ANTENNA
MANUSCRIPT

VA3ZNW Helical Antenna for the 20- meters

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Antenna Manuscript

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Book prepared by VA3ZNW

www.antentop.org

Richmond Hill, Canada,

2016

FOREWORD…….

My friends a new book from ***AntenTop Magazine*** is before you. The book is named ***Antenna Manuscript*** and devoted, of course, to antennas. You might ask me, OK, there are lots books on antennas around, why this new one is published and who needs the book…

Well, by the way it is not a real book. As you can see the title it is a ***Manuscript***. It is like a notebook where lovely schematics are redrawn by a ham.

Many of old timers still remember the golden days of Radio when there were no internet and printers and only printed magazines were circulated. At the times lots of amateurs had thick notebook with schematics and sketches that were drawn by hand from some magazines, books and just from rag conversation on the amateurs Bands. The notebook also kept some photos with ham schematics and letters from other hams with describing of antennas, ham equipment and pages with rules of the nearest contests… All time the photos, letters, pages fell down from the notebook… and they are lost under the table… it was not funny but it was real ham life. This notebook was the most valuable source of information in the shack.

So before you it is the same old notebook. It is not a Super Book with formulas and tons information. It is not a textbook. It is just a variant of old good notebook with informal information on antennas that may be useful for all amateurs. All of the information was taken from ***AntenTop Magazine*** and included practical designs proved by others amateurs. Because of the modern technologies I do not redraw the schematics from the site I just used my computer to create this notebook. Because of the modern technologies I may share the notebook, the ***Antenna Manuscript***, with you and with the all amateurs over the World.

Antenna manuscript is a special amateur book. You may open this one on any page and begin reading. Magic of antennas enchanted you. It is just like a reading of a detective book. You will find antenna design that you would like to do or just ideas about antennas suitable for your location. ***Antenna Manuscript*** helps you find antenna for apartment, for cottage, for small townhouse and a separately house, gives ideas on expedition antennas. There are only described simple antennas that are not required lots experience in tuning, costly tools, hardware stuff or costly control equipment. Anyway the ***Antenna Manuscript*** helps you go in the Air from almost any conditions. ***Antenna Manuscript*** is ***one more brick*** in your antenna fundament.

In conclusion: always all books from the ***AntenTop Magazine*** are free. You may download the ***Antenna Manuscript*** to your computer and share the book with fellow amateurs. You may print the ***Antenna Manuscript*** if you like it. I have loaded the ***Antenna Manuscript*** to

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so you may get printed version of the book for good price. Small amount from the book will go to support www.antentop.org . Thanks to all who ordered the ***Antenna Manuscript***.

Wall of the Book

Antenna Manuscript: One more Brick in Your Antenna Fundamentals

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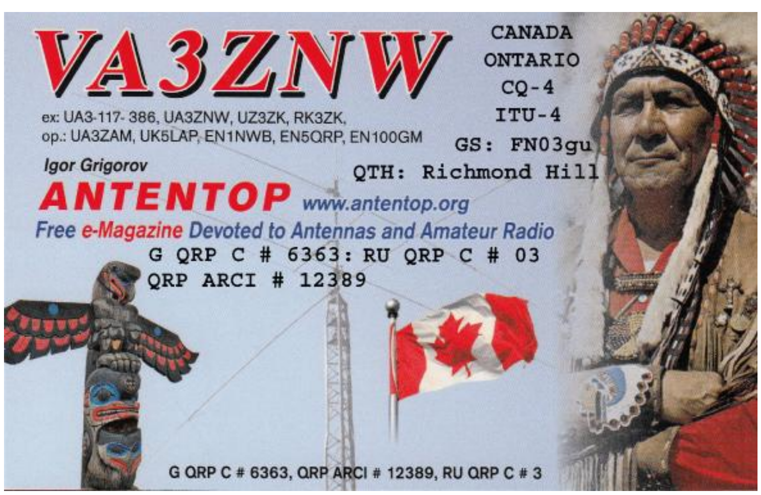
Chapter 10: ATU and RF Transformers



Thanks to our Contributors!

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RU4SJ	*UA9JKW*	*EW6BN*
R2DHF	*UA3AJO*	*VA3ZNW*
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RN9AAA	*K2MIJ*	*UA4HAZ*
UA9XBI	*UR0GT*	*WB4ENE*
RU3ARJ	*US4EM*	*RA3ARN*
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DL1BA	*RW4HFN*	*RA4NF*
UA6AGW	*R3PIN*	*RU1OZ*
RZ3DK	*UB5UG*	*RZ9CJ*
UA4QA	*UP2NV*	*R7AA*
RK3DL	*UA6HJQ*	*UU9JEW*

CHAPTER 1

Beverage Antenna

Beverage Antenna…It is most simple and reliable antenna that works without ATU at all HF amateur bands. Beverage Antenna is very simple for making. Any ham with no experience in antenna installation could make the antenna. Beverage Antenna does not require any tuning. So you do not need costly equipment for antenna tuning and adjusting. Beverage Antenna does not copy static electricity and it is practically safety (I nave newer problem with this) at lightning period. Beverage Antenna provides good reception. Stuff for making the Antenna is very inexpensive.

If you do not know yet what kind of antenna should you chose and you have enough space- without any doubt install a Beverage Antenna. With the antenna you will start explore all HF bands in the Air. Then you may think about another good antenna (that will require much more money and time for installation) for your favorite bands.

What do you need for Beverage Antenna? Main is space. If you have enough room rest you may find in junk box or buy for small money. You need wire (any shop like WALLMART or ever DOLLARAMA). You need RF transformer 50/300- Ohm- it is possible remade LDG Balun or use YOKE core from scrap monitor for the transformer. You need load resistor- you may make it from 2-Wtt resistors that possible buy on e-bay… Everything is very easy to find and cheap in price.

So, go to ***Chapter 1*** and know more about practical doing Transmitting Beverage Antenna.

Do not hesitate, transmitting Beverage Antennas used to in US and Russian military forces!

The Wonderful Beverage Antenna

- *What antenna do you use?*

- A Beverage antenna.

- *A Beverage antenna? What is it?*

- Well, it is just a very, very long wire…

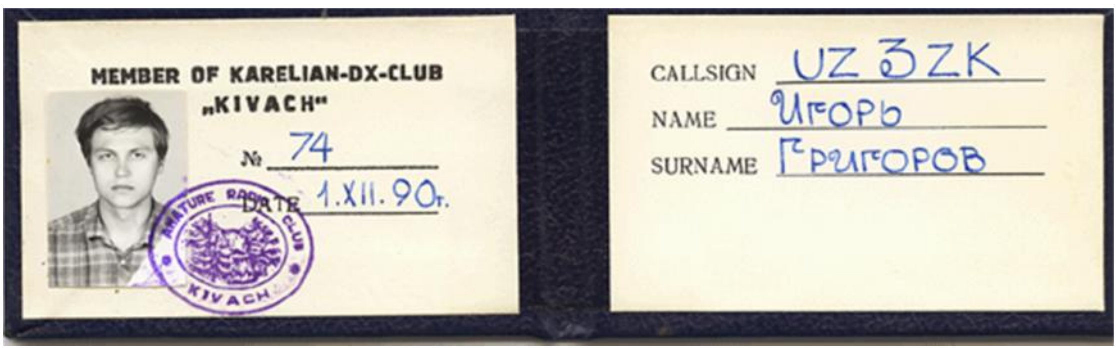
(From lots QSOs of EK1NWB)

By: Igor Grigorov, UA3ZNW

Credit Line: Express info K- DX- Kivach # 20/52, 15.10.1991

*Published with a little cutting

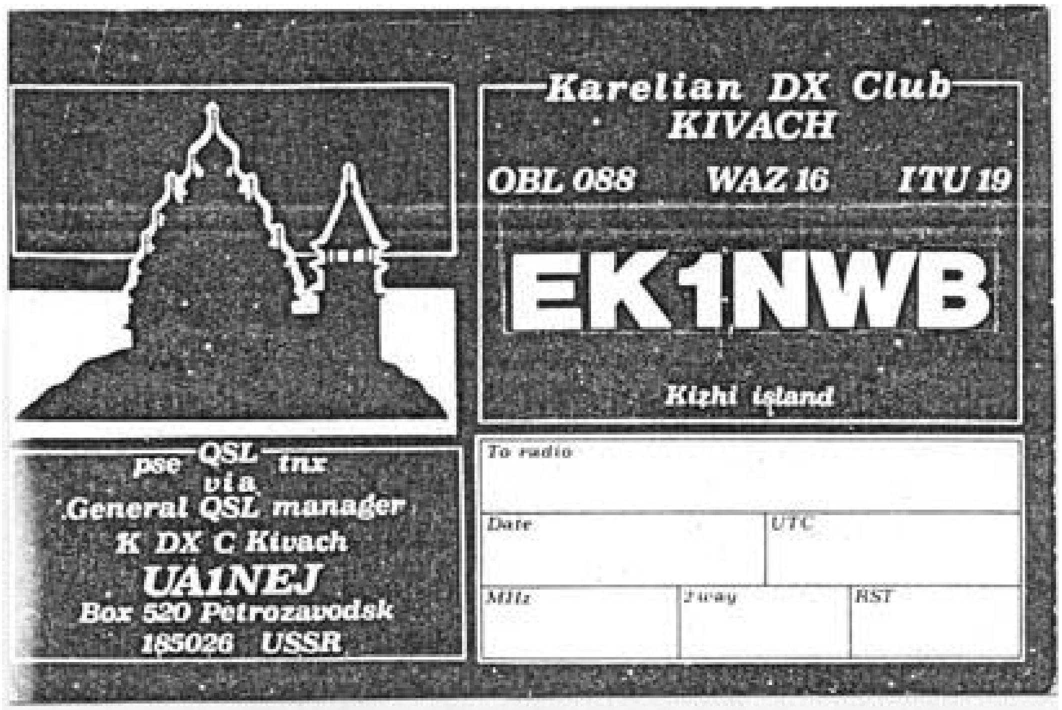
EK1NWB Prehistory: In 1991 (how it is far from that time!) the Karelian DX-club Kivach has organized DX -expedition to Kizhi Island, which is located in Onega Lake. I was a member of the club, so I with pleasure took part in the expedition. The DX- expedition took place from July 24 till August 8, 1991.



Membership card of K- DX-C
Issued for my new call UZ3ZK

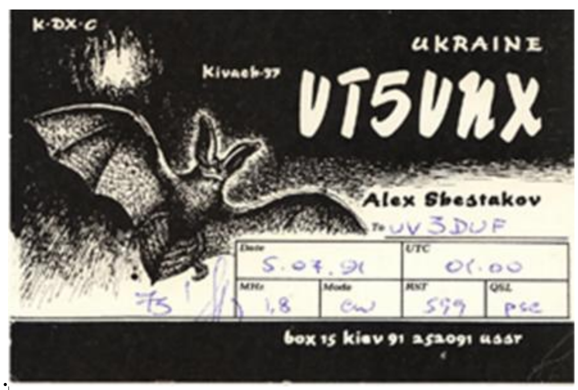
Landing: The first group of 6 hams was landed to Kizhi Island near 8.00 p.m. of July 24, 1991. After we had moved almost 1000 kg (2200 pounds) of our stuff to the site of our expedition, it was approximately 2 kilometer from the landing place we have begun to set up tents. Then UA1NDR and UV3VJ did connection to an emergency electrical power main of the local Fire Service. At last, by to 00.00 a.m. our tents were installed, we had 220 Volts inside the main tent, our equipment was ready for operation, but we had no antennas…

Main tent EK1NWB
(Old Military Tent)



QSL CARD of EK1NWB
Printed in Belgorod by one of the Sponsor of the DX- Pedition, Joint- Stock Company Progress

The First Antenna: Before the DX- pedition we were discussed what antenna would be the first. I offered Beverage Antenna. It was very easy to install, it can work at all amateurs HF- bands and I already had been used the antenna at my station UA3ZNW for 2 years. Almost ten minutes prior the boat had gone to Kizhi Island, UA1NCR has brought a transformer 50/300-Ohm (coiled on a ferrite ring from a color 27" TV) and UA1NDJ has brought a load for the Beverage. It was a numerous quantity of 18- k0m resistors soldered in bridge. The load had 350 Ohm overall. UT5UNX, who was with us, had a bay of wire, which was used for the Beverage Antenna.



QSL Card of UT5UNX

The Load of the Beverage

The Transformer of the Beverage

Installation of the Beverage Antenna:
So, after night supper, it was at 01.00 a.m., at dim light of polar night, me UA3ZNW and UA1NEQ with UV3DUF begun to install the Beverage. We put near 200 meters of wire in straight line to South-West. The wire was sitting at 0.7- 1.5 meters above the ground. Bushes, small trees and dry sticks were supported the wire.

At the feeding end we did grounding to an old steel mast which ten years ago was held antennas for the Fire Service. Now the mast was unused by the Fire Service. At the load end we installed artificial ground, 6- lambda/4 counterpoises for 10, 15, 20, 30, 40 and 80 meters. At all of the bands, as well as at 160 meter Band, the Beverage Antenna had SWR better the 1.5:1.

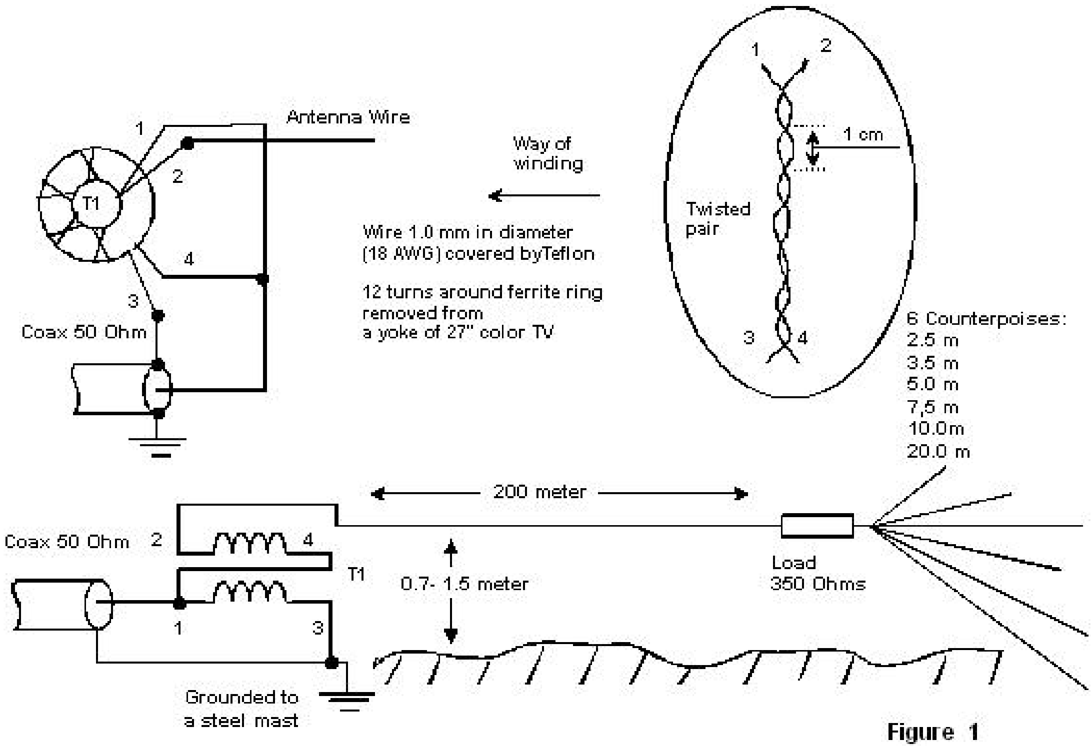
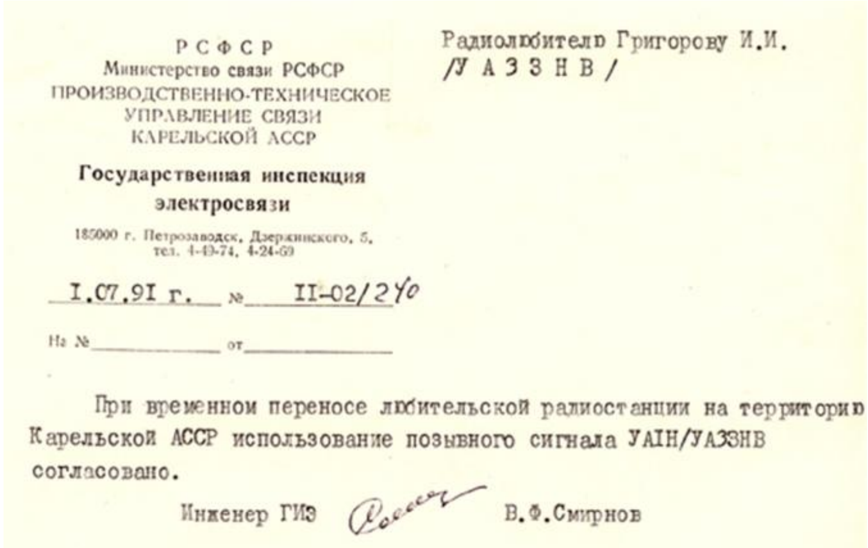


Figure 1 Beverage Antenna



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/УА3ЗНВ/

I.07.91 г. № II-02/240

На № ______ от ______

При временном переносе любительской радиостанции на территорию Карельской АССР использование позывного сигнала УАIН/УА3ЗНВ согласовано.

Инженер ГИЭ В.Ф.Смирнов

Permission to use callsign UN1/UA3ZNW

The Beverage Antenna on the Air: At 2.00 a.m. EK1NWB began the operation on the Air. 160, 80, 40 meter – at all of the bands we had received good RS in both sides. Morning came, came opening at 20, 15 and 10 meter. Again, we had received good RS in both sides. The Beverage Antenna worked well, worked despite of openly expressed scepticism of some members of the DX- expedition…

Comparison of Real Antennas with the Beverage: Later we had installed "Real" HF- antennas, there were double squares for 20-15-10 -meter, a vertical for 10- 40-meter, two I.V. for 80 and 160-meter. Some members of the expedition believed that the antennas did the trick.

Kizhi. Inside the main tent. 02.00 am, July 28, 1991

But… through some times, it was happened that we had noticed that very often the Beverage Antenna worked better the "Real" antennas. It was impossible to explain however lots members of the pedition preferred the Beverage Antenna rather than the "good antennas". I do not know, why the Beverage Antenna could beat such efficiency antennas, may be it is effect of the North propagation…

End of the Beverage Antenna: In a week, at light polar night, UV3VJ had cut off counterpoises for 80 and 40 meters from the Beverage. He had explained that he needs the wire for inclined dipoles for 30 and 17 meters. Well that, inclined dipoles made by him were good done and had SWR 1:1. But only nobody answered on these good dipoles. We continued to use for 30 and 17 meters the Beverage. The useless dipoles were swing by wind and gave us feed for evening discussion – Why the dipoles did not work at all but the Beverage Antenna worked fine.

Installation of the Square for 10- 15- 20-meters

Kizhi. Special Stamped Envelope

The Beverage SWR was raised to 1.8:1 at 160, 80 and 40- meter after cutting off the counterpoises. Anyway the Beverage worked perfect on these ranges. In next week a herd of Gipsy horses, which were rushing through the island, destroyed the Beverage.

Results of the Beverage: Well, what is possible to say about the Beverage? Certainly, we had mentioned the small efficiency of the Beverage at transmitting mode at low HF- bands- 160 and 80 (and sometimes 40-m) meter. But on the upper HF- bands 30- 10 meter the Beverage Antenna worked very well. Sometimes the Beverage Antenna worked better the double squares for 20-10-meter. Certainly, it is only subjective opinion of the members of our expedition. All members the pedition were agreed, that the Beverage should be used at next peditions.

P.S: Some readers familiar with the history of the USSR have paid attention for the date of our expedition. It was before August putsch 1991, after which lots changes came…

Kizhi. Windmill

Moscow, August 1991

Moscow, August 1991

Universal Beverage Antenna

Igor Grigorov, VA3ZNW, Richmond Hill, Canada

Beverage Antennas are widely used at commercial and military radio communication. In commercial communication Beverage Antenna as usual is used as a receiving antenna. However, in military communication Beverage Antenna is used for both purposes- for receiving and transmitting applications. Transmitting/receiving Beverage Antenna was used in DX- Pedition EK1NWB on to Kizhy island (the antenna described at: http://www.antentop.org/008/ua3znw008.htm) where the antenna (against skepticism of some persons) illuminated its good job.

So when again I have changed my QTH (move from Toronto to Richmond Hill) and at the QTH it was place for Beverage Antenna I did not hesitated take it.

Beverage Antenna has lots advantages that attractive me. ***First***, it is low noise receiving antenna. At all my previously settled QTHs I had so devastated noise level that 160 and 80 meter Bands were closed for me. ***Second***, Beverage Antenna is lighting and static safety antenna because the antenna wire grounded from both sides and the antenna wire is placed at small height above the ground. ***Third***, Beverage Antenna is sustained at strong winds and ice rain- that is very important for Canadian winter.

Forth, Beverage Antenna is (at proper installation) practically invisible. That is very important in the place where some antennas may be restricted. ***Fifth***, Beverage Antenna is very broadband antenna. Without any ATU the antenna may have good SWR on all amateur HF Bands from 160 to 6 meter. ***Sixth***, Beverage Antenna has single lobe diagram directivity. However it is possible count again and again the advantages of the Beverage Antenna…

But we begin count disadvantages. ***First and the main*** lack of the antenna is the low efficiency at transmitting. However, the lack may be easy improved with PA- but if you do not hear anything (usual matter in modern city overloaded by electromagnetic smog) you do not need PA…

Figure 1 shows a Classical Beverage Antenna. Beverage Antenna consists of a horizontal wire with length L. The length may be from one-half to tens wavelength long. The wire suspended above the ground at height H. For real receiving antennas the height may be vary from 1.5 up to 5.0 meter. For military transmitting Beverage Antennas the height may be vary from 0.5 up to 1.5 meter.

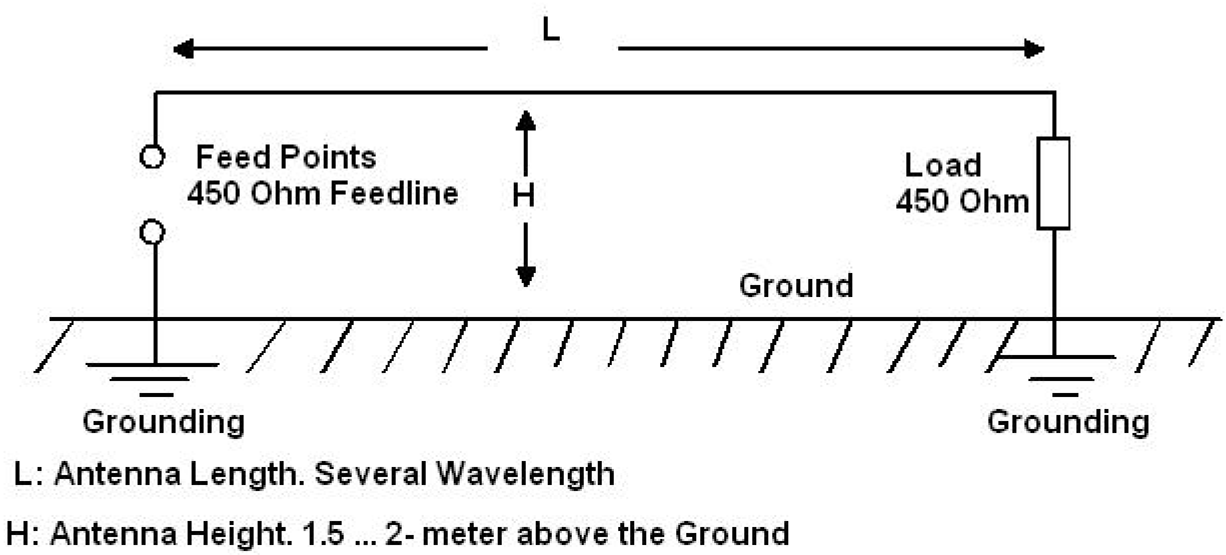


Figure 1 Classical Beverage Antenna

Receiver/transmitter with the feedline is attached to one end and the other terminated through a resistor (300- 600 Ohm) to the ground. The value of the resistor should be equal to the wave impedance of the transmission line that created by the antenna wire and the ground under the wire. So, optimum value of the resistor depends on the height the wire above the ground and diameter of the wire. Beverage Antenna has SWR close to 1.0:1.0 in a wide spectrum of the radio frequency band when the optimum value resistor is used and the antenna fed through line with impedance that is equal to the wave impedance of the antenna.

Beverage Antenna has practically unidirectional radiation pattern (small back lobe of course is present) with the main lobe directed to the resistor-terminated end. The wide of the lobe depends on to ratio “used frequency: antenna length.” I believe that the paragraph gave enough theoretical knowledge to build a Beverage Antenna.

Figure 2 shows Beverage Antenna that I have installed at my backyard. My Beverage antenna was 20- meter in length. The length was specified by the fence. Antenna wire was stapled to the fence. I used to a 16- AWG (1.3- mm) wire in strong black plastic insulation. The wire was bought at sale at Home Depot- 22 cent/meter. The wire used for electrical applications. The antenna wire was placed at height 1.8- meter above the ground. Height of the fence defines the height. Theoretical value of the wave impedance of my antenna was close to 500- Ohm. It is allowed me use 450- Ohm terminated resistor and transformer 1:9 to feed the antenna through coaxial cable RG8X 50- Ohm. At my case the cable had length in 50 feet. At both end sides the Beverage Antenna had RF and electrical grounding.

Below we discuss all parts of the Beverage Antenna.

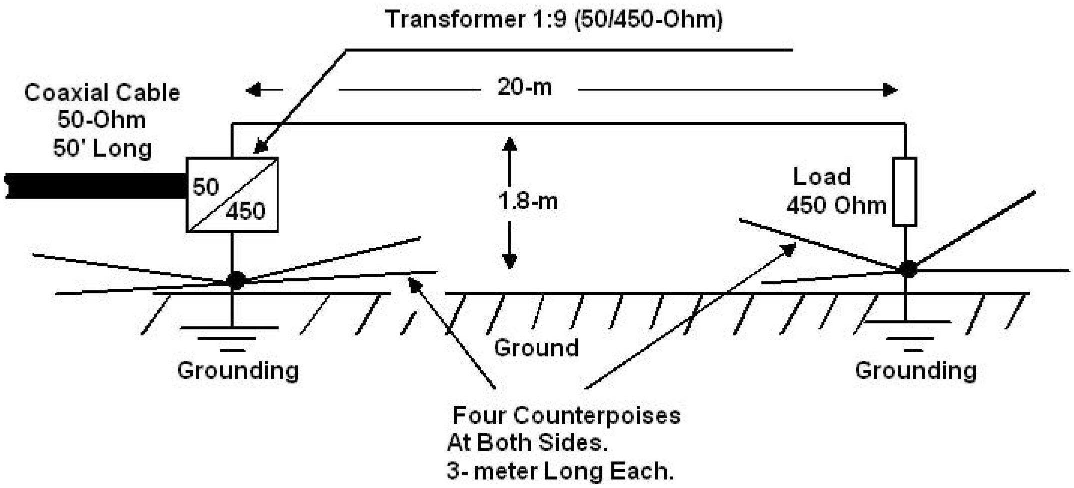


Figure 2 Practical Design of my Beverage Antenna

Terminated resistor of the Beverage Antenna

I need termination resistor for my Beverage Antenna. It should be 450- Ohm, non-inductive, 20… 50-W Broadband termination resistor. Power of the resistor depends on output power of used transmitter. The resistor may dissipate up to 50% of the RF power going to the antenna. It is not a problem to buy such resistor online in the internet. However, the chipper one costs $ 50.0 USD. I decided make the termination resistor by myself. I have bought a kit with 25 e.a. usual 4.7-kOm/2.5-W metal resistors for $ 5.0 USD on e-bay. Eleven such resistors switched to bridge have resistance 440- Ohm. **Figure 3** shows the home- brew termination resistor. 25 cent coin is placed beside the termination resistor. Dissipative power of the resistor should be 27.5- W. However my experiments show that the resistor could stand at least 50- W for a short time.

So, the Beverage Antenna may work with transmitter with output power 100- W on CW and SSB mode.

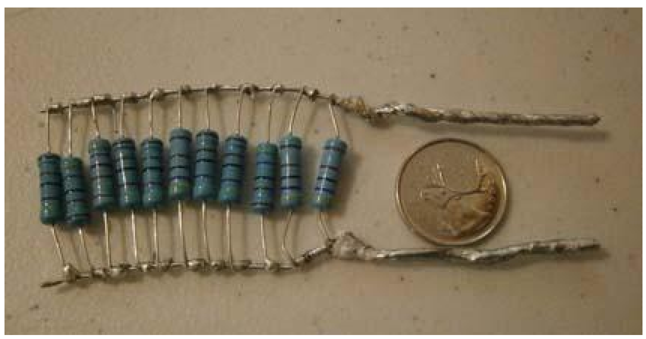


Figure 2 Practical Design of Home- Brew Termination Resistor

Transformer of the Beverage Antenna

Transformer of the Beverage Antenna is one of the important parts of the antenna. Transformer should work at all frequency range of the antenna. Transformer should stand power going to the antenna.

It is preferably use to transformer with insulated windings for any Beverage Antenna. **Figure 4** shows Beverage Antenna with transformer with insulated windings. Such transformer provides electrical insulation the antenna from transceiver that causes less noise from electrical interferences and provides additional protection of the transceiver from lightning discharge. However to make such transformer is not an easy task. Thereof I used unsymmetrical RF transformer 1:9.

Figure 5 shows schematic of classical unsymmetrical RF transformer 1:9. The transformer made with a triple wire winded across a ferrite core. It may be a ferrite ring or ferrite rod. Transformer may contain 7-… 15 turns.

Quantity of turns depends onto size and permeability of the ferrite core and frequency range of the antenna.

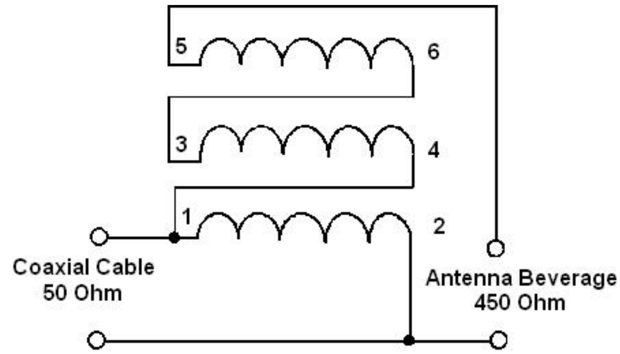


Figure 5 Schematic of Classical Unsymmetrical RF Transformer 1:9

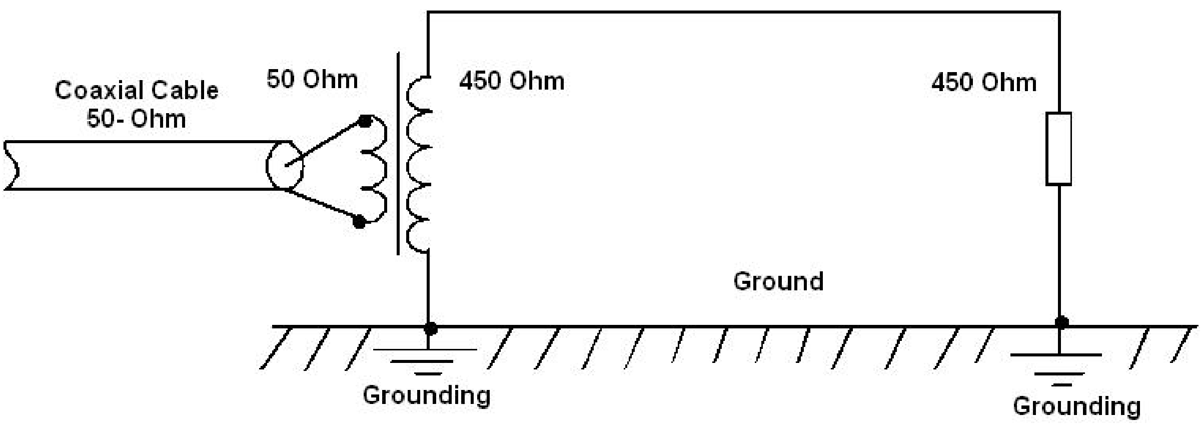


Figure 4 Beverage Antenna with Transformer with Insulated Windings

My first experimental RF transformer 1:9 was made on TV Yoke's ferrite ring. **Figure 6** shows the TV Yoke. I removed wires from the yoke. Then the ring was wrapped by black vinyl insulation tape. Unsymmetrical RF Transformer 1:9 was made according to the **Figure 5**. Transformer contained 8- turns of usual electrical wire. **Figure 7** shows ready Unsymmetrical RF Transformer 1:9 on TV Yoke. The transformer was tested. At the beginning the transformer was tested with usual metal resistor in resistance 440 Ohm. **Table 1** shows data for transformer made on Yoke Core loaded to Resistor 440 Ohm, the measurements made by MFJ- 259B. **Table 2** shows data for the transformer made on Yoke Core loaded to home brew Resistor 440 Ohm (shown at **Figure 3**), the measurements made by MFJ- 259B. The home brew resistor has some reactance that clearly seen from the two tables. MFJ- 259B does not indicates the character of the reactance (capacitance or inductive) so I used sign "@" at the reactance.

Figure 6 TV Yoke

Table 1 and **Table 2** show that the transformer works well at 160- and 80- meter Bands, fair at 40- and 20- meter Bands and bad beginning from 17- meter Band. Of course it is possible play with quantity of the turns but anyway it should be difficult to make a real broadband transformer that covers 160- 10- meter Bands. So I gave up attempt to use RF transformer on TV Yoke core at my Beverage Antenna.

In my parts box there was a symmetrical Balun from LDG. **Figure 8** shows the Balun. Some time ago I experimented with this Balun. However for that time it just took place in the box waiting for a new application. Time is come. The Balun had strong plastic cabinet with socket SO- 239 on it from one side and two terminals (for antenna and for ground) at another side.

Figure 7 Unsymmetrical RF Transformer 1:9 on TV Yoke

Table 1

Transformer made on Yoke Core. Loaded on to single resistor 440 Ohm. Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	48@j5	45@j4	35@j1.4	27@j1	19@j11	13@j29	11@j40	9@j54	6@j69
SWR	1.1	1.1	1.4	1.8	2.5	4.3	6.7	9.1	12.4

Table 2

Transformer made on Yoke Core. Loaded on to eleven 4.7-kOm resistors switched to bridge (440 Ohm overall). Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	49@j4	44@j6	31@j3	23@j2	15@j17	10@j33	10@j41	6@j61	5@j70
SWR	1.0	1.1	1.5	2.0	3.0	5.7	7.9	11.7	14.4

A ferrite ring was inside of the Balun. The sizes of the ring were suite for transformer 1:9 that could stand 100- W RF power going through. It was not hard to rework the Balun to unsymmetrical RF transformer 1:9. Additional wire in Teflon insulation was placed between turns of the Balun. Then the wires were connected according to **Figure 5**. **Figure 9** shows the unsymmetrical RF transformer 1:9. The transformer was tested. **Table 3** shows data for the transformer loaded to Resistor 440 Ohm, the measurements made by MFJ- 259B.

Figure 8 Balun RBA- 1:1 from LDG

Table 4 shows data for the transformer loaded to home brew Resistor 440 Ohm (shown at **Figure 3**), the measurements made by MFJ- 259B. As you can see the transformer works well from 160- to 10- meter band. It is possible play with quantity of the turns to move low SWR up or down inside the 160- 10- meter Band. However, I did not do it and leaved things like this.

Figure 9 Unsymmetrical RF transformer 1:9 on the Base of Balun RBA- 1:1

Table 3

Transformer made on LDG Balun Core. Loaded on to single resistor 440 Ohm. Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	42@j17	48@j8	45@j3	40@j3	35@j3	31@j8	29@j12	29@j17	27@j29
SWR	1.5	1.1	1.1	1.1	1.4	1.6	1.8	2.0	2.4

Table 4

Transformer made on LDG Balun Core. Loaded on to eleven 4.7-kOm resistors switched to bridge (440 Ohm overall). Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	43@j15	47@j7	42@j4	37Z@j4	31	27@j5	24@j10	23@j16	23@j21
SWR	1.4	1.1	1.2	1.3	1.6	1.8	2.1	2.5	2.8

Grounding of the Beverage Antenna

Right grounding of the each sides of Beverage Antenna is not a simple task. For example, at Receiving Centers of ex- USSR the grounding of Beverage Antenna was made by 10- 15 radial wires that were dig on to depth 20- 40-cm into the ground. It was good RF and electrical grounding. But it was not for me. I made simplified grounding. The grounding consisted of two parts (see **Figure 2**).

One part was ***RF grounding***. The grounding made suction of RF currents from the antenna wire. There were four wires in length 3- meter each. For grounding I used the same wire that for Beverage Antenna. The wires were dig on to depth 5- cm into the ground.

Another part of the grounding there was ***electrical grounding***. Electrical grounding allows static electricity flow from the antenna wire to the ground. As well the grounding increases the safety of the Beverage Antenna at lightning time. Antenna works quiet on to receiving with electrical grounding. **Figure 10** shows design of the electrical grounding. To make the grounding I used two copper strips (it was Copper Strapping from Home Depot) in length 3- feet and five copper tubes in length one foot each. The stuff was soldered according to the **Figure 10**.

I used a Compact Bernzomatic Butane Gas Burner for soldering. **Figure 11** shows soldered grounding. **Figure 12** shows grounding at the antenna (feeding side). Ditch in depth near 5- cm was made in the place of the copper strip. The strips were placed into the ditches. Copper tubes were hammered into the ground. After that a batch of earth (with grass seed) was covered the electrical grounding. Grass already covers my grounding.

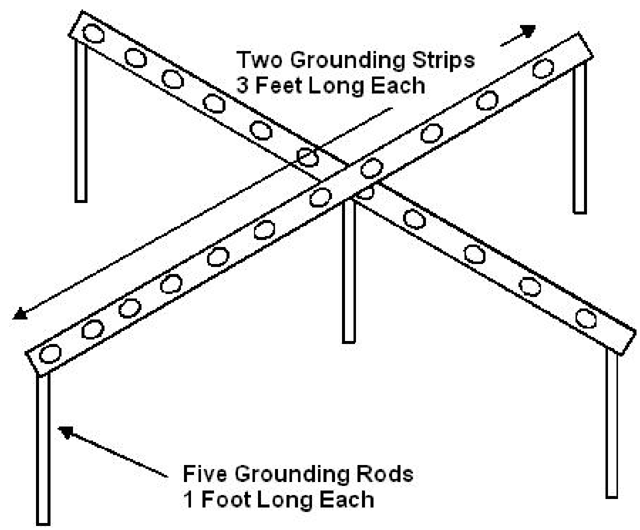


Figure 10 Design of the Electrical Grounding

Figure 11 Soldered Grounding

Design of the Beverage Antenna

Wire of the Beverage Antenna was stapled to the wooden fence. **Figure 13** shows stapled wire.

Termination resistor and transformer of Beverage Antenna were placed into food plastic boxes.

The boxes were chosen to fit the resistor assembly and transformer. **Figure 14** shows termination resistor in open plastic food box. **Figure 15** shows transformer in open plastic food box. Each box was closed by cover.

Then several turns of a vinyl plastic tape (I used electrical tape for outdoor application that should work at temperature range: – 20 C to + 60 C) were coiled above the cover. **Figure 16** shows termination resistor in closed plastic food box. **Figure 17** shows transformer in closed plastic food box. Coaxial cable is going to basement through a window with plastic insert. The insert made from soft foam. **Figure 18** shows the plastic insert on the window. Near entry of the cable to the plastic insert the coaxial cable was coiled in a small coil. The coil was an RF Choke that closed way for stray RF currents inducted to outer jacket of the coaxial cable to the transceiver. Also the choke gave additional protection from lightning. **Figure 19** shows the RF choke.

Figure 12 Grounding at the Antenna

Figure 13 Stapled Wire of Beverage Antenna

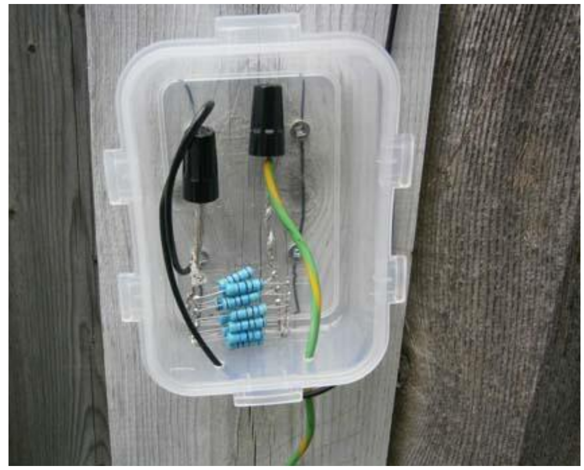


Figure 14 Termination Resistor of Beverage Antenna in Open Plastic Food Box

Figure 15 Transformer of Beverage Antenna in Open Plastic Food Box

Figure 16 Termination Resistor of Beverage Antenna in Closed Plastic Food Box

Figure 17 Transformer of Beverage Antenna in Closed Plastic Food Box

Test of the Beverage Antenna

At first I have measured SWR of the Beverage Antenna with help of MFJ-259B and with internal SWR- meter at IC-718. **Table 5** shows SWR of the Beverage Antenna measured with help of MFJ-259B. **Table 5** shows SWR of the Beverage Antenna measured with help of internal SWR- meter at IC-718. Data for MFJ- 259B a little differ from data obtained with internal SWR- meter at IC-718. It happened because at antenna wire there is some stray RF voltage receiving from different radio stations. The RF voltage add some errors to the reading SWR by MFJ-259B. In this case data obtained from the internal SWR-meter of IC-718 are close to the truth.

My Beverage Antenna has direction to Europe and East Cost of the USA. Antenna works perfect. Low bands 160 and 80- meter come to live. It was very good reception at all HF bands from 160- to 10 meter.

Figure 18 Plastic Insert on the Window

Figure 19 RF Choke near the Window

I could hear ham stations from Europe and Asia at all HF Bands- 160- to 10 meters. Of course, I cannot say that about transmitting operation on 160- 40- meter bands. It is noticeable that some power lost into the termination resistor. However, at good propagation the Beverage Antenna works perfect on transmission at all HF bands from 160- to 10 meter.

Table 5

Antenna Beverage with transformer made on LDG Balun Core. Load: 4.7-kOm x 11 Resistors (440 Ohm overall). Length of the 50- Ohm Coaxial Cable to antenna is 50 Feet. Measurement by MFJ- 259

Band	160	80	40	30	20	17	15	12	10
Z	75@j8	57@j4	42@j11	43@j19	50@j21	39@j28	24@j35	24@j12	97@j65
SWR	1.5	1.1	1.1	1.5	1.5	1.9	1.9	2.1	2.8

Table 6

Antenna Beverage with transformer made on LDG Balun Core. Load: 4.7-kOm x 11 Resistors (440 Ohm overall). Length of the 50- Ohm Coaxial Cable to antenna is 50 Feet. Measurement by SWR –meter of ICOM- 718

Band	160	80	40	30	20	17	15	12	10
SWR	1.7	1.0	1.0	1.5	1.1	1.8	1.8	2.0	2.9

Modified Beverage Antenna

By: Igor Grigorov, VA3ZNW

I took the decision. At last! I took the decision to participate in CQ- WW- 160- Meter Contest. My setup for the Contest was IC- 718 and Beverage Antenna described at Antentop- 01, 2015 (http://www.antentop.org/019/va3znw_019.htm). The antenna had termination resistor 450- Ohm/25- W. It allowed me run the IC-718 on 50- W without damage to Beverage's termination load. So I decided participate in the Contest in category "Low Power (up to 150- W) Single Operator."

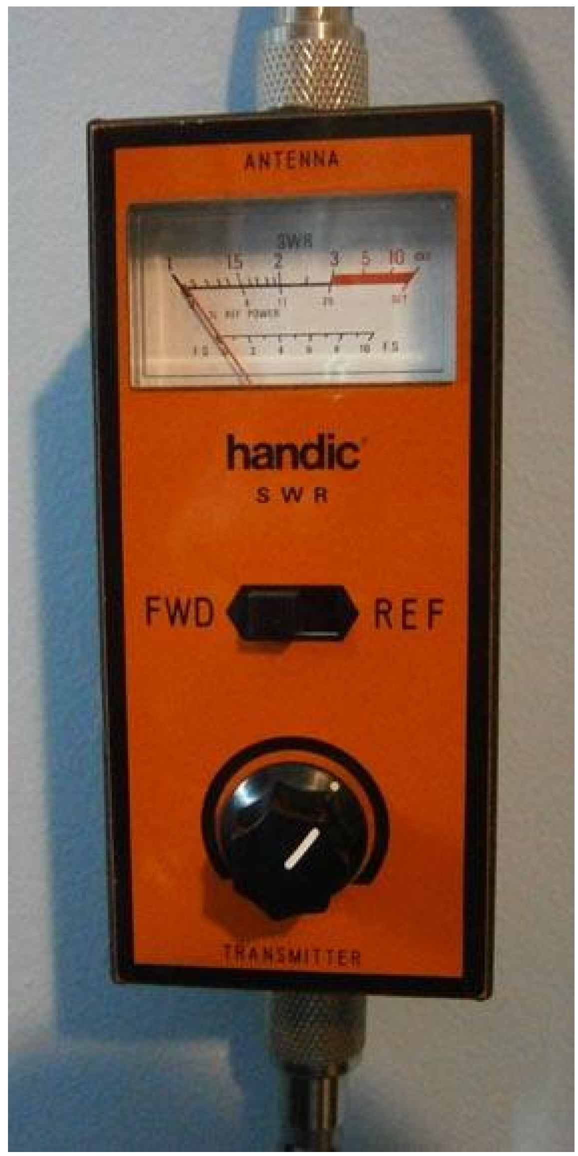
Finally Friday -29 (2016) came in. Of course, when I came home from my job I did not run to the transceiver like a crazy rabbit. I would like do contesting for my pleasure not for big result.

However my transceiver was turned on. CQ TEST from USA stations blown up my headphones. I worked several hours in the test and discovered that the 50- Watts is too little to be heard. Then I took another decision. I increased output power up to 100- watts (96- W actually). It gave result. Contest stations begun to answer me in much better way (or it was seems to me…).

I was known that termination load at Beverage Antenna could not stand 100- watts for a long time. However I kept hope that frost (it was minus 7 C degree) and wind (feels like minus 15 C with wind) cool down the load. For some times the cold weather hold situation under control. But… Suddenly SWR became floating. At every key down antenna current became floating too. Finally at the end of a short contest QSO the SWR –meter of the IC- 718 showed infinity. It was happened what I waiting for. Termination Load at the end of my Beverage antenna was burned out.

I took a break in my contesting. I expected the situation so I acted on to my plan. It was interesting for me how the Beverage antenna with burned load (anyway, it is already not a Beverage antenna it is low profile wire antenna) would be worked at the other bands. I made measurement of the antenna with help of SWR- Meter of the IC- 718 and with help of MFJ- 259B. **Table 1** shows SWR of the Beverage antenna with burned load measured by IC- 718.

Note: I use to a Japan made wall mounted SWR –Meter (***Handic*** brand) constantly turned on to the antenna cable. As usual I use to the SWR meter to measure antenna current while transmitting. However seldom I use the SWR- Meter to measure SWR in my antenna (to prove the IC- 718 internal SWR- Meter). Sometimes I used FSM function at the SWR- Meter.



Japan made SWR- Meter HANDIC

Table 2 shows SWR of the Beverage antenna with burned load measured by MFJ- 259B. MFJ- 259B does not indicates the character of the reactance (capacitance or inductive) so I used sign @ at the reactance.

Modified Beverage Antenna

As you could see from the tables the Beverage antenna with burned load (anyway, it is already not a Beverage antenna it is low profile wire antenna) became problematic to match with the transceiver at several bands, 160- meter was included.

Table 1

Beverage Antenna with LDG Transformer without Termination Load. Length of the 50- Ohm Coaxial Cable to antenna is 50'. Measurement by IC-718

Band	160	80	40	30	20	17	15	12	10
SWR	15	3.2	2.5	3.2	1.8	2.8	2.5	2.8	1.8

Table 2

Beverage Antenna with LDG Transformer without a Termination Load. Length of the 50- Ohm Coaxial Cable to antenna is 50'. Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	9@j44	9@j30	21@j30	38@j56	27@j28	38@j50	100@j60	17@j8	114@j33
SWR	5.6	4.6	2.7	2.9	2.9	2.9	2.8	3.0	2.4

It was obviously at the reception. I heard lots electrical noise, radio stations fall down especially it was at 160, 80 and 40- meter bands. Anyway I attempted to restore my antenna back to Air. Simplest way was to use an ATU. I have MFJ VERSA TUNER II. In minutes the ATU was switched between transceiver and antenna cable. But nobody answered me. Electrical cracks and electrical noise was very strong and hindered to the reception. I had matched only antenna cable to my transceiver not the antenna wire with cable. ATU could not help me in the situation.

MFJ VERSA TUNER II at my Station

So I need to restore the antenna in right way. Right way was to install a new termination resistor. However I had not a new one good non- inductive termination resistor. I had only a termination resistor made of from 10 wire- wound resistors on 4k7 that were connected to bridge. The load had 450- Ohm at DC.

Termination Load on the Base of the Wire Wound Resistors

Wire Wound Resistor

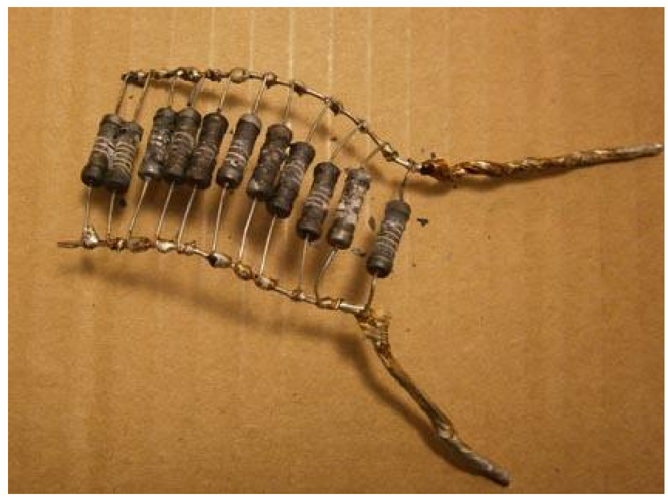
The type of wire wound resistor is used for DC current limitation circuit and it is not intended for RF application. The resistor has some significant reactance at RF. However the resistor has 5- Watt of dissipation power. So termination load contained 10 such resistors could easy stand 50- Watts. At my experimenters such one resistor could stand dissipation power up to 20- Watts. Resistor was very hot but not burned. Well then I could not worry about my 100 Watts going in to antenna. It was interesting for me how may work the Beverage antenna with termination load made on the base of wire wound resistor. Anyway only experiment could show me the result. I took flashlight put on coat and went with the new load to my antenna.

In spite of cold (minus 7 C degree, minus 15 with wind) and snow it not took long time to change burned termination resistor to a good one. In my Beverage Antenna the antenna wire and ground wire are connected to the termination load with help of an electrical automotive screw (bought it in Home Depot). So it took for me a moment to change the load.

If you look attentively at the burned load you may see that resistors from the load were burned out not evenly. Some resistors have burned out resistive lay in length in 1- 2- mm across them. Other resistors are almost black with burned resistive lay in circle or two circles of the resistors. There are completely burned out resistors. It is typical condition of a burned termination load of a Beverage Antenna. Below is explanation why it is in this way.

When termination load is overloaded at the beginning electrically weak resistors are burned out. At the next key down RF voltage at the antenna end would be increased (because some resistors are opened and summary resistance of the termination load is higher the 450- Ohm). Then it would be burned out the second parts of the resistors of the termination load. However while the voltage is increased the resistors are burned out more intensively. Then when we press key down the several live resistors would get to much RF voltage that finally destroyed at all the last live resistors. With each pressing down key the damage for live

Electrical Automotive Screw



Burned Termination Resistor

resistors would be sever compare to the first burned out ones.

I made measurement of the antenna with wire wound termination load with help of SWR- Meter of the IC- 718 and with help of MFJ- 259B. **Table 3** shows SWR of the Beverage Antenna with wire wound termination measured by IC- 718. **Table 4** shows SWR of the Beverage Antenna with wire wound termination measured by MFJ- 259B. MFJ- 259B does not indicates the character of the reactance (capacitance or inductive) so I used sign @ at the reactance.

Table 3

Beverage Antenna with LDG Transformer Loaded to Bridge of 10 Wire Wound Resistors (overall resistance: 450 Ohm). Length of the 50- Ohm Coaxial Cable to antenna is 50'. Measurement by IC-718

Band	160	80	40	30	20	17	15	12	10
SWR	1.4	1.0	1.2	1.1	1.0	1.5	1.4	1.6	2.2

Table 4

Beverage Antenna with LDG Transformer Loaded to Bridge of 10 Wire Wound Resistors (overall resistance: 450 Ohm). Length of the 50- Ohm Coaxial Cable to antenna is 50'. Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	72@j8	59@j8	38@j7	78@j7	38@j7	79@j5	28@j35	113@j15	20@j13
SWR	1.4	1.2	1.3	1.5	1.3	1.8	1.7	2.2	2.5

SWR was not so bad with the new termination load made on the base of wire wound resistors. I tried the antenna directly connected to IC-718. I was again on the Air. Clean sound was at the 160 and 80- meter Bands. Contest stations begin answered to me. My station was restored. However it was already 3.00- a.m. I went to sleep.

At the next day I decided change unsymmetrical RF Transformer that was used at my Beverage Antenna to transformer with insulated windings. At the times when I installed the Beverage Antenna I had no stuff to make the transformer with insulated windings.

However, at YORK REGION HAMFEST that was at 31- October, 2015, I bought butch of cables with ferrite ring on it.

Seller did not have any information for the cables and for the rings on it. However it was a good price and box with the cables jumped to my backpack. At home I found that lots of the rings had inner diameter in ¼ inch that allows me make an RF transformer with insulated windings with standard copper ¼ inch tube (because the rings it was possible inserted on the ¼ inch tube).

So at the day before evening with Contest I decided make transformer with insulated windings. I expected that the transformer would provide better matching of the Beverage Antenna with coaxial cable. As well transformer with insulated windings should decrease the electrical noise level. Anyway if the transformer would not good I may use my old transformer made on the base of LDG Symmetrical Transformer. You may find lots design of such insulated RF transformer in the Internet.

Note: For example, link at ANTENTOP to transformer with insulated windings:

http://www.antentop.org/019/Two%20Broadband%20Symmetrical%20Transformers%20_019.htm

Figure 1 shows design of the transformer with insulated windings. For the transformer it was used 10 ferrite rings and two length of copper tube in ¼ inch OD. Photo shows kit for making the transformer. I should say that at making the transformer I met some unexpected problem. I had short length (6- cm) of ¼ inch copper tube. I could insert the rings on the tube. I had another one length of copper tube (1- meter length) but I cannot insert the rings on it. The diameter of the tube was a little wide.

Of course it may be possible to decrease the diameter with Dremel but… I took the ring and went to Home Depot. It was wonderful for me that among the rolls of copper tube in ¼ inch OD I may found tubes on which I may inserted the ferrite ring as well I could not inserted the ring. So I took suitable tube roll with me.

Cable with Ferrite Ring on it

Note: At my job I did measurement the both copper tubes. Tube on which I may insert the ferrite rings had diameter in 0.248- 0.2495 inch.

Tube on which I could not insert the ferrite rings had diameter in 0.252- 0.255 inch. All dimensions were in the tolerance limits.

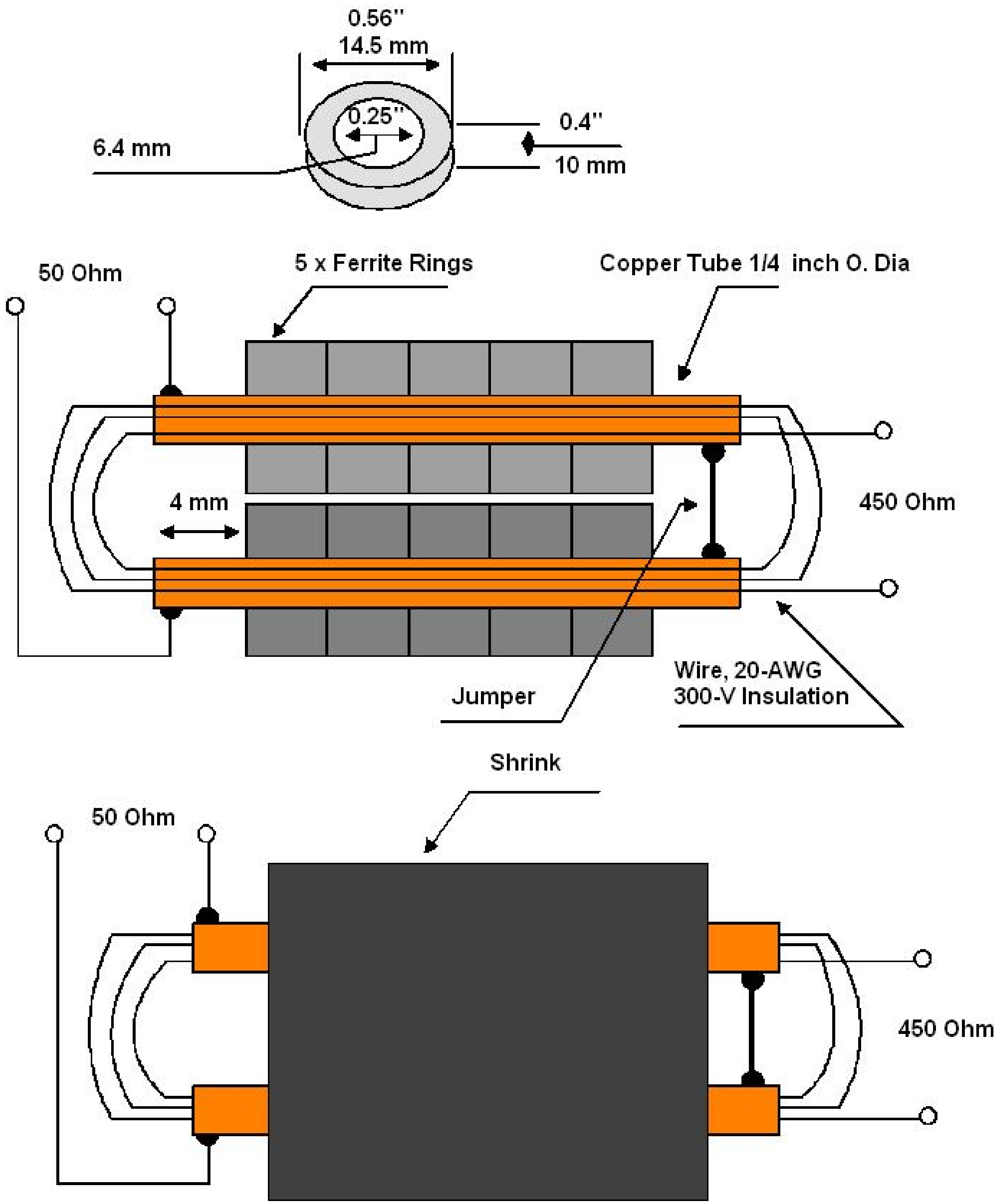


Figure 1 Transformer with Insulated Windings

Modified Beverage Antenna

Five rings were inserted on to copper tube in ¼ inch OD. At one side a jumper connected the tubes. At the other side a wire was soldered to the tubes. It was winding for coaxial cable, 50- Ohm. Three turns of insulated wire (300- V, 20- AWG) were inserted inside of the copper tubes. It was second winding, 450- Ohm, intended for Beverage Antenna. The transformer was covered by wide shrink that after thermal heating hold the rings.

Ready transformer was tested with small metal film 450-Ohm/ ¼- W resistor. **Table 5** shows data measured by MFJ- 259B. MFJ- 259B does not indicates the character of the reactance (capacitance or inductive) so I used sign @ at the reactance. It looks like the transformer was not optimal for the 160- meter band. Anyway I decided try it at the antenna. In 5 minutes I have the LDG transformer changed to Transformer with Insulated Windings.

Straight away I did measurement of the Beverage Antenna with Transformer with Insulated Windings. **Table 6** shows data for Beverage Antenna with Transformer with Insulated Windings measured by MFJ- 259B. MFJ- 259B does not indicates the character of the reactance (capacitance or inductive) so I used sign @ at the reactance. **Table 7** shows data for Beverage Antenna with Transformer with Insulated Windings measured by IC- 718.

SWR of the Beverage Antenna with the new transformer was good. For my opinion level of the electrical noise went down at all bands. The transformer with Insulated Windings worked well. Evening came to me and I turned on transceiver to the Test. The termination load worked in the final part of CQ- WW- 160- Meter Contest without burning. After Contest I visually checked the termination load. It looked like new. During the test I made 124 QSO, 33- US States and 3 Canadian Provinces. Not bad.

So at Beverage Antenna it is possible use termination load made on the base of wire wound resistors. It was surprisingly for me.

Ferrite Rings and Copper Tubes for the RF Transformer with Insulated Windings

Ready Transformer with Insulated Windings

Table 5

Transformer 2x5 Rings loaded to a Metal Film Resistor in 450- Ohm. Measurement by MFJ- 259B

Band	160	80	40	30	20	17	15	12	10
Z	33@j24	43@j14	44@j8	42@j6	40@j5	37@j5	35@j5	33@j7	32@j9
SWR	1.9	1.4	1.2	1.2	1.2	1.3	1.4	1.5	1.6

Table 6

Beverage Antenna with Transformer 2x5 Rings. Beverage Antenna Loaded to Bridge of 10 Wire Wound Resistors (overall resistance: 450 Ohm). Length of the 50- Ohm Coaxial Cable to antenna is 50'. ***Measurement by MFJ- 259***

Band	160	80	40	30	20	17	15	12	10
Z	84@j43	60@j14	37@j8	63@j29	37@j6	81@j13	50@j13	49@j12	53@j12
SWR	2.1	1.3	1.4	1.7	1.3	1.3	1.3	1.2	1.3

Table 7

Beverage Antenna with Transformer 2x5 Rings. Beverage Antenna Loaded to Bridge of 10 Wire Wound Resistors (overall resistance: 450 Ohm). Length of the 50- Ohm Coaxial Cable to antenna is 50'. ***Measurement by IC- 718***

Band	160	80	40	30	20	17	15	12	10
SWR	1.5	1.0	1.2	1.2	1.1	1.2	1.2	1.0	1.2

RF Transformer with Insulated Windings at the Beverage Antenna. Open Plastic Food Box

RF Transformer with Insulated Windings at the Beverage Antenna. Closed Plastic Food Box

73! I.G., VA3ZNW

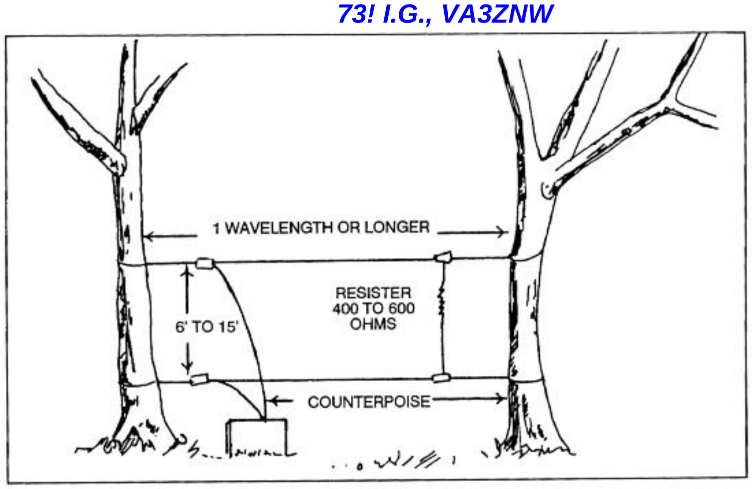


Figure D-11. Long-wire antenna.

A Beverage antenna that can be improvised for military field communications, from a U.S. Army field manual. Rather than being grounded, the resistor is attached to a second lower wire which serves as a counterpoise, an artificial ground for the transmitter. Credit Line: https://en.wikipedia.org/wiki/Beverage_antenna

Beverage Antenna. Theoretical Look on Practical Result

By: Igor Grigorov, VA3ZNW

My Beverage Antenna (**Figure 1**, that was described at: http://www.antentop.org/019/va3znw_019.htm) works well at my station. The antenna was successfully tested at CQ WW 160- Meter Contest (CW), CQ WPX (2016, CW) and ARRL International CW Contest (2016). I worked there with my IC- 718 using only 50… 90- W.

However it stands interesting for me what is the theoretical data for my Beverage Antenna. Parameters of the antenna were simulated with NEC for MMANA. **Table 1** shows the data for my antenna. Maxima gain is given to the radiation angle at where it is happened.

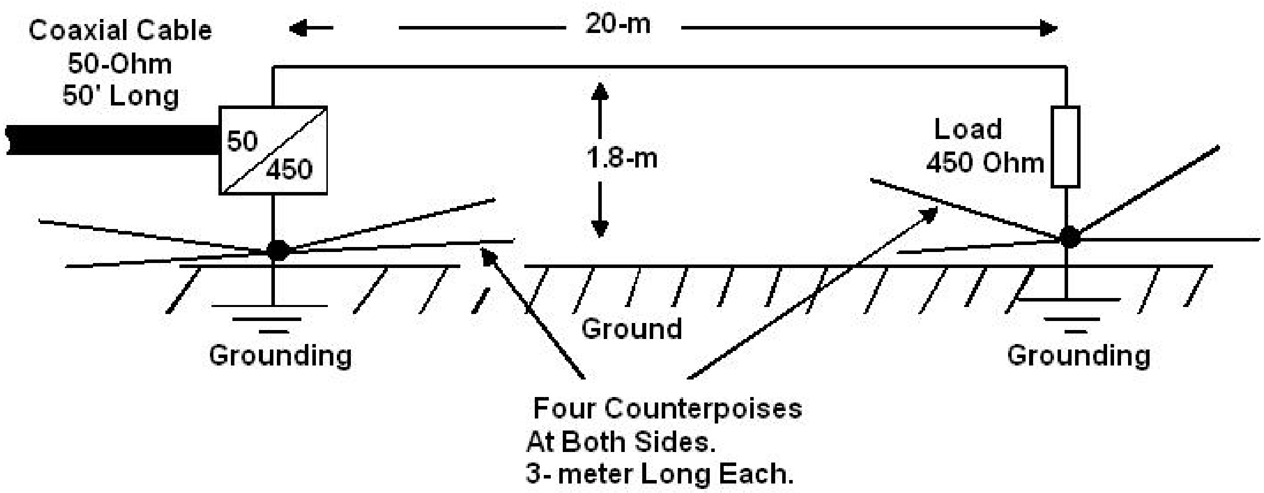


Figure 1
Beverage Antenna at VA3ZNW Amateur Station

Table 1
Data for Beverage Antenna placed at 1.8 meter above the Ground, simulated with NEC for MMANA and measured practically by SWR- Meter of IC- 718

Band	160	80	40	30	20	17	15	12	10
Z	163-j842	476-j96	418-j213	460-j75	489+j5	387+j119	568+j79	379+j267	569+j51
SWR	12.66	1.24	1.64	1.18	1.09	1.38	1.32	1.9	1.32
Gain	-19.1	- 13	-9.8	-7.43	-5.33	-4.5	-2.65	-2.36	-0.26
At Vertical degree	51	79	77	64	56	52	47	45	42
SWR by IC-718	1.5	1.0	1.2	1.2	1.1	1.2	1.2	1.0	1.2

Beverage Antenna: Theoretical Look on Practical Result.

The **Table 1** shows that at all amateur HF Bands my Beverage Antenna has the gain much below zero. However it is possible compensate at receiving mode by turn on the internal transceiver's preamplifier. At transmitting mode only propagation may help me. However I often received reports 559- 579 at 160- 20 Meter Bands where the antenna losses are big enough. At the 17- 10 Meter Bands the report 599 is common one there. It is very interesting that practically measured SWR is close to the theoretical one above the 160- Meter Band where the some known inaccuracy in simulation is happened. **Figure 2** shows SWR of the Beverage Antenna measured with the Rig Expert AA1000. It is very close to the reading by the IC- 718 and to the theoretical calculated by the NEC for MMANA.

Another important side of the Beverage Antenna is the Diagram Directivity. Below **Figure 3** to **Figure 11** show DD of the Beverage Antenna at the 160, 80, 40, 30, 20, 17, 15, 12 and 10- meter Bands in the vertical plane. Feedline with matching transformer is on the left side and the termination resistor is on the right side of the figures. As you can see from the **Figure 3** - **Figure 11** the DD of the Beverage Antenna is far away from a perfect one. Antenna has signification radiation into zenith. It is may be not bad for 160- 40 Meter Bands where it gives local QSOs. However at the higher bands it is just waist of the power given by transmitter.

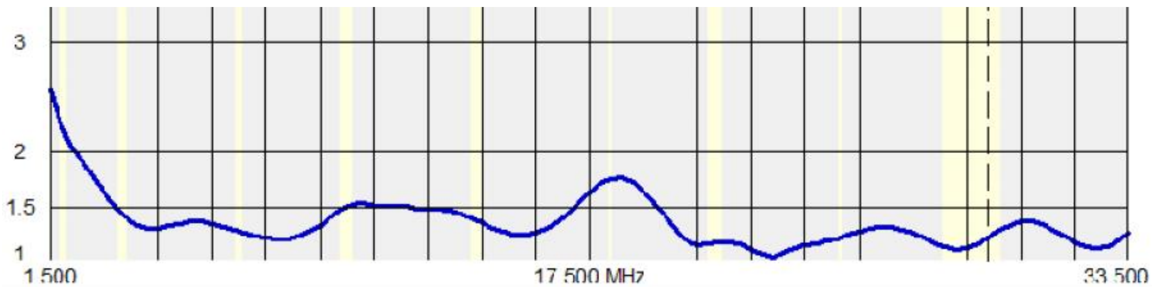


Figure 2
SWR of the Beverage Antenna shown by the Rig Expert AA1000

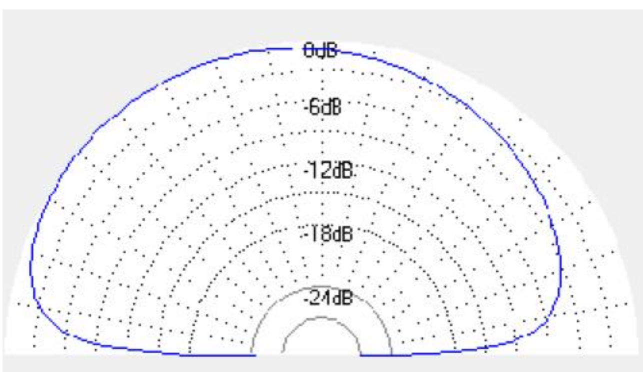


Figure 3
DD of my Beverage Antenna at 160- Meter Band

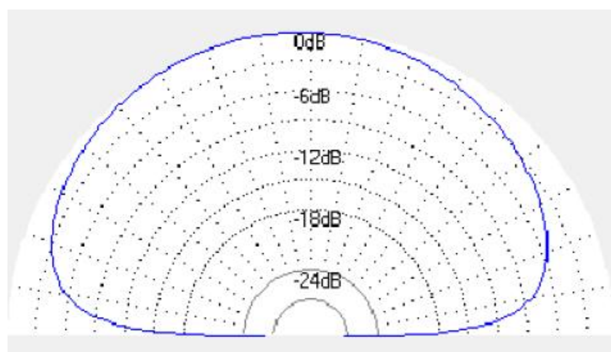


Figure 4
DD of my Beverage Antenna at 80- Meter Band

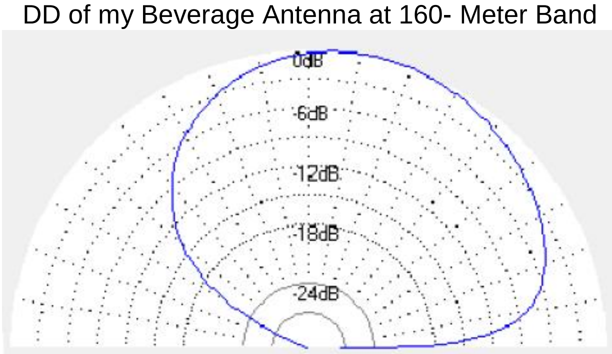


Figure 5
DD of my Beverage Antenna at 40- Meter Band

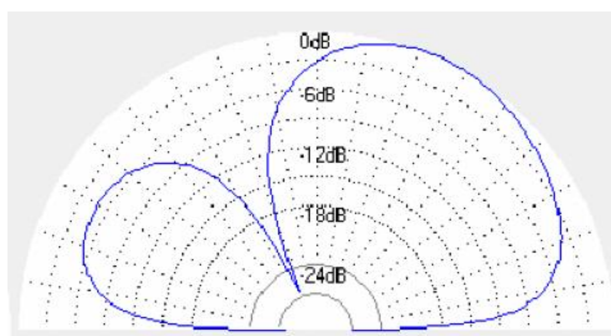


Figure 6
DD of my Beverage Antenna at 30- Meter Band

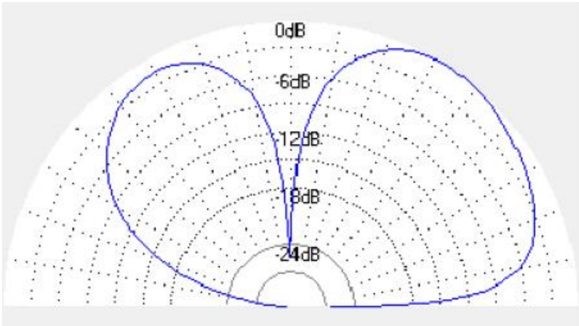


Figure 7
DD of my Beverage Antenna at 20- Meter Band

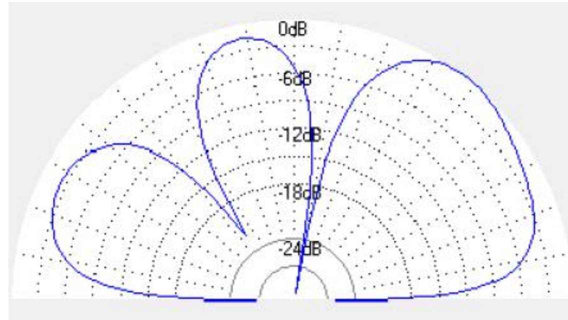


Figure 8
DD of my Beverage Antenna at 17- Meter Band

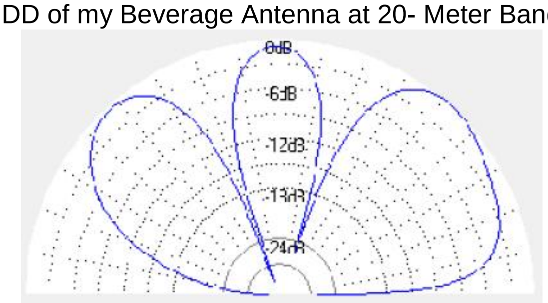


Figure 9
DD of my Beverage Antenna at 15- Meter Band

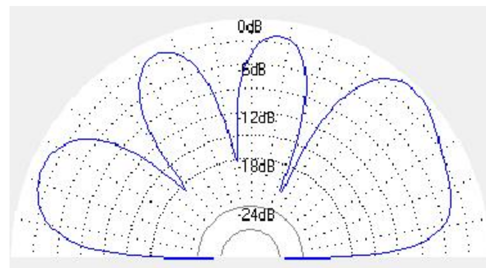


Figure 10
DD of my Beverage Antenna at 12- Meter Band

Of course, after I have found the theoretical data for my Beverage Antenna, I would like to improve the antenna efficiency. Most simple way to improve the efficiency of a broadband Beverage Antenna is to connect to the termination hot end an additional wire with length that is not resonant for the used bands. To find the needed length and possible practical configuration is a not simple task. But I decided to do it. Additional wire in 7 meter length was connected to the antenna load. **Figure 12** shows the antenna. Parameters of the antenna were simulated with NEC for MMANA. **Table 2** shows the data for my antenna. Maxima gain is given to the radiation angle at where it is happened.

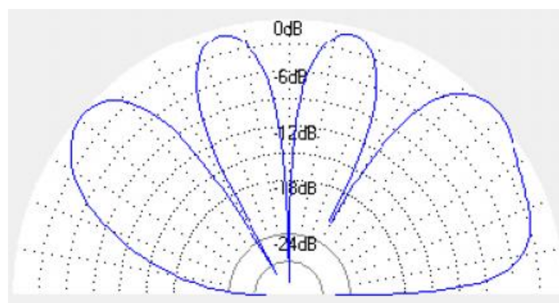


Figure 11
DD of my Beverage Antenna at 10- Meter Band

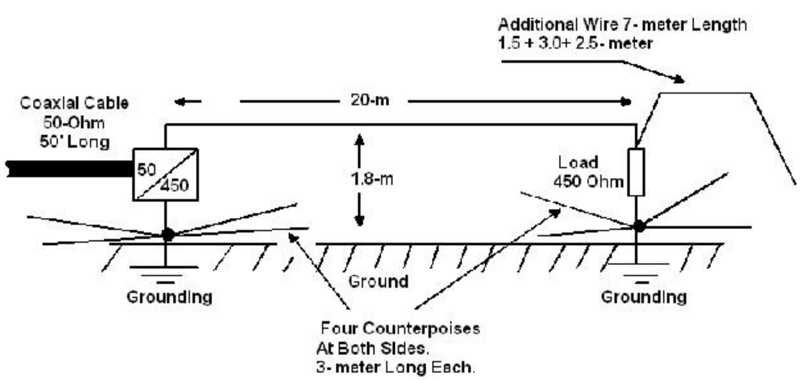


Figure 12
Beverage Antenna with additional wire at the termination end

Table 2

Data for Beverage Antenna placed at 1.8 meter above the Ground with additional wire at termination side (**Figure 12**), simulated with NEC for MMANA and measured practically by SWR- Meter of IC- 718

Band	160	80	40	30	20	17	15	12	10
Z	133+J736	601+J239	100-J172	1233-1518	401+326	353_51	417+104	622-204	277+711
SWR	12.56	1.71	5.16	7.12	2.14	1.32	1.29	1.65	6.14
Gain	-17	-10	-9.7	-1.21	-3.77	-2	-0.6	2.43	2.28
At Vertical degree	53	84	29	61	55	53	49	78	23
SWR by IC-718	1.3	1.0	3.0	3.5	3.0	1.1	1.0	1.0	1.2

As you can see from the **Table 2** additional wire affected my Beverage Antenna. Antenna gain was increased (theoretically) near to 3 dB at all working Bands. However due high SWR I lost middle of HF Bands- 40, 30 and 20- Meter Bands. I cannot say that I have noticed significant difference in reception and transmission mode at the rest Bands. Below **Figure 13** to **Figure 11** show DD of the Beverage Antenna at the 160, 80, 40, 30, 20, 17, 15, 12 and 10- meter Bands in the vertical plane. Feedline with matching transformer is on the left side and the termination resistor is on the right side of the figures. DD the Beverage Antenna at 160 and 80 Meter Bands are practically identical so those ones shown at one figure- **Figure 13**.

As you can see from the **Figure 13** - **Figure 20** the DD of the Beverage Antenna with additional wire at termination load changed compare to classical Beverage Antenna. In theory the antenna should work better compare to my old one. However the antenna as well has signification radiation into zenith.

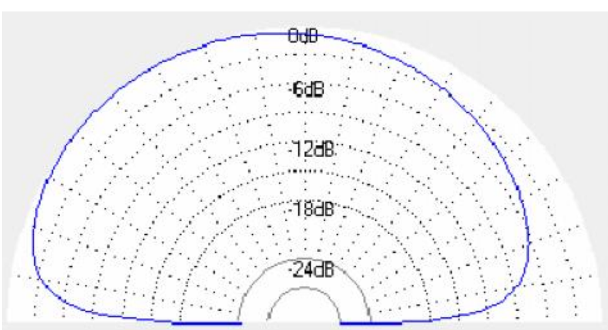


Figure 13
DD of modified Beverage Antenna with additional wire at termination load at 160 and 80- Meter Band

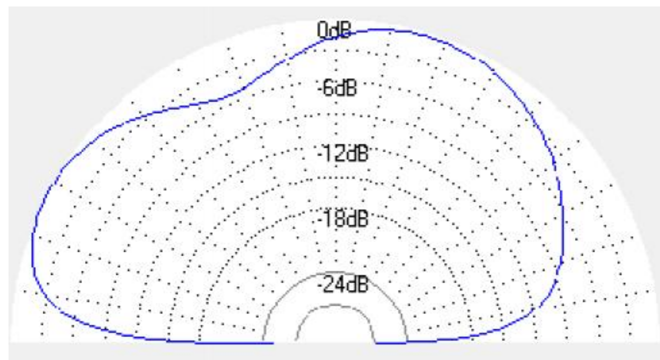


Figure 14
DD of modified Beverage Antenna with additional wire at termination load at 40- Meter Band

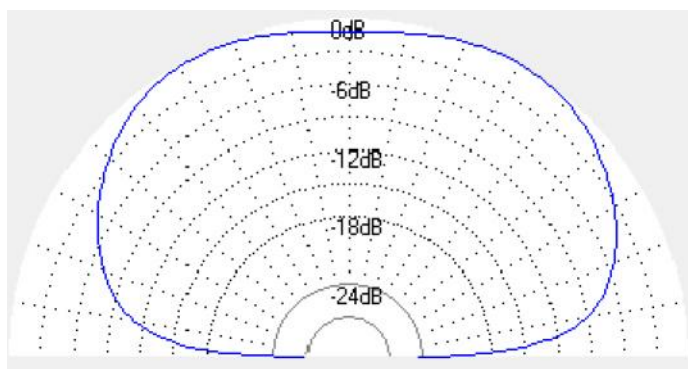


Figure 15
DD of modified Beverage Antenna with additional wire at termination load at 30- Meter Band

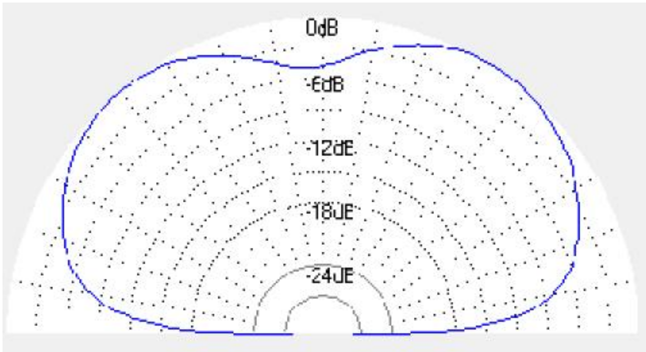


Figure 16
DD of modified Beverage Antenna with additional wire at termination load at 20- Meter Band

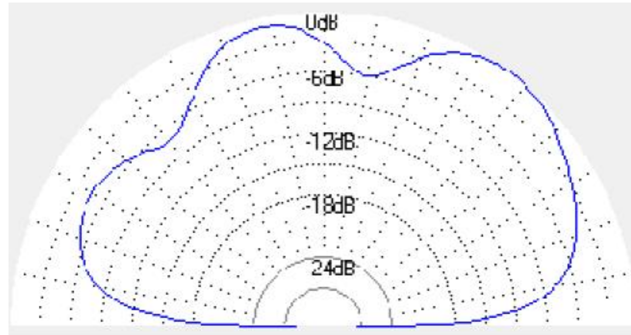


Figure 17
DD of modified Beverage Antenna with additional wire at termination load at 17- Meter Band

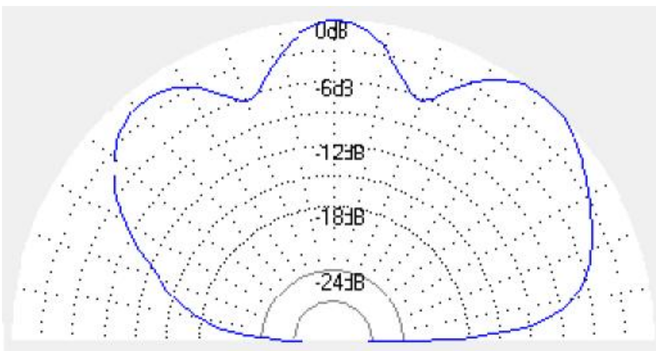


Figure 18
DD of modified Beverage Antenna with additional wire at termination load at 15- Meter Band

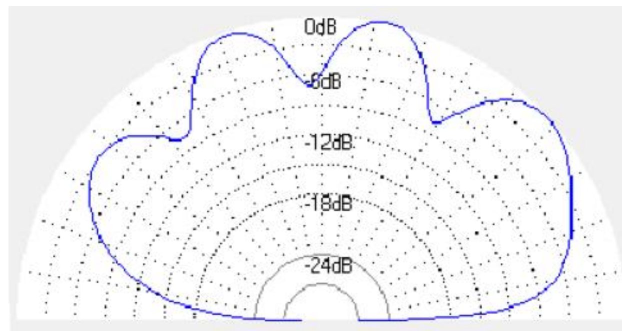


Figure 19
DD of modified Beverage Antenna with additional wire at termination load at 12- Meter Band

Anyway A- B test should be done to have an objective appraisal for the old and new antenna. I did not do it. Unexpectedly I found that the antenna at some days have received lots industrial electrical interferences. Because of it and because of I need the 40, 30 and 20 meter Band the antenna was de- configured to the classical design. Though sometimes it seems to me that the antenna (with additional wire) worked very well at 17, 15, 12 and 10 Meter Bands. May be at some days I return back to experimenters with Beverage Antenna with additional wire at termination load.

Next my experiment with my Beverage Antenna was simple. Under the antenna I installed a copper wire that connected together ground at feeding transformer and ground at termination load. **Figure 21** shows design of the Beverage Antenna. At early times when I experimented with Beverage Antenna I noticed that such additional wire very often improved efficiency of the Beverage Antenna. Parameters of the antenna were simulated with NEC for MMANA. **Table 3** shows the data for the antenna. Maxima gain is given to the radiation angle at where it is happened.

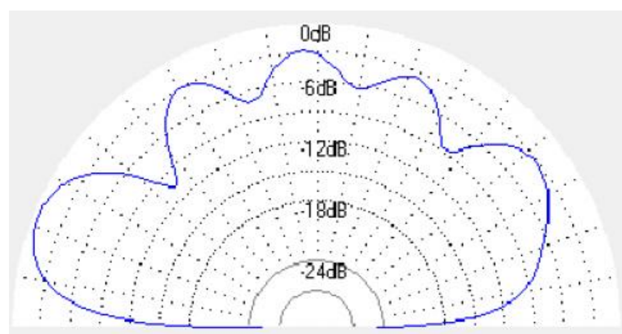


Figure 20

DD of modified Beverage Antenna with additional wire at termination load at 10- Meter Band

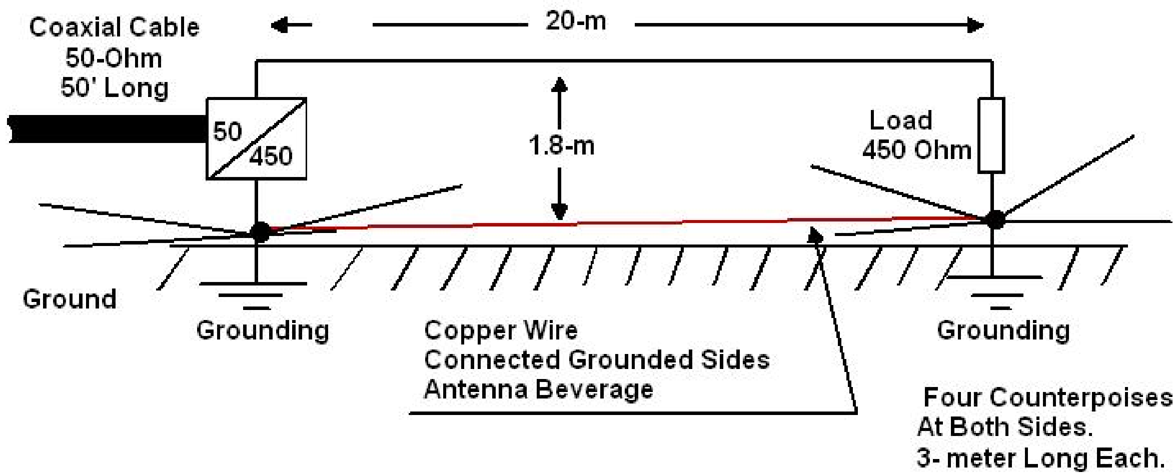


Figure 21
Beverage Antenna with additional wire between feeding transformer and termination load

Table 3

Data for Beverage Antenna placed at 1.8 meter above the Ground with additional wire between feeding transformer and termination load (**Figure 21**), simulated with NEC for MMANA and measured practically by SWR- Meter of IC- 718

Band	160	80	40	30	20	17	15	12	10
Z	2459-j160	374-257	618-283	466-64	534-13	395+108	586+46	379+259	411+82
SWR	5.49	1.9	1.85	1.16	1.19	1.33	1.32	1.89	1.23
Gain	-26	-12	-9	-7.7	-5.2	-4	-2.53	-2.3	0.2
At Vertical degree	36	65	72	64	54	51	48	45	42
SWR by IC-718	1.2	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0

Theoretical data show that the antenna gain a little improved (above 160- meter Band where some known inaccuracy at simulation is happened) at the configuration. Below **Figure 22** to **Figure 30** show DD of the Beverage Antenna at the 160, 80, 40, 30, 20, 17, 15, 12 and 10-meter Bands in the vertical plane.

Feedline with matching transformer is on the left side and the termination resistor is on the right side of the figures. As you can see from the **Figure 24** - **Figure 30** the DD of the Beverage Antenna with additional wire between feeding transformer and termination load looks better compare to my classical Beverage Antenna shown at **Figure 1**.

Theoretical DD at 160 and 80- meter Bands has more radiation to zenith compare to Beverage Antenna shown on **Figure 1**. My opinion was that the antenna began work better the classical variant (**Figure 1**).

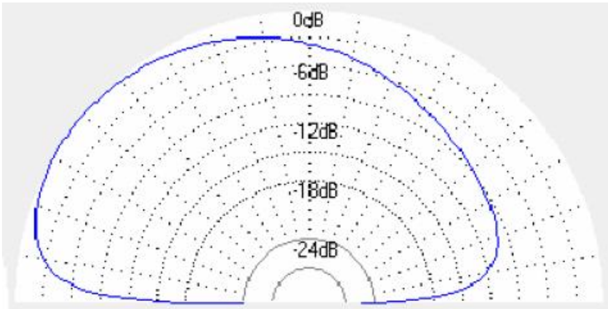


Figure 22
DD of Beverage Antenna with additional wire between feeding transformer and termination load at 160- Meter Band

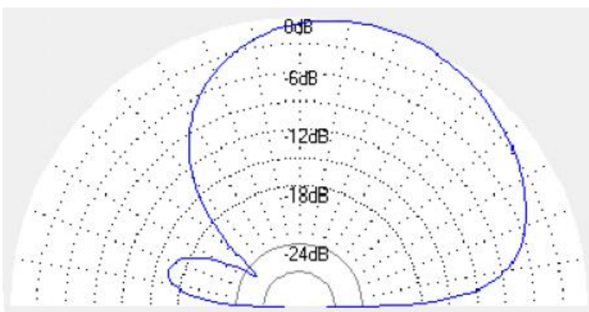


Figure 24
DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 40- Meter Band

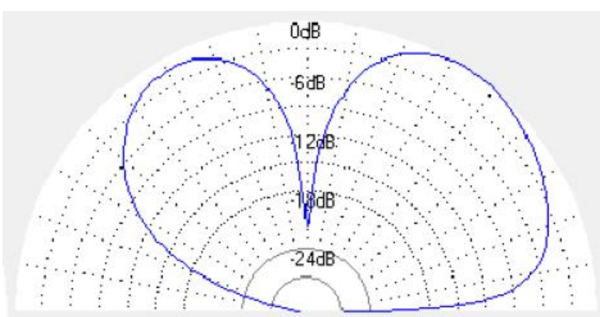


Figure 26
DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 20- Meter Band

However the configuration gave me unexpected effect. Beverage Antenna began received industrial electrical interferences. Antenna practically was not affected at day time but at evening time the interferences were such very strong that I cannot use 160 and 80- meter Bands. Sometimes the interferences closed the 40- meter Band.

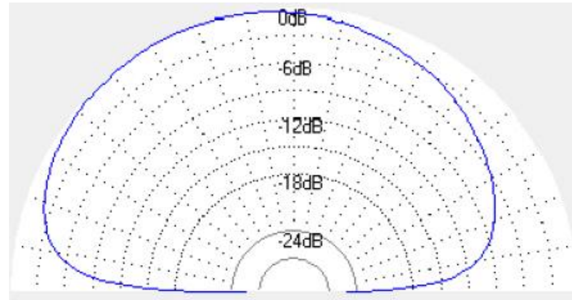


Figure 23
DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 80- Meter Band

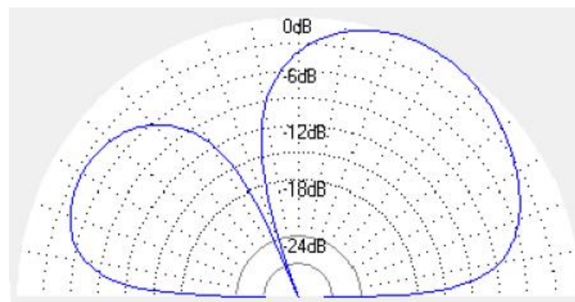


Figure 25
DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 30- Meter Band

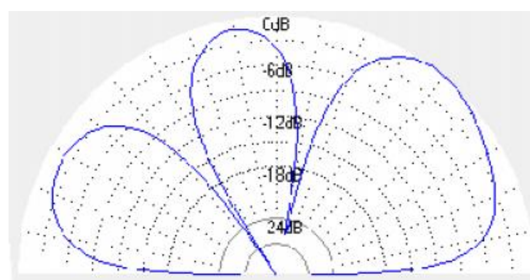


Figure 27
DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 17- Meter Band

Interferences not disappeared when I disconnected off the wire from any one side of the antenna- from termination load or feeding transformer. Moreover the interferences did not disappeared when the wire was disconnected from the both sides of antenna. I suspected that the ground wire for some reason received interferences from the street light. So, I should return to the old configuration of my Beverage Antenna…

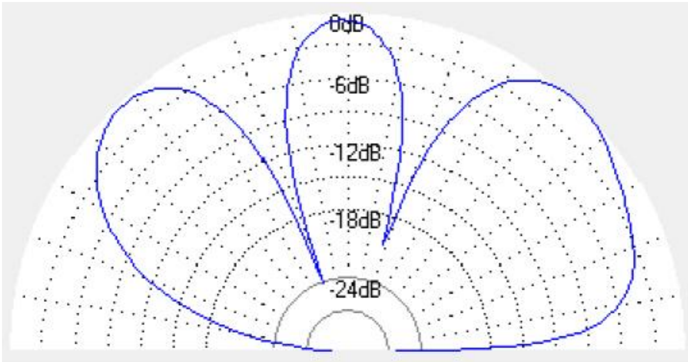


Figure 28

DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 15- Meter Band

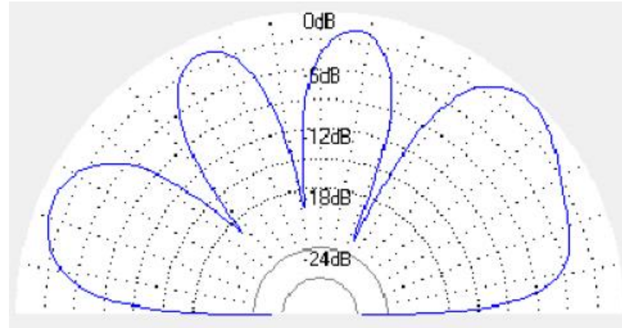


Figure 29

DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 12- Meter Band

Last possibility to improve the efficiency of the Beverage Antenna could be increasing the height of the horizontal wire to 4- meters above the ground. In theory this way should bring to multi beam DD at the high frequencies bands (because the vertical wires of the antenna take part at creation DD) and to some difference of the antenna impedance from the impedance of the termination load. **Figure 31** shows design of the Beverage Antenna with horizontal wire placed at height 4 meter above the ground. . Parameters of the antenna were simulated with NEC for MMANA. **Table 4** shows the data for the antenna. Maxima gain is given to the radiation angle at where it is happened.

Theoretical data show that the antenna gain improved at all Bands. However because the antenna impedance not to be close to the impedance of the termination load there would be difficulties with matching of the antenna at 12 and 10- meter Bands.

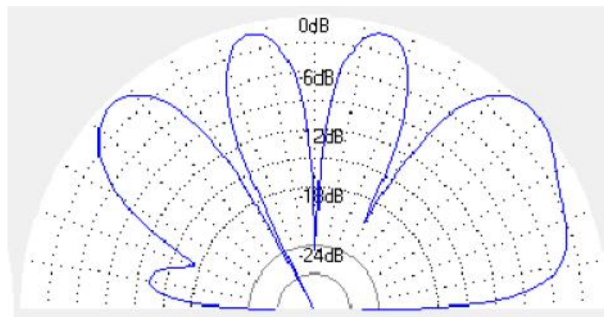


Figure 30

DD of my Beverage Antenna with additional wire between feeding transformer and termination load at 10- Meter Band

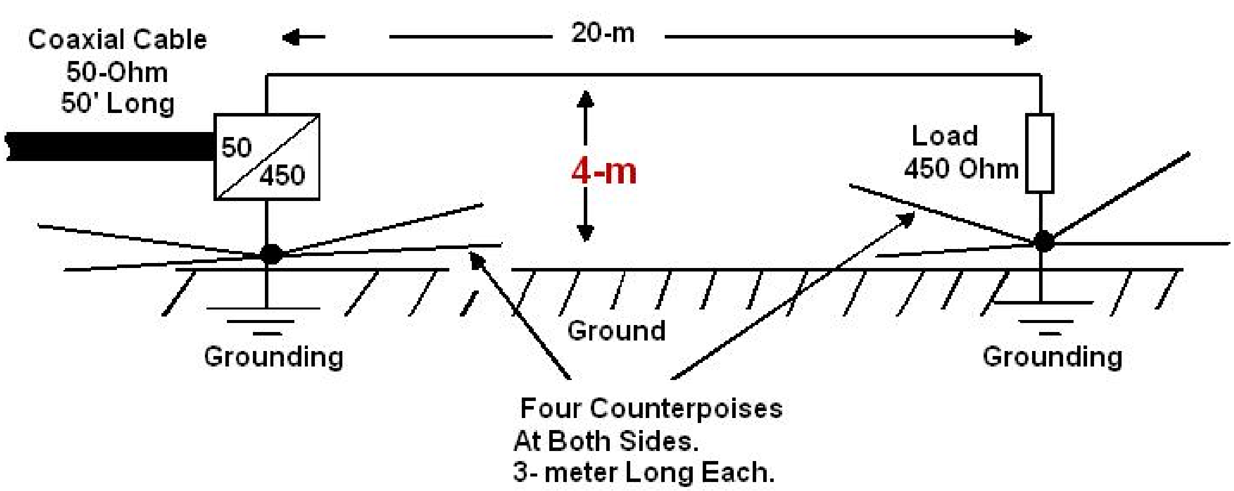


Figure 31
Beverage Antenna with horizontal wire placed at height 4 meter above the ground

Table 4

Data for Beverage Antenna placed at 4 meter above the Ground (**Figure 31**), simulated with NEC for MMANA

Band	160	80	40	30	20	17	15	12	10
Z	166-713	641-J145	462-J91	439+J4	554+J14	643+532	386_284	1399_J288	912+1580
SWR	9.77	1.56	1.22	1.03	1.23	2.75	1.99	3.26	8.49
Gain	-15.89	-10.44	-6.73	-4.3	-1.42	-0.2	1.69	3.65	0.42
At Vertical degree	49	71	86	74	62	33	51	34	47

Below **Figure 32** to **Figure 40** shows DD of the Beverage Antenna at the 160, 80, 40, 30, 20, 17, 15, 12 and 10-meter Bands in the vertical plane. Feedline with matching transformer is on the left side and the termination resistor is on the right side of the figures.

As you can see from the **Figure 32** - **Figure 40** the DD of the Beverage Antenna with horizontal wire placed at height 4 meter above the ground looks better compare to my classical Beverage Antenna shown at **Figure 1**. However lost 12 and 10- meter bands and complexity with installation of the horizontal wire did not compensate the new antenna advantages.

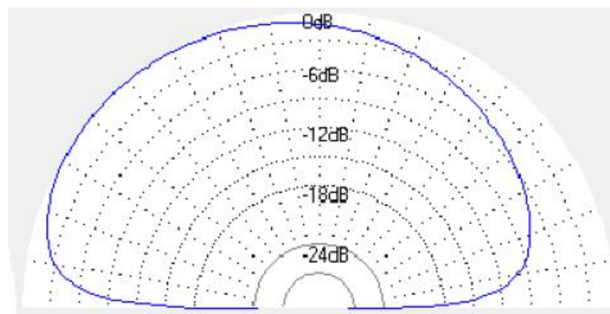


Figure 32
DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 160- Meter Band

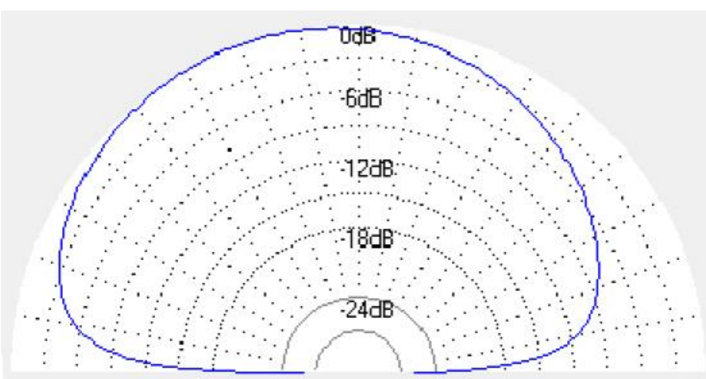


Figure 33
DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 80- Meter Band

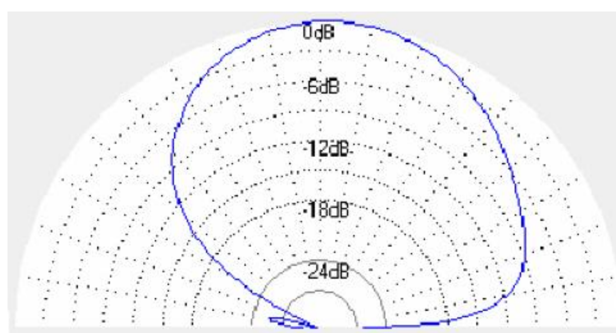


Figure 34

DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 40- Meter Band

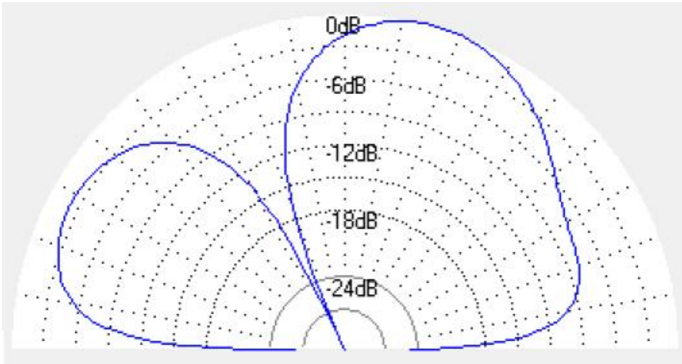


Figure 35

DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 30- Meter Band

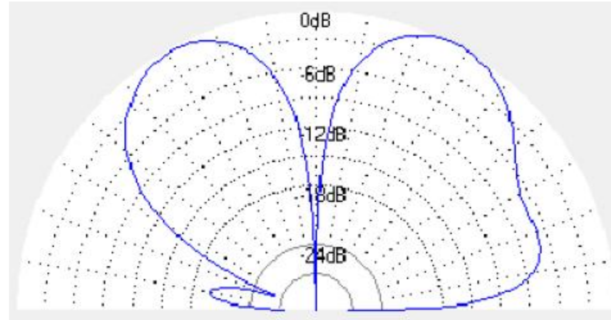


Figure 36

DD of Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 20- Meter Band

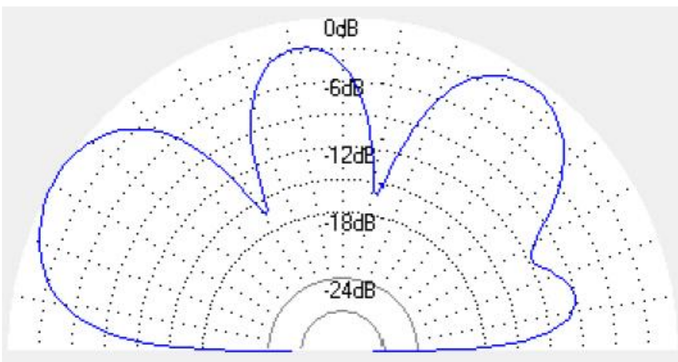


Figure 37

DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 17- Meter Band

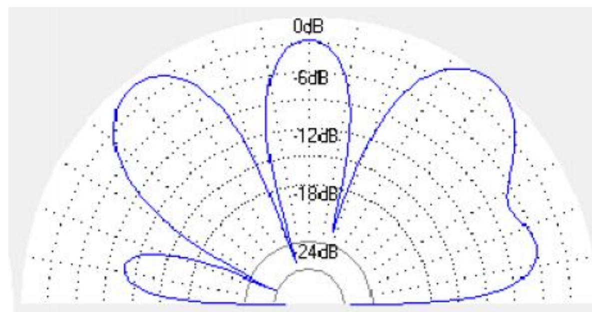


Figure 38

DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 15- Meter Band

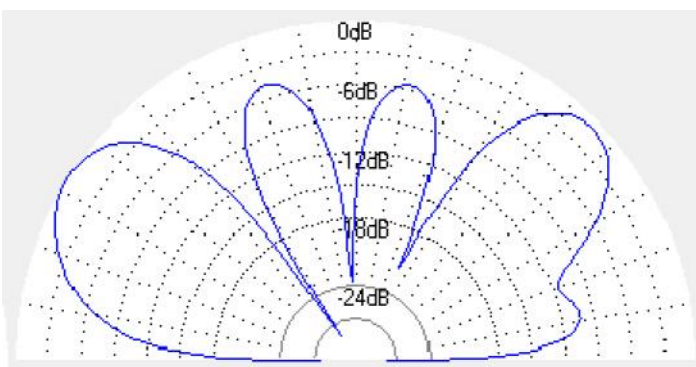


Figure 39

DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 12- Meter Band

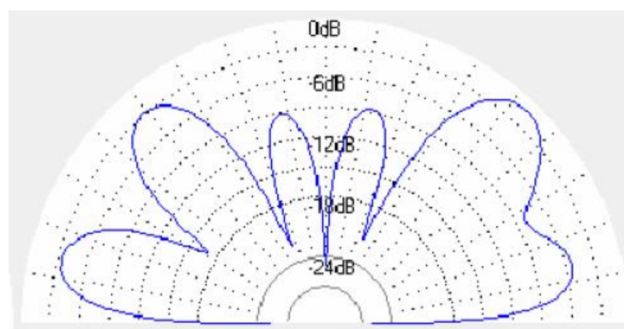


Figure 40

DD of theoretical Beverage Antenna with horizontal wire placed at height 4 meter above the ground at 10- Meter Band

In conclusion I decided to simulate Beverage Antenna that I used at my amateur station UA3ZNW- UZ3ZK- RK3ZK from 1990- to 2002 year in Belgorod, Russia. **Figure 41** shows the antenna. The antenna was installed on the parapet of the 9- storey building. Antenna length was 80 meters. The horizontal wire was located at height about 1- meter above the parapet. Antenna wire was stretched on several wooden masts placed near 5 meter from each other. I used the dry trunk from small trees. Transformer of the antenna was made according to **Figure 42**.

Transformer had 7 turns wound by tripled wire on ferrite ring from yoke from Color TV. I have no picture of the original transformer. However it looked like transformer shown on **Figure 43**. Transformer was placed inside a plastic bag for protection from the weather influences. Termination load of the antenna was made from 18- k/2- W Russian resistors MLT- 2 (the resistors are still in sell on ebay) that were connected to bridge. The load had resistance 600- Ohm.

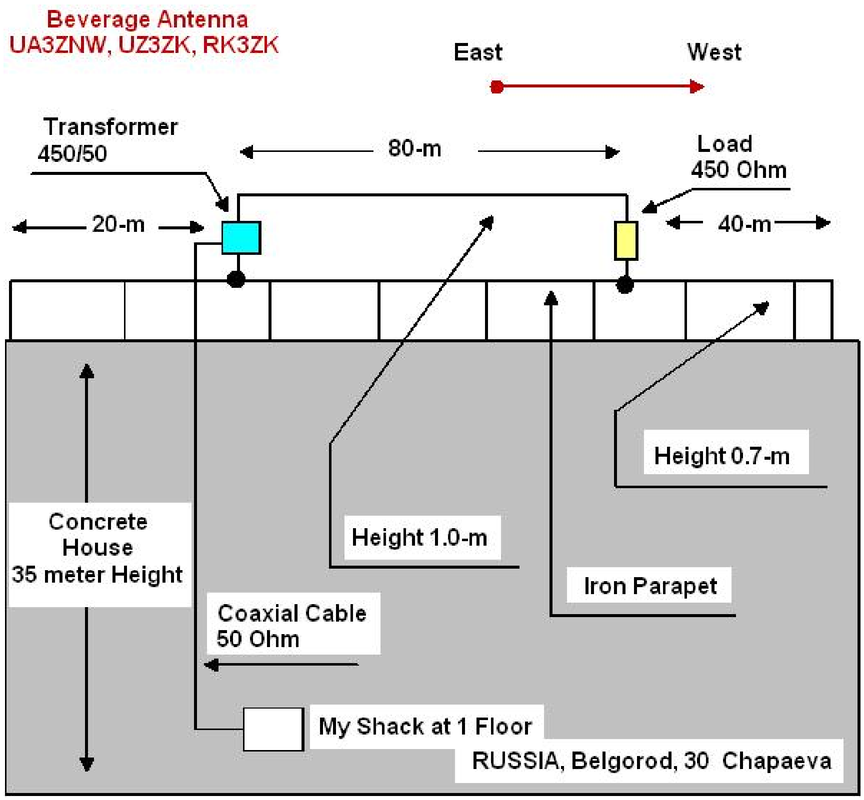


Figure 41

Beverage Antenna used at my amateur station UA3ZNW- UZ3ZK- RK3ZK from 1990- to 2002 year

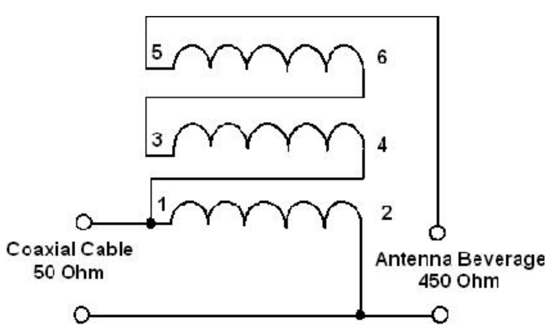


Figure 42

Transformer of the Beverage Antenna used at my amateur station UA3ZNW- UZ3ZK- RK3ZK from 1990- to 2002 year

Figure 43

Transformer 50/450 (75/600) wound by tripled wire on ferrite ring from TV yoke

Antenna for first several years was feed through 75- Ohm coaxial cable that was going along the building wall. Then I have removed this cable and have installed a new one (50- Ohm good coaxial cable) inside building in ventilation shaft. Termination load was reworked to 450- Ohm. SWR of the antenna was not more the 1.5: 1 at all bands with 75 and 50- Ohm coaxial cable. You may find on the **Figure 41** address of the building. It seems to me still it is possible to find remains of my antennas on the roof using Google Map…

Antenna worked great on all HF- Bands from 160 till 10- meter band. 160 and 80 meter bands at the antenna were good to communicate with Ham stations from Europe and Asia.

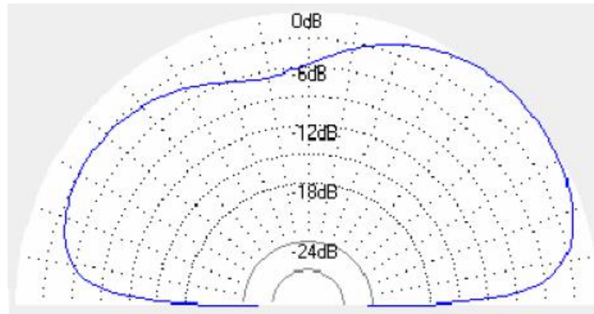


Figure 44
DD of Beverage Antenna of amateur station UA3ZNW- UZ3ZK- RK3ZK at 160- Meter Band

Table 5

Data for Beverage Antenna (**Figure 41**) used at my amateur station UA3ZNW- UZ3ZK- RK3ZK from 1990- to 2002 year

Band	160	80	40	30	20	17	15	12	10
Z	589+15	502+275	645-308	703-152	437-j11	524- J202	507-99	361+21	435+67
SWR	1.3	1.79	1.95	1.68	1.04	1.55	1.27	1.25	1.17
Gain	-20.9	-10	-8.7	-4.3	-5.64	-2.5	-1.47	-0.9	0.6
At Vertical degree	43	25	24	25	18	17	14	13	12

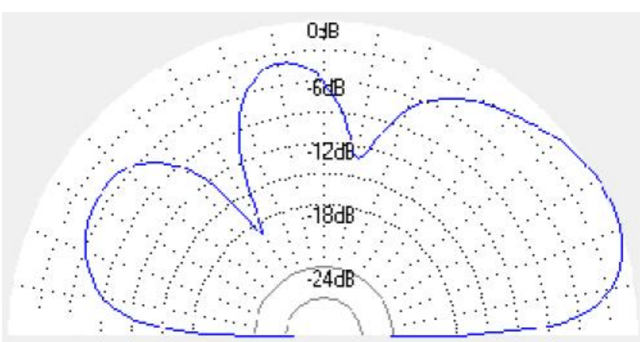


Figure 45
DD of Beverage Antenna of amateur station UA3ZNW- UZ3ZK- RK3ZK at 80- Meter Band

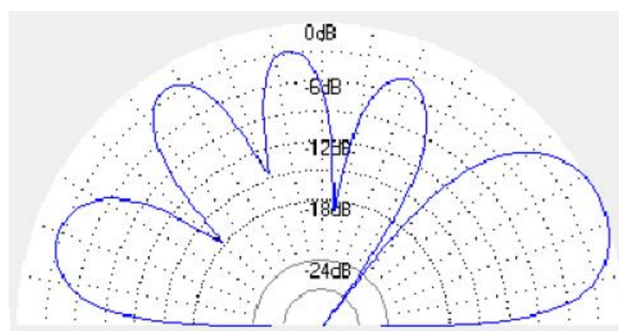


Figure 46
DD of Beverage Antenna of amateur station UA3ZNW- UZ3ZK- RK3ZK at 40- Meter Band

North America and Japan propagated good above 40- meter Band. **Table 5** shows the data for the antenna. Maxima gain is given to the radiation angle at where it ishappened. **Figure 44** to **Figure 52** show DD of the Beverage Antenna at the 160, 80, 40, 30, 20, 17, 15, 12 and 10- meter Bands in the vertical plane. Feedline with matching transformer is on the left side and the termination load is on the right side of the figures.

As you can see from **Figure 44** to **Figure 52** the Beverage Antenna has not so bad DD.

If you have possibility to install such antenna- do not hesitate. It is easy to install, easy to match, invisible and low noise antenna.

73! de VA3ZNW

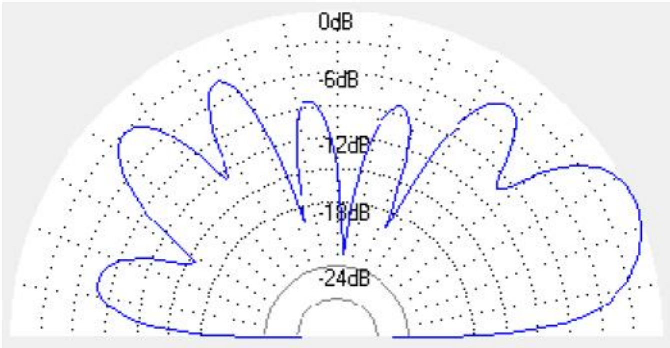


Figure 47

DD of Beverage Antenna of amateur station UA3ZNW-UZ3ZK- RK3ZK at 30- Meter Band

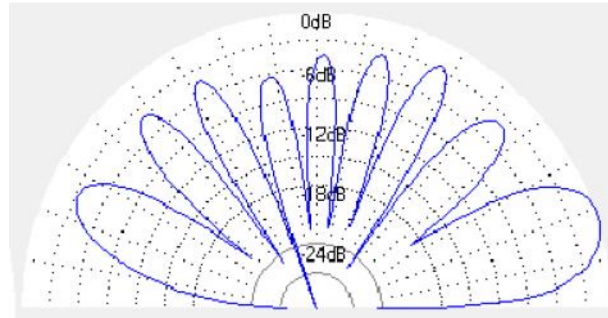


Figure 48

DD of Beverage Antenna of amateur station UA3ZNW-UZ3ZK- RK3ZK at 20- Meter Band

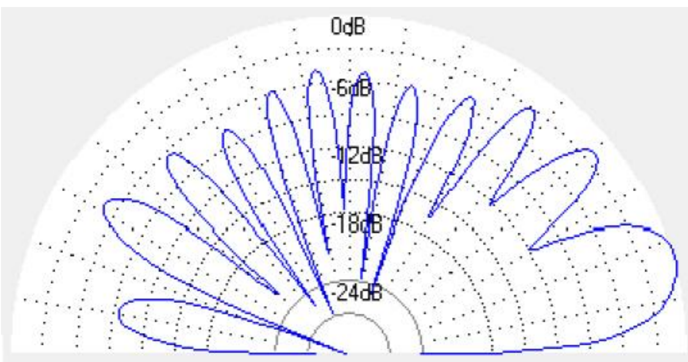


Figure 49

DD of Beverage Antenna of amateur station UA3ZNW-UZ3ZK- RK3ZK at 17- Meter Band

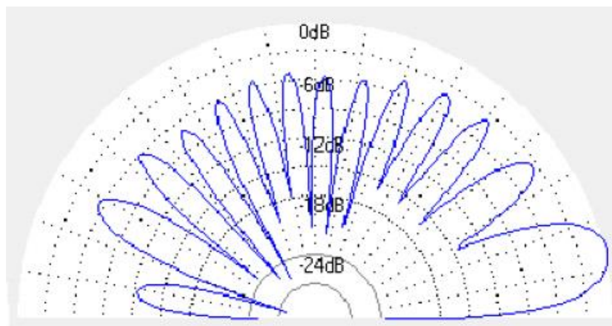


Figure 50

DD of Beverage Antenna of amateur station UA3ZNW-UZ3ZK- RK3ZK at 15- Meter Band

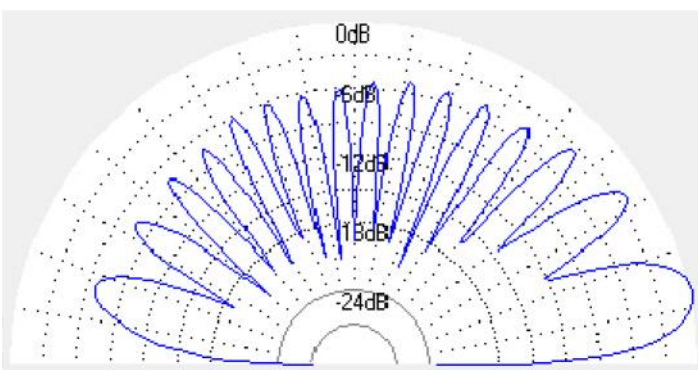


Figure 51

DD of Beverage Antenna of amateur station UA3ZNW-UZ3ZK- RK3ZK at 12- Meter Band

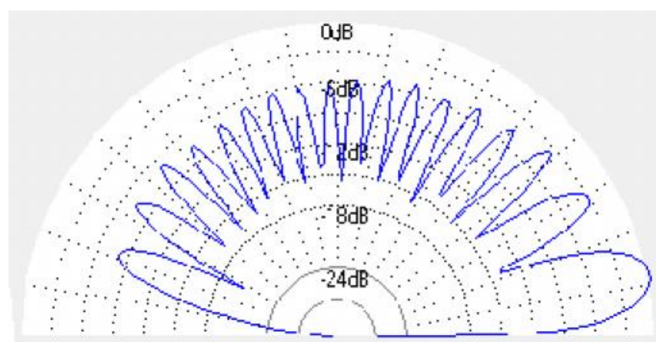


Figure 52

DD of Beverage Antenna of amateur station UA3ZNW-UZ3ZK- RK3ZK at 10- Meter Band

Conclusion

So, Chapter 1 ***"Beverage Antenna"*** is ended. You have got enough information to do own Beverage Antenna.

However, ***Chapter 1*** told you only about my experience with doing and working in the Air with the antenna. Try it yourself and get your own opinion about the ***wonderful*** Beverage Antenna.

As well I recommend you read "***MEMORANDUM ON THE BEVERAGE WAVE ANTENNA***…" It is very useful article that gives you additional knowledge on the Beverage Antenna. All links go to the ***antentop.org*** site.

73!
Igor, VA3ZNW

References:

Field Beverage Antenna

1. The Wonderful Beverage Antenna: http://www.antentop.org/008/ua3znw008.htm

Backyard Beverage Antenna

1. Universal Beverage Antenna: http://www.antentop.org/019/va3znw_019.htm
2. Modified Beverage Antenna: http://www.antentop.org/020/VA3ZNW_020.htm
3. Beverage Antenna. Theoretical Look on Practical Result: http://www.antentop.org/020/beverage_antenna_020.htm

Additional Source:

1. MEMORANDUM ON THE BEVERAGE WAVE ANTENNA FOR RECEPTION OF FREQUENCIES IN THE 550 - 1500 KILOCYCLE BAND: By: Benjamin Wolf and Adolph Andersen: http://www.antentop.org/020/memorandum_020.htm

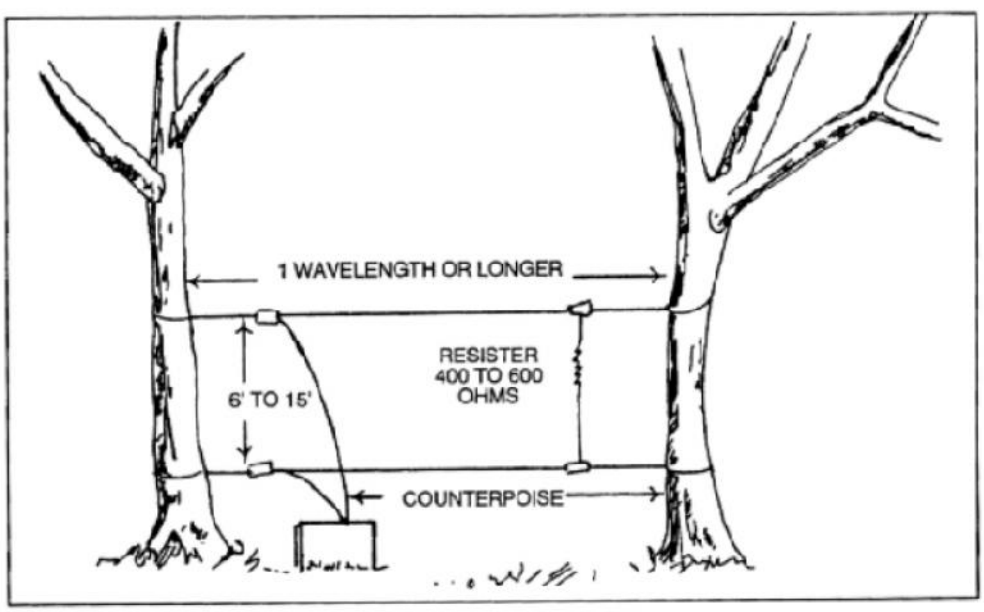


Figure D-11. Long-wire antenna.

CHAPTER 2

HF Helical Antennas

Helical Antenna... It is one of the oldest types from the antenna family. Ever it is possible to say- it is one of the first antennas used in radio communications. Nicola Tesla used prototype of the Helical Antenna in his Magnifier Transmitter just from 1895 year. Helical Antennas were used in in the 20- 30 years at some MW and LW broadcast radio transmitters. Helical Antennas still are widely used in radio communications. We may find those ones at two way radios (walkie- talkie), at some military and civil cars for mobile radios, etc.

Radio amateurs as well used to Helical Antennas. The antennas may be used at limited space. ***Chapter 2*** describes real Helical Antennas that were made by hams and that worked well. Length of plastic tube and some wire - that is all what you need to make a Helical Antenna.

Helical Antennas for all possible location are described in the ***Chapter 2***. It is windows antennas, balcony antennas and antennas for a small backyard. You will find resonances Helical Antennas for mono band for which tuning you may be needed a SWR meter or antenna analyzer (MFJ- 259B would be good for you). As well there are described multi band Helical Antennas that do not required any tuning but you may be need use ATU to feed them.

Helical Antennas has high voltage at the end (at transmission mode) so do not touch the antennas at transmitting. Keep the antennas as far as possible from other electronics and nearest subjects.

Anyway, try these antennas. The main thing is that the antennas are proved and worked, the antennas are inexpensive in cost and allow quickly turn on transmitter to the Air.

Small Sized Helical Antennas

***By*: I. Kapustin, UA0RW, Yakutsk, USSR**

Below described practical design of Small-Sized Helical Antennas. Generally speaking the antenna is just a wire that is coiled on a dielectric rod. UA0RW used a wood rod boiled in the paraffin.

Credit Line: Radio #1, 1958, pp.:26-27

Figure 1 shows the design of UA0RW Vertical Small Sized Helical Antenna. Antenna for the 20- meters had rod in OD 2- cm, length of winding was 30 cm, antenna is coiled turn to turn) by enamel wire in 1- mm OD (18- AWG).

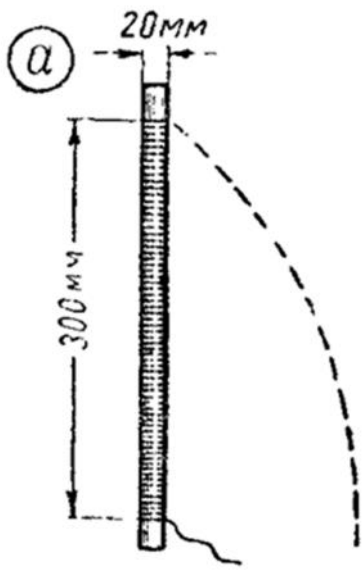


Figure 1
A. Design of the Vertical Small Sized Helical Antenna

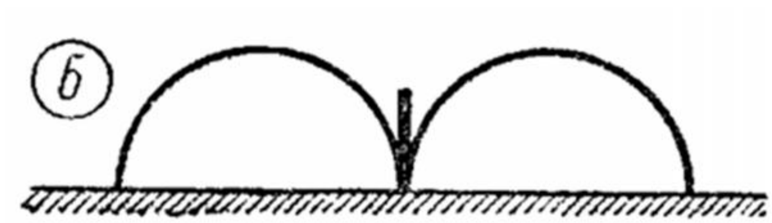


Figure 1
B. DD of the Vertical Small Sized Helical Antenna

Figure 2 shows the design of the UA0RW Dipole Small Sized Helical Antenna. Antenna for the 20- meters has rod in OD 2- cm, each parts of the dipole has 220 coils of the enamel wire in 1- mm OD (18- AWG). Overall length of the two parts of the antenna is 70- cm.

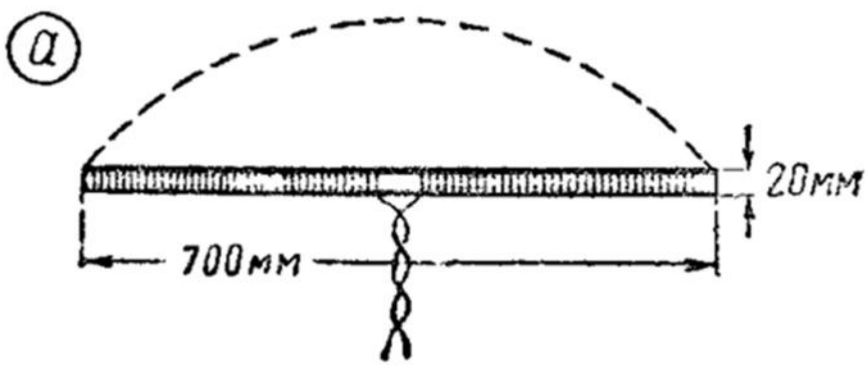


Figure 2
A. Dipole Small Sized Helical Antenna

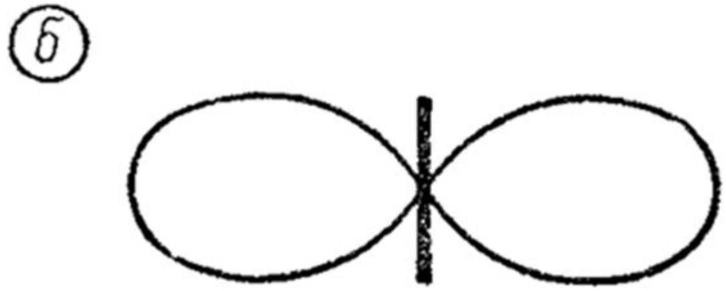


Figure 2
B. DD of the Dipole Small Sized Helical Antenna

Dipole Small Sized Helical Antenna was installed on the top of a 5-meter mast to be tested. The antenna was fed by usual two- wire main cord. It was discovered, that the antenna had strong radiation directivity. Received radio station almost disappeared when the antenna was turned by side to this one. The helical antenna lost 1- point at RS scale compare to Traveling-Wave Antenna pointed to correspondent.

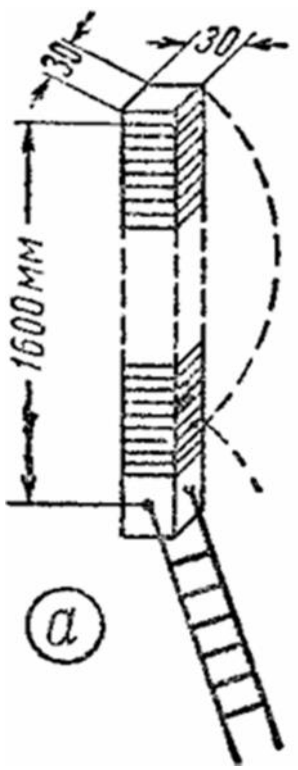


Figure 3
A. Design of the Vertical Small Sized Helical Antenna on a wooden square rod

Note I.G.: At the article there was not explained what the Traveling-Wave Antenna was used to compare.

Figure 3 shows the design of the Vertical Small Sized Helical Antenna coiled by copper cord in 2.5- mm diameter. Wooden square rod (3- cm side) was used for form of the antenna. Antenna had 200 coils. Distance between coils was 7.5- mm.

The Vertical Helical Antenna (**Fig.3**) was installed on the top of a 4-meter mast to be tested. Antenna was fed by 500- Ohm open two- wire line. At the antenna terminal one wire of the line was connected to the helical antenna, second wire was lived free. At the transmitter terminal one wire was connected to “Antenna” second one to the “Ground.” Antenna was successfully tested at 20- meter Band.

Practice shows that it is wise to use a square rod for a helical antenna because coils sitting well at the square form. Diameter/side of the square should be 1/50- 1/200 part from the length of the Helical Antenna. Wires should be protected from weather conditions. Coils should not touch each other. Wire for winding Helical Antenna should be taken in large diameter as it is possible.

Voltage distribution across the Helical Antenna may be found with the help of a neon bulb. Helical Antenna was should be tuned to maxima current (checked by antenna current meter) going to the antenna.

Table 1 shows data for the Helical Antennas shown on **Figure 1**, **2** and **3** for 20-40-80-160 meter Bands. Wire at the antennas was wound evenly on to the form.

Table 2 shows data at testing the Helical Antenna compare to a Traveling-Wave Antenna.

Note I.G.: At the article there is not explained what the Traveling-Wave Antenna is.
At the article there is not explained what a Helical Antenna and at which band was tested.

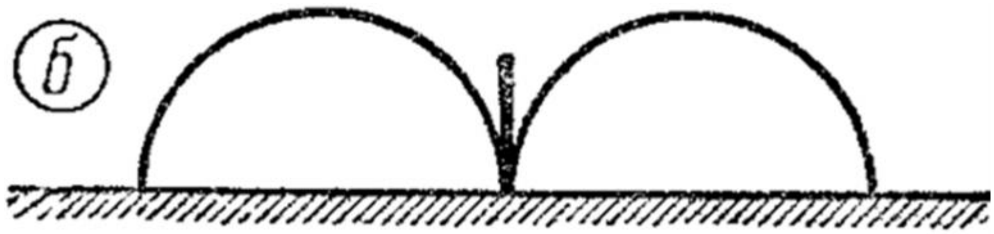


Figure 3
B. DD of the Vertical Small Sized Helical Antenna on a square rod

Table 1

	Numbers of turns for band:			
	20 M	40 M	80 M	160 M
Antenna on **Fig. 1**	90	180	360	720
Antenna on **Fig. 2**	90	180	360	720
Antenna on **Fig. 3**	200	400	800	1600

***Note:* For antenna shown on *Figure 2* the Data given for one part of the dipole**

Table 2

Date	Time, msk	City, Callsign	RST, sent	RST received when was used:	
				Traveling-Wave Antenna	Helical Antenna
22-V-1957	16-45	Sarapul, UA4WA	579	579	579
25-V-1957	16-00	Khabarovsk, UA0CJ	589	579	599
25-V-1957	18-30	Leningrad, UA1KAS	579	579	589
25-V-1957	21-15	Kaliningrad, UA2KAA	579	579	579
26-V-1957	14-00	Irkutsk, UA0SL	5(6/7)9	579	5(8/9)9
26-V-1957	14-45	Stalinabad, UJ8KAA	559	449	559
26-V-1957	16-00	579 Penza, UA4FC	579	569	579

Indoor Helical Antenna for the 20 and 17 meters for K1

By: Igor Grigorov, VA3ZNW

So, my K-1 with 40, 30, 20 and 17 meter Bands was successfully assembled and tuned. I needed only an antenna to go on the Air. Certainly, an antenna would be a simple thing if… if you were in a private house. But I lived in a 24 story rental apartment building (made from concrete) where there were huge restrictions on all things. So I could install my antenna only at a window. Good sign was that in mine apartment the windows were big sized - 150 to 210 centimeters.

My experience in working on the Air from such premises showed me that in this case a Magnetic Loop Antenna would be the best one. So my choice was the Magnetic Loop Antenna installed at the window. I already have bought a hula- hoop (for antenna itself) and a small stool (for the base of the antenna). However, after I have shown to my YL how the antenna would be looked at its installation place a top of the conditioner (buddy, it looked great!), my permission to antenna installation inside room was rejected by my wife. No one of my arguments to advocate the magnetic loop was accepted.

Other type of an antenna that could be effectively worked in my limited conditions was a Helical Antenna. (Some information on Helical Antenna is in **Reference 1**.)

So, I began search for stuff for the antenna. Some days back I have bought to my son a Magic Spring Spiral (DOLLARAMA, $1). This Spiral contained 96 coils, each coil had length of 11 centimeters total length of the wire was 1056 cm. Such length was perfect for helical antenna for the 20 meter Band. A wooden stick for open/close curtains (DOLLARAMA, $1) was very suitable for form of the antenna. The stick has diameter in ½” and length in 170 centimeters.

Design of the Helical Antenna: Three holes were drilled (one at top and two at the bottom) in the stick. Two lengths of copper wire in diameter of 18 AWG and 15 cm long were attached to the stick through top and bottom holes. Helical Antenna was hung up at an eave with the help of top wire. Down part of the antenna was fastened by another wire to aluminum window frame. The frame used as ground for the Helical Antenna. My window frame was connected (it was checked by multimeter) to the electrical “ground” (green wire in the socket).

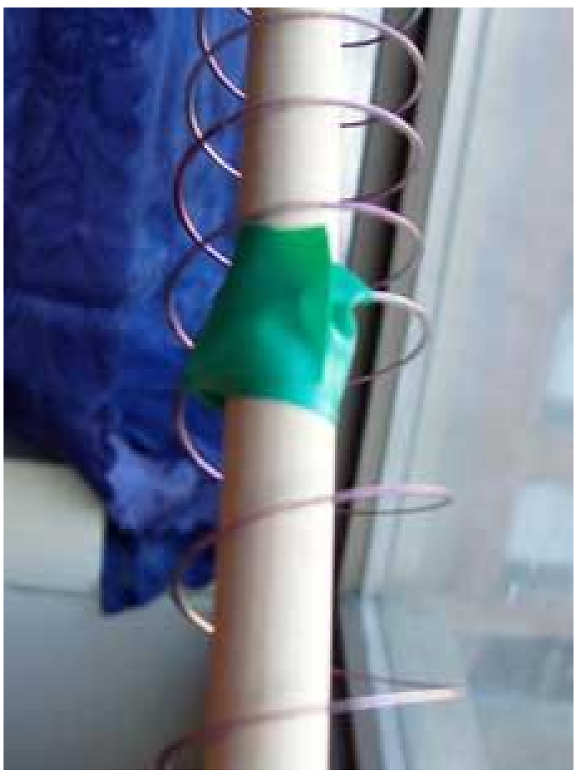
Helical Antenna at the Window

Magic Spring Spirale

Spiral wire was fixed at bottom part of the rod at the upper hole.

Indoor Helical Antenna

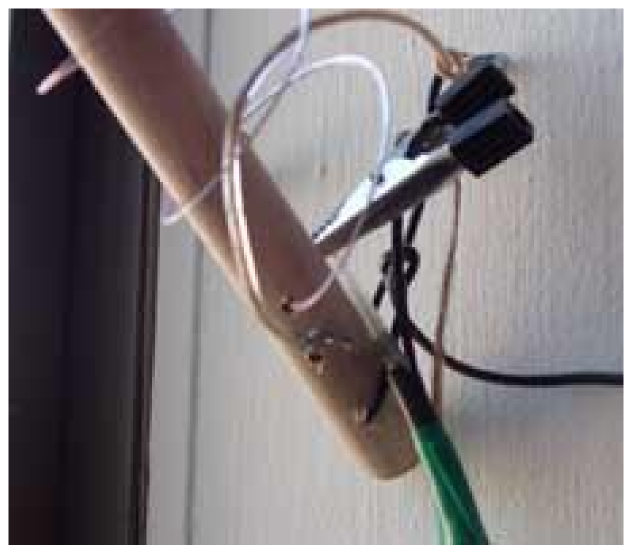
Antenna Adjustment at 20 meter Band: Install power at K-1 to 2 W and do not exceed the level during antenna tuning. Antenna (spiral not spreading across the stick) should be connected to K1 through a small (50- 70 cm) length of coaxial cable. A small bulb should be switched in serial with the spiral. I used a small bulb from a toy gun. Turn on K1 to receiving mode to the 20 meter Band. With help of a dielectric stick (I used a length of a plastic water pipe) in 1 meter length lift upwards the spiral. Find off the spiral length when K1 has the best reception. Do a hole in the stick at the length and pass through the hole the end of the spiral. After that once again with the help of the dielectric stick, approximately on the length of 2/3 (from spiral length) from the antenna bottom, lift or lower coils of the spiral to the best reception. Coils should be fixed by Scotch at several places to keep the spiral placement unchangeable. After that you may turn on K1 to transmitting mode (for a short time) and to make final adjustment of the spiral (by max glow of the bulb) at the length of 1/3 (from spiral length) from the bottom. Coils should be fixed then with Scotch at the proper place.



Fixing coils

Antenna Adjustment at 17 meter Band: Prepare length of insulated wire (18 AWG, 60 cm long) with crocodile clips at the both ends. Connect antenna to K1 then turn transceiver to RX. Short different parts of the spiral by the best reception with help of the jumper.

Antenna hung up to eave



Fastened the Spiral to the Form

Turn on K1 in TX and check the antenna by glow of the bulb. Put marks by marker at the shortened coils. You should turn on the jumper at marked coils when working at 17 meter Band.

Figure 1 shows the final design of the helical antenna. Short the bulb by a crocodile clip when you want work to transmit or you lose RF power in the glow bulb.

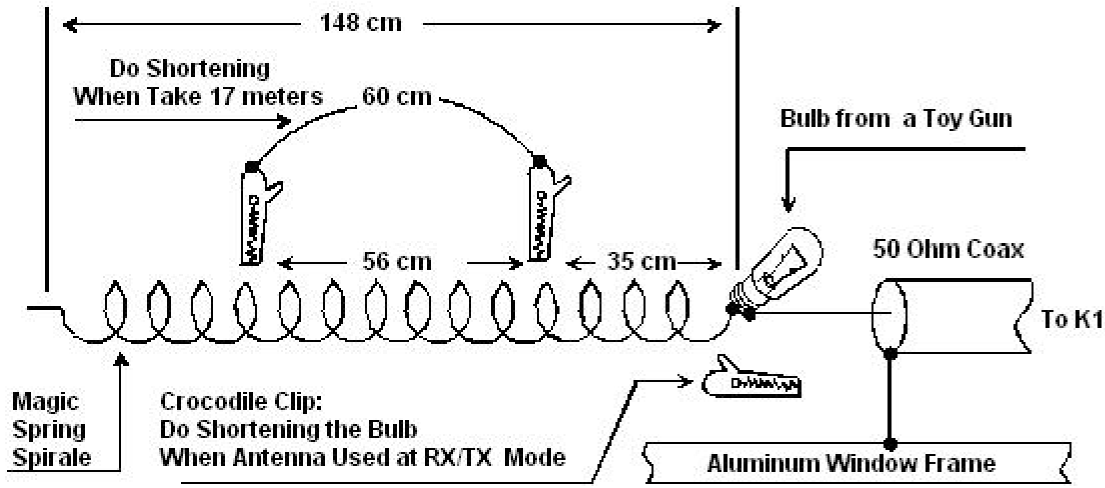
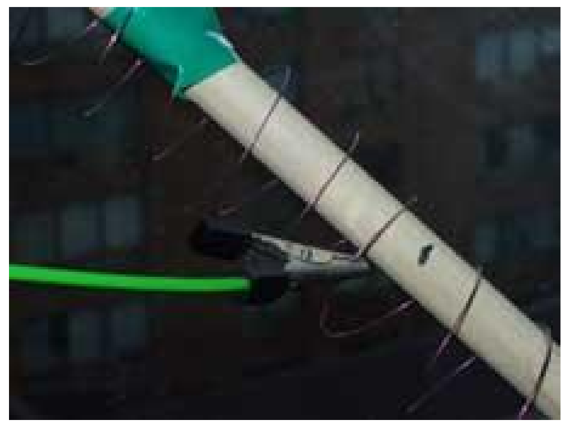


Figure 1 Helical Antenna



Jumper at 17 meter Band

Practical Measurement Parameters of the Helical Antenna: I used a home made RF bridge (see **Reference 2**) for metering of the Helical Antenna. My Helical Antenna had input impedance 35 Ohm at the 20 meter and 46 Ohm at the 17 meter Band.

Theoretical parameters of the Helical Antenna: The theoretical parameters of the Helical Antenna were simulated with the Helical3 (a special program for helical antennas) designed by R.J. Edwards, G4FGQ. On the basis of these calculations I ***could assume*** that the efficiency of my helical is near 12-15% (compare with quarter wave vertical antenna with good grounding). So my Helical Antenna lost up to 9 decibels or up to 1.5 balls on scale S compare with the quarter wave vertical.

Helical Antenna for 17 meters

References:

1. Igor Grigorov. Antennas. Practice of Radioamateur. – Moscow, RadioSoft, 2005 (In Russian)
2. Igor Grigorov. Antennas. Tuning and Adjustment. – Moscow, RadioSoft, 2002 (In Russian)

Helical Antenna for the 20- meter Band

Vladimir Semenov (RU4SJ)

Credit Line:

http://hamradio.mari-el.ru/technics/Spiral_RU4SJ/index.htm

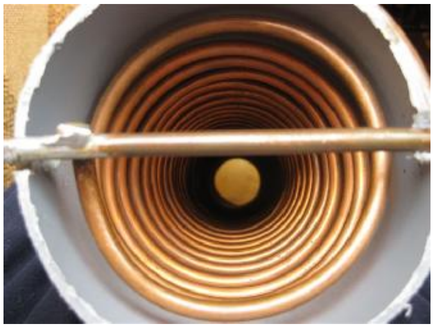
Antenna bandwidth was 13.941- 14.504 MHz. SWR 1.0:1.0 at 14.207 MHz. The Helical Antenna was fed by 75- Ohm coaxial cable in 15.82- meter length.

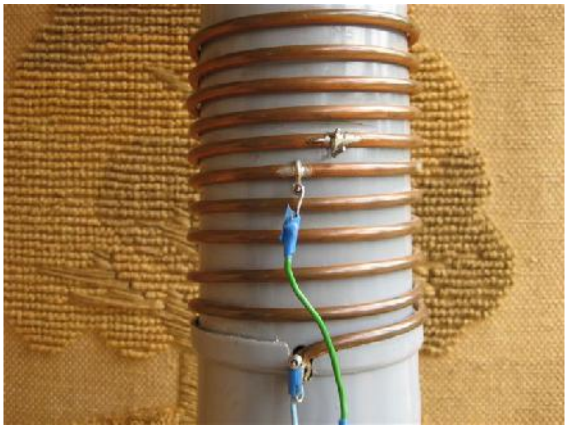
Design: PVC Pipe in diameter 110- mm and length 68- cm was used for the antenna. Antenna was wound by a copper tube with OD 6- mm. Photos are shown design of the antenna. Lower part of the antenna contained 10 ¾ - turns and wound above the tube. Middle part of the antenna contained 35.5 turns. The coil was inside of the tube. Upper part of the antenna contained 7 turns and wound above the pipe. At the 20 meter Band the core of the coaxial cable is connected to 5-th turn (from the cold end) and ground of the coaxial cable is connected to the beginning of the spiral. Antenna should be placed in 50 cm above a conductive surface.

15 meter Band: The antenna when being tuned to 20- meterBand should be matched at 15 – meter Band.

10 meter Band: Antenna may be tuned at 10- meter Band. Ground of the coaxial cable is connected to 6 turn (from the cold end) through inductor (OD- 9- mm, 7 turns of 1.0- mm (18- AWG) copper wire) and core of the coaxial cable is connected to 5th turn from the cold end.

73! RU4SJ





Helical Antenna for the 20- meter Band

Igor Grigorov, VA3ZNW

Described below Helical Antenna for the 20- meter Band has small sizes, this one is easy to tune and the antenna may operate at other amateur bands.

Let's see on the schematic of the Helical Antenna (**Figure 1A**). Helical Antenna consisted of from a vertical radiator V1, helical inductor L1, antistatic resistor R1, antenna grounding and Antenna Tuning Unit. **Figure 1B** allows us understand the design of the antenna.

For vertical radiator V1 (**item 1**) was used automobile whip antenna in 1.2- meter length. The antenna was bought by me on a sale in Canadian Tire for $6 CAD. Helical Inductor L1 was wound on a plastic tube (**item 3**). It was a water tube in 5-feet length and had diameter in 1-1/2 inch. I bought it in Canadian Tire for $7 CAD. Inductor L1 was wound by electrical copper wire in 18-AWG diameter the wire was in strong black insulation (33-cent/m, Home Depot supplier). The wire had 10- meter initial length. Coils were spread uniformly on the tube. A plastic water bottle (**item 2**) with cut bottom was inserted (through a hole in the cap: the hole should be a little smaller the diameter of the whip) on to the whip antenna. The bottle protected the water pipe form from rain, snow and dust leaking inside in. Antenna wire was fixed on the tube (at several places) with help of a Vinyl Electrical Tape. I used to a special outdoor tape with temperature range   – 35 + 90 C. The tape was bought by me in Sayal Electronics for $2 CAD for a reel.

The water pipe (**item 3**) was installed on to a surplus microphone stand (**item 4**). The microphone stand (I bought it in Sayal Electronics for $10 CAD) has a heavy metal circle base with a thick vertical pin. On to the pin the water pipe (**item 3**) was inserted. Near the bottom of the water pipe was installed an RF socket (SO- 239) (**item 6**), antistatic resistor (**item 5**) and copper strip (**item 8**). The copper strip was connected with iron microphone stand and with antenna grounding system.

Antenna grounding system included 10 burred counterpoises. The counterpoises surrounded the antenna similar to the figure of a star. Each counterpoise (3- meter long) consisted of two wires. It was copper wire in strong insulation (similar to antenna wire) and bared stainless steel wire in diameter 19- AWG (I bought it in Home Depot).

Helical Antenna for the 20- meter Band

(Antenna grounding system also was described at: www.antentop.org/017wires_017.html)

Now let's me say some words about tuning and matching the antenna. Antenna should be tuned and matched at the 20- meter Band. The tuning was very easy. At first you need to know the resonance frequency of the antenna and the antenna input impedance. It may be measured with help of an antenna analyzer or SWR-meter. The resonance frequency is measured across resistor R1. I used to a MFJ- 259B to find the resonance frequency. In my case I have got the resonance at 13900- kHz.

Then when near a 70- cm length of wire from the helical inductor was removed the resonance frequency of the antenna became 14.100- kHz. In my case the input impedance of the antenna on the resonance frequency was 8- Ohm.

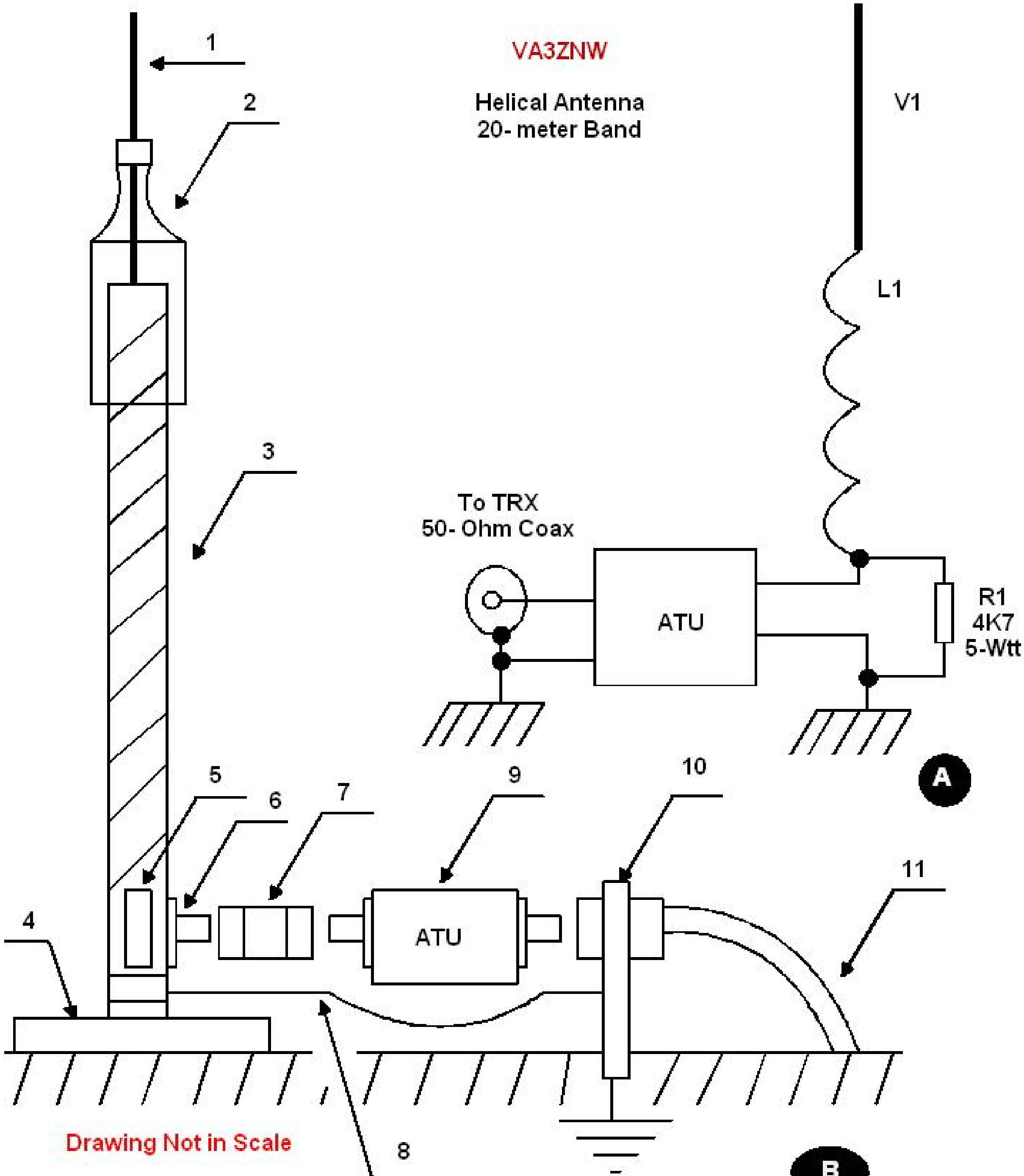


Figure 1 Schematic (A) and Design (B) of the Helical Antenna for the 20- meter Band

The input impedance of the Helical Antenna was strongly depended on the quality of the antenna grounding. With good antenna grounding the antenna should have input impedance around 8- 12- Ohm. For example, when I disconnected the grounding system (www.antentop.org/017wires_017.html) from the antenna and the antenna ground was only the metal base of the microphone stand the antenna had input impedance 70-Ohm.

The low input impedance of the Helical Antenna was matched with 50- Ohm coaxial cable with help of a simple ATU. **Figure 2** shows the schematic (A) and the design (B) of the ATU. Parameters of parts of the ATU were calculated by me with the help of the free antenna simulator MMANA.

Capacitor C1 had capacity 510- pF. I used a mica capacitor. Inductor L1 had inductance 0.21- uH. It contained 5.5- turns of bare strand copper wire (18-AWG) air coiled on a form with diameter 12-mm. Gap between turns was 1- mm. ATU was tuned by stretching – squeezing turns of the inductor. Antenna had SWR 1.0: 1.0 at 14.100- kHz. At the 14.000- kHz SWR was 1.2:1.0. At 14.450- kHz SWR was 2.0:1.0.

The ATU made inside of a clear plastic box (Food Box). With the antenna the ATU (**item 9**) was connected with help of M-M adaptor (**item 7**). Coaxial cable (**item 11**) was connected to the ATU. Copper strip (**item 10**) was attached to the RF- connector of the coaxial cable with help of a clamp. The strip was connected to the antenna grounding system. Antenna was fed through buried coaxial cable (BFLEX, DAVIS- RF was supplier). The coaxial cable then was going through a ventilation hole in to the basement where my shack was placed.
Antenna worked fine at the 20- meter Band. However, through some time I decided use to the antenna for others amateur bands.

The mostly effective solution was very clear for me. I need to install ATU, made inside a big clear box, with switch that could be match antenna at the used bands. The ATU circuits for other Bands should be similar to the 20- meter ATU. I have measured the antenna impedance at the other (10, 15, 30 and 40 meter) bands. New LC values for the bands were calculated. Old ATU was removed for the modification and the antenna was fed directly by the coaxial cable. Temporary fed as I thought… But other deals distracted me from doing of the universal ATU… Then autumn and then winter was coming…

So, the universal ATU still did not made. However, I discovered that the antenna worked good at the 10-, 15-, 20-, 30-, 40- meter Bands with help of just ATU between my transceiver and the coaxial cable going to the antenna. My MFJ VERSA TUNER II could match the antenna on the bands. Another one tuner, LDG Z- 11 PRO II also could match the antenna on the bands. Be truth my door on to backyard was frozen at the cold winter. So I could not go outside most of the cold days (way what I planned to switch the bands). So, the direct feeding was preferable for me at the situation. But may be at the coming summer I will make the universal tuner…

73! de VA3ZNW

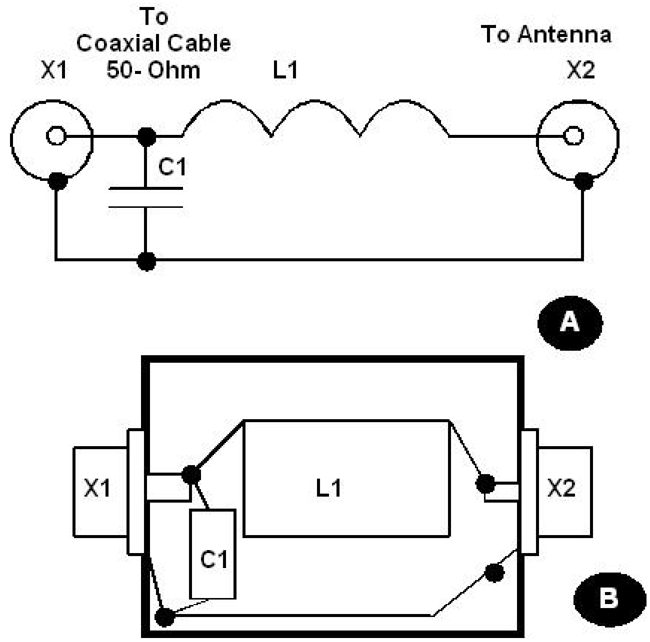


Figure 2 Schematic (A) and Design (B) of the Helical Antenna ATU

Helical Antenna for the 20- meter Band
Winter Time

RX3MS Helical Antennas

By: ***Vladimir Turkin, RX3MS***

Below there are described three Helical Antennas. All of the antennas were made and tested by RX3MS. The antennas later were duplicated at several amateur's radio stations and the antennas showed good efficiency.

Antennas were tested at balcony located at the first floor of two store wooden house.

Common concept for the Helical Antennas: Antenna mast was installed on balcony railing that was at 5 meter above the ground. RF transformer was used at antenna terminals. From the antenna a 5-meter length coaxial cable was going to home brew ATU that provided additional matching the Helical Antenna with transceiver.

Figure 1 shows RX3MS Helical Antenna.

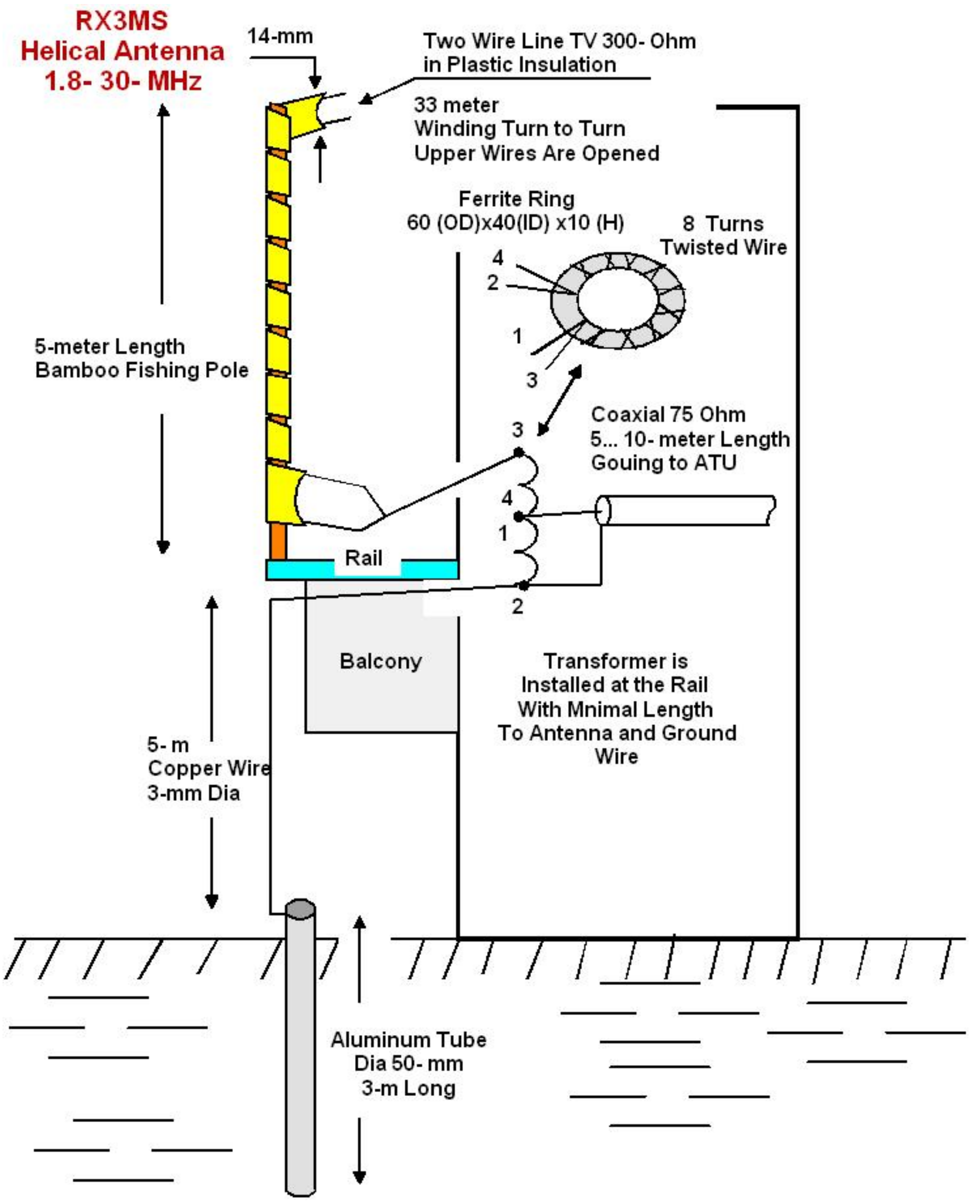


Figure 1 RX3MS Helical Antenna

Design: 300- Ohm TV Cable in 33 meter length was wound around a 5 meter long bamboo fishing pole. TV Cable on the antenna top was opened. TV Cable at the antenna bottom was closed. An RF transformer was installed at the antenna terminals. Transformer was wound on to a ferrite ring in dimensions 60- mm OD x 40- mm ID x 10-mm H. Windings were wound by a twisted wire and had 8 turns. Schematic of the transformer is shown in the **Figure 1**. Antenna had grounding. It was made by wire in diameter 3- mm. The wire was connected with aluminum tube. The tube was 3- meter long and was inserted into the ground. The antenna could be tuned from 1.8 to 30.0- MHz.

RX3MS Helical Antennas

Figure 2 shows MAXI RX3MS Helical Antenna.

Design: Plastic fishing pole was installed on top of the 10-meter long mast. A dry Pine Tree Pole was used to make the mast. 30 meter of twin wire line in plastic insulation was wound around the plastic fishing pole. Twin wire line on the antenna top was opened. The same line was downed to the balcony rail. Transformer (the same as for antenna shown on **Figure 1**) was installed at the antenna. Antenna had the same grounding as for antenna shown on **Figure 1**. The antenna could be tuned from 1.8 to 30.0- MHz.

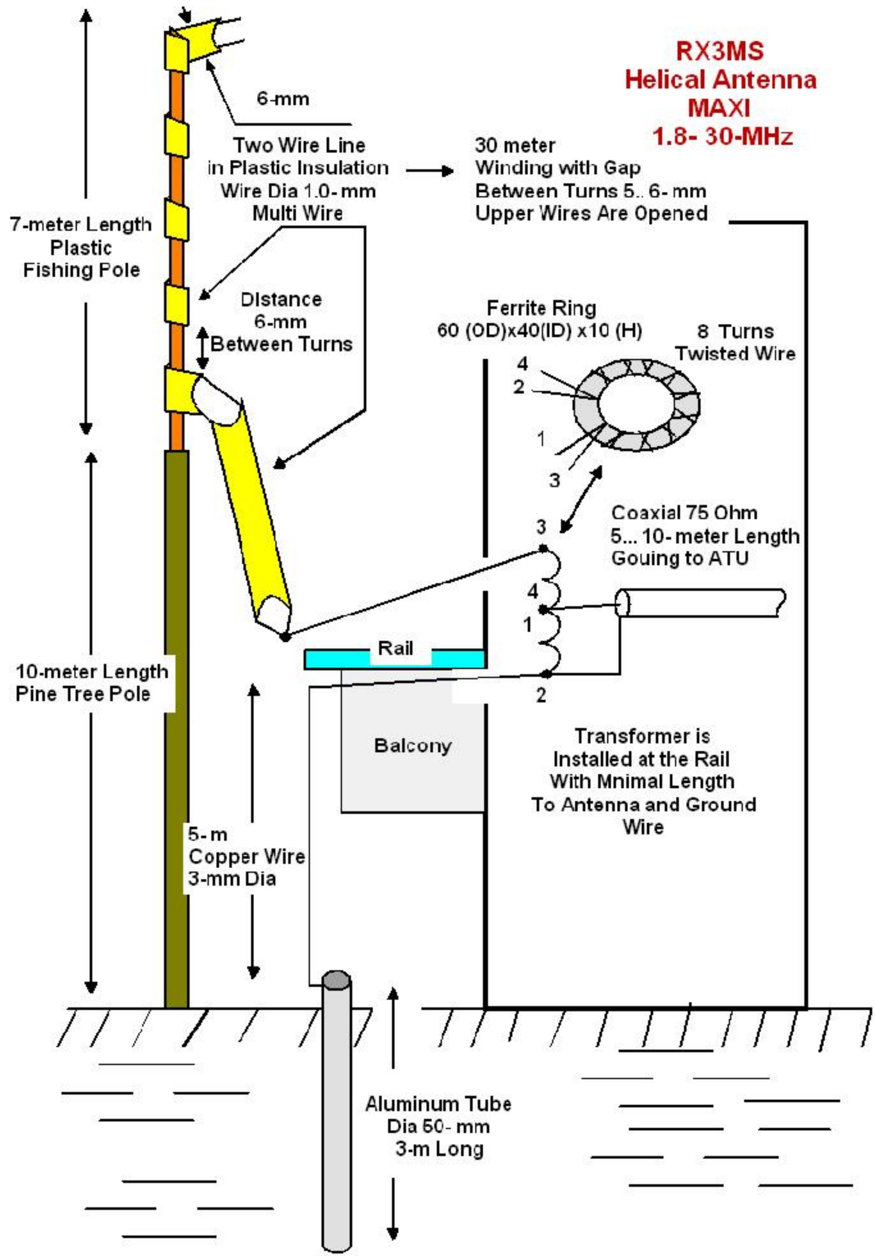


Figure 2 MAXI RX3MS Helical Antenna

Figure 3 shows MINI RX3MS Helical Antenna.

Design: For the antenna was used a 5 meter long dry wooden pole (dry Pine Tree) and water pipe in diameter 40- mm and 1.5- meter long. The pole was inserted into the water pipe. Twin wire line in plastic insulation and 33 meter length was wound around the plastic water pipe. Line on the antenna top was opened.

Copper wire in 2- mm diameter and 3.5 meter length was going to the transformer. Transformer was the same as for antenna shown on **Figure 1.** Antenna had the same grounding as for antenna shown on **Figure 1**. The antenna could be tuned from 1.8 to 30.0- MHz.

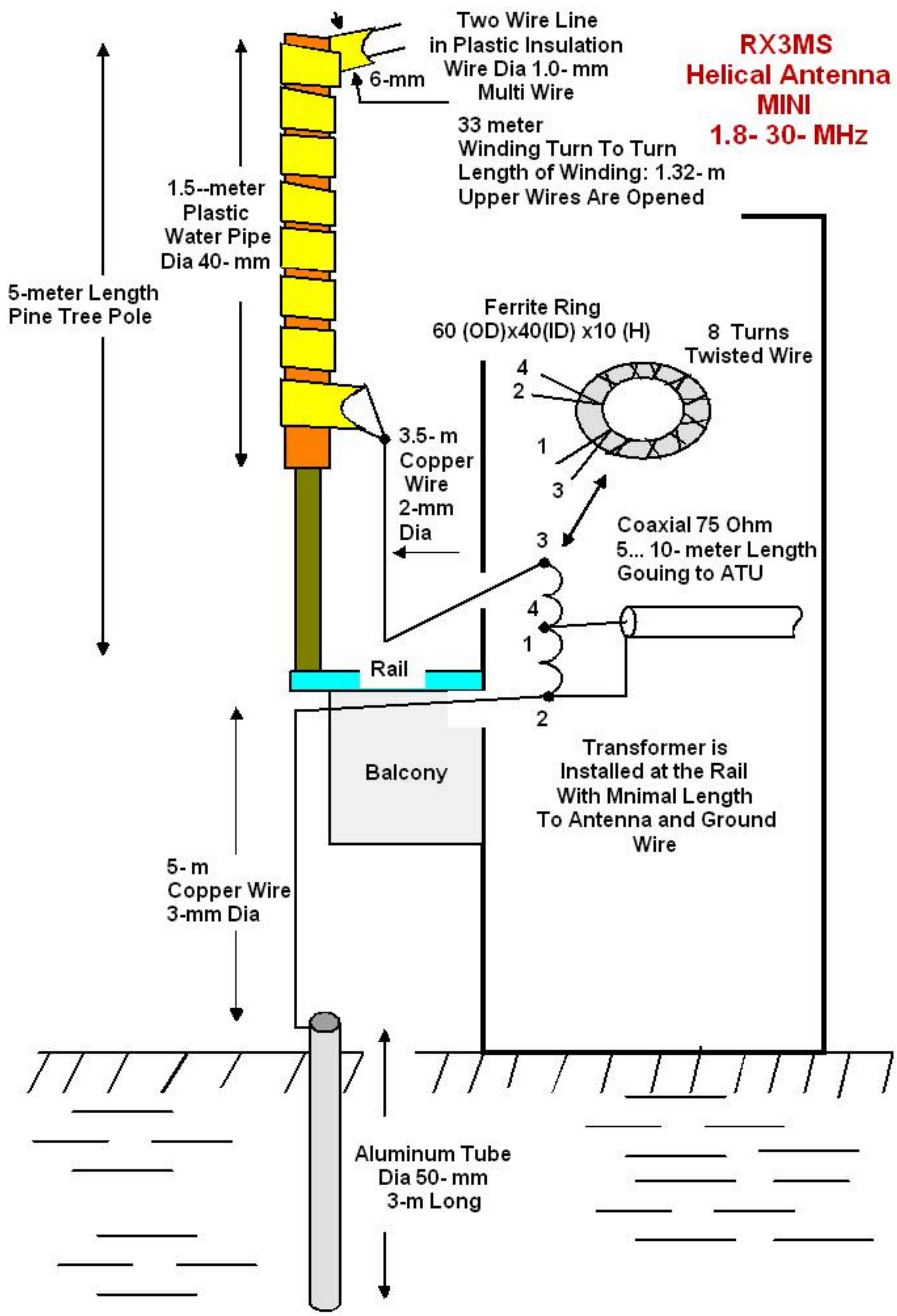


Figure 3 MINI RX3MS Helical Antenna

Antennas were tuned with help of the tuner shown in **Figure** 4. The tuner could match all of three helical antennas with used transceiver. Tuner was matched with the transceiver with help of a triple variable capacitor with capacity 11- 75- pF in each section. The capacitor was reworked from a usual variable capacitor from an old tube receiver. Each second plate at each section was deleted. Capacitor C4 at antenna side was air- dielectric capacitor with gap between plates in 2-mm. Such ATU could afford 100 W RF Power going through.

It was used an old variometer with roller from ex-Soviet military transmitter for inductor L1. The ATU could be tuned with internal SWR- Meter (to minima SWR) of the transceiver or by glow of the neon bulb. You just need to install proper capacitor C5 to view glowing of the bulb. It is possible to tune the antenna system by FSM installed at the transmitting site.

All of the three antennas was tested at QRP power and showed good result.

73! DE RX3MS

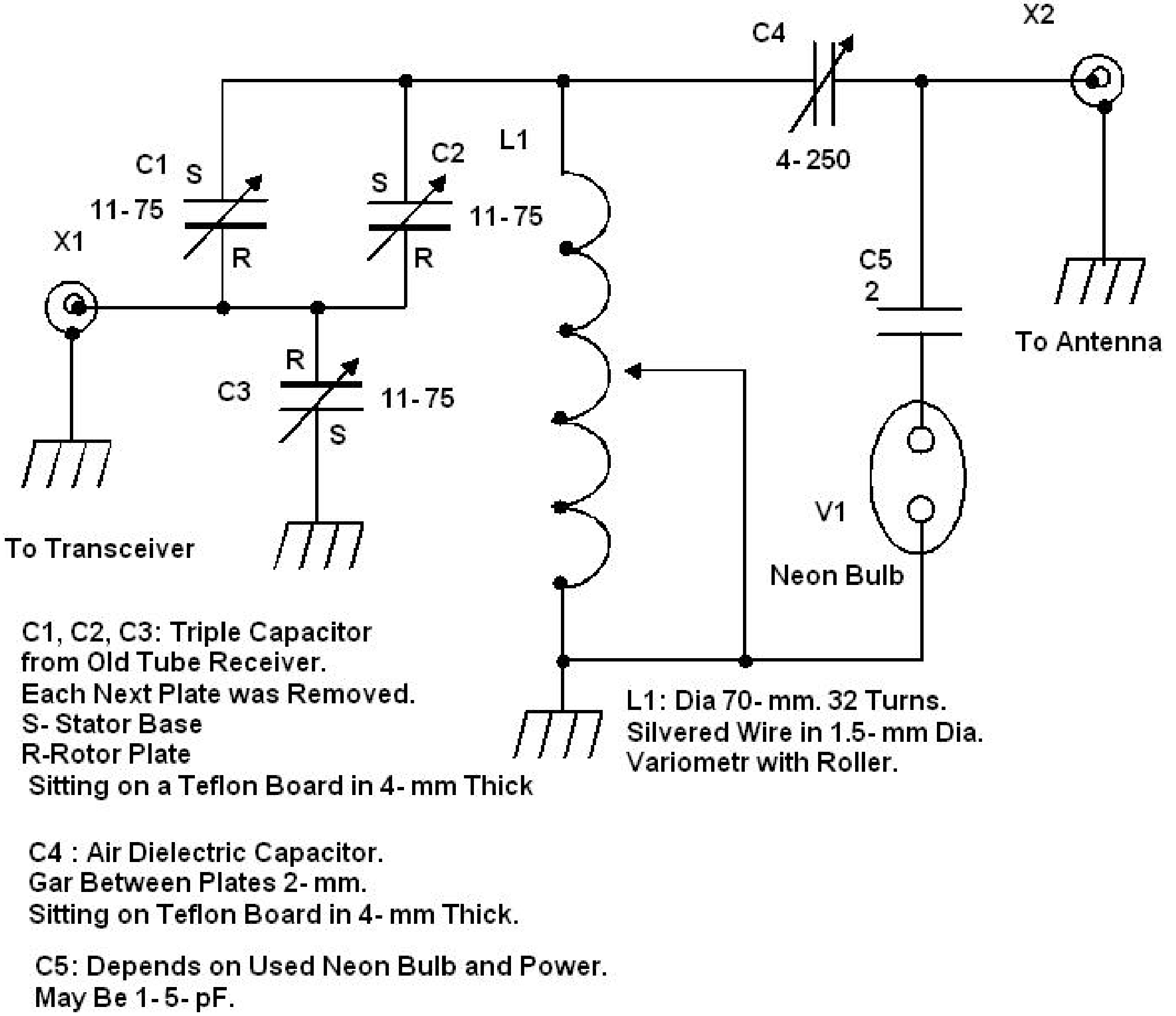


Figure 4 Antenna Tuner by RX3MS for his Helical Antennas

UR5WCA Balcony Antenna for 7, 10 and 14 MHz

By: Valeriy Prodanov, UR5WCA
ur5wca@ukr.net

Credit Line: www.cqham.ru

As I am an urban resident I have not a sufficient place for my antenna. My balcony, placed at the 2nd- floor at 5-store building, is my sole antenna polygon. So, I've installed there a balcony antenna for my favorite 7, 10 and 14 MHz- Bands. It was a Helical Vertical Antenna that could be used at these Bands. **Figure 1** shows the view of the antenna. **Figure 2** shows the schematic of the antenna.

Figure 1 UR5WCA Balcony Helical Antenna

Design of the antenna:

- Two PVC water tubes in 5 centimeters diameter and 1.5- meter long were used for the Helical Antenna.

- 11.5 meter of insulated copper wire in 1- mm (18 AWG) diameter was coiled on to length of 1.35 meter on each tube.

- Distance between the two Helical Verticals was 1 meter.

The two Helical Vertical Antennas were connected to first ATU. It was RF Transformer made according to **Reference 1**. **Figure 3** shows the picture of the ATU- RF Transformer. Usual ATU installed between coaxial cable going from the antenna and transceiver should be used as well.

UR5WCA

For testing the antenna I used a home- brew transceiver made on the base of old Russian receiver R-250 and ATU MFJ- 945E. SWR of the antenna at 7, 10 and 14 MHz Bands was close to 1:1. At the 18 MHz Band the antenna had SWR 1:2. While two weeks running the antenna on the bands I did a hundred CW QSO with practically with all the European countries and some district of Asia of the former USSR. Usually the QSOs were made with RST 569… 599. The antenna worked with low SWR at the 80- meter Band, however only local QSOs was done...

Modification of the UR5WCA Balcony Helical Antenna for 7, 10 and 14- MHz

Figure 4 shows modification of the antenna that increases it performance. Inductors L1 and L2 were coiled on to length of PVC water tube in 35- mm OD by insulated copper wire in 1.5-mm (15- AWG) diameter, spacing between turns is 2-mm, numbers of turns 29, tap from 9th turn from the cold end. FSM (Field Strength Meter) displayed increasing of electromagnetic field up to 30% compare to antenna without matching coils. The measurement was made at distance 5 meter far from the antenna.

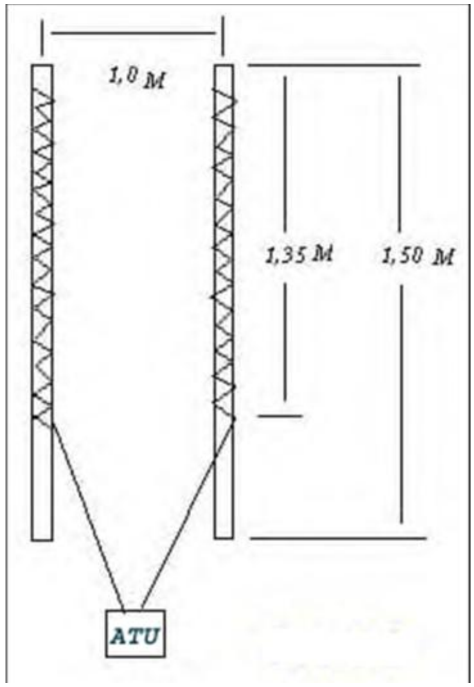


Figure 2 Schematic of the UR5WCA Balcony Helical Antenna

Figure 3 ATU of the UR5WCA Balcony Helical Antenna

The two Helical Vertical Antennas with coils were connected to first ATU. It was RF transformer made according to **Reference 1**. Usual ATU installed between coaxial cable going from the antenna and transceiver should be used as well.

After some tests I did other modifications.

1. Each vertical contained 20.2 meters of insulated copper wire in 1.5-mm (15- AWG) diameter.

2. The coils (see **Figure 4**) were deleted and verticals were connected straight away to RF transformer (see **Figure 5**).

3. Antenna Ground (I used metal balcony hand-rail) was used with the antenna.

After this modifications noise level decreased, SWR was not changed. ATU between coaxial cable going from the antenna and transceiver should be used as well. With the antenna I did some DX QSOs, for example, with KH0DQ (10-MHz, 589 received) and 5Z4LS (14-MHz, 599 received).

Conclusion: Of course, it is only a surrogate antenna, but the antenna is worked, and worked well.

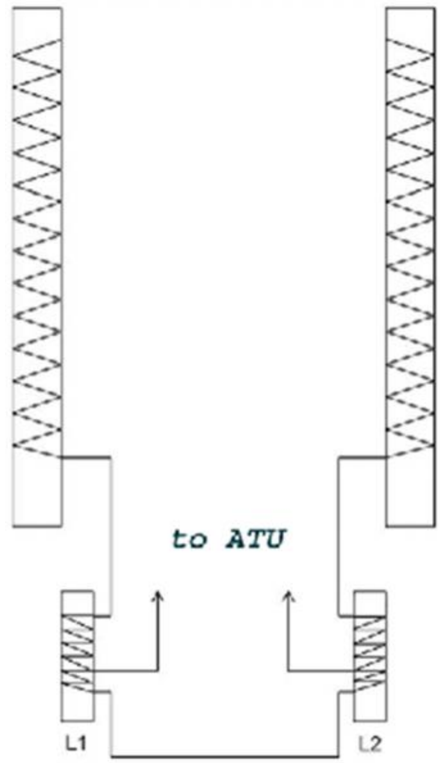


Figure 4 Modification of the UR5WCA Balcony Antenna

References:

. http://www.qsl.net/gw6hmj/antenna.htm

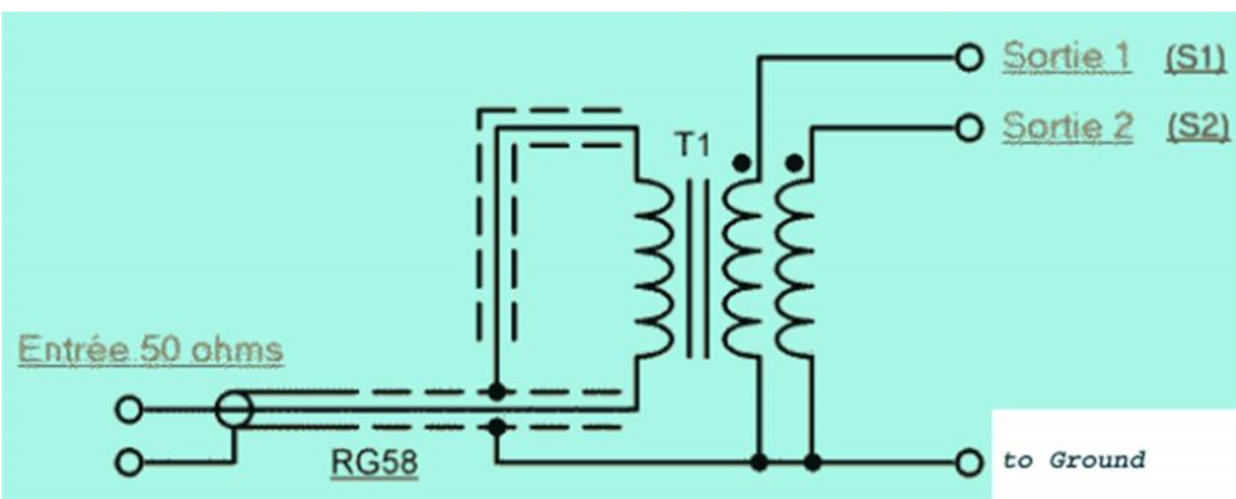


Figure 5 ATU of the UR5WCA Balcony Antenna

A HELICAL LOPP ANTENNA FOR THE 20 METERS BAND

***By Vladimir Kuz'min, UA9JKW*,**
KuzminVI@pn.yungjsc.com

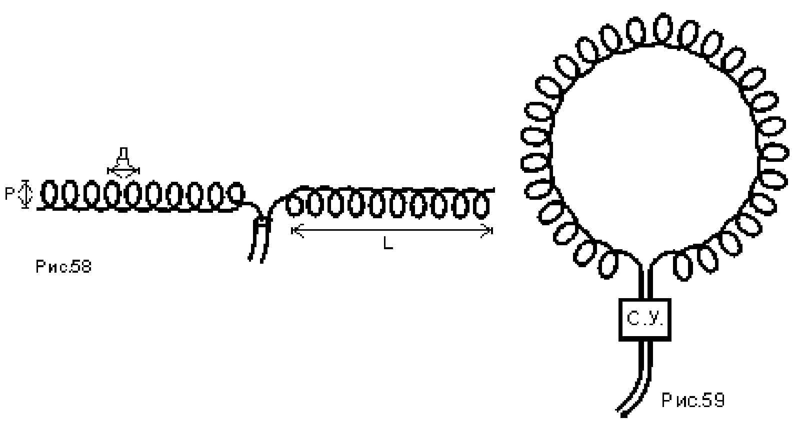
Two years back I have moved to Nefteyugansk (Russia, Siberia) where I could not get permission for installation for a full-sized HF- antenna on the roof of my house. So I began to do experimenters with small indoors antennas. Most successful design of my indoor antenna was antenna similar to ***Fig. 59****, given in* ***Reference 1****.*

Design: Plastic water in one inch diameter was used for form of the antenna. The pipe was formed into a hoop in 1 meter diameter. Then 580 turns (near 61 meters of length) of multicore isolated wire of 3 mm diameter with thickness of isolation of 1 mm were wound around the tube. So, the gap between turns was 2 mm. Space from the antenna to ceil was near 25 centimeters. With the antenna it was used a simple symmetrical device- 3 turns of coaxial cable going to antenna was wound on a TV yoke ferrite core. Antenna was fed by 50- Ohm coaxial cable. SWR was 1:1 at 14.100, bandwidth to SWR 1:1.5 was 300-kHz.

The antenna had quite good direction properties. Signals from radio stations changed up to 1-1.5 point at S- meter of my transceiver at rotation the antenna in horizon plane within 30-90 degree. I used transceiver YAESU FT840 for my work in the Air. Rotation of the antenna in vertical plane did not give any effect.

Helical Loop Antenna

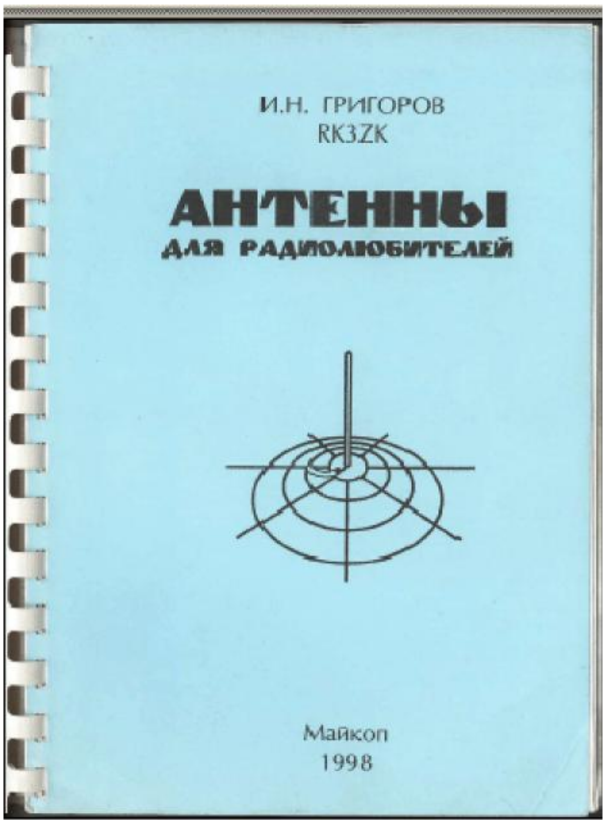
Figure 58 & 59 from Reference 1



In some my experimenters I took off the antenna at 1.5 meter from the balcony wall. I have got significant improvement of the operation in the Air with such antenna.

Anyway the antenna allowed me to be in the Air. Antenna was low noise one and no TVI was produced when I used to the antenna.

Reference:
I. Grigorov. Antennas for radio amateurs. - Majkop, 1998.



Antennas for Radio Amateurs:

by Igor Grigorov, RK3ZK

In Russian

http://www.antentop.org/library/shelf_hamant.htm

UA9JKW at his shack

Directional Helical Antennas

I. Kapustin, UA0RW
Radio # 7 1958, pp.: 34-35.

The antenna was designed for the 20-meter Band. It was two Helical Dipoles that fed with phase shift in 90 degree. Antenna fed by two wire open line in voltage antinode. **Figure 1** shows the Directional Dipole Helical Antenna.

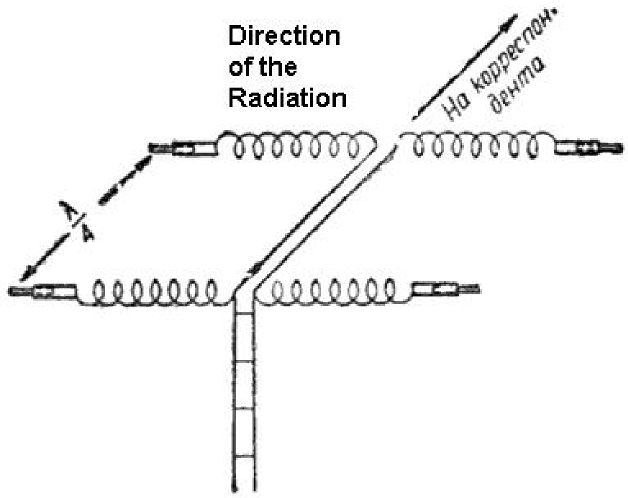


Figure 1 Directional Dipole Helical Antenna

The distance between the Helical Dipoles was Lambda/4. Form for the Helical Dipole was plastic tube in 3-cm diameter (it is possible to use wood rectangular 3x3 – cm) and 110-cm in length. Two spirals in 77 turns of strand wire in 3-mm (9-AWG) diameter were coiled at the each side of the tube. Gap between the coils was 7.5-mm. Ends of the tubes were plugged by wood plug. Copper tube by length in 45-cm and 8-mm OD was inserted in each wood plug. Ends of spirals were soldered to the copper tube near the plug. Bare wire (or tube) with OD that could fit inside the copper tube is inserted into. Antenna was tuned into resonance by symmetrical moving the end bare wires. **Figure 2** shows the design of the tube ending.

The Helical Dipoles were fastened to the traverse made from a strong square wood stick. The stick is fastened to the antenna mast. Open Two Wire Line made of copper cord wire (3- mm (9-AWG) OD) the distance between wires was 6- cm. The line was sitting on insulators under the strong square stick. Length of the line is 5.2- meter. Design of the Directional Dipole Helical Antenna is shown on **Figure 3**.

Front Cover of Radio #7 1958

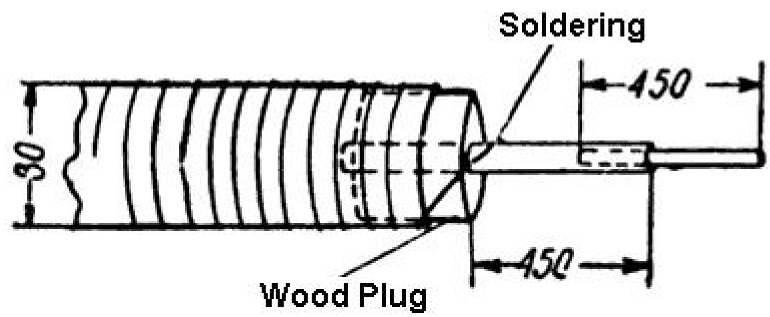


Figure 2 Ending of the Helical Dipole

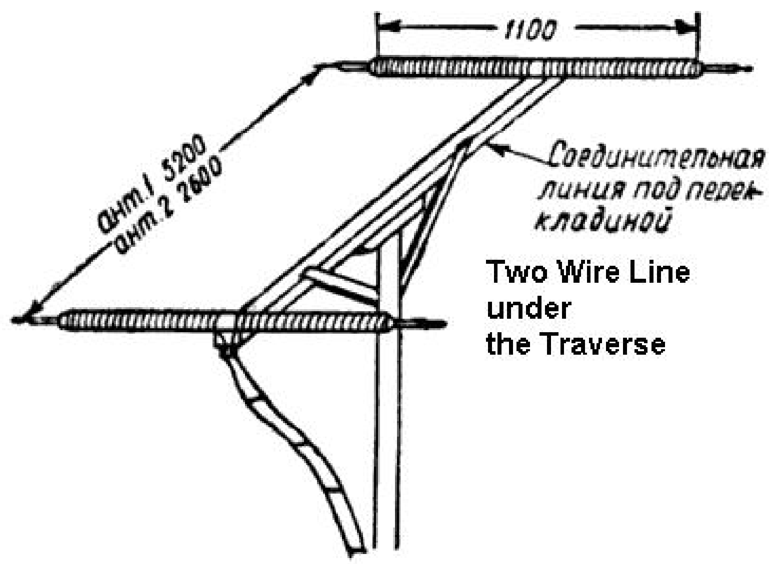


Figure 3 Design of the Directional Dipole Helical Antenna

It was done A- B teas the Directional Dipole Helical Antenna with Windom Antenna designed for the 20-meter Band. Windom Antenna was 10-meter in length. The Windom Antenna had maxima radiation to the South. At 1-km to the South from the tested antennas was installed a control receiver with S-Meter. **Table 1** shows the Data obtained from the test.

И. Капустин (UAФRW)

Title of the article
Directional Helical Antennas
From Radio # 7 1958

Table 1 Data for testing of the Helical Antenna vs Windom

#	Direction to maxima Radiation Of the Helical Antenna	S- Meter
1	North	0.8
2	East	2.0
3	South	2.4
4	West	2.0

Column “S- Meter” shows normalized level – Helical Antenna/Windom Antenna. For example, digit “2” shows that level from the Helical Antenna is in 2 times more (according to the S- meter of the receiver) compare to the level from the Windom Antenna.

It was tested Directional Dipole Helical Antenna with reduced sizes. Length between the Helical Dipoles was lambda/8 (2.6-m) for the 20- Meter Band. Phase shift line at the antenna made from Four Wire Open Line. **Figure 4** shows the design of the Small Directional Dipole Helical Antenna.

Figure 5 shows the design of the Four Wire Open Line. The Four- Wire Line was placed onto insulators under the square wood stick. The small sized Directional Dipole Helical Antenna at the test showed that this one worked similar to the helical antenna shown on the **Figure 3**.

However, the Small Directional Dipole Helical Antenna was more complicated in the tuning compare to Antenna from the **Figure 3**. The antennas were fed by 500- Ohm Two Wire Line in 15.6-meter (3/4- Lambda) length.

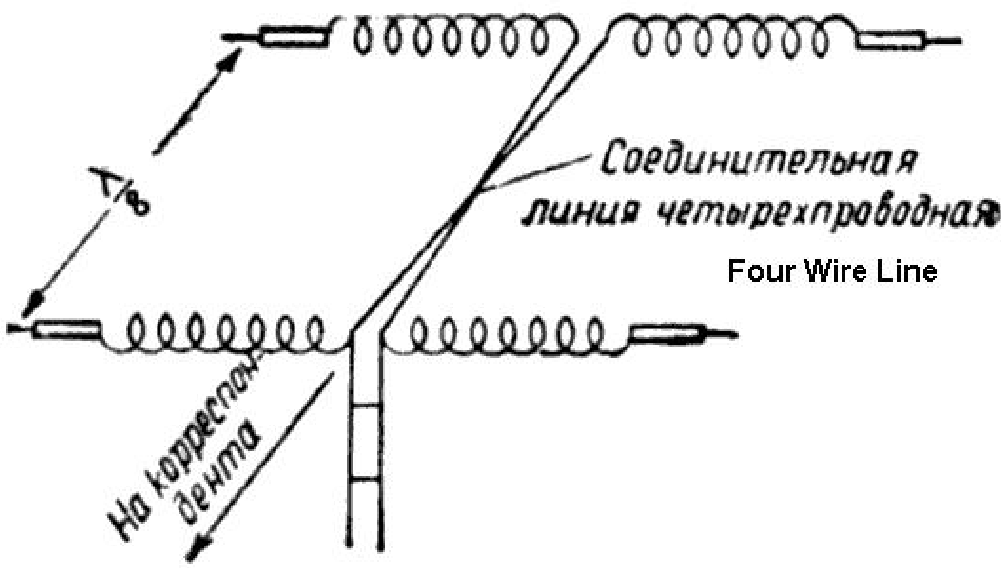


Figure 4 Design of the Small Directional Dipole Helical Antenna

Tuning of the Directional Dipole Helical Antenna (for both antennas- **Figure 3** and **Figure 4**):

1. Two wire feeder line (with length 15.6-m) should be disconnected from the antenna and connected to TX (***CAREFUL:*** To a Tube TX! May be used semiconductor PA with ATU). (**Figure 6A**)

2. TX should be tuned to the middle of the 20-meter Band and then PA should be tuned to the resonance with the two wire line.

3. Connect First dipole to the feeder. Tune the dipole to the resonance (using only the tuning strand wire at the dipole, do not change tuning at the PA). (**Figure 6B**)

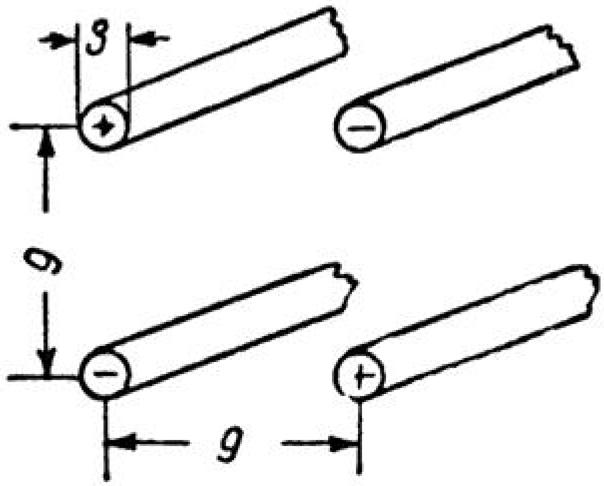


Figure 5 Design of the Four- Wire Line

4. If the dipole loaded too much the feeder, change distance between wires of the Two-Wire Line.
5. Second dipole with the phase two wire line should be connected to the feeder. (***First dipole is disconnected!***) Tune the dipole to the resonance (using the tuning strand wire). (**Figure 6C**)
6. If the dipole loaded too much the feeder, change distance between wires of the phase line.
7. Connect the antenna to the feeder. (Both dipoles, as shown on the **Figure 3** and **Figure 4**) (**Figure 6D**) Antenna should not detune the feeder. If it is, repeat tuning process from paragraph 1.

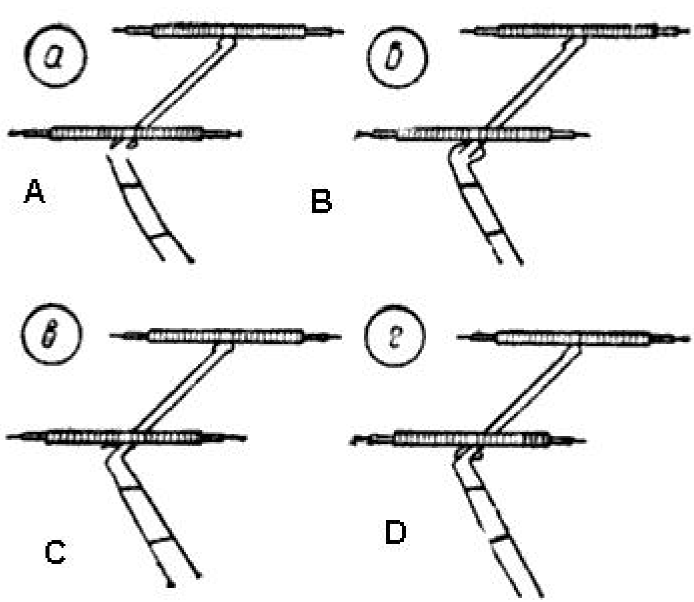


Figure 6 Steps for Tuning Directional Dipole Helical Antenna

Shortened Helical Antennas

The book is an author version of one of the chapters from the book: Antennas: Ham Practice. The book was published in Moscow, in 2006. The book published in Russian.

Book contains topics on design, tuning and measurement of the home made Shortened Helical Antennas intended for operation in the amateur HF- Bands. There are published theoretical and practically obtained data for Shortened Helical Antennas. The book describes some practical design of the helical antennas. Hope the book would be useful for those who attempts make and tune such antennas.

73!
Igor Grigorov, VA3ZNW


Igor Grigorov
(VA3ZNW)

Укороченные

Спиральные Антенны

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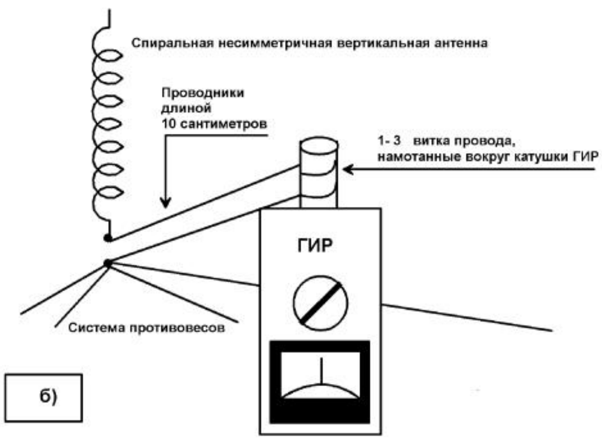
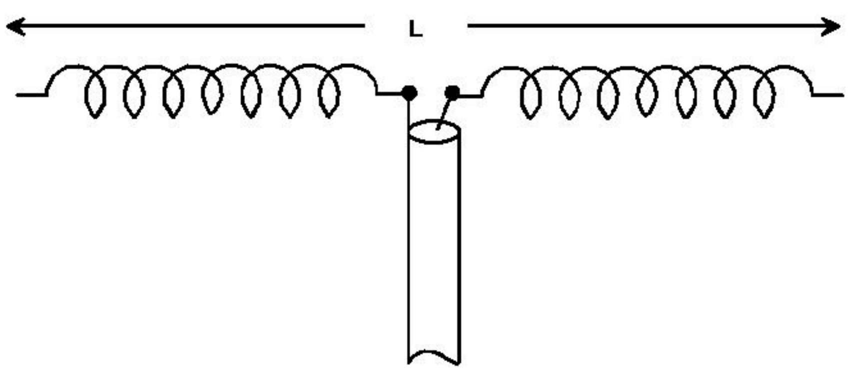
CANADA, Richmond Hill
2016





Link to load the book:
http://www.antentop.org/library/shelf_helical.htm

Conclusion

So, Chapter 2 ***"HF Helical Antennas"*** is ended. You have got enough information to install the HF Helical Antenna at any location. However HF Helical Antennas may require some experience and some equipment (SWR- meter or Antenna Analyzer) for tuning. ***But do not afraid it, just do it!***

Of course the ***Chapter 2*** gave you only practical recommendation about the antenna family. Some theoretical (as well as practical) info you may find at my book ***"Shortened Helical Antennas"*** (see below). The book is written in Russian however there are some translator (GOOGLE) that may do reasonable translation.

HF Helical Antenna requires good ground for proper work. Information on grounding you may find at ***References # 4*** and at **Additional Source # 2**. All links go to the ***antentop.org*** site.

I wish you success to design your own Helical Antennas. ***73! Igor, VA3ZNW***

References:

Old Helical Antennas

1. Small Sized Helical Antennas: http://www.antentop.org/011/helical_011.htm

Window Helical Antennas

1. Indoor Helical Antenna for the 20 and 17 meters for K1: http://www.antentop.org/008/hel008.htm

2. Helical Antenna for 20 meters Band: http://www.antentop.org/015/helical_ant_015.htm

Backyard Helical Antenna

1. Helical Antenna for the 20- meter Band: http://www.antentop.org/017/va3znw_017.htm

Balcony Helical Antennas

1. RX3MS Helical Antennas: http://www.antentop.org/020/RX3MS_020.htm

2. UR5WCA Balcony Antenna for 7, 10 and 14 MHz: http://www.antentop.org/009/ur5wca009.htm

3. A Helical Loop Antenna for the 20-meters Band: http://www.antentop.org/005/loop_005.htm

Directional Helical Antennas

1. Directional Helical Antennas: http://www.antentop.org/012/helical_012.htm

Additional Source:

1. Shortened Helical Antennas: http://www.antentop.org/library/shelf_helical.htm
2. Wires for Antenna and Grounding: http://www.antentop.org/017/wires_017.htm

CHAPTER 3

Magnetic Loop Antennas

Magnetic Loop Antennas... The ***receiving*** Magnetic Loop Antennas are very old. They were in use with first radio receivers and widespread in commercial and amateur application. However ***transmitting*** Magnetic Loop Antennas are not old and widespread as ***receiving*** Magnetic Loop Antennas. In the ham application the ***transmitting*** Magnetic Loop Antennas used from 1967 (though it is possible to find articles printed before ww2 that are described transmitting Magnetic Loop Antennas).

Start to the transmitting Magnetic Loop Antenna gave article written by Kenneth H Patterson (***Reference 1***) in 1967. The magnetic loop antenna described at the article was developed for military application in South East Asia to boost MF & HF signals covering the 2- 5MHz range to work out of narrow valleys and dense forests. Antenna was designed to be compact, just 12 feet wide, easy to assemble or dismantle and pack away in a small space.

Followed articles in amateur magazines (just example of two articles- ***References 2***, ***3***) spread info about the antenna to hams. Recently you may find hundreds design of the Magnetic Loop Antenna in the internet. Of course ***Antenna Manuscript*** cannot compete with internet and the main search engine ***GOOGLE***. You may find in the internet info about ***Antenna Calculator*** for Magnetic Loop Antenna (as well as critical articles on it, ***Reference 4***) that allows you design your own Magnetic Loop Antenna.

Chapter 3 gives you description of some old and modern practical design of the receiving and transmitting Magnetic Loop Antennas.

Transmitting Magnetic Loop Antenna should be placed as much far as possible from operator and nearest subjects. High density magnetic field near the transmitting Magnetic Loop Antenna may harm human health and will heat nearest subjects.

References:

1. Patterson, K. Aug 1967. Electronics Aug 1967.Down to earth army antenna.
2. Lewis G. McCoy, W1ICP McCoy. QST Mar 1968. The army loop in ham communication, pp.:17-18 & 150.
3. Pat Hawker G3VA. Radio Communications Nov 1967. RSGB Antenna Topics, pp.: 19-20.
4. Small transmitting loop calculators – a comparison: http://owenduffy.net/blog/?p=1693&

Magnetic Loop from the 1928

Note from I.G.: "Radio Vsem" (# 9, 1928 pp.: 43- 44, "QRP for Summer") described several antennas that was used at a military training in the USSR in 1927. One of the antennas (that worked well at the training) was antenna that now named as "Magnetic Loop" Antenna. In the magazine the antenna was named as "Frame" Antenna. In the article were described two transmitters with "Frame" antenna. **Figure 1** shows Transmitter with Frame Antenna with capacity tuning.

Description of the antenna: It was 3 turns square loop antenna length of the each size of the square was 60- cm. Antenna wound by insulated wire, diameter of the wire was 1.5… 2.5- mm (15- 10- AWG). Capacitor C1 had capacity up to 250- pF capacitor C2 had capacity up to 500- pF. Antenna covered wavelength from 40- to 120- meter. Wavelength is switched (roughly) by choosing turns of the loop (1, 2 or three), then smoothly by C1. C2 was tuned by maximum power (checking by the glow of the bulb) going to the antenna.

The capacitors should be work at 500- V. L2 and L3 were RF- Chokes. Those ones were identical with each other. RF choke contained 200 turns by wire in diameter of 0.5- mm (24- AWG), wound on the form in diameter ¾-inch. R2- 10.000 Ohm.

Figure 2 shows simplified version of transmitter with frame tap antenna. Tap was taken from the middle of the loop. The transmitter tuned to the needed frequency just with help of capacitor C1.

Transmitters with the Frame Antenna had strong directivity. Each turning of the frame caused to the small changing of the wavelength. Transmitter should be placed far from any metal subjects. The transmitters provided confident radio communication to 20-km.

The transmitters with the frame antennas had small sizes, easy to hide and has directivity in transmitting that was useful in military application. At the TX there were used Russian tubes UT- 1, R-5.

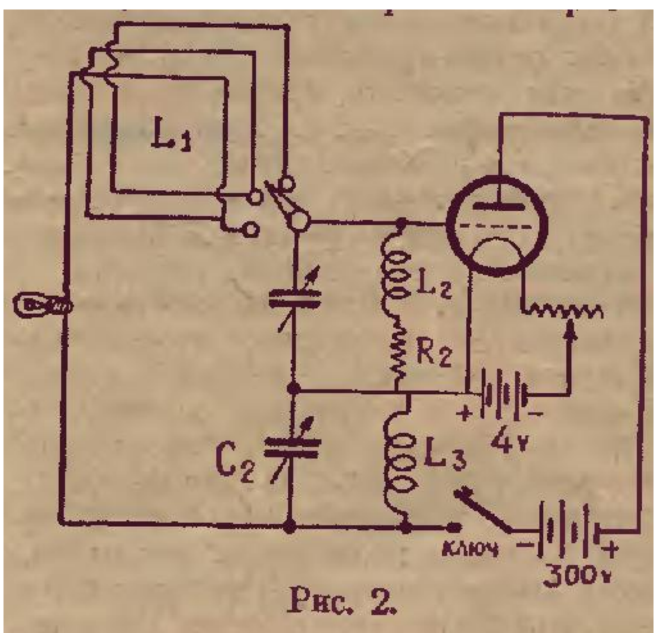


Figure 1 Transmitter with Frame Antenna with Capacity Tuning

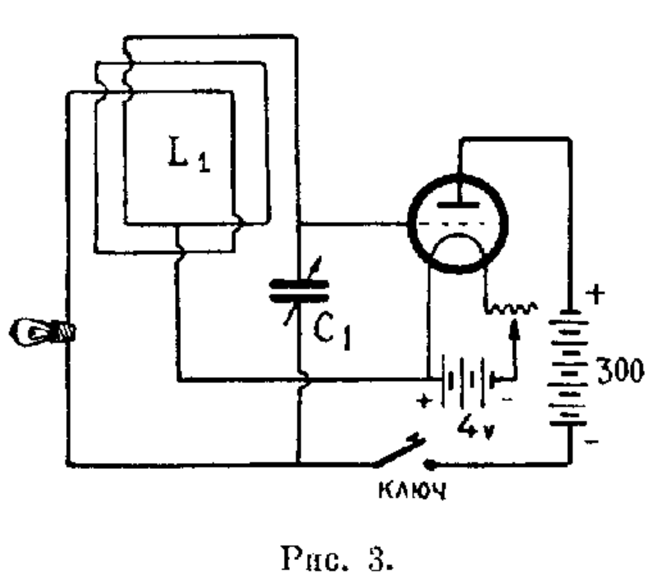


Figure 2 Simplified Version of Transmitter with Frame Tap Antenna

Once Again About Magnetic Loop Antenna

By: Igor Grigorov, RK3ZK

I made probably hundreds of various Magnetic Loop Antennas (some of them on the basis of hula- hoop) for frequencies from 136 kHz up to 148 MHz. Always I have got rather good results either for receiving or for transmitting Magnetic Loop Antennas.

For those radio amateur who would like try Magnetic Loop Antenna on basis of hula-hoop I prepared tables with calculations of parameters of magnetic loop antenna made on basis of aluminum Hula-Hoop with diameter 77 cm and 100 cm.

KI6GD Magnetic Loop Antenna Calculator V.1.3 was used for the simulation (***V1.6*** now is in the internet). At my guess this program quite well simulated parameters of Magnetic Loop Antennas. I may recommend the program for custom simulation of you own Magnetic Loop Antenna. **Table 1** and **Table 2** show data for Magnetic Loop Antenna for Hula Hoop base with diameter 77 cm and 100 cm.

I also calculated dimensions for gamma matching. **Table 3** shows length of the gamma for different Bands. The sizes may be needed to be corrected at a real antenna design.

Table 3

Band, m	80	40	30	20	17	15
Hula- Hoop 100 cm OD	500	300	250	200	180	200
Hula- Hoop 77 cm OD	600	350	300	250	200	180

The Gamma Match consists of from 1-mm OD (#18 AWG) wire placed at 50 mm above the Hula- Hoop

I wish you good luck in experiments with Magnetic Loop Antennas!

Table 1

Loop dimension: 77 cm OD, Aluminum tube 17 mm OD Loop Property: Loop Area 1.5 meter, Inductance 2.282 μH						
Frequency, MHz	3.6	7.03	10.1	14.06	18.1	21.1
Bandwidth, kHz	8.1	11.6	14.8	20.7	31	43.1
Capacitor Value, pF	849	217	101	48.6	26.3	17.4
Capacitor Voltage (at 5 Watts Power), V	300	600	700	800	900	900
Conductor Wavelength, λ	0.031	0.06	0.086	0.119	0.153	0.179
Efficiency, %	0.2	2.5	8.3	22.4	41	54.4
Inductive Reactance, Ohms	51.6	100.8	145	201.6	259	302.5
Loop Q, Qres	442	604	681	680	585	489.5
Radiation Resistance, Ohms	0.00	.0002	0.009	0.033	0.091	0.168
Resistance Loss	0.058	0.081	0.098	0.115	0.131	0.141

Table 2

Loop dimension: 100 cm OD, Aluminum tube 17 mm OD Loop Property: Loop Area 2.6 meter, Inductance 2.287 μH						
Frequency, MHz	3.6	7.03	10.1	14.06	18.1	21.1
Bandwidth, kHz	8.4	12.4	16.8	27.1	47.5	73.3
Capacitor Value, pF	671	169	77.3	36.4	17.7	10.6
Capacitor Voltage (at 5 Watts Power), V	400	600	700	800	800	700
Conductor Wavelength, λ	0.04	0.077	0.111	0.155	0.199	0.232
Efficiency, %	0.5	5.3	16.5	38.7	61	72.3
Inductive Reactance, Ohms	64.9	126.8	182.2	253.6	326.4	380.6
Loop Q, Qres	427	568	600	520	381	287
Radiation Resistance, Ohms	0.00	.0006	0.025	0.094	0.259	0.478
Resistance Loss	0.076	0.106	0.127	0.149	0.17	0.183

EW6BN Hula Hoop Magnetic Loop Antenna

By: Yuri Kazakevich, EW6BN

After long QRT (birth of my daughter, changing my QTH) I was going again QRV!!!

So, I needed an antenna. But where could I install it? It was not possible to install any antenna on the roof of my house. I had only one place for installation of an antenna. The place was my balcony. However what an antenna may be installed at the place? I though, it was only a Magnetic Loop Antenna.

I remembered, when I was a school boy I used a Magnetic Loop Antenna made from old coaxial cable for my work on 27 MHz CB Band. The antenna worked very well. So at my very restricted area I decided to install a Magnetic Loop Antenna for 20 meter Band.

Lots information about Magnetic Loop Antennas I found in the Internet, in particular in reference **[1]**…I decided to make my Magnetic Loop Antenna on the basis of an aluminum hula - hoop. Hula – hoop (outer diameter 77 centimeters made from 17 mm tube) was on sale in my local shop.

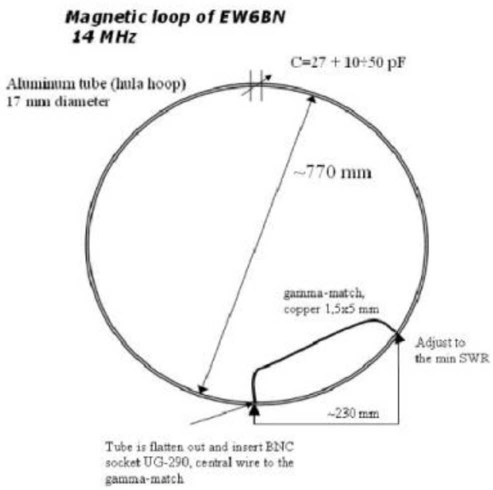
Figure 1 shows design of the Magnetic Loop Antenna. The Magnetic Loop Antenna tuned to 20 meter Band with help of two capacitors- one air variable capacitor 10- 50 pF, and other, bridged to the variable capacitor, a fixed capacitor in 27 pF. The capacitors placed at the top of the Loop. To feed my Magnetic Loop I used a gamma match. I have got SWR 1:1.3 with the gamma match.

The Magnetic Loop Antenna was installed on the third floor of a brick five-floor house. A wooden stick held the antenna almost in one meter aside from the balcony. It was impossible to do a rotary design of the antenna for my conditions, so I just fixed the antenna on the West – East. My house located at outskirts of the city, so the West is opened. However a high-voltage power electric line on 110 kV was in 50 meters from my antenna….

On receiving the antenna worked perfect. Unfortunately, there was a small electric noise from the high-voltage power electric line.

EW6BN Hula Hoop Magnetic Loop Antenna

Figure 1 Magnetic Loop Antenna



The antenna worked well at transmitting. Below placed my first QSOs that I have made straight away after installation of the antenna.

18:50 UTC, 13 July 2003:

I heard "CQ de G3KXV". I pressed key – "G3KXV de EW6BN/QRP..." And … "EW6BN/QRP de G3KXV" op Vic. YES, the QSO is made! Received 569 + QSB, 100 W in dipole antenna / I sent to him 579….

19:25, UTC, 13 July 2003:

HB9DRK/QRP stayed on CQ, he received my call, gave me 329, I gave him the info about my mag loop, and HB9DRK/QRP gave me new rprt 559, he used 5 W and delta.

Good... My soul was singing, but I had to do QRT for a while…

So, my balcony Magnetic Loop Antenna allowed me to be in the Air again and to do interesting QSOs over the World!

Reference:

1. Transmitting magnetic loop antennas: by Igor Grigorov, RK3ZK
   http://www.antentop.org/library/shelf_rk3zk.htm

EW6BN:A Field Operation

Simple Magnetic Loop Antenna for a Jorney

By: Alexander Eryomin, R2DHF

Credit Line: Forum at www.cqham.ru

The Magnetic Loop Antenna designed especially for working from journey. The Antenna ready for operation from disassembled to assembled condition in several minutes. Antenna contained cheap or not hard to find stuff. I spent less $ 50.0 for kit for the antenna. However, I have managed to buy the vacuum variable capacitor (old surplus stuff) for good price. **Figure 1** shows design of the Magnetic Loop Antenna.

Figure 1 Magnetic Loop Antenna

Loop of the antenna made of from an RG-213 Coaxial Cable in 3- meter length. So the loop had diameter near 1- meter. At both sides of the coaxial cable there were installed male PL- 259 connectors. The loop was formed by wooden spreaders (in diameter 14- mm) with plastic holders on the ends. **Figure 2** shows Central Spreader. **Figure 3** shows End Spreader.

Figure 2 Central Spreader

Coupling Loop had diameter 200- mm. The loop made from copper strip in 10- mm wide. One end of the Coupling Loop directly connected to the central core of feeding coaxial cable (50- Ohm) another end of the Coupling Loop connected to the shield of feeding coaxial cable. Several ferrite snap RF chokes (what were in my junk- box) were installed on the feeding coaxial cable near the Coupling Loop. **Figure 4** shows the Coupling Loop.

The vacuum variable capacitor was old military Russian one, type KP, 5- KV, 5- 250- pF. The capacitor was installed in the box that literally holds the Magnetic Loop Antenna. **Figure 5** shows the box. **Figure 6** shows the box inside. Two female SO-239 connectors were installed at both sides of the plastic box.

Figure 3 End Spreader

Figure 5 Plastic Box for Variable Capacitor

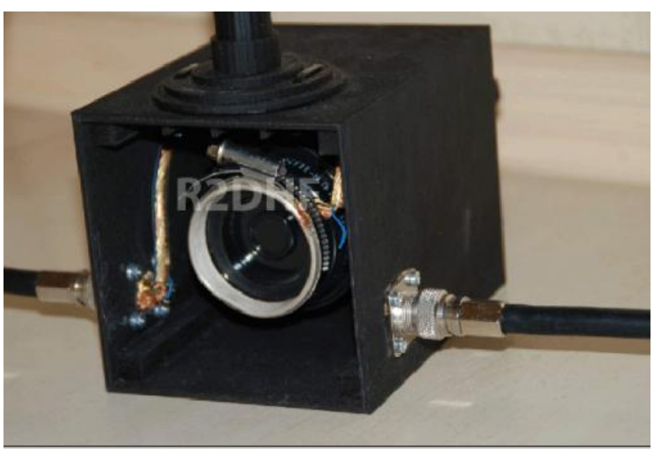


Figure 6 Plastic Box for Variable Capacitor, Inside View

Simple Magnetic Loop Antenna for a Journey

Figure 4 Coupling Loop

All plastic parts of the antenna made with 3D- Printer. You may find file with the parts at: http://www.antentop.org/020/R2DHF_020.htm

Antenna parts fastened with help of plastic ties and Velcro tape (you may see it on the figures).

Magnetic Loop Antenna was tested with Yaesu FT-817. It was discovered (in receiving mode) that the Antenna may be tuned from 10 to 80- meter Band. Antenna was tested in transmission mode at the 10 and 20- meter Band. It worked quite satisfactory.

Best Regards, 73!
de R2DHF

Ferrite Magnetic Antenna for the 160 and 80- meter Bands

Vladimir Fursenko, UA6CA and Ashot Bazoyan, UA6ACA
Credit Line: www.cqham.ru

The Ferrite Magnetic Antenna for the 160 and 80- meter Bands was just an experimental prototype. It was done to give some thought and ways for those hams who would like research the type of antennas.

The advantage of the Ferrite Magnetic Antenna is the small sizes. The antenna could be easy protected from the atmospheric influence while this one being installed outside of a room.

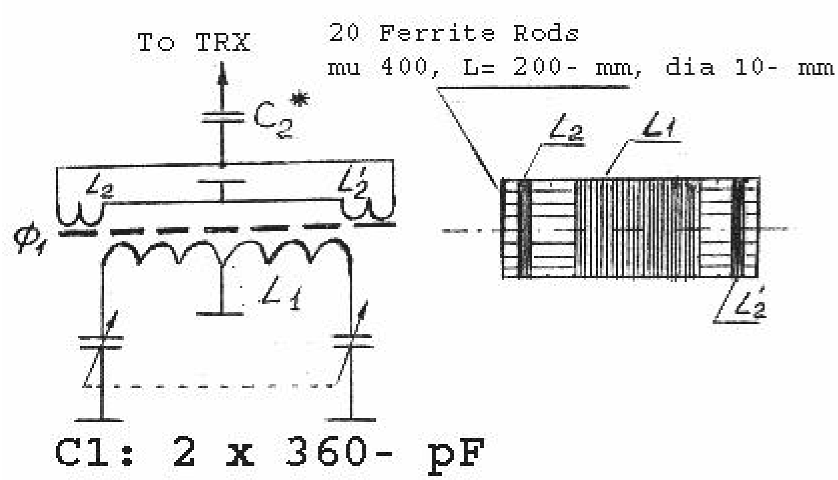


Figure 1 Schematic and Design of the Ferrite Magnetic Antenna for the 160 and 80- meter Bands

Ferrite Body of the antenna made of 20 ferrite rods. It was used rods with mu= 400, length = 200- mm and diameter = 10- mm. The rods were installed in ring similar to a stator of an electric motor. Diameter of the ring was 90- mm. The rods were installed with step in 18- degree. Copper wire in diameter 1- mm (18- AWG) was used for winding of the antenna inductors. It was no gap between coils of the inductors.

Inductor L1 has 2 x 8 turns. Inductor L2 has 2 x 2 turns. All inductors are coiled in one direction. Left and Right parts of the inductor L2 connected symmetrically relative to the inductor L1. Capacitor C2 provides matching with the transceiver. (***I. G.:*** *I made the antenna some years ago. I recommend use a variable capacitor- 3 x 12x495- pF instead of the fixed one C2*.) Antenna may stand RF- Power up to 10 W. Capacitor C1 should have air gap for transmitting variant of the antenna.

The Ferrite Magnetic Antenna (at the testing in the Air) worked good from 1750- kHz to 3660-kHz. Efficiency of the antenna was low at the frequencies higher the 3700- kHz.

Figure 2 Picture of the Ferrite Magnet Antenna for the 160 and 80- meter Bands

Experiments with the VHF Magnetic Loop

By: Igor Grigorov, RK3ZK

Credit Line: Igor Grigorov: Practical Antenna Design. Moscow, DMK, 2000 (in Russian)

Some experiments with "printed" VHF Magnetic Loop Antenna (i.e., antenna made on a PCB) were made by me at the 2 meter Band. Loop had square shape and printed wire was in 5 millimeter wide. 50-Ohm coax was matched with the Magnetic Loop Antenna by a coupling loop. **Figure 1** shows the design.

Design of the Magnetic Loop Antenna: Coupling loop (item 1) is located in the corner of the antenna loop (item 2). Rigid coax (item 3) is 8 centimeter in length and fastened to the PCB by a clamp (item 6). Treads (that hold the coupling loop) (item 5) go through holes (item 4) in the PCB.

Matching: The Magnetic Loop Antenna should be connected directly to a VHF hand- held turned on to Low Power (100 mW). Field Strength Meter used for tuning the loop. I used FSM described at **Reference 1**. Tune the loop in resonance with help of capacitor. Then it is possible to find optimal length of the coupling loop. At the beginning the perimeter of the coupling loop should be equal to 1/3 length of perimeter of the Magnetic Loop Antenna. Do matching of the Magnetic Loop Antenna by decreasing the perimeter of the coupling loop. Do tuning of the antenna capacitor every time when you decreased the perimeter of the coupling loop. Then you may turn on VHF transceiver to whole power.

Passband of the Magnetic Loop Antenna: Passband of the Magnetic Loop Antenna was near 2.0 -MHz at the 2 meter Band. The passband was determined by FSM by decreasing of the RF level in twice at both sides compare to the central frequency.

Theory and Practice: MMANA (see **Reference 2**) allowed to suggest that the Magnetic Loop Antenna had gain minus 5…- 7 dBi. Practical test of the antenna have shown that on the open area the antenna was equal to hand- held Helical Antenna in 14 centimeter length. However the Magnetic Loop Antenna did the same job as a lambda/4 vertical (50 cm at 144 MHz) when communication was inside and from concrete building.

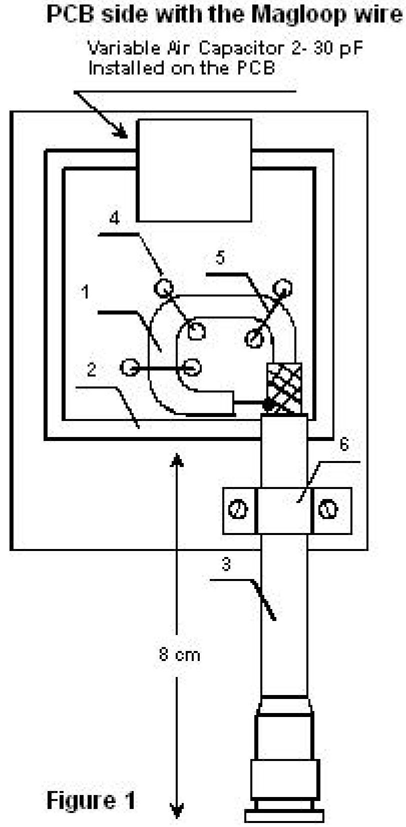
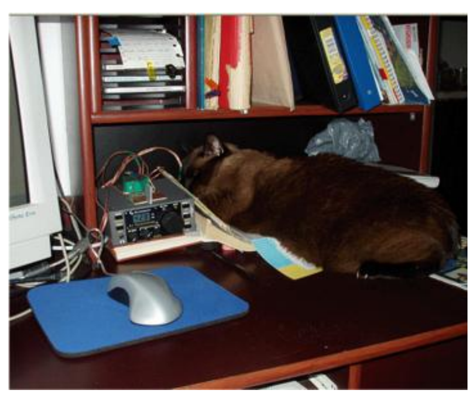


Figure 1 Printed VHF Magnetic Loop Antenna



Experimenters with the VHF Magnetic loop

Caution: Sometimes (at some cheap hand- helds in plastic cabinet without proper shielding) the Magnetic Loop Antenna (working at transmitting mode) could be seriously worse signal quality because of the strong magnetic inducing to transmitter circuits.

For further experimenters were simulated (with help of MMANA) a chart of Resonance Frequency (and Amplification) Vs. antenna tuning capacitor (it was suggested that the capacitor has Q= 1000) for square Magnetic Loop Antenna (5x5 cm made of wire in diameter of 2 mm or 12 AWG). **Figure 2** shows the antenna. **Figure 3** shows the chart. Certainly the chart is only for estimation purposes. Anyway the chart gives some ideas what is possible to get from such Magnetic Loop Antenna.

The chart shows that the Magnetic Loop Antenna may work from 70 up to 190 MHz (it depends on the capacitor). Experimenters made with the Magnetic Loop Antenna prove the suggestion. The Magnetic Loop Antenna worked not bad at receiving of FM broadcasting. A coupling loop was used with the Magnetic Loop Antenna.

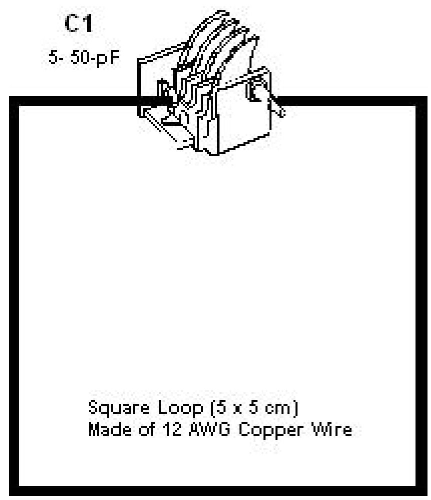


Figure 2

Figure 2 Wire VHF Magloop

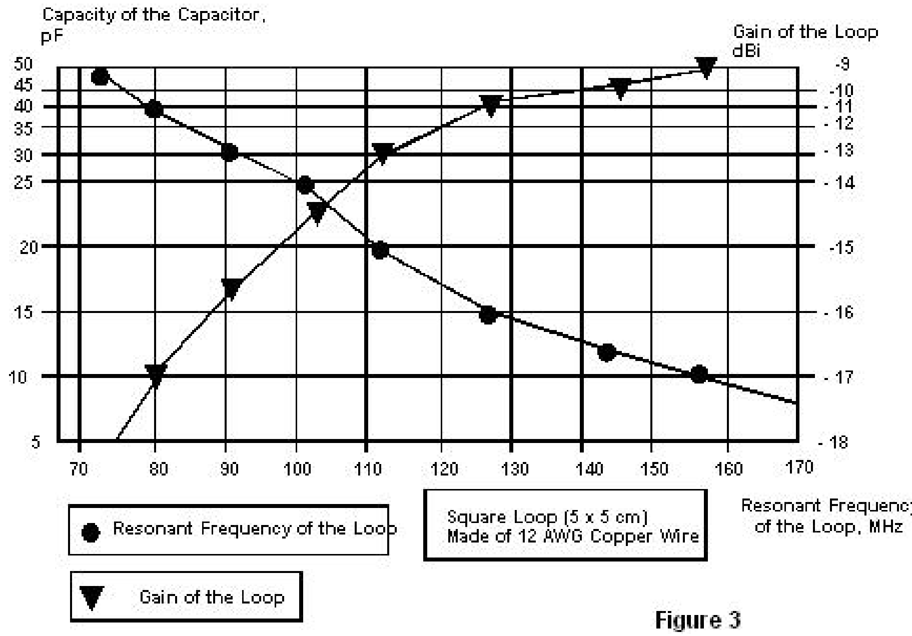


Figure 3

Figure 3 Chart Resonance Frequency (and Amplification) Vs. C1 Capacity

References:

1. Igor Grigorov. Antennas. Tuning and Adjusting. Moscow, RadioSoft, 2002 (in Russian)

2. Free Program MMANA (about MMANA see, for example, Antentop – 01, 2005)

73! I. G.

OLD RECEIVING MAGNETIC LOOP ANTENNAS

Igor Grigorov, RK3ZK

Receiving magnetic loop antennas were widely used in the professional radio communication from the beginning of the 20 Century. Since 1906 magnetic loop antennas were used for direction finding purposes needed for navigation of ships and planes. Later, from 20s, magnetic loop antennas were used for broadcasting reception. In the USSR in 20- 40 years of the 20 Century when broadcasting was done on LW and MW, huge loop antennas were used on Reception Wire Broadcasting Centers (http://www.antentop.org/006/brc006.htm). Magnetic Loop Antennas worldwide were used for reception service radio stations working in VLW, LW and MW. The article writes up several designs of such Old Receiving Loop Antennas.

LW- MW Huge Receiving Loop Antennas for Broadcasting and Direction Finding

In old radio textbooks you could find description of Old Magnetic Receiving Loop Antennas. As a rule, Old Magnetic Receiving Loop Antennas had a triangle or square shape, a side of the triangle or square had length in 10-20 meters. The huge square was put on to a corner. The distance from the ground up to lower wires of the Magnetic Receiving Loop usually was not less than 4 meter. **Fig. 1A** shows a Triangular Receiving Loop Antenna consisting of two perpendicular loops, used for direction finding at the old airport **[1]**, **Fig. 1B** shows a Square Receiving Loop Antenna used on the Wire Broadcasting Radio Center of the USSR at the end of 30s of the 20 Century **[15]**. Usually the Receiving Magnetic Loop contained from one up to eight turns.

Fig. 2 shows a typical connection of the above mention huge Magnetic Receiving Loop Antennas designed for working on one fixing frequency to the receiver. To the resonance the loop A1 was tuned by lengthening coil L1 (sometimes two lengthening coils switched symmetrically to both side of the loop were used) and variable air-dielectric capacitor C1. T1 did connection with antenna feedline. L1, C1 and T1, as a rule, were placed directly near the antenna keeping minimum length for wires from the antenna to the parts. Certainly, there were others circuits for connection of magnetic loops to receiver, but the circuits were almost the same as shown on **Fig. 2**.

Small- Sized Magnetic Loop of a Local Broadcasting Radio Center

Huge loop antennas were used for major (town) Wire Broadcasting Radio Centers, for rural Wire Broadcasting Radio Centers a small- sized loops were used.

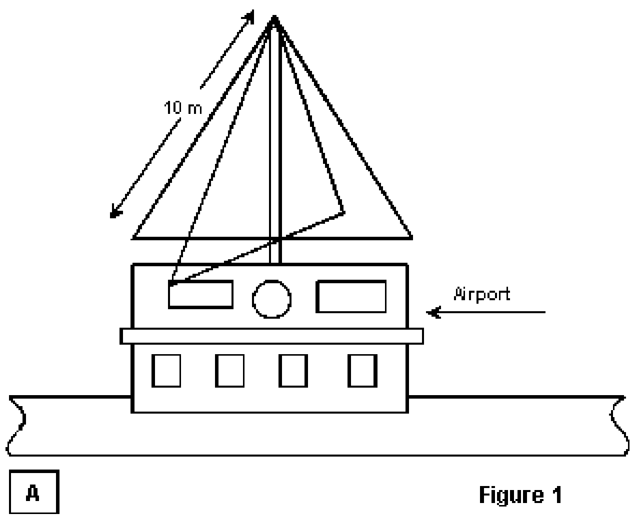


Figure 1 Old Huge Magnetic Receiving Loop Antenna for Airport Site

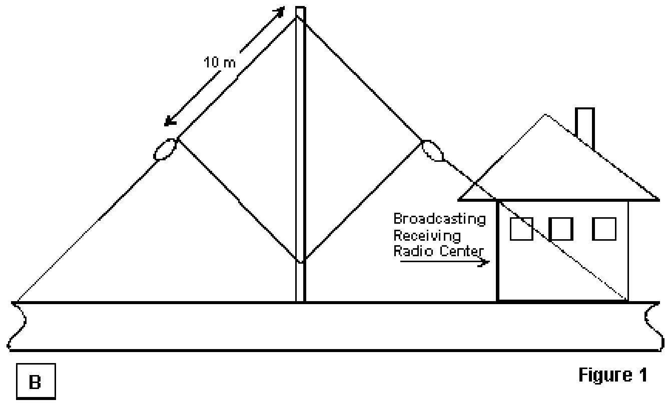


Figure 1 Old Huge Magnetic Receiving Loop Antenna of Wire Broadcasting Center

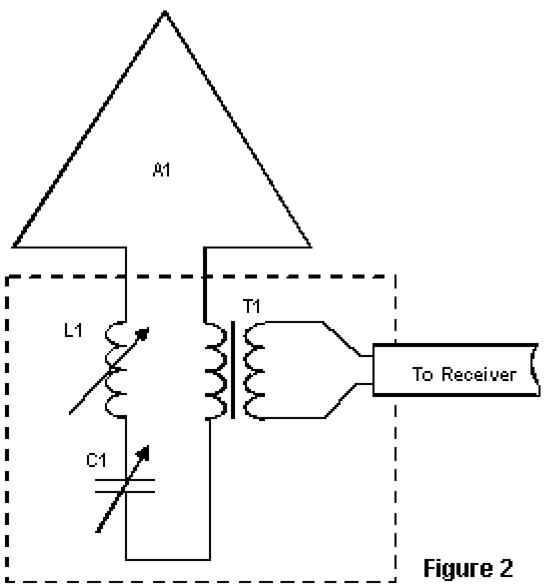


Figure 2 Connection of the Reception Magnetic Loop to a Radio Receiver

Such small- sized receiving loop I have seen in an old village Broadcasting Radio Center in Central Russia, where I was occasionally in 80s of the 20 Century. The center build in the beginning of 50 years of the 20 Century and till now was in operation practically without any changes. The wire broadcasting center settled down in a small room on a ground floor.

This rural Broadcasting Center contained a receiver PTS (http://www.antentop.org/006/brc006.htm) together with a small-sized loop antenna and an old tube audio amplifier, but I DID not remember the brand. All equipment was produced in the 50s. As I was told, the radio receiver and the audio amplifier never were switched off from the operation since the Broadcasting Center was in operation, so, the equipment were continuously operated already more than thirty years. Time to time the tubes from the receiver and amplifier were changed, it was only that was done. Quality of work of the Wire Broadcasting Center was great.

The most interesting part of this Wire Broadcasting Center was a small-sized (certainly, small-sized in comparison with the antennas shown on **Fig. 1**) receiving magnetic loop antenna. Nameplate from the antenna told that the antenna was made in 1949 on one of plants of Gorky (now Nizhniy Novgorod), Russia. **Fig. 3A** shows a design of the small-sized magnetic loop, **Fig. 3B** shows the electric circuit of the antenna. Design and circuit, both, were pictured by me from the real loop.

The loop antenna (item 1) had diamond shape, sides had length in 105-cm (it was measured by a roulette), the loop was attached to a wooden cross (item 2), this one was covered by light lacquer. Overall height of the magnetic loop antenna was near 2 meters. Antenna wires were more than 1.0- millimeter in diameter and were covered by thick black cotton insulation a strong thin layer of light varnish covered the isolation.

The loop contained 20 turns of the wire. The turns were rigidly settled down in trenches of plates (item 3) the plates were probably made of an ebonite. The distance between turns on the plates was equal to the diameter of the wire. The loop antenna was coupled to a receiver through a coupling loop (item 4) that contained 4 turns. The coupling loop was connected to a receiver through a feedline (item 5). The feedline has length near 3 meters and looks like a main wire.

A small wooden box (item 6) was in the bottom of the loop. A big three-section (each section has 12-500-pF) variable capacitor with vernier intended for tuning the loop to a resonance was in the box. Also there were tap switch S1 and two traps (L1C2 and L2C3) that may be tuned to hindered broadcasting radio stations. Traps may be switched to the feedline instead of the jumpers between clamping contacts K1K2 and K4K5. These contacts were installed inside the box. Feedline contacts K3K6 were installed at a cheek of the box.

However small-sized magnetic loop antennas were used not only to Broadcasting Radio Centers. In 30-50 years of the 20 Century such antennas frequently were installed inside broadcasting receivers. Some designs of the internal loop antennas are shown below.

Basket Magnetic Loop Antenna

Receiving Basket Loop Lntennas were widely used for operation of the LW and MW receivers of direct amplification since of the end of 20s of the 20 Century. As a matter of fact, Basket Loop Antennas are ones of the first types of magnetic loop antennas used by radio amateurs. Basket Loop Antennas were used both as to stationary receivers as to so called "suitcase receivers", i.e. tube receivers made inside a suitcase for a movable work. Old radio magazines of 30- 50s of the last century contained hundreds designs of Basket Loop Antennas and "suitcase receivers".

Basket Loop Antennas were very popular because: ***At the first***: ever a radio amateur having a minimal experience could easily make this one; ***At the second***: a Basket Loop Antenna could be made from almost any dielectric stuff, ***At the third:*** a Basket Loop Antenna made even in home conditions worked very effectively. The essence of the design of the Basket Loop Antenna is that at its winding the step between turns should be constant and equal to the diameter of the used wire (practically this step even bit more).

A coil, which had been reeled - up with this manner, had rather small own parasitic capacity of turns to each other. It is possible to show, that the more parasitic own capacity of a coil is the less would be Q (see, for example, reference **[3]**). So, the less own capacity has loop the high Q should be.

Several basic points to pay attention at design of a Basket Loop Antenna. A Basket Loop Antenna could be reeled up on a plate from any dielectric stuff having small losses on frequencies where the antenna should work. A Basket Loop Antenna for LW- MW ranges may be made on

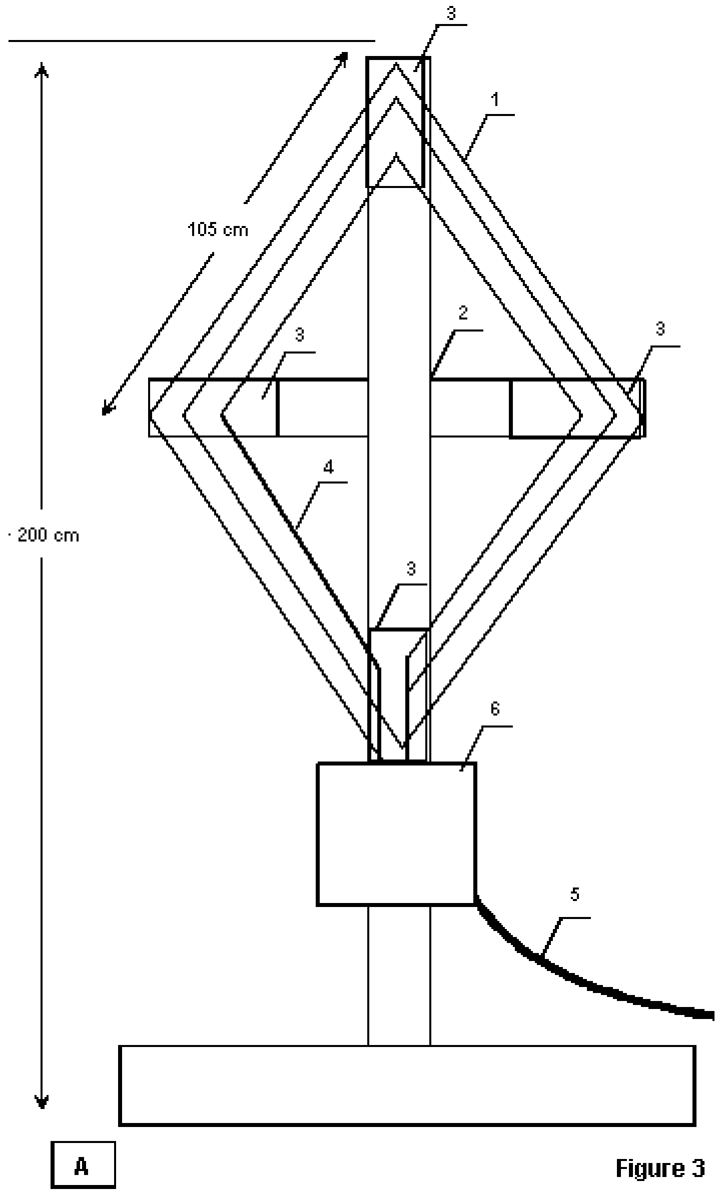


Figure 3 Small- Sized Receiving Loop of a Rural Broadcasting Radio Center

cardboard, wood, PC- board, getinaks or ebonite.

So-called "not washed" recycling cardboard (grey or very brown cardboard that made of from recycling paper with not washed off typographical paint) may have big losses at LW- MW ranges, at least, in a microwave this cardboard is strongly heated up. Certainly, do not use the grey cardboard for a Basket Loop Antenna. Odd number slots should be made in this dielectric plate, the more slots are done the winding has more density. Number of turns and sizes of an antenna form are depended on frequencies range used.

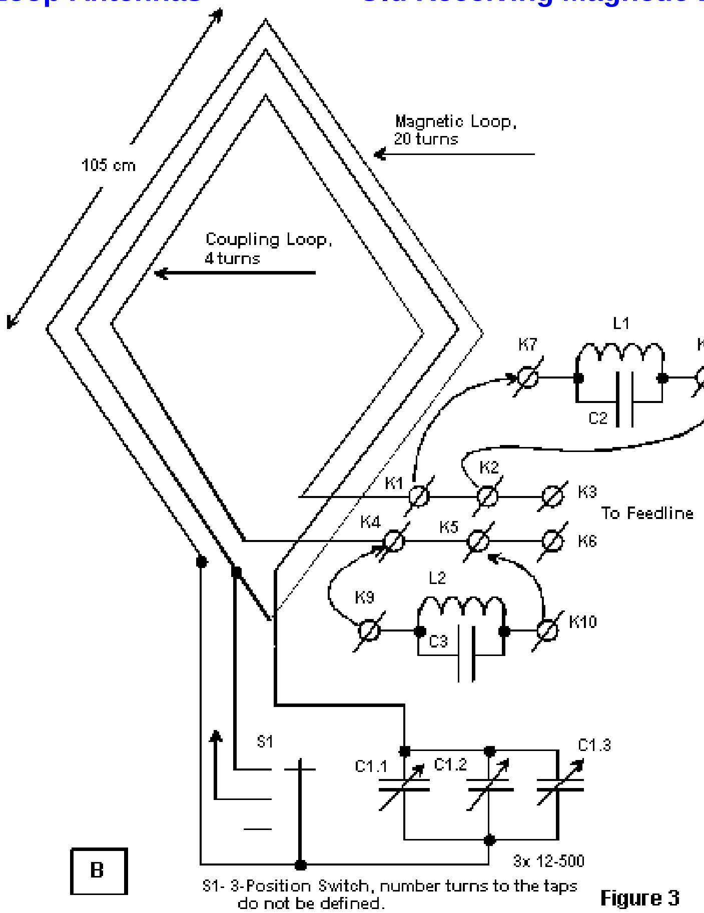


Figure 3 Small- Sized Receiving Loop of a Rural Broadcasting Radio Center

Basket Loop Antenna of a Simple Tube Regenerative Receiver

Fig. 4 shows the circuit and design of a Basket Loop Antenna intended for use in a simple three-tube regenerative receiver for LW- MW. The receiver was described in the **Reference [5].** For design of the antenna a disk made of a cardboard or plywoods was used. The disk had diameter in 120 millimeter and the thickness in 3 millimeter. Five slots of 45 millimeter in the length of and 2-3 millimeter in width were done on the disk at equal distance one after the other. A special ledge for fastening the loop antenna was made on the disk. Magnetic loop antenna contained 250 turns of an insulated copper wire in diameter of 0.15-0.25 millimeters. Beginning of the reeling was up of the center of the disk.

Taps were tapped from the loop for tuning the loop to a resonance. Taps were made from 50, 100, 150 and 200 turns.

Taps should not break off antenna wire. Wind wire for the tap into a loop in length of

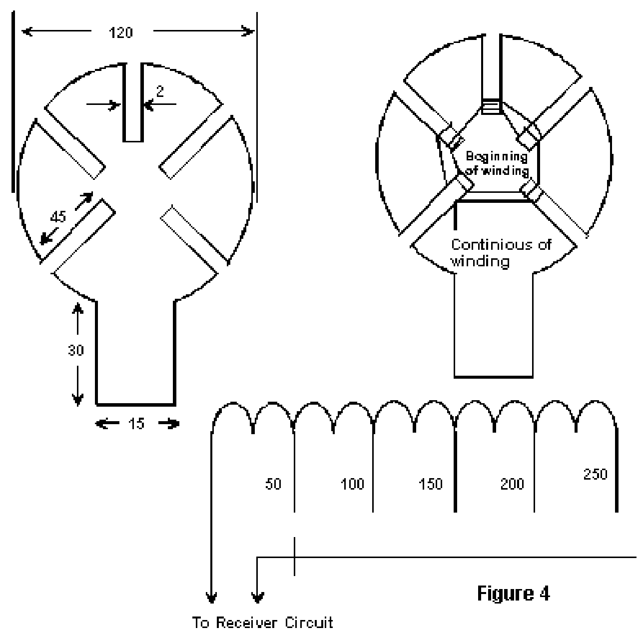


Figure 4 Magnetic Basket Loop Antenna of Old Regenerative Receiver of LW- MW

approximately 200 millimeters, then continue winding.

Basket Loop Antenna of a Simple Suitcase Tube Superheterodyne

Fig. 5 shows Basket Loop Antenna of an old superheterodyne receiver of LW- MW made in a suitcase. The receiver was described in the **Reference [5]**. The Basket Magnetic Loop antenna was placed on a cover of the suitcase in which the receiver was placed. Antenna had 17 slots.

The first section of the antenna contained 29 turn, it was winded by a Litz wire 10x0.07 (10 wires in diameter of 0.07 millimeter). Anyway this winding may be made by a core wire of 0.4-0.5 millimeter in diameter. The second section of the antenna continued winding of the first section. It was winded by a copper insulated wire in 0.2 millimeter in diameter and contained 70 coils. When the antenna worked at MW the first section was shortened. At LW both section of the loop antenna were in operation.

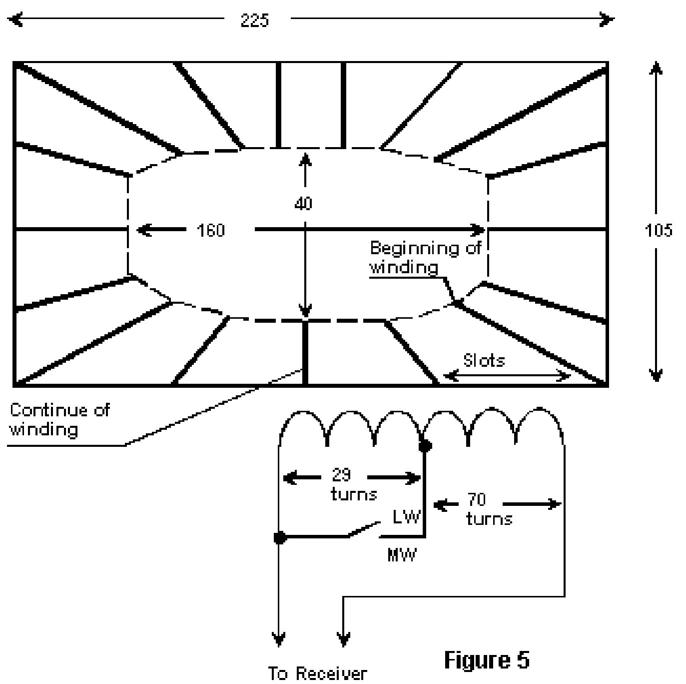


Figure 5 Magnetic Basket Loop Antenna of Old Superheterodyne Receiver of LW- MW

Magnetic Loop Antenna of a Suitcase Tube Superheterodyne

Certainly, not only Basket Loop Antennas were used in old receivers. Simple Loop Antennas were widely used also. A simple LW- MW superheterodyne receiver made in

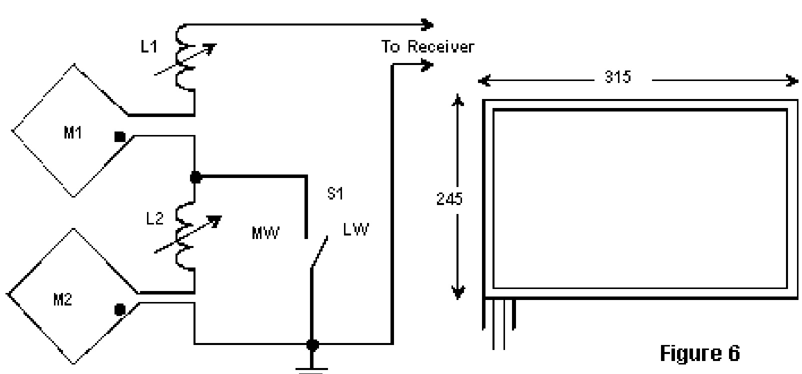


Figure 6 Magnetic loop antenna of old superheterodyne receiver of LW- MW

a suitcase that was used a Frame Magnetic Loop Antenna was described in the **Reference [5]**. **Fig. 6** shows the circuit and design of the Loop Antenna. There were used two Loop Antennas - M1 and M2. Lengthening coils are switched in serial with each loop antenna (L1 with M1 and L2 with M2), necessary for exact tuning of this loop to frequencies range needed. Both, M1 and M2 were used at LW. When the loop worked at MW, the M2 should be shortened.

Loop Antennas M1 and M2 had sizes 315x245 millimeter, M1 contained 14 turns of Litz wire 30x 0.06, M2 contained 50 turns of Litz wire 15x 0.05.Instead of a Litz it is possible to use a copper insulated wire in diameter of 0.15 millimeter.

Lengthening inductor L1 contained 50 turns, lengthening inductor L2 contained 125 turns. Both inductors were winded by Litz 15x 0.05 on the form in diameter of 8 millimeter. The width of winding was 7 millimeters for both inductors.

Short Wave Magnetic Loop Antenna

Loop Antennas were used not only for LW and MW bands. The antennas were used at the SW receivers. For example, in the **Reference [5]** it was described a SW Magnetic Loop Antenna which was used for 19- 75 meter Broadcasting Band. The Loop Antenna was also input circuit of the receiver. A variable capacitor 12x 500-pF did tuning to a resonance of the loop. **Fig. 7** shows design of the antenna.

The antenna was made of a copper strip 6x 3 mm (width in 6 millimeter, thickness in 3 millimeter). Such strip was used for winding the welding transformer. The loop antenna contained 2 turns, the distance between the turns was 10 millimeter. Inductance of the magnetic loop was 3.1- μH.

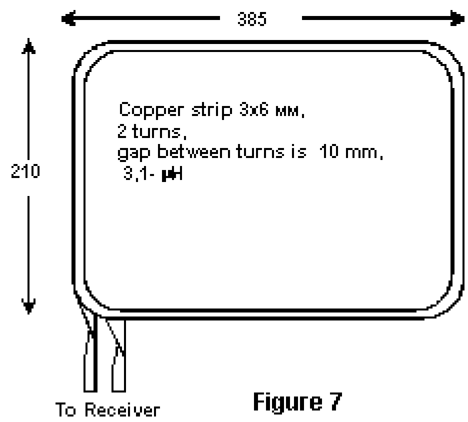


Figure 7 SW Magnetic Loop antenna

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2. A. Z. Sheinman. A Collective- Farm Broadcasting Center. Moscow, Zhurgazob'edinenie, 1938.

3. G. I. Atabekov. Linear Electric Circuits. Moscow, Energy, 1978.

4. Amateur Battery Radio Receivers. Moscow, MRB, Gosenergoizdat, 1950.

5. L. V. Troitskiy. Circuits of Amateur Receivers. Moscow, MRB, Gosenergoizdat, 1956.

73! de VA3ZNW

Two Receiving Magnetic Loop Antennas from Old Magazines

Very often it is possible to find something interesting and unusual while browsing around old magazines. Below there are two interesting design of the Receiving Magnetic Loop Antenna.

Loop Antenna with Eight Ferrite Rods

Credit Line: Funkschau # 6, 1958

Figure 1 shows a Loop Antenna with eight ferrite rods. To compare with usual magnetic loop antenna coiled on to a single ferrite rod the multi- rods antenna has advantage in effective height, diagram directivity and selectivity.

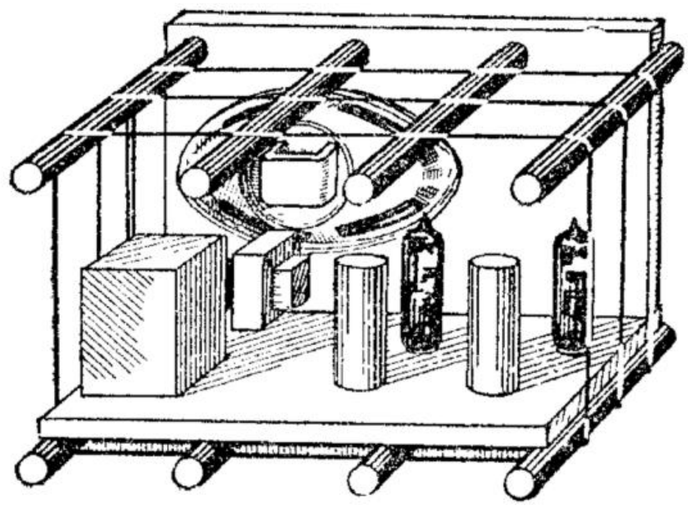


Figure 1 Loop Antenna with eight ferrite rods

Compact Ferrite Tuned Magnetic Loop Antenna

Credit Line: Radio Electronics, December, 1955

It is very often a Magnetic Loop Antenna is tuned on to the needed frequency by moving a ferrite rod along the inductor.

However it is not conveniently because the length of the tuned Magnetic Loop Antenna may be vary in twice. **Figure 2** shows a tuned Magnetic Loop Antenna with constant length.

Ferrite core (item 1) of the antenna consists of two ferrite plates (in dimension (W x T x L) 18x 2.5x 110-mm) that are divided by a thin disk insulator (item 2). When the plates are in one plane the antenna inductor has maximum inductance. When the plates are in cross position the inductor has minimum inductance.

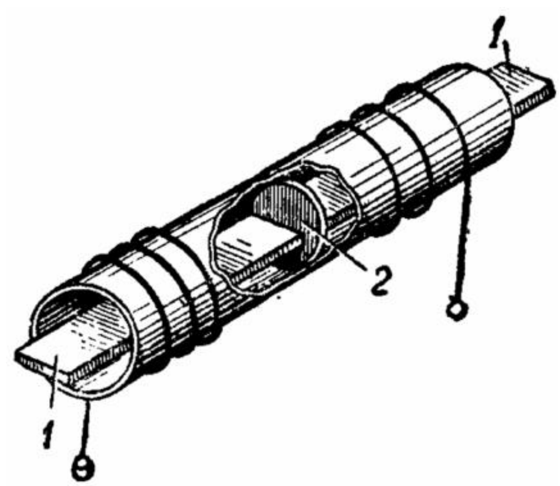


Figure 2 Tuned Magnetic Loop Antenna with Constant Length

Two Receiving Magnetic Loop Antennas

Twin Magnetic Loop Antenna

I. Dobrynin, Moscow

Radio 1960, # 1, p.22

Twin Magnetic Antenna has some advantage compare to a usual Magnetic Antenna.

The advantages are that the twin magnetic antenna, compare to a usual magnetic antenna, has higher Selectivity and higher Effective Height. Twin Magnetic Antenna was tested in a pocket transistor radio. The antenna was able to receive radio stations from the distance up to 800- km. **Figure 1** shows the antenna.

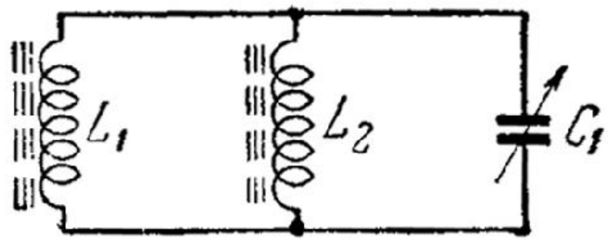


Figure 1 Twin Magnetic Antenna

Twin Magnetic Antenna consists of from two usual magnetic antennas switched into bridge.
Effective height of the antenna would be higher in $\sqrt{2}$ compare to with a single Magnetic Antenna.

Thereof the L1 and L2 are connected to a bridge the inductance of the each inductor should be higher (for the same working band) compare to inductor for a single Magnetic Antenna.

Loop Antenna for DEGEN- 1103

Vitali Tyurin, UA3AJO

CQ-QRP # 42
(RU-QRP-C Publication)

Receiver DEGEN- 1103 (in the USA/Canada it is sold as Kaito 1103) has sensitivity at MW near 100-micro-volt/m and at LW near 1- milli- volt/m. The sensitivity may be increased at least in 20- times if the receiver would be placed inside a loop shown on Figure 2. Sensitivity of the receiver depends on distance between axis of the loop and wires of the loop.

Figure 2 Loop for DEGEN 1103

Loop with sizes 300x400- mm made of from wooden stick with sizes 50 x 10- mm. Loop contains 10- turns of the copper wire in 0.8- mm diameter (20- AWG). At the MW range the Loop is tuned by a tripled variable capacitor 3x 12…500- pF. At the LW range an additional capacitor is switched to bridge to the variable capacitor. The additional capacitor may have capacity 1500- 2000- pF.

Ferrite Magnetic Antenna for the 160, 80 and 40- meter Bands

Vladimir Fursenko, UA6CA
Ashot Bazoyan, UA6ACA
Credit Line: www.cqham.ru

The experimental antenna made on so called home made "Ferrite Linear Heterogeneous Rod." It is an anisotropic ferrite rod. This one has advantages before isotropic ferrite rod. Heterogeneous Rod does not require special high efficiency ferrite stuff. The "thick" areas are magnetic concentrator.

Combination of the thin and thick areas in the Ferrite Linear Heterogeneous Rod allows significantly improved the efficiency of the ferrite antenna. Using of the Heterogeneous Rod allows create a ferrite antenna for 160- 40- meter. **Figure 1** shows design of the antenna.

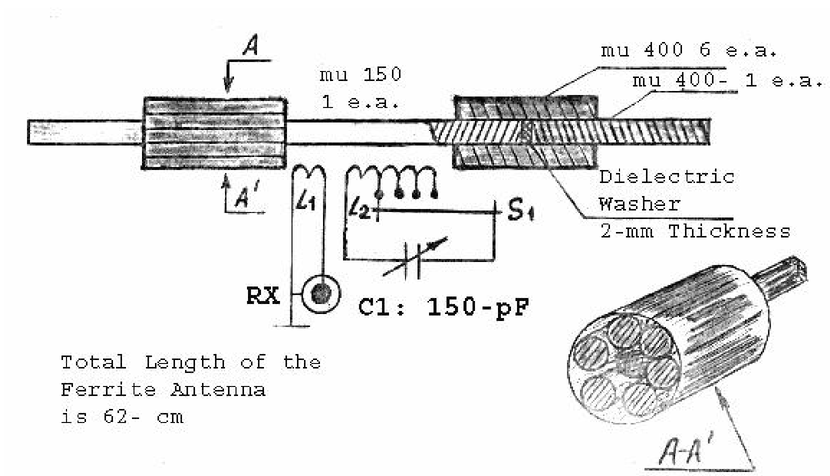


Figure 1 Design of the Ferrite Magnetic Antenna for the 160, 80 and 40- meter Band

For the construction of the antenna there is required 1- e.a. ferrite rod with mu= 150 and 14- e.a. ferrite rods with mu= 400. All rods have length 200- mm and the diameter 10- mm. Ferrite rod mu= 150 is glued with the ferrite rods mu= 400 through dielectric washers (2- mm thickness, plexiglass). Then the 3 ferrite rods (mu= 400 + mu= 150 + mu= 400) covered by a Scotch in a several lays. Summary thick of the cover should be 0.5… 1.0- mm.

Ferrite rods of the magnetic concentrator are fastened to the 3- rod ferrite by the Scotch. Inductors L1 and L2 are coiled in one direction by enamel wire in diameter of 0.3- mm (28- AWG). Inductor L1 contains 9- turns. Inductor L2 contains 65- turns. Taps are made of from 15th, 25th, 40th and 50th- turn. Data for the L1 and L2 may be differed when different of the described ferrites are used.

Figure 2 Ferrite Magnetic Antenna on the Revolving Stand

Antenna is mounted on a revolving stand from an old theodolite. **Figure 2** shows the assembled antenna on the stand.

Receiving Field HF Loop Antenna

Pavel Petrov, UU9JAN, Sevastopol

Credit Line: http://qrp.ru/articles

I needed an antenna for my receiver DEGEN- 1103. The antenna should provide a good reception on to HF bands. I would like to take the receiver to a field or hotel room. So, the antenna should be small in sizes and easy to installation. Through some my experimenters I stopped on a Loop Antenna.

Figure 1 shows the design of the HF Loop Antenna. It is very simple antenna and cheap in the used parts. The antenna worked fine from 7.0 to 30.0- MHz. Loop of the antenna made of 1- meter length of a TV-Coaxial Cable (75- Ohm). For the Loop of the antenna it was used the braid of the coaxial cable. The length of the cable had RF-Connectors from the both sides.

Then I found in junk – box of my wife a plastic box (it was a plastic box from old cosmetic). Inside of the plastic box there were installed two RF – Connectors for the TV-Cable, a variable capacitor 2x 250- pF and a toggle switch. At the band 9.0- 30.0- MHz it is used one section of the variable capacitor. At the band 7.0- 15.0- MHz there were used both section of the variable capacitor. The toggle switch turned on the sections to the Loop antenna.

Figure 1 Design of the HF Loop Antenna

Figure 2 Reception with Whip Antenna

Figure 3 Reception with Loop Antenna

The coupling loop of the antenna had diameter 1/5th from the diameter of the main Loop. It made of a copper wire in diameter near 1.5- mm (15- AWG). Coupling loop through a small length of a thin coaxial cable was connected to the DEGEN- 1103. Plastic box from a Chupa- Chups is protected the soldering of the coaxial cable with the coupling loop.

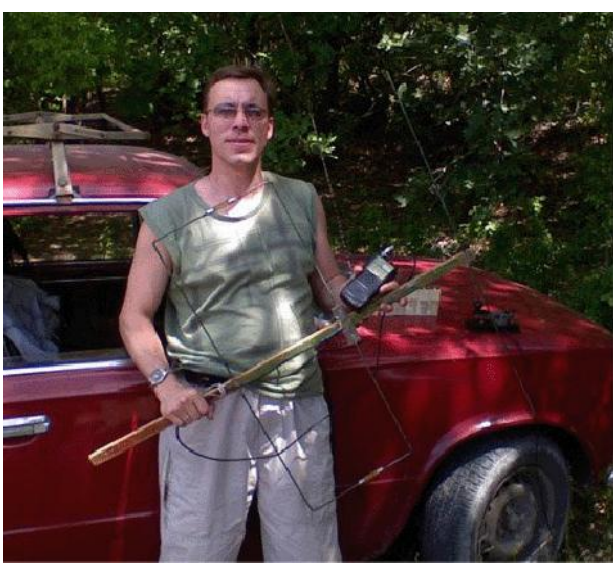
Antenna was tested with the DEGEN- 1103. The antenna worked perfect compare to the small sizes. Loop Antenna worked much better the whip of the receiver. Reception of the Ham- bands and broadcasting stations was much better compare to the receiver's whip antenna. **Figure 2** shows S- meter of the receiver with the Whip Antenna. **Figure 3** shows the S- meter of the receiver with the Loop Antenna. For the test it was used a broadcasting station working on the 15.300- kHz. However, the Loop Antenna lost 1… 2 balls to an internal long wire antenna.

Figure 4 shows the Loop Antenna and the DEGEN- 1103.

Then the Loop Antenna and the DEGEN- 1103 were prepared for a field test. **Figure 5** shows the kit. Antenna was tested with the DEGEN- 1103 in a field. **Figure 6** shows the Loop Antenna and the DEGEN- 1103 in a field. Antenna worked fine. I was very satisfied of the reception.

On my opinion it is optimal antenna when you want to use receiver in the field conditions or at hotel room. The antenna as well is good for the city conditions because it allows eliminate the industrial interferences.

72/73! Pavel, UU9JAN



Pavel, UU9JAN

Figure 4 Loop Antenna and Receiver

Figure 5 Kit for field operation

Figure 6 Receiver and Antenna in the Field

Conclusion

So, Chapter 3 ***"Magnetic Loop Antennas"*** is ended. You have got information how to do transmitting and receiving Magnetic Loop Antenna. Just remind you that for transmitting Magnetic Loop Antenna you need quality air capacitor. SWR- meter or Antenna Analyzer may be needed for tuning the transmitting antenna with SWR 1.0:1.0. Receiving Magnetic Loop Antenna could be tuned only with the help of a receiver.

Of course the ***Chapter 3*** gave you mostly practical recommendation about the antenna family. Some theoretical (as well as practical) info you may find at ***Additional Source*. All links go to the *antentop.org*** site.

Transmitting Magnetic Loop Antenna should be placed as much far as possible from operator and nearest subjects. High density magnetic field near the transmitting Magnetic Loop Antenna may harm human health and will heat nearest subjects.

I wish you success to design your own Magnetic Loop Antenna.
73!
Igor, VA3ZNW

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2. Once Again About Magnetic Loop Antenna: http://www.antentop.org/delta.htm
3. Hula- Hoop Magnetic Loop Antenna: http://www.antentop.org/ua1dz.htm
4. Simple Magnetic Loop Antenna for a Journey: http://www.antentop.org/020/R2DHF_020.htm
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6. Experimenters with the VHF Magnetic loop: http://www.antentop.org/008/magloop008.htm

Receiving Loop Antennas

1. Old Receiving Magnetic Loop Antennas: http://www.antentop.org/006/mag006.htm
2. Two Receiving Magnetic Loop Antennas from Old Magazines: http://www.antentop.org/016/loop_016.htm
3. Two Receiving Magnetic Loop Antennas: http://www.antentop.org/017/two_loop_017.htm
4. Ferrite Magnetic Antenna for the 160, 80 and 40- meter Bands: http://www.antentop.org/017/ua6aca_017.htm
5. Receiving Field HF Loop Antenna: http://www.antentop.org/017/uu9jan_017.htm

Additional Source:

Transmitting Loop Antennas

1. Loop Antennas for ALE and Frequency Hoping: http://www.antentop.org/004/starec.htm
2. Loop Antennas: http://www.antentop.org/004/loop004.htm
3. Transmitting magnetic loop antennas: http://www.antentop.org/library/shelf_rk3zk.htm

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1. Ferrite Magnetic Antennas by RN3DEK: Design, Experimenters and HF Antennas: http://www.antentop.org/017/rn3dek_hf_017.htm
2. Ferrite Magnetic Antennas by RN3DEK: LW, MW and 160- m Antennas: http://www.antentop.org/017/rn3dek_017.htm
3. Receiving Magnetic Loop Antennas: http://www.antentop.org/library/shelf_rma.htm
4. TV Ferrite Magnetic Loop Antenna: http://www.antentop.org/017/tv_loop_017.htm

CHAPTER 4

Apartment Antennas

Apartment Antenna… Invisible, small, efficient and of course working at all bands. Yes, it is not real it is just a dream. Yes, Apartment Antenna as usual may be small and invisible but the antenna has small efficiency and as usual the antenna working at one HF band. However sometimes it is only one type of antenna that could be used in the city apartment.

Below ***Chapter 4*** described some of Apartment Antennas that were used by radio amateurs. Description of the antennas give your ideas for own one in your place. Some of the antennas required tuning and adjustment so SWR- Meter or (that is better) Antenna Analyzer (MFJ- 259B or similar one) may be needed. As well some experience in antenna tuning and design would a big plus.

Apartment Antenna is not perfect antenna for operation in the Air. *The antenna pick up noise of the electrical devices in the room, the antenna may cause interferences to lot of electronics devices. The antenna should be placed as much far as possible from operator and nearest subjects. High density electromagnetic field near the transmitting Apartment Antenna may harm human and heat nearest subjects.*

But… If you have no choice… So, try these antennas. The main plus is that the antennas described in ***Chapter 4*** are proved and worked, the antennas are inexpensive in cost and allow quickly turn on transmitter to the Air.

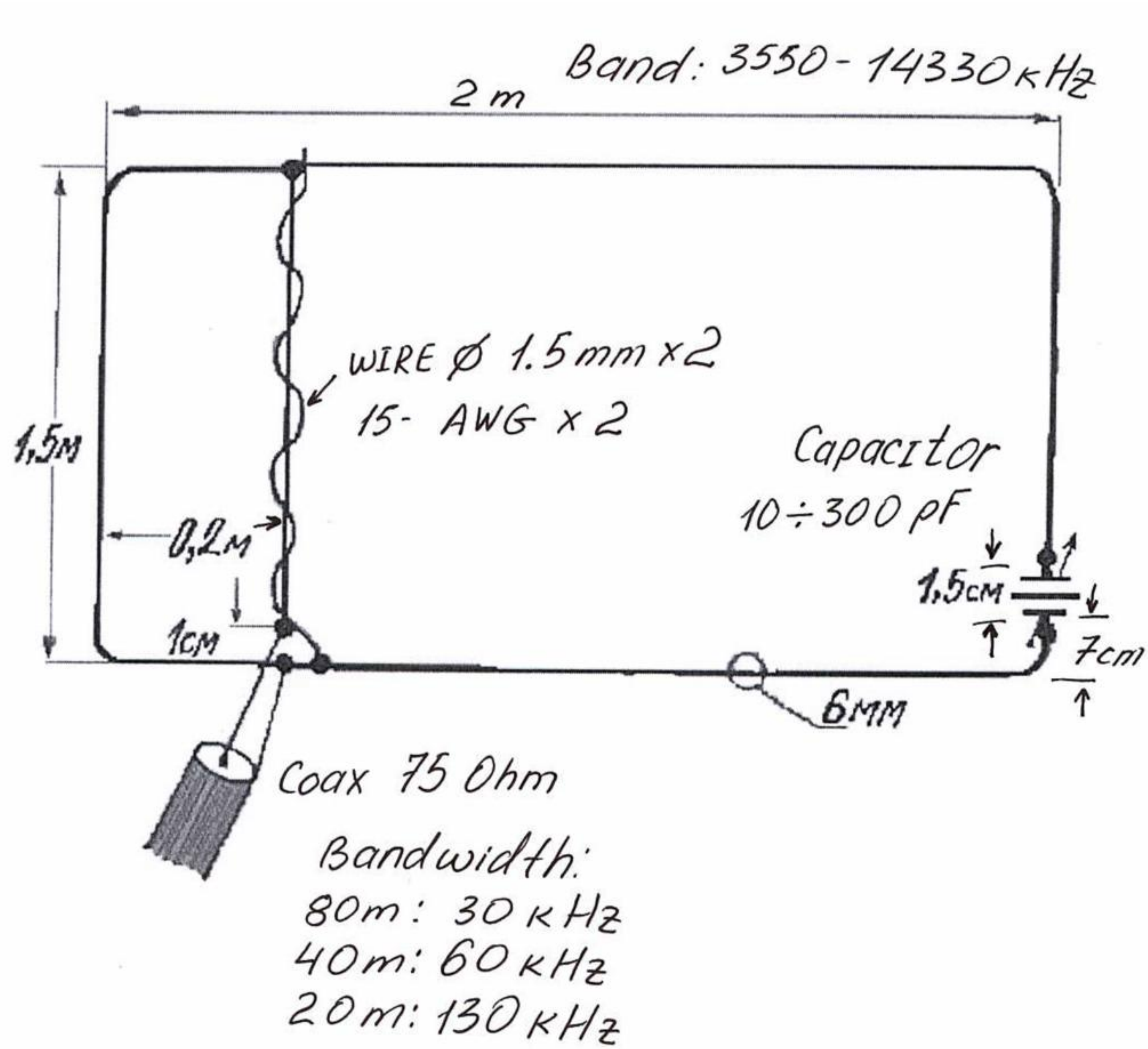
Urban Antenna

Vladimir Semenov (RU4SJ)

Credit Line: http://hamradio.mari-el.ru/technics/Gorodskaya_antenna_RU4SJ/index.htm

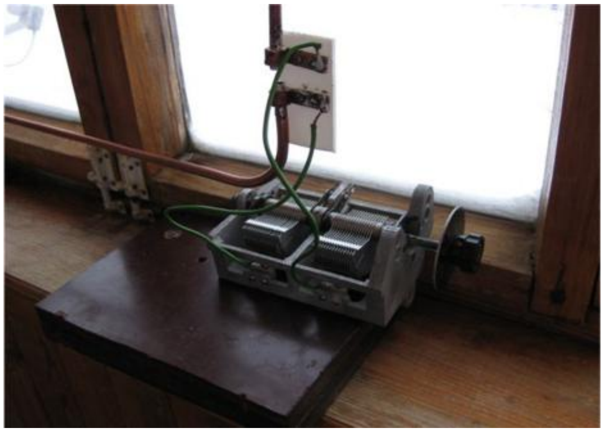
I have to use the antenna with a transceiver with RF- power 87- Wtts. Antenna was installed at a balcony in the second store of a multi- store building. Direction of the balcony is to the South. Antenna was tested at 80, 40 and 20- meter Band.

At the 80 meter Band I have got: RW9SM- 58, RA3RTS- 57, RN4HAX- 59, RW4LC- 59. At the 40 meter Band I have got: UU2UDE- 58, EW7EW- 56, ER4ER- 59, RK6JAT- 59, UA6YBE- 59. At the 20 meter Band I have got: 4L3Y- 59, ER2OG- 58, RZ6HJ- 59, UA6HN- 59, UA6GB- 59.



The antenna has poor efficiency at the 80- meter Band. However I believe that the efficiency may be improved if perimeter of the antenna and diameter of the tube (from which the antenna made of) increase in twice times. Matching the antenna with the coaxial cable is doing by moving the inner bridge.

Antenna has sharp matching. Tuning capacitor is connected by Butterfly circuit. Counterpoises connected to ground terminal of the transceiver could be improved the antenna efficiency. Device "Artificial Ground" could improve the efficiency of the antenna as well.



Inductor (OD- 9.0- mm, 9 turns of 2.0- mm (AWG- 12), length 25- mm) connected between coaxial shield and antenna could expand the working range from 3.44- MHz to 28.75- MHz and improve SWR but not for 15- meter Band. Additional matching may require at the band. However in my case I have got matching at the 15- meter just increased length of the feeding coaxial cable on 1.85- meter.

73! RU4SJ

Simple Window Loop Antenna

Aleksandr Sterlikov, RA9SUS

RA9SUS

The antenna was installed across wooden window frame. Perimeter of the loop in my case was 4.7- meter. Antenna could be tuned from 14 to 30- MHz. I fed the antenna by 50- Ohm coaxial cable. However, also I used to 75- Ohm coaxial cable with success. **Figure 1** shows the antenna. At antenna feeding terminal a simple home- brew symmetrical device (several turns coaxial cable coiled on to big ferrite ring) was installed.

Loop was made from wire in 0.3- mm (28- AWG) diameter. Wire was attached to the window frame by scotch. Variable capacitor should be with big gap between plates. However it is depends on power. I used usual capacitor 12- 495- pF from an old tube receiver when I run 30- Wtts at 14- MHz and 10- Wtts at 21 and 28- MHz. My antenna was installed at 4-th floor at 5- store concrete building. Windows were to the North- East side. While a short time at 20- meter band there were made QSOs with 36- countries. There were ex-USSR and USA, Canada, Japan, Europe, Asia. I worked by CW (50%), SSB (40%), and then RTTY and SSTV.

The window loop antenna may be installed practically at any window frame. Frequency range for the loop antenna depends on perimeter of the loop. Small loop would be tuned to high bands. Loop with long perimeter may be worked at lower bands.

73! RA9SUS

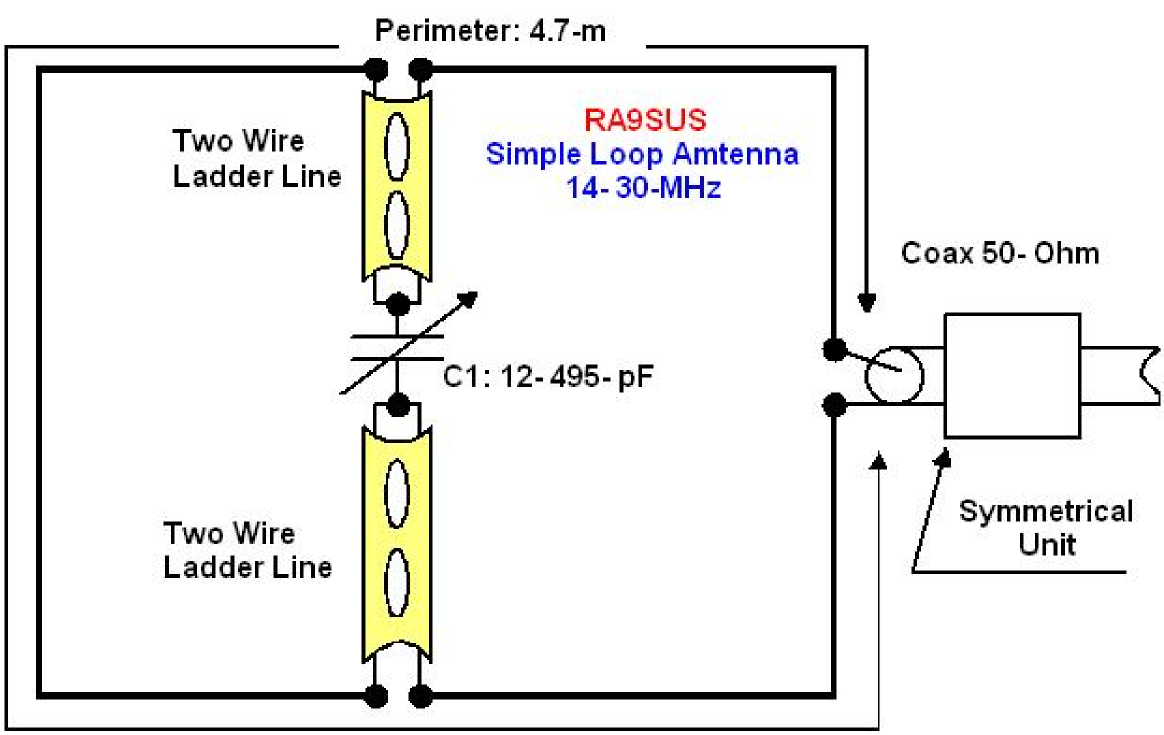


Figure 1 Simple Window Loop Antenna

Broadband Indoor Antenna

Igor Grigorov, VA3ZNW

It was in the middle of the winter 1994. Heavy winter wind and snowfall destroyed my outdoor antennas. I could not do repairs the antennas at cold winds and snowdrifts. So I decided to try indoor antennas. I tried several antennas at the times. The article describes one of those that works for me. It is a very simple antenna that could work at all amateurs HF bands.

Figure 1 shows design of the antenna. It was a loop of wire that was installed at perimeter of my window with sizes 210 x 140 centimeters.

One side of the loop was loaded to 600 Ohm dummy Load. From another side the loop was fed by 75- Ohm coaxial cable through RF transformer 9:1. At that times I used to home made transceiver with home made 100- Wtt broadband transistor PA. The PA worked well and had 75- Ohm output.

The antenna worked (with good SWR) from 160 through 10 meter Bands. At 160 and 80 meter the antenna worked at transmitting mode not satisfactorily. However at 40 and at the others higher bands the antenna did good job for me.

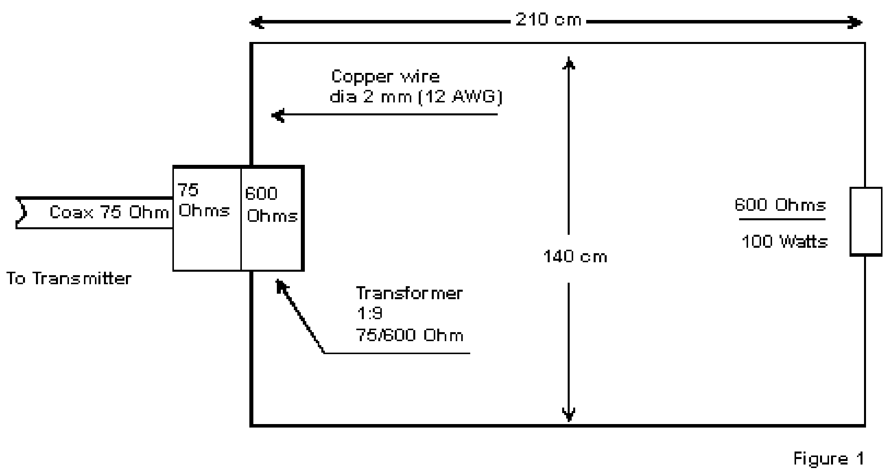


Figure 1 Broadband Indoor Antenna

For the antenna I used a home made RF transformer. **Figure 2** shows the schematic and design of the transformer. Winding of the transformer was made by a twisted wire, 2 twists per 1 centimeter each wire was 0.7- mm in diameter (21 AWG). Each wire was covered by Teflon insulation. For the core of the transformer I used a ferrite ring from a yoke of a color 27" TV.

The numbers of turns of the transformer depend on the sizes of the yoke core and on to working frequencies. I could not manage to make a transformer that would provide operation of the antenna from 160 to 10 meter Band. Three different transformers were used to cover the range of 160- 10 meter.

I switched needed me transformer when I changed a band. At my case, for 160- 80 meter the transformer contained 18 turns, for 40- 20 meter the transformer contained 12 turns, for 15- 10 meter the transformer contained 8 turns. The turns were evenly distributed on to the ferrite ring. The transformers were placed in a box made of PC- board stuff. The box was located near antenna's terminal. **See photo.**

Figure 3 shows the circuit for testing of a working range of the RF transformer. Output of the transformer is connected to 600 Ohm dummy load, input to a RF- Bridge. When working range of the transformer is determinate, you can change the frequencies range in needed side. It is possible to lower frequency range of the transformer by increasing number of the turns.

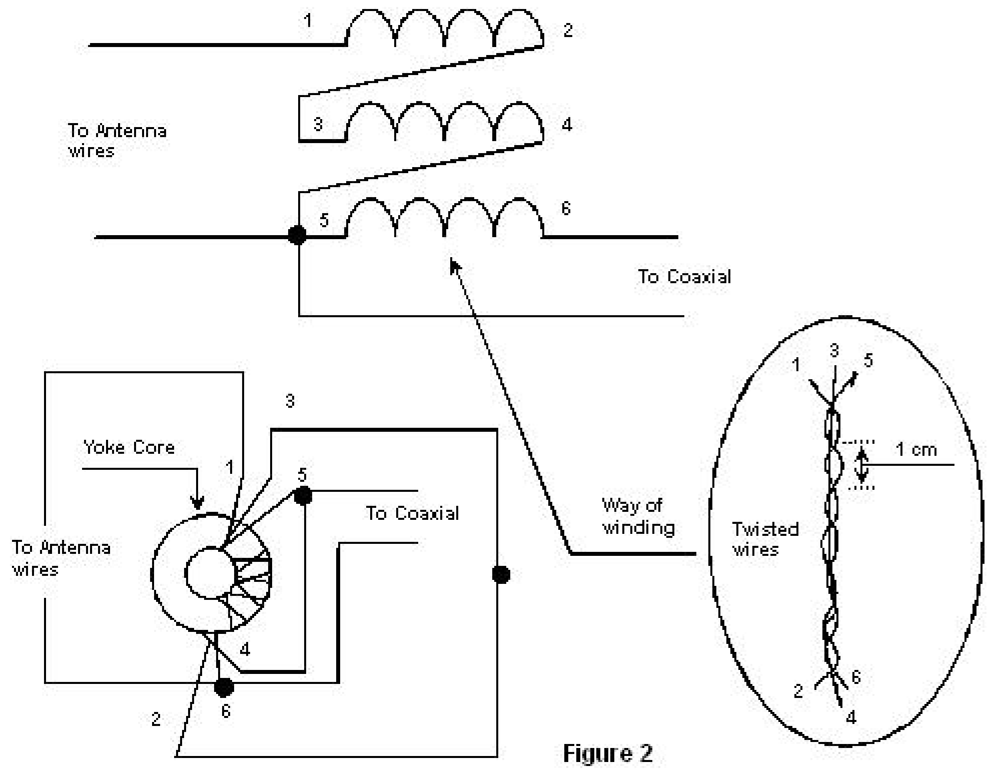


Figure 2 Transformer 9:1

It is possible to increase frequency range of the transformer by decreasing number of the turns. After adjustment of the transformer at 600 Ohm dummy load the transformer should be connected to real antenna and then fine tuning (by minimum SWR at all frequency range) by increasing/decreasing numbers of turns or distribution the turns along the core should be done.

Box with RF Transformers Installed Near a Window

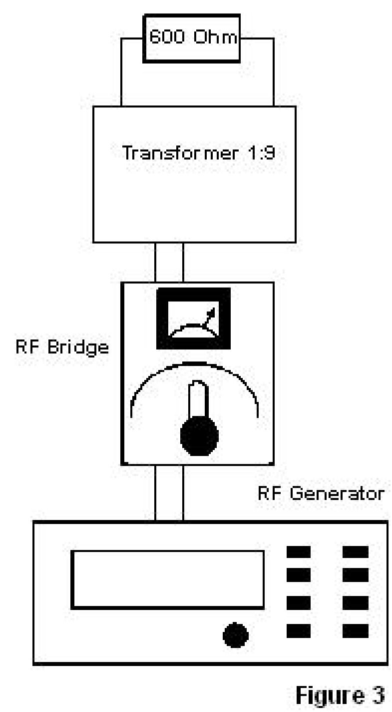


Figure 3 Circuit for Testing of a Working Range of the RF Transformer

At that times I had a broadband transformer 9:1 from an old marine transmitter, the transformer worked good from 160- to 10 meter Band. Unfortunately, the transformer had small sizes and it was very hot already at 50 Watts going through. Transformers made on a yoke ferrite core from 27" TV worked good at 200 Watts RF going through…

I experimented with antenna terminal loads 450 and 300 Ohm. However, the antenna with those loads was hard to match at broad frequencies range with help of my RF transformer.

Recently, using MMANA (**References 1**) I simulated parameters of the antenna loaded to 600, 450 and 300 Ohm. For simplification it was supposed that the antenna is located in a free space. **Table 1** shows the data.

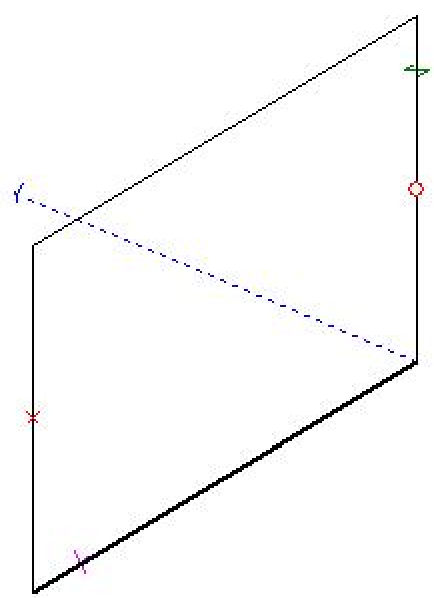
Table 1 Data for Broadband Antenna

Band, meters	Gain, dB			SWR		
	600 Ohm	450 Ohm	300 Ohm	600 Ohm	450 Ohm	300 Ohm
160	-56	-56	-56	1.05:1	1.1:1	1.1:1
80	- 44	- 44	- 44	1.07:1	1.2:1	1.5:1
40	- 30	- 30	- 30	1.2:1	1.6:1	2.6:1
20	- 19	- 19	- 19	1.4:1	2.25:1	4.6:1
15	- 13	- 13	- 13	1.55:1	2.7:1	6.1:1
10	- 10	- 10	- 10	1.62:1	2.6:1	5.2:1

The table shows that the antenna has best SWR at 160 through 10 meters only at the 600 Ohm load. I could notice, that in real conditions, the antenna had SWR better then shown by the **Table 1** because losses RF energy in the nearest subjects.

The table shows that the antenna is 'dead' at ranges 160 and 80 meters, but at good propagation you could make QSOs. Antenna gain is small at 40 through 10 meters too, but already even at rather average propagation (and 100 Watts in the antenna) I could easy make QSOs using the antenna.

MMANA shows that the antenna has one sided directivity, but I could not see that when I have used the antenna.



Broadband Antenna in MMANA

References

1. http://mmhamsoft.ham-radio.ch/

73! VA3ZNW

WINDOW DIPOLE ANTENNAS WITH CAPACITIVE LOADS FOR THE 6 AND 10 METERS BANDS

Igor Grigorov, VA3ZNW

It is possible to install a dipole antenna with capacitive loads for the 6 and 10 meter Bands at a standard window with sizes 140x150 or 140x210 centimeters. The design of the window antenna for the bands could be simple as well as the antenna impedance could be easy matched with 50-Ohm coaxial cable. Such dipole antenna with capacitive loads installed at upper floor of a high-rise building could provide DX- QSOs.

However, a dipole window antenna with capacitive loads for bands lower the 10-meter, if this one would be installed at a standard window with sizes 140x150 or 140x210 centimeters, should have low input impedance and narrow bandwidth thereof the antenna is hard to match with coaxial cable. Hence antennas for bands lower the 10 meters are not discussed in this article.

Types of Dipole Antenna with Capacitive Loads

There are several ways to install a dipole antenna with capacitive loads at a window. The best way is to install a dipole antenna with capacitive loads at the ***center of the window***. Such installation is suitable for any house which may build from bricks or wood as well as made from a concrete with iron rods. Let's name the antenna "antenna central installation."

If a house build from bricks or wood it is possible to install the dipole antenna with capacitive loads by up or down of the window. Let's name the antenna "antenna up or down installation." Of course, a non metal window-frame better the metal one because does not hinder the antenna operation.

Feeding Coaxial Cable of a Dipole Antenna with Capacitive Loads

Ferrite rings (5- 20 rings with any permeability) installed at two ends of the coaxial cable going from TX to the antenna prevent RF- currents going on to outer side of the braid from the antenna to TX. Fix the rings installed on to coax with a Scotch. The coaxial cable going from the antenna to the window sill should be placed athwart to the antenna. However the coaxial can be placed as you want at you room.

Stuff for a Dipole Antenna with Capacitive Loads

A dipole antenna with capacitive loads may be made of a single core wire or stranded wire. Any wire is good as naked as well covered by plastic isolation. Diameter of the wire could be near 1.0- 2.0 millimeters (12- 18 AWG). Use wire as much thick as possible. Compare to antenna made from a thin wire, antenna made from a thick wire has wider bandwidth. It is wise (because it is cheap) to do a dipole antenna with capacitive loads without ends insulators. The antenna can be installed with help of a rope or plastic (as well as fishing) cord. A dipole antenna with capacitive loads of up or down installation can be installed directly (with help of nail or Scotch) at plastic or wooden window frame.

Window Dipole Antennas with Capacitive Loads for 6-meter Band

Figure 1 shows schematic (**Figure 1a**) and design (**Figure 1b**) of window dipole antenna with capacitive loads of central installation. **Figure 2** shows schematic of window dipole antenna with capacitive loads of up or down installation. The design of the antenna is similar to design shown at **Figure 1b**. The design of the both antennas is simple. Two ropes are installed at two ends of the window. Capacitive loads fastened to the ropes by thin wires or ropes. Third rope is installed at the center of the window. Antenna central insulator (made from a piece of any plastic or PC board) is fastened to the rope.

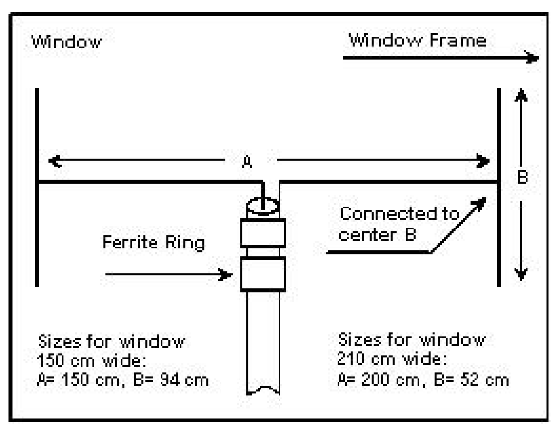


Figure 1A

Figure 1
Window Dipole Antenna with Capacitive Loads of Central Installation

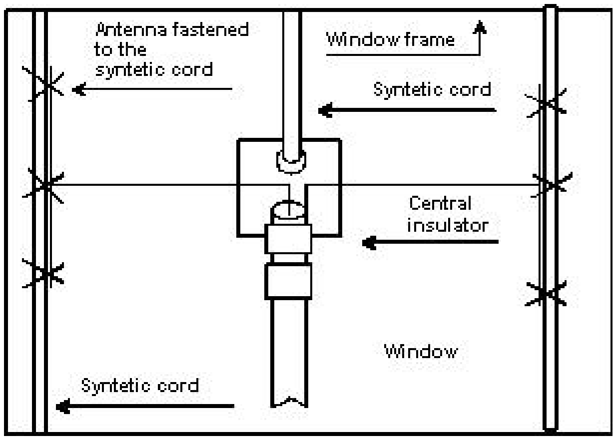


Figure 1B

Figure 1 Window Dipole Antenna with Capacitive Loads of Central Installation

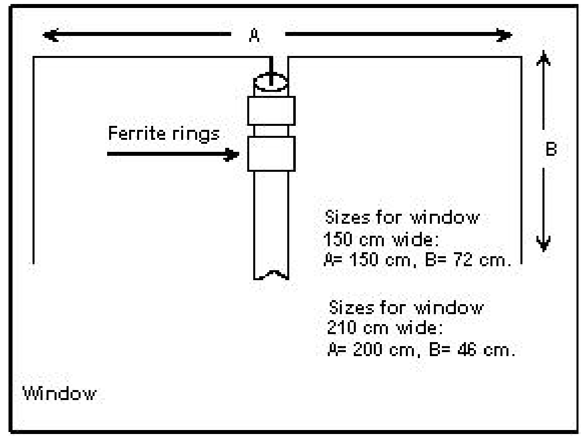


Figure 2

Figure 2 Window Dipole Antenna with Capacitive Loads of up or Down Installation

Adjustment of the both antennas is simple. A SWR-meter or HF- bridge (see References **[1]**) is connected to feed points of the tuned antenna. Gradually shorten 'moustaches' (symmetrically each moustache) of the antenna to minimum SWR or when antenna input impedance is active (has no reactive component) at needed frequency. At shortening moustaches the moustache wires roll up to a little coil.

Parameters of the Window Dipole Antenna with Capacitive Loads of Central Installation

Theoretical parameters of the antennas (copper, wire in 1.0- mm (18- AWG) diameter) were simulated with help of MMANA (see References **[2]**).

Theoretical input impedance for 'narrow' antenna is 42- Ohm, for 'wide' antenna is 60- Ohm. The data are very good matched with my practical measurement of the antennas. A 50- Ohm coaxial cable should be used for feeding of the antennas. This one can be connected directly to antenna feed points, as it is shown at **Figure 1**. A 75- Ohm coaxial cable is possible to use for the antenna installed at wide (210 cm) window. Theoretical gain for the antennas is near 1.5- 1.7 dBi.

Charts for those antennas with Impedance, SWR and Gain you may find at:

http://www.antentop.org/007/window007.htm

A 'narrow' antenna of central installation has theoretical pass band 1300 kHz at SWR 1.5:1 at 50- Ohm coaxial cable, and pass band 2744 kHz at SWR 2:1 at 50- Ohm coaxial cable.

A 'wide' antenna of central installation has theoretical pass band 1480 kHz at SWR 1.5:1 at 50- Ohm coaxial cable, and pass band 2979 kHz at SWR 2:1 at 50- Ohm coaxial cable. It is quite enough for working at 6- meter band especially since the real antenna has pass band wider the theoretical.

Parameters of the 6- meters Band Window Dipole Antenna with Capacitive Loads of Up and Bottom Installation

Theoretical parameters of the antennas (copper, wire in 1.0- mm (18- AWG) diameter) were simulated with the help of MMANA. Theoretical input impedance for 'narrow' antenna is 43- Ohm, for 'wide' antenna- 60- Ohm. The data are very good matched with my practical measurement of the antennas. Theoretical gain for the antennas is near 1.5- 1.7 dBi.

Charts for those antennas with Impedance, SWR and Gain you may find at:

http://www.antentop.org/007/window007.htm

A 50- Ohm coaxial cable should be used for feeding of the antennas. This one can be connected directly to antenna feed points, as it is shown at **Figure 2**. A 75- Ohm coaxial cable is possible to use for an antenna installed at wide (210 cm) window. A 'narrow' antenna with capacitive loads of up or down installation has theoretical pass band 1377 kHz at SWR 1.5:1 at 50- Ohm coaxial cable, and pass band 2697 kHz at SWR 2:1 at 50- Ohm coaxial cable. A 'wide' antenna with capacitive loads of central installation has theoretical pass band 1393 kHz at SWR 1.5:1 at 50- Ohm coaxial cable, and pass band 2876 kHz at SWR 2:1 at 50- Ohm coaxial cable. It is quite enough for working at 6- meter band especially since the real antenna has pass band wider the theoretical.

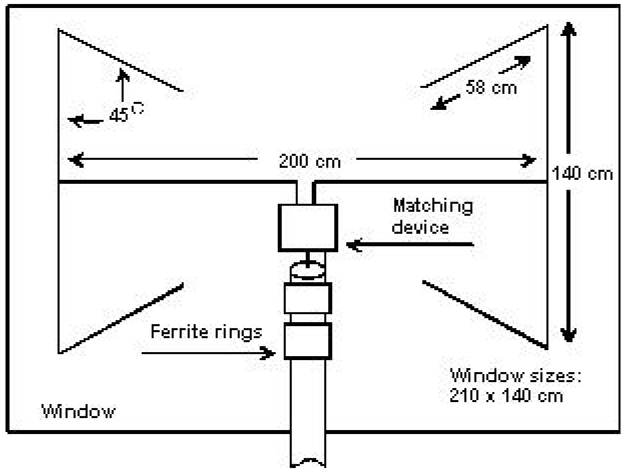


Figure 3 Window Dipole Antenna with Capacitive Loads of Central Installation

Window Dipole Antennas with Capacitive Loads for 10-meters Band

Figure 3 shows schematic window dipole antenna with capacitive loads of central installation. **Figure 4** shows schematic window dipole antenna with capacitive loads of up or down installation. Antenna central installation could be installed at window 210-cm wide. Antenna up or down installation could be installed at window 150 or 210-cm wide.

The design of the both antennas is similar to design shown at **Figure 1b**. Two ropes are installed at two sides of the window. Capacitive loads fastened to the ropes by thin wires or ropes. Diagonal capacitive loads are spread by thin ropes. Third rope is installed at the center of the window. Antenna central insulator (made from a piece of any plastic or PC board) is fastened to the rope.

Adjustment of the both antennas is simple. A SWR-meter or HF- bridge (see References **[1]**) is connected to feed points of the tuned antenna. Gradually shortened moustaches (symmetrically each moustache) of the antenna to minimum SWR or when antenna input impedance is just active (have no reactance) at needed frequency. At shortening moustaches the moustache wires roll up to a little coil.

Input Impedance of 10-meter Band Window Dipole Antennas with Capacitive Loads

Theoretical parameters of the antennas (copper, wire in 1.0- mm (18- AWG) diameter) were simulated with the help of MMANA. Theoretical input impedance of the antenna is 22- Ohm.

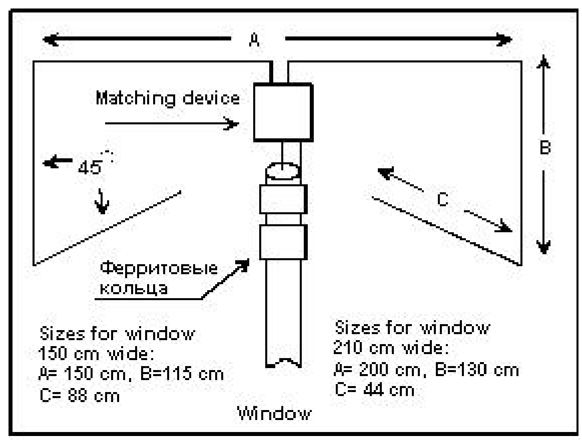


Figure 4
Window Dipole Antenna with Capacitive Loads of up or Down Installation

Practically measured input impedance of the antenna was 30- Ohm. Losses in neighbor objects add the 8 Ohm. Theoretical gain for the antennas is near 1.5- 1.7 dBi.

Charts for those antennas with Impedance, SWR and Gain you may find at:

http://www.antentop.org/007/window007.htm

Feeding of 10-meters Band Window Dipole Antennas with Capacitive Loads

Since the 10- meter band window dipole antenna with capacitive loads has a low input impedance a matching device should be installed between the antenna and the feeding coaxial cable.

MMANA allows simulate such matching device. **Figure 5** shows schematic of the matching device as well as data for different antennas. Of course, it needs adjust a little the L and C to operate with particular antenna.

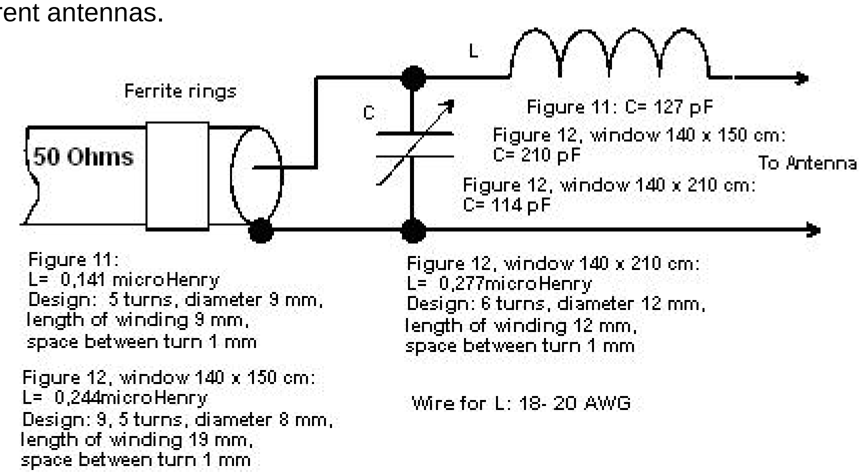


Figure 5 Matching Device for Antenna With Capacitive Loads

SWR of 10 – meter Band Window Dipole Antennas with Capacitive Loads

SWR was simulated by MMANA. The antenna has theoretical pass band 375 kHz at SWR 1,5:1 at 50- Ohm coaxial cable, and pass band 750 kHz at SWR 2:1 at 50- Ohm coaxial cable. It is not enough for working at all 10- meter band. However, due the losses at neighbor subjects the pass band of the antenna is wider the theoretical one.

Charts for those antennas with Impedance, SWR and Gain you may find at:

http://www.antentop.org/007/window007.htm

Parameters of the 10- meter Band Window Dipole Antenna with Capacitive Loads of Up and Bottom Installation

Theoretical parameters of the antennas (copper, wire in 1.0- mm (18- AWG) diameter) were simulated with help of MMANA. Theoretical input impedance for ‘narrow’ antenna is 12- Ohm, for ‘wide’ antenna- 26- Ohm. Practically measured impedance is higher on 8- 10 Ohm the theoretical one due to losses at neighbor subjects. Theoretical gain for the antennas is near 1,1- 1.3 dBi

A ‘narrow’ antenna with capacitive loads of up or down installation has theoretical pass band 157 kHz at SWR 1.5:1 at 50- Ohm coaxial cable, and pass band 314 kHz at SWR 2:1 at 50- Ohm coaxial cable. A ‘wide’ antenna has theoretical pass band 425 kHz at SWR 1.5:1 at 50- Ohm coaxial cable, and pass band 733 kHz at SWR 2:1 at 50- Ohm coaxial cable.

So those antennas can work only at a part of the 10 meter band. For working at all 10- meters band a matching device should be used for needed frequency. However, the ‘wide’ antenna often works at all 10 meter band without retuning the matching device due to losses at neighbor subjects.

References:

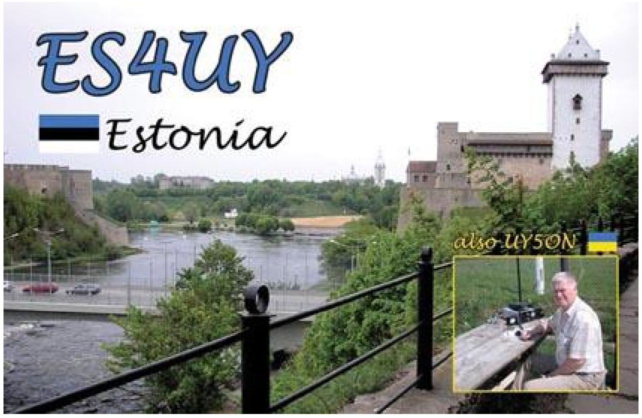
1. Igor Grigorov. Antennas. Matching and Adjustment. – Moscow. RadioSoft, 2002. ISBN 5-93037- 087-7

2. http://dl2kq.de/

Antenna for 50 and 70- MHz Band

By: Alex Karakaptan, es4uy, uy5on

The antenna was designed several years ago, when I got Estonian call sign ES4UY. With the call I able use 50 and 70- MHz bands from Estonia. Need to say that I was in a very rare square- K049CJ. So I need an antenna for those bands. Restricted place could not allow me to create something serious. So, wire in length in 3.75 meter was placed on to perimeter of my window then the wire was fixed at balcony. The wire was connected to the home brew ATU. Counterpoise in length 0.7- meter was connected to the ATU. **Figure 1** shows the antenna on the window. **Figure 2** shows design of the antenna. **Figure 3** shows schematic of the ATU. **Figure 4** shows design of the ATU.



ES4UY QSL Card

Figure 1 Antenna for 50 and 70- MHz Band Placed on the Window

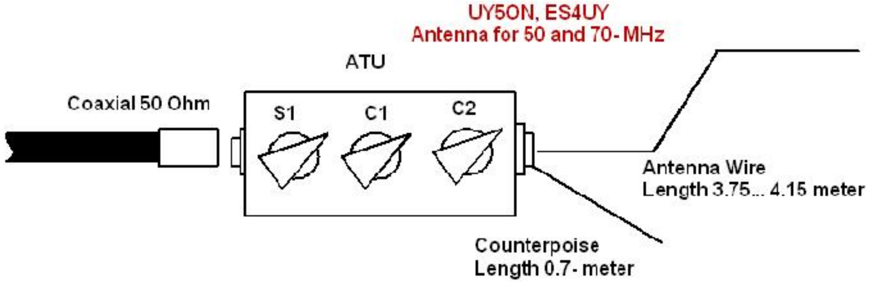


Figure 2 Design of the Antenna for 50 and 70- MHz Band

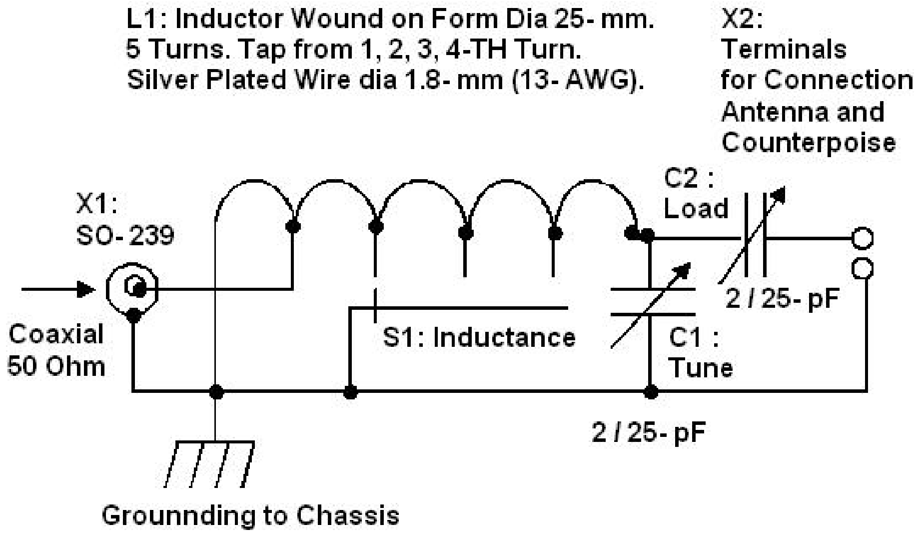


Figure 3 Schematic of the ATU

Figure 4 Design of the ATU

The antenna is kind of known Windom Antenna designed for 50- and 70- MHz. Length in 3.5 is the long part of Windom Antenna, counterpoise in 0.7- meter is next short part of the antenna. ATU does match the antenna with the coaxial cable.

I made the ATU inside of aluminum box. Inductor was wound on a form with OD- 25- mm and contained 5 turns. Inductor was coiled by silver- plated wire in diameter 1.8- mm (13- AWG).Taps were made from 1, 2, 3, and 4-th turn.

First tap of the inductor through a short length connected to the “hot” lead of the RF socket X1. Beginning of the inductor soldered to the ground of the RF socket X1. Taps 2, 3, 4 connected by short lengths to the switch S1.

Capacitors C1 and C2 were hi- Q air capacitors. Capacitor C2 was insulated from the box. I’ve managed tune capacitors of the ATU in such way that I could change working Band only with switch S1 (no capacitors tuning required). ATU has losses only minus 0.53 dB. It was checked by ADVANTEST made analyzer.

Below you can see data from my Log for 25- 26-June, 2015. There are 29 QSOs. Take attention to QSO with CT1HZE- the distance is 3600- km. So the antenna works and works well. So the antenna may be used at any place with restricted conditions.

QSO by ES4UY on 70mhz
Type of propagation: ES
Loc: KO49CJ
TRX: Ft-847 -60 wats Ant: Home Made with 3.75m Window Antenna.
Format: Call, Loc, RS/RST

DJ7MN, JN58WH, 599/ 599: S57LM, JN76HD, 599/559; OK2BGW, JN89CH, 599/ 599; OZ3ZW, JO54RS, 59/ 59; OK2BGW, JN89CH, 57/ 57; OK2BRD, JN99ET, 59/ 59; PA0RDY,JO22KJ, 579/ 559; PA0RDY, JO22KJ,579/ 559; OM5KM, JN98BG, 559/599; HA3GR, JN86VK,579/ 599; PA2IP, JO23VF, 599/599; SP3RNZ, JO92DF, 559/ 559; LZ1AG,KN22ID, 559/ 559; OK1KT, JO80CH, 599/599; HA3GR, N86VK, 599/ 599; SP6GWB, JO80JG, 599/ 599; YO7BSN, KN15OA, 599/ 599; 9A2SB, JN95GM, 559/559; CT1HZE, IM57NH,55/55; PG5V, JO21, 559/ 549 ; PA0O, JO33HG, 599/599; PA2M, JO21IP,59/59; ON4PS, JO20KQ, 599/599; ON4PS, JO20KQ,599/ 599; DK2PH, JO41GV, 599/559; OZ1BNN, JO55PM, 55/ 55; OZ2OE, JO45VV, 59/ 59; OZ3ZW, JO54RS, 59/ 59; OZ8ZS, JO55RT, 57/59; OZ1JXY, JO46TX,57/ 55.

Shortened Dipole Balcony Antenna for the 20- meter Band

Viktor Kovalensky, RN9AAA

Some years ago, just for fun, I install the Shortened Dipole Antenna for the 20- meter Band at my balcony. The antenna still exists and I use to it for my operation in the Air.

Figure 1 shows schematic of the antenna. As it is seen from the figure the antenna is kind of a shortened dipole antenna with lengthening inductor in each wire. Antenna is fed by 50- Ohm coaxial cable. RF- Choke plus balun is installed at the cable of the antenna. **Picture 2** shows the antenna installation on my balcony.

Home brew RF-Choke installed on the coaxial cable of the antenna is very simple in design.

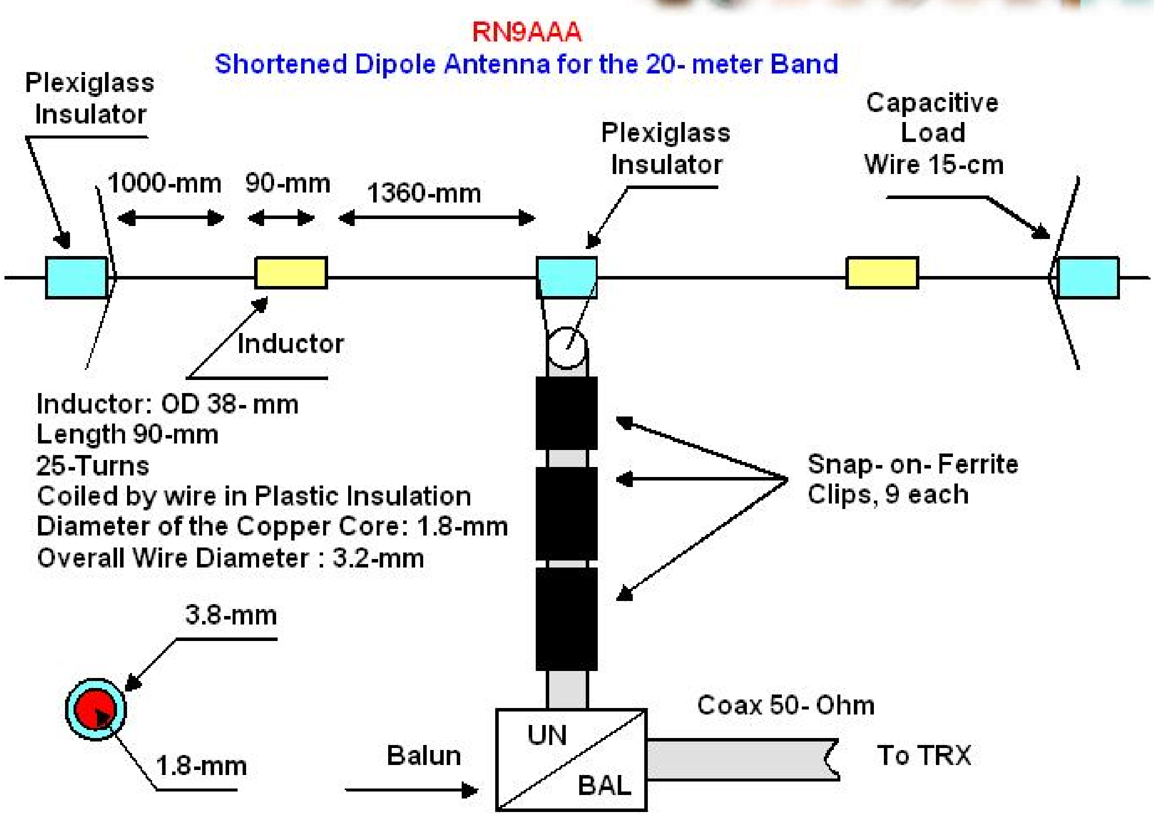
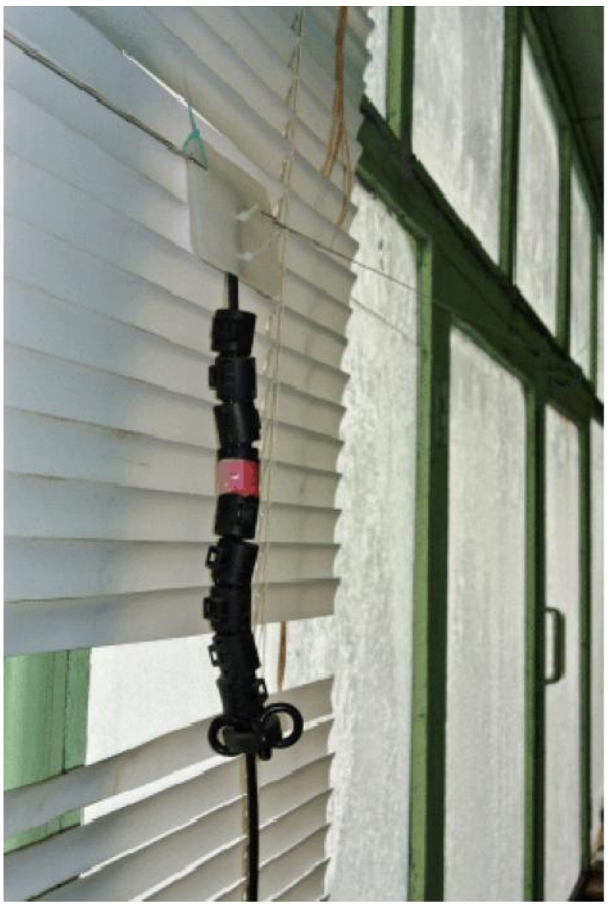


Figure 1 Shortened Dipole Antenna for the 20- meter Band

It is nine snap - on ferrite clips that are snapped on to the coaxial cable. Quantity of the ferrite clips depends on whether the position of the coaxial cable (in balcony space) is not interacted on to tuning of the antenna. When the needed quantity of the ferrite clips is found, install a balun. It is possible to find lots description "how to make a balun" in the internet. My balun also is very simple. It is four coils turned around a ferrite ring. It is possible use almost any ferrite ring with suitable sizes and permeability 100- 2000. **Picture 3** shows antenna analyzer MFJ-259B connected to the tuned into resonance antenna. Antenna input impedance is 53- Ohm at 14.075- MHz.



Picture 2 Shortened Dipole Antenna installed at my balcony

Picture 3 Antenna Analyzer MFJ- 259B Connected to the Tuned into Resonance Antenna

Design of the antenna is very simple. For the antenna it was used copper wire in diameter 0.7-mm (22- AWG). It is possible to use any suitable wire in diameter 0.5- 2.0-mm (25- 14- AWG). Homebrew insulators (made from plexiglass) used at the antenna. Lengthening inductor is wound around plastic tube in 38- mm (1-1/2'') diameter. For the inductor it was used electro- technical wire in plastic insulation. Diameter of the copper core is 1.8-mm (13- AWG). Overall diameter of the wire in plastic insulation is 3.8- mm (7- AWG).

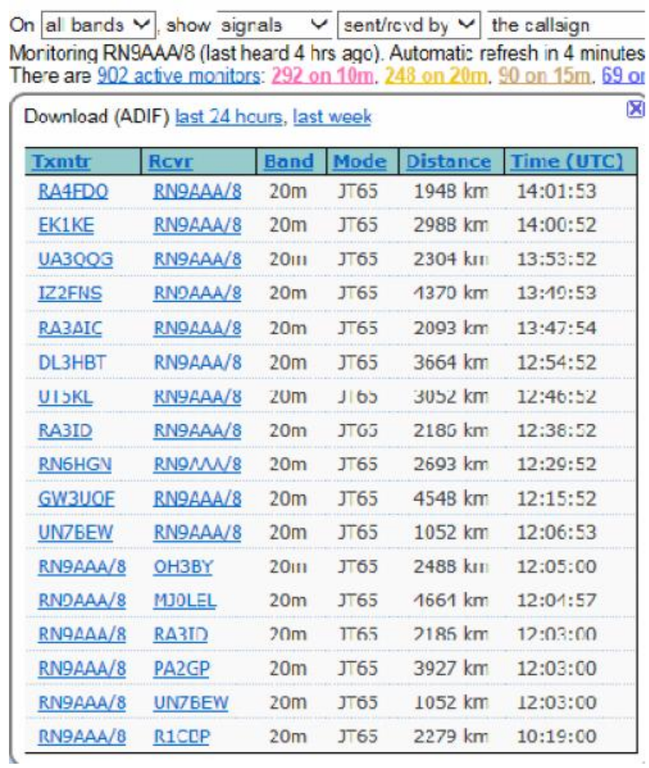
Picture 4 shows the inductor. Capacitive load is installed at the ends of the dipole. **Picture 5** shows the capacitive load.

Antenna is tuned in to resonance by shortening of the capacitive loads. It needs cut the wire symmetrically at the both ends of the antenna. Initially the length of capacitive load should be 20- cm.

Picture 4 Inductor of the Shortened Dipole Antenna for the 20- meter Band

Picture 5 Capacitive Load at the Shortened Dipole Antenna for the 20- meter Band

Of course the antenna cannot be a “super- efficiency” antenna. However the antenna provides not bad operation in the Air by CW and JT65. **Picture 6** shows screen shot of monitor for JT65 for one of the days. **Reference 1** gives information how to make a shortened dipole antenna.



On all bands, show signals sent/rcvd by the callsign
Monitoring RN9AAA/8 (last heard 4 hrs ago). Automatic refresh in 4 minutes
There are 902 active monitors: 292 on 10m, 248 on 20m, 90 on 15m, 69 o

Download (ADIF) last 24 hours, last week

Txmtr	Rcvr	Band	Mode	Distance	Time (UTC)
RA4FDO	RN9AAA/8	20m	JT65	1948 km	14:01:53
EK1KE	RN9AAA/8	20m	JT65	2988 km	14:00:52
UA3QOG	RN9AAA/8	20m	JT65	2304 km	13:53:52
IZ2FNS	RN9AAA/8	20m	JT65	4370 km	13:49:53
RA3AIC	RN9AAA/8	20m	JT65	2093 km	13:47:54
DL3HBT	RN9AAA/8	20m	JT65	3664 km	12:54:52
UT5KL	RN9AAA/8	20m	JT65	3052 km	12:46:52
RA3ID	RN9AAA/8	20m	JT65	2186 km	12:38:52
RN6HGN	RN9AAA/8	20m	JT65	2693 km	12:29:52
GW3UOF	RN9AAA/8	20m	JT65	4548 km	12:15:52
UN7BEW	RN9AAA/8	20m	JT65	1052 km	12:06:53
RN9AAA/8	OH3BY	20m	JT65	2488 km	12:05:00
RN9AAA/8	MJ0LEL	20m	JT65	4661 km	12:04:57
RN9AAA/8	RA3ID	20m	JT65	2186 km	12:03:00
RN9AAA/8	PA2GP	20m	JT65	3927 km	12:03:00
RN9AAA/8	UN7BEW	20m	JT65	1052 km	12:03:00
RN9AAA/8	R1CDP	20m	JT65	2279 km	10:19:00

Picture 6 Screen Shot of Monitor for JT65

References

1. http://www.k7mem.com/Electronic_Note.../shortant.html

73! RN9AAA

Shortened Antenna G5RV for 14- 50- MHz Bands

Alex Karakaptan, UY5ON, Kharkov Ukraine

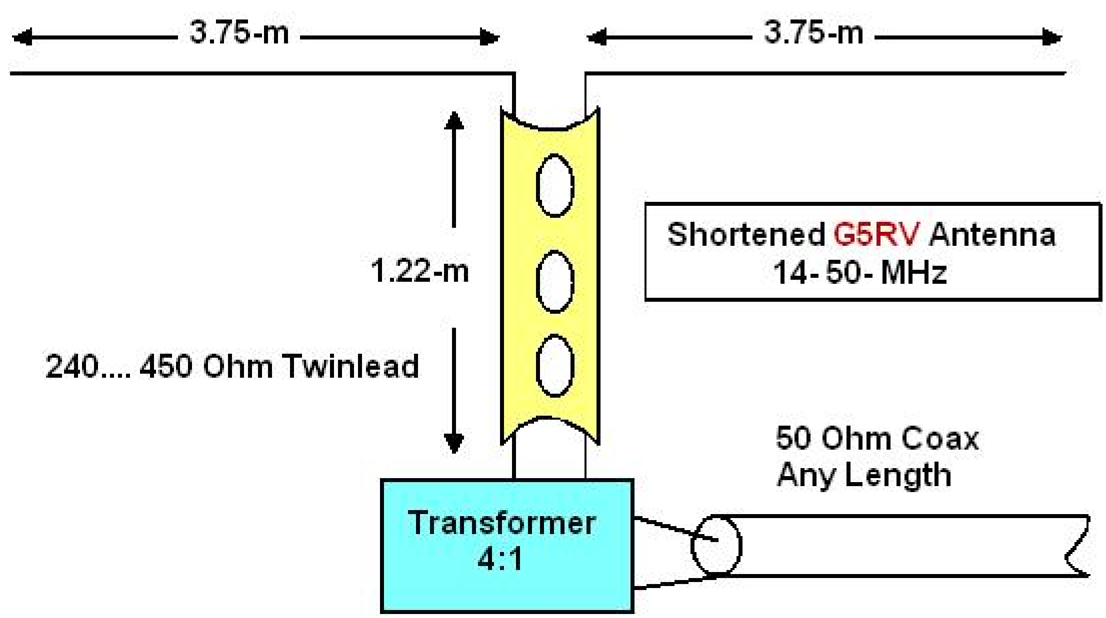
Shortened antenna G5RV is a variant of classical G5RV that is calculated for 14- 50- MHz. The antenna has shortened radiation parts and shortened matching two-wire line.

Amateur's Bands within 14- 50- MHz are mostly welcome for DX operation. Good propagation at the Bands allows make DX QSO using QRP power.

Antenna takes small room. Any limited open space- either balcony or window is suitable for the antenna. Antenna may be placed in horizontal position or installed similar to I.V.

Antenna could work at the 70- MHz band when proper transformer 4:1 is used. At some cases an ATU installed between coaxial cable and transceiver would be useful.

Credit Line: forum at cqham.ru



Shortened Antenna G5RV for 14- 50- MHz Bands

Attic Antenna for 40-, 30-, 20-, 17-, 15-, 12 and 10 meter Band

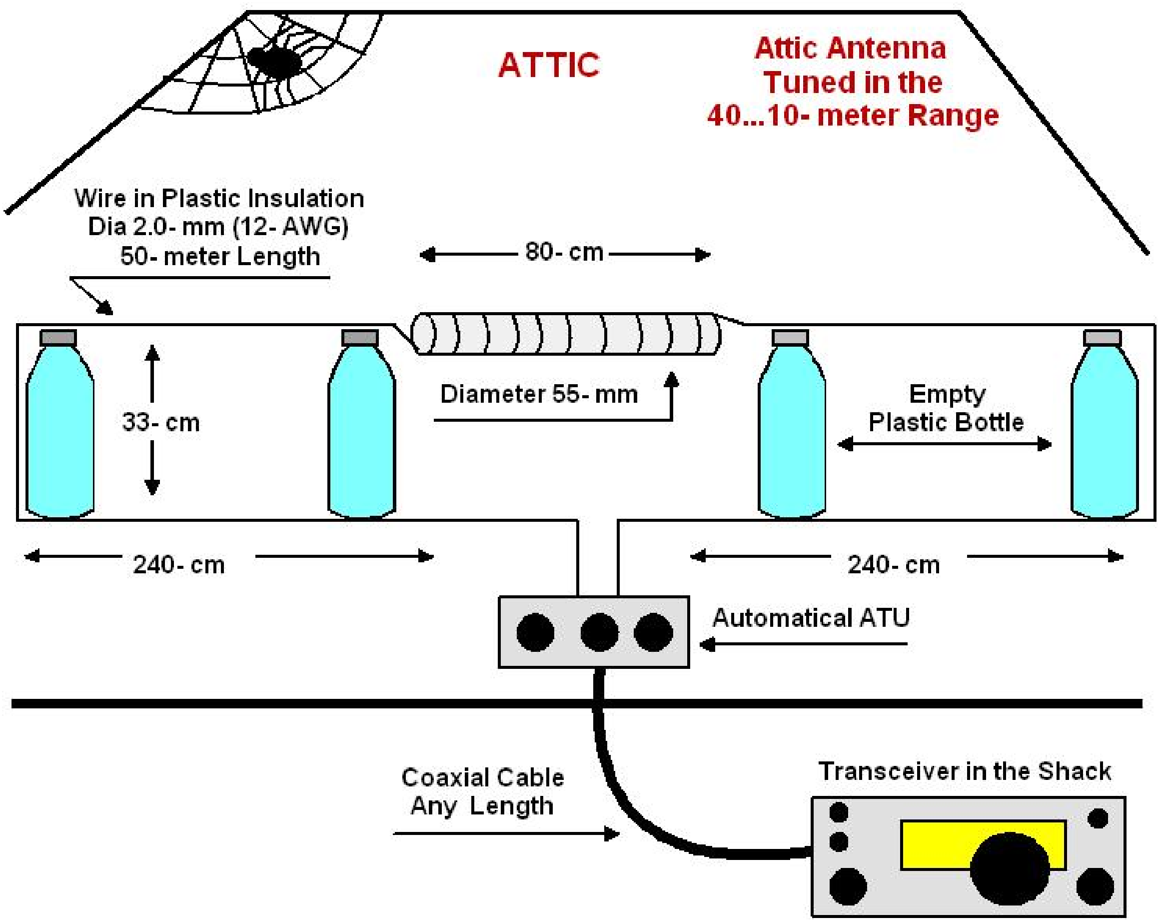
Eugene Viktorovich

The antenna was installed on the attic of my home. Antenna was matched with 50- Ohm coaxial cable at 40-, 30-, 20-, 17-, 15-, 12 and 10 meter amateur Bands with help of an Automatic ATU. The Antenna worked satisfactory on the above mentioned bands. To make the antenna you need just a length of 50- meters insulated wire in diameter 2.0 mm (12- AWG).

The antenna is a stub dipole with dimension 33- cm between wires and length of each side 240 cm. The dimension between wires is set up by empty plastic bottles (5- liter water container) that are used here as a spread insulator between the wires.

So, for the stub dipole there is used (240cm x 2 x 2= 960- cm) 960 cm of wire. Two lengths of the wire in 40- cm each are connected to the Automatic ATU. Coaxial cable is going from the Automatic ATU to shack with transceiver. Rest wire (near 39.6- m) is coiled around a form in diameter 55- mm. Length of the winding is 80- cm.

In spite of the simplicity of the design the antenna allows satisfactory work on to amateur HF bands.



Credit Line:

http://www.cqham.ru/forum/showthread.php?28949-Балконный-диполь-на-14-МГц/page17

Lawn Antenna

James R Kellner, K2MIJ, Hicksville, NY

Ok Gang in case you don't remember me....I am the guy who ran a couple of "Forks" as a dipole awhile back and actually worked W1AW/5 Oklahoma running 5 watts SSB from my trusty Yaesu FT-817....Well I have a new one for you and help will be appreciated to reach my goal!

I will digress a bit before making my help request.

Four days ago I received a text from my portable ops partner that 15 meters was showing some signs of opening, We had been discussing for awhile now at the lackluster band condx, I texted him back that I had noticed condx. seeming to be improving and that while cleaning the shack I found the "Fork Antenna" and had been giving it a good workout trying to get myself a spot on the RBN or possibly another contact with it.
He laughed and said "Knowing you, I am sure you will succeed" Standing in the yard while we were texting I noticed the two empty folding aluminum lawn chairs sitting there and I said to him "Perhaps I'll see if I can throw some RF into a couple of lawn chairs and see what happens!"

Well of course as soon as we finished our conversation I folded up the two chairs, stuck one under each arm and off to the shack I went. Five minutes later "The Lawn Chair Antenna" was born!

Running the 817 @ 5 watts into my favorite LDG Z11 AT, 6 feet of RG8X coax and a 4:1 balun the chairs loaded without a hitch on 10 thru 40! (40 you say....keep reading!)

But would it radiate? I threw out a quick "CQ CQ de K2MIJ K2MIJ" on 20 meters and was immediately spotted by N7TR Reno Nevada. Eureka, Success!

Could it actually work? IS DX possible?

I started working in earnest from that moment and the results have nothing less than amazing! First contact was with John N0JA in MO 20 meter SSB John gave me a 52 and I was ecstatic! Next up was Morris W4REX in FL a 53 report on 17 meters SSB and the mind blowing contact of the day was my 3rd QSO, Lacy HA3NU in Hungary on 17 meters SSB a typical 59 "contest exchange" report...BUT....I made it across the pond with 5 watts into a pair of lawn chairs sitting on a bed inside the shack!

Lawn Antenna

I was getting a complex, I could work phone contacts without a problem but a CW contact was an effort in futility!

Finally after a number of attempts....my 1st CW contact with K1GHL on 40 meters was a complete delight! The LDG Z11 tuner found a match quite easily on 40 meters but making a contact I thought would be at best a stroke of complete luck given the antennas obvious inefficiency at that low of a frequency...Boy was I ever wrong! My first CQ out of the box netted me an RBN spot by VE2WU with a SNR of 9db! As I was picking myself up off the floor it took me a minute to realize that was my call coming back through the speaker...K1GHL Glenn in upstate NY gave me a 559 report but disappointingly came back on the next go around saying he had lost me in the noise and bid me a 73...Crestfallen, I soon was to have my spirits lifted when immediately after Glenn, Art W2NRA called me and we completed a solid 5 to 6 turnover QSO and a good SKCC exchange! I
now have 6 completed 2 way CW contacts on 40 meters. Furthest distance is New Hampshire with Randy KX1NH.... Yes the lawn chairs will work on 40! My 1st CW DX contact finally came via S.E. station AO8BWC Canary Islands on 20 meters...

In the past 4 days, CW and/or SSB, I have so far put 55 domestic and DX contacts in the log, 14 states NH, NJ, NY, FL, GA, AL, IN, MI, WI, IL, MO, AR, TX and CO and 9 countries Hungary, Canary Islands, Germany, Sweden, Ireland, Poland, Czech Republic, Wales and Russia!

Antenna Manuscript

I know, took a long time to get to the subject line help request but here goes, I started this completely as a lark but after seeing how well it can and will work...I am now looking to seriously attempt Worked All States...IF you would like to help me on my quest I would be happy to have you in my log either CW or SSB. I will post here on the list from time to time when and where the "Lawn Chairs" will be operating. I will also spot myself on the QRP spots site...TNX in advance!

Well Gang Summer is winding down and Fall is right around the corner... before you sadly drag those lawn chairs into the garage or shed for their long Winter nap, why not extend their life and tuck a couple under your arms and bring em into the shack instead! Don't worry about that the Wife or Kids will think your crazy, Trust me, Your a Ham...They already know it! ;-)

1st time using Dropbox so hopefully if I have done everything correctly you can see some pictures of the Lawn Chair antenna in it's operating position...also I included a couple of links to some youtube videos. One while I worked Jim NV9X IL in this past weekends SKCC Weekend Sprint(if you watch the video don't ask me why I pronounced Illinois as "Ill e noise", I have no clue!) and a SSB contact with HG7T in the WAE contest...

72/73, Jim K2MIJ

Lawn Antenna

Feed Point of the Lawn Antenna

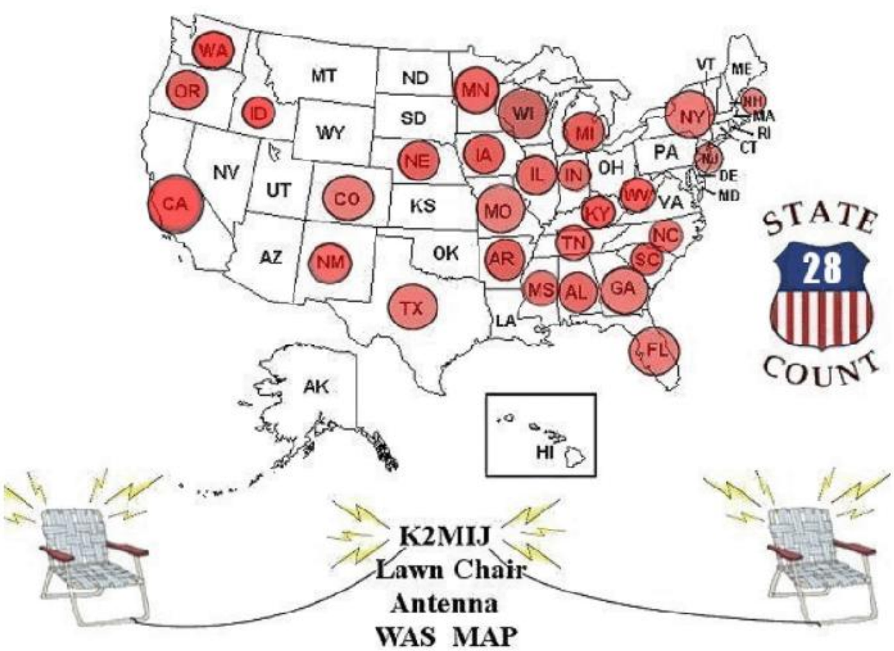
Link for videos with Lawn Antenna

HG7T SSB contact link-
http://youtu.be/ol6Or6RaWHM

NV9X SKCC CW link http://youtu.be/SjIKT10AaH4

Lawn Chair DXCC Countries/Entities worked list

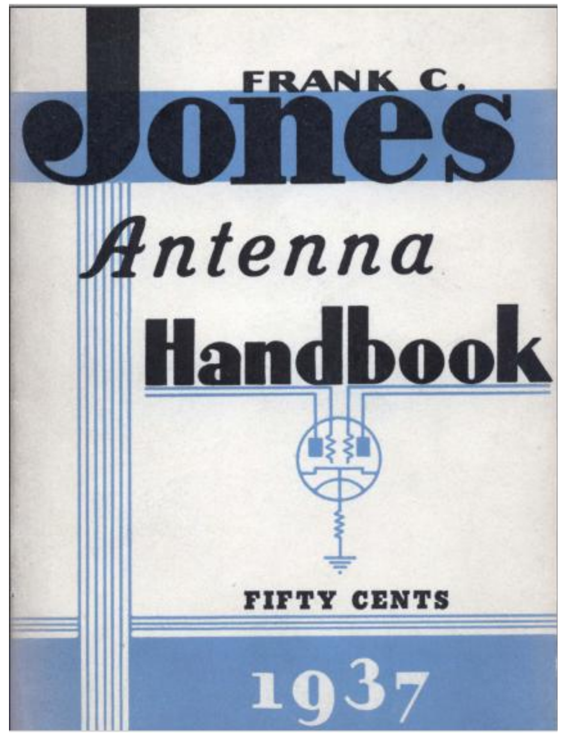
Hungary - Canary Islands - Germany - Sweden - Ireland - Poland - Czech Rep. - Russia - Wales - Spain - Trinidad & Tobago - Greece - Slovenia - Belgium - Cuba - Puerto Rico - Canada - Bermuda - Croatia - Scotland - St. Lucia - England - Bonaire - Austria - Azores - Italy - Belarus -*...more to follow!*



Jones Antenna Handbook

Jones Antenna Handbook contains only 66 pages but information that is given there is invaluable. The book describes in short and strict range of antennas used by amateurs and professionals on HF- VHF- UHF- Bands. The book gives very good view to the amateur history of the far- 30s.

Link to load the book:
http://www.antentop.org/library/shelf_Jones.htm



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Antennas for Transmitting

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Antennas for Receiving

Antennas for Ultra- High Frequencies

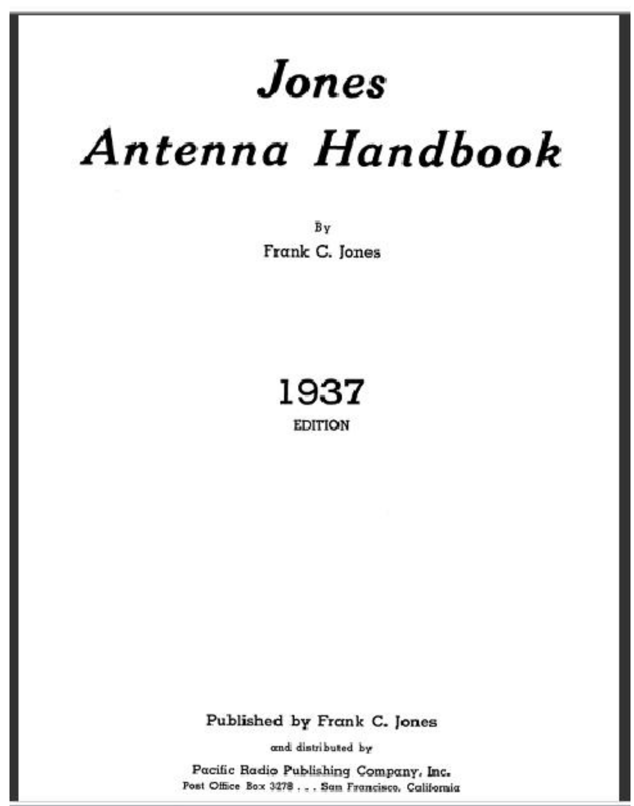
Special Purposes Antennas

160 Meter Antennas

Antenna Coupling Systems

Antenna Charts

Measuring Equipment



Jones
Antenna Handbook

By
Frank C. Jones

1937
EDITION

Published by Frank C. Jones
and distributed by
Pacific Radio Publishing Company, Inc.
Post Office Box 3278 . . . San Francisco, California

Introduction.

The aim of The Jones Antenna Handbook is to provide practical guidance in the selection and construction of that type of equipment which is best suited for a specified purpose and location. Because of the great diversity in types and the conflicting opinions as to their relative merits, the reader may well be puzzled in his choice of what is best for his particular needs.

The antenna is a most important factor in determining the performance of a radio transmitter or receiver. The type should be selected on the basis of known facts and not guesswork…

Conclusion

So, Chapter 4 ***"Apartment Antennas"*** is ended. You have got enough information how to do your own hidden antenna.

However, each shack has the own location with own characteristics… So it should be creative approach for antenna installation.

Just again remind: *The Apartment Antenna pick up noise of the electrical devices in the room, the antenna may cause interferences to lot of electronics devices. The antenna should be placed as much far as possible from operator and nearest subjects. High density electromagnetic field near the transmitting Apartment Antenna may harm human and heat nearest subjects.*

Additional source could give some more tricks for antenna installation. I wish you success to design your own Apartment Antenna.

73!
Igor, VA3ZNW

References:

Window Antennas

1. Urban Antenna: http://www.antentop.org/015/ru4sj_015.htm
2. Simple Window Loop Antenna: http://www.antentop.org/018/ra9sus_018.htm
3. Broadband Indoor Antenna: http://www.antentop.org/007/indoor007.htm
4. Window Dipole Antennas with Capacitive Loads: http://www.antentop.org/007/window007.htm
5. Antenna for 50 and 70- MHz Band: http://www.antentop.org/019/antenna_50_70_mhz_019.htm

Balcony Antennas

1. Shortened Dipole Balcony Antenna for the 20- meter Band: http://www.antentop.org/018/rn9aaa_018.htm
2. Shortened Antenna G5RV for 14- 50- MHz Bands: http://www.antentop.org/018/g5rv_018.htm

Attic Antennas

1. Attic Antenna for 40-, 30-, 20-, 17-, 15-, 12 and 10 meter Band: http://www.antentop.org/020/attic_antenna_020.htm

Unusual Antennas

1. Lawn Antenna: http://www.antentop.org/018/lawn_antenna_018.htm

Additional Source:

1. Building Antennas: http://www.antentop.org/007/whas007.htm
2. Balcony Antenna: http://www.antentop.org/007/balcony_antenna007.htm
3. Jones Antenna Handbook: http://www.antentop.org/library/shelf_Jones.htm

CHAPTER 5

Antennas for Limited Space

Antennas for Limited Space… If you have read Chapters 2, 3, and 4 you already know about small sized antennas that may be installed inside a room. However the placement is not good for antennas. RF energy would be dissipated at nearest subjects, electronics equipment could be catch interferences from those antennas and, anyway, such antennas may cause harm to health. So, move antennas far away from human and any subjects ***if you can***.

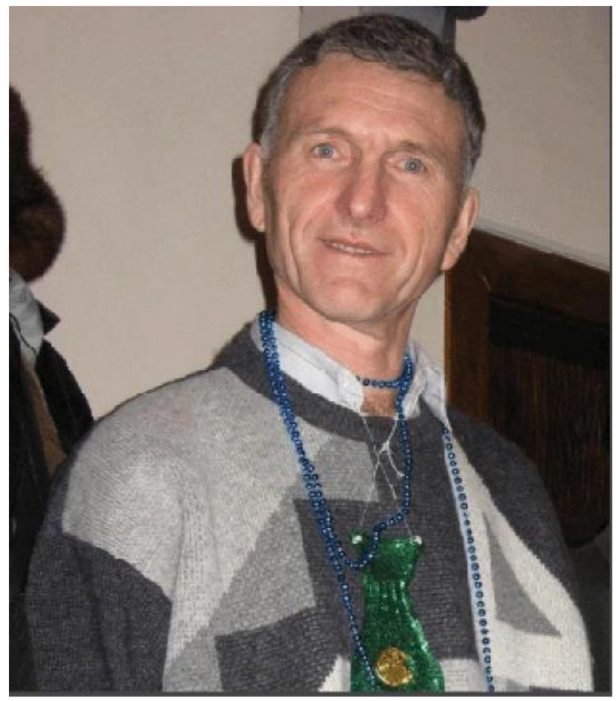
If you can. If you have ever small backyard you may install an antenna there. **Chapter 5** described some practical and theoretical (BTW, I have info that all of the theoretical antennas were successfully tried in the Air) antennas for such installation. So there is a chance for those who have very Limited Open Space. It is possible to find ready variant in **Chapter 5** or make own antenna based on to the existing ones.

Antennas for Limited Space required some experience for installation, tuning and adjustment. SWR- Meter or (that is better) Antenna Analyzer (MFJ- 259B or similar one) may be needed. As well some experience in antenna tuning and design of external antennas would a big plus.

Of course the Antennas for Limited Space are not perfect for operation in the Air. It is not Big Gun antennas. It is just antennas that allow you to be in the Air. The antennas are inexpensive and may be feet for lots small backyards. Try the antennas and modify according to your location.

Simple Folded Dipole Antenna for the 20- meter Band

Vladimir E. Tokarev, UA4HAZ



The antenna was designed for limited space. Antenna may be installed on balcony, on fence or at backyard and masked on to rope for drying clothes. Antenna has input impedance cloth to 50- Ohm. **Figure 1** shows drawing of the antenna.

Folded sides of the antenna may be placed vertically, horizontally or by another way. Input impedance and resonance frequency of the antenna depends on to position of the antenna relative to ground and on to different nearest subjects. So the antenna should be adjusted to the used frequency at the place of where this one is installed. You may compare parameters of the antenna installed on height of 3-meters above the ground (**Figure 2**, **Figure 3**, **Figure 4**) with parameters of the antenna in free space (**Figure 5**, **Figure 6**, **Figure 7**).

MMANA file for the antenna may be downloaded at:
http://www.antentop.org/018/ua4haz_018.htm

73!
de UA4HAZ

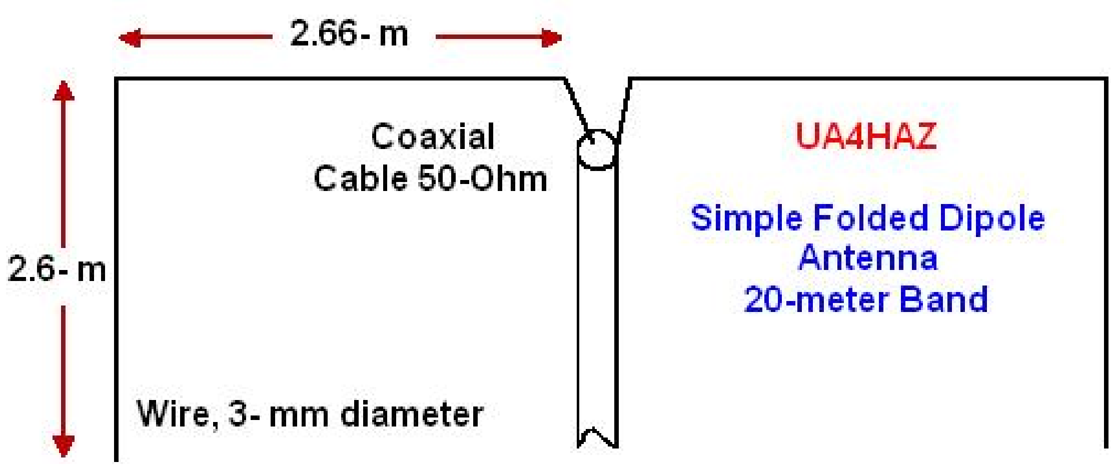


Figure 1 Simple Folded Dipole Antenna for the 20- meter Band

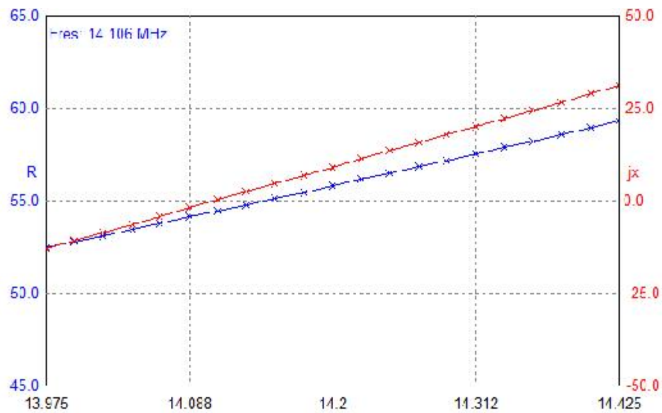


Figure 2 Input Impedance of the Simple Folded Dipole Antenna Installed at 3- meters above the Ground

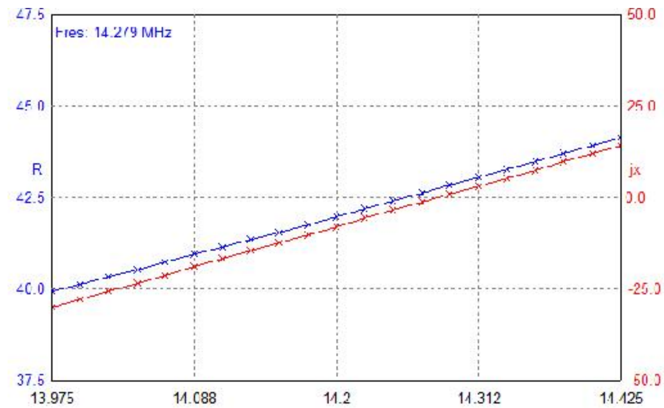


Figure 5 Input Impedance of the Simple Folded Dipole Antenna in Free Space

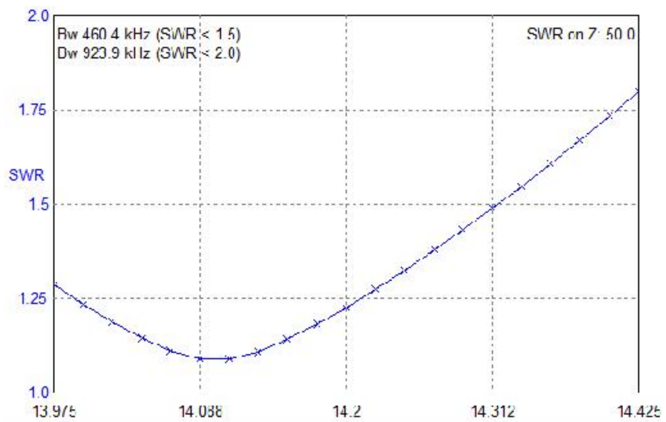


Figure 3 SWR of the Simple Folded Dipole Antenna Installed at 3- meters above the Ground

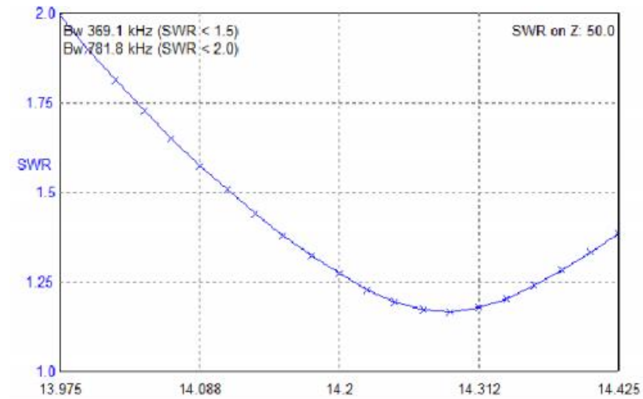


Figure 6 SWR of the Simple Folded Dipole Antenna in Free Space

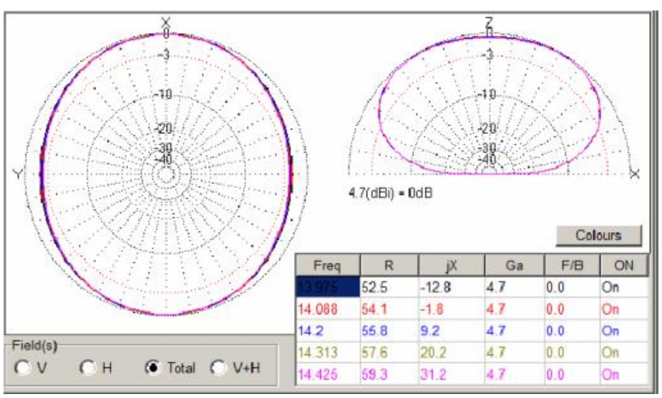


Figure 4 DD of the Simple Folded Dipole Antenna Installed at 3- meters above the Ground

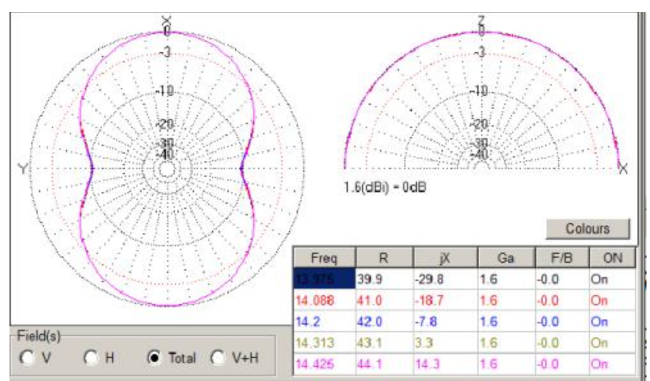


Figure 7 DD of the Simple Folded Dipole Antenna in Free Space

Old CDs in Antenna for 10 meter Band

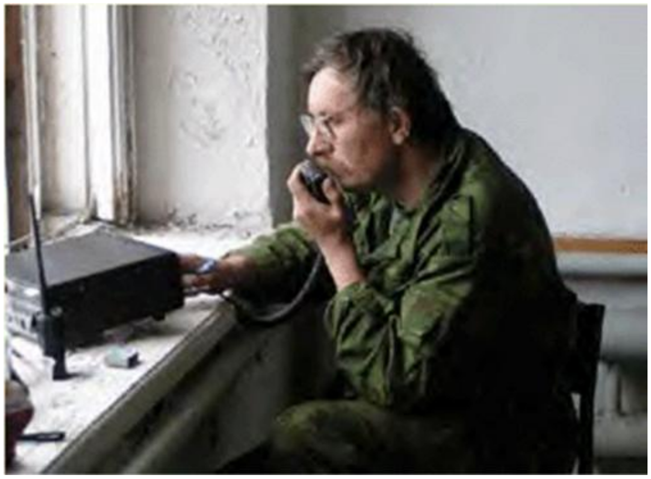
By: N. Filenko, UA9XBI ***Credit Line: www.cqham.ru***

Well for times being I collected lots unusable CDs. What should I do with the treasure? Throw away? Or, no. I guessed. Antenna. I should make antenna similar to Nadenenko Dipole Antenna (See ***References 1***). The CD would be spreaders at the antenna.

Straight away I took decision for which band the antenna should be designed. Of course for 10 meter Band. My thin GP for the band had high SWR at the edges. So new antenna should be good replacement for this one.

In several hours I made antenna with passband 3-MHz and input impedance 50 Ohm. **Figure 1** shows the antenna.

To do this antenna you need 4 plastic ski sticks, 16 bad CDs, 16 lengths of copper wire in 2.35 meter long, a piece of a strong plastic rod in 20 cm length and 4 cm in diameter and 2 pieces of aluminum tube.



UA9XBI
Radio club 'Arktika' Championship 2004
Photo Credit Line:
http://www.arktika.komi.com/Champ_2004.htm

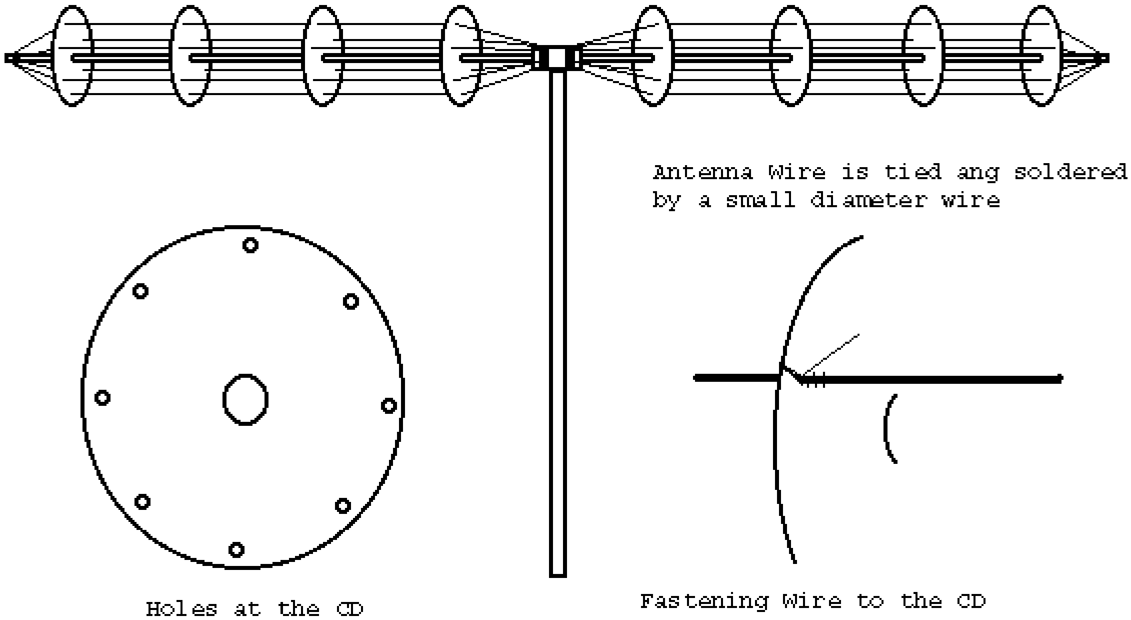


Figure 1 CD Antenna

Ski sticks (each to pairs) are jointed with the help of pieces of aluminum tube. Length of each side of the dipole is 2.30 meter. Ski sticks are inserted into the axial hole in the piece of plastic. The CDs are sitting on the ski sticks. Wires go through the CD. ***73! UA9XBI***

References:

1. **Dipole Nadenenko** PDF file, 250 KB (ANTENTOP-02-2004)

Simple Broadband Antenna for the 40- meter Band

Igor Grigorov, *VA3ZNW*

The Simple Broadband Antenna was designed on the base of my local environment and taking into account the ease/cheap to do. **Figure 1** shows the antenna. Three support points were needed to install the antenna. It was one point at right fence second point at left fence and third point at a window on the second floor of my house. For antenna wire it was used electrical copper wire in diameter 18- AWG in strong black insulation (33- cent/m, Home Depot is supplier).

Antenna was a simple to make. A 10 meter length of the wire was fastened by the ends to both fences. Leave free 50- 80 cm of the wire at both sides at initial installation. **Figure 2** shows the end of the wires.

The length from the left side, should be used for tuning the antenna in to the resonance, second length at right side should be connected with coaxial cable. Center of the wire is heightened and attached to the window frame.

The antenna is a type of L- Vertical that feed at small distance from the ground. It allowed increase antenna input impedance (that is low for small height antennas at ground feeding) and avoid matching devices at antenna feedline. Grounding at the antenna plays important role in the antenna operation. I used 3 wires (similar to the antenna wire) in length of 3 meters that were dug in the earth at depth near 5 centimeters straight away at the end of the antenna wire that touched to the ground.

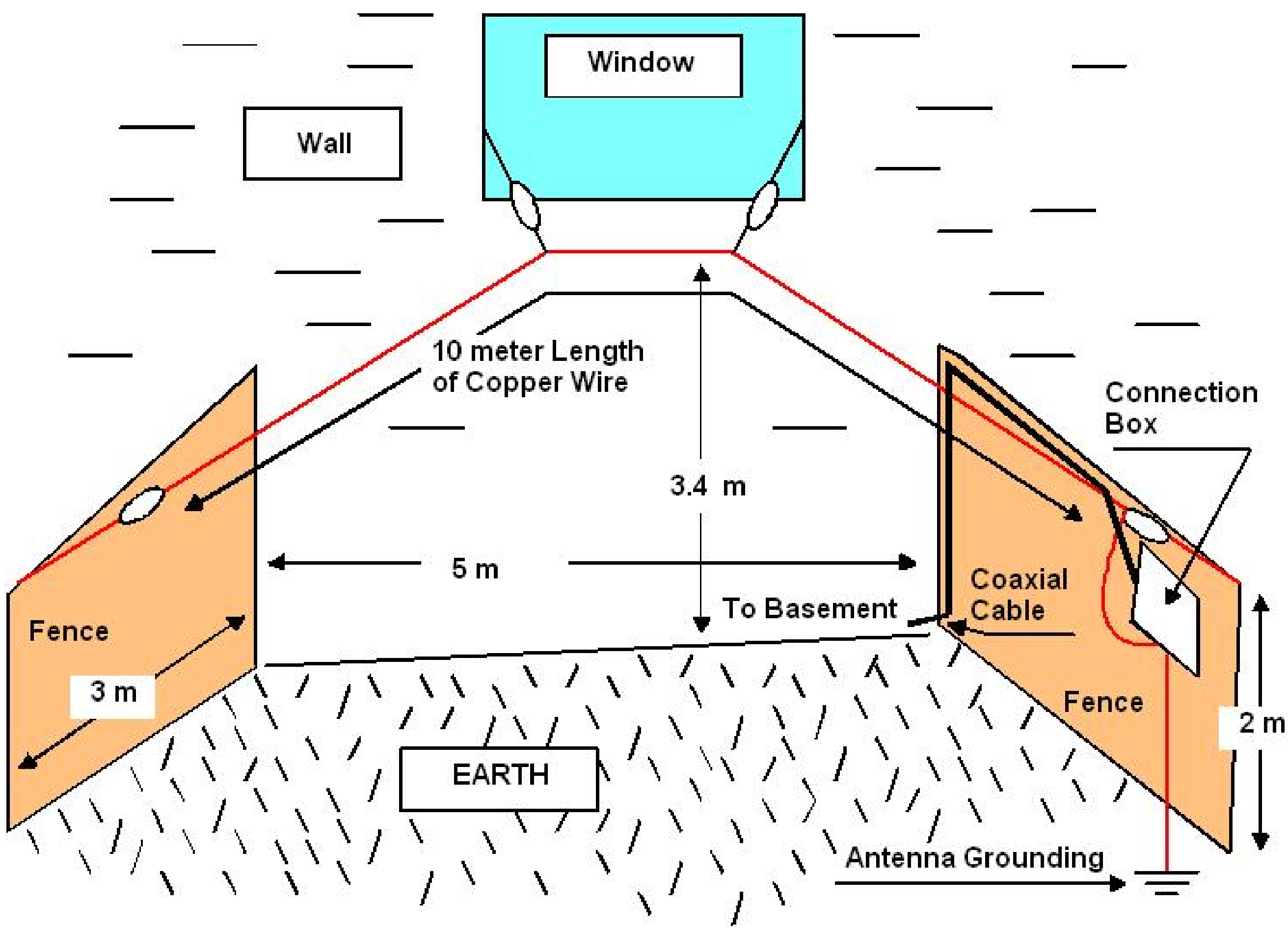


Figure 1 Simple Broadband Antenna for the 40- meter Band

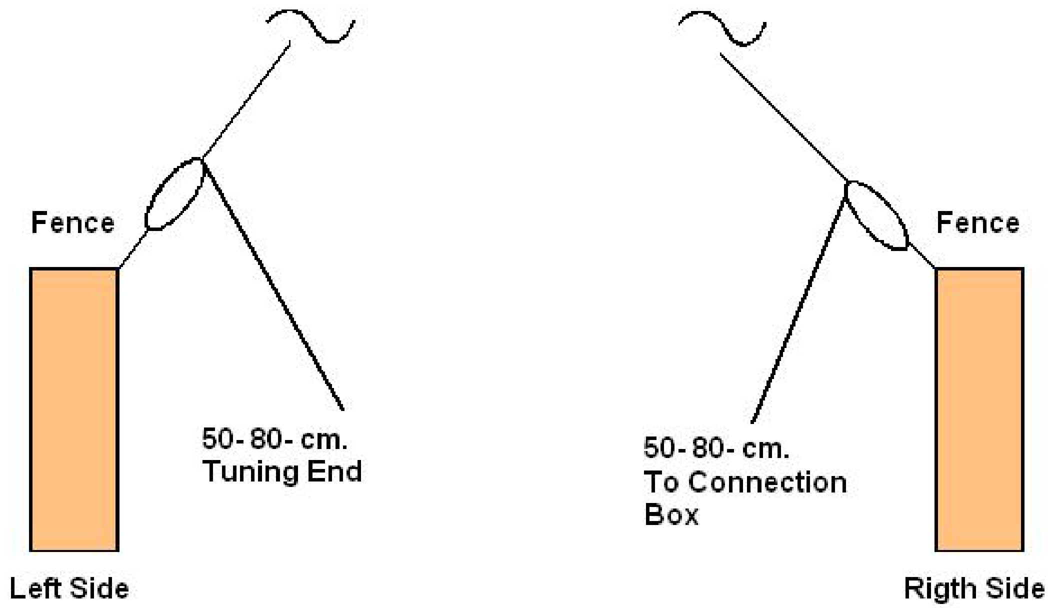


Figure 2 Free Wires at Initial Installation of the Antenna

Fourth wire was dug in the earth at depth near 10 centimeters. The wire was connected to the Artificial Earth of the Helical Antenna (**Reference 1**) that was located at distance 3.5 meter from the Simple Broadband Antenna grounding point. Ends of the counterpoises of the artificial ground were close to the Simple Broadband Antenna grounding point.

The Simple Broadband Antenna was fed by a 50-Ohm coaxial cable. The cable was attached at the upper side of the fence then went down to the ground and lead in to the basement through a ventilation hole. **Figure 3** shows schematic of the antenna.

Picture 1 shows Feed Points of the Simple Broadband Antenna for the 40- meter Band. **Picture 2** shows Center of the Simple Broadband Antenna for the 40- meter Band. **Picture 3** shows Tuning End of the Simple Broadband Antenna for the 40- meter Band. **Picture 4** shows Coaxial Cable going along the Fence. **Picture 5** shows Coaxial Cable going into my Basement.

Take attention, there were three coaxial cables going into the basement. One coaxial cable fed Helical Antenna (**Reference 1**) second coaxial cable fed the Simple Broadband Antenna for the 40- meter Band and the third coaxial cable was used for my experiments with antennas (in time free from experiments a 144/430- MHz vertical antenna was connected to the cable).

Picture 1 Feed Points of the Simple Broadband Antenna for the 40- meter Band

Picture 2 Center of the Simple Broadband Antenna for the 40- meter Band

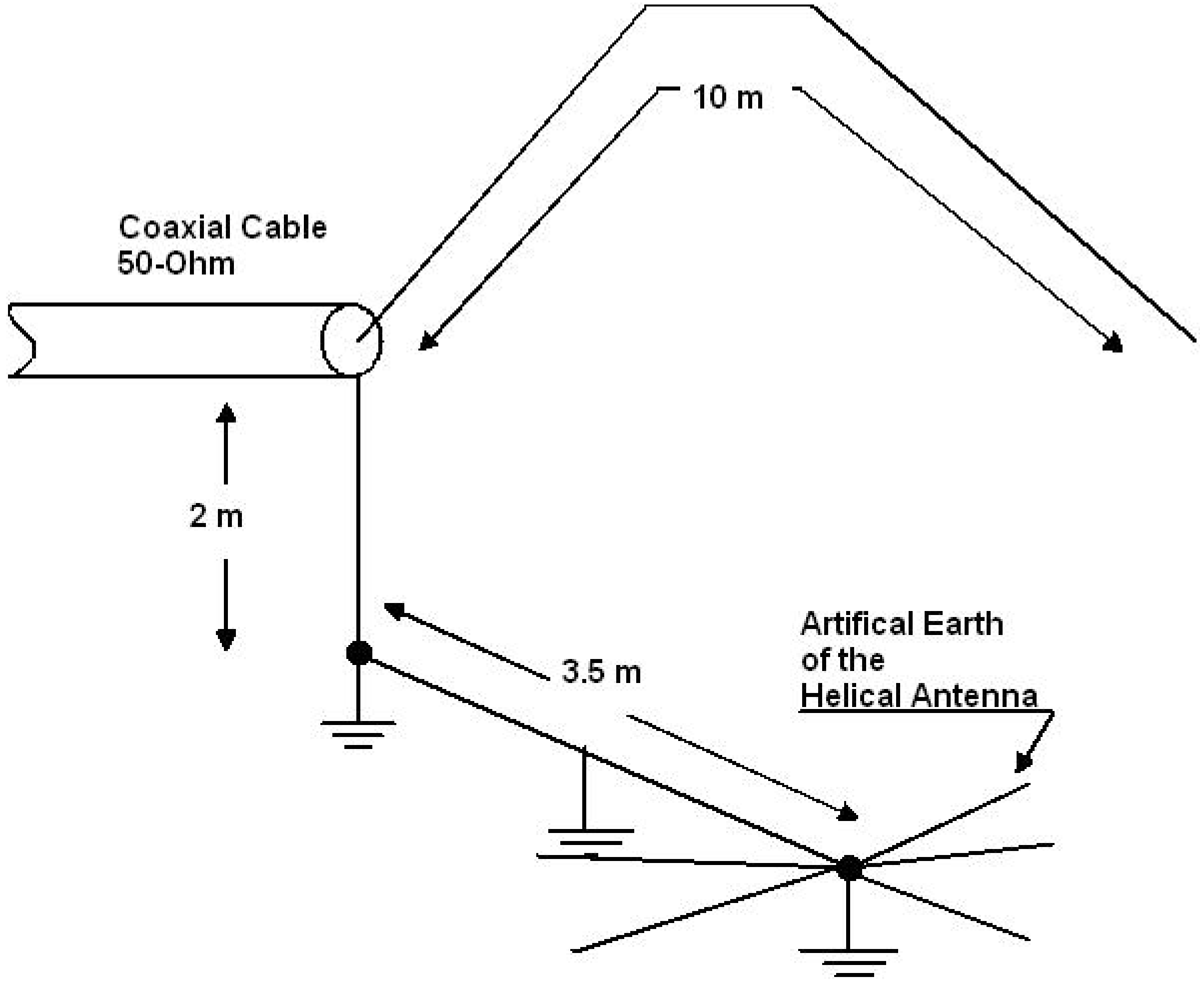


Figure 3 Schematic of the Simple Broadband Antenna for the 40- meter Band

Picture 3 Tuning End of the Simple Broadband Antenna for the 40- meter Band

Picture 4 Coaxial Cable Going Along the Fence

A connection box was installed at the feed points of the antenna. **Figure 4** shows drawing of the box. This box was made on the base of a plastic food container. An RF socket SO-239 was installed at the side of the box.

Feeding coaxial cable was connected to the socket. Arrestor resistor 4k7/5-W was soldered to the bridge to the socket.

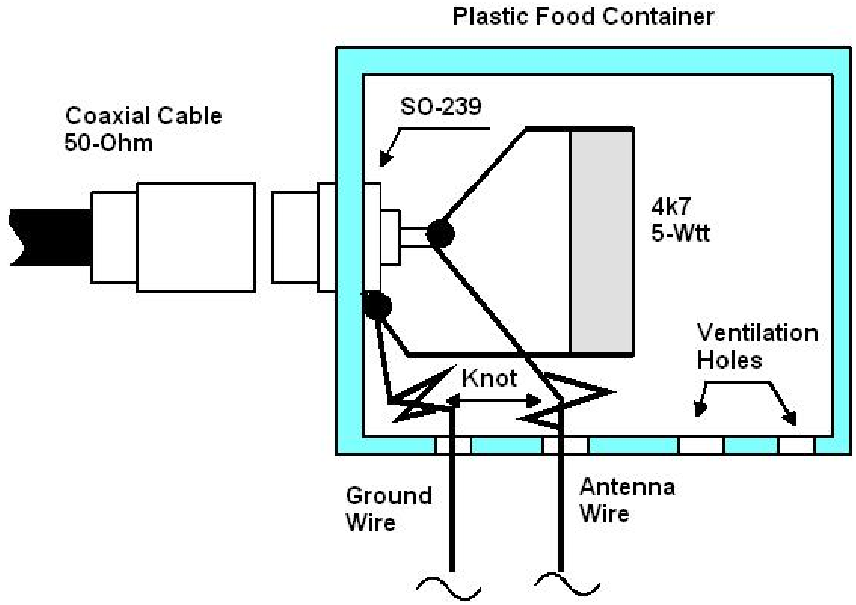


Figure 4 Connection Box

The resistor removed the static from the antenna wire to the ground. Antenna and ground wire went into the box from the down side. The wires had knots on it inside of the box. The knots did not allow the wires go off the box. Two ventilation holes (for removing condensed water) were drilled at the down side of the box.

Connection Box was placed on the fence at South – East side. So the most part of the day the box was shined by the Sun. At the autumn I discovered that tags at the cover had cracks at the bending. The tags went away from the cover when this one was opened. **Picture 6** shows the cover with cracked retaining tags. Take attention that one retaining tag had cutoff (the cutoff is near antenna socket). It was happened in 1.5 years from the antenna installation. However I had a spare cover to fix the box.

Picture 6 Cover with Cracked Retaining Tags

Picture 5 Coaxial Cable Going Into my Basement

Tuning the antenna to resonance is a simple matter. Connect an antenna analyzer (I use to a MFJ- 259B) directly to the antenna terminals. Ground of the coaxial cable should be connected with antenna and coaxial cable should be installed at the fence and inside the ventilation. It is possible to tune the antenna connected the antenna analyzer to the end of the coaxial cable at the shack. Then you need to find the resonance frequency of the antenna. The frequency should be lower the 7.0-MHz. After that do shortening of the antenna wire from the left side. I do not recommend cut the wire, just fold it like it is shown at **Figure 5**.

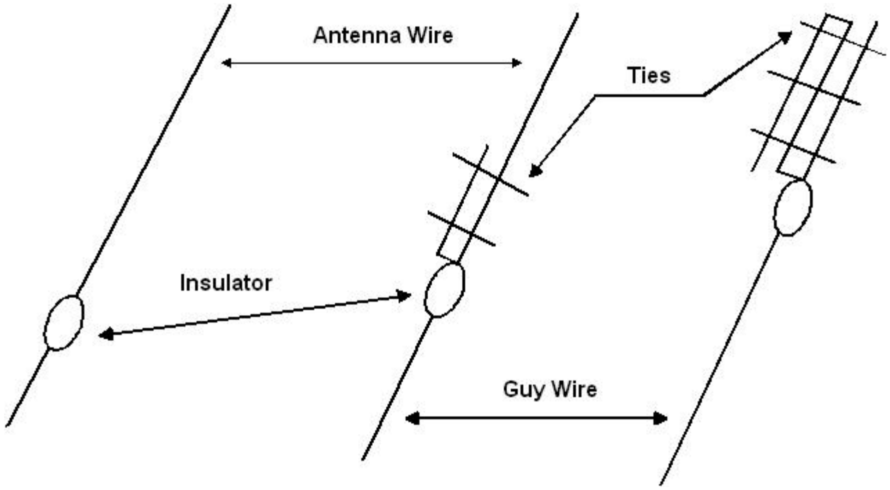


Figure 5 Folding Antenna Wire

I got antenna impedance 75- Ohm (at almost zero reactance) at 7.0- 7.350- kHz. The data is good matched with data obtained from Antenna Simulator EZNEC for MMANA (with some earth settings and assumptions). The antenna was simulated by me with this software.

Of course I would like get 50- Ohm… I simulated the antenna for 50- Ohm. But sometimes theory and practice does not matched together. The data shows that my antenna ground is far away from the perfect for the antenna. In spite of the antenna impedance is not strictly 50- Ohm at the 40- meter Band the antenna was matched well with my IC- 718 and K-1 without any ATU.

At the 30- 10- meter Bands the antenna could match with transceiver with the help of MFJ VERSA TUNER II or LDG Z- 11 PRO. It is possible to install a simple ATU inside the connection box to get SWR 1.0:1.0 at the 40- meter Band or find proper length from the grounding to the feed points or use gamma... However the 30- 10- meter band would be suffered at this case. TV- 75- Ohm coaxial cable may be used to feed the antenna. It is possible to buy very cheap such TV cable (ever intended for underground installation) on E-Bay.

Antenna impedance and the resonance frequency of the antenna depend on the ground conditions. At wet ground the resonance goes up and input impedance goes down. At the dry (or frosty) ground the resonance goes down and input impedance goes up. So it is useful take control on the antenna at the season changes. However it is possible to do adjusting of the length of antenna wire for particular weather that means the season changes do not hindered to the antenna work.

Photo 7 Antenna at Winter Time

73/72!
VA3ZNW

Reference

1. http://www.antentop.org/017/va3znw_017.htm

L- Vertical Antenna for nearest objects for the 40- and 20- meter Band

The publication is devoted to the memory UR0GT.

Credit Line: Forum from: www.cqham.ru

By: **Nikolay Kudryavchenko, UR0GT**

One L-Vertical Antenna may works at the two amateur Bands- 40- and 20- meters. The main feature of the antenna is that it may be located at nearest conductive objects- for example the antenna may be placed near water drain. Antenna may be placed at a wall of a house. Inside a house there are always a lot of conductive objects- for example electrical main, refrigerator, metal tubes of house ventilation system and so on.

Parts L1 and L2 of the antenna intended for tuning the antenna into resonance at the 20- meter Band. Length of the parts may be changed at real antenna installation. For the antenna a good ground system is required. However as usual it is not a big problem to make a ground system beside such antenna. For example, the antenna was simulated with two wire counterpoises in 5 meter length placed at height 0.1- meter above the ground. However in the real life those ones may be placed straight away on the ground.

The MMANA model of the L-Vertical Antenna for Nearest Objects for The 40- and 20- meter Bands may be loaded: http: // www.antentop.org/019/ur0gt_L_Vertical_019.htm

Figure 1 Shows design of the L-Vertical Antenna.

Figure 2 Z of the L-Vertical Antenna for the 40- meter Band.

Figure 3 Shows SWR of the L-Vertical Antenna for the 40- meter Band.

Figure 4 Shows DD of the L-Vertical Antenna for the 40- meter Band

Figure 5 Shows Z of the L-Vertical Antenna for the 20- meter Band.

Figure 6 Shows SWR of the L-Vertical Antenna for the 20- meter Band.

Figure 7 Shows DD of the L-Vertical Antenna for the 20- meter Band.

73! de UR0GT

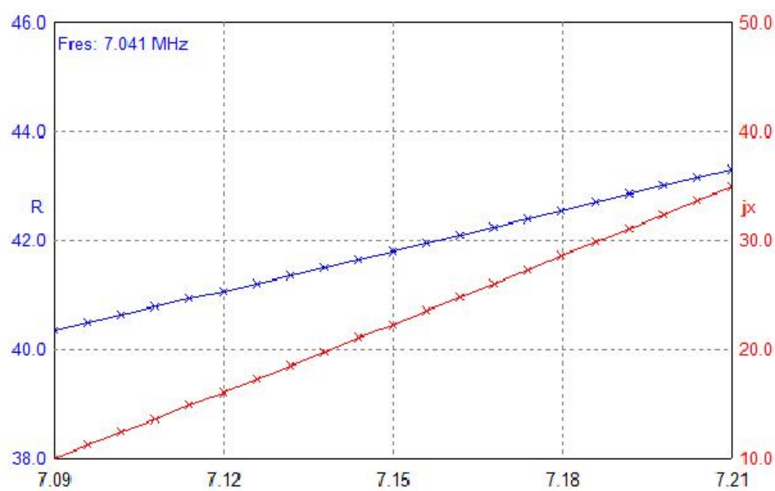


Figure 2 Z of the L-Vertical Antenna for the 40- meter Band

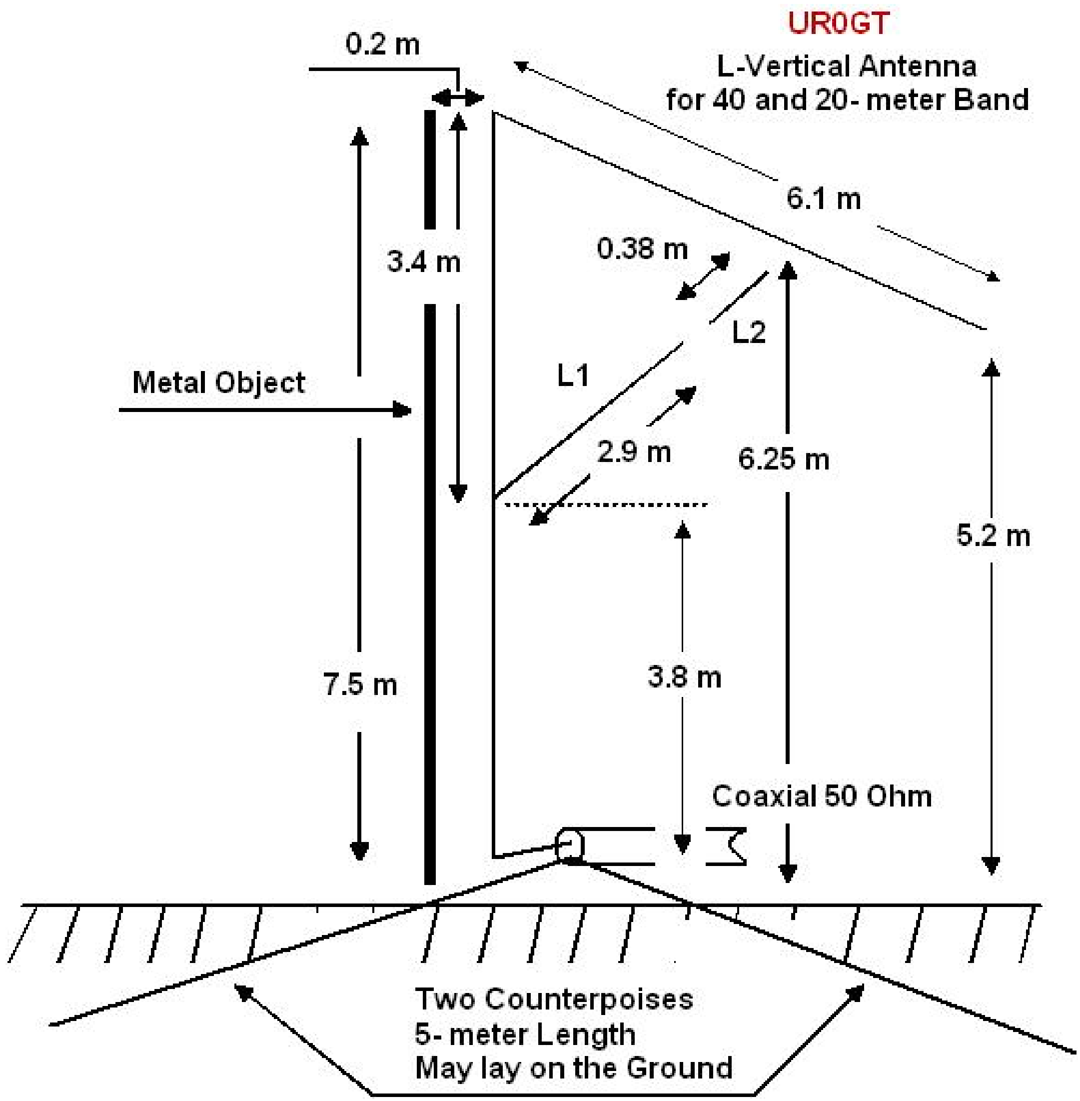


Figure 1 Design of the L-Vertical Antenna

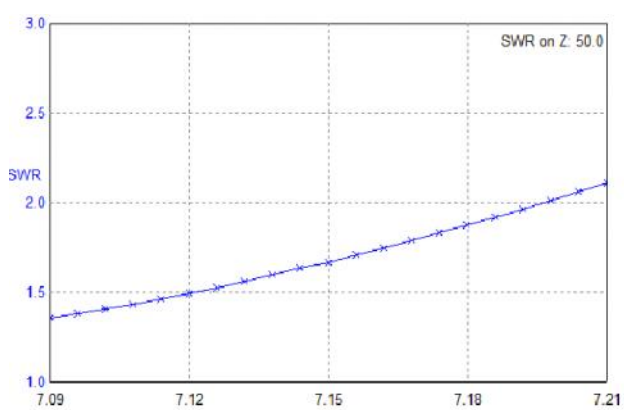


Figure 3 SWR of the L-Vertical Antenna for the 40-meter Band

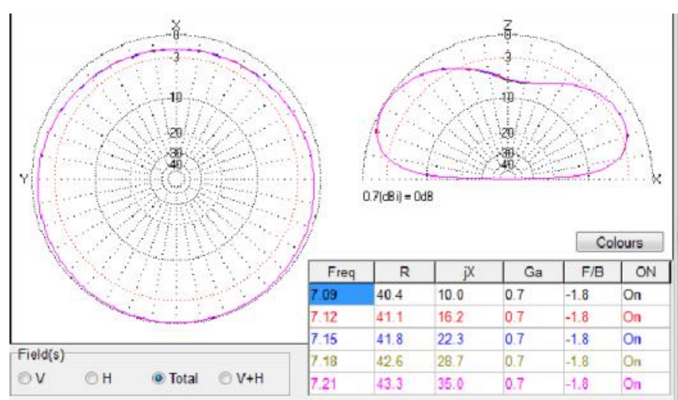


Figure 4 DD of the L-Vertical Antenna for the 40-meter Band

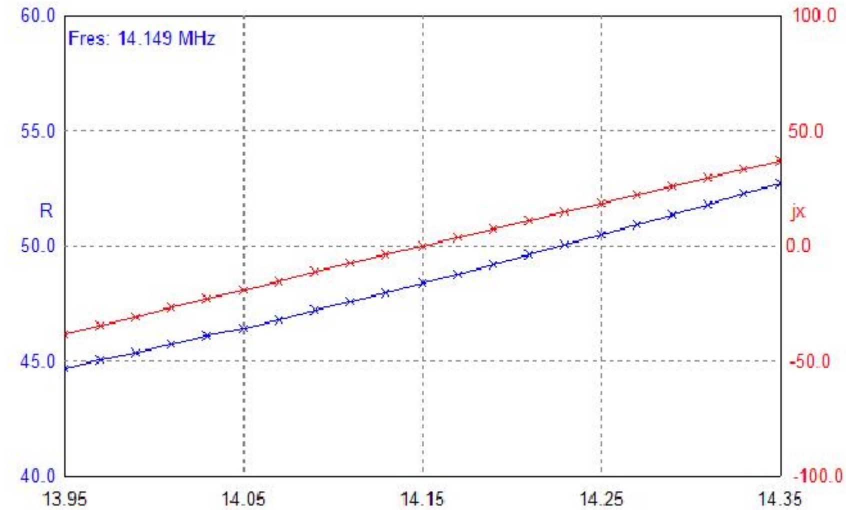


Figure 5 Z of the L-Vertical Antenna for the 20- meter Band

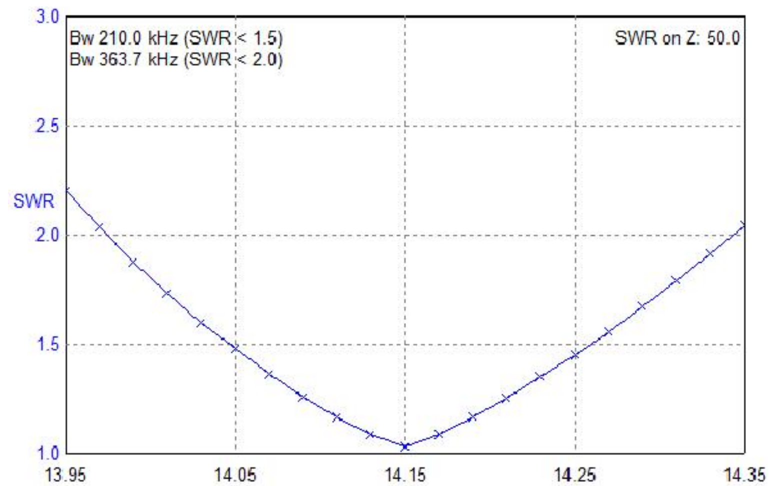


Figure 6 SWR of the L-Vertical Antenna for the 20- meter Band

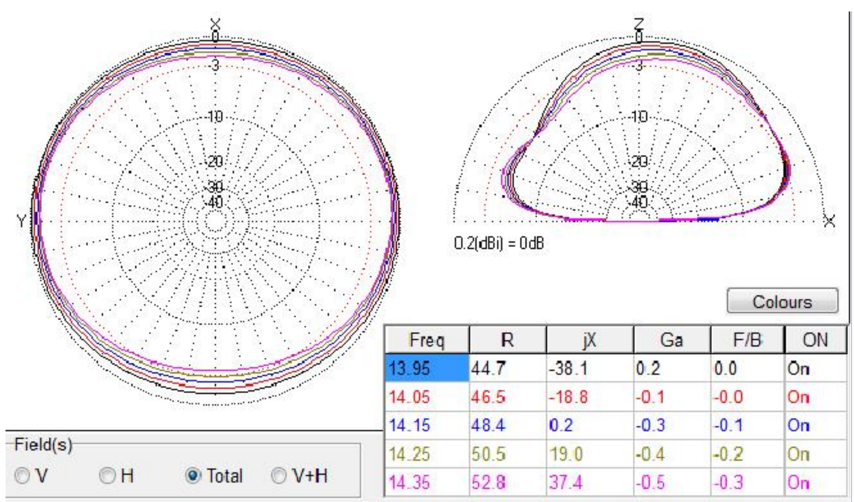


Figure 7 DD of the L-Vertical Antenna for the 20- meter Band

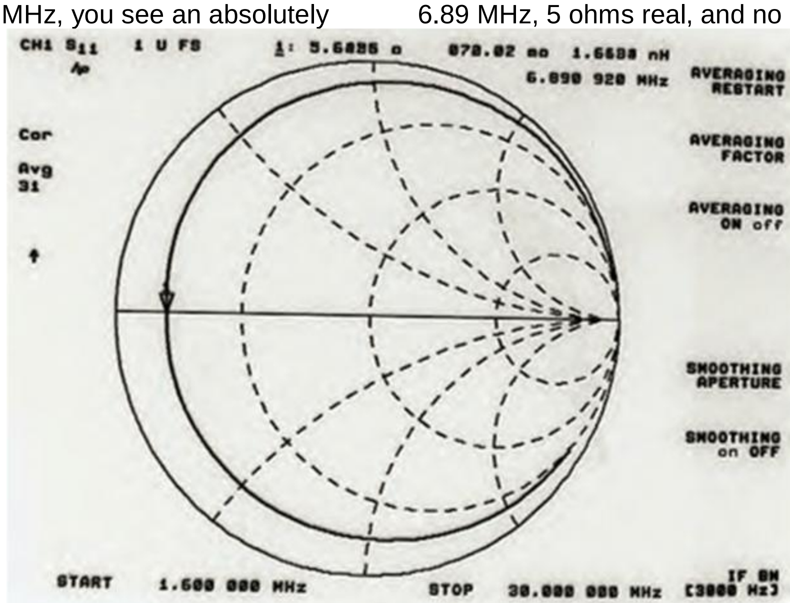
WB4ENE MRA
(Minimal Reactance Antenna)

Ken, WB4ENE, wb4ene@bellsouth.net

I call this antenna the MRA (Minimal Reactance Antenna). It works on 160 through 10 Meters. It is a top-loaded monopole. I don't think there has EVER been a top-loaded monopole as loaded as this MRA. The mast is a 6-inch cylinder, 6-feet long, that is surrounded by a 6-foot diameter octagonal group of panels of aluminum sheet. The metal conductivity is optimum, and every scrap of efficiency is gotten from how it is put together.

Matching will be with a remote-tuned LC network (on order from Bliss in Colorado). At the present, I match it with a standard MJF pi-network tuner in the shack. Yes, a high vswr exists, because the structure behaves like a 7-foot length of 180-ohm air dielectric coax cable (the 6-inch conductor in the 6-foot cylinder). The "trampoline" base is 18 feet in diameter (essentially a 12-foot radial torus, which is connected to the shield side of the feedline). Longer radials are not required.

When you look at the network analyzer plot of the antenna from 1.6 - 30 MHz, you see an absolutely smooth semi-circle plot, with self-resonance at 6.89 MHz, 5 ohms real, and no reactance.



75 feet of coax goes from the antenna to the shack. The coax is laying on the ground. Moving the coax around does not affect the impedance plot on the network analyzer, nor does connecting wires to the antenna tuner ground.
This implies the antenna is not being tuned by nearby conductive objects.

If you would like a sked to hear the antenna, contact me at wb4ene @ bellsouth net (delete spaces, add .) - Ken WB4ENE –

73!

Credit Line:
http://www.smeter.net/wb4ene/mra-antenna.php

Compact Cage Antenna

Vladislav Shcherbakov, RU3ARJ,

Credit Line: www.cqham.ru

Everyone knows “classical” quad antenna. This antenna has perimeter equal to working wavelength. Each side of the quad is equal to 1/4 wavelength.

Gain of the “classical” quad antenna is 3-dBi, input impedance (in a free space) is close to 120-Ohm **(Figure 1)**. Good antenna but the sizes!

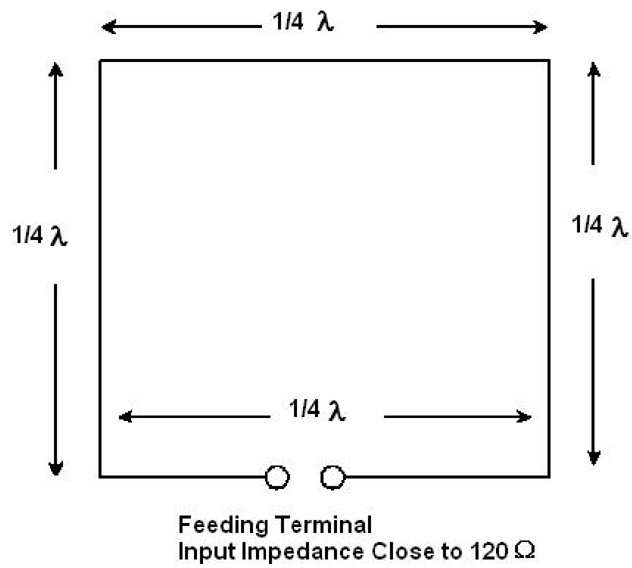


Figure 1 “Classical” Quad Antenna

My idea was to reduce overall space occupied by quad folding the quad wire in a “cage” shape figure. The simplest figure in which the quad may be transformed is a cage consisting of 10 sections in 0.11 wavelength each. I named the animal ***Compact Cage Antenna*** (**CCA**). **Figure 2** shows the picture of CCA grabbed from MMANA. At the **Figure 2** also shown antenna currents and the source - feed points. The antenna is fed to a center of the leg that connected two mini quads together.

MMANA file for the antenna may be found at MMANA “Antenna Library“ (**References 1**) or loaded by the link below the **Reference 1**. Gain of the Compact Cage Antenna is 1.5-dBi. Input impedance of the antenna is close to 50-Ohm. You may find the radiation pattern of Compact Cage Antenna placed at height in 1/3 and 1.0 wavelength above the ground at: http://www.antentop.org/011/cca_011.htm

Compact Cage Antenna may be fed at the low corner as it shown at **Figure 3**. All characteristics of the Corner Fed CCA are almost the same as for CCA shown on **Figure 2**.

MMANA file for the antenna (named Trihat- quad-1) may be found at MMANA “Antenna Library“ (**References 1**) or loaded by the link below the **Reference 1**.

By further modeling of both of these antennas I’ve found that their geometry may be modified for better matching with 50-Om coaxial cable. It could be done by bend the upper quad by 45-degrees upward (**Figure 4**). Another way do good matching is change the shape of the upper quad to a triangle and bend the sharp corner as it is shown on **Figure 5**.

Here are some notes for those who would like design own CCA: for example, sides of the CCA for the 10-meters are near 1 meter in length. So, the antenna may be made from a copper or aluminum tube 5-10-millimeters in diameter to be rigid design. For lower bands you may use a copper wire in diameter of 1-3 mm, stretched by some dielectric frame. For UHF-VHF bands the antenna may be made of any strong wire that could keep the shape.

Compact Cage Antenna

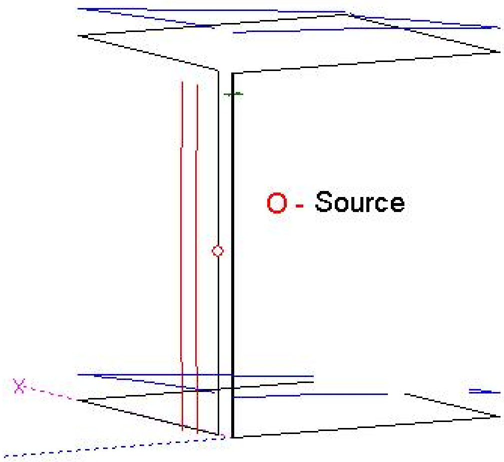


Figure 2
Compact Cage Antenna

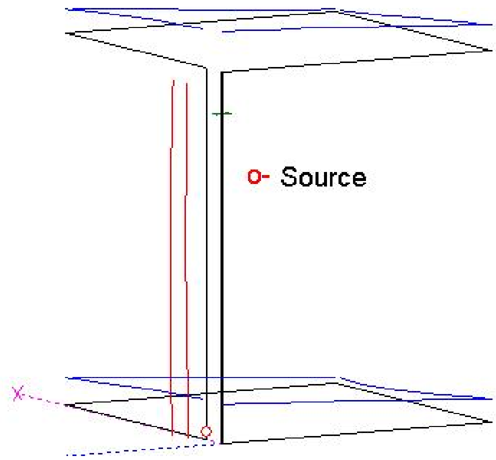


Figure 3
Compact Cage Antenna with Corner Feeding

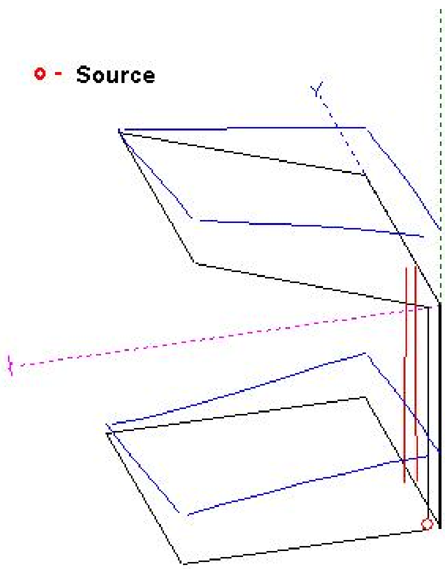


Figure 4
Compact Cage Antenna with Bended Upper Quad

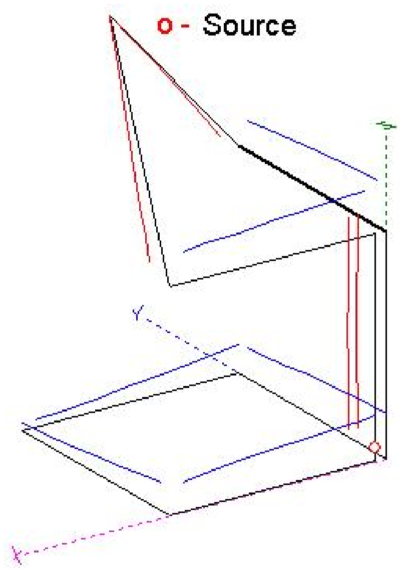


Figure 5
Compact Cage Antenna with Upper Quad Turning to Triangle and Bended Up

Some advantages of the CCA:

1. Tiny, toy-like sizes.
2. Bandwidth similar to usual full sized loop.
3. Gain is close to dipole's gain.
4. All-directional radiation pattern in the horizontal plane.
5. Low elevation angle in vertical plane.
6. Low noise.
7. Good match with 50-Ohm coaxial.

It could be very interesting to design a phase antenna arrays either with passive or active feeding using several CCA's.

However, I leave this for the readers.

73! de RU3ARJ

References 1: www.dl2kq.de

Files MMANA:

http://www.antentop.org/011/cca_011.htm

Conclusion

So, Chapter 5 ***"Antennas for Limited Space"*** is ended. You have got enough some information that helps you install your own antenna at a small backyard.

However, each shack has the own location with own characteristics… So it should be creative approach for antenna installation. And do not afraid do experimenters with antennas that could fit to you needs. May be a new type of antenna would be invented at this experiments.

73!
Igor, VA3ZNW

References:

Dipole Antennas

1. Simple Folded Dipole Antenna for the 20- meter Band: http://www.antentop.org/018/ua4haz_018.htm
2. Old CDs in Antenna for 10 meter Band: http://www.antentop.org/008/cda008.htm

L- Antennas

1. Simple Broadband Antenna for the 40- meter Band: http://www.antentop.org/018/simple_40m_antenna_018.htm

2. L-Vertical Antenna for Nearest Objects for The 40- and 20- meter Bands: http://www.antentop.org/019/L-Vertical%20Antenna%20for%20Nearest%20Objects_019.htm

Unusual Antennas

1. WB4ENE Minimal Reactance Antenna: http://www.antentop.org/007/wb4ene007.htm

2. Compact Cage Antenna: http://www.antentop.org/011/cca_011.htm

Simple Broadband Antenna for the 40- meter Band

CHAPTER 6

Antennas for Limited Open Space

Antennas for Limited Open Space… The antennas may be installed at backyard that is not like a cigar box… So the backyard has some reasonable sizes. Chapters 2, 3, 4 and 5 already gave you information about small sized antennas. Now you may expand you horizon. Antennas for limited Open Space installed at some distance from human are safety antennas compare to those ones that installed straight away at the shack.

Chapter 6 described lots practical designs of such antennas. Those antennas were built and tried by hams. As well the chapters described some theoretical designs of the Antennas for Limited Open Space. As I know most of the theoretical antennas already are practically build and operate in the Air

Antennas for Limited Open Space required some experience and some equipment for tuning and adjusting. SWR- Meter or (that is better) Antenna Analyzer (MFJ- 259B or similar one) may be needed. As well some experience in antenna tuning and design of external antennas would a big plus. However you may get some valuable experience when tuning and installation of those antennas ever you newer did it.

Of course the Antennas for Limited Open Space are not perfect for operation in the Air. It is not Big Gun antennas. However the antennas allow you to be in the Air and ever be great at some contests. Try the antennas and modify according to your location.

Simple All- Band HF- Antenna

By: Eugene Erohov (US4EM), Nikopol, Ukraine

Credit Line: www.cqham.ru

Every ham living in a location with restricted conditions for antenna installation has a dream to have a small invisible antenna for all bands. I have tried to turn the dream in reality. My antenna may be installed almost invisible for other eyes and the antenna working at all HF- Bands. **Figure 1** shows the design of this antenna.

The antenna is something middle between T2FD and loaded Loop. It is possible to find lots about the kind of those antennas in the internet. The Loop had perimeter in 24 meters. It made of wire in diameter 1-mm (18-AWG). Top of the loop was fixed at the end of a fishing rod in 8- meter length. Down side of the loop was at 1.5-meters above the ground. Loop was terminated to resistor 450- Ohm/32 W. This one was combined from 16 x 7.2- k/2- W non inductive resistors connected to bridge. Transformer 1:9 was made accordingly to recommendation of G5IJ (**References 1 and 2**).

The antenna had SWR between 1.2:1 and 2.0:1 at the frequencies from 1.8- 50- MHz. It allows use the antenna without tuner with my transceiver ICOM-756 at full power in 100- W. SWR of the antenna with internal tuner was 1:1 from 1.8- 50- MHz.

The practice using the antenna has confirmed the theory: Loaded Loop Antenna has good efficiency only if the antenna had perimeter more the used wavelength. So, the Loaded Loop Antenna could work at 10- 50- MHz with good efficiency.

This antenna has gain – 12 dBi at 7-MHz, - 20 dBi at 3.5- MHz and – 40 dBi at 1.8-MHz. At those bands the antenna is good enough only for local QSOs.

However the Loaded Loop Antenna very good works for receiving. For example with the antenna transceiver ICOM-756 had noise near 1 point on the S- scale. When two internal preamplifiers were switched on the transceiver had noise near 2- 3 points on the S- scale with clear reception of the hams' stations.

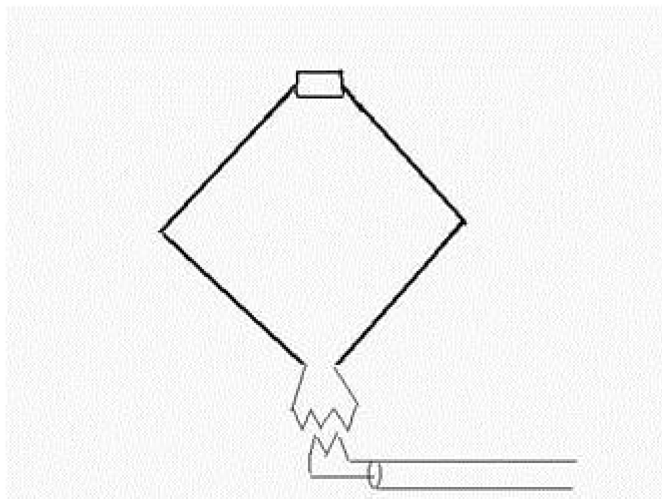


Figure 1 Design of the Simple All-Band HF- Antenna

Conclusion: The antenna could be used for receiving at 1.8- 7- MHz and for receiving/transmitting at 10- 50- MHz. Antenna with perimeter of 30- 40 meters could be used for receiving/transmitting at all amateurs HF- Bands.

For the termination load of the antenna it is possible to use usual Dummy Load on 50-Ohm (that is not hard to find) that is connected to the antenna through RF- transformer 9:1. The RF transformer may stand RF power twice less the feeding transformer.

Reference 1: http://www.qsl.net/gw6hmj/antenna.htm

Reference 2: http://www.gairney.plus.com/Radio/G5IJ_aerial.htm

More about loaded Loop Antenna:
1: Antennas for Radio Amateurs: by Igor Grigorov, RK3ZK: http://www.antentop.org/library/shelf_hamant.htm

73! de US4EM

Circle Antenna

By Simuhin Aleksandr, RA3ARN

How was it happened that I did the antenna? Propagation on the 10 meters pushed me to do the antenna. Propagation was coming, but I had not any antenna at my cottage. I really needed an antenna. I have red at some Antenna Books that antenna having shape like a circle should have good characteristics. So, I decided to do a “Circle Antenna” and went to a local “Home - Repair Store” for stuff for the antenna

RA3ARN

I have found what I was looking for. I bought cheapest plastic tube for cold water, however, inside the plastic it was a metal tube in thick near 0.6 mm. I have bought 11 meters for only 7 USD.

Installation of the antenna was a very simple matter. I did the tube straight, in the center of the tube I did a hole, with help of a screw I attached the tube to the highest point of my wooden cottage.

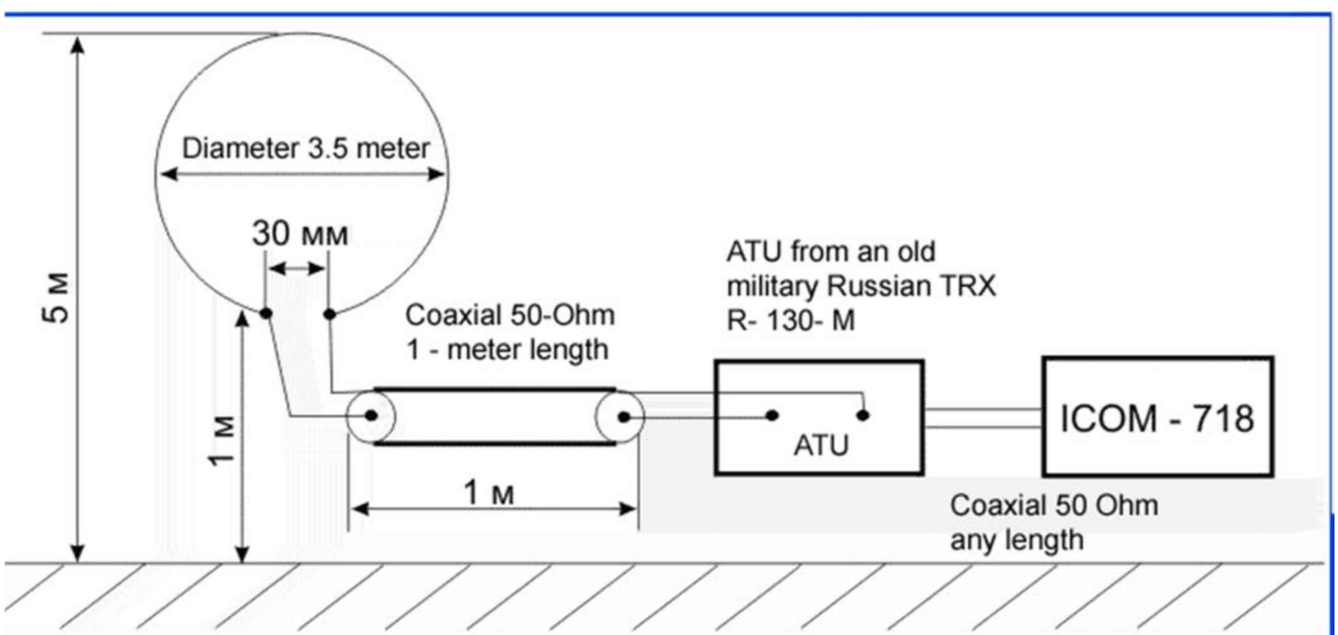
Then I shaped the tube in a circle, did several holes on the tube, with help screws did fastened the tube to the wooden wall of my cottage. That is all! Antenna is ready.

An one- meter length of a 50- Ohms Coaxial Cable was attached between the antenna and ATU. This ATU was from an old military Russian radio R- 130M. With help of the ATU I managed to get the SWR 1:1 at all amateur HF- bands, from 160 to 10 meters.

Lots interesting DX QSOs were made on the upper HF bands with the antenna. I was surprised how the antenna was working on the 160 meters. I had QSOs with almost all former regions of the USSR at the 160 meters.

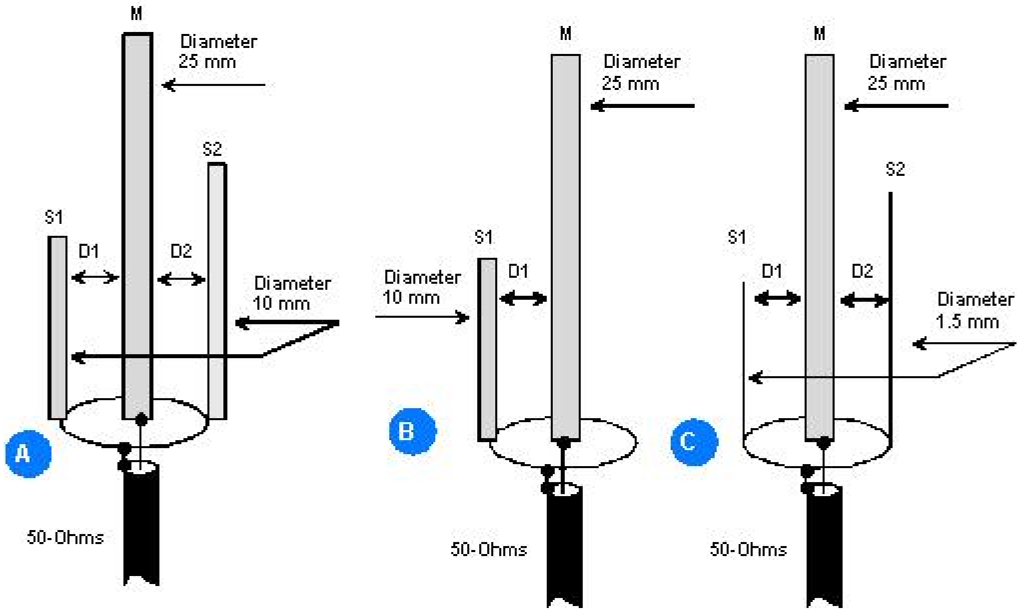
Of course, the antenna is not perfect but it allowed me work well from my country cottage and I had lots fun.

73 and DX! de RA3ARN



PRACTICAL DESIGN OF OPEN - SLEEVE ANTENNAS FOR UPPER AMATEUR HF - RANGES

By Dmitry Fedorov, UA3AVR



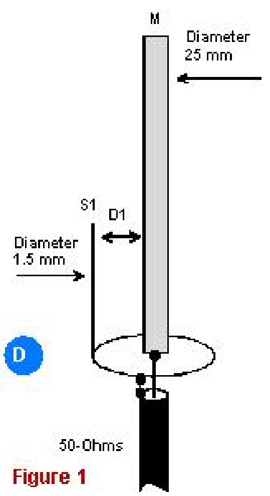


Figure 1

Open Sleeve antennas presented at this article were designed by UA3AVR (Reference: Dmitry Fedorov (UA3AVR): Multi- Bands Vertical Open Sleeve Antennas- Radiomir. HF and VHF, #8 2001, pp.: 34-36). **Figure 1** shows the design of the antennas. **Table 1** shows data for the Open Sleeve Antennas.

73! de UA3AVR

Band, m	Length M, mm	Length S1, mm	Distance D1, mm	Length S2, mm	Distance D2, mm	**Figure 1**
20; 14; 10	5168	3407	220	2573	200	A
14; 10	3630	2527	220	-	-	B
20; 14; 10	5149	3451	220	2601	200	C
14; 10	3432	2567	210	-	-	D

The publication is devoted to the memory UR0GT.

Two Vertical Antennas for 20-, 15- and 10- meter Bands

***Credit Line: Forum from:* www.cqham.ru**

By: **Nikolay Kudryavchenko, UR0GT**

Below described two vertical antennas that could work without any ATU at the 20-, 15 and 10- meter Bands. The antennas easy to made and easy to tune to the bands.

Figure 1 shows Triangle Vertical Antenna. **Figure 2** shows the antenna in 3d projection.

The MMANA model of the Triangle Vertical Antenna for 20, 15 and 10- meter Bands and Vertical Antenna with Inductor for 20, 15 and 10- meter Bands may be loaded: http: // www.antentop.org/019/two_verticals_ur0gt_019.htm

Figure 3 shows Vertical Antenna with Inductor. **Figure 4** shows the antenna in 3d projection. The inductor should have inductance in 10- microHenry. Mutual capacitance of the inductor should be not more the 1- pF. For example it is possible to use inductor having 15 turns coiled by wire in 1-mm dia (19- AWG) on form with OD 4.8- cm, gap between turns is 1- mm.

Chart of SWR, Z, DD of the Triangle Vertical Antenna at 20-, 15-, and 10 meter Bands simulated by MMANA may be found at: http: // www.antentop.org/019/two_verticals_ur0gt_019.htm
Antenna model was simulated at height 3- meter above the ground.

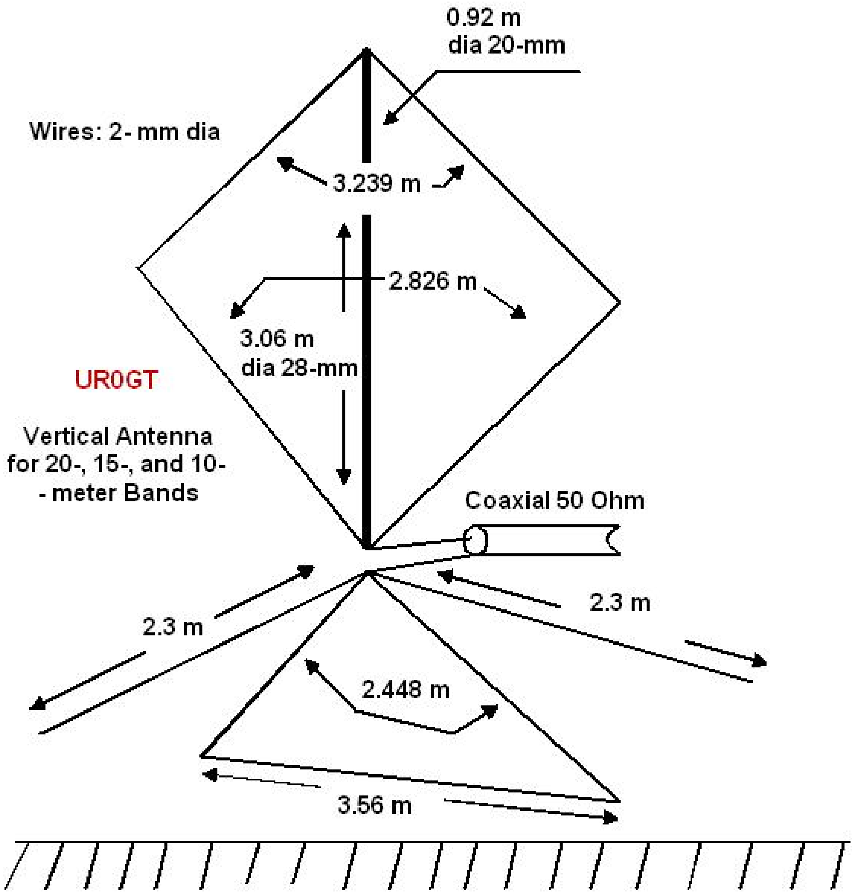


Figure 1 Triangle Vertical Antenna for 40, 20 and 10- meter Bands

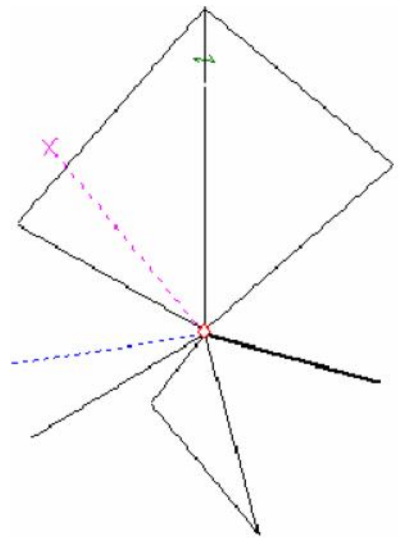


Figure 2 Triangle Vertical Antenna for 40, 20 and 10-meter Bands antenna in 3d projection

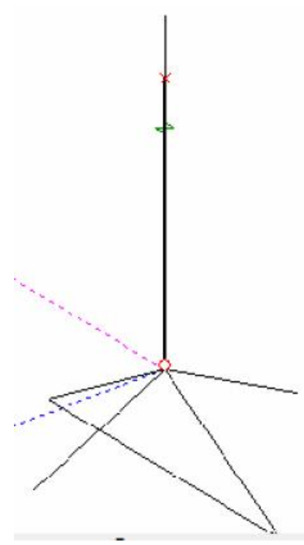


Figure 4 Vertical Antenna with Inductor for 40, 20 and 10- meter Bands antenna in 3d projection

Chart of SWR, Z, DD of the Vertical Antenna with Inductor at 20-, 15-, and 10 meter Bands simulated by MMANA may be found at: http: //
www.antentop.org/019/two_verticals_ur0gt_019.htm
Antenna model was simulated at height 3- meter above the ground.

73! de UR0GT

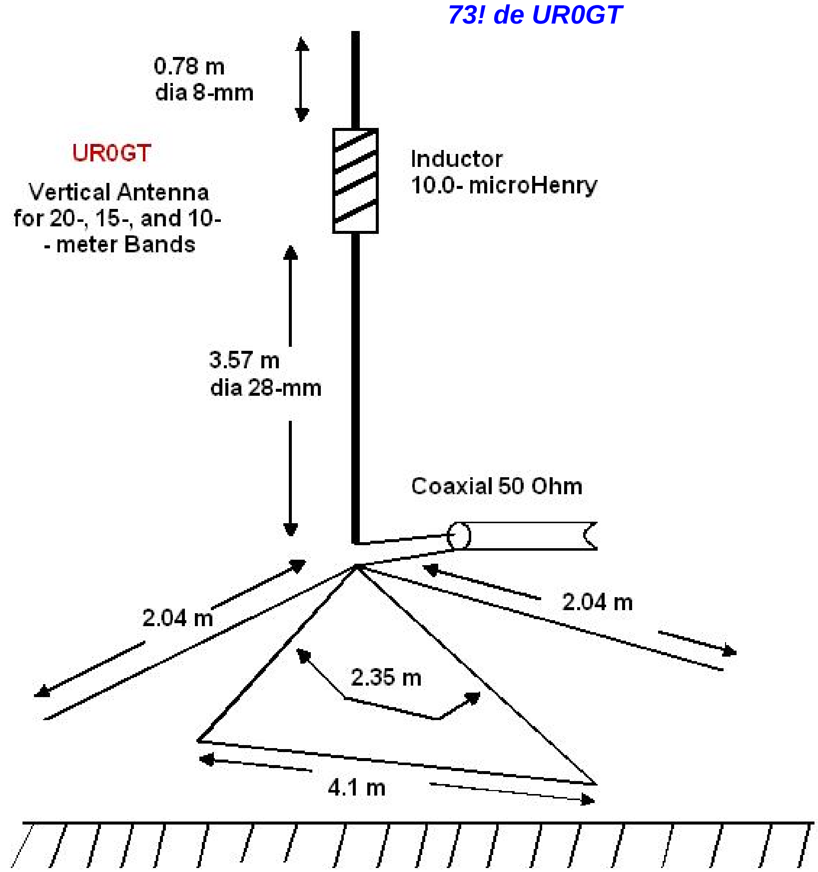


Figure 3 Vertical Antenna with Inductor for 40, 20 and 10- meter Bands antenna

Vertical Antenna for the 20-, 15-, 10-m Bands. (Antenna UW4HW)

Yuri Matiychenko, UW4HW

Credit Line: Radio # 12, 1968, p.: 21.

A Classical Vertical Antenna (aka ***Ground Plane Antenna***) without additional tuning works satisfactory only at one amateur band. However, so called “thick” antennas (looks like three-dimensional geometrical figure) could work with good SWR in the frequencies range F1/F2= 3, where, F1- high working frequency, F2- lower working frequency. Common use of those ones is a Conical Antenna (**Figure 1**) and Exponential Antenna (**Figure 2**).

For Conical Antenna the pass- band is increased with the increasing of the Alfa at the antenna base. Antenna has optimum parameters at Alfa = 60… 70- degree. At the Alfa = 60… 70- degree the Conical Antenna has impedance near 70- 80- Ohm. The same thing is for Exponential Antenna. However, the maximum diameter of the Exponential Antenna is almost in three times less compared to the Conical Antenna.

As usual the antennas shown on **Figure 1** and **Figure 2** made from wires or tubes to simulate the Conical or Exponential shape.

Radio # 12, 1968. Cover.

КВ и УКВ

МНОГОДИАПАЗОННАЯ ВЕРТИКАЛЬНАЯ АНТЕННА

Vertical Antenna for the 20-, 15-, 10- meter Bands (Antenna UW4HW)

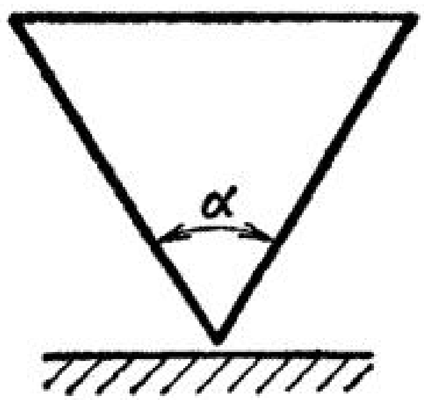


Figure 1 Conical Antenna

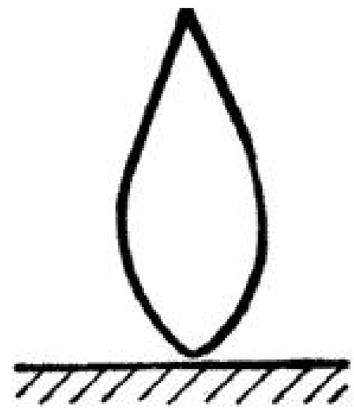


Figure 2 Exponential Antenna

Figure 3 shows Exponential Antenna for the 20-, 15-, and 10- meter Bands.

Antenna is fed by a 75- Ohm coaxial cable. Central core of the cable is connected to the antenna wires. Braid of the coaxial cable is connected to the antenna's ground. It is possible to use a metal roof as an antenna ground. Six wires in length equal to the length of the antenna side may be used as antenna ground. The wires should place perpendicularly to the antenna mast.

Copper wire in diameter of 1.5-mm (AWG 15) was used to make the antenna and the antenna ground. SWR of the antenna was from 1.2:1.0 to 1.9:1.0 at the working bands. It is possible to make the antenna for other ham bands. Length of the antenna wires (from the bottom to top) may be found at the below shown ***Formula*** (it is for Alfa = 60… 70- degree).

$$(0,24-0,28)\,\lambda_{min}$$

The antenna worked very well in the practical operation in the Air.

73! de UW4HW

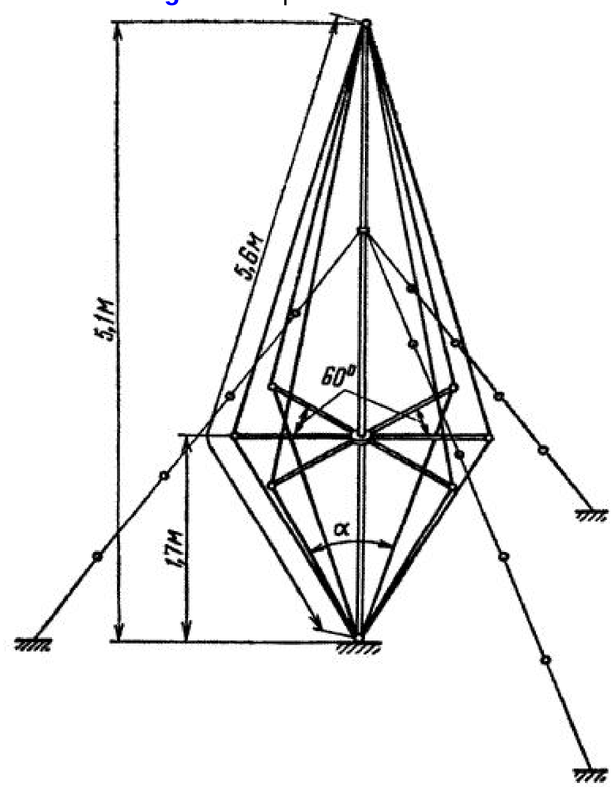


Figure 3 Exponential Antenna for the 20-, 15-, and 10- meter Bands

RA3AAE Antenna for the 10- and 2- meter Band

By Vladimir Polyakov, RA3AAE

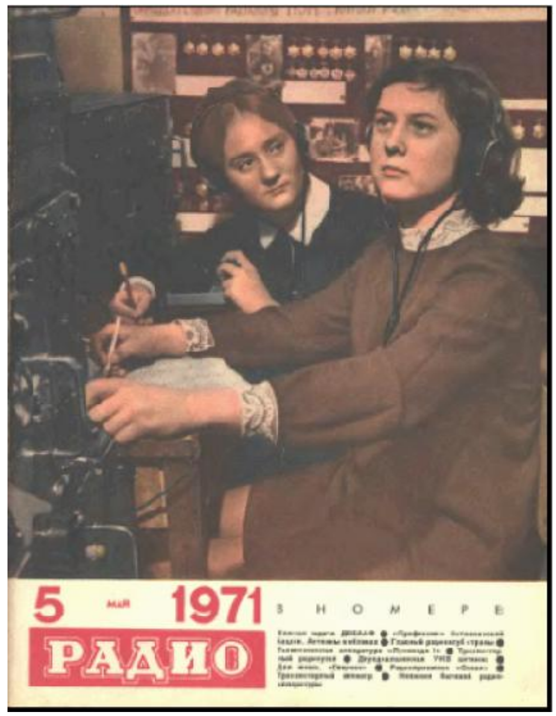
Credit Line: Radio # 5, 1971, p.: 26

The antenna works on the 10- and 2- meter Bands. Antenna does not require any switching in ATU when the band is changed. Antenna radiates radio wave with vertical polarisation. Antenna is fed by 75- Ohm coaxial cable. This cable is very chip compare to 50- Ohm coaxial cable. It is possible to buy 30- meters of good 75- Ohm coaxial cable intended for underground placement for 10… 20 dollars. Practically any transceiver (designed for 50- Ohm antenna) could work with 75- Ohm antenna. **Figure 1** shows design of the antenna.

At the 2- meter Band the radiated part of the antenna is a Vertical Dipole (item 1). Physically the dipole is simulated by two tubes (item 1). Vertical radiator (that serves at the 10- meter Band) (item 2) is going through the upper tube. The vertical is connected with the upper tube at the bottom of the tube. Coaxial cable (item 4) is going through the lower tube. Central core of the coaxial cable is connected to the upper tube. Braid of the coaxial cable is connected to the lower tube. Radials (item 3) for the 10- meter band antenna are connected to the braid of the coaxial cable a little lower of the lower tube. The tube (item 1) is quarter-wave sleeve (serves like an RF choke) for the 2- meter Band. The choke does not allow the leaking of the RF current of the 2- meter Band to the others parts of the antenna.

Hereby the vertical (item 2) and coaxial cable (item 4) going through the vertical and lower tube (item 1) is insulated on RF at the 2- meter Band from the Dipole Vertical antenna (item 1). The Dipole Vertical antenna (item 1) has input impedance close to 75- Ohm at the 2- meter Band.

At the 10- meter Band the antenna is a Vertical antenna with 3 slope downward radials. All parts of the antenna from the top of the vertical (item 2) to the ends of the radials (item 3) are radiated.



Radio # 5, 1971. Front Cover

Vertical antenna with 3 slope downward radials (as it is shown on the **Figure 1**) has input impedance near 40… 60- Ohm when the antenna is fed at the terminals "Vertical- Radials." The input impedance is less the 75- Ohm. To match the antenna input impedance with the 75- Ohm coaxial cable the feeding terminals are risen up. It is going to increasing of the antenna input impedance in proportional with:

$$1/Cos\ \frac{2\pi h}{\lambda}$$

Двухдиапазонная УКВ антенна

Header of the Article

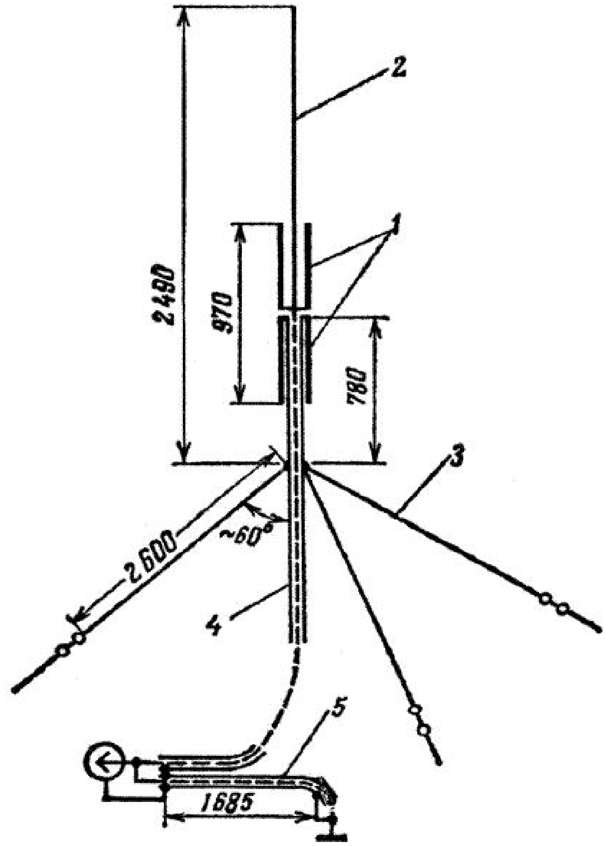


Figure 1 Design of the RA3AAE Antenna for the 10- and 2- meter Band

Where ***h*** is the height from the radials to the feeding terminals. The resonance frequency of the 10- meter Band antenna does not change at the shift of the feeding terminals. Moreover, at the antenna design the shift of the feeding terminals (for the 10- meter Band) allows to place the vertical antenna for the 2- meter band higher on to the antenna design. It has sense at the limited (on to height) installation of the antenna.

Vertical Dipole Antenna for 2- meter band influences to resonance frequency of the 10- meter Band antenna. The influence is lowered the resonance frequency of the antenna. So it is possible compensate the influence by the shortening of the vertical (item 2). This influence may be calculated theoretically but the simple way is practically find it. For the described here antenna it needs to be shortened the vertical on to 100- mm while the antenna would be tuned to the resonance.

Table 1 shows SWR of the RA3AAE Antenna for the 10- and 2- meter Band.

Vertical of the antenna (item 2) made of aluminum wire in diameter of 8- mm (0- AWG). Vertical Dipole Antenna (item 1) made of duralumin tube in diameter of 30- mm (diameter 1-1/2- inch). Antenna radials (item 3) made of antenna wire in diameter 1...2- mm (12- 18 AWG). Vertical (item 2) is fixed on to wooden mast with help of insulators. Each radial (item 3) has two insulators at the end.

The antenna needs lighting protection. Closed Stub (item 5) does this function. The stub has electrical length ¼ lambda at 10- meter Band and 5/4 lambda at 2- meter Band. The stub has high impedance at the bands and this one does not affect to the antenna- feeder system.

Table 1 SWR of the RA3AAE Antenna for the 10- and 2- meter Band

F, MHz	28.0	28.5	29.0	29.5	144.0-146.0
SWR	1.5:1.0	1.3:1.0	1.17:1.0	1.4:1.0	1.2:1.0

Multiband Vertical Stub Antennas

Roman Sergeev (RN9RQ)

Credit Line:
http://www.antentop.org/015/rn9rq_015.htm

Before describing of the antennas I would like to talk why those ones were designed. At fall 2009 the Youth Collective Radio Station RK9QWN had to change room that station occupied inside the building. Old antennas were removed because the roof was repaired. So it needed to install new antennas. The question was- what should be the antennas like?

Once night I was digging up models of antennas bundled with Antenna Simulator MMANA – GAL (may be loaded free, see **Reference 1**) and thinking about antennas for limited space. Among butch of the antennas I found of an interesting antenna for the 20-meter Band (model /ANT/Match/Short-Gamma-dipole.maa from the Antenna Simulator MMANA – GAL).

It is very interesting antenna. In **Reference 2** Igor Goncharenko treats the antenna like a limit case for a shortening dipole with gamma matching (when the gamma matching equal to the length of the shortening antenna). At the other side it is usual stub dipole. For future development of the antenna please take attention that the dimensions of the antenna would be resonance at 10- meter Band. On the base of the two antennas was designed my antenna for two Bands- the 20 and 40- meters. **Figure 1** shows design of the antenna.

MMANA file may be downloaded from:
http://www.antentop.org/015/ ant_1.maa

Adjusting and Matching of the Antenna: Antenna has input impedance 150 Ohm at the 20- meter Band. At the Band antenna is tuned in to resonance by the height. At the 40 meter Band antenna is tuned to resonance by the capacitor C1 (see **Figure 1**). At the 40- meter it is possible to play with input resistance of the antenna by changing distance between the antenna vertical wires. C1 just compensated the antenna reactance. Relay K1 is switched ON/OFF the capacitor that is provided the changing of the antenna Band.

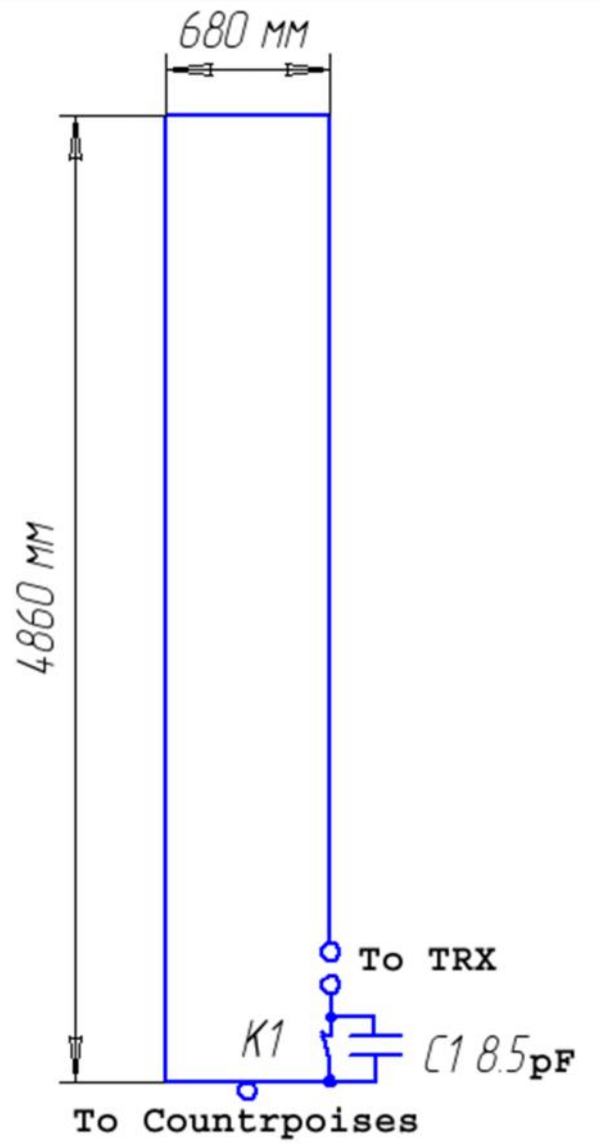


Figure 1 Vertical Stub Antenna for 40 and 20-meter Bands

Disadvantage of the antenna (**Figure 1**) is not smart design. It is needed at least two spacer to build the antenna. So it was created antenna without any spacer. **Figure 2** shows the design of the antenna. Parameters of the antenna (**Figure 2**) are almost equal to the antenna shown on **Figure 1**.
Disadvantage of the antenna (**Figure 2**) is that the base distance is almost twice more longer compare to antenna from **Figure 1**.

MMANA file may be downloaded from:

http://www.antentop.org/015/ ant_2.maa

At the 40- meter Band the antenna has some disadvantages. First, it is a narrow bandwidth. As usual the bandwidth is not more then 60- kHz at SWR 2.0:1. Satisfactory SWR may be reached only at one portion (CW or SSB) of the 40- meter Band. But the disadvantage is common for all types of the shortening antennas. The problem may be solved if it would be used additional relay to switch two matching capacitors- one for CW portion and another one for SSB portion of the 40- meter Band. Next disadvantage (that is also common for shortening antennas) is small gain compare to lambda/4 vertical antenna. However the gain of the antenna would be only less in 2- dB compare to lambda/4 vertical antenna. So what is about a multiband antenna that is in the header? There is still spoken only about two Bands antenna. **Figure 3** corrects the situation.

MMANA file for the multiband antenna may be downloaded from:
http://www.antentop.org/015/ ant_3.maa

The antenna works at 15 and 10- meter as "Open Sleeve" antenna. Such design already was done by me and written off in **Reference 3**. It is possible to add wires for WARC as it was made for 15 and 10- meter Bands. Additional wires between gamma match and antenna wire (it is only for 40- meter Band) provide screening this antenna parts one against another. It allows decrease distance between the parts. So there is needed smaller spacer. By me was used spacer in 450- mm length.

Adjusting and Matching of the Antenna: For tuning the antenna it should be used a SWR- Bridge or usual SWR- Meter.

At the 20- meter Band the antenna is tuned in to resonance by the height. At the 40 meter Band antenna is tuned by several steps.

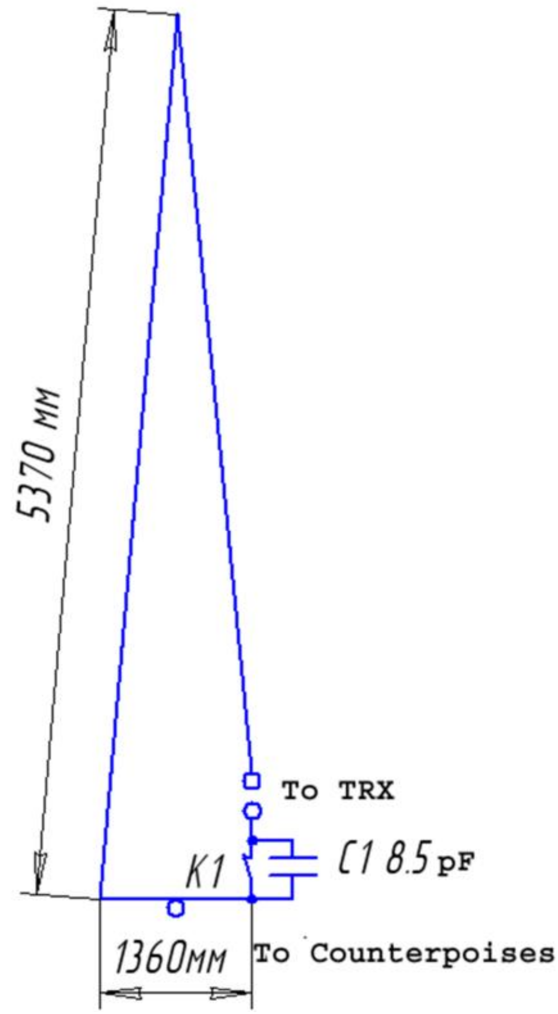


Figure 2 Vertical Stub Antenna for 40 and 20- meter Band without Upper Spacer

At first antenna is tuned by the capacitor C1 (see **Figure 3**). Then antenna is tuned fine by changing width. Then antenna again is tuned by C1 and tuned fine by changing width. It is needed several step to have the antenna tuned. After the antenna is tuned to 20 and 40- meter Band the 15 and 10 meter Band should be adjusted. It should be made just changing length of the proper to the band wire.

Antennas shown on **Figure 1**, **Figure 2** and **Figure 3** were simulated in MMANA in case to be installed those ones close to the ground (or equivalent of the ground- metal or concrete roof). For the installation several (the more the better) non- resonance counterpoises (4- 6 meter length) may be used with the antenna.

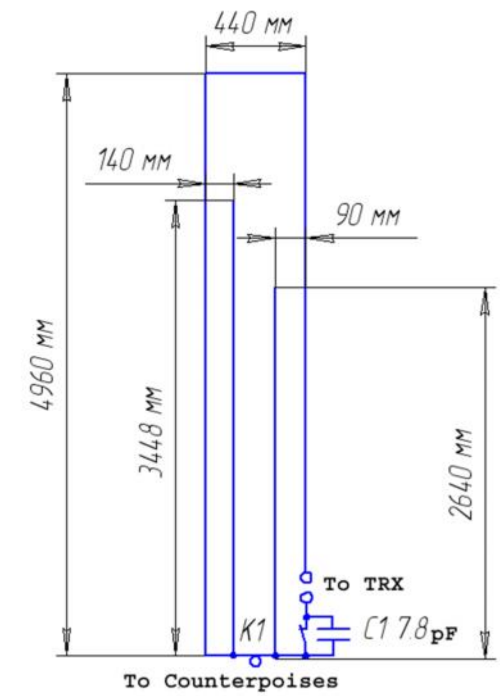


Figure 3 Vertical Stub Antenna for 40, 20, 15 and 10-meter Band

The antennas may be installed at height near one meter above the ground. Resonance counterpoises should be used at this placement.
Dimension of the antennas should be slightly corrected if installation at more the one meter above the ground is planned. **Figure 4** shows antenna from **Figure 1** that is recalculated for free space.

MMANA file may be downloaded from:
http://www.antentop.org/015/ ant_4.maa

Described above antennas may be made from strand copper or aluminum wire in diameter 1.5- 2.0- mm (15-12- AWG).Wire in plastic insulation may be used as well however the antennas size should be decrease approximately on 2.4% because shortening coefficient of the wire.

Below there are several words about feeding of the antennas.

I suggest do matching of the antennas with coaxial cable with help of transformer on ferrite tubes, so called “binocular transformer.” It is possible to find lots stuff about the “binocular transformer.” I suggest **References 4** and **5**.

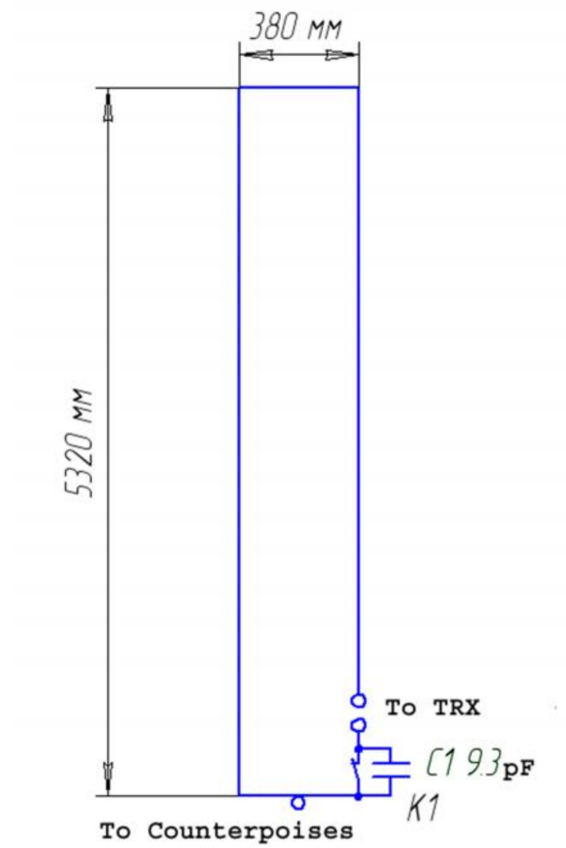


Figure 4 Vertical Stub Antenna for 40 and 20-meter Band calculated for free space

Transformer may be installed straight away at antenna terminals and use coaxial cable to feed the antenna. Antenna may be fed by two wire ladder line and the transformer may be installed at the shack.

References:

1. Antenna Simulator MMANA- GAL (try Google engine for best result)
2. Igor Goncharenko: HF and VHF antennas. Part II. Fundamentals and Practice – Moscow: Radiosoft and Magazine "Radio", 2006.

3. Roman Sergeev: 8- Band Asymmetrical Dipole Antenna –Radio, 2008

4. Semichev B: Ferrite RF transformers –Radio, 2007. # 3, pp.: 68- 69.

5. ***http://cqham.ru/ant78_71.htm***

73! Roman Sergeev (RN9RQ)

Vertical for the 20- meter Band

R9WI ex RA9WFD, Boris Krivosheev

Credit Line: http://www.cqham.ru/ant83_72.htm

The antenna design is based on the known “Bazooka” antenna. Vertical part of the antenna is a one side of the “Bazooka” antenna. Counterpoises are usual for any vertical antenna. I used two counterpoises because it is hard to place more at my 45- degree-slope roof. Vertical part of the antenna made of fiberglass tubes with diameter 14/10x2, 18/14x2, 23/19x2 (O/D/T). All tubes were in 2- meter length. The tubes were sandpapered degreased and coated with primer and enamel paint.

Figure 1 shows this antenna design. **Figure 2** shows design of part 1 from **Figure 1**. **Figure 3** shows design of part 2 from **Figure 3**. **Figure 4** shows design of part 3 from **Figure 1**. **Figure 5** shows way to insert coaxial cable into the tube.

Antenna is tuned to resonance with help of the length of the counterpoises. It needs to use counterpoises with length more the show at **Figure 4**. Then the counterpoises are shortened to the antenna resonance. The ends of counterpoises that connected to feeding coaxial cable are placed at one meter above the metal roof. Another ends of the counterpoises fastened through ceramic nut insulators at the hip of the roof.

My antenna was installed on the roof of the 5- story house that has height at 22 meters. The antenna had almost omnidirectional pattern. **Figure 6** shows data for the antenna. The data were taken off with help Antenna Analyzer AA- 330.Antenna made from different types of coaxial cables (Russian coaxial cables: RK-50- 7- 13, RK- 75- 9- 16, RK75-4-113) was tried and tested in field conditions.

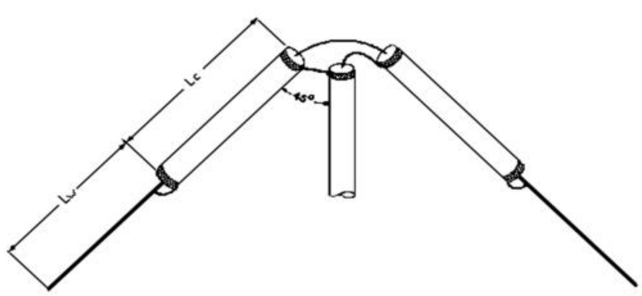
R9WI ex RA9WFD, Boris Krivosheev

There were almost no differences in the antenna operation for all of those antenna designs. However for the real antenna coaxial cable (part 2 of the **Figure 1**) should be chosen regarding the power going to the antenna. Antenna was fed through 50-Ohm coaxial cable with the length (it is noncritical) of 28- meter.

The antenna was tuned to resonance at the 20-meter band. However my ICOM-746PRO with help of the internal ATU could match the antenna on the upper HF- Bands (off course, with some losses!) from the 20 to 10 meter. With the antenna I had QSOs with Japan (6500- km) at 17 and 15 – meters.

Antenna may be used in field operation when instead rigid tubes a plastic fishing rod would be used.

73! RA9WFD



Classical Antenna Bazooka. I.V.
Picture from the Internet

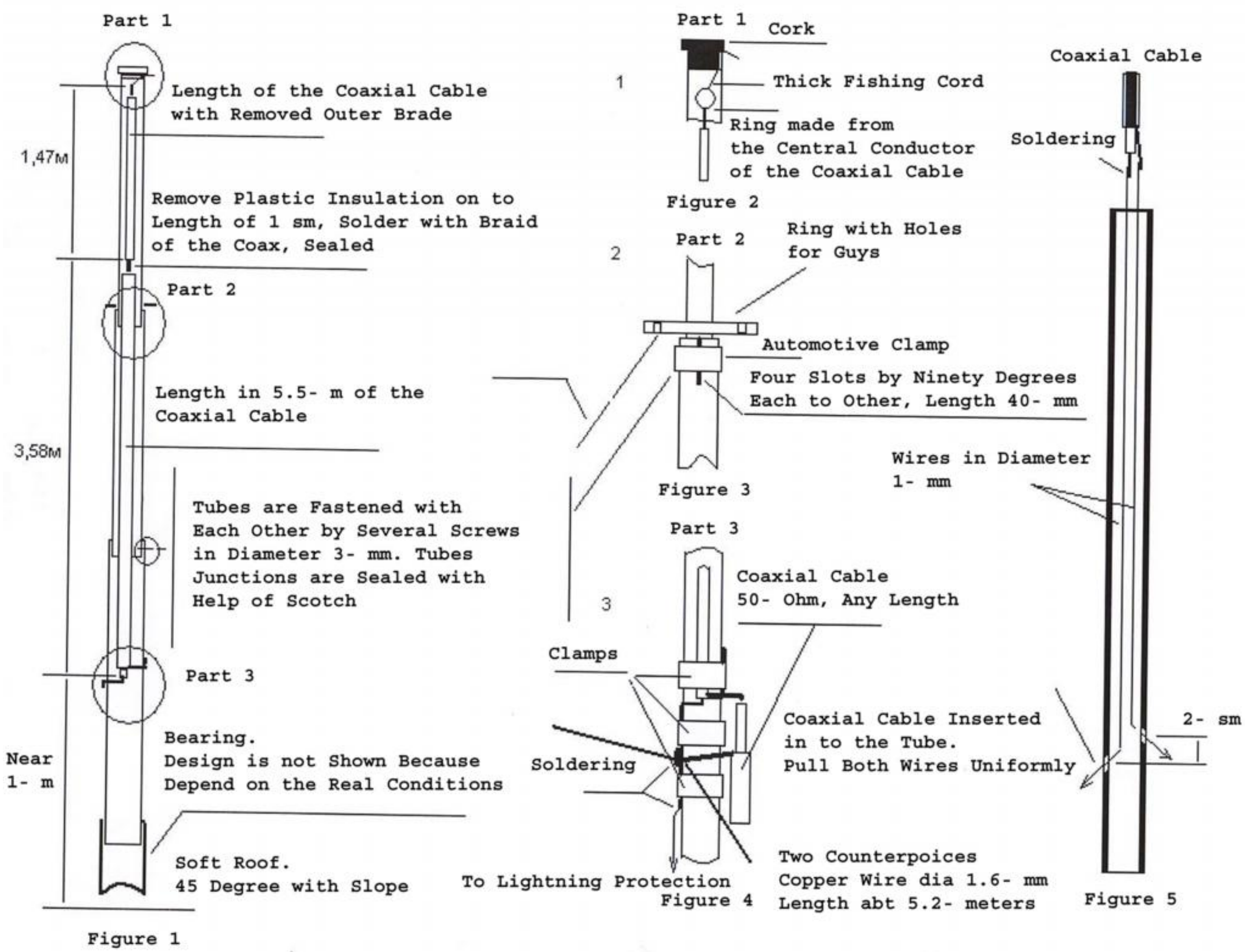


Figure 1- **Figure 6** Design of the Vertical Antenna

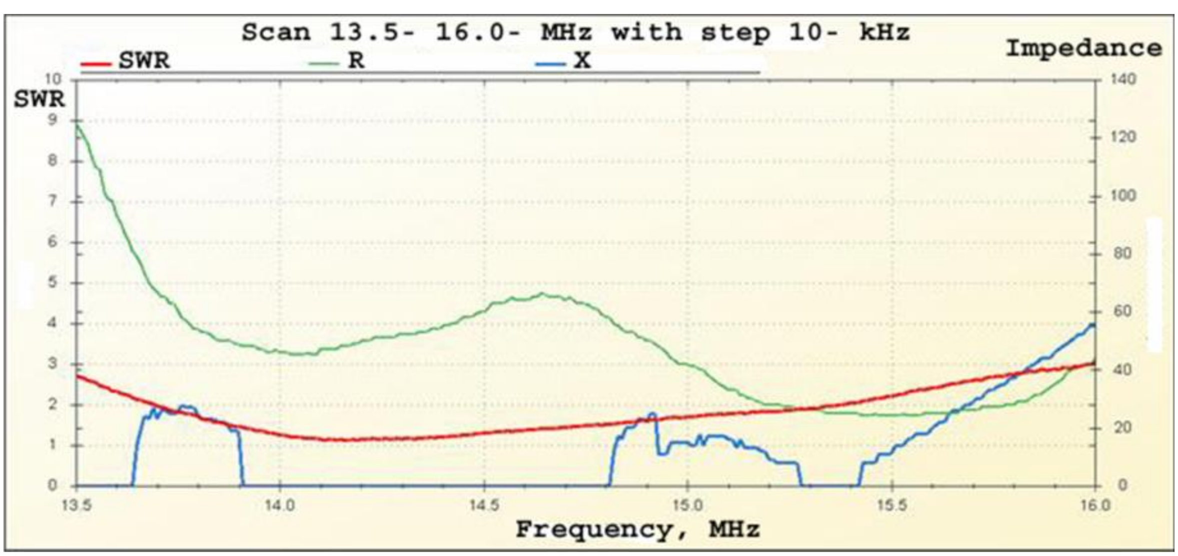


Figure 6 Data for the Vertical Antenna

UN7CI Vertical Antenna for 7, 14 and 21- MHz

*By: **Boris Popov (UN7CI)***
Petropavlovsk, Kazakhstan

Credit Line: www.cqham.ru

The antenna was designed for ham bands 7, 14 and 21-MHz. Antenna fed throw 50-Ohm coax. The antenna has SWR less the 1.5:1.0 at any band. Antenna has good efficiency and low angle of radiation at vertical plane (that is good for DX-ing). Only one power relay is used to switch a working band.

Operation:

The antenna made of on a base of a vertical tube that has diameter of 22-mm and length 8.5-meters. With help of a matching circuit this vertical is tuned to each used band. At the 7-MHz band the vertical (with the lengthen inductor) is a lambda/4 one, at the 14-MHz the vertical is a 5lambda/8 one, at 21-MHz band the vertical (with the lengthen inductor) is a lambda/2 one. **Figure 1** shows the antenna with the matching circuit.

Band 7 and 21-MHz: When D.C. voltage of 24-V is across the relay its contacts switch on the vertical through the lengthen inductor to 50-Ohm coaxial cable.

Band 14-MHz: If the 24-V cut off from the relay the vertical is working at 14-MHz. In the situation one relay's contact is grounded the vertical. Second relay's contact turns on the omega- matching network to 50-Ohm coaxial.

Design

Vertical may be made from aluminum tube in diameter 22- 30 millimeters. The vertical is installed onto a home-made insulator. The omega matching may be made from aluminum wire in diameter 4.5-8- millimeters. Lengthen inductor has 5 coils of silvered copper wire in diameter of 2.5-mm (10-AWG). The inductor has length of 30-mm and coiled diameter 45-mm (air-wound inductor). It was used a Russian power relay REN-33. However, it is possible to use any power relay that will work at RF-power going to the antenna.

73! de UN7CI

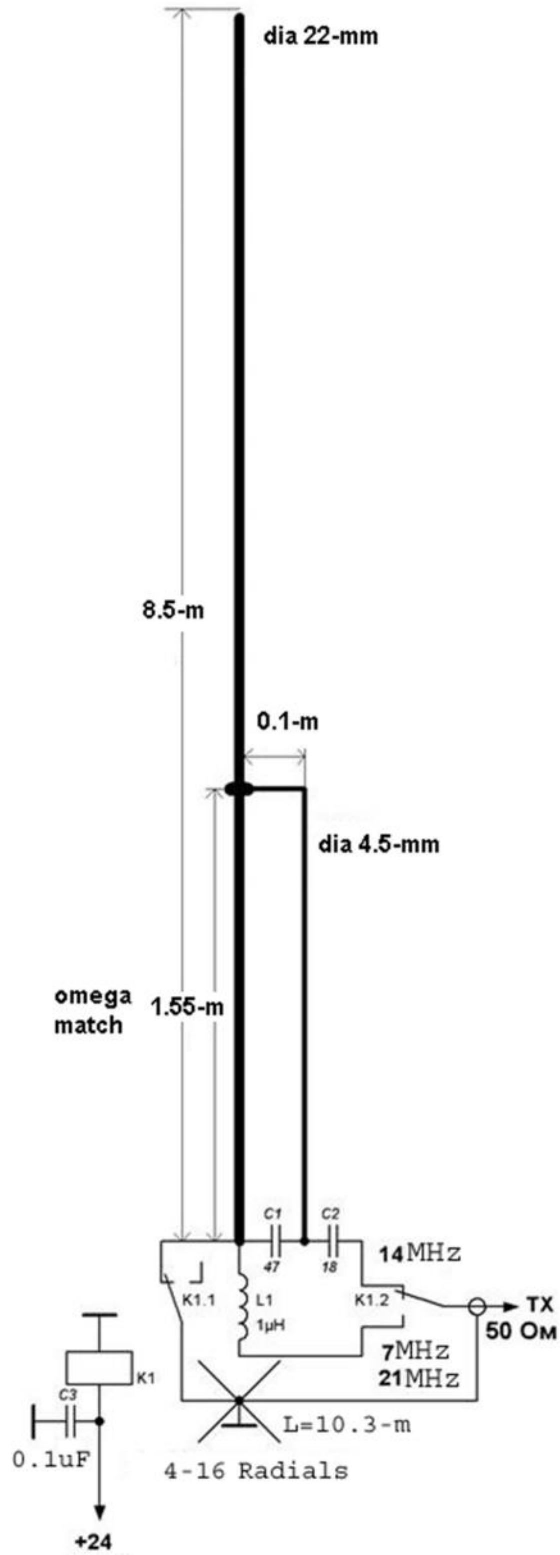


Figure 1 Vertical with Matching Circuit

Ground Plane Antenna for 40-, 20-, 15- and 10- meter Bands

Vsevolod Vorob'ev, UA3FE, Moscow

Credit Line: Radio 1958, #6, pp.: 30, 31, 36

Originally the antenna was used (and described) by polish ham Kahlickiy in 1946 year. The advantage of the antenna is that only one relay is used to switch the four working bands of the antenna. Vertical radiator of the antenna is grounded so the antenna may be used near lightning storm period.

To understand how the antenna is matched and tuned we need to review some pieces of the antenna theory. Let's see to the **Figure 1** and **Figure 2**. **Figure 1** shows "active antenna input resistance" vs "ratio antenna length/working wavelength". **Figure 2** shows "reactance of antenna input impedance" vs "ratio antenna length/working wavelength". The diagrams are simulated for vertical radiator placed above ideal ground. However, 4- counterpoises with length equal to the vertical part of the antenna are satisfactory analogue of an ideal ground.

Based on the **Figure 1** and **Figure 2** it is possible to find antenna impedance of the vertical radiator Vs of the length of the vertical. When the physical length of the vertical radiator is the value that is multiplied by the 0.25 lambda, the input impedance of the radiator is only resistive. Radiator has inductance reactance in the input impedance at the physical length from 0.25 to 0.5- lambda. Radiator has capacitance reactance in the input impedance at the physical length from 0.5 to 0.75- lambda. And so on.

However, it is for any antenna that to radiate efficiently this antenna should be matched with the feeder. As usual it is not complicated to match an antenna in narrow frequency band. Antenna is matched with the feeder with help of a circuit that commonly consist of from capacitors and inductors.

The circuit that is called Antenna Tuning Unit does compensation of the antenna reactance and match antenna resistance to the feeder.

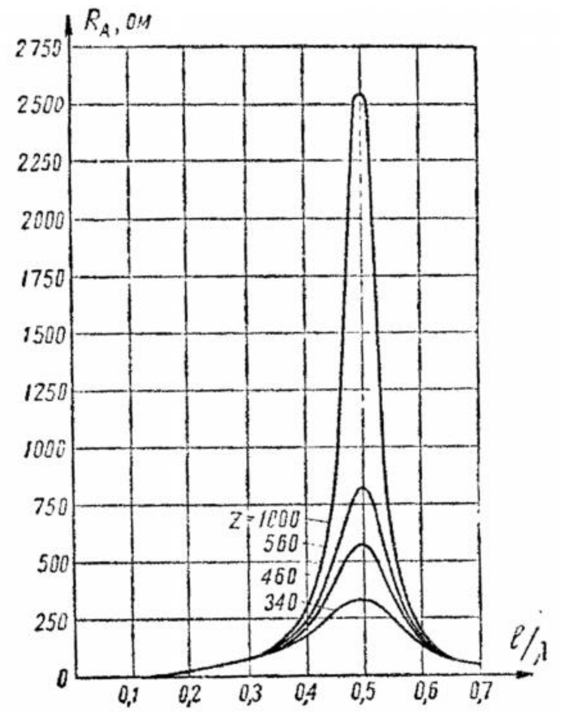


Figure 1
"Active Antenna Input Resistance" Vs "Ratio Antenna Length/Working Wavelength"

However it is very hard to find such ATU that would be worked at several bands without changing parameters of its parts. But it was found off for the antenna! **Figure 3** shows the ATU.

The ATU has a closed stub made of a length coaxial cable in 1.25- lambda for the 15- meter Band. At the band the stub has high resistance impedance and antenna is tuned with help L1 and C1. At the 20- meter Band the stub has capacitance impedance what is needed to match the antenna at the band.

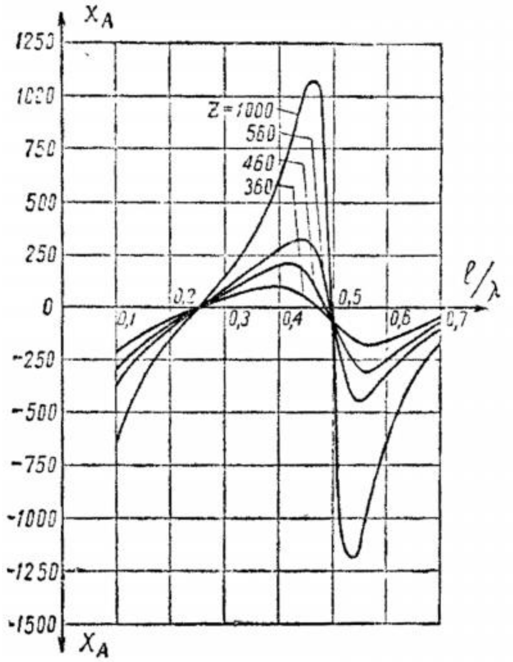


Figure 2

"Reactance of Antenna Input Impedance" Vs "Ratio Antenna Length/Working Wavelength"

At the 10- meter Band the stub has inductance impedance what is needed to match the antenna at the band.

Four counterpoises were used with the antenna. Each counterpoise had length 530- cm, diameter 2- mm and was installed at 45- degree to the Antenna Support Base Tube.

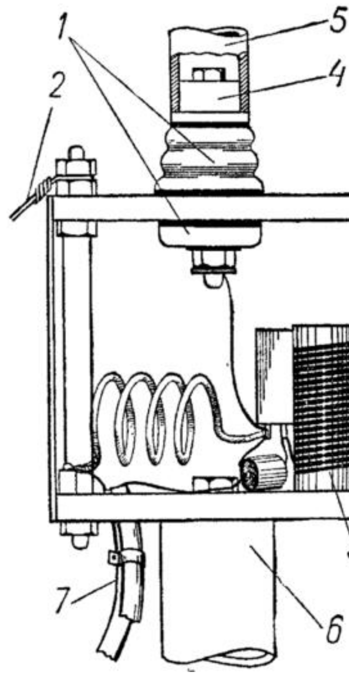


Figure 4

Design of the antenna base with ATU

Item 1: Porcelain Base Insulator
Item 2: Span- Counterpoise
Item 3: Lengthening Inductor L2
Item 4: Radiator Base
Item 5: Radiator
Item 6: Antenna Support Base Tube
Item 7: Feeder and Closed Stub

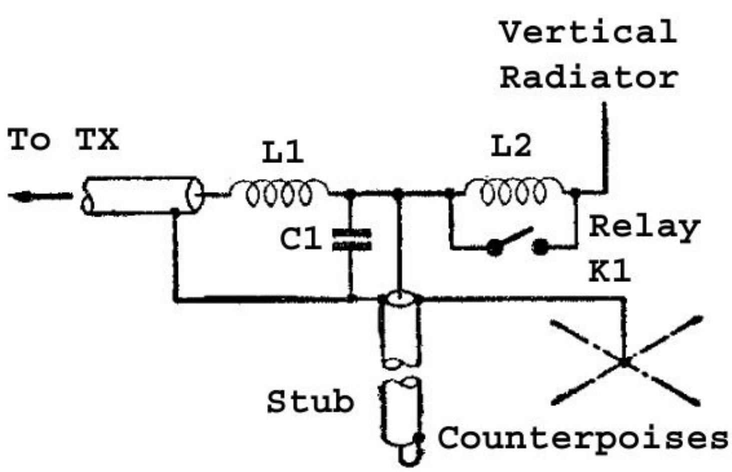


Figure 3

ATU of the Ground Plane Antenna for 40, 20, 15 and 10- meter Bands

Ground Plane Antenna for 40, 20, 15 and 10-meter Bands

Metal roof may be used instead of the counterpoises in case if the antenna is installed above such roof. Vertical radiator made of from an aluminum tube in diameter 4- cm and has length 530- cm.

Original ATU was calculated to match the antenna with coaxial cable 88- Ohm. **Table 1** gives data for the ATU for coaxial cables 88-, 50- and 75- Ohm.

At the 40- meters band a lengthening inductor L2 is used to match the antenna. The inductor is closed with help of Relay K1 at the other bands.
Good match of the antenna is possible only on one band- 15- meter. At the other bands the matching is only satisfactory. **Figure 4** shows design of the antenna base with ATU. ATU should be placed into weather- proof plastic or metal box.

73! de UA3FE

Header of the Article

Table 1 Data for the ATU for Coaxial Cables 88-, 50- and 75- Ohm

		Coaxial 88- Ohm	Coaxial 75- Ohm	Coaxial 50- Ohm
L1, micro- Henry		0.825	0.8	0.7
L2, micro- Henry		6.6	7.0	6.3
C1, pF		64	68	83
Length of the closed Stub, meter		10.7	11.4	11.4
SWR	10-meter	1.1	1.12	4.0
	15- meter	1.0	1.0	1.0
	20- meter	2.2	2.22	1.7
	40- meter	3.6	2.8	1.05

A Five Bands Vertical Trap Antenna

M. Chirkov, UL7GCC

The classical ***W3DZZ*** antenna in vertical installation designed by UL7GCC and listed at the **Reference** is well known in Russia. **Figure 1** shows the antenna. Diameter of sections A and B is 40- 50-mm.

How is this antenna work?

40-m band: The trap LC cut out the upper section B from the antenna. So only section A works as a radiator. The section A has length in 10.1 meters, i.e. electrical length 1/4- lambda for the 40 meters. Such antenna is a quarter wave vertical and works in very effectively way.

80-m band: On the 80-meter Band the antenna has summary physical length of two sections A+B a little less than 1/4- lambda. A + B = 16.47 m, less the 20 meters for quarter wave length for the 80-m band. A short vertical radiator has a capacity part in its input impedance. LC circuit at the 80-meter Band has an inductance part in its impedance. The inductance part compensates capacity part of the electrically short vertical, and the antenna has a low SWR at the 80-meter Band. In other words, the inductor of the LC works as usual lengthening coil.

10-, 15- and 20-meter Bands: At the 10-, 15-, and 20-meters the LC has a capacity part at its impedance. It compensates the inductance part of the impedance of the two sections at the Bands. Electrical length of the antenna is 1.75- lambda at 10-m, 1.25- lambda at 15-m and 0.75- lambda at 20-m.

Do not forget, any vertical likes counterpoises, so use several ¼- lambda counterpoises for each bands.

Reference

M. Chirkov, UL7GCC: Multi range vertical // Radio #12, 1991, p.: 21.

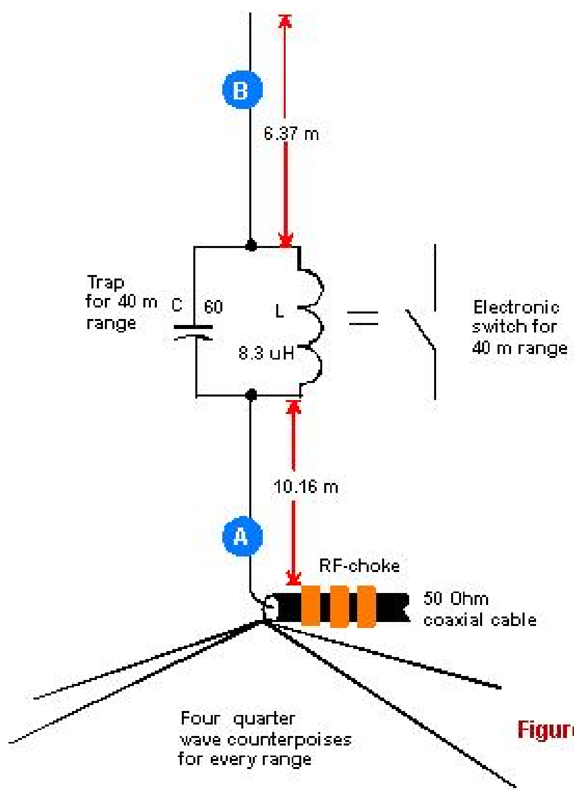


Figure 1

Vertical Open Stub Antenna for the 40 and 20- meter Bands

The publication is devoted to the memory UR0GT.

By: Nikolay Kudryavchenko, UR0GT

The antenna has enough good parameters at the 40 and 20 meter Bands. Antenna does not need any counterpoises. Antenna should place at some distance (say more the 1- meter) above the ground. To prevent radiation from the outer braid of the coaxial cable a good RF- Choke should be installed at the feeding terminals.

Figure 1 shows design of the Vertical Open Stub Antenna for the 40 and 20- meter Band.

Charts for Z, SWR and DD of the antenna and the MMANA model of the antenna may be found at: http: // http://www.antentop.org/015/vosa_015.htm

73! de UR0GT

Credit Line: Forum from: www.cqham.ru

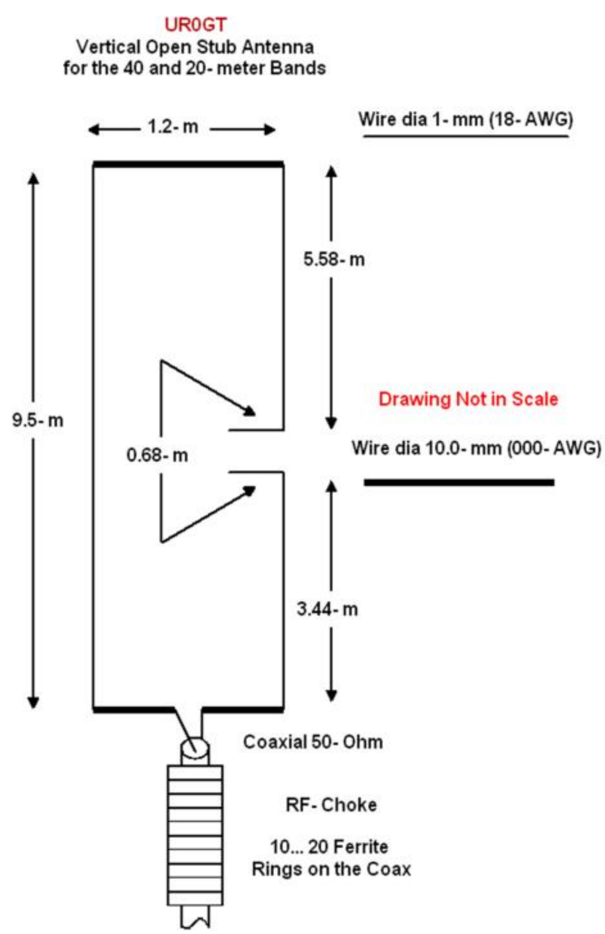


Figure 1
Design of the Vertical Open Stub Antenna for the 40 and 20- meter Bands

Bidirectional Vertical Antenna for the 20- meter Band

The publication is devoted to the memory UR0GT.

Credit Line: Forum from: www.cqham.ru

By**: **Nikolay Kudryavchenko, UR0GT

One Ground Plane allows get one directional switchable DD. For this purpose to the GP a two wires should be added. With help an RF Relay (or just with help of manually installed jumper) the wires turn on to Director and Reflector. Length of the GP should be taken a little more than lambda/4. For the minimum SWR the antenna tune up with the help of a capacitor.

Charts of Z, SWR and DD for the antenna as well as the MMANA model of the Bidirectional Vertical Antenna for the 20- meter Band may be found at: http://
www.antentop.org/019/ur0gt_directional_019.htm

73! de UR0GT

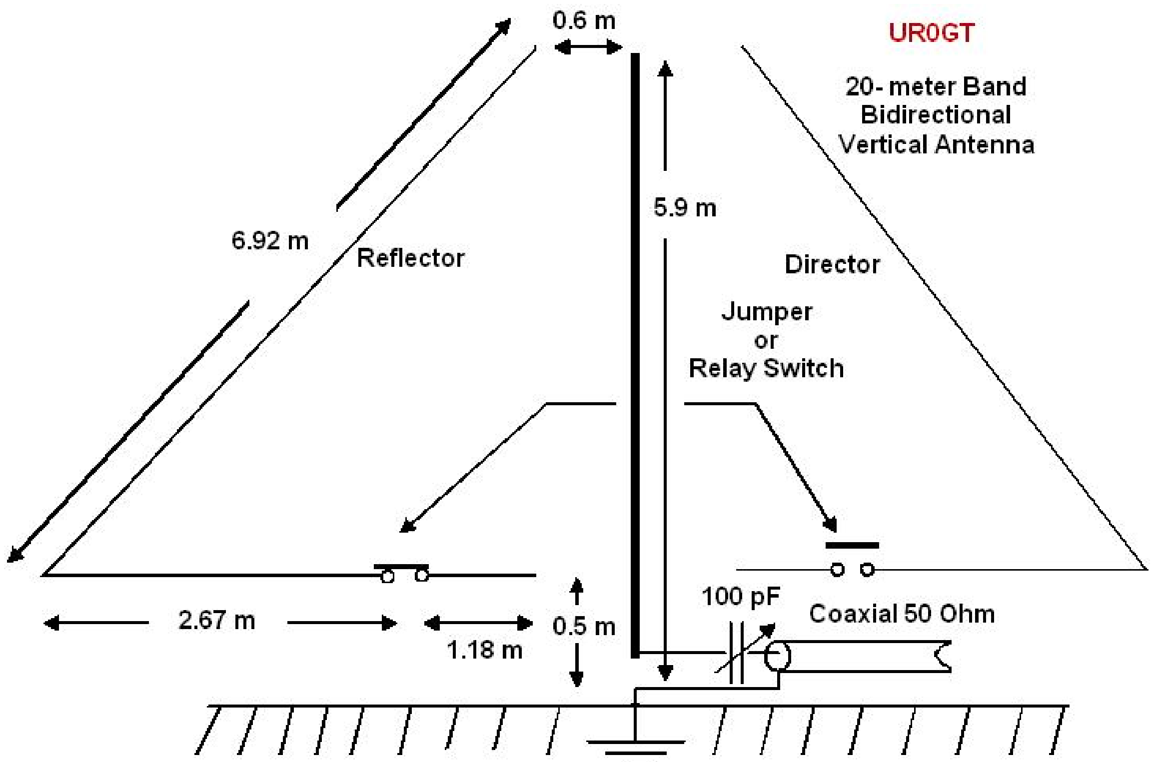


Figure 1

Design of the Bidirectional Vertical Antenna for the 20- meter Band

Small Vertical for the 80- meter Band

The publication is devoted to memory UR0GT.

By: **Nikolay Kudryavchenko, UR0GT**

Optimized Vertical in 4- meters length for the 80- meter Band is shown on **Figure 1**.
Lengthening coil is placed at 1.8- meters from the base. Gain of the antenna is minus 9.1- dBi, input impedance (at the resonance) is 20.7- Ohm.

The MMANA model of the Optimized Vertical for the 80- meters may be loaded: http: // www.antentop.org/014/sv_014.htm

73 Nick

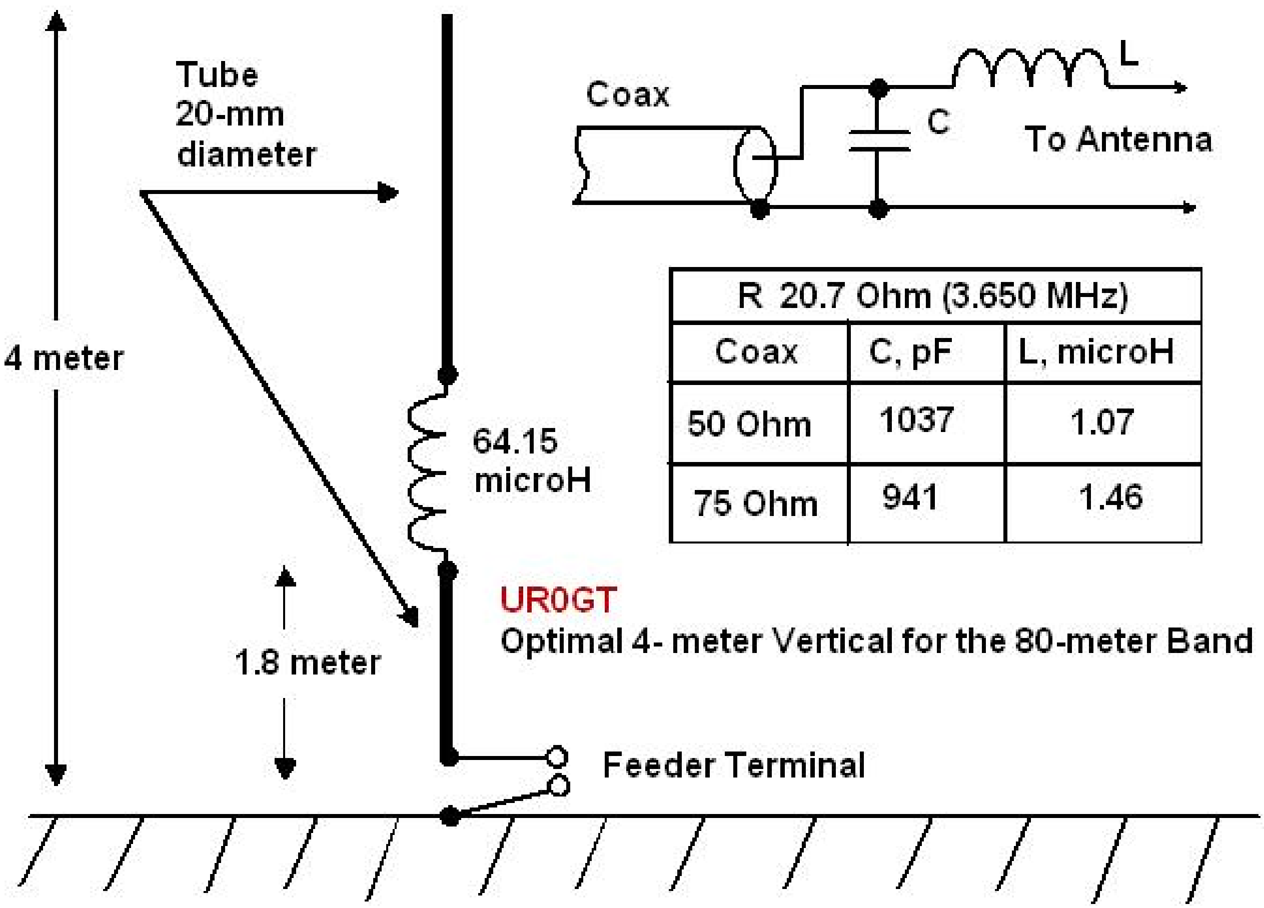


Figure 1

Optimized Vertical in 4- meter length for the 80- meter band

Broadband Sloper for the 80- meter Band

By: Vladimir Fursenko, UA6CA

Credit Line: http://www.cqham.ru/ant80.htm

The antenna works with good SWR at the frequencies 3.500- 4.000- kHz. All antennas, what I made before (there were I.Vs., dipoles and slopers) did not work at such wide frequencies range. The antenna has input impedance 75- Ohm. It allows use an inexpensive TV coaxial cable for the feeding of the antenna. The 75- Ohm coaxial as usual is matched well with the 50- Ohm output of the transceiver. **Figure 1** shows the design of the antenna.

It is a slope stub antenna. The antenna may be placed at 30- 60- degree to the horizon.

Antenna has two radials (more radials are better) that are placed at 120- degree to each other. Antenna has input impedance (at terminals "x-x1') close to 300- Ohm. A lambda/4 length of a 150- Ohm coaxial cable does match the input impedance with the feeding coaxial cable. Instead of the cable it is possible use a transformer 1:4. The antenna wire in the antenna is electrically closed. So the antenna is low noise at reception, does not copy static and has some lighting protection. Antenna may be recalculated for other ham bands.

73! de UA6CA

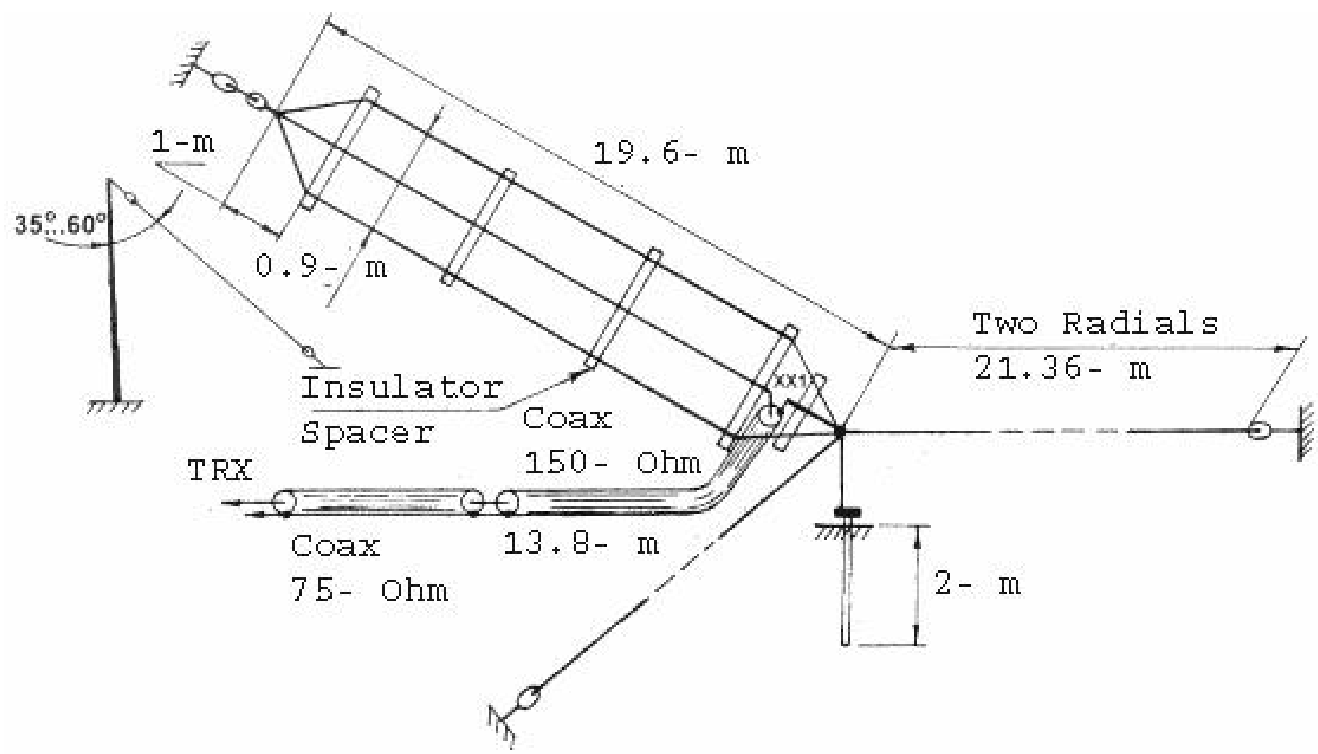


Figure 1

Design of the Broadband Sloper for the 80- meter Band

Two Slopers for All Traditional HF- Bands

By Vladimir Fursenko, UA6CA

It is possible at one mast install two slopers that cover all traditional five HF-Bands- 80,- 40,- 40,- 15 and 10-meter. **Figure 1** shows the antenna.

One sloper covers 80 and 10- meter Bands another one covers 40, 20 and 15- meter Bands. Each sloper feed through separate coaxial cable. It is possible use 50 or 75-Ohm coaxial cable. Coaxial cable matched with antenna with help of a length of two wire line. It may be open line or two wire line in plastic insulation.

For example, at the **Figure 1** it is shown at right- two wire open line and at left- two wire ribbon line. Line in plastic insulation should be shortened (factor 0.82) compare to two wire open line.

Coaxial cable may have any length. However, coaxial cable in length 13.65 or 27.30- meter for 40, 20 and 15-meter Band antenna and coaxial cable in length 27.0-meter for 80 and 10- meter Band antenna would give good result. The antenna gives over 0.5- 1.0- dB compare to VS1AA.

73! De UA6CA

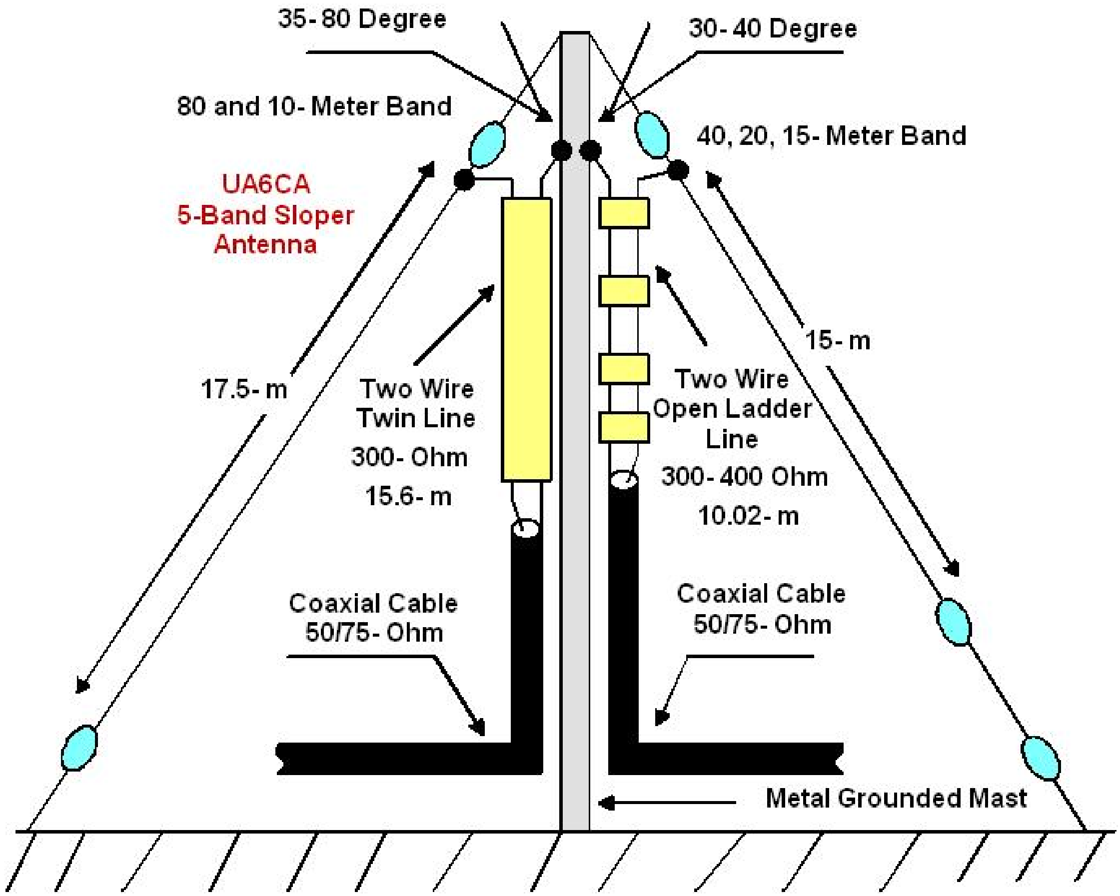


Figure 1

Two Slopers for All Traditional Five HF-Bands

Shortened Antenna for the 160- meter Band

Aleksandr Simuhin, RA3ARN

Credit Line: http://www.cqham.ru/

Aleksandr Simuhin, RA3ARN

At my QTH I had no space for full sized dipole antenna for the 160 meters. So what I may install there it was only a shortened antenna. After dig out in the internet and read bunch of books and after I tried out different antennas at my location I found the antenna that works for me.

The antenna was made in 2008. Several years in the Air on the 160- meter Band with the antenna and 15-watts TX gave good reference for the antenna. **Figure 1** shows the Shortened Antenna.

Design of the antenna: It is a symmetrical antenna. However it is possible to make asymmetrical one. Antenna may be installed in line similar to usual dipole antenna or may be installed similar to I.V. antenna.

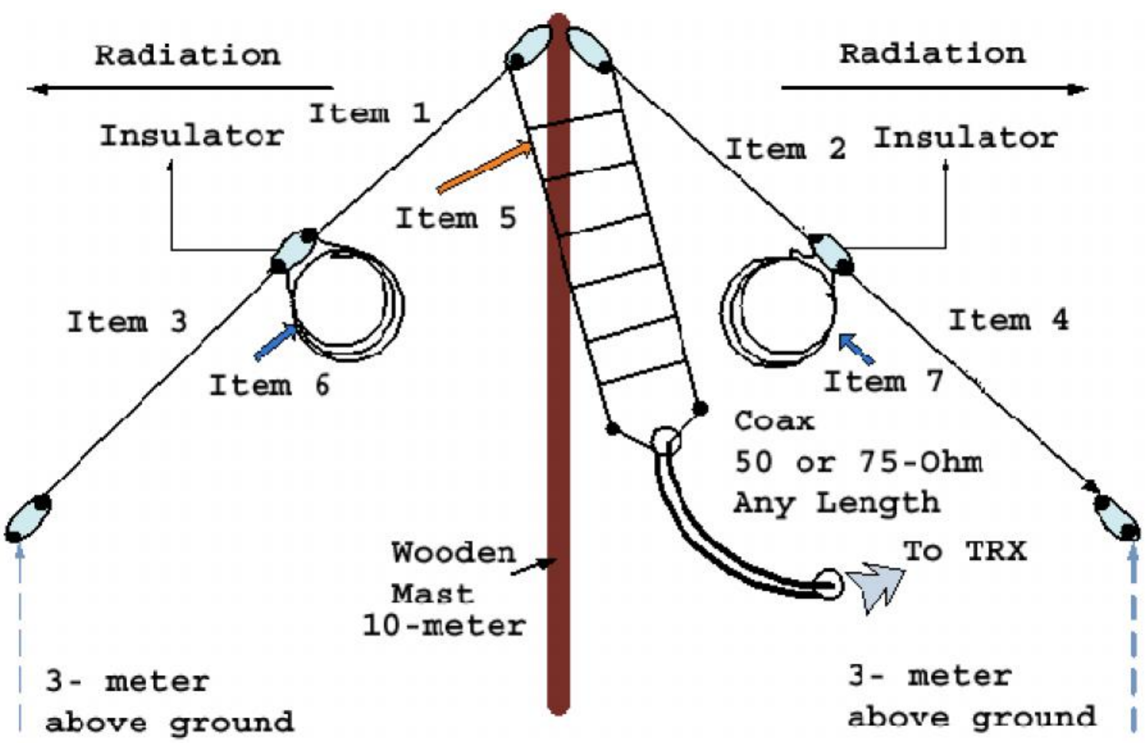


Figure 1

Shortened Antenna for the 160- meter Band

RA3ARN installed the antenna similar to I.V. antenna. It was used 10-meter wooden mast for the antenna. Lower ends of the antenna were at 3- meters above the ground. Antenna has two wires ***item 1*** and ***item 2*** with constant length 11- meter each. Length of the wires ***item 3*** and ***item 4*** may vary from 18 to 15- meters when antenna is tuned up. Antenna is matched with a coaxial cable with help of a length of a two wire open line – ***item 5***. It is 450- Ohm open line in length 12.5- meters. Coaxial cable 50 or 75- Ohm may be used to feed the antenna.

Antenna is lengthened with help of coils ***item 6*** and ***item 7***. The coils made from length of an Ethernet Cable, 17 meter each. RA3ARN used Ethernet Cable with mark on it: NEXANS UTP KATEGORY 5E TIA 568-5EC VERIFIED №11168 4PR 24AWG SU3505. Almost any 4- pair Ethernet Cable may be used for the coils. **Figure 2** shows diagram of the coil. All twisted pairs are connected in serial. Then the cable was coiled in a hank of 40- cm diameter. Soldered ends were protected from weather conditions with help of a thermo- shrink tube.

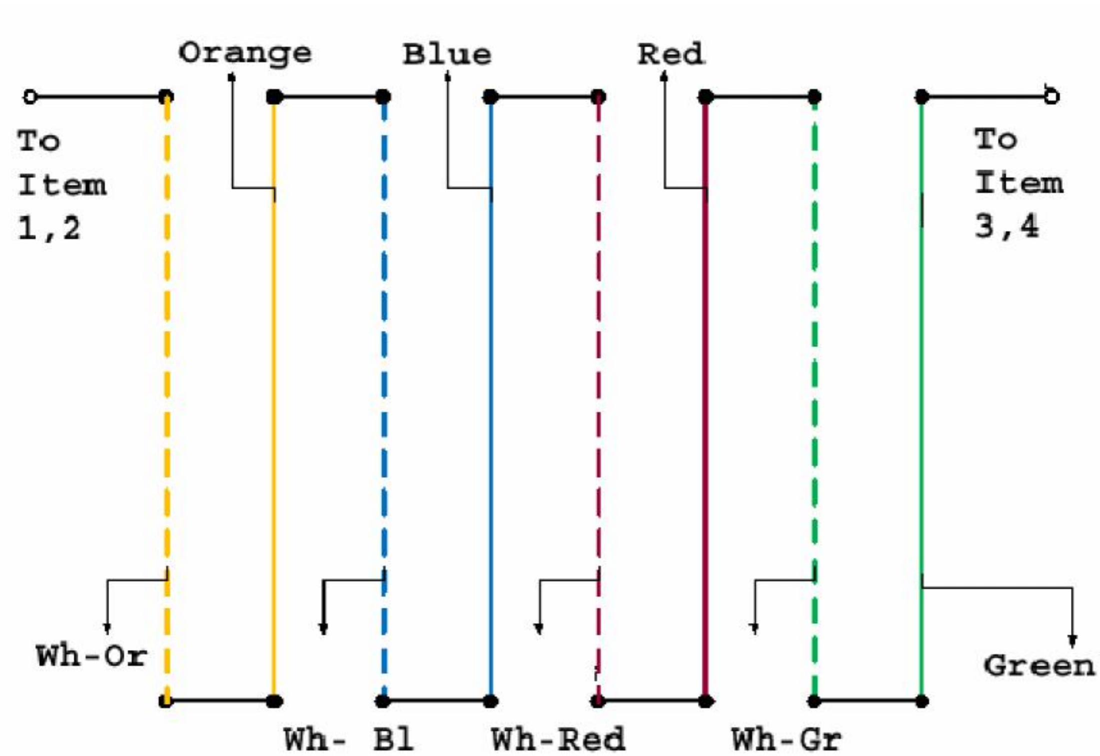


Figure 2

Diagram of the lengthen coil.

Overall length of the one side of the dipole antenna is 164 meters. Overall length of the all dipole antenna is 328 meters. Antenna had SWR 1.08 at 160 meters. Second resonance was at 20 meters with SWR 1.5 within 40- kHz. Antenna may be tuned to another ham bands with help of a simple ATU.

Antenna worked fine for several years. It was used 15- W at the 160- meter and 800- W at the 80-40- and 20- meter Bands. Using the shortening method it is possible to remake almost any wire antenna. For example, existing I.V. for the 80- meter may be easy turned on to a multi- band antenna.

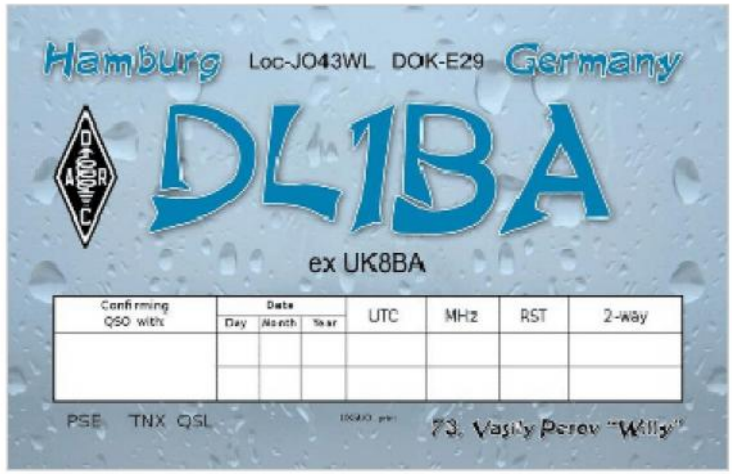
73! RA3ARN

Dipole Antenna for 40- and 20- meter Bands

By: Vasily Perov, DL1BA (ex UK8BA)

Because I have no lots space at my backyard for antenna installation I like do experiments with shortened antennas. Below described one of my experimental shortened dipole antenna for 40- and 20- meter Bands. It takes for me only 1 and half hour for installation and tuning of the antenna. After that the dipole antenna was tested at CQ WW Contest (2015). I made 300 QSOs using 100 W going into the antenna. **Figure 1** shows design of the antenna.

For the 20 meter Band the antenna is a full sized lambda/4 (each side) dipole antenna. For the 40- meter Band the antenna is a shortened dipole antenna. I used simulation program NEC2 to create the antenna. However on practice the sizes were a little different to the theoretical ones.



DL1BA QSL Card

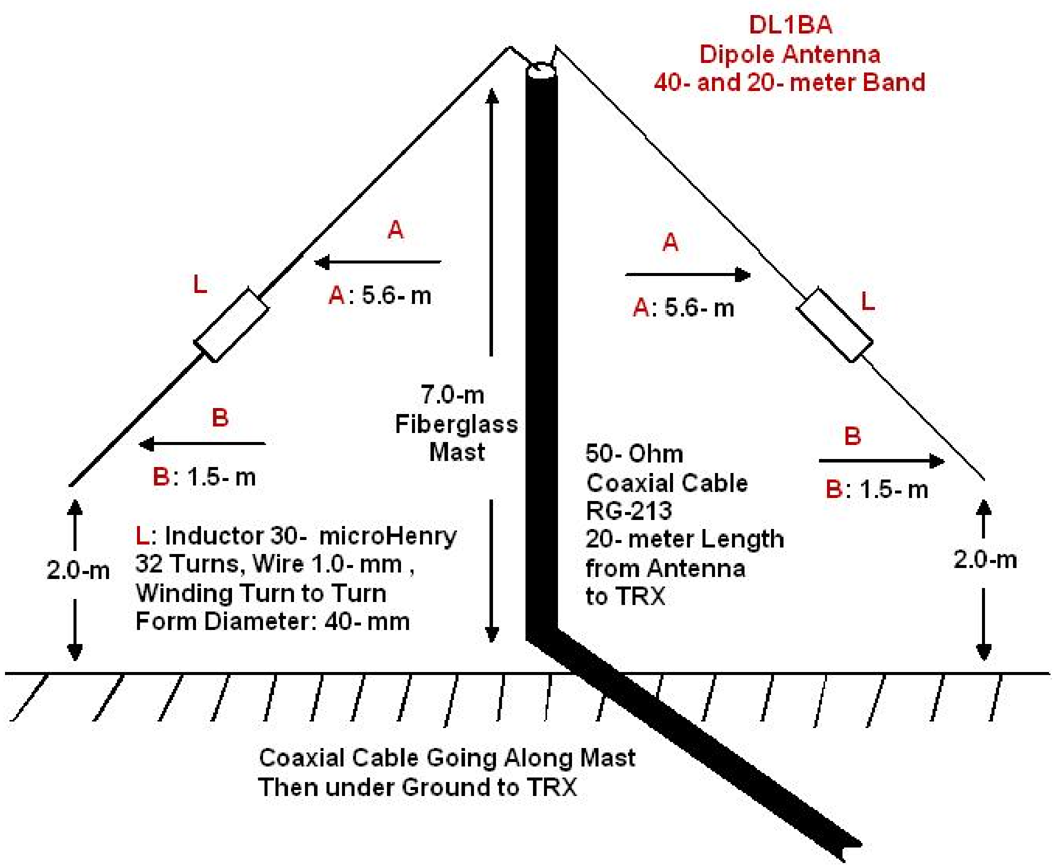


Figure 1

Dipole Antenna for 40- and 20- meter Bands

Dipole Antenna for 40- and 20- meter Bands

Antenna dimensions are depended on the placement and inductance of the inductor. However the inductance of the inductor is not critical for antenna operation. Most important thing is that the inductors have the same inductance. In my case the inductors (measured by me) have inductance 31.4- micro Henry. The inductance is influenced to the parameters of the antenna. The more it is inductance of the inductor the less length of the parts of the antenna and the less passband of the antenna.

Antenna was placed at the mast in 7- meters height. The mast was made from a fiberglass plastic. Antenna was made from stranded wire in plastic insulation. Antenna was fed through 50- Ohm coaxial cable.

I have used RG 313 type. This cable was going along the mast and then going underground to my shack. Length of the cable was near 20- meters. Weather practically did not influence to the antenna.

Antenna was easy tuned to SWR 1:1 at both Bands. Antenna had bandpass near 200- kHz (at SWR 1.5:1) at the 20 meter Band and bandpass near 75- kHz (at SWR 1.5:1) at the 40 meter Band. At first step the antenna should be tuned at the 20- meter Band by symmetrical changing lengths of the parts A. Then antenna should be tuned at the 40- meter Band by symmetrical changing parts B. Changing the length of the parts B practically did not influenced to the operation at the 20- meter Band.

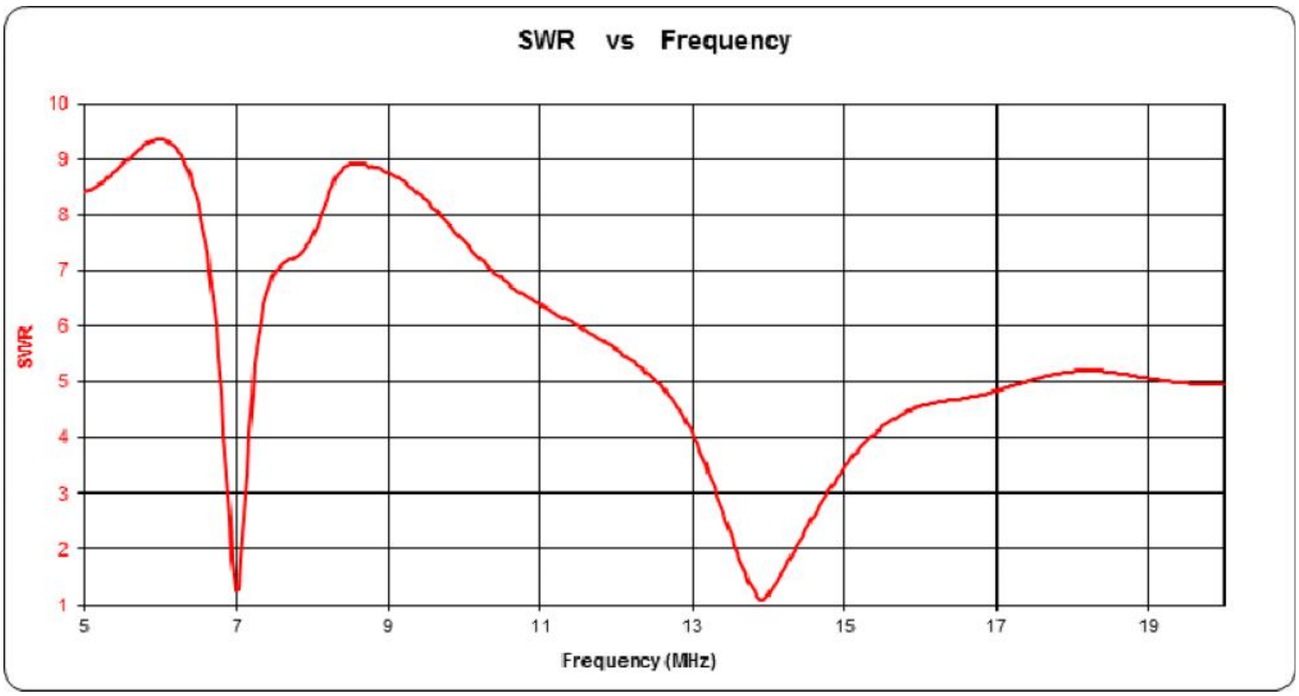


Figure 2

SWR of the Dipole Antenna for 40- and 20- meter Bands from 5 to 19.5- MHz

In my case changing length B on to 1- cm caused changing resonance frequency of the antenna up to 100- kHz at the 40- meter Band. **Figure 2** shows SWR of the antenna from 5 to 19.5- MHz. The plot was taken with VNA N2PK.

Charts for SWR of the antenna at the 40- meter Band, SWR of the antenna at the 20- meter Band, SWR of the antenna from 5 to 19.5- MHz with turned on function “remove coaxial cable length” may be found at: www.antentop.org/019/dl1ba_dipole_019.htm

The MMANA file of the Triangle Vertical Antenna for 20, 15 and 10- meter Bands may be loaded: http:// www.antentop.org/019/dl1ba_dipole_019.htm

The file was prepared by RW4HFN. Simulation the Triangle Vertical Antenna for 20, 15 and 10- meter Bands in MMANA shows very close theoretical parameters of the antenna to practical obtained ones.

73! de DL1BA

Modified Dipole Antenna DL1BA for 40- and 20- meter Bands

By: ***Igor Vakhreev, RW4HFN***

In my opinion the explanation how the DL1BA Antenna (*Antentop 01- 2015, pp: 53-55, Dipole Antenna for 40- and 20- meter Bands*) is working at the 20- meter Band is very simple. Parts of the antenna- there are long wire (5.6-meter length) before inductor, inductor and short wire (1.5- meter length) after inductor – make 1.5- lambda dipole at the 20- meter Band. **Figure 1** shows current distribution in the DL1BA Antenna at the 20- meter Band. The current distribution proves my suggestion.

As you can see from the **Figure 1** the minimal current (current node) is placed at half meter up from the inductor. It allows find another approach for tuning of the DL1BA Antenna. It is possible make one side of the antenna a little short- say to 30… 50- cm.

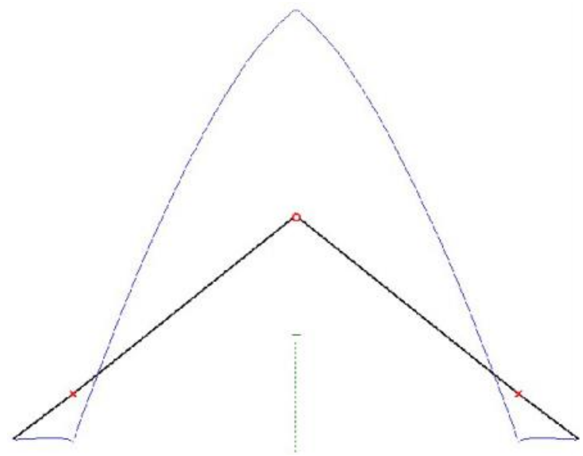


Figure 1 Current Distribution in the DL1BA Antenna at the 20- meter Band

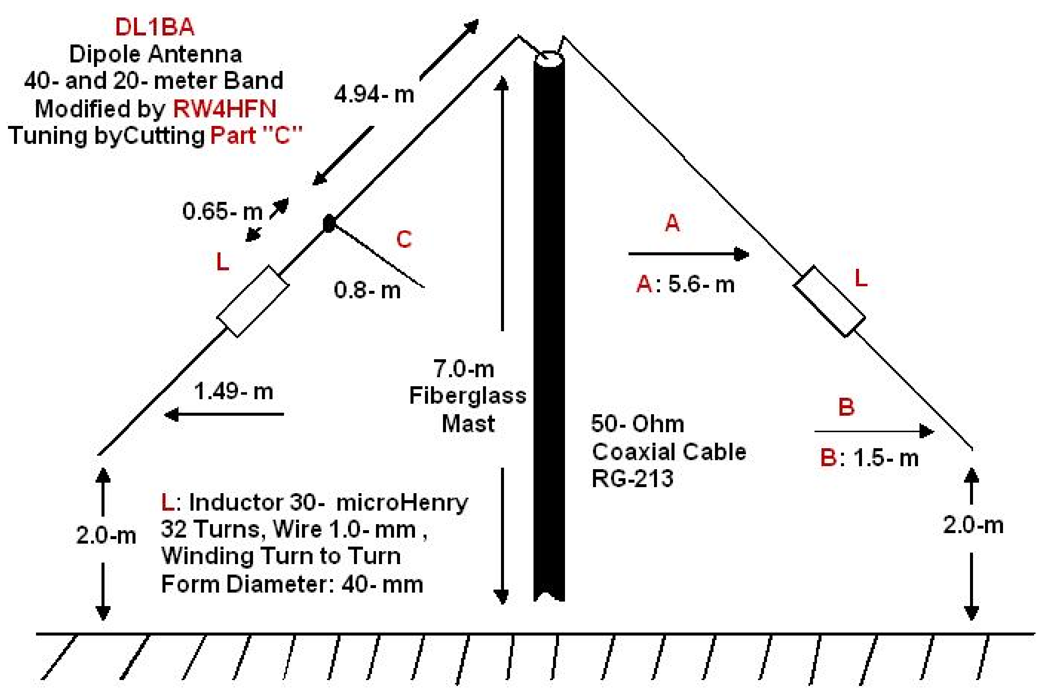


Figure 2
Modified Dipole Antenna DL1BA for 40- and 20- meter Bands

At the current node at the short side it is added wire in length (what the antenna is shortened) 30- 50- cm. At this case the adjusting of the antenna would be simple. At the 20- meter band the antenna is tuned by shortening the added wire. At the 40- meter Band the antenna is tuned by shortening of the one short wire after inductor that laid at non modification (that is without added wire) side. Both tuning practically do not influenced to each other. **Figure 2** shows the modified antenna.

Modified Dipole Antenna DL1BA for 40- and 20- meter Bands

The MMANA file of the Modified Dipole Antenna DL1BA for 40- and 20- meter Bands may be loaded: http: // www.antentop.org/019/rw4hfn_dipole_019.htm
Simulation the Antenna in MMANA shows that it is possible to tune the antenna for both Bands by playing the lengths of the added wire (part C see **Figure 2**) and the short wire after inductor (part B at right side antenna shown on **Figure 2**).

Figure 3 shows SWR of the modified antenna at the 40- meter Band. **Figure 4** shows SWR of the modified antenna at the 20- meter Band.

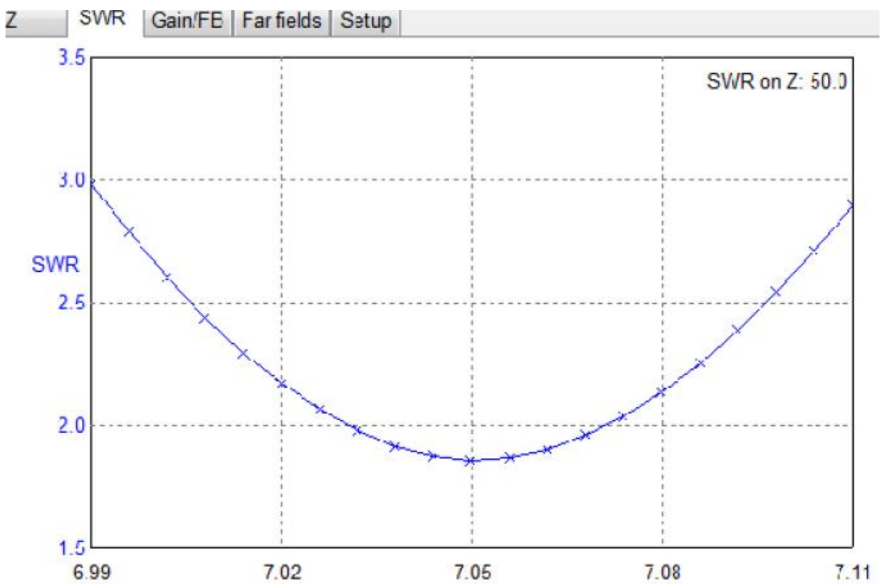


Figure 3 SWR of the Modified DL1BA Antenna at the 40- meter Band

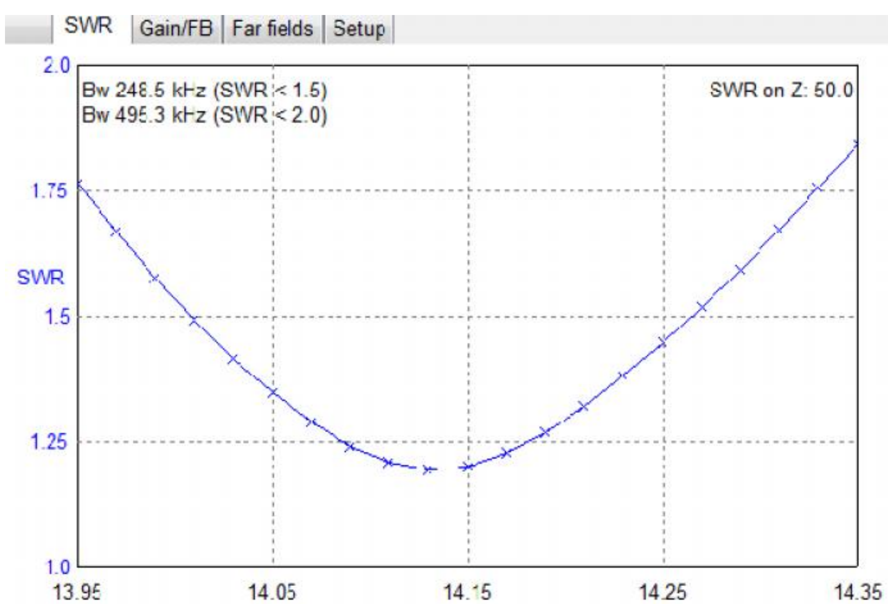


Figure 4 SWR of the Modified DL1BA Antenna at the 20- meter Band

Modified DL1BA Dipole Antenna for 40- , 20- meter Bands with additional 10- or 15- meter Band

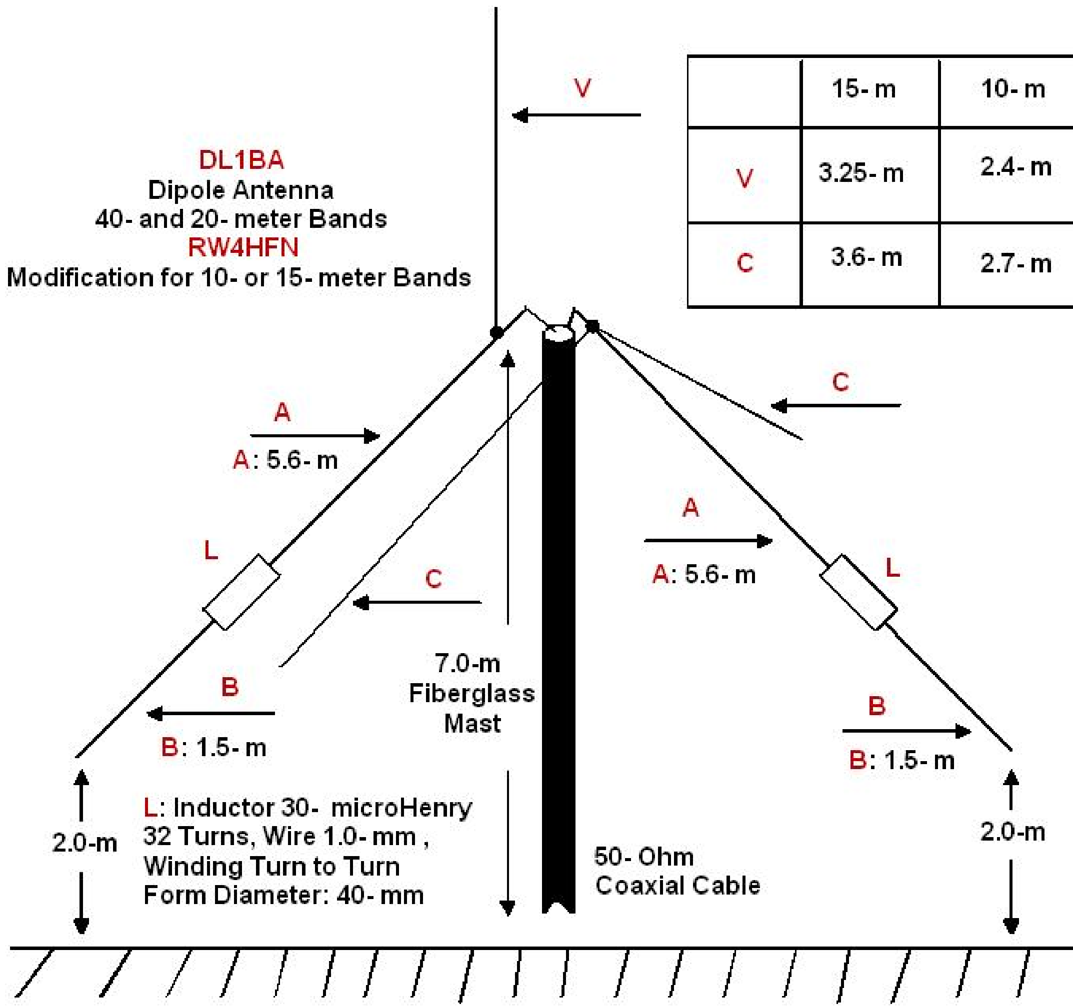
By: ***Igor Vakhreev, RW4HFN***

DL1BA Antenna (*Antentop 01- 2015, pp: 53-55, Dipole Antenna for 40- and 20- meter Bands*) may be modified for working at additional 10- or 15-meter Band. **Figure 1** shows design of the antenna.

As you can see from the **Figure 1** parts for additional band are added into the antenna design.

The MMANA file of the Modified DL1BA Dipole Antenna for 40- and 20- meter Bands with additional 10- or 15- meter Band may be loaded: http: // www.antentop.org/019/rw4hfn_modified_dipole_019.htm

Simulation of the antenna in MMANA showed that the antenna may be tuned at resonance at all of three Bands.



	15- m	10- m
V	3.25- m	2.4- m
C	3.6- m	2.7- m

Figure 1

Modified DL1BA Dipole Antenna for 40- and 20- meter Bands with Additional 10- or 15- meter Band

Modified DL1BA Dipole Antenna for 40- , 20-, 15-, and 10- meter Bands

By: ***Igor Vakhreev, RW4HFN***

DL1BA Antenna (*Antentop 01- 2015, pp: 53-55, Dipole Antenna for 40- and 20- meter Bands*) may be modified for working at additional 10- and 15-meter Bands. **Figure 1** shows design of the antenna.

As you can see from the **Figure 1** parts for additional bands are added into the antenna design.

The MMANA file of the Modified DL1BA Dipole Antenna for 40-, 20-, 15-, and 10- meter Bands may be loaded: http: // www.antentop.org/019/rw4hfn_modified_dl1ba_019.htm

Simulation of the antenna in MMANA showed that the antenna may be tuned at resonance at all of the four Bands.

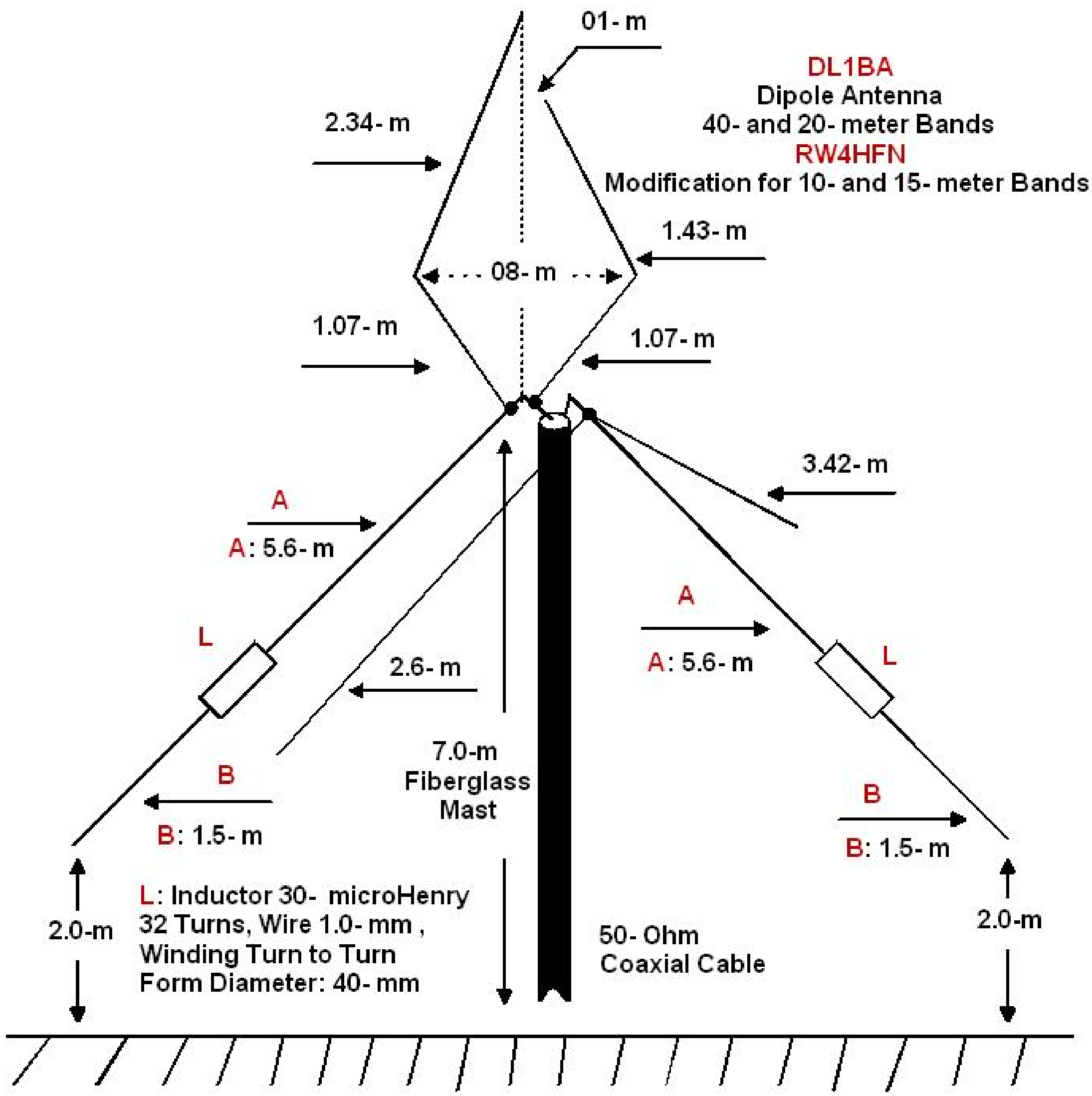


Figure 1

Modified DL1BA Dipole Antenna for 40-, 20-, 15-, and 10- meter Bands

Delta Loop for 40- and 20- meter Bands

The publication is devoted to the memory UR0GT.

By: **Nikolay Kudryavchenko, UR0GT**

Antenna has good SWR on both 40 and 20- meter Bands. Antenna placed on distance 2- meter above real ground. Input impedances of the antenna on both bands depend on distance above the ground and condition of the ground.

Figure 1 shows design of the antenna

Charts for Z, SWR and DD of the antenna for 40 and 20- meter Bands may be found at:

http://www.antentop.org/016/delta_016.htm

The MMANA file of the Delta Loop for 40- and 20- meter Band may be loaded:

http://www.antentop.org/016/delta_016.htm

73 Nick

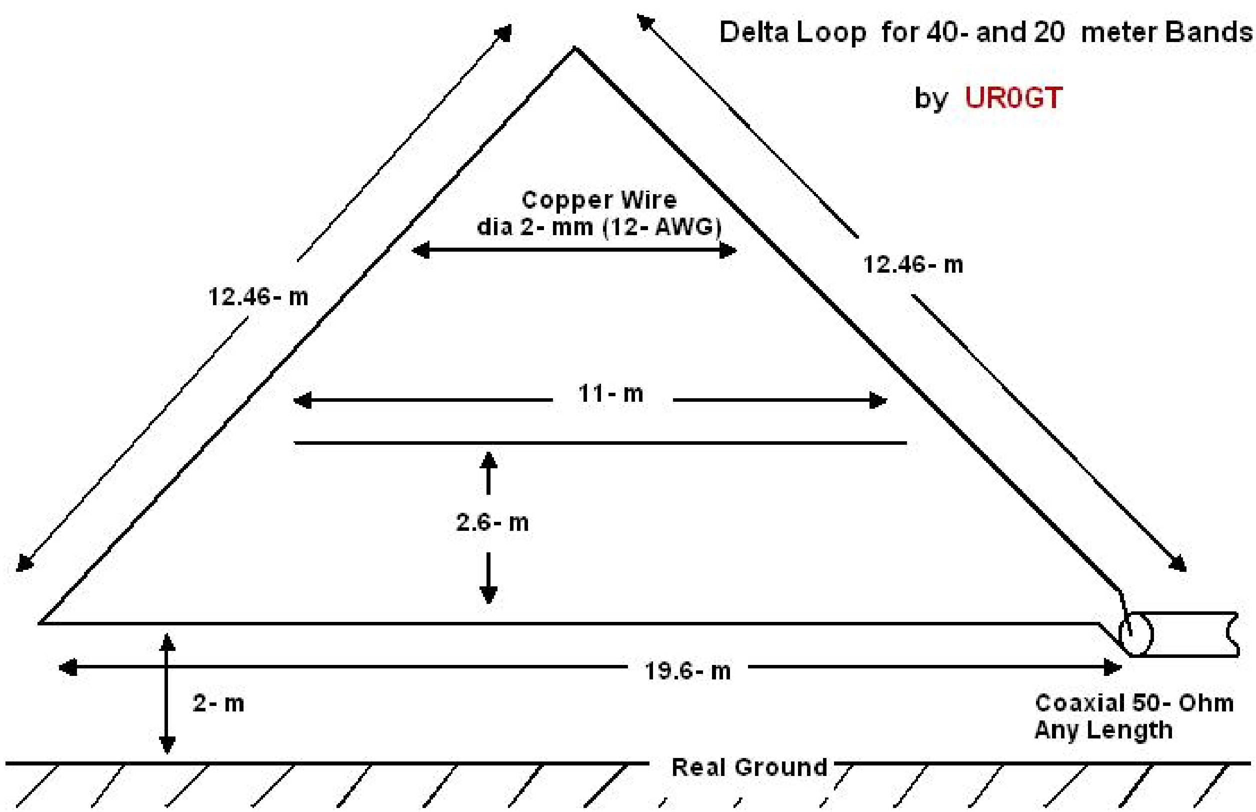


Figure 1

Design of the Delta Loop for 40- and 20- meter Band

Half Loop Antenna for the 80,- 40,- 20,- and 15-meter Bands

The publication is devoted to the memory UR0GT.

By: **Nikolay Kudryavchenko, UR0GT**

Credit Line: Forum from: www.cgham.ru

It is very simple and efficiency antenna that works in several amateurs bands- 80,- 40,- 20,- and 15-meters. The antenna has input impedance 75 – Ohm. **Figure 1** shows design of the antenna.

The MMANA model of the Half Loop for the 80-, 40,- 20,- and 15- meter Bands may be loaded: http: // www.antentop.org/016/hl_016.htm

Charts for Z, SWR and DD for all antenna bands may be found at: www.antentop.org/016/hl_016.htm

The MMANA model of the Half Loop for the 80-, 40,- 20,- and 15- meter Bands may be loaded: http: // www.antentop.org/016/hl_016.htm

73 Nick

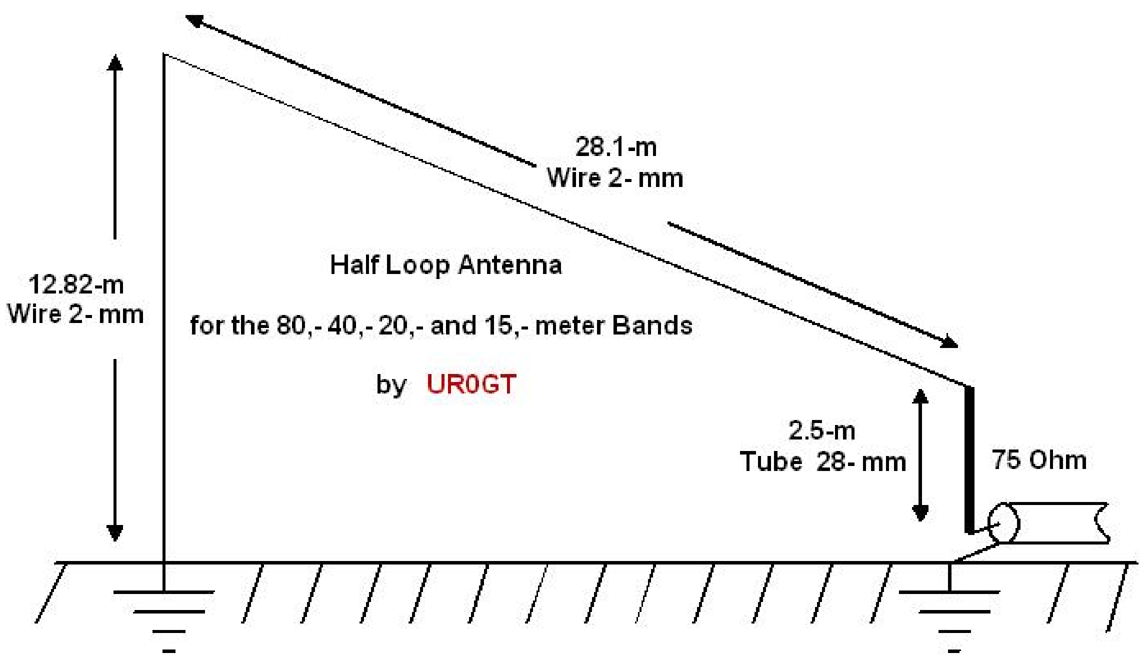


Figure 1

Design of the Half Loop for the 80-, 40,- 20,- and 15- meter Bands

Simple HF Antenna for the 20-, 17-, 15-, 12 and 10- meter Band

***By:* Andrey Korsakov, RA4NF**

Credit Line: www.cqham.ru

Below described a very simple HF Antenna for the 20-, 17-, 15-, 12- and 10- meter Bands. Antenna is fed by 50- Ohm coaxial cable. Antenna has very simple design and does not require any tuning if it made according to the drawing.**Figure 1** shows design of the antenna.

The Antenna consists of two vertical radiators that upper ends stand on distance 1.2… 1.5- meter apart together. It is an optimal distance for the antenna. However it is possible do not use the upper boom and place the radiators in triangle as it shown in dotted line in **Figure 1**. Two counterpoises are used for each band. Counterpoises should be placed at 15… 20 degree to horizon.

The two antenna Radiators fed by 150- Ohm two wires line. The line consists of from bottom antenna wire and wire in thick plastic insulation that is wound around the bottom line (marked in red on **Figure 1**). Length of the wire should be near in 20 percent more the lower parts of the antenna.

Mast and upper boom may be made from any insulation stuff- wood or plastic. Lower horizon wire of the antenna should be placed at some height above the ground. One meter should be enough (more is better). Antenna may be scaled to another ham HF bands.

73! RA4NF

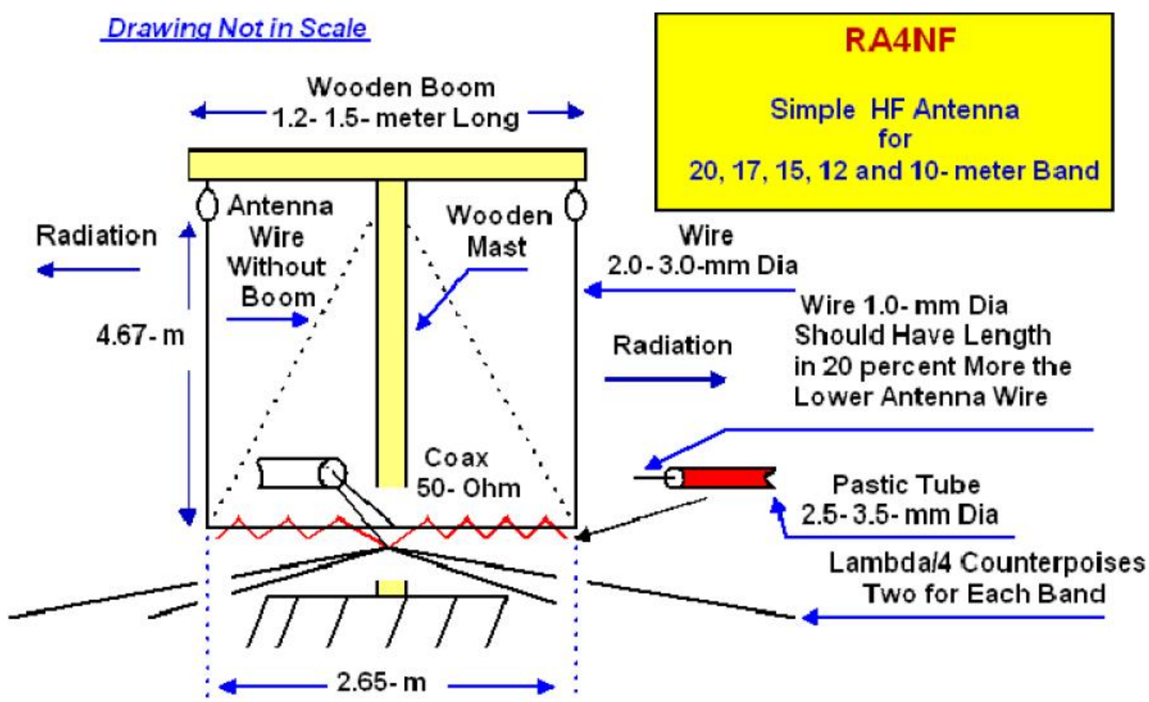


Figure 1

Simple HF Antenna for the 20-, 17-, 15-, 12- and 10- meter Band

Conclusion

So, Chapter 6 ***"Antennas for Limited Open Space"*** is ended. The Chapter described lots antennas that may fit for such place. Anyway, ideas given in the chapter may help to design own antenna for limited open space.

To tune some of the antennas it requires some experience for installation, tuning and adjustment. SWR- Meter or (that is better) Antenna Analyzer (MFJ- 259B or similar one) may be needed. Additional Source could give you some more tricks for antenna installation. I wish you success to design and installation your own antenna.

73!
Igor, VA3ZNW

References:

Multiband Loop Antennas

1. Simple All- Band HF- Antenna: http://www.antentop.org/010/us4em010.htm

2. Circle Antenna: http://www.antentop.org/009/circle009.htm

Vertical Antennas

1. Practical Design of Open- Sleeve Antennas for Upper HF- Bands: http://www.antentop.org/005html/005_p39.htm

2. Two Vertical Antennas for 20-, 15- and 10- meter Bands: http://www.antentop.org/019/Two%20Vertical%20Antennas%20for%2020-,%2015-%20and%2010-%20meter%20Bands_019.htm

3. Vertical Antenna for the 20-, 15-, 10- meter Bands (Antenna UW4HW): http://www.antentop.org/017/uw4hw_017.htm

4. RA3AAE Antenna for the 10- and 2- meter Band: http://www.antentop.org/017html/017_p50.htm

5. Multiband Vertical Stub Antennas: http://www.antentop.org/015/rn9rq_015.htm

6. Vertical for the 20- meter Band: http://www.antentop.org/015/ra9wfd_015.htm

7. Vertical UN7CI for 7, 14 and 21- MHz: http://www.antentop.org/010/vert_un7ci_010.htm

8. Ground Plane Antenna for 40, 20, 15 and 10- meter Bands: http://www.antentop.org/016/ua3fe_016.htm

9. A Five Bands Vertical Trap Antenna: http://www.antentop.org/005/w3dzz_005.htm

10. Vertical Open Stub Antenna for the 40 and 20- meter Band: http://www.antentop.org/015/vosa_015.htm

11. Bidirectional Vertical Antenna for the 20- meter Band: http://www.antentop.org/019/ur0gt_directional_019.htm

12. Small Vertical for the 80- meter Band: http://www.antentop.org/014/sv_014.htm

Sloper Antennas

1. Broadband Sloper for the 80- meter Band: http://www.antentop.org/017/sloper_ua6ca_017.htm
2. Two Slopers for All Traditional Five HF-Bands: http://www.antentop.org/019/two_slopers_019.htm

Inverted V Antennas

1. Shortened Antenna for the 160- meter Band: http://www.antentop.org/016/ra3arn_016.htm
2. Dipole Antenna for 40- and 20- meter Bands: http://www.antentop.org/019/dl1ba_dipole__019.htm
3. Modified Dipole Antenna DL1BA for 40- and 20- meter Bands: http://www.antentop.org/019/rw4hfn_dipole_019.htm
4. Modified DL1BA Dipole Antenna for 40- and 20- meter Bands with additional 10- or 15- meter Band: http://www.antentop.org/019/rw4hfn_modified_dipole_019.htm
5. Modified DL1BA Dipole Antenna for 40-, 20-, 15-, and 10- meter Bands: http://www.antentop.org/019/rw4hfn_modified_dl1ba_019.htm

Delta Loop Antennas

1. Delta Loop for 40- and 20- meter Band: http://www.antentop.org/016/delta_016.htm
2. Half Loop Antenna for the 80-, 40,- 20,- and 15- meter Bands:

Unusual Antennas

1. Simple HF Antenna for the 20-, 17-, 15-, 12- and 10- meter Band: http://www.antentop.org/020/ra4nf_020.htm

Additional Source

1. MOXON for 15 and 10- meter Bands: by: Nikolay Kudryavchenko, UR0GT: http://www.antentop.org/015/moxon_015.htm
2. Antenna for the 10- meter Band Compact Twin Delta Antenna for the 80- and 40- meter Bands: http://www.antentop.org/018/delta_hf_antennas_018.htm
3. Modifications for the Multiband UB5UG Antenna : by: Oleg Safiullin, Kazan, UA4PA: Credit Line: Radio # 9, 1969: http://www.antentop.org/017/ua4pa_017.htm
4. Multi- Range Vertical Antenna UA1DZ: by Igor Grigorov, RK3ZK: http://www.antentop.org/ua1dz.htm
5. Multirange Vertical Antennas: by Igor Grigorov, RK3ZK: http://www.antentop.org/004/multi_vert.htm
6. Three- Rod Vertical Ground Plane Antenna for the 10- meter Band: by: DM3SF: Credit Line: Funkamateur # 8, 1968. http://www.antentop.org/017/dm3sf_017.htm
7. Vertical Antenna for 80-, 40-, 20-, 15- and 10- meter Bands: by: Yuri Medinets, UB5UG, Kiev : http://www.antentop.org/016/ub5ug_016.htm

CHAPTER 7

UA6AGW Antennas

UA6AGW Antennas… One separate ***Chapter 7*** is devoted to those antennas. Depends on design the antennas may be included into ***Chapter 5*** (Antennas for Limited Space) or into ***Chapter 6*** (Antennas for Limited Open Space). Some of the UA6AGW Antennas may be included into ***Chapter 4*** (Apartment Antennas). So I decided all UA6AGW Antennas include in the ***Chapter 7***.

UA6AGW Antennas are a new type of antennas. The antennas small in dimension, may work in several amateurs Bands and not hard to do. Depends on design the antennas may be installed in limited space.

C***hapter 7*** described practical design of the UA6AGW Antennas for amateur bands from 80 to 10- meters. All of those antennas are practically build and tested in the Air by hams. It works. UA6AGW Antennas not complicated in design. However they require more stuff and time compare to antennas described in previously *Chapters 1-**6***. By the way, some stuff used in the antennas may be changed to not expensive ones. For example, an air variable capacitor used at the antennas may be changed to a length of a coaxial cable. UA6AGW Antennas installed on the mast at some distance from human are safety antennas compare to apartment antennas that installed straight away at the shack.

UA6AGW Antennas required some experience and some equipment for tuning and adjusting. However the antennas may be tuned ever with usual SWR- Meter or using S- Meter of the transceiver. Of course, Antenna Analyzer (MFJ- 259B or similar one) may be needed in some cases. As well some experience in antenna tuning and design of external antennas would a big plus.

So, go to ***Chapter 7*** find your lovely antenna and try it into the Air!

UA6AGW Antennas for 80 and 40- meters

Aleksandr Grachev, UA6AGW

Credit Line: CQ-QRP # 34, pp.: 23- 29

Two HF- antennas for 80- and 40- meter Bands are described below. The antennas were designed by me after some my experimenters with magnetic Loop Antennas (Reference 1).

Figure 2 Coaxial cable "LCFS 114-50 JA, RFS (15239211)"

Antenna for the 40- meter Band

Figure 1 shows sketch of the UA6AGW Antenna for the 40- meter Band. Loop of the antenna made of a length a coaxial cable marked as "LCFS 114-50 JA, RFS (15239211)". **Figure 2** shows the cable. Outer tube of the coaxial cable has diameter near 25- mm (1 inch). Inner conductor of the cable is a copper tube in diameter of 9- mm (3/8 inch). The antenna fed by a coupling loop. For simplicity of the design the coupling loop made from the feeding coaxial cable.

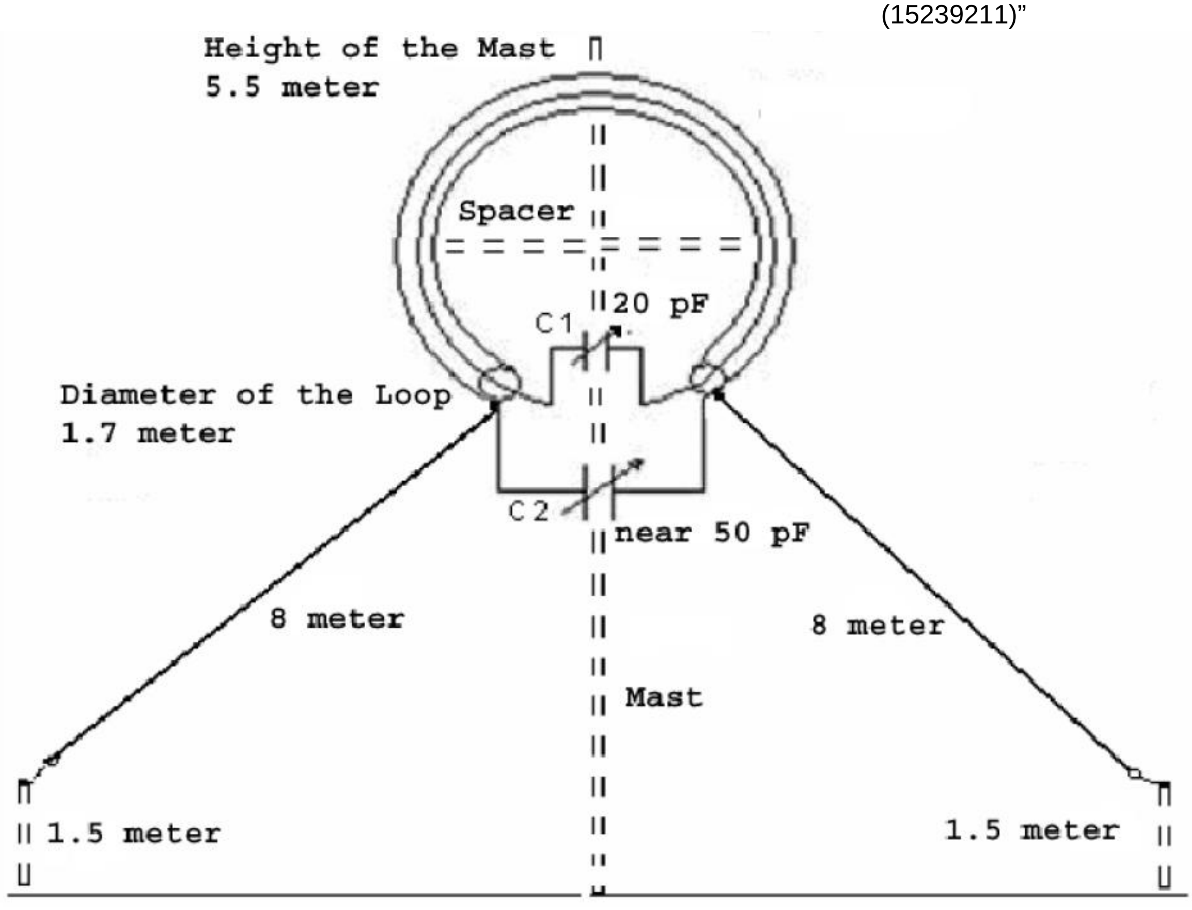


Figure 1 UA6AGW Antenna for the 40- meter Band

Figure 3 shows the coupling loop before it is circulated to loop. Length of the coaxial cable to be used for the coupling loop is 200- mm. Plastic from the length of the coaxial cable is removed on to 10– mm in the center and from two ends. Then braid of the coaxial cable is removed at the center. Inner conductor is soldered to the braid at the far (right) end of the length. Then the cable is turned to loop. Far end of the length is soldered to the first (left) side of the prepared cable. (In Russia the method of the making the coupling loop sometimes is named “method of the DF9IV”).

The coupling loop is fastened to the upper part of the antenna’s loop with help of a Scotch. **Figure 4** shows the picture of the antenna. Capacitors are in the plastic box. Horizontal wires have diameter 2... 3- mm. Copper strand wire or antenna cord may be used for those ones.

I believe that antenna arrangement according to **Figure 1** has optimal parameters. SWR of the antenna was less 2.0:1.0 at the pass band 200- kHz.

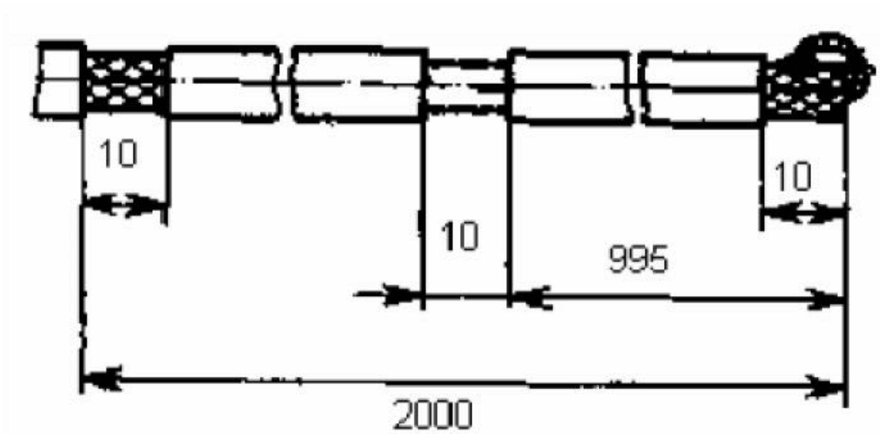


Figure 3 Preparation of the Coupling Loop for the UA6AGW Antenna for the 40-m Band (Dimensions in mm)

Figure 4 Picture of the UA6AGW Antenna for the 40-m Band

UA6AGW Antennas for 80 and 40- meters

In the vertical plane Antenna has DD similar to an ellipse with a maximum in the radiation along to the horizontal wires. Vertical plane radiation is going at the angle near 25- degree. In the horizontal plane the antenna has almost circular DD.

Antenna for the 80- meter Band

Figure 5 shows sketch of the antenna. Loop of the antenna made of a length a coaxial cable in diameter of 1-1/2 inch.

Horizontal wires are located parallel to the ground at the height 3.5- meter above it. Such antenna design was taken by me because of the local conditions and my possibility. Capacitors are placed in the plastic box. **Figure 6** shows a picture of the antenna. **Figure 7** shows the plastic box with installed inside capacitors. Coupling Loop made according to **Figure 8**. Horizontal wires have diameter 2... 3- mm. Copper strand wire or antenna cord may be used for those ones.

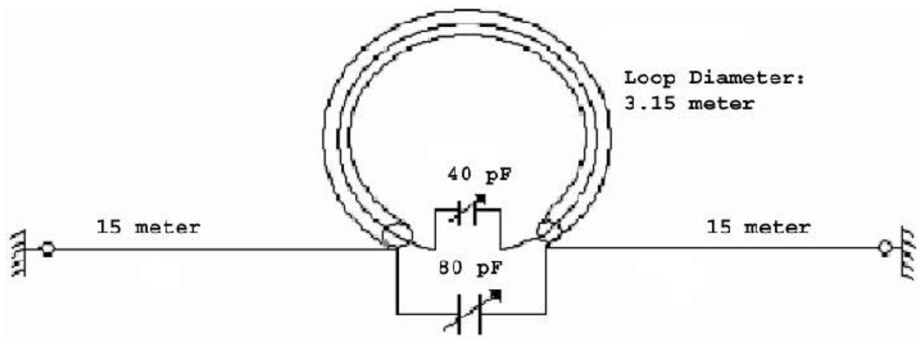


Figure 5 UA6AGW Antenna for the 80- meter Band

Figure 6 Picture of the UA6AGW Antenna for the 80-m Band

SWR of the antenna was less 2.0:1.0 at the pass band 100- kHz. In the vertical plane Antenna has DD similar to an ellipse with a maximum in the radiation along the horizontal wires. Vertical plane radiation is going at the angle near 25- degree. In the horizontal plane the antenna has almost circular DD.

Tuning of the Antennas

Tuning of the antennas is very simple. Firstly, set the capacity of the capacitor C1.

Capacity should be 20… 23- pF for antenna for 40- meter Band or 37… 40- pF for antenna for 80- meter Band. Then turn on the coaxial cable to transceiver. Antenna is tuned up to the resonance with the help of capacitor C2.

It may be done either in the receiving mode- just tune the C2 on to maximum receiving signals, or in the transmitting mode- just tune the C2 on to minimum SWR. It is possible to tune the antenna with the help of a FSM (Field Strength Meter). Maximum reading the FSM is matched to the minimum SWR.

Test of the antennas

The antennas were installed at my cottage where I was not so often in the Air to be enough to get an objectively judgement about the performance of the antennas. Antenna for the 40- meter Band was used to me often compare to antenna for the 80- meter Band.

At the 40- meter Band all continents (above the Antarctica) were worked with the antenna. At the 80- meter band I worked with East, West, North Europe, with ex- USSR Asia (Habarovsk, Chita), with Middle East. I used a SDR- transceiver with 100- W output on the bands.

Figure 7 Plastic Box with Capacitors

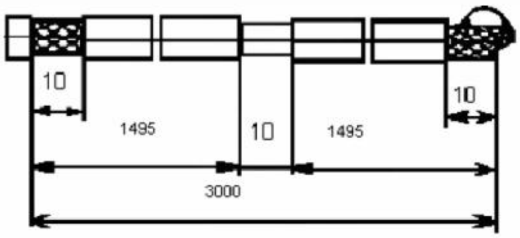


Figure 8 Preparation of the Coupling Loop for the Antenna UA6AGW for the 80-m Band (Dimensions in mm)

Resume

Table 1 shows data for resume on the antennas

References

1. Aleksandr Grachev:- Experimenters with Magnetic Loop Antennas.: CQ- QRP # 27, pp.: 9- 11.

Table 1 Data for UA6AGW Antenna

#	Antenna:	Rate
1	Not required counterpoises or good ground	Good
2	Vertical lobe is at 25 degree to the horizon	Very Good
3	May be installed at height 1/8- lambda above the ground to get the lobe vertical lobe 25 degree to the horizon	Very Good
4	Has SWR less 2.0:1.0 at pass band 100- kHz at 80- meter Band and SWR less 2.0:1.0 at pass band 200- kHz at 40- meter Band	Good
5	Easy to tune up	Good
6	Has circular horizon DD	Good
7	Has Low noise	Very Good
8	Low affected to -man made/static/lighting- interferences	Good
9	Not affected to moving around metal objects or man	Very Good

73/72! UA6AGW

UA6AGW Antennas: Modification and Development

Aleksandr Grachev, UA6AGW

Credit Line: CQ-QRP # 39, pp.: 22- 27.

In the summer 2011, UA6AGW persistently have been working on improvement of his antennas (see **Reference 1**). Article below is just a digest of the hard work.

Introduction

Figure 1 shows parameters of the UA6AGW Antenna V.40.0 that is obtained from the test with help of an Antenna Analyser AA- 330M. As it seen from **Figure 1**, the antenna has too much reactance at the working frequency. Next version of the antenna, UA6AGW Antenna V.40.1, has no the lack.

UA6AGW Antenna V.40.01

At the new version of the antenna the diameter of the loop was decreased. There were shortened the horizontal wires. Capacity of the capacitor C2 was increased. **Figure 2** shows the design of the new antenna- UA6AGW Antenna V.40.01.

The modification is caused increasing of the RF-voltage across the capacitor C2. If you remember, in the previously version (UA6AGW Antenna V.40.0) it was used an air- gap capacitor for C2.

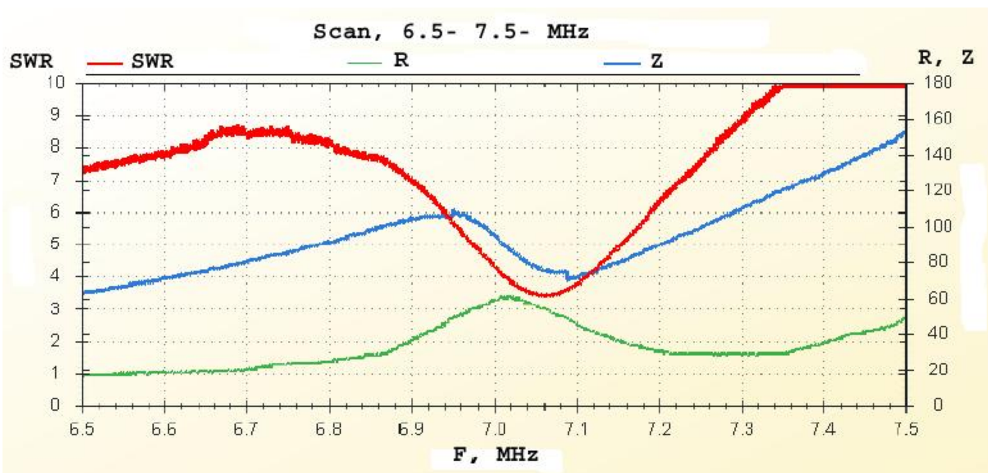


Figure 1 Parameters of the UA6AGW Antenna V.40.0

At the new version (UA6AGW Antenna V.40.01) there were used a fixed High- Voltage RF-Capacitors (Russian brand K-15U-1) for C1 and C2. Antenna was tuned in to resonance by changing of the length of the horizontal wires. **Figure 3** shows the box with the capacitors.

Figure 4 shows parameters of the UA6AGW Antenna V.40.01 that were obtained from the test with help of an Antenna Analyser AA- 330M. UA6AGW Antenna V.40.1 was demonstrated at annual *South Russia Maykop- Hamfest – 2011*.

UA6AGW Antenna V.40.02

Another version of the antenna- the UA6AGW Antenna V.40.02 was created like a cheap, light and suitable for field day antenna design. To reach the goals for loop of the antenna it was used a light coaxial cable with outer diameter of ½ inch.

Geometrical sizes of the antenna parts and the value of the capacitors are the same as for UA6AGW Antenna V.40.01.Parameters of the antenna are almost equal to parameters of the UA6AGW Antenna V.40.01 (those ones are shown on **Figure 4**).

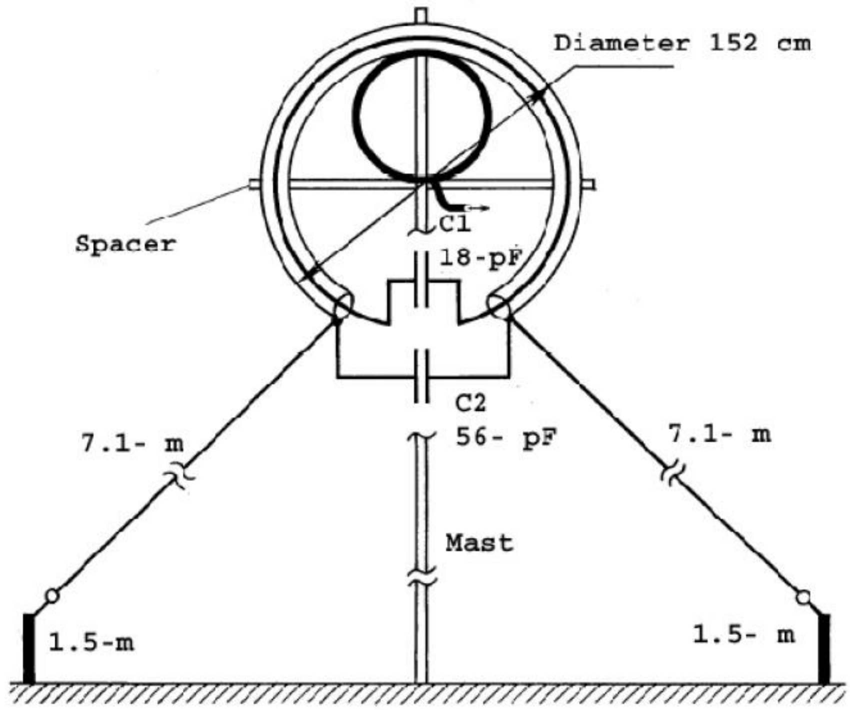


Figure 2 Design of the UA6AGW Antenna V.40.01

Figure 3 Capacitors Box

The capacitor C2 is switched on into the antenna with help of a two- wire line. It is possible use to almost any design of the two wire line. Antenna mast at my antenna installation has length near 11- meter. The two wire line going from the bottom of the loop is near 8- meter long.

Coupling loop for the antennas

Design and sizes of the coupling loop that used for the antennas is the same as for antennas described in the **Reference 1**. Below there are several simple rules how to install the coupling loop.

UA6AGW Antenna V.80.01

Design of the UA6AGW Antenna V.80.0 was modified for purpose to reach a low reactance and ability to tune the antenna to resonance across the 80- meter Band. The new version was named UA6AGW Antenna V.80.01.

Figure 5 shows the design of the antenna. Antenna has pass band (at SWR 2.0: 1.0) only 100- kHz. However, capacitor C2 (the capacitor is accessible for me so to tune the antenna for needed part of the band is a not big deal) can tune the antenna across the 80- meter Band.

At first, find on the antenna loop a point that is equidistance from left and right side of the C2. It is ***the point of symmetry*** of the antenna.

At second, find the point of symmetry of the coupling loop. The coupling loop is mounted in the top of the antenna loop. Point of symmetry of the coupling loop should concur with the point of symmetry of the antenna. **Figure 6** shows the coupling loop on the antenna.

At third, to fasten with help of the cable ties the coupling loop to the antenna loop at the distance of 6…8- cm from the point of symmetry of the antenna loop. **Figure 7** shows the bonding.

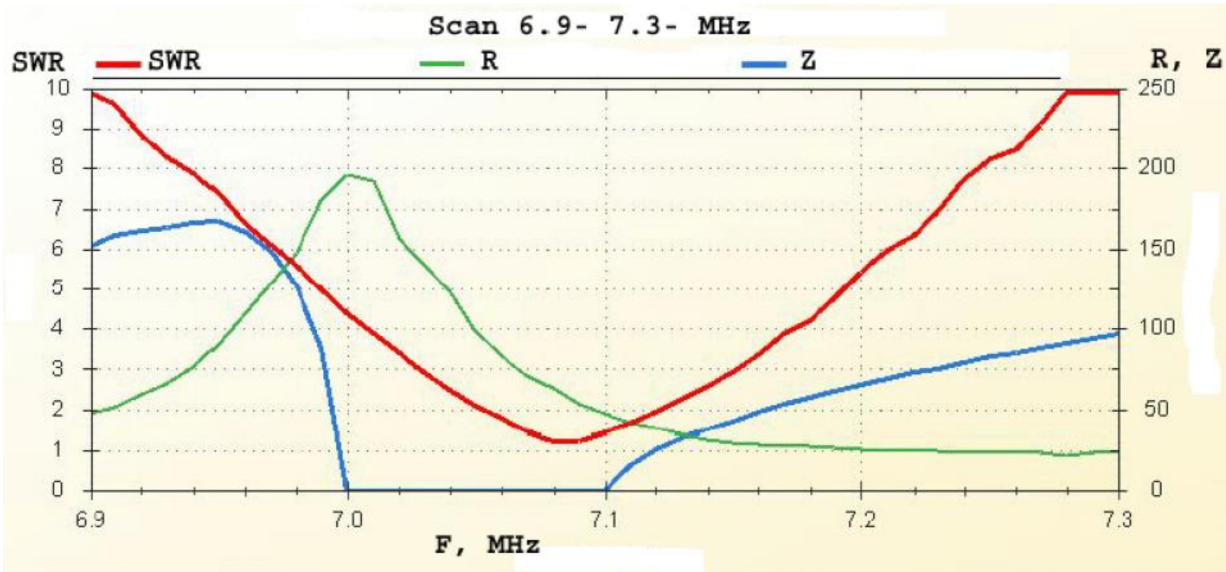


Figure 4 Parameters of the UA6AGW Antenna V.40.01

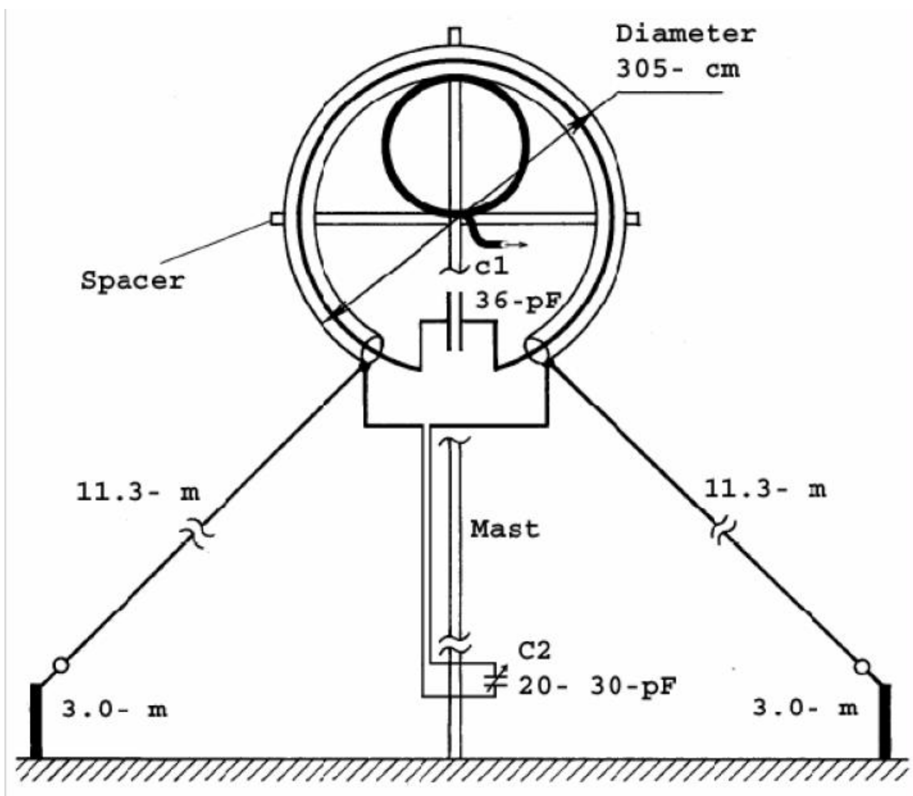


Figure 5 Design of the UA6AGW Antenna V.80.01

UA6AGW Antenna V.20.00

The antenna was designed and made by Igor Kulikov, UA3GDX (QTH: Gryazi, Lipetsk Region). **Figure 8** shows the design of the antenna. Loop of the antenna made from a water tube in diameter of 2/3 inch. It was a tube with outer aluminum cover and inside plastic form. Aluminum cover was used like the braid in the loop in the design of the UA6AGW Antenna. A coaxial cable was inserted into the tube. Braid of the coaxial cable was the inner conductor of loop in the design of the Antenna UA6AGW. Central conductor of the coaxial cable did not use to. Capacity of the capacitors C1 and C2 are shown approximately and depend on the antenna installation.

However, it looks like that capacity of the C1 should be close to 8… 15- pF and capacity of C2 should be close to 24… 30- pF.

Horizontal wires in the antenna design made of a copper wire in diameter of 3- mm. The wires are going along plastic fishing poles. The poles hold the form of the antenna. Such rigid design allows rotate the antenna on to needed direction.

Coupling loop for the UA6AGW Antenna V.20.0 may be made similar to the coupling loop from **Reference 1**. However, perimeter of the coupling loop should be decreased to 800- mm. The antenna was installed at the height of 8- meter above the ground. UA6AGW Antenna V.20.0 was compared with a G5RV Antenna that was installed at 21- meter above the ground. It was used a transceiver TS870S with testing of the antennas. Igor wrote about the testing: At the Mode JT65A (software JT65-HF) the UA6AGW Antenna V.20.0 allowed me to work with South Africa- 18- dB, Far East– 12- dB, Australia- 15- dB. G5RV Antenna received those territories much worst. UA6AGW Antenna V.20.0 is low noise antenna. The antenna could gain in direction (when it rotated) up to 5… 10- dB, sometimes up to 15- dB.

References

1. Aleksandr Grachev, UA6AGW: **Antennas UA6AGW,- ANTENTOP- 01- 2013, pp.: 31- 35.**

73! de UA6AGW

Figure 6 Coupling Loop on the Antenna Loop

Figure 7 Bonding of the Coupling Loop to the Antenna Loop

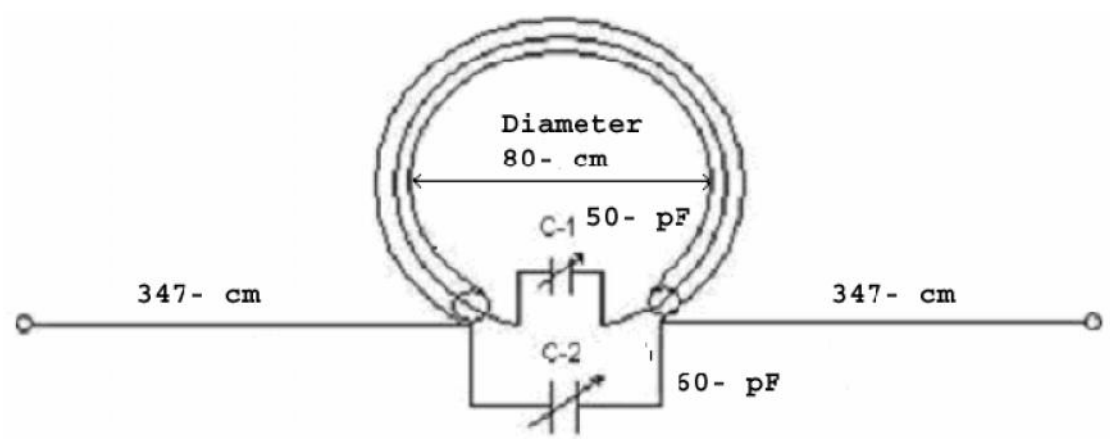


Figure 8 UA6AGW Antenna V.20.0

Directional UA6AGW Antenna V.7.00

Aleksandr Grachev, UA6AGW

Credit Line: CQ-QRP # 43 (Summer, 2013) pp.: 21-27.

The antenna was born after numerous experiments that were made in the past three years. Russian Patent # 125777 was obtained for the antenna. ***Prototype*** of the antenna is described in ***Reference 1, 2***. Some experimenters on the born of the antenna are described in ***Reference 3***. **Figure 1** shows the Directional Antenna. **Figure 1** shows all antenna dimension and placement of the antenna parts.

The antenna has some parts that are similar to the ***prototype***. Loop part of the antenna made of a coaxial cable and this one is placed vertically.

There are two phase- shift capacitors- C1 and C2. However horizontal wires have some modifications. Two long wires are connected to one part of the loop. One of the long wires (that is placed in the direction of the maxima radiation) form the main lobe. Other one long wire suppresses back radiation. Two short wires provide symmetrical of the antenna.

Design: Loop is made from so- called half- inch coaxial cable with crimped copper braid. The copper braid is covered by two layers of protection lacquer then covered by electrical protection plastic tube.

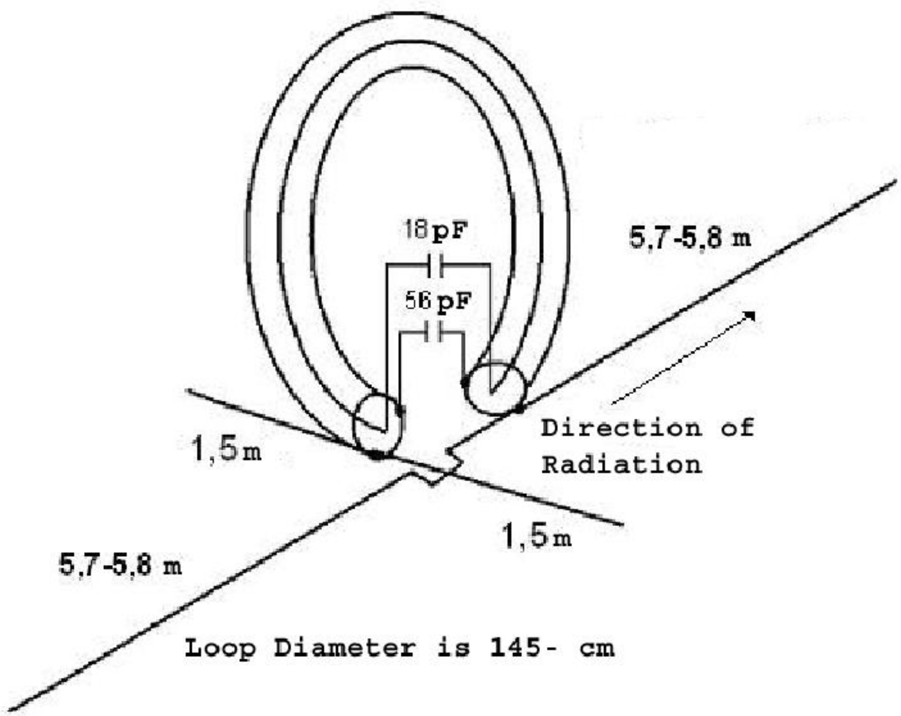


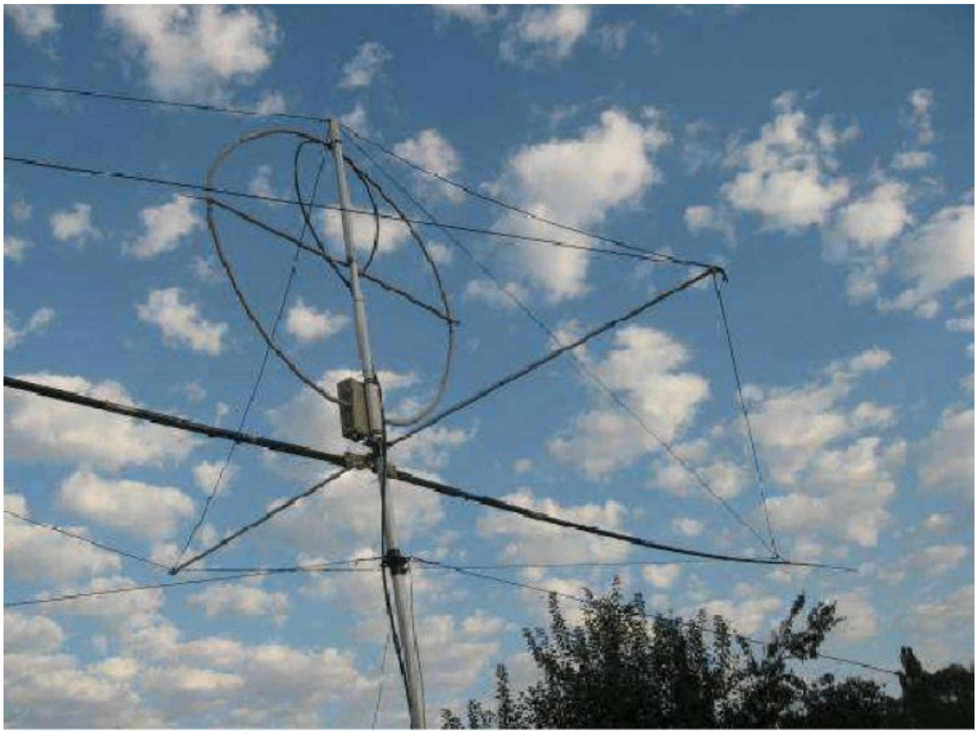
Figure 1 Directional UA6AGW Antenna V. 7.00

It is made for weather – proof sustain. **Picture 1** shows the antenna. Usual plastic fishing poles are used for the form for long wires. Inside the fishing pole a multi-cored copper wire is going through. Thin ends of the fishing pole are changed by light aluminum wire in diameter 8- mm. The multi- cored wire is connected to the aluminum wire. Short wires are placed along plastic tube in 14- mm diameter.

The tube is not only support for the short wires. Rope guys going from the ends of the tube to ends of the fishing poles provided rigid of the antenna structure.

Picture 2 shows mounting of the plastic tube and wire montage of the horizontal wires.

Mast of the antenna has height in 8- meters. Two water tubes made the mast. First tube that is sitting on the ground is a metal tube in 48- mm OD. It was in 5- meters long. The second one, that holds the antenna structure, is plastic tube in 42- mm OD. The plastic tube was in 3- meters long. The plastic tube is inserted inside the metal tube that allows rotate the antenna.



Picture 1 Directional UA6AGW Antenna V. 7.00

A simple home- made adaptor (made of from two pieces of metal water tubes in diameter 48- and 55- mm) is used for connection the mast's tubes. **Picture 3** shows jointing of the plastic and Metal tube.

The antenna fed by a coupling loop. For simplicity of the design the coupling loop made from the feeding coaxial cable. **Figure 2** shows the coupling loop before it is circulated to loop. Length of the coaxial cable to be used for the coupling loop is 200- mm. Plastic from the length of the coaxial cable is removed on to 10- mm in the center and from two ends.

Then braid of the coaxial cable is removed at the center. Inner conductor is soldered to the braid at the far (right) end of the length. Then the cable is turned to loop. Far end of the length is soldered to the first (left) side of the prepared cable. (In Russia the method of the making the coupling loop sometimes is named -method of the DF9IV). The coupling loop is fastened to the upper part of the antenna's loop with help of a Scotch and ties. Below there are several simple rules how to install the coupling loop.

Picture 2 Mounting of the Plastic Tube and Wire Montage of the Horizontal Wires

Picture 3 Jointing Mast's Tubes

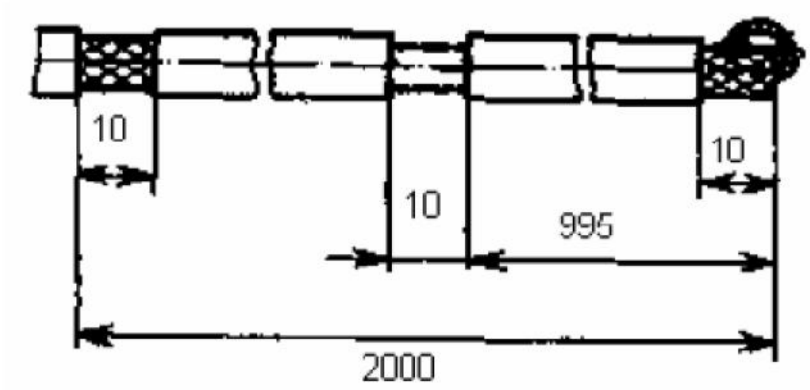


Figure 2 Preparation of the Coupling Loop for the Directional UA6AGW Antenna V. 7.00

At first, find on the antenna loop a point that is equidistance from left and right side of the C2. It is ***the point of symmetry*** of the antenna.

At second, find the point of symmetry of the coupling loop. The coupling loop is mounted in the top of the antenna loop. Point of symmetry of the coupling loop should concur with the point of symmetry of the antenna. **Picture 4** shows the coupling loop on the antenna.

At third, to fasten with help of the cable ties the coupling loop to the antenna loop at the distance of 6-8- cm from the point of symmetry of the antenna loop.

Antenna was tuned (when it was placed on mast) in height 5- meters (it is from the ground to the top of the mast).
Horizontal wires and matching box with capacitors was at 3.5- meters above the ground. A 2- meter ladder was used by me for tuning the antenna.

Antenna works fine ever at the small height. F/B ratio was near 20-dB in this case. Antenna was tuned to 7080- kHz in mind that the resonance frequency move up (to 7100- kHz) at the height 8- meter.

Antenna is simple to tune to the resonance. It may be tuned with help C2 (56- pF at **Figure 1**) to maximum RF-voltage at the long horizontal wire or with help receiver to maximum receiving signal. However I used fixed capacitors at my antenna. So I did tuning of the antenna by changing length of the horizontal wires.

Preliminary Summary: All good features of the prototype antennas (**References 1**, **2**) are not lost at the UA6AGW Antenna V. 7.00. The features are: small dimension, easy to do, interference immunity, ability to operate on small height. Antenna has input impedance 50- Ohm. Antenna bandwidth (at SWR 2.0:1.0, measured by an antenna analyzer) is near 150- kHz. **Picture 5** shows scan from the antenna analyzer.

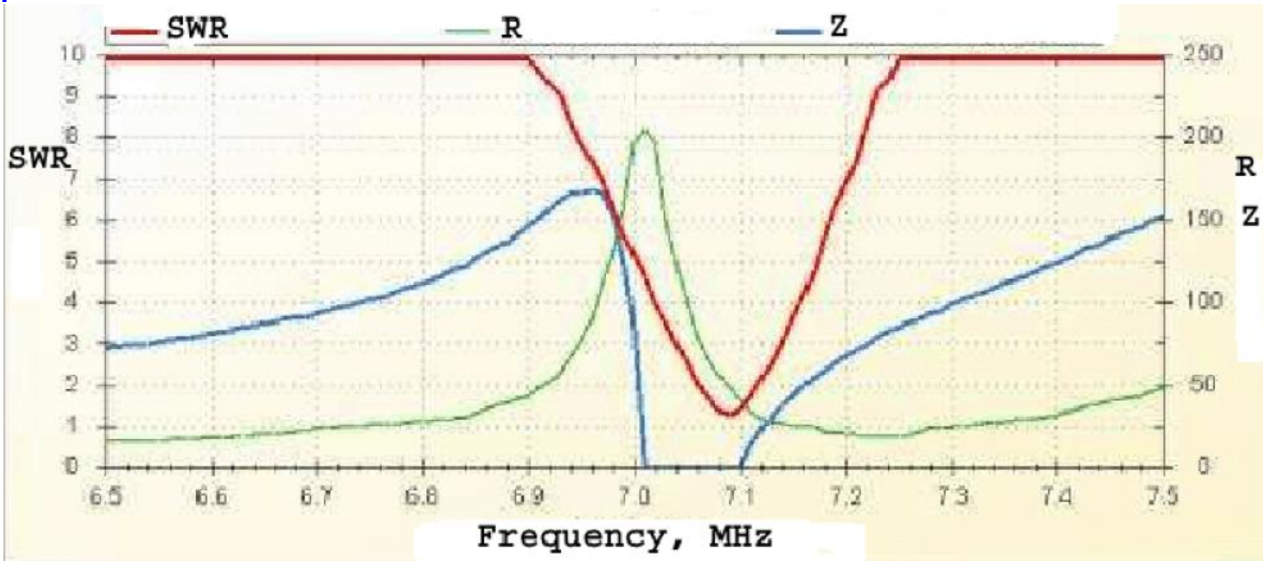
Within ten month UA6AGW Antenna V. 7.00 was tested in the Air. The antenna was compared with UA6AGW Antenna V.40.02 (**Reference 4**).

Antennas were switched through a small period of time. UA6AGW Antenna V. 7.00 had the same strength of the reception in main lobe (compare to UA6AGW Antenna V.40.02) however stations going not from main lobe were weak in reception.

Figure 3 shows DD of the UA6AGW Antenna V. 7.00 in horizontal plane. The DD was obtained by measuring of the signal of control transmitter located at distance 1- km from the antenna. Width of the DD in horizontal plane (at level 3- dB) was near 60 degree. Level F/B was not less 20- dB. Level F/S was near 15 dB.

Picture 4 Coupling loop on the Directional UA6AGW Antenna V. 7.00

At day time the antenna suppressed local stations (in radius 300- 350- km) on to 20- 30- dB. So the main lobe in vertical plane should have angle in 35- 40 degree.



Picture 5 Data for the UA6AGW Antenna V. 7.00

Antenna gain was estimated according to diagram and formulas from page 61 at **Reference 5**. Antenna gain for the antenna should be near 10- dB. **Figure 4** shows the diagram.

Summary:

1. UA6AGW Antenna V. 7.00 differs little from the prototype because turns to directional antenna.
2. Having small dimension the antenna compare to prototype has good F/B ratio in 20-dB.
3. F/B and F/S ratio for the antenna is constant at the working range.
4. There is a real possibility to design a small directional antenna for the 80- meter Band.
5. Antenna keeps all merits of the prototype.
6. Antenna is simple to design and easy to tune

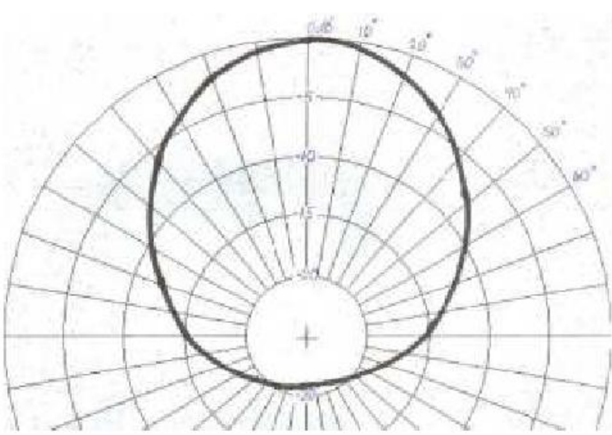


Figure 3 DD of the UA6AGW Antenna V. 7.00 in Horizontal Plane

References:

1. UA6AGW Antenna V.40, Aleksandr Grachev, Radio # 2, 2011, pp.: 59- 61
2. UA6AGW Antenna V. 80, Aleksandr Grachev, Radio 8, 2011, pp.: 60- 61.
3. Experimenters with Magnetic Loop Antennas, Aleksandr Grachev, CQ-QRP # 27, 2009, pp.: 9- 11.
4. http://www.antentop.org/017/ua6agw_md_017.htm
5. Antennas, Karl Rothammel, Nash Gorod, Minsk- 2001

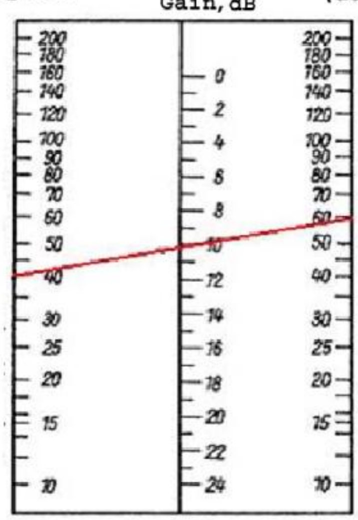


Figure 4 Diagram to Estimate Antenna Gain for the UA6AGW Antenna V. 7.00

UA6AGW Field Antenna V. 40.21

Aleksandr Grachev, UA6AGW

Credit Line: CQ-QRP # 46 (Spring, 2014) pp.: 15- 19.

The antenna was designed for installation in a field conditions or at limited space. Antenna may be installed on to a low- height mast. Antenna does not required guys for fixing mast and takes small room for installation. **Figure 1** shows schematic of the antenna.

At first experimenters the two horizontal wires were bended (prototype UA6AGW Antenna V.40. 20, ***ANTENTOP 01, 2014, p.: 42***). Then to reduce the occupied room the loop of the antenna was curved. **Picture 1** shows the Loop.

Two traverses for horizontal wires made from plastic fishing poles in 4- meters length each. The horizontal wires made from an audio cord in 1-mm diameter (18-AWG). **Picture 2** shows the traverse. Classical antenna insulators do not use in the antenna design. Fishing cord and plastic ties are used instead of those ones. The hook made from a thick bare wire is installed at some ends of the fishing cord. Capacitor C1 is a high- voltage capacitor. Variable capacitor C2 is usual tuning capacitor 12- 495- pF from an old tube receiver.

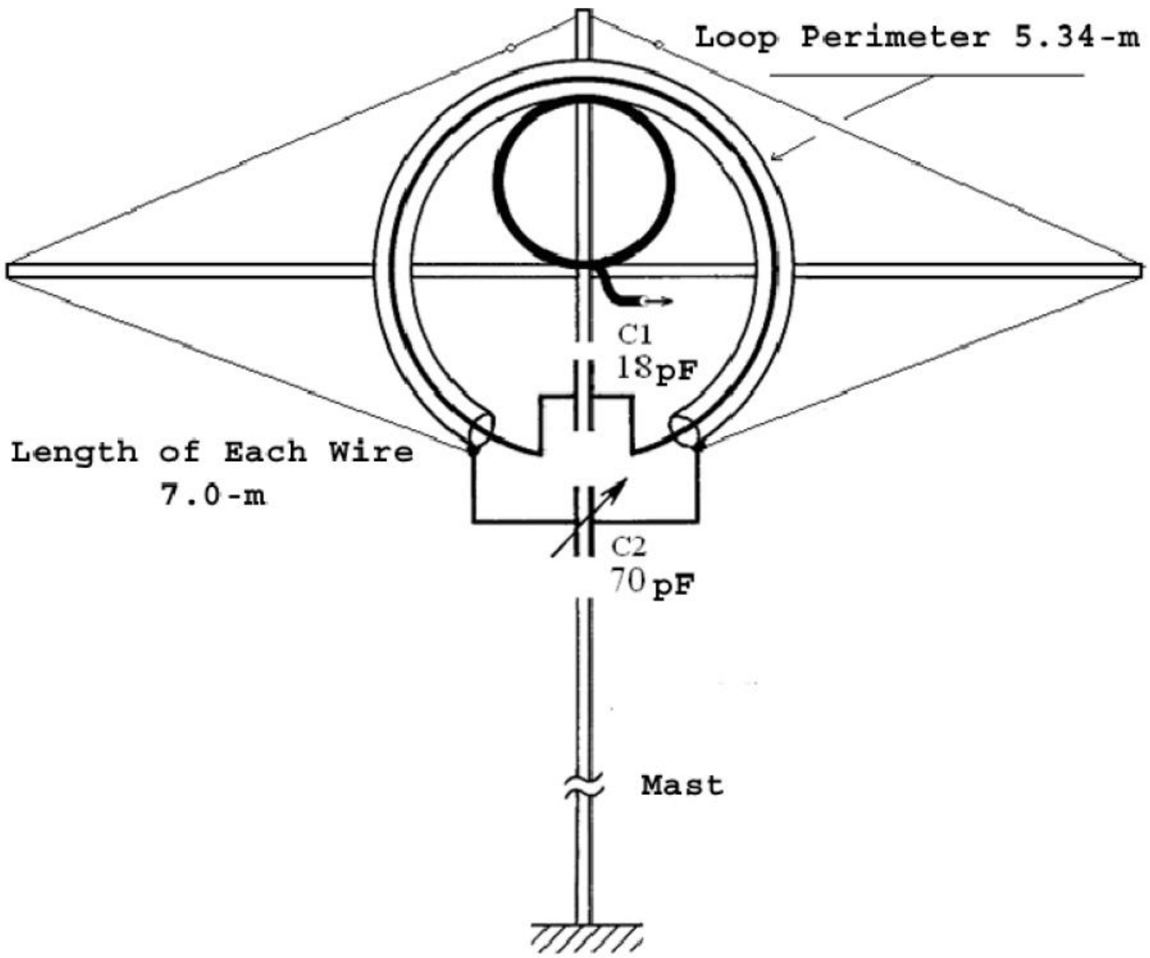


Figure 1 Schematic of the UA6AGW Field Antenna V.40.21

However every next plates of the capacitor are removed (to increase the working voltage). The capacitor connected to the loop only by two stator sections.

Picture 1 Loop of the UA6AGW Field Antenna V.40.21

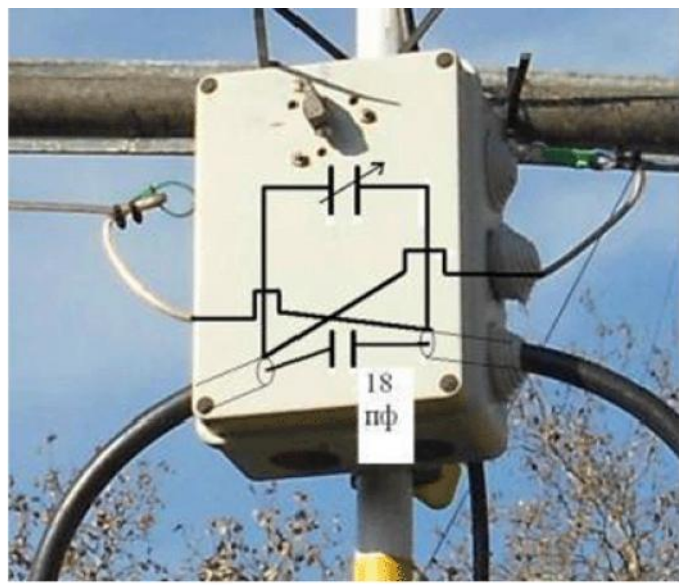
Picture 3 Ends of the Fishing Cord

Figure 2 shows the coupling loop before it is circulated to loop. Length of the coaxial cable to be used for the coupling loop is 200- mm. Plastic from the length of the coaxial cable is removed on to 10- mm in the center and from two ends. Then braid of the coaxial cable is removed at the center. Inner conductor is soldered to the braid at the far (right) end of the length. Then the cable is turned to loop. Far end of the length is soldered to the first (left) side of the prepared cable. The coupling loop is fastened to the upper part of the antenna's loop with help of a Scotch and ties. Below there are several simple rules how to install the coupling loop.

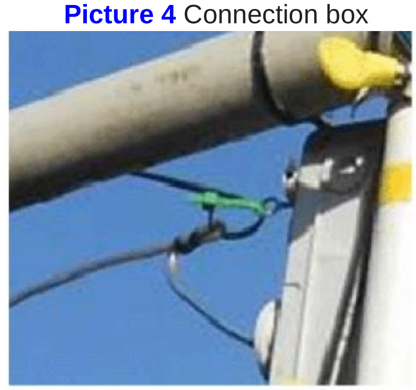
At first, find on the antenna loop a point that is equidistance from left and right side of the C2. It is ***the point of symmetry*** of the antenna.

Picture 3 shows ends of the fishing cord. **Picture 4** shows connection box of the antenna. **Picture 5** shows horizontal wires at the connection box.

Picture 2 Traverse of the UA6AGW Field Antenna V.40.21



Picture 4 Connection box



Picture 5 Horizontal Wires at Connection Box

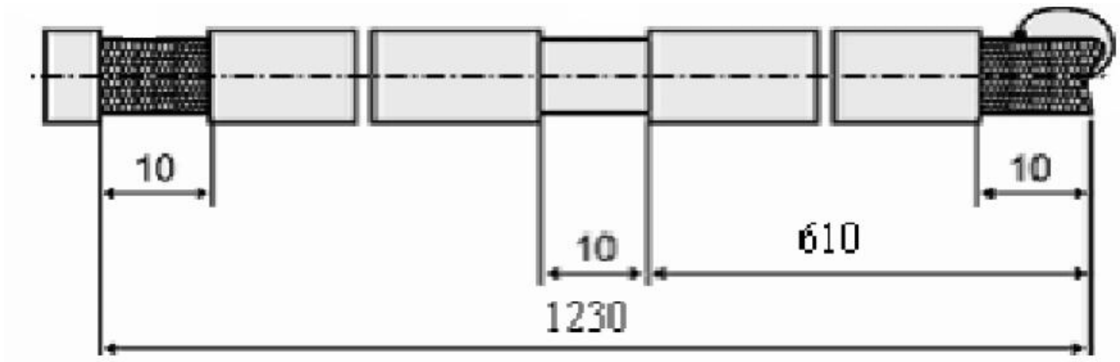


Figure 2 Preparation of the Coupling Loop

At second, find the point of symmetry of the coupling loop. The coupling loop is mounted in the top of the antenna loop. Point of symmetry of the coupling loop should concur with the point of symmetry of the antenna.

At third, to fasten with help of the cable ties the coupling loop to the antenna loop at the distance of 6-8- cm from the point of symmetry of the antenna loop.

Picture 6 shows the UA6AGW Field Antenna V.40.21. UA6AGW Antenna V.7.01 (horizontal wires are down) is seen on the background.

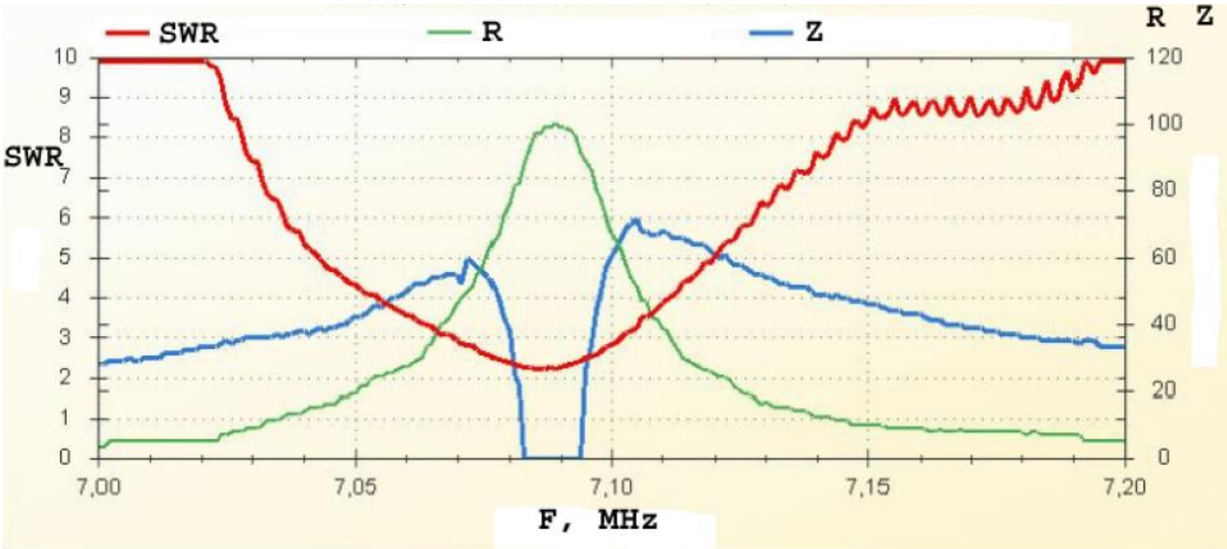
Antenna tuned to the resonance by capacitor C2. In receiving mode the antenna is tuned by maxima reception. In transmitting mode the antenna is tuned by maxima RF- Voltage on the horizontal wires. **Picture 7** shows parameters of the antenna measured by AA-330M Antenna Analyzer. Pass Band of the antenna at SWR 2.0: 1.0 is 90- kHz. However in the field conditions when capacitor C2 is accessible the antenna may be easy to retune.

UA6AGW Field Antenna V.40.21 was tested in the Air at height 6 and 4- meters above the ground. The antenna was compared with UA6AGW Antenna V.40.02 (**Reference 1**) installed on 7- meter height mast. UA6AGW Antenna V.40.21 was tuned to 7120- kHz. UA6AGW Antenna V.40.02 was tuned to 7110- kHz.

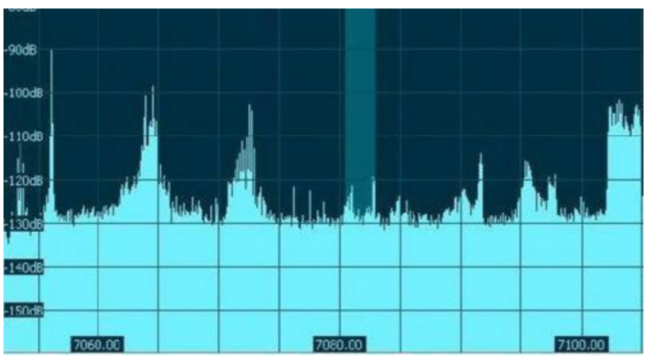
Picture 6 UA6AGW Field Antenna V.40.21

Test at 6-meters height.

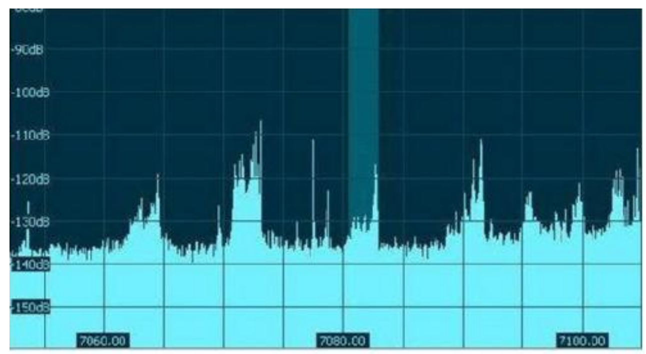
UA6AGW Antenna V.40.21 is low noise compare to UA6AGW Antenna V.40.02. **Picture 8** shows screen shot of my SDR transceiver with UA6AGW Antenna V.40.02. Receiving signal is near minus 120- dB. Ratio S/N is near 10- dB. **Picture 9** shows screen shot the SDR transceiver with UA6AGW Antenna V.40.21. Receiving signal is near minus 120- dB. Ratio S/N is near 15- dB. The picture is taken at day light time with minimal time tag.



Picture 7 Parameters of the UA6AGW Field Antenna V.40.21



Picture 8 Screen Shot from SDR Transceiver with UA6AGW Antenna V.40.02



Picture 9 Screen Shot from SDR Transceiver with UA6AGW Antenna V.40.21

Noise difference between the two antennas was from 5 up to 10- dB. Noise increased when UA6AGW Antenna V.40.21 was rotated in direction to the central part of the city. Then UA6AGW Antenna V.40.21 was oriented to minimum of the noise. At the position the UA6AGW Antenna V.40.21 (compare to UA6AGW Antenna V.40.02) gives advantage at reception of weak signals.

Test at 4-meters height.

At height 4- meters above the ground UA6AGW Antenna V.40.21 worked in the same way as at 6- meter height above the ground. No detuning in the resonance frequency was found. Antenna provided reception with low noise at day time period.

It was found very interesting features of the UA6AGW Antenna V.40.21. At evening time the antenna provided reception of the nearest stations with lower level compare with UA6AGW Antenna V.40.02.

Stations, placed at radius 400- 500- km, were received lower then 10- dB. Stations, placed at radius 400- 800- km, were received lower then 5- dB. Stations placed at distance 1000- km and more from the antenna was received with the same level as with UA6AGW Antenna V.40.02.

Summary

UA6AGW Antenna V.40.21 could work at a small height. The antenna takes small room. Antenna made from low-cost materials. Antenna is easy to tuning and installations.

Reference

1. http://www.antentop.org/017/ua6agw_md_017.htm

73! UA6AGW

UA6AGW Antenna V.40.20

Aleksandr Grachev, UA6AGW

The experimental antenna made on the base of previously described versions of the UA6AGW Antenna for 40- meter Band. Aim of the experiment was to reduce the room that the horizontal wire takes. For the purpose one of the horizontal wires was bended. **Figure 1** shows schematic of the antenna.

Antenna was tuned (by C2) to the 40- meter Band and connected to my transceiver. It was found that the antenna lost its symmetrical properties. Electrical noise appeared at receiving mode. At transmitting an RF-Voltage appeared at the transceiver cabinet. However it was possible corrected (return symmetrical properties back) by lengthening the bended horizontal wire on 10 percent.

Diagram Directivity was taken for the antenna. DD of the antenna looks like an ellipse. Receiving from the sides of the ellipse is lower on 3- 6- dB. Receiving from the bended horizontal wire is lower on to 10- dB.

Summary: It was made simple, easy to do and tune antenna with directional properties.

73! UA6AGW

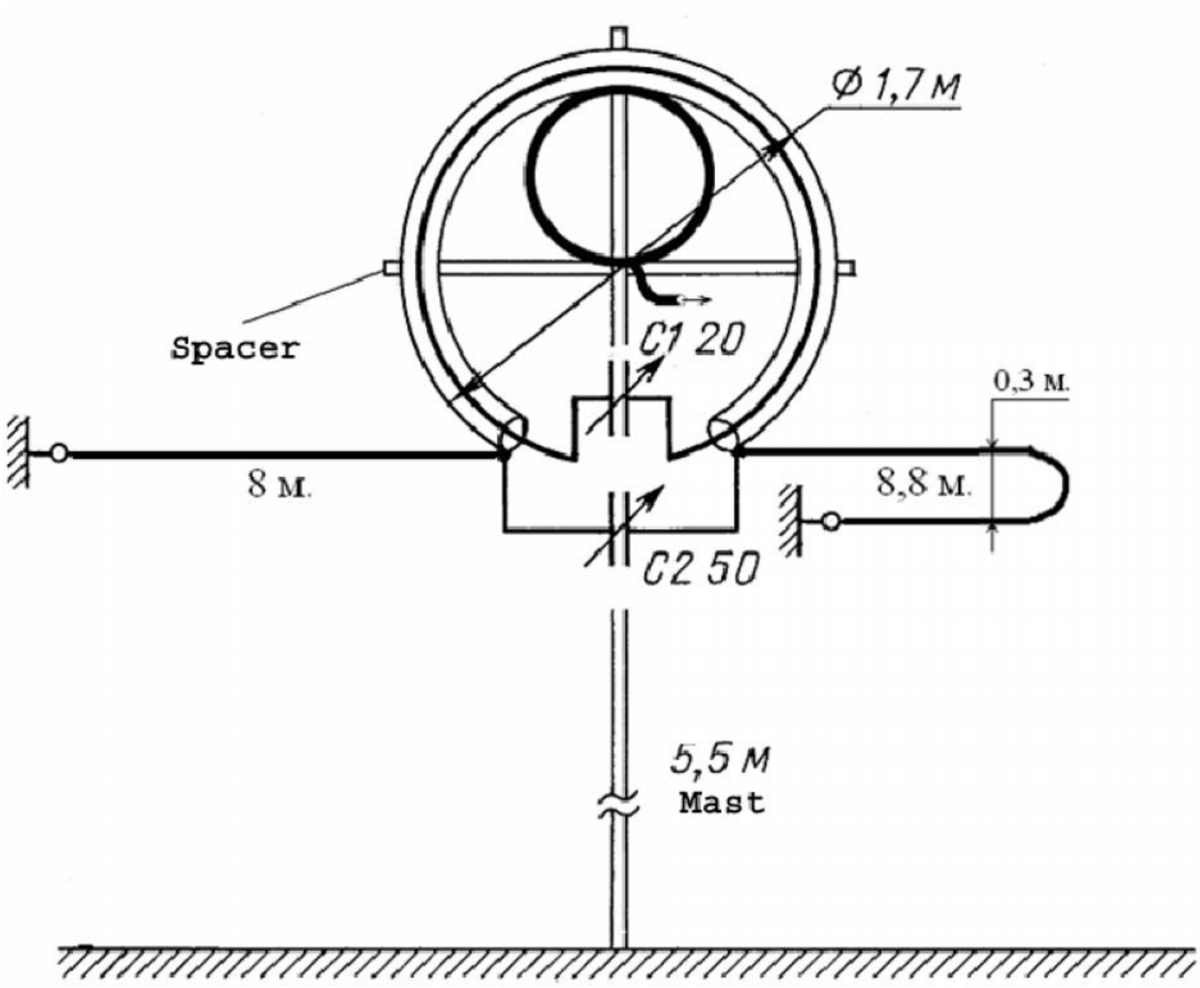


Figure 1 UA6AGW Antenna V.40.20

UA6AGW Antenna V.20- 10.51 (14.0- 29.5- MHz)

Aleksandr Grachev, UA6AGW

Credit Line: http://samlib.ru/u/ua6agw_g_a

UA6AGW Antenna V. 20-10.51 can work in frequency range from 14.0 to 29.5 MHz that is covered 20, 17, 15, 12 and 10- meter amateur Bands. This is provided by tuning the antenna in resonance to the used band with help of a remote- control variable capacitor installed at the antenna. UA6AGW Antenna V. 20-10.51 is designed for easy and quick installation in the field. **Figure 1** shows schematic diagram of the antenna.

At the end of the all it was designed ***Universal Field Antenna***. The antenna may be installed at any open place in the forest, on the mountain, on the shore as well on a small boat or truck. Antenna may be installed by force of one man. Antenna could stand storm weather.

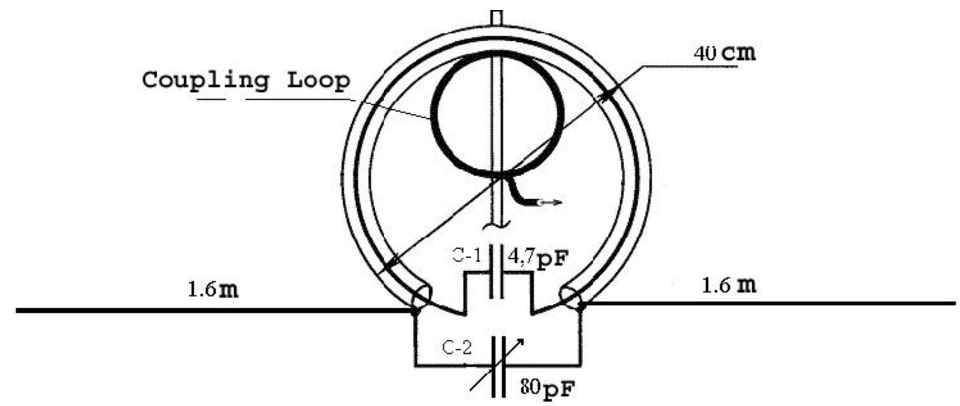


Figure 1 Schematic diagram of the UA6AGW Antenna V. 20-10.51

Schematic diagram of the UA6AGW Antenna V. 20-10.51 is the same as for previously published UA6AGW Omnidirectional Antennas (***Reference 1***). **Figure 1** shows dimensions for the range of 18.0- 29.0- MHz. For lower edge of the working range - 14.0- 18.0- MHz the horizontal wires placed under antenna should be extended to 3- meter length and additional capacitor should be switched in bridge to C2.

Design of the Antenna

To be compatible for transportation in the car it was set up some limitation factors when the Antenna was designed.

1. Length of any part of the antenna should not be more the 2 meter length.
2. Diameter of the loop should not be more the 1 meter.
3. DD of the antenna in the horizontal plane should be circular.

Antenna was mounted on the sectional plastic mast in 6- meters height. Each section is in 2- meter length. **Figure 2** shows the UA6AGW Antenna V. 20-10.51 on the mast. The antenna mast does not required guys.

The mast is a commercial made one 8- meter height plastic mast named “Mast 8-2U” that is produced by R-QUAD (***Reference 2***). There are used only 3 sections (from 4 sections for 8- meter height) for 6- meter height. Mast stays vertically and firmly with help of two struts. **Figure 3** shows the mast in vertical position. The struts fastened to the ground with help of a metal peg. **Figure 4** shows strut fastened to the ground.

Main loop of the antenna made of 1/2 inch corrugated coaxial cable. Outer plastic was removed. For protection from weather conditions it was used snap- up plastic tube for electrical wires. Horizontal wires were made from telescopic pair of aluminum tubes.

Figure 2 UA6AGW Antenna V. 20-10.51 on the mast

Figure 3 Mast in vertical position

Figure 4 Strut fastened to the ground

Figure 6 Center (with a clamp) of the horizontal wire

Inner tube was in 14- mm diameter and outer tube was in 18- mm diameter. In folded position the horizontal wire has length in 1.6- meter. Outer tube holds the inner tube with help of a clamp. **Figure 5** shows assembled UA6AGW Antenna V. 20-10.51. **Figure 6** shows center (with a clamp) of the horizontal wire.

Home brew "butterfly" variable capacitor is used for tuning the antenna. Plates of the capacitor made of galvanized iron in 0.5- mm thickness. Capacitor has seven stator plates and six rotor plates. Bolts in 5.0- mm diameter hold the plates. Spacer for the plates are nuts. **Figure 7** shows the capacitor. Additional capacitor (for 20- and 17- meter Bands) made from a length of a coaxial cable. The capacitor is connected to bridge to the variable capacitor. It is easy to do because the connection points are accessible in the field. Connection points are placed on the horizontal wires. **Figure 8** shows the additional capacitor.

Capacitor is tuned with help of servo motor HS-311 with standard hardware (***Reference 3***). **Figure 9** shows servo motor installed on to the variable capacitor.

To operate the servo motor it was made a special control box. The box was made on the base of China servo tester HJ (***Reference 4***). **Figure 10** shows the Control Box. Table on the box shows data displayed on the servo tester to tune the capacitor for needed band of operation.

Figure 5 Assembled UA6AGW Antenna V. 20-10.51

Figure 7 Capacitor of the UA6AGW Antenna V. 20-10.51

Figure 8 Additional capacitor made of a length of coaxial cable

At the servo tester it was installed a big dial (instead a small one) for the fine tune. Servo tester may be feed by 4.8- 6.0- V. To feed the servo motor it was used a LAN cable between the control box and those one.

Coupling Loop made of from 50- Ohm coaxial cable. Length of the coaxial cable to be used for the coupling loop is 400- mm. **Figure 11** shows the preparation of the coaxial cable for coupling loop before it was formed to loop shape. Plastic from the length of the coaxial cable is removed on to 10- mm in the center and from two ends. Then braid of the coaxial cable is removed at the center. Inner conductor is soldered to the braid at the far (right) end of the length.

Then the cable is turned to loop. Far end of the length is soldered to the first (left) side of the prepared cable. The coupling loop is fastened to the upper part of the antenna's loop with help of a Scotch and ties. Below there are several simple rules how to install the coupling loop.

At first, find on the antenna loop a point that is equidistance from left and right side of the C2. It is ***the point of symmetry*** of the antenna.

At second, find the point of symmetry of the coupling loop. The coupling loop is mounted in the top of the antenna loop. Point of symmetry of the coupling loop should concur with the point of symmetry of the antenna.

At third, to fasten with help of the cable ties the coupling loop to the antenna loop at the distance of 4- 5- cm from the point of symmetry of the antenna loop.

Tuning and Adjusting

Antenna is tuned to the working band with help of C2. When horizontal wires are fully inserted (length is near 1.6- meter) the antenna should tune with help of C2 to the frequency range of 18.0- 29.0- MHz.

When horizontal wires are fully opened (length is near 3.0- meter) and additional capacitor (length of coaxial cable) is connected to bridge to C2 the antenna should tune with help of C2 to the frequency range of 14.0- 18.0- MHz.

Antenna may be tuned to the working frequency by minima SWR or maxima level of reception signals. As usual SWR is not exceeded 1.5:1:0 at any band of operation of the antenna. Sometimes changing form of the coupling loop (from circular to oval) may help tune the antenna fine into resonance across the used bands.

When antenna is tuned and the data for servo motor for every band is obtained and wrote down at the servo tester the next re- tuning of the antenna is a very simply. Just put the data to the servo tester press the control knob and servo motor will tune the antenna.

(Please, read carefully instruction to the servo motor and servo tester how they are working together.) UA6AGW Antenna V. 20-10.51 is broadband. When antenna is tuned to the center of the ham band (SWR is not exceeded 1.5:1:0) the SWR at the edges of the band is not exceeded 2.0:1:0. However sometimes at the 10- meter band it may be required fine tuning of the C2 at the edges of the band.

Figure 10 Control Box

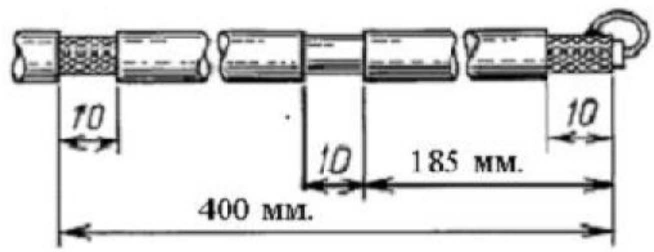


Figure 11 Preparation of the Coaxial Cable for Coupling Loop

Test of the UA6AGW Antenna V. 20-10.51

Antenna was tested at all working bands. Especially attention was taken at the 20 meter Band.

Antenna showed very high efficiency. DD of the antenna in the horizontal plane is almost circular. Difference in DD across and along the horizontal wire is near 3- dB. There were made lots QSOs with the antenna. Diploma "POBEDA" (***Reference 5***) was made in three evening on the 20- meter Band with the antenna.

References:

1. Antentop 01 203, Antentop 01 2014, Antentop 01 2015
2. http://www.quad.ru/production/tube.php
3. https://www.servocity.com/html/hs-311_standard.html#.V4w92KhzaNI
4. http://ru.aliexpress.com/store/product/HJ-Digital-Servo-Tester-ESC-Consistency-Tester-for-RC-Helicopter-4-8v-6v/912559_1872459794.html?storeId=912559
5. http://py2nl.blogspot.ca/2015/04/memorial-diploma-pobeda-70-victory-70.html

UA6AGW Antenna in Experimenters by RU1OZ

Nikolay Chabanov, RU1OZ

Credit Line: CQ- QRP # 42. Spring- 2013. Pp.: 15-17.

In my native city Archangelsk my house is located very close to the Power Transmission Line. High noise from the line forced me to use Magnetic Loop Antennas. The antennas could work very effective and may eliminate the electrical noise. I can make QSOs with EU and JA (at 10- 18- MHz) using only 4-watts with my Magnetic Loop Antenna. But… The Magnetic Loop Antenna has some disadvantage for me. It is a narrow pass-band (I need tune the Loop across the amateur band). My variable capacitor at the Loop is sparked at power close to 5-watts (that is way I used to only 4-watts with the Magnetic Loop).

In one of the lucky day I have read article about the UA6AGW Antenna. The antenna straight away attractive my attention because:

1. Antenna takes small room. So I may place it instead my Magnetic Loop Antenna
2. Pass Band of the antenna is 150… 200- kHz. So, I do not need retune the antenna inside the working Band.
3. The horizontal wires are lowered the RF-Voltage across the variable capacitor. That could be no sparking at the variable capacitor.

The three above mentioned factors were main point to make the antenna. For making the antenna I used a length of a 75-Ohm coaxial cable in diameter 13- mm. To turn the antenna in rigid design the length of coaxial cable was hid inside a plastic Hula- Hoop that had diameter 80- cm. **Figure 1** shows the schematic of the antenna for the 10 and 14- MHz.

Picture 1 UA6AGW Antenna for 14 and 18- MHz Installed at my Room

I used usual variable capacitor (12- 495- pF) from an old radio as C2. Usual variable capacitor 10- 70-pF was used as C1. Horizontal wires were made from a multicore copper wire in diameter 3- mm. Antenna for testing purpose was installed inside of my room. **Picture 1** shows the antenna in my room. Antenna was tested at 18 and 14- MHz Bands. The length of the horizontal wires for the bands was 2.5- meter.

Straight away I noticed that in comparison with old Magnetic Loop (made from the same coaxial cable) the UA6AGW Antenna worked better on to reception. And it is no sparking at the variable capacitor at 5-watts RF- power. I used to an old surplus military radio R-143 that fed by 12- Volts. At the voltage the radio gives no more the 5-watt of output power.

Антенна UA6AGW — рамочно-лучевая (v.30/20. 00)

Николай Чабанов RU1OZ

Heading of the Article

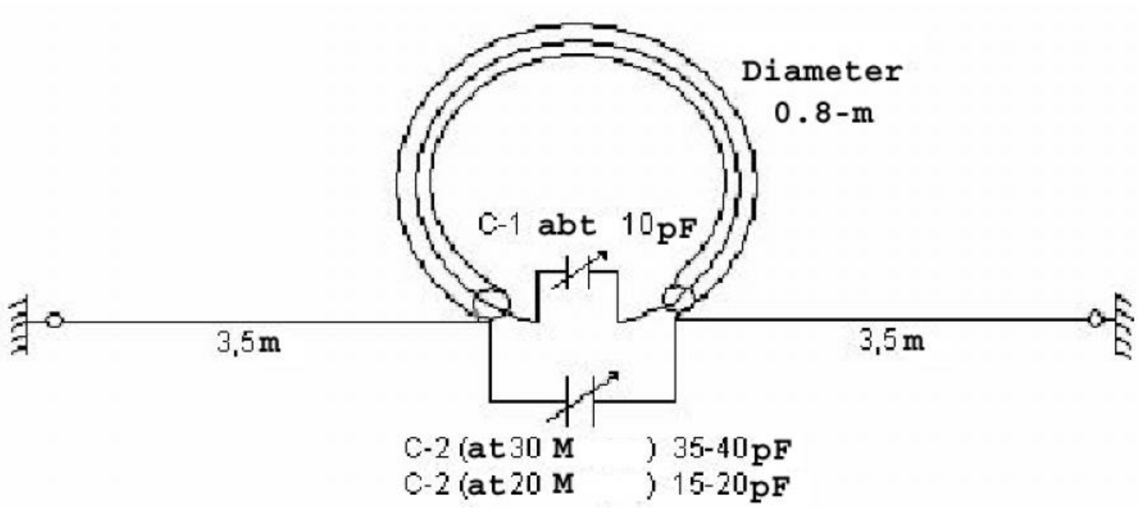


Figure 1 UA6AGW Antenna

Antenna worked well at the 18 and 14- MHz Bands. SWR was 1.2: 1.0 at the Bands. Pass Band was (at SWR 2.0: 1.0) 150- kHz at both bands. I made several CW and PSK- 31 QSOs with EU, Russia and Ukraine. As usual reports were 599 at the both ends.

Then I installed the antenna at my attic. The antenna was intended for 14 and 10-MHz. Horizontal wires were 3.5- meters in length in this case. Pass Band at 14- MHz Band was 230- kHz at SWR 2.0:1.0. **Picture 2** shows the antenna in my attic. Coupling loop for the antenna was made from copper wire in diameter 4- mm. Length of the wire was equal to the diameter of the UA6AGW Antenna (80- cm in my case). Coaxial cable RG-58 (length 18- meter) was going from the antenna to my radio. Antenna was tuned to needed band manually by C2.

UA6AGW Antenna placed in the attic was situated at height near 8- 9- meter above the ground. Antenna worked well at all- seasons- at dry summer, at wet autumn and in the winter when snow blanket in 30- 50- cm thick was placed on the roof above the antenna.

Later a LW-Antenna in 41- meters length and at 7-meter height above the ground was installed at my location. The antenna was fed from the end by Fuchs method (see **Reference 1**). The LW was compared with UA6AGW Antenna. Program WSPR (that showed levels of the receiving stations on the computer screen) objectively proved the UA6AGW Antenna advantage with the 41- meter length of wire antenna.

73! de RU1OZ

Picture 2 UA6AGW Antenna in the Attic

Reference 1
Josef Fuchs (OE1JF) Antenna: Patent Description
http://www.antentop.org/016/oe1jf_016.htm

Ex- Soviet Military Radio R-143

R3PIN Experimenters with UA6AGW Antenna

Aleksandr Grachev, UA6AGW

Credit Line: CQ-QRP # 48 (Autumn 2014), pp.: 19-22.

Articles below described experimenters with UA6AGW Antenna made by Sergey Tetuyhin, R3PIN. Sergey would like create an UA6AGW Antenna for 2- meter Band. He did not have schematic of the antenna for 2- meter Band. He made two antennas that he believed would work at the 2- meter Band. However his attempt was not successful. But Sergey during the experimenters found some unusual sides at UA6AGW Antenna. Both antennas were made accordingly schematic shown at **Figure 1**.

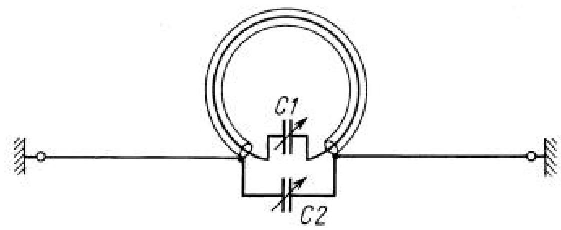


Figure 1 UA6AGW Antenna

Experiment # 1

Design of the Antenna

First antenna made by R3PIN is shown at **Figure 2**.The antenna was made as a table design. Height of the antenna was 45- cm. Loop of the antenna had diameter 13- cm. It was a copper tube in 8- mm OD. To make a "copper tube coaxial cable" inside of the tube was inserted plastic with central copper wire that was got from a piece of an old 50- Ohm coaxial cable. Plastic with central copper wire was in 2.5- mm diameter. Coupling loop was made from the same copper tube. Coaxial cable was soldered straight away to the coupling loop. Coupling loop had no electrical connection to the loop of the UA6AGW Antenna. **Figure 3** shows coupling loop at UA6AGW Antenna.

Antenna whiskers had telescopic design. The whiskers may be moved along the antenna loop by screw clamps. Capacitors C1 and C2 were Air – dielectric with capacitance 8- 140- pF. **Figure 4** shows the whiskers and capacitors.

Figure 2 First Experimental Antenna made by R3PIN

Russian Amateur RU-QRP Radio Club CQ-QRP
Издание Российского Клуба Радиооператоров Малой Мощности
48 Осень 2014

Figure 3 Coupling Loop at UA6AGW Antenna

Data for the Antenna

Dimension of the antenna were too big for the 2- meter Band. Antenna with help of C1 and C2 may be tuned across 18… 56- MHz. Test of the antenna was made at 10- meter band at frequency 28.850- MHz. Antenna was tested at position showed at **Figure 1**. Antenna had SWR 1.0: 1.0. C2 had maximum capacitance. Antenna was tuned to the 28.850- MHz by C1.

Antenna had Diagram Directivity similar to classical UA6AGW Antenna, i.e. the DD was ellipse sitting along whiskers of the antenna. Side suppression of the antenna was near minus15- dB. It was possible to make local QSOs when the antenna was placed at a table or windowsill. Experimenters with the antenna was loaded to Youtube at: http://www.youtube.com/watch?v=-uNrlRNcLu4&feature=em-upload_owner

Experiment # 2

Design of the Antenna

Second antenna made by R3PIN is shown at **Figure 5**.The antenna was made as a table design. Dimensions of the antenna were decreased compare to antenna from first experiment. Loop of the antenna has diameter 5.5-cm. It was a copper tube in 4.7- mm OD. To make a “copper tube coaxial cable” inside of the tube was inserted Teflon insulated wire in 0.27- mm diameter. Whiskers of the antenna had length 10- cm.

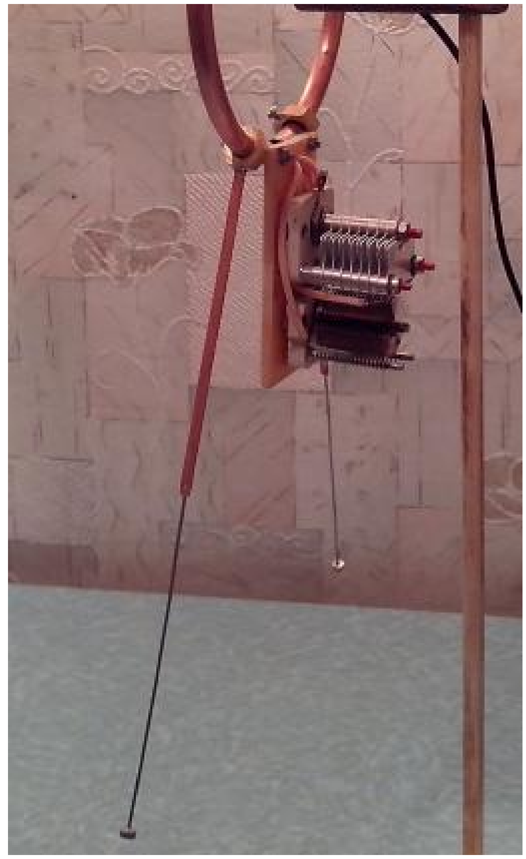


Figure 4 Whiskers and Capacitors

The whiskers made from strand tinned wire. Capacitors C1 and C2 were ceramic – dielectric with capacitance 6-25- pF. Coupling loop was completely different from the counterpoint of antenna shown at **Figure 2**.

The coupling loop was placed athwart to radiation loop. Coupling loop had two turns of copper wire in 1.2- mm diameter (17-AWG). Gap between the turns was 5- mm. Coaxial cable was soldered directly to the coupling loop.

Two ferrite rings, one at the coupling loop another one at the connector side of the cable, were placed on to the coaxial cable. **Figure 6** shows the coupling loop. With help a fixture (similar to the clock hand) the loop could move along the radiation loop. **Figure 7** shows the fixture.

R3PIN Experimenters with UA6AGW Antenna

Figure 5 Small UA6AGW Antenna

Data for the Antenna

Dimension of the antenna were too big for the 2- meter band. However the antenna with help of C1 and C2 may be tuned across FM Band 88… 108- MHz. Test of the antenna was made at the band only at receiving mode.

Antenna had one lobe diagram of directivity. The lobe was 30… 40 degree. Suppression from back and sides was at least minus 20- dB. Moving the coupling loop across the loop in one direction was going to increasing of the level receiving stations.

Moving the coupling loop across the loop in the opposition direction was going to decreasing of the level receiving stations and almost stopping of the receiving. Changing the coaxial cable connection to the coupling loop (visa versa) changed the direction. Looks like the one direction diagram directivity of the antenna was obtained due to the coupling loop placed athwart to radiation loop. Experimenters with the antenna was loaded to Youtube at: http://www.youtube.com/watch?v=gPBTSM-uFKI

Figure 6 Coupling Loop

Figure 7 Fixture for Moving Coupling Loop

Sergey, R3P9N, talking about his experimenters with UA6AGW Antenna

Conclusion

So, Chapter 7 ***"UA6AGW Antennas"*** is ended. Lots practical designs of the antenna were described at the chapter. You may built for your needs already existing UA6AGW Antenna or design a new one.

UA6AGW Antennas are easy to do, low noise and broadband ones. Try the antennas and you will like it.

73!

Igor, VA3ZNW

References:

1. UA6AGW Antennas for 80 and 40- meters: http://www.antentop.org/017/ua6agw_017.htm

2. UA6AGW Antennas: Modification and Development: http://www.antentop.org/017/ua6agw_md_017.htm

3. Directional UA6AGW Antenna: V. 7.00: http://www.antentop.org/018/ua6agw_018.htm

4. UA6AGW Field Antenna: V.40.21: http://www.antentop.org/018/ua6agw_field_018.htm

5. UA6AGW Antenna: V.40.20: http://www.antentop.org/018/ua6agw_02_018.htm

6. UA6AGW Antenna: V. 20-10.51 (14.0- 29.5- MHz): http://www.antentop.org/020/ua6agw_020.htm

7. UA6AGW Antenna in Experimenters by RU1OZ: http://www.antentop.org/018/ru1oz_018.htm

8. R3PIN Experimenters with UA6AGW Antenna: http://www.antentop.org/019/r3pin_019.htm

UA6AGW Antenna for the 80-m Band

CHAPTER 8

Antennas for Unlimited Open Space

Antennas for Unlimited Open Space… The antennas may be installed at large backyard, at farmer field or at cottage having some open space. Antennas for Unlimited Open Space installed at some distance from human are safety antennas compare to those ones that installed straight away at the shack.

Chapter 8 described lots practical designs of Antennas for Unlimited Open Space. Those antennas were built and tried by hams. As well the ***Chapter 8*** described some theoretical designs of the Antennas for Unlimited Open Space. As I know most of the theoretical antennas already are practically build and operated in the Air

Antennas for Unlimited Open Space required experience and some equipment for tuning and adjusting. SWR- Meter or (that is better) Antenna Analyzer (MFJ- 259B or similar one) may be needed. As well some experience in antenna tuning and design of external antennas would a big plus. However you may get some valuable experience when tuning and installation of those antennas ever you newer did it.

Of course described here Antennas for Unlimited Open Space are not Big Gun antennas. It is not rotated YAGI and super efficiency multi- element antennas. It is just antennas that usual ham may make using stuff from nearest construction shop and may install at "Unlimited Open Space" by own force. That is what most of hams need. Try the antennas and modify according to your location.

Simple Wire Antenna for All HF- Bands

Vladimir Fursenko, UA6CA

The simple wire antenna works well from 160- to 10 meters. The antenna may be tuned (to needed amateur band) at a shack. Antenna contains only one tuning parts- it is a variable capacitor 10… 200- pF. An inductor (near 3… 5- micro- Henry) is switched in serial with the antenna at the 40- meter Band. **Figure 1** shows schematic diagram of the Simple Wire Antenna.

Antenna has wide pass- band that covered all amateur band that is used by the antenna. Good grounding is needed for the antenna.

The Simple Wire Antenna was used at UA6CA ham station with a 4.5- W QRP-Transceiver. Antenna provided good result at the operation.

73! de UA6CA

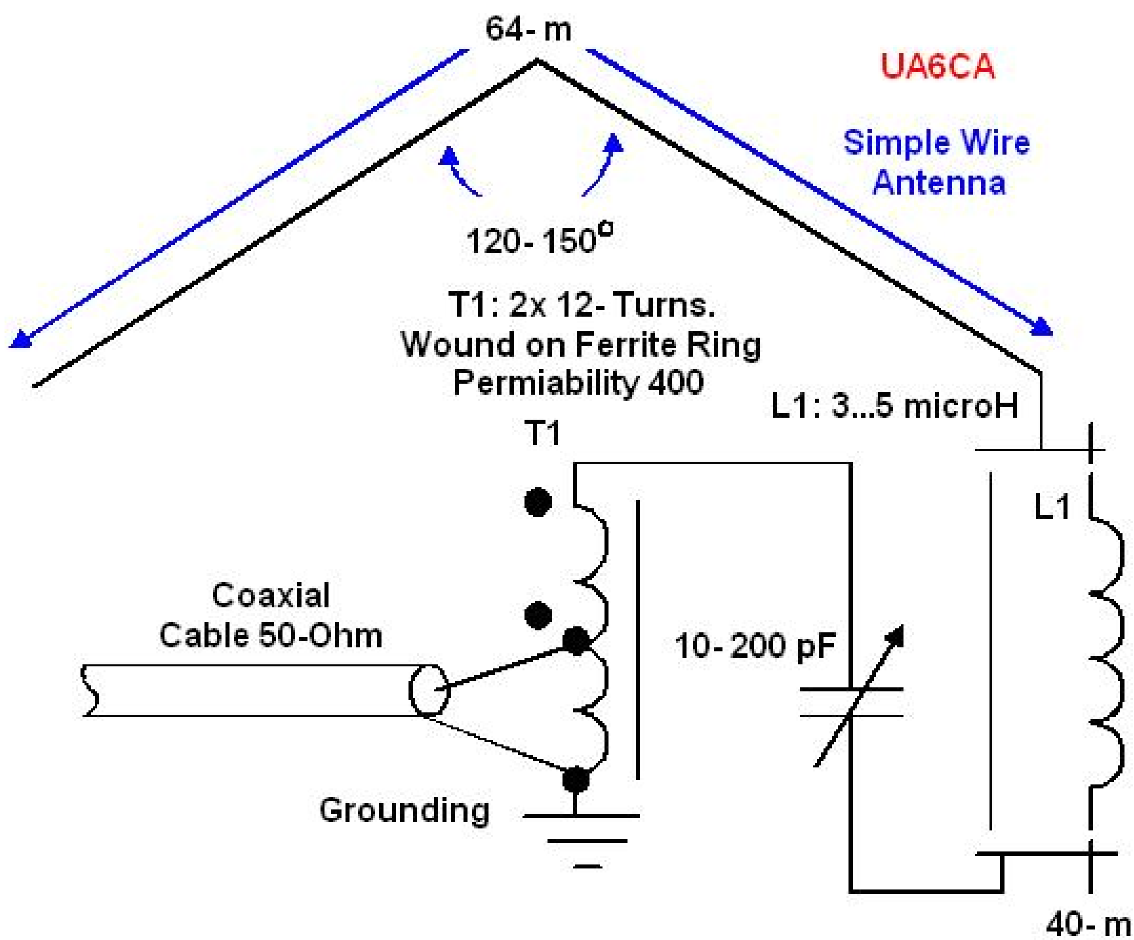


Figure 1 Simple Wire Antenna for All HF- Bands

Compact Antenna for 160- meter Band for the DX- Window

The publication is devoted to the memory UR0GT.

Credit Line: Forum from: www.cqham.ru

By: **Nikolay Kudryavchenko, UR0GT**

Below described Compact Antenna for 160- meter Band for the DX- Window. Model of the antenna made by UR0GT. Antenna has "compact" sizes related to the 160- meter band. However with the dimensions the antenna has good parameters at the DX- Window at the 160- meter Band. **Figure 1** shows design of the antenna. **Figure 2** shows schematic of the antenna.

Charts for Z of the antenna, SWR of the antenna and DD of the antenna may be found at:
www.antentop.org/020/160_ur0gt_020.htm

Simulation was made at the antenna height 2 meters above the real ground. Antenna may be scaled to another amateur's HF band.

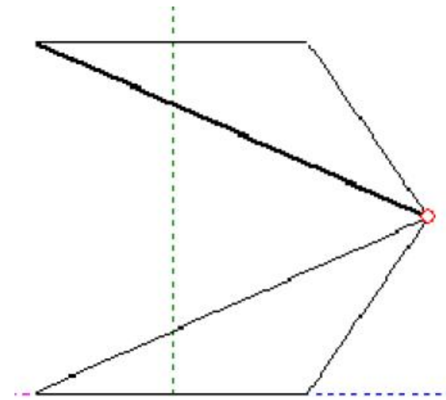


Figure 1 3D View of the antenna

The MMANA model of the Compact Antenna for 160- meter Band for the DX- Window may be loaded: http: // www.antentop.org/020/160_ur0gt_020.htm

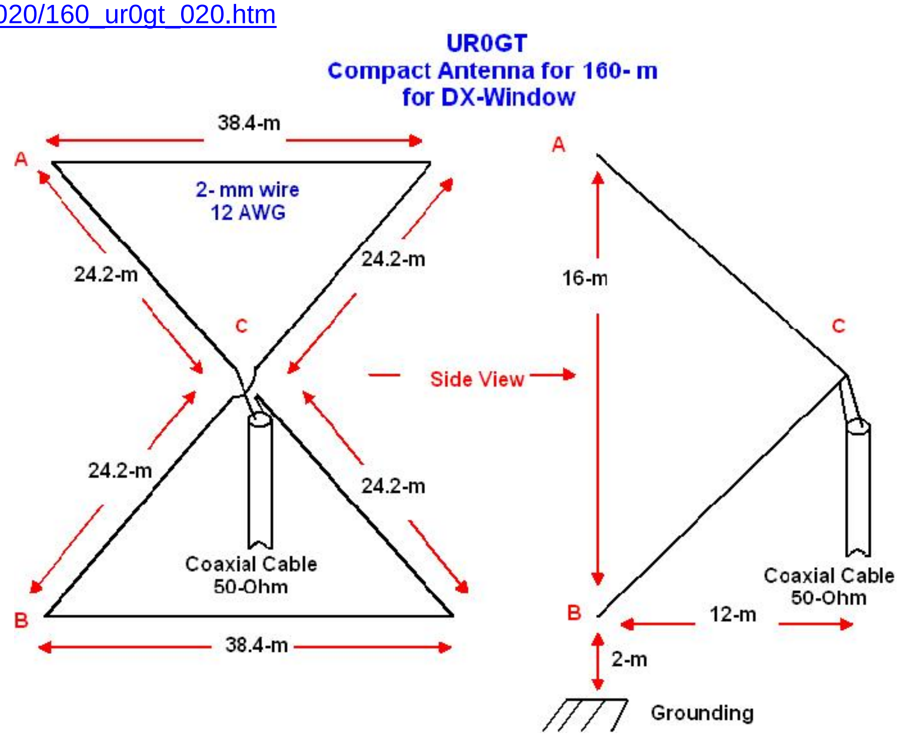


Figure 2 Compact Antenna for 160- meter Band for the DX- Window

73 Nick

Delta Antenna for 80-, 40-, 20- and 15- meter Bands

The publication is devoted to the memory UR0GT.

Credit Line: Forum from: ***www.cqham.ru***

By: **Nikolay Kudryavchenko, UR0GT**

The Delta Antenna has perimeter 86- meter. Antenna has resonances at four amateur bands. There are 80, 40, 20 and 15 meters. However, input impedance at the bands not allows use a 50- Ohm coaxial cable to feed the antenna with low SWR at all the bands. Best solution is to use a 100- Ohm coaxial cable. Then simple ATU to match the antenna system with transceiver.

By the way, common use TV 75- Ohm coaxial cable may be used to feed the antenna. Two wires open line allows use the antenna at all amateur HF bands. At this case an ATU should be used to match the antenna system,

Figure 1 shows three version of the antenna. Each of the versions has some advantages and disadvantages.

The MMANA model of the Delta Antenna for 80-, 40-, 20- and 15- meter Bands may be loaded: http: // www.antentop.org/018/ur0gt_delta_018.htm

Charts for Z of the antenna, SWR of the antenna and DD of the antenna may be found at:

www.antentop.org/018/ur0gt_delta_018.htm

73 Nick

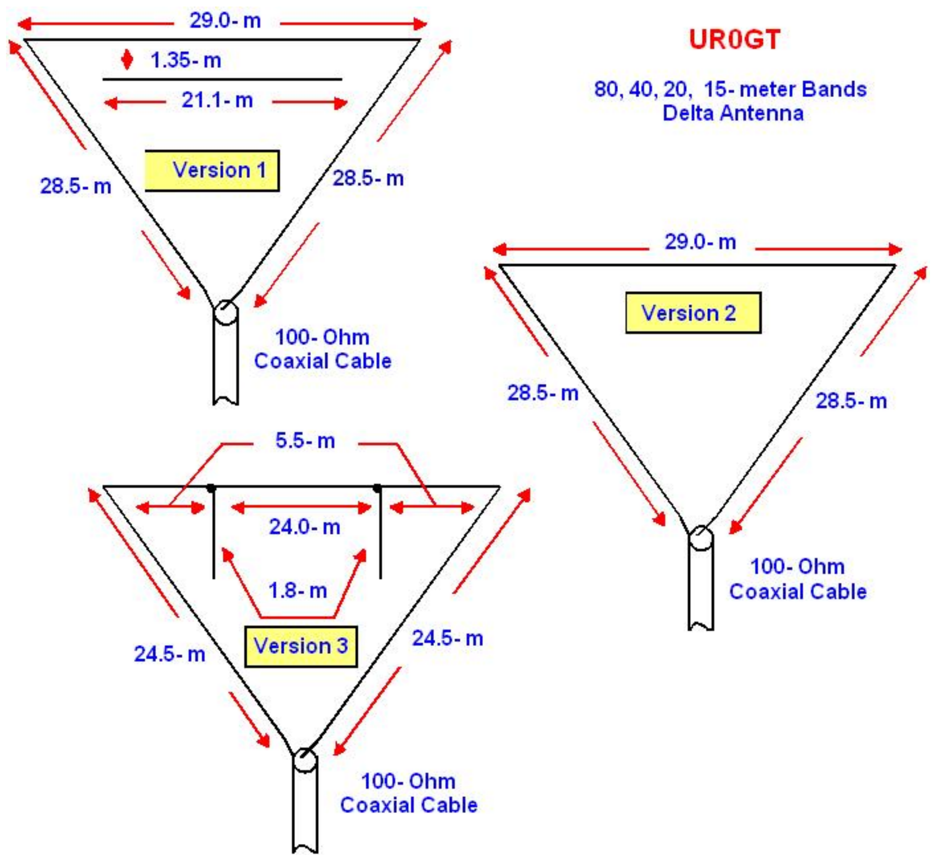


Figure 1 Design of the Delta Antenna for 80-, 40-, 20- and 15- meter Bands

Delta for the 80 and 40 meter Bands

By: Valentin, RZ3DK

Credit Line: www.cqham.ru

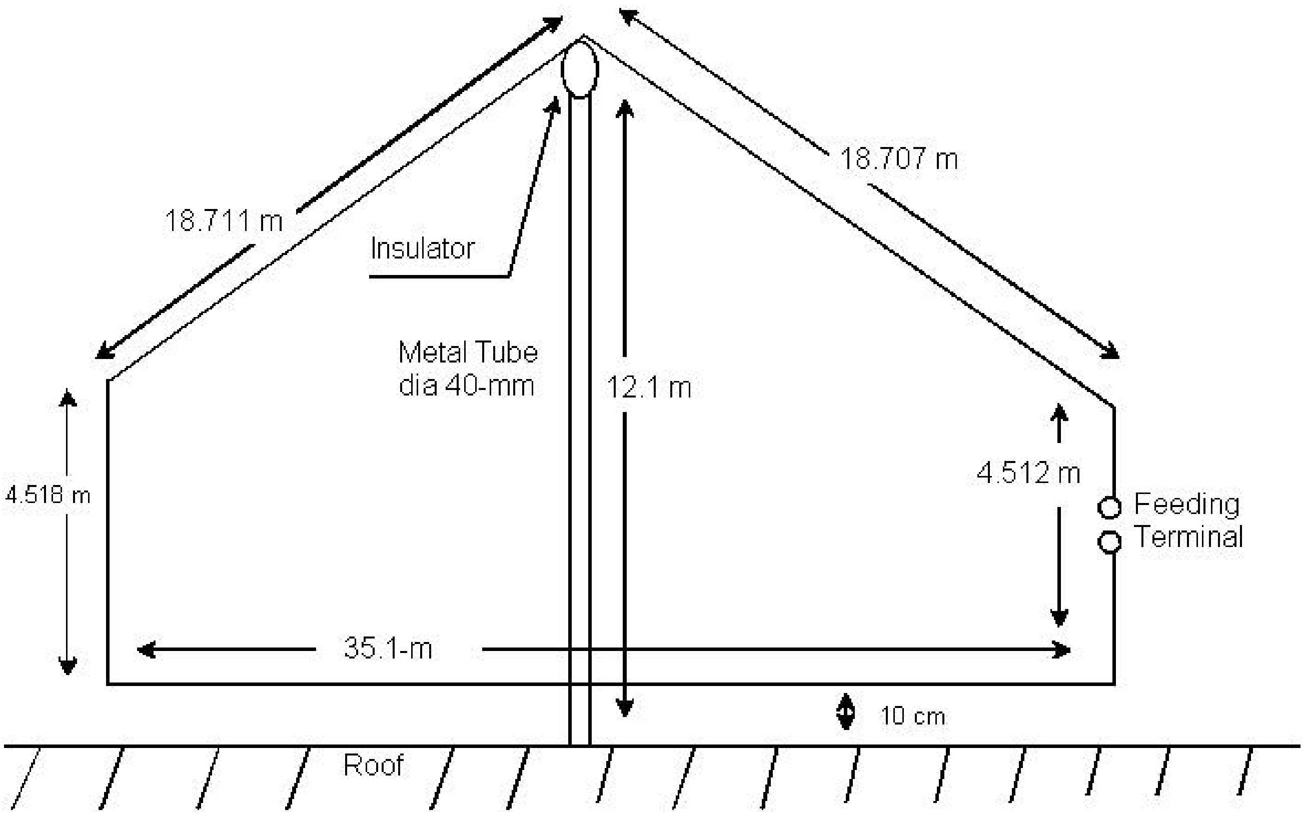


Figure 1 Design of the Delta for 80- 40 meters

The Delta for the 80 and 40 meters was designed for installation on the roof of a building with help of a metal mast. Design of the antenna is shown on **Figure 1**. The MMANA model of the Delta for the 80- 40 meters may be loaded:
http://www.antentop.org/010/rz3dk_010.htm

File *maa contains correct dimension for the antenna. However, MMANA does simulation of the antenna (in the particular installation with down wire close to the ground) in not correct way. Correct data may be obtained by using NEC for MMANA. All of those software are free.

Charts SWR of the antenna and DD of the antenna may be found at:
http://www.antentop.org/010/rz3dk_010.htm

Matching of the antenna at both bands is possible with the help of a length of 75-Ohm Coaxial in 4.82-meters. SWR at the both bands (at this case) is 1.46:1.0. Charts SWR of the antenna and DD of the antenna with the match may be found at:
http://www.antentop.org/010/rz3dk_010.htm

Another one matching device is a length of 75-Ohm coaxial cable in 3.9 meters and opened stub from a length of 75-Ohm coaxial cable in 1.7 meters that are connected to antenna's terminal. SWR at the both bands (at this case) is 1.23:1.0. Charts SWR of the antenna and DD of the antenna with the match may be found at:
http://www.antentop.org/010/rz3dk_010.htm

It is a theoretical model. In the coming spring I hope to install and check the antenna.

73! de RZ3DK

UB5UG Rectangular Loop Antenna

Yuri Medinets, UB5UG, Kiev

Credit Line: Radio #7, 1963, p.20

UB5UG Rectangular Loop Antenna (shown at **Figure 1)** has good parameters and not so sensitive to the nearest ground compare with a dipole antenna. Distance between down wire and the roof or ground may be several tens centimeters. It makes the antenna suitable for 80- and 40-meter Bands when conditions for antenna installation are not perfect.

However, it should not be any high- rise conductive objects near the antenna. Those objects do "shadow" to the antenna that hindered to operation. Input impedance of the antenna may depend on installation conditions.

Matching of the antenna with the feeder provides by choice of the feeding points at the down horizon wire. At the corner of the rectangle the antenna has input impedance near 30-40- Ohms. The far the feeding points are from the corner the more input impedance (up to several thousand Ohms) may be found.

Feeder is going along antenna down wire and then side tube. From the middle of a vertical side the feeder is going aside (to any direction). For good symmetrical it is desirable to connect the braid of the coaxial to the side tube.

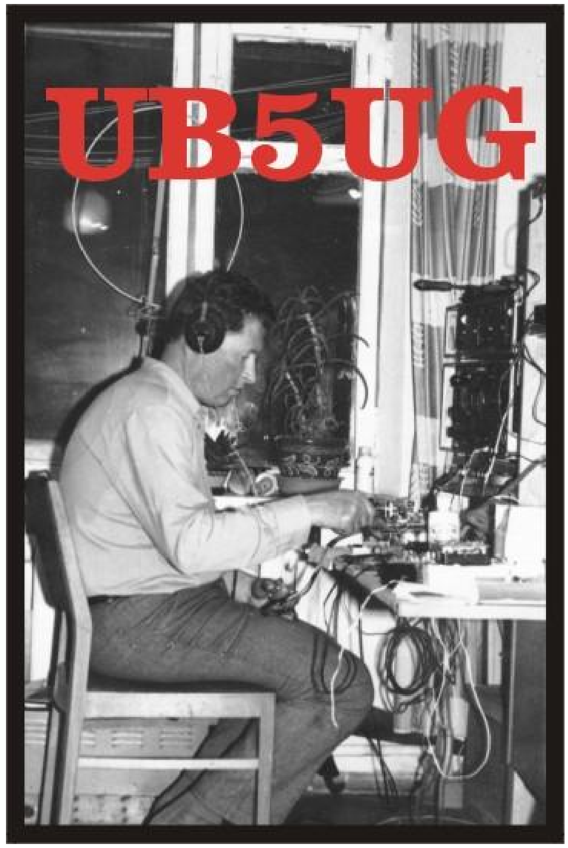
Upper horizon wire is broken by a nut insulator at the center. Radiation parts at the antenna are the vertical sides. For increasing of the efficiency of the UB5UG Rectangular Loop Antenna the sides should be made from aluminum tubes in diameter 10- 20- mm.

Horizon sides of the antenna provide very low radiation (because the currents distribution at the antenna), so, they could be made from wire in diameter of 1-2 mm. **Figure 2** shows the currents distribution at the UB5UG Rectangular Loop Antenna (made by MMANA). MMANA file for the antenna made by UR0GT.

The MMANA model of the UB5UG Rectangular Loop Antenna may be loaded:

http://www.antentop.org/010/ub5ug_010.htm

Charts for Z of the antenna, SWR of the antenna and DD of the antenna may be found at:
http://www.antentop.org/010/ub5ug_010.htm



Yuri Medinets
(1932-23.09.2003)
Credit Line: http://ham.kiev.ua/ub5ug/

All diagrams made by MMANA for the Rectangular designed for 7.050-MHz, placed at height of the 2 – meters above the real ground, vertical parts of the antenna –aluminum tube in diameter 10- mm (000-AWG), horizon wires- aluminum wire in diameter of 1-mm (18-AWG).

It is possible to design a directional antenna on the base of the UB5UG Rectangular Loop Antenna. Reflector and director may be made similar to the UB5UG Rectangular Loop Antenna. Such directional antenna may be designed for all amateurs HF bands. Parameters of a Three- Elements Antenna made on the base of the Rectangular elements are almost equal to parameters of a Four Elements Antenna made on the base of linear wires (YAGI).

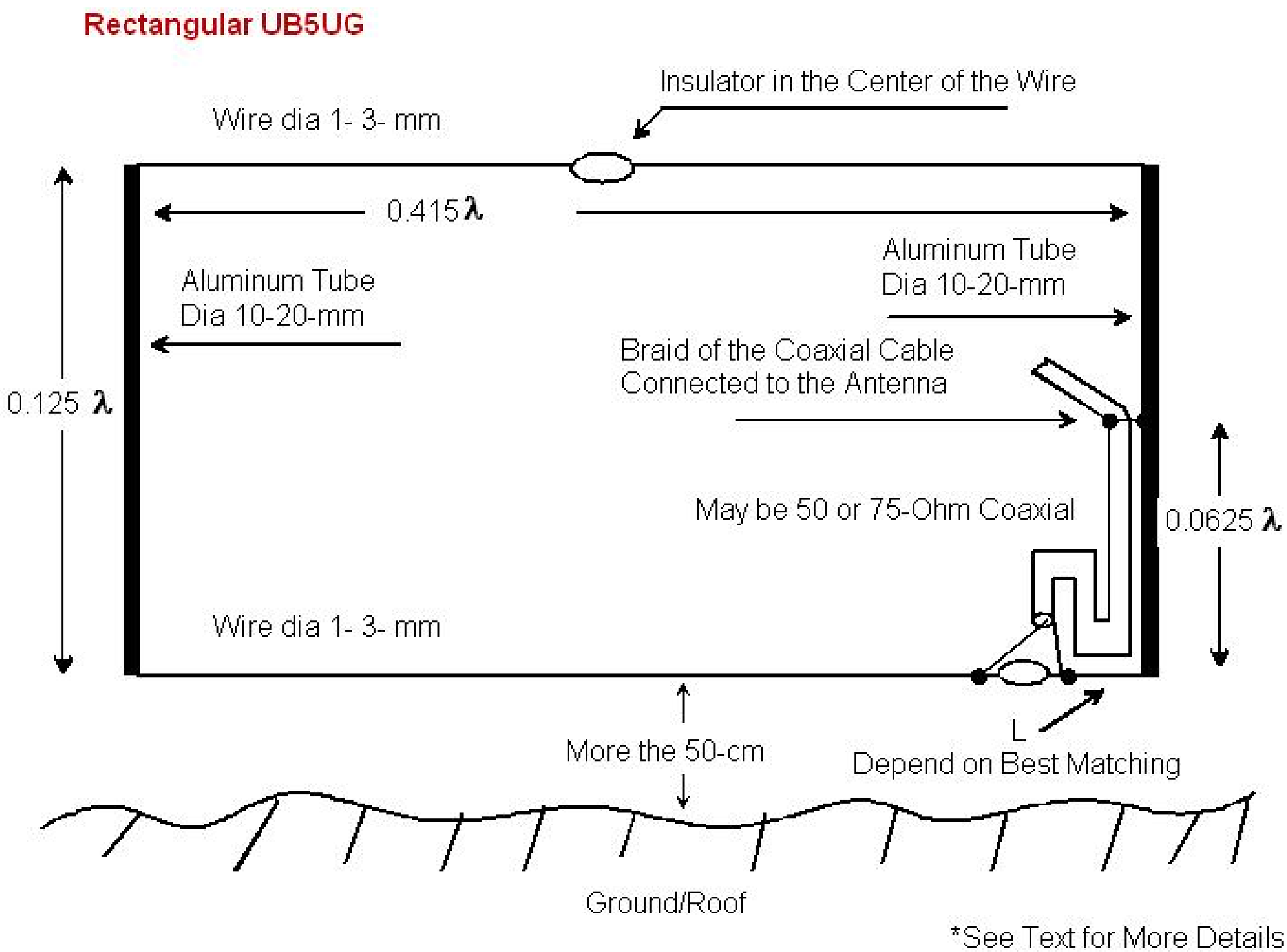


Figure 1 UB5UG Rectangular Loop Antenna

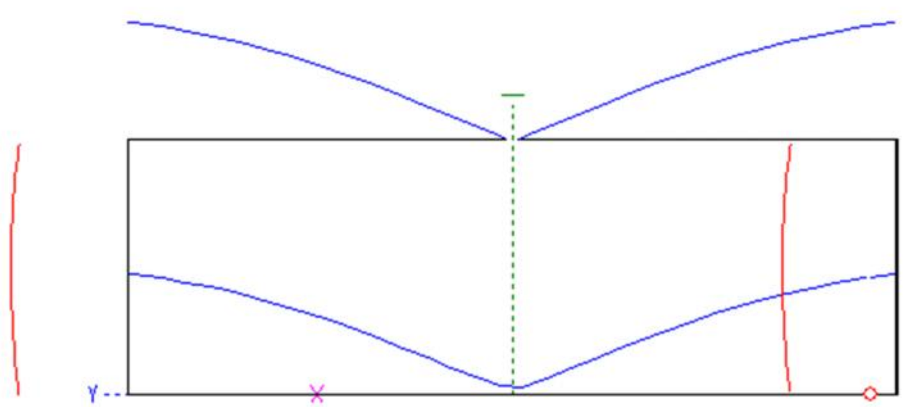


Figure 2 Currents distribution at the UB5UG Rectangular Loop Antenna

73! de UB5UG

Butterfly Antenna for the 20 meters

N. Filenko, UA9XBI ua9xbi@online.ru

Credit Line: www.cqham.ru

The Butterfly Antenna is a version of a shunt fed loop antenna (**Reference 1**). However, the antenna has some advantage compare to the version.

1. Input impedance is close to 50 Ohm.
2. The antenna has narrow diagram directivity.
3. Easy for installation. It could be hanged up between two trees, tree and house, etc.

Figure 1 shows the Butterfly Antenna at a horizontal installation. Charts for Z of the antenna, SWR of the antenna and DD of the antenna may be found at: http://www.antentop.org/009/butterfly009.htm

Parameters of the antenna for horizontal installation are very depended on the ground conditions. The more wet ground the stronger main lobe is declined to the ground, i. e., the better antenna works for DX. Parameters of the Butterfly Antenna at vertical installation are not so depends on the ground properties. **Figure 2** shows the antenna at a vertical installation. Charts for Z of the antenna, SWR of the antenna and DD of the antenna may be found at: http://www.antentop.org/009/butterfly009.htm

Antenna may be made from bare copper wire in 4 mm diameter. May be used any 50 Ohm coax for feeding the antenna. Try place the coax athwart to antenna at least 5 meter.

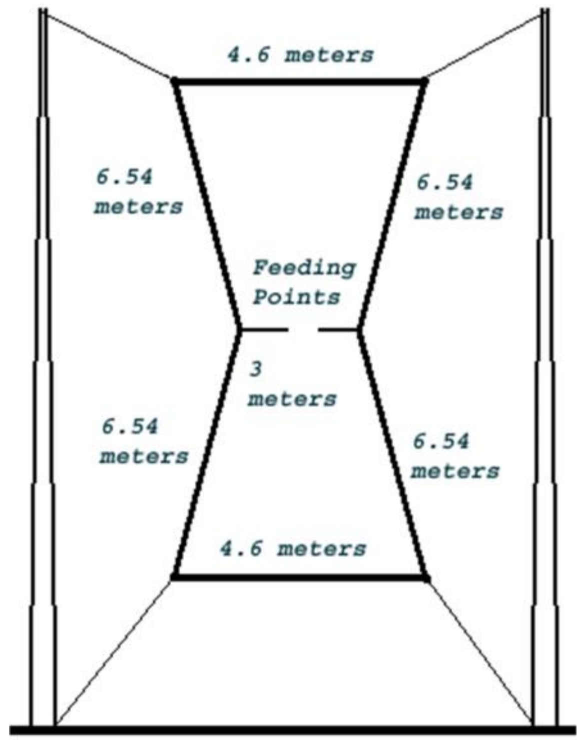


Figure 2 Butterfly Antenna at Vertical Installation

References:
1. Antennas for Radio Amateurs
By Igor Grigorov, RK3ZK. Antentop -1-2007, Antentop 2- 2004

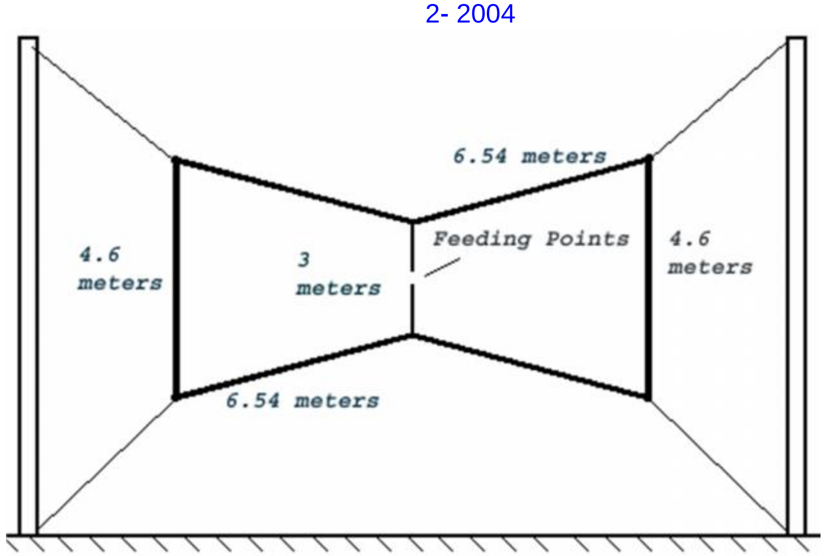


Figure 1 Butterfly Antenna at Horizontal Installation

Antenna for 80-, 40-, 20-, 17-, 15-, 12-, and 10- meter Bands

By Vladimir Fursenko, UA6CA

The two- level antenna works at 80-, 40-, 20-, 17-, 15-, 12- and 10- meter Bands. Upper level works on 80-, 40-, 20-, 15- and 10- meter Bands. Lower level works on 17- and 12- meter Bands. **Figure 1** shows design of the antenna.

Upper level has input impedance of 180… 220- Ohm. Lower level has input impedance of 50- Ohm. Each level feeds by its own coaxial cable. **Figure 2** shows feeding of the levels. Antenna at the upper level is fed through a transformer with ratio 1:4.

The transformer is wound on a ferrite ring with OD 60- mm and height 10-mm. The ring may have permeability 400… 600. Transformer has 10 turns wound by a pair of wire in diameter 1.5- mm (15- AWG). Then the turns are connected with antenna and together accordingly to **Figure 2**. The antenna may be fed through one coaxial cable. It needs to install RF Relay at the lower level that would be turn the cable to a chosen antenna. The RF Relay should switch both- central core and braid of the coaxial cable.

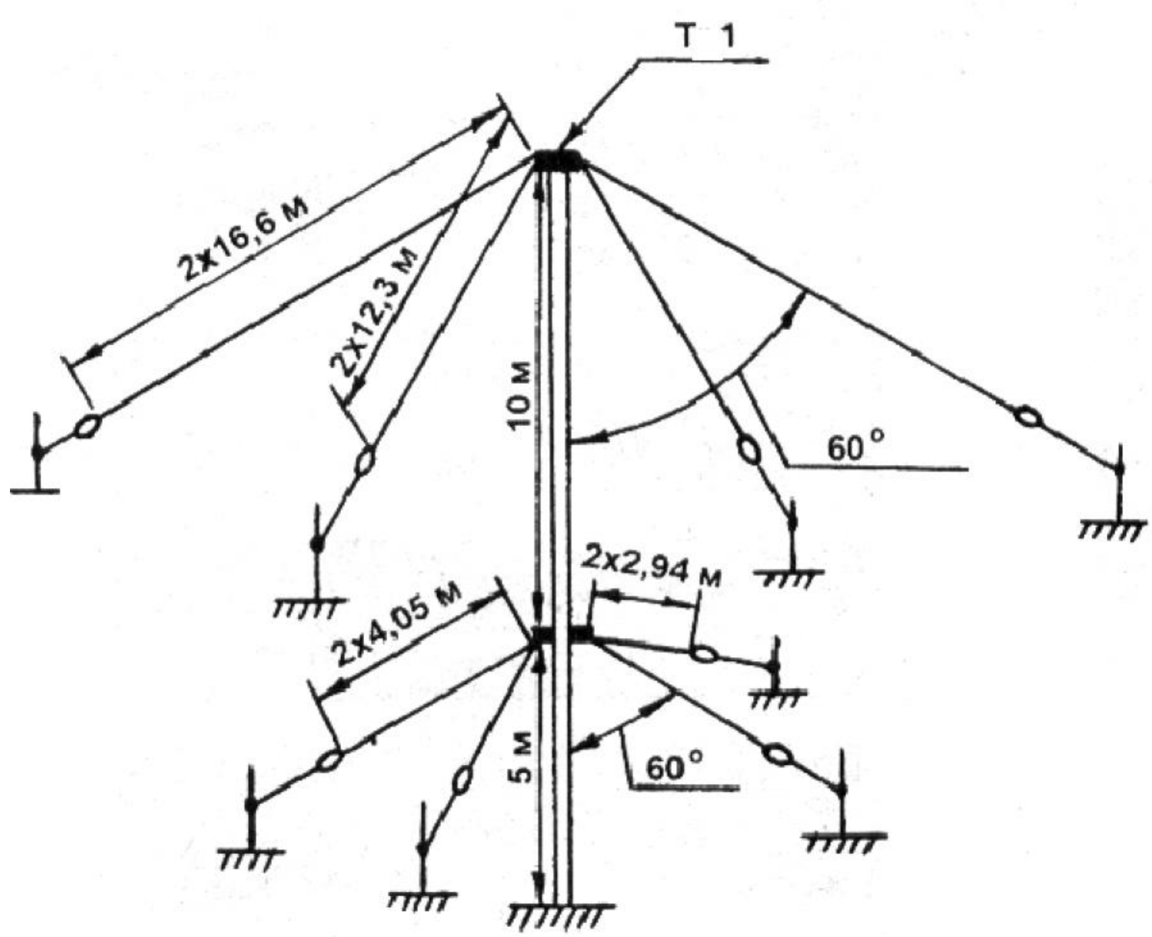


Figure 1 Design of the Antenna for 80-, 40-, 20-, 17-, 15-, 12-, and 10- meter Bands

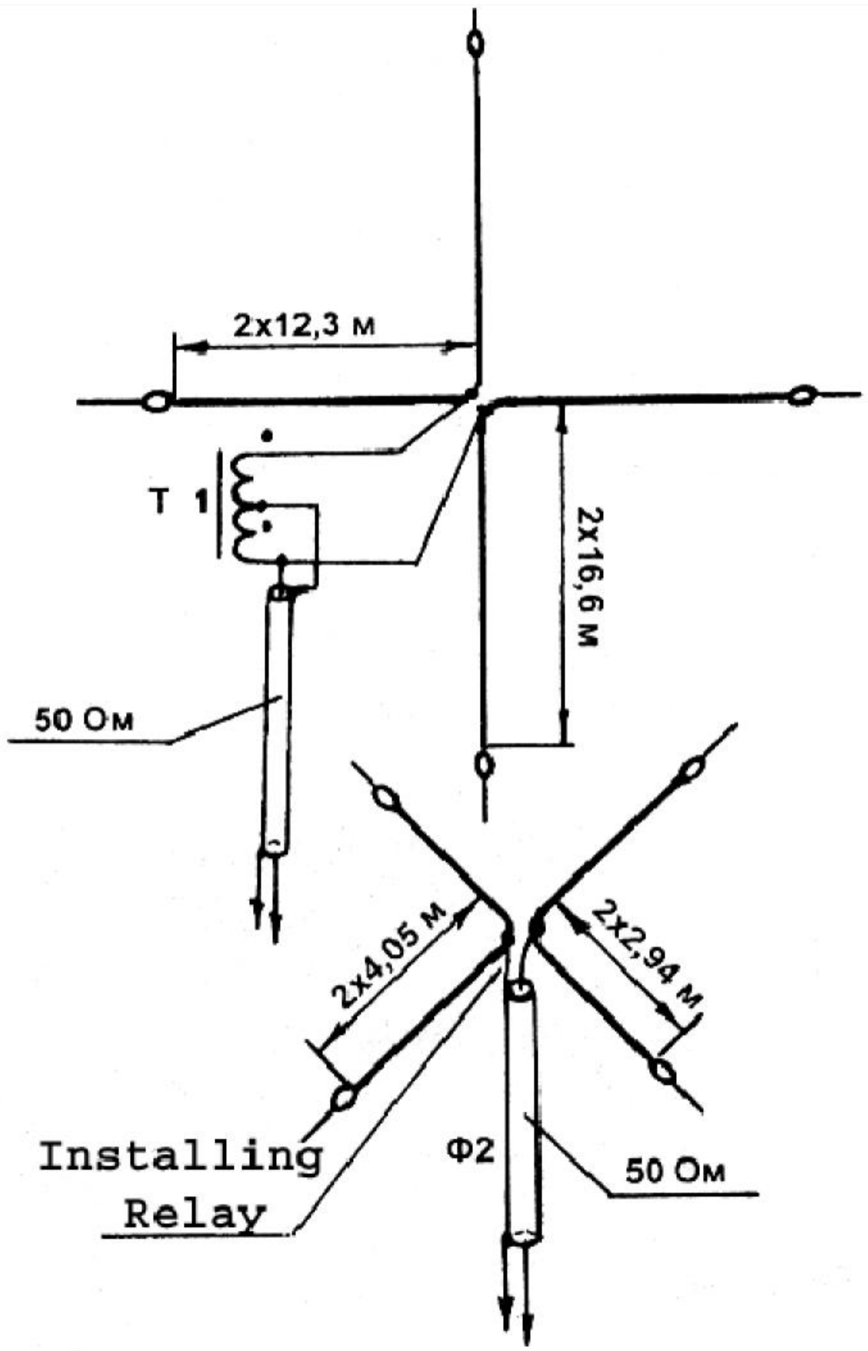


Figure 2 Feeding of each Level of the Antenna for 80-, 40-, 20-, 17-, 15-, 12-, and 10- meter Bands

73! de UA6CA

Asymmetrical I.V. for the 80 and 40- meters

The publication is devoted to the memory UR0GT.

Nikolay Kudryavchenko, UR0GT

Credit Line: Forum at: www.cqham.ru

Asymmetrical I.V. for the 80- and 40- meter band is shown on **Figure 1**. Antenna fed by 50- Ohm coaxial cable. The antenna has good SWR at the 40 meters. At the 80 meters the parameters are not so nice but workable.

Charts for Z of the antenna, SWR of the antenna and DD of the antenna may be found at: www.antentop.org/014/iv_014.htm

The MMANA model of the Optimized Vertical for the 80- meters may be loaded: http: // www.antentop.org/014/iv_014.htm

73 Nick

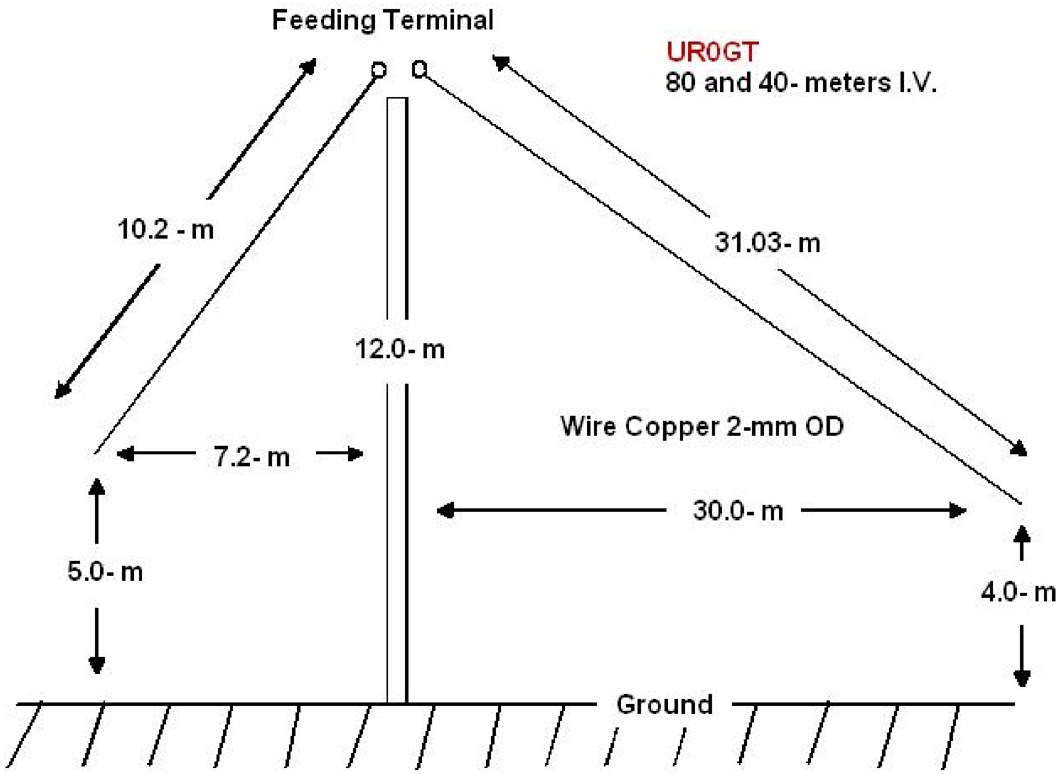


Figure 1 Asymmetrical I.V. for the 80- and 40- meter band

www.cqham.ru

Two DEWD Inverted-Vee for the 80- meters

The publication is devoted to the memory UR0GT.

Nikolay Kudryavchenko, UR0GT

DEWD IV antenna has broad pass band. The antenna should be fed by 50- Ohm coaxial cable. **Figure 1** shows design of the DEWD IV antenna, **Figure 2** shows SWR of the antenna.

The MMANA model of the DEWD IV antenna may be loaded:
http: // www.antentop.org/011/dewd_iv_011.htm

Charts for Z of the antenna and DD of the antenna may be found at:
http: // www.antentop.org/011/dewd_iv_011.htm

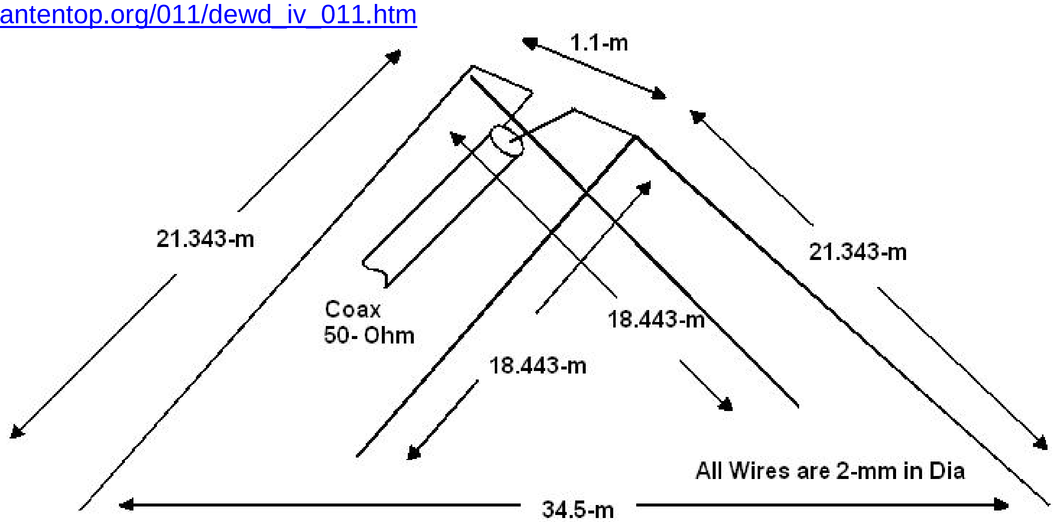


Figure 1 DEWD IV for the 80- meters

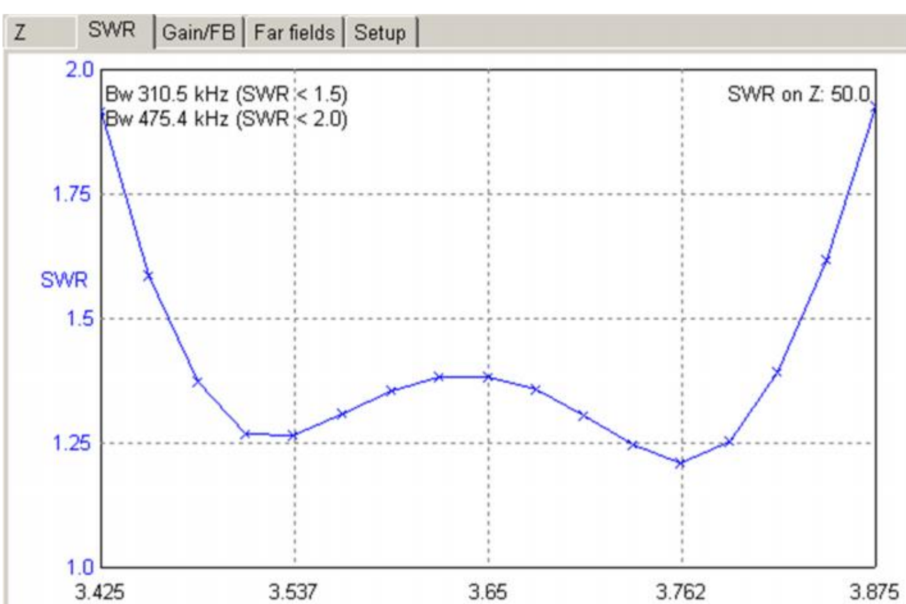


Figure 2 SWR of the DEWD IV for the 80- meters (placed in the free space)

The antenna may be optimized for pass band and SWR. The antenna should be fed by 50- Ohm coaxial cable. **Figure 3** shows design of the optimized DEWD IV for the 80- meters, **Figure 4** shows SWR of the antenna.

The model of the optimized DEWD IV antenna may be loaded at:
http: // www.antentop.org/011/dewd_iv_011.htm

Two DEWD Inverted-Vee for the 80- meters

Charts for Z of the antenna and DD of the antenna may be found at:
http: // www.antentop.org/011/dewd_iv_011.htm

73! Nick

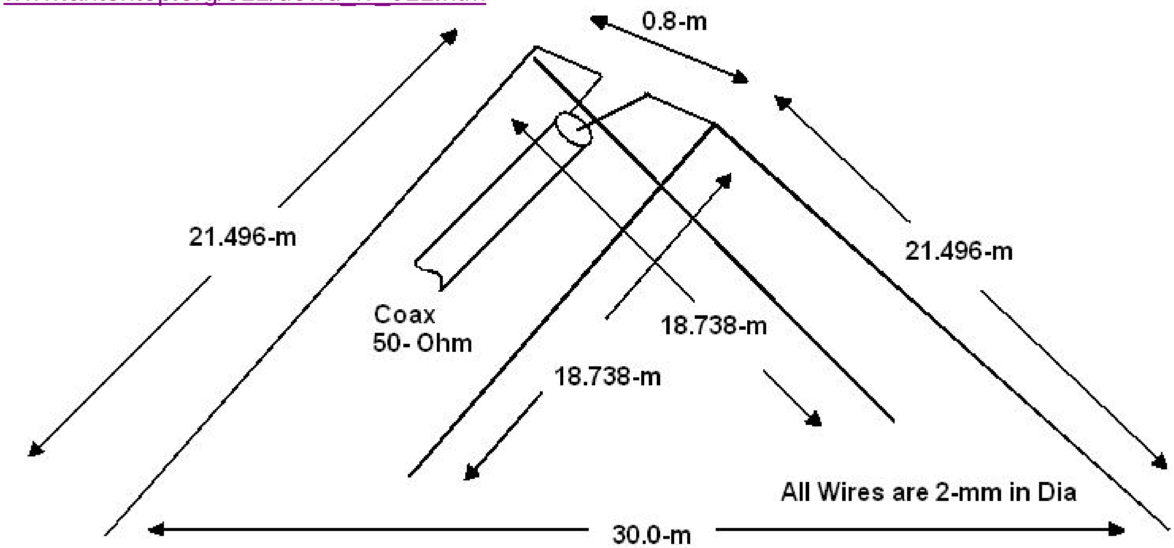


Figure 3 Optimized DEWD IV for the 80- meters

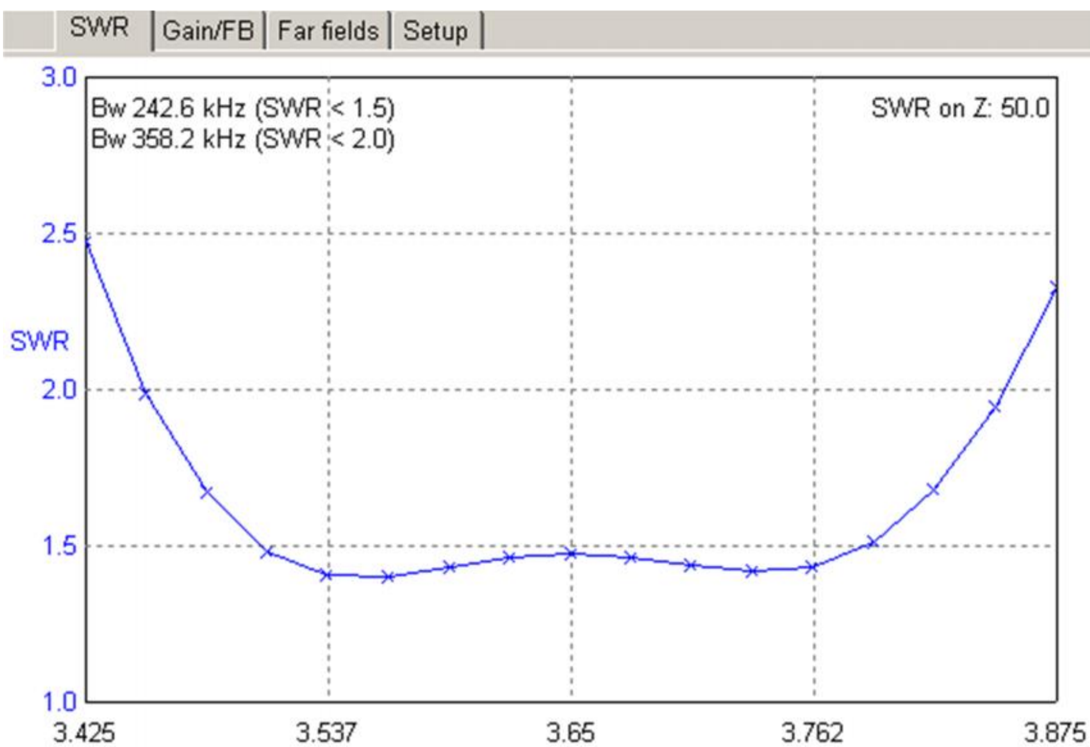
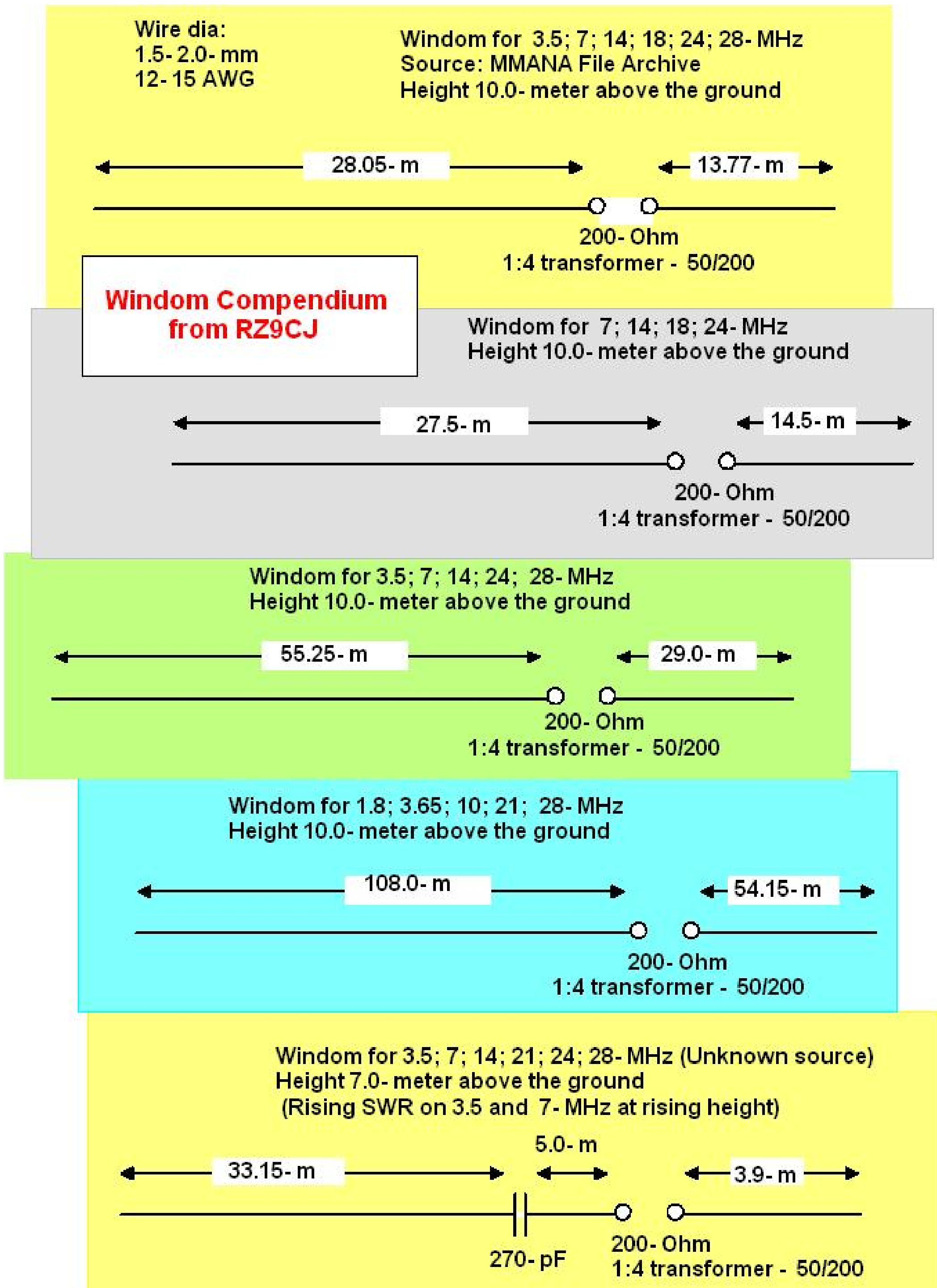


Figure 4 SWR of the optimized DEWD IV for the 80- meters (placed in the free space)

Windom Compendium from RZ9CJ

By: Sergey Popov, RZ9CJ, Ekaterinburg, Russia
Credit Line: http://qrz-e.ru/forum/29-786-1



UA6CA Windom Antenna for 80-, 40-, 20- and 10- meter Bands

Vladimir Fursenko, UA6CA

Antenna was installed at the edge of the roof of the 5-storey house. Transmitter was placed at the first floor. For improving of the efficiency of the antenna a grounding “mirror” wire was dug in the ground. Mirror wire was in plastic insulation. Ends of the mirror wire and connection to the wire were insulated from the ground. **Figure 1** shows the antenna.

Antenna was used with transmitter with Pi- Filter at transmitting output. The Pi- Filter could match well the antenna system. Antenna worked good at the 80, 40, 20 and 10- meter Bands. The antenna was used on UA6CA ham station at 1970- 1972 years.

73! UA6CA

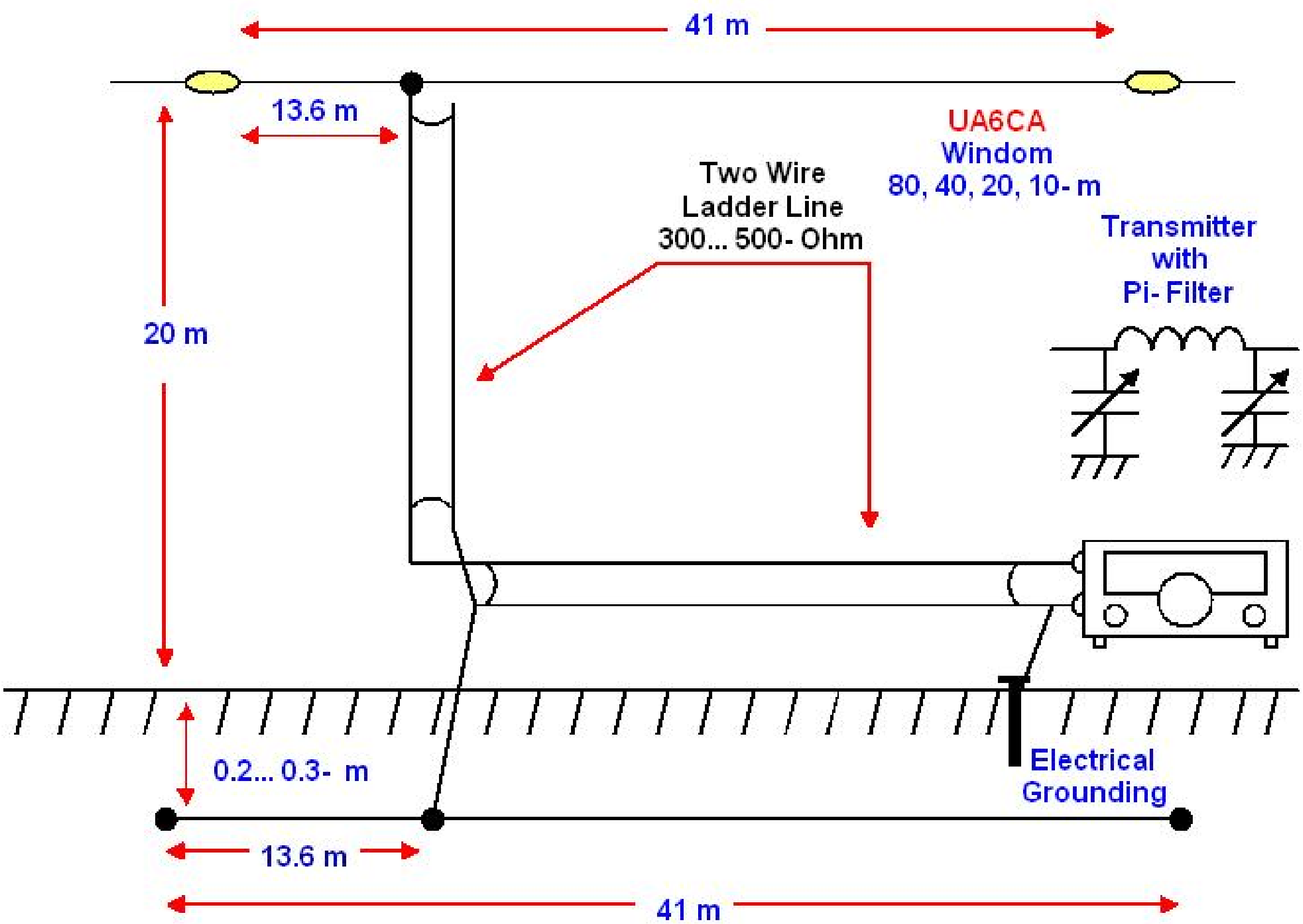


Figure 1 UA6CA Windom Antenna for 80-, 40-, 20- and 10- meter Bands

UR0GT Windom Antenna

The publication is devoted to the memory UR0GT.

Credit Line: Forum from:
www.cqham.ru

Windom is one of the oldest and reliable antennas that used in ham radio. There are lots modifications of Windom Antenna (or in other words Off Center Dipole Antenna). One of such modification was optimized by UR0GT. The antenna was optimized for 40, 20 and 10- meter Bands.

The main advantage of the UR0GT Windom Antenna is that the antenna may work at several bands with low SWR.

The MMANA model of the UR0GT Windom Antenna for 40, 20 and 10- meter Bands may be loaded: http: // www.antentop.org/019/windom_ur0gt_019.htm

Nikolay Kudryavchenko, UR0GT

It is possible get by choosing the point of the feeding of the antenna and lengths of short and long parts of the antenna. Height of the antenna as well influenced on the input impedance and resonance of the antenna. It would be useful to check the antenna in MMANA before antenna installation.

Simple broadband transformer 50/200- Ohm that may be used with the antenna described at Antentop- 01, 2015, pages 96- 97, *Broadband Transformer 50/200 Ohm by RZ9CJ.*

73! de UR0GT

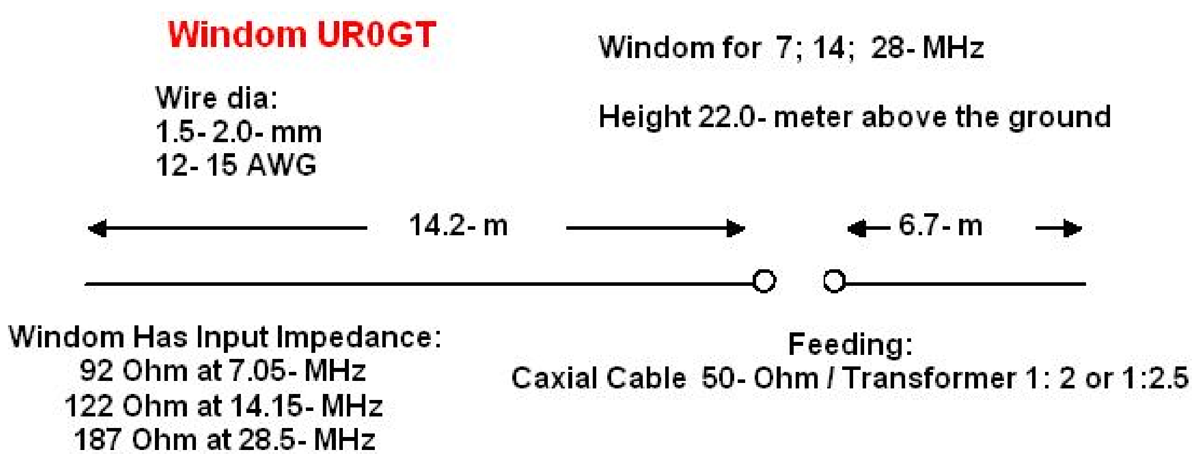
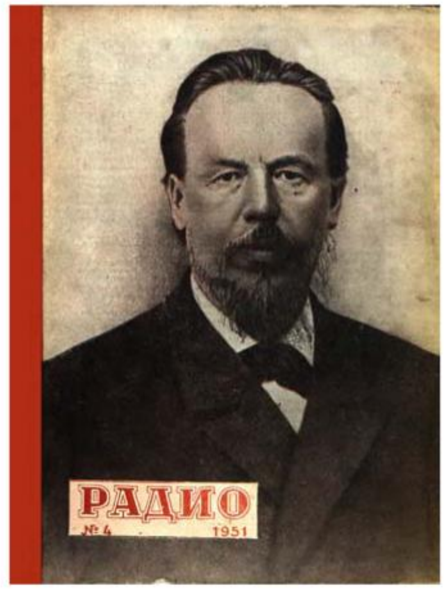


Figure 1 UR0GT Windom Antenna for 40, 20 and 10- meter Bands

Conical Windom Antenna

N. Tyutin, UA4QA, Kazan

Credit Line: Radio 1951, # 4, p. 39



Radio # 4, 1951

The antenna was installed and tested by UA4QA. Despite of the antenna was installed at a small height between the roofs of a two houses, on the 20 – meters the antenna did + 2… + 4 balls (at S-Scale) compare to usual one- wire Windom designed for the band. **Figure 1** shows the design of the antenna.

Antenna made of seven lengths in 0.477- lambda and in 3-mm diameter each. The wires were going through two ebonite rings and soldered in the places of the insulators and the connection of the one- wire feeder. (***Note by I.G.: There is no information about placement the rings on the antenna***).

Feeder should be athwart to the Antenna for the distance at least 2/3 lambda and then should not have sharp bending.

73! de UA4QA

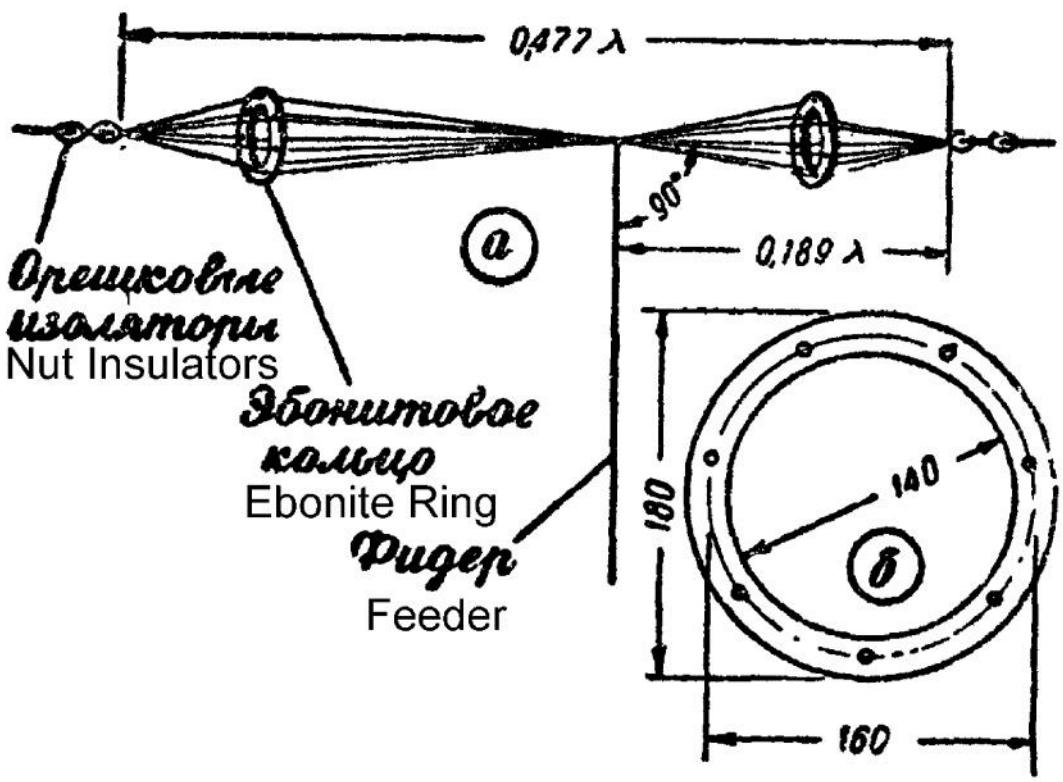


Figure 1 Conical Windom Antenna

Nadenenko Dipole Antenna

Nadenenko Dipole Antenna is a broadband antenna. The broadbandness is obtained by making sides of the dipole in thick manner of ten or more wires placed outside several circle forms that shaped the sides like a cylinder. The antenna was designed in the USSR in the middle of 30-s of 20 century. Then the antenna was widely used in military and civil radio communication. **Figure 1** shows design of the Nadenenko Dipole Antenna.

Ham as well may use the antenna. Dimensions of the antenna (see **Figure 1** for reference) for 40- 10 meters are: L= 8 meters, L1= 3 meters, L2= 1 meter, 2R= 1 meter. Diameter of wires is 1.5- 3 millimeters.

Dipole struts may be made from any stuff- metal or wood. Commonly metal struts with the shape of a circle or wooden struts with the shape of a polygon are used at commercial made Nadenenko Dipole Antenna. Wires may be attached to the struts at any way. Ends of the wires should be soldered together.

Commercial made Nadenenko Dipole Antenna fed by a 300- Ohm two wires line. Antenna radiates waves with horizon polarization.

By Radio 1959

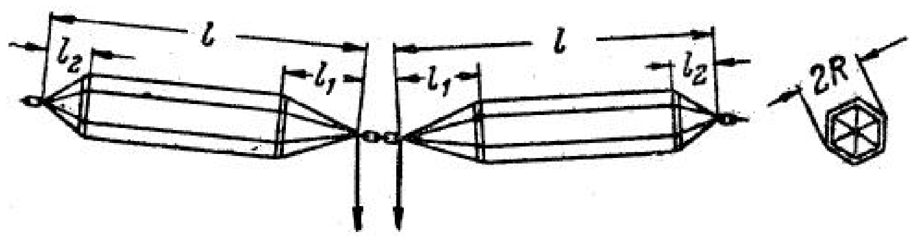


Figure 1 Nadenenko Dipole Antenna

With help of MMANA there were simulated parameters of the Nadenenko Dipole Antenna that was located at 10 meters above the real ground. Dimensions of the antenna were chosen for 40- 10 meters (L= 8 meters, L1= 3 meters, L2= 1 meter, 2R= 1 meter, diameter of wires is 2 millimeters).

Figure 2 shows plots for SWR of the antenna at 200,- 300,- and 600 Ohm feeder.

As you can see the 300- Ohm two wires line or transformer 1:4 with 50- Ohm coaxial cable may be used to feed the antenna. Of course ATU between transceiver and the feeder should be used.

Charts for DD and Z of the antenna for amateurs bands 40,- 30,- 20,- 15,- 12,- 10,- and 6 meters may be found at:
http://www.antentop.org/006/dipole_006.htm

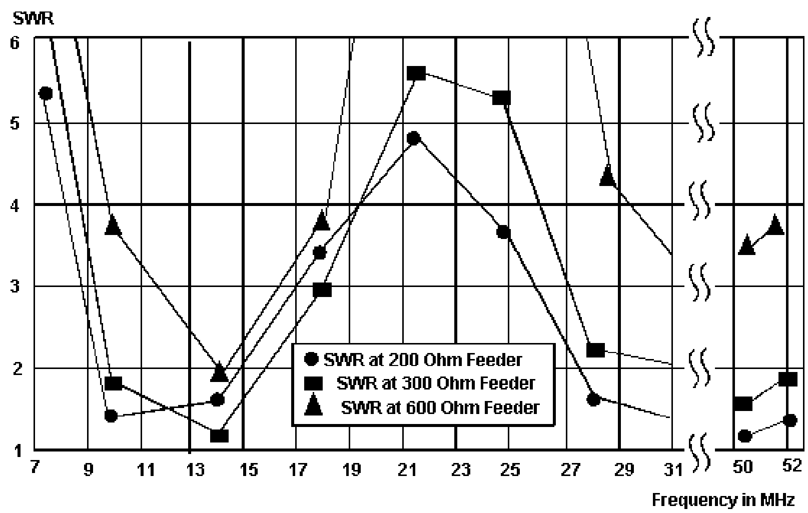


Figure 2 Plots for SWR of the Nadenenko Dipole Antenna at 200,- 300,- and 600 Ohm Feeder

Off Center Fed Dipole Antenna for 80- 40- 20- 15- and 10- meter Bands

Credit Line: Radio and TV-news, June, 1958

A Four- Bands Off-Center Fed Dipole Antenna (for 80- 40- 20- and 10- meter Bands) is well known among radio amateurs. However, the antenna cold be tuned to the fifth band (15- meters) just by adding of two 2 insulators and two closed stub with electrical length lambda/4 at the 15- meter Band. **Figure 1** shows the antenna.

15- meters: The wires located before the insulators A (from feeding terminals) work on the 15- meter Band. The wires located after insulators A cut off from the antenna by15- meters lambda/4 closed stubs.

Other Bands: At the other bands all parts of the antenna are worked because the stubs included in the overall antenna length.

The 15- meters lambda/4 closed stubs made from a ribbon two wires ladder line. Length for each of the stub is 4.85- meters. Wires at the far end of the stub soldered together (closed stub).

Stubs should be tuned to the 15- meter Band (for example with help of a DIP-Meter) before the installation into the antenna. Both stubs should be tuned onto the same frequency.

Radio and TV-news, June, 1958
Front Cover

The stubs are bended and placed at a small distance (15- 20- cm) near antenna wires.

The antenna worked great at the all five bands.

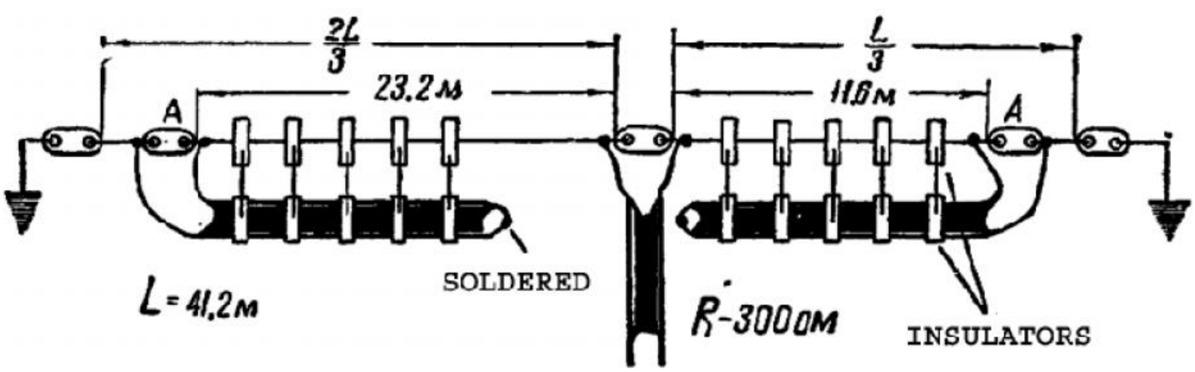


Figure 1 Off Center Fed Dipole Antenna for 80- 40- 20- 15- and 10- meter Bands

UP2NV Antenna for 80-, 40-, and 15- meter Bands

By: *Vladas Zhalnerauskas, UP2NV*

W3DZZ Antenna is widely used by radio amateurs. The antenna as usual works at several ham bands (from 3 to 5) where proved the efficiency. W3DZZ Antenna needs a little stuff to make it and easy to tune.

The described below antenna is a modification of the W3DZZ Antenna. The antenna could work at 80- 40- and 15- meter Bands. **Figure 1** shows all steps to transform W3DZZ Antenna to UP2NV Antenna.

It is known that classical W3DZZ Antenna has traps for one or several bands. In this case the traps were changed at first to quarter wave stubs then the stubs were superposed with antenna wires. It was got compact and reliable antenna that worked good at three Bands- 80-, 40-, and 15- meters. Sizes of the antenna shown at **Figure 1** are given in centimeters. Stubs were fixed with help of dielectric struts. Antenna should feed through 75- Ohm coaxial cable if it is placed at some height above the ground. If the antenna made in the shape of Inverted V the 50- Ohm coaxial cable should be used for feeding the antenna. Antenna was made from 2- mm (12- AWG) copper wire. Coaxial cable should be placed at right angle to the antenna wires.

The Antenna was used for several years at UP2NV ham station with a good result.

73! de UP2NV

UP2NV. Klaipeda, 1981.
Credit Line:
http://deltaclub.org.ua/bibliteka/history-taught-extramural-competitions-hf-year-1981.html

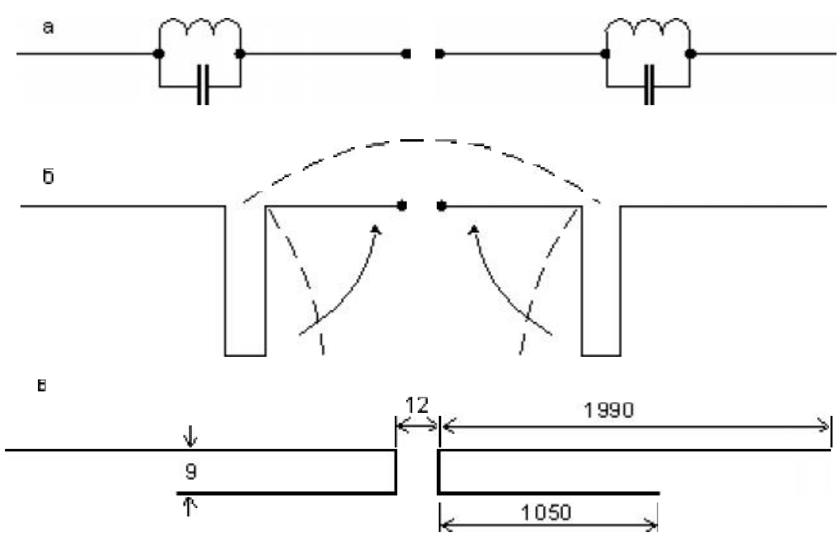


Figure 1 Transformation W3DZZ Antenna to UP2NV Antenna

Two Multiband Asymmetrical Dipole Antennas

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

Asymmetrical Dipole Antenna for 80/40/20/10- meter bands is shown on the **Figure 1**. Asymmetrical Dipole Antenna for 80/40/20/15/10- meter bands is shown on the **Figure 2**.

The MMANA models for the both antennas may be loaded:
http://www.antentop.org/014/dipole_014.htm

Charts for both antennas for Z, SWR and DD for all working bands may be found at:
http://www.antentop.org/014/dipole_014.htm

Input impedance of the antennas close to 150- 200- Ohm, it depends on the band. To match the antenna with coaxial cable 50- Ohm it is need to use transformer 1:3 or 1:4. Transformer 1:4 could improve the efficiency of the antennas at the 10- meter Band.

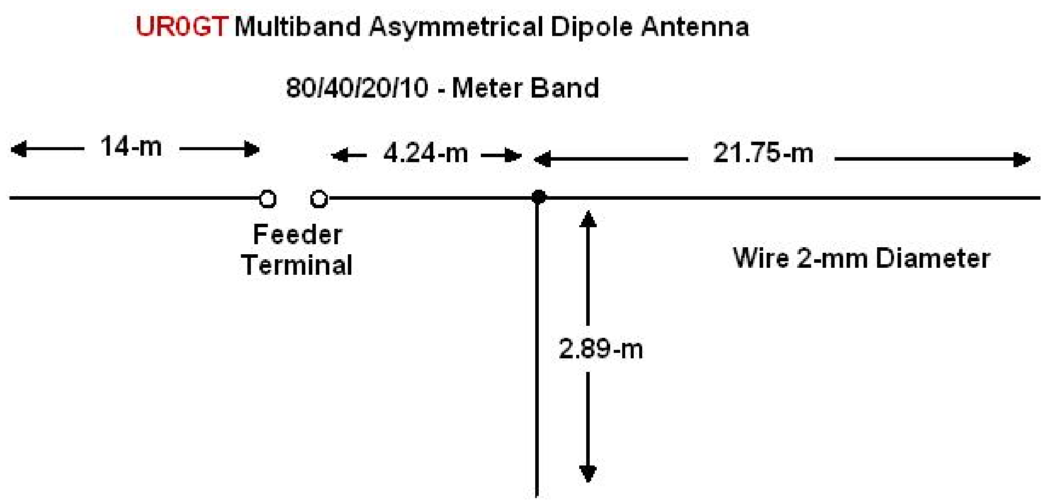


Figure 1 Asymmetrical Dipole Antenna for 80/40/20/10- meter Bands

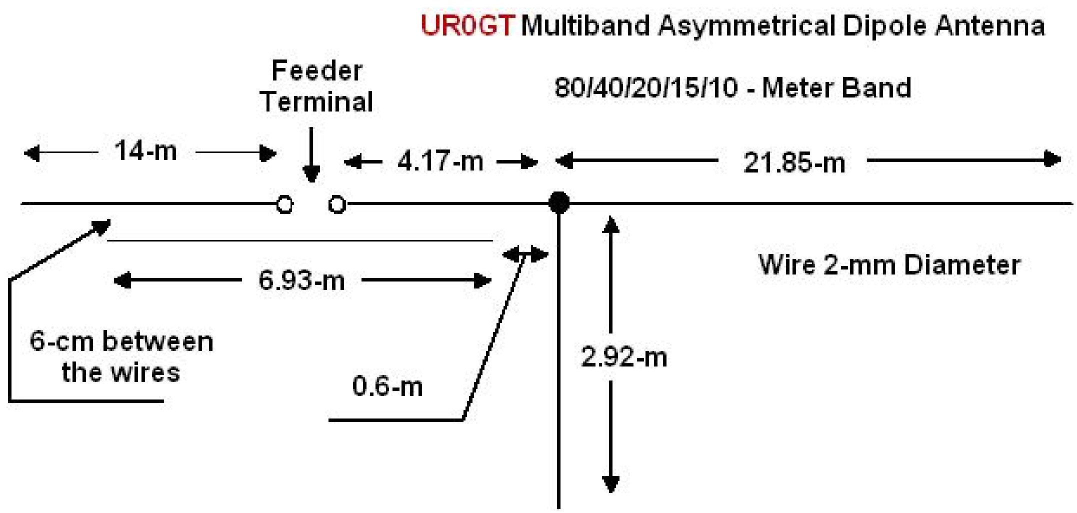


Figure 2 Asymmetrical Dipole Antenna for 80/40/20/10- meter Bands

Two DEWD Dipole Antennas for the 80- meters

The publication is devoted to the memory UR0GT.

By: **Nikolay Kudryavchenko, UR0GT**

DEWD Antenna for the 80- meters is shown on **Figure 1**. Shortened DEWD Antenna for the 80- meters is shown on **Figure 2**.
The antennas have SWR less the 1.2:1.0 in the range of 3.5- 3.8- MHz.

Tuning of the antenna: To move the resonance frequencies it needs to change the length of the "short" and "long" parts of the antenna. To shift the reactance- change the width between antenna wires.

Model for both antennas may be loaded:
http: // www.antentop.org/011/dewd_dipole_011.htm

Chart for Z, SWR and DD of the antennas may be found at:
http: // www.antentop.org/011/dewd_dipole_011.htm

73, UR0GT

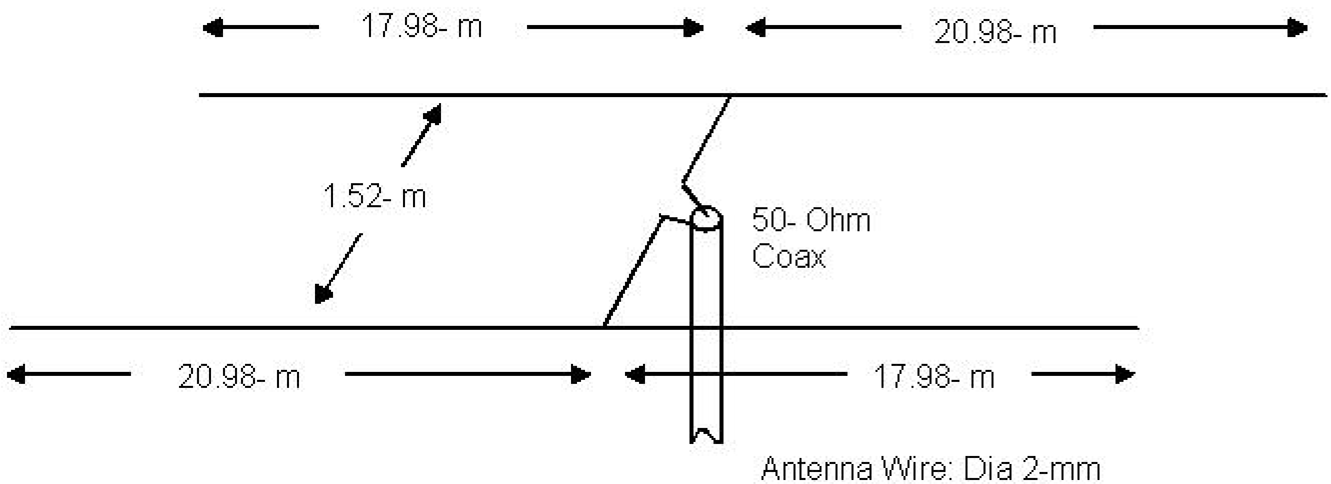


Figure 1 DEWD Dipole Antenna for the 80- meters

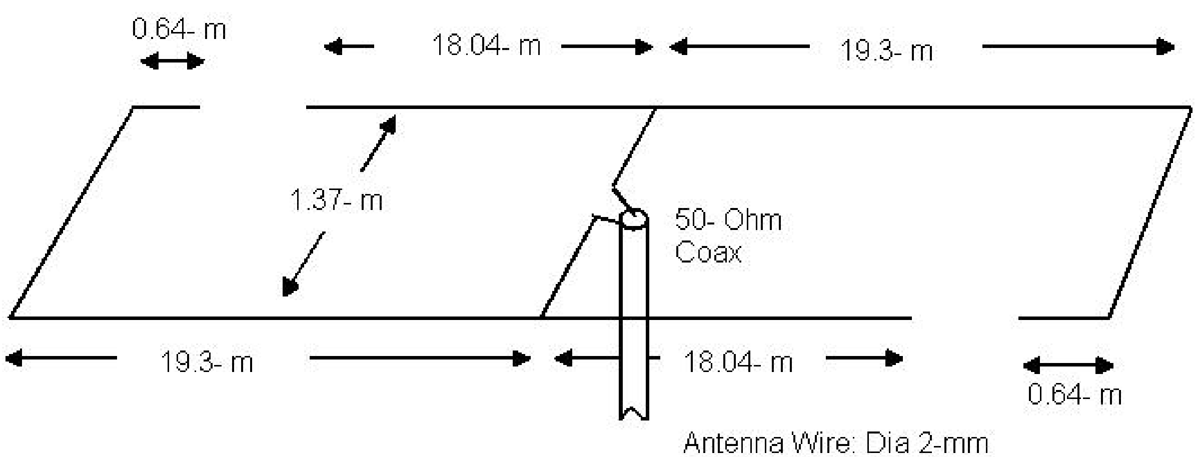


Figure 2 Shortened DEWD Dipole Antenna for the 80- meters

Stub Matching DEWD Dipole Antenna for the 80- meters

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

It is just a variant of a DEWD Dipole Antenna for the 80- meters. Stub Matching is used to match the antenna with 50- Ohm coaxial cable.
The antenna has enough good parameters – Pass Band and Efficiency.

Figure 1 shows design of the Stub Matching DEWD Dipole Antenna. **Figure 2** shows SWR of the Stub Matching DEWD Dipole Antenna.

Charts for Z and DD of the antenna may be found at: http: // www.antentop.org/012/stub_dewd_012.htm,

The MMANA model of the antenna may be loaded: http: // www.antentop.org/012/stub_dewd_012.htm,

73 Nick

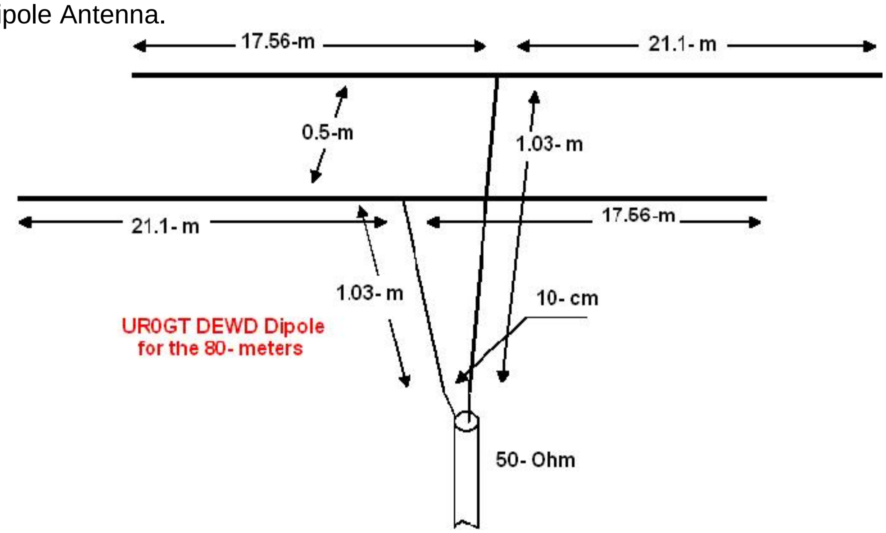


Figure 1 Design of the DEWD Dipole for the 80- meters with Stub Matching

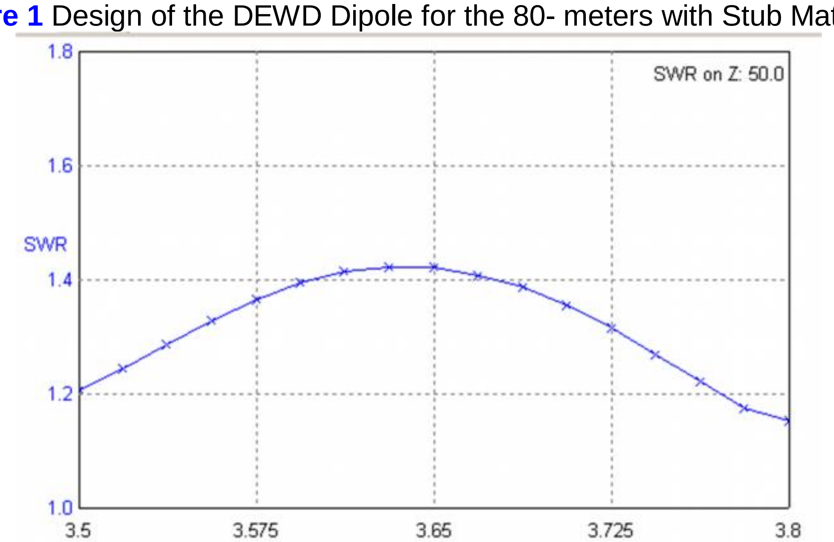


Figure 2 SWR of the Stub Matching DEWD Dipole Antenna for the 80- meters (Installed at height of 30- m above the real ground)

Dipole Antenna for the 80- meters with Rectangular UR0GT- Match

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

It is an alternative way (compare to DEWD) to design a broadband antenna. So called "UR0GT- Match" may increase the passband of the antenna. This way to match an antenna was offered by UR0GT at 2004 at HZ- Forum. At first this way to match antenna was offered for VHF- Antennas however it works at HF too.
Figure 1 shows design of the antenna. **Figure 2** shows SWR of the antenna.

The "UR0GT- Match" may be used at all antenna types – dipoles, verticals, YAGI- either symmetrical or asymmetrical.

The MMANA model of the Dipole Antenna for the 80- meters with rectangular UR0GT- Match
may be loaded:
http: // www.antentop.org/012/r_ur0gt_012.htm

73 Nick

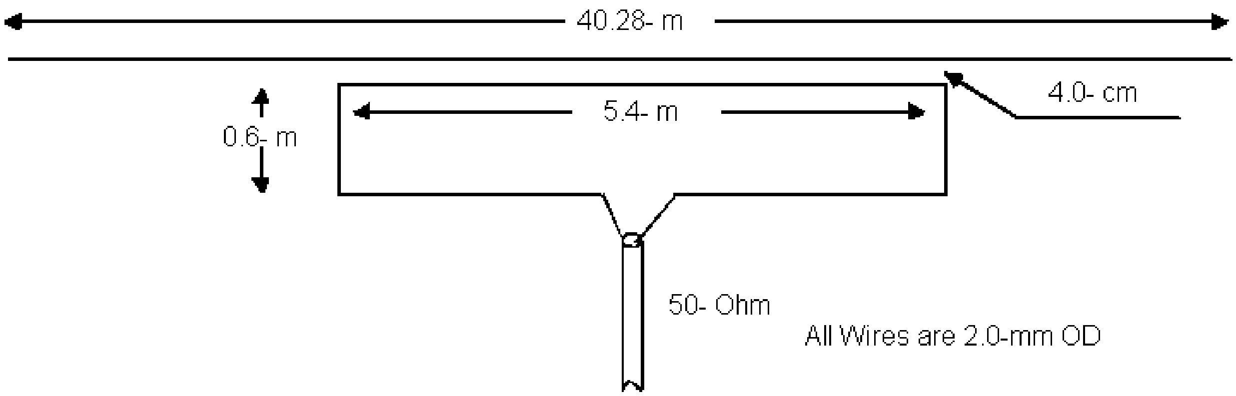


Figure 1 Design of the Dipole Antenna for the 80- meters with Rectangular UR0GT- Match

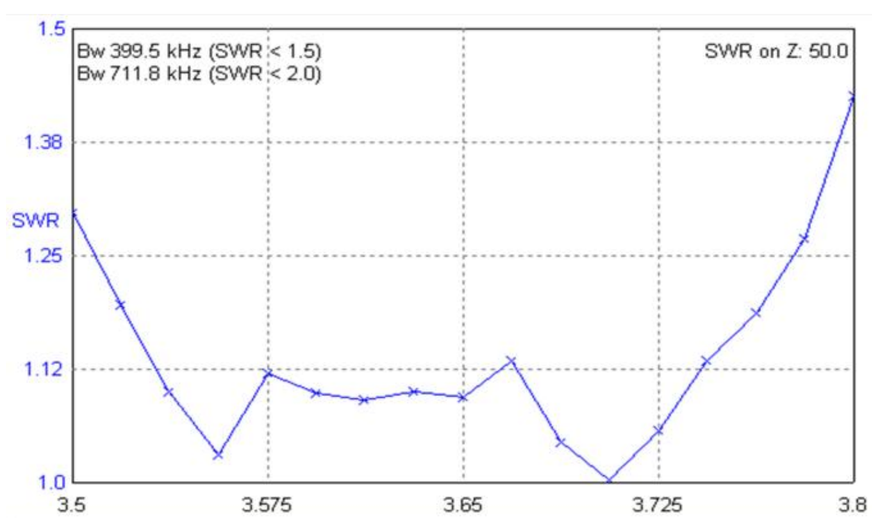


Figure 2 SWR of the Dipole Antenna for the 80- meters with rectangular UR0GT- Match
(Installed at height of 30- m above the real ground)

Dipole Antenna for the 80- meters with Triangular UR0GT- Match

The publication is devoted to the memory UR0GT.

By**: **Nikolay Kudryavchenko, UR0GT

It is an alternative way (compare to DEWD) to design a broadband antenna. So called "UR0GT- Match" may increase the passband of the antenna. This way to match an antenna was offered by UR0GT at 2004 at HZ- Forum. At first this way to match antenna was offered for VHF- Antennas however it works at HF too.

Figure 1 shows design of the antenna. **Figure 2** shows SWR of the antenna.

The "UR0GT- Match" may be used at all antenna types – dipoles, verticals, YAGI- either symmetrical or asymmetrical.

The MMANA model of the Dipole Antenna for the 80- meters with triangular UR0GT- Match may be loaded:
http: // www.antentop.org/012/t_ur0gt_012.htm

73 Nick

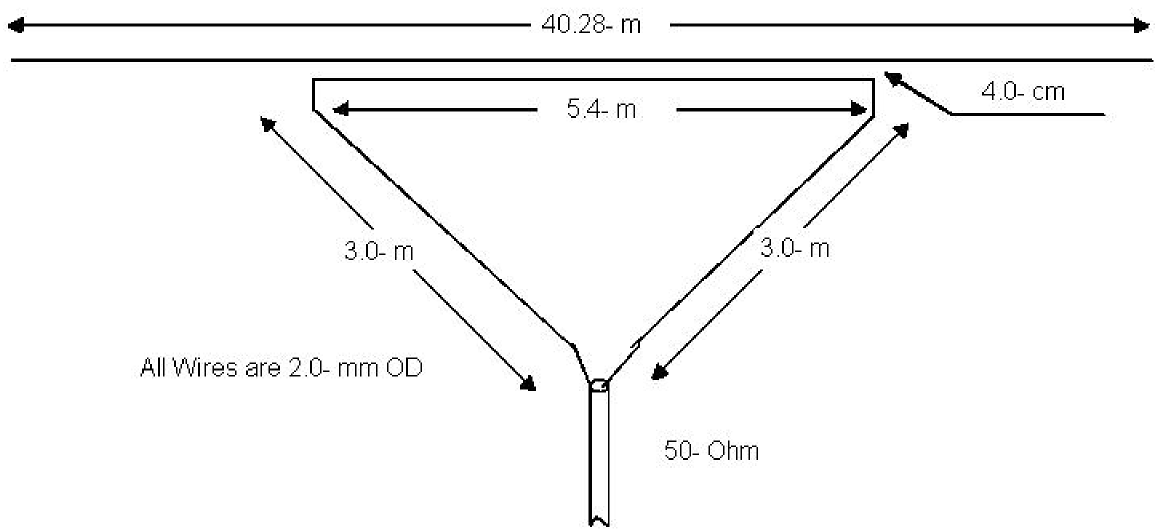


Figure 1 Design of the Dipole Antenna for the 80- meters with Triangular UR0GT- Match

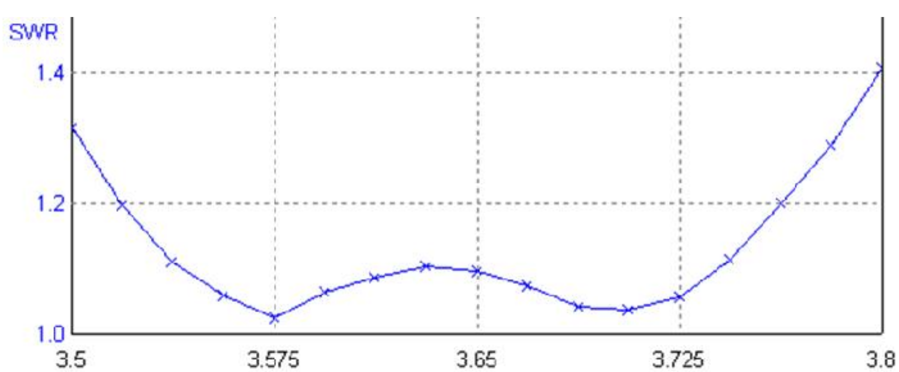


Figure 2 SWR of the Dipole Antenna for the 80- meters with Triangular UR0GT- Match (Installed at height of 30- m above the real ground)

Narrow DEWD Dipole Antenna for the 80- meters

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

It is a variant of a Narrow DEWD Dipole Antenna where the distance between antenna wires is 10- cm. The antenna contains four wires with equal length (each wire is in 19.0- meter long). However, the antenna has enough good parameters compare to usual DEWD antennas (that were described at Antentop-01- 2009).

Figure 1 shows design of the antenna. **Figure 2** shows SWR of the antenna.

The MMANA model of the antenna may be loaded: http: // www.antentop.org/012/narrow_dewd_012.htm

73 Nick

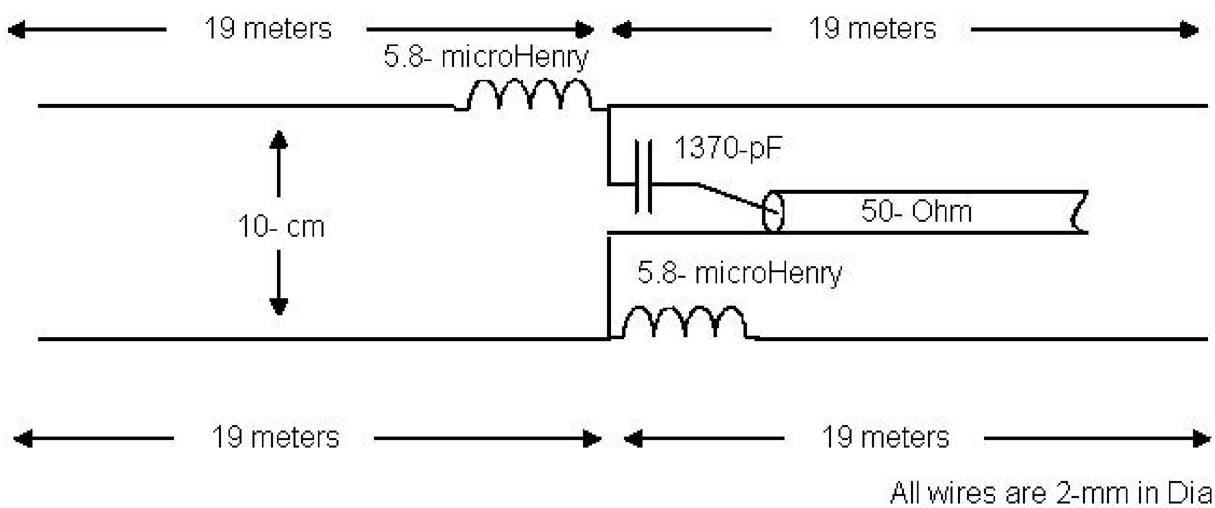


Figure 1 Design of the Narrow DEWD Dipole Antenna

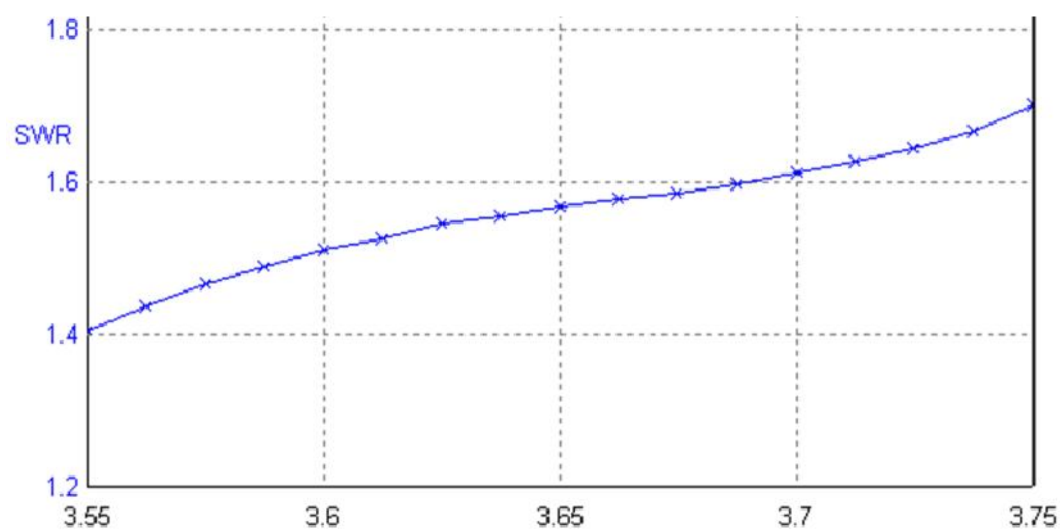


Figure 2 SWR of the Narrow DEWD Dipole Antenna
(Installed at height of 20- m above the real ground)

Narrow DEWD Dipole Antenna for the 80- meters with Inductance Matching

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

It is just a variant of a DEWD Dipole for the 80- meters with Inductance Matching. The antenna has enough good parameters – Pass Band and Efficiency.

Figure 1 shows design of the antenna. **Figure 2** shows SWR of the antenna.

The MMANA model of the antenna may be loaded: http: // www.antentop.org/012/nl_dewd_012.htm

73 Nick

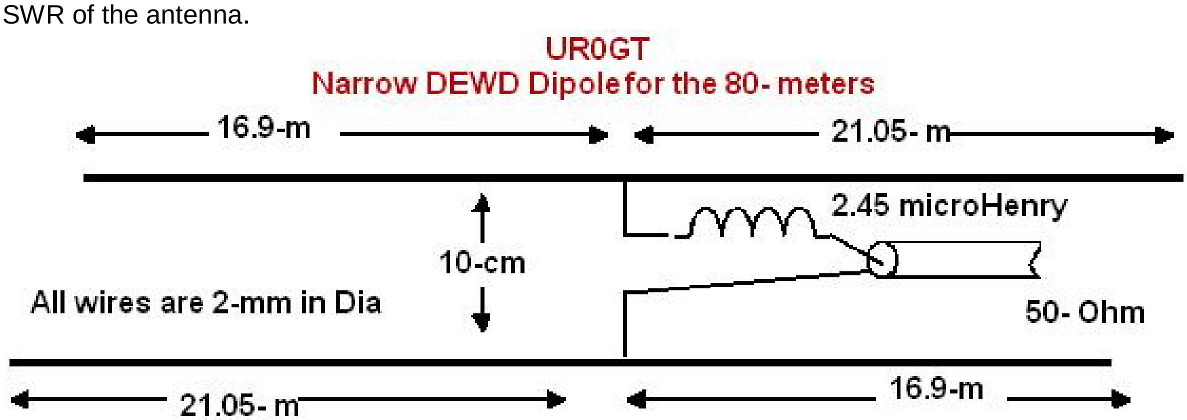


Figure 1 Design of the Narrow DEWD Dipole for the 80- meters with an Inductance Matching

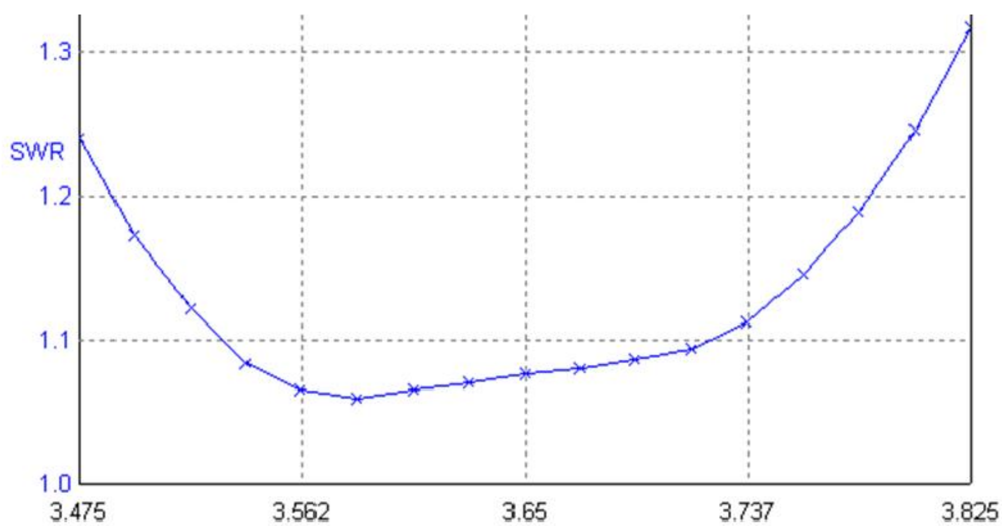


Figure 2 SWR of the Narrow DEWD Dipole for the 80- meters with an Inductance Matching (Installed at height of 30- m above the real ground)

Narrow DEWD Dipole Antenna for the 80- meters with a Stub Matching

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

It is just a variant of a DEWD Dipole for the 80- meters with a Stub Matching. The antenna has enough good parameters – Pass Band and Efficiency.

Figure 1 shows design of the antenna. **Figure 2** shows SWR of the antenna.

The MMANA model of the antenna may be loaded: http: // www.antentop.org/012/n_dewd_012.htm

73 Nick

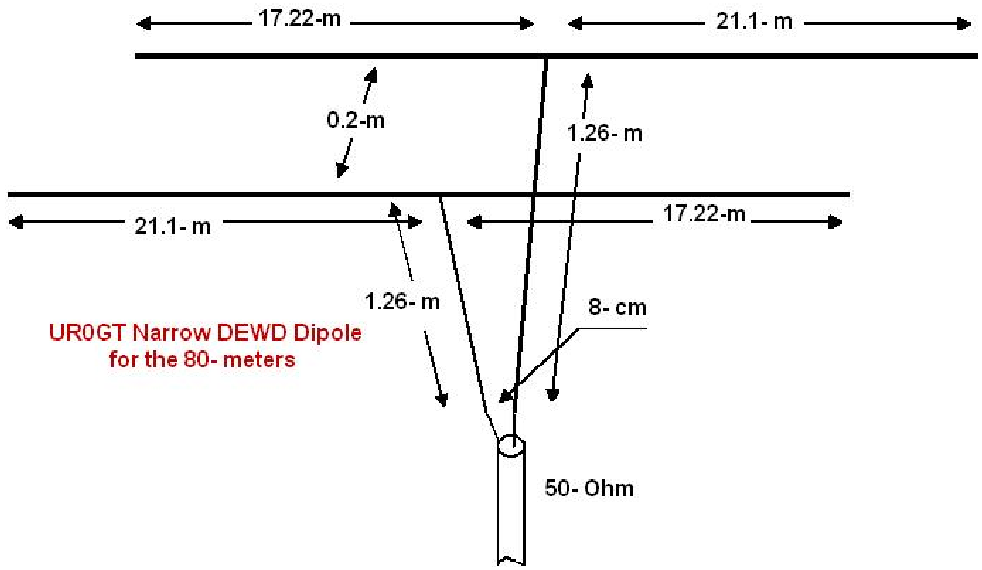


Figure 1 Design of the Narrow DEWD Dipole for the 80- meters with a Stub Matching

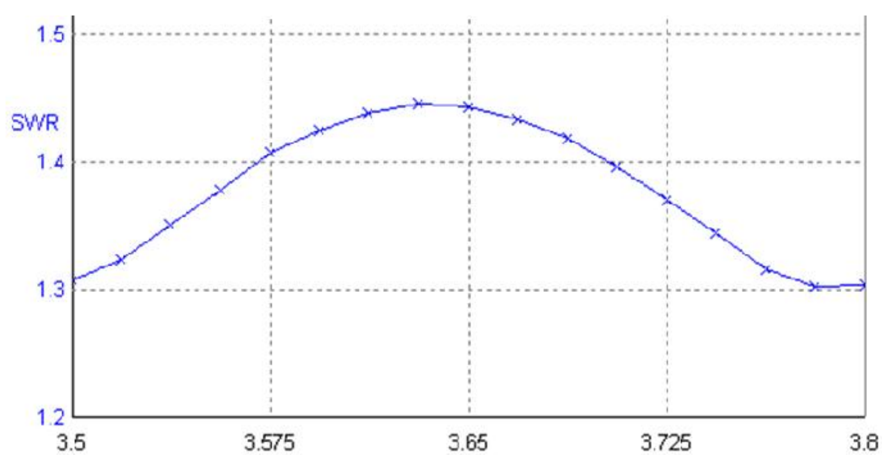


Figure 2 SWR of the Narrow DEWD Dipole for the 80- meters with a Stub Matching (Installed at height of 30- m above the real ground)

Super Narrow DEWD Dipole Antenna for the 80- meters with A Stub Matching

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

It is just a variant of a DEWD Dipole Antenna for the 80- meters with a Stub Matching. The antenna has enough good parameters – Pass Band and Efficiency.

Figure 1 shows design of the antenna. **Figure 2** shows SWR of the antenna.

The MMANA model of the antenna may be loaded: http: // www.antentop.org/012/sn_dewd_012.htm

73 Nick

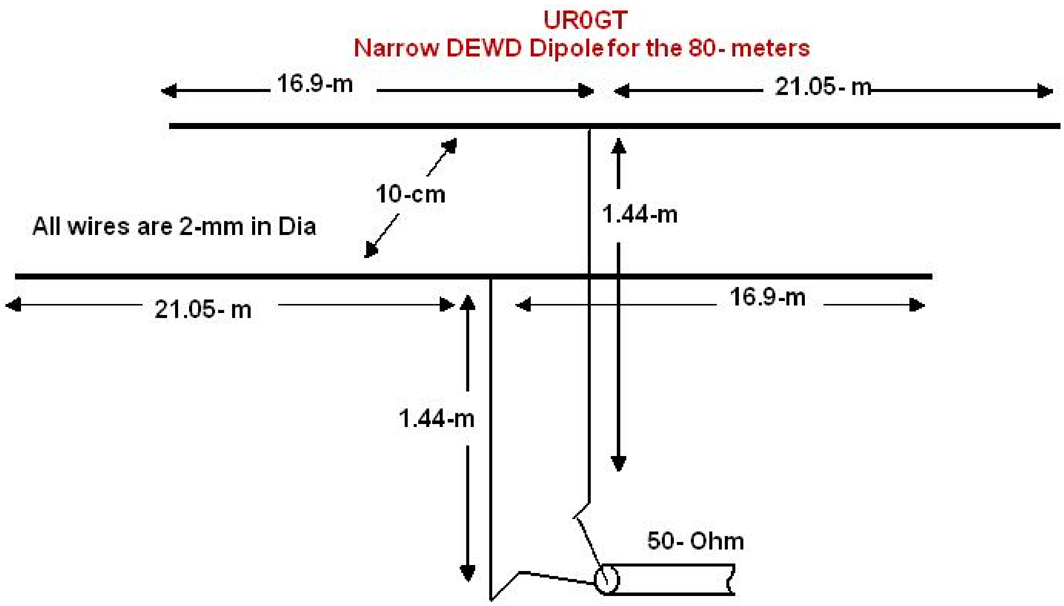


Figure 1 Design of the Super Narrow DEWD Dipole Antenna for the 80- meters with a Stub Matching

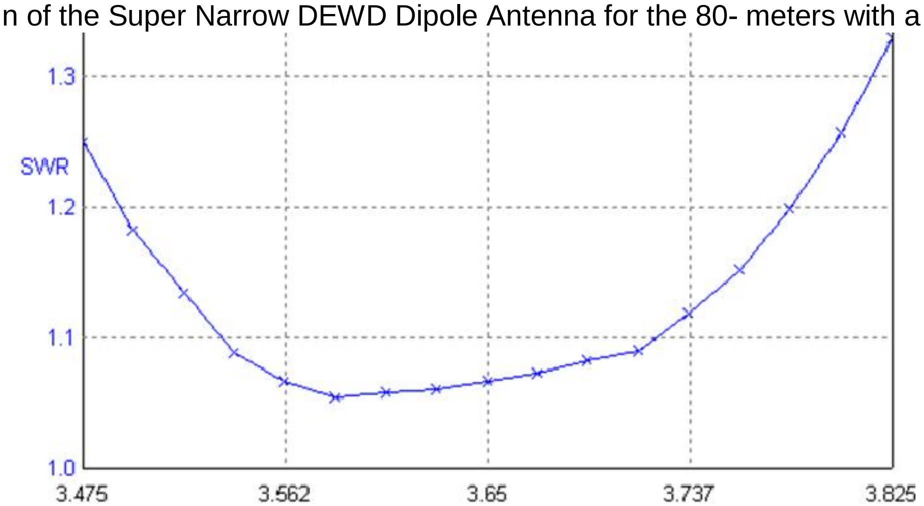


Figure 2 SWR of the Super Narrow DEWD Dipole Antenna for the 80- meters with a Stub Matching (Installed at height of 30- m above the real ground)

Ground Plane for the 40,-30,-20 and 17- meter Bands

By: Vasiliy Samay, R7AA

Credit Line:
http://news.cqham.ru/articles/detail.phtml?id=1076

The antenna is a very simple. It is just a vertical radiator in 10- meter length that is matched at the each working band by its own matching unit that is switched on with help of pair relays. However to this design I came out not straight away. Before I was tried several multiband antennas (for example, antennas from **References** 1 and **2**) but for some reason no one of them did not satisfied me. I could not get good SWR at each of desirable working bands of the antennas.

Friend of mine, UA7A, ex UA6CW, advised to me to use the described below antenna. He helped to me to calculate matching circuits for the antenna. **Figure 1** shows schematic of the antenna. **Figure 2** shows schematic of the matching circuits for 40,- 30,- 20 and 17- meter Bands. To eliminate static from the antenna the vertical radiator is grounded through pair resistors in 430 k/2-W.

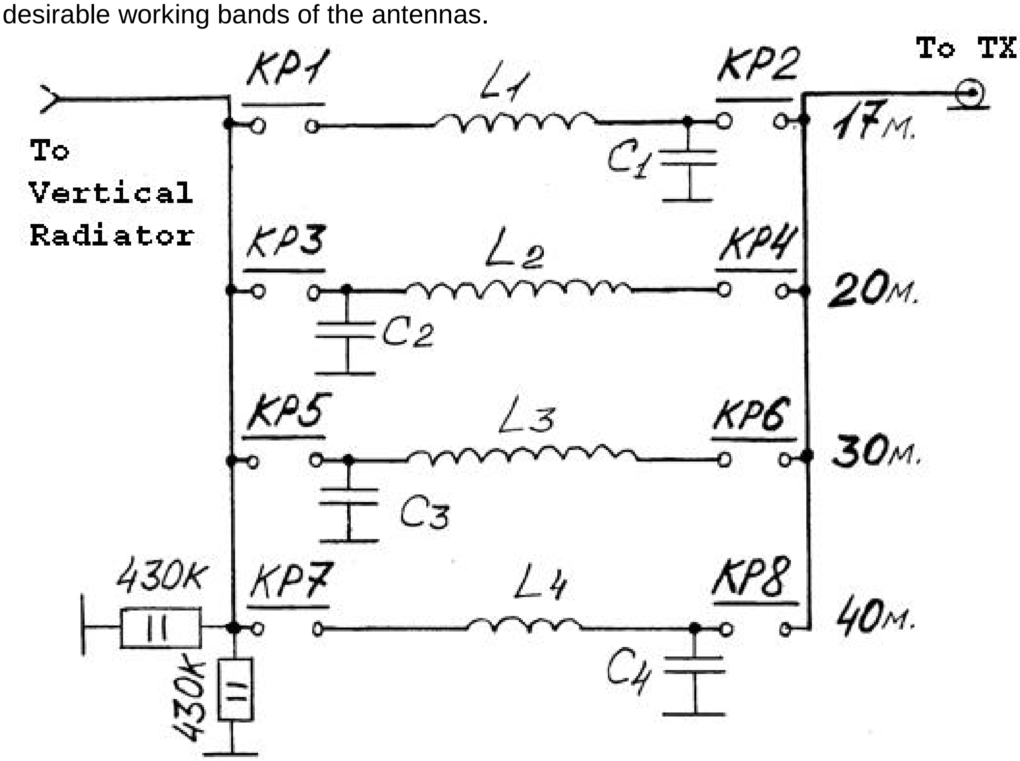


Figure 2 Matching Circuits for 40,- 30,- 20 and 17- meter Bands.

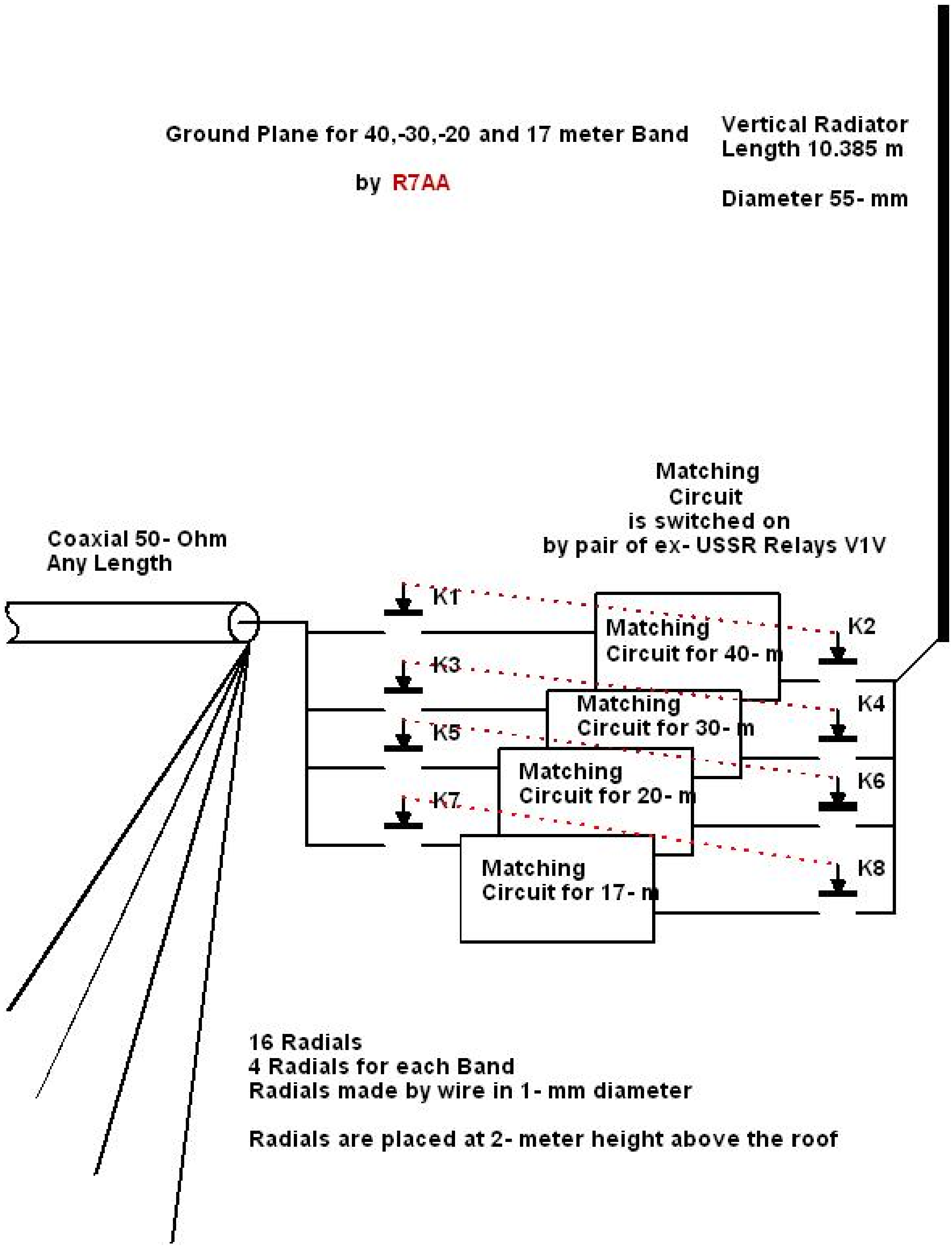


Figure 1 Ground Plane for the 40,- 30,- 20 and 17- meter Bands

Table 1 shows data for the matching circuits. All inductors are coiled by wire in 2- mm diameter (12- AWG). Inductors are air- winding. Diameter of each inductor is 40- mm. Gap between coils is 3- 5-mm. The gap should be defined at the tuning of the antenna. High- voltage ex- USSR capacitors **K15U-1** are used in the matching circuits.

Vacuum ex- USSR relay **V1V** did switching on the matching circuit. All matching circuits were sitting in aluminum box by dimension 330x200x130- mm. **Figure 3** shows the design of the box. (There are matching circuits for the 80/75- meter Band inside the matching box. However, the antenna could not provide satisfaction operation on the bands. So I did not use the antenna on the bands)

Ground Plane. General view

Table 1 Data for Parts for the Matching Circuits

Band, m	Inductor, turns	Capacitor, pF
40	3	300 (3X100- pF)
30	8	118 (100- pF + 18- pF)
20	8.5	22
17	5.3	112 (100- pF+ 18- pF)

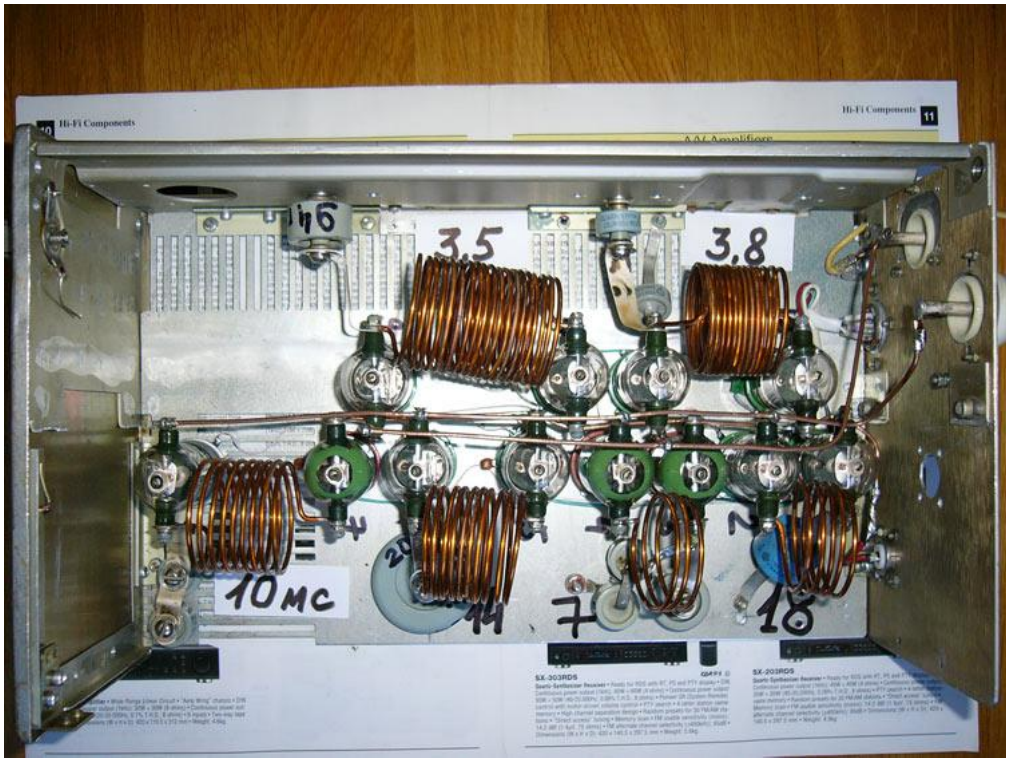


Figure 3 Box with Matching Circuits

Relay V1V

Ground Plane. Radials

Antenna may be tuned in the resonance by length of the radials and changing inductance of the inductors (by squeeze/stretch). **Table 2** shows data for the antenna measured by MFJ- 259-B. There are shown data for two antenna locations at the roof. "Variant 1" shows data for initial installation of the antenna. Then antenna for some reason was relocated to other place. "Variant 2" shows the data for the other installation of the antenna.

The places were almost equal to each other. The difference is in the length of the coaxial cable going from my transceiver to the antenna. Length of the cable at "Variant 1" was 18- meters. Length of the cable at "Variant 2" was 40.6- meters.

References

1. http://www.dl2kq.de/ant/3-3.htm
2. http://www.antentop.org/ua1dz.htm

Table 2 Data for Two Variants of Installation of the Ground Plane Antenna

Variant 1				***Variant 2***			
F, MHz	SWR	R	X	F, MHz	SWR	R	X
18.200	1.1	52	7	18.170	1.0	49	3
18.068	1.2	58	8	18.068	1.1	56	4
14.100	1.1	44	3	14.110	1.0	50	4
14.000	1.2	46	8	14.000	1.2	56	7
14.200	1.2	41	0	14.200	1.1	46	6
14.300	1.3	36	0	14.300	1.3	44	11
14.370	1.5	33	0	14.350	1.3	44	14
10.110	1.0	49	3	10.100	1.1	46	7
1.150	1.1	46	4	10.150	1.1	45	4
7.000	1.1	49	6	7.000	1.2	41	6
7.100	1.1	45	4	7.100	1.0	50	1
7.200	1.4	37	8	7.200	1.3	62	7

Capacitors **K15U-1**

Ground Plane. Box with Matching Circuits

Top Fed Five Bands Vertical Antenna

By: **Yuri Medinets, UB5UG, Kiev**

Credit Line: Radio #1, 1984, p.24

There is one simple solution to increase the efficiency of a vertical antenna. Just to rise high currents parts of the antenna (it is usual down part of the vertical) from the ground. The losses at the ground would be decreased and the overall performance of the antenna should be increased. The more the high current parts of the antenna is rose the less losses in the ground. In the limit of all we have got a ***Top Fed Vertical Antenna***.

Figure 1 shows one band Top Fed Vertical Antenna. Upper horizon part of the antenna stretched with help of a fishing rope by 1.0-mm in diameter.

To the middle of the horizon wire the inner conductor of the coaxial cable is connected. The outer shield of the coaxial cable is free. Coaxial cable is going straight down or with some angle to the horizon wire. An RF-Choke is installed at the distance lambda/4 from the top end of the coaxial cable. The RF-Choke made like a resonant LC-circuit. The circuit has resonant at the working frequency of the antenna.

RF- Choke practically made by coiling around of one side of a ferrite ring (having low losses at HF) with large OD/ID one or two turns by the antenna coaxial cable. A Resonance Coil coiled at another side of the ring. The circuit (coil and bridged to it capacitor) has resonance at the working frequency.

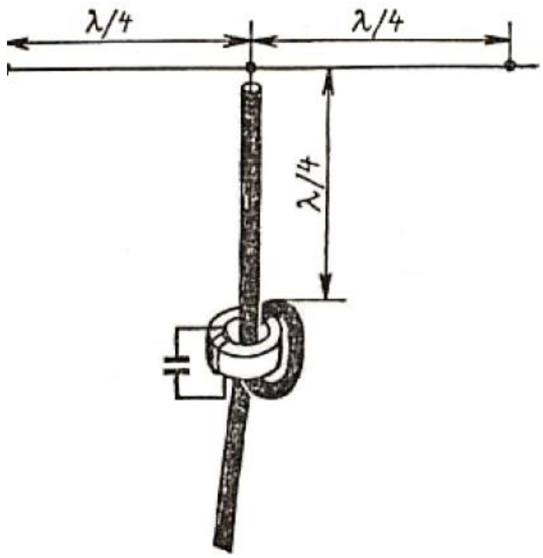


Figure 1 One band Top Fed Vertical Antenna

The Choke may be made without a ferrite ring. Such choke looks like two- three large turns of wire in 2- 4-mm in diameter bridged to capacitor. Coaxial cable in the needed place is coiled by one turn with this coil. The coax and the coil are tight by a Scotch. Capacitor should have high Q and high working voltage. TX with output power in 100- W may induce across the capacitor 400-500- V RF.

Data (approximately) for the Choke (made by wire in 2-mm in diameter) are given in **Table 1**.

The Choke does not influence to the coaxial going below the Choke. Below the Choke coaxial (any length) may go in any way- lay on the ground or roof, go near a home wall, etc.

It is very possible to create a multi- band Top Fed Choke Antenna. Use vertical wires that have resonance for each band and just place at needed places on to coaxial cable the special resonance Chokes. **Figure 2** shows the schematic for 5-band Top Fed Choke Antenna.

Table 1 Data for Loop Choke

Band, MHz	Numbers of turns	Length of the wire, cm	C, PF	Q
7	3	160	150	260
14	2	115	68	230
21	2	80	47	210
28	2	60	36	265

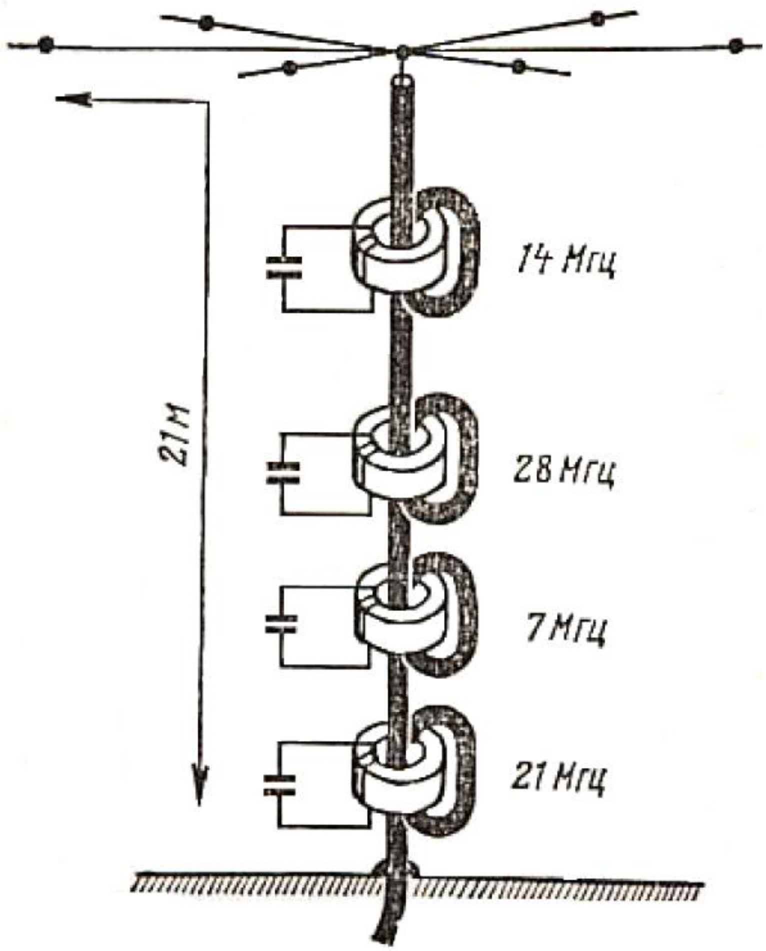


Figure 2 Top Fed Five Bands Antenna

Horizon part of the antenna has three pair wires in length 10- m (for 7 and 21- MHz), 5- meters (for 14- MHz), 2.5- meters (for 28- MHz). Chokes are placed (from the Top End): 7.5- meters for 28- MHz, 3.5 or 10.5- meters for 21- MHz, 5- meters for 14- MHz, 10- meters for 7- MHz. The sizes are approximately and should be corrected at antenna tuning.

For 3.5- MHz the outer shield of the coaxial is grounded to the ground after last Choke.

The distance is approximately and should be corrected at antenna tuning. It is possible to tune the antenna at 3.5- MHz by the coil or capacity that is switching on between the outer shield of the coaxial and the ground.

The input impedance of the antenna at the 7- 14- 21- 28- MHz is close to 50- Ohm. The input impedance of the antenna at the 3.5- MHz is close to 100- Ohm.

DEWD Vertical Antenna for the 80- meters

The publication is devoted to the memory UR0GT.

***By*: Nikolay Kudryavchenko, UR0GT**

Variant of a DEWD Vertical Antenna for 3.5 – 4.0 MHz looks astonishingly simply. Just one wire in diameter of 2- mm and 18.04 meters long is installed on the distance 74- cm near a Vertical Antenna with diameter of 60- mm and height of 20.6 meters. **Figure 1** shows the simplified DEWD Vertical Antenna for 3.5 – 4.0.

This additional wire should be connected to counterpoises or to other (common with the Vertical Antenna) grounding.

SWR for the DEWD Vertical is not exceeded 1.45:1.0 at the range 3.5 – 4.0- MHz. The rest parameters for the antenna are almost similar to ¼-lambda Vertical Antenna.

Chart for Z, SWR and DD of the antenna may be found at:
http: // www.antentop.org/011/vertical_011.htm

The model of the simplified DEWD Vertical Antenna (file *DV3.5_4MHz.maa*) without counterpoises ("ground" does the job) may be loaded:
http: // www.antentop.org/011/vertical_011.htm

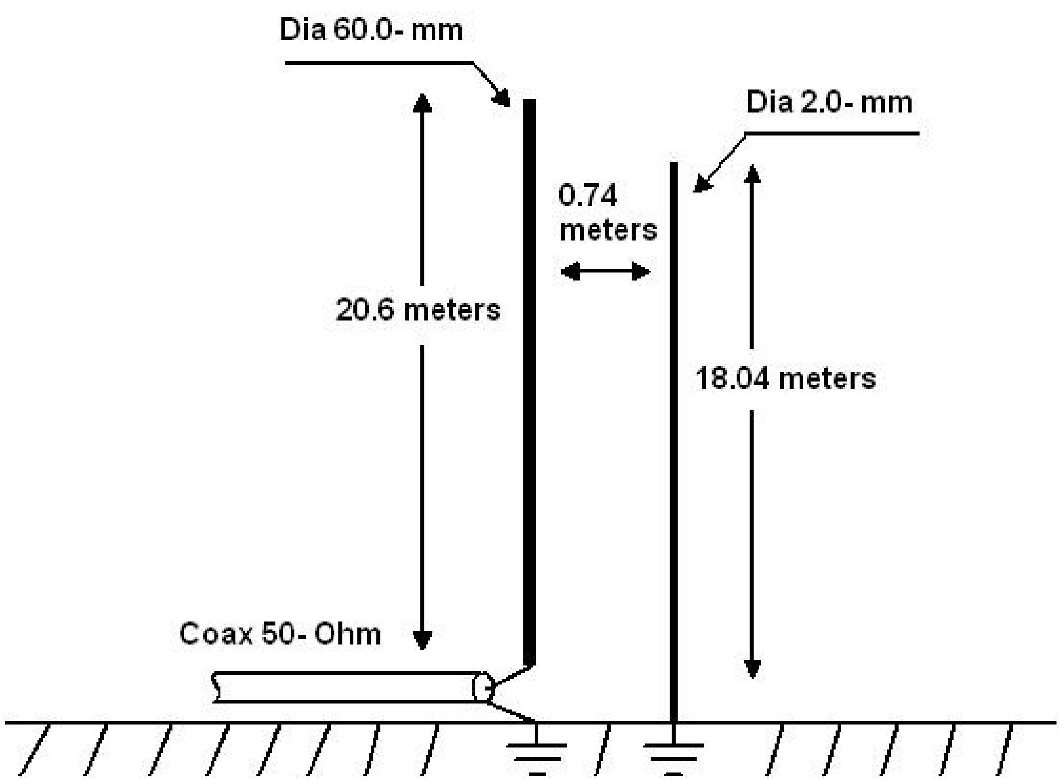


Figure 1 Simplified DEWD Vertical Antenna for the 80- meters

Figure 2 shows real DEWD Vertical Antenna for 3.5 – 4.0. The antenna has ground wires that were count at simulation of the antenna parameters.

SWR for the DEWD Vertical is not exceeded 1.45:1.0 at the range 3.5 – 3.9- MHz. The rest parameters for the antenna are almost similar to ¼-lambda Vertical Antenna.

Chart for Z, SWR and DD of the antenna may be found at: http: // www.antentop.org/011/vertical_011.htm

Model of the "Real" DEWD Vertical with counterpoises (file *DV3.5_4MHz.2.maa*) placed at 1- meter above ground may be loaded from: http: // www.antentop.org/011/vertical_011.htm

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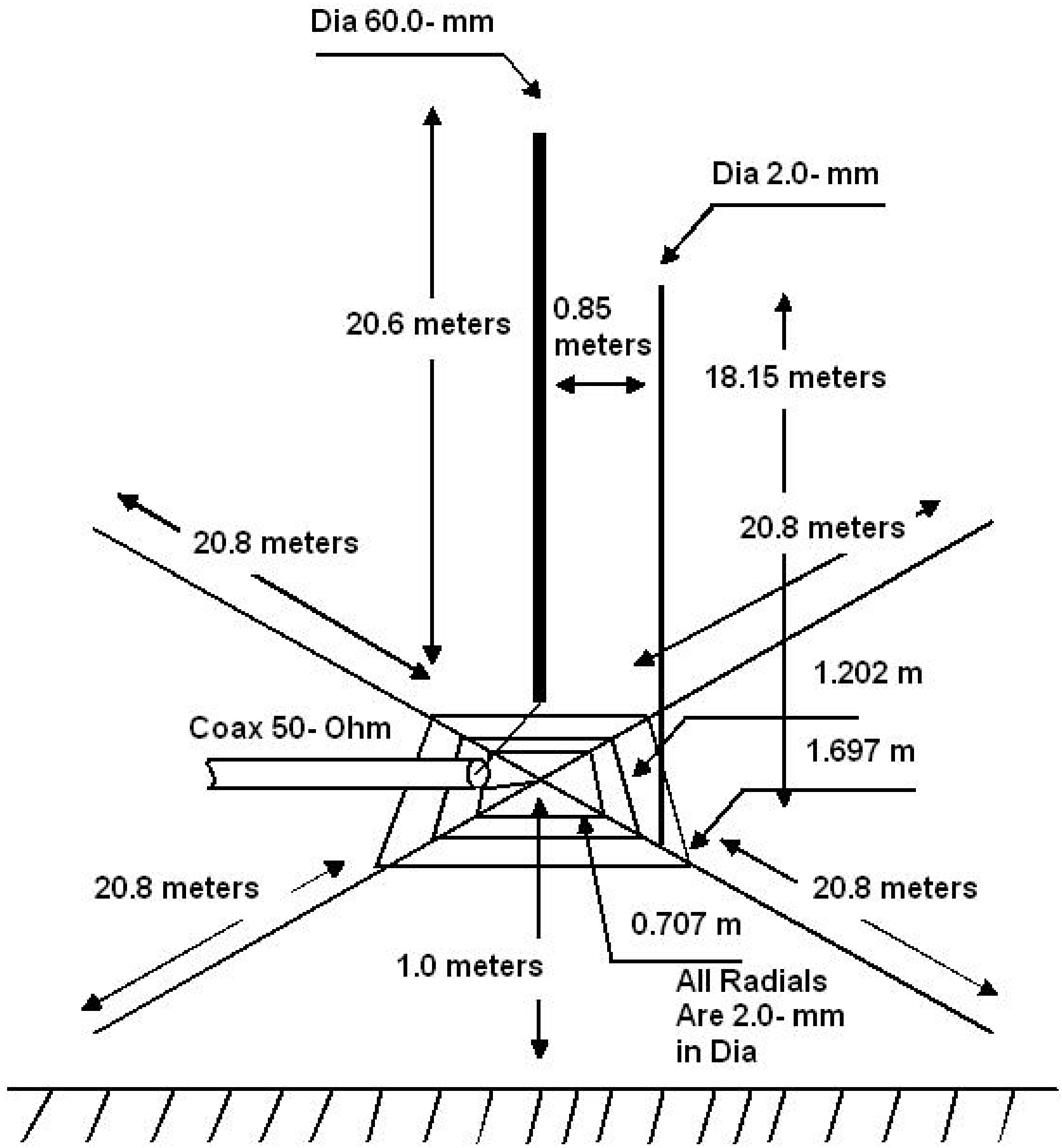

Figure 2 Real DEWD Vertical for the 80- meters

Conclusion

So, Chapter 8 ***"Antennas for Unlimited Open Space"*** is ended. Lots practical designs of the antenna were described at the chapter. I believe you will find antenna design that fit you "Unlimited Open Space" or just idea what you will do.To find more information for described here antennas- Z, SWR and DD just follow link that is mention in the Chapter.

Some antennas are given in ***Additional Source***. All links go to ***AntenTop site***.

73!

Igor, VA3ZNW

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2. Delta Antenna for 80-. 40-, 20- and 15- meter Bands: http://www.antentop.org/018/ur0gt_delta_018.htm
3. Delta for 80 and 40- meters: http://www.antentop.org/010/rz3dk_010.htm
4. Rectangular UB5UG: http://www.antentop.org/010/ub5ug_010.htm
5. BA- Butterfly Antenna: http://www.antentop.org/009/butterfly009.htm

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2. Off Center Dipole Fed Antenna for 80- 40- 20- 15- and 10- meter Bands : http://www.antentop.org/016/ocfda_016.htm
3. Antenna for 80-, 40-, and 15- meter Bands: http://www.antentop.org/019/UP2NV_019.htm
4. Multiband Asymmetrical Dipole Antennas: 80/40/20/10- meter bands http://www.antentop.org/014/dipole_014.htm
5. DEWD Dipole Antenna for the 80- meters**:** http://www.antentop.org/011/dewd_dipole_011.htm
6. DEWD Dipole for the 80- meters with a Stub Matching: http://www.antentop.org/012/stub_dewd_012.htm
7. Dipole Antenna for the 80- meters With Rectangular UR0GT- Match : http://www.antentop.org/012/r_ur0gt_012.htm
8. Dipole Antenna for the 80- meters With Triangular UR0GT- Match: http://www.antentop.org/012/t_ur0gt_012.htm
9. Narrow DEWD Dipole for the 80- meters: http://www.antentop.org/012/narrow_dewd_012.htm
10. Narrow DEWD Dipole for the 80- meters with an Inductance Matching: http://www.antentop.org/012/nl_dewd_012.htm
11. Narrow DEWD Dipole for the 80- meters with a Stub Matching: http://www.antentop.org/012/n_dewd_012.htm
12. Super Narrow DEWD Dipole for the 80- meters with A Stub Matching: http://www.antentop.org/012/sn_dewd_012.htm

Inverted-Vee Antennas

1. Antenna for 80-, 40-, 20-, 17-, 15-, 12-, and 10- meter HF Band: http://www.antentop.org/019/Antenna%20for%2080-,%2040-,%2020-,%2017-,%2015-,%2012-,%20and%2010_019.htm
2. Asymmetrical I.V. for the 80 and 40- meters: http://www.antentop.org/014/iv_014.htm
3. DEWD I.V. for the 80- meters: http://www.antentop.org/011/dewd_iv_011.htm

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1. Windom Compendium from RZ9CJ: http://www.antentop.org/019/windom_019.htm
2. Windom UA6CA for 80-, 40-, 20- and 10- meter Bands: http://www.antentop.org/018/windom_018.htm
3. Windom UR0GT: http://www.antentop.org/019/windom_ur0gt_019.htm
4. Conical Windom Antenna: http://www.antentop.org/014/cwa_014.htm

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1. Ground Plane for the 40,-30,-20 and 17- meter Bands: http://www.antentop.org/016/r7aa_016.htm
2. Top Fed Five Band Vertical Antenna: http://www.antentop.org/011/top_fed_011.htm
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4. Vertical Inverted L for the 160, 80 and 40- meter Bands: http://www.antentop.org/014/il_014.htm

Additional Source

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2. Asymmetrical Trap Dipole Antenna: http://www.antentop.org/015/ra9qce_015.htm
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1. RW3XA’s 9 Band HF Vertical Antenna: http://www.antentop.org/007/rw3xa007.htm
2. Multirange Trap Antennas: http://www.antentop.org/006/w3dzz_006.htm
3. Shunt Vertical Universal HF Antenna: http://www.antentop.org/006/shunt_antenna_006.htm

YAGI

1. 3- Elements YAGI Antenna for the 20- meter Band: http://www.antentop.org/016/3el_yagil_016.htm
2. UB5LCV YAGI Antennas: http://www.antentop.org/005/cont005.htm

CHAPTER 9

Field Antennas

Field Antennas… Almost every ham early or late would like go outside with his transceiver. Right away stand a question- what is antenna should be used for? It is not so simple question. Field Antenna is a very creative one that depends on lots things. It is possible to buy a transceiver that could be used at almost any field operation but it is impossible or too hard to find antenna that would be optimal for any expedition. Almost any field trip is unique and optimal antenna for the trip as well is unique.

However ***Chapter 9*** described lots practical designs of Field Antennas that may be used at almost any Field operation. Those antennas were built and tried by hams in the field conditions. So it is possible to find an antenna or tips to make for your own Field Antenna.

Antennas for field operation described here required experience and may require some equipment for tuning and adjusting. SWR- Meter or (that is better) Antenna Analyzer (MFJ- 259B or similar one) may be needed. As well some experience in antenna tuning and design of external antennas would a big plus. However you may get some valuable experience when tuning and installation of those antennas ever you newer did it.

All antennas described in ***Chapter 9*** do not required expensive stuff to make it. Junk box or nearest Wall Mart give you stuff to make your own field antenna. Of course the antennas not intended for far Island DX Expedition where thousands QSOs should be made by team of many person. There is a recreational antennas for usual ham who wants just operate in the Air from outside. Try the antennas and modify according to your trip and equipment.

UN7CI Delta Loop Antenna for 7, 10, 14 and 21- MHz

Boris Popov (UN7CI), Petropavlovsk, Kazakhstan

Credit Line: www.cqham.ru

The antenna was designed to work from a field conditions at amateur's bands 7, 10, 14 and 21-MHz. The antenna has SWR less the 2.0:1.0 while the lower side of the antenna is at height 1.2 meters above the ground. Antenna has good efficiency.

At 14-MHz the antenna is a full- sized "Delta Loop" antenna (**Figure 1**). ***At 10-MHz*** the antenna is electrically lengthened (with inductor) "Delta Loop" (**Figure 2**). ***At 7-MHz*** the antenna is a lambda/2 I.V. antenna (**Figure 3**). ***At 21-MHz*** the antenna is a 3lambda/2 I.V. antenna (**Figure 4**).

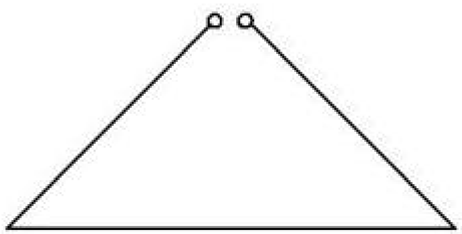


Figure 1. Full sized "Delta Loop" antenna for 14-MHz

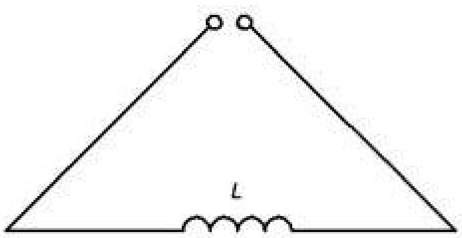


Figure 2. Electrically Lengthened "Delta Loop" antenna for 10-MHz

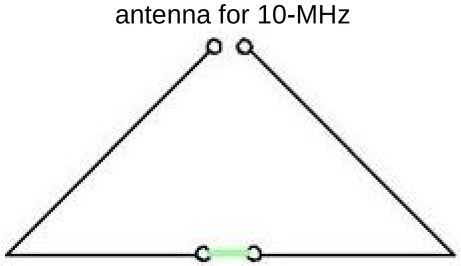


Figure 3. Lambda/2 I.V. antenna for 7-MHz

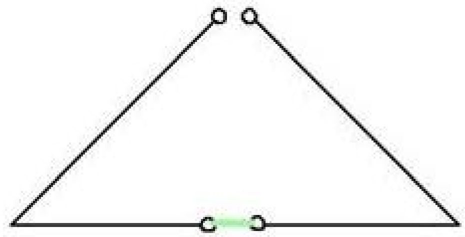


Figure 4. 3Lambda/2 I.V. antenna for 21-MHz

So, on the base of a Delta Loop Antenna with perimeter 20 meters (or I.V. antenna with two sides on 10 meters in length) it is possible to do a four band antenna. **Figure 5** shows the design of the antenna.

When the antenna is used for a field operation and the middle of the antenna is accessible it is possible to switch the operation band with help of any suitable manual switch. Off course, it is possible to use RF-relays to choose the operated band. Inductor L contains 20 turns of insulated wire in diameter of 1.5-mm (15-AWG), coiled turn to turn on form with diameter 50- mm.

Tuning

Step 1: Antenna is installed at working position in the field. Switch S1 is installed at position "3"- 14-MHz. Antenna connected to a transceiver (frequency 14.150-MHz) and tuned to resonance (to minima SWR) with help of length A and B.

Step 2: Switch S1 is installed in position "1"- 10-MHz. Antenna connected to a transceiver (frequency 10.12-MHz) and tuned to resonance (to minima SWR) with help of inductor L.

When the antenna is tuned to the 14- and 10-MHz matching at 7- and 21-MHz should be reached without any additional tuning of the antenna.

73! de UN7CI

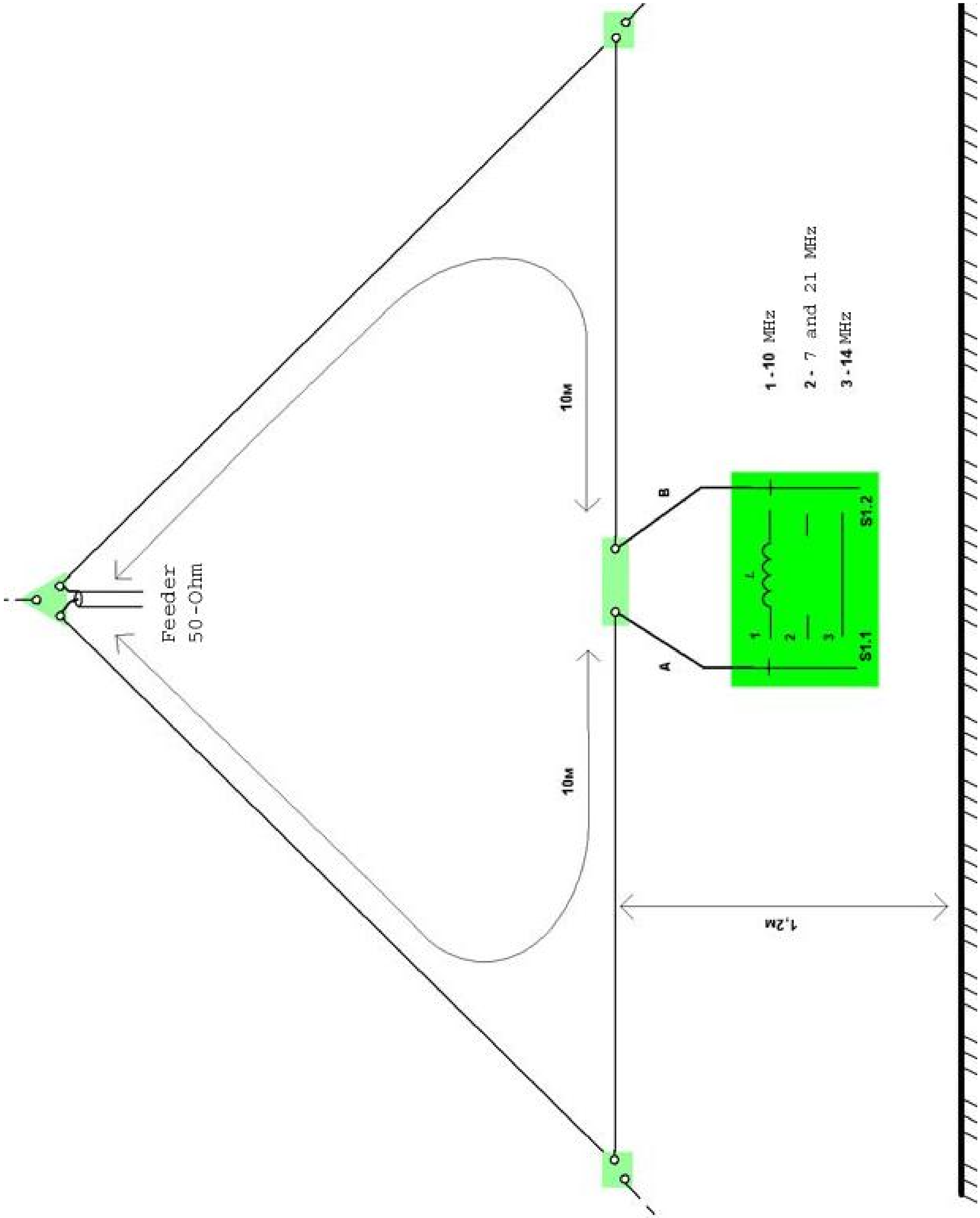


Figure 5 Design of the Four Bands Field Antenna

Simple Field One - Wire - Length HF Antennas

Igor Lavrushov , UA6HJQ

Credit Line:
http: //
www.hamradio.cmw.ru/antenna/kusok.htm

UA6HJQ

Below there are described simple one- length- wire HF Antennas. The antennas were designed for mountain radio- expeditions. Two main conditions for the antennas that were taken to consideration were low weight and simplicity. All described below HF- Antennas were tested in Northern Caucasus Mountains with a transceiver FT- 817 and ATU MFJ-902. The antennas provided good operation in the Air.

... About Antenna Wire

For the field antenna you need a proper wire. Copper strand wire in a plastic insulation is the best choice. Diameter of the copper wire should be 1.5- 2- mm. Wire that is thinner – has no enough mechanical strength, wire that is thicker - heavy. Antenna wires should be not too hard but not too soft at bending. It should have reasonable rigidity. **Photo 1** shows some examples of good strand wires.

When the wire is taken it should be determinate the optimal length of the wire for the field antenna. For any antenna the length of the antenna wire depends on the used bands. As usual 7 and 14- MHz bands are those ones that commonly used in the mountain radio-expedition.

Photo 1 Examples of Some Good Antenna Strand Wires

Expedition antenna for the 7 and 14- MHz bands should have length not less the 9 meters and no more the 21 meters. Why that? Because we need antenna that would be work without counterpoises, so, the antenna should have length lambda or lambda/2.

Wire in length 10-meters would be enough if you would like to use bands 14- 28- MHz at the expedition. Antenna with such length is suitable for local and DX-QSO on 14- MHz and has good efficiency on 18- 28- MHz. Such antenna still is working on 7-MHz (lambda/4 length).

Wire in length 20-meters would work efficiency on 7- and 14- MHz as well as at 18- 28- MHz. The antenna provides local QSO at the 3.6- MHz. However at good propagation and if the end of the antenna is hanged up at 10 and more meters above the earth the antenna allows to make DX-QSOs on the 3.6- MHz.

… How would it hang up?

Classical mountain expedition antenna is a Sloper Antenna. **Figure 1** shows the antenna. Use any natural support- tree, stone, etc., to install the antenna.

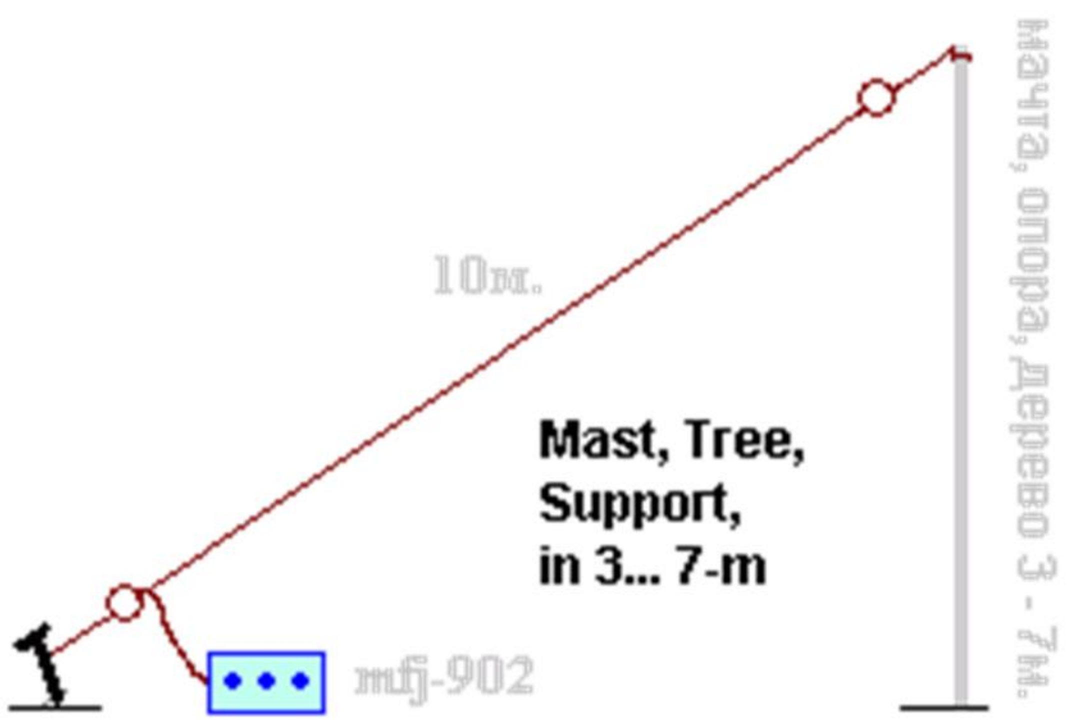


Figure 1 Expedition Sloper Antenna in 10- meters length

It should be used additional support for Sloper Antenna with wire in length of 20 meters. It may be any natural support- for example tree or large stone, or artificial- plastic fishing pole. **Figure 2** shows Sloper Antenna in 20 meters length. DD of the antennas shown on **Figure 1** and **Figure 2** has maxima radiation in direction of the inclination of the antenna wire.

Antenna wire may be placed along the fishing pole. DD of the antenna has maxima radiation into opposite side of the inclination of the wire. **Figure 3** shows Sloper Antenna with fishing pole.

It is possible to install support or fishing pole at any place on to length of the wire. In this case it is a variant of an End Feed Asymmetrical Dipole Antenna. **Figure 4** shows the antenna. Good solution is to install the support in the center of the antenna wire how it is shown on **Figure 5.** In this case we have got a kind of End Feed I.V. Antenna. The antenna has good efficiency at 7- and 14- MHz Bands.

The feature of the Sloper Antennas made on the base of one wire is that all of those antennas are radiated waves having approximately 50/50% horizon/vertical polarization. It is useful for expedition radio communications.

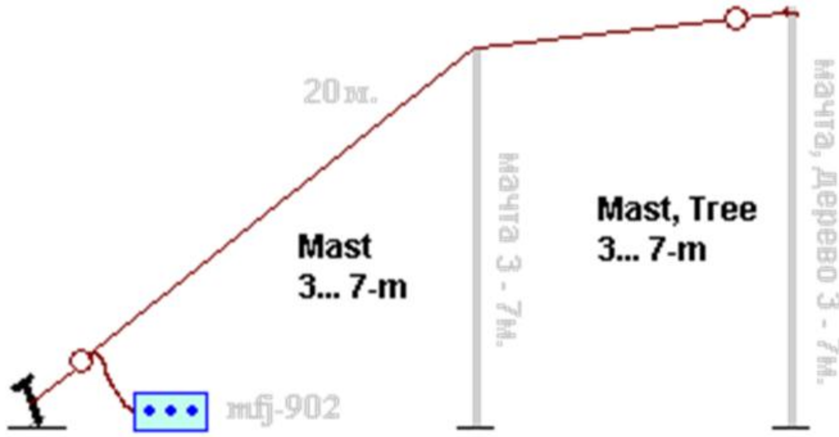


Figure 2 Expedition Sloper Antenna in 20- meters length

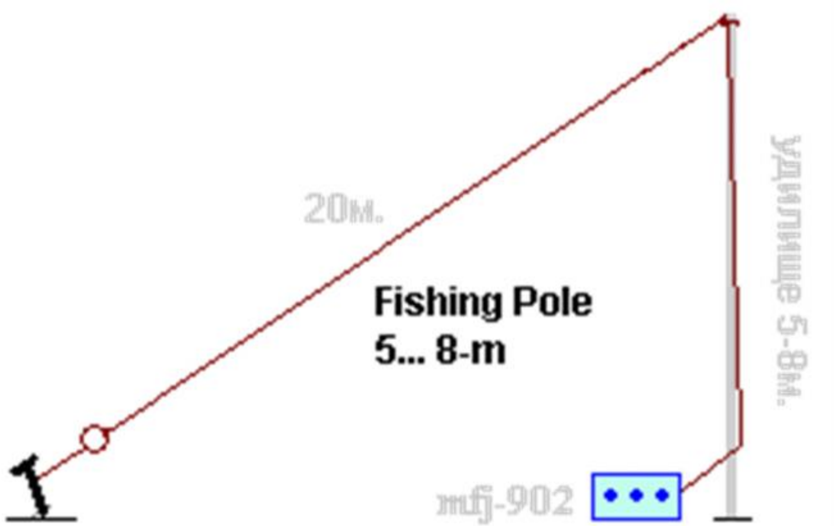


Figure 3 Antenna Sloper with Fishing Pole

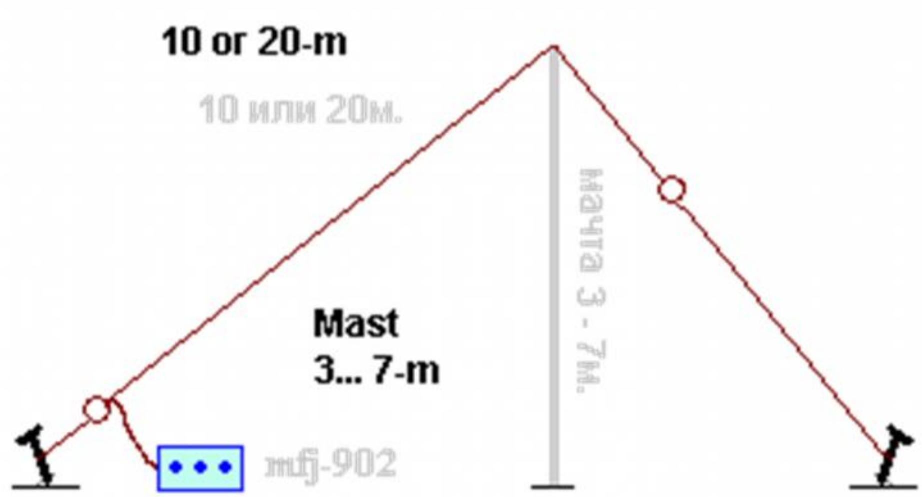


Figure 4 Field End Feed Asymmetrical Dipole Antenna

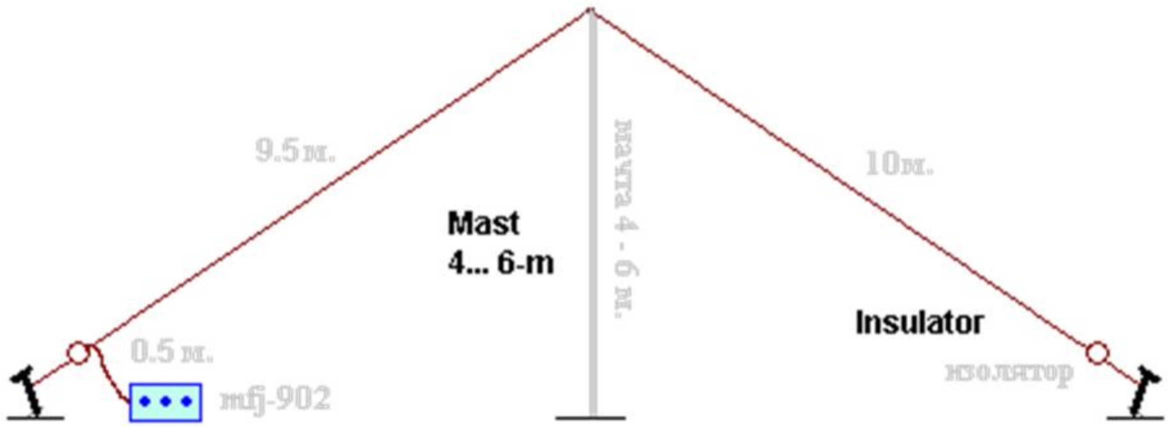


Figure 5 End Feed I.V. Antenna

If you need antenna with the vertical polarization you may try a helical antenna shown in the **Figure 6**. However the antenna needs good grounding or several counterpoises. Counterpoises are preferably in mountains where it is difficult to provide grounding due to stone surface.

All antennas, shown at **Figure 1**- **Figure 6** were tested in mountain conditions with ATU MFJ- 902 and transceiver FT- 817 at 7- 28- MHz Bands where the antennas showed good result in the Air.

…In conclusion there are below some practical advices.

1. If you will use transceiver in known for you place where you can find natural support you may leave antenna mast (fishing pole) at home.

2. At emergency situation try wire in 10 or 20 meters length placed at height 2- 3 meters above the ground.

3. Avoid place antenna end near tree or bushes, use plastic rope to have distance between antenna end and the subjects.

4. Very often grounding of the case of the ATU MFJ-902 may increase antenna efficiency. For grounding use a counterpoise in length 5- 20 meter. Sometimes several metal sticks inserted to the earth and connected (by wire any length) with the case of the MFJ-902 may provide good grounding.

5. In the forest use antenna shown in the **Figure 5**.

6. Protect antenna tuner (MFJ-902) from rain and snow. You may just install the tuner inside a tent.

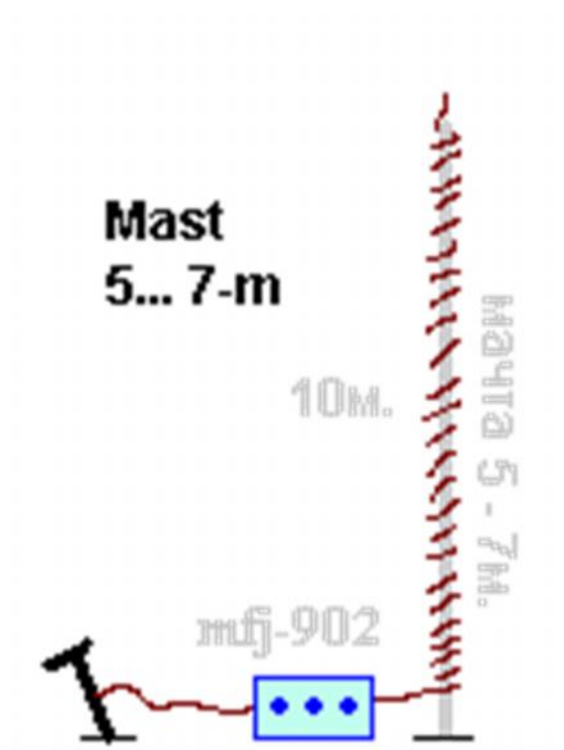


Figure 6 Helical Vertical Antenna

7. Connect Transceiver and ATU with 50-Ohm coaxial cable of any length.

73!

June – 2007, UA6HJQ

Field Antenna for FT- 817

Vladislav Merkulov, UU9JEW, Sevastopol

I am going to try my FT- 817 from field conditions so I need a field antenna to do it. I have found proper antenna at the internet. It was ATX-1080. But… ***At first***, the cost for the antenna was more the 100 EUR - it was too much for me and ***the second***, it was hard to order this one from my location. So I decided to do a prototype of the antenna by myself. Alas, my home brew antenna did not work at the 80 meters. However, 10- 40 bands, where the antenna operated well, were enough for me.

UU9JEW at the field operation

Design of the Antenna:

Plastic tube has length 380 mm and diameter 12 mm. 250 turns of a copper wire (0.8 mm in diameter or 20 AWG) were coiled above the form turn to turns.

Number of contact clips/ Quantity of turns between The clips	**Length between clips, mm**
1-2c. c. –135t.	1-2 –140
2-3 c.c. – 43t.	2-3 – 50
3-4 c.c. – 27t	3-4 – 30
4-5 c.c. – 15t.	4-5 – 20
5-6 c.c. – 14t.	5-6 – 20

Field Antenna for FT- 817

An angular PL- socket is attached underneath of the plastic tube. A screw for jointing an old TV telescope antenna (1100 mm length, 11 sections) is attached at upper parts of the plastic tube.

Contact clips were melted in the plastic form. A small piece of wire does shortening the clips depend on used band. The coil was covered by a shrink tube.

Band, meters	**40**	**30**	**20**	**17**	**15**	**12**	**11**	**10**
Number of used sections of the TV- antenna	9,5	9	9	11	9	11	11	8
Shortened clips	3-6	1-2	1-3	1-4	1-4	1-5	1-5	1-5
Counterpoise length, meters	7,8	4,8	3,0	3,0	2,5	2,5	2,5	2,5

May be you got another data for you antenna to tune it for the bands because length of the telescope whip and shortened clips may be depend on to installation place and the neighboring environment.

At first checking the antenna with 2.5 W power I have got 59 from UA9 at 20 meters and 57 from Ukraine at 40 meters.

Stuff for the antenna costs only $ 4.

73! UU9JEW

Oh, I forgot, I used a Chinese metal tape-line in 10 meters long as a counterpoise for my antenna.

Credit Line: http://www.qrz.ru/schemes/contribute/antenns/uu9jew.shtml

Fast Made a Half - Wave Antenna for 80 Mete

Igor Grigorov, RK3ZK

The antenna was made by me in one of the hot summer days at the 1998. I was going for weekend to my bungalow and I decided to take my home- brew 80 – meters transceiver with myself. I had no antenna for the transceiver. So, I needed to do the antenna, but …I had no time as I have no quality stuff for doing this one. I opened my junk box with old stuff… and… Thirty minutes while I have had a new antenna that served me then several years!

I have done a half wave antenna with "bottle" matching device. **Figure 1** shows the antenna. As you can see a wire in long of 40 meters (a half wave antenna) is matched with 50-Ohm output of my transceiver with help of a parallel circuit ("bottle" matching device) – it is L1C1 in **Figure 1**. Inductor L2 has not electrical connection with antenna circuit. RF energy is transferred only by magnetic field that reduces the level of static interferences at receiving mode. The counterpoise has length of 20 meters of a naked copper wire in diameter of 1.5 millimeters (#14 AWG).

I used a wire from an old burned down electrical transformer 220-V/12-V.

The counterpoise serves both as electrical and radio grounding for the antenna. At operation time of the antenna the counterpoise is placed on the ground in any position (straight or bending). To short static electrical charge from antenna wire to ground is main task of the counterpoise. Not wise to use a long antenna in the field without an electrical ground, because at the first it is unsafe, and in the second, the antenna is very noisy on reception without the electrical grounding.

Figure 2 shows the construction of the matching device. I used a half - liter plastic bottle in diameter 60 millimeters from a mineral water. C1 is attached at a side of the bottle with help of a strong copper wire in diameter of 1 millimeter (#18 AWG). L1 has 15 turns of a copper wire in diameter of 1.5 millimeters (# 14 AWG), length of winding is 70 millimeters.

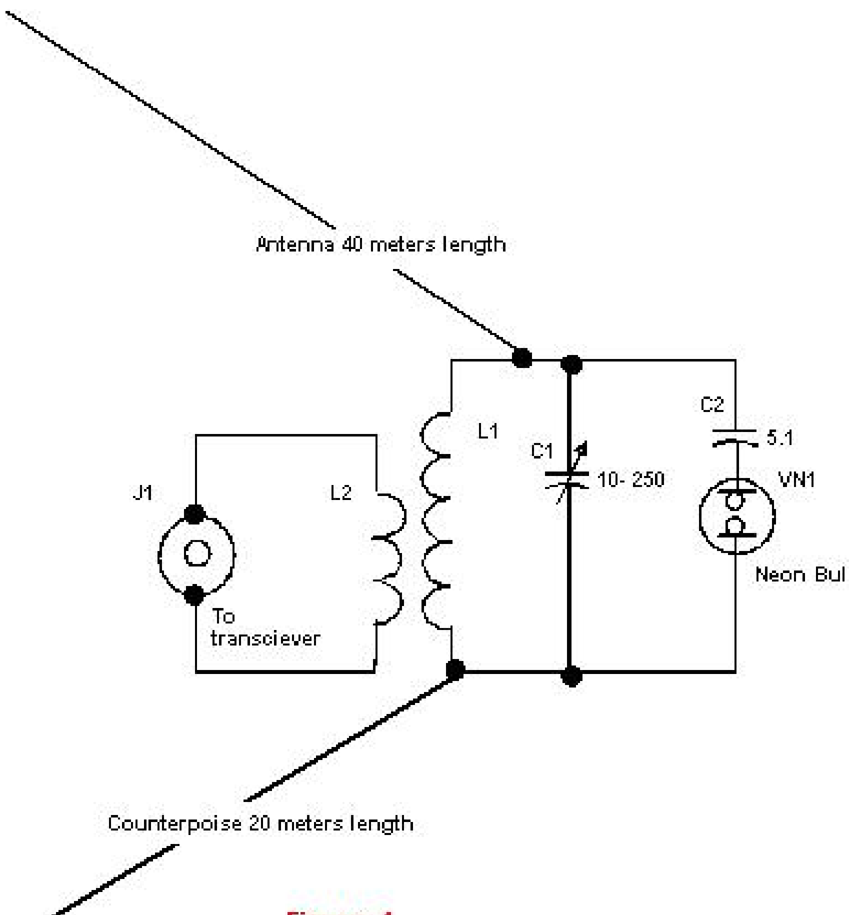


Figure- 1

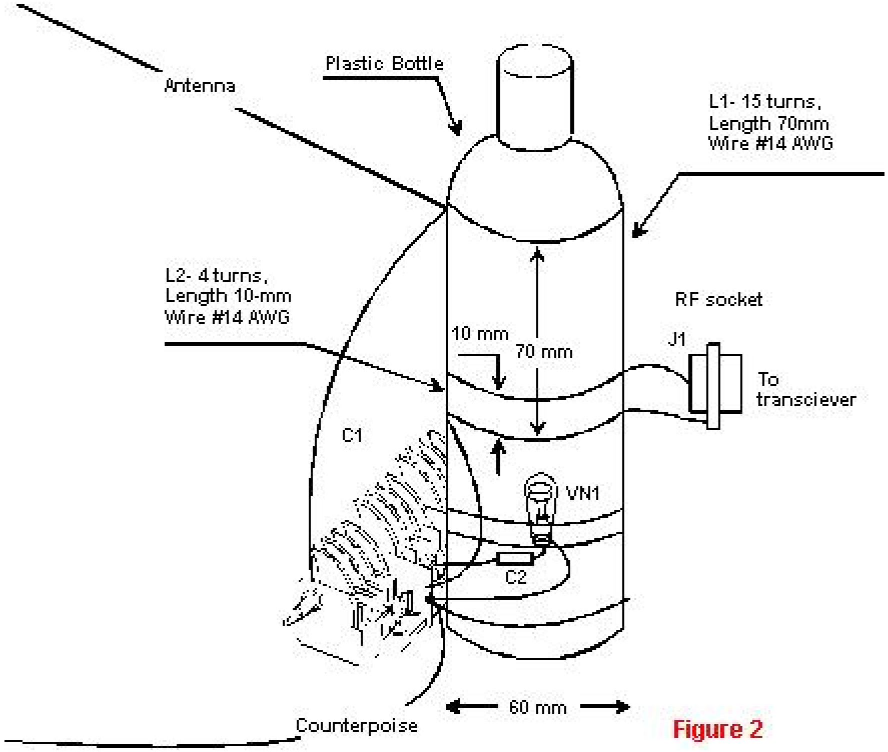


Figure 2

L2 is placed at the bottom of L1. L2 contains 4 turns of copper wire in diameter of 1.5 millimeters (# 14 AWG), length of winding is 10 millimeters. Ends of L2 are directly soldered to RF – socket. Neon Bulb is attached by a piece of Scotch to the bottle. Antenna is tuned by max glow of the Neon Bulb.

The antenna worked very effectively when the upper end of the antenna was placed at height of five or more meters above the ground. I did not use an end antenna insulator. A long synthetic rope was attached to the upper end of the antenna.

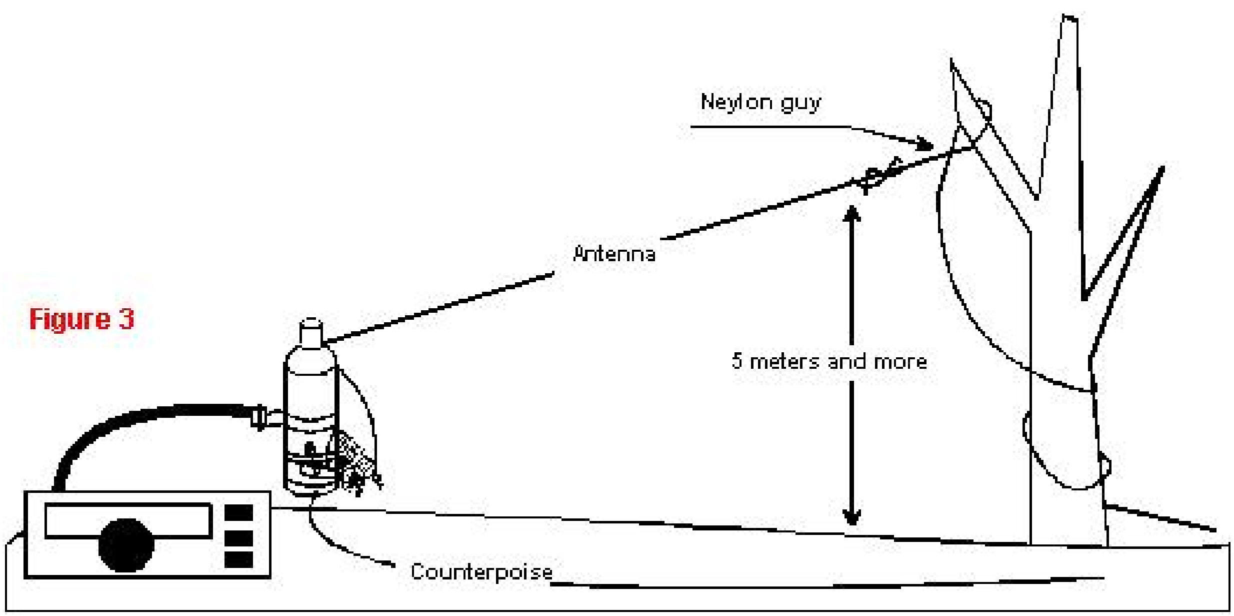
The counterpoise of the antenna was located on the ground surface. Between the "bottle" ATU and a transceiver could be placed coaxial cable with any reasonable length.

Figure 3 shows the antenna at field operation. Of course, it is possible to use the antenna for stationary work from a ham shack.

The antenna works very well and I recommend try it!

73/72!

Figure 3



Field Antenna for the 40- meters

Proved in mountains of Northern Caucasus, March 2006.

Igor Lavrushov, UA6HJQ
Credit Line:
http://www.hamradio.cmw.ru/antenna/ant-hfp.htm

Before my QRP- pedition I have searched for an effective field antenna for the 40 meters. I need such antenna that can radiate both as vertical as horizon wave, antenna that does not need an antenna tuner and at the same time could be a resonant one. I have found the antenna. This one was designed by G3XAP. The prototype of the antenna was built by me and worked well at my mountain QRP- pedition.

UA6HJQ at a slope of the Elbrus, Northern Caucasus

Figure 1 shows design of the antenna. **Table 1** gives data for the antenna for 20, 40 and 80 meters. The maximum radiation of the antenna is directed to direction opposite side L2. The difference in forward/back antenna gain is small. It is only near 3-dB. Two counterpoises in length 0.25 lambda each are used with the antenna. However for improving antenna efficiency use as more counterpoises as you can. The main radiation takes place in sector of 30 - 70 degrees.

Tuning of the antenna is very simple. Antenna is tuned to minima SWR with help of base capacitor C. I used a variable capacitor while tuning. I get SWR 1:1 (at SWR meter of my FT- 817) while tuning the antenna. Then I have changed the variable capacitor to fixed one. The capacitor should be protected against atmospheric influences.

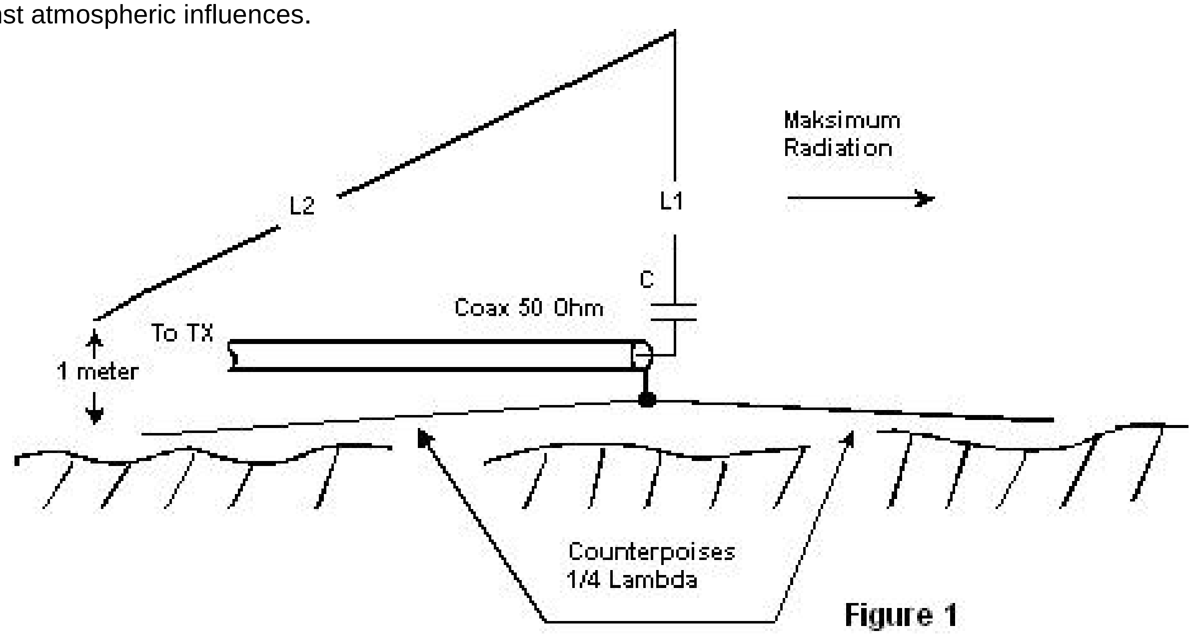


Figure 1 Field Antenna for the 40- meters

Table 1

Frequency, MHz	L1, meters	L2, meters	C, pF
14.15	1.8	3.8	314
7.07	4.4	8.4	115
3.67	6.6	17.8	287

For example, I put the capacitor into an empty film box. May be at antenna tuning you need change the length (in + or -) of the side L2. Counterpoises should be laid on the ground.

Overall weight of the antenna with mast (it was used a telescopic plastic fishing rod) was a little more the 1000 gram (2.2 pound). **Figure 2** shows a diagram directivity of the antenna simulated by MMANA

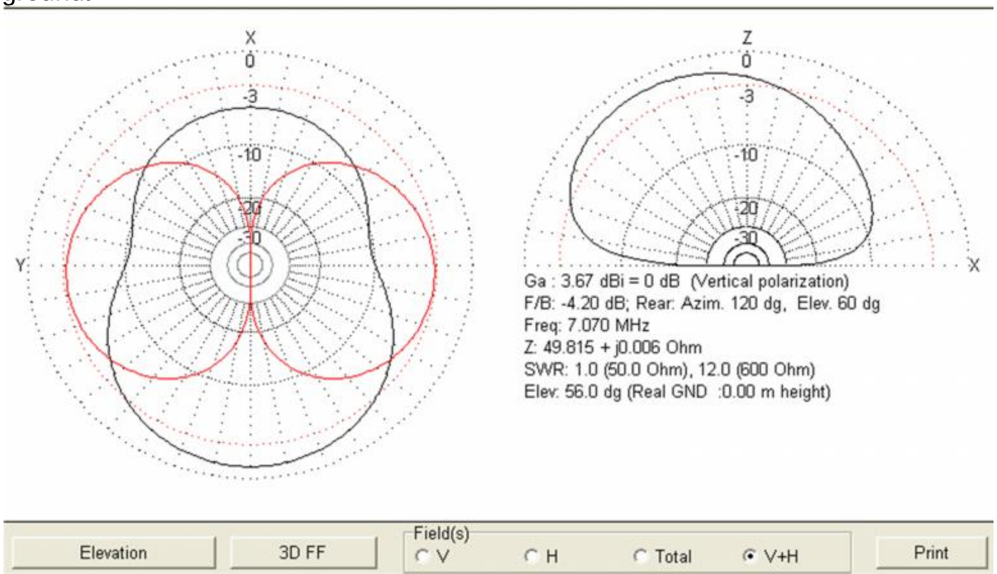


Figure 2 DD of the Field Antenna for the 40- meters

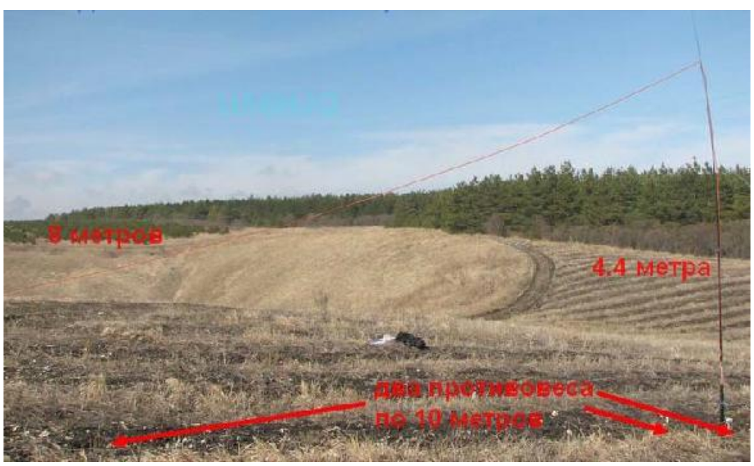


Figure 3 Field Antenna for the 40- meters Installed in Caucasus Mountains

Figure 4
Mast of the Field Antenna for the 40- meters

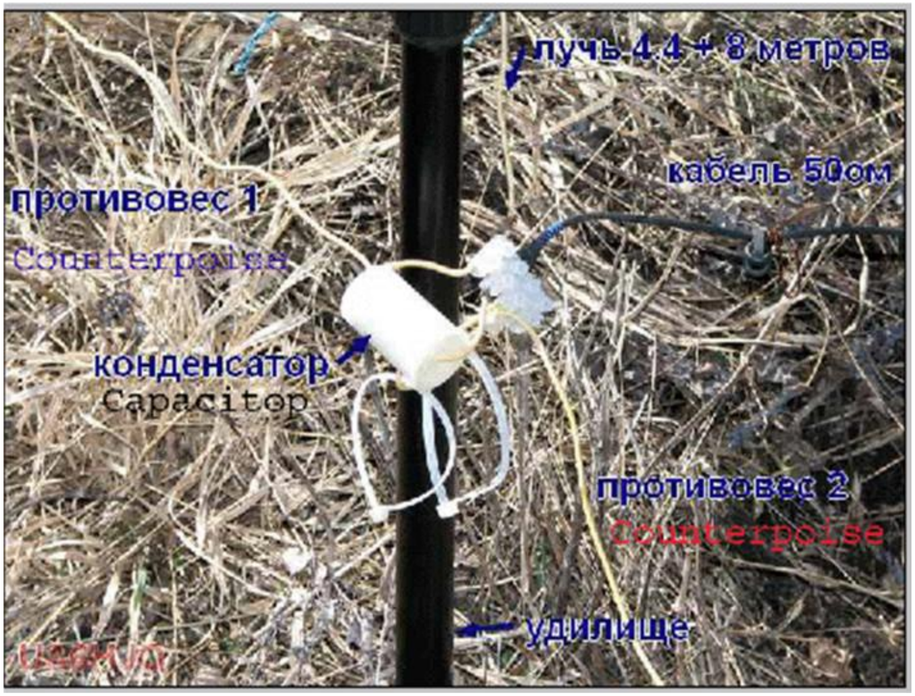


Figure 5 Base of the Field Antenna for the 40- meters

Note by VA3ZNW: MMANA does not provide correct simulation when elements of the antenna are located close to the ground. **NEC- 2 for MMANA** should be used in this situation. So by me the antenna was simulated in NEC- 2 for MMANA.

Figure 7 shows the diagram directivity and data for the antenna. Input impedance is near 21 Ohm, capacitor should be 132-pF. For matching the antenna with 50-Ohm coaxial cable an inductor 0.9 micro Henry should be connected across antenna clips, and base capacitor C should be 100-pF. Off course, the real capacity should be found at tuning of the antenna. **Figure 8** shows the circuit of this matching device.

Figure 9 shows parameters of the antenna depending on the ground above which the antenna is located. As you can see, the ground does not influence much to the parameters of the antenna. So, the antenna could be placed above any ground.

11. Average (Eps=13, Sigma=5)
12. Poor (Eps=13, Sigma=2)
13. Pastoral (Eps=13, Sigma=6)
14. Marshy land (Eps=12, Sigma=7.5)
15. Pastoral rich (Eps=14, Sigma=10)
16. Very good (Eps=20, Sigma=30)

Figure 6

Wire and Guys of the Field Antenna for the 40- meters

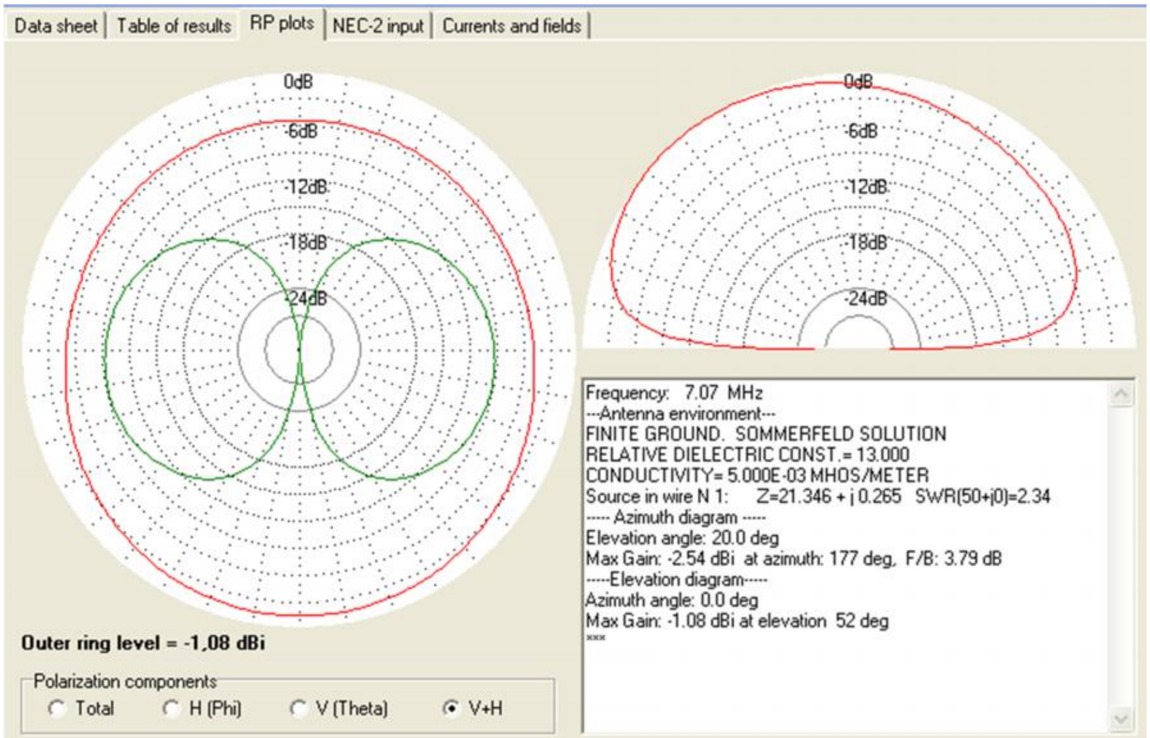


Figure 7 DD of the Field Antenna (NEC for MMANA simulation) for the 40- meters

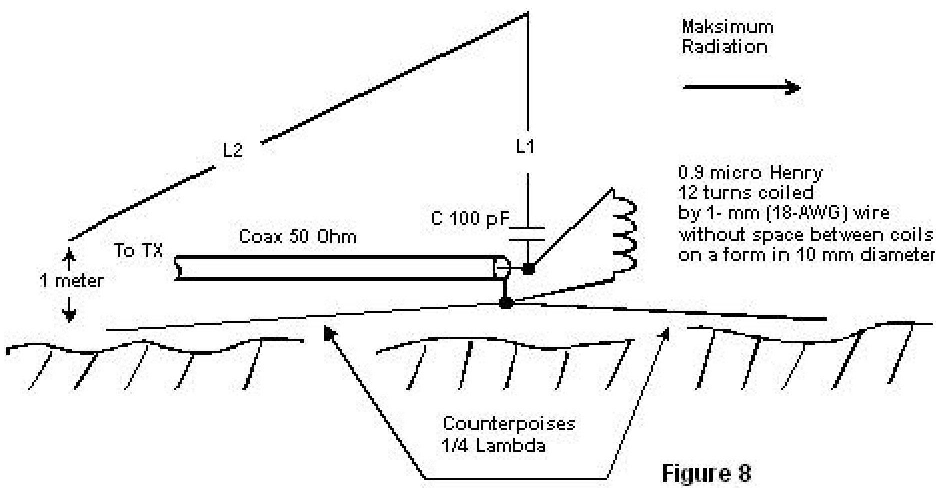


Figure 8 Matching Device of the Field Antenna for the 40- meters

N	Wire No	F, MHz	R, Ohm	jX, Ohm	SWR	Gnd.	H, m.	El, deg	Gaz, dBi	at Az	Az, deg	Gel, dBi	at El
16	1	7.07	19.507	-j1.838	2.57	Som.	0	20.0	-1.02	177 deg	0.0	-0.54	40 deg
15	1	7.07	21.032	+j0.711	2.38	Som.	0	20.0	-2.14	177 deg	0.0	-1.02	47 deg
14	1	7.07	21.380	+j0.747	2.34	Som.	0	20.0	-2.44	176 deg	0.0	-1.12	51 deg
13	1	7.07	21.417	+j0.492	2.33	Som.	0	20.0	-2.50	178 deg	0.0	-1.10	49 deg
12	1	7.07	19.887	-j0.401	2.51	Som.	0	20.0	-2.26	178 deg	0.0	-0.66	51 deg
11	1	7.07	21.346	+j0.265	2.34	Som.	0	20.0	-2.54	177 deg	0.0	-1.08	52 deg

Figure 9 Parameters of the Field Antenna (NEC for MMANA simulation) for the 40- meters

Efficient Field Low Height Dipole Antenna for the 20- meter Band

Igor Lavrushov, UA6HJQ

The antenna was designed for using in a mountain hiking where the main requirement is a low weight and high efficiency at the limited stuff around there.

Why a symmetrical dipole antenna?

Symmetrical dipole antenna is mostly fitted for the field conditions. Military, geologist expedition, rescue and emergency communication service- all of those are used a dipole antenna. The antenna works well in the near zone (100- 200- 300- km, depends on the Band) that is needed for communication from a mounting trip. It is important that the antenna would have some gain because in the mountain it is used a QRP-equipment. Dipole antenna works well in the forest, in the deep ravine, among tents in Alpinist Camp. **Figure 1** shows design of the Dipole Antenna for the 20 meters. The antenna has gain plus 5- dBi.

Field test shows that the antenna has almost circle diagram directivity.

Antenna Design

The antenna is a symmetrical dipole (with length a little bit more the lambda/4) installed on the top of a plastic fishing pole. The antenna is fed by a 50- Ohm coaxial cable. The cable is matching with the antenna with the help of two fixed capacitors. One is connected to the central core another one is connected to the braid of the coaxial cable. The value of the capacitors (50- 200- pF) should be found out for the current antenna design. Coaxial cable at the feeding terminal is coiled (2- 3 turns) on to a ferrite ring. Capacitors and the ferrite ring should be protected from moisture. Those ones may be placed into a plastic box (from an old 35- mm film) or shrinked.

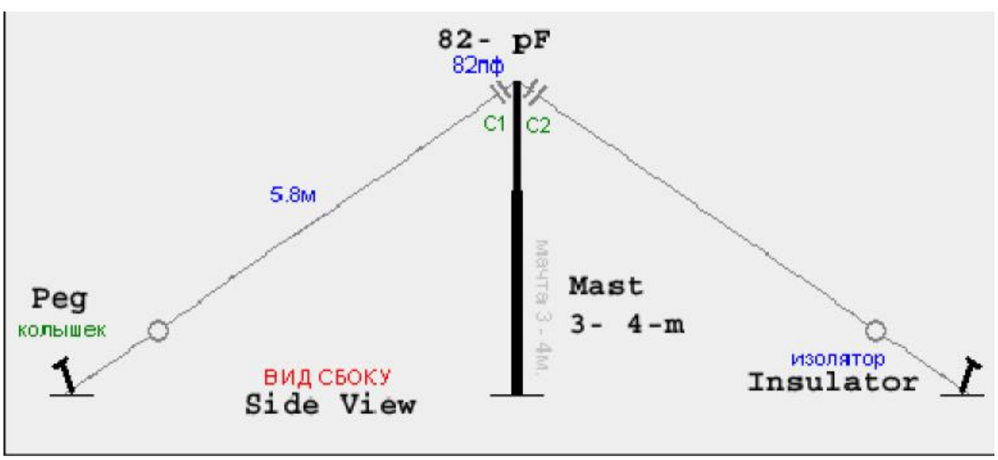


Figure 1 Field Dipole Antenna for the 20 meters

Antenna in the mountains

Capacitors in the Film Box

Matching Box on the Antenna

Stability of the mast of the antenna is provided by one guy and two antenna wires that are used like two guys.

Three long screwdrivers are used like a peg for the guys. **Figure 2** shows installation of the mast of the antenna.

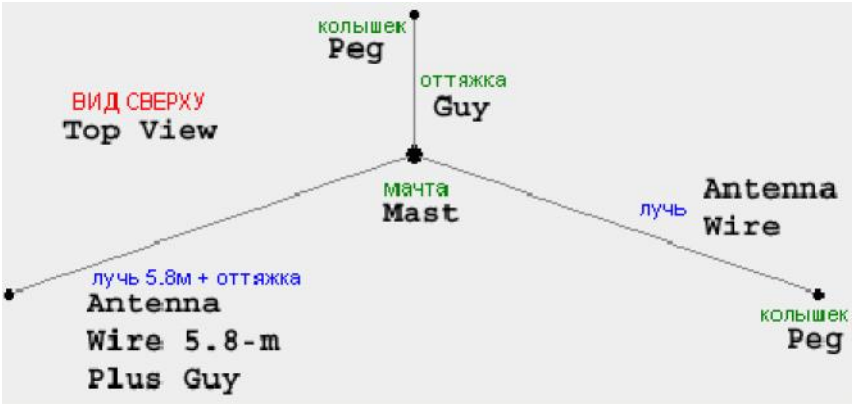


Figure 2 Installation of the Mast of the Field Dipole Antenna for the 20 meters

Antenna End Connection with a Guy

Fastened the Guy at the Ground

Tuning of the Antenna

Install the antenna according to the **Figure 2**. Angle between the antenna wires should be near 130- degree. Length of the each wire is 6.0- meter. Turn on the coaxial cable to a MFJ- 259 or to SWR- meter plus Transceiver.

Do shortening the wires by length of the 10- cm by low SWR. Sometimes it needs to change value of the capacitors to reach the low SWR. As usual it is possible to get SWR 1.0:1.0.

Multi Band Version of the Antenna

The Antenna may be made in a multi band version. For the version antenna wires are broken into lengths that would be resonance for the desire bands. Shortening capacitor may be the same for all of the bands. Turning on of the next band is provided with the help of two jumpers. **Figure 3** shows the multi band antenna. Tuning of the antenna begin from the upper band and sequentially is going to the next lower band.

Conclusion

The antenna was tested in my mountain trips. It is showed good result. I am strongly recommended the antenna for one- day field operation as well as for several- days mountain trip. Antenna may be designed as for one band either for several operation bands.

Unpacked Antenna Ready to Installation

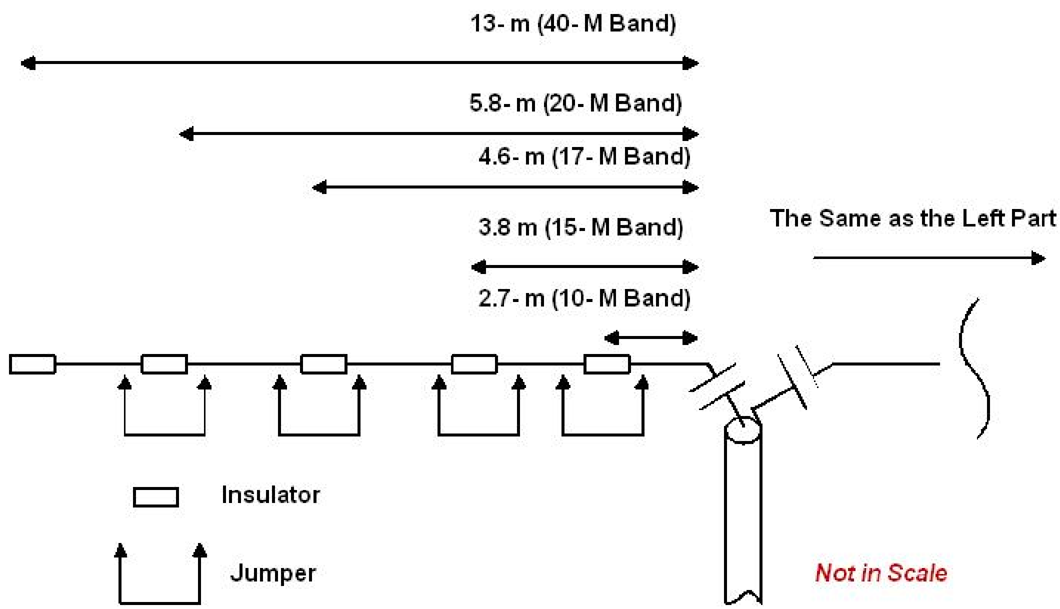


Figure 3 Multiband Field Antenna

73! UA6HJQ

Expedition Two Elements Antenna for the 20- meter Band

N. Filenko, UA9XBI

Credit Line: www.cqham.ru

The antenna was designed for field operations or working at the DX- pedition. Antenna consists of two elements- mast in height of 10 meters and in diameter of 30-50-mm (it is a reflector) and a dipole for the 20 meters (it is a driver). Dipole has length 2x 495 centimeters for bare copper wire in diameter 1.5-mm (15-AWG). For the best operation of the antenna the mast should be isolated from the ground, for example with help a simple insulator in dimensions 5- 10 centimeters (plastic bread board or empty glass bottle may be used). Input impedance for the antenna is close to 50-Ohm. Gain is near 4 dBi. Main radiation is going up to 20-22 degree to horizon.

UA9XBI
Radio club 'Arktika' Championship 2004
Photo Credit Line:
http://www.arktika.komi.com/Champ_2004.htm

The upper part of the dipole works like a guy for the mast. It fixed to the mast with strong synthetic rope in 50 centimeter length. Lower part of the dipole hangs free. Lower part of the dipole allows tune the antenna by trimming the length to minima SWR. Coaxial cable goes aside and down from the mast. **Figure 1** shows the drawing of the Two Element Antenna.

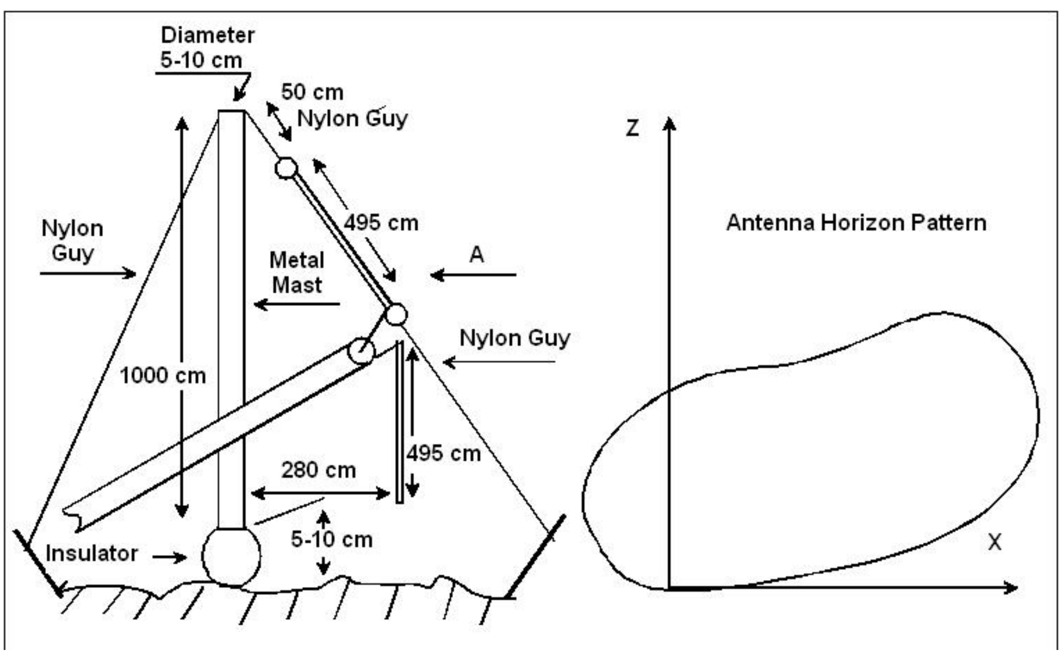


Figure 1 Two Element Antenna

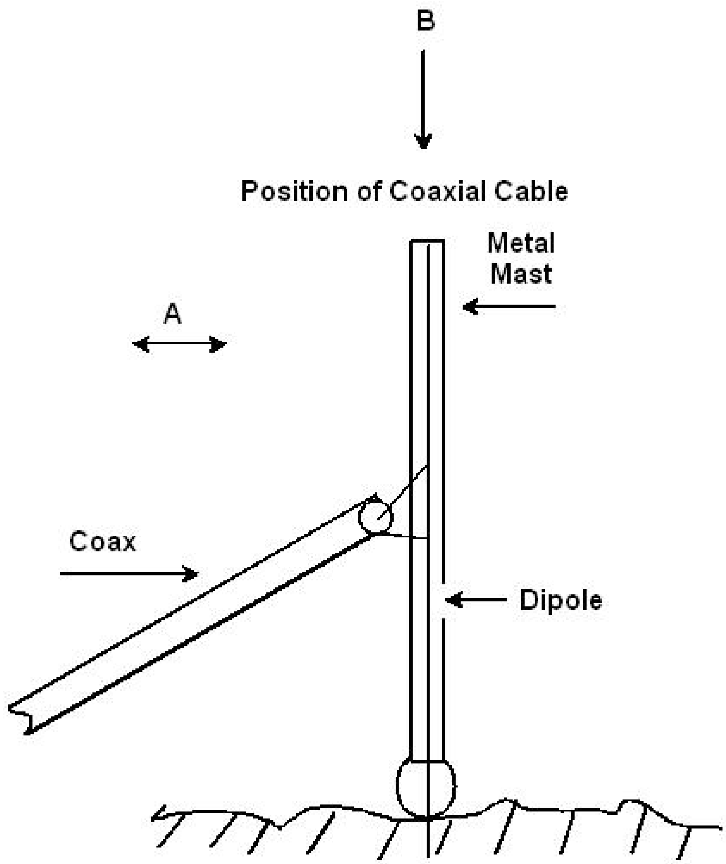


Figure 1.1 Two Element Antenna

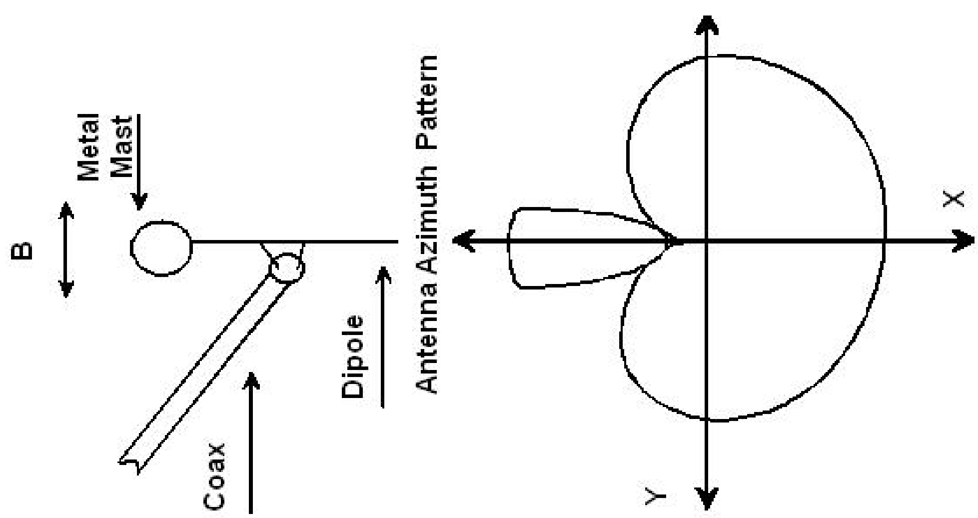


Figure 1.2 Two Element Antenna

73! de UA9XBI

Conclusion

So, Chapter 9 ***"Field Antennas"*** is ended. Lots practical designs of the field antenna were described at the chapter. All of those antennas were made and tested by hams in the field conditions. So if you decided go outside with ham radio- there are lots ideas for antennas that you may install in the field.

To tune some of the antennas some experience may be needed and of course equipment like SWR- meter or Antenna Analyzer (MFJ-259B or similar one) provide a great help. I wish you success for field operation.

73!

Igor, VA3ZNW

References:

1. Delta Loop UN7CI for 7, 10, 14 and 21- MHz: http://www.antentop.org/010/un7ci_010.htm
2. Simple Field One- Wire- Length HF Antennas: http://www.antentop.org/012/ua6hjq_012.htm
3. Field Antenna for FT- 817: http://www.antentop.org/008/uu9jew008.htm
4. Fast Made a Half Wave Antenna for 80 meters: http://www.antentop.org/003/rk3zk.htm
5. Field Antenna for the 40 meters: http://www.antentop.org/008/ua6hjq008.htm
6. Efficient Field Low Height Dipole Antenna for the 20- meter Band: http://www.antentop.org/015/field_015.htm
7. Expedition Two Element Antenna for the 20-meter Band: http://www.antentop.org/010/20m_010.htm

Additional Source

1. Field Universal HF Antenna RV3DA: http://www.antentop.org/006/ant006.htm

Field Antenna for FT- 817 by UU9JEW

CHAPTER 10

ATU and RF Transformers

ATU and RF Transformers… Some antennas that were described in previous ***Chapters*** may need for feeding ATU or RF Transformer. Of course it is not difficult to buy an ATU or RF Transformer. As for me I have been used MFJ- 941E ATU for a long time and I am very satisfied how it works. As well I have some ATU that I have bought at the Ham Flea Market. The ATU were reworked by me for some my experiments. However, the MFJ- 941E I leaved untouchable. It serves like a control ATU where I have possibility to check SWR and RF power. I used some RF Transformers from LDG and as well satisfied in the product. For several years I have been used LDG automatic ATU. It was Z-11 PRO II. This ATU worked very well with my IC- 718 and with my antennas. Good stuff!

So there are two ways to obtain ATU and RF Transformers. First easy way it is just buy a ready one unit. Second way is complicated. It is to make a home brew unit. But it is very exiting way that gives you experience and satisfaction. ***Chapter 10*** describes some practical designs of home brew ATU and RF Transformers. Those devices were built and tried by hams. As well the ***Chapter 10*** described some theoretical dark sides of the ATU.

To make your own ATU it requires some parts, hardware, some tools, and experience to use the tools. All of the ATU described in the ***Chapter 10*** are not complicated to build. Any ham may try repeat or modified the designs.

Of course the Chapter 10 does not describe all exiting variants of ATU. Here done just some basic designs that are not complicated and fit to most of amateurs needs. If you like soldering iron and you are handy man try the units.

Something about ATU

Igor Grigorov, RK3ZK

What an ATU does?

You should not believe that an Antenna Tuning Unit (ATU) is a magic box that ensures any antenna work effectively with your transceiver. When the ATU is installed between your transmitter and the antenna feeder the magic box only does matching of output impedance of the transmitter with input impedance of system "feeder - antenna".

It means that ATU allows to the transmitter with output of 50 Ohm to work normally with antenna plus feeder where the antenna may not be 50- Ohm animal so feeder may be not a 50- Ohm coaxial. If the ATU is installed between antenna and feeder (that is a 50- Ohm coaxial) it does low SWR in feeder and provides good operation for the transmitter with 50- Ohm output.

So, an ATU provides safe operation for transmitters end stage, if the ATU is between the transmitter and the feeder, additionally an ATU does low SWR in feeder, if the ATU is installed between antenna and feeder.

As usual modern transceivers and military equipment have internal ATU that does matching end stage of the transmitter with feeder or antenna. Below we take close look to widespread ATU design.

ATU Design

Figure 1 shows schematic of a "classical" ATU. Such ATU has:

- Matching Unit that provides the matching of end stage of the transmitter with antenna - feeder system. Matching Unit is the "heart" of any ATU;
- SWR meter or HF-bridge, that shows how the matching is done;

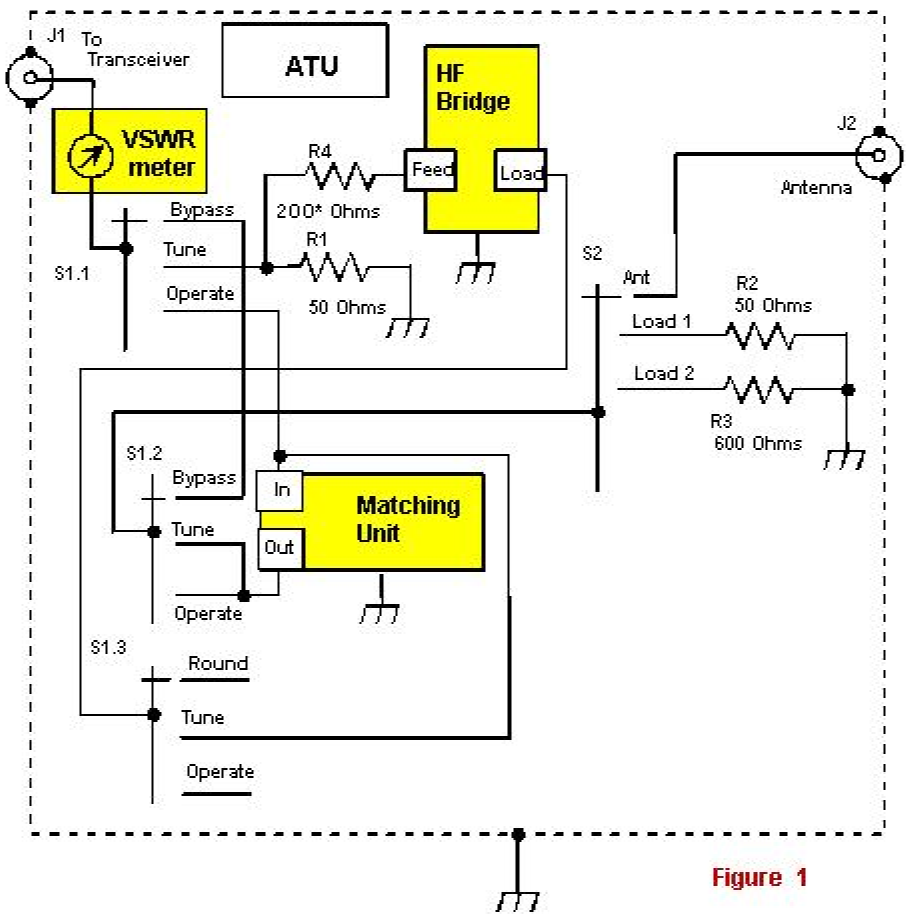


Figure 1

- Several Dummy loads R1, R2 and R3, that help us to monitor how Matching Unit and SWR – meter (HF-bridge) operates:
- S1 and S2 for proper connection of the above mentioned parts;
- Sockets J1 and J2 for transmitter and antenna connection.

So, how the ATU does work?

S1 at “Bypass” position does connection of the transmitter to S2. S2 does connection either to antenna or to Dummy Load R2 (50 Ohms) or R3 (600 Ohms). So, at good 50-Ohms antenna the transmitter works straight on the antenna, also is possibility to load the transmitter on 50-Ohm Dummy Load for a tuning of the transmitter or checking of the SWR- meter.

S1 at “Tune” position does connection of the transmitter through internal HF-bridge and Matching Unit to S2. So, it is possible to tune the Matching Unit or on to real antenna (S2 in position Ant) or check how the Matching Unit provides matching to 50-Ohm (S2 in position Load 1) or to 600-Ohm (S2 in position Load 2) Dummy Load. When you have your system feeder- antenna tuned, switch S1 in position “Operate” and just work in the Air.

You can see, it is possible to use either SWR- meter or HF-bridge for tuning the Matching Unit on to real load.

As it is visible from this schematic diagram the matching of the transmitter with used system feeder - antenna depends only on used Matching Unit. Let’s see what the Matching Unit may contain.

Classical Matching Unit

One of most effective and oldest Matching Unit is shown on **Figure 2**. This design came from the early 30s of the 20s century and till recently days is widely used by radio amateurs.

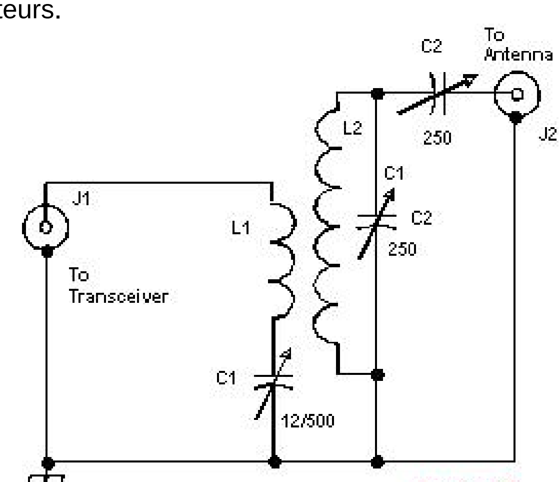


Figure 2

At the Matching Unit the end stage of the transmitter is connected through coupling coil L1 and matching capacitor C1. Circuit L2C2 is tuned to resonance to input signal. C3 does matching with the existing load (antenna or feeder).

As usual, L1 has from ¼ to 1/6 from amount of turns of L2. L1 is winded in lower part of L2. L1 should be isolated from L2 by any good isolation. In some designs of this Matching Unit, L1 is isolated by air. The transmitter is coupled to the antenna only by magnetic field, so the end stage of the transmitter is protected from a lightning. Resonance circuit kills harmonics. The Classical Matching Unit does well match to load from 10 to 1000 Ohms with end stage of transmitter in 50 or 75-Ohm.

C1 should have maximum of capacity up to 1500-pF at operation through 1.8- 29.0 MHz, and 500-pF would be enough for operation through 3.5- 29.0 MHz. If L1 has optimal number of turns the C1 is not necessary at all. C2 and C3 should have the widest possible gap between their plates.

At constant parameters of L1 and L2 the Classical Matching Unit works with high efficiency only in two multiple amateur HF - ranges, for example, 1.8 and 3.5 MHz, 7.0 and 14.0 MHz and so on. At others ranges efficiency is dropped. Old Classical Matching Unit had plug-in coils for all amateur range for keeping the efficiency at high level. L2 should be placed as far as possible from metal walls of the cabinet of the ATU.

Procedure to tune the MU is not complicated. At first, C1 should have the maximum capacity C2 and C3 have minimum capacity. Then, with help of C2 do tune the circuit L2C2 to the resonance to working frequency, then C3 tune to optima matching with the antenna. After that do additional tuning C2 and C1. It is necessary repeat the procedure several times trying to reach maxima capacity for C3.

Advantages of the Matching Unit are following. It does not require too careful make inductors L1 and L2. The system provides good matching with efficiency up to 80 percents. Tuning is done only with help of capacitors. However to obtain the high efficiency it should be used one optimal inductor for one or two closest Bands. One variable capacitor is isolated from the chassis that complicated design of the ATU.

Classical Matching Unit with a symmetrical output

Recently it is not often used a symmetrical antenna with a symmetrical feeder. However some time ago (gold 30-60s) it was a usual matter. For symmetrical feeder line it needs an ATU with symmetrical output.

Classical Matching Unit with symmetrical output is shown on **Figure 3**. In practical design L1 should be placed symmetrically to inductor L2. C2.1 and C2.2 is a twin capacitor where the C2.1 and C2.2 tuned by one axe. It is as well as for C3.1 and C3.2.

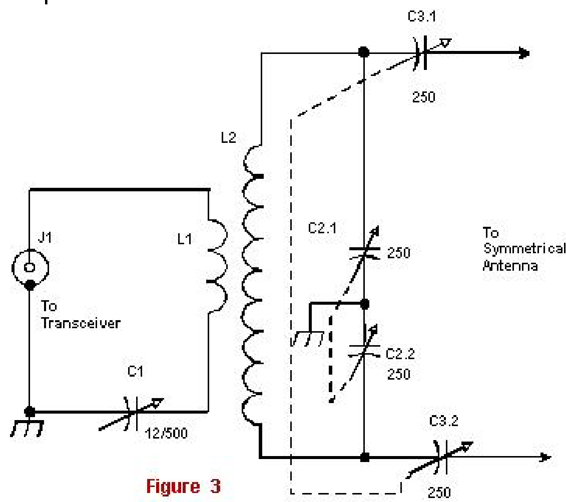


Figure 3

Classical Matching Unit with Tapped Inductor

You can see that at Classical Matching Unit (**Figure 2**) matching capacitor C3 is isolated from metal cabinet of the ATU. It is not convenient in practical design for any ATU. So sometimes amateurs use a Classical Matching Unit with a Tapped Inductor.

Figure 4 shows a Matching Unit with Tapped Inductor with asymmetrical output. **Figure 5** shows a Matching Unit with Tapped Inductor with symmetrical output. Those schematics (**Figure 4 and 5**) cannot provide so good matching that may be expected from ATU shown in **Figure 2** or **Figure 3.** Though in case when it is needed to minimize dimensions of an ATU the schematic are useful to be used.

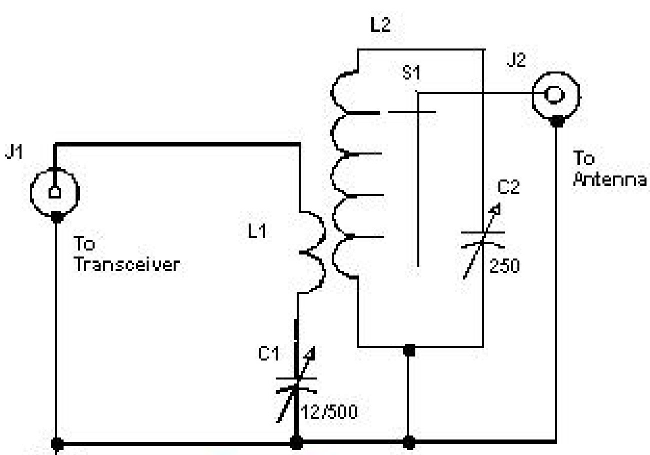


Figure 4

Multi- Band Matching Unit with Tapped Inductor

So, if you want to build an ATU with small sizes and minimum used parts try the schematic shown in **Figure 6**. Switch S1 provides tuning L2C2 to resonance. Switch S2 choose the optimal matching tap from L2. However, the Matching Unit may not provide high efficiency at upper amateur Bands because of lowering of the Q-factor of L2 and because of not optimal selection of taps from L2. But such simplified Matching Unit is quite acceptable for HF – Bands from 1.8- to 14.0 -MHz.

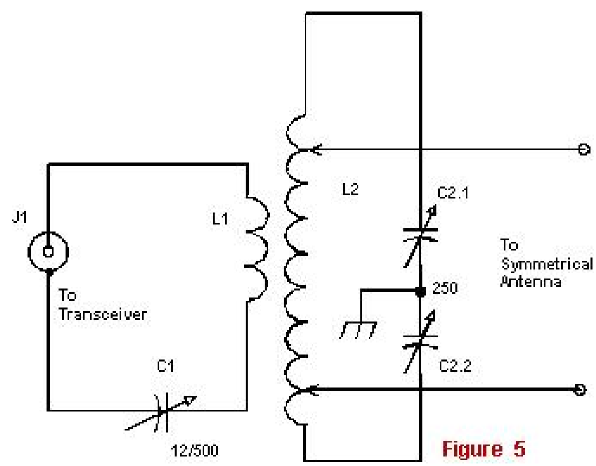


Figure 5

T - Matching Unit

Classical Matching Unit (**Figure 2**) is very effective in operation. However T- Matching Unit won more popularity among radio amateurs and military then Classical one. It is happened because, ***at first***, T- Matching Unit have high efficiency at very wide frequency range and ***at second***, T- Matching Unit allows to do easy automatic tuning (that is military wants), ***at third***, T- Matching Unit works good withr asymmetrical coaxial cables that feeding modern antennas.

Something about ATU

Figure 7 shows schematic of T- Matching Unit. The MU has rather good parameters. This one allows do matching a 50– Ohms transmitter to antenna with wide range impedance - up to 10- 1000-Ohms. It is possible overlap all HF- amateur Bands from 3,5 up to 30 MHz using only one variable inductor at 0.5-30-microH and two variable capacitors at 10- 250-pF. The Matching Unit would be did matching at 1.8-MHz if to bridge to capacitors C1 and C2 the fixed capacitor at 200-pF would be connected.

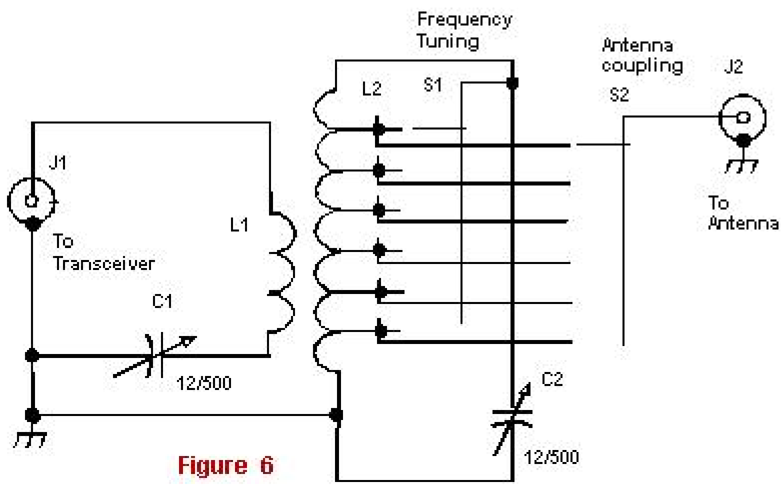


Figure 6

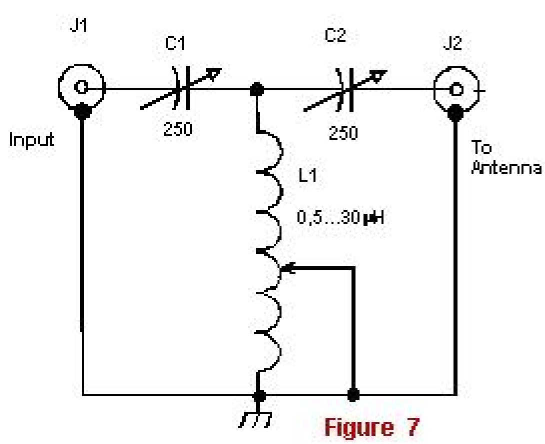


Figure 7

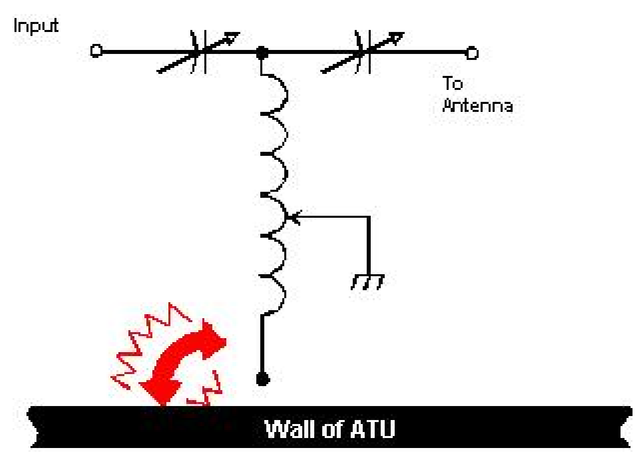


Figure 8

Figure 8 Arcing inductor

The "cold" end of L1 should be grounded or isolated carefully from the metal case of ATU. Otherwise you probably will have strong arc between the ungrounded end of L1 and a metal parts of the ATU (for example, metal side) as it is shown in **Figure 8**. Capacitors C1 and C2 should be very high grade ones with aerial or vacuum dielectric. The clearance between plates of the capacitors should be not less than 2-mm at 200-W bypass power. Stray capacitance of C1 and C2 to the metal case of ATU should be no more than 25-pF, otherwise the efficiency at 24- 28-MHz drop down.

If you want to connect symmetrical antennas feeding through symmetrical ladder lines to the T- Matching Unit, use a symmetrical transformer 1:4 or 1:6. BTW, many of symmetrical antennas, feeding through ladder lines, have large reactive component, which is not optimal for transformation by simple transformers 1:4 or 1:6. The T - Matching Unit suppress high harmonics at least up to 10-15 dB down relative to main signal.

T - Matching Unit with a “digital” inductor

Inductor L1 at T Matching Unit should have a slide contact regarding that the ATU may operate in good way. Sometimes ever plus- minus half of a turn influences to the matching especially at upper portion of the HF Bands. It is did not effective a tapped inductor for using in the unit.

W3TS found simple decision on this problem. He offered a “digital” inductor that **Figure 9** shows. It is possible with the help of several switches very fine to adjust needed inductance.

Electronic relays operated by special chips allow realize automatic T Matching Unit. Military also use this method at their automatic ATU.

T - Matching Unit with mirror parts

For practical design of T Matching Unit it is not conveniently to use two capacitors insulated from the chassis. AEA Corporation (USA) made a T- Matching Unit without the lack. Figure 10 shows design of the ATU. You can see that at the design the variable inductor is changed to variable capacitor and two isolated variable capacitors changed to tapped inductors. In the theory the two schematics (one from **Figure 7** and other from **Figure 10**) are equivalent ones.

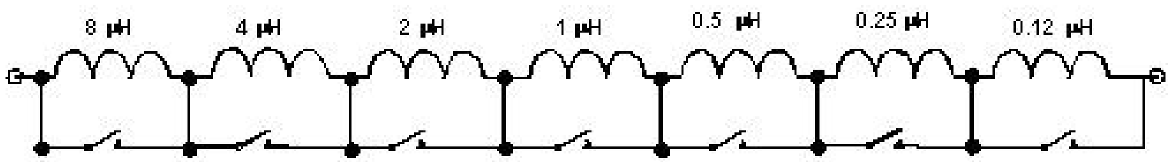


Figure 9

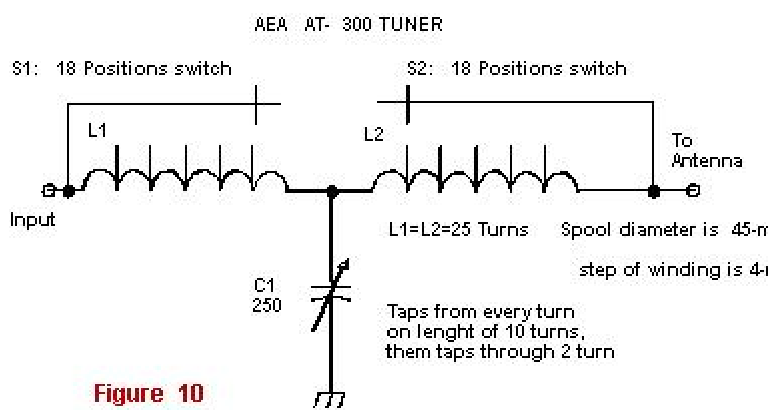


Figure 10

However the schematic shown in **Figure 10** has advantages before schematic shown in **Figure 7**. ***At first***, it is much easier to use only one grounded high-quality capacitor instead of two ones but insulated from metal cabinet. ***At the second***, it is wise to substitute expensive inductor with slide control to two cheap tapped inductors.

ATU shown on **Figure 10** was made by me for testing in the Air. The ATU worked well on all amateur Bands from 1,8 up to 30 MHz. The ATU could match my transceiver (Volna- K, made in Kharkov, Ukraine) with 50-Ohm output to different experimental antenna with impedance from 15 up to 500-Ohms.

Figure 11 and 12 shows design of the inductors. Form of inductors was made on the base one sided foil PCB.

At the board there were made slots for turns to be soldered. Tap Switch was installed on the board aside of inductor.

Pi- Matching Unit

Pi – Matching Unit is used in radio amateur practice for a long time. It is possible to find Pi – Matching Unit and disputes on this subject either at radio amateur magazines from 20s of the 20 century or in our time in some Ham Internet Forum. **Figure 13** shows Pi – Matching Unit. The unit often is used as internal Matching Unit inside the transmitter with tube or transistor power amplifier. Sometimes Pi – Matching Unit may be installed at antenna terminals.

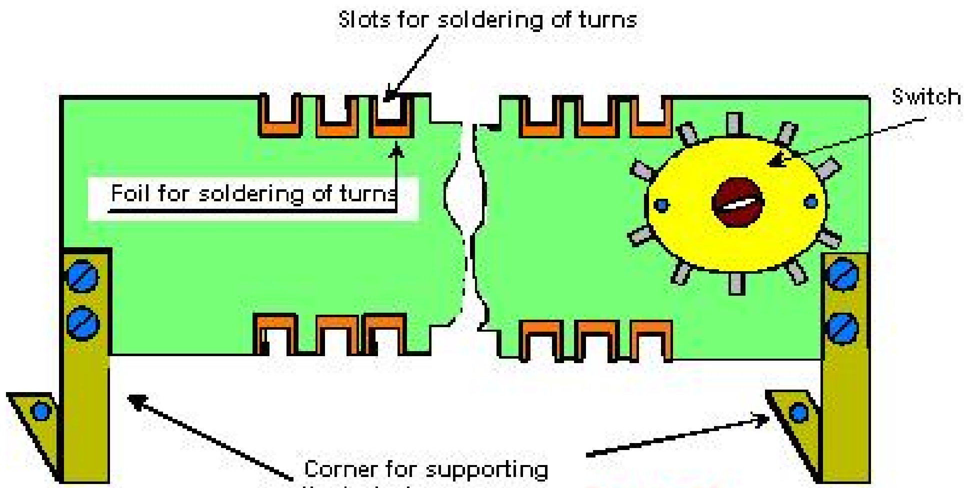


Figure 11

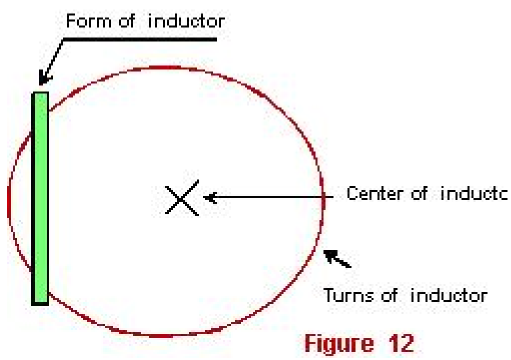


Figure 12

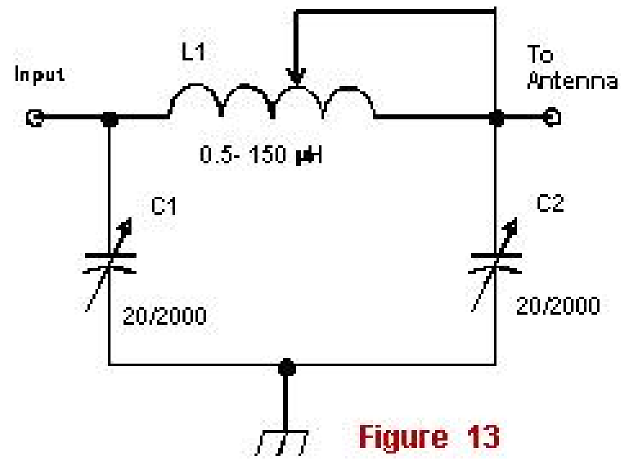


Figure 13

As a separate ATU the Pi – Matching Unit is used very seldom because for operation in a wide frequency range and for matching different loads with wide impedance 10- 1000- Ohms the values of inductor and capacitors should be greatly varied.

It is preferably to use a slider inductor because it gives possibility for fine matching compare to inductor with taps.

L- Matching Unit

Fig. 14 shows L- Matching Unit. This one is a simplified version of Pi – Matching Unit. ATU on the base of L- Matching Unit often is used for operation with a simple tube or transistor transceivers for matching simple multi- Band antennas which do not contain large reactive component in its impedance.

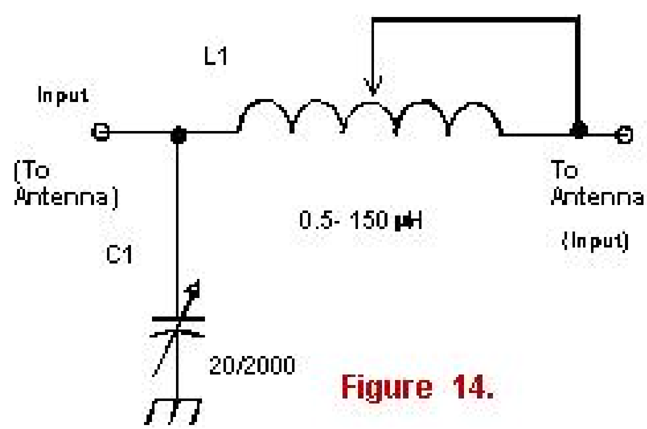


Figure 14.

Parts for the ATU

The data for inductors for the Matching Unit shown on **Figure 2** are shown in **Table 1.** The data for inductors for the Matching Unit shown on **Figure 3** are shown in **Table 2.**

Table 1

Data for Matching Unit shown on **Figure 2**

Frequency band, MHz	1,9	3,5-3,8	7	10	18	14	21	24	27-30
Diameter of form, mm	50	30	25	25	25	25	25	25	25
Length of winding, mm	50	30	40	40	40	40	30	30	30
Number of turns	100	30	20	15	10	11,5	8,5	7,5	6,5

Table 2

Data for Matching Unit shown on **Figure 3**

Frequency band, MHz	1,9	3,5-3,8	7	10	14	18	21	24	27-30
Diameter of form, mm	50	40	25	25	25	25	25	25	25
Length of winding, mm	60	40	40	50	40	40	40	40	35
Number of turns, n	130	35	28	20	15	11,5	11	9,5	8,5

Tab. 3

Data for digital inductor shown on **Figure 9**

Inductance, micro-H	8	4	2	1	0,5	0,25	0,12
Diameter of form, mm	30	20	20	20	25	10	10
Length of winding, mm	30	20	25	20	20	10	10
Number of turns, mm	20	18	12	8,5	5	6	4

Any variometer with inductance 0- 30- micro- H may be used in the design of the T – Matching Unit.

If the inductance of the variometer is less the 30 - micro- H the lower working band would be decreased. To increase the ATU working range it needs just connect in serial with the variometer a fixed inductor. If the minimum inductance of the variometer does not reach zero, it is may cut off the upper range of operation of the ATU.

The design data for digital inductor (**Figure 9)** are shown in **Table 3**.

At power 100- W power going into ATU there would be flow significant RF-currents through the parts (capacitors, inductors, and switches) of the ATU. So all of the parts should be high grade ones.

73! de RK3ZK

Simple HF ATU on Lengths of Coaxial Cable

Igor Grigorov, VA3ZNW

The ATU was made by me in far 80s. It was may be a simplest ATU what I made ever. It contains only one rotary switch and rolls of a coaxial cable. But the ATU works very well. The ATU has only one lack- sizes. Sizes of the ATU are not small. ***Below there are several words onto the theoretical base of the ATU***.

For those who know the Smith Chart the principle of operation of the ATU is not a secret. Using Smith Chart we can find how impedance of antenna system is changed along a transmission line. Based on this we can find optimal length of the transmission line and place(s) on transmission line where we can install stub(s) to eliminate the reactance in the line. Of course, the description is too simple and GOOGLE helps those who want to know more about Smith Chart and how we could match antenna impedance with our transmitter using only transmission line of definitely length with stubs.

For described here matching unit it means: let's turn on our antenna through line with variable length and find when SWR at our transmitter would be best. It is easy. It is simple. It works in most cases.

Yes, at some cases the ATU does not work or work not good but only in some cases… **Figure 1** shows schematic of the ATU.

The ATU contains 11 lengths of 50-Ohm coaxial cable. First length is 1 meter long, second one is 2 meters long, third one is 3 meters long, and so on, next one has length in 1 meter longer the previously one. The lengths of coaxial cable are connected to a four-pole 11-position rotary switch S1. So with help of the S1 you may choose the length of the transmission line from transmitter to antenna system. And if you are lucky (you will be lucky!) match the transmitter with existing antenna system. The matching device works fine at HF- Ranges 3.5- 30.0- MHz.

If you wish use the device only at 7.0- 30.0- MHz the lengths of the coaxial cable should have step 0.5- m. First one should have 0.5- m length, the second 1.0- meter length, the third one 1.5- meter length and so on. **Figure 2** shows the design of the ATU.

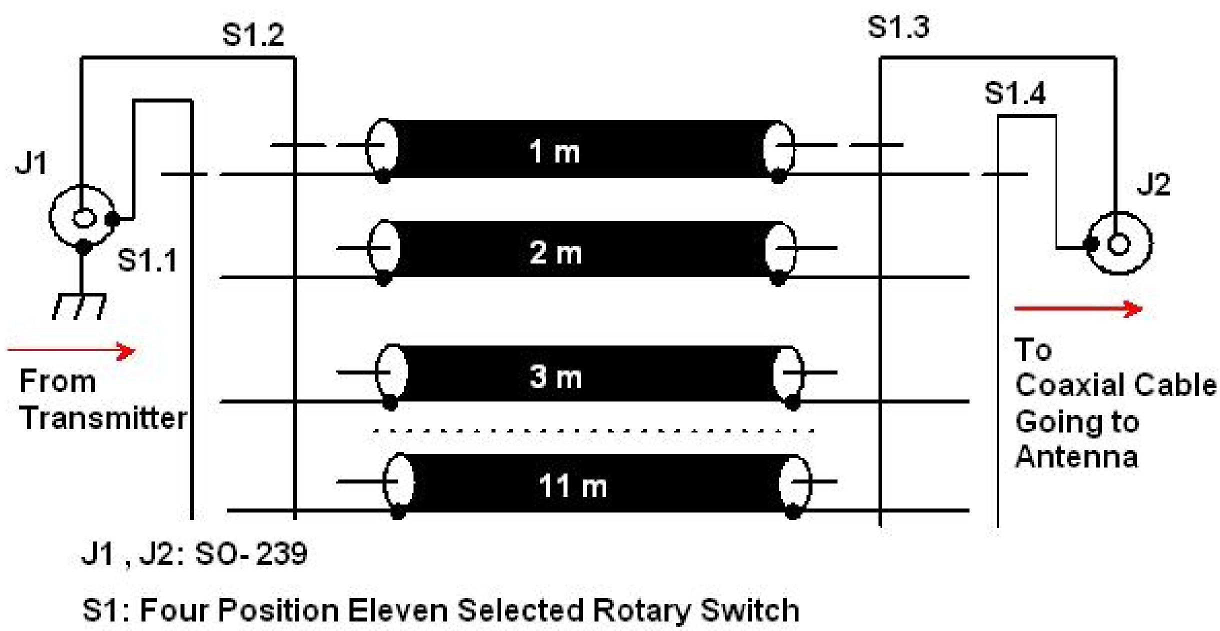


Figure 1 Simple HF ATU on lengths of Coaxial Cable

Note: Pay attention that "ground" of the socket J2 is not connected to the ATU case. The socket is placed on a dielectric plate (it was used a piece of PCB without foil).

The design was very simple. A big metal box from unknown surplus device was used for the ATU. Lengths of the coaxial cable was coiled and then dressed on to a plastic tube. It was used plastic water pipe (something like 1… 2-inch OD).

The ATU is very simple to use. Just connect the ATU between transmitter and antenna system. Then rotate S1 on to minimum SWR. **Figure 3** shows connection of the ATU. It is possible to use the transceiver's internal SWR–meter or an external one. Do not rotate the S1 when transceiver is in transmission mode. S1 breaks the transmission line so it may cause high SWR. Go to receiving mode, switch the length of the coaxial cable, go to transmission mode and check SWR.

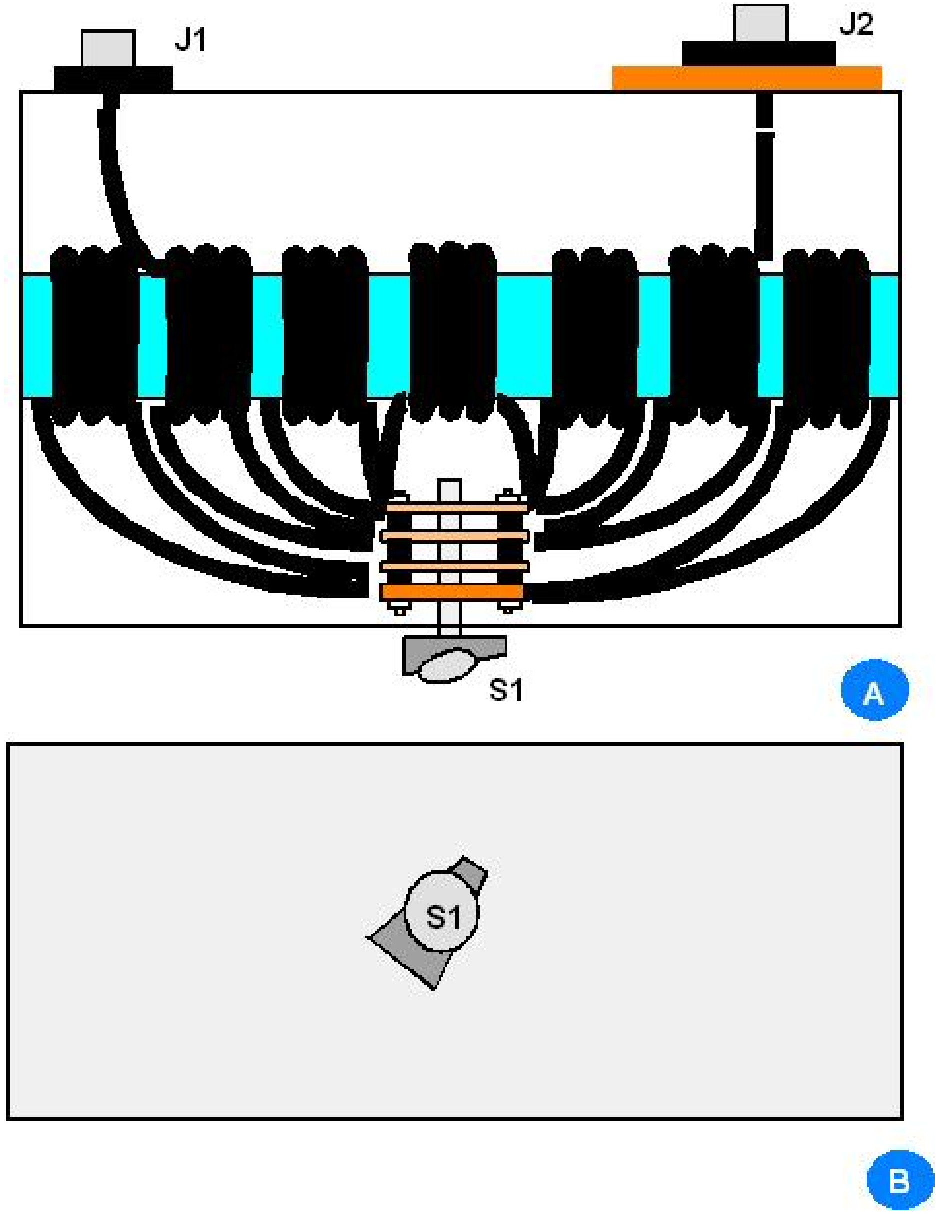


Figure 2 Design of the Simple HF ATU on lengths of Coaxial Cable

However, you may rotate the S1 in receiving mode and tune on to maxima reception. You need begin the tuning from the lowest length of the lengths of the coaxial cable. Then turn on the next length of the coaxial cable and check SWR.

On my memory it was very effectively ATU that could match lots of my experimental antennas (be truth – antenna system- antenna plus coaxial cable going to my transmitter) that I just connected to the coaxial cable placed on the roof. One of the days I decided to rework the ATU to get more efficiency. Any lover of the Smith Chart and matching of the antenna by length of the transmission line straight away could understand how the next ATU works. For those, who do not care about the theory I include some simple explanation. **Figure 4** illustrates the explanation.

For example, there is an antenna with impedance, let's say, 500 Ohm and Reactance minus 100 Ohm. Line L3 transform the impedance, let's say, to 200 Ohm and Reactance Plus 300-Ohm. Stub L2 kills the reactance. The stub, depends on the length, may be opened or closed. Then line L1 transform the pure 200- Ohm to 50-Ohm at the transmitter terminal.

Of course it is very simple explanation. In the real life it is required work with the Smith Chart to find the gold length of the L1, L2 and L3. I have a doubt that in real life somebody will do the theoretical simulation at amateur station. But we may try it in practical way. May be we would be lucky and maybe we can do it with our ATU.

At the design of our ATU we have all components that are at **Figure 4**. Line L3- it is coaxial going from the antenna to the ATU. Line L1- it is variable length of the coaxial cable that we connect between transmitter and antenna system. Line L2- it is row of length of not used coaxial cables that are sitting inside ATU. What can we do- just connect the unused cable in to terminal ATU-antenna system. Then play! Chose length from transmitter to antenna system, then connect the stub and check SWR, and again try another connection to find the low SWR at transmitter terminal. At first sight is hard to do but having some experience (and maybe some theoretical base- GOOGLE helps you) it is not so hard. **Figure 5** shows schematic of the modified ATU. Pay attention that Switch S2 has one empty position (physically I removed stopper from the switch) when no one stub does not connected to the ATU. Switch S2 was placed under switch S1.

73! de VA3ZNW

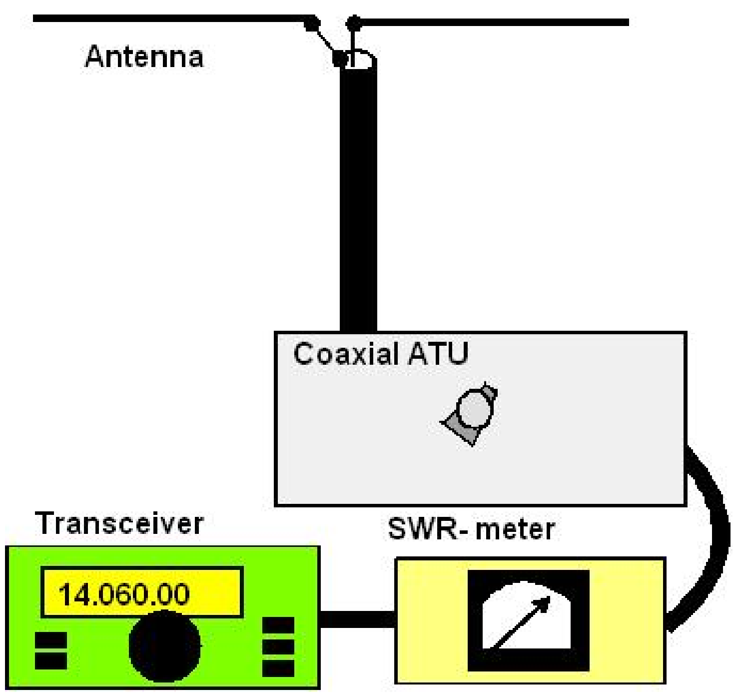


Figure 3 Connection of the Simple HF ATU on lengths of Coaxial Cable

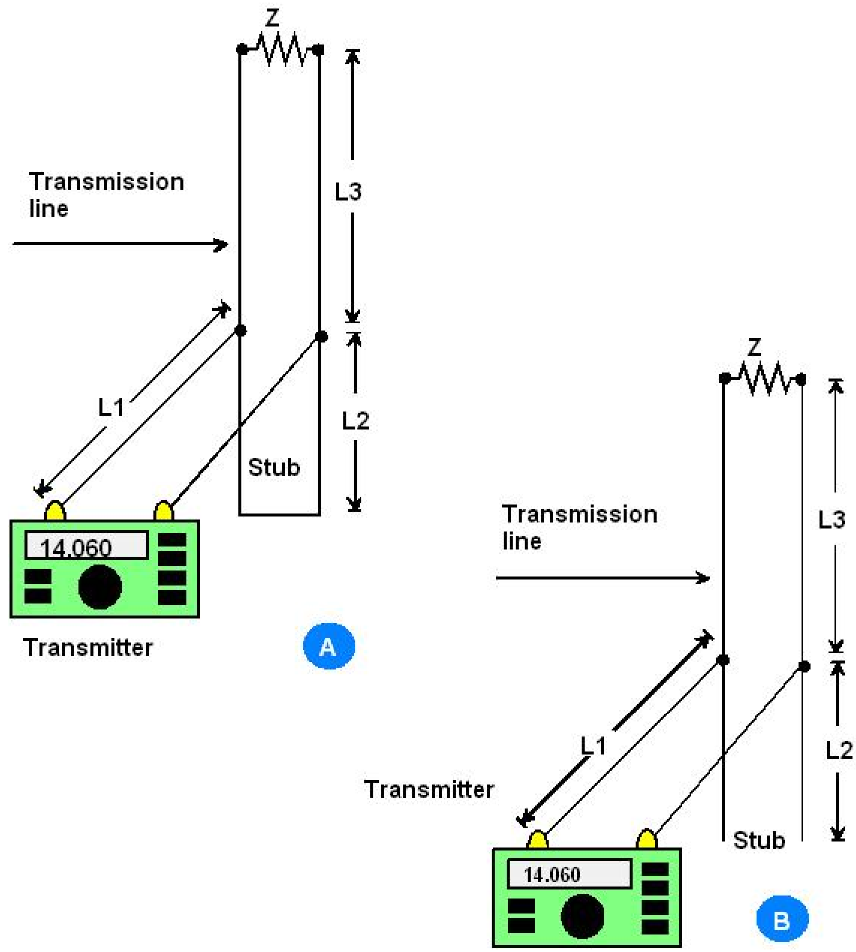


Figure 4 Method of Matching Antenna with help of the Length of the Transmission Line with Stub

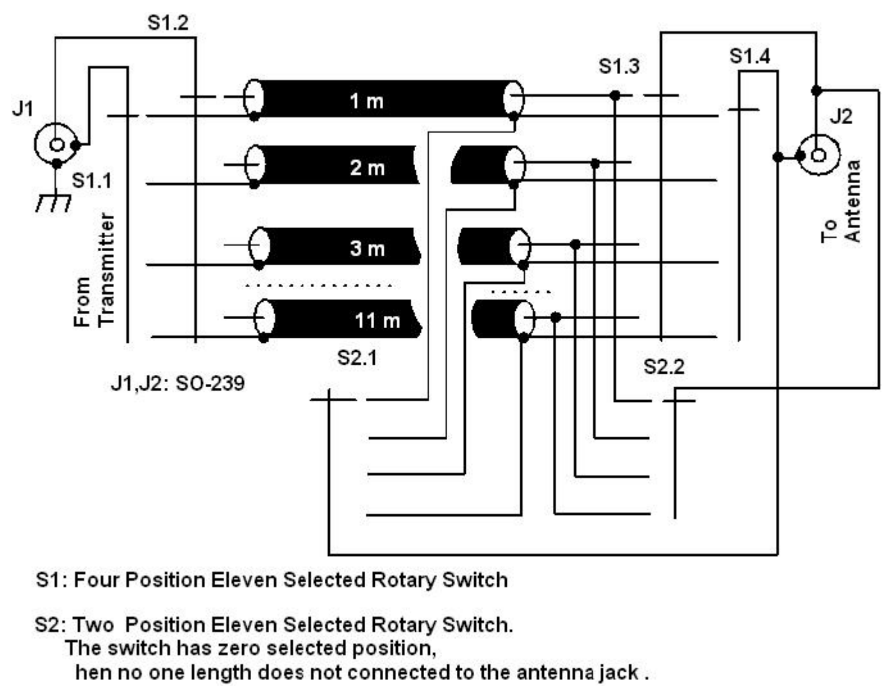


Figure 5 Modified Simple HF ATU on lengths of Coaxial Cable

Pocket Antenna Tuner

Boris Popov, UN7CI

This article is described a small (almost pocket) Antenna Tuner that can work with 100- Watt transceiver.

The Antenna Tuner is a small version of the legendary "Ultimate Transmatch" introduced by Lew McCoy, W1ICP. However at the Lew McCoy's transmatch is used a roller inductor and all capacitors were variable ones. It is very nice for good matching but it is not real for a pocket design. At this version the roller inductor changed to tapped one and a coupling variable capacitor changed to row of the fixed ones. **Figure 1** shows schematic of the tuner.

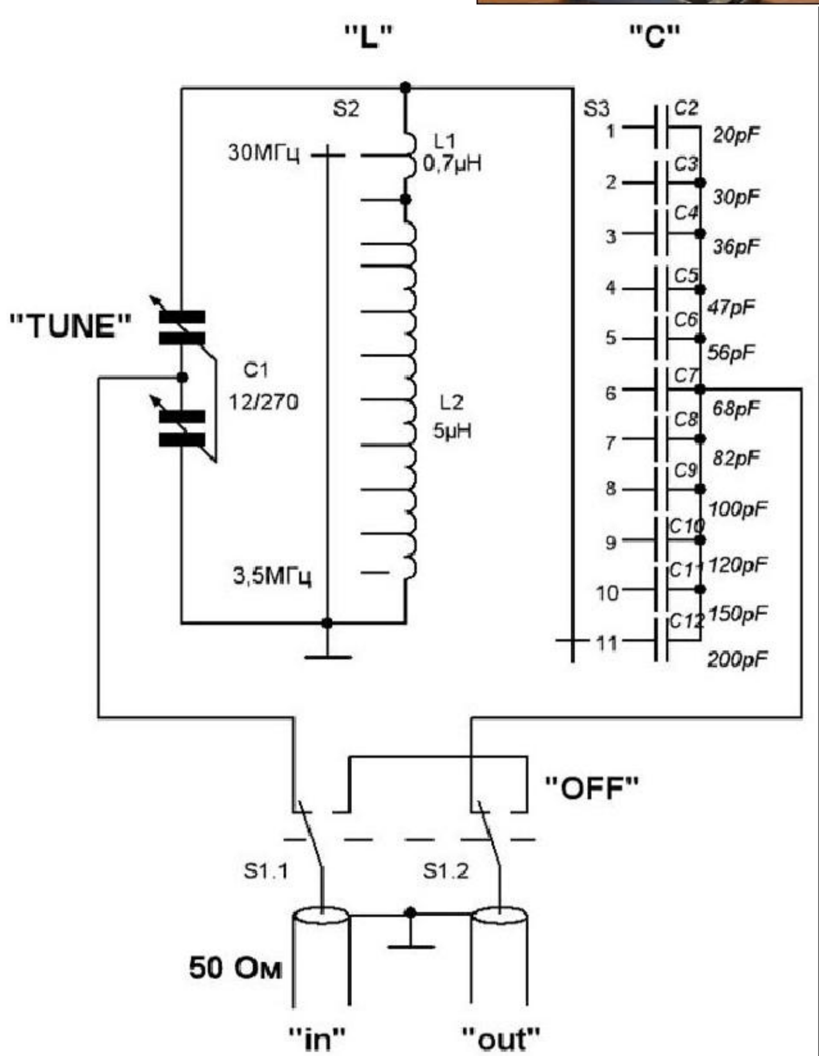


Figure 1 Pocket Antenna Tuner

Antenna and transmitter sockets (to decrease the sizes of the box) did not use at the design. SWR- meter (or RF-Current Meter) as well did not used here for the reason. Variable tank capacitor had simple inbuilt vernier 1:3. The tuner could match antenna with impedance up to 300-Ohm. Limitation is only to working voltage of the row capacitors and input variable capacitor. **Figure 2** shows (for reference) schematic of the Lew McCoy's "Ultimate Transmatch."

Note from I.G.: *The Ultimate Transmatch was described in the "Beginner and Novice" section of the July 1970 QST (Page 24). The circuit was very popular that it was also published in several of the ARRL Handbooks from the 1970s. I have seen one "Real McCoy Transmatch" (as a seller sad to me) at one of Ontario Hamfests. When I decided if I heed to buy this one or not, another person bought it.*

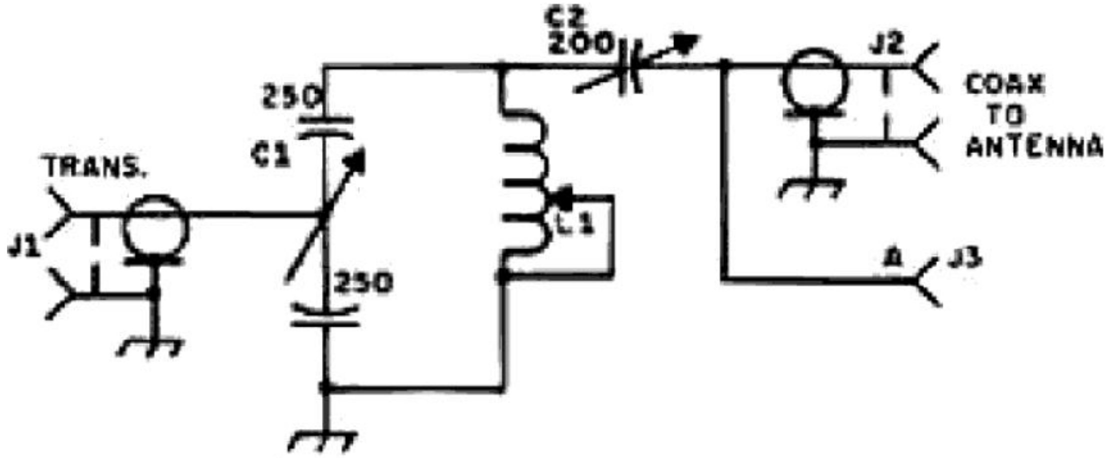


Figure 2 "Ultimate Transmatch" by Lew McCoy, W1ICP

Simple broadband transformer, connected to the tuner, allows use the tuner with symmetrical antennas that are fed through ladder line and with large generation of the wire antennas. The transformer provides 1:4 and 1:9 transformation ratio.

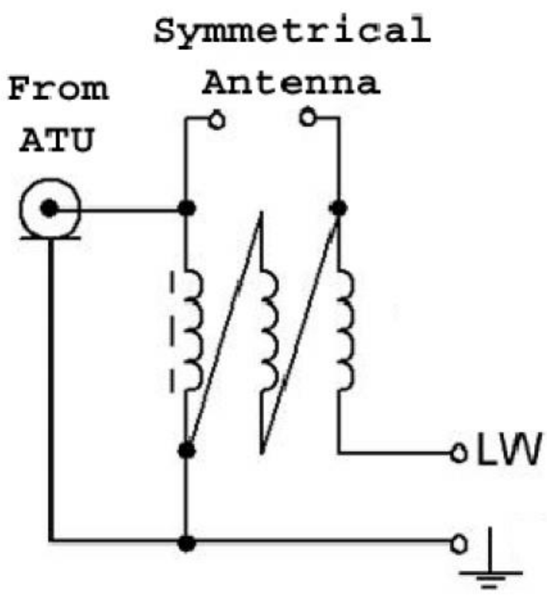
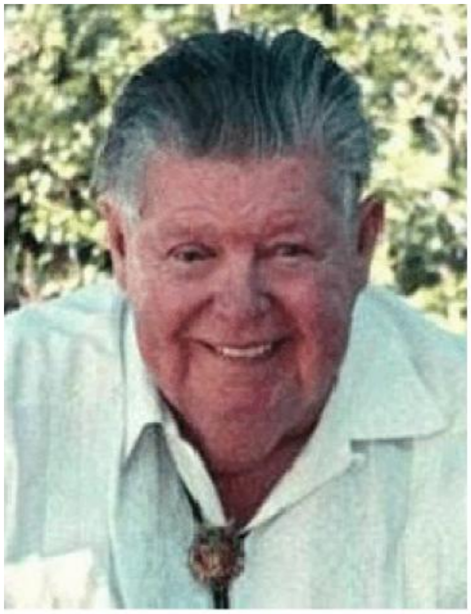


Figure 3 Broadband Transformer



Lew McCoy, W1ICP

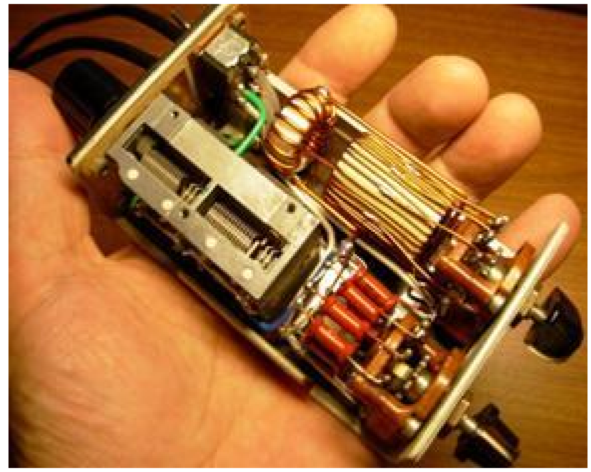
Figure 3 shows schematic of the transformer. Transformer is wound on to ferrite ring in 30- mm OD and permeability 20 by triple wires in diameter 1- mm (18-AWG) in Teflon insulation. Pictures below show design of the tuner.

Parts List

C1: Variable Capacitor 12/495- pF from old tube receiver.
C2- C12: Ceramic Capacitors, 250- V
S1: Toggle Switch.
S2, S3: Small Rotary Switch for 11- position.
L1: Coiled on to plastic ring (from plastic water-pipe tube) in diameter 20- mm and height 8- mm. Contains 15 turns, tap from the middle. It was used wire in diameter 1.5- mm (15- AWG).
L2: Coiled on to plastic ring (from plastic water-pipe tube) in diameter 20- mm and height 40- mm. Contains 32 turns, tap made from each forth turn. It was used wire in diameter 0.8- mm (20- AWG).

Antenna matching very conveniently may be made in receiving mode. At first, Switch S3 installed at Position 1 (Coupling Capacitor C2). Then with help of C1 and S2 tune tank resonator to resonance (on maxima receiving signals). After that find optimal antenna coupling by S3 and consistently tuning C1 and may be switching S2. May be in transmitting mode the tuner would be need some small tuning onto minimal SWR.

73! UN7CI



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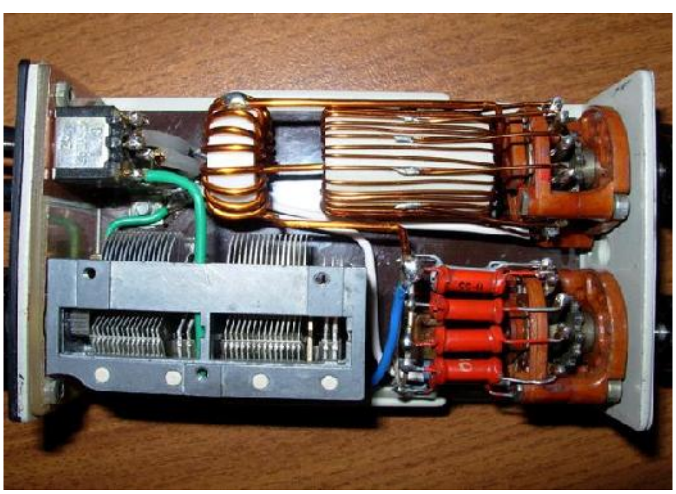
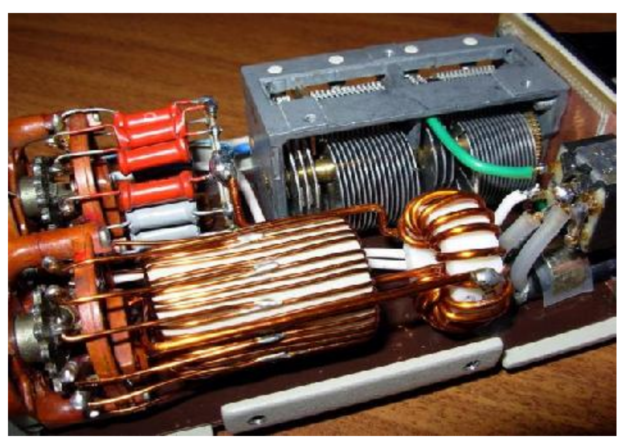




Converting Antenna Tuner MFJ-962D for Operation with Symmetrical Ladder Line

Viktor Drobot, RK3DL

For operation in the Air at all HF- Bands I use to antenna Delta. The antenna is fed by 300- Ohm Ladder Line. To match the antenna with my transceiver I use to ATU MFJ-962D. The ATU has symmetrical transformer at output. The transformer could provide good symmetrical operation … but with antennas that has low reactance. My Delta has significant reactance through amateur's bands. So the concept is not for me.

However it is very simple convert the tuner for operation with symmetrical antenna that has high reactance. **Figure 1 A** shows simplified schematic of the ATU MFJ-962D. **Figure 1 B** shows converting ATU for operation with 300-Ohm ladder line that is fed antenna with significant reactance.

73! RK3DL

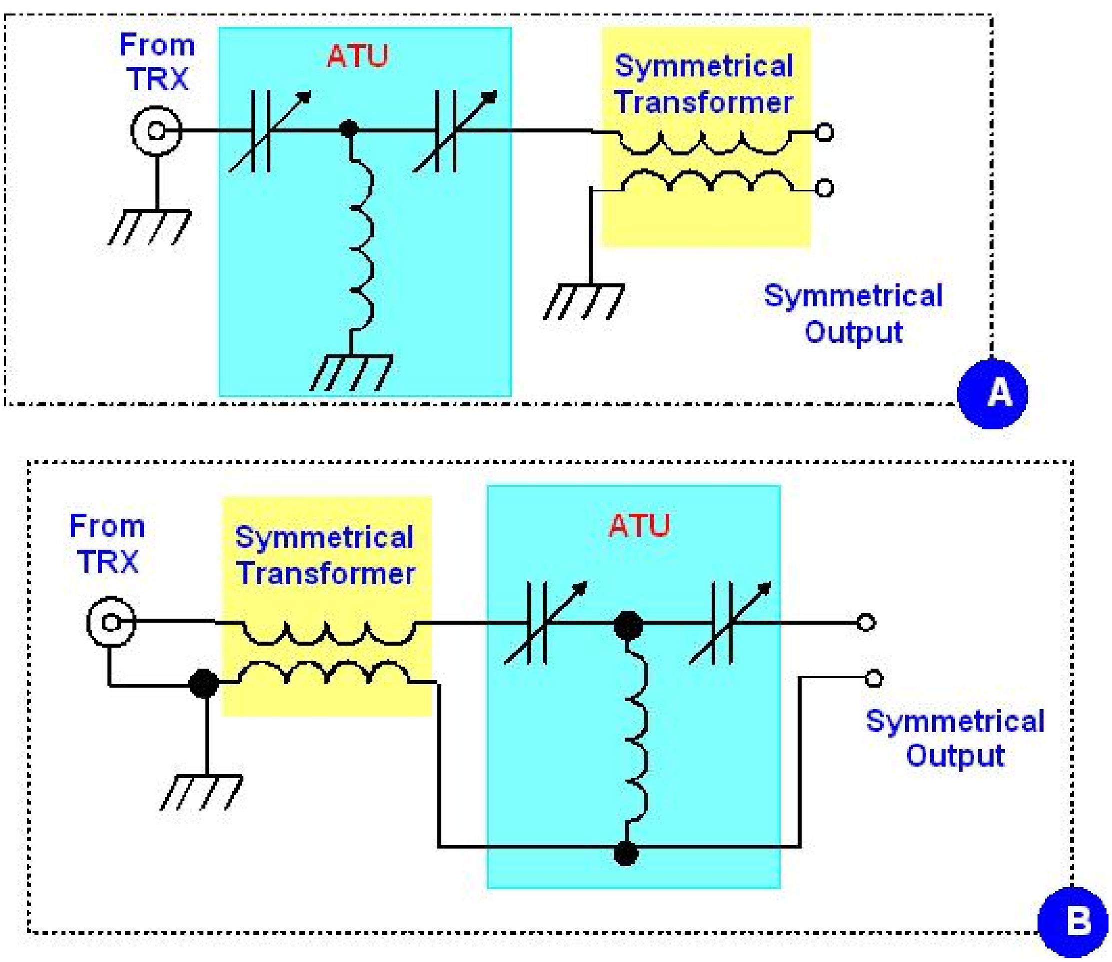


Figure 1

Symmetrical ATU

Vasily Perov, DL1BA (ex UK8BA)

Prototype of the tuner was made by VK5RG. The tuner was found by me at „Das DARC Antennenbuch“(***Reference 1***). However at the book there was given only brief description of the unit. The tuner takes my attention and by trial-and-error method I found the design (data for Inductors and Capacitors) of the tuner. **Figure 1** shows schematic of the Symmetrical ATU. Pay attention that at the tuner the rotary switches S1-1 and S1- 2 do shortening of the unused turns.

The Symmetrical ATU is kind of usual two Pi- circuits, C1 is capacitor at hot end- capacitor that tune the inductor L2 to resonance and C2 is capacitor at cold end- capacitor that does matching for the load. **Figure 2** shows design of the Symmetrical ATU.

All three inductors are placed in row. The inductors are wound by copper wire in 1.5- mm diameter (15- AWG). Inductor L1 contains 4 turns and placed between matching inductors L2-1 and L2-2. Inductors wound on a dielectric plate (PCB plate without foil) by dimensions – 150x 80x 2mm. Two row holes were drilled in the plate. The rows were 50 – mm apart and it was 3- mm distance between the holes.

At first step the inductors were being wound on to a form in 50- mm diameter. Then the dummy inductor was taken off from the form and inserted into the plate turn by turn. Inductor L1 contains 4 turns. Inductors L2- 1 and L2- 2 have 16 turns each.

73! de DL1BA

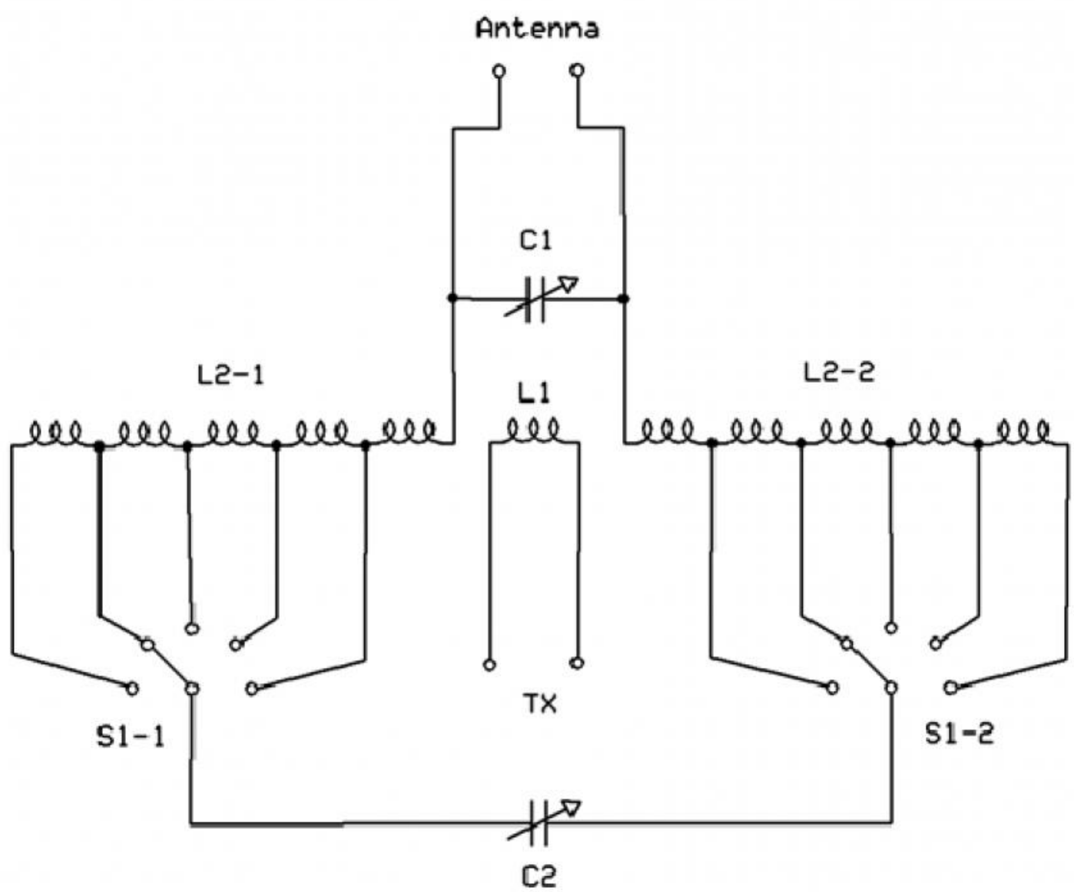


Figure 1 Schematic of the Symmetrical ATU

Taps are taken from 8, 12, 13 and 14- turns from ends of the inductors (see **Figure 2**). The five taps were enough to tune antenna at all amateur's bands (including WARC). Taps of the inductor L1 placed at the other side of the dielectric plate.

It was used a three – plate rotary switch at the ATU. It allowed used the ATU at high power – up to 500- W. Take a look to the **Figure 2**. Taps for upper bands for L2- 1 and L2- 2 are connected to one plate (near the inductor) of the rotary switch. Taps for lower bands for L2- 1 and L2- are connected to separate plates (one plate for one inductor) of the rotary switch.

Capacitor C1 is 500- pF air capacitor from old tube receiver. Capacitor C2 should be high quality high voltage capacitor with maxima 150- pF. For 150- W going to the Symmetrical ATU it would be enough to install air capacitor with 2… 3 mm gap between plates. However when I used the Symmetrical ATU with such capacitor connected to my amplifier FL-2100 it is happened sparking between plates of the C2. Vacuum variable capacitor (as seen on **Figure 2**) installed in the ATU resolved the problem.

References

(1) Gierlach, W.: *Das DARC Antennenbuch*. DARC-Verlag, 1994

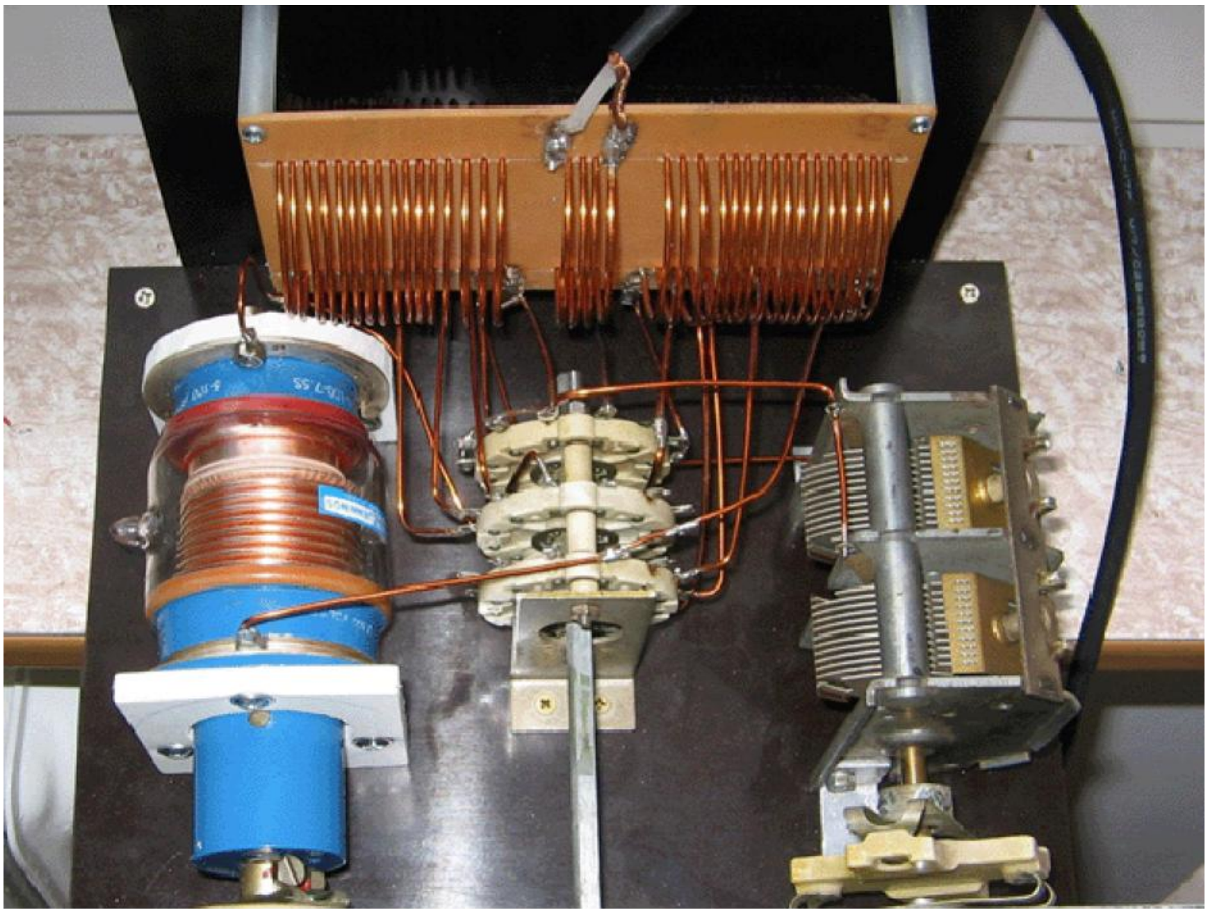


Figure 2 Design of the Symmetrical ATU

Antenna Tuning Unit for 6-meters

Igor Grigorov, RK3ZK

For experimental operation on the 6-meters some antennas for others bands feeding through ATU could be used. It is especially if a radio amateur only starts to work on the “magic” band and has no dedicated antennas. Schematic for such ATU that does match of almost any antenna from 10- 20 meters to 6-meters is shown on **Fig. 1**.

The ATU allows match a casual antenna having impedance of 15 to 1000 Ohms with 50- Ohms coaxial cable or with final stage of the 6- meters transceiver. Efficiency of the ATU is not less than 70%. The ATU has resonant circuit (L2C1) that kills TVI very well.

Of course, to install the ATU between the antenna and the coaxial cable is the best way for the RF power going to the antenna. In this case you can connect the antenna to terminals J3 and the coaxial cable to socket J1. Of course, the situation is impossible at many cases, because it requires install the ATU straight by at the antenna terminals. So, more often we have only one way - connect the coaxial cable going from the antenna to socket J2 and the transceiver to socket J1. The coaxial cable going from the antenna may work with high SWR and maybe with large losses. But we will have possibility operate on the 6-meters.

Some words about parts of the ATU. Inductor L2 consists of 8 turns of copper wire in 2.0-mm diameter or # 12- AWG. The coil is air wound, OD is 16-mm diameter, the length is 24-mm.

Inductor L1 consists of 3 turns of copper wire in diameter of 1.0-mm or # 18- AWG. Inductor L1 is wound above "cold" end of the inductor L2. The length of L1 is approximately 5-mm. R1 serves for removal of static electricity accumulated by an antenna. Terminals J3 that are just two screws in diameter of 3-mm made for connection straight away to the antenna terminals or for feeding the antenna through a ladder line. C1 and C2 should be with aerial dielectric. Plate gap should be 0.5-mm to 30 watts bypass power.

ATU is tuned with help of a Neon bulb VL1. You may use any small neon bulb. One terminal of the bulb is connected to the antenna. A piece of wire of length of 3-10-cm (depends on the transceiver power) is connected to another bulb terminal. ATU is tuned by maxima of glow of the bulb.

Do tuning in this way. Firstly C2 stands to minimum capacity. Secondly, with the help of C1 do tune the L2C1 to the resonance (by the neon bulb VL1). Then gradually increase capacity of C2 and decrease capacity of C1 refer to maxima glow of the neon bulb VL1.

The ATU was assembled inside a box soldered from PC – board. Box had dimensions 100*70*50 mm.

73! de RK3ZK

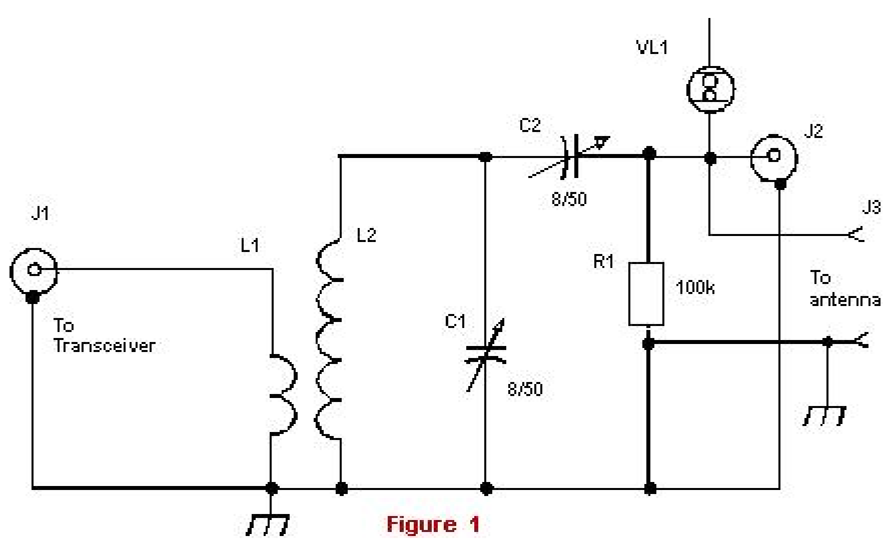


Figure 1

Broadband Transformer 50/200 Ohm

Sergey Popov, RZ9CJ, Ekaterinburg, Russia

Credit Line: http://qrz-e.ru/forum/29-786-2

Below I describe a simple way to make broadband transformer 50/200 Ohm with isolated windings. (Theoretically the transformer is for 50/140- Ohm. However it works fine for most common matching application for 50/200 Ohm.)

Figure 1 shows schematic of the transformer. At first you need take a ferrite ring (or several identical ferrite rings) with permeability 600… 2000. OD should be 40-50- mm. Power going through the transformer depends on the sizes. I took two ferrite rings with permeability 2000 for the transformer. **Figure 2** shows the rings.

The rings stuck together. Rings should be protected from atmospheric influences. It may be done with protection lacquer or just with electrical insulation tape. **Figure 3** shows two rings wrapped with electrical insulation tape. Of course, at the antenna the transformer should be protected from straight atmospheric influences with help of a simple cover.

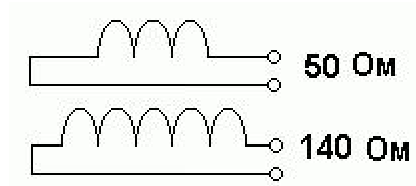


Figure 1 Schematic of the Broadband Transformer 50/200 Ohm

Second winding has two turns around each turn of the first winding. Wires should be close and parallel each to other.

Figure 6 shows beginning of the second winding at one side of the ring. In one turn (first winding) is in brown, two turns (second winding) are in yellow. **Figure 7** shows ready second winding.

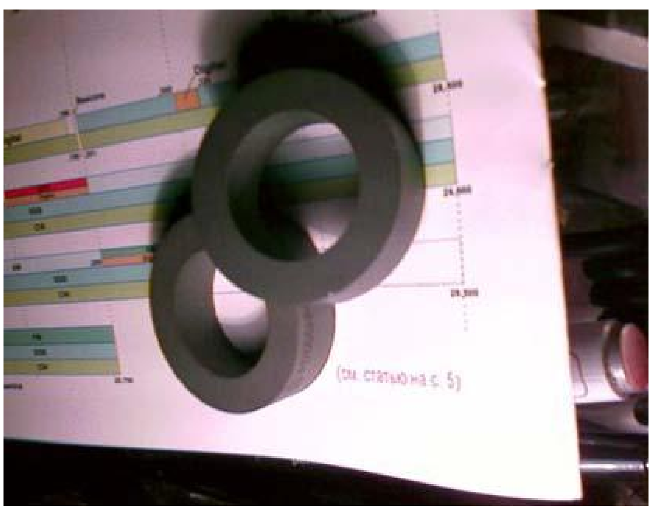


Figure 2 Rings for the Broadband Transformer

Figure 3 Two Rings Wrapped with Electrical Insulation Tape

I used thin wire in diameter near 1.5- mm (14- AWG) for the windings. First winding contains 2 turns. **Figure 4** shows transformer with the winding. Then one turns is moved to the opposite side of the ring. It is the first winding. **Figure 5** shows the first winding.

After that the turns should be pressed together and fixed with electrical insulation tape. Transformer 50/200 Ohm is ready. **Figure 8** shows the transformer. First winding is for coaxial cable 50 Ohm the second one for antenna 200 Ohm.

Broadband Transformer 50/200 Ohm

Figure 4 Transformer with 2 turns winding

Figure 5 First Winding

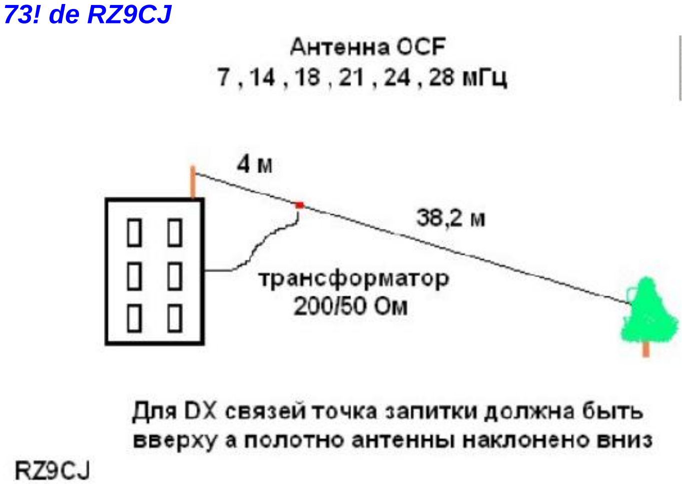
Figure 6 Beginning of the Second Winding at One Side of the Ring

Figure 7 Ready Second Winding

Figure 8 50/200 Ohm Transformer

The transformer may use with an OCF (Windom) Antenna that is shown below. For DX communication feed points should be at up position compare to the long wire of the antenna.

73! de RZ9CJ



Two Broadband Symmetrical Transformers for HF and VHF Bands

By: Alex Karakaptan, UY5ON, ES4UY, Kharkov, Ukraine

Below there are described two broadband transformers with transformation ratio 1:5 and 1:10. First transformer could match 50 Ohm to 250 Ohm the second one could match 50 Ohm to 500 Ohm. The transformers may be used to feed different types of hi- ohmic antennas, for example, G5RV. The transformers provide symmetrical output. The transformers provide SWR 1.15 at 144 MHz, 1.1 at 70- MHz, 1.0 at 50- MHz, 1.1 at 3.5- MHz and 1.15 at 1.9- MHz. The transformers do not overheated at 500- W power going through.

Figure 1 shows design of the transformer with ratio 1: 5 (50/250 Ohm). Main core of the transformer is a ferrite tube taken from an RFI filter that was placed on control wires of old CRT monitor. Such tube may have OD 18… 20- mm, ID 8… 9- mm, and length 25- 28- mm. Permeability of the core is near 800- 1000.

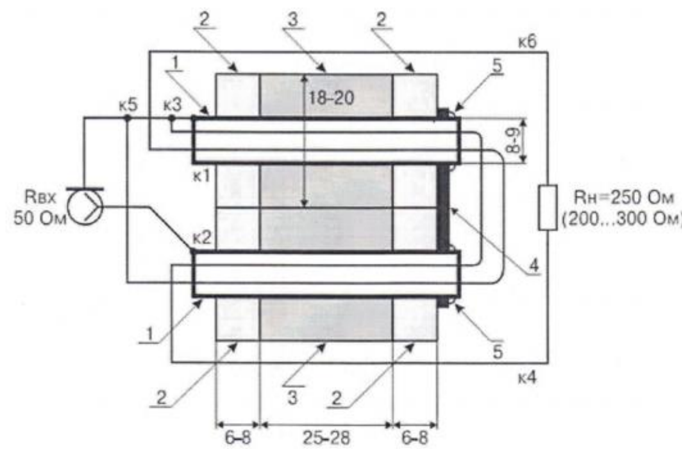


Figure 1 Design of the Transformer with Ratio 1: 5 (50/250 Ohm)

Length ferrite core for the transformer should be 37... 44- mm. So, two ferrite rings with equal to the tube OD and ID placed from the both sides of the core. First winding of the transformer (k1k2 at **Figure 1**) consist of two copper tubes (pos.1) that are inserted into the ferrite cores. The tubes should have a minimal gap between the cores. The tubes are shorted by a jumper (pos.4). The jumper made of a copper strip. The jumper is soldered (pos.5) to the copper tubes. Second winding (k3k4 + k5k6) made by teflon wire in diameter 1.5- 2.0 mm (15… 12 AWG).

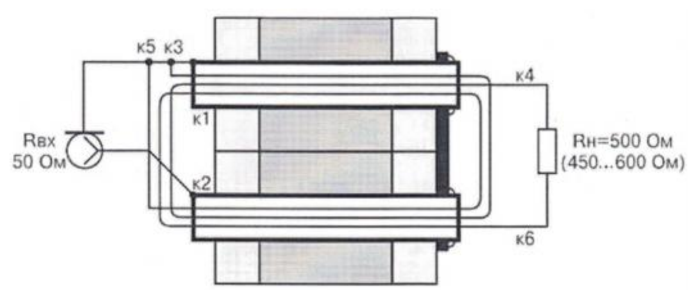


Figure 2 Design of the Transformer with Ratio 1: 10 (50/500 Ohm)

Figure 2 shows design of the transformer with ratio 1: 10 (50/500 Ohm). The transformer has design similar to the transformer with ratio 1: 5 (50/250 Ohm). Difference is only in the second winding that design is cleared from **Figure 2**.

Both transformers were tested at real antennas. They worked perfect at least much better the usual transformer made on a ferrite ring. The transformers have equal frequency parameters from 1.9 to 144 MHz that could not provide the usual transformers on a ferrite ring.

Credit Line: Radio Hobby # 6, 2014

73! de UY5ON

Insulation RX Transformer

Igor Grigorov, VA3ZNW

At my shack I have used a Coaxial Antenna Switch Protax CSR- 5G to change devices connected to my antenna**. Figure 1** shows commutation graph and schematic of the switch. **Figure 2** shows the switch sitting at my table. The switch is very convenient for amateur operation in the Air. I can easy switch antenna from one transceiver (ICOM- 718) to another one (K1) or turn antenna to general coverage receiver (Hallicrafters S-85). I use the receiver to check propagation in the Air and just to catch some interesting broadcasting word wide HF- stations.

I have bought the switch at some Hamfest for 5 dollars. It is very reliable switch that worked at me without any problem. Somedays I discovered ads of the switch at old 73- Magazine from 1967. **Figure 3** shows old advertising of the switch from 73- Magazine # 1, 1967.

Figure 2 Protax Coaxial Antenna Switch Sitting at my Table

The switch cost was $ 12.50 in 1967. I used online calculator (http://www.dollartimes.com/index.htm) to find value of the one dollar from 1967 to dollar in 2015. It occurred that one dollar from 1967 cost 7.13 dollars from 2015. So the switch would cost 89 dollars if being sold in the 2015 year.

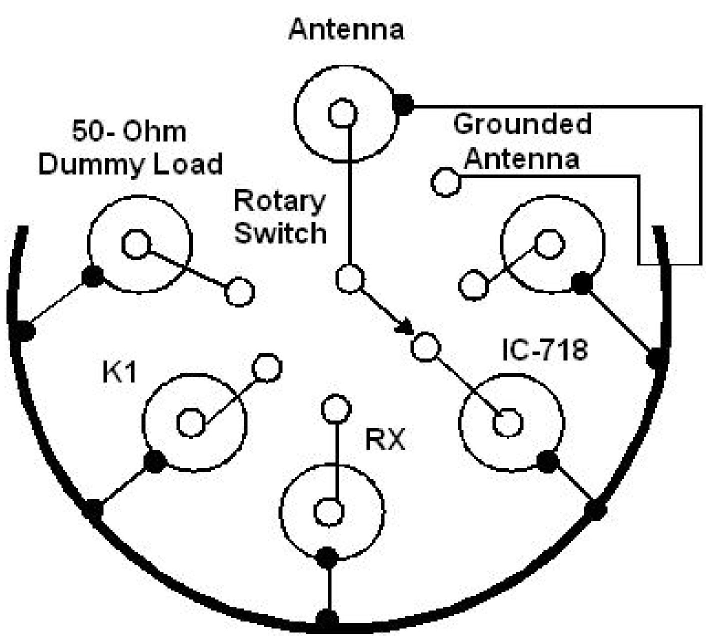


Figure 1 Commutation Graph and Schematic of the Switch

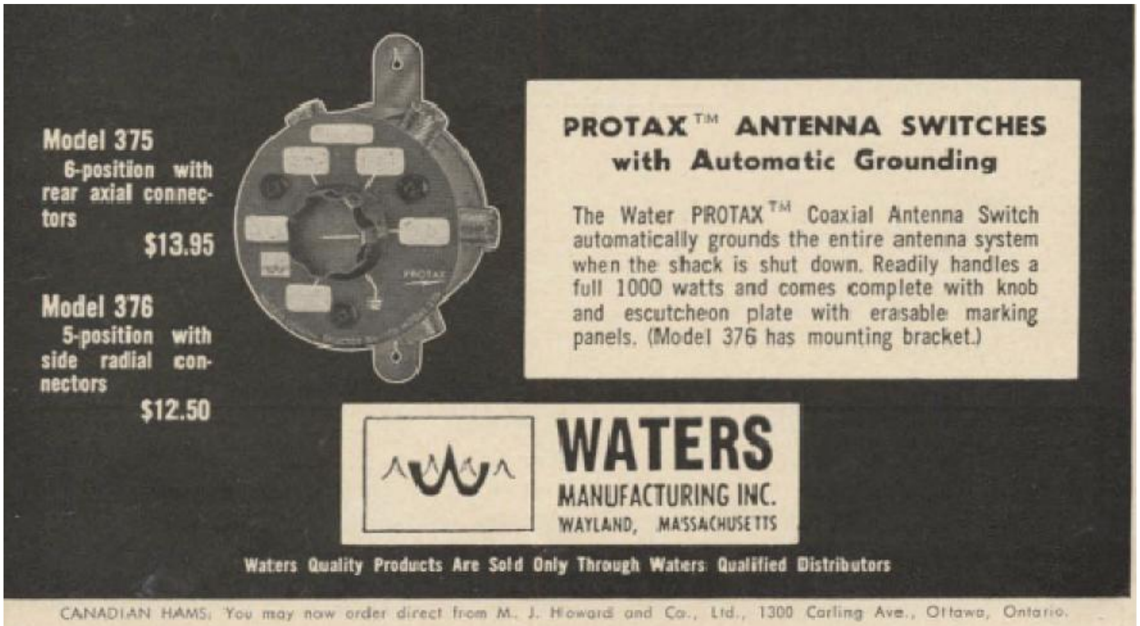


Figure 3 Advertising of the Coaxial Antenna Switch Protax from 73- Magazine # 1, 1967

Please, take attention that a 50- Ohm dummy load is switched there. Why? The switch has position when the antenna is grounded. It is very useful at lighting time or time when static could copy on to antenna wires. It is time of strong winds, snowfall or before lighting period. When antenna is grounded the static goes to the ground and could be not damaged devices that are switched to the Coaxial Switch. However it is worked well when antenna does not contains a ferrite transformer (s) in the design. If antenna had ferrite transformer in the design and the antenna is grounded to the natural ground, antenna current caused by static or lighting discharge may be strong enough to destroy the ferrite transformer.

I use to the switch with my Beverage Antenna that was described at ***Antentop 01- 2015, pp.: 35- 41***. My Beverage Antenna has ferrite matching transformer at the end. So theoretically the transformer may be damaged when switch grounded the antenna directly to the ground.

At professional radio communication an antenna that has ferrite parts in the design newer being directly grounded to the natural ground. Such antenna is grounded through a low ohm resistor that as usual has nominal equal to surge impedance of the transmission line. In this case the current going through the antenna ferrite parts would be limited by the resistor and the ferrite parts would not be destroyed by the lighting and static electricity. I use 50- Ohm coaxial cable so I turn on my antenna to a Dummy Load 50- Ohm when the antenna is not in use.

The main lack of the Coaxial Antenna Switch Protax CSR- 5G is that one position rotary switch is used at the device. So grounds of all devices connected together at the switch. It may be caused that interferences catching by one device may penetrate to another one having common ground. Professional Antenna Commutator as usual has 2 positions rotary switch that commutate simultaneously input and ground of antenna or used device.

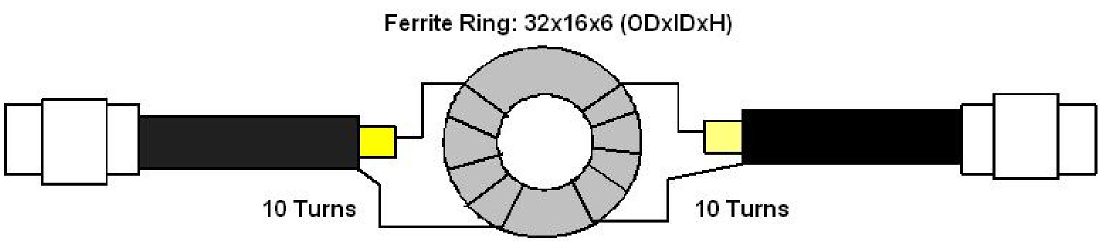


Figure 4 Design of the Insulation Transformer

Insulation RX Transformer

In my case I mentioned that connecting on receiver Hallicrafters S-85 to the Coaxial Switch went to increasing noise at transceivers connected to the Switch. Insulation transformer helped me to remove the effect. **Figure 4** shows design of the transformer. **Figure 5** shows Hallicrafters S-85 on the bench.

Transformer was made with ferrite ring that I saved from an old Computer PIII. The ring had dimensions 32x16x6 (ODxIDxH). Permeability of the ring was unknown for me. Transformer had two identical coils, each contained 10 turns made by wire in 0.5- mm diameter (24 AWG). The inductors were placed at opposite sides of the ferrite ring. Two lengths of coaxial cable in 20 cm were connected to the coils. The design was placed in a plastic food box. The transformer was switched on between Coaxial Antenna Switch Protax CSR- 5G and coaxial cable going to the receiver Hallicrafters S-85. **Figure 6** shows the transformer inside opened food box. **Figure 2** shows the closed food box sitting beside the Coaxial Antenna Switch.

The insulation transformer allows use the Hallicrafters S-85 without any noise influences to transceivers connected to the switch. Reception of the receiver was improved with the insulation transformer. Stations sound clearly with the transformer. I was mention that there were less noise and clicks in the receiver especially at lighting and pre storm period.

I measured SWR when the transformer was connected to the 50- Ohm coaxial cable going from Beverage antenna to antenna analyzer MFJ-259B. SWR was in limit 3..4 up to 4- MHz. Then SWR was sharply increased and reach 25 at 20- MHz. However, such high SWR does not hinder the reception.

Figure 5 Hallicrafters S-85

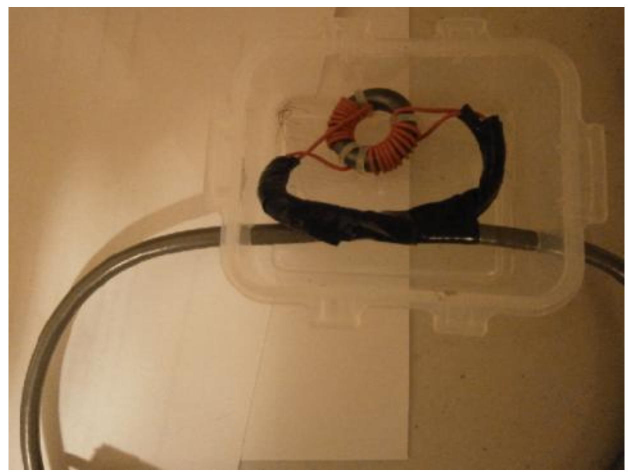


Figure 6 Insulation Transformer Inside Opened Food Box

73! de VA3ZNW

Conclusion

So, Chapter 10 ***"ATU and RF Transformers"*** is ended. Practical designs of the ATU and RF Transformers were described at the chapter. All of those devices were made and tested by hams. So if you need an ATU or RF Transformer and you want to do it yourself the ***Chapter 10*** gives you enough information on the topic.

Some parts, hardware stock and base knowledge for tools operation would be required for design of the home brew equipment. I wish you success in doing your own home brew ATU.

73!

Igor, VA3ZNW

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HF ATU

1. Something about Antenna Tuning Units: http://www.antentop.org/005/atu_005.htm
2. Simple HF ATU on Lengths of Coaxial Cable**:** http://www.antentop.org/018/coax_atu_018.htm
3. Pocket Antenna Tuner: http://www.antentop.org/018/un7ci_018.htm

HF ATU for Symmetrical Ladder Line

1. Converting Antenna Tuner MFJ-962D for Operation with Symmetrical Ladder Line**:** http://www.antentop.org/018/rk3dl_018.htm
2. Symmetrical ATU: http://www.antentop.org/019/dl1ba_019.htm

ATU for 6 meters

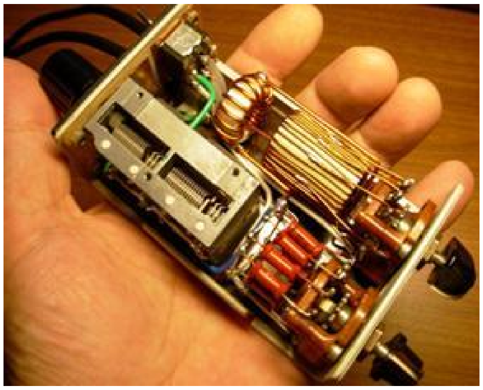
1. Antenna Tuning Unit for 6-meters: http://www.antentop.org/005/50mhz_005.htm

RF Transformers

1. Broadband Transformer 50/200 Ohm: http://www.antentop.org/019/Broadband%20Transformer%20_019.htm

Additional Source

1. Experimenters with Non Snap Ferrite Cylinder Bead RF Chokes : http://www.antentop.org/020/cylinder_choke_020.htm



UN7CI Pocket Antenna Tuner

Almost every book contains Appendix. Or, almost every book shall contain Appendix. OK, the book as well contains a small Appendix. I believe that the Appendix will be useful for Antenna Designer, gives some information that often need at Antenna practical building. There are included useful tools for calculation inductors, table to transfer Metric to AWG, and transfer frequency to metric length of radio wave.

Lightning Tank Calculator

Very often radio amateur need calculate parameters of resonator tank (see **Figure 1**). Certainly, there are lots programs that can do the calculations. However very quick and with acceptable tolerance amateur can do it using **Table 1**. The table gives value for L (in microH) multiple to C (in pF).

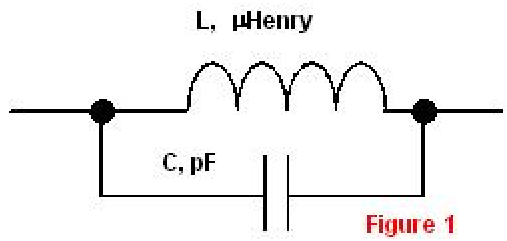


Figure 1

Example 1: You need resonator tank for 10 MHz. Value LxC is 253.3.

So, you may use, L= 2.53 microH and C= 100 pF. 2.53X100= 253.

Or, you may use L= 5 microH and C= 56.6-pF. 5X56.6= 253.

Subtract from the capacitance 10- 15 pF- it is selfcapacitance L plus capacitance parts to the ground. So, real C should be 238 pF(253- 15) or 41 pF (56- 15) in the second variant.

Example 2: You need resonator tank for 14 MHz. Value LxC is 129.2.

So, you may use, L= 1.0-microH and C= 129 pF. 1.0X129= 129.

Or, you may use L= 2 microH and C= 64.6-pF. 2X64.6= 129,2.

Subtract from the capacitance 10- 15 pF- it is selfcapacitance L plus capacitance parts to ground. So, real C should be 114 pF(129-15) or 49 pF (64-15) in the second variant.

Table 1 LC Value

F, MHz	LC	F, MHz	LC	F, MHz	LC	F, MHz	LC	F, MHz	L
0.5	101320	1.8	7818	6	703.6	15	112.6	24	43.
0.6	70361	2.0	6333	7	516.9	16	98.95	25	40.
0.7	51694	2.5	4053	8	395.8	17	87.65	26	37.
0.8	39578	3.0	2814	9	312.7	18	78.18	27	34.
0.9	31272	3.5	2068	10	253.3	19	70.17	28	32.
1.0	25330	4.0	1583	11	209.3	20	63.33	29	30.
1.2	17590	4.5	1251	12	175.9	21	57.44	30	28.
1.4	12923	5.0	1013	13	149.9	22	52.33	31	26.
1.6	9695	5.5	837.4	14	129.2	23	47.88	32	24.

Wire Metric Diameter/Gauge Standard

Number #		0000	000	00	0	1	2	3	4	5	6	7
Diameter in mm	SWG	10.16	9.45	8.84	8.23	7.62	7.01	6.40	5.89	5.38	4.88	4.47
	AWG	11.68	10.41	9.27	8.25	7.35	6.54	5.83	5.19	4.62	4.11	3.66
	BWG	11.53	10.80	9.65	8.64	7.62	7.21	6.58	6.05	5.59	5.16	4.57

Number #		8	9	10	11	12	13	14	15	16	17	18
Diameter in mm	SWG	4.08	3.68	3.25	2.95	2.64	2.34	2.03	1.83	1.63	1.42	1.22
	AWG	3.25	2.90	2.59	2.30	2.05	1.83	1.63	1.45	1.29	1.15	1.02
	BWG	4.19	3.76	3.40	3.05	2.77	2.41	2.11	1.83	1.65	1.47	1.24

Number #		19	20	21	22	23	24	25	26	27	28	29
Diameter in mm	SWG	1.02	0.92	0.81	0.71	0.61	0.56	0.51	0.46	0.41	0.38	0.35
	AWG	0.91	0.81	0.72	0.64	0.57	0.51	0.45	0.40	0.36	0.32	0.29
	BWG	1.07	0.89	0.81	0.71	0.64	0.56	0.51	0.46	0.41	0.35	0.33

Number #		30	31	32	33	34	35	36	37	38	39
Diameter in mm	SWG	0.30	0.29	0.27	0.254	0.229	0.203	0.178	0.17	0.15	0.127
	AWG	0.25	0.23	0.20	0.18	0.16	0.14	0.13	0.11	0.10	0.08
	BWG	0.30	0.25	0.229	0.203	0.178	0.127	0.102			

Wave kHz/Meters m

Sometimes it needs to do transfer amateurs frequencies to meters. Tables below allow to do it fast and clearly.

кГц = kHz

F, кГц	1810	1830	1900	1950	2000		
λ, м	165,74	163,93	157,89	153,84	150,0		
λ/2, м	82,87	81,96	78,94	76,92	75		
λ/4, м	41,43	40,98	39,47	38,46	37,5		
F, кГц	3500	3560	3600	3620	3650		
λ, м	85,71	84,27	83,33	82,87	82,19		
λ/2, м	42,85	42,13	41,66	41,44	41,09		
λ/4, м	21,42	21,07	20,23	20,71	20,54		
F, кГц	3700	3750	3800				
λ, м	81,08	80	78,94				
λ/2, м	40,54	40	39,47				
λ/4, м	20,27	20	19,73				
F, кГц	7000	7030	7060	7100			
λ, м	42,85	42,67	42,49	42,25			
λ/2, м	21,43	21,33	21,24	21,12			
λ/4, м	10,71	10,66	10,62	10,56			
F, кГц	10100	10130	10150				
λ, м	29,7	29,61	29,55				
λ/2, м	14,85	14,8	14,77				
λ/4, м	7,42	7,4	7,38				
F, кГц	14000	14020	14050	14100	14200	14250	14350
λ, м	21,42	21,39	21,35	21,27	21,12	21,05	20,9
λ/2, м	10,71	10,7	10,67	10,64	10,56	10,52	10,45
λ/4, м	5,35	5,35	5,34	5,32	5,28	5,26	5,22
F, кГц	18068	18100	18150	18250	18318		
λ, м	16,6	16,57	16,53	16,44	16,37		
λ/2, м	8,3	8,28	8,26	8,22	8,18		
λ/4, м	4,15	4,14	4,13	4,11	4,1		

F, кГц	21000	21060	21150	21250	21300			
λ, м	14,28	14,24	14,18	14,12	14,08	13,98		
λ/2, м	7,14	7,12	7,09	7,06	7,04	6,99		
λ/4, м	3,57	3,56	3,54	3,53	3,52	3,49		
F, кГц	24890	24920	24950	25000	25140			
λ, м	12,05	12,03	12,02	12,0	11,93			
λ/2, м	6,02	6,02	6,01	6,0	5,96			
λ/4, м	3,01	3,01	3,0	3,0	2,98			
F, кГц	26000	26250	26500	26750	27000	27250	27500	27800
λ, м	11,54	11,43	11,32	11,21	11,11	11,10	10,9	10,79
λ/2, м	5,77	5,71	5,66	5,6	5,55	5,5	5,45	5,39
λ/4, м	2,88	2,85	2,83	2,8	2,77	2,75	2,72	2,69
F, кГц	28000	28050	28200	28800	29200	29900		
λ, м	10,71	10,69	10,63	10,41	10,27	10,03		
λ/2, м	5,35	5,35	5,32	5,21	5,13	5,02		
λ/4, м	2,67	2,67	2,66	2,6	2,57	2,51		
F, кГц	50000	51000	52000	53000	54000			
λ, м	6	5,88	5,77	5,66	5,55			
λ/2, м	3	2,94	2,88	2,83	2,77			
λ/4, м	1,5	1,47	1,44	1,41	1,38			
F, кГц	144,0	144,2	144,5	145,0	145,5	146,0		
λ, м	2,083	2,08	2,076	2,068	2,062	2,054		
λ/2, м	1,041	1,04	1,038	1,034	1,031	1,027		
λ/4, м	0,5208	0,52	0,519	0,517	0,515	0,513		

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Antenna Manuscript

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