Antenna with Rotating Directional Pattern for the 80, 40, 20, 14 and 10 meter Band

By: **Valeriy Chihuga RA6AA and Georgiy Matcoyan UV6AF**

The articles based on different sources from the internet.

The antenna, developed by RA6AA and UV6AF, allows rotate the directional pattern by changing the setting in the Antenna Tuning Unit that may be sitting directly on the table at radio shack. The antenna was made and tested at the end of the 80s in the USSR. Many of the Soviet hams did the antenna. Reviews of the antenna were different. Someone got excellent results someone got far away from what was expected for. However, it is understandable because it is only four phased sloper antennas and the antenna design could be provide only that it could be provide.

Yes, the antenna is a very simple design that contains only four wire sloper antennas. Due to changing the current phase in each four sloper the antenna system does a simple rotation of the Diagram Directivity. Of course it is not a rotational YAGI antenna. However the simple antenna system allows rotate the Diagram Directivity that was fantastic in that time!

Anyway design of the antenna is given below that allows to any ham make the antenna and see what is happened. Small practice is better the big theory.

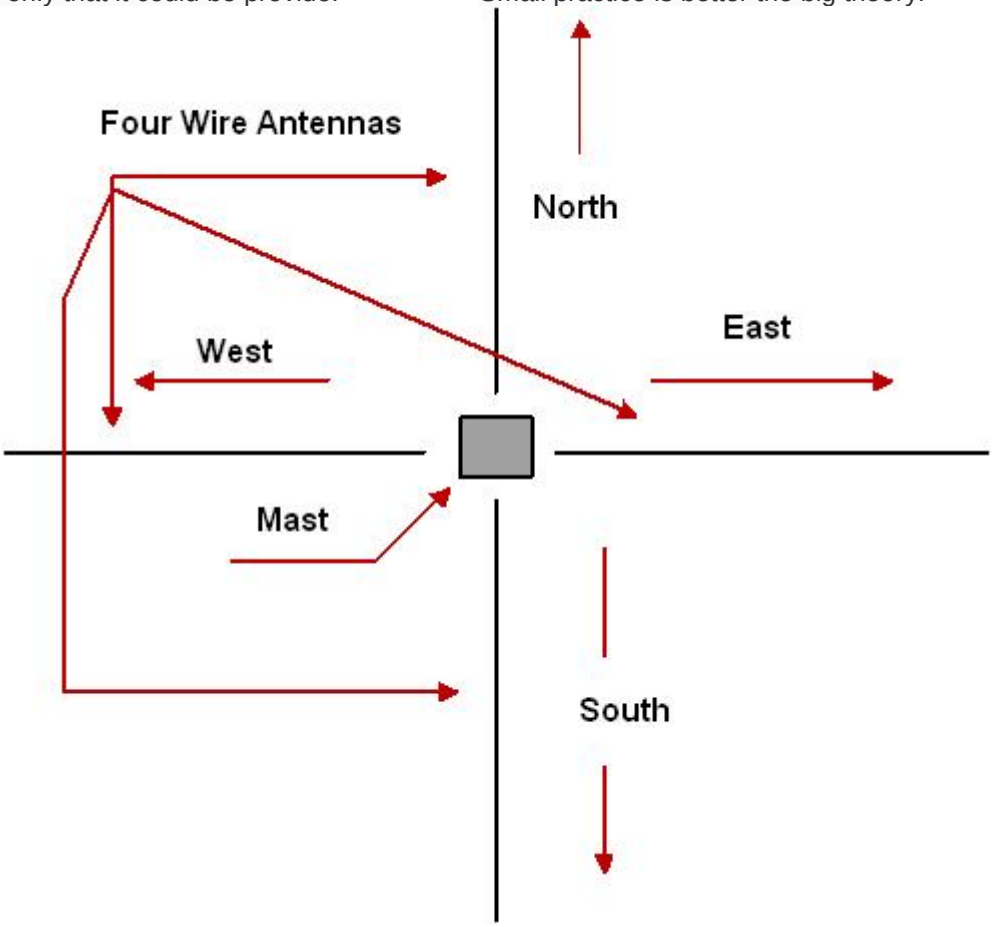

Figure 1

Base design of the Antenna with Rotating Directional Pattern for the 80, 40, 20, 14 and 10 meter

Antenna with Rotating Directional Pattern for the 80, 40, 20, 14 and 10 meter Band

Step by step you find tips how make the antenna.

Base design of the antenna is shown on **Figure 1**. The system consists of four sloper wire antennas. Each of the sloper antenna directed to the side of the horizon- South, North, West and East.

From each sloper antenna a feeding coaxial cable is going to special ATU, as it is shown on **Figure 2**. Each coaxial cable, going from sloper antenna to the ATU has electrical length of lambda/2 for the 80 meter band. The ATU is sitting on the table at radio shack and allows rotate the antenna directional pattern.

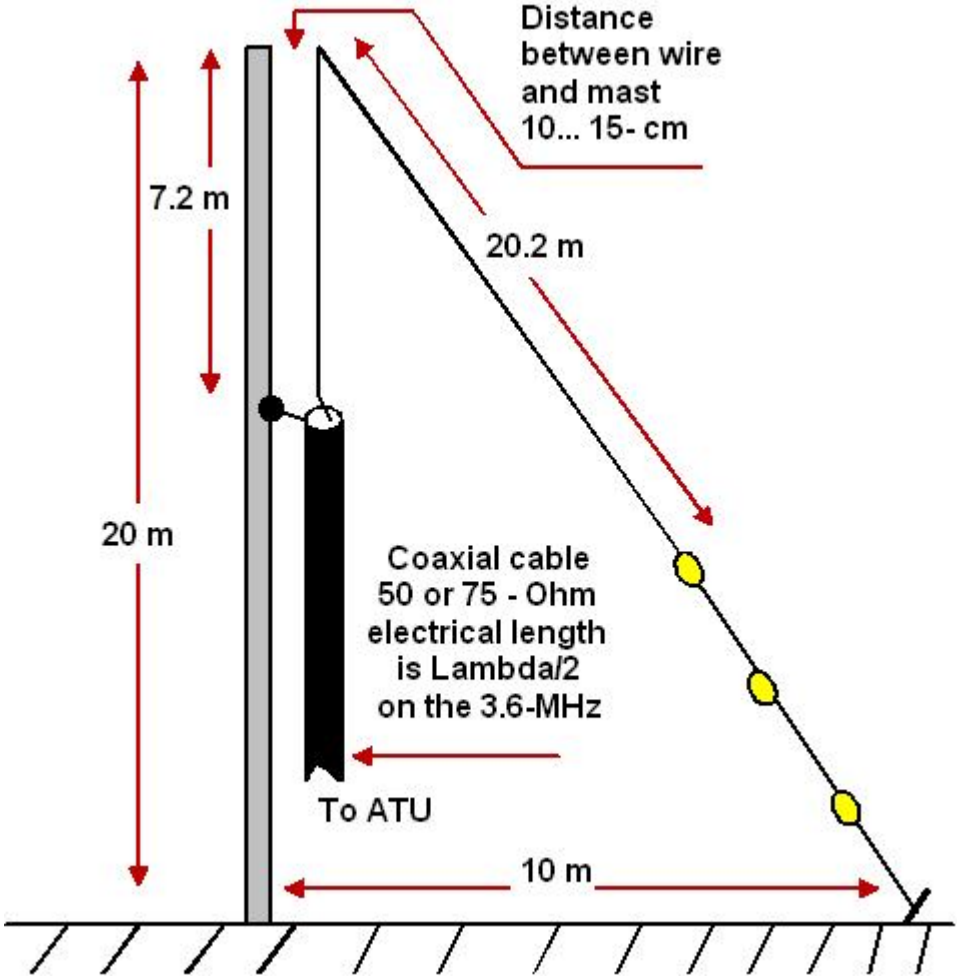

Figure 2

Sloper Antenna on the Mast

As you can see each sloper antenna is connected to the ATU through a length of the coaxial cable in lambda/2 for the 80 meter band. However, at the 40 meter band the cable has electrical length in lambda, at the 20 meter band the cable has electrical length in 2 x lambda, at the 10 meter band the cable has electrical length in 4 x lambda. Coaxial cable of such length carries the same antenna impedance from the connected antenna to the end. It allows use coaxial cable with 50 or 75-Ohm impedance. This length of the coaxial cable as well satisfactory works at the 15 meter band.

RA6AA used to coaxial cable with physical length 28 meter that has electrical length lambda/2 for the 80 meter band. So velocity factor for this coaxial cable was 0.66 that is match for coaxial cable with polyethylene dielectric. Coaxial cable with polyethylene dielectric was common in use in the USSR.
Velocity factor for the coaxial cable may be found from the datasheet so it is easy to find needed length of the coaxial cable used for the antenna design. If ham has a surplus coaxial cable with unknown velocity factor the factor may be easy to find in practical way.

Let's show this with practical example. I have a length of coaxial cable in 9 meter long. Therefore, if the velocity factor of the coaxial cable is equal to 1 then this coaxial cable should have lambda/2 wavelength at 18 meters, or at the frequency of 16.65- MHz. It is theoretically. This length of the cable was loaded to 100- Ohm resistor and connected to the MFJ- 259B.

Figure 3 shows the practical test. MFJ- 259B found the 100- Ohm impedance at the 14.023- MHz. So the velocity factor of the coaxial cable is: 14.023/16.65= 0.84. Such velocity factor has coaxial cable with foam polyethylene dielectric that it is right for the tested coaxial cable.

Each coaxial cable going from the sloper antenna is connected to the special Antenna Tuning Unit. **Figure 4** shows schematic of the ATU. Base of the ATU is home brew variable capacitor four section of 12-700-pF. The capacitor was made from a military butterfly capacitor. Stator of the capacitor was divided to four sections, as it shown on the **Figure 5**. **Figure 5A** shows stator before rework, **Figure 5B** shows stator after rework. Rotor of the capacitor was remade to one section, as it is shown on the **Figure 6**. **Figure 6A** shows rotor before rework, **Figure 6B** shows rotor after rework.

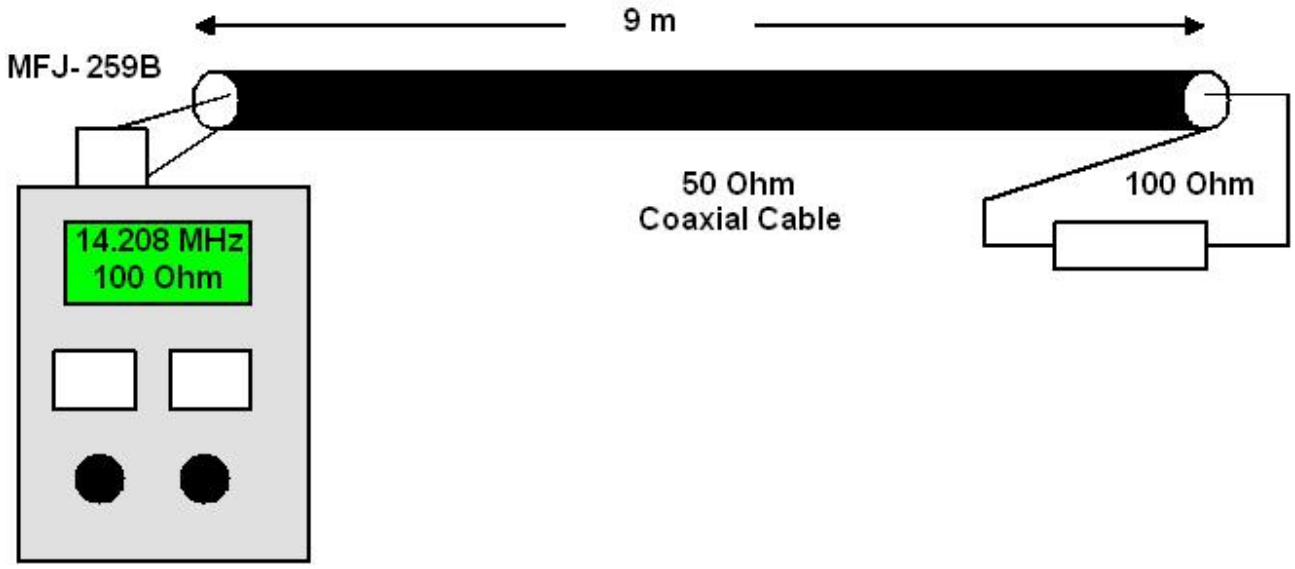

Figure 3 Practical Test of the Coaxial Cable

MFJ-259B Shows the Frequency of the Lambda/2 Length

Curious Cat and 100- Ohm Resistor (2x 50- Ohm) at the End of the Coaxial Cable

Of course, for such rework you should have proper butterfly capacitor. Lots of Soviet amateurs make the capacitor from some drawing as a home brew project. . I had several drawing for the home made capacitor but alas I lost them while moving to Canada.

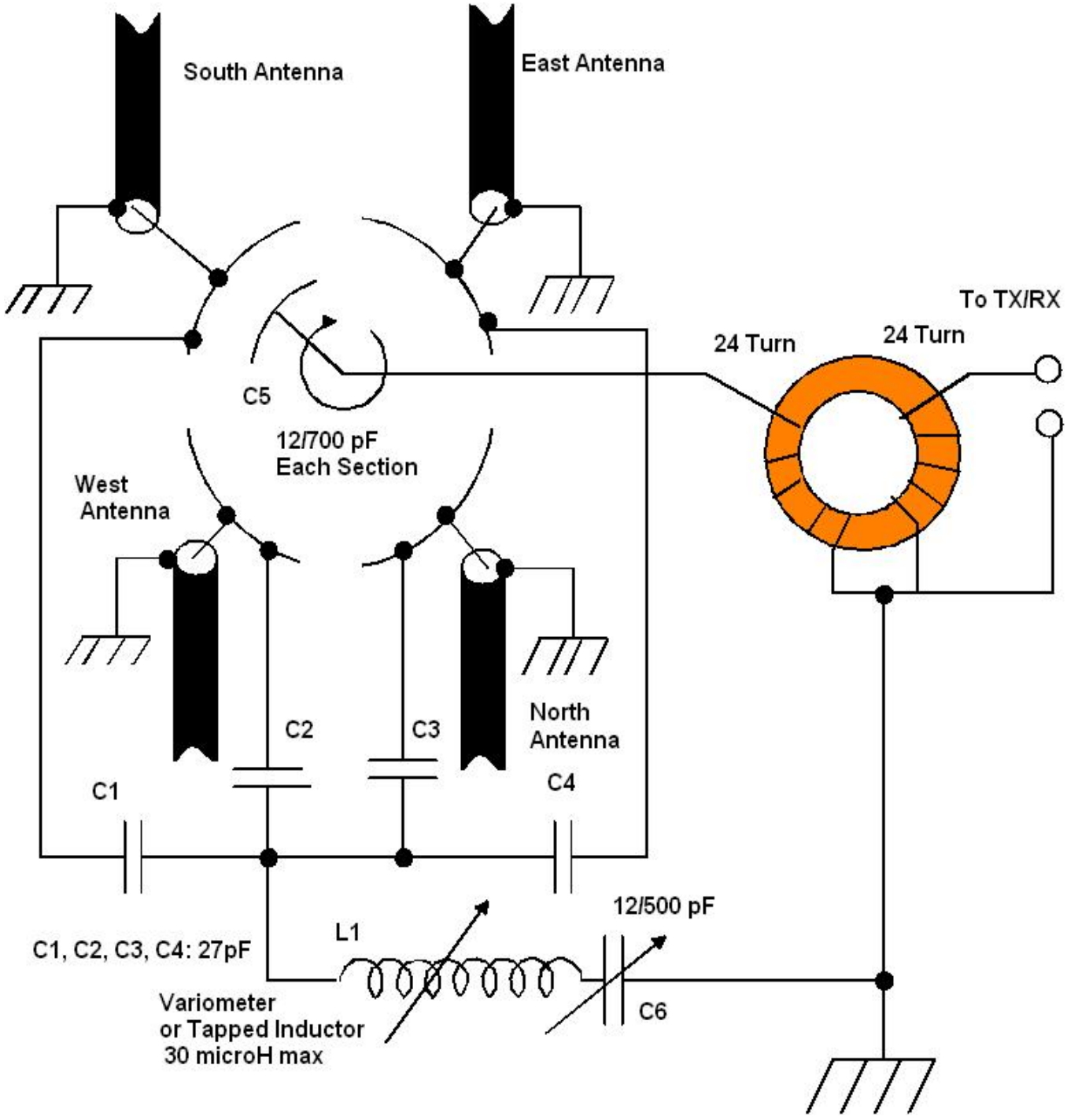

Figure 4

Schematic of the ATU for Antenna with Rotating Directional Pattern for the 80, 40, 20, 14 and 10 meter Band

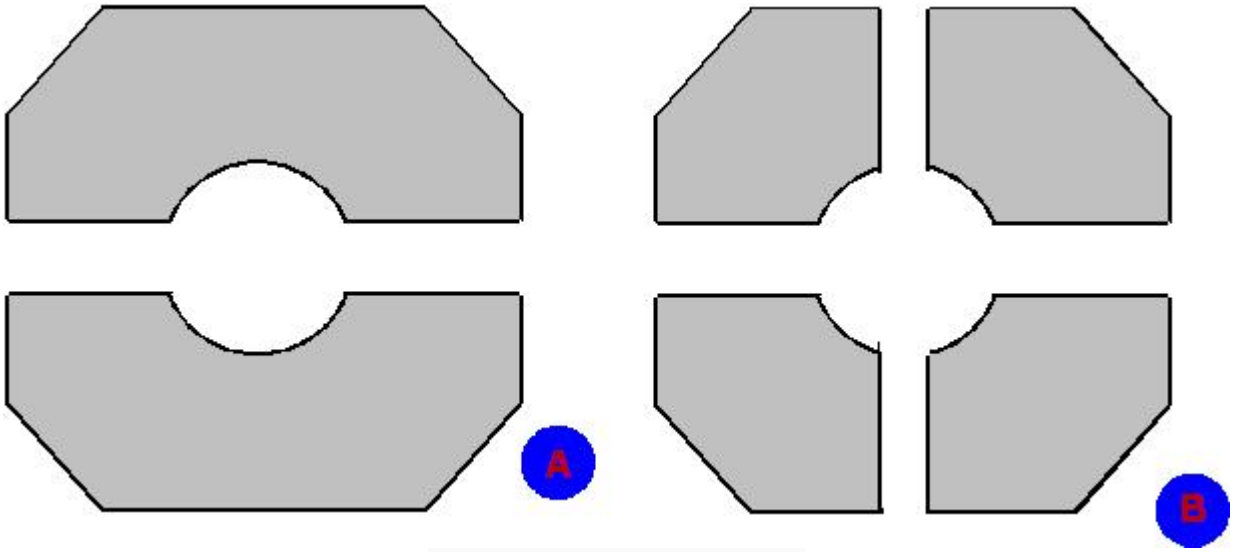

Figure 5 Stator of the Capacitor

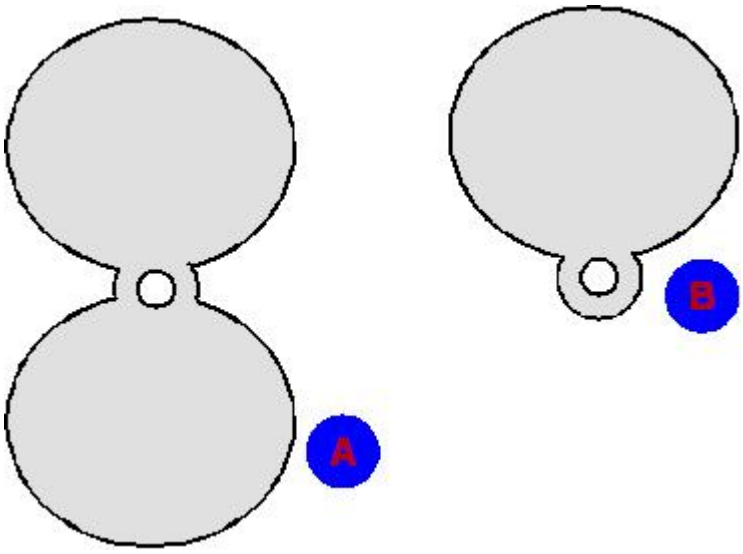

Figure 6 Rotor of the Capacitor

Several words about the ATU: Transformer T1 isolated ATU (with antenna system) from the transmitter. The transformer was made on a ferrite ring, it is possible use any suitable ring. Soviet radio-amateurs ever used to a ferrite from yoke transformer of TV. Inductor L1 may be tapped (should be chosen right tap for every band) or used a variometer inductor. The impedance of the antenna system is not 50-Ohm. At that time most of Soviet hams used to transmitters with tube PA that can be matched with load having impedance from 10 to 1000 Ohm. So, if you do not use a tube PA, you should use additional ATU between the antenna and transistor transceiver.

How the antenna works: First at all it needs with help of the C6 capacitor set up direction to the receiving station. The direction is set up on to maxima receiving signal. Then with help of the C5 set up the optimal direction diagram of the antenna. Inductor L1 should be installed to optimal inductivity (find in practical way) for the antenna. After that PA should be tuned to maxima output power. That is all, happy QSO!

73! de RA6AA and UV6AF