

TV Antennas for Distance Receiving

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At the original articles published at Radio # 10, 1953, there were described several antennas for distance receiving TV broadcasting stations. Below it is described one of those antennas- it is a Rhombic Antenna. Rhombic Antenna is easy to make and at the same time has perfect parameters.

Rhombic Antennas are easy to build and at the same time has high gain and good diagram directivity. However the antennas have some lack. Such antennas required lots space for installations and need at least for masts instead one that used to support traditional directional antennas.

Figure 1 shows design of the Rhombic Antenna. Rhombic Antenna is a rhomb that hang up horizontally at the ground. Feeder is connected on to one sharp angle of the rhomb. Terminated resistor is connected on to far sharp angle of the rhomb. The resistor's value should be equal to the impedance of the rhomb at the working frequencies of the antenna. As usual the value is near 700- Ohm. Working frequencies of the antenna may have pass band in hundreds megahertz. So using such matched resistor allows create a super broadband antenna that has impedance near 700- Ohm at the frequencies window in several hundred megahertz.

High gain and high directivity of the rhomb antenna could be explained by combining gain and diagram directivity of the parts of the antenna. The antenna consists of four wires with traveling wave. **Figure 2** shows the combination. Each wire has own gain and diagram directivity.



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The gain and diagram directivity depends on ratio the length of the wire to the working wavelength. So, the summary gain and diagram directivity depends on the ratio the length of the wire to the working wavelength and to the sharp angle of the rhomb.

АНТЕННЫ ДЛЯ „ДАЛЬНОГО“ ПРИЕМА ТЕЛЕВИДЕНИЯ

Title of the Article

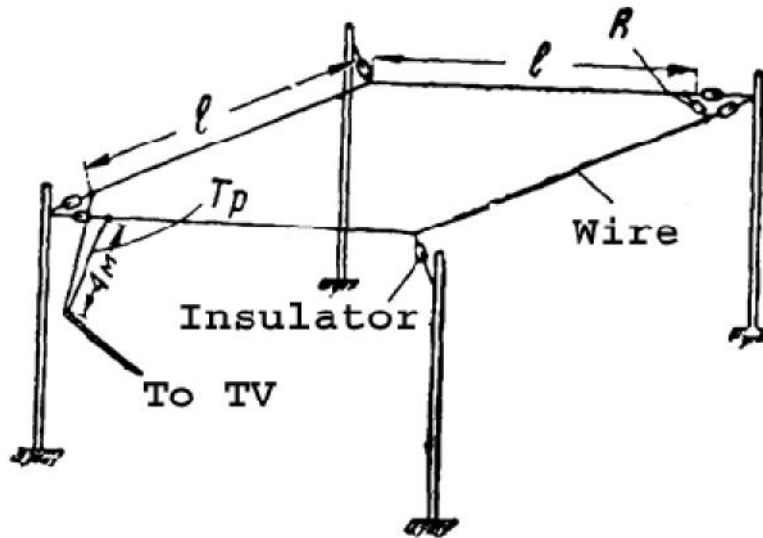


Figure 1 Rhombic Antenna

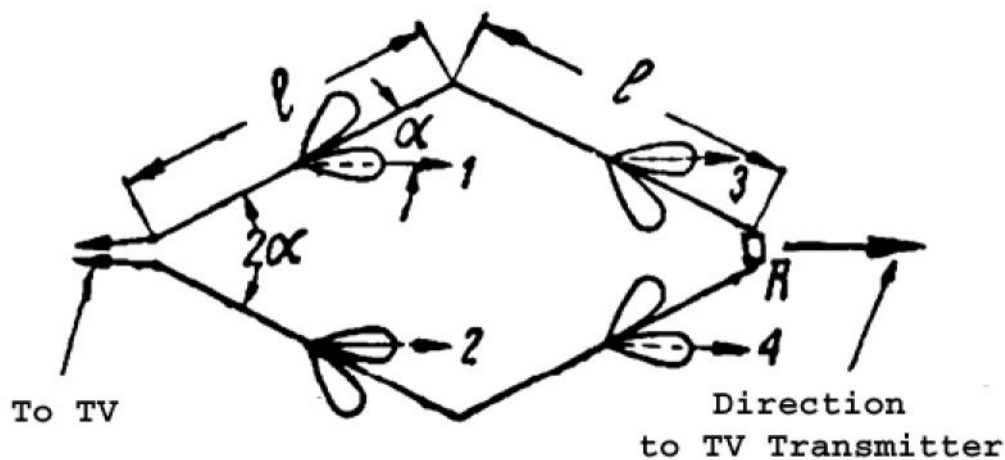


Figure 2 Rhombic antenna is Combination of Four Wires with Traveling Wave

Table 1 shows data for Rhombic Antenna with different parameters. To keep such parameters antenna should be placed above the ground at height not less the 2- 3 wavelength of the working band of the antenna.

Antenna may be fed by open ladder line with wave impedance 300... 600- Ohm. At this case the antenna could be matched at all working frequencies band. Antenna may be fed through a coaxial cable when two simple matching transformers are used. Figure 3 shows feeding Rhombic Antenna through a coaxial cable. First transformer is a broadband transformer made on two wire ladder line. It is two wires line with varying wave impedance on the length.

The wave impedance of the line changes from 700- Ohm at rhomb side to 300- Ohm at coaxial cable side. At coaxial cable side the coaxial cable should not connect straight away to the line. Coaxial cable connected to the line through a symmetrical transformer 4:1 made on lengths of the used coaxial cable. The transformer makes symmetrical and provides matching of the Rhombic Antenna to coaxial cable. Loop of the coaxial cable should have electrical length $\lambda/2$. To calculate such transformer you need to know the shortening coefficient of the used coaxial cable.

Table 1 Data for Rhombic Antenna with Different Parameters

Length Side of the Rhomb L in Lambda	Sharp Angle of the Rhomb 2α Degree	Gain of the Antenna	Directivity Gain
2	90	4	13
3	70	7	20
4	60	9	25
5	50	13	36
7	40	20	52

It is possible to use coaxial cable with any wave impedance- 50 or 75 Ohm. Matching impedance of the 4:1 transformer depends on the coaxial cable. At 50-Ohm cable it is got transformer 200:50- Ohm, at 75-Ohm cable it is got transformer 300:75- Ohm. Transformer 300:75- Ohm should have best matching result with open line transformer. There are lots link in the internet how the transformer may be calculated. One of them is: <http://www.n-lemma.com/calcs/dipole/balun.htm>. When the coaxial cable symmetrical transformer is used the broadband of the antenna depends on the broadband of the transformer. As usual coaxial cable transformer has good matching at the 5% frequencies band calculated from the central working frequency of the transformer. So, when such transformer is used the broad band of the Rhombic Antenna is limited to pass band of the transformer.

Antenna may be made from a strand wire in diameter 2... 3- mm. It may be copper, aluminum or bimetal (with copper or aluminum layer) wire. Terminated resistor at the antenna may be any small power non-inductive resistor. This one should be protected from atmospheric influences.

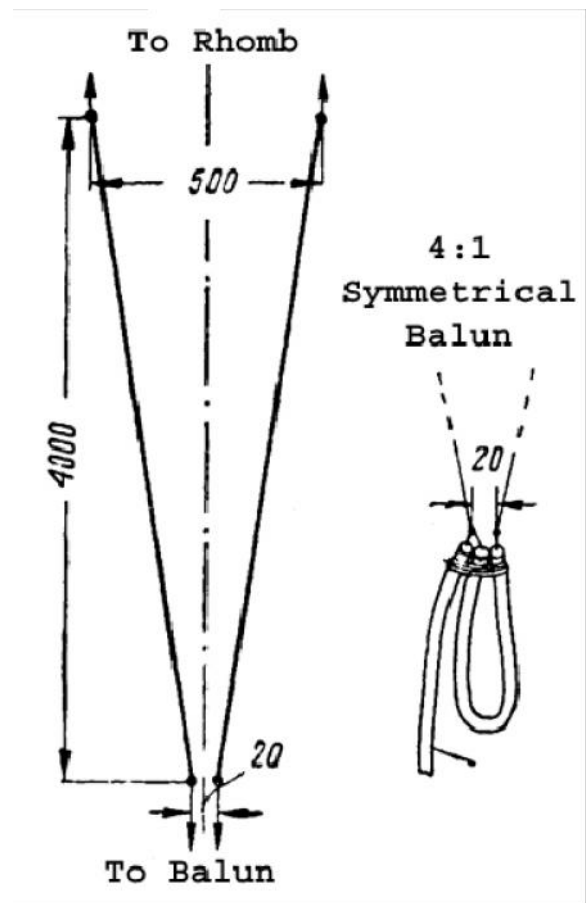


Figure 3 Feeding Rhombic Antenna through Coaxial Cable