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

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

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

Types of a Dipole Antenna with Capacitive Loads

There is 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 by the center of the window. In that case the antenna can be installed at any house as made from a brick or wood as well as made from a concrete. Let's name the antenna "antenna central installation." If a house made of a brick 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 works better the metal one.

Feeding Coaxial Cable of a Dipole Antenna with Capacitive Loads

Ferrite rings (5- 20 ring with any permeability) installed at two ends of the coaxial cable going from TX to the antenna prevent RF- currents going from the antenna to TX. Since the rings do balun's job. Fasten the rings at the 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 can be made of a flexible multi- wire cable as well as of a strand wire. Any wire is good as naked as well covered by plastic isolation. Diameter of the wire can be near 1- 2 millimeters (12- 18 AWG). Use wire as much thick as possible. Compare to antenna made from thin wire thick antenna 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 staple) at plastic or wooden window frame.

Window Dipole Antennas with Capacitive Loads for 6-meters Band

Figure 1 shows a schematic (**Figure 1a**) and design (**Figure 1b**) of a window dipole antenna with capacitive loads of central installation. **Figure 2** shows a schematic of a 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.

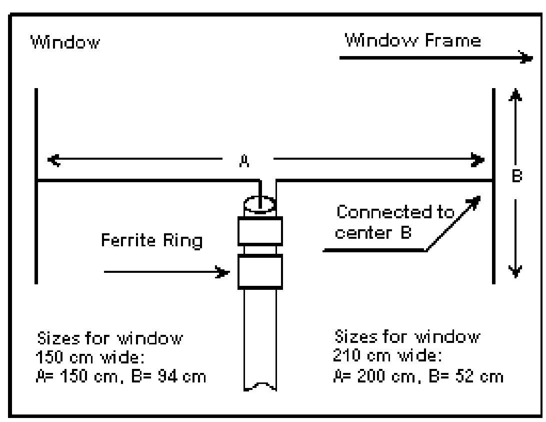

Figure 1A

Figure 1 A window dipole antenna with capacitive loads of central installation

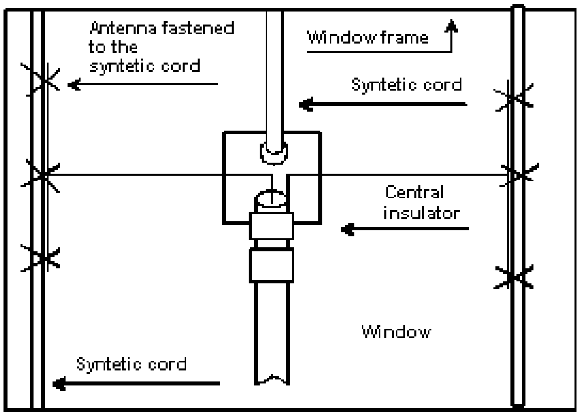

Figure 1B

Figure 1 A window dipole antenna with capacitive loads of central installation

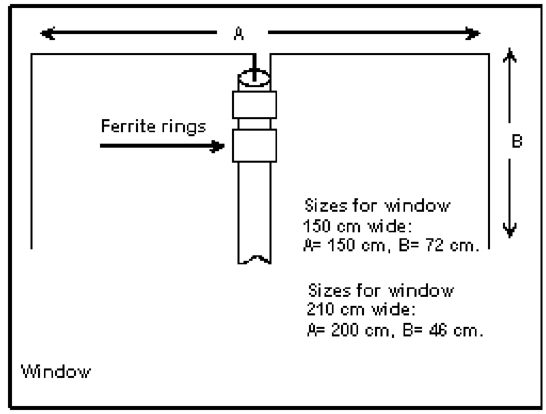

Figure 2

Figure 2 A 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-mm (18- AWG) diameter) were simulated with help of MMANA (see References **[2]**).

Figure 3 shows the input impedance of the antenna installed at window 150-cm wide. **Figure 4** shows the input impedance of the antenna installed at window 210-cm wide. Theoretical input impedance for 'narrow' antenna is 42-Ohms, for 'wide' antenna is 60- Ohms. 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. **Figure 5** shows a SWR at 50- Ohm coaxial for 'narrow' antenna shown at **Figure 1**. **Figure 6** shows a SWR at 50- Ohm coaxial for 'wide' antenna shown at **Figure 1**. Theoretical gain for the antennas is near 1,5- 1,7 dBi.

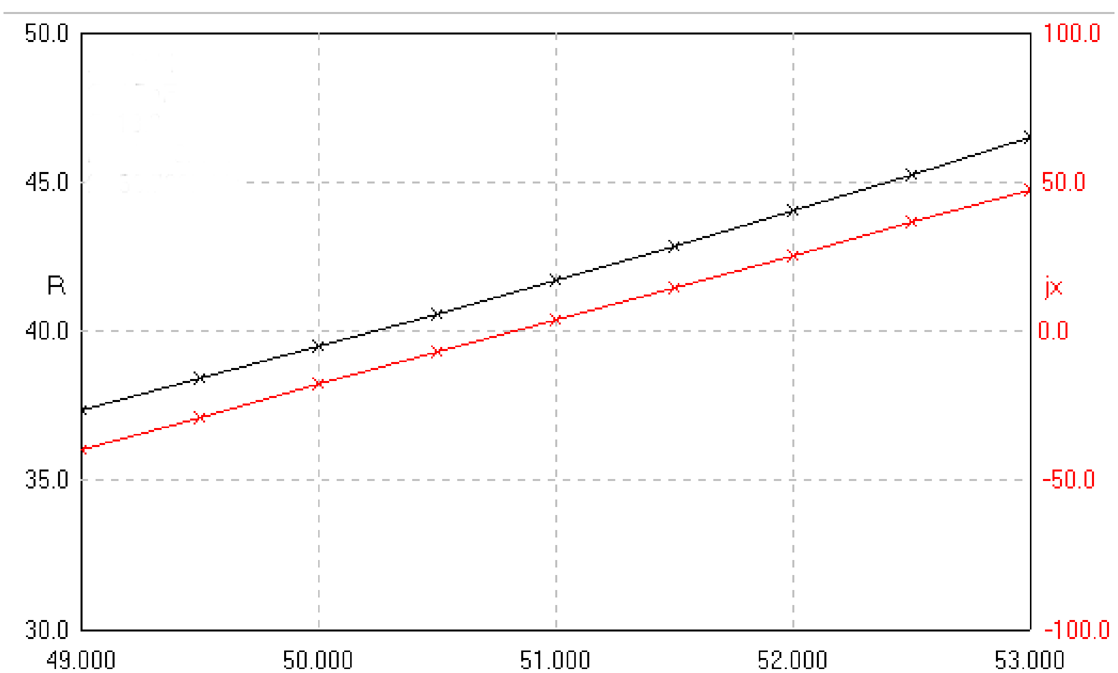

Figure 3 Input impedance of 'narrow' antenna

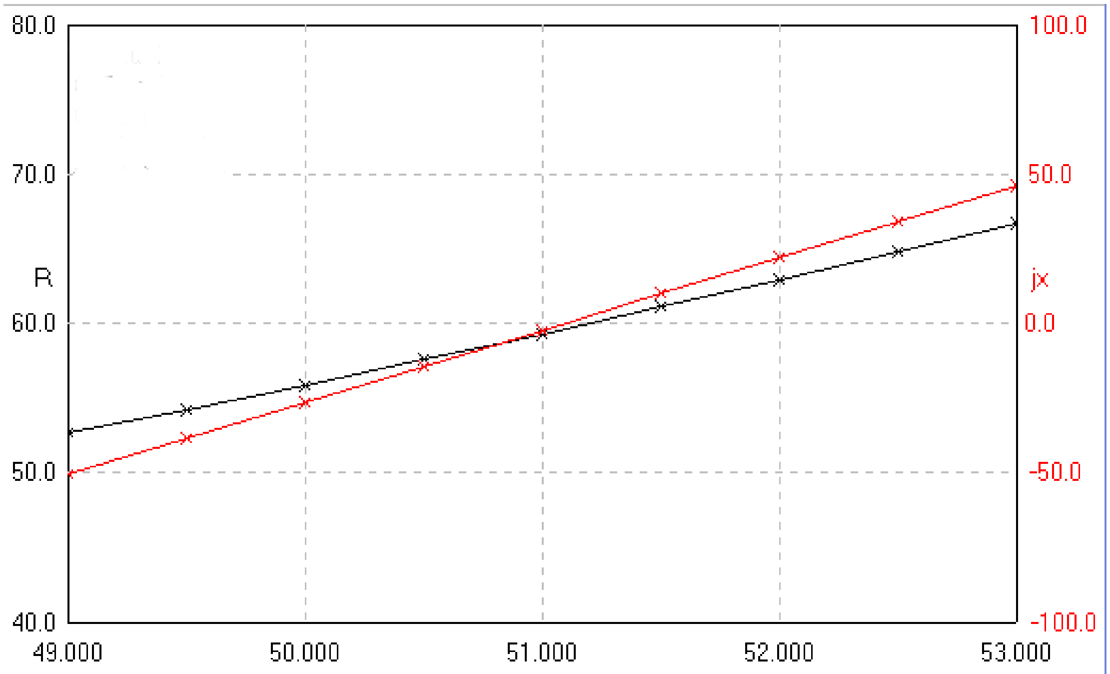

Figure 4 Input impedance of 'wide' antenna

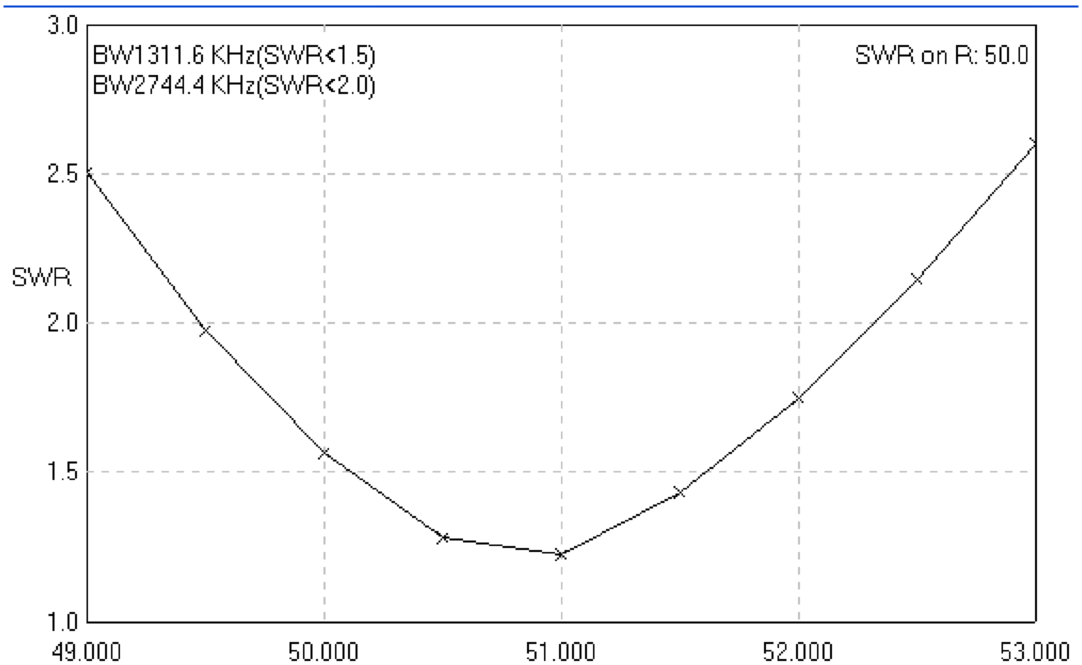

Figure 5 SWR at 50- Ohm coaxial for 'narrow' antenna

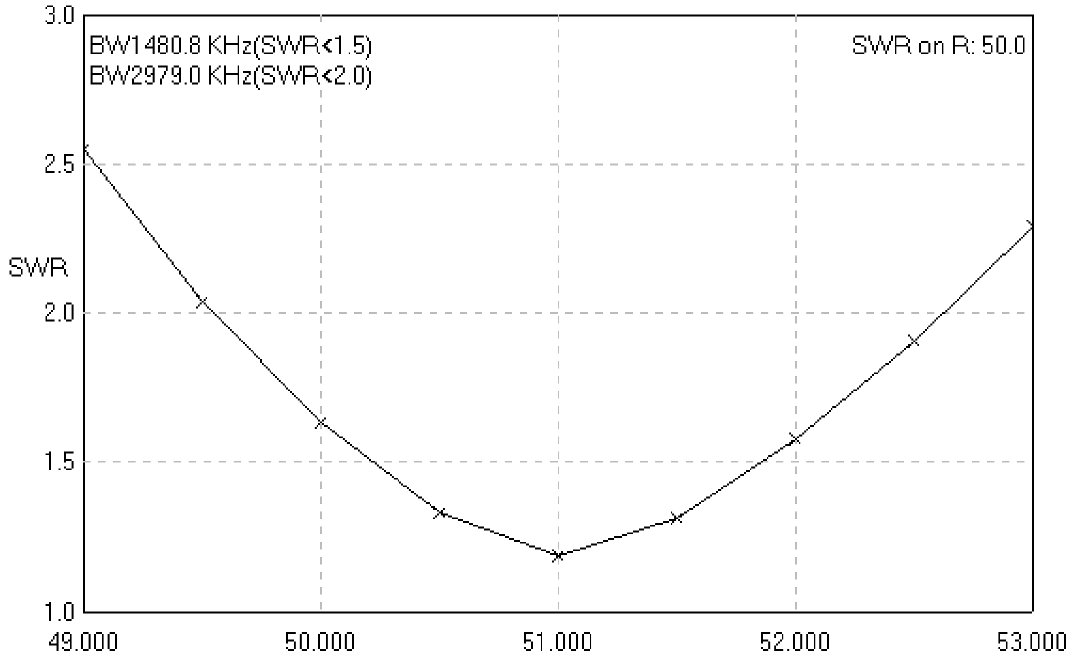

Figure 6 SWR at 50- Ohm coaxial for 'wide' antenna

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- meters 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-mm (18- AWG) diameter) were simulated with the help of MMANA. **Figure 7** shows input impedance of the antenna installed at window 150 cm wide. **Figure 8** shows input impedance of the antenna installed at window 210 cm wide. Theoretical input impedance for 'narrow' antenna is 43- Ohms, for 'wide' antenna- 60- Ohms. 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 2**. A 75- Ohm coaxial cable is possible to use for an antenna installed at wide (210 cm) window.

Figure 9 shows a SWR at 50- Ohm coaxial for 'narrow' antenna shown at **Figure 2**. **Figure 10** shows a SWR at 50- Ohm coaxial for 'wide' antenna shown at **Figure 2**. Theoretical gain for the antennas is near 1,5- 1,7 dBi.

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- meters band especially since the real antenna has pass band wider the theoretical.

Window Dipole Antennas with Capacitive Loads for 10-meters Band

Figure 11 shows schematic a window dipole antenna with capacitive loads of central installation. **Figure 12** shows schematic a window dipole antenna with capacitive loads of up or down installation. Antenna central installation can be installed at window 210-cm wide. Antenna up or down installation can 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 ends 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.

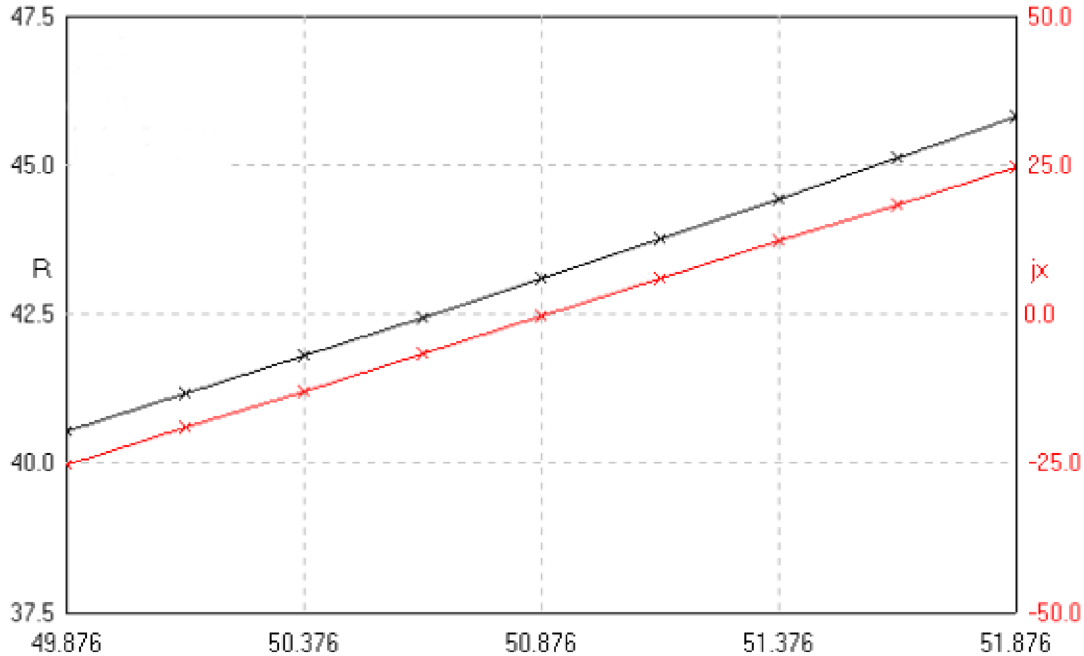

Figure 7 Input impedance of 'narrow' antenna

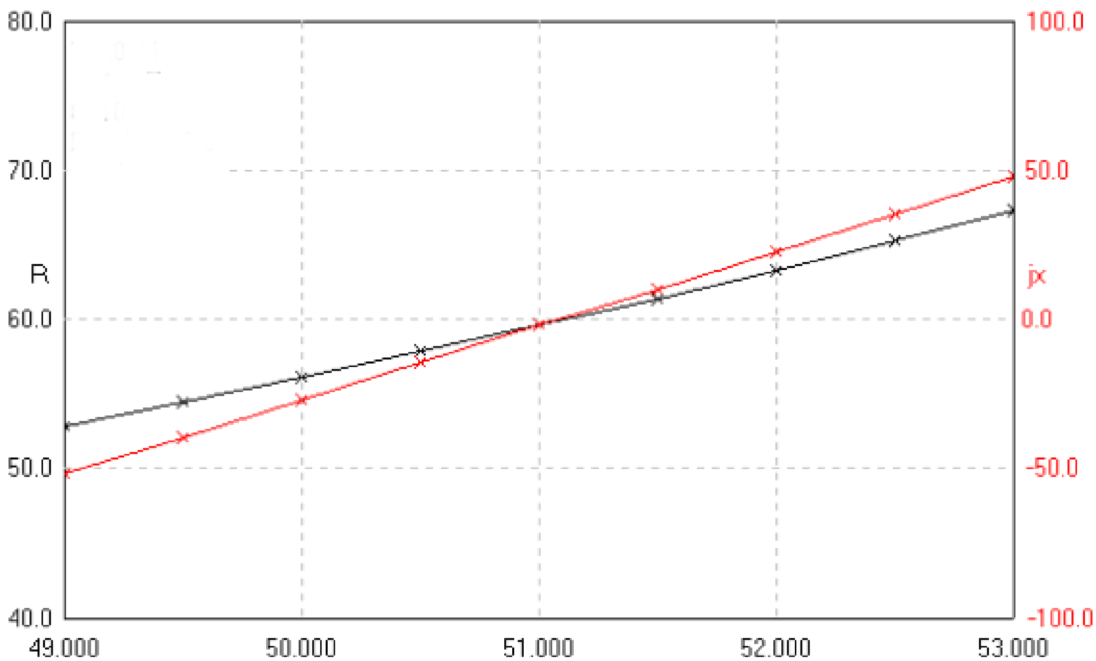

Figure 8 Input impedance of 'wide' antenna

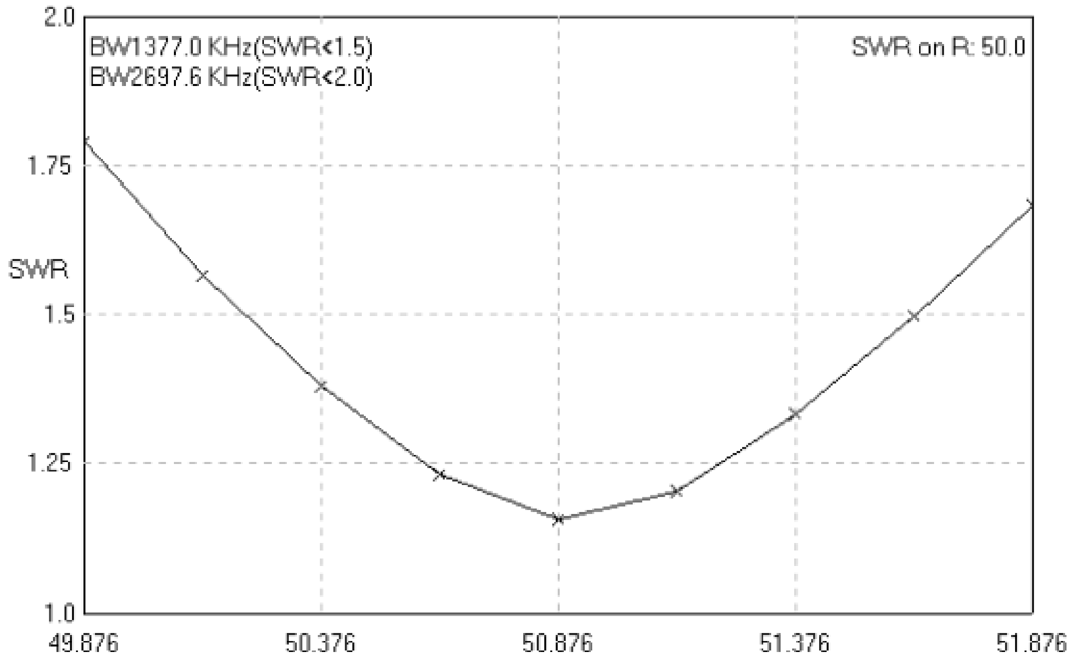

Figure 9 SWR at 50- Ohm coaxial for 'narrow' antenna

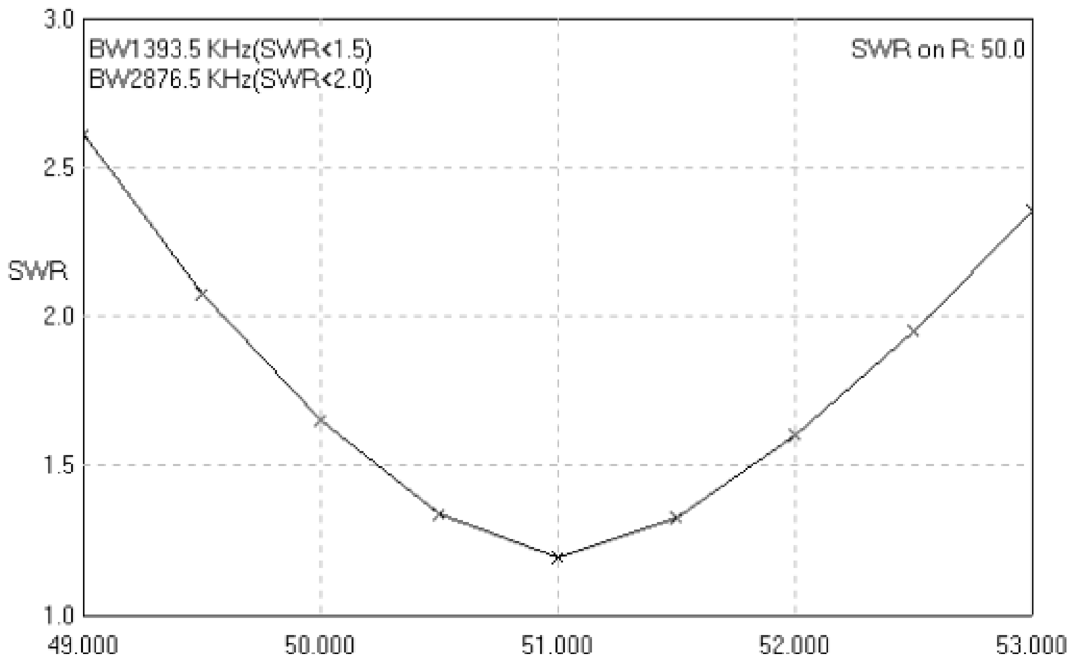

Figure 10 SWR at 50- Ohm coaxial for 'wide' antenna

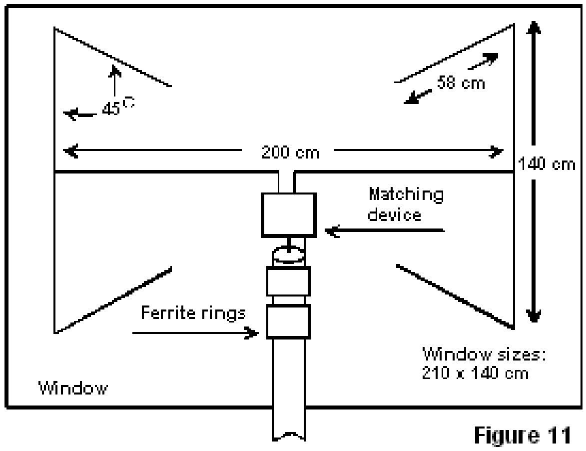

Figure 11 A window dipole antenna with capacitive loads of central installation

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 just active (have no reactance) at needed frequency. At shortening moustaches the moustache wires roll up to a little coil.

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

Theoretical parameters of the antennas (copper, wire in 1-mm (18- AWG) diameter) were simulated with the help of MMANA. **Figure 13** shows input impedance of the antenna shown in **Figure 11**. Theoretical input impedance of the antenna is 22- Ohms. Practically measured input impedance of the antenna was 30- Ohms. Losses in neighbor objects add the 8 Ohms. Theoretical gain for the antennas is near 1,5- 1,7 dBi.

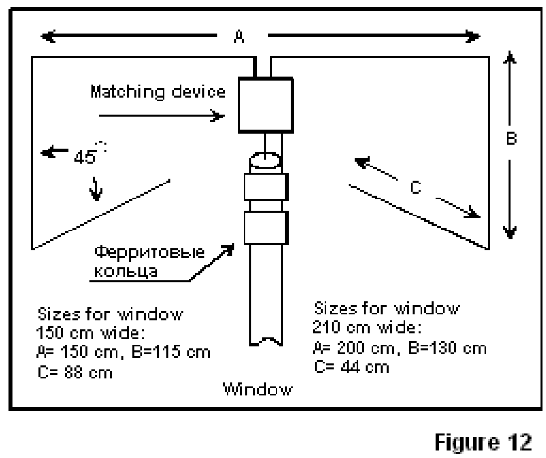

Figure 12 A window dipole antenna with capacitive loads of up or down installation

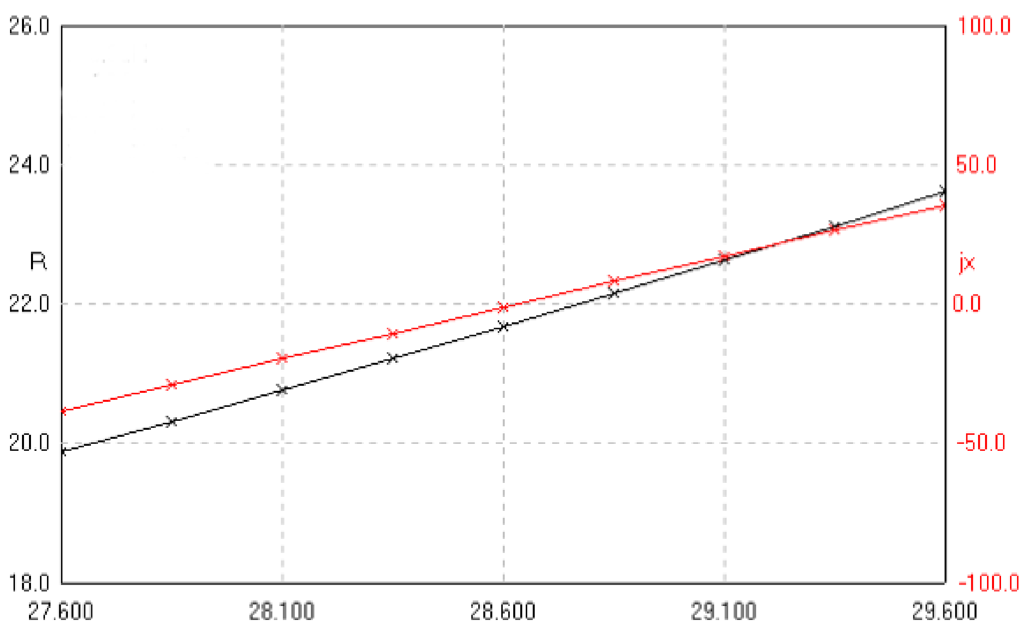

Figure 13 Input impedance of the antenna shown in **Figure 11**

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

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

MMANA allows to simulate such matching device. **Figure 14** shows schematic of that matching device as well as data for different antennas. Of course, it needs adjust a little the L and C to particular antenna.

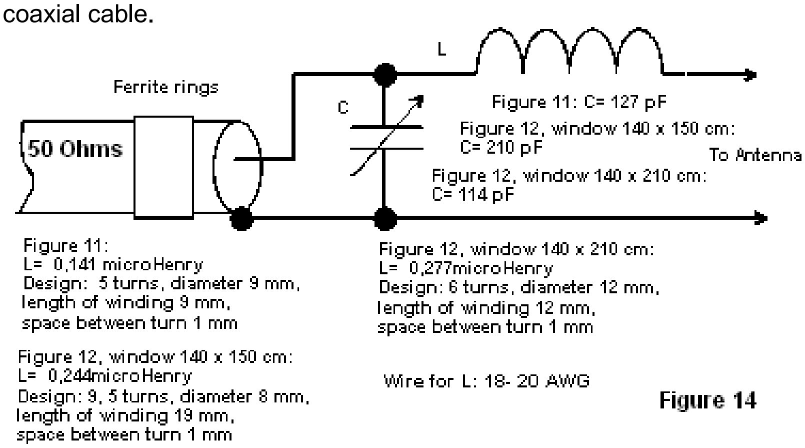

Figure 14 Matching device for antenna with capacitive loads

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

Figure 15 shows a SWR at 50- Ohm coaxial connected through a matching device (see **Figure 14**) to antenna shown at **Figure 11**. 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- meters band. However, due the losses at neighbor subjects the pass band of the antenna is wider the theoretical one.

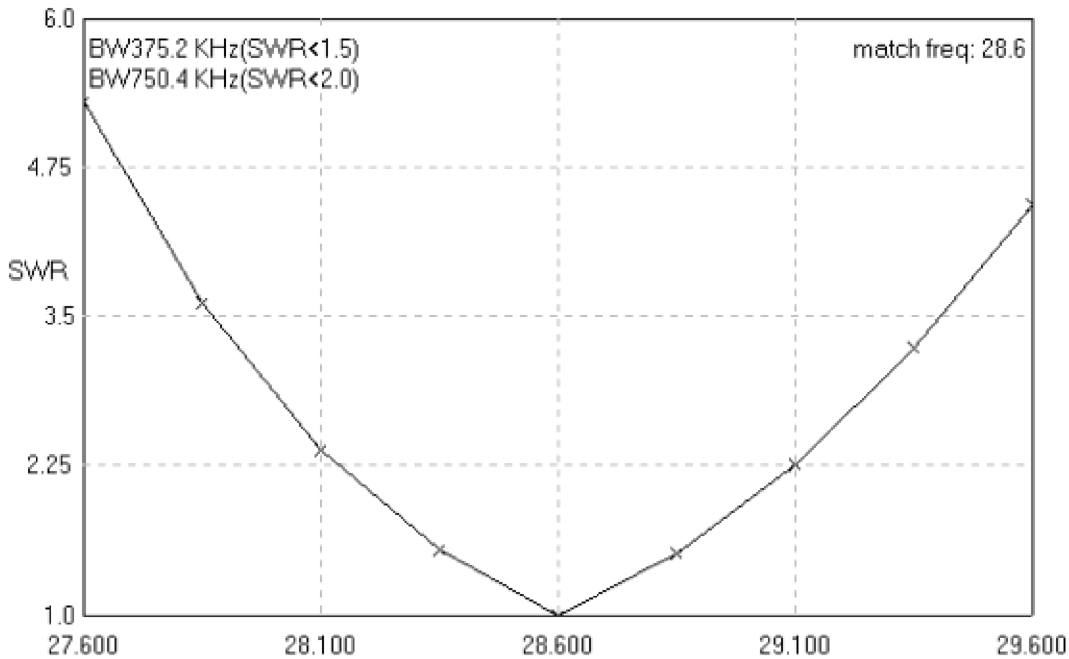

Figure 15 SWR at 50- Ohm coaxial connected through a matching device (see **Figure 14**) to antenna shown at **Figure 11**

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

Theoretical parameters of the antennas (copper, wire in 1-mm (18- AWG) diameter) (see **Figure 12**) were simulated with help of MMANA. **Figure 16** shows input impedance of the antenna installed at window 150 cm wide.

Figure 17 shows input impedance of the antenna installed at window 210 cm wide. Theoretical input impedance for 'narrow' antenna is 12- Ohms, for 'wide' antenna- 26- Ohms. Practically measured impedance is higher on 8- 10 Ohms the theoretical due losses at neighbor subjects. **Figure 18** shows a SWR at 50- Ohm coaxial connected through matching device (see **Figure 14**) to 'narrow' antenna (see **Figure 12**).

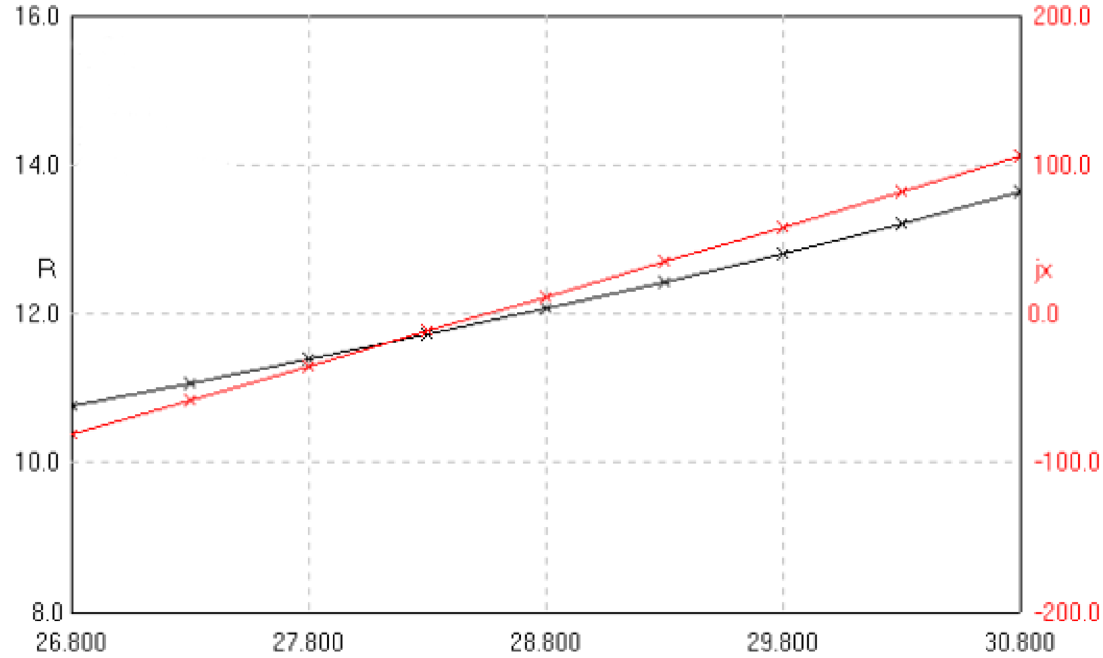

Figure 16 Input impedance of the antenna installed at window 150-cm wide

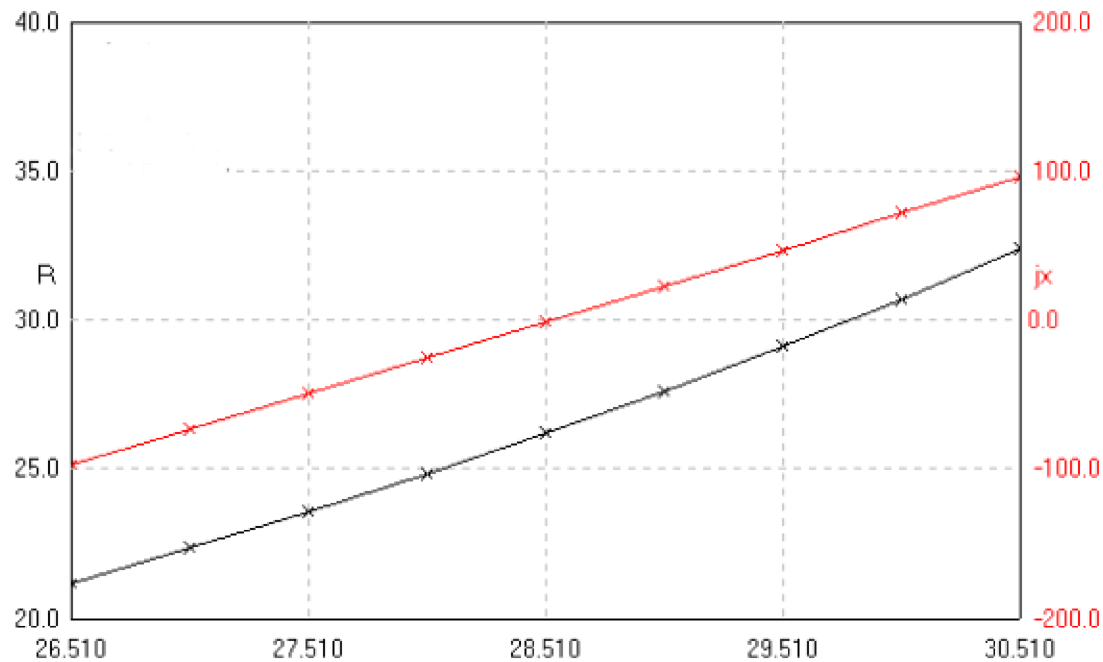

Figure 17 Input impedance of the antenna installed at window 210-cm wide

Figure 19 shows a SWR at 50- Ohm coaxial connected through matching device (see **Figure 14**) to 'wide' antenna (see **Figure 12**). SWR was simulated by MMANA. 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 meters band. For working at all 10- meters band matching device can be retuned for needed frequency. However, the 'wide' antenna often works at all 10 meters band without retuning the matching device due losses at neighbor subjects.

References:

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

2. http://dl2kq.de/

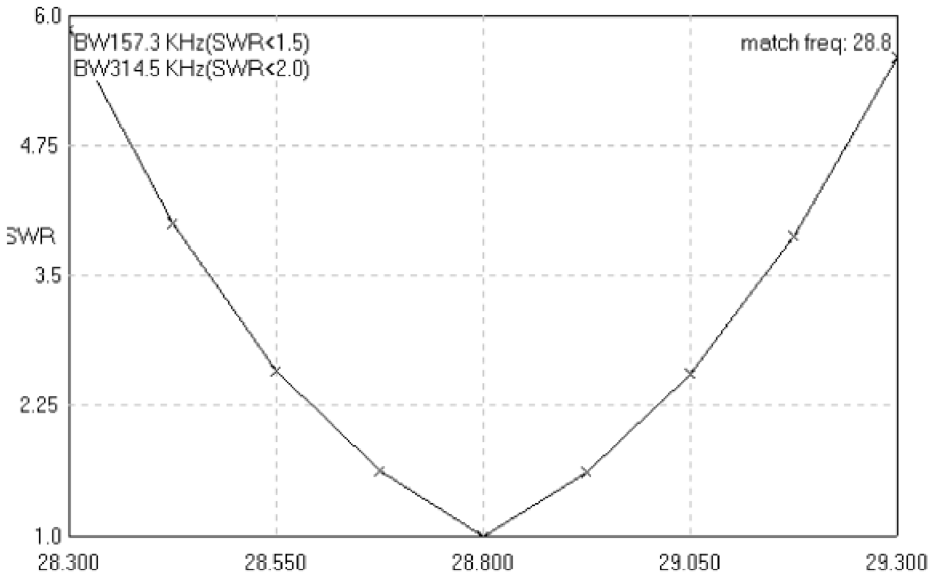

Figure 18 SWR at 50- Ohm coaxial connected through matching device to 'narrow' antenna

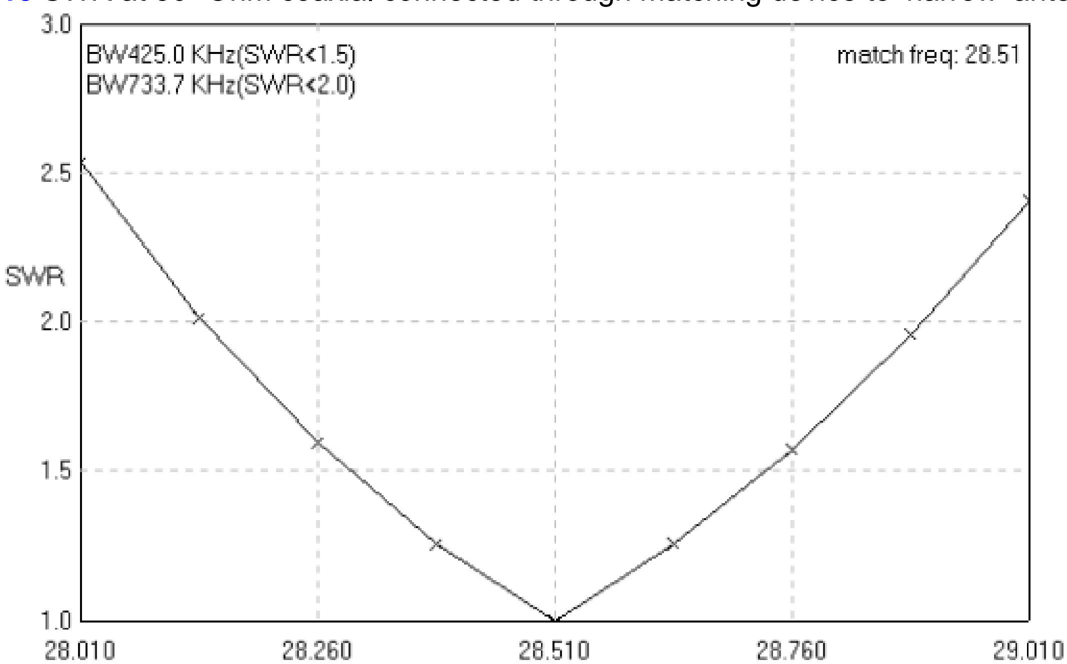

Figure 19 SWR at 50- Ohm coaxial connected through matching device to 'wide' antenna