four-band high-frequency windom antenna

The rebirth of the Windom antenna — a high performance multiband antenna popular in the 1930s

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Do you have antenna space limitations? Can't swing a rotary beam? Need a good field-day antenna? Then the old standby, the Windom antenna, may be your answer. It offers four-band operation with a single feedline, and in most cases does not require an antenna tuner.

It's odd how ideas crop up in ham radio and then fade into oblivion. The Windom is a good, simple, multiband antenna system that is unheard of among today's hams. So, let's revive it and simplify the feed system. (This will be old hat to you if you remember when you weren't one of the boys on 75 meters unless you had an RME-45 receiver and a Windom antenna.)

theory of operation

If the impedances present along the length of a half-wave dipole in free space are plotted, the values vary from about 3600 ohms at the ends to 72 ohms at the center. **Fig. 1** is a plot of antenna impedance versus length along a dipole. The center impedance of 72 ohms, coupled with the ease of using coaxial cable, has given rise to the extensive use of low-impedance feedlines and single-band dipoles. Today, open-wire feeders and other than 50- or 72-ohm coaxial feedlines are rare.

However, one way of feeding a dipole with open wire-line is to tap the antenna equidistant from the center to match the feedline impedance. **Fig. 2** illustrates a method of matching 600-ohm line to a dipole. Note that the dipole does not have to be split into two parts with an insulator. This is called the delta match and is used extensively by vhf enthusiasts for matching stacked arrays.

preplanning

Lets calculate the length required for a four-band antenna. Since the highest frequency band, ten meters, will be the most sensitive to antenna length, overall antenna length must be some multiple of a half-wavelength at ten meters. From the handbook formula for long-wire antennas

$$\text{length in feet} = \frac{492\,(N - 0.05)}{\text{frequency (MHz)}}$$

where N is number of half waves.

For an antenna nine half-wavelengths long at 28.9 MHz, the length is slightly more than 152 feet. This is a bit long for 80-meter operation. Plugging in eight half waves and turning the crank gives

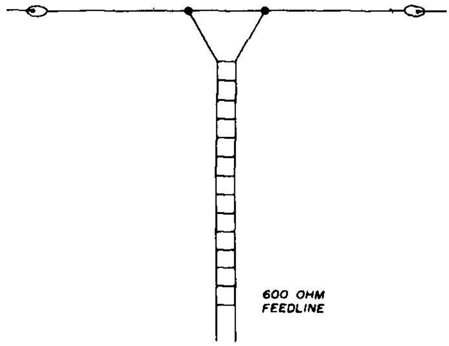

fig. 2. Classic single band antenna uses an open-wire feedline and a delta match. No center insulator is required.

135.342 feet. This looks good. Round the length off to 136 feet.

Now, using the formula for a half-wave dipole, and working backwards to find resonant frequency

$$f_{MHz} = \frac{492}{\text{length}} = \frac{492}{136} = 3.617\ \text{MHz}$$

This looks good. The 80- and 75-meter bandedge mismatch will be a small percentage of antenna length.

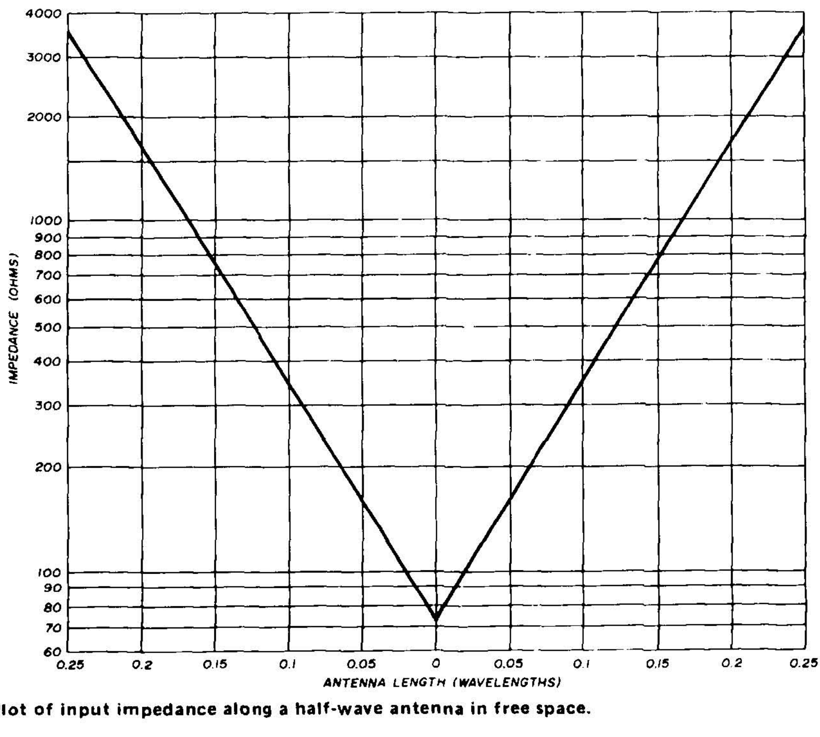

fig. 1. Plot of input impedance along a half-wave antenna in free space.

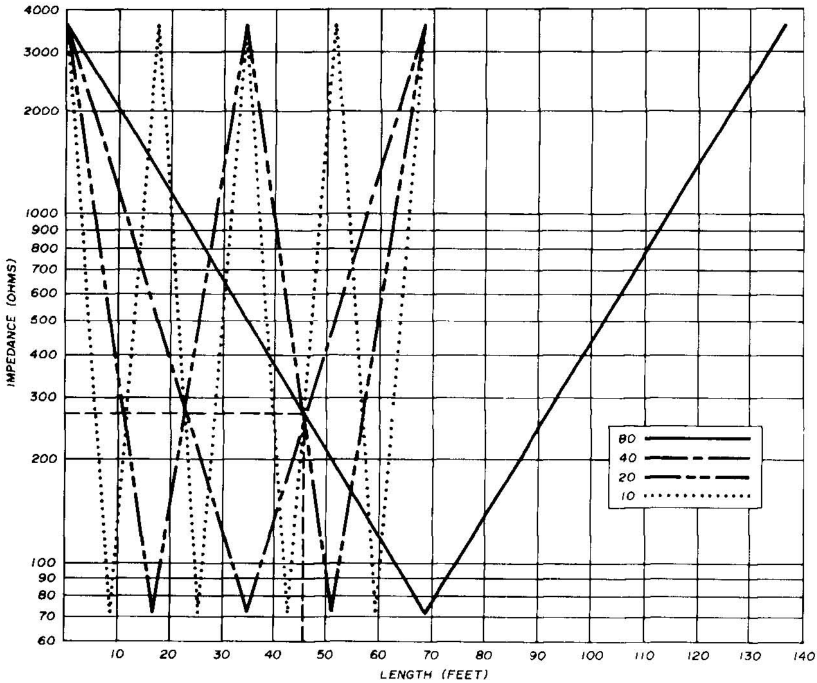

fig. 3. Impedance along a 136-foot antenna on 80, 40, 20 and 10 meters. Approximately 45 feet from one end of the antenna the impedance plots cross at 270 ohms — providing a fairly good match to 300-ohm feedline.

If the impedances present along this 136-foot antenna are plotted for the 80, 40, 20, and 10-meter bands, at a point 45 feet from one end, all four band plots cross at about 270 ohms (see **fig. 3**). If the antenna wire is broken at this point and the two wires are fed with 300-ohm twinlead, a fairly good match will be obtained for all four bands. In practice, certain lengths of feedline have been found to be preferred for easier transmitter loading. These lengths are multiples of 44 feet.

The advantages of both types of feedline, coax and twinlead, can be achieved by combining the optimum length of 44-feet of 300-ohm twinlead with a balun to match 75-ohm coax. A random length of coax can then be run to the hamshack as shown in **fig. 4**.

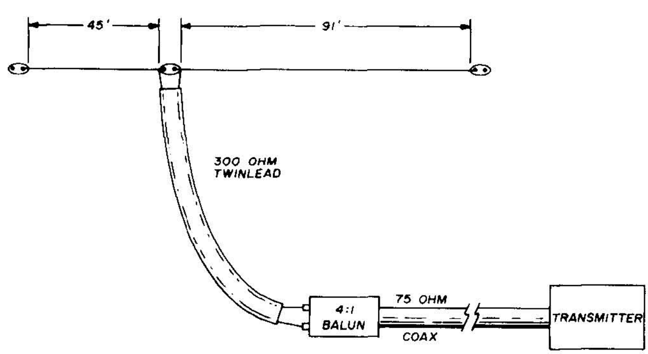

fig. 4. Windom antenna for four amateur bands uses 300-ohm twinlead, a 4:1 balun and 75-ohm coax to the transmitter.

construction

After obtaining 140-feet of number-12 Copperweld antenna wire, three egg insulators and 50-feet of 300-ohm twinlead, you are ready to proceed. Using the dimensions shown in **fig. 4,** install the three insulators. The distances shown are *between* insulators. Attach the premeasured 44-feet of 300-ohm twinlead (or multiples thereof) between the feedpoint insulator and the balun. Install the antenna as high and as in the clear as possible.

Route the 300-ohm feedline away from the feedpoint at a 90-degree angle for as far as possible. The balun should be waterproofed if it is exposed to the weather. One method is to completely wrap it with Scotch Brand vinyl tape of the type used by electricians and carried by most hardware stores.

There are several good commercial broadband baluns on the market that can be used, as well as toroidal kits for assembling a kilowatt unit in a small Minibox. The *ARRL Handbook* provides construction details for an easily made toroid balun.

There is one note of caution that applies to any multiband antenna system. Any harmonics generated on the lower bands will be efficiently radiated by this antenna. A conventional antenna tuner can be substituted for the balun, or used at the transmitter end of the coax to eliminate harmonics reaching the antenna. However, the use of an antenna tuner defeats the basic simplicity of the balun-to-coax feed system with its automatic bandchanging and no tuning to fuss with. Several excellent antenna tuners have been described in the amateur magazines.[1,2,3]

references

1. Ed Noll, W3FQJ, "Antenna Tuners," *ham radio,* December, 1972, page 58.
2. Gregory Widin, WB2ZSH, "Medium Power Toroidal Antenna Tuner," *ham radio*, January, 1974, page 58.
3. Ed Marriner, W6BLZ, "Match Box Antenna Tuner," *73,* September, 1966, page 38.

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