An End-Fed Extended Double Zepp for 2 Meters

Add a bit of "Zepp" to your 2-meter signal. Build this inexpensive gain antenna that'll provide the coverage you need.

By Jim McDonald,* WBØJQH

The Zepp, double Zepp and extended double Zepp have been a part of the amateur's antenna repertoire for many years. The extended double Zepp offers some advantages over other antennas of simple construction, such as the dipole or ground plane vertical. It has approximately 3 dB of gain over a half-wavelength dipole[1,2] when center or stub fed,[3] is easy to feed with common transmission lines and is fairly broadband. An extended double Zepp is composed of two approximate 5/8 wavelength elements driven (usually) through a phasing section. The antenna exhibits gain over a half-wavelength dipole because of the addition of another element and the greater current-lobe spacing than would occur in a one-wavelength dipole (Fig. 1). In practical use, the conventional construction method has some disadvantages: no dc ground, and transmission line interaction with the lower radiating element, when the antenna is polarized vertically.

The end-fed version described here eliminates these problems. This feed method (Fig. 2) lends itself nicely to vertical operation. The transmission line is tapped along a shorted quarter wavelength matching section, or J-feed. This permits antenna and transmission line impedance matching and removes the feed line from the radiating plane. It also provides a dc grounding point for lightning protection.

The "Why"

This antenna was designed for accessing 2-meter repeaters in a 60-mile[4] radius, and occasionally a distant one about 100 miles away. These repeaters are scattered along the Front Range of the Rocky Mountains from above the Wyoming/Colorado border to south of Colorado Springs. No coverage to the east, the open plains, was needed. To obtain this pattern, I decided to ensure a little gain by properly spacing the antenna alongside the tower, using the tower as a reflector.

Construction

Assembling an antenna of this type is simple and inexpensive. Construction details are provided in Figs. 3, 4 and 5. Aluminum tubing or EMT (electrical metallic tubing) can be used. Check your local building supply store or junkyard for economical antenna materials.

A PVC center insulator is satisfactory with transmitter power inputs of up to 100 watts. If high power operation is anticipated, a better insulating material, such as Plexiglas, Lucite or ceramic should be substituted.

The completed antenna is spaced 16.25 inches (about 0.2 wavelength) from the

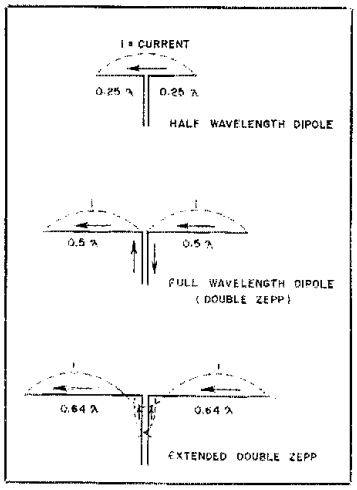

Fig. 1 — Current distribution for the various antennas discussed in the text.

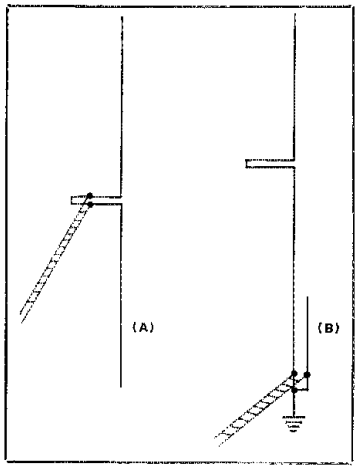

Fig. 2 — At A, the conventional arrangement for feeding the extended double Zepp. The end-fed or J-fed method is shown at B.

[1]Notes appear on page 35.
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tower on two brackets. These brackets are made of the same materials used for the antenna. The upper bracket has PVC tubing as an insulating sleeve and attaches to the upper element about 20 inches above the center. The lower bracket has no insulator and provides the dc ground through contact with the tower leg. Mounting details are shown in Fig. 6.

Feed Methods

I have used two methods of coupling the coaxial feed line to the quarter wavelength matching section: direct, unbalanced, coaxial feed, and balanced input using a bazooka or 1:1 coaxial balun.[5] There seems to be little difference in the performance of the antenna with either feed method, although the balanced input seems to "feel good" to me. Another amateur in the area has reported success using a 4:1 coaxial balun.

An SWR indicator is inserted in the feed line and observed while the transmission line is moved along the matching section rods. When the best match is obtained, the line is permanently attached to the rods with sheet-metal screws or compression clamps. In my installation these points are between 4 and 4.5 inches above the shorting strap at the end of the section. If the 4:1 balun is used, these dimensions will probably vary.

How Well Does It Work?

Now that the antenna is up, how does it fare against the competition? A wire version of this antenna was built and compared to a vertically polarized half-wave dipole. The antennas were connected to an antenna switch through equal lengths of RG-58/U coaxial cable. An rf step attenuator, similar to those described in *The Radio Amateur's Handbook*,[6] was inserted in the transmission line from the extended double Zepp. Signals were monitored using a 2-meter transceiver while I switched between the antennas. The attenuator was adjusted until the extended double Zepp showed the same S-meter reading as the dipole. With the Zepp in the clear (using no reflector) it showed approximately 3 dB gain over the dipole. This would correspond roughly to 4.5 dB over a ground plane. A slight reduction from the 3-dB figure was expected because of the end-fed system causing slight differences in the magnitude of the currents in the two radiating elements, but none was detected with the equipment used. When mounted on a mast and spaced 0.2 wavelength from it, the wire antenna showed the expected cardioid pattern and an additional 1 to 1.5 dB forward gain.

This antenna has proven to be quite effective. The desired repeaters can be accessed and good signal reports are received. Simplex operation is improved dramatically compared with similar operations using a J-pole antenna at the same height. Try the extended double Zepp. An antenna design that is almost as old as Amateur Radio itself, it's inexpensive and performs well. QST

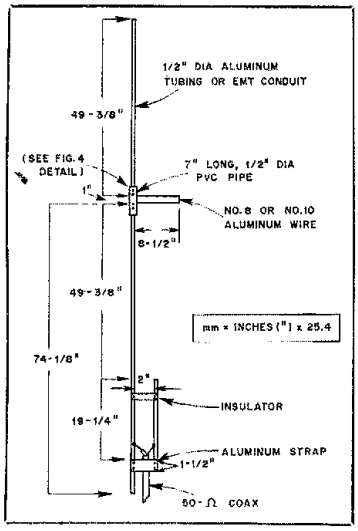

Fig. 3 — Construction of the end-fed extended double Zepp for 2 meters.

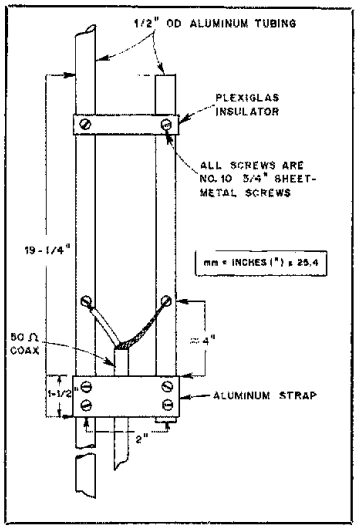

Fig. 5 — Quarter-wave matching section details.

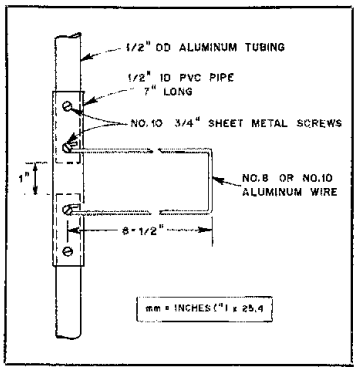

Fig. 4 — Center phasing section construction details.

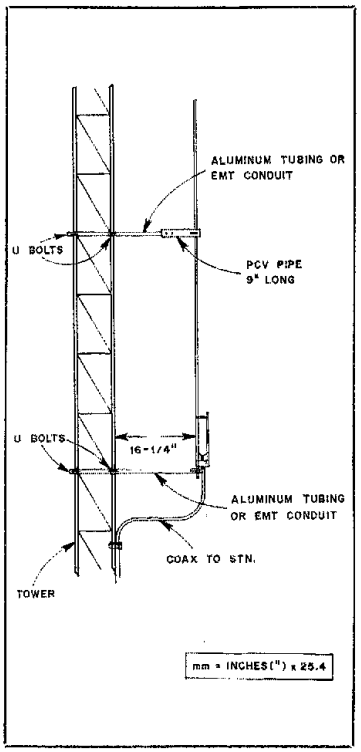

Fig. 6 — The method used in securing the extended double Zepp to the side of a tower. A section of PVC pipe is used to insulate the upper support from the antenna proper. The lower support provides a dc ground for the antenna (through the tower).

Notes

[1] *The ARRL Antenna Book*, twelfth edition (Newington: American Radio Relay League, 1970), p. 141.
[2] W. Orr, *The Radio Handbook*, twenty-first edition (Indianapolis: Editors and Engineers, 1978), p. 28.11.
[3] *The Radio Amateur's VHF Manual* (Newington: American Radio Relay League, 1965), p. 173.
[4] km = mi. x 1.609, mm = in. x 25.4
[5] See note 1.
[6] *The Radio Amateur's Handbook*, fifty-eighth edition (Newington: American Radio Relay League, 1981), p. 16-38.