Easy Antenna Reference

Part 2: More options.

Keith Woodward VK2AT
19 Dolphin Ave.
Taree NSW 2430
Australia

Part 1 of this article (February 1999) covered some quick and easy basics to enable you to make some simple decisions. Here, we'll look at some more options.

To round off the simple approach, let's consider the antennas in **Figs. 1** and **2**. An easy-to-construct antenna is the folded quarter-wave. This antenna is a variation of a ground-plane antenna and works best with a good ground-plane or resonant radials. Theoretically, it should exhibit a feed impedance of 39 ohms and may be fed with 50-ohm coaxial cable. An antenna tuner will most likely be required.

The antenna consists of a quarter-wavelength of heavy-duty wire with an insulated support at the point where the wire changes from vertical to horizontal (or thereabouts). The length may be calculated by dividing 234 by the frequency of operation in megahertz. The answer is in feet. As always, be generous and make the antenna too long—then prune to resonance. Make the largest amount possible vertical and then put the remainder in a horizontal position. If this is not possible, one support allowing a sloper (diagonal) erection will still give fair results.

Should you suffer from lack of real estate, then the folded "T" configuration may be your solution. I suggest that this antenna be made from slotted 300-ohm ribbon. The horizontal section of the "T" may be calculated from $270/f_{MHz}$, the answer again being in feet. Each end is shorted, and the center of one side opened to join the ribbon feeder. Calculate the feeder length by multiplying 270 by the velocity factor and dividing the answer by the operating frequency in megahertz. A typical velocity factor for this type of ribbon is about 0.82. This is claimed to give an approximate 50-ohm feedpoint. Expect to use an antenna tuner for best results.

For the higher frequency bands, another wire antenna that radiates vertically with broad bidirectional lobes is illustrated in **Fig. 3**. It is simple to feed with 50-ohm coaxial cable, and with a gain of 3 dB over a ground-plane, it gives good results over a fixed beam area.

This does not at all exhaust the configurations of simple wire antennas.

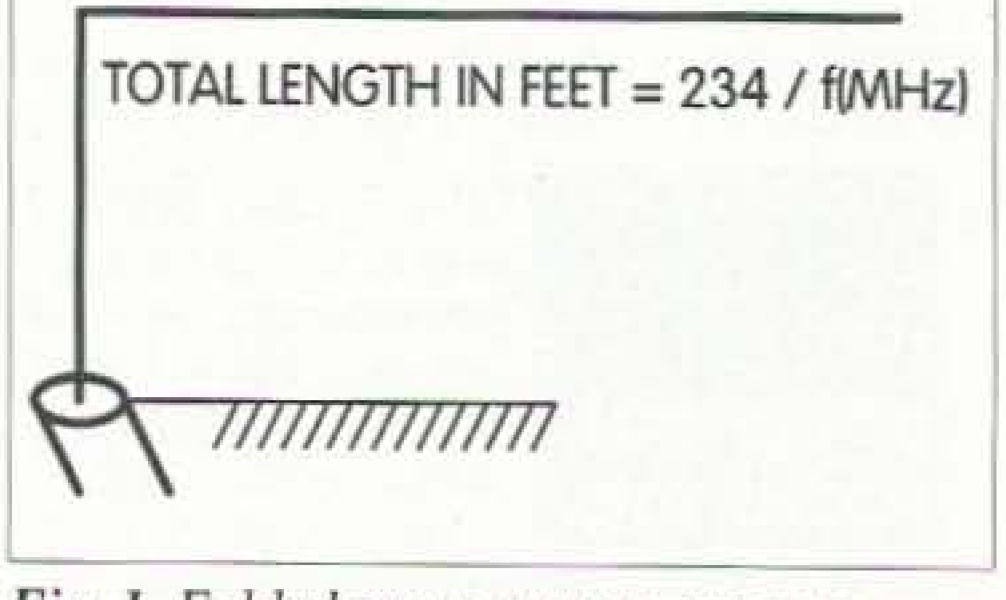

***Fig. 1.** Folded quarter-wave antenna.*

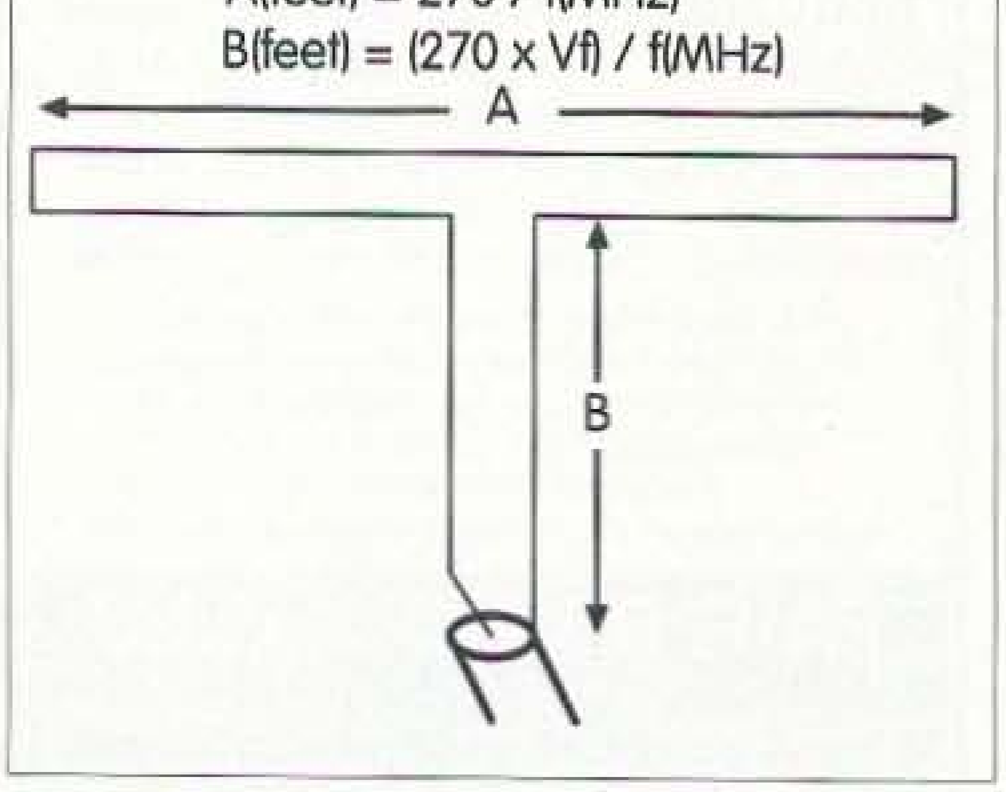

***Fig. 2.** "T" antenna.*

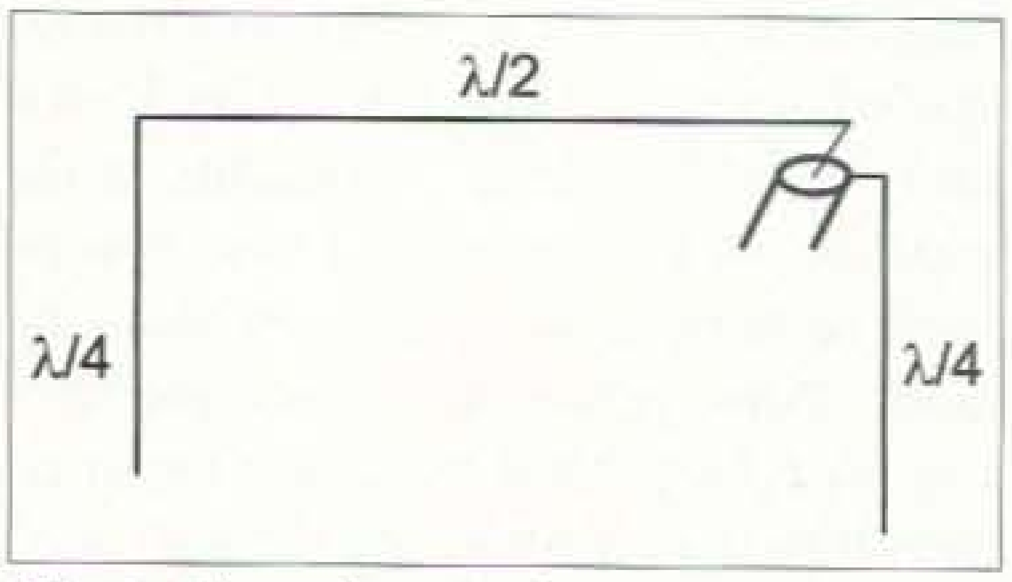

***Fig. 3.** Phased verticals.*

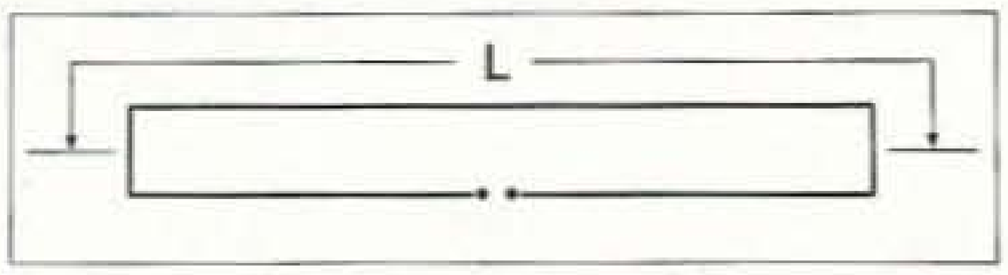

Fig. 4. Folded dipole measurement.

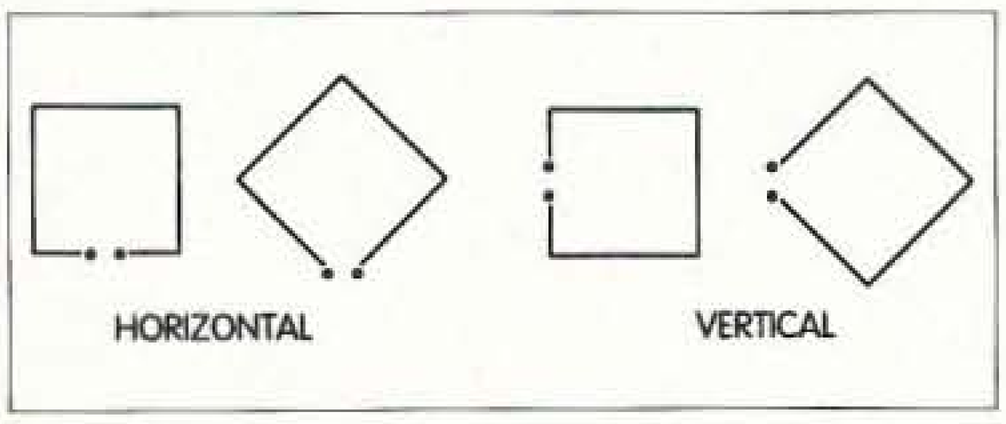

Fig. 5. Polarization of quad antennas, based on orientation of feedpoint.

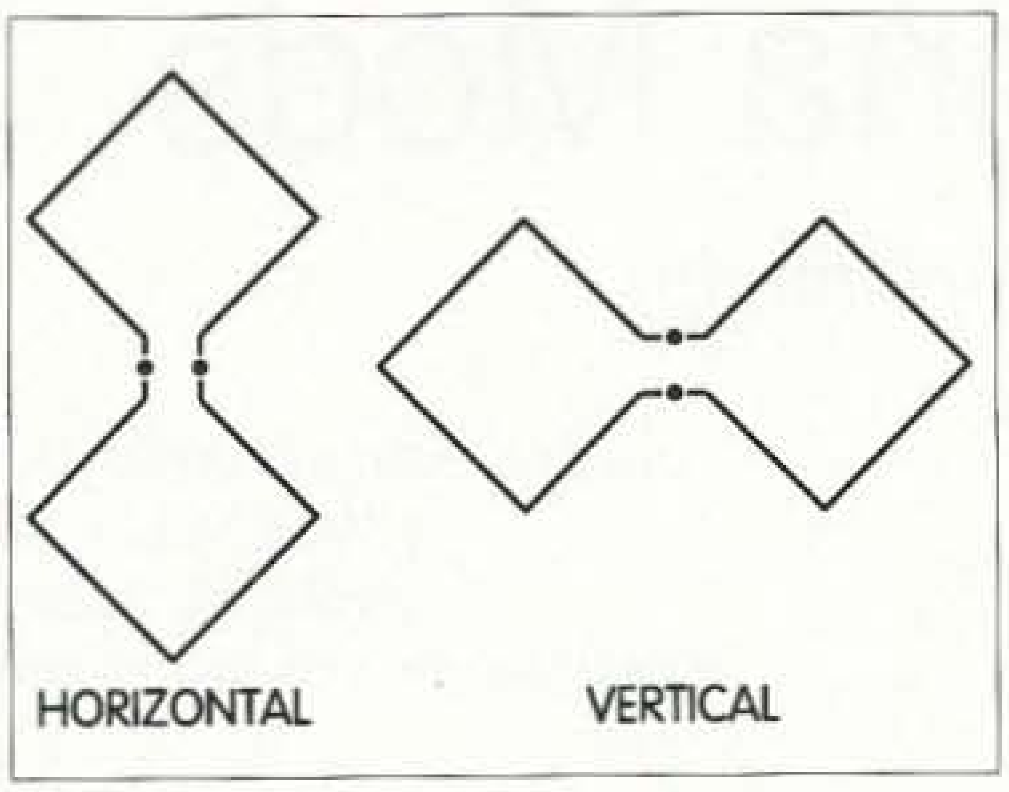

Fig. 6. Dual-quad configuration.

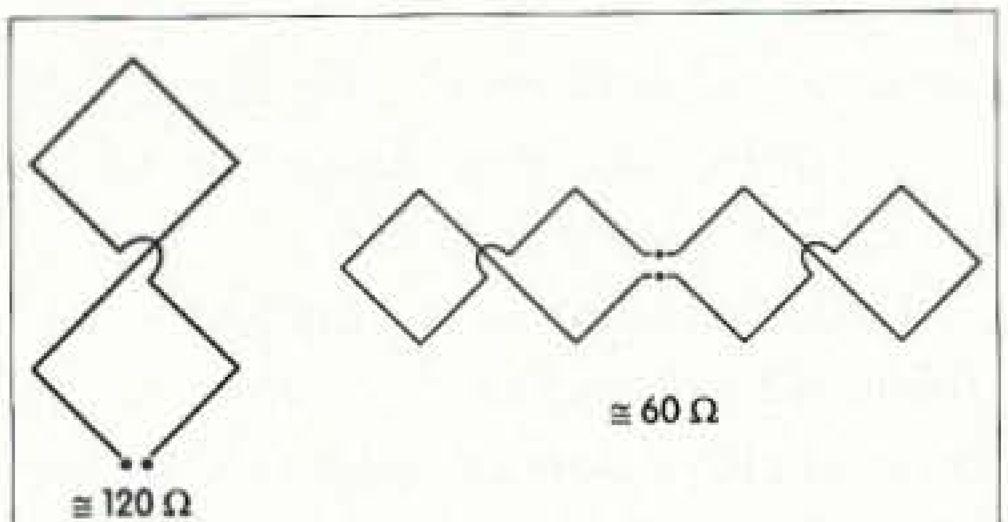

Fig. 7. Other quad combination suggestions.

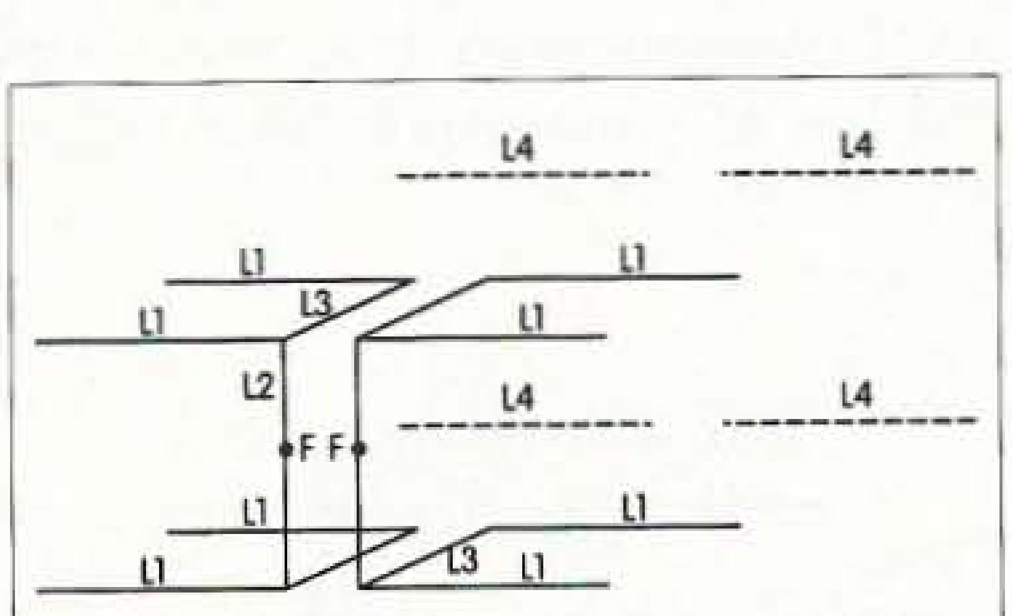

Fig. 8. Extended flat-top beam, with gain of approximately 10–12 dBd.

Having promised to pass on information about quad antenna configurations, I will endeavor to do so after the following brief interlude.

One question I have often heard is, "How do you measure the elements of a folded dipole?" Assume that the folded dipole is for VHF/UHF, made of aluminum tubing, and self-supporting, somewhat such as used in a TV antenna. The length dimension applies to the overall length of the unsplit element from the midpoint of one end jumper to the midpoint of the other end jumper. This is illustrated in **Fig. 4**. The impedance of the folded dipole (half-wave) is four times that of a single half-wave dipole in the same surroundings, such as supports or additional elements. It is assumed that the upper and lower elements of the folded dipole are the same diameter.

An easy-to-remember method of calculating the length of a folded dipole is to divide 5555 by the operating frequency in megahertz. The answer is in inches, e.g., 5555/147.4 equals 37.6865 inches, or 37-5/8 inches. The big factor in favor of folded dipoles is their wide bandwidth of operation—hence the reason for their use in many TV antennas.

A useful, simple antenna is the quad. As illustrated in **Fig. 5**, it may be fed to give vertical or horizontal polarization. The total length of wire used to make a quad may be calculated by dividing 1005 by the frequency in megahertz to give the answer in feet. In metric, divide 306,324 by the frequency in megahertz to give the answer in millimeters. The quad exhibits approximately 100–125 ohms impedance, which varies with supports, height, and surrounding objects. It has an approximate gain of 1.5 dB over a dipole and a lower angle of radiation. A close match to 50-ohm coaxial feeder may be obtained by using an electrical quarter-wavelength of 75-ohm coaxial cable between the feedpoint and the 50-ohm feeder.

The dual-quad configuration, **Fig. 6**, gives a bidirectional pattern with a reasonable gain of approximately 3–4.5 dBd. The horizontally polarized configuration produces a good low angle of radiation. The size of this configuration may limit it to the upper frequency bands. In **Fig. 7**, another dual-quad configuration is shown. Some enterprising amateur might like to parallel two of these in the horizontal plane, both increasing the bidirectional gain and reducing the feedpoint impedance to approximately 50 ohms. At 28.4 MHz, such an array would be about 100 feet long and approximately twelve-and-a-half feet high.

	21.2 MHz	28.4 MHz
L1	6722 mm	5018 mm
L2	7076 mm	5282 mm
L3	3538 mm	2641 mm
L4	6504 mm	4855 mm
L5	1415 mm	1056 mm

***Table 1.** (See **Fig. 8.**) A broadband, high-gain antenna sometimes referred to as a "Lazy H." Note that tuned feeders connect to the points marked F.*

Finally, for those amateurs who like to challenge the elements (literally) and have the room, **Fig. 8** shows details of the extended flat-top beam. It may be built with or without directors, which are spaced at about one tenth of a wavelength (see dimension L5 in **Table 1**). Best results may be obtained using open-wire feeder and an antenna tuner. If a quarter-wave shorted stub is used, the system could be matched to a coaxial cable transmission line. 73

LOW PROFILE HF ANTENNAS
THAT REALLY WORK!
"Work the World Without Working Up the Neighborhood"
ISOTRON
BILAL COMPANY
Call for a FREE Catalog:
719/687-0650
137 Manchester Dr.
Florissant, CO 80816
www.catalogcity.com
Go to Keyword Search & Type in: Isotron
CIRCLE 42 ON READER SERVICE CARD

FREE!
NEW CATALOG
CALL TOLL FREE: 1-800-JAN-XTAL
Quality Crystals
and Oscillators for:
AMATEUR BANDS•CB•MARINE VHF
SCANNERS•MICROPROCESSORS•PAGERS
P.O. Box 60017 • Fort Myers, Florida 33906
(941) 936-2397
JAN Crystals
CIRCLE 242 ON READER SERVICE CARD