AD5I reminds us that sometimes a simple wire antenna can fill the bill for multi-band operation.

An Off-Center-Fed Dipole Antenna

BY R. F. SWARTZENDRUBER*, AD5I

By far the most popular antenna for newcomers to the HF bands is the half-wave dipole, fed in the middle with 50 ohm coax. Many amateurs don't realize that with minor modifications their 80 meter dipole can be a 4-band antenna with excellent performance.

My first Novice antenna, 30-some years ago, was an off-center-fed 80 meter half-wavelength dipole. Strung from the peak of the house to the tallest tree in the yard, it gave excellent performance on both 80 and 40 meters. After upgrading to General, it served me well on 20 and 10 meters also.

Everything has a price, and the price for four bands instead of one is a 300 ohm feedpoint. At the center of a half-wave dipole the feedpoint impedance is about 75 ohms. The impedance goes up as you move either way from the center and is around 4000 ohms at the ends. Since 300 is between 75 and 4000, it's logical to assume that a 300 ohm impedance point occurs somewhere each side of center in a half-wave dipole. It does, and that point is about a third of the way in from either end. Actually, it's about 0.3375, not one third, but measuring 136 feet of wire with that kind of accuracy is difficult.

How does it work on 40 meters? A half-wave on 80 is a full wave on 40, so it's now two half-waves long. Each half-wave has two 300 ohm points, one of which conveniently matches the 80 meter feedpoint. On 10 and 20 meters there are also multiple 300 ohm points, one of which matches the 80 meter feedpoint. On 15 meters the feedpoint falls on an impedance peak, and the antenna will not perform satisfactorily. Four out of five bands is still a lot better than just one.

What's to be done with this 300 ohm feedpoint? Use 300 ohm twinlead. The recent two-part series on balanced feedlines by Fred Bonavita, W5QJM (Jan. and Feb. 1994 *CQ*) does an excellent job of explaining how to use balanced feedlines and describes their advantages, not the least of which are lower cost and less loss. At the transmitter end of the feedline a simple antenna tuner can transform the balanced 300 ohms to unbalanced 50 ohms. If you really must use 50 ohm coax, put a 6:1 balun at the feedpoint. A 4:1 will also work, leaving a slight mismatch of 75 to 50 ohms. That's no worse than using 50 ohm coax and a 1:1 balun on a center-fed dipole.

What does it take to build one of these antennas? About 140 feet of wire and three insulators. Remember the formula for the length of a half-wave? In free space it's 492/frequency in MHz. In the real world it's shortened about 5% to 468/frequency in MHz. Start with about 140 feet and plan to trim it to length. It is easier to shorten a dipole than it is to lengthen it, so start long. Cut the wire one third of the way from one end. If two people are available, it's probably easier to physically fold the wire into thirds than to measure it accurately. Install an insulator at the feedpoint, connect the 300 ohm feedline or a balun, and put an insulator at each end. At this point it's installed like any other dipole. Since the feedpoint is off-center, orient the antenna to minimize the length of feedline required.

Check the SWR on all four bands and trim as required. To shorten the antenna by a foot, take 4 inches off the short side and 8 inches off the long side. Keep the feedpoint at one-third the length of the antenna.

On 80 meters the pattern will be the same as a center-fed dipole, peaking 90 degrees off each side in a "figure 8" pattern. As the frequency increases, the pattern moves towards the ends, with the peaks on 10 meters about 30 degrees off each side at each end. As with any dipole, the peaks and nulls aren't all that pronounced.

If an 80 meter antenna isn't needed, or space won't allow one, the same design can be used for 40, 20, and 10 meters. It still won't work on 15. Start with about 68 feet of wire, feed it one-third of the way in from one end, and trim to length by checking the SWR on all three bands.

Although the off-center-fed dipole has been around for at least 40 years, it still offers a lot to the newcomer. It's an efficient, low-cost antenna with excellent performance on four bands. ■

** 1016 Kirnwood Dr., Plano, TX 75075*