Antenna of the Month

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Using a 40 m Dipole on 15 m With a Better Match

It's possible to use any dipole on its third harmonic (or even higher, odd harmonics) while obtaining a usable match on both bands. This is very convenient, giving you two bands for the price of one, and is attempted most commonly with 40 and 15 m bands (7 and 21 MHz). However, the desired match does not occur exactly at the third harmonic, but rather at a somewhat higher frequency. For instance, a 40 m dipole resonant at 7.0 MHz will also be resonant at 22 MHz, which is way above the top of the 15 m band (Fig. 1). You'll find that the SWR is near 10:1 within the band, and it's quite possible that your antenna tuner can't match it very well, if at all.

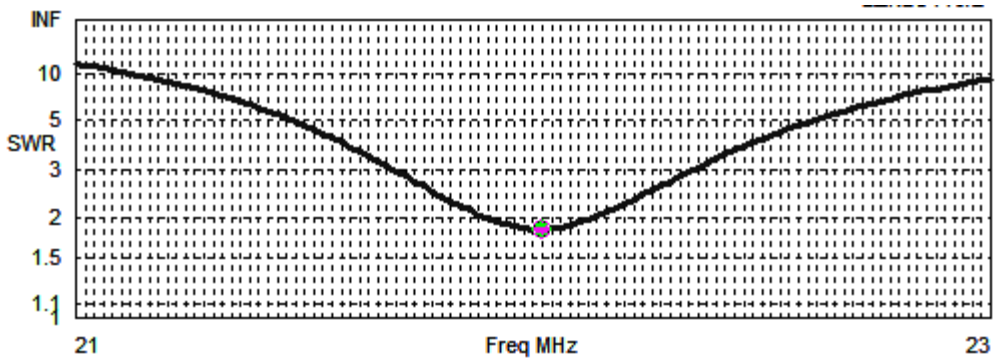

Figure 1. SWR of a basic 40 m dipole up 30 ft on 15 m. It's resonant at 22 MHz with an impedance of about 90 ohms. This could be difficult to match…

Here is a simple solution that I've been using for many years. All you have to do is add small "hats" about 1/3 of the way out on each side of the dipole, which is about 1/4 wavelength on 21 MHz. The diagram in Fig. 2 shows typical dimensions. The hats are pieces of wire soldered at their midpoints to the main conductor. I like to use 0.063 inch bronze brazing rod which is available at welding supply stores, but any kind of stiff wire will do. Bend it a little so it forms a bit of an inverted vee, then it won't spin around all the time.

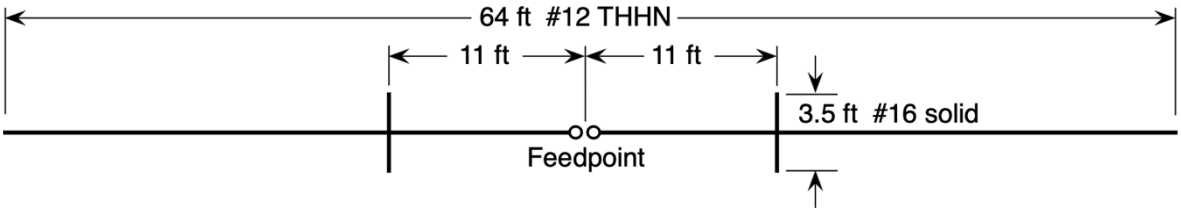

Figure 2. Typical dimensions of the 40/15 m dipole. Remember to leave your wires a bit long for trimming.

The exact location of the hats isn't too critical. I put them at 11 ft out from the center. Trim the overall dipole for resonance on 40 m, then check it out on 15. If you want to further refine the

resonance on 15 m, you can trim the length of the hats. The tuning rate is about 33 kHz per inch, so trim carefully. Changing the hats will also slightly affect the 40 m resonance at about 12 kHz per inch. In the end, you will easily cover the whole 15 m band with a reasonable SWR. It will be far better than without this trick! Note that this antenna will probably be a better match to 75 ohms, but it's fine with 50 ohm coax for any antenna tuner (Fig. 3).

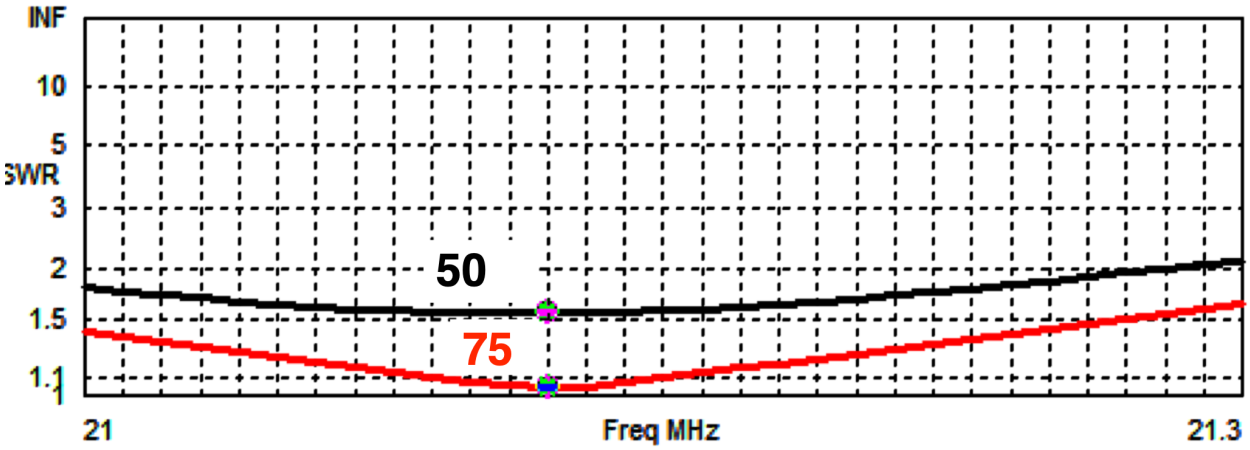

Figure 3. SWR plots on 15 m with the added hats. Note that it's a better match to 75 ohms which is typical of dipoles at this height (30 ft).

I should also mention that the radiation pattern (Fig. 4) on 15 m is quite complex since it's no longer a simple 1/2-wave dipole (the hats have nothing to do with that fact). Peak gain is actually greater than a dipole but there are also many nulls.

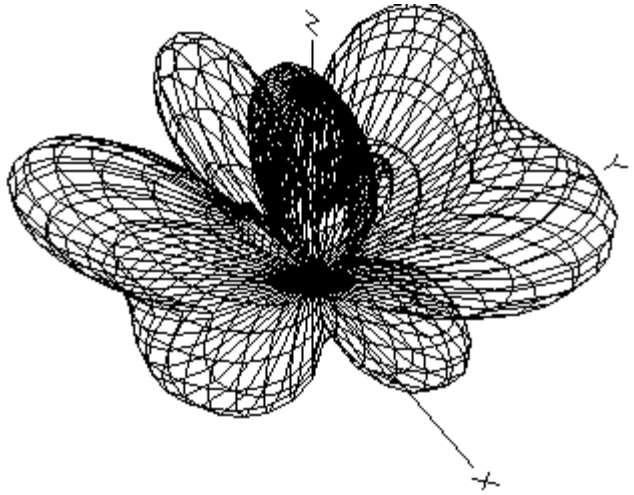

Figure 4. Three-dimensional radiation pattern on 15 m.

Figure 5 shows my original installation on a low-observable 4-band fan dipole (40, 30, 20, and 15 m). I used 18 AWG solid wire for the hats in this case and actually spliced some on because it was a first experiment. The thing has survived for 12 years so far.

Has this been published elsewhere? Yes, in the June 1991 QST it was mentioned in a general article about dipoles by NJ2L. Sadly, it's never made it into the ARRL Antenna Handbook. If you

want to try simulation with EZNEC or some other tool, this makes a great exercise. Speaking of simulation, I wondered if this method would work on an 80 m dipole, making it usable on 30 m. It will, however the hats are about 9 feet long. Perhaps this could be implemented with wires pulled out via insulators and string. Further simulation and experimentation is in order here.

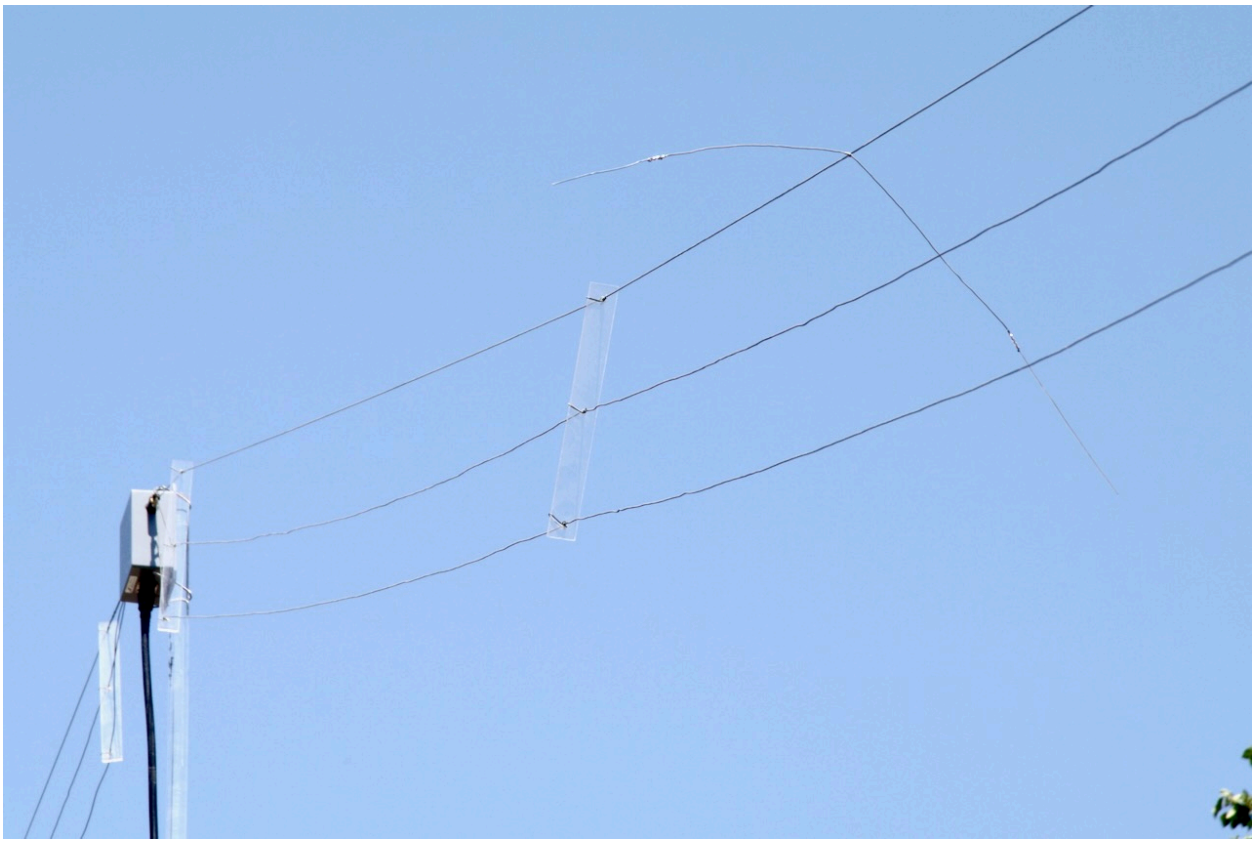

Figure 5. My fan dipole with the 15m hat.