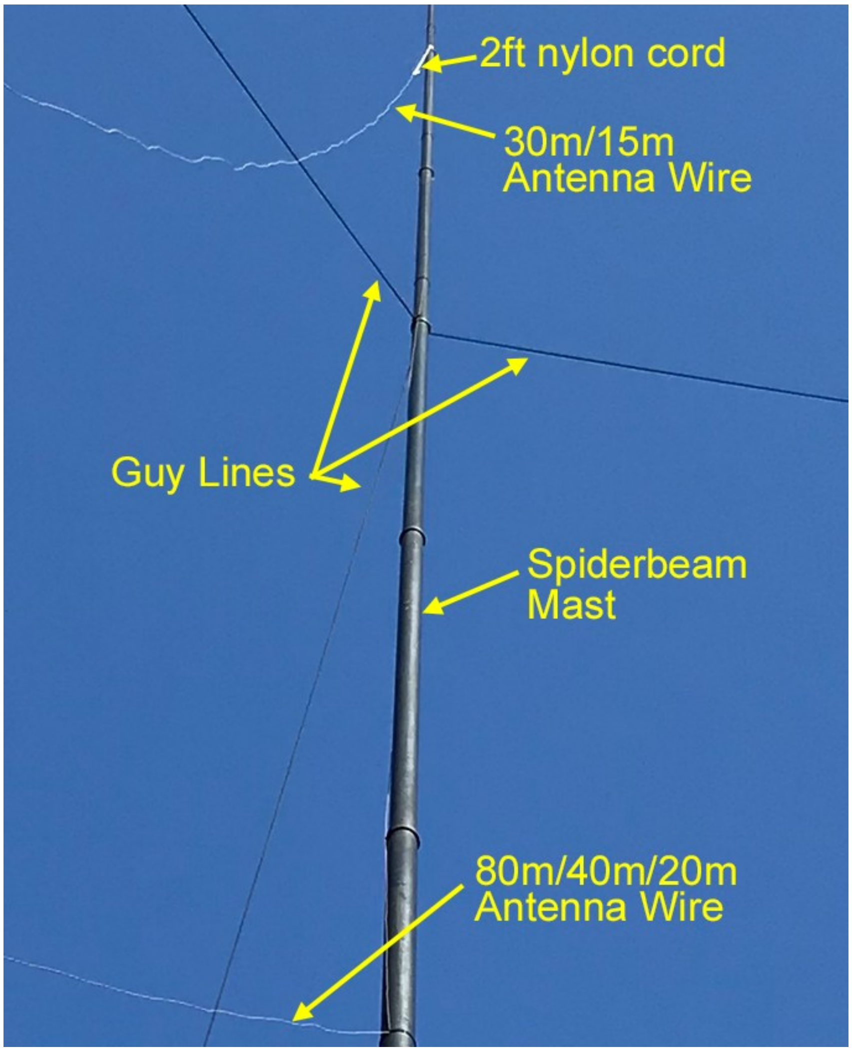
A MULTI-BAND END FED ANTENNA
IN-DEPTH MATERIALS

2022-11-29 Dan Wiley, W6AZI

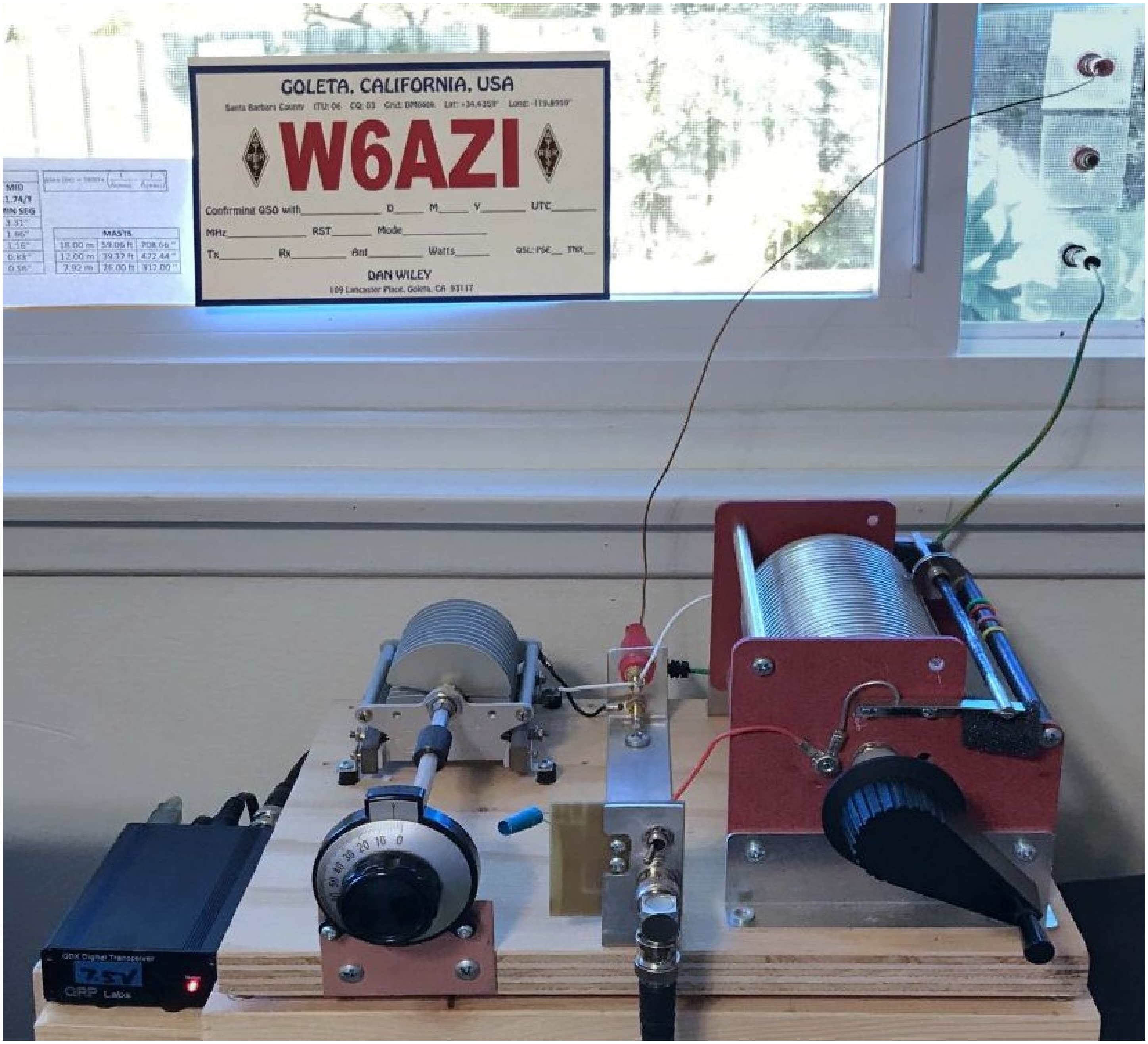
Here is some some supplemental information for my article on an end-fed multi band antenna. Since the initial submission of the article in March, my antenna and station have undergone several changes and improvements, which I will also describe here.

Once I had the antenna operating on 80, 40, and 20 meters, I realized I could easily add a 30/15-meter end-fed antenna. I simply tied a 2-foot length of nylon cord to the Spiderbeam mast about 3/4 of the way up, then tied a length of 18-gauge bare stranded wire to the free end, running it back down to my station. I then adjusted the wire length for resonance on 30 meters (10.136 MHz).

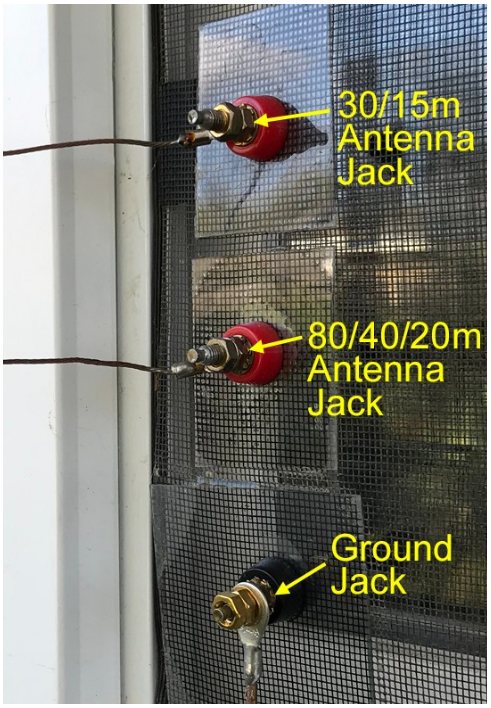
I also beefed-up my guy lines to significantly reduce flexing of the mast in windy conditions. I used three lengths of 110-pound 550 Nylon Paracord, which provides a good balance of weight and strength.



I built a new L-network for matching to the high-impedance antennas, as seen in the picture below. The L-network uses a Cardwell 100pF bread-slicer variable cap with vernier dial and a Palstar 32uH roller inductor. Also seen are the banana window feed-throughs to my two antennas and ground. The small black box on the left is a QDX digital transceiver I use for FT8 operation.

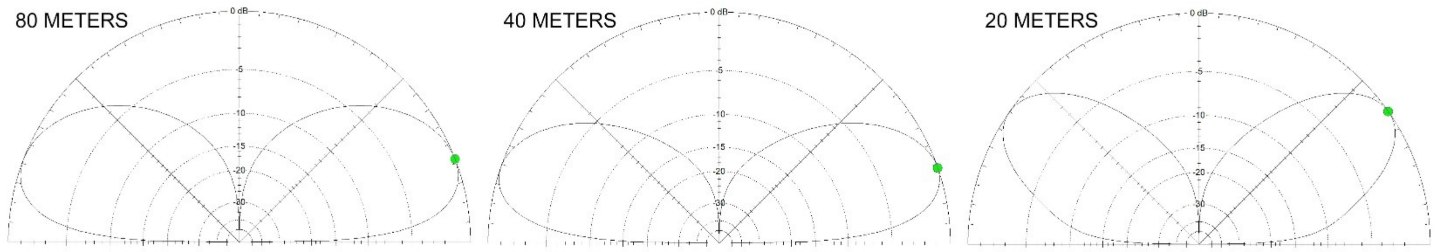


Here is a view of the three banana jacks seen from the exterior side of my screen window. Note I used squares of clear polycarbonate and epoxy on both sides of the screen to provide mechanical reinforcement.

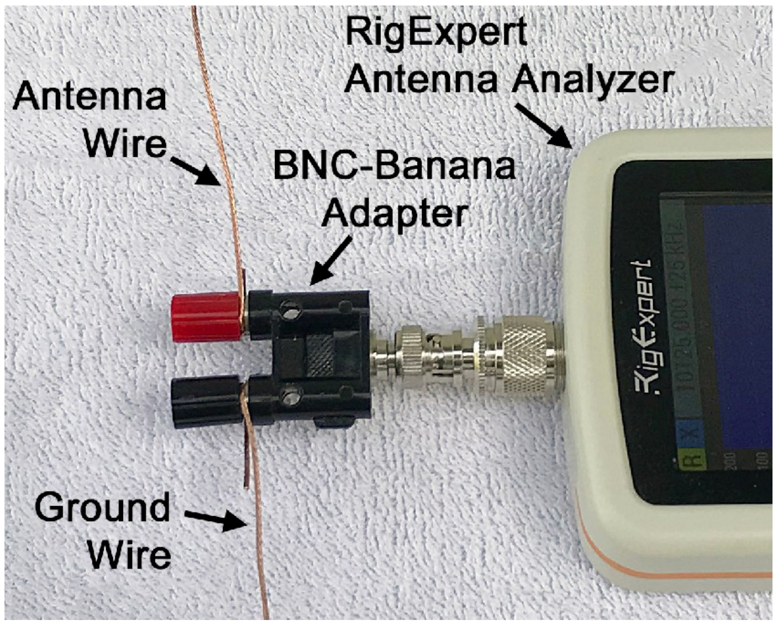


I originally used a simple counterpoise wire for the ground connection, since that is all that is needed for these high-impedance antennas. But I recently changed my ground to a standard 8-foot ground rod just below the location of the banana jacks. This change did not result in any noticeable improvement in the antenna operation, but it is nice to have in case I decide to operate on other frequencies at lower impedances. The rod is conveniently located near my irrigation system, which helps increase the conductivity of the soil.

I entered the 80/40/20-meter antenna design in EZNEC to confirm that the takeoff angles are nice and low, which would be good for DX operation.



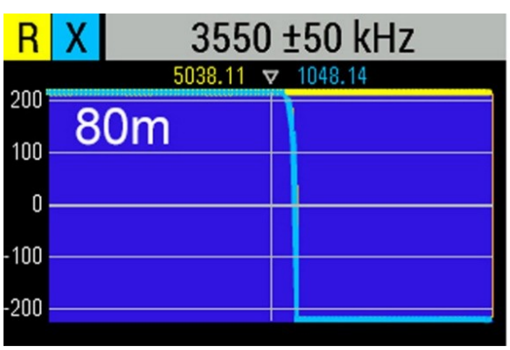
To tune the antennas, I used a Rig Expert antenna analyzer to directly measure the antenna impedances for adjusting the lengths to resonance.

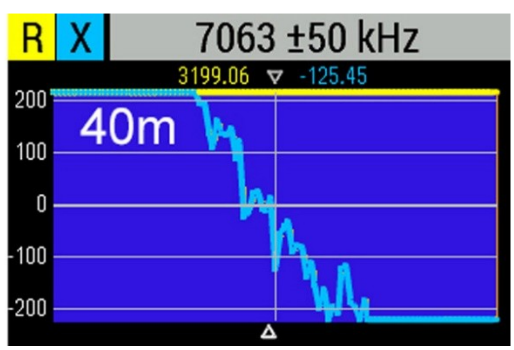


For the 80/40/20-meter antenna, the procedure requires alternately adjusting the length of the short wire from the loading coil to the top of the mast and the long wire from the shack to the loading coil so that resonance is achieved at both 80 and 40 meters.

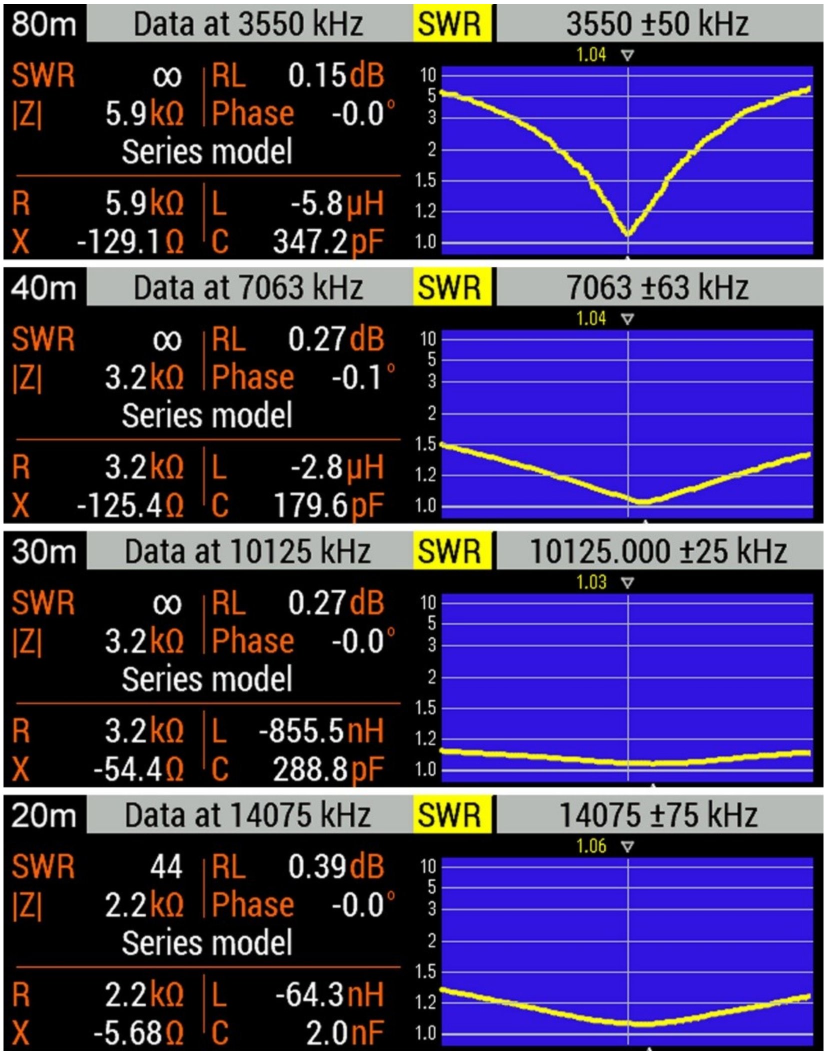
When using this method, it is very important to have a bleeder resistor installed or temporarily connect the antenna wire to earth ground to discharge any static electricity prior to connecting it to the antenna analyzer. Otherwise, the analyzer can be damaged by ESD, as I discovered the hard way.

Here are example antenna analyzer plots of the reactive impedance (X, blue trace) passing through resonance within the CW portion of each band.

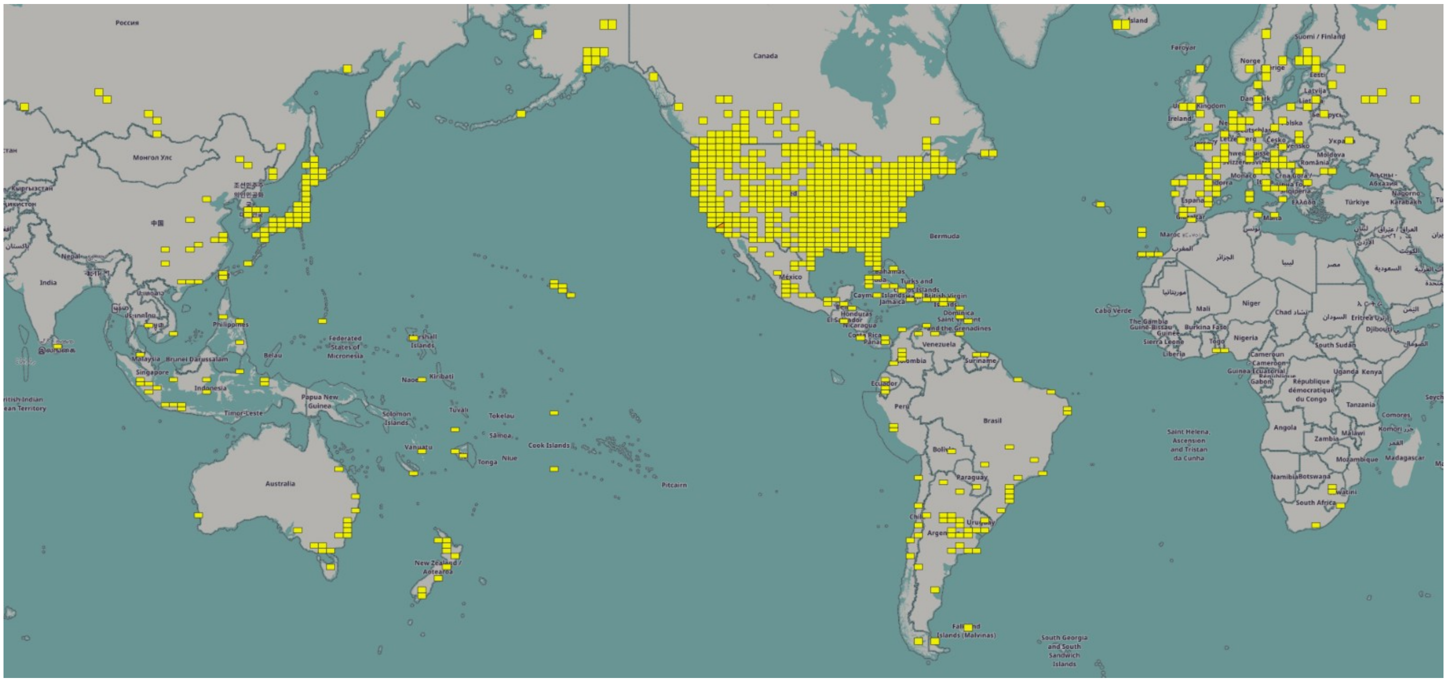




Here are antenna analyzer screen shots of the impedance data and SWR plots. The upper right plot shows the 80-meter SWR has a much narrower bandwidth than the other three bands. This is expected due to the shortened antenna design with a loading coil. The narrow bandwidth means the antenna match network needs to be re-adjusted if I change the transmit frequency significantly. I am willing to accept this minor inconvenience for the sake of a significantly shortened 80-meter antenna.



As an indication of the performance of this antenna, below is a map of my GridTracker grid squares (yellow) in which I have had successful FT8 QSOs. My QRZ is the orange grid square DM04 in the Santa Barbara area, just north of Los Angeles.



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