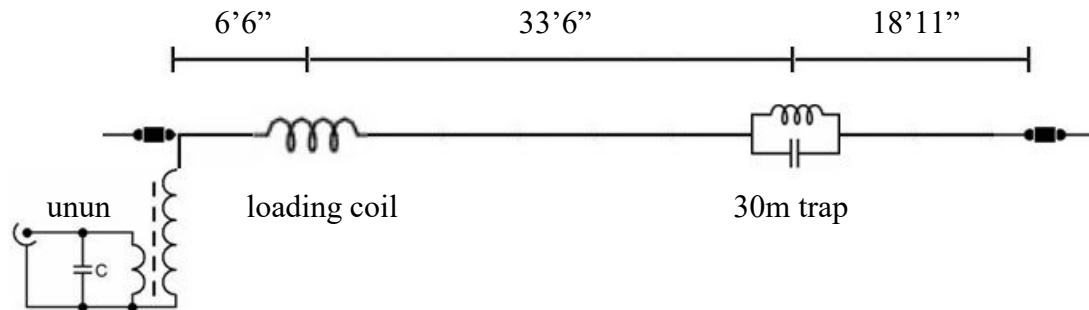


An End-fed Half-wave for 40, 30, and 20 meters

I am a fan of WSPR and wanted an end-fed antenna which would resonate on 40, 30, and 20 meters without any switching, tuning, etc. so that it would be able to run unattended. There are several EFHWs on the market - some with traps and some which require changing connections. And there are some with only a small loading coil which would work on bands which are harmonically related but that does not include 30 meters.

So I wondered if a hybrid approach might work – that is, an antenna which is a half wave on 40 meters (7.1 MHz) and a full wave on 20 meters (14.1 MHz) and which would use most of the length on 30 meters (10.125 MHz) by virtue of having a single trap.

I used MMANA to play with the design before trying to build the antenna. A small loading coil allows resonance at both desired frequencies on 40 and 20. Adding the trap also means some adjustment of the wire lengths is needed. It turns out that such an antenna is just under 59 feet long. Adjusting the loading coil permits moving the SWR minimum on 20 meters quite easily while 40 meters has a broad SWR curve and the SWR minimum frequency on 30 meters is set by the trap.



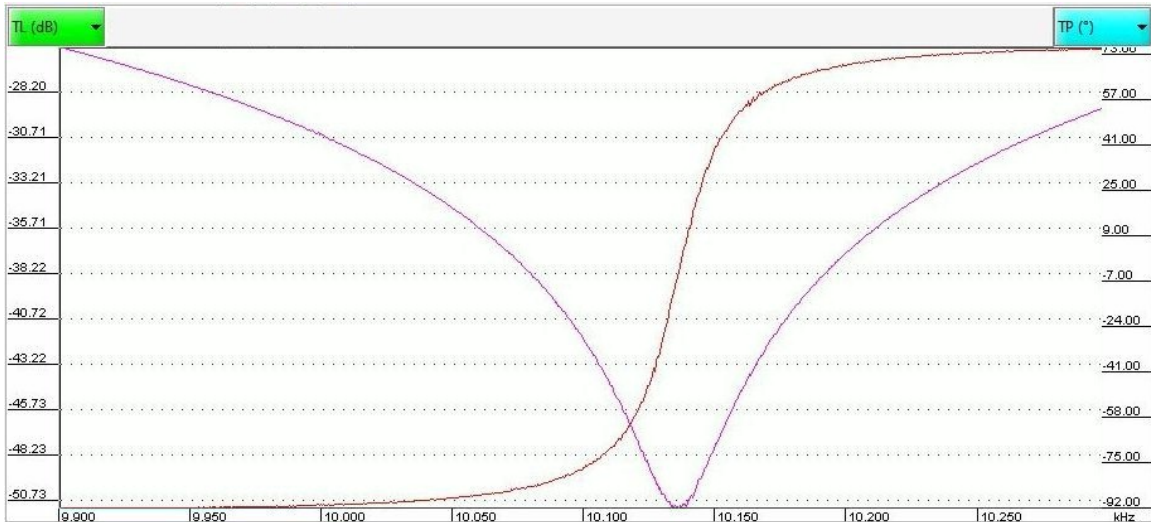
The antenna was constructed of 14 AWG stranded wire with PVC insulation. The loading coil is made by just passing the wire through drilled holes in a piece of 3 inch diameter PVC pipe. I made the coil with 10 turns to begin with but ended up removing a turn to shift the 20 meter SWR minimum point up as needed. 9 turns gives 6.5 uH inductance. The excess wire from the unused turn was removed at the end where the unun matching device is attached.



The 30 meter trap was constructed around an insulator by winding 7 turns of ¼ inch copper tubing on a 2 inch form. This resonates with a 150 pf, 4 kv ceramic capacitor I had in the junk box. Voltages will be high. I used the miniVNA to adjust the turns and spacing of the coil to obtain resonance in the middle of the 30 meter band. (see below)

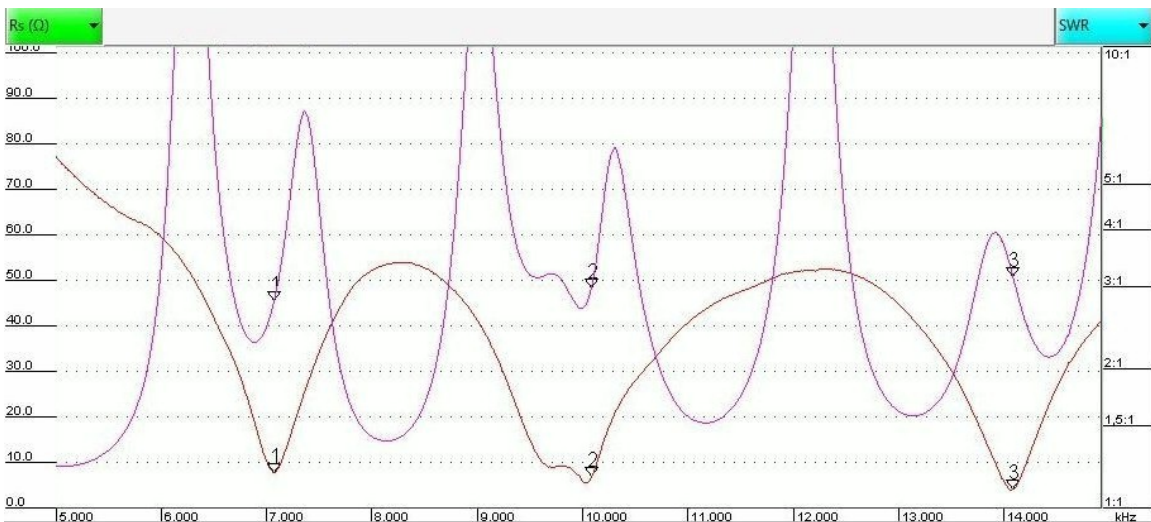


Connecting the trap between the input and output pins of the miniVNA makes the final adjustment of the spacing of the turns to get the trap centered within 30 meters easy.



The unun matching device is typical of those used to match end-fed half-waves. It is made from an FT240-43 ferrite core with a 3 turn primary and a 27 turn secondary. The antenna end impedance is somewhat high, around 5000 ohms, which is why I used more turns on the secondary than the usual 7:1 turns ratio. I tested the unun on the bench with a 5000 ohm carbon resistor and the miniVNA to ensure a good match over 7 to 14 MHz. Experimentation with the parallel capacitor at the coax input gave the flattest response with 110 pf but you might need a somewhat different value.

Final tuning turned out to be easy. I didn't have to adjust the wire lengths for 40 meters though I had folded about a yard of extra wire back at the far end just in case. Because I had adjusted the trap on the bench 30 meters was very close to being centered so I left it alone. As mentioned I did have to remove one turn from the loading coil to move 20 meters up as desired. SWR minimum was 1.2:1 or less on all three bands as seen below:



The antenna slopes from 25 to 35 feet above ground and works great. I get WSPR reports from all around the world every day with just 1 watt. 73 Jim Bailey #4142