A Trap Dipole for 80/40/20/15/10 Meters for Field Day

An 80/40/20/15/10 meters trap is planned for digital operations. It supports all 5 bands without external antenna tuning. Internal rig antenna tuners capable of 3:1 SWR tuning should still be used to provide a match very close to 1:1 for the RF amplifier. The low SWR of the antenna on all bands for digital also ensures good operation with the bandpass filters designed for 50 ohms impedance. And the low SWR is helpful to minimize coax cable losses, even with low loss cable such as LMR400 or BuryFlex, especially since fairly long coax runs of 250 feet will be needed to place the antenna in a clear area for good performance and in line with other antennas to achieve polarization isolation. The trap antenna design is based on this plan using coaxial traps: http://degood.org/coaxtrap/

This is the 80/40/20/15/10 meters trap antenna during tuning and test. The antenna is tuned for the low end of each band covering CW and digital segments of the bands. The SWR at resonance varies between about 1.05 and 1.7 for each band. A coaxial feedline of 100 feet of RF-8x was used during measurements. Due to small losses in the coax, the SWR at the antenna would be slightly higher, of course. Detailed plots are shown below. A balun at the center point eliminates coaxial radiation and provides a balanced antenna match. Seven strand 14 gauge copper antenna wire is used for the antenna segments. Each antenna segment is coupled to the next with a high performance ceramic

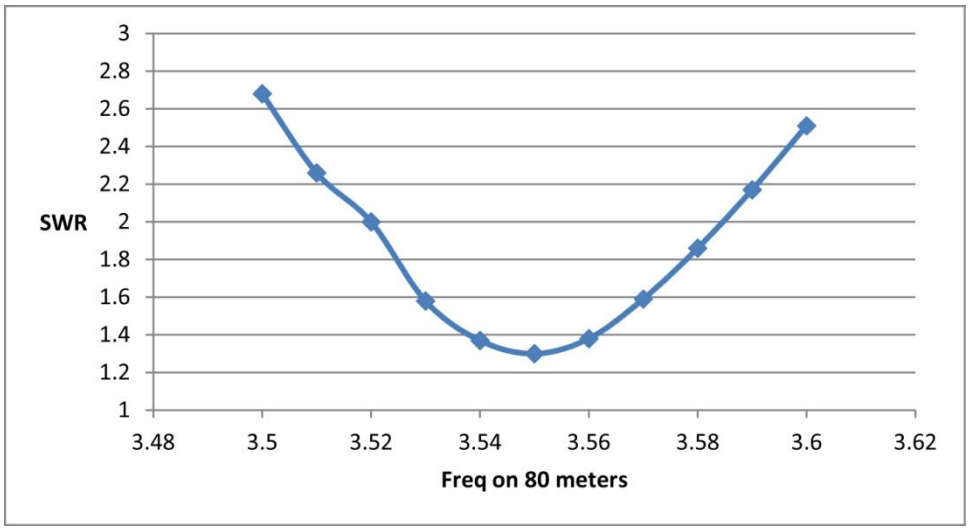
insulator, and the traps are hung in parallel with the ceramic insulators. This arrangement places the strain on the ceramic insulators and eliminates strain on the coaxial traps.

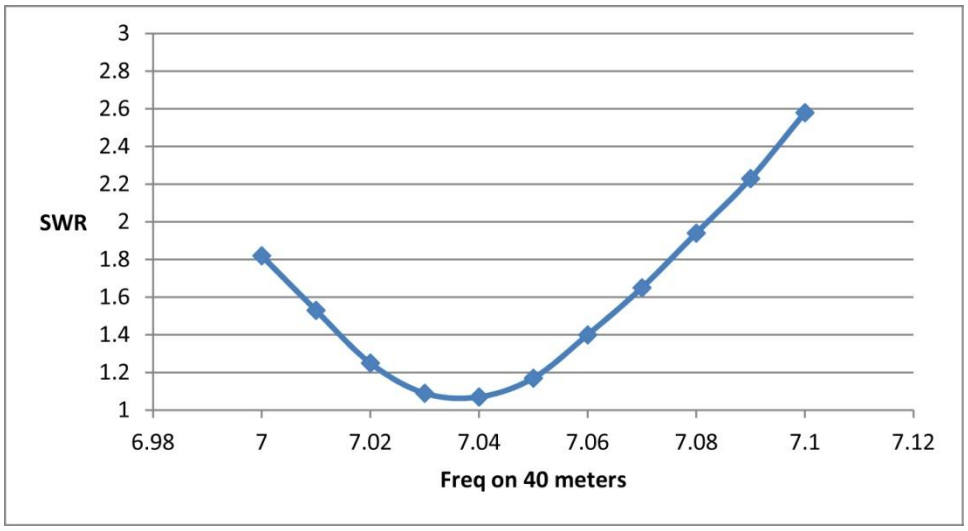
The coaxial traps are implemented very closely to the designs in the design article, but the wire segment lengths vary somewhat. Especially the 80 meter segments are considerably longer. The wire lengths (not including center balun and ceramic insulator lengths) are listed here:

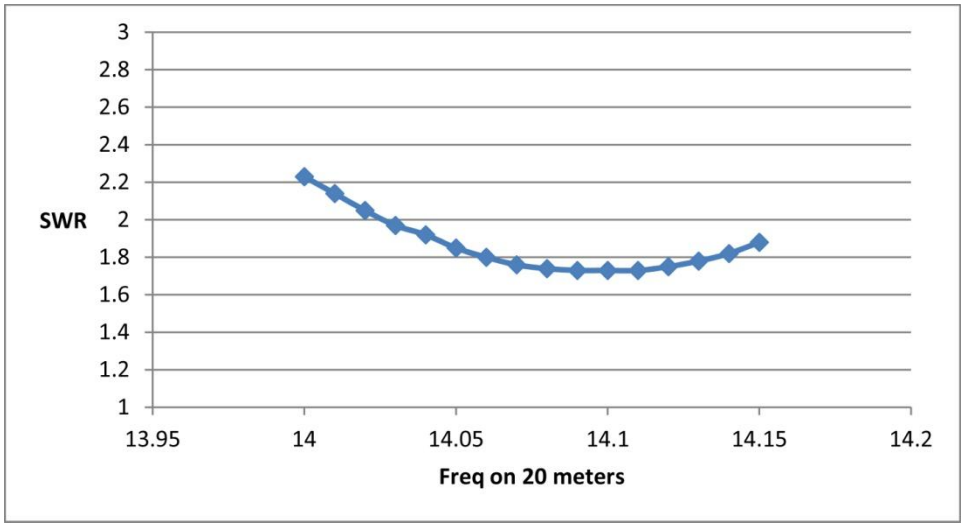
Side A:
80 meters: 237”
40 meters: 118”
20 meters: 26”
15 meters: 13”
10 meters: 88”
Side B:
10 meters: 88”
15 meters: 13”
20 meters: 27”
40 meters: 98”
80 meters: 244”

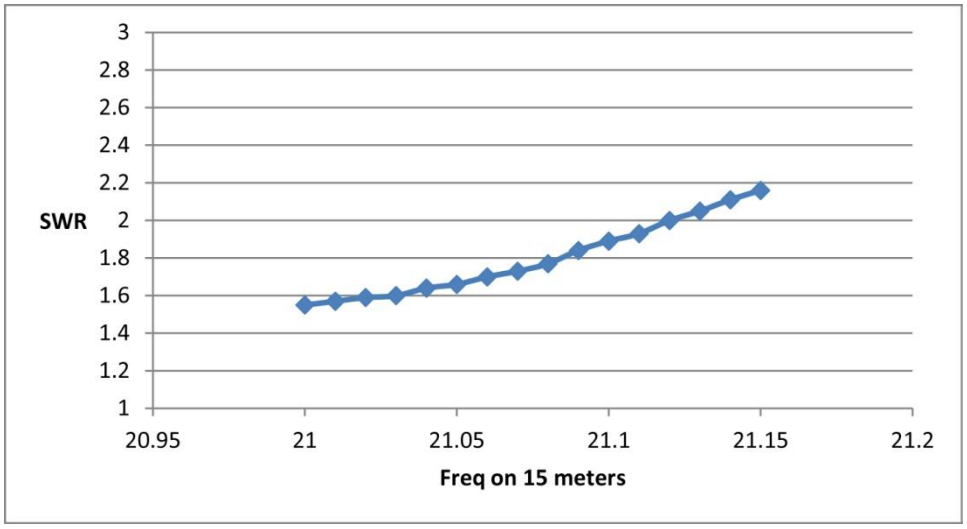
The traps are tuned slightly below each band of operation. W8JI has shown that while coaxial trap losses are not very high (but higher than lumped circuit implementations), loss can be minimized (order of 0.5 dB) by tuning each trap to be slightly below the desired band. See this link: https://www.w8ji.com/traps.htm This causes the trap to “look like” a small capacitor at the desired operating frequency, and so it looks equivalent to capacitive hat loading, and lowers the resonant frequency slightly. The desired band is brought to resonance by shortening the corresponding wire elements. The trap dipole is tuned by starting at the highest band and then going down the bands in sequence adjusting the wire lengths to achieve resonance at the desired frequency. This is important since the wire lengths for a higher frequency band affects directly the wire lengths for lower frequency bands while the reverse is not true. W8JI’s work suggests that these coaxial traps will have a few tenths of a dB loss by tuning them below the desired band. The traps frequency responses were measured with a NanoVNA. They are shown in below.

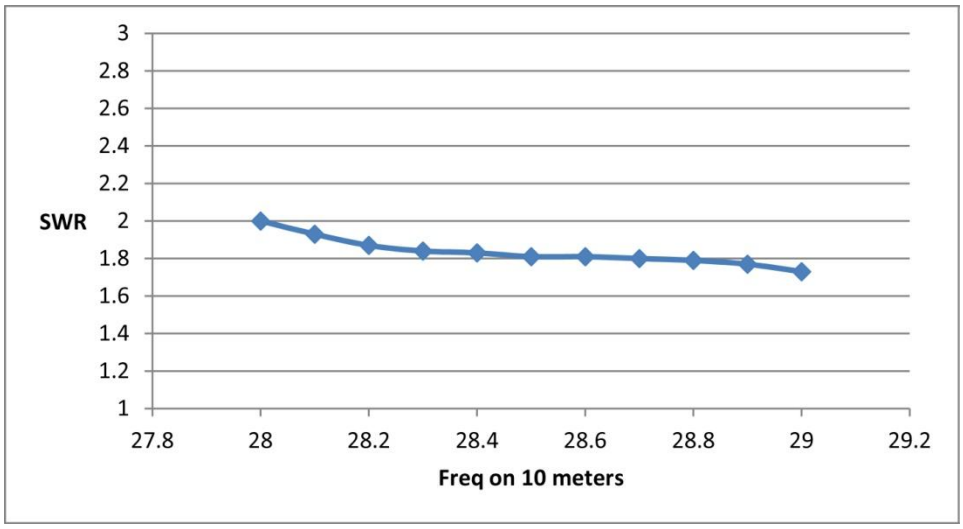
80/40/20/15/10 meters trap dipole measured SWR



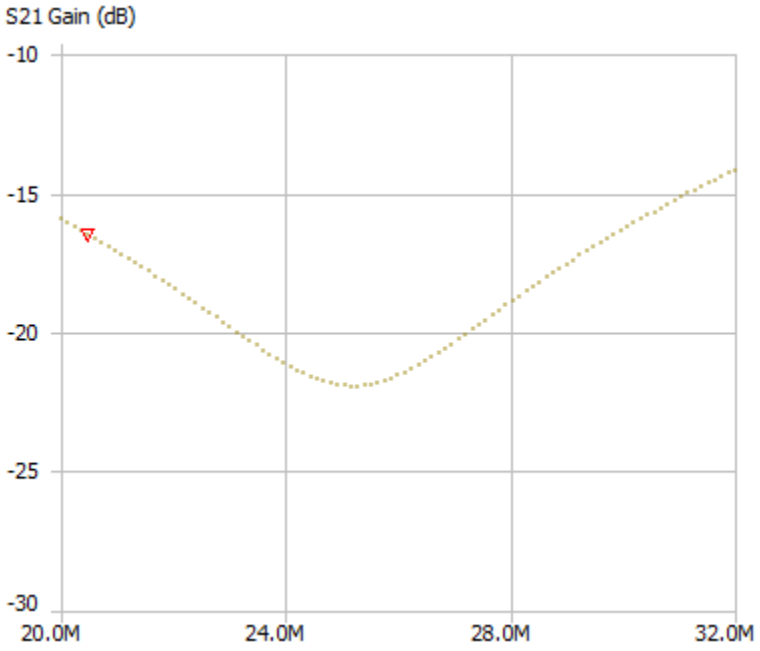


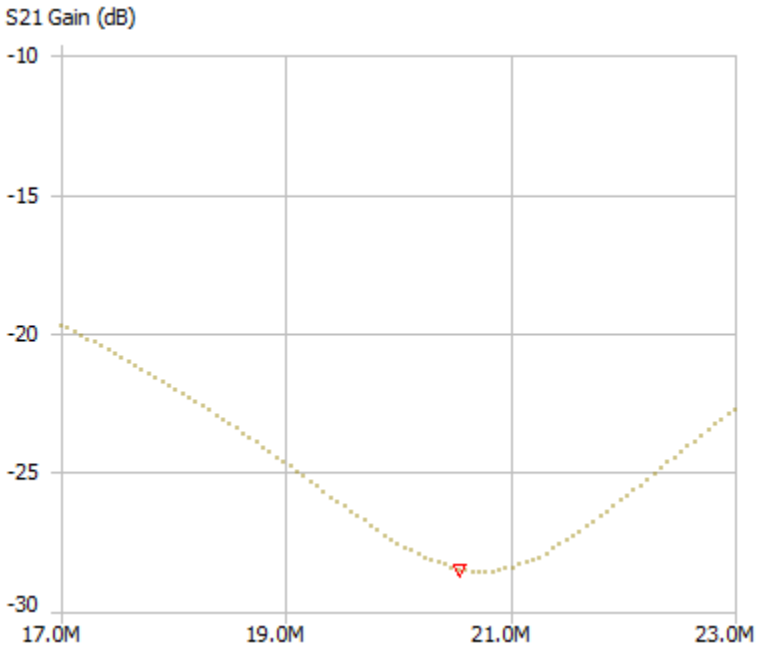

SWR
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
13.95
14
14.05
14.1
14.15
14.2
Freq on 20 meters

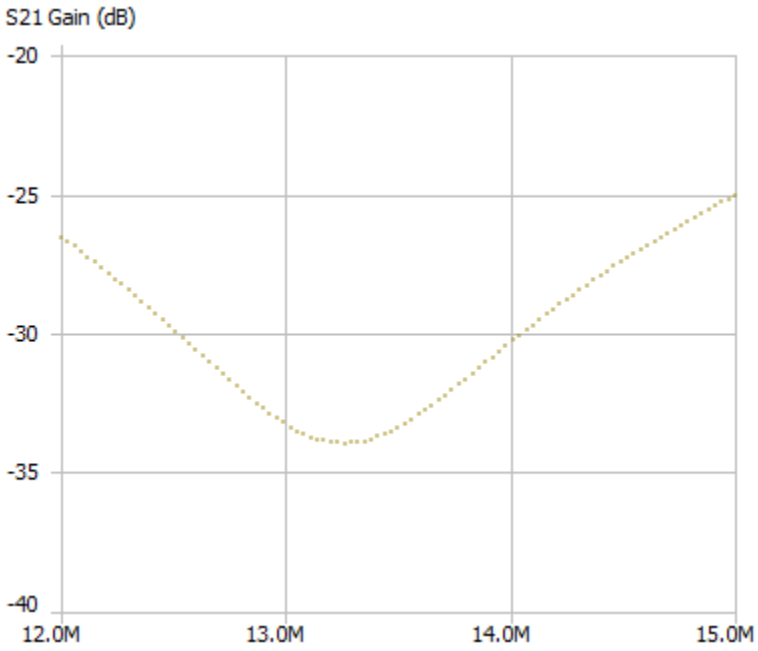

SWR
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
20.95
21
21.05
21.1
21.15
21.2
Freq on 15 meters

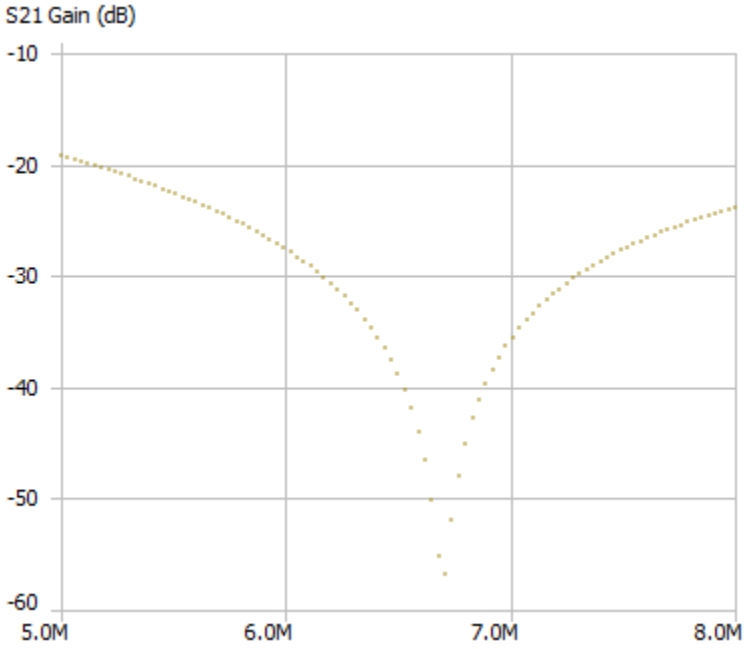

SWR
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
27.8
28
28.2
28.4
28.6
28.8
29
29.2
Freq on 10 meters

Trap frequency response






S21 Gain (dB)
-20
-25
-30
-35
-40
12.0M
13.0M
14.0M
15.0M


S21 Gain (dB)
-10
-20
-30
-40
-50
-60
5.0M
6.0M
7.0M
8.0M