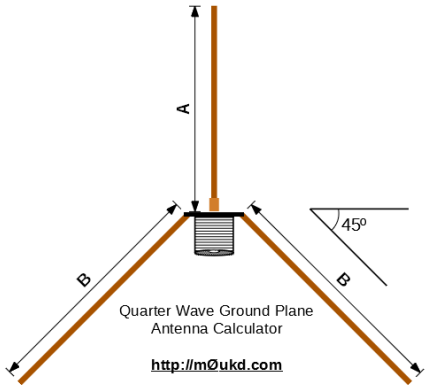
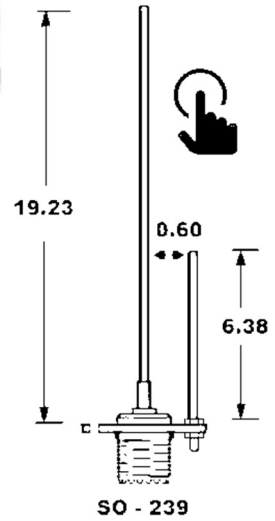
# ¼ Wave Ground Plane for 2 meter/440 J-Pole

**KI5QPX**

I built this dual band antenna using measurements easily found on the internet. Typical articles speak to 2 Meter only, but I found information leading me to install the all-thread stub to add the 440 MHz capability as well. Without the extra tuning stub it is only suitable for 2 m. The drawings I used for reference:




My final element lengths were determined by the nanoVNA-H Network Analyzer. I trimmed the main element for lowest swr at 146 MHz and adjusted the all-thread length for lowest swr at 440 MHz.

Parts List:

5 brass solid round rods (Lowes) 1/8 inch x 3 foot (antenna elements)
1 galvanized steel angle brace 2-in x 2-in x 4-in 12-Gauge (can be a lighter gauge)
U bolt plate clamp (for antenna mast mount)
8x32 all-thread 12 inch

4 screws 8x32 1 inch length
6 nuts 8x32
10 lock washers for the screws and bolts
4 flat washers for the screws and bolts
1 SO-239 chassis mount female solder coax connector
Cable of sufficient length to connect antenna to the radio with UHF PL-259 to connect to the antenna and whatever connector needed to connect to a radio.
Antenna pole (the higher the better)

Tools:

nanoVNA-H Network Analyzer
swr meter
Grinder with cutting wheel
Sanding wheel
60 watt solder iron
Solder
Safety goggles for cutting metal
Vise
Section of pipe to hold components as you build
Step drill bits

Starting with the angle brace prepare the mounting holes for the SO-239 connector. I also trimmed off some of the brace to make sure the ground plane elements cleared the brace antenna pole mount.

With the brace in a vise drill out the connector mounting holes. I started with the large hole about midway of the brace platform and used a step drill bit to get to the correct hole size for the connector

center. Now place the connector in the hole and mark the mounting holes for the 8x32 screws. Don't drill too big of a hole for the screws.

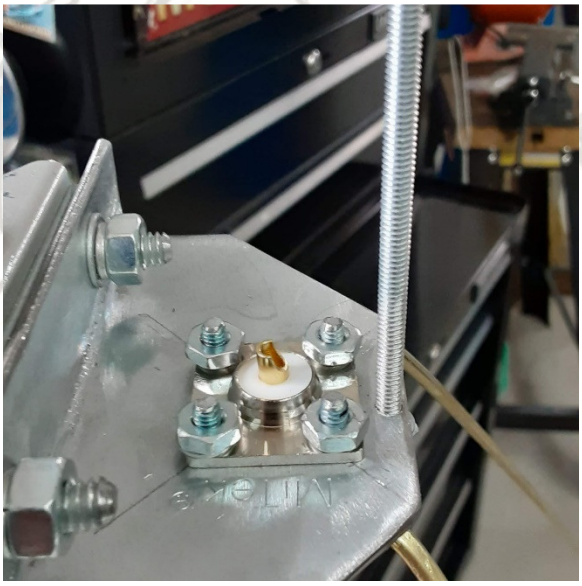
I also marked the corners and removed some of the antenna pole side of the brace (see marks). This is optional.



The bracket with the holes and cuts performed. If you have a sanding wheel for the grinder this will smooth up the metal.

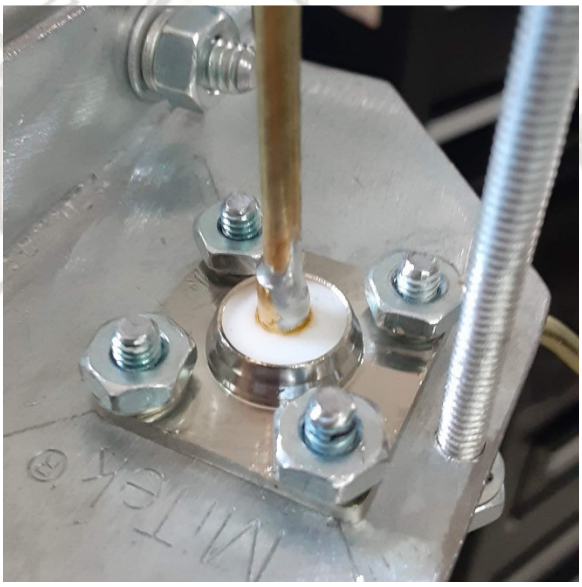
The SO-239 chassis mount connector before screws.  I actually turn over the bracket so the backside of the bracket is up in the final assembly.

Here is the bracket with the holes drilled for the u bolt and a section of antenna mast. The u bolt I used was a bit long so I cut the bolt ends to be a flush with the nuts and to not interfere with the antenna main element.

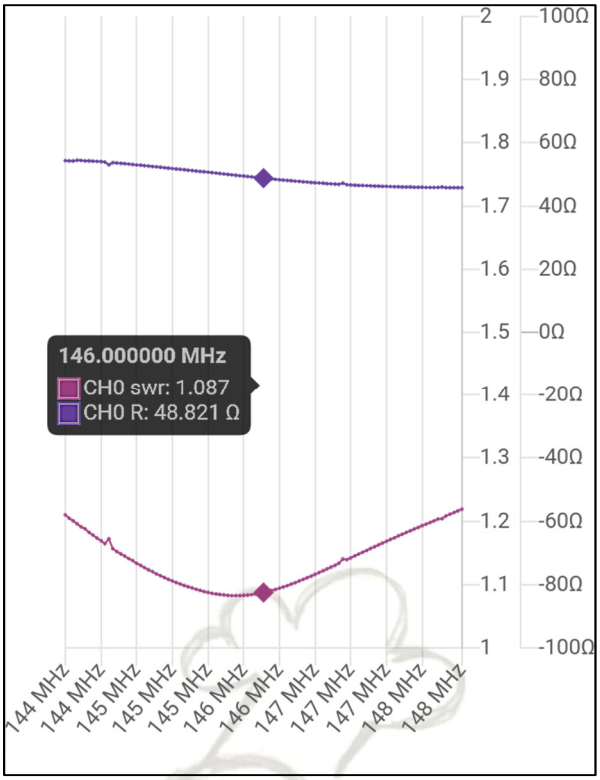


Before I installed the connector I drilled the hole for the J pole all-thread. In this case I drilled and tapped some threads so I can screw in the all-thread to the bracket and then secure with a single nut below. This isn't necessary, a large enough hole to allow free passage of the all-thread and then secure the all-thread with a nut top and bottom after tuning the length.

These are the ground plane elements secured with the 8x32 screws which also secures the connector to the bracket. I used star type lock washers on both sides to prevent the elements from slipping and moving from their position.

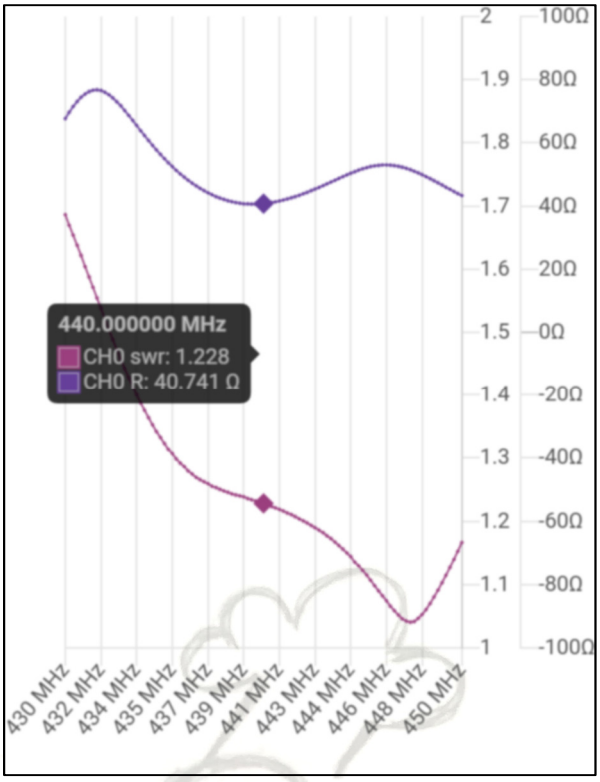


The main 2 meter antenna element is soldered in to the connector. I used a 60 watt soldering iron and try to keep solder at the bare minimum. I started with the element at 20 inches long. This will be trimmed to a 146 MHz center.






The ground radials are trimmed to 21 ½ inches and bent to about 45 degrees to get close to 50 ohm impedance. The main 2meter radial is trimmed to 18 3/8 inches for a swr of 1.087 at 146 MHz. I used the AURSINC nanoVNA-H network analyzer to make these adjustments.






Again using the network analyzer I adjusted the all-thread stub to about 6 7/8 inches to get the 440 MHz frequency swr at 1.228. I tightened down the nut and trimmed excess below. Impedance is at 40 ohms, close enough. Most of the usable repeater frequencies are above 440 MHz so this works out ok. Without this all-tread stub the antenna is not usable a 440 MHz.

The fully assemble and adjusted antenna. I will probably coat the bracket area with some white spray paint to protect from corrosion and weatherproof the coax connection with self-sealing silicon electrical tape. I plan on installing this on my workshop at about 20 feet up. I want to use about 15 feet of LMR400 coax to keep signal losses at a minimum. I'll use a short (3 foot) RG58 pigtail into the shop itself.