

Building a 2 Meter Antenna

The Flowerpot / Broomstick / What Antenna?

ABSTRACT

Of all of the possible 2 meter antennas, the flowerpot or broomstick, is far and away the easiest to build. This antenna is a simple, omnidirectional vertical dipole with a base loading coil. We can argue that only one cut is required!

A favorite pastime of many amateur radio operators is building and testing antennas. A vast field, exotic materials, and piles of expensive gear are not required.

The flowerpot antenna provides improved performance over a "rubber ducky" or mobile mag mount antenna. Mounting and testing the antenna are easy with common tools. Building the antenna helps the operator develop the skills necessary for building more advanced antennas. Amateurs in constrained spaces – apartments, dorms, townhouses, HOA areas – will like the ease of setup and teardown.

In this document, the required materials are listed, the steps for building are described, and the testing of the final product is demonstrated. Components are inexpensive and readily available from several sources.

MATERIALS

Experimenting with antennas shouldn't break the bank. In this case, we start with a long coax cable, terminated in BNC connectors on each end and a 10 foot stick of 3/4 inch PVC pipe. We will also need a few cable ties, electrical tape, and a knife. A four-foot section of iron rebar to pound into the ground is used to stabilize the mast at home or on the road.

These materials are all available at Home Depot or Lowe's.

DESIGN

The wavelength in meters of the frequency of our favorite repeater, 146.94 MHz, is the speed of light divided by the frequency, or about $300/146.94$, giving about 2 meters. One quarter of 2 meters is 50 cm, or about 20 inches. We will have 20 inches of radiating element and 20 inches of shielded coax, followed by a common mode choke. Very simple.

CONSTRUCTION

The first step is to lop the end off the coax feed line. Happily, we can take off 12-18 inches and save that for the next design.

The only cut is going to be 20 inches from the end. Cut only through the insulation and the shield. Do not cut the internal insulator. Cut a slit in the insulator to make removing it and the shield braid easier. That's it.

With the PVC pipe on a stable surface, tape the end of the cut line at one end of the pipe. Leave a few inches free for tuning. Move down to the insulation and tape the stripped portion and the insulated portion at 20 inches.

Prepare the common mode choke. Securely zip tie the coax to the pipe at 40 inches. Make a sharp turn and make nine turns, tightly wound on the pipe. Add zip ties to finalize the choke.

Follow this up with two layers of electrical tape for weatherproofing.



MOUNT THE ANTENNA

Drive the rebar about a foot into the ground (or a five-gallon bucket of sand for apartment dwellers). Slide the pipe over the rebar. This will provide stability and height in an easy-to-setup and take-down solution. Pull the remainder of the coax to the radio area.



TUNE THE ANTENNA

Straight off of the page, the design is stable and should work across the 2 meter band.

Readers with the NanoVNA can read SWR and impedance on the same chart. The use of other tools is left as an exercise for the reader.

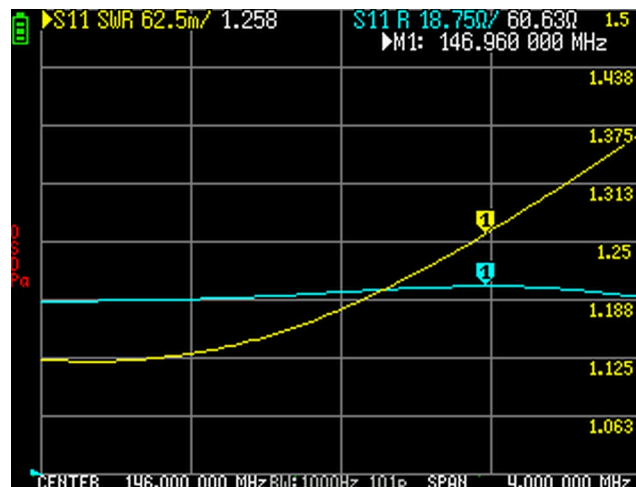
The length of the radiating element affects the SWR and impedance.

TESTING RESULTS

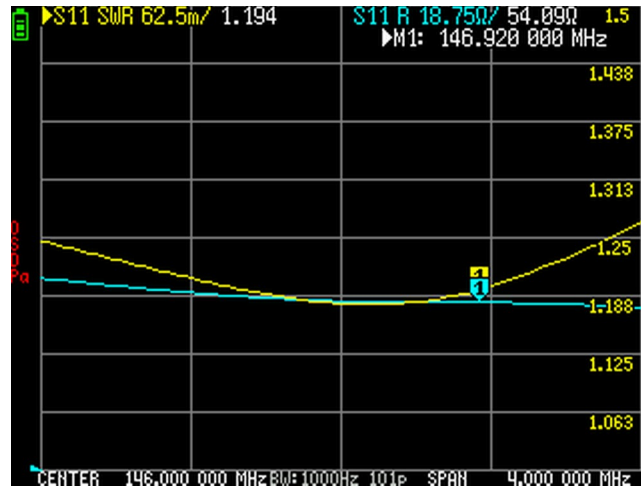
In the first field test, the SWR is 1.25:1, which isn't all that bad.

The plot shows the SWR minimum to be off the chart to the left, so experience tells us the driven element is too long.

The impedance is over 60 Ohms, which is not so great:



After lopping off ½ inch, we get the next chart:



We now see both response curves have flattened. There is little to be gained from further cutting. The SWR is 1.194:1 and the impedance is 54 Ohms. We can work with this.

FINAL THOUGHTS

The flowerpot is a very easy-to-build antenna. Commonly available parts and simple construction techniques make this a good starter project. This antenna can provide improved performance on handhelds and mobile radios over supplied antennas.

Differences in materials and feed line may influence SWR and impedance. Lengths of different antennas may be different. It is important to learn and use antenna tuning skills.