Portable or Emergency VHF Antennas
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For emergency or public service events it is often necessary to have more antenna than the rubber duck on your handheld VHF radio. Nearly ANY external antenna will provide more coverage for your handheld than the flexible dummy loads that come with the radios. While operating portable there are commercial antenna options like extendable half or 5/8 wave antennas that attach directly to the radio. Other commercial options include any base type antenna, quarter wave verticals, or mobile antenna (with a ground plane) attached to a coaxial cable. All of the commercial antenna options cost more than antennas you can build yourself for just a few dollars—plus a bit of your time!

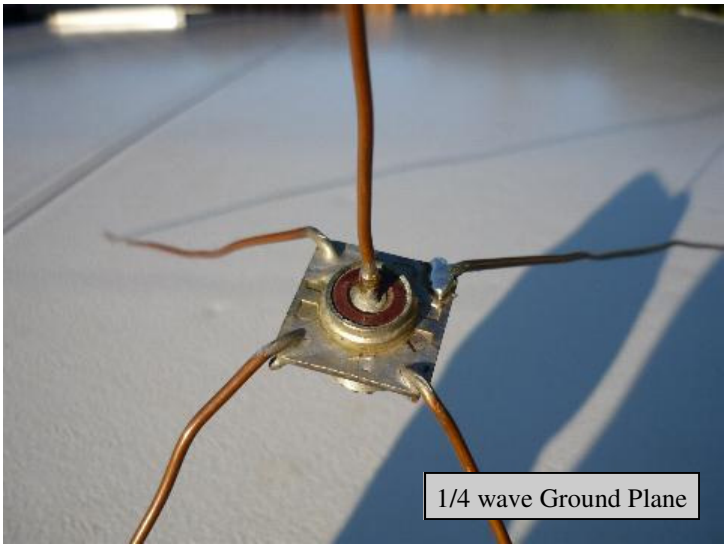
Ground Plane - 1/4 wave vertical

1/4 wave Ground Plane

The ground plane or 1/4 wave vertical will give a good amount of gain over a rubber duck type antenna. It is also incredibly simple to build consisting of quarter wave elements for the vertical and radials. For 2 meters, each part is cut to be 19 inches and then soldered to a coaxial connector. The connector could be a UHF type (shown) or a BNC type. Made out of #14 bare house wire, it is robust and can take multiple instances of being folded down for transport in a pack and then unfolded for use. The radials are bent down at a 45 degree angle as shown to match 50 ohm coax. The small hook at the top of the antenna allows it to be hung from an insulating string or piece of PVC pipe for extra elevation. More height equals better coverage

Wire:
#12 or #14 house wire, bare -
about 100 inches total.

SO-239 UHF connector:
Radio Shack 278-201 $3.69



1/4 wave Ground Plane

Hanging hook

Tiger Tail

Homebrew antenna options include the simple "Tiger Tail" or 1/4 wave (~19" at 2 meters) of wire with a crimp connector to attach under your rubber duck. These work as the counterpoise to make the antenna act more like a dipole rather than a loaded vertical and work amazingly well. You can go from barely breaking the squelch on a repeater to being full quieting by just adding a simple piece of wire!

J-Pole

A more complex, but easily built antenna is the J-Pole. A J-Pole is a 1/2 wave vertical with a 1/4 wave matching stub. A J-Pole is really a radiating feed line and thus can be fed on either side of the 1/4 wave stub.. The J-Pole has some gain over a quarter wave vertical and is omni directional. A J-Pole antenna can be built out of old style TV twin lead (300 ohm parallel feed line) as a roll up antenna. The solder joints and stub matching point can be a bit of a challenge to keep together but this antenna is worth having in you portable kit. This type of antenna is usually hung from a support and needs to be kept away from other metal objects by at least a 1/4 wave—more is better.

I built a J-Pole for portable use with #14 house wire (bare) zip tied to a piece of PVC water pipe. It is rugged and performs quite well. Being more rigid than a roll up allows more mounting options to keep away from metal or to find a "hot spot" to reach the distant repeater. Simple PVC legs can be used for vertical support or it can even be handheld over your head (ask me how I know…).

The measurements are simple for this antenna. The main piece of wire that forms the J is 83 1/2 inches long. This piece bends into a 60 inch long piece to the bottom of the J which is 2 1/4 inches wide to the short side of the J which is 19 inches long. The feed point is done with a BNC connector and a piece of wire to bridge the J gap. The feed point I found to give the best SWR was 3 inches above the bottom of the J. To get the best SWR, I also put a short stub of 11 inches of wire below the J which seemed to help decouple the feed line from the antenna and made the antenna very stable. Performance was the same either way, but the SWR was better making the radio happier.

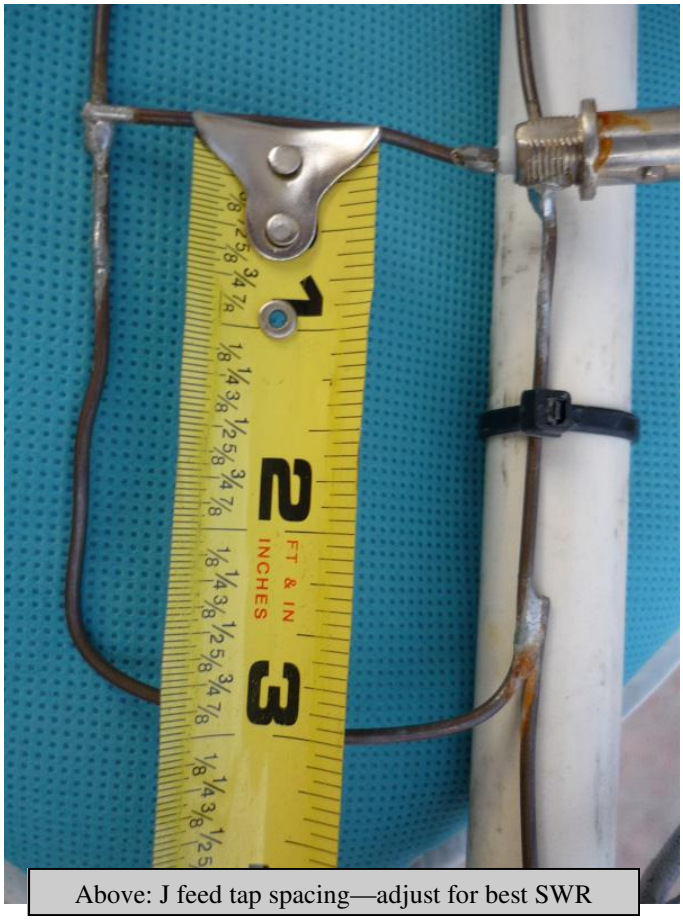
The antenna is attached to the PVC water pipe with zip ties. The zip tie which lines up with the top of the J section is left long to be a horizontal support across the gap. Some electrical tape keeps it around the short section and the folded part of the zip tie together. A very small J bend on the top of the antenna keeps it from sliding down the pipe. A piece of nylon string is attached to the top of the pipe to allow hanging from the top like a roll up antenna

While not as robust as the 1/2 inch copper J-Poles that I have built, this antenna is quite a bit cheaper with less than $5 in parts even if you have to buy everything new. Scrounging or substituting different parts is allowed—just build something!

J-Pole built of house wire attached to PVC pipe

Above: J attaching and length

Above: J spacing



Above: J feed tap spacing—adjust for best SWR

Above: J attaching and length

Wire:
#12 or #14 house wire, bare - about 100 inches total.

BNC Connector :
Mouser: 227754-2 $1.44
eBay from China 10 for $5—free shipping

Zip ties:
$2 per bag at Harbor Freight

3 Element Yagi Beam

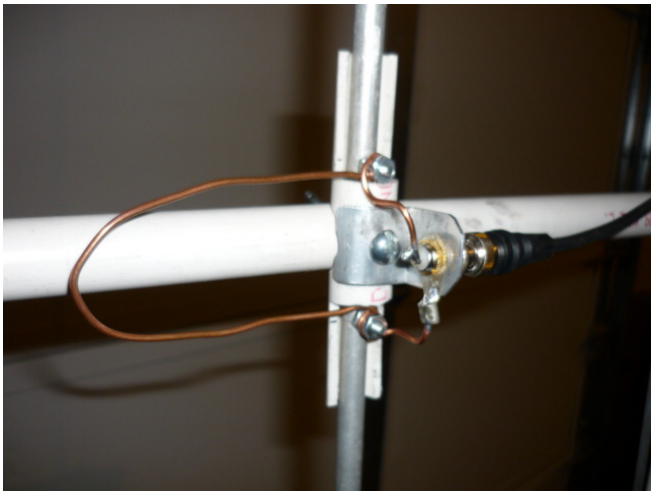
A slightly more complex antenna, but very build capable with simple tools, is a Yagi beam. Small aluminum tube or solid rod can be bought at home centers or better hardware stores. Copper tubing, like the size for ice makers or evaporative coolers, could be used at slightly more expense. Use what you have or can scrounge! PVC pipe, 1/2 or 3/4 inch, is used for the insulated boom and driven element insulator. A piece of copper house wire is used for a hairpin match to allow feeding directly with coax.

The construction is similar to the "tape measure beam" except using solid elements which are removable from the boom for transport and insert into holes in the boom. Pieces of electrical tape set the distance that the element goes into the boom and only allows one end to be used to keep the element alignment correct. A bolt and a wing nut attach the driven element assembly to the boom. A BNC bulkhead connector allows easy attachment to a coax to run to the radio. This beam can be handheld or attached to a temporary support for extra height.

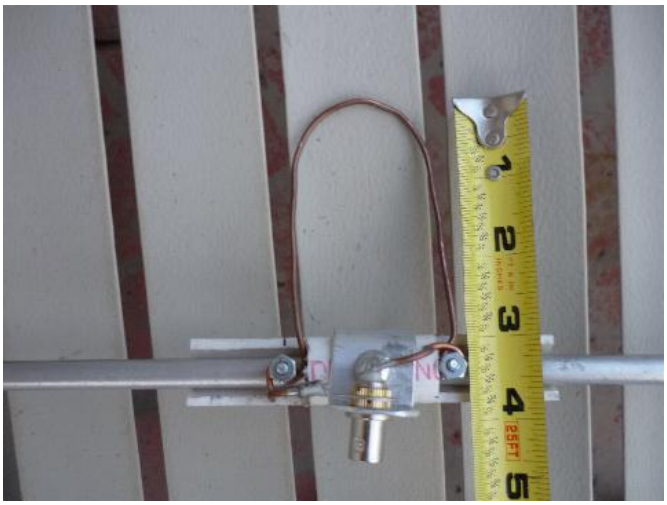
The element spacing is 8 inches between the reflector and the driven element; 12 1/2 inches between the driven element and the director. The reflector is 41 3/8 inches long. The driven element is two pieces of 17 3/4 inch. The director is 35 1/8 inches long. Further directors could be added with the 12 1/2 inch spacing, but PVC pipe boom will only hold so much weight. The hairpin match is 3 inches by 1 3/4 inches. The hairpin attaches to each side of the driven element and to the BNC connector.

Driven element support construction

Above: Beam apart for transport

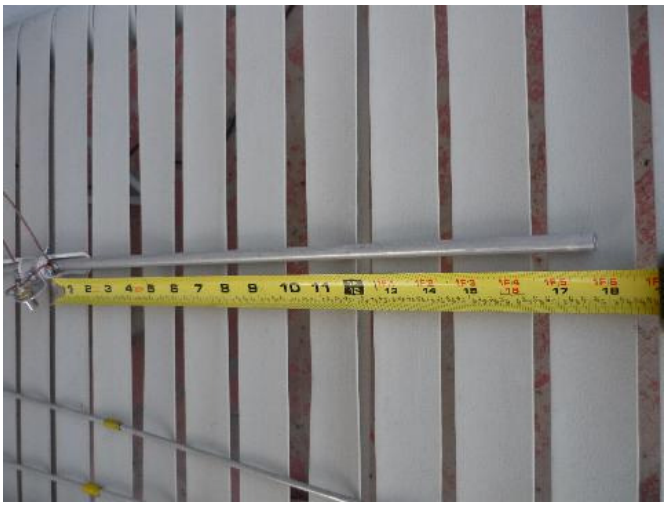


Above: Hairpin matching and driven element



Above: Hairpin length

Above: Hairpin width



Above: Driven element length (each)

Above: Reflector length


Above: Driven element details

Simple Supports

PVC pipe and connectors can be assembled into a temporary support to hold any of the above antennas. 1/2 inch or 3/4 inch pipe with a small collection of tee, cross, and elbow connections can be assembled into many configurations to hold your antenna in a good spot for transmitting while you are at the other end of a coax in a nice chair. A locally obtained weight will keep the simple support from being blown over in a breeze—use a rock or a board or whatever is at hand to get the job done. Nylon string can also be used as guy wires to support the vertical section using tent stakes or other locally obtained weights (rock, board, etc.).