Geoff Haines, N1GY

A Neat Dual Band Antenna

Need an easy to build and inexpensive VHF/UHF antenna for field or base station use? Geoff tells us how to make one.

This project is the latest in an ongoing series of antenna projects all using the same basic design. The original design was by Harold Melton, KV5R, of the Athens (Texas) Amateur Radio Club. I found it on the club's Web site (**www.athensarc.org/techindex.htm**). There you will find a link to a *Sleeved Dipole*. My first attempt at building this antenna was a complete success! It worked just as Harold said it would.

Follow KV5R's directions about adding the Penetrox treatment to prevent corrosion. The performance on both 2 meters and 70 cm was excellent and the cost was almost free. I did add a few features such as a ground spike so I could mount it just by planting it firmly in the dirt and a take-apart connector just below the antenna elements so it will fit in my car easily. This antenna, made of aluminum duct tape (the shiny metal tape, not the grey cloth stuff) applied to a 7 or 8 foot chunk of ½ inch schedule 40 PVC pipe, is now a part of my ARES "go-kit" (see Figure 1).

Final version of dual band antenna.

Can I Make a Better Mousetrap?

Encouraged by this success, I started to wonder what else could be done with this design. I had some ¾ inch aluminum tubing (previously known as old tent poles) lying around the shop, so I decided to perform a little experiment.

I cut two pieces of the tubing to the dimensions listed in Harold's article and assembled them to the coax with a short piece of PVC to space them the proper ¼ inch apart. The coax was terminated in soldered ring terminals. Self tapping sheet metal screws connected the shield and center conductor to the appropriate elements and secured the elements to the PVC spacer. The coax, as before, comes up through the lower element and exits through a hole in the PVC to be secured with the sheet metal screws as shown in Figure 1.

This antenna was then secured to another piece of ¾ inch PVC as a short mast extension to place the antenna elements above the metal mast I planned to secure it to. I did place a common mode choke in the coax about 12 inches below the lower element. I used five turns of the coax wound in a 5 inch diameter flat coil as shown in the photos. This version, cut to exactly the same measurements as the tape model, also worked as well. The VSWR measured under 1.2:1 on the FM portion of 2 meters and under 1.8:1 on the FM portion of 70 cm. On both bands it measured 1.0:1 near the band center. I erected it on a 15 foot conduit mast at the back of my home and it is still in use as my primary dual band antenna. The only downside was a somewhat ragged appearance.

Making a Silk Purse from a Sow's Ear

I decided to take the design one more step and see if I could come up with a neat and clean looking antenna. The measurements from KV5R's original article were again used for the ¾ inch aluminum tube elements — 21⅛ for the upper element, 15⅝ for the lower element, with a ¼ inch gap between the two. I realized that the ¾ inch aluminum tubing uses that number as its outside diameter, and that ¾ inch PVC pipe quotes an inside diameter. Sure enough, the aluminum tubing slides neatly into the PVC with just a little slop. If I could find a plastic spacer/connector to control the ¼ inch spacing, it might work.

The local home improvement store came to the rescue with a ⅝ inch hose barb. Well, almost. The center of the barb has a collar around it that was a problem, but I solved that by sanding it off with my belt sander. I also had to sand the barbed portions to just a little smaller diameter for a snug but not too tight fit in the ¾ inch aluminum tubing. With a hole drilled through the side of the barb I ran the coax up through the lower element, and out through the hole in the side of the hose barb. After dressing the end of the coax to create a shield lead and a center conductor lead, the coax was pulled back until the leads were level with the side of the barb. The leads were then secured to the aluminum elements using adhesive foil of the type used in assembling stained glass projects. This adhesive copper foil is available from craft shops. An inexpensive roll will last you through many projects, and has many uses, including building "quick and dirty" simple "cardboard PCB boards."

I then assembled a UHF connector on the other end of the coax and tested the antenna for short circuits. Finding none, I proceeded to create the PVC *radome*. I measured the total length of the antenna assembly as 37 inches. I measured down from the top of the PVC pipe that same 37 inches and inserted a single short screw through the side to serve as a stop. The coax and antenna assembly were then threaded down the PVC pipe from the top until the lower element hit the stop screw. At this point the UHF connector and coax extended well past the bottom end of the radome. I put a weatherproofed PVC end cap on the top end of the pipe.

Since the PVC pipe I used was about 5 feet long, there was plenty of empty PVC pipe below the antenna to permit securing it to any kind of mast, metal

Figure 1 — Intermediate antenna design as shown in Figure 3.

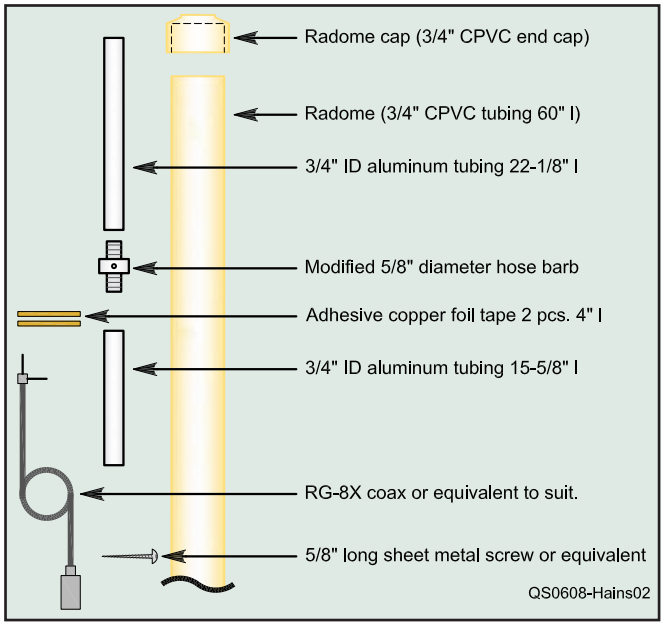

Figure 2 — The components of N1GY's version of the antenna.

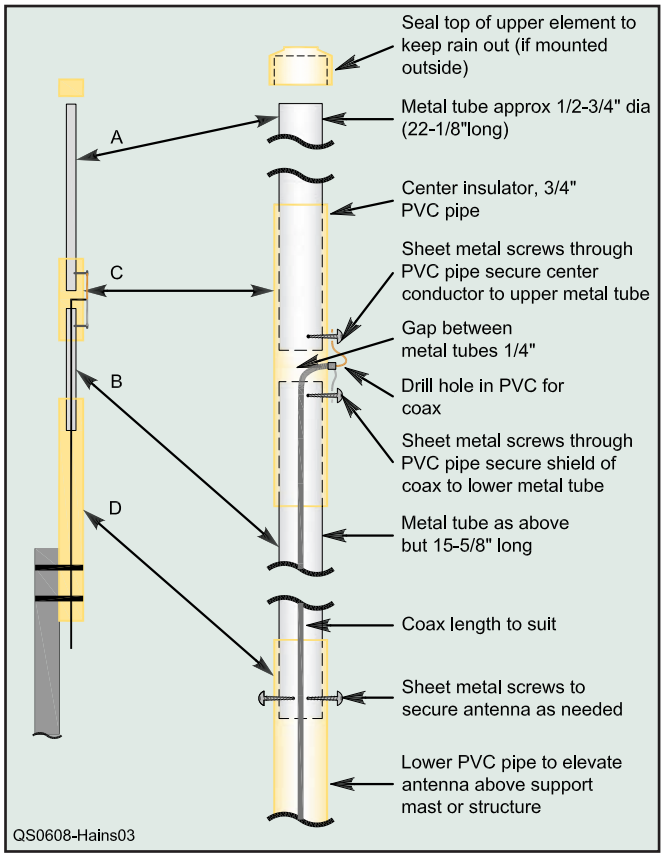

Figure 3 — Details of radome construction.

or otherwise. I took the precaution of marking the outside of the PVC radome to indicate where the lower antenna element ends, so that securing it with metal hose clamps or U bolts would not detune the antenna. The construction details of this version are shown in Figures 3 and 4.

So How's it Work?

Another session with the VSWR meter proved that an excellent VSWR was still present on both 2 meters and 70 cm. This antenna is really broad-banded, because I could not find a point on either band

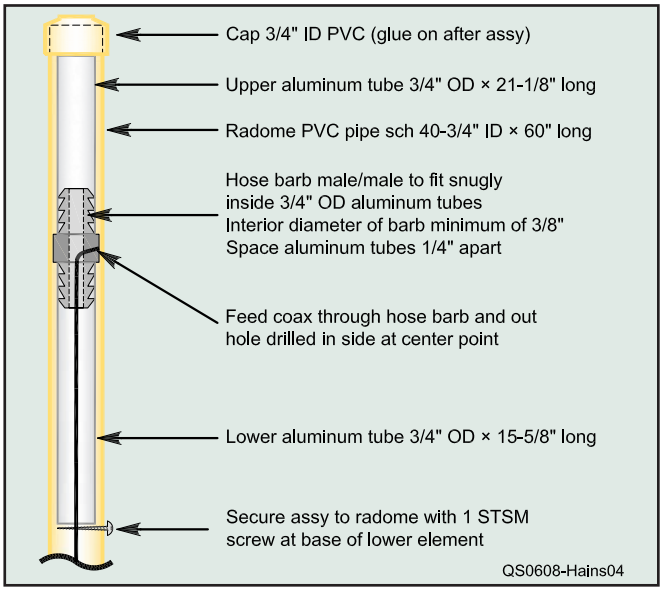

Figure 4 — Details of antenna installation in radome.

Figure 5 — A simple ground spike is all that's needed to get it on the air.

at which the SWR was above 2:1. A session with an MFJ-269 antenna analyzer demonstrated the antenna's broadband coverage. It certainly performs as well as the commercial dual band J Pole antenna it replaced, and provided a better VSWR on 70 cm as well.

Esthetically, the antenna is a complete success. It has all the appearance of one of those fancy fiberglass radome base station or repeater antennas at a cost of less than $20. The choice of mounting clamps is up to the builder. Anything from U-bolts to big wire ties will work. The spike shown in Figure 5 provides a convenient way to secure a portable version. Mileage may vary on the choice, of course.

On the RF side, I think we have success also. Pending the results of more precise analysis, the anecdotal reports are all good. All of the different versions of the antenna have good VSWR. My results have been verified by another builder who used ½ inch copper tubing for his version. He is able to get into a repeater with full quieting from about 50 miles away using only 10 W with his antenna mounted inside his attic due to CC&R restrictions. The antenna is sleek and easy to construct. With all the materials at hand and appropriate hand and power tools such as a belt or disc sander, I estimate it will take less than two hours to complete the latest version, probably less for the earlier ones.

Geoff Haines, N1GY, has been licensed since 1992 and holds an Amateur Extra class license. He retired after a career in respiratory care. He currently holds several ARRL appointments in the West Central Florida Section, including Technical Coordinator, Technical Specialist, Official Bulletin Station, Net Manager, Official Emergency Station and Official Relay Station. He is the President of the Manatee Amateur Radio Club, a member of the Manatee ARES group and member of the Bradenton Amateur Radio Club, the Yale University Amateur Radio Club and the Meriden (CT) Amateur Radio Club. In his spare time, he enjoys homebrewing antennas and accessories for his Amateur Radio operations. Geoff can be reached at 708 52nd Av Ln W, Bradenton, FL 34207; **n1gy@arrl.net**.