DIY

Worthwhile projects you can build on your own

40-meter Dipole Antenna Plus

Continuing our HF theme from last time, let's take things down to a slightly simpler (and cheaper) level, and build perhaps the most basic HF antenna you can make: a halfwave dipole, this time for 40 meters. The ironic part to this, however, is that the halfwave dipole is also perhaps *one of the most effective antennas you can DIY easily*. In fact, if you think about it, many good antennas are actually dipoles in one form or another. Let's start again with a parts list:

SO-239 bulkhead

√ Two 1-1/4″ PVC slip (not threaded) caps and PVC glue
√ 3″ long 1-1/4″ PVC tubing
√ Four 8″ zip ties
√ SO-239 bulkhead (flanged and solderable) connector
√ Four #6 screws (about 3/4″), nuts, and lock washers
√ Three 3/16″ or #10 eyebolts (about 2″) and nuts
√ 64 feet of stranded 14 AWG wire (THHN insulation is good)
√ Two dogbone (or other) insulators

PVC slip cap

Drill a 3/16″ hole in the center of one of the PVC caps, then install one of the eyebolts and its nut in the hole. Apply a *smear of* PVC glue to the inside of the clean, bolted cap, then insert the clean PVC tubing and allow to dry. Drill two more 3/16″ holes in the sides of the same bolted cap, on opposite sides from each other, about the middle of the cap (not the tube) sides. Install the remaining eyebolts and nuts in the newly drilled holes. Drill two 3/16″ holes in the PVC *tubing* below the side eyebolts, about 1/4″ below the cap edge.

In the center of the other PVC cap, drill a 10 mm hole. Place the SO-239 bulkhead on the hole to locate where the smaller flange holes should be drilled, then drill the four #6 (about 9/64″) holes. Cut the wire in half and thread one of the wires through one of the side eyebolts, its nearest 3/16″ tube hole into the tube, then through the large hole in the loose cap. Thread the other wire through the other side eyebolt, its nearest 3/16″ tube hole into the tube, then again through the large cap hole. (BTW, using 12 AWG instead will lower your loss.)

Strip and solder the end of one wire appearing through the large cap hole onto the center conductor of the bulkhead, then connect the other (using a crimped lug, for example) to one of the four bulkhead screws. Bolt the bulkhead onto the cap, then glue the cap to the tube. Drill a 3/16″ hole in the cap right next to the bulkhead, for a rainwater drain. Zip tie a loop in each wire around its eyebolt about an inch from the eyebolt as a strain-relief. Use the following to measure the wire from the eyebolt to its dogbone insulator (use the lowest band frequency to reduce antenna loss throughout the band):

Dogbone insulator

$$234 \div 7.00 \text{ MHz} \times 0.95 = 31.757 \text{ ft} \approx 31 \text{ ft } 9 \text{ in}$$

Thread the end of each wire through the dogbone, and zip tie the wire back around itself, but do not cut it, so that you can tune it if needed. Your 40-meter dipole is now ready to use.

DIY, continued

40-meter Dipole Antenna Plus

The completed 40-meter dipole

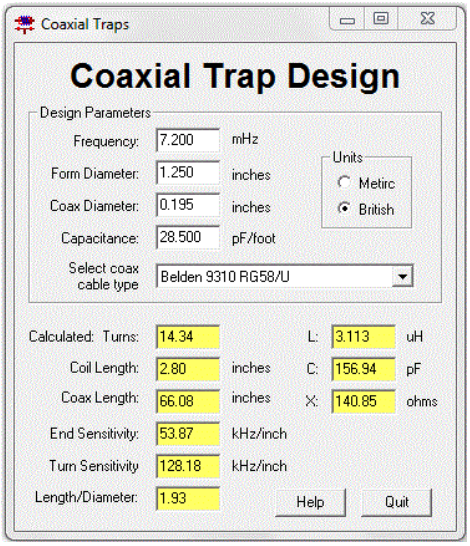
But wait...there's more! Here's where the ***Plus*** part comes in.

Wouldn't it be nice to somehow turn this simple gem into a dual-bander for, say, 80 meters *and* 40 meters, yet keep the project simple? Well, knowing a little about reactance and resonance, we can build what's known as a ***trap***, which will transform our nice 40-meter dipole into a dual-band dipole. And since the inductance and capacitance (and therefore reactance) properties of RG-58 are well-known, let's use a length of that coax as the trap conductor. You're also going to need to cut two more 24-foot lengths of the 14 AWG antenna wire for the 80-meter wires, and remove the dogbone insulators from the 40-meter dipole.

$$L = \frac{\mu_0 N^2 A}{l}$$

Air-core inductance

The goal is to use parts that you already have, and it turns out I have a short tube of 1-1/4˝ Schedule 40 PVC plus a roll of RG-58/U (not RG-58A/U). On one hand, you can use the "air-core inductance equation" to calculate the trap inductance to start with. On the other hand, you can use the *Coaxial Trap* program (freeware download from VE6YP) to perform that calculation and more. Entering what we know (frequency, coax type, PVC diameter), it indicates that we need 66 inches of the coax in 14-1/3 turns around the PVC. After winding and securing the coax to the PVC, cut the tube to an inch past the coax windings.



Make use of the trap's internal capacitance by connecting the center conductor of one end to the shield of the other end. Attach one wire of the 40-meter dipole to one (the unconnected trap center conductor) end, and the 80-meter wire to the other (shield) end of the trap. Attach the 40-meter wire to the trap PVC tube to relieve the strain on the trap coax. Thread the other end of the 80-meter wire through a dogbone insulator, such that the length of the wire between the trap and the dogbone is 21 ft 5 inches. You might want to borrow an antenna analyzer to make sure your 80-meter wires are length-tuned to about 3.7 MHz, and that the 40-meter section is still tuned to 7.0 MHz. Your dual-band 40/80 HF antenna is complete! See W8JI Traps for more tips on improving this antenna.

Finished trap, showing connections

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