

# DIY

Worthwhile projects you can build on your own



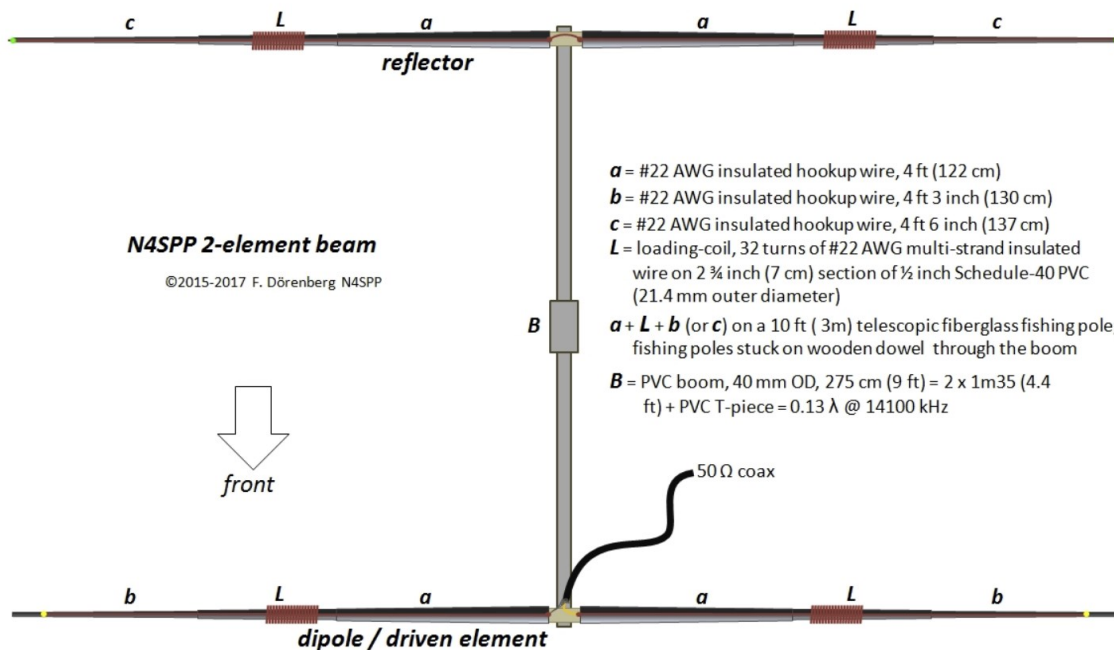
## 20-meter portable Yagi beam antenna

Many of you have commented that you really appreciate the several 2-meter antenna and dipole HF designs we've featured in the *UVARC Shack*. But several have asked whether there aren't any real HF beam antenna plans available for DIY, so that they can compete with the big boys and their big boy antennas, but on a little boy budget. Turns out there are, and this one, compliments [N4SPP](#) and [WB3JZO](#) is a terrific performer. Plus, it's vehicle-portable.

When completed, this Yagi beam exhibits about 7.1 dBi gain at 14.150 MHz, with a 2.0:1 bandwidth slightly wider than the 20-meter band. Like many store-bought HF antennas, this one uses loading coils to shorten its elements and reduce its size to one that's a lot easier to mount and support by normal humans. But that shortened size comes at the price of performance, as in gain and beamwidth. Still, for the cost and simple construction, you can't beat it.

### Parts list:

- |   |                                   |
|---|-----------------------------------|
| 60 feet of 18 AWG speaker wire (30 feet of the pair)  | 10 8-32 X 1-3/4" truss head bolts |
| 3 1" X 10-foot section of Schedule 80 PVC (conduit)   | 10 8-32 flat washers              |
| 2 1/2" X 10-foot section of Schedule 80 PVC (conduit) | 10 8-32 wing nuts                 |
| 3 1" three-way electrical conduit T-boxes             | 3 7/8" X 48" wooden dowels        |
| 1 pkg 18 AWG spade lugs                               | 1 pkg 18 AWG spade receivers      |
| 1 SO-239 solder bulkhead connector                    | 1 10-foot top-rail                |



This diagram closely reflects our description in many respects



# DIY, continued

## 20-meter portable Yagi beam antenna



The design I'm going to describe, which requires the parts in the list on the previous page, is for a non-telescopic set of elements. This keeps our construction simple and inexpensive, yet allows the entire setup to be broken down into 5-foot-long sections for vehicle portability. I'm also using 18 AWG wire for convenience, instead of the recommended 22 AWG, which changes things a bit from the diagram.

### Let's get started

The speaker wire is normally sold as a pair of wires wound on a spool, so before you begin using it, separate the entire 30-foot length into 60 feet of single wires. Typically one wire will be copper-colored and the other silver-colored, but it doesn't make any difference which you use where.

Cut four inside legs from 52- $\frac{1}{2}$ " inches of 1" PVC. Wind 26 turns of the wire in a tight coil starting 2" from one end of the inside leg, leaving 3" of wire, so that 1" of the wire extends past the end of the PVC. Run the wire from the coil to the other end of the PVC, so that the wire extends 5- $\frac{1}{2}$ " past the other end. Install spade receivers onto three of the non-coil (boom) wire ends, and a spade lug onto the fourth boom (reflector) wire end. Install spade lugs (males) on the coil end of all four wires. Secure all the coils and wires to the 1" PVC.

Cut two reflector legs of 54 inches of  $\frac{1}{2}$ " PVC and two driven legs of 51 inches of  $\frac{1}{2}$ " PVC. Attach speaker wire to all four reflector and driven legs such that the wire terminates at the end of the  $\frac{1}{2}$ " PVC on the outside end and extends an inch past the end of the  $\frac{1}{2}$ " PVC on the inside end. Terminate all four inside wires with spade receivers (females).

Cut two 51- $\frac{1}{2}$ " lengths of 1" PVC for the boom. At one end of one of the two boom pieces attach an SO-239 bulkhead solder connector. One thing I did was attach an angle bracket to the boom with wood screws, about an inch from where



*Coil detail*



*Spade lug and receiver*



*SO-239 bulkhead detail*

the T-box will go, then bolt the bulkhead to the bracket. Attach an 8-inch speaker wire to each of the conductors of the bulkhead connector, and terminate the other end with a spade lug. Because of the soft Teflon dielectric of the bulkhead connector, another thing I do is install a PL-259 connector to it prior to soldering, in case you heat the center conductor just a bit too much. That'll keep the center pin centered as it should be.



# DIY, continued

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For each pair of inside legs, insert dowels (as stiffeners) between two of the inside legs at the non-coil end through the boom end T. Drill a 5/32" hole about 1" from the coil end of each leg, through the 1" PVC and the 1/2" PVC and the dowel.



### Set it up

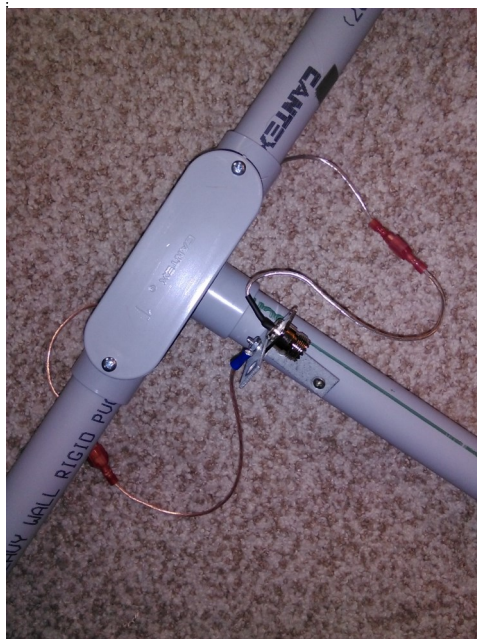
For each leg, slip the dowel into the inside end of the 1/2" PVC leg, **Electrical conduit T-box** the inside end of the 1/2" PVC leg into a 1" PVC at the coil end, and secure all three with a truss head bolt, flat washer, and wing nut. Connect all the spade lugs to their receivers. Connect the coax to the SO-239 bulkhead, and drape the coax over the boom for a strain-relief. Place the boom center T onto the mast, and have fun on 20 meters!



As the author points out in his article, you're not going to wind your coils the same way I do, and your antenna dimensions and environment will differ from mine slightly, so once you build this beast, you'll want to tune it. You can do this by checking your SWR bandwidth with an analyzer while shortening a wire element here and there.

**Dowel inserted through the T**

One neat thing I found is that a top-rail fits perfectly in the boom center T, so I use two 10-foot sections for my mast, which I then insert into a tripod. Also, the antenna will obviously be quite top-heavy, so you'll want to guy the whole setup, especially if you raise it on a windy day.



**Completed boom and driven joint**



**The author's finished project**