6 Meter / 2 Meter / 440
Tri-Band Sleeved Collinear Antenna Project

by
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Here is a Tri-Band 6/2/440 Collinear antenna that if built properly, using the materials suggested by the author, should give you years of service. It is a heavy duty fiberglass radome style collinear multiband vertical capable of operating on your choice of 6 meters, 2 meters or the 440 ham band. The radome enclosure is about 18 feet long containing the 5 antenna elements. Mother Nature will need lots of help to harm it!

PREPARATION FOR BUILDING

Supplies & Suppliers:

Fiberglass Tubing from Max-Gain - 4 sections:
1ea 1 3/4” X 48”
3 ea 2” X 48”
(Only 2 of the 3ea 2" X 48" sections are used for the antenna. I used the extra 2" section for later on the bottom mount)
http://www.mgs4u.com/fiberglass-tube-rod.htm

Tip: PVC CAN BE SUBSTITUTED for fiber glass tubing, but won't be as strong.

Galvanized Hardware cloth 1/4” or smaller mesh at any Hardware store:
3 sections 38.1/4” X 4”
2 sections 19.1/8” X 4”

20 feet. #18 insulated wire (used for hookup of elements from bottom to top)

Wooden Dowels- 5 pieces 1 1/4” x 6”.
(Used for support of antenna elements inside radome and to center connecting wires.)

Marine Epoxy
Hot Glue gun
Staple gun

Assorted hand tools as needed

Preparing the dowels:

Drill 5 pieces with 8" x 1/4" drill bit and drill press.
Tip: If you don't have a drill press, just use a 4 inch or longer 1/4" drill bit.
Secure the dowel in a vice upright and drill as carefully as possible starting centered at one end of a dowel and drill towards the center of the opposite end. Repeat from the other end. Hopefully the holes will meet and you will have a 1/4 inch hole all the way through the dowels. Smaller or larger size drill bits may be used as long as #18 wire will go through the hole in the dowel easily.
Drill center of dowel end to end as best possible. If you are a perfectionist, just take the dowels to a local shop that has a drill press and tell them exactly what you want.

Next, near the center of the dowels on opposite sides, drill 45 degree angle holes down into the center hole. Both holes should exit the dowel near the center 180 degrees apart, (on opposite sides). This is required so you can pull the #18 insulated wire through the dowels so it can be fed to the next element. See Drawing below:

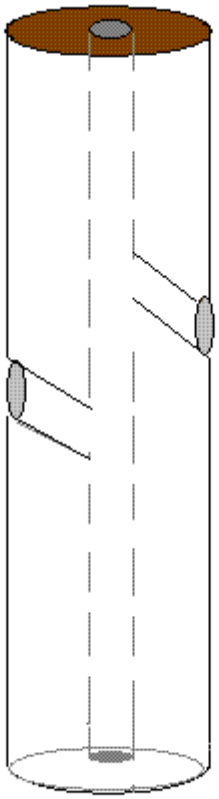

Figure 1.

Preparing the coax end:

5 ft RG-213 with high quality PL-259 at one end. Strip about 3 inches of insulation back and twist the shielding together so both conductors may be pulled through the bottom dowel later. **The bottom dowel must be drilled large enough so the coax can be pushed through it.** Leave about ¼ inch inner insulation on the center conductor to isolate them electrically.

The Balun:

7 pieces of #43 ferrite beads for balun. **You must slide them over coax now before assembly of antenna unless you leave the PL-259 off until later.** http://www.amidoncorp.com/

THE BASIC CONSTRUCTION:

The basic construction of the Tri-Band Collinear consists of an outer radome of 1 3/4" and a 2" fiberglass tubing (PVC can be used) with a PVC cap at the top. I purchased the tubing from Max-Gain, and had them cut to 48" for shipping. The exact length of sections or placement

of the joints in the fiber glass radome is not critical, as long as you end up with enough total length to house the entire assembled internal parts. It will be about 18 feet including bottom support.

To assemble, join the 1 3/4"X48" sections with marine epoxy and 2" X 12" sleeve tubing epoxyed over the joints to reinforce and strengthen it. Total finished length is about 18 feet. **Refer to diagram drawing below and pictures at bottom or article.**

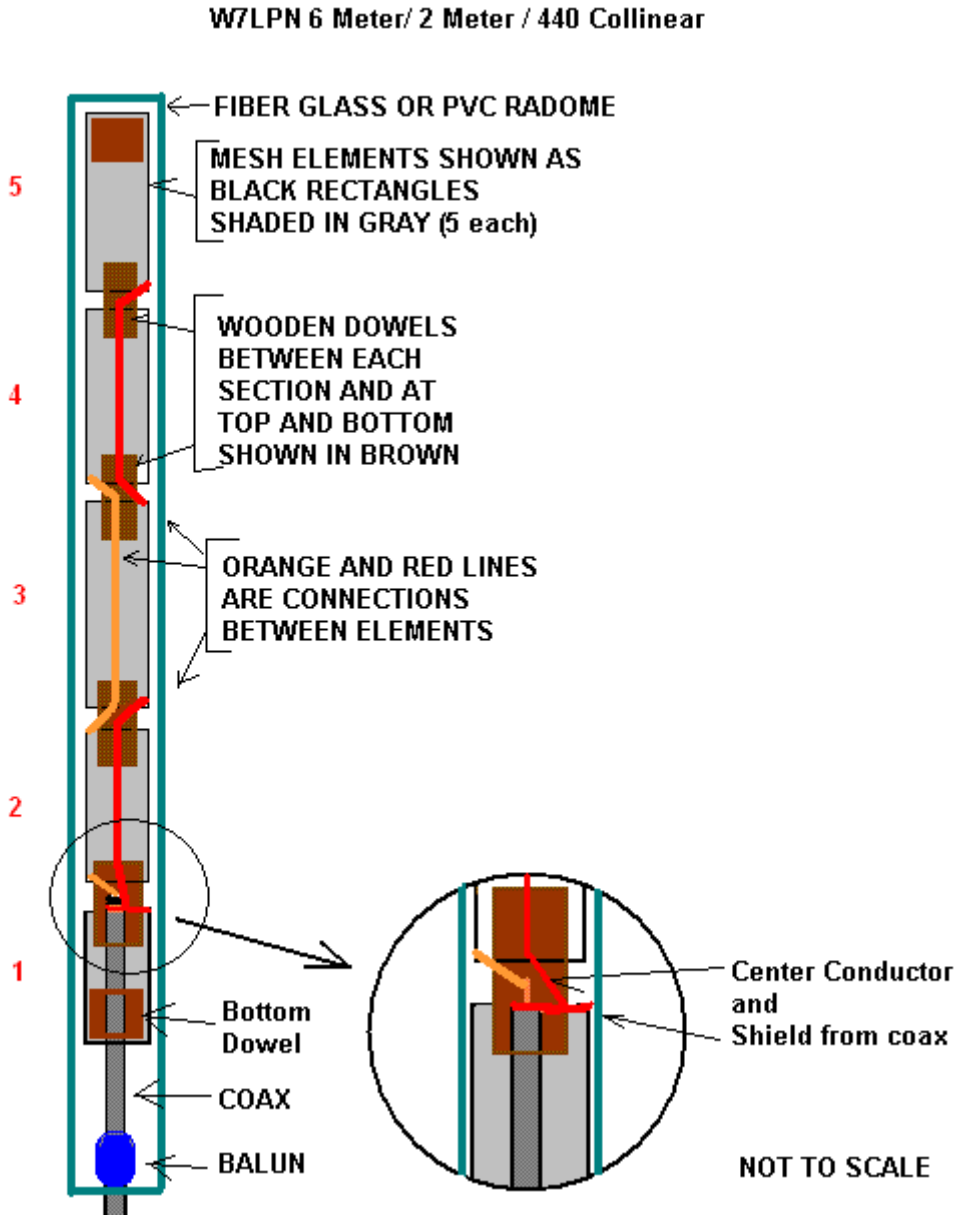

Figure 2.

Notice in the inset in drawing that the center conductor from coax is connected to the bottom of element #2. The shield is connected to

the bottom decoupling sleeve shown in gray in the drawing and also to the length of #18 wire that is fed up through the dowel in the bottom of element #2.

Building the antenna elements:

The actual antenna consist of 1/4” hardware cloth sections cut 38 1/4”x 4” and curled around 1”x 6” wooden dowels placed between each element. There should be a dowel inserted in each end of the mesh sections when done. The top and bottom sections are 19 1/8 inches long. The other 3 remaining elements are each 38 1/4 inches long.

If you have a long enough working area lay out all the mesh on the floor end to end starting with a 19 1/8” section and ending with a 19 1/8” section.
Element lengths:
#1 - 19 1/8" (**At bottom of antenna**)
#2 - 38 1/4"
#3 - 38 1/4"
#4 - 38 1/4"
#5 - 19 1/8" (**At top of antenna**)
1/2" space between each element.

Place the finished dowels between each element and at both ends. First staple the mesh on the ends to each dowel making one continuous piece, leaving an electrical separation between elements of about 1/2”. Curl them around the dowels at the ends of the 38 1/4” lengths by wrapping the 4” around the dowels to form a 1 1/4” mesh and wooden tube.
The center edges of mesh between the dowels will be opened a little. Don't worry about that, but make sure the sharp edges are bent inward slightly. Staying open helps keep it flexible while inserting it into the tubing later.
The dowels have been center drilled end to end to run the thin #18 wire through. It doesn't have to be perfect. This allows you to maintain the thin wire #18 centered. Think of the thin wire as the center conductor of a piece of coax and the mess as the shielding.

Connecting the elements:

The thin #18 wire is threaded through the dowels and soldered alternately, skipping one element at a time and soldered 180 degrees

from the other thin wire connection to separate the connections electrically. **See drawing Figure 1. and Figure 2. above.**

Element#1 drops down over the open end of the coax as a decoupling sleeve with dowel #1 drilled 1/2" so it slides over the coax.

Solder the shielding to the upper end of element #1 on the opposite side where you will solder the center conductor to element #2. At that same spot, a thin #18 wire is soldered to the shield and threaded through dowel #2, between elements 1 & 2, up through dowel #2 to element #3, which is repeated to #5. 45 degree holes in the dowels are there to pull the shielding downward, and the center conductor up and outward.

The center conductor of the coax is soldered directly to element # 2, then a thin wire from the top of element #2 threaded though dowel (#3) up and through dowel (#4) and soldered to element #4. Then, the #1 shielding decoupling element (at bottom) conducts to #3, which conducts to #5. #2 center lead conducts to #4.

In other words, the center conductor of the coax feed, using #18 wire, is connected to elements 2 and 4 ONLY. The shield of the coax connects ONLY to elements 1, 3, and 5, using #18 wire.
If you are having trouble understanding this, just refer to the drawings.

The finished internal parts are close to 13 feet minus the balun.

I chose to use the other 48”X 2” fiberglass tubing as a bottom mounting stub and to cover the balun for weather proofing. I slid the 2” tubing up over the 1 ¾” tubing, 2 feet, to reinforce the base and leave enough to cover the balun.
The Balun is provided by placing 7 pieces of #43 ferrite beads at 38” below #1 element.

We used spray silicone to slide the completed "guts" into the radome and held everything in place with marine epoxy.
Everything is sealed air-tight within the fiberglass radome.

Here are some un-scientific "gain" and SWR readings:

2m - 8.56 dBi
440 - 12.02 dBi

6m - 3.07 dBi

SWR- Taken from the idiot meter on my FT-857D
Barely shows a mark from 144.1 to 147.9 -1.2 or better.
about 1.4 to 1 for the entire 440 band
6m - Still checking. Seems about 1.7-1.9 to 1.
Im going to get a good SWR meter!

Caution! It is suggested that no more than 100 watts of power be used with this antenna on any band. Higher levels may damage the antenna or your transmitter!
Exact safe power levels have not been verified!

References:
If you are familiar with the “Coax Collinear" (http://www.sadona.com/news/ant_coaxcol.html) made from RG-58 of similar length elements, all I have done here is used large elements for broader band width and removed the velocity factor shortening of the coax, borrowed the thin wire alternating with large diameter elements from the “Simple Collinear" (http://home.comcast.net/~ross_anderson/sc.htm), and beefed up the wind loading. Practical reception should be better due to the increased overall length. This is a very strong antenna. We have joked about mounting an American Flag on it.