A Plumber's Delight 3-Element 6-Meter Yagi

Introduction

This construction article provides guidelines to fabricate a 6-meter 3-element yagi. I've been using it for five years at field day and it's hotter than a fire cracker. Without having a junk box of aluminum tubing it can be built for about $60.

Tom McDermott –N5EG originally modeled it for optimized operation at 50.1 MHz and I constructed and tested it. **Figure 1** shows the gain and front-to-back curves.

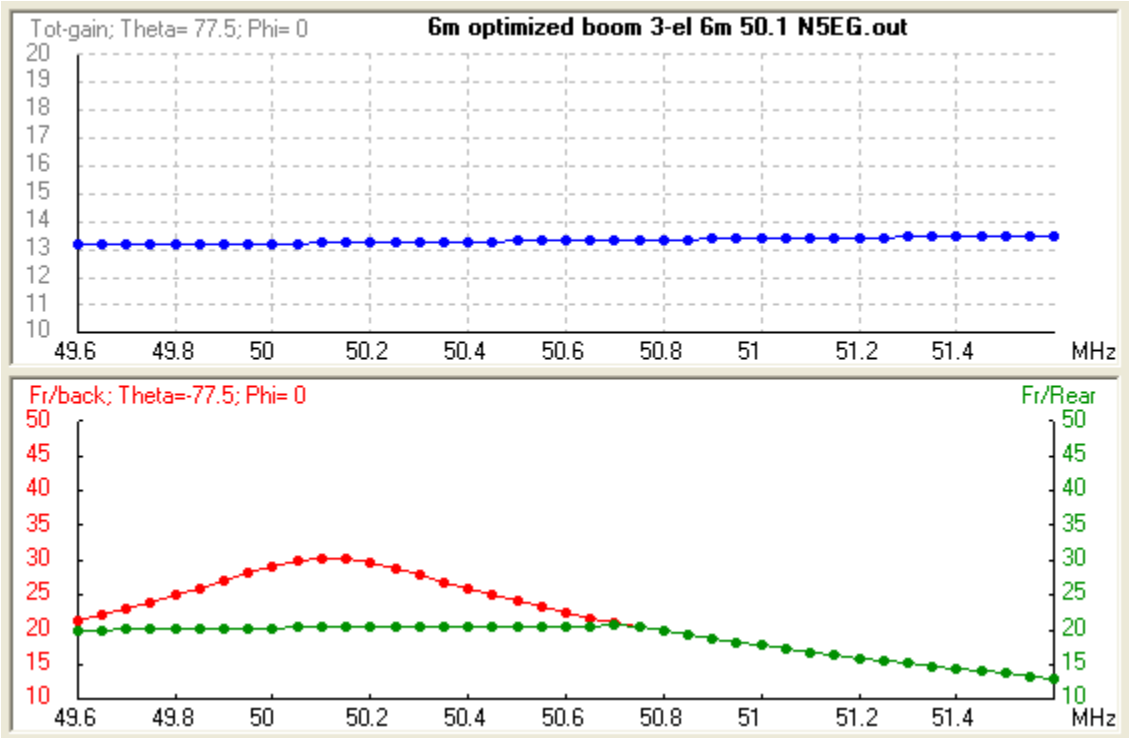


Figure 1. Gain and front-to-back curves show the design over a wide bandwidth.

Construction

The following illustrations give guidelines that detail the antenna construction. Standard hand tools, metal shears, and a good drill are all that are required to build this yagi.

Boom

Figure 2 shows the hole dimensions for the aluminum material required prepare a 6 ft square boom.

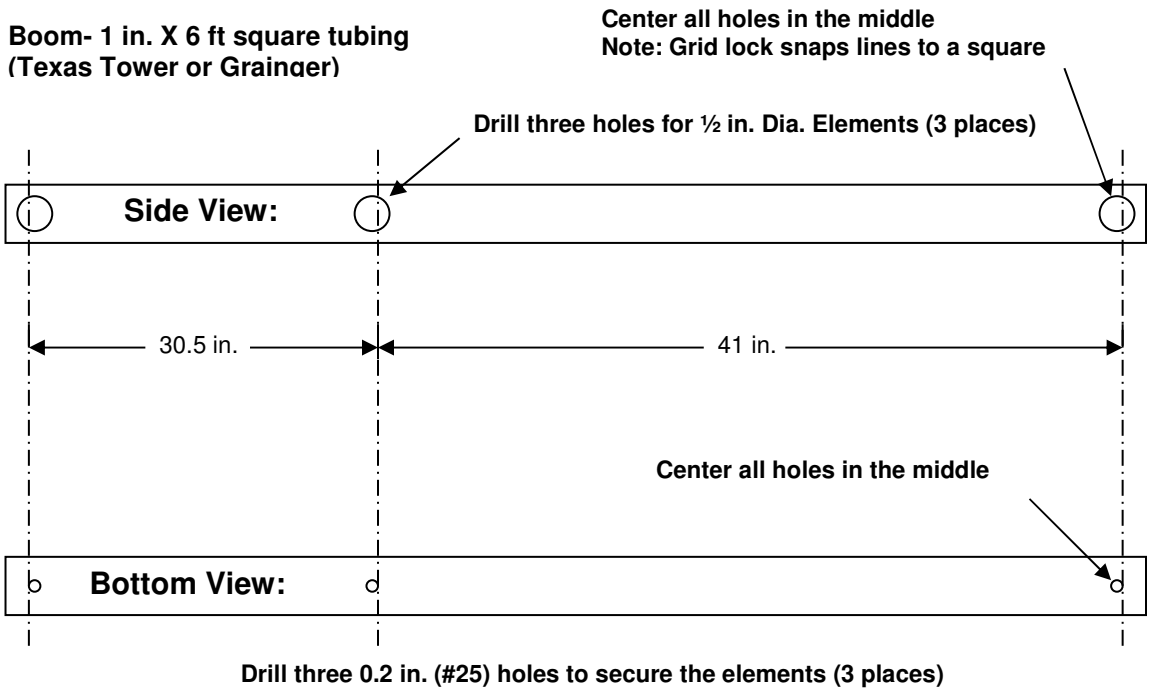


Figure 2. Dimensions for the mounting holes required for 1 in. X 6 ft square boom preparation.

Prepare each element

Each element uses a ½ in. X 48 in. aluminum tubing center piece. Cut four ¾ in. slots to clamp down the end pieces. **Figure 3** shows the end pieces that are 3/8 in. tubing. The lengths vary and you should allow at least an extra 2 in. to slide into the ½ in. center piece.

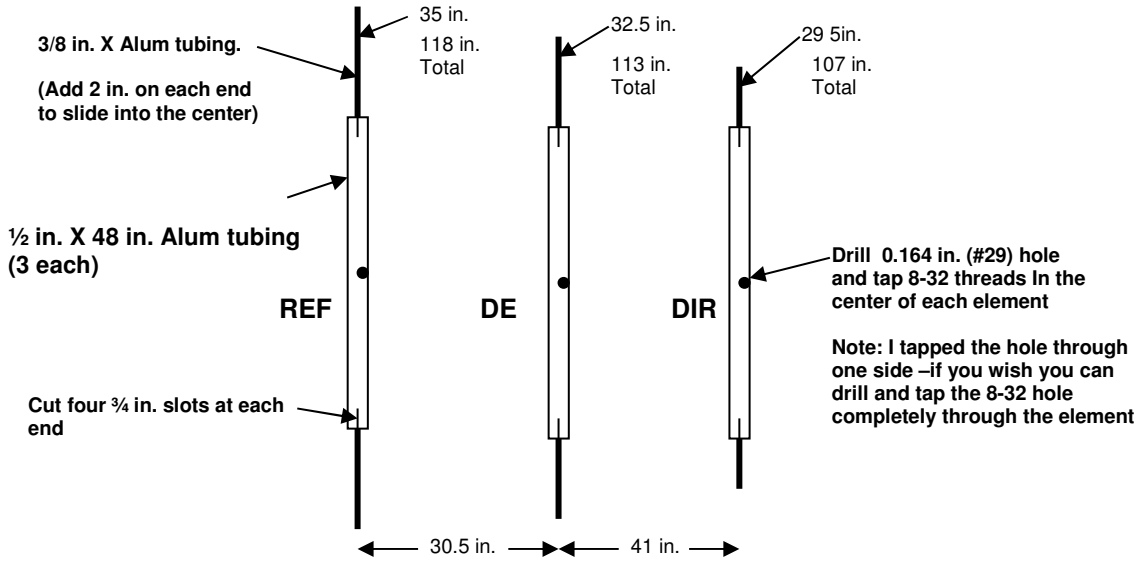


Figure 3. This illustration shows element construction.

Gamma Match

The Gamma match consists of gamma tube, a piece of RG-213 center conductor, and two gamma plates. **Figure 4** shows and lists the parts and dimensions required to prepare the Gamma assembly. The thin wall Gamma tube slides over the coax center conductor perfectly. It can be obtained from Grainger (PN 4NRY5). The other aluminum parts are from an old bud aluminum chassis that I cut up.

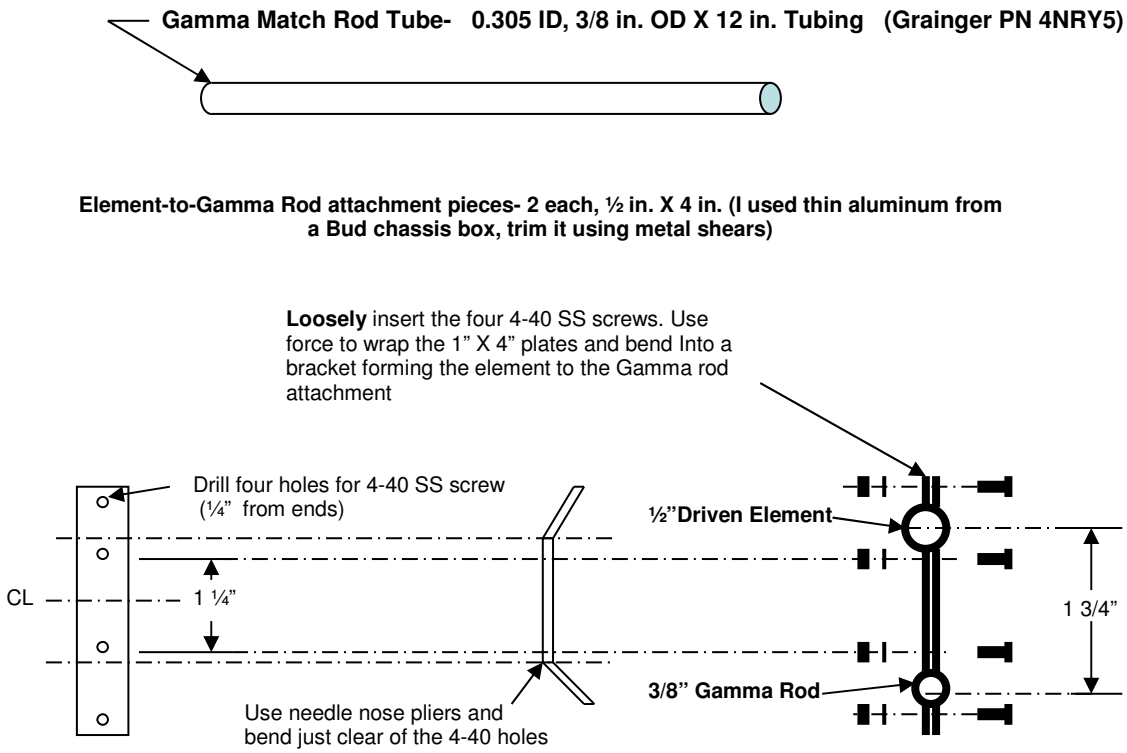
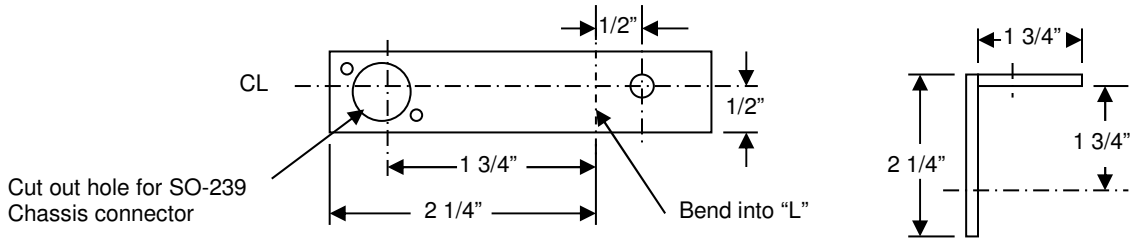


Figure 4. This illustration shows details to fabricate the Gamma match assembly.

Connector bracket

Prepare an SO-239 coax connector bracket using a 1 in. X 4 in. piece of aluminum. **Figure 4** shows the hole locations and bending dimensions. Prepare the connector bracket.



Inner Gamma Rod- 14 in. RG-213 with shield removed

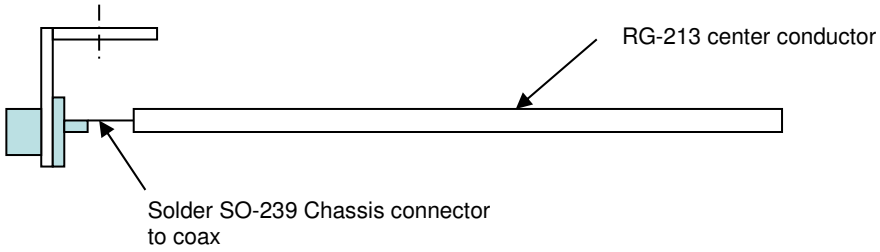


Figure 4. This illustration shows the hole locations and bending dimensions for the SO-239 coax connector.

Subassemblies

Figure 5 shows assembly of the yagi after the boom, elements, and gamma match subassemblies have been fabricated. All the parts are now ready to assemble.

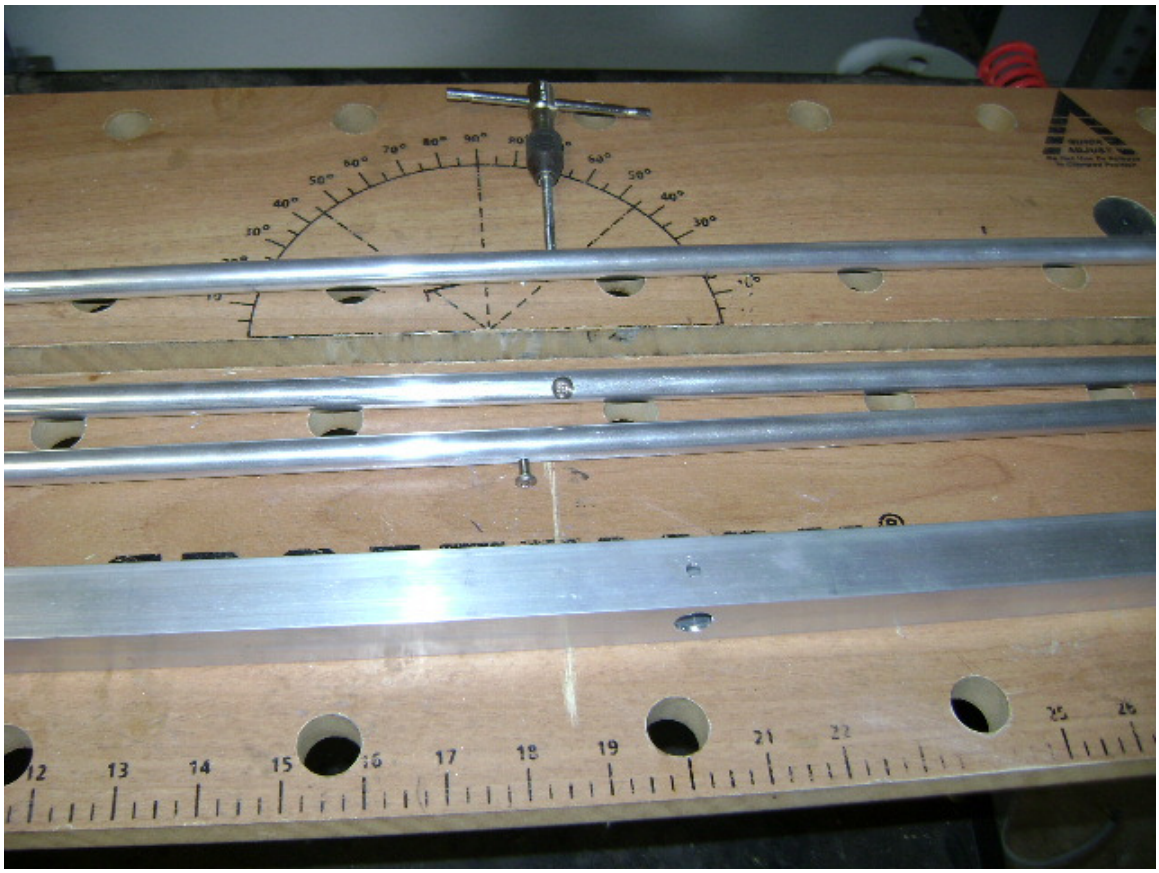


Figure 5. Yagi Assemblies showing a boom hole and element holes that have been tapped for 8-32 screws.

Element to boom assembly

Start by inserting each ½ in. X 48 in. element into the boom. Align the 8-32 threaded holes of the center element to the holes in the boom and tighten down a ½ in. 8-32 screw and lockwasher into the Reflector and Director elements. (Don't insert a screw into the Driven element yet.) **Figure 6** shows the director 48 in. element secured into the boom.

Figure 6. Center Elements into Boom Installation

Gamma match installation

Install the L-bracket with connector and coax into the Driven element using an 8-32 screw and lockwasher.

Note: Connector should face towards the center of the boom (or Director).

Figure 7 shows the rear view towards the director. Install the 3/8 in. X 12 in. gamma rod tubing over the coax. Install the two assemblies supporting the Driven element to the gamma rod with 4-40 screws and lockwasher. (Do not completely tighten –just enough to secure the gamma assembly.)

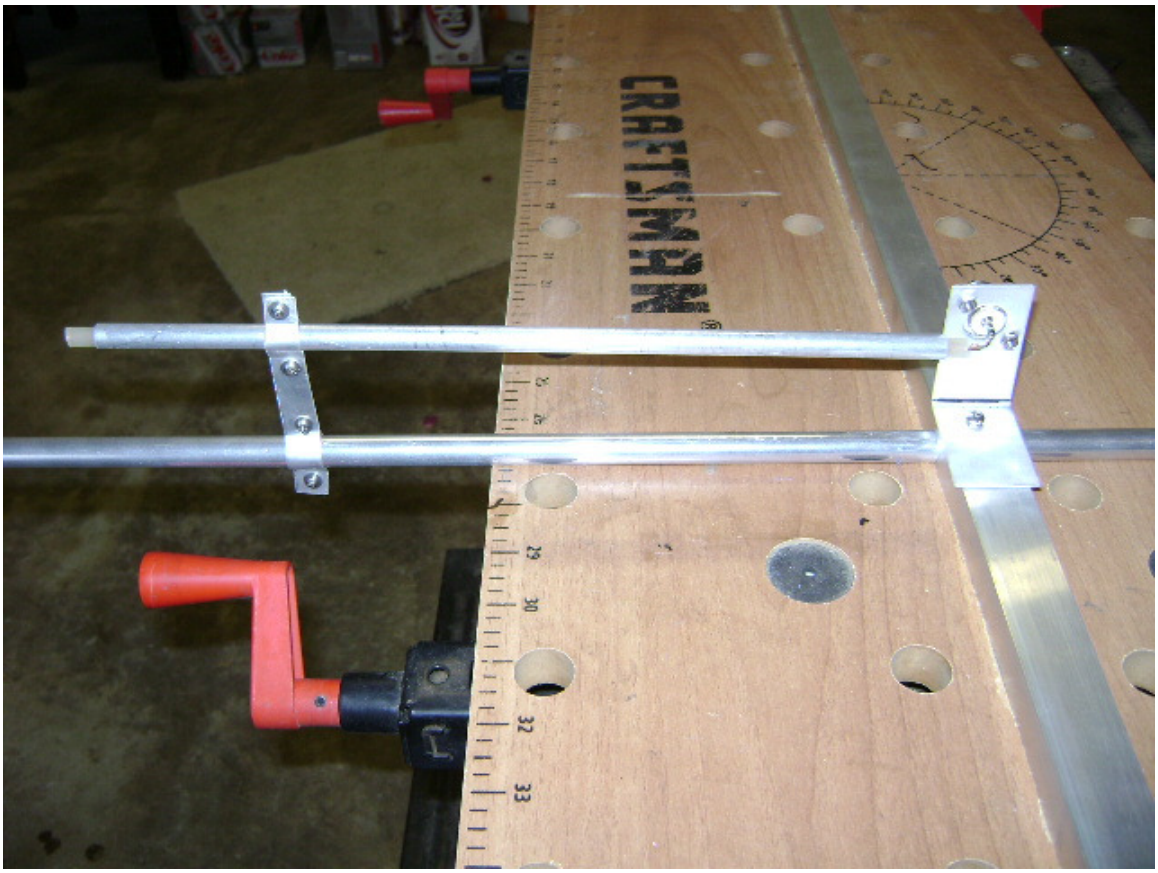


Figure 7. Gamma match assembly to boom installation. The view is looking towards the director.

3/8 in. element tip installation

Install the 3/8 in. element tips into the ½ in. elements. Loosely tighten each with SS #4 hose clamps.

Note: Each element should be at least 2 inches or longer to slide in the larger tubing.

Reflector (rear)	35 in.	Total Reflector length 118 in.
Driven Element	32.5 in.	Total Driven Element length 113 in.
Director (front)	29.5 in	Total Direct length 107 in,

When all elements are measured, tighten the #4 hose clamps.

Adjust the Gamma match

Note: A boom-to-mast mounting bracket was not built in this assembly guide. It is up to the user to fabricate his own.

Note: A ½ -wavelength length of coax reflects the actual yagi feed point impedance. If one is available it should be used.

Figure 8 shows the yagi 8 ft above ground while the gamma match is adjusted. If a mast is not available pointing the beam towards the sky with the Reflector element near ground will give acceptable results. Connect a SWR Analyzer.

Start adjusting by moving the two connecting plates between the driven element and gamma rod until the lowest SWR is obtained. Then move the 3/8 in. gamma tube back and forth until the lowest SWR is obtained.

Repeat above procedure until an acceptable low SWR is obtained and tighten the four 4-40 screws down. Weather proof the gamma match.

Figure 8. Adjust the yagi for minimum SWR above ground as high as possible.

Final Comments

Figure 9 shows the plumbers delight six-meter being compared to my four element yagi. The beam was tested at 50.1 MHz and A-B compared favorably to my 4-ele optimized yagi. It's a simple antenna to build and I've built two of them before I moved up to four and five elements. It's been at a field day for several years and holds its own on the band.

Figure 9. This plumber's delight six-meter yagi being compared and tested against my four element yagi with great signal gain and front-to-back patterns.

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