

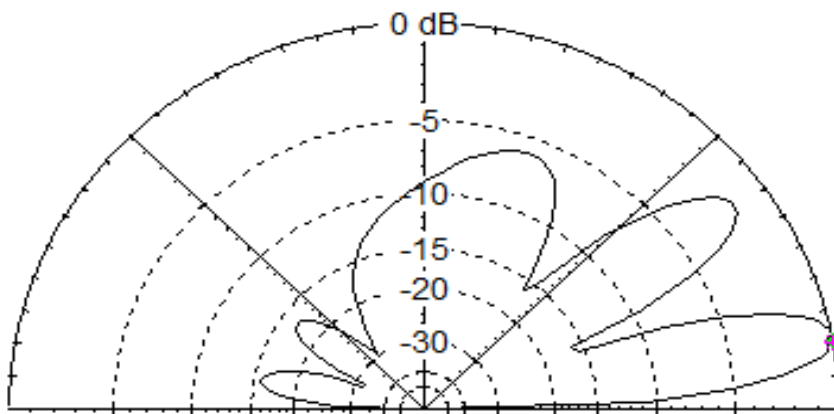
Ultimate (meaning final) Cheap and Light 6 Meter 3 el Yagi Aug 2015 N6MW

For reasons still unclear, it was decided to make yet another 6 meter yagi. The prime object is light weight and the next is cheap. The basic design plan is 3 elements, a six foot boom, aluminum elements and, if possible, a boom made from 1X2 inch lumber and toleration of 500 watts. And as has become my habit, it is to be direct feed to avoid matching complexity. Total cost ~\$45 with some re-use of junk box items.

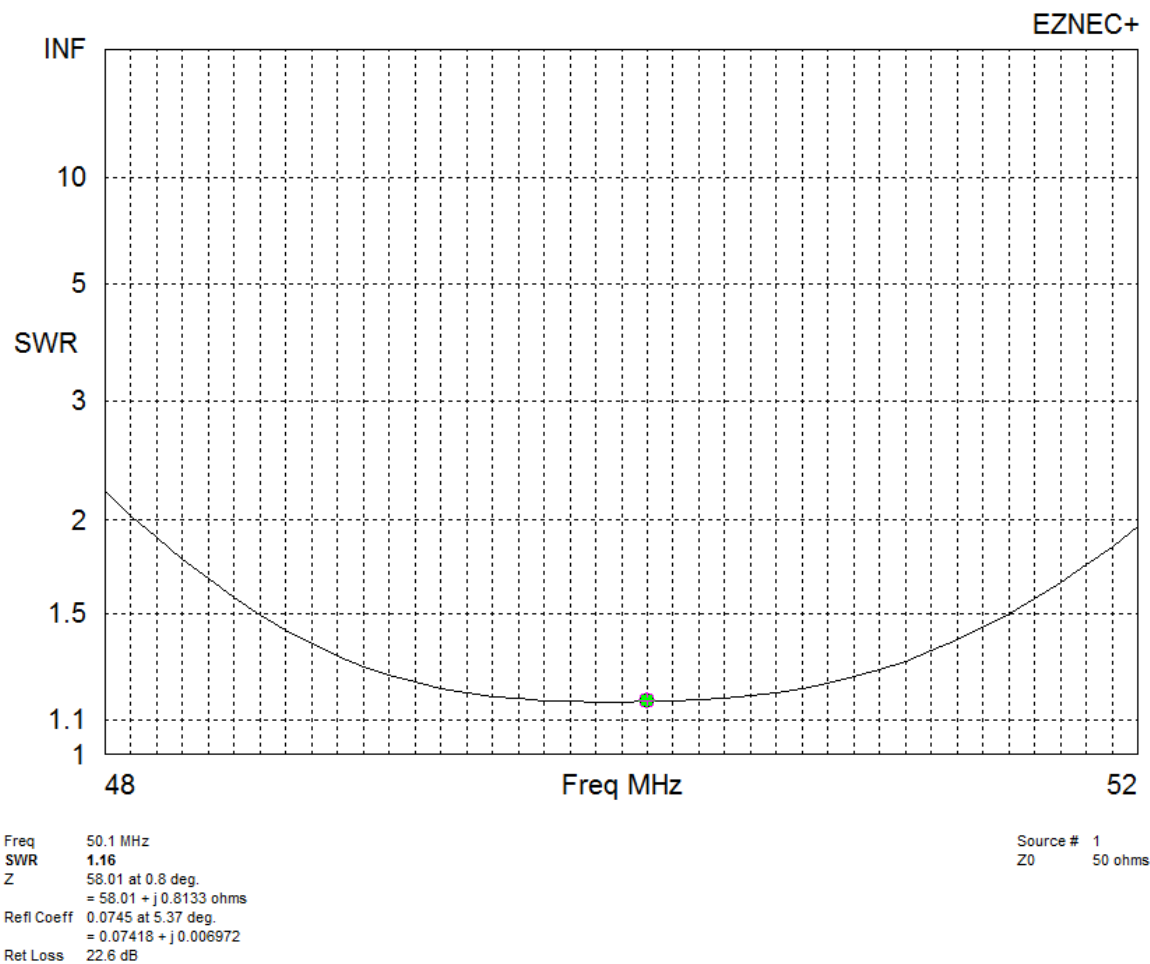
Breaking out EZNEC again, it is found that this is electrically possible and the gain can be made respectable (while keeping direct feed at 50 ohms) with the driven element (DE) not centered but about 5 inches off center toward the director. The trades in gain, using 25' height, are not critical but some care in selection of DE offset and even the length of the director (DIR) is needed. The reflector (REF) length, beyond being resonant comfortably below the lowest operating frequency, is not critical. The target frequency is 50.1 MHz. If the boom is much longer than six feet, a bit more gain is available but the direct feed becomes difficult and mechanical issues result. The F/B was not a serious requirement but it tends to move with the gain and it serves as a test.

Total Field

EZNEC+



50.1 MHz



With EZNEC a design was settled on using 3/16 aluminum rods as elements. Later the design went to the use of 1/8 rods for the outer portion of the elements but this has little impact. This plan, for 25' height, has half elements of 59, 57 and 52 inches with a 5" offset of the DE toward the DIR. The individual element resonant frequencies are then, 47.8, 49.5 and 54.4 MHz, but a bit higher at my 10' test height (says EZNEC).

The original plan called for use of 1/4 and/or 3/16 AL tubing. Finding 6' lengths is difficult for small quantities and decent cost. The final plan uses 3/16 and 1/8 AL rods (from MSCDirect) with 3.5" long couplers made from some old 1/4" AL tubing retained from a previous project. It was necessary to drill out the tubing to allow the 3/16 rod to fit snugly into the coupler. Of course, the ID of the tubing was too big for the 1/8" rod so slots and clamps were needed.

It turns out that a 1X2 board is just about strong enough to serve as boom, if it is bolstered with doubled 1X2 near the center and short blocks of 1X2 are added at the ends for DIR and REF support. In addition, a section of 1X2 was mounted across the boom to support the DE center where the element is split for the direct feed. The whole thing weighs about 3 pounds and would probably not fare well in high winds or any real winter weather. SoCal mostly okay.

Next a bare dipole was formed to find the real lengths needed for the DIR and REF to get single

element desired resonance as predicted at 10' high. This resulted in final lengths of 53.7 and 59.5 inches respectively. Then the whole antenna was assembled, starting with a generously long DE, to trim the DE to get a decent SWR minimum of 1.4, maybe a bit high, in the range of interest centered on about 50.2. This was initially done at 10' high. It was then verified that there was something resembling the calculated F/B. It turned out to be about 20 dB, which was comforting. Then, using EZNEC, the DE length was adjusted (shortened a bit) to try to compensate for the theoretically anticipated change when at 25' putting it at 56.5".

Finally the antenna is put up at the target 25' atop 2 and ½ Radio Shack steel masts, that being just above the peak in the garage roof to avoid attracting undesired attention. Since the outcome was confidently expected to be that predicted, the unit was mounted with all the final bolts, coax and tape in place. But alas, the SWR proved to be other than desired. It was now closer to 2 at 50.1 and showed a nice minimum of about 1.2 at 50.8 MHz. But the tuner can handle it. However, the Elecraft PA was curiously not too happy at full power at 50.1.

A quick calculation indicated that making the DE halves 1" longer would do wonders. So two new end pieces were cut from my modest amount of left over 1/8 rod, the antenna came down for the replacement parts and back up again, this time checking before that final climb of the ladder to put on the nuts. Much better – now shows SWR of < 1.2 from 50.0 to 50.4. Final half lengths of the elements are then 53.7", 57.5" and 59.5". Finally tighten all down again and get ready to complete WAS on 6. assuming the season is not over.

Some construction details are shown in the following unorganized pictures.





