WA8CCU
2 Meter "Coax" Beam Project
Construction details of a 3 and 4 Element Coax Beam

I had been looking for an inexpensive 2 meter antenna project for some time.
One, I dislike buying an antenna when one can be built for a reasonable cost.
Two, it is very satisfying to construct an antenna and actually have it perform well.

I discovered K4MMG's coax beam project on Hamuniverse.com that really caught my attention, small, simple, looked effective and very inexpensive.

So I built his 3 element coax beam and was very impressed with the ease of construction and its performance. This led me to the 4 Element version later in this article.

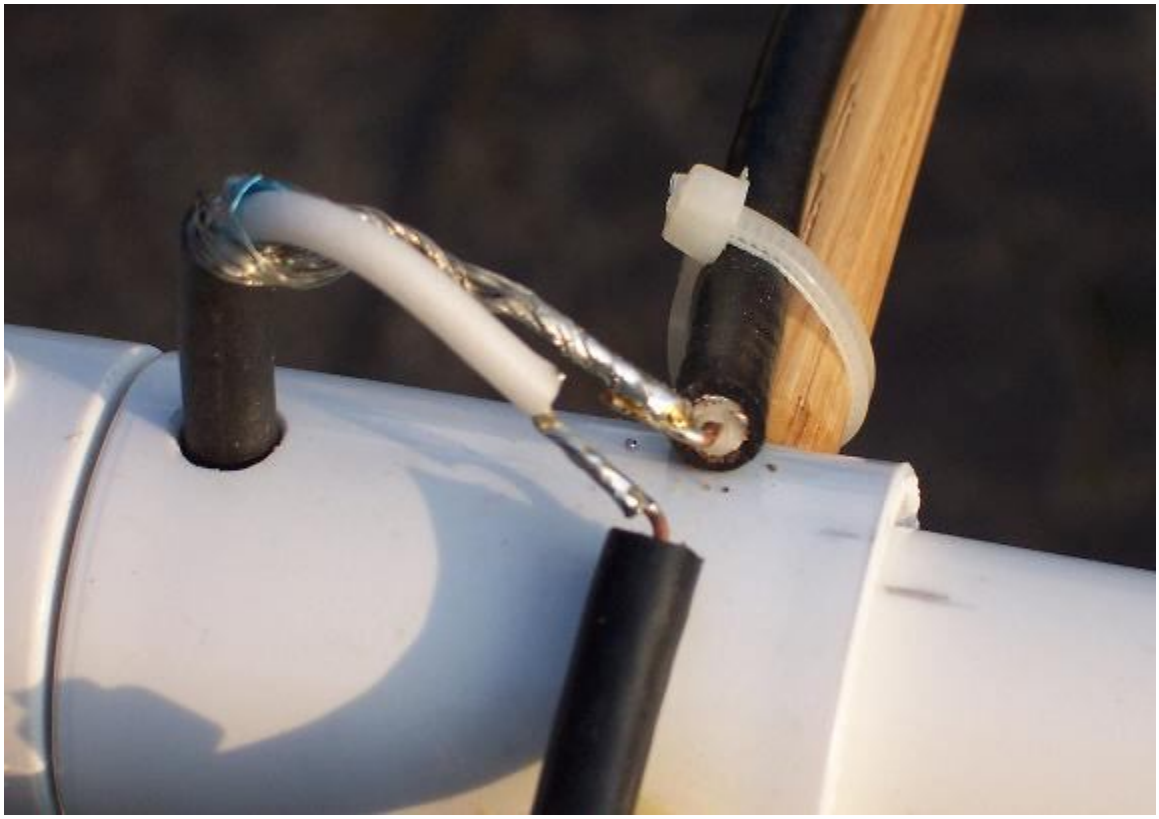
Steve, (K4MMG), states in his article that he used an MFJ antenna analyzer, but one could probably construct the antenna without one.
Not having an antenna analyzer that would cover 2 meters, I decided to construct anyway using a field strength meter and an SWR bridge.

I mounted a pipe flange on the backyard deck railing and used a 1/2" x 4' wooden dowel rod as a mast. Total height of the beam off the ground was 10 feet.
Turning the beam direction was by accomplished by hand.

Base mount (Pipe Flange)

2 Meter 3 Element Coax Beam

Tuning the elements for 146.0 was straightforward using the SWR bridge and the FSM. Start with just the driven element, tune, then add the reflector and tune it, then add the director and tune it, etc.



Driven Element construction.
Note: NO connection to shield on either side of driven element!
(Refer to K4MMG's project for details)

Coax outer connection during testing.

The field strength meter was placed on the deck railing approx. 10feet away from the beam. Low power must be used here, (about 1-2 watts) to keep the FSM from going nutz.

After construction, I was able to make solid contacts to about 80% of the local repeaters, (and some much more distant), but I did notice that the front to back ratio of the beam could use improvement so I proceeded with the 4 Element version described below!

The 4 Element Coax Beam

Conversing with Steve by Email I told him I was going to try to add a second director and could he provide some starting point as to distance from the 1st director and the length of the second director element.

Steve willingly obliged and said although he had no modeling program that would capture what I was trying to do, he thought the same distance from the driven element to the 1st director could also be used for the distance from the 1st director to the 2nd director. He also felt that the 2nd director length would be about 5% shorter than the 1st director.

I added a coupling and more PVC pipe to the boom plus another dowel rod for the 4th element at the suggested spacing. I also started the 2nd director coax length the same as the 1st director. I kept trimming the 2nd director until the F-B ratio peaked sharply on the FSM in the forward direction.

Wouldn't ya know it, 5.5% shorter than the 1st director length was the length for the 2nd director. Hereafter I refer to Steve as the AG, (Antenna Guru).

4 Element 2 Meter Beam

Weather here in Northeast Ohio has degraded and experimenting outside on the deck is not too pleasant, so I am using the beam inside the shack about 4 feet off ground level and pointed toward the window for one repeater 23 miles away, (total quieting), and turned about 180 degrees toward another. Even though the 180 degree direction points through walls, the barn and other sundry items, I make solid contact with that
repeater about 12 miles away, all with 9 watts.

Odds & ends: First, I must acknowledge K4MMG, (the AG), and his knowledge of coax behavior as an antenna. Second, this is a very worthwhile project for any amateur seeking a good 2 meter beam and the satisfaction of building his own.

Note that the pictures show some nylon rope to the antenna. This was only to keep the beam from sagging forward with the additional element.
The "T" for the mast must be moved to a new boom balance position in the final construction.

Also note that as I trim elements, I do not solder them just yet. I just wrap the outer braid over the inner conductor and crimp gently with long nose pliers. This is done in the interests of speed while tuning the elements. Be sure to only use coax with a .66 VF. Solder ends of coax after completion of testing and trimming.
SEAL ALL COAX ENDS AND CENTER FEED POINT WELL.

In his article on the six meter beam, Steve found that the frequency shifted down slightly when the coax elements were removed from the dowel rods, (the prototype), and inserted into a PVC "pipe", (the final construction). I expect this will also be the case with this beam as well, but I have not proceeded to that point yet as I am having too much fun with what I have built at this time.

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K4MMG does spec his element spacing and lengths in his article.
I did not change his spacing's as it gets too hard and complicated to 'juggle' both spacings and lengths while tuning.
But I did start with somewhat longer elements as he states that element length will vary from builder to builder.

Nomenclature: DE= driven element, DIR= director, REF= reflector

Element spacing as follows:
DE to REF....17.250"
DE to 1st DIR....13.250"
1st DIR to 2nd DIR= 13.250"

Final element lengths: (Refer to the picture or K4MMG's construction detail.)
DE= 22.125" (including the air gap)
REF= 24.000"
1st DIR= 21.500"
2nd DIR= 20.250"

It is important that elements be cut about 1.5 to 2.0 inches LONGER when starting construction so there will coax to trim back when tuning.
The DE should be alone on the boom and trimmed first for lowest SWR at the desired operating frequency.
Then add the REF to the boom and start trimming it for the highest reading on FSM. When tuning the REF and both DIR's, the FSM should always be sampling RF placed ahead of what will become the 'front' of the beam.
Next mount the 1st DIR and tune it for highest FSM reading. Do the same for the 2nd DIR.

Always maintain the same beam to FSM setup for tuning elements. Do not move the FSM to different distances or locations during element trimming or things become to complicated.
To check the F-B ratio, turn the beam. Use only enough power to get midscale FSM readings so differences between forward gain and backside radiation can be easily determined.

Now get on the air with yours and have fun....73 Al, WA8CCU