2 Meter Bobtail Rover Beam!

Tom Clifton, KC0VSJ

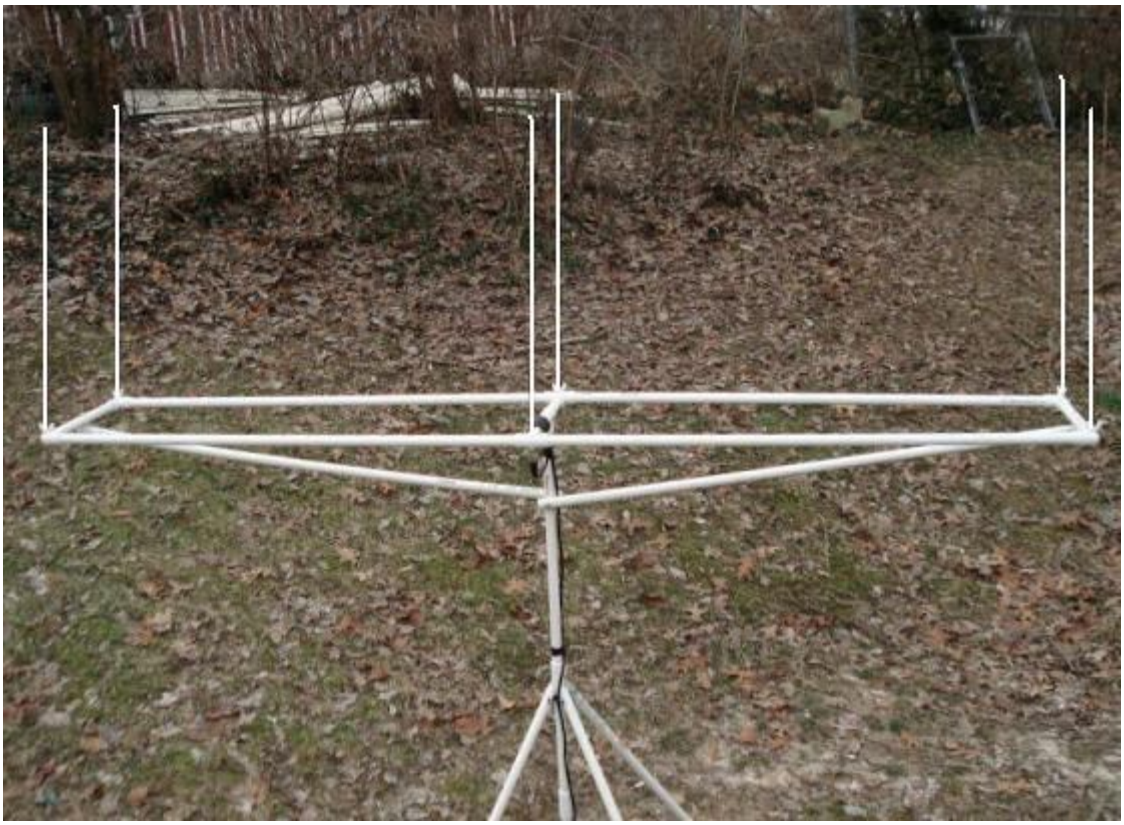
Tom builds something in this project just to upset the neighbors!

"What is that "Thing" on top of his Jeep!" Said the neighbors.

"A tent frame, a portable clothes line, some new fangled TV antenna?
A kite frame?"
Sorry neighbors! None of the above.

It's Tom's new Bobtail Beam project
all ready to go roving and irritate more neighbors, fellow employees, and wild life!
We bet the cops will turn their heads too, but to a true ham, isn't it a beautiful sight!

That "thing" on top of Tom's Jeep is his new homebrew 2 meter Bobtail Beam designed for roving around the countryside. Let's find out how Tom built it. Get in, fasten your seat belts and hang on!



Bobtail Beam Posing for camera with wings spread and feet on the ground
using "Quad Pod" base fixture designed by Tom
Elements "Magically Enhanced" by Windows Technology to Show Detail
Camera position is direction of radiation

Instructions and materials

Even if you purchase absolutely everything new it should cost under $50 to make and less if you are a great scrounger....

2 Meter version Material:

8' 14ga speaker wire $5.71
6 1/4-20 x 1.5 Brass Bolts $3.54
2 1/2" PVC Tee $0.64
4 1/2" PVC Elbow $0.96
1 1/2" PVC Cross $1.02
1 1/2" PVC Cap $0.28
2 1/2" x 10' PVC Pipe $3.24
6 1/4" x 14ga ring lugs $0.96
6 #4 x 14ga ring lugs $0.96
1 1/8" x 12" K&S Brass Tubing $0.79 XXX
1 5/32 x 12" K&S Brass Tubing $0.89 XXX
1 Pound 3/32 x 36" Brazing Rod $7.00
2 7/64 twist Drill Bits $3.85

6 1/4-20 nylon wing nuts $3.00
1 SO-239 Chassis Connector $1.50
1 15' RG-8 w PL259 coax $9.75
2 6/32 x 1-3/4 bolt $0.30
2 6/32 nut $0.10
1 Nylon masons cord $1.00
4 6"x6"x 3/4" Plywood Scrap $0.00
1 1/4-20 Steel Wing Nut $0.25
2 1/4" steel flat washer $0.10
1 dozen 12" nylon cable ties $1.00

Total $46.84

Total PVC about 22 feet including mast.
(Your total length may be different
depending on your construction, errors, etc.)
NOTE: XXX = See below

FORMULAS:
(These formulas are not exact but should be close.)

Front Elements 248/freqmhz = length in feet (multiply
by 12 = inches)
Reflector Elements 263 / freqmhz = length in feet)
multiply by 12 = inches)
Spacing = .15 X one wavelength
1 Wavelength = 11808 / freq = inches

GETTING STARTED - The 2 Meter Version
(Please note that some of the pictures in this project could be showing the
70cm band antenna that Tom is also working on and is not an error.
They are used this way only to show physical constructions details which are much
the same for both bands!)

Use Caution with hand tools!
Eye protection is a good idea.
Don't poke an eye with the elements!
Be careful cutting PVC

Cut the 1/2"PVC pipe:

2 @ 5" (Center Spreaders)
2 @ 11" (End Spreaders)
4 @ 40" (Side Spreaders)
1 @ 20" (Vertical stabilizer)
1 @ 48" (Mast)

Drill a 7/64" hole in the ends of the brass bolts.
Before starting, fashion a bolt holder from a
6"x6"scrap of 3/4" plywood (or similar material)
as you are not going to be able to hold the bolts in
your fingers without burning or otherwise hurting
yourself..

Drill a 1/4" hole in the middle of the plywood scrap

and secure the brass bolt with washers and a nut. Make sure it is tight... Drill the 7/64 hole approximately 3/4" deep with a drill press or electric hand drill. A new (sharp) twist drill bit is recommended as is having an extra bit and a spare bolt around. This be handy if you break a bit as I did. Only five bolts are needed.

Cut five lengths of 3/32 brazing rod to 23". To cut the brazing rod you can make a deep score with the edge of a metal file and snap the rod. Insert the rods into the bolts and solder using a small torch or heavy duty iron. Don't worry about the exact length at this time as they will be trimmed later.

Drill (or file) a 9/16" hole in one of the PVC Tee's for mounting the SO-239 Connector. Once the connector is in place, drill holes to clear, then 6/32 bolts. Drill a 3/32 hole for the driven element in the side opposite the 9/16" hole.

In this photo you will notice the SO-239 is mounted to the bottom of the front (toward station) element. The driven element is attached (inside PVC T) directly to the end tip of the SO-239 and extends up through the front element. The feed line is routed as per instructions below using the coax choke around the center "boom" and down to the rig. (Photo above not to scale for 2 meters)

Drill 1/4" holes in the rest of PVC Tee's and elbows

for mounting bolts. (see photo)

Photo showing ends with elements, ring lugs and wire extending from them.

Prepare two 14 ga wires with 1/4" ring lugs so that the centers between lugs are 40 3/16". These are the common "ground" wire for the three rear elements.

Prepare two 14 ga wires with a 1/4: ring lug on one end and a #4 ring lug on the other end. Center to center each cable is about 39 11/16". When the two cables are connected to the SO-239 connector, the end rings will be 40 3/16"center to center.

Lay the PVC frame pieces out on the ground and assemble. The front row to back row spacing is 12" from element to element. The horizontal spacing is 40 3/16" element to element. Be sure the center cross is vertical - glue all joints, or if you wish to make the antenna "portable" you may want to use sheet metal screws or nuts and bolts to assemble the frame.

XXX To prepare the driven element, nest a 1" length of 5/32 K&S tubing with 1" of 1/8" K&S tubing and insert a 23" piece of 3/32 rod into the center of the XXX 1/8" tube. The 5/32" tube should fit neatly over the center conductor of the PL-239 connector. Use a small torch or heavy duty iron and solder.

To prepare the driven element, file 3/8" of one end of a 23" long 3/32" rod to fit into the center conductor (tip end, not connector end) of a SO-239 socket. Tin the end of the rod, then solder it into the tip part of the SO-239.
For the reflectors, trim three of the rod/bolt assemblies to 21 9/16" The length is measured from the tip to the point where the bolt touches the common ground.

**Photo of rear "center" element on reflector portion of antenna.
Notice connections to each outside element using speaker wire.**

For the two front directors, trim the elements to
20 1/4"> (cut longer for tuning)

For the time being, leave the driven element long, and
assemble the "grounds" and elements to the frame.

Connect the RG-8 coax to the SO-239 connector. Make a
coax choke by wrapping five turns around the center
spreader closest to the connector. Secure with
cable ties and dress the rest of the coax to the mast.

See photo below:

TUNING UP

Elevate the antenna about 4' to 6' in the air and at least a wavelength away horizontally from any other objects. Apply low power at the desired operating frequency and trim the driven element for the best SWR. The length should be about the same as the reflectors. If you cut too short, the driven element may be lengthened with a piece of the 1/8" K&S tubing - be sure to solder when done.
After trimming the driven element, trim the remaining two directors to the same length to optimize the pattern.

My own personal preference is to paint everything using flat grey spray paint. This will prevent rust and the inevitable UV damage to the PVC piping if you are going to leave the antenna outdoors for any length of time.

Alternate methods of construction:

An alternative frame assembly may be made out of 3/4" or 1" aluminum angle iron. It is important that the front and rear rows are electrically isolated from each other regardless of your construction method. Use plastic or a dense hardwood for the spreaders.

If you use metal, be sure you leave a fairly thick dielectric insulator of plastic to minimize DC and capacitive coupling between the sections.

Notes:
Non-corroding hardware such as brass, nylon or stainless is highly recommended on any antenna project.

Try this antenna rotated 90 degrees for horizontal polarization - you may wish to lengthen the design a bit for the "low" end of the SSB portion of the band.

Formulas, and examples:
(Includes 2 meter and 440 examples)

Front elements 248/147 = 1.68 feet X 12 = 20.24" @ 147
[6.72” @ 443]
[20.64" @ 144]

Reflector elements 263/147 =1.78 feet X 12 = 21.46" @ 147
[7.13” @ 443]
[21.96" @ 144]

11808/147 = 1 wavelength front and rear = 80.32" @ 147
[26.65” @ 443]
[82.01" @ 144]

.15 wavelength spacing = 80.32 X .15 =12.04" @ 147
[3.99” @ 443]
[12.31" @ 144]
(These formulas are not exact but should be close, as stated earlier.)

Many thanks to N0UHJ for his valuable assistance with the testing and his input to this project. Thanks Joseph!