Simple 440 MHZ Yagi Antennas

By Pete Rimmel N8PR
But FIRST:

Let’s talk a bit about satellite tracking

since questions were asked on the last

“RF” net on Thursday

The most info can be obtained at:

www.amasat.org
AMSAT Online Satellite Pass Predictions

Please select a satellite and provide your latitude, longitude and elevation or calculate them from your grid square. If you choose we will save your position information in a cookie on your system for future predictions.

Show Predictions for: AO-51 ▼ for Next 10 ▼ Passes

Calculate Latitude and Longitude from Gridsquare:

Or

Enter Decimal Latitude:* ▼ North ▼
Enter Decimal Longitude:* ▼ West ▼

Elevation (Metres):

Predict

Save my location for later use

**example XX.xxxx

For the best in full featured tracking software visit The AMSAT Store
### AMSAT Online Satellite Pass Predictions - AO-51

View the current location of AO-51

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<th>Date (UTC)</th>
<th>AOS (UTC)</th>
<th>Duration</th>
<th>AOS Azimuth</th>
<th>Maximum Elevation</th>
<th>Max El Azimuth</th>
<th>LOS Azimuth</th>
<th>LOS (UTC)</th>
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<td>09:09:16</td>
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</table>

Your results are shown above
Use the form below to request more pass predictions

Show Predictions for: AO-51 for Next 10 Passes

Calculate Latitude and Longitude from Gridsquare: el96va

Calculate Position
Orbitron from: www.stoff.pl
Satellite passes / Orbitron 3.71 / www.stoff.pl

Location: N8PR (80.2917° W, 26.0208° N)
Time zone: UTC -4:00
Search period: 2012-05-04 17:39:51 - 2 days
2012-05-06 17:39:51

Conditions: Maximum sun elevation = None
Minimum sat elevation = 3 deg
Illumination NOT required

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<th>Time</th>
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<th>Azm</th>
<th>Elv</th>
<th>Mag</th>
<th>Range</th>
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</table>
Azimuth: 136.3 Degrees
Elevation: 3 Degrees
Azimuth: 071.7 Degrees
Elevation: 26.3 Degrees
AND NEXT:

Before we talk about the yagi antennas let's talk about how to make your handi-talkie work better:
1/2 Wave Length Long

Simple Dipole Antenna

Rotate it 90 degrees
Now it is a Vertical Half Wave Dipole
How about that!

Your Rubber Duckie can be Half of the Dipole... just clip on a ¼ wave long wire to the ground side of the BNC and you have a more effective antenna!

For 2 meters this wire is about 19 ½ inches long.

That will work for 440 as well – or clip on a 6” wire as on the right.
AND N-O-W

On to the 440 MHz Yagi antennas!
Design criteria for a simple 440 MHz antenna:

They can be made using various materials and in various sizes.

We want to keep the design simple.

We want to use readily available materials.

We want enough forward gain to hit the local repeater.

We want enough beam width so aiming is not critical.

It must be inexpensive.

We will look at two antennas a 4 element and 6 element yagi
The BOOM:

The boom can be made from ANY NON-METALLIC material. We do not want to use aluminum or we will have to change the dimensions that we have – and mounting will be much more difficult, since we would then have to isolate the driven element.

Wood is easy to work with, but not weather resistant. ½ inch PVC pipe and couplings are our best choice.
The ELEMENTS:

Wire coat hangars  (for inside use – they will rust)

#8 Copper wire ~1/8” diameter - cheap and available  
(from Home Depot)

1/8 Inch aluminum tube or aluminum welding rod  
(local aluminum supplier)

Bronze brazing rod  (welding supplier)
The basic dimensions are:

### 70 Centimeter 4 element yagi

<table>
<thead>
<tr>
<th>Element</th>
<th>Length</th>
<th>Element spacing from Reflector</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 Centimeter 4 element beam 1/8&quot; diameter tubing</td>
<td>Element Length</td>
<td></td>
</tr>
<tr>
<td>Reflector</td>
<td>13&quot;</td>
<td>0</td>
</tr>
<tr>
<td>Driven</td>
<td>12&quot;</td>
<td>8-1/16&quot;</td>
</tr>
<tr>
<td>Director 1</td>
<td>11-7/8&quot;</td>
<td>16-3/4&quot;</td>
</tr>
<tr>
<td>Director 2</td>
<td>11-3/4&quot;</td>
<td>23-3/8&quot;</td>
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</table>

#### 70 CM 4 element yagi dimensions:

<table>
<thead>
<tr>
<th>Element</th>
<th>Length</th>
<th>Dist. From R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector</td>
<td>13”</td>
<td>0</td>
</tr>
<tr>
<td>Driven Element</td>
<td>Special</td>
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</tr>
<tr>
<td>Director. 1</td>
<td>12.1”</td>
<td>5.5”</td>
</tr>
<tr>
<td>Director. 2</td>
<td>11.75”</td>
<td>11”</td>
</tr>
<tr>
<td>Director. 3</td>
<td>11.75”</td>
<td>18”</td>
</tr>
<tr>
<td>Director. 4</td>
<td>10.75”</td>
<td>28.5”</td>
</tr>
</tbody>
</table>
What are the differences?

4 Element yagi has less gain (~8 dBi) but a wider beamwidth for a wider pattern

6 Element yagi has more gain (~11 dBi) but is narrower and needs more precise aiming.

4 element yagi pattern

6 element yagi pattern
4 element yagi easy to build and feed directly with 50 ohm coax.

Center of boom has no element and makes for easy mounting.

6 el. Yagi a bit more work to build. Directly fed with 50 ohm coax

Must decide where the balance point is for mounting.
NOTE: Coax must be led away from the antenna at 90 degrees from the boom and elements.

If led from the driven element to the back, it still must leave the antenna at 90 degrees from the elements.
The driven element can be straight or in a half folded dipole configuration. Either way it is fed directly with 50 ohm Coax.
There are many ways to bend the driven element.

The important thing is to have the two parts parallel and spaced correctly when done.
One way to assure proper spacing is to solder the loop part of the driven element directly to a coax or other connector before inserting it into the boom.

Draw a line the length of the boom to use as a guide for drilling the element holes. BE SURE the holes are all lined up or your elements will be crooked on the boom.
Let’s build an antenna!
First measure and cut some wire or rod to the dimensions we need.

<table>
<thead>
<tr>
<th>70 Centimeter 4 element beam 1/8&quot; diameter tubing</th>
<th>Element Length</th>
<th>Element spacing from Reflector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector</td>
<td>13&quot;</td>
<td>0</td>
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<tr>
<td>Director 2</td>
<td>11-3/4&quot;</td>
<td>23-3/8&quot;</td>
</tr>
</tbody>
</table>
Prepare the driven element leaving a \( \frac{1}{4} \)" gap. Tape it and secure it with heat shrink. You may have to re-cut the element to length.

Be sure to re-measure it after this step.
Drill the PVC boom and insert the elements. Note the ‘TEE’ in the middle for mounting the antenna.
Prepare the Feed Line:

Remove 1” of the outer cover of your Coax - RG-58 or RG-8X 50 Ohm Coax

With a pointed tool, comb out the braid away from the center conductor.

Twist and tin the braid. Cut 3/8” Off the center insulation and tin The center conductor.
Bend the tinned wires to fit over the driven element... Tin the driven element where you will attach the coax. DO NOT USE EXCESSIVE HEAT!

Solder the coax to the driven element and tape the coax to the boom in two places.

The coax should lead toward the reflector.
Here’s the finished antenna…

Any questions???
References:

http://www.qsl.net/w4sat/antlegen.htm

http://www.tristantech.net/articles/yagi/1.php

http://picaxe.orconhosting.net.nz/yagi433.jpg

http://www.nr6ca.org/70cmyagi.html

Thank you for your interest.

See you (hear you) on the repeater!

73 de N8PR