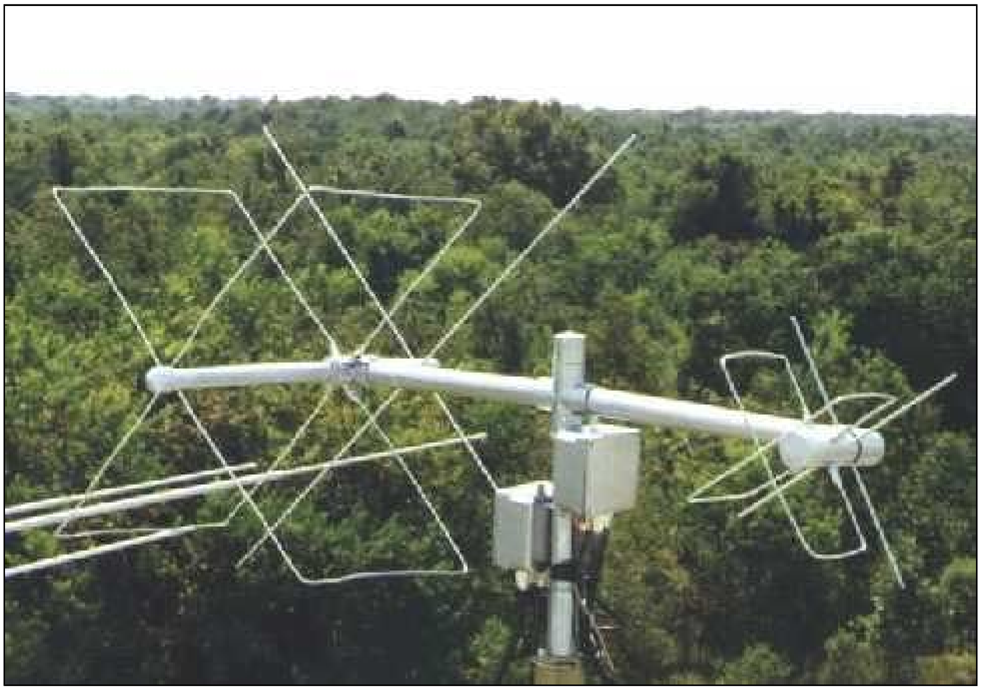
The *Texas Potato Masher II* Antenna



This "new and inproved" *Texas Potato Masher II* is my current LEO antenna. I have been using it since June 1999, first with it set up for RHCP only and now, with polarity-switching relays. The plots below show the dramatic performance improvement for the new design. My on-the-air testing has confirmed the predicted improvements and also the benefits from switching circular polarity sense. I routinely work AO-27 at less than 3 degrees elevation and can work FO-20 to -1 degree.

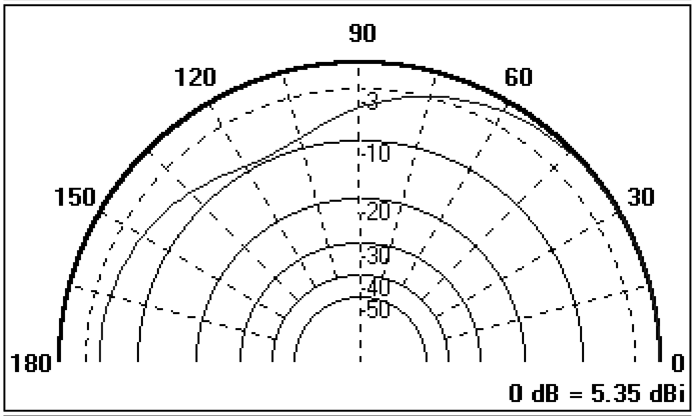
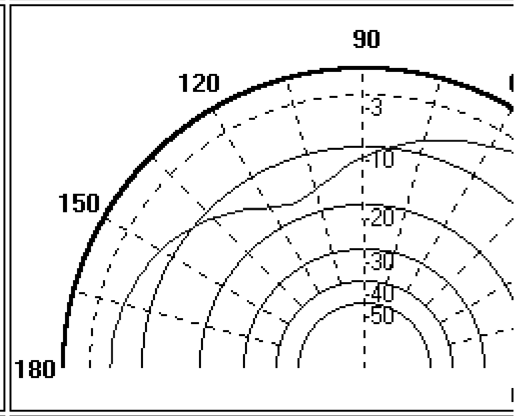
As on the original Texas Potato Masher, no elevation rotor is employed. The revised pattern compensates nicely for the satellites' proximity on overhead passes and I am still able to work the LEO's directly overhead. Azimuth tracking is noticably more sensitive and I have to be more attentive to tracking the bird (manually, of course) than before. The ability to change circular polarity has been more beneficial than I anticipated, allowing me to follow the frequent shifts that before would have been a "fade." This is especially important for AO-10, which I routinely work out to 25,000 km.

The shape of the loops is more compact than the original Texas Potato Masher. The two 4"x4" plastic electrical boxes on the mast hold the coaxial relays for switching circular polarity. All the mast, boom, *etc.*, are made from 1" schedule 40 PVC pipe and painted to prevent UV deterioratin.

Design:

One of the big differences with this antenna is it points at the horizon, not up at 30 degrees like the original TPM. Experience on the LEO's has led me to search for a design that improves the signal level at low elevations and allows the natural decrease in the satellite's path loss to compensate for a lower antenna gain at higher elevations.

The relay-switching scheme for circular polarity switching uses, for each antenna, a SPDT coaxial relay. Each antenna "loop" is designed with a nominal 100 Ohm feedpoint impedance. Each loop is then fed with 93 Ohm RG-62 to one side of the relay. At that point, a 1/4 wavelength delay line of RG-62 is connected to each port (NO & NC) of the relay as well--each relay connection has both a feedline and one end of the delay line connected to it. The common port of the relay is fed with 9913F (Cable-Experts). I made the RG-62 feedlines to the loops multiples of 1/2 wavelength to take advantage of the output repeating feature of a 1/2 wl feedline, but that detail is probably not absolutely necessary.

<table>
<tr><td></td><td>Original TPM</td><td>Revised TPM II</td></tr>
<tr><td>Free Space Elevation</td><td>
</td><td>
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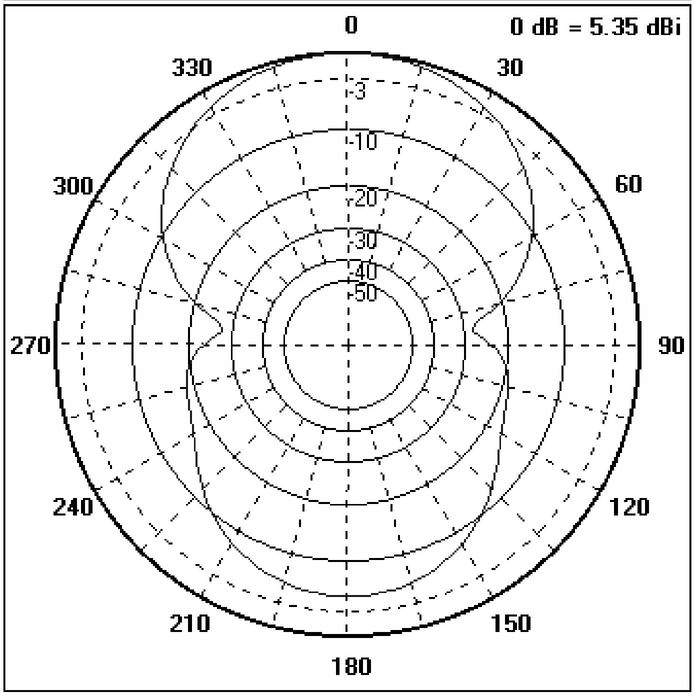
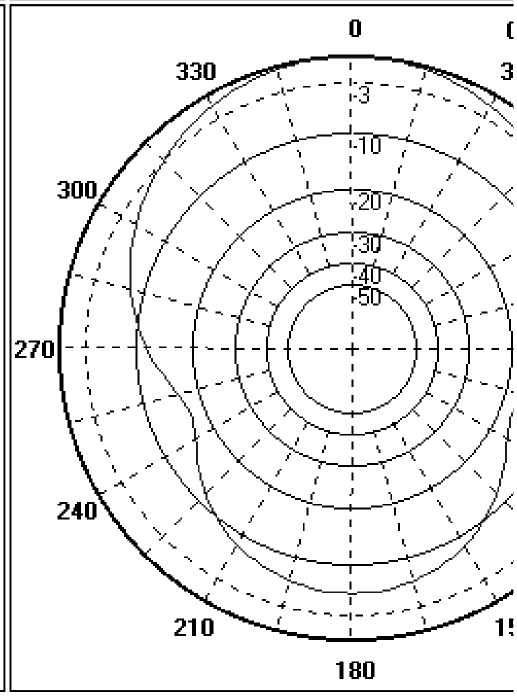
<tr><td>Free Space Azimuth at 0 Deg.</td><td>
</td><td>
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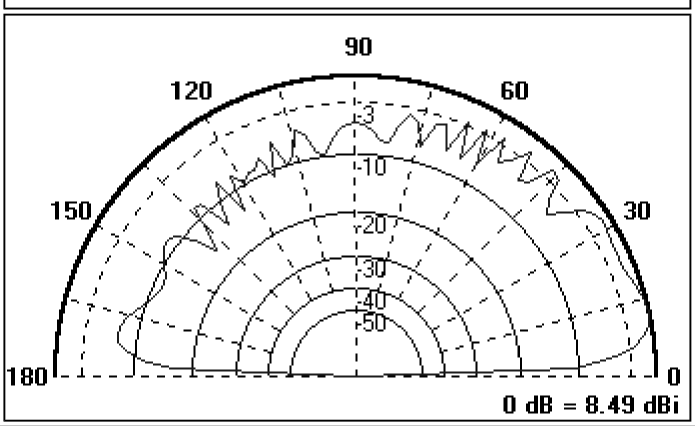
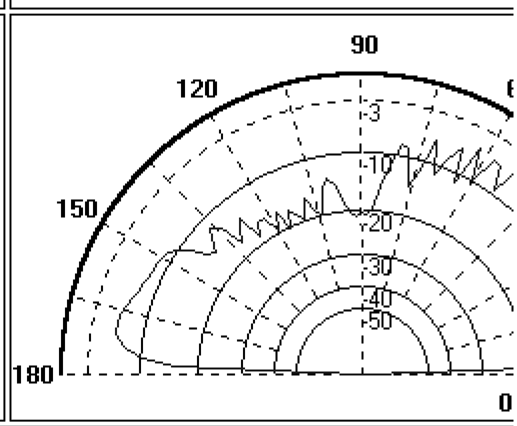
<tr><td>Ground Based Elevation</td><td>
</td><td>
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Construction:

These are the nominal dimensions for the antennas:

> For 70 cm, the "loops" are 4-1/4" (10.75 cm) tall by 9-3/8" (24 cm) wide. The reflectors are 13-1/4" (33.65 cm) long and are spaced 2" (5 cm) from the loops. The RG-62 feedlines to the relay are 33" (84 cm) long and the phasing line is 5-1/2" (14 cm) long.
>
> For 2 meters, the "loops" are 12-3/4" (32.5 cm) tall by 27-3/4" (70.5) wide. The reflectors are 39-1/2" (100.5 cm) long and are spaced 6" (15.25 cm) from the loops. The RG-62 feedlines to the relay are 33" (84 cm) long and the phasing line is 16-1/2" (42 cm) long.

This is a much higher gain design and the tuning is much more sensitive to changes in the length/width ratio. Take a look at the SWR tuning procedure I outlined on the Eggbeater II page, using a single coax feed to both loops. That will work for these as well. If the initial SWR is not below 2.0:1, adjust the shape slightly before cutting any length from the driven element. The reflectors should not be trimmed. After you have "fiddled" with the SWR to the way you like it, you can install the phasing line for RHCP or the relay scheme described above. I adjusted the loops slightly after installation of the relays.