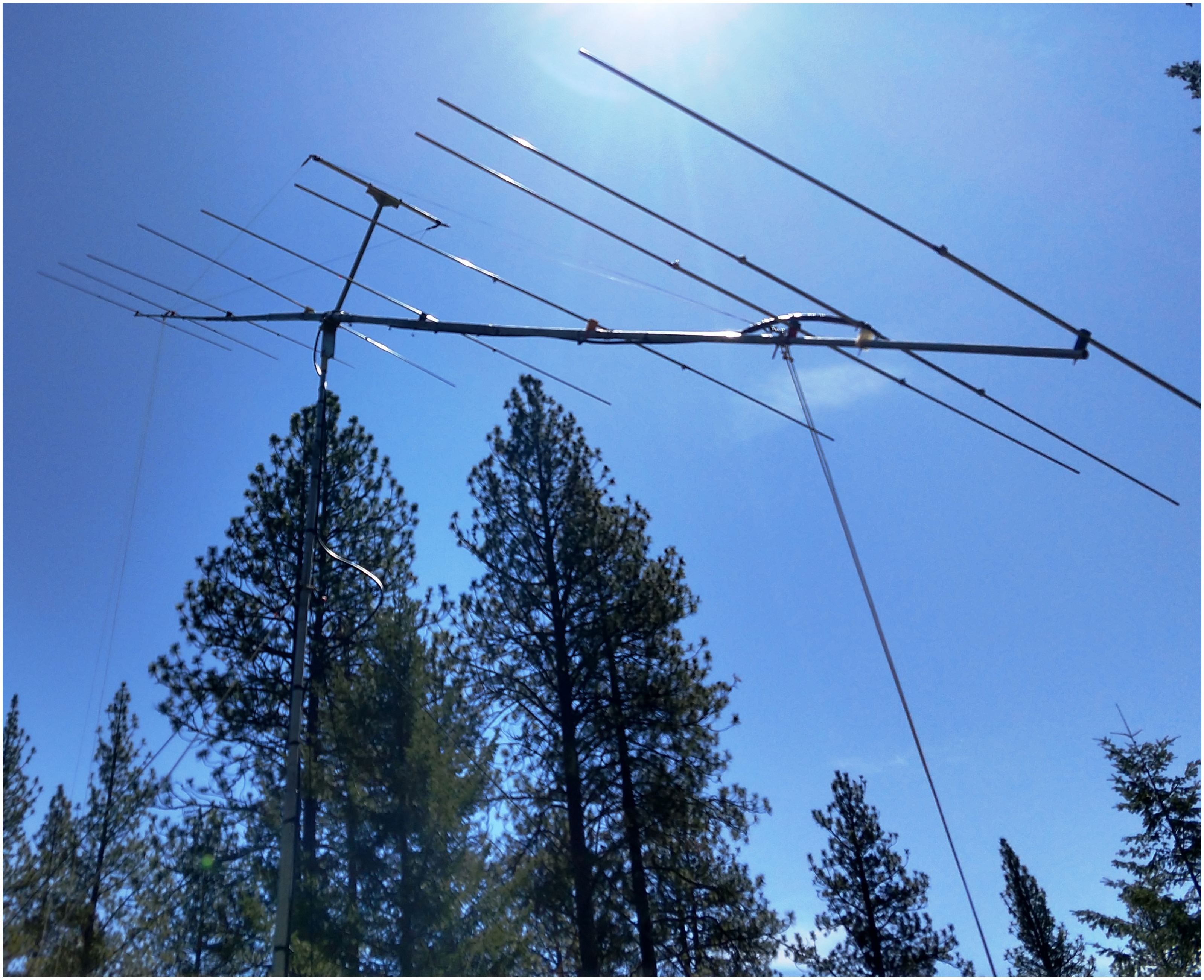
# EF0609GJ by YU7EF

## *as used by W7GJ*



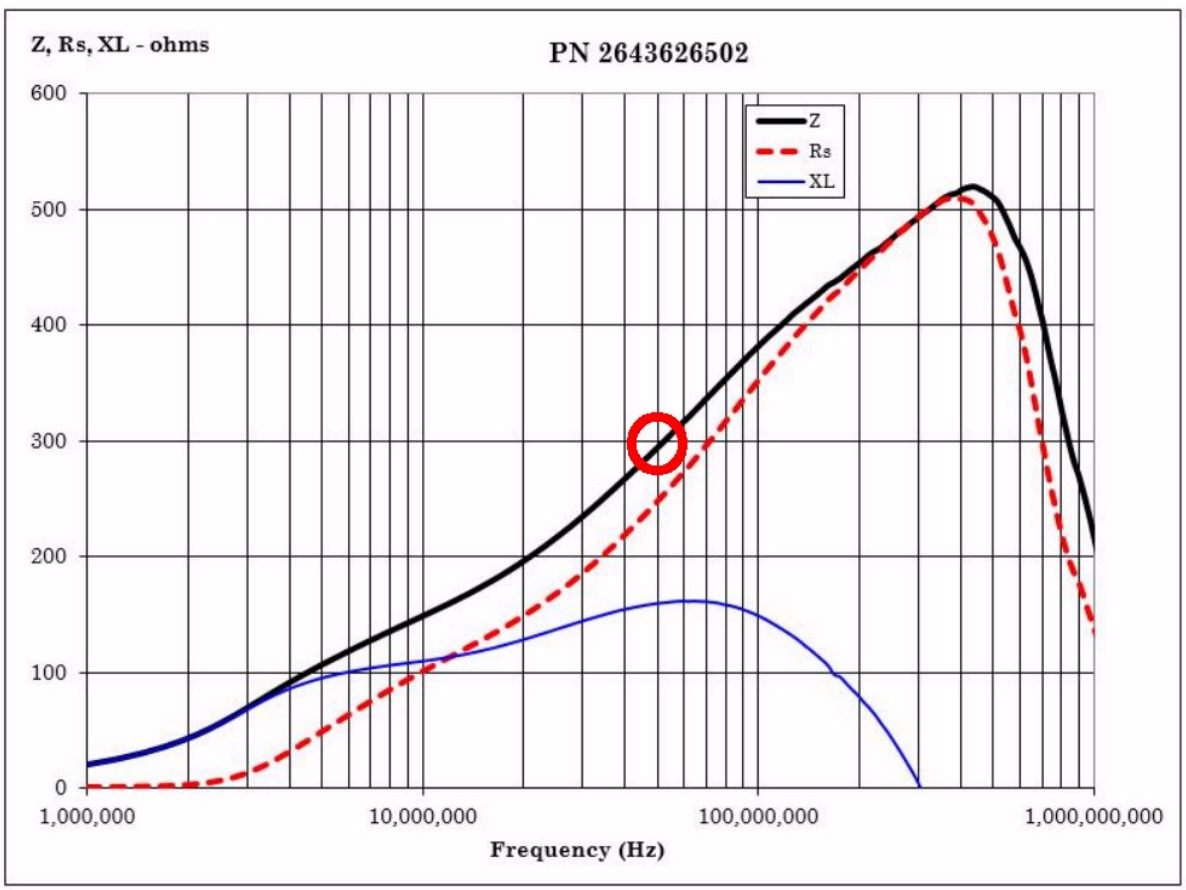
When I started doing annual 6m EME DXpeditions in 2008, it was expected that my primary operation would be dedicated to 6m EME, and my operation would limited to frequencies just below 50.200. For that application, the M2 6M8GJ did an exceptional job! However, now that FT8 has been so popular on 50.313, the need has arisen for an antenna that will cover frequencies below 50.200 and above 50.300, and work effectively even during periods of heavy rainfall.

The EF0609GJ was designed by YU7EF to provide for 12.03 dBD gain and maximum bandwidth on 6m, using a 6M8GJ boom.  I constructed this design, as shown in the above photo when I was testing it in a clearing and elevated 45 degrees up at a clear spot in the sky. I am looking forward to trying it on my next 6m EME DXpedition! I am hoping for close to 12 dBD gain. The RF Choke 1:1 balun I first made uses 1770 ohms of ferrite core sleeves on an 18” long piece of RG-393 Teflon coaxial cable. I expect this coax balun to have about .03 dB loss at 6m, but it should hold up very well, even at 1500w.

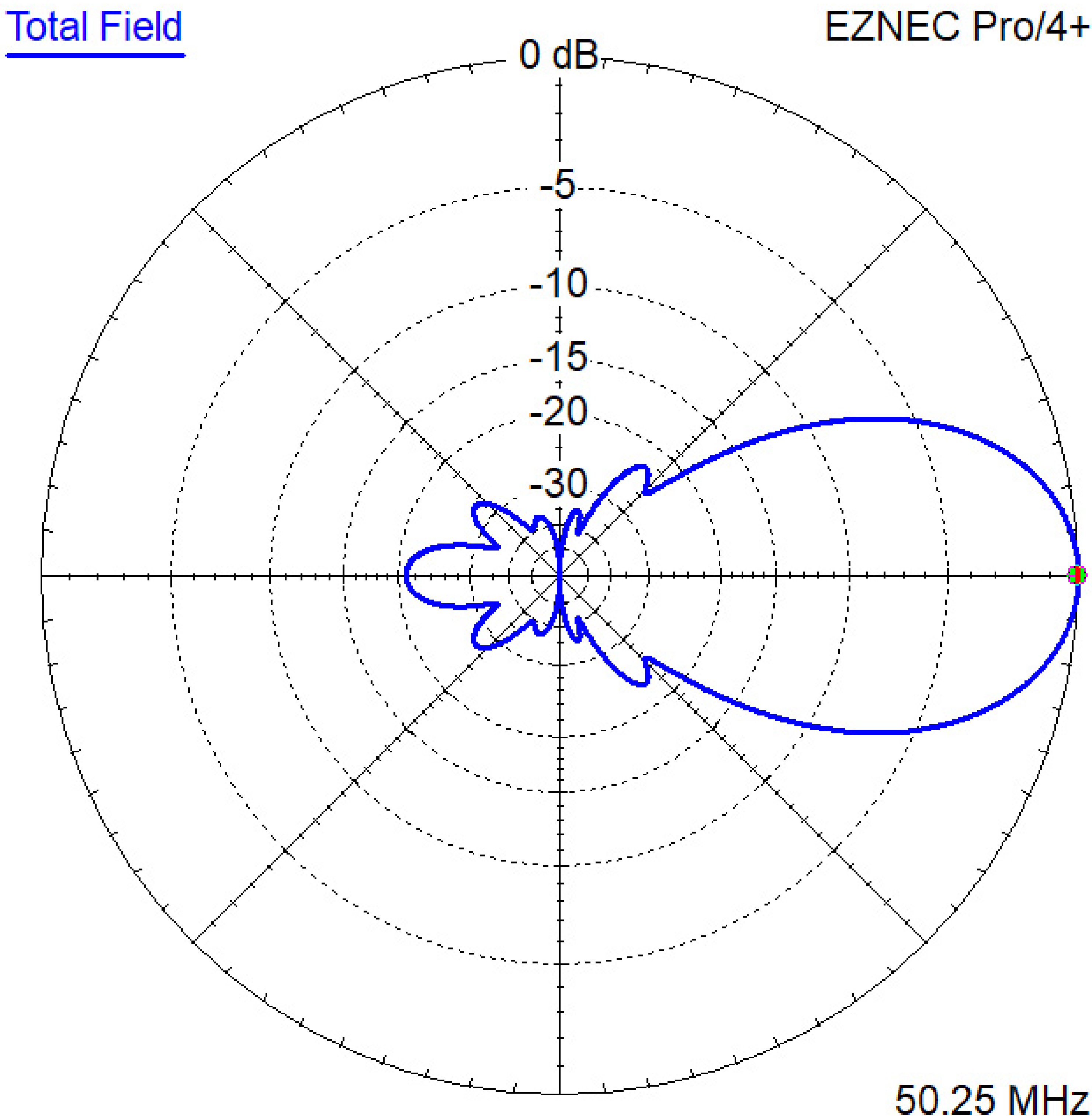
# RF Choke 1:1 Balun Constructed for the EF0609GJ

Because the EF0609GJ was designed to provide a 50 ohm impedance at the Driven Element, if can be fed directly with 50 ohm coaxial cable, provided that some type of RF Choke, or “1:1 Balun” is used at the feed point. I used an 18” length of RG-393 Teflon coaxial cable with a female N connector on one end and the braid and center conductor soldered to screw ring connectors on the other end. The 6M8GJ Driven Element was set up for 3.25” spacing between #8 screws to fasten the RF to the halves of the Driven Element, so I prepared the end of the balun to match that spacing. I carefully wrapped many layers of Teflon tape over the end of the cable, taped a piece of Teflon over the end and sealed the end with liquid rubber after installing heat shrink tubing to the entire assembly It is held 2” above the boom, and goes over top of the insulated mount for the first Director (D1).

I used six #43 ferrite round cable suppression cores that fit tightly over the RG-393 (Fair-Rite #2643626502). They are rated at 393 ohms impedance at 100 MHz, and are approximately 295 ohms at 50 MHz, as shown in the table below. That results in approximately 1770 ohms RF Choke impedance for the balun at 50 Mhz.



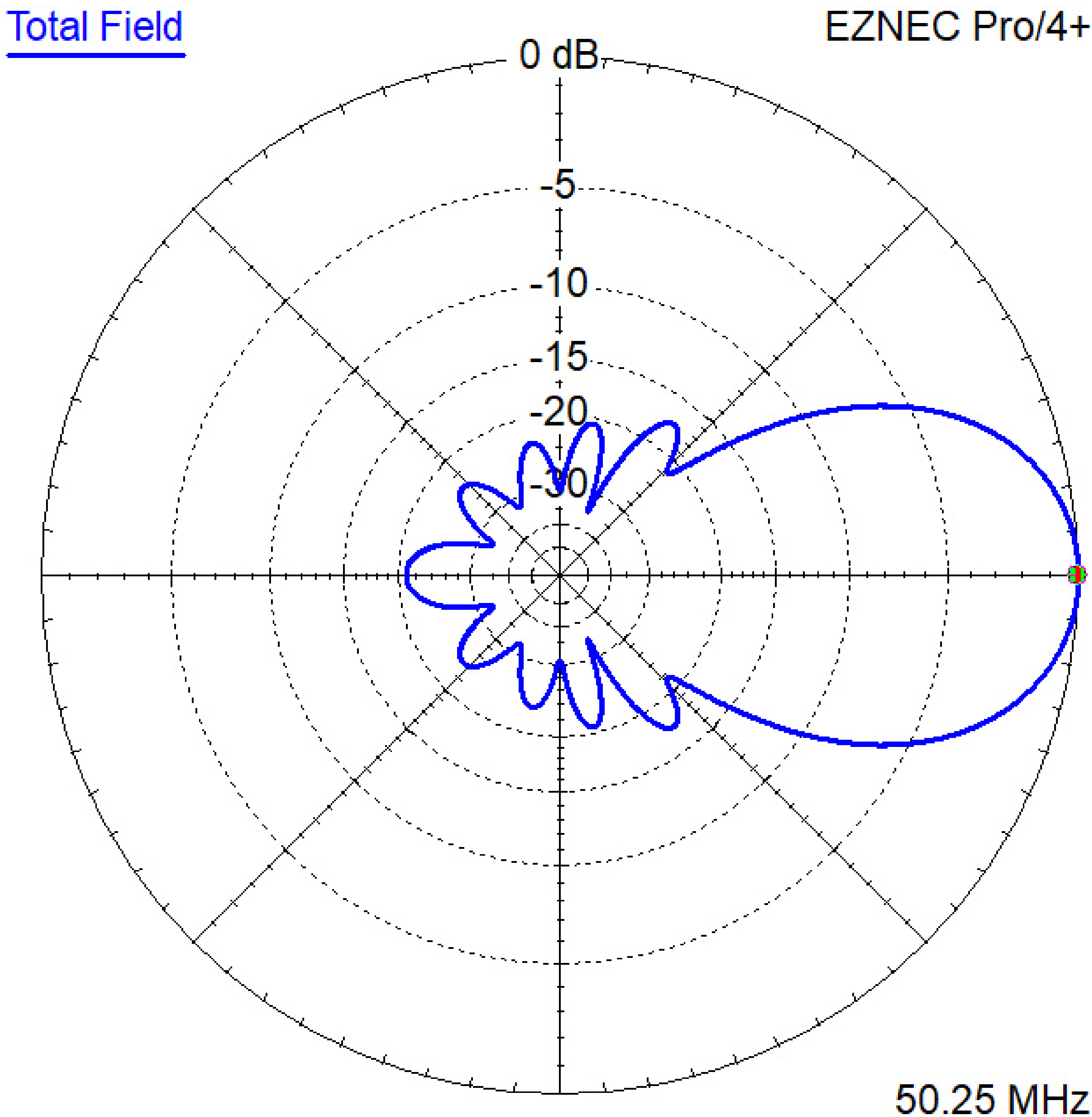

To try to reduce the loss of the Teflon RG-393 in half, I made another 1:1 balun using a 16” long piece of LMR400 coaxial cable. This RF choke has 7 of the above suppression cores on it, yielding 2065 ohms at 50 Mhz. Again, I installed a Female N connector (Amphenol 082-209-1006 from DigiKey) on the end away from the Driven Element.




| | |
|---|---|
| Azimuth Plot | |
| Elevation Angle | 0.0 deg. |
| Outer Ring | 14.17 dBi |

| | | |
|---|---|---|
| Cursor Az | 0.0 deg. |
| Gain | 14.17 dBi |
| | 0.0 dBmax |

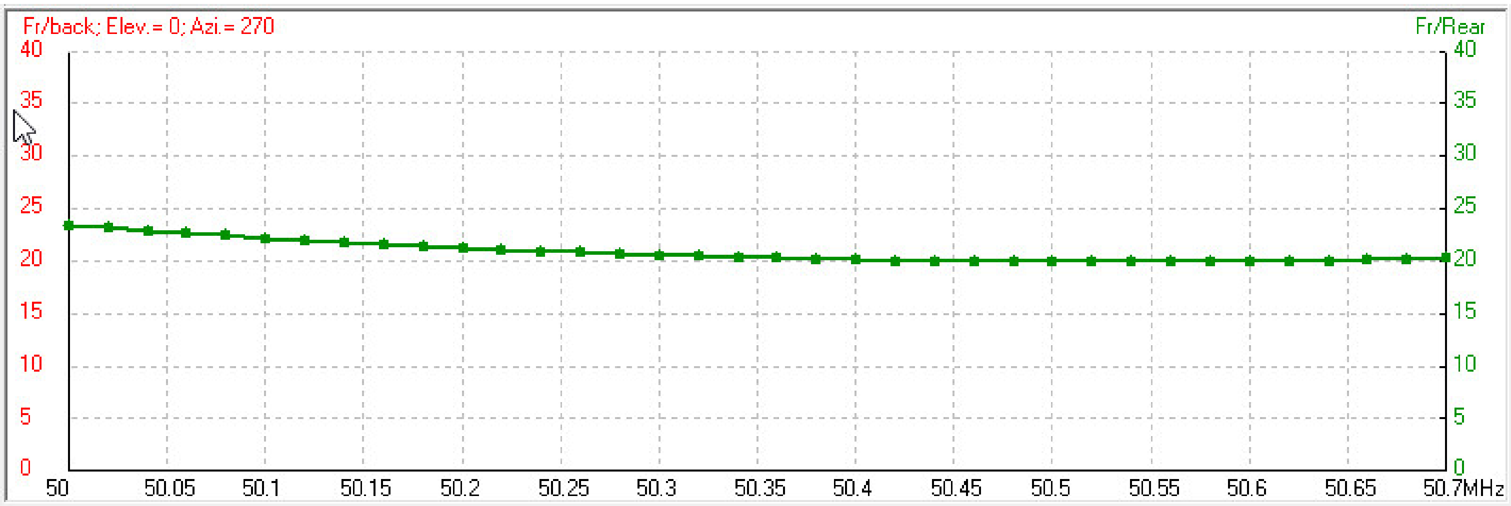
| | |
|---|---|
| Slice Max Gain | 14.17 dBi @ Az Angle = 0.0 deg. |
| Front/Back | 20.91 dB |
| Beamwidth | 37.6 deg.; -3dB @ 341.2, 18.8 deg. |
| Sidelobe Gain | -6.74 dBi @ Az Angle = 180.0 deg. |
| Front/Sidelobe | 20.91 dB |

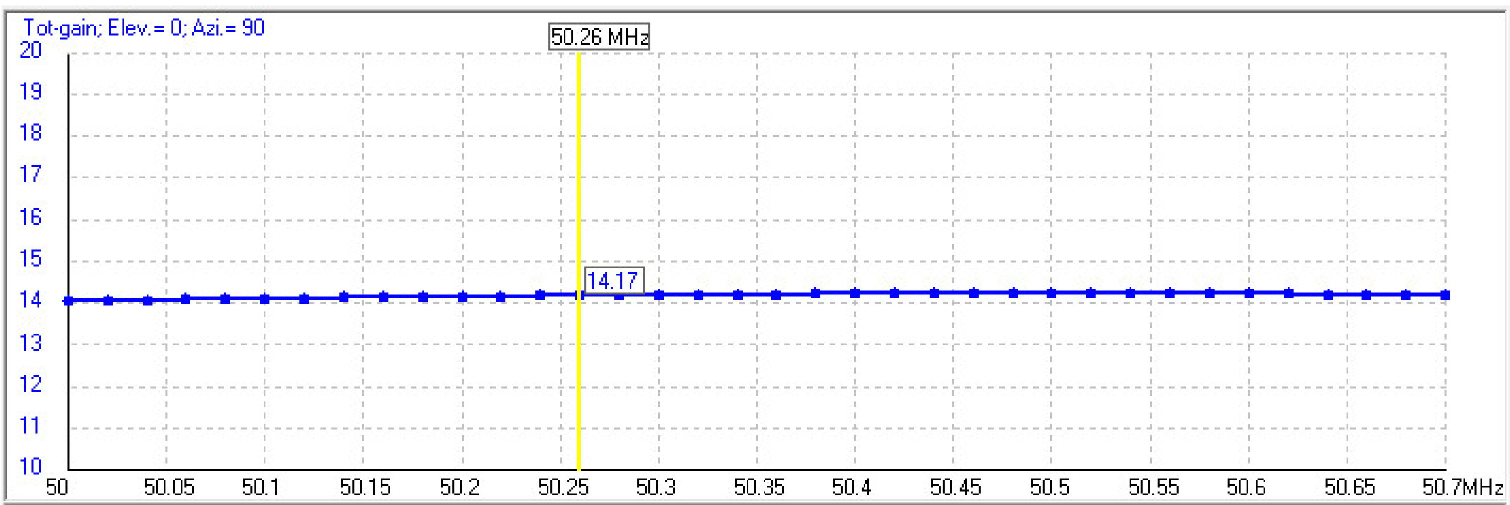


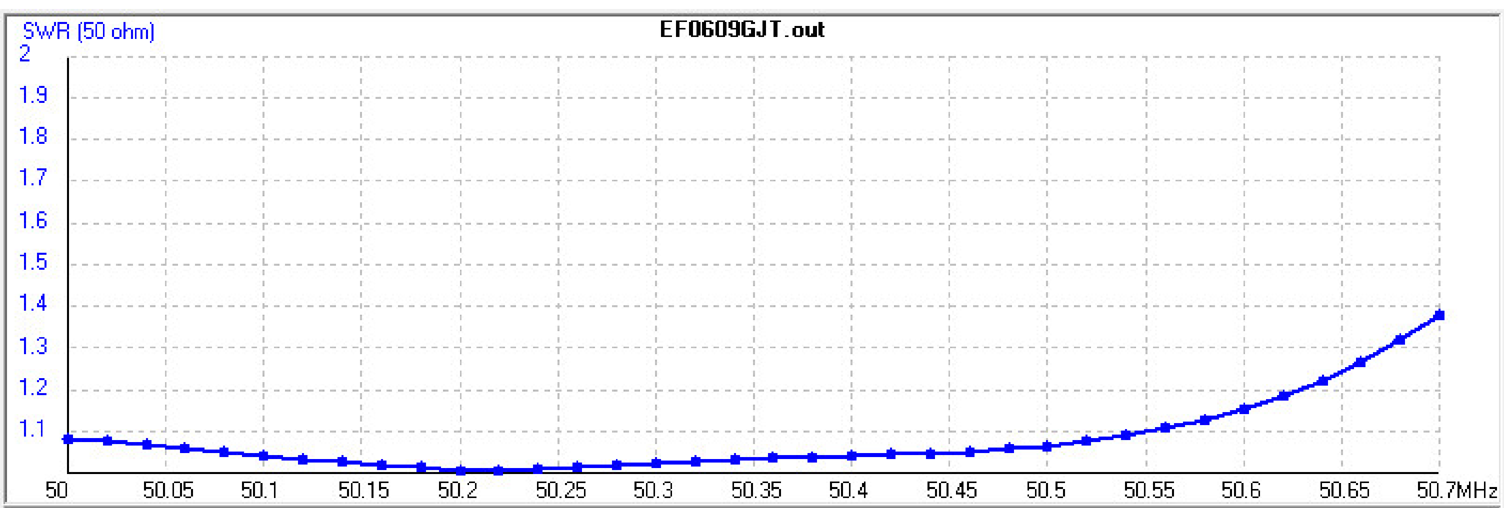

| | |
|---|---|
| Elevation Plot | |
| Azimuth Angle | 0.0 deg. |
| Outer Ring | 14.17 dBi |

| | |
|---|---|
| Cursor Elev | 0.0 deg. |
| Gain | 14.17 dBi |
| | 0.0 dBmax |

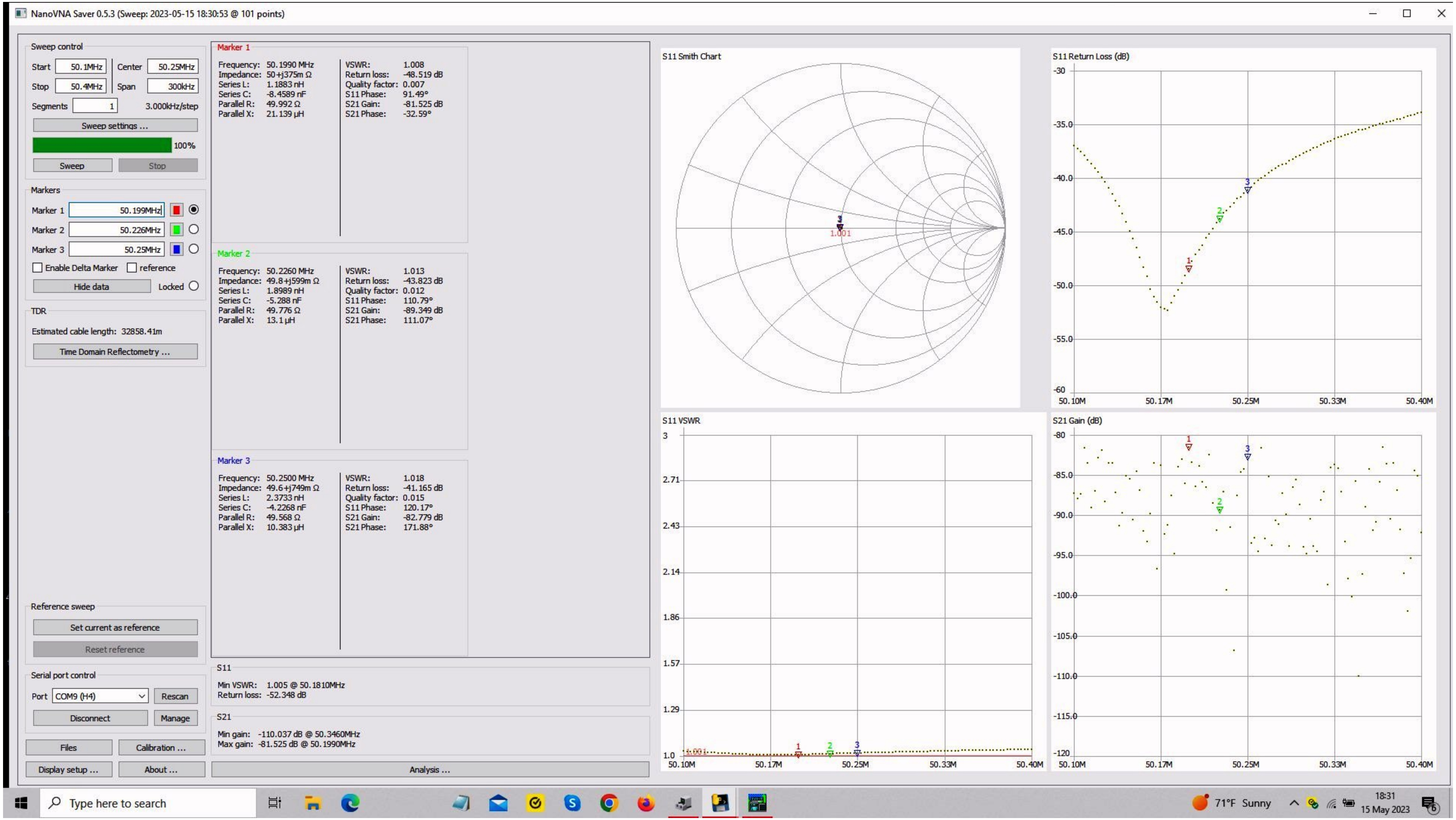
| | |
|---|---|
| Slice Max Gain | 14.17 dBi @ Elev Angle = 0.0 deg. |
| Front/Back | 20.91 dB |
| Beamwidth | 41.6 deg.; -3dB @ 339.2, 20.8 deg. |
| Sidelobe Gain | -3.13 dBi @ Elev Angle = 52.8 deg. |
| Front/Sidelobe | 17.3 dB |




The NanoVNA plot below shows the results of testing the EF0600GJ prototype at the W7GJ home QTH on my 24’ tall Portable Mast on May 15, 2023.


NanoVNA Saver 0.5.3 (Sweep: 2023-05-15 18:30:53 @ 101 points)
Sweep control
Start 50.1MHz
Center 50.25MHz
Stop 50.4MHz
Span 300kHz
Segments 1
3.000kHz/step
Sweep settings ...
100%
Sweep
Stop
Markers
Marker 1 50.199MHz
Marker 2 50.226MHz
Marker 3 50.25MHz
Enable Delta Marker
reference
Hide data
Locked
TDR
Estimated cable length: 32858.41m
Time Domain Reflectometry ...
Reference sweep
Set current as reference
Reset reference
Serial port control
Port COM9 (H4)
Rescan
Disconnect
Manage
Files
Calibration ...
Display setup ...
About ...
Marker 1
Frequency: 50.1990 MHz
Impedance: 50+j375m Ω
Series L: 1.1883 nH
Series C: -8.4589 nF
Parallel R: 49.992 Ω
Parallel X: 21.139 µH
VSWR: 1.008
Return loss: -48.519 dB
Quality factor: 0.007
S11 Phase: 91.49°
S21 Gain: -81.525 dB
S21 Phase: -32.59°
Marker 2
Frequency: 50.2260 MHz
Impedance: 49.8+j599m Ω
Series L: 1.8989 nH
Series C: -5.288 nF
Parallel R: 49.776 Ω
Parallel X: 13.1 µH
VSWR: 1.013
Return loss: -43.823 dB
Quality factor: 0.012
S11 Phase: 110.79°
S21 Gain: -89.349 dB
S21 Phase: 111.07°
Marker 3
Frequency: 50.2500 MHz
Impedance: 49.6+j749m Ω
Series L: 2.3733 nH
Series C: -4.2268 nF
Parallel R: 49.568 Ω
Parallel X: 10.383 µH
VSWR: 1.018
Return loss: -41.165 dB
Quality factor: 0.015
S11 Phase: 120.17°
S21 Gain: -82.779 dB
S21 Phase: 171.88°
S11
Min VSWR: 1.005 @ 50.1810MHz
Return loss: -52.348 dB
S21
Min gain: -110.037 dB @ 50.3460MHz
Max gain: -81.525 dB @ 50.1990MHz
Analysis ...
S11 Smith Chart
S11 Return Loss (dB)
S11 VSWR
S21 Gain (dB)
50.10M
50.17M
50.25M
50.33M
50.40M
Type here to search
71°F Sunny
18:31
15 May 2023