Vehicle-Mounted Earth Station

TracStar - i450M
Antenna Gain Plots

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Revision History

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2. INTRODUCTION

This report presents the test range data from four days of antenna testing by Optim Microwave, Inc. of the TracStar-i450M antenna performed at the ITT Loop Canyon far-field test range on October 6 through 10,2008.

The goal of the measurements was to obtain as complete a set of measurements as possible on a production version of the antenna over the following parameters:

- Three frequencies within the operational bands,
- Transmit and receive bands,
- Horizontal and vertical polarizations,
- Co-polarized and cross-polarized patterns,
- Elevation and azimuthally cuts,
- Three elevation tilt angles.

The results are presented in this report.

3. Antenna Plots

In this report the patterns are drawn normalized to the gain. The gain used is the measured gain. For these plots, a gain of 33.0 dBi is used.

The envelopes shown on the plots are from FCC section 2.209 of "47cfr Ch. 1 (10/01/04) Edition".

The first envelope is for the plane in the geostationary orbit and is used for the azimuth plots:

(1) Azimuth Envelope =

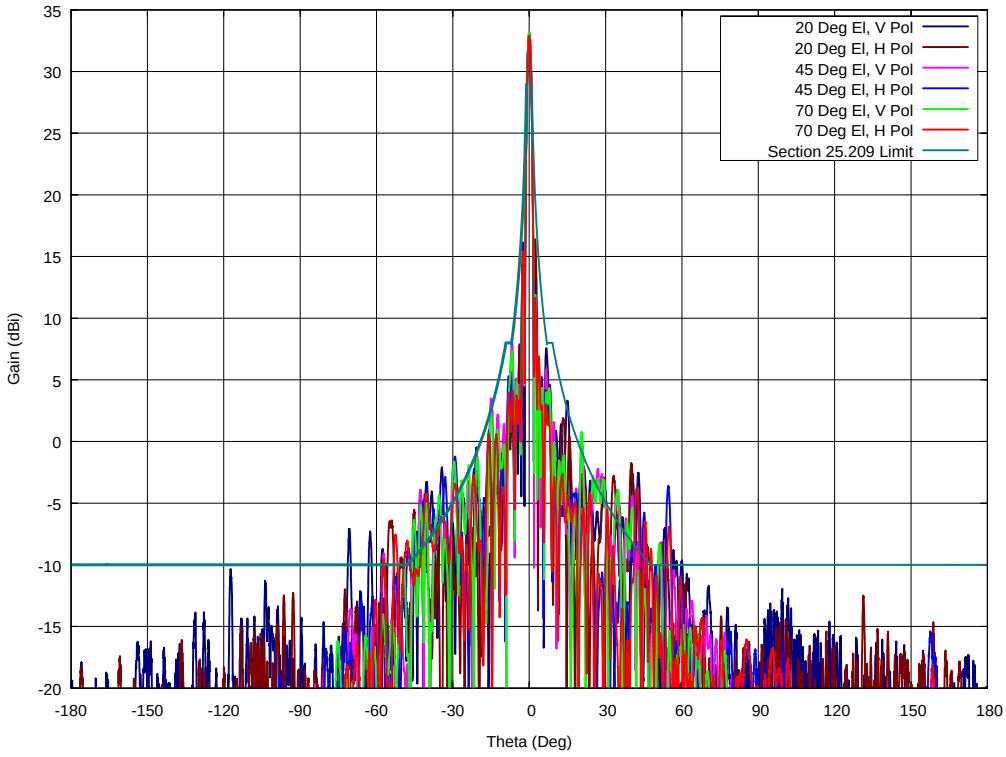
$$\begin{array}{ll} 29 - 25 \log(\Theta)\ \text{dBi}, & 1^o \le \Theta \le 7^o \\ +8\text{dBi}, & 7^o < \Theta \le 9.2^o \\ 32 - 25 \log(\Theta)\ \text{dBi}, & 9.2^o \le \Theta \le 48^o \\ -10\text{dBi}, & 48^o < \Theta \le 180^o \end{array}$$

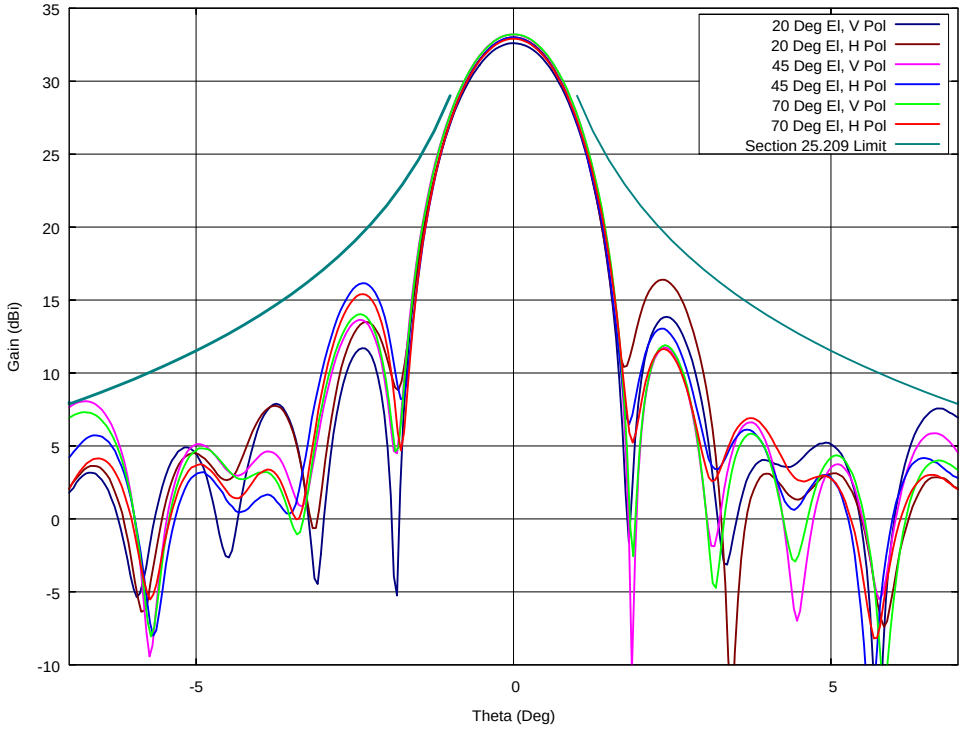
The second one is for all other directions and is used for the elevation cuts:

(2) Elevation Envelope =

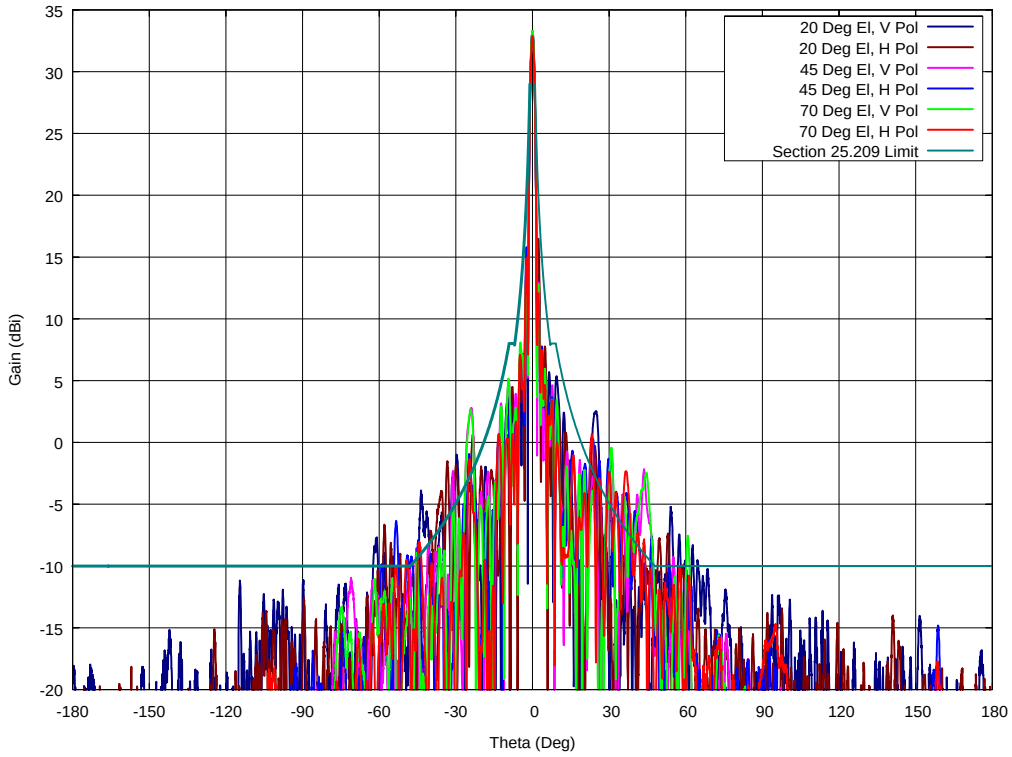
$$\begin{array}{ll} 32 - 25 \log(\Theta)\ \text{dBi}, & 1^o \le \Theta \le 48^o \\ -10\text{dBi}, & 48^o < \Theta \le 180^o \end{array}$$

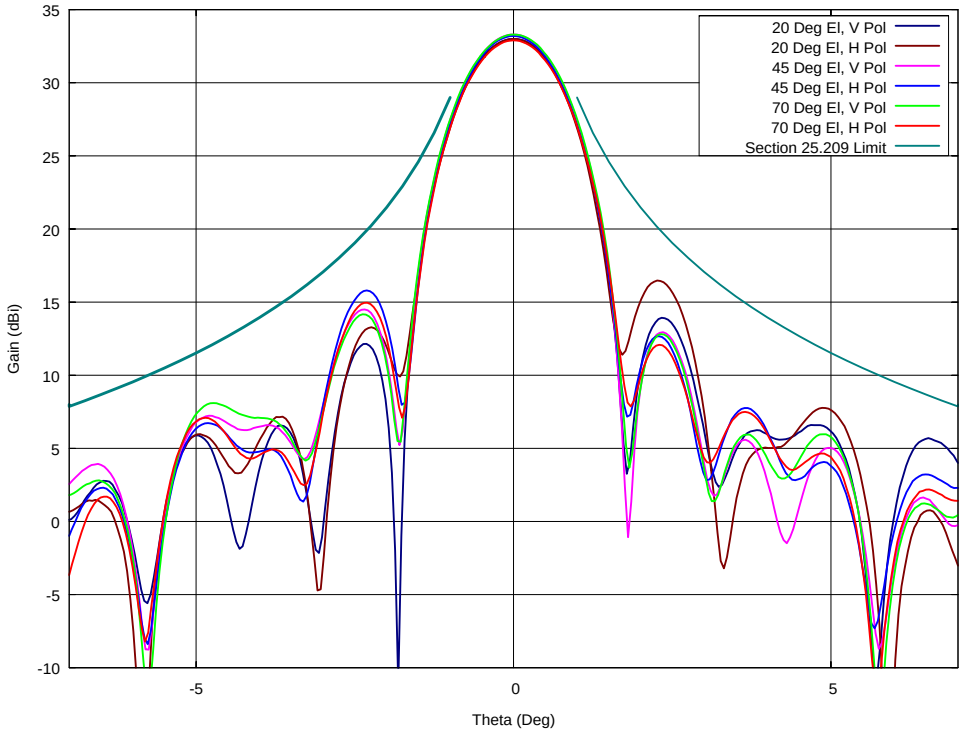
1. Azimuth Gain cuts over Elevation Angles and Polarizations at Fixed Frequencies.



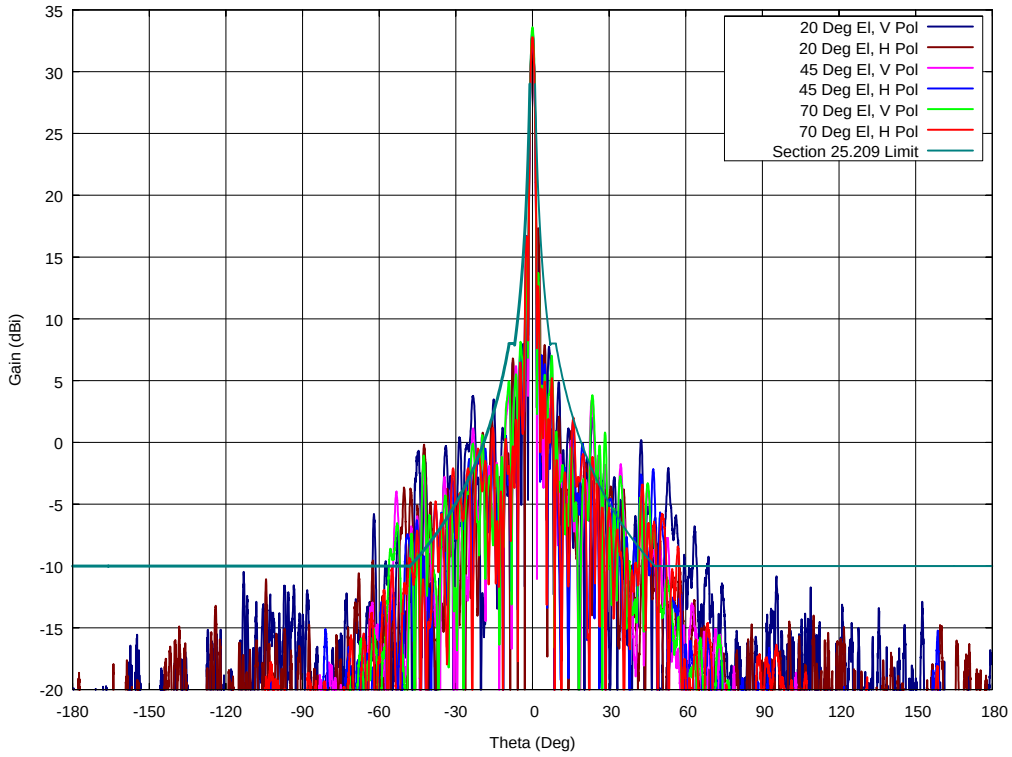


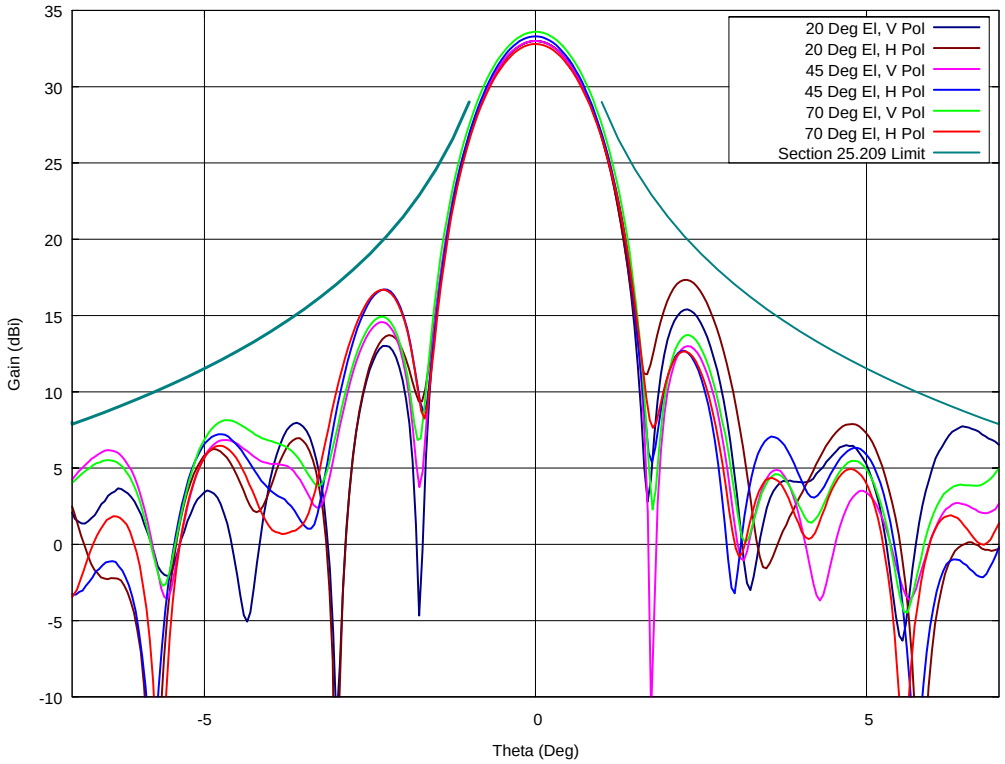
Frequency: 14.00 GHz





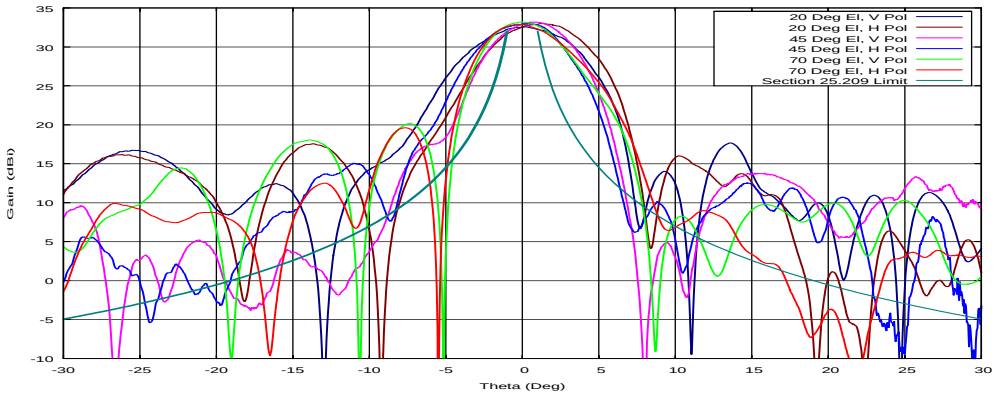
Frequency: 14.25 GHZ



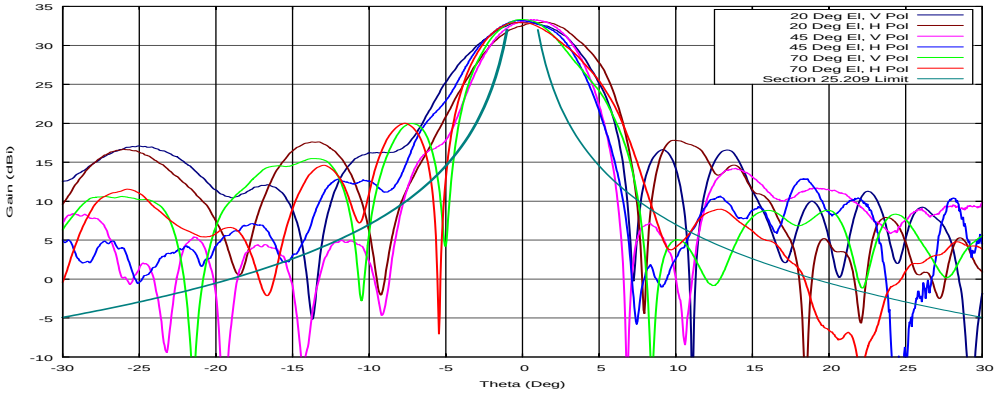


Frequency: 14.50 GHz

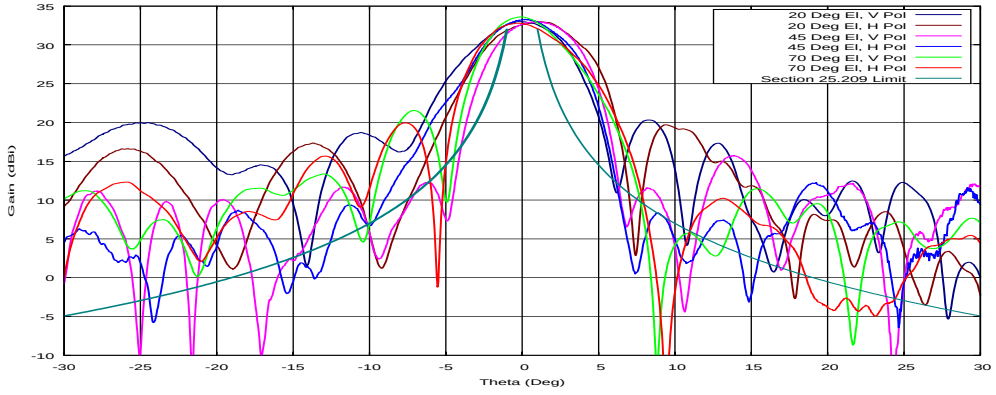
2. Elevation Gain cuts over Elevation Angles and Polarizations at Fixed Frequencies.



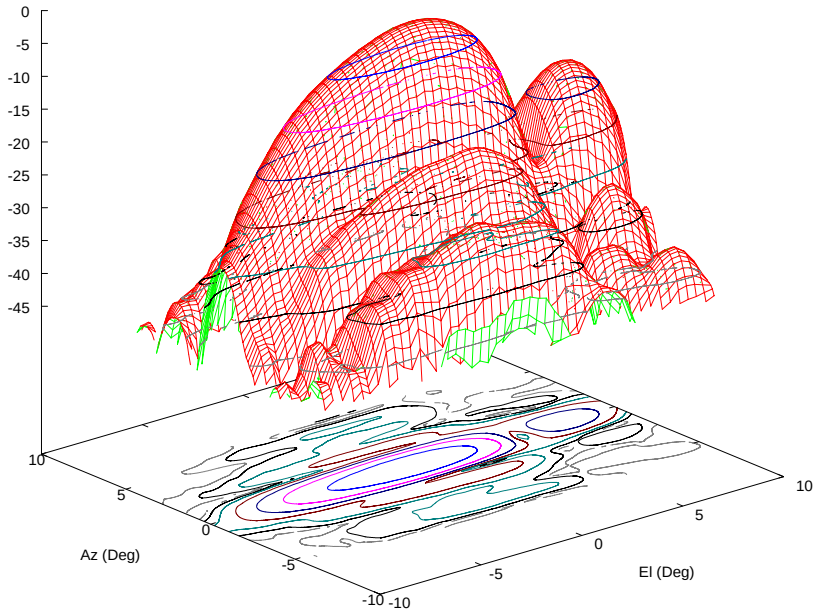
Frequency: 14.00 GHz

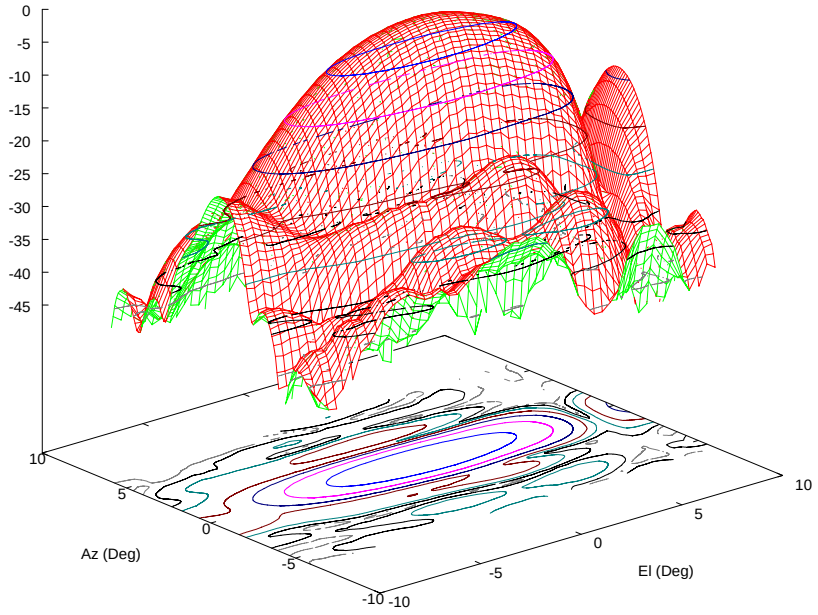


Frequency: 14.25 GHz



Frequency: 14.50 GHz





Three-Dimensional Isometric Views: Horizontal and Vertical Polarizations

4. SUMMARY

In this section the measurement results are summarized. The cross-polarized signal levels for the three elevation tilt angles are summarized in Table 1. The boresight cross-pol level is presented for both the azimuth and elevation cuts.

The measured gain levels are summarized in Table 2. Note that the transmit gain is measured at the input to the type-N adapter and includes losses not included in the last measurement. Specifically it includes losses in: the type-N-to-SMA adapter, SMA-to-WR62 adapter, flex waveguide, waveguide adapter, rotary joint, low loss coax, and waveguide adapter.

	Cross-Pol Level			
Frequency	Vertical		Horizontal	
(GHz)	Azimuth	Elevation	Azimuth	Elevation
10.95 GHz	-24.4	-28.5	-20.5	-20.0
11.75 GHz	-24.4	-27.1	-22.1	-23.4
12.75 GHz	-25.8	-27.4	-25.6	-34.2
14.00 GHz	-24.8	-21.2	-13.7	-17.8
14.25 GHz	-25.8	-24.2	-17.4	-20.6
14.50 GHz	-23.3	-23.6	-21.7	-20.0

a. 20o Elevation

	Cross-Pol Level			
Frequency	Vertical		Horizontal	
(GHz)	Azimuth	Elevation	Azimuth	Elevation
10.95 GHz	-22.0	-22.8	-22.9	-22.8
11.75 GHz	-24.0	-24.6	-25.8	-25.9
12.75 GHz	-25.4	-26.0	-38.0	-36.3
14.00 GHz	-23.8	-24.3	-20.3	-18.4
14.25 GHz	-25.5	-25.7	-23.9	-22.0
14.50 GHz	-23.9	-24.3	-25.4	-23.5

b. 45o Elevation

	Cross-Pol Level			
Frequency	Vertical		Horizontal	
(GHz)	Azimuth	Elevation	Azimuth	Elevation
10.95 GHz	-24.4	-22.5	-22.1	-19.9
11.75 GHz	-26.2	-23.8	-24.4	-23.4
12.75 GHz	-26.4	-25.2	-26.3	-31.6
14.00 GHz	-23.6		-18.9	-17.3
14.25 GHz	-25.8		-19.2	-18.3
14.50 GHz	-24.0		-24.4	-23.5

c. 70o Elevation

Table 1: Boresight Cross-Pol Levels. Comparison of cross-pol levels recorded when taken with elevation and azimuth cuts. Note that the cross-pol cuts for the 70^{o} elevation cuts were not made through the main beam and those results are not included.

Freq	Gain (dBi)	Vertical Azimuth HPBW	Elevation HPBW	Gain (dBi)	Horizontal Azimuth HPBW	Elevation HPBW
10.95 GHz	32.2	1.97°	7.15°	31.9	1.96°	7.77°
11.75 GHz	32.4	1.84°	6.99°	32.6	1.82°	7.49°
12.75 GHz	33.5	1.71°	6.65°	32.8	1.68°	6.70°
14.00 GHz	32.6	1.50°	6.94°	33.0	1.48°	6.24°
14.25 GHz	36.1	1.48°	6.33°	35.8	1.44°	6.11°
14.50 GHz	30.8	1.44°	5.60°	29.3	1.42°	6.02°

a. 20° Elevation.

Freq	Gain (dBi)	Vertical Azimuth HPBW	Elevation HPBW	Gain (dBi)	Horizontal Azimuth HPBW	Elevation HPBW
10.95 GHz	33.0	1.97°	6.32°	33.3	1.98°	6.51°
11.75 GHz	33.2	1.82°	6.59°	34.4	1.84°	5.79°
12.75 GHz	34.1	1.70°	5.66°	34.0	1.70°	5.58°
14.00 GHz	33.2	1.50°	5.24°	33.0	1.47°	5.46°
14.25 GHz	33.3	1.46°	5.14°	33.2	1.44°	5.58°
14.50 GHz	33.0	1.43°	5.25°	33.3	1.41°	5.21°

b. 45° Elevation.

Freq	Gain (dBi)	Vertical Azimuth HPBW	Elevation HPBW	Gain (dBi)	Horizontal Azimuth HPBW	Elevation HPBW
10.95 GHz	33.1	1.98°	6.17°	32.2	1.95°	6.96°
11.75 GHz	32.4	1.83°	6.30°	32.8	1.84°	6.55°
12.75 GHz	33.5	1.69°	6.05°	33.1	1.69°	6.10°
14.00 GHz	33.2	1.51°	4.91°	32.9	1.49°	5.45°
14.25 GHz	33.3	1.48°	4.69°	32.9	1.46°	5.47°
14.50 GHz	33.6	1.44°	4.47°	32.8	1.42°	5.51°

c. 70° Elevation.

Table 2: Measured gain. Measured by taking azimuth cut through main beam and comparing the gain level to that recorded for a standard gain horn.