

**ATTACHMENT 1**

**TECHNICAL APPENDIX**

# **AURA LE - TECHNICAL APPENDIX**

This Technical Appendix describes the operational characteristics of the Panasonic Aura LE aircraft earth station (“AES”) terminal with the licensed eXConnect Ku-band aeronautical mobile-satellite service (“AMSS”) system.

The eXConnect System consists of a network of eXConnect AES terminals (the “AES Segment”), leased satellite capacity on commercial Ku-band FSS satellites (the “Space Segment”) and iDirect hub earth stations and network management functionality (the “Ground Segment”). Relevant changes/additions to these eXConnect System elements to accommodate AURA LE AES operations are highlighted below.

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# 1 AES Segment

In addition to the licensed MELCO antenna, the AES Segment includes the AURA LE AES terminal and a previously described broadband controller. The AURA LE AES terminal was specifically designed for the aeronautical environment and compatibility with the eXConnect System.

## 1.1 AURA LE Antenna Sub-System

The AURA LE AES antenna is a mechanically steered phased array antenna using CoMPA™ (Coherent Multi Plate Antenna) technology. It is comprised of two dual-polarization panels with full receive and transmit bandwidth capability. The system is designed as two receive/transmit flat panels with appropriate provisions for coherent combining of the two flat panels to form effectively one larger elliptical narrow beam receive/transmit array with an elevation range of 0° to 90°. The AURA LE AES antenna is shown in Figure 1.

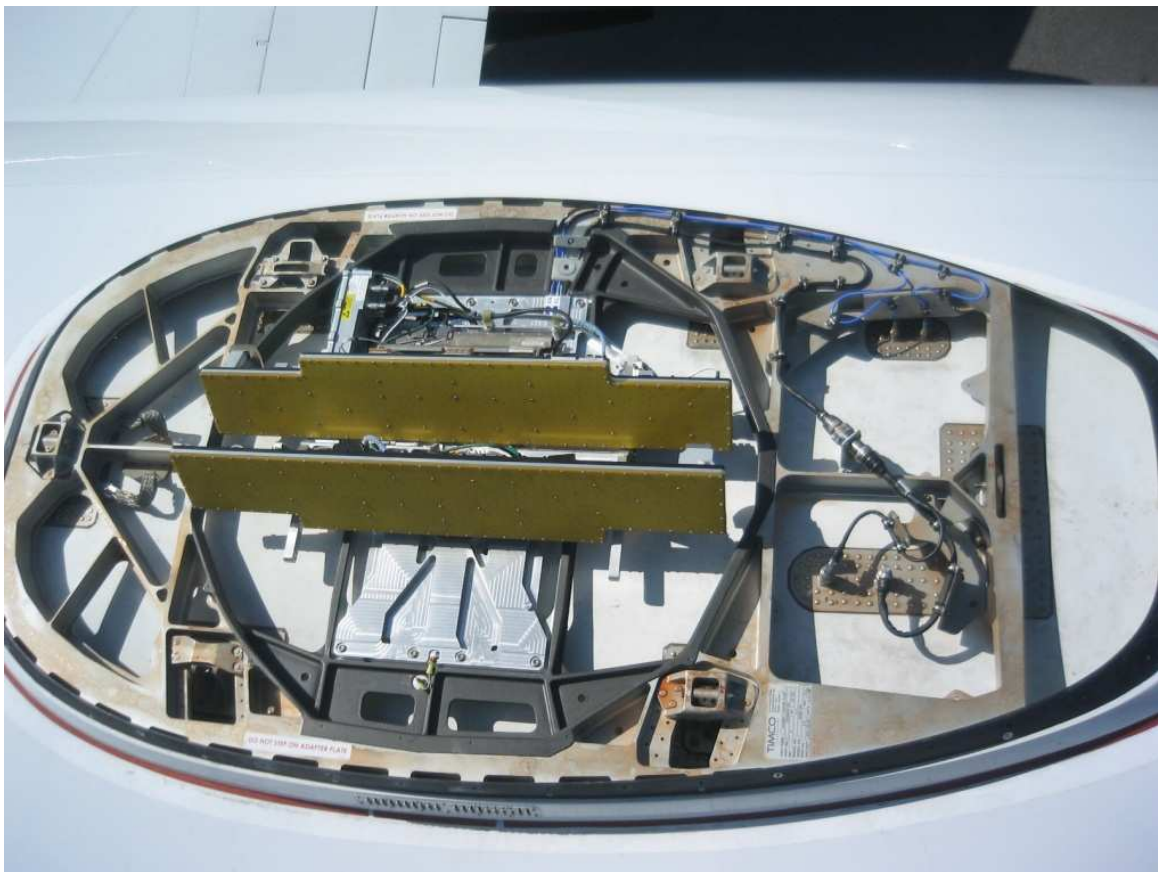


Figure 1. AURA LE antenna.

The characteristics of the AURA LE antenna are summarized in Table 1 below.

**Table 1. Summary of AURA LE antenna Technical Parameters**

<b>Antenna Dimensions</b>	34.7 inches (0.88 m) 6.6 inches height (0.17 m)
<b>Type of Antenna</b>	Dual panel waveguide fed phased array
<b>SSPA Rated Output Power</b>	16 watts
<b>Bandwidth</b>	10.70 GHz to 12.75 GHz 14.0 GHz to 14.5 GHz
<b>Transmit Gain</b>	38 dBi
<b>EIRP</b>	48 dBW
<b>Transmit Polarization</b>	Horizontal or Vertical
<b>Receive G/T</b>	10 to 14 dB/K
<b>Transmit Azimuth Beamwidth</b>	1.5 degrees
<b>Transmit Elevation Beamwidth</b>	4 degrees

## 1.2 Antenna Pointing

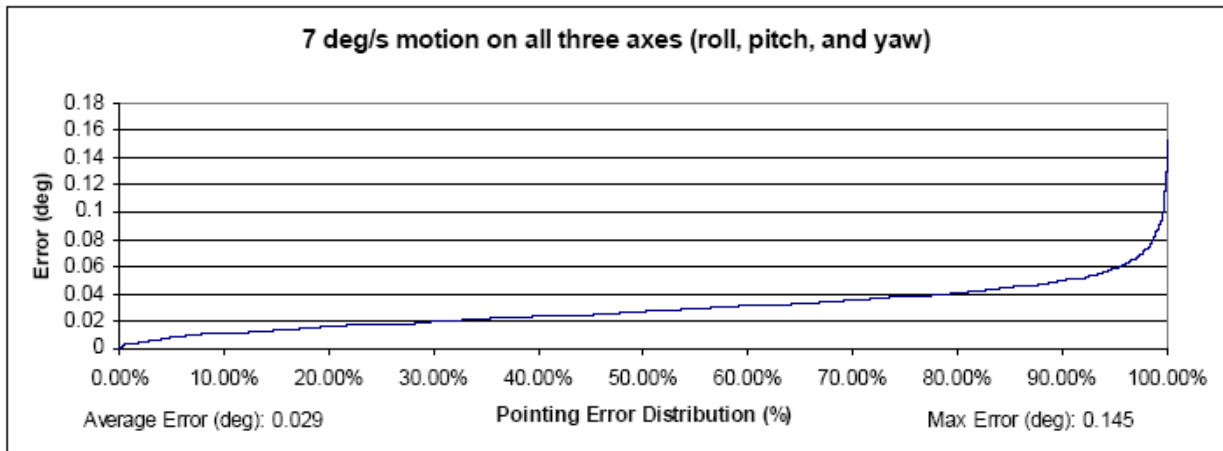
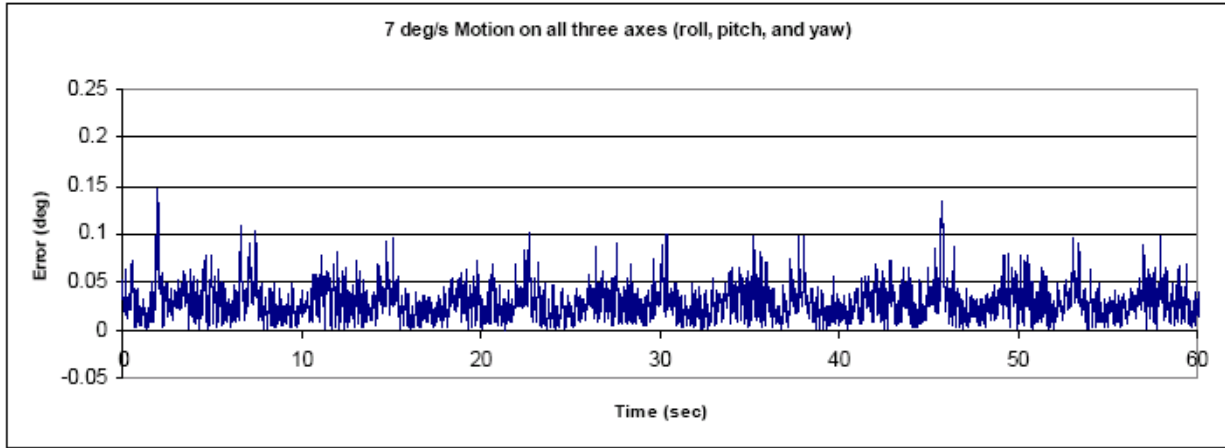
Pointing for the AURA LE AES terminal is accomplished via mechanical steering of the antenna and uses the aircraft attitude data (*i.e.*, yaw, roll, pitch and heading vector), together with location of the aircraft (latitude, longitude and altitude) to calculate the command vectors. Attitude data, available from the ARINC 429 bus, and satellite coordinates are used to continuously update steering commands for the antenna elevation, azimuth, and polarization. The pointing error of the AURA LE AES terminal is typically less than 0.20 deg. Pointing error is continuously monitored and emissions are automatically muted if the azimuth pointing error exceeds 0.35 deg.

A motion simulator (see pictures below) was used to measure the pointing performance of the AURA LE. The simulator measures the antenna's ability to respond to aircraft attitude changes in roll, pitch and heading is tested dynamically.



**Figure 2. Motion Performance Testing Environment**

The following two plots contain the beam radial errors and the error distribution of a dynamic stability test with 7 deg/second maximum velocity on all three axes. Note that no pointing error exceeds 0.145 degrees. Also note that the pointing error is 0.1 degree or less for over 99% of the time.



**Figure 3. Motion Pointing Performance**

Operational and test flight data confirms these conclusions regarding pointing accuracy. Indeed, in a recent assessment, there were no instances above 10,000 feet where the measured error exceeded 0.2 degrees peak (excluding beam switches, of course, which involve antenna repointing to a new satellite while muted). Panasonic collected data every 5 milliseconds and analyzed over 1.5 million data points. Our analysis shows that the standard deviation (1-sigma) for pointing error is 0.02 degrees.

## 1.3 Waveforms and Emission Designators

### 1.3.1 Waveforms

**Forward Link:** The eXConnect System uses well established industry standard waveforms: DVB-S2. The iDirect forward link (hub to mobile terminal) will consist of a single DVB-S2 carrier that may occupy up to a full transponder and operate in saturation but in most cases will be operated in a partial transponder. DVB-S2 is a widely adopted standard for digital data and video broadcasting over satellite. Data may be multiplexed on this carrier for multiple terminals. The DVB-S2 standard supports Adaptive Coding and Modulation (ACM) with QPSK, 8PSK, and 16APSK modulations and Low Density Parity Check Coding.

**Return Link:** The eXConnect System uses iDirect D-TDMA on the return link (mobile terminal to hub). In order to comply with EIRP Spectral Density limit and Satellite operator's coordination requirements eXConnect uses the Spread Spectrum technology. On the return carrier, BPSK modulation and spread factor in range 1 to 16 can be used.

### 1.3.2 Emission Designators

Note: The AES transmits one carrier only.

Satellite Name	Tx/Rx	Emission Designator	Max EIRP (dBW)	Max EIRP Density (dBW/4kHz)
T11N-AOR	Tx	500KG7D	33.60	13.42
T11N-AOR	Tx	9M00G7D	46.15	13.42
T11N-AOR	Rx	1M20G7D		
T11N-AOR	Rx	36M0G7D		
T11N-AOR	Rx	72M0G7D		
T11N-US	Tx	500KG7D	30.60	10.42
T11N-US	Tx	9M00G7D	43.15	10.42
T11N-US	Rx	1M20G7D		
T11N-US	Rx	36M0G7D		
T11N-US	Rx	72M0G7D		
Asiasat-5	Tx	500KG7D	39.50	19.32
Asiasat-5	Tx	9M00G7D	48.00	15.27
Asiasat-5	Rx	1M20G7D		
Asiasat-5	Rx	36M0G7D		
Asiasat-5	Rx	72M0G7D		



Satellite Name	Tx/Rx	Emission Designator	Max EIRP (dBW)	Max EIRP Density (dBW/4kHz)
W2A	Tx	500KG7D	40.50	20.32
W2A	Tx	9M00G7D	48.00	15.27
W2A	Rx	1M20G7D		
W2A	Rx	36M0G7D		
W2A	Rx	72M0G7D		
GE23-SP	Tx	500KG7D	32.90	12.72
GE23-SP	Tx	9M00G7D	45.45	12.72
GE23-SP	Rx	1M20G7D		
GE23-SP	Rx	36M0G7D		
GE23-SP	Rx	72M0G7D		
GE23-NP	Tx	500KG7D	43.00	22.82
GE23-NP	Tx	9M00G7D	48.00	15.27
GE23-NP	Rx	1M20G7D		
GE23-NP	Rx	36M0G7D		
GE23-NP	Rx	72M0G7D		
GE23-SWP	Tx	500KG7D	34.80	14.62
GE23-SWP	Tx	9M00G7D	47.35	14.62
GE23-SWP	Rx	1M20G7D		
GE23-SWP	Rx	36M0G7D		
GE23-SWP	Rx	72M0G7D		
Yamal-201	Tx	500KG7D	42.40	22.22
Yamal-201	Tx	9M00G7D	48.00	15.27
Yamal-201	Rx	1M20G7D		
Yamal-201	Rx	36M0G7D		
Yamal-201	Rx	72M0G7D		
G-17	Tx	500KG7D	36.50	16.32
G-17	Tx	9M00G7D	48.00	15.27
G-17	Rx	1M20G7D		
G-17	Rx	36M0G7D		
Superbird-C2	Tx	500KG7D	33.90	13.72
Superbird-C2	Tx	9M00G7D	46.45	13.72
Superbird-C2	Rx	1M20G7D		
Superbird-C2	Rx	36M0G7D		
T14R	Tx	500KG7D	41.00	20.82
T14R	Tx	9M00G7D	48.00	15.27
T14R	Rx	1M20G7D		

Satellite Name	Tx/Rx	Emission Designator	Max EIRP (dBW)	Max EIRP Density (dBW/4kHz)
T14R	Rx	36M0G7D		
IS-14	Tx	500KG7D	36.10	15.92
IS-14	Tx	9M00G7D	48.00	15.27
IS-14	Rx	1M20G7D		
IS-14	Rx	36M0G7D		
IS-14	Rx	72M0G7D		
Anik-F1	Tx	500KG7D	31.20	11.02
Anik-F1	Tx	9M00G7D	43.75	11.02
Anik-F1	Rx	1M20G7D		
Anik-F1	Rx	36M0G7D		
Apstar-6	Tx	500KG7D	40.5	20.32
Apstar-6	Tx	9M00G7D	48	15.27
Apstar-6	Rx	1M20G7D		
Apstar-6	Rx	36M0G7D		
Apstar-7	Tx	500KG7D	31.0	10.82
Apstar-7	Tx	9M00G7D	43.55	10.82
Apstar-7	Rx	1M20G7D		
Apstar-7	Rx	36M0G7D		

### 1.3.3 Out of Band Emissions

The AURA LE AES will comply with the emissions limitations in 47 C.F.R. §25.202(f).

### 1.3.4 Transmission Cessation

The AURA LE AES antenna ceases transmission in the event of the following fault conditions:

- Loss of ARINC-429 data from the IRS.
- Invalid status message from the IRS.
- Loss of 10 MHz reference.

- Antenna out of position. If azimuth pointing error exceeds 0.35 degrees, the antenna ceases transmission within 100 ms and will not resume transmission until the pointing error is less than 0.2 degrees.
- Any critical fault detected by the antenna.

Furthermore, any event that results in the loss of modem lock to the DVB-S2 downlink will cause the modem to cease all transmission.

## 2 PROTECTION OF GSO FSS SERVICES

The eXConnect System will protect GSO and NGSO FSS satellite uplinks, Space Research downlinks, and Radio Astronomy service operations in the 14.0-14.5 GHz Band. Because previously identified coordination agreements and operational restrictions that are already applicable to eXConnect System operations will protect other co-frequency services, the following discussion focuses on AURA LE AES operational characteristics in the context of protecting primary GSO FSS operations.

### 2.1 Off-Axis EIRP Spectral Density Control

The AURA LE AES protects GSO FSS satellites uplinks by controlling the off-axis EIRP spectral density generated by an AURA LE AES single terminal so that it is no greater than the levels of interference that have been accepted by the adjacent satellites in coordination or the levels for Ku-band terminals under FCC Part 25.

The U.S. off-axis limits on EIRP spectral density limits under FCC Part 25 are defined by 25.218(f)(1), where  $N = 1$  for TDMA, is given by:

$15-25\log_{10}(\Theta)$	dBW/4 kHz	For	$1.5^\circ \leq \Theta \leq 7^\circ$
-6	dBW/4 kHz	For	$7^\circ < \Theta \leq 9.2^\circ$
$18-25\log_{10}(\Theta)$	dBW/4 kHz	For	$9.2^\circ < \Theta \leq 48^\circ$
-24	dBW/4 kHz	For	$48^\circ < \Theta \leq 85^\circ$
-14	dBW/4 kHz	For	$85^\circ < \Theta \leq 180^\circ$

Off-axis EIRP spectral density is managed on an individual terminal basis. Only one AURA LE AES terminal transmits at a given time slot in a given bandwidth. The off-axis EIRP spectral density of an individual eXConnect terminal is a function of its transmit signal bandwidth, input power to the antenna, the projection of the antenna gain pattern of the antenna along the geostationary arc, and antenna pointing error.

Input power to the AURA LE AES is controlled by limiting the output power of the modem. A built in burst power meter in the antenna is used to calibrate the input power to the antenna accurately and remove any gain variation between the modem and the antenna. The input power limitations are specified on a satellite beam-by-satellite beam basis.

The contribution of pointing error to off-axis EIRP spectral density is minimized by inhibiting the transmitter for pointing errors greater than 0.35 deg. and not resuming transmission until the pointing error is less than 0.2 deg. The AURA LE AES has been proven to operate on an interference-free basis within these pointing parameters in flight testing and standard operation on foreign aircraft. There have been no reported interference cases associated with AURA LE AES operations.

An example of off-axis EIRP control is shown in Figure 4 for the AURA LE AES antenna. The off-axis EIRP spectral density (“ESD”) values are based on the specific link parameters shown in the link budget in Exhibit A. The ESD values represent edge of beam cases where the terminal is operating with a maximum skew angle of 35 degrees. The terminal off-axis ESD, shown in the solid red line, remains well below the 25.218(f)(1) off-axis ESD limit, shown in the solid blue line. A comprehensive set of antenna gain plots and off-axis EIRP plots and tables are included as Exhibits B and C of this Technical Appendix.

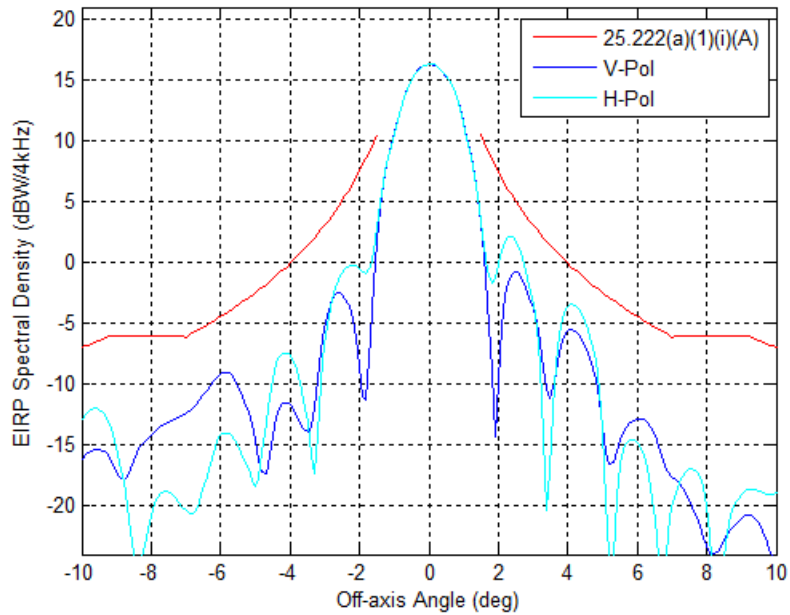
Note that AURA LE AES antenna performance varies with elevation angles and skew angle, and power levels may vary with serving satellite (i.e., operations in two-degree versus three-degree spacing environments). Panasonic has provided best case (azimuth cut or 0 degree skew), worst case (elevation cut or 90 degree skew) and an representative 35 degree skew for communications (plotted against the Commission’s two-degree spacing levels). Off-axis EIRP will be controlled to permissible two-degree spacing levels or the coordinated limits for the satellite. Control will be achieved by limiting maximum EIRP spectral density and skew angle.

For example, the maximum skew angle in CONUS for Galaxy-17 is 35 degrees, which occurs at the southwestern most tip of the US in the vicinity of San Diego. Figure 4 and 5 show the co-pol off-axis EIRP along the GSO for a maximum skew angle of 35 degrees and a maximum EIRP spectral density of 16.3 dBW/4kHz, the maximum ESD for Galaxy-17 from Form 312. Figure 6 and 7 show the co-pol off-axis EIRP perpendicular to the GSO and Figure 8 and 9 show the cross-pol off-axis EIRP along the GSO for the same scenario.

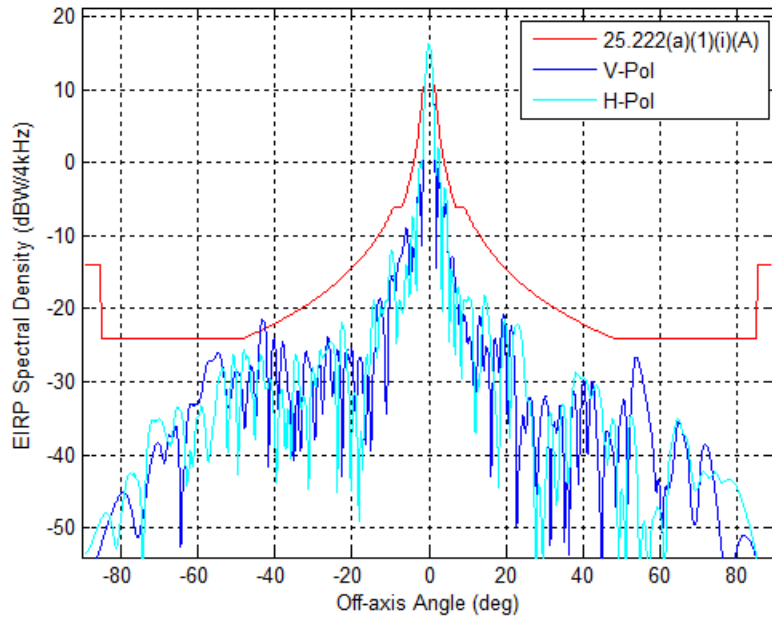
Table 1 contains the corresponding EIRP spectral density data. Data is only shown for +/-90 degrees off-axis<sup>1</sup>. As shown in the principle plane gain patterns, there are no significant spillover side-lobes beyond 90 deg because the AURA LE antenna is a planer array.

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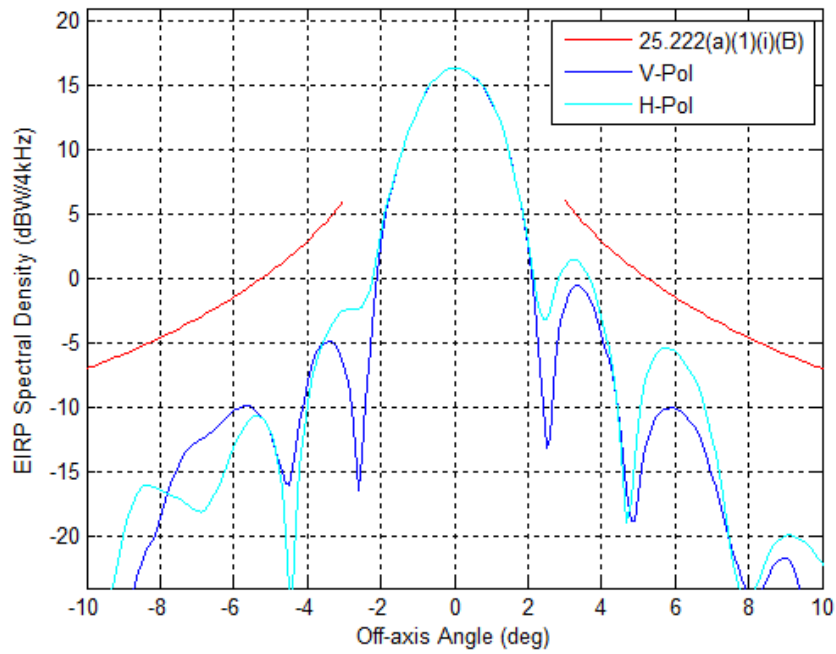
<sup>11</sup> Please see attached plots and tables for the full range of off-axis angles and frequencies.



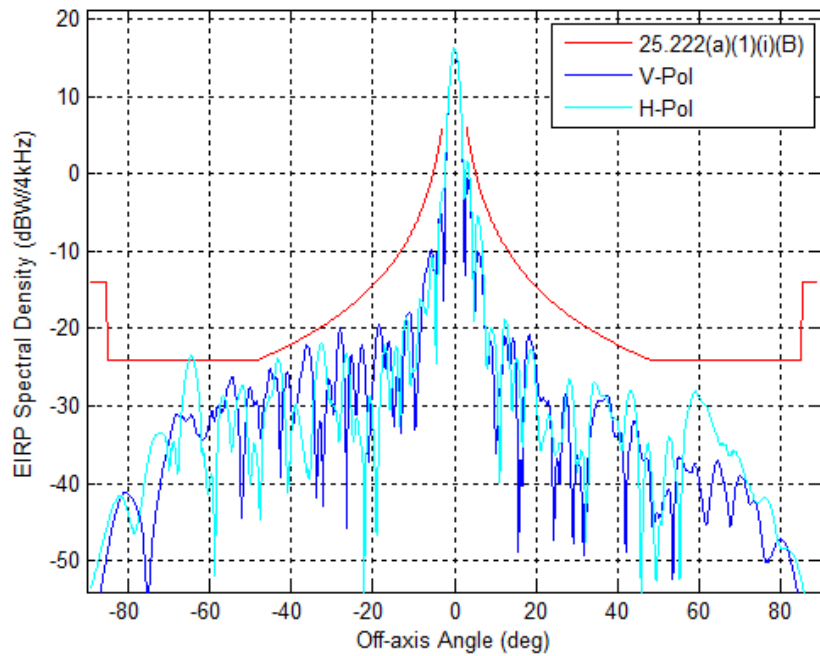
**Figure 4. Co-Pol Off-axis EIRP Spectral Density along the GSO**  
(V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)



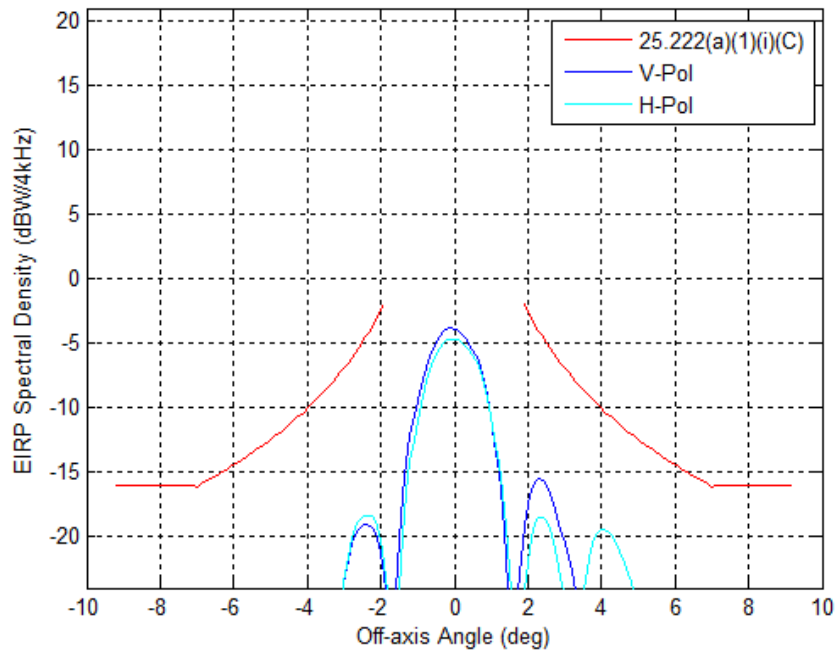
**Figure 5. Co-Pol Off-axis EIRP Spectral Density along the GSO**  
(V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)



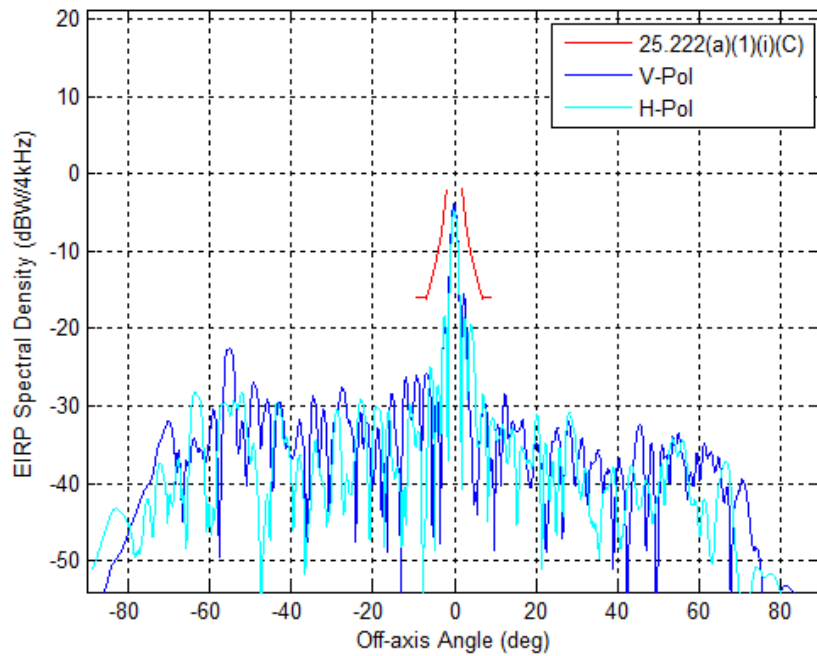
**Figure 6. Co-Pol Off-axis EIRP Spectral Density perpendicular to the GSO**  
 (V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)



**Figure 7. Co-Pol Off-axis EIRP Spectral Density perpendicular to the GSO**  
 (V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)



**Figure 8. Cross-Pol Off-axis EIRP Spectral Density along the GSO**  
(V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)



**Figure 9. Cross-Pol Off-axis EIRP Spectral Density along the GSO**  
(V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)



**Table 1 - Off-axis EIRP Spectral Density Co-pol, along the GSO,  
Cross-pol along the GSO and Co-pol perpendicular to the GSO  
(V-pol and H-pol, 14.25 GHz, 35 deg Skew Angle, 45 deg elevation angle)**

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-89.0	-58.3	-53.6	-60.5	-53.5	-59.6	-51.3
-85.0	-52.3	-48.8	-49.1	-45.5	-52.7	-45.3
-80.0	-45.4	-49.4	-41.2	-43.6	-46.7	-45.1
-75.0	-50.7	-44.7	-55.6	-37.2	-40.4	-42.2
-70.0	-38.3	-35.2	-35.1	-36.7	-31.9	-43.4
-65.0	-38.9	-33.5	-31.6	-24.1	-37.9	-36.8
-60.0	-33.0	-34.7	-32.1	-40.4	-34.2	-43.3
-55.0	-26.2	-31.7	-27.1	-33.1	-22.6	-31.1
-50.0	-28.5	-30.0	-27.7	-40.0	-31.1	-37.3
-45.0	-34.6	-35.9	-25.2	-28.6	-33.9	-44.2
-40.0	-24.6	-36.6	-29.6	-34.6	-36.8	-37.8
-35.0	-37.7	-28.2	-24.6	-35.3	-30.3	-41.4
-30.0	-33.1	-28.2	-28.9	-29.5	-35.7	-39.6
-25.0	-31.9	-24.7	-23.7	-32.7	-33.5	-40.8
-20.0	-25.5	-37.6	-27.1	-32.4	-39.3	-33.7
-15.0	-39.1	-23.2	-30.5	-25.3	-28.9	-38.2
-10.0	-16.2	-12.9	-25.5	-25.1	-29.7	-32.4
-9.9	-15.8	-12.5	-27.2	-25.1	-29.1	-33.1
-9.8	-15.6	-12.2	-29.5	-25.1	-28.4	-33.8
-9.7	-15.5	-12.1	-31.7	-25.2	-27.8	-34.6
-9.6	-15.4	-12.0	-33.0	-25.3	-27.2	-35.1
-9.5	-15.4	-12.1	-32.7	-25.2	-26.7	-35.3
-9.4	-15.5	-12.3	-31.5	-24.9	-26.3	-35.0
-9.3	-15.7	-12.7	-30.0	-23.9	-26.1	-34.5
-9.2	-16.0	-13.2	-28.9	-22.7	-25.9	-34.0
-9.1	-16.5	-14.0	-28.1	-21.3	-26.0	-33.6
-9.0	-17.2	-15.1	-27.2	-20.0	-26.1	-33.3
-8.9	-17.6	-16.4	-26.1	-18.8	-26.4	-33.2
-8.8	-17.9	-18.0	-24.9	-17.8	-26.8	-33.3
-8.7	-17.6	-19.9	-23.8	-17.1	-27.3	-33.5

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-8.6	-17.0	-22.0	-22.8	-16.6	-28.0	-33.8
-8.5	-16.3	-23.9	-22.0	-16.2	-28.8	-34.2
-8.4	-15.7	-24.8	-21.4	-16.1	-29.9	-34.6
-8.3	-15.2	-24.5	-20.8	-16.1	-31.4	-35.3
-8.2	-14.8	-23.3	-20.2	-16.1	-33.6	-36.4
-8.1	-14.5	-21.9	-19.4	-16.3	-36.1	-38.1
-8.0	-14.2	-20.8	-18.6	-16.4	-37.4	-40.6
-7.9	-13.9	-19.9	-17.7	-16.6	-35.6	-44.4
-7.8	-13.6	-19.3	-16.8	-16.7	-33.3	-51.0
-7.7	-13.4	-19.0	-15.9	-16.8	-30.9	-55.0
-7.6	-13.3	-18.9	-15.1	-17.0	-29.3	-51.0
-7.5	-13.1	-18.9	-14.4	-17.1	-28.2	-49.3
-7.4	-13.0	-19.1	-13.9	-17.3	-27.4	-47.3
-7.3	-12.9	-19.3	-13.4	-17.5	-26.8	-47.4
-7.2	-12.7	-19.7	-13.1	-17.6	-26.4	-47.1
-7.1	-12.6	-20.1	-12.9	-17.8	-26.1	-45.4
-7.0	-12.4	-20.4	-12.7	-18.0	-25.9	-43.7
-6.9	-12.2	-20.6	-12.5	-18.1	-25.9	-41.2
-6.8	-11.9	-20.6	-12.3	-18.0	-25.8	-38.8
-6.7	-11.7	-20.4	-12.1	-17.7	-25.9	-36.6
-6.6	-11.3	-19.7	-11.9	-17.2	-26.0	-34.2
-6.5	-11.0	-18.7	-11.7	-16.7	-26.1	-31.9
-6.4	-10.6	-17.6	-11.4	-16.0	-26.3	-30.0
-6.3	-10.1	-16.5	-11.0	-15.3	-26.5	-28.4
-6.2	-9.7	-15.6	-10.7	-14.5	-26.7	-27.0
-6.1	-9.4	-14.8	-10.5	-13.8	-27.0	-26.0
-6.0	-9.1	-14.2	-10.2	-13.2	-27.5	-25.3
-5.9	-9.0	-14.0	-10.1	-12.5	-28.2	-24.9
-5.8	-9.1	-14.1	-9.9	-11.9	-29.3	-24.8
-5.7	-9.2	-14.2	-9.9	-11.4	-31.1	-24.9
-5.6	-9.6	-14.6	-9.9	-11.1	-33.8	-25.1
-5.5	-10.1	-15.0	-10.0	-10.8	-37.9	-25.5
-5.4	-10.7	-15.6	-10.2	-10.7	-44.0	-26.1
-5.3	-11.4	-16.2	-10.5	-10.7	-46.8	-26.8

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-5.2	-12.2	-17.0	-10.9	-10.9	-42.5	-27.8
-5.1	-13.2	-17.9	-11.3	-11.2	-38.3	-29.2
-5.0	-14.6	-18.4	-12.0	-11.8	-35.9	-31.7
-4.9	-16.2	-17.8	-12.9	-12.7	-34.0	-36.5
-4.8	-17.2	-15.6	-13.8	-14.0	-32.6	-48.5
-4.7	-17.3	-13.2	-15.0	-16.2	-31.3	-44.5
-4.6	-15.9	-11.1	-16.0	-19.9	-30.3	-35.5
-4.5	-14.2	-9.5	-16.1	-24.4	-29.7	-31.6
-4.4	-12.7	-8.3	-14.8	-24.5	-29.1	-29.2
-4.3	-12.0	-7.7	-13.1	-19.0	-28.9	-28.0
-4.2	-11.6	-7.4	-11.1	-14.6	-29.0	-27.5
-4.1	-11.6	-7.4	-9.5	-11.7	-29.6	-27.3
-4.0	-11.7	-7.6	-8.0	-9.7	-30.3	-27.3
-3.9	-12.1	-8.1	-6.9	-8.1	-31.5	-27.6
-3.8	-12.6	-8.8	-6.1	-7.0	-33.2	-28.1
-3.7	-13.2	-9.8	-5.6	-6.0	-35.9	-28.9
-3.6	-13.7	-11.2	-5.2	-5.2	-41.0	-30.1
-3.5	-13.9	-13.2	-5.0	-4.5	-47.8	-31.9
-3.4	-13.5	-15.8	-4.9	-3.9	-46.3	-33.6
-3.3	-12.0	-17.4	-5.0	-3.4	-35.3	-33.5
-3.2	-9.6	-14.2	-5.3	-2.9	-29.8	-29.9
-3.1	-7.3	-9.8	-5.9	-2.6	-26.2	-26.3
-3.0	-5.4	-6.7	-6.7	-2.4	-23.7	-23.5
-2.9	-4.0	-4.5	-8.0	-2.3	-21.9	-21.5
-2.8	-3.0	-3.0	-10.0	-2.3	-20.6	-20.1
-2.7	-2.6	-2.0	-13.0	-2.3	-19.8	-19.3
-2.6	-2.5	-1.5	-16.4	-2.4	-19.4	-18.9
-2.5	-2.6	-1.0	-13.7	-2.2	-19.2	-18.5
-2.4	-3.0	-0.6	-9.5	-1.7	-19.1	-18.3
-2.3	-3.6	-0.3	-5.4	-0.7	-19.2	-18.4
-2.2	-4.6	-0.2	-2.1	0.6	-19.5	-18.6
-2.1	-6.2	-0.3	0.5	2.0	-20.2	-19.2
-2.0	-8.6	-0.5	2.6	3.4	-21.2	-20.2
-1.9	-11.0	-0.8	4.4	4.8	-23.0	-22.0

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-1.8	-11.3	-0.9	5.9	6.1	-25.4	-25.6
-1.7	-6.2	-0.4	7.2	7.3	-27.6	-31.2
-1.6	-1.6	0.9	8.2	8.3	-24.3	-36.9
-1.5	1.7	2.9	9.2	9.2	-20.2	-25.3
-1.4	4.4	4.9	10.1	10.1	-16.8	-20.0
-1.3	6.5	6.6	10.9	10.9	-14.2	-16.6
-1.2	8.2	8.2	11.7	11.7	-12.2	-14.2
-1.1	9.6	9.5	12.4	12.4	-10.6	-12.4
-1.0	10.7	10.6	13.1	13.1	-9.5	-11.0
-0.9	11.7	11.6	13.7	13.8	-8.4	-9.7
-0.8	12.7	12.6	14.3	14.3	-7.3	-8.6
-0.7	13.6	13.5	14.8	14.8	-6.4	-7.5
-0.6	14.3	14.3	15.2	15.2	-5.6	-6.7
-0.5	15.0	15.0	15.6	15.6	-5.0	-6.0
-0.4	15.5	15.5	15.8	15.9	-4.5	-5.4
-0.3	15.9	15.9	16.1	16.1	-4.1	-5.0
-0.2	16.1	16.1	16.2	16.2	-3.9	-4.8
-0.1	16.3	16.3	16.3	16.3	-3.8	-4.7
0.0	16.3	16.3	16.3	16.3	-3.9	-4.7
0.1	16.3	16.3	16.3	16.3	-4.0	-4.8
0.2	16.1	16.1	16.2	16.2	-4.3	-4.9
0.3	15.9	16.0	16.1	16.1	-4.6	-5.2
0.4	15.7	15.7	15.9	15.9	-5.0	-5.5
0.5	15.3	15.4	15.7	15.7	-5.5	-6.0
0.6	14.9	14.9	15.5	15.5	-6.1	-6.5
0.7	14.4	14.3	15.2	15.2	-6.8	-7.2
0.8	13.6	13.6	14.8	14.8	-7.8	-8.1
0.9	12.7	12.6	14.4	14.4	-9.1	-9.3
1.0	11.6	11.5	13.9	13.9	-10.7	-10.7
1.1	10.3	10.2	13.3	13.3	-12.6	-12.4
1.2	8.9	8.7	12.5	12.5	-15.0	-14.3
1.3	7.2	7.1	11.7	11.7	-17.9	-16.6
1.4	5.4	5.4	10.8	10.7	-21.4	-19.1
1.5	3.3	3.5	9.7	9.7	-25.9	-22.6

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
1.6	0.6	1.4	8.6	8.5	-28.4	-28.5
1.7	-3.2	-0.6	7.3	7.2	-25.4	-40.8
1.8	-9.0	-1.6	5.8	5.8	-21.7	-31.8
1.9	-14.4	-1.3	4.3	4.4	-19.2	-25.2
2.0	-9.7	-0.2	2.6	2.9	-17.5	-22.0
2.1	-5.2	0.9	0.6	1.2	-16.4	-20.2
2.2	-2.8	1.7	-2.0	-0.5	-15.8	-19.1
2.3	-1.5	2.1	-5.4	-2.1	-15.5	-18.6
2.4	-0.9	2.1	-9.8	-3.2	-15.7	-18.5
2.5	-0.8	1.8	-13.2	-3.1	-16.1	-18.9
2.6	-1.0	1.2	-12.4	-2.4	-16.7	-19.5
2.7	-1.4	0.4	-8.4	-1.4	-17.5	-20.4
2.8	-2.1	-0.7	-5.2	-0.4	-18.5	-21.7
2.9	-2.9	-2.0	-3.3	0.4	-19.5	-23.1
3.0	-3.8	-3.4	-2.0	1.0	-20.5	-24.7
3.1	-4.9	-5.3	-1.2	1.3	-21.5	-26.7
3.2	-6.5	-8.4	-0.7	1.5	-22.8	-28.7
3.3	-8.6	-14.3	-0.5	1.5	-24.3	-29.0
3.4	-10.4	-20.4	-0.6	1.3	-25.9	-27.1
3.5	-11.1	-17.1	-0.8	1.0	-27.5	-24.6
3.6	-9.8	-9.9	-1.2	0.5	-28.9	-22.5
3.7	-8.2	-6.9	-1.7	-0.1	-29.9	-21.0
3.8	-6.8	-5.1	-2.4	-0.9	-30.8	-20.2
3.9	-6.1	-4.1	-3.2	-1.8	-31.5	-19.7
4.0	-5.6	-3.6	-4.1	-2.9	-32.3	-19.5
4.1	-5.5	-3.5	-5.2	-4.1	-33.3	-19.5
4.2	-5.6	-3.5	-6.3	-5.4	-34.5	-19.7
4.3	-5.9	-3.8	-7.5	-6.9	-35.9	-20.0
4.4	-6.3	-4.2	-9.1	-9.0	-37.4	-20.5
4.5	-6.8	-4.8	-11.2	-11.8	-39.0	-21.1
4.6	-7.5	-5.5	-13.7	-15.4	-40.6	-21.8
4.7	-8.3	-6.5	-16.5	-18.9	-42.0	-22.5
4.8	-9.6	-8.0	-18.9	-17.3	-42.7	-23.6
4.9	-11.3	-10.5	-18.8	-14.1	-42.3	-24.9

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
5.0	-13.4	-13.7	-16.8	-11.4	-41.7	-26.5
5.1	-15.5	-19.6	-14.7	-9.3	-41.2	-28.3
5.2	-16.6	-24.1	-13.1	-7.9	-41.2	-30.3
5.3	-16.5	-24.6	-12.0	-6.9	-41.8	-32.0
5.4	-15.5	-19.3	-11.2	-6.2	-42.9	-33.5
5.5	-14.6	-16.5	-10.7	-5.7	-43.9	-34.3
5.6	-14.0	-15.4	-10.3	-5.5	-43.9	-34.8
5.7	-13.5	-14.8	-10.2	-5.4	-42.6	-35.1
5.8	-13.2	-14.6	-10.1	-5.4	-40.6	-35.2
5.9	-13.0	-14.6	-10.0	-5.5	-38.7	-35.3
6.0	-12.8	-14.9	-10.1	-5.7	-37.1	-35.3
6.1	-12.8	-15.3	-10.2	-5.9	-35.8	-35.3
6.2	-12.9	-15.9	-10.4	-6.3	-34.8	-35.2
6.3	-13.1	-16.8	-10.7	-6.7	-34.1	-34.9
6.4	-13.6	-18.5	-11.0	-7.1	-33.3	-34.1
6.5	-14.3	-21.2	-11.4	-7.6	-32.5	-32.9
6.6	-15.1	-24.1	-11.9	-8.2	-31.7	-31.7
6.7	-15.9	-26.2	-12.5	-9.0	-31.1	-30.5
6.8	-16.7	-25.4	-13.2	-9.9	-30.5	-29.6
6.9	-17.2	-22.3	-14.1	-10.9	-30.0	-28.9
7.0	-17.6	-20.1	-15.1	-12.2	-29.7	-28.5
7.1	-17.9	-18.9	-16.1	-13.6	-29.5	-28.5
7.2	-18.1	-18.2	-17.2	-15.1	-29.5	-28.7
7.3	-18.5	-17.6	-18.3	-16.8	-29.5	-29.2
7.4	-19.0	-17.2	-19.4	-18.6	-29.6	-29.9
7.5	-19.5	-17.0	-20.4	-20.5	-29.8	-30.8
7.6	-20.2	-17.0	-21.3	-22.2	-29.9	-31.9
7.7	-20.9	-17.2	-22.3	-23.6	-30.2	-33.4
7.8	-21.7	-17.6	-23.2	-24.6	-30.5	-35.3
7.9	-22.6	-18.4	-24.0	-25.1	-31.0	-37.7
8.0	-23.3	-20.0	-24.6	-25.1	-31.8	-41.3
8.1	-23.9	-22.4	-24.9	-24.7	-32.8	-44.9
8.2	-24.0	-26.1	-24.8	-24.0	-34.4	-43.7
8.3	-23.8	-29.6	-24.4	-23.2	-36.0	-39.6

Off-axis Angle (deg)	Along the GSO 14.25 GHz		Perpendicular to the GSO 14.25 GHz		Cross Pol 14.25 GHz	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
8.4	-23.5	-28.2	-24.0	-22.4	-37.8	-36.6
8.5	-22.9	-24.8	-23.4	-21.7	-39.1	-34.6
8.6	-22.4	-22.2	-22.8	-21.1	-39.2	-33.4
8.7	-22.0	-20.8	-22.2	-20.7	-38.7	-32.8
8.8	-21.7	-20.0	-21.9	-20.3	-38.1	-32.4
8.9	-21.3	-19.4	-21.6	-20.1	-37.5	-32.2
9.0	-21.0	-19.0	-21.7	-19.9	-37.0	-32.1
9.1	-20.8	-18.8	-21.8	-19.9	-36.8	-31.9
9.2	-20.8	-18.6	-22.3	-20.0	-36.7	-31.8
9.3	-20.8	-18.6	-23.0	-20.1	-37.1	-31.6
9.4	-21.1	-18.6	-23.9	-20.3	-37.7	-31.5
9.5	-21.5	-18.8	-25.2	-20.4	-39.0	-31.6
9.6	-22.0	-18.9	-26.6	-20.7	-42.3	-31.7
9.7	-22.7	-19.0	-28.4	-20.9	-48.6	-32.0
9.8	-23.5	-19.1	-30.2	-21.2	-46.3	-32.3
9.9	-24.2	-19.0	-32.1	-21.7	-43.6	-32.8
10.0	-24.6	-18.9	-33.8	-22.1	-39.2	-33.3
15.0	-25.1	-19.3	-24.5	-24.4	-33.1	-38.9
20.0	-27.1	-22.2	-25.0	-27.5	-34.9	-31.8
25.0	-36.9	-30.7	-37.0	-36.1	-32.9	-46.2
30.0	-32.1	-46.0	-36.7	-38.6	-38.2	-37.3
35.0	-42.2	-33.4	-29.7	-27.6	-35.9	-46.7
40.0	-30.0	-29.5	-33.7	-32.3	-37.5	-46.5
45.0	-48.5	-35.1	-34.0	-36.7	-33.0	-43.3
50.0	-33.8	-44.8	-44.3	-46.6	-44.5	-40.6
55.0	-28.6	-53.5	-36.7	-47.8	-33.7	-36.2
60.0	-46.0	-48.1	-39.9	-29.0	-39.0	-46.9
65.0	-35.5	-35.3	-37.8	-34.8	-37.3	-39.6
70.0	-44.4	-43.8	-38.9	-37.1	-40.1	-55.5
75.0	-48.6	-42.9	-46.2	-42.2	-51.1	-51.4
80.0	-52.6	-44.6	-47.2	-48.4	-53.9	-54.5
85.0	-54.3	-54.0	-57.5	-52.6	-56.7	-66.5
89.0	-60.3	-61.2	-67.7	-61.4	-62.4	-70.0

### 3 Space Segment

The Space Segment consists of capacity leased on commercial Ku-band satellites from established providers. Uplinks from AURA LE AES terminals occur in permissible portions of the 14.0-14.5 GHz band and downlinks will occur in permissible portions of the 10.70-12.75 GHz band.

The eXConnect System may use whole or partial transponders and operated with single saturated carriers (forward link only) in a transponder or with multiple carriers. Forward and return links may be operated in the same or different transponders.

A list of the satellite points of communication and associated gateway antennas are shown in Table 2.

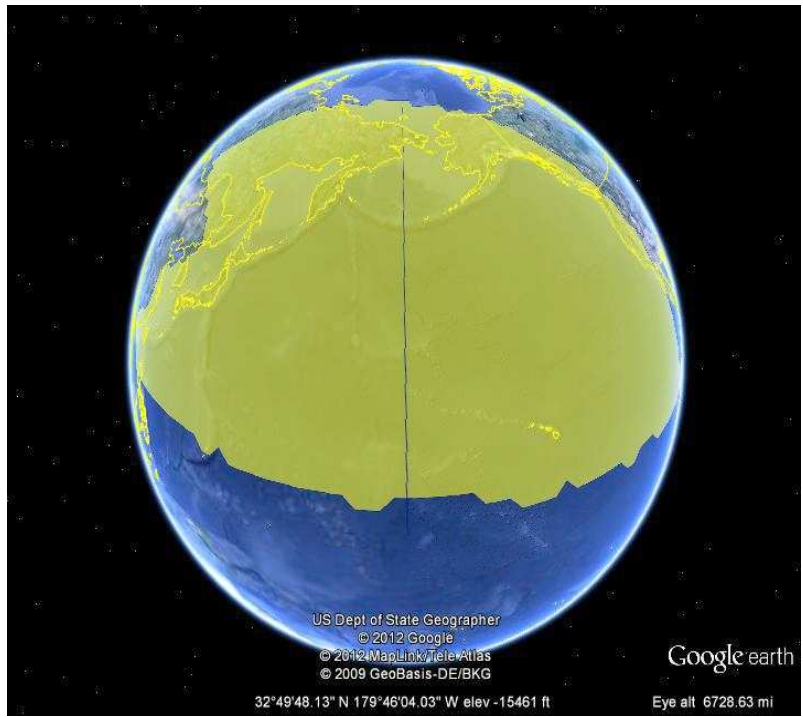
**Table 2. Additional Satellite Points of Communication for the eXConnect System**

Satellite	Orbital Position	Frequency Bands	
		Transmit	Receive
GE-23	172° E	14.0-14.5 GHz	11.45-12.2 GHz
Superbird C2	144° E	14.0-14.5 GHz	11.7-12.2 GHz
Asiasat 5	100.5° E	14.0-14.5 GHz	11.45-12.2 GHz
Yamal 201	90° E	14.0-14.5 GHz	11.45-11.7 GHz
Eutelsat 10A (W2A)	10° E	14.0-14.5 GHz	11.7-12.2 GHz
Anik F1R	107.3° W	14.0-14.5 GHz	11.45-12.2 GHz
Estrela DO SUL2 (T-14R)	63° W	14.0-14.5 GHz	12.25-12.75 GHz
Intelsat 14 (IS-14)	45° W	14.0-14.5 GHz	12.25-12.75 GHz
Telstar 11N	37.5° W	14.0-14.5 GHz	11.45-12.2 GHz
Apstar 6	134.0° E	14.0-14.5 GHz	10.7-12.75 GHz
Apstar 7	76.5° E	14.0-14.5 GHz	10.7-12.75 GHz

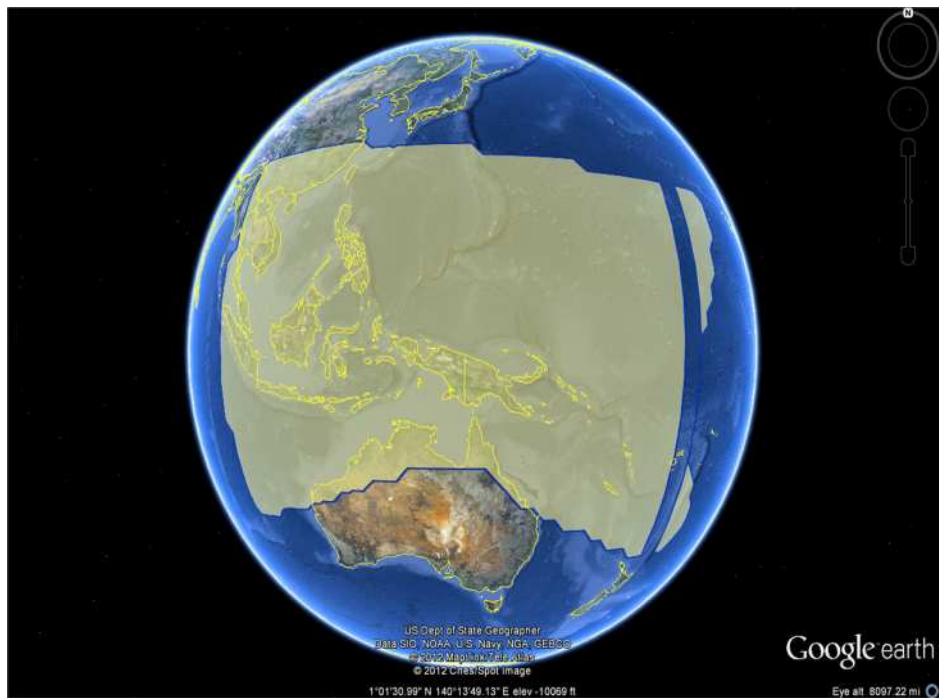
The operators of these satellites have substantial experience in Ku-band mobile operations, including AMSS applications. The eXConnect System's operation on these satellites will conform with the coordinated uplink off-axis EIRP spectral density limitations and downlink power spectral density limits for these satellites.

The eXConnect service areas for each of these satellites follow:

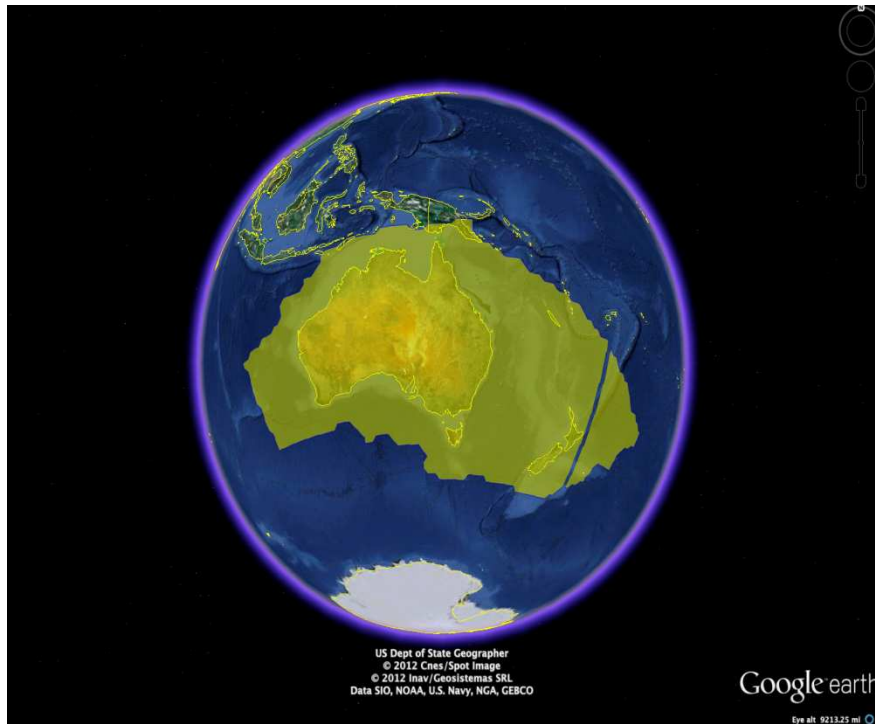




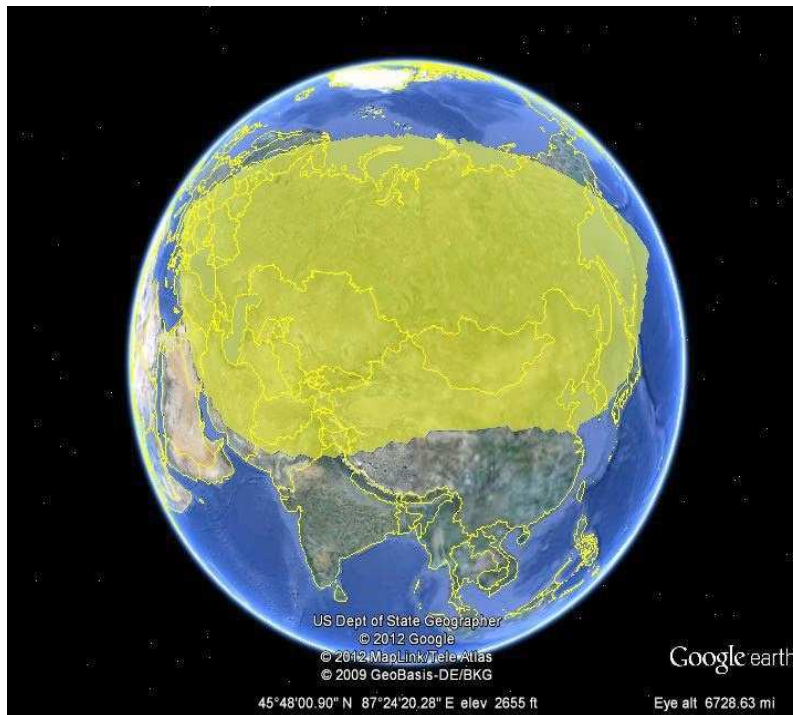
**Figure 10. GE-23 North Pacific**



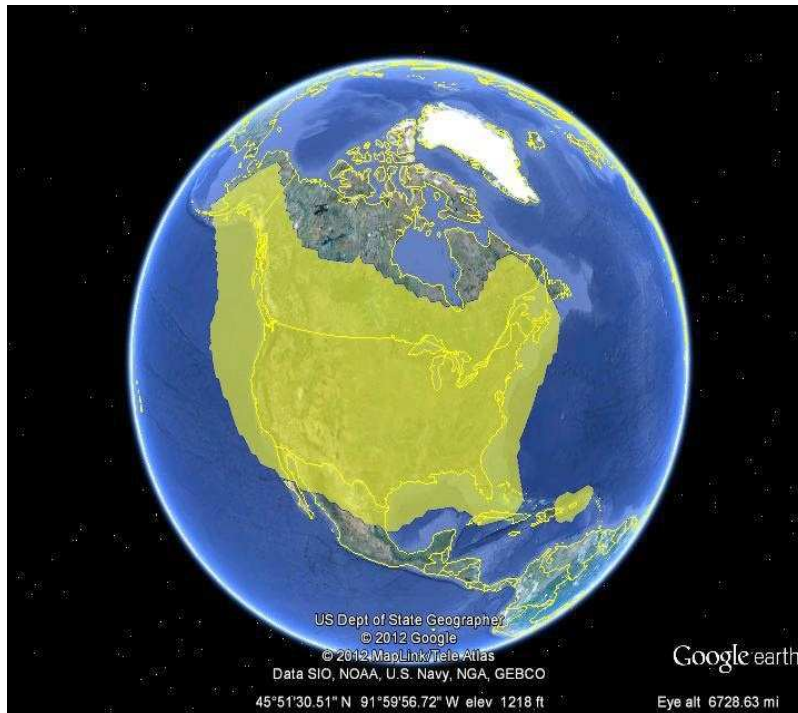
**Figure 11. GE-23 Southwest Pacific**



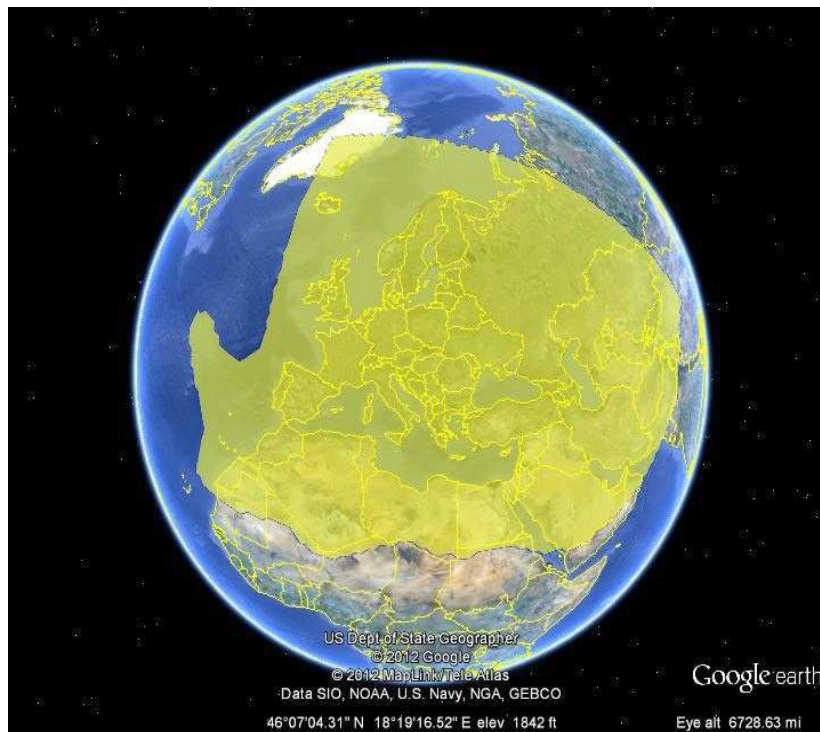
**Figure 12. GE-23 South Pacific**



**Figure 13. Yamal 201**



**Figure 14. G-17 North America**



**Figure 15. W2A**

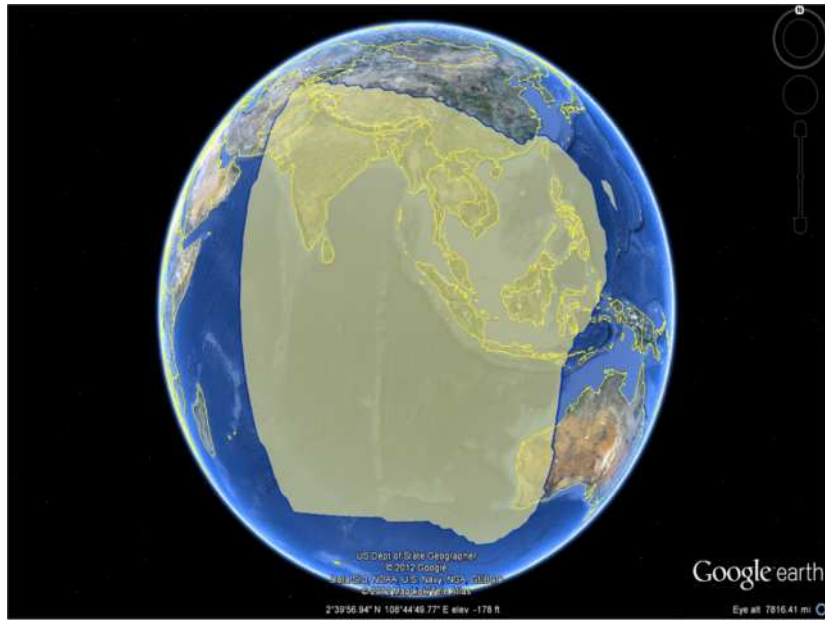


Figure 16. Superbird C2

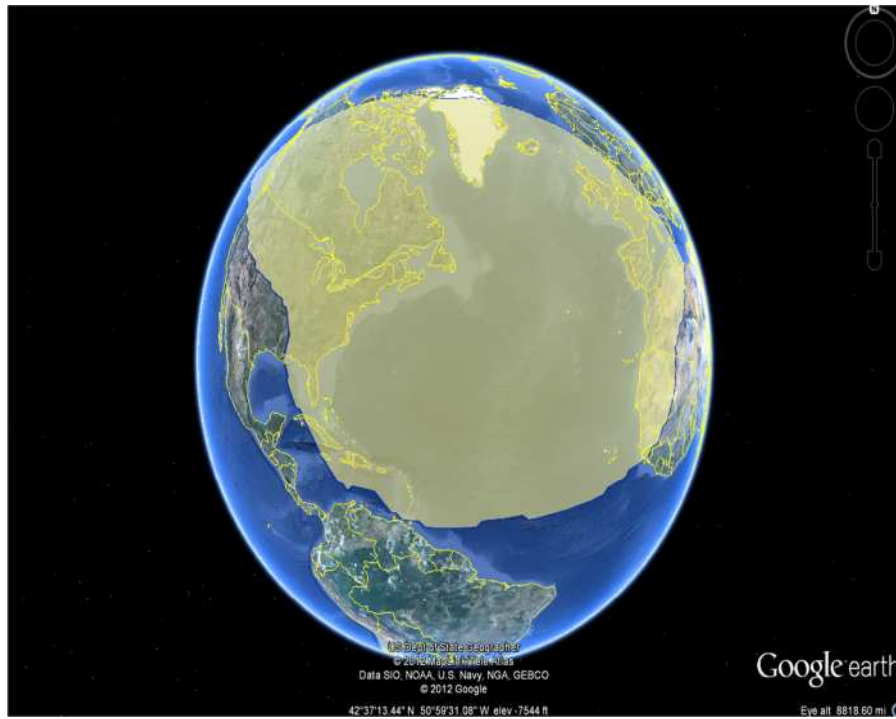
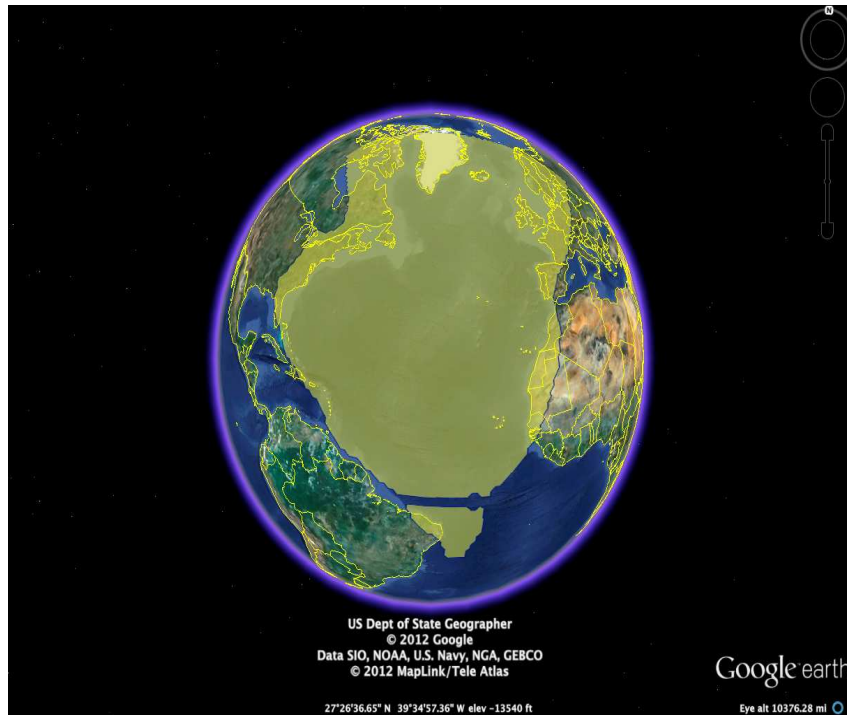
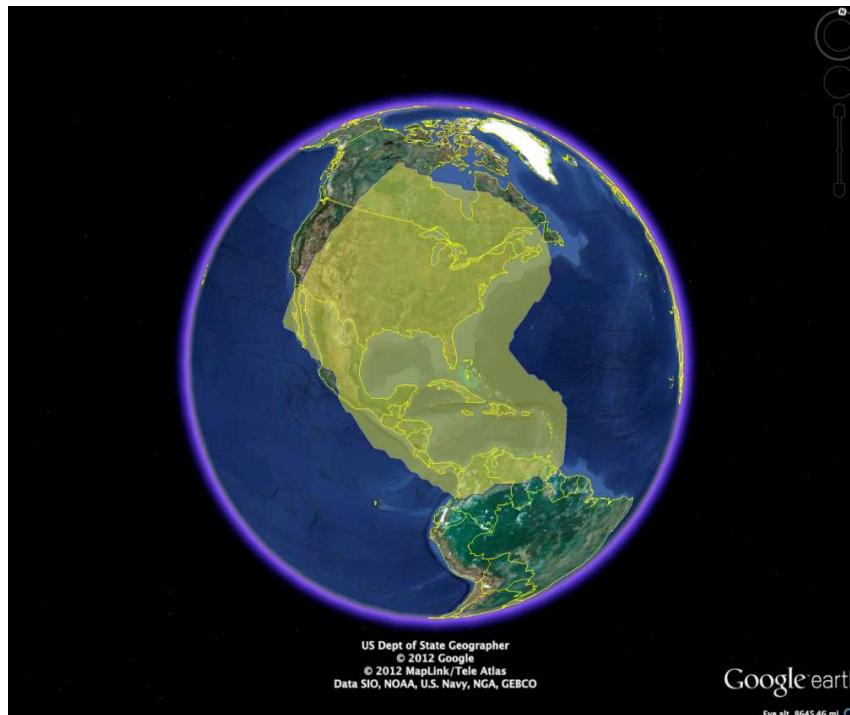


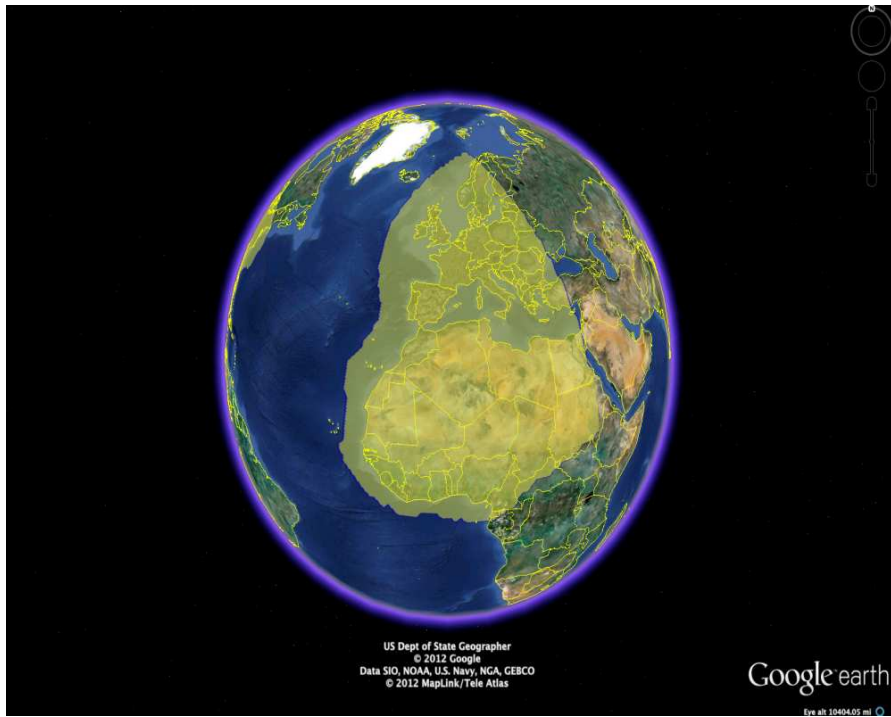
Figure 17. T-14R



**Figure 18. T-11N Atlantic Ocean**



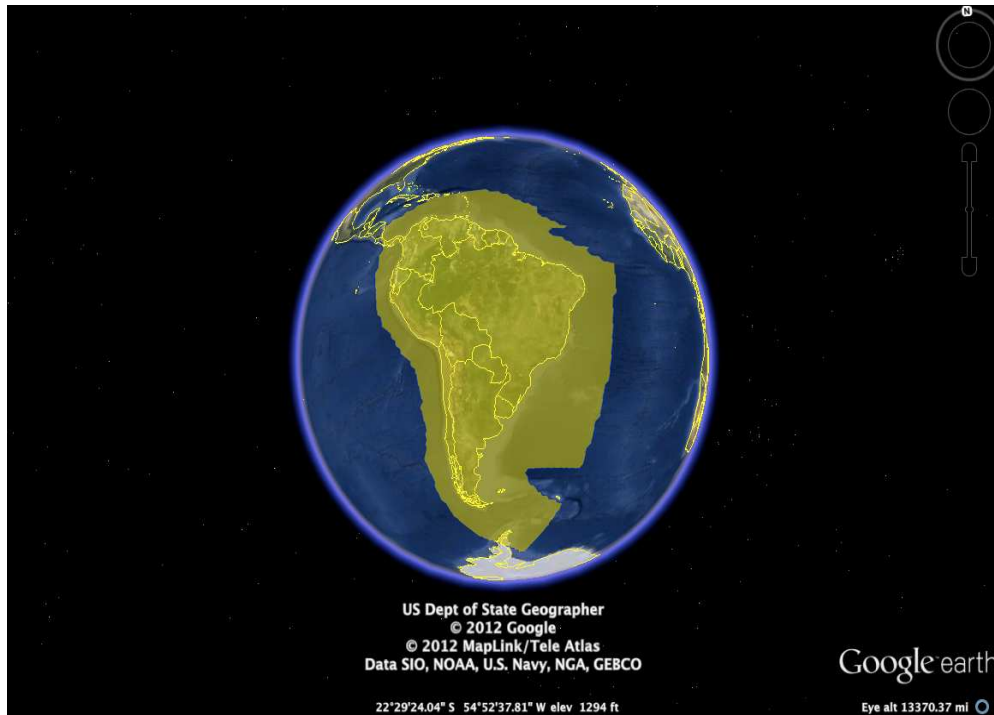
**Figure 19. T-11N United States**



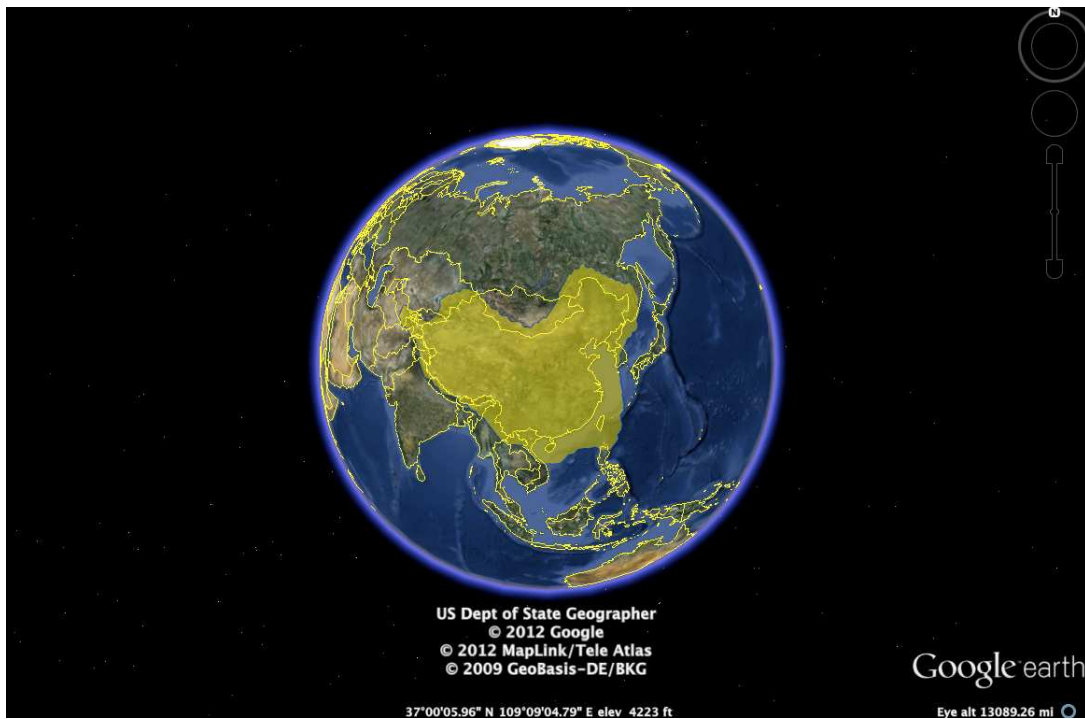
**Figure 20. IS-14**



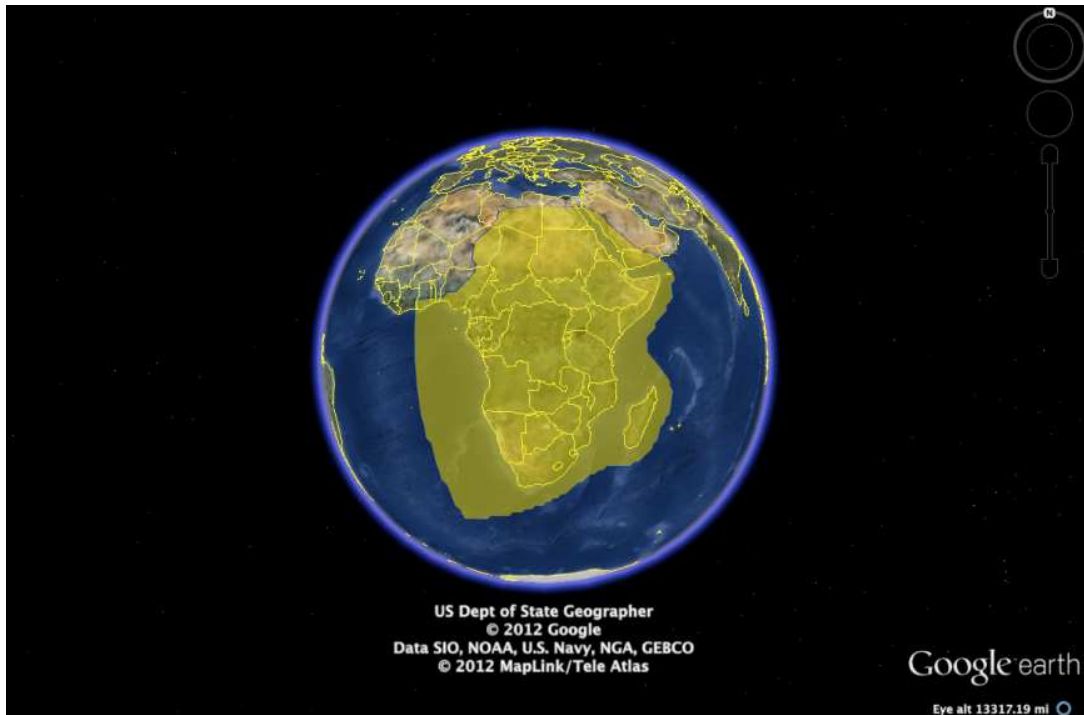
**Figure 21. Asiasat 5**



**Figure 22. ANIK F1R**



**Figure 23. Apstar 6**



**Figure 24. Apstar 7**



## 4 Ground Segment

The Ground Segment consists of hub earth stations that are leased at commercial teleport facilities, a DVB-S2 modulator and iDirect demodulator installed in the teleport facility, connectivity to the Internet and network management facilities.

The eXConnect gateway earth stations are listed in Table 3, below. Installed at the gateway facility will be DVB-S2 modulator cards for the forward link and iDirect demodulators cards for the return link. The eXConnect System will be connected to the Internet and other content providers at the gateway. eXConnect ground stations are separately licensed by the teleport operator and are not a part of this application.

**Table 3. Gateway Earth Stations for the eXConnect System**

Satellite	Gateway Earth Station	
	City, Country	Operator
GE 23 (NP/NP, NP/SWP)	Brewster, USA	USEI
GE 23 (SP/SP)	Adelaide, Australia	ASCS
Superbird C2	Hong Kong, China	PCCW
Asiasat 5	Dubai (Sharjah)	Etisalat
Yamal 201	Moscow, Russia	Rusat
W2A (Eutelsat 10A)	Santander, Spain	MTN/Eriza
Anik F1R	Mt. Jackson, Virginia, USA	Telesat
Estrela do Sul 2 (T-14R)	Mt. Jackson, Virginia, USA	Telesat
Intelsat 14 (IS-14)	Cologne, Germany	Stellar
Apstar 6	Beijing, China	China Satcom
Apstar 7	Djibouti, Africa	Bringcom
Galaxy 17	Atlanta (Ellenwood), Georgia, USA	Intelsat
T-11N (Telstar 11R)	Mt. Jackson, Virginia, USA	Telesat

## **5 Network Management**

The eXConnect System is monitored and controlled from the Panasonic Mission Control Center (“MCC”) in Lake Forest, CA on a 24/7/365 basis.

The MCC makes use of the iDirect’s Network Management System (NMS) to provide complete control and visibility to all components the eXConnect network. The NMS system has the capability of shutting down any component in the system that is malfunctioning.

### **Contact Information:**

Panasonic Mission Control Center  
26200 Enterprise Way  
Lake Forest, CA 92630 USA

Phone: 425-415-9800 or 877-627-2300 (US Domestic Toll-free)

Fax: (425) 482-3515

Email: [mcc@panasonic.aero](mailto:mcc@panasonic.aero)

## **EXHIBIT A. LINK BUDGET**

Edge of coverage link budgets for the AURA LE AES forward and return links are shown below. The eXConnect network in this example is operating with a DVB-S2 forward link that supports 28 Mbps to an AURA LE terminal (8PSK rate 0.6) and a return link at 638 kbps (BPSK rate 0.53, spread factor 4). As shown by the table, the terminal is able to close its links.

Forward Link Budget		Return Link Budget	
<b>eXConnect Terminal</b>		<b>eXConnect Terminal</b>	
Antenna Type	Remote	Antenna Type	Remote
G/T	11.8 dB/K	EIRP	46.7 dBW
<b>Hub Earth Station</b>		<b>Hub Earth Station</b>	
EIRP max	80.0 dBW	G/T	37.0 dB/K
<b>Signal</b>		<b>Signal</b>	
Waveform	DVB-S2	Waveform	iDirect
Modulation	8PSK	Modulation	BPSK
Coding Rate	0.60	Coding Rate	0.53
Spread Factor	none	Spread Factor	4
Data Rate	2.81E+07 bps	Data Rate	6.38E+05 bps
Symbol Rate	1.67E+07 Hz	Symbol Rate	1.67E+06 Hz
Occupied Bandwidth	2.00E+07 Hz	Occupied Bandwidth	8.00E+06 Hz
C/No Threshold	79.3 dBHz	C/No Threshold	64.6 dBHz
C/N Threshold	6.3 dB	C/N Threshold	-4.4 dB
<b>Uplink</b>		<b>Uplink</b>	
Frequency	14.332 GHz	Frequency	14.346 GHz
EIRP Spectral Density	30.3 dBW/4kHz	EIRP Spectral Density	14.5 dBW/4kHz
Slant Range	37072 km	Slant Range	37596 km
Space Loss, Ls	207.0 dB	Space Loss, Ls	207.1 dB
Pointing Loss, Lpnt	0.0 dB	Pointing Loss, Lpnt	0.1 dB
Atmosphere / Weather Loss, La	2.7 dB	Atmosphere / Weather Loss, La	0.0 dB
Transponder G/T @ Hub	7.1 dB/K	Transponder G/T @ Terminal	4.1 dB/K
C/(No+Io)	92.0 dBHz	C/(No+Io)	71.7 dBHz
<b>Satellite</b>		<b>Satellite</b>	
Flux Density	-98.6 dBW/m2	Flux Density	-115.9 dBW/m2
SFD @ Hub	-92.6 dBW/m2	SFD @ Terminal	-89.6 dBW/m2
Small Signal Gain (IBO/OBO)	2.3 dB	Small Signal Gain (IBO/OBO)	2.3 dB
OBO	3.7 dB	OBO	24.0 dB
<b>Downlink</b>		<b>Downlink</b>	
Frequency	12.032 GHz	Frequency	12.046 GHz
Transponder Sat. EIRP @ Beam F	51.4 dBW	Transponder Sat. EIRP @ Beam F	51.4 dBW
Transponder Sat. EIRP @ Termin	49.4 dBW	Transponder Sat. EIRP @ Hub	50.4 dBW
Carrier EIRP @ Beam Peak	47.7 dBW	Carrier EIRP @ Beam Peak	27.4 dBW
Carrier EIRP @ Terminal	45.7 dBW	Carrier EIRP @ Hub	26.4 dBW
Slant Range	37596 km	Slant Range	37072 km
Space Loss, Ls	205.6 dB	Space Loss, Ls	205.4 dB
Pointing Loss, Lpnt	0.1 dB	Pointing Loss, Lpnt	0.0 dB
Atmosphere / Weather Loss, La	0.0 dB	Atmosphere / Weather Loss, La	3.5 dB
C/(No+Io)	80.0 dBHz	C/(No+Io)	82.5 dBHz
<b>End to End</b>		<b>End to End</b>	
End to End C/(No+Io)	79.7 dBHz	End to End C/(No+Io)	71.4 dBHz
Link Margin	0.2 dB	Link Margin	7.5 dB

## **EXHIBIT B. Antenna Gain Patterns**

Antenna gain patterns are presented in this section for the azimuth and elevation of the AURA LE antenna, including co-pol and cross-pol, at various elevation angles and frequencies. All patterns are plotted against the FCC 25.209 gain masks.

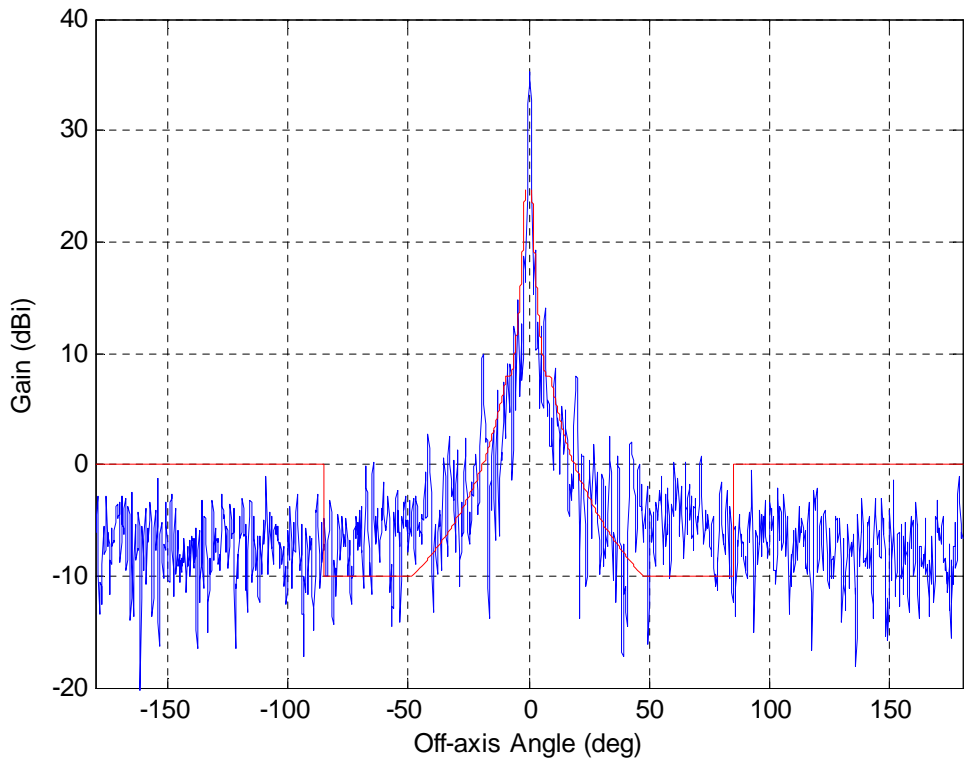


Figure 1. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 5°, Azimuth Cut

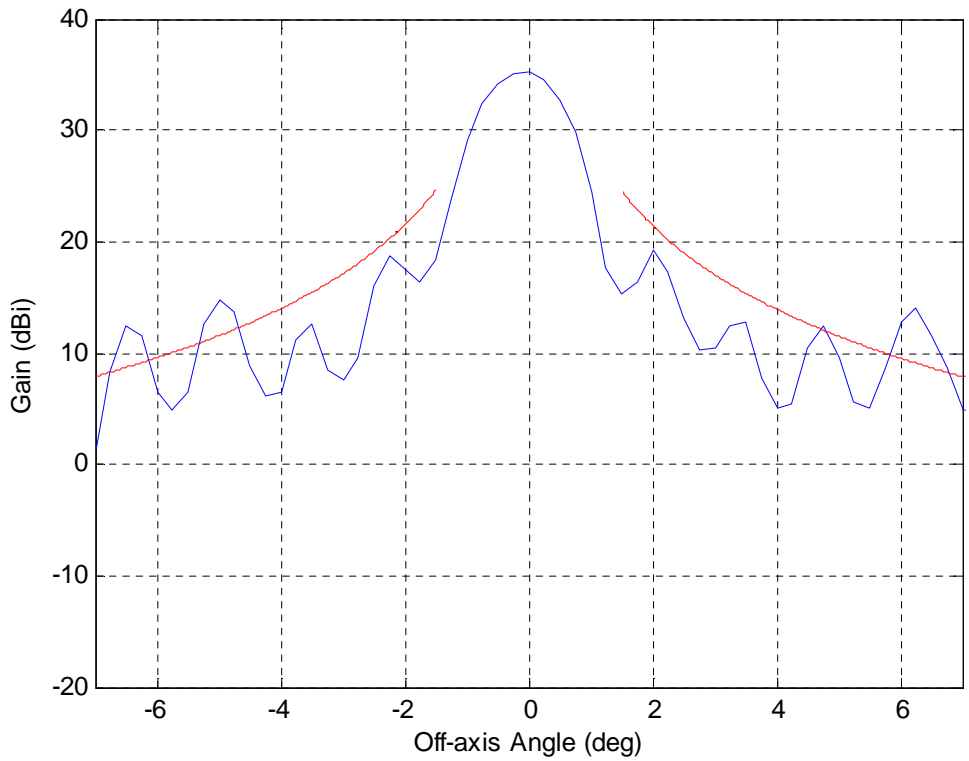


Figure 2. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 5°, Azimuth Cut

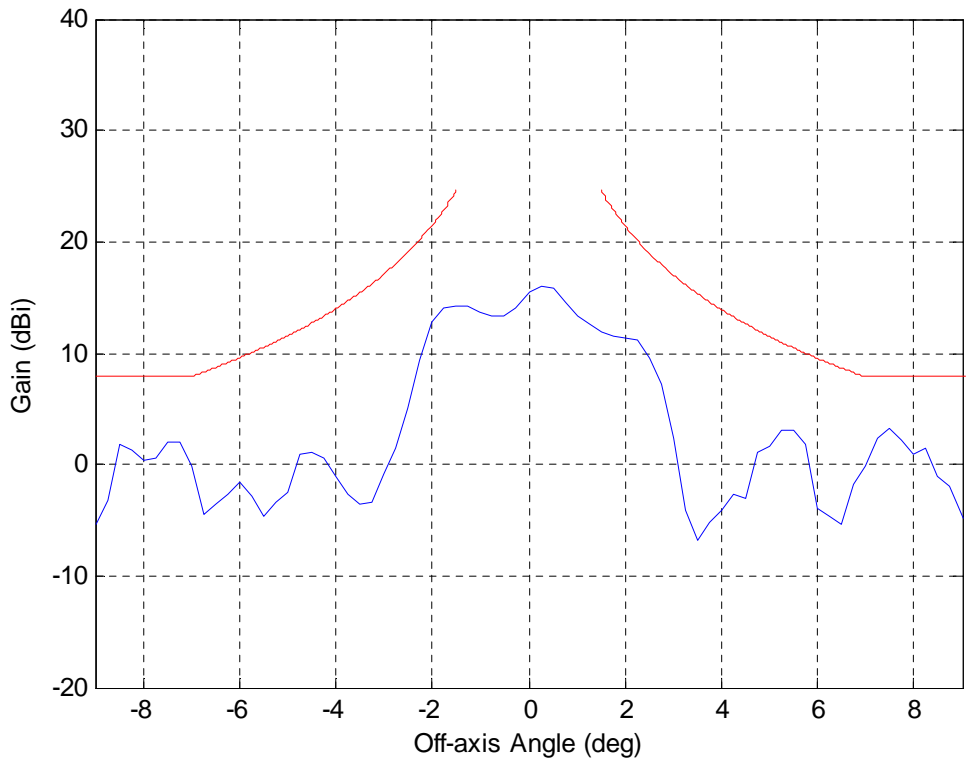


Figure 3. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Cross, Elevation: 5°, Azimuth Cut

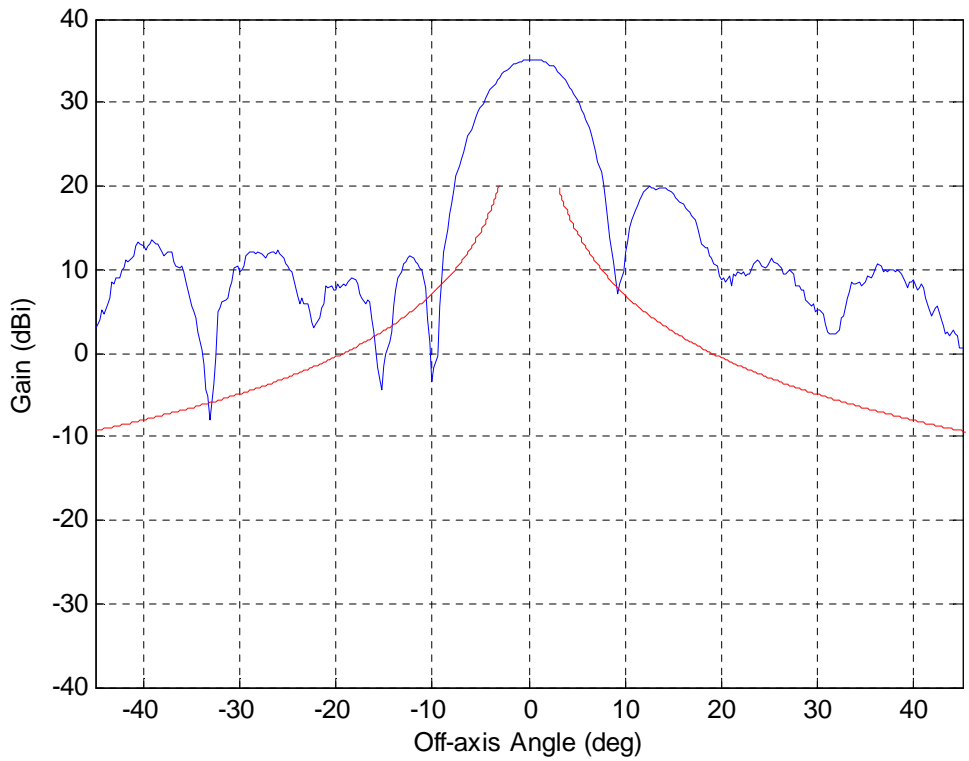


Figure 4. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 5°, Elevation Cut

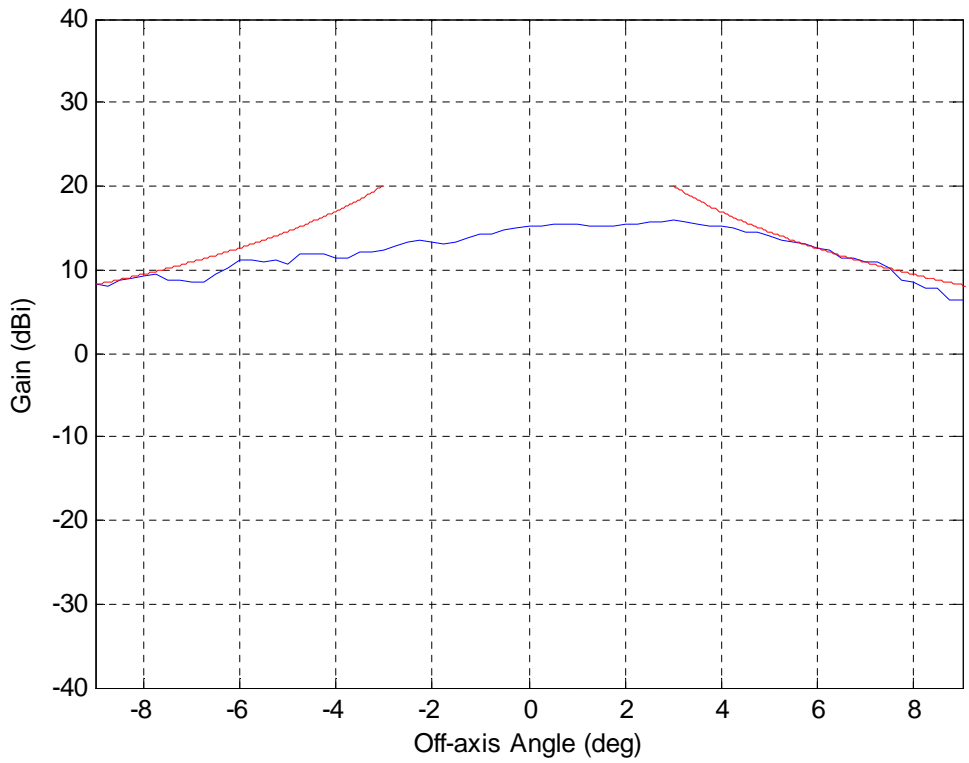


Figure 5. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Cross, Elevation: 5°, Elevation Cut

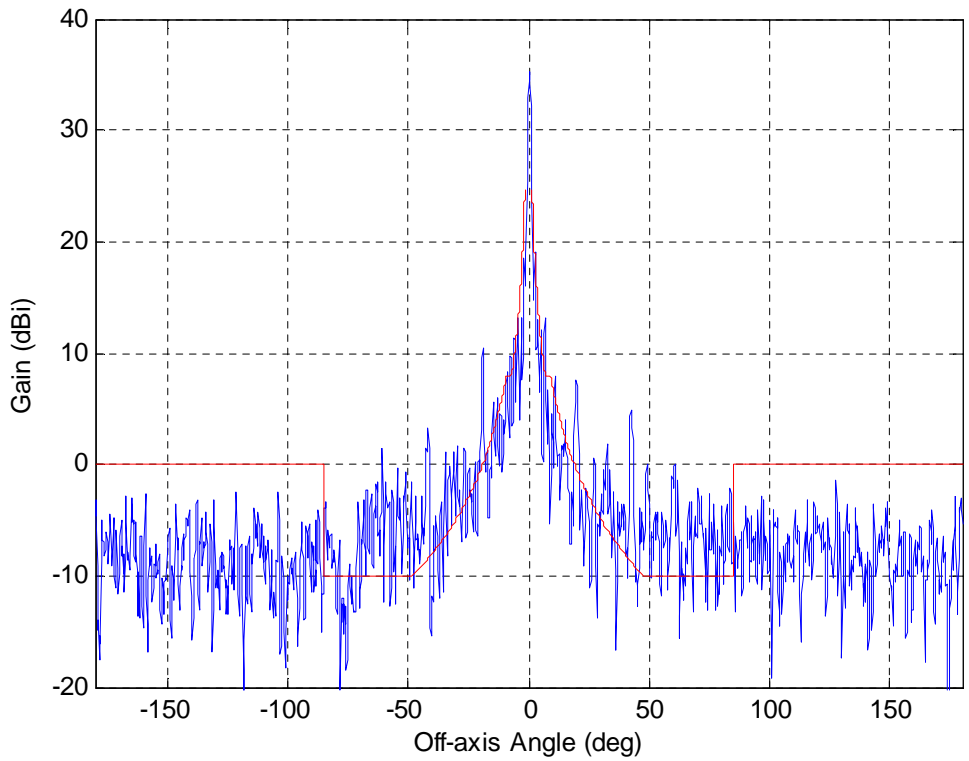


Figure 6. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 5°, Azimuth Cut



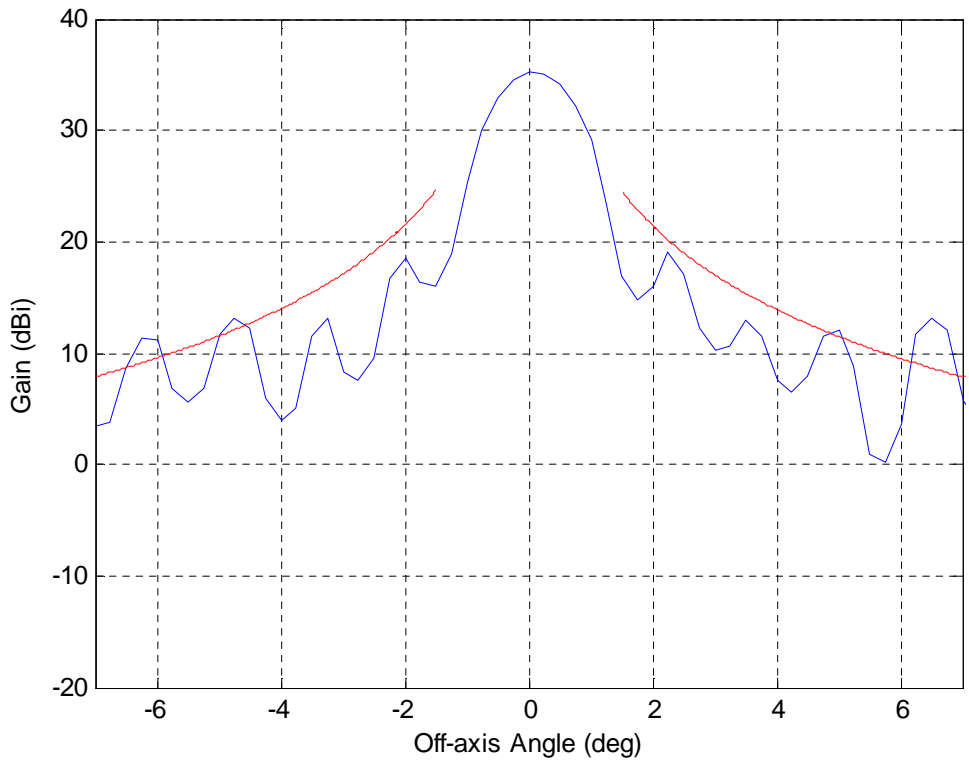


Figure 7. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 5°, Azimuth Cut

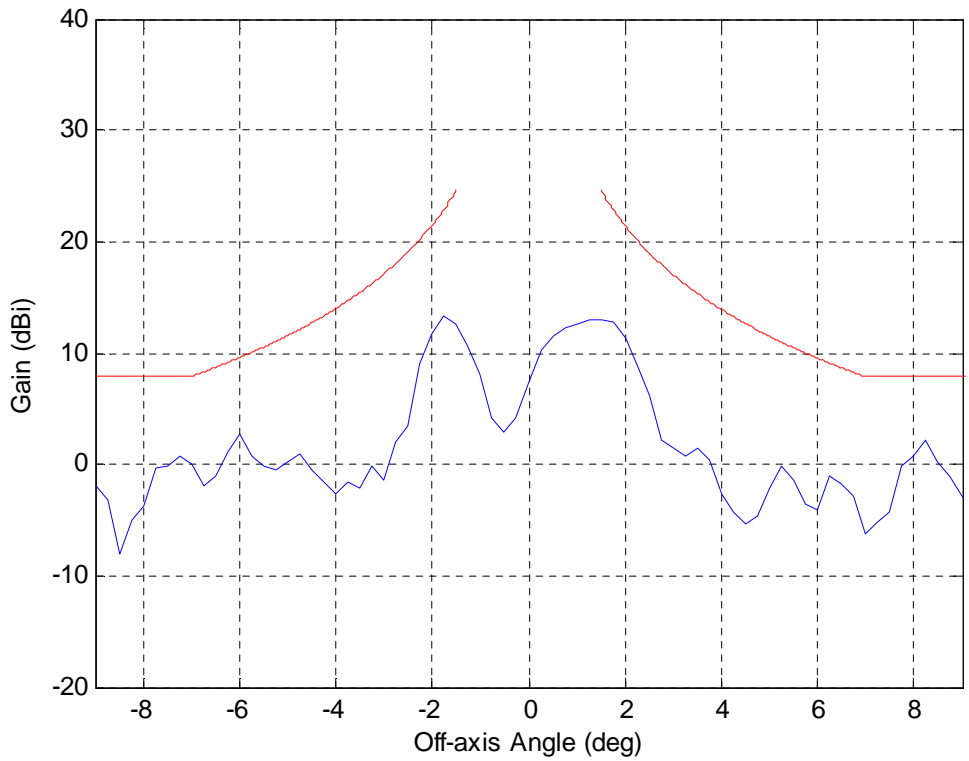


Figure 8. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Cross, Elevation: 5°, Azimuth Cut

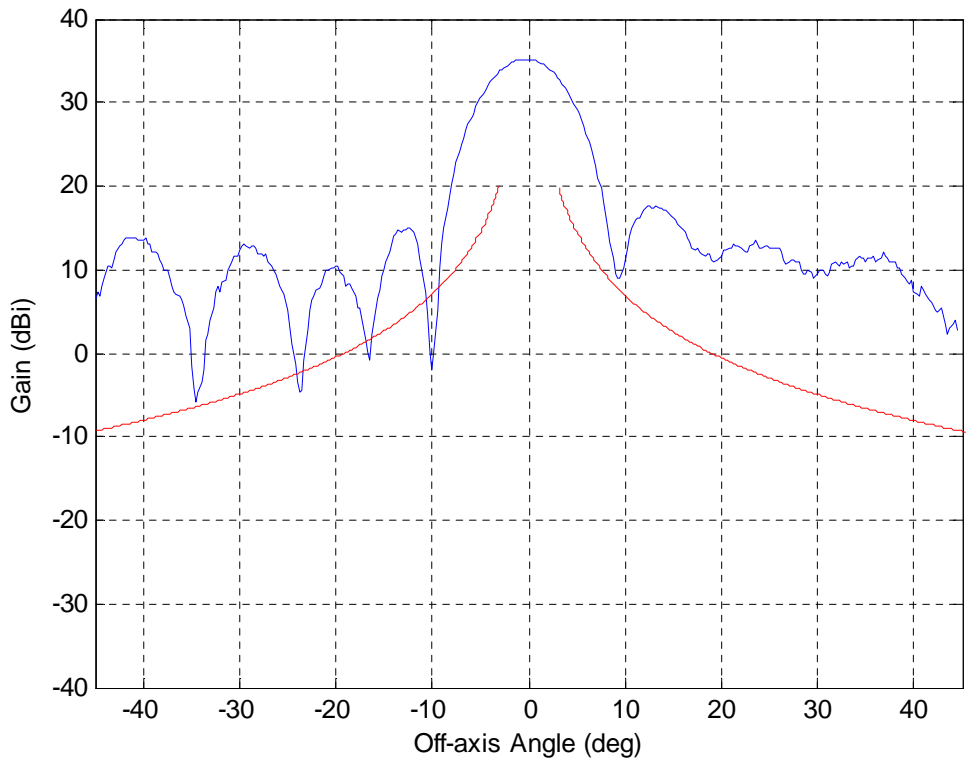


Figure 9. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 5°, Elevation Cut

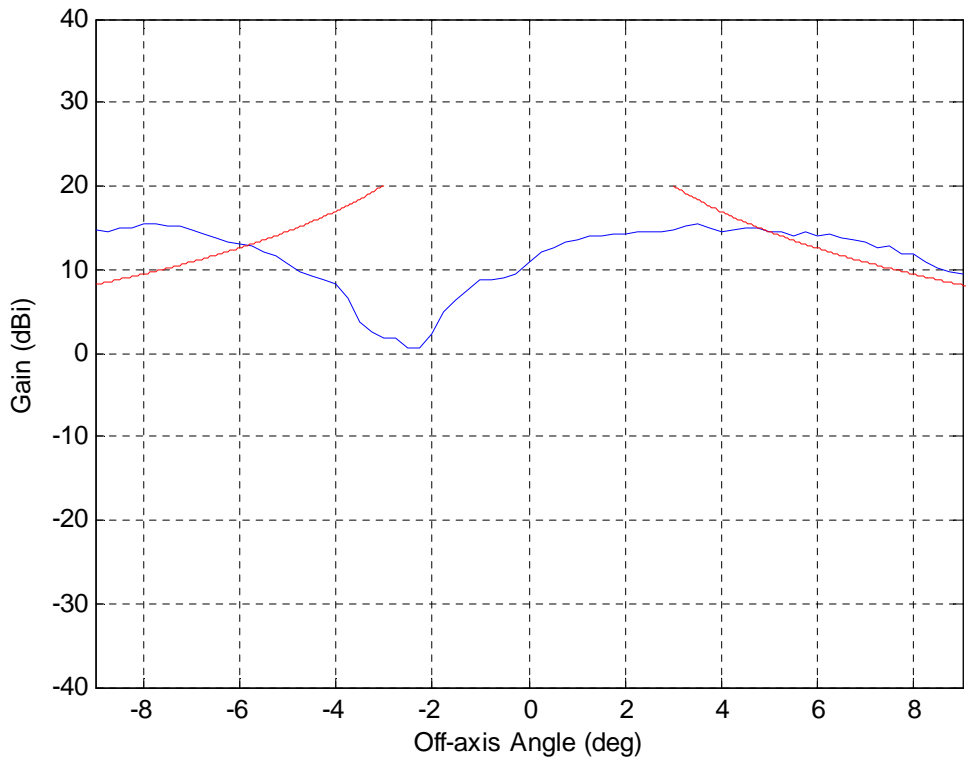


Figure 10. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Cross, Elevation: 5°, Elevation Cut

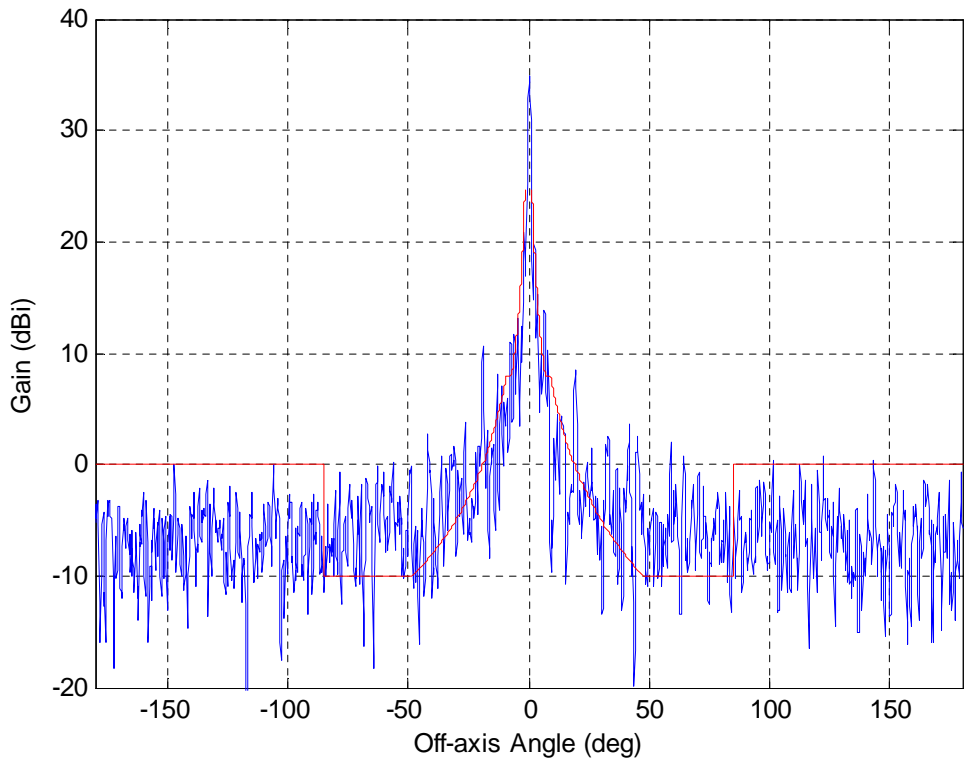


Figure 11. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 5°, Azimuth Cut

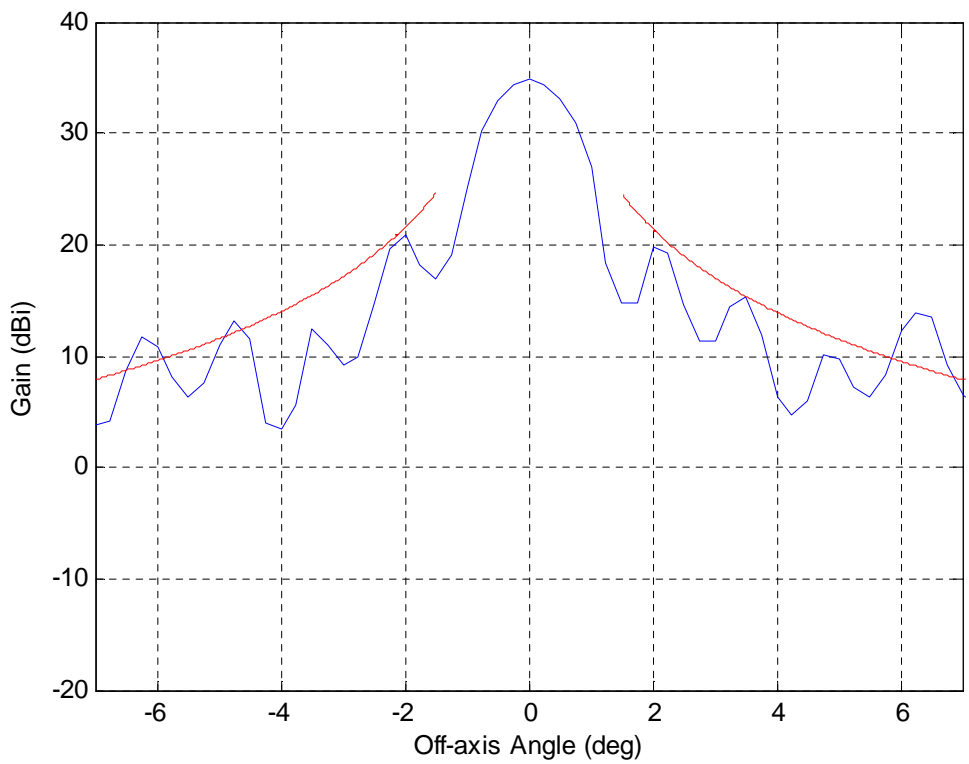


Figure 12. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 5°, Azimuth Cut

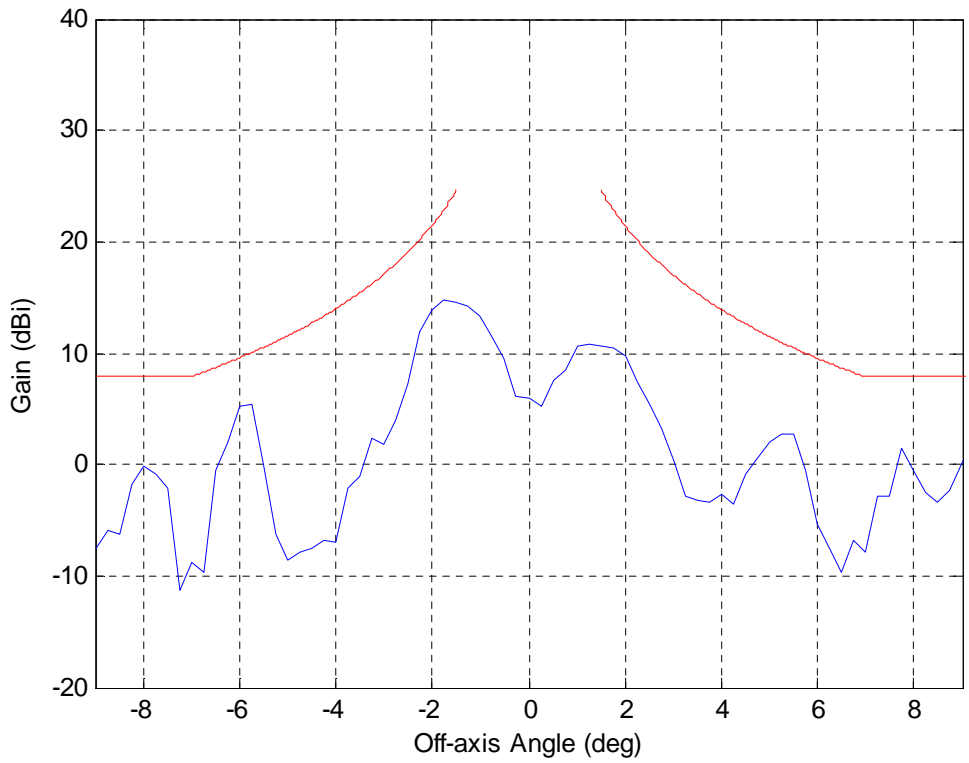


Figure 13. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Cross, Elevation: 5°, Azimuth Cut

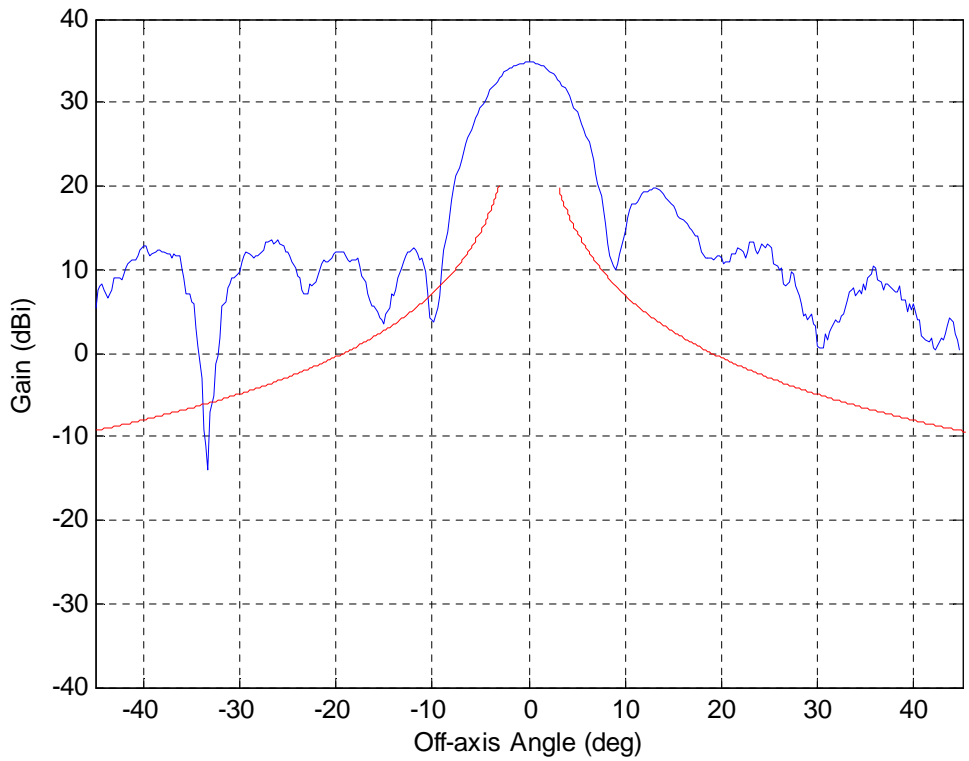


Figure 14. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 5°, Elevation Cut

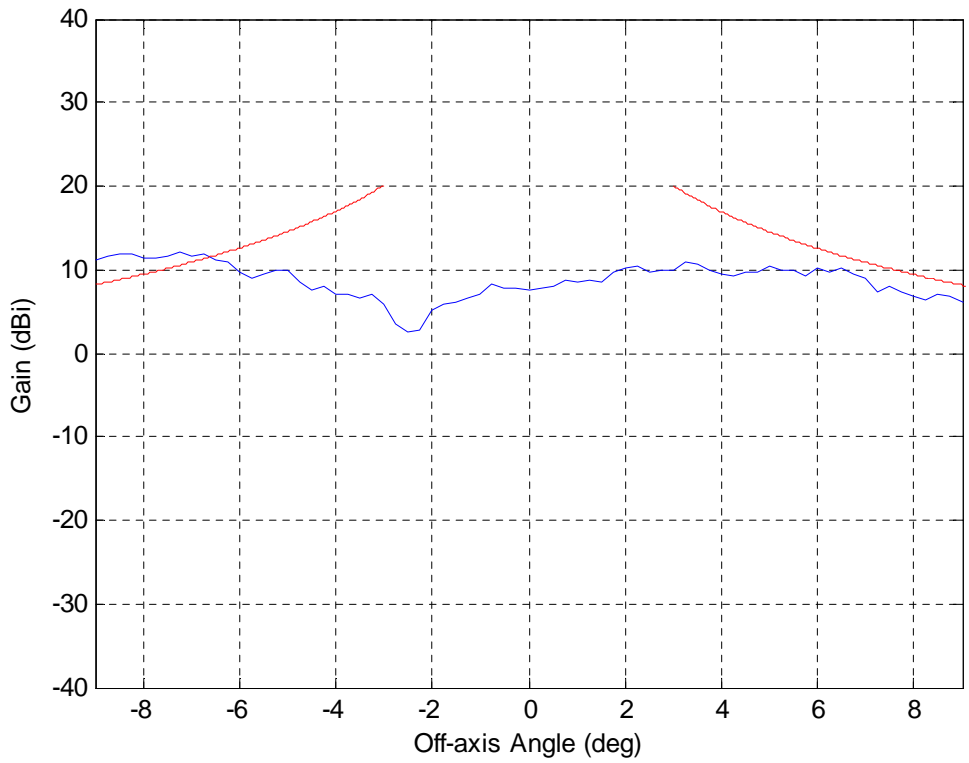


Figure 15. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Cross, Elevation: 5°, Elevation Cut

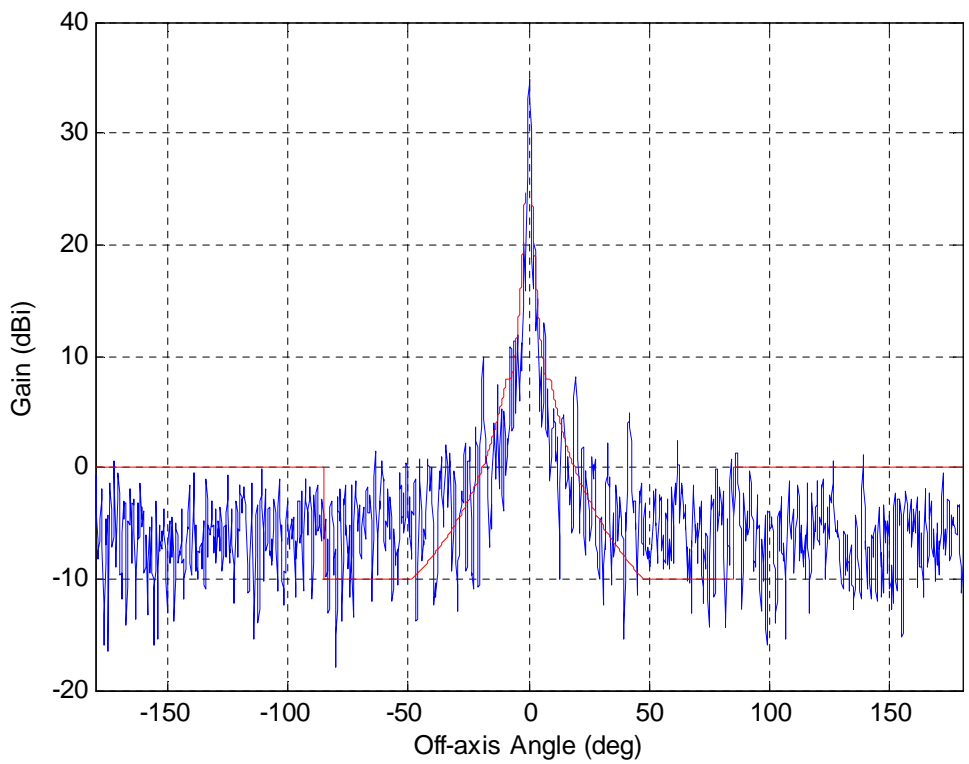


Figure 16. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 5°, Azimuth Cut

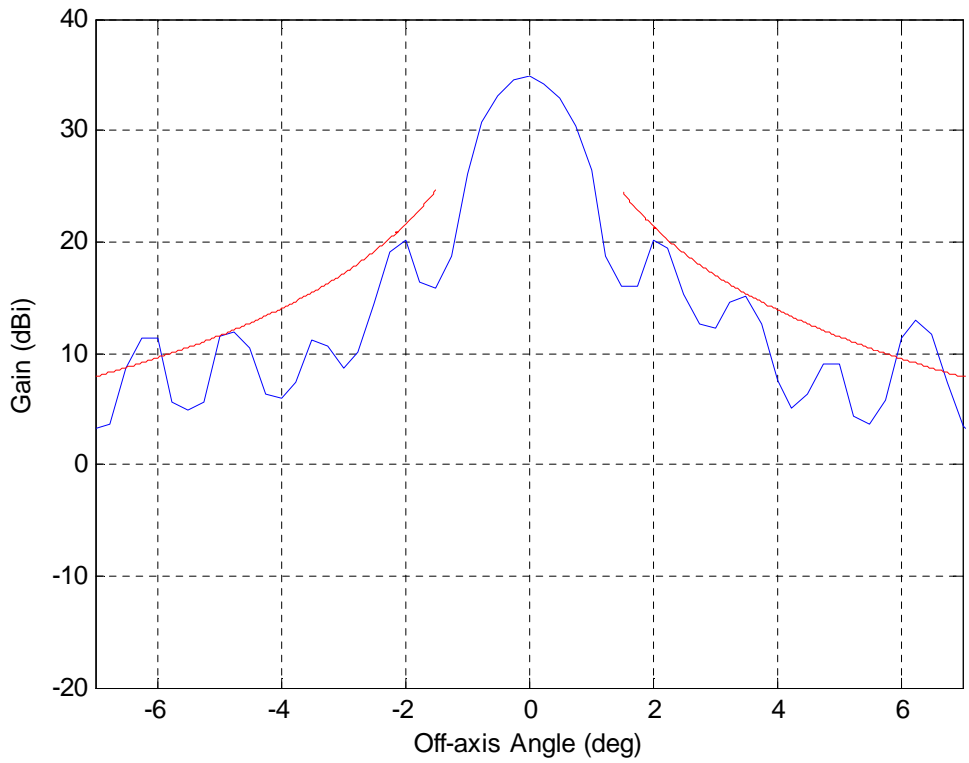


Figure 17. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 5°, Azimuth Cut

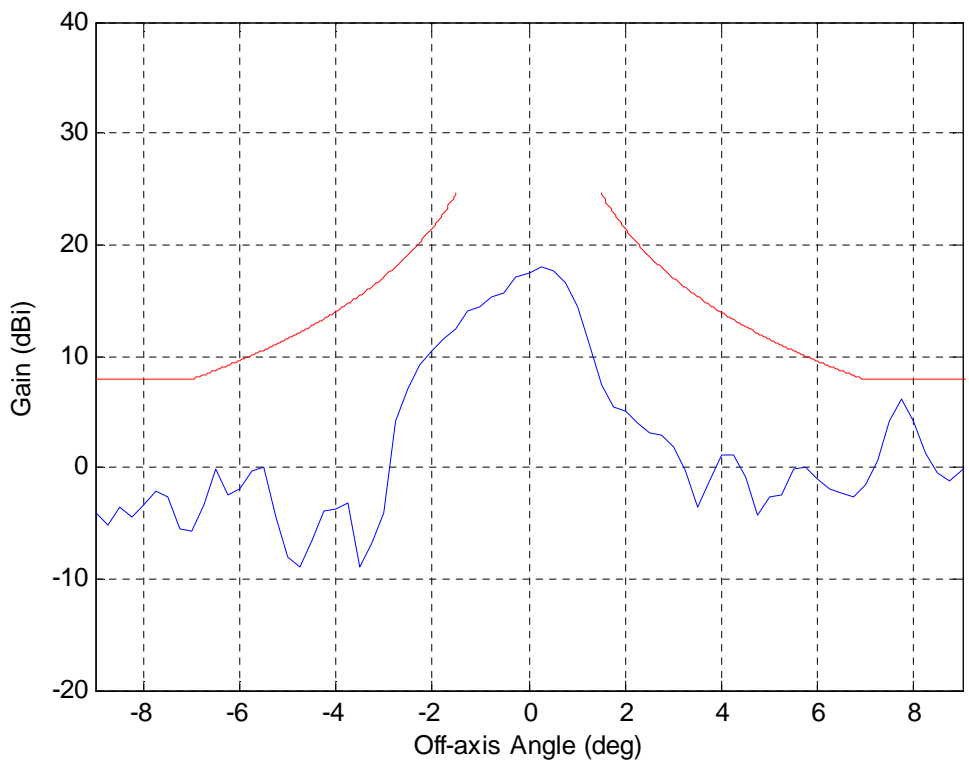


Figure 18. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Cross, Elevation: 5°, Azimuth Cut

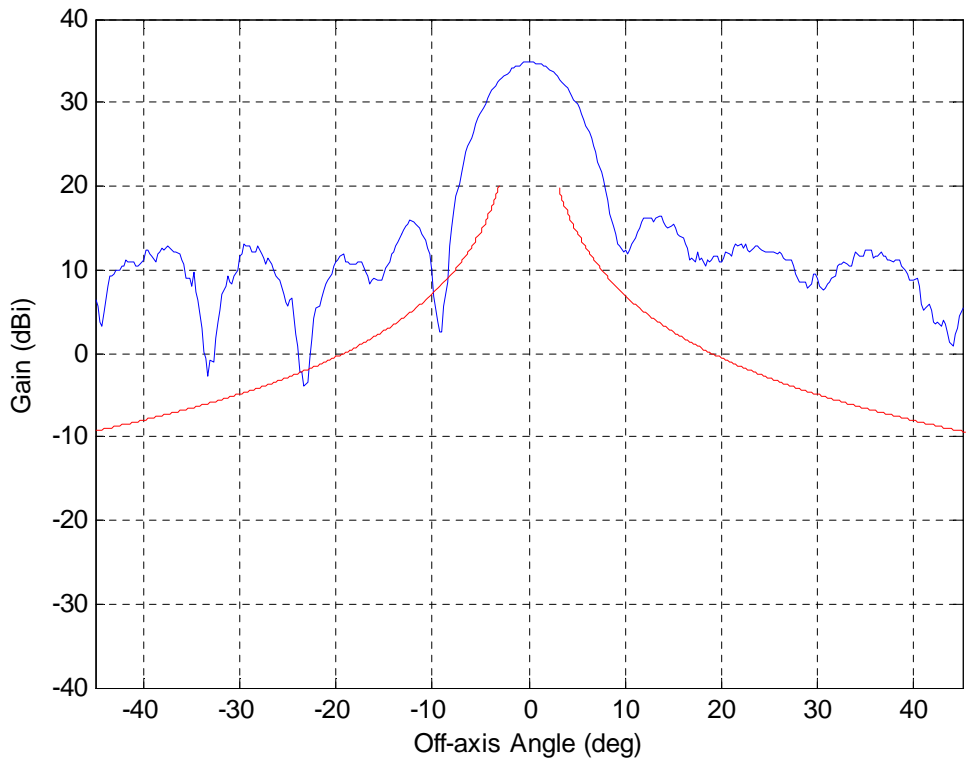


Figure 19. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 5°, Elevation Cut

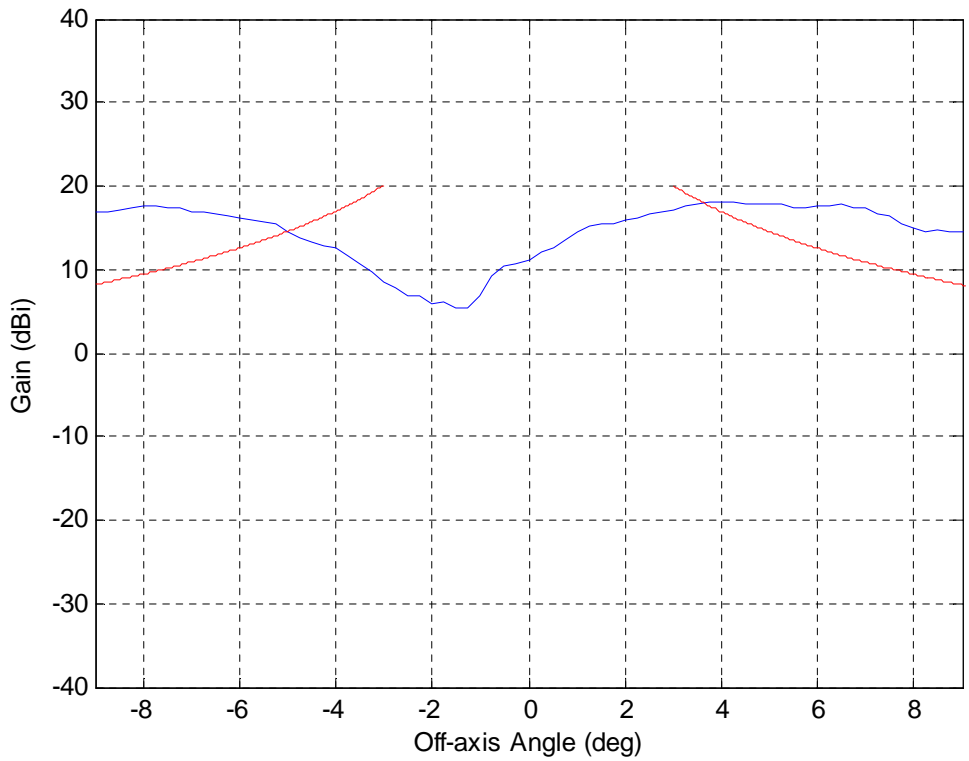


Figure 20. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Cross, Elevation: 5°, Elevation Cut

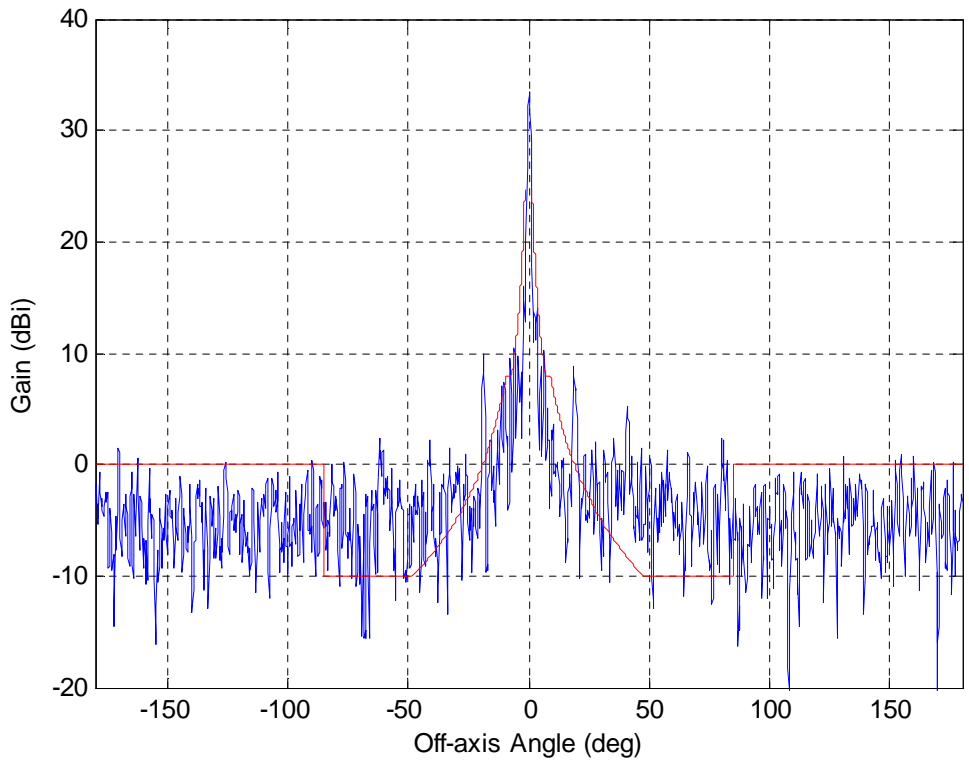


Figure 21. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 5°, Azimuth Cut

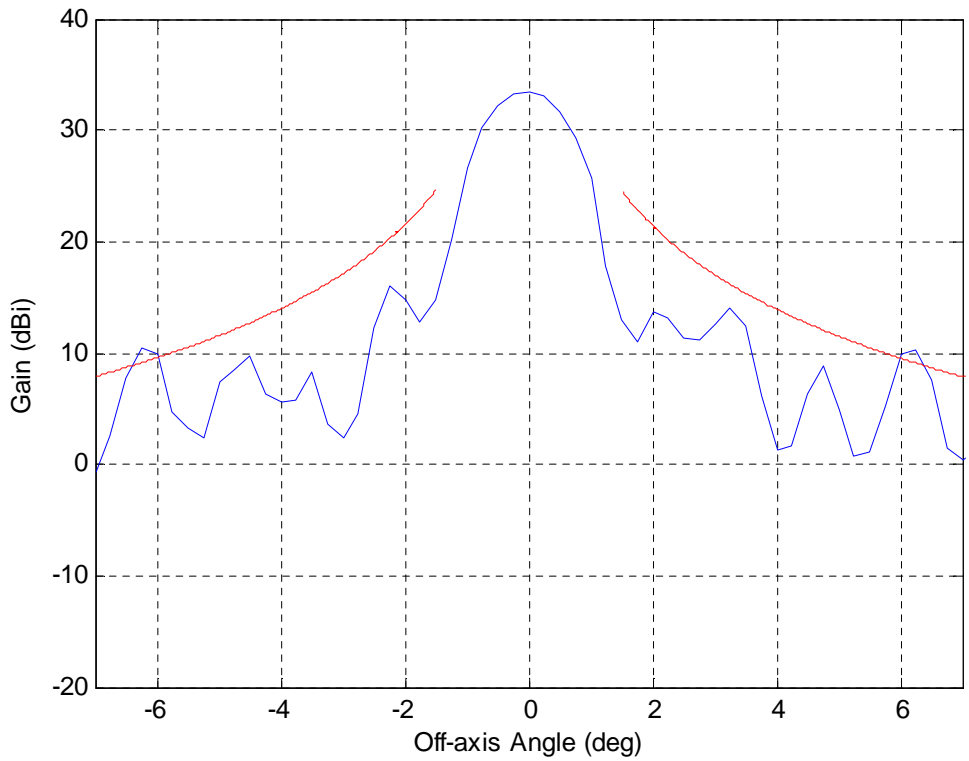


Figure 22. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 5°, Azimuth Cut



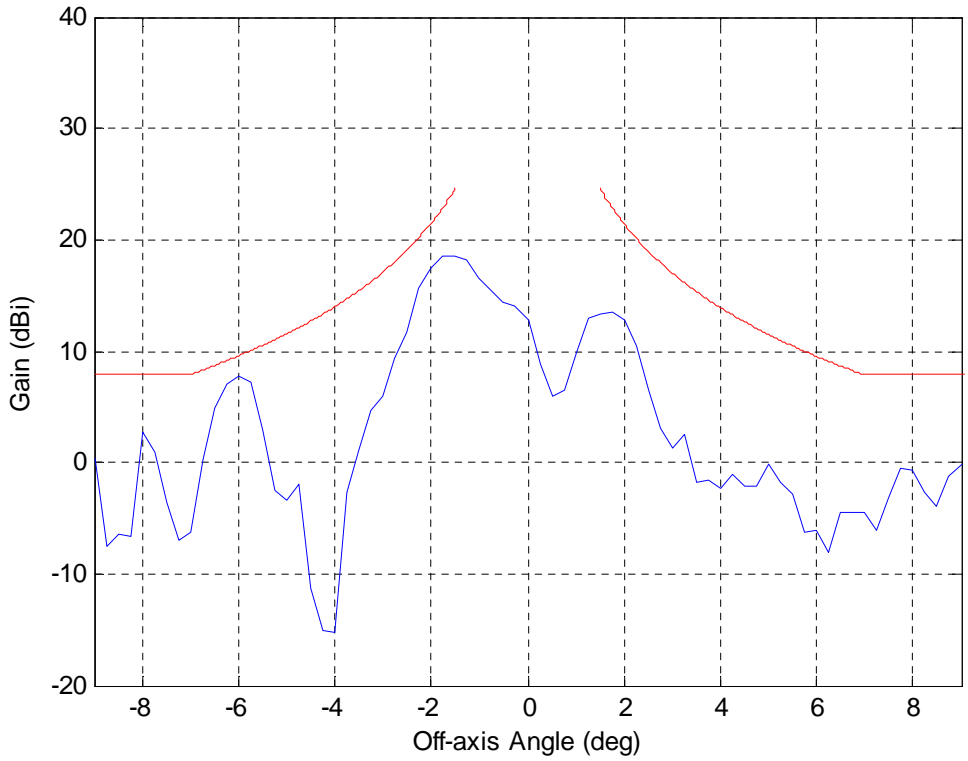


Figure 23. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Cross, Elevation: 5°, Azimuth Cut

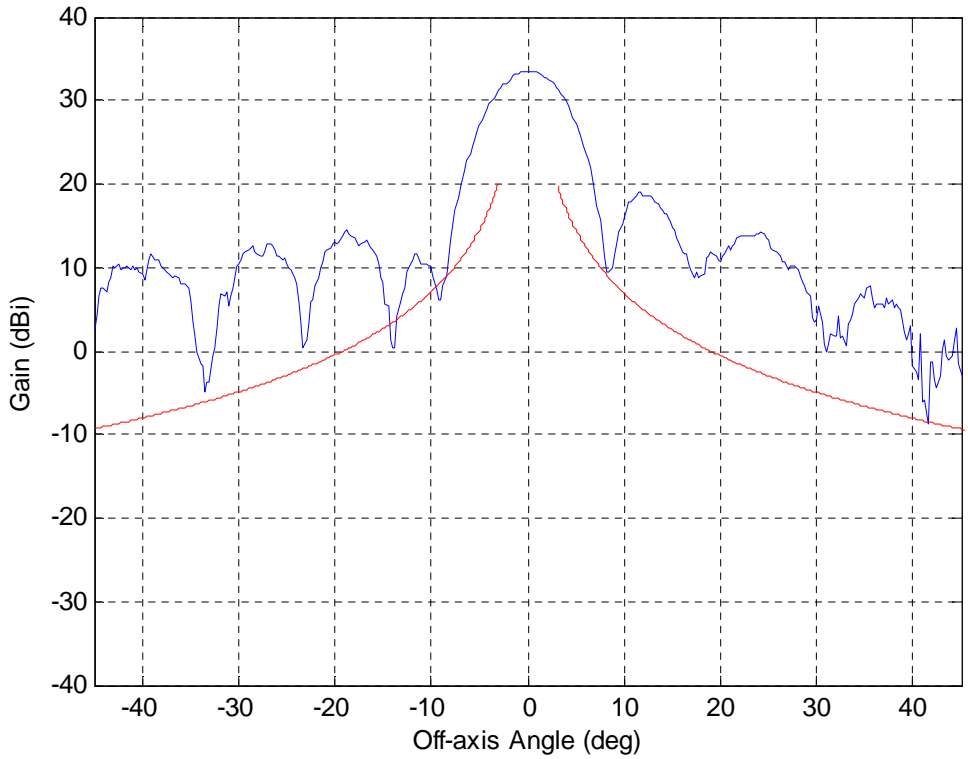


Figure 24. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 5°, Elevation Cut

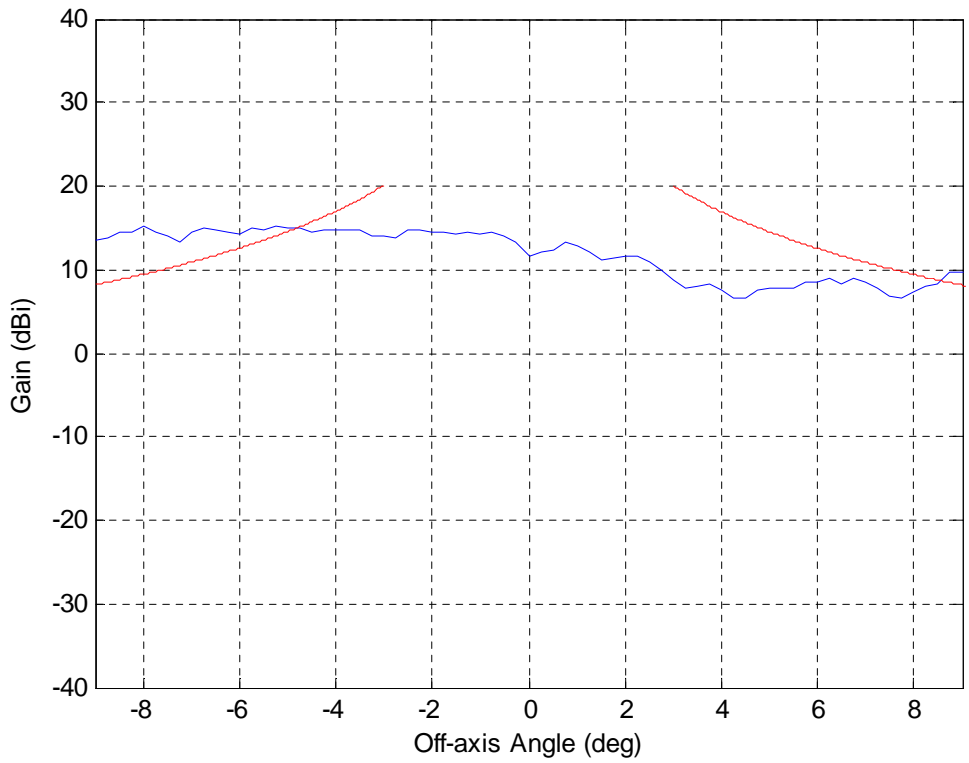


Figure 25. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Cross, Elevation: 5°, Elevation Cut

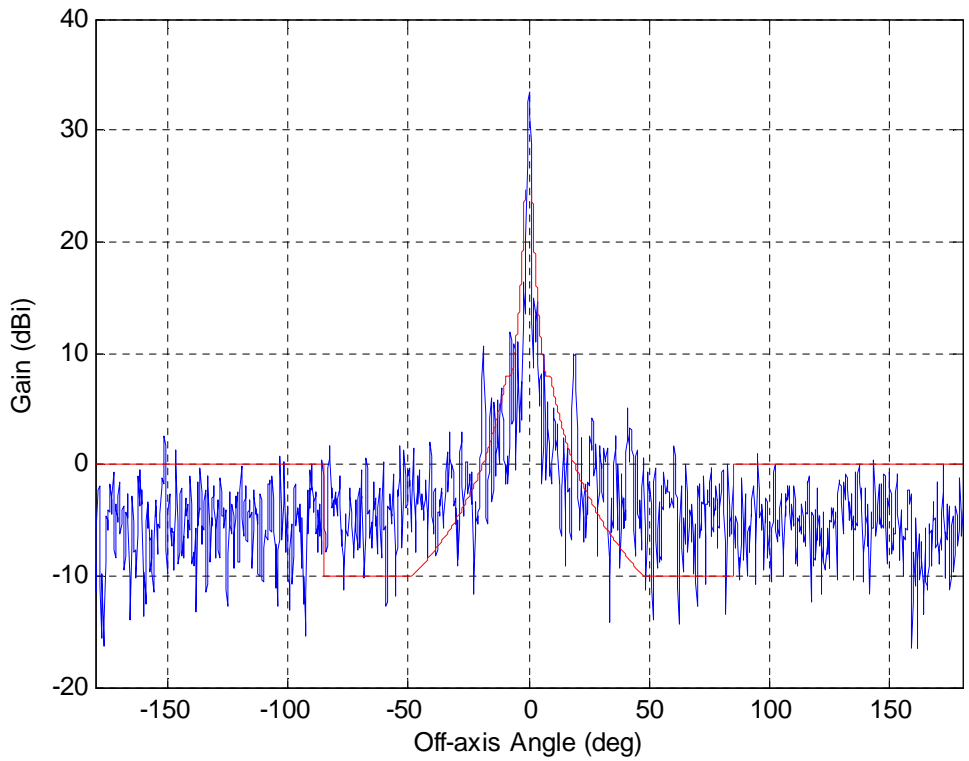


Figure 26. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 5°, Azimuth Cut

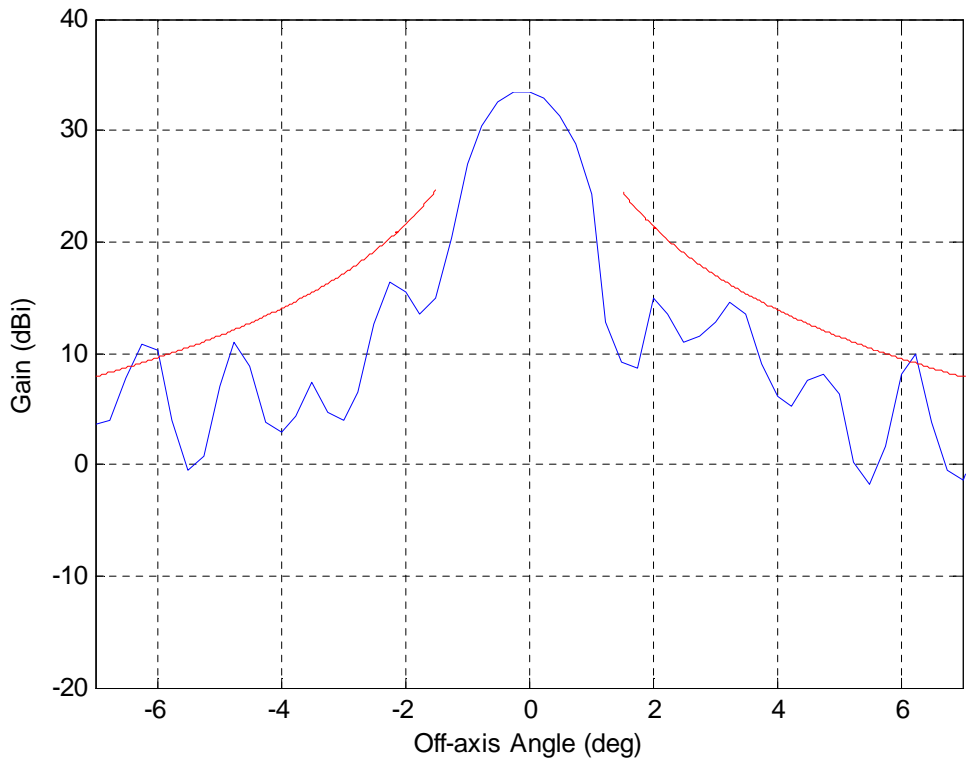


Figure 27. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 5°, Azimuth Cut

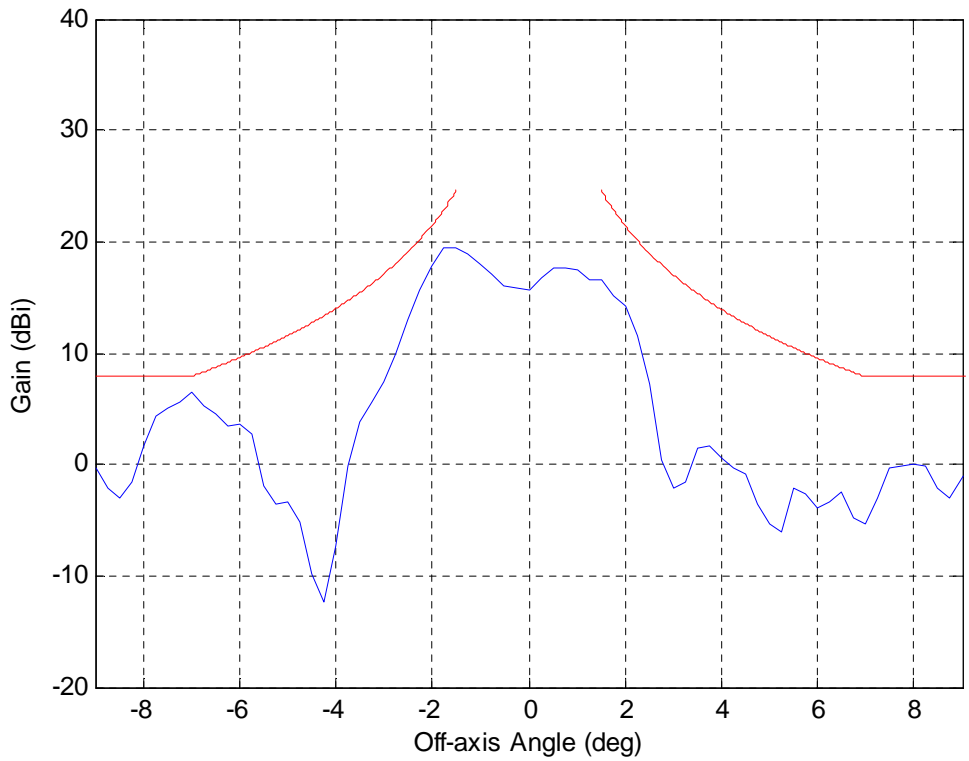


Figure 28. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Cross, Elevation: 5°, Azimuth Cut

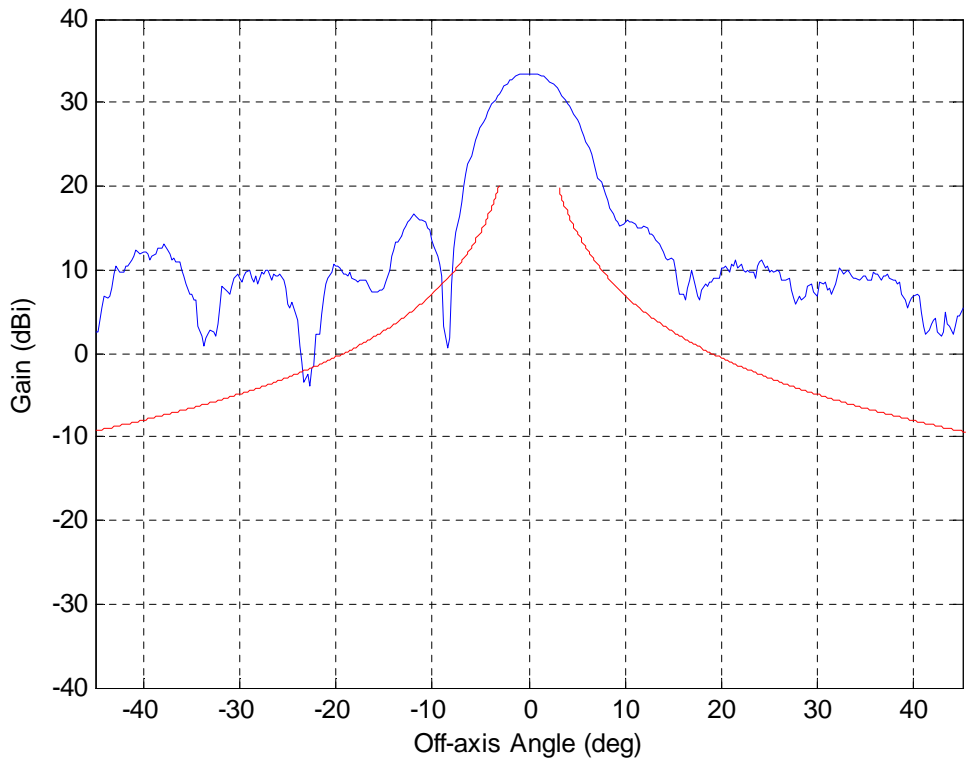


Figure 29. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 5°, Elevation Cut

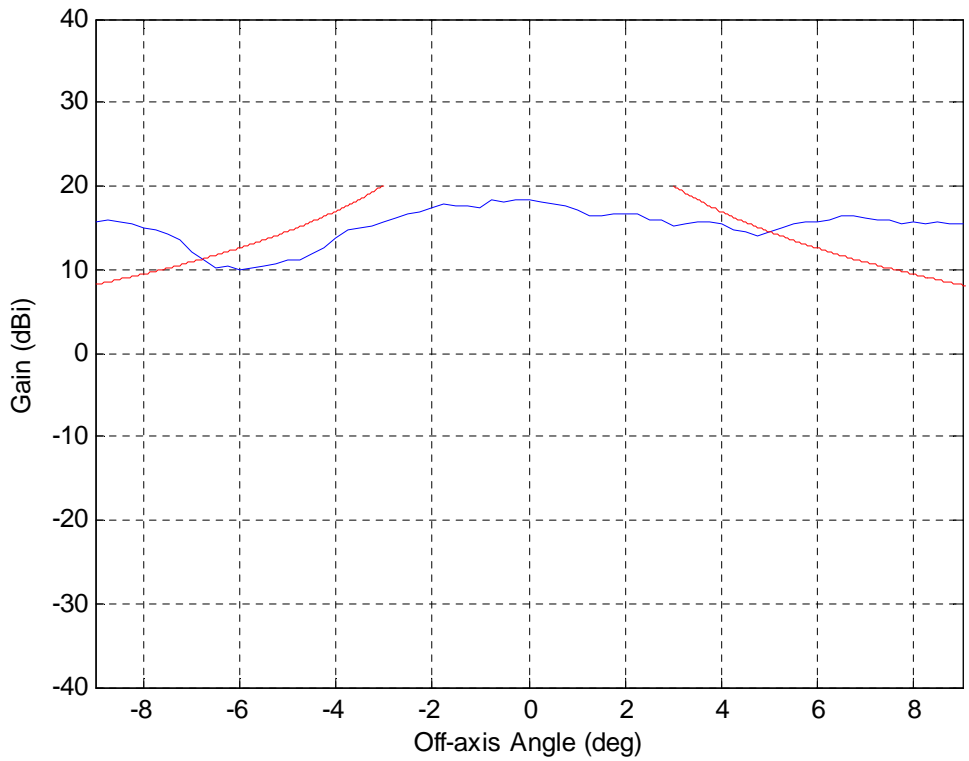


Figure 30. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Cross, Elevation: 5°, Elevation Cut

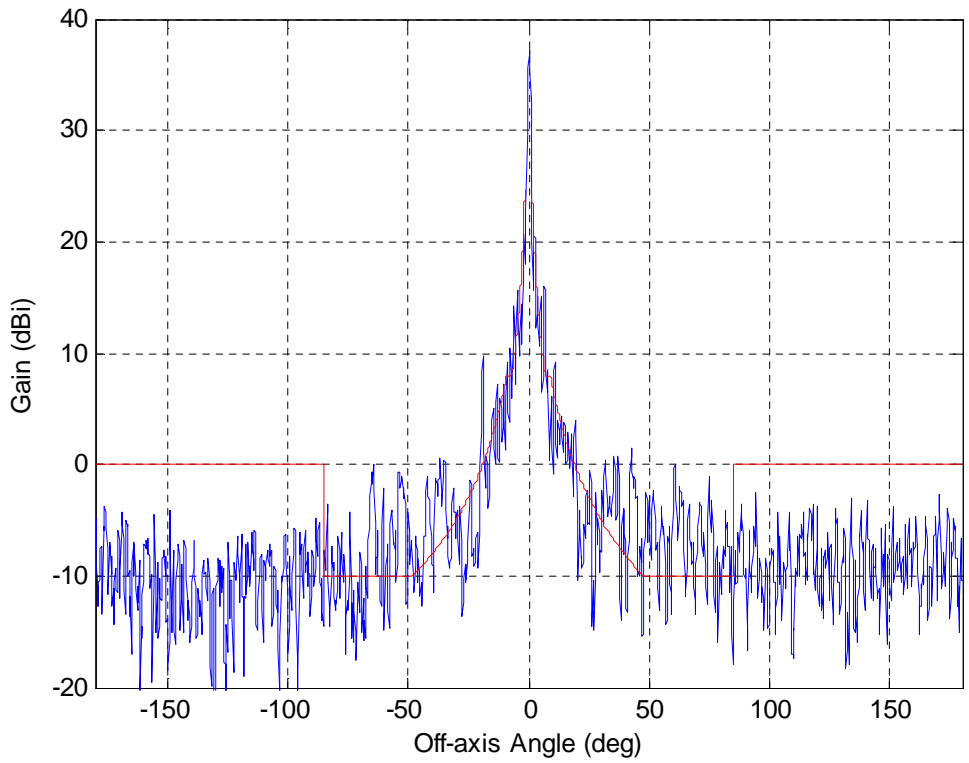


Figure 31. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 45°, Azimuth Cut

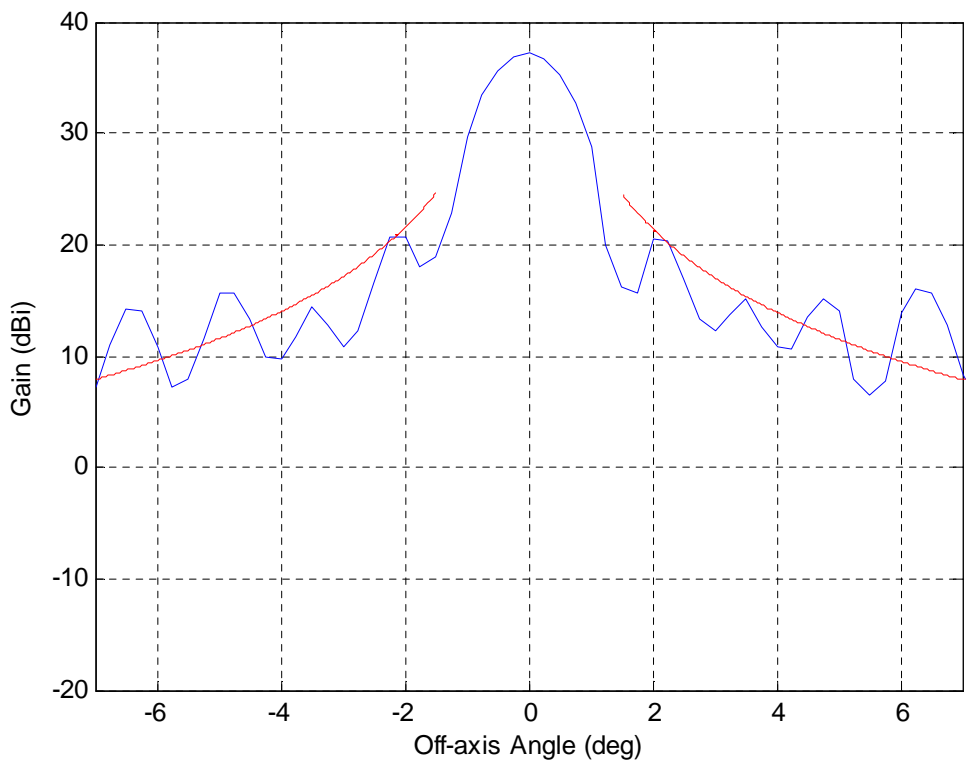


Figure 32. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 45°, Azimuth Cut

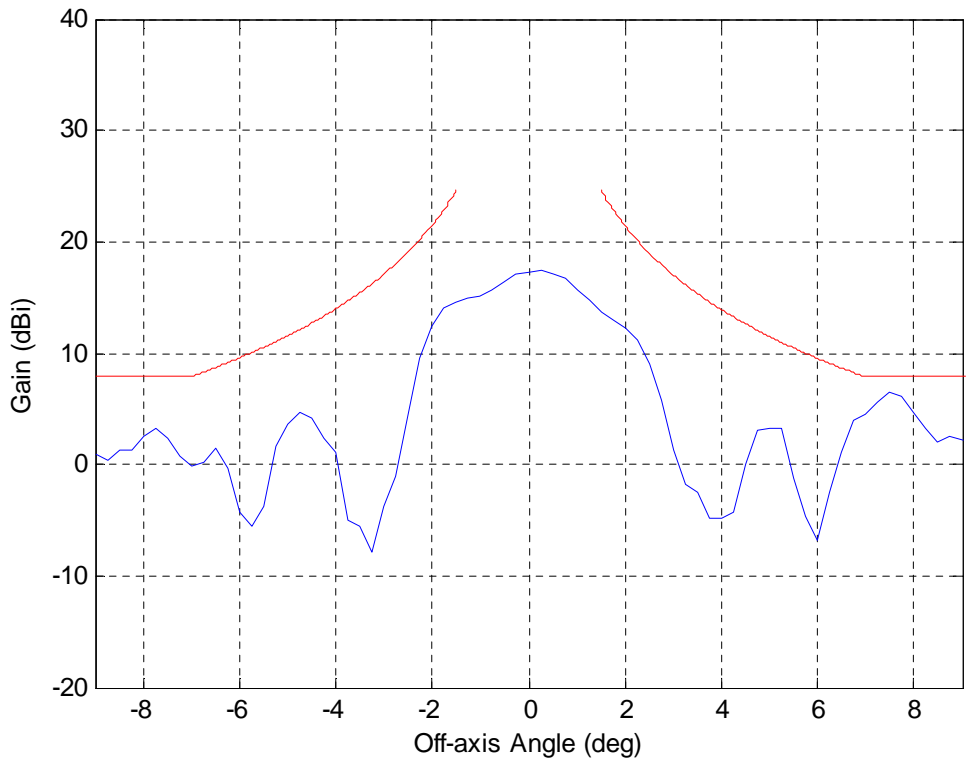


Figure 33. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Cross, Elevation: 45°, Azimuth Cut

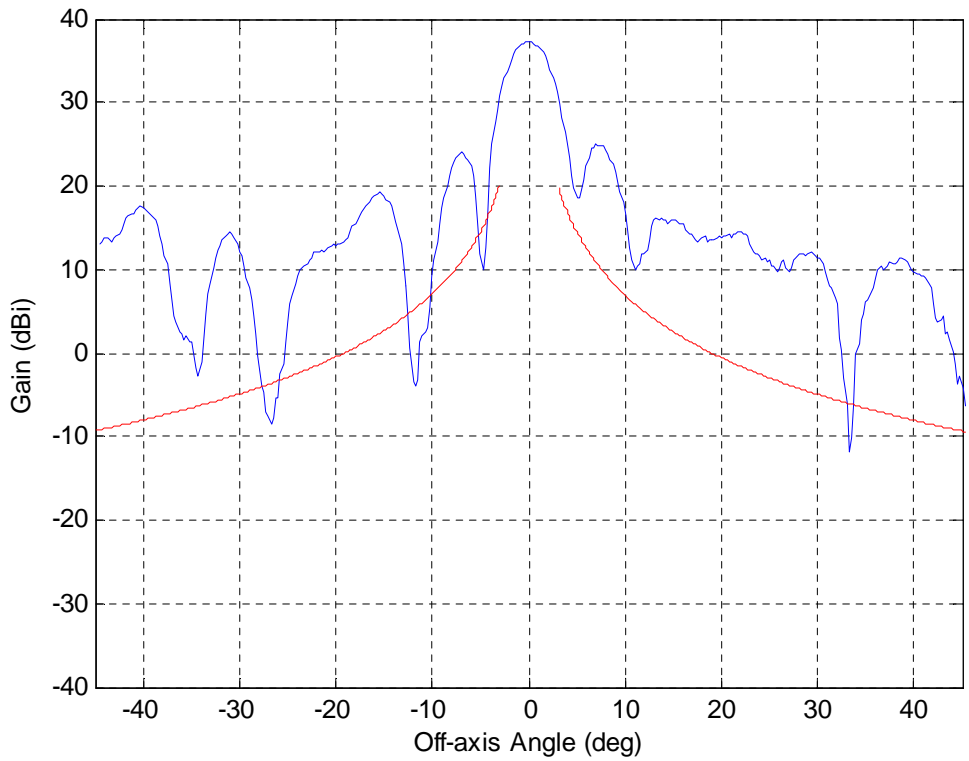


Figure 34. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 45°, Elevation Cut

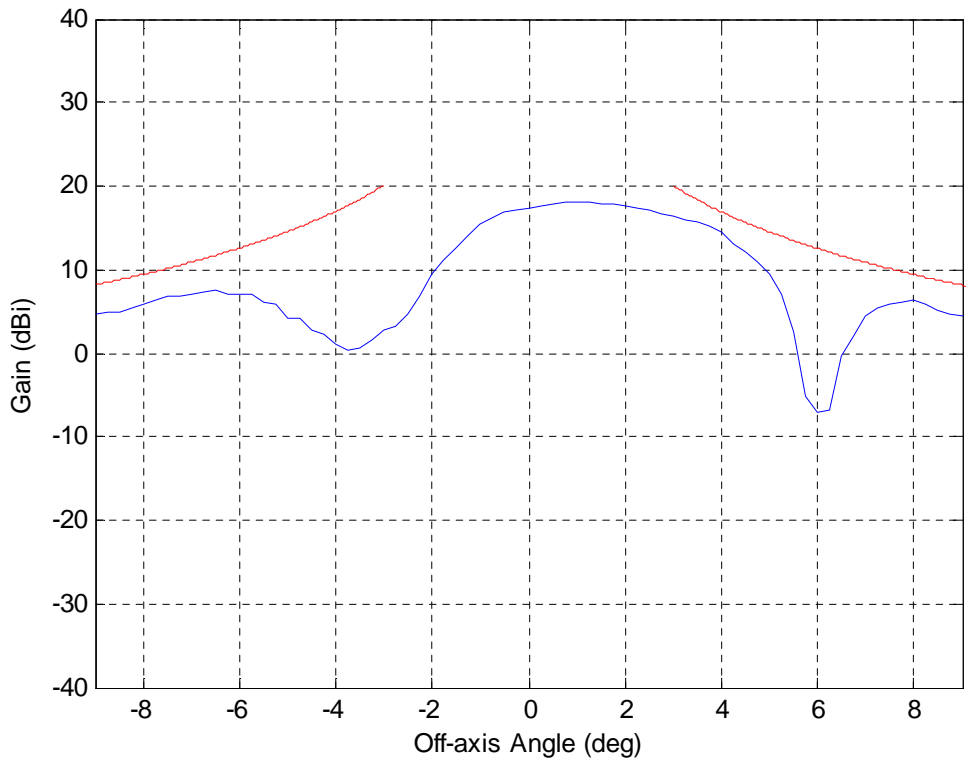


Figure 35. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Cross, Elevation: 45°, Elevation Cut

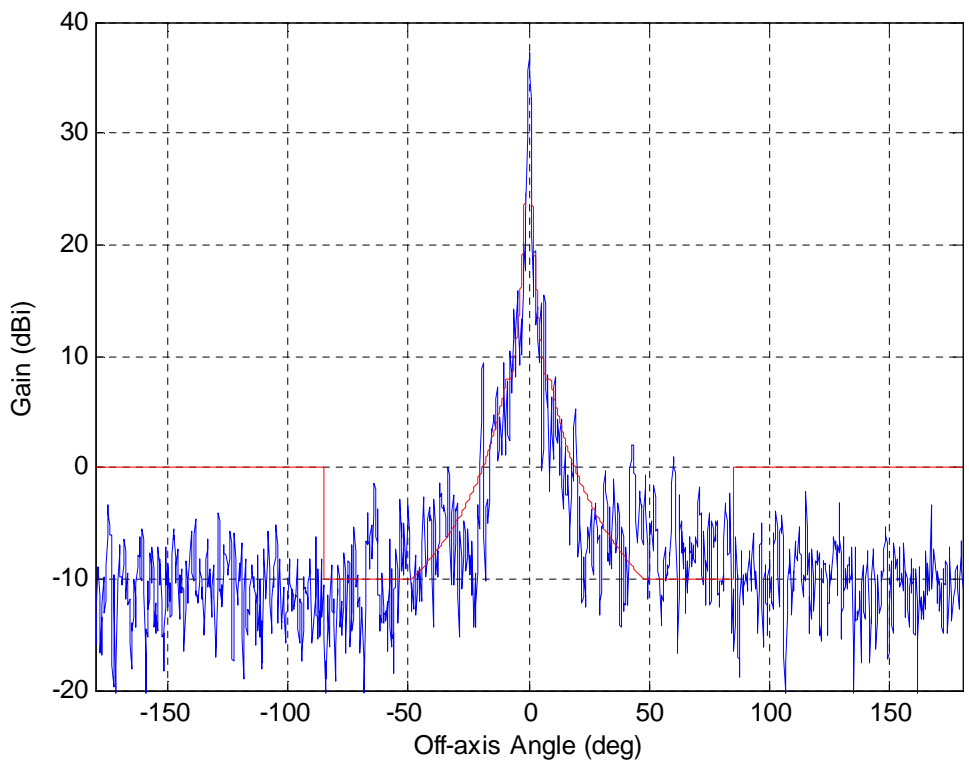


Figure 36. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 45°, Azimuth Cut

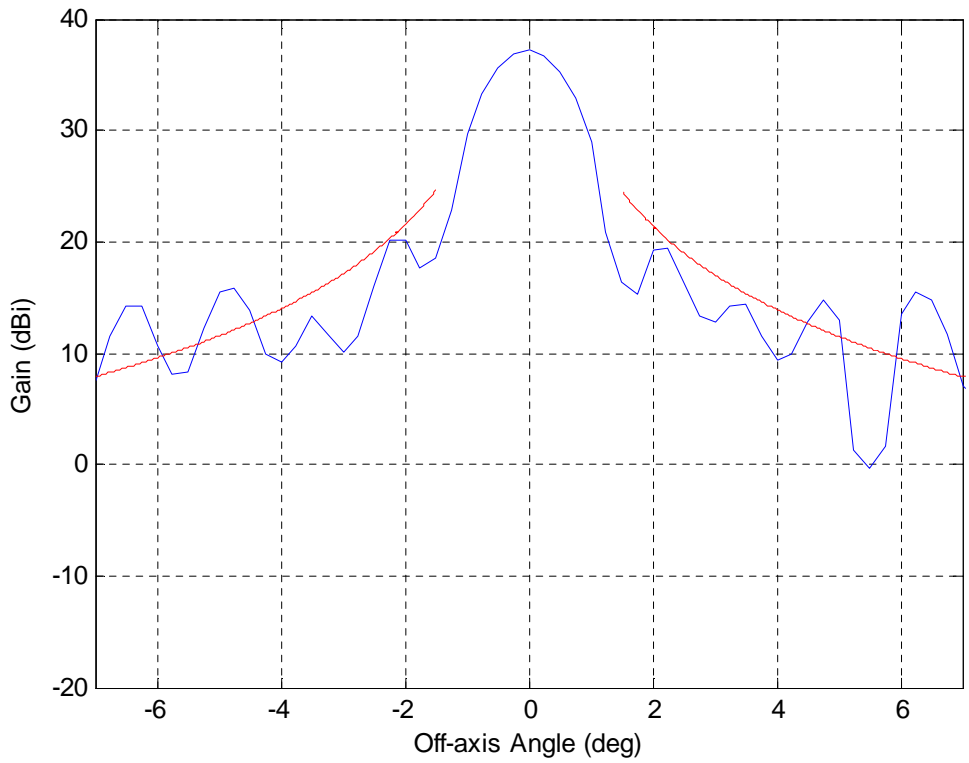


Figure 37. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 45°, Azimuth Cut

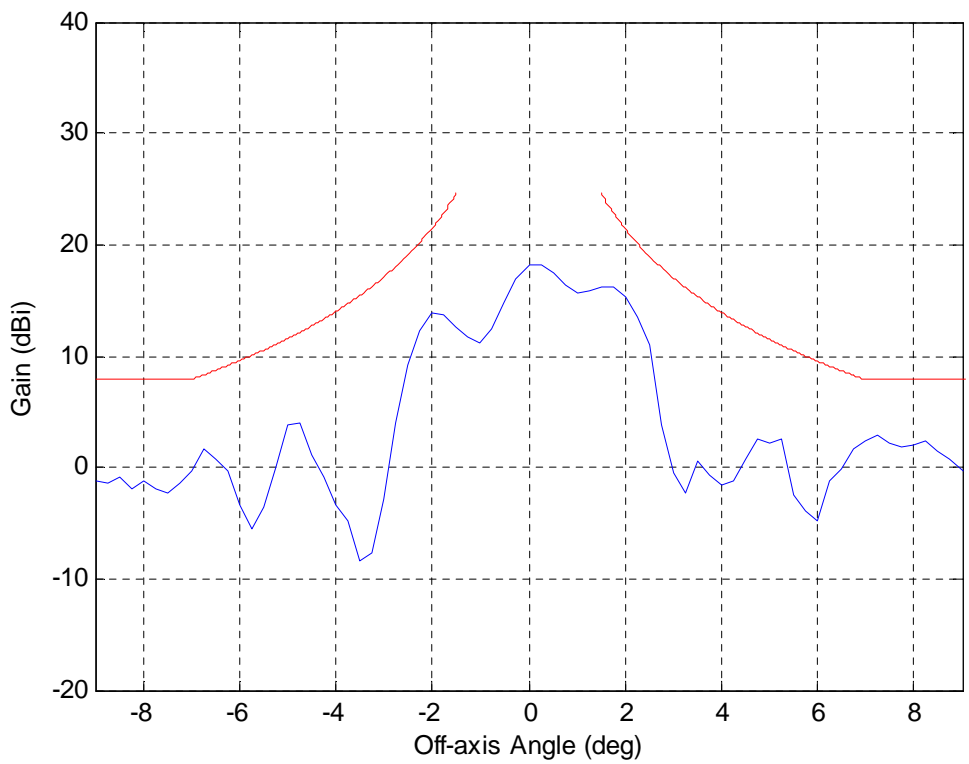


Figure 38. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Cross, Elevation: 45°, Azimuth Cut



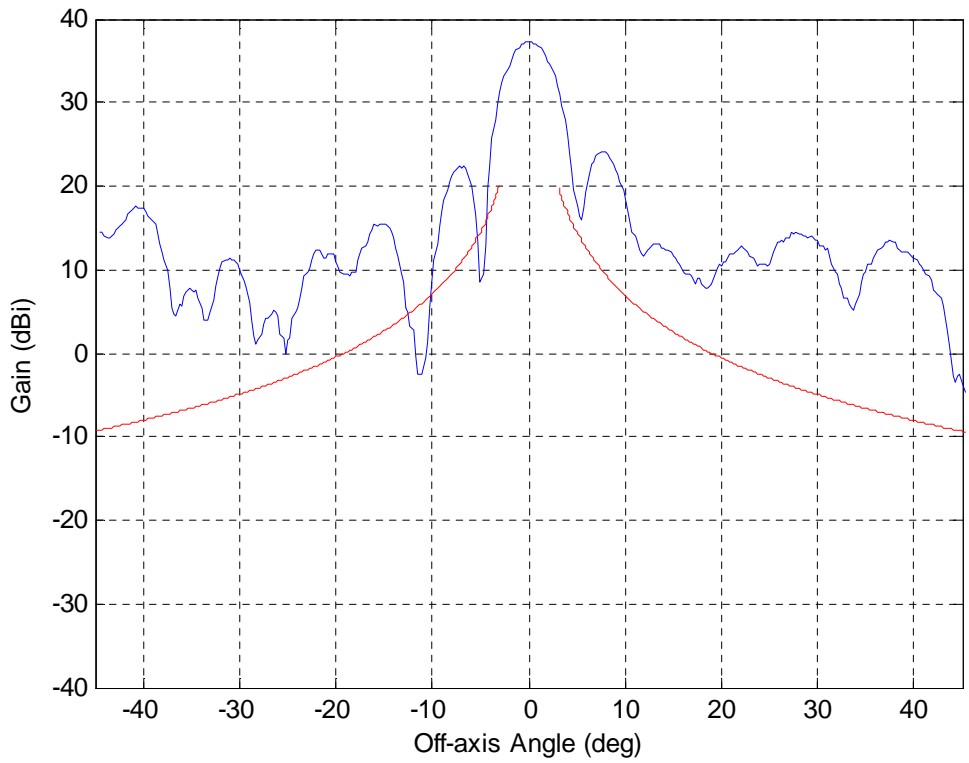


Figure 39. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 45°, Elevation Cut

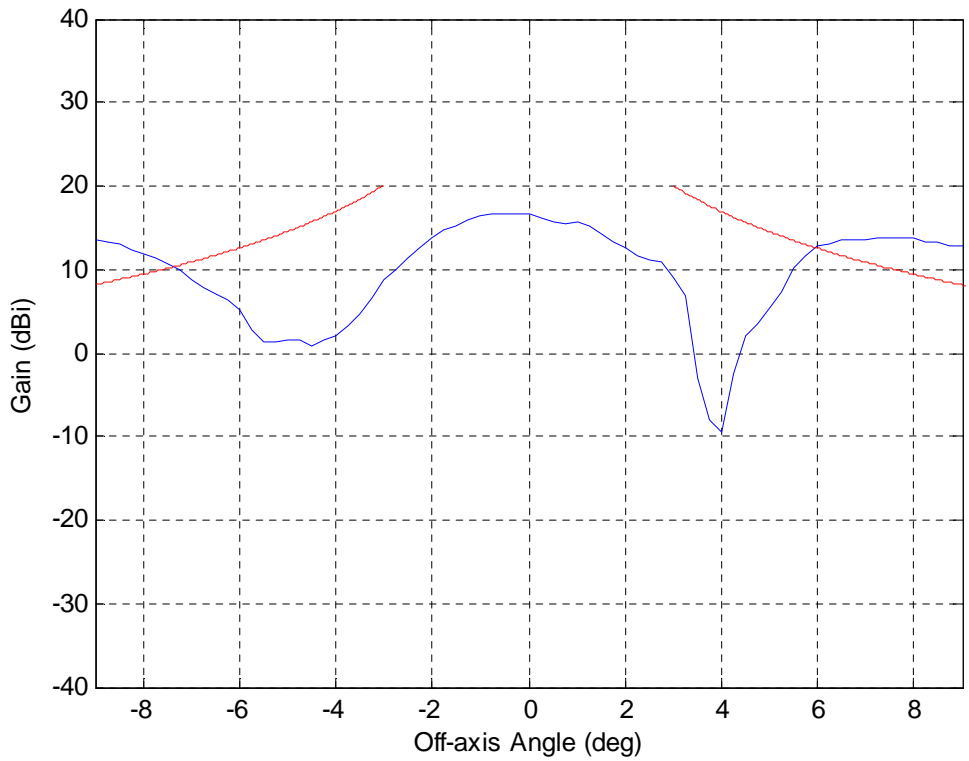


Figure 40. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Cross, Elevation: 45°, Elevation Cut

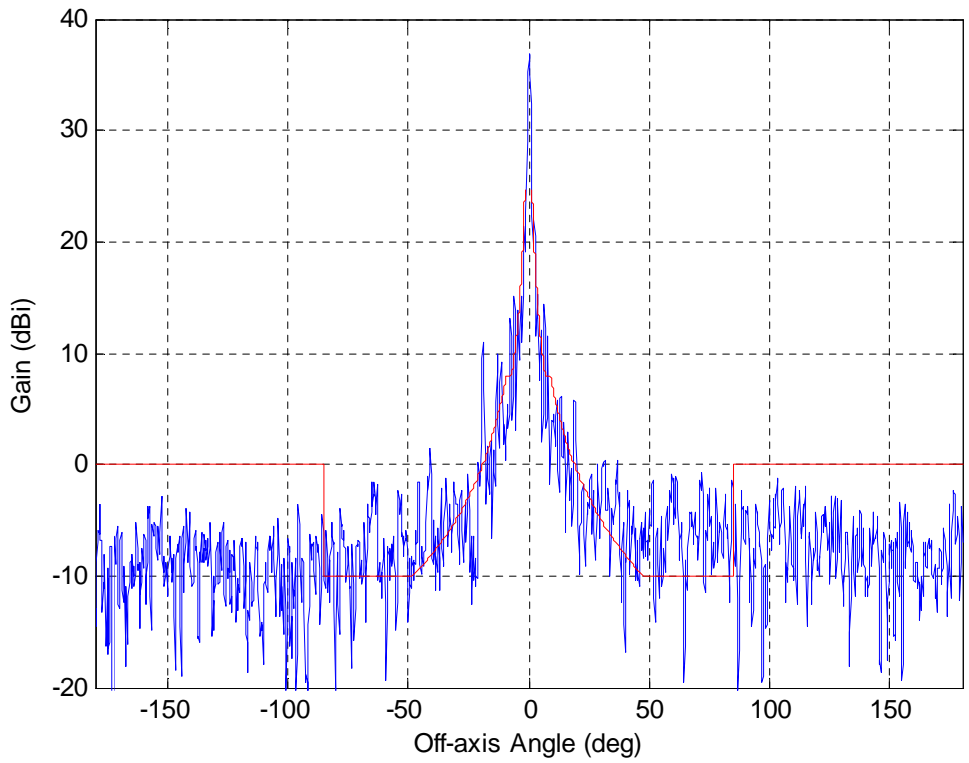


Figure 41. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 45°, Azimuth Cut

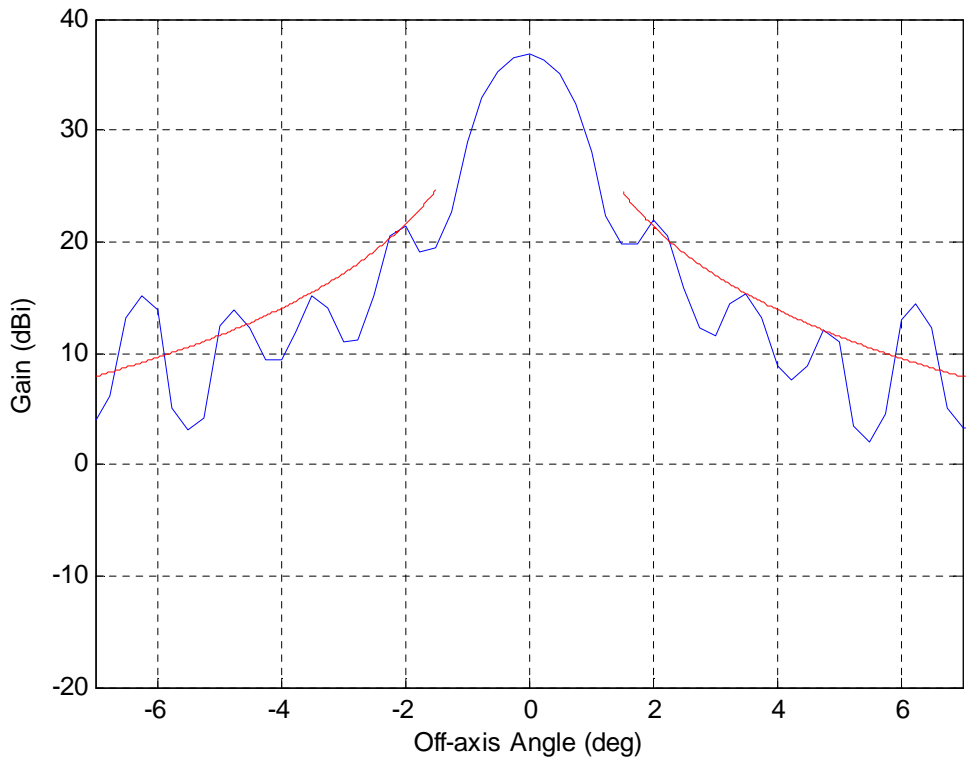


Figure 42. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 45°, Azimuth Cut

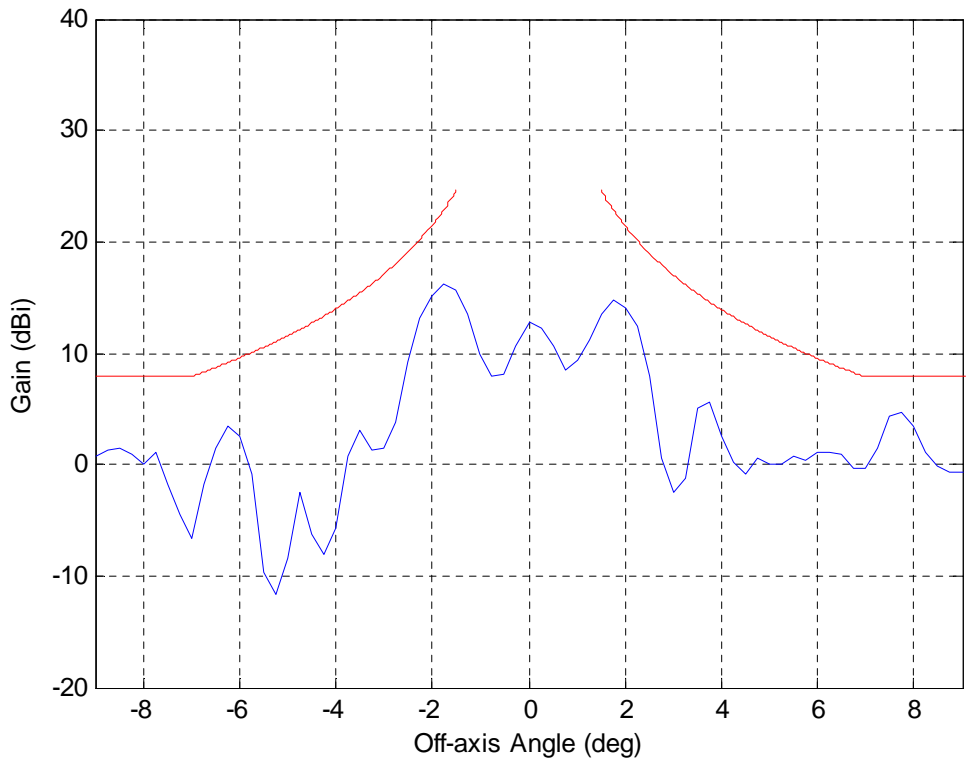


Figure 43. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Cross, Elevation: 45°, Azimuth Cut

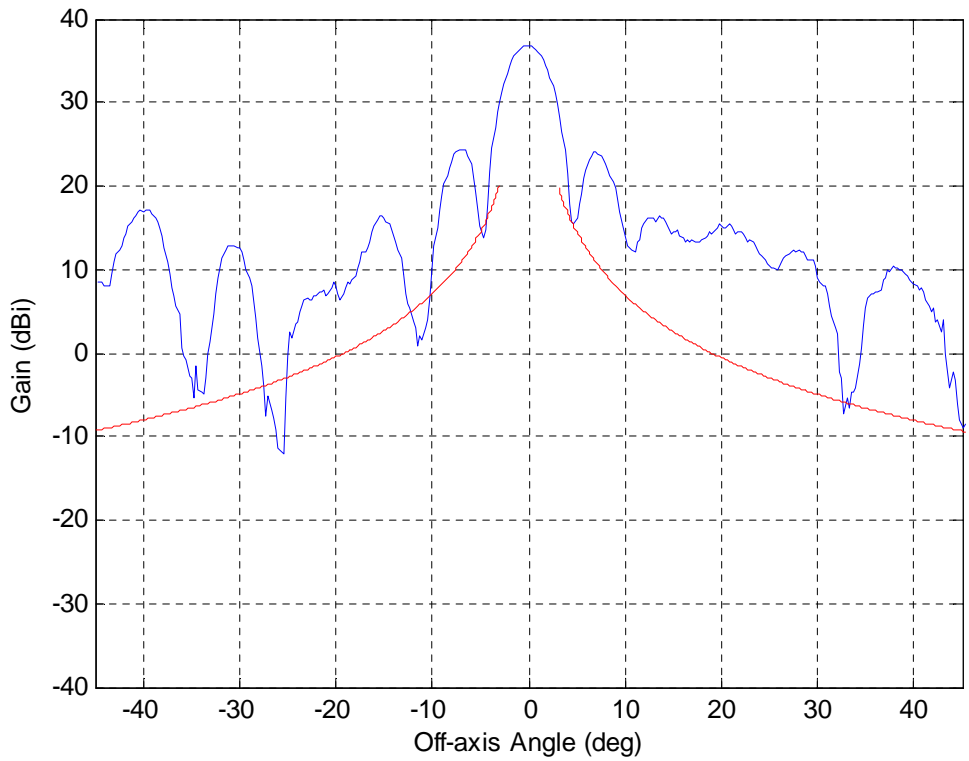


Figure 44. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 45°, Elevation Cut

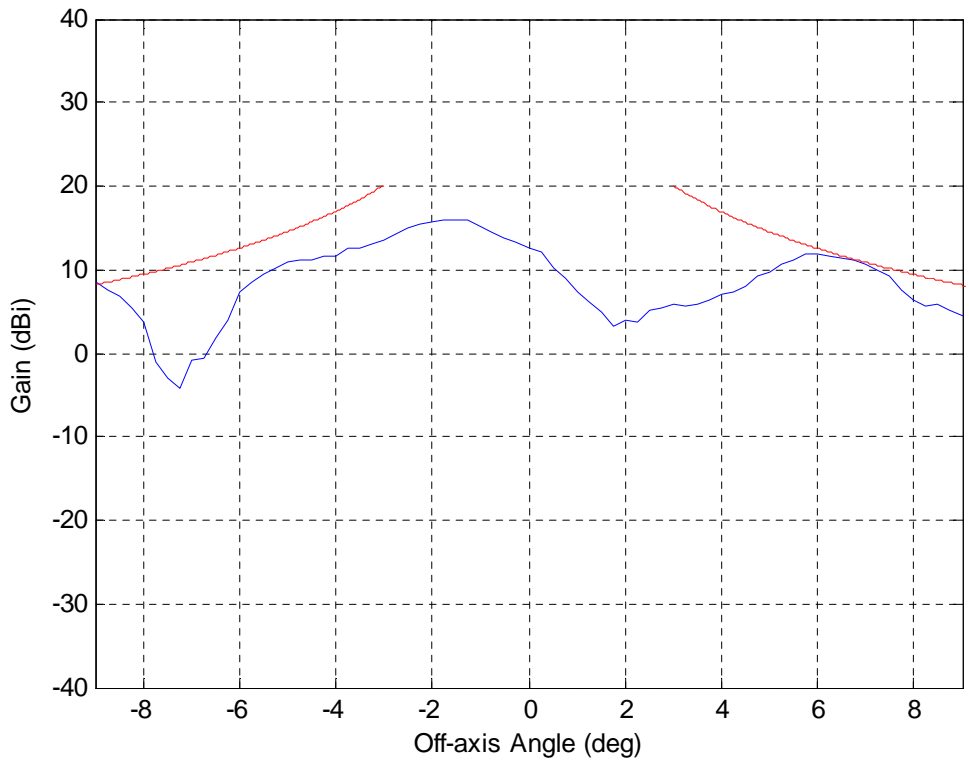


Figure 45. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Cross, Elevation: 45°, Elevation Cut

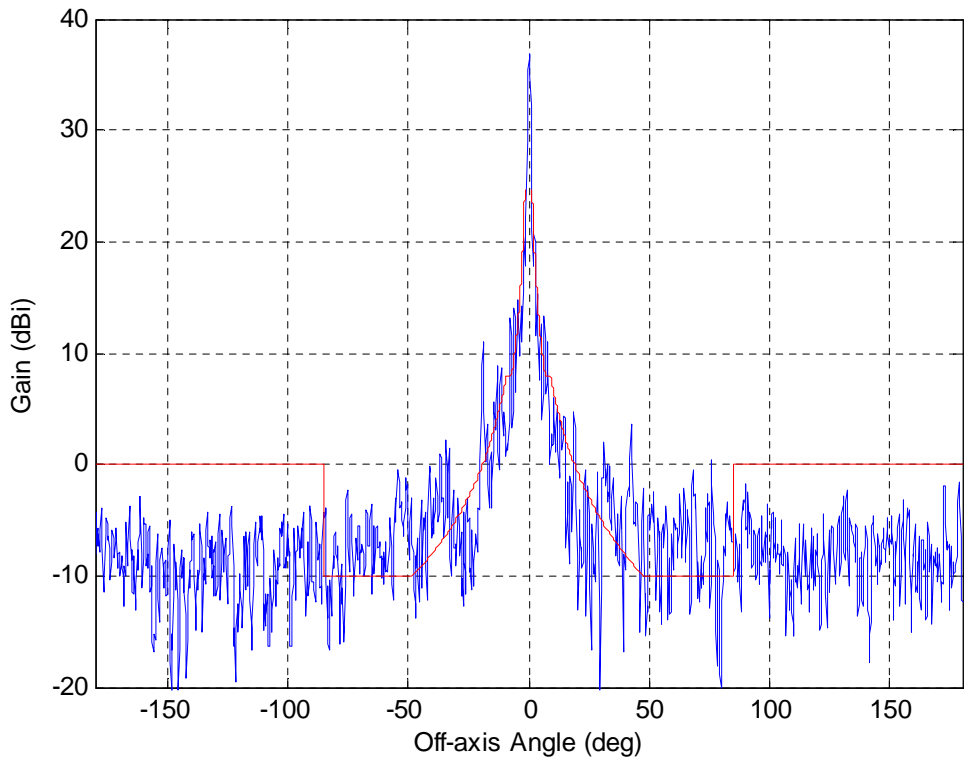


Figure 46. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 45°, Azimuth Cut

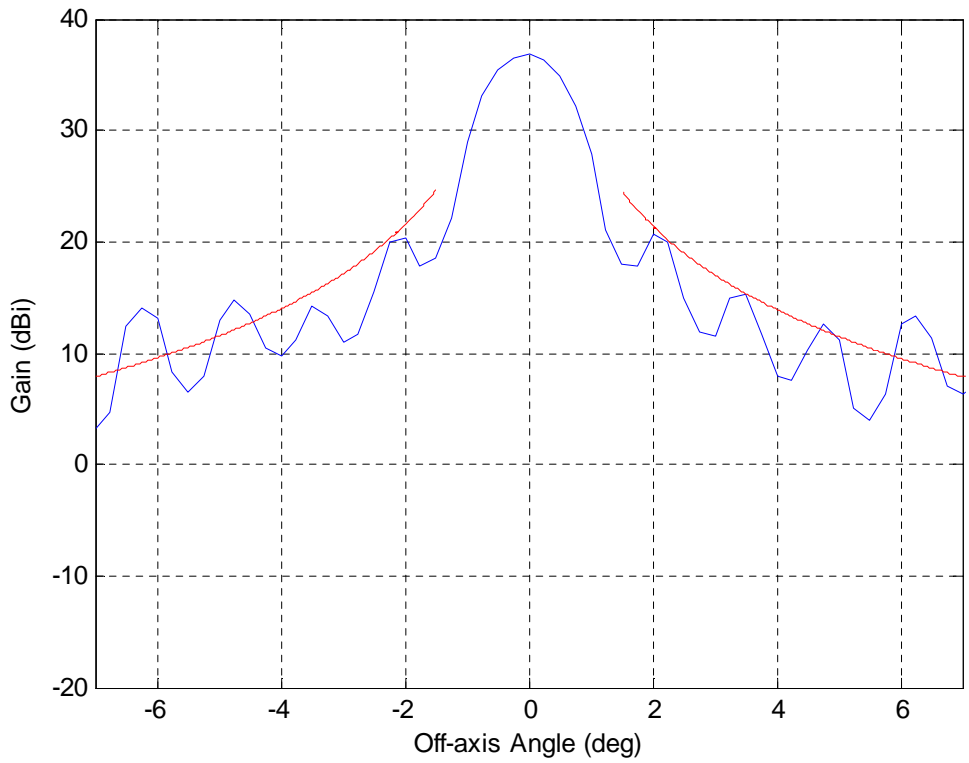


Figure 47. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 45°, Azimuth Cut

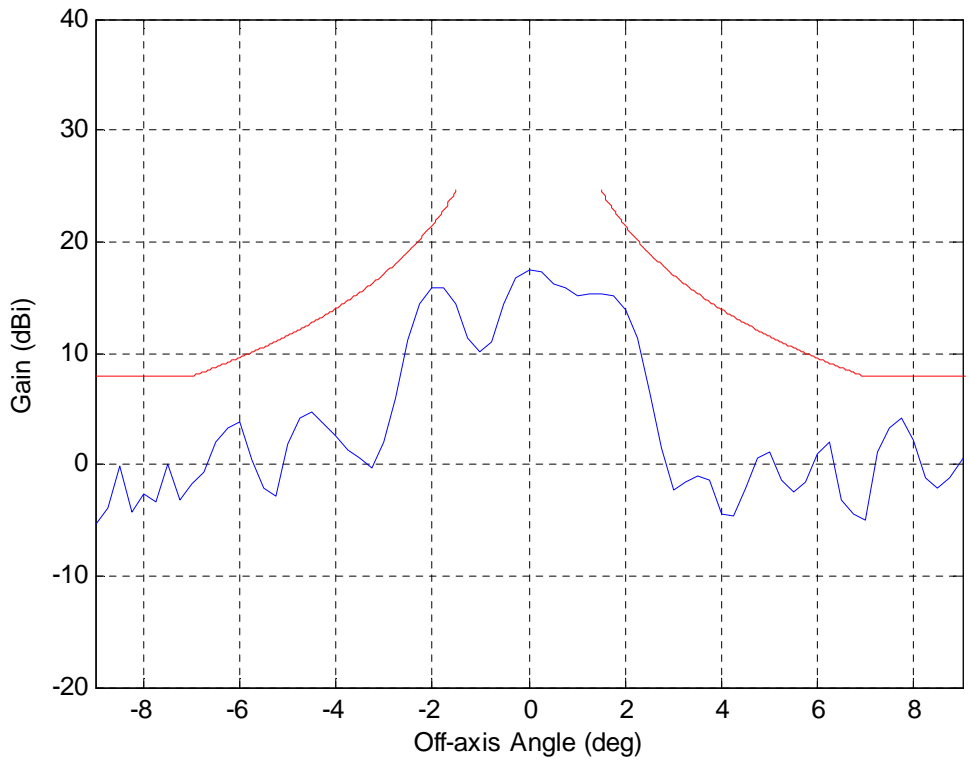


Figure 48. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Cross, Elevation: 45°, Azimuth Cut

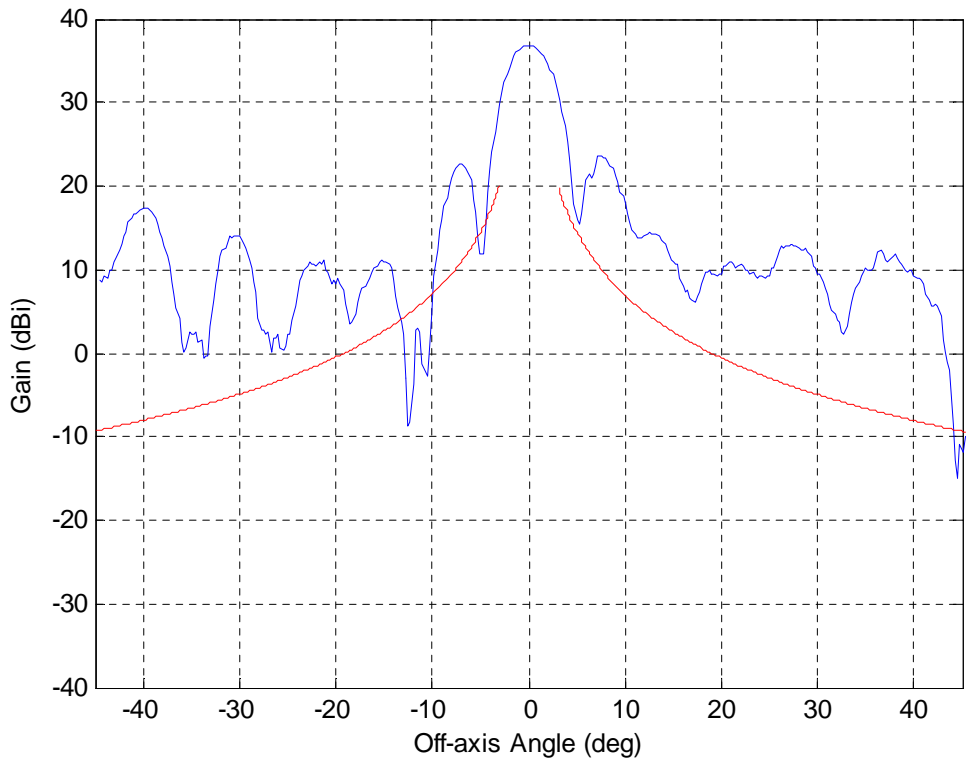


Figure 49. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 45°, Elevation Cut

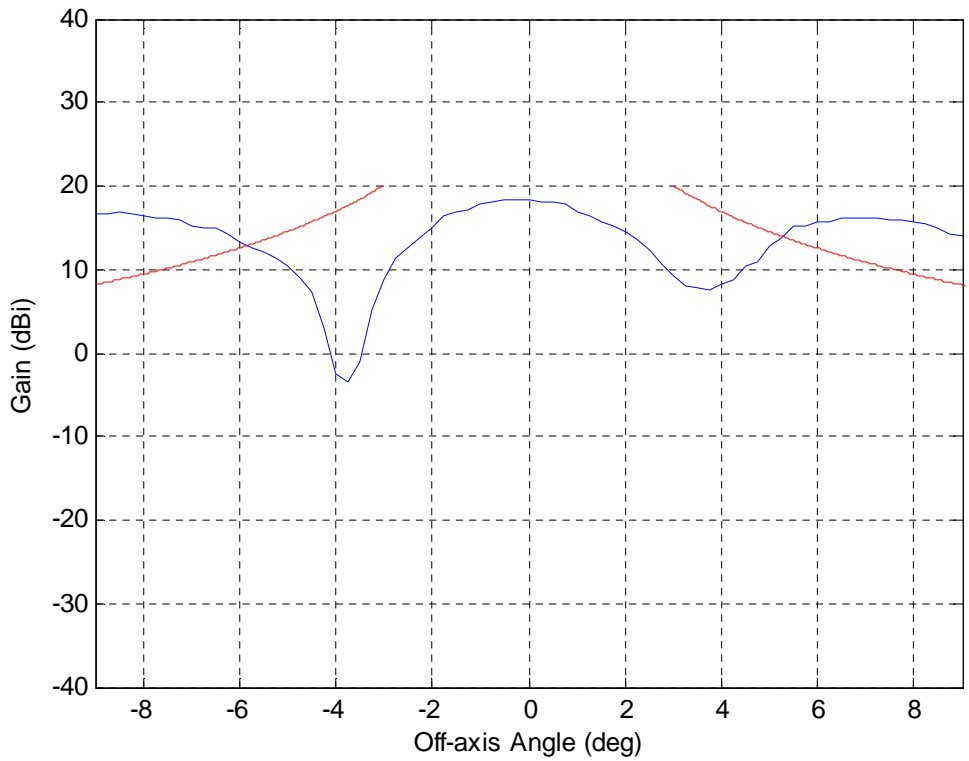


Figure 50. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Cross, Elevation: 45°, Elevation Cut

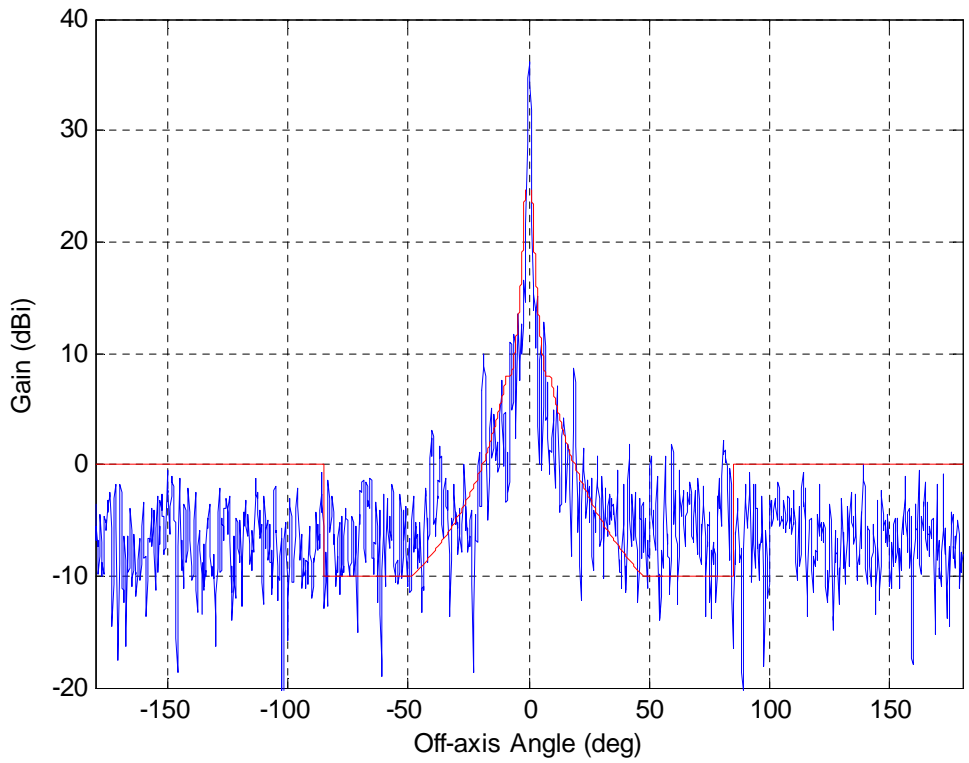


Figure 51. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 45°, Azimuth Cut

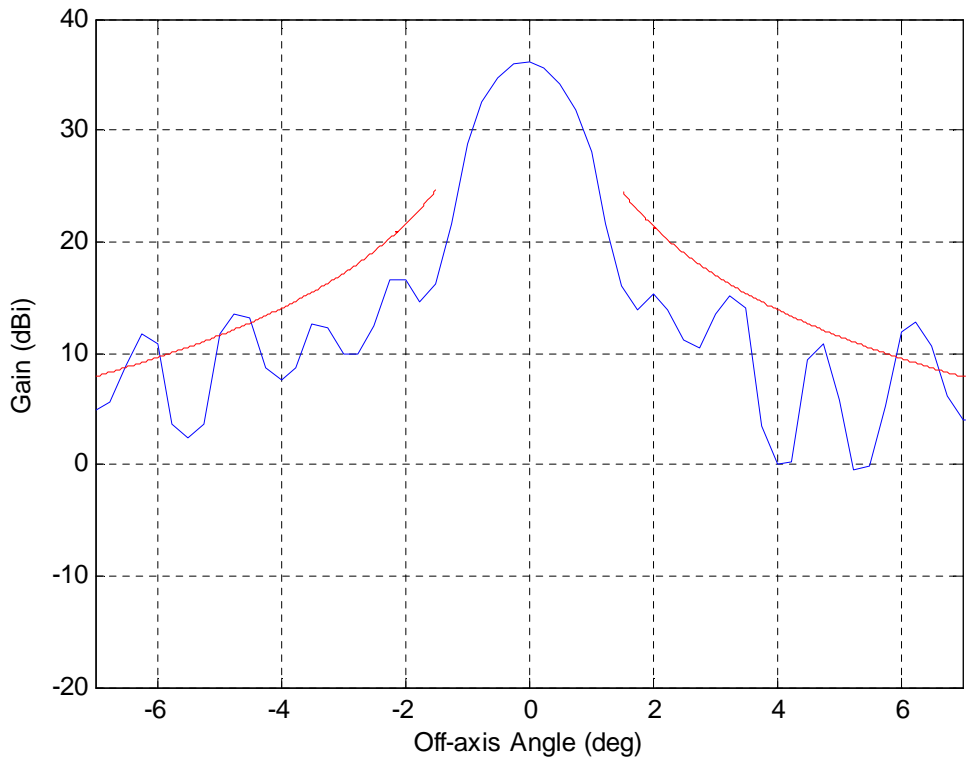


Figure 52. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 45°, Azimuth Cut

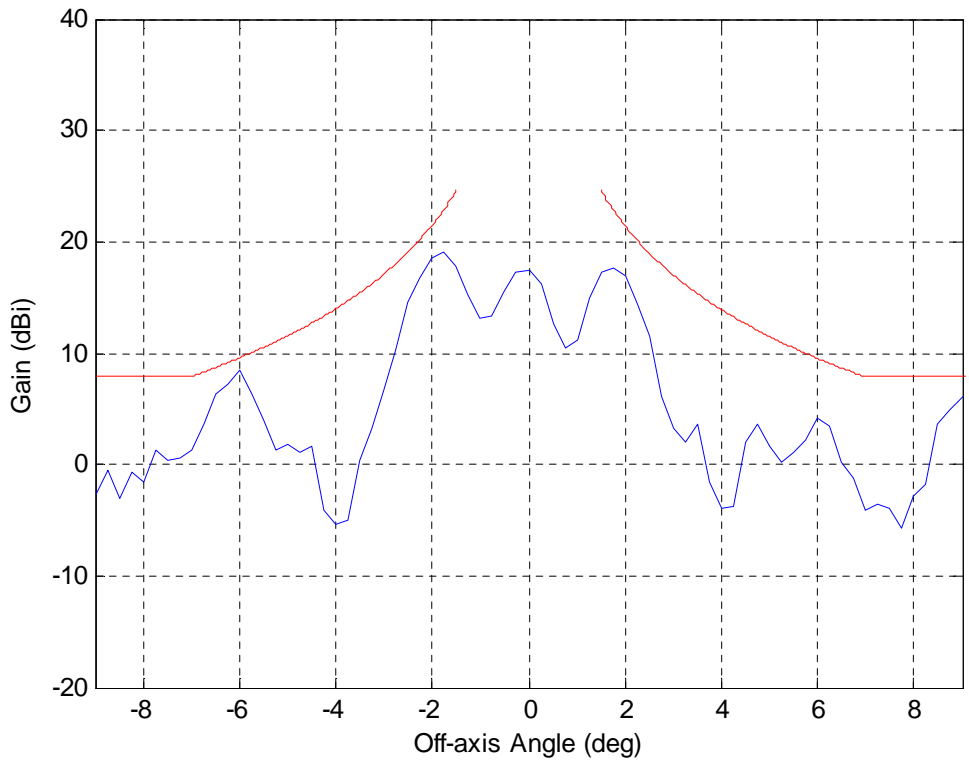


Figure 53. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Cross, Elevation: 45°, Azimuth Cut

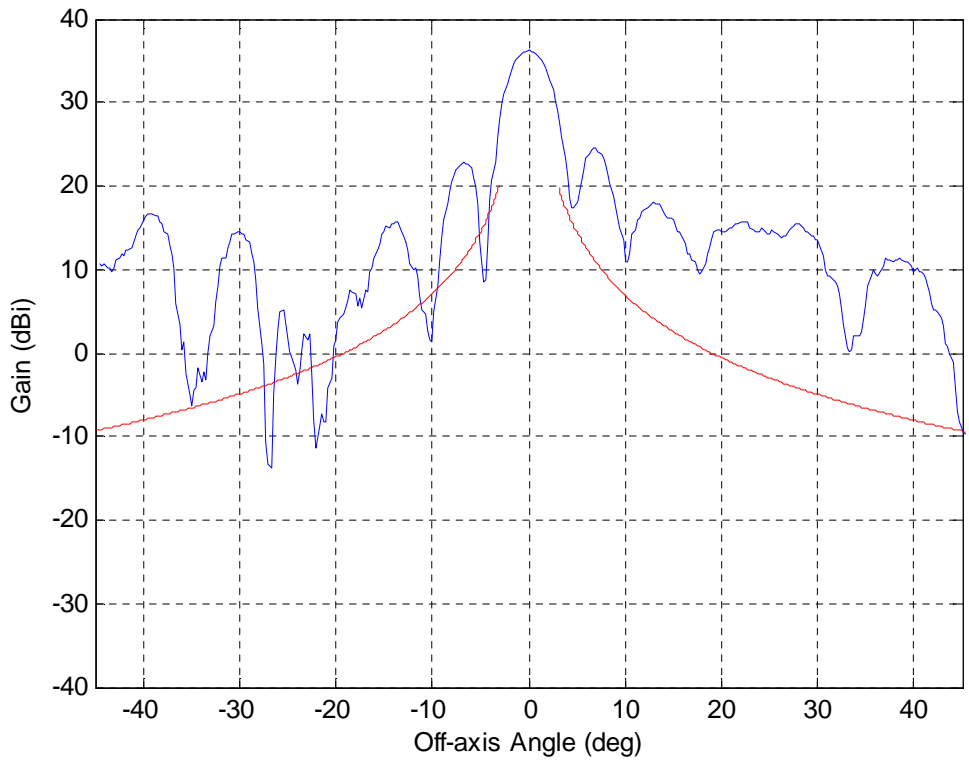


Figure 54. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 45°, Elevation Cut



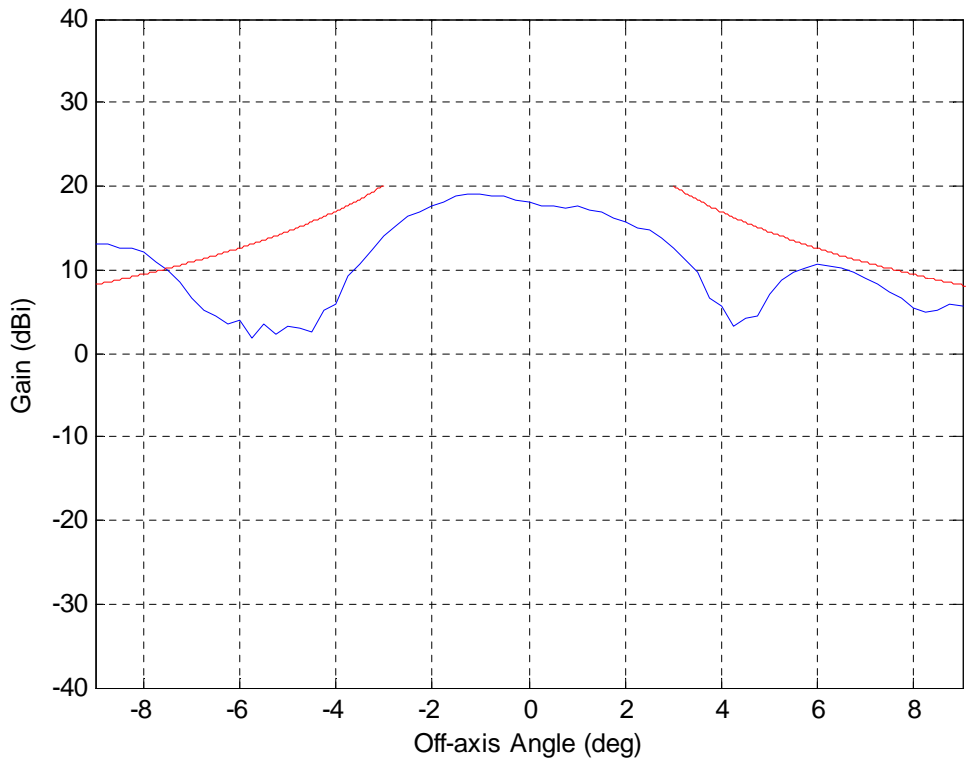


Figure 55. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Cross, Elevation: 45°, Elevation Cut

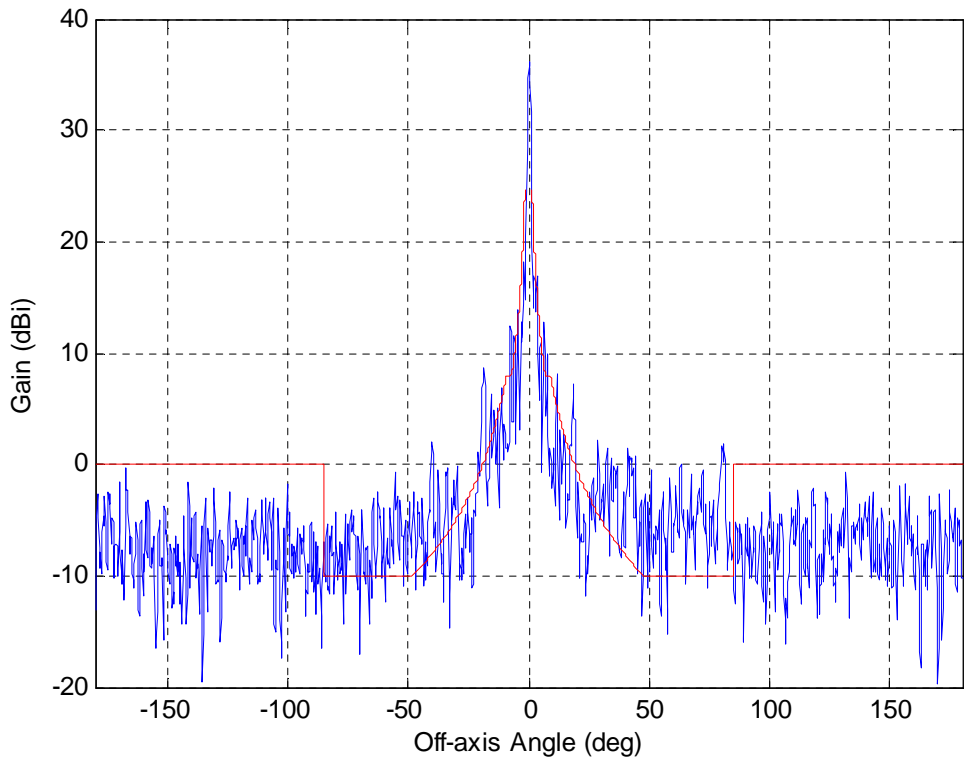


Figure 56. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 45°, Azimuth Cut

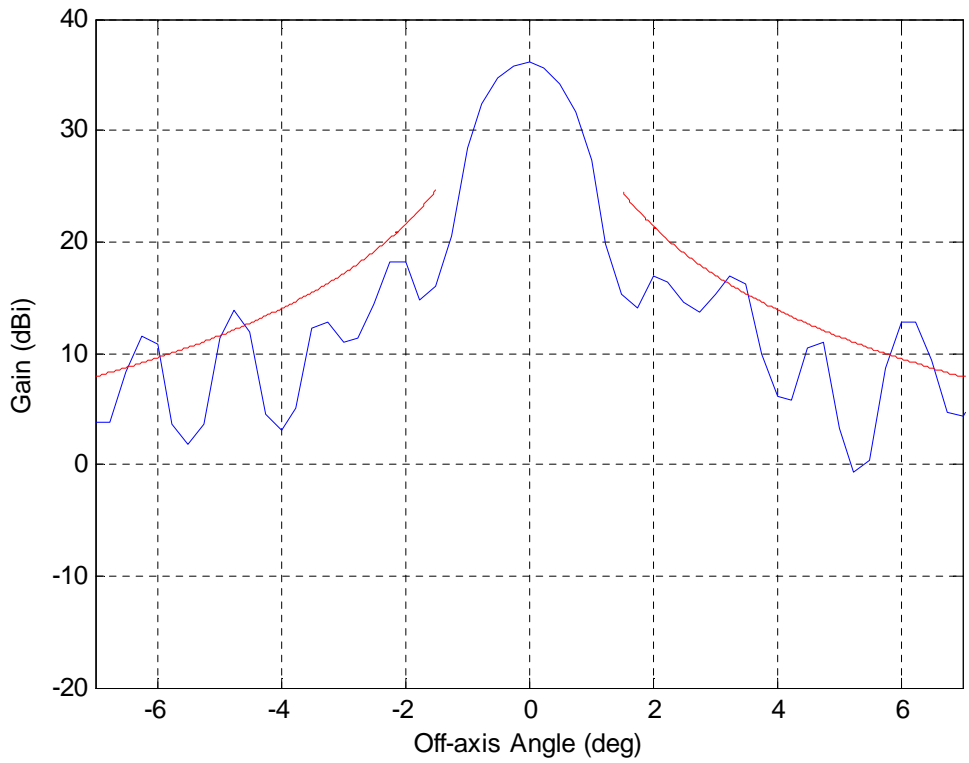


Figure 57. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 45°, Azimuth Cut

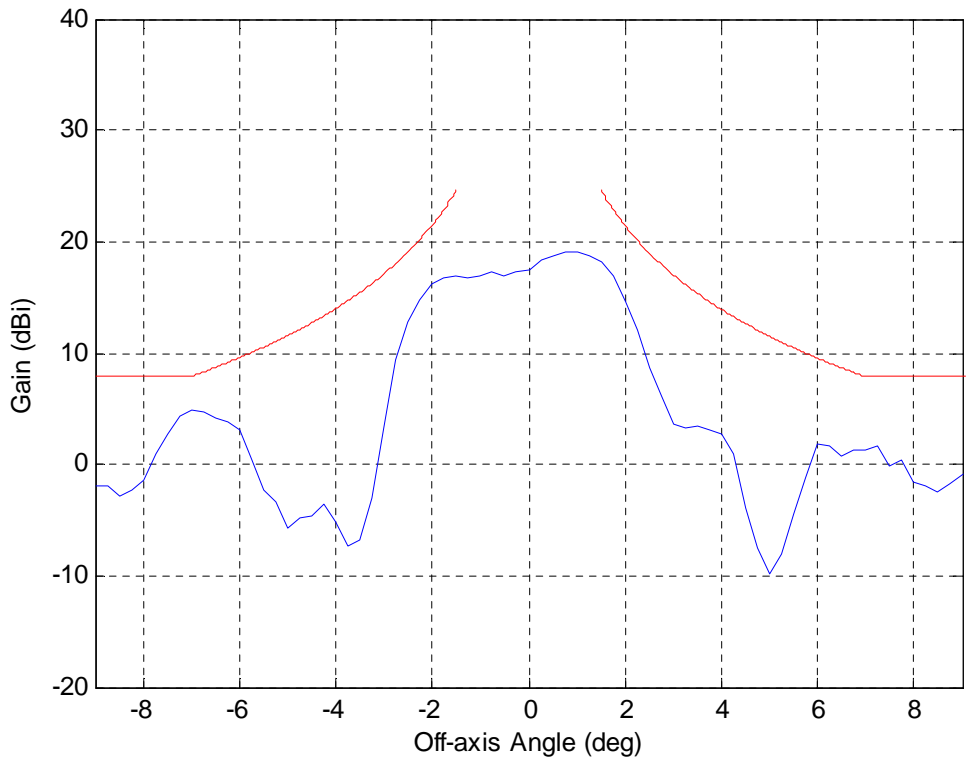


Figure 58. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Cross, Elevation: 45°, Azimuth Cut

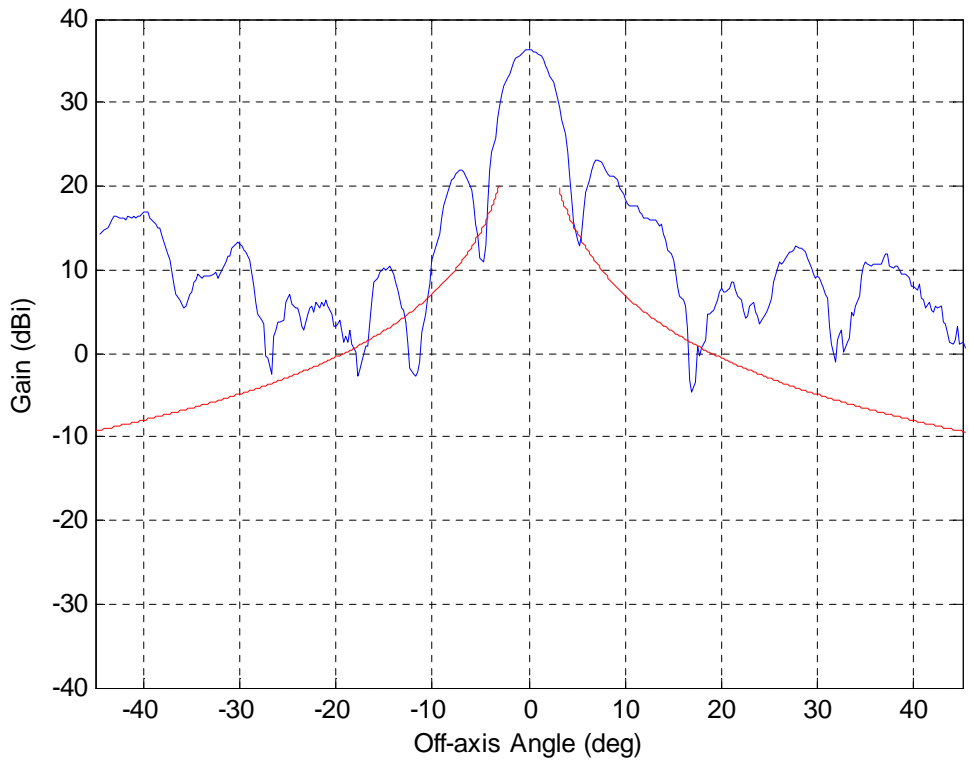


Figure 59. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 45°, Elevation Cut

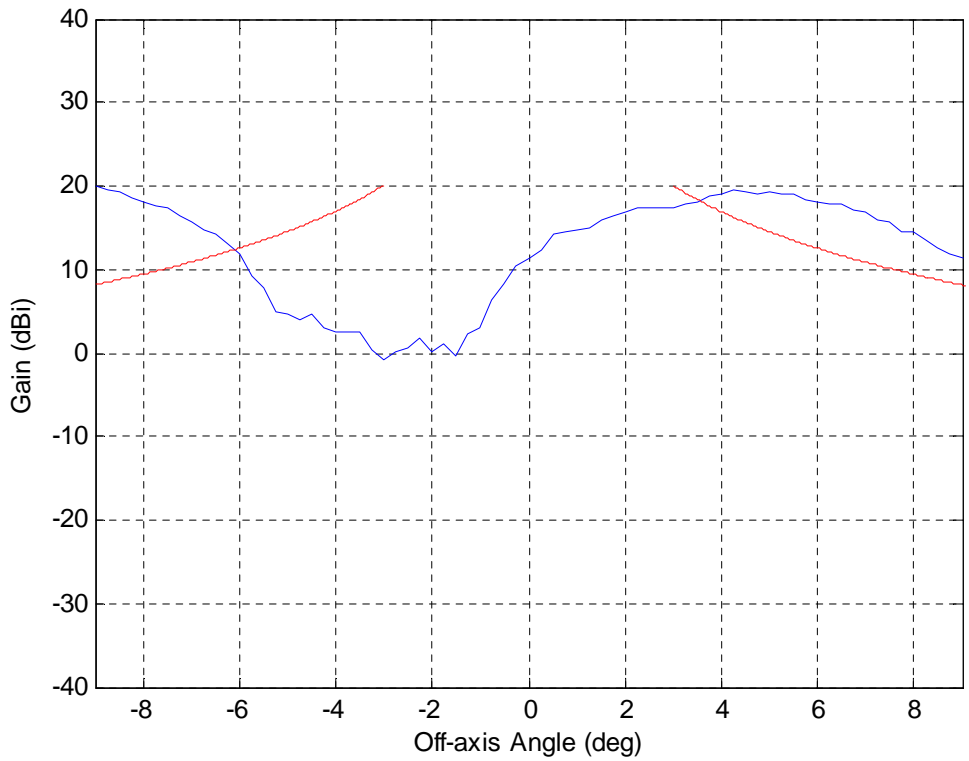


Figure 60. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Cross, Elevation: 45°, Elevation Cut

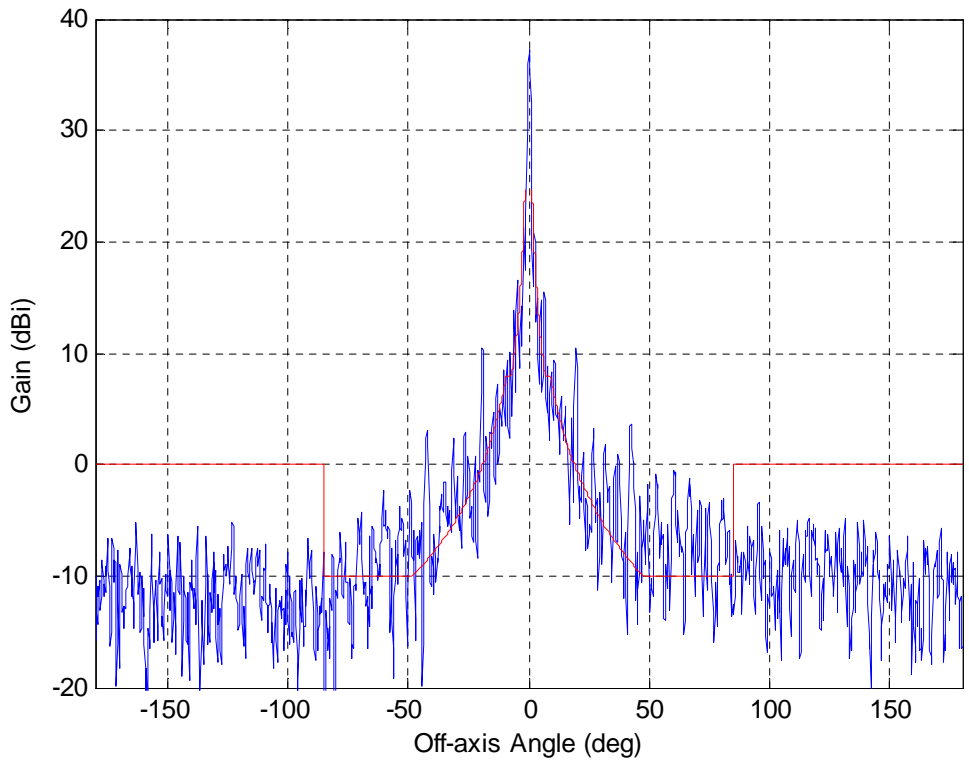


Figure 61. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 90°, Azimuth Cut

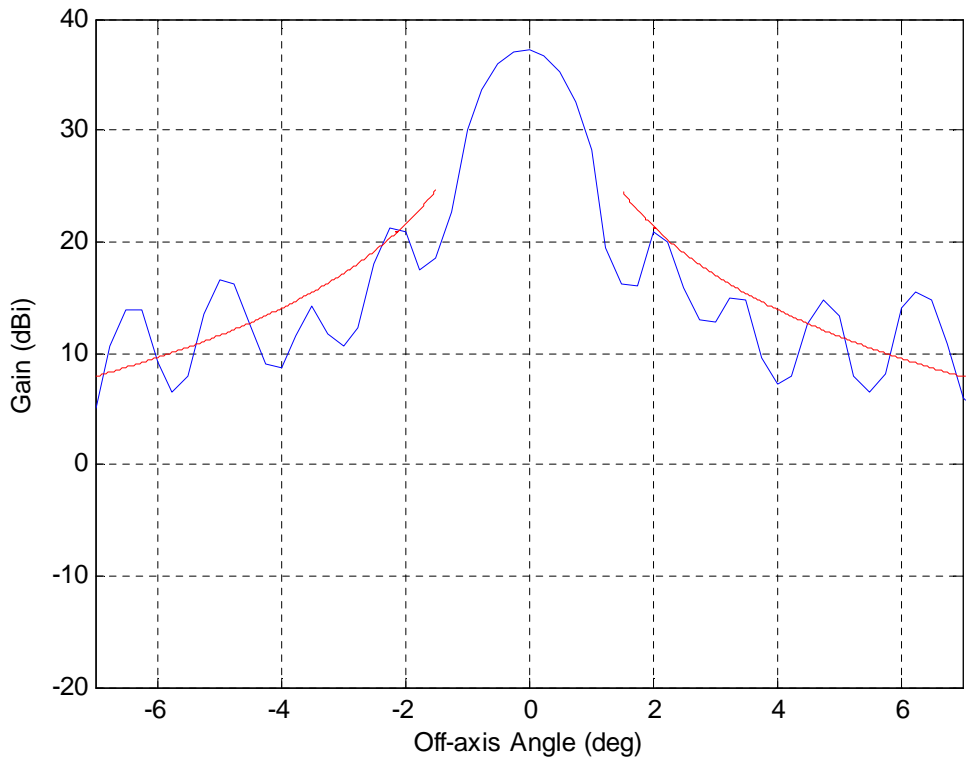


Figure 62. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 90°, Azimuth Cut

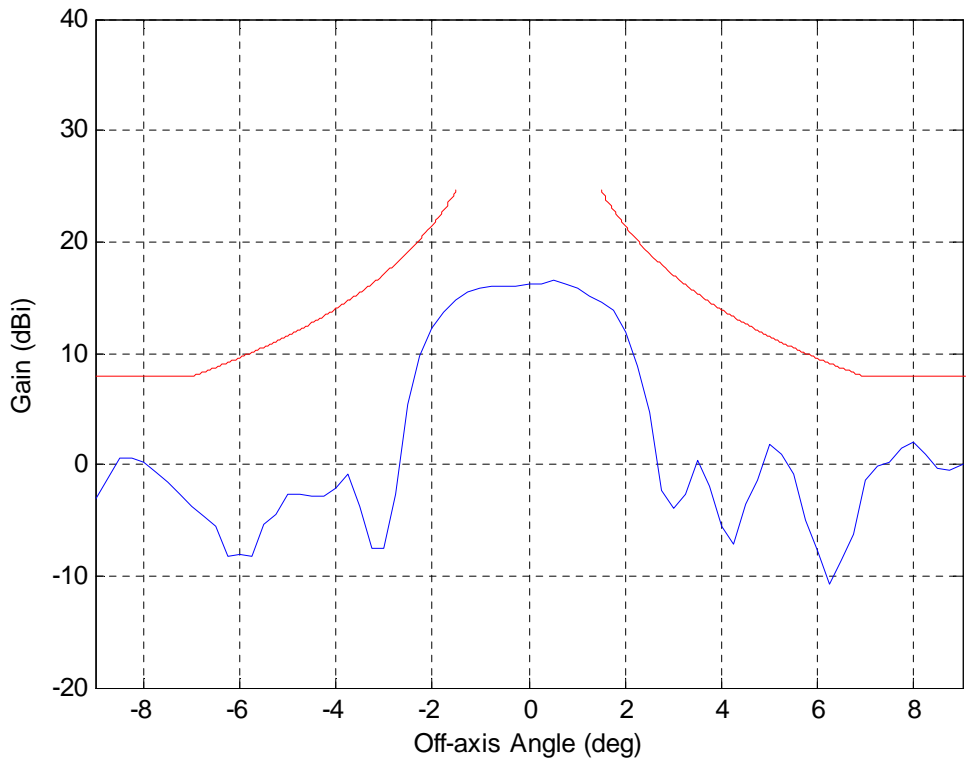


Figure 63. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Cross, Elevation: 90°, Azimuth Cut

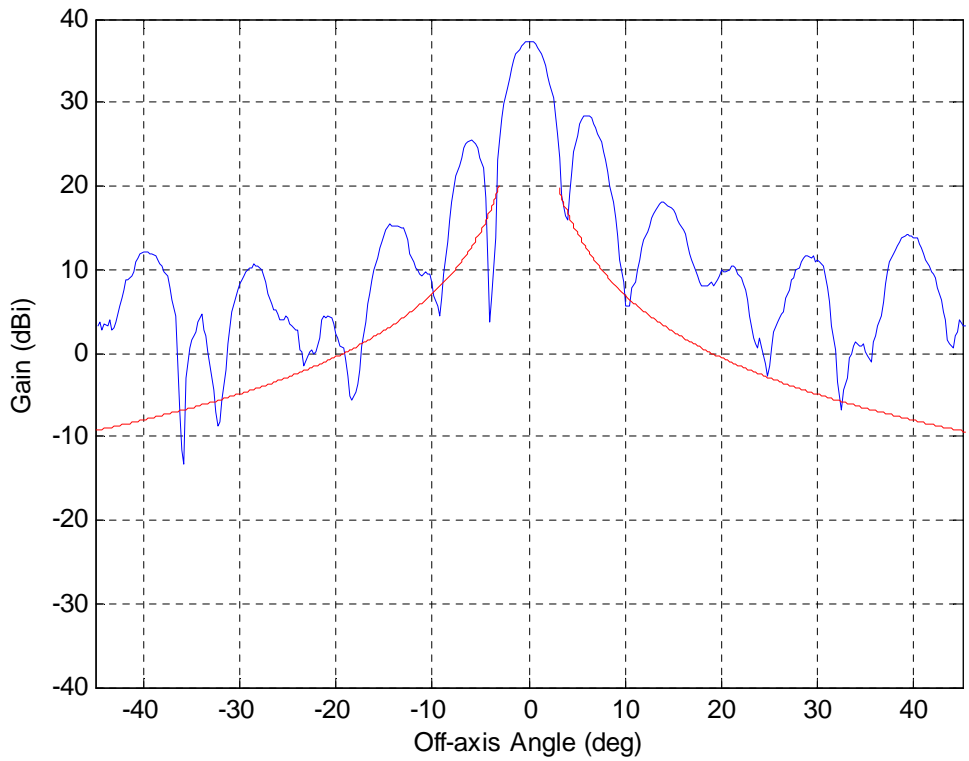


Figure 64. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Co, Elevation: 90°, Elevation Cut

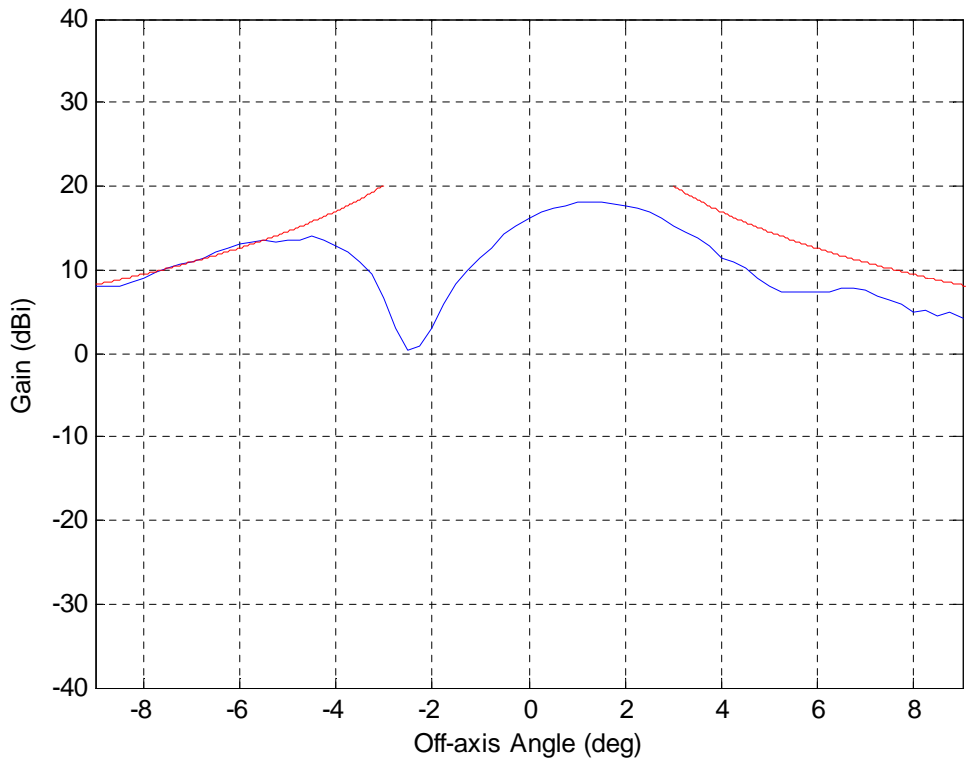


Figure 65. Tx Pattern @ 14.05GHz, Polarity: V, Plane: Cross, Elevation: 90°, Elevation Cut

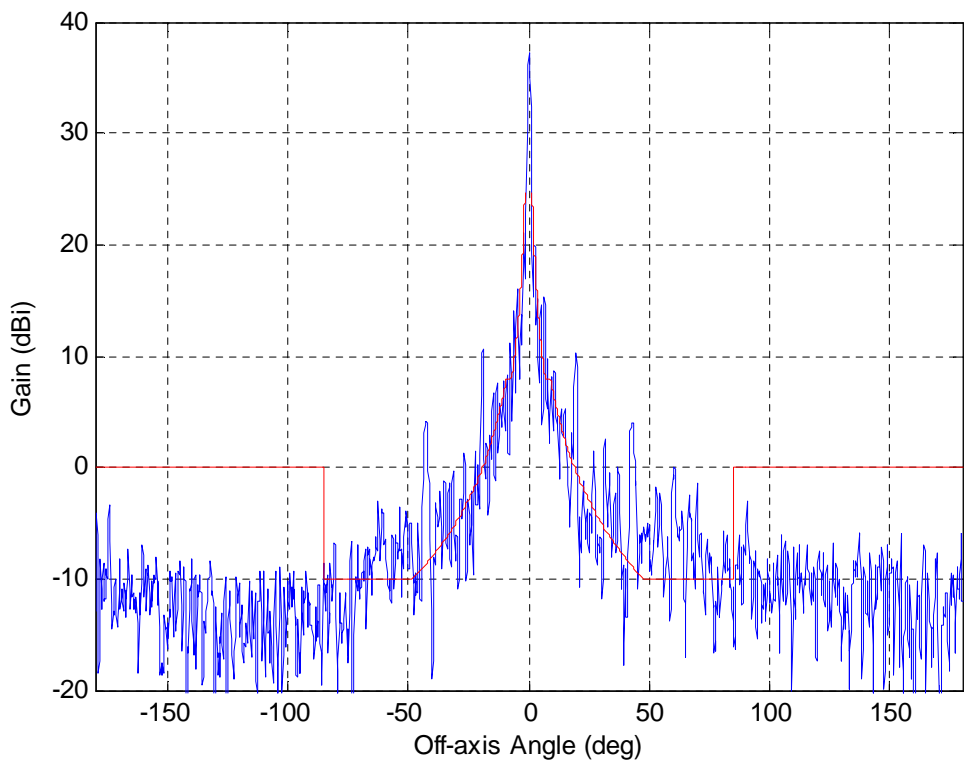


Figure 66. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 90°, Azimuth Cut

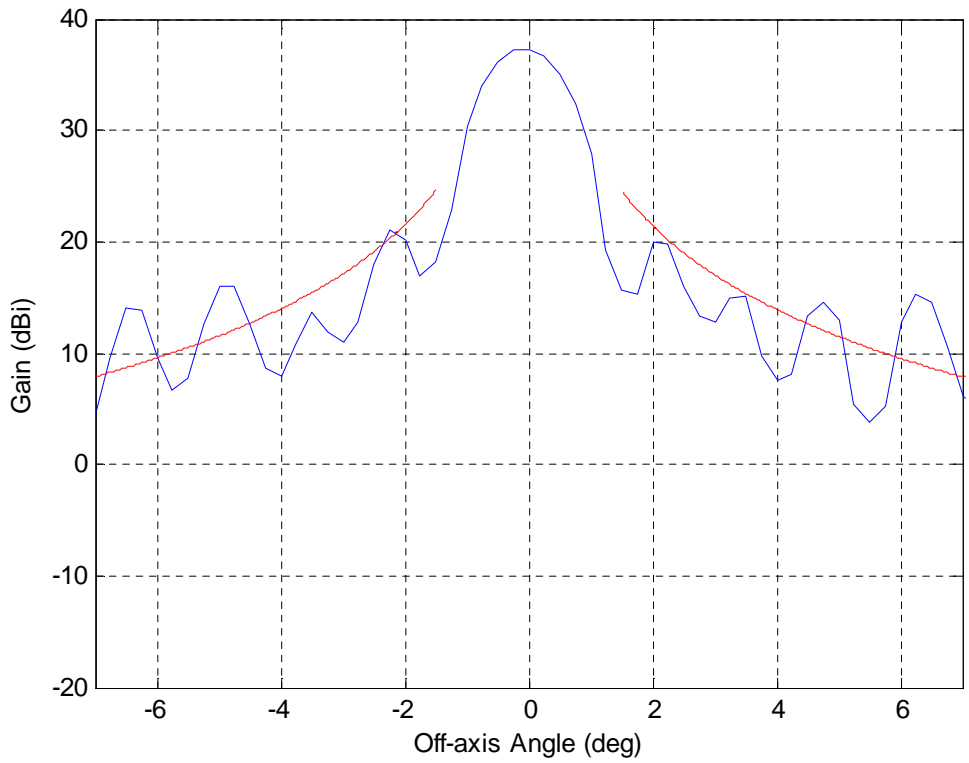


Figure 67. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 90°, Azimuth Cut

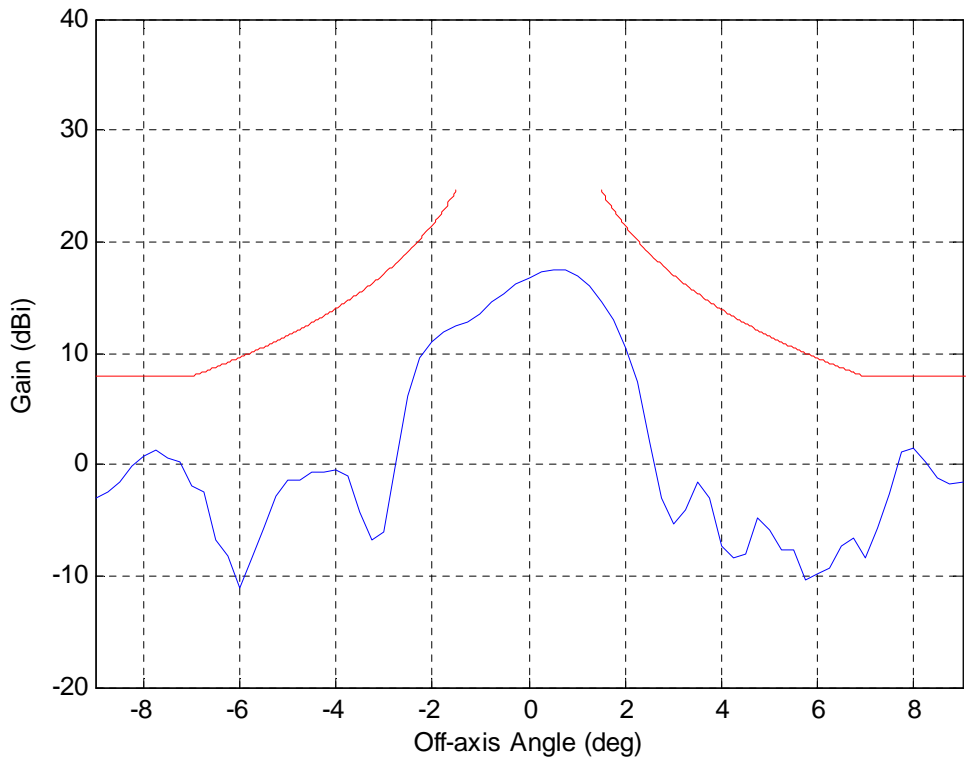


Figure 68. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Cross, Elevation: 90°, Azimuth Cut

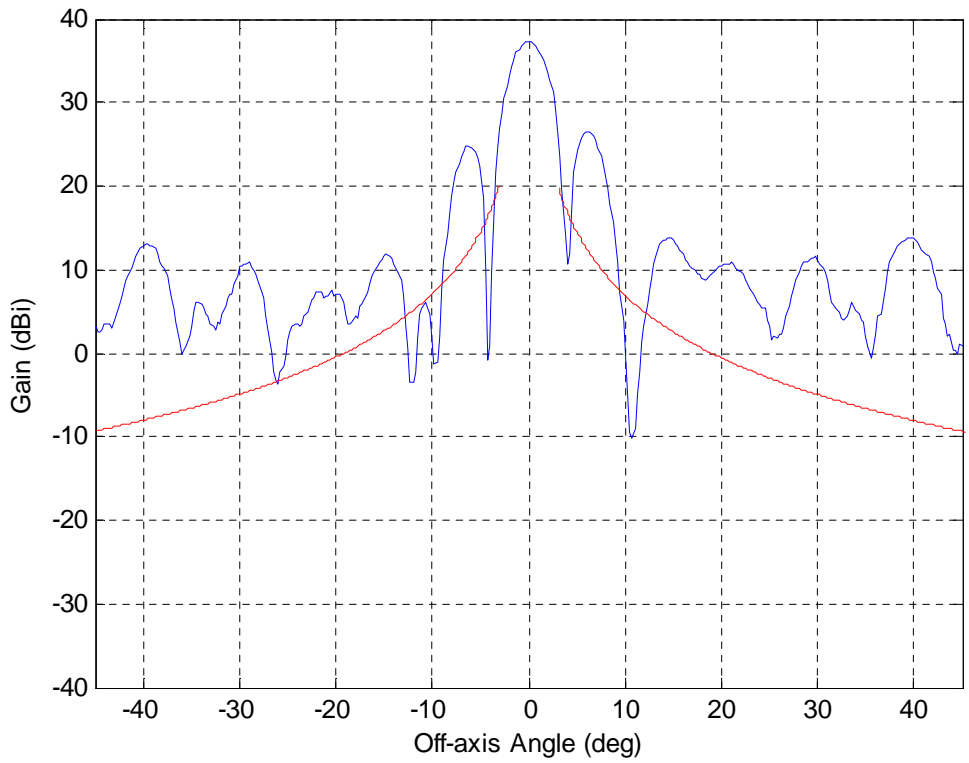


Figure 69. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Co, Elevation: 90°, Elevation Cut

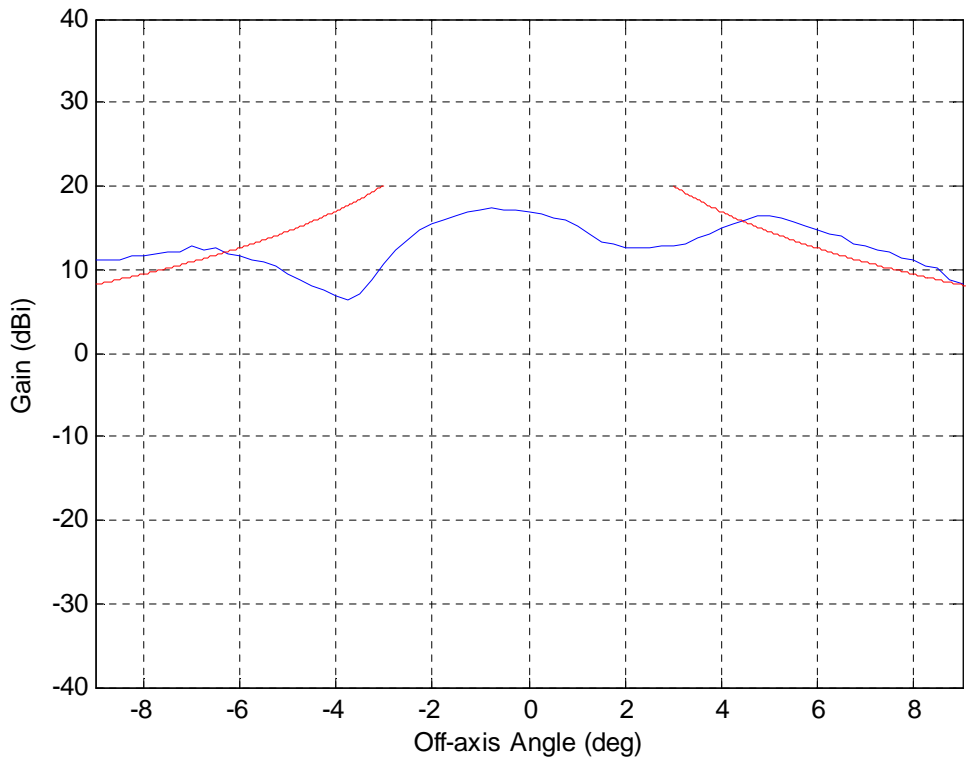


Figure 70. Tx Pattern @ 14.05GHz, Polarity: H, Plane: Cross, Elevation: 90°, Elevation Cut



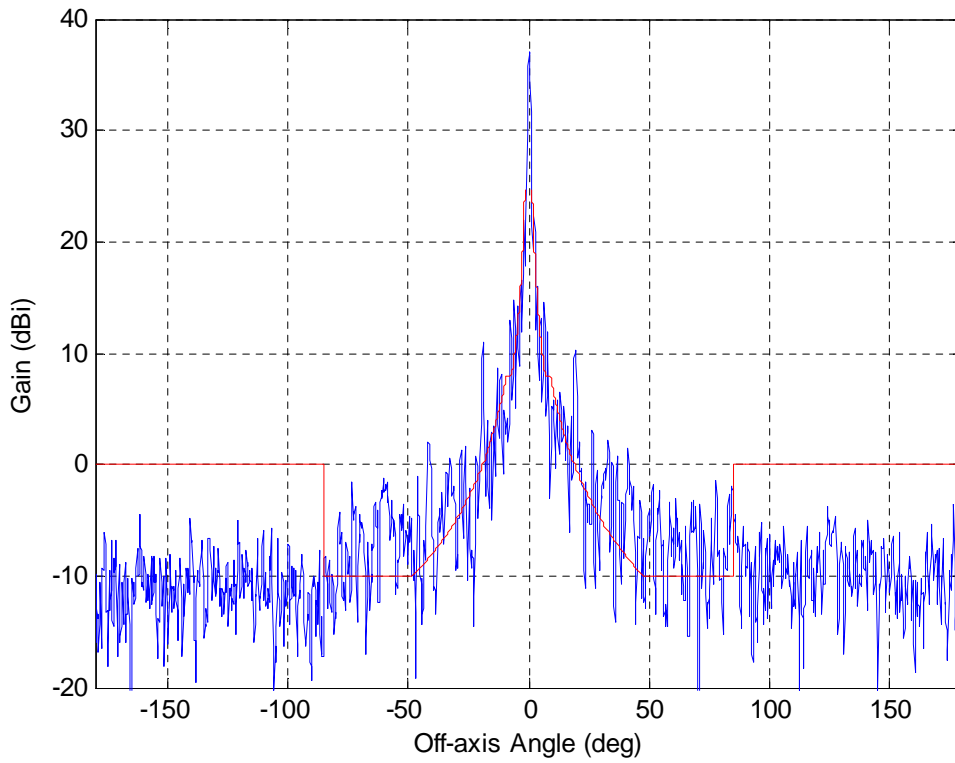


Figure 71. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 90°, Azimuth Cut

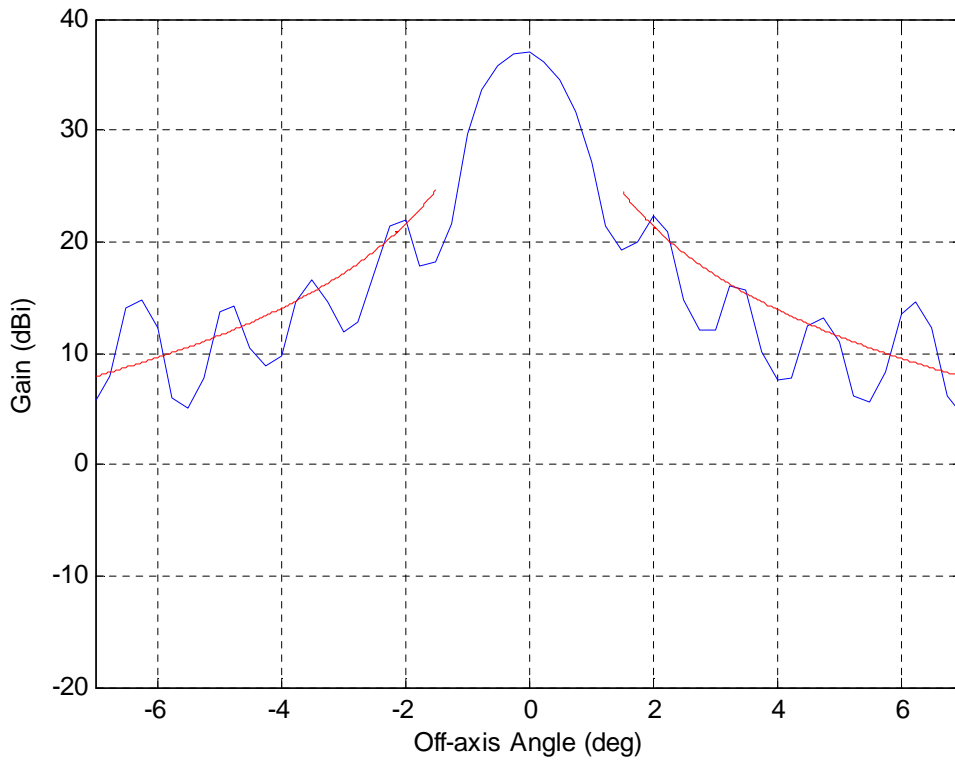


Figure 72. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 90°, Azimuth Cut

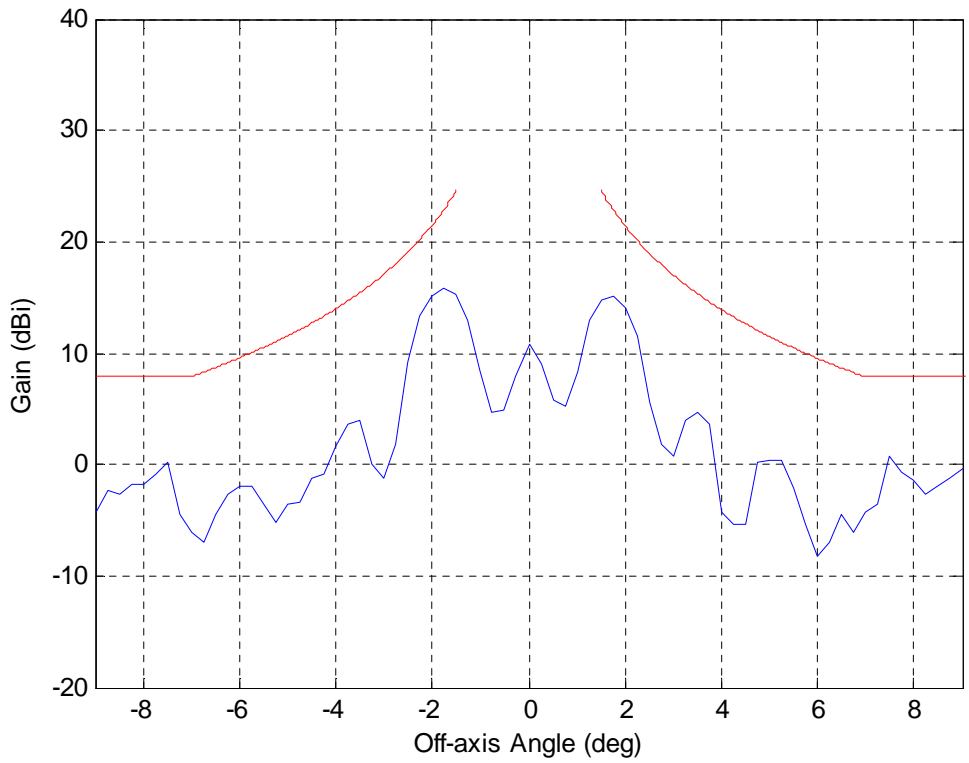


Figure 73. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Cross, Elevation: 90°, Azimuth Cut

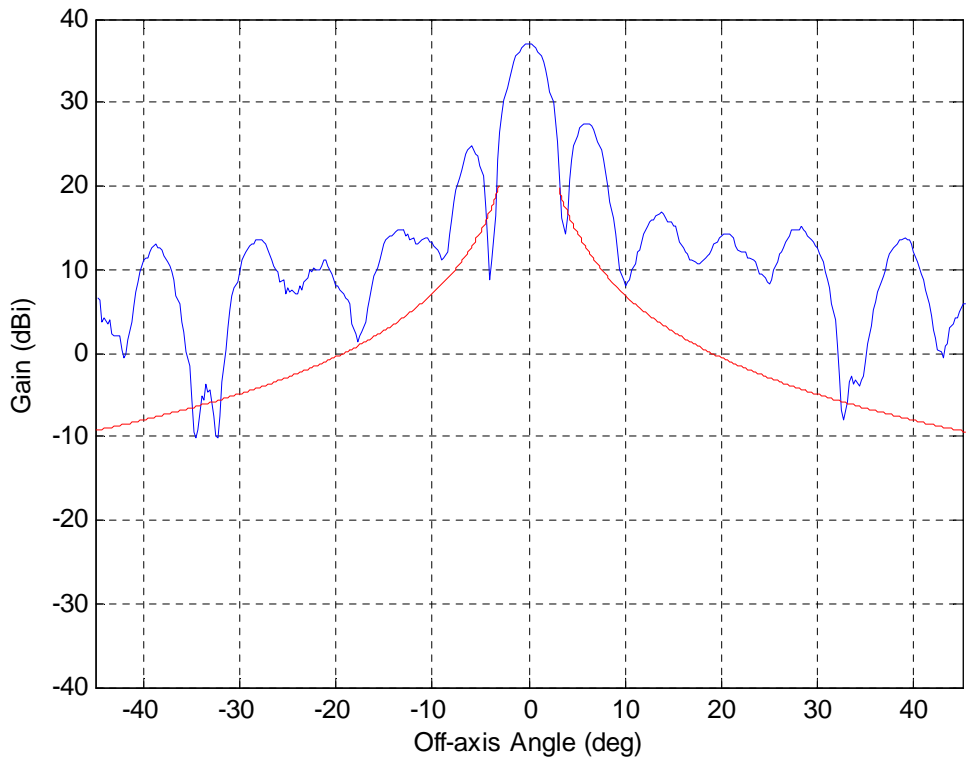


Figure 74. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Co, Elevation: 90°, Elevation Cut

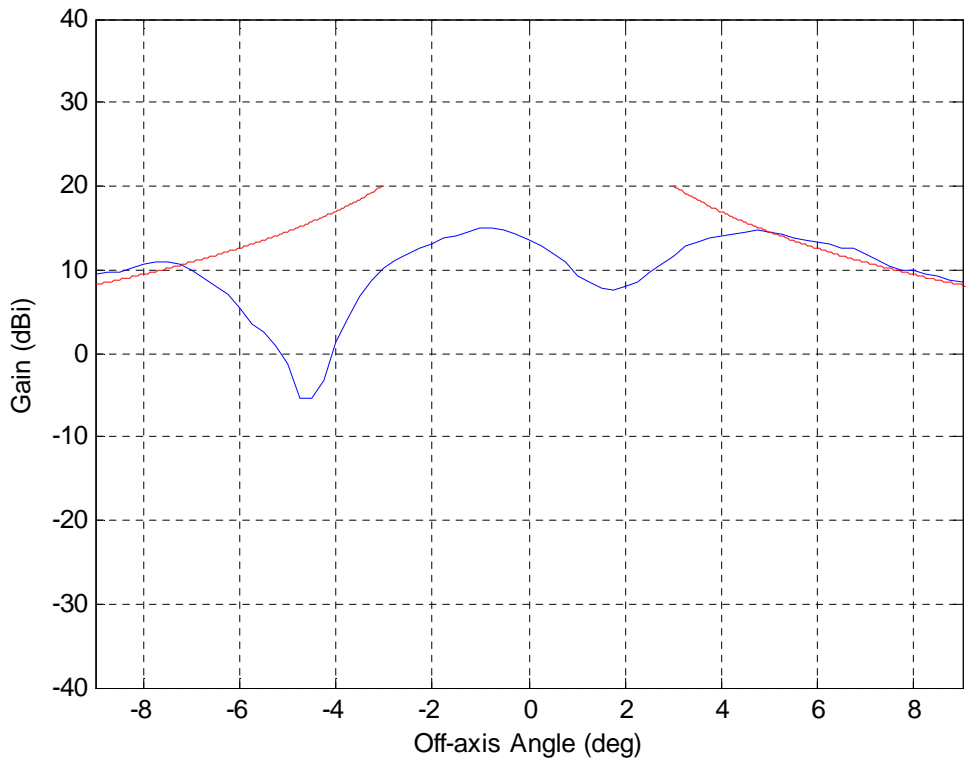


Figure 75. Tx Pattern @ 14.25GHz, Polarity: V, Plane: Cross, Elevation: 90°, Elevation Cut

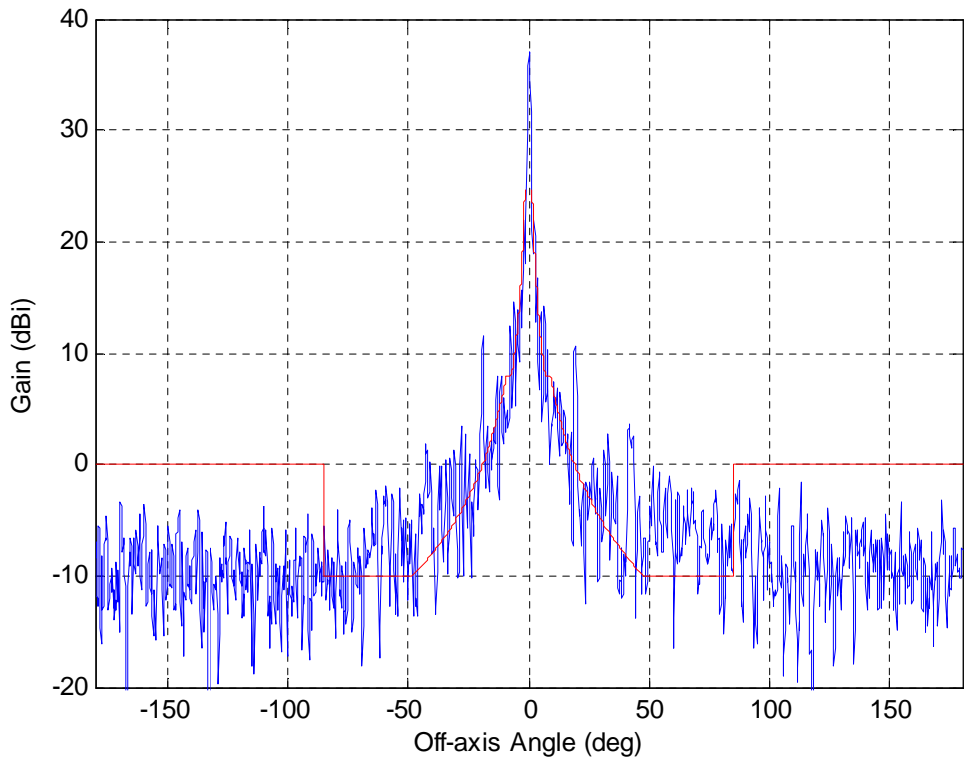


Figure 76. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 90°, Azimuth Cut

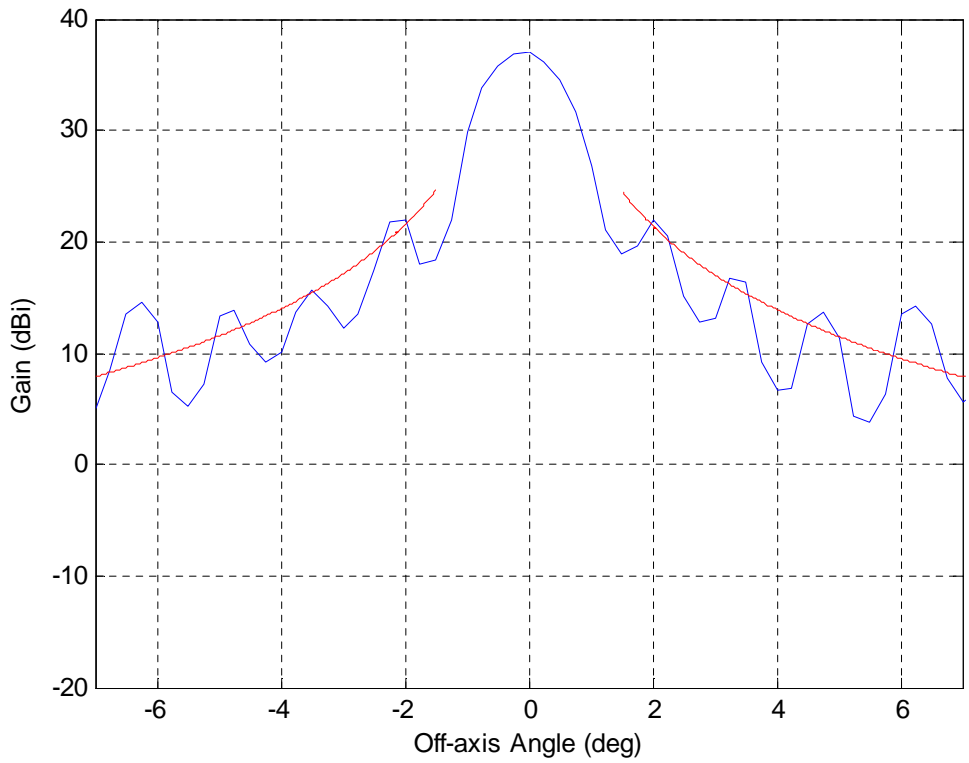


Figure 77. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 90°, Azimuth Cut

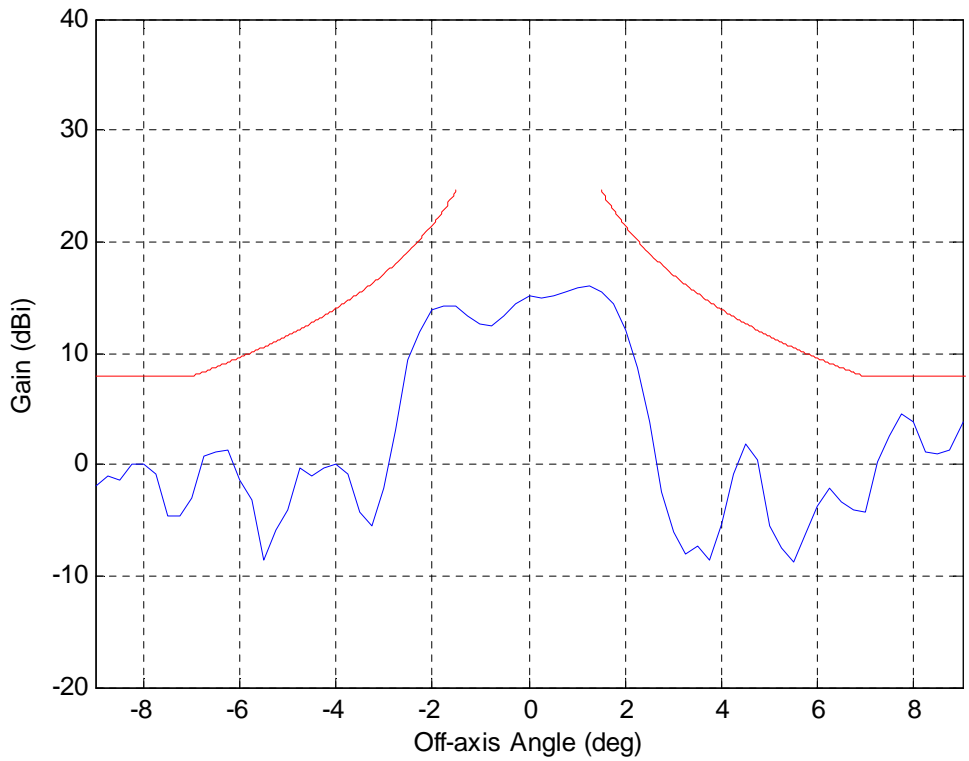


Figure 78. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Cross, Elevation: 90°, Azimuth Cut

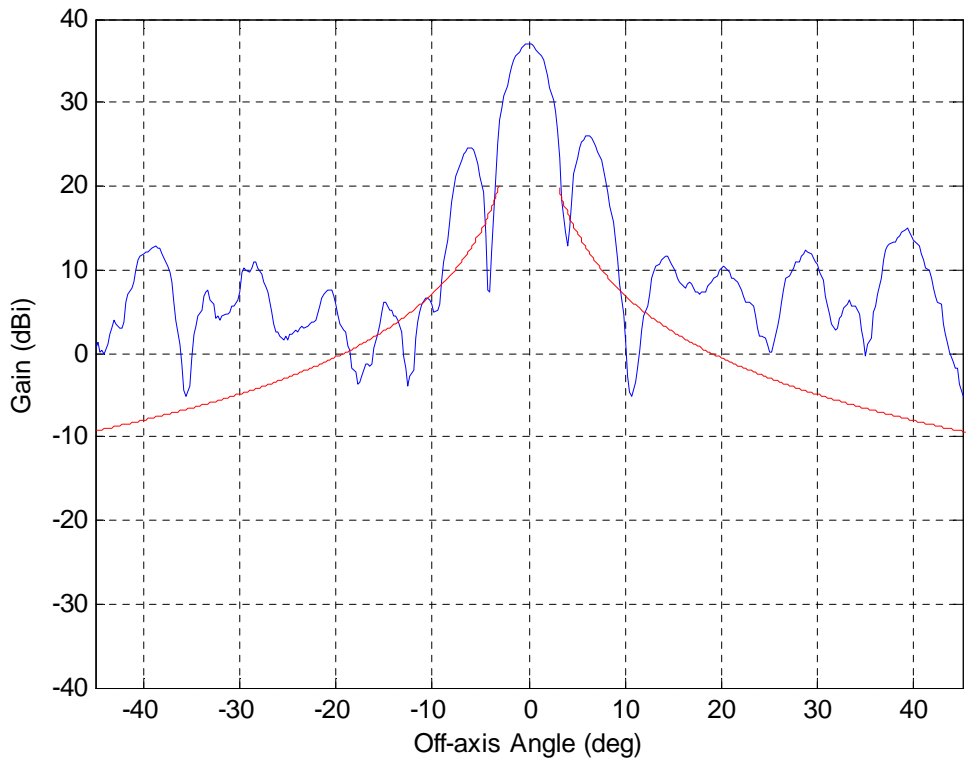


Figure 79. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Co, Elevation: 90°, Elevation Cut

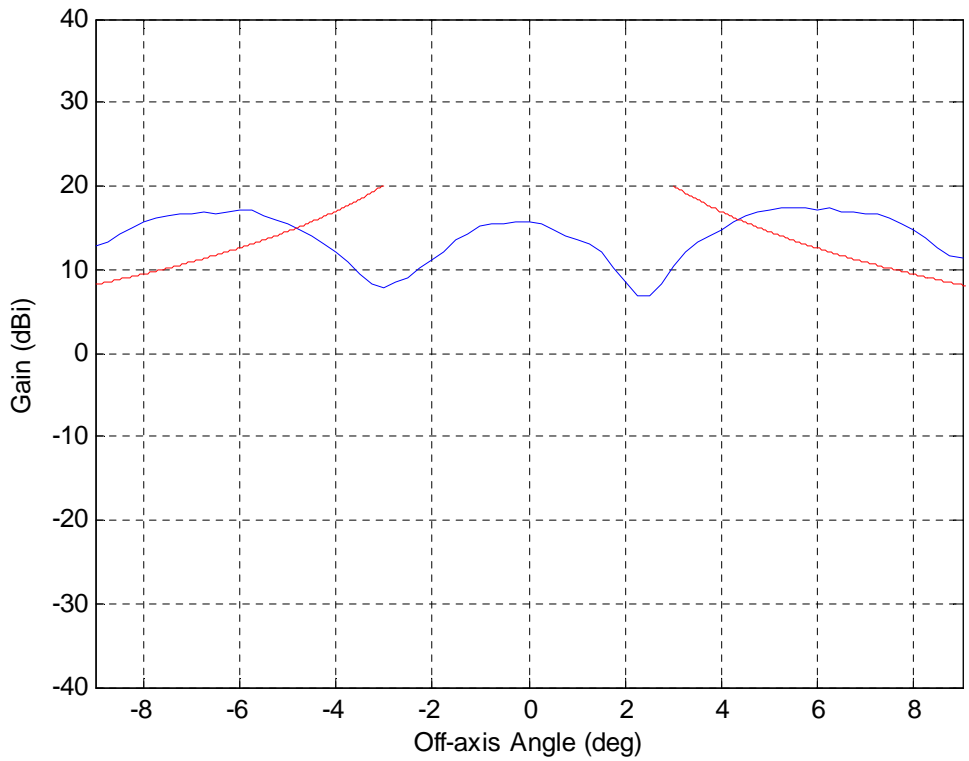


Figure 80. Tx Pattern @ 14.25GHz, Polarity: H, Plane: Cross, Elevation: 90°, Elevation Cut

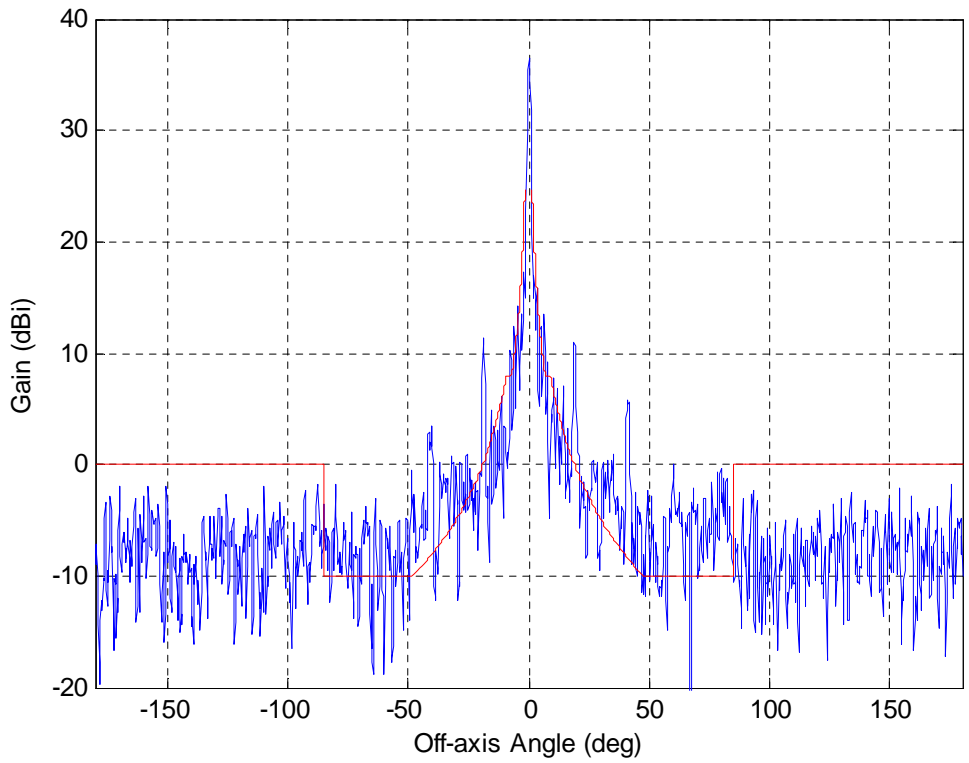


Figure 81. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 90°, Azimuth Cut

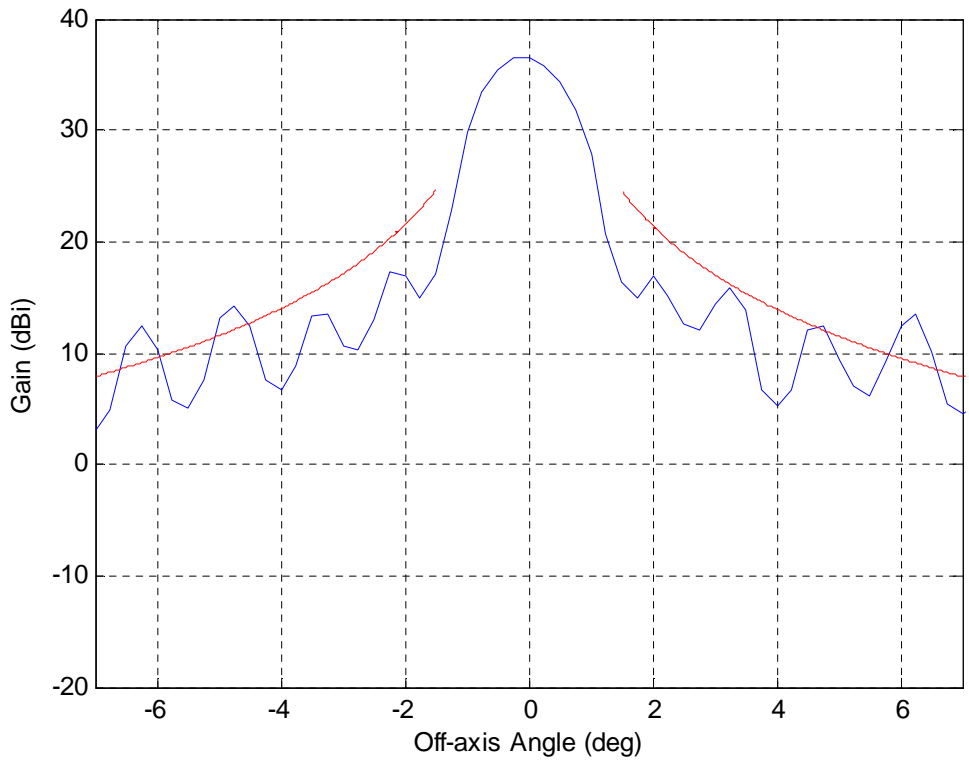


Figure 82. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 90°, Azimuth Cut

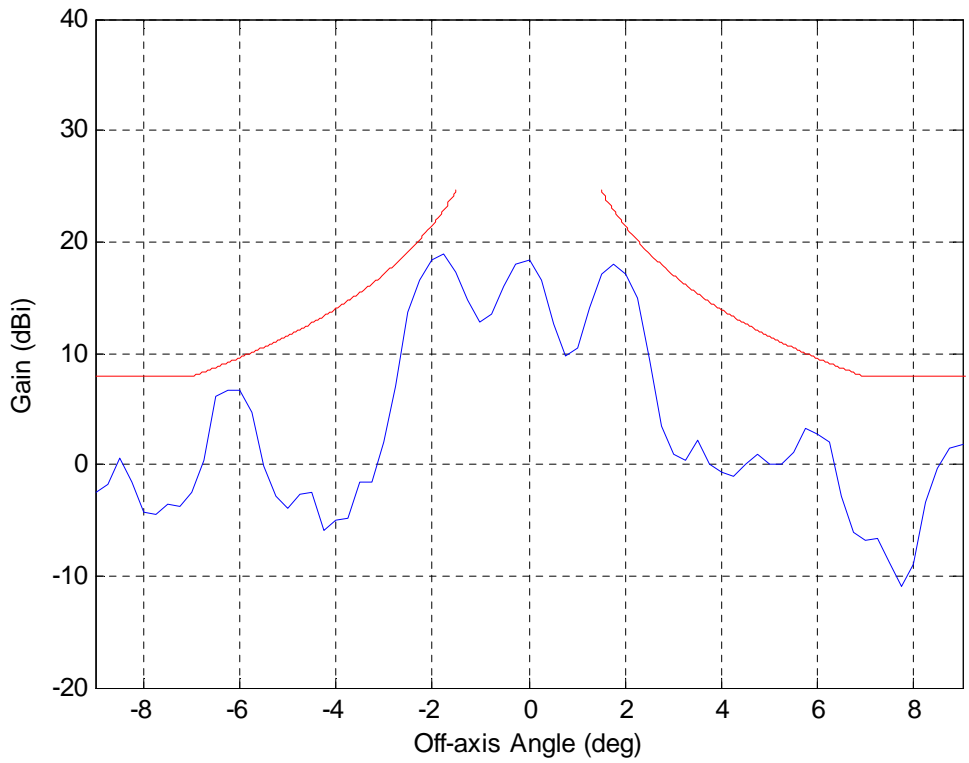


Figure 83. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Cross, Elevation: 90°, Azimuth Cut

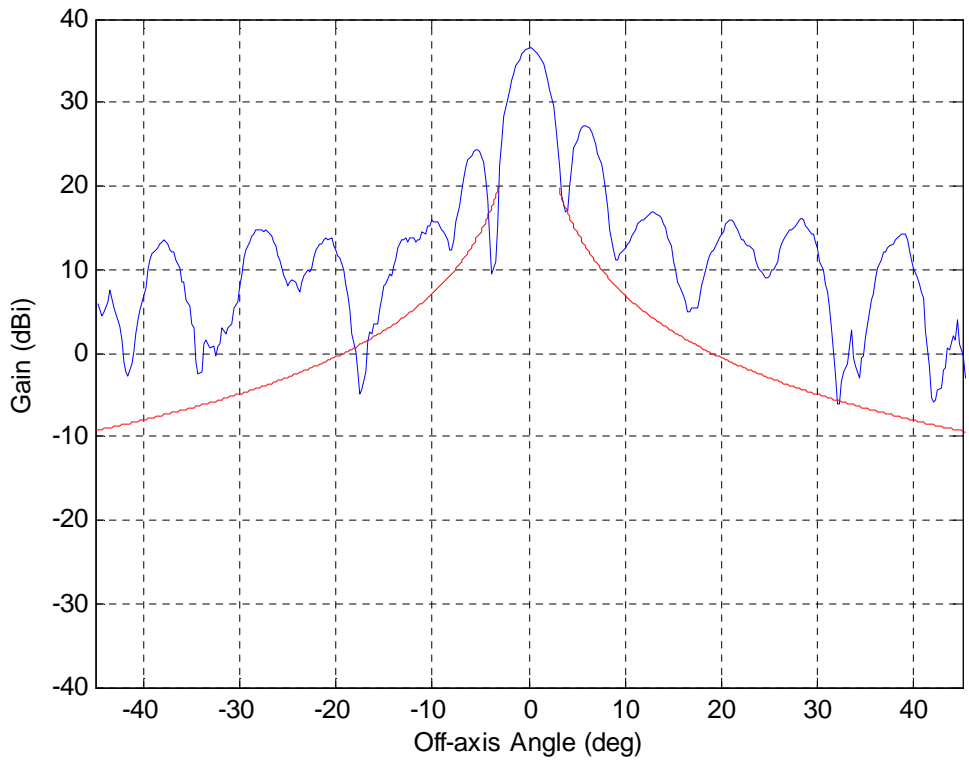


Figure 84. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Co, Elevation: 90°, Elevation Cut

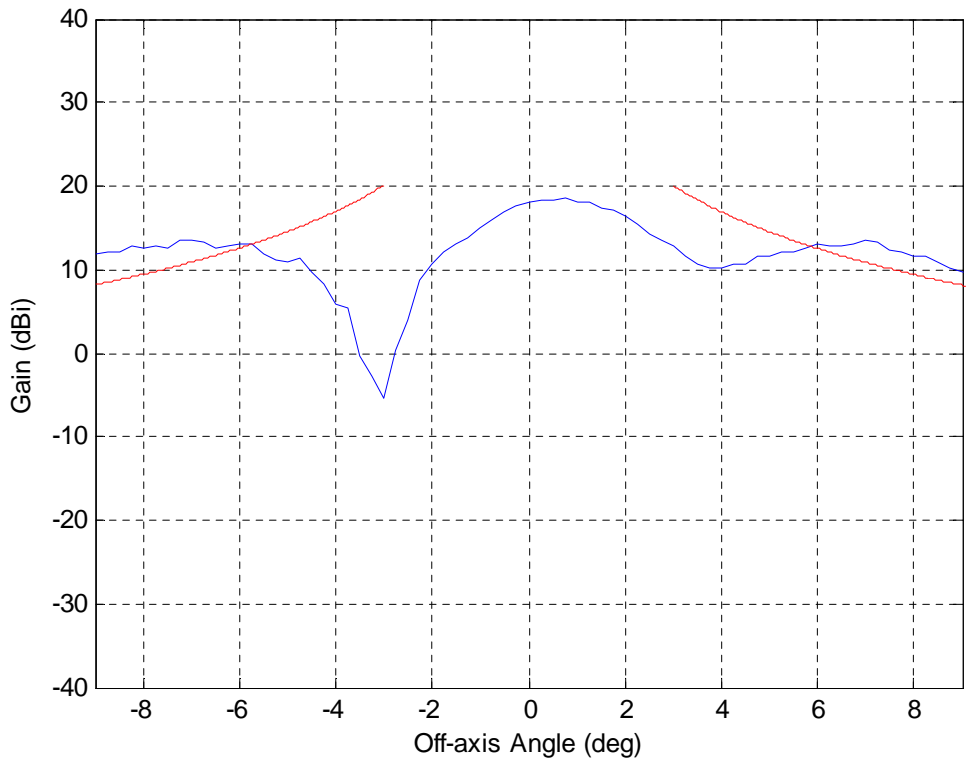


Figure 85. Tx Pattern @ 14.45GHz, Polarity: V, Plane: Cross, Elevation: 90°, Elevation Cut

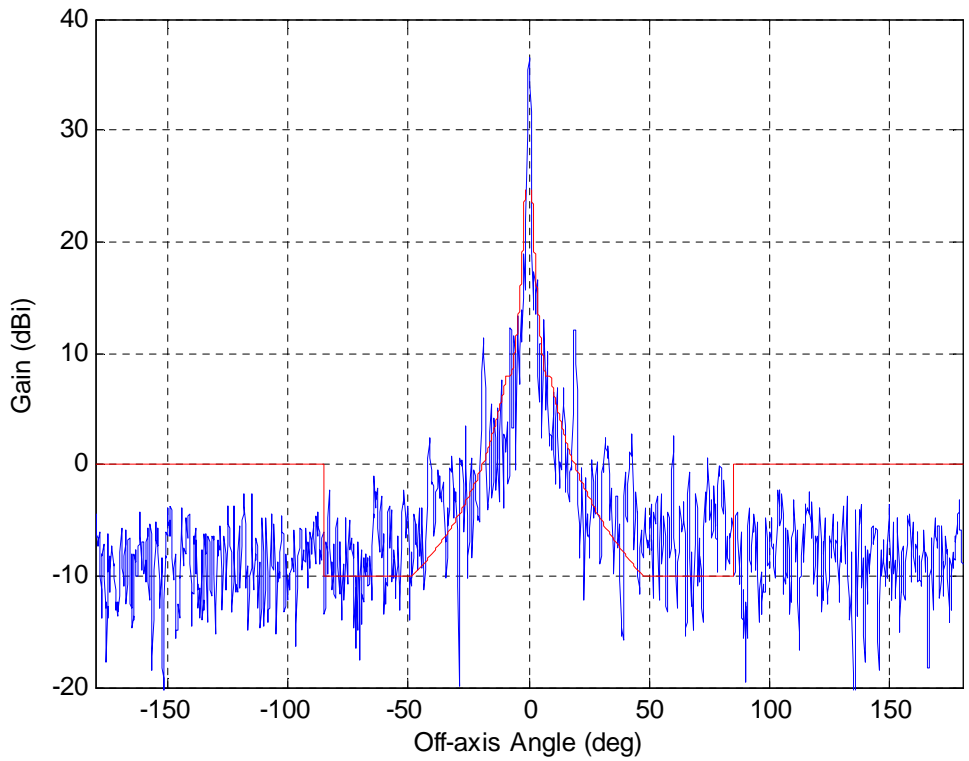


Figure 86. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 90°, Azimuth Cut



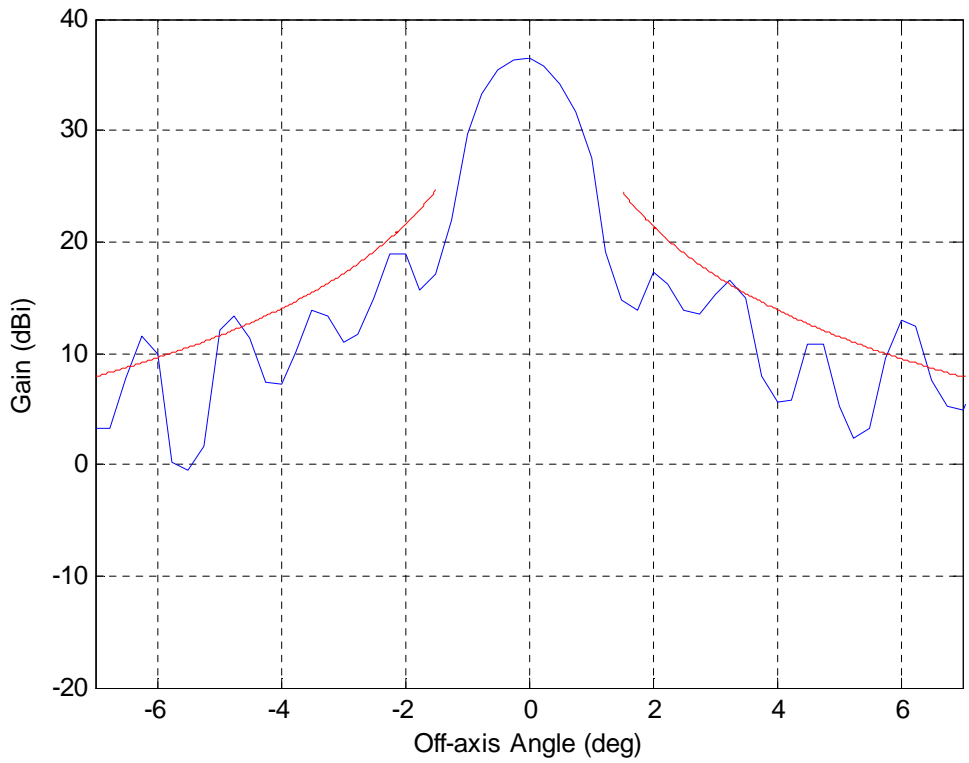


Figure 87. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 90°, Azimuth Cut

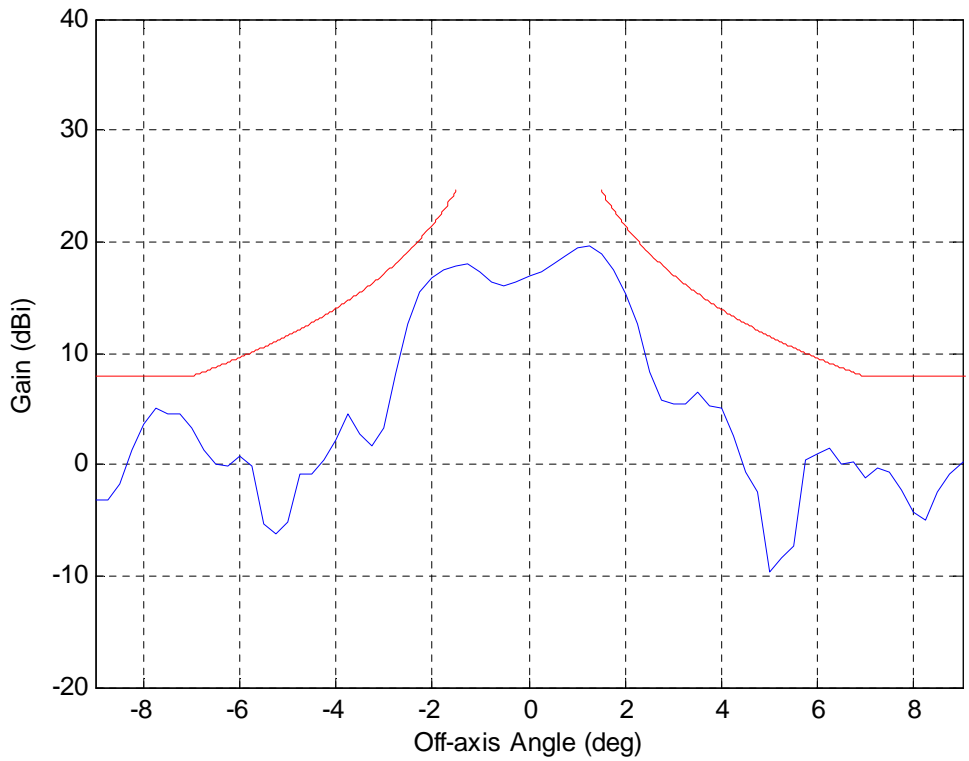


Figure 88. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Cross, Elevation: 90°, Azimuth Cut

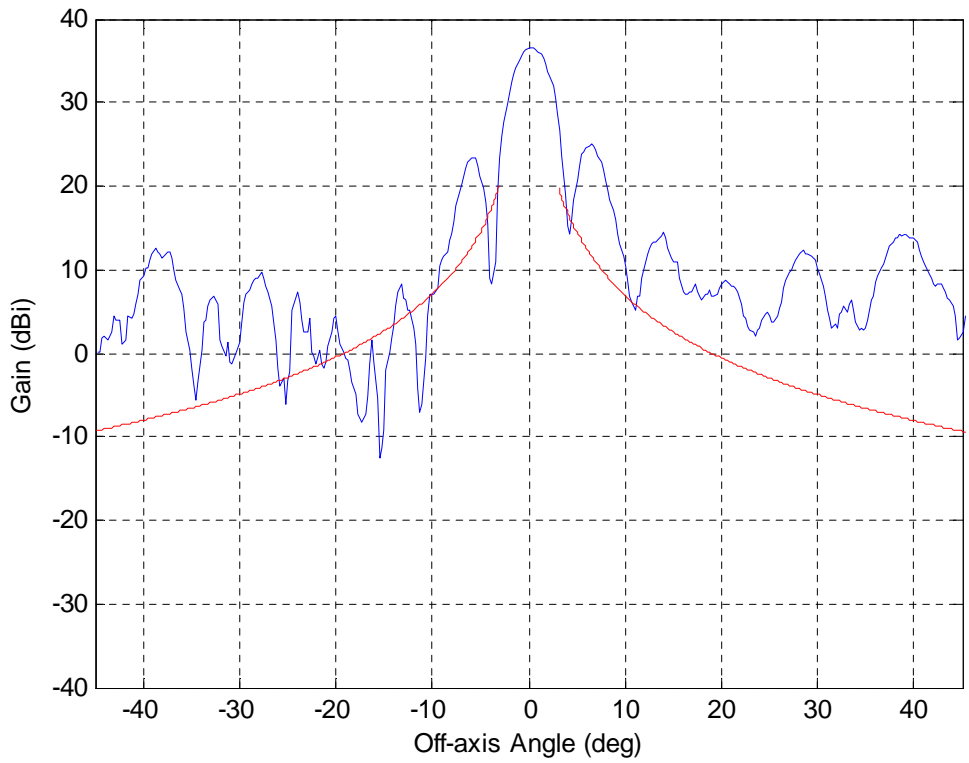


Figure 89. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Co, Elevation: 90°, Elevation Cut

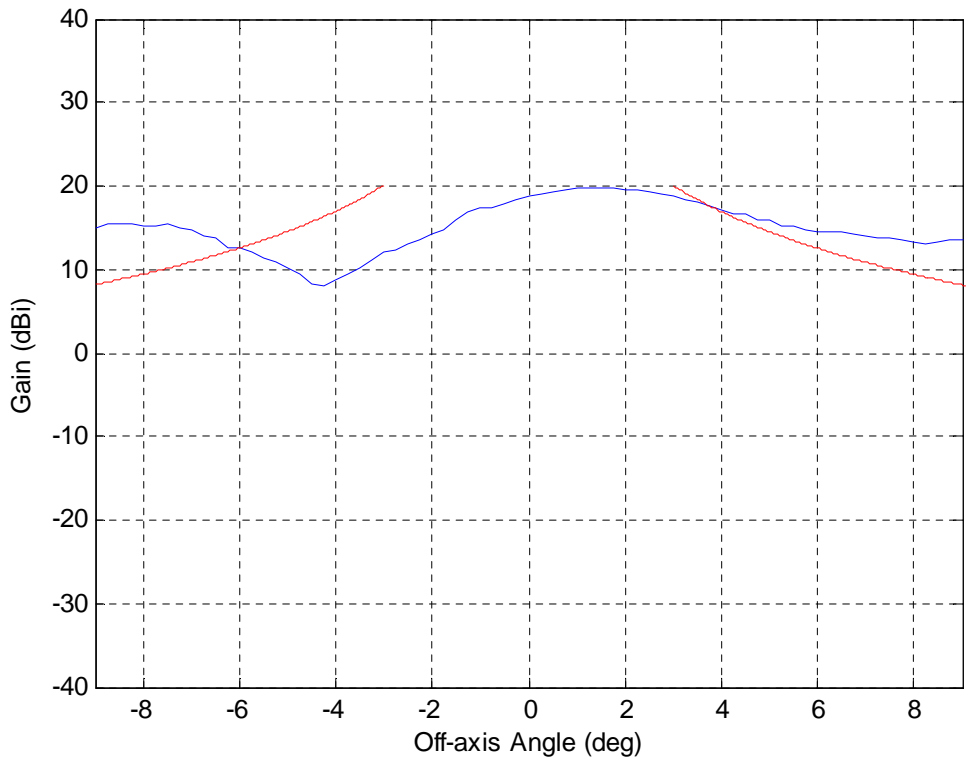


Figure 90. Tx Pattern @ 14.45GHz, Polarity: H, Plane: Cross, Elevation: 90°, Elevation Cut



## **EXHIBIT C. Off-Axis EIRP Patterns**

This appendix gives off-axis EIRP data for additional skew and elevation angle cases. Included are elevations of 25, 45 and 90 degrees and skew angles of 30 and 60 deg. Peak off-axis ESD in each case is set to be compliant to the 25.222(a)(1)(i)(A) off axis requirements.

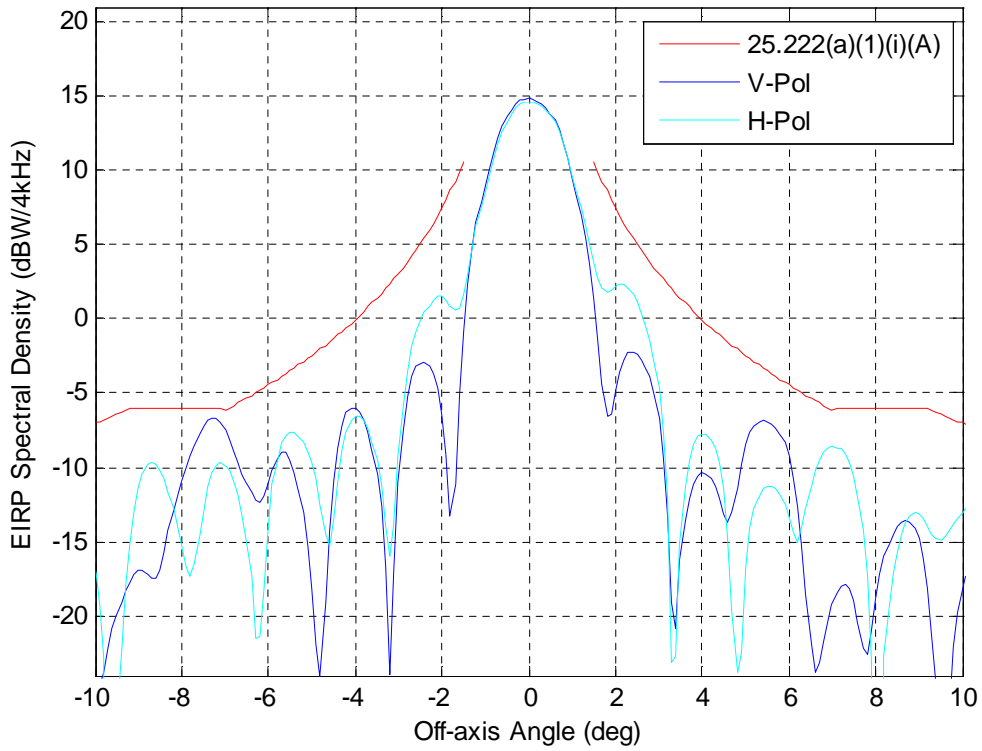


Figure 1. Along the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

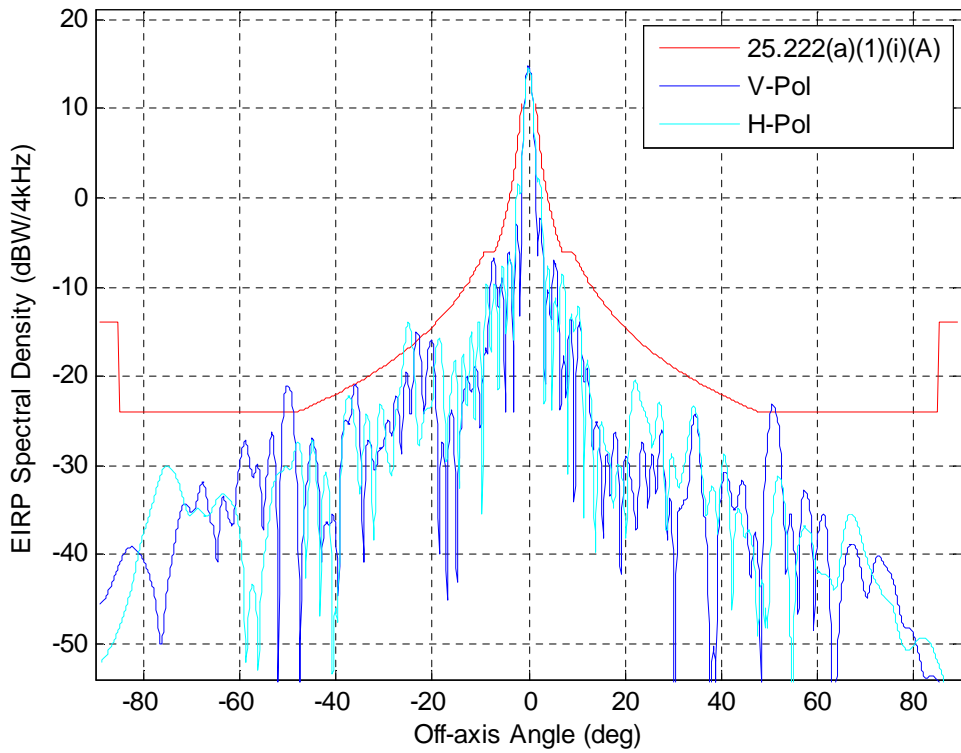


Figure 2. Along the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

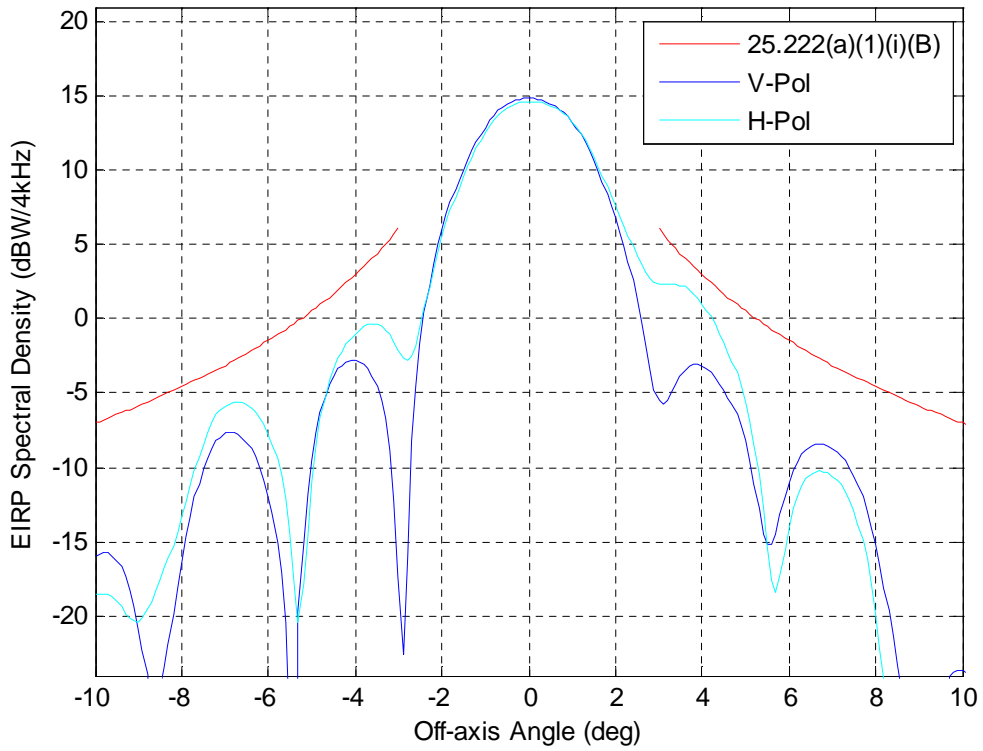


Figure 3. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

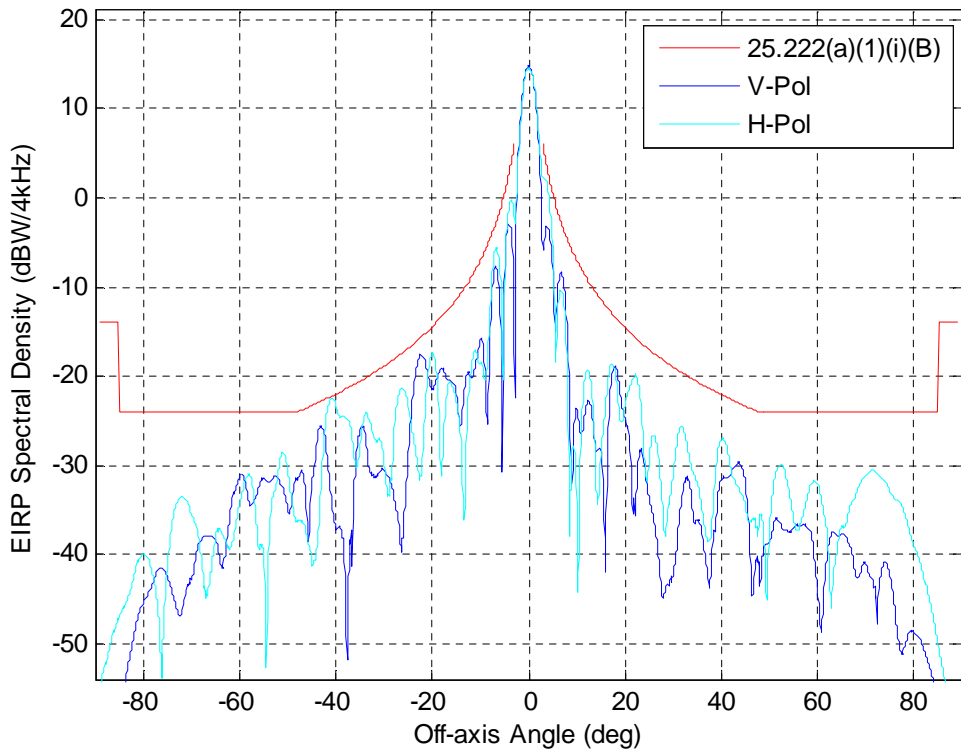


Figure 4. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

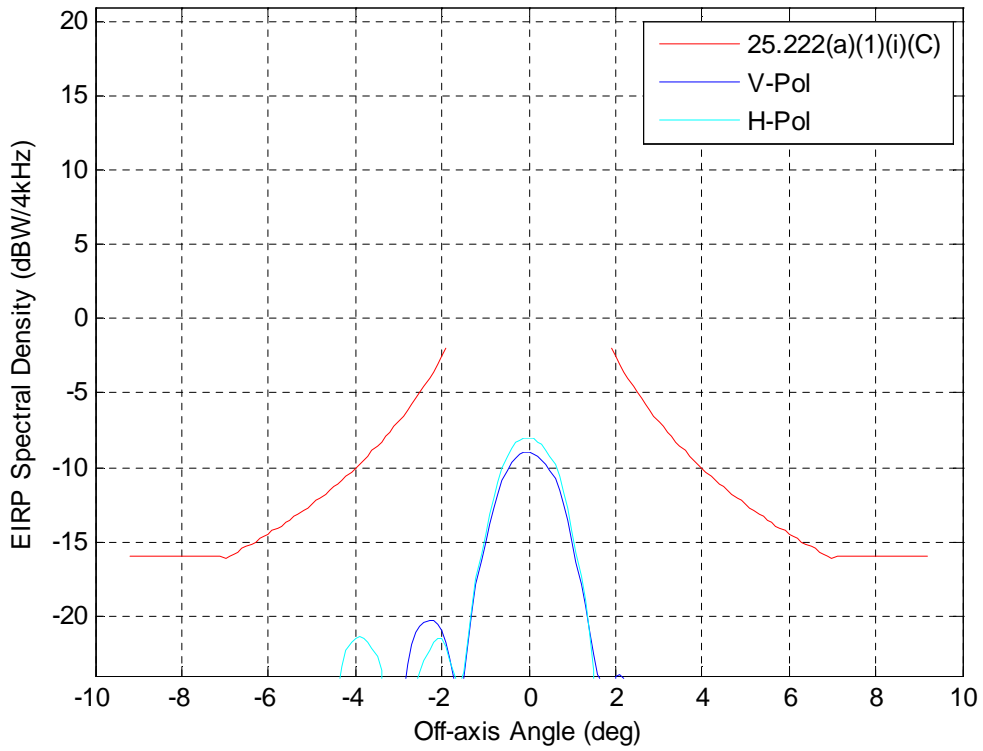


Figure 5. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

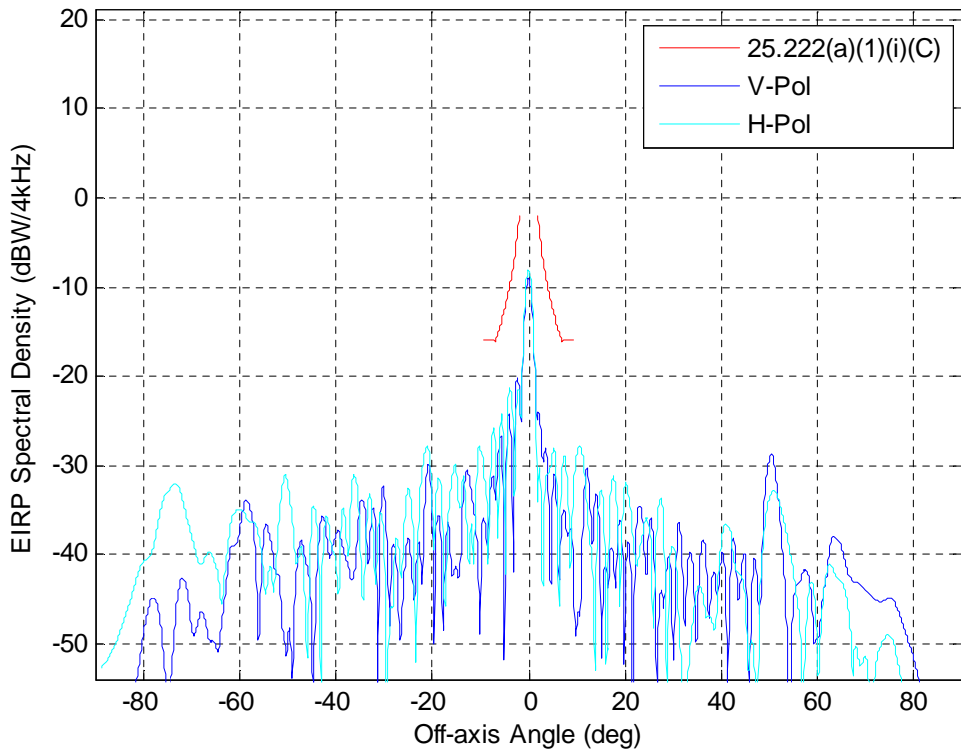


Figure 6. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

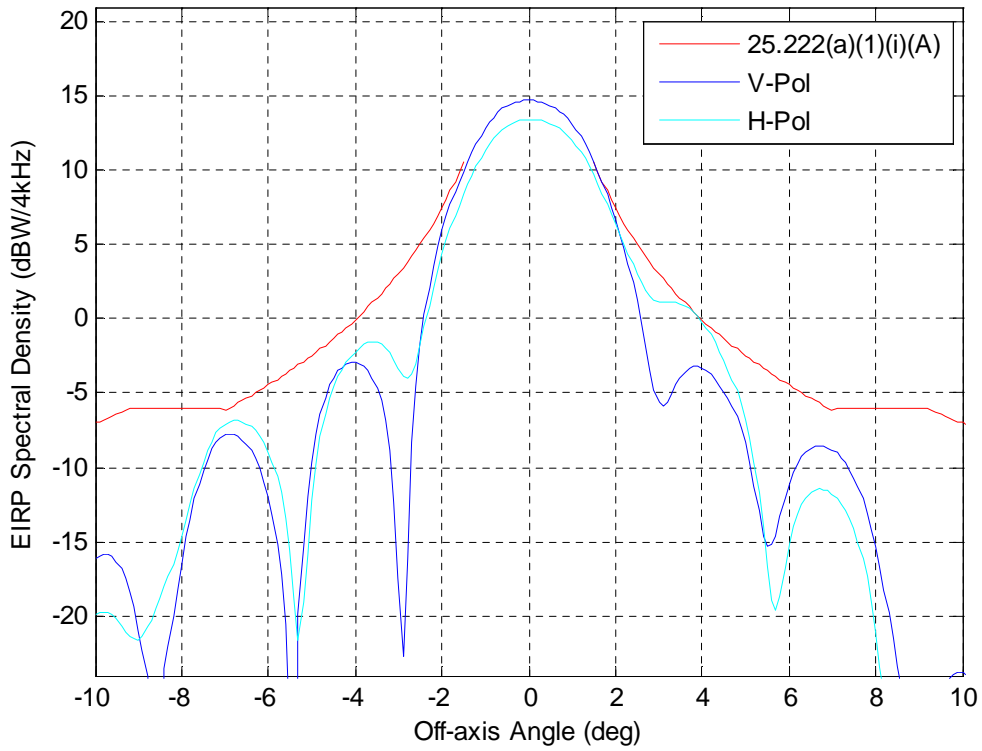


Figure 7. Along the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

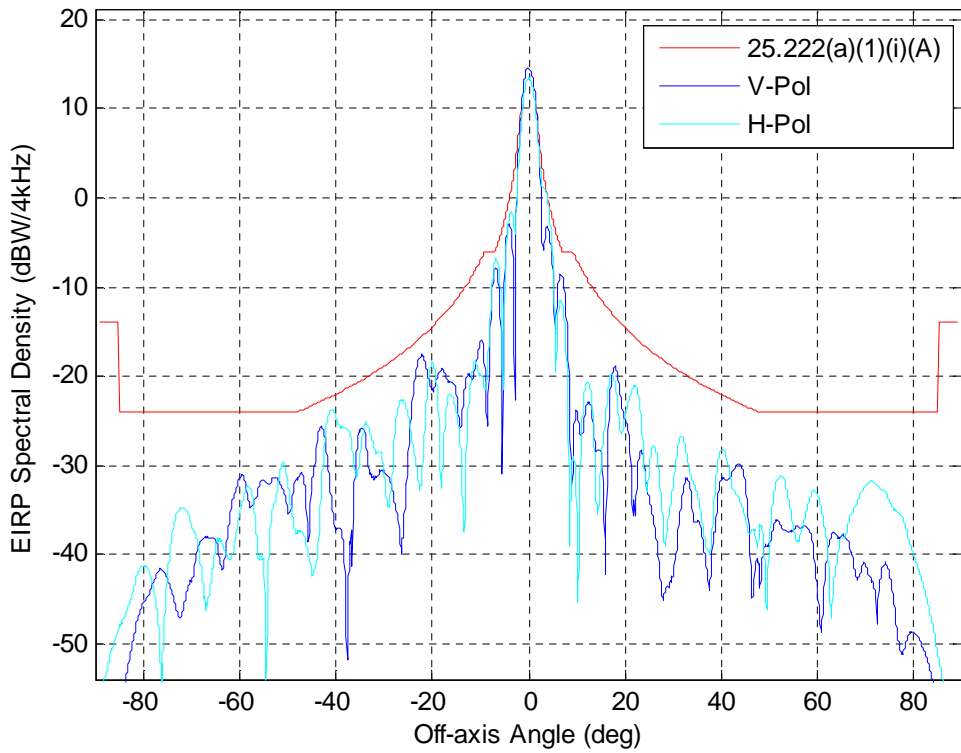


Figure 8. Along the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg



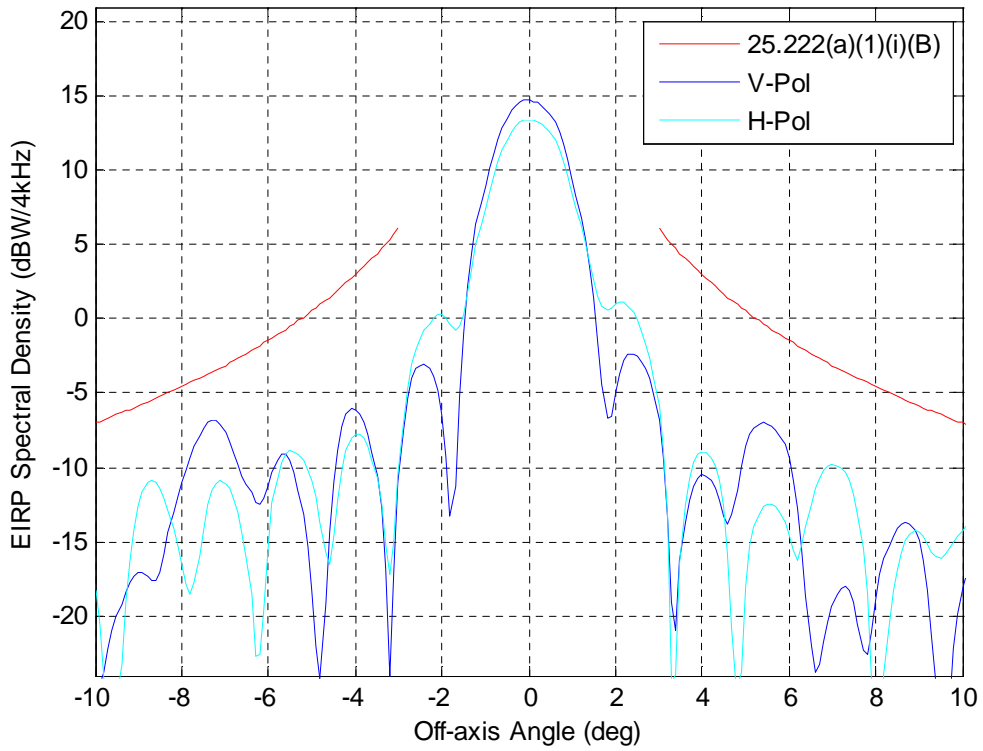


Figure 9. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

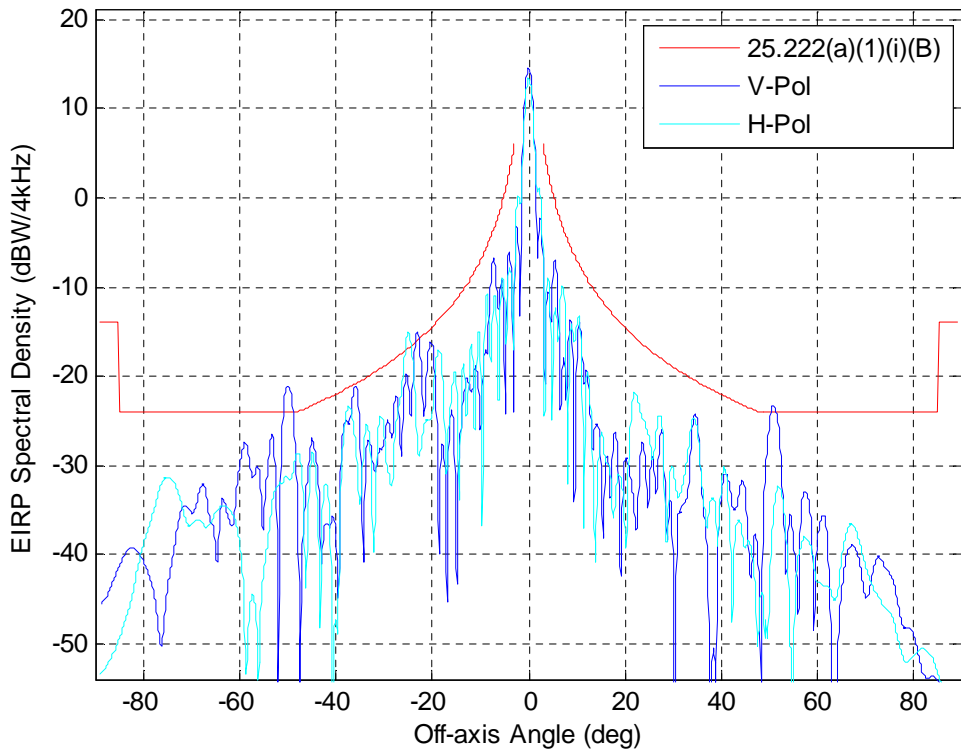


Figure 10. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

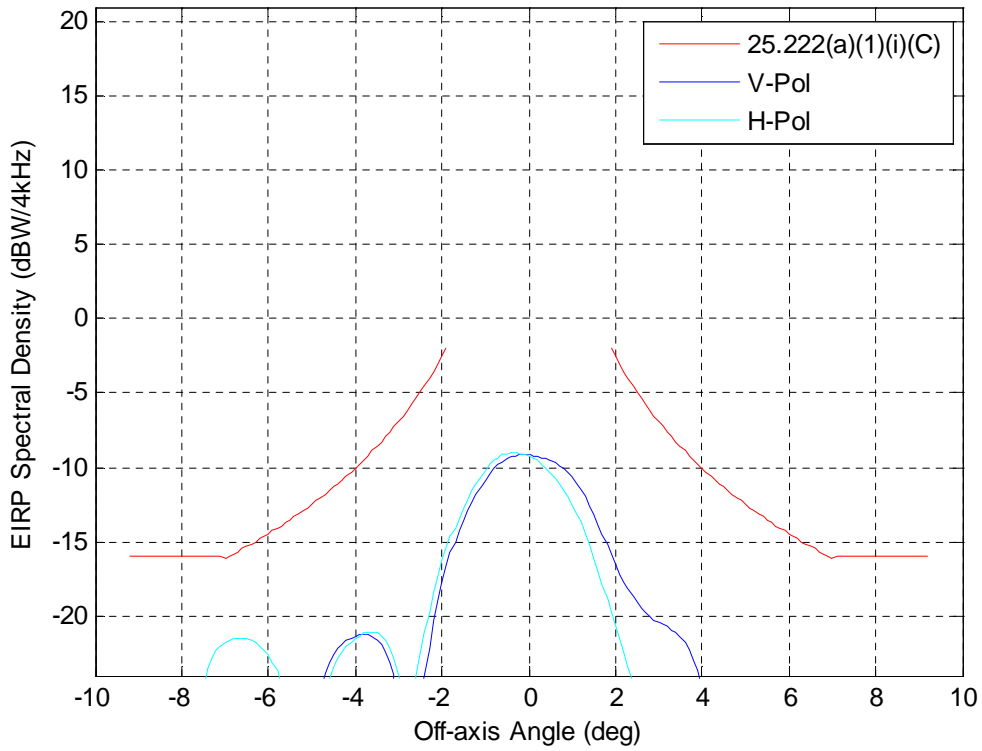


Figure 11. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

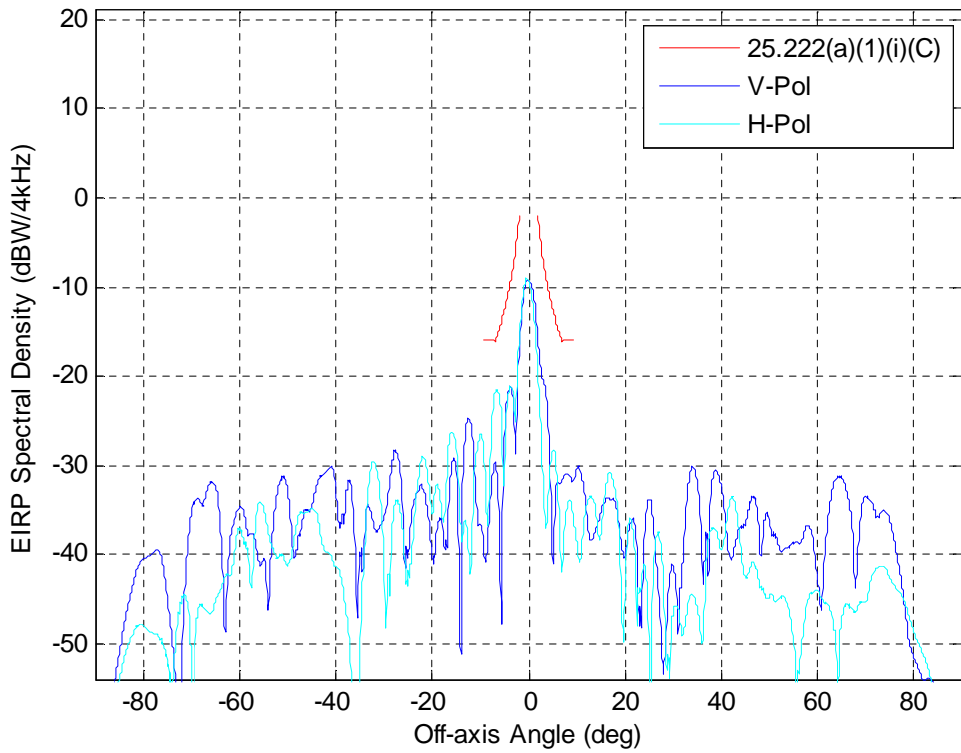


Figure 12. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

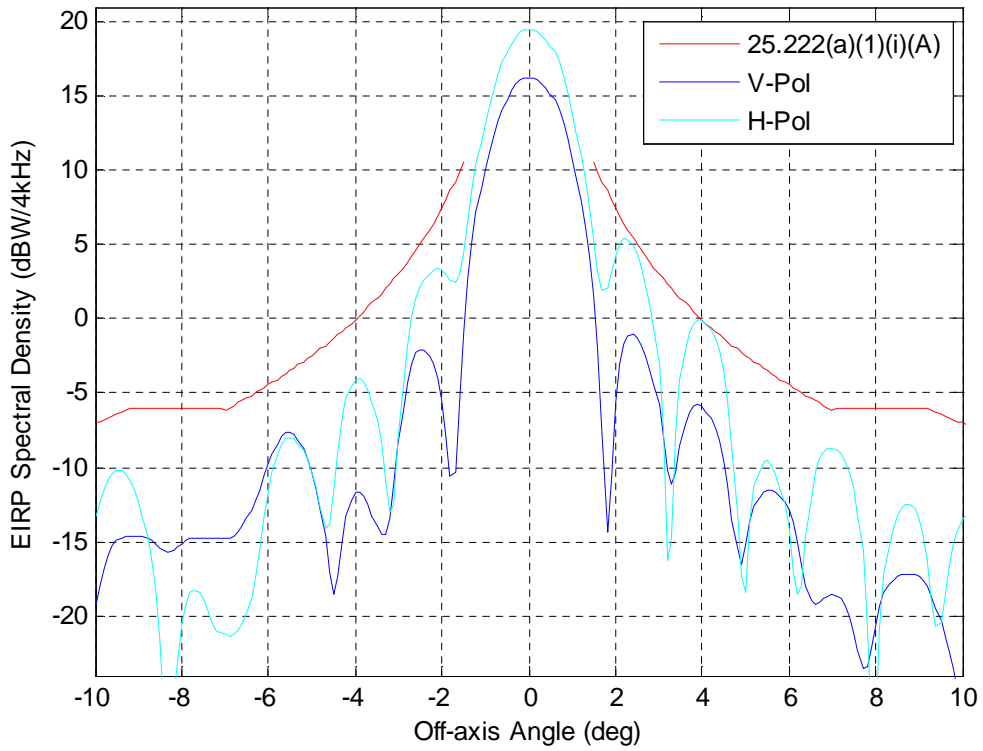


Figure 13. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

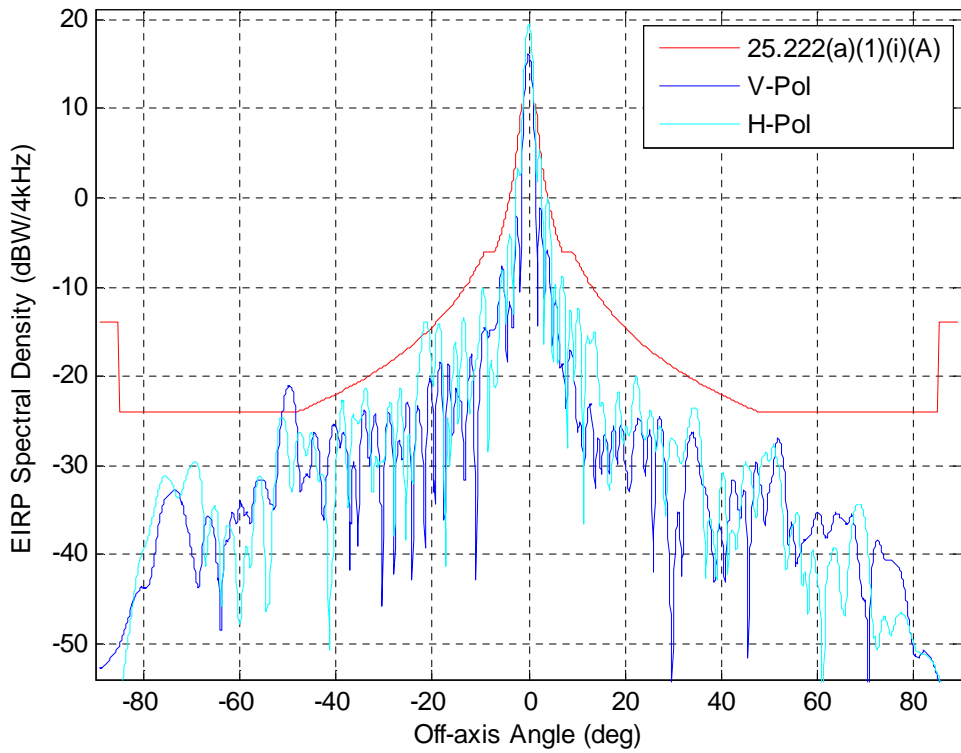


Figure 14. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

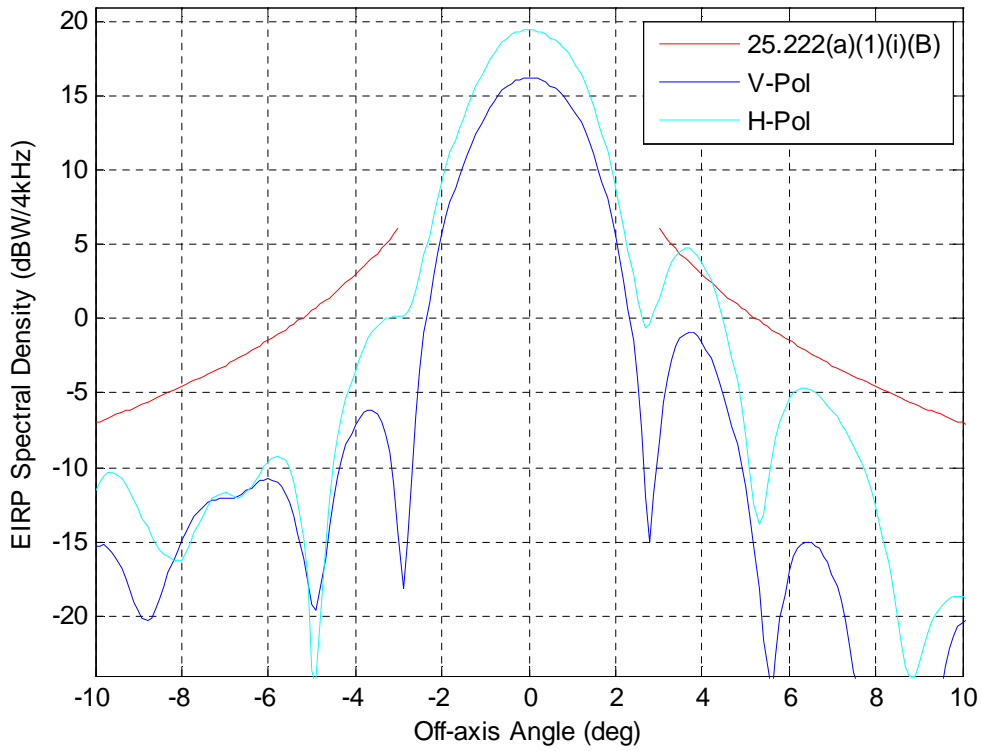


Figure 15. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

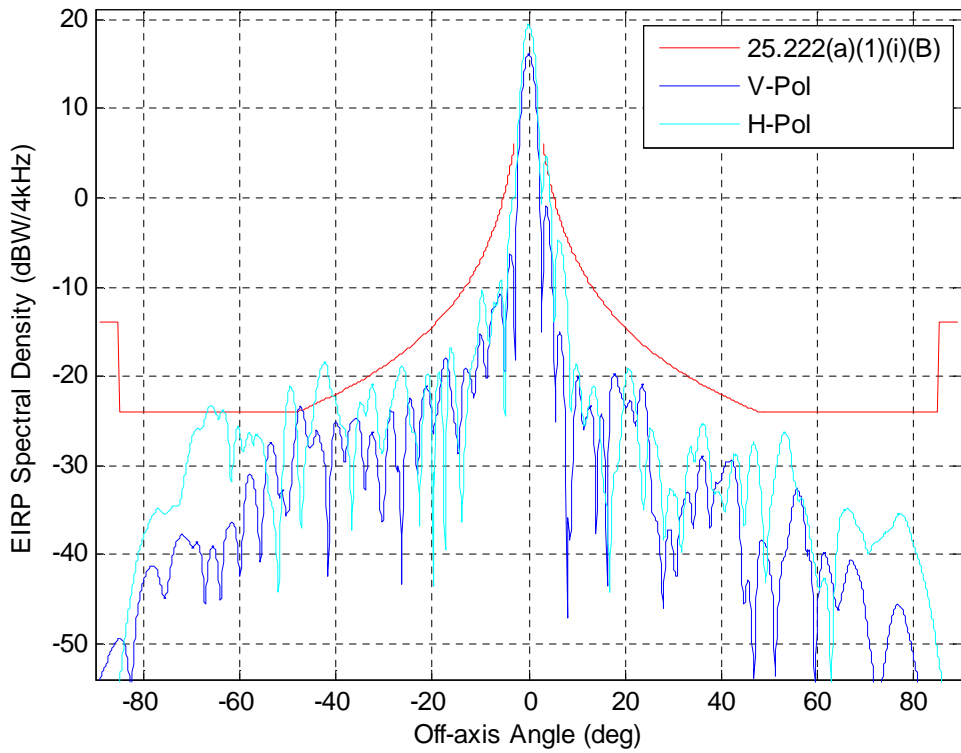


Figure 16. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

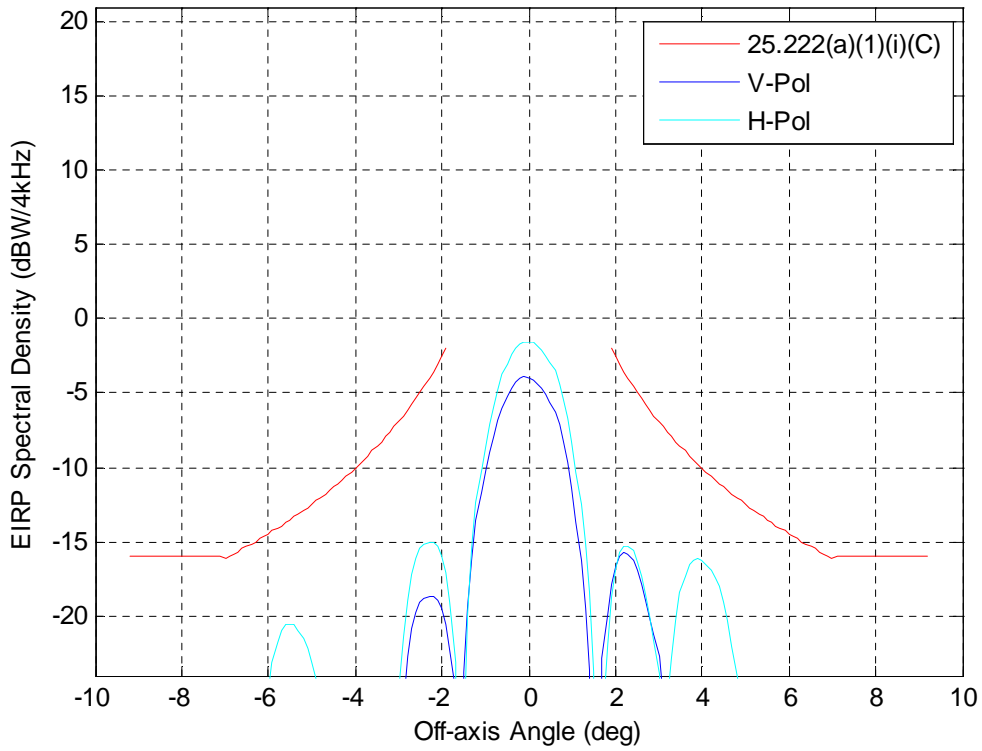


Figure 17. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

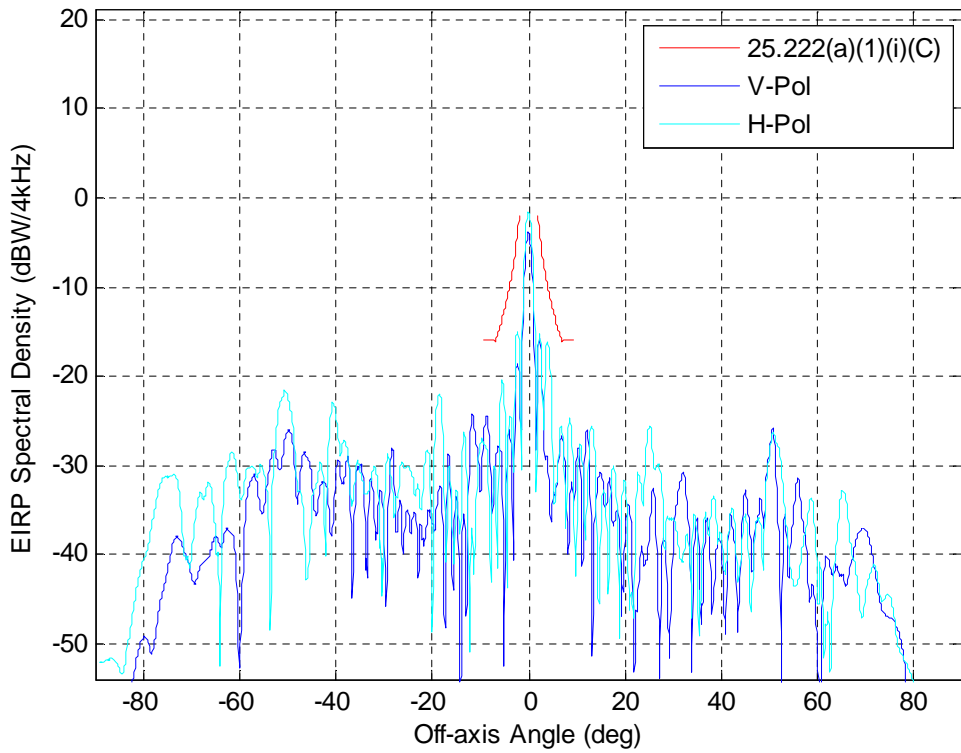


Figure 18. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

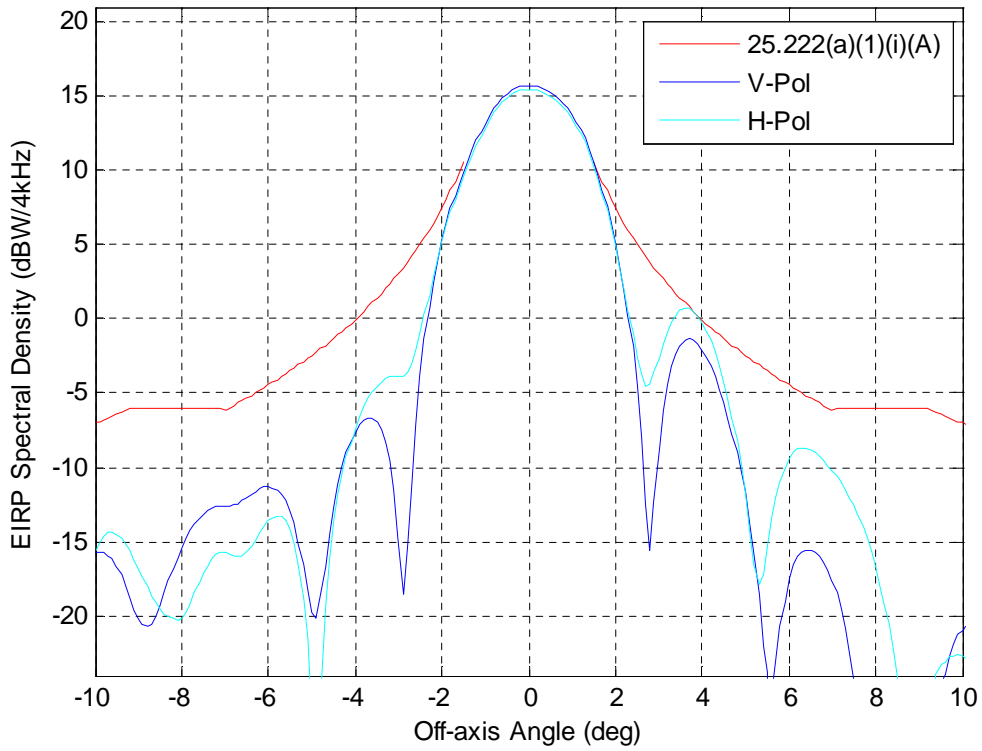


Figure 19. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

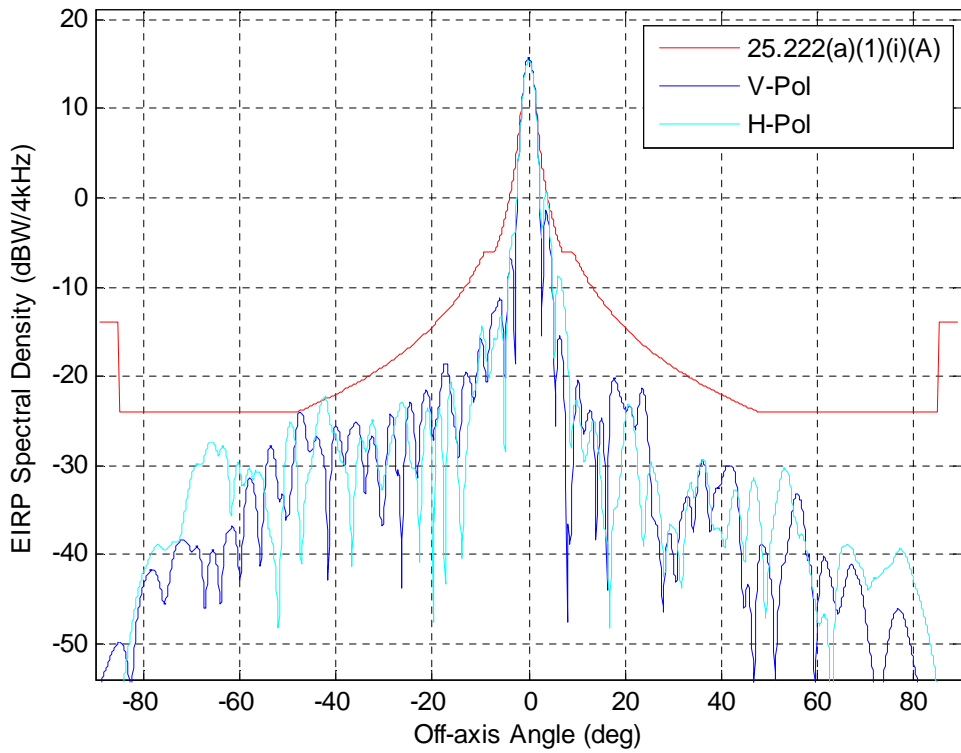


Figure 20. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

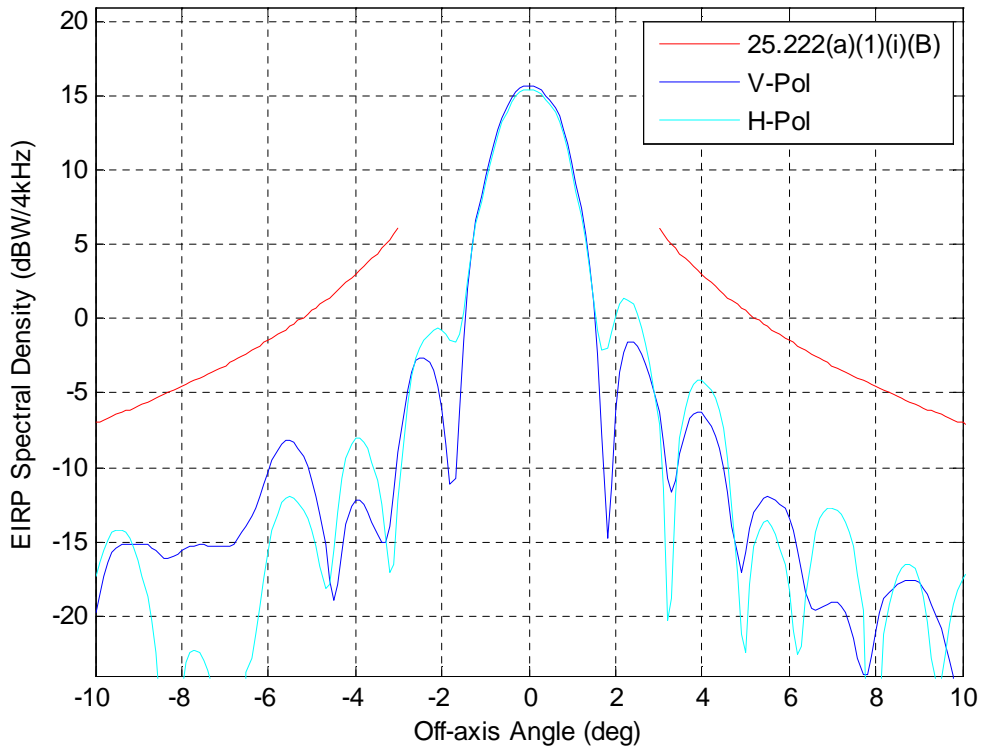


Figure 21. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

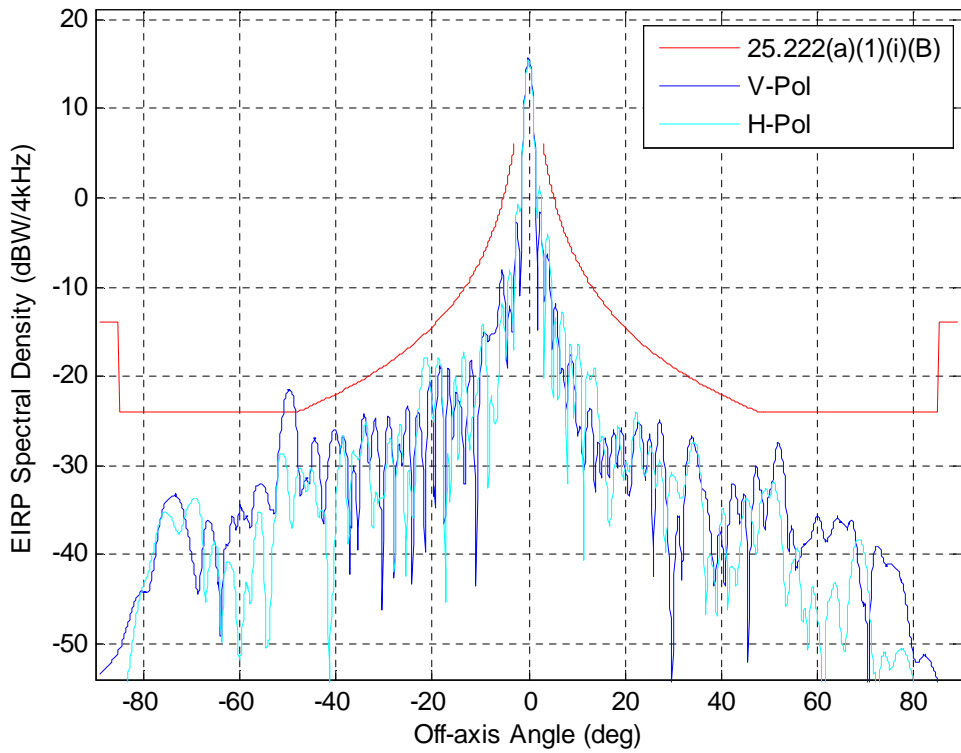


Figure 22. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

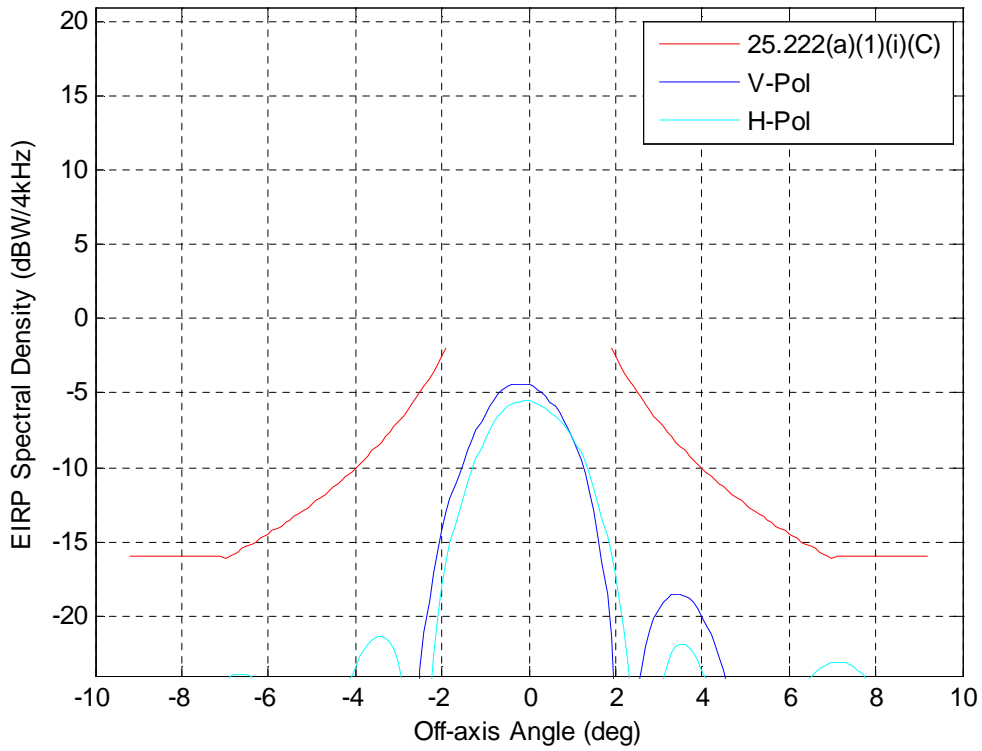


Figure 23. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

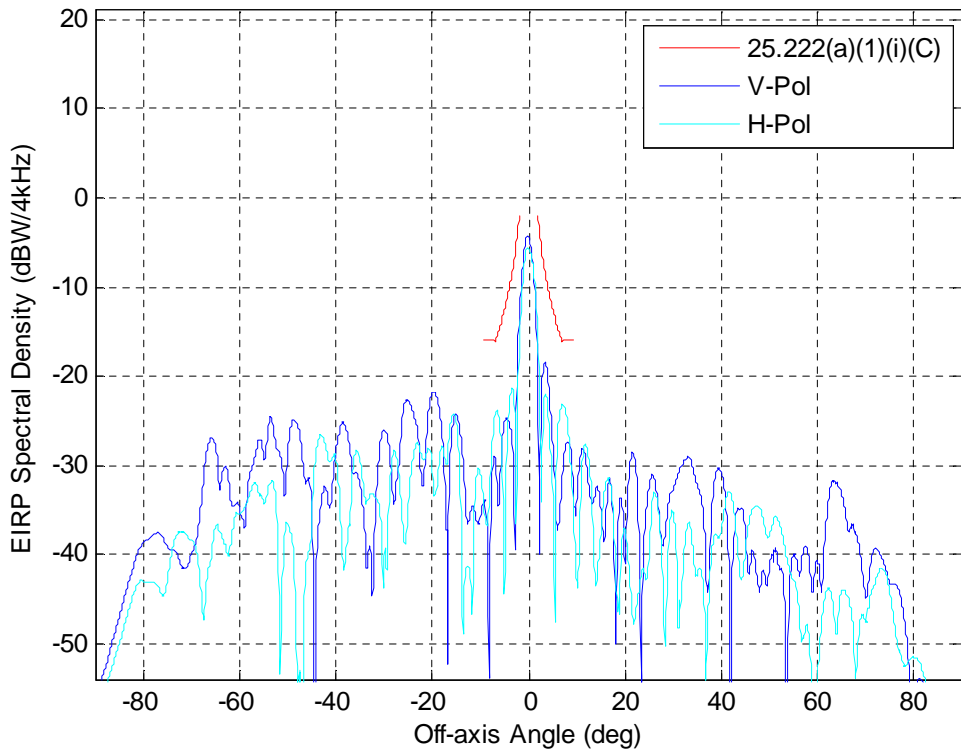


Figure 24. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg



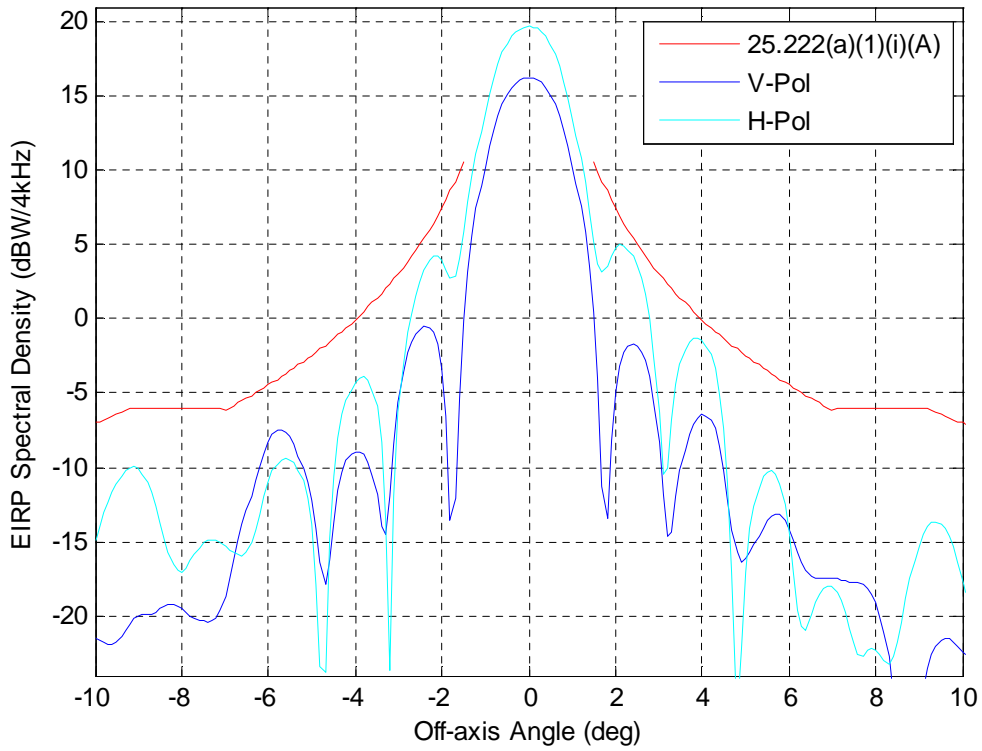


Figure 25. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

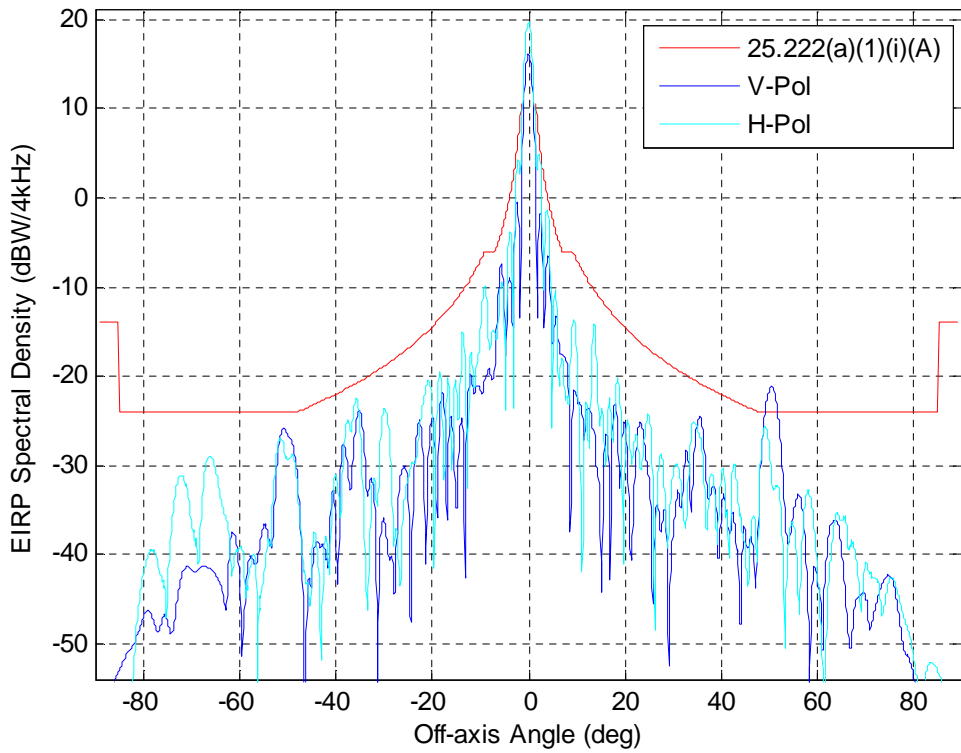


Figure 26. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

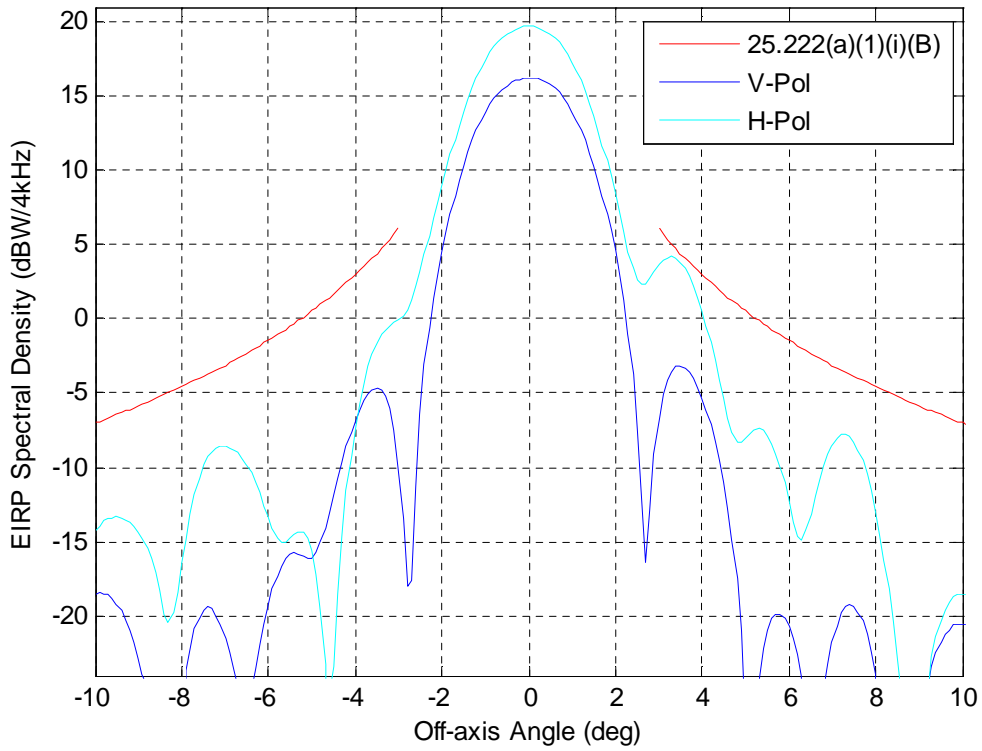


Figure 27. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

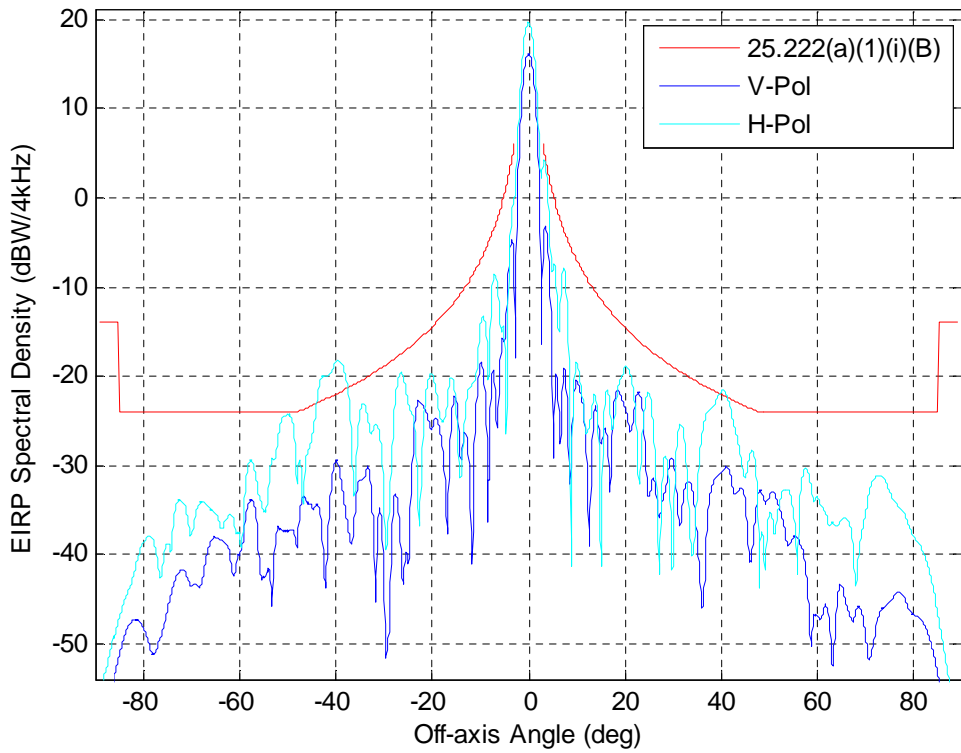


Figure 28. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

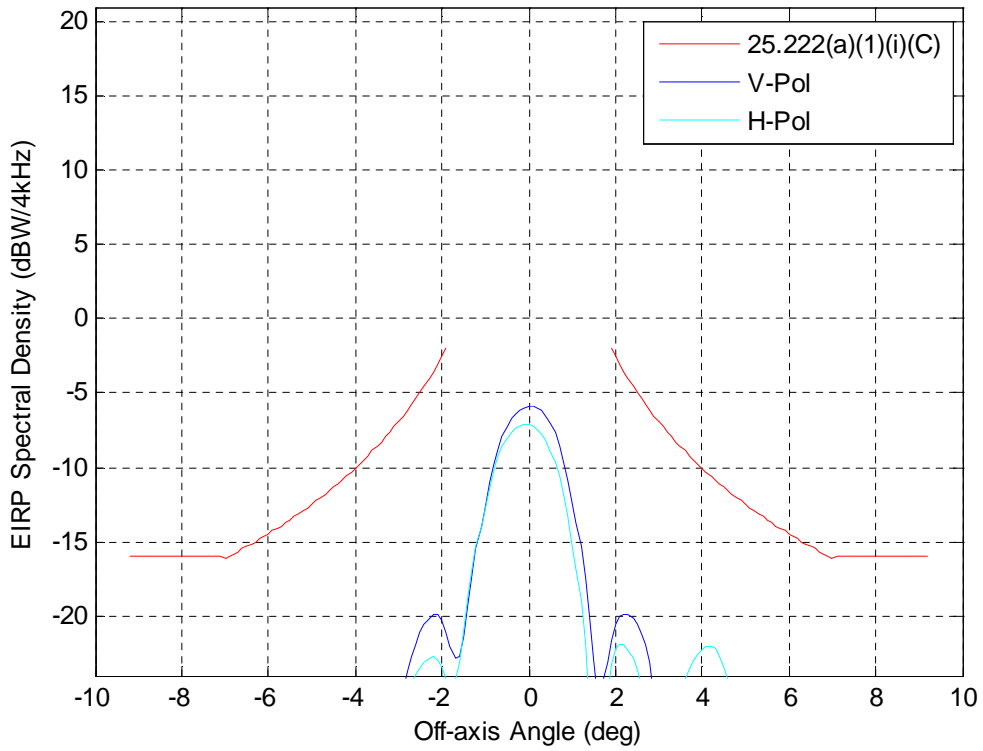


Figure 29. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

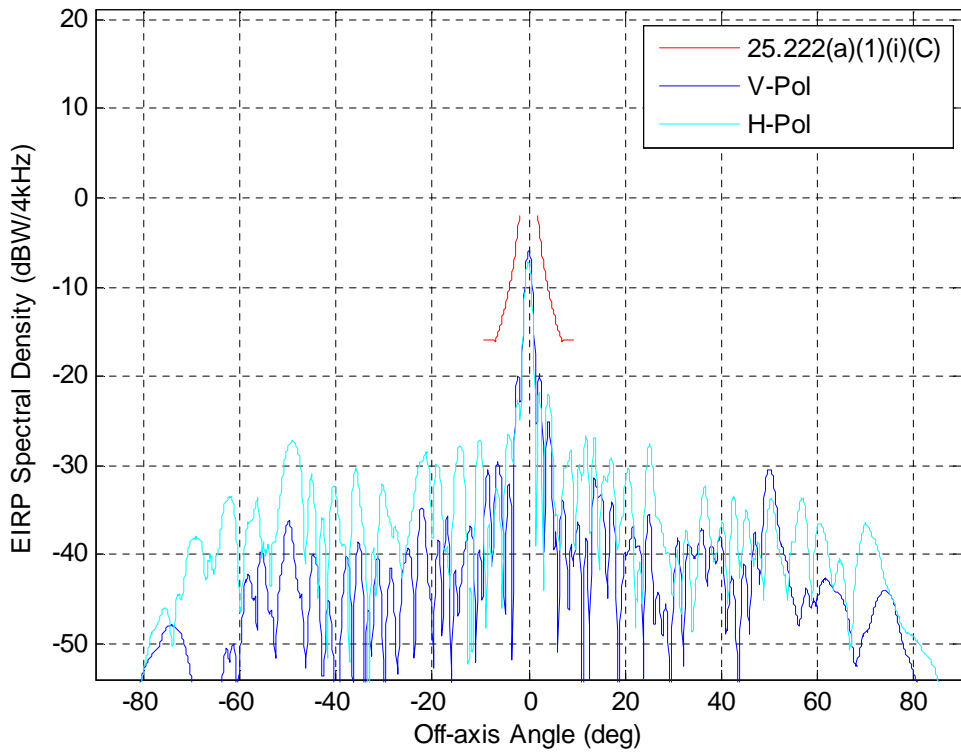


Figure 30. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

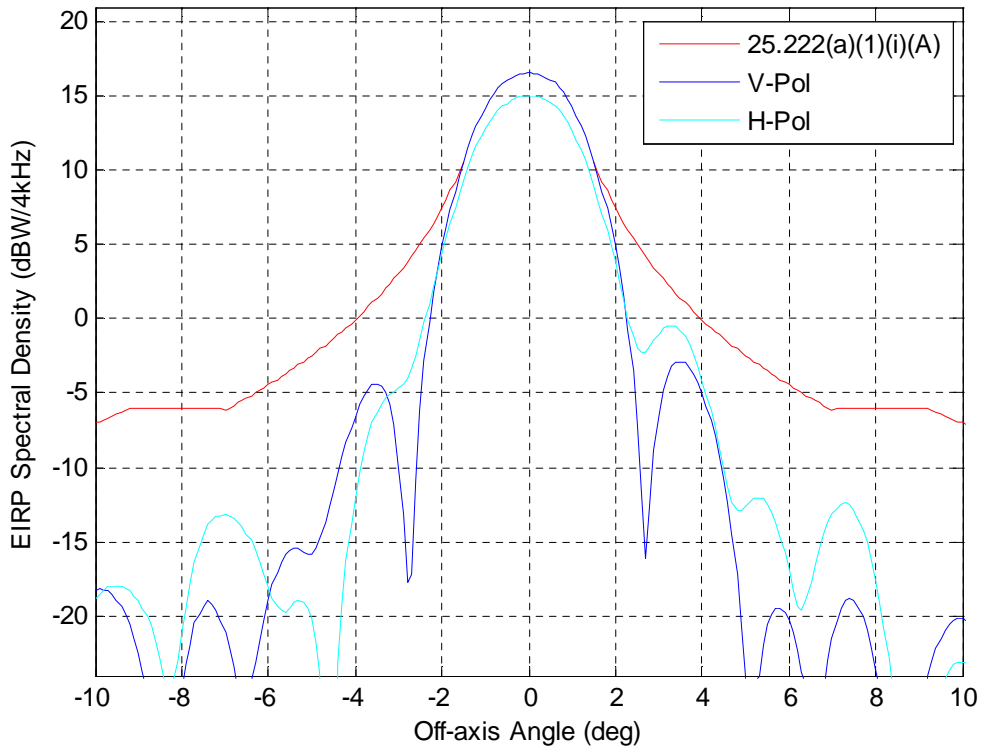


Figure 31. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

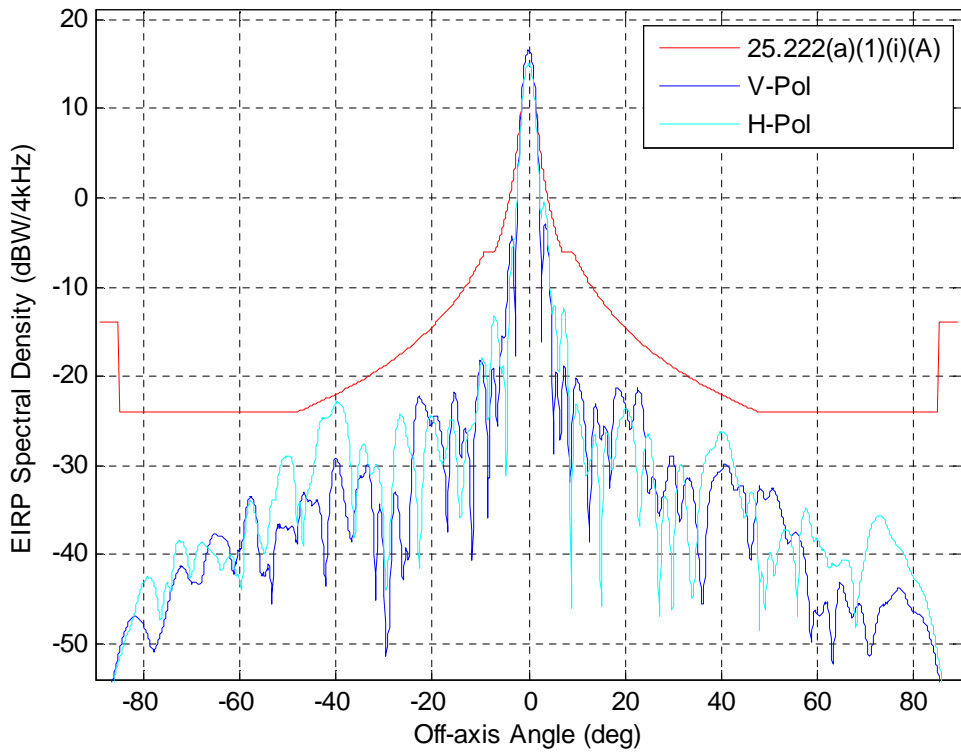


Figure 32. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

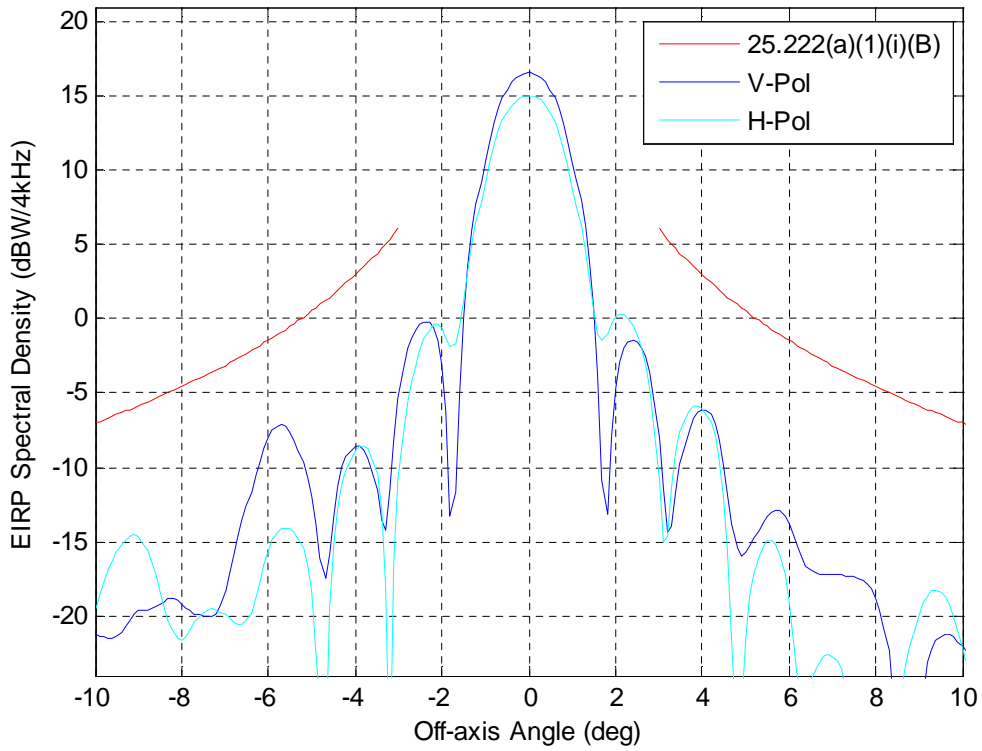


Figure 33. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

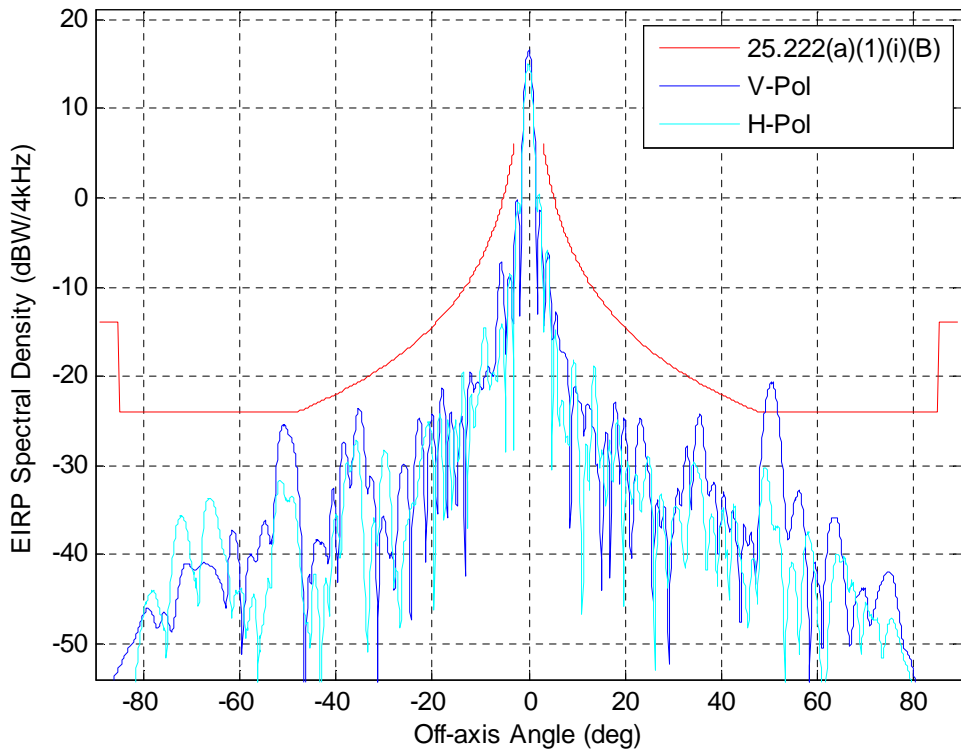


Figure 34. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

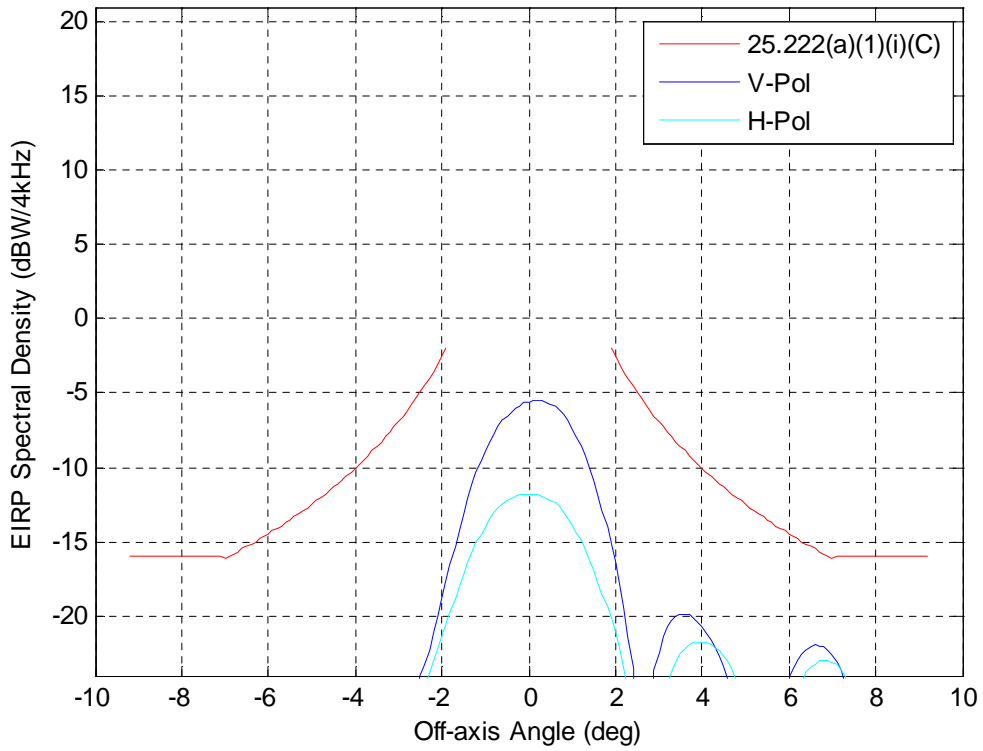


Figure 35. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

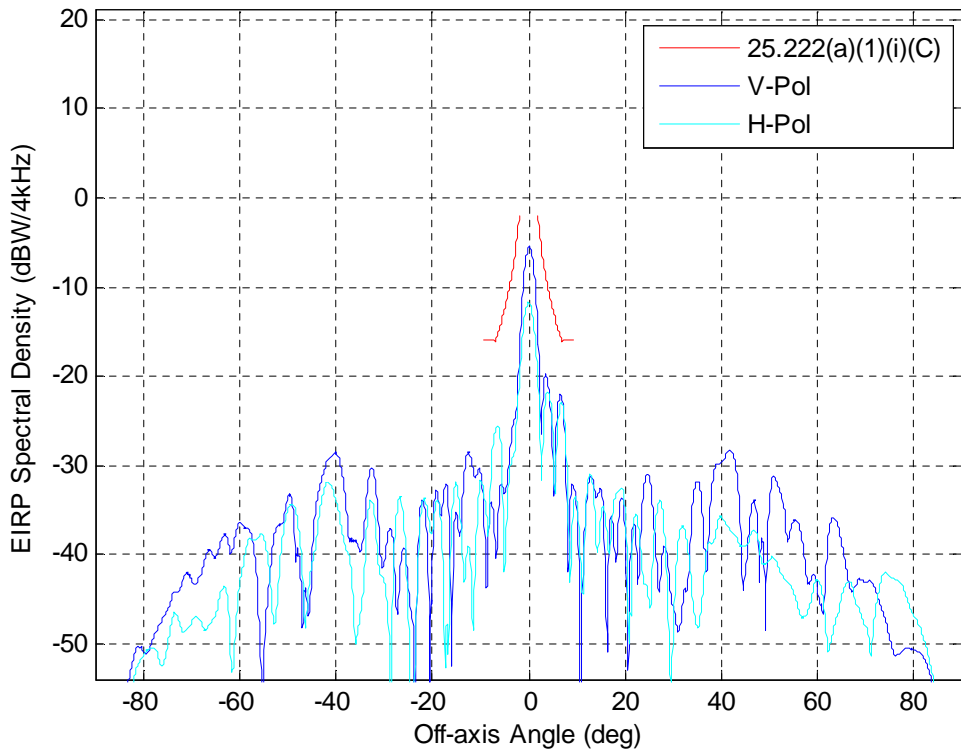
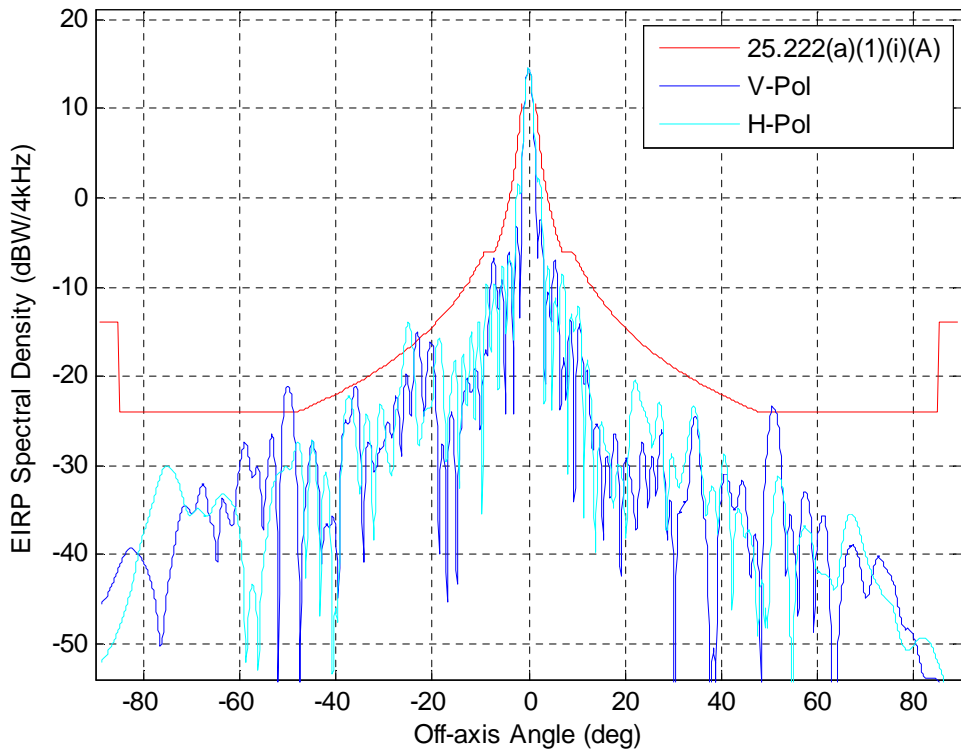
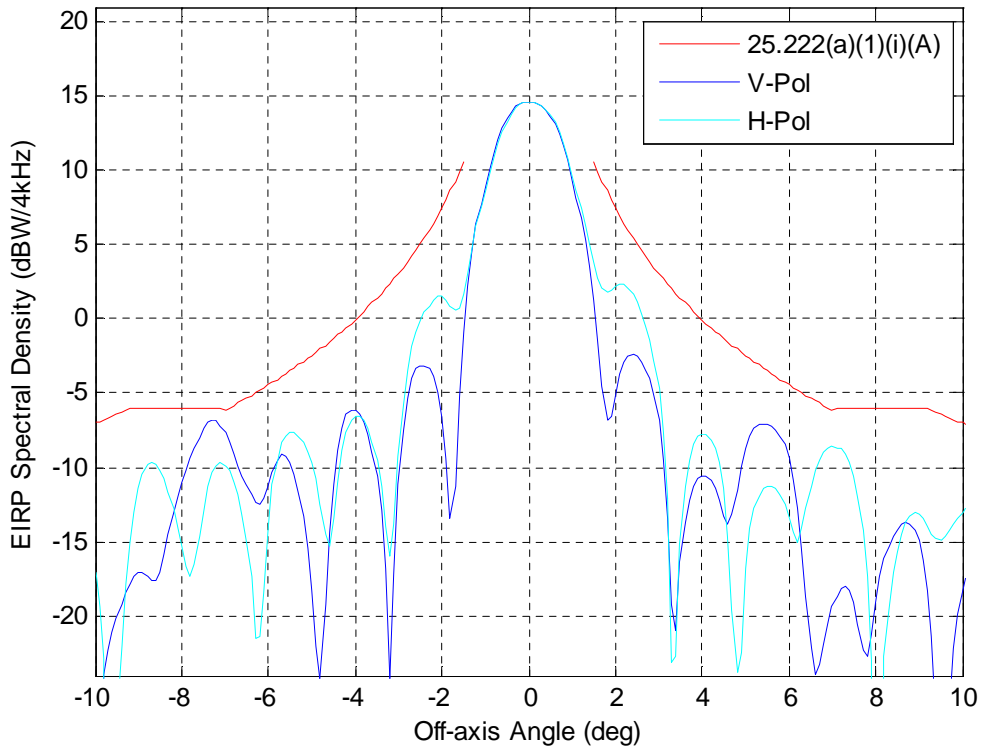


Figure 36. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg



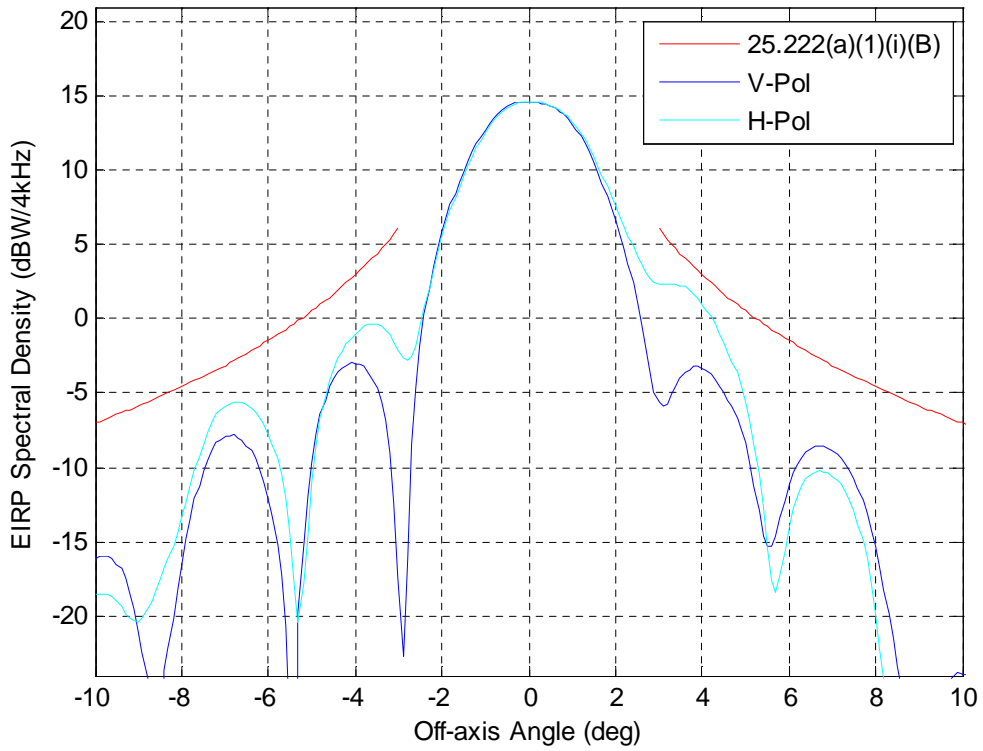


Figure 3. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

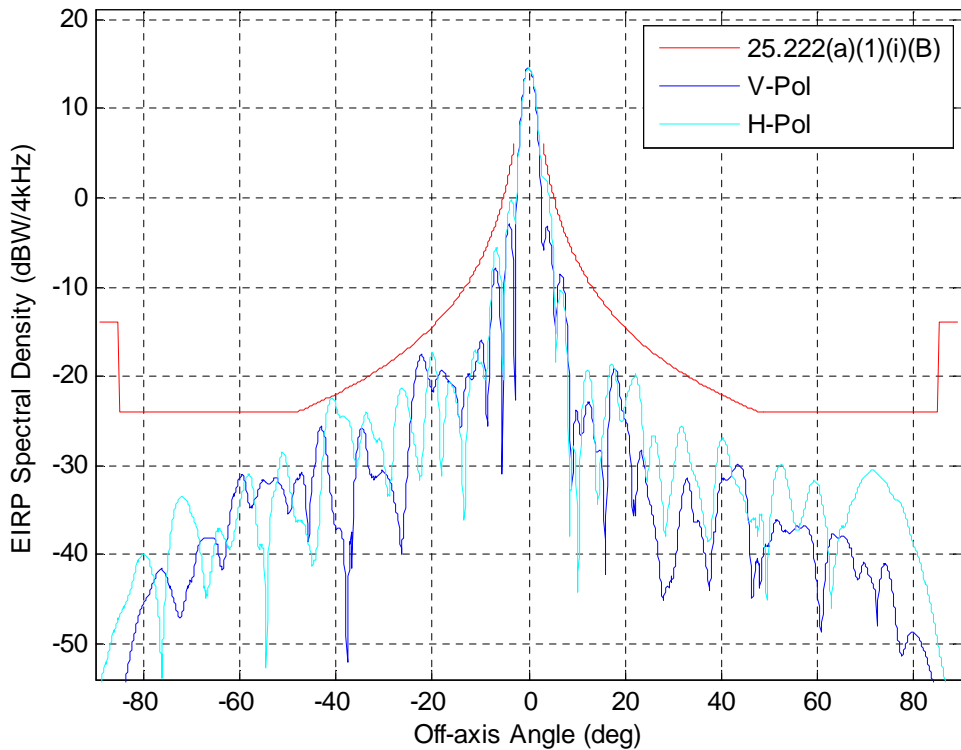


Figure 4. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg



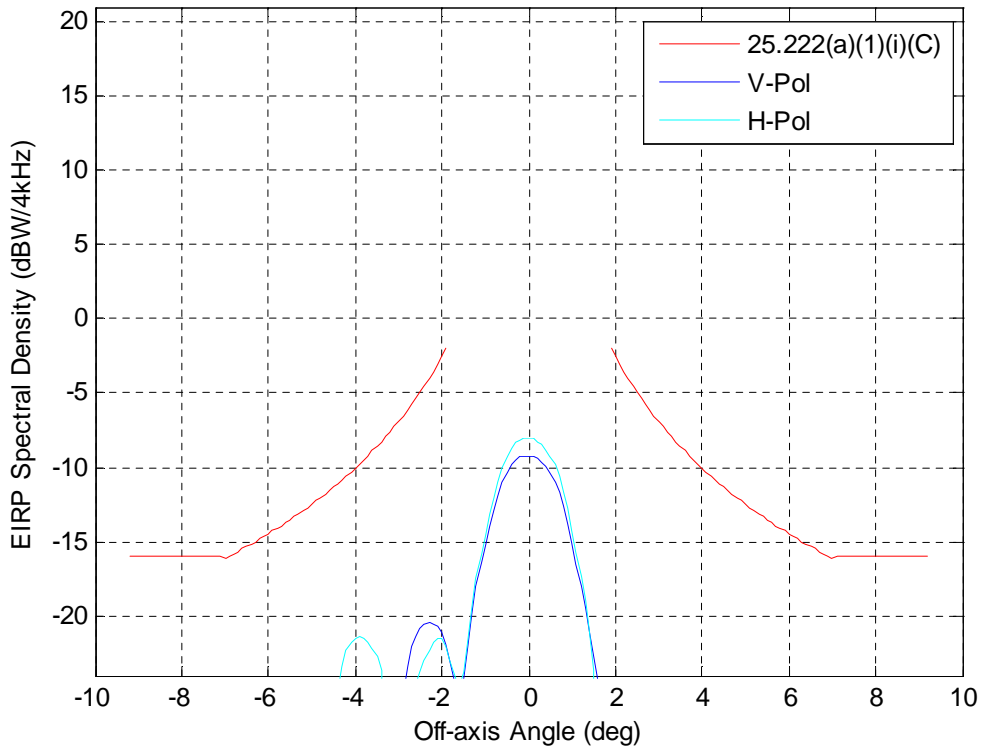


Figure 5. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

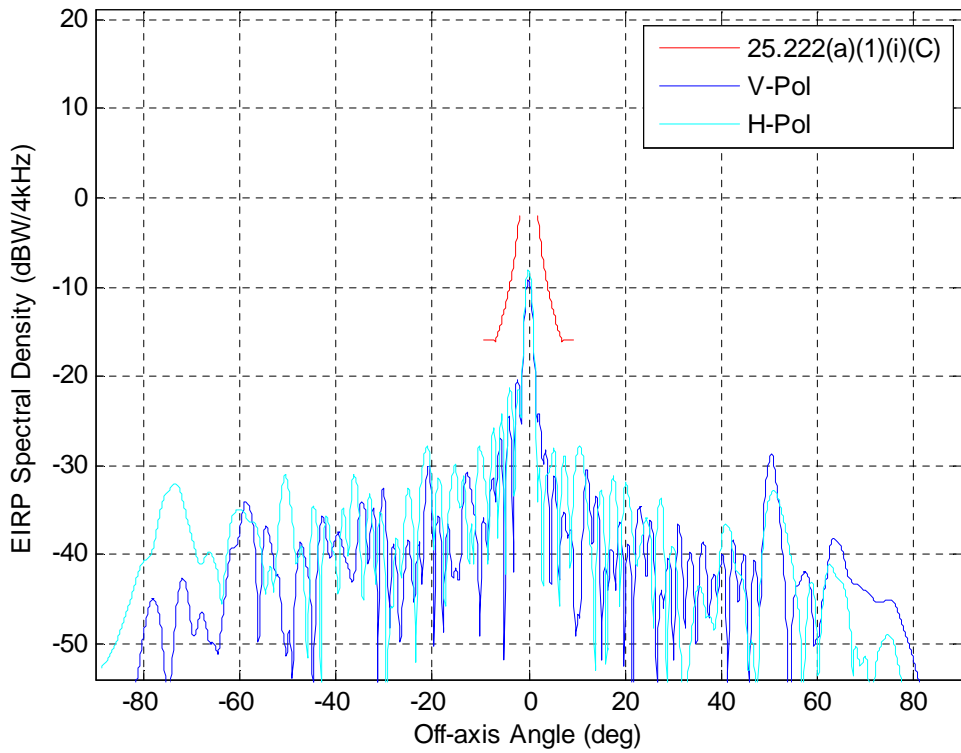


Figure 6. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

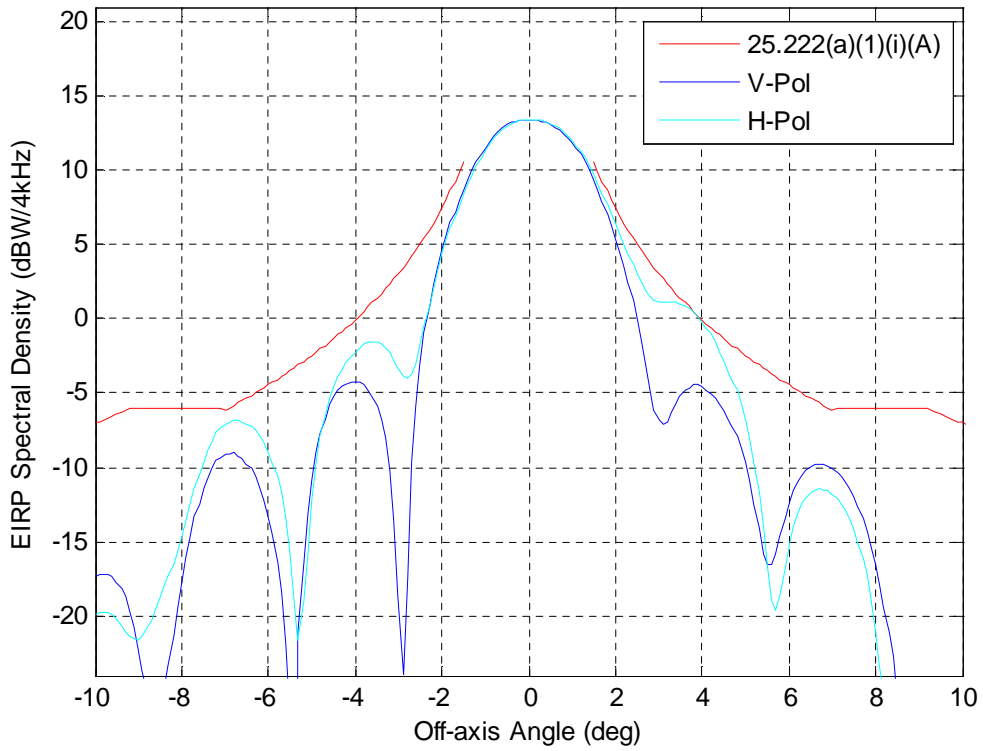


Figure 7. Along the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

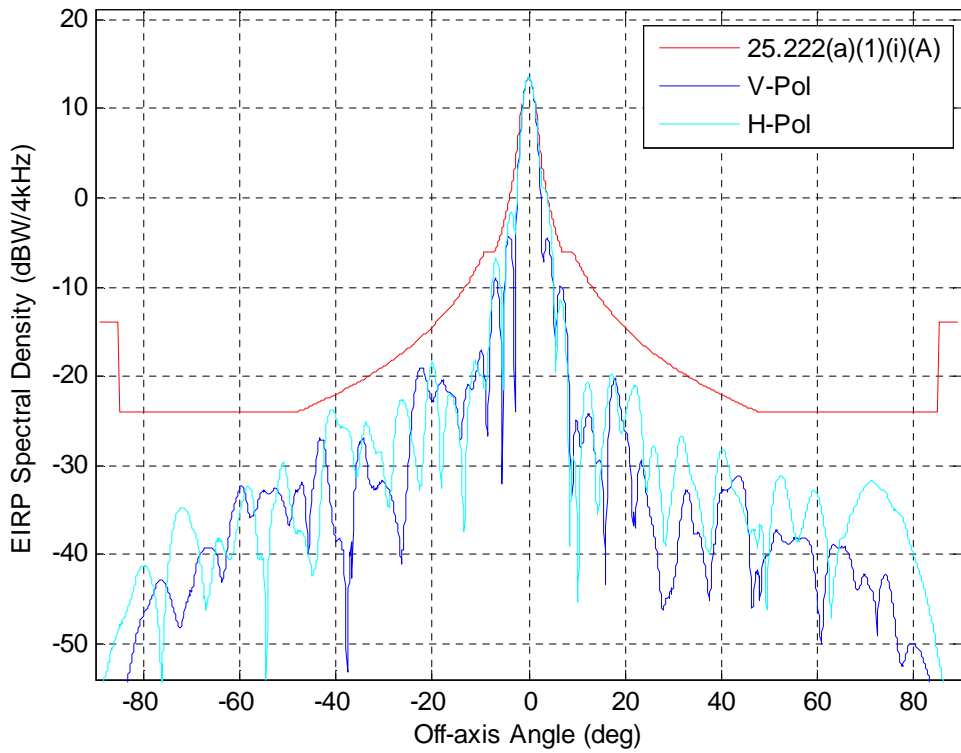


Figure 8. Along the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

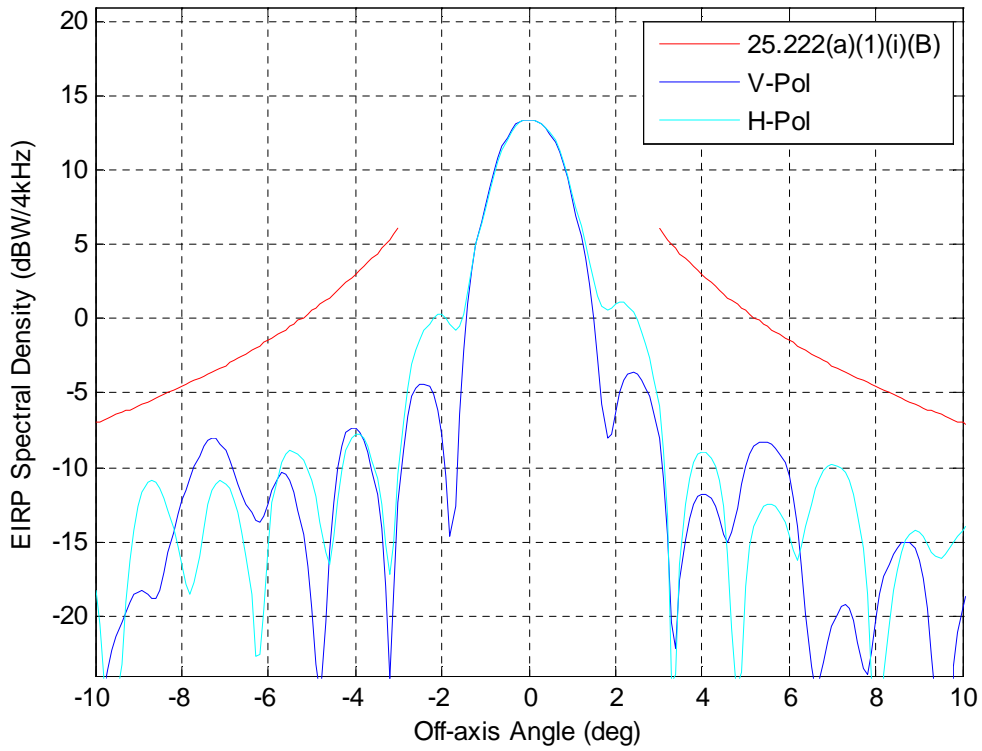


Figure 9. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

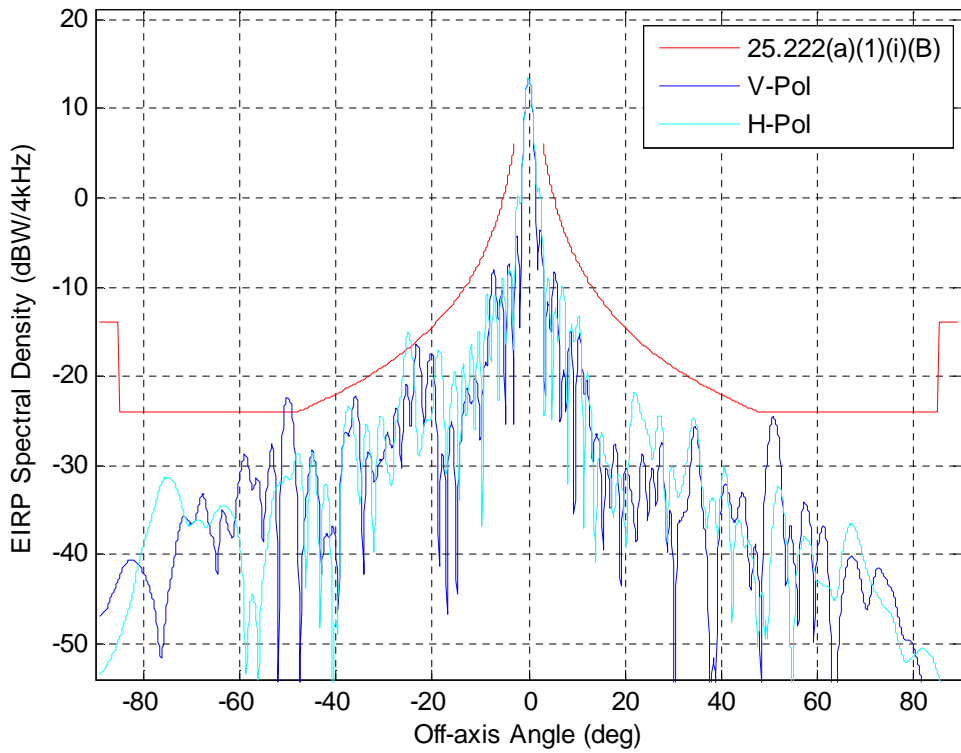


Figure 10. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 25 deg, Skew 30 deg

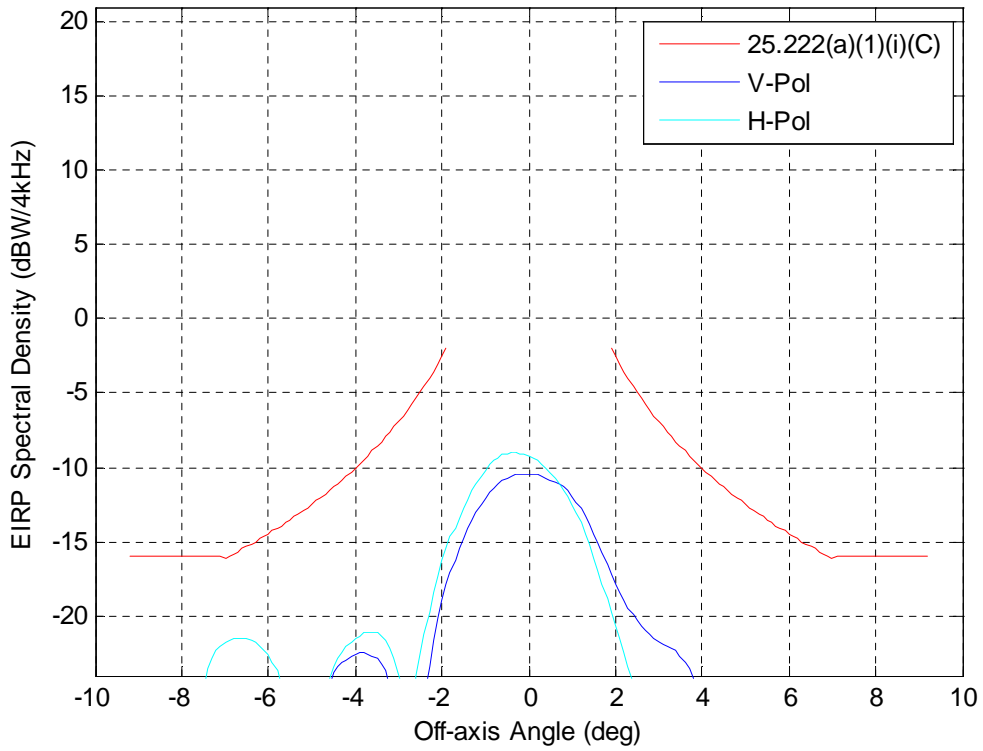


Figure 11. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

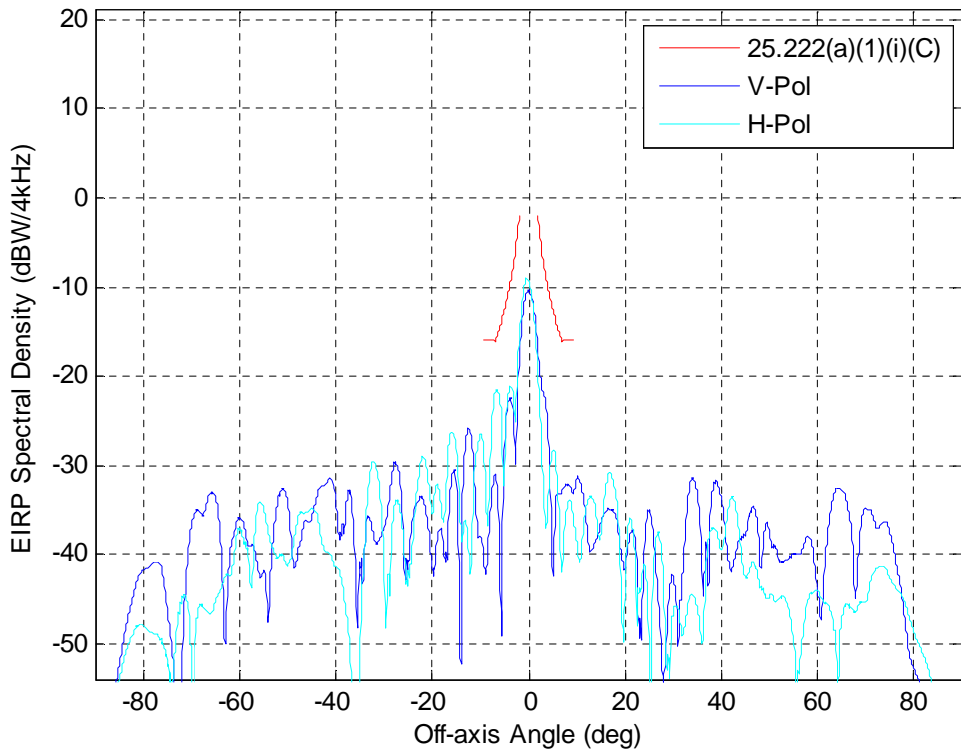


Figure 12. Along the GSO, Cross-Pol, 14.25 GHz, EI 25 deg, Skew 60 deg

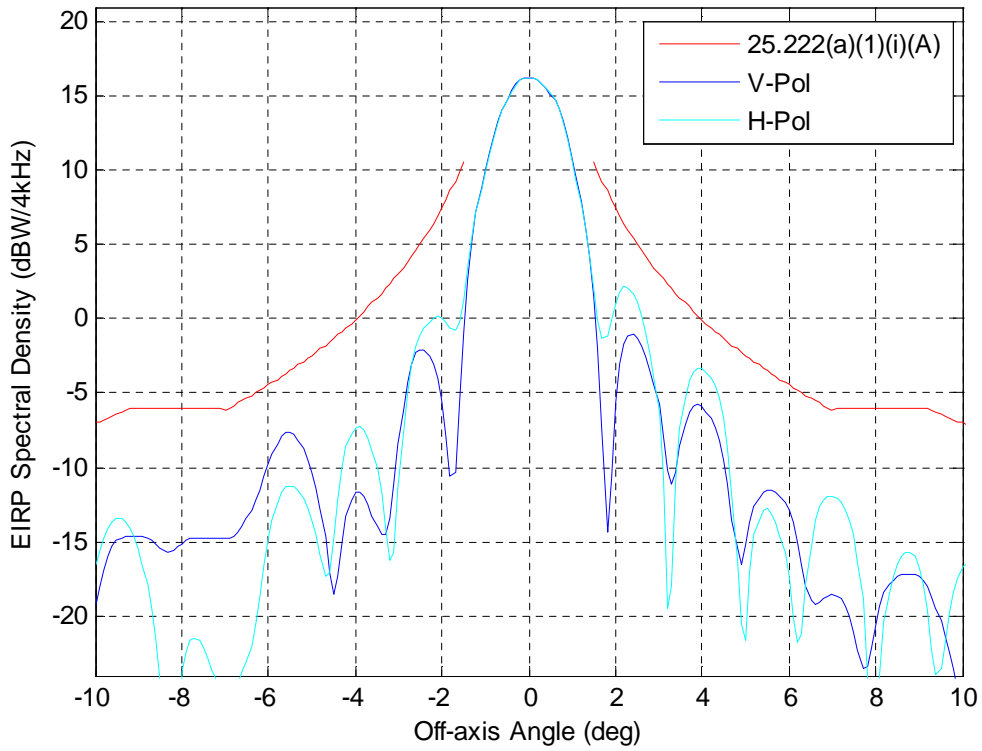


Figure 13. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

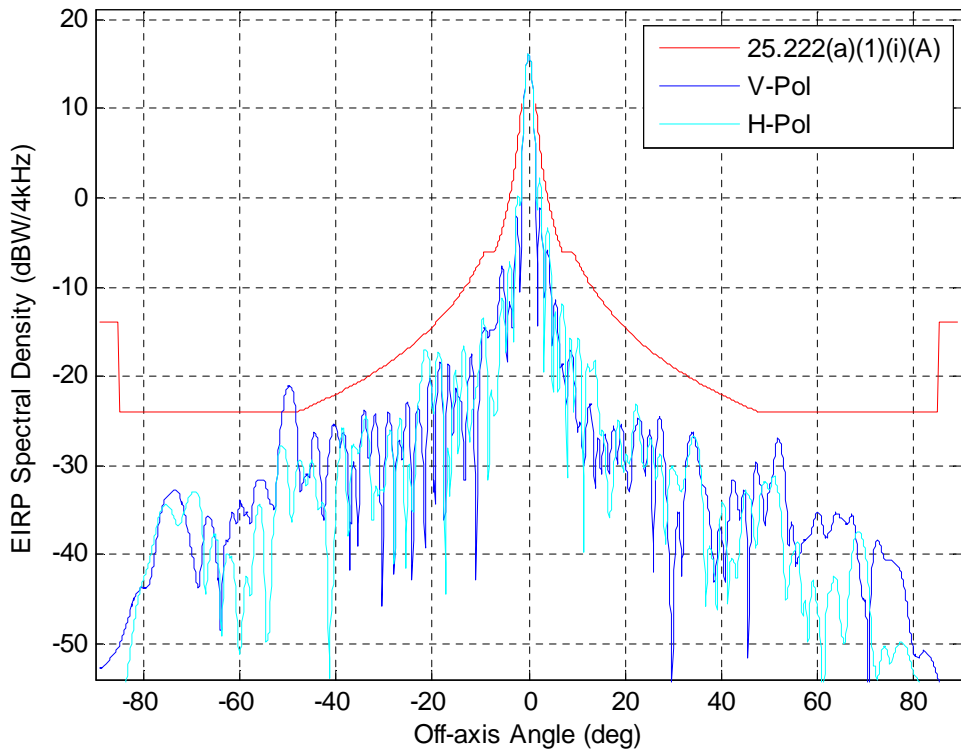


Figure 14. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

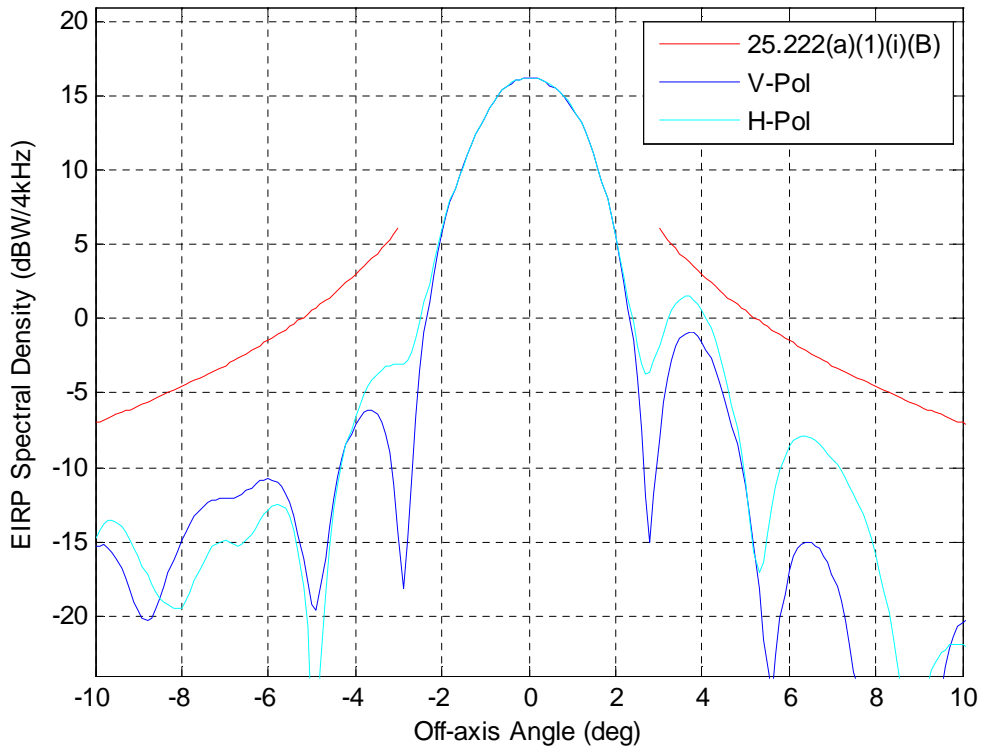


Figure 15. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

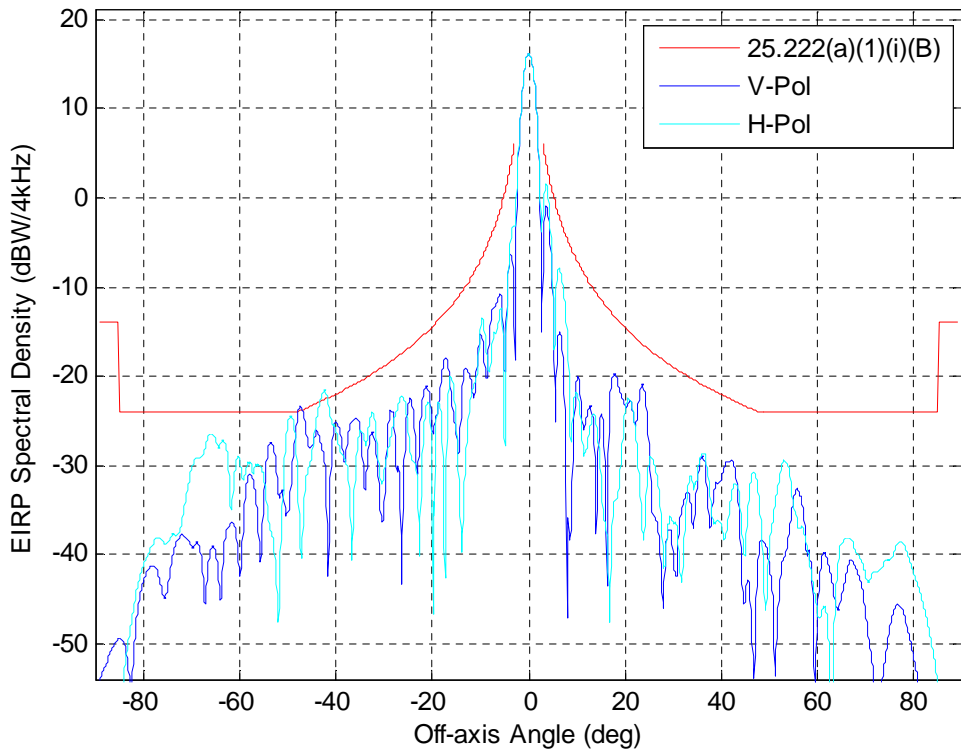


Figure 16. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

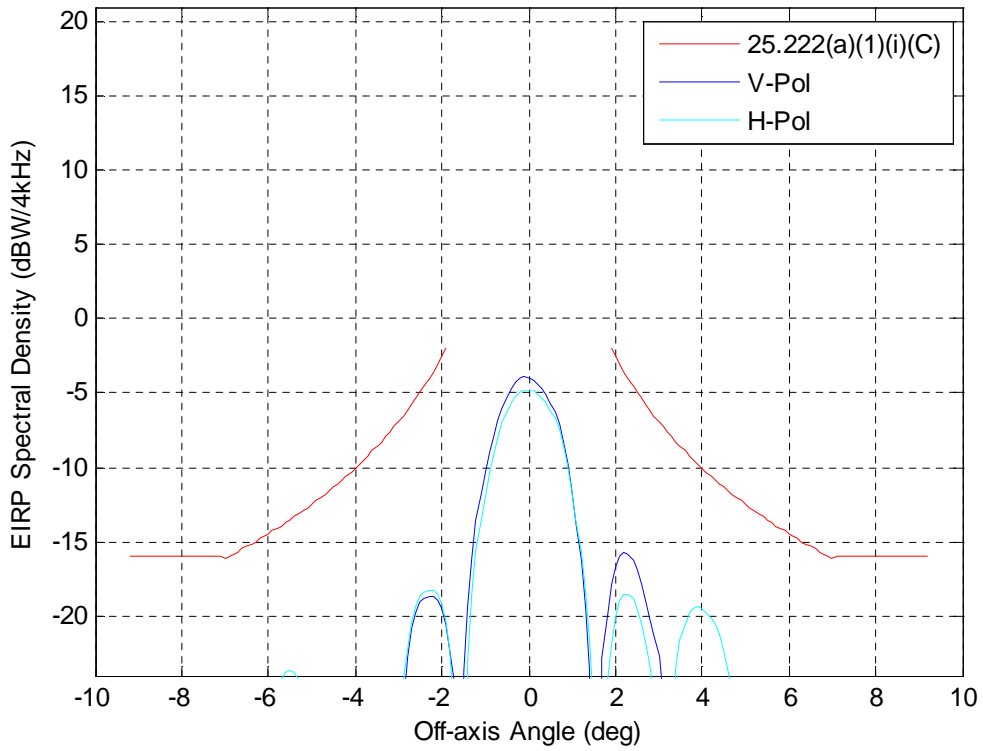


Figure 17. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

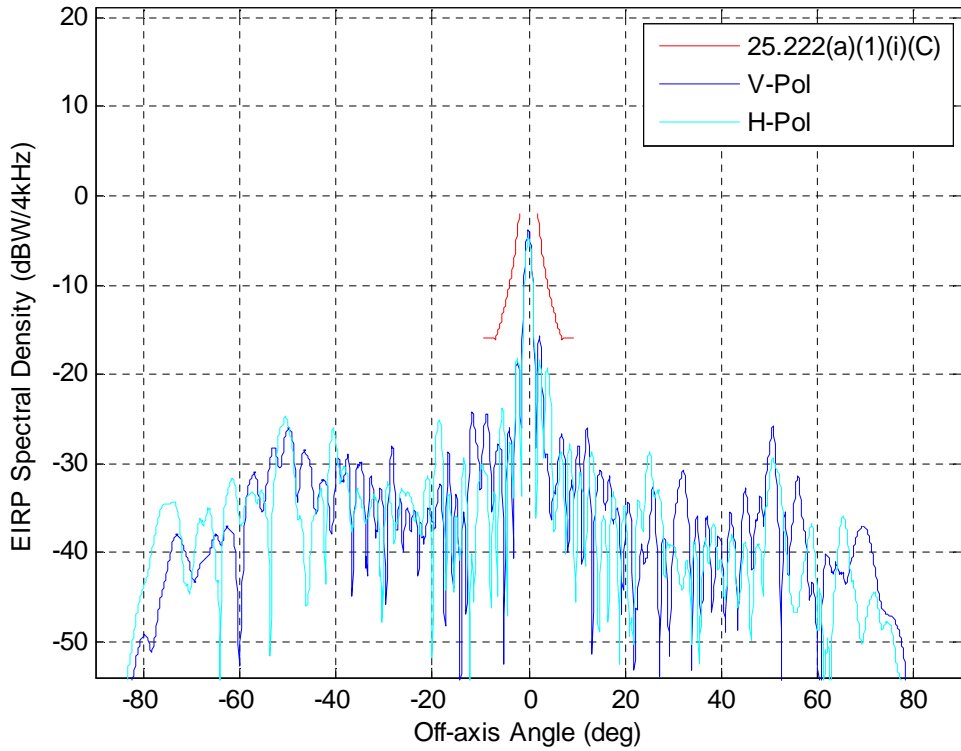


Figure 18. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

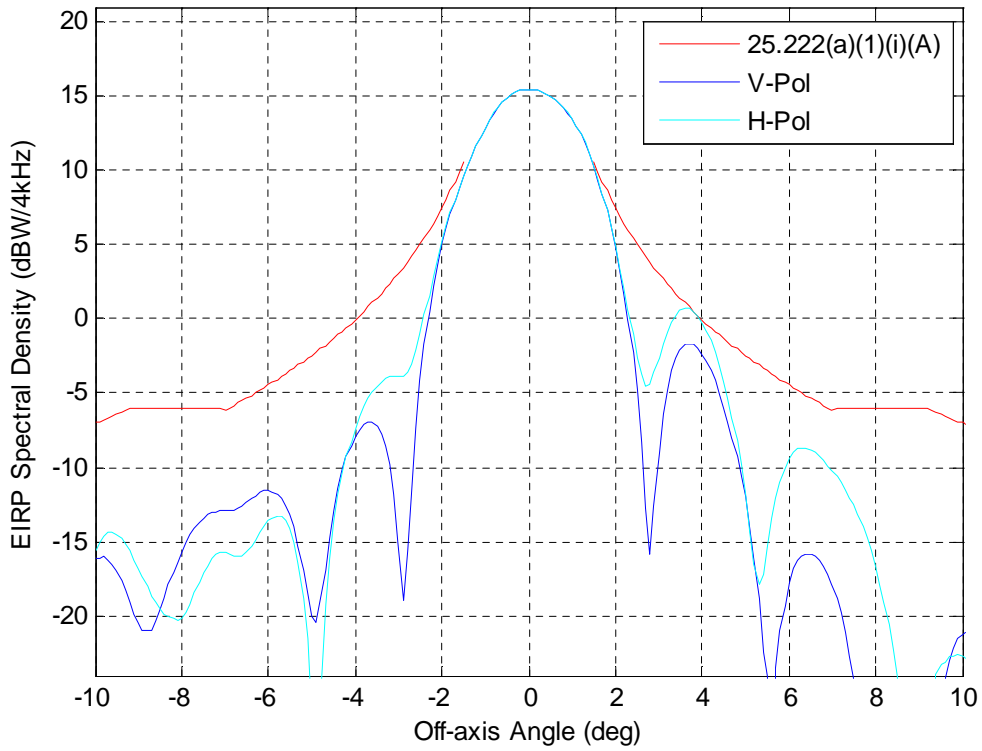


Figure 19. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

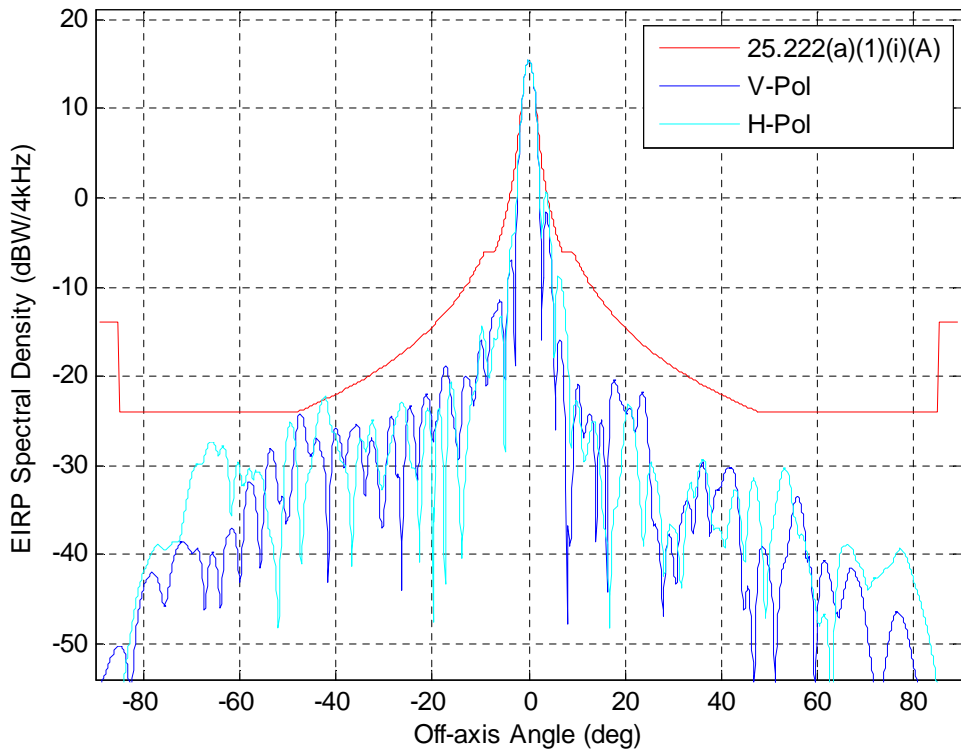


Figure 20. Along the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg



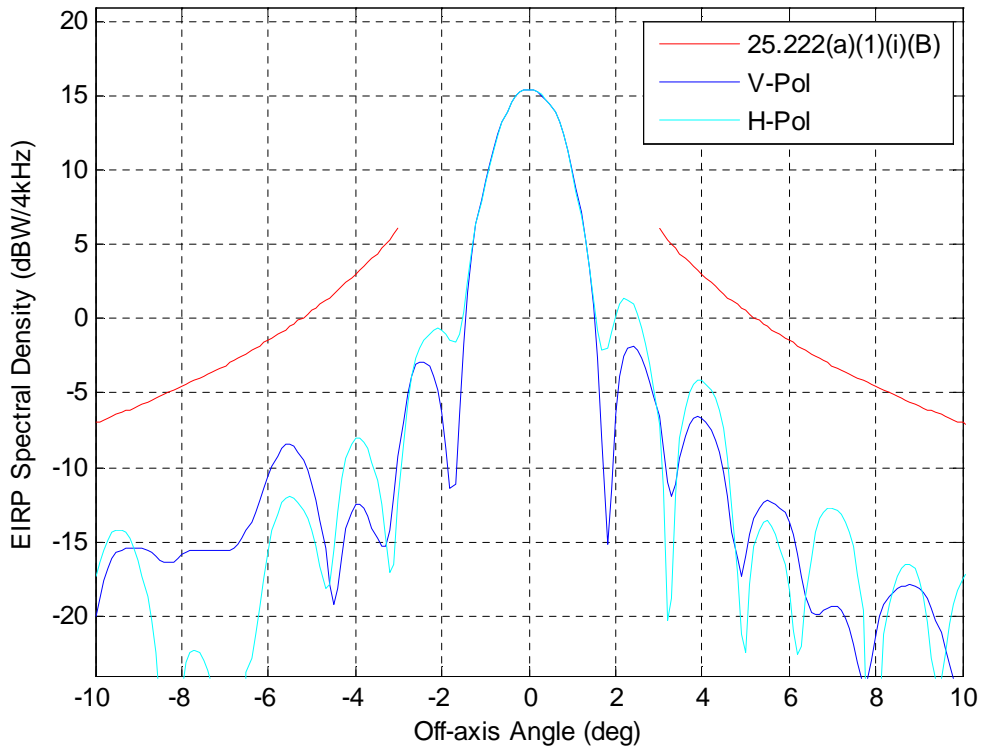


Figure 21. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

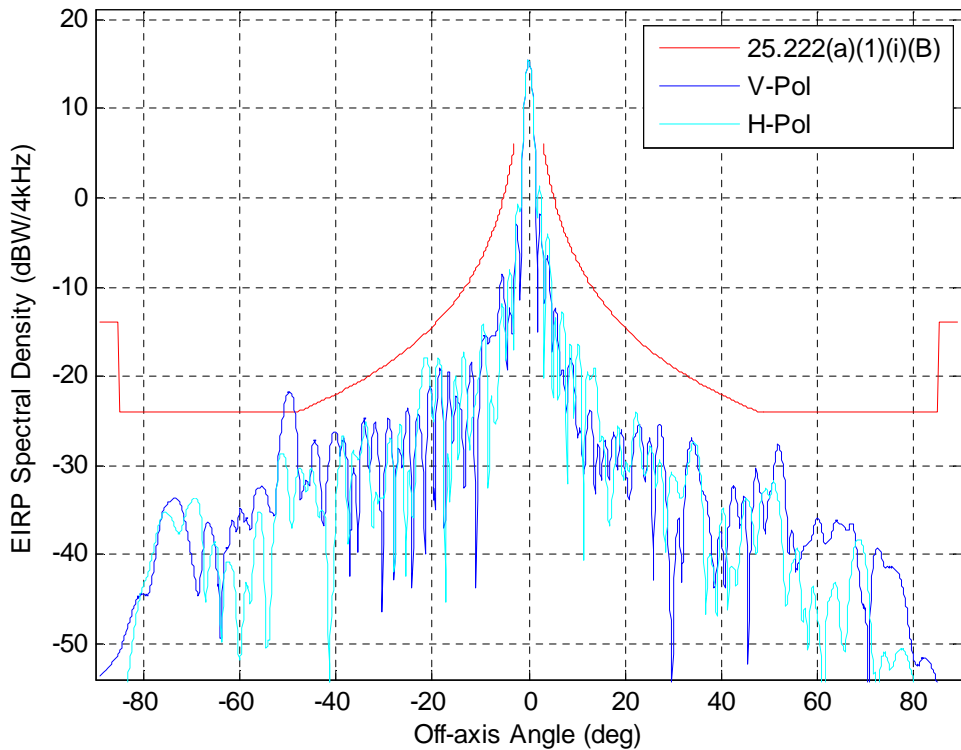


Figure 22. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 45 deg, Skew 30 deg

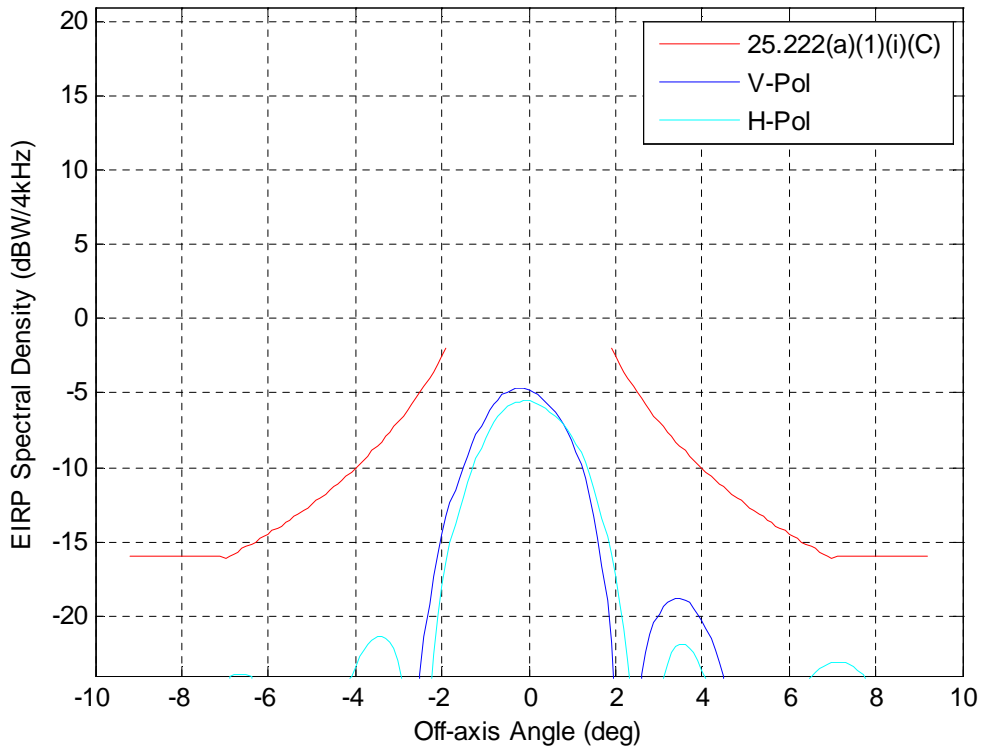


Figure 23. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

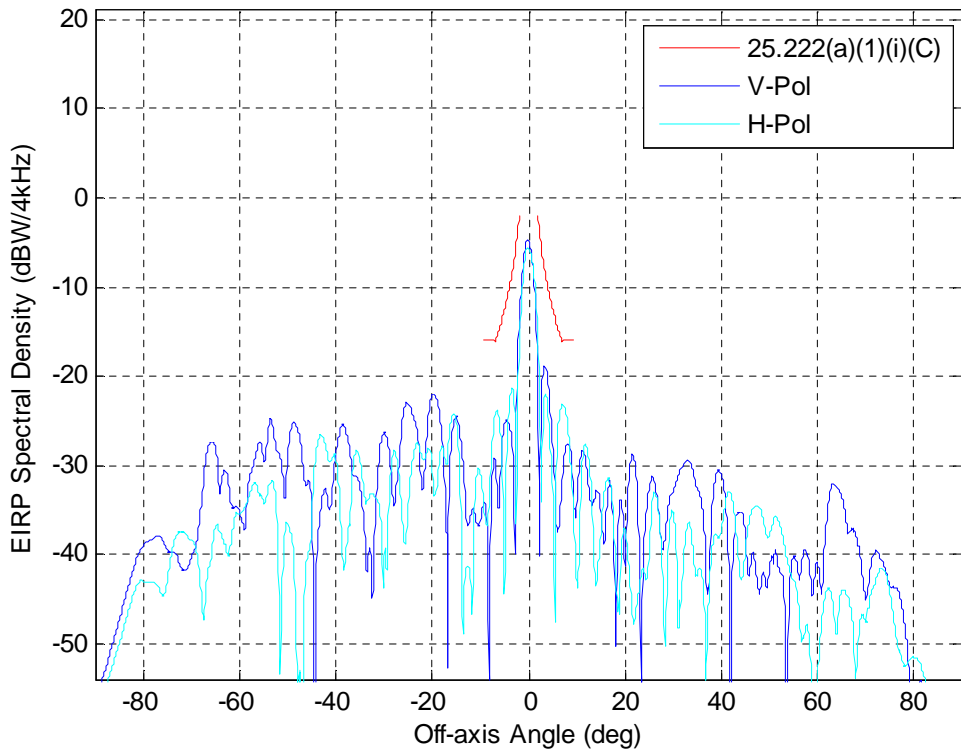


Figure 24. Along the GSO, Cross-Pol, 14.25 GHz, EI 45 deg, Skew 60 deg

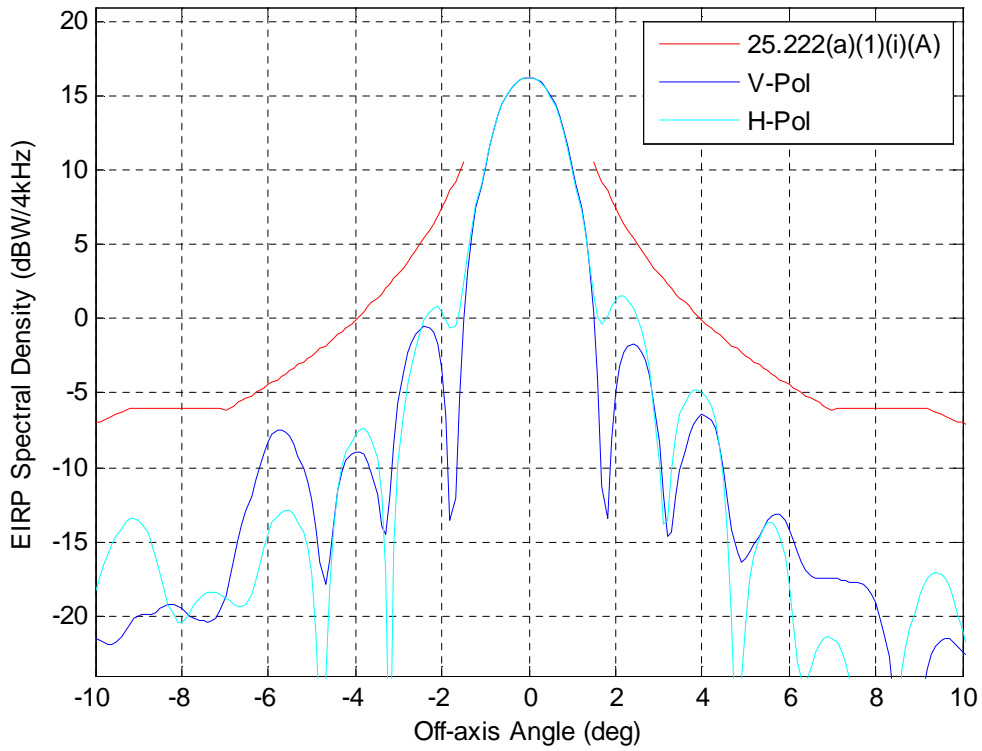


Figure 25. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

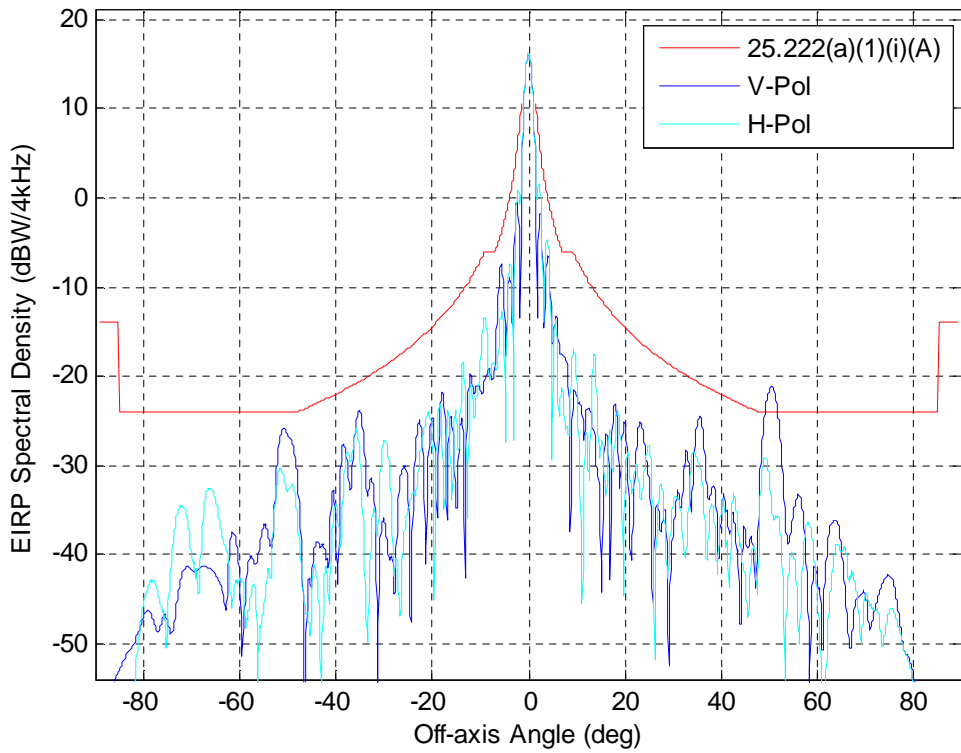


Figure 26. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

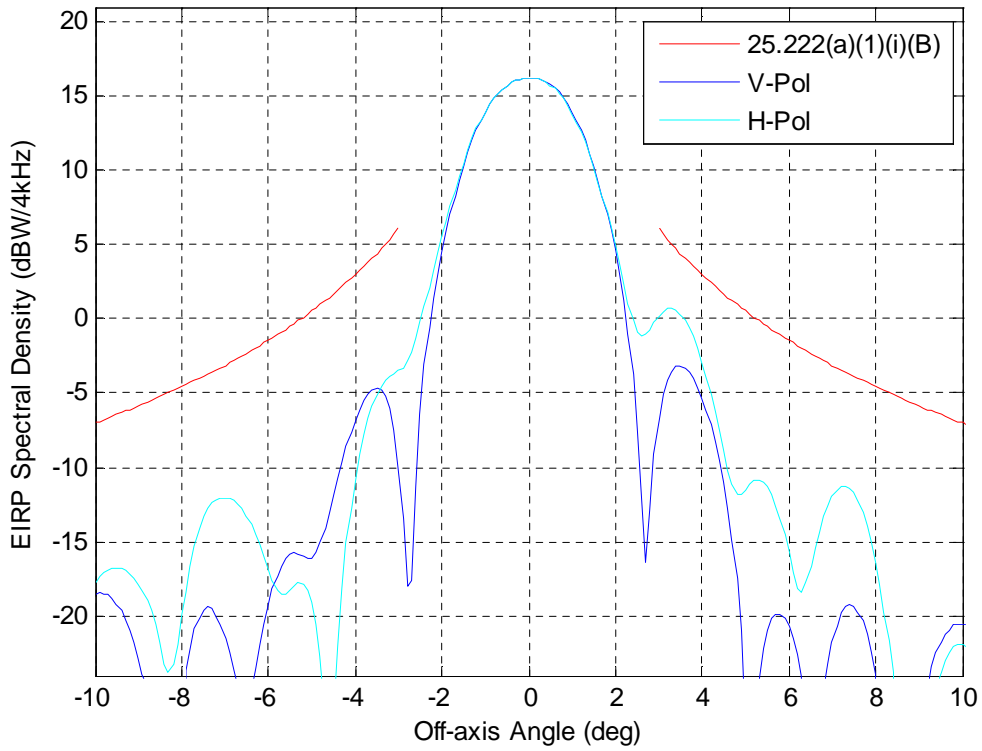


Figure 27. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

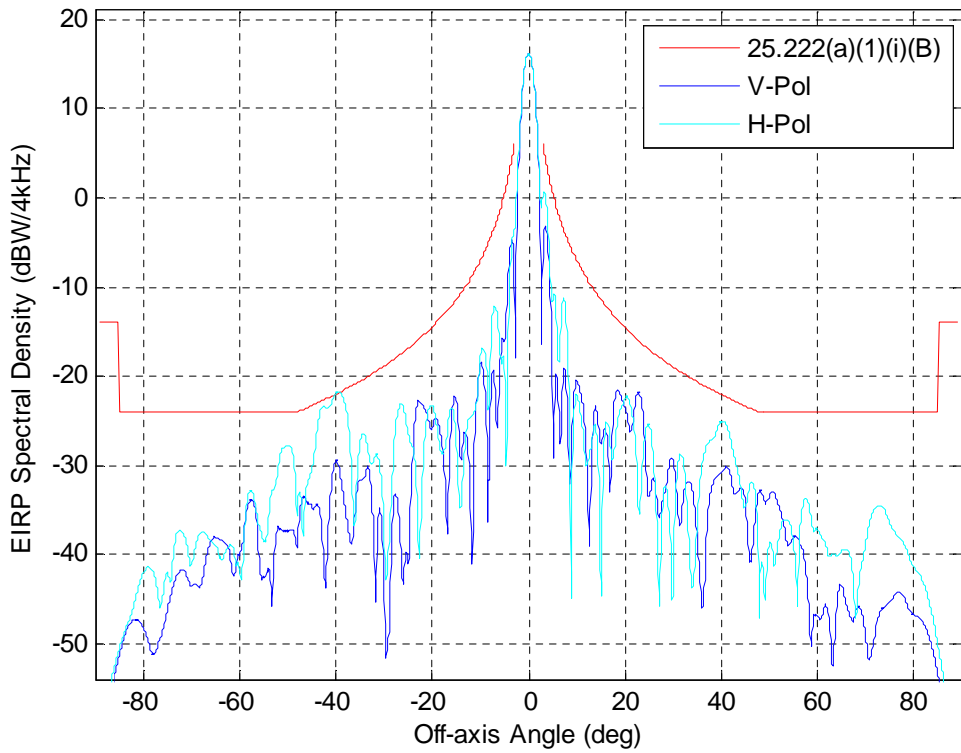


Figure 28. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

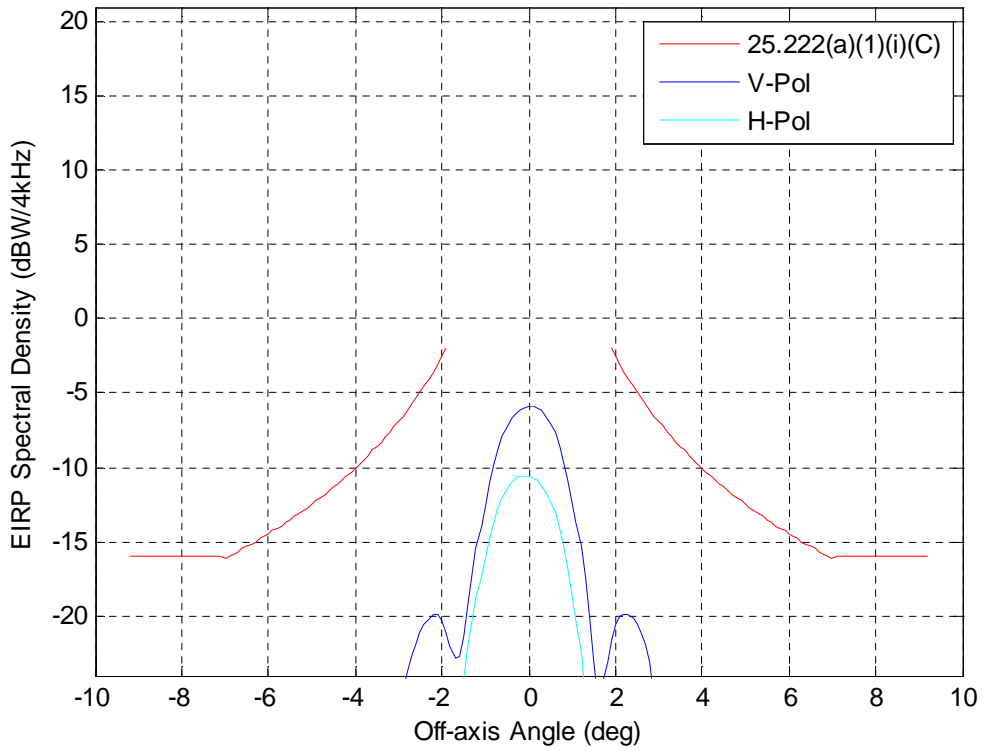


Figure 29. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

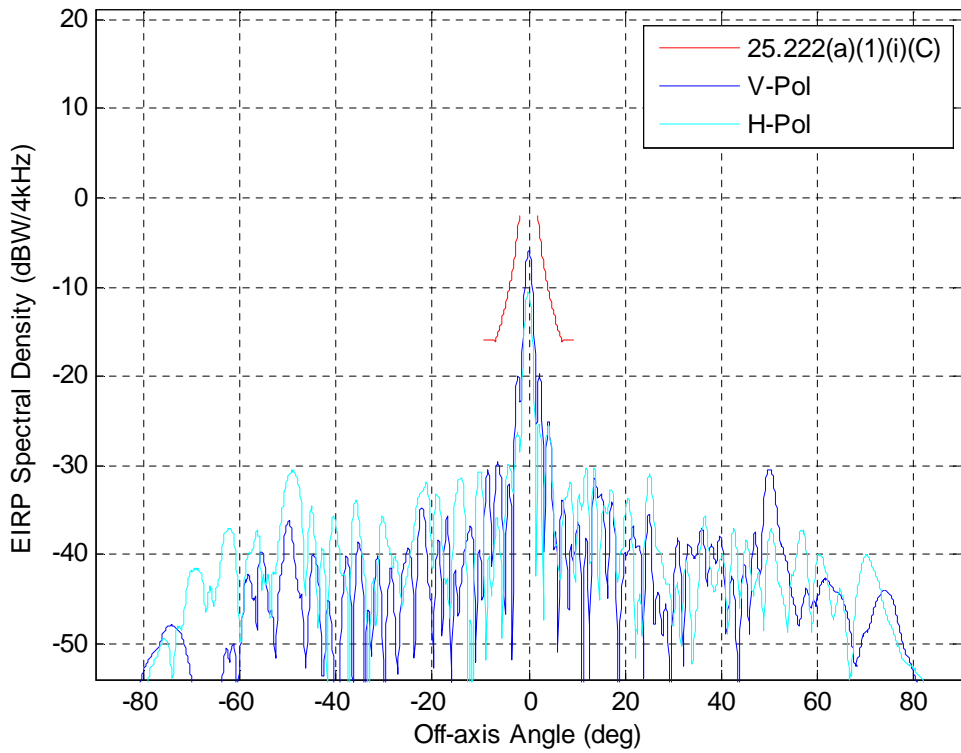


Figure 30. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

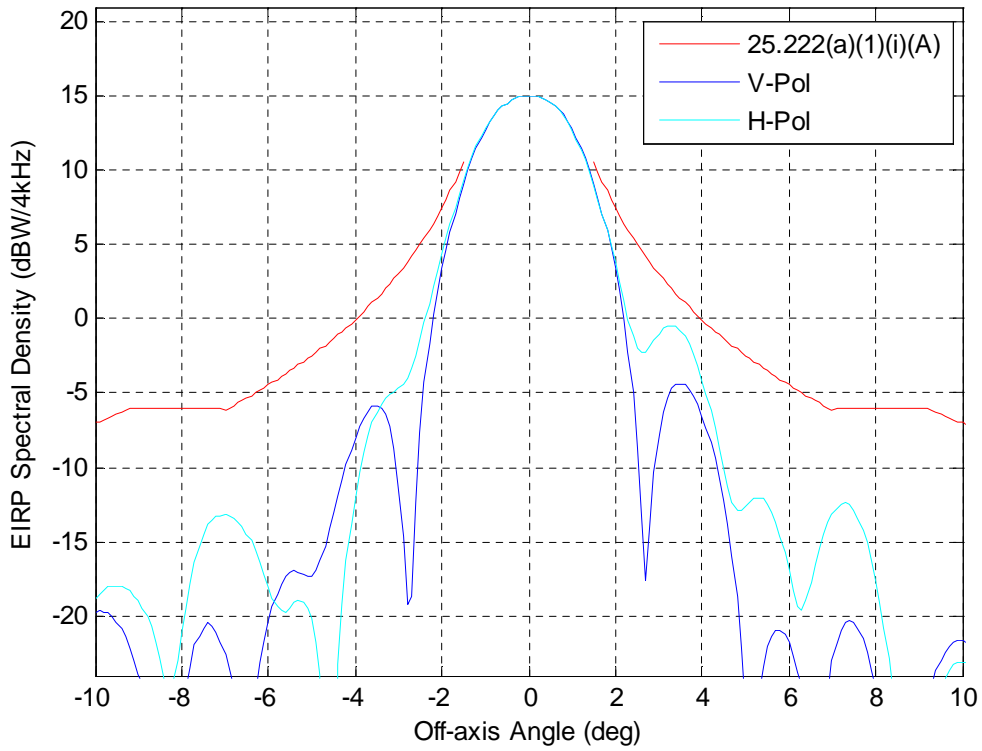


Figure 31. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

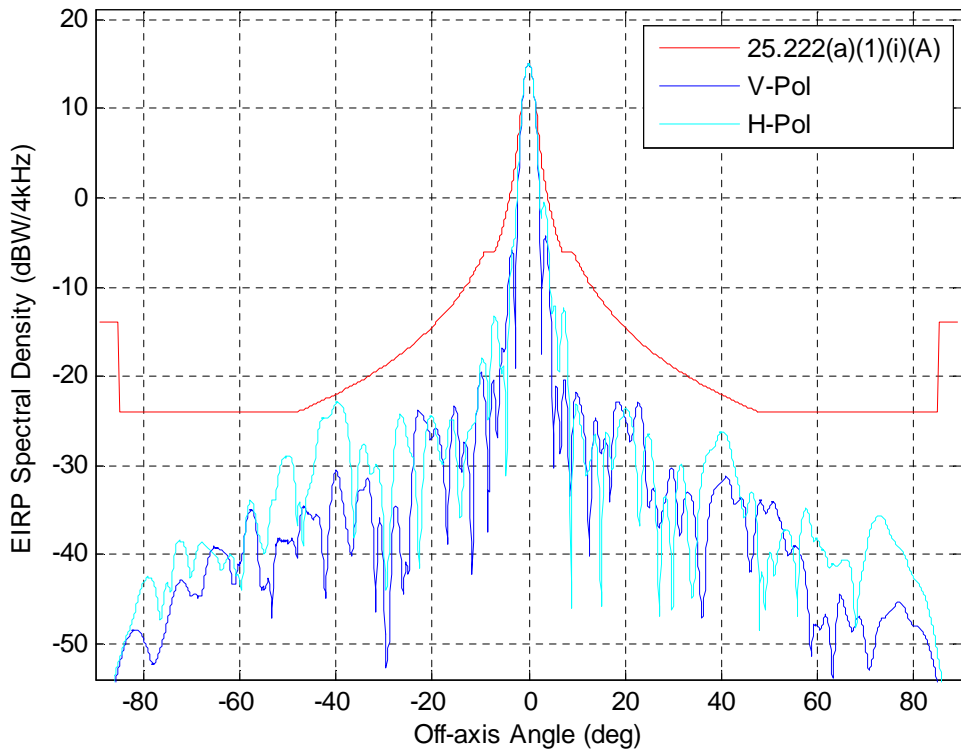


Figure 32. Along the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

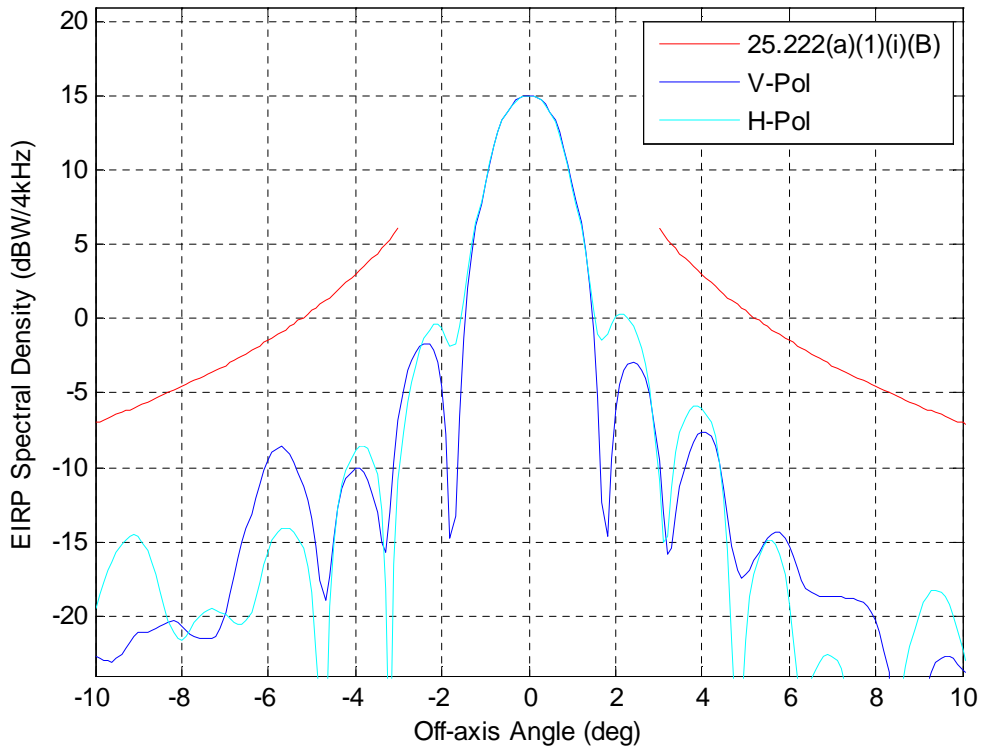


Figure 33. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

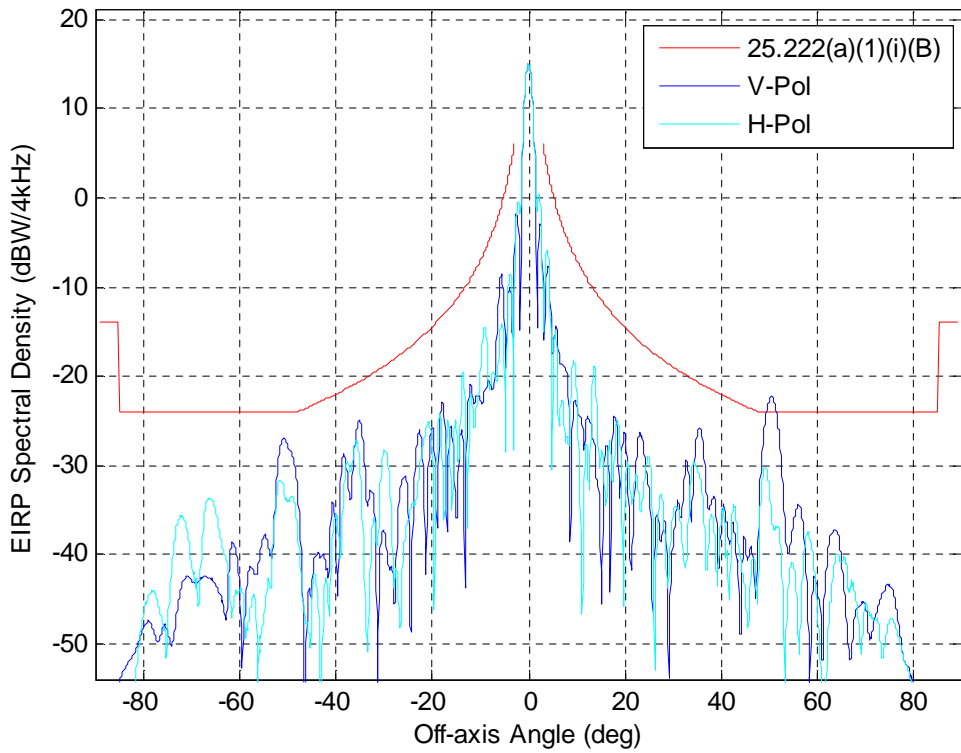


Figure 34. Perpendicular to the GSO, Co-Pol, 14.25 GHz, EI 90 deg, Skew 30 deg

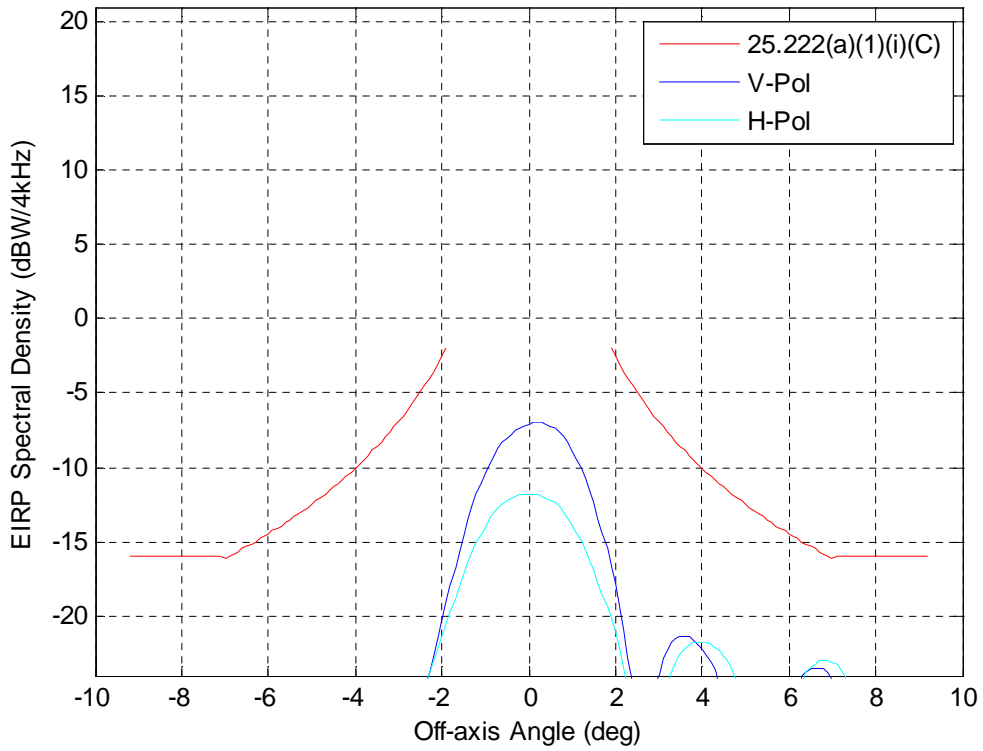


Figure 35. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg

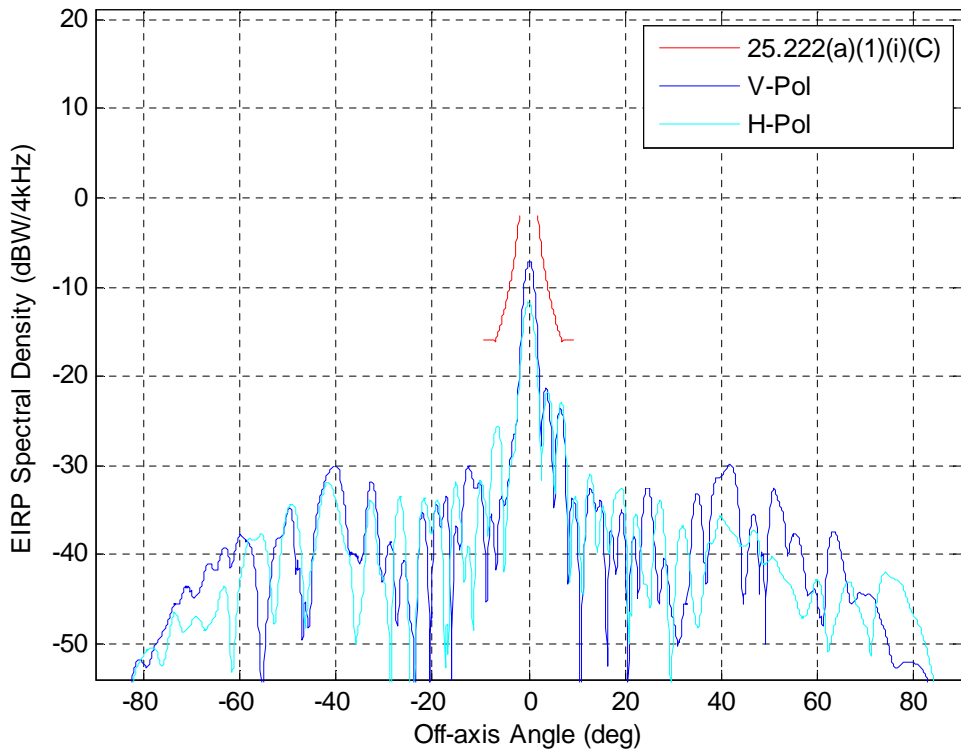


Figure 36. Along the GSO, Cross-Pol, 14.25 GHz, EI 90 deg, Skew 60 deg



## EXHIBIT D. Off-Axis EIRP Tables

Off-axis EIRP values are presented in this section for the azimuth and elevation planes of the AURA LE antenna, including co-pol and cross-pol, at various elevation angles and frequencies. All values are plotted against the FCC 25.209gain masks.

### 5.1 Table 1. Off-axis EIRP Spectral Density-25 Degree Elevation

(14.25 GHz, 30 and 60 deg skew angle, 25 deg elevation)

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-89.0	-45.7	-52.2	-68.9	-54.6	-59.7	-52.9	-70.2	-55.8	-47.0	-53.4	-62.3	-63.3
-85.0	-41.4	-48.3	-58.9	-47.0	-56.1	-49.0	-60.1	-48.2	-42.7	-49.6	-52.5	-54.1
-80.0	-40.8	-37.8	-45.6	-40.0	-49.3	-40.9	-46.9	-41.3	-42.0	-39.0	-41.8	-48.0
-75.0	-44.2	-30.1	-42.6	-41.8	-54.7	-33.0	-43.9	-43.0	-45.4	-31.3	-45.9	-51.8
-70.0	-35.4	-35.6	-43.1	-35.3	-47.9	-37.7	-44.3	-36.5	-36.6	-36.8	-37.0	-50.3
-65.0	-39.2	-34.1	-38.5	-37.9	-50.4	-41.2	-39.7	-39.2	-40.5	-35.4	-33.7	-45.3
-60.0	-30.2	-37.4	-31.5	-34.3	-37.6	-35.0	-32.7	-35.5	-31.4	-38.6	-35.9	-37.0
-55.0	-37.0	-40.9	-31.7	-40.2	-38.4	-42.2	-32.9	-41.4	-38.2	-42.1	-41.8	-34.8
-50.0	-21.2	-30.1	-34.8	-30.5	-50.2	-31.9	-36.1	-31.7	-22.4	-31.3	-34.0	-41.1
-45.0	-27.2	-27.6	-31.7	-40.8	-48.6	-35.9	-32.9	-42.0	-28.4	-28.8	-35.9	-34.8
-40.0	-38.0	-46.2	-37.1	-23.3	-38.1	-41.2	-38.4	-24.5	-39.3	-47.5	-34.0	-41.3
-35.0	-26.6	-33.2	-26.3	-27.9	-34.7	-38.1	-27.5	-29.1	-27.8	-34.4	-40.9	-51.5
-30.0	-27.6	-24.7	-30.8	-29.6	-33.0	-38.7	-32.0	-30.8	-28.8	-25.9	-37.0	-41.4
-25.0	-20.4	-14.0	-29.6	-23.0	-38.4	-32.7	-30.8	-24.2	-21.6	-15.2	-41.7	-43.2
-20.0	-16.4	-22.9	-21.5	-17.3	-36.9	-34.7	-22.7	-18.5	-17.6	-24.1	-41.6	-35.4
-15.0	-41.7	-19.5	-22.1	-22.8	-41.7	-30.8	-23.3	-24.0	-42.9	-20.8	-31.7	-28.2
-10.0	-26.0	-17.0	-16.1	-18.6	-46.6	-28.2	-17.3	-19.8	-27.2	-18.2	-37.9	-26.5
-9.9	-25.5	-19.4	-16.0	-18.5	-42.7	-28.4	-17.2	-19.7	-26.7	-20.6	-37.9	-26.5
-9.8	-23.9	-22.9	-15.9	-18.5	-39.7	-28.5	-17.2	-19.7	-25.1	-24.1	-38.0	-26.4
-9.7	-22.3	-29.4	-15.9	-18.5	-37.8	-28.6	-17.1	-19.7	-23.5	-30.7	-38.2	-26.6
-9.6	-21.0	-35.6	-16.1	-18.7	-36.7	-28.8	-17.3	-19.9	-22.3	-36.8	-38.6	-26.9
-9.5	-20.1	-29.3	-16.5	-19.0	-36.2	-29.2	-17.7	-20.2	-21.3	-30.5	-39.3	-27.3
-9.4	-19.2	-22.0	-16.9	-19.4	-36.0	-29.9	-18.1	-20.6	-20.5	-23.2	-40.0	-28.0
-9.3	-18.5	-17.8	-17.5	-19.8	-36.1	-30.7	-18.7	-21.1	-19.7	-19.0	-40.7	-28.7
-9.2	-17.8	-15.1	-18.5	-20.2	-36.3	-31.4	-19.7	-21.4	-19.1	-16.3	-41.4	-29.7
-9.1	-17.4	-13.0	-19.4	-20.3	-36.7	-31.9	-20.7	-21.6	-18.6	-14.2	-41.9	-30.9
-9.0	-17.1	-11.4	-21.0	-20.4	-37.1	-32.3	-22.2	-21.6	-18.3	-12.7	-42.2	-32.2
-8.9	-17.1	-10.4	-22.4	-20.2	-37.7	-32.7	-23.6	-21.4	-18.3	-11.6	-42.1	-33.8

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-8.8	-17.3	-9.8	-24.2	-19.5	-38.4	-33.2	-25.4	-20.7	-18.5	-11.0	-41.6	-35.1
-8.7	-17.6	-9.6	-25.1	-19.0	-39.4	-34.4	-26.3	-20.3	-18.9	-10.8	-41.0	-35.8
-8.6	-17.7	-9.8	-25.1	-18.3	-40.5	-36.5	-26.3	-19.5	-18.9	-11.0	-40.3	-36.7
-8.5	-17.1	-10.1	-25.6	-17.6	-40.7	-39.1	-26.8	-18.8	-18.3	-11.4	-39.7	-35.9
-8.4	-15.9	-10.8	-23.6	-16.8	-39.4	-41.1	-24.8	-18.0	-17.1	-12.0	-39.0	-35.5
-8.3	-14.5	-11.7	-22.1	-16.1	-37.4	-39.8	-23.3	-17.3	-15.7	-12.9	-38.3	-35.1
-8.2	-13.1	-12.8	-20.1	-15.3	-35.6	-36.9	-21.3	-16.5	-14.3	-14.0	-37.5	-33.7
-8.1	-11.9	-14.0	-18.1	-14.3	-34.3	-34.6	-19.3	-15.5	-13.2	-15.3	-36.8	-32.6
-8.0	-11.0	-15.3	-16.6	-13.3	-33.5	-32.9	-17.8	-14.6	-12.3	-16.5	-36.0	-31.1
-7.9	-10.2	-16.6	-14.7	-12.3	-32.9	-31.6	-16.0	-13.5	-11.5	-17.8	-35.3	-29.5
-7.8	-9.4	-17.3	-13.5	-11.2	-32.5	-30.2	-14.8	-12.4	-10.7	-18.5	-34.5	-28.0
-7.7	-8.7	-16.5	-12.1	-10.2	-32.1	-28.9	-13.4	-11.4	-9.9	-17.7	-33.7	-26.6
-7.6	-8.0	-14.7	-11.2	-9.2	-31.8	-27.7	-12.5	-10.4	-9.2	-15.9	-33.2	-25.5
-7.5	-7.4	-12.8	-10.2	-8.4	-31.6	-26.7	-11.4	-9.6	-8.6	-14.1	-32.5	-24.5
-7.4	-7.0	-11.3	-9.6	-7.6	-31.5	-26.0	-10.8	-8.8	-8.2	-12.5	-32.1	-23.6
-7.3	-6.8	-10.3	-8.8	-7.0	-31.5	-25.7	-10.0	-8.2	-8.0	-11.5	-31.6	-22.9
-7.2	-6.9	-9.9	-8.3	-6.4	-32.0	-25.9	-9.6	-7.7	-8.1	-11.1	-31.2	-22.3
-7.1	-7.2	-9.7	-8.1	-6.2	-32.7	-26.3	-9.4	-7.4	-8.4	-10.9	-31.2	-22.1
-7.0	-7.7	-9.9	-7.8	-5.8	-33.6	-27.3	-9.1	-7.1	-8.9	-11.1	-31.0	-21.8
-6.9	-8.3	-10.2	-7.8	-5.7	-34.1	-28.6	-9.1	-7.0	-9.6	-11.5	-31.1	-21.6
-6.8	-9.1	-11.0	-7.8	-5.6	-33.7	-30.2	-9.0	-6.8	-10.3	-12.2	-31.3	-21.5
-6.7	-9.9	-11.9	-8.0	-5.6	-32.6	-32.4	-9.2	-6.9	-11.1	-13.1	-31.8	-21.4
-6.6	-10.6	-13.1	-8.2	-5.7	-31.4	-34.8	-9.4	-6.9	-11.8	-14.3	-32.3	-21.5
-6.5	-11.2	-14.8	-8.5	-5.8	-30.3	-37.1	-9.7	-7.0	-12.4	-16.0	-33.0	-21.5
-6.4	-11.8	-17.3	-8.9	-6.0	-29.5	-38.2	-10.1	-7.2	-13.0	-18.6	-33.7	-21.6
-6.3	-12.3	-21.5	-9.4	-6.3	-28.9	-36.3	-10.6	-7.5	-13.6	-22.8	-34.8	-21.8
-6.2	-12.5	-21.4	-10.2	-6.7	-28.3	-33.1	-11.4	-7.9	-13.7	-22.6	-36.5	-22.0
-6.1	-12.1	-18.4	-11.0	-7.1	-27.8	-29.8	-12.2	-8.3	-13.3	-19.6	-38.5	-22.3
-6.0	-11.3	-14.3	-12.0	-7.7	-27.3	-27.6	-13.3	-9.0	-12.5	-15.5	-41.0	-22.6
-5.9	-10.3	-11.2	-13.2	-8.5	-27.0	-25.8	-14.4	-9.7	-11.5	-12.4	-44.0	-23.1
-5.8	-9.6	-9.5	-15.2	-9.4	-26.9	-24.9	-16.4	-10.6	-10.8	-10.7	-46.5	-23.7
-5.7	-9.2	-8.4	-17.2	-10.4	-27.1	-24.3	-18.4	-11.7	-10.4	-9.6	-49.1	-24.5
-5.6	-9.2	-7.9	-20.6	-12.1	-27.7	-24.3	-21.9	-13.4	-10.4	-9.1	-45.7	-25.5
-5.5	-9.6	-7.7	-29.2	-14.3	-28.7	-24.7	-30.4	-15.6	-10.8	-8.9	-40.2	-26.9
-5.4	-10.4	-7.7	-30.9	-17.6	-30.4	-25.5	-32.2	-18.8	-11.6	-8.9	-36.5	-28.7
-5.3	-11.6	-7.9	-19.9	-20.4	-32.8	-26.6	-21.2	-21.6	-12.8	-9.1	-33.7	-30.8
-5.2	-13.2	-8.3	-15.3	-17.8	-36.5	-28.2	-16.5	-19.1	-14.4	-9.6	-31.5	-32.3

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-5.1	-15.4	-8.9	-12.0	-14.6	-43.1	-30.1	-13.2	-15.8	-16.6	-10.1	-29.8	-31.9
-5.0	-18.3	-9.7	-9.6	-11.0	-52.0	-33.0	-10.9	-12.3	-19.5	-10.9	-28.3	-30.8
-4.9	-22.1	-10.8	-7.7	-8.6	-43.7	-37.5	-9.0	-9.8	-23.3	-12.0	-27.0	-28.6
-4.8	-24.3	-12.4	-6.5	-6.6	-37.1	-42.1	-7.7	-7.9	-25.5	-13.7	-26.0	-26.7
-4.7	-19.3	-14.5	-5.4	-5.2	-32.9	-38.9	-6.6	-6.4	-20.5	-15.7	-25.1	-25.3
-4.6	-14.4	-15.3	-4.5	-4.1	-30.0	-32.0	-5.7	-5.3	-15.6	-16.5	-24.4	-24.2
-4.5	-11.1	-13.5	-4.0	-3.3	-27.9	-27.8	-5.2	-4.5	-12.3	-14.7	-23.8	-23.4
-4.4	-8.8	-11.0	-3.5	-2.7	-26.3	-25.2	-4.8	-3.9	-10.1	-12.3	-23.5	-22.8
-4.3	-7.3	-8.9	-3.3	-2.2	-25.2	-23.4	-4.5	-3.4	-8.5	-10.1	-23.2	-22.4
-4.2	-6.4	-7.6	-3.1	-1.7	-24.6	-22.4	-4.3	-3.0	-7.7	-8.8	-22.9	-22.1
-4.1	-6.1	-6.8	-3.0	-1.3	-24.5	-21.8	-4.2	-2.6	-7.3	-8.1	-22.7	-21.8
-4.0	-6.1	-6.6	-3.0	-1.0	-24.7	-21.5	-4.2	-2.2	-7.3	-7.8	-22.6	-21.5
-3.9	-6.4	-6.6	-3.1	-0.7	-25.2	-21.4	-4.3	-1.9	-7.6	-7.8	-22.5	-21.3
-3.8	-7.0	-6.8	-3.2	-0.5	-26.0	-21.5	-4.4	-1.7	-8.2	-8.1	-22.5	-21.2
-3.7	-7.8	-7.4	-3.5	-0.4	-27.1	-21.7	-4.8	-1.6	-9.0	-8.6	-22.5	-21.1
-3.6	-9.0	-8.3	-4.0	-0.3	-28.6	-22.2	-5.2	-1.5	-10.2	-9.5	-22.7	-21.1
-3.5	-10.6	-9.5	-4.7	-0.3	-30.6	-22.8	-5.9	-1.6	-11.8	-10.7	-22.9	-21.1
-3.4	-12.8	-11.3	-5.6	-0.5	-33.5	-23.7	-6.8	-1.7	-14.1	-12.5	-23.2	-21.4
-3.3	-16.8	-13.9	-6.9	-0.7	-38.7	-25.1	-8.1	-1.9	-18.0	-15.1	-23.7	-21.7
-3.2	-24.1	-15.9	-8.9	-1.1	-42.1	-27.5	-10.2	-2.3	-25.4	-17.2	-24.4	-22.2
-3.1	-17.2	-13.9	-12.4	-1.5	-33.6	-30.9	-13.6	-2.8	-18.5	-15.1	-25.2	-22.9
-3.0	-11.1	-9.2	-17.5	-2.1	-28.6	-33.5	-18.7	-3.3	-12.3	-10.4	-26.6	-23.8
-2.9	-7.6	-5.8	-22.7	-2.6	-25.5	-32.5	-23.9	-3.8	-8.8	-7.0	-28.0	-24.6
-2.8	-5.3	-3.5	-16.2	-2.8	-23.4	-28.8	-17.4	-4.0	-6.6	-4.7	-29.3	-25.1
-2.7	-4.0	-1.9	-8.4	-2.6	-22.1	-26.2	-9.6	-3.8	-5.2	-3.1	-29.9	-24.9
-2.6	-3.4	-0.9	-4.6	-1.8	-21.3	-24.7	-5.8	-3.1	-4.6	-2.1	-29.7	-24.1
-2.5	-3.2	-0.2	-1.9	-0.6	-20.9	-23.8	-3.1	-1.8	-4.4	-1.4	-27.7	-22.7
-2.4	-3.1	0.4	0.3	0.7	-20.6	-23.0	-0.9	-0.6	-4.4	-0.8	-25.4	-21.2
-2.3	-3.4	0.9	2.0	2.0	-20.5	-22.3	0.8	0.8	-4.6	-0.3	-23.4	-19.8
-2.2	-3.9	1.3	3.6	3.3	-20.5	-21.7	2.3	2.1	-5.1	0.1	-21.6	-18.5
-2.1	-4.9	1.5	4.8	4.5	-20.7	-21.5	3.6	3.2	-6.1	0.3	-20.2	-17.3
-2.0	-6.5	1.5	5.9	5.5	-21.2	-21.5	4.7	4.3	-7.7	0.3	-19.0	-16.3
-1.9	-9.3	1.3	6.8	6.5	-21.9	-22.0	5.6	5.2	-10.5	0.1	-17.9	-15.5
-1.8	-13.4	0.9	7.7	7.3	-23.0	-22.9	6.5	6.1	-14.6	-0.4	-17.0	-14.7
-1.7	-11.3	0.5	8.5	8.1	-24.4	-24.2	7.2	6.9	-12.6	-0.7	-16.2	-14.0
-1.6	-5.2	0.7	9.2	8.8	-25.3	-24.7	8.0	7.6	-6.4	-0.5	-15.5	-13.4
-1.5	-0.9	1.6	9.9	9.6	-24.4	-23.8	8.7	8.3	-2.2	0.4	-14.8	-12.8

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-1.4	2.2	3.0	10.6	10.2	-22.2	-21.8	9.3	9.0	0.9	1.8	-14.2	-12.1
-1.3	4.5	4.7	11.2	10.9	-19.9	-19.5	10.0	9.7	3.3	3.4	-13.6	-11.6
-1.2	6.3	6.2	11.8	11.5	-18.0	-17.5	10.5	10.3	5.1	5.0	-13.0	-11.1
-1.1	7.8	7.5	12.3	12.0	-16.4	-15.8	11.1	10.8	6.5	6.3	-12.5	-10.6
-1.0	8.9	8.7	12.8	12.5	-15.2	-14.5	11.5	11.3	7.7	7.5	-12.1	-10.2
-0.9	10.1	9.8	13.2	13.0	-14.0	-13.2	11.9	11.8	8.8	8.6	-11.7	-9.8
-0.8	11.1	10.8	13.5	13.4	-12.9	-12.0	12.3	12.2	9.9	9.6	-11.4	-9.6
-0.7	12.0	11.8	13.8	13.7	-11.9	-11.0	12.6	12.5	10.8	10.5	-11.1	-9.3
-0.6	12.8	12.6	14.1	14.0	-11.1	-10.0	12.9	12.8	11.6	11.4	-10.9	-9.2
-0.5	13.5	13.3	14.3	14.2	-10.4	-9.3	13.1	13.0	12.2	12.1	-10.7	-9.1
-0.4	14.0	13.8	14.4	14.4	-9.9	-8.8	13.2	13.1	12.7	12.6	-10.6	-9.0
-0.3	14.3	14.2	14.5	14.5	-9.5	-8.4	13.3	13.3	13.1	13.0	-10.5	-9.0
-0.2	14.5	14.5	14.6	14.6	-9.3	-8.2	13.4	13.4	13.3	13.2	-10.4	-9.1
-0.1	14.6	14.6	14.7	14.6	-9.2	-8.0	13.4	13.4	13.4	13.4	-10.4	-9.1
0.0	14.7	14.7	14.7	14.7	-9.2	-8.0	13.4	13.4	13.4	13.4	-10.4	-9.2
0.1	14.6	14.6	14.6	14.7	-9.3	-8.1	13.4	13.4	13.4	13.4	-10.4	-9.4
0.2	14.5	14.5	14.6	14.6	-9.4	-8.2	13.4	13.4	13.3	13.3	-10.5	-9.6
0.3	14.3	14.4	14.5	14.6	-9.7	-8.5	13.3	13.3	13.1	13.1	-10.6	-9.8
0.4	14.0	14.1	14.4	14.5	-10.0	-8.8	13.2	13.2	12.8	12.9	-10.7	-10.1
0.5	13.7	13.8	14.3	14.3	-10.4	-9.3	13.1	13.1	12.5	12.5	-10.8	-10.4
0.6	13.2	13.3	14.1	14.2	-10.9	-9.9	12.9	13.0	12.0	12.1	-11.0	-10.7
0.7	12.5	12.6	13.9	14.0	-11.7	-10.6	12.7	12.8	11.3	11.4	-11.1	-11.1
0.8	11.7	11.8	13.7	13.8	-12.6	-11.6	12.5	12.6	10.4	10.6	-11.3	-11.5
0.9	10.7	10.9	13.5	13.6	-13.8	-12.8	12.2	12.4	9.4	9.7	-11.6	-11.9
1.0	9.5	9.8	13.1	13.3	-15.1	-14.2	11.9	12.1	8.3	8.6	-11.9	-12.5
1.1	8.2	8.6	12.7	12.9	-16.5	-15.7	11.5	11.7	7.0	7.4	-12.3	-13.1
1.2	6.8	7.4	12.3	12.5	-18.0	-17.3	11.1	11.3	5.6	6.2	-12.8	-13.7
1.3	5.3	6.3	11.8	12.0	-19.5	-19.0	10.5	10.8	4.1	5.0	-13.3	-14.5
1.4	3.5	5.0	11.2	11.5	-21.1	-21.0	10.0	10.3	2.3	3.8	-13.8	-15.2
1.5	1.3	3.8	10.5	10.9	-22.7	-23.6	9.3	9.7	0.1	2.6	-14.4	-16.1
1.6	-1.4	2.7	9.9	10.3	-24.2	-26.9	8.6	9.1	-2.6	1.5	-15.1	-16.9
1.7	-4.5	2.1	9.1	9.7	-25.0	-30.8	7.9	8.4	-5.7	0.8	-15.8	-17.8
1.8	-6.8	1.9	8.3	9.0	-25.0	-34.1	7.1	7.8	-8.0	0.6	-16.5	-18.8
1.9	-6.6	2.0	7.5	8.3	-24.7	-33.8	6.2	7.1	-7.8	0.8	-17.2	-19.7
2.0	-5.0	2.2	6.6	7.6	-24.3	-31.9	5.4	6.4	-6.2	1.0	-17.8	-20.6
2.1	-3.7	2.4	5.7	6.9	-24.2	-30.7	4.5	5.7	-4.9	1.1	-18.4	-21.5
2.2	-2.9	2.3	4.7	6.2	-24.3	-30.3	3.5	5.0	-4.1	1.1	-18.9	-22.4

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
2.3	-2.5	2.1	3.7	5.6	-24.8	-30.7	2.4	4.3	-3.7	0.9	-19.4	-23.4
2.4	-2.4	1.7	2.5	4.9	-25.5	-31.5	1.3	3.7	-3.6	0.5	-19.9	-24.4
2.5	-2.5	1.1	1.2	4.2	-26.3	-32.9	-0.1	3.0	-3.8	-0.1	-20.3	-25.4
2.6	-2.9	0.4	-0.3	3.7	-27.1	-34.8	-1.6	2.4	-4.1	-0.9	-20.7	-26.5
2.7	-3.4	-0.5	-1.9	3.2	-27.9	-37.2	-3.1	1.9	-4.6	-1.7	-21.0	-27.7
2.8	-4.0	-1.5	-3.5	2.7	-28.6	-39.7	-4.7	1.5	-5.3	-2.7	-21.3	-28.8
2.9	-5.1	-2.7	-4.9	2.5	-29.2	-42.8	-6.1	1.3	-6.3	-4.0	-21.5	-30.0
3.0	-6.8	-4.7	-5.7	2.4	-29.7	-43.7	-6.9	1.1	-8.1	-5.9	-21.7	-31.3
3.1	-9.5	-7.6	-5.9	2.3	-29.8	-40.4	-7.1	1.1	-10.7	-8.8	-21.9	-32.5
3.2	-13.5	-12.1	-5.7	2.3	-29.5	-36.9	-6.9	1.1	-14.7	-13.3	-22.0	-33.7
3.3	-19.2	-23.2	-5.1	2.3	-29.0	-34.3	-6.3	1.1	-20.4	-24.4	-22.2	-34.9
3.4	-21.0	-22.7	-4.5	2.3	-28.5	-32.7	-5.7	1.1	-22.2	-23.9	-22.4	-35.8
3.5	-16.3	-15.2	-4.0	2.3	-28.2	-31.7	-5.2	1.0	-17.6	-16.5	-22.7	-36.6
3.6	-13.7	-11.3	-3.6	2.1	-28.3	-31.3	-4.9	0.9	-15.0	-12.5	-23.1	-37.0
3.7	-12.2	-9.5	-3.4	2.0	-28.8	-31.2	-4.6	0.7	-13.4	-10.8	-23.6	-36.9
3.8	-11.3	-8.5	-3.2	1.7	-29.4	-31.2	-4.4	0.5	-12.5	-9.7	-24.2	-36.4
3.9	-10.7	-7.9	-3.2	1.4	-30.4	-31.2	-4.4	0.2	-12.0	-9.1	-25.0	-35.5
4.0	-10.5	-7.7	-3.3	1.0	-31.5	-31.2	-4.6	-0.2	-11.8	-9.0	-25.9	-34.5
4.1	-10.6	-7.8	-3.5	0.6	-33.0	-31.0	-4.7	-0.6	-11.8	-9.0	-26.9	-33.5
4.2	-10.9	-8.1	-3.8	0.1	-34.7	-30.9	-5.0	-1.1	-12.1	-9.3	-28.0	-32.5
4.3	-11.4	-8.7	-4.1	-0.4	-36.8	-30.7	-5.3	-1.6	-12.6	-9.9	-29.3	-31.6
4.4	-12.2	-9.7	-4.5	-1.0	-39.5	-30.5	-5.7	-2.2	-13.4	-10.9	-30.8	-30.7
4.5	-13.3	-11.4	-5.0	-1.6	-43.0	-30.4	-6.2	-2.8	-14.5	-12.6	-32.6	-30.0
4.6	-13.9	-14.7	-5.4	-2.2	-43.4	-30.1	-6.7	-3.5	-15.1	-15.9	-34.7	-29.4
4.7	-13.1	-19.7	-5.9	-2.9	-39.6	-29.7	-7.2	-4.1	-14.4	-20.9	-37.0	-29.0
4.8	-11.6	-23.7	-6.6	-3.6	-36.2	-29.3	-7.8	-4.9	-12.8	-25.0	-39.4	-28.6
4.9	-9.9	-22.5	-7.4	-4.5	-33.9	-28.8	-8.7	-5.7	-11.1	-23.7	-41.3	-28.4
5.0	-8.6	-16.8	-8.4	-5.5	-32.5	-28.4	-9.6	-6.8	-9.9	-18.0	-42.4	-28.3
5.1	-7.8	-14.1	-9.6	-6.9	-31.7	-28.2	-10.9	-8.1	-9.1	-15.3	-41.4	-28.2
5.2	-7.4	-12.7	-11.3	-8.5	-31.3	-28.2	-12.5	-9.7	-8.6	-14.0	-39.8	-28.3
5.3	-7.1	-12.0	-12.9	-10.4	-31.2	-28.2	-14.2	-11.7	-8.4	-13.2	-38.2	-28.4
5.4	-7.0	-11.4	-14.6	-12.8	-31.4	-28.5	-15.9	-14.0	-8.3	-12.7	-36.8	-28.6
5.5	-7.1	-11.3	-15.3	-15.4	-31.7	-28.9	-16.5	-16.6	-8.3	-12.5	-35.7	-29.0
5.6	-7.2	-11.2	-15.3	-17.7	-32.3	-29.4	-16.5	-18.9	-8.4	-12.4	-34.8	-29.4
5.7	-7.5	-11.4	-14.7	-18.4	-33.0	-30.2	-15.9	-19.6	-8.7	-12.6	-34.0	-29.9
5.8	-7.9	-11.8	-13.4	-17.4	-33.9	-31.1	-14.6	-18.6	-9.1	-13.0	-33.5	-30.5
5.9	-8.5	-12.4	-12.2	-15.6	-34.9	-32.4	-13.4	-16.8	-9.7	-13.6	-33.2	-31.2

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
6.0	-9.4	-13.4	-11.1	-13.9	-36.5	-34.4	-12.4	-15.2	-10.6	-14.6	-33.1	-31.9
6.1	-10.9	-14.3	-10.4	-12.8	-38.6	-37.8	-11.6	-14.0	-12.1	-15.5	-33.1	-32.9
6.2	-12.8	-15.0	-9.8	-11.9	-41.2	-42.5	-11.0	-13.1	-14.0	-16.3	-33.2	-33.9
6.3	-15.4	-14.1	-9.3	-11.2	-43.0	-45.9	-10.5	-12.5	-16.6	-15.3	-33.3	-35.1
6.4	-18.7	-12.8	-9.0	-10.8	-42.6	-43.6	-10.2	-12.0	-19.9	-14.0	-33.4	-36.5
6.5	-22.1	-11.3	-8.7	-10.5	-40.8	-38.1	-10.0	-11.7	-23.3	-12.5	-33.4	-38.0
6.6	-23.9	-10.2	-8.6	-10.3	-39.1	-35.1	-9.8	-11.5	-25.1	-11.4	-33.3	-39.6
6.7	-23.2	-9.5	-8.6	-10.2	-38.0	-33.2	-9.8	-11.5	-24.5	-10.7	-33.2	-40.9
6.8	-21.9	-9.0	-8.6	-10.3	-37.1	-31.9	-9.8	-11.5	-23.1	-10.2	-33.1	-41.8
6.9	-20.5	-8.7	-8.7	-10.4	-36.4	-31.0	-9.9	-11.6	-21.7	-9.9	-33.0	-41.9
7.0	-19.4	-8.6	-8.9	-10.6	-35.9	-30.2	-10.1	-11.8	-20.6	-9.8	-32.9	-41.5
7.1	-18.6	-8.6	-9.1	-10.9	-35.5	-29.7	-10.3	-12.1	-19.8	-9.9	-32.7	-40.5
7.2	-18.1	-8.8	-9.4	-11.2	-35.2	-29.3	-10.6	-12.4	-19.3	-10.0	-32.6	-39.5
7.3	-18.0	-9.1	-9.7	-11.6	-35.1	-29.1	-10.9	-12.9	-19.2	-10.3	-32.5	-38.4
7.4	-18.3	-9.6	-10.2	-12.1	-35.2	-29.0	-11.5	-13.4	-19.5	-10.8	-32.4	-37.5
7.5	-19.1	-10.6	-10.8	-12.9	-35.5	-29.1	-12.0	-14.1	-20.3	-11.9	-32.3	-36.7
7.6	-20.6	-11.9	-11.4	-13.8	-36.0	-29.4	-12.6	-15.0	-21.8	-13.1	-32.2	-36.1
7.7	-22.3	-14.2	-12.2	-14.9	-36.6	-29.9	-13.4	-16.1	-23.5	-15.5	-32.2	-35.6
7.8	-22.7	-17.3	-13.2	-16.2	-37.3	-30.6	-14.4	-17.4	-23.9	-18.6	-32.1	-35.1
7.9	-21.2	-23.0	-14.3	-17.9	-37.8	-31.4	-15.5	-19.1	-22.4	-24.3	-32.1	-34.8
8.0	-19.0	-31.0	-15.3	-19.8	-38.1	-32.3	-16.5	-21.1	-20.3	-32.2	-32.2	-34.5
8.1	-17.3	-30.9	-16.6	-22.2	-38.1	-33.2	-17.9	-23.4	-18.5	-32.2	-32.2	-34.3
8.2	-16.1	-22.7	-18.2	-25.5	-37.9	-34.4	-19.5	-26.7	-17.4	-23.9	-32.2	-34.1
8.3	-15.3	-19.4	-19.8	-29.7	-37.8	-35.7	-21.1	-30.9	-16.6	-20.6	-32.2	-33.9
8.4	-14.7	-17.1	-21.6	-37.0	-37.7	-37.3	-22.8	-38.2	-15.9	-18.3	-32.3	-33.8
8.5	-14.2	-15.7	-23.4	-37.9	-37.6	-39.2	-24.6	-39.1	-15.4	-16.9	-32.3	-33.8
8.6	-13.9	-14.5	-25.3	-36.0	-37.5	-40.7	-26.5	-37.2	-15.1	-15.7	-32.4	-33.8
8.7	-13.8	-13.7	-27.2	-32.9	-37.3	-41.6	-28.4	-34.1	-15.0	-14.9	-32.5	-34.0
8.8	-13.9	-13.3	-29.5	-32.8	-37.3	-40.6	-30.7	-34.0	-15.1	-14.5	-32.6	-34.1
8.9	-14.2	-13.0	-29.7	-30.3	-37.4	-38.9	-30.9	-31.5	-15.5	-14.3	-32.8	-34.3
9.0	-15.0	-13.2	-32.3	-29.0	-37.7	-37.3	-33.5	-30.2	-16.2	-14.4	-32.9	-34.7
9.1	-16.2	-13.5	-32.2	-28.3	-38.4	-35.9	-33.4	-29.5	-17.5	-14.7	-33.0	-35.0
9.2	-18.3	-14.0	-30.7	-27.9	-39.6	-34.6	-32.0	-29.1	-19.5	-15.2	-33.1	-35.4
9.3	-21.3	-14.5	-28.0	-27.8	-41.3	-33.3	-29.2	-29.0	-22.5	-15.7	-33.1	-35.9
9.4	-26.5	-14.8	-26.5	-27.8	-43.4	-32.2	-27.7	-29.0	-27.7	-16.0	-33.0	-36.3
9.5	-34.2	-14.9	-25.4	-28.2	-45.9	-31.3	-26.6	-29.4	-35.4	-16.2	-32.8	-36.7
9.6	-32.6	-14.6	-24.9	-28.7	-48.1	-30.5	-26.1	-29.9	-33.8	-15.8	-32.5	-37.1

Off-axis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
9.7	-25.5	-14.2	-24.2	-29.4	-49.2	-29.8	-25.4	-30.6	-26.7	-15.4	-32.3	-37.5
9.8	-22.2	-13.8	-24.0	-30.6	-49.2	-29.4	-25.2	-31.8	-23.4	-15.0	-32.0	-37.9
9.9	-19.9	-13.4	-23.8	-32.0	-48.7	-29.0	-25.0	-33.3	-21.1	-14.6	-31.7	-38.3
10.0	-18.1	-13.0	-23.9	-34.6	-47.9	-28.7	-25.1	-35.8	-19.3	-14.2	-31.5	-38.7
15.0	-30.1	-25.3	-28.6	-28.8	-47.5	-32.9	-29.8	-30.1	-31.3	-26.5	-36.4	-37.6
20.0	-29.4	-36.0	-24.9	-23.4	-46.6	-32.2	-26.1	-24.6	-30.6	-37.2	-41.5	-44.8
25.0	-32.4	-25.6	-34.0	-29.2	-36.9	-36.7	-35.2	-30.4	-33.6	-26.8	-34.9	-51.8
30.0	-41.7	-29.4	-42.0	-30.9	-52.0	-39.1	-43.2	-32.1	-42.9	-30.7	-42.5	-46.2
35.0	-25.2	-24.8	-36.2	-31.9	-48.1	-43.8	-37.4	-33.1	-26.4	-26.0	-33.3	-46.0
40.0	-33.3	-31.2	-31.7	-27.2	-40.6	-38.7	-32.9	-28.4	-34.5	-32.4	-33.7	-39.6
45.0	-33.5	-38.1	-32.5	-34.6	-41.3	-45.7	-33.7	-35.8	-34.7	-39.3	-37.9	-42.5
50.0	-24.9	-41.5	-38.8	-36.5	-29.2	-33.5	-40.0	-37.7	-26.1	-42.8	-38.1	-44.7
55.0	-38.9	-50.8	-37.1	-35.9	-45.4	-42.2	-38.3	-37.2	-40.1	-52.0	-40.1	-49.9
60.0	-38.2	-42.0	-44.4	-32.0	-49.5	-52.3	-45.6	-33.3	-39.4	-43.2	-44.2	-44.0
65.0	-44.1	-39.2	-38.0	-36.9	-39.4	-43.1	-39.2	-38.1	-45.3	-40.4	-32.7	-47.3
70.0	-44.9	-40.2	-41.3	-31.2	-44.1	-51.7	-42.5	-32.4	-46.1	-41.5	-34.8	-45.4
75.0	-42.4	-45.3	-42.6	-32.9	-45.1	-49.1	-43.9	-34.2	-43.6	-46.5	-37.7	-42.7
80.0	-49.3	-50.2	-48.8	-39.0	-52.0	-57.0	-50.1	-40.2	-50.5	-51.4	-52.8	-48.7
85.0	-54.2	-52.2	-57.1	-50.1	-58.7	-62.9	-58.4	-51.4	-55.4	-53.4	-57.2	-57.9
89.0	-58.5	-57.8	-68.2	-60.1	-63.0	-67.9	-69.4	-61.3	-59.7	-59.0	-69.8	-67.6

## 5.2 Table 2. Off-axis EIRP Spectral Density-45 Degree Elevation

(14.25 GHz, 30 and 60 deg skew angle, 45 deg elevation)

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-89.0	-52.9	-73.2	-54.0	-68.0	-59.8	-55.4	-54.8	-68.8	-53.7	-74.0	-54.7	-57.0
-85.0	-50.2	-60.6	-49.4	-57.8	-59.8	-56.0	-50.2	-58.6	-51.0	-61.4	-47.4	-50.1
-80.0	-43.6	-42.8	-43.2	-41.4	-49.3	-44.0	-44.0	-42.2	-44.4	-43.6	-39.0	-43.0
-75.0	-33.6	-34.5	-44.2	-38.7	-42.1	-34.5	-45.0	-39.5	-34.4	-35.3	-39.5	-43.1
-70.0	-39.2	-33.2	-39.0	-30.6	-42.3	-43.8	-39.8	-31.4	-40.0	-34.0	-40.4	-38.3
-65.0	-39.1	-37.9	-39.8	-27.2	-37.9	-40.8	-40.6	-27.9	-39.8	-38.7	-28.1	-37.0
-60.0	-34.3	-51.1	-42.1	-29.3	-52.7	-36.5	-42.9	-30.1	-35.1	-51.9	-35.1	-35.5
-55.0	-31.6	-38.7	-34.6	-31.2	-35.2	-33.7	-35.4	-32.0	-32.4	-39.4	-29.3	-34.1
-50.0	-21.3	-30.4	-35.3	-25.7	-26.2	-25.3	-36.1	-26.5	-22.0	-31.2	-29.4	-36.4
-45.0	-28.3	-29.5	-28.0	-29.1	-31.5	-37.7	-28.8	-29.9	-29.1	-30.3	-35.3	-36.3
-40.0	-25.5	-33.4	-25.1	-26.0	-31.1	-27.7	-25.9	-26.8	-26.3	-34.2	-28.6	-29.2
-35.0	-29.6	-28.4	-25.7	-26.2	-29.9	-33.6	-26.4	-27.0	-30.4	-29.2	-32.4	-29.3
-30.0	-32.1	-32.6	-35.1	-30.8	-36.9	-38.9	-35.9	-31.6	-32.8	-33.4	-26.4	-40.9
-25.0	-22.8	-30.8	-23.3	-25.8	-35.1	-33.3	-24.1	-26.6	-23.6	-31.6	-23.0	-35.2
-20.0	-22.6	-23.6	-26.0	-34.3	-36.6	-51.9	-26.8	-35.1	-23.4	-24.4	-22.0	-30.7
-15.0	-21.4	-20.1	-26.5	-26.0	-33.5	-35.9	-27.3	-26.8	-22.2	-20.9	-24.5	-25.2
-10.0	-19.3	-16.5	-15.3	-14.7	-33.0	-30.9	-16.1	-15.5	-20.1	-17.3	-36.3	-30.9
-9.9	-18.0	-15.6	-15.3	-14.3	-32.8	-30.6	-16.1	-15.0	-18.8	-16.4	-35.9	-31.3
-9.8	-16.9	-14.8	-15.2	-13.9	-31.9	-30.4	-16.0	-14.7	-17.7	-15.5	-35.5	-31.7
-9.7	-16.0	-14.1	-15.4	-13.6	-30.5	-30.2	-16.2	-14.4	-16.7	-14.9	-35.1	-32.1
-9.6	-15.3	-13.6	-15.7	-13.5	-29.2	-30.1	-16.5	-14.3	-16.1	-14.4	-34.8	-32.6
-9.5	-14.9	-13.4	-16.2	-13.6	-28.1	-30.1	-17.0	-14.4	-15.7	-14.2	-34.5	-33.2
-9.4	-14.7	-13.4	-16.8	-13.9	-27.2	-30.3	-17.5	-14.7	-15.5	-14.2	-34.3	-33.9
-9.3	-14.7	-13.6	-17.5	-14.3	-26.5	-30.6	-18.3	-15.1	-15.5	-14.4	-34.2	-34.6
-9.2	-14.6	-14.0	-18.3	-14.9	-25.8	-30.9	-19.1	-15.6	-15.4	-14.8	-34.2	-35.2
-9.1	-14.6	-14.6	-19.1	-15.4	-25.3	-31.1	-19.9	-16.2	-15.4	-15.4	-34.3	-35.9
-9.0	-14.7	-15.5	-19.7	-16.0	-24.9	-31.2	-20.5	-16.8	-15.4	-16.2	-34.6	-36.3
-8.9	-14.7	-16.5	-20.1	-16.6	-24.6	-31.3	-20.9	-17.4	-15.5	-17.3	-35.1	-36.5
-8.8	-14.8	-17.8	-20.2	-17.2	-24.4	-31.3	-21.0	-18.0	-15.5	-18.6	-35.8	-36.7
-8.7	-14.9	-19.5	-20.1	-17.8	-24.4	-31.5	-20.9	-18.6	-15.7	-20.3	-36.9	-36.9
-8.6	-15.1	-21.7	-19.5	-18.3	-24.5	-31.9	-20.3	-19.1	-15.9	-22.4	-38.3	-36.7
-8.5	-15.4	-24.7	-18.8	-18.8	-24.8	-32.7	-19.6	-19.6	-16.2	-25.5	-40.2	-36.5
-8.4	-15.6	-28.8	-18.0	-19.0	-25.3	-33.8	-18.8	-19.8	-16.4	-29.6	-43.4	-36.0
-8.3	-15.7	-31.7	-17.1	-19.2	-25.9	-35.2	-17.9	-20.0	-16.4	-32.5	-47.3	-35.4



offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-8.2	-15.6	-29.8	-16.3	-19.4	-26.6	-37.0	-17.1	-20.2	-16.3	-30.5	-54.1	-34.6
-8.1	-15.3	-26.1	-15.6	-19.5	-27.5	-38.9	-16.4	-20.3	-16.1	-26.8	-50.4	-33.7
-8.0	-15.1	-23.8	-14.9	-19.4	-28.5	-41.0	-15.7	-20.2	-15.9	-24.6	-43.6	-32.5
-7.9	-14.9	-22.4	-14.3	-19.0	-29.7	-43.5	-15.1	-19.8	-15.7	-23.2	-39.1	-31.5
-7.8	-14.8	-21.7	-13.8	-18.4	-31.4	-46.4	-14.6	-19.2	-15.6	-22.5	-36.2	-30.4
-7.7	-14.8	-21.5	-13.3	-17.6	-33.4	-45.8	-14.1	-18.3	-15.6	-22.3	-34.3	-29.4
-7.6	-14.7	-21.6	-12.9	-16.9	-35.1	-41.7	-13.7	-17.7	-15.5	-22.4	-32.6	-28.4
-7.5	-14.7	-22.2	-12.6	-16.3	-35.4	-38.2	-13.4	-17.1	-15.5	-23.0	-31.2	-27.4
-7.4	-14.8	-22.9	-12.4	-15.8	-34.2	-35.8	-13.2	-16.6	-15.5	-23.7	-30.3	-26.5
-7.3	-14.8	-23.6	-12.2	-15.3	-32.6	-34.2	-13.0	-16.1	-15.6	-24.4	-29.7	-25.8
-7.2	-14.8	-24.1	-12.2	-15.1	-31.3	-33.4	-13.0	-15.9	-15.6	-24.9	-29.4	-25.2
-7.1	-14.8	-24.4	-12.1	-15.0	-30.5	-33.2	-12.9	-15.8	-15.6	-25.2	-29.2	-24.7
-7.0	-14.8	-24.5	-12.1	-14.9	-29.9	-33.8	-12.9	-15.7	-15.6	-25.3	-29.4	-24.3
-6.9	-14.8	-24.6	-12.1	-15.1	-29.4	-34.9	-12.9	-15.9	-15.6	-25.4	-29.8	-24.1
-6.8	-14.6	-24.5	-12.1	-15.2	-29.1	-36.7	-12.8	-16.0	-15.4	-25.3	-30.5	-24.0
-6.7	-14.3	-24.3	-11.9	-15.3	-28.7	-39.4	-12.7	-16.0	-15.1	-25.0	-31.4	-23.9
-6.6	-13.9	-23.8	-11.8	-15.2	-28.4	-43.0	-12.6	-16.0	-14.7	-24.6	-32.3	-23.9
-6.5	-13.4	-23.1	-11.6	-14.9	-28.2	-44.8	-12.4	-15.7	-14.2	-23.9	-33.4	-24.0
-6.4	-12.8	-22.0	-11.3	-14.6	-28.0	-41.3	-12.1	-15.3	-13.6	-22.8	-34.2	-24.1
-6.3	-12.2	-20.5	-11.1	-14.1	-27.9	-36.9	-11.9	-14.9	-13.0	-21.3	-34.9	-24.3
-6.2	-11.5	-18.6	-10.9	-13.6	-27.9	-33.2	-11.7	-14.4	-12.3	-19.4	-34.7	-24.7
-6.1	-10.7	-16.7	-10.8	-13.2	-27.9	-30.3	-11.6	-14.0	-11.4	-17.5	-33.9	-25.0
-6.0	-9.8	-15.0	-10.8	-12.8	-28.1	-28.0	-11.6	-13.6	-10.6	-15.8	-32.7	-25.5
-5.9	-9.1	-13.5	-10.8	-12.6	-28.3	-26.3	-11.6	-13.4	-9.9	-14.3	-31.4	-26.2
-5.8	-8.4	-12.4	-11.0	-12.4	-28.6	-25.1	-11.8	-13.2	-9.2	-13.2	-30.1	-26.9
-5.7	-7.9	-11.6	-11.3	-12.6	-29.1	-24.2	-12.1	-13.4	-8.7	-12.4	-29.2	-27.7
-5.6	-7.7	-11.3	-11.8	-12.8	-29.8	-23.8	-12.6	-13.5	-8.5	-12.1	-28.3	-28.4
-5.5	-7.6	-11.2	-12.4	-13.3	-31.1	-23.7	-13.2	-14.1	-8.4	-12.0	-27.6	-29.7
-5.4	-7.8	-11.3	-13.2	-14.2	-33.2	-23.8	-14.0	-15.0	-8.6	-12.1	-27.0	-31.3
-5.3	-8.2	-11.6	-14.5	-15.6	-36.2	-24.2	-15.3	-16.3	-9.0	-12.4	-26.5	-33.9
-5.2	-8.7	-12.1	-16.1	-18.0	-41.5	-24.7	-16.9	-18.8	-9.5	-12.8	-26.1	-38.0
-5.1	-9.5	-12.7	-17.7	-20.7	-52.6	-25.4	-18.5	-21.5	-10.2	-13.5	-25.7	-42.7
-5.0	-10.4	-13.5	-19.3	-26.9	-46.9	-26.3	-20.0	-27.7	-11.1	-14.3	-25.4	-44.5
-4.9	-11.4	-14.5	-19.6	-27.8	-40.6	-27.5	-20.4	-28.6	-12.2	-15.3	-25.2	-42.1
-4.8	-12.7	-15.9	-18.3	-23.9	-36.7	-29.1	-19.1	-24.7	-13.5	-16.7	-25.1	-36.0
-4.7	-14.7	-17.4	-16.2	-18.4	-34.2	-31.9	-17.0	-19.2	-15.5	-18.2	-25.0	-32.5
-4.6	-17.1	-17.0	-13.9	-15.3	-32.0	-37.5	-14.7	-16.1	-17.9	-17.8	-24.9	-30.1

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-4.5	-18.5	-14.8	-12.1	-12.8	-30.2	-47.1	-12.9	-13.6	-19.3	-15.6	-24.9	-28.3
-4.4	-17.3	-12.2	-10.6	-11.1	-28.6	-40.1	-11.4	-11.9	-18.1	-13.0	-25.0	-26.9
-4.3	-15.2	-10.0	-9.4	-9.6	-27.5	-33.4	-10.2	-10.4	-16.0	-10.8	-25.1	-25.7
-4.2	-13.3	-8.5	-8.5	-8.5	-26.6	-30.2	-9.3	-9.3	-14.1	-9.3	-25.2	-24.8
-4.1	-12.2	-7.7	-7.7	-7.5	-26.2	-28.7	-8.5	-8.3	-13.0	-8.5	-25.4	-24.0
-4.0	-11.7	-7.3	-7.1	-6.6	-26.1	-27.9	-7.9	-7.4	-12.4	-8.1	-25.6	-23.4
-3.9	-11.7	-7.2	-6.7	-5.8	-26.3	-27.6	-7.4	-6.6	-12.5	-8.0	-25.8	-22.8
-3.8	-12.0	-7.5	-6.3	-5.1	-26.8	-27.7	-7.1	-5.9	-12.8	-8.3	-26.0	-22.3
-3.7	-12.5	-8.0	-6.2	-4.6	-27.6	-28.0	-7.0	-5.4	-13.3	-8.8	-26.3	-21.9
-3.6	-13.3	-8.8	-6.2	-4.1	-28.9	-28.6	-7.0	-4.9	-14.0	-9.6	-26.6	-21.6
-3.5	-14.0	-10.0	-6.5	-3.7	-30.7	-29.6	-7.2	-4.5	-14.8	-10.8	-27.2	-21.4
-3.4	-14.6	-11.7	-7.0	-3.4	-33.7	-31.1	-7.7	-4.2	-15.3	-12.5	-27.9	-21.4
-3.3	-14.5	-14.0	-7.8	-3.2	-38.5	-33.1	-8.6	-4.0	-15.3	-14.8	-28.9	-21.5
-3.2	-13.5	-16.2	-9.0	-3.1	-40.7	-33.9	-9.8	-3.9	-14.3	-17.0	-30.4	-21.7
-3.1	-11.2	-15.7	-11.1	-3.1	-37.0	-32.1	-11.9	-3.9	-12.0	-16.5	-32.7	-22.2
-3.0	-8.5	-11.4	-14.3	-3.1	-29.5	-28.0	-15.1	-3.9	-9.2	-12.2	-35.9	-23.0
-2.9	-6.1	-7.6	-18.1	-3.0	-25.4	-24.6	-18.9	-3.8	-6.9	-8.4	-39.9	-24.3
-2.8	-4.3	-4.9	-14.7	-2.8	-22.7	-22.1	-15.5	-3.6	-5.1	-5.7	-35.3	-26.3
-2.7	-3.0	-3.0	-10.9	-2.2	-20.9	-20.4	-11.7	-3.0	-3.8	-3.8	-32.7	-29.8
-2.6	-2.3	-1.8	-6.6	-1.3	-19.7	-19.3	-7.4	-2.1	-3.1	-2.6	-27.3	-36.4
-2.5	-2.1	-1.2	-3.4	-0.2	-19.1	-18.7	-4.2	-1.0	-2.9	-2.0	-24.0	-36.5
-2.4	-2.2	-0.6	-0.9	1.1	-18.8	-18.4	-1.7	0.3	-3.0	-1.4	-21.3	-32.2
-2.3	-2.5	-0.2	1.2	2.4	-18.6	-18.2	0.4	1.6	-3.2	-1.0	-19.2	-26.3
-2.2	-3.0	0.0	2.9	3.7	-18.6	-18.3	2.1	2.9	-3.8	-0.7	-17.4	-22.6
-2.1	-4.0	0.1	4.4	4.9	-18.9	-18.5	3.6	4.1	-4.8	-0.6	-15.8	-20.1
-2.0	-5.5	0.0	5.8	6.0	-19.5	-19.2	5.0	5.2	-6.3	-0.7	-14.5	-18.0
-1.9	-8.0	-0.2	6.9	7.0	-20.5	-20.3	6.1	6.2	-8.7	-1.0	-13.3	-16.4
-1.8	-10.6	-0.6	7.9	8.0	-22.3	-22.3	7.1	7.2	-11.4	-1.4	-12.3	-15.0
-1.7	-10.3	-0.8	8.8	8.8	-24.6	-26.4	8.0	8.0	-11.1	-1.6	-11.5	-13.9
-1.6	-5.6	-0.2	9.6	9.6	-26.0	-32.5	8.8	8.8	-6.4	-1.0	-10.7	-12.9
-1.5	-0.9	1.3	10.4	10.3	-23.8	-33.7	9.6	9.5	-1.7	0.5	-9.9	-11.9
-1.4	2.6	3.4	11.1	11.1	-19.4	-23.2	10.3	10.3	1.8	2.6	-9.2	-11.0
-1.3	5.1	5.4	11.8	11.8	-16.1	-18.6	11.0	11.0	4.3	4.6	-8.5	-10.1
-1.2	7.1	7.2	12.5	12.5	-13.6	-15.6	11.7	11.7	6.4	6.4	-7.8	-9.4
-1.1	8.8	8.7	13.1	13.1	-11.7	-13.4	12.3	12.3	8.0	7.9	-7.2	-8.7
-1.0	10.1	10.0	13.7	13.7	-10.2	-11.8	12.9	12.9	9.3	9.2	-6.7	-8.0
-0.9	11.2	11.1	14.2	14.2	-9.0	-10.4	13.4	13.4	10.4	10.3	-6.2	-7.5

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-0.8	12.3	12.2	14.6	14.7	-7.9	-9.1	13.8	13.9	11.5	11.4	-5.8	-7.0
-0.7	13.2	13.1	15.0	15.0	-6.9	-8.0	14.2	14.3	12.4	12.3	-5.4	-6.6
-0.6	14.1	14.0	15.4	15.4	-6.0	-7.0	14.6	14.6	13.3	13.2	-5.1	-6.2
-0.5	14.8	14.7	15.7	15.7	-5.2	-6.2	14.9	14.9	14.0	13.9	-4.9	-5.9
-0.4	15.3	15.3	15.9	15.9	-4.6	-5.6	15.1	15.1	14.6	14.5	-4.7	-5.8
-0.3	15.8	15.7	16.0	16.0	-4.2	-5.1	15.2	15.3	15.0	15.0	-4.7	-5.6
-0.2	16.0	16.0	16.1	16.1	-4.0	-4.9	15.4	15.4	15.2	15.2	-4.6	-5.6
-0.1	16.2	16.2	16.2	16.2	-3.9	-4.8	15.4	15.4	15.4	15.4	-4.7	-5.5
0.0	16.2	16.2	16.2	16.2	-4.0	-4.7	15.4	15.4	15.4	15.4	-4.7	-5.5
0.1	16.2	16.2	16.2	16.2	-4.1	-4.8	15.4	15.4	15.4	15.4	-4.9	-5.6
0.2	16.1	16.1	16.2	16.2	-4.3	-5.0	15.4	15.4	15.3	15.3	-5.1	-5.7
0.3	15.8	15.9	16.1	16.1	-4.7	-5.3	15.3	15.3	15.1	15.1	-5.3	-5.9
0.4	15.6	15.6	15.9	15.9	-5.1	-5.7	15.1	15.1	14.8	14.8	-5.6	-6.0
0.5	15.2	15.2	15.7	15.7	-5.6	-6.1	14.9	15.0	14.4	14.4	-5.9	-6.3
0.6	14.7	14.7	15.5	15.5	-6.3	-6.7	14.7	14.8	13.9	13.9	-6.2	-6.5
0.7	14.1	14.0	15.3	15.3	-7.1	-7.6	14.5	14.5	13.3	13.3	-6.6	-6.8
0.8	13.2	13.2	15.0	15.0	-8.3	-8.6	14.2	14.2	12.5	12.4	-7.1	-7.1
0.9	12.2	12.1	14.6	14.7	-9.7	-10.0	13.9	13.9	11.4	11.3	-7.6	-7.5
1.0	11.0	10.8	14.3	14.3	-11.5	-11.6	13.5	13.5	10.2	10.0	-8.2	-7.9
1.1	9.5	9.4	13.8	13.8	-13.6	-13.5	13.0	13.0	8.8	8.6	-8.9	-8.4
1.2	7.9	7.8	13.2	13.3	-16.3	-15.8	12.5	12.5	7.1	7.0	-9.8	-9.0
1.3	6.2	6.1	12.6	12.6	-19.5	-18.3	11.8	11.9	5.4	5.3	-10.8	-9.7
1.4	4.2	4.2	11.9	11.9	-23.6	-21.7	11.1	11.1	3.4	3.4	-11.9	-10.5
1.5	1.6	2.1	11.1	11.1	-28.2	-27.1	10.3	10.3	0.8	1.3	-13.2	-11.3
1.6	-1.9	0.0	10.2	10.2	-27.0	-36.2	9.4	9.4	-2.7	-0.8	-14.8	-12.3
1.7	-7.3	-1.3	9.2	9.2	-22.9	-31.7	8.4	8.4	-8.1	-2.1	-16.7	-13.4
1.8	-14.3	-1.2	8.1	8.1	-19.9	-25.1	7.3	7.3	-15.1	-2.0	-18.9	-14.6
1.9	-10.7	-0.1	6.9	6.9	-17.9	-21.9	6.1	6.1	-11.5	-0.9	-21.7	-15.9
2.0	-5.6	1.0	5.5	5.6	-16.6	-20.0	4.7	4.8	-6.4	0.2	-25.8	-17.4
2.1	-3.0	1.8	4.1	4.3	-15.9	-18.9	3.3	3.5	-3.8	1.0	-32.0	-19.0
2.2	-1.7	2.1	2.5	2.9	-15.7	-18.5	1.7	2.1	-2.5	1.4	-40.3	-20.8
2.3	-1.1	2.1	0.7	1.4	-15.8	-18.5	-0.1	0.6	-1.9	1.3	-35.5	-23.0
2.4	-1.0	1.7	-1.4	-0.2	-16.3	-18.9	-2.2	-1.0	-1.8	0.9	-29.3	-25.7
2.5	-1.3	1.1	-4.1	-1.8	-17.0	-19.6	-4.8	-2.6	-2.1	0.3	-26.0	-29.3
2.6	-1.8	0.2	-7.5	-3.0	-17.9	-20.5	-8.3	-3.8	-2.6	-0.6	-23.9	-33.5
2.7	-2.6	-1.0	-12.0	-3.8	-19.0	-21.8	-12.8	-4.6	-3.4	-1.7	-22.4	-34.0
2.8	-3.4	-2.3	-15.1	-3.6	-20.1	-23.2	-15.9	-4.4	-4.2	-3.1	-21.3	-31.3

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
2.9	-4.4	-3.9	-11.8	-2.8	-21.3	-24.9	-12.6	-3.6	-5.2	-4.6	-20.5	-28.2
3.0	-5.8	-6.3	-8.2	-1.9	-22.7	-27.2	-9.0	-2.7	-6.6	-7.1	-19.8	-25.8
3.1	-7.9	-10.6	-5.7	-1.0	-24.5	-29.4	-6.5	-1.8	-8.7	-11.4	-19.4	-24.3
3.2	-10.2	-19.5	-4.0	-0.1	-26.5	-28.9	-4.7	-0.9	-11.0	-20.3	-19.1	-23.2
3.3	-11.1	-18.0	-2.7	0.5	-28.3	-26.1	-3.5	-0.3	-11.9	-18.8	-18.9	-22.5
3.4	-10.3	-11.0	-1.8	1.0	-29.4	-23.6	-2.6	0.2	-11.1	-11.8	-18.8	-22.1
3.5	-8.6	-7.3	-1.3	1.3	-29.5	-21.7	-2.1	0.5	-9.4	-8.1	-18.8	-21.9
3.6	-7.1	-5.3	-1.0	1.5	-29.2	-20.5	-1.8	0.7	-7.9	-6.1	-18.9	-21.9
3.7	-6.3	-4.2	-0.9	1.5	-29.0	-19.8	-1.7	0.7	-7.0	-4.9	-19.1	-22.1
3.8	-5.9	-3.6	-1.0	1.3	-29.0	-19.5	-1.7	0.5	-6.7	-4.4	-19.4	-22.5
3.9	-5.7	-3.3	-1.2	1.0	-29.3	-19.3	-2.0	0.2	-6.5	-4.1	-19.8	-23.0
4.0	-5.8	-3.3	-1.6	0.6	-29.9	-19.4	-2.4	-0.2	-6.6	-4.1	-20.3	-23.7
4.1	-6.2	-3.5	-2.0	0.0	-30.7	-19.7	-2.8	-0.8	-7.0	-4.3	-20.9	-24.4
4.2	-6.7	-4.0	-2.7	-0.7	-31.7	-20.1	-3.4	-1.4	-7.5	-4.8	-21.6	-25.3
4.3	-7.4	-4.6	-3.4	-1.5	-32.9	-20.6	-4.2	-2.2	-8.2	-5.4	-22.3	-26.2
4.4	-8.2	-5.3	-4.3	-2.4	-34.2	-21.3	-5.1	-3.2	-9.0	-6.1	-23.1	-27.1
4.5	-9.5	-6.6	-5.2	-3.4	-35.5	-22.3	-6.0	-4.2	-10.3	-7.4	-24.0	-28.0
4.6	-11.2	-8.7	-6.2	-4.5	-36.3	-23.5	-7.0	-5.3	-12.0	-9.4	-24.9	-28.9
4.7	-13.5	-11.8	-7.3	-5.9	-36.3	-25.3	-8.1	-6.6	-14.3	-12.6	-25.8	-29.8
4.8	-15.4	-16.4	-8.5	-7.3	-35.5	-27.5	-9.3	-8.1	-16.2	-17.2	-26.6	-30.8
4.9	-16.5	-20.5	-9.8	-9.0	-34.4	-30.1	-10.6	-9.7	-17.3	-21.3	-27.5	-31.8
5.0	-15.2	-21.7	-11.2	-11.1	-33.6	-33.1	-12.0	-11.9	-16.0	-22.5	-28.2	-33.4
5.1	-13.7	-17.0	-13.2	-13.4	-33.2	-35.9	-14.0	-14.2	-14.5	-17.8	-29.1	-35.3
5.2	-12.6	-14.5	-15.3	-15.8	-33.1	-37.5	-16.1	-16.5	-13.4	-15.3	-29.9	-38.5
5.3	-12.0	-13.5	-18.1	-17.1	-33.2	-37.7	-18.9	-17.9	-12.8	-14.3	-30.8	-42.4
5.4	-11.6	-12.9	-21.6	-16.4	-33.4	-37.4	-22.4	-17.2	-12.4	-13.7	-31.8	-47.7
5.5	-11.5	-12.8	-23.3	-14.5	-33.4	-36.7	-24.1	-15.3	-12.3	-13.6	-33.1	-44.5
5.6	-11.5	-13.1	-25.2	-12.7	-33.3	-36.2	-26.0	-13.5	-12.3	-13.9	-34.2	-38.8
5.7	-11.7	-13.7	-22.7	-11.3	-33.1	-35.7	-23.5	-12.1	-12.5	-14.5	-35.5	-34.0
5.8	-11.9	-14.6	-20.2	-10.2	-32.7	-35.4	-21.0	-11.0	-12.7	-15.4	-36.5	-30.7
5.9	-12.3	-15.7	-18.6	-9.3	-32.1	-35.1	-19.3	-10.1	-13.1	-16.5	-37.1	-28.9
6.0	-12.9	-17.5	-16.9	-8.6	-31.5	-34.7	-17.7	-9.4	-13.7	-18.3	-37.5	-27.3
6.1	-13.7	-20.2	-16.0	-8.2	-30.7	-33.9	-16.8	-9.0	-14.5	-21.0	-37.5	-26.2
6.2	-15.0	-21.8	-15.5	-8.0	-29.9	-32.9	-16.3	-8.8	-15.8	-22.6	-37.2	-25.4
6.3	-16.5	-21.3	-15.2	-7.9	-29.0	-31.7	-16.0	-8.7	-17.3	-22.1	-36.7	-24.9
6.4	-18.0	-17.9	-15.0	-7.9	-28.2	-30.6	-15.8	-8.7	-18.7	-18.6	-36.2	-24.4
6.5	-18.9	-15.3	-15.0	-8.1	-27.6	-29.7	-15.8	-8.8	-19.7	-16.1	-35.5	-24.1

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
6.6	-19.2	-13.5	-15.2	-8.2	-27.2	-29.1	-16.0	-9.0	-20.0	-14.3	-34.7	-23.8
6.7	-19.0	-12.6	-15.5	-8.5	-26.9	-28.7	-16.3	-9.3	-19.8	-13.4	-34.0	-23.6
6.8	-18.9	-12.2	-15.9	-8.8	-26.8	-28.8	-16.7	-9.6	-19.6	-13.0	-33.1	-23.4
6.9	-18.7	-12.0	-16.4	-9.1	-26.9	-29.1	-17.2	-9.9	-19.5	-12.8	-32.4	-23.2
7.0	-18.6	-12.0	-17.1	-9.4	-27.1	-29.5	-17.9	-10.2	-19.4	-12.7	-31.6	-23.2
7.1	-18.6	-12.1	-18.0	-9.8	-27.3	-30.1	-18.8	-10.6	-19.4	-12.9	-30.8	-23.1
7.2	-18.9	-12.4	-19.0	-10.3	-27.7	-31.0	-19.8	-11.0	-19.7	-13.2	-30.1	-23.1
7.3	-19.3	-12.9	-20.3	-10.7	-28.2	-32.1	-21.1	-11.5	-20.1	-13.6	-29.5	-23.1
7.4	-20.0	-13.5	-21.9	-11.2	-28.9	-33.6	-22.7	-12.0	-20.8	-14.3	-28.9	-23.2
7.5	-21.1	-14.5	-23.8	-11.8	-29.7	-35.6	-24.6	-12.5	-21.9	-15.3	-28.5	-23.4
7.6	-22.4	-16.4	-26.2	-12.4	-30.7	-38.9	-27.0	-13.2	-23.2	-17.2	-28.2	-23.6
7.7	-23.5	-18.8	-28.6	-13.2	-32.2	-40.2	-29.4	-14.0	-24.3	-19.6	-28.0	-23.9
7.8	-23.4	-24.1	-31.8	-14.0	-34.1	-39.6	-32.6	-14.8	-24.2	-24.9	-27.8	-24.3
7.9	-22.2	-31.3	-47.1	-14.8	-36.3	-35.6	-47.9	-15.6	-23.0	-32.1	-27.7	-24.8
8.0	-20.6	-29.6	-36.0	-15.8	-38.6	-32.5	-36.8	-16.6	-21.4	-30.4	-27.7	-25.2
8.1	-19.3	-24.0	-38.2	-17.1	-39.9	-30.2	-39.0	-17.9	-20.1	-24.8	-27.6	-25.8
8.2	-18.4	-20.4	-36.2	-18.3	-39.6	-29.0	-37.0	-19.0	-19.2	-21.2	-27.6	-26.4
8.3	-17.9	-18.5	-37.6	-19.7	-38.5	-28.4	-38.4	-20.5	-18.7	-19.3	-27.6	-27.0
8.4	-17.6	-17.3	-37.9	-21.5	-37.1	-28.0	-38.7	-22.3	-18.4	-18.1	-27.7	-27.7
8.5	-17.4	-16.5	-38.3	-23.3	-35.6	-27.9	-39.1	-24.1	-18.2	-17.3	-27.8	-28.4
8.6	-17.2	-16.0	-38.3	-25.1	-34.3	-28.0	-39.1	-25.9	-18.0	-16.7	-27.9	-29.0
8.7	-17.2	-15.7	-38.1	-26.7	-33.2	-28.3	-38.9	-27.5	-18.0	-16.5	-28.2	-29.6
8.8	-17.1	-15.7	-37.3	-27.3	-32.4	-28.8	-38.1	-28.1	-17.9	-16.5	-28.6	-30.2
8.9	-17.2	-16.0	-35.8	-27.2	-32.0	-29.3	-36.6	-28.0	-18.0	-16.8	-29.2	-30.9
9.0	-17.3	-16.8	-33.8	-26.4	-32.0	-30.1	-34.6	-27.2	-18.1	-17.6	-29.9	-31.6
9.1	-17.6	-17.8	-31.8	-25.4	-32.4	-31.0	-32.6	-26.2	-18.4	-18.6	-30.8	-32.4
9.2	-18.0	-19.7	-29.5	-24.4	-33.1	-32.5	-30.3	-25.2	-18.8	-20.5	-31.8	-33.6
9.3	-18.7	-22.1	-27.5	-23.7	-34.0	-34.3	-28.3	-24.5	-19.5	-22.9	-32.9	-34.8
9.4	-19.4	-23.9	-26.1	-23.1	-34.5	-36.9	-26.9	-23.9	-20.2	-24.7	-33.7	-35.9
9.5	-20.3	-23.6	-24.7	-22.5	-34.1	-39.9	-25.4	-23.3	-21.1	-24.4	-34.9	-37.5
9.6	-21.4	-21.7	-23.5	-22.3	-32.9	-43.4	-24.2	-23.1	-22.2	-22.5	-35.1	-38.8
9.7	-22.4	-19.8	-22.2	-22.0	-31.5	-44.7	-23.0	-22.8	-23.2	-20.6	-35.9	-40.3
9.8	-23.5	-18.4	-21.4	-22.0	-30.4	-45.6	-22.2	-22.7	-24.3	-19.2	-35.3	-41.4
9.9	-24.6	-17.4	-20.7	-21.9	-29.7	-42.9	-21.5	-22.6	-25.4	-18.2	-34.7	-42.7
10.0	-25.5	-16.7	-20.5	-22.0	-29.0	-39.3	-21.3	-22.8	-26.3	-17.5	-33.9	-43.0
15.0	-30.6	-26.7	-24.3	-31.1	-30.7	-40.2	-25.1	-31.9	-31.4	-27.5	-35.4	-37.7
20.0	-30.0	-29.5	-23.3	-24.1	-38.3	-34.9	-24.1	-24.9	-30.8	-30.3	-41.4	-37.2

offaxis Angle (deg)	Skew 30				Skew 60				Skew 60			
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
25.0	-26.1	-27.2	-28.6	-29.4	-37.4	-28.9	-29.4	-30.2	-26.9	-28.0	-32.5	-39.5
30.0	-47.5	-30.3	-40.3	-36.4	-38.6	-39.2	-41.1	-37.2	-48.3	-31.1	-32.9	-35.3
35.0	-28.6	-27.3	-32.1	-31.1	-36.5	-42.4	-32.9	-31.9	-29.4	-28.1	-32.5	-42.3
40.0	-37.2	-35.0	-31.5	-36.9	-39.2	-41.0	-32.3	-37.7	-38.0	-35.7	-31.1	-37.2
45.0	-33.8	-32.9	-44.4	-39.4	-32.9	-38.7	-45.2	-40.2	-34.6	-33.6	-38.5	-39.4
50.0	-32.4	-32.9	-41.6	-38.7	-28.1	-31.6	-42.4	-39.5	-33.2	-33.7	-41.4	-37.8
55.0	-37.8	-40.0	-33.7	-34.7	-35.4	-46.5	-34.5	-35.5	-38.6	-40.8	-40.3	-42.8
60.0	-35.2	-46.4	-46.0	-46.5	-51.5	-45.3	-46.8	-47.3	-36.0	-47.2	-41.1	-53.5
65.0	-35.9	-48.8	-44.6	-38.7	-42.4	-36.3	-45.4	-39.5	-36.6	-49.6	-33.5	-44.1
70.0	-46.9	-40.4	-47.1	-42.6	-37.3	-47.3	-47.9	-43.4	-47.7	-41.2	-45.2	-47.5
75.0	-40.5	-52.2	-48.0	-40.5	-47.1	-48.1	-48.7	-41.3	-41.3	-53.0	-43.5	-44.6
80.0	-51.2	-53.4	-51.9	-42.2	-63.4	-58.1	-52.7	-43.0	-51.9	-54.2	-56.1	-51.5
85.0	-54.0	-56.7	-63.6	-54.6	-60.4	-69.9	-64.4	-55.4	-54.8	-57.5	-62.6	-62.2
89.0	-60.2	-61.8	-70.8	-66.1	-66.7	-70.4	-71.6	-66.8	-61.0	-62.6	-74.9	-73.6

### 5.3 Table 3. Off-axis EIRP Spectral Density-90 Degree Elevation

(14.25 GHz, 30 and 60 deg skew angle, 90 deg elevation)

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-89.0	-56.7	-61.1	-60.9	-58.5	-64.8	-69.6	-62.1	-59.7	-57.9	-62.3	-68.4	-69.3
-85.0	-53.1	-60.0	-51.4	-50.7	-61.0	-64.0	-52.6	-51.9	-54.2	-61.2	-59.1	-60.7
-80.0	-47.2	-45.8	-48.2	-42.1	-53.3	-56.9	-49.4	-43.3	-48.4	-46.9	-52.2	-51.4
-75.0	-47.3	-49.0	-46.5	-42.1	-48.1	-49.7	-47.6	-43.3	-48.4	-50.2	-47.9	-50.5
-70.0	-41.7	-39.7	-43.5	-41.4	-53.6	-42.0	-44.7	-42.6	-42.9	-40.9	-44.1	-47.8
-65.0	-42.2	-33.9	-38.0	-38.8	-57.0	-44.6	-39.2	-40.0	-43.4	-35.1	-41.9	-47.0
-60.0	-42.1	-42.9	-39.8	-41.4	-52.1	-49.0	-40.9	-42.6	-43.3	-44.0	-37.9	-43.3
-55.0	-36.8	-46.4	-42.6	-38.6	-40.3	-42.7	-43.8	-39.7	-38.0	-47.5	-56.2	-38.0
-50.0	-26.6	-32.8	-37.3	-27.8	-36.5	-31.5	-38.5	-29.0	-27.7	-33.9	-35.3	-35.0
-45.0	-43.4	-44.4	-34.6	-30.4	-40.6	-34.5	-35.8	-31.6	-44.6	-45.6	-43.1	-41.3
-40.0	-37.6	-34.5	-29.5	-21.8	-65.5	-36.6	-30.6	-23.0	-38.8	-35.7	-30.1	-34.0
-35.0	-23.9	-28.8	-31.6	-27.6	-38.9	-37.4	-32.8	-28.7	-25.1	-29.9	-41.2	-47.0
-30.0	-36.1	-27.2	-43.1	-37.3	-60.1	-35.9	-44.3	-38.4	-37.3	-28.4	-42.7	-42.7
-25.0	-32.5	-35.0	-40.9	-26.3	-39.3	-41.9	-42.0	-27.5	-33.7	-36.2	-44.6	-45.8
-20.0	-24.6	-27.4	-25.7	-23.3	-48.5	-41.6	-26.9	-24.5	-25.8	-28.6	-42.0	-37.4
-15.0	-34.8	-24.7	-22.7	-27.7	-43.4	-33.2	-23.9	-28.9	-36.0	-25.9	-36.8	-32.1
-10.0	-21.5	-18.3	-18.6	-17.7	-40.2	-30.7	-19.7	-18.8	-22.7	-19.5	-32.2	-31.7
-9.9	-21.6	-17.4	-18.5	-17.4	-40.9	-30.9	-19.6	-18.5	-22.8	-18.5	-32.4	-31.6
-9.8	-21.8	-16.5	-18.5	-17.1	-42.0	-31.2	-19.7	-18.2	-22.9	-17.7	-32.7	-31.7
-9.7	-21.8	-15.8	-18.6	-16.9	-43.4	-31.7	-19.8	-18.1	-23.0	-17.0	-33.3	-31.8
-9.6	-21.9	-15.2	-18.8	-16.8	-45.1	-32.6	-20.0	-18.0	-23.1	-16.4	-33.9	-32.1
-9.5	-21.7	-14.6	-19.2	-16.8	-44.8	-33.9	-20.4	-17.9	-22.9	-15.8	-34.8	-32.4
-9.4	-21.4	-14.1	-19.7	-16.8	-41.8	-35.8	-20.8	-18.0	-22.6	-15.2	-35.8	-32.9
-9.3	-21.0	-13.7	-20.2	-17.0	-38.5	-38.4	-21.4	-18.1	-22.2	-14.9	-37.0	-33.3
-9.2	-20.6	-13.5	-21.0	-17.2	-36.0	-42.2	-22.1	-18.3	-21.7	-14.6	-38.3	-33.7
-9.1	-20.2	-13.4	-21.8	-17.5	-34.1	-46.9	-23.0	-18.6	-21.4	-14.6	-40.0	-34.1
-9.0	-20.0	-13.5	-22.8	-17.8	-32.8	-51.8	-24.0	-19.0	-21.2	-14.7	-41.9	-34.6
-8.9	-19.9	-13.9	-24.0	-18.3	-32.0	-50.8	-25.2	-19.5	-21.1	-15.0	-43.9	-35.0
-8.8	-19.9	-14.4	-25.4	-18.9	-31.5	-50.2	-26.6	-20.1	-21.1	-15.6	-45.3	-35.5
-8.7	-19.8	-15.2	-27.0	-19.6	-31.0	-45.9	-28.2	-20.7	-21.0	-16.3	-45.1	-36.0
-8.6	-19.7	-16.1	-29.2	-20.6	-30.8	-43.8	-30.4	-21.7	-20.9	-17.2	-44.1	-36.7
-8.5	-19.5	-17.1	-32.7	-21.7	-30.6	-42.5	-33.8	-22.9	-20.7	-18.3	-42.2	-37.5
-8.4	-19.3	-18.2	-36.3	-23.3	-30.6	-41.2	-37.5	-24.5	-20.5	-19.3	-40.7	-38.0
-8.3	-19.2	-19.2	-31.6	-23.9	-30.8	-40.6	-32.8	-25.0	-20.4	-20.3	-39.2	-37.5

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-8.2	-19.2	-19.9	-31.8	-23.2	-31.2	-40.2	-32.9	-24.4	-20.4	-21.1	-38.0	-36.6
-8.1	-19.3	-20.4	-28.4	-21.9	-31.8	-40.5	-29.6	-23.1	-20.5	-21.6	-37.1	-35.6
-8.0	-19.6	-20.5	-26.6	-19.9	-33.0	-41.2	-27.8	-21.1	-20.7	-21.7	-36.3	-34.5
-7.9	-19.8	-20.2	-23.6	-18.3	-34.6	-42.6	-24.8	-19.5	-21.0	-21.4	-35.9	-33.0
-7.8	-20.0	-19.7	-22.4	-16.6	-36.8	-44.0	-23.5	-17.8	-21.2	-20.9	-35.7	-31.5
-7.7	-20.2	-19.2	-20.8	-15.3	-39.4	-44.5	-21.9	-16.4	-21.3	-20.4	-35.5	-30.2
-7.6	-20.3	-18.8	-20.2	-14.1	-41.4	-44.7	-21.4	-15.3	-21.4	-20.0	-35.8	-29.2
-7.5	-20.3	-18.6	-19.7	-13.3	-41.1	-43.8	-20.8	-14.5	-21.5	-19.7	-36.1	-28.3
-7.4	-20.4	-18.4	-19.3	-12.7	-39.4	-42.7	-20.5	-13.9	-21.5	-19.6	-36.5	-27.6
-7.3	-20.3	-18.4	-19.5	-12.4	-37.6	-41.5	-20.7	-13.6	-21.5	-19.5	-37.2	-27.2
-7.2	-20.2	-18.4	-20.0	-12.1	-35.9	-40.3	-21.1	-13.3	-21.3	-19.6	-38.1	-26.8
-7.1	-19.6	-18.5	-20.6	-12.1	-34.3	-39.1	-21.8	-13.2	-20.8	-19.7	-39.1	-26.6
-7.0	-18.7	-18.7	-21.4	-12.0	-32.9	-38.0	-22.6	-13.2	-19.8	-19.9	-40.2	-26.3
-6.9	-17.4	-19.0	-22.5	-12.1	-31.7	-37.1	-23.7	-13.3	-18.6	-20.1	-41.2	-26.1
-6.8	-16.1	-19.2	-23.7	-12.2	-30.8	-36.5	-24.8	-13.4	-17.3	-20.4	-41.9	-26.0
-6.7	-14.9	-19.4	-24.8	-12.5	-30.2	-36.0	-26.0	-13.6	-16.1	-20.5	-41.7	-25.8
-6.6	-13.9	-19.4	-25.8	-12.8	-29.8	-36.0	-26.9	-14.0	-15.0	-20.6	-40.8	-25.7
-6.5	-12.9	-19.2	-25.8	-13.3	-29.6	-36.0	-27.0	-14.4	-14.1	-20.3	-39.5	-25.6
-6.4	-11.9	-18.5	-25.0	-13.8	-29.7	-36.3	-26.1	-15.0	-13.1	-19.7	-38.1	-25.6
-6.3	-10.9	-17.7	-23.5	-14.5	-29.8	-36.7	-24.7	-15.6	-12.1	-18.8	-36.9	-25.6
-6.2	-9.9	-16.6	-21.9	-15.2	-30.0	-37.2	-23.1	-16.3	-11.1	-17.7	-35.9	-25.8
-6.1	-9.1	-15.4	-20.6	-16.0	-30.3	-37.8	-21.7	-17.2	-10.2	-16.6	-35.0	-26.0
-6.0	-8.3	-14.5	-19.3	-16.8	-30.7	-38.6	-20.5	-18.0	-9.5	-15.7	-34.4	-26.4
-5.9	-7.8	-13.7	-18.2	-17.6	-31.0	-39.6	-19.4	-18.8	-9.0	-14.9	-33.9	-26.9
-5.8	-7.5	-13.2	-17.3	-18.2	-31.5	-41.0	-18.5	-19.4	-8.7	-14.4	-33.6	-27.5
-5.7	-7.4	-13.0	-16.7	-18.5	-32.2	-43.4	-17.8	-19.7	-8.6	-14.2	-33.5	-28.6
-5.6	-7.6	-12.9	-16.2	-18.5	-33.1	-46.4	-17.3	-19.7	-8.8	-14.0	-33.5	-29.6
-5.5	-8.0	-12.9	-15.9	-18.3	-34.3	-49.4	-17.1	-19.4	-9.1	-14.1	-33.6	-31.1
-5.4	-8.5	-13.2	-15.8	-18.0	-35.8	-48.0	-16.9	-19.1	-9.7	-14.3	-33.8	-32.9
-5.3	-9.2	-13.6	-15.8	-17.8	-37.6	-43.7	-17.0	-18.9	-10.3	-14.8	-34.0	-35.1
-5.2	-10.0	-14.3	-16.0	-17.9	-39.8	-40.7	-17.2	-19.0	-11.2	-15.5	-34.3	-38.0
-5.1	-11.1	-15.5	-16.1	-18.3	-42.2	-38.5	-17.3	-19.4	-12.2	-16.6	-34.5	-40.3
-5.0	-12.3	-17.3	-16.1	-19.1	-44.7	-36.8	-17.3	-20.2	-13.4	-18.4	-34.7	-42.0
-4.9	-14.1	-21.3	-15.8	-20.6	-46.7	-35.3	-16.9	-21.8	-15.3	-22.4	-34.7	-40.9
-4.8	-16.4	-26.9	-15.1	-22.8	-44.7	-33.9	-16.2	-23.9	-17.6	-28.0	-34.6	-40.1
-4.7	-17.8	-27.3	-14.1	-26.8	-40.8	-32.7	-15.2	-27.9	-19.0	-28.5	-34.3	-38.6
-4.6	-16.2	-18.2	-13.0	-30.0	-37.7	-31.7	-14.2	-31.2	-17.4	-19.4	-34.0	-37.1



offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-4.5	-13.7	-14.0	-11.9	-26.8	-35.4	-30.9	-13.0	-28.0	-14.8	-15.2	-33.5	-35.9
-4.4	-11.6	-11.5	-10.7	-22.1	-33.8	-30.4	-11.9	-23.2	-12.8	-12.7	-33.1	-34.7
-4.3	-10.3	-9.9	-9.6	-18.1	-32.8	-30.0	-10.8	-19.3	-11.4	-11.1	-32.5	-33.7
-4.2	-9.6	-9.0	-8.6	-15.0	-32.4	-29.9	-9.8	-16.2	-10.7	-10.1	-32.0	-32.6
-4.1	-9.1	-8.3	-7.7	-12.7	-32.2	-29.9	-8.8	-13.9	-10.3	-9.4	-31.4	-31.8
-4.0	-8.9	-7.7	-6.8	-10.7	-32.3	-29.9	-8.0	-11.9	-10.1	-8.9	-30.7	-31.1
-3.9	-8.9	-7.4	-6.1	-9.2	-32.7	-30.1	-7.3	-10.3	-10.1	-8.6	-30.1	-30.5
-3.8	-9.2	-7.4	-5.5	-7.8	-33.4	-30.4	-6.7	-9.0	-10.3	-8.5	-29.5	-30.1
-3.7	-9.6	-7.6	-5.1	-6.7	-34.6	-30.7	-6.3	-7.9	-10.8	-8.8	-28.9	-29.8
-3.6	-10.5	-8.2	-4.8	-5.8	-36.5	-31.2	-5.9	-7.0	-11.7	-9.4	-28.3	-29.5
-3.5	-11.9	-9.4	-4.7	-5.1	-40.0	-31.9	-5.9	-6.3	-13.0	-10.5	-27.8	-29.3
-3.4	-13.9	-11.8	-4.9	-4.6	-52.0	-32.7	-6.0	-5.7	-15.1	-12.9	-27.3	-29.3
-3.3	-14.5	-17.0	-5.2	-4.2	-44.2	-33.2	-6.4	-5.3	-15.7	-18.2	-27.0	-29.2
-3.2	-11.9	-27.1	-6.1	-3.9	-35.5	-33.1	-7.2	-5.1	-13.1	-28.2	-26.7	-29.1
-3.1	-8.4	-15.4	-7.5	-3.7	-30.7	-32.1	-8.6	-4.9	-9.6	-16.6	-26.5	-28.9
-3.0	-5.6	-9.7	-9.9	-3.5	-27.5	-30.7	-11.1	-4.7	-6.8	-10.9	-26.5	-28.6
-2.9	-3.6	-6.5	-13.5	-3.3	-25.3	-29.5	-14.6	-4.5	-4.8	-7.6	-26.5	-28.2
-2.8	-2.3	-4.4	-18.0	-2.8	-23.7	-28.5	-19.2	-4.0	-3.5	-5.6	-26.5	-27.7
-2.7	-1.6	-3.1	-17.6	-2.2	-22.7	-27.9	-18.7	-3.4	-2.7	-4.3	-26.4	-27.1
-2.6	-1.1	-2.0	-11.2	-1.3	-21.9	-27.5	-12.4	-2.5	-2.2	-3.2	-26.1	-26.3
-2.5	-0.7	-1.0	-6.5	-0.3	-21.1	-27.0	-7.6	-1.4	-1.9	-2.1	-25.6	-25.5
-2.4	-0.5	-0.1	-3.1	0.9	-20.5	-26.6	-4.3	-0.2	-1.7	-1.3	-24.8	-24.7
-2.3	-0.6	0.5	-0.6	2.1	-20.1	-26.3	-1.7	1.0	-1.7	-0.7	-23.8	-23.8
-2.2	-0.9	0.8	1.4	3.3	-19.9	-26.2	0.3	2.2	-2.1	-0.4	-22.7	-23.0
-2.1	-1.7	0.8	3.1	4.4	-19.9	-26.4	1.9	3.3	-2.9	-0.4	-21.5	-22.1
-2.0	-3.4	0.5	4.5	5.5	-20.3	-26.9	3.4	4.4	-4.5	-0.7	-20.3	-21.3
-1.9	-6.6	-0.1	5.8	6.6	-21.0	-27.7	4.7	5.4	-7.8	-1.3	-19.1	-20.5
-1.8	-13.6	-0.7	7.1	7.6	-22.0	-28.4	5.9	6.4	-14.7	-1.8	-18.0	-19.7
-1.7	-12.1	-0.5	8.2	8.6	-22.8	-28.1	7.0	7.4	-13.2	-1.7	-16.8	-18.9
-1.6	-5.3	0.6	9.3	9.6	-22.7	-26.6	8.1	8.4	-6.5	-0.5	-15.7	-18.0
-1.5	-0.1	2.4	10.3	10.5	-21.3	-24.4	9.1	9.3	-1.3	1.3	-14.6	-17.2
-1.4	3.2	4.4	11.2	11.3	-19.3	-22.2	10.0	10.2	2.0	3.2	-13.6	-16.4
-1.3	5.6	6.1	12.0	12.1	-17.3	-20.4	10.8	10.9	4.4	5.0	-12.7	-15.7
-1.2	7.4	7.7	12.7	12.8	-15.5	-18.8	11.5	11.6	6.2	6.5	-11.8	-15.1
-1.1	8.9	9.1	13.4	13.4	-13.9	-17.4	12.2	12.3	7.8	7.9	-11.0	-14.4
-1.0	10.4	10.4	13.9	14.0	-12.4	-16.0	12.8	12.8	9.2	9.2	-10.4	-13.9
-0.9	11.6	11.7	14.4	14.5	-11.0	-14.8	13.3	13.3	10.5	10.5	-9.7	-13.4

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
-0.8	12.8	12.8	14.8	14.9	-9.8	-13.7	13.7	13.7	11.6	11.6	-9.2	-13.1
-0.7	13.7	13.7	15.2	15.2	-8.8	-12.8	14.0	14.0	12.6	12.6	-8.7	-12.7
-0.6	14.5	14.5	15.5	15.5	-7.9	-12.0	14.3	14.3	13.3	13.3	-8.4	-12.4
-0.5	15.1	15.1	15.7	15.7	-7.2	-11.4	14.5	14.5	13.9	13.9	-8.0	-12.2
-0.4	15.6	15.5	15.9	15.9	-6.7	-11.0	14.7	14.7	14.4	14.4	-7.7	-12.0
-0.3	15.8	15.8	16.0	16.0	-6.4	-10.8	14.9	14.9	14.7	14.7	-7.5	-11.9
-0.2	16.1	16.0	16.1	16.1	-6.1	-10.6	15.0	15.0	14.9	14.9	-7.3	-11.8
-0.1	16.2	16.2	16.2	16.2	-6.0	-10.6	15.0	15.0	15.0	15.0	-7.2	-11.8
0.0	16.2	16.2	16.2	16.2	-5.9	-10.6	15.1	15.1	15.1	15.1	-7.1	-11.8
0.1	16.2	16.2	16.2	16.2	-5.9	-10.7	15.0	15.0	15.0	15.0	-7.0	-11.8
0.2	16.1	16.1	16.2	16.2	-6.0	-10.9	15.0	15.0	14.9	14.9	-7.0	-11.8
0.3	15.9	15.9	16.1	16.1	-6.2	-11.2	14.9	14.9	14.7	14.7	-7.0	-11.9
0.4	15.6	15.5	15.9	15.9	-6.5	-11.6	14.8	14.8	14.4	14.4	-7.1	-12.1
0.5	15.1	15.0	15.8	15.7	-7.0	-12.2	14.6	14.6	14.0	13.9	-7.2	-12.2
0.6	14.5	14.4	15.6	15.5	-7.7	-13.1	14.4	14.3	13.3	13.2	-7.4	-12.4
0.7	13.7	13.5	15.3	15.2	-8.6	-14.1	14.1	14.0	12.5	12.3	-7.6	-12.7
0.8	12.7	12.5	14.9	14.8	-9.6	-15.3	13.7	13.7	11.6	11.4	-8.0	-13.0
0.9	11.6	11.4	14.5	14.4	-10.9	-16.8	13.3	13.2	10.5	10.2	-8.4	-13.4
1.0	10.4	10.1	14.0	13.9	-12.2	-18.4	12.8	12.7	9.2	9.0	-8.8	-13.8
1.1	9.1	8.8	13.4	13.3	-13.7	-20.3	12.2	12.1	7.9	7.7	-9.4	-14.3
1.2	7.7	7.4	12.7	12.6	-15.4	-22.5	11.5	11.4	6.5	6.2	-10.0	-14.9
1.3	5.9	5.7	12.0	11.8	-17.4	-25.4	10.8	10.7	4.7	4.5	-10.7	-15.5
1.4	3.5	3.7	11.2	11.0	-20.0	-29.8	10.0	9.9	2.4	2.6	-11.5	-16.2
1.5	0.4	1.7	10.3	10.2	-23.0	-38.3	9.1	9.0	-0.7	0.6	-12.4	-16.9
1.6	-4.0	0.2	9.3	9.2	-25.4	-42.5	8.1	8.0	-5.2	-1.0	-13.4	-17.7
1.7	-11.2	-0.3	8.2	8.2	-25.0	-32.6	7.1	7.0	-12.4	-1.5	-14.4	-18.5
1.8	-13.4	0.1	7.1	7.2	-23.2	-28.7	5.9	6.0	-14.6	-1.0	-15.5	-19.3
1.9	-8.2	0.8	5.9	6.1	-21.6	-26.7	4.7	4.9	-9.4	-0.4	-16.6	-20.2
2.0	-5.0	1.3	4.6	4.9	-20.6	-25.7	3.5	3.8	-6.1	0.1	-17.9	-21.1
2.1	-3.2	1.5	3.1	3.7	-20.0	-25.3	1.9	2.5	-4.4	0.4	-19.3	-22.2
2.2	-2.3	1.5	1.2	2.4	-19.8	-25.4	0.1	1.2	-3.5	0.3	-21.0	-23.6
2.3	-1.8	1.2	-1.1	1.1	-19.9	-25.7	-2.2	-0.1	-3.0	0.1	-22.9	-25.1
2.4	-1.7	0.7	-3.8	-0.1	-20.2	-26.4	-4.9	-1.2	-2.9	-0.4	-25.0	-26.9
2.5	-1.9	0.1	-7.6	-0.9	-20.6	-27.2	-8.8	-2.0	-3.1	-1.1	-26.9	-29.0
2.6	-2.3	-0.8	-12.3	-1.1	-21.2	-28.2	-13.4	-2.3	-3.4	-1.9	-27.9	-31.0
2.7	-2.8	-1.8	-16.4	-1.1	-22.0	-29.4	-17.6	-2.2	-4.0	-3.0	-27.8	-31.7
2.8	-3.9	-3.5	-12.8	-0.7	-23.1	-31.5	-14.0	-1.9	-5.0	-4.6	-26.5	-30.8

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
2.9	-5.7	-6.0	-9.1	-0.3	-25.0	-35.2	-10.3	-1.4	-6.8	-7.1	-25.1	-29.1
3.0	-8.3	-9.7	-6.6	0.2	-27.9	-45.1	-7.8	-1.0	-9.5	-10.9	-23.9	-27.3
3.1	-11.8	-13.9	-5.1	0.5	-32.3	-47.4	-6.3	-0.6	-13.0	-15.0	-22.9	-25.8
3.2	-14.7	-13.5	-4.1	0.7	-38.9	-37.3	-5.3	-0.5	-15.8	-14.7	-22.3	-24.6
3.3	-14.3	-10.3	-3.6	0.7	-39.7	-32.6	-4.7	-0.4	-15.5	-11.4	-21.8	-23.8
3.4	-11.9	-7.8	-3.3	0.6	-34.5	-30.3	-4.4	-0.5	-13.1	-9.0	-21.5	-23.1
3.5	-10.2	-6.5	-3.2	0.4	-31.6	-28.8	-4.4	-0.8	-11.3	-7.6	-21.4	-22.6
3.6	-8.8	-5.6	-3.3	0.0	-29.5	-27.8	-4.5	-1.2	-9.9	-6.7	-21.3	-22.2
3.7	-7.8	-5.0	-3.6	-0.6	-28.1	-27.0	-4.7	-1.7	-9.0	-6.2	-21.4	-22.0
3.8	-7.1	-4.8	-4.0	-1.2	-27.0	-26.5	-5.2	-2.4	-8.2	-5.9	-21.6	-21.8
3.9	-6.6	-4.7	-4.6	-2.0	-26.2	-26.0	-5.8	-3.2	-7.8	-5.9	-21.9	-21.8
4.0	-6.5	-4.9	-5.3	-2.9	-25.6	-25.8	-6.5	-4.1	-7.6	-6.1	-22.2	-21.7
4.1	-6.5	-5.3	-6.2	-3.9	-25.3	-25.6	-7.3	-5.1	-7.7	-6.4	-22.6	-21.8
4.2	-6.8	-5.8	-7.1	-5.0	-25.1	-25.5	-8.3	-6.2	-7.9	-7.0	-23.1	-22.0
4.3	-7.4	-6.8	-8.3	-6.2	-25.2	-25.7	-9.4	-7.4	-8.6	-8.0	-23.7	-22.2
4.4	-8.5	-8.5	-9.5	-7.5	-25.8	-26.2	-10.7	-8.7	-9.7	-9.7	-24.3	-22.4
4.5	-10.2	-10.9	-11.0	-8.9	-26.8	-26.9	-12.2	-10.0	-11.4	-12.0	-24.9	-22.7
4.6	-12.1	-14.5	-12.7	-10.1	-28.1	-27.8	-13.9	-11.3	-13.3	-15.6	-25.7	-23.0
4.7	-14.2	-20.5	-14.8	-11.1	-29.7	-29.0	-16.0	-12.3	-15.4	-21.6	-26.7	-23.6
4.8	-15.8	-29.4	-17.5	-11.7	-31.6	-30.3	-18.7	-12.9	-16.9	-30.5	-27.9	-24.3
4.9	-16.3	-25.6	-21.0	-11.8	-33.6	-31.7	-22.1	-12.9	-17.5	-26.8	-29.4	-25.3
5.0	-16.1	-20.5	-25.4	-11.5	-35.5	-33.0	-26.5	-12.7	-17.2	-21.7	-31.2	-26.5
5.1	-15.7	-17.5	-29.2	-11.2	-37.1	-34.4	-30.3	-12.3	-16.9	-18.7	-33.3	-28.1
5.2	-15.1	-16.0	-27.5	-10.9	-38.4	-35.9	-28.7	-12.1	-16.3	-17.2	-34.9	-30.0
5.3	-14.6	-14.8	-24.4	-10.9	-39.4	-37.3	-25.5	-12.0	-15.8	-16.0	-34.9	-32.1
5.4	-14.1	-14.1	-22.2	-11.0	-39.0	-38.4	-23.4	-12.1	-15.2	-15.3	-33.4	-33.1
5.5	-13.6	-13.7	-20.9	-11.3	-38.4	-39.1	-22.1	-12.5	-14.8	-14.9	-31.5	-33.3
5.6	-13.3	-13.7	-20.2	-11.8	-37.8	-39.1	-21.3	-13.0	-14.5	-14.9	-29.8	-32.2
5.7	-13.1	-13.9	-19.9	-12.5	-37.5	-39.0	-21.0	-13.7	-14.3	-15.1	-28.3	-30.5
5.8	-13.2	-14.6	-19.9	-13.4	-38.0	-38.9	-21.0	-14.6	-14.4	-15.8	-27.2	-29.0
5.9	-13.6	-16.0	-20.1	-14.5	-39.9	-39.1	-21.3	-15.6	-14.7	-17.2	-26.4	-27.7
6.0	-14.2	-18.0	-20.7	-15.7	-43.8	-39.6	-21.8	-16.9	-15.4	-19.2	-25.6	-26.6
6.1	-14.9	-20.5	-21.5	-17.1	-51.1	-40.3	-22.7	-18.3	-16.0	-21.7	-25.0	-25.7
6.2	-15.7	-23.1	-22.6	-18.1	-50.3	-41.2	-23.8	-19.3	-16.8	-24.2	-24.5	-24.9
6.3	-16.4	-24.2	-24.1	-18.4	-44.6	-42.2	-25.2	-19.6	-17.5	-25.4	-24.1	-24.3
6.4	-16.9	-24.5	-25.7	-17.8	-39.9	-42.7	-26.9	-18.9	-18.1	-25.6	-23.8	-23.8
6.5	-17.3	-23.3	-27.1	-16.6	-37.3	-42.9	-28.3	-17.8	-18.5	-24.5	-23.6	-23.5

offaxis Angle (deg)	Skew 30				Skew 60							
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
6.6	-17.4	-22.5	-27.6	-15.4	-36.2	-42.8	-28.7	-16.6	-18.6	-23.7	-23.5	-23.2
6.7	-17.5	-21.9	-26.6	-14.3	-35.4	-42.1	-27.8	-15.5	-18.7	-23.1	-23.5	-23.0
6.8	-17.5	-21.6	-25.0	-13.4	-34.7	-40.4	-26.2	-14.5	-18.7	-22.7	-23.6	-23.0
6.9	-17.5	-21.4	-23.3	-12.6	-34.3	-38.6	-24.4	-13.7	-18.7	-22.6	-23.8	-23.0
7.0	-17.5	-21.5	-21.8	-12.0	-34.0	-37.1	-23.0	-13.1	-18.7	-22.7	-24.1	-23.1
7.1	-17.5	-21.8	-20.6	-11.5	-33.9	-35.8	-21.8	-12.7	-18.7	-23.0	-24.6	-23.3
7.2	-17.6	-22.4	-19.8	-11.3	-33.9	-34.8	-21.0	-12.4	-18.7	-23.5	-25.2	-23.6
7.3	-17.6	-23.2	-19.3	-11.2	-34.2	-34.2	-20.5	-12.4	-18.8	-24.3	-25.9	-24.1
7.4	-17.7	-24.3	-19.2	-11.4	-34.7	-33.8	-20.3	-12.5	-18.8	-25.5	-26.8	-24.6
7.5	-17.7	-25.3	-19.3	-11.7	-35.6	-33.8	-20.5	-12.9	-18.9	-26.4	-27.9	-25.4
7.6	-17.8	-26.0	-19.7	-12.3	-36.9	-33.7	-20.9	-13.4	-18.9	-27.1	-29.3	-26.4
7.7	-17.9	-26.1	-20.3	-13.0	-38.3	-33.8	-21.5	-14.2	-19.1	-27.3	-31.0	-27.5
7.8	-18.1	-25.8	-21.3	-13.9	-40.1	-33.8	-22.5	-15.1	-19.3	-27.0	-33.3	-28.8
7.9	-18.5	-25.7	-22.4	-15.1	-41.8	-33.6	-23.6	-16.2	-19.7	-26.8	-36.1	-30.3
8.0	-19.1	-25.7	-24.0	-16.4	-43.9	-33.4	-25.2	-17.6	-20.3	-26.9	-39.8	-32.1
8.1	-20.0	-26.1	-25.7	-17.9	-45.1	-33.3	-26.9	-19.1	-21.2	-27.2	-43.4	-34.0
8.2	-21.2	-26.5	-27.8	-19.7	-46.0	-33.1	-29.0	-20.9	-22.3	-27.6	-43.4	-36.3
8.3	-22.7	-26.7	-29.8	-21.7	-46.2	-33.0	-31.0	-22.8	-23.9	-27.8	-41.9	-38.6
8.4	-25.0	-26.2	-31.3	-23.9	-44.9	-32.6	-32.4	-25.0	-26.2	-27.4	-39.5	-40.8
8.5	-28.0	-25.2	-32.1	-26.4	-42.4	-32.3	-33.2	-27.5	-29.1	-26.4	-37.6	-42.5
8.6	-33.6	-23.8	-32.2	-29.7	-40.9	-32.1	-33.3	-30.9	-34.8	-25.0	-36.3	-43.2
8.7	-37.4	-22.2	-31.7	-34.0	-39.7	-31.9	-32.9	-35.2	-38.6	-23.4	-35.3	-42.6
8.8	-34.4	-20.9	-30.4	-42.0	-38.9	-31.8	-31.6	-43.1	-35.5	-22.0	-34.6	-41.2
8.9	-29.8	-19.7	-28.8	-44.9	-39.0	-32.2	-29.9	-46.0	-31.0	-20.9	-34.2	-39.6
9.0	-26.9	-18.7	-27.2	-34.7	-39.4	-32.9	-28.3	-35.9	-28.1	-19.9	-33.9	-38.0
9.1	-24.9	-18.0	-25.6	-30.4	-40.2	-33.9	-26.8	-31.6	-26.1	-19.1	-33.7	-36.8
9.2	-23.5	-17.4	-24.4	-28.0	-41.0	-35.6	-25.6	-29.2	-24.7	-18.6	-33.7	-35.7
9.3	-22.6	-17.2	-23.4	-26.2	-41.4	-37.6	-24.6	-27.4	-23.8	-18.3	-33.7	-34.9
9.4	-22.0	-17.1	-22.5	-24.9	-41.0	-39.9	-23.6	-26.0	-23.2	-18.3	-33.9	-34.2
9.5	-21.7	-17.2	-21.8	-23.8	-40.3	-42.0	-23.0	-25.0	-22.8	-18.4	-34.1	-33.8
9.6	-21.5	-17.5	-21.3	-23.0	-39.5	-43.1	-22.5	-24.2	-22.7	-18.7	-34.4	-33.5
9.7	-21.5	-18.0	-20.9	-22.5	-38.8	-42.7	-22.1	-23.7	-22.7	-19.2	-34.8	-33.5
9.8	-21.7	-18.8	-20.6	-22.1	-38.2	-41.2	-21.8	-23.3	-22.9	-20.0	-35.3	-33.5
9.9	-22.1	-19.9	-20.5	-22.0	-37.6	-39.3	-21.7	-23.1	-23.2	-21.0	-35.9	-33.8
10.0	-22.4	-21.1	-20.5	-22.0	-37.1	-37.4	-21.7	-23.1	-23.6	-22.3	-36.7	-34.2
15.0	-40.9	-27.7	-27.6	-43.1	-33.4	-37.9	-28.7	-44.3	-42.0	-28.9	-34.0	-35.8
20.0	-25.3	-32.4	-23.5	-22.5	-39.9	-35.5	-24.7	-23.7	-26.5	-33.5	-38.7	-34.9

offaxis Angle (deg)	Skew 30				Skew 60				Skew 90			
	Along the GSO		Perpendicular to the GSO		Cross Pol		Along the GSO		Perpendicular to the GSO		Cross Pol	
	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol	V-Pol	H-Pol
25.0	-31.9	-27.9	-33.5	-25.4	-35.5	-31.1	-34.7	-26.6	-33.1	-29.1	-32.8	-45.6
30.0	-37.2	-34.2	-29.5	-41.9	-44.4	-48.0	-30.7	-43.1	-38.4	-35.4	-47.4	-48.3
35.0	-25.4	-29.3	-38.4	-36.3	-39.8	-45.6	-39.6	-37.4	-26.5	-30.4	-33.1	-48.2
40.0	-35.3	-34.7	-30.8	-25.1	-38.3	-40.0	-32.0	-26.3	-36.5	-35.9	-31.3	-35.8
45.0	-37.9	-43.3	-34.5	-34.8	-41.8	-38.6	-35.6	-36.0	-39.1	-44.4	-43.7	-39.0
50.0	-21.4	-31.9	-33.4	-38.7	-30.4	-37.6	-34.5	-39.8	-22.6	-33.1	-35.3	-40.5
55.0	-35.2	-40.1	-38.0	-39.0	-45.3	-42.1	-39.1	-40.2	-36.3	-41.2	-37.7	-44.2
60.0	-43.1	-45.6	-47.1	-37.1	-45.2	-40.4	-48.2	-38.2	-44.3	-46.7	-45.4	-42.8
65.0	-39.8	-39.7	-43.5	-39.6	-44.9	-44.5	-44.7	-40.7	-40.9	-40.9	-40.3	-44.7
70.0	-45.1	-44.3	-49.8	-38.5	-48.7	-40.0	-50.9	-39.7	-46.2	-45.4	-44.6	-48.2
75.0	-42.3	-46.2	-45.3	-36.6	-44.5	-47.8	-46.5	-37.7	-43.5	-47.4	-51.2	-42.4
80.0	-54.0	-55.3	-46.8	-41.5	-53.4	-52.8	-48.0	-42.7	-55.2	-56.5	-52.2	-47.0
85.0	-61.3	-56.6	-53.6	-50.4	-59.1	-57.6	-54.8	-51.5	-62.5	-57.7	-58.9	-57.0
89.0	-67.0	-61.8	-64.0	-62.0	-64.9	-63.9	-65.1	-63.1	-68.2	-62.9	-70.7	-66.9

## EXHIBIT E. Radiation Hazard Assessment

This report provides an analysis of the non-ionizing radiation levels for the AURA LE antenna. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure:

- General Population/**Uncontrolled** Environment and
- **Controlled** Environment, where the general population does not have access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of:

- 5 milliwatts per square centimeter (**5 mW/cm<sup>2</sup>**) averaged over any 6 minute period in a **controlled** environment, and
- 1 milliwatt per square centimeter (**1 mW/cm<sup>2</sup>**) averaged over any 30 minute period in an **uncontrolled** environment.

In the normal range of transmit powers for satellite antennas, the power densities at or around the antenna surface are expected to exceed safe levels. This area will not be accessible to the general public.

Operators and technicians will receive training specifying this area as a high exposure area. Procedures will be established to ensure that all transmitters are turned off before this area may be accessed by operators, maintenance or other authorized personnel.

## Near Field Exposure

The AURA LE antenna potentially exceeds MPE limits in the near field within the rectangular volume directly in front of the panels (7.0 mW/cm<sup>2</sup>). For this calculation, it was assumed that all 10 watts from each SSPA module are uniformly distributed across the surface area of the panel. There are two SSPA modules, one for each antenna panel. This is a reasonable assumption for a flat panel waveguide fed phased array with minimal sidelobe tapering.

The extent of the near field region is defined by the following

$$R_{nf} = D^2 / (4\lambda) \\ = 9.2 \text{ meters}$$

Where **D** is the width of the panel (0.88 meters)

The maximum power density in the Near Field can be determined by the following equation:

$$S_{nf} = P_{SSPA} / A \\ = 6.8 \text{ mW/ cm}^2$$

Where **A** is the surface area of the panel and **P** is the power available from the SSPA. In normal operation, this antenna is mounted on a fuselage top with the main beam pointed toward the sky at a minimum elevation angle of 10 degrees such that human exposure in the near field is not possible. Furthermore, normal TDMA operation uses a duty cycle of 10% or less, reducing maximum near field exposure by an order of magnitude to 0.7 mW/cm<sup>2</sup>.

In normal operation, the transmitter is turned off or muted below 10,000 feet altitude. Clearly the general public will not be able to be in the path of a transmitting antenna.

On the ground, operation of the transmitter may be required for maintenance or testing. A manual override switch will allow ground personnel to enable the transmitter when the altitude is below 10,000 feet. This is a controlled environment. Personnel must be trained in the safe operation of the transmitter.

Additionally, any blockage in the near field (human or otherwise) will cause the transmitter to be disabled within seconds as the system does not transmit unless it can receive the downlink carrier from the satellite. Therefore, prolonged exposure in the near field is not possible in normal operation.

### **Far Field Exposure (in main beam)**

$$R_{ff} = 0.60D^2 / \lambda$$
$$= 22 \text{ m}$$

$$S_{ff} = P_{EIRP} / (4\pi R_{ff}^2)$$
$$= 1.0 \text{ mW/cm}^2$$

At a distance of 22 meters, the power density of the AURA LE is 1.0 mW/cm<sup>2</sup>, which is within the limits of General Population/Uncontrolled Exposure (MPE) even in the direction of the main beam of the antenna.

Maximum far field exposure to humans would be due to a sidelobe which is at least 15 dB below the main beam. The exposure to humans would be less than 0.032 mW/cm<sup>2</sup>.

### **Transition Region Exposure (in main beam)**

At a distance of 13 m from the antenna, maximum exposure in the main beam is 5 mW/cm<sup>2</sup>. This assumes that PFD decreases linearly from the near to the far field.

### **Exposure to personnel located below antenna height**

The antenna will be mounted at a height above personnel. In this case, the worst case exposure is due to the first elevation sidelobe at a level of -15 dB. For the AURA LE antenna, the far field distance in the elevation plane is approximately 0.8 meters.

The 5 mW/cm<sup>2</sup> threshold is reached at a distance of 1.8 meters and the 1 mW/cm<sup>2</sup> threshold is reached at a distance of 4.0 m.

Observing the safe radius distance noted above during transmit operations will ensure that the threshold will not be exceeded.



**Table 1: Parameters Used for Determining PFD (AURA LE)**

<b>Antenna</b>		
Width		34.7 in 0.88 m
Height		6.6 in 0.17 m
Surface Area		0.148 m <sup>2</sup>
Frequency		14250 MHz
Wavelength (Lambda)		0.0211 m
Transmit Power	P <sub>SSPA</sub>	10 W
Transmit Power		10 dBW
Antenna Gain	G	38 dBi
EIRP	P <sub>EIRP</sub>	48 dBW
<b>Near Field (Azimuth)</b>		
Boundary	$D^2/(4\lambda)$	9.2 m
Power Density	$P_{SSPA}/A$	6.8 mW/cm <sup>2</sup>
<b>Far Field (Azimuth)</b>		
Boundary	$0.6D^2/\lambda$	22 m
Power Density	$P_{EIRP}/(4\pi R^2)$	1.0 mW/cm <sup>2</sup>
Side Lobe Level		-15 dB
Power Density	$P_{EIRP}/(4\pi R^2)$	0.032 mW/cm <sup>2</sup>
<b>Transition Region (Azimuth)</b>		
Safe Distance		13 m
Power Density	linear interpolation	5.0 mW/cm <sup>2</sup>
<b>Far Field (Elevation)</b>		
Boundary	$0.6D^2/\lambda$	0.8 m
Power Density	$P_{EIRP}/(4\pi R^2)$	782.7 mW/cm <sup>2</sup>
Elevation Side Lobe Level		-15 dB
Power Density	$P_{EIRP}/(4\pi R^2)$	24.8 mW/cm <sup>2</sup>
<b>Safe Distance - Main beam</b>		
Safe Distance		22.0 m
Power Density	$P_{EIRP}/(4\pi R^2)$	1.0 mW/cm <sup>2</sup>
Safe Distance		10 m
Power Density	$P_{EIRP}/(4\pi R^2)$	5.0 mW/cm <sup>2</sup>
<b>Safe Distance - in Sidelobe</b>		
Safe Distance		1.8 m
Power Density	$P_{EIRP}/(4\pi R^2)$	5.0 mW/cm <sup>2</sup>
Safe Distance		4 m
Power Density	$P_{EIRP}/(4\pi R^2)$	1.0 mW/cm <sup>2</sup>
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## **Conclusions**

The worse-case radiation hazards exist along the main beam axis. In the case of the maintenance, it is highly unlikely that the antenna axis will be aligned with any uncontrolled area since maintenance will be carefully monitored and limited in time and transmit operations will only be conducted with a clear field of view towards the serving satellite. In this case, the safety radius where the General Population/Uncontrolled Exposure limits are satisfied is 4 meters.

Commissioning and testing of the AURA LE antenna will only be conducted by trained personnel in a controlled environment. By maintaining a safety radius of 22 meters during transmit operations, it can be guaranteed that the General Population/Uncontrolled Exposure limits will not be exceeded under any test conditions.

Panasonic shall take all reasonable and customary measures to prevent human exposure to harmful non-ionizing radiation exceeding the maximum permissible exposure limits in Section 1.1310 of the Commission's rules, 47 C.F.R. § 1.1310. The exterior surface of the antenna shall be prominently marked with a warning of the potential for exposure to high levels of radiofrequency energy.