

Antenna Report

FCC ID: A4RGZDQ6

May 13, 2026

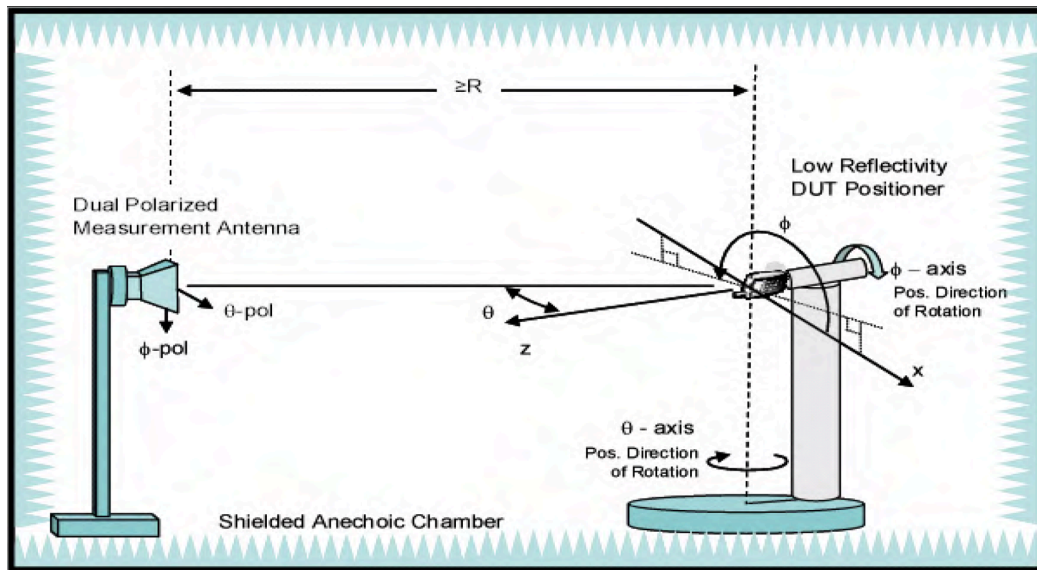
Google LLC

1. Test Method

The antenna gains are obtained through measurements in a fully anechoic OTA chamber with a 3D positioner.

Measurements are taken in discrete steps in theta and phi direction, data is being recorded using the spectrum analyzer (active) or network analyzer (passive) for both theta and phi polarizations at each position resulting in a 3D gain pattern. Step size is <30 deg along both axes.

Gain is either derived directly through spatial averaging of VNA S21 measurements (passive measurement) or by the ratio of spatial averaging of 3D EIRP/TRP measurements vs the conducted power (active measurement)



2. Test Equipment

Site Description	Chamber Manufacturer	Type
AMS-8500	ETS-Lindgren	Fully anechoic
Software Version	ETS-Lindgren	EMQuest V1.08 Build 142267
Site location	No.4, Minsheng St, Tucheng District, New Taipei City 23679, Taiwan	
Test Engineer	Tank Huang (TankSTHuang@fih-foxconn.com)	
Date	Dec. 2025	

Description	Manufacturer	Model	Calibration Date	Due Date
Network Analyzer	Keysight	E5071C	Jun. 1, 2025	Jun. 1, 2026
Spectrum Analyzer	Rohde&Schwarz	FSP7	Jun. 1, 2025	Jun. 1, 2026

3. Test Setup

See separate appendix document for pictures of the test setup in this filing.

4. Antenna Information

Ant #	Antenna Type
Ant3	IFA
Ant4	ILA

Ant	Band	Frequency Band	Open mode Peak Gain(dBi)	Closed mode Peak Gain(dBi)
Ant3	WiFi/BT 2.4 GHz	2402 MHz	-5.90	-9.02
		2412 MHz	-5.89	-9.22
		2437 MHz	-6.60	-9.11
		2462 MHz	-6.51	-8.75
		2480 MHz	-6.77	-9.13
Ant4	WiFi/BT/Thread 2.4 GHz	2402 MHz	-1.73	-2.34
		2412 MHz	-1.61	-2.46
		2437 MHz	-2.09	-3.94
		2462 MHz	-3.14	-5.59
		2480 MHz	-3.70	-6.10
Ant3	UNII-1	5150-5250 MHz	-5.8	-7.59
	UNII-2A	5250-5350 MHz	-5.64	-6.64
	UNII-2C	5470-5725 MHz	-7.24	-6.42
	UNII-3	5725-5850 MHz	-7.4	-6.42
	UNII-4	5850-5895 MHz	-6.84	-6.87
	UNII-5	5925-6425 MHz	-4.23	-6.15
	UNII-6	6425-6525 MHz	-7.39	-6.62
	UNII-7	6525-6875 MHz	-5.89	-5.96
	UNII-8	6875-7125 MHz	-7.45	-7.49
Ant4	UNII-1	5150-5250 MHz	-5.46	-6.93
	UNII-2A	5250-5350 MHz	-4.07	-5.27
	UNII-2C	5470-5725 MHz	-3.35	-4.14
	UNII-3	5725-5850 MHz	-2.31	-4.53
	UNII-4	5850-5895 MHz	-2.51	-6.48
	UNII-5	5925-6425 MHz	-1	-1.61
	UNII-6	6425-6525 MHz	-1.9	-0.95
	UNII-7	6525-6875 MHz	-2.72	-0.71
	UNII-8	6875-7125 MHz	-2.25	-2.23

Note: Antenna gain is measured at Google's partner OTA chamber (FIH-Foxconn). The measurement antenna is fixed in position and the EUT is rotated in both the azimuth and the roll direction to achieve three-dimensional measurement. We use the vector network analyzer method for measurement. The signal from the output port of the vector network analyzer is connected by a cable to the measurement antenna and the input port is connected to the DUT. The vector network analyzer system splits the transmission signal from the output port and gets feedback as a reference signal to the input port for comparison with the measured signal to evaluate the antenna gain.

Measurement Facilities:

Measurement Chamber: ETS-Lindgren AMS-8500 3D fully anechoic test system

ETS-Lindgren positioner: ETS-2090

RF Relay Switches: Agilent 3499A

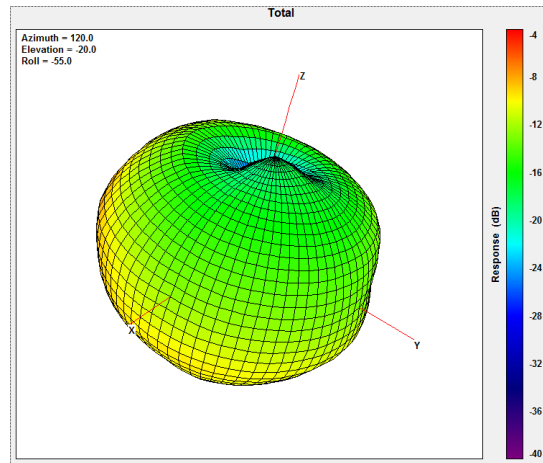
Network Analyzer: Keysight E5071C

5. Radiation Plots for Max Gain Plane

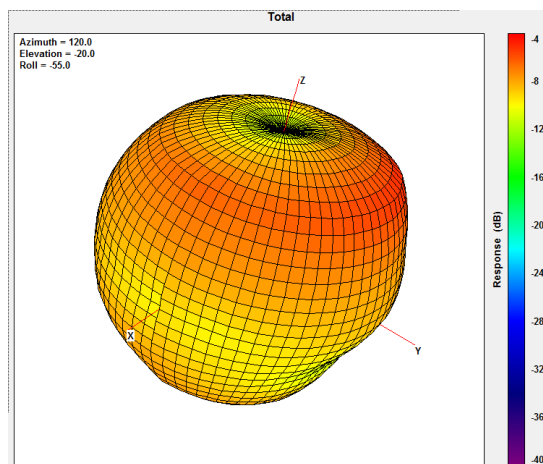
Open mode

Ant3:

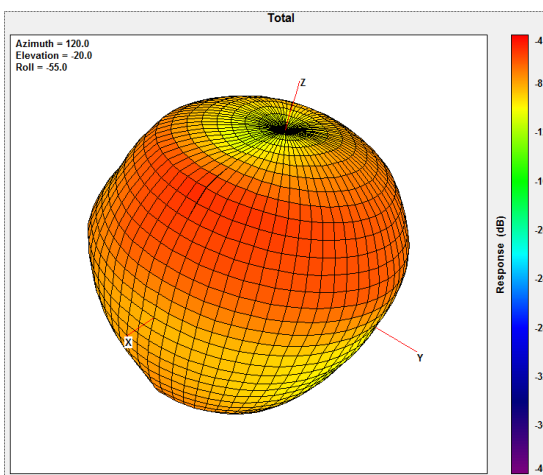
ANT3 Frequency 2400-2483.5MHz



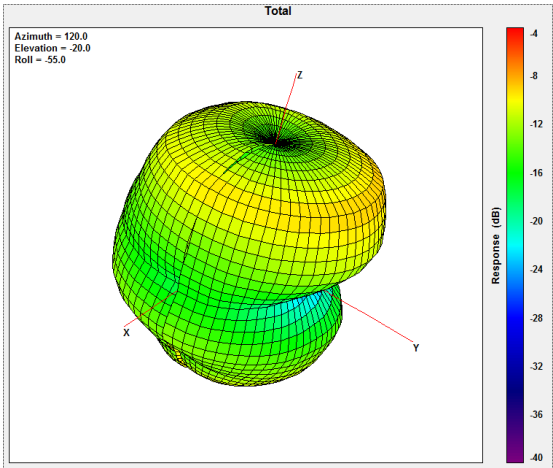
ANT3 Frequency 5150-5250 MHz



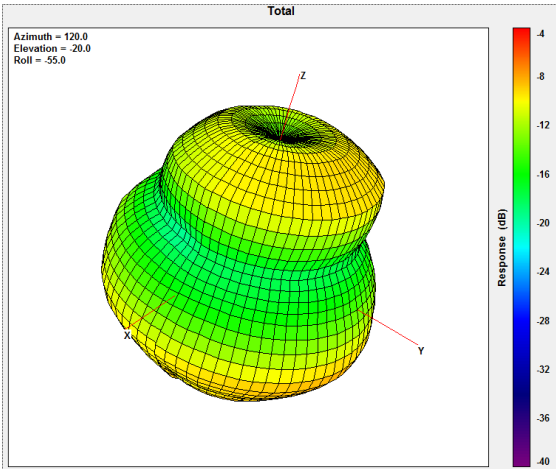
ANT3 Frequency 5250-5350 MHz



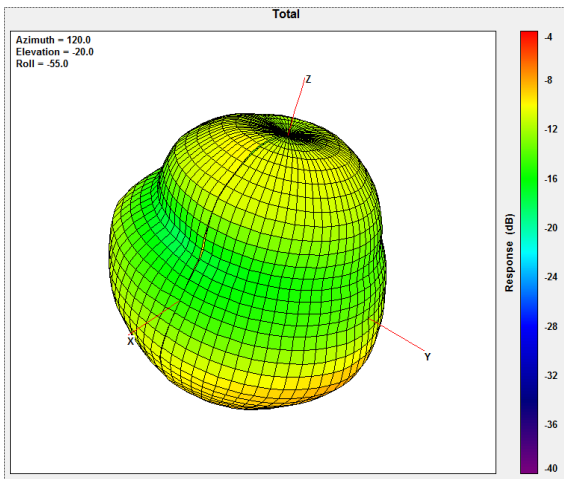
ANT3 Frequency 5470-5725 MHz



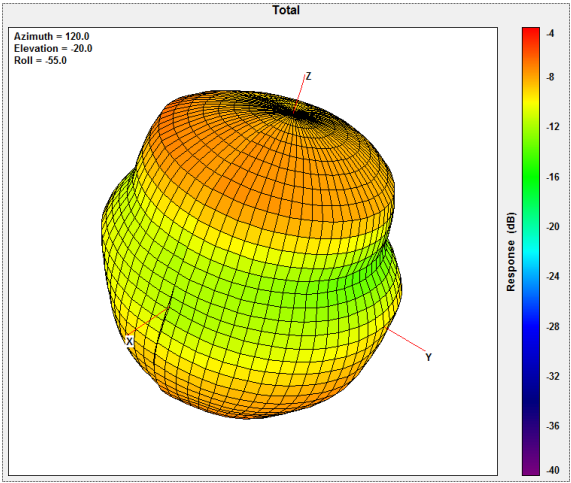
ANT3 Frequency 5725-5850 MHz



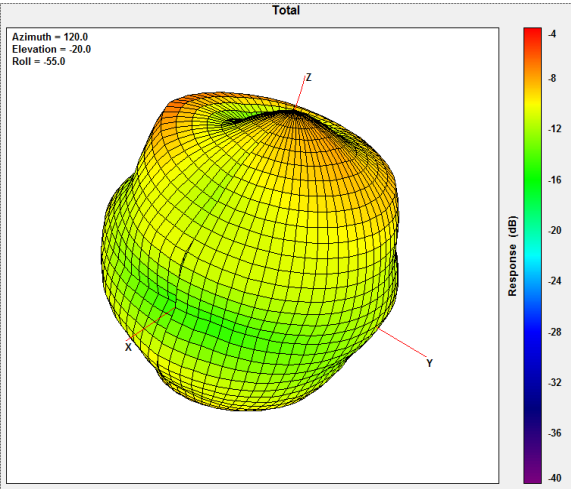
ANT3 Frequency 5850-5895 MHz



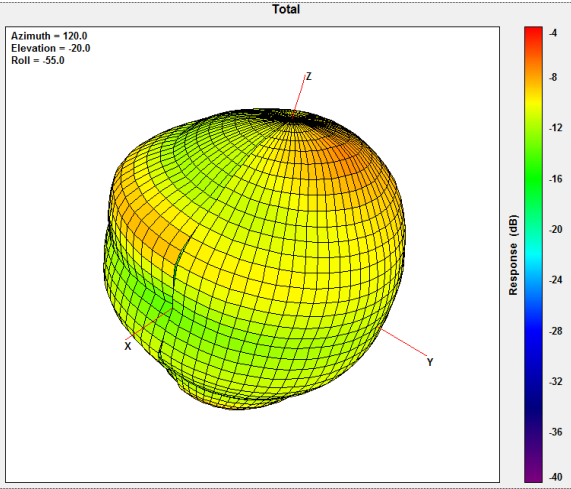
ANT3 Frequency 5925-6425 MHz



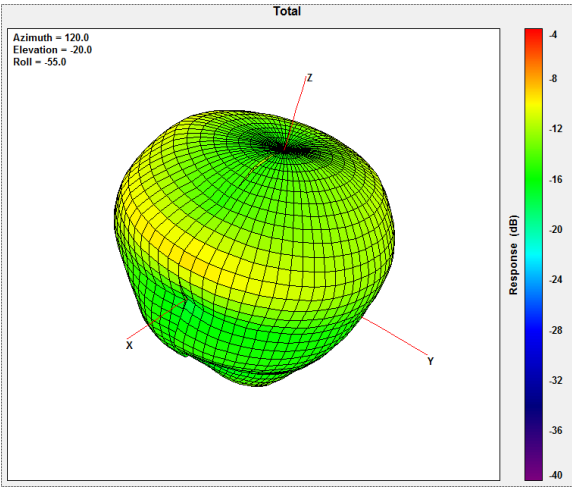
ANT3 Frequency 6425-6525 MHz



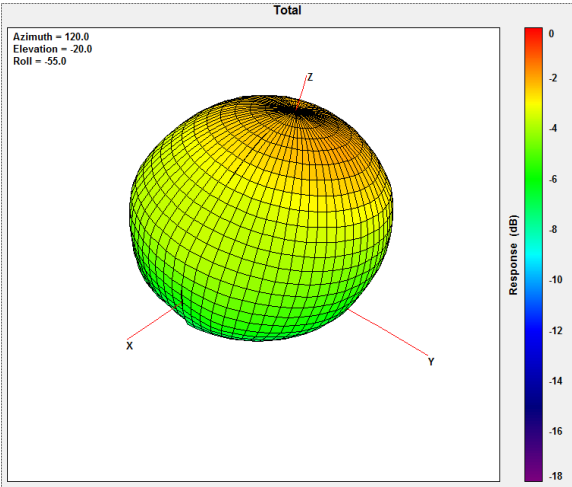
ANT3 Frequency 6525-6875 MHz



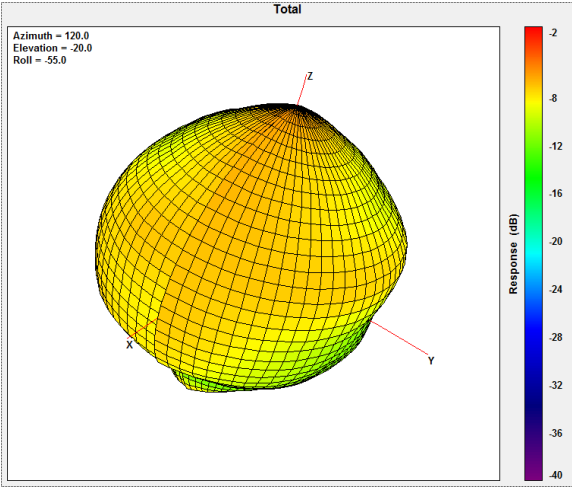
ANT3 Frequency 6875-7125 MHz



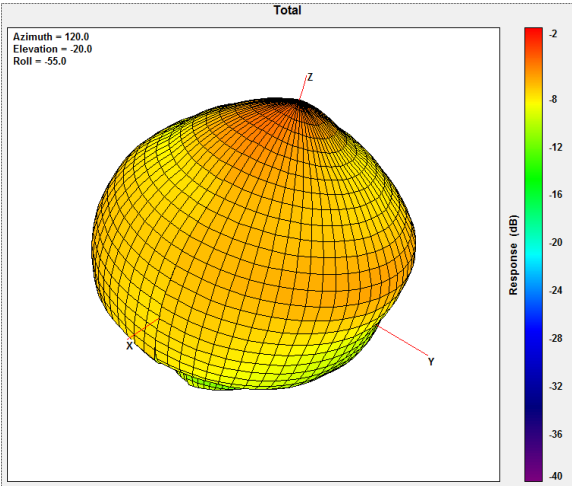
Ant4:
ANT4 Frequency 2400-2483.5MHz



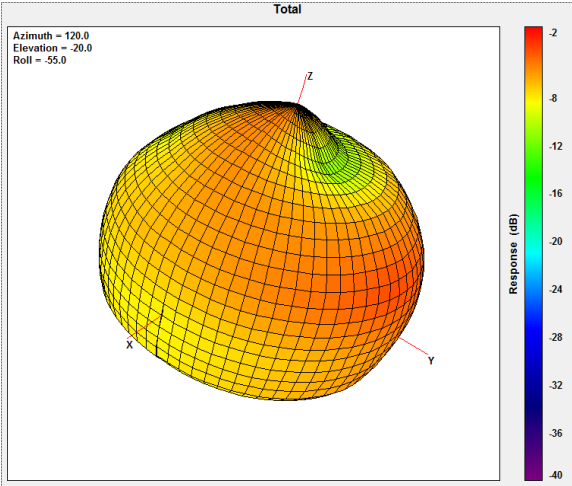
ANT4 Frequency 5150-5250 MHz



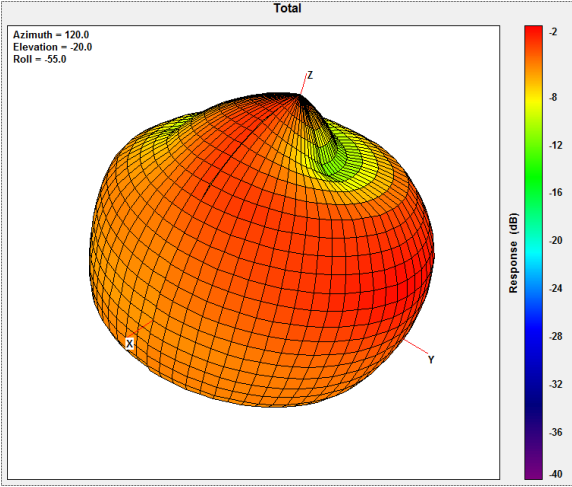
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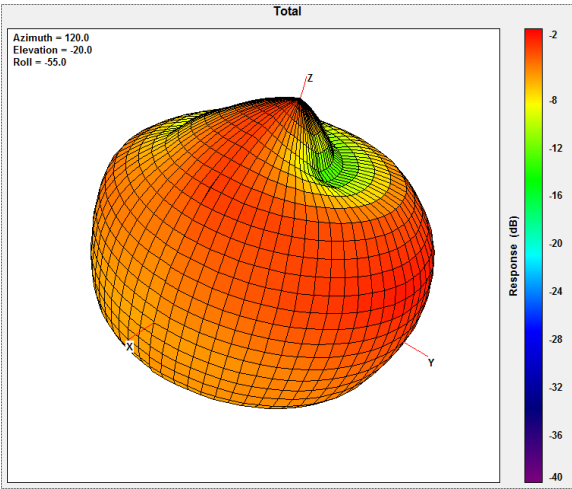
ANT4 Frequency 5470-5725 MHz



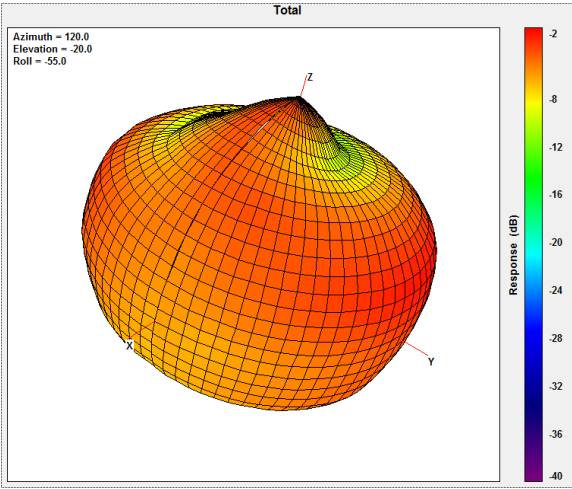
ANT4 Frequency 5725-5850 MHz



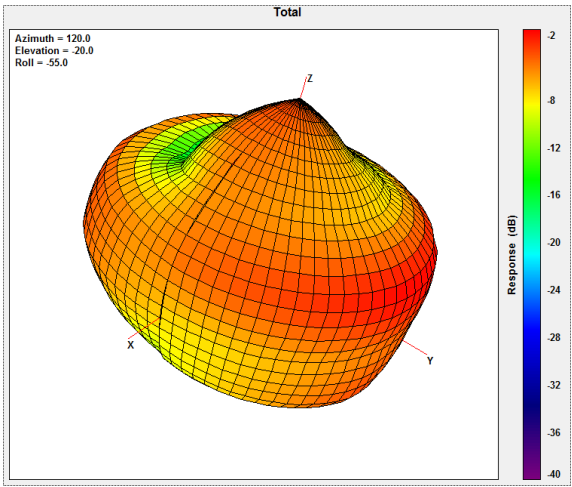
ANT4 Frequency 5850-5895 MHz



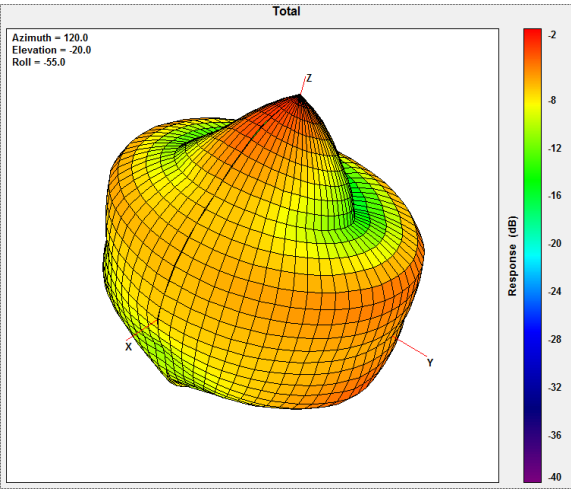
ANT4 Frequency 5925-6425 MHz



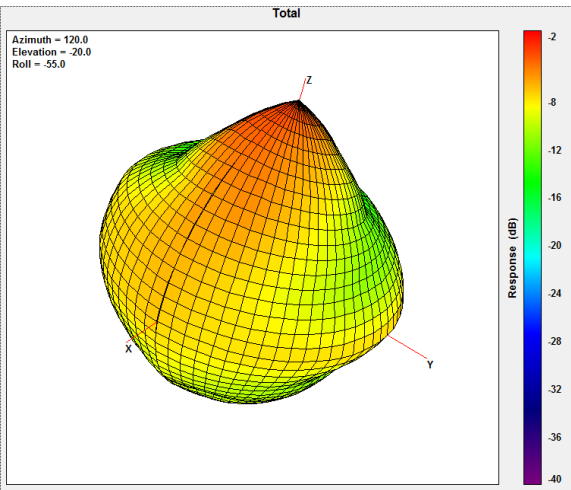
ANT4 Frequency 6425-6525 MHz



ANT4 Frequency 6525-6875 MHz



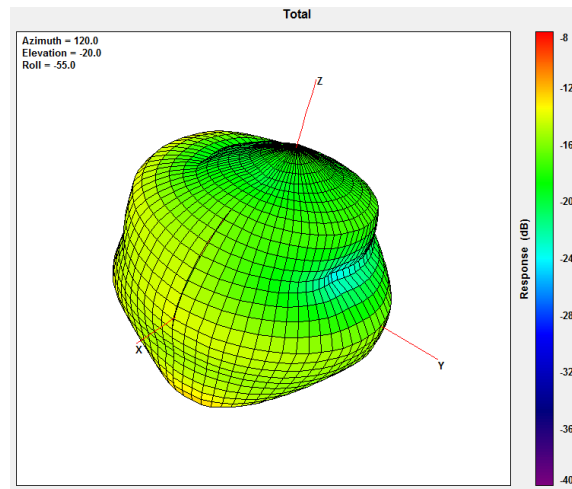
ANT4 Frequency 6875-7125 MHz



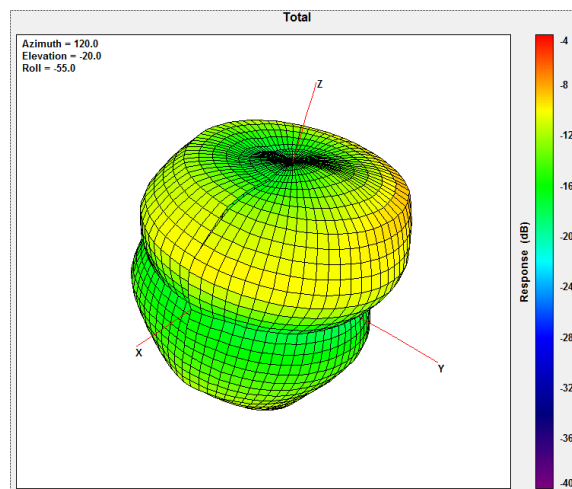
Closed mode

Ant3:

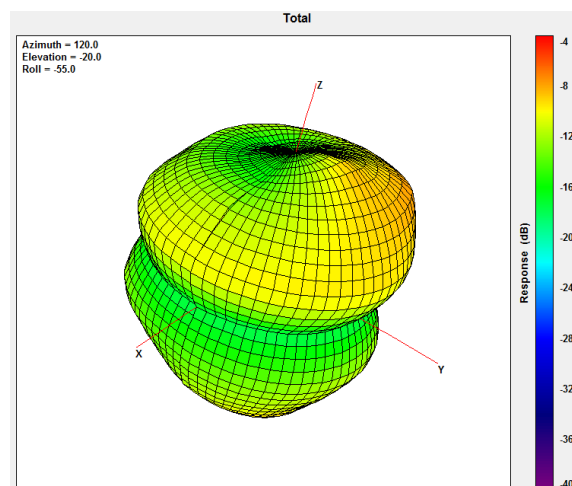
ANT3 Frequency 2400-2483.5MHz



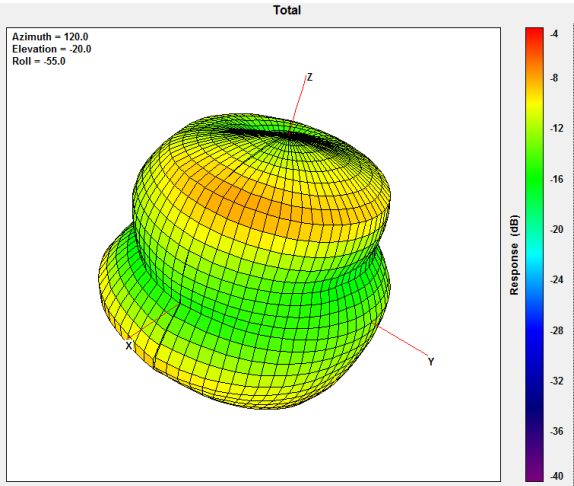
ANT3 Frequency 5150-5250 MHz



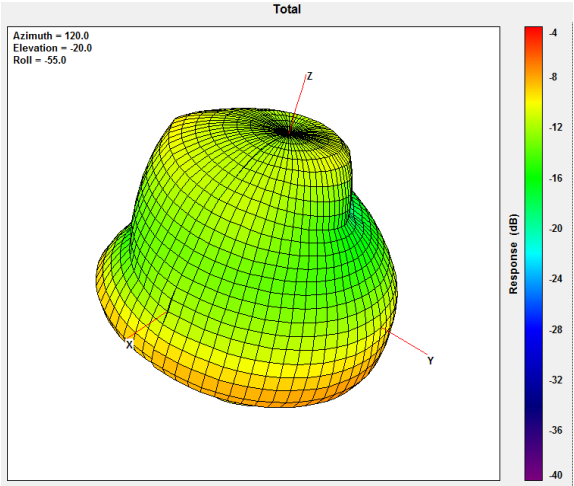
ANT3 Frequency 5250-5350 MHz



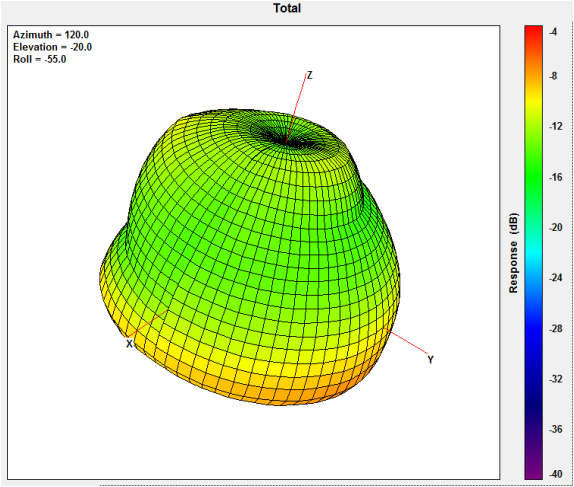
ANT3 Frequency 5470-5725 MHz



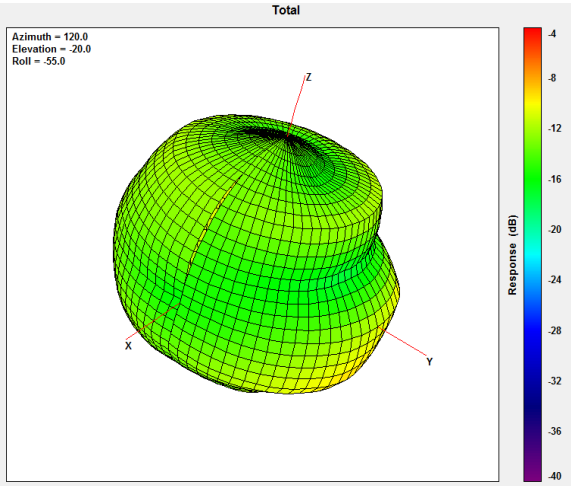
ANT3 Frequency 5725-5850 MHz



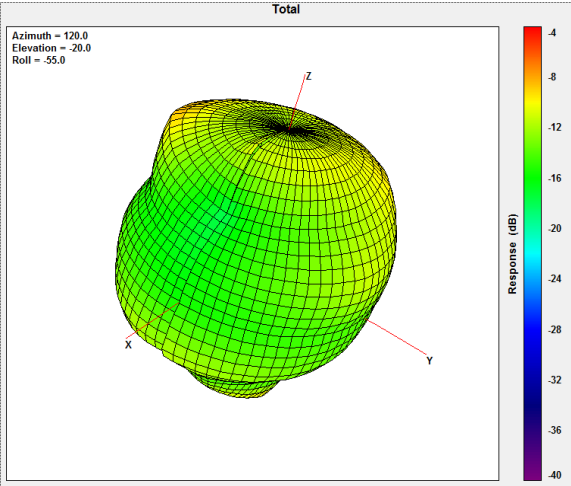
ANT3 Frequency 5850-5895 MHz



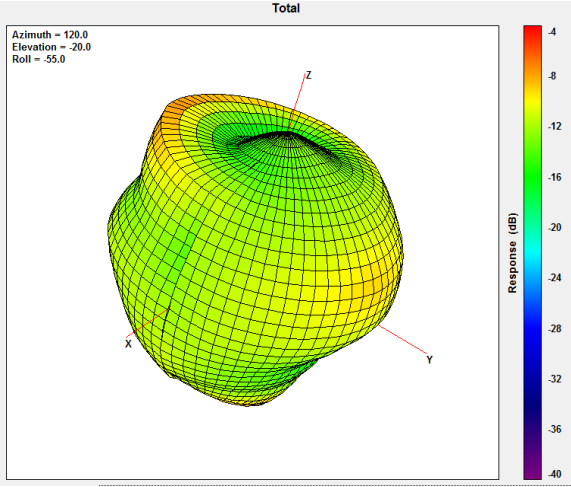
ANT3 Frequency 5925-6425 MHz



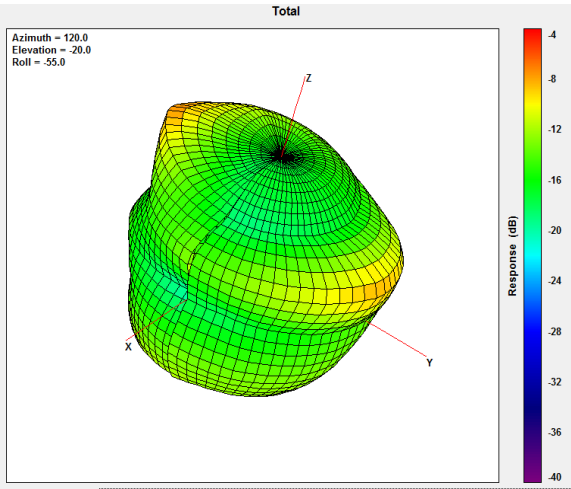
ANT3 Frequency 6425-6525 MHz



ANT3 Frequency 6525-6875 MHz

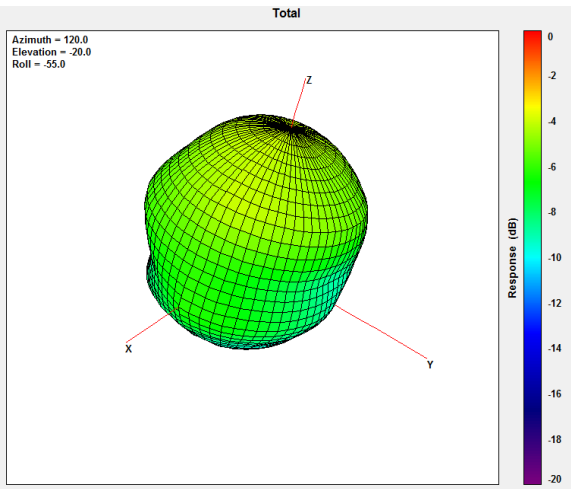


ANT3 Frequency 6875-7125 MHz

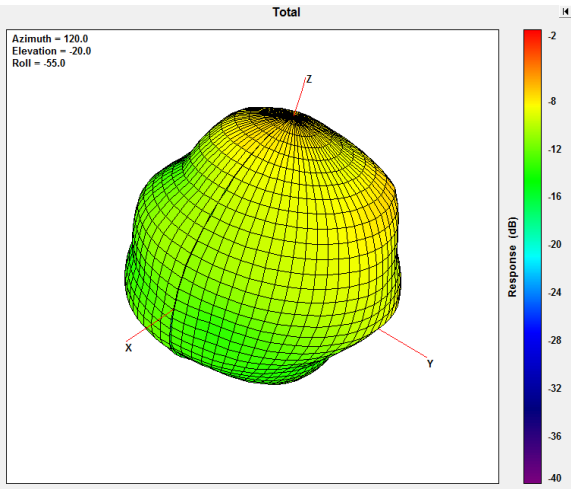


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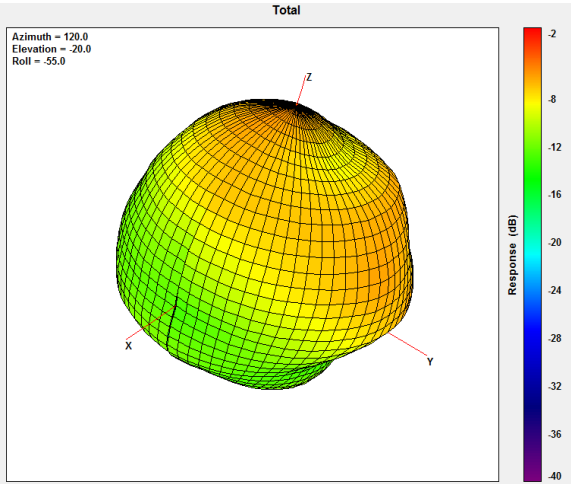
ANT4 Frequency 2400-2483.5MHz



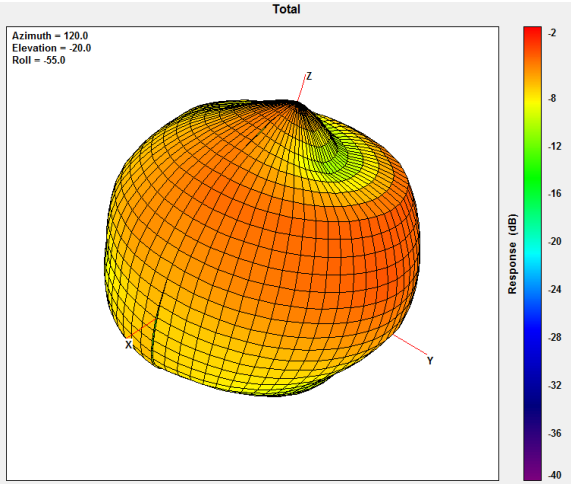
ANT4 Frequency 5150-5250 MHz



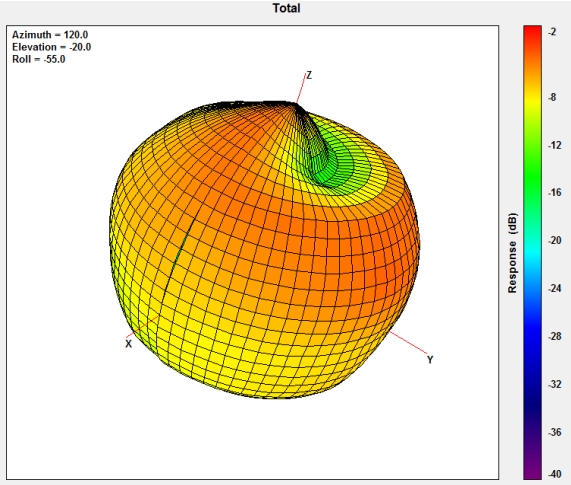
ANT4 Frequency 5250-5350 MHz



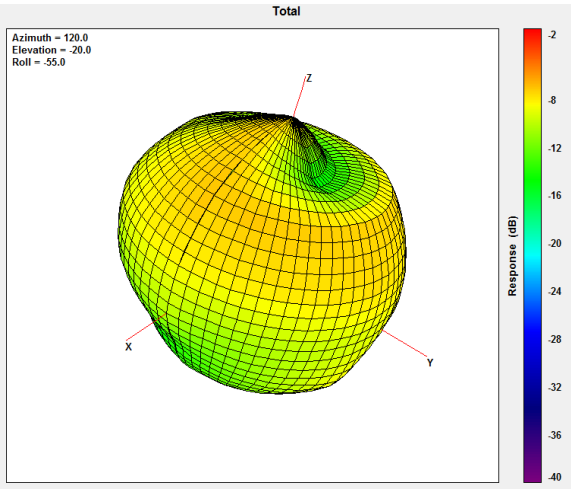
ANT4 Frequency 5470-5725 MHz



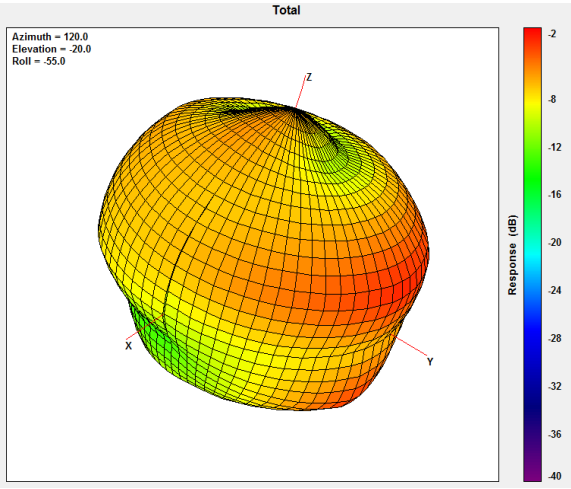
ANT4 Frequency 5725-5850 MHz



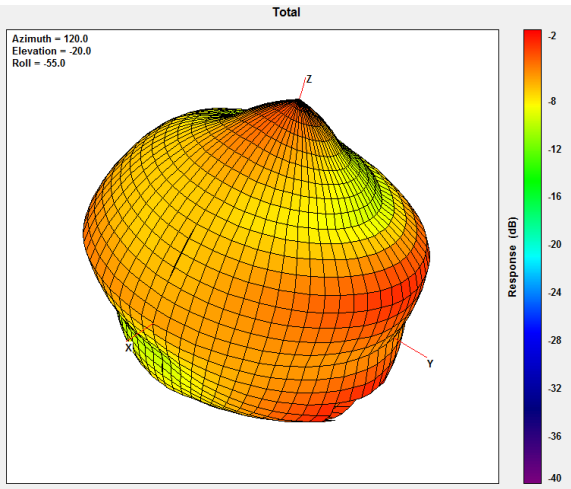
ANT4 Frequency 5850-5895 MHz



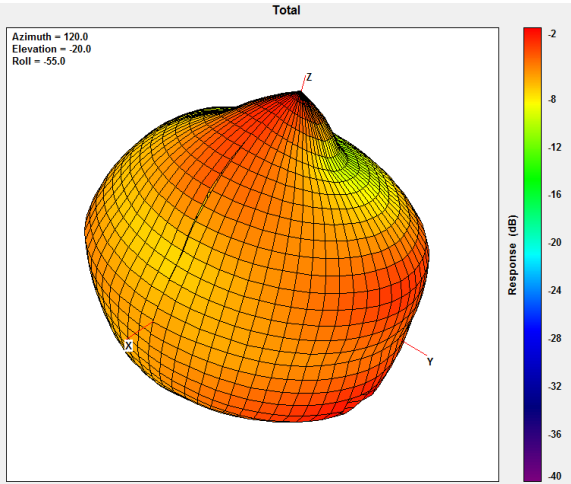
ANT4 Frequency 5925-6425 MHz



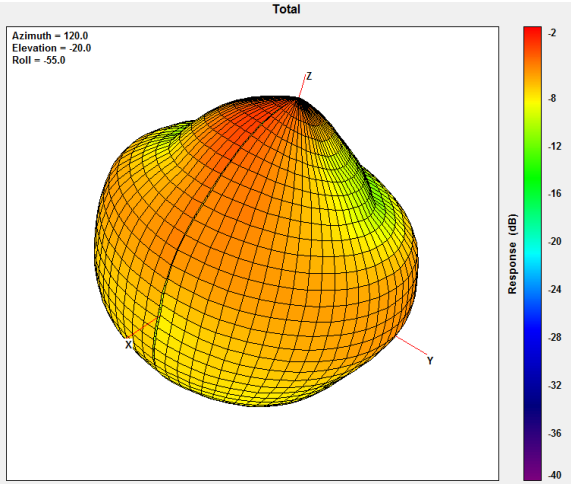
ANT4 Frequency 6425-6525 MHz



ANT4 Frequency 6525-6875 MHz



ANT4 Frequency 6875-7125 MHz



6. Antenna Composite Gain Test Method

The great-circle-cut method, whereby the measuring antenna remains in fixed position while the EUT is rotated about two axes in sequential order. The radiated RF performance of the EUT is measured by sampling the radiated transmit power of the mobile at various locations surrounding the device. A three-dimensional characterization of the transmit performance of the EUT is pieced together by analyzing the data from the spatially distributed measurements.

Data points are taken at every 15 degrees in the theta (θ) and phi (φ) axes to fully characterize the EUT's Far-Field radiation pattern and total radiated power. All of the measured power values are then integrated

The correlated gain and uncorrelated gain are calculated of each degree in the specific spatial domain of the sphere generated by each antenna, and the highest among them is extracted to be the correlation gain of the represented one.

Gain formulas of the correlated gain and uncorrelated gain are based on KDB 662911 D01, (F)(2)(d)(i)&(ii), and listed in the following:

d) *Unequal antenna gains, with equal transmit powers.* For antenna gains given by $G_1, G_2, \dots, G_N$ dBi

(i) If transmit signals are *correlated*, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

(ii) If all transmit signals are *completely uncorrelated*, then

Directional gain = $10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{\text{ANT}}]$ dBi

Frequency (MHz)	Band	Directional Gain - Correlated _ Open mode			
		Ant 3	Ant4	Theta, Phi	Directional Gain(dBi)
5150 - 5250	UNII-1	-9.11	-7.3	-120, 105	-5.15
5925 - 6425	UNII-5	-9.16	-3.52	-165, 0	-2.88
6425 - 6525	UNII-6	-8.19	-3.63	-165, 0	-2.6
6525 - 6875	UNII-7	-10.2	-2.79	-165, 0	-2.72
6875 - 7125	UNII-8	-16.44	-3.48	-180, 0	-4.73

Frequency (MHz)	Band	Directional Gain - Correlated _ Closed mode			
		Ant 3	Ant4	Theta, Phi	Directional Gain(dBi)
5150 - 5250	UNII-1	-8.16	-10.91	120, 45	-6.42
5925 - 6425	UNII-5	-12.38	-6.42	75, 120	-5.89
6425 - 6525	UNII-6	-12.43	-3.56	-90, 0	-3.9
6525 - 6875	UNII-7	-12.83	-2.34	-90, 0	-3.08
6875 - 7125	UNII-8	-12.08	-5.72	120, 90	-5.32

Frequency (MHz)	Band	Directional Gain - Uncorrelated _ Open mode			
		Ant 3	Ant4	Theta, Phi	Directional Gain(dBi)
5150 - 5250	UNII-1	-9.11	-7.3	-120, 105	-8.11
5925 - 6425	UNII-5	-9.16	-3.52	-165, 0	-5.48
6425 - 6525	UNII-6	-8.19	-3.63	-165, 0	-5.34
6525 - 6875	UNII-7	-10.2	-2.79	-165, 0	-5.08
6875 - 7125	UNII-8	-16.44	-3.48	-180, 0	-6.28

Frequency (MHz)	Band	Directional Gain - Uncorrelated _ Closed mode			
		Ant 3	Ant4	Theta, Phi	Directional Gain(dBi)
5150 - 5250	UNII-1	-8.16	-10.91	120, 45	-9.32
5925 - 6425	UNII-5	-19.63	-5	120, 75	-7.86
6425 - 6525	UNII-6	-12.43	-3.56	-90, 0	-6.04
6525 - 6875	UNII-7	-12.83	-2.34	-90, 0	-4.98
6875 - 7125	UNII-8	-17.79	-3.95	-165, 0	-6.78