



Antenna Test Report

GHR13

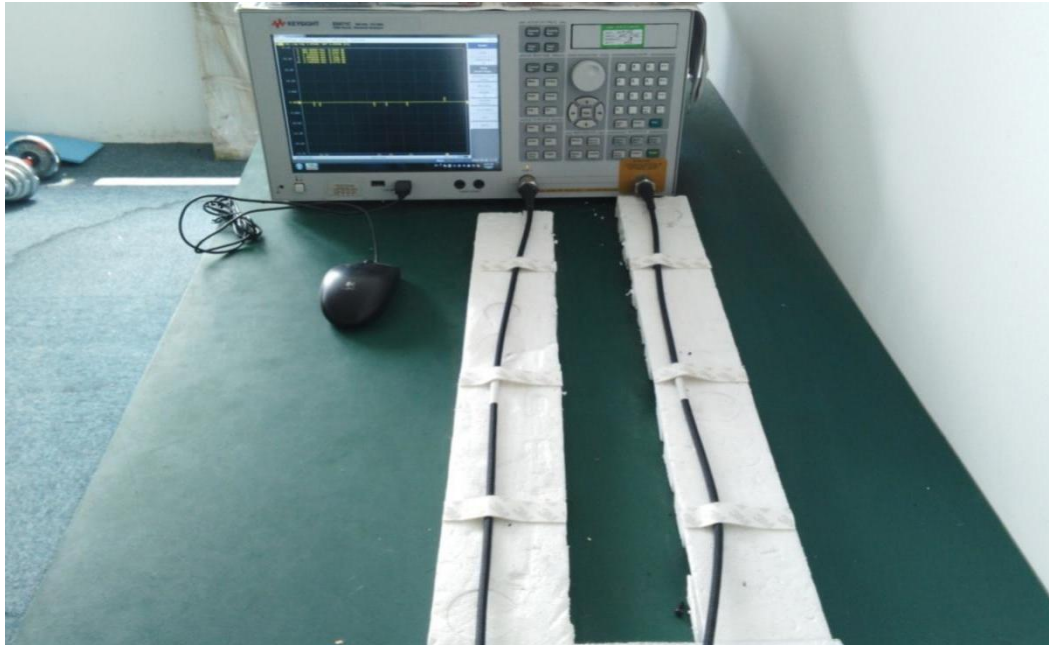
Room 201, Building B, Xinqiao Business Center, 2163 Wanyuan Road, Minhang District, Shanghai

1. RF Fixture Experiment

1.1 Test Setup

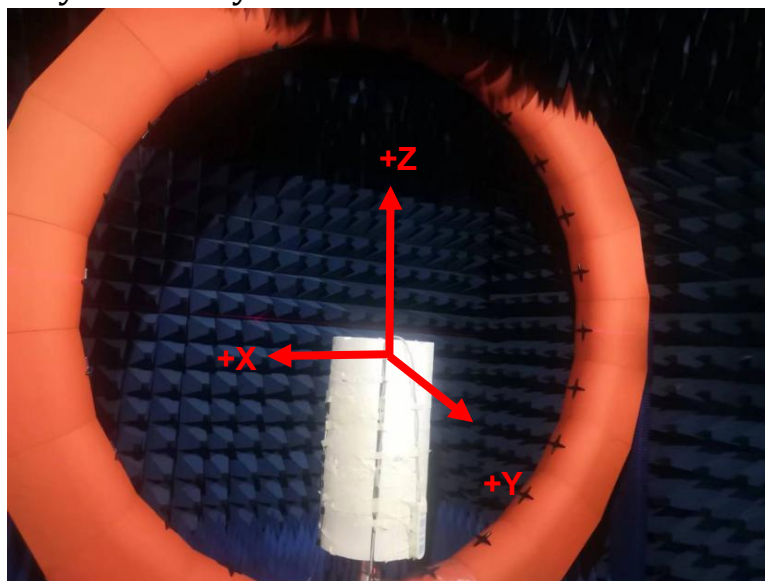
1.1.1 VNA Test Setup

VSWR and Return Loss measurements (S_{11}) were performed using an Keysight E5071C Network Analyzer. The isolation between antennas is also tested. The testing was performed with apparatus in free space.



1.1.2 Anechoic Chamber Test Setup

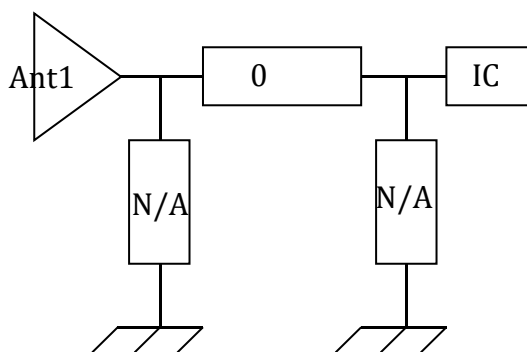
The gain of the antenna was measured in the anechoic chamber. The chamber provides less than -30 dB reflectivity from 400 MHz through 6 GHz. The chamber size is: 7m*4m*3m. The measurement results are calibrated using a leaky wave horn standard. We can measure the antenna gain and efficiency accurately.



2. Antenna Solution



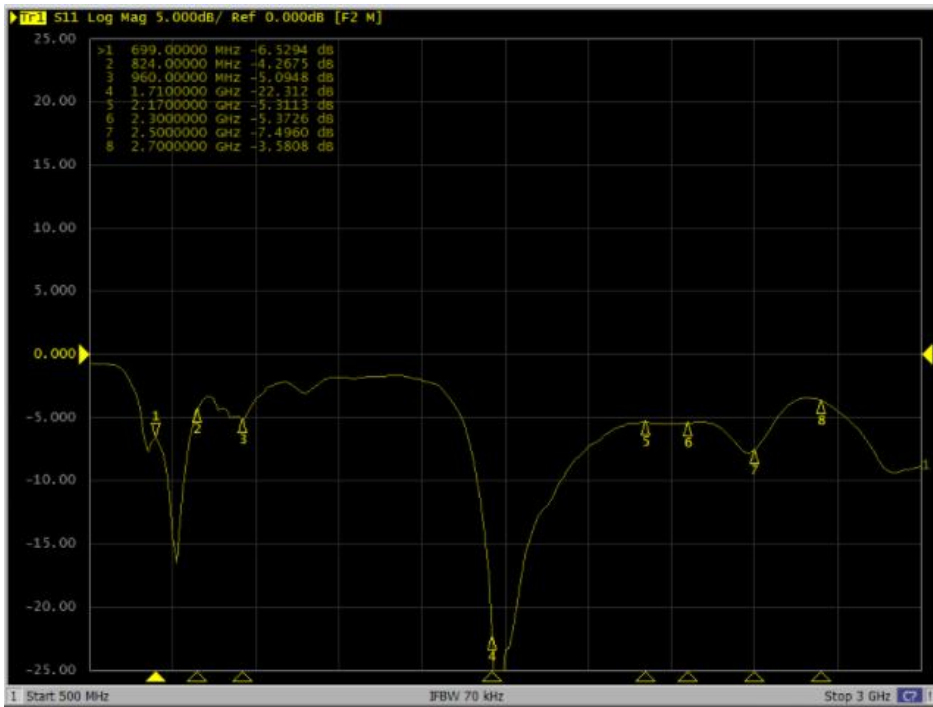
3. RF matching circuit for different antennas



Data Preview

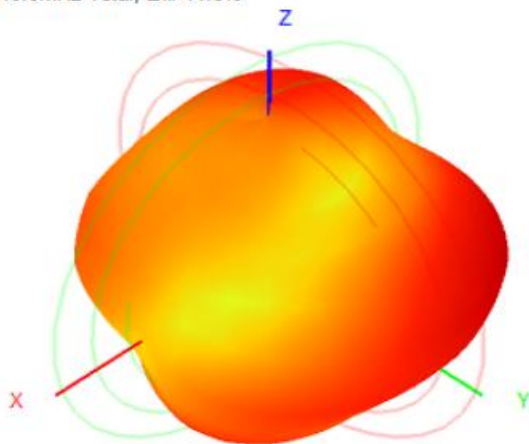
Freq (MHz)	Gain (dBi)	Effi (%)	Freq (MHz)	Gain (dBi)	Effi (%)	Freq (MHz)	Gain (dBi)	Effi (%)
700	1.9	35%	1700	4.4	54%	2240	2.0	47%
710	2.1	42%	1720	4.3	54%	2260	1.5	45%
720	2.6	49%	1740	4.3	54%	2280	0.6	40%
730	2.5	50%	1760	5.0	55%	2300	1.4	44%
740	3.1	59%	1780	4.8	56%	2320	1.6	45%
750	2.8	57%	1800	4.1	59%	2340	0.8	35%
760	3.0	60%	1820	3.6	58%	2360	2.1	44%
770	2.6	54%	1840	3.9	57%	2380	2.0	42%
780	2.4	53%	1860	3.9	59%	2400	2.1	42%
790	3.0	55%	1880	3.1	53%	2420	2.8	47%
800	2.7	51%	1900	3.4	60%	2440	2.5	50%
810	1.9	44%	1920	2.9	56%	2460	2.5	57%
820	2.4	46%	1940	2.3	51%	2480	2.0	63%
830	2.2	43%	1960	2.6	55%	2500	1.5	58%
840	2.1	40%	1980	2.4	51%	2520	1.2	48%
850	2.7	43%	2000	2.4	50%	2540	1.7	49%
860	2.7	39%	2020	2.8	51%	2560	1.3	39%
870	2.7	37%	2040	2.9	51%	2580	0.4	31%
880	2.1	37%	2060	1.8	40%	2600	0.2	32%
890	1.3	36%	2080	3.0	52%	2620	1.7	43%
900	0.7	34%	2100	2.5	43%	2640	0.9	37%
910	1.0	35%	2120	2.5	43%	2660	2.1	45%
920	0.8	34%	2140	2.4	43%	2680	-0.8	25%
930	0.4	32%	2160	1.6	39%	2700	-0.6	28%
940	0.1	30%	2180	2.0	41%			
950	-0.4	28%	2200	2.3	45%			
960	-0.7	26%	2220	1.6	41%			

S11

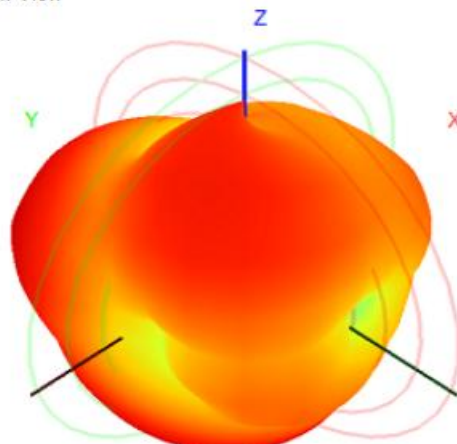


Radiation patterns:3D

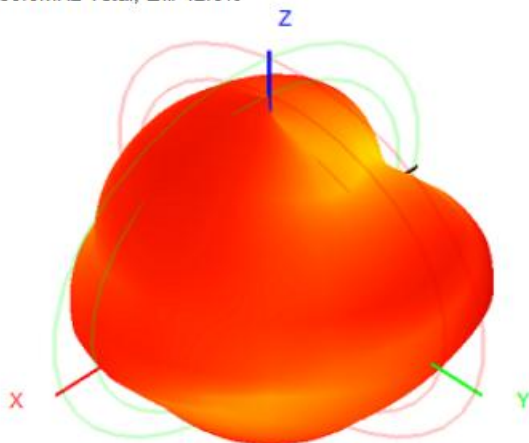
710.0MHz Total, Eff. 41.6%



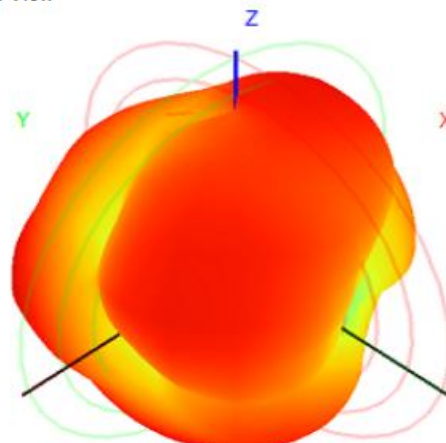
Back View



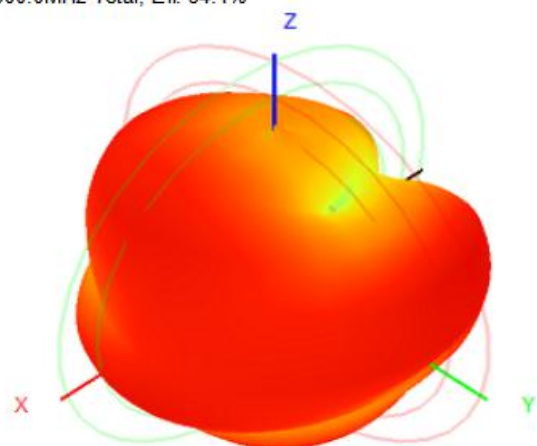
830.0MHz Total, Eff. 42.6%



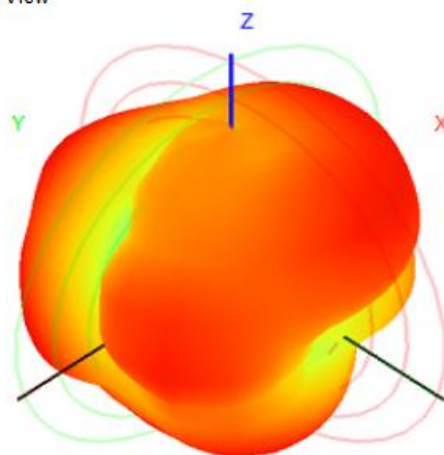
Back View



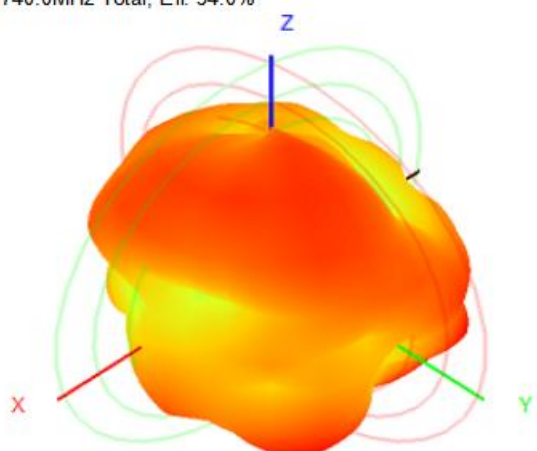
900.0MHz Total, Eff. 34.1%



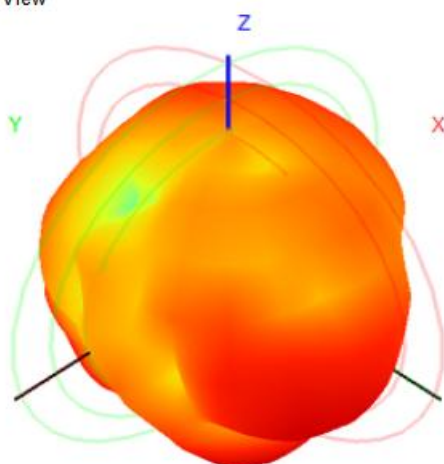
Back View



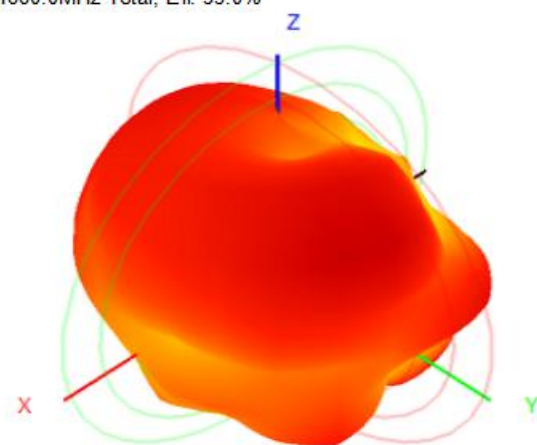
1740.0MHz Total, Eff. 54.0%



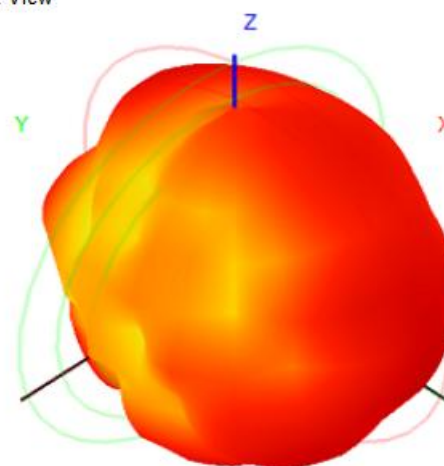
Back View



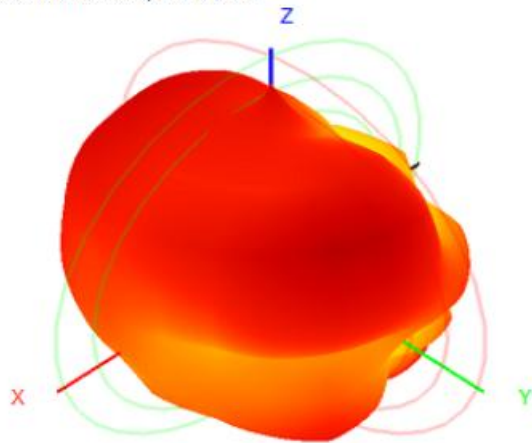
1880.0MHz Total, Eff. 53.0%



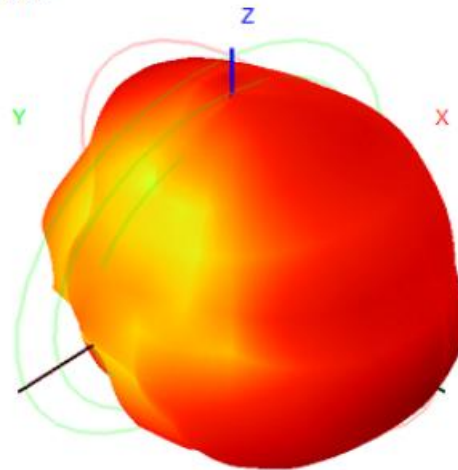
Back View



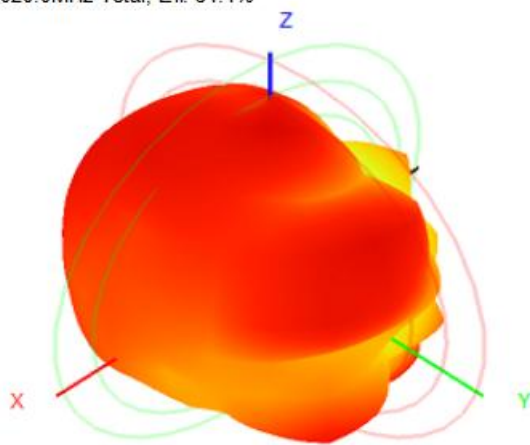
1940.0MHz Total, Eff. 51.3%



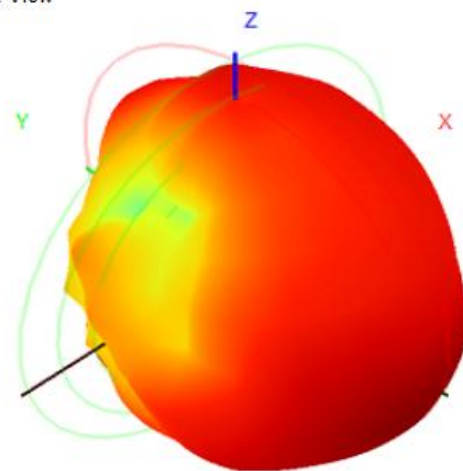
Back View



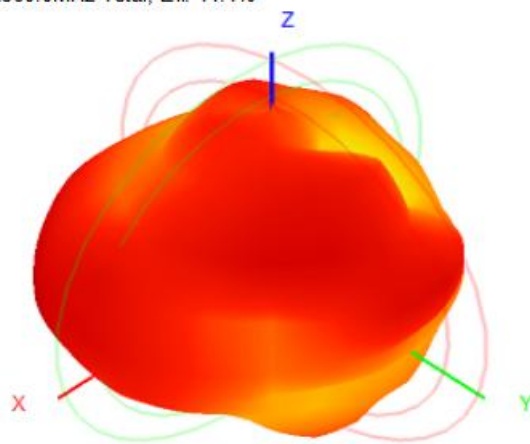
2020.0MHz Total, Eff. 51.1%



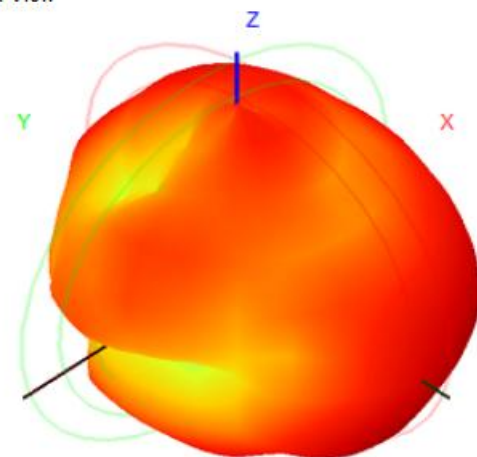
Back View



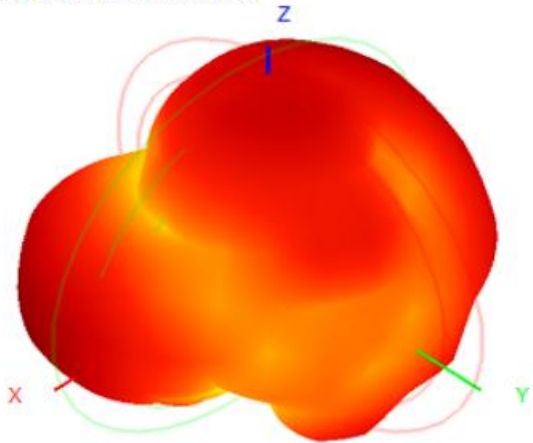
2360.0MHz Total, Eff. 44.1%



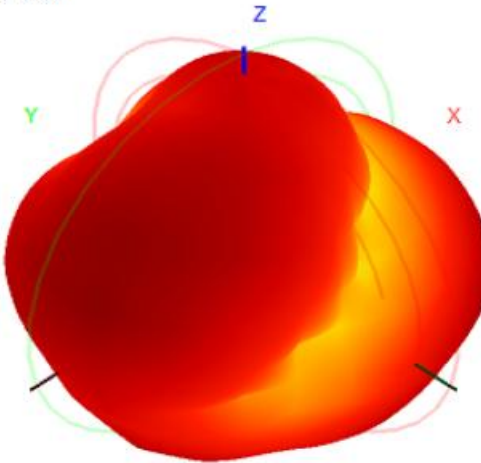
Back View



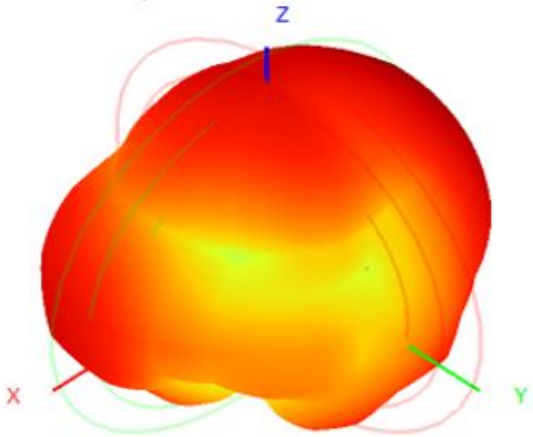
2500.0MHz Total, Eff. 58.4%



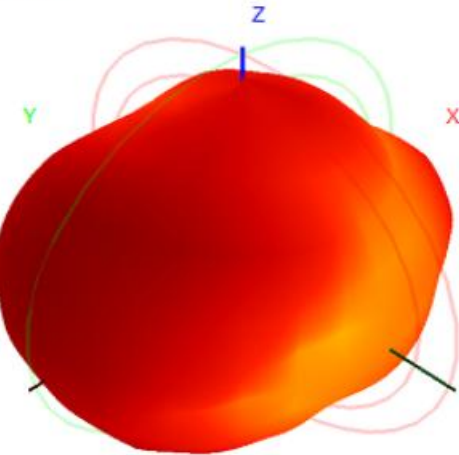
Back View



2580.0MHz Total, Eff. 31.2%

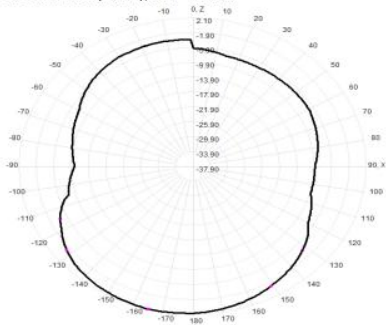


Back View

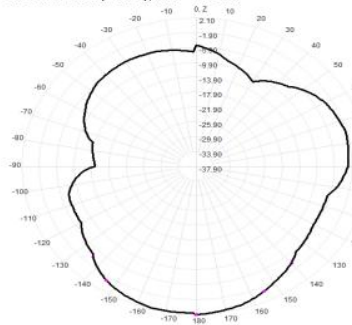


Radiation patterns:2D

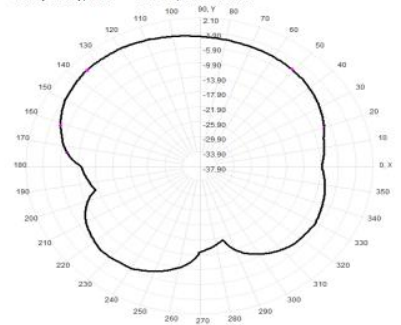
710.0MHz Total(E1-XZ), Max= 1.91dBi



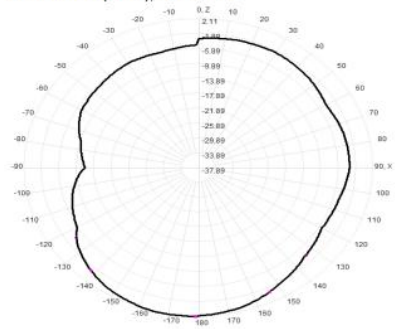
710.0MHz Total(E2-YZ), Max= 2.10dBi



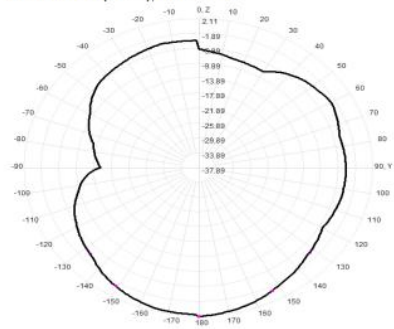
Total(H-XY), Max= -1.27dBi, CirD=16.14



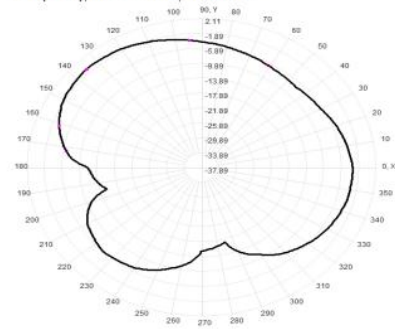
830.0MHz Total(E1-XZ), Max= 2.06dBi



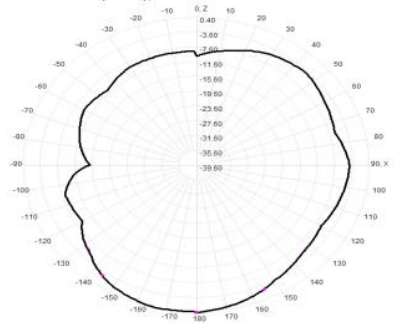
830.0MHz Total(E2-YZ), Max= 2.11dBi



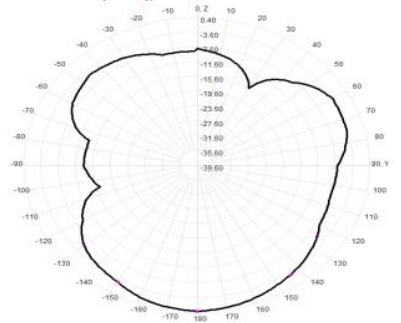
Total(H-XY), Max= -0.58dBi, CirD=16.54



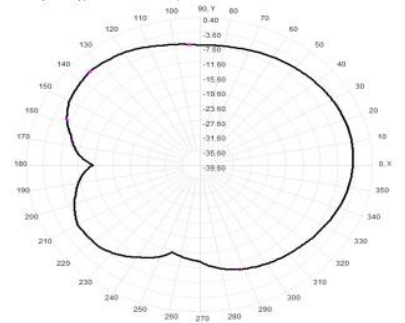
900.0MHz Total(E1-XZ), Max= 0.40dBi



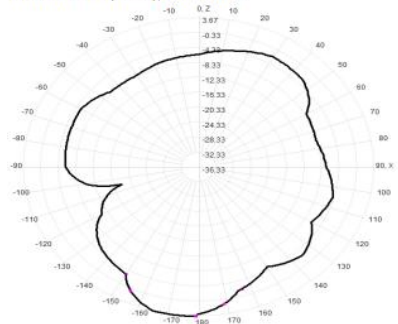
900.0MHz Total(E2-YZ), Max= 0.04dBi



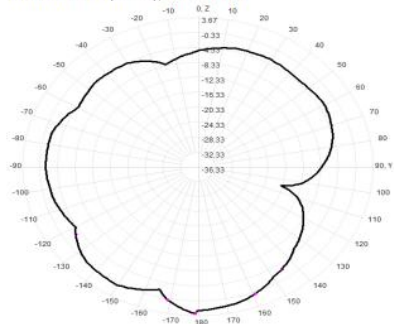
Total(H-XY), Max= -3.85dBi, CirD=11.29



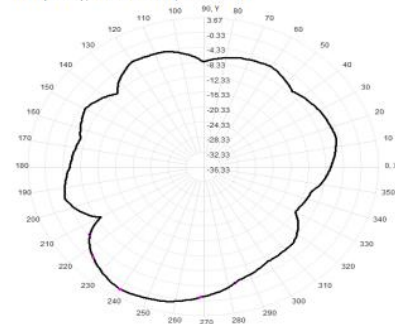
1740.0MHz Total(E1-XZ), Max= 3.67dBi



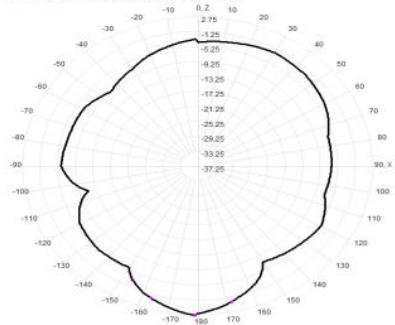
1740.0MHz Total(E2-YZ), Max= 2.91dBi



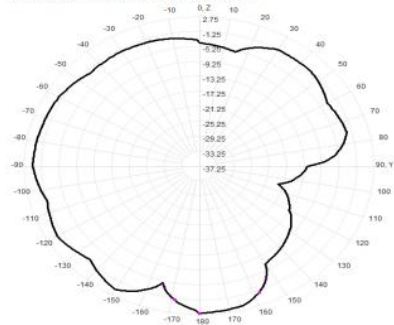
Total(H-XY), Max= 1.58dBi, CirD=13.84



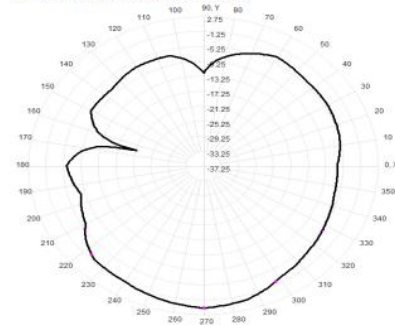
1880.0MHz Total(E1-XZ), Max= 2.75dBi



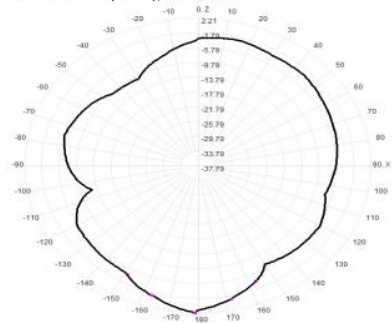
1880.0MHz Total(E2-YZ), Max= 2.22dBi



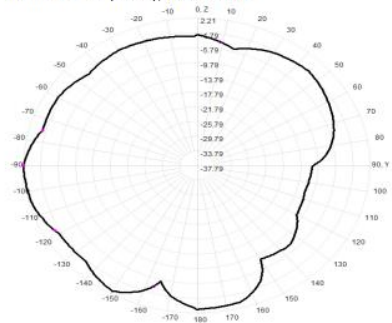
Total(H-XY), Max= 0.76dBi, CirD=22.28



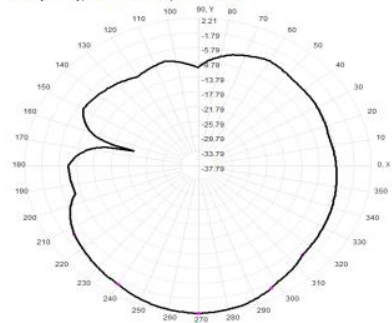
1940.0MHz Total(E1-XZ), Max= 1.94dBi



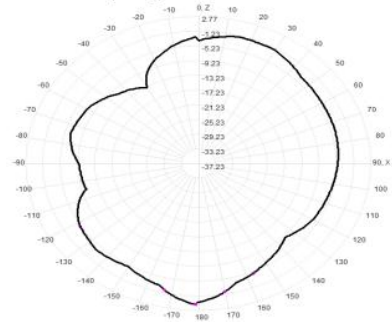
1940.0MHz Total(E2-YZ), Max= 2.21dBi



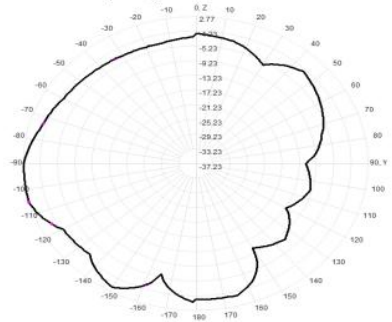
Total(H-XY), Max= 2.21dBi, CirD=24.77



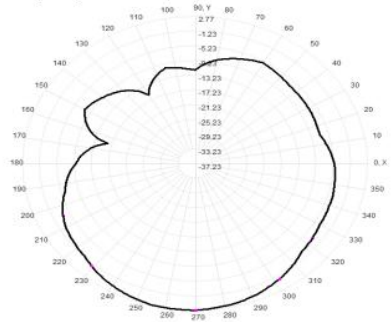
2020.0MHz Total(E1-XZ), Max= 0.99dBi



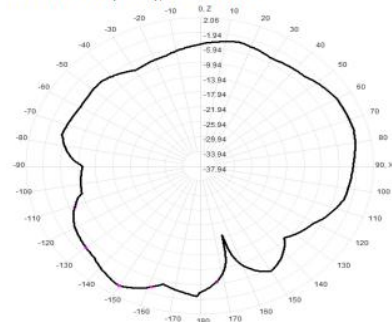
2020.0MHz Total(E2-YZ), Max= 2.77dBi



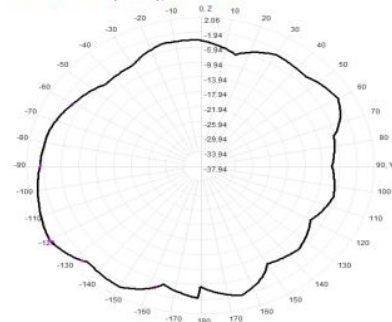
Total(H-XY), Max= 2.52dBi, CirD=18.86



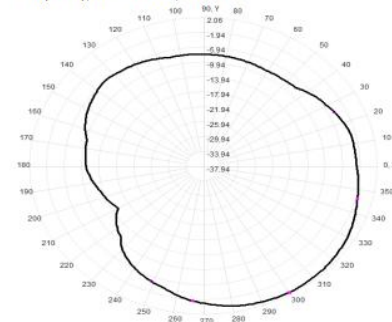
2360.0MHz Total(E1-XZ), Max= -0.84dBi



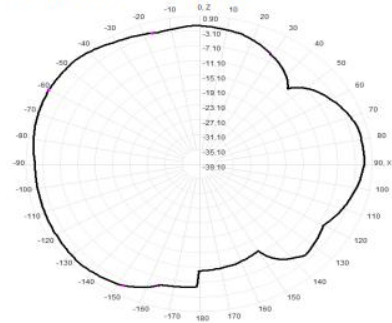
2360.0MHz Total(E2-YZ), Max= 2.06dBi



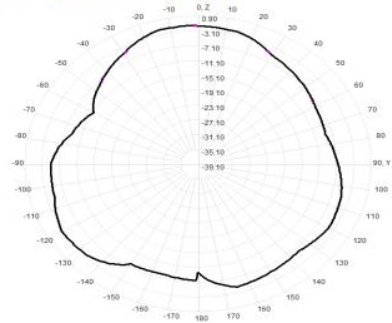
Total(H-XY), Max= 1.35dBi, CirD=16.72



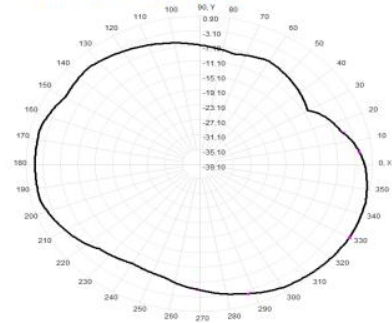
2520.0MHz Total(E1-XZ), Max= 0.90dBi



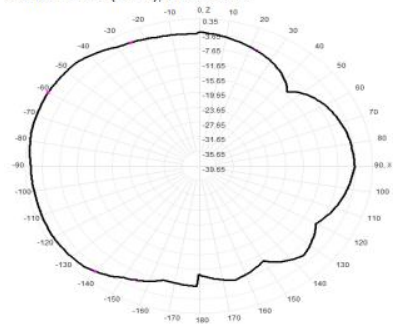
2520.0MHz Total(E2-YZ), Max= -1.62dBi



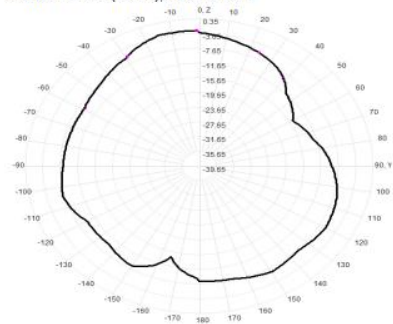
Total(H-XY), Max= 0.76dBi, CirD=11.05



2580.0MHz Total(E1-XZ), Max= 0.35dBi



2580.0MHz Total(E2-YZ), Max= -2.89dBi



Total(H-XY), Max= -0.62dBi, CirD=10.59

