

Regulatory WWAN Antenna Information

(English Language Required for Intel Regulatory Review / Approval)

**(OEM/ODM or antenna vendor is required to complete this document with platform antenna information.
Remove Intel references and make this your own document)**

Platform	
Platform Owner	DELL
Brand Name	DELL
Model Name	P115F
ODM	Compal Electronics, Inc.
Target Launch Date	
Antenna	
Manufacturer	Hong-BO
Part Number	<ul style="list-style-type: none"> ■ <u>TPx Antenna</u> WWAN Main: Antenna P/N: Main: 350-24015 COMPAL P/N: DC33002OH0L
	<ul style="list-style-type: none"> ■ DRx Antenna WWAN Aux : Antenna P/N: Main: 350-24015 COMPAL P/N: DC33002OH0L
	<ul style="list-style-type: none"> ■ DRx2 Antenna MIMO2: Antenna P/N: Main: 350-24015 COMPAL P/N: DC33002OH0L
	<ul style="list-style-type: none"> ■ DRx1 Antenna MIMO3: Antenna P/N: Main: 350-24015 COMPAL P/N: DC33002OH0L
Module	
With WWAN Module	T99W175(DW5930e) FR1
(Check Box)	

Antenna Sample / Antenna Data Requirements for worldwide regulatory approval

Section	Description of Required OEM / ODM Antenna Information	US / IC	EU	Japan	Taiwan	S.Korea
1A	Part Number for Antenna only	Required	Required	Required	Required	Required
1B	Antenna Manufacturer Name	Required	Required	Required	Required	Required
1C	Description of Antenna Type	Required	N/A	N/A	N/A	N/A
1D	Part number of Antenna Assembly / cable impedance, length & diameter.	Required	Desired	Desired	Desired	Desired
1E	Tx1, Tx2 & Tx3 antenna (Peak Gain W/ cable loss) *	Required	Required	Required	Required	Required
	1E OR 1F, 1G, 1H					
1F	Tx1, Tx2 & Tx3 antenna (Peak Gain only) *	Required	Required	Required	Required	Required
1G	VSWR of cable including connector	Required	Required	Required	Required	Required
1H	Tx1, Tx2 & Tx3 antenna (Cable loss W/ connector) *	Required	Required	Required	Required	Required
2	Dimensioned Photographs <u>and</u> Drawings of Tx1, Tx2, and Tx3 (or Rx3) antennas	Required	Required	Required	Required	Required
3	Radiation patterns of antennas loaded in the host platform.	Required	Desired	Required	N/A	Required
4	Platform model name / number - correlated to antenna manufacturer and antenna part number	Required	Required	Desired	Required	Desired
5	Photograph(s) or Drawings showing location of antennas in platform. <u>(S. Korea requires photographs of antennas for approval submission). Taiwan requires pictures of each antenna type shown in the system.</u>	Required	Required	Desired	<u>Required (Photos)</u>	<u>Required (Photos)</u>
6	Mech. drawings / photos with dimensions of antenna locations and distance from end-user (For evaluation of SAR testing requirement).	Required	N/A	N/A	N/A	N/A
7	Photograph(s) or Drawings showing the location of all antennas (WLAN, other) and distance between those transmitting antennas. Information will be used to evaluate whether co-location testing is required.	Required	N/A	N/A	N/A	N/A
8	Local representative contact information for LMA/ PARS process.	Required	N/A	N/A	N/A	N/A

Antenna Information

Section 1. Antenna Assembly Specifications

1A Antenna Part Number	1B Manufacture	1C Antenna Type	1D Cable Assembly Part Number and Information	1E *Peak Gain W/ Cable loss (dBi)	1F Peak Gain w/o Cable Loss (dBi)	1G VSWR	1H Cable Loss (dBi)
(P/N: 350-24015 / (DC33002OH0L) TPx Antenna	Hong-BO Co., Ltd.	PIFA	(1)Cable length: 519mm diameter: 1.37mm SLLS 50 ohm Coaxial (2)Connector P/N: I-PEX MHF- 4L(20632-001R-37)	698-821MHz 1.29 dBi (peak)	698-821MHz 1.72 dBi (peak)	698-821MHz 5.00 max	698-821MHz 0.43 dBi (peak)
				824-960MHz -0.38 dBi (peak)	824-960MHz 0.17 dBi (peak)	824-960MHz 4.00 max	824-960MHz 0.55 dBi (peak)
				1425-1515MHz -0.41 dBi (peak)	1425-1515MHz 0.25 dBi (peak)	1425-1515MHz 3.00 max	1425-1515MHz 0.66 dBi (peak)
				1710-2200MHz 4.42 dBi (peak)	1710-2200MHz 5.20 dBi (peak)	1710-2200MHz 3.00 max	1710-2200MHz 0.78 dBi (peak)
				2300-2690MHz 4.38 dBi (peak)	2300-2690MHz 5.25 dBi (peak)	2300-2690MHz 4.00 max	2300-2690MHz 0.87 dBi (peak)
				3400-3800MHz -0.54 dBi (peak)	3400-3800MHz 0.54 dBi (peak)	3400-3800MHz 4.00 max	3400-3800MHz 1.08 dBi (peak)
				4200-4700MHz 1.69 dBi(peak)	4200-4700MHz 2.94 dBi(peak)	4200-4700MHz 3.00 max	4200-4700MHz 1.25 dBi (peak)
				5150-5925MHz 1.50 dBi (peak)	5150-5925MHz 2.89 dBi (peak)	5150-5925MHz 3.00 max	5150-5925MHz 1.39 dBi (peak)
(P/N: 350-24015 / (DC33002OH0L) DRx Antenna	Hong-BO Co., Ltd.	PIFA	(1)Cable length: 722mm diameter: 1.13mm SLLS 50 ohm Coaxial (2)Connector P/N: I-PEX MHF- 4L(20565-001R-13)	717-821MHz 0.41 dBi (peak)	717-821MHz 1.04 dBi (peak)	717-821MHz 5.00 max	717-821MHz 0.63 dBi (peak)
				824-960MHz -0.87 dBi (peak)	824-960MHz -0.07 dBi (peak)	824-960MHz 5.00 max	824-960MHz 0.80 dBi (peak)
				1425-1515MHz -2.36 dBi (peak)	1425-1515MHz -1.38 dBi (peak)	1425-1515MHz 3.00 max	1425-1515MHz 0.98 dBi (peak)
				1557-1610 MHz -2.22 dBi (peak)	1557-1610 MHz -1.12 dBi (peak)	1557-1610 MHz 3.00 max	1557-1610 MHz 1.10 dBi (peak)
				1805-2200MHz 0.68 dBi (peak)	1805-2200MHz 1.85 dBi (peak)	1805-2200MHz 3.00 max	1805-2200MHz 1.17 dBi (peak)
				2300-2690MHz 2.15 dBi (peak)	2300-2690MHz 3.80 dBi (peak)	2300-2690MHz 3.00 max	2300-2690MHz 1.65 dBi (peak)
				3400-3800MHz -3.21 dBi (peak)	3400-3800MHz -1.31 dBi (peak)	3400-3800MHz 3.00 max	3400-3800MHz 1.90 dBi (peak)
				4200-4700MHz -4.39 dBi(peak)	4200-4700MHz -2.29 dBi(peak)	4200-4700MHz 3.00 max	4200-4700MHz 2.10 dBi (peak)
5150-5925MHz -0.08 dBi (peak)	5150-5925MHz 2.08 dBi (peak)	5150-5925MHz 3.00 max	5150-5925MHz 2.16 dBi (peak)				

1A Antenna Part Number	1B Manufacture	1C Antenna Type	1D Cable Assembly Part Number and Information	1E *Peak Gain W/ Cable loss (dBi)	1F Peak Gain w/o Cable Loss (dBi)	1G VSWR	1H Cable Loss (dBi)
(P/N: 350-24015 / (DC33002OH0L) DRx2 Antenna	Hong-BO Co., Ltd.	PIFA	(1)Cable length: 246.5mm diameter: 1.13mm SLLS (2)Connector P/N: I-PEX MHF- 4L(20565-001R-13)	1805-2200MHz 1.16 dBi (peak)	1805-2200MHz 1.57 dBi (peak)	1805-2200MHz 3.00 dBi (peak)	1805-2200MHz 0.41 dBi (peak)
				2300-2690MHz 1.56 dBi(peak)	2300-2690MHz 2.01 dBi (peak)	2300-2690MHz 3.00 dBi (peak)	2300-2690MHz 0.45 dBi (peak)
				3400-3800MHz 0.22 dBi(peak)	3400-3800MHz 0.80 dBi(peak)	3400-3800MHz 4.00 dBi (peak)	3400-3800MHz 0.58 dBi (peak)
				4200-5000MHz -0.65 dBi(peak)	4200-5000MHz 0.10 dBi(peak)	4200-5000MHz 3.00 dBi (peak)	4200-5000MHz 0.75 dBi (peak)
(P/N: 350-24015 / (DC33002OH0L) DRx1 Antenna	Hong-BO Co., Ltd.	PIFA	(1)Cable length: 293mm diameter: 1.13mm SLLS (2)Connector P/N: I-PEX MHF- 4L(20565-001R-13)	1710-2200MHz 2.59 dBi (peak)	1710-2200MHz 3.02 dBi (peak)	1710-2200MHz 3.00 dBi (peak)	1710-2200MHz 0.43 dBi (peak)
				2300-2690MHz 2.19 dBi (peak)	2300-2690MHz 2.66 dBi (peak)	2300-2690MHz 3.00 dBi (peak)	2300-2690MHz 0.47 dBi (peak)
				3400-3800MHz -0.50 dBi (peak)	3400-3800MHz 0.11 dBi (peak)	3400-3800MHz 4.00 dBi (peak)	3400-3800MHz 0.61 dBi (peak)
				4200-5000MHz -0.87 dBi (peak)	4200-5000MHz -0.09 dBi (peak)	4200-5000MHz 4.00 dBi (peak)	4200-5000MHz 0.78 dBi (peak)

- Antenna Peak Gain required being test in system basis.
- 1E frame contend absolutely peak antenna gain include H/V

Antenna Peak Gain Table: Low and middle band

Frequency (MHz)	TPx antenna		DRx antenna	
	Horizontal (dBi)	Vertical (dBi)	Horizontal (dBi)	Vertical (dBi)
698	-1.19	-1.57		
703	-0.81	-1.15		
707.5	-0.65	-0.92		
717	-0.66	-0.69	-1.77	-0.64
725.5	-1.06	-0.84	-1.70	-0.53
748	0.58	1.14	-1.35	0.30
756	1.02	1.29	-0.99	0.41
768	0.64	0.68	-0.84	-0.07
777	-0.06	-0.44	-1.54	-1.11
782	-0.56	-1.17	-1.65	-1.73
787	-1.07	-1.85	-1.79	-2.35
814	-1.10	-1.26	-1.21	-1.21
824	-1.34	-0.88	-1.26	-0.88
832	-1.13	-0.59	-1.54	-0.87
836.5	-1.09	-0.58	-1.75	-0.97
849	-1.07	-0.38	-2.12	-1.60
862	-1.17	-0.48	-1.97	-1.91
880	-1.57	-1.14	-1.87	-2.12
897.5	-2.30	-2.02	-2.79	-2.65
915	-2.17	-1.73	-3.06	-2.93
925	-1.89	-1.80	-3.15	-3.25
960	-2.58	-3.46	-4.76	-5.12
1427.9	-3.18	-2.34	-4.29	-4.85
1447.9	-2.68	-1.94	-3.80	-4.19
1455.4	-2.43	-1.93	-3.71	-4.09
1462.9	-1.94	-1.65	-3.52	-3.94
1496	-0.80	-0.53	-2.62	-2.74
1510.9	-0.57	-0.41	-2.36	-2.52
1557			-3.31	-2.22
1575			-3.14	-2.26
1610			-3.29	-2.55

High band

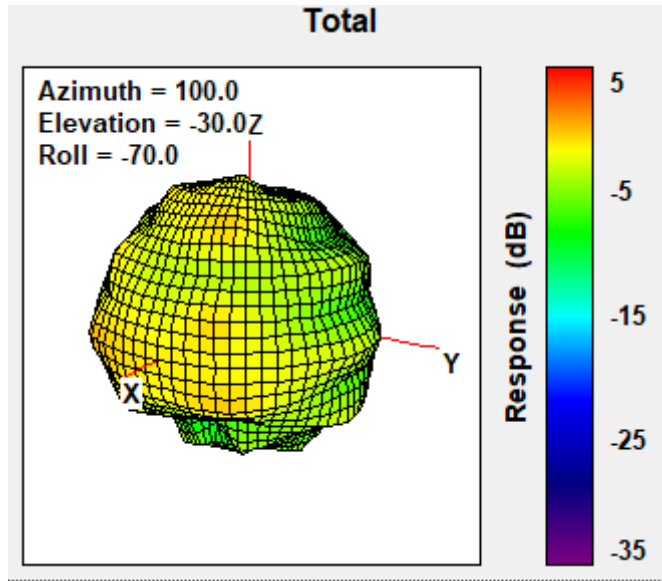
Frequency (MHz)	TPx antenna		DRx antenna	
	Horizontal (dBi)	Vertical (dBi)	Horizontal (dBi)	Vertical (dBi)
1710	2.07	0.92		
1732.5	2.30	1.37		
1747.5	2.42	1.70		
1755	2.44	1.82		
1785	2.07	1.87		
1805	1.65	1.88	-0.03	-0.16
1850	2.32	0.86	-0.71	0.41
1880	1.17	0.96	-0.97	0.29
1910	1.62	0.47	-0.77	-0.41
1920	1.89	0.95	-0.81	-0.80
1950	2.26	2.17	-0.25	-0.66
1980	2.53	3.00	-0.06	-0.37
2110	4.42	4.00	0.54	-0.58
2200	3.03	3.49	0.68	-0.72
2300	3.98	4.28	2.15	0.41
2305	4.20	4.35	2.12	0.44
2315	4.38	4.32	1.93	0.56
2350	4.07	3.50	1.01	0.73
2400	2.39	3.66	1.34	-0.07
2500	3.52	3.43	0.09	-0.76
2570	2.26	2.76	-0.69	-1.00
2595	2.21	2.65	-1.10	-1.37
2620	1.91	2.14	-1.31	-2.24
2690	1.52	1.90	-3.54	-4.11
3400	-1.15	-1.29	-3.21	-4.08
3500	-0.54	-1.22	-3.81	-3.74
3600	-1.76	-0.77	-5.39	-5.22
3700	-1.60	-1.41	-5.42	-5.15
3800	-0.88	-1.11	-3.81	-4.37
4200	-0.53	-1.57	-4.82	-5.01
4400	1.69	-0.22	-5.52	-5.09
4700	-1.77	-4.29	-4.39	-4.49
5150	1.23	0.76	-0.29	0.01
5537.5	1.50	0.64	-0.88	-4.14
5925	-0.62	-1.48	0.08	-2.15

Frequency (MHz)	DRx1 antenna		DRx2 antenna	
	Horizontal (dBi)	Vertical (dBi)	Horizontal (dBi)	Vertical (dBi)
1710	-0.86	-2.91		
1732.5	-0.23	-2.27		
1747.5	0.51	-1.55		
1755	0.73	-1.26		
1785	0.95	0.36		
1805	-0.51	-0.38	-0.22	-2.89
1850	-0.04	-0.32	-0.70	-2.33
1880	0.43	-0.40	-0.75	-3.43
1910	0.70	-0.63	-0.45	-3.85
1920	0.77	-0.55	-0.39	-3.64
1950	0.63	-0.65	-0.56	-3.57
1980	0.42	-1.33	-0.83	-3.50
2110	2.59	2.46	1.16	-0.88
2200	0.29	1.48	0.77	-2.75
2300	0.85	1.83	1.48	-3.13
2305	0.86	1.86	1.56	-2.78
2315	0.89	1.91	1.55	-2.49
2350	0.71	1.55	1.15	-0.28
2400	1.89	0.43	1.49	-0.65
2500	2.19	1.30	0.35	-0.63
2570	1.49	1.93	-0.04	-0.31
2595	1.12	1.92	0.52	-0.47
2620	0.74	1.71	0.79	-0.15
2690	1.19	1.06	0.84	0.18
3400	-1.83	-4.02	0.22	-0.62
3500	-0.91	-2.77	0.06	-0.53
3600	-1.38	-4.10	-1.54	-2.10
3700	-3.05	-3.72	-1.79	-2.87
3800	-0.50	-3.35	-0.28	-1.16
4200	-0.87	-1.73	-0.65	-0.75
4400	-2.09	-2.35	-2.29	-1.49
4700	-2.56	-2.36	-4.05	-1.63
5000	-4.49	-2.01	-4.25	-1.47

Section 3. Radiation characteristics of antennae Loaded in Host Platform

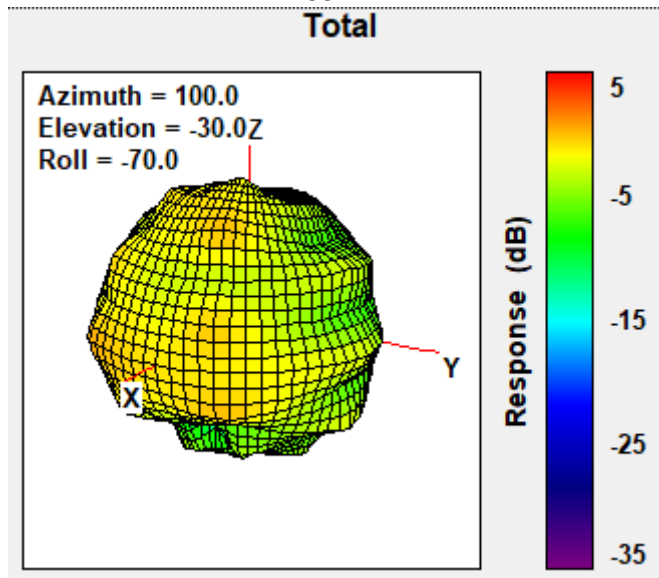
WWAN Main Antenna (TPx)

698MHz



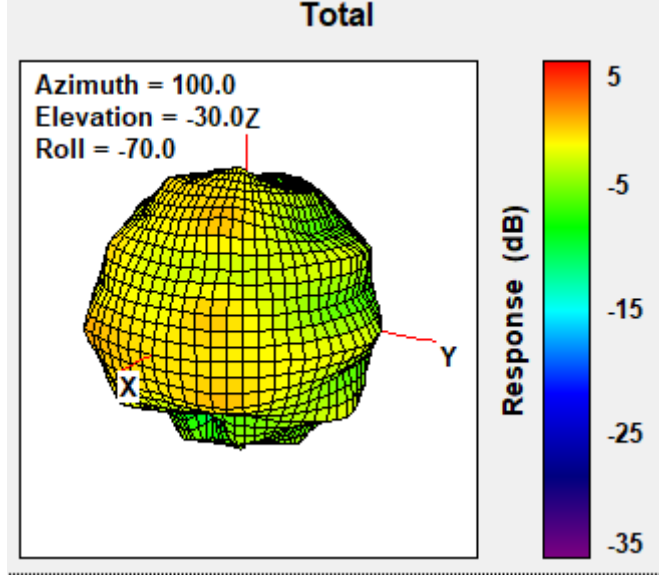
Center Frequency	698 MHz
Horizontal (dBi) peak	-1.19
Vertical (dBi) peak	-1.57

703MHz



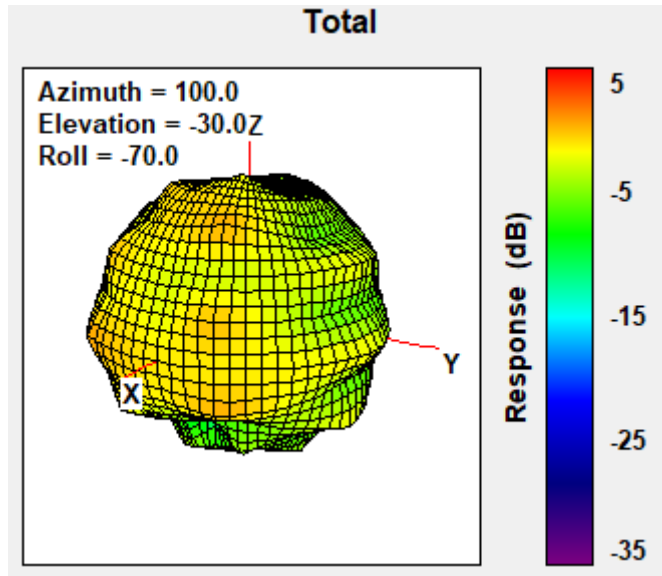
Center Frequency	703MHz
Horizontal (dBi) peak	-0.81
Vertical (dBi) peak	-1.15

**707.5MHz
Total**



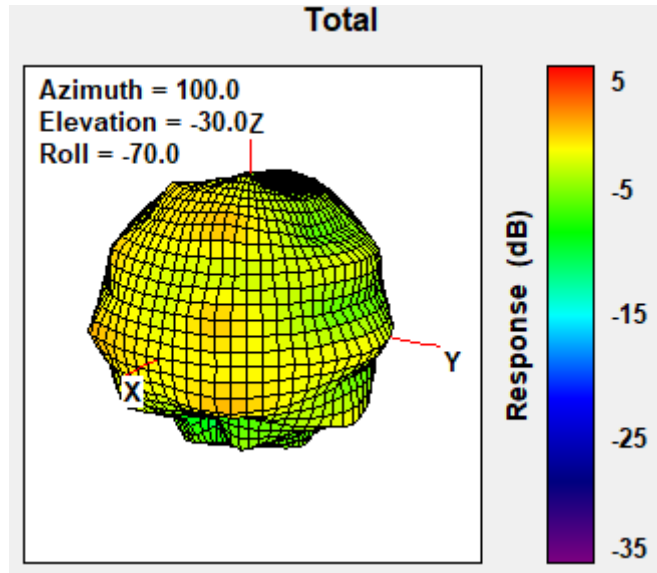
Center Frequency	707.5MHz
Horizontal (dBi) peak	-0.65
Vertical (dBi) peak	-0.92

**717MHz
Total**



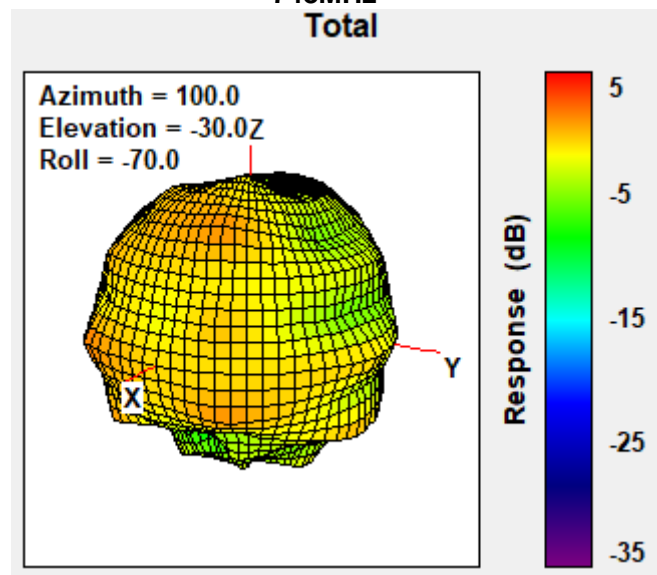
Center Frequency	717MHz
Horizontal (dBi) peak	-0.66
Vertical (dBi) peak	-0.69

**725.5MHz
Total**



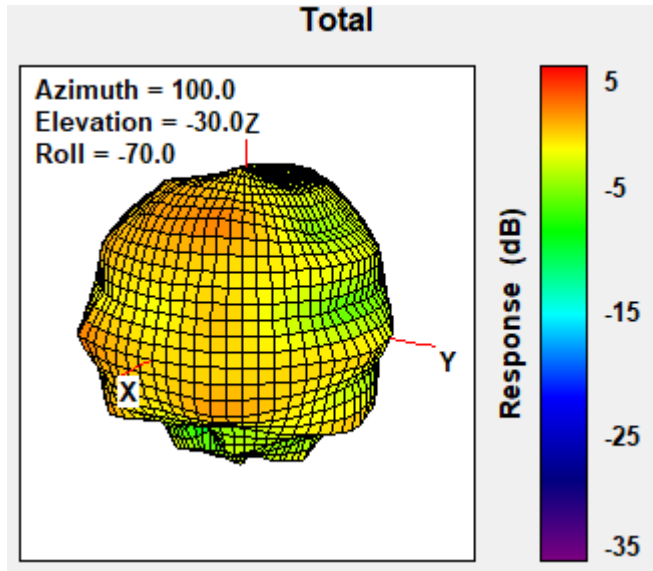
Center Frequency	725.5MHz
Horizontal (dBi) peak	-1.06
Vertical (dBi) peak	-0.84

**748MHz
Total**



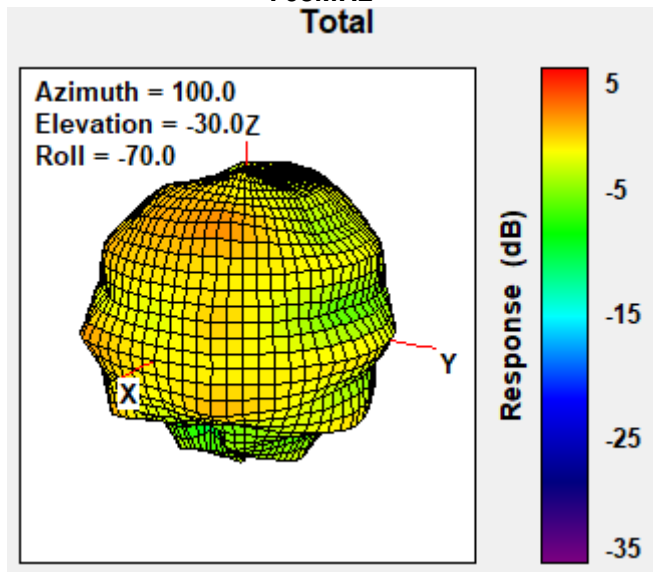
Center Frequency	748MHz
Horizontal (dBi) peak	0.58
Vertical (dBi) peak	1.14

**756MHz
Total**



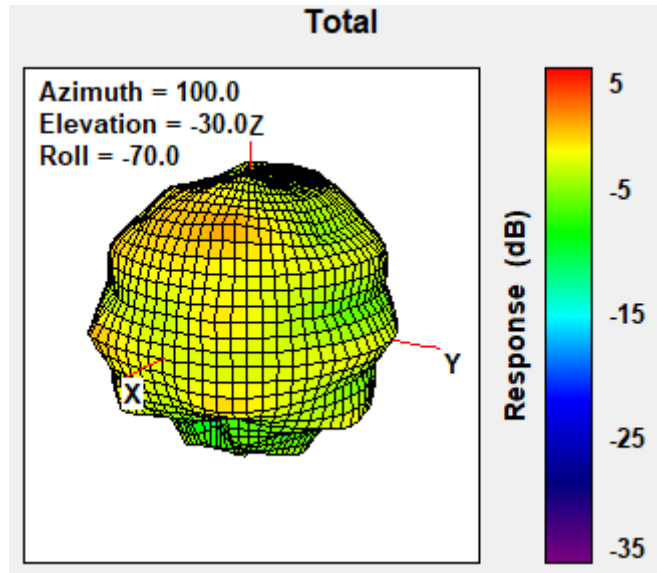
Center Frequency	756MHz
Horizontal (dBi) peak	1.02
Vertical (dBi) peak	1.29

**768MHz
Total**



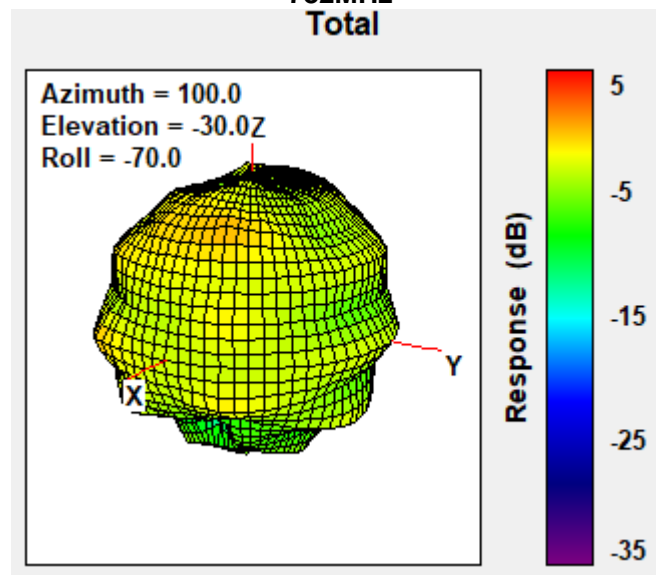
Center Frequency	768MHz
Horizontal (dBi) peak	0.64
Vertical (dBi) peak	0.68

**777MHz
Total**



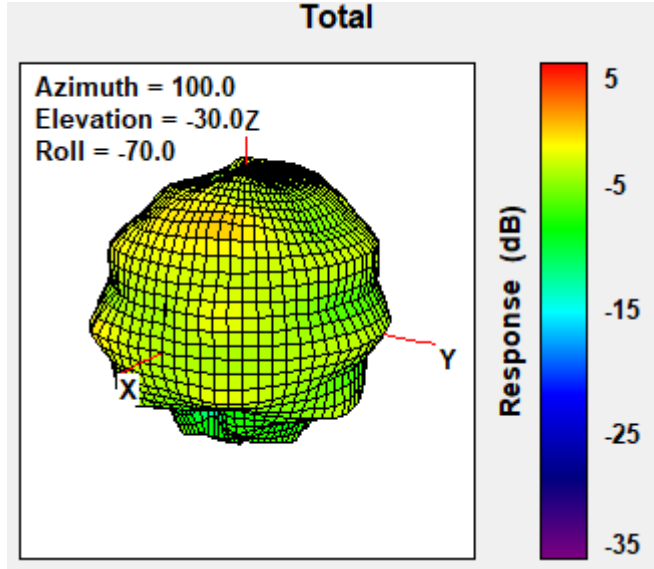
Center Frequency	777MHz
Horizontal (dBi) peak	-0.06
Vertical (dBi) peak	-0.44

**782MHz
Total**



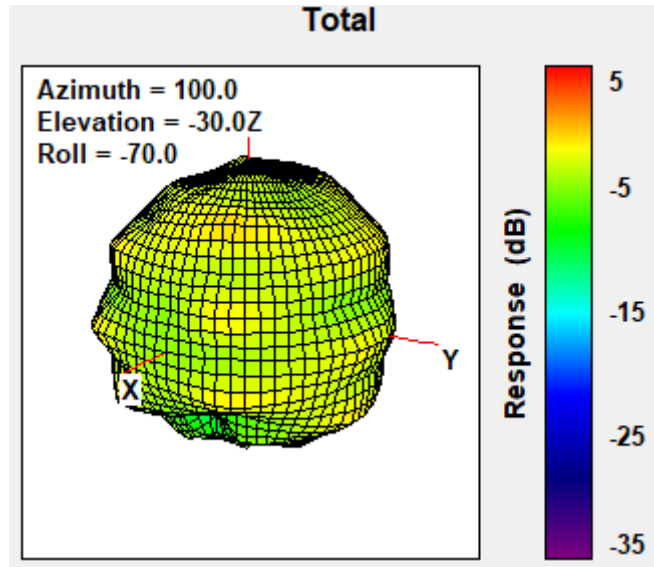
Center Frequency	782MHz
Horizontal (dBi) peak	-0.56
Vertical (dBi) peak	-1.17

**787MHz
Total**



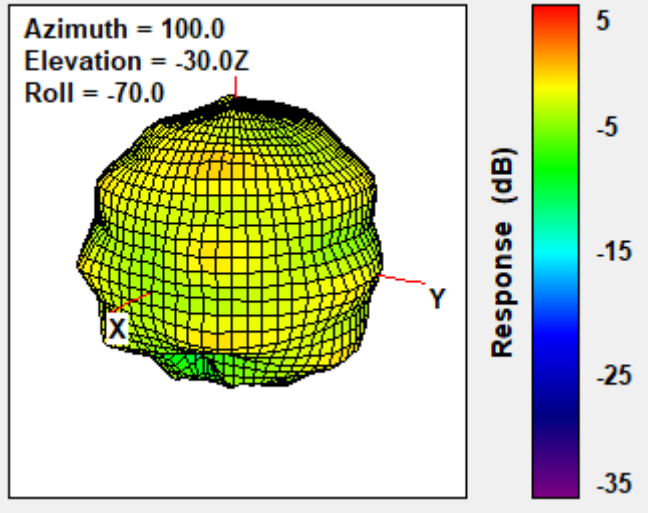
Center Frequency	787MHz
Horizontal (dBi) peak	-1.07
Vertical (dBi) peak	-1.85

**814MHz
Total**



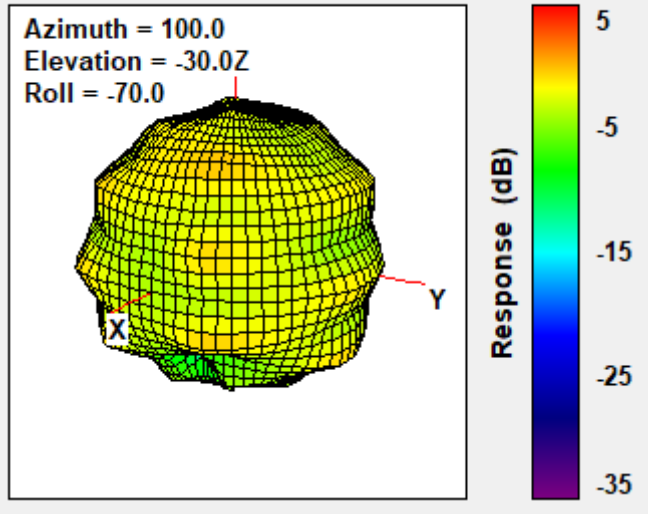
Center Frequency	814MHz
Horizontal (dBi) peak	-1.10
Vertical (dBi) peak	-1.26

**824MHz
Total**



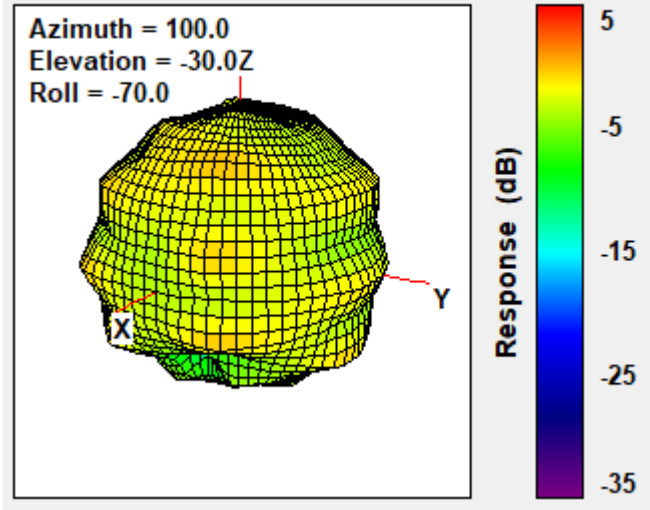
Center Frequency	824MHz
Horizontal (dBi) peak	-1.34
Vertical (dBi) peak	-0.88

**832MHz
Total**



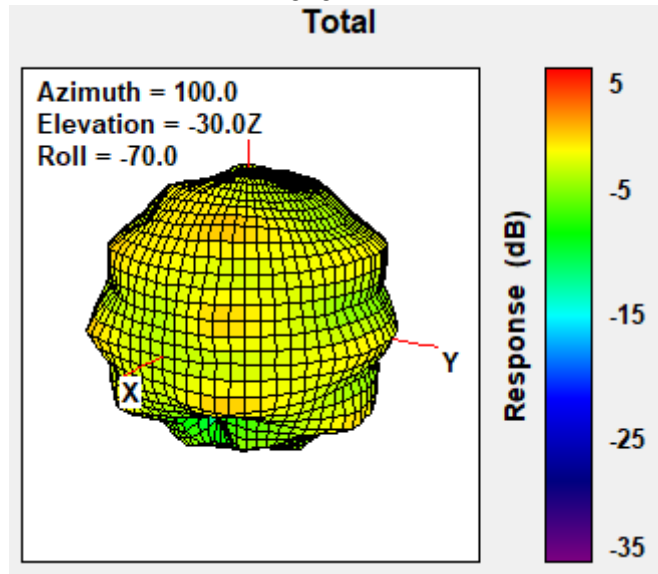
Center Frequency	832MHz
Horizontal (dBi) peak	-1.13
Vertical (dBi) peak	-0.59

**836.5MHz
Total**



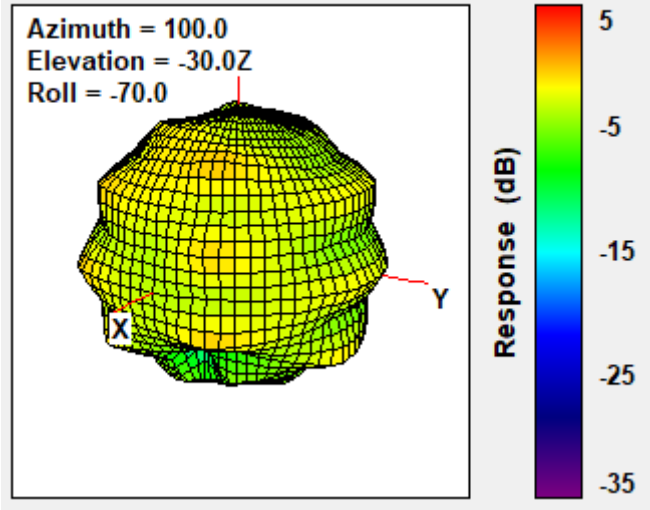
Center Frequency	836.5MHz
Horizontal (dBi) peak	-1.09
Vertical (dBi) peak	-0.58

**849MHz
Total**



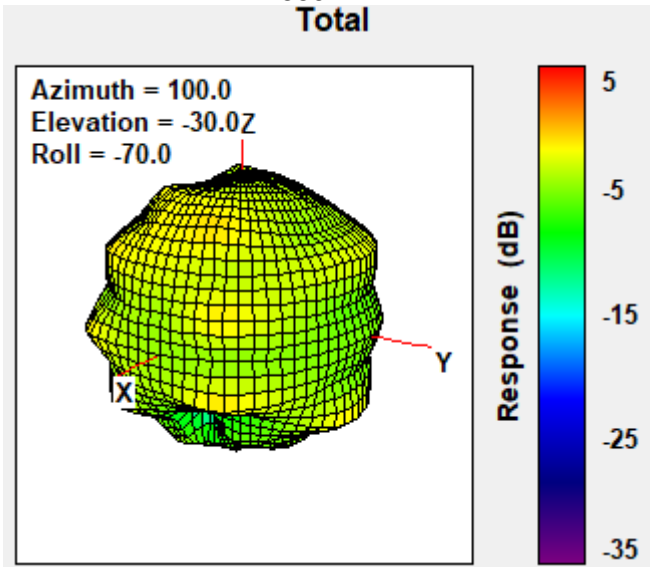
Center Frequency	849MHz
Horizontal (dBi) peak	-1.07
Vertical (dBi) peak	-0.38

**862MHz
Total**



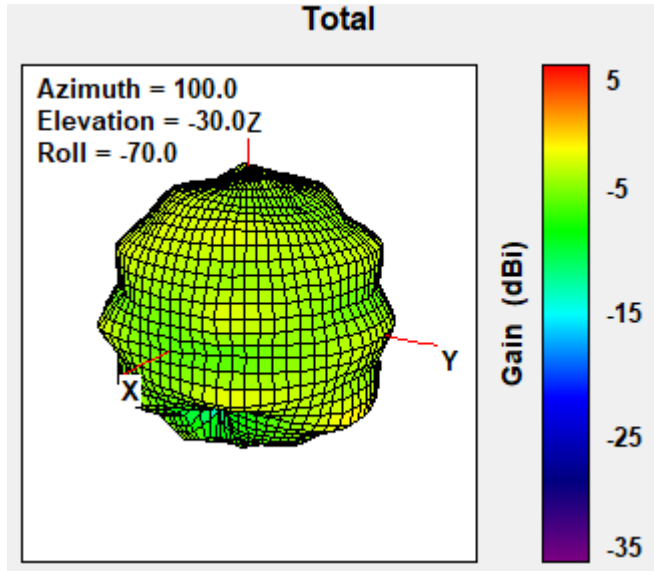
Center Frequency	862MHz
Horizontal (dBi) peak	-1.17
Vertical (dBi) peak	-0.48

**880MHz
Total**



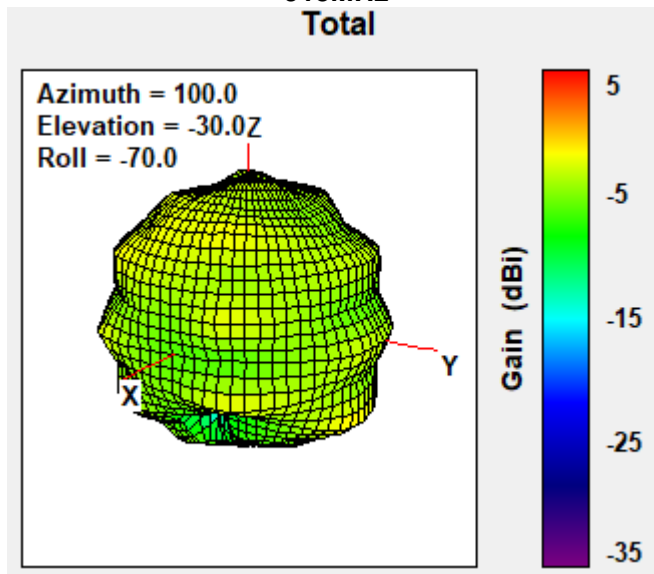
Center Frequency	880MHz
Horizontal (dBi) peak	-1.57
Vertical (dBi) peak	-1.14

**897.5MHz
Total**



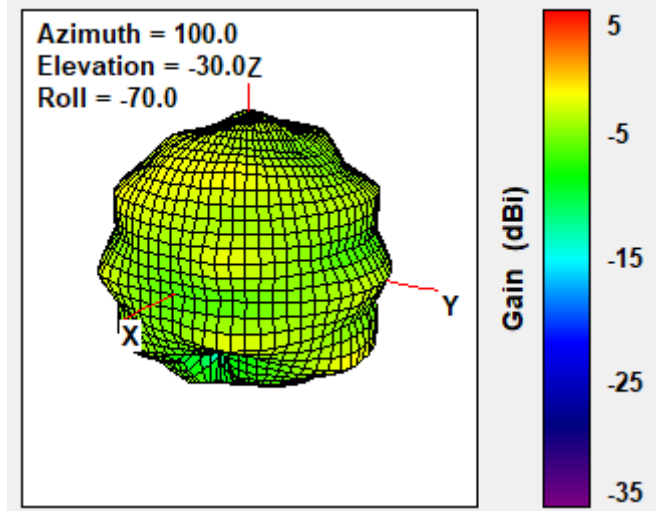
Center Frequency	897.5MHz
Horizontal (dBi) peak	-2.30
Vertical (dBi) peak	-2.02

**915MHz
Total**



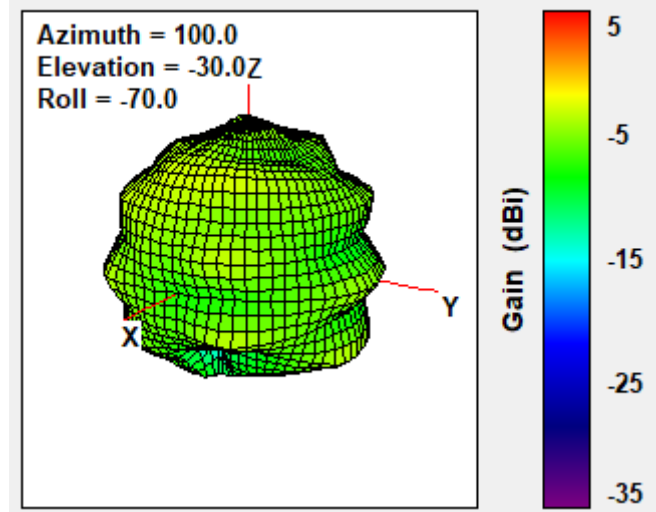
Center Frequency	915MHz
Horizontal (dBi) peak	-2.17
Vertical (dBi) peak	-1.73

**925MHz
Total**



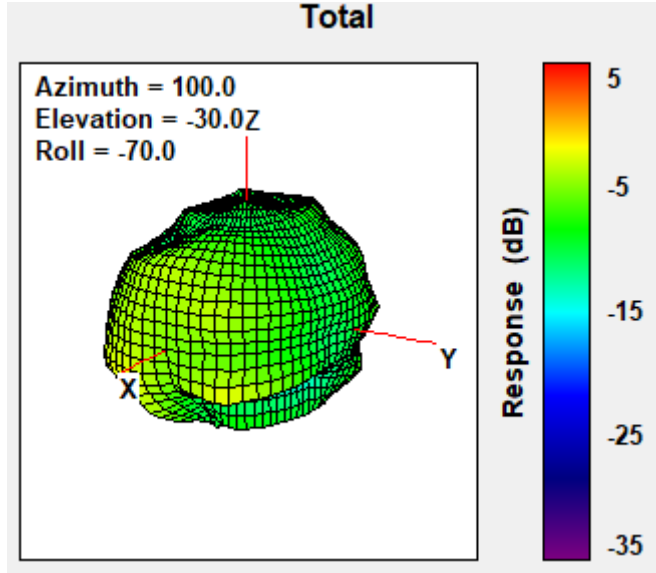
Center Frequency	925MHz
Horizontal (dBi) peak	-1.89
Vertical (dBi) peak	-1.80

**960MHz
Total**



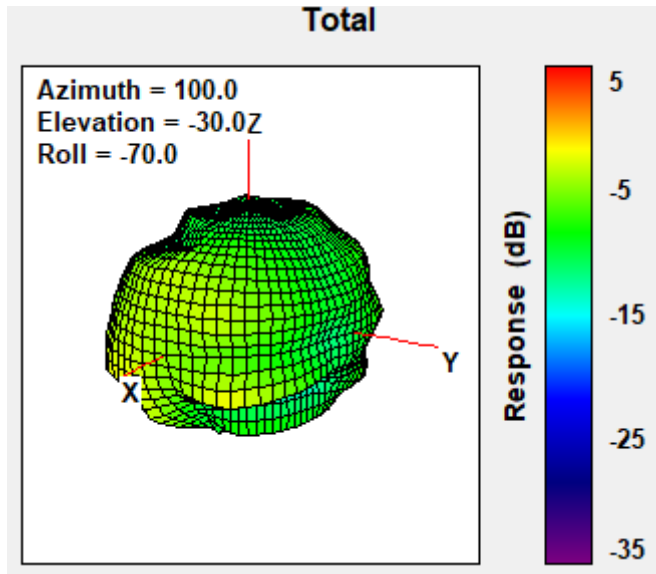
Center Frequency	960MHz
Horizontal (dBi) peak	-2.58
Vertical (dBi) peak	-3.46

**1427.9MHz
Total**



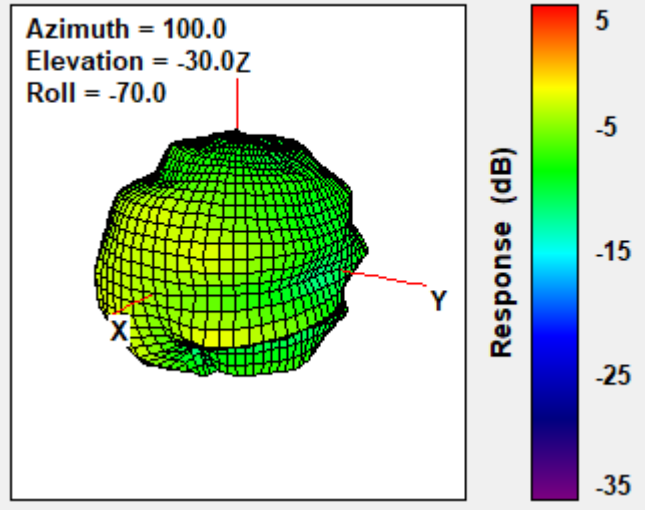
Center Frequency	1427.9MHz
Horizontal (dBi) peak	-3.18
Vertical (dBi) peak	-2.34

**1447.9MHz
Total**



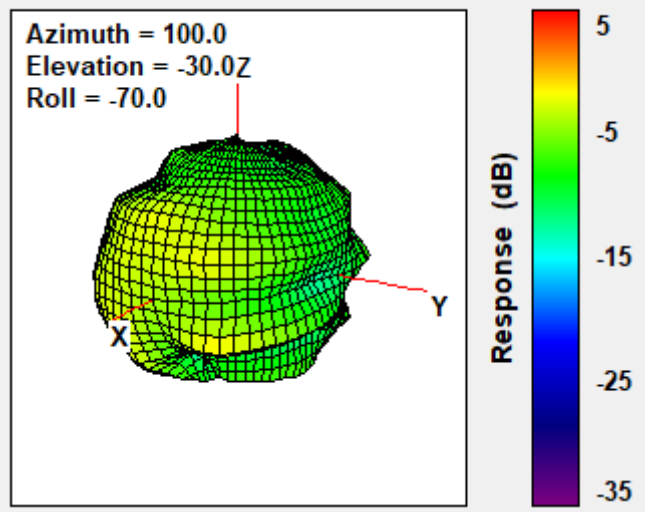
Center Frequency	1447.9MHz
Horizontal (dBi) peak	-2.68
Vertical (dBi) peak	-1.94

**1455.4MHz
Total**



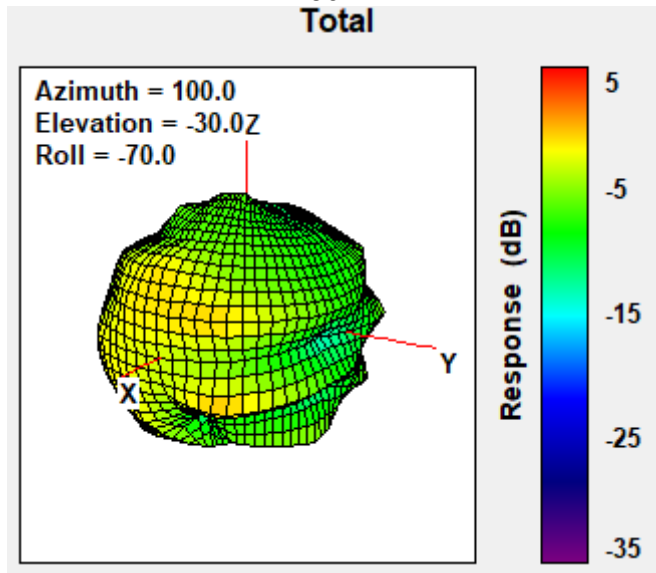
Center Frequency	1455.4MHz
Horizontal (dBi) peak	-2.43
Vertical (dBi) peak	-1.93

**1462.9MHz
Total**



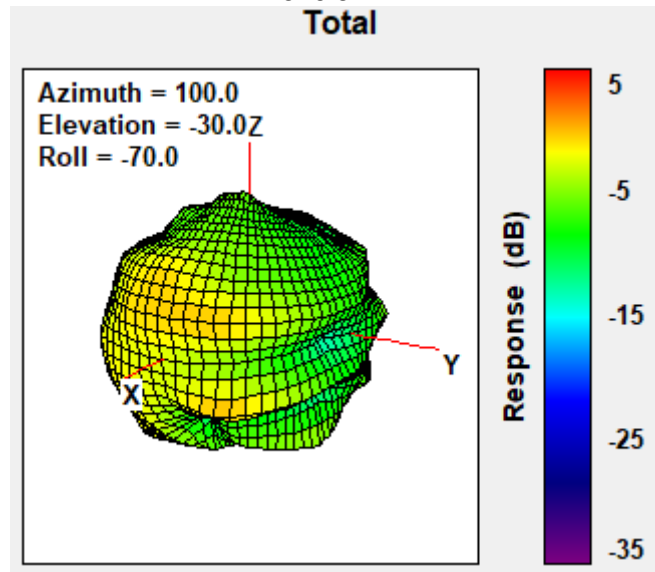
Center Frequency	1462.9MHz
Horizontal (dBi) peak	-1.94
Vertical (dBi) peak	-1.65

**1496MHz
Total**



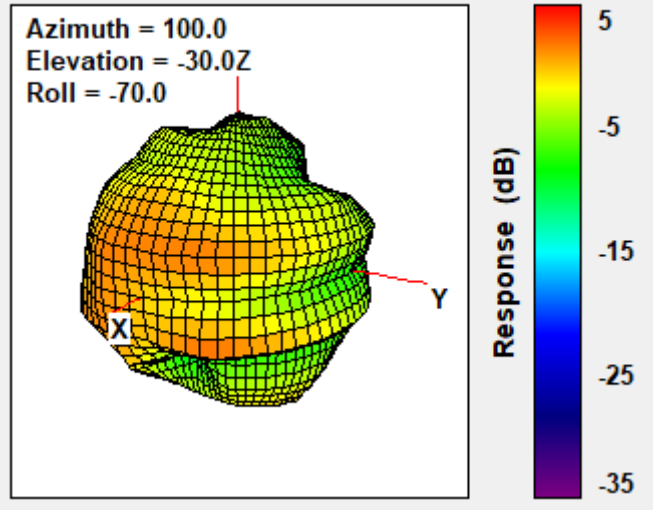
Center Frequency	1496MHz
Horizontal (dBi) peak	-0.80
Vertical (dBi) peak	-0.53

**1510.9 MHz
Total**



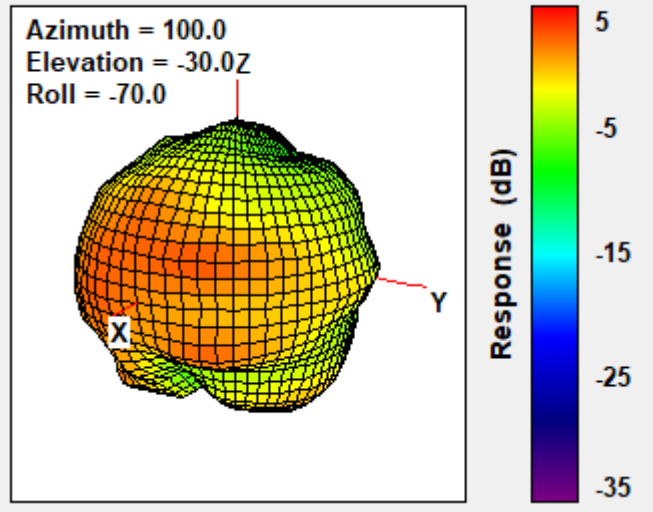
Center Frequency	1510.9 MHz
Horizontal (dBi) peak	-0.57
Vertical (dBi) peak	-0.41

**1710 MHz
Total**



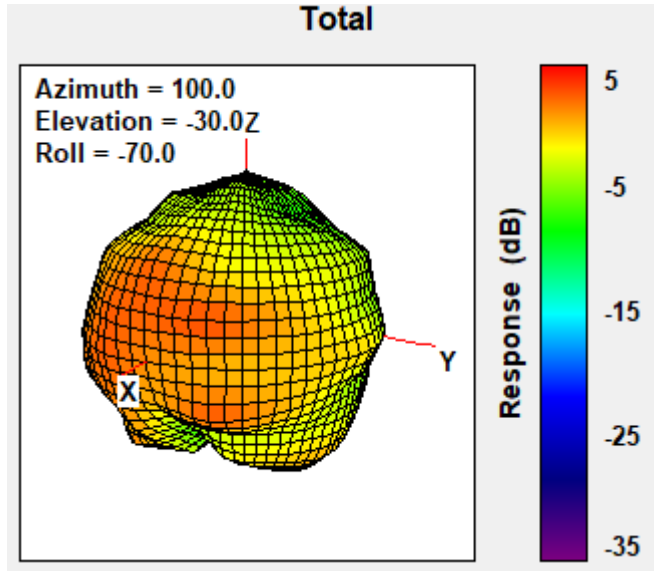
Center Frequency	1710 MHz
Horizontal (dBi) peak	2.07
Vertical (dBi) peak	0.92

**1732.5 MHz
Total**



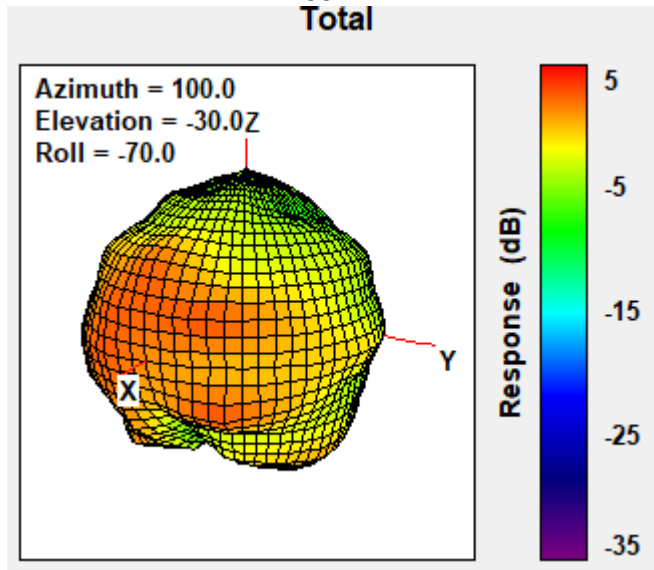
Center Frequency	1732.5 MHz
Horizontal (dBi) peak	2.30
Vertical (dBi) peak	1.37

**1747.5 MHz
Total**



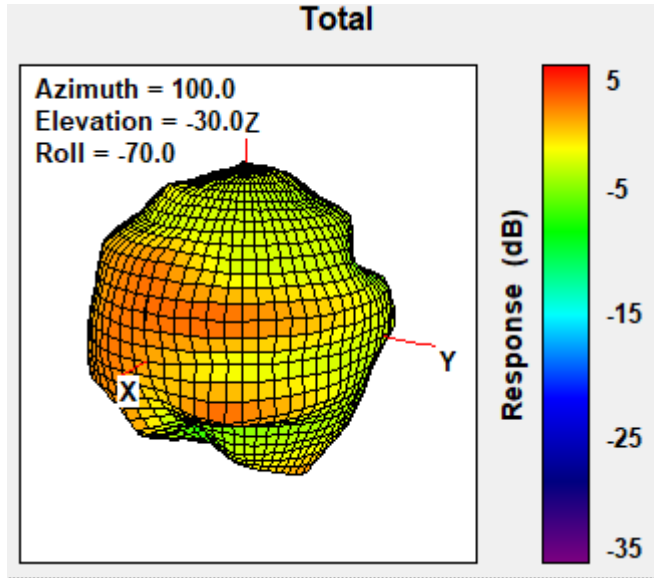
Center Frequency	1747.5 MHz
Horizontal (dBi) peak	2.42
Vertical (dBi) peak	1.70

**1755 MHz
Total**



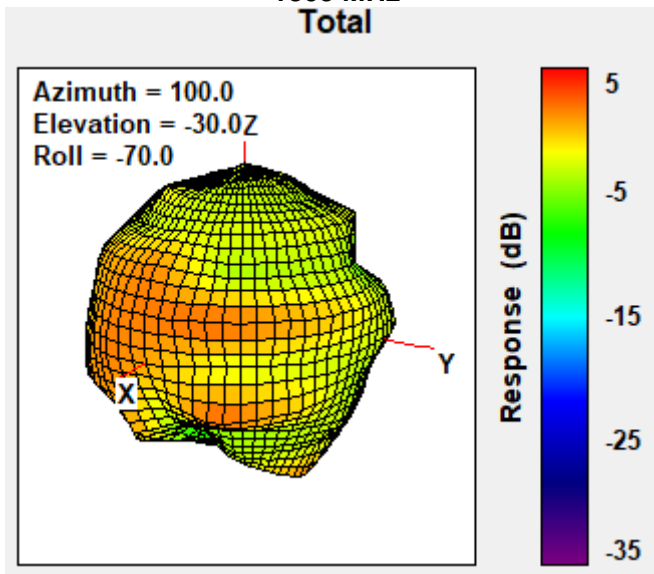
Center Frequency	1755 MHz
Horizontal (dBi) peak	2.44
Vertical (dBi) peak	1.82

**1785 MHz
Total**



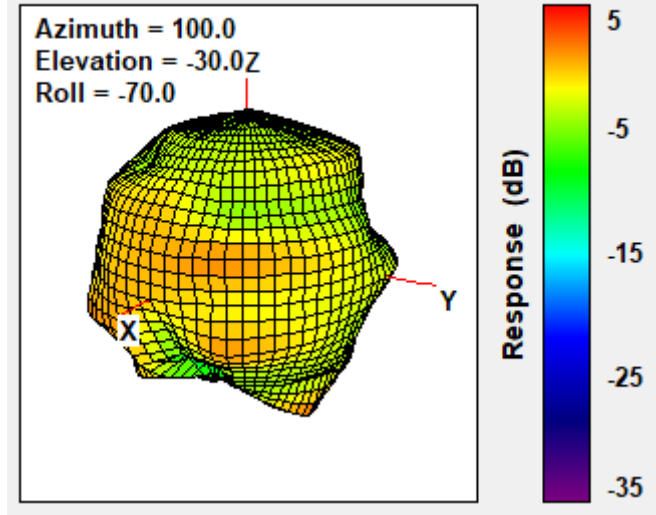
Center Frequency	1785 MHz
Horizontal (dBi) peak	2.07
Vertical (dBi) peak	1.87

**1805 MHz
Total**



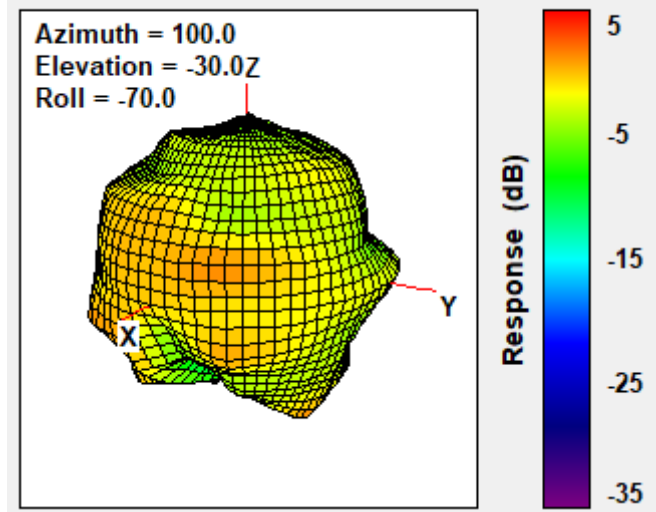
Center Frequency	1805 MHz
Horizontal (dBi) peak	1.65
Vertical (dBi) peak	1.88

**1850 MHz
Total**



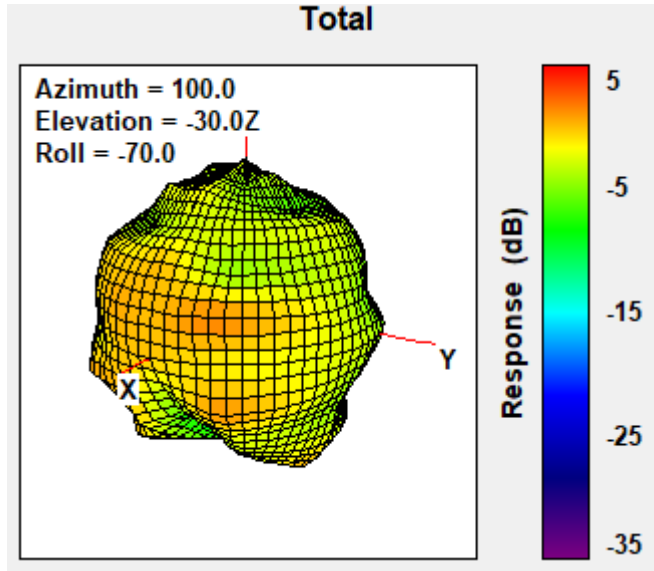
Center Frequency	1850 MHz
Horizontal (dBi) peak	2.32
Vertical (dBi) peak	0.86

**1880 MHz
Total**



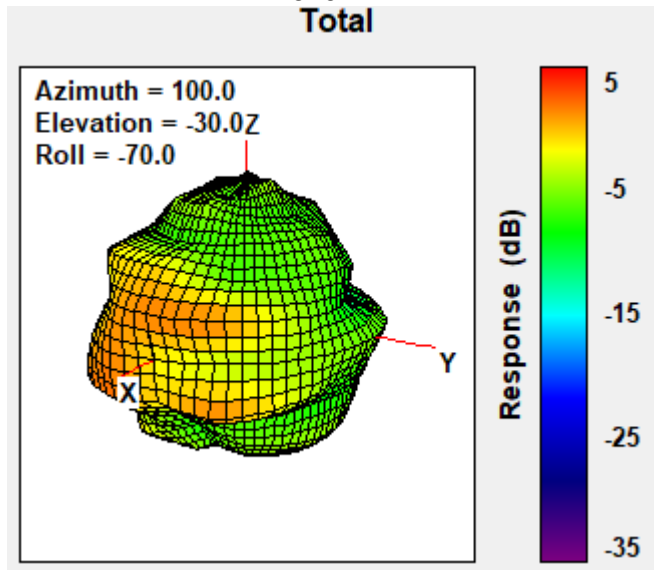
Center Frequency	1880 MHz
Horizontal (dBi) peak	1.17
Vertical (dBi) peak	0.96

**1910MHz
Total**



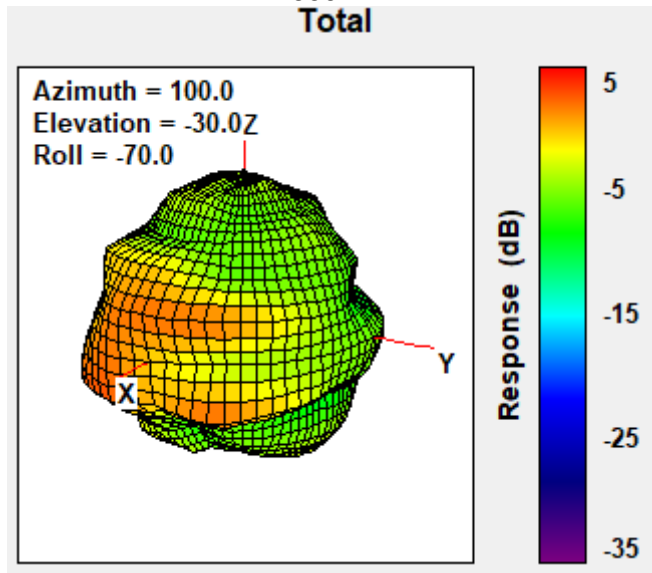
Center Frequency	1910MHz
Horizontal (dBi) peak	1.62
Vertical (dBi) peak	0.47

**1920MHz
Total**



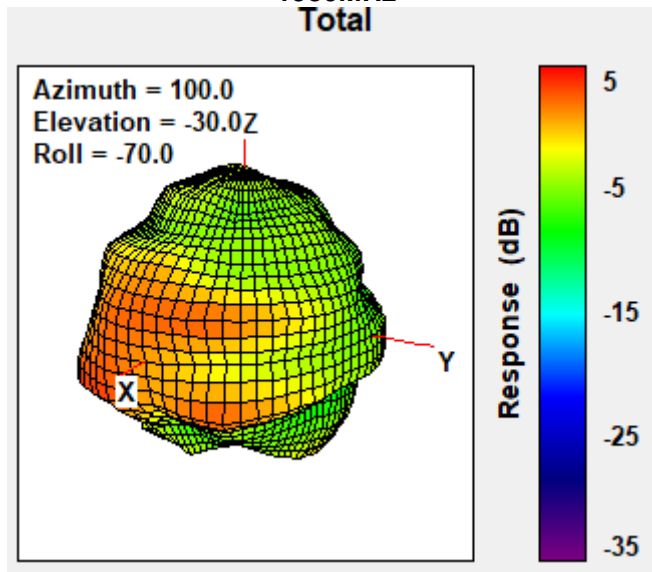
Center Frequency	1920MHz
Horizontal (dBi) peak	1.89
Vertical (dBi) peak	0.95

**1950MHz
Total**



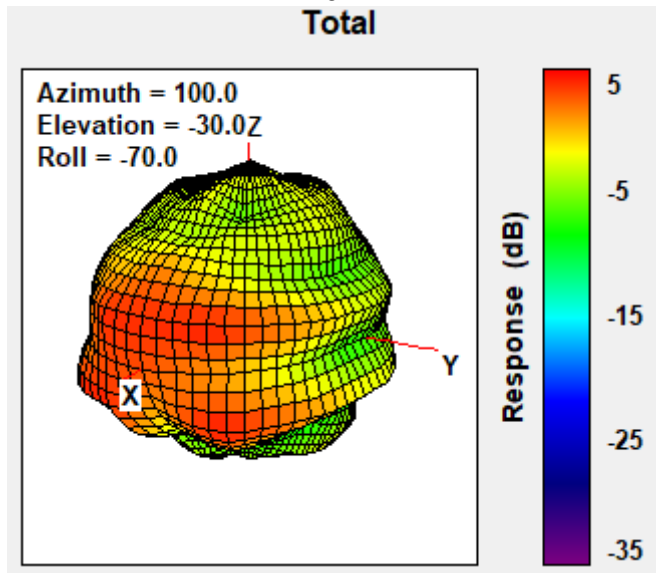
Center Frequency	1950MHz
Horizontal (dBi) peak	2.26
Vertical (dBi) peak	2.17

**1980MHz
Total**



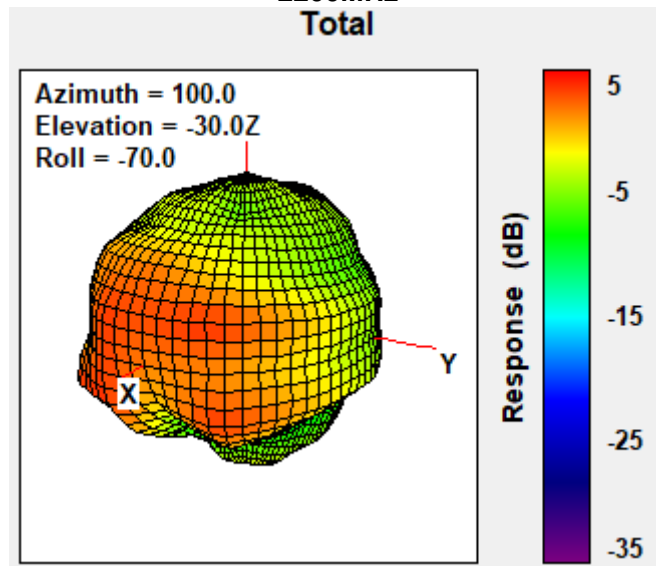
Center Frequency	1980MHz
Horizontal (dBi) peak	2.53
Vertical (dBi) peak	3.00

**2110MHz
Total**



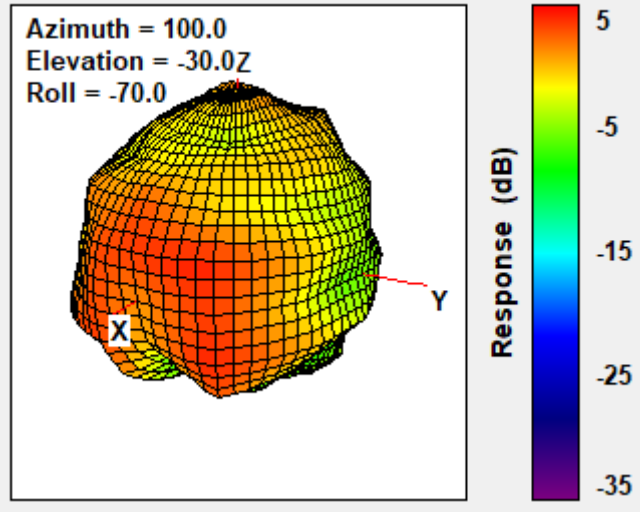
Center Frequency	2110MHz
Horizontal (dBi) peak	4.42
Vertical (dBi) peak	4.00

**2200MHz
Total**



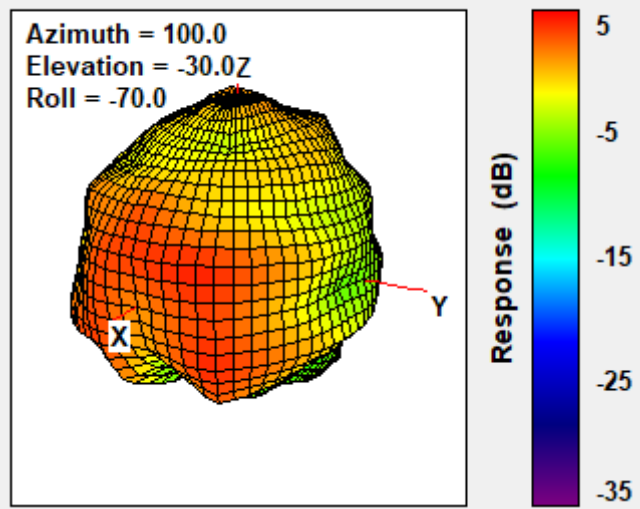
Center Frequency	2200MHz
Horizontal (dBi) peak	3.03
Vertical (dBi) peak	3.49

**2300MHz
Total**



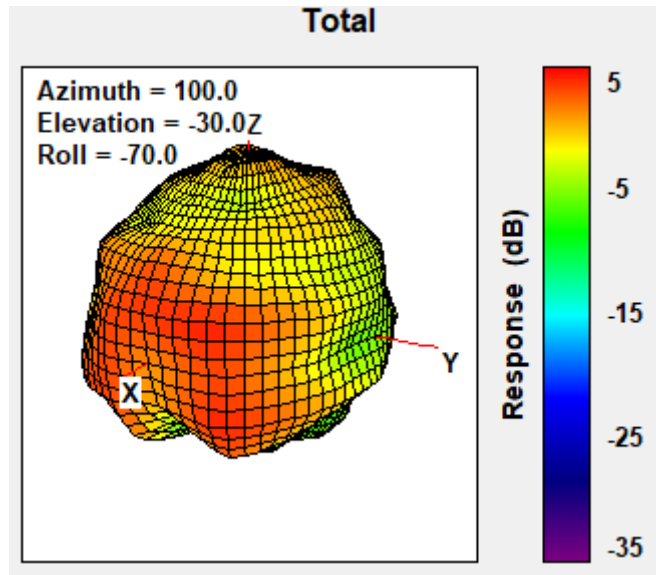
Center Frequency	2300MHz
Horizontal (dBi) peak	3.98
Vertical (dBi) peak	4.28

**2305MHz
Total**

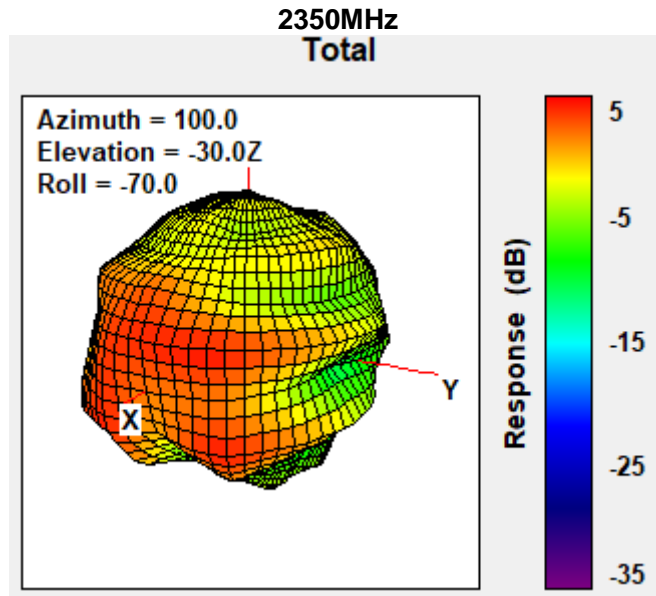


Center Frequency	2305MHz
Horizontal (dBi) peak	4.20
Vertical (dBi) peak	4.35

2315MHz

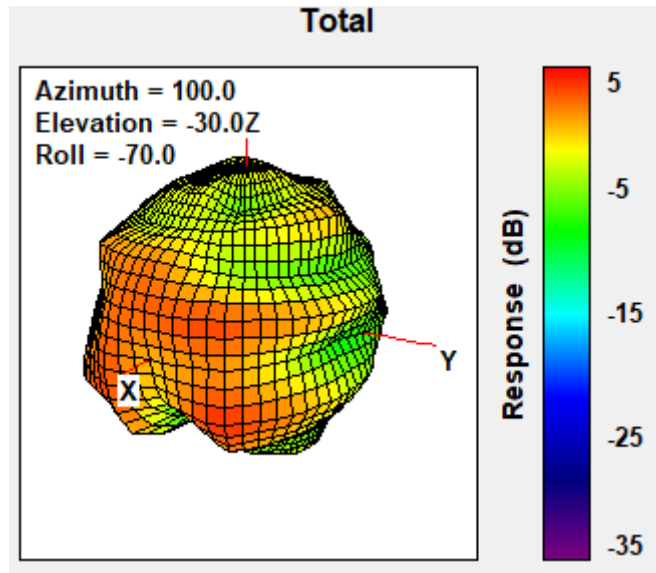


Center Frequency	2315MHz
Horizontal (dBi) peak	4.38
Vertical (dBi) peak	4.32

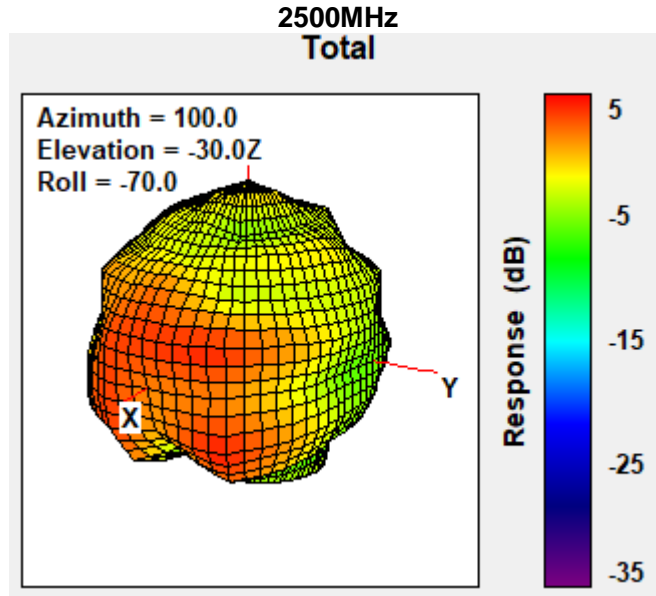


Center Frequency	2350MHz
Horizontal (dBi) peak	4.07
Vertical (dBi) peak	3.50

2400MHz

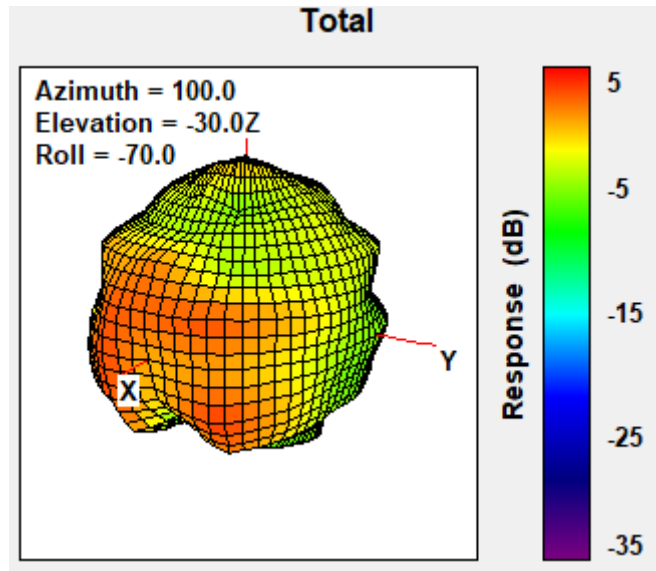


Center Frequency	2400MHz
Horizontal (dBi) peak	2.39
Vertical (dBi) peak	3.66

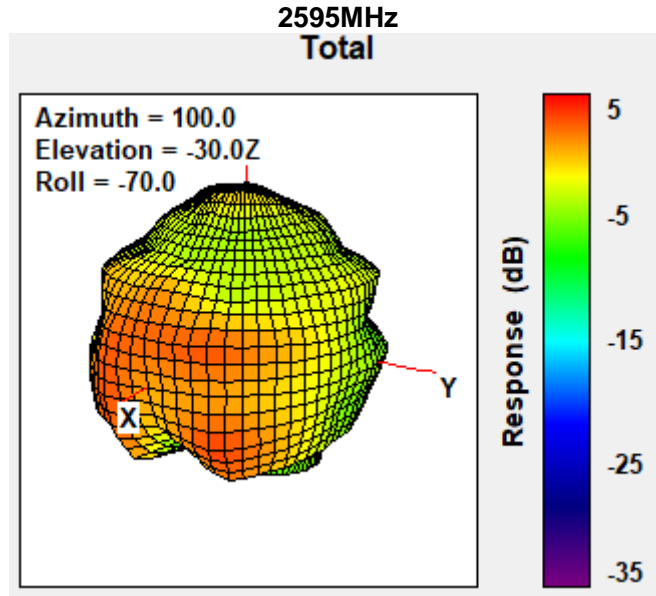


Center Frequency	2500MHz
Horizontal (dBi) peak	3.52
Vertical (dBi) peak	3.43

2570MHz

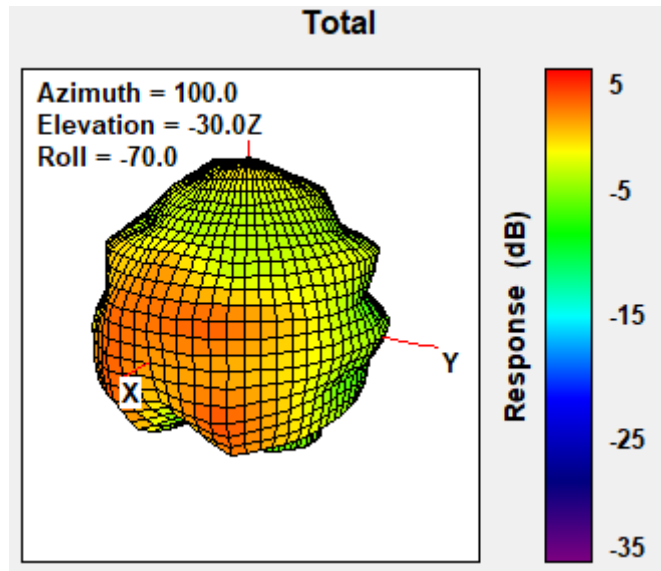


Center Frequency	2570MHz
Horizontal (dBi) peak	2.26
Vertical (dBi) peak	2.76

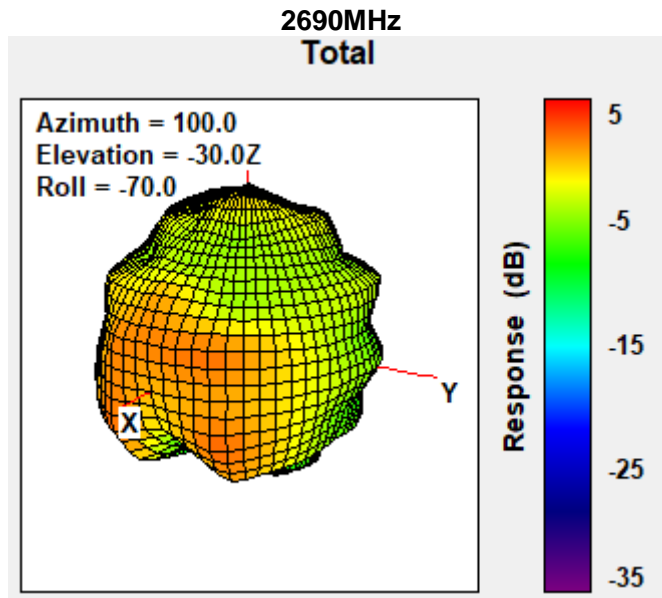


Center Frequency	2595MHz
Horizontal (dBi) peak	2.21
Vertical (dBi) peak	2.65

2620MHz

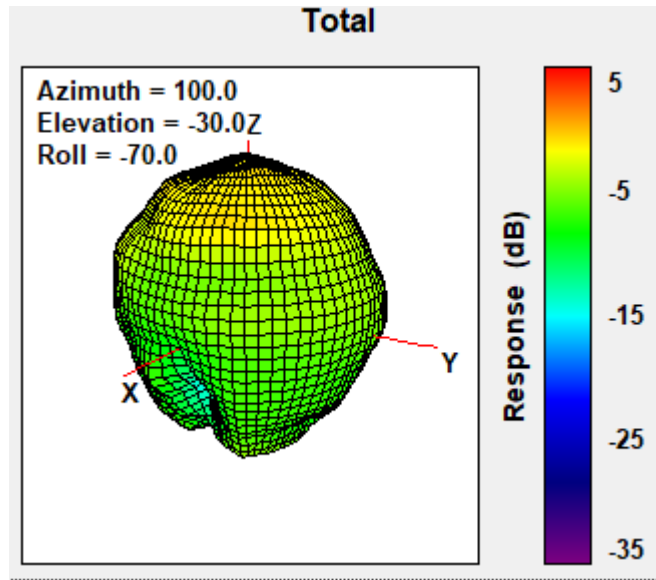


Center Frequency	2620MHz
Horizontal (dBi) peak	1.91
Vertical (dBi) peak	2.14

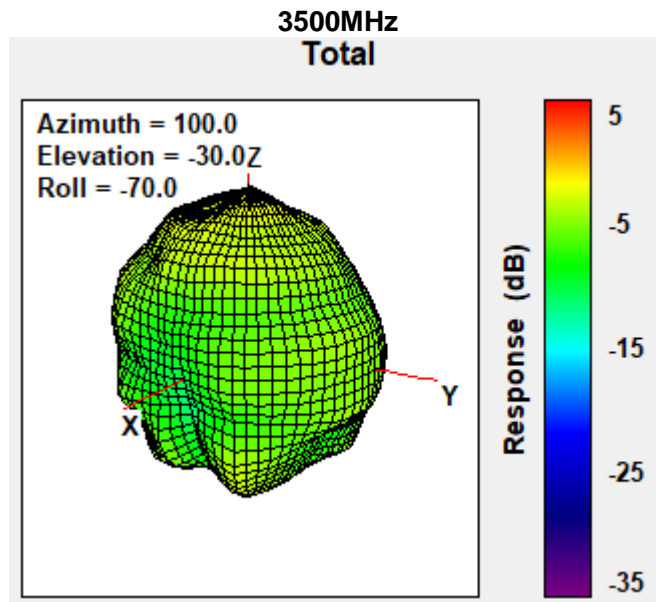


Center Frequency	2690MHz
Horizontal (dBi) peak	1.52
Vertical (dBi) peak	1.90

3400MHz

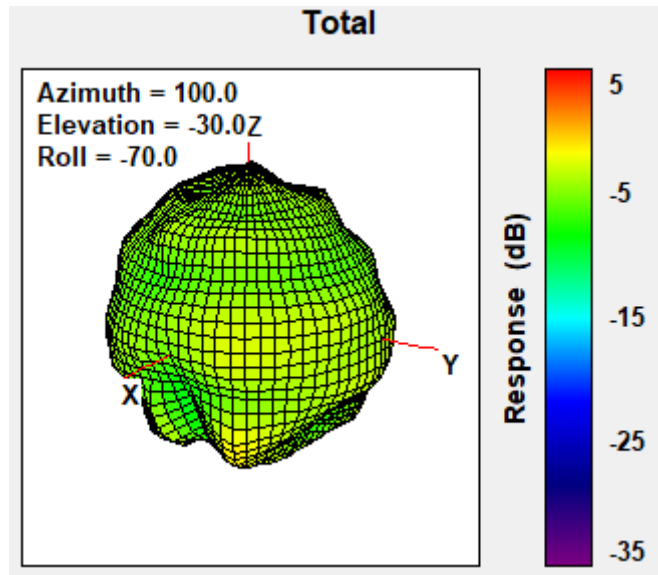


Center Frequency	3400MHz
Horizontal (dBi) peak	-1.15
Vertical (dBi) peak	-1.29

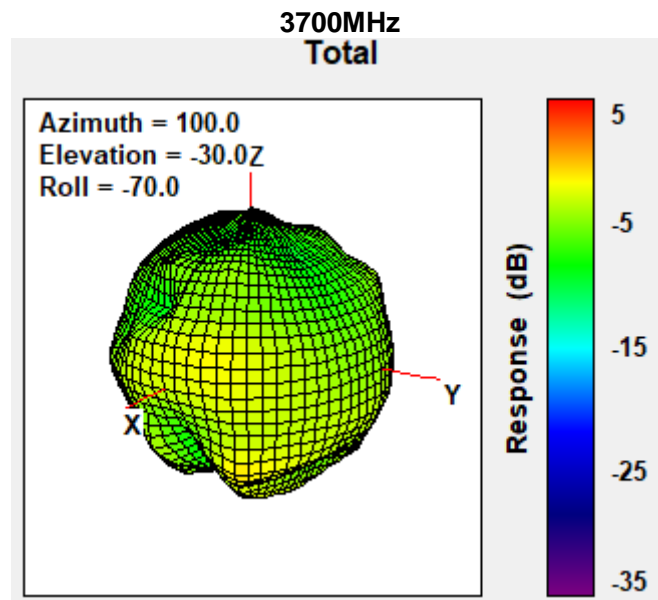


Center Frequency	3500MHz
Horizontal (dBi) peak	-0.54
Vertical (dBi) peak	-1.22

3600MHz

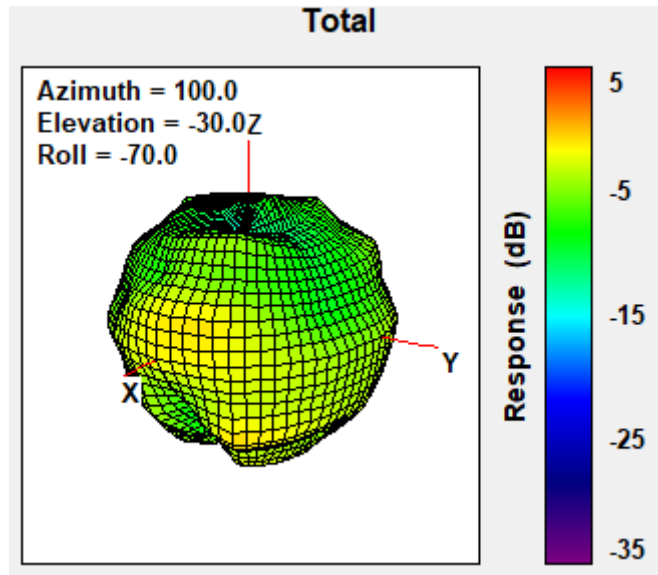


Center Frequency	3600MHz
Horizontal (dBi) peak	-1.76
Vertical (dBi) peak	-0.77

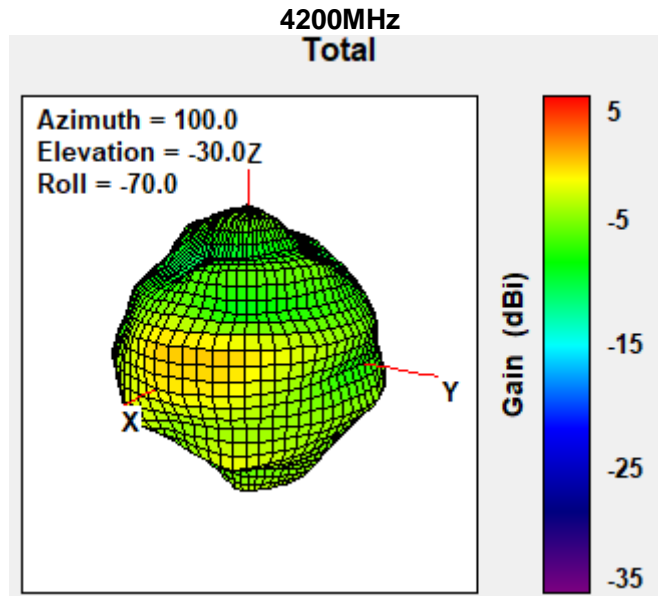


Center Frequency	3700MHz
Horizontal (dBi) peak	-1.60
Vertical (dBi) peak	-1.41

3800MHz

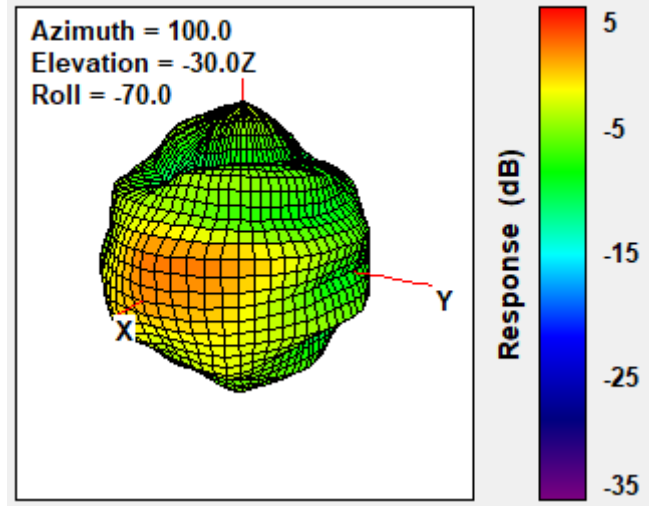


Center Frequency	3800MHz
Horizontal (dBi) peak	-0.88
Vertical (dBi) peak	-1.11



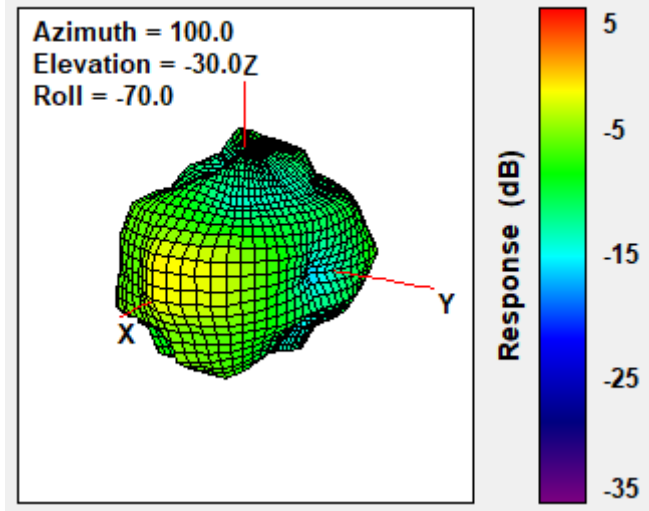
Center Frequency	4200MHz
Horizontal (dBi) peak	-0.53
Vertical (dBi) peak	-1.57

**4400MHz
Total**



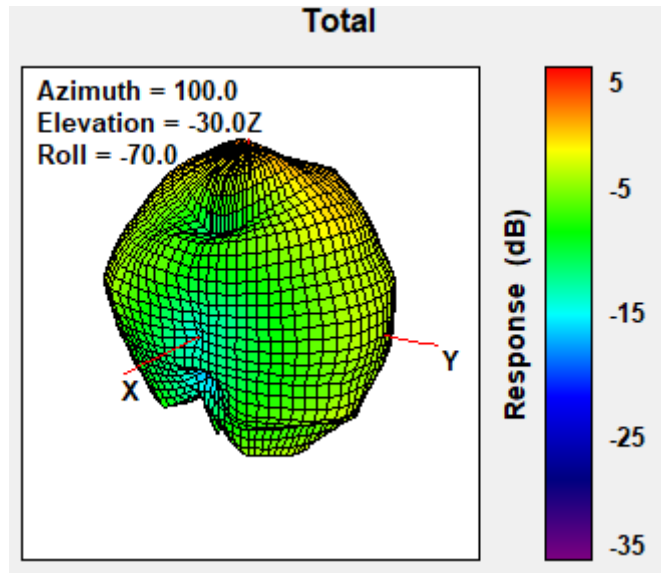
Center Frequency	4400MHz
Horizontal (dBi) peak	1.69
Vertical (dBi) peak	-0.22

**4700MHz
Total**

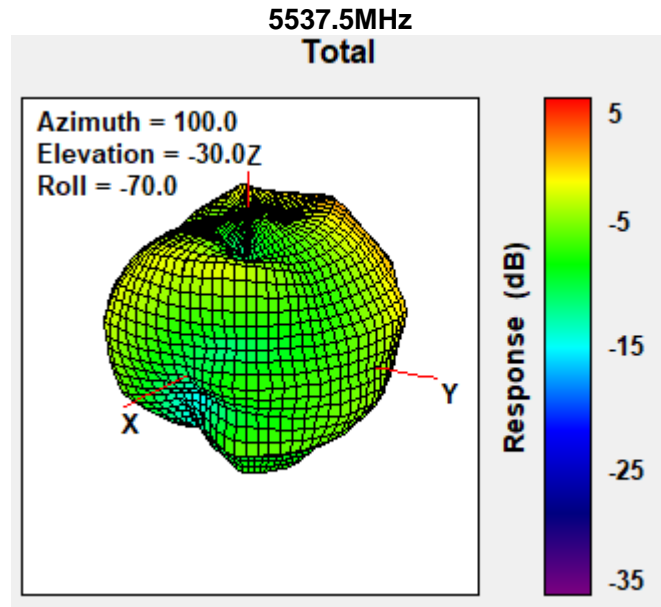


Center Frequency	4700MHz
Horizontal (dBi) peak	-1.77
Vertical (dBi) peak	-4.29

5150MHz

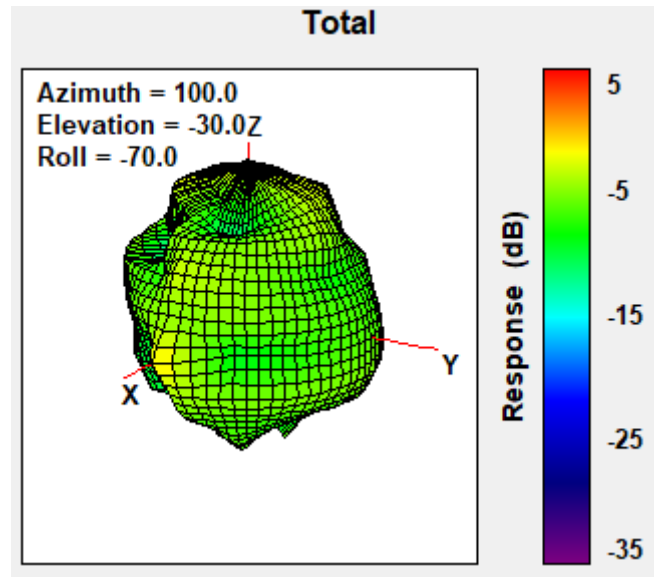


Center Frequency	5150MHz
Horizontal (dBi) peak	1.23
Vertical (dBi) peak	0.76



Center Frequency	5537.5MHz
Horizontal (dBi) peak	1.50
Vertical (dBi) peak	0.64

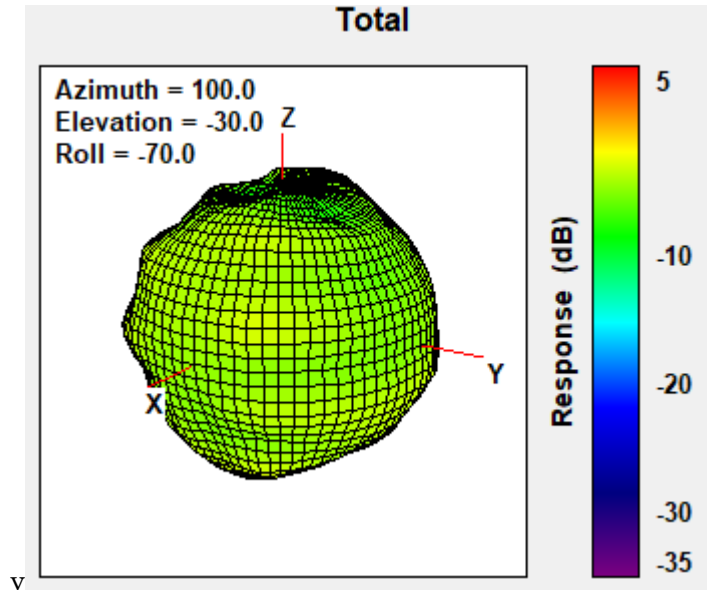
5925MHz



Center Frequency	5925MHz
Horizontal (dBi) peak	-0.62
Vertical (dBi) peak	-1.48

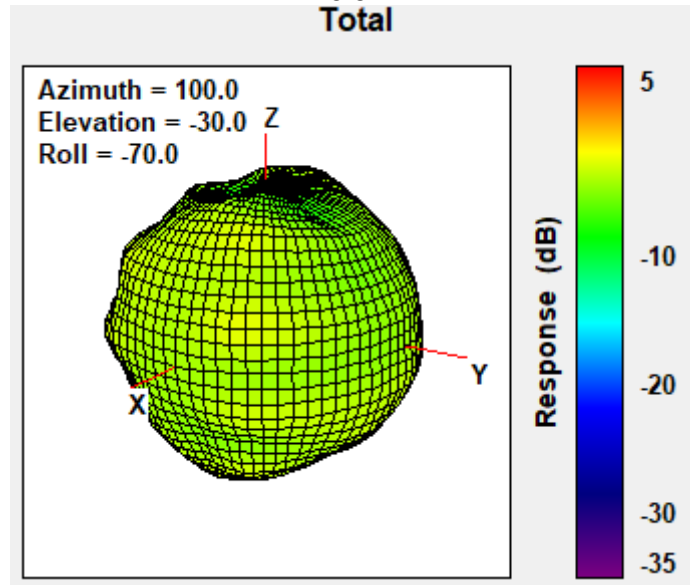
WWAN Aux Antenna (DRx)

717MHz Total



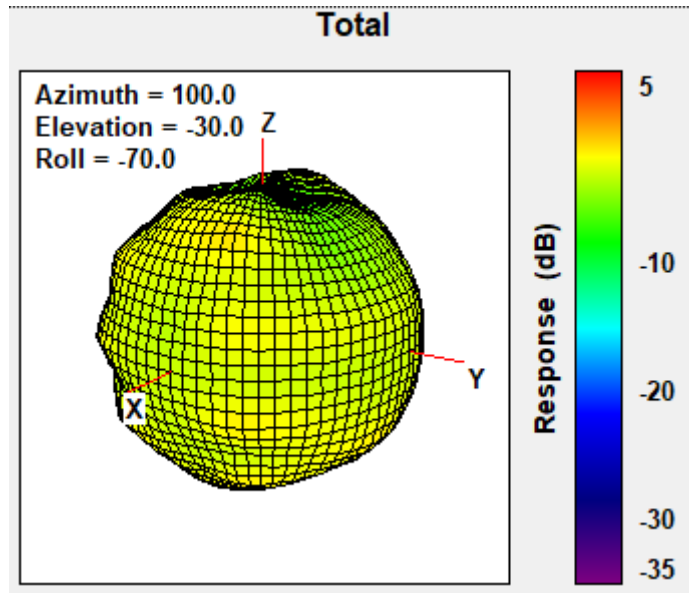
Center Frequency	717MHz
Horizontal (dBi) peak	-1.77
Vertical (dBi) peak	-0.64

725.5MHz Total

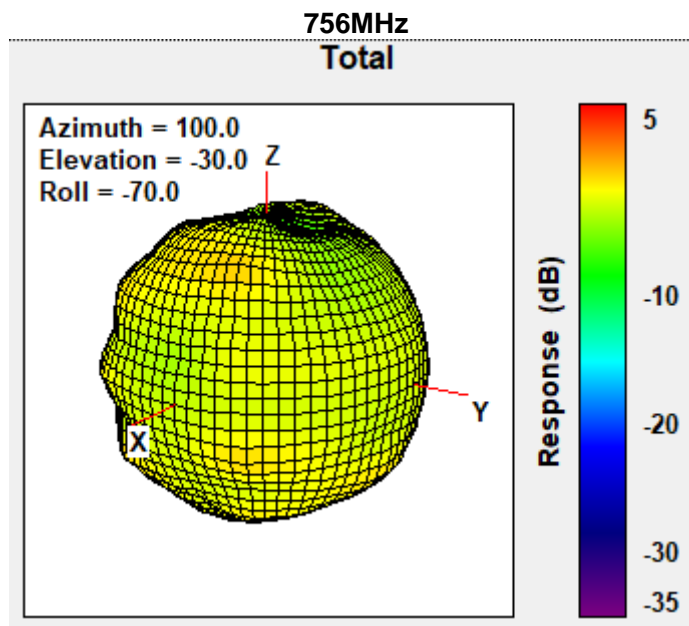


Center Frequency	725.5MHz
Horizontal (dBi) peak	-1.70
Vertical (dBi) peak	-0.53

748MHz

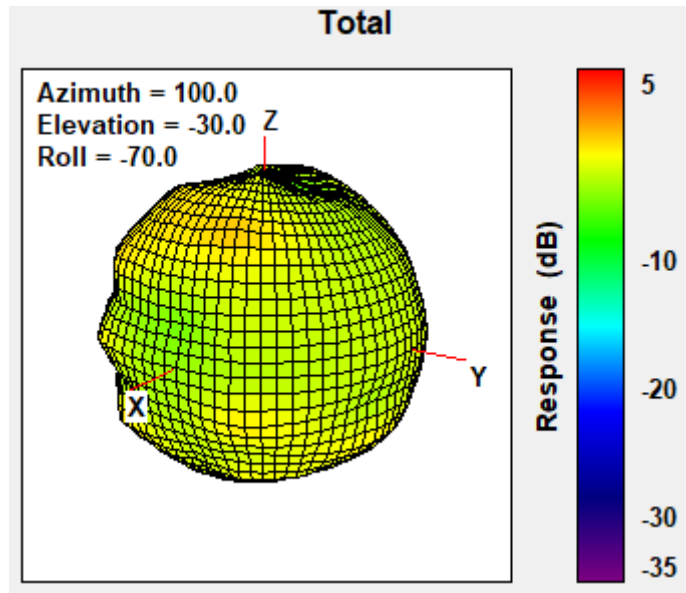


Center Frequency	748MHz
Horizontal (dBi) peak	-1.35
Vertical (dBi) peak	0.30

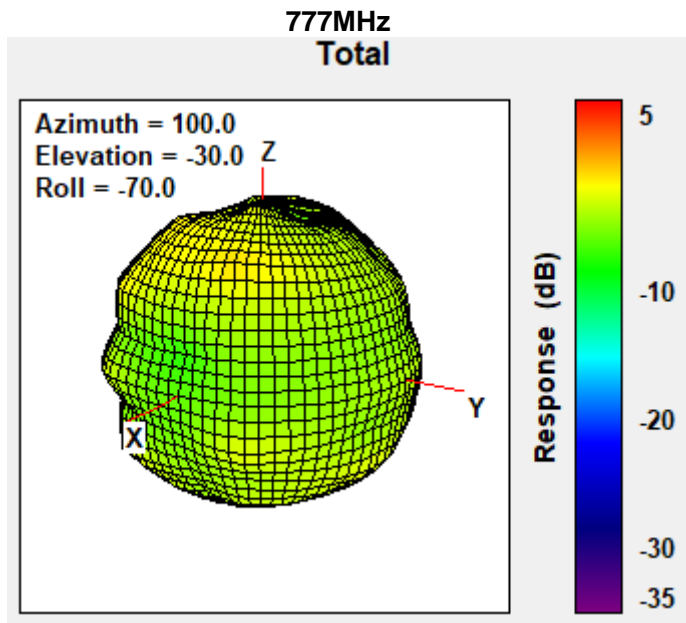


Center Frequency	756MHz
Horizontal (dBi) peak	-0.99
Vertical (dBi) peak	0.41

768MHz

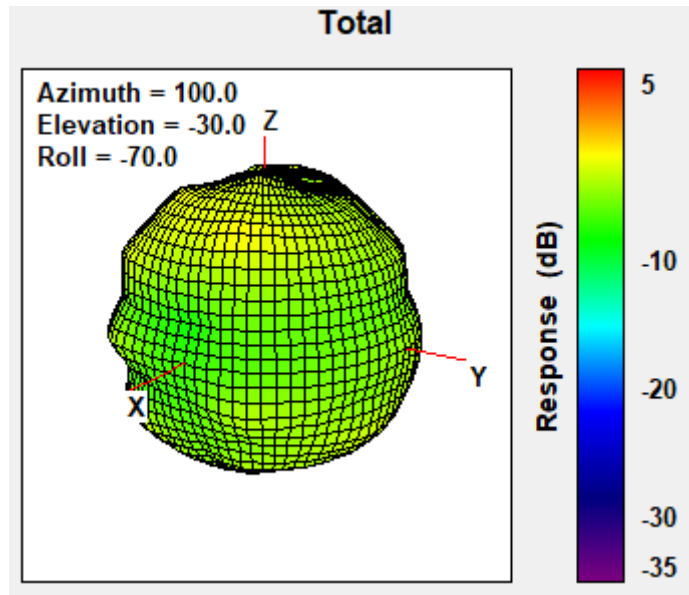


Center Frequency	768MHz
Horizontal (dBi) peak	-0.84
Vertical (dBi) peak	-0.07

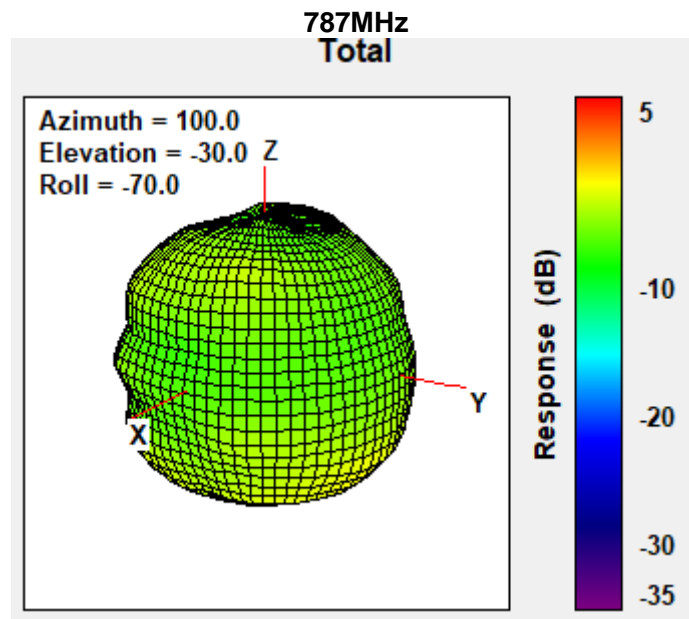


Center Frequency	777MHz
Horizontal (dBi) peak	-1.54
Vertical (dBi) peak	-1.11

782MHz

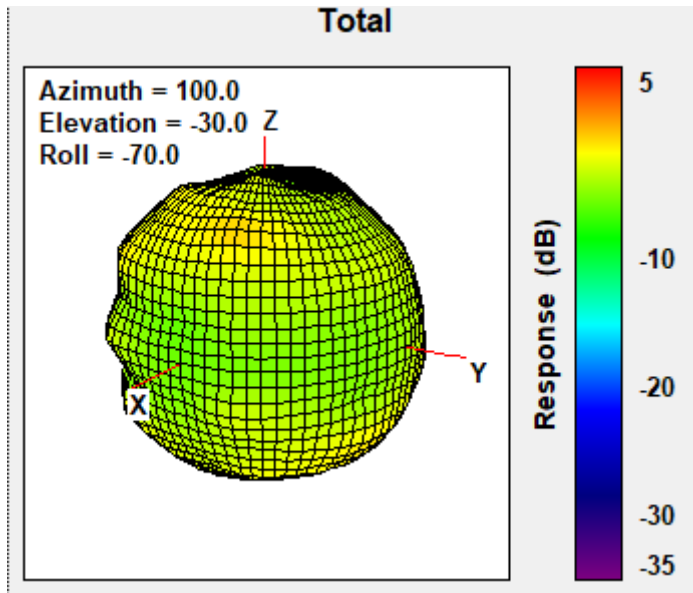


Center Frequency	782MHz
Horizontal (dBi) peak	-1.65
Vertical (dBi) peak	-1.73

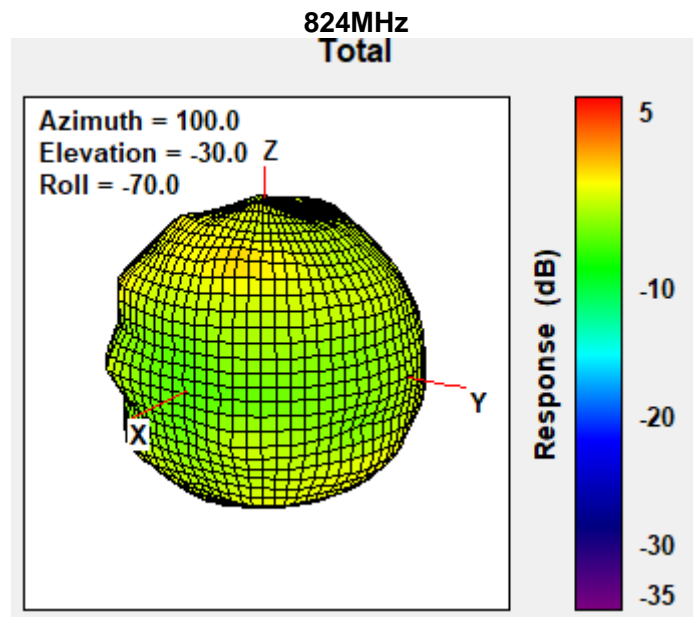


Center Frequency	787MHz
Horizontal (dBi) peak	-1.79
Vertical (dBi) peak	-2.35

814MHz

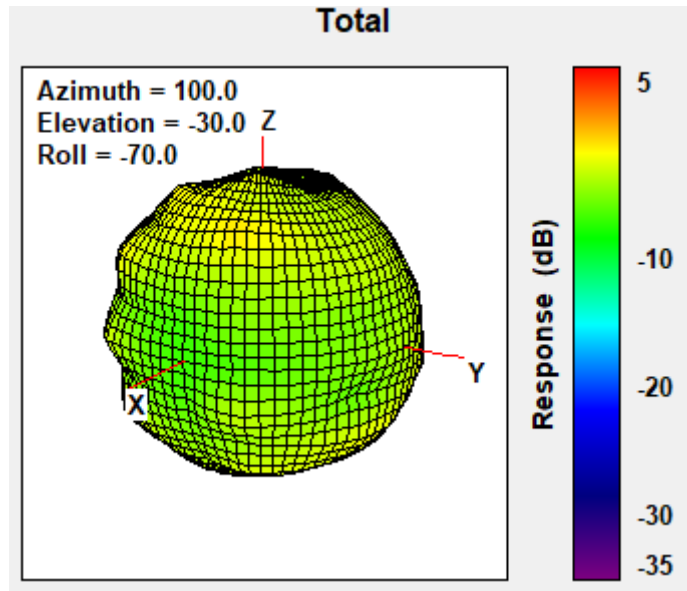


Center Frequency	814MHz
Horizontal (dBi) peak	-1.21
Vertical (dBi) peak	-1.21

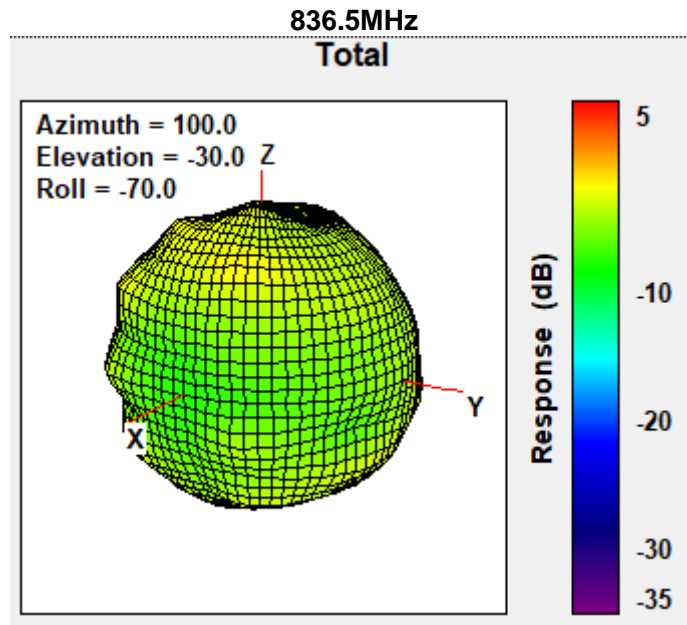


Center Frequency	824MHz
Horizontal (dBi) peak	-1.26
Vertical (dBi) peak	-0.88

832MHz

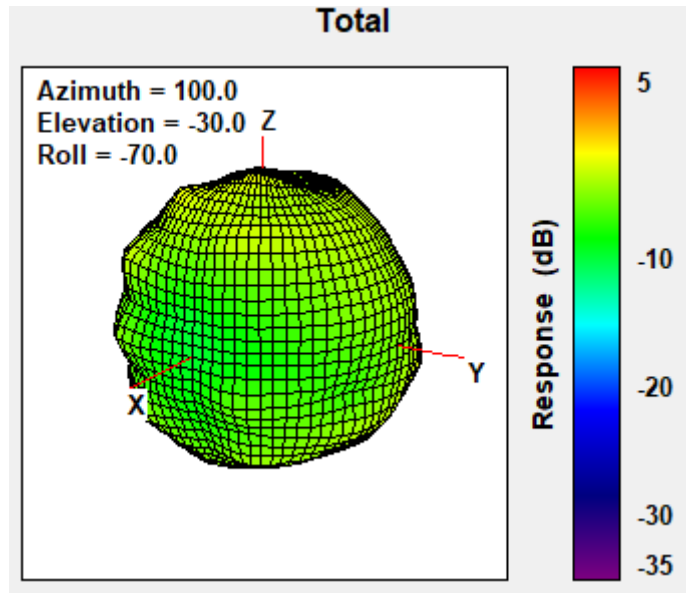


Center Frequency	832MHz
Horizontal (dBi) peak	-1.54
Vertical (dBi) peak	-0.87

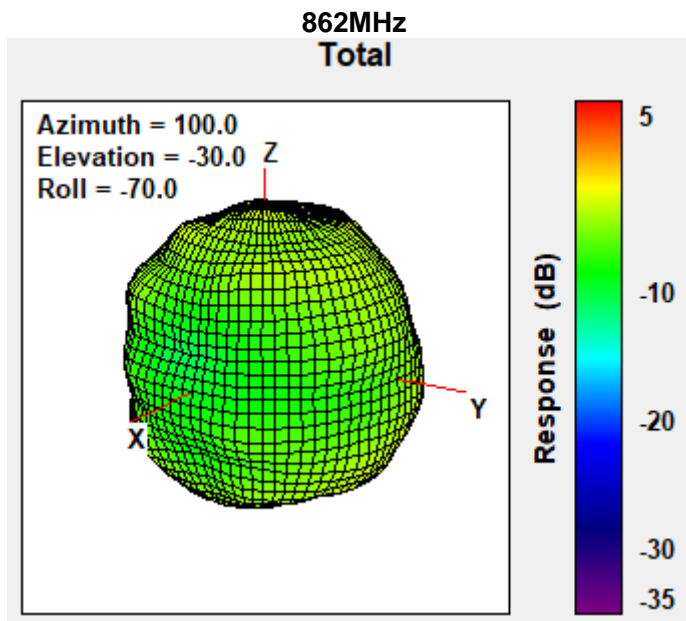


Center Frequency	836.5MHz
Horizontal (dBi) peak	-1.75
Vertical (dBi) peak	-0.97

849MHz

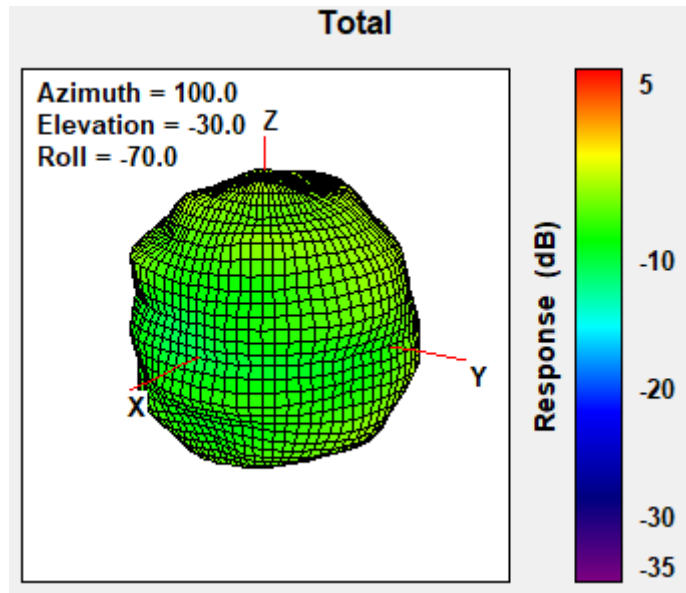


Center Frequency	849MHz
Horizontal (dBi) peak	-2.12
Vertical (dBi) peak	-1.60

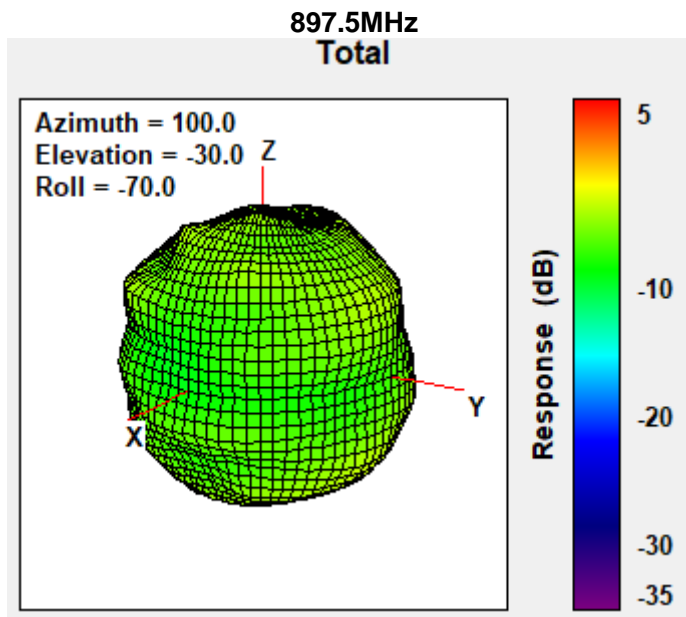


Center Frequency	862MHz
Horizontal (dBi) peak	-1.97
Vertical (dBi) peak	-1.91

880MHz

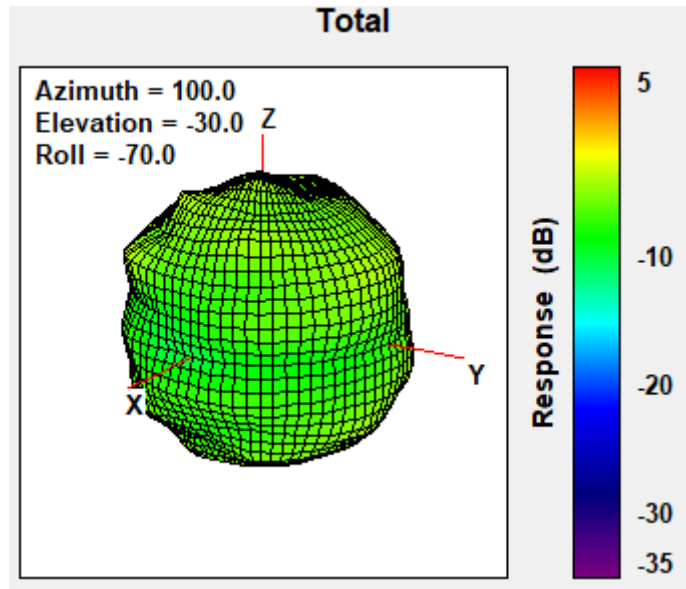


Center Frequency	880MHz
Horizontal (dBi) peak	-1.87
Vertical (dBi) peak	-2.12

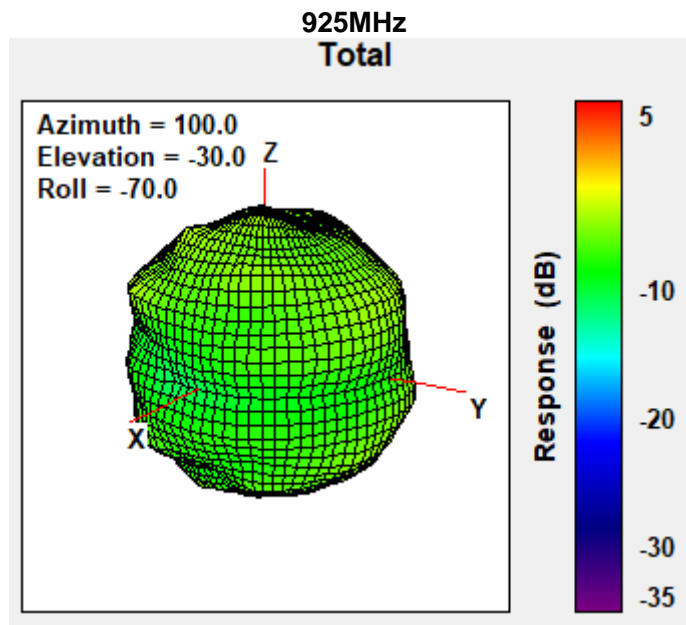


Center Frequency	897.5MHz
Horizontal (dBi) peak	-2.79
Vertical (dBi) peak	-2.65

915MHz

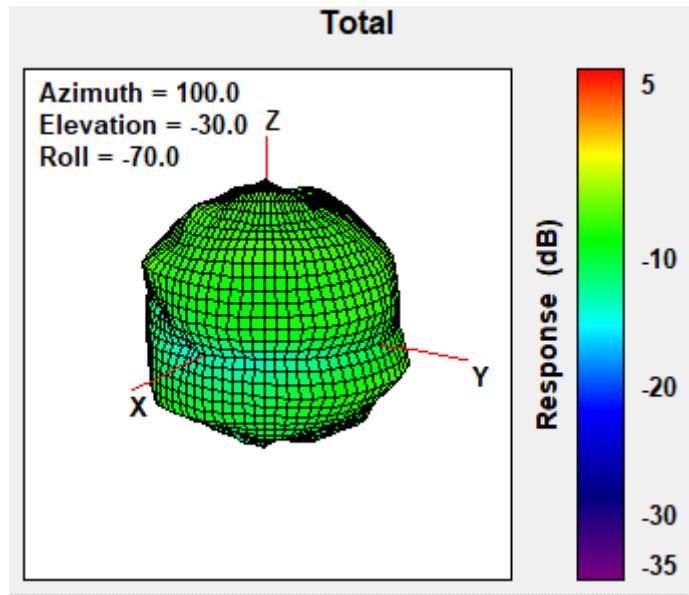


Center Frequency	915MHz
Horizontal (dBi) peak	-3.06
Vertical (dBi) peak	-2.93

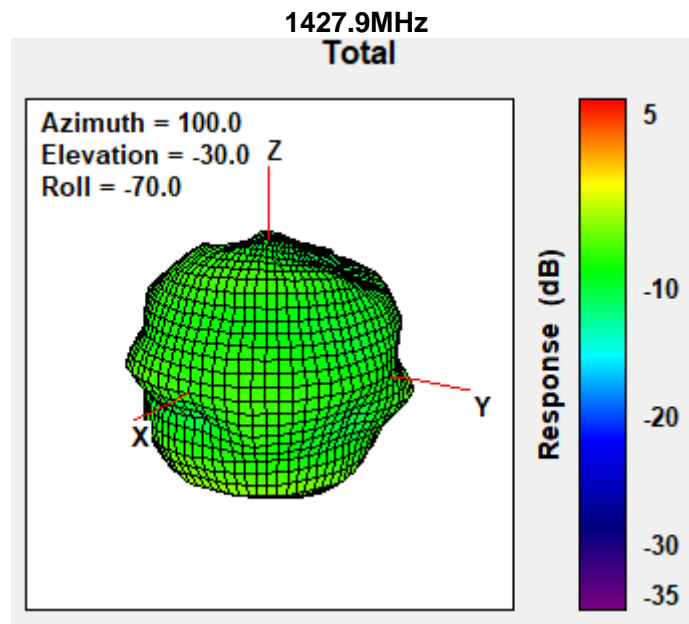


Center Frequency	925MHz
Horizontal (dBi) peak	-3.15
Vertical (dBi) peak	-3.25

960MHz

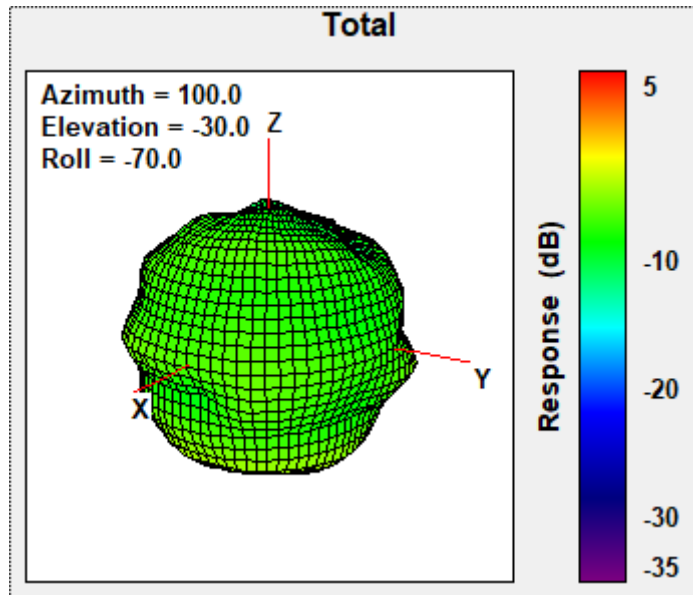


Center Frequency	960MHz
Horizontal (dBi) peak	-4.76
Vertical (dBi) peak	-5.12

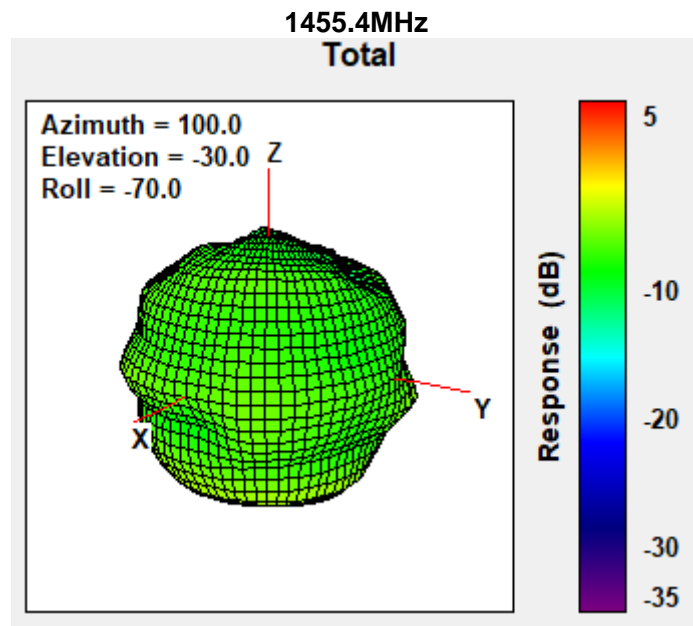


Center Frequency	1427.9MHz
Horizontal (dBi) peak	-4.29
Vertical (dBi) peak	-4.85

1447.9MHz

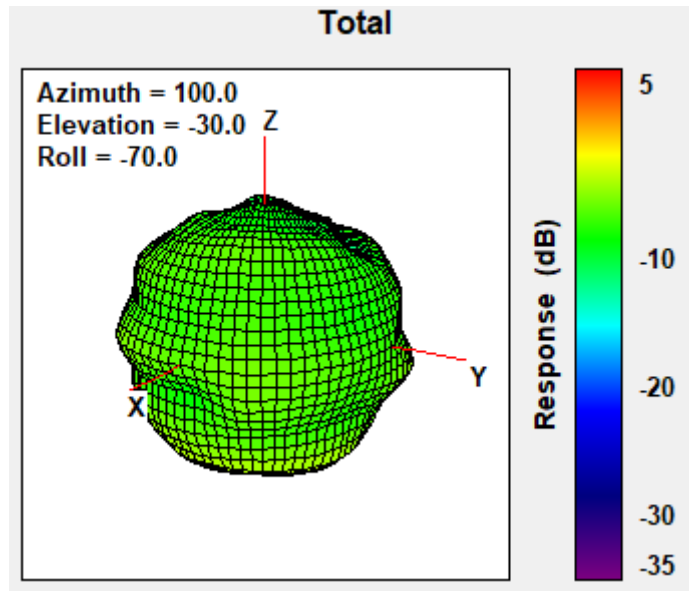


Center Frequency	1447.9MHz
Horizontal (dBi) peak	-3.80
Vertical (dBi) peak	-4.19

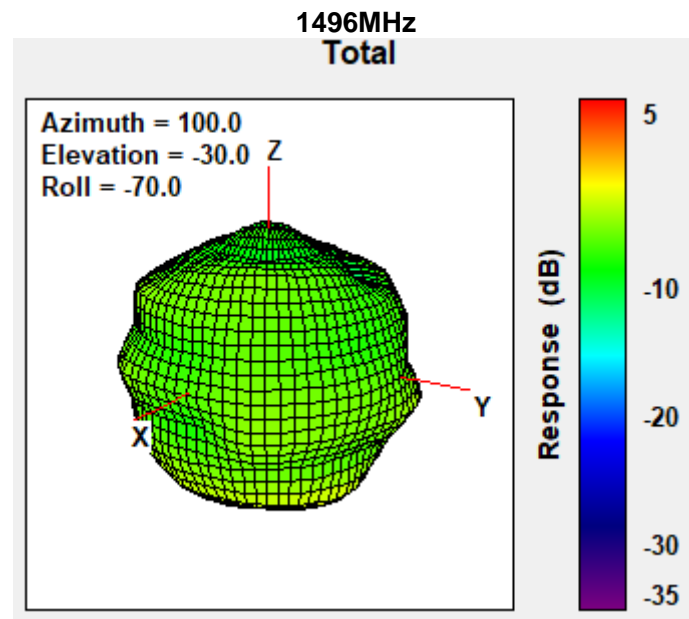


Center Frequency	1455.4MHz
Horizontal (dBi) peak	-3.71
Vertical (dBi) peak	-4.09

1462.9MHz

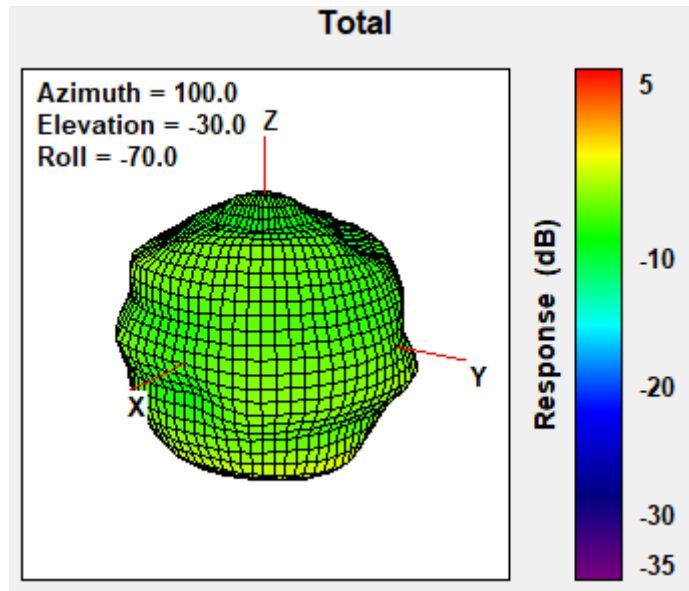


Center Frequency	1462.9MHz
Horizontal (dBi) peak	-3.52
Vertical (dBi) peak	-3.94

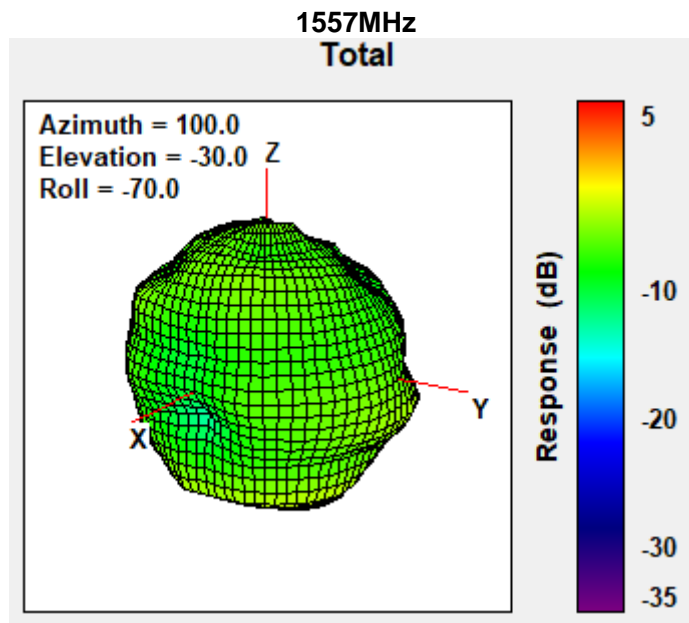


Center Frequency	1496MHz
Horizontal (dBi) peak	-2.62
Vertical (dBi) peak	-2.74

1510.9MHz

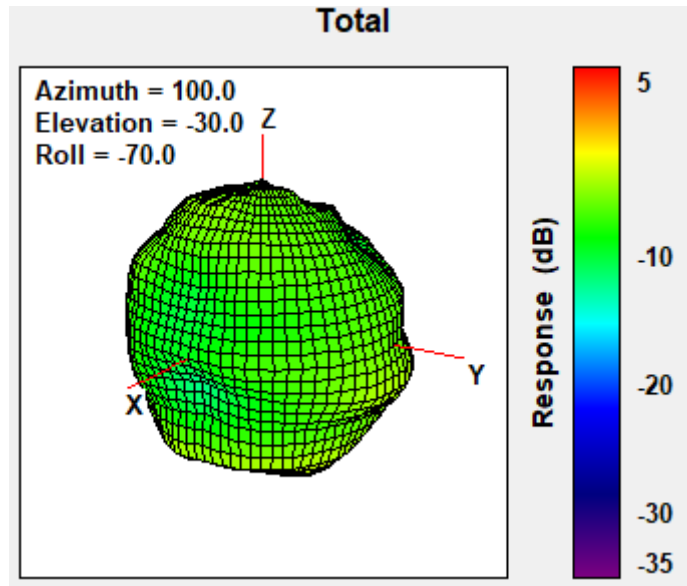


Center Frequency	1510.9MHz
Horizontal (dBi) peak	-2.36
Vertical (dBi) peak	-2.52

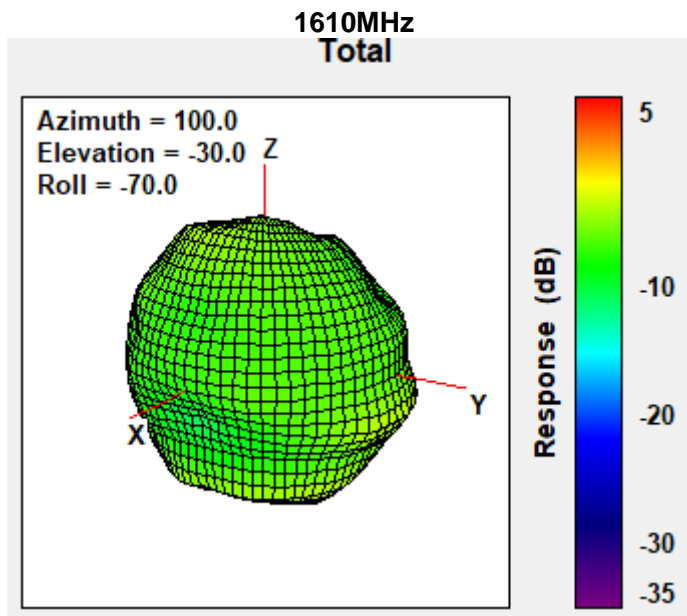


Center Frequency	1557MHz
Horizontal (dBi) peak	-3.31
Vertical (dBi) peak	-2.22

1575MHz

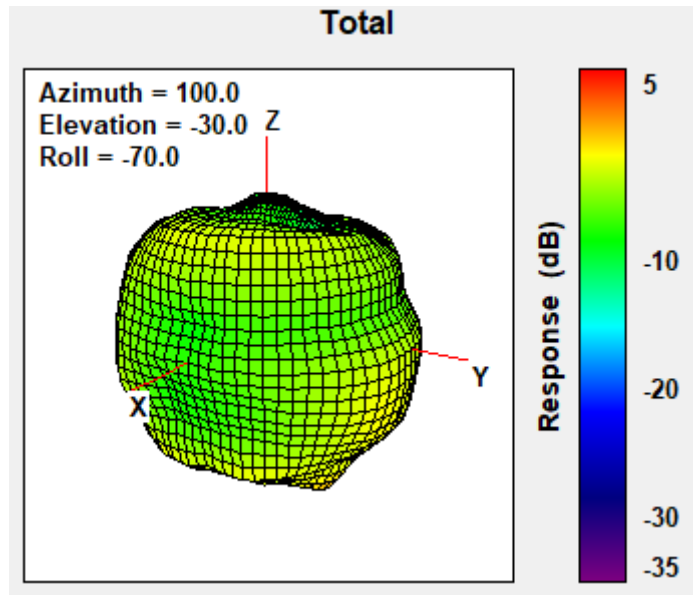


Center Frequency	1575MHz
Horizontal (dBi) peak	-3.14
Vertical (dBi) peak	-2.26

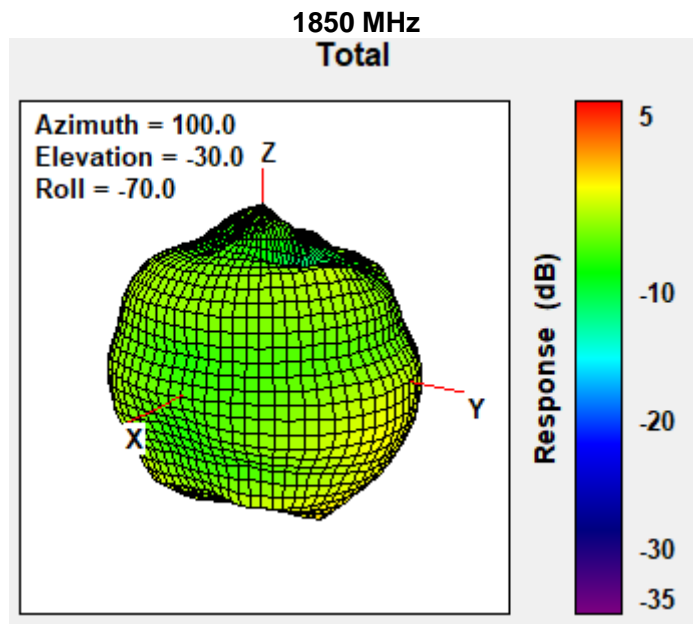


Center Frequency	1610MHz
Horizontal (dBi) peak	-3.29
Vertical (dBi) peak	-2.55

1805 MHz

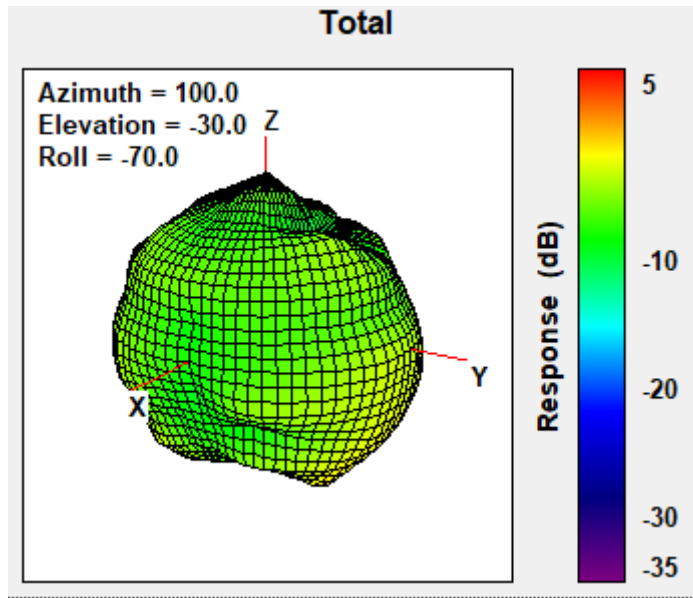


Center Frequency	1805 MHz
Horizontal (dBi) peak	-0.03
Vertical (dBi) peak	-0.16

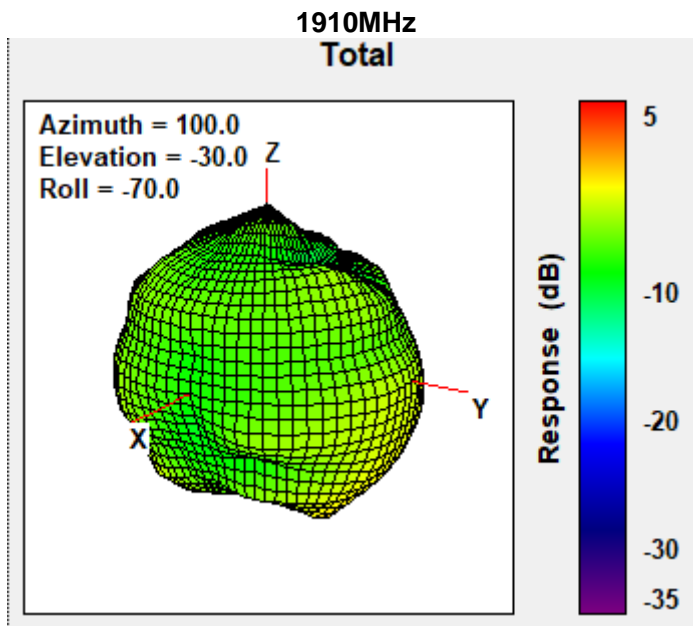


Center Frequency	1850 MHz
Horizontal (dBi) peak	-0.71
Vertical (dBi) peak	0.41

1880 MHz

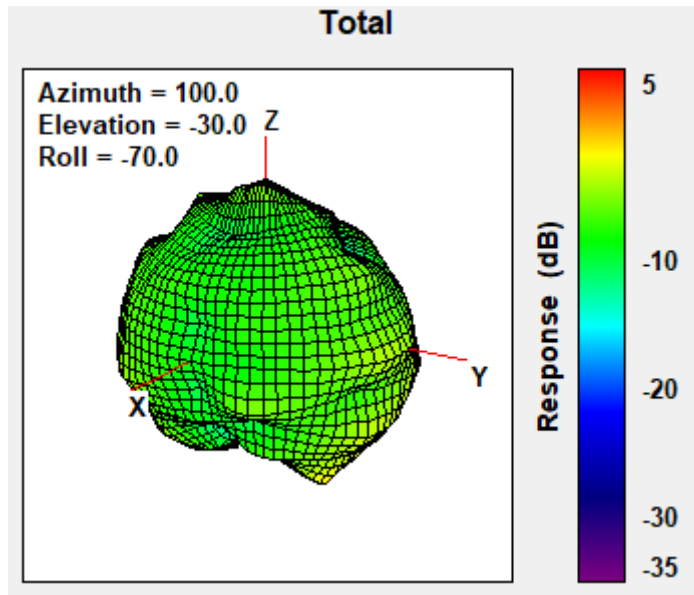


Center Frequency	1880 MHz
Horizontal (dBi) peak	-0.97
Vertical (dBi) peak	0.29

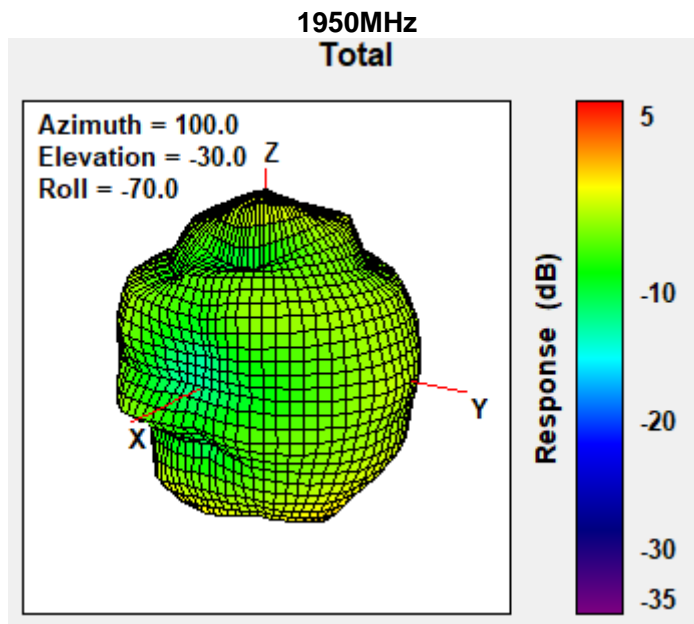


Center Frequency	1910MHz
Horizontal (dBi) peak	-0.77
Vertical (dBi) peak	-0.41

1920MHz

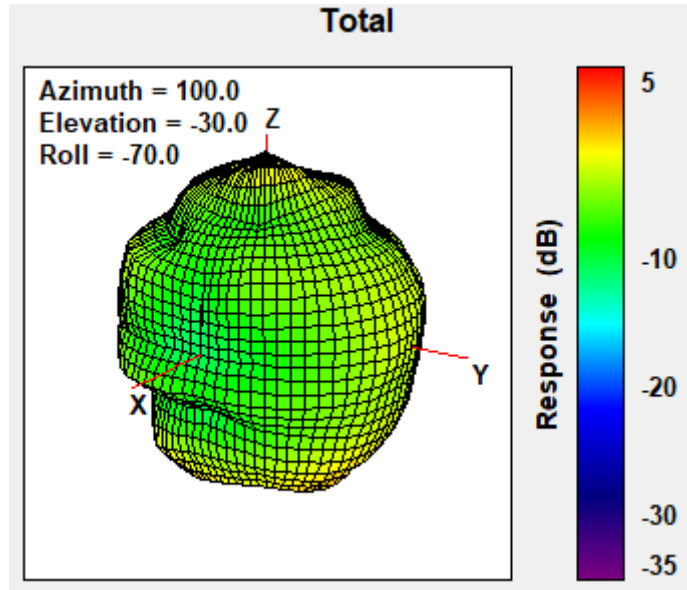


Center Frequency	1920MHz
Horizontal (dBi) peak	-0.81
Vertical (dBi) peak	-0.80



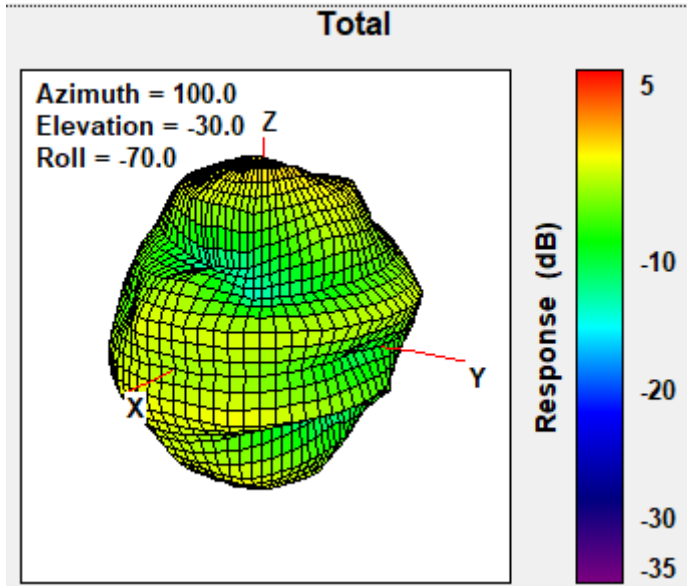
Center Frequency	1950MHz
Horizontal (dBi) peak	-0.25
Vertical (dBi) peak	-0.66

**1980MHz
Total**



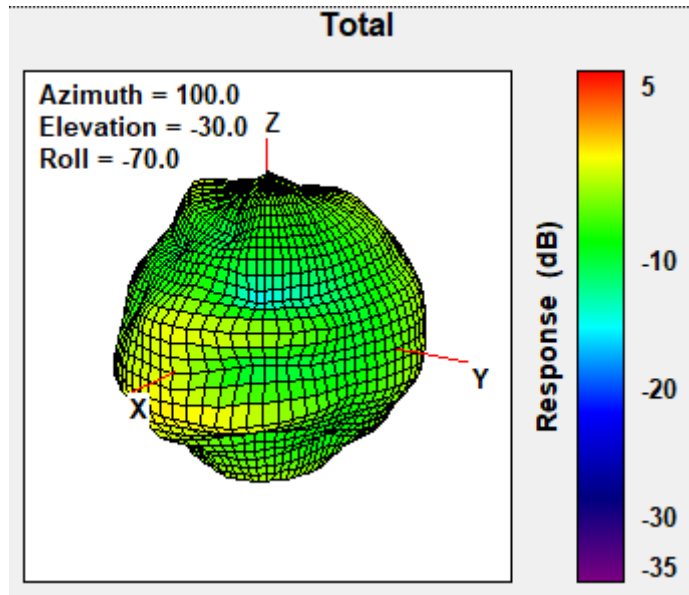
Center Frequency	1980MHz
Horizontal (dBi) peak	-0.06
Vertical (dBi) peak	-0.37

**2110MHz
Total**

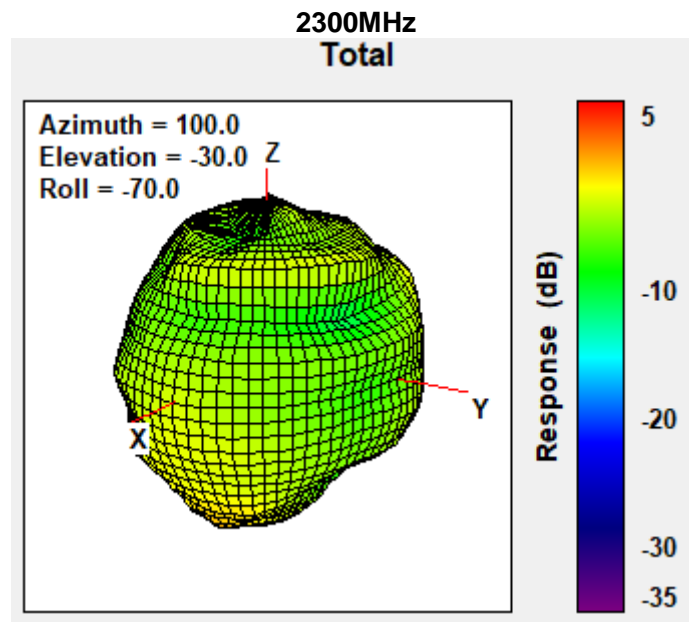


Center Frequency	2110MHz
Horizontal (dBi) peak	0.54
Vertical (dBi) peak	-0.58

2200MHz

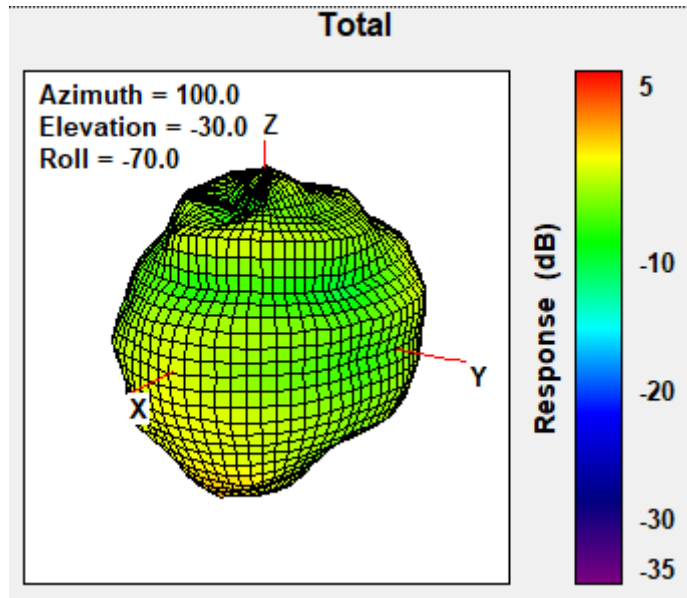


Center Frequency	2200MHz
Horizontal (dBi) peak	0.68
Vertical (dBi) peak	-0.72

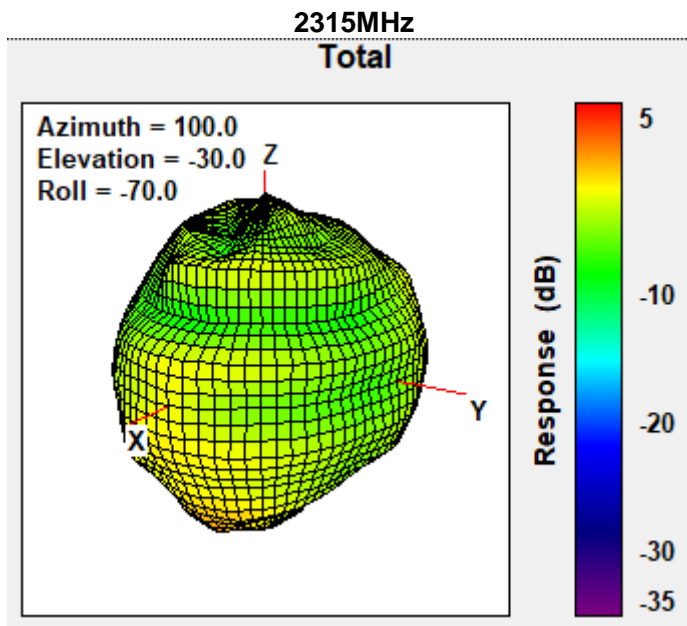


Center Frequency	2300MHz
Horizontal (dBi) peak	2.15
Vertical (dBi) peak	0.41

2305MHz

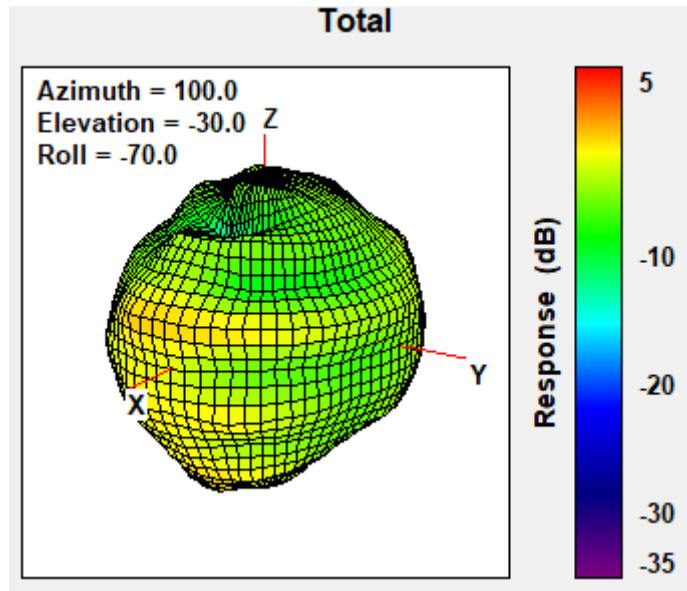


Center Frequency	2305MHz
Horizontal (dBi) peak	2.12
Vertical (dBi) peak	0.44

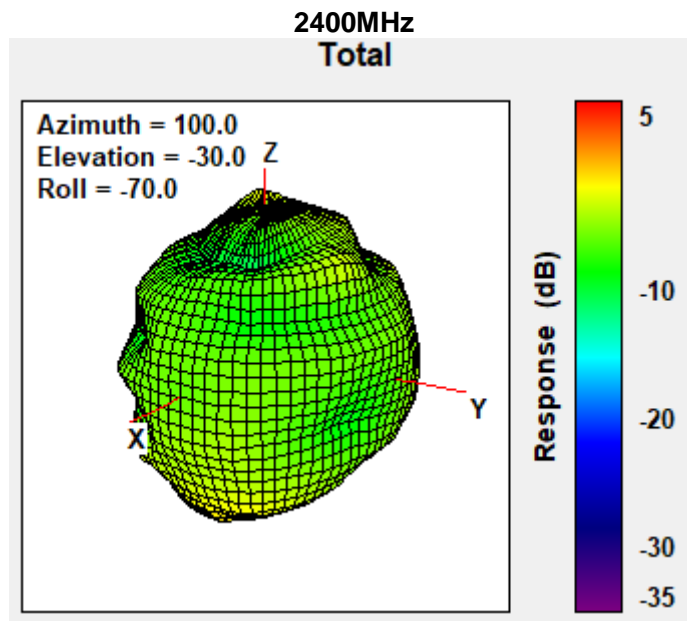


Center Frequency	2315MHz
Horizontal (dBi) peak	1.93
Vertical (dBi) peak	0.56

2350MHz

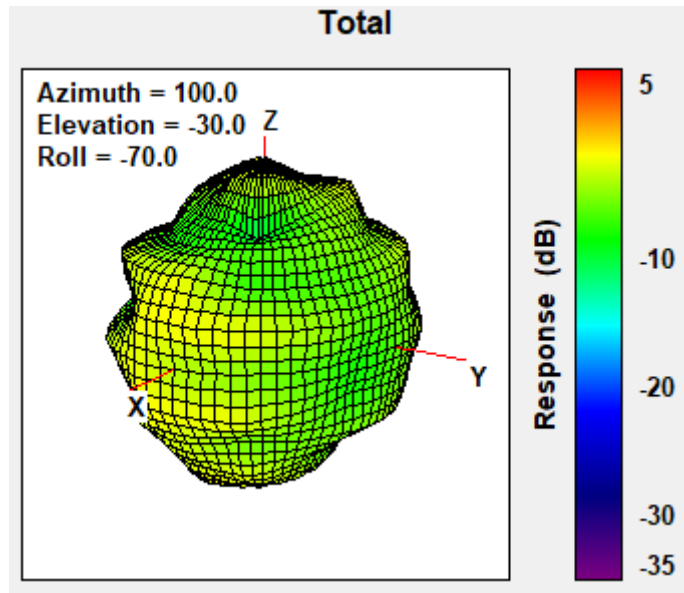


Center Frequency	2350MHz
Horizontal (dBi) peak	1.01
Vertical (dBi) peak	0.73

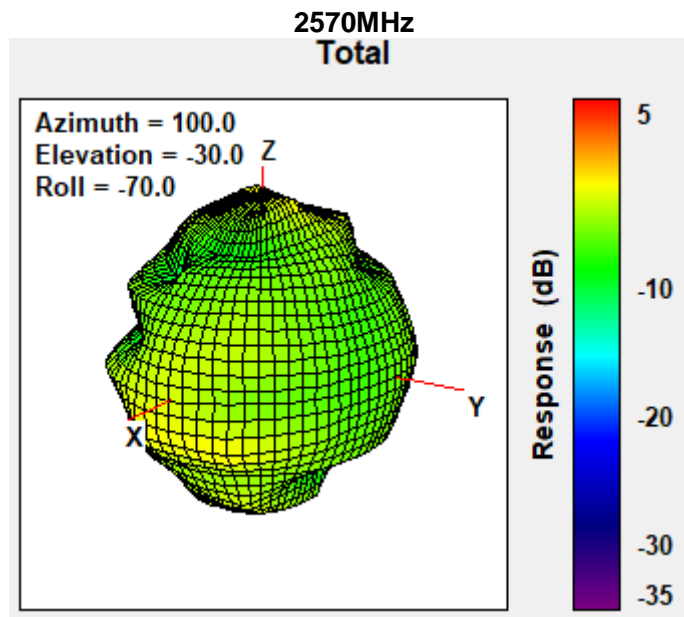


Center Frequency	2400MHz
Horizontal (dBi) peak	1.34
Vertical (dBi) peak	-0.07

2500MHz

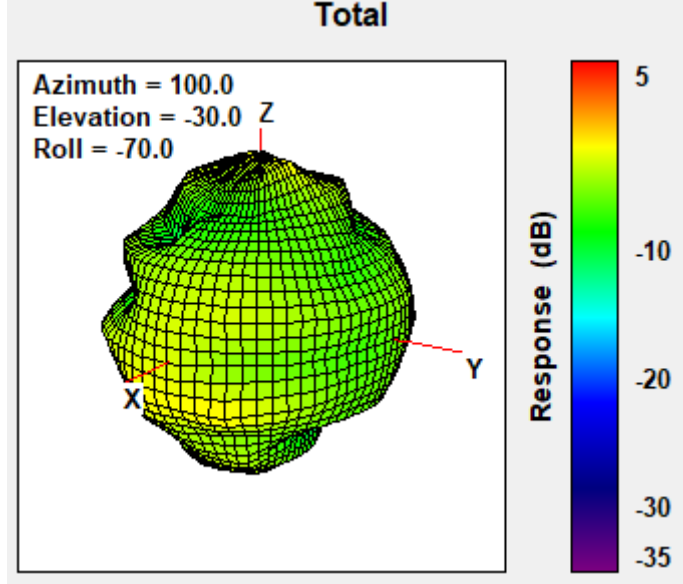


Center Frequency	2500MHz
Horizontal (dBi) peak	0.09
Vertical (dBi) peak	-0.76



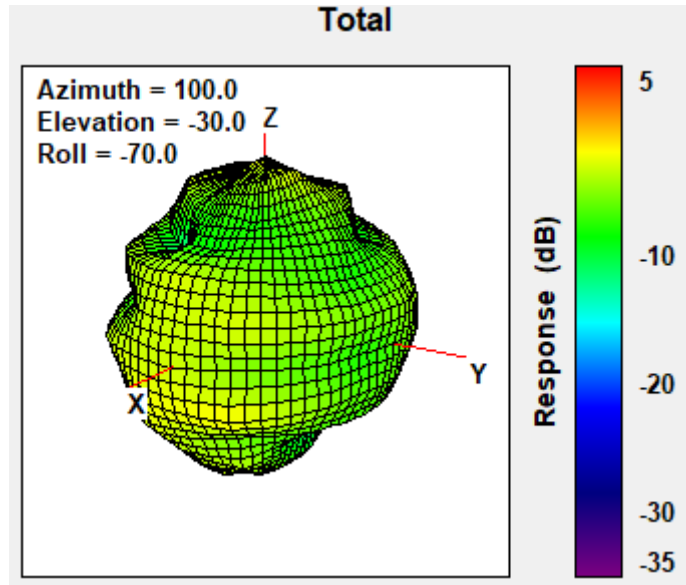
Center Frequency	2570MHz
Horizontal (dBi) peak	-0.69
Vertical (dBi) peak	-1.00

**2595MHz
Total**



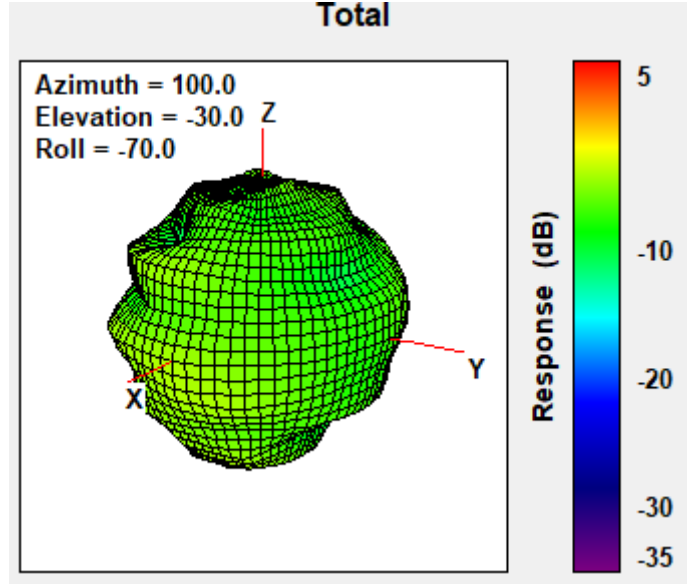
Center Frequency	2595MHz
Horizontal (dBi) peak	-1.10
Vertical (dBi) peak	-1.37

**2620MHz
Total**



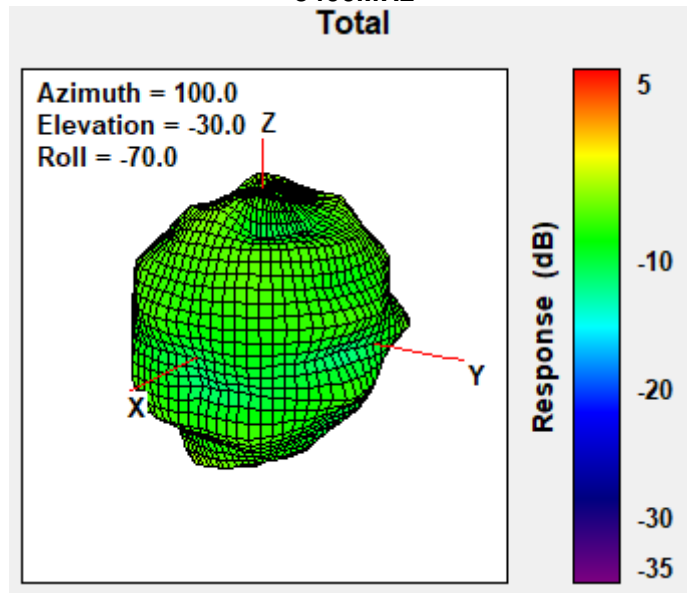
Center Frequency	2620MHz
Horizontal (dBi) peak	-1.31
Vertical (dBi) peak	-2.24

**2690MHz
Total**



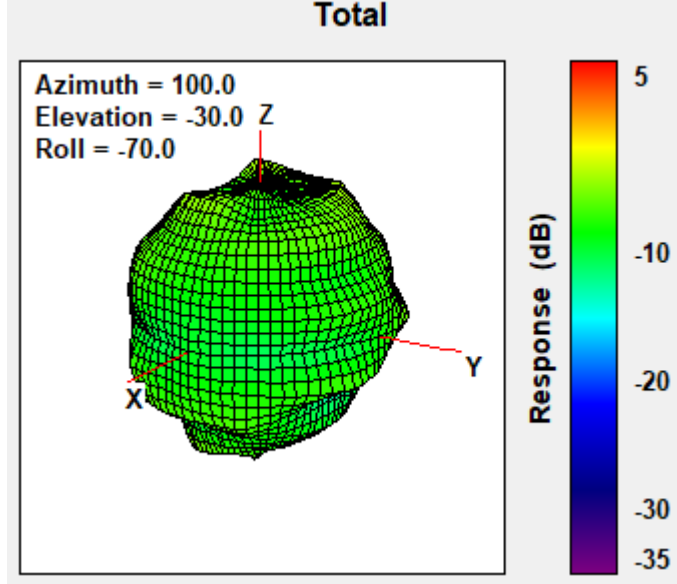
Center Frequency	2690MHz
Horizontal (dBi) peak	-3.54
Vertical (dBi) peak	-4.11

**3400MHz
Total**



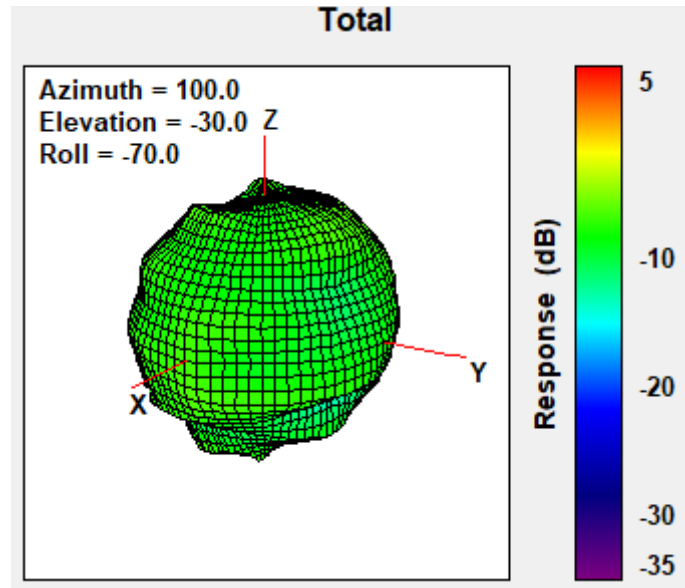
Center Frequency	3400MHz
Horizontal (dBi) peak	-3.21
Vertical (dBi) peak	-4.08

**3500MHz
Total**



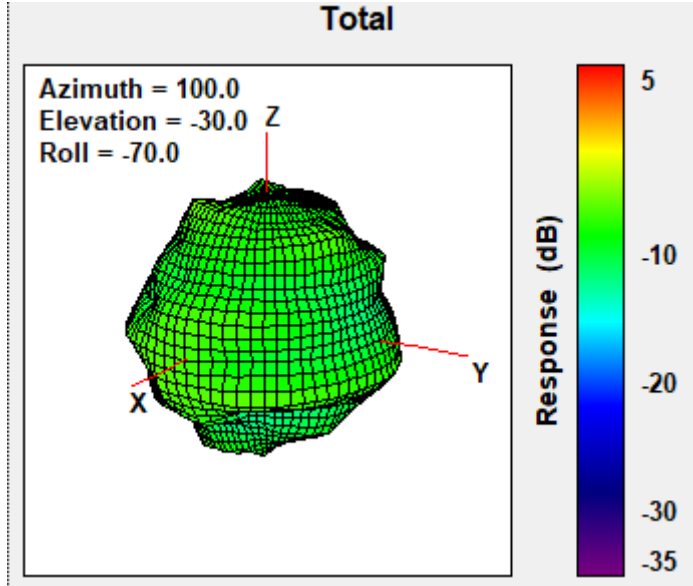
Center Frequency	3500MHz
Horizontal (dBi) peak	-3.81
Vertical (dBi) peak	-3.74

**3600MHz
Total**



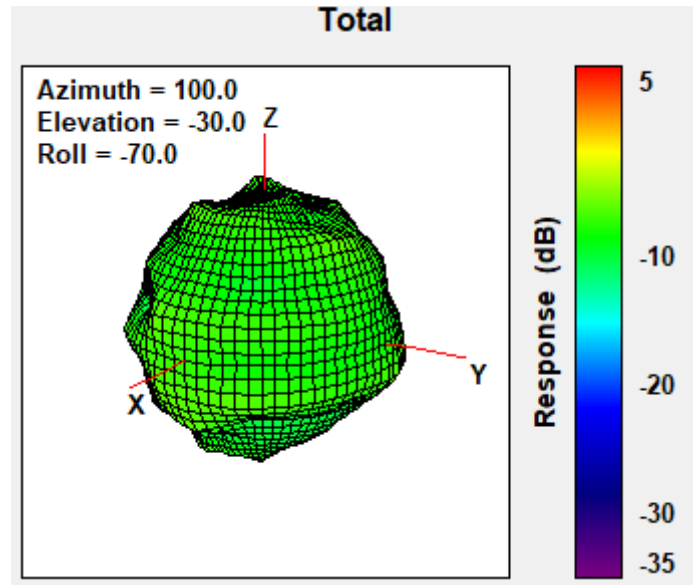
Center Frequency	3600MHz
Horizontal (dBi) peak	-5.39
Vertical (dBi) peak	-5.22

**3700MHz
Total**



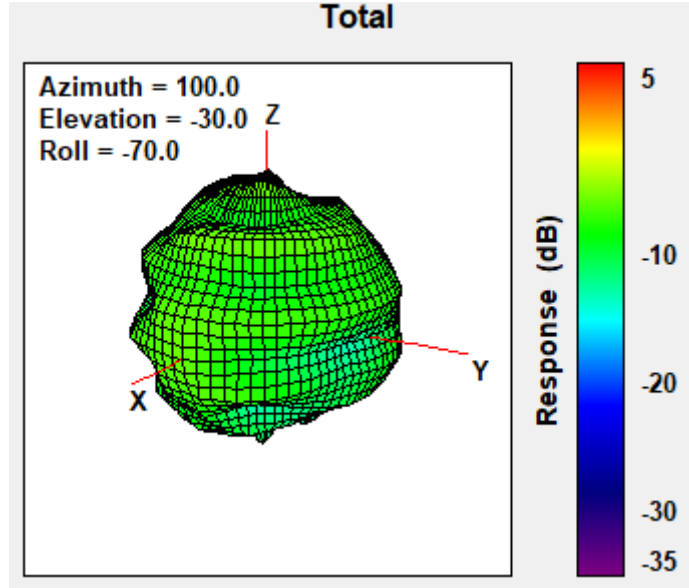
Center Frequency	3700MHz
Horizontal (dBi) peak	-5.42
Vertical (dBi) peak	-5.15

**3800MHz
Total**



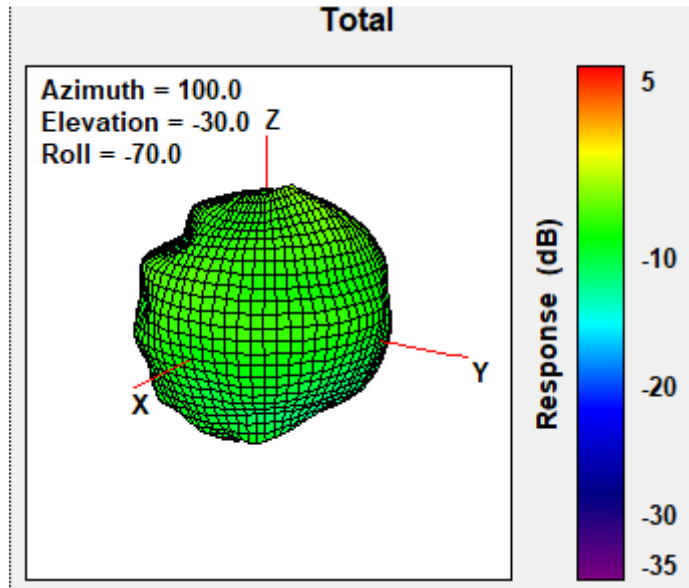
Center Frequency	3800MHz
Horizontal (dBi) peak	-3.81
Vertical (dBi) peak	-4.37

**4200MHz
Total**



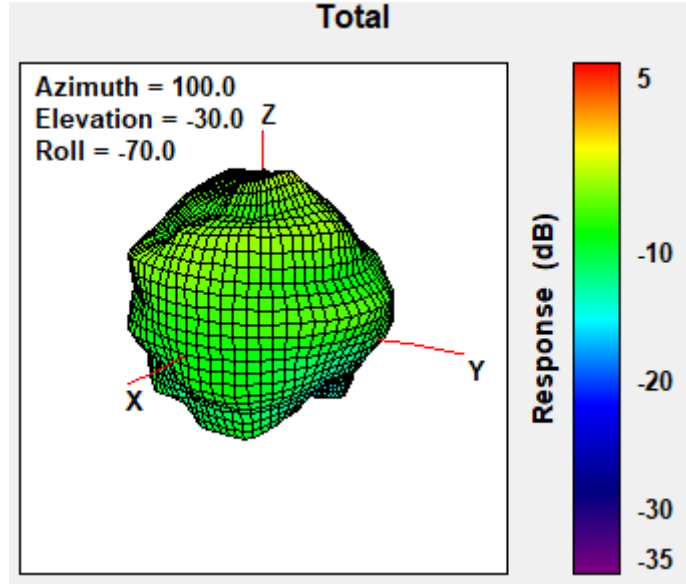
Center Frequency	4200MHz
Horizontal (dBi) peak	-4.82
Vertical (dBi) peak	-5.01

**4400MHz
Total**



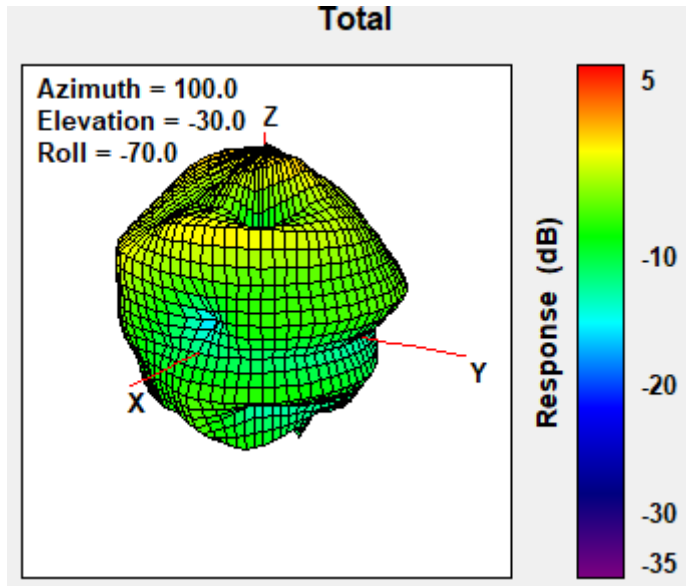
Center Frequency	4400MHz
Horizontal (dBi) peak	-5.52
Vertical (dBi) peak	-5.09

**4700MHz
Total**



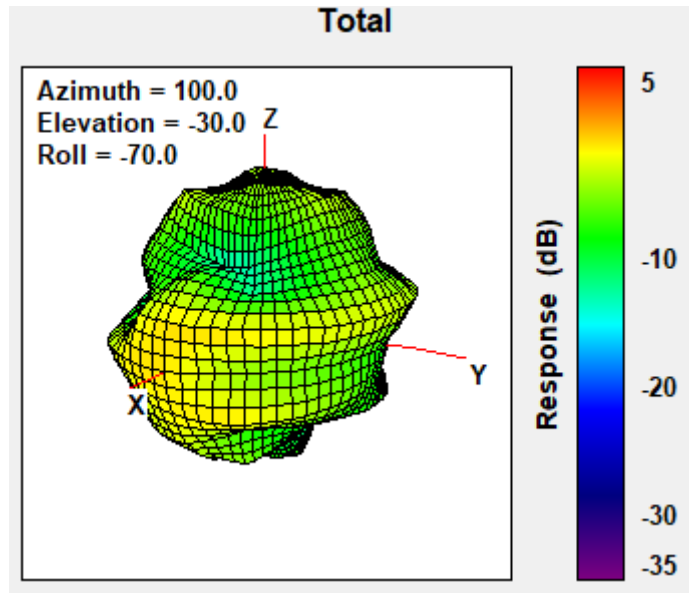
Center Frequency	4700MHz
Horizontal (dBi) peak	-4.39
Vertical (dBi) peak	-4.49

**5150MHz
Total**

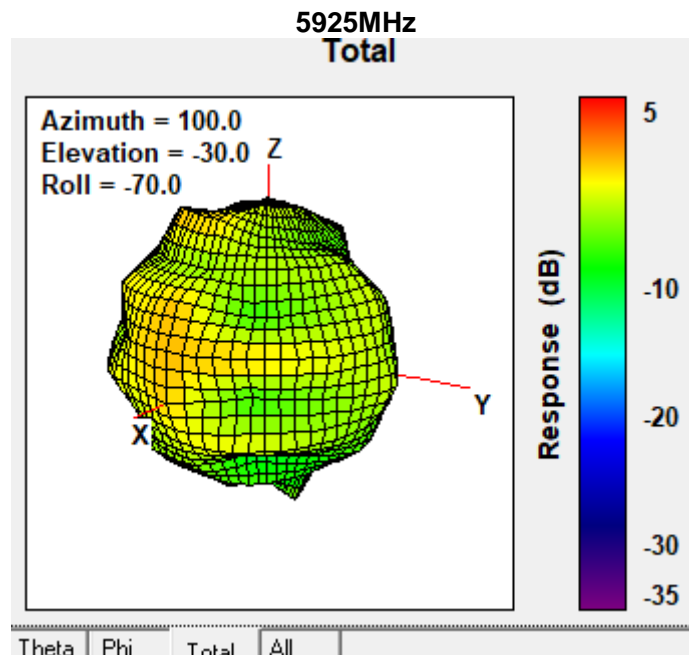


Center Frequency	5150MHz
Horizontal (dBi) peak	-0.29
Vertical (dBi) peak	0.01

5537.5MHz



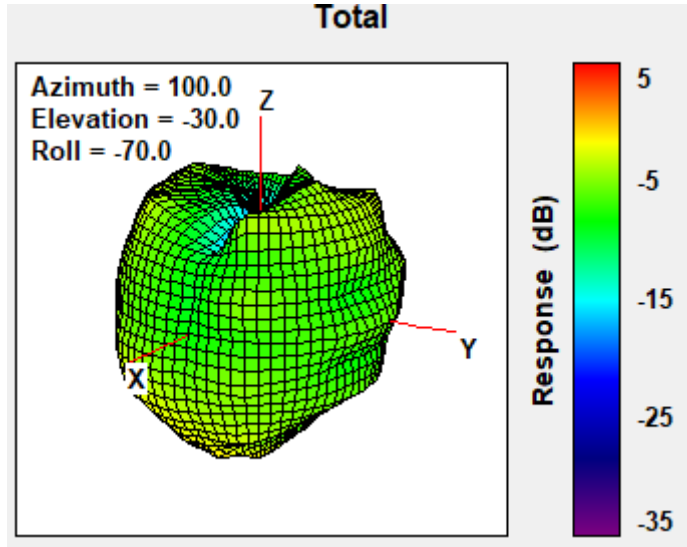
Center Frequency	5537.5MHz
Horizontal (dBi) peak	-0.88
Vertical (dBi) peak	-4.14



Center Frequency	5925MHz
Horizontal (dBi) peak	0.08
Vertical (dBi) peak	-2.15

MIMO2 Antenna (DRx2)

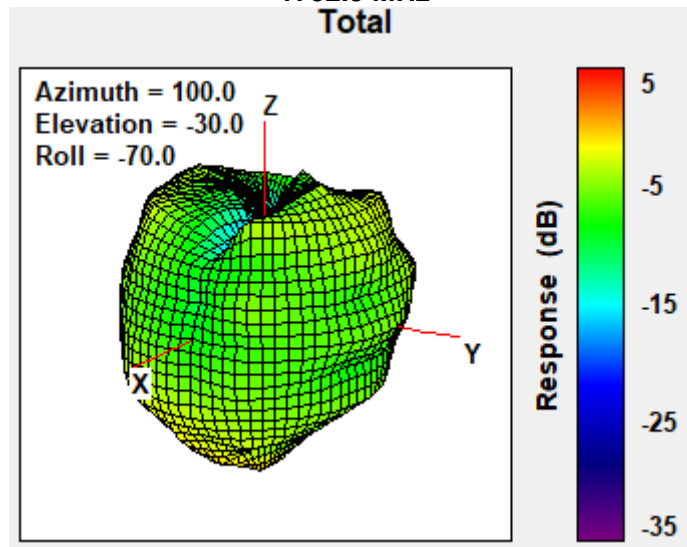
1710 MHz Total



Center Frequency	1710 MHz
Horizontal (dBi) peak	-0.86
Vertical (dBi) peak	-2.91

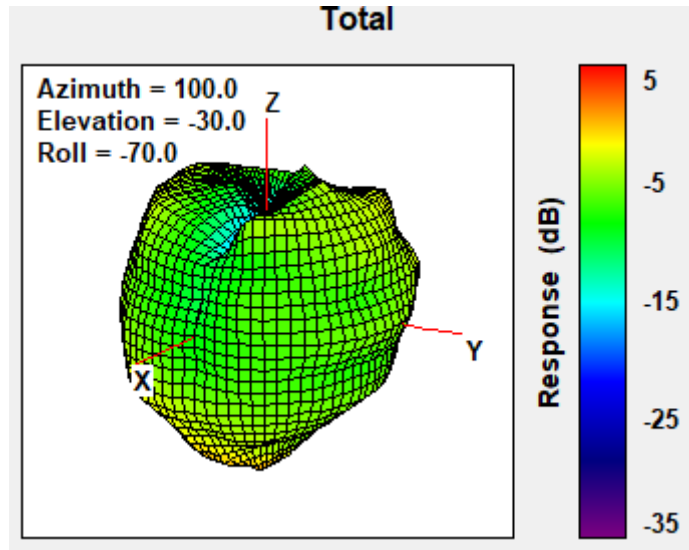
之

1732.5 MHz Total

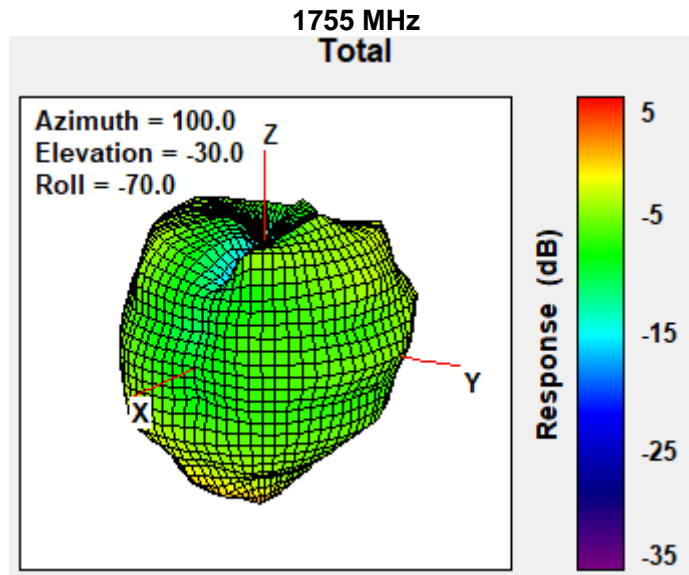


Center Frequency	1732.5 MHz
Horizontal (dBi) peak	-0.23
Vertical (dBi) peak	-2.27

1747.5 MHz

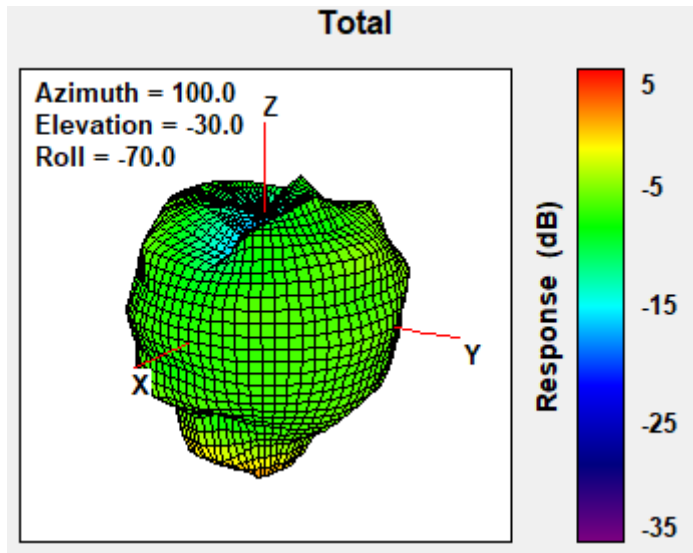


Center Frequency	1747.5 MHz
Horizontal (dBi) peak	0.51
Vertical (dBi) peak	-1.55

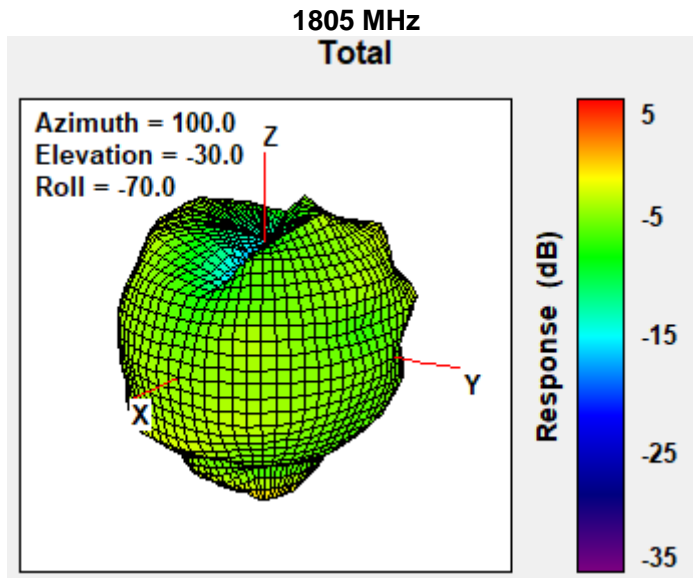


Center Frequency	1755 MHz
Horizontal (dBi) peak	0.73
Vertical (dBi) peak	-1.26

1785 MHz

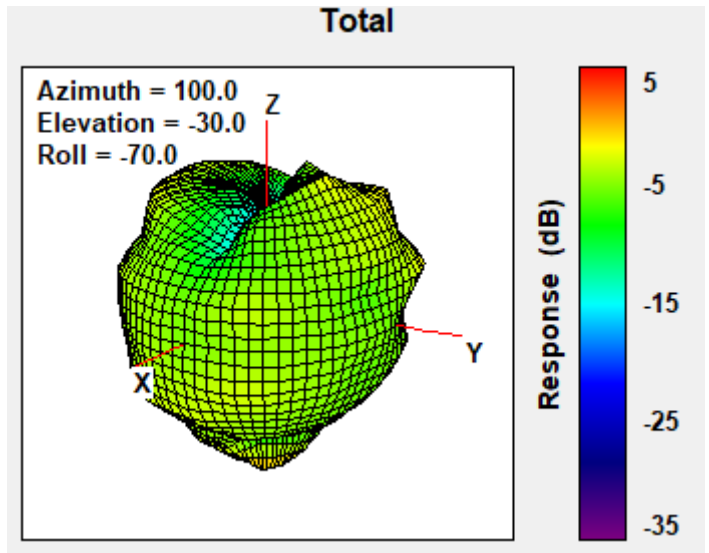


Center Frequency	1785 MHz
Horizontal (dBi) peak	0.95
Vertical (dBi) peak	0.36

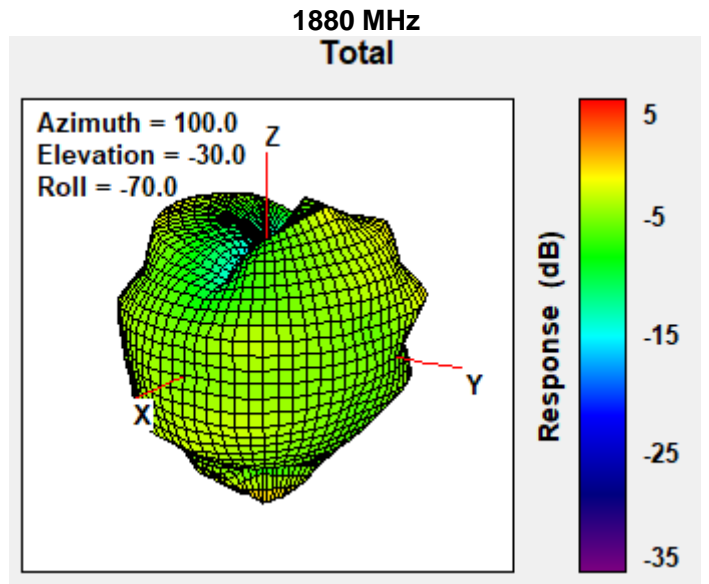


Center Frequency	1805 MHz
Horizontal (dBi) peak	-0.51
Vertical (dBi) peak	-0.38

1850 MHz

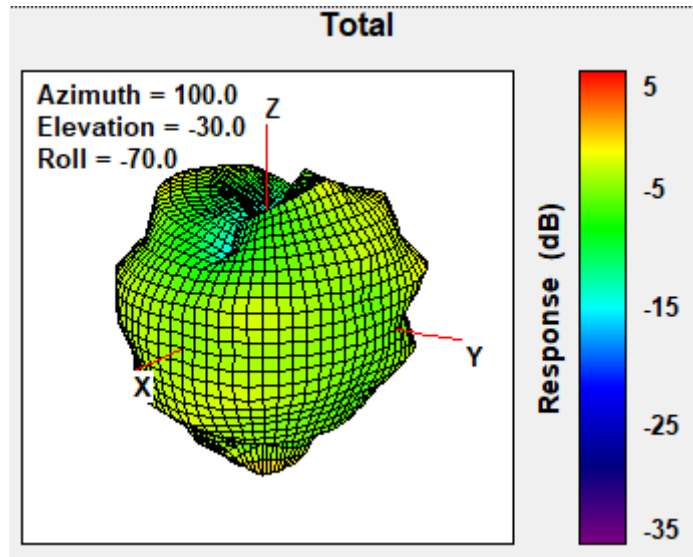


Center Frequency	1850 MHz
Horizontal (dBi) peak	-0.04
Vertical (dBi) peak	-0.32

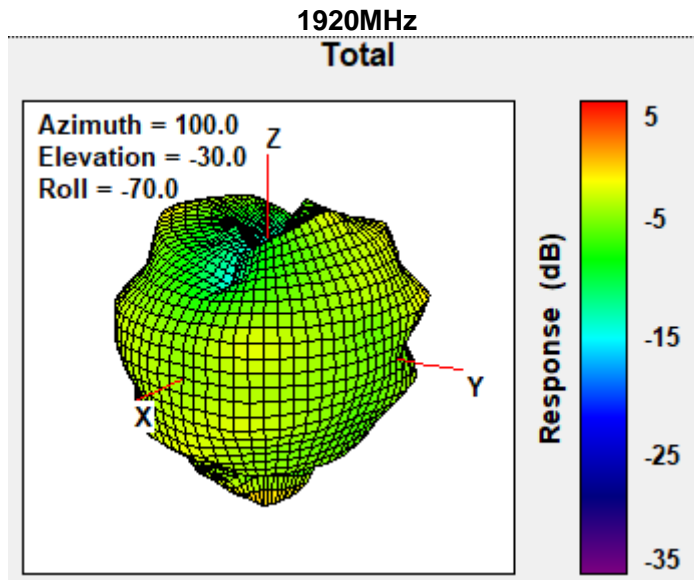


Center Frequency	1880 MHz
Horizontal (dBi) peak	0.43
Vertical (dBi) peak	-0.40

1910MHz

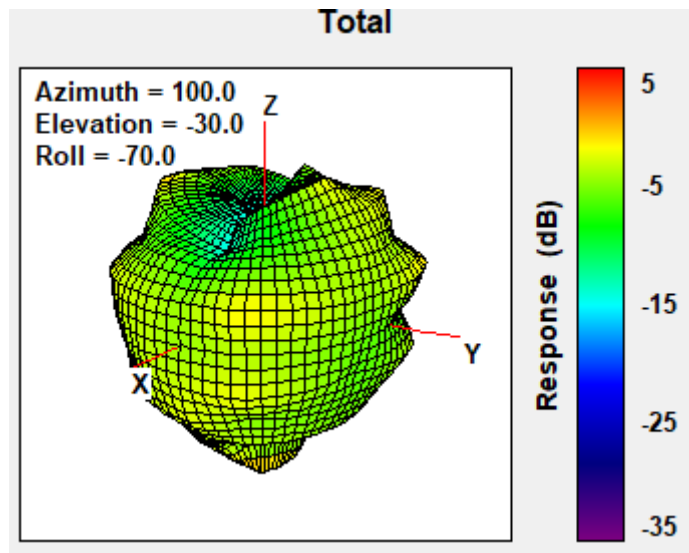


Center Frequency	1910MHz
Horizontal (dBi) peak	0.70
Vertical (dBi) peak	-0.63

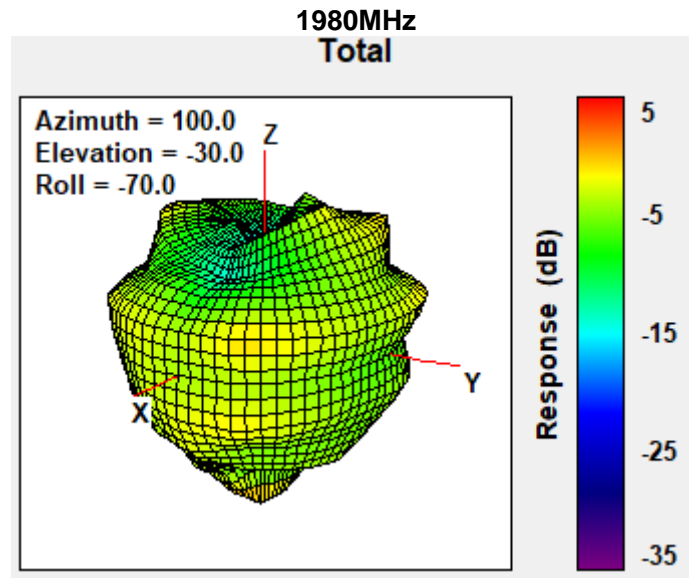


Center Frequency	1920MHz
Horizontal (dBi) peak	0.77
Vertical (dBi) peak	-0.55

1950MHz

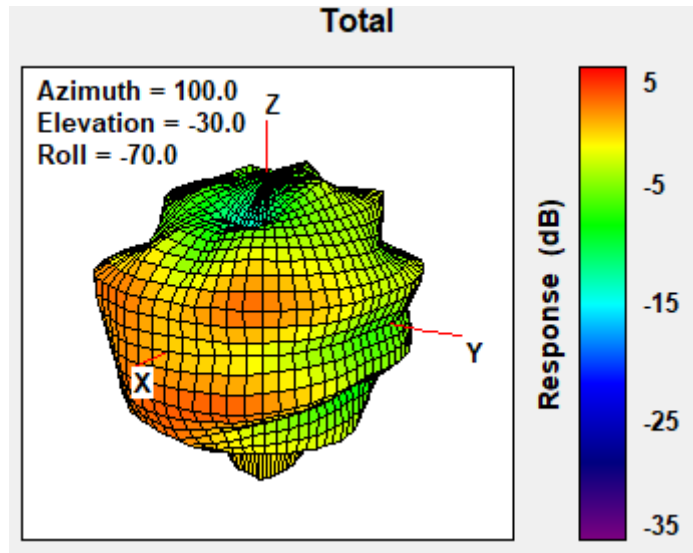


Center Frequency	1950MHz
Horizontal (dBi) peak	0.63
Vertical (dBi) peak	-0.65

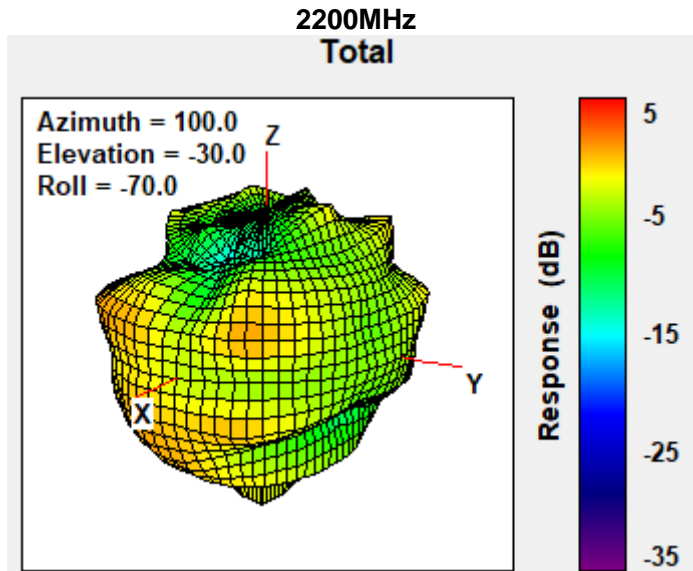


Center Frequency	1980MHz
Horizontal (dBi) peak	0.42
Vertical (dBi) peak	-1.33

2110MHz

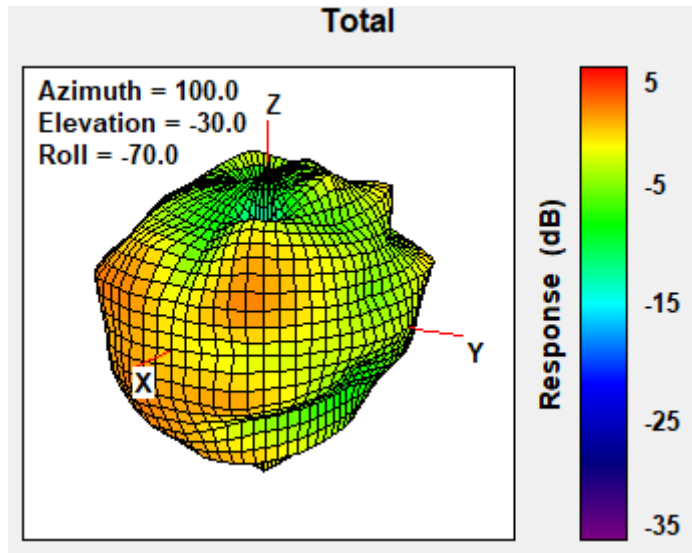


Center Frequency	2110MHz
Horizontal (dBi) peak	2.59
Vertical (dBi) peak	2.46

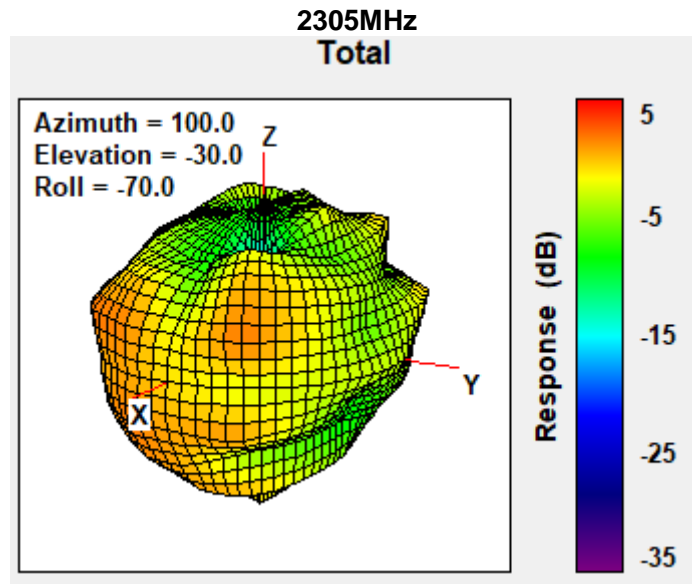


Center Frequency	2200MHz
Horizontal (dBi) peak	0.29
Vertical (dBi) peak	1.48

2300MHz

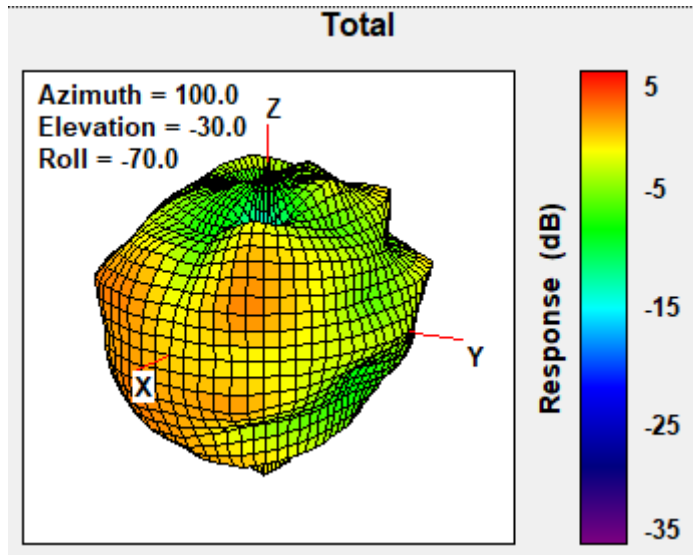


Center Frequency	2300MHz
Horizontal (dBi) peak	0.85
Vertical (dBi) peak	1.83

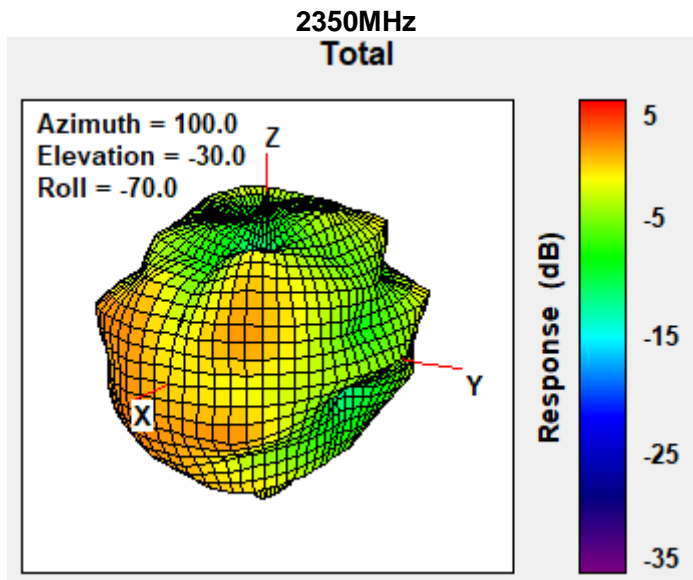


Center Frequency	2305MHz
Horizontal (dBi) peak	0.86
Vertical (dBi) peak	1.86

2315MHz

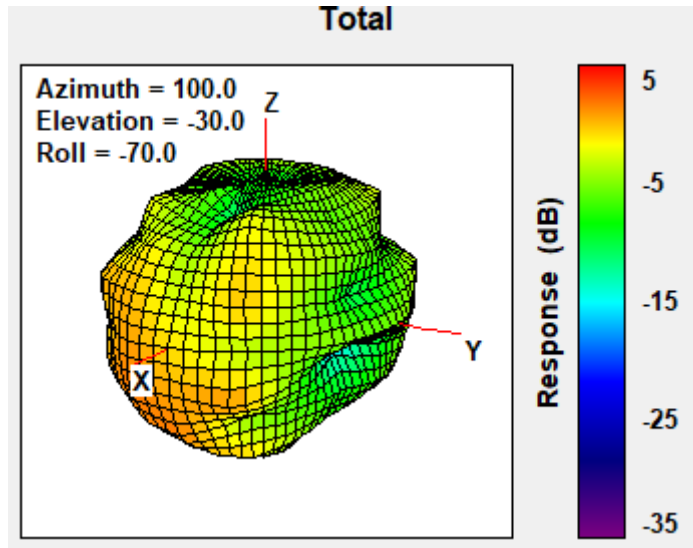


Center Frequency	2315MHz
Horizontal (dBi) peak	0.89
Vertical (dBi) peak	1.91

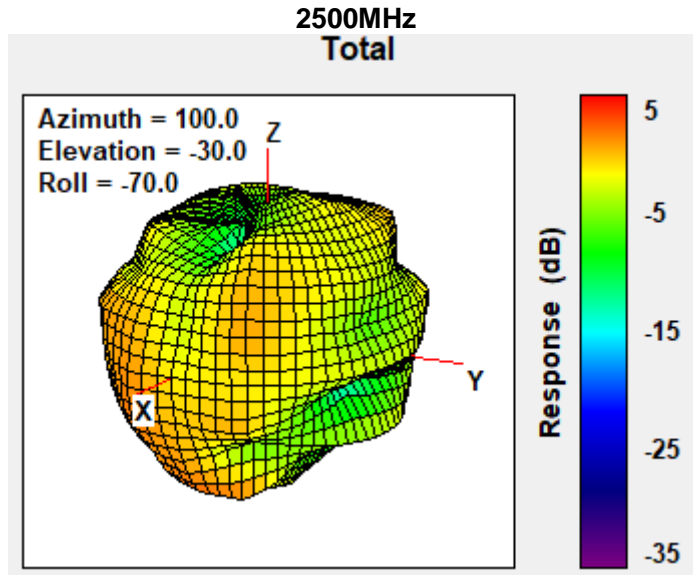


Center Frequency	2350MHz
Horizontal (dBi) peak	0.71
Vertical (dBi) peak	1.55

2400MHz

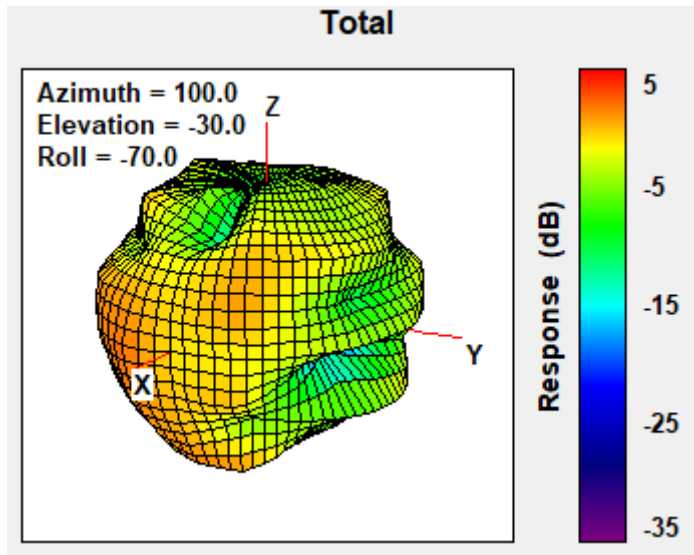


Center Frequency	2400MHz
Horizontal (dBi) peak	1.89
Vertical (dBi) peak	0.43

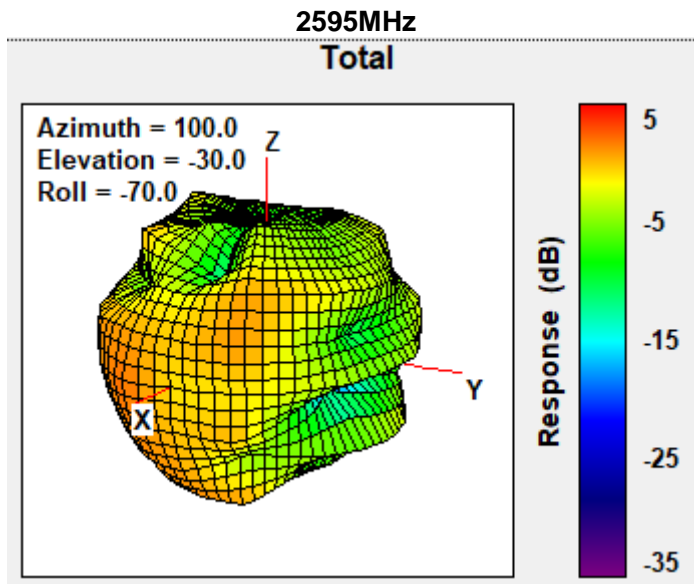


Center Frequency	2500MHz
Horizontal (dBi) peak	2.19
Vertical (dBi) peak	1.30

2570MHz

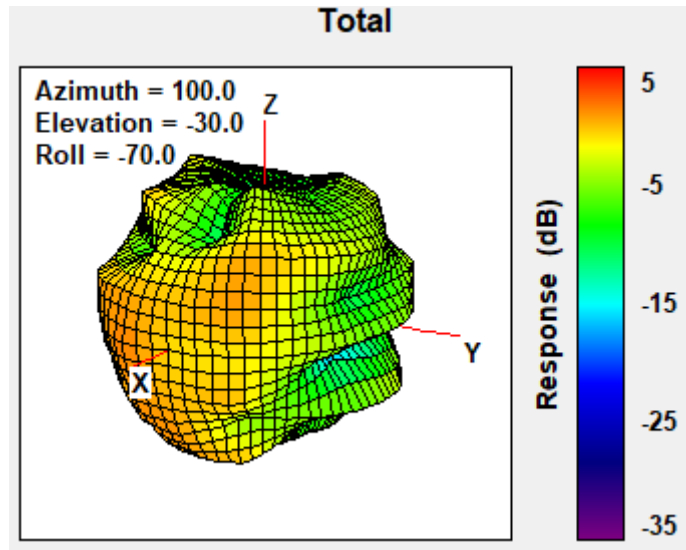


Center Frequency	2570MHz
Horizontal (dBi) peak	1.49
Vertical (dBi) peak	1.93

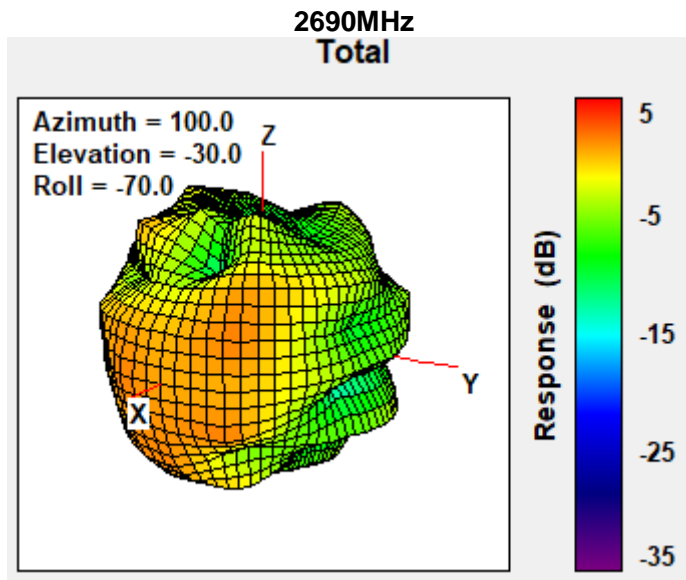


Center Frequency	2595MHz
Horizontal (dBi) peak	1.12
Vertical (dBi) peak	1.92

2620MHz

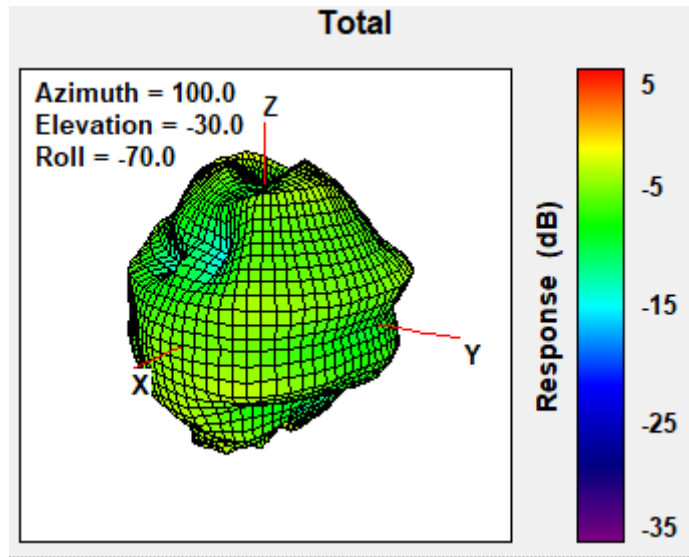


Center Frequency	2620MHz
Horizontal (dBi) peak	0.74
Vertical (dBi) peak	1.71

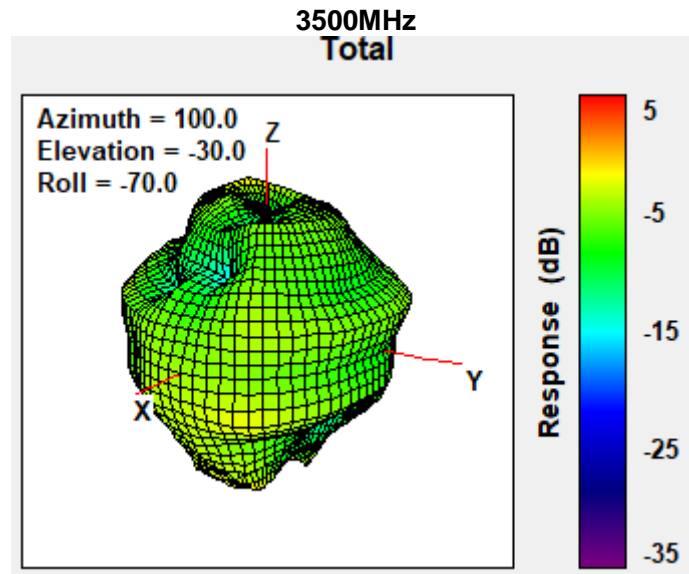


Center Frequency	2690MHz
Horizontal (dBi) peak	1.19
Vertical (dBi) peak	1.06

3400MHz

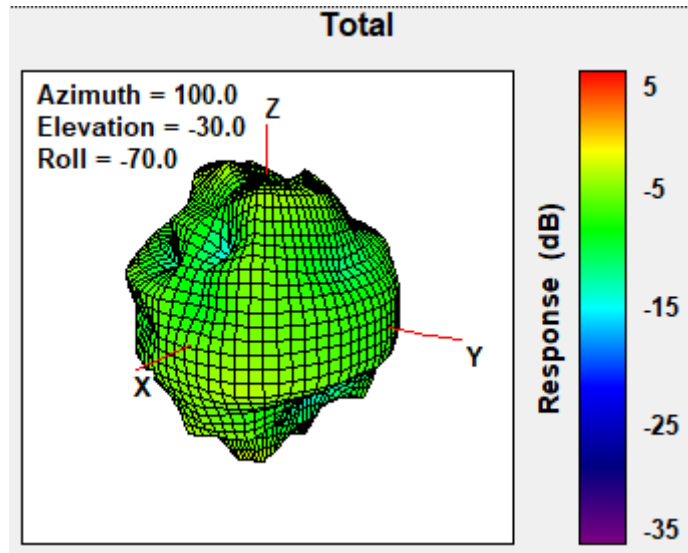


Center Frequency	3400MHz
Horizontal (dBi) peak	-1.83
Vertical (dBi) peak	-4.02

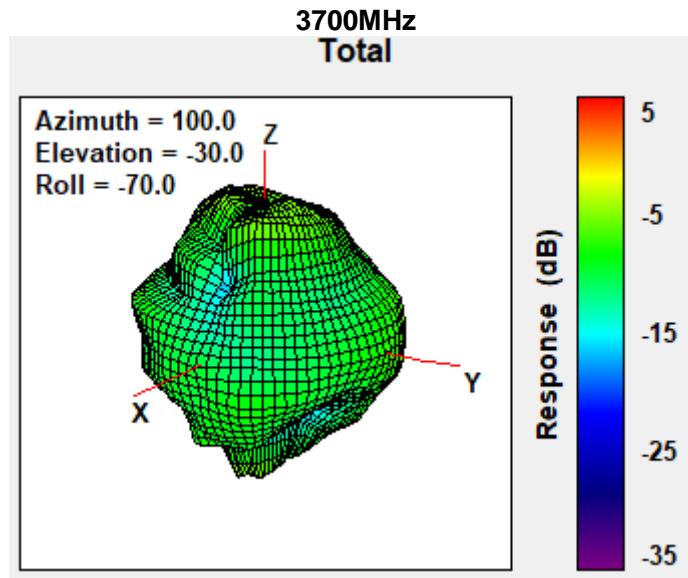


Center Frequency	3500MHz
Horizontal (dBi) peak	-0.91
Vertical (dBi) peak	-2.77

3600MHz

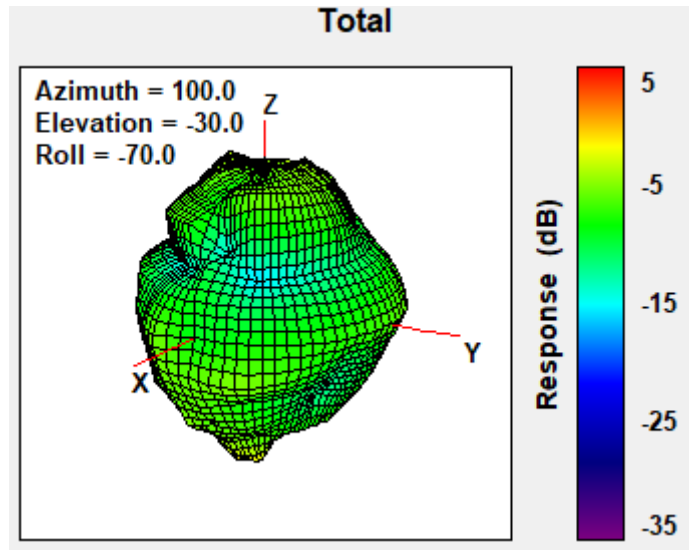


Center Frequency	3600MHz
Horizontal (dBi) peak	-1.38
Vertical (dBi) peak	-4.10

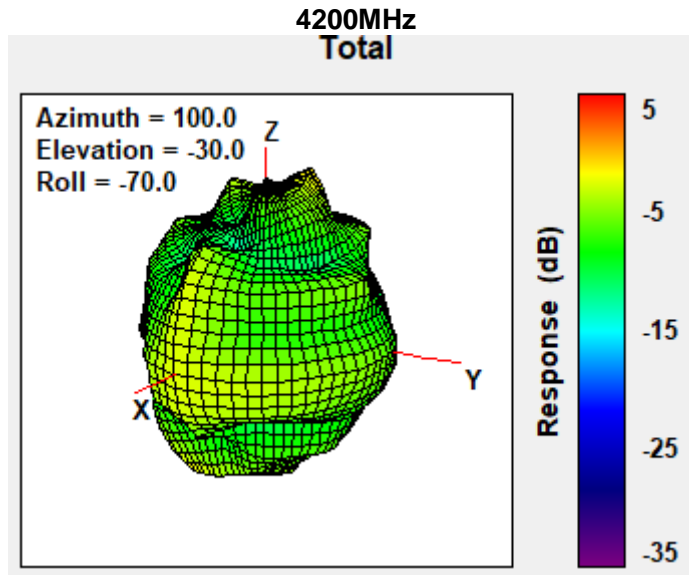


Center Frequency	3700MHz
Horizontal (dBi) peak	-3.05
Vertical (dBi) peak	-3.72

3800MHz

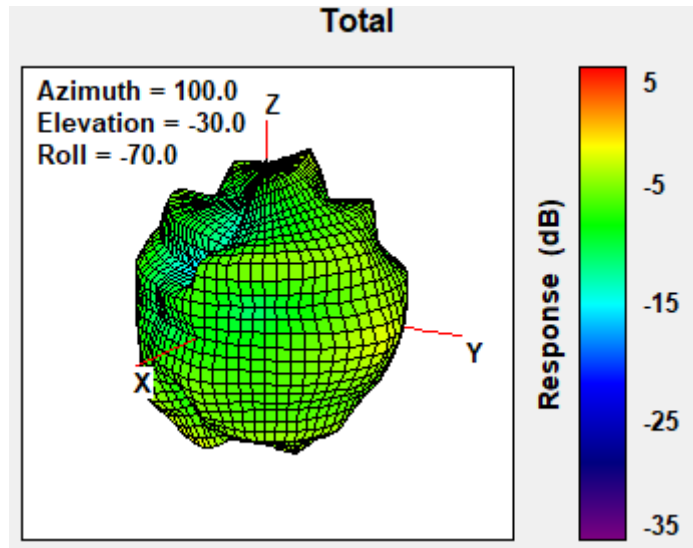


Center Frequency	3800MHz
Horizontal (dBi) peak	-0.50
Vertical (dBi) peak	-3.35

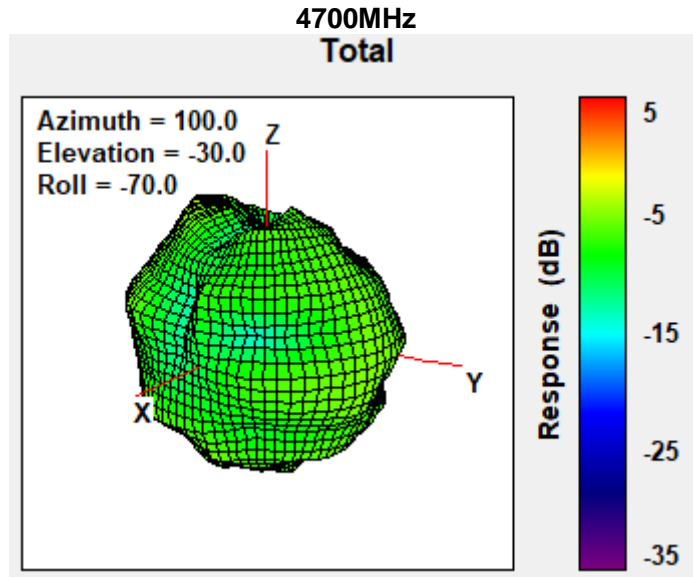


Center Frequency	4200MHz
Horizontal (dBi) peak	-0.87
Vertical (dBi) peak	-1.73

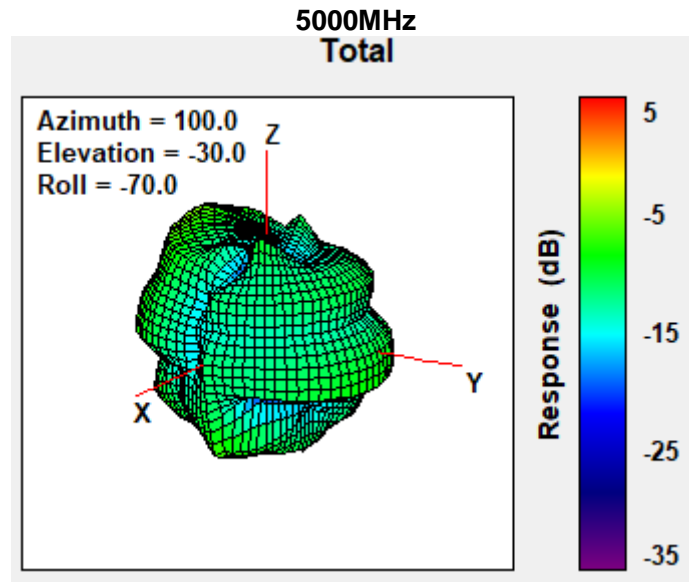
4400MHz



Center Frequency	4400MHz
Horizontal (dBi) peak	-2.09
Vertical (dBi) peak	-2.35



Center Frequency	4700MHz
Horizontal (dBi) peak	-2.56
Vertical (dBi) peak	-2.36

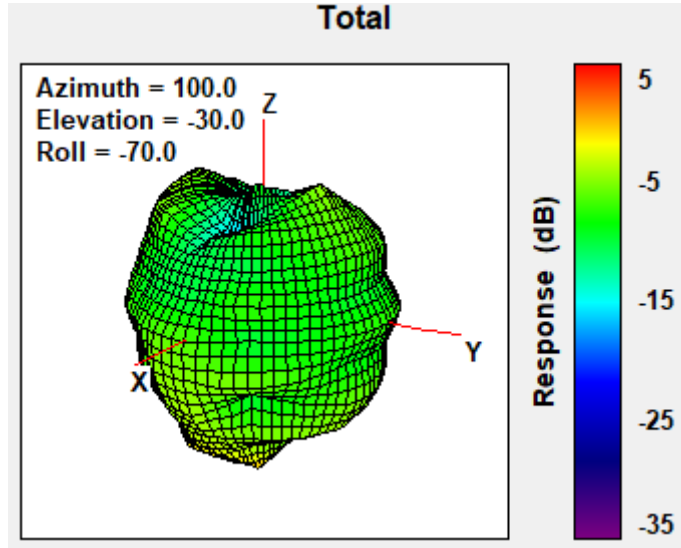


Center Frequency	5000MHz
Horizontal (dBi) peak	-4.49
Vertical (dBi) peak	-2.01



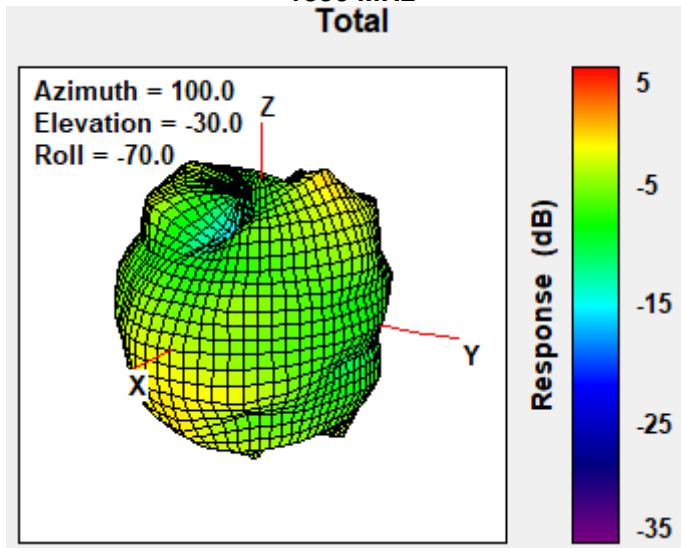
MIMO3 Antenna (DRx1)

**1805 MHz
Total**



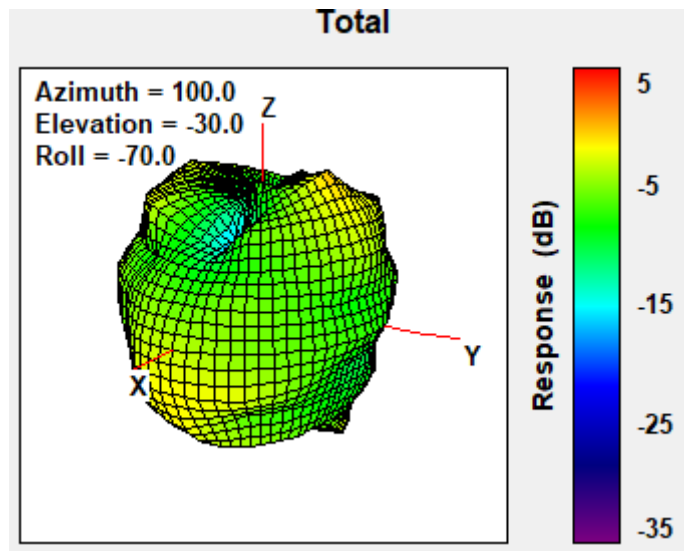
Center Frequency	1805 MHz
Horizontal (dBi) peak	-0.22
Vertical (dBi) peak	-2.89

**1850 MHz
Total**

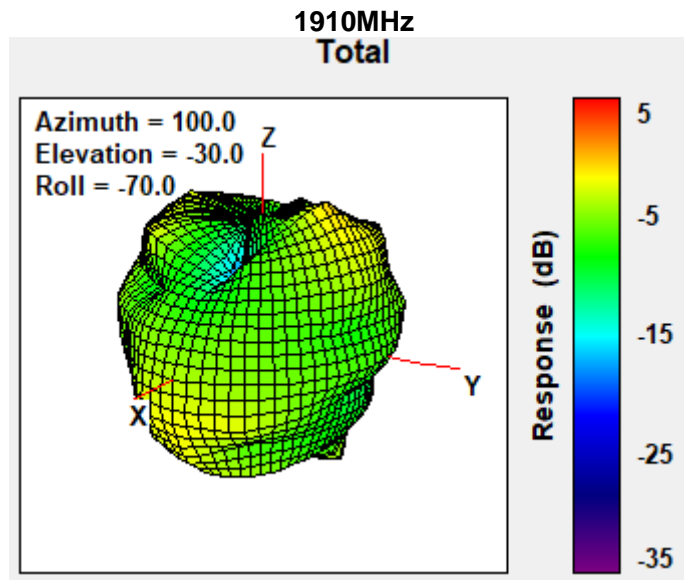


Center Frequency	1850 MHz
Horizontal (dBi) peak	-0.70
Vertical (dBi) peak	-2.33

1880 MHz

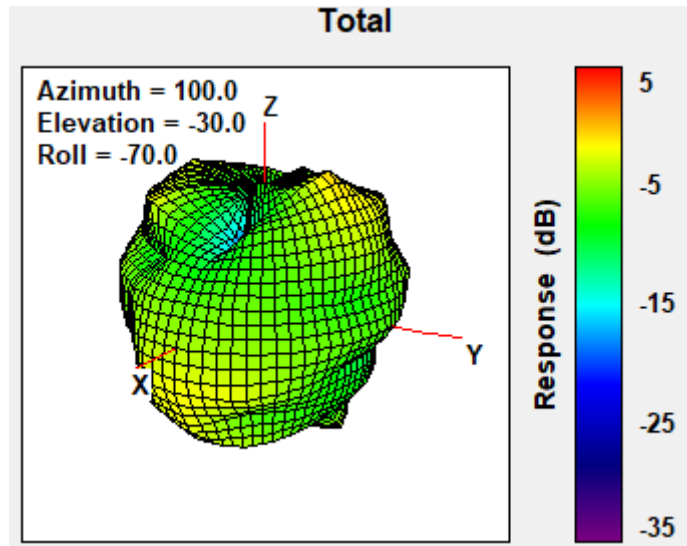


Center Frequency	1880 MHz
Horizontal (dBi) peak	-0.75
Vertical (dBi) peak	-3.43

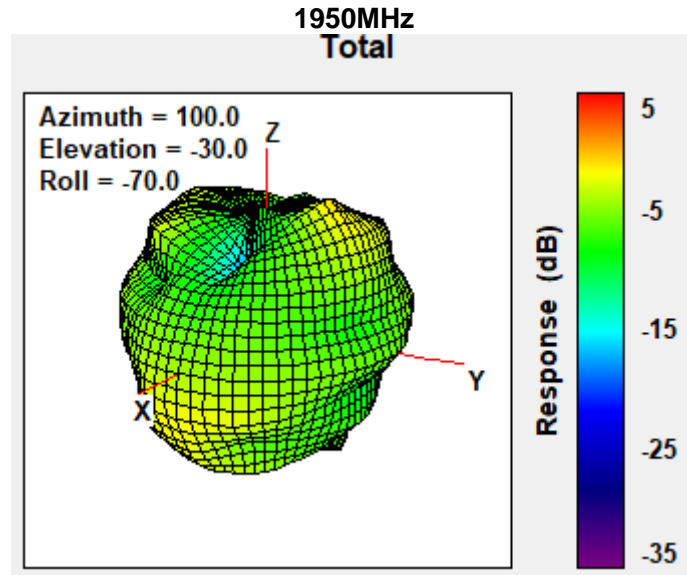


Center Frequency	1910MHz
Horizontal (dBi) peak	-0.45
Vertical (dBi) peak	-3.85

1920MHz

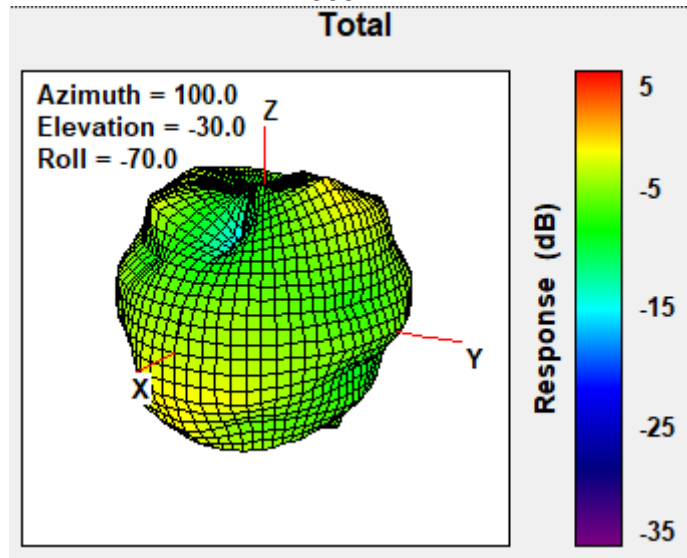


Center Frequency	1920MHz
Horizontal (dBi) peak	-0.39
Vertical (dBi) peak	-3.64



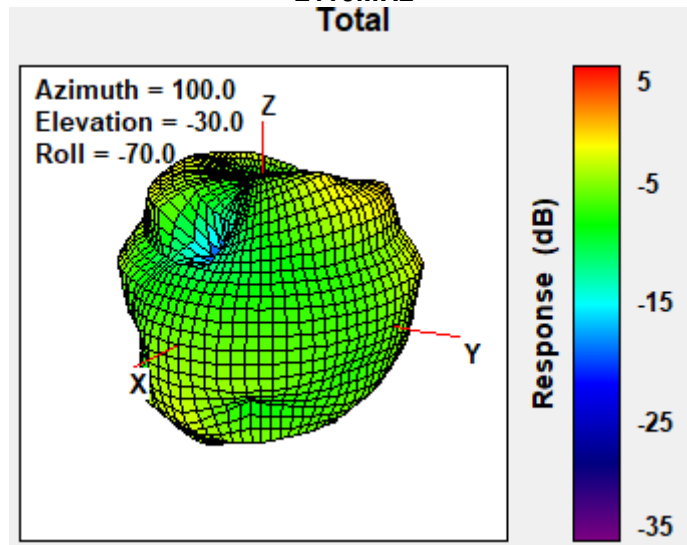
Center Frequency	1950MHz
Horizontal (dBi) peak	-0.56
Vertical (dBi) peak	-3.57

1980MHz



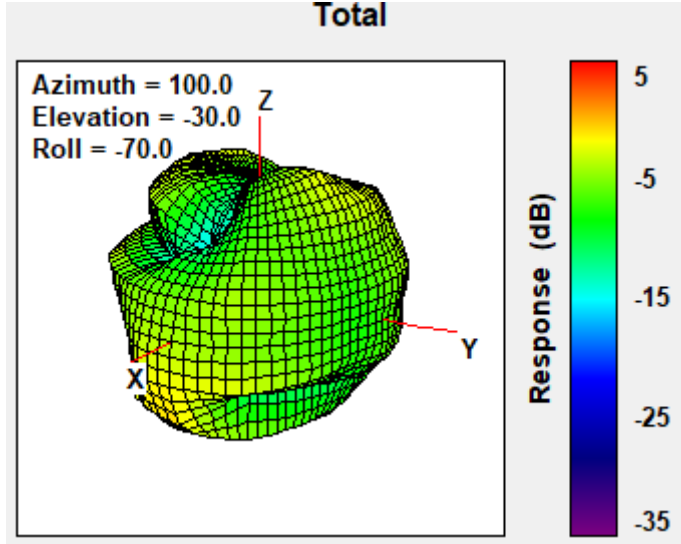
Center Frequency	1980MHz
Horizontal (dBi) peak	-0.83
Vertical (dBi) peak	-3.50

2110MHz



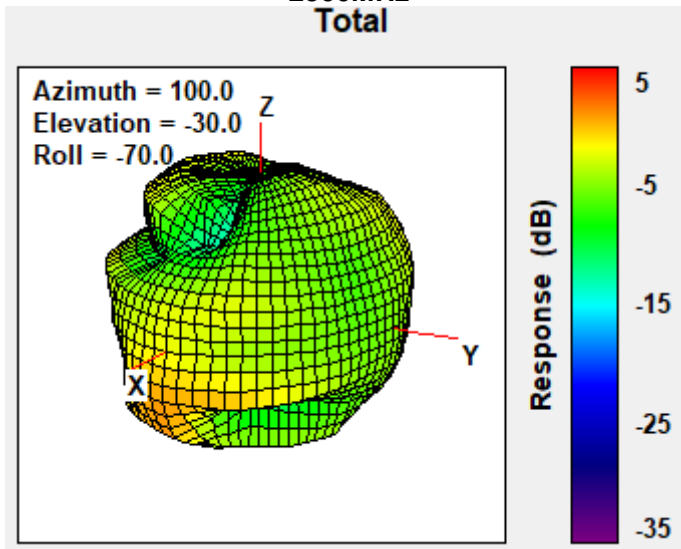
Center Frequency	2110MHz
Horizontal (dBi) peak	1.16
Vertical (dBi) peak	-0.88

**2200MHz
Total**



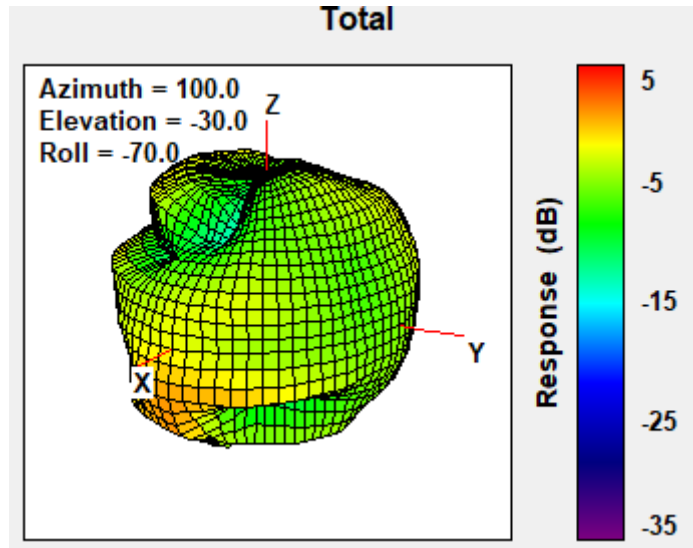
Center Frequency	2200MHz
Horizontal (dBi) peak	0.77
Vertical (dBi) peak	-2.75

**2300MHz
Total**

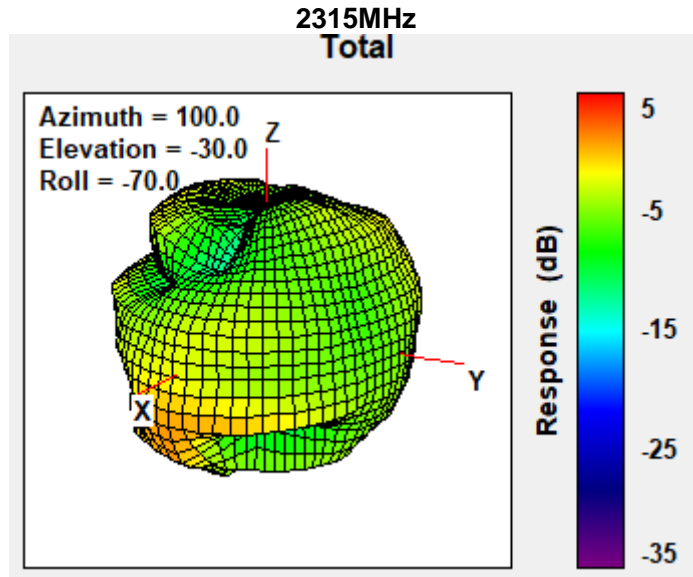


Center Frequency	2300MHz
Horizontal (dBi) peak	1.48
Vertical (dBi) peak	-3.13

2305MHz

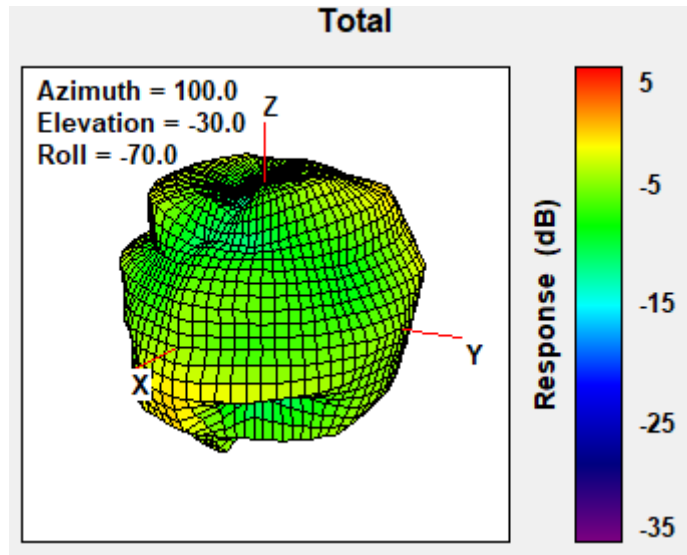


Center Frequency	2305MHz
Horizontal (dBi) peak	1.56
Vertical (dBi) peak	-2.78

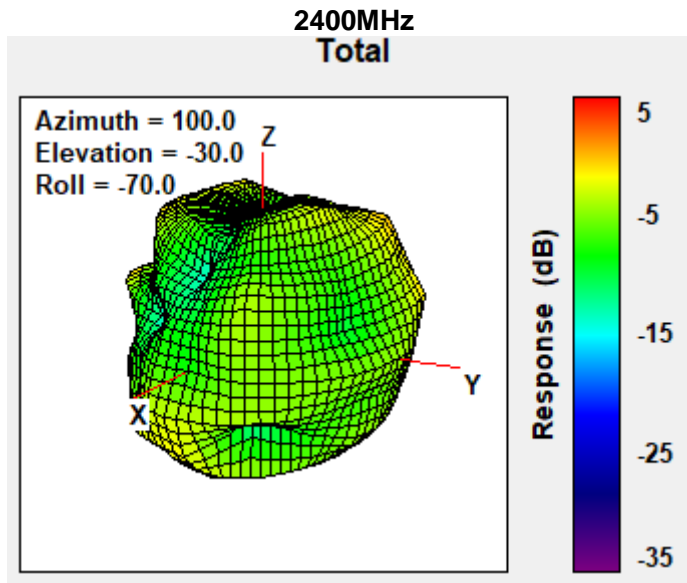


Center Frequency	2315MHz
Horizontal (dBi) peak	1.55
Vertical (dBi) peak	-2.49

2350MHz

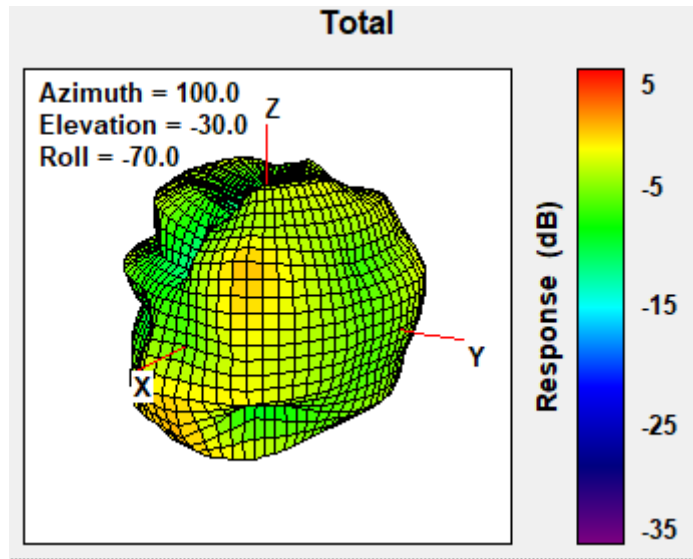


Center Frequency	2350MHz
Horizontal (dBi) peak	1.15
Vertical (dBi) peak	-0.28

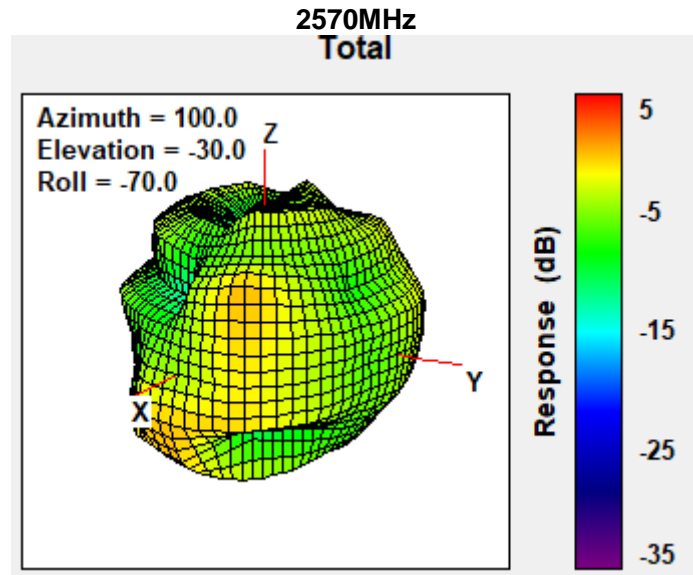


Center Frequency	2400MHz
Horizontal (dBi) peak	1.49
Vertical (dBi) peak	-0.65

2500MHz

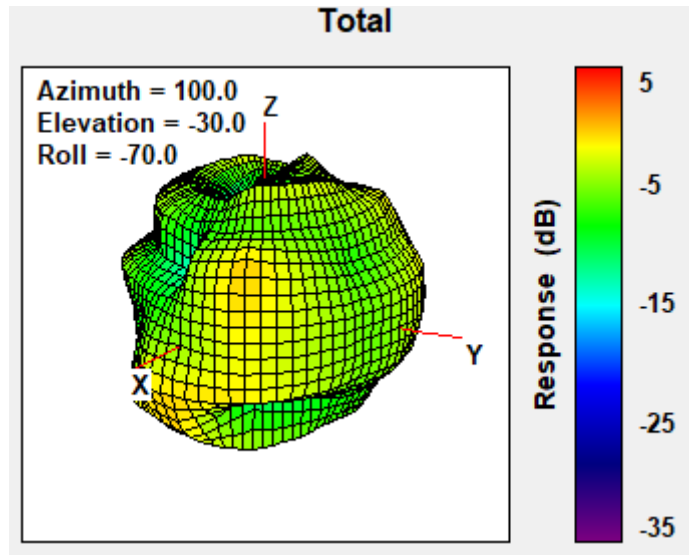


Center Frequency	2500MHz
Horizontal (dBi) peak	0.35
Vertical (dBi) peak	-0.63

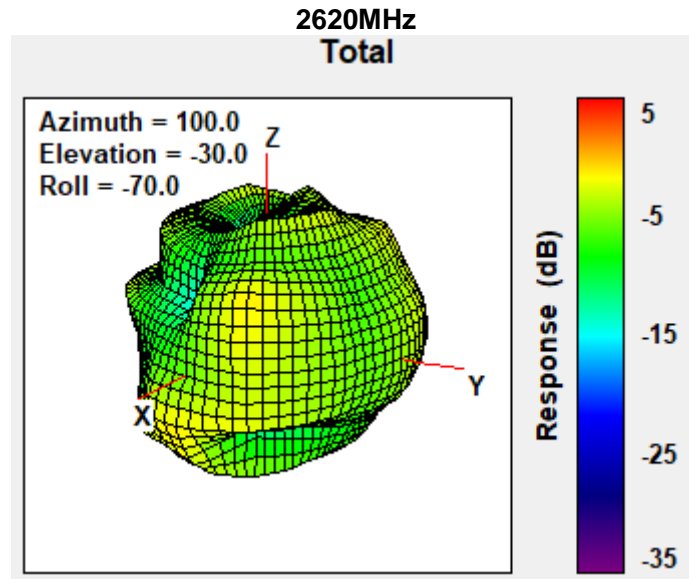


Center Frequency	2570MHz
Horizontal (dBi) peak	-0.04
Vertical (dBi) peak	-0.31

2595MHz

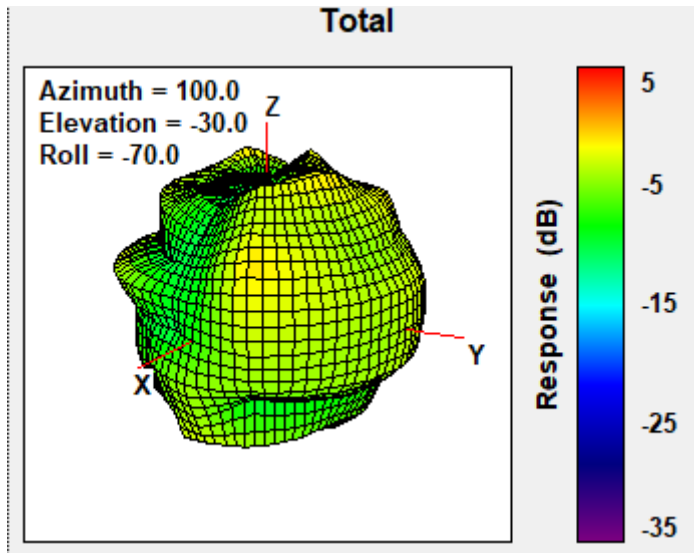


Center Frequency	2595MHz
Horizontal (dBi) peak	0.52
Vertical (dBi) peak	-0.47

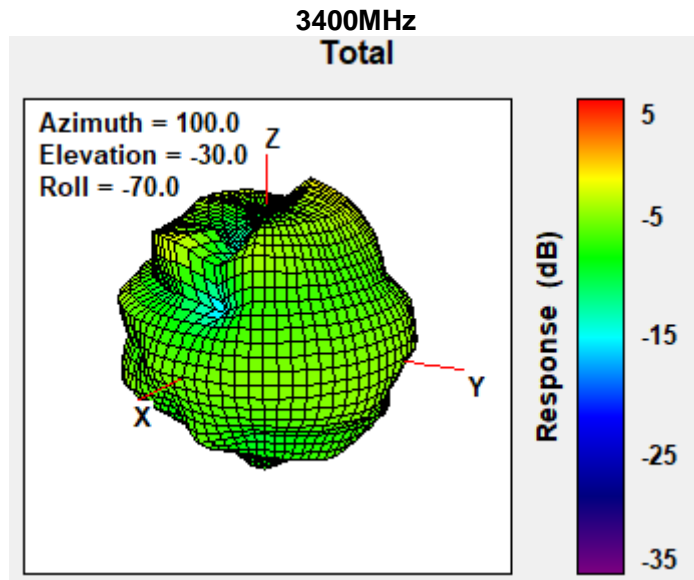


Center Frequency	2620MHz
Horizontal (dBi) peak	0.79
Vertical (dBi) peak	-0.15

2690MHz



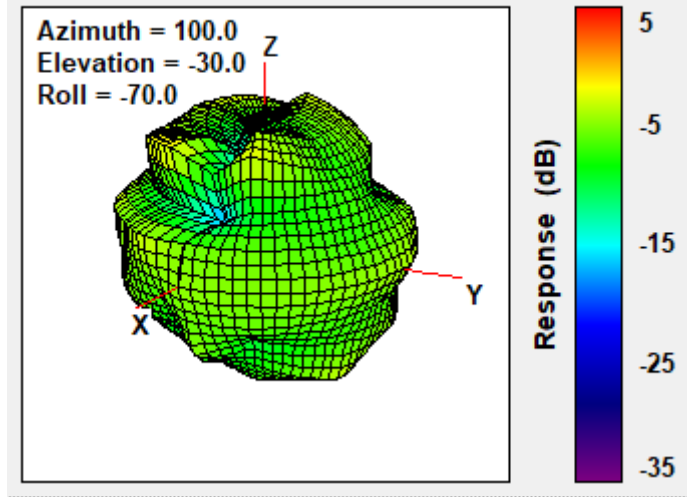
Center Frequency	2690MHz
Horizontal (dBi) peak	0.84
Vertical (dBi) peak	0.18



Center Frequency	3400MHz
Horizontal (dBi) peak	0.22
Vertical (dBi) peak	-0.62

3500MHz

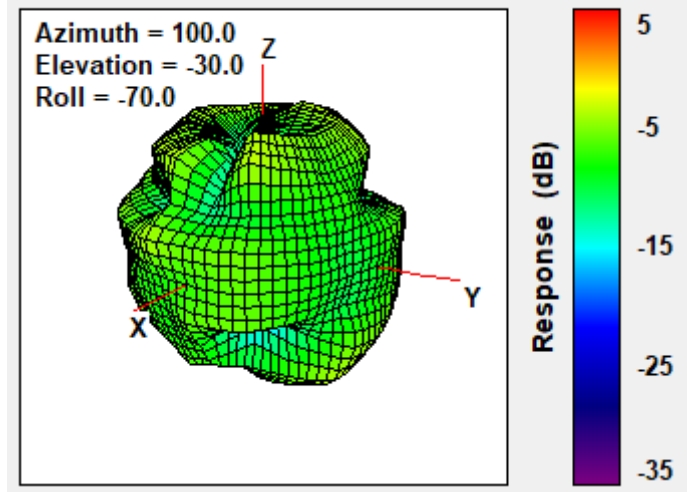
Total



Center Frequency	3500MHz
Horizontal (dBi) peak	0.06
Vertical (dBi) peak	-0.53

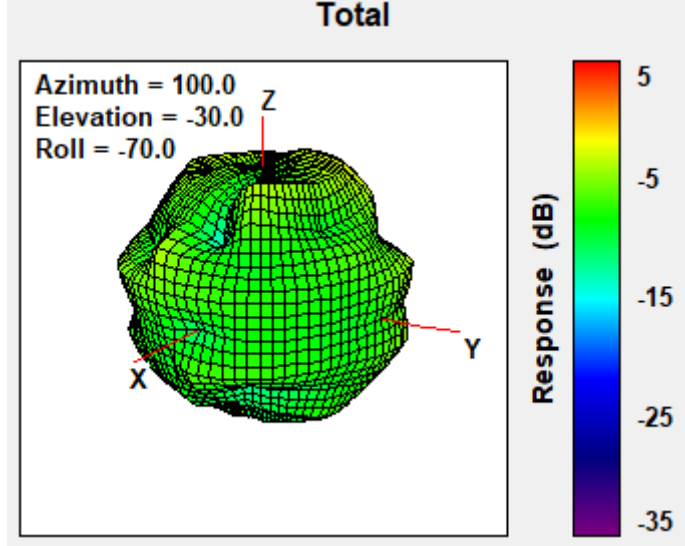
3600MHz

Total



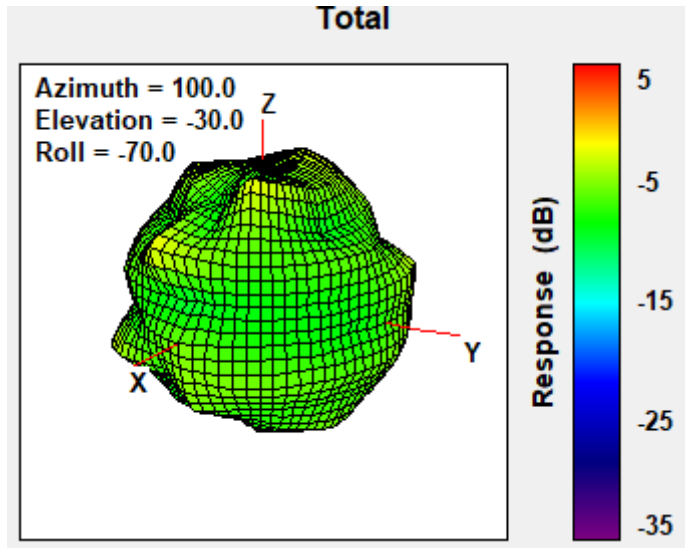
Center Frequency	3600MHz
Horizontal (dBi) peak	-1.54
Vertical (dBi) peak	-2.10

**3700MHz
Total**



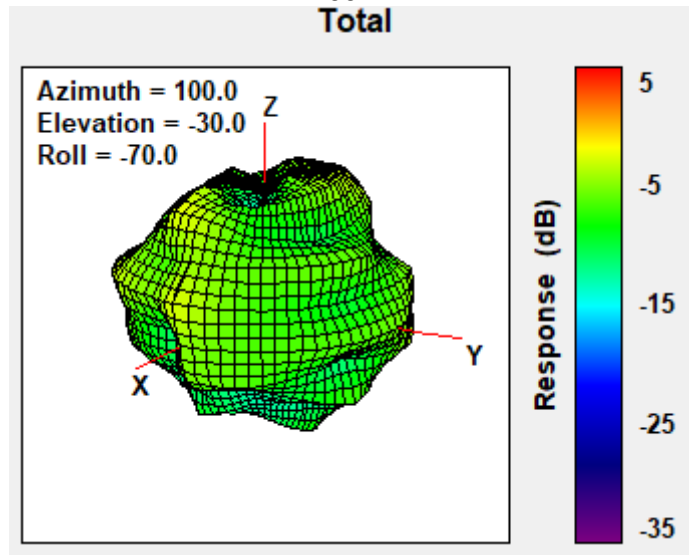
Center Frequency	3700MHz
Horizontal (dBi) peak	-1.79
Vertical (dBi) peak	-2.87

**3800MHz
Total**



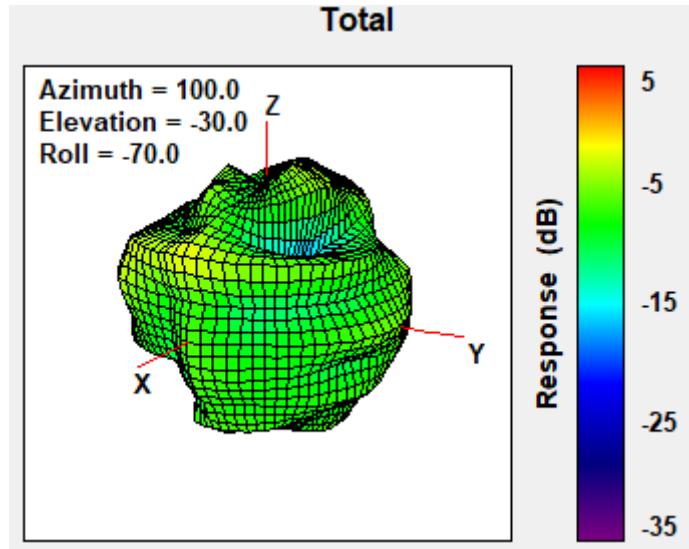
Center Frequency	3800MHz
Horizontal (dBi) peak	-0.28
Vertical (dBi) peak	-1.16

**4200MHz
Total**



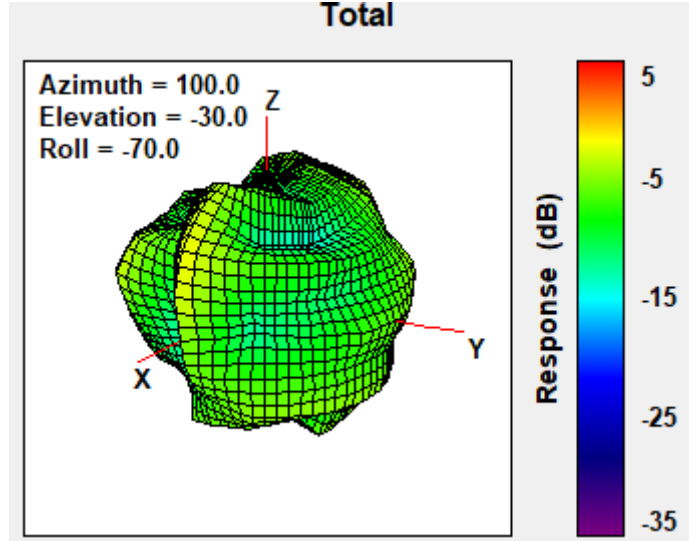
Center Frequency	4200MHz
Horizontal (dBi) peak	-0.65
Vertical (dBi) peak	-0.75

**4400MHz
Total**



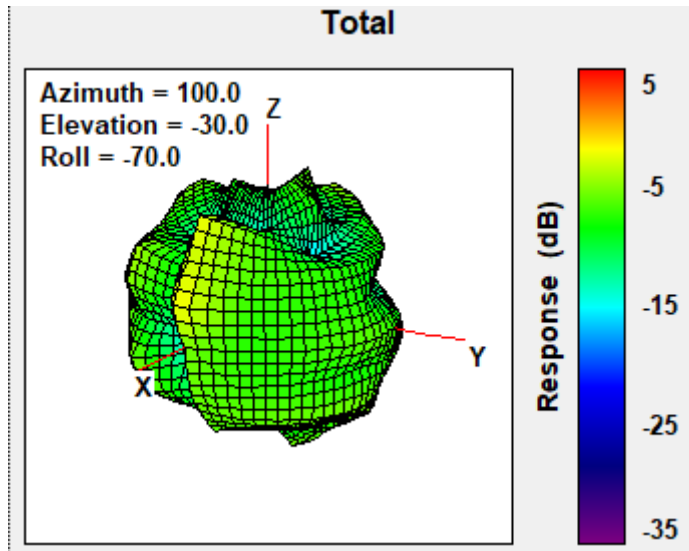
Center Frequency	4400MHz
Horizontal (dBi) peak	-2.29
Vertical (dBi) peak	-1.49

**4700MHz
Total**



Center Frequency	4700MHz
Horizontal (dBi) peak	-4.05
Vertical (dBi) peak	-1.63

**5000MHz
Total**



Center Frequency	5000MHz
Horizontal (dBi) peak	-4.25
Vertical (dBi) peak	-1.47

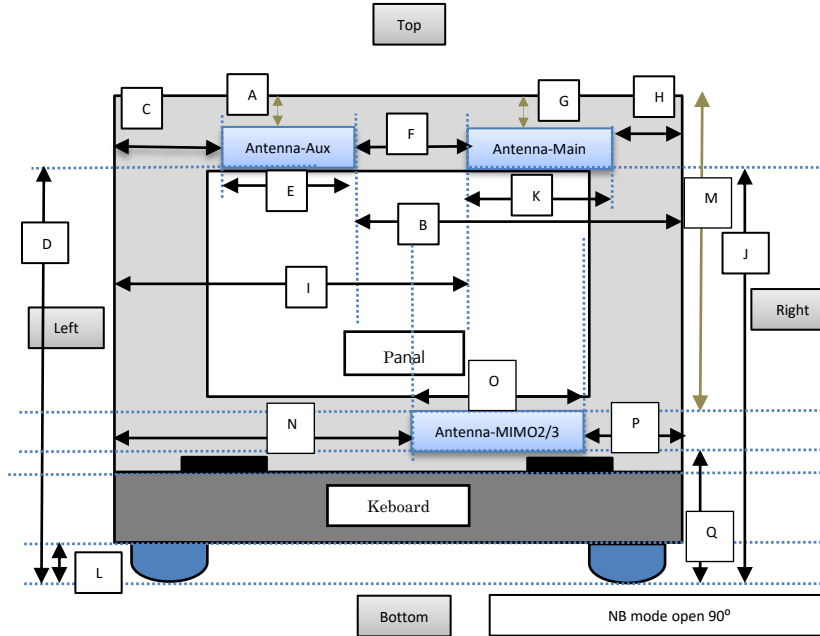
Section 4. Antenna Host Platform Location Information

Include a **dimensioned photo(s) or dimensioned drawing(s)** of Main and Aux antenna placements (measurements are not required for receive-only antenna).

Any antenna that transmits must show dimensions to bottom of laptop. Provide a description of the materials that are used for supporting or surrounding transmit antennas; for example, non-conductive plastics vs. conductive coated plastic or metallic materials.

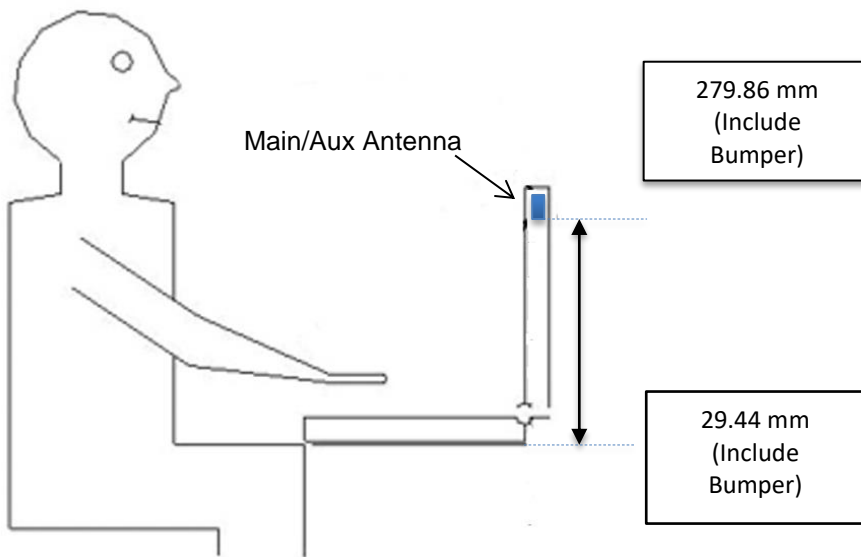
Minimum Separation Distance

Item	Antenna	Position	Distance (mm)
A	WWAN-Aux	to Top	2.39
B	WWAN-Aux	to Right	289.4
C	WWAN-Aux	to Left	16.95
D	WWAN-Aux	to Bottom	279.86
E	WWAN-Aux	Aux Antenna Length	91.65
F	Main-Aux	Main to Aux	180.80
G	WWAN-Main	to Top	2.39
H	WWAN-Main	to Right	16.95
I	WWAN-Main	to Left	289.4
J	WWAN-Main	to Bottom	279.86
K	WWAN-Main	Main Antenna Length	91.65
L	NB	Bumper thickness	1.8
M	WWAN-MIMO2/3	to Top	252.31
N	WWAN-MIMO2/3	to Left	228.5
O	WWAN-MIMO2/3	MIMO2/3 Antenna Length	80
P	WWAN-MIMO2/3	to Right	89.5
Q	WWAN-MIMO2/3	to Bottom	29.44



Section 5. Antenna dimensional information for SAR evaluation

Include a **dimensioned photo(s) or dimensioned drawing(s)** showing the distance (mm) between the transmit antennas and the user. For notebook/laptop hosts show lapheld position (example below). For tablet hosts show all orientations including lapheld, primary & secondary portrait, primary & secondary landscape positions. Include a description of any proximity sensors or power throttling implementations that limit or exclude use of any host orientation.



Section 7. Diagram Example of Co-Location Antenna Separation

Include a dimensioned photo or dimensioned drawing showing the distance (mm) between all WLAN transmit antennas and other co-located radiator transmit antenna such as Bluetooth, WWAN,...

(Note: Due to the evolving rules regarding co-location, each platform will need to be reviewed on a case by case basis)

