



MAG.LAYERS

Mag.Layers Scientific-Technics

Document Code:

Version: 1

Page - 1

CUSTOMER : Qualcomm
PART NO. : DBA-7040-25GS3-A1
AUTHORIZED BY : Jacky Cheng
DATE : 2007/09/04

美磊科技股份有限公司

MAG. LAYERS SCIENTIFIC-TECHNICS CO., LTD

HEAD OFFICE / HSINCHU PLANT

No 18, Tz-Chiang Road, Hsin-Chu Industrial Park, Hsin-Chu, Taiwan

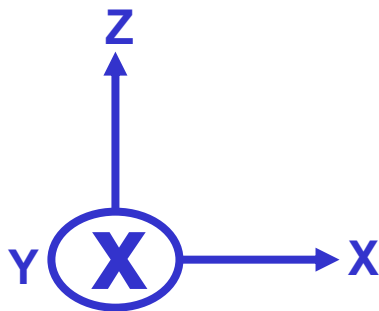
TEL: +886-3-5972488 FAX: +886-3-5972477

<http://www.maglayers.com.tw>

E-mail : info@maglayers.com.tw



1. Experimental Setup

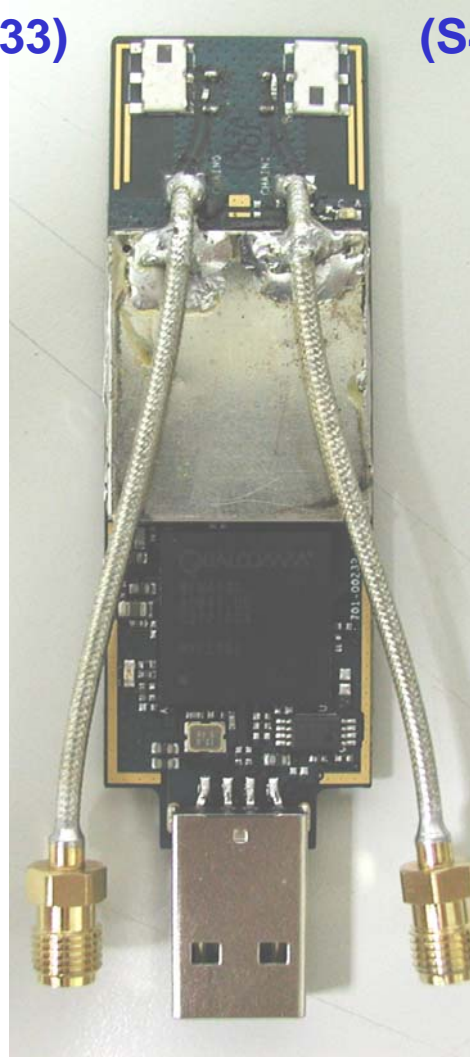


Antenna1

(S33)

Antenna2

(S44)



- Measurement Item :
 - a. Return loss
 - b. Radiation pattern

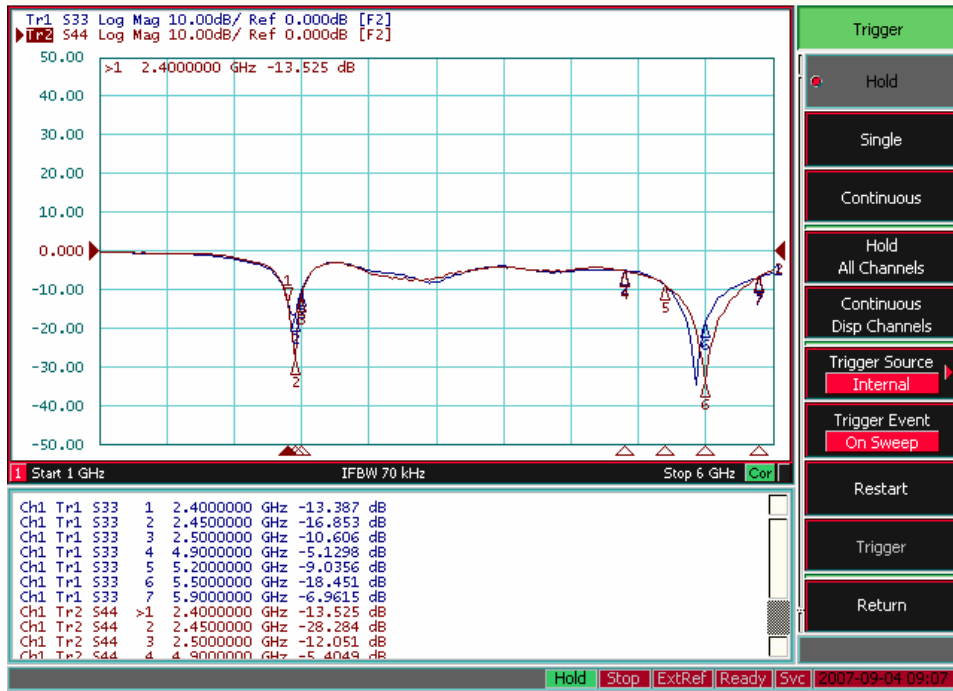
- Return Loss :
 - a. Instrument : vector network analyzer – Agilent N5230A
 - b. Calibration method : SOLT

- 3D Radiation Pattern :
 - a. Instrument: Satimo StarLab

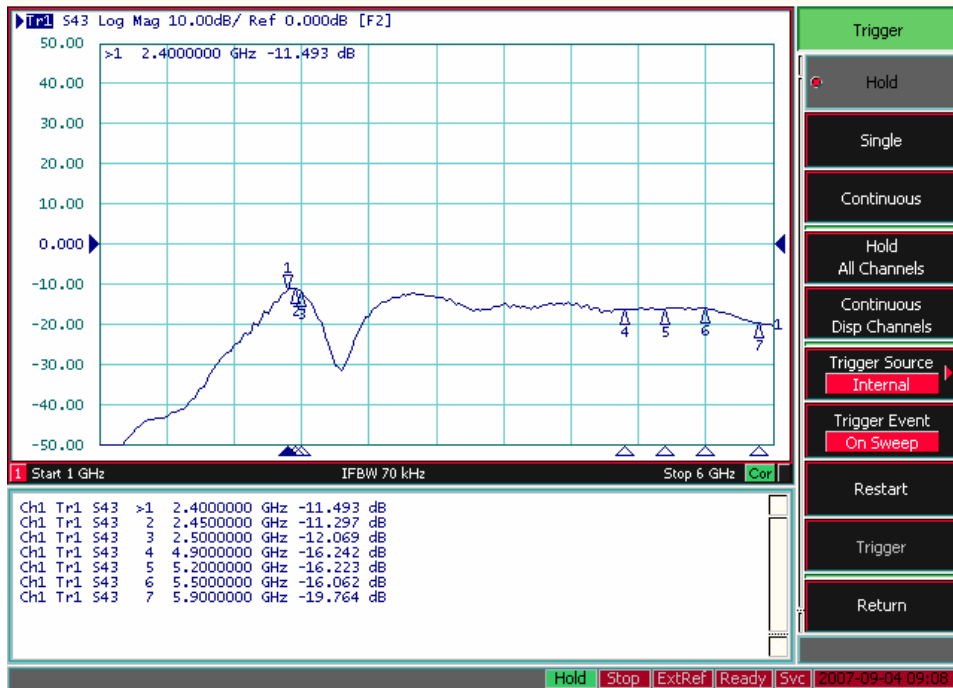


2. Return Loss

Return Loss



Isolation



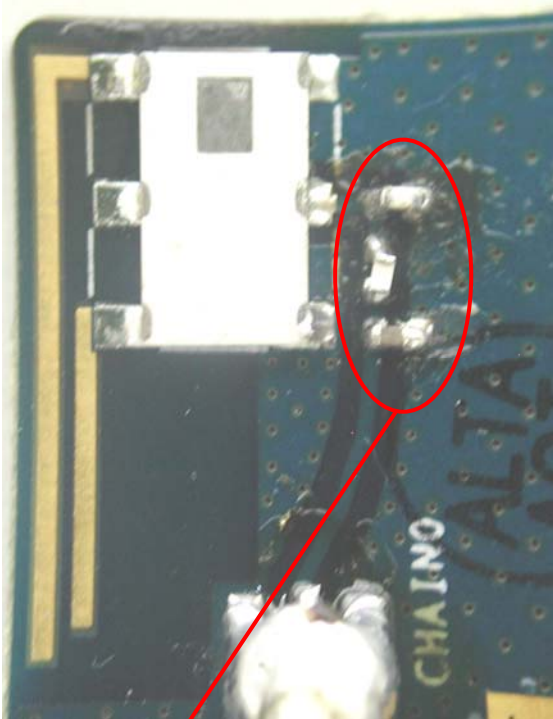


Antenna	Frequency(GHz)	Return Loss(db)
Antenna 1(S33)	2.4	-13.387
	2.45	-16.853
	2.5	-10.606
	4.9	-5.1298
	5.2	-9.0356
	5.5	-18.451
	5.9	-6.9615
Antenna2(S44)	2.4	-13.525
	2.45	-28.284
	2.5	-12.051
	4.9	-5.4049
	5.2	-8.8805
	5.5	-33.861
	5.9	-6.6022
Isolation(S43)	2.4	-11.493
	2.45	-11.297
	2.5	-12.069
	4.9	-16.242
	5.2	-16.223
	5.5	-16.062
	5.9	-19.764

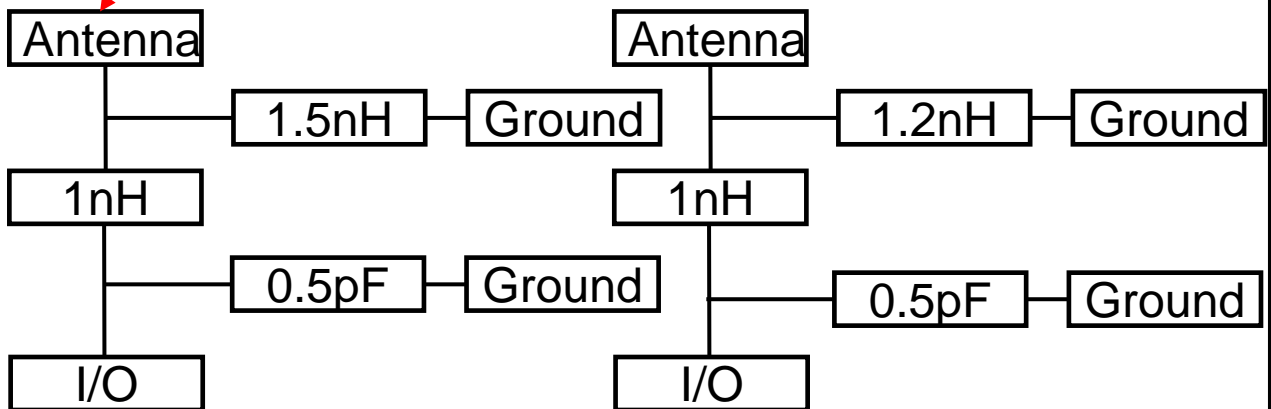
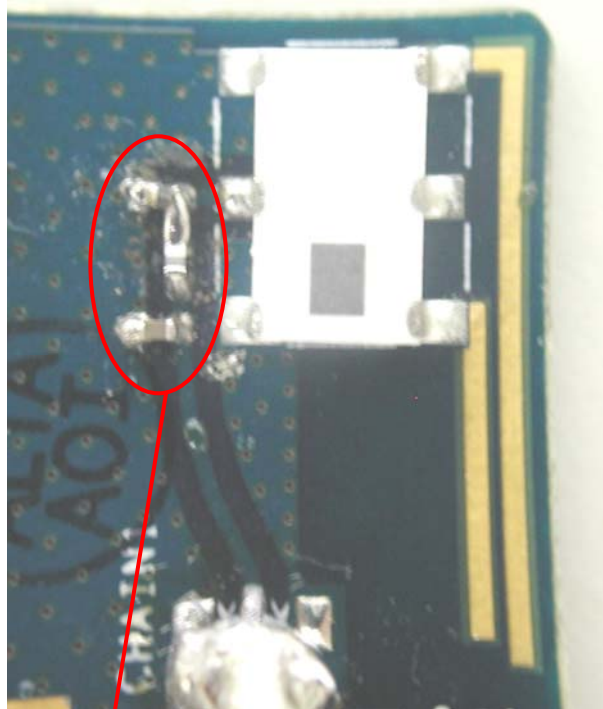


3. Antenna Matching Circuit Diagram

**Antenna1
(S33)**



**Antenna2
(S44)**

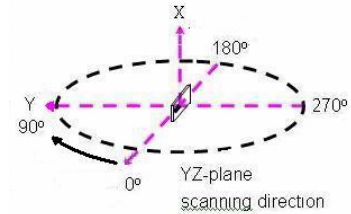




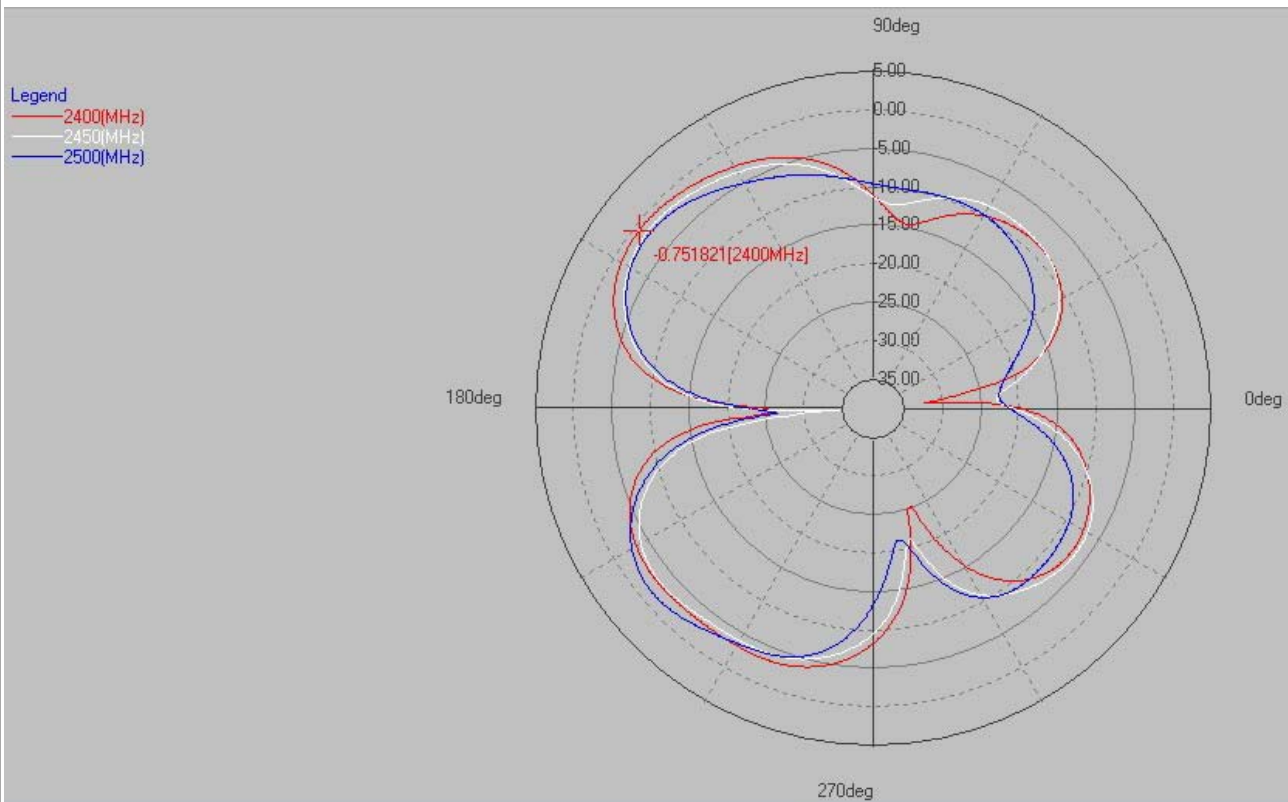
4. Radiation Patterns

Antenna1(Low)

Y-Z Plane



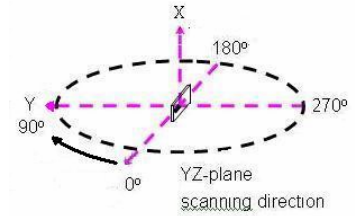
Horizontal Polarization



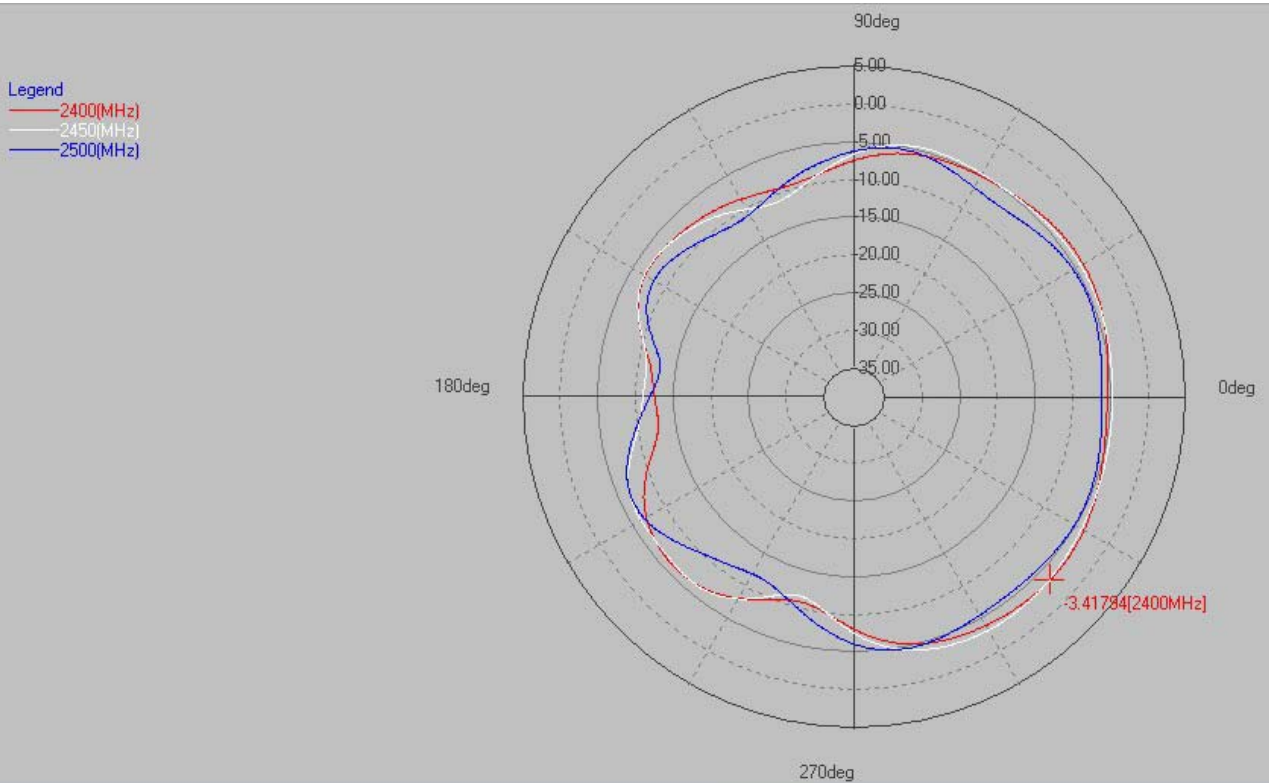
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-0.75	-6.25
2.45	-1.72	-6.88
2.5	-1.54	-7.15



Y-Z Plane



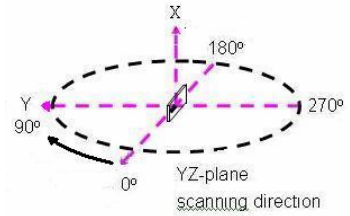
Vertical Polarization



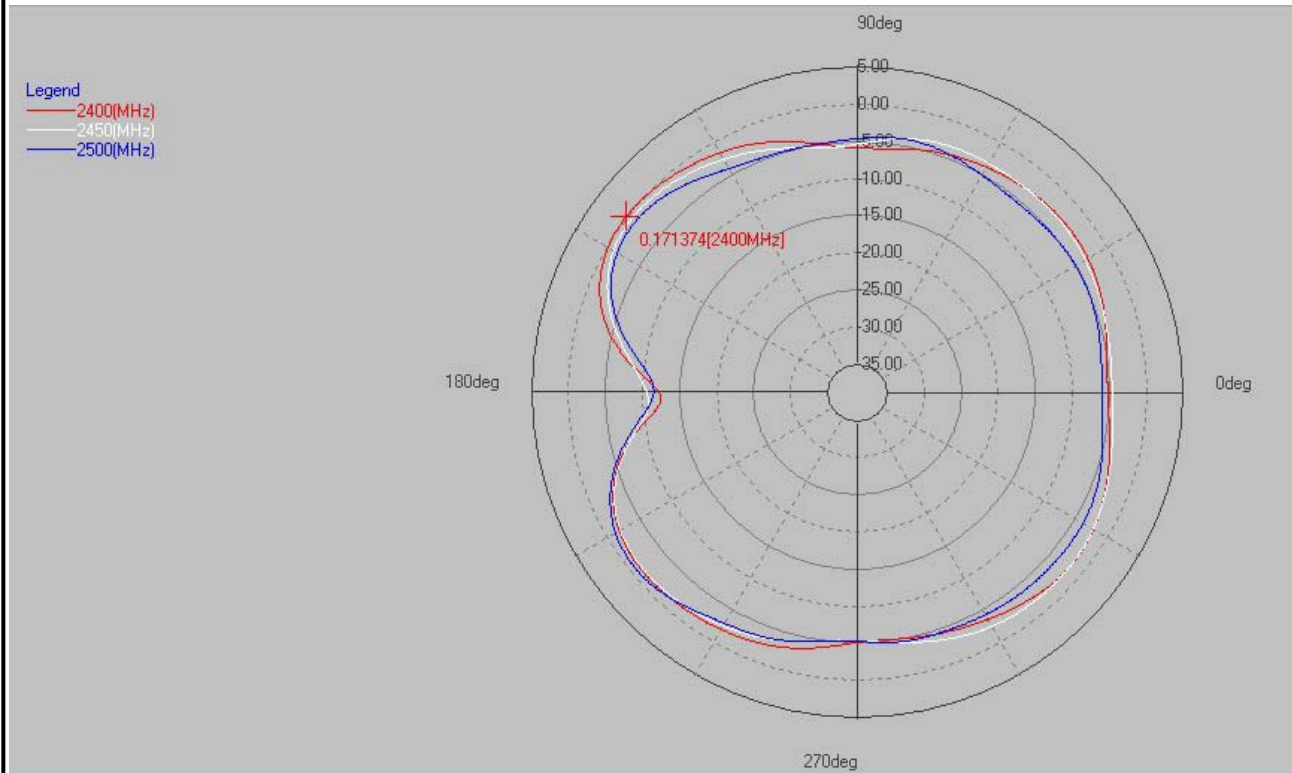
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.42	-6.24
2.45	-3.23	-6
2.5	-4.89	-7.14



Y-Z Plane



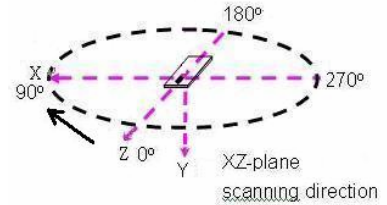
TOTAL



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	0.17	-3.23
2.45	-0.59	-3.41
2.5	-0.74	-4.13



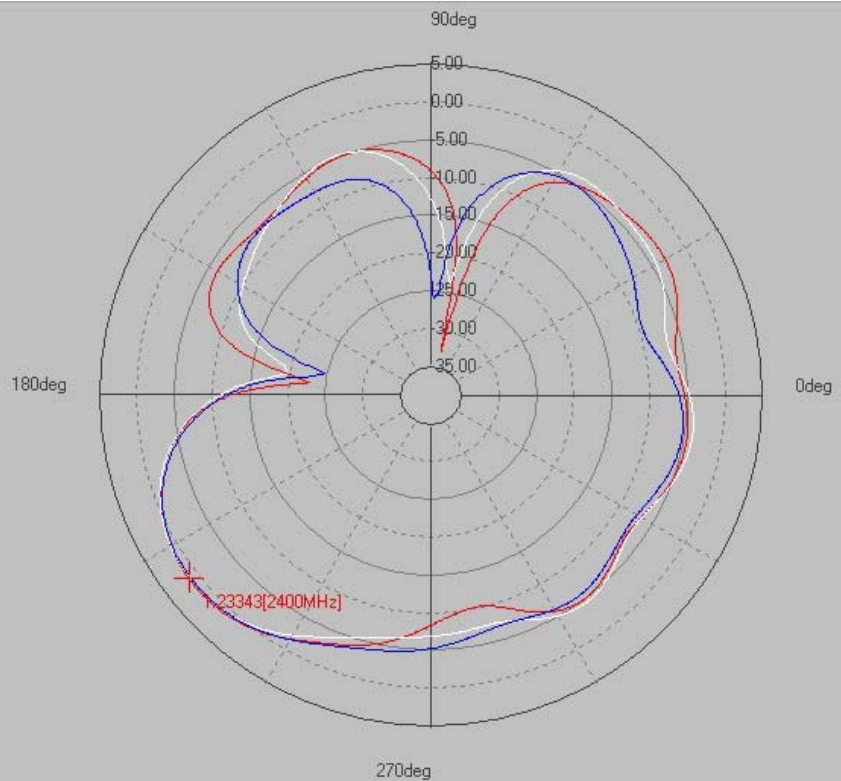
X-Z Plane



Horizontal Polarization

Legend

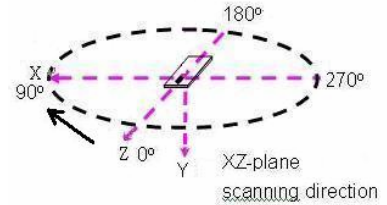
- 2400(MHz)
- 2450(MHz)
- 2500(MHz)



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	1.23	-4.61
2.45	1.06	-4.77
2.5	1.02	-5.94



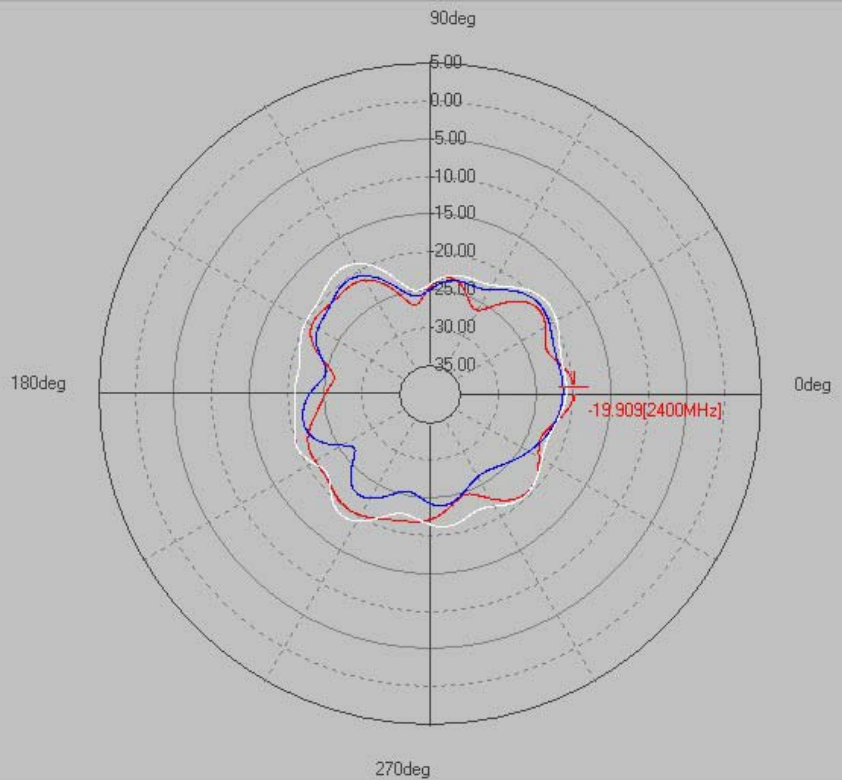
X-Z Plane



Vertical Polarization

Legend

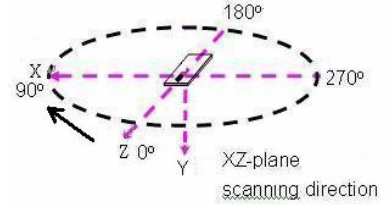
- 2400(MHz)
- 2450(MHz)
- 2500(MHz)



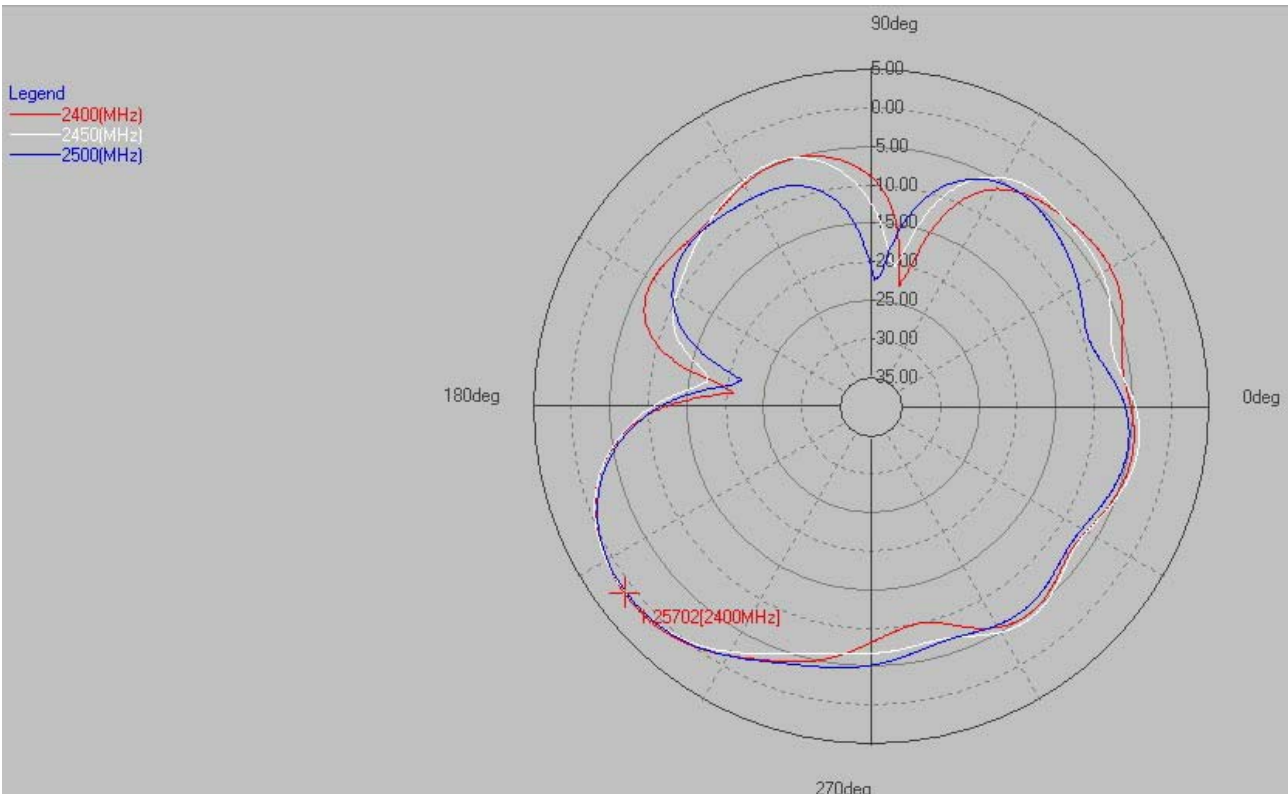
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-19.91	-22.25
2.45	-18.68	-21.01
2.5	-20.28	-22.97



X-Z Plane



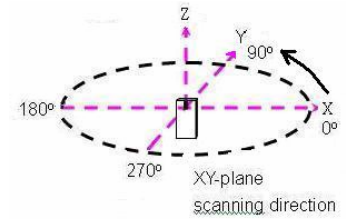
TOTAL



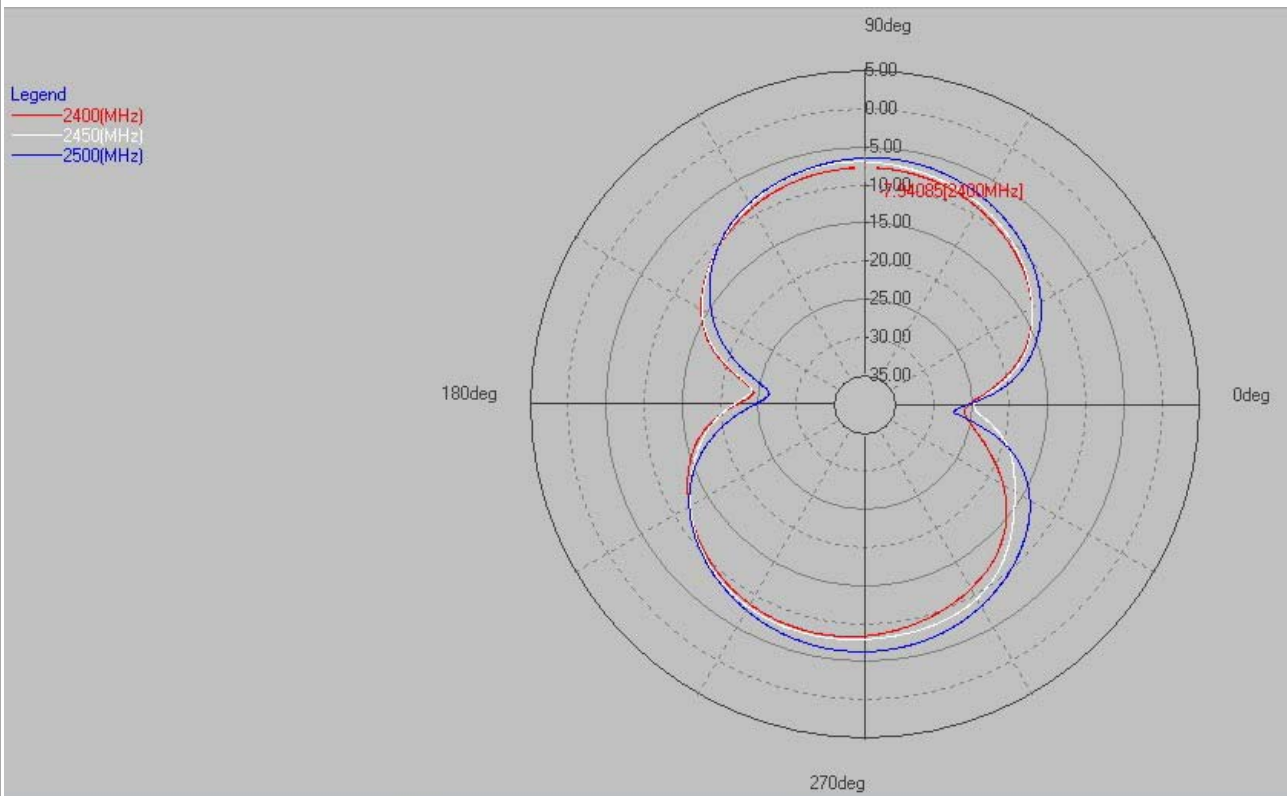
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	1.26	-4.54
2.45	1.08	-4.67
2.5	1.03	-5.2



X-Y Plane



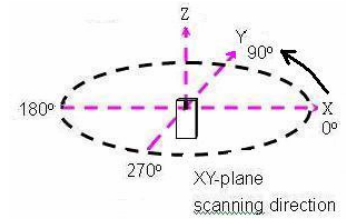
Horizontal Polarization



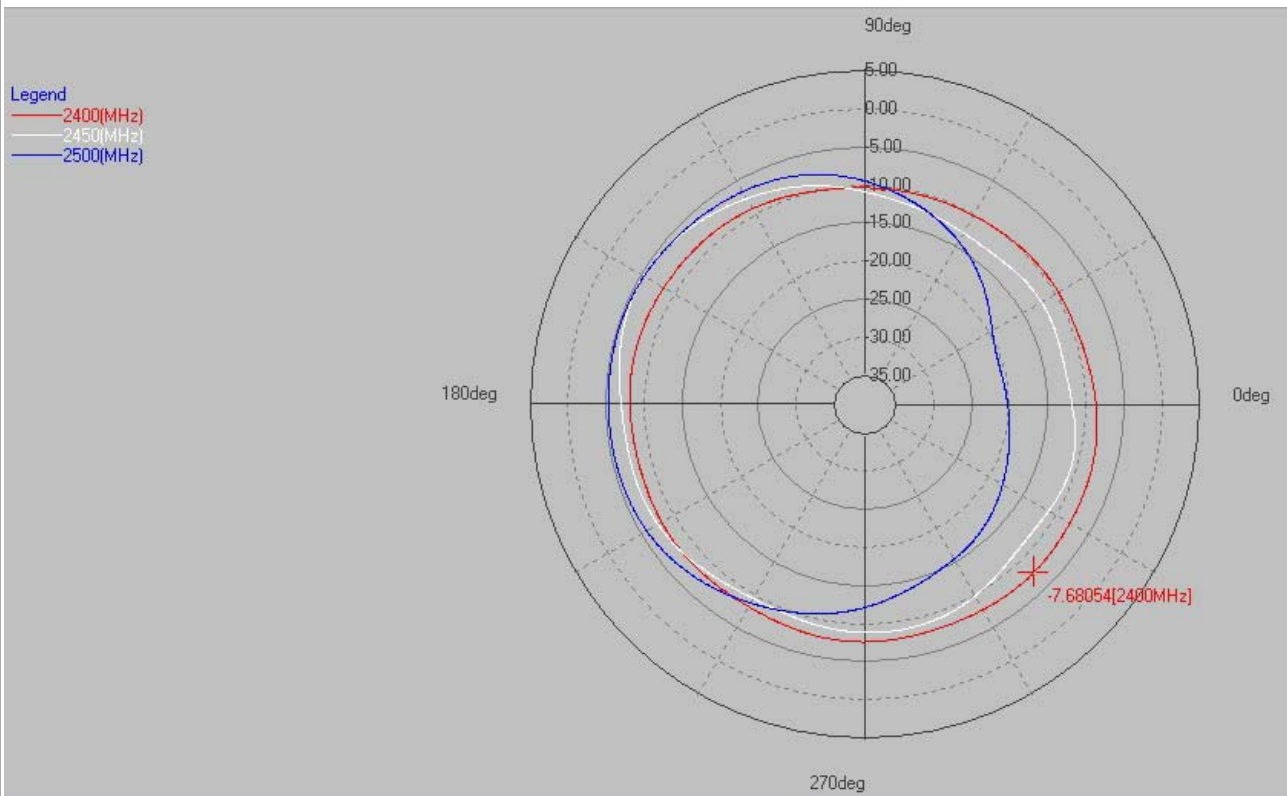
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-7.94	-11.16
2.45	-7.13	-10.6
2.5	-6.49	-9.81



X-Y Plane



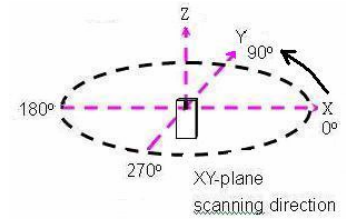
Vertical Polarization



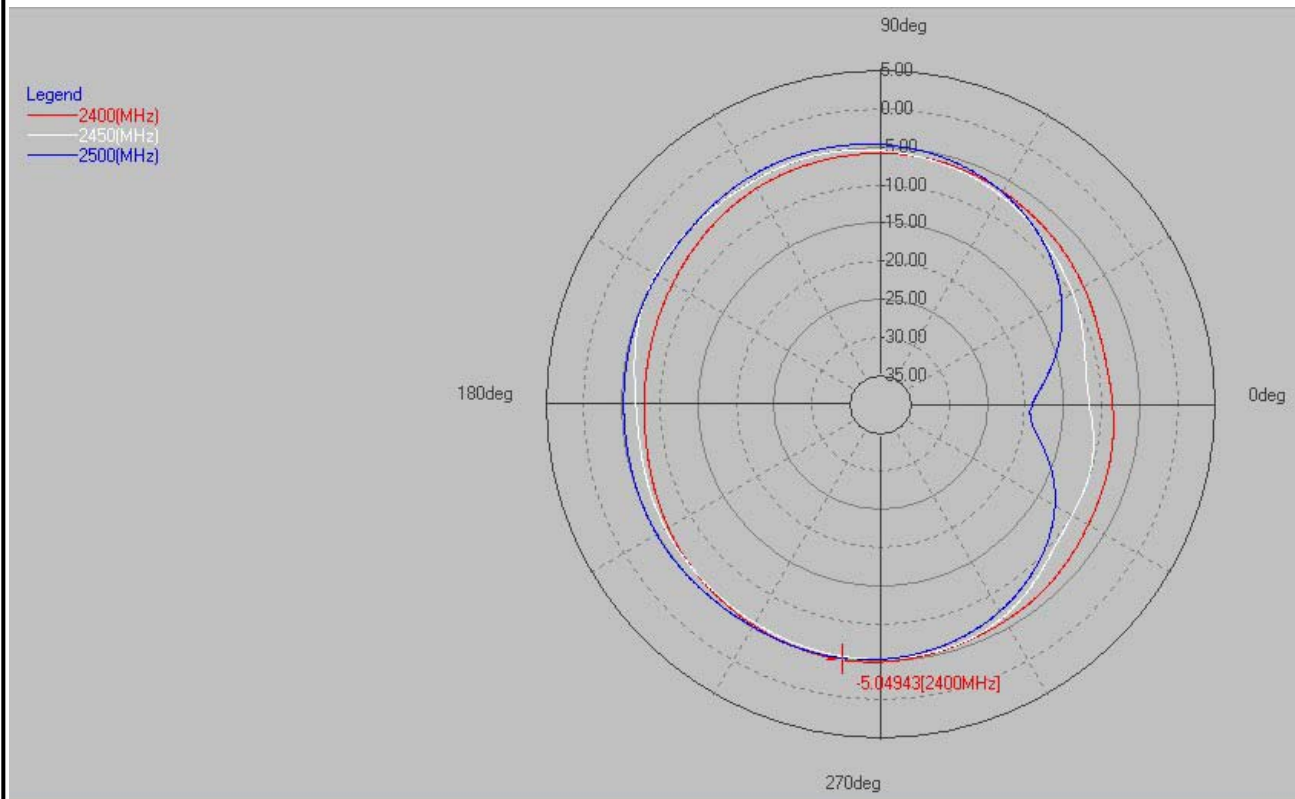
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-7.68	-8.67
2.45	-5.4	-9.03
2.5	-5.2	-9.16



X-Y Plane



TOTAL



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-5.05	-6.73
2.45	-4.88	-6.73
2.5	-4.5	-6.47



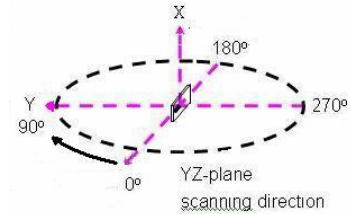
Document Code:

Version: 1

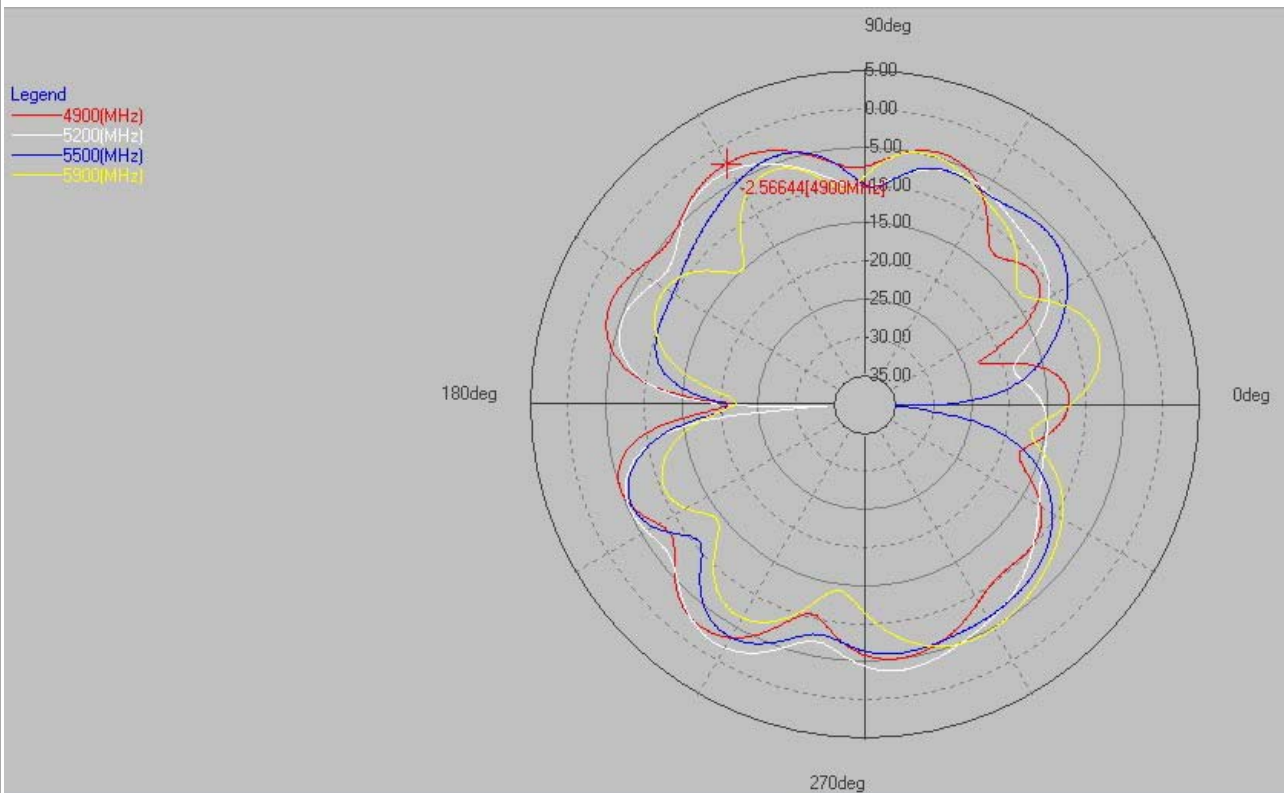
Page - 15

Antenna1(High)

Y-Z Plane



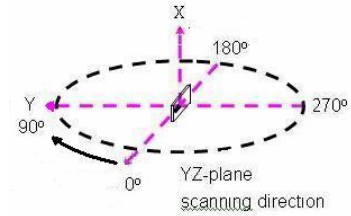
Horizontal Polarization



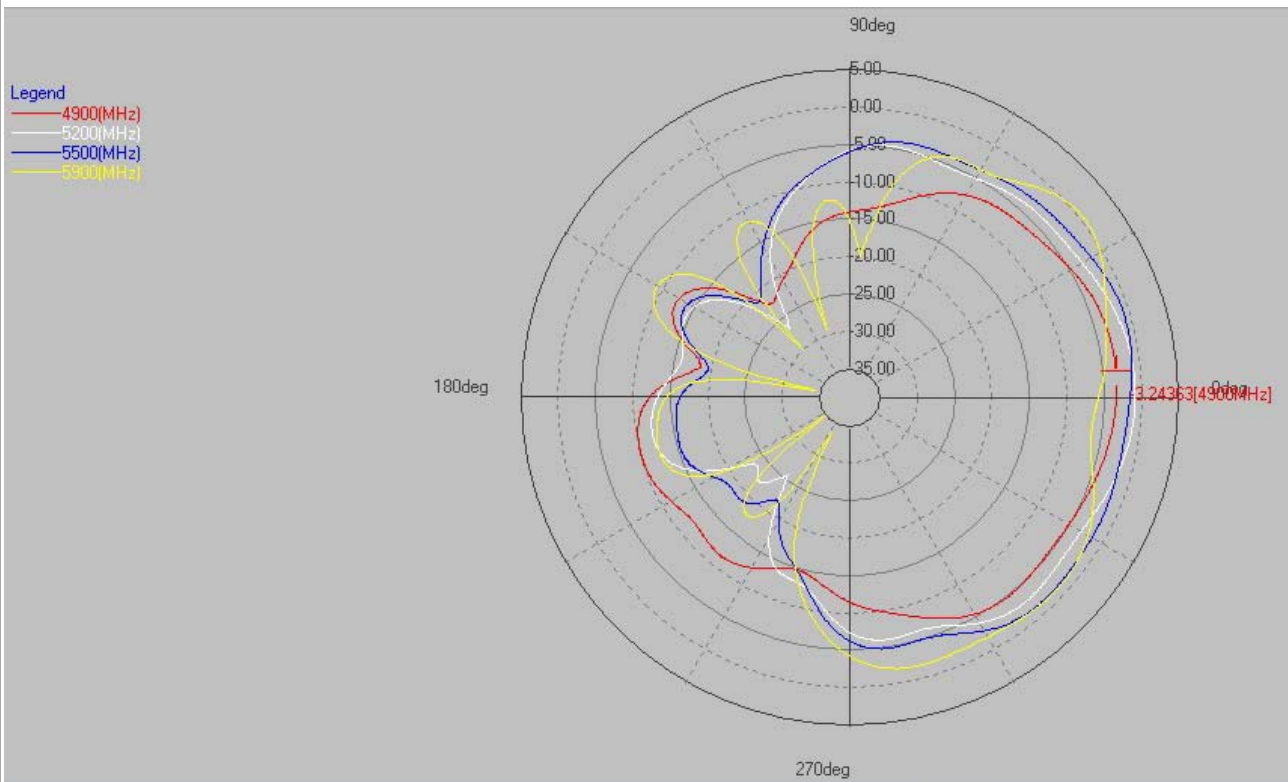
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-2.57	-6.77
5.2	-1.94	-6.82
5.5	-3.65	-7.79
5.9	-4.94	-8.87



Y-Z Plane



Vertical Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-3.24	-8.1
5.2	-0.83	-5.96
5.5	-0.69	-5.22
5.9	0.43	-5.48

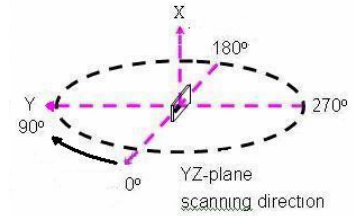


Document Code:

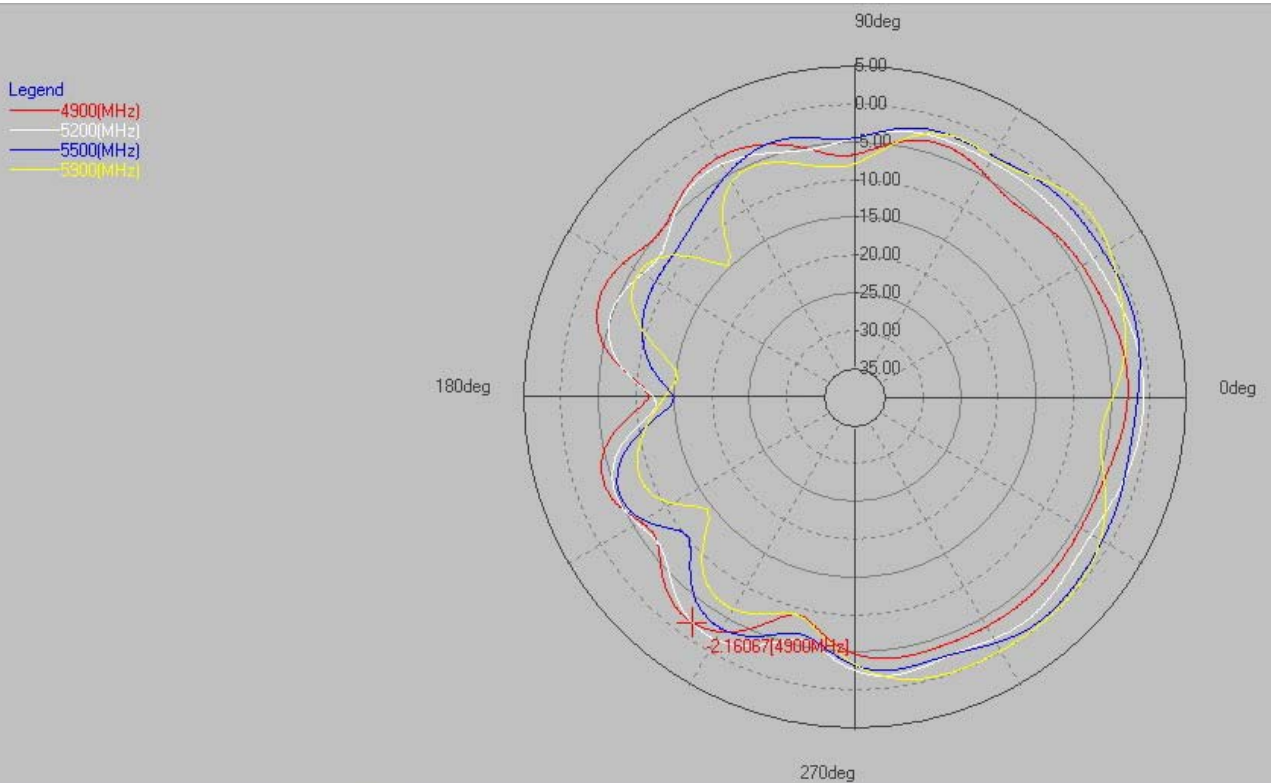
Version: 1

Page - 17

Y-Z Plane



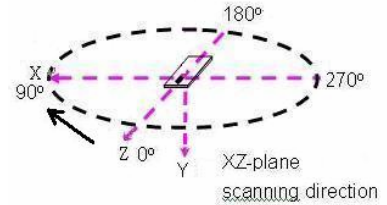
TOTAL



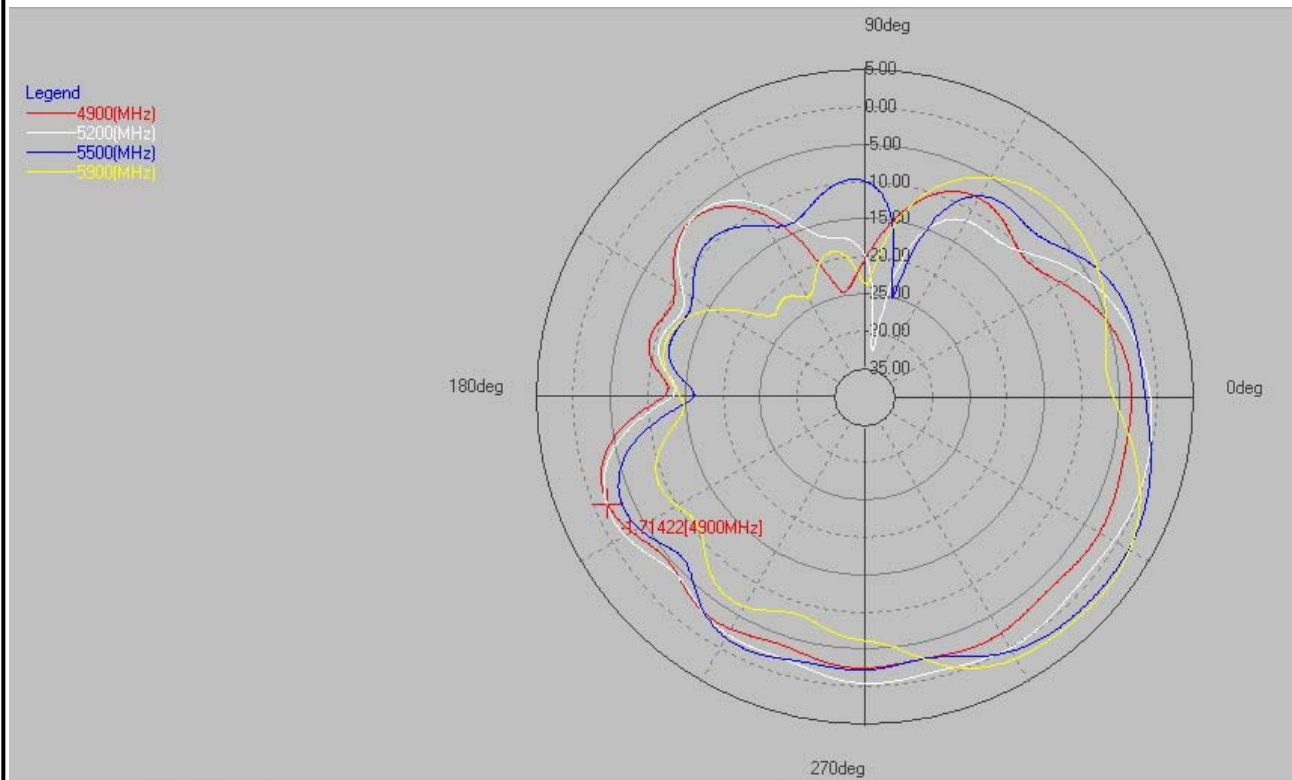
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-2.16	-4.37
5.2	-0.69	-3.35
5.5	-0.46	-3.3
5.9	0.58	-3.83



X-Z Plane



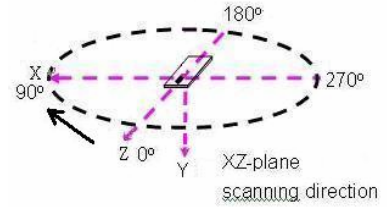
Horizontal Polarization



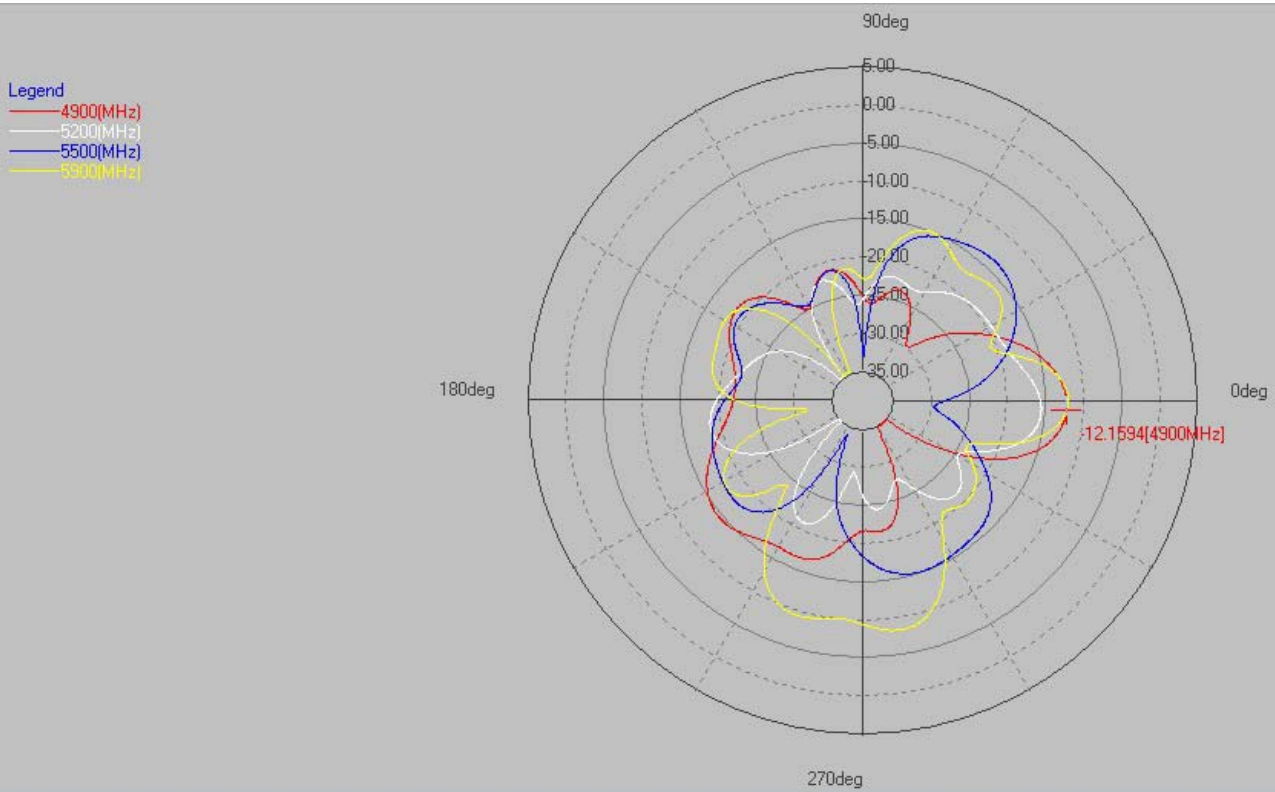
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-1.71	-5.16
5.2	-0.1	-3.62
5.5	1.81	-3.4
5.9	2.32	-4.29



X-Z Plane



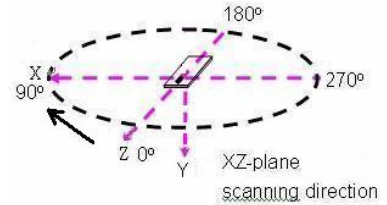
Vertical Polarization



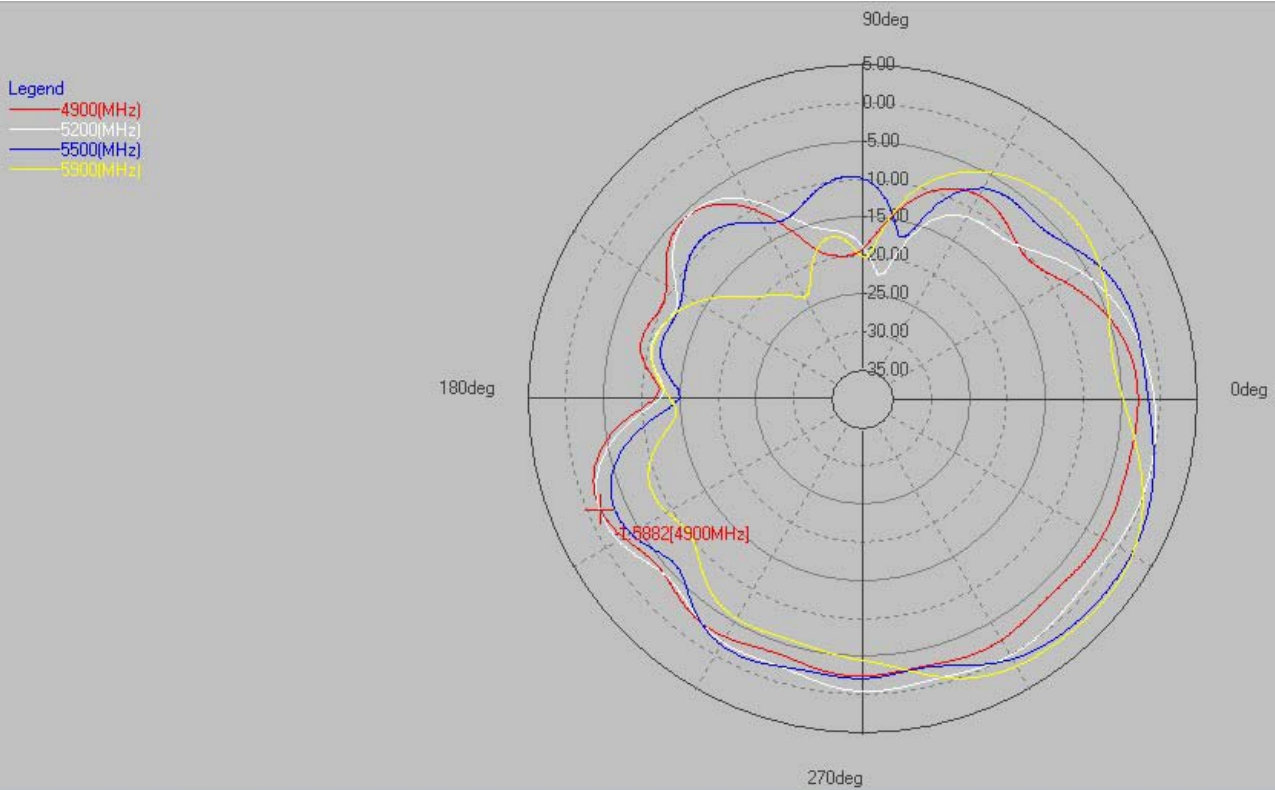
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-12.16	-18.86
5.2	-15.5	-21.66
5.5	-13.82	-18.64
5.9	-8.42	-15.46



X-Z Plane



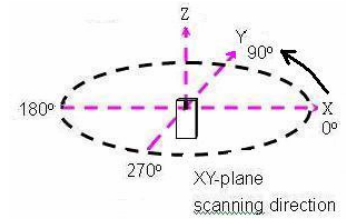
TOTAL



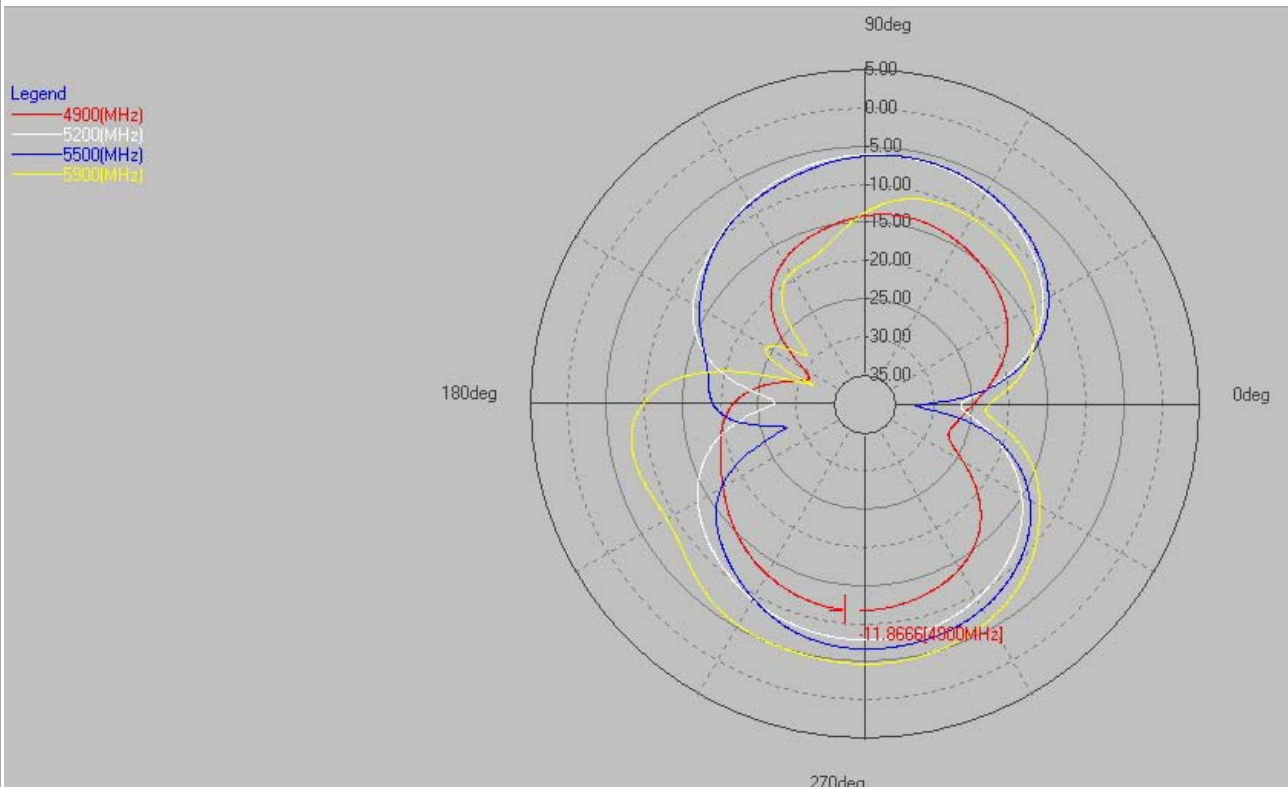
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-1.59	-4.97
5.2	-0.04	-3.55
5.5	1.85	-3.27
5.9	2.34	-3.97



X-Y Plane



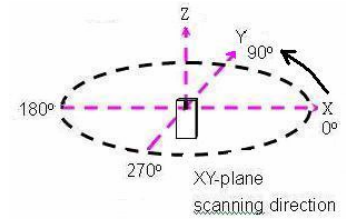
Horizontal Polarization



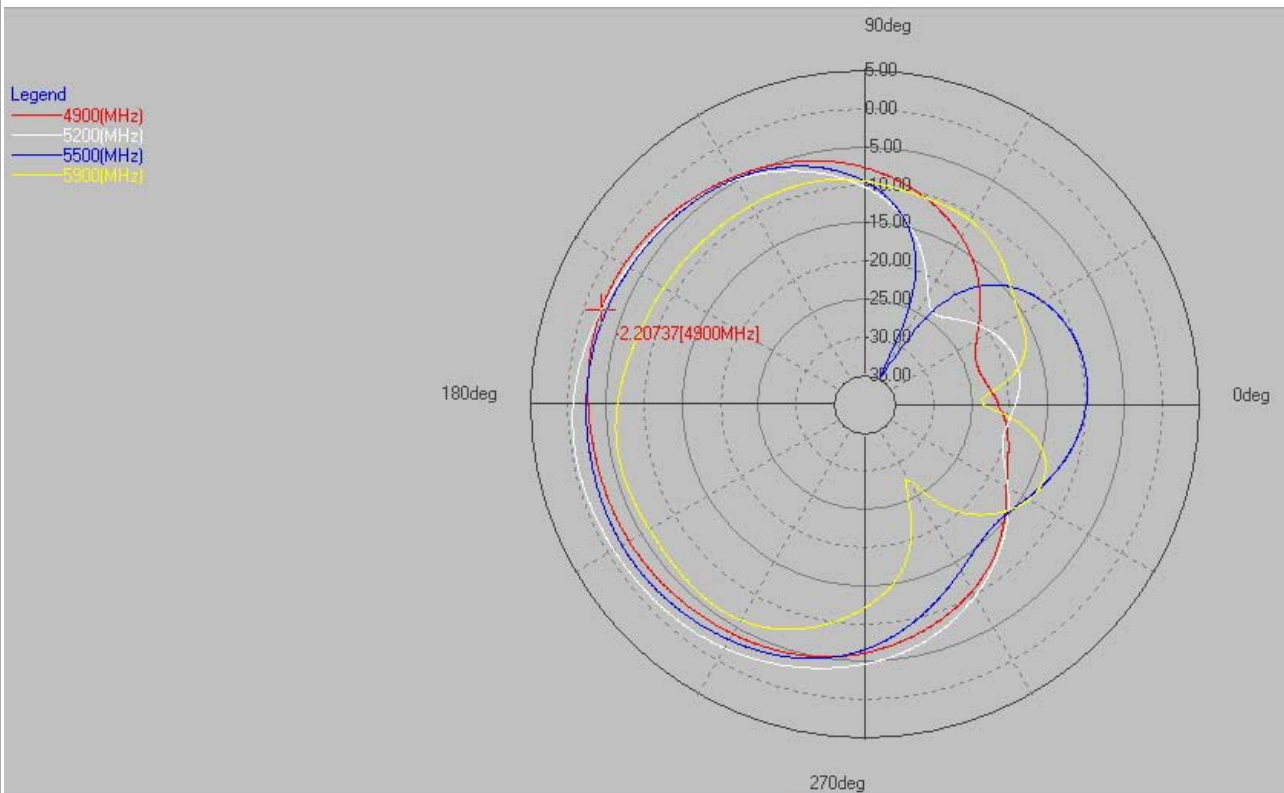
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-11.87	-16.12
5.2	-6.26	-10.19
5.5	-6.19	-9.89
5.9	-4.87	-9.59



X-Y Plane



Vertical Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-2.21	-6.17
5.2	-0.42	-5.1
5.5	-2.09	-5.98
5.9	-5.9	-9.68

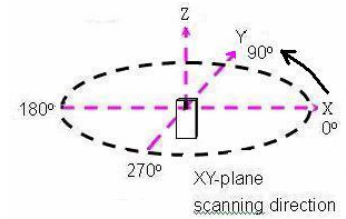


Document Code:

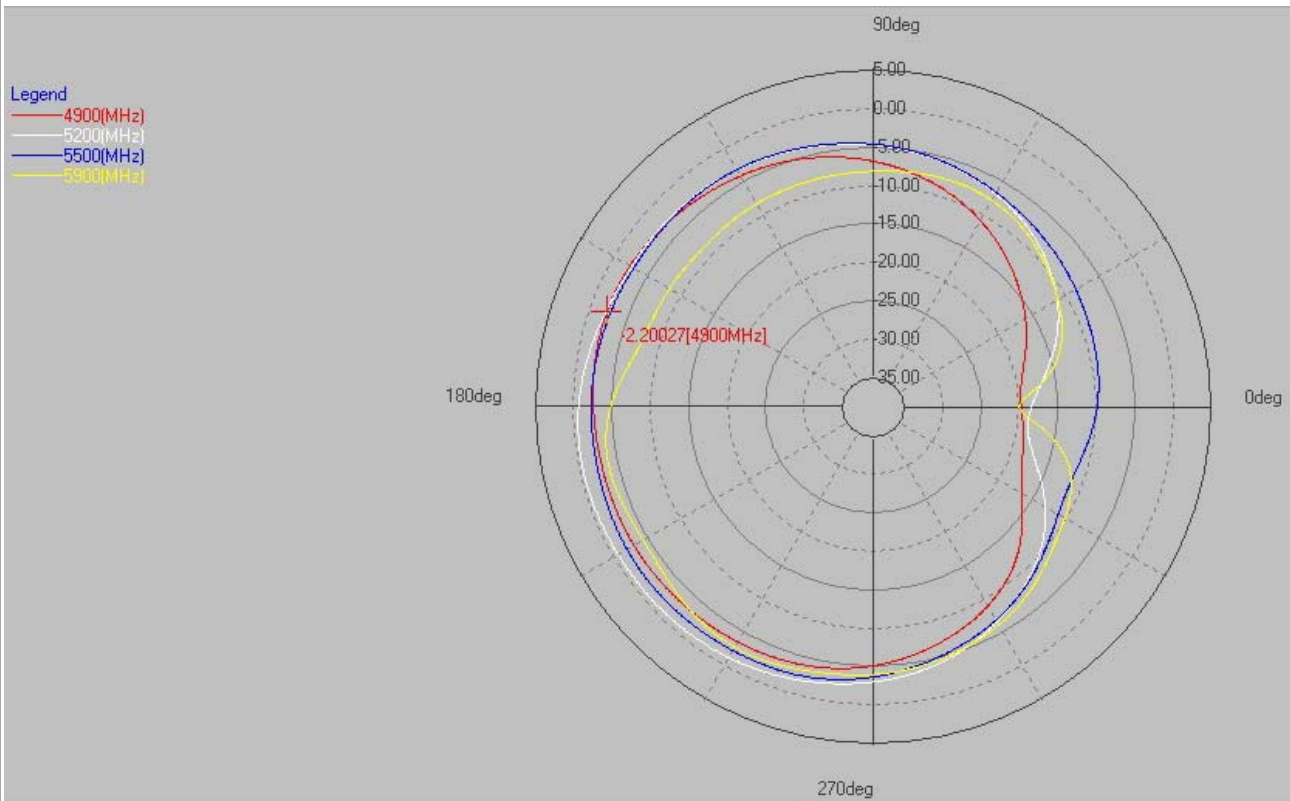
Version: 1

Page - 23

X-Y Plane



TOTAL



Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-2.2	-5.75
5.2	-0.37	-3.93
5.5	-1.94	-4.5
5.9	-2.86	-6.62



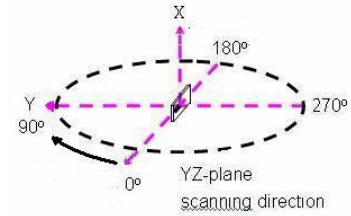
Document Code:

Version: 1

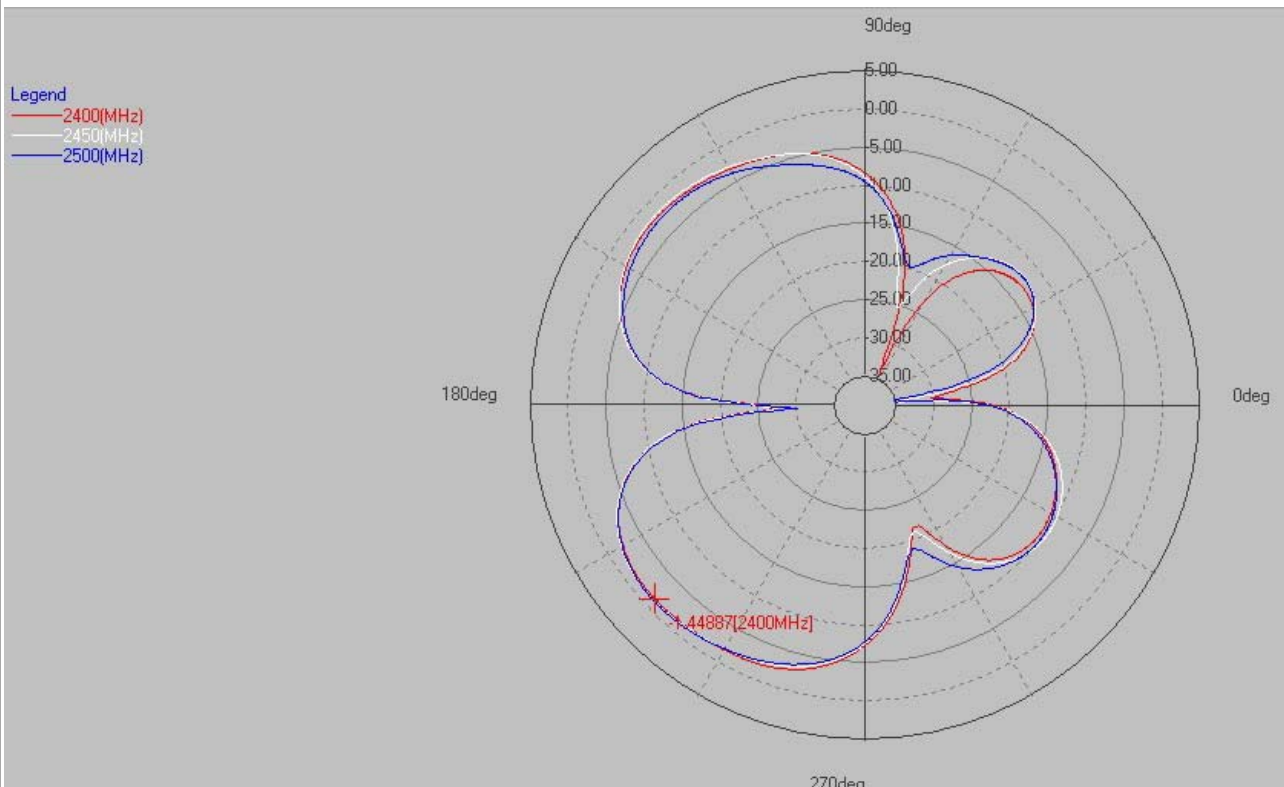
Page - 24

Antenna2(Low)

Y-Z Plane



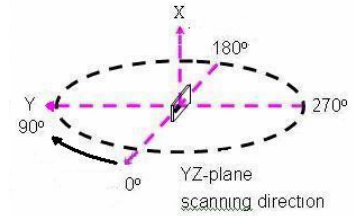
Horizontal Polarization



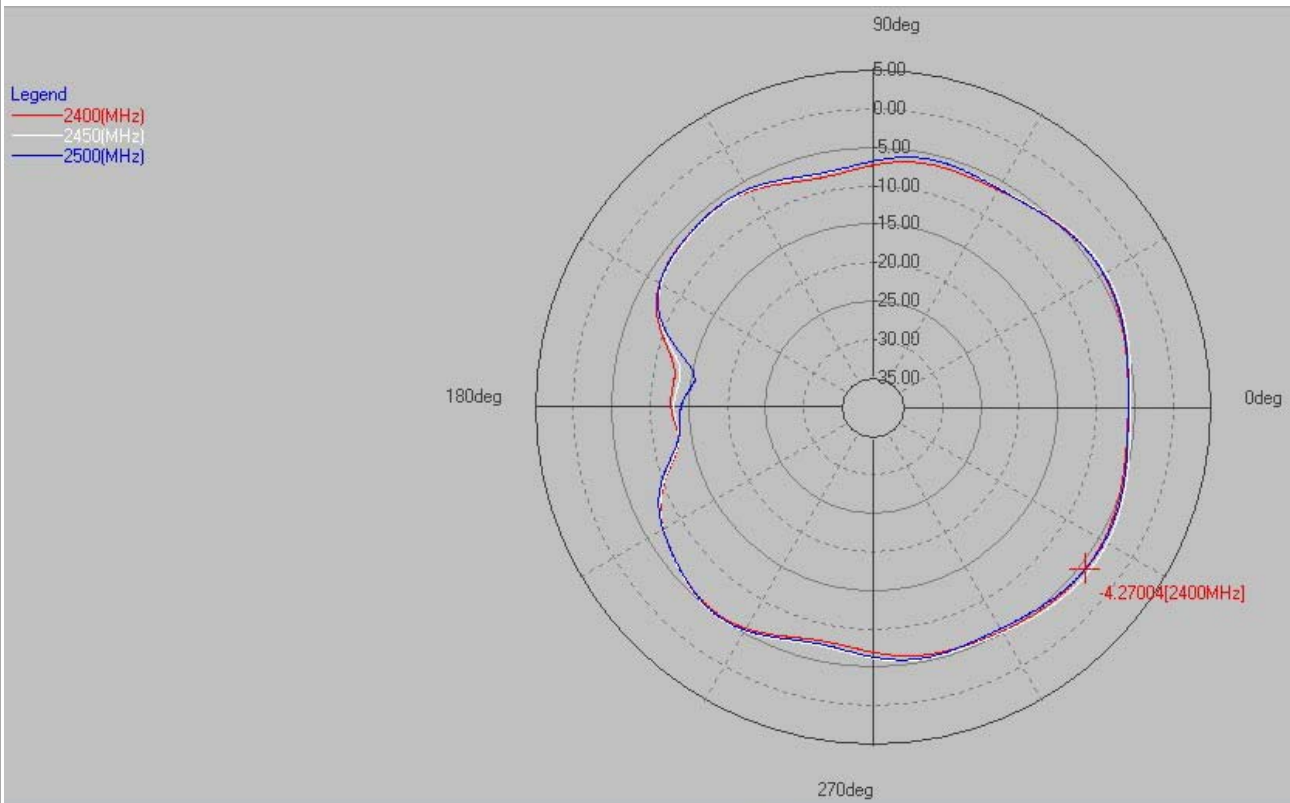
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-1.45	-6.47
2.45	-1.23	-6.35
2.5	-1.17	-6.74



Y-Z Plane



Vertical Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-4.27	-6.4
2.45	-3.72	-6.09
2.5	-4.18	-6.29

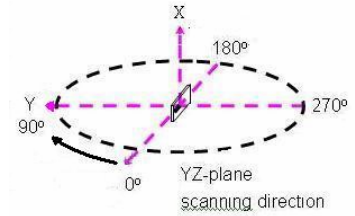


Document Code:

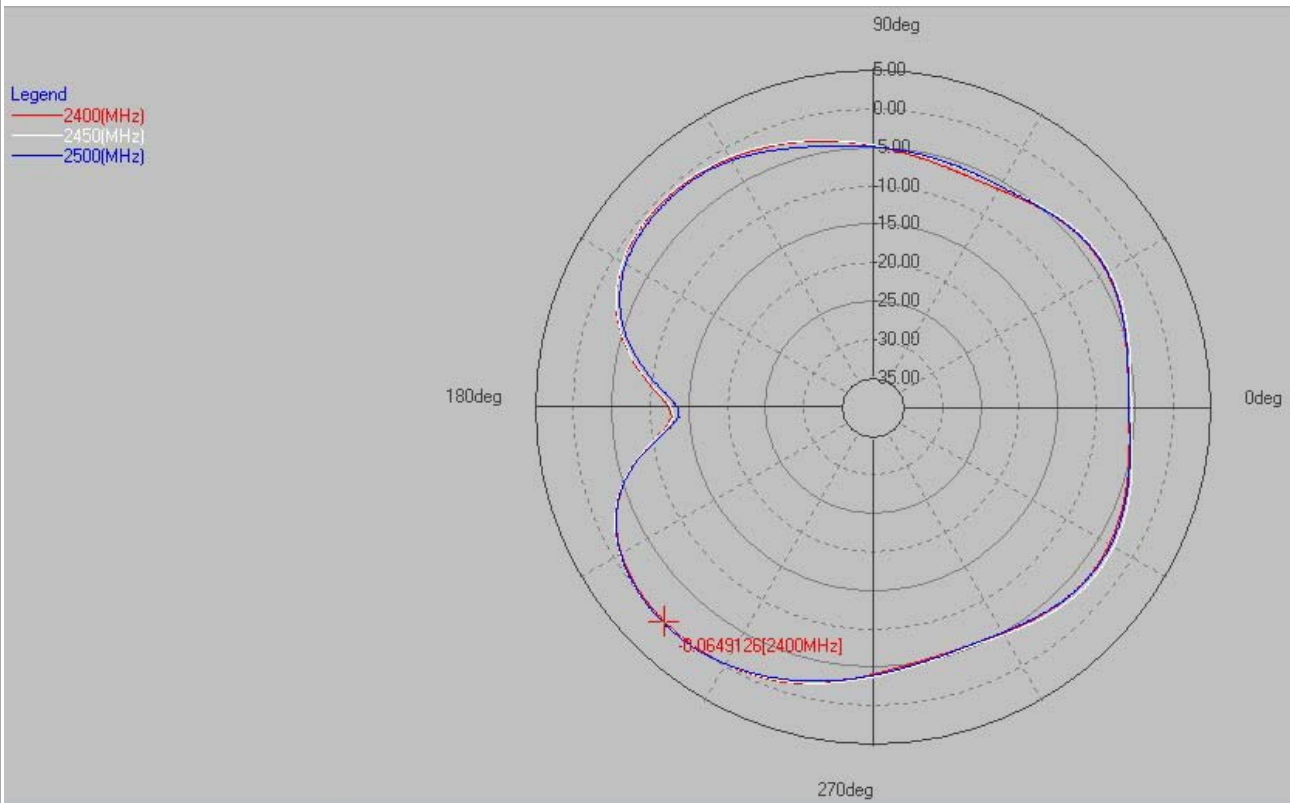
Version: 1

Page - 26

Y-Z Plane



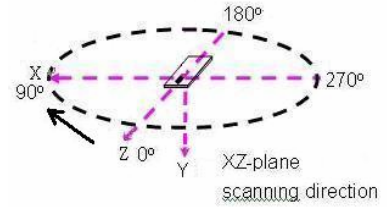
TOTAL



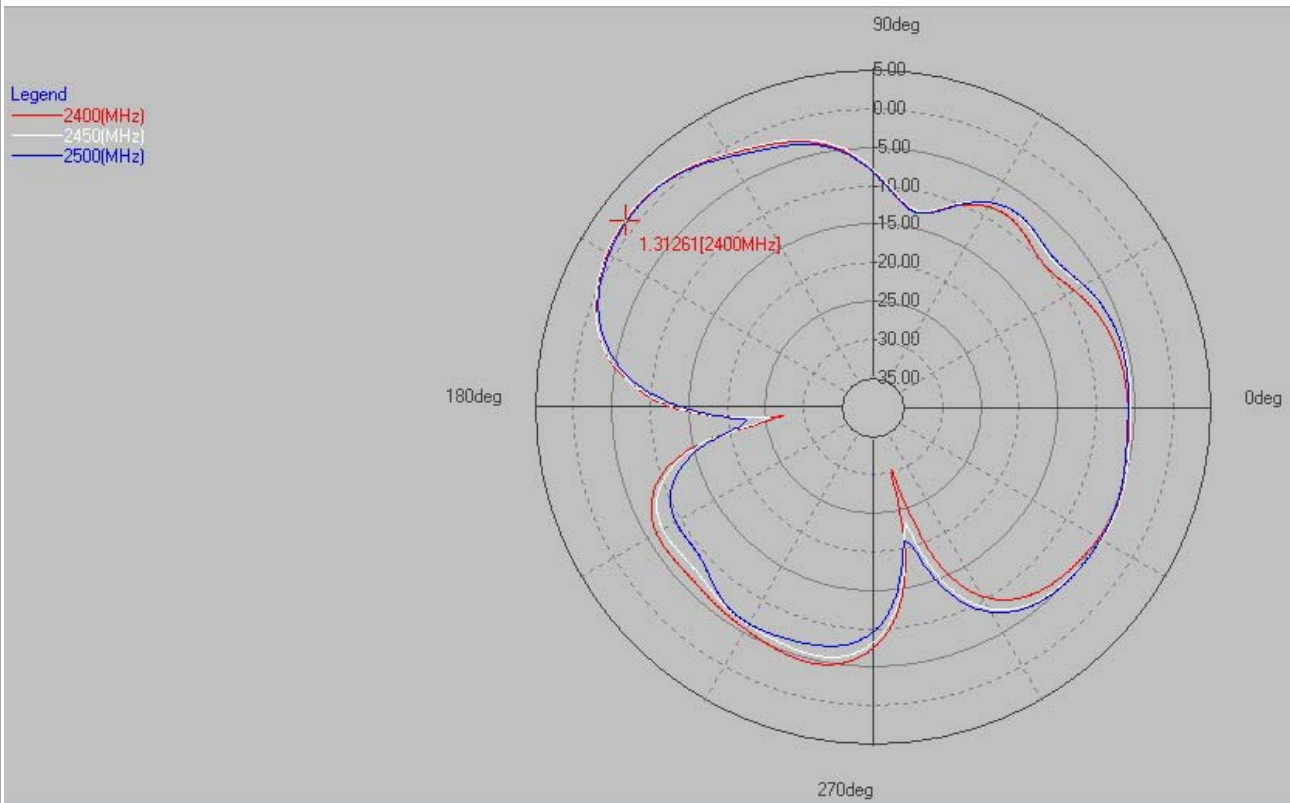
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-0.06	-3.42
2.45	0.11	-3.2
2.5	0.15	-3.49



X-Z Plane



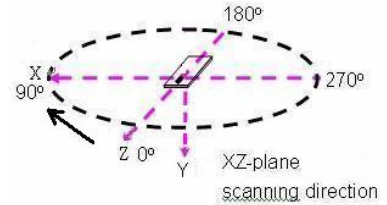
Horizontal Polarization



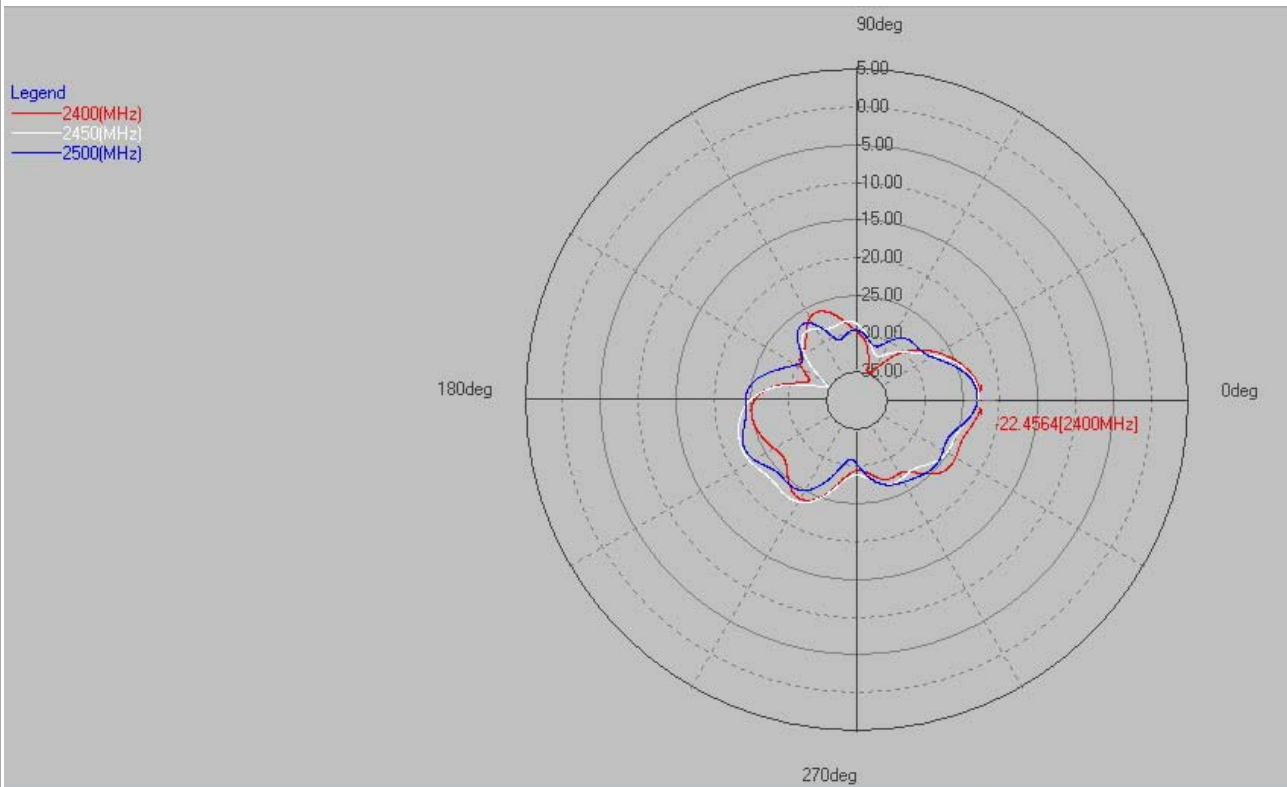
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	1.31	-4.91
2.45	1.51	-4.77
2.5	1.2	-5.17



X-Z Plane



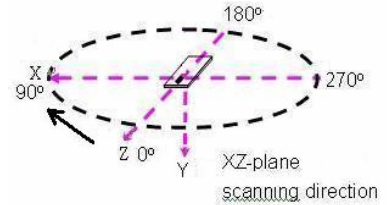
Vertical Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-22.46	-26.42
2.45	-22.44	-26.13
2.5	-22.78	-26.29

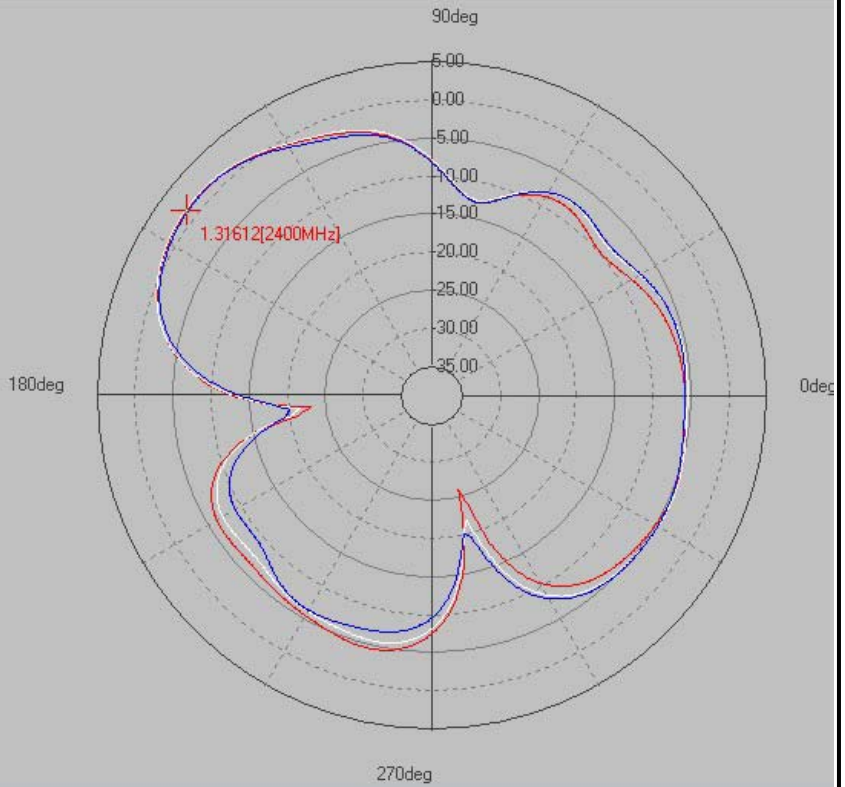


X-Z Plane



TOTAL

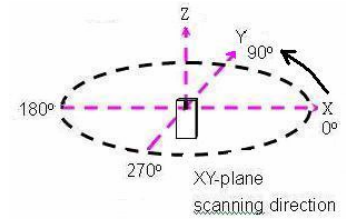
Legend
 — 2400(MHz)
 — 2450(MHz)
 — 2500(MHz)



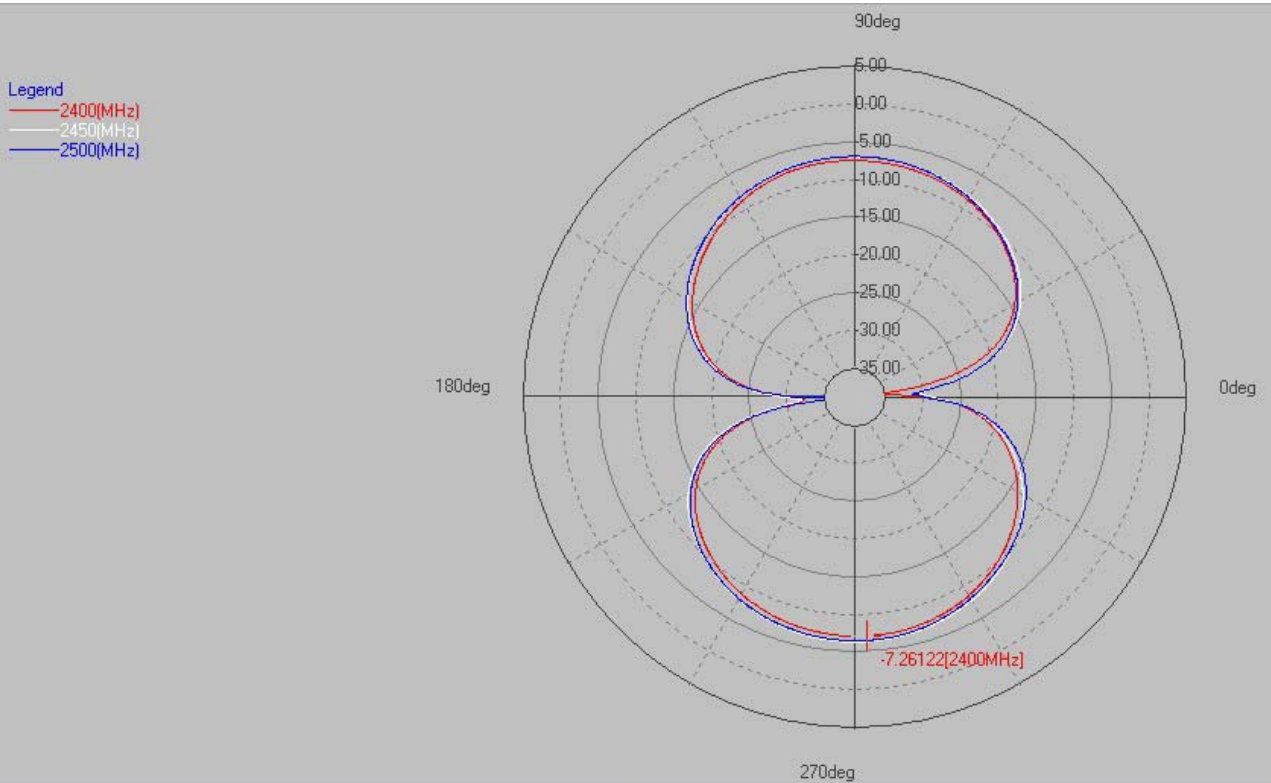
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	1.32	-4.88
2.45	1.51	-4.74
2.5	1.21	-5.14



X-Y Plane



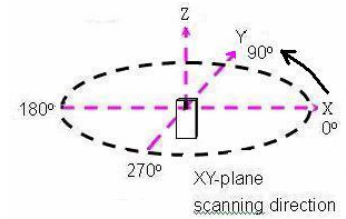
Horizontal Polarization



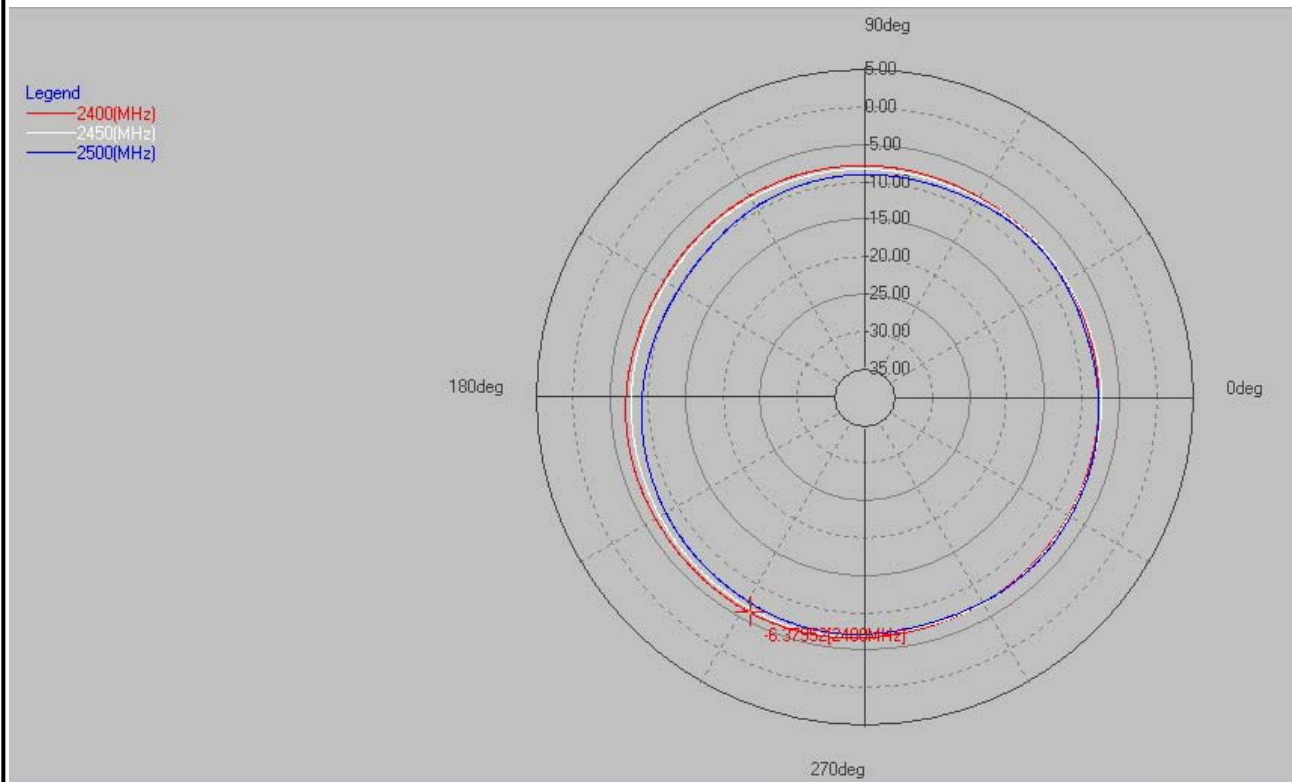
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-7.26	-10.67
2.45	-6.49	-9.97
2.5	-6.66	-10.08



X-Y Plane



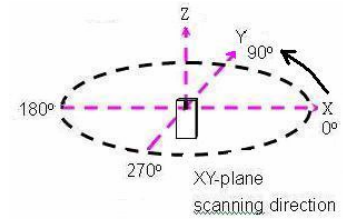
Vertical Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-6.38	-7.42
2.45	-6.76	-7.68
2.5	-7.12	-8.32



X-Y Plane



TOTAL



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.99	-5.74
2.45	-3.71	-5.66
2.5	-3.96	-6.1



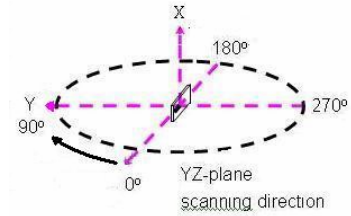
Document Code:

Version: 1

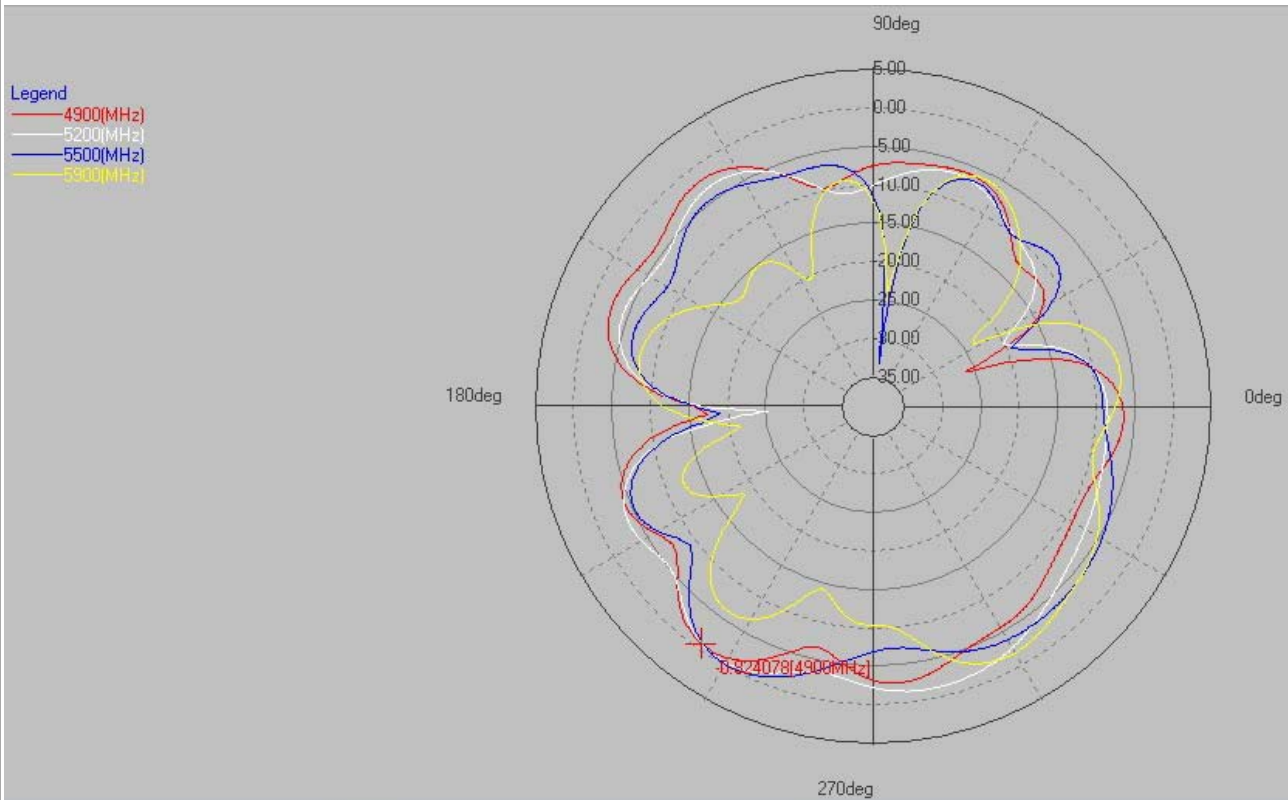
Page - 33

Antenna2(High)

Y-Z Plane



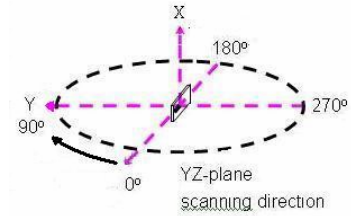
Horizontal Polarization



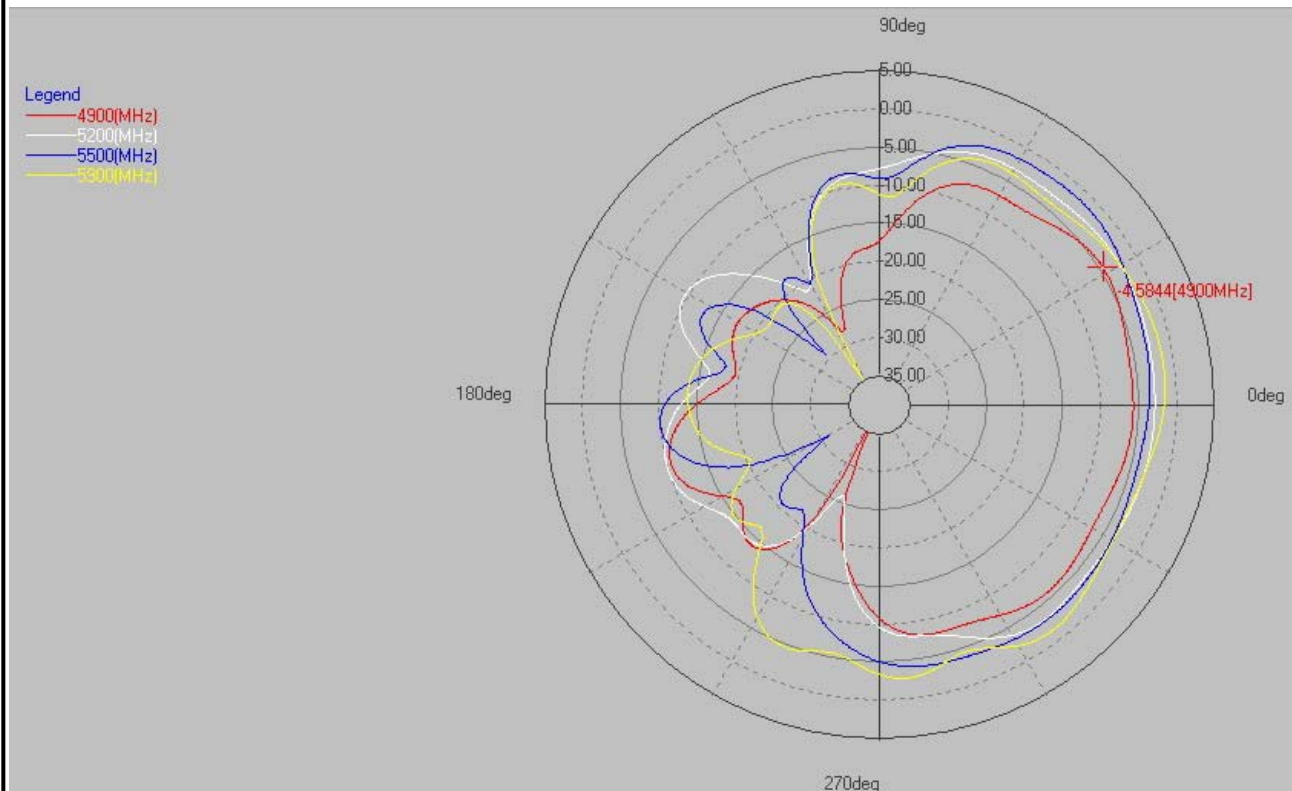
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-0.82	-5.63
5.2	-0.46	-5.27
5.5	-0.29	-6.14
5.9	-1.98	-8.42



Y-Z Plane



Vertical Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-4.58	-9.25
5.2	-2.46	-6.28
5.5	-1.41	-5.82
5.9	-1.32	-5.51

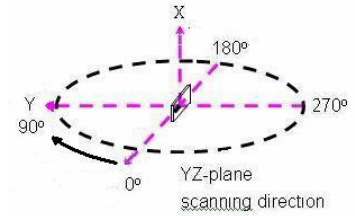


Document Code:

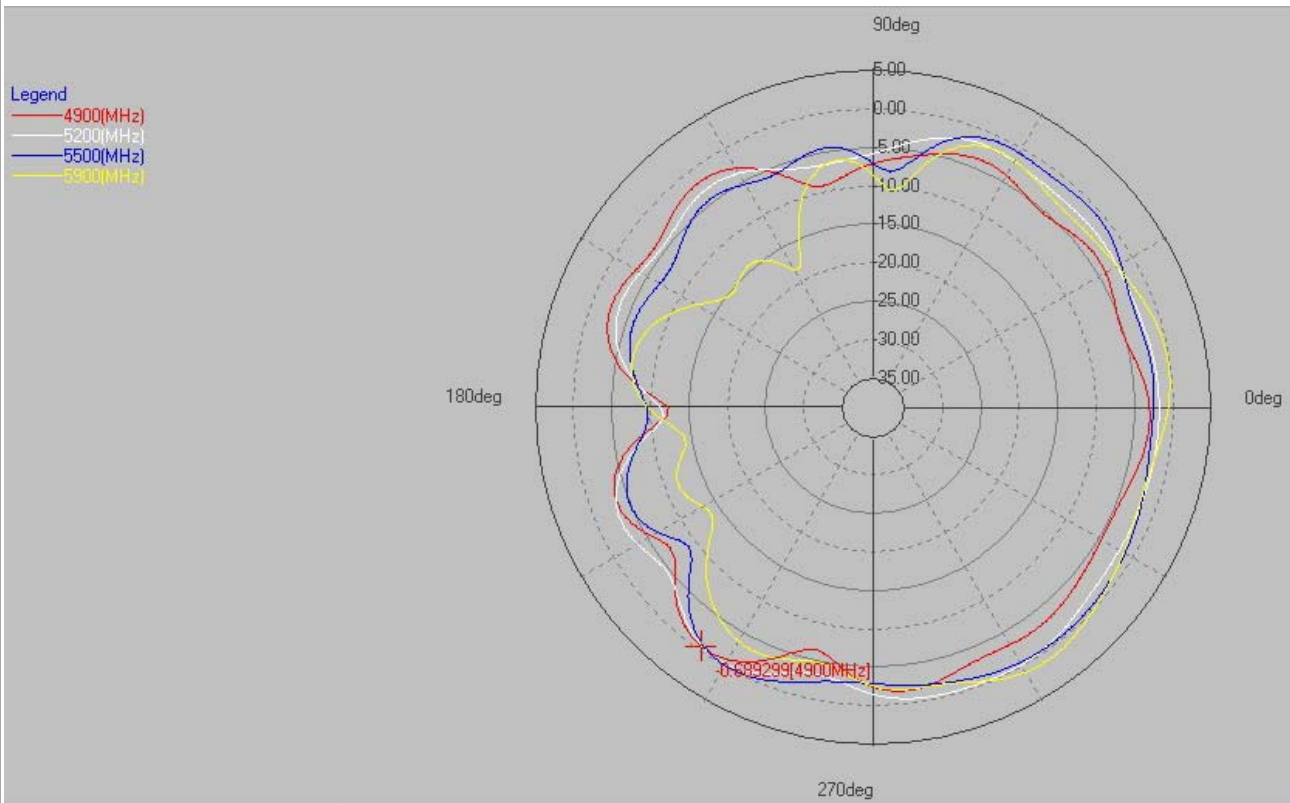
Version: 1

Page - 35

Y-Z Plane



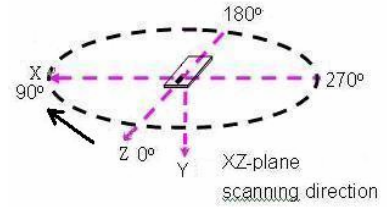
TOTAL



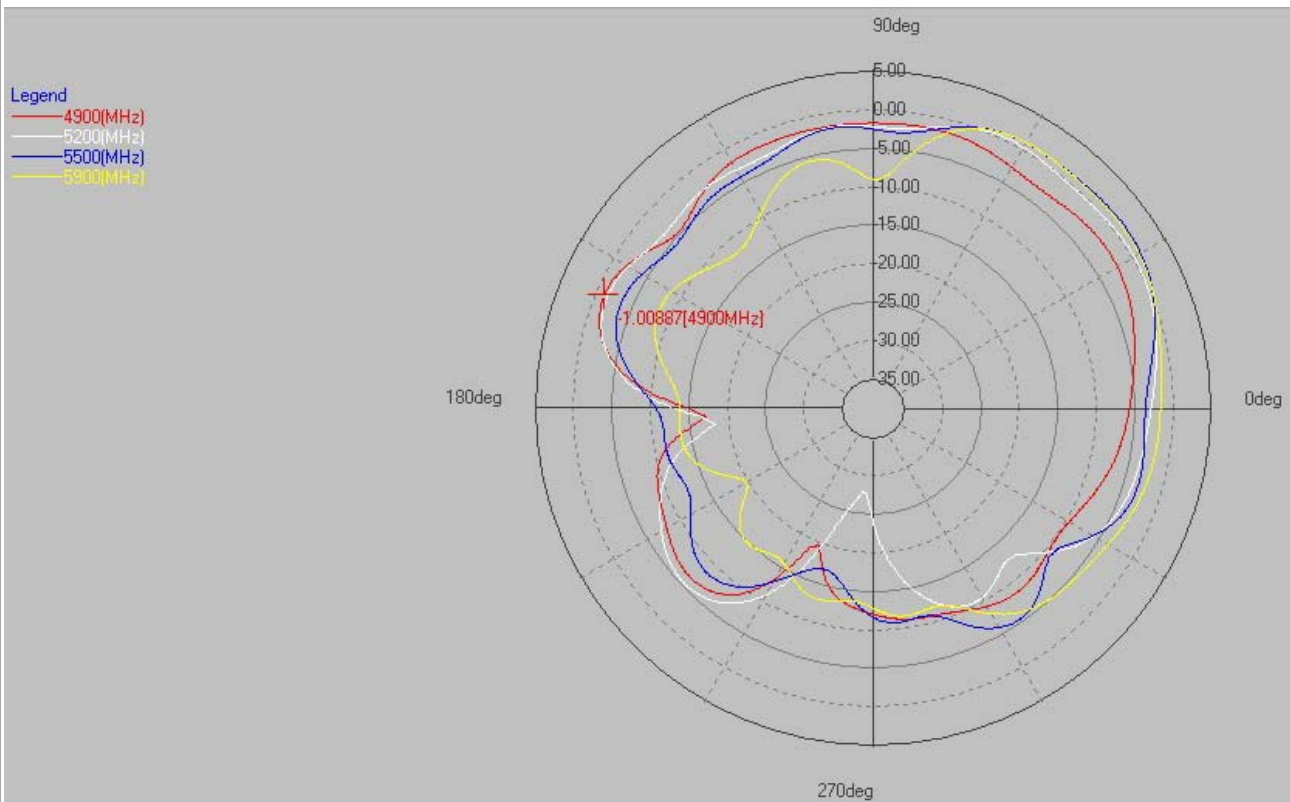
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-0.69	-4.06
5.2	-0.34	-2.73
5.5	-0.23	-2.97
5.9	1.01	-3.71



X-Z Plane



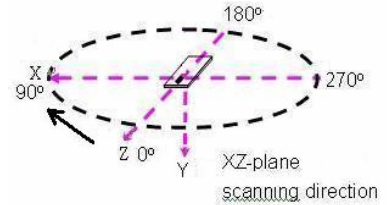
Horizontal Polarization



Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-1.01	-4.94
5.2	0.25	-3.84
5.5	1.39	-3.82
5.9	1.11	-4.5

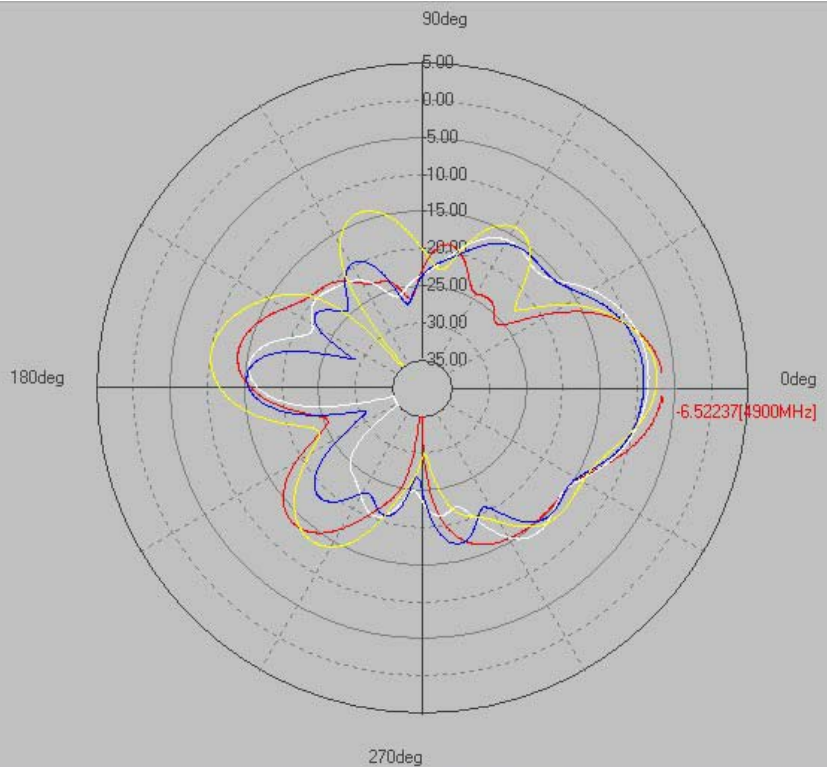


X-Z Plane



Vertical Polarization

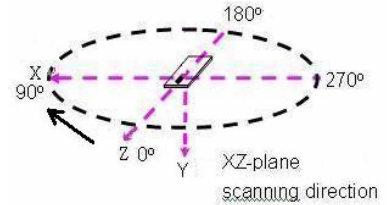
- Legend
- 4900(MHz)
 - 5200(MHz)
 - 5500(MHz)
 - 5900(MHz)



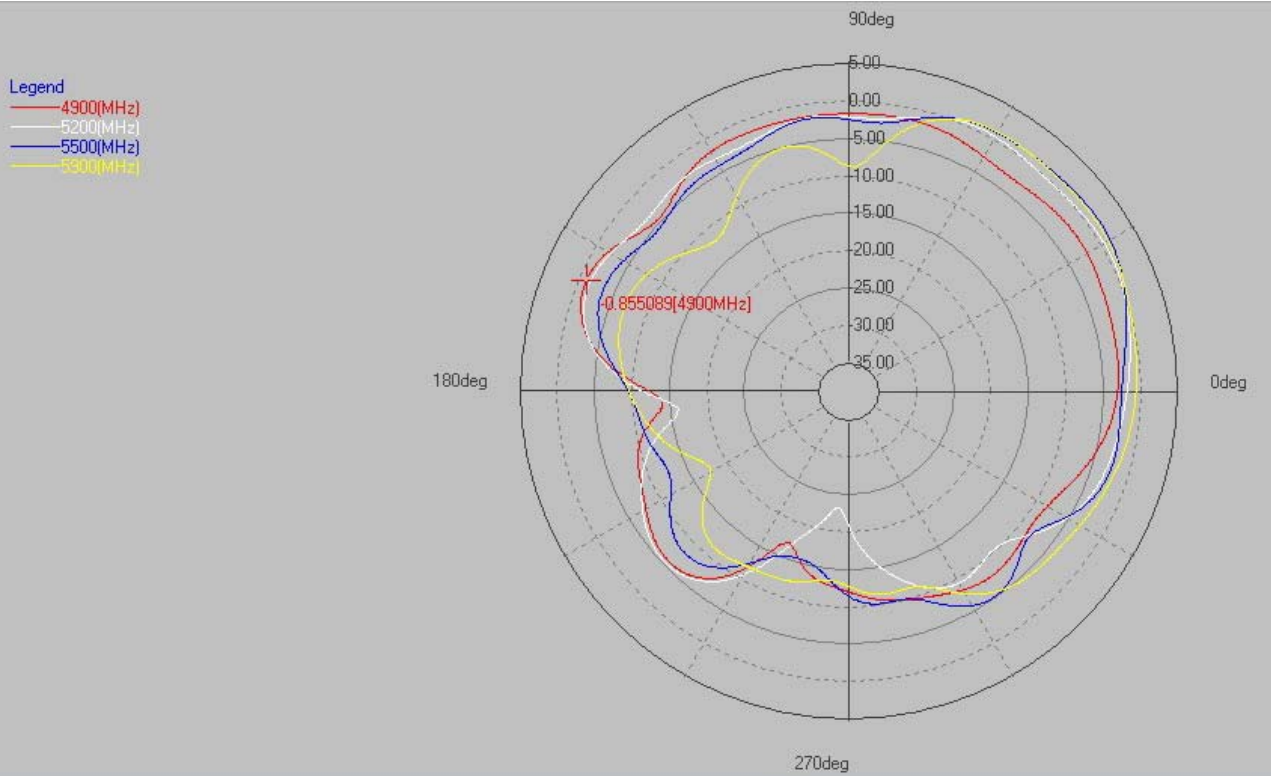
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-6.52	-14.84
5.2	-8.43	-15.62
5.5	-9.08	-16.03
5.9	-7.3	-14.21



X-Z Plane



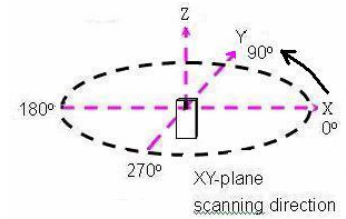
TOTAL



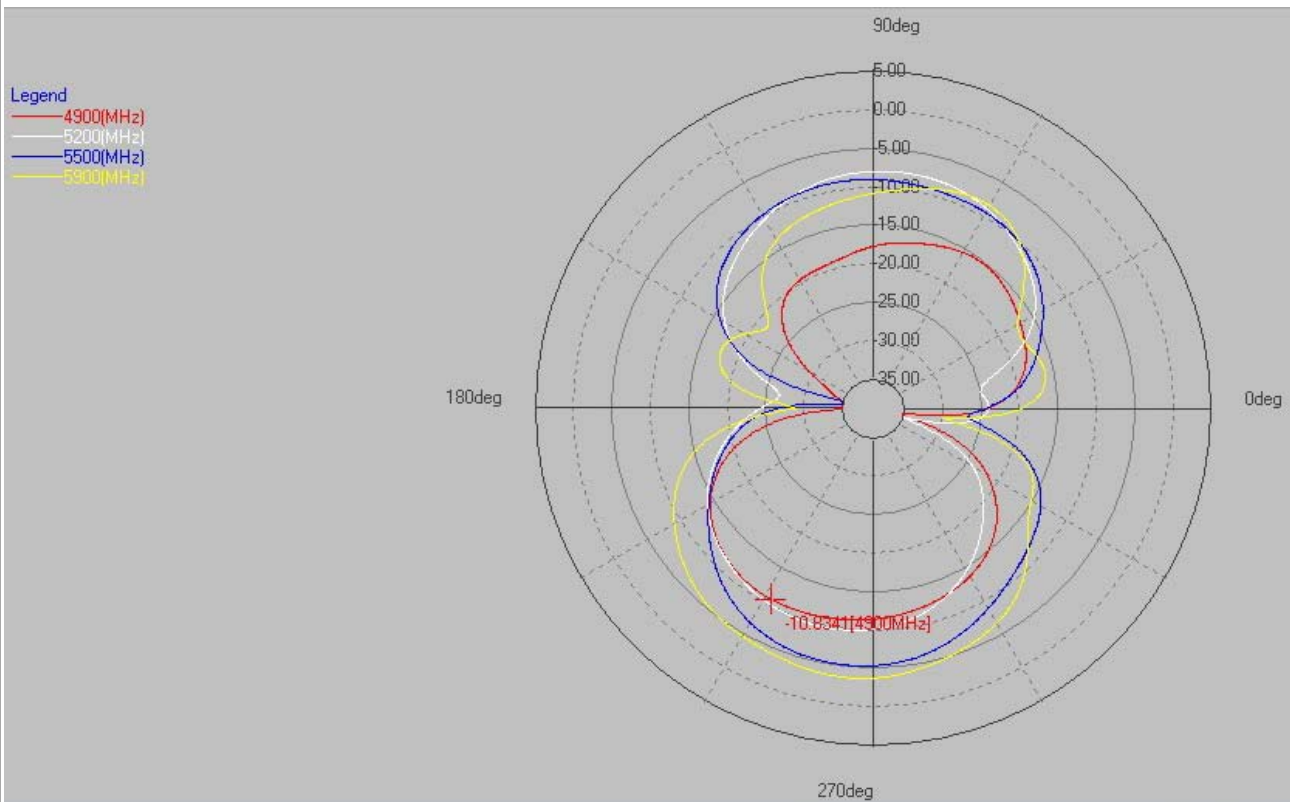
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-0.86	-4.52
5.2	0.47	-3.56
5.5	1.49	-3.56
5.9	1.14	-4.05



X-Y Plane



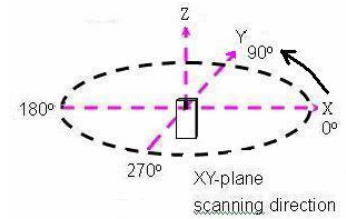
Horizontal Polarization



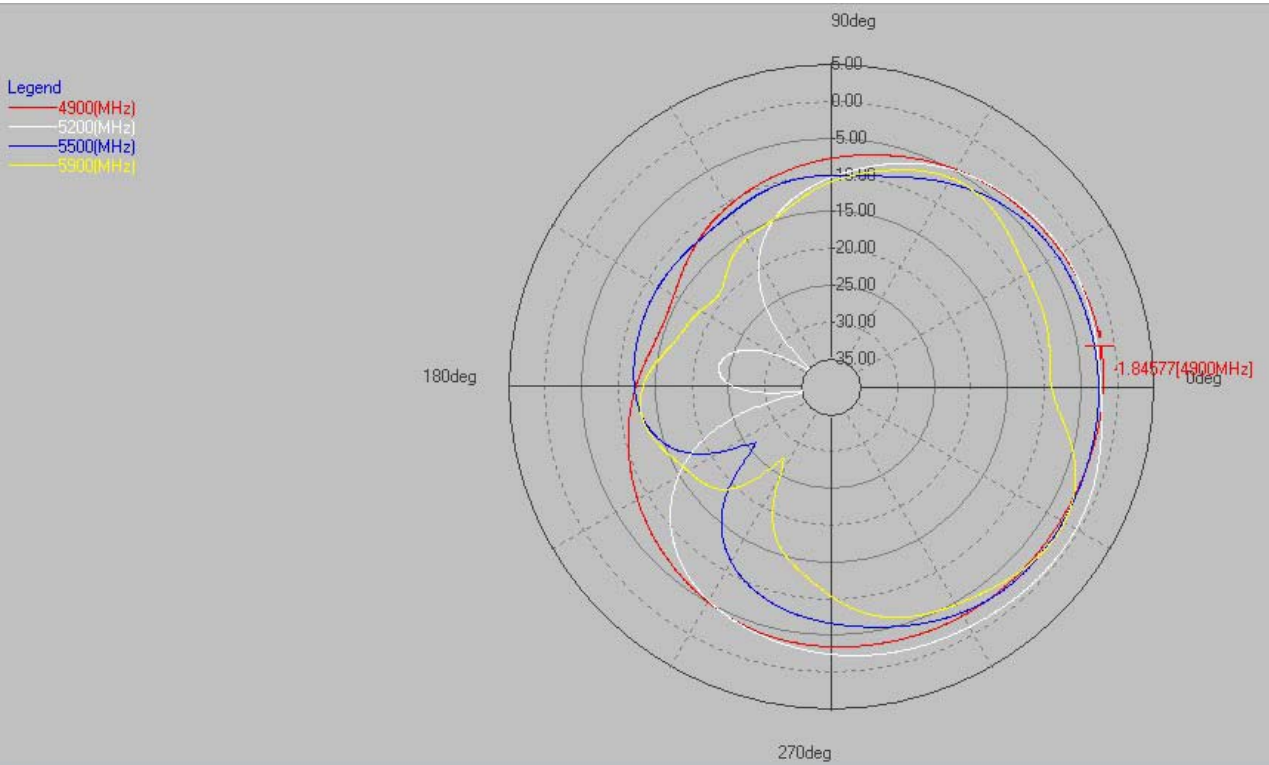
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-10.83	-15.79
5.2	-8.14	-12.44
5.5	-5.41	-10.39
5.9	-3.79	-9.35



X-Y Plane



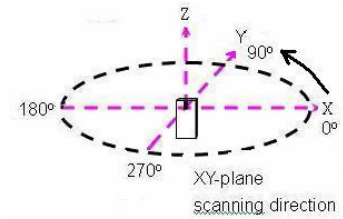
Vertical Polarization



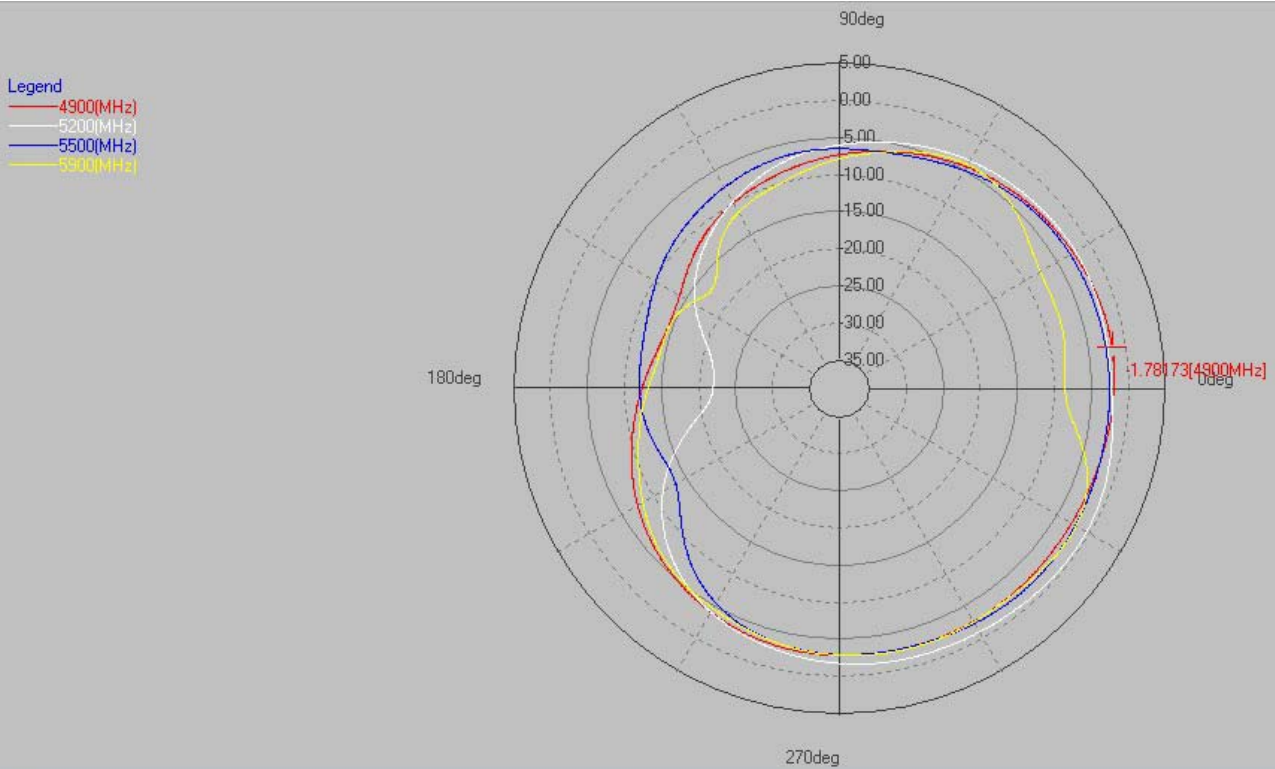
Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-1.85	-5.11
5.2	-0.43	-4.71
5.5	-2.47	-6.39
5.9	-2.24	-8.4



X-Y Plane



TOTAL



Frequency(GHz)	Max Value(dBi)	Average(dBi)
4.9	-1.78	-4.76
5.2	-0.41	-4.04
5.5	-2.04	-4.93
5.9	-2	-5.88



5. Measurement Results

Antenna	Frequency (GHz)	Y-Z Plane					
		Horizontal (dBi)		Vertical (dBi)		Total(dBi)	
		Max Value	Average	Max Value	Average	Max Value	Average
ANTENNA1 (S33)	2.4	-0.75	-6.25	-3.42	-6.24	0.17	-3.23
	2.45	-1.72	-6.88	-3.23	-6	-0.59	-3.41
	2.5	-1.54	-7.15	-4.89	-7.14	-0.74	-4.13
	4.9	-2.57	-6.77	-3.24	-8.1	-2.16	-4.37
	5.2	-1.94	-6.82	-0.83	-5.96	-0.69	-3.35
	5.5	-3.65	-7.79	-0.69	-5.22	-0.46	-3.3
	5.9	-4.94	-8.87	0.43	-5.48	0.58	-3.83
ANTENNA2 (S44)	2.4	-1.45	-6.47	-4.27	-6.4	-0.06	-3.42
	2.45	-1.23	-6.35	-3.72	-6.09	0.11	-3.2
	2.5	-1.17	-6.74	-4.18	-6.29	0.15	-3.49
	4.9	-0.82	-5.63	-4.58	-9.25	-0.69	-4.06
	5.2	-0.46	-5.27	-2.46	-6.28	-0.34	-2.73
	5.5	-0.29	-6.14	-1.41	-5.82	-0.23	-2.97
	5.9	-1.98	-8.42	-1.32	-5.51	1.01	-3.71

Antenna	Frequency (GHz)	X-Z Plane					
		Horizontal (dBi)		Vertical (dBi)		Total(dBi)	
		Max Value	Average	Max Value	Average	Max Value	Average
ANTENNA1 (S33)	2.4	1.23	-4.61	-19.91	-22.25	1.26	-4.54
	2.45	1.06	-4.77	-18.68	-21.01	1.08	-4.67
	2.5	1.02	-5.94	-20.28	-22.97	1.03	-5.2
	4.9	-1.71	-5.16	-12.16	-18.86	-1.59	-4.97
	5.2	-0.1	-3.62	-15.5	-21.66	-0.04	-3.55
	5.5	1.81	-3.4	-13.82	-18.64	1.85	-3.27
	5.9	2.32	-4.29	-8.42	-15.46	2.34	-3.97
ANTENNA2 (S44)	2.4	1.31	-4.91	-22.46	-26.42	1.32	-4.88
	2.45	1.51	-4.77	-22.44	-26.13	1.51	-4.74
	2.5	1.2	-5.17	-22.78	-26.29	1.21	-5.14
	4.9	-1.01	-4.94	-6.52	-14.84	-0.86	-4.52
	5.2	0.25	-3.84	-8.43	-15.62	0.47	-3.56
	5.5	1.39	-3.82	-9.08	-16.03	1.49	-3.56
	5.9	1.11	-4.5	-7.3	-14.21	1.14	-4.05

Antenna	Frequency (GHz)	X-Y Plane					
		Horizontal (dBi)		Vertical (dBi)		Total(dBi)	
		Max Value	Average	Max Value	Average	Max Value	Average
ANTENNA1 (S33)	2.4	-7.94	-11.16	-7.68	-8.67	-5.05	-6.73
	2.45	-7.13	-10.6	-5.4	-9.03	-4.88	-6.73
	2.5	-6.49	-9.81	-5.2	-9.16	-4.5	-6.47
	4.9	-11.87	-16.12	-2.21	-6.17	-2.2	-5.75
	5.2	-6.26	-10.19	-0.42	-5.1	-0.37	-3.93
	5.5	-6.19	-9.89	-2.09	-5.98	-1.94	-4.5
	5.9	-4.87	-9.59	-5.9	-9.68	-2.86	-6.62
ANTENNA2 (S44)	2.4	-7.26	-10.67	-6.38	-7.42	-3.99	-5.74
	2.45	-6.49	-9.97	-6.76	-7.68	-3.71	-5.66
	2.5	-6.66	-10.08	-7.12	-8.32	-3.96	-6.1
	4.9	-10.83	-15.79	-1.85	-5.11	-1.78	-4.76
	5.2	-8.14	-12.44	-0.43	-4.71	-0.41	-4.04
	5.5	-5.41	-10.39	-2.47	-6.39	-2.04	-4.93
	5.9	-3.79	-9.35	-2.24	-8.4	-2	-5.88