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Version: 1

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**DUT : Qualcomm Cardbus printed Antenna**

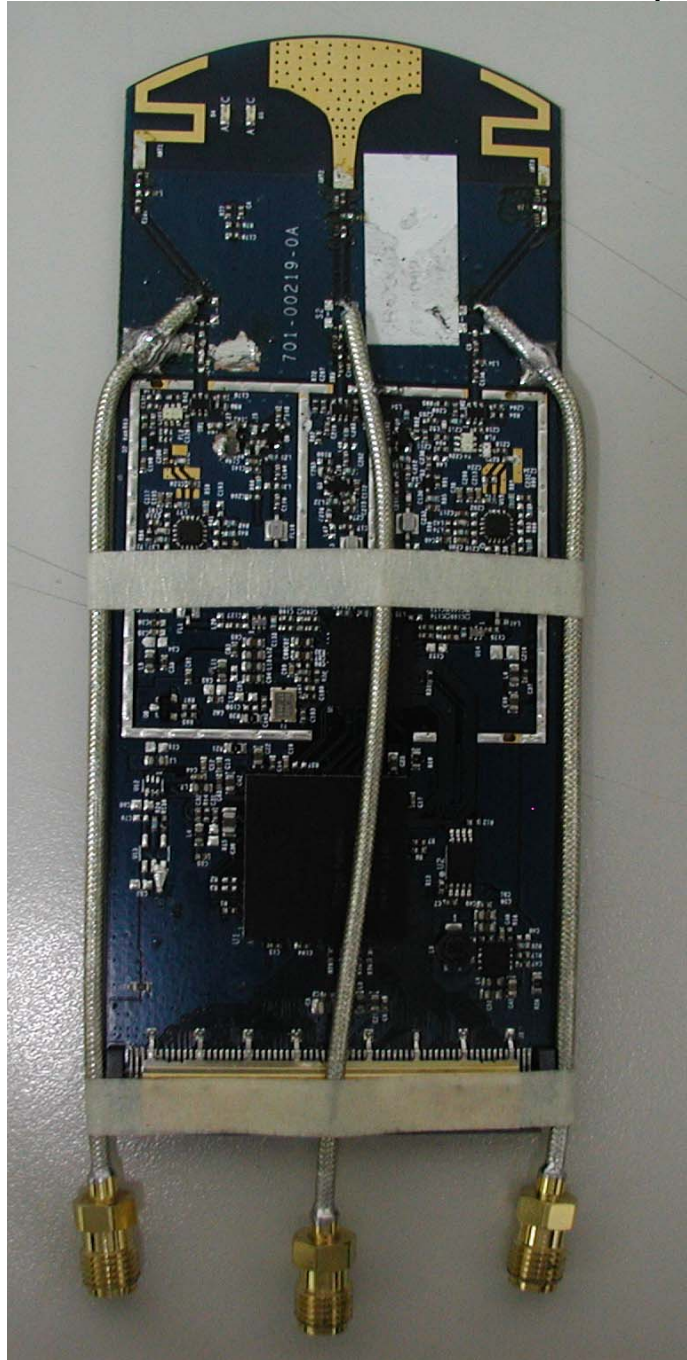
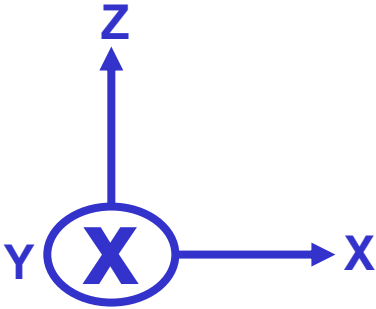
**DATE : 2007/04/04**

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## 1. Experimental Setup



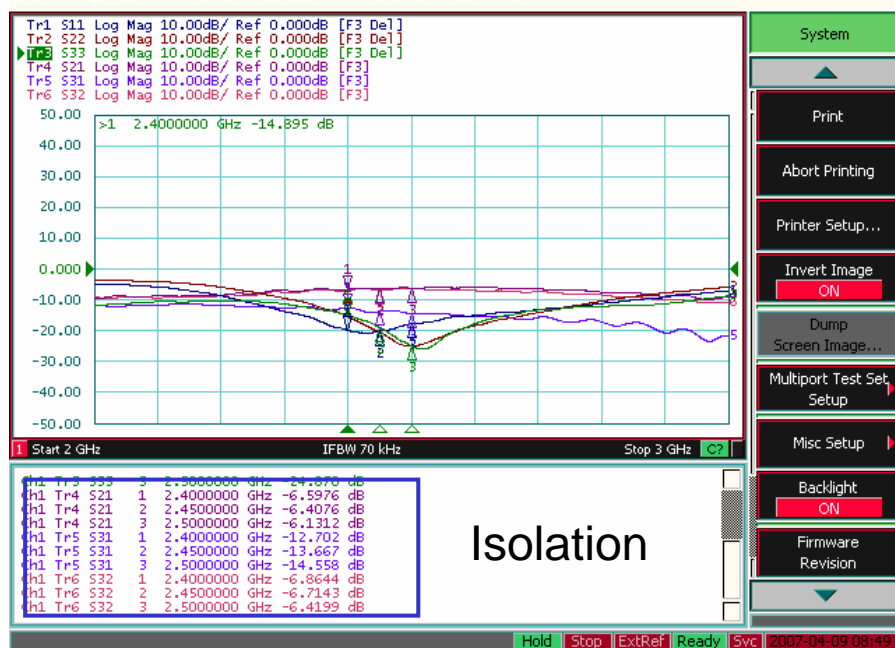
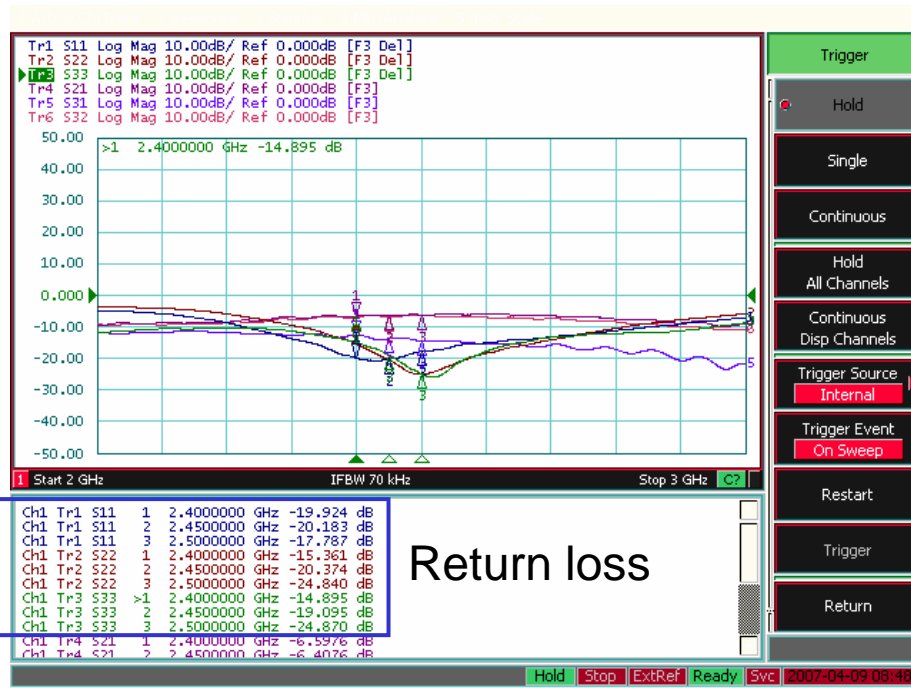
- Measurement Item :
  - a. Return loss
  - b. Radiation pattern
  
- Return Loss :
  - a. Instrument : vector network analyzer – Agilent N5230A
  - b. Calibration method : SOLT
  
- 3D Radiation Pattern :
  - a. Instrument: Satimo StarLab

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## 2. Return loss LEFT S11 MIDDLE S22 RIGHT S33

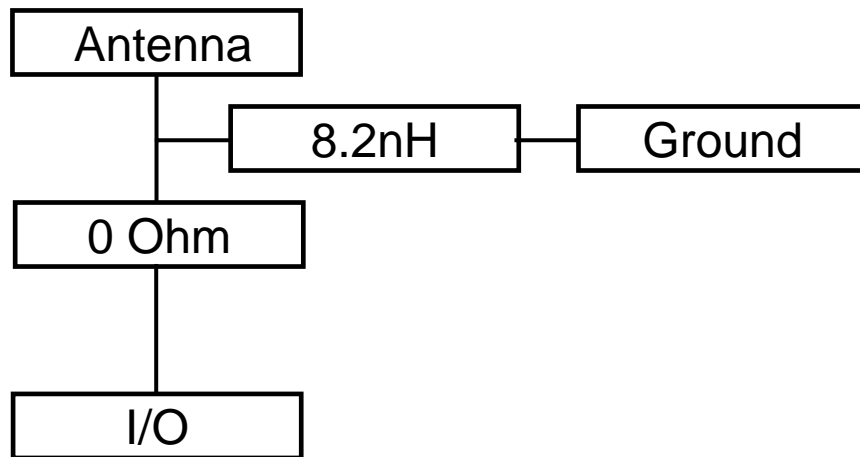
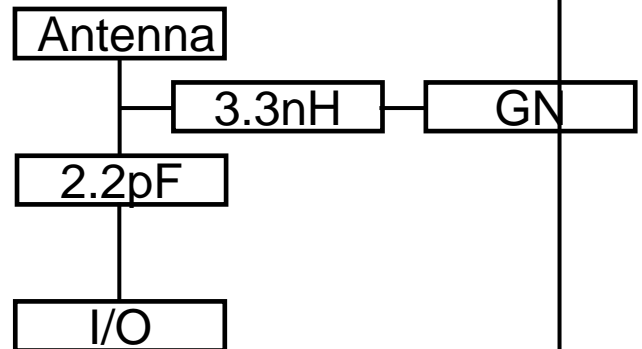
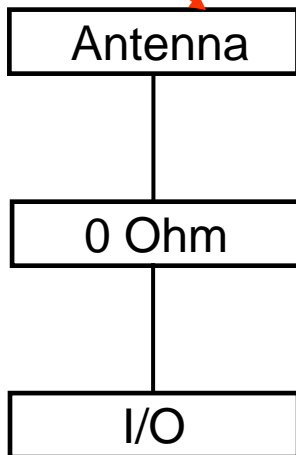
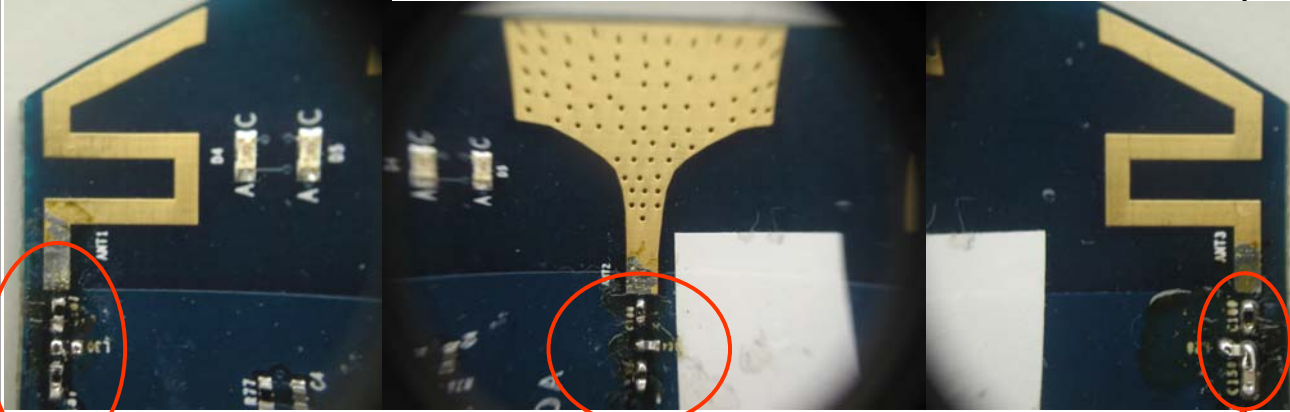


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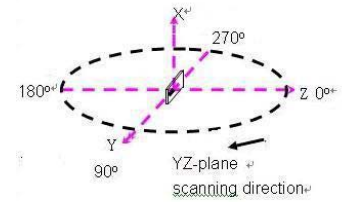
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### 3. Antenna Matching Circuit Diagram



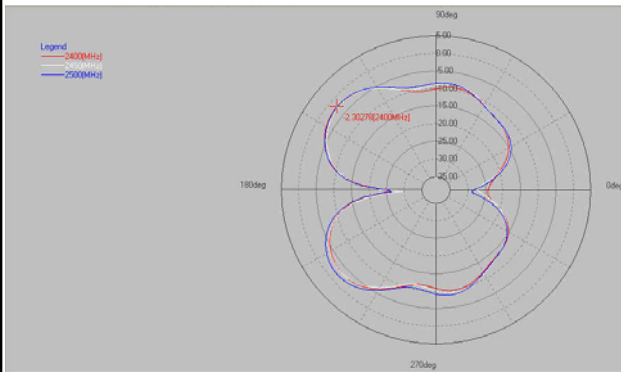
## 4. Radiation Patterns

### Y-Z Plane



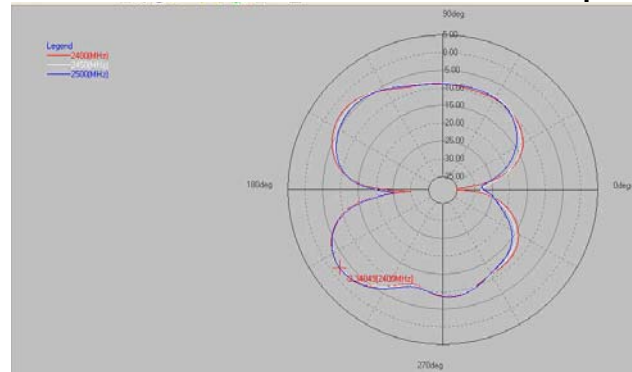
### Horizontal Polarization

#### LEFT



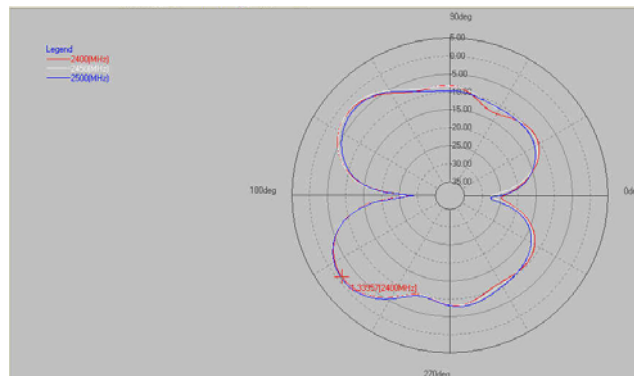
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-2.3	-8.36
2.45	-2.65	-8.41
2.5	-2.03	-7.82

#### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-2.34	-8.03
2.45	-2.58	-8.23
2.5	-2.36	-8.33

#### RIGHT



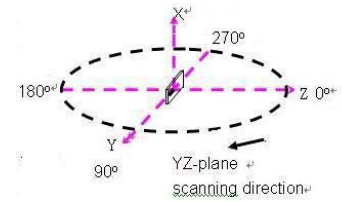
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-1.34	-7.52
2.45	-1.08	-7.3
2.5	-1.02	-7.55

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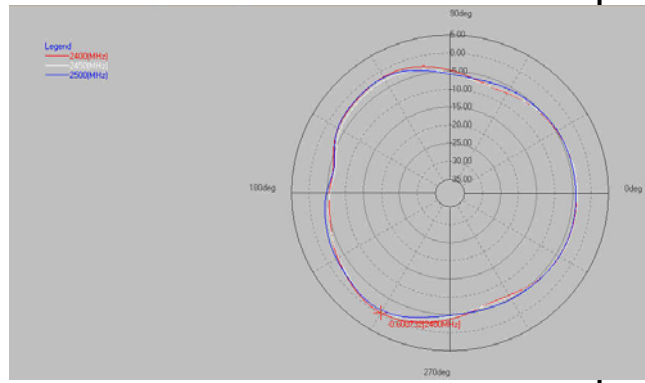
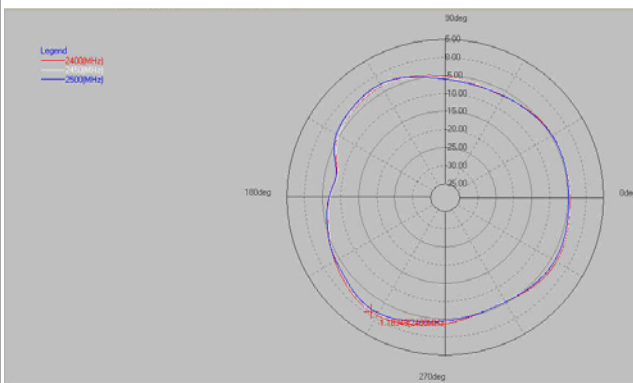
## Y-Z Plane



## Vertical Polarization

LEFT

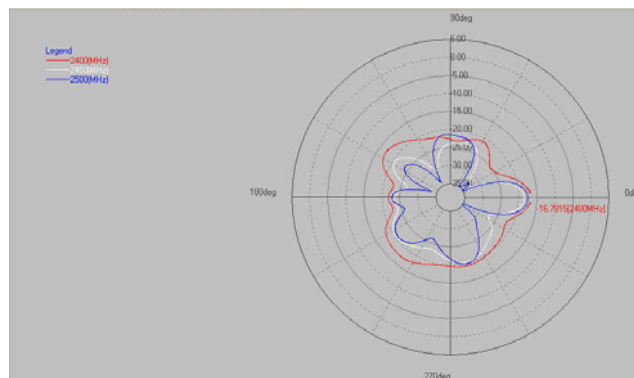
MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-1.18	-4.34
2.45	-1.32	-4.48
2.5	-1.82	-4.52

Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-16.78	-20.02
2.45	-18.52	-22.99
2.5	-17.54	-23.43

RIGHT



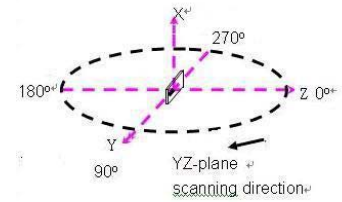
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-0.6	-3.81
2.45	-1.21	-4.17
2.5	-1.23	-3.92

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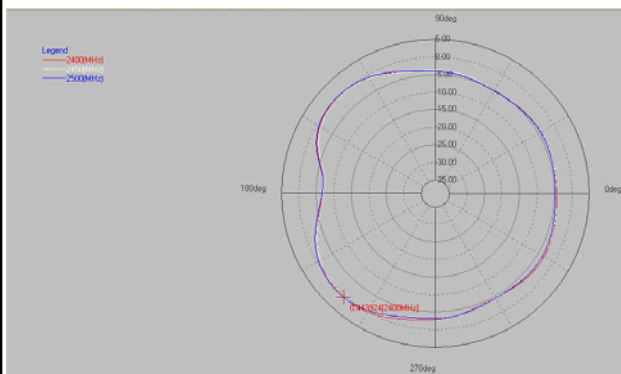
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## Y-Z Plane



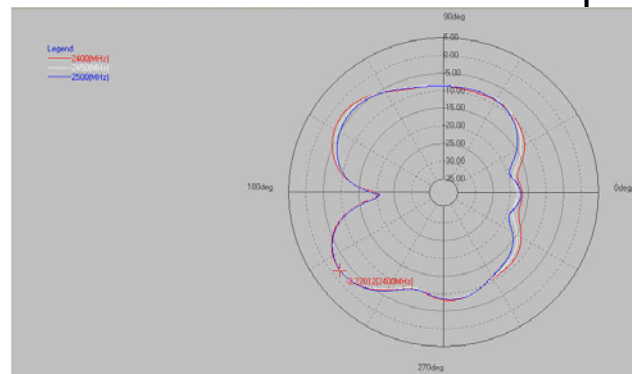
## TOTAL

### LEFT



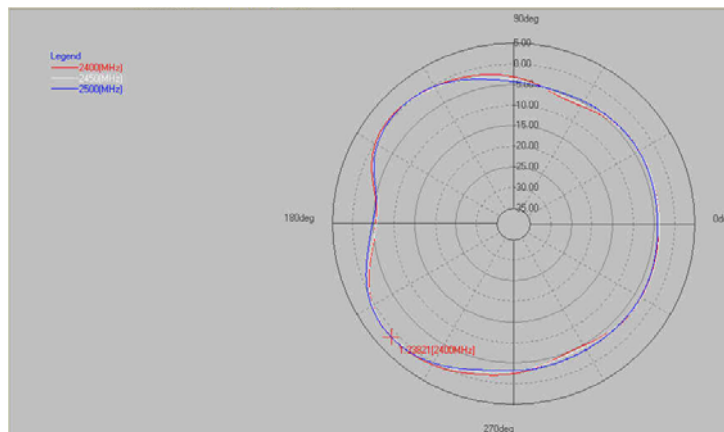
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	0.44	-2.89
2.45	0.31	-3
2.5	0.55	-2.85

### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-2.22	-7.76
2.45	-2.51	-8.08
2.5	-2.29	-8.2

### RIGHT



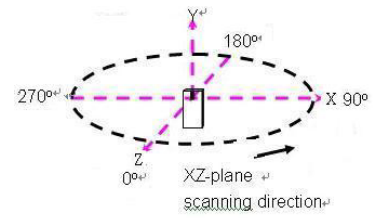
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	1.34	-2.27
2.45	1.22	-2.45
2.5	1.44	-2.35

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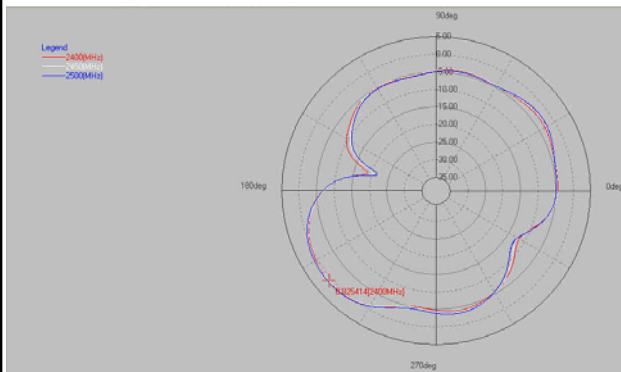
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## X-Z Plane



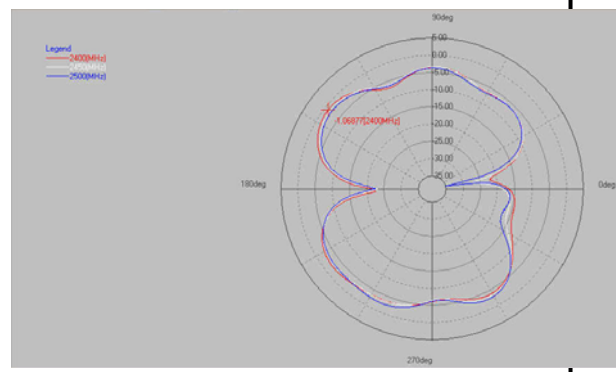
## Horizontal Polarization

### LEFT



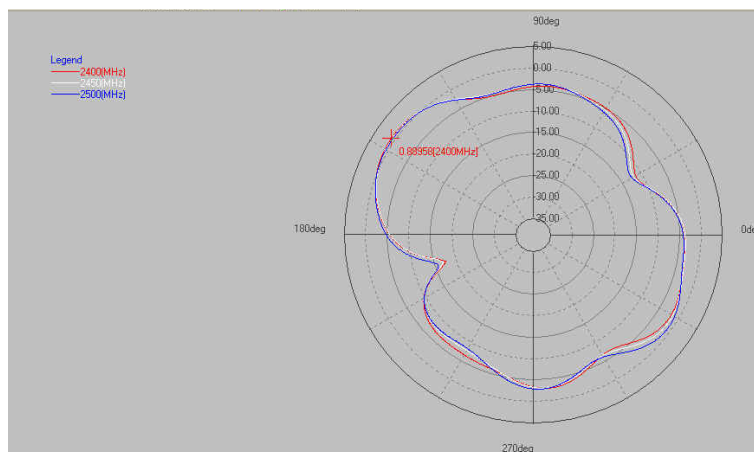
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	0.83	-4.14
2.45	0.85	-4.09
2.5	1.13	-3.98

### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-1.07	-5.48
2.45	-1.68	-5.63
2.5	-2.15	-5.66

### RIGHT



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	0.89	-4.07
2.45	0.71	-4.07
2.5	0.59	-4.01

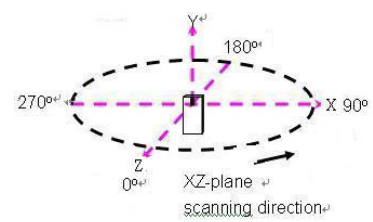


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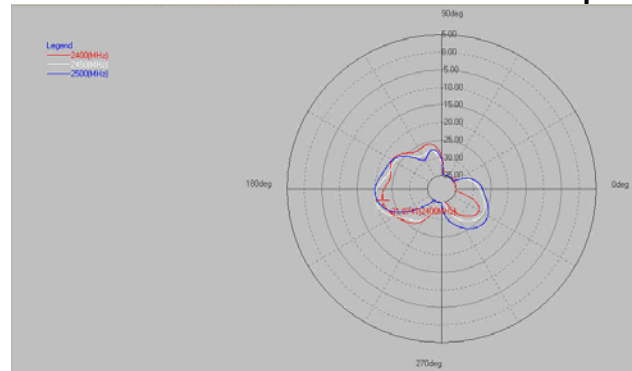
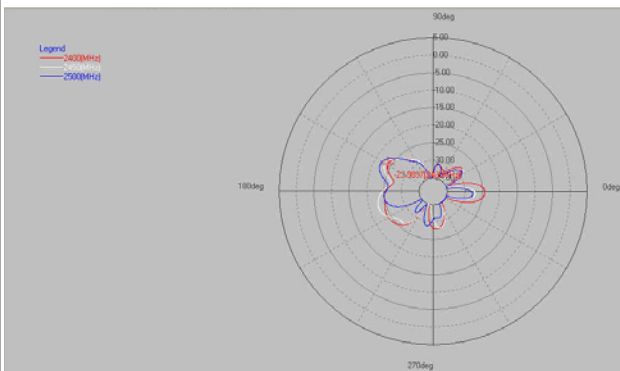
## X-Z Plane



## Vertical Polarization

### LEFT

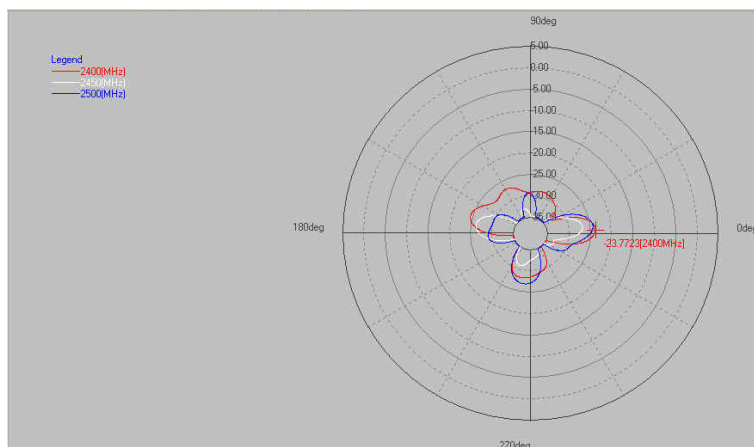
### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-23.99	-28.05
2.45	-22.74	-28.36
2.5	-22.1	-29.09

Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-21.87	-27.2
2.45	-19.77	-26.39
2.5	-20	-26.16

### RIGHT



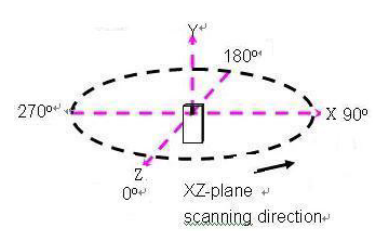
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-23.77	-28.91
2.45	-26.11	-31.99
2.5	-24.28	-30.36

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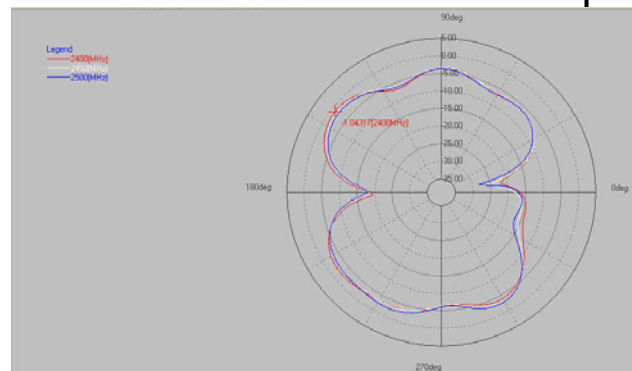
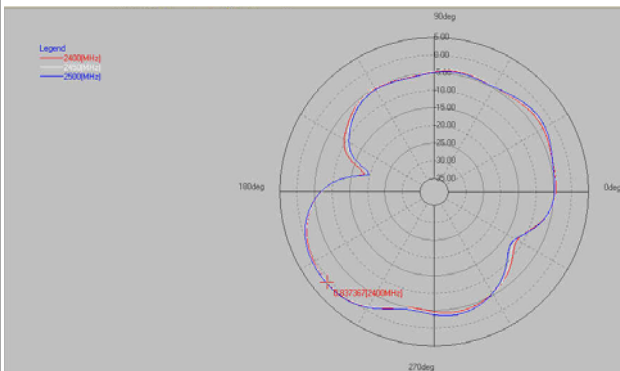
## X-Z Plane



## TOTAL

### LEFT

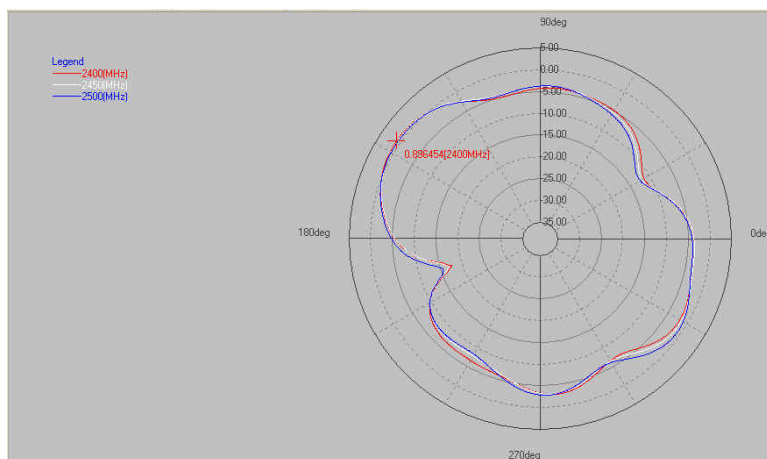
### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	0.84	-4.12
2.45	0.86	-4.08
2.5	1.13	-3.97

Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-1.04	-5.45
2.45	-1.66	-5.59
2.5	-2.12	-5.62

### RIGHT



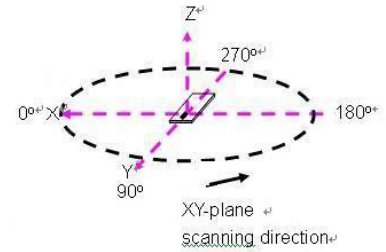
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	0.9	-4.06
2.45	0.71	-4.07
2.5	0.59	-4

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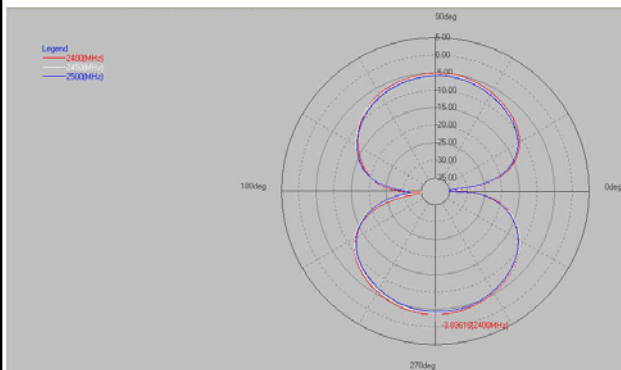
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## X-Y Plane



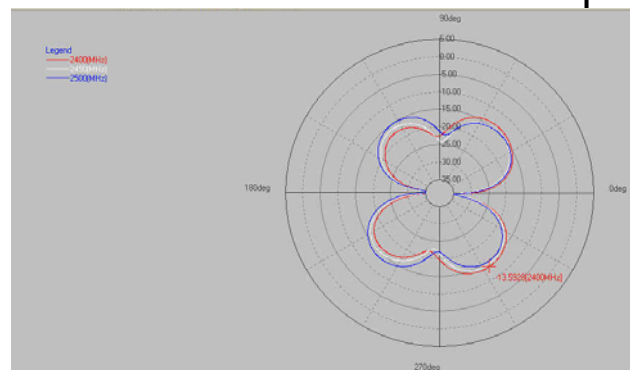
## Horizontal Polarization

### LEFT



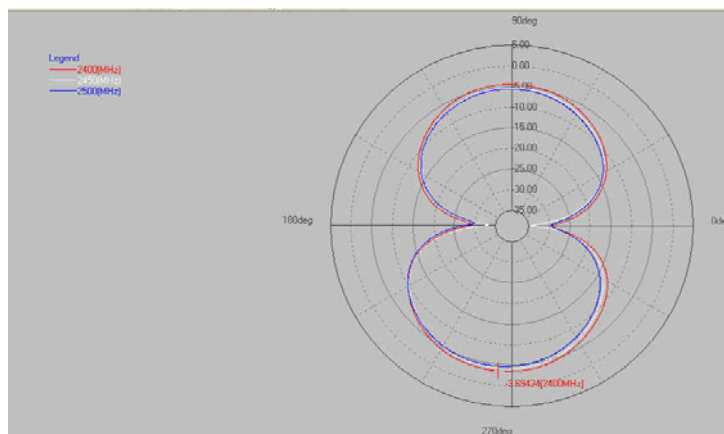
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.84	-7.97
2.45	-4.34	-8.26
2.5	-4.58	-8.63

### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-13.59	-17.71
2.45	-14.34	-17.96
2.5	-13.76	-17.49

### RIGHT



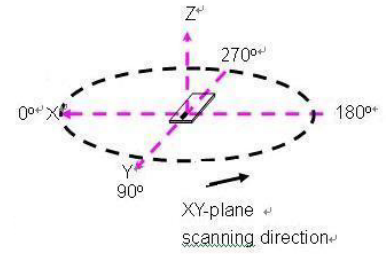
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.69	-7.61
2.45	-4.37	-8.39
2.5	-4.75	-8.71

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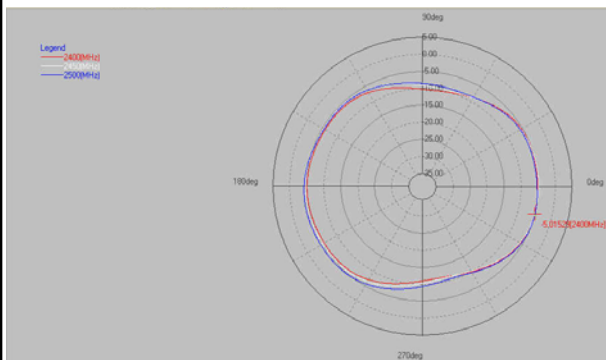
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## X-Y Plane



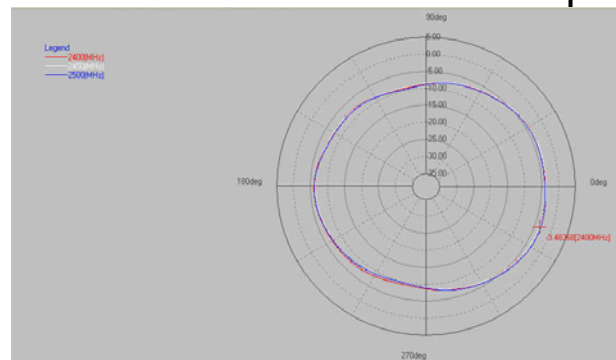
## Vertical Polarization

### LEFT



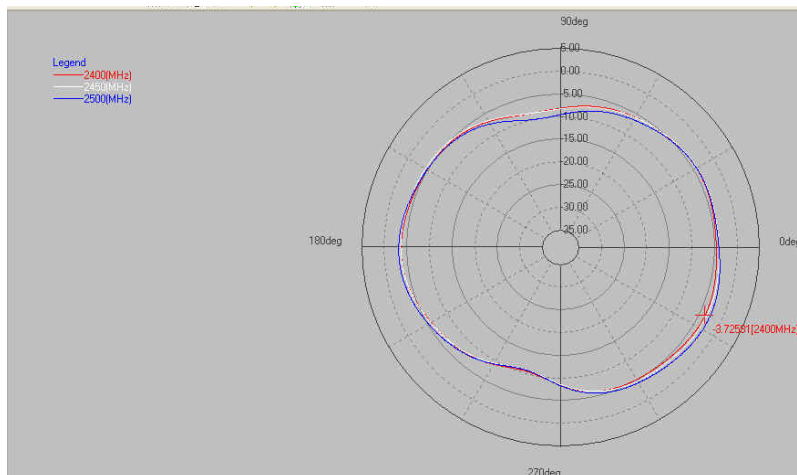
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-5.02	-6.89
2.45	-4.67	-6.53
2.5	-4.14	-6.29

### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.48	-6.3
2.45	-3.45	-6.38
2.5	-3.18	-6.4

### RIGHT



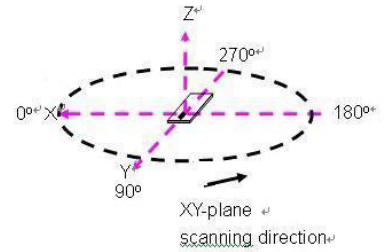
Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.73	-5.64
2.45	-3.3	-5.43
2.5	-2.63	-5.35

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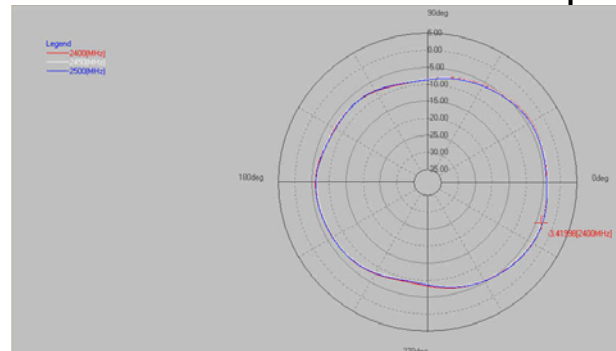
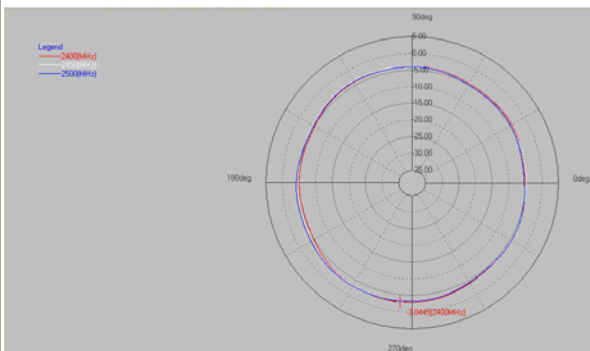
# X-Y Plane



## TOTAL

### LEFT

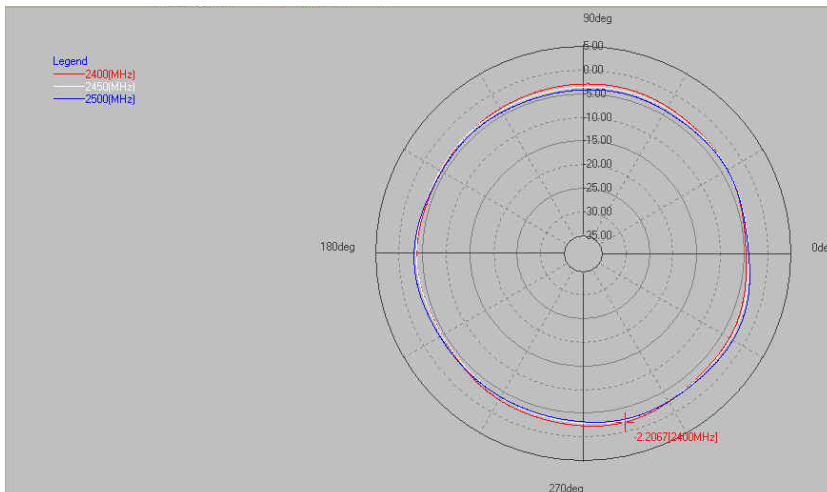
### MIDDLE



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.04	-4.38
2.45	-3.26	-4.3
2.5	-3.25	-4.3

Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-3.42	-6
2.45	-3.41	-6.09
2.5	-3.13	-6.07

### RIGHT



Frequency(GHz)	Max Value(dBi)	Average(dBi)
2.4	-2.21	-3.5
2.45	-2.58	-3.65
2.5	-2.42	-3.7

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## 5. Measurement Results

Antenna	Frequency (GHz)	Y-Z Plane					
		Horizontal (dBi)		Vertical (dBi)		Total(dBi)	
		Max Value	Average	Max Value	Average	Max Value	Average
LEFT	2.4	-2.3	-8.36	-1.18	-4.34	0.44	-2.89
	2.45	-2.65	-8.41	-1.32	-4.48	0.31	-3
	2.5	-2.03	-7.82	-1.82	-4.52	0.55	-2.85
MIDDLE	2.4	-2.34	-8.03	-16.78	-20.02	-2.22	-7.76
	2.45	-2.58	-8.23	-18.52	-22.99	-2.51	-8.08
	2.5	-2.36	-8.33	-17.54	-23.43	-2.29	-8.2
RIGHT	2.4	-1.34	-7.52	-0.6	-3.81	1.34	-2.27
	2.45	-1.08	-7.3	-1.21	-4.17	1.22	-2.45
	2.5	-1.02	-7.55	-1.23	-3.92	1.44	-2.35

Antenna	Frequency (GHz)	X-Z Plane					
		Horizontal (dBi)		Vertical (dBi)		Total(dBi)	
		Max Value	Average	Max Value	Average	Max Value	Average
LEFT	2.4	0.83	-4.14	-23.99	-28.05	0.84	-4.12
	2.45	0.85	-4.09	-22.74	-28.36	0.86	-4.08
	2.5	1.13	-3.98	-22.1	-29.09	1.13	-3.97
MIDDLE	2.4	-1.07	-5.48	-21.87	-27.2	-1.04	-5.45
	2.45	-1.68	-5.63	-19.77	-26.39	-1.66	-5.59
	2.5	-2.15	-5.66	-20	-26.16	-2.12	-5.62
RIGHT	2.4	0.89	-4.07	-23.77	-28.91	0.9	-4.06
	2.45	0.71	-4.07	-26.11	-31.99	0.71	-4.07
	2.5	0.59	-4.01	-24.28	-30.36	0.59	-4

Antenna	Frequency (GHz)	X-Y Plane					
		Horizontal (dBi)		Vertical (dBi)		Total(dBi)	
		Max Value	Average	Max Value	Average	Max Value	Average
LEFT	2.4	-3.84	-7.97	-5.02	-6.89	-3.04	-4.38
	2.45	-4.34	-8.26	-4.67	-6.53	-3.26	-4.3
	2.5	-4.58	-8.63	-4.14	-6.29	-3.25	-4.3
MIDDLE	2.4	-13.59	-17.71	-3.48	-6.3	-3.42	-6
	2.45	-14.34	-17.96	-3.45	-6.38	-3.41	-6.09
	2.5	-13.76	-17.49	-3.18	-6.4	-3.13	-6.07
RIGHT	2.4	-3.69	-7.61	-3.73	-5.64	-2.21	-3.5
	2.45	-4.37	-8.39	-3.3	-5.43	-2.58	-3.65
	2.5	-4.75	-8.71	-2.63	-5.35	-2.42	-3.7