Antenna Test Report

For

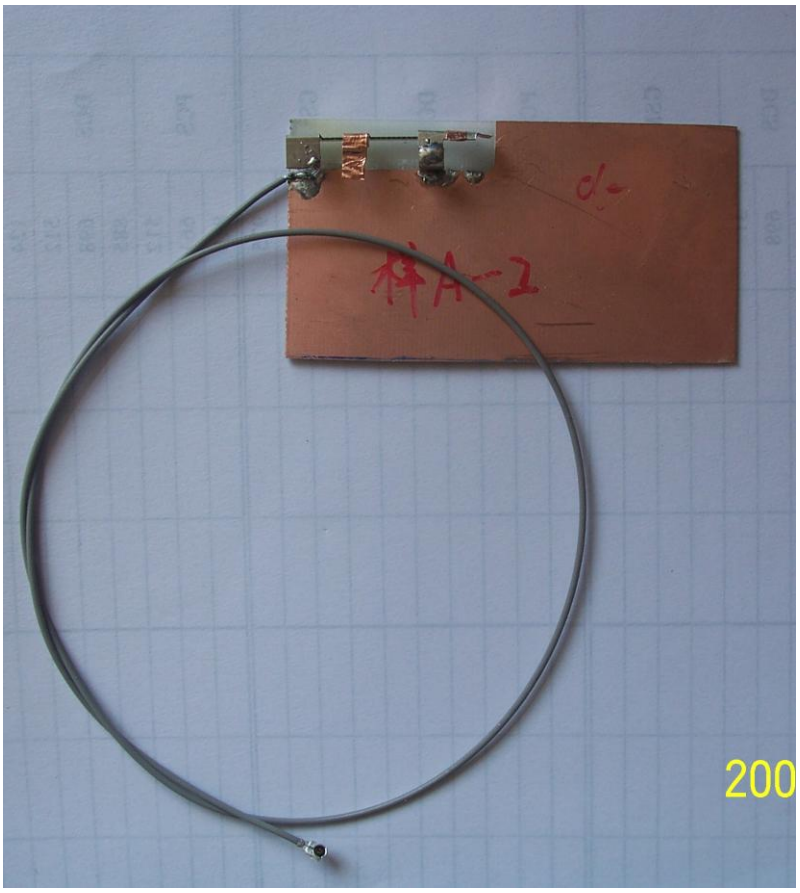
Intel project

Customer	**Intel**	**Project**	**---**
Band	**2.3~2.7&3.3~3.8 &5.15~5.85GHz**	**Color**	**---**
SUC PN	**---**	**Version**	

Issued by		**Checked by**	
Confirmed by		**Date**	**2007/3/30**

1 Summary of the Test results

The test fixture was made for further testing, which was shown below.



2. Test Result

2.1 RF Performance

2.1.1 S11 Measurement

The S11 parameter was performed using a Hewlett Packard E5071B Network Analyzer. We use a 45cm long 1.13 cable to mitigate surface currents on the outside of the testing cable.

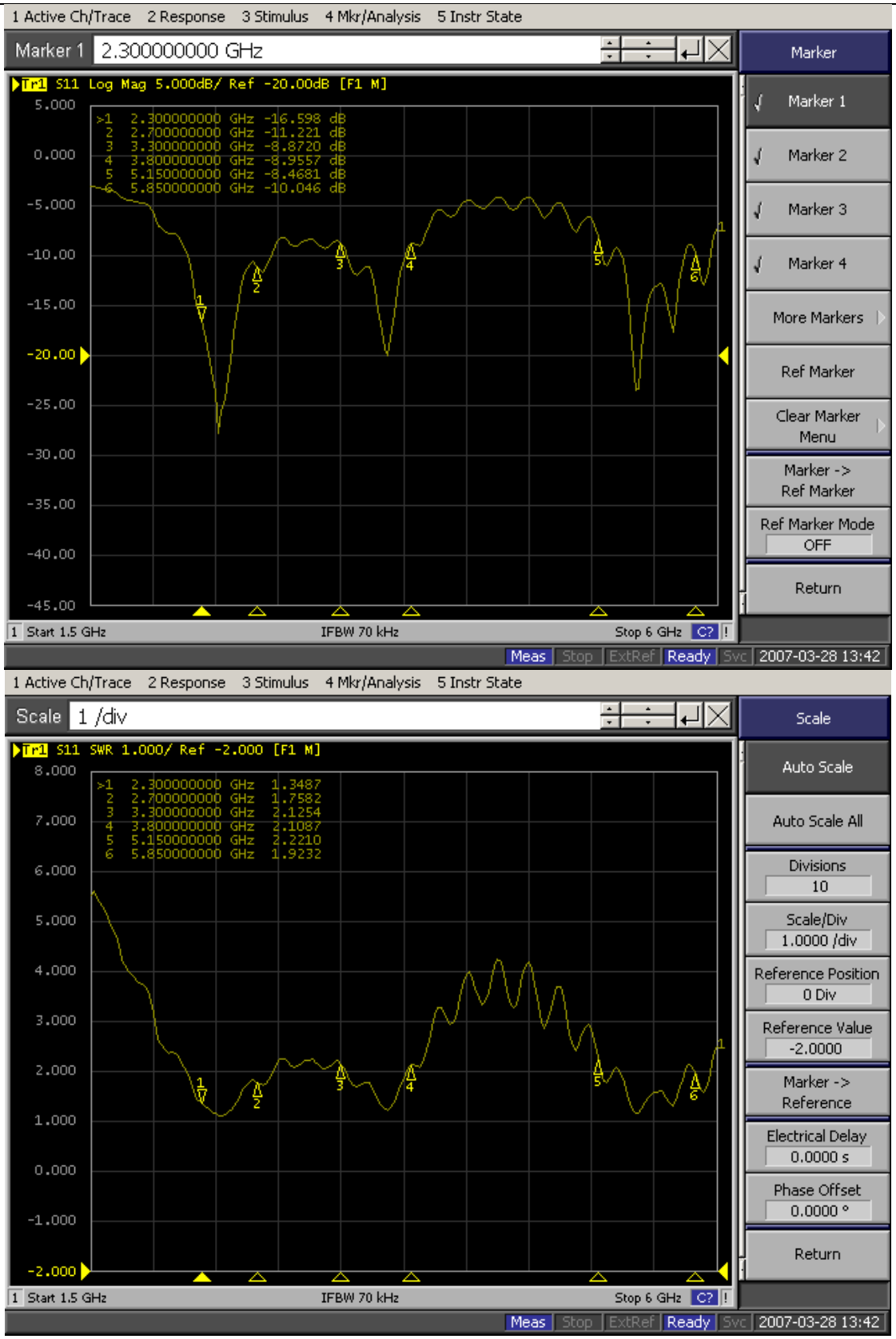
We used no matching circuit .

The S11 parameter was shown below, you could check it.

SUC ANT S11 parameter Summary						
Band	**2.3 ~2.7&3.3~3.8&5.15~5.85(GHz)**					
	2.3	2.7	3.3	3.8	5.15	5.85
R.L (dB)	-16.59	-11.22	-8.87	-8.96	-8.46	-10.04
VSWR	1.35	1.76	2.13	2.11	2.22	1.92

You could also check in detail in below figures.

S11 parameter of sample antenna tested in free space


1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Marker 1 2.300000000 GHz
Tr1 S11 Log Mag 5.000dB/ Ref -20.00dB [F1 M]
>1 2.300000000 GHz -16.598 dB
2 2.700000000 GHz -11.221 dB
3 3.300000000 GHz -8.8720 dB
4 3.800000000 GHz -8.9557 dB
5 5.150000000 GHz -8.4681 dB
6 5.850000000 GHz -10.046 dB
5.000
0.000
-5.000
-10.00
-15.00
-20.00
-25.00
-30.00
-35.00
-40.00
-45.00
1 Start 1.5 GHz
IFBW 70 kHz
Stop 6 GHz
Marker
Marker 1
Marker 2
Marker 3
Marker 4
More Markers
Ref Marker
Clear Marker Menu
Marker -> Ref Marker
Ref Marker Mode OFF
Return
Meas Stop ExtRef Ready Svc 2007-03-28 13:42
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Scale 1 /div
Tr1 S11 SWR 1.000/ Ref -2.000 [F1 M]
>1 2.300000000 GHz 1.3487
2 2.700000000 GHz 1.7582
3 3.300000000 GHz 2.1254
4 3.800000000 GHz 2.1087
5 5.150000000 GHz 2.2210
6 5.850000000 GHz 1.9232
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
1 Start 1.5 GHz
IFBW 70 kHz
Stop 6 GHz
Scale
Auto Scale
Auto Scale All
Divisions 10
Scale/Div 1.0000 /div
Reference Position 0 Div
Reference Value -2.0000
Marker -> Reference
Electrical Delay 0.0000 s
Phase Offset 0.0000 °
Return
Meas Stop ExtRef Ready Svc 2007-03-28 13:42

2.1.2 Radiation pattern and Gain Measurement

An anechoic chamber was used to measure radiation pattern and antenna Gain. SUC's chamber was working from 700MHz to 6GHz. The chamber provides less than –40 dB reflectivity from 700 MHz through 6 GHz. A standard horn was used to calibrate the chamber, and we also use a decoupling sleeve to reduce feed line radiation, so we can measure the antenna gain accurately.

The Gain parameter was shown below, you could check it.

SUC ANT Gain parameter Summary							
Band	**2.4(GHz)**						
	2.3	2.35	2.4	2.45	2.5	2.6	2.7
MAX Gain (dBi)	3.22	3.54	3.24	2.97	3.16	3.47	2.8
Efficiency (%)	74.48	73.72	73.39	72.52	74.29	88.94	74.38

SUC ANT Gain parameter Summary			
Band	**3.4 (GHz)**		
	3.3	3.5	3.8
MAX Gain (dBi)	4.54	3.59	4.38
Efficiency (%)	70.9	72.85	77.4

SUC ANT Gain parameter Summary						
Band	**5.4 (GHz)**					
	5.15	5.25	5.35	5.45	5.75	5.85
MAX Gain (dBi)	3.64	2.57	3.73	4.77	4.43	4.97
Efficiency (%)	61.74	60.1	78.92	85.58	78.31	69.99

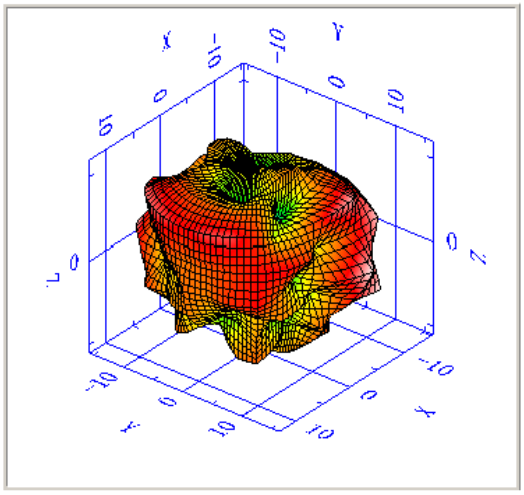
The radiation pattern was shown below, you could check it.

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:00:23**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2300.00	
TRP (dBm)	Peak EIRP (dBm)
-1.28	3.22
Efficiency (%)	Max. Power (dBm)
74.48	3.22
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.85	-13.68
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.66	-2.17
Directivity (dBi)	Max. / Min. Ratio (dB)
4.5	16.89
Gain (dBi)	Max. / Avg. Ratio (dB)
3.22	5.39
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.28	-11.51

2.3GHz

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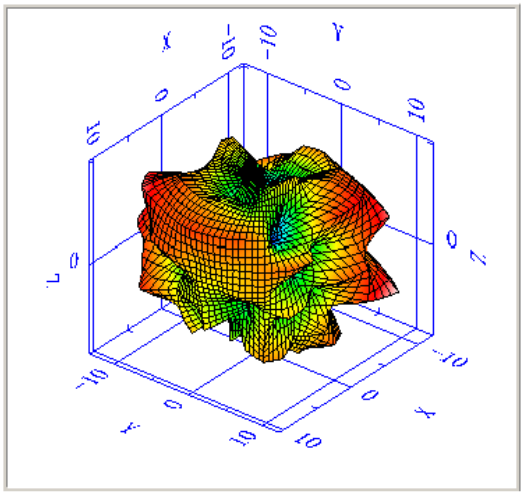
Location: **RF Chamber** Date: **2007-3-30** Time: **11:00:37**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2350.00	
TRP (dBm)	Peak EIRP (dBm)
-1.32	3.54
Efficiency (%)	Max. Power (dBm)
73.72	3.54
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.89	-11.17
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.76	-2.18
Directivity (dBi)	Max. / Min. Ratio (dB)
4.87	14.72
Gain (dBi)	Max. / Avg. Ratio (dB)
3.54	5.72
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.32	-9

2.35GHz

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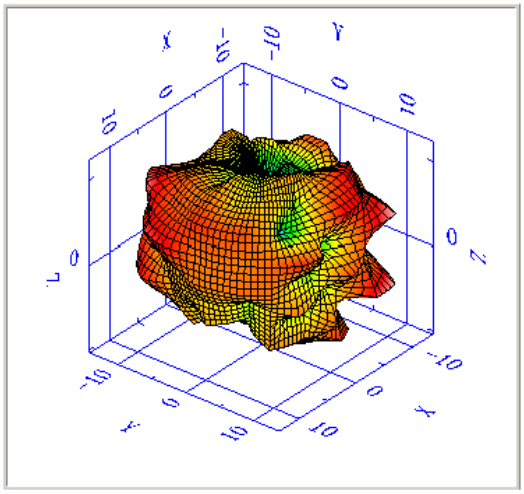
Location: **RF Chamber** Date: **2007-3-30** Time: **11:01:28**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2400.00	
TRP (dBm)	Peak EIRP (dBm)
-1.34	3.24
Efficiency (%)	Max. Power (dBm)
73.39	3.24
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.89	-13.08
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.79	-2.21
Directivity (dBi)	Max. / Min. Ratio (dB)
4.58	16.31
Gain (dBi)	Max. / Avg. Ratio (dB)
3.24	5.45
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.34	-10.87

2.4GHz

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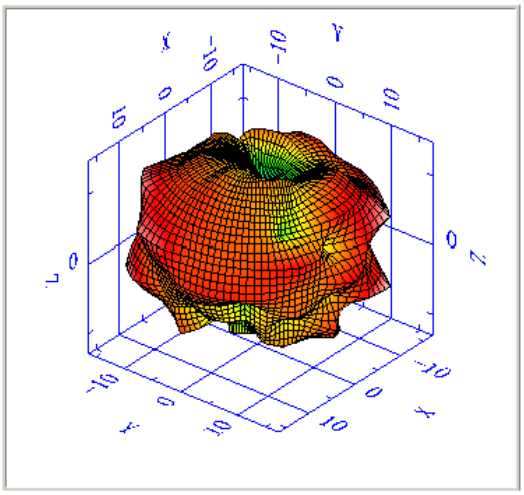
Location: **RF Chamber** Date: **2007-3-30** Time: **11:01:34**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2450.00	
TRP (dBm)	Peak EIRP (dBm)
-1.4	2.97
Efficiency (%)	Max. Power (dBm)
72.52	2.97
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.87	-16.47
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.71	-2.28
Directivity (dBi)	Max. / Min. Ratio (dB)
4.37	19.44
Gain (dBi)	Max. / Avg. Ratio (dB)
2.97	5.25
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.4	-14.19

2.45GHz

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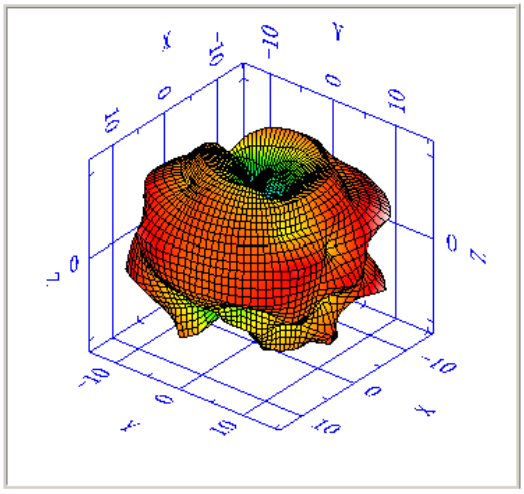
Location: **RF Chamber** Date: **2007-3-30** Time: **11:01:41**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2500.00	
TRP (dBm)	Peak EIRP (dBm)
-1.29	3.16
Efficiency (%)	Max. Power (dBm)
74.29	3.16
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.71	-14.26
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.61	-2.22
Directivity (dBi)	Max. / Min. Ratio (dB)
4.45	17.42
Gain (dBi)	Max. / Avg. Ratio (dB)
3.16	5.38
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.29	-12.04

2.5GHz

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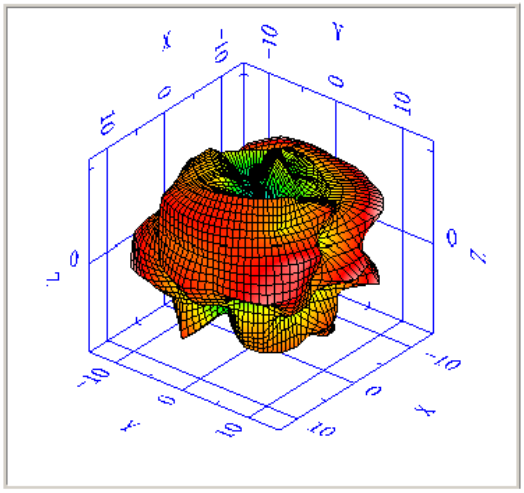
Location: **RF Chamber** Date: **2007-3-30** Time: **11:01:48**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2600.00	
TRP (dBm)	Peak EIRP (dBm)
-0.51	3.47
Efficiency (%)	Max. Power (dBm)
88.94	3.47
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-0.91	-11.83
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-1.82	-1.32
Directivity (dBi)	Max. / Min. Ratio (dB)
3.98	15.29
Gain (dBi)	Max. / Avg. Ratio (dB)
3.47	4.78
Average Gain (dB)	Min. / Avg. Ratio (dB)
-0.51	-10.51

2.6GHz

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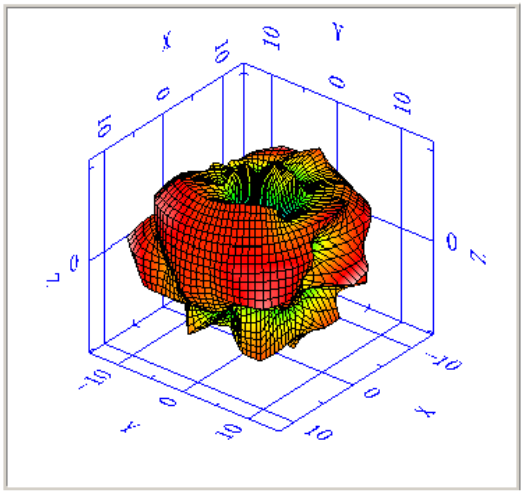
Location: **RF Chamber** Date: **2007-3-30** Time: **11:01:54**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
2700.00	
TRP (dBm)	Peak EIRP (dBm)
-1.29	2.8
Efficiency (%)	Max. Power (dBm)
74.38	2.8
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.73	-12.24
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.52	-1.98
Directivity (dBi)	Max. / Min. Ratio (dB)
4.09	15.05
Gain (dBi)	Max. / Avg. Ratio (dB)
2.8	4.78
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.29	-10.27

2.7GHz

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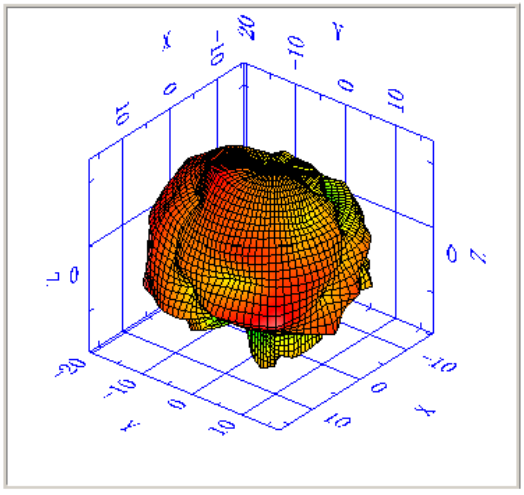
Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:03**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
3300.00	
TRP (dBm)	Peak EIRP (dBm)
-1.49	4.54
Efficiency (%)	Max. Power (dBm)
70.9	4.54
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-2.18	-16.7
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.96	-2.05
Directivity (dBi)	Max. / Min. Ratio (dB)
6.04	21.25
Gain (dBi)	Max. / Avg. Ratio (dB)
4.54	6.59
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.49	-14.65

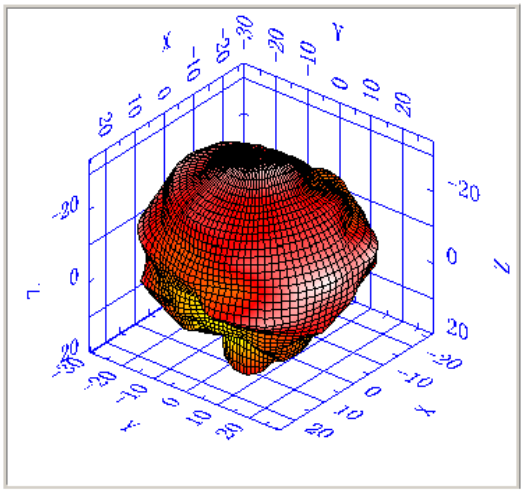
3.3GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:14**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
3500.00	
TRP (dBm)	Peak EIRP (dBm)
-1.38	3.59
Efficiency (%)	Max. Power (dBm)
72.85	3.59
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-2.26	-27.9
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-3.25	-1.23
Directivity (dBi)	Max. / Min. Ratio (dB)
4.97	31.49
Gain (dBi)	Max. / Avg. Ratio (dB)
3.59	4.82
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.38	-26.67

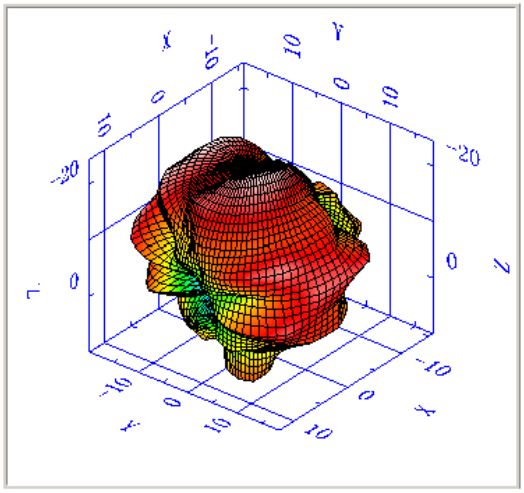
3.5GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:21**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
3800.00	
TRP (dBm)	Peak EIRP (dBm)
-1.11	4.38
Efficiency (%)	Max. Power (dBm)
77.4	4.38
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-2.31	-16.55
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-3.34	-0.69
Directivity (dBi)	Max. / Min. Ratio (dB)
5.5	20.93
Gain (dBi)	Max. / Avg. Ratio (dB)
4.38	5.07
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.11	-15.86

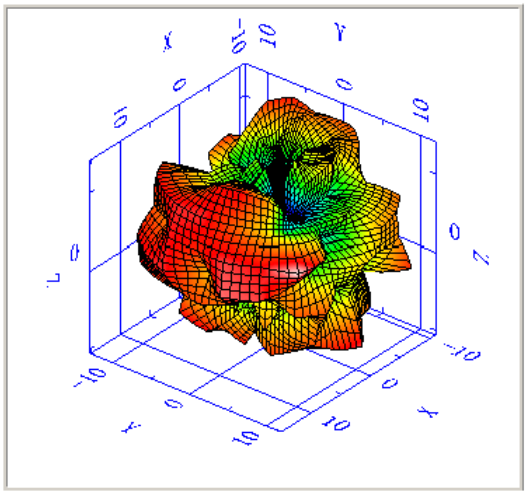
3.8GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:28**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
5150.00	
TRP (dBm)	Peak EIRP (dBm)
-2.09	3.64
Efficiency (%)	Max. Power (dBm)
61.74	3.64
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-2.84	-13.26
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-3.98	-2.36
Directivity (dBi)	Max. / Min. Ratio (dB)
5.73	16.89
Gain (dBi)	Max. / Avg. Ratio (dB)
3.64	5.99
Average Gain (dB)	Min. / Avg. Ratio (dB)
-2.09	-10.9

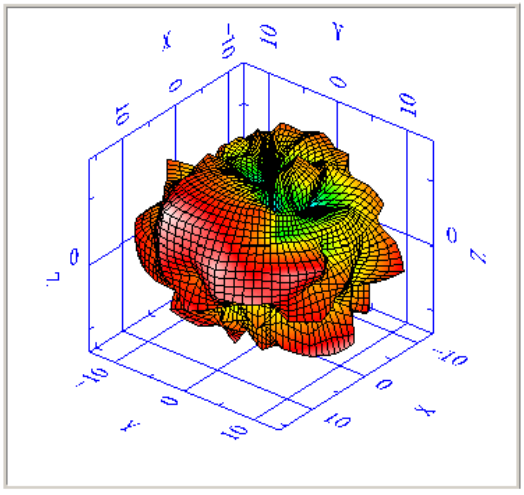
5.15GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:36**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
5250.00	
TRP (dBm)	Peak EIRP (dBm)
-2.21	2.57
Efficiency (%)	Max. Power (dBm)
60.1	2.57
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-2.99	-15.24
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-4.2	-2.57
Directivity (dBi)	Max. / Min. Ratio (dB)
4.78	17.81
Gain (dBi)	Max. / Avg. Ratio (dB)
2.57	5.14
Average Gain (dB)	Min. / Avg. Ratio (dB)
-2.21	-12.67

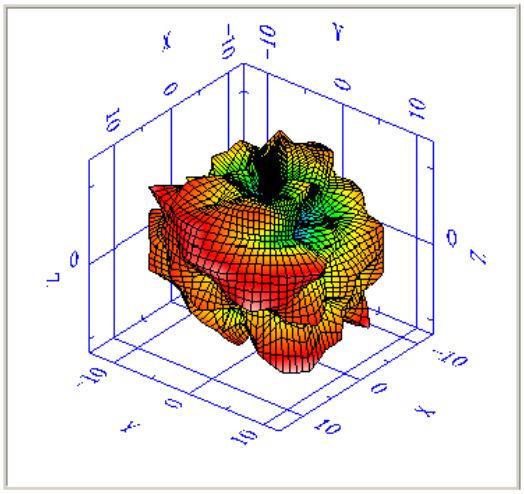
5.25GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:44**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
5350.00	
TRP (dBm)	Peak EIRP (dBm)
-1.03	3.73
Efficiency (%)	Max. Power (dBm)
78.92	3.73
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.79	-12.15
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-3.07	-1.42
Directivity (dBi)	Max. / Min. Ratio (dB)
4.76	15.88
Gain (dBi)	Max. / Avg. Ratio (dB)
3.73	5.15
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.03	-10.73

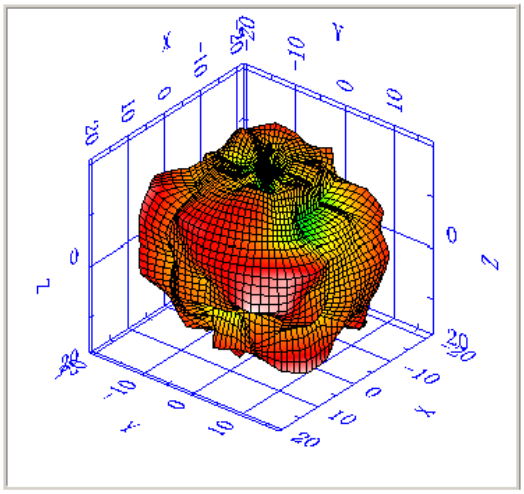
5.35GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:02:52**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
5450.00	
TRP (dBm)	Peak EIRP (dBm)
-0.68	4.77
Efficiency (%)	Max. Power (dBm)
85.58	4.77
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.36	-19.17
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-2.68	-1.07
Directivity (dBi)	Max. / Min. Ratio (dB)
5.44	23.94
Gain (dBi)	Max. / Avg. Ratio (dB)
4.77	5.83
Average Gain (dB)	Min. / Avg. Ratio (dB)
-0.68	-18.11

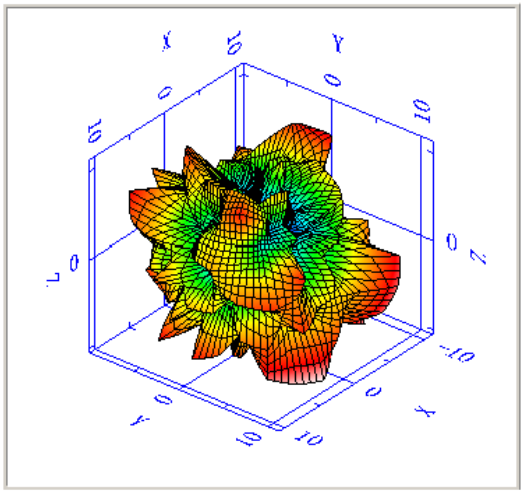
5.45GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:03:21**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
5750.00	
TRP (dBm)	Peak EIRP (dBm)
-1.06	4.43
Efficiency (%)	Max. Power (dBm)
78.31	4.43
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-1.82	-10.02
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-3.15	-1.21
Directivity (dBi)	Max. / Min. Ratio (dB)
5.49	14.45
Gain (dBi)	Max. / Avg. Ratio (dB)
4.43	5.64
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.06	-8.81

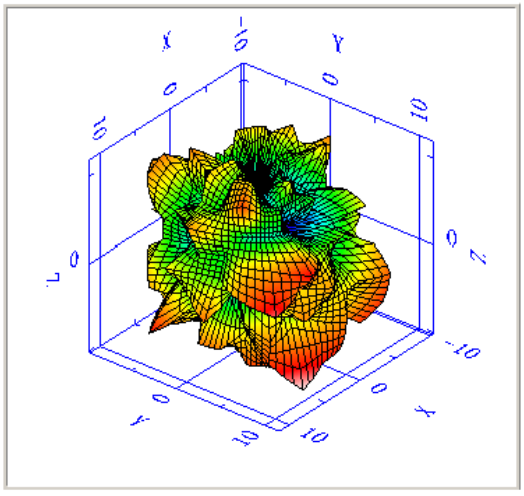
5.75GHz

S

Location: **RF Chamber** Date: **2007-3-30** Time: **11:03:37**

Temperatuer ( ): **22.00** Humidity (%): **65.00** Approved by:

Total View



Frequency (MHz)	
5850.00	
TRP (dBm)	Peak EIRP (dBm)
-1.55	4.97
Efficiency (%)	Max. Power (dBm)
69.99	4.97
NHPRP +/- 45 (dBm)	Min. Power (dBm)
-2.42	-10.66
NHPRP +/- 30 (dBm)	Avg. Power (dBm)
-3.81	-1.54
Directivity (dBi)	Max. / Min. Ratio (dB)
6.52	15.63
Gain (dBi)	Max. / Avg. Ratio (dB)
4.97	6.51
Average Gain (dB)	Min. / Avg. Ratio (dB)
-1.55	-9.12

5.85GHz