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Antenna Evaluation Report

Customer	**GoldTek**
Project	**GT2000**
Product Description	**GSM Antenna** **BT Antenna** **WiFi Antenna**
Sample Version	**GSM Metal PIFA V3** **BT EAM-S-0300-2** **WiFi EAM-S-0300-2**

Report Date	2009/07/06	**Prepared by**	Alex Tsai
Report Version	A3	**Checked by**	Alan Chen
Request Form No.	RFN-970024	**Approved by**	Jimmy Su

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Purpose

This report is the test results of metal PIFA for GSM, BT and WiFi band. All performance is to meet the requirement of GT2000 structure, as shows Product Overview.

Contents

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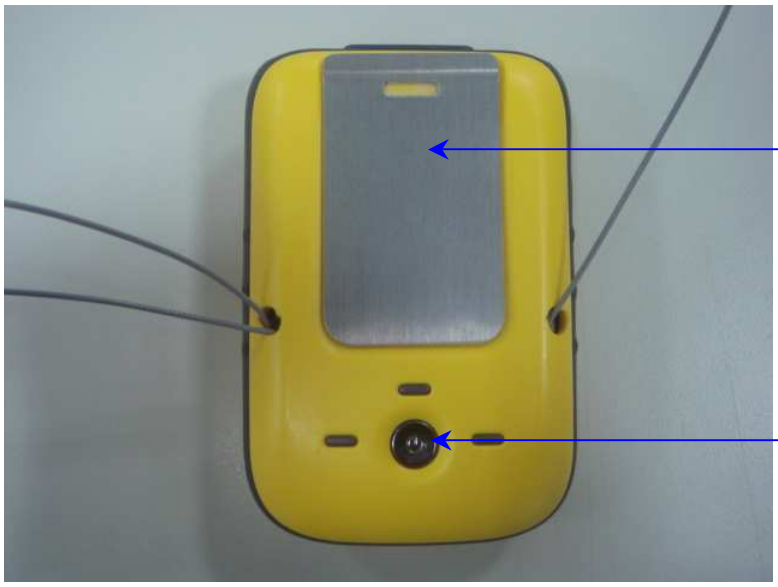
Product Overview



Front view

Antenna position

Antenna	Application	Band (MHz)
GSM	Penta Band	824 ~ 960 1710 ~ 2170
BT		2400 ~ 2500
WiFi		2400 ~ 2500

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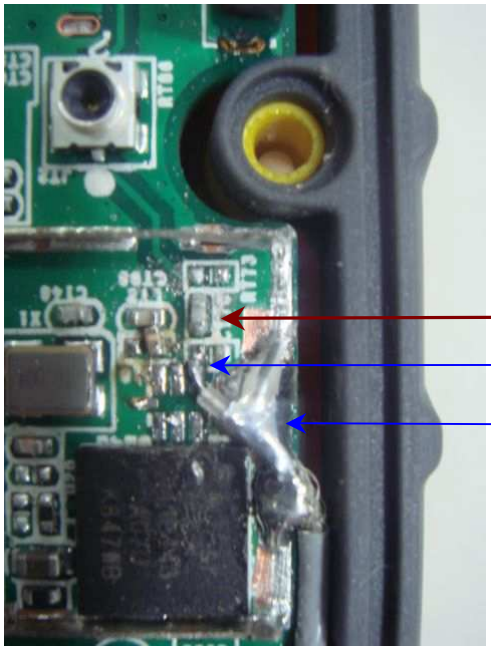
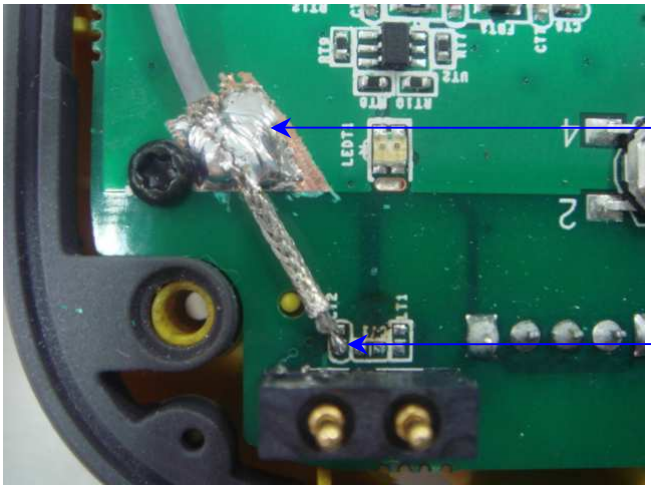
Position for Feed point and Ground point

Total View

WiFi Ant.



BT Ant.



GSM Ant.

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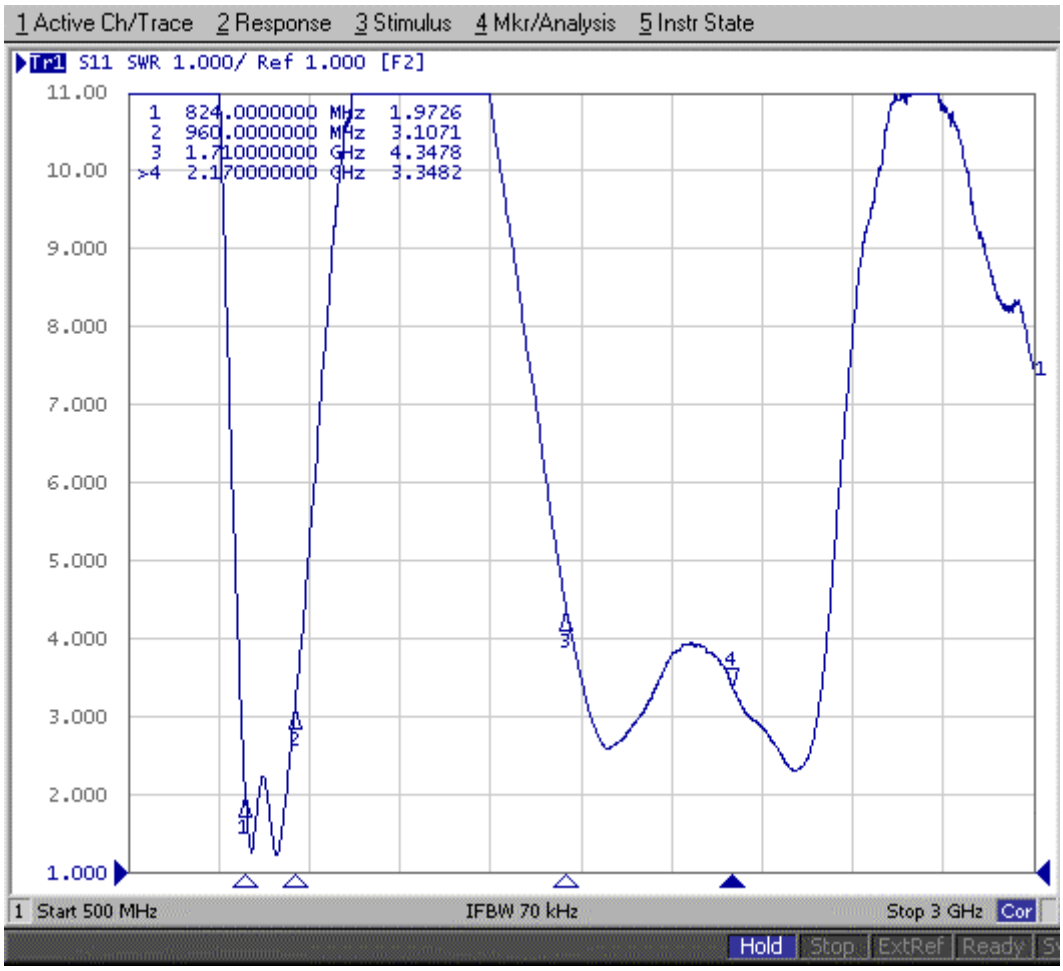
GSM Antenna

Test Results

Penta-Band		
Frequency Range (MHz)	824 ~ 960	1710 ~ 2170
Efficiency Range (%)	40.3 ~ 65.1	49.5 ~ 64.8
Average Gain Range (dBi)	-3.94 ~ -1.87	-3.05 ~ -1.87
VSWR	< 3.5	< 4.5

GSM Antenna VSWR



Freq. (MHz)	824	960	1710	2170
VSWR	1.9	3.1	4.3	3.3

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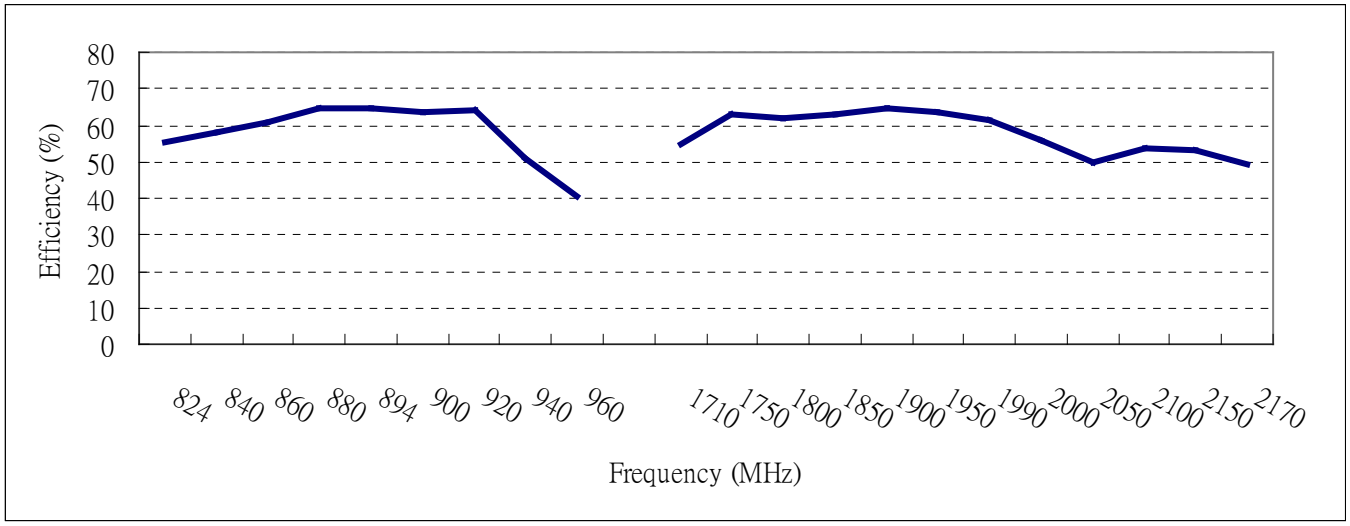
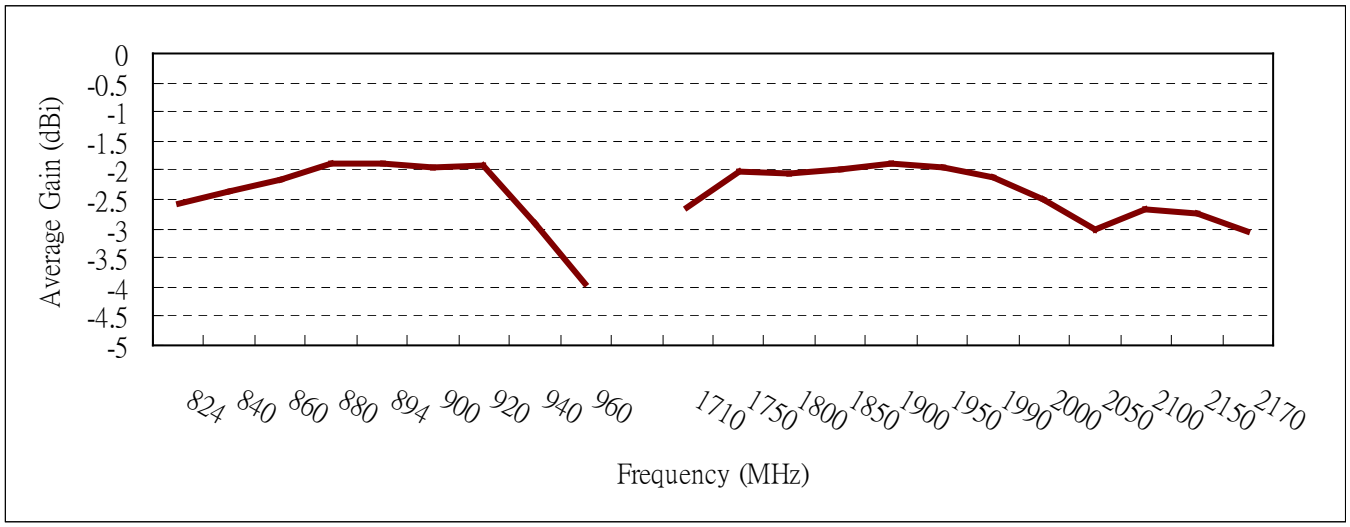
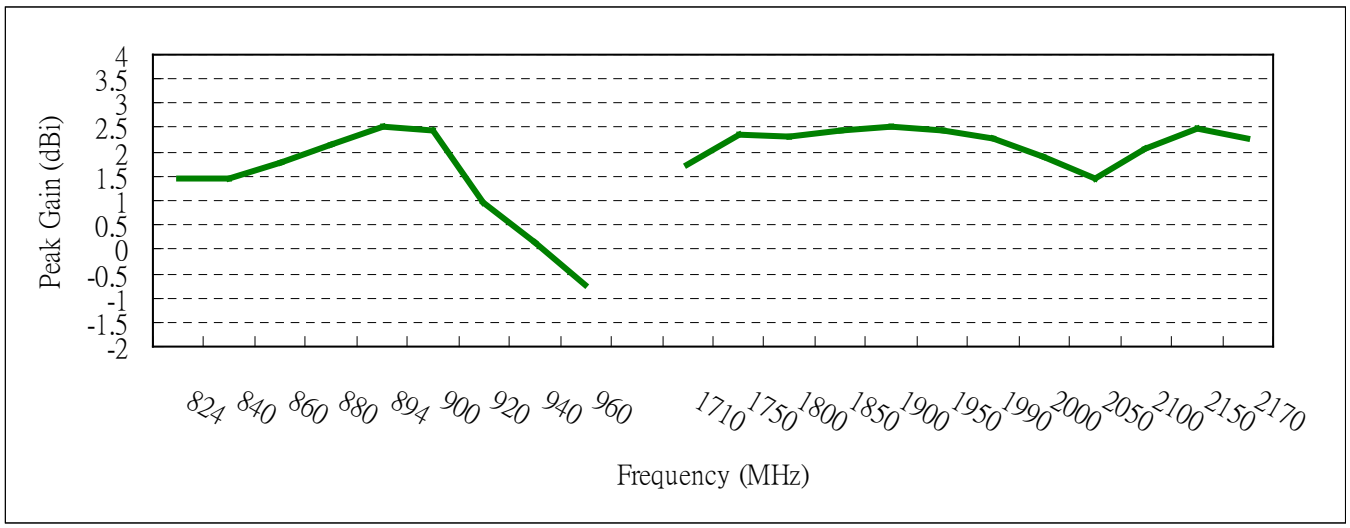
GSM Antenna Efficiency, Average Gain and Peak Gain







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Freq. (MHz)	Gain Data		
	Main		
	Peak Gain (dBi)	Average Gain (dBi)	Efficiency (%)
824	1.45	-2.55	55.5
840	1.44	-2.36	58.0
860	1.78	-2.15	60.9
880	2.15	-1.89	64.6
894	2.53	-1.87	65.1
900	2.43	-1.95	63.7
920	0.97	-1.91	64.3
940	0.13	-2.91	51.1
960	-0.74	-3.94	40.3
1710	1.73	-2.62	54.6
1750	2.34	-2.02	62.7
1800	2.31	-2.06	62.1
1850	2.42	-1.99	63.1
1900	2.53	-1.87	64.8
1950	2.43	-1.95	63.7
1990	2.28	-2.11	61.5
2000	1.88	-2.51	56.0
2050	1.44	-3.00	50.0
2100	2.07	-2.68	53.9
2150	2.49	-2.75	53.0
2170	2.27	-3.05	49.5

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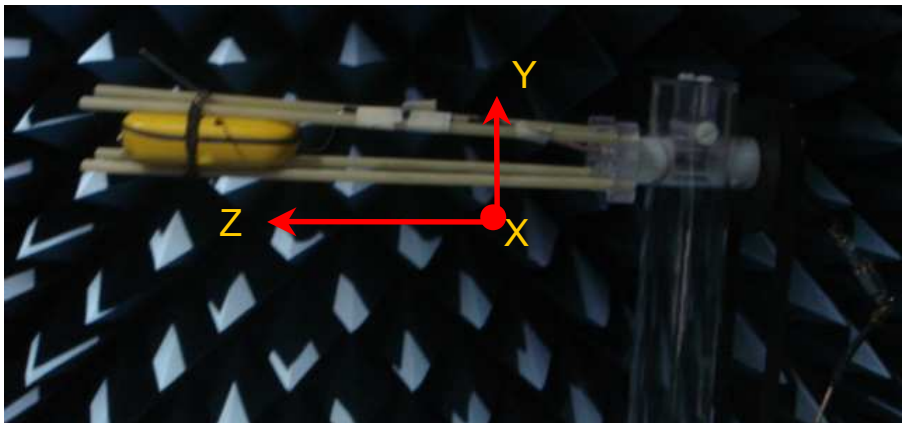
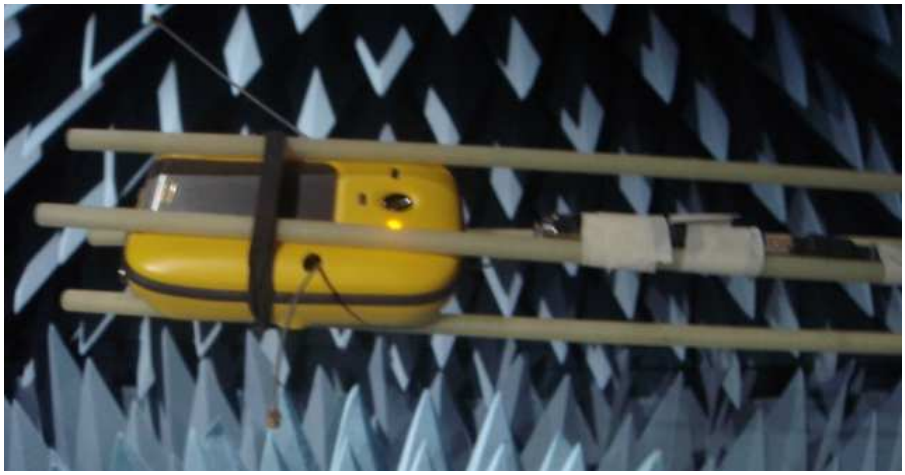
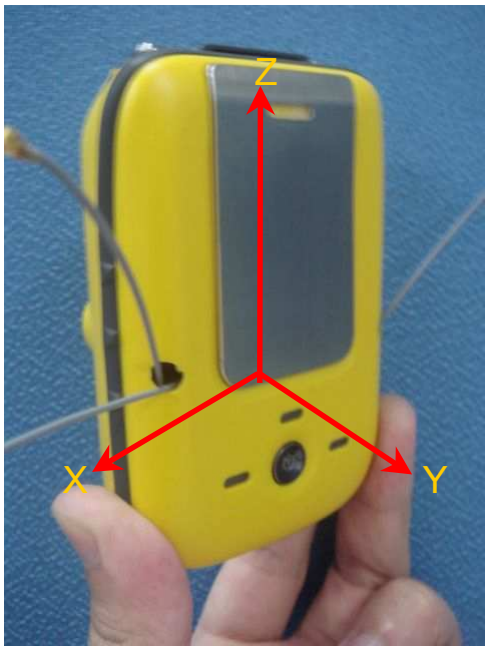
Axis Definition





Chamber situation



3D Radiation Pattern

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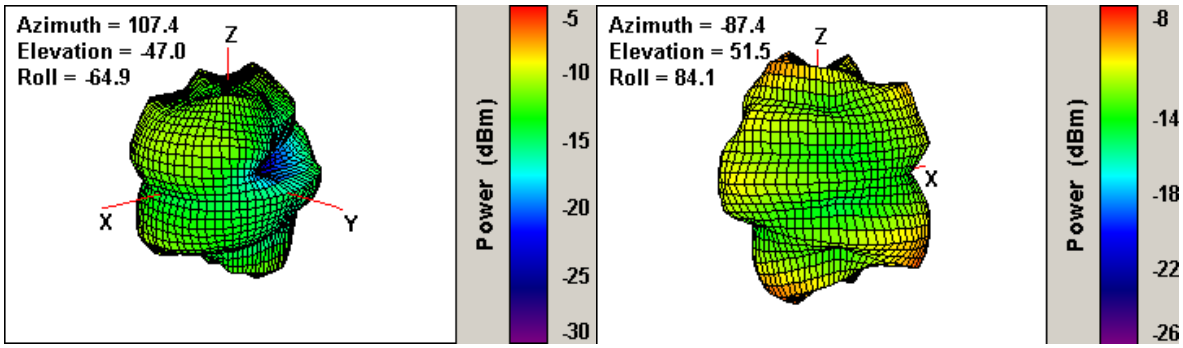
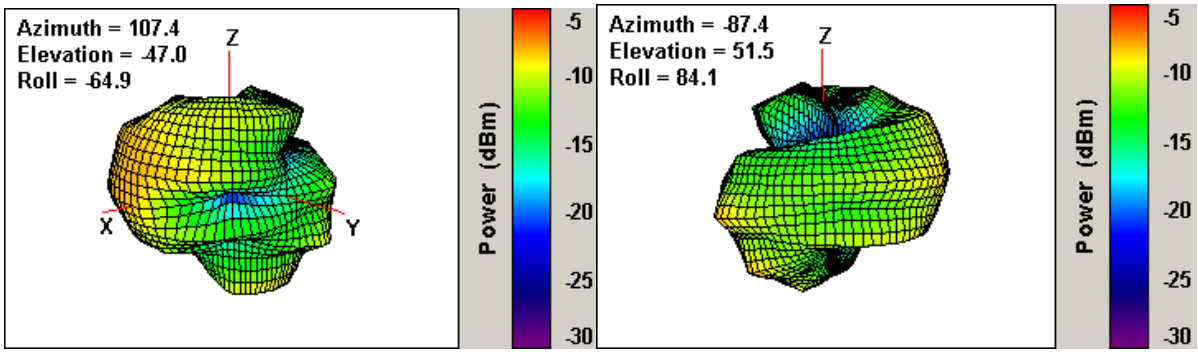
GSM Antenna 3D Radiation Pattern

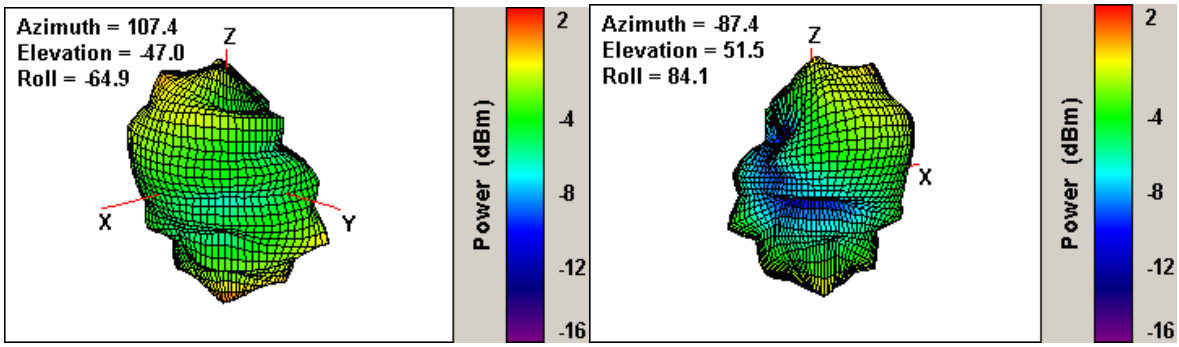
Front View Back View



Frequency: 824 MHz



Frequency: 960 MHz



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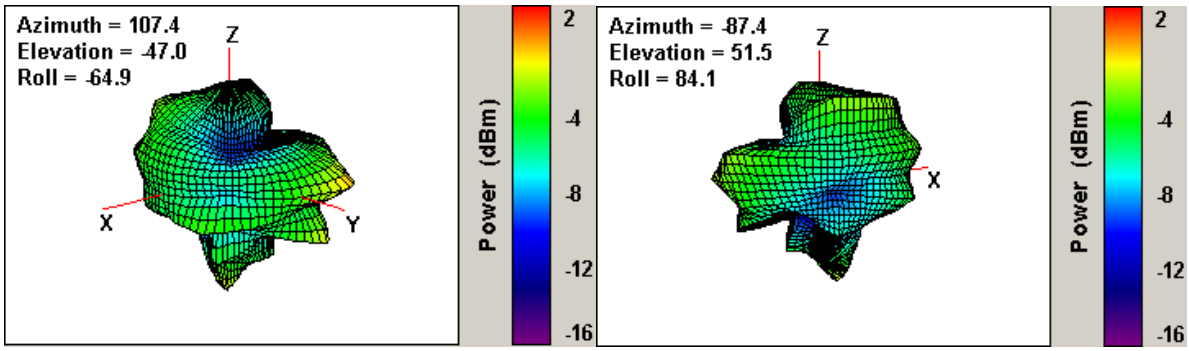

Frequency: 2170 MHz

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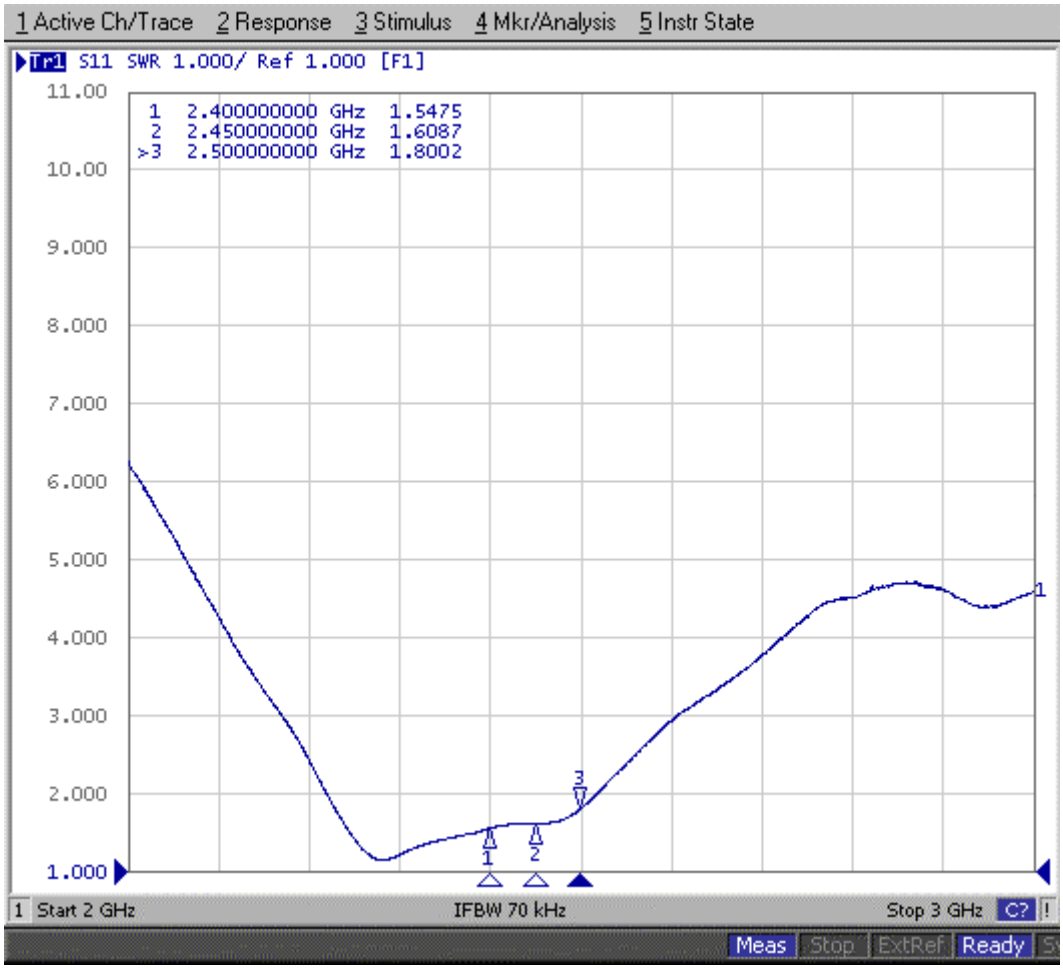
BT Antenna on the right side

Test Results

Frequency Range (MHz)	2400 ~ 2500
Efficiency Range (%)	30.2 ~ 35.8
Average Gain Range (dBi)	-5.19 ~ -4.45
VSWR	< 2

BT Antenna S-parameters and VSWR



Freq. (MHz)	2400	2450	2500
VSWR	1.5	1.6	1.8

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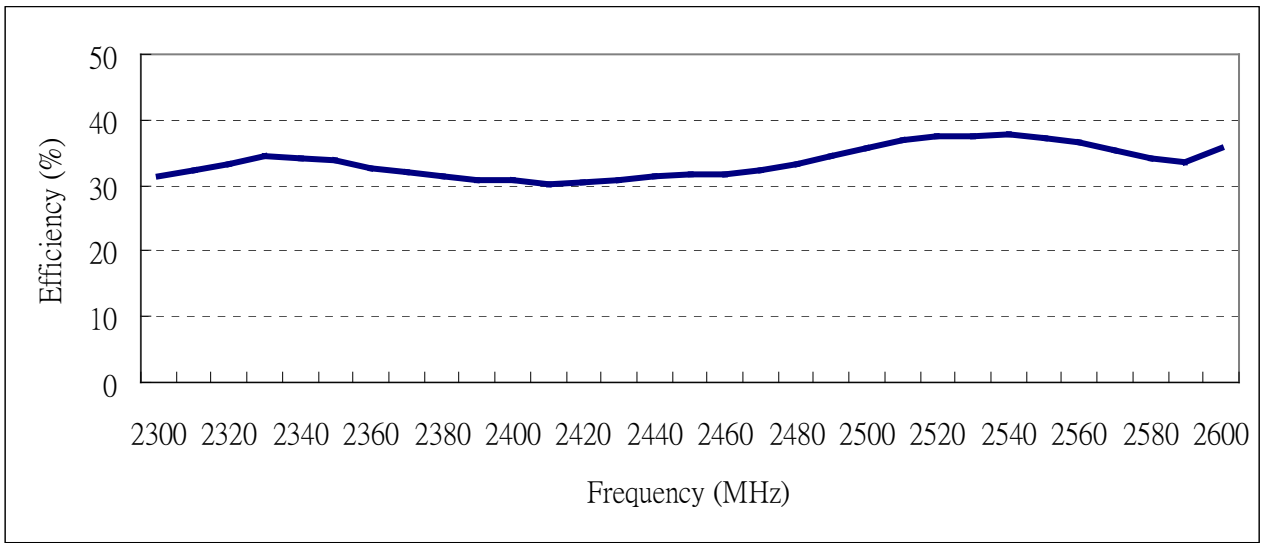
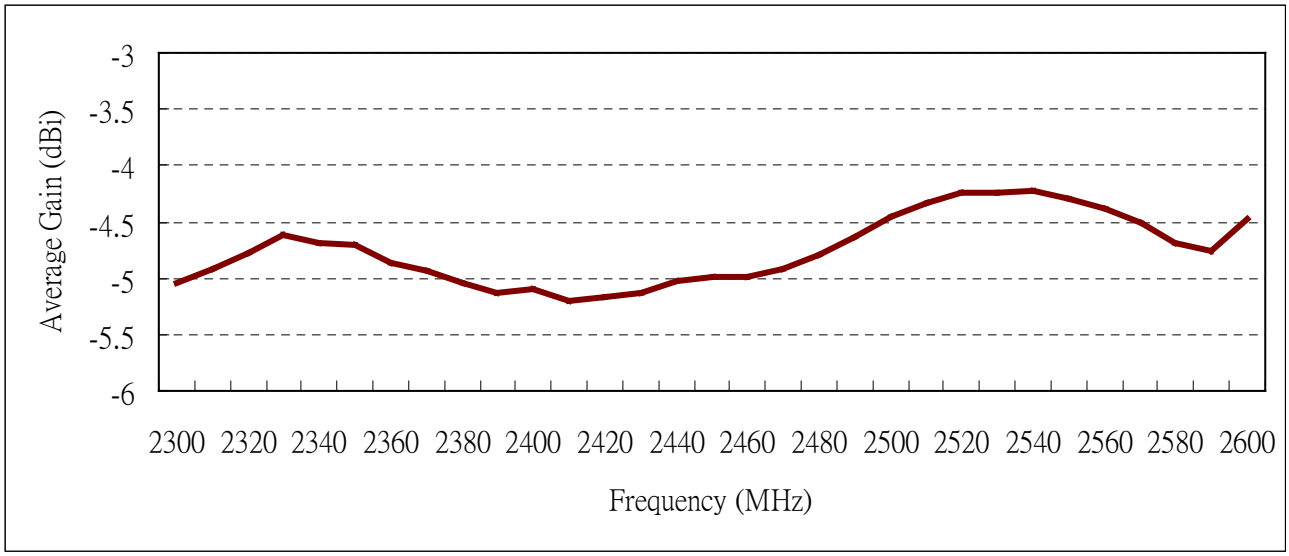
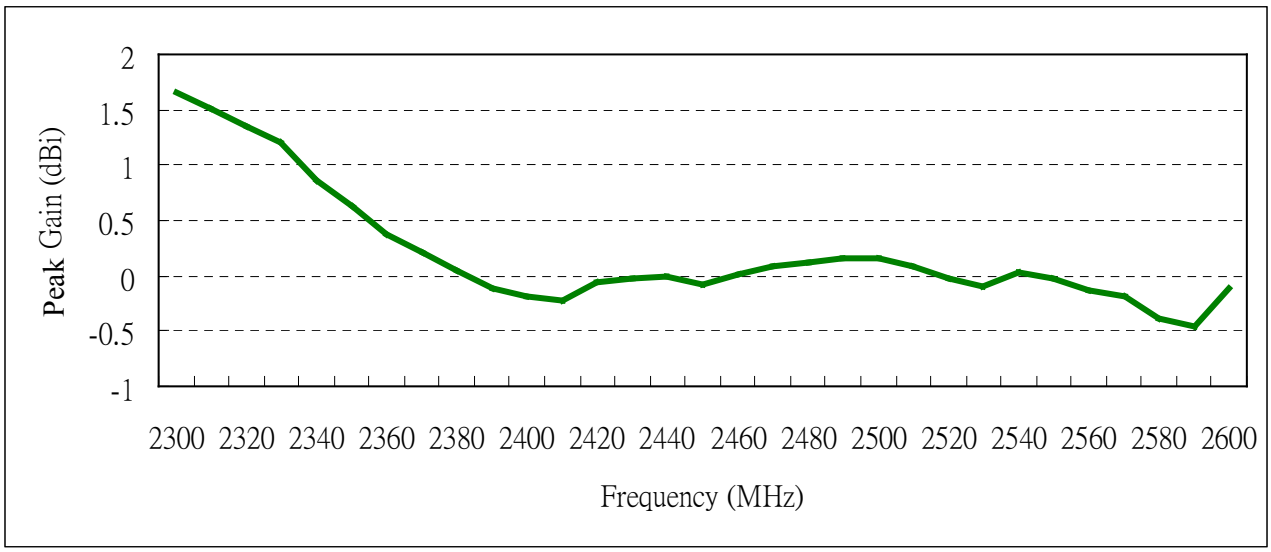
BT Antenna Efficiency, Average Gain and Peak Gain







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Frequency (MHz)	Gain Data		
	Main		
	Peak Gain (dBi)	Average Gain (dBi)	Efficiency (%)
2300	1.64	-5.03	31.3
2310	1.52	-4.91	32.2
2320	1.35	-4.77	33.3
2330	1.20	-4.62	34.5
2340	0.85	-4.68	34.0
2350	0.61	-4.71	33.7
2360	0.36	-4.85	32.6
2370	0.21	-4.93	32.1
2380	0.04	-5.04	31.3
2390	-0.11	-5.13	30.6
2400	-0.18	-5.09	30.9
2410	-0.21	-5.19	30.2
2420	-0.06	-5.16	30.4
2430	-0.01	-5.13	30.6
2440	-0.00	-5.02	31.4
2450	-0.07	-4.99	31.6
2460	0.00	-4.98	31.7
2470	0.07	-4.92	32.1
2480	0.12	-4.79	33.1
2490	0.15	-4.63	34.3
2500	0.14	-4.45	35.8
2510	0.08	-4.32	36.9
2520	-0.01	-4.24	37.6
2530	-0.09	-4.24	37.6
2540	0.02	-4.21	37.8
2550	-0.03	-4.28	37.2
2560	-0.13	-4.38	36.4
2570	-0.19	-4.50	35.4
2580	-0.38	-4.67	34.0
2590	-0.45	-4.76	33.4
2600	-0.12	-4.47	35.6

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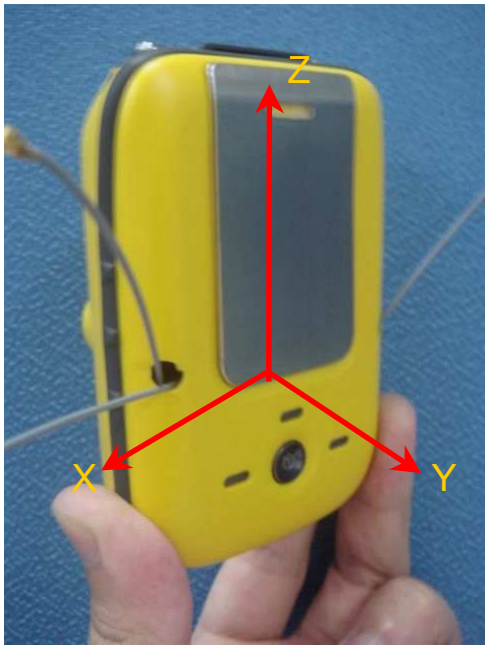
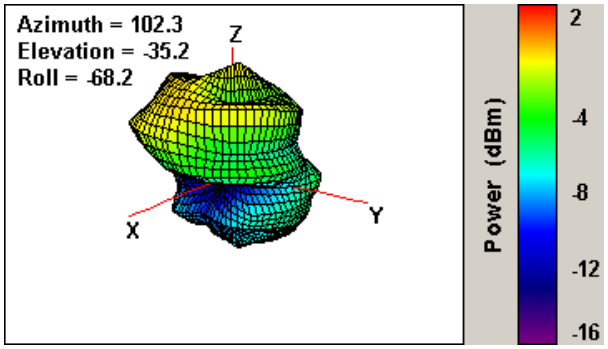
Axis Definition



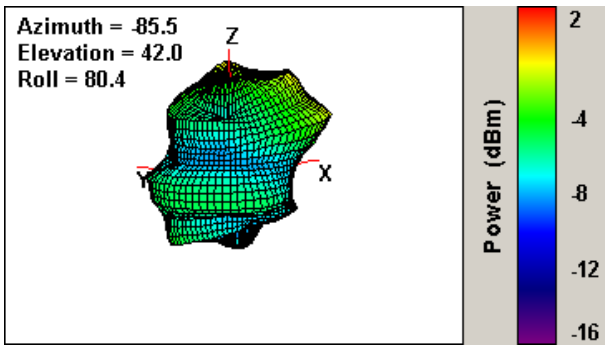
3D Radiation Pattern

BT Antenna 3D Radiation Pattern

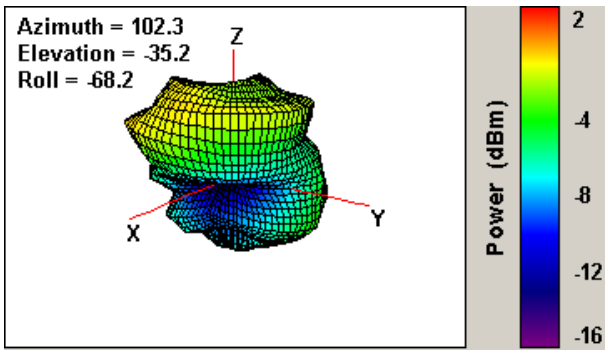
Front View

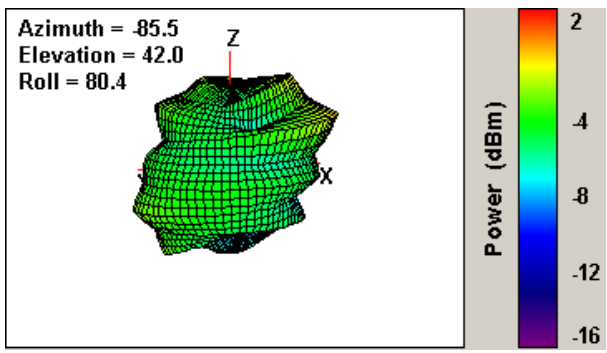


Back View



Frequency: 2400 MHz





Frequency: 2500 MHz

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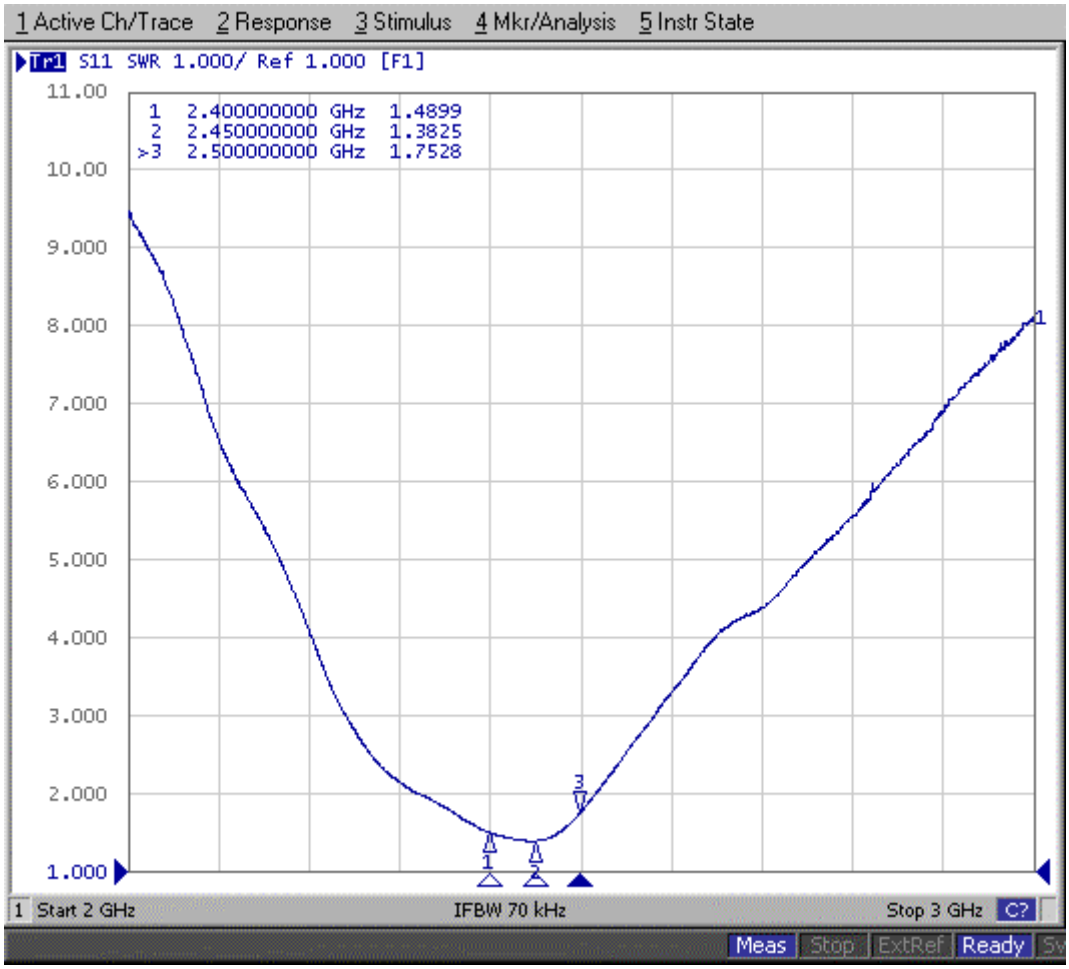
WiFi Antenna on the left side

Test Results

Frequency Range (MHz)	2400 ~ 2500
Efficiency Range (%)	43.0 ~ 51.3
Average Gain Range (dBi)	-3.66 ~ -2.89
VSWR	< 2

WiFi Antenna VSWR



Freq. (MHz)	2400	2450	2500
VSWR	1.4	1.3	1.7

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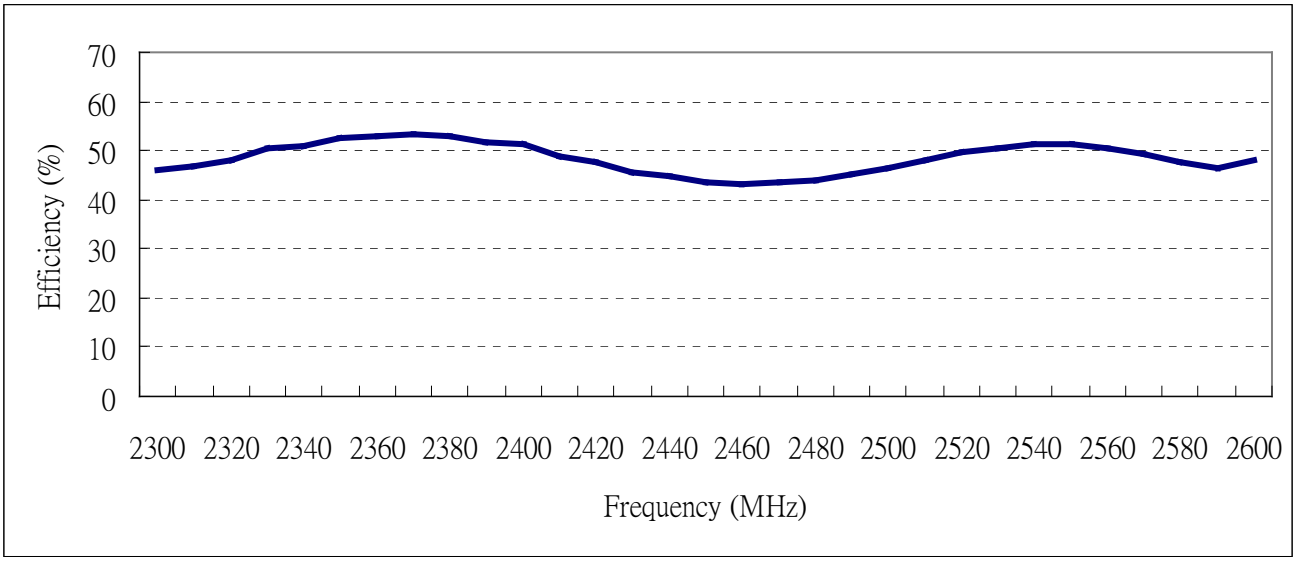
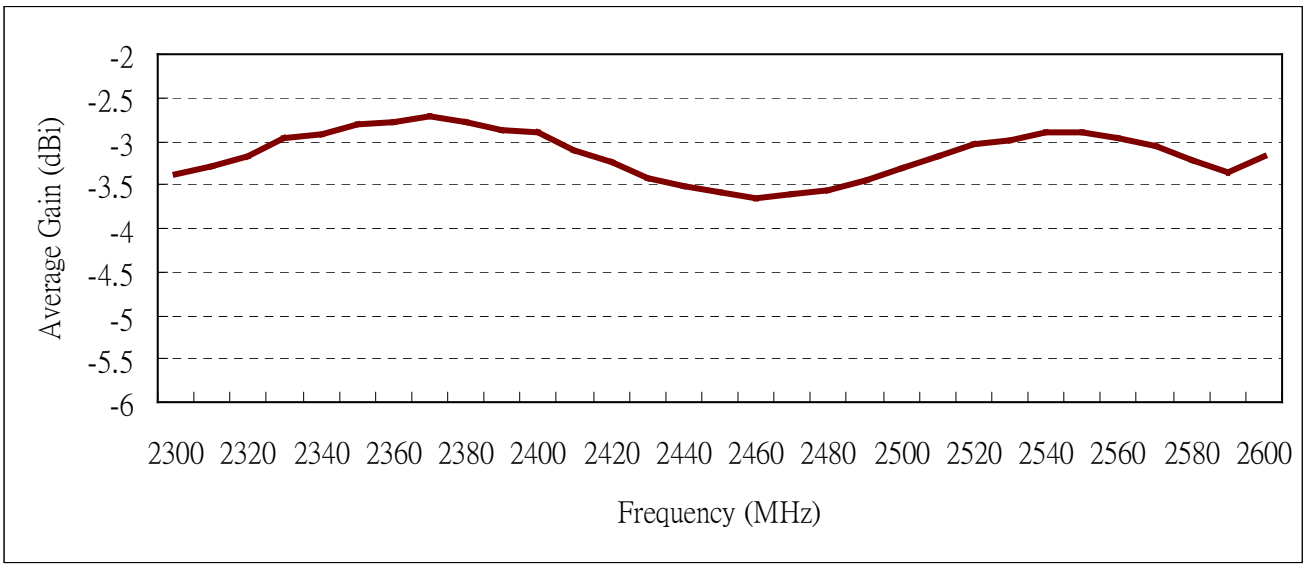
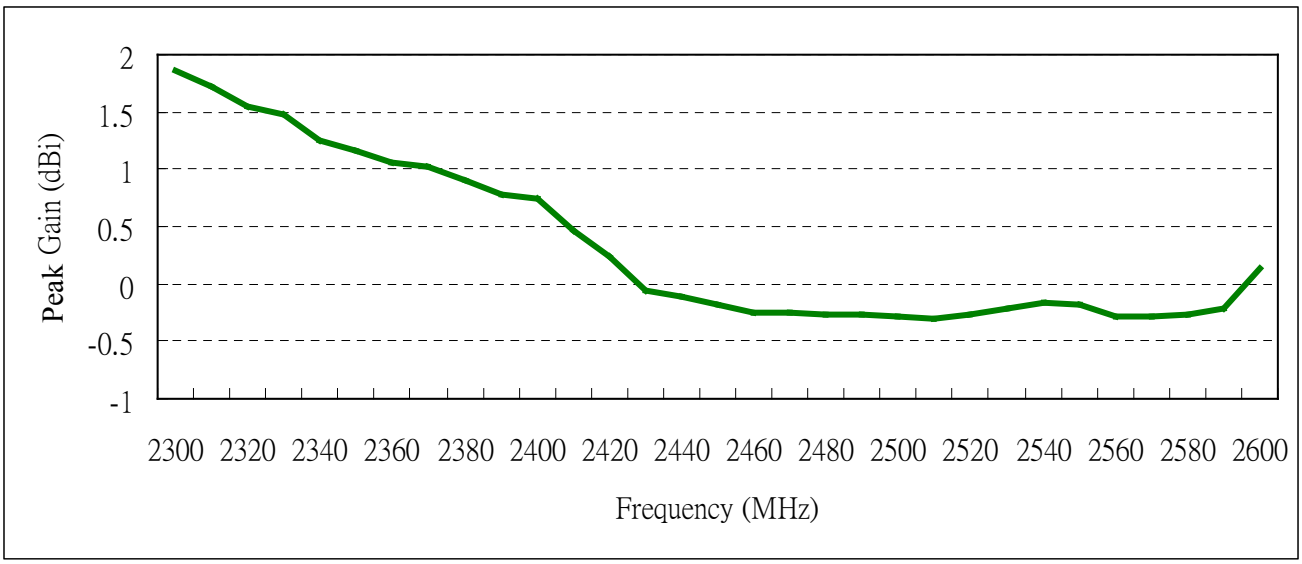
WiFi Antenna Efficiency, Average Gain and Peak Gain







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Frequency (MHz)	Gain Data		
	Main		
	Peak Gain (dBi)	Average Gain (dBi)	Efficiency (%)
2300	1.86	-3.38	45.8
2310	1.71	-3.29	46.8
2320	1.53	-3.17	48.1
2330	1.47	-2.97	50.4
2340	1.24	-2.92	51.0
2350	1.15	-2.79	52.4
2360	1.05	-2.77	52.7
2370	1.02	-2.72	53.4
2380	0.90	-2.77	52.7
2390	0.77	-2.87	51.5
2400	0.73	-2.89	51.3
2410	0.45	-3.09	48.9
2420	0.24	-3.23	47.4
2430	-0.05	-3.42	45.4
2440	-0.11	-3.50	44.6
2450	-0.18	-3.59	43.6
2460	-0.24	-3.66	43.0
2470	-0.24	-3.61	43.4
2480	-0.26	-3.55	44.1
2490	-0.26	-3.44	45.1
2500	-0.28	-3.31	46.5
2510	-0.29	-3.16	48.2
2520	-0.26	-3.03	49.6
2530	-0.22	-2.98	50.3
2540	-0.16	-2.88	51.4
2550	-0.18	-2.89	51.3
2560	-0.28	-2.95	50.6
2570	-0.28	-3.06	49.3
2580	-0.26	-3.22	47.6
2590	-0.20	-3.35	46.2
2600	0.13	-3.17	48.1

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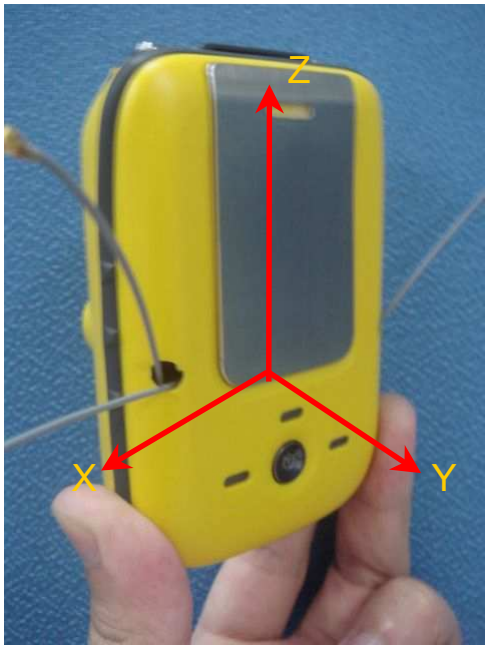
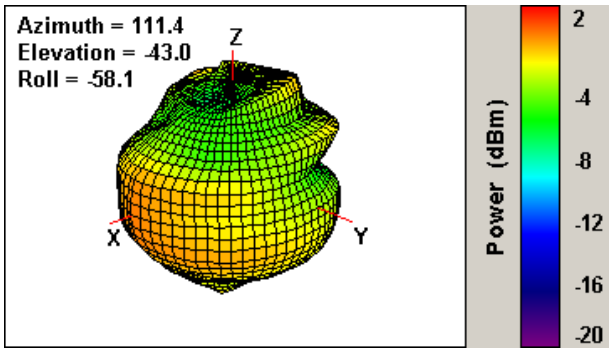
Axis Definition



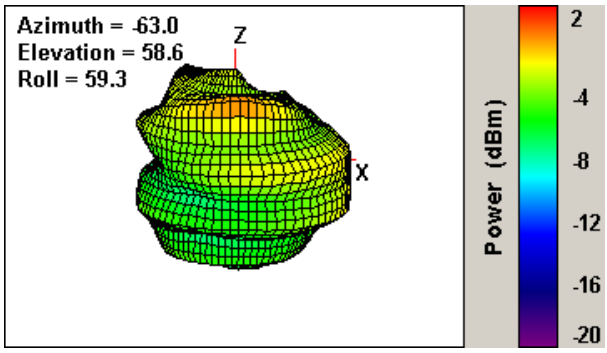
3D Radiation Pattern

BT Antenna 3D Radiation Pattern

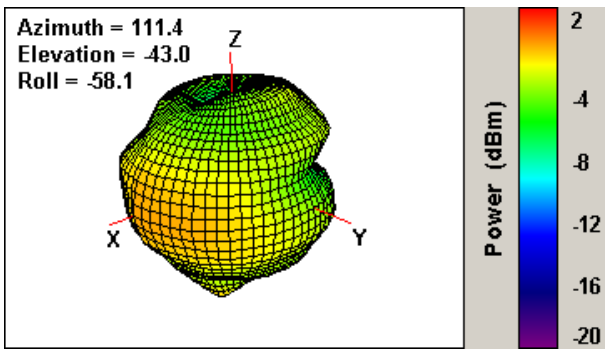
Front View

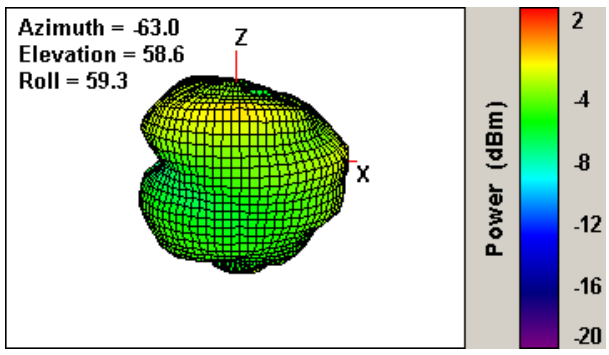


Back View



Frequency: 2400 MHz





Frequency: 2500 MHz

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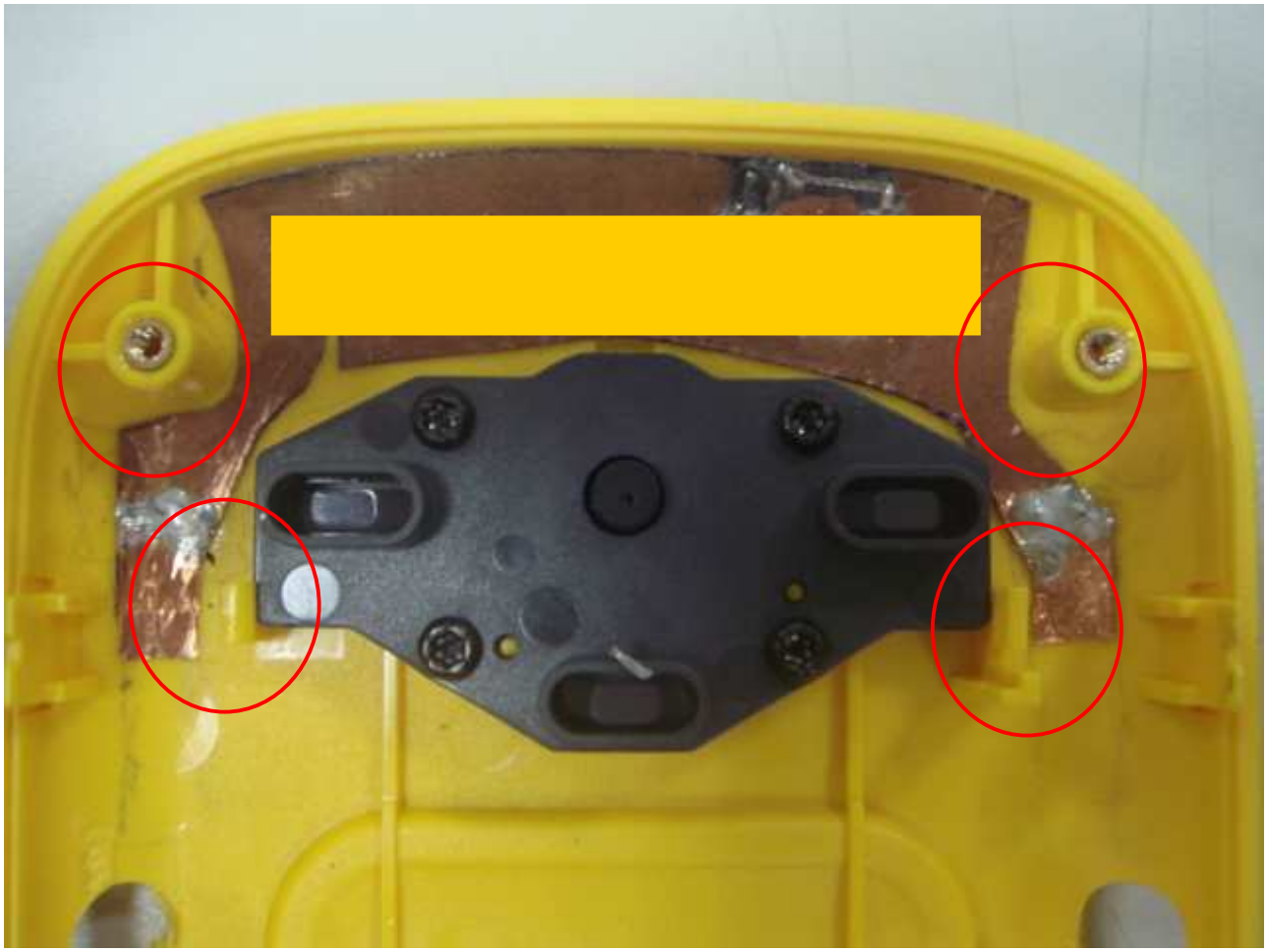
Conclusion

This report is the test of three kind of antenna for GT2000 structure, and it used metal PIFA for GSM, BT and WiFi band. These conclusion have three parts, first is focus on metal PIFA for GSM band, and second one used metal PIFA for BT band.

1. *The GSM efficiency varying from 40.3 % ~ 86.9 % at 880 MHz ~ 960 MHz, and that efficiency varying from 49.5 % ~ 64.8 % at 1710 MHz ~ 2170 MHz.*
2. *The BT efficiency varying from 30.2 % ~ 35.8 %, and all of the VSWR is under 2.*
3. *The WiFi efficiency varying from 43.0 % ~ 51.3 %, and all of the VSWR is under 2.*
4. *The BT and WiFi can used standard product of EAM-S-0300-2 on this final version.*

Mechanical



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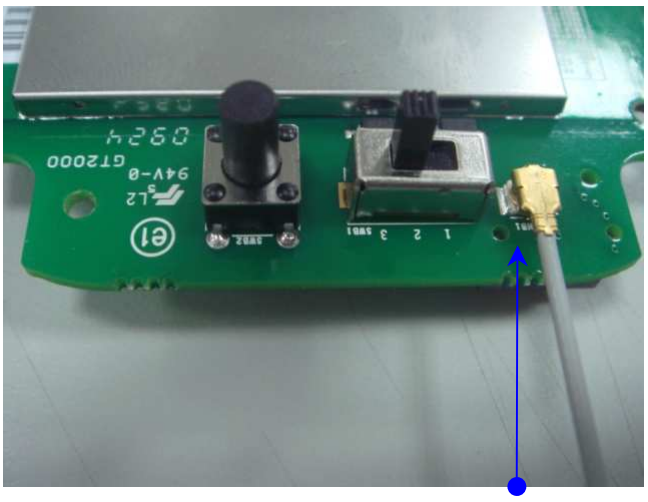
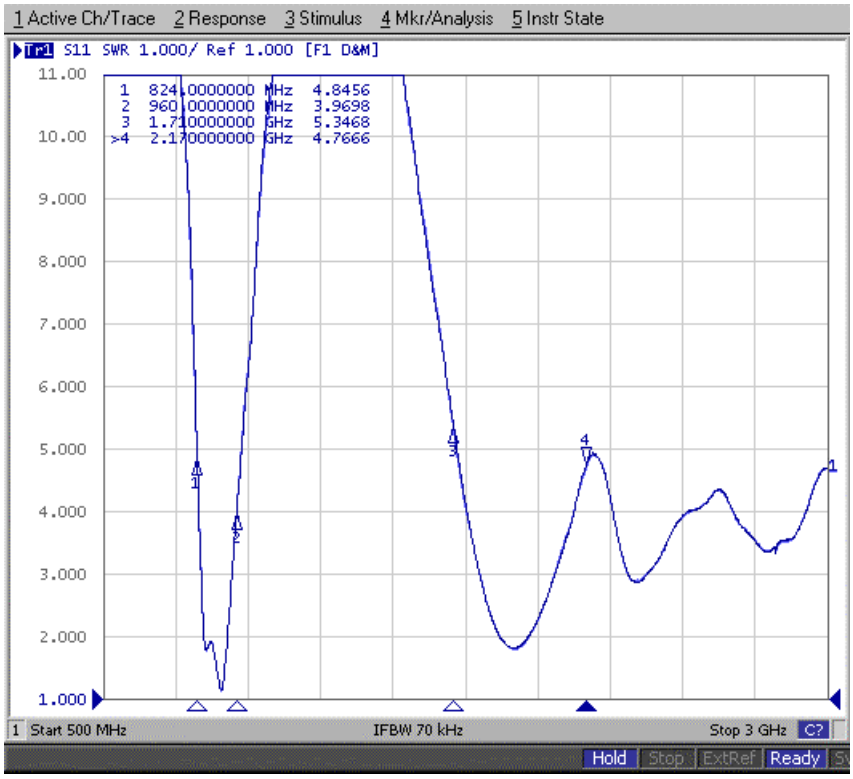
Experiment



Feed point and ground point is connector

GSM Antenna VSWR



Freq. (MHz)	824	960	1710	2170
VSWR	4.8	3.9	5.3	4.7

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GSM Antenna Efficiency, Average Gain and Peak Gain

Freq. (MHz)	Gain Data		
	Main		
	Peak Gain (dBi)	Average Gain (dBi)	Efficiency (%)
800	-12.10	-16.10	2.4
824	-8.07	-12.27	5.9
840	-6.06	-10.19	9.5
860	-3.52	-7.76	16.7
880	-2.11	-6.55	22.0
894	-2.41	-6.73	21.2
900	-2.79	-6.96	20.1
920	-4.35	-8.23	15.0
940	-5.89	-9.74	10.6
960	-7.56	-11.19	7.5
980	-8.48	-12.42	5.71
1650	0.34	-4.46	35.7
1710	1.32	-3.66	43.0
1750	2.05	-3.07	49.2
1800	3.46	-2.17	60.6
1850	3.62	-1.67	68.0
1900	3.26	-1.72	67.2
1950	3.01	-1.74	66.9
1990	3.05	-1.82	65.6
2000	2.65	-2.22	59.9
2050	1.67	-3.42	45.4
2100	0.79	-4.24	37.6
2150	0.61	-4.68	34.0
2170	0.45	-4.89	32.4
2200	0.39	-4.78	33.2

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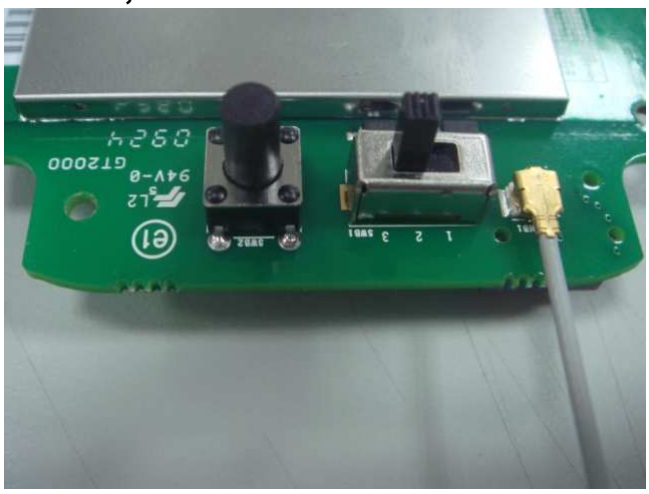
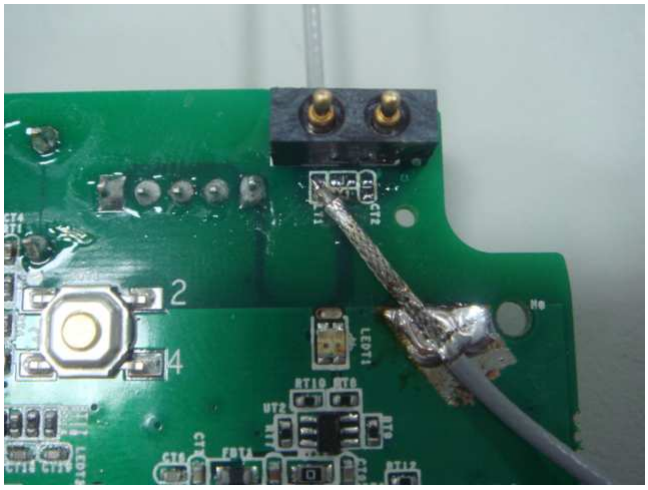
S11 S22, S21



Port 1



Port2