士誼科技事業股份有限公司
JOYMAX ELECTRONICS CO., LTD.

MD-100A

ZigBee PIFA Module

Antenna Test Report

Document Number	**RD3-2009-0XX**
RD Instruction Sheet	**SSP-90038**
1st Released Date	**2009/08/16**
Last Released Date	**2009/08/16**
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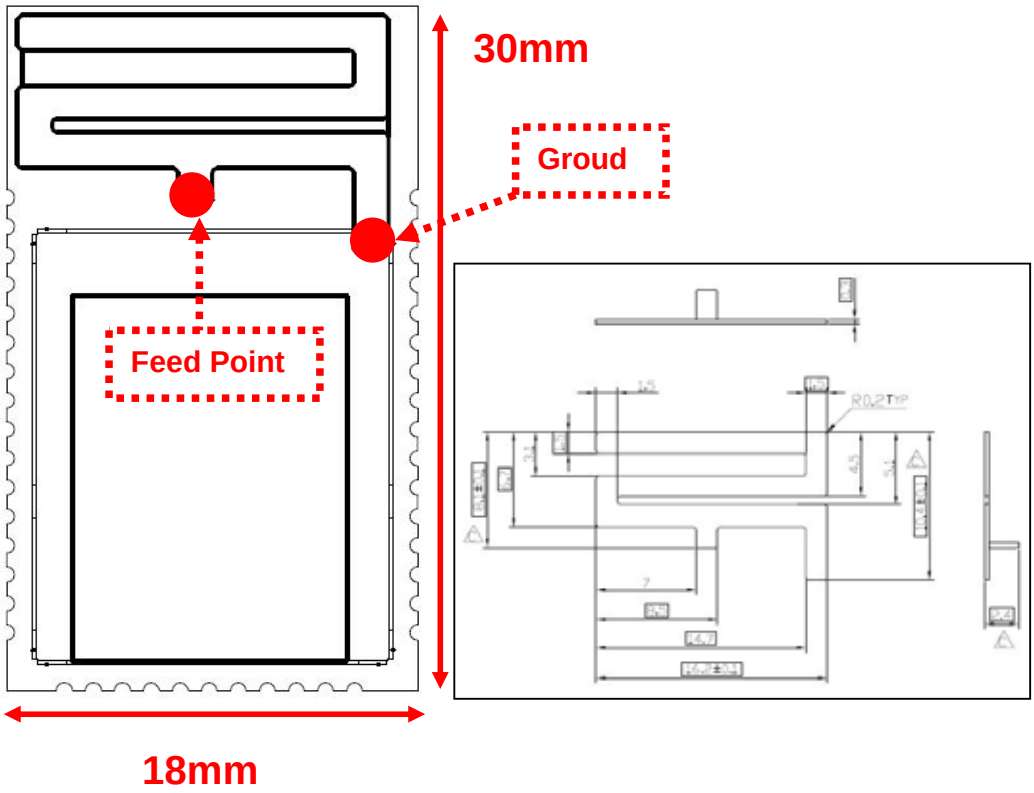
Review by	**Havin Lu**

Revised History

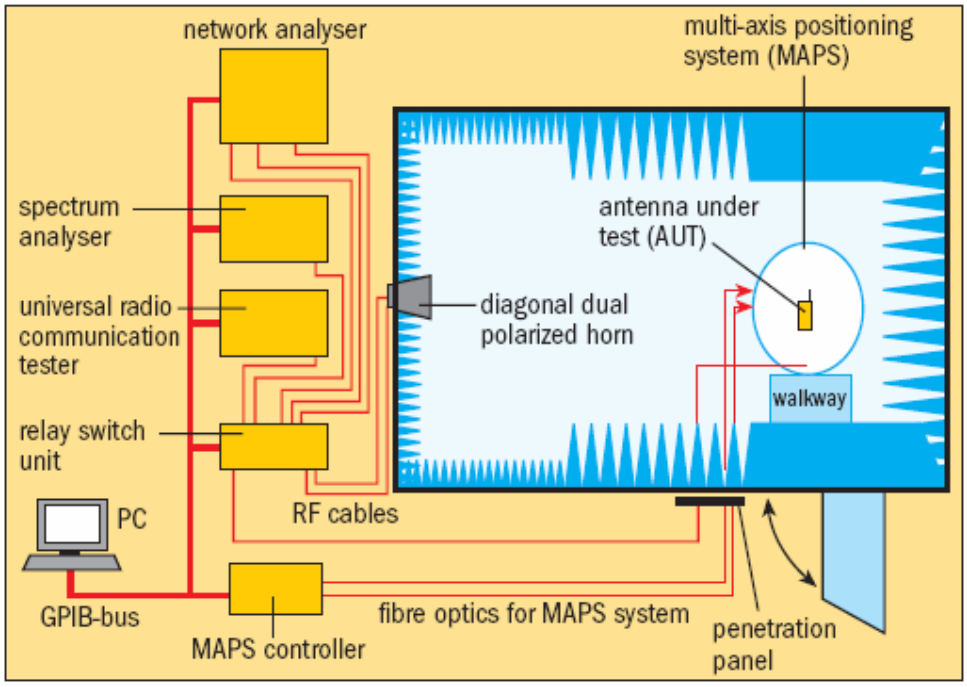
Date	Version	Revised History
8/16	**0.0**	**1st released**

Antenna Specification

Specification	PIFA
Center Frequency (MHz)	2400 ~ 2500
Gain (dBi)	3
Efficiency (%)	70
Return Loss (dB)	< -10
VSWR	< 2.0
Impedance(Ohm)	50
Test Ground Plane L*W (mm)	40*35
Polarization	Linear
Dimension L*W*H (mm)	16.2*10.4*2.4
Weight (g)	0.1
Material	洋白銅 C7521
Operating Temp (℃)	-40 ~ +85
Substance	Meets RoHs requirement



Test Chamber Configuration



Equipment Specification

ETS-lindgren AMS-8500 (CTIA Authorized Chamber)

Fully Anechoic Chamber — 7x4x4 m，outside dimension

Quiet Zone Volume — 0.3 m，diameter sphere

EUT Dimension — max. 0.54 m

Path Length — 5 m

Performance

— Quiet Zone Reflectivity Level：< - 27dB

— Amplitude Ripples：± 0.5dB

— Amplitude Taper： < 0.5dB

Spectrum Analyzer:
R&S FSP7/ 9kHz~7GHz

Universal Radio Communication Tester:
R&S CMU200
(GSM/GPRS/EGPRS/CDMA/1xEVDO/WCDMA supported)

Network Analyzer:
Agilent E5071B / 300Hz~8.5GHz

Testing Capability

OTA：CTIA OTA Certification / Vodafone Certification

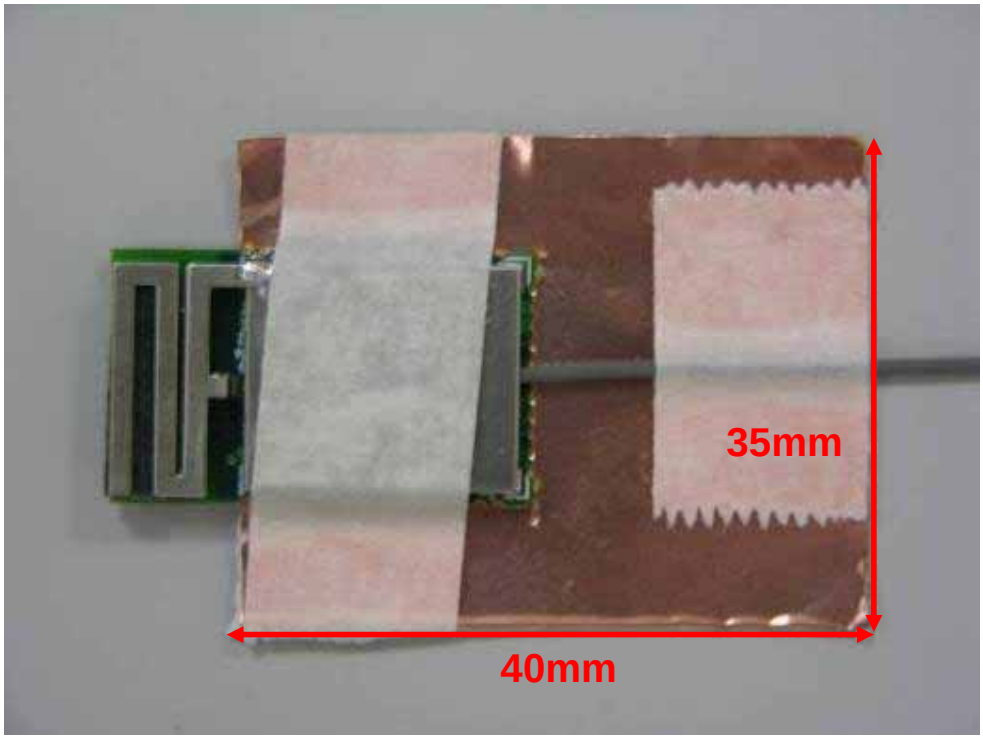
2D / 3D Gain：780MHz – 6GHz

Free Space

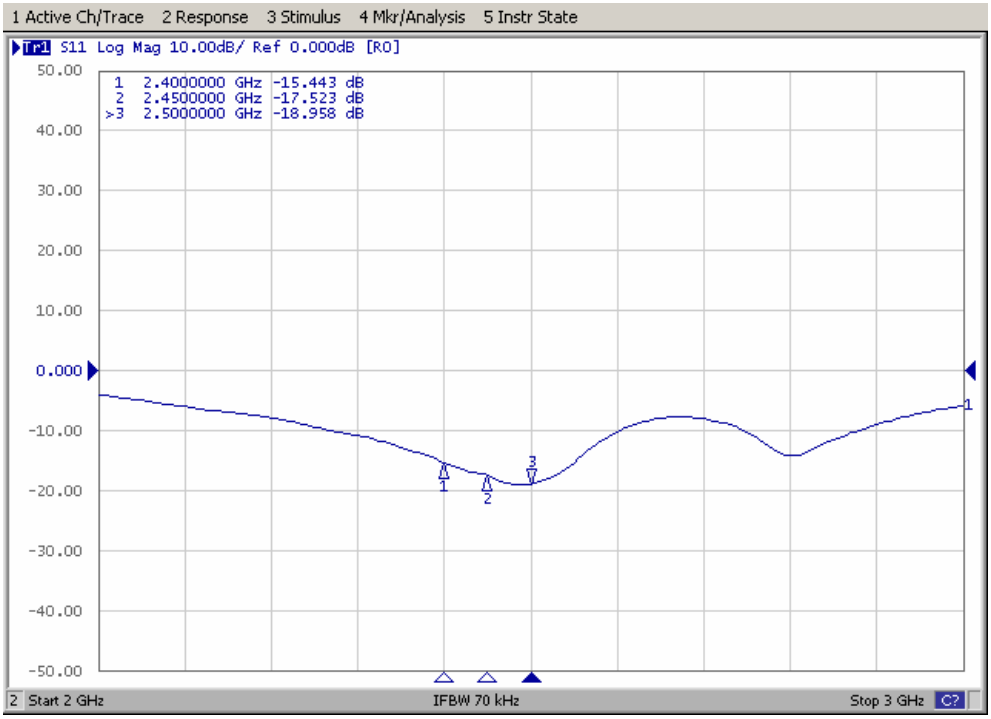
Talking Position — SAM Phantom (Phantom)

Talking — SAM Phantom (Phantom + hand)

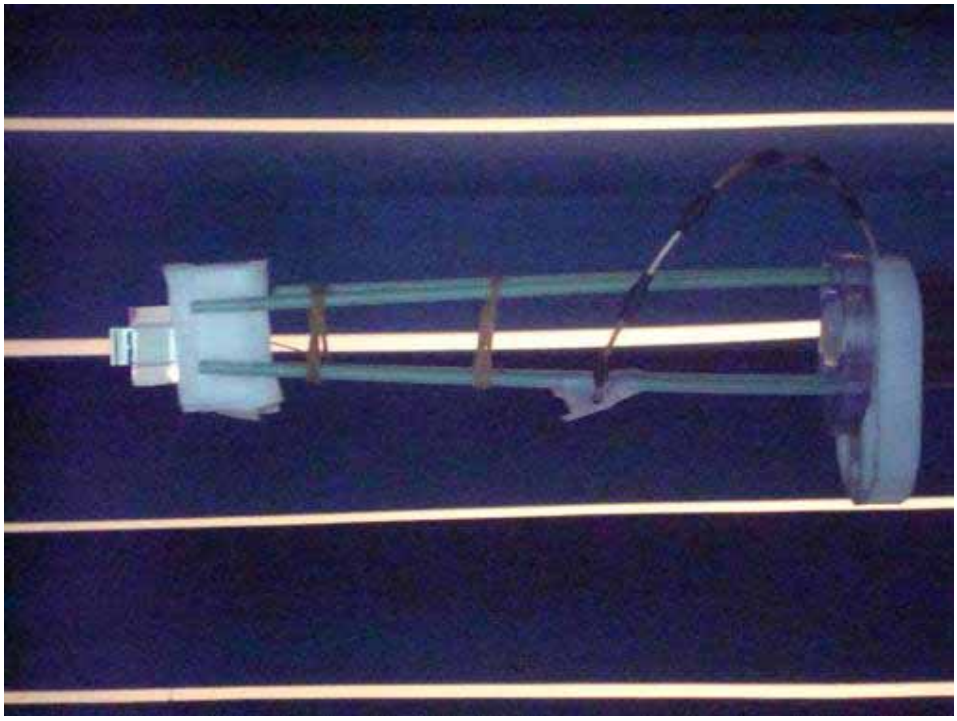
Antenna Structure

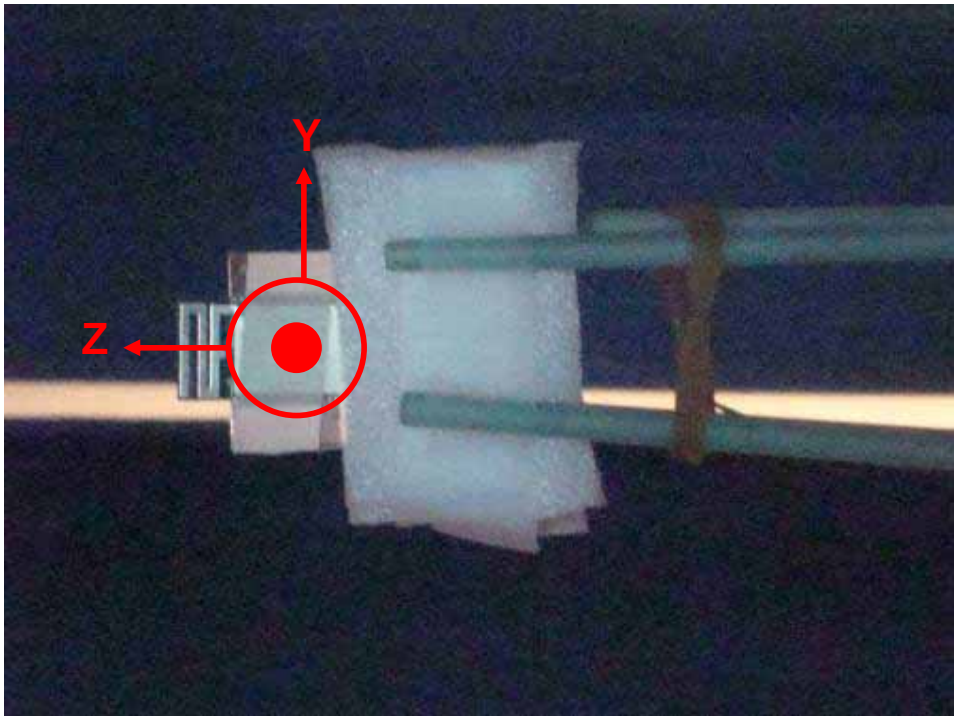


Antenna Return Loss



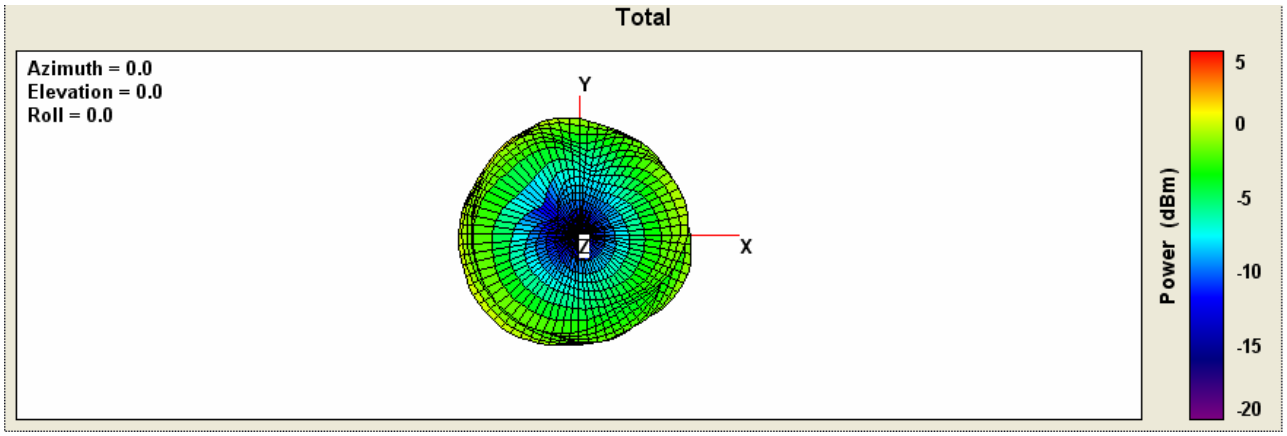
Pattern Measurement Reference Coordination

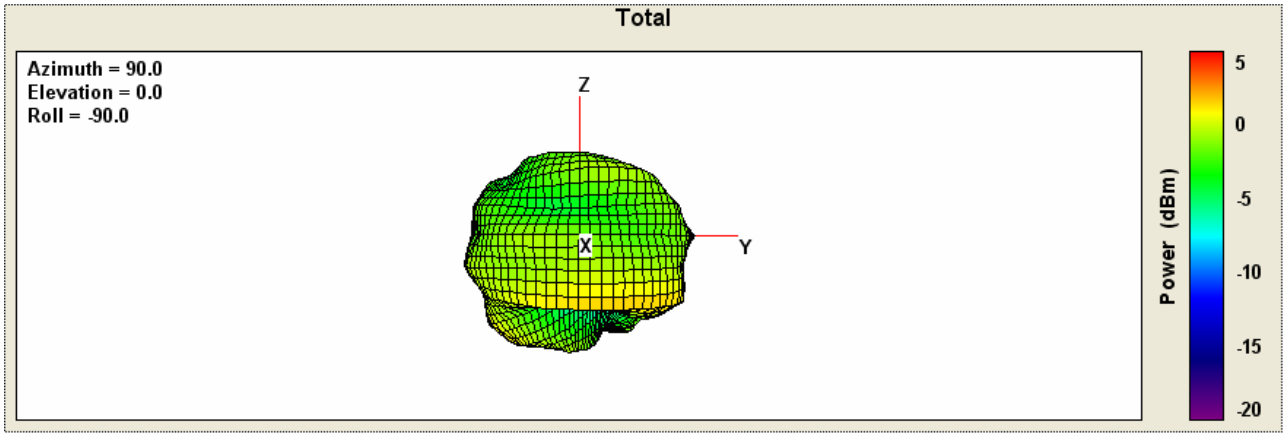


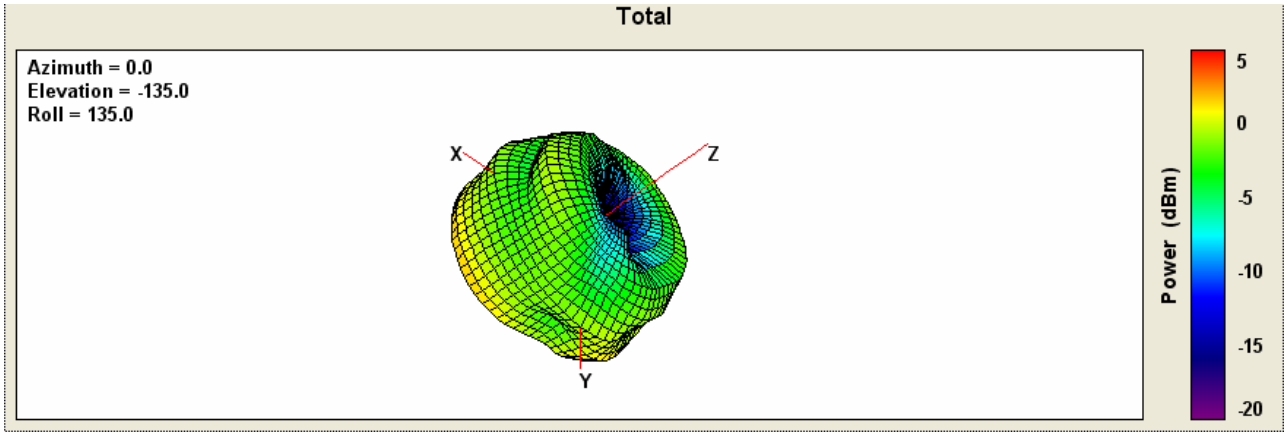


Antenna 3D Pattern

@ 2400 MHz

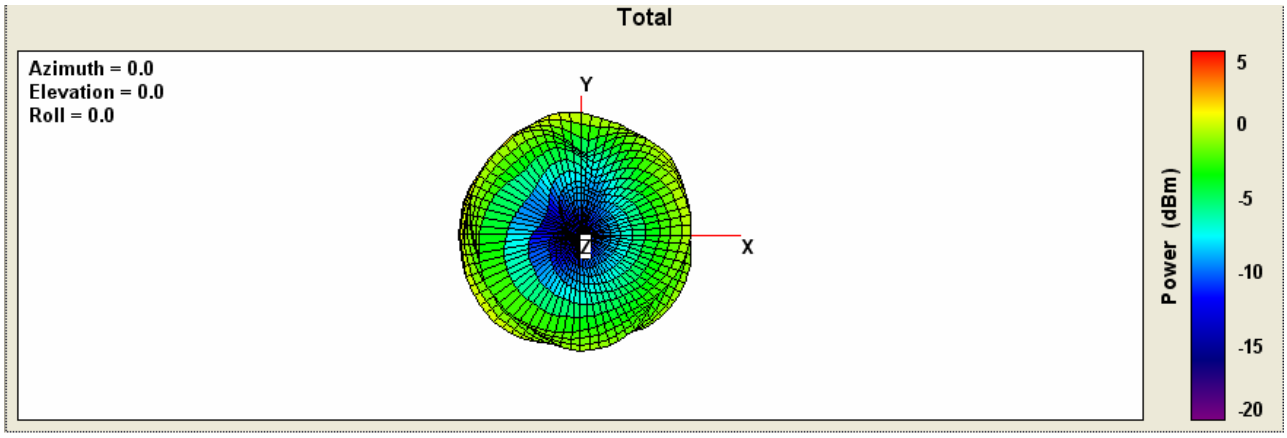


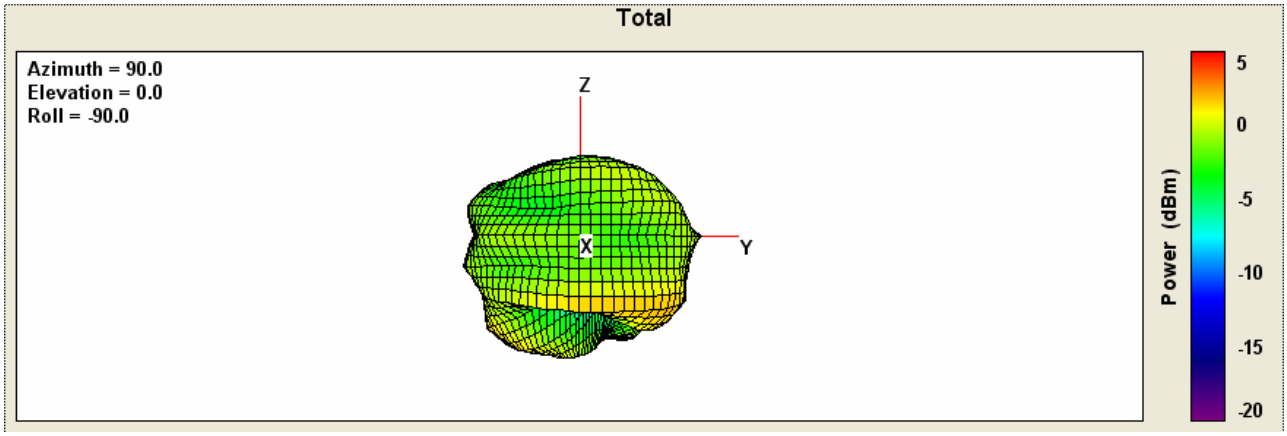


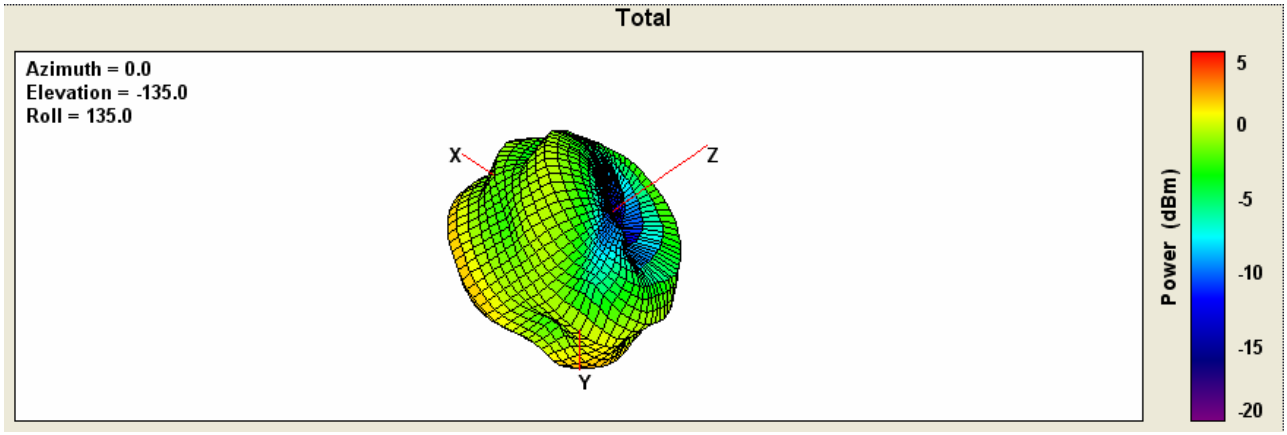


Antenna 3D Pattern

@ 2450 MHz

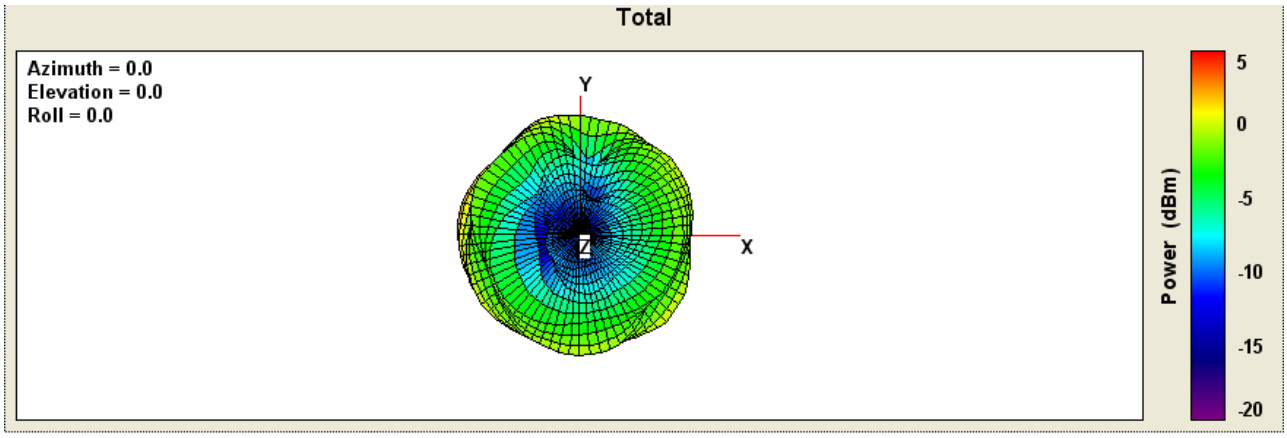


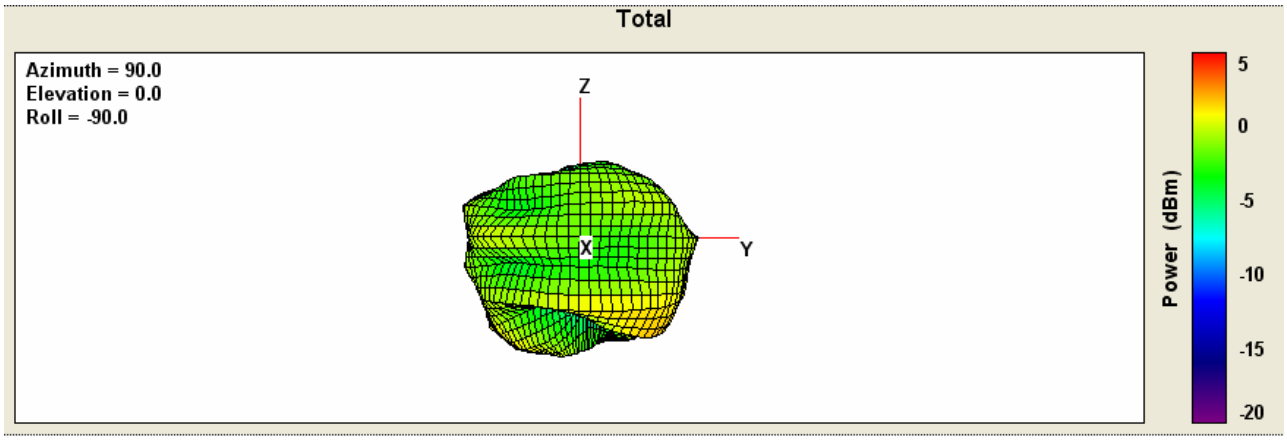


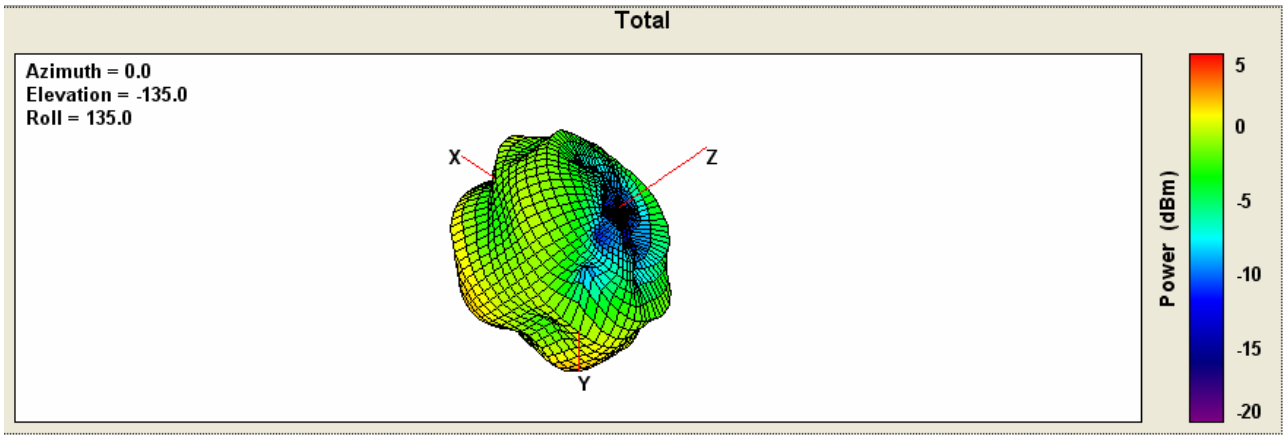


Antenna 3D Pattern

@ 2500 MHz







Summary

Frequency (MHz)	2400	2450	2500
Antenna	PIFA		
Directivity (dBi)	3.89	4.29	4.37
Gain (dBi)	2.19	2.93	2.71
Efficiency (%)	67.54	73.12	68.33
Average Gain (dB)	-1.70	-1.36	-1.65

3D Gain Table

Test Date	2009/4/30		
Trade Name	JOYMAX		
App.No	09-D0155-C		
Model Name	SSP-90038		
Test Mode Free Space &Talking Position	Free Space		
Communication System			
Frequency (MHz)	2400	2450	2500
TC01 Note	PIFA		
Ant. Port Input Pwr. (dBm)	0	0	0
Tot. Rad. Pwr. (dBm)	-1.7046	-1.3598	-1.6538
Peak EIRP (dBm)	2.18585	2.93269	2.71336
Directivity (dBi)	3.89044	4.29244	4.36715
Efficiency (dB)	-1.7046	-1.3598	-1.6538
Efficiency (%)	67.5369	73.1181	68.3314
Gain (dBi)	2.18585	2.93269	2.71336
NHPRP ±Pi/4 (dBm)	-2.6771	-2.3952	-2.7054
NHPRP ±Pi/6 (dBm)	-3.9895	-3.6984	-3.9555
NHPRP ±Pi/8 (dBm)	-5.1362	-4.8278	-5.0056
Upper Hem. PRP (dBm)	-6.2503	-6.1535	-6.5043
Lower Hem. PRP (dBm)	-3.5828	-3.1095	-3.3756
NHPRP4 / TRP Ratio (dB)	-0.9725	-1.0355	-1.0516
NHPRP4 / TRP Ratio (%)	79.9375	78.787	78.4954
NHPRP6 / TRP Ratio (dB)	-2.2849	-2.3387	-2.3017
NHPRP6 / TRP Ratio (%)	59.0893	58.3627	58.8616
NHPRP8 / TRP Ratio (dB)	-3.4316	-3.468	-3.3518
NHPRP8 / TRP Ratio (%)	45.377	44.9986	46.2191
UHPRP / TRP Ratio (dB)	-4.5457	-4.7937	-4.8505
UHPRP / TRP Ratio (%)	35.1102	33.1611	32.7306

LHPRP / TRP Ratio (dB)	-1.8782	-1.7497	-1.7218
LHPRP / TRP Ratio (%)	64.8898	66.8389	67.2694
Front/Back Ratio (dB)	9.72643	12.2588	4.68554
Phi BW (°)	97	65	169
+ Phi BW (°)	67	36	73
- Phi BW (°)	30	29	96
Theta BW (°)	37	37	24
+ Th. BW (°)	26	27	12
- Th. BW (°)	11	10	12
Boresight Phi (°)	245.5	245.5	173.05
Boresight Th. (°)	135	135	105
Maximum Power (dBm)	2.18585	2.93269	2.71336
Minimum Power (dBm)	-16.49	-16.129	-15.098
Average Power (dBm)	-2.5202	-2.0721	-2.3461
Max/Min Ratio (dB)	18.6761	19.0619	17.8109
Max/Avg Ratio (dB)	4.70604	5.00477	5.0595
Min/Avg Ratio (dB)	-13.97	-14.057	-12.751
Average Gain (dB)	-1.7046	-1.3598	-1.6538
E-Plane BW (°)	40	40	38
+ E-Plane BW (°)	28	29	21
- E-Plane BW (°)	12	11	17
H-Plane BW (°)	58	55	32
+ H-Plane BW (°)	40	38	15
- H-Plane BW (°)	18	17	17