

2018.04.24

RA-N0211-16

APPROVAL SHEET

MODEL: SENA_10A
Antenna layout

Review	Consent	Approval

Messrs. SENA Technology Co.,Ltd



RadiNa Co. ,Ltd

TEL:+82-2-463-0373

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	MODEL NAME		REV.	1.0	Page	2 / 11

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1. Revision History

NO.	Before	After	Reason	Date
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2.Product Information

2.1 General Features

PART NUMBER	GradiANT
ANTENNA TYPE	Dipole Antenna
APPLICATIONS	Bluetooth

2.2 Electrical Specifications

Frequency Range1 (TX)		2400MHz~2485MHz	
Frequency Range1 (RX)		2400MHz~2485MHz	
IMPEDANCE		50 Ω	
V.S.W.R	TX	2400MHz	2485MHz
		5 ↓	5 ↓
	RX	2400MHz	2485MHz
		5 ↓	5 ↓
RADIATION PATTERN		Omni-directional	
POLARIZATION		Linear	

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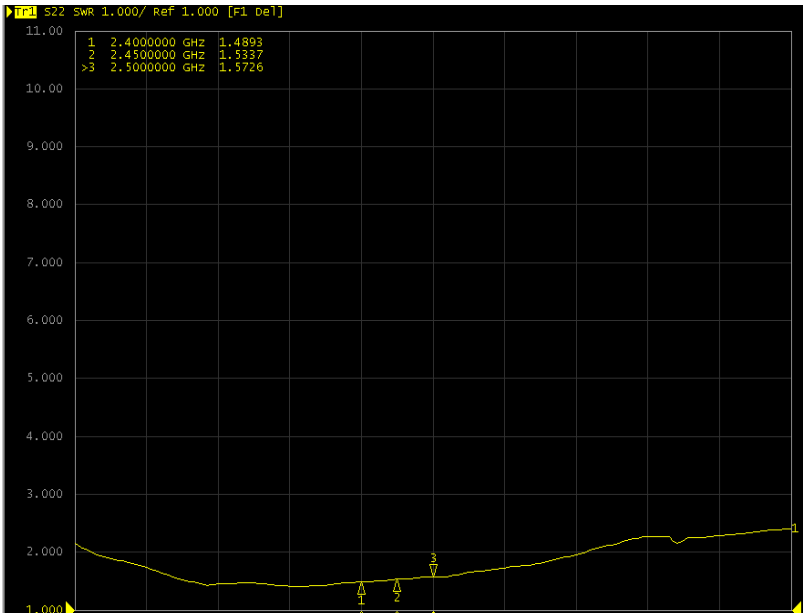
3. Pattern Specifications



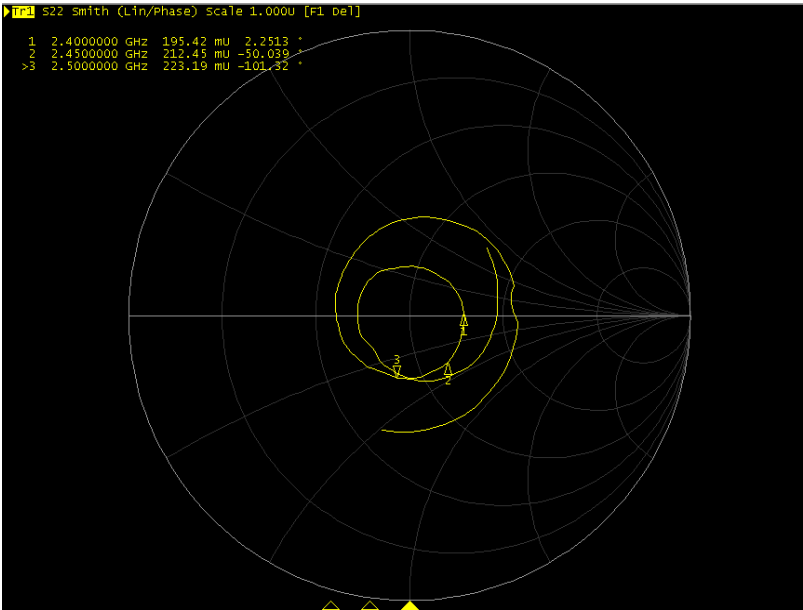
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4. Electrical Characterristics

4.1 VSWR



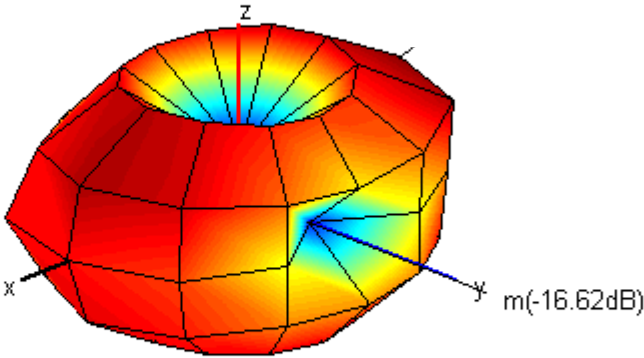
4.2 SMITH CHART



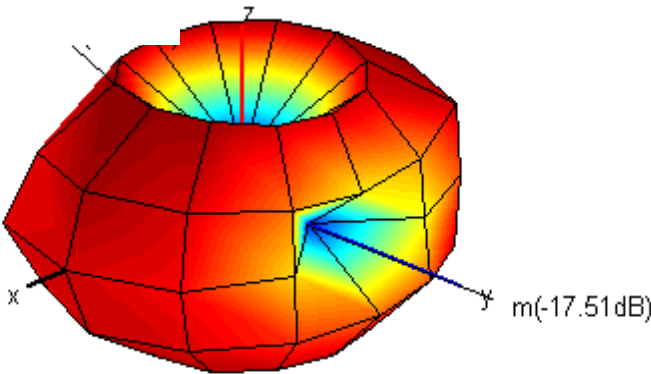
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4.3 3D-PLOTs

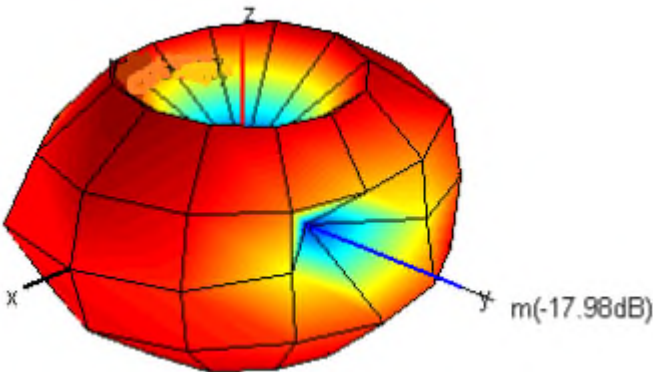
2400MHZ



2445MHZ



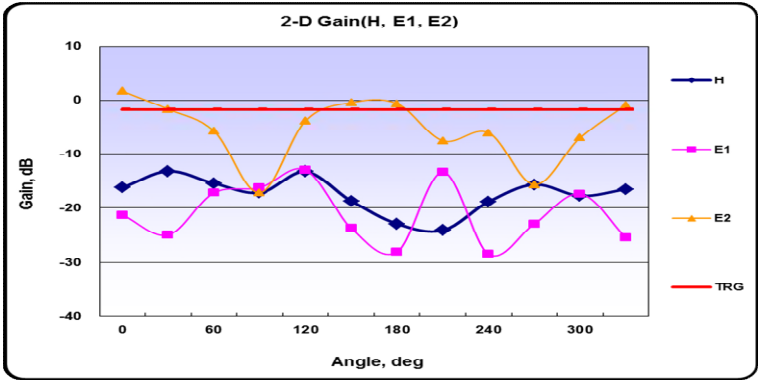
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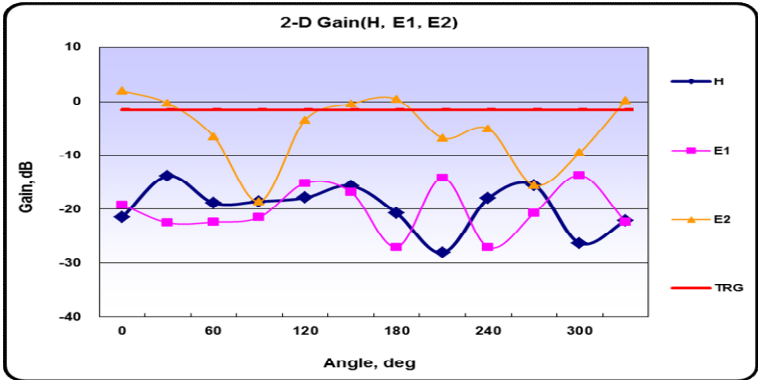
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4.4 2D-GAIN

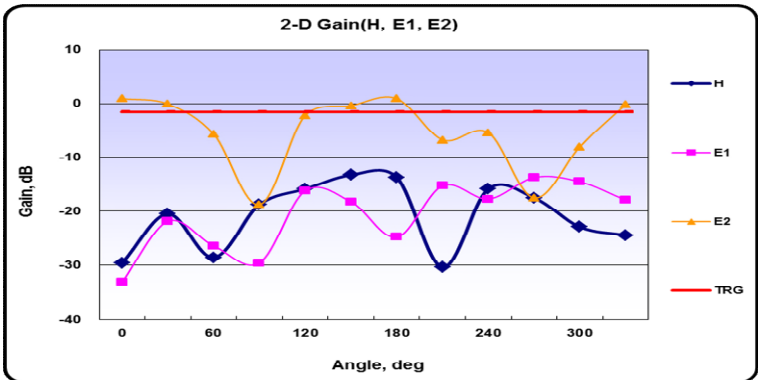
2400MHZ



2445MHZ



2485MHZ



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5. Passive Measurement

	1	2	3	4	5	6	7	8	9	10
Frequency(MHz)	2400	2405	2410	2415	2420	2425	2430	2435	2440	2445
Efficiency(dB)	-1.68	-1.80	-1.94	-1.86	-1.90	-1.74	-1.75	-1.73	-1.75	-1.59
Efficiency(%)	67.89	66.09	64.01	65.12	64.64	66.94	66.82	67.21	66.85	69.31
TRG(dB)	-1.68	-1.80	-1.94	-1.86	-1.90	-1.74	-1.75	-1.73	-1.75	-1.59
TRG _{Theta} (dB)	-7.75	-7.86	-7.96	-7.93	-7.94	-7.74	-7.63	-7.59	-7.55	-7.37
TRG _{Phi} (dB)	-2.92	-3.04	-3.19	-3.10	-3.14	-3.00	-3.05	-3.03	-3.07	-2.92
UHRG(dB)	-4.25	-4.42	-4.61	-4.57	-4.66	-4.54	-4.56	-4.58	-4.58	-4.40
UHRG/TRG(%)	55.36	54.66	54.08	53.61	52.92	52.47	52.32	51.77	52.16	52.41
H-Plane	-16.43	-16.82	-17.16	-16.92	-17.80	-17.65	-17.12	-18.21	-17.86	-18.24
E1-Plane, AVG(dB)	-18.08	-18.72	-18.99	-18.12	-18.40	-17.95	-17.92	-18.05	-17.95	-18.26
E2-Plane, AVG(dB)	-2.94	-3.13	-3.04	-3.08	-3.02	-2.80	-2.64	-2.60	-2.69	-2.43
Peak Gain(dB)	0.56	0.48	0.35	0.35	0.32	0.38	0.27	0.21	0.25	0.22
Directivity(dB)	3.78	3.62	3.44	3.37	3.36	3.30	3.02	2.86	3.02	2.94
Minimum Gain(dB)	-16.63	-16.38	-17.22	-17.64	-16.71	-17.63	-18.36	-20.13	-19.16	-17.51

		11	12	13	14	15	16	17	18	19	20
Frequency(MHz)		2450	2455	2460	2465	2470	2475	2480	2485	2490	2497
Efficiency(dB)		-1.63	-1.53	-1.53	-1.53	-1.56	-1.45	-1.55	-1.57	-1.49	-1.41
Efficiency(%)		68.78	70.31	70.38	70.38	69.75	71.57	69.94	69.67	71.03	72.22
TRG(dB)		-1.63	-1.53	-1.53	-1.53	-1.56	-1.45	-1.55	-1.57	-1.49	-1.41
TRG _{Theta} (dB)		-7.31	-7.16	-7.20	-7.11	-7.04	-6.96	-7.15	-7.13	-6.95	-6.87
TRG _{Phi} (dB)		-2.99	-2.92	-2.90	-2.93	-3.01	-2.89	-2.95	-2.98	-2.94	-2.87
UHRG(dB)		-4.44	-4.30	-4.33	-4.30	-4.31	-4.18	-4.23	-4.24	-4.12	-3.99
UHRG/TRG(%)		52.31	52.85	52.42	52.78	53.12	53.38	53.95	54.09	54.51	55.19
H-Plane		-17.93	-18.53	-17.86	-17.91	-18.29	-17.68	-18.03	-17.86	-18.38	-17.21
E1-Plane, AVG(dB)		-17.62	-17.53	-17.37	-17.48	-17.12	-17.14	-17.82	-17.86	-17.59	-17.27
E2-Plane, AVG(dB)		-2.34	-2.18	-2.27	-2.29	-2.24	-2.18	-2.31	-2.44	-2.33	-2.27
Peak Gain(dB)		0.29	0.35	0.34	0.39	0.32	0.41	0.38	0.42	0.49	0.54
Directivity(dB)		3.12	3.17	3.13	3.33	3.21	3.31	3.32	3.46	3.48	3.62
Minimum Gain(dB)		-21.04	-20.55	-19.59	-18.15	-18.18	-19.91	-19.49	-17.99	-19.05	-16.16
Average Efficiency				-1.65dBi,				68.44%			
Peak Gain				0.56dBi							

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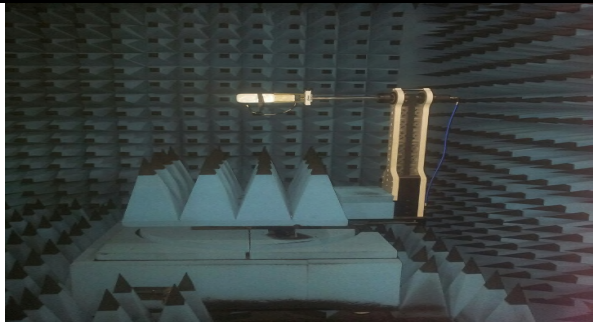
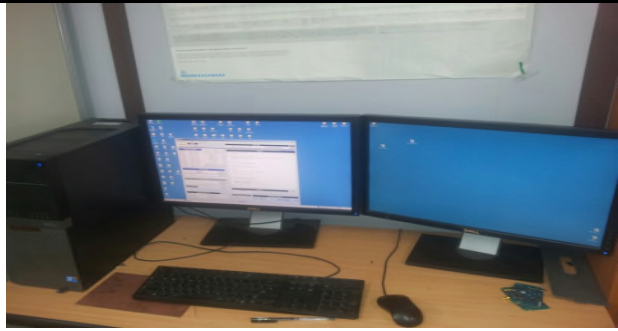
6.Measurement Process

6.1 SWR / Return loss

	Set Condition
Network Analyzer	Agilent 8753ES
Cable	Semi-ridid (40mm, 60mm)
Test condition	

6.2 Gain

Antenna gain is measured in the anechoic chamber of this company.

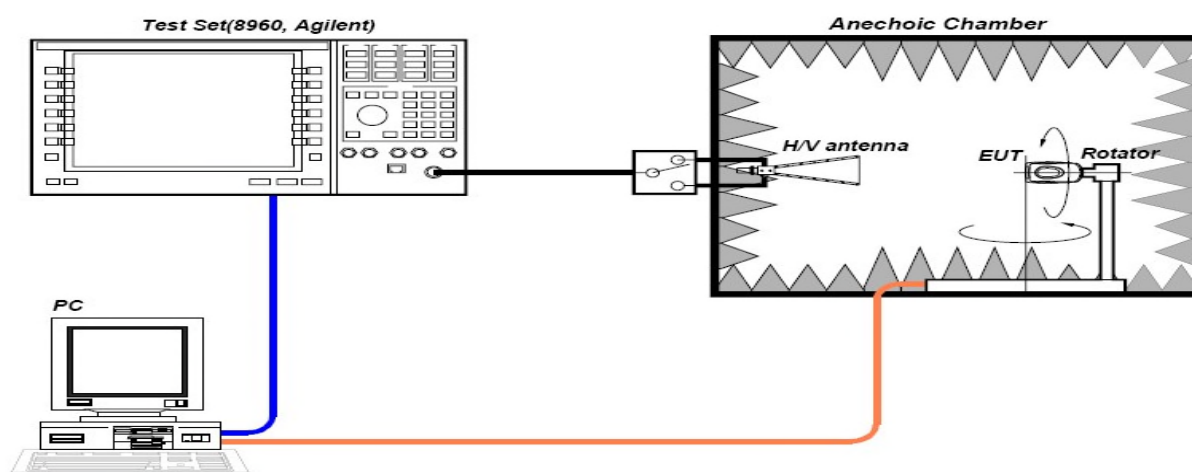
Anechoic Chamber for Antenna Gain Measurement	
	
	

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6.3 Gain test block diagram

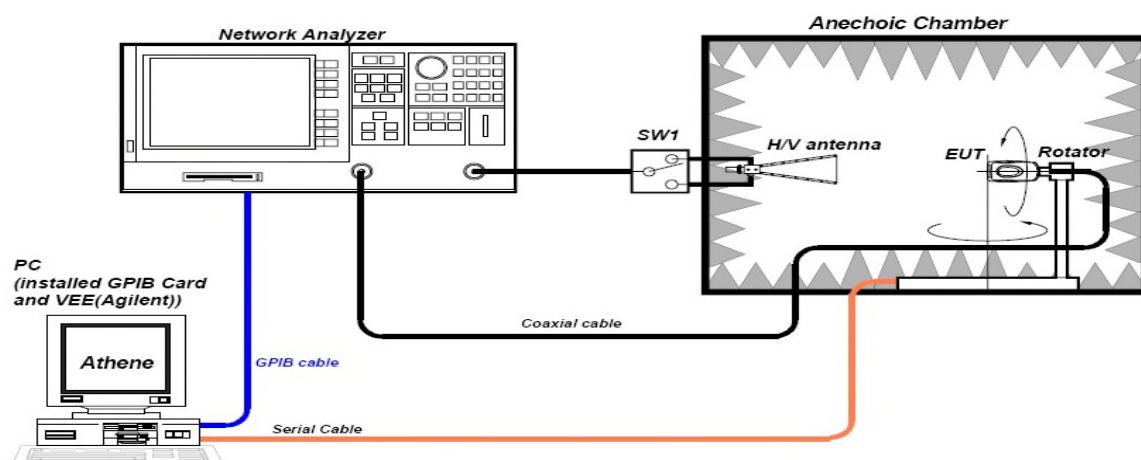
Active test Sysetm

- TRP, NHPRP, UHRP
- TIS, NHPIS, UHIS
- Relative Sensitivity



Passiver test Sysetm

- Efficiency
- Peak Gain, Avg, Gain
- Min, Max PWR



2018.04.24

RA-N0211-14

APPROVAL SHEET

MODEL : SENA_20A
Antenna layout

Review	Consent	Approval

Messrs. SENA Technology Co.,Ltd



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4.4 2D-GAIN

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2. Product Information

2.1 General Features

PART NUMBER	GradiANT
ANTENNA TYPE	Dipole Antenna
APPLICATIONS	Bluetooth

2.2 Electrical Specifications

Frequency Range1 (TX)		2400MHz~2485MHz	
Frequency Range1 (RX)		2400MHz~2485MHz	
IMPEDANCE		50 Ω	
V.S.W.R	TX	2400MHz	2485MHz
		5 ↓	5 ↓
	RX	2400MHz	2485MHz
		5 ↓	5 ↓
RADIATION PATTERN		Omni-directional	
POLARIZATION		Linear	

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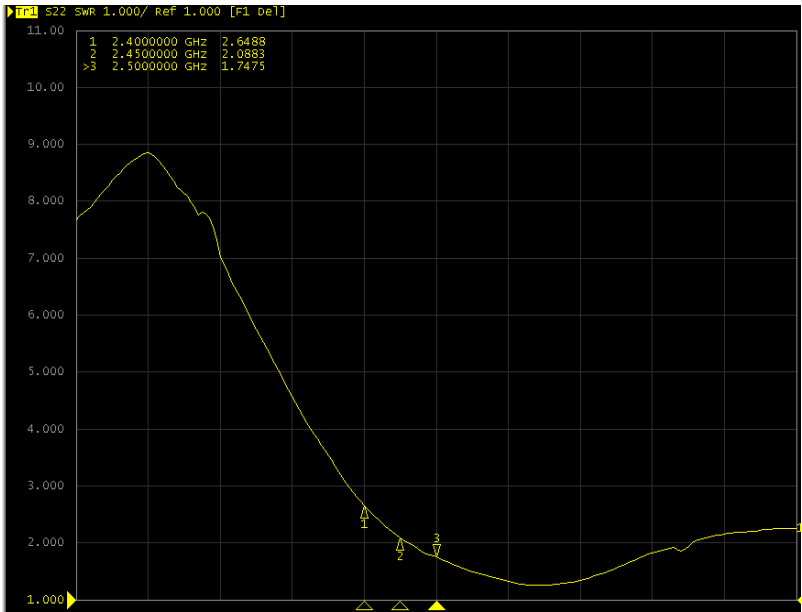
3. Pattern Specifications



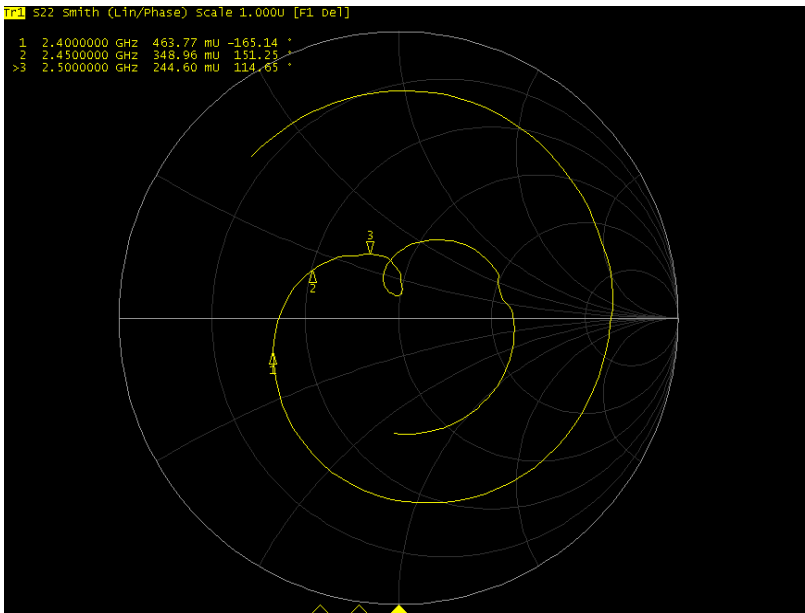
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	MODEL NAME		REV.	1.0	Page	6 / 11

4. Electrical Characterristics

4.1 VSWR



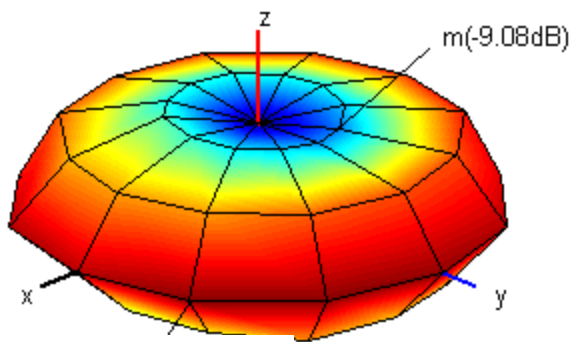
4.2 SMITH CHART



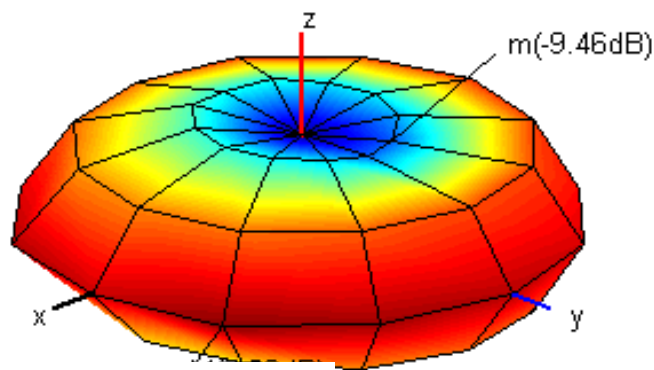
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4.3 3D-PLoTs

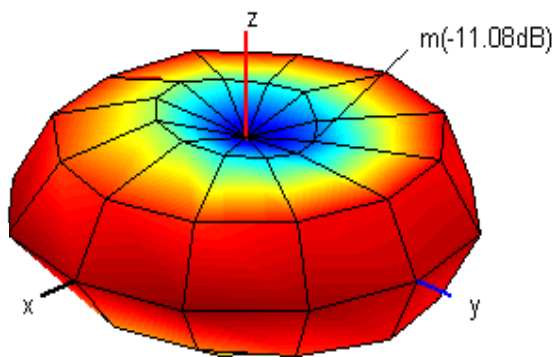
2400MHZ



2445MHZ



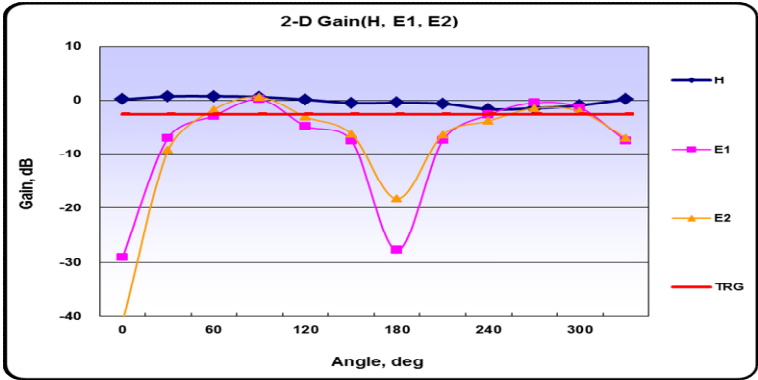
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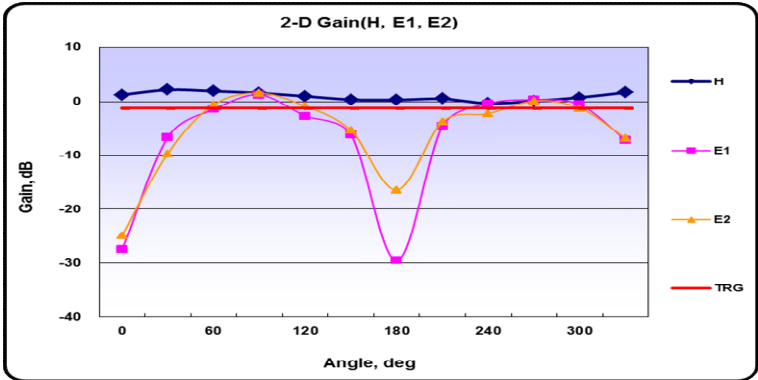
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4.4 2D-GAIN

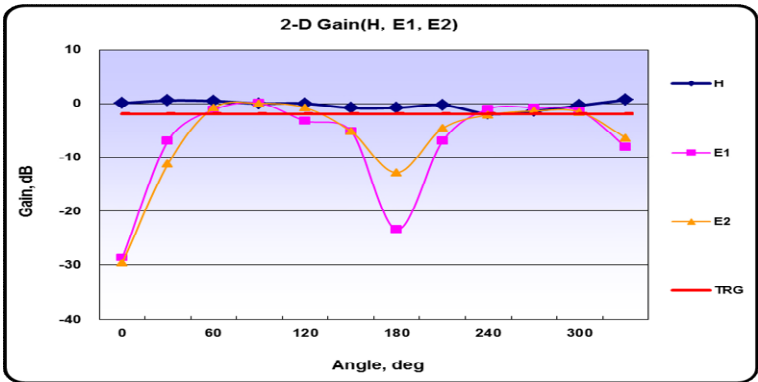
2400MHZ



2445MHZ



2485MHZ



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5. Passive Measurement

	1	2	3	4	5	6	7	8	9	10
Frequency(MHz)	2400	2405	2410	2415	2420	2425	2430	2435	2440	2445
Efficiency(dB)	-2.57	-2.60	-2.29	-2.04	-1.85	-1.85	-1.54	-1.34	-1.20	-1.25
Efficiency(%)	55.32	54.90	58.97	62.46	65.38	65.36	70.11	73.49	75.91	74.95
TRG(dB)	-2.57	-2.60	-2.29	-2.04	-1.85	-1.85	-1.54	-1.34	-1.20	-1.25
TRG _{Theta} (dB)	-2.66	-2.70	-2.38	-2.14	-1.94	-1.94	-1.64	-1.44	-1.30	-1.36
TRG _{Phi} (dB)	-19.27	-19.38	-19.36	-18.74	-18.59	-18.65	-17.94	-17.76	-17.68	-17.22
UHRG(dB)	-5.27	-5.37	-5.12	-4.89	-4.78	-4.78	-4.47	-4.30	-4.17	-4.22
UHRG/TRG(%)	53.67	52.94	52.12	51.94	50.83	50.95	50.98	50.52	50.39	50.54
H-Plane	-0.21	-0.20	-0.01	0.29	0.46	0.47	0.71	0.95	1.03	0.99
E1-Plane, AVG(dB)	-3.99	-4.17	-3.68	-3.48	-3.31	-3.41	-2.98	-2.86	-2.60	-2.72
E2-Plane, AVG(dB)	-3.92	-3.91	-3.58	-3.40	-3.17	-3.08	-2.89	-2.68	-2.50	-2.65
Peak Gain(dB)	-0.43	-0.30	-0.21	-0.23	-0.19	0.02	0.21	0.27	0.34	0.51
Directivity(dB)	3.31	3.40	3.07	3.38	3.37	3.37	3.20	3.23	3.13	3.48
Minimum Gain(dB)	-9.09	-9.84	-9.62	-8.90	-8.85	-9.28	-9.45	-8.85	-8.84	-9.46

		11	12	13	14	15	16	17	18	19	20
Frequency(MHz)		2450	2455	2460	2465	2470	2475	2480	2485	2490	2497
Efficiency(dB)		-1.44	-1.41	-1.37	-1.57	-1.74	-1.79	-2.01	-1.92	-1.92	-2.04
Efficiency(%)		71.86	72.20	72.99	69.59	66.99	66.17	62.97	64.20	64.33	62.58
TRG(dB)		-1.44	-1.41	-1.37	-1.57	-1.74	-1.79	-2.01	-1.92	-1.92	-2.04
TRG _{Theta} (dB)		-1.54	-1.54	-1.49	-1.70	-1.86	-1.93	-2.15	-2.08	-2.08	-2.22
TRG _{Phi} (dB)		-17.67	-17.05	-17.07	-16.96	-17.27	-16.74	-16.82	-16.52	-16.15	-15.88
UHRG(dB)		-4.43	-4.43	-4.35	-4.56	-4.71	-4.78	-5.00	-4.91	-4.86	-4.99
UHRG/TRG(%)		50.22	49.98	50.28	50.31	50.50	50.28	50.23	50.26	50.73	50.62
H-Plane		0.72	0.64	0.70	0.41	0.27	0.00	-0.27	-0.26	-0.28	-0.52
E1-Plane, AVG(dB)		-2.89	-2.85	-2.79	-3.10	-3.21	-3.30	-3.48	-3.43	-3.35	-3.47
E2-Plane, AVG(dB)		-2.88	-2.72	-2.70	-2.90	-3.03	-3.09	-3.32	-3.25	-3.17	-3.19
Peak Gain(dB)		0.42	0.31	0.35	0.27	0.19	0.21	0.03	-0.05	-0.22	-0.25
Directivity(dB)		3.23	2.99	2.98	2.99	2.84	2.94	2.70	2.65	2.68	2.70
Minimum Gain(dB)		-9.71	-9.94	-9.95	-10.49	-10.74	-11.03	-10.91	-11.08	-10.69	-10.69
Average Efficiency				-1.77dBi,				66.54%			
Peak Gain				0.51dBi							

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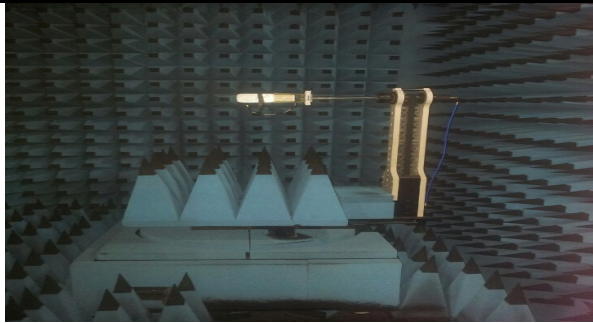
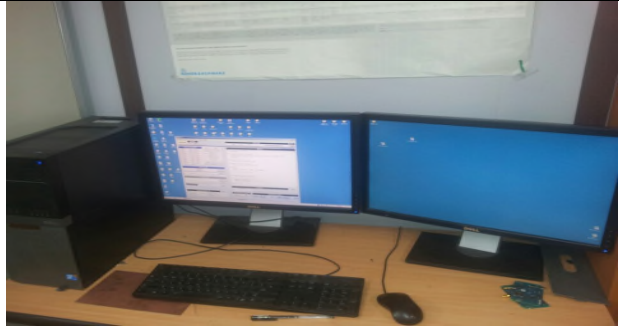
6.Measurement Process

6.1 SWR / Return loss

	Set Condition
Network Analyzer	Agilent 8753ES
Cable	Semi-ridid (40mm, 60mm)
Test condition	

6.2 Gain

Antenna gain is measured in the anechoic chamber of this company.

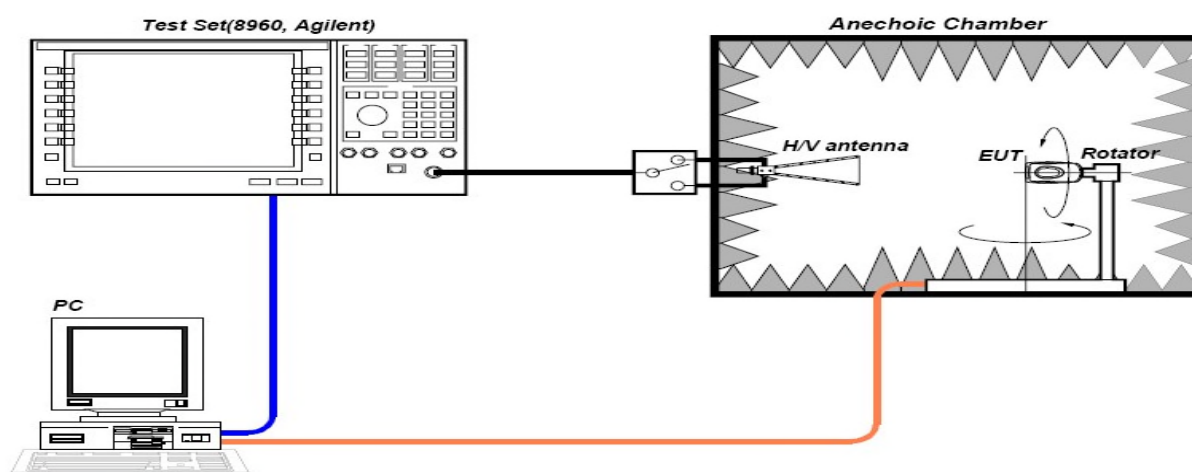
Anechoic Chamber for Antenna Gain Measurement	
	
	

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6.3 Gain test block diagram

Active test Sysetm

- TRP, NHPRP, UHRP
- TIS, NHPIS, UHIS
- Relative Sensitivity



Passiver test Sysetm

- Efficiency
- Peak Gain, Avg, Gain
- Min, Max PWR

