

2020.07.02

RA-N2007-1

# APPROVAL SHEET

**MODEL : 3S PLUS  
Antenna layout**

Review	Consent	Approval


**Messrs. SENA Technology Co.,Ltd**



**RadiNa Co. ,Ltd**


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### 1. Revision History

NO.	Before	After	Reason	Date
1				
2				
3				
4				
5				
6				
7				
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10				
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12				
13				

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## 2. Product Information

### 2.1 General Features

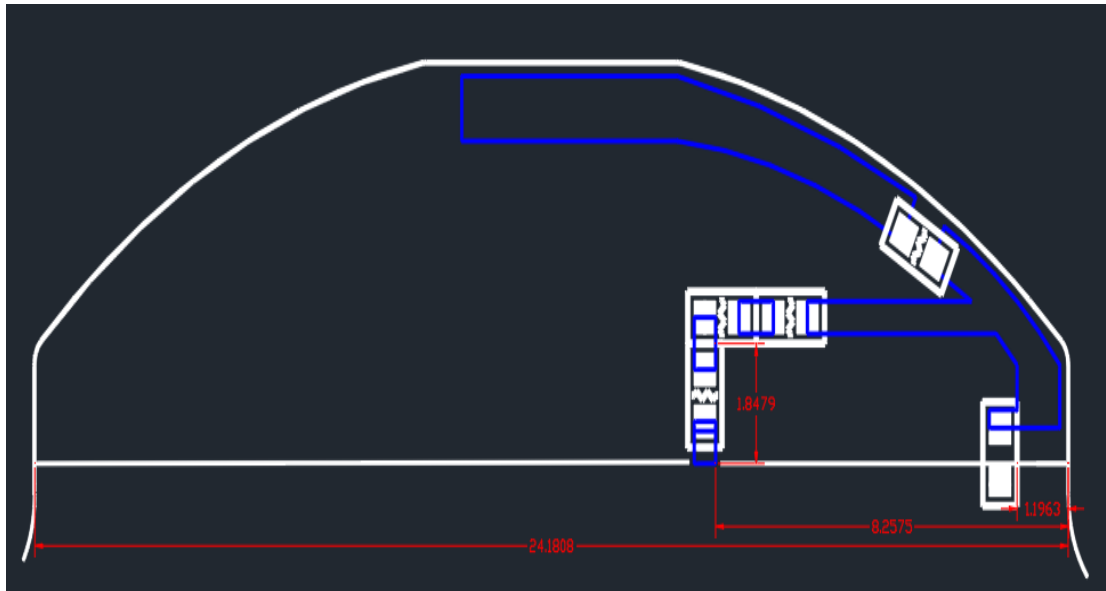
PART NUMBER	GradiANT
ANTENNA TYPE	PCB Pattern Antenna
APPLICATIONS	Bluetooth

### 2.2 Electrical Specifications

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

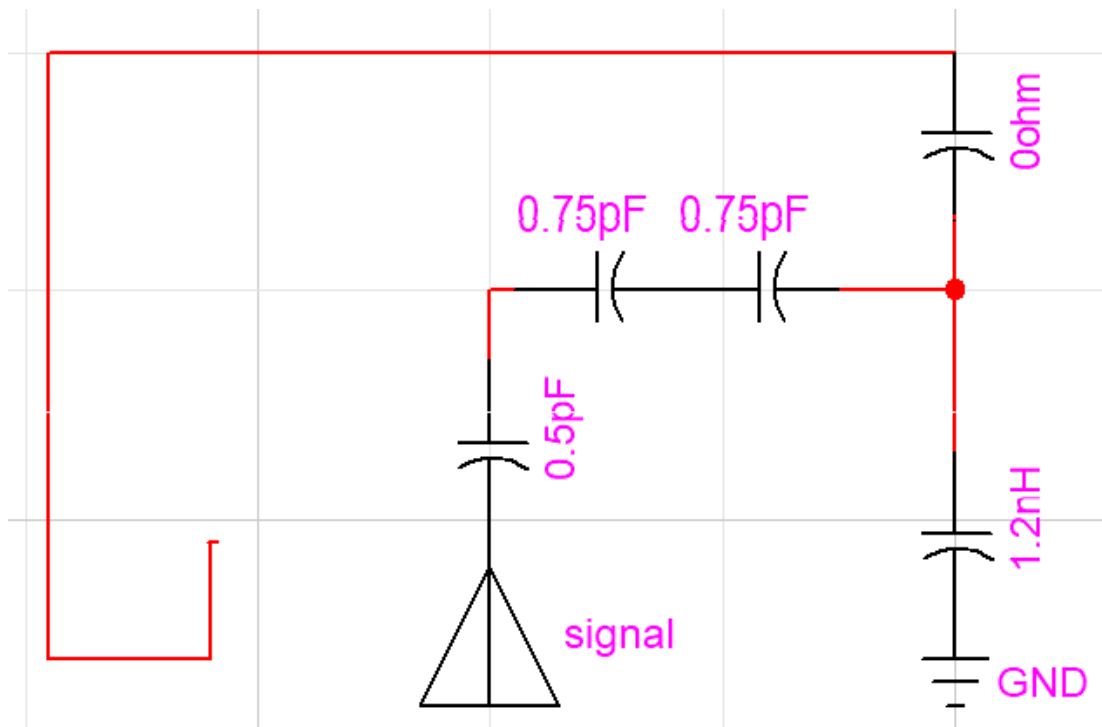
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### 3. Pattern Specifications



### 4. Matching Network

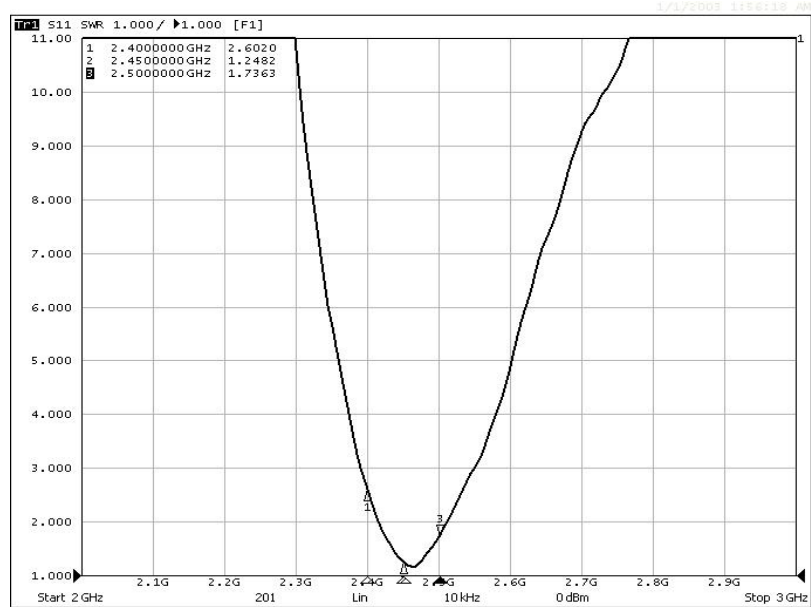
Capacitor value can be changed depending on different situation



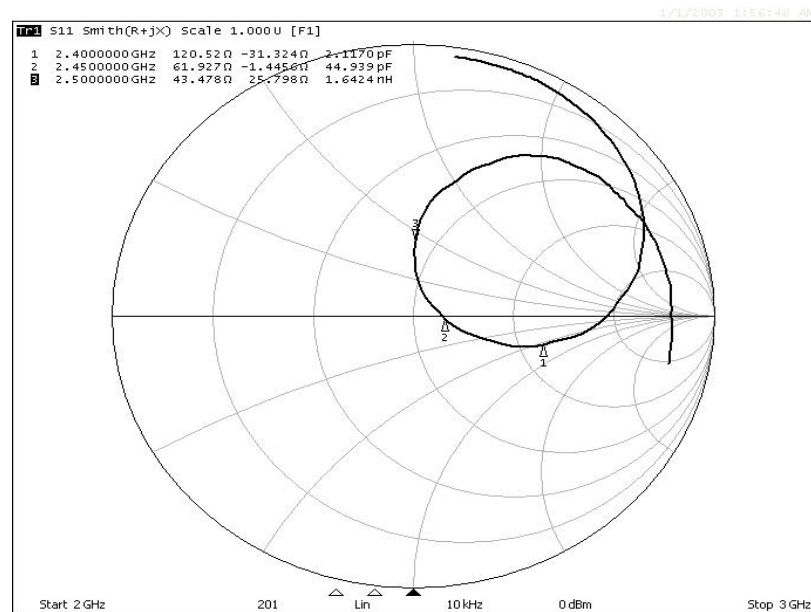


## 5. Electrical Characteristics

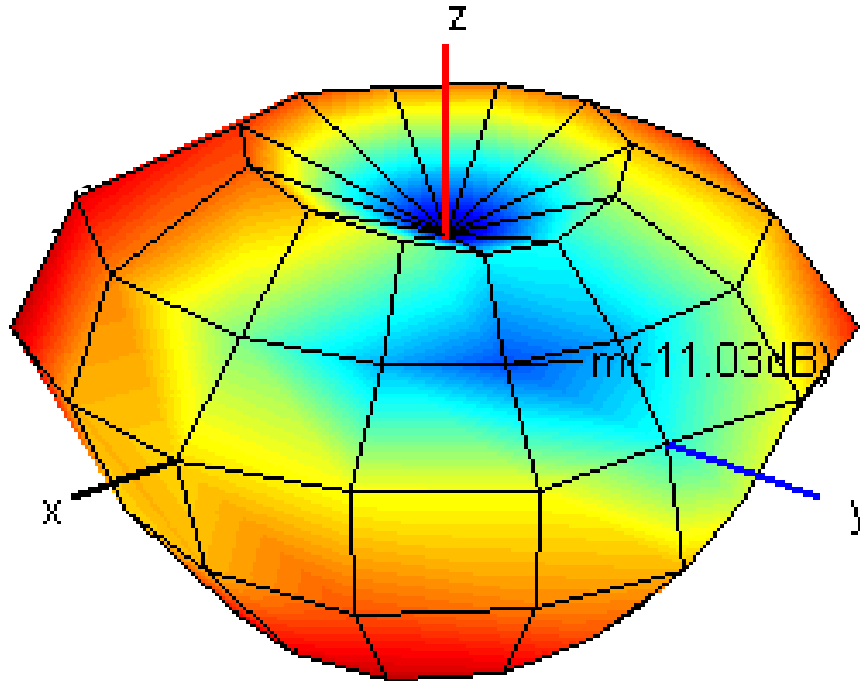
### 5.1 VSWR



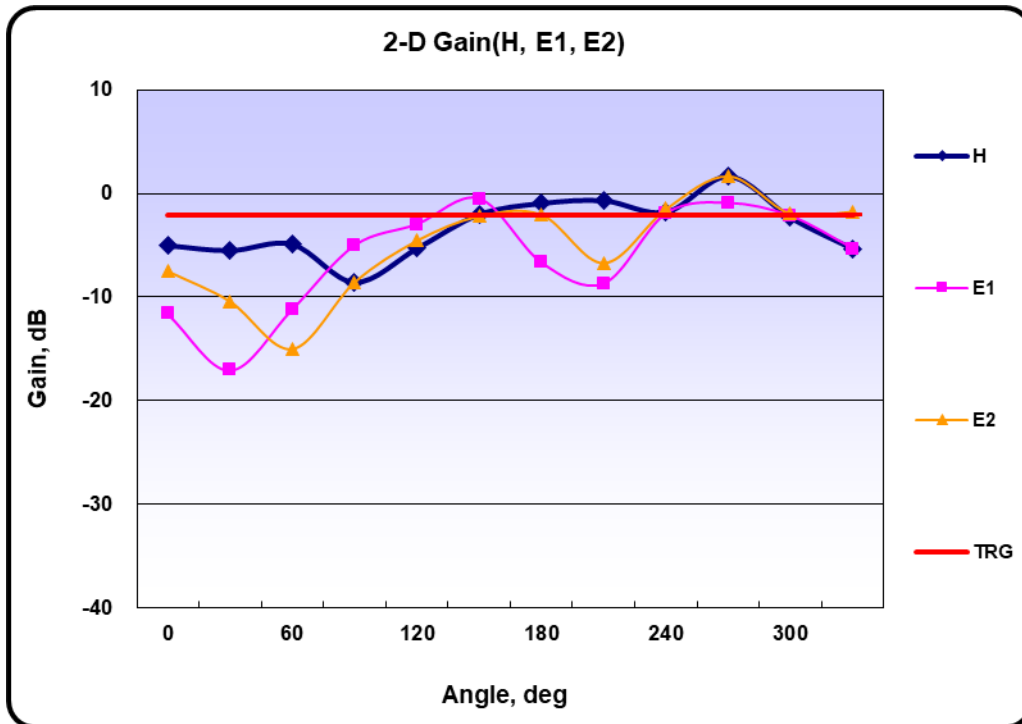
### 5.2 SMITH CHART




5.3 3D-PLOTS



5.4 2D-GAIN



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## 6. 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)	-3.00	-2.98	-2.79	-2.53	-2.56	-2.48	-2.35	-2.32	-2.18	-2.09
Efficiency(%)	50.16	50.39	52.66	55.89	55.41	56.45	58.17	58.67	60.53	61.78
TRG(dB)	-3.00	-2.98	-2.79	-2.53	-2.56	-2.48	-2.35	-2.32	-2.18	-2.09
TRG <sub>Theta</sub> (dB)	-4.60	-4.56	-4.34	-4.09	-4.14	-4.10	-3.88	-3.84	-3.73	-3.63
TRG <sub>Phi</sub> (dB)	-8.11	-8.12	-8.00	-7.71	-7.73	-7.55	-7.64	-7.59	-7.41	-7.35
UHRG(dB)	-6.08	-6.08	-5.91	-5.68	-5.73	-5.67	-5.59	-5.58	-5.48	-5.42
UHRG/TRG(%)	49.14	48.99	48.67	48.42	48.20	47.96	47.45	47.19	46.80	46.46
H-Plane	-3.43	-3.43	-3.23	-3.01	-3.09	-3.07	-2.85	-2.79	-2.67	-2.56
E1-Plane, AVG(dB)	-5.21	-5.15	-4.92	-4.65	-4.69	-4.64	-4.42	-4.40	-4.28	-4.19
E2-Plane, AVG(dB)	-3.81	-3.83	-3.64	-3.43	-3.52	-3.53	-3.35	-3.35	-3.28	-3.22
Peak Gain(dB)	-0.18	-0.23	-0.02	0.19	0.09	0.07	0.28	0.29	0.36	0.42
Directivity(dB)	2.82	2.75	2.77	2.72	2.65	2.56	2.64	2.60	2.54	2.51
Minimum Gain(dB)	-9.93	-10.04	-9.99	-9.87	-10.19	-10.28	-10.70	-10.86	-10.91	-11.04

	11	12	13	14	15	16	17	18	19	20
Frequency(MHz)	2450	2455	2460	2465	2470	2475	2480	2485	2490	2497
Efficiency(dB)	-2.12	-2.06	-2.03	-2.17	-2.27	-2.20	-2.40	-2.65	-2.73	-2.89
Efficiency(%)	61.36	62.26	62.67	60.64	59.30	60.23	57.57	54.37	53.30	51.36
TRG(dB)	-2.12	-2.06	-2.03	-2.17	-2.27	-2.20	-2.40	-2.65	-2.73	-2.89
TRG <sub>Theta</sub> (dB)	-3.61	-3.53	-3.51	-3.65	-3.71	-3.64	-3.86	-4.11	-4.16	-4.33
TRG <sub>Phi</sub> (dB)	-7.49	-7.48	-7.43	-7.58	-7.76	-7.70	-7.83	-8.08	-8.27	-8.39
UHRG(dB)	-5.48	-5.45	-5.46	-5.63	-5.76	-5.71	-5.93	-6.19	-6.29	-6.47
UHRG/TRG(%)	46.10	45.78	45.40	45.09	44.75	44.54	44.38	44.26	44.07	43.93
H-Plane	-2.54	-2.48	-2.50	-2.67	-2.77	-2.73	-3.00	-3.30	-3.42	-3.65
E1-Plane, AVG(dB)	-4.18	-4.10	-4.09	-4.21	-4.27	-4.19	-4.38	-4.62	-4.66	-4.83
E2-Plane, AVG(dB)	-3.24	-3.19	-3.18	-3.36	-3.44	-3.38	-3.65	-3.90	-3.96	-4.14
Peak Gain(dB)	0.38	0.38	0.34	0.13	-0.05	-0.04	-0.37	-0.67	-0.80	-0.97
Directivity(dB)	2.50	2.44	2.37	2.30	2.22	2.16	2.03	1.97	1.93	1.92
Minimum Gain(dB)	-11.42	-11.60	-11.71	-12.12	-12.47	-12.52	-12.79	-13.20	-13.24	-13.53


<b>Average Efficiency</b>	<b>-2.43dBi,</b>	<b>57.16%</b>
<b>Peak Gain</b>	<b>0.42dBi,</b>	



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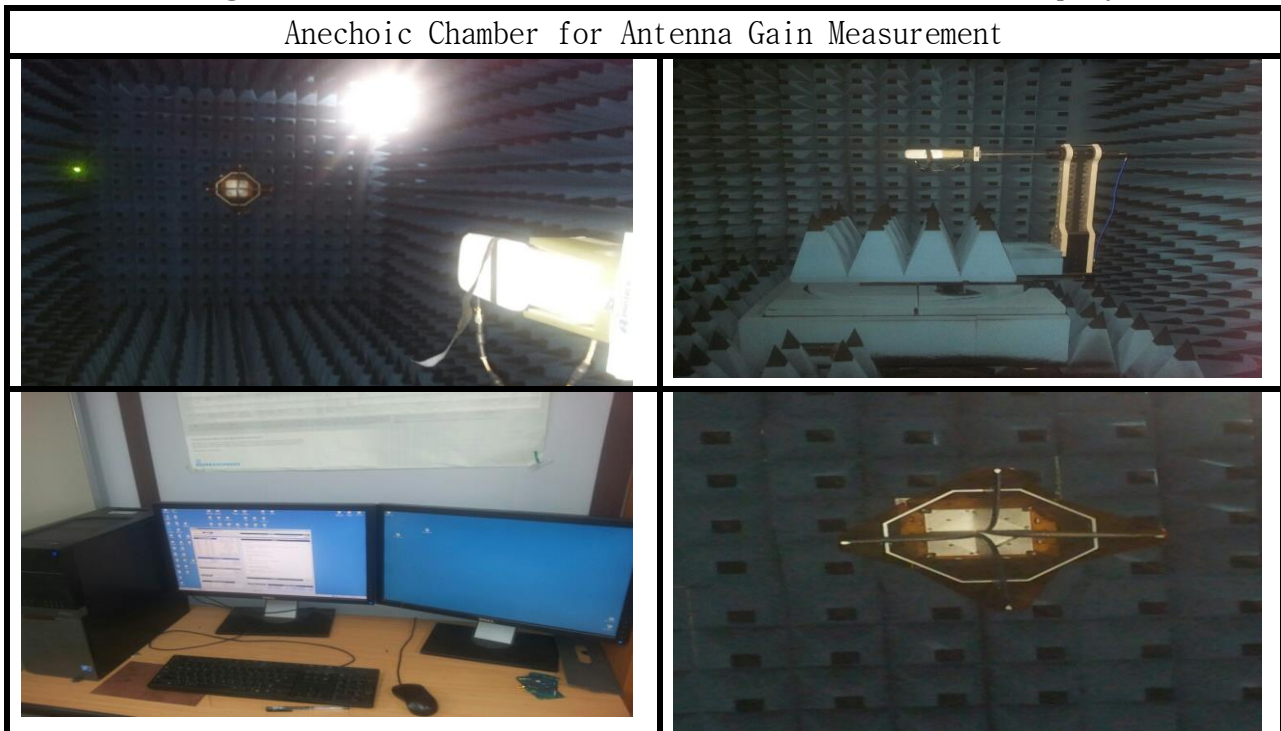
## 7. Measurement Process

### 5.1 SWR / Return loss

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

### 5.2 Gain

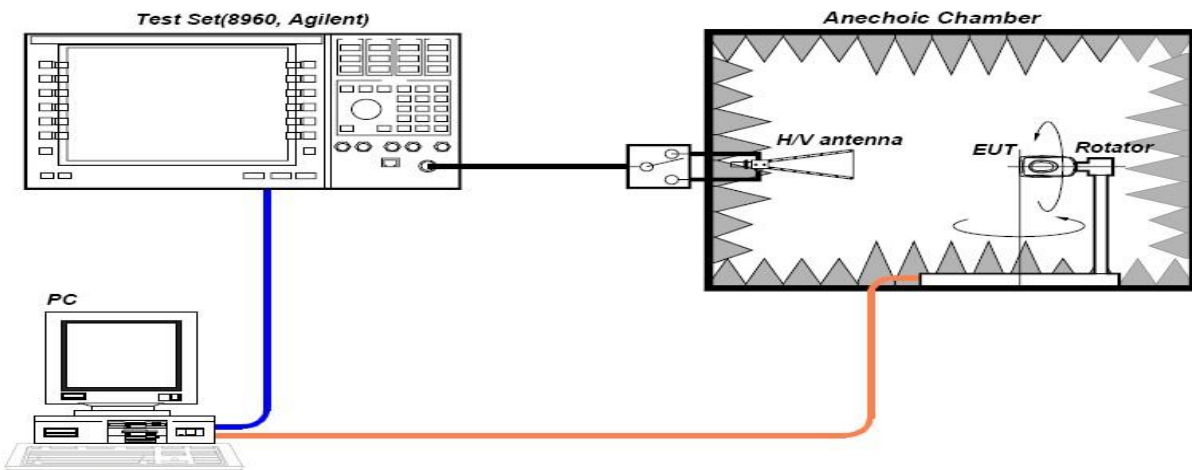
Antenna gain is measured in the anechoic chamber of this company.



5.3 Gain test block diagram

Active test System

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



Passive test System

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

