

2021.12.21

RA-N2112-32

APPROVAL SHEET

MODEL : TuffTalk –
New
Antenna layout

Review	Consent	Approval

Messrs. SENA Technology Co.,Ltd



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1. Revision History

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

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2.Product Information

2.1 General Features

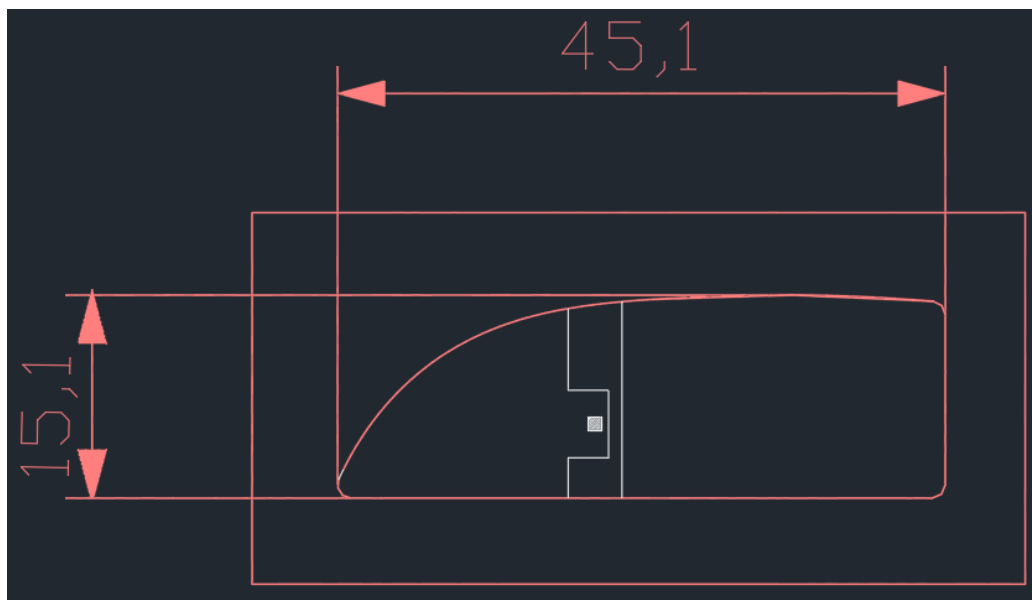
PART NUMBER	GradiANT
ANTENNA TYPE	PCB Pattern Antenna
APPLICATIONS	Bluetooth

2.2 Electrical Specifications

Frequency Range1 (TX)		2400MHz~2485MHz	
Frequency Range1 (RX)		2400MHz~2485MHz	
IMPEDANCE		50 Ω	
V.S.W.R	TX	2400MHz	2485MHz
		3 ↓	3 ↓
	RX	2400MHz	2485MHz
		3 ↓	3 ↓
RADIATION PATTERN		Omni-directional	
POLARIZATION		Linear	

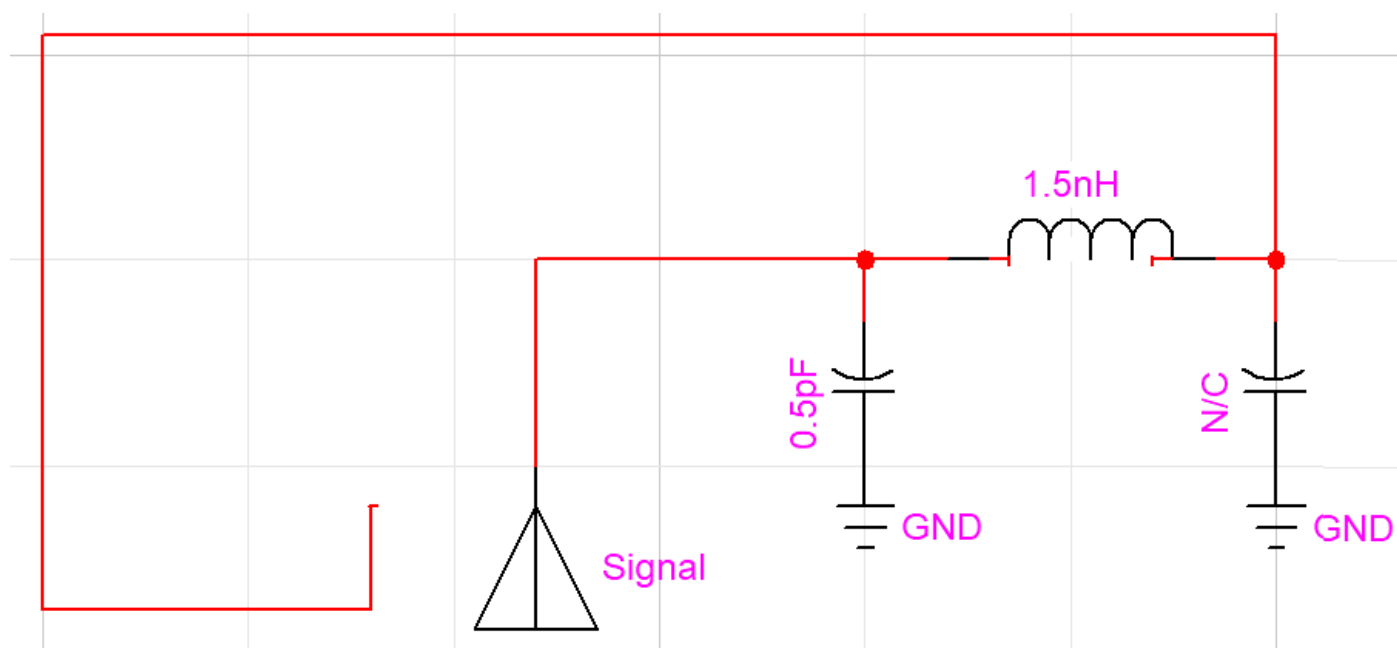
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3. Pattern Specifications



4. Matching Network

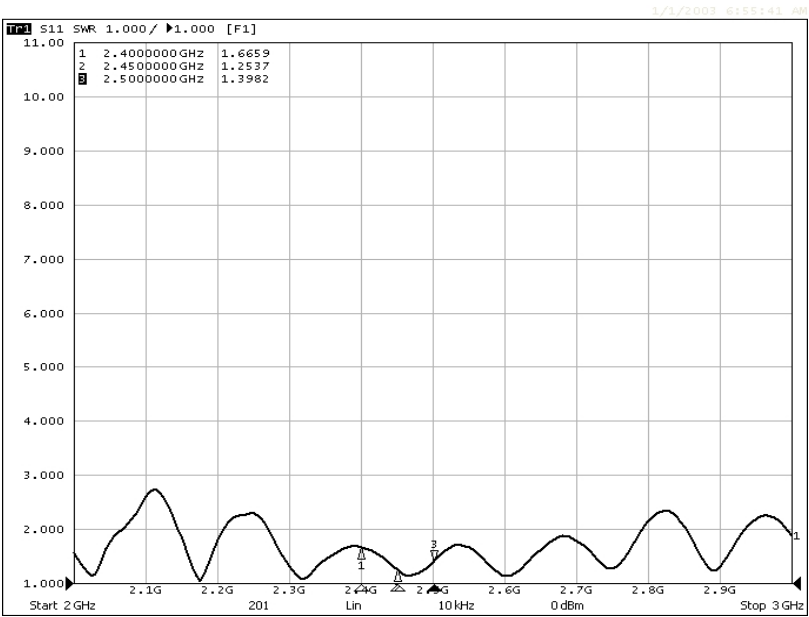
Capacitor value can be changed depending on different situation



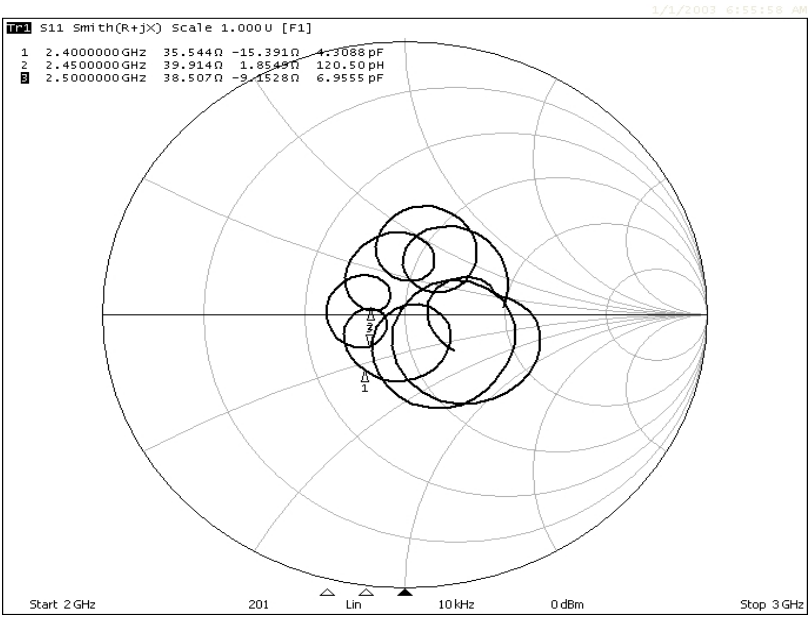
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5. Electrical Characterristics

5.1 VSWR

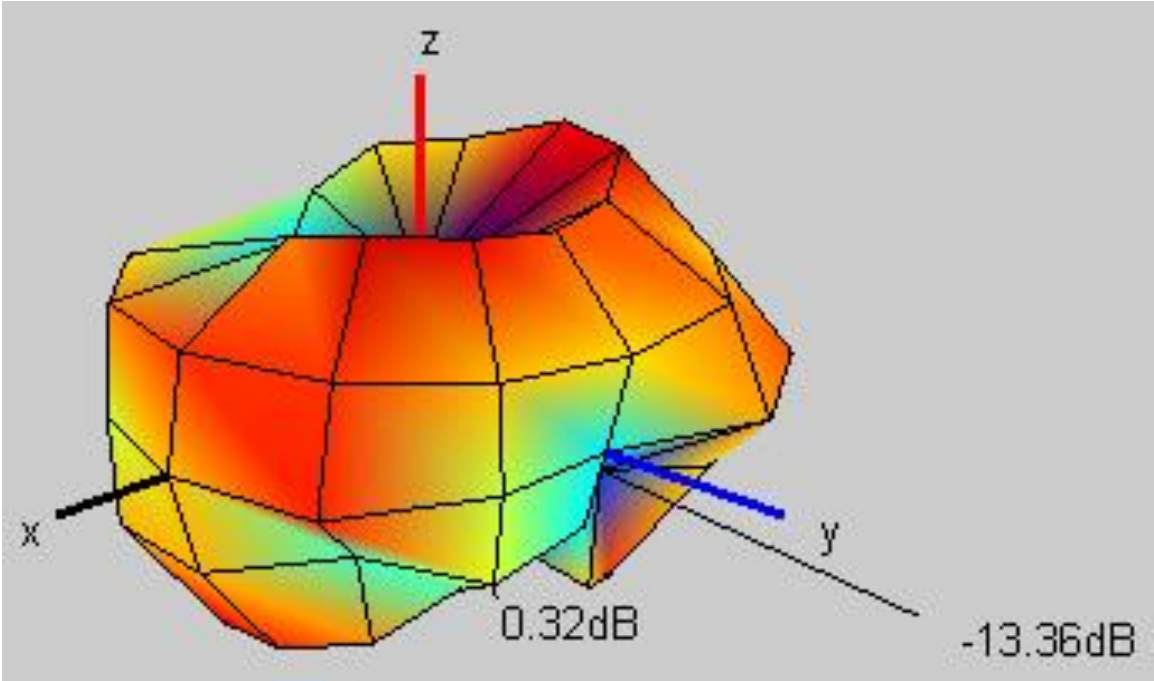


5.2 SMITH CHART

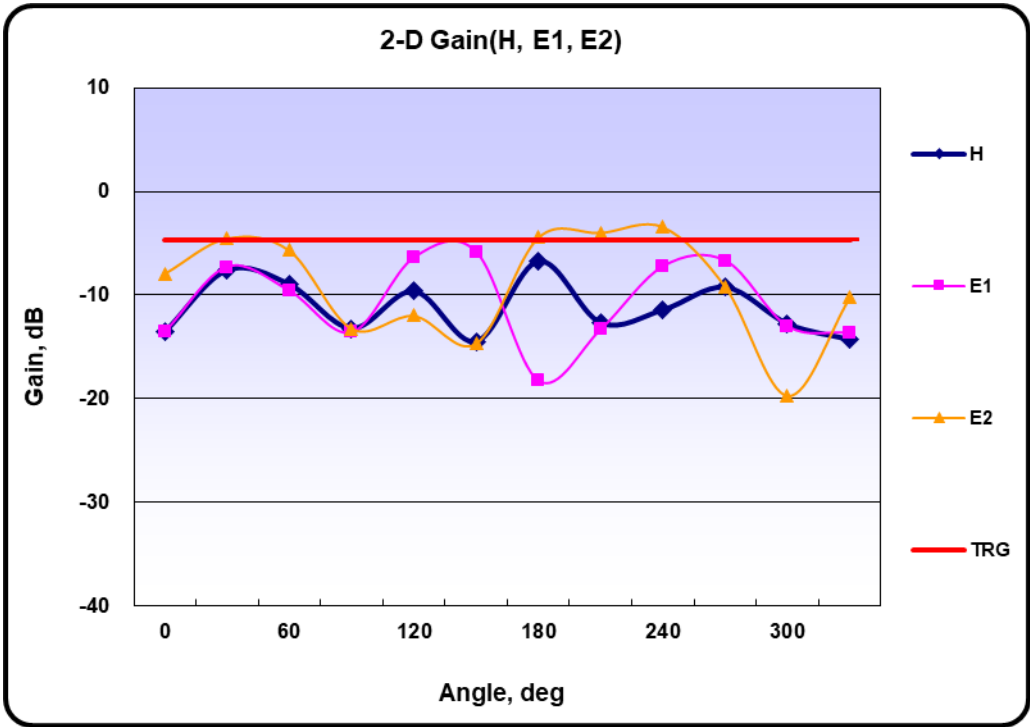


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5.3 3D-PLOTs



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)	-5.21	-5.28	-5.15	-5.02	-5.14	-5.05	-5.08	-4.98	-4.79	-4.68
Efficiency(%)	30.10	29.68	30.57	31.45	30.62	31.26	31.05	31.79	33.20	34.01
TRG(dB)	-5.21	-5.28	-5.15	-5.02	-5.14	-5.05	-5.08	-4.98	-4.79	-4.68
TRG _{Theta} (dB)	-8.63	-8.62	-8.44	-8.38	-8.62	-8.68	-8.53	-8.36	-8.28	-8.19
TRG _{Phi} (dB)	-7.85	-7.98	-7.90	-7.71	-7.73	-7.52	-7.69	-7.65	-7.37	-7.25
UHRG(dB)	-8.45	-8.63	-8.38	-8.23	-8.32	-8.12	-8.13	-8.15	-7.86	-7.76
UHRG/TRG(%)	47.52	46.18	47.51	47.76	48.06	49.28	49.57	48.11	49.26	49.28
H-Plane	-11.72	-11.78	-11.45	-11.13	-11.26	-11.18	-10.85	-10.67	-10.48	-10.44
E1-Plane, AVG(dB)	-9.49	-9.70	-9.21	-9.15	-9.64	-9.73	-9.68	-9.43	-9.44	-9.23
E2-Plane, AVG(dB)	-7.22	-7.47	-7.51	-7.38	-7.69	-7.78	-7.69	-7.47	-7.30	-7.04
Peak Gain(dB)	-0.07	-0.17	-0.12	0.17	0.20	0.09	0.07	0.44	0.20	0.32
Directivity(dB)	5.15	5.11	5.03	5.20	5.34	5.14	5.14	5.42	4.99	5.01
Minimum Gain(dB)	-13.44	-12.65	-13.06	-12.11	-12.30	-12.58	-12.76	-14.00	-13.99	-13.36

	11	12	13	14	15	16	17	18	19	20
Frequency(MHz)	2450	2455	2460	2465	2470	2475	2480	2485	2490	2497
Efficiency(dB)	-4.83	-4.68	-4.41	-4.50	-4.63	-4.57	-4.74	-5.10	-5.08	-5.07
Efficiency(%)	32.85	34.04	36.25	35.50	34.45	34.89	33.56	30.89	31.07	31.08
TRG(dB)	-4.83	-4.68	-4.41	-4.50	-4.63	-4.57	-4.74	-5.10	-5.08	-5.07
TRG _{Theta} (dB)	-8.23	-8.04	-7.81	-7.93	-8.01	-7.95	-8.30	-8.59	-8.51	-8.61
TRG _{Phi} (dB)	-7.49	-7.37	-7.06	-7.13	-7.30	-7.25	-7.27	-7.68	-7.70	-7.62
UHRG(dB)	-8.00	-7.86	-7.48	-7.60	-7.73	-7.64	-7.76	-8.11	-8.17	-8.19
UHRG/TRG(%)	48.30	48.10	49.34	48.98	49.00	49.32	49.91	50.00	49.03	48.79
H-Plane	-10.88	-10.54	-10.11	-10.29	-10.33	-10.10	-10.55	-10.68	-10.54	-10.33
E1-Plane, AVG(dB)	-8.87	-8.76	-8.39	-8.35	-8.39	-8.51	-9.04	-9.51	-9.43	-9.84
E2-Plane, AVG(dB)	-6.93	-6.72	-6.49	-6.54	-6.59	-6.46	-6.68	-6.85	-6.62	-6.59
Peak Gain(dB)	-0.06	0.04	0.43	0.53	-0.29	-0.40	0.22	-0.64	-0.73	-0.52
Directivity(dB)	4.78	4.72	4.84	5.03	4.34	4.17	4.96	4.46	4.34	4.56
Minimum Gain(dB)	-13.16	-12.33	-12.24	-12.18	-11.85	-12.19	-12.62	-11.95	-11.64	-10.97

Average Efficiency	-4.89dBi,	32.41%
Peak Gain	0.53dBi,	

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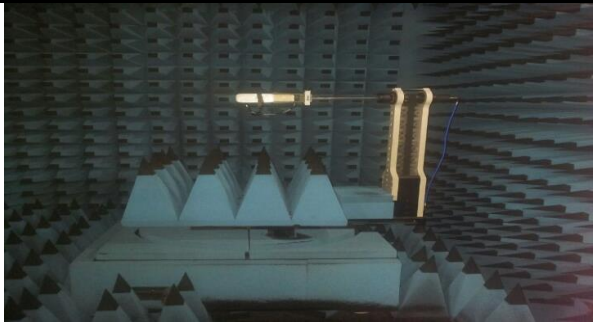
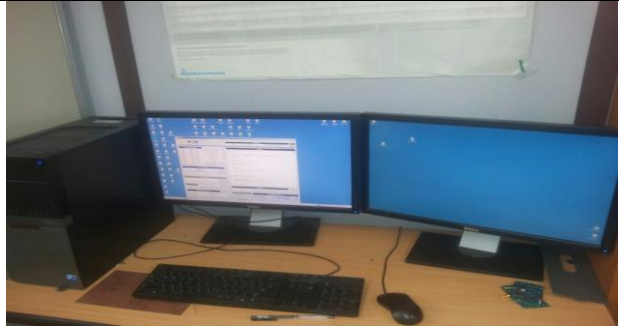
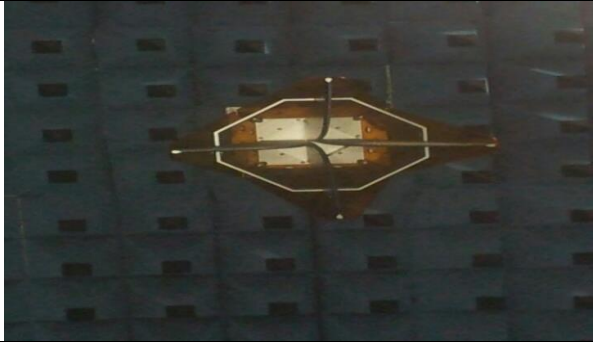
7.Measurement Process

7.1 SWR / Return loss

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

7.2 Gain

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

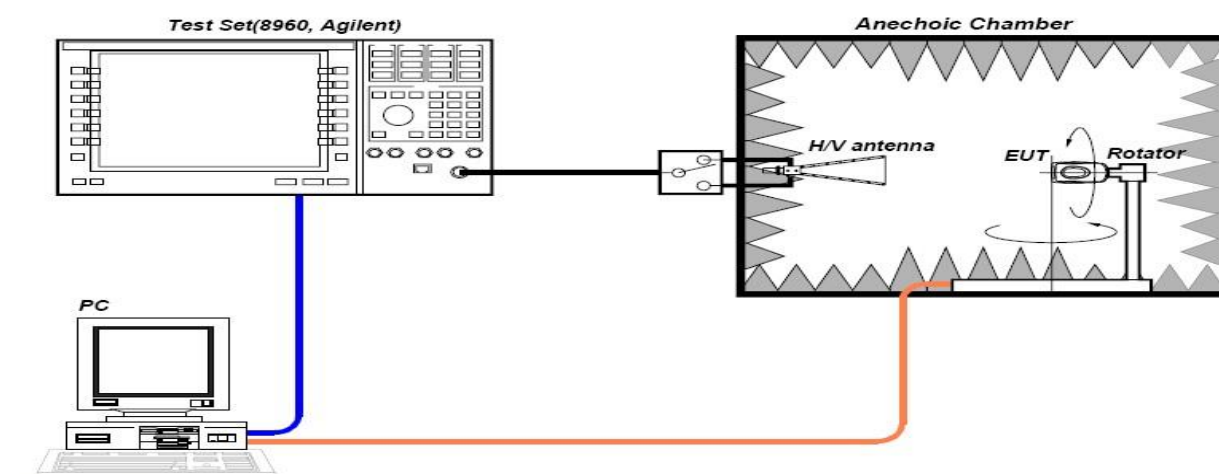
Anechoic Chamber for Antenna Gain Measurement	
	
	

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7.3 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

