

2021.12.21

RA-N2112-31

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				
7				
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9				
10				
11				
12				
13				

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2.Product Information

2.1 General Features

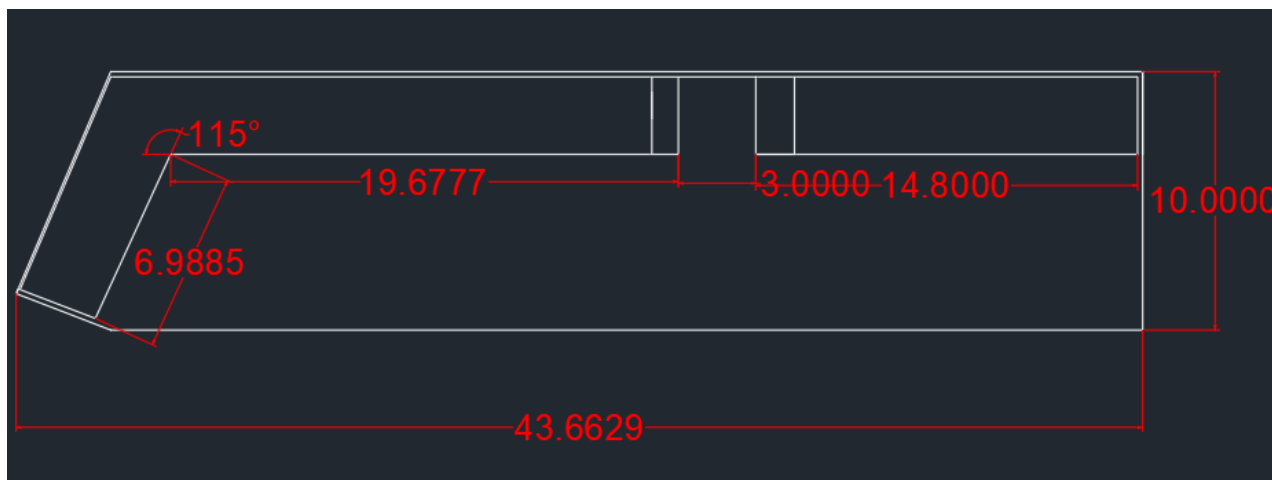
PART NUMBER	GradiANT
ANTENNA TYPE	PCB Pattern Antenna
APPLICATIONS	Bluetooth

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	

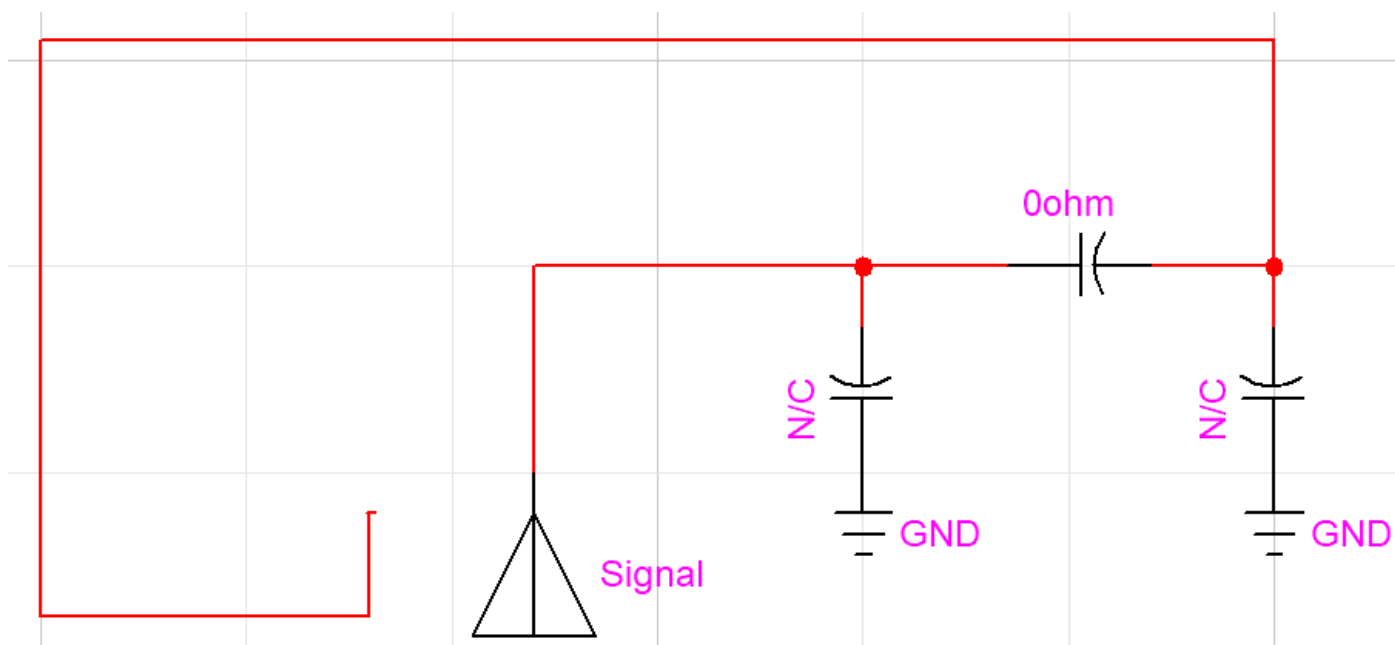
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3. Pattern Specifications



4. Matching Network

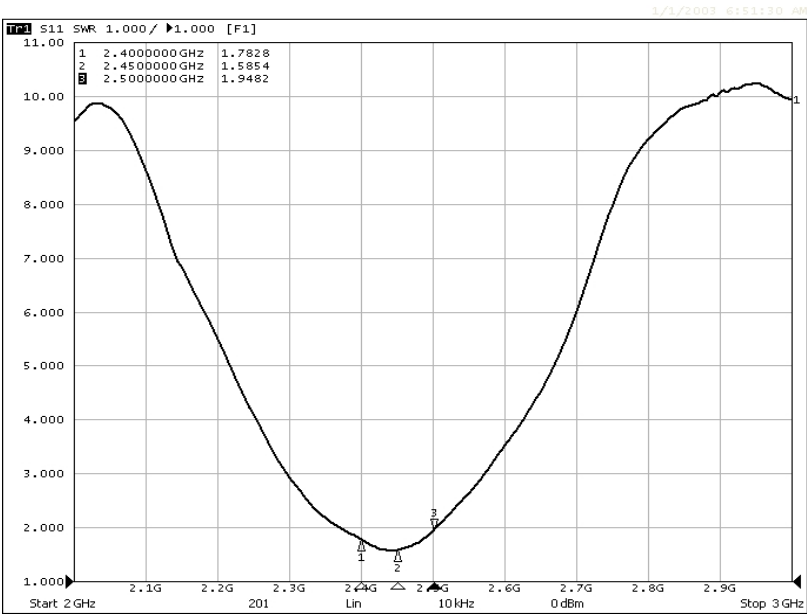
Capacitor value can be changed depending on different situation



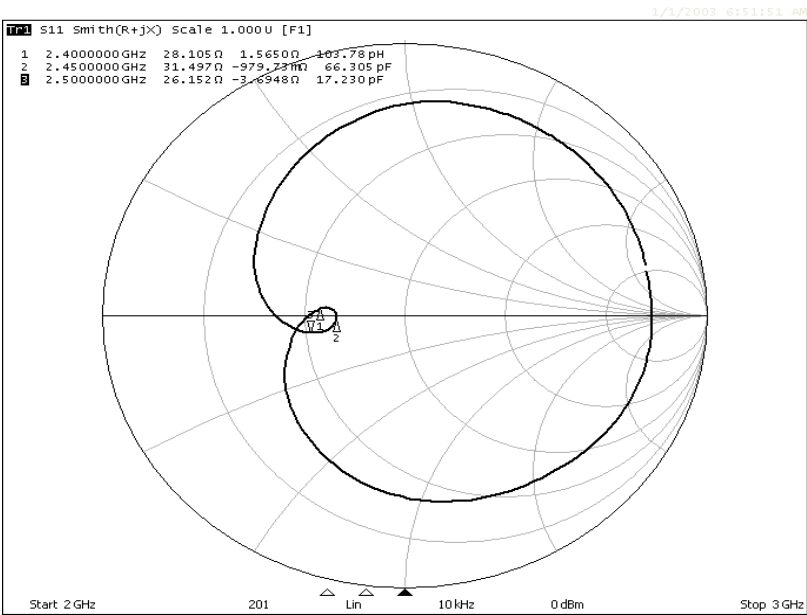
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5. Electrical Characterristics

5.1 VSWR

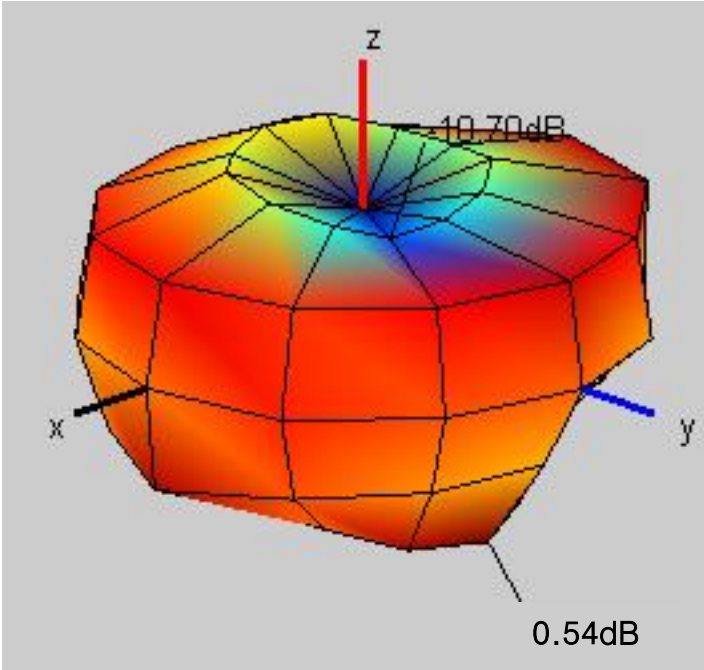


5.2 SMITH CHART

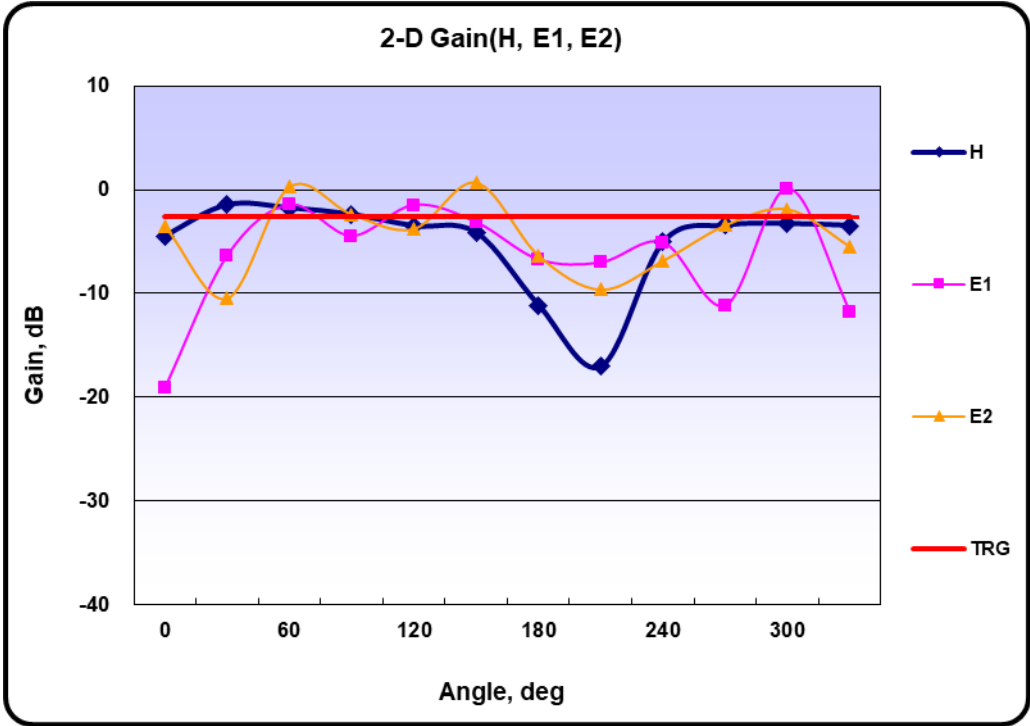


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5.3 3D-PLOTs



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)	-3.41	-3.39	-3.15	-2.92	-3.08	-3.04	-2.87	-2.67	-2.64	-2.64
Efficiency(%)	45.56	45.81	48.37	51.00	49.21	49.70	51.58	54.07	54.40	54.42
TRG(dB)	-3.41	-3.39	-3.15	-2.92	-3.08	-3.04	-2.87	-2.67	-2.64	-2.64
TRG _{Theta} (dB)	-4.51	-4.50	-4.22	-4.01	-4.14	-4.09	-3.83	-3.59	-3.52	-3.50
TRG _{Phi} (dB)	-9.93	-9.86	-9.76	-9.48	-9.72	-9.71	-9.92	-9.88	-10.01	-10.10
UHRG(dB)	-6.30	-6.30	-6.06	-5.78	-5.95	-5.85	-5.62	-5.36	-5.34	-5.28
UHRG/TRG(%)	51.51	51.20	51.27	51.79	51.61	52.27	53.10	53.84	53.72	54.44
H-Plane	-5.40	-5.39	-4.95	-4.70	-4.75	-4.65	-4.33	-4.05	-3.92	-3.86
E1-Plane, AVG(dB)	-5.34	-5.29	-4.98	-4.79	-4.91	-4.89	-4.62	-4.41	-4.36	-4.37
E2-Plane, AVG(dB)	-4.21	-4.18	-3.99	-3.77	-3.90	-3.78	-3.56	-3.31	-3.24	-3.23
Peak Gain(dB)	-0.33	-0.17	0.05	0.32	0.10	0.23	0.41	0.60	0.53	0.54
Directivity(dB)	3.09	3.32	3.21	3.25	3.18	3.27	3.28	3.27	3.17	3.18
Minimum Gain(dB)	-11.37	-9.22	-11.19	-9.45	-9.19	-9.77	-10.48	-10.11	-10.12	-10.70

	11	12	13	14	15	16	17	18	19	20
Frequency(MHz)	2450	2455	2460	2465	2470	2475	2480	2485	2490	2497
Efficiency(dB)	-2.68	-2.64	-2.40	-2.49	-2.60	-2.63	-2.88	-3.13	-2.85	-2.76
Efficiency(%)	53.94	54.45	57.50	56.37	54.99	54.63	51.50	48.63	51.93	52.96
TRG(dB)	-2.68	-2.64	-2.40	-2.49	-2.60	-2.63	-2.88	-3.13	-2.85	-2.76
TRG _{Theta} (dB)	-3.52	-3.42	-3.18	-3.27	-3.36	-3.39	-3.67	-3.93	-3.64	-3.56
TRG _{Phi} (dB)	-10.24	-10.51	-10.24	-10.33	-10.52	-10.53	-10.68	-10.86	-10.63	-10.52
UHRG(dB)	-5.29	-5.24	-4.98	-5.07	-5.19	-5.19	-5.47	-5.72	-5.40	-5.32
UHRG/TRG(%)	54.90	54.99	55.22	55.24	55.03	55.39	55.17	55.07	55.57	55.47
H-Plane	-3.88	-3.69	-3.45	-3.54	-3.63	-3.60	-3.93	-4.16	-3.80	-3.74
E1-Plane, AVG(dB)	-4.43	-4.40	-4.17	-4.29	-4.42	-4.46	-4.68	-5.03	-4.75	-4.61
E2-Plane, AVG(dB)	-3.29	-3.23	-2.98	-3.10	-3.24	-3.29	-3.57	-3.90	-3.58	-3.54
Peak Gain(dB)	0.44	0.47	0.76	0.58	0.57	0.55	0.30	0.08	0.27	0.39
Directivity(dB)	3.12	3.11	3.16	3.07	3.17	3.18	3.19	3.21	3.11	3.15
Minimum Gain(dB)	-10.53	-10.06	-10.30	-10.79	-10.58	-9.91	-10.24	-11.29	-9.79	-9.23

Average Efficiency	-2.84dBi,	52.05%
Peak Gain	0.76dBi,	

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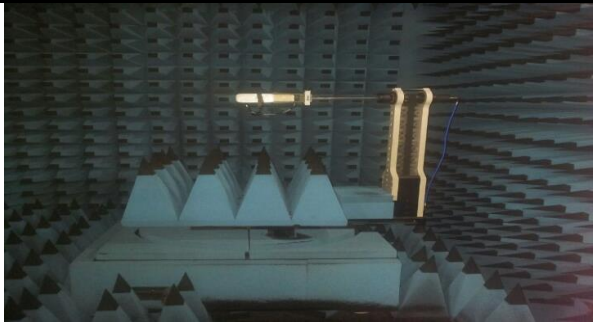
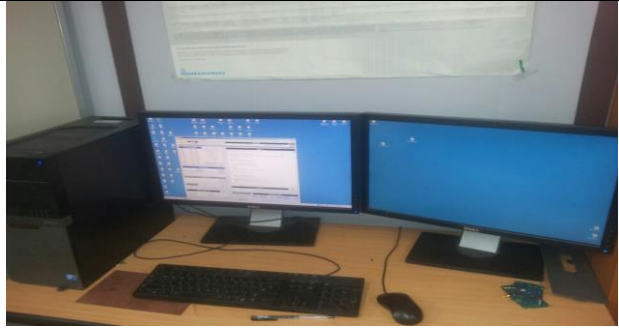
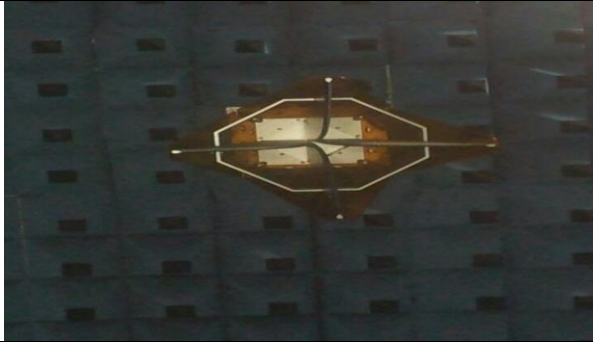
7.Measurement Process

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.

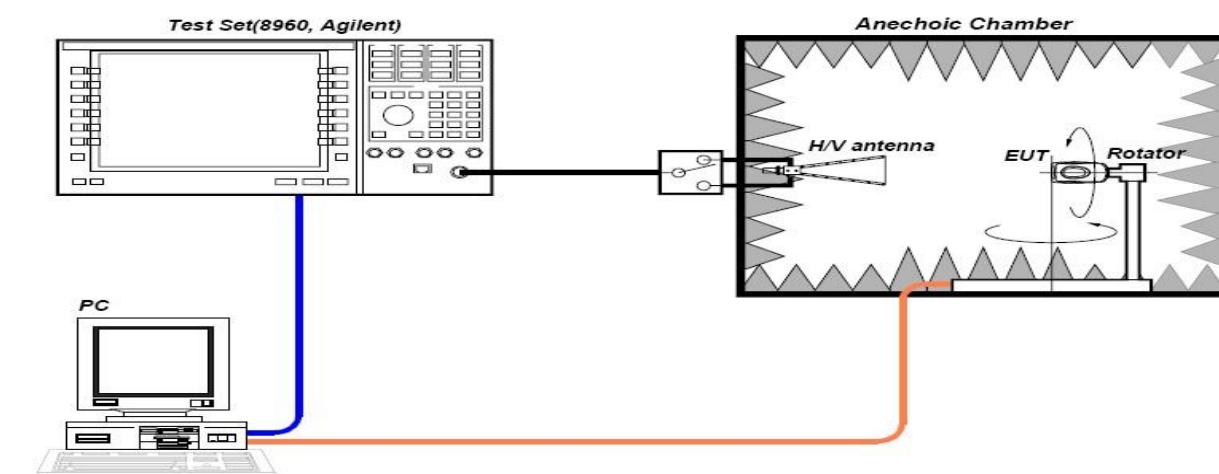
Anechoic Chamber for Antenna Gain Measurement	
	
	

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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

