26.02.23
RA-N2602-21

APPROVAL SHEET

MODEL : VORTEX
Bluetooth
Antenna layout

Review	Consent	Approval

Messrs. SENA Technology Co.,Ltd

RadiNa Co. ,Ltd

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1. Revision History

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2. Product Information

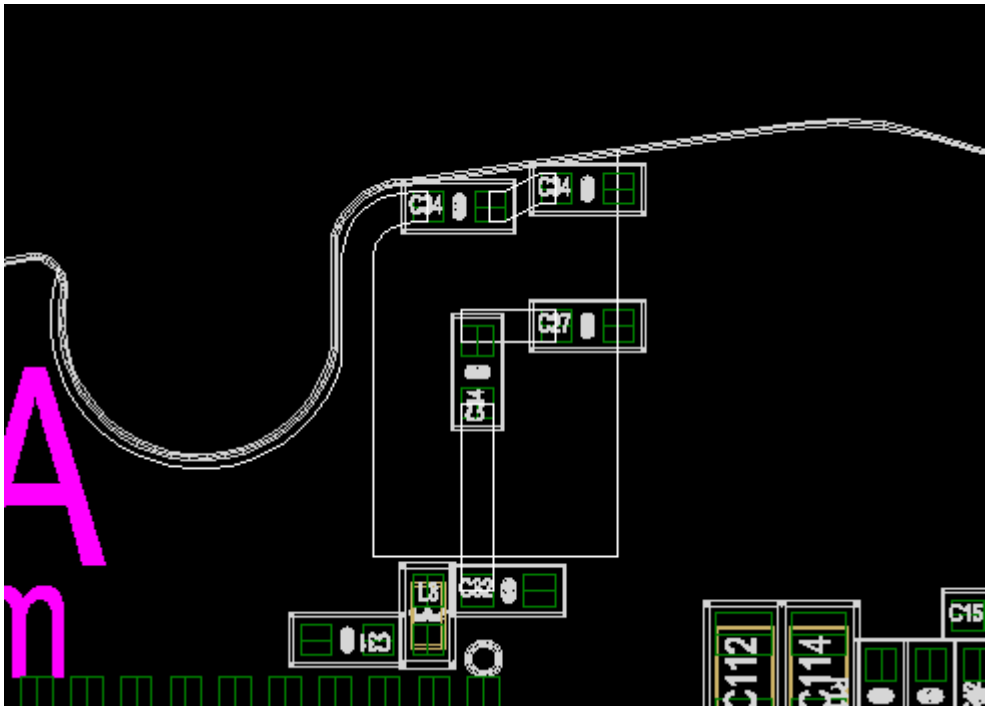
2.1 General Features

PART NUMBER	GradiANT
ANTENNA TYPE	PCB pattern Antenna
APPLICATIONS	Bluetooth

2.2 Electrical Specifications

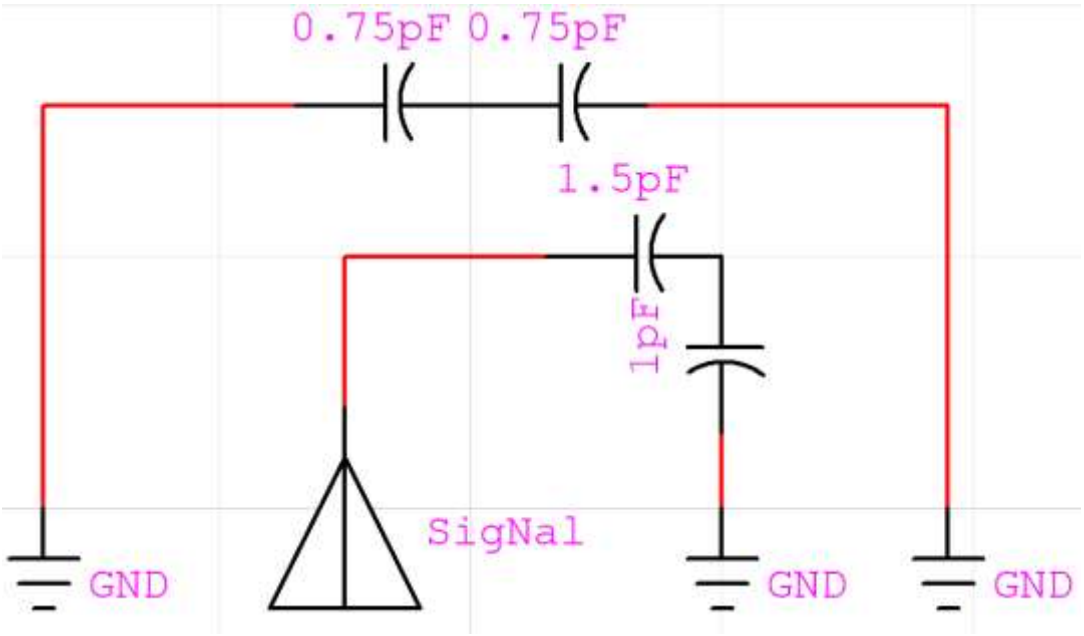
Frequency Range1 (TX)		2400MHz~2485MHz	
Frequency Range1 (RX)		2400MHz~2485MHz.	
IMPEDANCE		50 Ω	
V.S.W.R	TX	2400MHz	2485MHz
		5↓	5↓
	RX	2400MHz	2485MHz
		5↓	5↓
RADIATION PATTERN		Omni-directional	
POLARIZATION		Linear	

3. Pattern Specifications



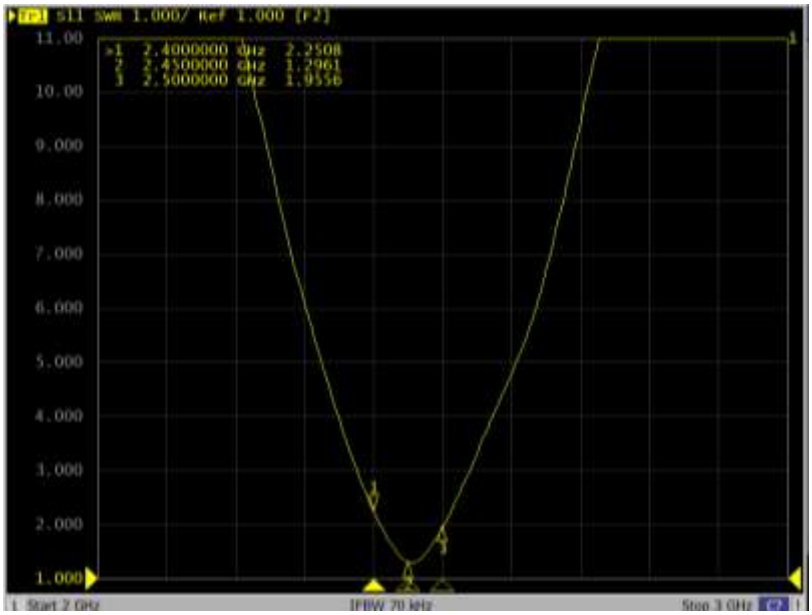
4. Matching Network

Capacitor value can be changed depending on different situation

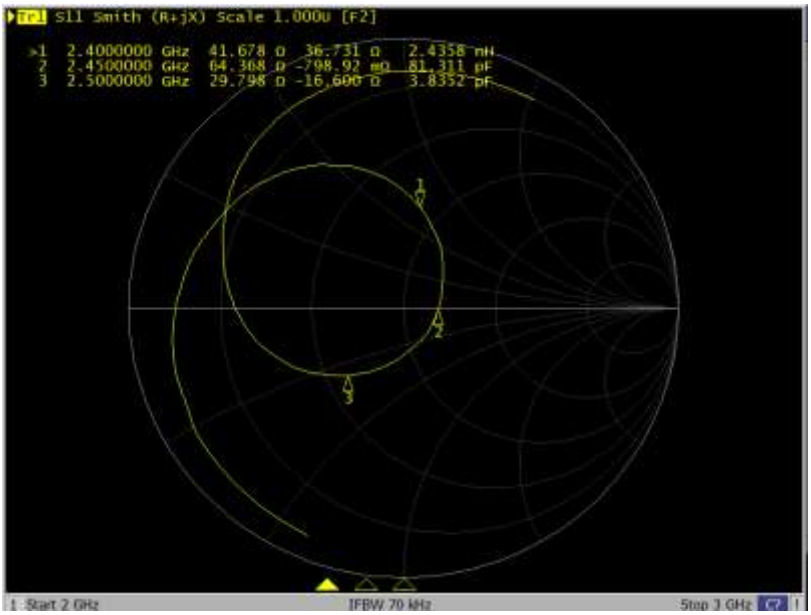


5. Electrical Characterristics

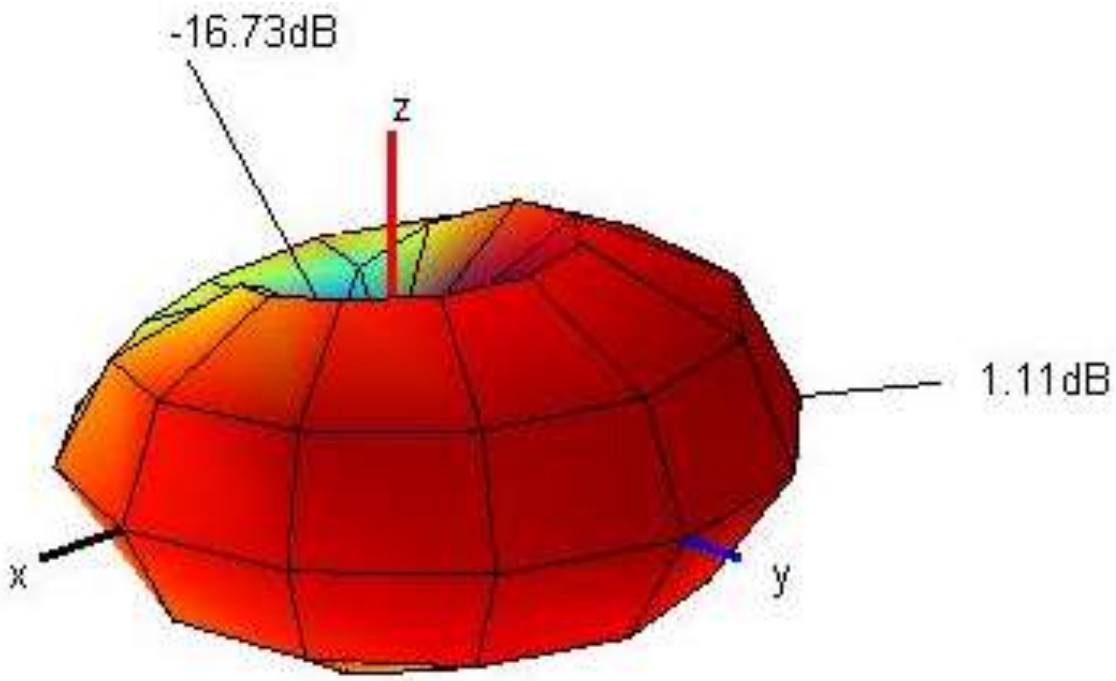
5.1 VSWR



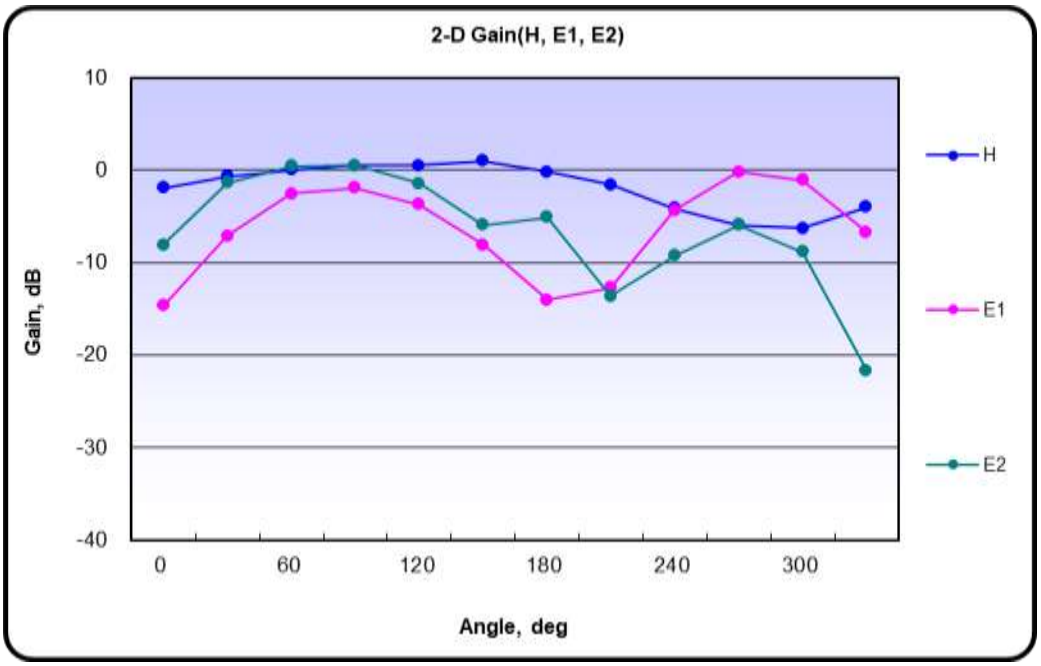
5.2 SMITH CHART



5.3 3D-PLOTs



5.4 2D-Gain



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]	**-3.53**	**-3.32**	**-3.32**	**-3.16**	**-3.26**	**-3.02**	**-2.86**	**-2.75**	**-2.65**	**-2.62**
Efficiency [%]	**44.4**	**46.5**	**46.5**	**48.3**	**47.2**	**49.9**	**51.8**	**53.0**	**54.3**	**54.6**
TRG_{θ} [dB]	-4.01	-3.81	-3.80	-3.64	-3.75	-3.51	-3.35	-3.27	-3.18	-3.16
$Gain_{\theta\ Peak}$ [dB]	-0.27	-0.01	0.26	0.28	0.25	0.46	0.51	0.48	0.83	0.96
$Gain_{\theta\ Min}$ [dB]	-32.49	-26.48	-31.06	-26.17	-26.38	-29.88	-31.92	-33.26	-26.15	-45.78
TRG_{φ} [dB]	-13.32	-13.07	-13.18	-12.99	-12.97	-12.69	-12.60	-12.27	-12.07	-12.01
$Gain_{\varphi\ Peak}$ [dB]	-6.80	-6.84	-7.04	-6.78	-5.88	-6.40	-6.51	-6.19	-5.83	-5.57
$Gain_{\varphi\ Min}$ [dB]	-30.33	-31.18	-44.69	-37.16	-33.39	-34.65	-31.11	-29.34	-35.52	-32.23
UHRG [dB]	-5.97	-5.77	-5.77	-5.54	-5.67	-5.38	-5.26	-5.13	-4.99	-4.97
UHRG/TRG [%]	57.0	57.0	57.0	57.8	57.4	58.1	57.6	57.9	58.3	58.2
H-Plane	-2.10	-2.03	-1.82	-1.87	-1.79	-1.64	-1.54	-1.41	-1.16	-1.30
E1-Plane, AVG [dB]	-5.19	-5.00	-5.15	-4.84	-4.83	-4.71	-4.69	-4.56	-4.43	-4.34
E2-Plane, AVG [dB]	-4.71	-4.40	-4.37	-4.17	-4.50	-4.23	-3.95	-3.87	-3.93	-3.85
Peak Gain [dB]	-0.05	0.17	0.35	0.47	0.40	0.65	0.70	0.68	0.99	1.11
Directivity [dB]	3.48	3.50	3.67	3.63	3.66	3.67	3.56	3.43	3.64	3.73
Minimum Gain [dB]	-15.28	-16.45	-17.73	-14.89	-16.61	-15.51	-15.12	-14.69	-13.47	-16.73

	11	12	13	14	15	16	17	18	19	20
Frequency [MHz]	**2450**	**2455**	**2460**	**2465**	**2470**	**2475**	**2480**	**2485**	**2490**	**2497**
Efficiency [dB]	**-2.50**	**-2.62**	**-2.64**	**-2.69**	**-2.63**	**-2.72**	**-2.86**	**-3.18**	**-3.58**	**-3.72**
Efficiency [%]	**56.2**	**54.7**	**54.5**	**53.8**	**54.5**	**53.4**	**51.7**	**48.1**	**43.8**	**42.4**
TRG_{θ} [dB]	-3.02	-3.14	-3.17	-3.22	-3.15	-3.24	-3.39	-3.73	-4.10	-4.25
$Gain_{\theta\ Peak}$ [dB]	1.23	1.01	0.96	0.71	0.96	0.98	0.84	0.78	-0.07	-0.02
$Gain_{\theta\ Min}$ [dB]	-29.58	-28.14	-27.55	-25.67	-25.46	-26.88	-28.96	-26.76	-26.25	-29.98
TRG_{φ} [dB]	-12.01	-12.12	-11.98	-12.05	-12.14	-12.23	-12.25	-12.42	-13.05	-13.16
$Gain_{\varphi\ Peak}$ [dB]	-5.74	-6.43	-6.17	-5.66	-5.58	-5.57	-5.26	-5.38	-6.39	-6.54
$Gain_{\varphi\ Min}$ [dB]	-48.08	-25.64	-30.39	-25.88	-40.39	-31.98	-28.68	-24.62	-36.97	-29.20
UHRG [dB]	-4.82	-4.90	-4.91	-4.97	-4.92	-4.97	-5.09	-5.40	-5.79	-6.02
UHRG/TRG [%]	58.6	59.1	59.2	59.1	59.1	59.6	59.8	59.9	60.1	59.0
H-Plane	-1.10	-1.21	-1.28	-1.39	-1.19	-1.25	-1.49	-1.82	-2.18	-2.22
E1-Plane, AVG [dB]	-4.22	-4.17	-4.27	-4.46	-4.27	-4.37	-4.24	-4.85	-5.23	-5.14
E2-Plane, AVG [dB]	-3.67	-3.67	-3.92	-3.85	-3.80	-4.00	-4.21	-4.35	-4.79	-4.96
Peak Gain [dB]	1.37	1.12	1.18	0.97	1.16	1.24	0.96	0.92	0.17	0.17
Directivity [dB]	3.88	3.74	3.81	3.66	3.79	3.96	3.82	4.10	3.75	3.89
Minimum Gain [dB]	-16.73	-16.61	-14.32	-16.06	-14.56	-14.43	-17.00	-16.47	-16.18	-13.67

Average Efficiency	**-2.97dBi**	**50.49%**
Peak Gain	**1.37dBi**	