



V

Huginn

Antenna PERFORMANCE TEST REPORT

Product Name	VCR03
Applicant	INPAQ
Manufacturer	INPAQ
Test site	INPAQ
Model	Huginn_ANT Huginn_BT Huginn_WIFI1 Huginn_WIFI2
Antenna type	1. ANT+/ PIFA 2. BT/PIFA 3. WIFI1/PIFA 4. WIFI2/PIFA
Address	No.566-1, Kao-Shi Rd., Yangmei Dist., Taoyuan City 32668, Taiwan

Approved by	Reviewed by	Issued by

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1. INTRODUCTION

1.1 TEST EQUIPMENT

Passive Test:

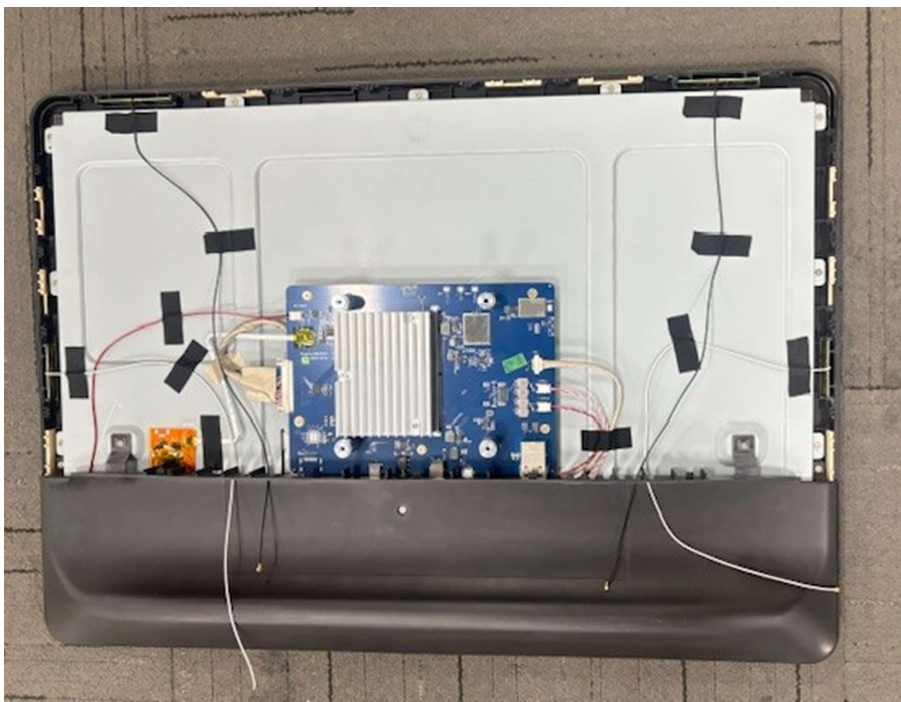
Network Analyzer: R/S ZNB20

Passive Chamber: Satimo SG24 (Large)

1.2 TEST SAMPLE

Quantity: 1

EVT

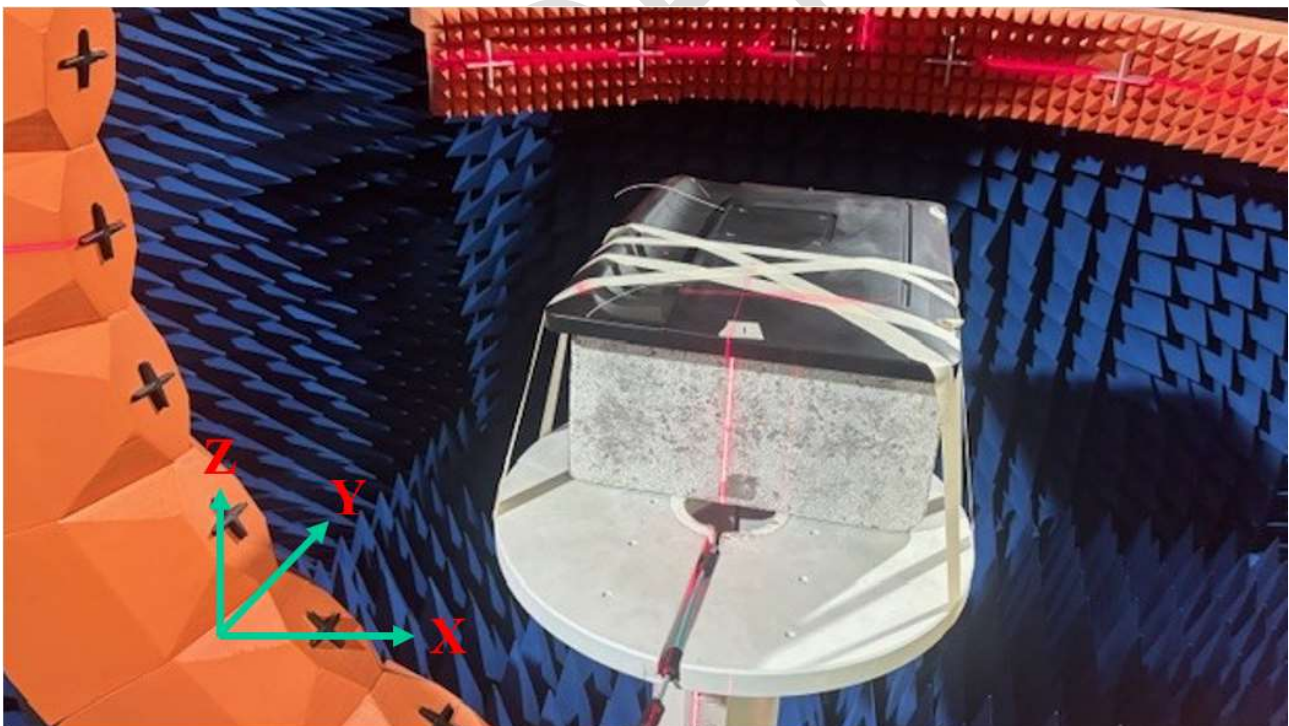
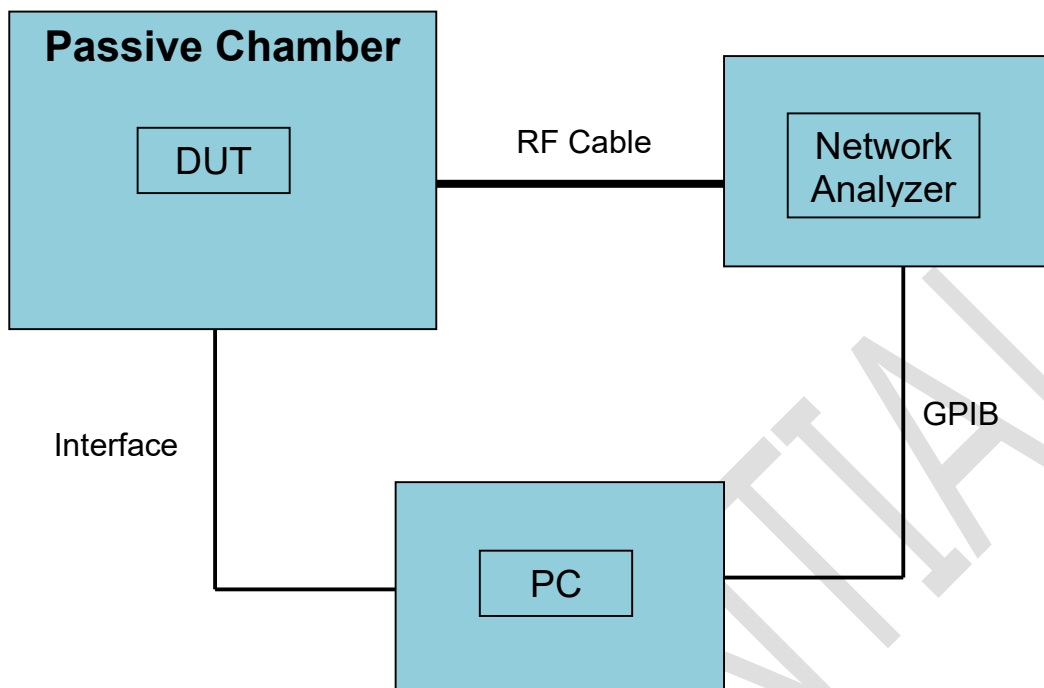


1.3 TEST CONDITION

Support Band: BLE_2402MHz~2480MHz 4910~5835 MHz

Temperature: 18.7°C

1.4 TEST SETUP



2. PASSIVE PERFORMANCE TEST

2.1 AVERAGE EFFICIENCY/ PEAK GAIN

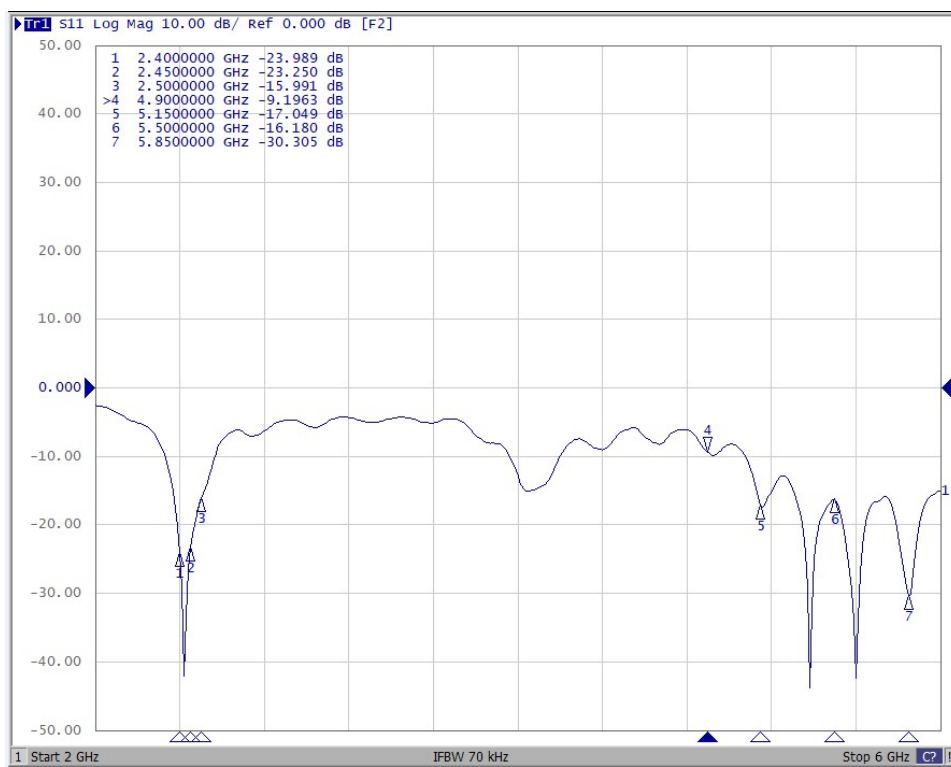
	ANT+			BT			WiFi-1			WiFi-2		
Frequency(MHz)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)
2402	55.08	-2.59	3.34	55.47	-2.56	4.39	48.64	-3.13	3.77	48.24	-3.17	3.51
2412	54.67	-2.62	3.55	54.85	-2.61	4.01	48.54	-3.14	3.69	48.62	-3.13	3.52
2442	52.56	-2.79	2.90	53.62	-2.71	3.80	50.09	-3.00	4.39	49.78	-3.03	3.77
2472	48.32	-3.16	2.94	48.76	-3.12	3.45	49.13	-3.09	4.15	48.61	-3.13	3.82
2480	47.52	-3.23	2.50	47.63	-3.22	3.25	49.37	-3.07	4.11	49.17	-3.08	3.76
4910							47.98	-3.19	5.16	45.90	-3.38	4.97
5050							46.74	-3.30	5.59	45.23	-3.45	5.34
5180							53.39	-2.73	6.48	53.86	-2.69	6.51
5320							54.75	-2.62	7.13	55.59	-2.55	6.90
5620							51.22	-2.91	6.98	54.47	-2.64	7.27
5835							53.23	-2.74	6.03	53.65	-2.70	6.07

2.2 3D GAIN OF FREE SPACE (AVERAGE)

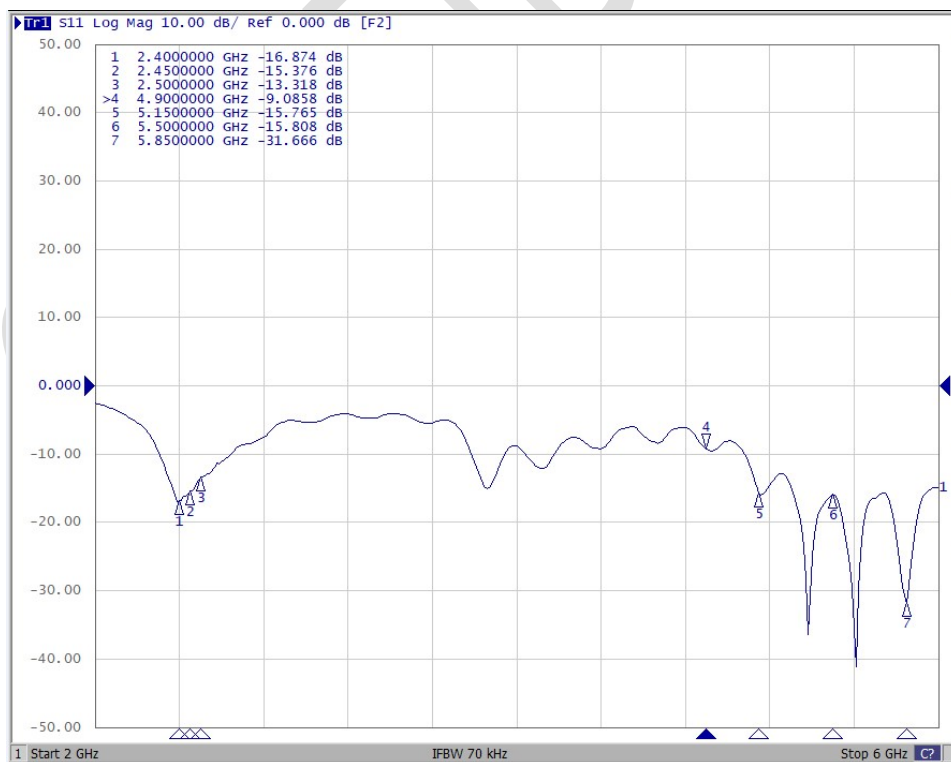
	ANT+			BT			WiFi-1			WiFi-2		
Frequency(MHz)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)	Efficiency (%)	AVG. Gain (dBi)	Peak Gain (dBi)
2402	55.08	-2.59	3.34	55.47	-2.56	4.39	48.64	-3.13	3.77	48.24	-3.17	3.51
2412	54.67	-2.62	3.55	54.85	-2.61	4.01	48.54	-3.14	3.69	48.62	-3.13	3.52
2442	52.56	-2.79	2.90	53.62	-2.71	3.80	50.09	-3.00	4.39	49.78	-3.03	3.77
2472	48.32	-3.16	2.94	48.76	-3.12	3.45	49.13	-3.09	4.15	48.61	-3.13	3.82
2480	47.52	-3.23	2.50	47.63	-3.22	3.25	49.37	-3.07	4.11	49.17	-3.08	3.76
4910							47.98	-3.19	5.16	45.90	-3.38	4.97
5050							46.74	-3.30	5.59	45.23	-3.45	5.34
5180							53.39	-2.73	6.48	53.86	-2.69	6.51
5320							54.75	-2.62	7.13	55.59	-2.55	6.90
5620							51.22	-2.91	6.98	54.47	-2.64	7.27
5835							53.23	-2.74	6.03	53.65	-2.70	6.07

2.3 RETURN LOSS

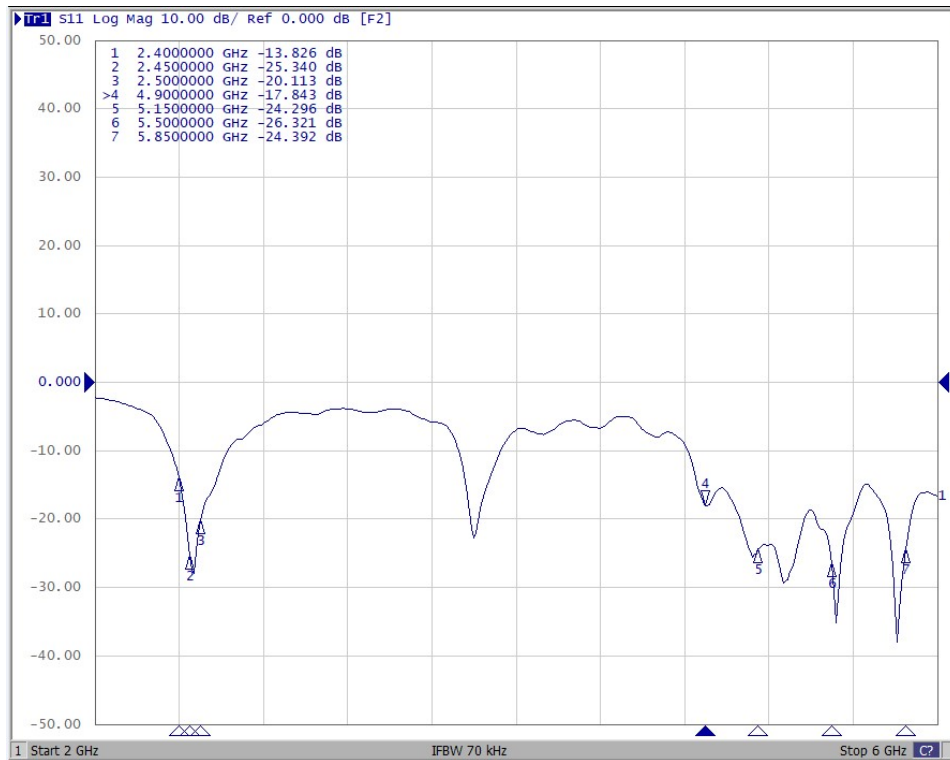
ANT+



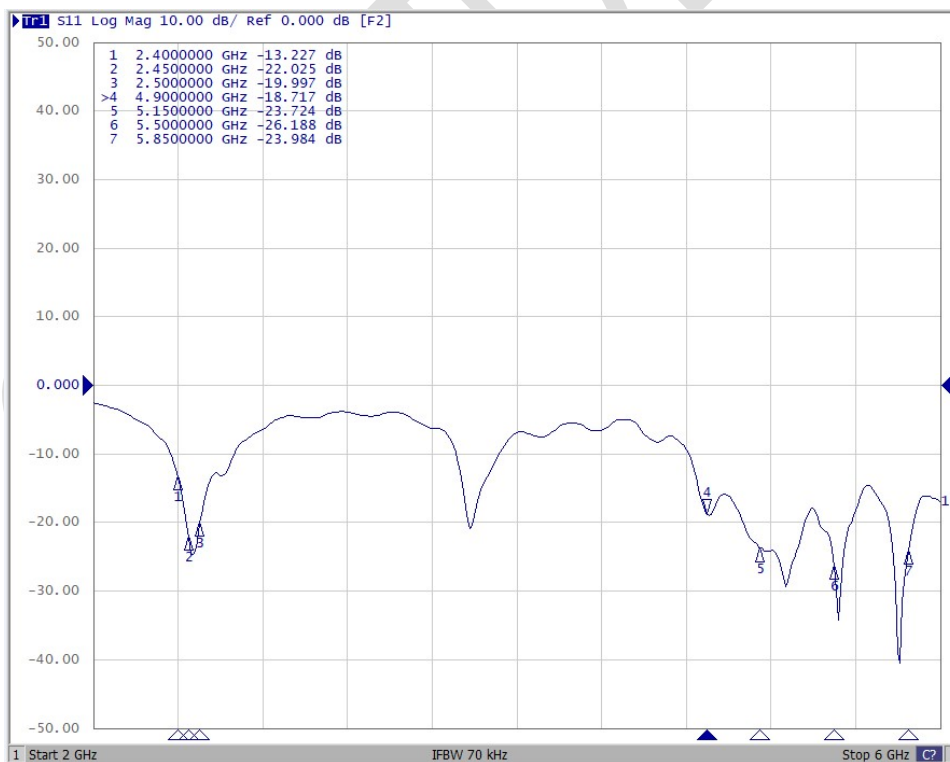
BT



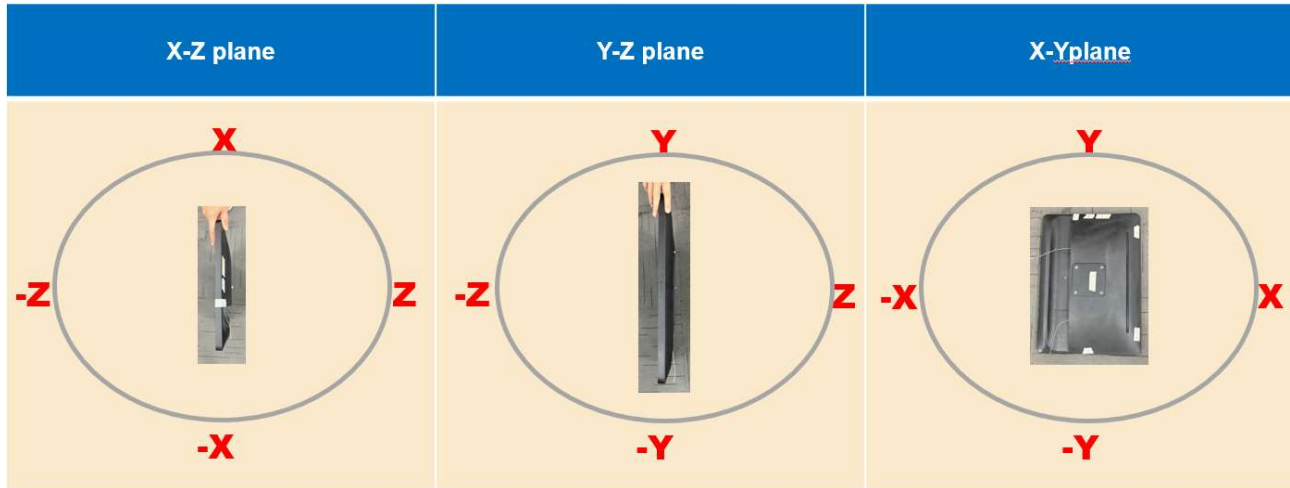
WiFi-1



WiFi-2



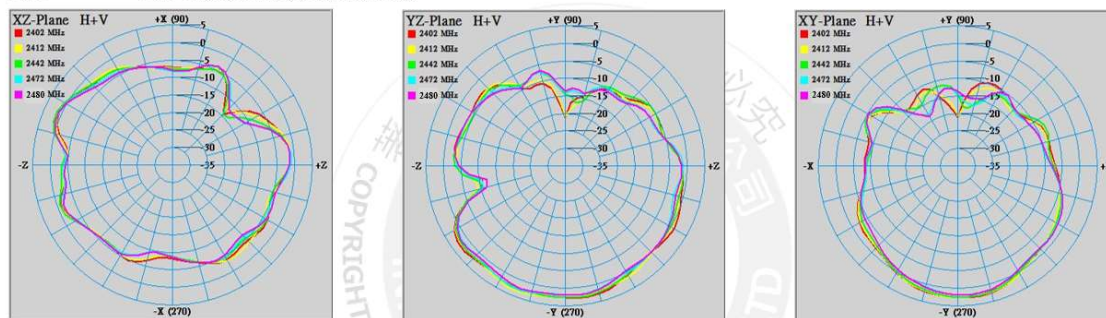
2.4 2D PLOTS



2. Antenna Characteristics

ANT+

2.3 2D Radiation Patterns

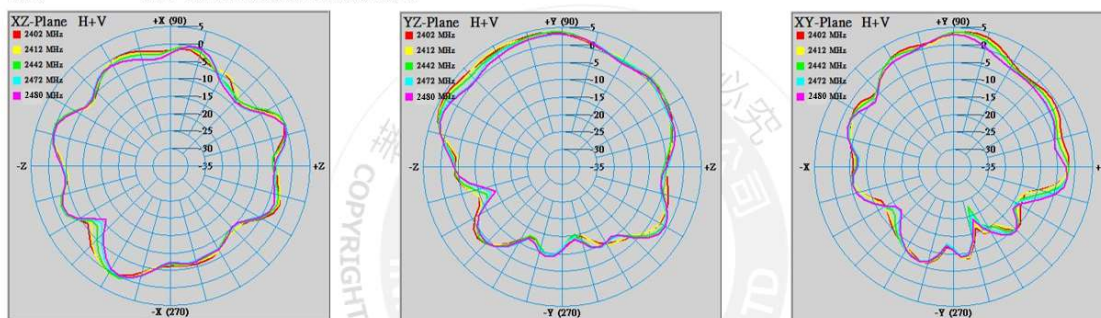


Frequency [MHz]	ZX plane		ZY plane		XY plane	
	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]
2402	0.77	-4.01	3.01	-1.12	2.72	-3.07
2412	0.83	-4	3.49	-1.21	2.61	-3.24
2442	1.42	-4.07	2.7	-1.4	2.59	-3.33
2472	0.85	-4.33	2.9	-1.87	1.95	-3.9
2480	0.96	-4.41	2.36	-1.94	1.99	-3.8

2. Antenna Characteristics

BT

2.3 2D Radiation Patterns

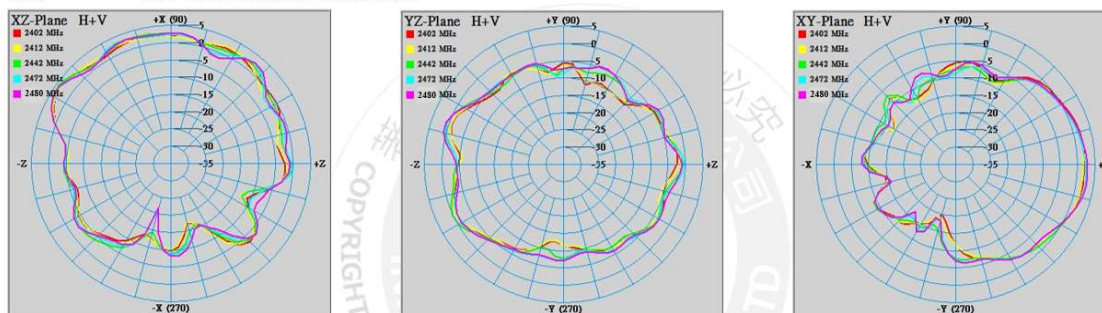


Frequency [MHz]	ZX plane		ZY plane		XY plane	
	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]
2402	0.01	-3.17	4.34	-0.63	3.89	-2.57
2412	0.62	-3.14	3.99	-0.77	3.56	-2.99
2442	0.46	-3.27	3.8	-0.83	3.75	-2.91
2472	0.04	-3.54	3.06	-1.24	2.96	-3.67
2480	-0.19	-3.65	3.1	-1.37	2.94	-3.57

2. Antenna Characteristics

WiFi-1 (2G)

2.3 2D Radiation Patterns

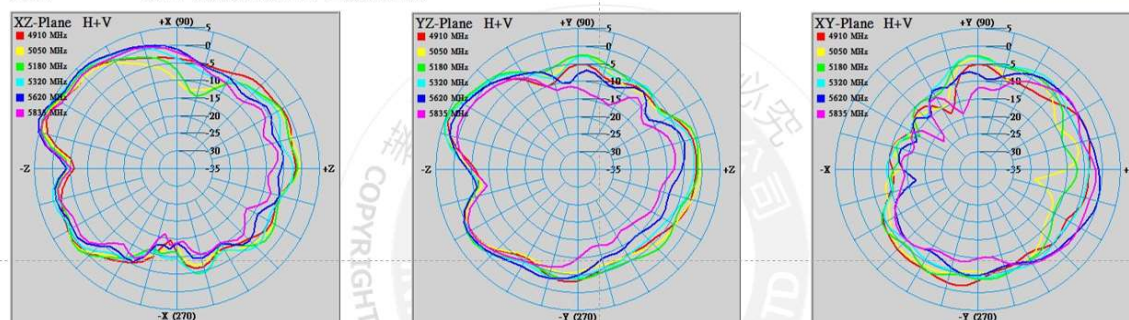


Frequency [MHz]	ZX plane		ZY plane		XY plane	
	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]
2402	3.69	-1.39	-0.79	-5.14	2.01	-3.64
2412	3.6	-1.39	-0.62	-5.05	1.82	-3.93
2442	4.35	-0.98	0.47	-4.32	2.79	-3.57
2472	4.08	-1.16	0.6	-4.19	2.66	-3.77
2480	4.06	-1.12	0.91	-4.18	2.91	-3.47

2. Antenna Characteristics

WiFi-1 (5G)

2.3 2D Radiation Patterns

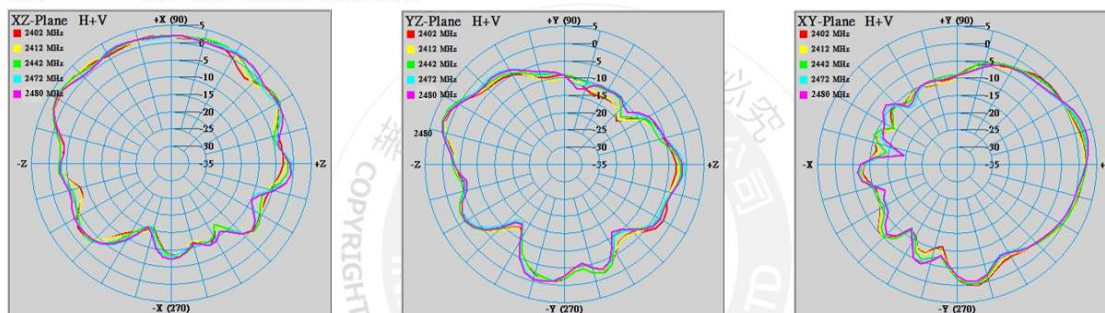


Frequency [MHz]	ZX plane		ZY plane		XY plane	
	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]
4910	4.29	-1.87	4.17	-2.75	-1.58	-5.58
5050	4.92	-2.08	4.62	-2.3	-3.16	-7.13
5180	5.25	-1.56	4.8	-1.77	-2.59	-6.18
5320	6.06	-1.05	4.5	-2.36	-2.52	-5.44
5620	6.13	-1.31	2.89	-3.45	-0.23	-5.19
5835	5.03	-2.51	0.77	-5.4	-1.71	-6.31

2. Antenna Characteristics

WiFi-2 (2G)

2.3 2D Radiation Patterns

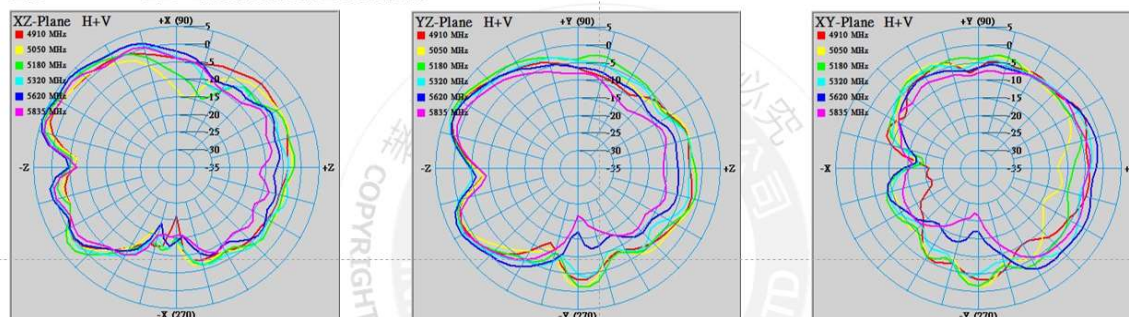


Frequency [MHz]	ZX plane		ZY plane		XY plane	
	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]
2402	2.7	-1.63	1.44	-4.31	1.83	-3.16
2412	2.5	-1.59	1.59	-4.26	1.57	-3.36
2442	3.16	-1.25	2.28	-3.94	2.38	-3.1
2472	2.88	-1.34	1.82	-3.94	2.69	-3.47
2480	2.83	-1.29	1.87	-3.93	3.13	-3.24

2. Antenna Characteristics

WiFi-2 (5G)

2.3 2D Radiation Patterns



Frequency [MHz]	ZX plane		ZY plane		XY plane	
	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]	Max Value [dBi]	Average [dBi]
4910	2.95	-2.6	3.29	-2.8	-1.97	-5.86
5050	3.32	-2.8	3.56	-2.22	-1.37	-6.37
5180	4.37	-2	3.86	-1.84	-1.65	-5.48
5320	5.09	-1.38	3.56	-2.4	-1.48	-5.28
5620	4.97	-1.59	2.94	-3.16	-0.96	-5.2
5835	3.81	-2.99	1.49	-4.97	-3.32	-7.09