

ANT5G001 Project Product Specification

Version: A/2

Product Name: antenna

Type: MT40AX

Manufacturer: Xi'an BYD Electronics Co., Ltd.

Address: No.2 Yadi Road, New Industrial Park, Xi'an High-tech District, Xi'an

Automotive New
Technology Research
Institute on November
14, 2024

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 1 of 15

History of document changes

Serial number	Version number	Modify the content	Date of modification	Compilation	Audit	Approve
1	A/0	First release	2022/05/22	Chen Shi Shi	Wu Qingan	Zhu yuan
2	A/1	Complete dimension and test information	2024/11/06	Chen Shi Shi	Wu Qingan	Zhu yuan
3	A/2	Complete test data and directional diagram	2024/11/14	Chen Shi Shi	Wu Qingan	Zhu yuan

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 2 of 15

Table of contents 1 Product

Information. 3

1.1 Overview. 3

1.2 System/Product Block Diagram. 3

1.3 PCB Layout.. 3

1.4 Outline dimension drawing. 4

1.5 pin definition. 4

1.6 Sheath type and manufacturer.. 5

2 Product Parameters. 5

2.15G Antenna. 5

2.1.1 Passive Parameters. 5

2.1.2 Directional pattern. .. Error! Bookmark is not defined.

2.2 WIFI Antenna. 6

2.2.1 Passive Parameters. 10

2.2.2 Directional pattern. .. Error! Bookmark is not defined.

3 Reliability. 13

4 Installation recommendations. 14

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 3 of 15

1 Product information

1.1 General

The antenna consists of two 5G antennas and a BT/WIFI antenna.

1.2 System/Product Block Diagram

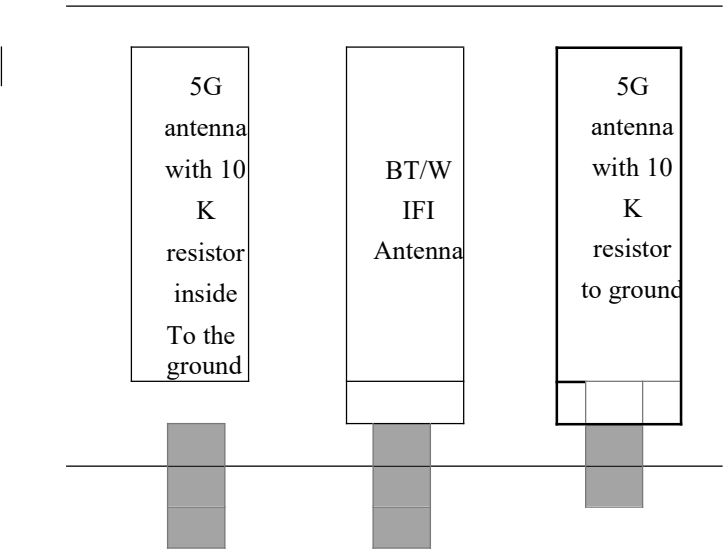


Figure 1 Product Block Diagram

1.3 PCB board diagram

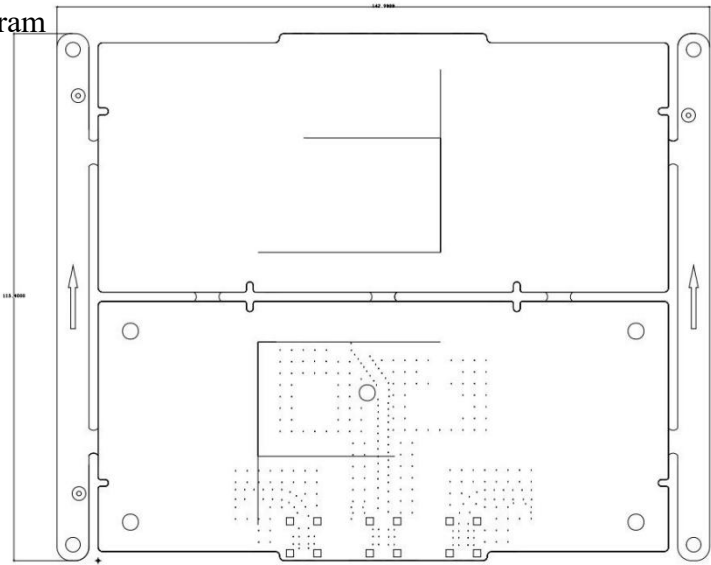
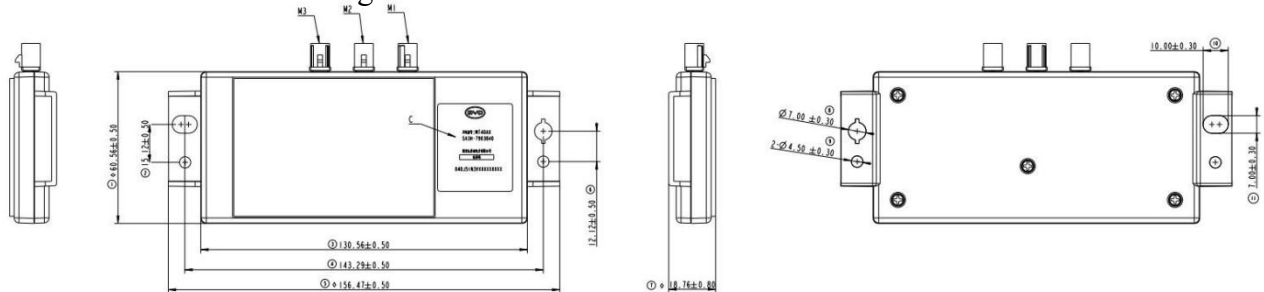


Figure 2 PCB

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 4 of 15

1.4 Outline dimension drawing



unit: mm

Figure 3 Outline drawing

1.5 Pin definition

Table 1 Terminal Definition

Port number	Color	Port name	Port definition (FAKARA)	Manufacturer
M1	Green	5G main antenna	59S2AQ-40MT5-E_1	Rosenberg
M2	Curry color	BT/WIFI antenna	59S2AQ-40MT5-K_1	Rosenberg
M3	White	5G secondary antenna	59S2AQ-40MT5-B_1	Rosenberg

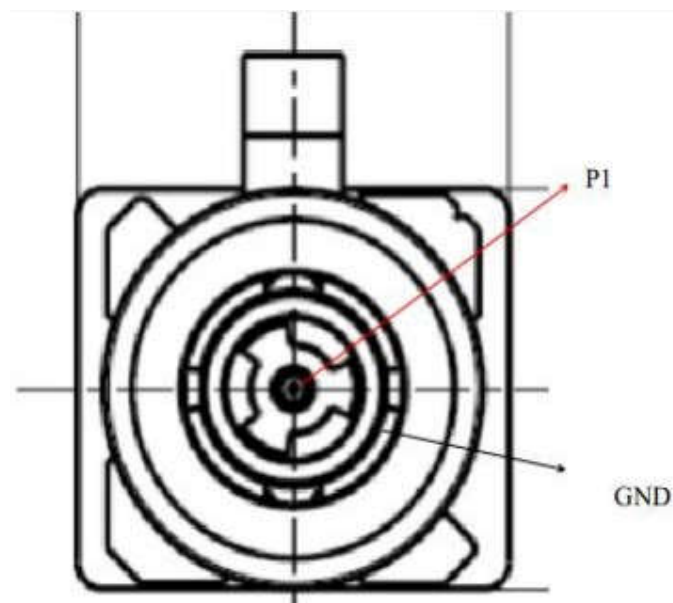


Fig. 4 Schematic diagram of terminal

Description of terminals. Currently, the terminals are all single signals + GND.

Template Version: A/0 Template No.:

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 5 of 15

Table 2 Pin Definition

M1 port (5G TR antenna)	
Pin number	Pin definitions
P1	5GTR antenna signal
M2 port (BT/WIFI antenna)	
Pin number	Pin definitions
P1	BT/WIFI antenna signal
M3 port (5GRX antenna)	
Pin number	Pin definitions
P1	5GRX antenna signal

1.6 Sheath model and manufacturer

Table 3 Sheath Model and Manufacturer

Serial number	Port number	Electrode end			Harness end	
		Color	Port name	Port definition	Port definition	Manufacturer
1	M1	Green	5G main antenna	59S2AQ-40MT5-E_1	59z113-000-E	Rosenberg
2	M2	Curry color	BT/WIFI antenna	59S2AQ-40MT5-K_1	59z113-000-K	Rosenberg
3	M3	White	5G secondary antenna	59S2AQ-40MT5-B_1	59z113-000-B	Rosenberg

2 Product parameters

2.1 5G antenna

2.1.1 passive parameter

Table 45 Passive Parameters of G Antenna

Mode	Antenna frequency (MHZ)	Standing Wave Ratio	Isolation (dB) (5G 1 & 5G2)	DC resistance to ground
Cellular Antenna	703-960	703-803:VSWR<3.5; 803-960:VSWR<3	<-14	10Kohm
	1710-2170	<1.9	<-12.3	
	2300-2400	<1.8	<-18.3	

Template Version: A/0 Template No.:

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 6 of 15
	2500-2690	<2.1		<-23.5	
	3300-4200	<1.6		<-23.5	
	4200-5000	<1.8		<-27.7	

Frequency (MHz)	700	710	720	730	740	750	760	770	780	790
gain Gain (dBi)	2.97	3.06	3.2	3.4	3.66	3.84	3.95	4.08	4.21	4.41
efficiency Efficiency (dB)	-2.64	-2.53	-2.49	-2.43	-2.39	-2.37	-2.31	-2.2	-2	-1.77
efficiency Efficiency (%)	54.47	55.83	56.41	57.09	57.74	57.93	58.71	60.24	63.16	66.58

800	810	820	830	840	850	860	870	880	890	900
4.7	5.05	5.34	5.55	5.6	5.69	5.54	5.54	5.51	5.46	5.52
-1.54	-1.37	-1.27	-1.22	-1.23	-1.09	-1.34	-1.39	-1.53	-1.65	-1.77
70.22	72.99	74.67	75.52	75.39	77.79	73.43	72.55	70.38	68.39	66.59

910	920	930	940	950	960	1440	1710	1730	1750	1770
5.39	5.35	5.3	5.27	5.28	5.19	2.39	1.21	1.31	1.94	2.43
-1.7	-1.66	-1.6	-1.56	-1.5	-1.6	-3.4	-2.63	-2.73	-2.65	-2.61
67.59	68.18	69.15	69.9	70.78	69.18	45.73	54.57	53.37	54.31	54.82

1790	1810	1830	1850	1870	1890	1910	1930	1950	1970	1990
2.87	3.72	3.53	3.57	3.57	3.63	3.57	3.93	4.03	3.95	3.73
-2.48	-2.42	-2.32	-2.26	-2.18	-2.17	-2.06	-2.09	-2.04	-2.05	-2.04
56.46	57.32	58.67	59.43	60.51	60.65	62.2	61.81	62.52	62.41	62.58

Template Version: A/0 Template No.:

File name		ANT5G001 Project Product Specification						Document number	EL034_FC_A30-30044	
File version		A/2		Secret level		Confidential		Page	Page 7 of 15	
2010	2030	2050	2070	2090	2110	2130	2150	2170	2300	2320
3.36	2.89	2.58	2.34	2.3	2.31	2.22	2.21	1.86	2.43	2.64
-2.03	-2.05	-2.07	-2.04	-1.99	-1.97	-2	-1.99	-2.22	-2.15	-2.04
62.68	62.37	62.13	62.53	63.3	63.47	63.12	63.23	59.96	60.9	62.52

2340	2360	2380	2400	2420	2440	2460	2480	2500	2520	2540
2.33	2.14	1.89	1.64	1.44	1.34	1.21	1.15	1.1	1.14	1.25
-2.29	-2.37	-2.43	-2.53	-2.6	-2.62	-2.68	-2.81	-2.96	-3.03	-3.05
59.05	57.88	57.15	55.81	55.01	54.75	53.97	52.36	50.64	49.78	49.51

2560	2580	2600	2620	2640	2660	2680	2700	3000	3050	3100
1.49	1.64	1.68	1.77	1.62	1.44	1.27	1.15	3.26	3.42	3.55
-3.01	-2.91	-2.81	-2.66	-2.54	-2.46	-2.39	-2.29	-2.09	-1.97	-2.01
50	51.11	52.32	54.24	55.66	56.7	57.63	58.97	61.86	63.55	62.94

3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650
3.81	4	4.55	4.33	4.59	4.37	4.29	4.14	4.07	4	4.22
-1.96	-2.03	-1.83	-1.95	-1.92	-1.99	-2.02	-2.08	-2.18	-2.26	-2.23
63.65	62.6	65.62	63.88	64.32	63.31	62.75	61.96	60.5	59.48	59.84

3700	3750	3800	3850	3900	3950	4000	4050	4100	4150	4200
4.41	4.64	4.95	5.1	5.16	5.23	4.92	4.54	3.77	3.83	3.76
-2.16	-2.05	-2.09	-2.09	-2.16	-2.28	-2.4	-2.16	-2.28	-2.29	-2.41
60.79	62.33	61.78	61.77	60.8	59.11	57.53	60.76	59.14	59.03	57.45

Template Version: A/0 Template No.:

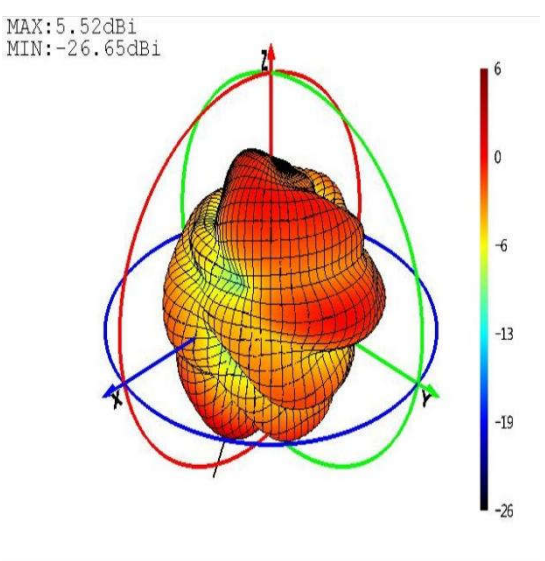
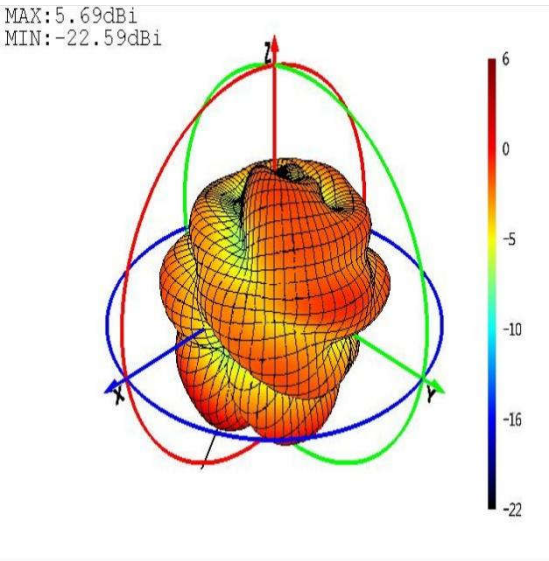
File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 8 of 15

4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750
4.15	4.3	4.59	4.7	4.62	4.32	4.04	3.73	3.48	3.38	3.51
-2.21	-2.57	-2.65	-2.76	-2.77	-2.86	-2.81	-2.87	-2.89	-2.94	-2.9
60.08	55.29	54.33	52.95	52.85	51.74	52.35	51.65	51.39	50.8	51.31

4800	4850	4900	4950	5000
3.47	3.27	3.08	2.62	2.58
-3.05	-3.14	-3.29	-3.59	-3.65
49.51	48.51	46.86	43.78	43.14

2.1.2 pattern

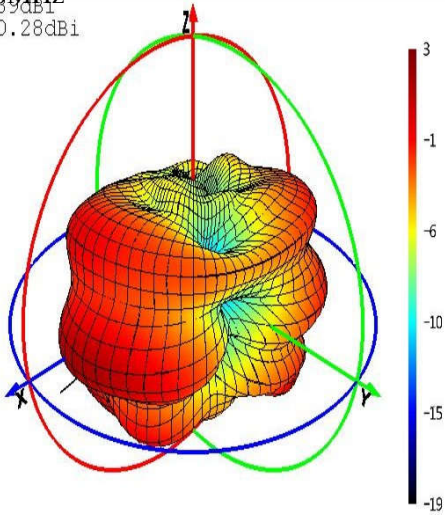
f=850MHz



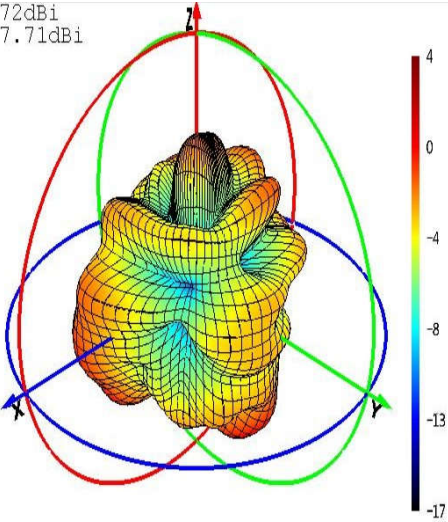
Template No.:

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 9 of 15

f=1440MHz
MAX:2.39dBi
MIN:-20.28dBi



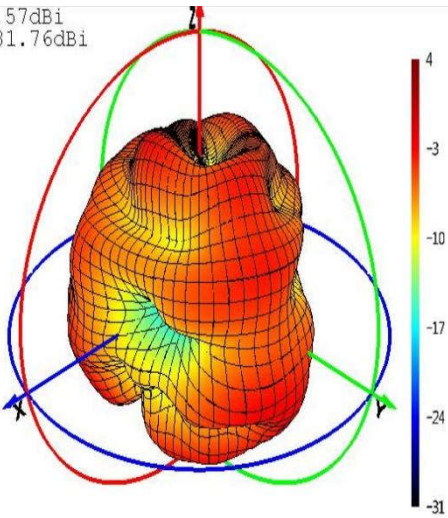
MAX:3.72dBi
MIN:-17.71dBi



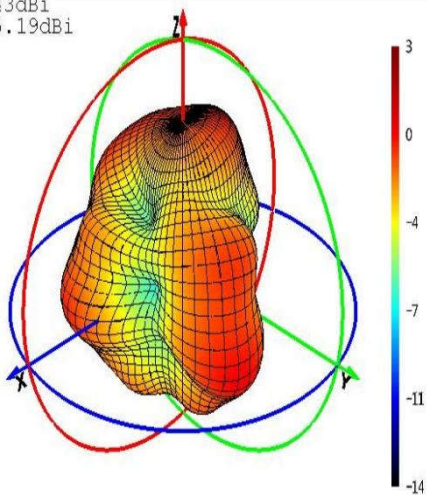
f=2300MHz

f=1910MHz

MAX:3.57dBi
MIN:-31.76dBi



MAX:2.43dBi
MIN:-15.19dBi



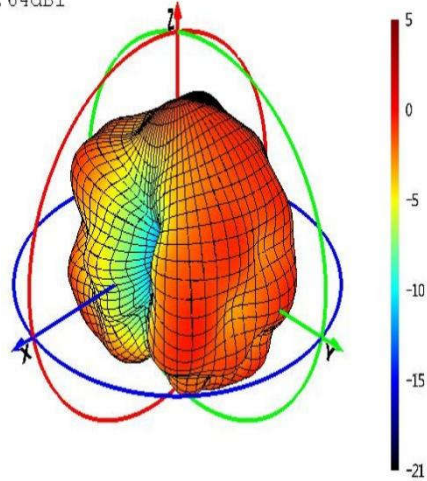
Template No.:

Template
Version: A/0

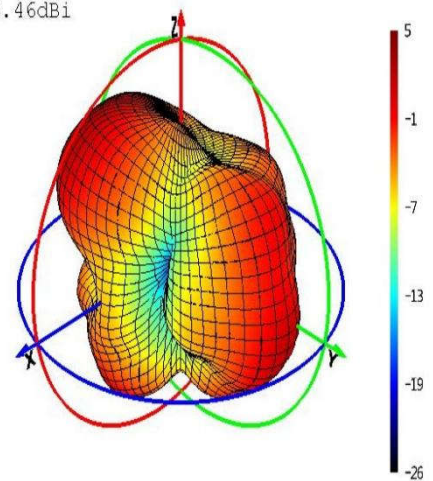
f=1810MHz

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 10 of 15

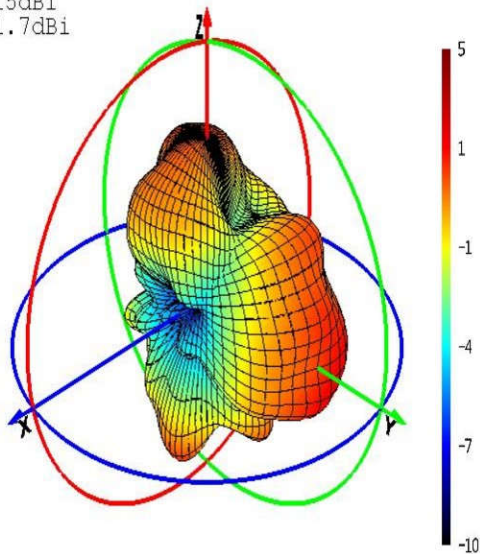
f=3250MHz
MAX:4.95dBi
MIN:-21.64dBi



f=3750MHz
MAX:4.64dBi
MIN:-26.46dBi

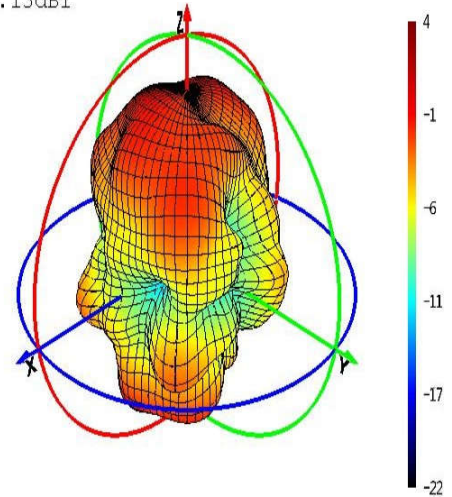


f=4250MHz
MAX:4.15dBi
MIN:-11.7dBi



f=4750MHz

MAX:3.51dBi
MIN:-23.13dBi



2.2 WiFi antenna

2.2.1 passive parameter

Template Version: A/0 Template No.:

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 11 of 15

Table 5 Passive Parameters of WiFi Antenna

Mode	Antenna frequency (MHZ)	Standing Wave Ratio	Isolation (dB) (5G & WIFI)
WIFI antenna	2400-2500	<1.9	<-21.8
	5150-5850	<2	<-26.1

Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490
gain Gain (dBi)	1.16	0.94	0.87	0.73	0.61	0.48	0.42	0.39	0.41	0.92
efficiency Efficiency (dB)	-3.05	-3.1	-3.15	-3.2	-3.25	-3.27	-3.27	-3.23	-3.19	-3.33
efficiency Efficiency (%)	49.52	49.03	48.4	47.83	47.34	47.08	47.07	47.49	47.94	46.49

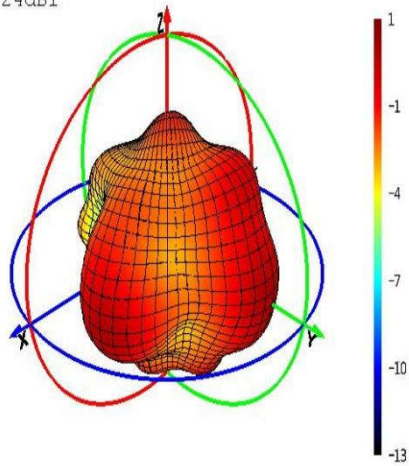
2500	5150	5200	5250	5300	5350	5400	5450	5500	5550	5600
1.49	1.87	3.02	2.56	2.34	2.28	2.22	2.14	1.99	1.66	1.38
-3.39	-3.61	-3.61	-3.92	-3.69	-3.91	-3.79	-3.77	-3.78	-3.72	-3.86
45.77	43.57	43.53	40.58	42.74	40.63	41.79	41.98	41.86	42.45	41.07

5650	5700	5750	5800	5850
1.81	2.6	2.88	3.33	3.99
-3.49	-3.56	-3.9	-3.78	-3.85
48.38	44.09	40.74	41.88	41.24

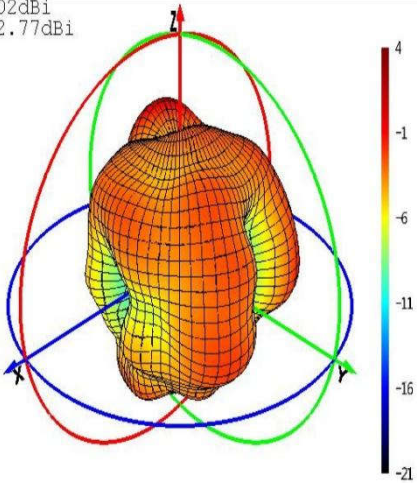
File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 12 of 15

2.2.2 Directional pattern

f=2450MHz
MAX:0.98dBi
MIN:-14.24dBi

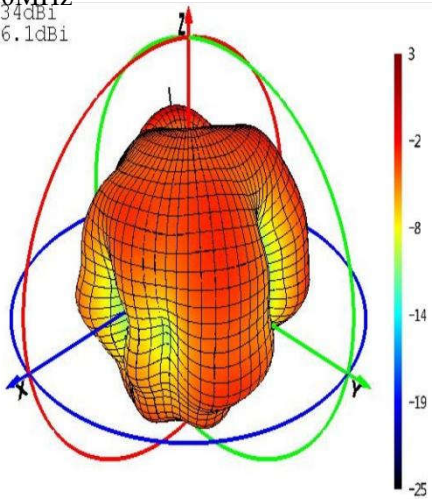


MAX:3.02dBi
MIN:-22.77dBi

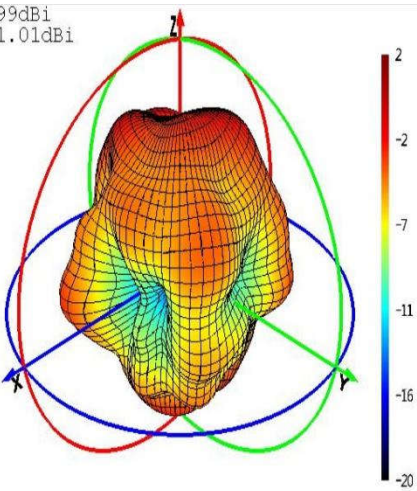


f=5500MHz

f=5300MHz
MAX:2.34dBi
MIN:-26.1dBi

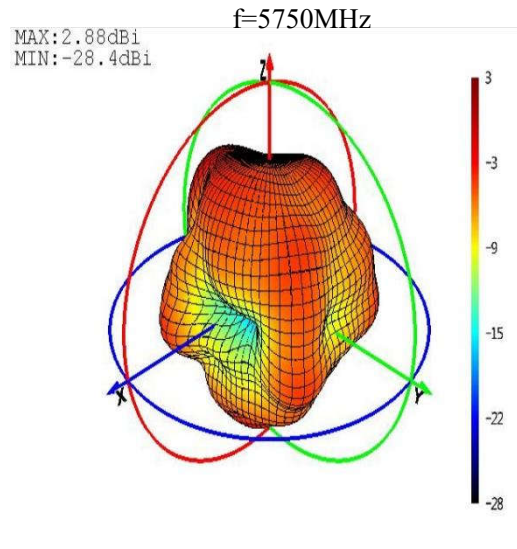


MAX:1.99dBi
MIN:-21.01dBi



Template No.:

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 13 of 15



3 Reliability

Table 6: Reliability Specifications		
Project	Specifications	Remarks
Operating temperature	-40°C~85°C	
Storage temperature	-40°C~90°C	
High temperature durability	85°C600h	
Work at low temperature	-40 °C 48h (24h for low temperature storage and 24h for startup)	
Constant damp heat	85°C, 85%, 280h	
Cold and hot shock	85 °C, -40 °C, temperature holding for 30 min, 170 cycles	
Temperature change	85 °C, -40 °C, low temperature 0.5 h, high temperature 0.5 h, 60 cycles	
Vibration	Effective value of acceleration: 27.1m/s ²	
Mechanical impact	Impact form: half sine, peak acceleration: 25g, pulse time: 10ms, impact times: 400 times in each direction of ± X, ± Y and ± Z axes, totaling 2400 times.	

File name	ANT5G001 Project Product Specification			Document number	EL034_FC_A30-30044
File version	A/2	Secret level	Confidential 1	Page	Page 14 of 15

4 Installation recommendations

1. Antenna body shall be as far as possible (> 50mm) away from large metal objects such as surrounding A/C control panel, harness tube, frame tubular beam, etc. Sometimes high speed signal circuits

The board appears near the antenna area. At this time, the antenna should be hollowed out, and the metal shield of the high-speed circuit board should be made as far as possible, otherwise it will affect the receiving sensitivity.

Degree.

2. Try to avoid the microstrip, lead, etc. on the PCB being parallel to the antenna. Try to avoid placing the antenna box near other electrical circuit boards, such as display screens.

Motor and motor drive board, etc.

3. Do not do electroplating process in the area near the antenna and avoid designing metal decorative parts. A metal ring with a ring shape shall be grounded. Decorative parts shall be made of conductive metal

Belonging to the guide ground.

4. The antenna and antenna feeder shall not be wired together with the high-voltage wire harness, and the bending radian of the antenna feeder shall be at least 5 times larger than that of the feeder according to the radian radius.

Bending according to the principle of diameter.