Approval Sheet

Product :WiFi Dual Band Antenna

Date: March 31, 2015

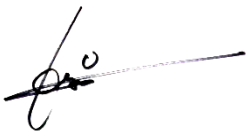
Customer Applied Model	Top Table Media		
Customer			
Customer Part No.			
Supplier	JEMA		
Supplier Part No.	FSD-WF5G-JH-13-01D-T3		
Customer	By designed	By checked	By approved
Supplier	By designed	By checked	By approved
			
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Table of Contents

- Revision List

Revision no	Originator	Description of changes	Date of changes
1	Kim K.H	First documents	2014.08.08
2	Kim K.H	5.6GHz band Gain update	2015.03.31
3			
4			
5			

1. General

1.1 The Product

Customer Model Name	TopTable Media
Antenna Type	PCB Antenna
Applications	WiFi

1.2 Electrical Properties

Frequency Range[MHz]	2400 ~ 2500, 5150 ~ 5825
Impedance	50Ω ± Normal
VSWR	Less Than 5.1:1
Gain	≥ Peak 0 dBi
Radiation Pattern	Omni-Directional
Polarization	Linear

1.3 Mechanical Properties

Dimension	See page15
Operational Temperature	-30°C ~ +80°C
Connector Type	IPEX

2. Electrical Properties

2.1 Frequency Band

Type / Band	WiFiDual Band
TX/RX	2400 ~ 2500, 5150 ~ 5825MHz

2.2 Impedance

2.2.1 Normal Value

50Ω ± Normal

2.2.2 Measuring Method

The impedance over the frequency bands shall be as close as possible to 50Ω after matching. Both free space and talk position are considered.

2.3 V.S.W.R

The impedance matching should be optimized in the more critical talk position.

2.3.1 Maximum values in free space

Frequency Band	WiFi 2.4G	WiFi 5G
V.S.W.R	3.3 : 1	5.1 : 1

2.3.2 Measuring Method

A 50Ω coaxial cable is connected(soldered) to the 50Ω point, at the duplex-filter on the main PCB. The connection of the coaxial cable shall be done to introduce a minimum of mismatch. As much as possible the coaxial cable arrangement shall prevent influences from induced currents on the cable. In the other end, the coaxial cable is connected to a network analyzer. The measurement is performed at room temperature. The handset, including the PCB, must not in any significant way differ from the mass production, i.e. the antenna feeding network has to be equivalent tothe feeding network in mass production. The specification shall be met in the entire frequency band.

2.4 Gain(dBi)

2.4.1 Measuring Method

The connection is done according to 2.3.2.

Radiation patterns are measured at 3 different Plane

The antenna measured according to thefigure 2 below.

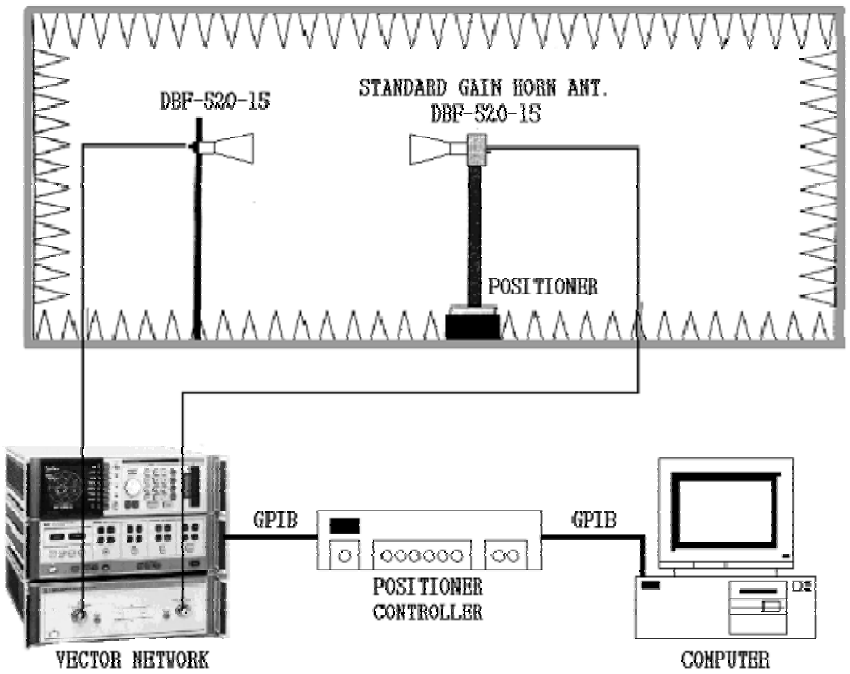


Figure2

2.4.2Radiation Pattern Measure

Radiation Pattern is measured according to figure3(a), figure3(b)

Scale and Range set up 5dB,30dB(each).

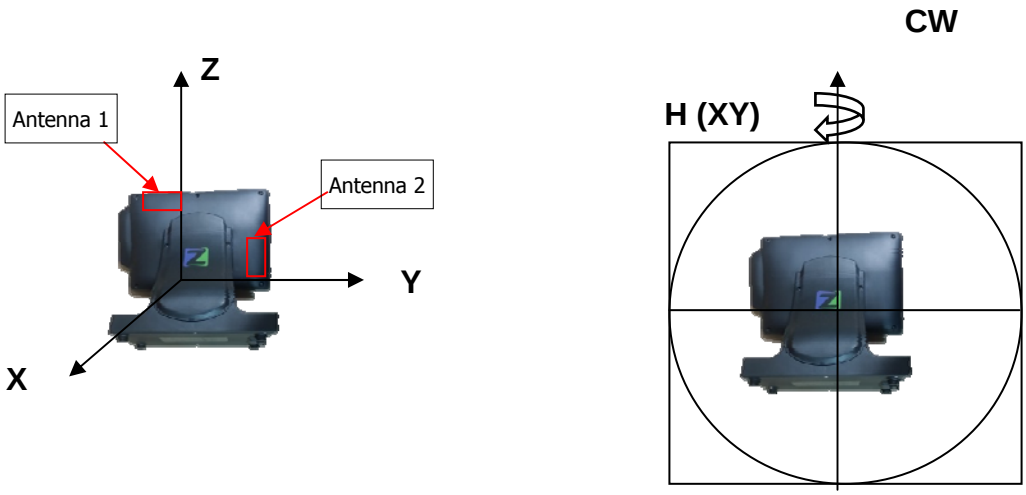


Figure 3 (a)

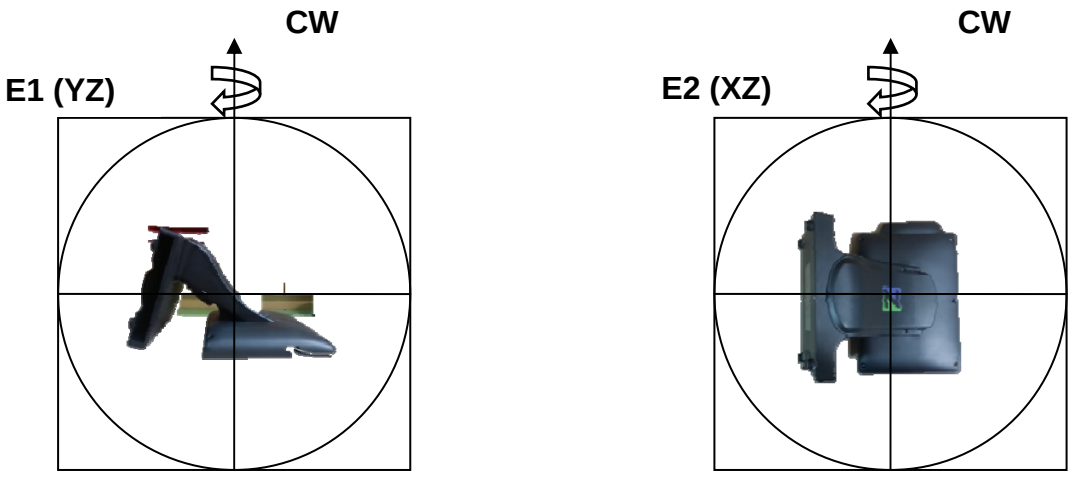


Figure 3 (b)

2.4.3 Typical values in maximum direction

2.4.3.1 Gain

A. Antenna 1

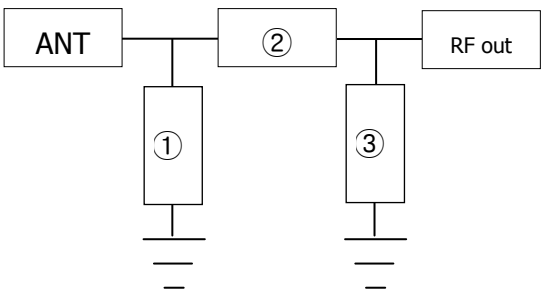
		PwrSum					H(θ=90)				E1(φ=0)				E2(φ=90)			
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	BW[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	BW[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	BW[deg]
1	2400.0000	31.34	-5.04	0.83	30.00	90.00	-4.96	-0.25	90.00	31.63	-5.84	-0.20	0.00	39.26	-2.36	0.83	30.00	190.17
2	2450.0000	28.93	-5.39	0.46	15.00	105.00	-5.39	-0.89	90.00	31.49	-6.03	-0.54	0.00	38.93	-2.76	0.31	30.00	195.05
3	2500.0000	27.13	-5.66	-0.05	30.00	90.00	-5.64	-0.98	90.00	30.02	-6.17	-0.62	0.00	37.93	-3.07	-0.05	30.00	176.98
4	5150.0000	35.25	-4.53	2.54	45.00	105.00	-5.33	-0.09	75.00	21.75	-5.53	2.13	-15.00	13.86	-4.36	-1.39	60.00	187.93
5	5250.0000	29.96	-5.24	1.31	30.00	120.00	-5.95	-0.80	75.00	24.92	-5.97	0.61	-15.00	18.00	-4.91	-1.62	30.00	155.24
6	5350.0000	21.79	-6.62	-0.69	30.00	45.00	-7.03	-2.24	75.00	23.85	-7.07	-1.49	15.00	54.21	-5.99	-1.47	30.00	77.67
7	5470.0000	50.62	-2.96	2.75	75.00	105.00	-2.17	1.82	105.00	35.90	-3.02	0.75	-15.00	53.23	-4.93	-0.95	-45.00	69.25
8	5725.0000	32.38	-4.90	1.94	45.00	90.00	-5.50	-2.35	105.00	74.76	-5.66	0.11	0.00	63.38	-2.94	1.94	45.00	83.39
9	5825.0000	25.82	-5.88	0.93	30.00	90.00	-6.53	-1.36	105.00	55.90	-7.07	-0.39	0.00	56.86	-3.77	0.93	30.00	90.81

B. Antenna 2

		PwrSum					H(θ=90)				E1(φ=0)				E2(φ=90)			
No.	Freq.	Eff.[%]	Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	Avg.[dBi]	Peak[dBi]	φ[deg]	BW[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	BW[deg]	Avg.[dBi]	Peak[dBi]	θ[deg]	BW[deg]
1	2400.0000	50.38	-2.98	1.81	45.00	105.00	-2.97	1.33	120.00	62.01	-4.26	-0.68	-15.00	117.03	-2.69	1.46	45.00	92.19
2	2450.0000	42.10	-3.76	1.04	60.00	120.00	-3.82	0.49	105.00	65.13	-5.28	-1.32	-15.00	101.79	-3.23	0.37	45.00	109.42
3	2500.0000	38.01	-4.20	0.73	30.00	120.00	-4.19	0.45	105.00	113.25	-5.67	-1.53	-30.00	91.27	-3.45	0.15	45.00	112.72
4	5150.0000	51.14	-2.91	3.01	60.00	120.00	-3.08	1.69	90.00	80.91	-4.44	0.91	0.00	70.74	-1.36	2.24	75.00	152.46
5	5250.0000	51.64	-2.87	2.51	75.00	90.00	-2.92	2.09	105.00	79.41	-4.04	1.32	0.00	70.79	-1.32	2.51	75.00	144.68
6	5350.0000	43.22	-3.64	1.52	75.00	90.00	-3.59	1.30	105.00	73.71	-4.78	0.73	0.00	68.34	-1.93	1.52	75.00	160.88
7	5470.0000	18.94	-7.23	1.67	0.00	180.00	-6.59	-4.34	90.00	216.34	-6.93	0.69	0.00	8.75	-6.48	-4.34	90.00	86.49
8	5725.0000	37.01	-4.32	2.47	30.00	105.00	-5.15	-1.34	90.00	80.83	-5.62	0.24	0.00	61.08	-2.32	1.94	30.00	114.77
9	5825.0000	27.72	-5.57	0.36	30.00	120.00	-6.31	-2.26	90.00	76.38	-6.92	-1.68	0.00	74.14	-3.75	-0.01	30.00	143.37

2.4.3.2 Antenna Matching Value

No.	Antenna 1	Antenna 2
①	N.C	N.C
②	0Ω	0Ω
③	N.C	N.C



3. Mechanical Properties

3.1 Appearance

The appearance shall be according to the specification drawing on page 15.
The antenna shall have no cuts, abrasion or other mechanical damages.

3.2 Drop

3.2.1 Drops

1 drop in retracted mode(3cycles)

3.2.2 Drop Height

1m

3.2.3 Drop Angle

180°

3.2.4 Actual handset applied

3.2.5 Demands

The original shape shall be possible to restore. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

3.2.6 Measuring Method

The antenna is placed in the handset or an equivalent test fixture.
The handset is dropped with the antenna downwards onto a metal plate.

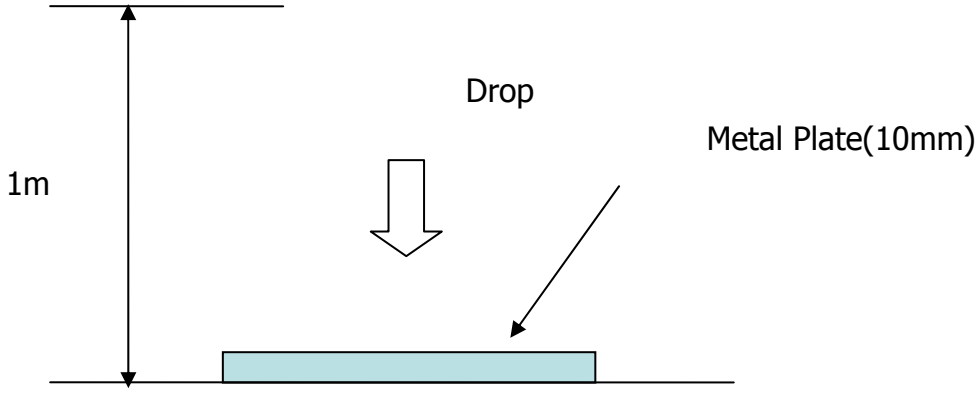


Figure4. Drop Test

4.Environment Resistance Properties

4.1 Operational Temperature

4.1.1. Low Operational Temperature

TLO = -40°C

4.1.2 High Operational Temperature

THO = +80°C

4.1.3 Demands

No visual deterioration shall occur, and the antenna shall satisfy the electrical demands, according to 2.4.1, during the test.

4.1.4 Measuring Method

The antenna is placed in a climatic chamber at temperature TLO.

The antenna is taken out after 1 hour, and VSWR is immediately measured.

The antenna is placed in a climatic chamber at temperature THO.

The antenna is taken out after 1 hour, and VSWR is immediately measured.

4.2 Temperature Cycling

4.2.1 Low Cycling Temperature

TLC = -40°C

4.2.2 High Cycling Temperature

THC = +80°C

4.2.3 Demands

No visual deterioration shall occur during the test. The antenna shall satisfy the electrical demands, according to 2.4.1.

4.2.4 Measuring Method

The antenna is placed in a climatic chamber. The temperature is cycled as follows : The temperature is kept constantly at TLC for 1 hour, increased to THC during 1 hour, kept constantly at THC for 1 hour, and then decreased to TLC during 1 hour.

This procedure is repeated 10 times, ending at room temperature according tofigure 5 below.

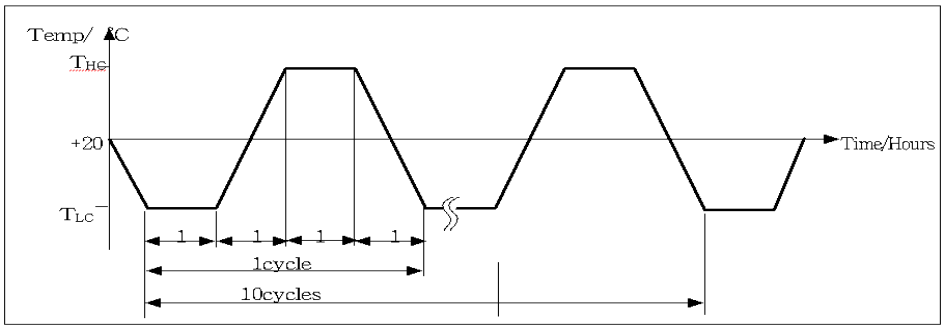


Figure5. Temperature Cycling

4.3 Humidity

4.3.1 Relative Humidity

95%

4.3.2 Temperature

+55°C

4.3.3 Demands

No visual deterioration shall occur during the test. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

4.3.4 Measuring Method

The antenna is placed in a climatic chamber for 24 hours. The antenna is taken out from the chamber and measured after another 24 hours in room temperature.

4.4 Sinusoidal Vibration

4.4.1 Vibration Frequencies

10-55-10Hz(1cycle)

4.4.2 Sweep Rate

1 octave/min(logarithmic)

4.4.3 Maximum Amplitude

A = 1.52mm

4.4.4 Maxim Acceleration

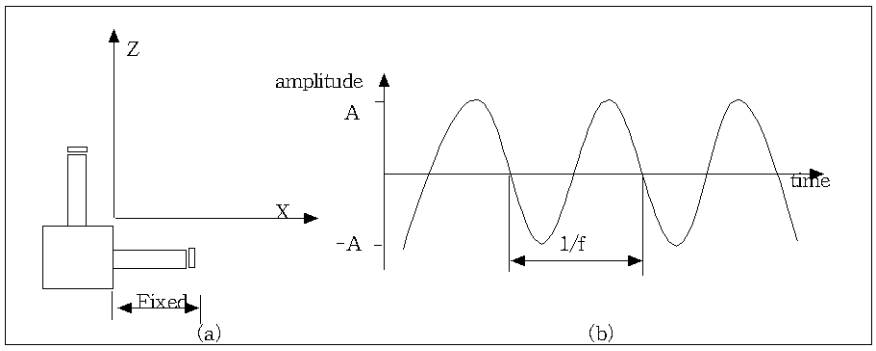
2g

4.4.5 Crossover Frequency

18.2Hz

4.4.6 Measuring Method

The fixed antenna is assembled in the test equipment. The vibration is done both in x-and z-directions, according to figure 6(a), with a duration of 1 hour in each direction.



(a) Vibration directions (b) Vibration form

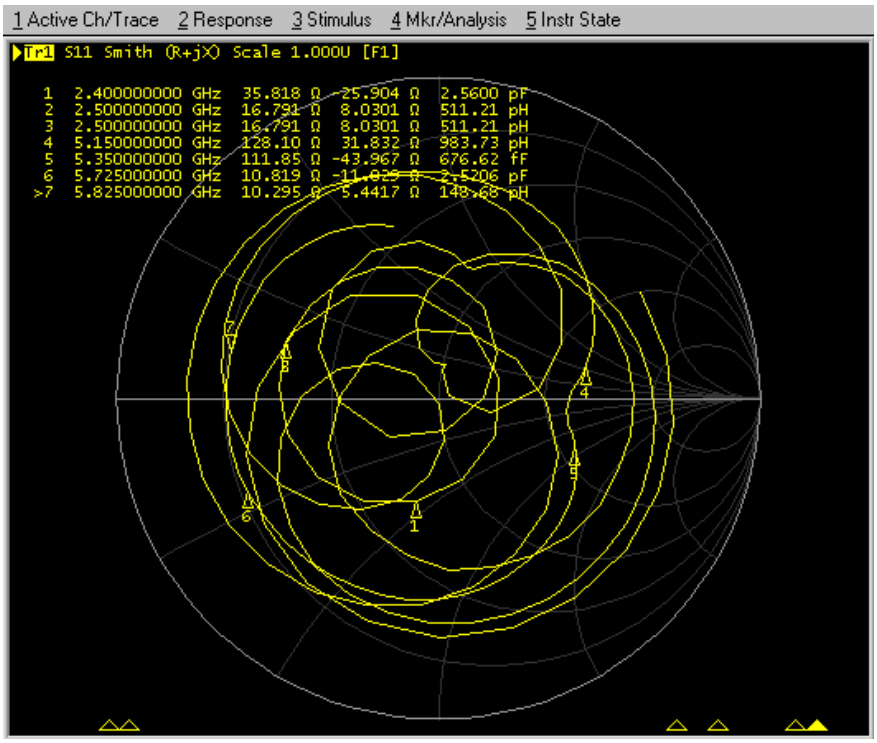
Figure 6. Sinusoidal Vibrator

5. Test Data

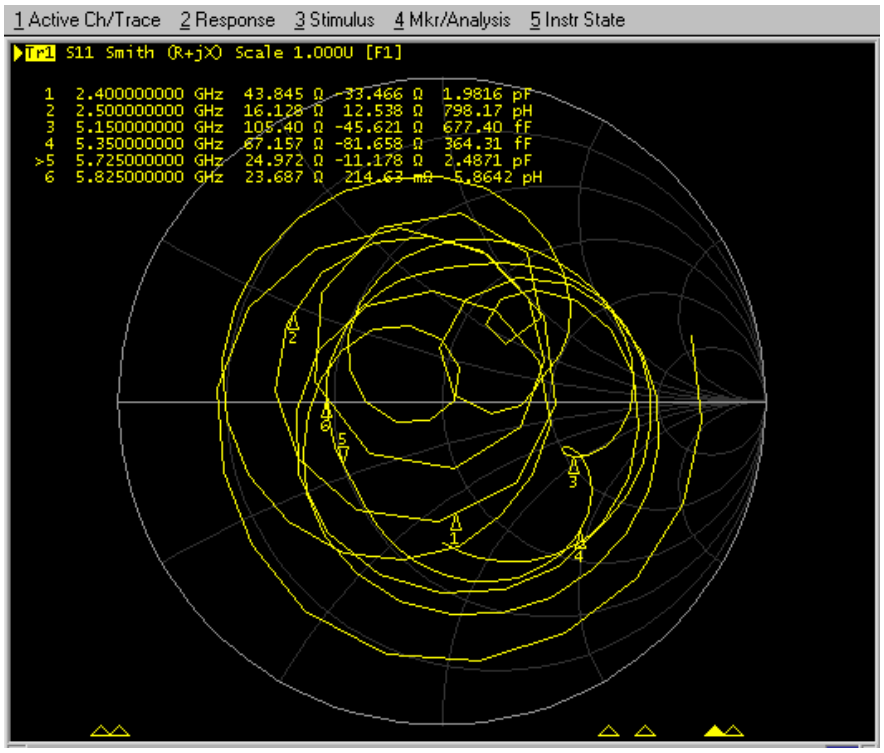
5.1 Network Data

5.1.1 Smith Chart

5.1.1.1 Antenna 1

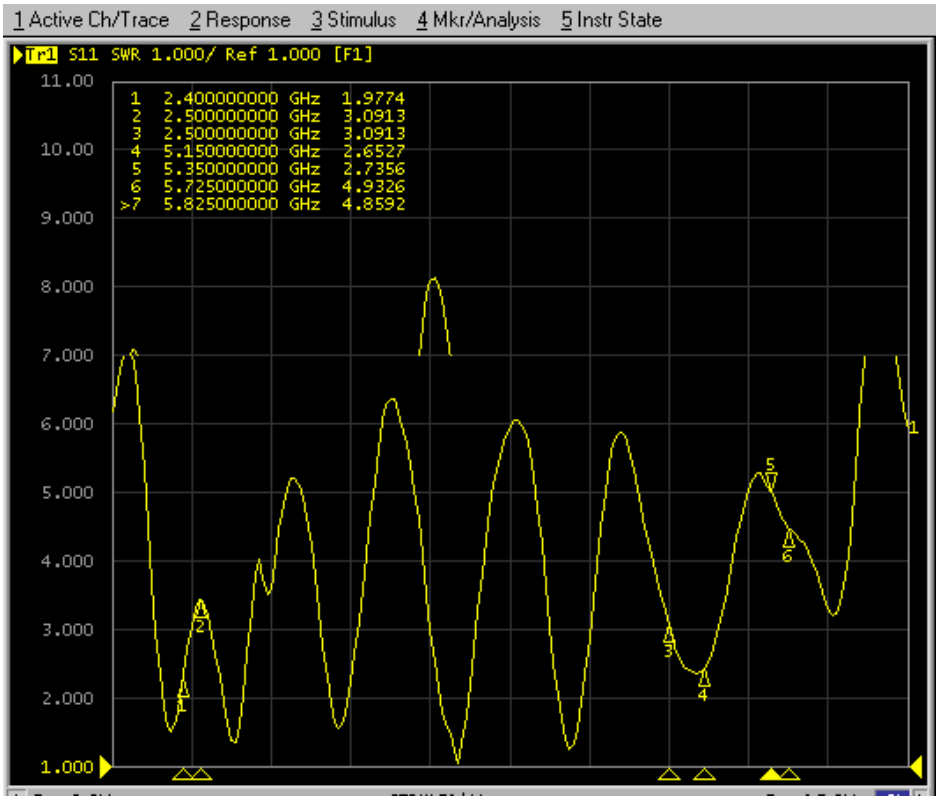


5.1.1.2 Antenna 2

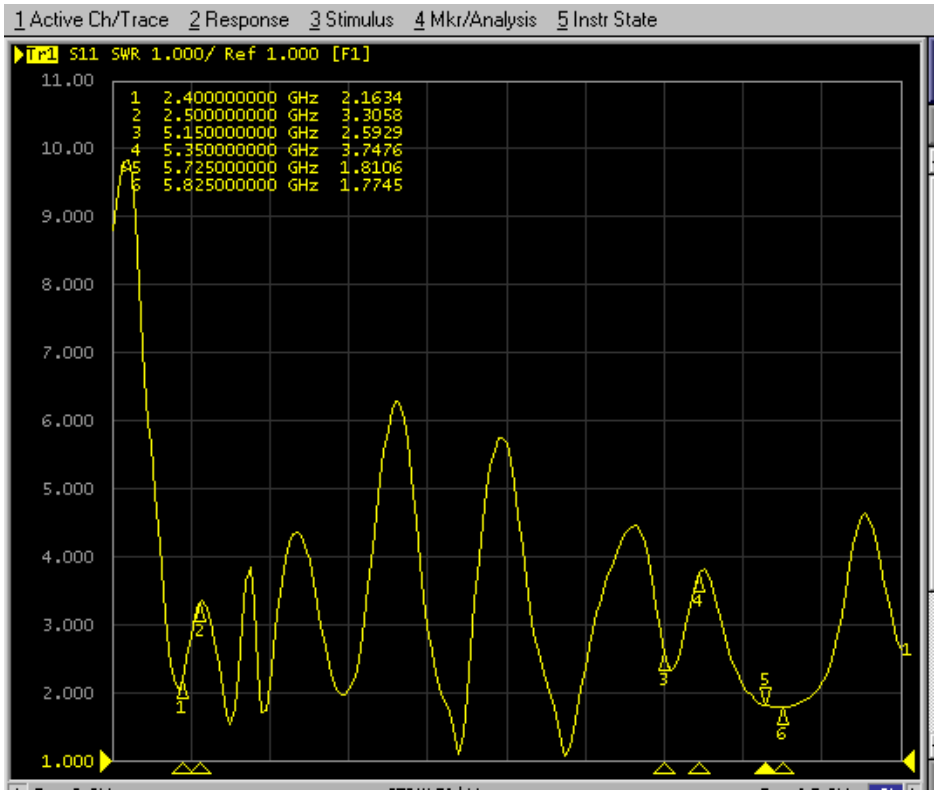


5.1.2 VSWR

5.1.2.1 Antenna 1

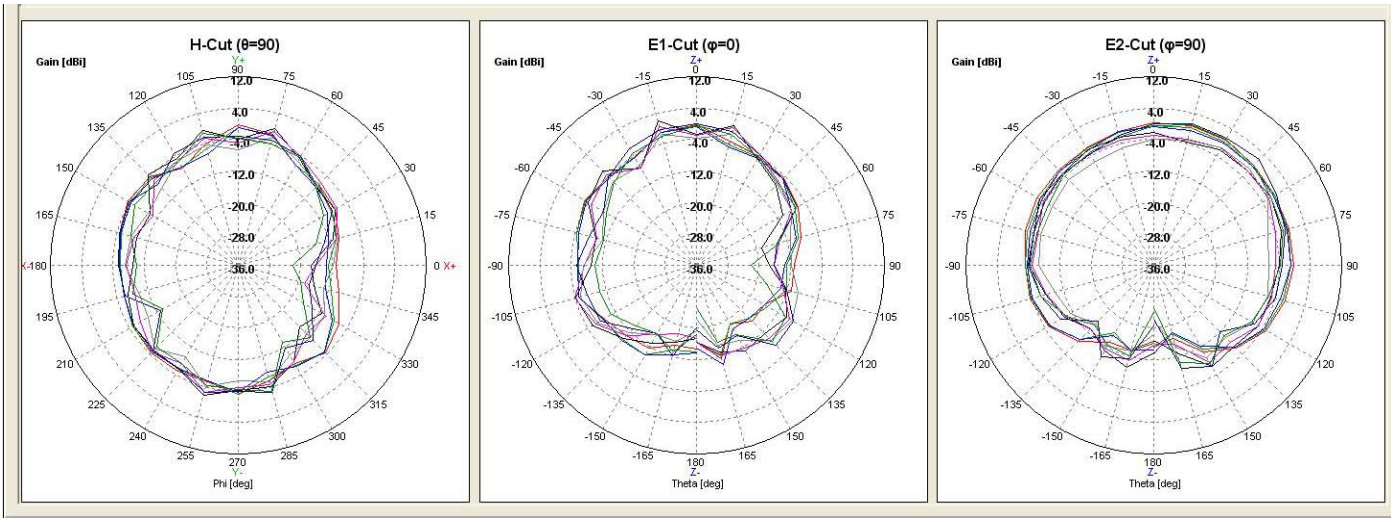


5.1.2.1 Antenna 2

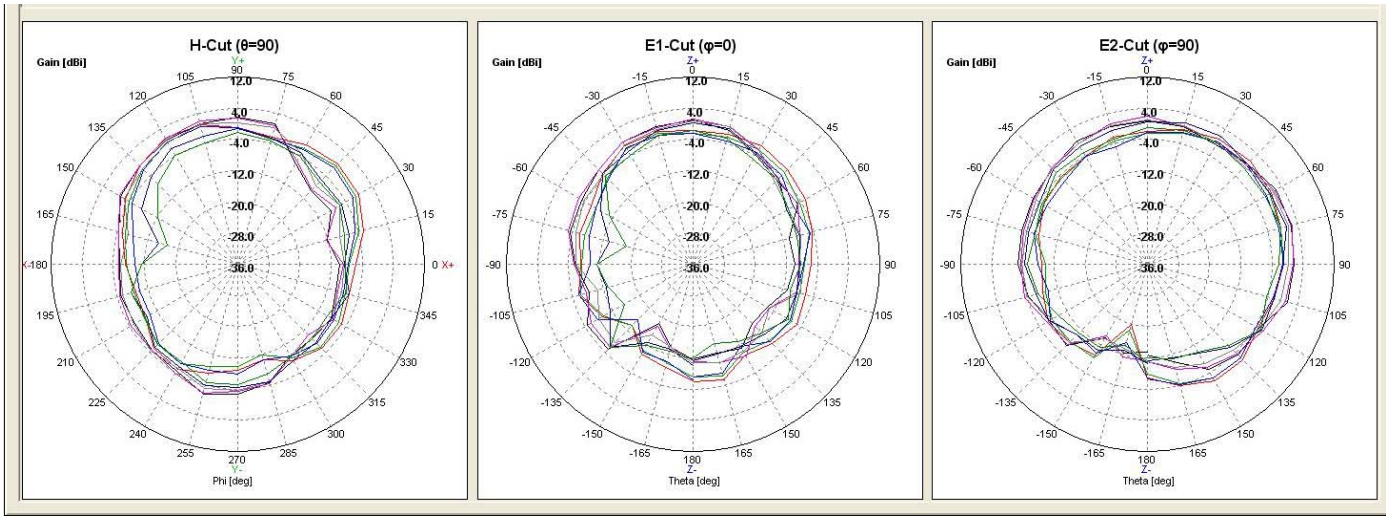


5.2 Radiation Pattern

5.2.1.Antenna 1



5.2.2Antenna 2



6. Mechanical Drawing

6.1 PCBAntenna