Application note of Chip Dielectric Antenna M1-AA075 type

for Bluetooth

1mm thickness type

(P/N : ANCM12G45SAA075)

1st Report on 2001/July/6
2nd Report on 2001/Nov/14
3rd Report on 2004/Mar/24

Kanazawa Murata Manufacturing Co., Ltd.

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1. Introduction

Recently, the Chip Dielectric Antenna (CDA) is attractive device as internal antenna. It allows no-broken antenna when the hand-held terminal is dropped. But, as internal chip antenna for hand-held terminal is not popular antenna, It is required many test data at some environments.
In order to realize internal antenna, we propose M1 type CDA and evaluate them. M1 type works as a helical antenna, but this antenna has a small projection length, a low profile, a wide band-width.
We are very sure that this kind of data sheet is very helpful for you to design your small type Bluetooth with our CDA. This application note is for internal chip dielectric antenna for small type Bluetooth.

2. The information of the evaluation samples

2.1 Part Number

: ANCM12G45SAA075***
*** : TT1 : Bulk package, RD5 : Taping (5000pcs/reel)

2.2 Dimensions

The dimensions of the test samples is shown in Fig.1.

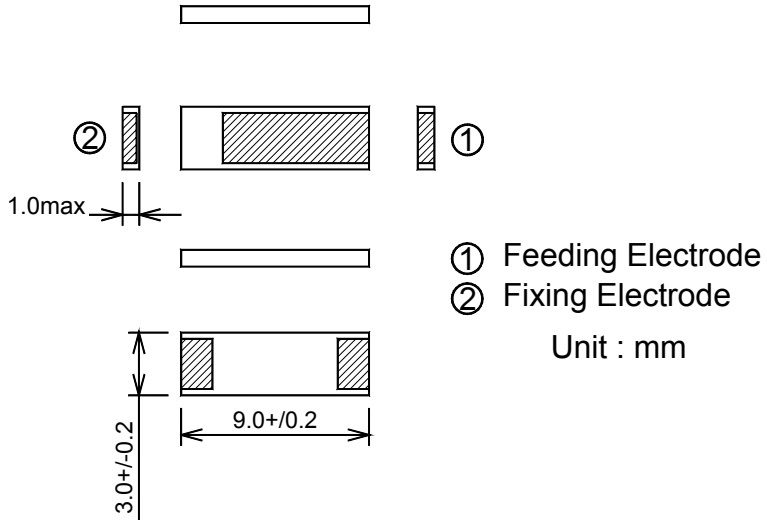
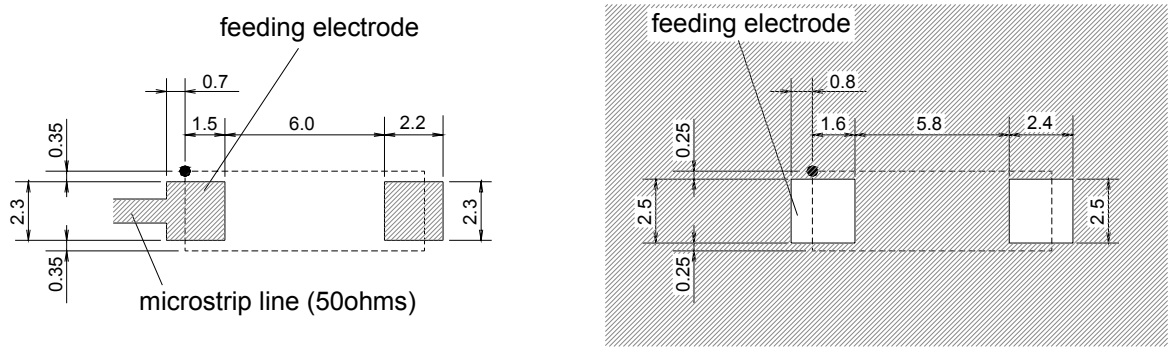


Fig.1 Dimensions of the test samples

2.3 Recommended land pattern and resist pattern

See Fig.2.



recommended land pattern of PCB

recommended solder-resist pattern

DIMENSIONS : mm
TOLERANCE : +/-0.05mm

Fig.2 Recommended land pattern and resist pattern

2.4 Electrical Characteristics

The electrical characteristics are shown in table 1. These characteristics are guaranteed with our standard PCB which size is 100x40mm. The characteristics are influenced by the land pattern, PCB size, case and so on.

Table 1 Electrical Characteristics

Operation Temp.	-40 to +85 degree C
Storage Temp.	-10 to +40 degree C
Polarization	Linear
Frequency	2450 MHz.
Range	Fo +/- 50.0 MHz
V.S.W.R at BW	2.5 max.
Impedance	50 ohm

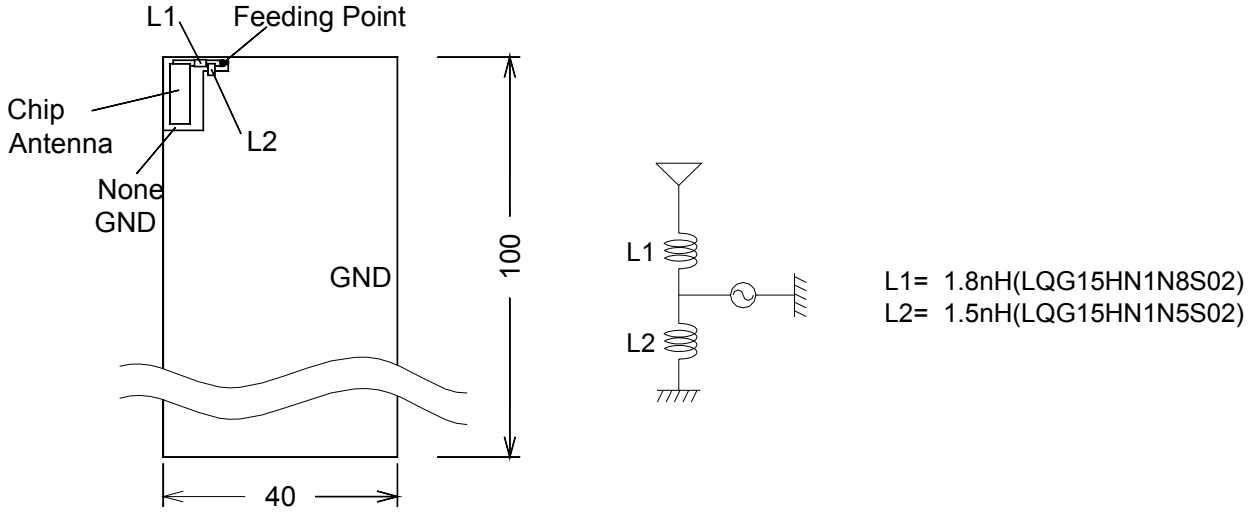
3. Special features

- Small and light weight antenna (Size : 9x3x1mm, Weight : 1.0gram)
- Surface mount device with pick & place and reflow soldering.
- Small influence close to the ground plane and another devises.
- Easy to change the center frequency and impedance matching with external matching circuit on PCB.
- Vertical and Horizontal placing on PCB is available.

4. The evaluation method

4.1 Standard PCB

The standard PCB is required to measure the electrical characteristics. The all test data are measured with following PCB in Fig.3.
It is easy to adjust the center frequency and the matching by L1 and L2 on your PCB. The value of L1 and L2 are recommended in each case.
In this case, the matching circuit L1 is 3.3nH and L2 is 1.5nH are used.



Substrate : FR-4 (Both Printed)
Thickness : 1.0mm
(Thickness of Cupper : 35 um)
Unit : mm

Fig.3 Standard PCB and matching circuit

4.2 Measurement condition

The antenna gain are measured with standard PCB and following direction and polarization (Fig.4).

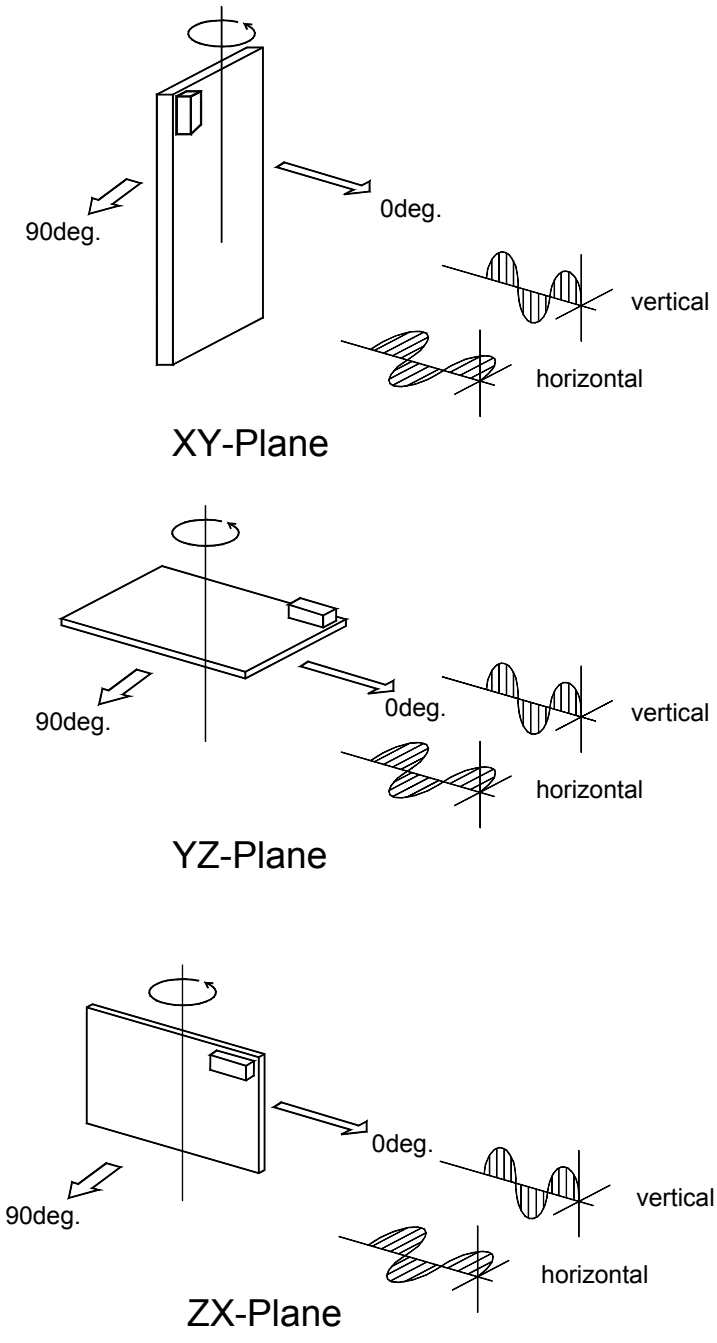


Fig.4 The measurement direction, plane and polarization

4.3 Measurement Environment

We measured the antenna gain in an anechoic chamber which shown in Fig.5. This chamber has a size of 5.5x3x3m. A rotating turntable was placed 3 meters from a transmitting antenna. The transmitting antenna is rotated from 0 degree to 90 degree at 90 increment. Meanwhile a receiving antenna is put on the turntable and rotated from 0 degree to 360 degree at 10 increment.

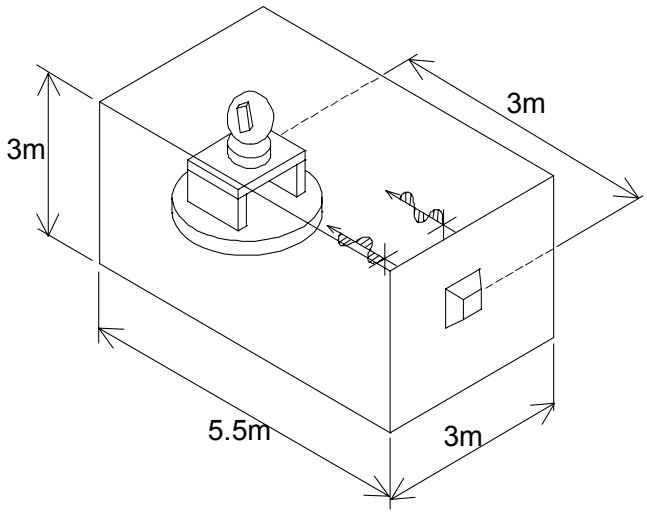


Fig.5 Anechoic Chamber

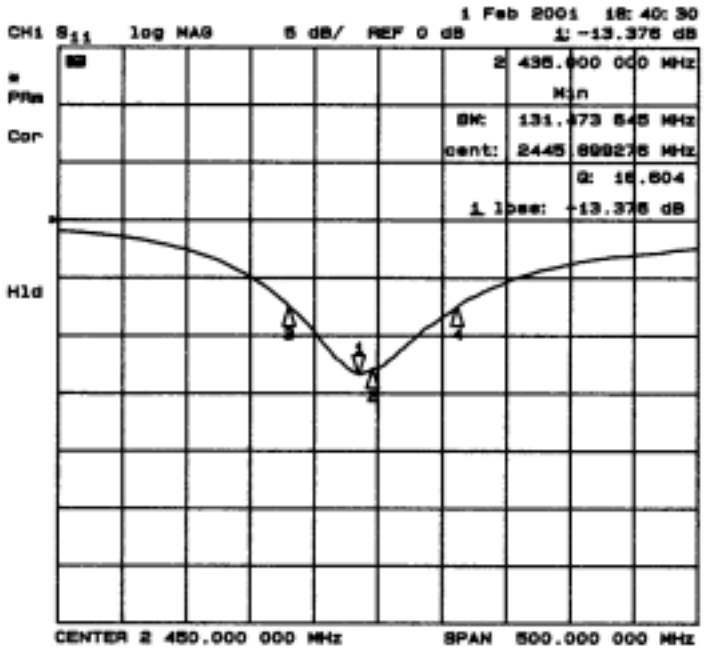
5. Measurement Result

5.1 ANCM12G45SAA075

These data were for 1mm thickness antenna.

5.1.1 Return loss

The return loss data is shown in below. The bandwidth is around 131MHz at VSWR = 2.5.

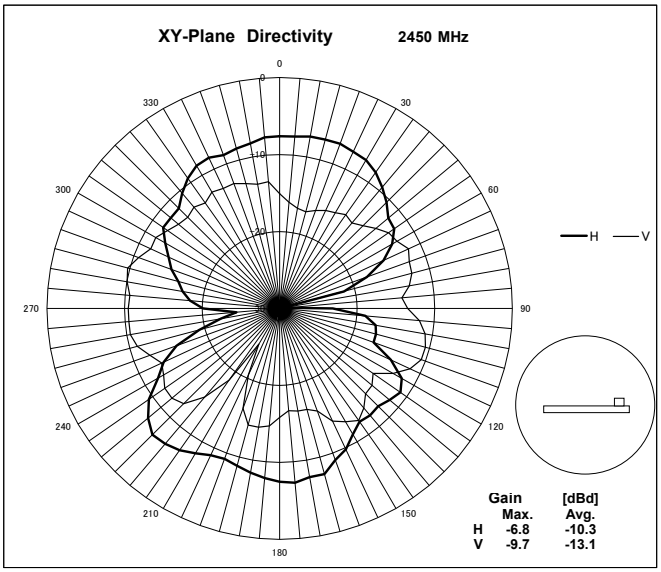


5.1.2 Gain

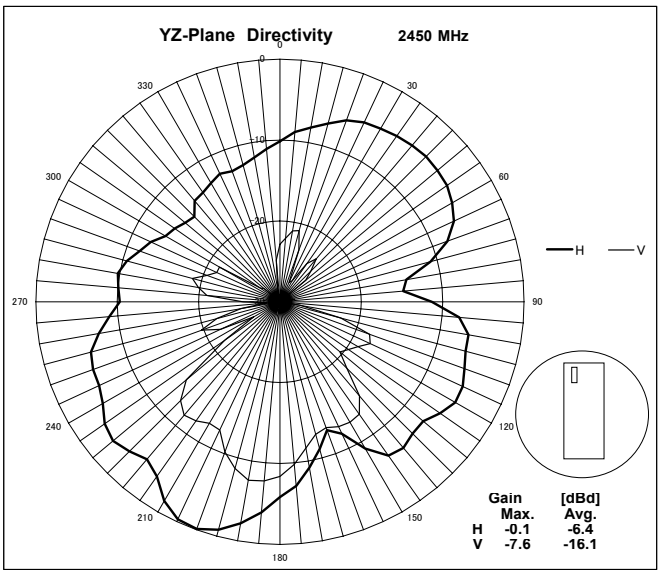
	Gain	Free Space						Center Frequency	Band Width atVSWR=2. 5
		XY-Plane		YZ-Plane		ZX-Plane		Total Gain		
	[dBd]	H	V	H	V	H	V		[MHz]	[MHz]
2400 MHz	Max.	-7.7	-10.8	-1.0	-8.4	-2.0	-2.6	-9.2	2445.9	131.5
	Avg.	-11.5	-14.6	-7.1	-16.8	-6.8	-7.3			
2450 MHz	Max.	-6.8	-9.7	-0.1	-7.6	-1.2	-2.4	-8.4		
	Avg.	-10.3	-13.1	-6.4	-16.1	-6.0	-6.7			
2500 MHz	Max.	-6.5	-10.3	-0.3	-7.0	-1.1	-1.9	-8.3		
	Avg.	-10.1	-13.2	-6.3	-15.3	-5.9	-6.5			

Total Gain = Average (XY-Plane(H and V)+ (YZ-Plane(H and V)+ (ZX-Plane(H and V))

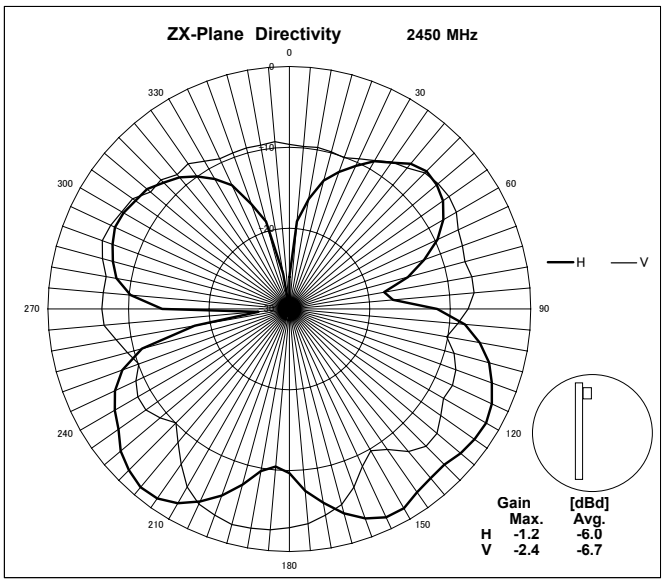
5.1.3 Radiation Pattern



XY Plane



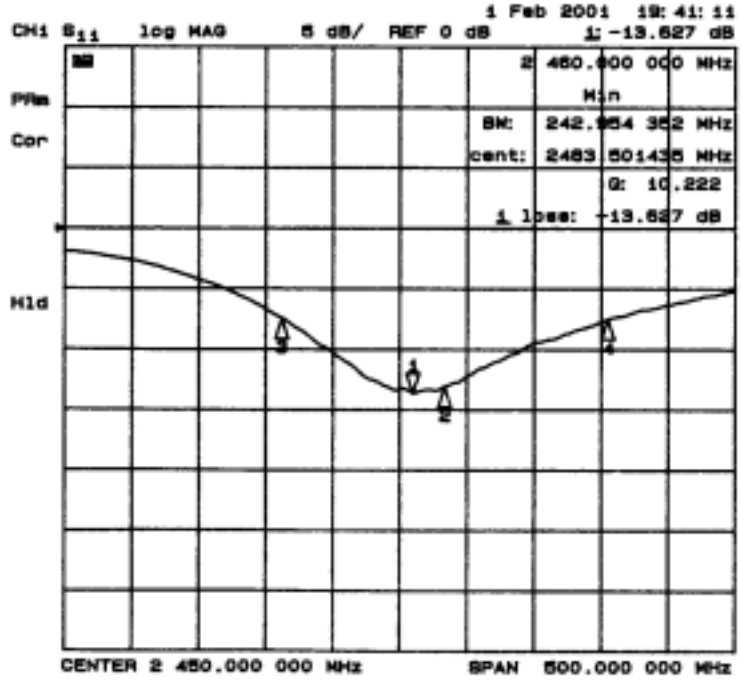
YZ Plane



ZX Plane

5.2 ANCM12G45SAA072
These data were for 2.0mm max. thickness antenna.

5.2.1 Return loss
The return loss data is shown in below. The bandwidth is around 242MHz at VSWR = 2.5.

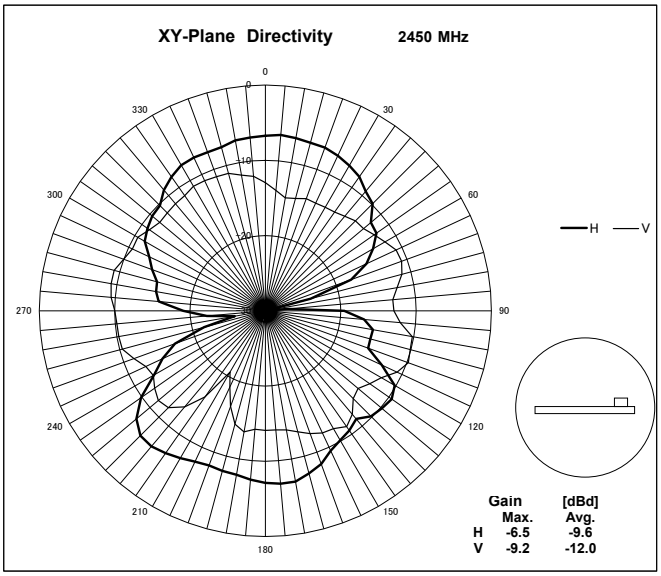


5.2.2 Gain

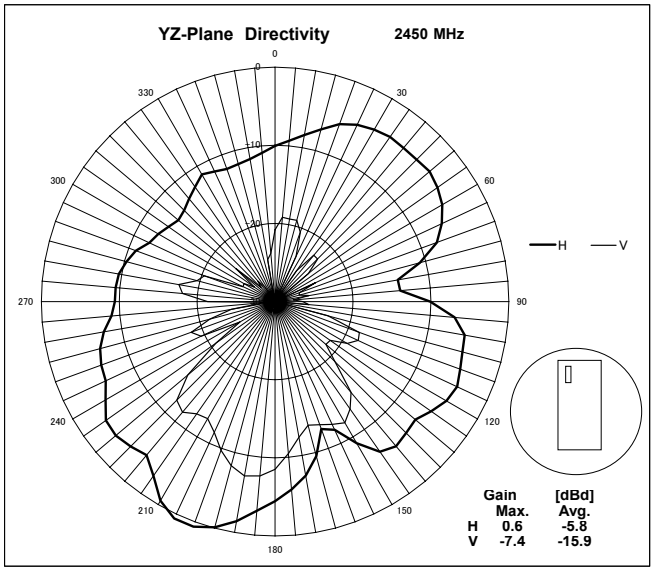
	Gain	Free Space							Center Frequency	Band Width atVSWR=2. 5
		XY-Plane		YZ-Plane		ZX-Plane		Total Gain		
	[dBd]	H	V	H	V	H	V		[MHz]	[MHz]
2400 MHz	Max.	-6.5	-9.8	0.3	-7.8	-1.4	-1.6	-8.3	2483.5	242.9
	Avg.	-10.4	-13.1	-6.2	-16.3	-6.1	-6.4			
2450 MHz	Max.	-6.5	-9.2	0.6	-7.4	-1.0	-1.3	-7.9		
	Avg.	-9.6	-12.0	-5.8	-15.9	-5.6	-6.0			
2500 MHz	Max.	-5.5	-9.4	0.8	-6.4	-0.7	-0.3	-7.4		
	Avg.	-9.1	-11.7	-5.5	-14.9	-5.1	-5.4			

Total Gain = Average (XY-Plane(H and V)+ (YZ-Plane(H and V)+ (ZX-Plane(H and V))

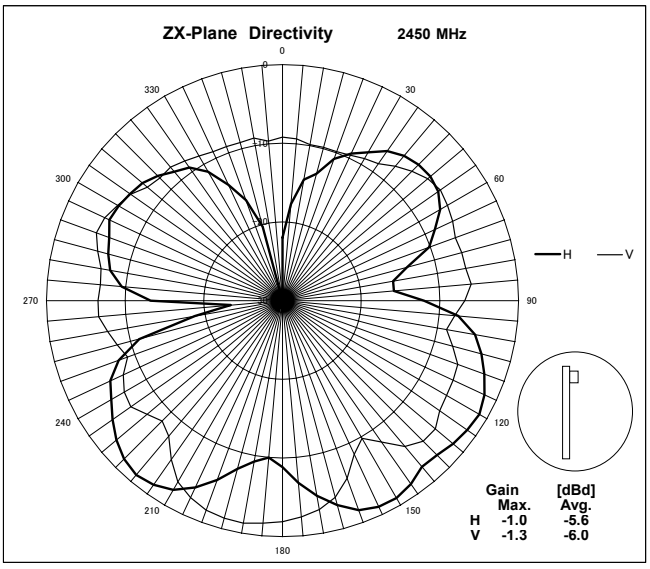
5.2.3 Radiation Pattern



XY Plane



YZ Plane



ZX Plane