

## Antenna report

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## 1. Introduction

This document describes the design verification test in order to determine the antenna gain.

### 1.1 Antenna information

This antenna is PCB antenna, and it's formed as a part of the PCB board pattern when the WLAN module shown in Fig 1 is fabricated. Thus, the manufacturer of the antenna is same as that of the module. The manufacturer of the module is:

Company:

Panasonic Electric Works Electrical Construction Materials Mie Co., Ltd.

Address: 1668, Fujikata, Tsu Mie 514-8555, Japan

The antenna itself is not assigned model name, but the module name is:

Module name: KY0000-ADAWA (when it's incorporated in EYADA screwdriver)

KY0010-FMH1 (when it's incorporated in EYFMH impact wrench)

\*Both modules are identical, but two product name is assigned for production management purpose.

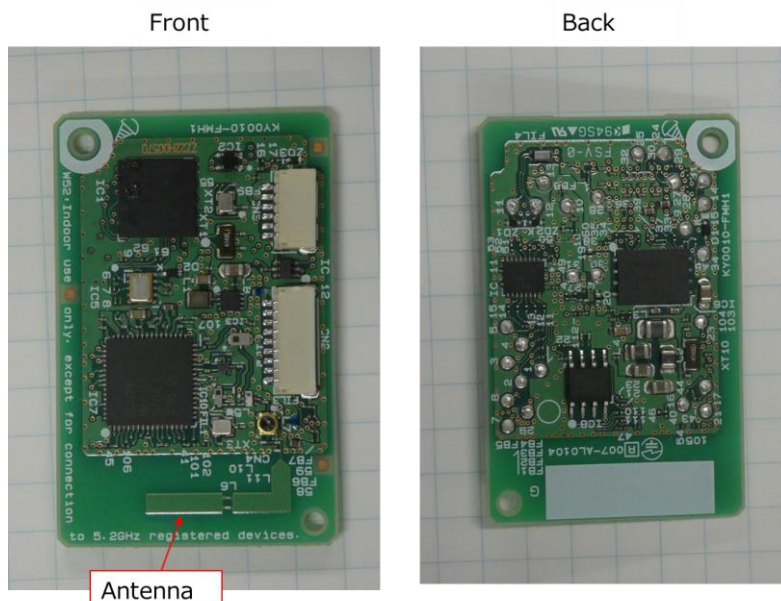


Fig. 1 PCB antenna on WLAN module

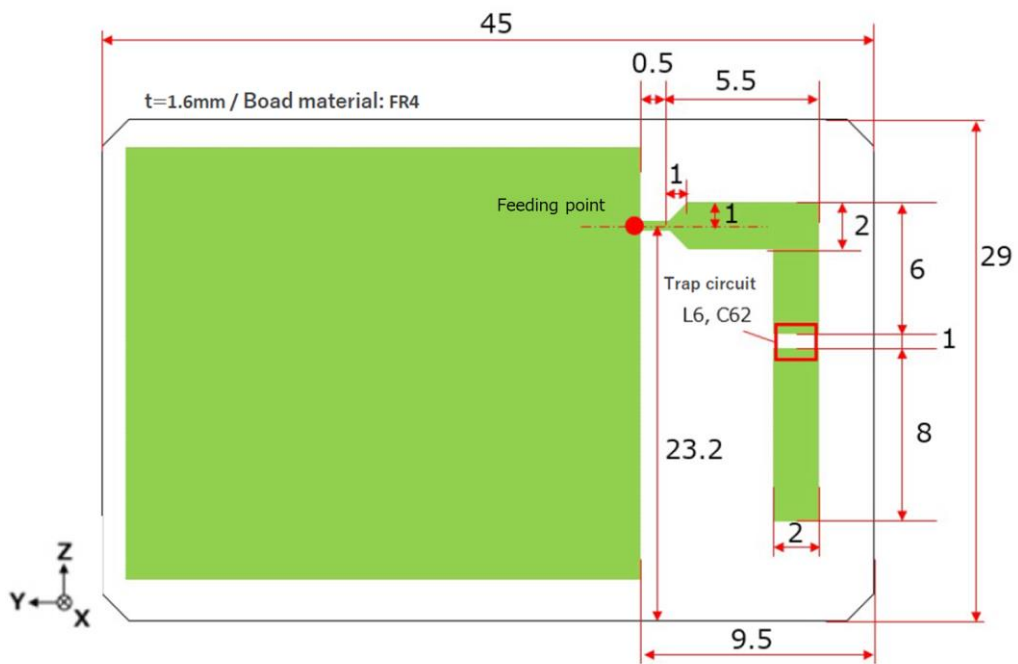


Fig. 2 PCB board pattern

## 1.2 Test equipment

Following equipment were used.

- Anritsu MT8852B
- Agilent N9322C

1.3 Test Setup

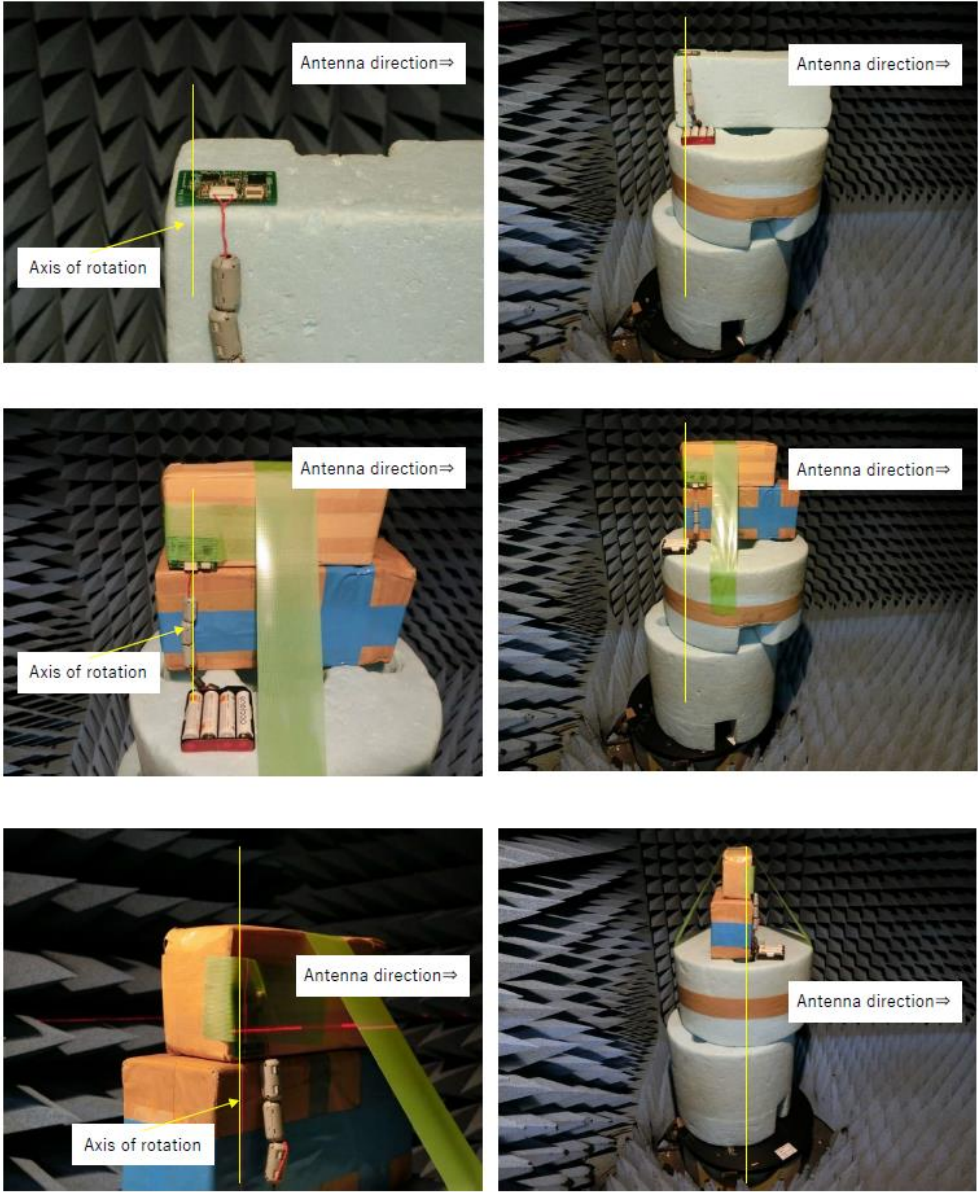


Fig. 3 Photo of test setup

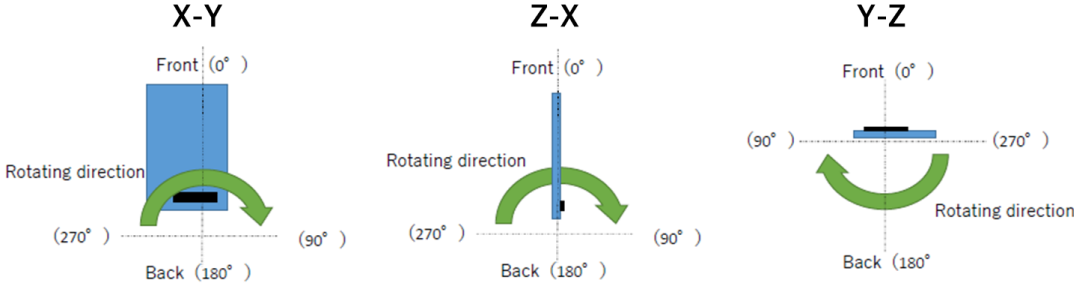
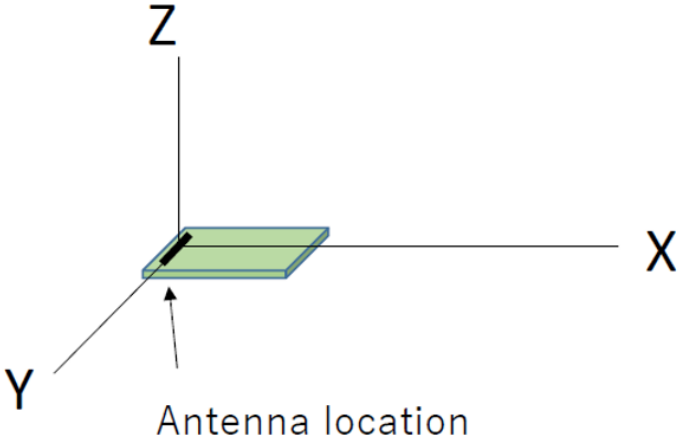


Fig. 4 Antenna location

## 2 Test result

### 2.1 Maximum gain

Antenna max gain is:

2,4GHz: 1.25dBi

5GHz: -0.97dBi

## 2.2 Test data for 2,4 GHz

Test data for 2,4GHz is shown Fig. 5 through 8.

X-Y		X-Z		Y-Z	
-16.52	0.25	-9.23	<b>1.25</b>	0.28	-14.5

Fig. 5 Maximum antenna gain for 2,4 GHz (dBi)

(deg)	X-Y		X-Z		Y-Z	
0	-20.41	-8.41	-9.59	-22.21	-2.45	-19.08
45	-17.73	-6.74	-12.4	-3.63	-3.53	-14.55
90	-31.89	-0.59	-15.02	-2.72	-3.46	-21.91
135	-18.8	-1.84	-11.63	-7.29	-4.29	-28.35
180	-20.54	-15.41	-9.69	-26.36	-1.74	-20.31
225	-22.33	-9.54	-12.2	-4.09	0.02	-17.21
270	-27.32	-0.66	-16	1.15	0.28	-24.82
315	-21.33	-1.69	-13.23	-4.52	-0.39	-15.54
Ave	-20.99	-3.52	-11.97	-3.97	-1.64	-18.43

Fig. 6 Antenna gain for 2,4 GHz (dBi)

(deg)	X-Y		X-Z		Y-Z	
0	85.93	97.93	96.75	84.13	103.89	87.26
45	88.61	99.6	93.94	102.71	102.81	91.79
90	74.45	105.75	91.32	103.62	102.88	84.43
135	87.54	104.5	94.71	99.05	102.05	77.99
180	85.8	90.93	96.65	79.98	104.6	86.03
225	84.01	96.8	94.14	102.25	106.36	89.13
270	79.02	105.68	90.34	107.49	106.62	81.52
315	85.01	104.65	93.11	101.82	105.94	90.8
Ave	84.73	101.97	94.12	100.96	104.55	87.13

Fig. 7 Field intensity for 2,4 GHz (dB $\mu$ V/m)

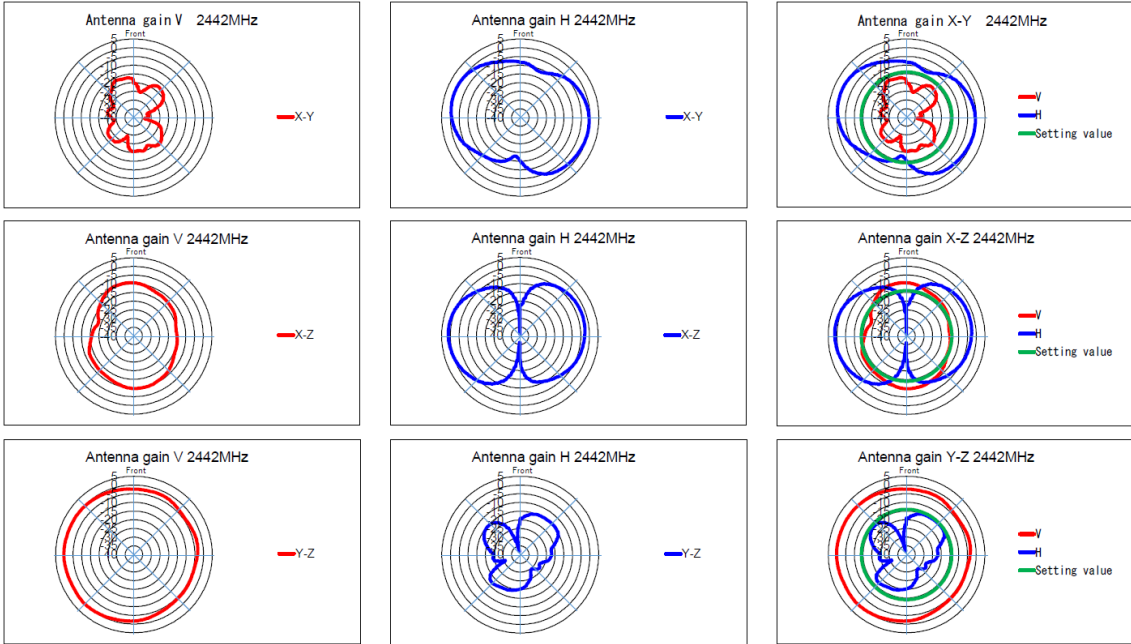


Fig. 8 Antenna gain for 2,4 GHz (dBi)

### 2.3 Test data for 5 GHz

Test data for 5 GHz is shown Fig. 9 through 12.

X-Y		X-Z		Y-Z	
-15.72	-1.37	<b>-0.97</b>	-3.1	-2.61	-6.32

Fig. 9 Maximum antenna gain for 5 GHz (dBi)

(deg)	X-Y		X-Z		Y-Z	
0	-23.21	-4.27	-2.79	-19.14	-24.46	-7.19
45	-20.24	-18.81	-3.52	-5.24	-10.29	-8.75
90	-17.25	-2.4	-5.99	-6.84	-4.31	-26.99
135	-21.51	-8.72	-2.9	-12.41	-6.08	-11.98
180	-15.75	-1.37	-1.01	-30.85	-22.96	-7.14
225	-18.11	-4.41	-2.73	-13.03	-5.01	-12.7
270	-24.11	-3.81	-5.84	-16.2	-2.81	-33.92
315	-18.24	-8.47	-3.41	-9.43	-5.44	-11.5
Ave	-18.99	-4.64	-3.26	-10.2	-6.37	-10.53

Fig. 10 Antenna gain for 5 GHz (dBi)

(deg)	X-Y		X-Z		Y-Z	
0	82.26	101.2	102.68	86.33	81.01	98.28
45	85.23	86.66	101.95	100.23	95.18	96.72
90	88.22	103.07	99.48	98.63	101.16	78.48
135	83.96	96.75	102.57	93.06	99.39	93.49
180	89.72	104.1	104.46	74.62	82.51	98.33
225	87.36	101.06	102.74	92.44	100.46	92.77
270	81.36	101.66	99.63	89.27	102.66	71.55
315	87.23	97	102.06	96.04	100.03	93.97
Ave	86.09	100.14	102.08	93.84	97.94	93.67

Fig. 11 Field intensity for 5 GHz (dB $\mu$ V/m)



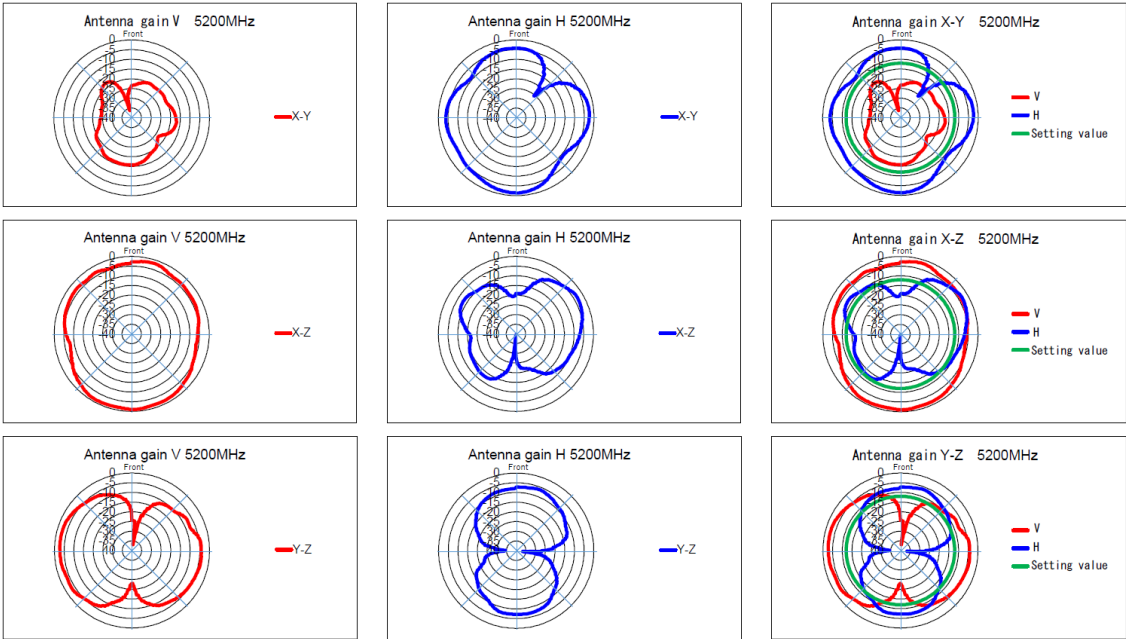


Fig. 12 Antenna gain for 5 GHz (dBi)