

FCC Part 15 Antenna Gain

Test Report

(UA-651BLE)

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1. Overview

This test report presents the results of measuring the antenna gain for the Equipment Under Test (EUT) using the standard antenna method.

2. Test Objective

To measure the antenna gain of a specific EUT using the standard antenna method and evaluate its performance.

This test report demonstrates compliance with the antenna gain reporting requirements of FCC 2.1033(b)(4), 15.203, 15.212.

3. Test Equipment

The equipment used for this test is shown below.

- **Equipment Under Test (EUT):**

- Model: UA-651BLE**

- Antenna Type: Pattern Antenna**

- Antenna Manufacturer: A&D Company, Limited**

- Operating frequency range: 2402-2480MHz (ISM)**

- **Antenna Measurement System:**

- Fully anechoic chamber with Double-Ridged Horn Antenna, mechanical positioners of Phi axes.**

- Horn Antenna:**

- EMCO 3115**

- Calibration Date: 03/06/2024**

- **Spectrum analyzer:**

- Rohde & Schwarz FSW26**

- Calibration Date: 07/05/2024**

- **Signal Generators**

- Keysight Technology N1513B**

- Calibration Date: 07/05/2024**

- **Commercial Test Software:**

- MATEOS.NET sold by Microwave Factory Co., Ltd.**

4. Test Method

The standard antenna method, which is an industry standard measurement method, is used to measure the antenna gain and directivity of the EUT.

Prepare a transmit antenna and a reference antenna, and install them in the anechoic chamber at a certain distance. Measuring the received power of reference antenna P_{rs} [dBm] in this state.

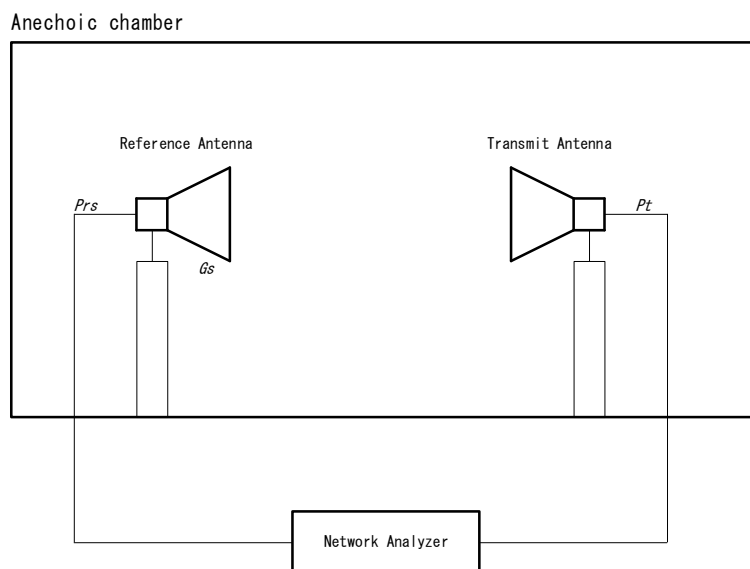


Fig.1 Measurement of Reference Antenna

Install the test antenna (EUT) in place of the reference antenna, and measuring the received power of EUT P_{rt} [dBm].

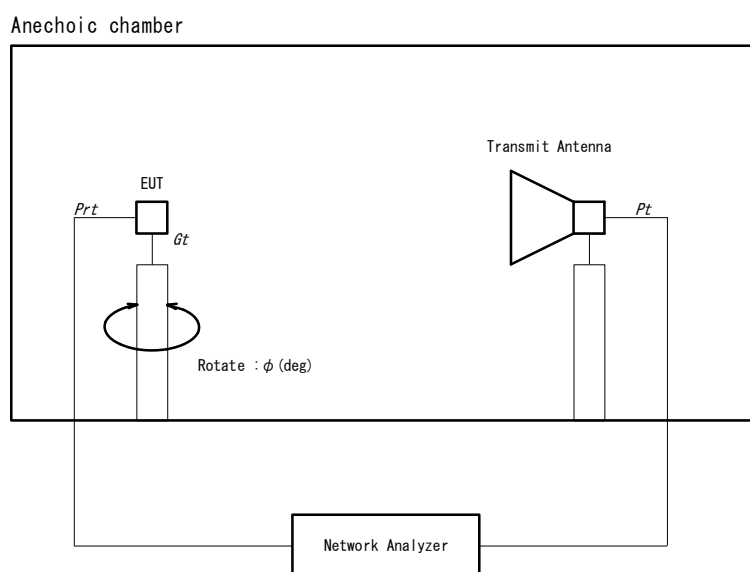


Fig.2 Measurement of EUT

EUT gain G_t [dBi] is calculated from the reference antenna gain G_s [dBi] and received power of reference antenna Prs [dBm] using the following formula.

$$G_t = Prt - Prs + G_s$$

Also, measurement of antenna directivity by rotating the EUT in the Phi axes direction.

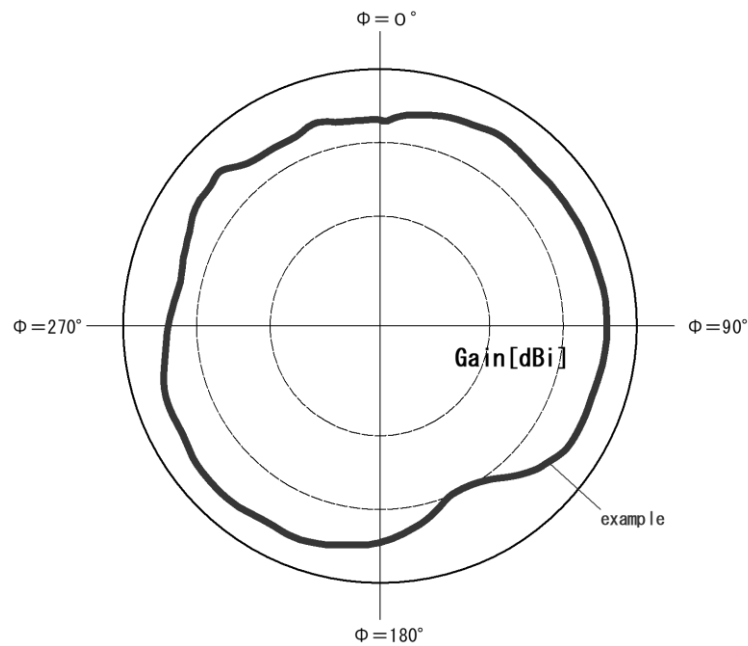


Fig.3 Antenna directivity diagram

5. Test Information

Test Lab: Telecom Engineering Center

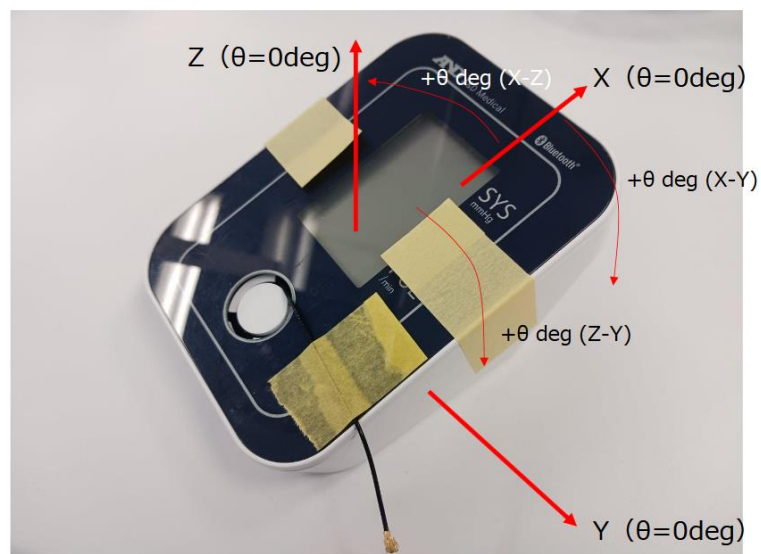
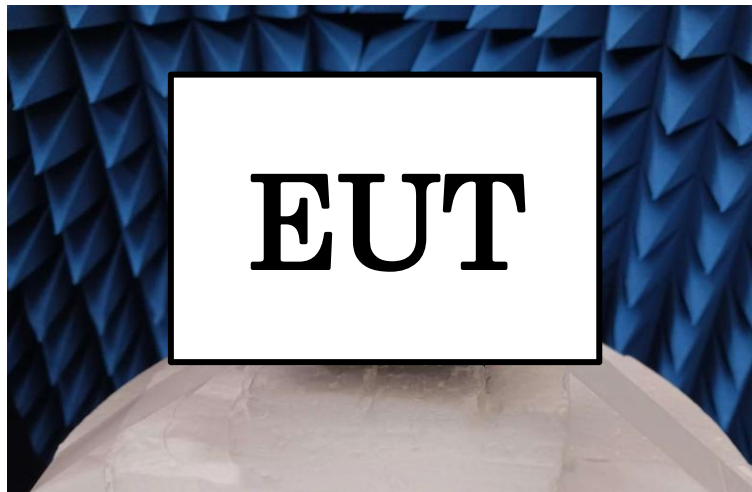
Test Lab Address: 580-2, Takatsukashinden, Matsudo-city, Chiba, Japan

Test Date: 7, Oct, 2024

Test Person: Hiroto Yamaguchi

6. Test Setup Photos

The device containing the integral antenna is placed on the styrofoam pylon.

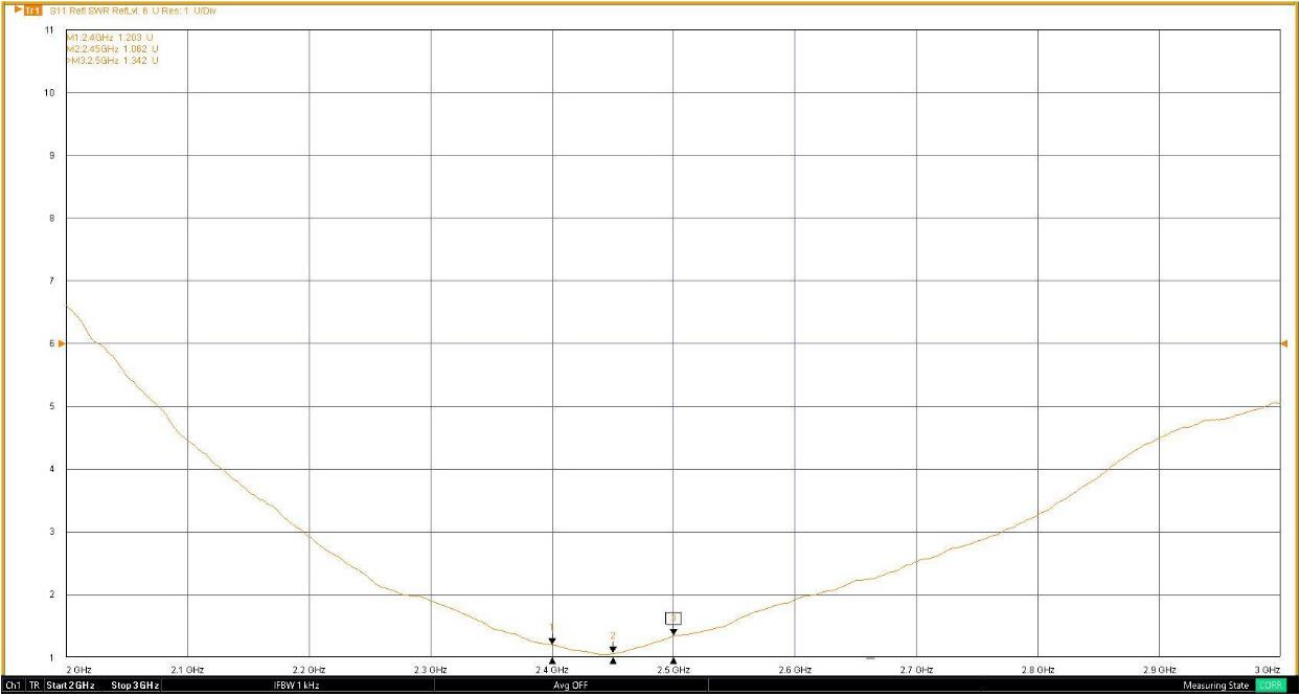


Definition of antenna measurement axis

7. Test Result

The following is the result of the antenna test.

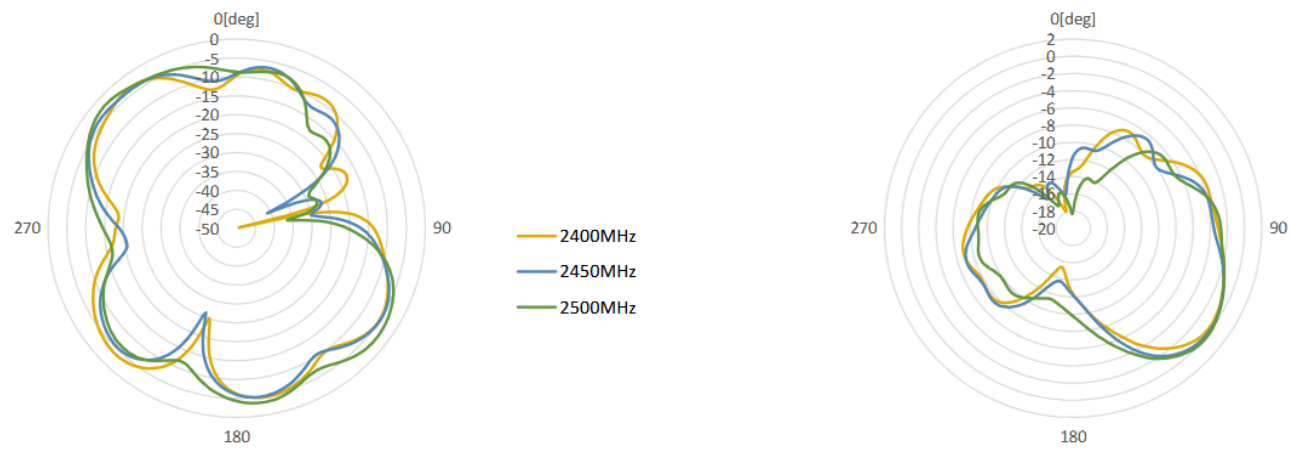
(1) VSWR



(2) Directivity



XY-Plane



ZY-Plane



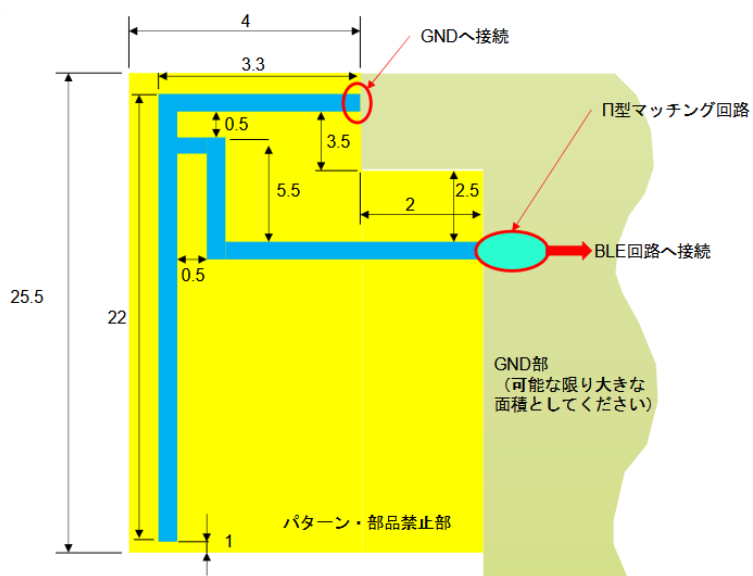
XZ-Plane

(3) Antenna Efficiency & Maximum Gain

	2400MHz	2450MHz	2500MHz
Antenna Efficiency	-3.7dB	-3.6dB	-3.2dB

	XY-Plane	ZY-Plane	XZ-Plane
Maximum Gain	+1.7dBi	+1.1dBi	-0.7dBi

8. Antenna Photos or Drawings



Antenna Dimension



RF circuit

9. Revision History

Revision#	Date	Description of Change
1.00	14/01/2025	Original

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