

## TEST REPORT

Date of Issue: 2025/10/01

The laboratory doesn't take part in the sampling and this test report applies only to the samples tested.

Without the laboratory approval by the documents, this report should not be copied in part.

### 1. Applicant

Company Name : SHIMANO INC.  
Mailing Address : 3-77 Oimatsu-cho, Sakai-ku, Sakai City,  
Osaka 590-8577, Japan

### 2. Identification of Tested Device

Type of Device : Digital Device  
Device Name : Dual Control Lever  
Model Number : 0ZC1  
Trade Name : SHIMANO  
Type of Test : ☐ Production ☐ Pre-production ☐ Prototype

### 3. Test Items

Antenna Gains

Shimano Inc.  
3-77 Oimatsu-cho, Sakai-ku, Sakai City, Osaka, 590-8577, Japan

Test engineer: Takaya Masuda  
Takaya Masuda

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1. REVISION HISTORY

| Report Version | Page | Revised Content         | Reason for Revision | Date of Issue | Status   |
|----------------|------|-------------------------|---------------------|---------------|----------|
| A              | -    | Initial issue of report | -                   | 2025/10/01    | Original |
|                |      |                         |                     |               |          |
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|                |      |                         |                     |               |          |

## 2. GENERAL INFORMATION

The information provided from the customer is as follows;

-Applicant, Type of EUT, Model Number of EUT on the cover and other relevant pages.

-2.1. : Product Description

\*The laboratory is exempted from liability of any test results affected from the above information.

### 2.1. Product Description

#### (1) Technical Specifications

|                       |                 |                                   |                                   |
|-----------------------|-----------------|-----------------------------------|-----------------------------------|
| Antenna Number        |                 | 1                                 |                                   |
| Operating Temperature |                 | -10 °C ~ 50 °C                    |                                   |
| Operation Voltage     |                 | 3.0 V                             |                                   |
| Antenna Material      |                 | PCB on board                      |                                   |
| Antenna Type          |                 | Printed monopole antenna          |                                   |
| Antenna dimension     |                 | 15.6 x 1.0 mm<br>(LengthxWidth)   |                                   |
| Wireless Circuit      | Frequency Range | 2478 MHz                          | 2402 – 2480 MHz                   |
|                       | Output Power    | <10 dBm                           | <2.4 dBm(BLE)                     |
|                       | Modulation      | GFSK                              | GFSK                              |
|                       | Antenna Gain    | PCB antenna<br>with 1.80 dBi gain | PCB antenna<br>with 2.15 dBi gain |

#### (2) Test Arrangement

| Test Arrangement                              |                                         |                                       |                                                     |
|-----------------------------------------------|-----------------------------------------|---------------------------------------|-----------------------------------------------------|
| <input checked="" type="checkbox"/> Table-top | <input type="checkbox"/> Floor-standing | <input type="checkbox"/> Combinations | <input type="checkbox"/> Other (Install on bicycle) |

[Attention]

All above information in this chapter was declared by the applicant.

### 2.2. Engineering changes to the EUT

☒ without changes, ☐ with changes (details are found inside of this report)

### 3. TEST SYSTEM

#### 3.1. Test Procedure

- Reference Antenna Measurement
  - (1) Set the reference antenna which has the known antenna gain in the anechoic chamber at the center of the rotation table in the condition of horizontal or vertical polarization.  
See also the block diagram and the photographs of EUT System configuration in this report.  
Also, the EUT is placed about 1.5 m high from the vertical reference ground plane.
  - (2) Feed the antenna with signal generator at the specific power※<sup>1</sup> and receive it with another antenna at the 2 m distance and the same height.
  - (3) Rotate the table 360 degrees and get the maximum value of the received power as the reference with the spectrum analyzer ※<sup>2</sup>.
- EUT Antenna Measurement
  - (4) Change the measurement equipment to the EUT antenna measurement system.
  - (5) Change from the reference antenna to the EUT antenna and measure the received power with the same manner of (1).
  - (6) Feed the EUT antenna with Internal signal of the EUT and receive it with another antenna at the 2 m distance and the same height.
  - (7) Rotate the table 360 degrees and get the maximum value of the received power as the EUT with the spectrum analyzer.
  - (8) Calculate the antenna gain using the measured value and the reference value and plot it in the polar chart.

[Note]

※<sup>1</sup> Supply the dipole antenna with the same power as the EUT's transmission power

※<sup>2</sup> Spectrum Analyzer Set Up Conditions

|                      |                     |
|----------------------|---------------------|
| Center Frequency     | : 2478 MHz (0ZC1_W) |
|                      | 2442 MHz (0ZC1_B)   |
| Frequency span       | : 0 Hz              |
| Resolution bandwidth | : 3 MHz             |
| Sweep time           | : Auto              |
| Detector function    | : Normal            |
| Number of points     | : 101               |

#### 3.2. Test Software List

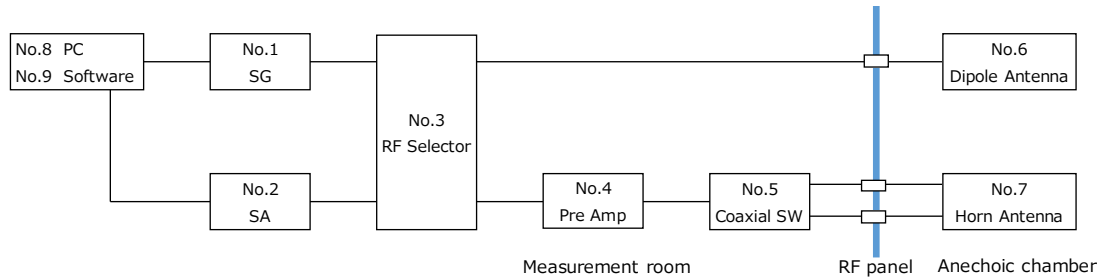
| Software Name | Version | Manufacture       |
|---------------|---------|-------------------|
| MATEOS.NET    | 1.13.16 | Microwave Factory |

#### 3.3. Date of Test

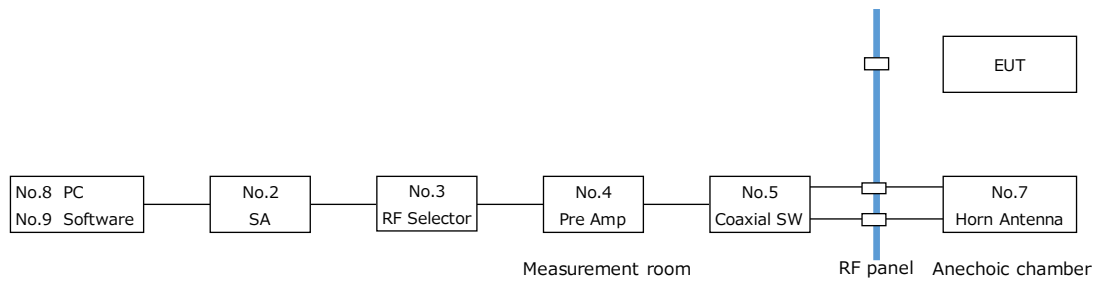
- Receipt of Test Sample : 18th July 2025
- Condition of Test Sample : ☒ Damage is not found on the set.  
☐ Damage is found on the set. (Details are described in this report)
- Test Completed on : 18th July 2025
- Condition of Test Sample : ☒ Damage is not found on the set.  
☐ Damage is found on the set. (Details are described in this report)

### 3.4. Block Diagram of Test System

- Reference Antenna Measurement



- EUT Antenna Measurement



### 3.5. Test Location

Shimano Inc. EMC Test Laboratory  
3-77 Oimatsu-cho, Sakai-ku, Sakai City, Osaka, 590-8577, Japan

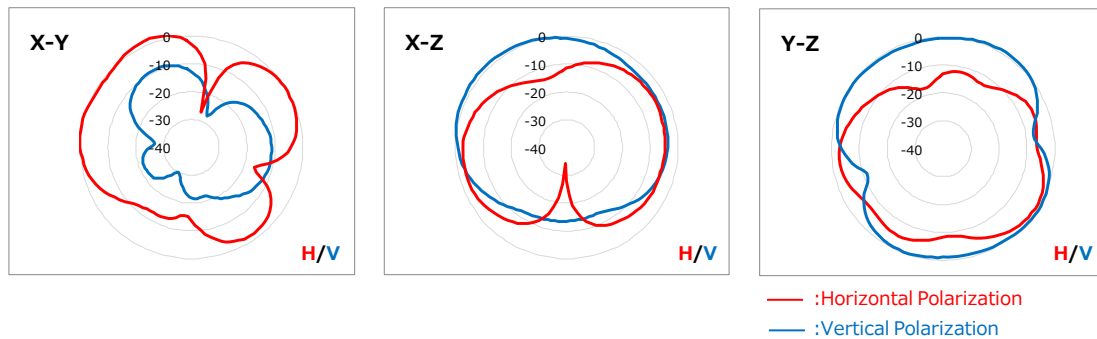
## 4. ANTENNA GAIN

### 4.1. Test Results

#### 0ZC1\_W

| Measured Frequency (MHz) | Plane | Polarization | Meter Reading (dBm) | Reference Value (dBm) | Reference Antenna Gain (dBi) | EUT Antenna Gain (dBi) |
|--------------------------|-------|--------------|---------------------|-----------------------|------------------------------|------------------------|
| 2478                     | XY    | Horizontal   | 8.94                | 9.29                  | 2.15                         | 1.80                   |
|                          |       | Vertical     | -2.05               | 9.15                  | 2.15                         | -9.05                  |
|                          | XZ    | Horizontal   | 4.64                | 9.29                  | 2.15                         | -2.50                  |
|                          |       | Vertical     | 8.43                | 9.15                  | 2.15                         | 1.43                   |
|                          | YZ    | Horizontal   | 6.39                | 9.29                  | 2.15                         | -0.75                  |
|                          |       | Vertical     | 8.10                | 9.15                  | 2.15                         | 1.10                   |

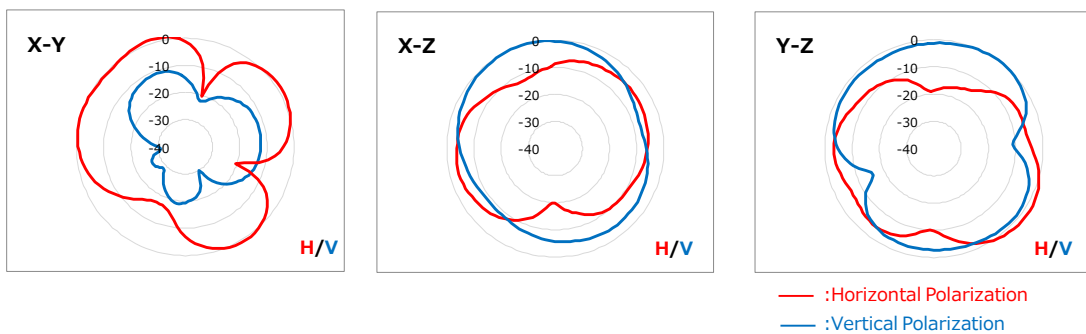
#### Test Results in Graph



#### 0ZC1\_B

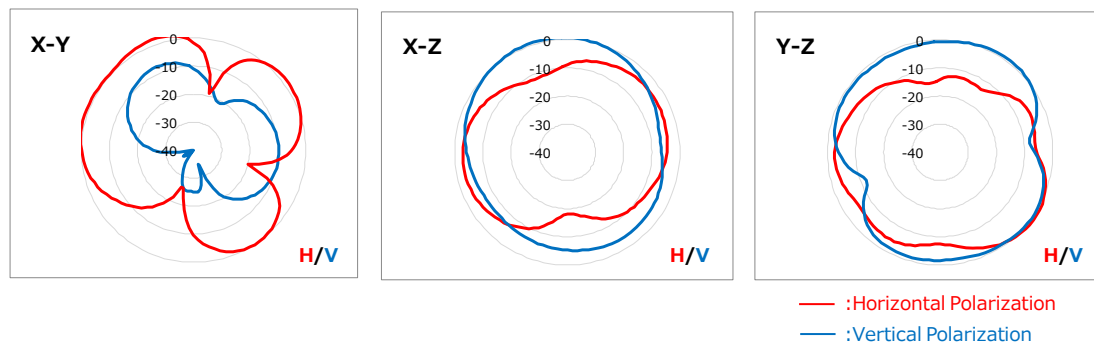
| Measured Frequency (MHz) | Plane | Polarization | Meter Reading (dBm) | Reference Value (dBm) | Reference Antenna Gain (dBi) | EUT Antenna Gain (dBi) |
|--------------------------|-------|--------------|---------------------|-----------------------|------------------------------|------------------------|
| 2402                     | XY    | Horizontal   | 9.21                | 9.97                  | 2.15                         | 1.39                   |
|                          |       | Vertical     | -2.48               | 10.65                 | 2.15                         | -10.98                 |
|                          | XZ    | Horizontal   | 4.56                | 9.97                  | 2.15                         | -3.27                  |
|                          |       | Vertical     | 8.56                | 10.65                 | 2.15                         | 0.06                   |
|                          | YZ    | Horizontal   | 9.83                | 9.97                  | 2.15                         | 2.01                   |
|                          |       | Vertical     | 8.64                | 10.65                 | 2.15                         | 0.14                   |

#### Test Results in Graph



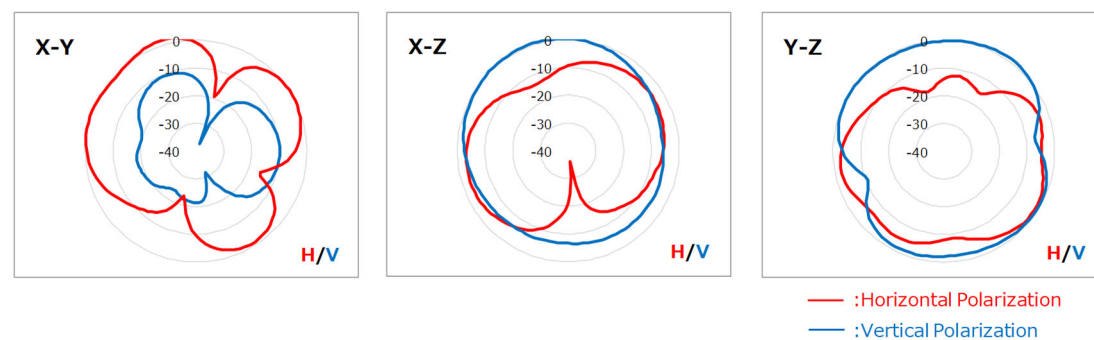
| Measured Frequency (MHz) | Plane | Polarization | Meter Reading (dBm) | Reference Value (dBm) | Reference Antenna Gain (dBi) | EUT Antenna Gain (dBi) |
|--------------------------|-------|--------------|---------------------|-----------------------|------------------------------|------------------------|
| 2442                     | XY    | Horizontal   | 10.05               | 10.05                 | 2.15                         | 2.15                   |
|                          |       | Vertical     | 0.82                | 10.45                 | 2.15                         | -7.48                  |
|                          | XZ    | Horizontal   | 5.13                | 10.05                 | 2.15                         | -2.77                  |
|                          |       | Vertical     | 9.25                | 10.45                 | 2.15                         | 0.95                   |
|                          | YZ    | Horizontal   | 8.94                | 10.05                 | 2.15                         | 1.04                   |
|                          |       | Vertical     | 9.24                | 10.45                 | 2.15                         | 0.94                   |

Test Results in Graph



| Measured Frequency (MHz) | Plane | Polarization | Meter Reading (dBm) | Reference Value (dBm) | Reference Antenna Gain (dBi) | EUT Antenna Gain (dBi) |
|--------------------------|-------|--------------|---------------------|-----------------------|------------------------------|------------------------|
| 2480                     | XY    | Horizontal   | 10.21               | 10.45                 | 2.15                         | 1.91                   |
|                          |       | Vertical     | -1.65               | 10.31                 | 2.15                         | -9.81                  |
|                          | XZ    | Horizontal   | 5.40                | 10.45                 | 2.15                         | -2.91                  |
|                          |       | Vertical     | 8.91                | 10.31                 | 2.15                         | 0.75                   |
|                          | YZ    | Horizontal   | 7.28                | 10.45                 | 2.15                         | -1.02                  |
|                          |       | Vertical     | 9.28                | 10.31                 | 2.15                         | 1.12                   |

Test Results in Graph



## [Note]

(1) The reference value is the maximum value of the reference antenna which is positioned at the same manner with the EUT.

## [Calculation Method]

EUT Antenna Gain (dBi)

= Meter Reading (maximum level of all directions) (dBm) – Reference value (dBm)  
+ Reference Antenna Gain (dBi)

For example: at 2478 MHz XY Plane Horizontal value,

EUT Antenna Gain (dBi) = (8.94) (dBm) – (9.29) (dBm) + (2.15) (dBi) = 1.80

Reference value: the results of the reference antenna measurement

Reference Antenna Gain: the characteristic value of the reference antenna

## 4.2. Photographs of Test System

Refer to a separate test setup photo.

## 5. TEST EQUIPMENT

| No. | Equipment                                  | Manufacturer        | Model No.                  | Calibration Date |
|-----|--------------------------------------------|---------------------|----------------------------|------------------|
| 1   | Signal Generator                           | Rohde&Schwarz       | SMB100B                    | Apr-26           |
| 2   | Spectrum Analyzer                          | Keysight Technology | N9020B                     | Dec-25           |
| 3   | RF Selector                                | Microwave Factory   | MRM-S78T                   | N/A              |
| 4   | RF Pre-Amplifier<br>(500 MHz ~ 8 GHz)      | R&K                 | LA1020-RS                  | Jun-26           |
| 5   | USB Coaxial Switch                         | Keysight Technology | U1810B                     | N/A              |
| 6   | Dipole Antenna                             | Anritsu             | MA5612 B4                  | 29-Aug-23        |
| 7   | Horn Antenna                               | Schwarzbeck         | BBHX 9120 LF               | Apr-26           |
| 8   | Personal Computer<br>(Control measurement) | HP                  | EliteTower 800 G9          | N/A              |
| 9   | Antenna Measurement Software               | Microwave Factory   | MATEOS.NET<br>Ver.:1.13.16 | N/A              |

Note: Shimano Inc. EMC Test Laboratory checked the performance, before using this device.

The overall program of calibration and verification of equipment is designed and operated so as to ensure that measurement made by Shimano Inc.

End of Report.