

# RADIO TEST REPORT

## Test Report No. 15116658S-A

|                     |                              |
|---------------------|------------------------------|
| Customer            | Nintendo Co., Ltd.           |
| Description of EUT  | Game controller              |
| Model Number of EUT | BEE-008                      |
| FCC ID              | BKEBEE008                    |
| Test Regulation     | FCC Part 15 Subpart C        |
| Test Result         | Complied                     |
| Issue Date          | October 29, 2024             |
| Remarks             | Bluetooth Low Energy part(s) |

**Representative Test Engineer**Yusuke Tanikawara  
Engineer**Approved By**Akio Hayashi  
Manager

CERTIFICATE 1266.03

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.
- ☒ There is no testing item of "Non-accreditation".

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 23.0

## **ANNOUNCEMENT**

- This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
- The results in this report apply only to the sample tested. (Laboratory was not involved in sampling.)
- This sample tested is in compliance with the limits of the above regulation.
- The test results in this test report are traceable to the national or international standards.
- This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
- This test report covers Radio technical requirements.  
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
- The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- The information provided by the customer for this report is identified in SECTION 1.
- The laboratory is not responsible for information provided by the customer which can impact the validity of the results.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

## **REVISION HISTORY**

### **Original Test Report No. 15116658S-A**

| Revision        | Test Report No. | Date             | Page Revised Contents |
|-----------------|-----------------|------------------|-----------------------|
| -<br>(Original) | 15116658S-A     | October 29, 2024 | -                     |

## Reference: Abbreviations (Including words undescribed in this report)

|                |                                                                 |         |                                                     |
|----------------|-----------------------------------------------------------------|---------|-----------------------------------------------------|
| A2LA           | The American Association for Laboratory Accreditation           | IEC     | International Electrotechnical Commission           |
| AC             | Alternating Current                                             | IEEE    | Institute of Electrical and Electronics Engineers   |
| AFH            | Adaptive Frequency Hopping                                      | IF      | Intermediate Frequency                              |
| AM             | Amplitude Modulation                                            | ILAC    | International Laboratory Accreditation Conference   |
| Amp, AMP       | Amplifier                                                       | ISED    | Innovation, Science and Economic Development Canada |
| ANSI           | American National Standards Institute                           | ISO     | International Organization for Standardization      |
| Ant, ANT       | Antenna                                                         | JAB     | Japan Accreditation Board                           |
| AP             | Access Point                                                    | LAN     | Local Area Network                                  |
| ASK            | Amplitude Shift Keying                                          | LIMS    | Laboratory Information Management System            |
| Atten., ATT    | Attenuator                                                      | MCS     | Modulation and Coding Scheme                        |
| AV             | Average                                                         | MRA     | Mutual Recognition Arrangement                      |
| BPSK           | Binary Phase-Shift Keying                                       | N/A     | Not Applicable                                      |
| BR             | Bluetooth Basic Rate                                            | NIST    | National Institute of Standards and Technology      |
| BT             | Bluetooth                                                       | NS      | No signal detect.                                   |
| BT LE          | Bluetooth Low Energy                                            | NSA     | Normalized Site Attenuation                         |
| BW             | BandWidth                                                       | NVLAP   | National Voluntary Laboratory Accreditation Program |
| Cal Int        | Calibration Interval                                            | OBW     | Occupied Band Width                                 |
| CCK            | Complementary Code Keying                                       | OFDM    | Orthogonal Frequency Division Multiplexing          |
| Ch., CH        | Channel                                                         | OFDMA   | Orthogonal Frequency Division Multiple Access       |
| CISPR          | Comite International Special des Perturbations Radioelectriques | P/M     | Power meter                                         |
| CW             | Continuous Wave                                                 | PCB     | Printed Circuit Board                               |
| DBPSK          | Differential BPSK                                               | PER     | Packet Error Rate                                   |
| DC             | Direct Current                                                  | PHY     | Physical Layer                                      |
| D-factor       | Distance factor                                                 | PK      | Peak                                                |
| DFS            | Dynamic Frequency Selection                                     | PN      | Pseudo random Noise                                 |
| DQPSK          | Differential QPSK                                               | PP      | Preamble Puncturing                                 |
| DSSS           | Direct Sequence Spread Spectrum                                 | PRBS    | Pseudo-Random Bit Sequence                          |
| EDR            | Enhanced Data Rate                                              | PSD     | Power Spectral Density                              |
| EIRP, e.i.r.p. | Equivalent Isotropically Radiated Power                         | QAM     | Quadrature Amplitude Modulation                     |
| EMC            | ElectroMagnetic Compatibility                                   | QP      | Quasi-Peak                                          |
| EMI            | ElectroMagnetic Interference                                    | QPSK    | Quadri-Phase Shift Keying                           |
| EN             | European Norm                                                   | RBW     | Resolution Band Width                               |
| ERP, e.r.p.    | Effective Radiated Power                                        | RDS     | Radio Data System                                   |
| EU             | European Union                                                  | RE      | Radio Equipment                                     |
| EUT            | Equipment Under Test                                            | RF      | Radio Frequency                                     |
| Fac.           | Factor                                                          | RMS     | Root Mean Square                                    |
| FCC            | Federal Communications Commission                               | RSS     | Radio Standards Specifications                      |
| FHSS           | Frequency Hopping Spread Spectrum                               | Rx      | Receiving                                           |
| FM             | Frequency Modulation                                            | SA, S/A | Spectrum Analyzer                                   |
| Freq.          | Frequency                                                       | SG      | Signal Generator                                    |
| FSK            | Frequency Shift Keying                                          | SVSWR   | Site-Voltage Standing Wave Ratio                    |
| GFSK           | Gaussian Frequency-Shift Keying                                 | TR      | Test Receiver                                       |
| GNSS           | Global Navigation Satellite System                              | Tx      | Transmitting                                        |
| GPS            | Global Positioning System                                       | VBW     | Video BandWidth                                     |
| Hori.          | Horizontal                                                      | Vert.   | Vertical                                            |
| ICES           | Interference-Causing Equipment Standard                         | WLAN    | Wireless LAN                                        |

---

| <b>CONTENTS</b>                                                      | <b>PAGE</b> |
|----------------------------------------------------------------------|-------------|
| <b>SECTION 1: Customer Information .....</b>                         | <b>5</b>    |
| <b>SECTION 2: Equipment Under Test (EUT).....</b>                    | <b>5</b>    |
| <b>SECTION 3: Test Specification, Procedures &amp; Results .....</b> | <b>6</b>    |
| <b>SECTION 4: Operation of EUT during testing .....</b>              | <b>9</b>    |
| <b>SECTION 5: Conducted Emission.....</b>                            | <b>11</b>   |
| <b>SECTION 6: Radiated Spurious Emission.....</b>                    | <b>12</b>   |
| <b>SECTION 7: Antenna Terminal Conducted Tests .....</b>             | <b>14</b>   |
| <b>APPENDIX 1: Test Data .....</b>                                   | <b>15</b>   |
| Conducted Emission .....                                             | 15          |
| 99 % Occupied Bandwidth and 6 dB Bandwidth.....                      | 16          |
| Maximum Peak Output Power .....                                      | 19          |
| Radiated Spurious Emission.....                                      | 21          |
| Conducted Spurious Emission.....                                     | 32          |
| Power Density .....                                                  | 33          |
| <b>APPENDIX 2: Test Instruments .....</b>                            | <b>35</b>   |
| <b>APPENDIX 3: Photographs of Test Setup .....</b>                   | <b>36</b>   |
| Conducted Emission .....                                             | 36          |
| Radiated Spurious Emission.....                                      | 37          |
| Pre-Check of Worst Case Position .....                               | 38          |
| Antenna Terminal Conducted Tests .....                               | 39          |

## SECTION 1: Customer Information

|                  |                                                               |
|------------------|---------------------------------------------------------------|
| Company Name     | Nintendo Co., Ltd.                                            |
| Address          | 11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan |
| Telephone Number | +81-75-662-9600                                               |
| Contact Person   | Yosuke Ishikawa                                               |

The information provided by the customer is as follows;

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

## SECTION 2: Equipment Under Test (EUT)

### 2.1 Identification of EUT

|               |                                                                                            |
|---------------|--------------------------------------------------------------------------------------------|
| Description   | Game controller                                                                            |
| Model Number  | BEE-008                                                                                    |
| Serial Number | Refer to SECTION 4.2                                                                       |
| Condition     | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | No Modification by the test lab                                                            |
| Receipt Date  | May 21, 2024                                                                               |
| Test Date     | June 24 to October 4, 2024                                                                 |

### 2.2 Product Description

#### General Specification

|                       |                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------|
| Rating                | DC 5 V (*.Supply voltage from connector) (*. DC 3.87 V from Re-chargeable Li-ion battery for the internal circuit) |
| Operating temperature | 5 deg. C to 35 deg. C                                                                                              |

#### Radio Specification

This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer. The data provided by the customer is marked "a)" in the table below.

#### Bluetooth (Low Energy)

|                            |                      |
|----------------------------|----------------------|
| Equipment Type             | Transceiver          |
| Frequency of Operation     | 2402 MHz to 2480 MHz |
| Type of Modulation         | GFSK                 |
| Antenna Gain <sup>a)</sup> | 3.24 dBi             |

#### Bluetooth (BR/BDR)

|                            |                                    |
|----------------------------|------------------------------------|
| Equipment Type             | Transceiver                        |
| Frequency of Operation     | 2402 MHz to 2480 MHz               |
| Type of Modulation         | FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK) |
| Antenna Gain <sup>a)</sup> | 3.24 dBi                           |

#### RFID

|                        |             |
|------------------------|-------------|
| Equipment Type         | Transceiver |
| Frequency of Operation | 13.56 MHz   |
| Type of Modulation     | ASK         |

## SECTION 3: Test Specification, Procedures & Results

### 3.1 Test Specification

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Specification | FCC Part 15 Subpart C<br>The latest version on the first day of the testing period                                                                                                                           |
| Title              | FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.207 Conducted limits<br>Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,<br>and 5725-5850 MHz |

\* Also the EUT complies with FCC Part 15 Subpart B.

### 3.2 Procedures and Results

| Item                                                                                                                                                                                                                                                                                                                                                     | Test Procedure                                                              | Specification                                                              | Worst Margin                                                                  | Results  | Remarks                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------|-------------------------------------------------------------|
| Conducted Emission                                                                                                                                                                                                                                                                                                                                       | FCC: ANSI C63.10-2013<br>6. Standard test methods<br>ISED: RSS-Gen 8.8      | FCC: Section 15.207<br>ISED: RSS-Gen 8.8                                   | 27.8 dB<br>0.15225 MHz, N, QP                                                 | Complied | -                                                           |
| 6 dB Bandwidth                                                                                                                                                                                                                                                                                                                                           | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(2)<br>ISED: RSS-247 5.2(a)                          | See data.                                                                     | Complied | Conducted                                                   |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.12 | FCC: Section 15.247(b)(3)<br>ISED: RSS-247 5.4(d)                          |                                                                               | Complied | Conducted                                                   |
| Power Density                                                                                                                                                                                                                                                                                                                                            | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(e)<br>ISED: RSS-247 5.2(b)                             |                                                                               | Complied | Conducted                                                   |
| Spurious Emission Restricted Band Edges                                                                                                                                                                                                                                                                                                                  | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.13 | FCC: Section 15.247(d)<br>ISED: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 7.7 dB<br>2483.500 MHz,<br>AV, Vertical,<br>Mode: Tx BT LE<br>2M-PHY 2480 MHz | Complied | Conducted (below 30 MHz)/<br>Radiated (above 30 MHz)<br>*1) |
| <p>Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.<br/>* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.</p> <p>*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.</p> |                                                                             |                                                                            |                                                                               |          |                                                             |

#### **FCC Part 15.31 (e)**

This EUT provides the stable voltage constantly to RF Module regardless of input voltage.  
Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.  
Therefore, the equipment complies with the antenna requirement of Section 15.203.

### 3.3 Addition to Standard

| Item                    | Test Procedure    | Specification | Worst Margin | Results | Remarks   |
|-------------------------|-------------------|---------------|--------------|---------|-----------|
| 99 % Occupied Bandwidth | ISED: RSS-Gen 6.7 | ISED: -       | N/A          | -       | Conducted |

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.  
Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k = 2$ .

| Item                                             | Frequency range   | Uncertainty (+/-) |
|--------------------------------------------------|-------------------|-------------------|
| Conducted Emission (AC Mains) LISN               | 150 kHz to 30 MHz | 3.2 dB            |
| Radiated Emission<br>(Measurement distance: 3 m) | 9 kHz to 30 MHz   | 3.3 dB            |
|                                                  | 30 MHz to 200 MHz | 4.9 dB            |
|                                                  | 200 MHz to 1 GHz  | 6.2 dB            |
|                                                  | 1 GHz to 6 GHz    | 4.7 dB            |
|                                                  | 6 GHz to 18 GHz   | 5.3 dB            |
|                                                  | 18 GHz to 40 GHz  | 5.5 dB            |
| Radiated Emission<br>(Measurement distance: 1 m) | 1 GHz to 18 GHz   | 5.6 dB            |
|                                                  | 18 GHz to 40 GHz  | 5.8 dB            |

| Antenna terminal test                                         | Uncertainty (+/-) |
|---------------------------------------------------------------|-------------------|
| Power Measurement above 1 GHz (Average Detector)              | 1.3 dB            |
| Power Measurement above 1 GHz (Peak Detector)                 | 1.8 dB            |
| Spurious Emission (Conducted) below 1 GHz                     | 0.91 dB           |
| Conducted Emissions Power Density Measurement 1 GHz to 3 GHz  | 1.3 dB            |
| Conducted Emissions Power Density Measurement 3 GHz to 18 GHz | 2.5 dB            |
| Spurious Emission (Conducted) 18 GHz to 26.5 GHz              | 2.8 dB            |
| Spurious Emission (Conducted) 26.5 GHz to 40 GHz              | 2.6 dB            |
| Bandwidth Measurement                                         | 0.012 %           |
| Duty Cycle and Time Measurement                               | 0.27 %            |
| Temperature                                                   | 2.2 deg.C.        |
| Humidity                                                      | 4.0 %             |
| Voltage                                                       | 0.74 %            |

### 3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan

Telephone: +81-463-50-6400

A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

| Test room                          | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|------------------------------------|----------------------------|------------------------------------------------------------------|------------------------------|
| No.1 Semi-anechoic chamber (SAC1)  | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.2 Semi-anechoic chamber (SAC2)  | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.3 Semi-anechoic chamber (SAC3)  | 12.7 x 7.7 x 5.35          | 12.7 x 7.7                                                       | 5 m                          |
| No.4 Semi-anechoic chamber (SAC4)  | 8.1 x 5.1 x 3.55           | 8.1 x 5.1                                                        | -                            |
| Wireless anechoic chamber 1 (WAC1) | 9.5 x 6.0 x 5.4            | 9.5 x 6.0                                                        | 3 m                          |
| Wireless anechoic chamber 2 (WAC2) | 9.5 x 6.0 x 5.4            | 9.5 x 6.0                                                        | 3 m                          |
| No.1 Shielded room                 | 6.8 x 4.1 x 2.7            | 6.8 x 4.1                                                        | -                            |
| No.2 Shielded room                 | 6.8 x 4.1 x 2.7            | 6.8 x 4.1                                                        | -                            |
| No.3 Shielded room                 | 6.3 x 4.7 x 2.7            | 6.3 x 4.7                                                        | -                            |
| No.4 Shielded room                 | 4.4 x 4.7 x 2.7            | 4.4 x 4.7                                                        | -                            |
| No.5 Shielded room                 | 7.8 x 6.4 x 2.7            | 7.8 x 6.4                                                        | -                            |
| No.6 Shielded room                 | 7.8 x 6.4 x 2.7            | 7.8 x 6.4                                                        | -                            |
| No.8 Shielded room                 | 3.45 x 5.5 x 2.4           | 3.45 x 5.5                                                       | -                            |
| No.1 Measurement room              | 2.55 x 4.1 x 2.5           | -                                                                | -                            |
| No.2 Measurement room              | 4.5 x 3.5 x 2.5            | -                                                                | -                            |
| Wireless shielded room 1           | 3.0 x 4.5 x 2.7            | 3.0 x 4.5                                                        | -                            |
| Wireless shielded room 2           | 3.0 x 4.5 x 2.7            | 3.0 x 4.5                                                        | -                            |

### 3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

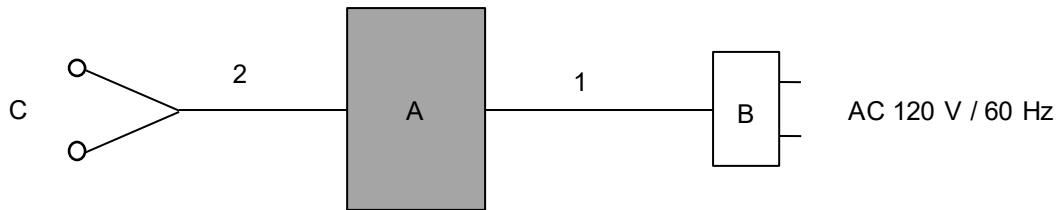
| Mode                                                                                                                                                                                                                                                                                                                                                                                                                        | Remarks*                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Bluetooth Low Energy (BT LE)                                                                                                                                                                                                                                                                                                                                                                                                | 1M-PHY Uncoded PHY (1M-PHY), Maximum Packet Size, PRBS9 |
| Bluetooth Low Energy (BT LE)                                                                                                                                                                                                                                                                                                                                                                                                | 2M-PHY Uncoded PHY (2M-PHY), Maximum Packet Size, PRBS9 |
| <p>*Power of the EUT was set by the software as follows;<br/>Power Setting: Fixed<br/>Software: InspectionFwPackage Version: V0.15.0<br/>(Date: 2024.05 21, Storage location: EUT memory)</p> <p>*This setting of software is the worst case.<br/>Any conditions under the normal use do not exceed the condition of setting.<br/>In addition, end users cannot change the settings of the output power of the product.</p> |                                                         |

\*The Details of Operating Mode(s)

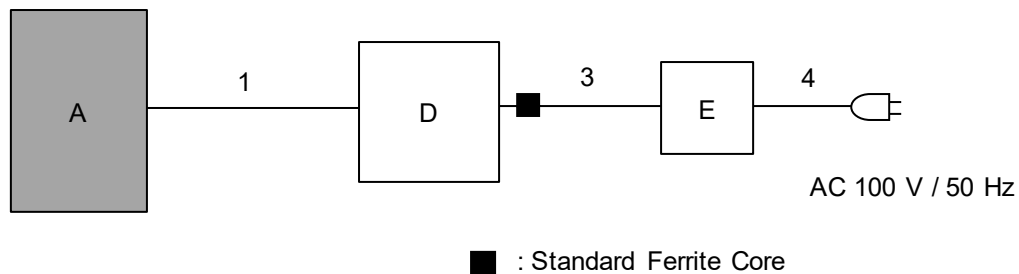
| Test Item                                                                                                                                                                                                                                                                                                                                           | Operating Mode                       | Tested Frequency                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------------------|
| Conducted Emission,<br>Radiated Spurious Emission (Below 1 GHz),<br>Conducted Spurious Emission                                                                                                                                                                                                                                                     | Tx BT LE, 1M-PHY *1)                 | 2402 MHz                         |
| Radiated Spurious Emission (Above 1 GHz),<br>Maximum Peak Output Power,<br>Power Density,<br>6 dB Bandwidth,<br>99 % Occupied Bandwidth                                                                                                                                                                                                             | Tx BT LE, 1M-PHY<br>Tx BT LE, 2M-PHY | 2402 MHz<br>2440 MHz<br>2480 MHz |
| <p>*1) Conducted emissions, Spurious emissions for frequencies below 1 GHz and Conducted Spurious Emission were limited to the channel that had the highest power during the antenna terminal test, as preliminary testing indicated that changing the operating frequency had no significant impact on the emissions in those frequency bands.</p> |                                      |                                  |

## 4.2 Configuration and Peripherals

[For Radiated Emission test and Conducted Emission test]



[For Antenna Terminal test]



\* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

\*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

### Description of EUT and Support Equipment

| No. | Item            | Model number  | Serial Number                            | Manufacturer       | Remarks |
|-----|-----------------|---------------|------------------------------------------|--------------------|---------|
| A   | Game controller | BEE-008       | HEL01000022214 *1)<br>HEL01000002285 *2) | Nintendo Co., Ltd. | -       |
| B   | AC Adapter      | NGN-01        | 0A0000030                                | Nintendo Co., Ltd. | -       |
| C   | Earphones       | MDR-EX255AP   | -                                        | Sony               | -       |
| D   | Laptop PC       | CF-SZ6RDYVS   | 8KKSC50259                               | Panasonic          | -       |
| E   | AC Adaptor      | CF-AA64L2C M1 | 64L2CM118906341A                         | Panasonic          | -       |

\*1) Used for Conducted Emission test and Radiated Emission test

\*2) Used for Antenna Terminal conducted test

### List of Cables Used

| No. | Name      | Length (m) | Shield     |            | Remarks |
|-----|-----------|------------|------------|------------|---------|
|     |           |            | Cable      | Connector  |         |
| 1   | USB       | 1.5        | Shielded   | Shielded   | -       |
| 2   | Earphones | 1.25       | Unshielded | Unshielded | -       |
| 3   | DC        | 1.0        | Unshielded | Unshielded | -       |
| 4   | AC        | 0.8        | Unshielded | Unshielded | -       |

## **SECTION 5: Conducted Emission**

### **Test Procedure and Conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN).

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Shielded Room.

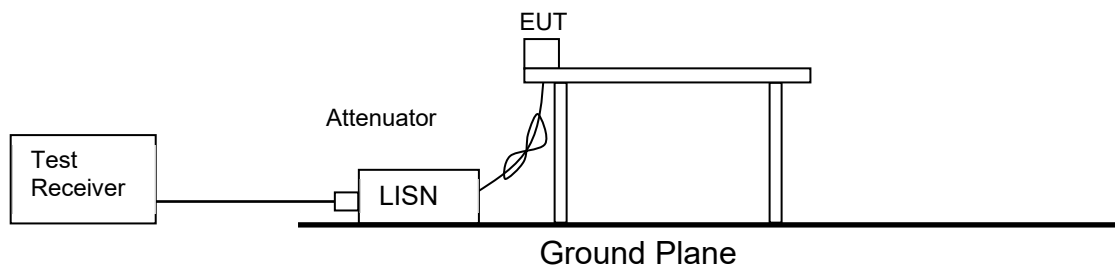
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

Test results are rounded off and limit are rounded down, so some differences might be observed.

|                          |                             |
|--------------------------|-----------------------------|
| <b>Detector</b>          | <b>: QP and CISPR AV</b>    |
| <b>Measurement Range</b> | <b>: 0.15 MHz to 30 MHz</b> |
| <b>Test Data</b>         | <b>: APPENDIX</b>           |
| <b>Test Result</b>       | <b>: Pass</b>               |

**Figure 1: Test Setup**



## SECTION 6: Radiated Spurious Emission

### Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### Test Antennas are used as below;

|              |                   |                  |             |
|--------------|-------------------|------------------|-------------|
| Frequency    | 30 MHz to 200 MHz | 200 MHz to 1 GHz | Above 1 GHz |
| Antenna Type | Biconical         | Logperiodic      | Horn        |

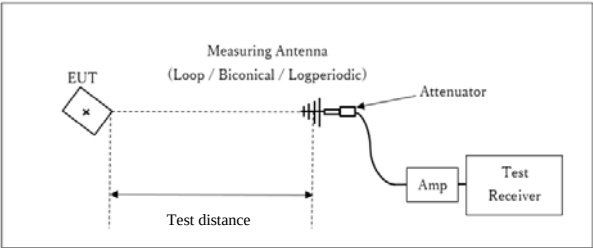
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

**20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).**

|                 |               |                          |                                                                                                                                                        |                              |
|-----------------|---------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz              |                                                                                                                                                        | 20 dBc                       |
| Instrument Used | Test Receiver | Spectrum Analyzer        |                                                                                                                                                        | Spectrum Analyzer            |
| Detector        | QP            | PK                       | AV                                                                                                                                                     | PK                           |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz | 11.12.2.5.2<br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (Linear voltage)<br>Trace: 100 traces<br>Duty factor was added to the results. | RBW: 100 kHz<br>VBW: 300 kHz |

Figure 2: Test Setup

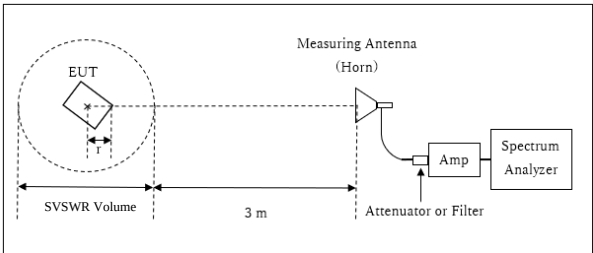
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

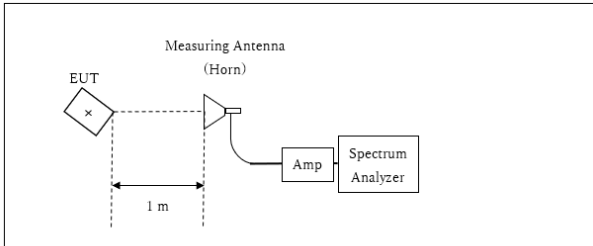


r : Radius of an outer periphery of EUT  
x : Center of turn table

Distance Factor:  $20 \times \log (3.925 \text{ m} / 3.0 \text{ m}) = 2.34 \text{ dB}$   
\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.93 \text{ m}$

SVSWR Volume : 2.0 m  
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)  
 $r = 0.075 \text{ m}$

10 GHz to 26.5 GHz



x : Center of turn table

Distance Factor:  $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$   
\*Test Distance: 1 m

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

|            | Carrier | Spurious<br>(30 MHz - 1 GHz) | Spurious<br>(1 GHz - 2.8 GHz) | Spurious<br>(2.8 GHz - 10 GHz) | Spurious<br>(Above 10 GHz) |
|------------|---------|------------------------------|-------------------------------|--------------------------------|----------------------------|
| Horizontal | X       | X                            | X                             | X                              | X                          |
| Vertical   | Y       | X                            | Y                             | Z                              | X                          |

Test results are rounded off and limit are rounded down, so some differences might be observed.

Measurement Range : 30 MHz to 26.5 GHz  
Test Data : APPENDIX  
Test Result : Pass

## SECTION 7: Antenna Terminal Conducted Tests

### Test Procedure

The tests were made with below setting connected to the antenna port.

| Test                                | Span                                    | RBW              | VBW                | Sweep time | Detector | Trace    | Instrument Used                  |
|-------------------------------------|-----------------------------------------|------------------|--------------------|------------|----------|----------|----------------------------------|
| 6 dB Bandwidth                      | Enough width to display emission skirts | 100 kHz          | 300 kHz            | Auto       | Peak     | Max Hold | Spectrum Analyzer                |
| 99 % Occupied Bandwidth *1)         | Enough width to display emission skirts | 1 to 5 % of OBW  | Three times of RBW | Auto       | Peak     | Max Hold | Spectrum Analyzer                |
| Maximum Peak Output Power           | -                                       | -                | -                  | Auto       | Peak     | -        | Power Meter (Sensor: 160 MHz BW) |
| Peak Power Density                  | 1.5 times the 6 dB Bandwidth            | 3 kHz            | 9.1 kHz            | Auto       | Peak     | Max Hold | Spectrum Analyzer *2)            |
| Conducted Spurious Emission *3) *4) | 9 kHz to 150 kHz<br>150 kHz to 30 MHz   | 200 Hz<br>10 kHz | 620 Hz<br>30 kHz   | Auto       | Peak     | Max Hold | Spectrum Analyzer                |

\*1) Peak hold was applied as Worst-case measurement.  
 \*2) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".  
 \*3) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.  
 Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.  
 (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)  
 \*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to  $45.5 - 51.5 = -6.0$  dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

Test results are rounded off and limit are rounded down, so some differences might be observed.  
 The equipment and cables were not used for factor 0 dB of the data sheets.

Test Data : APPENDIX  
 Test Result : Pass

APPENDIX 1: Test Data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

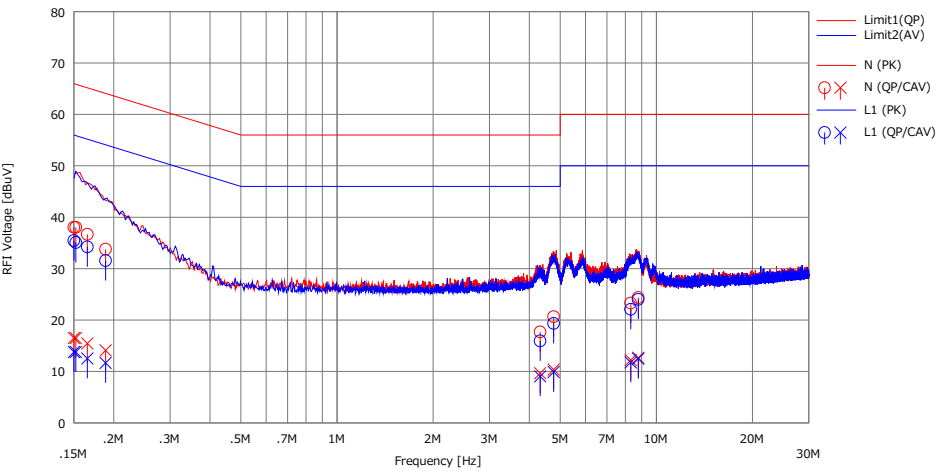
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2024/08/18

Mode : Tx, BT LE 1M-PHY, 2402 MHz  
Power : AC 120 V / 60 Hz (AC adapter)  
Temp./Humi. : 25 deg.C / 59 %RH

Remarks : -

Limit : FCC\_Part 15 Subpart C(15.207)

Engineer : Masahide Ozaki



| No. | Freq.<br>[MHz] | Reading        |                 | C.Fac<br>[dB] | Results        |                 | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|-----------------|---------------|----------------|-----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | (QP)<br>[dBuV] | (CAV)<br>[dBuV] |               | (QP)<br>[dBuV] | (CAV)<br>[dBuV] | (QP)<br>[dBuV] | (AV)<br>[dBuV] | (QP)<br>[dB] | (AV)<br>[dB] |       |         |
| 1   | 0.15000        | 25.49          | 3.97            | 12.55         | 38.04          | 16.52           | 66.00          | 56.00          | 27.9         | 39.4         | N     |         |
| 2   | 0.15225        | 25.48          | 3.94            | 12.55         | 38.03          | 16.49           | 65.88          | 55.88          | 27.8         | 39.3         | N     |         |
| 3   | 0.16536        | 24.11          | 2.88            | 12.57         | 36.68          | 15.45           | 65.19          | 55.19          | 28.5         | 39.7         | N     |         |
| 4   | 0.18850        | 21.20          | 1.53            | 12.57         | 33.77          | 14.10           | 64.10          | 54.10          | 30.3         | 40.0         | N     |         |
| 5   | 4.32779        | 4.69           | -3.36           | 13.00         | 17.69          | 9.64            | 56.00          | 46.00          | 38.3         | 36.3         | N     |         |
| 6   | 4.77138        | 7.60           | -2.69           | 13.06         | 20.66          | 10.37           | 56.00          | 46.00          | 35.3         | 35.6         | N     |         |
| 7   | 8.31358        | 9.90           | -1.17           | 13.41         | 23.31          | 12.24           | 60.00          | 50.00          | 36.6         | 37.7         | N     |         |
| 8   | 8.77955        | 10.92          | -0.78           | 13.45         | 24.37          | 12.67           | 60.00          | 50.00          | 35.6         | 37.3         | N     |         |
| 9   | 0.15000        | 22.88          | 1.22            | 12.57         | 35.45          | 13.79           | 66.00          | 56.00          | 30.5         | 42.2         | L1    |         |
| 10  | 0.15225        | 22.51          | 1.22            | 12.57         | 35.08          | 13.79           | 65.88          | 55.88          | 30.8         | 42.0         | L1    |         |
| 11  | 0.16536        | 21.66          | -0.04           | 12.57         | 34.23          | 12.53           | 65.19          | 55.19          | 30.9         | 42.6         | L1    |         |
| 12  | 0.18850        | 18.98          | -0.93           | 12.58         | 31.56          | 11.65           | 64.10          | 54.10          | 32.5         | 42.4         | L1    |         |
| 13  | 4.32779        | 2.97           | -3.92           | 12.97         | 15.94          | 9.06            | 56.00          | 46.00          | 40.0         | 36.9         | L1    |         |
| 14  | 4.77138        | 6.31           | -3.13           | 13.02         | 19.33          | 9.89            | 56.00          | 46.00          | 36.6         | 36.1         | L1    |         |
| 15  | 8.31358        | 8.80           | -1.51           | 13.29         | 22.09          | 11.78           | 60.00          | 50.00          | 37.9         | 38.2         | L1    |         |
| 16  | 8.77955        | 10.69          | -0.84           | 13.32         | 24.01          | 12.48           | 60.00          | 50.00          | 35.9         | 37.5         | L1    |         |

Calculation: Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]  
LISN(AMN):145539

### **99 % Occupied Bandwidth and 6 dB Bandwidth**

Test place                      Shonan EMC Lab. No.1 Measurement Room  
Date                              June 24, 2024  
Temperature / Humidity      24 deg. C / 52 % RH  
Engineer                        Kazuya Noda  
Mode                              Tx BT LE

#### **BT LE 1M-PHY**

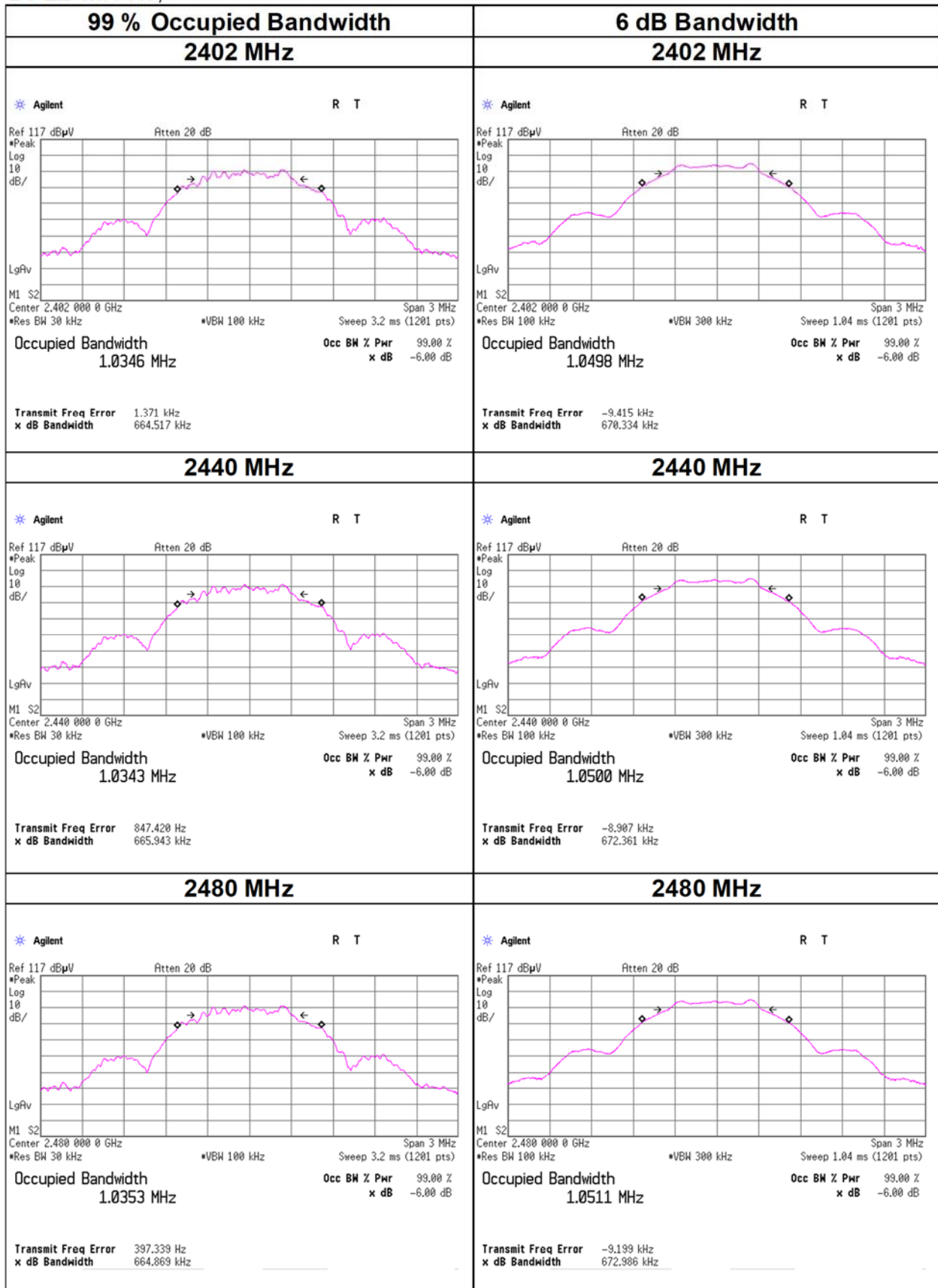
| Frequency<br>[MHz] | 99 % Occupied<br>Bandwidth<br>[kHz] | 6 dB Bandwidth<br>[MHz] | Limit for<br>6 dB Bandwidth<br>[MHz] |
|--------------------|-------------------------------------|-------------------------|--------------------------------------|
| 2402               | 1034.6                              | 0.670                   | > 0.5000                             |
| 2440               | 1034.3                              | 0.672                   | > 0.5000                             |
| 2480               | 1035.3                              | 0.673                   | > 0.5000                             |

#### **BT LE 2M-PHY**

| Frequency<br>[MHz] | 99 % Occupied<br>Bandwidth<br>[kHz] | 6 dB Bandwidth<br>[MHz] | Limit for<br>6 dB Bandwidth<br>[MHz] |
|--------------------|-------------------------------------|-------------------------|--------------------------------------|
| 2402               | 2060.5                              | 1.196                   | > 0.5000                             |
| 2440               | 2060.5                              | 1.199                   | > 0.5000                             |
| 2480               | 2060.7                              | 1.198                   | > 0.5000                             |

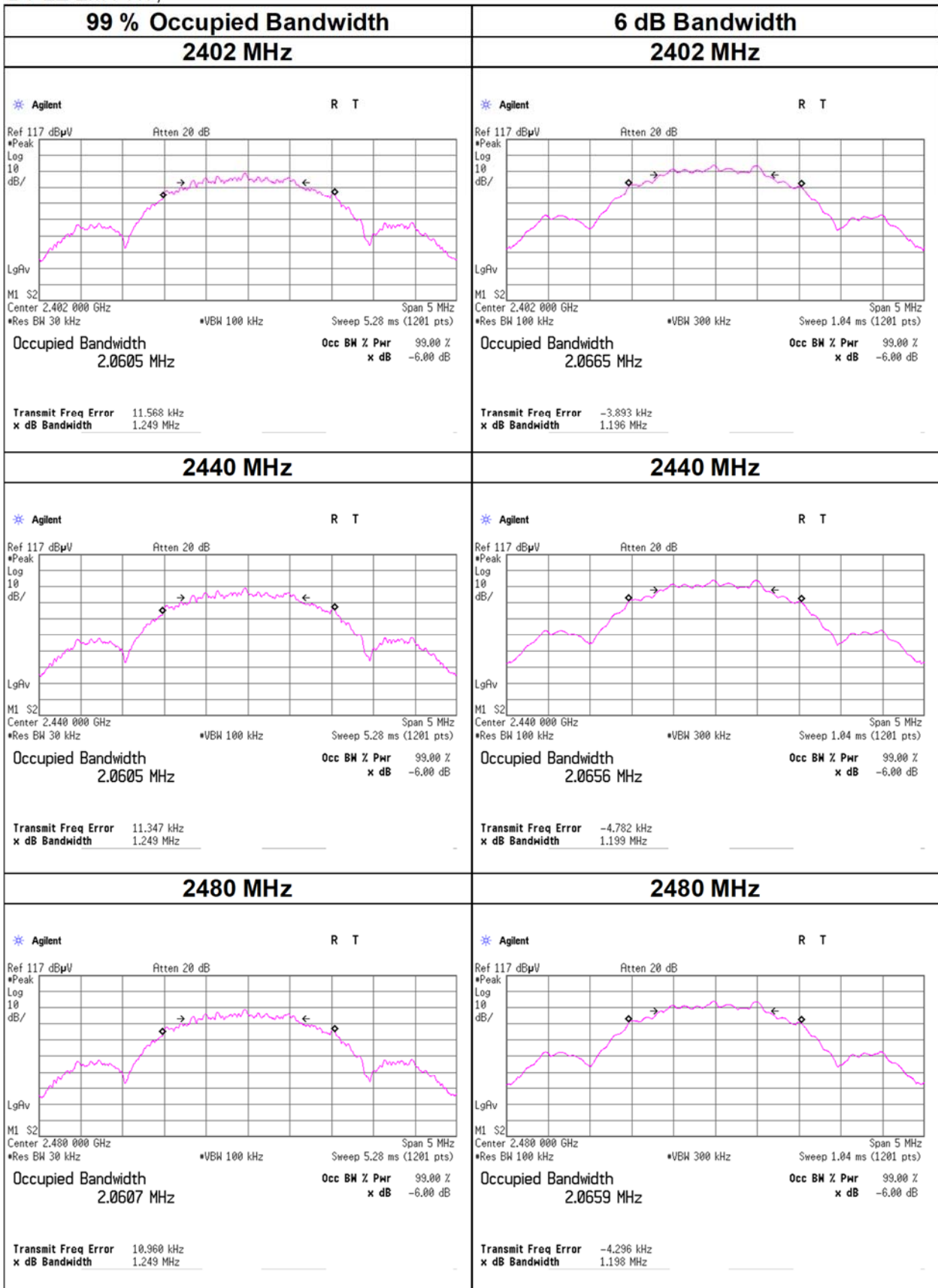
## 99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE 1M-PHY,



## 99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE 2M-PHY,



## Maximum Peak Output Power

Test place Shonan EMC Lab. No.1 Measurement Room  
Date June 24, 2024  
Temperature / Humidity 24 deg. C / 52 % RH  
Engineer Kazuya Noda  
Mode Tx BT LE

### BT LE 1M-PHY

#### Maximum peak output power

|       |         |            |             | Conducted Power |      |       |      |        | e.i.r.p. for RSS-247 |        |      |       |      |        |
|-------|---------|------------|-------------|-----------------|------|-------|------|--------|----------------------|--------|------|-------|------|--------|
| Freq. | Reading | Cable Loss | Atten. Loss | Result          |      | Limit |      | Margin | Antenna Gain         | Result |      | Limit |      | Margin |
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW] | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW] | [dBm] | [mW] | [dB]   |
| 2402  | -4.84   | 1.62       | 9.94        | 6.72            | 4.70 | 30.00 | 1000 | 23.28  | 3.24                 | 9.96   | 9.91 | 36.02 | 4000 | 26.06  |
| 2440  | -4.95   | 1.63       | 9.94        | 6.62            | 4.59 | 30.00 | 1000 | 23.38  | 3.24                 | 9.86   | 9.68 | 36.02 | 4000 | 26.16  |
| 2480  | -5.01   | 1.63       | 9.94        | 6.56            | 4.53 | 30.00 | 1000 | 23.44  | 3.24                 | 9.80   | 9.55 | 36.02 | 4000 | 26.22  |

### BT LE 2M-PHY

#### Maximum peak output power

|       |         |            |             | Conducted Power |      |       |      |        | e.i.r.p. for RSS-247 |        |      |       |      |        |
|-------|---------|------------|-------------|-----------------|------|-------|------|--------|----------------------|--------|------|-------|------|--------|
| Freq. | Reading | Cable Loss | Atten. Loss | Result          |      | Limit |      | Margin | Antenna Gain         | Result |      | Limit |      | Margin |
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW] | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW] | [dBm] | [mW] | [dB]   |
| 2402  | -4.86   | 1.62       | 9.94        | 6.70            | 4.68 | 30.00 | 1000 | 23.30  | 3.24                 | 9.94   | 9.86 | 36.02 | 4000 | 26.08  |
| 2440  | -4.95   | 1.63       | 9.94        | 6.62            | 4.59 | 30.00 | 1000 | 23.38  | 3.24                 | 9.86   | 9.68 | 36.02 | 4000 | 26.16  |
| 2480  | -5.01   | 1.63       | 9.94        | 6.56            | 4.53 | 30.00 | 1000 | 23.44  | 3.24                 | 9.80   | 9.55 | 36.02 | 4000 | 26.22  |

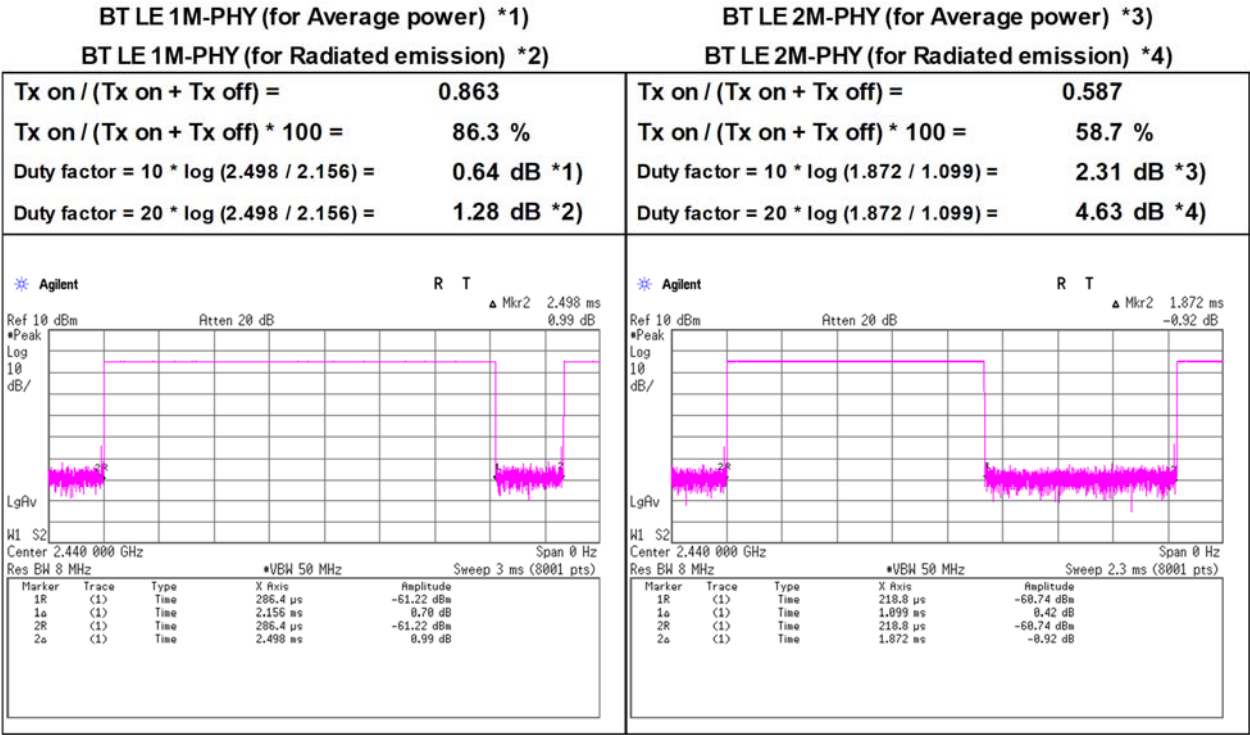
Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

**Burst rate confirmation**

|                        |                                       |
|------------------------|---------------------------------------|
| Test place             | Shonan EMC Lab. No.1 Measurement Room |
| Date                   | June 24, 2024                         |
| Temperature / Humidity | 24 deg. C / 52 % RH                   |
| Engineer               | Kazuya Noda                           |
| Mode                   | Tx BT LE                              |



\* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

## Radiated Spurious Emission

|                        |                          |                     |                      |
|------------------------|--------------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.          |                     |                      |
| Semi Anechoic Chamber  | WAC2                     | WAC2                | WAC2                 |
| Date                   | October 4, 2024          | August 13, 2024     | October 2, 2024      |
| Temperature / Humidity | 22 deg. C / 54 % RH      | 25 deg. C / 48 % RH | 24 deg. C / 55 % RH  |
| Engineer               | Yusuke Tanikawara        | Makoto Hosaka       | Yusuke Tanikawara    |
|                        | (30 MHz to 1 GHz)        | (1 GHz to 10 GHz)   | (10 GHz to 26.5 GHz) |
| Mode                   | Tx BT LE 1M-PHY 2402 MHz |                     |                      |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 194.013         | QP       | 39.40          | 14.22           | 7.19      | 33.07     | 0.00                 | 27.74           | 43.5           | 15.7        | 170         | 264         | -           |
| Hori.    | 197.199         | QP       | 38.40          | 14.36           | 7.16      | 33.07     | 0.00                 | 26.85           | 43.5           | 16.6        | 169         | 273         | -           |
| Hori.    | 200.603         | QP       | 37.40          | 11.53           | 7.23      | 33.06     | 0.00                 | 23.10           | 43.5           | 20.4        | 166         | 276         | -           |
| Hori.    | 2390.000        | PK       | 48.15          | 27.75           | -28.27    | -         | 2.34                 | 49.97           | 73.9           | 23.9        | 115         | 173         | -           |
| Hori.    | 4804.000        | PK       | 51.09          | 31.56           | -36.04    | -         | 2.34                 | 48.95           | 73.9           | 24.9        | 361         | 267         | -           |
| Hori.    | 7206.000        | PK       | 46.56          | 36.21           | -34.48    | -         | 2.34                 | 50.63           | 73.9           | 23.2        | 150         | 0           | -           |
| Hori.    | 9608.000        | PK       | 45.87          | 38.14           | -31.55    | -         | 2.34                 | 54.80           | 73.9           | 19.1        | 150         | 0           | -           |
| Hori.    | 7206.000        | AV       | 35.17          | 36.21           | -34.48    | -         | 2.34                 | 39.24           | 53.9           | 14.6        | 150         | 0           | Floor noise |
| Hori.    | 9608.000        | AV       | 34.12          | 38.14           | -31.55    | -         | 2.34                 | 43.05           | 53.9           | 10.8        | 150         | 0           | Floor noise |
| Vert.    | 33.376          | QP       | 34.30          | 12.83           | 6.29      | 32.76     | 0.00                 | 20.66           | 40.0           | 19.3        | 100         | 342         | -           |
| Vert.    | 34.891          | QP       | 36.40          | 12.47           | 6.31      | 32.80     | 0.00                 | 22.38           | 40.0           | 17.6        | 100         | 354         | -           |
| Vert.    | 197.538         | QP       | 35.20          | 14.38           | 7.15      | 33.06     | 0.00                 | 23.67           | 43.5           | 19.8        | 100         | 196         | -           |
| Vert.    | 200.493         | QP       | 37.20          | 11.53           | 7.23      | 33.06     | 0.00                 | 22.90           | 43.5           | 20.6        | 100         | 181         | -           |
| Vert.    | 367.821         | QP       | 37.40          | 15.15           | 7.74      | 32.62     | 0.00                 | 27.67           | 46.0           | 18.3        | 100         | 174         | -           |
| Vert.    | 378.715         | QP       | 37.20          | 15.24           | 7.77      | 32.58     | 0.00                 | 27.63           | 46.0           | 18.3        | 100         | 158         | -           |
| Vert.    | 491.716         | QP       | 32.60          | 17.72           | 8.06      | 32.28     | 0.00                 | 26.10           | 46.0           | 19.9        | 100         | 161         | -           |
| Vert.    | 2390.000        | PK       | 47.94          | 27.75           | -28.27    | -         | 2.34                 | 49.76           | 73.9           | 24.1        | 154         | 129         | -           |
| Vert.    | 4804.000        | PK       | 51.47          | 31.56           | -36.04    | -         | 2.34                 | 49.33           | 73.9           | 24.5        | 105         | 294         | -           |
| Vert.    | 7206.000        | PK       | 46.79          | 36.21           | -34.48    | -         | 2.34                 | 50.86           | 73.9           | 23.0        | 150         | 0           | -           |
| Vert.    | 9608.000        | PK       | 45.84          | 38.14           | -31.55    | -         | 2.34                 | 54.77           | 73.9           | 19.1        | 150         | 0           | -           |
| Vert.    | 7206.000        | AV       | 35.11          | 36.21           | -34.48    | -         | 2.34                 | 39.18           | 53.9           | 14.7        | 150         | 0           | Floor noise |
| Vert.    | 9608.000        | AV       | 34.50          | 38.14           | -31.55    | -         | 2.34                 | 43.43           | 53.9           | 10.4        | 150         | 0           | Floor noise |

(1 GHz to 18 GHz) Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

(Other band) Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator below 1 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.925\text{ m} / 3.0\text{ m}) = 2.34\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2390.000        | AV       | 35.67          | 27.75           | -28.27    | -         | 1.28             | 2.34                 | 38.77           | 53.9           | 15.1        | *1)    |
| Hori.    | 4804.000        | AV       | 42.03          | 31.56           | -36.04    | -         | 1.28             | 2.34                 | 41.17           | 53.9           | 12.7        | -      |
| Vert.    | 2390.000        | AV       | 35.60          | 27.75           | -28.27    | -         | 1.28             | 2.34                 | 38.70           | 53.9           | 15.2        | *1)    |
| Vert.    | 4804.000        | AV       | 42.03          | 31.56           | -36.04    | -         | 1.28             | 2.34                 | 41.17           | 53.9           | 12.7        | -      |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.925\text{ m} / 3.0\text{ m}) = 2.34\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Duty factor refer to "Burst rate confirmation" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2402.000        | PK       | 98.76          | 27.77           | -28.26    | -         | 2.34                 | 100.61          | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 42.75          | 27.77           | -28.26    | -         | 2.34                 | 44.60           | 80.6           | 36.0        | -       |
| Vert.    | 2402.000        | PK       | 99.92          | 27.77           | -28.26    | -         | 2.34                 | 101.77          | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 43.16          | 27.77           | -28.26    | -         | 2.34                 | 45.01           | 81.7           | 36.6        | -       |

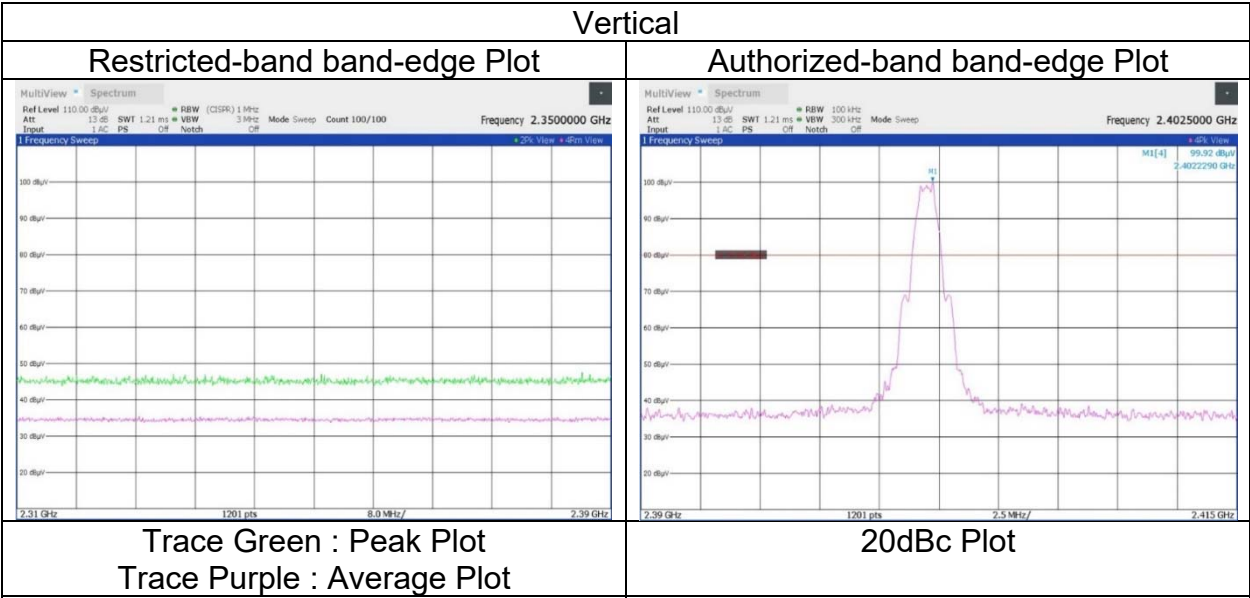
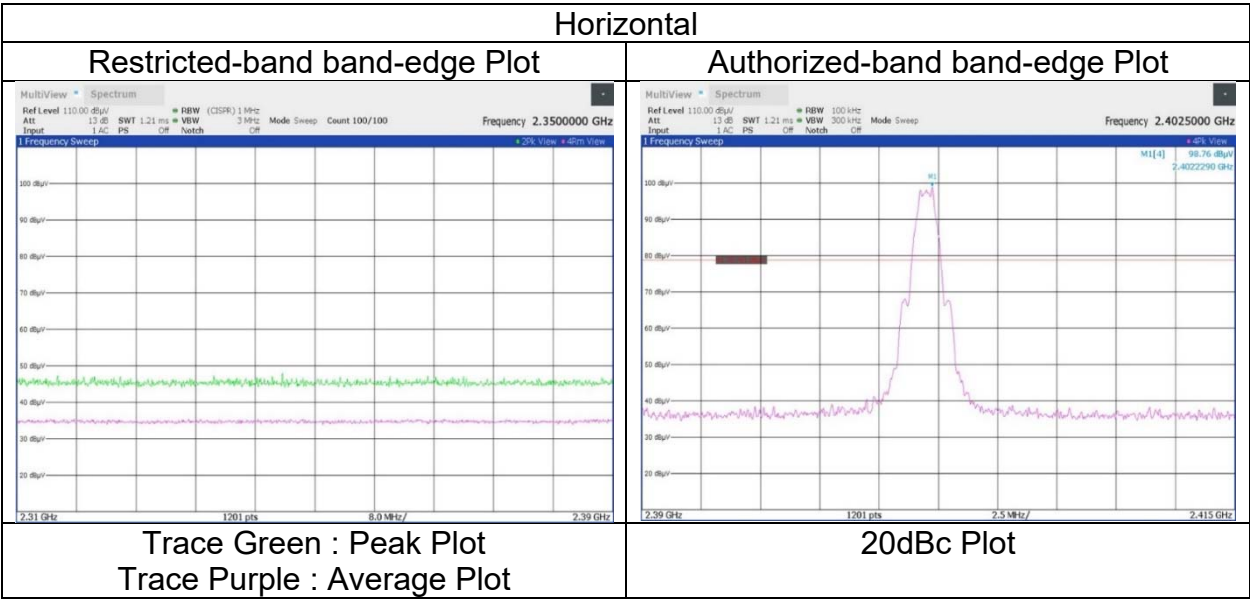
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.925\text{ m} / 3.0\text{ m}) = 2.34\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

|                        |                          |
|------------------------|--------------------------|
| Test place             | Shonan EMC Lab.          |
| Semi Anechoic Chamber  | WAC2                     |
| Date                   | August 13, 2024          |
| Temperature / Humidity | 25 deg. C / 48 % RH      |
| Engineer               | Makoto Hosaka            |
| Mode                   | Tx BT LE 1M-PHY 2402 MHz |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge and authorized band edge were shown in tabular data.

## Radiated Spurious Emission

|                        |                          |                      |
|------------------------|--------------------------|----------------------|
| Test place             | Shonan EMC Lab.          |                      |
| Semi Anechoic Chamber  | WAC2                     | WAC2                 |
| Date                   | August 13, 2024          | October 2, 2024      |
| Temperature / Humidity | 25 deg. C / 48 % RH      | 24 deg. C / 55 % RH  |
| Engineer               | Makoto Hosaka            | Yusuke Tanikawara    |
|                        | (1 GHz to 10 GHz)        | (10 GHz to 26.5 GHz) |
| Mode                   | Tx BT LE 1M-PHY 2440 MHz |                      |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 4880.000        | PK       | 49.84          | 31.95           | -36.01    | -         | 2.34                 | 48.12           | 73.9           | 25.7        | 322         | 224         | -           |
| Hori.    | 7320.000        | PK       | 47.73          | 36.66           | -34.24    | -         | 2.34                 | 52.49           | 73.9           | 21.4        | 150         | 0           | -           |
| Hori.    | 9760.000        | PK       | 45.53          | 38.10           | -31.33    | -         | 2.34                 | 54.64           | 73.9           | 19.2        | 150         | 0           | -           |
| Hori.    | 7320.000        | AV       | 35.86          | 36.66           | -34.24    | -         | 2.34                 | 40.62           | 53.9           | 13.2        | 150         | 0           | Floor noise |
| Hori.    | 9760.000        | AV       | 34.27          | 38.10           | -31.33    | -         | 2.34                 | 43.38           | 53.9           | 10.5        | 150         | 0           | Floor noise |
| Vert.    | 4880.000        | PK       | 50.69          | 31.95           | -36.01    | -         | 2.34                 | 48.97           | 73.9           | 24.9        | 135         | 101         | -           |
| Vert.    | 7320.000        | PK       | 47.76          | 36.66           | -34.24    | -         | 2.34                 | 52.52           | 73.9           | 21.3        | 150         | 0           | -           |
| Vert.    | 9760.000        | PK       | 46.66          | 38.10           | -31.33    | -         | 2.34                 | 55.77           | 73.9           | 18.1        | 150         | 0           | -           |
| Vert.    | 7320.000        | AV       | 35.73          | 36.66           | -34.24    | -         | 2.34                 | 40.49           | 53.9           | 13.4        | 150         | 0           | Floor noise |
| Vert.    | 9760.000        | AV       | 34.15          | 38.10           | -31.33    | -         | 2.34                 | 43.26           | 53.9           | 10.6        | 150         | 0           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4880.000        | AV       | 39.57          | 31.95           | -36.01    | -         | 1.28             | 2.34                 | 39.13           | 53.9           | 14.7        | -      |
| Vert.    | 4880.000        | AV       | 40.24          | 31.95           | -36.01    | -         | 1.28             | 2.34                 | 39.80           | 53.9           | 14.1        | -      |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

**Radiated Spurious Emission**

Test place                                      Shonan EMC Lab.  
Semi Anechoic Chamber                      WAC2                                              WAC2  
Date                                              August 13, 2024                                      October 2, 2024  
Temperature / Humidity                      25 deg. C / 48 % RH                                      24 deg. C / 55 % RH  
Engineer                                              Makoto Hosaka                                      Yusuke Tanikawara  
                                                            (1 GHz to 10 GHz)                                      (10 GHz to 26.5 GHz)  
Mode                                              Tx BT LE 1M-PHY 2480 MHz

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 2483.500           | PK       | 49.93             | 27.80              | -28.21       | -            | 2.34                    | 51.86              | 73.9              | 22.0           | 150            | 179            | -           |
| Hori.    | 4960.000           | PK       | 48.97             | 32.23              | -35.97       | -            | 2.34                    | 47.57              | 73.9              | 26.3           | 209            | 301            | -           |
| Hori.    | 7440.000           | PK       | 47.62             | 36.81              | -33.99       | -            | 2.34                    | 52.78              | 73.9              | 21.1           | 150            | 0              | -           |
| Hori.    | 9920.000           | PK       | 45.68             | 38.04              | -31.10       | -            | 2.34                    | 54.96              | 73.9              | 18.9           | 150            | 0              | -           |
| Hori.    | 7440.000           | AV       | 35.64             | 36.81              | -33.99       | -            | 2.34                    | 40.80              | 53.9              | 13.1           | 150            | 0              | Floor noise |
| Hori.    | 9920.000           | AV       | 34.04             | 38.04              | -31.10       | -            | 2.34                    | 43.32              | 53.9              | 10.5           | 150            | 0              | Floor noise |
| Vert.    | 2483.500           | PK       | 51.62             | 27.80              | -28.21       | -            | 2.34                    | 53.55              | 73.9              | 20.3           | 157            | 136            | -           |
| Vert.    | 4960.000           | PK       | 49.73             | 32.23              | -35.97       | -            | 2.34                    | 48.33              | 73.9              | 25.5           | 100            | 105            | -           |
| Vert.    | 7440.000           | PK       | 46.92             | 36.81              | -33.99       | -            | 2.34                    | 52.08              | 73.9              | 21.8           | 150            | 0              | -           |
| Vert.    | 9920.000           | PK       | 46.08             | 38.04              | -31.10       | -            | 2.34                    | 55.36              | 73.9              | 18.5           | 150            | 0              | -           |
| Vert.    | 7440.000           | AV       | 35.77             | 36.81              | -33.99       | -            | 2.34                    | 40.93              | 53.9              | 12.9           | 150            | 0              | Floor noise |
| Vert.    | 9920.000           | AV       | 34.37             | 38.04              | -31.10       | -            | 2.34                    | 43.65              | 53.9              | 10.2           | 150            | 0              | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor  
Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB  
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

**Average measurement value with duty factor**

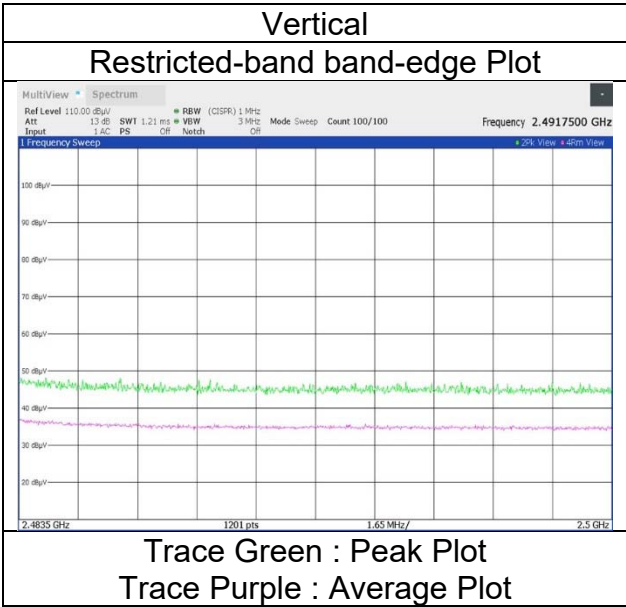
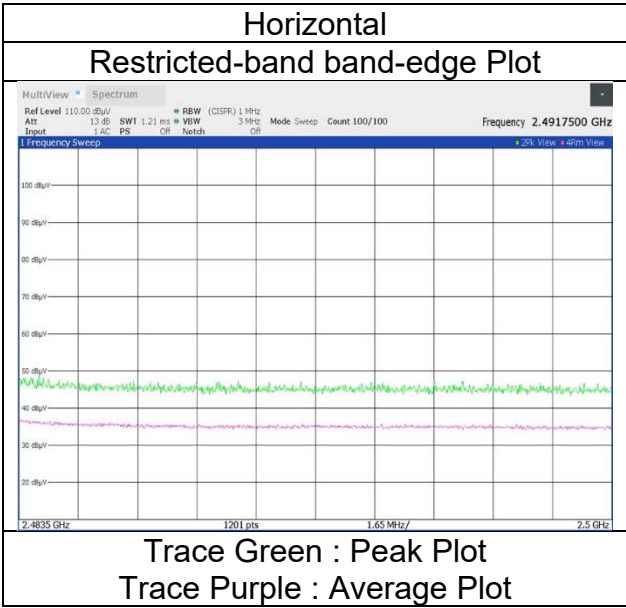
| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|------------------------|-------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2483.500           | AV       | 37.68             | 27.80              | -28.21       | -            | 1.28                   | 2.34                    | 40.89              | 53.9              | 13.0           | *1)    |
| Hori.    | 4960.000           | AV       | 37.87             | 32.23              | -35.97       | -            | 1.28                   | 2.34                    | 37.75              | 53.9              | 16.1           | -      |
| Vert.    | 2483.500           | AV       | 37.77             | 27.80              | -28.21       | -            | 1.28                   | 2.34                    | 40.98              | 53.9              | 12.9           | *1)    |
| Vert.    | 4960.000           | AV       | 39.59             | 32.23              | -35.97       | -            | 1.28                   | 2.34                    | 39.47              | 53.9              | 14.4           | -      |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Duty factor + Distance factor  
Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB  
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB  
Duty factor refer to "Burst rate confirmation" sheet.  
\*1) Not out of band emission (Leakage Power)

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer  
Mode

Shonan EMC Lab.  
WAC2  
August 13, 2024  
25 deg. C / 48 % RH  
Makoto Hosaka  
Tx BT LE 1M-PHY 2480 MHz



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

|                        |                          |                      |
|------------------------|--------------------------|----------------------|
| Test place             | Shonan EMC Lab.          |                      |
| Semi Anechoic Chamber  | WAC2                     | WAC2                 |
| Date                   | August 13, 2024          | October 2, 2024      |
| Temperature / Humidity | 25 deg. C / 48 % RH      | 24 deg. C / 55 % RH  |
| Engineer               | Makoto Hosaka            | Yusuke Tanikawara    |
|                        | (1 GHz to 10 GHz)        | (10 GHz to 26.5 GHz) |
| Mode                   | Tx BT LE 2M-PHY 2402 MHz |                      |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2390.000        | PK       | 47.01          | 27.75           | -28.27    | -         | 2.34                 | 48.83           | 73.9           | 25.0        | 118         | 172         | -           |
| Hori.    | 4804.000        | PK       | 50.81          | 31.56           | -36.04    | -         | 2.34                 | 48.67           | 73.9           | 25.2        | 298         | 266         | -           |
| Hori.    | 7206.000        | PK       | 47.28          | 36.21           | -34.48    | -         | 2.34                 | 51.35           | 73.9           | 22.5        | 150         | 0           | -           |
| Hori.    | 9608.000        | PK       | 46.46          | 38.14           | -31.55    | -         | 2.34                 | 55.39           | 73.9           | 18.5        | 150         | 0           | -           |
| Hori.    | 7206.000        | AV       | 35.14          | 36.21           | -34.48    | -         | 2.34                 | 39.21           | 53.9           | 14.6        | 150         | 0           | Floor noise |
| Hori.    | 9608.000        | AV       | 34.45          | 38.14           | -31.55    | -         | 2.34                 | 43.38           | 53.9           | 10.5        | 150         | 0           | Floor noise |
| Vert.    | 2390.000        | PK       | 47.54          | 27.75           | -28.27    | -         | 2.34                 | 49.36           | 73.9           | 24.5        | 137         | 145         | -           |
| Vert.    | 4804.000        | PK       | 51.61          | 31.56           | -36.04    | -         | 2.34                 | 49.47           | 73.9           | 24.4        | 151         | 142         | -           |
| Vert.    | 7206.000        | PK       | 46.53          | 36.21           | -34.48    | -         | 2.34                 | 50.60           | 73.9           | 23.3        | 150         | 0           | -           |
| Vert.    | 9608.000        | PK       | 46.11          | 38.14           | -31.55    | -         | 2.34                 | 55.04           | 73.9           | 18.8        | 150         | 0           | -           |
| Vert.    | 7206.000        | AV       | 35.10          | 36.21           | -34.48    | -         | 2.34                 | 39.17           | 53.9           | 14.7        | 150         | 0           | Floor noise |
| Vert.    | 9608.000        | AV       | 34.49          | 38.14           | -31.55    | -         | 2.34                 | 43.42           | 53.9           | 10.4        | 150         | 0           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2390.000        | AV       | 35.87          | 27.75           | -28.27    | -         | 4.63             | 2.34                 | 42.32           | 53.9           | 11.5        | *1)    |
| Hori.    | 4804.000        | AV       | 39.10          | 31.56           | -36.04    | -         | 4.63             | 2.34                 | 41.59           | 53.9           | 12.3        | -      |
| Vert.    | 2390.000        | AV       | 35.45          | 27.75           | -28.27    | -         | 4.63             | 2.34                 | 41.90           | 53.9           | 12.0        | *1)    |
| Vert.    | 4804.000        | AV       | 39.53          | 31.56           | -36.04    | -         | 4.63             | 2.34                 | 42.02           | 53.9           | 11.8        | -      |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2402.000        | PK       | 97.49          | 27.77           | -28.26    | -         | 2.34                 | 99.34           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 66.72          | 27.77           | -28.26    | -         | 2.34                 | 68.57           | 79.3           | 10.7        | -       |
| Vert.    | 2402.000        | PK       | 100.23         | 27.77           | -28.26    | -         | 2.34                 | 102.08          | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 69.14          | 27.77           | -28.26    | -         | 2.34                 | 70.99           | 82.0           | 11.0        | -       |

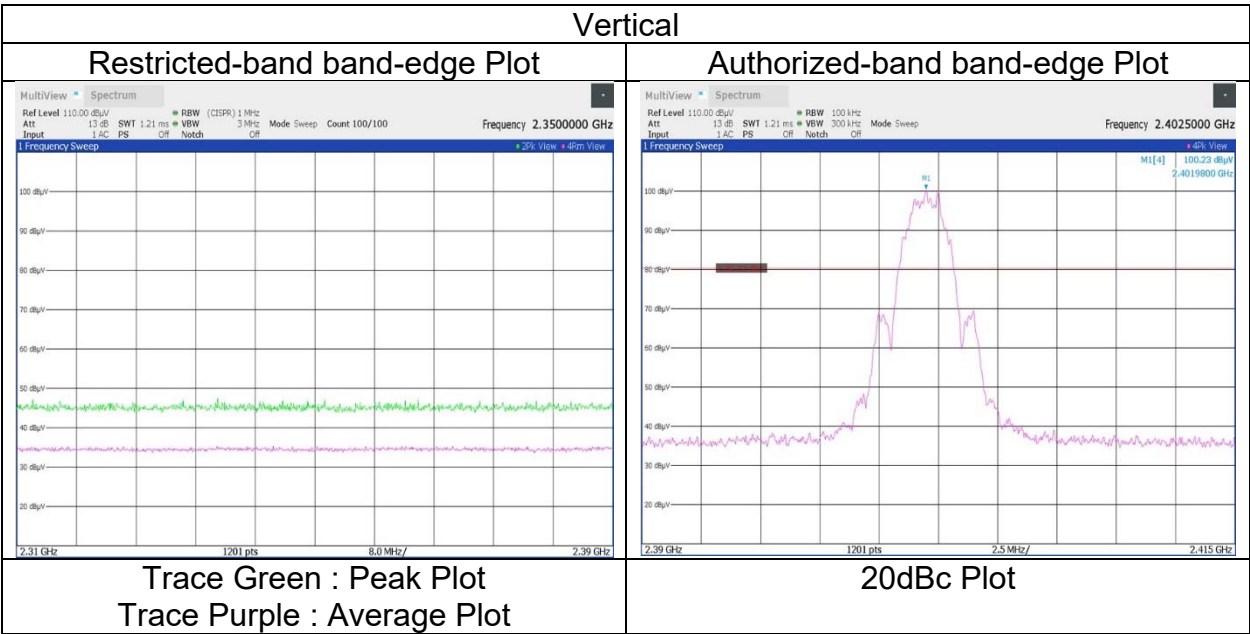
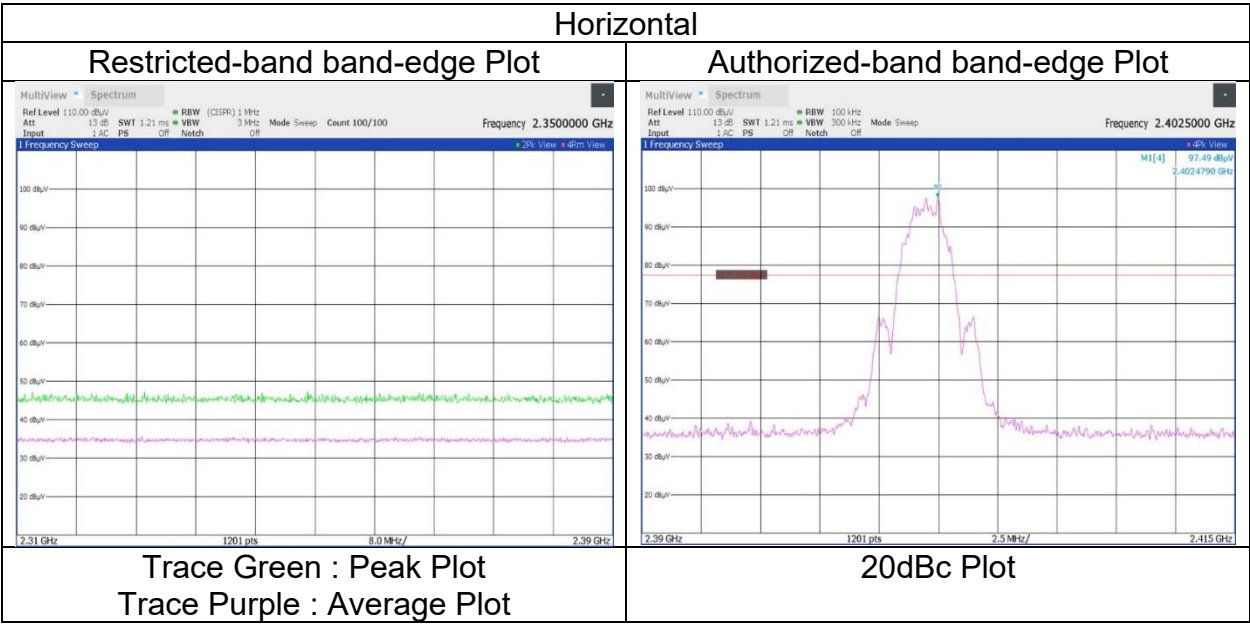
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

|                        |                          |
|------------------------|--------------------------|
| Test place             | Shonan EMC Lab.          |
| Semi Anechoic Chamber  | WAC2                     |
| Date                   | August 13, 2024          |
| Temperature / Humidity | 25 deg. C / 48 % RH      |
| Engineer               | Makoto Hosaka            |
| Mode                   | Tx BT LE 2M-PHY 2402 MHz |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge and authorized band edge were shown in tabular data.

## Radiated Spurious Emission

|                        |                          |                      |
|------------------------|--------------------------|----------------------|
| Test place             | Shonan EMC Lab.          |                      |
| Semi Anechoic Chamber  | WAC2                     | WAC2                 |
| Date                   | August 13, 2024          | October 2, 2024      |
| Temperature / Humidity | 25 deg. C / 48 % RH      | 24 deg. C / 55 % RH  |
| Engineer               | Makoto Hosaka            | Yusuke Tanikawara    |
|                        | (1 GHz to 10 GHz)        | (10 GHz to 26.5 GHz) |
| Mode                   | Tx BT LE 2M-PHY 2440 MHz |                      |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 4880.000        | PK       | 49.20          | 31.95           | -36.01    | -         | 2.34                 | 47.48           | 73.9           | 26.4        | 260         | 305         | -           |
| Hori.    | 7320.000        | PK       | 46.95          | 36.66           | -34.24    | -         | 2.34                 | 51.71           | 73.9           | 22.1        | 150         | 0           | -           |
| Hori.    | 9760.000        | PK       | 46.05          | 38.10           | -31.33    | -         | 2.34                 | 55.16           | 73.9           | 18.7        | 150         | 0           | -           |
| Hori.    | 7320.000        | AV       | 35.80          | 36.66           | -34.24    | -         | 2.34                 | 40.56           | 53.9           | 13.3        | 150         | 0           | Floor noise |
| Hori.    | 9760.000        | AV       | 34.30          | 38.10           | -31.33    | -         | 2.34                 | 43.41           | 53.9           | 10.4        | 150         | 0           | Floor noise |
| Vert.    | 4880.000        | PK       | 50.16          | 31.95           | -36.01    | -         | 2.34                 | 48.44           | 73.9           | 25.4        | 114         | 107         | -           |
| Vert.    | 7320.000        | PK       | 47.62          | 36.66           | -34.24    | -         | 2.34                 | 52.38           | 73.9           | 21.5        | 150         | 0           | -           |
| Vert.    | 9760.000        | PK       | 46.12          | 38.10           | -31.33    | -         | 2.34                 | 55.23           | 73.9           | 18.6        | 150         | 0           | -           |
| Vert.    | 7320.000        | AV       | 35.63          | 36.66           | -34.24    | -         | 2.34                 | 40.39           | 53.9           | 13.5        | 150         | 0           | Floor noise |
| Vert.    | 9760.000        | AV       | 34.18          | 38.10           | -31.33    | -         | 2.34                 | 43.29           | 53.9           | 10.6        | 150         | 0           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4880.000        | AV       | 37.04          | 31.95           | -36.01    | -         | 4.63             | 2.34                 | 39.95           | 53.9           | 13.9        | -      |
| Vert.    | 4880.000        | AV       | 38.33          | 31.95           | -36.01    | -         | 4.63             | 2.34                 | 41.24           | 53.9           | 12.6        | -      |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.925 m / 3.0 m) = 2.34 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Duty factor refer to "Burst rate confirmation" sheet.

## Radiated Spurious Emission

|                        |                          |                      |
|------------------------|--------------------------|----------------------|
| Test place             | Shonan EMC Lab.          |                      |
| Semi Anechoic Chamber  | WAC2                     | WAC2                 |
| Date                   | August 13, 2024          | October 2, 2024      |
| Temperature / Humidity | 25 deg. C / 48 % RH      | 24 deg. C / 55 % RH  |
| Engineer               | Makoto Hosaka            | Yusuke Tanikawara    |
|                        | (1 GHz to 10 GHz)        | (10 GHz to 26.5 GHz) |
| Mode                   | Tx BT LE 2M-PHY 2480 MHz |                      |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2483.500        | PK       | 51.29          | 27.80           | -28.21    | -         | 2.34                 | 53.22           | 73.9           | 20.6        | 160         | 179         | -           |
| Hori.    | 4960.000        | PK       | 48.83          | 32.23           | -35.97    | -         | 2.34                 | 47.43           | 73.9           | 26.4        | 299         | 297         | -           |
| Hori.    | 7440.000        | PK       | 48.00          | 36.81           | -33.99    | -         | 2.34                 | 53.16           | 73.9           | 20.7        | 150         | 0           | -           |
| Hori.    | 9920.000        | PK       | 45.97          | 38.04           | -31.10    | -         | 2.34                 | 55.25           | 73.9           | 18.6        | 150         | 0           | -           |
| Hori.    | 7440.000        | AV       | 35.67          | 36.81           | -33.99    | -         | 2.34                 | 40.83           | 53.9           | 13.0        | 150         | 0           | Floor noise |
| Hori.    | 9920.000        | AV       | 34.26          | 38.04           | -31.10    | -         | 2.34                 | 43.54           | 53.9           | 10.3        | 150         | 0           | Floor noise |
| Vert.    | 2483.500        | PK       | 52.26          | 27.80           | -28.21    | -         | 2.34                 | 54.19           | 73.9           | 19.7        | 155         | 134         | -           |
| Vert.    | 4960.000        | PK       | 49.52          | 32.23           | -35.97    | -         | 2.34                 | 48.12           | 73.9           | 25.7        | 133         | 105         | -           |
| Vert.    | 7440.000        | PK       | 47.86          | 36.81           | -33.99    | -         | 2.34                 | 53.02           | 73.9           | 20.8        | 150         | 0           | -           |
| Vert.    | 9920.000        | PK       | 45.75          | 38.04           | -31.10    | -         | 2.34                 | 55.03           | 73.9           | 18.8        | 150         | 0           | -           |
| Vert.    | 7440.000        | AV       | 35.53          | 36.81           | -33.99    | -         | 2.34                 | 40.69           | 53.9           | 13.2        | 150         | 0           | Floor noise |
| Vert.    | 9920.000        | AV       | 34.22          | 38.04           | -31.10    | -         | 2.34                 | 43.50           | 53.9           | 10.4        | 150         | 0           | Floor noise |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.925\text{ m} / 3.0\text{ m}) = 2.34\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2483.500        | AV       | 38.73          | 27.80           | -28.21    | -         | 4.63             | 2.34                 | 45.29           | 53.9           | 8.6         | *1)    |
| Hori.    | 4960.000        | AV       | 37.29          | 32.23           | -35.97    | -         | 4.63             | 2.34                 | 40.52           | 53.9           | 13.3        | -      |
| Vert.    | 2483.500        | AV       | 39.63          | 27.80           | -28.21    | -         | 4.63             | 2.34                 | 46.19           | 53.9           | 7.7         | *1)    |
| Vert.    | 4960.000        | AV       | 38.03          | 32.23           | -35.97    | -         | 4.63             | 2.34                 | 41.26           | 53.9           | 12.6        | -      |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(3.925\text{ m} / 3.0\text{ m}) = 2.34\text{ dB}$

10 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

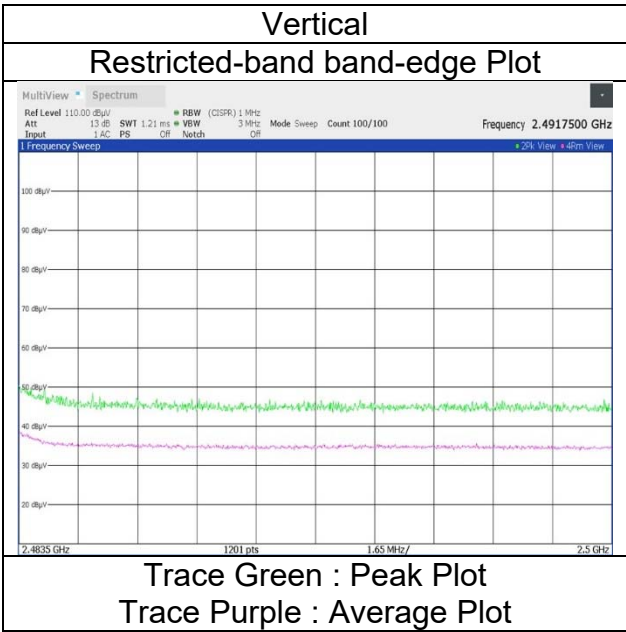
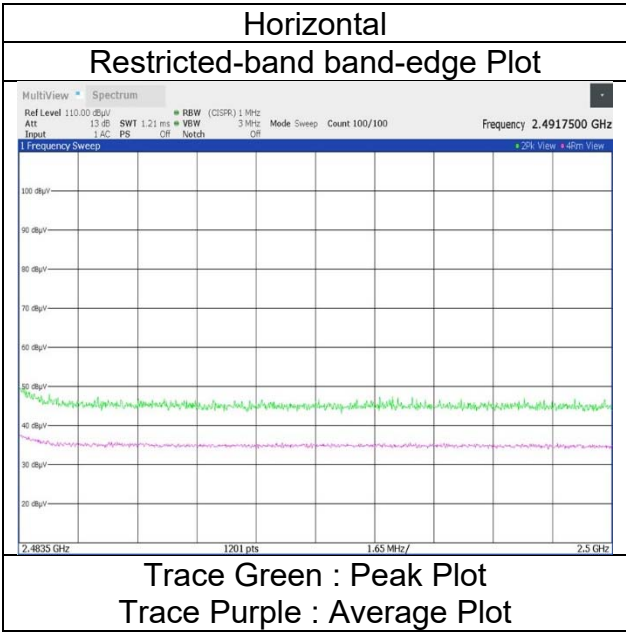
Duty factor refer to "Burst rate confirmation" sheet.

\*1) Not out of band emission (Leakage Power)

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer  
Mode

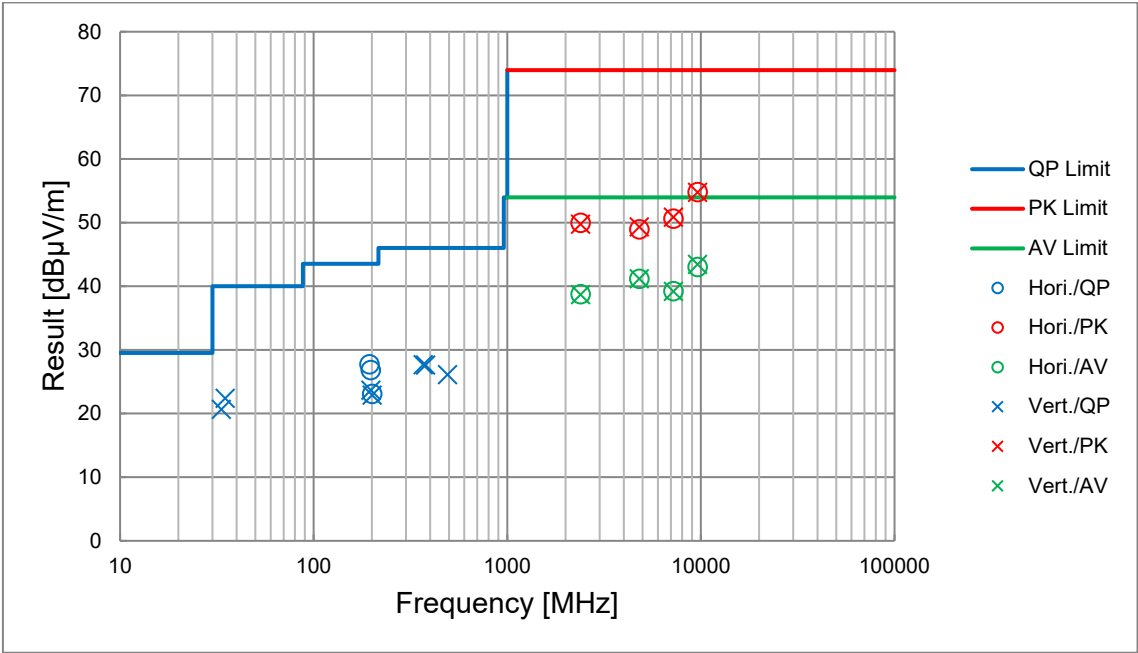
Shonan EMC Lab.  
WAC2  
August 13, 2024  
25 deg. C / 48 % RH  
Makoto Hosaka  
Tx BT LE 2M-PHY 2480 MHz



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

**Radiated Spurious Emission**  
**(Plot data, Worst case mode for Maximum Peak Output Power)**

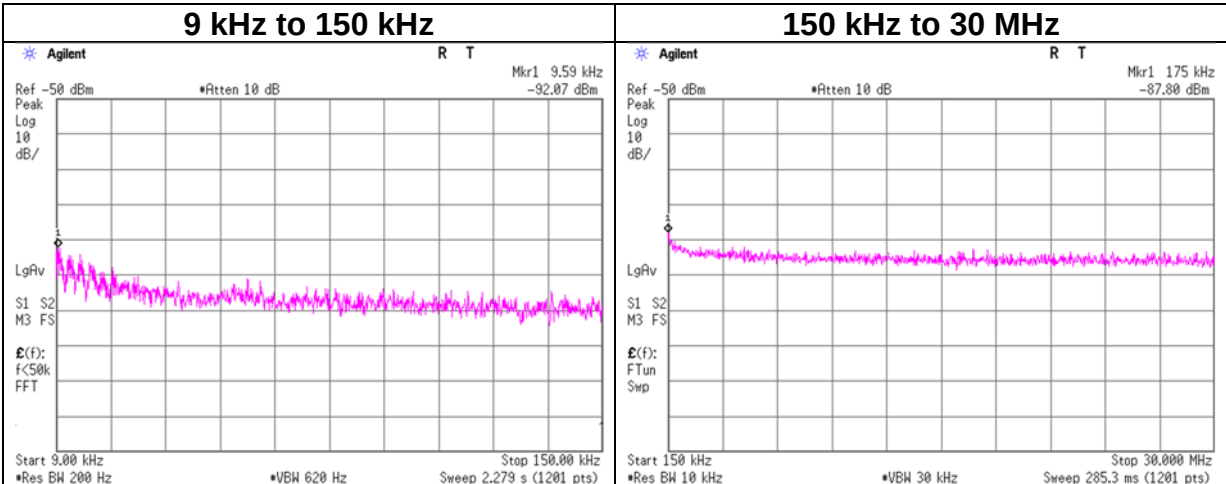
|                        |                          |                     |                      |
|------------------------|--------------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.          |                     |                      |
| Semi Anechoic Chamber  | WAC2                     | WAC2                | WAC2                 |
| Date                   | October 4, 2024          | August 13, 2024     | October 2, 2024      |
| Temperature / Humidity | 22 deg. C / 54 % RH      | 25 deg. C / 48 % RH | 24 deg. C / 55 % RH  |
| Engineer               | Yusuke Tanikawara        | Makoto Hosaka       | Yusuke Tanikawara    |
|                        | (30 MHz to 1 GHz)        | (1 GHz to 10 GHz)   | (10 GHz to 26.5 GHz) |
| Mode                   | Tx BT LE 1M-PHY 2402 MHz |                     |                      |



\*These plots data contain sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place                      Shonan EMC Lab. No.1 Measurement Room  
Date                              June 24, 2024  
Temperature / Humidity      24 deg. C / 52 % RH  
Engineer                        Kazuya Noda  
Mode                              Tx BT LE 1M-PHY 2402 MHz



| Frequency | Reading | Cable | Attenuator | Antenna | N          | EIRP  | Distance | Ground | E                | Limit    | Margin | Remark |
|-----------|---------|-------|------------|---------|------------|-------|----------|--------|------------------|----------|--------|--------|
| [kHz]     | [dBm]   | Loss  | Loss       | Gain    | (Number    | [dBm] | [m]      | bounce | (field strength) | [dBuV/m] | [dB]   |        |
|           |         | [dB]  | [dB]       | [dBi]   | of Output) |       |          | [dB]   | [dBuV/m]         |          |        |        |
| 9.59      | -92.1   | 1.00  | 9.86       | 3.24    | 1          | -78.0 | 300      | 6.0    | -16.7            | 47.9     | 64.6   | -      |
| 175.00    | -87.8   | 1.00  | 9.86       | 3.24    | 1          | -73.7 | 300      | 6.0    | -12.4            | 22.7     | 35.1   | -      |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$   
 $\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$   
N: Number of output

Power Density

|                        |                                       |
|------------------------|---------------------------------------|
| Test place             | Shonan EMC Lab. No.1 Measurement Room |
| Date                   | June 24, 2024                         |
| Temperature / Humidity | 24 deg. C / 52 % RH                   |
| Engineer               | Kazuya Noda                           |
| Mode                   | Tx BT LE                              |

BT LE 1M-PHY

| Frequency<br>[MHz] | Measured<br>Frequency<br>[MHz] | Reading<br>[dBm/3 kHz] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>[dBm/3 kHz] | Limit<br>[dBm/3 kHz] | Margin<br>[dB] |
|--------------------|--------------------------------|------------------------|-----------------------|------------------------|-----------------------|----------------------|----------------|
| 2402               | 2402.014                       | -21.17                 | 1.62                  | 9.94                   | -9.61                 | 8.00                 | 17.61          |
| 2440               | 2440.014                       | -21.20                 | 1.63                  | 9.94                   | -9.63                 | 8.00                 | 17.63          |
| 2480               | 2480.014                       | -21.34                 | 1.63                  | 9.94                   | -9.77                 | 8.00                 | 17.77          |

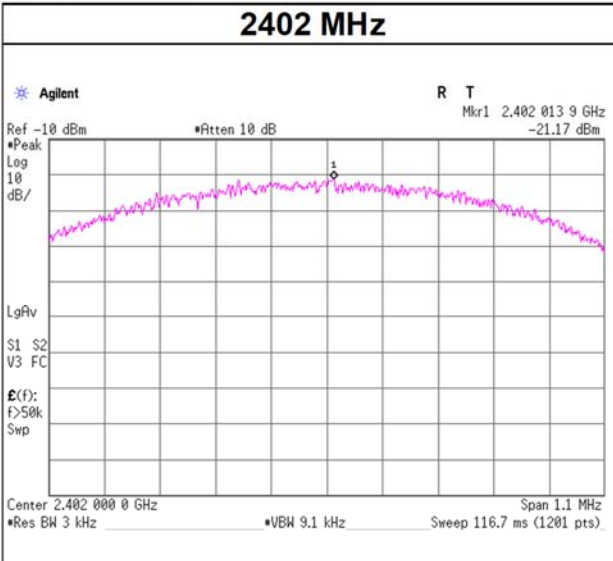
BT LE 2M-PHY

| Frequency<br>[MHz] | Measured<br>Frequency<br>[MHz] | Reading<br>[dBm/3 kHz] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>[dBm/3 kHz] | Limit<br>[dBm/3 kHz] | Margin<br>[dB] |
|--------------------|--------------------------------|------------------------|-----------------------|------------------------|-----------------------|----------------------|----------------|
| 2402               | 2401.960                       | -23.70                 | 1.62                  | 9.94                   | -12.14                | 8.00                 | 20.14          |
| 2440               | 2439.960                       | -23.62                 | 1.63                  | 9.94                   | -12.05                | 8.00                 | 20.05          |
| 2480               | 2479.960                       | -23.82                 | 1.63                  | 9.94                   | -12.25                | 8.00                 | 20.25          |

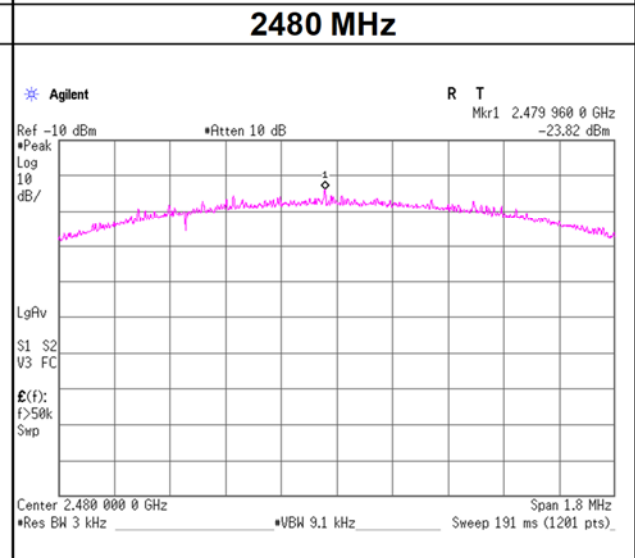
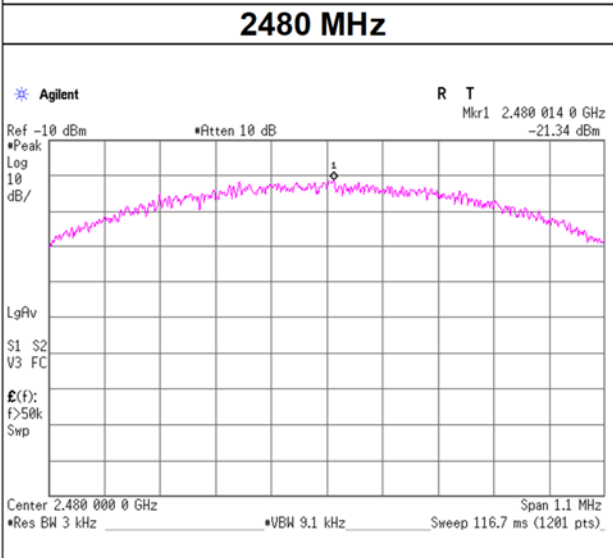
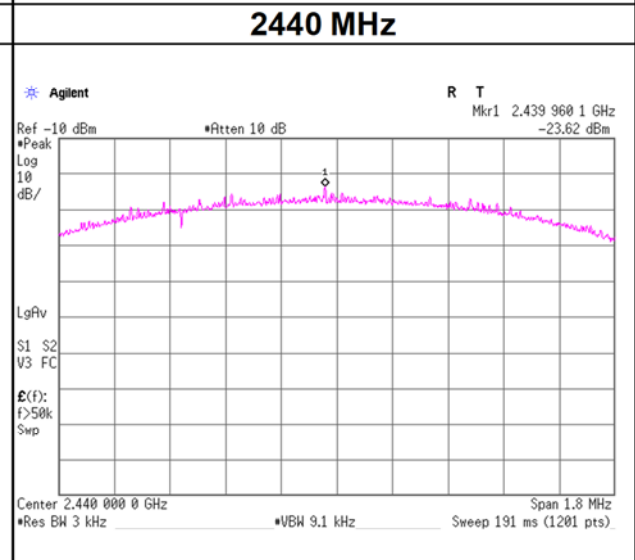
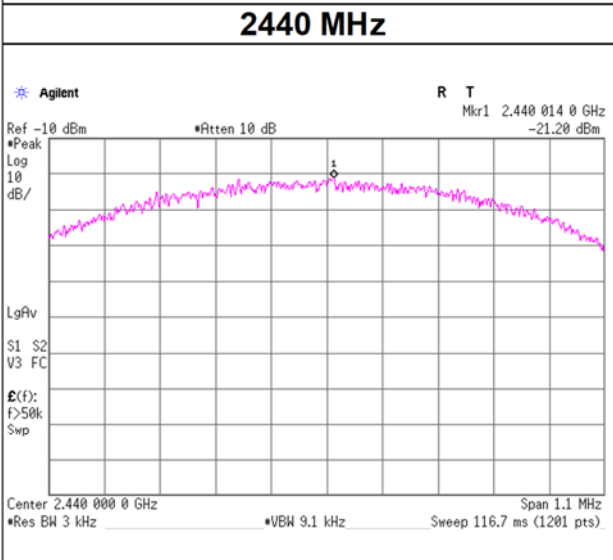
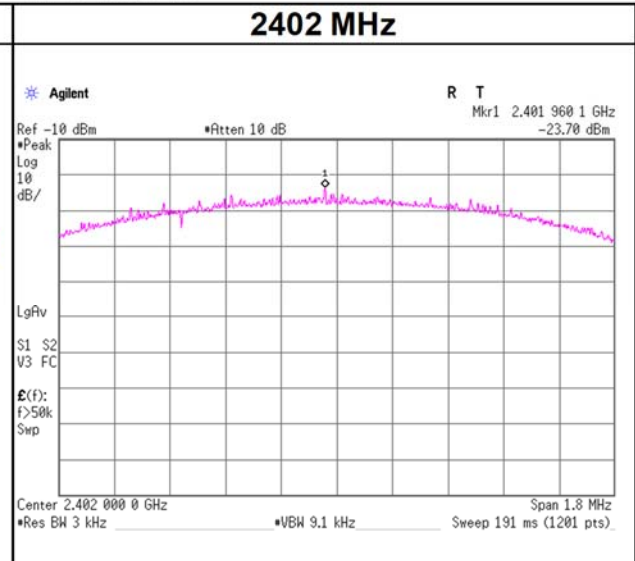
Sample Calculation:  
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Power Density

BT LE 1M-PHY



BT LE 2M-PHY



## APPENDIX 2: Test Instruments

### Test Equipment

| Test Item | LIMS ID | Description                       | Manufacturer                      | Model                                      | Serial                                  | Last Calibration Date | Cal Int |
|-----------|---------|-----------------------------------|-----------------------------------|--------------------------------------------|-----------------------------------------|-----------------------|---------|
| AT        | 145801  | Spectrum Analyzer                 | Keysight Technologies Inc         | E4448A                                     | MY48250152                              | 2024/02/27            | 12      |
| AT        | 146247  | Power Meter                       | Keysight Technologies Inc         | 8990B                                      | MY51000272                              | 2024/05/14            | 12      |
| AT        | 146310  | Power sensor                      | Keysight Technologies Inc         | N1923A                                     | MY5326009                               | 2024/05/14            | 12      |
| AT        | 196942  | Coaxial Cable                     | Huber+Suhner                      | SUCOFLEX 102                               | 803416/2                                | 2024/03/07            | 12      |
| AT        | 204928  | Attenuator                        | Weinschel Corp.                   | 54A-10                                     | 109973                                  | 2024/02/09            | 12      |
| AT        | 175823  | Thermo-Hygrometer                 | CUSTOM. Inc                       | CTH-201                                    | -                                       | 2023/08/01            | 12 *1)  |
| CE        | 144896  | Attenuator                        | JFW IND. INC.                     | 50HF-003N                                  | -                                       | 2024/07/11            | 12      |
| CE        | 144969  | Coaxial Cable&RF Selector         | Suhner/Suhner/TOYO                | RG223U/141PE/NS4906                        | -/0901-270(RF Selector)                 | 2024/04/10            | 12      |
| CE        | 145539  | LISN                              | Rohde & Schwarz                   | ENV216                                     | 100512                                  | 2024/02/06            | 12      |
| CE        | 145792  | Digital Hitester                  | HIOKI E.E. CORPORATION            | 3805-50                                    | 80997812                                | 2024/09/24            | 12      |
| CE        | 146188  | Terminator                        | TME                               | CT-01 BP                                   | -                                       | 2023/12/08            | 12      |
| CE        | 150463  | Test Receiver                     | Rohde & Schwarz                   | ESW44                                      | 101581                                  | 2024/08/06            | 12      |
| CE        | 207277  | Tape Measure                      | ASKUL                             | -                                          | -                                       | -                     | -       |
| CE        | 235739  | Thermo-Hygrometer                 | CUSTOM. Inc                       | CTH-230                                    | -                                       | 2024/04/28            | 12      |
| CE        | 242076  | Terminator                        | Weinschel - API Technologies Corp | M1459A                                     | 121090                                  | 2023/11/17            | 12      |
| CE,RE     | 170932  | EMI Software                      | TSJ (Techno Science Japan)        | TEPTO-DV3(RE,CE,ME,PE)                     | Ver 3.1.0546                            | -                     | -       |
| RE        | 145007  | Pre Amplifier                     | Toyo Corporation                  | HAP18-26W                                  | 19                                      | 2024/08/21            | 12      |
| RE        | 145176  | Coaxial Cable                     | Suhner                            | SUCOFLEX 102                               | 32703/2                                 | 2024/08/21            | 12      |
| RE        | 145512  | Horn Antenna                      | ETS-Lindgren                      | 3160-09                                    | 00094868                                | 2024/06/20            | 12      |
| RE        | 145528  | Logperiodic Antenna               | Schwarzbeck Mess-Elektronik OHG   | VUSLP9111B                                 | 195                                     | 2024/04/10            | 12      |
| RE        | 179540  | Coaxial Cable                     | Huber+Suhner                      | SUCOFLEX 102                               | 802815/2                                | 2024/03/05            | 12      |
| RE        | 199783  | Attenuator                        | JFW                               | 50HF-006N                                  | -                                       | 2024/06/14            | 12      |
| RE        | 207281  | Tape Measure                      | ASKUL                             | -                                          | -                                       | -                     | -       |
| RE        | 235268  | Test Receiver                     | Rohde & Schwarz                   | ESW44                                      | 103212                                  | 2023/12/26            | 12      |
| RE        | 235640  | DIGITAL MULTIMETER                | HIOKI E.E. CORPORATION            | DT4261                                     | 230313157                               | 2024/05/29            | 12      |
| RE        | 235738  | Thermo-Hygrometer                 | CUSTOM. Inc                       | CTH-230                                    | -                                       | 2024/04/28            | 12      |
| RE        | 236584  | Horn Antenna                      | AINFO Inc.                        | LB-8180-NF                                 | 2030013000112                           | 2024/04/04            | 12      |
| RE        | 236615  | Semi-Anechoic Chamber             | TDK                               | SWAC-02(NSA)                               | 2                                       | 2024/05/10            | 12      |
| RE        | 236617  | Semi-Anechoic Chamber             | TDK                               | SWAC-02(SVSWR)                             | 2                                       | 2024/06/06            | 12      |
| RE        | 236687  | Horn Antenna                      | Schwarzbeck Mess-Elektronik OHG   | BBHA 9120 C                                | 788                                     | 2024/04/04            | 12      |
| RE        | 236709  | Coaxial Cable                     | Hayashi-Repic co., Ltd.           | NMS079B-GL310C-SMS117B-2m                  | 47256-02-04                             | 2024/05/09            | 12      |
| RE        | 236720  | Coaxial Cable                     | Huber+Suhner                      | SF106/SF106/SF106                          | 2001167/2001168/2001161                 | 2024/05/10            | 12      |
| RE        | 236724  | Coaxial Cable                     | Hayashi-Repic co., Ltd.           | SF106(HUBER+SUHNER)/LMR400UF/GL310C/GL310C | 2000430/47753-2/47256-01-04/47256-01-02 | 2024/05/10            | 12      |
| RE        | 236756  | Coaxial Cable                     | Huber+Suhner                      | SF106/11N/11N/6000                         | 2001167                                 | 2024/05/10            | 12      |
| RE        | 236967  | Pre Amplifier                     | TSJ (Techno Science Japan)        | MLA-9K01-L01                               | 23050010                                | 2024/06/14            | 12      |
| RE        | 237786  | RF RELAY MATRIX with preamplifier | TSJ (Techno Science Japan)        | RFM-E221261R                               | 07796                                   | 2023/11/01            | 12      |
| RE        | 239644  | Coaxial Cable                     | Junkosha                          | MWX221-01000NFSNMS/B                       | 2306S022                                | 2024/08/21            | 12      |
| RE        | 239787  | Biconical Antenna                 | Schwarzbeck Mess-Elektronik OHG   | VHBB 9124+BBA9106                          | 01908                                   | 2024/08/10            | 12      |

\*Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

The expiration\*1) This test equipment was used for the tests before the expiration date of the calibration. All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:

AT: Antenna Terminal Conducted test  
CE: Conducted Emission  
RE: Radiated Emission