



# RADIO TEST REPORT

Test Report No.: 14499085H-A

|                     |                                |
|---------------------|--------------------------------|
| Customer            | Murata Manufacturing Co., Ltd. |
| Description of EUT  | Communication Module           |
| Model Number of EUT | 2DV                            |
| FCC ID              | VPYLBCA1ZZ2DV                  |
| Test Regulation     | FCC Part 15 Subpart C          |
| Test Result         | Complied (Refer to SECTION 3)  |
| Issue Date          | December 22, 2022              |
| Remarks             | -                              |

Representative Test Engineer

Tetsuro Yoshida  
Engineer

Approved By

Takumi Shimada  
Engineer



CERTIFICATE 5107.02

- ☐ 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".

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- The information provided from the customer for this report is identified in Section 1.
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## **REVISION HISTORY**

**Original Test Report No.: 14499085H-A**

| Revision        | Test Report No. | Date              | Page Revised Contents |
|-----------------|-----------------|-------------------|-----------------------|
| -<br>(Original) | 14499085H-A     | December 22, 2022 | -                     |

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

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

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## **SECTION 1: Customer Information**

|                  |                                                            |
|------------------|------------------------------------------------------------|
| Company Name     | Murata Manufacturing Co., Ltd.                             |
| Address          | 1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan |
| Telephone Number | +81-75-955-6736                                            |
| Contact Person   | Motoo Hayashi                                              |

The information provided from 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

\* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

## **SECTION 2: Equipment Under Test (EUT)**

### **2.1 Identification of EUT**

|               |                                 |
|---------------|---------------------------------|
| Description   | Communication Module            |
| Model Number  | 2DV                             |
| Serial Number | Refer to SECTION 4.2            |
| Condition     | Production model                |
| Modification  | No Modification by the test lab |
| Receipt Date  | November 21, 2022               |
| Test Date     | November 21 and 22, 2022        |

### **2.2 Product Description**

#### **General Specification**

|        |                                                |
|--------|------------------------------------------------|
| Rating | Typ. DC 3.3 V / Min. DC 2.4 V / Max. DC 4.75 V |
|--------|------------------------------------------------|

#### **Radio Specification**

##### **Bluetooth (Low Energy)**

|                        |                      |
|------------------------|----------------------|
| Equipment Type         | Transceiver          |
| Frequency of Operation | 2402 MHz to 2480 MHz |
| Type of Modulation     | GFSK                 |
| Antenna Gain           | 1.0 dBi              |

## SECTION 3: Test Specification, Procedures & Results

### 3.1 Test Specification

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Specification | FCC Part 15 Subpart C                                                                                                                                                                                        |
| 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 |

### 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>-----<br>ISED: RSS-Gen 8.8                                   | 33.37 dB<br>0.15000 MHz, N, QP       | Complied<br>a)     | -                                                                 |
| 6dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FCC: KDB 558074 D01 15.247<br>Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(a)(2)<br>-----<br>ISED: RSS-247 5.2(a)                          | See data.                            | Complied<br>b)     | Conducted                                                         |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FCC: KDB 558074 D01 15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.12 | FCC: Section 15.247(b)(3)<br>-----<br>ISED: RSS-247 5.4(d)                          |                                      | Complied<br>c)     | Conducted                                                         |
| Power Density                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FCC: KDB 558074 D01 15.247<br>Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(e)<br>-----<br>ISED: RSS-247 5.2(b)                             |                                      | Complied<br>d)     | Conducted                                                         |
| Spurious Emission Restricted Band Edges                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | FCC: KDB 558074 D01 15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.13 | FCC: Section 15.247(d)<br>-----<br>ISED: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 4.0 dB<br>2483.5 MHz, AV, Horizontal | Complied<br>e), f) | Conducted<br>(below 30 MHz)/<br>Radiated<br>(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> <p>a) Refer to APPENDIX 1 (data of Conducted Emission)<br/>           b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)<br/>           c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)<br/>           d) Refer to APPENDIX 1 (data of Power Density)<br/>           e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)<br/>           f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)</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 203/212 Antenna requirement

The antenna is not removable from 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          | -<br>a) | Conducted |
| a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth) |                   |               |              |         |           |

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  $k = 2$ .

#### Conducted emission

| Using Item | Frequency range       | Uncertainty (+/-) |
|------------|-----------------------|-------------------|
| AMN (LISN) | 0.009 MHz to 0.15 MHz | 3.7 dB            |
|            | 0.15 MHz to 30 MHz    | 3.3 dB            |

#### Radiated emission

| Measurement distance | Frequency range     |            | Uncertainty (+/-) |
|----------------------|---------------------|------------|-------------------|
| 3 m                  | 9 kHz to 30 MHz     |            | 3.2 dB            |
| 10 m                 |                     |            | 3.0 dB            |
| 3 m                  | 30 MHz to 200 MHz   | Horizontal | 4.8 dB            |
|                      |                     | Vertical   | 5.0 dB            |
|                      | 200 MHz to 1000 MHz | Horizontal | 5.1 dB            |
|                      |                     | Vertical   | 6.2 dB            |
| 10 m                 | 30 MHz to 200 MHz   | Horizontal | 4.8 dB            |
|                      |                     | Vertical   | 4.8 dB            |
|                      | 200 MHz to 1000 MHz | Horizontal | 5.0 dB            |
|                      |                     | Vertical   | 5.0 dB            |
| 3 m                  | 1 GHz to 6 GHz      |            | 4.9 dB            |
|                      | 6 GHz to 18 GHz     |            | 5.2 dB            |
| 1 m                  | 10 GHz to 26.5 GHz  |            | 5.4 dB            |
|                      | 26.5 GHz to 40 GHz  |            | 5.4 dB            |
| 10 m                 | 1 GHz to 18 GHz     |            | 5.4 dB            |

#### Antenna Terminal test

| Test Item                                        | Uncertainty (+/-) |
|--------------------------------------------------|-------------------|
| 20 dB Bandwidth / 99 % Occupied Bandwidth        | 0.96 %            |
| Maximum Peak Output Power / Average Output Power | 1.5 dB            |
| Carrier Frequency Separation                     | 0.42 %            |
| Dwell time / Burst rate                          | 0.10 %            |
| Conducted Spurious Emission                      | 2.7 dB            |

### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

\*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

ISED Lab Company Number: 2973C / CAB identifier: JP0002

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan

Telephone: +81-596-24-8999

| Test site                  | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms            | Maximum measurement distance |
|----------------------------|----------------------------|------------------------------------------------------------------|------------------------|------------------------------|
| No.1 semi-anechoic chamber | 19.2 x 11.2 x 7.7          | 7.0 x 6.0                                                        | No.1 Power source room | 10 m                         |
| No.2 semi-anechoic chamber | 7.5 x 5.8 x 5.2            | 4.0 x 4.0                                                        | -                      | 3 m                          |
| No.3 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.3 Preparation room  | 3 m                          |
| No.3 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.4 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.4 Preparation room  | 3 m                          |
| No.4 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.5 semi-anechoic chamber | 6.0 x 6.0 x 3.9            | 6.0 x 6.0                                                        | -                      | -                            |
| No.5 measurement room      | 6.4 x 6.4 x 3.0            | 6.4 x 6.4                                                        | -                      | -                            |
| No.6 shielded room         | 4.0 x 4.5 x 2.7            | 4.0 x 4.5                                                        | -                      | -                            |
| No.6 measurement room      | 4.75 x 5.4 x 3.0           | 4.75 x 4.15                                                      | -                      | -                            |
| No.7 shielded room         | 4.7 x 7.5 x 2.7            | 4.7 x 7.5                                                        | -                      | -                            |
| No.8 measurement room      | 3.1 x 5.0 x 2.7            | 3.1 x 5.0                                                        | -                      | -                            |
| No.9 measurement room      | 8.8 x 4.6 x 2.8            | 2.4 x 2.4                                                        | -                      | -                            |
| No.10 shielded room        | 3.8 x 2.8 x 2.8            | 3.8 x 2.8                                                        | -                      | -                            |
| No.11 measurement room     | 4.0 x 3.4 x 2.5            | N/A                                                              | -                      | -                            |
| No.12 measurement room     | 2.6 x 3.4 x 2.5            | N/A                                                              | -                      | -                            |
| Large Chamber              | 16.9 x 22.1 x 10.17        | 16.9 x 22.1                                                      | -                      | 10 m                         |
| Small Chamber              | 5.3 x 6.69 x 3.59          | 5.3 x 6.69                                                       | -                      | -                            |

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 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)**

#### **[BLE]**

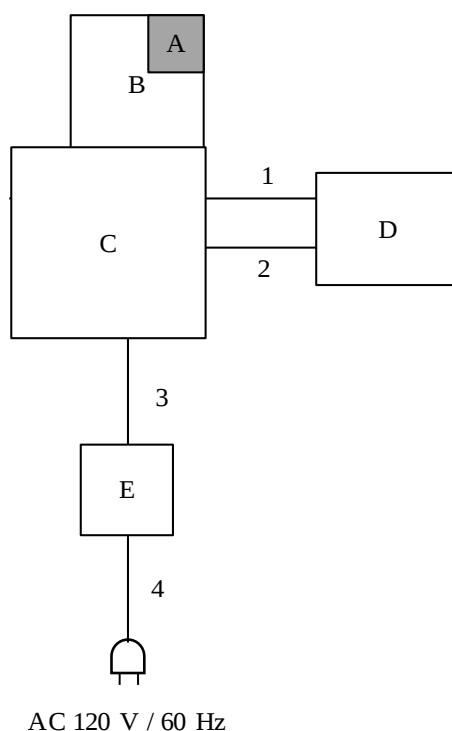
| <b>Mode</b>                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Remarks*</b>            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Bluetooth Low Energy (BLE) 1M-PHY Uncoded PHY (1M-PHY)                                                                                                                                                                                                                                                                                                                                                                       | Maximum Packet Size, PRBS9 |
| Bluetooth Low Energy (BLE) 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: 5 dBm, -18 dBm<br/> Software: SDK139<br/> (Date: November 21, 2022, Storage location: Driven by connected PC)<br/> *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)

| <b>Test Item</b>                                                                                                                                                                                                                                                                                                       | <b>Operating Mode</b>            | <b>Tested frequency</b>          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------|
| Conducted Emission,<br>Radiated Spurious Emission (Below 1 GHz)                                                                                                                                                                                                                                                        | Tx BLE, 1M-PHY *1)               | 2402 MHz                         |
| Radiated Spurious Emission (Above 1 GHz),<br>Maximum Peak Output Power,<br>Power Density,<br>6dB Bandwidth,<br>99% Occupied Bandwidth,<br>Conducted Spurious Emission                                                                                                                                                  | Tx BLE, 1M-PHY<br>Tx BLE, 2M-PHY | 2402 MHz<br>2440 MHz<br>2480 MHz |
| <p>*1) Conducted emissions and Spurious emissions for frequencies below 1 GHz 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

### < Conducted Emission Test >



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

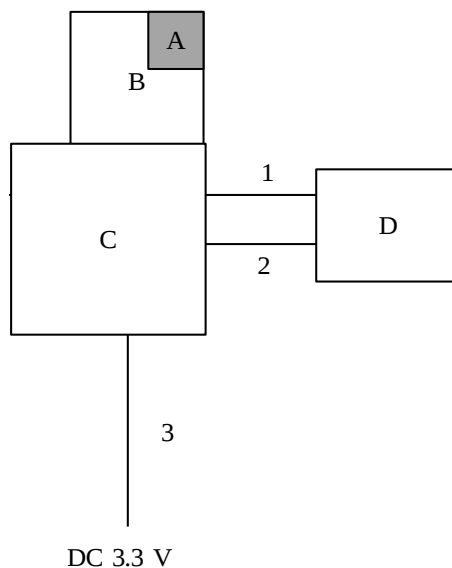
#### Description of EUT and Support Equipment

| No. | Item                 | Model number | Serial Number | Manufacturer                   | Remarks |
|-----|----------------------|--------------|---------------|--------------------------------|---------|
| A   | Communication Module | 2DV          | 2905ES2Q      | Murata Manufacturing Co., Ltd. | EUT     |
| B   | Jig Board            | P2ML10527    | -             | Murata Manufacturing Co., Ltd. | -       |
| C   | Jig Board            | P2ML3635     | -             | Murata Manufacturing Co., Ltd. | -       |
| D   | Jig Board            | P2ML7727     | -             | Murata Manufacturing Co., Ltd. | -       |
| E   | DC Power Supply      | PMC35-2A     | 2871          | KIKUSUI                        | -       |

#### List of Cables Used

| No. | Name         | Length (m) | Shield     |            | Remarks |
|-----|--------------|------------|------------|------------|---------|
|     |              |            | Cable      | Connector  |         |
| 1   | Signal Cable | 0.05       | Unshielded | Unshielded | -       |
| 2   | Signal Cable | 0.20       | Unshielded | Unshielded | -       |
| 3   | DC Cable     | 0.70       | Unshielded | Unshielded | -       |
| 4   | AC Cable     | 1.80       | Unshielded | Unshielded | -       |

< Radiated Emission Test >



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

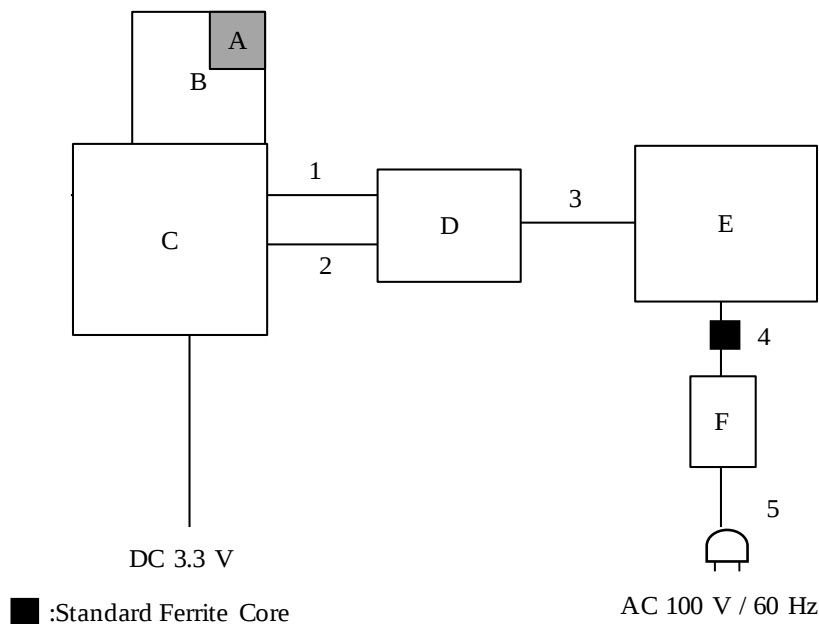
**Description of EUT and Support Equipment**

| No. | Item                 | Model number | Serial Number | Manufacturer                   | Remarks |
|-----|----------------------|--------------|---------------|--------------------------------|---------|
| A   | Communication Module | 2DV          | 2905ES2Q      | Murata Manufacturing Co., Ltd. | EUT     |
| B   | Jig Board            | P2ML10527    | -             | Murata Manufacturing Co., Ltd. | -       |
| C   | Jig Board            | P2ML3635     | -             | Murata Manufacturing Co., Ltd. | -       |
| D   | Jig Board            | P2ML7727     | -             | Murata Manufacturing Co., Ltd. | -       |

**List of Cables Used**

| No. | Name         | Length (m) | Shield     |            | Remarks |
|-----|--------------|------------|------------|------------|---------|
|     |              |            | Cable      | Connector  |         |
| 1   | Signal Cable | 0.05       | Unshielded | Unshielded | -       |
| 2   | Signal Cable | 0.20       | Unshielded | Unshielded | -       |
| 3   | DC Cable     | 2.70       | Unshielded | Unshielded | -       |

< Antenna Terminal Conducted Test >



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

**Description of EUT and Support Equipment**

| No. | Item                 | Model number | Serial Number  | Manufacturer                   | Remarks |
|-----|----------------------|--------------|----------------|--------------------------------|---------|
| A   | Communication Module | 2DV          | 2818ES15       | Murata Manufacturing Co., Ltd. | EUT     |
| B   | Jig Board            | P2ML10467    | -              | Murata Manufacturing Co., Ltd. | -       |
| C   | Jig Board            | P2ML3635     | -              | Murata Manufacturing Co., Ltd. | -       |
| D   | Jig Board            | P2ML7727     | -              | Murata Manufacturing Co., Ltd. | -       |
| E   | Laptop PC            | X1 Carbon    | R9-OH8OBW 15/9 | Lenovo                         | -       |
| F   | AC Adapter           | ADLX45NCC2A  | 36200281       | Lenovo                         | -       |

**List of Cables Used**

| No. | Name         | Length (m) | Shield     |            | Remarks |
|-----|--------------|------------|------------|------------|---------|
|     |              |            | Cable      | Connector  |         |
| 1   | Signal Cable | 0.05       | Unshielded | Unshielded | -       |
| 2   | Signal Cable | 0.20       | Unshielded | Unshielded | -       |
| 3   | USB Cable    | 1.00       | Shielded   | Shielded   | -       |
| 4   | DC Cable     | 1.90       | Unshielded | Unshielded | -       |
| 5   | AC Cable     | 0.90       | Unshielded | Unshielded | -       |

## **SECTION 5: Conducted Emission**

### **Test Procedure and Conditions**

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

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. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

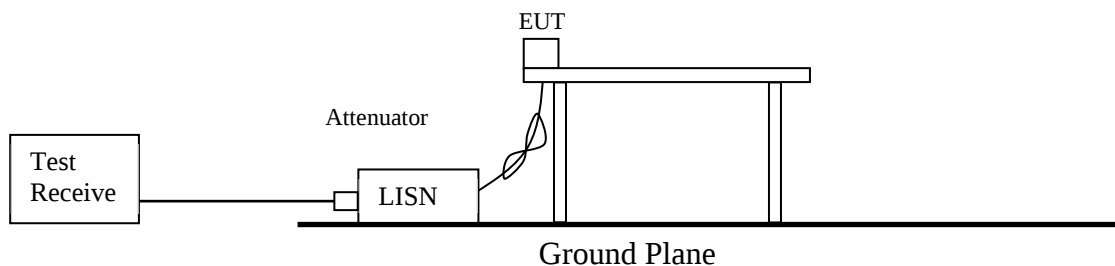
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, 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, 0.5 m by 1.0 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.

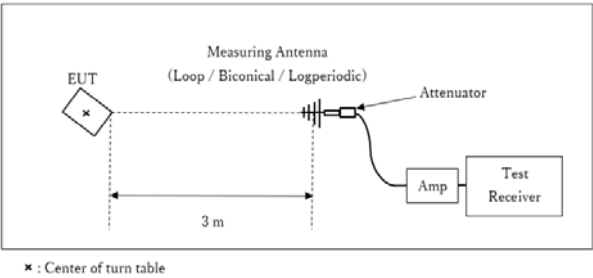
#### **20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).**

|                 |               |                          |                                                                                                                                                                                                                                             |                              |
|-----------------|---------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz              |                                                                                                                                                                                                                                             | 20 dBc                       |
| Instrument Used | Test Receiver | Spectrum Analyzer        |                                                                                                                                                                                                                                             | Spectrum Analyzer            |
| Detector        | QP            | PK                       | AV *1)                                                                                                                                                                                                                                      | PK                           |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz | <u>11.12.2.5.1</u><br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (RMS)<br>Trace: 100 traces<br><u>11.12.2.5.2</u><br>The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results. | RBW: 100 kHz<br>VBW: 300 kHz |

\*1) Average Power Measurement was performed based on ANSI C63.10-2013.

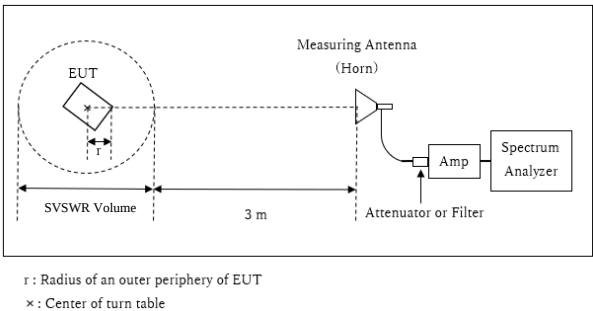
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

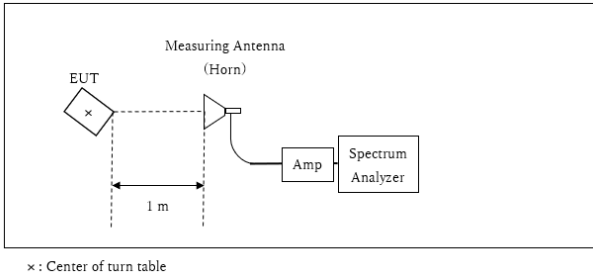
1 GHz to 10 GHz



Distance Factor:  $20 \times \log (3.95 \text{ m} / 3.0 \text{ m}) = 2.39 \text{ dB}$   
\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.95 \text{ m}$

SVSWR Volume : 2.0 m  
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)  
 $r = 0.05 \text{ m}$

10 GHz to 26.5 GHz



Distance Factor:  $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$   
\*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.

The test results and limit are rounded off to one decimal place, 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                    |
|-------------------------------------|-----------------------------------------|-----------------|--------------------|------------|----------------------|----------|------------------------------------|
| 6dB Bandwidth                       | 3 MHz                                   | 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/<br>Average *2) | -        | Power Meter<br>(Sensor: 50 MHz BW) |
| Peak Power Density                  | 1.5 times the 6dB Bandwidth             | 3 kHz           | 10 kHz             | Auto       | Peak                 | Max Hold | Spectrum Analyzer *3)              |
| Conducted Spurious Emission *4) *5) | 9kHz to 150kHz                          | 200 Hz          | 620 Hz             | Auto       | Peak                 | Max Hold | Spectrum Analyzer                  |
|                                     | 150kHz to 30MHz                         | 9.1 kHz         | 27 kHz             |            |                      |          |                                    |

\*1) Peak hold was applied as Worst-case measurement.  
 \*2) Reference data  
 \*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".  
 \*4) In the frequency range below 30MHz, 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 = 9.1 kHz)  
 \*5) 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.

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

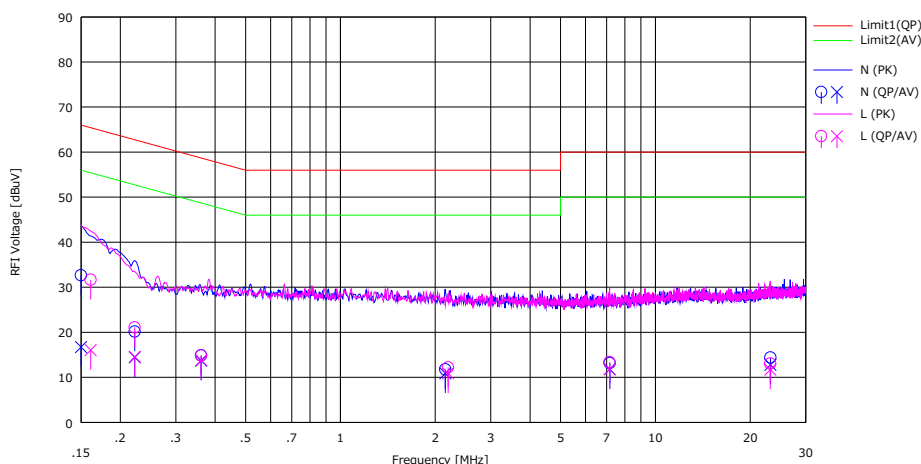
**Test Data** : APPENDIX  
**Test Result** : Pass

## APPENDIX 1: Test Data

### Conducted Emission

Test place: Ise EMC Lab. No.1 Semi Anechoic Chamber  
Date: November 22, 2022  
Temperature / Humidity: 20 deg. C / 50 % RH  
Engineer: Tetsuro Yoshida  
Mode: Tx BT LE\_Uncoded 1M-PHY, 2402 MHz

Limit : FCC\_Part 15 Subpart C(15.207)



| No. | Freq.<br>[MHz] | Reading        |                | LISN<br>[dB] | LOSS<br>[dB] | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|--------------|--------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <AV><br>[dBuV] |              |              | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
| 1   | 0.15000        | 19.50          | 3.60           | 0.04         | 13.09        | 32.63          | 16.73          | 66.00          | 56.00          | 33.37        | 39.27        | N     |         |
| 2   | 0.22225        | 7.00           | 1.30           | 0.04         | 13.11        | 20.15          | 14.45          | 62.73          | 52.73          | 42.58        | 38.28        | N     |         |
| 3   | 0.36115        | 1.70           | 0.50           | 0.04         | 13.14        | 14.88          | 13.68          | 58.70          | 48.70          | 43.82        | 35.02        | N     |         |
| 4   | 2.15200        | -1.70          | -2.60          | 0.06         | 13.41        | 11.77          | 10.87          | 56.00          | 46.00          | 44.23        | 35.13        | N     |         |
| 5   | 7.16500        | -0.80          | -2.10          | 0.14         | 13.80        | 13.14          | 11.84          | 60.00          | 50.00          | 46.86        | 38.16        | N     |         |
| 6   | 23.20000       | -0.50          | -2.10          | 0.37         | 14.52        | 14.39          | 12.79          | 60.00          | 50.00          | 45.61        | 37.21        | N     |         |
| 7   | 0.16105        | 18.50          | 2.90           | 0.07         | 13.09        | 31.66          | 16.06          | 65.41          | 55.41          | 33.75        | 39.35        | L     |         |
| 8   | 0.22225        | 7.90           | 1.40           | 0.06         | 13.11        | 21.07          | 14.57          | 62.73          | 52.73          | 41.66        | 38.16        | L     |         |
| 9   | 0.36115        | 1.60           | 0.60           | 0.07         | 13.14        | 14.81          | 13.81          | 58.70          | 48.70          | 43.89        | 34.89        | L     |         |
| 10  | 2.19700        | -1.30          | -2.60          | 0.08         | 13.41        | 12.19          | 10.89          | 56.00          | 46.00          | 43.81        | 35.11        | L     |         |
| 11  | 7.15600        | -0.60          | -2.20          | 0.16         | 13.80        | 13.36          | 11.76          | 60.00          | 50.00          | 46.64        | 38.24        | L     |         |
| 12  | 23.16000       | -1.90          | -3.20          | 0.41         | 14.51        | 13.02          | 11.72          | 60.00          | 50.00          | 46.98        | 38.28        | L     |         |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)  
Except for the above table: adequate margin data below the limits.

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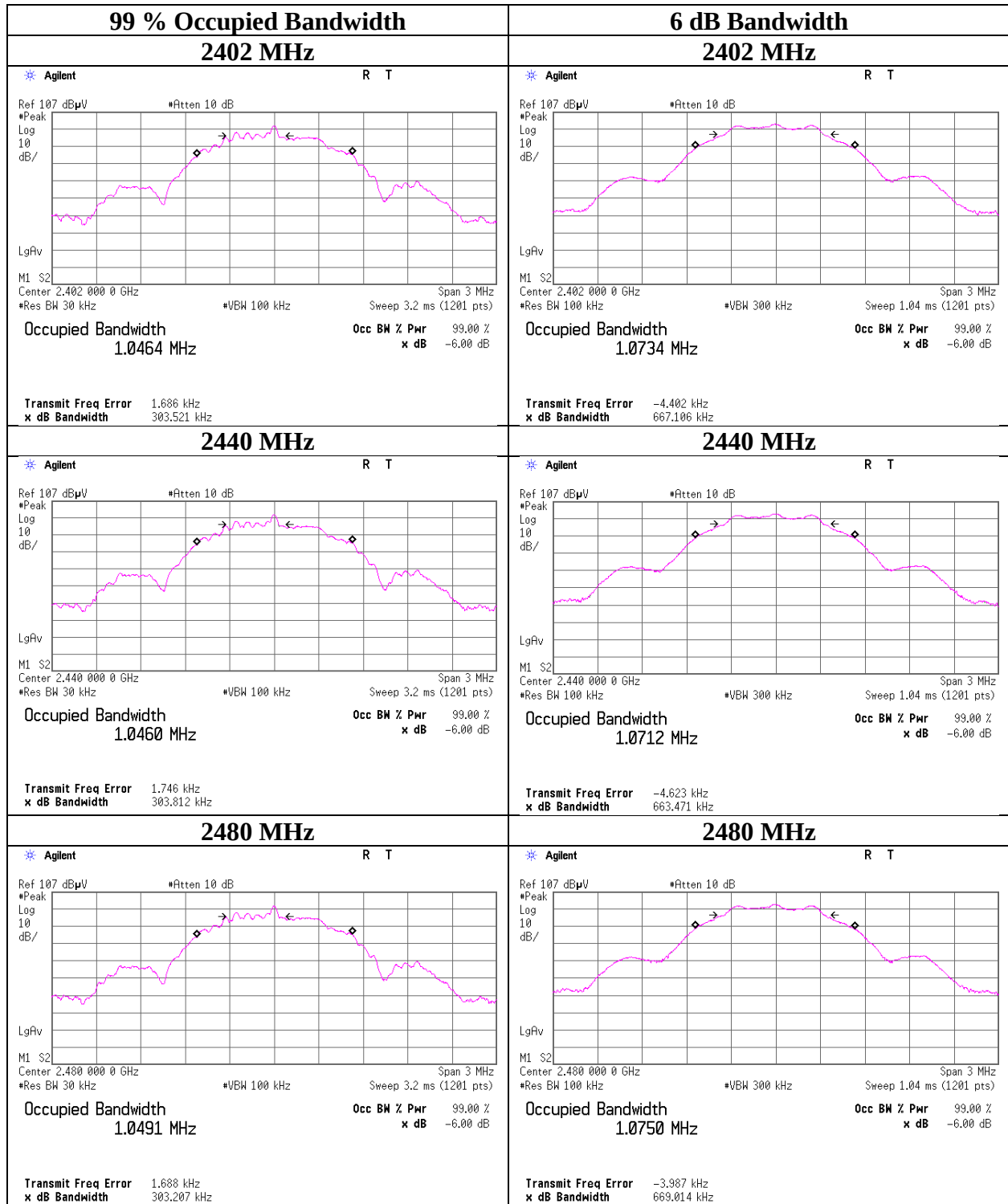
### **99 % Occupied Bandwidth and 6 dB Bandwidth**

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | November 21, 2022                  |
| Temperature / Humidity | 22 deg. C / 60 % RH                |
| Engineer               | Keiya Ido                          |
| Mode                   | Tx BT LE                           |

| Mode   | Frequency<br>[MHz] | 99 % Occupied<br>Bandwidth<br>[kHz] | 6 dB Bandwidth<br>[MHz] | Limit for<br>6 dB Bandwidth<br>[MHz] |
|--------|--------------------|-------------------------------------|-------------------------|--------------------------------------|
| 1M-PHY | 2402               | 1046.4                              | 0.667                   | > 0.5000                             |
|        | 2440               | 1046.0                              | 0.663                   | > 0.5000                             |
|        | 2480               | 1049.1                              | 0.669                   | > 0.5000                             |
| 2M-PHY | 2402               | 2071.5                              | 1.143                   | > 0.5000                             |
|        | 2440               | 2072.5                              | 1.138                   | > 0.5000                             |
|        | 2480               | 2073.1                              | 1.140                   | > 0.5000                             |

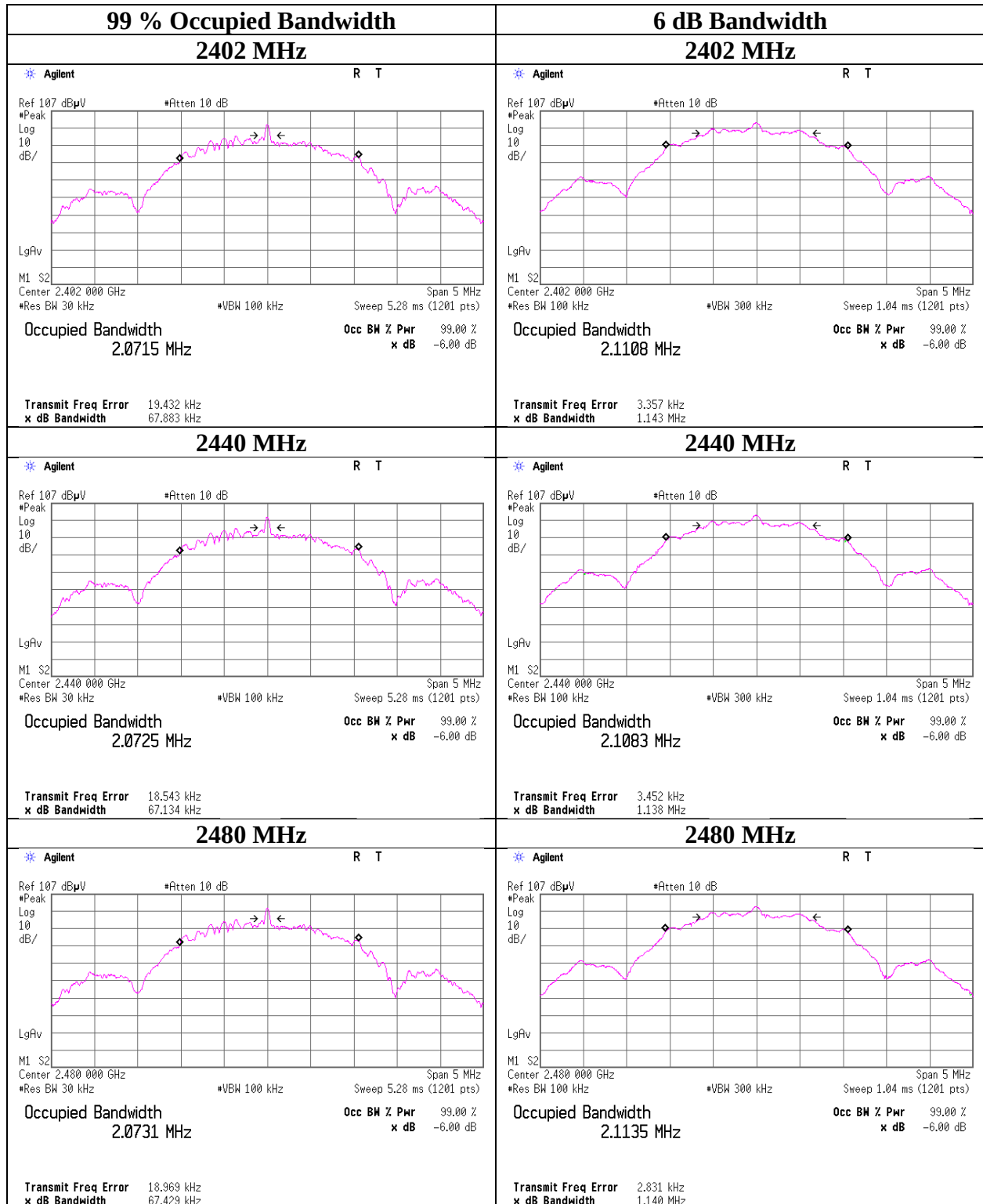
## 99 % Occupied Bandwidth and 6 dB Bandwidth

### BT LE 1M-PHY



## 99 % Occupied Bandwidth and 6 dB Bandwidth

### BT LE 2M-PHY



## Maximum Peak Output Power

Test place Ise EMC Lab. No.8 Measurement Room  
Date November 21, 2022  
Temperature / Humidity 22 deg. C / 60 % RH  
Engineer Keiya Ido  
Mode Tx BT LE 1M-PHY 2402 MHz

### Power Setting 5 dBm

| 1M-PHY         |                  |                       |                        |        | Conducted Power |       |      |                | e.i.r.p. for RSS-247     |        |      |       |      |                |
|----------------|------------------|-----------------------|------------------------|--------|-----------------|-------|------|----------------|--------------------------|--------|------|-------|------|----------------|
| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |                 | Limit |      | Margin<br>[dB] | Antenna<br>Gain<br>[dBi] | Result |      | Limit |      | Margin<br>[dB] |
|                |                  |                       |                        | [dBm]  | [mW]            | [dBm] | [mW] |                |                          | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2402           | -7.13            | 1.87                  | 9.79                   | 4.53   | 2.84            | 30.00 | 1000 | 25.47          | 1.00                     | 5.53   | 3.57 | 36.02 | 4000 | 30.49          |
| 2440           | -7.22            | 1.88                  | 9.79                   | 4.45   | 2.79            | 30.00 | 1000 | 25.55          | 1.00                     | 5.45   | 3.51 | 36.02 | 4000 | 30.57          |
| 2480           | -7.34            | 1.90                  | 9.79                   | 4.35   | 2.72            | 30.00 | 1000 | 25.65          | 1.00                     | 5.35   | 3.43 | 36.02 | 4000 | 30.67          |

| 2M-PHY         |                  |                       |                        |        | Conducted Power |       |      |                | e.i.r.p. for RSS-247     |        |      |       |      |                |
|----------------|------------------|-----------------------|------------------------|--------|-----------------|-------|------|----------------|--------------------------|--------|------|-------|------|----------------|
| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |                 | Limit |      | Margin<br>[dB] | Antenna<br>Gain<br>[dBi] | Result |      | Limit |      | Margin<br>[dB] |
|                |                  |                       |                        | [dBm]  | [mW]            | [dBm] | [mW] |                |                          | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2402           | -7.16            | 1.87                  | 9.79                   | 4.50   | 2.82            | 30.00 | 1000 | 25.50          | 1.00                     | 5.50   | 3.55 | 36.02 | 4000 | 30.52          |
| 2440           | -7.21            | 1.88                  | 9.79                   | 4.46   | 2.79            | 30.00 | 1000 | 25.54          | 1.00                     | 5.46   | 3.52 | 36.02 | 4000 | 30.56          |
| 2480           | -7.37            | 1.90                  | 9.79                   | 4.32   | 2.70            | 30.00 | 1000 | 25.68          | 1.00                     | 5.32   | 3.40 | 36.02 | 4000 | 30.70          |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

\*The equipment and cables were not used for factor 0 dB of the data sheets.

### Power Setting -18 dBm

| 1M-PHY |         |          |            |             | Conducted Power |      |       |      |        | e.i.r.p. for RSS-247 |        |      |       |      |        |
|--------|---------|----------|------------|-------------|-----------------|------|-------|------|--------|----------------------|--------|------|-------|------|--------|
| Freq.  | Reading | AMP Gain | Cable Loss | Atten. Loss | Result          |      | Limit |      | Margin | Antenna Gain         | Result |      | Limit |      | Margin |
| [MHz]  | [dBm]   | [dB]     | [dB]       | [dB]        | [dBm]           | [mW] | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW] | [dBm] | [mW] | [dB]   |
| 2402   | -7.61   | 32.87    | 1.87       | 19.54       | -19.07          | 0.01 | 30.00 | 1000 | 49.07  | 1.00                 | -18.07 | 0.02 | 36.02 | 4000 | 54.09  |
| 2440   | -7.77   | 32.85    | 1.88       | 19.54       | -19.20          | 0.01 | 30.00 | 1000 | 49.20  | 1.00                 | -18.20 | 0.02 | 36.02 | 4000 | 54.22  |
| 2480   | -7.87   | 32.84    | 1.90       | 19.54       | -19.27          | 0.01 | 30.00 | 1000 | 49.27  | 1.00                 | -18.27 | 0.01 | 36.02 | 4000 | 54.29  |

| 2M-PHY |         |          |            |             | Conducted Power |      |       |      |        | e.i.r.p. for RSS-247 |        |      |       |      |        |
|--------|---------|----------|------------|-------------|-----------------|------|-------|------|--------|----------------------|--------|------|-------|------|--------|
| Freq.  | Reading | AMP Gain | Cable Loss | Atten. Loss | Result          |      | Limit |      | Margin | Antenna Gain         | Result |      | Limit |      | Margin |
| [MHz]  | [dBm]   | [dB]     | [dB]       | [dB]        | [dBm]           | [mW] | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW] | [dBm] | [mW] | [dB]   |
| 2402   | -7.66   | 32.87    | 1.87       | 19.54       | -19.12          | 0.01 | 30.00 | 1000 | 49.12  | 1.00                 | -18.12 | 0.02 | 36.02 | 4000 | 54.14  |
| 2440   | -7.79   | 32.85    | 1.88       | 19.54       | -19.22          | 0.01 | 30.00 | 1000 | 49.22  | 1.00                 | -18.22 | 0.02 | 36.02 | 4000 | 54.24  |
| 2480   | -7.92   | 32.84    | 1.90       | 19.54       | -19.32          | 0.01 | 30.00 | 1000 | 49.32  | 1.00                 | -18.32 | 0.01 | 36.02 | 4000 | 54.34  |

Sample Calculation:

Result = Reading - AMP Gain + Cable Loss + Attenuator Loss

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

\*The equipment and cables were not used for factor 0 dB of the data sheets.

## Average Output Power (Reference data for RF Exposure / SAR testing)

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | November 21, 2022                  |
| Temperature / Humidity | 22 deg. C / 60 % RH                |
| Engineer               | Keiya Ido                          |
| Mode                   | Tx BT LE                           |

### Power Setting 5 dBm

#### 1M-PHY

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2402           | -9.30            | 1.87                  | 9.79                   | 2.36                     | 1.72 | 1.80                   | 4.16                            | 2.61 |
| 2440           | -9.35            | 1.88                  | 9.79                   | 2.32                     | 1.71 | 1.80                   | 4.12                            | 2.58 |
| 2480           | -9.50            | 1.90                  | 9.79                   | 2.19                     | 1.66 | 1.80                   | 3.99                            | 2.51 |

#### 2M-PHY

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2402           | -11.96           | 1.87                  | 9.79                   | -0.30                    | 0.93 | 4.36                   | 4.06                            | 2.55 |
| 2440           | -12.00           | 1.88                  | 9.79                   | -0.33                    | 0.93 | 4.36                   | 4.03                            | 2.53 |
| 2480           | -12.15           | 1.90                  | 9.79                   | -0.46                    | 0.90 | 4.36                   | 3.90                            | 2.45 |

Sample Calculation:

Result (Time average) = Reading + Cable Loss + Attenuator Loss

Result (Burst power average) = Time average + Duty factor

\*The equipment and cables were not used for factor 0 dB of the data sheets.

### Power Setting -18 dBm

#### 1M-PHY

| Freq.<br>[MHz] | Reading<br>[dBm] | AMP<br>Gain<br>[dB] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|---------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                     |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2402           | -9.79            | 32.87               | 1.87                  | 19.54                  | -21.25                   | 0.01 | 1.80                   | -19.45                          | 0.01 |
| 2440           | -9.93            | 32.85               | 1.88                  | 19.54                  | -21.36                   | 0.01 | 1.80                   | -19.56                          | 0.01 |
| 2480           | -10.05           | 32.84               | 1.90                  | 19.54                  | -21.45                   | 0.01 | 1.80                   | -19.65                          | 0.01 |

#### 2M-PHY

| Freq.<br>[MHz] | Reading<br>[dBm] | AMP<br>Gain<br>[dB] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|---------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                     |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2402           | -12.44           | 32.87               | 1.87                  | 19.54                  | -23.90                   | 0.00 | 4.36                   | -19.54                          | 0.01 |
| 2440           | -12.57           | 32.85               | 1.88                  | 19.54                  | -24.00                   | 0.00 | 4.36                   | -19.64                          | 0.01 |
| 2480           | -12.71           | 32.84               | 1.90                  | 19.54                  | -24.11                   | 0.00 | 4.36                   | -19.75                          | 0.01 |

Sample Calculation:

Result (Time average) = Reading - AMP Gain + Cable Loss + Attenuator Loss

Result (Burst power average) = Time average + Duty factor

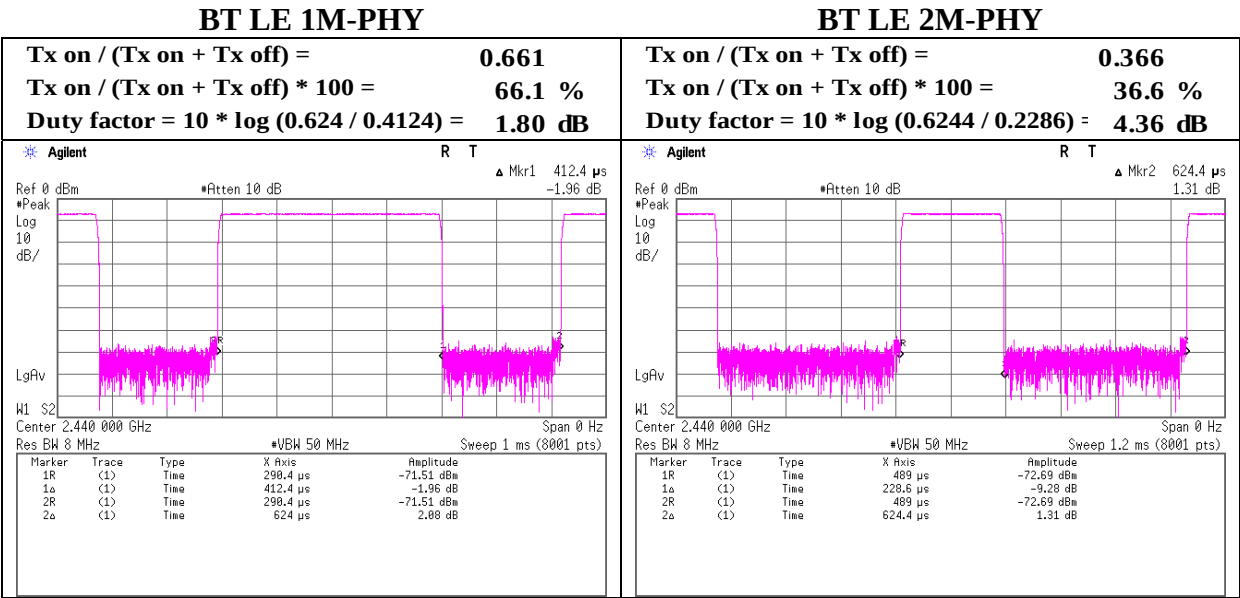
\*The equipment and cables were not used for factor 0 dB of the data sheets.

**The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.**

Burst rate confirmation

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
November 21, 2022  
22 deg. C / 60 % RH  
Keiya Ido  
Tx BT LE



## Radiated Spurious Emission

|                        |                          |
|------------------------|--------------------------|
| Test place             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| Mode                   | Tx BT LE 1M-PHY 2402 MHz |

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(QP / PK)<br>[dBuV] | Reading<br>(AV)<br>[dBuV] | Ant.<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(QP / PK)<br>[dBuV/m] | Result<br>(AV)<br>[dBuV/m] | Limit<br>(QP / PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(QP / PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Remark      |
|-------------------------|--------------------|--------------------------------|---------------------------|--------------------------|--------------|--------------|------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------|-----------------------------|------------------------|-------------|
| Hori.                   | 36.8               | 33.5                           | -                         | 16.0                     | 7.4          | 39.0         | -                      | 17.8                            | -                          | 40.0                           | -                         | 22.2                        | -                      |             |
| Hori.                   | 80.0               | 38.1                           | -                         | 7.0                      | 8.1          | 39.1         | -                      | 14.1                            | -                          | 40.0                           | -                         | 25.9                        | -                      |             |
| Hori.                   | 114.7              | 31.2                           | -                         | 12.2                     | 8.6          | 39.1         | -                      | 12.8                            | -                          | 43.5                           | -                         | 30.7                        | -                      |             |
| Hori.                   | 186.5              | 27.7                           | -                         | 16.3                     | 9.4          | 39.1         | -                      | 14.2                            | -                          | 43.5                           | -                         | 29.3                        | -                      |             |
| Hori.                   | 222.4              | 30.4                           | -                         | 12.8                     | 9.7          | 39.1         | -                      | 13.8                            | -                          | 46.0                           | -                         | 32.2                        | -                      |             |
| Hori.                   | 491.3              | 29.2                           | -                         | 18.2                     | 11.8         | 38.6         | -                      | 20.6                            | -                          | 46.0                           | -                         | 25.4                        | -                      |             |
| Hori.                   | 2390.0             | 50.0                           | 36.9                      | 27.6                     | 5.6          | 36.3         | 1.8                    | 47.0                            | 35.7                       | 73.9                           | 53.9                      | 26.9                        | 18.2                   | *1)         |
| Hori.                   | 4804.0             | 42.1                           | 34.4                      | 31.5                     | 7.8          | 35.8         | -                      | 45.8                            | 38.1                       | 73.9                           | 53.9                      | 28.2                        | 15.8                   | Floor noise |
| Hori.                   | 7206.0             | 42.9                           | 35.0                      | 35.9                     | 9.1          | 35.9         | -                      | 52.1                            | 44.1                       | 73.9                           | 53.9                      | 21.9                        | 9.8                    | Floor noise |
| Hori.                   | 9608.0             | 43.4                           | 35.6                      | 38.7                     | 9.7          | 36.3         | -                      | 55.5                            | 47.8                       | 73.9                           | 53.9                      | 18.4                        | 6.2                    | Floor noise |
| Vert.                   | 36.8               | 33.4                           | -                         | 16.0                     | 7.4          | 39.0         | -                      | 17.7                            | -                          | 40.0                           | -                         | 22.3                        | -                      |             |
| Vert.                   | 80.0               | 37.9                           | -                         | 7.0                      | 8.1          | 39.1         | -                      | 13.9                            | -                          | 40.0                           | -                         | 26.1                        | -                      |             |
| Vert.                   | 114.7              | 34.3                           | -                         | 12.2                     | 8.6          | 39.1         | -                      | 15.9                            | -                          | 43.5                           | -                         | 27.6                        | -                      |             |
| Vert.                   | 186.5              | 27.9                           | -                         | 16.3                     | 9.4          | 39.1         | -                      | 14.4                            | -                          | 43.5                           | -                         | 29.1                        | -                      |             |
| Vert.                   | 222.4              | 30.3                           | -                         | 12.8                     | 9.7          | 39.1         | -                      | 13.7                            | -                          | 46.0                           | -                         | 32.3                        | -                      |             |
| Vert.                   | 491.3              | 29.3                           | -                         | 18.2                     | 11.8         | 38.6         | -                      | 20.7                            | -                          | 46.0                           | -                         | 25.3                        | -                      |             |
| Vert.                   | 2390.0             | 49.9                           | 37.0                      | 27.6                     | 5.6          | 36.3         | 1.8                    | 46.9                            | 35.8                       | 73.9                           | 53.9                      | 27.1                        | 18.1                   | *1)         |
| Vert.                   | 4804.0             | 42.1                           | 34.4                      | 31.5                     | 7.8          | 35.8         | -                      | 45.7                            | 38.0                       | 73.9                           | 53.9                      | 28.2                        | 15.9                   | Floor noise |
| Vert.                   | 7206.0             | 42.9                           | 36.0                      | 35.9                     | 9.1          | 35.9         | -                      | 52.0                            | 45.1                       | 73.9                           | 53.9                      | 21.9                        | 8.8                    | Floor noise |
| Vert.                   | 9608.0             | 43.3                           | 35.6                      | 38.7                     | 9.7          | 36.3         | -                      | 55.4                            | 47.7                       | 73.9                           | 53.9                      | 18.5                        | 6.2                    | Floor noise |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*QP detector was used up to 1GHz.

\*1) Not Out of Band emission(Leakage Power)

### 20dBc Data Sheet

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(PK)<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|-------------------------|--------------------|---------------------------|-------------------------|--------------|--------------|--------------------|-------------------|----------------|---------|
| Hori.                   | 2402.0             | 98.3                      | 27.6                    | 5.6          | 36.3         | 95.3               | -                 | -              | Carrier |
| Hori.                   | 2400.0             | 57.2                      | 27.6                    | 5.6          | 36.3         | 54.2               | 75.3              | 21.1           |         |
| Vert.                   | 2402.0             | 98.9                      | 27.6                    | 5.6          | 36.3         | 95.8               | -                 | -              | Carrier |
| Vert.                   | 2400.0             | 57.9                      | 27.6                    | 5.6          | 36.3         | 54.8               | 75.8              | 21.0           |         |

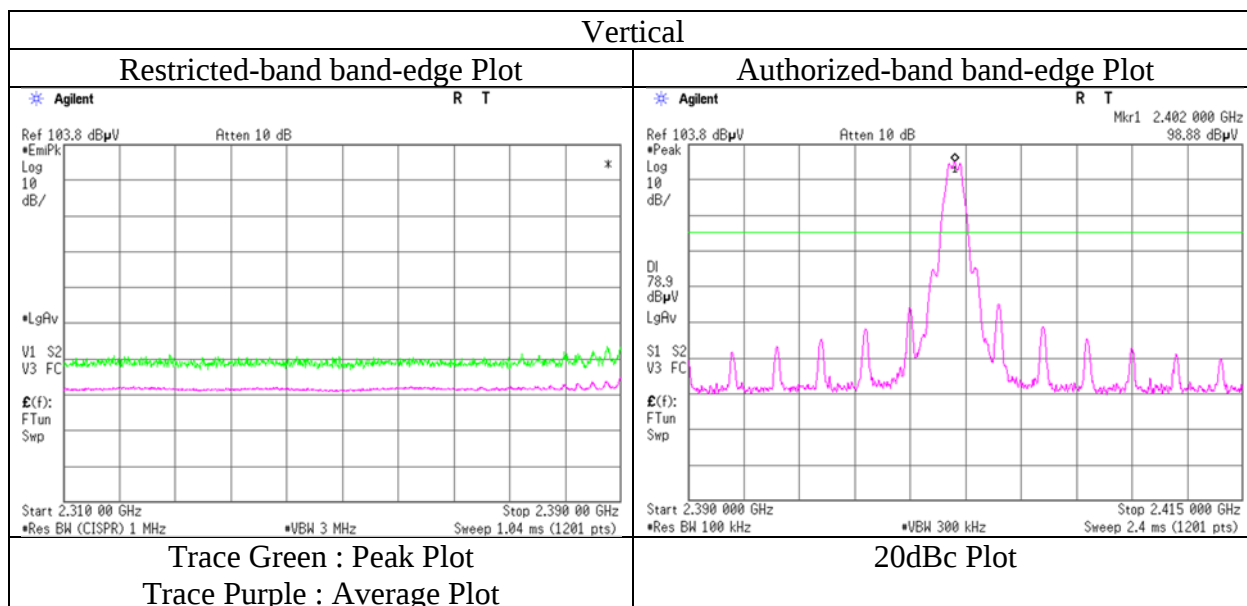
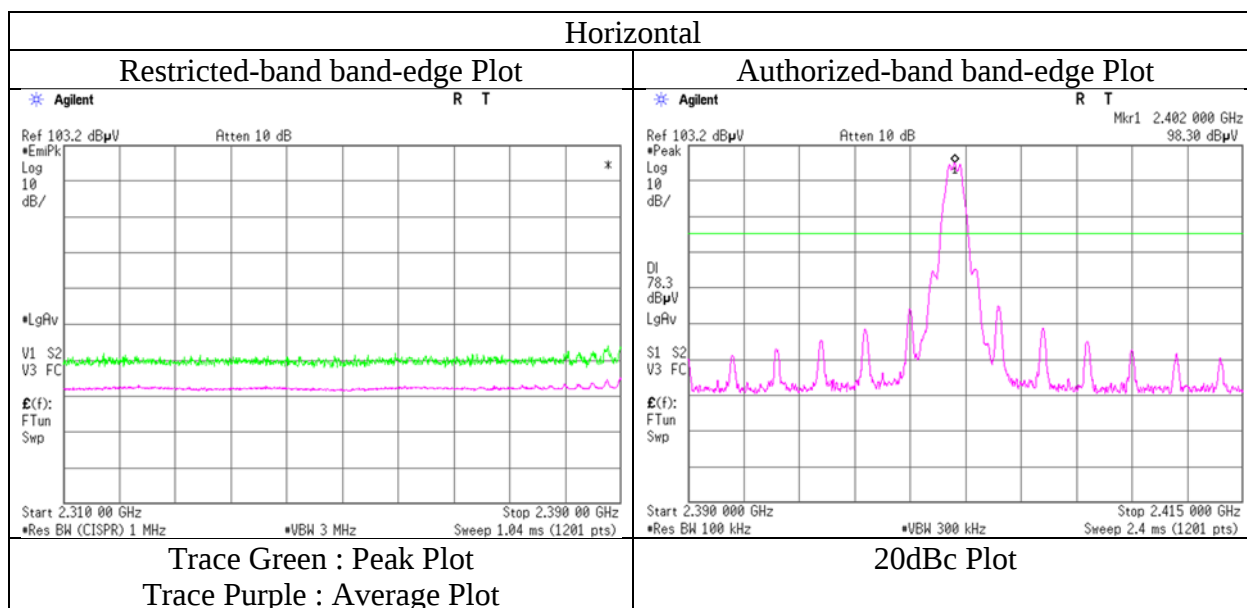
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log (3.95 m / 3.0 m) = 2.39 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

|                        |                          |
|------------------------|--------------------------|
| Test place             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| 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 was shown in tabular data.

## Radiated Spurious Emission

|                        |                          |
|------------------------|--------------------------|
| Test place             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| Mode                   | Tx BT LE 1M-PHY 2440 MHz |

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(QP / PK)<br>[dBuV] | Reading<br>(AV)<br>[dBuV] | Ant.<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(QP / PK)<br>[dBuV/m] | Result<br>(AV)<br>[dBuV/m] | Limit<br>(QP / PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(QP / PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Remark      |
|-------------------------|--------------------|--------------------------------|---------------------------|--------------------------|--------------|--------------|------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------|-----------------------------|------------------------|-------------|
| Hori.                   | 4880.0             | 42.3                           | 34.3                      | 31.6                     | 7.8          | 35.7         | -                      | 46.0                            | 38.0                       | 73.9                           | 53.9                      | 27.9                        | 15.9                   | Floor noise |
| Hori.                   | 7320.0             | 42.7                           | 35.2                      | 36.1                     | 9.1          | 35.9         | -                      | 52.0                            | 44.5                       | 73.9                           | 53.9                      | 21.9                        | 9.4                    | Floor noise |
| Hori.                   | 9760.0             | 43.4                           | 35.2                      | 39.1                     | 9.7          | 36.4         | -                      | 55.9                            | 47.7                       | 73.9                           | 53.9                      | 18.0                        | 6.2                    | Floor noise |
| Vert.                   | 4880.0             | 42.1                           | 34.5                      | 31.6                     | 7.8          | 35.7         | -                      | 45.8                            | 38.2                       | 73.9                           | 53.9                      | 28.1                        | 15.7                   | Floor noise |
| Vert.                   | 7320.0             | 42.9                           | 35.8                      | 36.1                     | 9.1          | 35.9         | -                      | 52.2                            | 45.1                       | 73.9                           | 53.9                      | 21.7                        | 8.8                    | Floor noise |
| Vert.                   | 9760.0             | 43.1                           | 35.1                      | 39.1                     | 9.7          | 36.4         | -                      | 55.6                            | 47.6                       | 73.9                           | 53.9                      | 18.3                        | 6.3                    | Floor noise |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*QP detector was used up to 1GHz.

|                  |                   |                                                            |
|------------------|-------------------|------------------------------------------------------------|
| Distance factor: | 1 GHz - 10 GHz    | $20\log(3.95 \text{ m} / 3.0 \text{ m}) = 2.39 \text{ dB}$ |
|                  | 10 GHz - 26.5 GHz | $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$  |

## Radiated Spurious Emission

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab.  
No.1  
November 22, 2022  
20 deg. C / 50 % RH  
Tetsuro Yoshida  
(Above 1 GHz)  
Tx BT LE 1M-PHY 2480 MHz

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(QP / PK)<br>[dBuV] | Reading<br>(AV)<br>[dBuV] | Ant.<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(QP / PK)<br>[dBuV/m] | Result<br>(AV)<br>[dBuV/m] | Limit<br>(QP / PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(QP / PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Remark      |
|-------------------------|--------------------|--------------------------------|---------------------------|--------------------------|--------------|--------------|------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------|-----------------------------|------------------------|-------------|
| Hori.                   | 2483.5             | 57.6                           | 45.0                      | 27.5                     | 5.7          | 36.3         | 1.8                    | 54.5                            | 43.7                       | 73.9                           | 53.9                      | 19.4                        | 10.2                   | *1)         |
| Hori.                   | 2484.0             | 60.7                           | 44.0                      | 27.5                     | 5.7          | 36.3         | 1.8                    | 57.6                            | 42.7                       | 73.9                           | 53.9                      | 16.3                        | 11.2                   |             |
| Hori.                   | 4960.0             | 42.3                           | 34.3                      | 31.7                     | 7.8          | 35.7         | -                      | 46.1                            | 38.1                       | 73.9                           | 53.9                      | 27.8                        | 15.8                   | Floor noise |
| Hori.                   | 7440.0             | 42.5                           | 35.3                      | 36.3                     | 9.1          | 35.9         | -                      | 52.0                            | 44.7                       | 73.9                           | 53.9                      | 22.0                        | 9.2                    | Floor noise |
| Hori.                   | 9920.0             | 43.4                           | 35.1                      | 39.1                     | 9.8          | 36.4         | -                      | 55.8                            | 47.5                       | 73.9                           | 53.9                      | 18.1                        | 6.4                    | Floor noise |
| Vert.                   | 2483.5             | 52.6                           | 40.3                      | 27.5                     | 5.7          | 36.3         | 1.8                    | 49.5                            | 39.0                       | 73.9                           | 53.9                      | 24.5                        | 14.9                   | *1)         |
| Vert.                   | 2484.0             | 55.9                           | 39.9                      | 27.5                     | 5.7          | 36.3         | 1.8                    | 52.8                            | 38.6                       | 73.9                           | 53.9                      | 21.1                        | 15.3                   |             |
| Vert.                   | 4960.0             | 42.1                           | 34.6                      | 31.7                     | 7.8          | 35.7         | -                      | 45.9                            | 38.4                       | 73.9                           | 53.9                      | 28.0                        | 15.5                   | Floor noise |
| Vert.                   | 7440.0             | 42.9                           | 35.7                      | 36.3                     | 9.1          | 35.9         | -                      | 52.3                            | 45.1                       | 73.9                           | 53.9                      | 21.6                        | 8.8                    | Floor noise |
| Vert.                   | 9920.0             | 43.1                           | 35.1                      | 39.1                     | 9.8          | 36.4         | -                      | 55.5                            | 47.5                       | 73.9                           | 53.9                      | 18.4                        | 6.4                    | Floor noise |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*QP detector was used up to 1GHz.

\*1) Not Out of Band emission(Leakage Power)

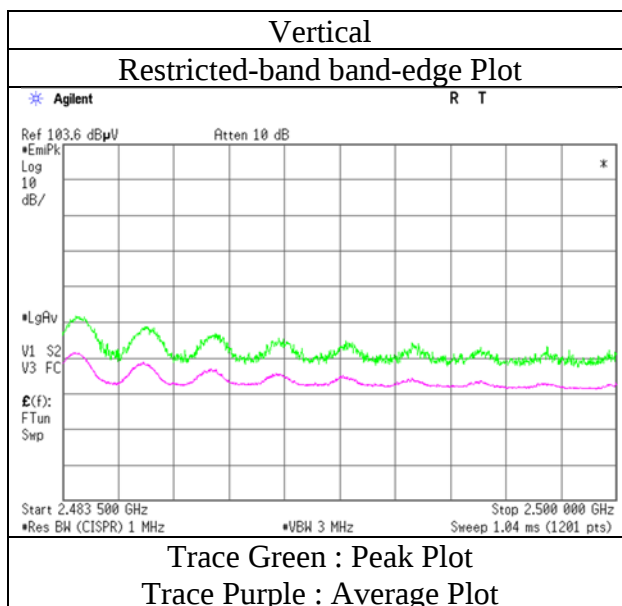
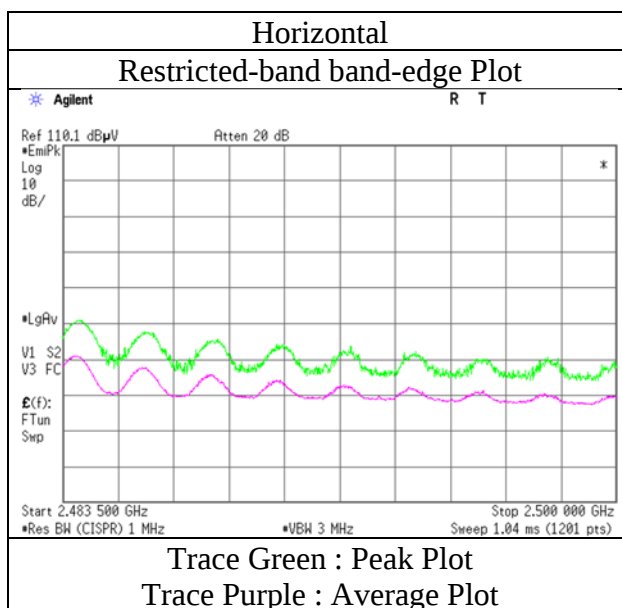
Distance factor:      1 GHz - 10 GHz       $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$   
                                  10 GHz - 26.5 GHz       $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer

Ise EMC Lab.  
No.1  
November 22, 2022  
20 deg. C / 50 % RH  
Tetsuro Yoshida  
(Above 1 GHz)  
Tx BT LE 1M-PHY 2480 MHz

Mode



\* 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             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| Mode                   | Tx BT LE 2M-PHY 2402 MHz |

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(QP / PK)<br>[dBuV] | Reading<br>(AV)<br>[dBuV] | Ant.<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(QP / PK)<br>[dBuV/m] | Result<br>(AV)<br>[dBuV/m] | Limit<br>(QP / PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(QP / PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Remark      |
|-------------------------|--------------------|--------------------------------|---------------------------|--------------------------|--------------|--------------|------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------|-----------------------------|------------------------|-------------|
| Hori.                   | 2390.0             | 51.7                           | 38.2                      | 27.6                     | 5.6          | 36.3         | 4.4                    | 48.6                            | 39.5                       | 73.9                           | 53.9                      | 25.3                        | 14.4                   | *1)         |
| Hori.                   | 4804.0             | 42.2                           | 34.5                      | 31.5                     | 7.8          | 35.8         | -                      | 45.9                            | 38.1                       | 73.9                           | 53.9                      | 28.0                        | 15.8                   | Floor noise |
| Hori.                   | 7206.0             | 42.8                           | 35.1                      | 35.9                     | 9.1          | 35.9         | -                      | 51.9                            | 44.2                       | 73.9                           | 53.9                      | 22.0                        | 9.7                    | Floor noise |
| Hori.                   | 9608.0             | 43.4                           | 35.5                      | 38.7                     | 9.7          | 36.3         | -                      | 55.5                            | 47.6                       | 73.9                           | 53.9                      | 18.4                        | 6.3                    | Floor noise |
| Vert.                   | 2390.0             | 47.9                           | 36.2                      | 27.6                     | 5.6          | 36.3         | 4.4                    | 44.9                            | 37.5                       | 73.9                           | 53.9                      | 29.1                        | 16.4                   | *1)         |
| Vert.                   | 4804.0             | 42.2                           | 34.4                      | 31.5                     | 7.8          | 35.8         | -                      | 45.8                            | 38.1                       | 73.9                           | 53.9                      | 28.1                        | 15.9                   | Floor noise |
| Vert.                   | 7206.0             | 42.9                           | 35.3                      | 35.9                     | 9.1          | 35.9         | -                      | 52.0                            | 44.4                       | 73.9                           | 53.9                      | 21.9                        | 9.5                    | Floor noise |
| Vert.                   | 9608.0             | 43.3                           | 35.6                      | 38.7                     | 9.7          | 36.3         | -                      | 55.4                            | 47.7                       | 73.9                           | 53.9                      | 18.5                        | 6.2                    | Floor noise |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*QP detector was used up to 1GHz.

\*1) W126

### 20dBc Data Sheet

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(PK)<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|-------------------------|--------------------|---------------------------|-------------------------|--------------|--------------|--------------------|-------------------|----------------|---------|
| Hori.                   | 2402.0             | 95.8                      | 27.6                    | 5.6          | 36.3         | 92.7               | -                 | -              | Carrier |
| Hori.                   | 2400.0             | 64.6                      | 27.6                    | 5.6          | 36.3         | 61.6               | 72.7              | 11.2           |         |
| Vert.                   | 2402.0             | 102.4                     | 27.6                    | 5.6          | 36.3         | 99.3               | -                 | -              | Carrier |
| Vert.                   | 2400.0             | 71.3                      | 27.6                    | 5.6          | 36.3         | 68.3               | 79.3              | 11.1           |         |

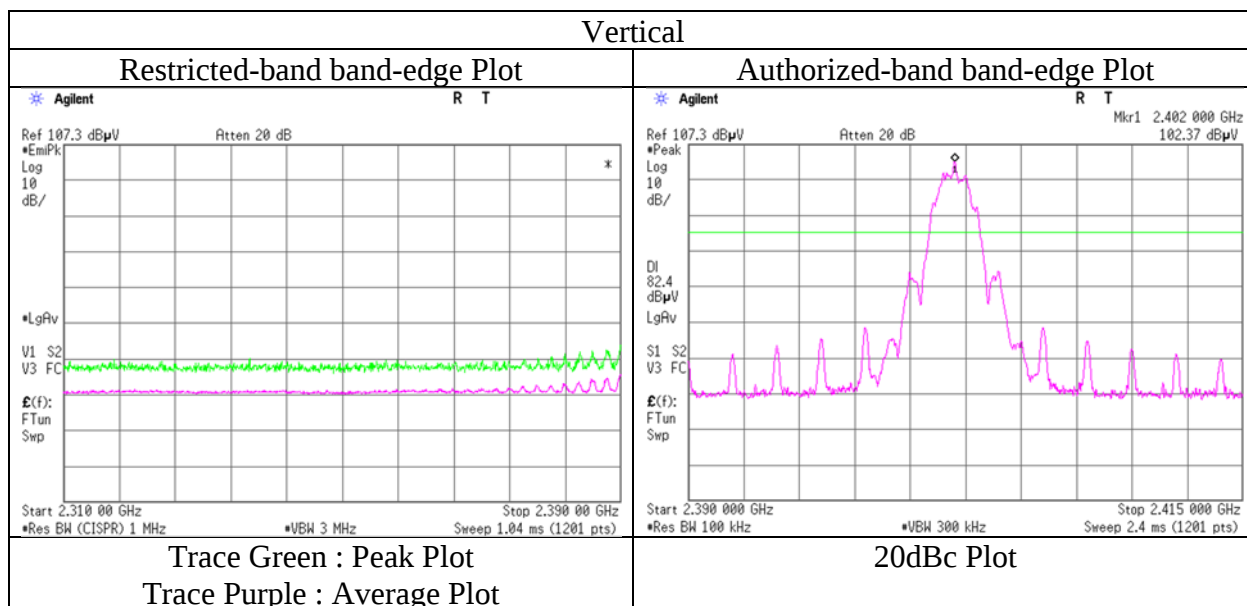
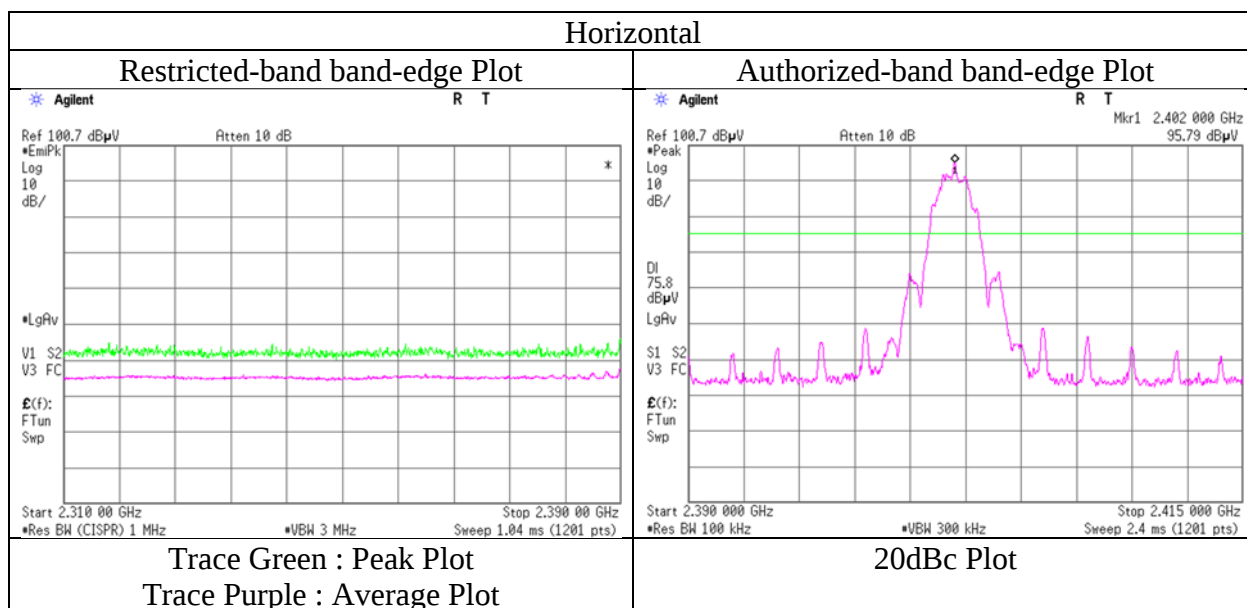
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor: 1 GHz - 10 GHz 20log (3.95 m / 3.0 m) = 2.39 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

|                        |                          |
|------------------------|--------------------------|
| Test place             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| 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 was shown in tabular data.

## Radiated Spurious Emission

|                        |                          |
|------------------------|--------------------------|
| Test place             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| Mode                   | Tx BT LE 2M-PHY 2440 MHz |

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(QP / PK)<br>[dBuV] | Reading<br>(AV)<br>[dBuV] | Ant.<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(QP / PK)<br>[dBuV/m] | Result<br>(AV)<br>[dBuV/m] | Limit<br>(QP / PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(QP / PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Remark      |
|-------------------------|--------------------|--------------------------------|---------------------------|--------------------------|--------------|--------------|------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------|-----------------------------|------------------------|-------------|
| Hori.                   | 4880.0             | 42.3                           | 34.4                      | 31.6                     | 7.8          | 35.7         | -                      | 46.0                            | 38.1                       | 73.9                           | 53.9                      | 28.0                        | 15.8                   | Floor noise |
| Hori.                   | 7320.0             | 42.7                           | 35.3                      | 36.1                     | 9.1          | 35.9         | -                      | 51.9                            | 44.6                       | 73.9                           | 53.9                      | 22.0                        | 9.3                    | Floor noise |
| Hori.                   | 9760.0             | 43.4                           | 35.2                      | 39.1                     | 9.7          | 36.4         | -                      | 55.9                            | 47.7                       | 73.9                           | 53.9                      | 18.0                        | 6.2                    | Floor noise |
| Vert.                   | 4880.0             | 42.2                           | 34.4                      | 31.6                     | 7.8          | 35.7         | -                      | 45.9                            | 38.1                       | 73.9                           | 53.9                      | 28.0                        | 15.8                   | Floor noise |
| Vert.                   | 7320.0             | 42.9                           | 35.8                      | 36.1                     | 9.1          | 35.9         | -                      | 52.2                            | 45.1                       | 73.9                           | 53.9                      | 21.8                        | 8.8                    | Floor noise |
| Vert.                   | 9760.0             | 43.1                           | 35.1                      | 39.1                     | 9.7          | 36.4         | -                      | 55.6                            | 47.6                       | 73.9                           | 53.9                      | 18.3                        | 6.3                    | Floor noise |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*QP detector was used up to 1GHz.

|                  |                   |                                                            |
|------------------|-------------------|------------------------------------------------------------|
| Distance factor: | 1 GHz - 10 GHz    | $20\log(3.95 \text{ m} / 3.0 \text{ m}) = 2.39 \text{ dB}$ |
|                  | 10 GHz - 26.5 GHz | $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$  |

## Radiated Spurious Emission

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab.  
No.1  
November 22, 2022  
20 deg. C / 50 % RH  
Tetsuro Yoshida  
(Above 1 GHz)  
Tx BT LE 2M-PHY 2480 MHz

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(QP / PK)<br>[dBuV] | Reading<br>(AV)<br>[dBuV] | Ant.<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(QP / PK)<br>[dBuV/m] | Result<br>(AV)<br>[dBuV/m] | Limit<br>(QP / PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(QP / PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Remark      |
|-------------------------|--------------------|--------------------------------|---------------------------|--------------------------|--------------|--------------|------------------------|---------------------------------|----------------------------|--------------------------------|---------------------------|-----------------------------|------------------------|-------------|
| Hori.                   | 2483.5             | 58.0                           | 48.7                      | 27.5                     | 5.7          | 36.3         | 4.4                    | 54.9                            | 49.9                       | 73.9                           | 53.9                      | 19.0                        | 4.0                    | *1)         |
| Hori.                   | 2484.0             | 61.8                           | 48.2                      | 27.5                     | 5.7          | 36.3         | 4.4                    | 58.7                            | 49.5                       | 73.9                           | 53.9                      | 15.2                        | 4.5                    |             |
| Hori.                   | 4960.0             | 42.4                           | 34.3                      | 31.7                     | 7.8          | 35.7         | -                      | 46.2                            | 38.1                       | 73.9                           | 53.9                      | 27.7                        | 15.8                   | Floor noise |
| Hori.                   | 7440.0             | 42.5                           | 35.3                      | 36.3                     | 9.1          | 35.9         | -                      | 51.9                            | 44.7                       | 73.9                           | 53.9                      | 22.0                        | 9.2                    | Floor noise |
| Hori.                   | 9920.0             | 43.4                           | 35.1                      | 39.1                     | 9.8          | 36.4         | -                      | 55.8                            | 47.5                       | 73.9                           | 53.9                      | 18.1                        | 6.4                    | Floor noise |
| Vert.                   | 2483.5             | 51.8                           | 42.2                      | 27.5                     | 5.7          | 36.3         | 4.4                    | 48.7                            | 43.5                       | 73.9                           | 53.9                      | 25.2                        | 10.4                   | *1)         |
| Vert.                   | 2484.0             | 54.2                           | 42.0                      | 27.5                     | 5.7          | 36.3         | 4.4                    | 51.1                            | 43.2                       | 73.9                           | 53.9                      | 22.8                        | 10.7                   |             |
| Vert.                   | 4960.0             | 42.1                           | 34.5                      | 31.7                     | 7.8          | 35.7         | -                      | 45.9                            | 38.3                       | 73.9                           | 53.9                      | 28.0                        | 15.6                   | Floor noise |
| Vert.                   | 7440.0             | 42.8                           | 35.7                      | 36.3                     | 9.1          | 35.9         | -                      | 52.2                            | 45.1                       | 73.9                           | 53.9                      | 21.7                        | 8.8                    | Floor noise |
| Vert.                   | 9920.0             | 43.0                           | 35.1                      | 39.1                     | 9.8          | 36.4         | -                      | 55.5                            | 47.5                       | 73.9                           | 53.9                      | 18.5                        | 6.4                    | Floor noise |

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Result (AV)= Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

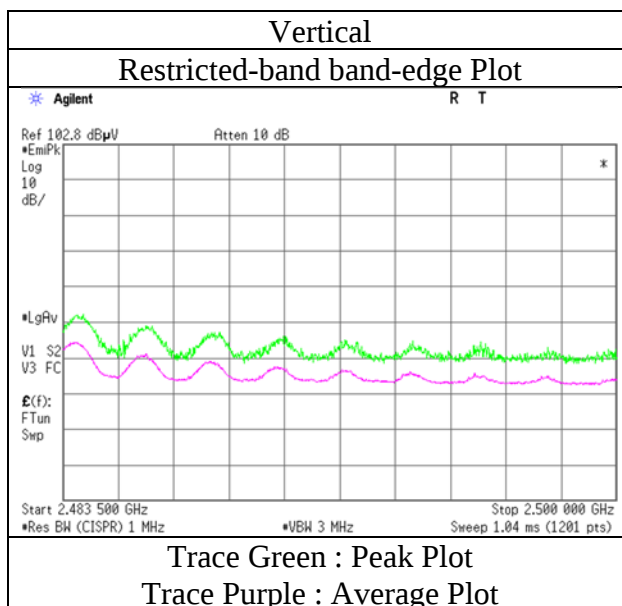
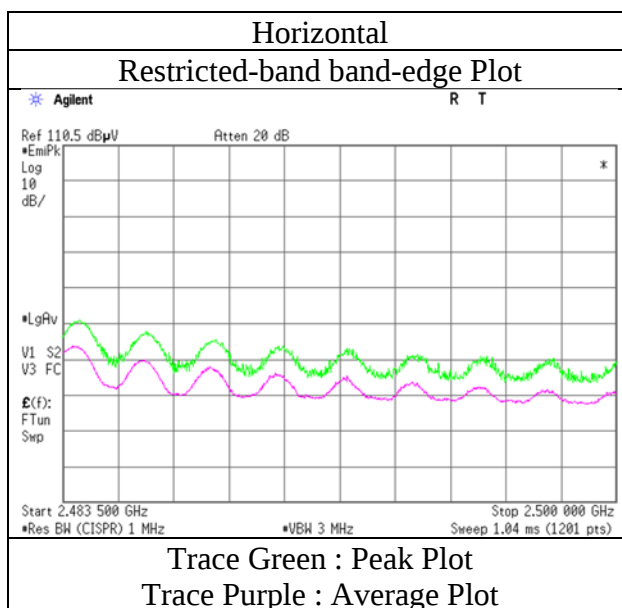
\*QP detector was used up to 1GHz.

\*1) Not Out of Band emission(Leakage Power)

Distance factor:      1 GHz - 10 GHz       $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.39\text{ dB}$   
                                  10 GHz - 26.5 GHz       $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

|                        |                          |
|------------------------|--------------------------|
| Test place             | Ise EMC Lab.             |
| Semi Anechoic Chamber  | No.1                     |
| Date                   | November 22, 2022        |
| Temperature / Humidity | 20 deg. C / 50 % RH      |
| Engineer               | Tetsuro Yoshida          |
|                        | (Above 1 GHz)            |
| Mode                   | Tx BT LE 2M-PHY 2480 MHz |

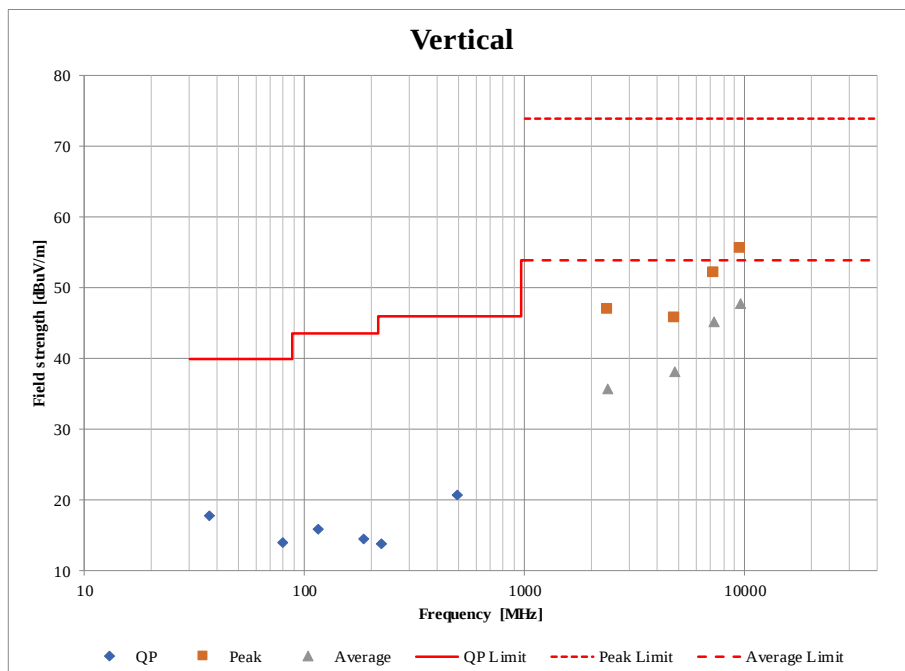
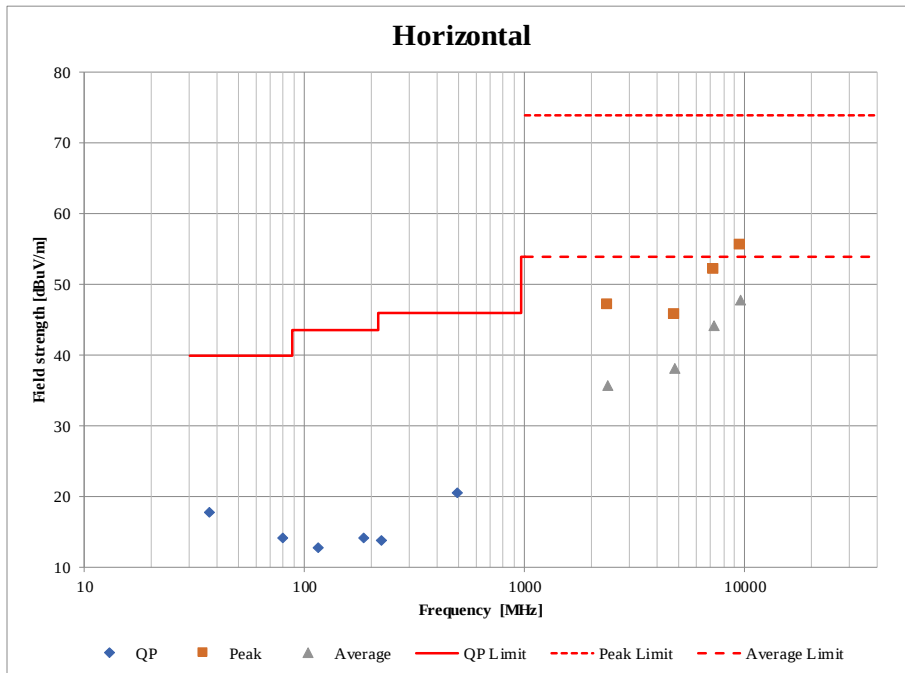


\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

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

Test place                      Ise EMC Lab.  
Semi Anechoic Chamber      No.1  
Date                              November 22, 2022  
Temperature / Humidity      20 deg. C / 50 % RH  
Engineer                        Tetsuro Yoshida

Mode                              Tx BT LE 1M-PHY 2402 MHz

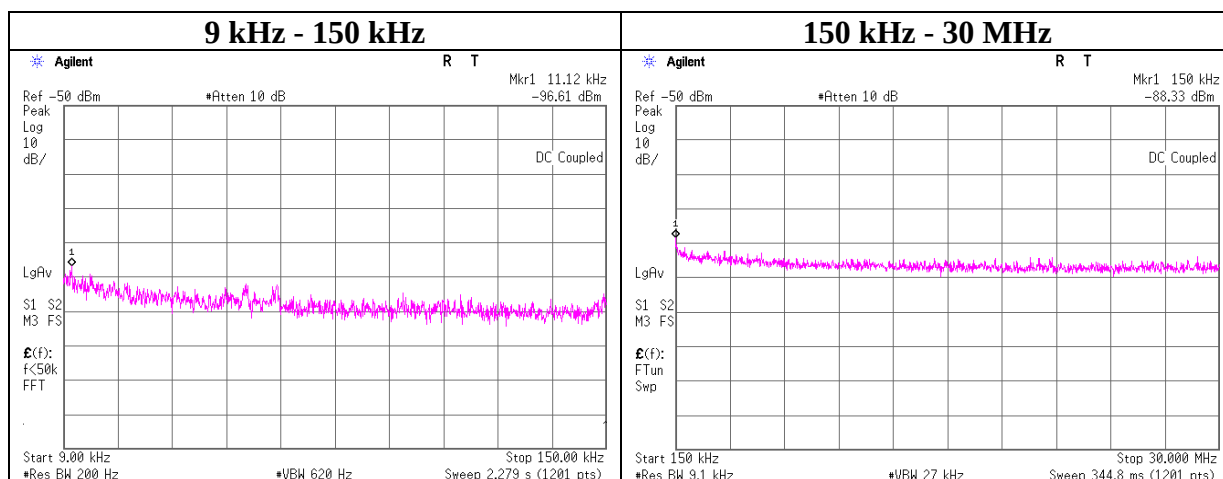


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Conducted Spurious Emission

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
November 21, 2022  
22 deg. C / 60 % RH  
Keiya Ido  
Tx BT LE 1M-PHY 2402 MHz



| Frequency | Reading | Cable Loss | Attenuator Loss | Antenna Gain* | N (Number of Output) | EIRP  | Distance | Ground bounce | E (field strength) | Limit    | Margin | Remark |
|-----------|---------|------------|-----------------|---------------|----------------------|-------|----------|---------------|--------------------|----------|--------|--------|
| [kHz]     | [dBm]   | [dB]       | [dB]            | [dBi]         |                      | [dBm] | [m]      | [dB]          | [dBuV/m]           | [dBuV/m] | [dB]   |        |
| 11.12     | -96.6   | 0.00       | 9.7             | 2.0           | 1                    | -84.9 | 300      | 6.0           | -23.7              | 46.6     | 70.3   |        |
| 150.00    | -88.3   | 0.00       | 9.7             | 2.0           | 1                    | -76.7 | 300      | 6.0           | -15.4              | 24.0     | 39.4   |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

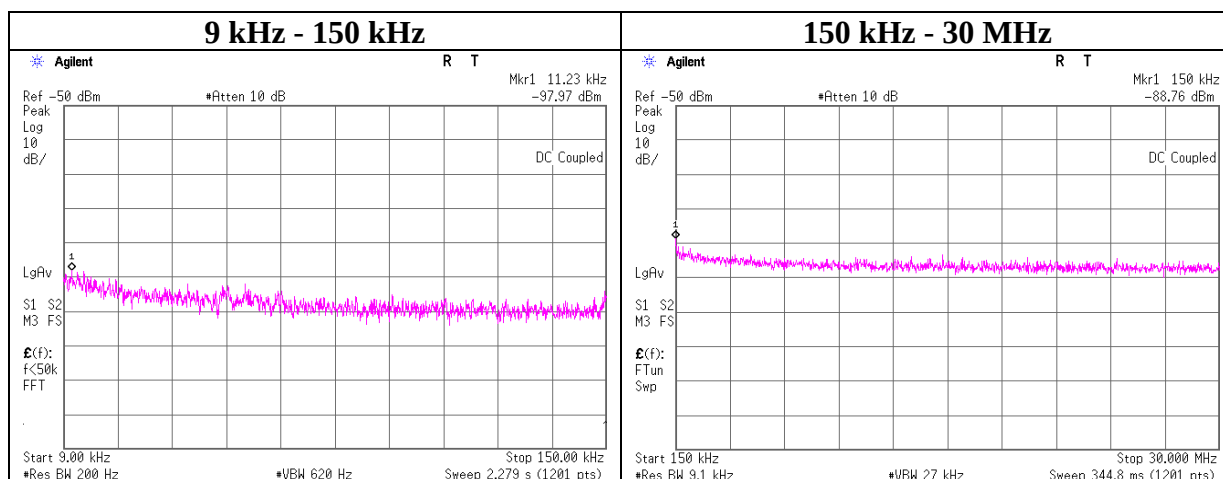
N: Number of output

\*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
November 21, 2022  
22 deg. C / 60 % RH  
Keiya Ido  
Tx BT LE 1M-PHY 2440 MHz



| Frequency | Reading | Cable Loss | Attenuator Loss | Antenna Gain* | N (Number of Output) | EIRP  | Distance | Ground bounce | E (field strength) | Limit    | Margin | Remark |
|-----------|---------|------------|-----------------|---------------|----------------------|-------|----------|---------------|--------------------|----------|--------|--------|
| [kHz]     | [dBm]   | [dB]       | [dB]            | [dBi]         |                      | [dBm] | [m]      | [dB]          | [dBuV/m]           | [dBuV/m] | [dB]   |        |
| 11.23     | -98.0   | 0.00       | 9.7             | 2.0           | 1                    | -86.3 | 300      | 6.0           | -25.0              | 46.5     | 71.5   |        |
| 150.00    | -88.8   | 0.00       | 9.7             | 2.0           | 1                    | -77.1 | 300      | 6.0           | -15.8              | 24.0     | 39.8   |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

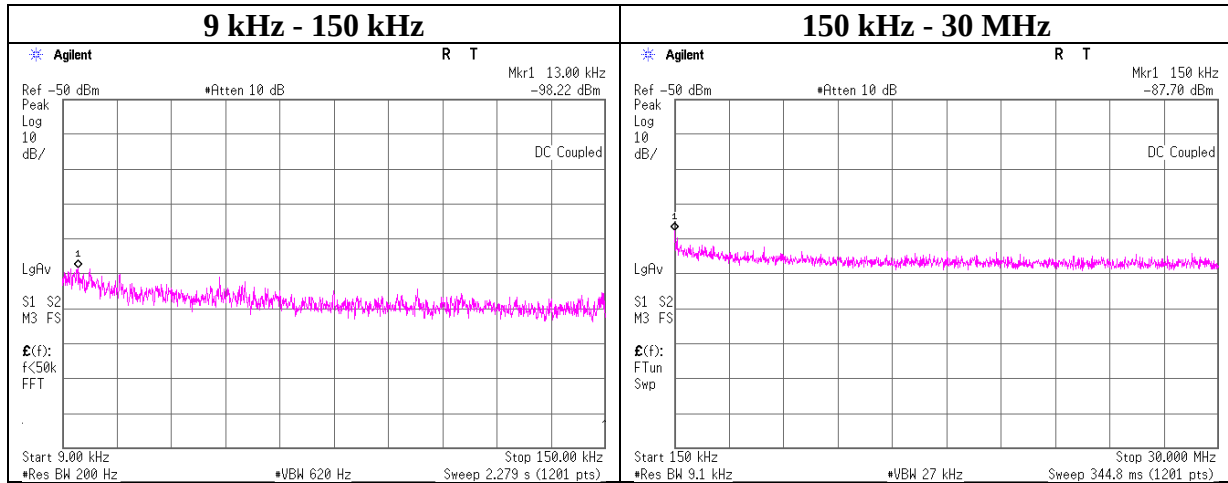
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Test place                      Ise EMC Lab. No.8 Measurement Room  
Date                              November 21, 2022  
Temperature / Humidity      22 deg. C / 60 % RH  
Engineer                        Keiya Ido  
Mode                              Tx BT LE 1M-PHY 2480 MHz



| Frequency | Reading | Cable Loss | Attenuator Loss | Antenna Gain* | N (Number of Output) | EIRP  | Distance | Ground bounce | E (field strength) | Limit    | Margin | Remark |
|-----------|---------|------------|-----------------|---------------|----------------------|-------|----------|---------------|--------------------|----------|--------|--------|
| [kHz]     | [dBm]   | [dB]       | [dB]            | [dBi]         |                      | [dBm] | [m]      | [dB]          | [dBuV/m]           | [dBuV/m] | [dB]   |        |
| 13.00     | -98.2   | 0.00       | 9.7             | 2.0           | 1                    | -86.5 | 300      | 6.0           | -25.3              | 45.3     | 70.6   |        |
| 150.00    | -87.7   | 0.00       | 9.7             | 2.0           | 1                    | -76.0 | 300      | 6.0           | -14.8              | 24.0     | 38.8   |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

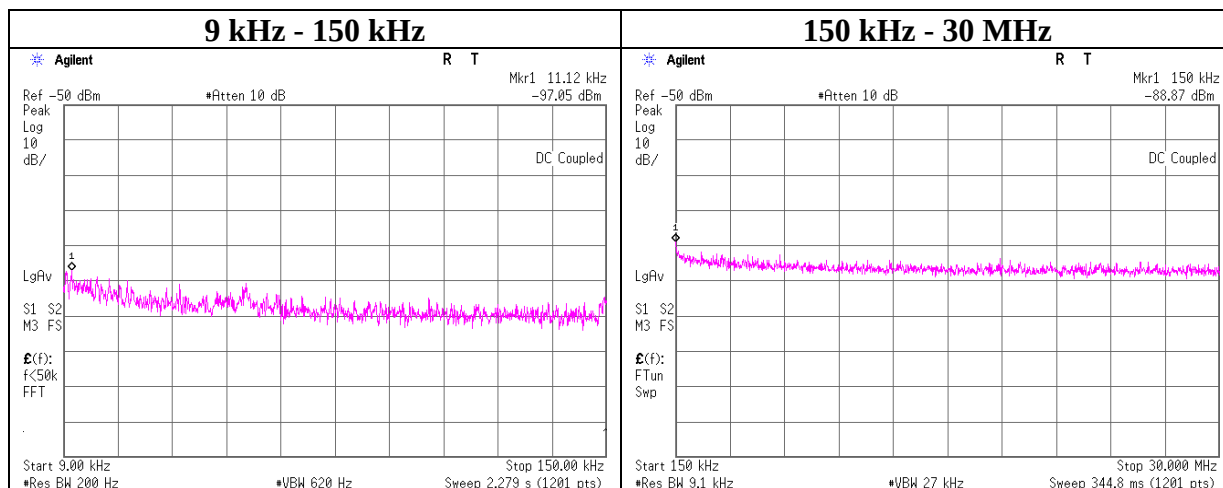
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Test place                      Ise EMC Lab. No.8 Measurement Room  
Date                              November 21, 2022  
Temperature / Humidity      22 deg. C / 60 % RH  
Engineer                        Keiya Ido  
Mode                              Tx BT LE 2M-PHY 2402 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain*<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|---------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 11.12              | -97.1            | 0.00                  | 9.7                        | 2.0                       | 1                          | -85.4         | 300             | 6.0                      | -24.1                             | 46.6              | 70.7           |        |
| 150.00             | -88.9            | 0.00                  | 9.7                        | 2.0                       | 1                          | -77.2         | 300             | 6.0                      | -15.9                             | 24.0              | 39.9           |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

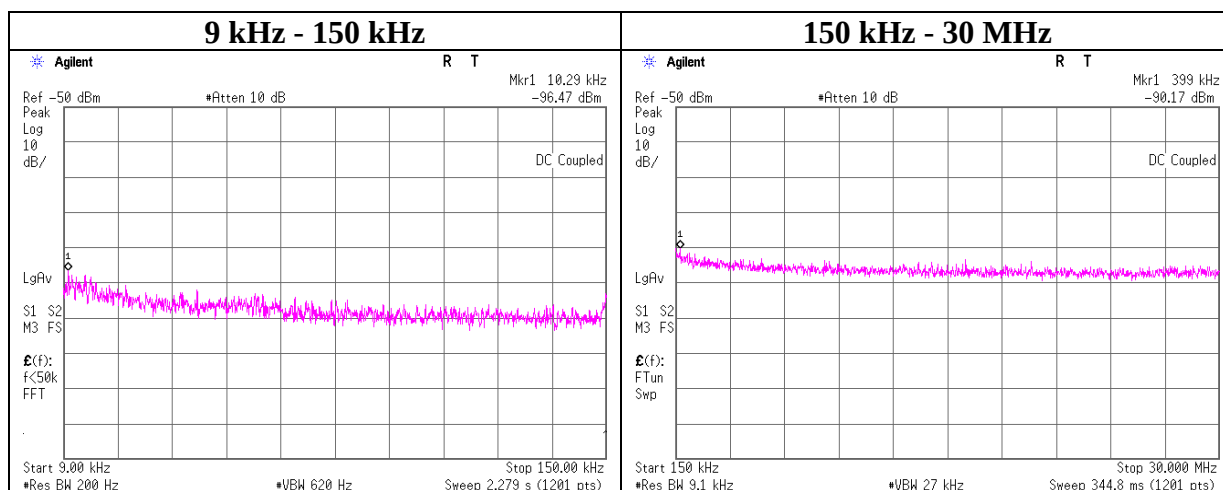
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Test place                      Ise EMC Lab. No.8 Measurement Room  
Date                              November 21, 2022  
Temperature / Humidity      22 deg. C / 60 % RH  
Engineer                        Keiya Ido  
Mode                              Tx BT LE 2M-PHY 2440 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain*<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|---------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 10.29              | -96.5            | 0.00                  | 9.7                        | 2.0                       | 1                          | -84.8         | 300             | 6.0                      | -23.5                             | 47.3              | 70.8           |        |
| 399.00             | -90.2            | 0.01                  | 9.7                        | 2.0                       | 1                          | -78.5         | 300             | 6.0                      | -17.2                             | 15.5              | 32.7           |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

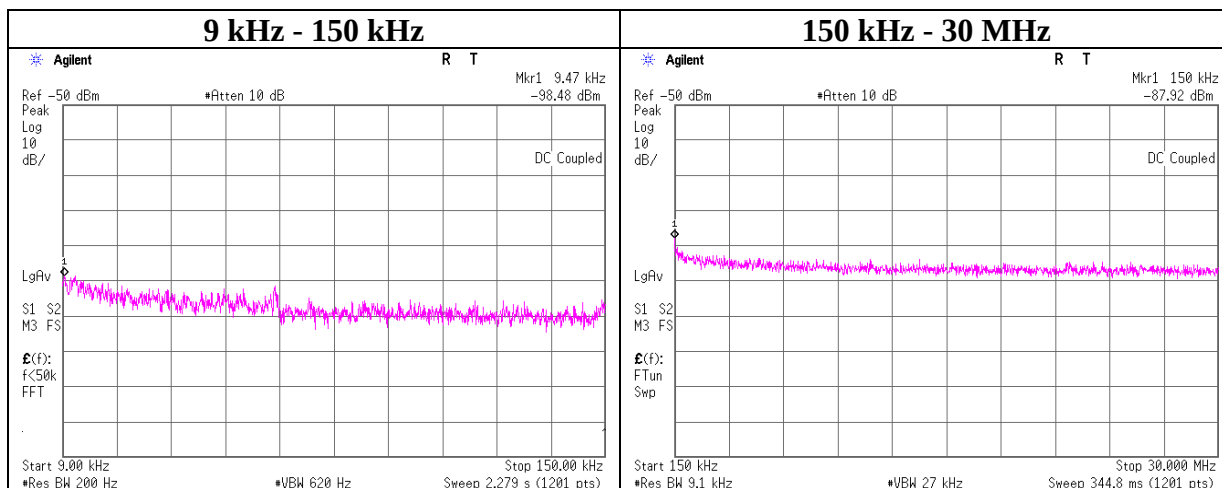
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

## Conducted Spurious Emission

Test place                      Ise EMC Lab. No.8 Measurement Room  
Date                              November 21, 2022  
Temperature / Humidity      22 deg. C / 60 % RH  
Engineer                        Keiya Ido  
Mode                              Tx BT LE 2M-PHY 2480 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain*<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|---------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 9.47               | -98.5            | 0.00                  | 9.7                        | 2.0                       | 1                          | -86.8         | 300             | 6.0                      | -25.5                             | 48.0              | 73.5           |        |
| 150.00             | -87.9            | 0.00                  | 9.7                        | 2.0                       | 1                          | -76.2         | 300             | 6.0                      | -15.0                             | 24.0              | 39.0           |        |

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$

$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

\*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

## Power Density

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | November 21, 2022                  |
| Temperature / Humidity | 22 deg. C / 60 % RH                |
| Engineer               | Keiya Ido                          |
| Mode                   | Tx BT LE                           |

### 1M-PHY

| Freq. | Reading       | Cable Loss | Atten. Loss | Result        | Limit         | Margin |
|-------|---------------|------------|-------------|---------------|---------------|--------|
| [MHz] | [dBm / 3 kHz] | [dB]       | [dB]        | [dBm / 3 kHz] | [dBm / 3 kHz] | [dB]   |
| 2402  | -22.63        | 1.87       | 9.79        | -10.97        | 8.00          | 18.97  |
| 2440  | -22.67        | 1.88       | 9.79        | -11.00        | 8.00          | 19.00  |
| 2480  | -22.85        | 1.90       | 9.79        | -11.16        | 8.00          | 19.16  |

### 2M-PHY

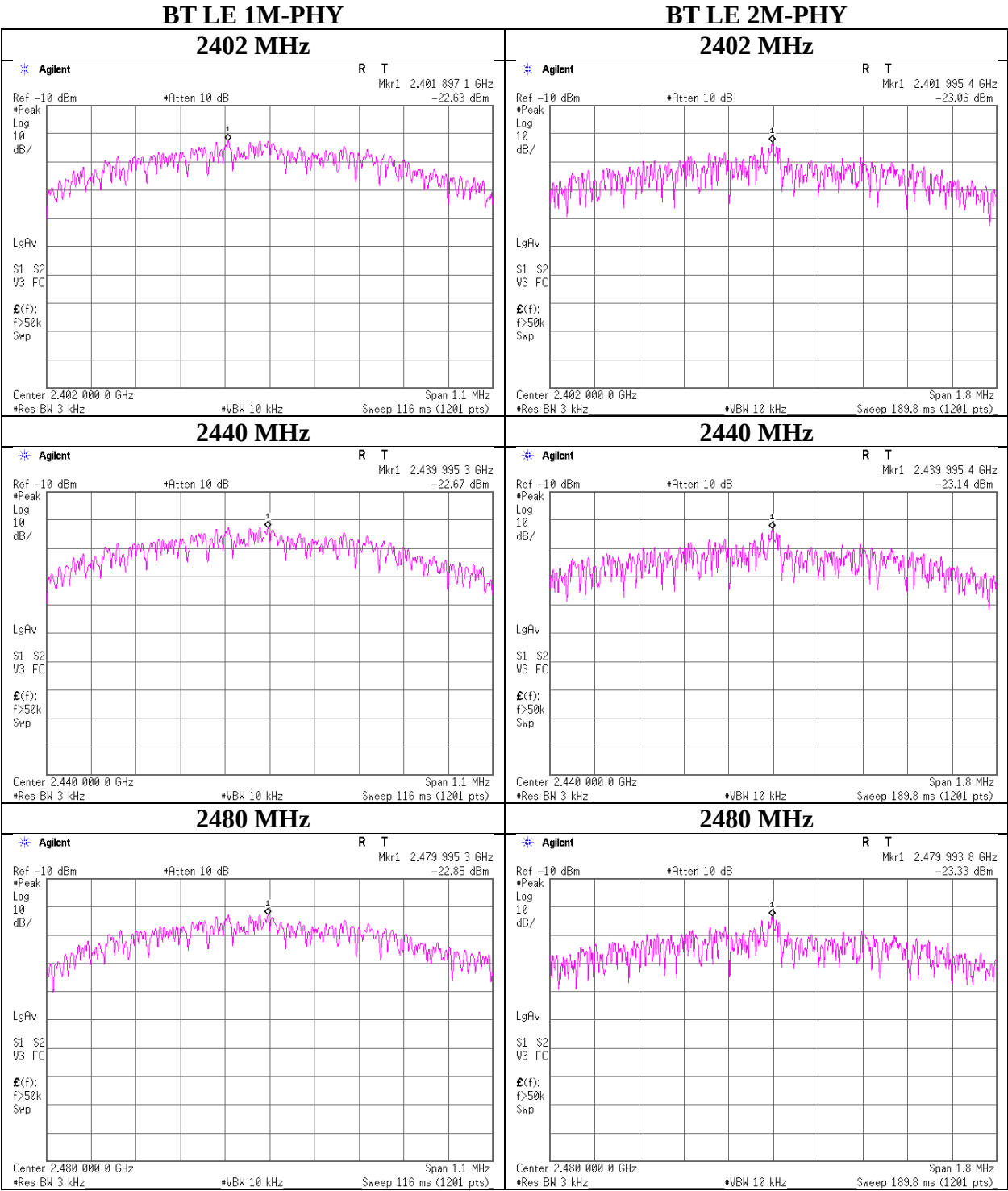
| Freq. | Reading       | Cable Loss | Atten. Loss | Result        | Limit         | Margin |
|-------|---------------|------------|-------------|---------------|---------------|--------|
| [MHz] | [dBm / 3 kHz] | [dB]       | [dB]        | [dBm / 3 kHz] | [dBm / 3 kHz] | [dB]   |
| 2402  | -23.06        | 1.87       | 9.79        | -11.40        | 8.00          | 19.40  |
| 2440  | -23.14        | 1.88       | 9.79        | -11.47        | 8.00          | 19.47  |
| 2480  | -23.33        | 1.90       | 9.79        | -11.64        | 8.00          | 19.64  |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

\*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density



## APPENDIX 2: Test Instruments

### Test Equipment (1/2)

| Test Item | Local ID      | LIMS ID | Description                      | Manufacturer                    | Model                           | Serial                        | Last Calibration Date | Cal Int |
|-----------|---------------|---------|----------------------------------|---------------------------------|---------------------------------|-------------------------------|-----------------------|---------|
| CE        | COTS-MEMI-02  | 178648  | EMI measurement program          | TSJ (Techno Science Japan)      | TEPTO-DV                        | -                             | -                     | -       |
| CE        | MAEC-01       | 141998  | AC1_Semi Anechoic Chamber(NSA)   | TDK                             | Semi Anechoic Chamber 10m       | DA-06881                      | 06/28/2022            | 24      |
| CE        | MAT-67        | 141248  | Attenuator                       | JFW Industries, Inc.            | 50FP-013H2 N                    | -                             | 12/17/2021            | 12      |
| CE        | MCC-03        | 141215  | Coaxial Cable                    | Fujikura/Suhner/TSJ             | 5D-2W/3D-2W/RG400u/RFM-E421(SW) | -/01068(Switcher)             | 06/11/2022            | 12      |
| CE        | MJM-25        | 142226  | Measure                          | KOMELON                         | KMC-36                          | -                             | -                     | -       |
| CE        | MLS-26        | 141538  | LISN(AMN)                        | Schwarzbeck Mess-Elektronik OHG | NSLK8127                        | 8127-732                      | 07/25/2022            | 12      |
| CE        | MMM-09        | 141533  | DIGITAL HiTESTER                 | HIOKI E.E. CORPORATION          | 3805                            | 51201195                      | 01/16/2022            | 12      |
| CE        | MOS-27        | 141566  | Thermo-Hygrometer                | CUSTOM. Inc                     | CTH-201                         | A08Q26                        | 01/10/2022            | 12      |
| CE        | MTR-10        | 141951  | EMI Test Receiver                | Rohde & Schwarz                 | ESR26                           | 101408                        | 07/25/2022            | 12      |
| RE        | COTS-MEMI-02  | 178648  | EMI measurement program          | TSJ (Techno Science Japan)      | TEPTO-DV                        | -                             | -                     | -       |
| RE        | KBA-05        | 141198  | Biconical Antenna                | Schwarzbeck Mess-Elektronik OHG | VHA9103+BBA9106                 | 2513                          | 05/14/2022            | 12      |
| RE        | MAEC-01       | 141998  | AC1_Semi Anechoic Chamber(NSA)   | TDK                             | Semi Anechoic Chamber 10m       | DA-06881                      | 06/28/2022            | 24      |
| RE        | MAEC-01-SVSWR | 141994  | AC1_Semi Anechoic Chamber(SVSWR) | TDK                             | Semi Anechoic Chamber 10m       | DA-06881                      | 04/05/2021            | 24      |
| RE        | MAT-08        | 141213  | Attenuator(6dB)                  | Weinschel Corp                  | 2                               | BK7971                        | 11/19/2022            | 12      |
| RE        | MCC-02        | 141350  | Coaxial Cable                    | Suhner/storm/Agilent/TSJ        | -                               | -                             | 03/08/2022            | 12      |
| RE        | MCC-217       | 141393  | Microwave Cable                  | Junkosha                        | MWX221                          | 1604S254(1 m) / 1608S088(5 m) | 08/02/2022            | 12      |
| RE        | MHA-05        | 141511  | Horn Antenna 1-18GHz             | Schwarzbeck Mess-Elektronik OHG | BBHA9120D                       | 253                           | 09/20/2022            | 12      |
| RE        | MHA-16        | 141513  | Horn Antenna 15-40GHz            | Schwarzbeck Mess-Elektronik OHG | BBHA9170                        | BBHA9170306                   | 07/05/2022            | 12      |
| RE        | MHF-25        | 141232  | High Pass Filter 3.5-18.0GHz     | UL Japan                        | HPF SELECTOR                    | 001                           | 09/07/2022            | 12      |
| RE        | MJM-25        | 142226  | Measure                          | KOMELON                         | KMC-36                          | -                             | -                     | -       |
| RE        | MLA-20        | 141264  | Logperiodic Antenna(200-1000MHz) | Schwarzbeck Mess-Elektronik OHG | VUSLP9111B                      | 189                           | 05/14/2022            | 12      |
| RE        | MMM-09        | 141533  | DIGITAL HiTESTER                 | HIOKI E.E. CORPORATION          | 3805                            | 51201195                      | 01/16/2022            | 12      |
| RE        | MOS-27        | 141566  | Thermo-Hygrometer                | CUSTOM. Inc                     | CTH-201                         | A08Q26                        | 01/10/2022            | 12      |
| RE        | MPA-01        | 141576  | Pre Amplifier                    | Keysight Technologies Inc       | 8449B                           | 3008A01671                    | 02/22/2022            | 12      |
| RE        | MPA-19        | 141585  | Pre Amplifier                    | MITEQ                           | MLA-10K01-B01-35                | 1237616                       | 02/28/2022            | 12      |
| RE        | MRENT-130     | 141855  | Spectrum Analyzer                | Keysight Technologies Inc       | E4440A                          | MY46187750                    | 11/28/2021            | 12      |
| RE        | MTR-10        | 141951  | EMI Test Receiver                | Rohde & Schwarz                 | ESR26                           | 101408                        | 07/25/2022            | 12      |

## Test Equipment (2/2)

| Test Item | Local ID | LIMS ID | Description                | Manufacturer                      | Model           | Serial     | Last Calibration Date | Cal Int |
|-----------|----------|---------|----------------------------|-----------------------------------|-----------------|------------|-----------------------|---------|
| AT        | MAT-26   | 141244  | Attenuator(10dB)           | Weinschel - API Technologies Corp | WA8-10-34       | A198       | 02/25/2022            | 12      |
| AT        | MAT-89   | 141419  | Attenuator                 | Weinschel Associates              | WA56-10         | 56100305   | 05/12/2022            | 12      |
| AT        | MAT-92   | 141421  | Attenuator                 | Weinschel Associates              | WA56-10         | 56100308   | 05/12/2022            | 12      |
| AT        | MCC-138  | 141410  | Microwave cable            | Huber+Suhner                      | SUCOFLEX 102    | 37953/2    | 09/11/2022            | 12      |
| AT        | MCC-206  | 141286  | Microwave Cable            | RS Pro                            | R-132G7210200CD | -          | 02/28/2022            | 12      |
| AT        | MCC-38   | 141395  | Coaxial Cable              | UL Japan                          | -               | -          | 11/18/2022            | 12      |
| AT        | MMM-17   | 141557  | DIGITAL HiTESTER           | HIOKI E.E. CORPORATION            | 3805            | 70900530   | 01/16/2022            | 12      |
| AT        | MOS-28   | 141567  | Thermo-Hygrometer          | CUSTOM. Inc                       | CTH-201         | 0008       | 01/10/2022            | 12      |
| AT        | MPA-11   | 141580  | MicroWave System Amplifier | Keysight Technologies Inc         | 83017A          | MY39500779 | 03/17/2022            | 12      |
| AT        | MPM-16   | 141812  | Power Meter                | Keysight Technologies Inc         | 8990B           | MY51000271 | 08/05/2022            | 12      |
| AT        | MPSE-22  | 141842  | Power sensor               | Keysight Technologies Inc         | N1923A          | MY54070003 | 08/05/2022            | 12      |
| AT        | MSA-16   | 141903  | Spectrum Analyzer          | Keysight Technologies Inc         | E4440A          | MY46186390 | 01/07/2022            | 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.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: CE: Conducted Emission  
RE: Radiated Emission  
AT: Antenna Terminal Conducted