



# RADIO TEST REPORT

Test Report No.: 14729685H-A-R1

|                     |                               |
|---------------------|-------------------------------|
| Customer            | TOKAI RIKI CO., LTD.          |
| Description of EUT  | Electronic Key                |
| Model Number of EUT | G2C2J2S                       |
| FCC ID              | MOZG2C2J2S                    |
| Test Regulation     | FCC Part 15 Subpart C         |
| Test Result         | Complied (Refer to SECTION 3) |
| Issue Date          | April 6, 2023                 |
| Remarks             | -                             |

Representative test engineer

Takumi Nishida  
Engineer

Approved by

Tsubasa Takayama  
Leader



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".

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 21.0

## **ANNOUNCEMENT**

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

## **REVISION HISTORY**

### **Original Test Report No.: 14729685H-A**

This report is a revised version of 14729685H-A. 14729685H-A is replaced with this report.

| Revision        | Test Report No. | Date          | Page Revised Contents                                                                                             |
|-----------------|-----------------|---------------|-------------------------------------------------------------------------------------------------------------------|
| -<br>(Original) | 14729685H-A     | April 3, 2023 | -                                                                                                                 |
| 1               | 14729685H-A-R1  | April 6, 2023 | Correction of the test mode for Maximum RF Output Power in Clause 4.1                                             |
| 1               | 14729685H-A-R1  | April 6, 2023 | Correction of notes in Clause 4.2 (by the correction of test mode for Maximum RF Output Power)                    |
| 1               | 14729685H-A-R1  | April 6, 2023 | Correction of the No.2 Cable name in Clause 4.2;<br>From Signal Cable to DC Cable                                 |
| 1               | 14729685H-A-R1  | April 6, 2023 | Correction of the Restricted Bands for 2500.000 MHz in Radiated Emission test data;<br>From “Outside” to “Inside” |

## 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                                        |

---

| <b>CONTENTS</b>                                                      | <b>PAGE</b> |
|----------------------------------------------------------------------|-------------|
| <b>SECTION 1: Customer Information .....</b>                         | <b>5</b>    |
| <b>SECTION 2: Equipment Under Test (EUT).....</b>                    | <b>5</b>    |
| <b>SECTION 3: Test Specification, Procedures &amp; Results .....</b> | <b>6</b>    |
| <b>SECTION 4: Operation of EUT during testing.....</b>               | <b>9</b>    |
| <b>SECTION 5: Radiated Spurious Emission .....</b>                   | <b>11</b>   |
| <b>SECTION 6: Automatically deactivate .....</b>                     | <b>13</b>   |
| <b>SECTION 7: -20 dB Bandwidth and 99% emission bandwidth .....</b>  | <b>13</b>   |
| <b>SECTION 8: Maximum RF Output Power .....</b>                      | <b>13</b>   |
| <b>APPENDIX 1: Test Data .....</b>                                   | <b>14</b>   |
| Automatically deactivate .....                                       | 14          |
| Maximum RF Output Power.....                                         | 15          |
| Radiated Emission (Fundamental and Spurious Emission) .....          | 16          |
| -20 dB Bandwidth / 99% emission bandwidth .....                      | 18          |
| <b>APPENDIX 2: Test Instruments.....</b>                             | <b>19</b>   |
| <b>APPENDIX 3: Photographs of Test Setup .....</b>                   | <b>20</b>   |
| Radiated Spurious Emission .....                                     | 20          |
| Worst Case Position.....                                             | 22          |
| Maximum RF Output Power.....                                         | 23          |

## **SECTION 1: Customer Information**

|                  |                                                           |
|------------------|-----------------------------------------------------------|
| Company Name     | TOKAI RIKA CO., LTD.                                      |
| Address          | 3-260 Toyota, Oguchi-cho, Niwa-gun, Aichi 480-0195, Japan |
| Telephone Number | +81-587-95-0093                                           |
| Contact Person   | Tetsuhiro Okuoka                                          |

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   | Electronic Key                                                                            |
| Model Number  | G2C2J2S                                                                                   |
| Serial Number | Refer to SECTION 4.2                                                                      |
| Condition     | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | No Modification by the test lab                                                           |
| Receipt Date  | March 17, 2023                                                                            |
| Test Date     | March 22, 2023                                                                            |

### **2.2 Product Description**

#### **General Specification**

|        |                   |
|--------|-------------------|
| Rating | DC 3.0 V (CR2032) |
|--------|-------------------|

#### **Radio Specification**

|                         |                   |
|-------------------------|-------------------|
| Equipment Type          | Transmitter       |
| Frequency of Operation  | 312.5 MHz         |
| Operating voltage range | DC 2.5 V to 3.3 V |
| Type of Modulation      | FSK               |
| Antenna Gain            | -28.19 dBi        |

## SECTION 3: Test Specification, Procedures & Results

### 3.1 Test Specification

|                    |                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Specification | FCC Part 15 Subpart C<br>The latest version on the first day of the testing period                                                                         |
| Title              | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 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><br>ISED: RSS-Gen 8.8  | FCC: Section 15.207<br><br>ISED: RSS-Gen 8.8                                                    | N/A                                     | N/A            | *1)      |
| Automatically Deactivate                           | FCC: ANSI C63.10:2013<br>6 Standard test methods<br><br>ISED: -            | FCC: Section 15.231(a)(1)<br><br>ISED: RSS-210 A1.1                                             | N/A                                     | Complied<br>a) | Radiated |
| Electric Field Strength<br>of Fundamental Emission | FCC: ANSI C63.10:2013<br>6 Standard test methods<br><br>ISED: RSS-Gen 6.12 | FCC: Section 15.231(b)<br><br>ISED: RSS-210 A1.2                                                | 2.7 dB<br>312.500 MHz<br>Horizontal, AV | Complied<br>b) | Radiated |
| Electric Field Strength<br>of Spurious Emission    | FCC: ANSI C63.10:2013<br>6 Standard test methods<br><br>ISED: RSS-Gen 6.13 | FCC: Section 15.205<br>Section 15.209<br>Section 15.231(b)<br>ISED: RSS-210 A1.2<br>RSS-Gen 8.9 | 3.8 dB<br>1250.000 MHz<br>Vertical, AV  | Complied<br>b) | Radiated |
| -20dB Bandwidth                                    | FCC: ANSI C63.10:2013<br>6 Standard test methods<br><br>ISED: -            | FCC: Section 15.231(c)<br><br>ISED: Reference data                                              | N/A                                     | Complied<br>c) | Radiated |

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

\*1) The test is not applicable since the EUT does not have AC Mains.

a) Refer to APPENDIX 1 (data of Automatically Deactivate)

b) Refer to APPENDIX 1 (data of Radiated Emission (Fundamental and Spurious Emission))

c) Refer to APPENDIX 1 (data of -20 dB Bandwidth / 99% emission bandwidth)

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

The supply voltage was varied and tested at 85 % and 115 % of the nominal rated supply voltage during Maximum RF Output Power test. The other tests were performed with the New Battery during the tests. Therefore, the EUT complies with the requirement.

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

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

### 3.3 Addition to Standard

| Item                    | Test Procedure                                               | Specification  | Worst margin | Results | Remarks   |
|-------------------------|--------------------------------------------------------------|----------------|--------------|---------|-----------|
| Maximum RF Output Power | ANSI C63.10:2013<br>11 Procedures for<br>testing DTS devices | Reference data | N/A          | -       | Conducted |
| 99% emission bandwidth  | ANSI C63.10:2013<br>6 Standard test methods                  | Reference data | N/A          | -       | Radiated  |

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

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  $k=2$ .

| Test Item                                 |      | Frequency range     |            | Uncertainty (+/-) |
|-------------------------------------------|------|---------------------|------------|-------------------|
| Radiated emission                         | 3 m  | 9 kHz to 30 MHz     |            | 3.3 dB            |
|                                           | 10 m |                     |            | 3.1 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 | 4.9 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            |
| Automatically Deactivate                  |      | -                   |            | 0.10 %            |
| -20 dB Bandwidth / 99% emission bandwidth |      | -                   |            | 0.96 %            |

### 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                                                       | -                      | -                            |

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

Refer to APPENDIX.

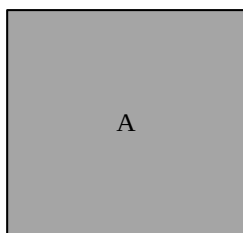
## **SECTION 4: Operation of EUT during testing**

### **4.1 Operating Mode(s)**

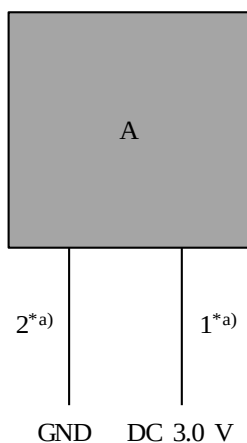
| <b>Test mode</b>                                                                                                                                                                                                     | <b>Test Item</b>                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) Normal use mode                                                                                                                                                                                                   | Automatically deactivate                                                                                                                                                   |
| 2) Transmitting mode (Tx 312.5 MHz)                                                                                                                                                                                  | Maximum RF Output Power,<br>Electric Field Strength of Fundamental Emission,<br>Electric Field Strength of Spurious Emission,<br>-20 dB Bandwidth / 99% emission bandwidth |
| * The system was configured in typical fashion (as a user would normally use it) for testing.                                                                                                                        |                                                                                                                                                                            |
| *Power of the EUT was set by the software as follows;<br>Software: VN99_KeyCard Version: v810<br>(Date: 2016.06 14, Storage location: EUT memory)                                                                    |                                                                                                                                                                            |
| *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. |                                                                                                                                                                            |
| Justification: The system was configured in typical fashion (as a user would normally use it) for testing.                                                                                                           |                                                                                                                                                                            |
| <b><u>Extreme test condition</u></b>                                                                                                                                                                                 |                                                                                                                                                                            |
| Voltage:                                                                                                                                                                                                             | Vnom: DC 3.0 V, Vmin: DC 2.5 V, Vmax: DC 3.3 V                                                                                                                             |

## 4.2 Configuration and Peripherals

### [Radiated Emission test]



### [Antenna Terminal Conducted]



\*a) This cable was attached only for Antenna terminal conducted tests, and it is not installed the end product.  
Also, the attachment of this cable does not affect the RF performance.

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

### Description of EUT

| No. | Item           | Model number | Serial Number                 | Manufacturer            | Remarks |
|-----|----------------|--------------|-------------------------------|-------------------------|---------|
| A   | Electronic Key | G2C2J2S      | 785 *1)<br>794 *2)<br>786 *3) | TOKAI RIKA CO.,<br>LTD. | EUT     |

\*1) Used for Normal use mode

\*2) Used for Transmitting mode (Maximum RF Output Power test)

\*3) Used for Transmitting mode (Other tests except for Maximum RF Output Power test)

### List of cables used

| No. | Name     | Length (m) | Shield     |            | Remark |
|-----|----------|------------|------------|------------|--------|
|     |          |            | Cable      | Connector  |        |
| 1   | DC Cable | 1.0        | Unshielded | Unshielded | -      |
| 2   | DC Cable | 1.0        | Unshielded | Unshielded | -      |

## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

[For below 30 MHz]

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

[For 30 MHz to 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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

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 measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

### **Test Antennas are used as below;**

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

|               |                                                           |                              |                               |                              |                                      |                                   |
|---------------|-----------------------------------------------------------|------------------------------|-------------------------------|------------------------------|--------------------------------------|-----------------------------------|
|               | From 9 kHz<br>to 90 kHz and<br>From 110 kHz<br>to 150 kHz | From<br>90 kHz<br>to 110 kHz | From<br>150 kHz<br>to 490 kHz | From<br>490 kHz<br>to 30 MHz | From<br>30 MHz<br>to 1 GHz           | Above 1 GHz                       |
| Detector Type | Peak                                                      | Peak                         | Peak                          | Peak                         | Peak and<br>Peak with<br>Duty factor | Peak and<br>Peak with Duty factor |
| IF Bandwidth  | 200 Hz                                                    | 200 Hz                       | 9.1 kHz                       | 9.1 kHz                      | 120 kHz                              | PK: S/A: RBW 1 MHz,<br>VBW: 3 MHz |

- 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.

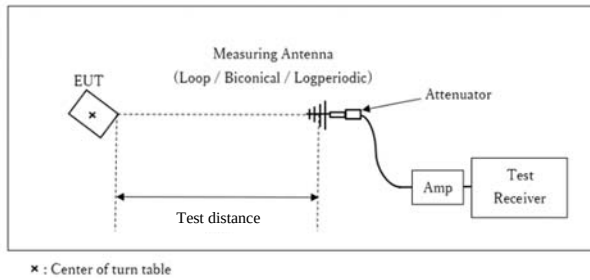
The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Measurement range** : 9 kHz to 3.2 GHz

**Test data** : APPENDIX

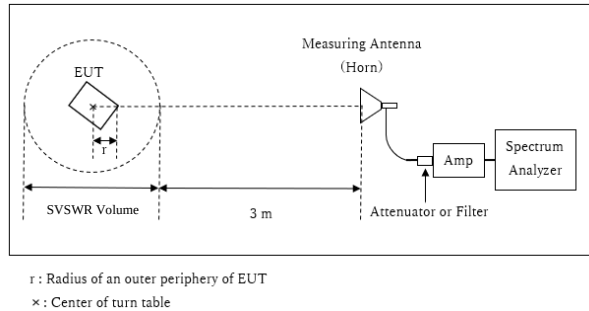
**Test result** : Pass

[Test Setup]  
Below 1 GHz



Test Distance: 3 m

1 GHz to 3.2 GHz



Distance Factor:  $20 \times \log (4.0 \text{ m} / 3.0 \text{ m}) = 2.50 \text{ dB}$

\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 4.00 \text{ m}$

SVSWR Volume : 2.0 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.0 \text{ m}$

\* The test was performed with  $r = 0.0 \text{ m}$  since EUT is small and it was the rather conservative condition.

---

## **SECTION 6: Automatically deactivate**

### **Test Procedure**

The measurement was performed with Electric field strength using a spectrum analyzer.

**Test data** : APPENDIX

**Test result** : Pass

## **SECTION 7: -20 dB Bandwidth and 99% emission bandwidth**

### **Test Procedure**

The test was measured with a spectrum analyzer using a test fixture.

| Test                                                 | Span                                    | RBW             | VBW                | Sweep | Detector | Trace        | Instrument used   |
|------------------------------------------------------|-----------------------------------------|-----------------|--------------------|-------|----------|--------------|-------------------|
| -20 dB Bandwidth / 99% emission bandwidth            | Enough width to display emission skirts | 1 to 5 % of OBW | Three times of RBW | Auto  | Peak *1) | Max Hold *1) | Spectrum Analyzer |
| *1) Peak hold was applied as Worst-case measurement. |                                         |                 |                    |       |          |              |                   |

**Test data** : APPENDIX

**Test result** : Pass

## **SECTION 8: Maximum RF Output Power**

### **Test Procedure**

Maximum RF Output Power was measured with a Power Meter. The measurement was performed under 100 % duty cycle conditions.

The test data is reference data for RF Exposure.

**Test data** : APPENDIX

APPENDIX 1: Test Data

Automatically deactivate

Test place

Semi Anechoic Chamber

Date

Temperature / Humidity

Engineer

Mode

Ise EMC Lab.

No.4

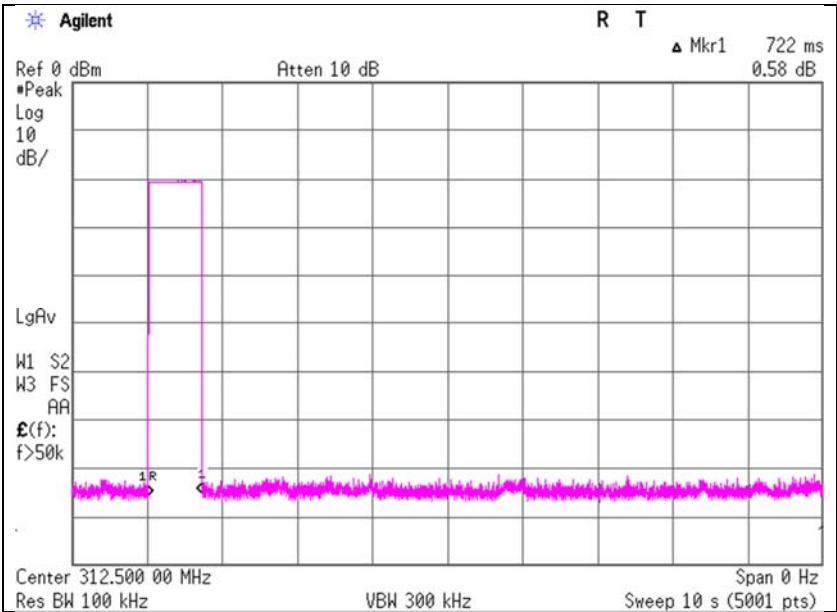
March 22, 2023

21 deg. C / 43 % RH

Takumi Nishida

Mode 1

| Time of Transmitting<br>[s] | Limit<br>[s] | Result |
|-----------------------------|--------------|--------|
| 0.722                       | 5.00         | Pass   |



---

**Maximum RF Output Power**  
**(Reference data for RF Exposure)**

|                        |                     |
|------------------------|---------------------|
| Test place             | Ise EMC Lab.        |
| Measurement room       | No.4                |
| Date                   | March 22, 2023      |
| Temperature / Humidity | 21 deg. C / 43 % RH |
| Engineer               | Takumi Nishida      |
| Mode                   | Mode 2              |

| Test Condition<br>(Voltage) | Freq.<br>[MHz] | Reading<br>(P/M)<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result (Conducted Power)<br>(Burst average) |      | Antenna<br>Gain<br>[dBi] | Result (e.i.r.p.) |       | Result (e.r.p.) |       |
|-----------------------------|----------------|---------------------------|-----------------------|------------------------|---------------------------------------------|------|--------------------------|-------------------|-------|-----------------|-------|
|                             |                |                           |                       |                        | [dBm]                                       | [mW] |                          | [dBm]             | [mW]  | [dBm]           | [mW]  |
| nom                         | 312.50         | -9.99                     | 0.10                  | 9.93                   | 0.04                                        | 1.01 | -28.19                   | -28.15            | 0.002 | -30.29          | 0.001 |
| min                         | 312.50         | -10.38                    | 0.10                  | 9.93                   | -0.35                                       | 0.92 | -28.19                   | -28.54            | 0.001 | -30.68          | 0.001 |
| max                         | 312.50         | -9.79                     | 0.10                  | 9.93                   | 0.24                                        | 1.06 | -28.19                   | -27.95            | 0.002 | -30.09          | 0.001 |

Sample Calculation:

Result (Conducted Power) = Reading + Cable Loss + Atten. Loss

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

Result (e.r.p.) = Result (Conducted Power) + Antenna Gain + 2.14

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

## Radiated Emission (Fundamental and Spurious Emission)

|                        |                     |
|------------------------|---------------------|
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.4                |
| Date                   | March 22, 2023      |
| Temperature / Humidity | 21 deg. C / 43 % RH |
| Engineer               | Takumi Nishida      |
| Mode                   | Mode 2              |

| Polarity<br>[Hori/Vert] | Frequency<br>[MHz] | Reading<br>(PK)<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>(PK)<br>[dBuV/m] | Result<br>(PK with<br>Duty Factor)<br>[dBuV/m] | Limit<br>(PK)<br>[dBuV/m] | Limit<br>(AV)<br>[dBuV/m] | Margin<br>(PK)<br>[dB] | Margin<br>(AV)<br>[dB] | Inside or Outside<br>of Restricted Bands | Remarks     |
|-------------------------|--------------------|---------------------------|-------------------------|--------------|--------------|------------------------|----------------------------|------------------------------------------------|---------------------------|---------------------------|------------------------|------------------------|------------------------------------------|-------------|
| Hori.                   | 312.500            | 81.0                      | 14.0                    | 9.7          | 32.0         | 0.0                    | 72.7                       | 72.7                                           | 95.4                      | 75.4                      | 22.7                   | 2.7                    | Carrier                                  |             |
| Hori.                   | 625.000            | 32.0                      | 19.6                    | 11.4         | 32.4         | 0.0                    | 30.6                       | 30.6                                           | 75.4                      | 55.4                      | 44.8                   | 24.8                   | Outside                                  |             |
| Hori.                   | 937.500            | 31.8                      | 22.1                    | 12.5         | 31.1         | 0.0                    | 35.3                       | 35.3                                           | 75.4                      | 55.4                      | 40.1                   | 20.1                   | Outside                                  |             |
| Hori.                   | 1250.000           | 53.3                      | 25.7                    | 5.9          | 34.2         | 0.0                    | 50.7                       | 50.7                                           | 75.4                      | 55.4                      | 24.7                   | 4.7                    | Outside                                  |             |
| Hori.                   | 1562.500           | 45.0                      | 25.2                    | 5.1          | 33.4         | 0.0                    | 41.9                       | 41.9                                           | 73.9                      | 53.9                      | 32.0                   | 12.0                   | Inside                                   |             |
| Hori.                   | 1875.000           | 45.9                      | 25.6                    | 5.1          | 32.6         | 0.0                    | 44.0                       | 44.0                                           | 75.4                      | 55.4                      | 31.4                   | 11.4                   | Outside                                  |             |
| Hori.                   | 2187.500           | 44.0                      | 28.2                    | 5.2          | 32.1         | -                      | 45.3                       | 45.3                                           | 75.4                      | 55.4                      | 30.1                   | 10.1                   | Outside                                  | Floor noise |
| Hori.                   | 2500.000           | 43.6                      | 27.5                    | 5.3          | 32.0         | -                      | 44.4                       | 44.4                                           | 73.9                      | 53.9                      | 29.5                   | 9.5                    | Inside                                   | Floor noise |
| Hori.                   | 2812.500           | 43.1                      | 28.4                    | 5.5          | 31.8         | -                      | 45.2                       | 45.2                                           | 73.9                      | 53.9                      | 28.7                   | 8.7                    | Inside                                   | Floor noise |
| Hori.                   | 3125.000           | 44.1                      | 28.6                    | 5.7          | 31.6         | -                      | 46.8                       | 46.8                                           | 75.4                      | 55.4                      | 28.6                   | 8.6                    | Outside                                  | Floor noise |
| Vert.                   | 312.500            | 78.1                      | 14.0                    | 9.7          | 32.0         | 0.0                    | 69.8                       | 69.8                                           | 95.4                      | 75.4                      | 25.6                   | 5.6                    | Carrier                                  |             |
| Vert.                   | 625.000            | 31.9                      | 19.6                    | 11.4         | 32.4         | 0.0                    | 30.5                       | 30.5                                           | 75.4                      | 55.4                      | 44.9                   | 24.9                   | Outside                                  |             |
| Vert.                   | 937.500            | 32.7                      | 22.1                    | 12.5         | 31.1         | 0.0                    | 36.2                       | 36.2                                           | 75.4                      | 55.4                      | 39.2                   | 19.2                   | Outside                                  |             |
| Vert.                   | 1250.000           | 54.2                      | 25.7                    | 5.9          | 34.2         | 0.0                    | 51.6                       | 51.6                                           | 75.4                      | 55.4                      | 23.8                   | 3.8                    | Outside                                  |             |
| Vert.                   | 1562.500           | 44.6                      | 25.2                    | 5.1          | 33.4         | 0.0                    | 41.5                       | 41.5                                           | 73.9                      | 53.9                      | 32.4                   | 12.4                   | Inside                                   |             |
| Vert.                   | 1875.000           | 45.8                      | 25.6                    | 5.1          | 32.6         | 0.0                    | 43.9                       | 43.9                                           | 75.4                      | 55.4                      | 31.5                   | 11.5                   | Outside                                  |             |
| Vert.                   | 2187.500           | 44.2                      | 28.2                    | 5.2          | 32.1         | -                      | 45.5                       | 45.5                                           | 75.4                      | 55.4                      | 29.9                   | 9.9                    | Outside                                  | Floor noise |
| Vert.                   | 2500.000           | 44.0                      | 27.5                    | 5.3          | 32.0         | -                      | 44.8                       | 44.8                                           | 73.9                      | 53.9                      | 29.1                   | 9.1                    | Inside                                   | Floor noise |
| Vert.                   | 2812.500           | 42.8                      | 28.4                    | 5.5          | 31.8         | -                      | 44.9                       | 44.9                                           | 73.9                      | 53.9                      | 29.0                   | 9.0                    | Inside                                   | Floor noise |
| Vert.                   | 3125.000           | 44.1                      | 28.6                    | 5.7          | 31.6         | -                      | 46.8                       | 46.8                                           | 75.4                      | 55.4                      | 28.6                   | 8.6                    | Outside                                  | Floor noise |

Sample calculation:

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

Result of PK with Duty factor (PK / W) = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) + Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor

For above 1 GHz: Distance Factor:  $20 \times \log(4.0 \text{ m}/3.0 \text{ m}) = 2.50 \text{ dB}$

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

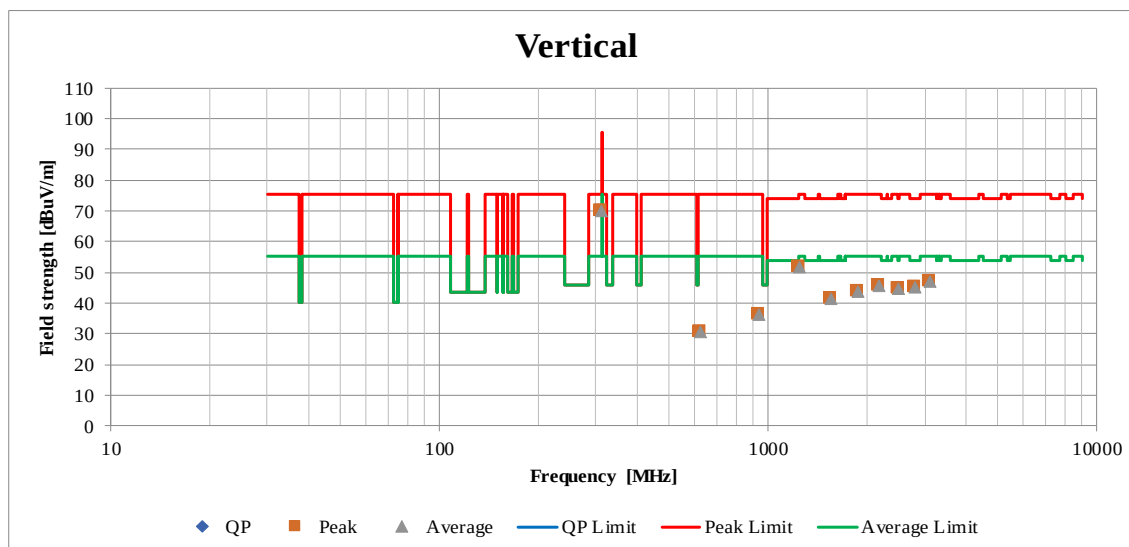
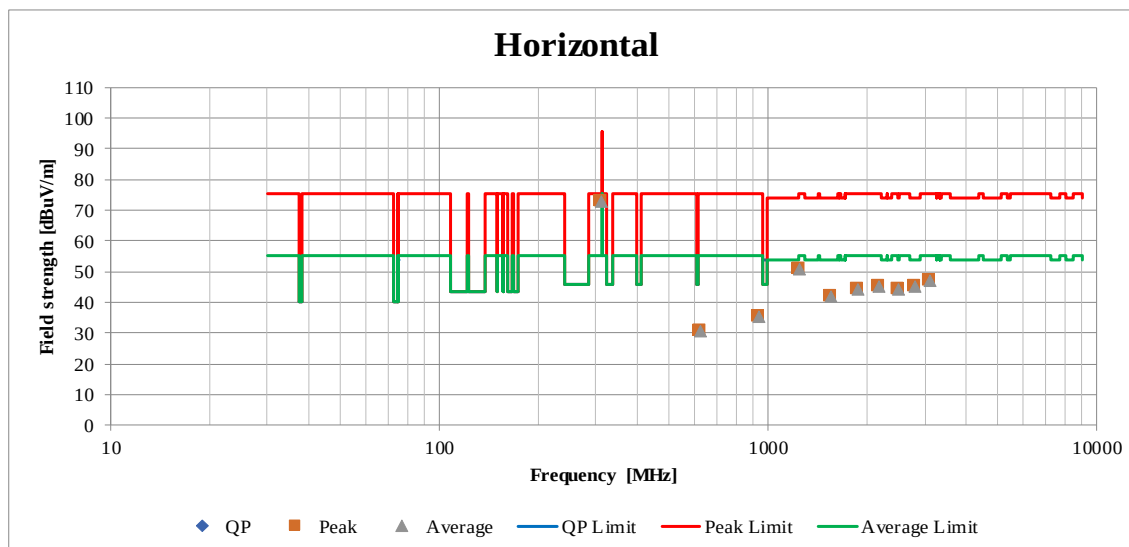
Since the peak emission result satisfied the average limit, duty factor was omitted.

If Gain 0.0 dB shown in the above table, pre-amplifier was not used to avoid the influence of carrier power. The pre-amplifier used for carrier frequency measurement was not saturated.

## **Radiated Spurious Emission** **(Plot data, Worst case for Fundamental Emission)**

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab.  
No.4  
March 22, 2023  
21 deg. C / 43 % RH  
Takumi Nishida  
Mode 2



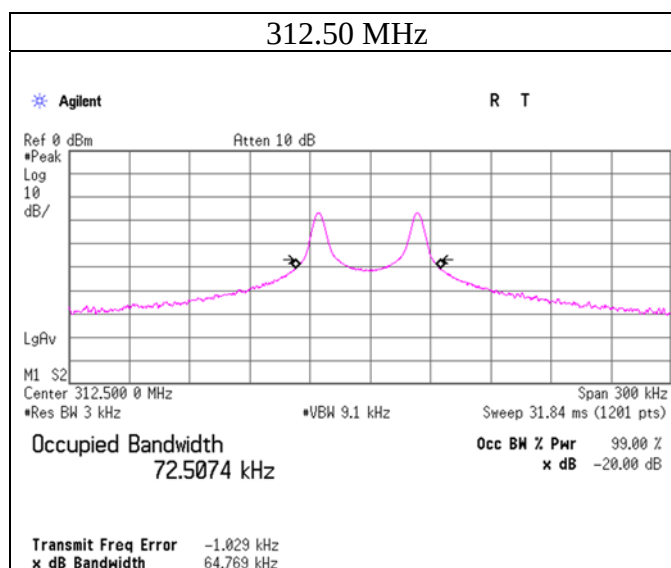
## -20 dB Bandwidth / 99% emission bandwidth

Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date March 22, 2023  
Temperature / Humidity 21 deg. C / 43 % RH  
Engineer Takumi Nishida  
Mode Mode 2

Bandwidth Limit : Fundamental Frequency  $312.50 \text{ MHz} \times 0.25\% = 781.25 \text{ kHz}$

| -20dB Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|--------------------------|--------------------------|--------|
| 64.769                   | 781.25                   | Pass   |

| 99% Occupied Bandwidth Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|-------------------------------------------|--------------------------|--------|
| 72.5074                                   | 781.25                   | Pass   |



## APPENDIX 2: Test Instruments

### Test Equipment

| Test Item | Local ID      | LIMS ID | Description                       | Manufacturer                    | Model                            | Serial                    | Last Calibration Date | Cal Int |
|-----------|---------------|---------|-----------------------------------|---------------------------------|----------------------------------|---------------------------|-----------------------|---------|
| RE        | COTS-MEMI-02  | 178648  | EMI measurement program           | TSJ (Techno Science Japan)      | TEPTO-DV                         | -                         | -                     | -       |
| RE        | MAEC-04       | 142011  | AC4_Semi Anechoic Chamber(NSA)    | TDK                             | Semi Anechoic Chamber 3m         | DA-10005                  | 05/22/2022            | 24      |
| RE        | MAEC-04-SVSWR | 142017  | AC4_Semi Anechoic Chamber(SVSWR)  | TDK                             | Semi Anechoic Chamber 3m         | DA-10005                  | 04/12/2021            | 24      |
| RE        | MAT-34        | 141331  | Attenuator(6dB)                   | TME                             | UFA-01                           | -                         | 02/01/2023            | 12      |
| RE        | MBA-05        | 141425  | Biconical Antenna                 | Schwarzbeck Mess-Elektronik OHG | VHA9103+ BBA9106                 | VHA 91031302              | 08/26/2022            | 12      |
| RE        | MCC-265       | 234602  | Microwave Cable                   | Huber+Suhner                    | SF126E/11PC35/11PC35/1000M,5000M | 537063/126E / 537074/126E | 03/16/2023            | -       |
| RE        | MCC-50        | 141397  | Coaxial Cable                     | UL Japan                        | -                                | -                         | 11/18/2022            | 12      |
| RE        | MHA-05        | 141511  | Horn Antenna 1-18GHz              | Schwarzbeck Mess-Elektronik OHG | BBHA9120D                        | 253                       | 09/20/2022            | 12      |
| RE        | MHF-04        | 141403  | High Pass Filter 1.22-4.60GHz     | Mini-Circuits                   | VHF-1200                         | 10435                     | 08/01/2022            | 12      |
| RE        | MJM-29        | 142230  | Measure, Tape, Steel              | KOMELON                         | KMC-36                           | -                         | -                     | -       |
| RE        | MLA-23        | 141267  | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess-Elektronik OHG | VUSLP9111B                       | 9111B-192                 | 09/21/2022            | 12      |
| RE        | MMM-10        | 141545  | DIGITAL HiTESTER                  | HIOKI E.E. CORPORATION          | 3805                             | 51201148                  | 01/18/2023            | 12      |
| RE        | MOS-15        | 141562  | Thermo-Hygrometer                 | CUSTOM. Inc                     | CTH-201                          | 0010                      | 01/13/2023            | 12      |
| RE        | MPA-12        | 141581  | MicroWave System Amplifier        | Keysight Technologies Inc       | 83017A                           | 00650                     | 10/05/2022            | 12      |
| RE        | MPA-14        | 141583  | Pre Amplifier                     | SONOMA INSTRUMENT               | 310                              | 260833                    | 04/04/2022            | 12      |
| RE        | MSA-10        | 141899  | Spectrum Analyzer                 | Keysight Technologies Inc       | E4448A                           | MY46180655                | 02/20/2023            | 12      |
| RE        | MTR-10        | 141951  | EMI Test Receiver                 | Rohde & Schwarz                 | ESR26                            | 101408                    | 07/25/2022            | 12      |
| RE        | MLPA-07       | 142645  | Loop Antenna                      | UL Japan                        | -                                | -                         | -                     | -       |
| AT        | MAEC-04       | 142011  | AC4_Semi Anechoic Chamber(NSA)    | TDK                             | Semi Anechoic Chamber 3m         | DA-10005                  | 05/22/2022            | 24      |
| AT        | MAT-10        | 141156  | Attenuator(10dB)                  | Weinschel Corp                  | 2                                | BL1173                    | 11/10/2022            | 12      |
| AT        | MDCB-02       | 141485  | DC Block Filter                   | Keysight Technologies Inc       | N9398C                           | 51053                     | 10/19/2022            | 12      |
| AT        | MOS-15        | 141562  | Thermo-Hygrometer                 | CUSTOM. Inc                     | CTH-201                          | 0010                      | 01/13/2023            | 12      |
| AT        | MPM-08        | 141805  | Power Meter                       | Anritsu Corporation             | ML2495A                          | 6K00003338                | 07/04/2022            | 12      |
| AT        | MPSE-11       | 141840  | Power sensor                      | Anritsu Corporation             | MA2411B                          | 11737                     | 07/04/2022            | 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: RE: Radiated Emission  
AT: Antenna Terminal Conducted