



# **RADIO TEST REPORT**

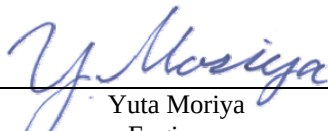
**Test Report No. : 13619652H-A-R1**

**Applicant** : TOYOTA MOTOR CORPORATION  
**Type of EUT** : Smart LF Oscillator  
**Model Number of EUT** : TMLF19T-2  
**FCC ID** : NI4TMLF19T-2  
**Test regulation** : FCC Part 15 Subpart C: 2021  
**Test Result** : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in Section 1.
10. This report is a revised version of 13619652H-A. 13619652H-A is replaced with this report.

**Date of test:** December 9 to 15, 2020

**Representative test engineer:**

  
Yuta Moriya  
Engineer  
Consumer Technology Division

**Approved by:**

  
Motoya Imura  
Leader  
Consumer Technology Division



CERTIFICATE 5107.02

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

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## **REVISION HISTORY**

**Original Test Report No.: 13619652H-A**

| Revision        | Test report No. | Date             | Page revised | Contents                       |
|-----------------|-----------------|------------------|--------------|--------------------------------|
| -<br>(Original) | 13619652H-A     | January 26, 2021 | -            | -                              |
| 1               | 13619652H-A-R1  | March 10, 2021   | P.36         | Exchange "with" and "without". |

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

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

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## **SECTION 1: Customer information**

|                  |   |                                              |
|------------------|---|----------------------------------------------|
| Company Name     | : | TOYOTA MOTOR CORPORATION                     |
| Address          | : | 1, Toyota-Cho, Toyota, Aichi, 471-8572 Japan |
| Telephone Number | : | +81-565-94-0902                              |
| Facsimile Number | : | +81-565-94-1161                              |
| Contact Person   | : | Shinji Suganuma                              |

The information provided from the customer is as follows;

- Applicant, Type 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
- 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**

|               |   |                                                                                           |
|---------------|---|-------------------------------------------------------------------------------------------|
| Type          | : | Smart LF Oscillator                                                                       |
| Model Number  | : | TMLF19T-2                                                                                 |
| Serial Number | : | Refer to SECTION 4.2                                                                      |
| Rating        | : | DC 12.0 V (Max 1.71 A (ave.))                                                             |
| Receipt Date  | : | November 24, 2020                                                                         |
| Condition     | : | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | : | No Modification by the test lab                                                           |

### **2.2 Product Description**

Smart LF Oscillator, model: TMLF19T-2 is a transmitter that is installed in a motor vehicle and is used as part of Smart System.

#### **Radio Specification**

|                        |   |              |
|------------------------|---|--------------|
| Radio Type             | : | Transmitter  |
| Frequency of Operation | : | 125 kHz      |
| Modulation             | : | ASK          |
| Antenna type           | : | Coil Antenna |

Smart LF Oscillator (model: TMLF19T-2) consists of the following parts:

- Computer Assy, Smart Key (ECU)
- D Door Antenna (Door Antenna)
- P Door Antenna (Door Antenna)
- Back Door Antenna (Trunk Antenna)
- Fr Antenna (Room Antenna)
- Rr1 Antenna (Room Antenna)
- Rr2 Antenna (Room Antenna)
- Immobilizer Antenna

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### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits; general requirements.

\* The revision does not affect the test result conducted before its effective date.

#### **3.2 Procedures and results**

| Item                                            | Test Procedure                                                                           | Specification                                                   | Remarks  | Deviation | Worst margin                                                    | Results        |
|-------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------|-----------|-----------------------------------------------------------------|----------------|
| Conducted Emission                              | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br><ISED><br>RSS-Gen 8.8            | <FCC><br>Section 15.207<br><ISED><br>RSS-Gen 8.8                | -        | N/A       | N/A                                                             | N/A<br>*1)     |
| Electric Field Strength of Fundamental Emission | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br><ISED><br>RSS-Gen 6.5, 6.12      | <FCC><br>Section 15.209<br><ISED><br>RSS-210 7.2<br>RSS-Gen 8.9 | Radiated | N/A       | 10.9 dB<br>125 kHz, 0 deg.<br>Peak with Duty factor<br><Mode 5> | Complied<br>a) |
| Electric Field Strength of Spurious Emission    | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br><ISED><br>RSS-Gen 6.5, 6.6, 6.13 | <FCC><br>Section 15.209<br><ISED><br>RSS-210 7.3<br>RSS-Gen 8.9 | Radiated | N/A       | 0.7 dB<br>58.499 MHz,<br>Vertical, QP<br><Mode 5>               | Complied<br>a) |
| -26 dB Bandwidth                                | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br><ISED><br>-                      | <FCC><br>Reference data<br><ISED><br>-                          | Radiated | N/A       | N/A                                                             | Complied<br>b) |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

\*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

a) Refer to APPENDIX 1 (data of Radiated emission)

b) Refer to APPENDIX 1 (data of -26 dB Bandwidth and 99 % Occupied Bandwidth)

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

This EUT provides stable voltage constantly to RF Module regardless of input voltage.

Instead of a new battery, DC power supply was used for the test.

That does not affect the test result, 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

| Item                     | Test Procedure | Specification | Remarks  | Deviation | Worst margin | Results |
|--------------------------|----------------|---------------|----------|-----------|--------------|---------|
| 99 % Occupied Band Width | RSS-Gen 6.7    | -             | Radiated | N/A       | N/A          | -       |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

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

### 3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

#### Radiated emission

| Measurement distance | Frequency range                  | Uncertainty (+/-) |
|----------------------|----------------------------------|-------------------|
| 3 m                  | 9 kHz to 30 MHz                  | 3.3 dB            |
| 10 m                 |                                  | 3.2 dB            |
| 3 m                  | 30 MHz to 200 MHz (Horizontal)   | 4.8 dB            |
|                      |                                  | 5.0 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal) | 5.2 dB            |
|                      |                                  | 6.3 dB            |
| 10 m                 | 30 MHz to 200 MHz (Horizontal)   | 4.8 dB            |
|                      |                                  | 4.8 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal) | 5.0 dB            |
|                      |                                  | 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               | 5.5 dB            |
|                      | 26.5 GHz to 40 GHz               | 5.5 dB            |
| 10 m                 | 1 GHz to 18 GHz                  | 5.2 dB            |

#### Antenna Terminal test

| Test Item                                  | Uncertainty (+/-) |
|--------------------------------------------|-------------------|
| -26 dB Bandwidth / 99 % Occupied Bandwidth | 0.96 %            |

### 3.5 Test Location

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\*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967

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

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| 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.11 measurement room     | 6.2 x 4.7 x 3.0            | 4.8 x 4.6                                                        | -                      | -                            |

\* 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.

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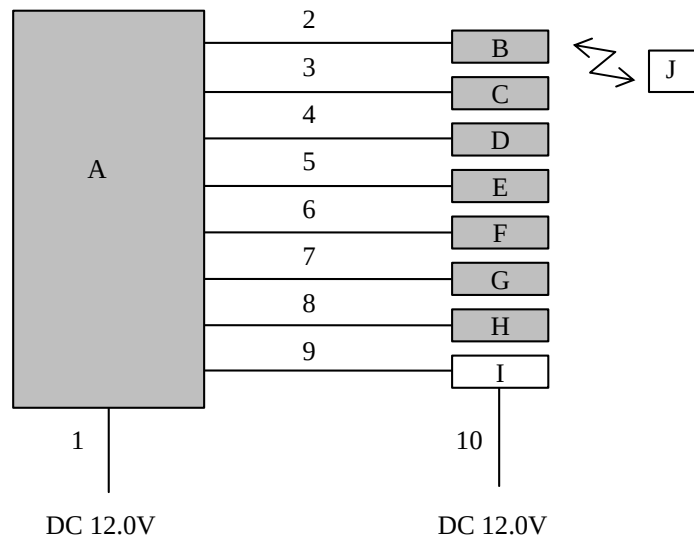
## SECTION 4: Operation of EUT during testing

### 4.1 Operating Modes

| Test mode                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remarks                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1) Tx 125 kHz D Door Antenna                                                                                                                                                                                                                                                                                                                                                                                                                       | Representative antenna by comparing D Door Antenna and P Door Antenna      |
| 2) Tx 125 kHz Back Door Antenna                                                                                                                                                                                                                                                                                                                                                                                                                    | -                                                                          |
| 3) Tx 125 kHz Fr Antenna                                                                                                                                                                                                                                                                                                                                                                                                                           | Representative antenna by comparing Fr Antenna, Rr1 Antenna and Rr2Antenna |
| 4) Tx 125 kHz Immobilizer Antenna                                                                                                                                                                                                                                                                                                                                                                                                                  | -                                                                          |
| 5) Tx 125 kHz D Door + P door Antenna                                                                                                                                                                                                                                                                                                                                                                                                              | -                                                                          |
| 6) Tx 125 kHz D Door Antenna (Min Power)                                                                                                                                                                                                                                                                                                                                                                                                           | carrier level and worst spurious emission (for Mode 1)                     |
| 7) Tx 125 kHz Back Door Antenna (Min Power)                                                                                                                                                                                                                                                                                                                                                                                                        | carrier level and worst spurious emission (for Mode 2)                     |
| 8) Tx 125 kHz Fr Antenna (Min Power)                                                                                                                                                                                                                                                                                                                                                                                                               | carrier level and worst spurious emission (for Mode 3)                     |
| <p>* EUT was set by the software as follows;<br/> Software: S19T-2-01_max V1.00 (for maximum output)<br/> S19T-2-01_min V1.00 (for minimum output)<br/> (Date: December 9, 2020, Storage location: EUT memory)</p> <p>*This setting of software is the worst case.<br/> Any conditions under the normal use do not exceed the condition of setting.<br/> In addition, end users cannot change the settings of the output power of the product.</p> |                                                                            |

Justification : The system was configured in typical fashion (as a user would normally use it) for testing.

### 4.2 Configuration and peripherals



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

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#### Description of EUT and Support equipment

| No. | Item                           | Model number     | Serial number | Manufacturer | Remarks |
|-----|--------------------------------|------------------|---------------|--------------|---------|
| A   | Computer Assy, Smart Key (ECU) | TMLF19T-2(19ADX) | 19ECU2006     | -            | EUT     |
| B   | Immobilizer Antenna            | 19PA0            | 19ENG2001     | -            | EUT     |
| C   | D Door Antenna                 | 19DA0            | 19DRD2001     | -            | EUT     |
| D   | P Door Antenna                 | 19DA1            | 19DRP2001     | -            | EUT     |
| E   | Back Door Antenna              | 12TA0            | 19BK2001      | -            | EUT     |
| F   | Fr Antenna                     | 19WA0            | 19LF2001      | -            | EUT     |
| G   | Rr1 Antenna                    | 19WA0            | 19LF2002      | -            | EUT     |
| H   | Rr2 Antenna                    | 19WA0            | 19LF2003      | -            | EUT     |
| I   | Low Frequency Evaluation Bench | -                | 19SEB2001     | -            | -       |
| J   | Electronic Key                 | -                | -             | -            | -       |

#### List of cables used

| No. | Name                   | Length (m) | Shield     |            | Remarks |
|-----|------------------------|------------|------------|------------|---------|
|     |                        |            | Cable      | Connector  |         |
| 1   | DC Cable               | 3.0        | Unshielded | Unshielded | -       |
| 2   | Immobilizer Ant. Cable | 1.0        | Unshielded | Unshielded | -       |
| 3   | D Door Ant. Cable      | 1.0        | Unshielded | Unshielded | -       |
| 4   | P Door Ant. Cable      | 1.0        | Unshielded | Unshielded | -       |
| 5   | Back Door Ant. Cable   | 1.0        | Unshielded | Unshielded | -       |
| 6   | Fr Ant. Cable          | 1.0        | Unshielded | Unshielded | -       |
| 7   | Rr1 Ant. Cable         | 1.0        | Unshielded | Unshielded | -       |
| 8   | Rr2 Ant. Cable         | 1.0        | Unshielded | Unshielded | -       |
| 9   | Switch BOX Cable       | 0.5        | Unshielded | Unshielded | -       |
| 10  | DC Cable               | 3.0        | Unshielded | Unshielded | -       |

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## SECTION 5: Radiated emission (Fundamental and Spurious Emission)

### Test Procedure

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.

Frequency : From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

\*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

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

The measurements were performed for both vertical and horizontal antenna polarization.

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

| Frequency       | From 9 kHz to 90 kHz and From 110 kHz to 150 kHz | From 90 kHz to 110 kHz | From 150 kHz to 490 kHz | From 490 kHz to 30 MHz | From 30 MHz to 1 GHz |
|-----------------|--------------------------------------------------|------------------------|-------------------------|------------------------|----------------------|
| Instrument used | Test Receiver                                    |                        |                         |                        |                      |
| Detector        | PK / AV                                          | QP                     | PK / AV                 | QP                     | QP                   |
| IF Bandwidth    | 200 Hz                                           | 200 Hz                 | 9 kHz                   | 9 kHz                  | 120 kHz              |
| Test Distance   | 3 m *1)                                          | 3 m *1)                | 3 m *1)                 | 3 m *2)                | 3 m                  |

\*1) Distance Factor:  $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

\*2) Distance Factor:  $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

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  $45.5 - 51.5 = -6.0 \text{ dBuA/m}$ , which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

**UL Japan, Inc.**

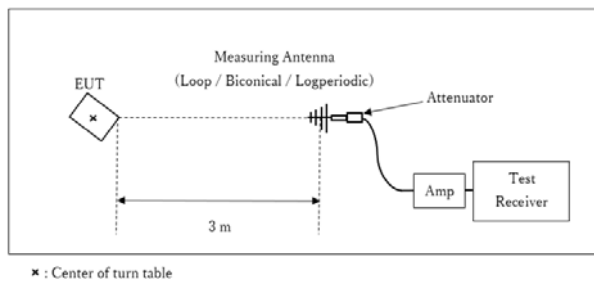
**Ise EMC Lab.**

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Facsimile : +81 596 24 8124

[Test Setup]  
Below 1 GHz



Test Distance: 3 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.

- This EUT has two modes which transponder key is inserted or not. The worst case was confirmed with and without transponder key, as a result, the test without transponder key was the worst case. Therefore the test without transponder key was performed only.

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

**Measurement range** : 9 kHz - 1 GHz

**Test data** : APPENDIX 1

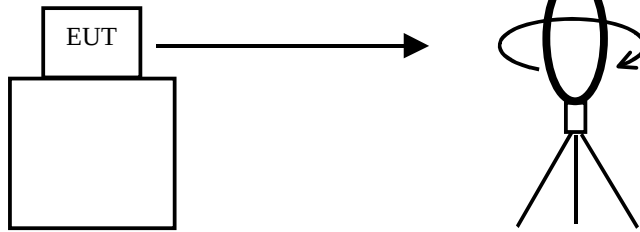
**Test result** : Pass

Date: December 9 and 10, 2020  
December 15, 2020

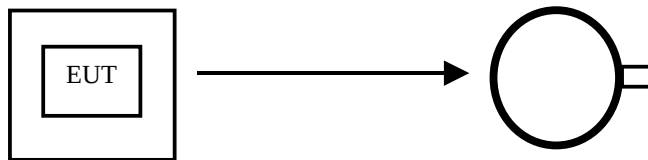
Test engineer: Shinya Watanabe  
Yuta Moriya

**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



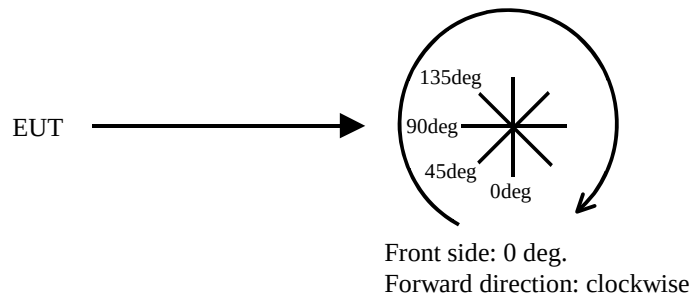
.....  
*Top View (Horizontal)*



Antenna was not rotated.

.....

*Top View (Vertical)*



## **SECTION 6: -26 dB Bandwidth**

### **Test Procedure**

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

<Other Mode except for Mode 4>

| Test             | Span    | RBW   | VBW   | Sweep | Detector | Trace    | Instrument used   |
|------------------|---------|-------|-------|-------|----------|----------|-------------------|
| -26 dB Bandwidth | 100 kHz | 1 kHz | 3 kHz | Auto  | Peak     | Max Hold | Spectrum Analyzer |

<Mode 4>

| Test             | Span    | RBW   | VBW   | Sweep | Detector | Trace    | Instrument used   |
|------------------|---------|-------|-------|-------|----------|----------|-------------------|
| -26 dB Bandwidth | 100 kHz | 1 kHz | 3 kHz | Auto  | Peak     | Max Hold | Spectrum Analyzer |

Test data : APPENDIX 1

Test result : Pass

## **SECTION 7: 99 % Occupied Bandwidth**

### **Test Procedure**

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

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

Test data : APPENDIX 1

Test result : Pass

## APPENDIX 1: Test data

### Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 1

#### PK or QP

| Ant Deg [deg]<br>or<br>Polarity [Hori/Vert] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>dBuV/m] | Margin<br>[dB] | Remark             |
|---------------------------------------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|------------------|----------------|--------------------|
| 0deg                                        | 0.12500            | PK       | 96.5              | 18.9                    | -74.0        | 32.3         | -                      | 9.2                | 45.6             | 36.4           | Fundamental        |
| 0deg                                        | 0.12500            | PK       | 77.9              | 18.9                    | -74.0        | 32.3         | -                      | -9.4               | 45.6             | 55.0           | Fundamental(Mode6) |
| 0deg                                        | 0.25000            | PK       | 78.6              | 18.9                    | -74.0        | 32.3         | -                      | -8.8               | 39.6             | 48.4           |                    |
| 0deg                                        | 0.37500            | PK       | 69.7              | 18.8                    | -73.9        | 32.3         | -                      | -17.7              | 36.1             | 53.8           |                    |
| 0deg                                        | 0.50000            | QP       | 45.8              | 18.8                    | -33.9        | 32.2         | -                      | -1.6               | 33.6             | 35.2           |                    |
| 0deg                                        | 0.62500            | QP       | 67.4              | 18.8                    | -33.9        | 32.2         | -                      | 20.0               | 31.7             | 11.6           |                    |
| 0deg                                        | 0.62500            | QP       | 57.7              | 18.8                    | -33.9        | 32.2         | -                      | 10.3               | 31.7             | 21.3           | (Mode6)            |
| 0deg                                        | 0.75000            | QP       | 37.4              | 18.8                    | -33.9        | 32.2         | -                      | -9.9               | 30.1             | 40.0           |                    |
| 0deg                                        | 0.87500            | QP       | 46.9              | 18.8                    | -33.9        | 32.2         | -                      | -0.4               | 28.7             | 29.2           |                    |
| 0deg                                        | 1.00000            | QP       | 38.8              | 18.8                    | -33.9        | 32.2         | -                      | -8.5               | 27.6             | 36.1           |                    |
| 0deg                                        | 1.12500            | QP       | 54.4              | 18.8                    | -33.9        | 32.2         | -                      | 7.1                | 26.5             | 19.4           |                    |
| 0deg                                        | 1.25000            | QP       | 31.0              | 18.8                    | -33.8        | 32.2         | -                      | -16.3              | 25.6             | 41.9           |                    |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

#### PK with Duty factor

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>dBuV/m] | Margin<br>[dB] | Remark  |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|------------------|----------------|---------|
| 0deg          | 0.12500            | AV       | 96.5              | 18.9                    | -74.0        | 32.3         | 0.0                    | 9.2                | 25.6             | 16.4           |         |
| 0deg          | 0.12500            | AV       | 77.9              | 18.9                    | -74.0        | 32.3         | 0.0                    | -9.4               | 25.6             | 35.0           | (Mode6) |
| 0deg          | 0.25000            | AV       | 78.6              | 18.9                    | -74.0        | 32.3         | 0.0                    | -8.8               | 19.6             | 28.4           |         |
| 0deg          | 0.37500            | AV       | 69.7              | 18.8                    | -73.9        | 32.3         | 0.0                    | -17.7              | 16.1             | 33.8           |         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

### Result of the fundamental emission at 3m without Distance factor

#### PK or QP

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>dBuV/m] | Margin<br>[dB] | Remark             |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|------------------|----------------|--------------------|
| 0deg          | 0.12500            | PK       | 96.5              | 18.9                    | 6.0          | 32.3         | -                      | 89.2               | -                | -              | Fundamental        |
| 0deg          | 0.12500            | PK       | 77.9              | 18.9                    | 6.0          | 32.3         | -                      | 70.6               | -                | -              | Fundamental(Mode6) |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\*For Mode 6 (ECU: Min Power), only the carrier level and worst spurious emission of Mode 1 (ECU: Max Power) were confirmed.

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## Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 2

### PK or QP

| Ant Deg [deg]<br>or<br>Polarity [Hori/Vert] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark             |
|---------------------------------------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|--------------------|
| 0deg                                        | 0.12500            | PK       | 95.8              | 18.9                    | -74.0        | 32.3         | -                      | 8.5                | 45.6              | 37.1           | Fundamental        |
| 0deg                                        | 0.12500            | PK       | 75.0              | 18.9                    | -74.0        | 32.3         | -                      | -12.3              | 45.6              | 57.9           | Fundamental(Mode7) |
| 0deg                                        | 0.25000            | PK       | 83.2              | 18.9                    | -74.0        | 32.3         | -                      | -4.2               | 39.6              | 43.8           |                    |
| 0deg                                        | 0.37500            | PK       | 67.3              | 18.8                    | -73.9        | 32.3         | -                      | -20.1              | 36.1              | 56.2           |                    |
| 0deg                                        | 0.50000            | QP       | 62.1              | 18.8                    | -33.9        | 32.2         | -                      | 14.7               | 33.6              | 18.9           |                    |
| 0deg                                        | 0.62500            | QP       | 63.3              | 18.8                    | -33.9        | 32.2         | -                      | 15.9               | 31.7              | 15.7           |                    |
| 0deg                                        | 0.62500            | QP       | 54.6              | 18.8                    | -33.9        | 32.2         | -                      | 7.2                | 31.7              | 24.4           | (Mode7)            |
| 0deg                                        | 0.75000            | QP       | 57.1              | 18.8                    | -33.9        | 32.2         | -                      | 9.8                | 30.1              | 20.3           |                    |
| 0deg                                        | 0.87500            | QP       | 45.0              | 18.8                    | -33.9        | 32.2         | -                      | -2.3               | 28.7              | 31.1           |                    |
| 0deg                                        | 1.00000            | QP       | 53.8              | 18.8                    | -33.9        | 32.2         | -                      | 6.5                | 27.6              | 21.1           |                    |
| 0deg                                        | 1.12500            | QP       | 52.0              | 18.8                    | -33.9        | 32.2         | -                      | 4.7                | 26.5              | 21.8           |                    |
| 0deg                                        | 1.25000            | QP       | 42.9              | 18.8                    | -33.8        | 32.2         | -                      | -4.4               | 25.6              | 30.0           |                    |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

### PK with Duty factor

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|---------|
| 0deg          | 0.12500            | AV       | 95.8              | 18.9                    | -74.0        | 32.3         | 0.0                    | 8.5                | 25.6              | 17.1           |         |
| 0deg          | 0.12500            | AV       | 75.0              | 18.9                    | -74.0        | 32.3         | 0.0                    | -12.3              | 25.6              | 37.9           | (Mode7) |
| 0deg          | 0.25000            | AV       | 83.2              | 18.9                    | -74.0        | 32.3         | 0.0                    | -4.2               | 19.6              | 23.8           |         |
| 0deg          | 0.37500            | AV       | 67.3              | 18.8                    | -73.9        | 32.3         | 0.0                    | -20.1              | 16.1              | 36.2           |         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

## Result of the fundamental emission at 3m without Distance factor

### PK or QP

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark             |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|--------------------|
| 0deg          | 0.12500            | PK       | 95.8              | 18.9                    | 6.0          | 32.3         | -                      | 88.5               | -                 | -              | Fundamental        |
| 0deg          | 0.12500            | PK       | 75.0              | 18.9                    | 6.0          | 32.3         | -                      | 67.7               | -                 | -              | Fundamental(Mode7) |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\* For Mode 7 (ECU: Min Power), only the carrier level and worst spurious emission of Mode 2 (ECU: Max Power) were confirmed.

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## Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 3

### PK or QP

| Ant Deg [deg]<br>or<br>Polarity [Hori/Vert] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark             |
|---------------------------------------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|--------------------|
| 0deg                                        | 0.12500            | PK       | 96.7              | 18.9                    | -74.0        | 32.3         | -                      | 9.3                | 45.6              | 36.3           | Fundamental        |
| 0deg                                        | 0.12500            | PK       | 72.3              | 18.9                    | -74.0        | 32.3         | -                      | -15.0              | 45.6              | 60.6           | Fundamental(Mode8) |
| 0deg                                        | 0.25000            | PK       | 60.3              | 18.9                    | -74.0        | 32.3         | -                      | -27.1              | 39.6              | 66.7           |                    |
| 0deg                                        | 0.37500            | PK       | 73.1              | 18.8                    | -73.9        | 32.3         | -                      | -14.3              | 36.1              | 50.4           |                    |
| 0deg                                        | 0.50000            | QP       | 47.6              | 18.8                    | -33.9        | 32.2         | -                      | 0.2                | 33.6              | 33.4           |                    |
| 0deg                                        | 0.62500            | QP       | 69.9              | 18.8                    | -33.9        | 32.2         | -                      | 22.5               | 31.7              | 9.1            |                    |
| 0deg                                        | 0.62500            | QP       | 57.3              | 18.8                    | -33.9        | 32.2         | -                      | 9.9                | 31.7              | 21.7           | (Mode8)            |
| 0deg                                        | 0.75000            | QP       | 35.2              | 18.8                    | -33.9        | 32.2         | -                      | -12.1              | 30.1              | 42.2           |                    |
| 0deg                                        | 0.87500            | QP       | 54.2              | 18.8                    | -33.9        | 32.2         | -                      | 6.9                | 28.7              | 21.9           |                    |
| 0deg                                        | 1.00000            | QP       | 43.1              | 18.8                    | -33.9        | 32.2         | -                      | -4.2               | 27.6              | 31.8           |                    |
| 0deg                                        | 1.12500            | QP       | 58.1              | 18.8                    | -33.9        | 32.2         | -                      | 10.8               | 26.5              | 15.7           |                    |
| 0deg                                        | 1.25000            | QP       | 30.5              | 18.8                    | -33.8        | 32.2         | -                      | -16.8              | 25.6              | 42.4           |                    |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

### PK with Duty factor

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|---------|
| 0deg          | 0.12500            | AV       | 96.7              | 18.9                    | -74.0        | 32.3         | 0.0                    | 9.3                | 25.6              | 16.3           |         |
| 0deg          | 0.12500            | AV       | 72.3              | 18.9                    | -74.0        | 32.3         | 0.0                    | -15.0              | 25.6              | 40.6           | (Mode8) |
| 0deg          | 0.25000            | AV       | 60.3              | 18.9                    | -74.0        | 32.3         | 0.0                    | -27.1              | 19.6              | 46.7           |         |
| 0deg          | 0.37500            | AV       | 73.1              | 18.8                    | -73.9        | 32.3         | 0.0                    | -14.3              | 16.1              | 30.4           |         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

## Result of the fundamental emission at 3m without Distance factor

### PK or QP

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark             |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|--------------------|
| 0deg          | 0.12500            | PK       | 96.7              | 18.9                    | 6.0          | 32.3         | -                      | 89.3               | -                 | -              | Fundamental        |
| 0deg          | 0.12500            | PK       | 72.3              | 18.9                    | 6.0          | 32.3         | -                      | 65.0               | -                 | -              | Fundamental(Mode8) |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\*For Mode 8 (ECU: Min Power), only the carrier level and worst spurious emission of Mode 3 (ECU: Max Power) were confirmed.

UL Japan, Inc.

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Telephone : +81 596 24 8999

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## Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 4

### PK or QP

| Ant Deg [deg]<br>or<br>Polarity [Hori/Vert] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|---------------------------------------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0deg                                        | 0.12500            | PK       | 98.7              | 18.9                    | -74.0        | 32.3         | -                      | 11.4               | 45.6              | 34.2           | Fundamental |
| 0deg                                        | 0.25000            | PK       | 64.7              | 18.9                    | -74.0        | 32.3         | -                      | -22.7              | 39.6              | 62.3           |             |
| 0deg                                        | 0.37500            | PK       | 66.7              | 18.8                    | -73.9        | 32.3         | -                      | -20.7              | 36.1              | 56.8           |             |
| 0deg                                        | 0.50000            | QP       | 42.5              | 18.8                    | -33.9        | 32.2         | -                      | -4.9               | 33.6              | 38.5           |             |
| 0deg                                        | 0.62500            | QP       | 49.5              | 18.8                    | -33.9        | 32.2         | -                      | 2.1                | 31.7              | 29.5           |             |
| 0deg                                        | 0.75000            | QP       | 31.1              | 18.8                    | -33.9        | 32.2         | -                      | -16.2              | 30.1              | 46.3           |             |
| 0deg                                        | 0.87500            | QP       | 50.6              | 18.8                    | -33.9        | 32.2         | -                      | 3.3                | 28.7              | 25.5           |             |
| 0deg                                        | 1.00000            | QP       | 45.6              | 18.8                    | -33.9        | 32.2         | -                      | -1.7               | 27.6              | 29.3           |             |
| 0deg                                        | 1.12500            | QP       | 36.3              | 18.8                    | -33.9        | 32.2         | -                      | -11.0              | 26.5              | 37.5           |             |
| 0deg                                        | 1.25000            | QP       | 30.4              | 18.8                    | -33.8        | 32.2         | -                      | -16.9              | 25.6              | 42.5           |             |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

### PK with Duty factor

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|--------|
| 0deg          | 0.12500            | AV       | 98.7              | 18.9                    | -74.0        | 32.3         | 0.0                    | 11.4               | 25.6              | 14.2           |        |
| 0deg          | 0.25000            | AV       | 64.7              | 18.9                    | -74.0        | 32.3         | 0.0                    | -22.7              | 19.6              | 42.3           |        |
| 0deg          | 0.37500            | AV       | 66.7              | 18.8                    | -73.9        | 32.3         | 0.0                    | -20.7              | 16.1              | 36.8           |        |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

## Result of the fundamental emission at 3m without Distance factor

### PK or QP

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0deg          | 0.12500            | PK       | 98.7              | 18.9                    | 6.0          | 32.3         | -                      | 91.4               | -                 | -              | Fundamental |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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## Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 5

### PK or QP

| Ant Deg [deg]<br>or<br>Polarity [Hori/Vert] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|---------------------------------------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0deg                                        | 0.12500            | PK       | 102.0             | 18.9                    | -74.0        | 32.3         | -                      | 14.7               | 45.6              | 30.9           | Fundamental |
| 0deg                                        | 0.25000            | PK       | 68.3              | 18.9                    | -74.0        | 32.3         | -                      | -19.1              | 39.6              | 58.7           |             |
| 0deg                                        | 0.37500            | PK       | 76.3              | 18.8                    | -73.9        | 32.3         | -                      | -11.1              | 36.1              | 47.2           |             |
| 0deg                                        | 0.50000            | QP       | 44.1              | 18.8                    | -33.9        | 32.2         | -                      | -3.3               | 33.6              | 36.9           |             |
| 0deg                                        | 0.62500            | QP       | 65.5              | 18.8                    | -33.9        | 32.2         | -                      | 18.1               | 31.7              | 13.5           |             |
| 0deg                                        | 0.75000            | QP       | 35.5              | 18.8                    | -33.9        | 32.2         | -                      | -11.8              | 30.1              | 41.9           |             |
| 0deg                                        | 0.87500            | QP       | 37.1              | 18.8                    | -33.9        | 32.2         | -                      | -10.2              | 28.7              | 39.0           |             |
| 0deg                                        | 1.00000            | QP       | 32.7              | 18.8                    | -33.9        | 32.2         | -                      | -14.6              | 27.6              | 42.2           |             |
| 0deg                                        | 1.12500            | QP       | 55.0              | 18.8                    | -33.9        | 32.2         | -                      | 7.7                | 26.5              | 18.8           |             |
| 0deg                                        | 1.25000            | QP       | 31.0              | 18.8                    | -33.8        | 32.2         | -                      | -16.3              | 25.6              | 41.9           |             |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

### PK with Duty factor

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|--------|
| 0deg          | 0.12500            | AV       | 102.0             | 18.9                    | -74.0        | 32.3         | 0.0                    | 14.7               | 25.6              | 10.9           |        |
| 0deg          | 0.25000            | AV       | 68.3              | 18.9                    | -74.0        | 32.3         | 0.0                    | -19.1              | 19.6              | 38.7           |        |
| 0deg          | 0.37500            | AV       | 76.3              | 18.8                    | -73.9        | 32.3         | 0.0                    | -11.1              | 16.1              | 27.2           |        |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

## Result of the fundamental emission at 3m without Distance factor

### PK or QP

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0deg          | 0.12500            | PK       | 102.0             | 18.9                    | 6.0          | 32.3         | -                      | 94.7               | -                 | -              | Fundamental |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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## Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date December 10, 2020  
Temperature / Humidity 20 deg. C / 37 % RH  
Engineer Shinya Watanabe  
Mode Mode 1

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.003             | QP       | 39.6              | 18.4               | 7.1          | 38.8         | 26.3               | 40.0              | 13.7           |        |
| Hori.    | 44.745             | QP       | 35.2              | 13.1               | 7.4          | 38.8         | 16.7               | 40.0              | 23.3           |        |
| Hori.    | 55.497             | QP       | 47.3              | 9.1                | 7.5          | 38.8         | 25.1               | 40.0              | 14.9           |        |
| Hori.    | 60.499             | QP       | 47.0              | 7.6                | 7.6          | 38.8         | 23.4               | 40.0              | 16.6           |        |
| Hori.    | 176.048            | QP       | 46.6              | 15.8               | 8.6          | 38.9         | 32.1               | 43.5              | 11.4           |        |
| Hori.    | 191.995            | QP       | 44.5              | 16.3               | 8.8          | 38.9         | 30.7               | 43.5              | 12.9           |        |
| Vert.    | 30.003             | QP       | 51.7              | 18.4               | 7.1          | 38.8         | 38.4               | 40.0              | 1.6            |        |
| Vert.    | 44.745             | QP       | 40.7              | 13.1               | 7.4          | 38.8         | 22.3               | 40.0              | 17.7           |        |
| Vert.    | 55.497             | QP       | 53.5              | 9.1                | 7.5          | 38.8         | 31.3               | 40.0              | 8.8            |        |
| Vert.    | 60.499             | QP       | 60.9              | 7.6                | 7.6          | 38.8         | 37.3               | 40.0              | 2.8            |        |
| Vert.    | 176.048            | QP       | 45.3              | 15.8               | 8.6          | 38.9         | 30.9               | 43.5              | 12.7           |        |
| Vert.    | 191.995            | QP       | 50.1              | 16.3               | 8.8          | 38.9         | 36.3               | 43.5              | 7.3            |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date December 10, 2020  
Temperature / Humidity 20 deg. C / 37 % RH  
Engineer Shinya Watanabe  
Mode Mode 6

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.003             | QP       | 36.4              | 18.4               | 7.1          | 38.8         | 23.2               | 40.0              | 16.8           |        |
| Vert.    | 30.003             | QP       | 47.2              | 18.4               | 7.1          | 38.8         | 34.0               | 40.0              | 6.0            |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\*For Mode 6 (ECU: Min Power), only the carrier level and worst spurious emission of Mode 1 (ECU: Max Power) were confirmed.

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## Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 09, 2020  
Temperature / Humidity 21 deg. C / 38 % RH  
Engineer Shinya Watanabe  
Mode Mode 2

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.000             | QP       | 32.6              | 18.5               | 7.1          | 32.2         | 26.0               | 40.0              | 14.0           |        |
| Hori.    | 53.499             | QP       | 31.2              | 9.8                | 7.5          | 32.2         | 16.4               | 40.0              | 23.6           |        |
| Hori.    | 60.999             | QP       | 45.7              | 7.5                | 7.6          | 32.2         | 28.6               | 40.0              | 11.4           |        |
| Hori.    | 64.499             | QP       | 42.8              | 6.8                | 7.7          | 32.2         | 25.2               | 40.0              | 14.8           |        |
| Hori.    | 182.495            | QP       | 32.0              | 16.3               | 9.1          | 32.0         | 25.3               | 43.5              | 18.3           |        |
| Hori.    | 182.995            | QP       | 30.1              | 16.3               | 9.1          | 32.0         | 23.4               | 43.5              | 20.1           |        |
| Vert.    | 30.000             | QP       | 44.5              | 18.5               | 7.1          | 32.2         | 37.9               | 40.0              | 2.1            |        |
| Vert.    | 53.499             | QP       | 41.6              | 9.8                | 7.5          | 32.2         | 26.8               | 40.0              | 13.2           |        |
| Vert.    | 60.999             | QP       | 51.8              | 7.5                | 7.6          | 32.2         | 34.8               | 40.0              | 5.2            |        |
| Vert.    | 64.499             | QP       | 51.9              | 6.8                | 7.7          | 32.2         | 34.3               | 40.0              | 5.8            |        |
| Vert.    | 182.495            | QP       | 36.4              | 16.3               | 9.1          | 32.0         | 29.7               | 43.5              | 13.8           |        |
| Vert.    | 182.995            | QP       | 35.2              | 16.3               | 9.1          | 32.0         | 28.5               | 43.5              | 15.1           |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date December 10, 2020  
Temperature / Humidity 20 deg. C / 37 % RH  
Engineer Shinya Watanabe  
Mode Mode 7

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.000             | QP       | 33.6              | 18.4               | 7.1          | 38.8         | 20.4               | 40.0              | 19.7           |        |
| Vert.    | 30.000             | QP       | 44.1              | 18.4               | 7.1          | 38.8         | 30.8               | 40.0              | 9.2            |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\*For Mode 7 (ECU: Min Power), only the carrier level and worst spurious emission of Mode 2 (ECU: Max Power) were confirmed.

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## Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 09, 2020  
Temperature / Humidity 21 deg. C / 38 % RH  
Engineer Shinya Watanabe  
Mode Mode 3

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.000             | QP       | 32.5              | 18.5               | 7.1          | 32.2         | 25.8               | 40.0              | 14.2           |        |
| Hori.    | 53.999             | QP       | 30.7              | 9.6                | 7.5          | 32.2         | 15.7               | 40.0              | 24.3           |        |
| Hori.    | 61.498             | QP       | 46.0              | 7.4                | 7.7          | 32.2         | 28.8               | 40.0              | 11.2           |        |
| Hori.    | 64.998             | QP       | 40.8              | 6.7                | 7.7          | 32.2         | 23.0               | 40.0              | 17.0           |        |
| Hori.    | 180.495            | QP       | 36.3              | 16.2               | 9.0          | 32.0         | 29.4               | 43.5              | 14.1           |        |
| Hori.    | 182.995            | QP       | 34.4              | 16.3               | 9.1          | 32.0         | 27.7               | 43.5              | 15.8           |        |
| Vert.    | 30.000             | QP       | 44.5              | 18.5               | 7.1          | 32.2         | 37.9               | 40.0              | 2.1            |        |
| Vert.    | 53.999             | QP       | 40.9              | 9.6                | 7.5          | 32.2         | 25.9               | 40.0              | 14.1           |        |
| Vert.    | 61.498             | QP       | 51.5              | 7.4                | 7.7          | 32.2         | 34.4               | 40.0              | 5.6            |        |
| Vert.    | 64.998             | QP       | 49.7              | 6.7                | 7.7          | 32.2         | 32.0               | 40.0              | 8.0            |        |
| Vert.    | 180.495            | QP       | 44.1              | 16.2               | 9.0          | 32.0         | 37.3               | 43.5              | 6.2            |        |
| Vert.    | 182.995            | QP       | 42.2              | 16.3               | 9.1          | 32.0         | 35.5               | 43.5              | 8.0            |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date December 10, 2020  
Temperature / Humidity 20 deg. C / 37 % RH  
Engineer Shinya Watanabe  
Mode Mode 8

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.000             | QP       | 34.4              | 18.4               | 7.1          | 38.8         | 21.1               | 40.0              | 18.9           |        |
| Vert.    | 30.000             | QP       | 46.1              | 18.4               | 7.1          | 38.8         | 32.8               | 40.0              | 7.2            |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\*For Mode 8 (ECU: Min Power), only the carrier level and worst spurious emission of Mode 3 (ECU: Max Power) were confirmed.

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## Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date December 10, 2020  
Temperature / Humidity 20 deg. C / 37 % RH  
Engineer Shinya Watanabe  
Mode Mode 4

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.500             | QP       | 40.7              | 18.2               | 7.1          | 38.8         | 27.3               | 40.0              | 12.8           |        |
| Hori.    | 54.999             | QP       | 45.8              | 9.3                | 7.5          | 38.8         | 23.7               | 40.0              | 16.3           |        |
| Hori.    | 59.999             | QP       | 41.5              | 7.7                | 7.5          | 38.8         | 17.9               | 40.0              | 22.1           |        |
| Hori.    | 64.998             | QP       | 45.0              | 6.7                | 7.6          | 38.9         | 20.5               | 40.0              | 19.5           |        |
| Hori.    | 177.996            | QP       | 42.6              | 15.9               | 8.7          | 38.9         | 28.2               | 43.5              | 15.3           |        |
| Hori.    | 189.996            | QP       | 39.8              | 16.2               | 8.8          | 38.9         | 25.9               | 43.5              | 17.7           |        |
| Hori.    | 224.996            | QP       | 42.8              | 11.2               | 9.0          | 38.9         | 24.2               | 46.0              | 21.9           |        |
| Vert.    | 30.500             | QP       | 51.5              | 18.2               | 7.1          | 38.8         | 38.1               | 40.0              | 2.0            |        |
| Vert.    | 54.999             | QP       | 51.5              | 9.3                | 7.5          | 38.8         | 29.4               | 40.0              | 10.6           |        |
| Vert.    | 59.999             | QP       | 55.8              | 7.7                | 7.5          | 38.8         | 32.3               | 40.0              | 7.8            |        |
| Vert.    | 64.998             | QP       | 56.6              | 6.7                | 7.6          | 38.9         | 32.1               | 40.0              | 7.9            |        |
| Vert.    | 177.996            | QP       | 41.1              | 15.9               | 8.7          | 38.9         | 26.7               | 43.5              | 16.8           |        |
| Vert.    | 189.996            | QP       | 39.7              | 16.2               | 8.8          | 38.9         | 25.7               | 43.5              | 17.8           |        |
| Vert.    | 224.996            | QP       | 42.4              | 11.2               | 9.0          | 38.9         | 23.7               | 46.0              | 22.3           |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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## Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date December 10, 2020  
Temperature / Humidity 20 deg. C / 37 % RH  
Engineer Shinya Watanabe  
Mode Mode 5

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 30.499             | QP       | 38.5              | 18.2               | 7.1          | 38.8         | 25.1               | 40.0              | 14.9           |        |
| Hori.    | 53.491             | QP       | 44.7              | 9.8                | 7.5          | 38.8         | 23.1               | 40.0              | 16.9           |        |
| Hori.    | 55.499             | QP       | 51.9              | 9.1                | 7.5          | 38.8         | 29.7               | 40.0              | 10.3           |        |
| Hori.    | 58.499             | QP       | 45.6              | 8.2                | 7.5          | 38.8         | 22.5               | 40.0              | 17.5           |        |
| Hori.    | 63.999             | QP       | 52.0              | 6.9                | 7.6          | 38.8         | 27.7               | 40.0              | 12.4           |        |
| Hori.    | 85.998             | QP       | 40.4              | 7.7                | 7.8          | 38.9         | 17.1               | 40.0              | 23.0           |        |
| Hori.    | 177.499            | QP       | 45.5              | 15.9               | 8.7          | 38.9         | 31.1               | 43.5              | 12.4           |        |
| Hori.    | 202.496            | QP       | 50.4              | 11.4               | 8.9          | 38.9         | 31.7               | 43.5              | 11.8           |        |
| Vert.    | 30.499             | QP       | 49.5              | 18.2               | 7.1          | 38.8         | 36.0               | 40.0              | 4.0            |        |
| Vert.    | 53.491             | QP       | 55.9              | 9.8                | 7.5          | 38.8         | 34.3               | 40.0              | 5.7            |        |
| Vert.    | 55.499             | QP       | 61.0              | 9.1                | 7.5          | 38.8         | 38.8               | 40.0              | 1.2            |        |
| Vert.    | 58.499             | QP       | 62.4              | 8.2                | 7.5          | 38.8         | 39.3               | 40.0              | 0.7            |        |
| Vert.    | 65.999             | QP       | 59.4              | 6.6                | 7.6          | 38.9         | 34.8               | 40.0              | 5.2            |        |
| Vert.    | 85.998             | QP       | 46.3              | 7.7                | 7.8          | 38.9         | 23.0               | 40.0              | 17.0           |        |
| Vert.    | 177.499            | QP       | 49.7              | 15.9               | 8.7          | 38.9         | 35.3               | 43.5              | 8.3            |        |
| Vert.    | 202.496            | QP       | 52.6              | 11.4               | 8.9          | 38.9         | 33.9               | 43.5              | 9.6            |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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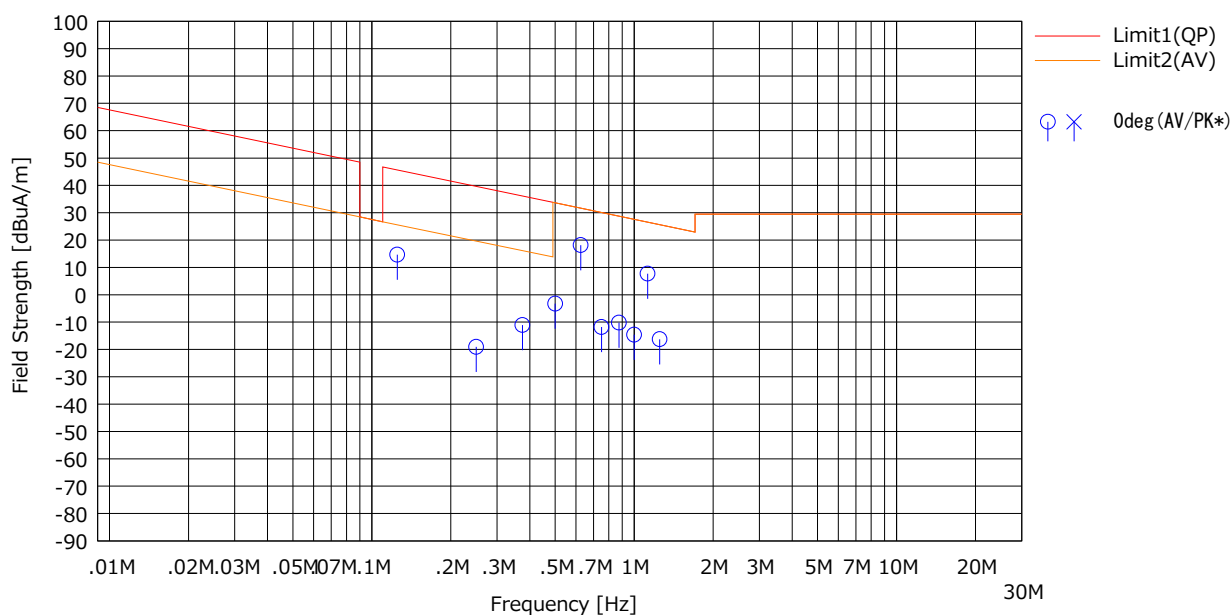
Facsimile : +81 596 24 8124

## Radiated Emission Plot data, Worst case

|                        |                       |                       |
|------------------------|-----------------------|-----------------------|
| Report No.             | 13619652H             |                       |
| Test place             | Ise EMC Lab.          |                       |
| Semi Anechoic Chamber  | No.4                  | No.3                  |
| Date                   | December 10, 2020     | December 15, 2020     |
| Temperature / Humidity | 20 deg. C / 37 % RH   | 25 deg. C / 30 % RH   |
| Engineer               | Shinya Watanabe       | Yuta Moriya           |
| Mode                   | Mode 5 (above 30 MHz) | Mode 5 (below 30 MHz) |

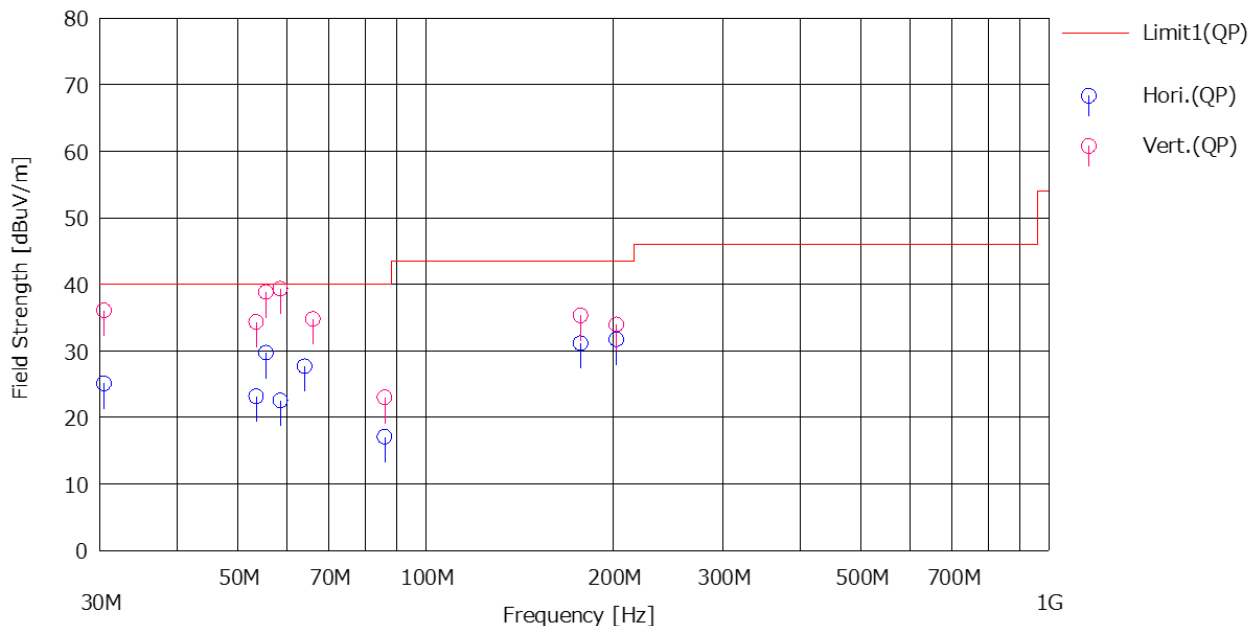
### (below 30MHz)

Limit : FCC15.209(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



\* Data above 490 kHz were measured using a QP detector.

### (above 30MHz)



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

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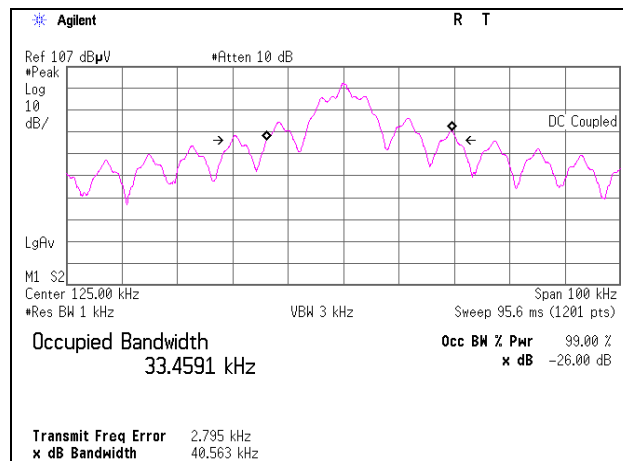
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## -26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 1

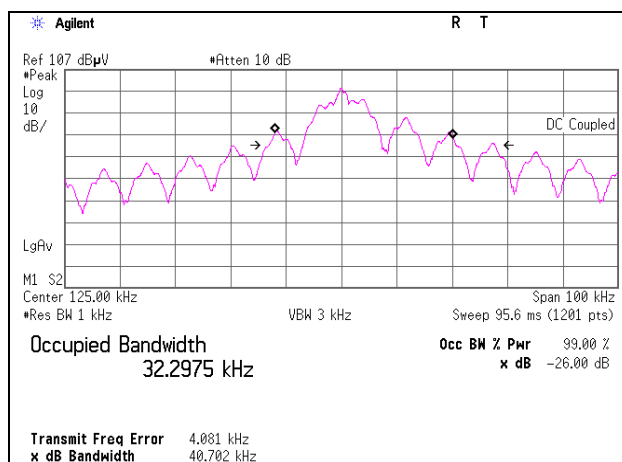
| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 40.563                    | 33.4591                          |



## -26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 2

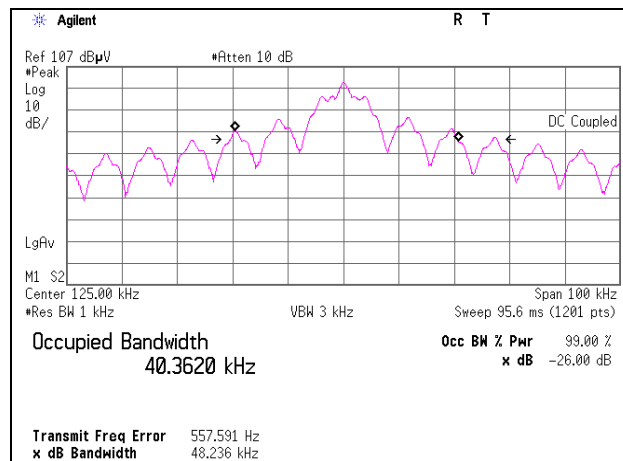
| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 40.702                    | 32.2975                          |



## -26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 3

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 48.236                    | 40.3620                          |



## -26 dB Bandwidth and 99 % Occupied Bandwidth

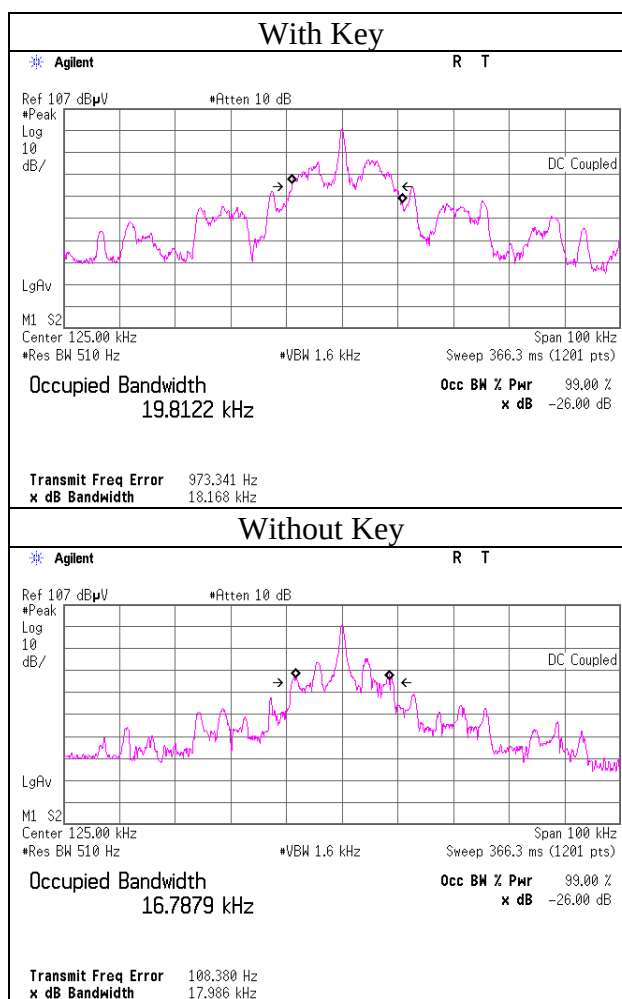
Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 4

< With Key >

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 18.168                    | 19.8122                          |

< Without Key >

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 17.986                    | 16.7879                          |



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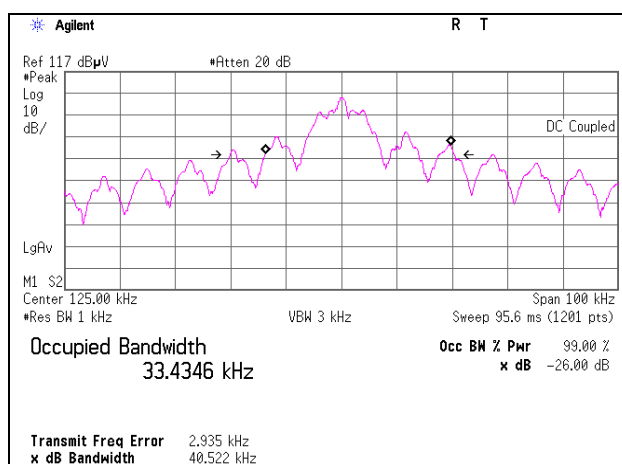
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## -26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13619652H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 15, 2020  
Temperature / Humidity 25 deg. C / 30 % RH  
Engineer Yuta Moriya  
Mode Mode 5

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 40.522                    | 33.4346                          |



## APPENDIX 2: Test instruments

### Test equipment

| Test Item | Local ID     | LIMS ID | Description                       | Manufacturer                  | Model                                           | Serial       | Last Calibration Date | Cal Int |
|-----------|--------------|---------|-----------------------------------|-------------------------------|-------------------------------------------------|--------------|-----------------------|---------|
| RE        | MAEC-03      | 142008  | AC3_Semi Anechoic Chamber(NSA)    | TDK                           | Semi Anechoic Chamber 3m                        | DA-10005     | 05/22/2020            | 24      |
| RE        | MOS-13       | 141554  | Thermo-Hygrometer                 | CUSTOM. Inc                   | CTH-201                                         | 1301         | 01/07/2020            | 12      |
| RE        | MJM-12       | 142180  | Measure                           | KOMELON                       | KMC-36                                          | -            | -                     | -       |
| RE        | COTS-MEMI    | 141152  | EMI measurement program           | TSJ (Techno Science Japan)    | TEPTO-DV                                        | -            | -                     | -       |
| RE        | MTR-08       | 141949  | Test Receiver                     | Rohde & Schwarz               | ESCI                                            | 100767       | 08/18/2020            | 12      |
| RE        | MBA-03       | 141424  | Biconical Antenna                 | Schwarzbeck Mess - Elektronik | VHA9103+BBA9106                                 | 1915         | 08/13/2020            | 12      |
| RE        | MLA-22       | 141266  | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess - Elektronik | VUSLP9111B                                      | 9111B-191    | 08/13/2020            | 12      |
| RE        | MAT-95       | 142314  | Attenuator                        | Pasternack                    | PE7390-6                                        | D/C 1504     | 06/17/2020            | 12      |
| RE        | MCC-51       | 141323  | Coaxial cable                     | UL Japan                      | -                                               | -            | 07/06/2020            | 12      |
| RE        | MPA-13       | 141582  | Pre Amplifier                     | SONOMA INSTRUMENT             | 310                                             | 260834       | 02/10/2020            | 12      |
| RE        | MAEC-04      | 142011  | AC4_Semi Anechoic Chamber(NSA)    | TDK                           | Semi Anechoic Chamber 3m                        | DA-10005     | 05/25/2020            | 24      |
| RE        | MOS-15       | 141562  | Thermo-Hygrometer                 | CUSTOM. Inc                   | CTH-201                                         | 0010         | 01/07/2020            | 12      |
| RE        | MJM-29       | 142230  | Measure                           | KOMELON                       | KMC-36                                          | -            | -                     | -       |
| RE        | MTR-10       | 141951  | EMI Test Receiver                 | Rohde & Schwarz               | ESR26                                           | 101408       | 03/10/2020            | 12      |
| RE        | MBA-05       | 141425  | Biconical Antenna                 | Schwarzbeck Mess - Elektronik | VHA9103+BBA9106                                 | VHA 91031302 | 08/31/2020            | 12      |
| RE        | MLA-23       | 141267  | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess - Elektronik | VUSLP9111B                                      | 9111B-192    | 09/02/2020            | 12      |
| RE        | MAT-34       | 141331  | Attenuator(6dB)                   | TME                           | UFA-01                                          | -            | 02/05/2020            | 12      |
| RE        | MCC-50       | 141397  | Coaxial Cable                     | UL Japan                      | -                                               | -            | 11/06/2020            | 12      |
| RE        | MPA-19       | 141585  | Pre Amplifier                     | MITEQ                         | MLA-10K01-B01-35                                | 1237616      | 02/10/2020            | 12      |
| RE        | MMM-08       | 141532  | DIGITAL HiTESTER                  | Hioki                         | 3805                                            | 51201197     | 01/06/2020            | 12      |
| RE        | MJM-16       | 142183  | Measure                           | KOMELON                       | KMC-36                                          | -            | -                     | -       |
| RE        | COTS-MEMI-02 | 178648  | EMI measurement program           | TSJ (Techno Science Japan)    | TEPTO-DV                                        | -            | -                     | -       |
| RE        | MCC-112      | 141216  | Coaxial cable                     | Fujikura/Suhner/TSJ           | 5D-2W/SFM14/sucoform141-PE/421-010/RFM-E321(SW) | -/00640      | 07/06/2020            | 12      |
| RE        | MLPA-02      | 142152  | Loop Antenna                      | Rohde & Schwarz               | HFH2-Z2                                         | 836553/009   | 12/04/2020            | 12      |
| RE        | MCC-219      | 159670  | Coaxial Cable                     | UL Japan Inc.                 | -                                               | -            | 11/17/2020            | 12      |
| RE        | MSA-15       | 141902  | Spectrum Analyzer                 | Keysight Technologies Inc     | E4440A                                          | MY46187105   | 10/15/2020            | 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: Spurious emission

UL Japan, Inc.

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