



# **RADIO TEST REPORT**

**Test Report No. : 13439589H-A-R2**

**Applicant** : DAIHATSU MOTOR CO., LTD.  
**Type of EUT** : Keyfree system  
**Model Number of EUT** : DH19S-2  
**FCC ID** : 2AVSADH19S-2  
**Test regulation** : FCC Part 15 Subpart C: 2020  
**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 13439589H-A-R1. 13439589H-A-R1 is replaced with this report.

**Date of test:** July 26 and December 16, 2020

**Representative test engineer:**

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Consumer Technology Division

**Approved by:**

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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.: 13439589H-A

| Revision          | Test report No. | Date               | Page revised     | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
|-------------------|-----------------|--------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|-----------|------------------|-----------------|------|-----|------|---|-------|-------------------|-----------|-----------|------------------|-----------------|------|-----|------|---|-------|
| -<br>(Original)   | 13439589H-A     | September 11, 2020 | -                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 1                 | 13439589H-A-R1  | November 30, 2020  | P.10             | Correction of the note sentence of Clause 4.2;<br>From “* The input voltage (DC 12 V) passes through Item No. A without affecting it and is supplied to the antennas (Item No. B to G) without any drop in voltage.”<br>To “* The input voltage (DC 12 V) passes through Item No. A without affecting it and is supplied to the antennas (Item No. B) without any drop in voltage.”                                                                                                                                                                                                         |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 1                 | 13439589H-A-R1  | November 30, 2020  | P.21             | Correction of the following value of Result of the fundamental emission at 3 m without Distance factor data;<br>From<br><table border="1"> <tr> <td>Ant Factor [dB/m]</td><td>Loss [dB]</td><td>Gain [dB]</td><td>Duty Factor [dB]</td><td>Result [dBuV/m]</td></tr> <tr> <td>19.9</td><td>6.1</td><td>32.3</td><td>-</td><td>101.5</td></tr> </table> To<br><table border="1"> <tr> <td>Ant Factor [dB/m]</td><td>Loss [dB]</td><td>Gain [dB]</td><td>Duty Factor [dB]</td><td>Result [dBuV/m]</td></tr> <tr> <td>19.4</td><td>6.0</td><td>32.3</td><td>-</td><td>101.0</td></tr> </table> | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | 19.9 | 6.1 | 32.3 | - | 101.5 | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | 19.4 | 6.0 | 32.3 | - | 101.0 |
| Ant Factor [dB/m] | Loss [dB]       | Gain [dB]          | Duty Factor [dB] | Result [dBuV/m]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 19.9              | 6.1             | 32.3               | -                | 101.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| Ant Factor [dB/m] | Loss [dB]       | Gain [dB]          | Duty Factor [dB] | Result [dBuV/m]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 19.4              | 6.0             | 32.3               | -                | 101.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 1                 | 13439589H-A-R1  | November 30, 2020  | P.22             | Correction of the following value of Result of the fundamental emission at 3 m without Distance factor data;<br>From<br><table border="1"> <tr> <td>Ant Factor [dB/m]</td><td>Loss [dB]</td><td>Gain [dB]</td><td>Duty Factor [dB]</td><td>Result [dBuV/m]</td></tr> <tr> <td>19.9</td><td>6.1</td><td>32.3</td><td>-</td><td>84.1</td></tr> </table> To<br><table border="1"> <tr> <td>Ant Factor [dB/m]</td><td>Loss [dB]</td><td>Gain [dB]</td><td>Duty Factor [dB]</td><td>Result [dBuV/m]</td></tr> <tr> <td>19.4</td><td>6.0</td><td>32.3</td><td>-</td><td>83.6</td></tr> </table>   | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | 19.9 | 6.1 | 32.3 | - | 84.1  | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | 19.4 | 6.0 | 32.3 | - | 83.6  |
| Ant Factor [dB/m] | Loss [dB]       | Gain [dB]          | Duty Factor [dB] | Result [dBuV/m]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 19.9              | 6.1             | 32.3               | -                | 84.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| Ant Factor [dB/m] | Loss [dB]       | Gain [dB]          | Duty Factor [dB] | Result [dBuV/m]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 19.4              | 6.0             | 32.3               | -                | 83.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P.1              | Addition of the test date to cover page.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P.10             | Correction of worst margin for “Electric Field Strength of Spurious Emission” test due to mode 8 additional test in Clause 3.2;<br>From 5.3 dB, 33.562 MHz, Vertical, QP<br>To 1.8 dB, 30.578 MHz, Vertical, QP                                                                                                                                                                                                                                                                                                                                                                             |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P.10             | Addition of the test mode 8 in Clause 4.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P.10             | Correction of erroneous description of Section 4.2;<br>From Item B to Item G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P.13             | Addition of the additional test date and engineer name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P.23, 31, 32, 40 | Addition of the mode 8 test results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |
| 2                 | 13439589H-A-R2  | December 18, 2020  | P. 41            | Addition of the Test equipment used for Mode 8 test in APPENDIX 2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |           |           |                  |                 |      |     |      |   |       |                   |           |           |                  |                 |      |     |      |   |       |

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

|                |                                                                 |         |                                                     |
|----------------|-----------------------------------------------------------------|---------|-----------------------------------------------------|
| A2LA           | The American Association for Laboratory Accreditation           | MCS     | Modulation and Coding Scheme                        |
| AC             | Alternating Current                                             | MRA     | Mutual Recognition Arrangement                      |
| AFH            | Adaptive Frequency Hopping                                      | N/A     | Not Applicable                                      |
| AM             | Amplitude Modulation                                            | NIST    | National Institute of Standards and Technology      |
| Amp, AMP       | Amplifier                                                       | NS      | No signal detect.                                   |
| ANSI           | American National Standards Institute                           | NSA     | Normalized Site Attenuation                         |
| Ant, ANT       | Antenna                                                         | NVLAP   | National Voluntary Laboratory Accreditation Program |
| AP             | Access Point                                                    | OBW     | Occupied Band Width                                 |
| ASK            | Amplitude Shift Keying                                          | OFDM    | Orthogonal Frequency Division Multiplexing          |
| Atten., ATT    | Attenuator                                                      | P/M     | Power meter                                         |
| AV             | Average                                                         | PCB     | Printed Circuit Board                               |
| BPSK           | Binary Phase-Shift Keying                                       | PER     | Packet Error Rate                                   |
| BR             | Bluetooth Basic Rate                                            | PHY     | Physical Layer                                      |
| BT             | Bluetooth                                                       | PK      | Peak                                                |
| BT LE          | Bluetooth Low Energy                                            | PN      | Pseudo random Noise                                 |
| BW             | BandWidth                                                       | PRBS    | Pseudo-Random Bit Sequence                          |
| Cal Int        | Calibration Interval                                            | PSD     | Power Spectral Density                              |
| CCK            | Complementary Code Keying                                       | QAM     | Quadrature Amplitude Modulation                     |
| Ch., CH        | Channel                                                         | QP      | Quasi-Peak                                          |
| CISPR          | Comite International Special des Perturbations Radioelectriques | QPSK    | Quadri-Phase Shift Keying                           |
| CW             | Continuous Wave                                                 | RBW     | Resolution Band Width                               |
| DBPSK          | Differential BPSK                                               | RDS     | Radio Data System                                   |
| DC             | Direct Current                                                  | RE      | Radio Equipment                                     |
| D-factor       | Distance factor                                                 | RF      | Radio Frequency                                     |
| DFS            | Dynamic Frequency Selection                                     | RMS     | Root Mean Square                                    |
| DQPSK          | Differential QPSK                                               | RSS     | Radio Standards Specifications                      |
| DSSS           | Direct Sequence Spread Spectrum                                 | 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                                     |
| EU             | European Union                                                  | Vert.   | Vertical                                            |
| EUT            | Equipment Under Test                                            | WLAN    | Wireless LAN                                        |
| 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                                              |         |                                                     |
| LIMS           | Laboratory Information Management System                        |         |                                                     |

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## **SECTION 1: Customer information**

|                  |   |                                                    |
|------------------|---|----------------------------------------------------|
| Company Name     | : | DAIHATSU MOTOR CO., LTD.*                          |
| Address          | : | 2-1-1, Momozono, Ikeda-shi, Osaka, 563-8651, Japan |
| Telephone Number | : | +81-72-754-4526                                    |
| Facsimile Number | : | +81-72-754-3857                                    |
| Contact Person   | : | Hideshige Nakano                                   |

### **\*Remarks:**

DAIHATSU MOTOR CO., LTD. designates DENSO CORPORATION and TOKAI RIKA CO., LTD. as manufacturer of the product (Keyfree system).

The information provided from the customer is as follows;

- Applicant, Type of EUT, Model Number of EUT 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                       | : | Keyfree system                                                    |
| Model Number               | : | DH19S-2                                                           |
| Serial Number              | : | Refer to SECTION 4.2                                              |
| Rating                     | : | DC 12.0 V                                                         |
| Receipt Date               | : | July 25, 2020                                                     |
| Country of Mass-production | : | Malaysia and Republic of Indonesia                                |
| Condition                  | : | Production prototype                                              |
|                            |   | (Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification               | : | No Modification by the test lab                                   |

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## 2.2 Product Description

Model: DH19S-2 (referred to as the EUT in this report) is a Keyfree system.

### **Radio Specification**

#### [Transmitter part]

|                           |   |                                                                                                                                                                                                               |
|---------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radio Type                | : | LF Transmitter                                                                                                                                                                                                |
| Frequency of Operation    | : | 125 kHz                                                                                                                                                                                                       |
| Oscillation circuit       | : | Ceramic resonator                                                                                                                                                                                             |
| Oscillator frequency      | : | 4 MHz                                                                                                                                                                                                         |
| Modulation                | : | ASK                                                                                                                                                                                                           |
| Antenna type              | : | Antenna (Outside Antenna D)<br>Antenna (Outside Antenna P)<br>Antenna (Outside Antenna B)<br>Antenna (Inside Antenna Fr)<br>Antenna (Inside Antenna Rr)<br>Antenna (Inside Antenna Mi)<br>Immobilizer Antenna |
| Antenna Specification     | : | Antenna (Outside, Inside): Ferrite antenna coil<br>Immobilizer Antenna: Loop antenna coil                                                                                                                     |
| Clock Frequency (maximum) | : | MPU: 8 MHz                                                                                                                                                                                                    |

#### [Receiver part]

|                          |   |                                       |
|--------------------------|---|---------------------------------------|
| Frequency of Operation   | : | 433.92 MHz                            |
| Oscillator frequency     | : | 33.600 MHz (Crystal)                  |
| Intermediate frequency   | : | 525 kHz                               |
| Modulation               | : | FSK                                   |
| Type of receiving system | : | Super-heterodyne                      |
| Antenna Specification    | : | Internal antenna (Inverted F antenna) |
| Receiver Bandwidth       | : | 120 kHz                               |

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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 June 26, 2020 and effective July 27, 2020

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.

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

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

| Item                                            | Test Procedure                                                                           | Specification                                                   | Remarks  | Deviation | Worst margin                                         | Results     | Remarks |
|-------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------|-----------|------------------------------------------------------|-------------|---------|
| 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         | *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 4.4<br>RSS-Gen 8.9 | Radiated | N/A       | 4.4 dB<br>125 kHz<br>0 deg.<br>Peak with Duty factor | Complied 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 4.4<br>RSS-Gen 8.9 | Radiated | N/A       | 1.8 dB<br>30.578 MHz<br>Vertical, QP                 | Complied 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 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 Part 15.31 (e)**

The battery voltage (DC 12V) is provided to the EUT. Input voltage to RF part doesn't go through the regulator. So the test was performed with the supply voltage varied between 85 % and 115% of the nominal rated supply voltage (DC 12 V) and the variation of the input power 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            |

#### Antenna Terminal test

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

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### 3.5 Test Location

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A2LA Certificate Number: 5107.02

| 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 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

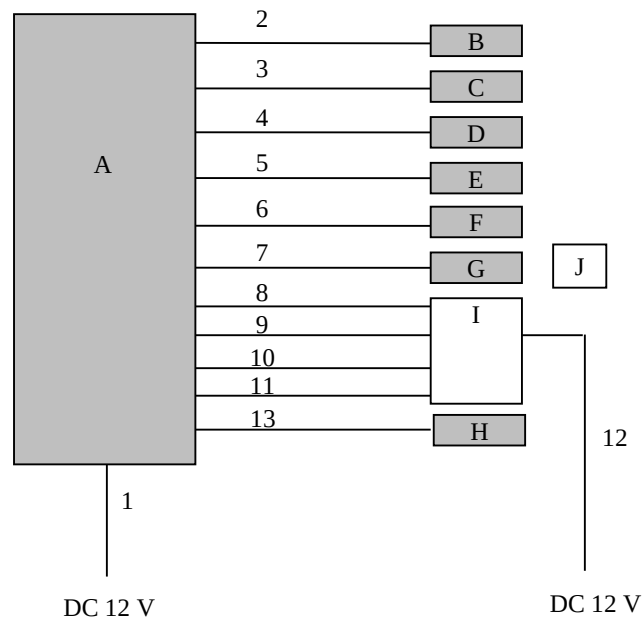
## SECTION 4: Operation of EUT during testing

### 4.1 Operating Modes

| Test mode                                                                                                                                                                                                                                                                                                                                                                             | Remarks |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1) Tx 125 kHz Outside Antenna D                                                                                                                                                                                                                                                                                                                                                       | -       |
| 2) Tx 125 kHz Outside Antenna P                                                                                                                                                                                                                                                                                                                                                       | -       |
| 3) Tx 125 kHz Outside Antenna B                                                                                                                                                                                                                                                                                                                                                       | -       |
| 4) Tx 125 kHz Inside Antenna Fr                                                                                                                                                                                                                                                                                                                                                       | -       |
| 5) Tx 125 kHz Inside Antenna Rr                                                                                                                                                                                                                                                                                                                                                       | -       |
| 6) Tx 125 kHz Inside Antenna Mi                                                                                                                                                                                                                                                                                                                                                       | -       |
| 7) Tx 125 kHz Immobilizer Antenna                                                                                                                                                                                                                                                                                                                                                     | -       |
| 8) Tx 125 kHz Outside Antenna D+P                                                                                                                                                                                                                                                                                                                                                     | -       |
| <p>* EUT was set by the software as follows;<br/> Software: 200213_RadioTest_TypeA.s<br/> (Date: February 13, 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(s) were taken into consideration and test data was taken under worse case conditions.

\* The input voltage (DC 12 V) passes through Item No. A without affecting it and is supplied to the antennas (Item No. G) without any drop in voltage.

For the antenna (Item No. B to F and H), a fixed voltage is supplied through the regulator.

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#### Description of EUT and Support equipment

| No. | Item             | Model number        | Serial number | Manufacturer       | Remarks |
|-----|------------------|---------------------|---------------|--------------------|---------|
| A   | Body ECU         | DH19S-2             | No.286        | DENSO CORPORATION  | EUT     |
| B   | Antenna          | Outside Antenna D   | No.286-1      | TOKAIRIKA CO.,LTD. | EUT     |
| C   | Antenna          | Outside Antenna P   | No.286-2      | TOKAIRIKA CO.,LTD. | EUT     |
| D   | Antenna          | Outside Antenna B   | No.286-3      | TOKAIRIKA CO.,LTD. | EUT     |
| E   | Antenna          | Inside Antenna Fr   | No.286-4      | TOKAIRIKA CO.,LTD. | EUT     |
| F   | Antenna          | Inside Antenna Rr   | No.286-5      | TOKAIRIKA CO.,LTD. | EUT     |
| G   | Antenna          | Immobilizer Antenna | No.286        | TOKAIRIKA CO.,LTD. | EUT     |
| H   | Antenna          | Inside Antenna Mi   | No.286-6      | TOKAIRIKA CO.,LTD. | EUT     |
| I   | Evaluation Bench | -                   | 18            | DENSO CORPORATION  | -       |
| J   | Smart Key        | -                   | No.286        | DENSO CORPORATION  | -       |

#### List of cables used

| No. | Name                | Length (m) | Shield     |            | Remark |
|-----|---------------------|------------|------------|------------|--------|
|     |                     |            | Cable      | Connector  |        |
| 1   | DC Cable            | 3.0        | Unshielded | Unshielded | -      |
| 2   | Antenna Cable (AND) | 3.0        | Unshielded | Unshielded | -      |
| 3   | Antenna Cable (ANP) | 3.0        | Unshielded | Unshielded | -      |
| 4   | Antenna Cable (ANB) | 3.0        | Unshielded | Unshielded | -      |
| 5   | Antenna Cable (ANF) | 3.0        | Unshielded | Unshielded | -      |
| 6   | Antenna Cable (ANR) | 3.0        | Unshielded | Unshielded | -      |
| 7   | Antenna Cable       | 3.0        | Unshielded | Unshielded | -      |
| 8   | Signal Cable (CN-C) | 3.0        | Unshielded | Unshielded | -      |
| 9   | Signal Cable (CN-K) | 3.0        | Unshielded | Unshielded | -      |
| 10  | Signal Cable (CN-M) | 3.0        | Unshielded | Unshielded | -      |
| 11  | Signal Cable (CN-P) | 3.0        | Unshielded | Unshielded | -      |
| 12  | DC Cable            | 3.0        | Unshielded | Unshielded | -      |
| 13  | Antenna Cable (ANM) | 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., 135 deg., and 180 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.

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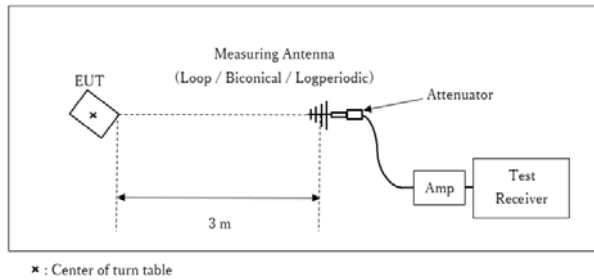
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[Test Setup]  
Below 1 GHz



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: July 26, 2020 (day)  
July 26, 2020 (night)  
December 16, 2020

Test engineer: Hiroyuki Furutaka  
Junya Okuno  
Akihiko Maeda

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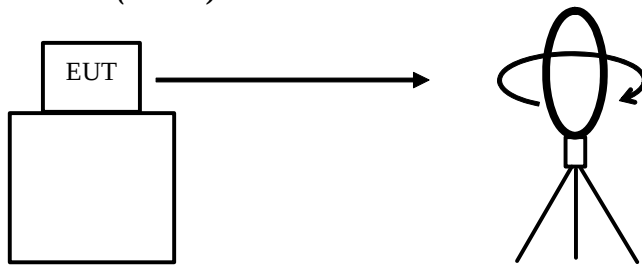
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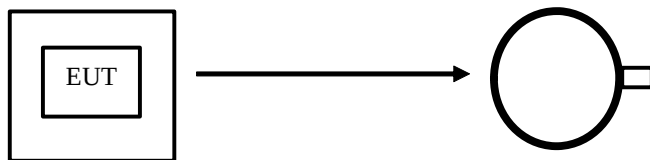
**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



.....

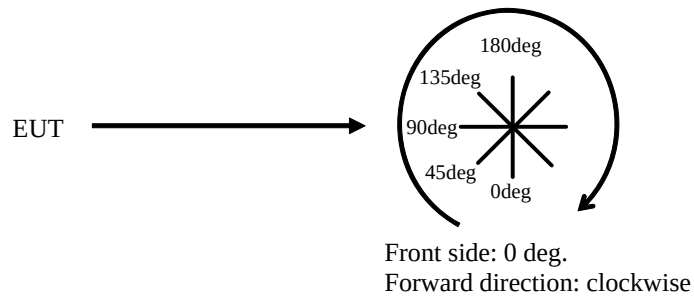
*Top View (Horizontal)*



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.

| Test             | Span              | RBW    | VBW     | Sweep | Detector | Trace    | Instrument used   |
|------------------|-------------------|--------|---------|-------|----------|----------|-------------------|
| -26 dB Bandwidth | 75 kHz<br>100 kHz | 510 Hz | 1.6 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 *1) | Max Hold *1) | Spectrum Analyzer |

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.  
Peak hold was applied as Worst-case measurement.

Test data : APPENDIX 1  
Test result : Pass

---

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## APPENDIX 1: Test data

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

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
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       | 107.1             | 19.4                    | -74.0        | 32.3         | -                      | 20.3               | 45.6              | 25.3           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 107.1             | 19.4                    | -74.0        | 32.3         | -                      | 20.3               | 45.6              | 25.3           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 107.1             | 19.4                    | -74.0        | 32.3         | -                      | 20.3               | 45.6              | 25.3           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 73.3              | 19.5                    | -74.0        | 32.3         | -                      | -13.5              | 39.6              | 53.1           |                         |
| 0deg                                        | 0.37500            | PK       | 56.3              | 19.5                    | -73.9        | 32.3         | -                      | -30.4              | 36.1              | 66.5           |                         |
| 0deg                                        | 0.50000            | QP       | 37.3              | 19.4                    | -33.9        | 32.2         | -                      | -9.4               | 33.6              | 43.0           |                         |
| 0deg                                        | 0.62500            | QP       | 37.3              | 19.4                    | -33.9        | 32.2         | -                      | -9.4               | 31.7              | 41.1           |                         |
| 0deg                                        | 0.75000            | QP       | 31.3              | 19.4                    | -33.9        | 32.2         | -                      | -15.4              | 30.1              | 45.5           |                         |
| 0deg                                        | 0.87500            | QP       | 32.3              | 19.4                    | -33.9        | 32.2         | -                      | -14.4              | 28.7              | 43.1           |                         |
| 0deg                                        | 1.00000            | QP       | 30.5              | 19.5                    | -33.9        | 32.2         | -                      | -16.1              | 27.6              | 43.7           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 107.1             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.3               | 25.6              | 5.3            | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 107.1             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.3               | 25.6              | 5.3            | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 107.1             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.3               | 25.6              | 5.3            | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 73.3              | 19.5                    | -74.0        | 32.3         | 0.0                    | -13.5              | 19.6              | 33.1           |           |
| 0deg          | 0.37500            | AV       | 56.3              | 19.5                    | -73.9        | 32.3         | 0.0                    | -30.4              | 16.1              | 46.5           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 107.1             | 19.4                    | 6.0          | 32.3         | -                      | 100.3              | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
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       | 107.1             | 19.4                    | -74.0        | 32.3         | -                      | 20.3               | 45.6              | 25.3           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 107.1             | 19.4                    | -74.0        | 32.3         | -                      | 20.3               | 45.6              | 25.3           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 107.1             | 19.4                    | -74.0        | 32.3         | -                      | 20.3               | 45.6              | 25.3           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 72.8              | 19.5                    | -74.0        | 32.3         | -                      | -14.0              | 39.6              | 53.6           |                         |
| 0deg                                        | 0.37500            | PK       | 55.3              | 19.5                    | -73.9        | 32.3         | -                      | -31.4              | 36.1              | 67.5           |                         |
| 0deg                                        | 0.50000            | QP       | 36.9              | 19.4                    | -33.9        | 32.2         | -                      | -9.8               | 33.6              | 43.4           |                         |
| 0deg                                        | 0.62500            | QP       | 36.7              | 19.4                    | -33.9        | 32.2         | -                      | -10.0              | 31.7              | 41.7           |                         |
| 0deg                                        | 0.75000            | QP       | 31.2              | 19.4                    | -33.9        | 32.2         | -                      | -15.5              | 30.1              | 45.6           |                         |
| 0deg                                        | 0.87500            | QP       | 32.4              | 19.4                    | -33.9        | 32.2         | -                      | -14.3              | 28.7              | 43.0           |                         |
| 0deg                                        | 1.00000            | QP       | 30.7              | 19.5                    | -33.9        | 32.2         | -                      | -15.9              | 27.6              | 43.5           |                         |
| 0deg                                        | 1.12500            | QP       | 30.3              | 19.5                    | -33.9        | 32.2         | -                      | -16.3              | 26.5              | 42.8           |                         |
| 0deg                                        | 1.25000            | QP       | 30.5              | 19.5                    | -33.9        | 32.2         | -                      | -16.1              | 25.6              | 41.7           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 107.1             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.3               | 25.6              | 5.3            | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 107.1             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.3               | 25.6              | 5.3            | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 107.1             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.3               | 25.6              | 5.3            | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 72.8              | 19.5                    | -74.0        | 32.3         | 0.0                    | -14.0              | 19.6              | 33.6           |           |
| 0deg          | 0.37500            | AV       | 55.3              | 19.5                    | -73.9        | 32.3         | 0.0                    | -31.4              | 16.1              | 47.5           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 107.1             | 19.4                    | 6.0          | 32.3         | -                      | 100.3              | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
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       | 108.0             | 19.4                    | -74.0        | 32.3         | -                      | 21.2               | 45.6              | 24.4           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 108.0             | 19.4                    | -74.0        | 32.3         | -                      | 21.2               | 45.6              | 24.4           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 108.0             | 19.4                    | -74.0        | 32.3         | -                      | 21.2               | 45.6              | 24.4           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 72.1              | 19.5                    | -74.0        | 32.3         | -                      | -14.7              | 39.6              | 54.3           |                         |
| 0deg                                        | 0.37500            | PK       | 63.0              | 19.5                    | -73.9        | 32.3         | -                      | -23.7              | 36.1              | 59.8           |                         |
| 0deg                                        | 0.50000            | QP       | 37.0              | 19.4                    | -33.9        | 32.2         | -                      | -9.7               | 33.6              | 43.3           |                         |
| 0deg                                        | 0.62500            | QP       | 38.6              | 19.4                    | -33.9        | 32.2         | -                      | -8.1               | 31.7              | 39.8           |                         |
| 0deg                                        | 0.75000            | QP       | 32.2              | 19.4                    | -33.9        | 32.2         | -                      | -14.5              | 30.1              | 44.6           |                         |
| 0deg                                        | 0.87500            | QP       | 32.6              | 19.4                    | -33.9        | 32.2         | -                      | -14.1              | 28.7              | 42.8           |                         |
| 0deg                                        | 1.00000            | QP       | 30.7              | 19.5                    | -33.9        | 32.2         | -                      | -15.9              | 27.6              | 43.5           |                         |
| 0deg                                        | 1.12500            | QP       | 30.2              | 19.5                    | -33.9        | 32.2         | -                      | -16.4              | 26.5              | 42.9           |                         |
| 0deg                                        | 1.25000            | QP       | 30.3              | 19.5                    | -33.9        | 32.2         | -                      | -16.3              | 25.6              | 41.9           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 108.0             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.2               | 25.6              | 4.4            | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 108.0             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.2               | 25.6              | 4.4            | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 108.0             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.2               | 25.6              | 4.4            | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 72.1              | 19.5                    | -74.0        | 32.3         | 0.0                    | -14.7              | 19.6              | 34.3           |           |
| 0deg          | 0.37500            | AV       | 63.0              | 19.5                    | -73.9        | 32.3         | 0.0                    | -23.7              | 16.1              | 39.8           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 108.0             | 19.4                    | 6.0          | 32.3         | -                      | 101.2              | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
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       | 107.0             | 19.4                    | -74.0        | 32.3         | -                      | 20.2               | 45.6              | 25.4           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 107.0             | 19.4                    | -74.0        | 32.3         | -                      | 20.2               | 45.6              | 25.4           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 107.0             | 19.4                    | -74.0        | 32.3         | -                      | 20.2               | 45.6              | 25.4           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 73.6              | 19.5                    | -74.0        | 32.3         | -                      | -13.2              | 39.6              | 52.8           |                         |
| 0deg                                        | 0.37500            | PK       | 55.7              | 19.5                    | -73.9        | 32.3         | -                      | -31.0              | 36.1              | 67.1           |                         |
| 0deg                                        | 0.50000            | QP       | 37.4              | 19.4                    | -33.9        | 32.2         | -                      | -9.3               | 33.6              | 42.9           |                         |
| 0deg                                        | 0.62500            | QP       | 32.5              | 19.4                    | -33.9        | 32.2         | -                      | -14.2              | 31.7              | 45.9           |                         |
| 0deg                                        | 0.75000            | QP       | 31.0              | 19.4                    | -33.9        | 32.2         | -                      | -15.7              | 30.1              | 45.8           |                         |
| 0deg                                        | 0.87500            | QP       | 30.6              | 19.4                    | -33.9        | 32.2         | -                      | -16.1              | 28.7              | 44.8           |                         |
| 0deg                                        | 1.00000            | QP       | 30.2              | 19.5                    | -33.9        | 32.2         | -                      | -16.4              | 27.6              | 44.0           |                         |
| 0deg                                        | 1.12500            | QP       | 30.0              | 19.5                    | -33.9        | 32.2         | -                      | -16.6              | 26.5              | 43.1           |                         |
| 0deg                                        | 1.25000            | QP       | 30.0              | 19.5                    | -33.9        | 32.2         | -                      | -16.6              | 25.6              | 42.2           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 107.0             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.2               | 25.6              | 5.4            | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 107.0             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.2               | 25.6              | 5.4            | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 107.0             | 19.4                    | -74.0        | 32.3         | 0.0                    | 20.2               | 25.6              | 5.4            | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 73.6              | 19.5                    | -74.0        | 32.3         | 0.0                    | -13.2              | 19.6              | 32.8           |           |
| 0deg          | 0.37500            | AV       | 55.7              | 19.5                    | -73.9        | 32.3         | 0.0                    | -31.0              | 16.1              | 47.1           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 107.0             | 19.4                    | 6.0          | 32.3         | -                      | 100.2              | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
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       | 107.9             | 19.4                    | -74.0        | 32.3         | -                      | 21.1               | 45.6              | 24.5           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 107.9             | 19.4                    | -74.0        | 32.3         | -                      | 21.1               | 45.6              | 24.5           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 107.9             | 19.4                    | -74.0        | 32.3         | -                      | 21.1               | 45.6              | 24.5           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 77.0              | 19.5                    | -74.0        | 32.3         | -                      | -9.8               | 39.6              | 49.4           |                         |
| 0deg                                        | 0.37500            | PK       | 63.0              | 19.5                    | -73.9        | 32.3         | -                      | -23.7              | 36.1              | 59.8           |                         |
| 0deg                                        | 0.50000            | PK       | 37.3              | 19.4                    | -33.9        | 32.2         | -                      | -9.4               | 33.6              | 43.0           |                         |
| 0deg                                        | 0.62500            | PK       | 38.5              | 19.4                    | -33.9        | 32.2         | -                      | -8.2               | 31.7              | 39.9           |                         |
| 0deg                                        | 0.75000            | AV       | 31.3              | 19.4                    | -33.9        | 32.2         | -                      | -15.4              | 30.1              | 45.5           |                         |
| 0deg                                        | 0.87500            | AV       | 31.9              | 19.4                    | -33.9        | 32.2         | -                      | -14.8              | 28.7              | 43.5           |                         |
| 0deg                                        | 1.00000            | AV       | 30.3              | 19.5                    | -33.9        | 32.2         | -                      | -16.3              | 27.6              | 43.9           |                         |
| 0deg                                        | 1.12500            | AV       | 30.3              | 19.5                    | -33.9        | 32.2         | -                      | -16.3              | 26.5              | 42.8           |                         |
| 0deg                                        | 1.25000            | AV       | 30.0              | 19.5                    | -33.9        | 32.2         | -                      | -16.6              | 25.6              | 42.2           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 107.9             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.1               | 25.6              | 4.5            | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 107.9             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.1               | 25.6              | 4.5            | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 107.9             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.1               | 25.6              | 4.5            | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 77.0              | 19.5                    | -74.0        | 32.3         | 0.0                    | -9.8               | 19.6              | 29.4           |           |
| 0deg          | 0.37500            | AV       | 63.0              | 19.5                    | -73.9        | 32.3         | 0.0                    | -23.7              | 16.1              | 39.8           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 107.9             | 19.4                    | 6.0          | 32.3         | -                      | 101.1              | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
Mode Mode 6

### **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       | 107.8             | 19.4                    | -74.0        | 32.3         | -                      | 21.0               | 45.6              | 24.6           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 107.8             | 19.4                    | -74.0        | 32.3         | -                      | 21.0               | 45.6              | 24.6           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 107.8             | 19.4                    | -74.0        | 32.3         | -                      | 21.0               | 45.6              | 24.6           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 76.7              | 19.5                    | -74.0        | 32.3         | -                      | -10.1              | 39.6              | 49.7           |                         |
| 0deg                                        | 0.37500            | PK       | 56.4              | 19.5                    | -73.9        | 32.3         | -                      | -30.3              | 36.1              | 66.4           |                         |
| 0deg                                        | 0.50000            | PK       | 36.7              | 19.4                    | -33.9        | 32.2         | -                      | -10.0              | 33.6              | 43.6           |                         |
| 0deg                                        | 0.62500            | PK       | 38.3              | 19.4                    | -33.9        | 32.2         | -                      | -8.4               | 31.7              | 40.1           |                         |
| 0deg                                        | 0.75000            | AV       | 32.2              | 19.4                    | -33.9        | 32.2         | -                      | -14.5              | 30.1              | 44.6           |                         |
| 0deg                                        | 0.87500            | AV       | 30.6              | 19.4                    | -33.9        | 32.2         | -                      | -16.1              | 28.7              | 44.8           |                         |
| 0deg                                        | 1.00000            | AV       | 30.5              | 19.5                    | -33.9        | 32.2         | -                      | -16.1              | 27.6              | 43.7           |                         |
| 0deg                                        | 1.12500            | AV       | 30.2              | 19.5                    | -33.9        | 32.2         | -                      | -16.4              | 26.5              | 42.9           |                         |
| 0deg                                        | 1.25000            | AV       | 30.0              | 19.5                    | -33.9        | 32.2         | -                      | -16.6              | 25.6              | 42.2           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 107.8             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.0               | 25.6              | 4.6            | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 107.8             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.0               | 25.6              | 4.6            | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 107.8             | 19.4                    | -74.0        | 32.3         | 0.0                    | 21.0               | 25.6              | 4.6            | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 76.7              | 19.5                    | -74.0        | 32.3         | 0.0                    | -10.1              | 19.6              | 29.7           |           |
| 0deg          | 0.37500            | AV       | 56.4              | 19.5                    | -73.9        | 32.3         | 0.0                    | -30.3              | 16.1              | 46.4           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 107.8             | 19.4                    | 6.0          | 32.3         | -                      | 101.0              | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
Mode Mode 7

### 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       | 90.4              | 19.4                    | -74.0        | 32.3         | -                      | 3.6                | 45.6              | 42.0           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 90.4              | 19.4                    | -74.0        | 32.3         | -                      | 3.6                | 45.6              | 42.0           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 90.4              | 19.4                    | -74.0        | 32.3         | -                      | 3.6                | 45.6              | 42.0           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 47.6              | 19.5                    | -74.0        | 32.3         | -                      | -39.2              | 39.6              | 78.8           |                         |
| 0deg                                        | 0.37500            | PK       | 53.5              | 19.5                    | -73.9        | 32.3         | -                      | -33.2              | 36.1              | 69.3           |                         |
| 0deg                                        | 0.50000            | QP       | 31.4              | 19.4                    | -33.9        | 32.2         | -                      | -15.3              | 33.6              | 48.9           |                         |
| 0deg                                        | 0.62500            | QP       | 42.5              | 19.4                    | -33.9        | 32.2         | -                      | -4.2               | 31.7              | 35.9           |                         |
| 0deg                                        | 0.75000            | QP       | 30.5              | 19.4                    | -33.9        | 32.2         | -                      | -16.2              | 30.1              | 46.3           |                         |
| 0deg                                        | 0.87500            | QP       | 37.4              | 19.4                    | -33.9        | 32.2         | -                      | -9.3               | 28.7              | 38.0           |                         |
| 0deg                                        | 1.00000            | QP       | 29.8              | 19.5                    | -33.9        | 32.2         | -                      | -16.8              | 27.6              | 44.4           |                         |
| 0deg                                        | 1.12500            | QP       | 34.5              | 19.5                    | -33.9        | 32.2         | -                      | -12.1              | 26.5              | 38.6           |                         |
| 0deg                                        | 1.25000            | QP       | 34.3              | 19.5                    | -33.9        | 32.2         | -                      | -12.3              | 25.6              | 37.9           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 90.4              | 19.4                    | -74.0        | 32.3         | 0.0                    | 3.6                | 25.6              | 22.0           | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 90.4              | 19.4                    | -74.0        | 32.3         | 0.0                    | 3.6                | 25.6              | 22.0           | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 90.4              | 19.4                    | -74.0        | 32.3         | 0.0                    | 3.6                | 25.6              | 22.0           | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 47.6              | 19.5                    | -74.0        | 32.3         | 0.0                    | -39.2              | 19.6              | 58.8           |           |
| 0deg          | 0.37500            | AV       | 53.5              | 19.5                    | -73.9        | 32.3         | 0.0                    | -33.2              | 16.1              | 49.3           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 90.4              | 19.4                    | 6.0          | 32.3         | -                      | 83.6               | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 16, 2020  
Temperature / Humidity 21 deg. C / 31 % RH  
Engineer Akihiko Maeda  
Mode Mode 8

### 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       | 100.3             | 18.9                    | -74.0        | 32.3         | -                      | 13.0               | 45.6              | 32.6           | Fundamental (DC 10.2 V) |
| 0deg                                        | 0.12500            | PK       | 100.3             | 18.9                    | -74.0        | 32.3         | -                      | 13.0               | 45.6              | 32.6           | Fundamental (DC 12.0 V) |
| 0deg                                        | 0.12500            | PK       | 100.3             | 18.9                    | -74.0        | 32.3         | -                      | 13.0               | 45.6              | 32.6           | Fundamental (DC 13.8 V) |
| 0deg                                        | 0.25000            | PK       | 71.5              | 18.9                    | -74.0        | 32.3         | -                      | -15.9              | 39.6              | 55.5           |                         |
| 0deg                                        | 0.37500            | PK       | 71.2              | 18.8                    | -73.9        | 32.3         | -                      | -16.2              | 36.1              | 52.3           |                         |
| 0deg                                        | 0.50000            | QP       | 37.9              | 18.8                    | -33.9        | 32.2         | -                      | -9.5               | 33.6              | 43.1           |                         |
| 0deg                                        | 0.62500            | QP       | 54.3              | 18.8                    | -33.9        | 32.2         | -                      | 6.9                | 31.7              | 24.8           |                         |
| 0deg                                        | 0.75000            | QP       | 33.8              | 18.8                    | -33.9        | 32.2         | -                      | -13.5              | 30.1              | 43.6           |                         |
| 0deg                                        | 0.87500            | QP       | 48.6              | 18.8                    | -33.9        | 32.2         | -                      | 1.3                | 28.7              | 27.4           |                         |
| 0deg                                        | 1.00000            | QP       | 30.5              | 18.8                    | -33.9        | 32.2         | -                      | -16.8              | 27.6              | 44.4           |                         |
| 0deg                                        | 1.12500            | QP       | 44.2              | 18.8                    | -33.9        | 32.2         | -                      | -3.1               | 26.5              | 29.6           |                         |
| 0deg                                        | 1.25000            | QP       | 31.1              | 18.8                    | -33.8        | 32.2         | -                      | -16.2              | 25.6              | 41.8           |                         |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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       | 100.3             | 18.9                    | -74.0        | 32.3         | 0.0                    | 13.0               | 25.6              | 12.6           | DC 10.2 V |
| 0deg          | 0.12500            | AV       | 100.3             | 18.9                    | -74.0        | 32.3         | 0.0                    | 13.0               | 25.6              | 12.6           | DC 12.0 V |
| 0deg          | 0.12500            | AV       | 100.3             | 18.9                    | -74.0        | 32.3         | 0.0                    | 13.0               | 25.6              | 12.6           | DC 13.8 V |
| 0deg          | 0.25000            | AV       | 71.5              | 18.9                    | -74.0        | 32.3         | 0.0                    | -15.9              | 19.6              | 35.5           |           |
| 0deg          | 0.37500            | AV       | 71.2              | 18.8                    | -73.9        | 32.3         | 0.0                    | -16.2              | 16.1              | 32.3           |           |

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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 3 m 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       | 100.3             | 18.9                    | 6.0          | 32.3         | -                      | 93.0               | -                 | -              | Fundamental |

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

\*It was confirmed that there was no difference by the input voltage in the spurious emission.

\* 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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
Mode Mode 1

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori.    | 58.555          | QP       | 39.1           | 8.3             | 7.6       | 32.2      | 22.8            | 40.0           | 17.2        |        |
| Hori.    | 95.088          | QP       | 35.4           | 9.4             | 8.1       | 32.1      | 20.7            | 43.5           | 22.8        |        |
| Hori.    | 132.621         | QP       | 31.3           | 14.0            | 8.5       | 32.1      | 21.7            | 43.5           | 21.8        |        |
| Hori.    | 168.337         | QP       | 32.3           | 15.7            | 8.9       | 32.1      | 24.9            | 43.5           | 18.6        |        |
| Hori.    | 215.900         | QP       | 35.5           | 11.1            | 9.4       | 32.0      | 23.9            | 43.5           | 19.6        |        |
| Hori.    | 320.105         | QP       | 35.8           | 14.1            | 10.2      | 32.0      | 28.1            | 46.0           | 17.9        |        |
| Vert.    | 32.569          | QP       | 31.5           | 17.6            | 7.2       | 32.2      | 24.1            | 40.0           | 16.0        |        |
| Vert.    | 91.416          | QP       | 38.5           | 8.8             | 8.1       | 32.2      | 23.2            | 43.5           | 20.3        |        |
| Vert.    | 132.619         | QP       | 35.7           | 14.0            | 8.5       | 32.1      | 26.1            | 43.5           | 17.4        |        |
| Vert.    | 161.545         | QP       | 31.7           | 15.5            | 8.9       | 32.1      | 24.0            | 43.5           | 19.5        |        |
| Vert.    | 211.892         | QP       | 39.3           | 11.1            | 9.3       | 32.0      | 27.7            | 43.5           | 15.8        |        |
| Vert.    | 444.892         | QP       | 29.1           | 16.4            | 11.1      | 32.0      | 24.6            | 46.0           | 21.4        |        |

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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
Mode Mode 2

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori.    | 57.553          | QP       | 36.7           | 8.6             | 7.6       | 32.2      | 20.7            | 40.0           | 19.3        |        |
| Hori.    | 67.253          | QP       | 42.5           | 6.6             | 7.8       | 32.2      | 24.7            | 40.0           | 15.3        |        |
| Hori.    | 158.045         | QP       | 34.6           | 15.4            | 8.8       | 32.1      | 26.8            | 43.5           | 16.7        |        |
| Hori.    | 284.255         | QP       | 37.4           | 13.4            | 9.9       | 32.0      | 28.7            | 46.0           | 17.3        |        |
| Hori.    | 382.834         | QP       | 33.5           | 15.3            | 10.7      | 32.0      | 27.4            | 46.0           | 18.6        |        |
| Hori.    | 443.890         | QP       | 34.2           | 16.4            | 11.1      | 32.0      | 29.7            | 46.0           | 16.3        |        |
| Vert.    | 32.559          | QP       | 31.8           | 17.6            | 7.2       | 32.2      | 24.4            | 40.0           | 15.6        |        |
| Vert.    | 66.251          | QP       | 41.0           | 6.7             | 7.7       | 32.2      | 23.2            | 40.0           | 16.8        |        |
| Vert.    | 157.793         | QP       | 33.0           | 15.4            | 8.8       | 32.1      | 25.2            | 43.5           | 18.3        |        |
| Vert.    | 164.806         | QP       | 32.2           | 15.6            | 8.9       | 32.1      | 24.7            | 43.5           | 18.8        |        |
| Vert.    | 321.095         | QP       | 33.0           | 14.1            | 10.2      | 32.0      | 25.4            | 46.0           | 20.6        |        |
| Vert.    | 445.890         | QP       | 31.2           | 16.5            | 11.1      | 32.0      | 26.7            | 46.0           | 19.3        |        |

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. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
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.    | 58.555             | QP       | 41.7              | 8.3                | 7.6          | 32.2         | 25.4               | 40.0              | 14.6           |        |
| Hori.    | 69.999             | QP       | 37.1              | 6.4                | 7.8          | 32.2         | 19.1               | 40.0              | 20.9           |        |
| Hori.    | 212.370            | QP       | 35.8              | 11.1               | 9.3          | 32.0         | 24.2               | 43.5              | 19.3           |        |
| Hori.    | 291.255            | QP       | 36.5              | 13.4               | 10.0         | 32.0         | 27.9               | 46.0              | 18.1           |        |
| Hori.    | 308.035            | QP       | 33.4              | 13.7               | 10.1         | 32.0         | 25.2               | 46.0              | 20.8           |        |
| Hori.    | 445.893            | QP       | 33.1              | 16.5               | 11.1         | 32.0         | 28.6               | 46.0              | 17.4           |        |
| Vert.    | 32.528             | QP       | 31.3              | 17.6               | 7.2          | 32.2         | 23.9               | 40.0              | 16.1           |        |
| Vert.    | 59.552             | QP       | 41.7              | 8.0                | 7.6          | 32.2         | 25.2               | 40.0              | 14.8           |        |
| Vert.    | 92.413             | QP       | 38.4              | 9.0                | 8.1          | 32.2         | 23.3               | 43.5              | 20.2           |        |
| Vert.    | 164.536            | QP       | 29.2              | 15.6               | 8.9          | 32.1         | 21.7               | 43.5              | 21.9           |        |
| Vert.    | 211.119            | QP       | 35.4              | 11.1               | 9.3          | 32.0         | 23.8               | 43.5              | 19.7           |        |
| Vert.    | 446.895            | QP       | 30.4              | 16.5               | 11.1         | 32.0         | 26.0               | 46.0              | 20.0           |        |

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.

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### Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
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.    | 58.555             | QP       | 40.1              | 8.3                | 7.6          | 32.2         | 23.8               | 40.0              | 16.2           |        |
| Hori.    | 95.097             | QP       | 35.1              | 9.4                | 8.1          | 32.1         | 20.4               | 43.5              | 23.1           |        |
| Hori.    | 132.621            | QP       | 32.2              | 14.0               | 8.5          | 32.1         | 22.6               | 43.5              | 20.9           |        |
| Hori.    | 170.317            | QP       | 30.4              | 15.9               | 8.9          | 32.1         | 23.1               | 43.5              | 20.4           |        |
| Hori.    | 215.900            | QP       | 35.0              | 11.1               | 9.4          | 32.0         | 23.4               | 43.5              | 20.1           |        |
| Hori.    | 320.105            | QP       | 35.1              | 14.1               | 10.2         | 32.0         | 27.4               | 46.0              | 18.6           |        |
| Vert.    | 32.569             | QP       | 31.8              | 17.6               | 7.2          | 32.2         | 24.4               | 40.0              | 15.7           |        |
| Vert.    | 59.558             | QP       | 40.5              | 8.0                | 7.6          | 32.2         | 24.0               | 40.0              | 16.1           |        |
| Vert.    | 91.404             | QP       | 37.3              | 8.7                | 8.1          | 32.2         | 22.0               | 43.5              | 21.5           |        |
| Vert.    | 132.619            | QP       | 37.0              | 14.0               | 8.5          | 32.1         | 27.4               | 43.5              | 16.1           |        |
| Vert.    | 215.900            | QP       | 36.8              | 11.1               | 9.4          | 32.0         | 25.2               | 43.5              | 18.3           |        |
| Vert.    | 444.892            | QP       | 28.3              | 16.4               | 11.1         | 32.0         | 23.8               | 46.0              | 22.2           |        |

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.

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### **Radiated Emission above 30 MHz (Spurious Emission)**

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
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.    | 33.436             | QP       | 28.0              | 17.3               | 7.2          | 32.2         | 20.3               | 40.0              | 19.7           |        |
| Hori.    | 58.552             | QP       | 41.9              | 8.3                | 7.6          | 32.2         | 25.6               | 40.0              | 14.4           |        |
| Hori.    | 67.500             | QP       | 36.6              | 6.5                | 7.8          | 32.2         | 18.7               | 40.0              | 21.3           |        |
| Hori.    | 73.756             | QP       | 37.1              | 6.4                | 7.8          | 32.2         | 19.2               | 40.0              | 20.8           |        |
| Hori.    | 373.826            | QP       | 35.0              | 15.1               | 10.6         | 32.0         | 28.7               | 46.0              | 17.3           |        |
| Hori.    | 443.885            | QP       | 31.0              | 16.4               | 11.1         | 32.0         | 26.5               | 46.0              | 19.5           |        |
| Vert.    | 33.562             | QP       | 42.5              | 17.3               | 7.2          | 32.2         | 34.8               | 40.0              | 5.3            |        |
| Vert.    | 59.555             | QP       | 40.8              | 8.0                | 7.6          | 32.2         | 24.3               | 40.0              | 15.7           |        |
| Vert.    | 92.163             | QP       | 39.9              | 8.9                | 8.1          | 32.2         | 24.7               | 43.5              | 18.8           |        |
| Vert.    | 102.590            | QP       | 39.2              | 10.6               | 8.2          | 32.1         | 25.9               | 43.5              | 17.6           |        |
| Vert.    | 131.613            | QP       | 34.2              | 13.9               | 8.5          | 32.1         | 24.5               | 43.5              | 19.0           |        |
| Vert.    | 342.095            | QP       | 31.5              | 14.9               | 10.4         | 32.0         | 24.8               | 46.0              | 21.2           |        |

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.

**UL Japan, Inc.**

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### Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
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.    | 58.555             | QP       | 40.1              | 8.3                | 7.6          | 32.2         | 23.8               | 40.0              | 16.2           |        |
| Hori.    | 64.740             | QP       | 39.1              | 6.8                | 7.7          | 32.2         | 21.5               | 40.0              | 18.5           |        |
| Hori.    | 67.243             | QP       | 39.3              | 6.6                | 7.8          | 32.2         | 21.5               | 40.0              | 18.5           |        |
| Hori.    | 215.883            | QP       | 35.7              | 11.1               | 9.4          | 32.0         | 24.1               | 43.5              | 19.4           |        |
| Hori.    | 284.253            | QP       | 37.5              | 13.4               | 9.9          | 32.0         | 28.8               | 46.0              | 17.2           |        |
| Hori.    | 443.887            | QP       | 33.3              | 16.4               | 11.1         | 32.0         | 28.8               | 46.0              | 17.2           |        |
| Vert.    | 32.543             | QP       | 31.7              | 17.6               | 7.2          | 32.2         | 24.3               | 40.0              | 15.7           |        |
| Vert.    | 63.997             | QP       | 43.0              | 7.0                | 7.7          | 32.2         | 25.5               | 40.0              | 14.5           |        |
| Vert.    | 132.619            | QP       | 36.6              | 14.0               | 8.5          | 32.1         | 27.0               | 43.5              | 16.5           |        |
| Vert.    | 144.010            | QP       | 32.9              | 14.7               | 8.7          | 32.1         | 24.2               | 43.5              | 19.3           |        |
| Vert.    | 175.061            | QP       | 31.8              | 16.1               | 9.0          | 32.0         | 24.9               | 43.5              | 18.6           |        |
| Vert.    | 215.883            | QP       | 38.0              | 11.1               | 9.4          | 32.0         | 26.4               | 43.5              | 17.1           |        |

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.

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### Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 23 deg. C / 70 % RH  
Engineer Junya Okuno  
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.    | 31.610             | QP       | 22.1              | 17.9               | 7.1          | 32.2         | 14.9               | 40.0              | 25.1           |        |
| Hori.    | 37.059             | QP       | 22.1              | 15.9               | 7.2          | 32.2         | 13.1               | 40.0              | 26.9           |        |
| Hori.    | 276.234            | QP       | 28.5              | 13.2               | 9.9          | 32.0         | 19.6               | 46.0              | 26.5           |        |
| Hori.    | 284.247            | QP       | 32.8              | 13.4               | 9.9          | 32.0         | 24.1               | 46.0              | 21.9           |        |
| Hori.    | 308.266            | QP       | 33.0              | 13.7               | 10.1         | 32.0         | 24.8               | 46.0              | 21.2           |        |
| Hori.    | 316.314            | QP       | 31.8              | 14.0               | 10.2         | 32.0         | 24.0               | 46.0              | 22.1           |        |
| Vert.    | 31.610             | QP       | 25.0              | 17.9               | 7.1          | 32.2         | 17.8               | 40.0              | 22.2           |        |
| Vert.    | 37.059             | QP       | 28.1              | 15.9               | 7.2          | 32.2         | 19.1               | 40.0              | 20.9           |        |
| Vert.    | 276.242            | QP       | 30.5              | 13.2               | 9.9          | 32.0         | 21.6               | 46.0              | 24.5           |        |
| Vert.    | 284.247            | QP       | 31.8              | 13.4               | 9.9          | 32.0         | 23.1               | 46.0              | 22.9           |        |
| Vert.    | 308.266            | QP       | 27.5              | 13.7               | 10.1         | 32.0         | 19.3               | 46.0              | 26.7           |        |
| Vert.    | 316.314            | QP       | 22.9              | 14.0               | 10.2         | 32.0         | 15.1               | 46.0              | 31.0           |        |

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.

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### Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date December 16, 2020  
Temperature / Humidity 21 deg. C / 31 % RH  
Engineer Akihiko Maeda  
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.    | 30.085             | QP       | 22.3              | 18.5               | 7.1          | 32.2         | 15.7               | 40.0              | 24.4           |        |
| Hori.    | 67.932             | QP       | 29.4              | 6.5                | 7.8          | 32.2         | 11.5               | 40.0              | 28.5           |        |
| Hori.    | 276.243            | QP       | 36.0              | 13.2               | 9.9          | 32.0         | 27.1               | 46.0              | 18.9           |        |
| Hori.    | 300.265            | QP       | 32.3              | 13.5               | 10.1         | 32.0         | 23.9               | 46.0              | 22.2           |        |
| Hori.    | 404.829            | QP       | 28.7              | 15.8               | 10.8         | 32.0         | 23.3               | 46.0              | 22.8           |        |
| Hori.    | 532.467            | QP       | 26.2              | 17.5               | 11.6         | 32.0         | 23.4               | 46.0              | 22.7           |        |
| Vert.    | 30.578             | QP       | 45.1              | 18.2               | 7.1          | 32.2         | 38.2               | 40.0              | 1.8            |        |
| Vert.    | 60.578             | QP       | 37.0              | 7.6                | 7.6          | 32.2         | 20.1               | 40.0              | 19.9           |        |
| Vert.    | 276.243            | QP       | 30.3              | 13.2               | 9.9          | 32.0         | 21.4               | 46.0              | 24.6           |        |
| Vert.    | 300.265            | QP       | 33.4              | 13.5               | 10.1         | 32.0         | 25.0               | 46.0              | 21.1           |        |
| Vert.    | 404.829            | QP       | 21.8              | 15.8               | 10.8         | 32.0         | 16.4               | 46.0              | 29.7           |        |
| Vert.    | 532.467            | QP       | 23.3              | 17.5               | 11.6         | 32.0         | 20.5               | 46.0              | 25.6           |        |

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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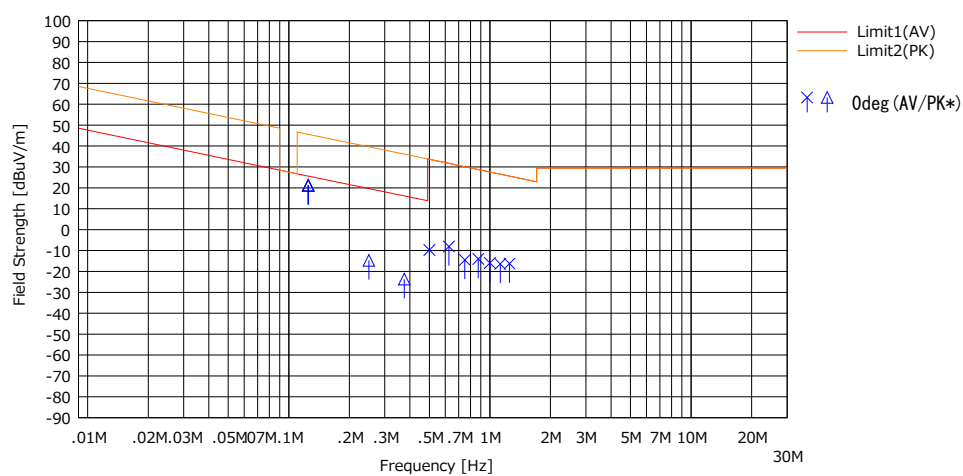
Facsimile : +81 596 24 8124

### Radiated Emission Plot data, Worst case

|                        |                                     |                                 |
|------------------------|-------------------------------------|---------------------------------|
| Report No.             | 13439589H                           |                                 |
| Test place             | Ise EMC Lab.                        |                                 |
| Semi Anechoic Chamber  | No.3                                | No.3                            |
| Date                   | July 26, 2020                       | December 16, 2020               |
| Temperature / Humidity | 22 deg. C / 47 % RH                 | 21 deg. C / 31 % RH             |
| Engineer               | Hiroyuki Furutaka<br>(Below 30 MHz) | Akihiko Maeda<br>(Above 30 MHz) |
| Mode                   | Mode 3                              |                                 |

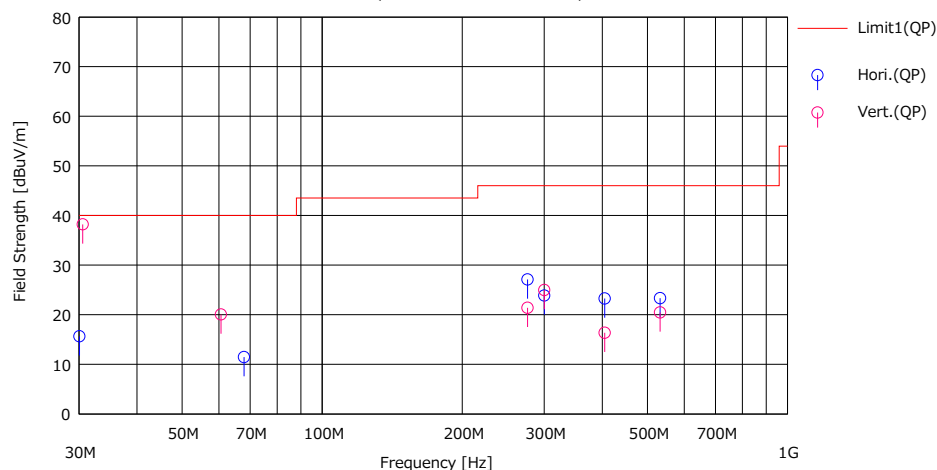
#### (Below 30MHz)

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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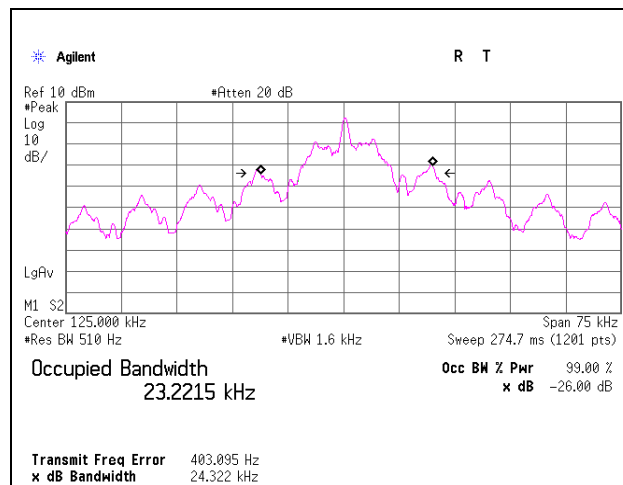
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Facsimile : +81 596 24 8124

## -26 dB Bandwidth and 99 % Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | July 26, 2020       |
| Temperature / Humidity | 22 deg. C / 47 % RH |
| Engineer               | Hiroyuki Furutaka   |
| Mode                   | Mode 1              |

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 24.322                    | 23.2215                          |



\*It was confirmed that there was no difference by the input voltage.

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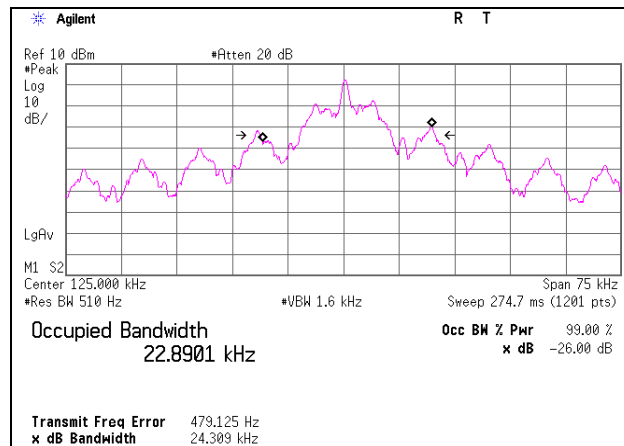
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### -26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13439589H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 26, 2020  
Temperature / Humidity 22 deg. C / 47 % RH  
Engineer Hiroyuki Furutaka  
Mode Mode 2

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 24.309                    | 22.8901                          |



\*It was confirmed that there was no difference by the input voltage.

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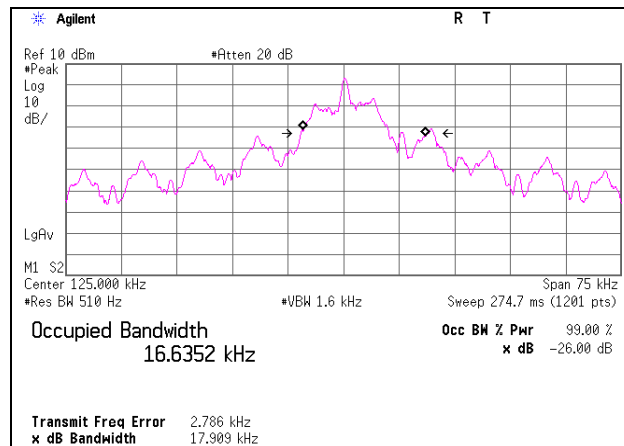
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### -26 dB Bandwidth and 99 % Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | July 26, 2020       |
| Temperature / Humidity | 22 deg. C / 47 % RH |
| Engineer               | Hiroyuki Furutaka   |
| Mode                   | Mode 3              |

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 17.909                    | 16.6352                          |



\*It was confirmed that there was no difference by the input voltage.

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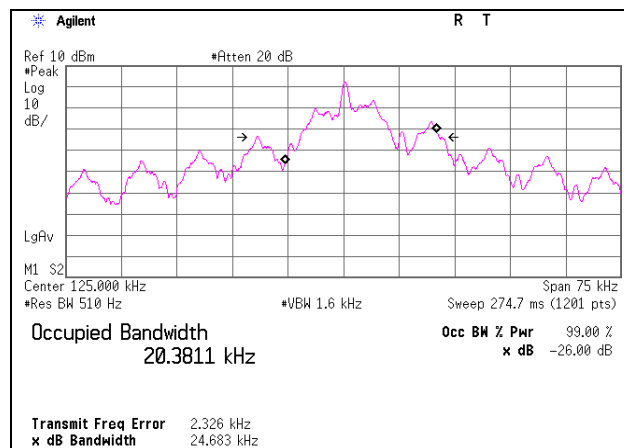
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Facsimile : +81 596 24 8124

### -26 dB Bandwidth and 99 % Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | July 26, 2020       |
| Temperature / Humidity | 22 deg. C / 47 % RH |
| Engineer               | Hiroyuki Furutaka   |
| Mode                   | Mode 4              |

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 24.683                    | 20.3811                          |



\*It was confirmed that there was no difference by the input voltage.

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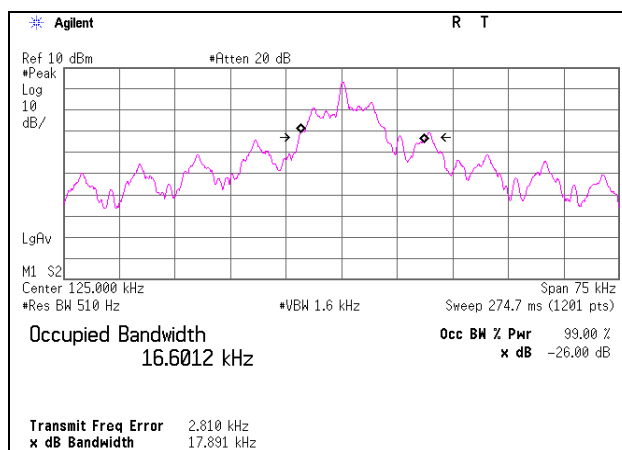
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## -26 dB Bandwidth and 99 % Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | July 26, 2020       |
| Temperature / Humidity | 22 deg. C / 47 % RH |
| Engineer               | Hiroyuki Furutaka   |
| Mode                   | Mode 5              |

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 17.891                    | 16.6012                          |



\*It was confirmed that there was no difference by the input voltage.

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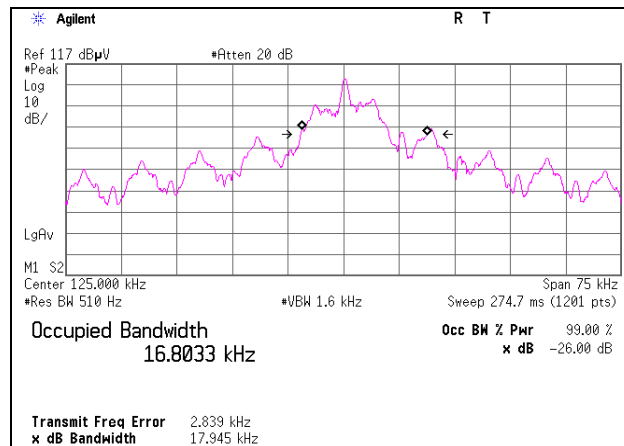
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### -26 dB Bandwidth and 99 % Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | July 26, 2020       |
| Temperature / Humidity | 22 deg. C / 47 % RH |
| Engineer               | Hiroyuki Furutaka   |
| Mode                   | Mode 6              |

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 17.945                    | 16.8033                          |



\*It was confirmed that there was no difference by the input voltage.

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## -26 dB Bandwidth and 99 % Occupied Bandwidth

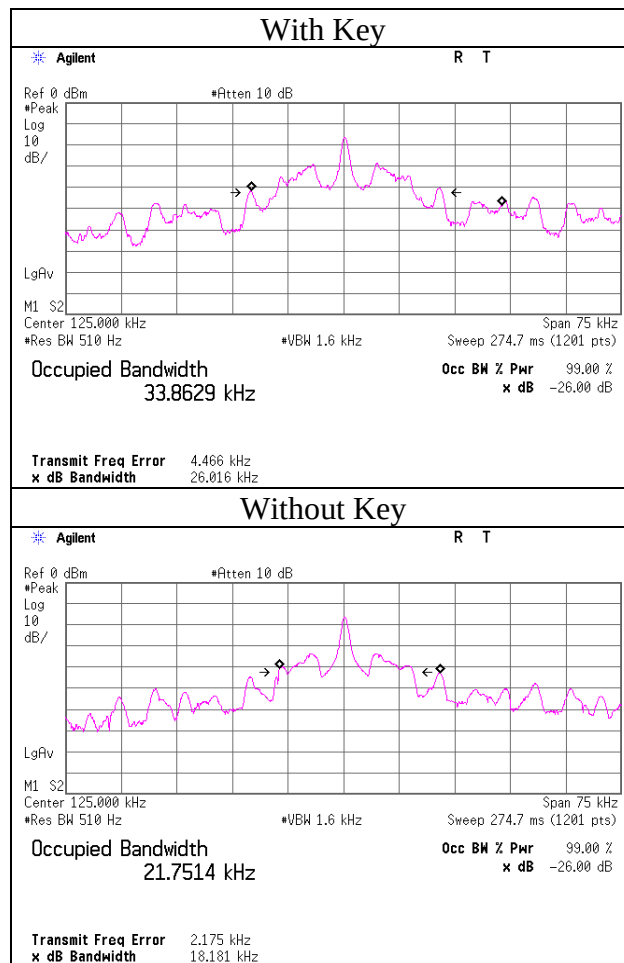
|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | July 26, 2020       |
| Temperature / Humidity | 22 deg. C / 47 % RH |
| Engineer               | Hiroyuki Furutaka   |
| Mode                   | Mode 7              |

### With Key

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 26.016                    | 33.8629                          |

### Without Key

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 18.181                    | 21.7514                          |



\*It was confirmed that there was no difference by the input voltage.

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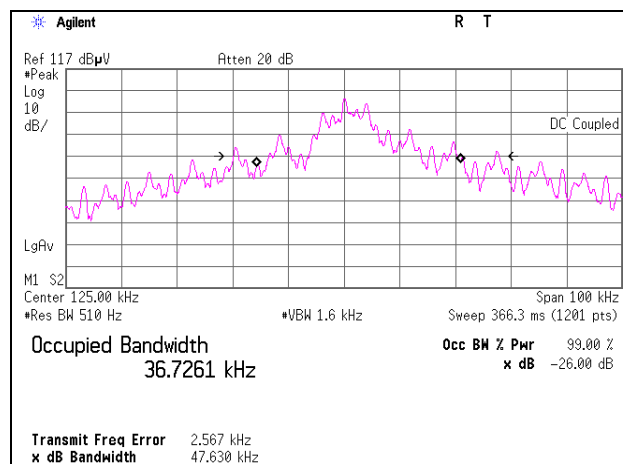
Facsimile : +81 596 24 8124

### -26 dB Bandwidth and 99 % Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 13439589H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.3                |
| Date                   | December 16, 2020   |
| Temperature / Humidity | 21 deg. C / 31 % RH |
| Engineer               | Akihiko Maeda       |
| Mode                   | Mode 8              |

#### With Key

| -26 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------------------|----------------------------------|
| 47.630                    | 36.7261                          |



\*It was confirmed that there was no difference by the input voltage.

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## APPENDIX 2: Test instruments

### Test equipment (Tested on July 26, 2020)

| 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        | 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        | MAT-95       | 142314  | Attenuator                        | Pasternack                    | PE7390-6                                        | D/C 1504   | 06/17/2020            | 12      |
| RE        | MCC-143      | 141413  | Coaxial Cable                     | UL Japan                      | -                                               | -          | 06/18/2020            | 12      |
| RE        | MLPA-02      | 142152  | Loop Antenna                      | Rohde & Schwarz               | HFH2-Z2                                         | 836553/009 | 11/25/2019            | 12      |
| 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        | MPA-13       | 141582  | Pre Amplifier                     | SONOMA INSTRUMENT             | 310                                             | 260834     | 02/10/2020            | 12      |
| RE        | MTR-08       | 141949  | Test Receiver                     | Rohde & Schwarz               | ESCI                                            | 100767     | 08/02/2019            | 12      |
| RE        | MSA-04       | 141885  | Spectrum Analyzer                 | Keysight Technologies Inc     | E4448A                                          | US44300523 | 11/21/2019            | 12      |
| RE        | MBA-03       | 141424  | Biconical Antenna                 | Schwarzbeck Mess - Elektronik | VHA9103+BBA9106                                 | 1915       | 08/24/2019            | 12      |
| RE        | MCC-51       | 141323  | Coaxial cable                     | UL Japan                      | -                                               | -          | 07/06/2020            | 12      |
| RE        | MLA-22       | 141266  | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess - Elektronik | VUSLP9111B                                      | 9111B-191  | 08/24/2019            | 12      |

### Test equipment (Tested on December 16, 2020)

| 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   | 2020/05/22            | 24      |
| RE        | MOS-13       | 141554  | Thermo-Hygrometer                 | CUSTOM. Inc                   | CTH-201                  | 1301       | 2020/01/07            | 12      |
| RE        | MMM-08       | 141532  | DIGITAL HiTESTER                  | Hioki                         | 3805                     | 51201197   | 2020/01/06            | 12      |
| RE        | MJM-16       | 142183  | Measure                           | KOMELON                       | KMC-36                   | -          | -                     | -       |
| RE        | COTS-MEMI-02 | 178648  | EMI measurement program           | TSJ (Techno Science Japan)    | TEPTO-DV                 | -          | -                     | -       |
| RE        | MLPA-02      | 142152  | Loop Antenna                      | Rohde & Schwarz               | HFH2-Z2                  | 836553/009 | 2020/12/04            | 12      |
| RE        | MPA-13       | 141582  | Pre Amplifier                     | SONOMA INSTRUMENT             | 310                      | 260834     | 2020/02/10            | 12      |
| RE        | MCC-219      | 159670  | Coaxial Cable                     | UL Japan Inc.                 | -                        | -          | 2020/11/17            | 12      |
| RE        | MAT-95       | 142314  | Attenuator                        | Pasternack                    | PE7390-6                 | D/C 1504   | 2020/06/17            | 12      |
| RE        | MSA-15       | 141902  | Spectrum Analyzer                 | Keysight Technologies Inc     | E4440A                   | MY46187105 | 2020/10/15            | 12      |
| RE        | MTR-08       | 141949  | Test Receiver                     | Rohde & Schwarz               | ESCI                     | 100767     | 2020/08/18            | 12      |
| RE        | MBA-03       | 141424  | Biconical Antenna                 | Schwarzbeck Mess - Elektronik | VHA9103+BBA9106          | 1915       | 2020/08/13            | 12      |
| RE        | MCC-51       | 141323  | Coaxial cable                     | UL Japan                      | -                        | -          | 2020/07/06            | 12      |
| RE        | MLA-22       | 141266  | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess - Elektronik | VUSLP9111B               | 9111B-191  | 2020/08/13            | 12      |

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**\*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**

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