# EMI TEST REPORT

## Test Report No. : 13487461H-B-R1

| | | |
|---|---|---|
| **Applicant** | : | **NIDEC MOBILITY CORPORATION** |
| **Type of EUT** | : | **ECU of Keyless Operation System** |
| **Model Number of EUT** | : | **R515E** |
| **FCC ID** | : | **OUCR515E** |
| **Test regulation** | : | **FCC Part 15 Subpart B: 2020** |
| **Test Result** | : | **Complied (Refer to SECTION 3.2)** |

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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.
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6. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC 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 13487461H-B. 13487461H-B is replaced with this report.

**Date of test:** September 6, 2020

**Representative test engineer:**
Ken Fujita
Engineer
Consumer Technology Division

**Approved by:**
Shinichi Miyazono
Engineer
Consumer Technology Division

CERTIFICATE 5107.02

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

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# REVISION HISTORY

## Original Test Report No.: 13487461H-B

<table>
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<tr><td>-<br>(Original)</td><td>13487461H-B</td><td>October 13, 2020</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>13487461H-B-R1</td><td>November 26, 2020</td><td>P.6</td><td>Addition of “Type of Modulation: ASK” in Smart System: LF Transmitting function of Clause 2.2</td></tr>
<tr><td>1</td><td>13487461H-B-R1</td><td>November 26, 2020</td><td>P.11</td><td>Correction of the following table in Clause 4.2;<br>From<br>Description of EUT and Support equipment<br><table><tr><th>No.</th><th>Item</th><th>Model number</th><th>Serial number</th></tr><tr><td>A</td><td>ECU</td><td>R515E</td><td>14</td></tr><tr><td>B</td><td>LF Anttena DR</td><td>CGF-M004-T04</td><td>8637C166</td></tr><tr><td>C</td><td>LF Anttena AS</td><td>CGF-M004-T04</td><td>8637C166</td></tr><tr><td>D</td><td>LF Anttena INF</td><td>CGF-M004-T04</td><td>8637C166</td></tr><tr><td>E</td><td>LF Anttena INR</td><td>CGF-M004-T04</td><td>8637C166</td></tr><tr><td>F</td><td>LF Anttena T/G</td><td>CGF-M004-T04</td><td>8637C166</td></tr></table>To<br>Description of EUT and Support equipment<br><table><tr><th>No.</th><th>Item</th><th>Model number</th><th>Serial number</th></tr><tr><td>A</td><td>KOS</td><td>R515E</td><td>#14</td></tr><tr><td>B</td><td>LF Antenna DR</td><td>CGF-M004-T03</td><td>200826-7</td></tr><tr><td>C</td><td>LF Antenna AS</td><td>CGF-M004-T03</td><td>200826-8</td></tr><tr><td>D</td><td>LF Antenna INF</td><td>CGF-M004-T03</td><td>200826-9</td></tr><tr><td>E</td><td>LF Antenna INR</td><td>CGF-M004-T03</td><td>200826-10</td></tr><tr><td>F</td><td>LF Antenna T/G</td><td>CGF-M004-T04</td><td>200826-11</td></tr></table></td></tr>
<tr><td>1</td><td>13487461H-B-R1</td><td>November 26, 2020</td><td>P.11</td><td>Correction of No.7 cable name in the cable list of Clause 4.2;<br>From Antenna Cable to Signal Cable</td></tr>
<tr><td>1</td><td>13487461H-B-R1</td><td>November 26, 2020</td><td>P.13</td><td>Correction of the calculation formula for 1GHz-6 GHz in Figure 2: Test Setup of SECTION 5;<br>From:<br>Distance Factor: 20 x log (3.7 m*/3.0 m) = 0.83 dB<br>To:<br>Distance Factor: 20 x log (3.3 m*/3.0 m) = 0.83 dB</td></tr>
<tr><td>1</td><td>13487461H-B-R1</td><td>November 26, 2020</td><td>P.16</td><td>Addition of “EMI Test Receiver” (Local ID: MTR-09) in Test equipment list</td></tr>
</table>

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

| | |
|---|---|
| AAN | Asymmetric Artificial Network |
| AC | Alternating Current |
| AM | Amplitude Modulation |
| AMN | Artificial Mains Network |
| Amp, AMP | Amplifier |
| ANSI | American National Standards Institute |
| Ant, ANT | Antenna |
| AP | Access Point |
| ASK | Amplitude Shift Keying |
| Atten., ATT | Attenuator |
| AV | Average |
| BPSK | Binary Phase-Shift Keying |
| BR | Bluetooth Basic Rate |
| BT | Bluetooth |
| BT LE | Bluetooth Low Energy |
| BW | BandWidth |
| C.F | Correction Factor |
| Cal Int | Calibration Interval |
| CAV | CISPR AV |
| CCK | Complementary Code Keying |
| CDN | Coupling Decoupling Network |
| Ch., CH | Channel |
| CISPR | Comite International Special des Perturbations Radioelectriques |
| Corr. | Correction |
| CPE | Customer premise equipment |
| CW | Continuous Wave |
| DBPSK | Differential BPSK |
| DC | Direct Current |
| DET | Detector |
| D-factor | Distance factor |
| Dmax | maximum absolute voltage change during an observation period |
| DQPSK | Differential QPSK |
| DSSS | Direct Sequence Spread Spectrum |
| EDR | Enhanced Data Rate |
| e.i.r.p., EIRP | Equivalent Isotropically Radiated Power |
| EM clamp | Electromagnetic clamp |
| EMC | ElectroMagnetic Compatibility |
| EMI | ElectroMagnetic Interference |
| EMS | ElectroMagnetic Susceptibility |
| EN | European Norm |
| e.r.p., ERP | Effective Radiated Power |
| EU | European Union |
| EUT | Equipment Under Test |
| Fac. | Factor |
| FCC | Federal Communications Commission |
| FHSS | Frequency Hopping Spread Spectrum |
| FM | Frequency Modulation |
| Freq. | Frequency |
| FSK | Frequency Shift Keying |
| Fund | Fundamental |
| FWD | Forward |
| GFSK | Gaussian Frequency-Shift Keying |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| Hori. | Horizontal |
| ICES | Interference-Causing Equipment Standard |
| I/O | Input/Output |
| 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 |
| ISN | Impedance Stabilization Network |
| ISO | International Organization for Standardization |
| JAB | Japan Accreditation Board |
| LAN | Local Area Network |
| LCL | Longitudinal Conversion Loss |
| LIMS | Laboratory Information Management System |
| LISN | Line Impedance Stabilization Network |
| MRA | Mutual Recognition Arrangement |
| N/A | Not Applicable |
| NIST | National Institute of Standards and Technology |
| NS | No signal detect. |
| NSA | Normalized Site Attenuation |
| NVLAP | National Voluntary Laboratory Accreditation Program |
| OBW | Occupied Band Width |
| OFDM | Orthogonal Frequency Division Multiplexing |
| PK | Peak |
| $P_{LT}$ | long-term flicker severity |
| POHC(A) | Partial Odd Harmonic Current |
| Pol., Pola. | Polarization |
| PR-ASK | Phase Reversal ASK |
| $P_{ST}$ | short-term flicker severity |
| QAM | Quadrature Amplitude Modulation |
| QP | Quasi-Peak |
| QPSK | Quadri-Phase Shift Keying |
| r.m.s., RMS | Root Mean Square |
| RBW | Resolution Band Width |
| RE | Radio Equipment |
| REV | Reverse |
| RF | Radio Frequency |
| RFID | Radio Frequency Identifier |
| RSS | Radio Standards Specifications |
| Rx | Receiving |
| SINAD | Ratio of (Signal + Noise + Distortion) to (Noise + Distortion) |
| S/N | Signal to Noise ratio |
| SA, S/A | Spectrum Analyzer |
| SG | Signal Generator |
| SVSWR | Site-Voltage Standing Wave Ratio |
| THC(A) | Total Harmonic Current |
| THD(%) | Total Harmonic Distortion |
| TR | Test Receiver |
| Tx | Transmitting |
| VBW | Video BandWidth |
| Vert. | Vertical |
| WLAN | Wireless LAN |
| xDSL | Generic term for all types of DSL technology (DSL: Digital Subscriber Line) |

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**CONTENTS** **PAGE**

# SECTION 1: Customer information

| | | |
|---|---|---|
| Company Name | : | NIDEC MOBILITY CORPORATION |
| Address | : | 6368, Nenjo-zaka, Okusa, Komaki-city, Aichi 485-802 Japan |
| Telephone Number | : | +81-568-78-6159 |
| Facsimile Number | : | +81-568-78-7659 |
| Contact Person | : | Kazushi Yamasaki |

The information provided from the customer is as follows;
- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT) other than the Receipt Date
- SECTION 4: Operation of EUT during testing

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

# SECTION 2: Equipment under test (EUT)

## 2.1 Identification of EUT

| | | |
|---|---|---|
| Type | : | ECU of Keyless Operation System |
| Model Number | : | R515E |
| Serial Number | : | Refer to SECTION 4.2 |
| Rating | : | DC 12.0 V |
| Receipt Date | : | August 28, 2020 |
| Country of Mass-production | : | China |
| Condition | : | Production model |
| Modification | : | No Modification by the test lab |

## 2.2 Product Description

Model No: R515E, (referred to as the EUT in this report), is the ECU of Keyless Operation System.Keyless Operation System has the following radio functions: Immobilizer system and Smart System (LF Transmitting / UHF Receiving).

**General Specification**

| | | |
|---|---|---|
| Clock frequency (maximum) | : | UHF: 21.948717 MHz |
| Operating Temperature | : | -40 deg. C to +85 deg. C |

**Radio Specification**

**Immobilizer system function ***

| | | |
|---|---|---|
| Equipment Type | : | Transceiver |
| Frequency of Operation | : | 125 kHz |
| Type of Modulation | : | ASK |
| Antenna Type | : | Coil Antenna |

**Smart System: LF Transmitting function ***

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

**Smart System: UHF Receiving function**

| | | |
|---|---|---|
| Type of Receiver | : | Super Heterodyne |
| Receiving Frequency | : | 433.92 MHz |
| Oscillator Frequency | : | 21.948717 MHz |
| Local Oscillator Frequency | : | 434.194 MHz |
| Intermediate Frequency | : | 274 kHz |
| Antenna Type | : | λ/4 Monopole Antenna |

*The test of these functions was performed separately from this test report, and the conformability is confirmed.

# SECTION 3: Test specification, procedures & results

## 3.1 Test Specification

| | | |
|---|---|---|
| Test Specification | : | FCC Part 15 Subpart B<br>FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020 |
| Title | : | FCC 47CFR Part15 Radio Frequency Device<br>Subpart B Unintentional Radiators |

## 3.2 Procedures and results

| Item | Test Procedure | Limits | Deviation | Worst margin | Result | Remarks |
|---|---|---|---|---|---|---|
| Conducted emission | **FCC:** ANSI C63.4: 2014 7. AC power - line conducted emission measurements | **FCC:**Part 15 Subpart B 15.107(a) | N/A | N/A | N/A | *1) |
| | **ISED:** RSS-Gen 7.1 | **ISED:** RSS-Gen 7.2 | | | | |
| Radiated emission | **FCC:** ANSI C63.4: 2014 8. Radiated emission measurements | **FCC:** Part 15 Subpart B 15.109(a) | N/A | 15.2 dB<br>172.162 MHz, Horizontal, QP <Mode 1> | Complied a) | - |
| | **ISED:** RSS-Gen 7.1 | **ISED:** RSS-Gen 7.3 | | | | |
| Antenna Terminal | **FCC:** ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE | **FCC:** Part 15 Subpart B 15.111(a) | N/A | N/A | N/A | *2) |
| | **ISED:** - RSS-Gen 7.1 | **ISED:** RSS-Gen 7.4 | | | | |

*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.
*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.
*2) The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached).
Therefore, Radiated emission test was performed.

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

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. |

## 3.3 Addition to standard

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 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 | 30 MHz to 200 MHz | (Horizontal) | 4.8 dB |
| | | (Vertical) | 5.0 dB |
| | 200 MHz to 1000 MHz | (Horizontal) | 5.2 dB |
| | | (Vertical) | 6.3 dB |
| 10 m | 30 MHz to 200 MHz | (Horizontal) | 4.8 dB |
| | | (Vertical) | 4.8 dB |
| | 200 MHz to 1000 MHz | (Horizontal) | 5.0 dB |
| | | (Vertical) | 5.0 dB |
| | | | |
| 3 m | 1 GHz to 6 GHz | | 4.9 dB |
| | 6 GHz to 18 GHz | | 5.2 dB |
| 1 m | 10 GHz to 26.5 GHz | | 5.5 dB |
| | 26.5 GHz to 40 GHz | | 5.5 dB |
| 0.5 m | 26.5 GHz to 40 GHz | | 5.5 dB |
| 10 m | 1 GHz to 18 GHz | | 5.2 dB |

## 3.5 Test Location

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* A2LA Certificate Number: 5107.02/ FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

| 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.

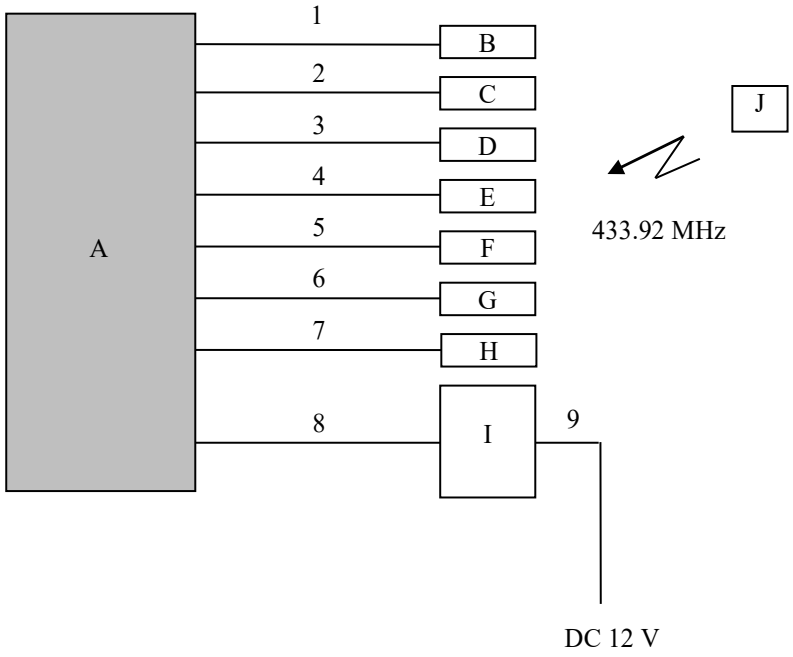
# SECTION 4: Operation of EUT during testing

## 4.1 Operating Mode(s)

| Mode | Remarks |
|---|---|
| 1) Receiving mode (Rx) 433.92MHz | - |
| * EUT was set by the software as follows;<br>Software: Radio_Law_Certification_EU Version 35 FC E1 | |

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.
* It was confirmed by using checker that the EUT receives the signal from the transmitter (pair of EUT).

## 4.2 Configuration and peripherals




* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
* Item No.A includes Receiver Antenna.

**Description of EUT and Support equipment**

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|---|---|---|---|---|---|
| A | KOS | R515E | #14 | NIDEC MOBILITY CORPORATION | EUT |
| B | LF Antenna DR | CGF-M004-T03 | 200826-7 | NIDEC MOBILITY CORPORATION | - |
| C | LF Antenna AS | CGF-M004-T03 | 200826-8 | NIDEC MOBILITY CORPORATION | - |
| D | LF Antenna INF | CGF-M004-T03 | 200826-9 | NIDEC MOBILITY CORPORATION | - |
| E | LF Antenna INR | CGF-M004-T03 | 200826-10 | NIDEC MOBILITY CORPORATION | - |
| F | LF Antenna T/G | CGF-M004-T04 | 200826-11 | NIDEC MOBILITY CORPORATION | - |
| G | FOB BOX | C8Z-F116M-K-T | 3718747 | NIDEC MOBILITY CORPORATION | - |
| H | Push Start Switch | C8N-B100M-Z | CA541389 | NIDEC MOBILITY CORPORATION | - |
| I | Jig | - | - | NIDEC MOBILITY CORPORATION | - |
| J | FOB | GHR-M014 | 45 | NIDEC MOBILITY CORPORATION | - |

**List of cables used**

| No. | Name | Length (m) | Shield | | Remark |
|---|---|---|---|---|---|
| | | | Cable | Connector | |
| 1 | Antenna Cable | 2.3 | Unshielded | Unshielded | - |
| 2 | Antenna Cable | 2.3 | Unshielded | Unshielded | - |
| 3 | Antenna Cable | 2.3 | Unshielded | Unshielded | - |
| 4 | Antenna Cable | 2.3 | Unshielded | Unshielded | - |
| 5 | Antenna Cable | 2.3 | Unshielded | Unshielded | - |
| 6 | Antenna Cable | 2.3 | Unshielded | Unshielded | - |
| 7 | Signal Cable | 2.3 | Unshielded | Unshielded | - |
| 8 | DC & Signal Cable | 3.0 | Unshielded | Unshielded | - |
| 9 | DC Cable | 3.0 | Unshielded | Unshielded | - |

# SECTION 5: Radiated Emission

## 5.1 Operating environment

Test place : No.4 semi anechoic chamber
Temperature : See data
Humidity : See data

## 5.2 Test configuration

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 EUT was set on the edge of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
Photographs of the set up are shown in Appendix 3.

## 5.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 6000 MHz (Horn antenna)
Test distance : 3 m
EUT position : Table top
EUT operation mode : See Clause 4.1

## 5.4 Test procedure

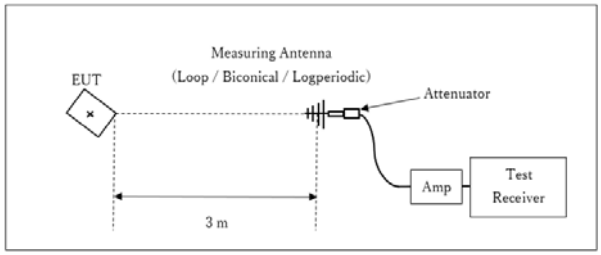
The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver
The radiated emission measurements were made with the following detector function of the Test Receiver
For above 1 GHz, test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

| Frequency | Below 1GHz | Above 1GHz *1) |
|---|---|---|
| Instrument used | Test Receiver | Test Receiver |
| IF Bandwidth | QP: BW 120 kHz | PK: BW 1 MHz, CISPR AV: BW 1 MHz |

*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.
Distance Factor: See Figure 2.

**Figure 2: Test Setup**

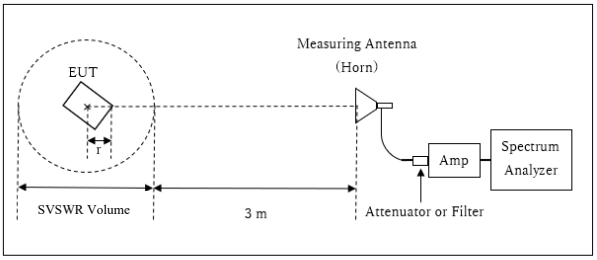
Below 1 GHz




× : Center of turn table

Test Distance: 3 m

1 GHz - 6 GHz




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

Distance Factor: 20 x log (3.3 m*/3.0 m) = 0.83 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.3 m

SVSWR Volume: 2 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.7m

- The 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.

### 5.5 Test result

Summary of the test results: Pass

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

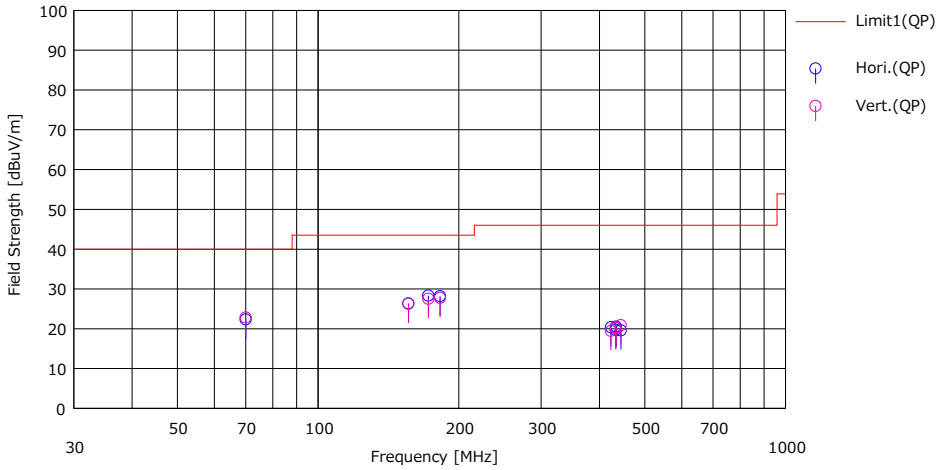
Date: September 6, 2020 Test engineer: Ken Fujita

# APPENDIX 1: Test data

## Radiated Emission
(Below 1 GHz)

| | |
|---|---|
| Report No. | 13487461H |
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | September 6, 2020 |
| Temperature / Humidity | 23 deg. C / 51 % RH |
| Engineer | Ken Fujita |
| Mode | Mode 1 |

Limit : FCC_Part 15 Subpart B(15.109)_Class B



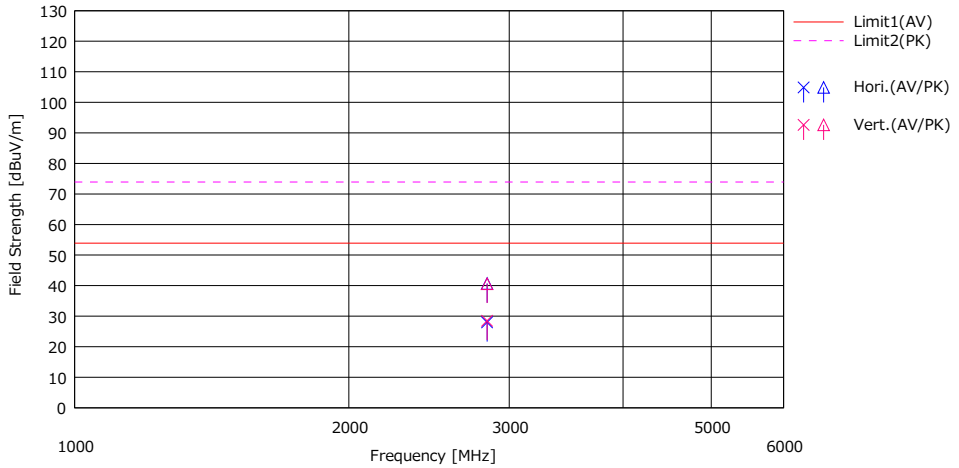

| No. | Freq. [MHz] | Reading (QP) [dBuV] | Ant.Fac [dB/m] | Loss [dB] | Gain [dB] | Result (QP) [dBuV/m] | Limit (QP) [dBuV/m] | Margin (QP) [dB] | Pola. [H/V] | Height [cm] | Angle [deg] | Ant. Type | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 70.021 | 34.20 | 8.91 | 7.75 | 28.56 | 22.30 | 40.00 | 17.7 | Hori. | 300 | 4 | BA | |
| 2 | 156.065 | 33.70 | 12.33 | 8.62 | 28.29 | 26.36 | 43.50 | 17.1 | Hori. | 100 | 125 | BA | |
| 3 | 172.162 | 34.60 | 13.15 | 8.75 | 28.20 | 28.30 | 43.50 | 15.2 | Hori. | 300 | 356 | BA | |
| 4 | 182.421 | 33.80 | 13.67 | 8.84 | 28.15 | 28.16 | 43.50 | 15.3 | Hori. | 100 | 293 | BA | |
| 5 | 423.220 | 22.40 | 16.17 | 10.49 | 28.74 | 20.32 | 46.00 | 25.6 | Hori. | 200 | 325 | LA | |
| 6 | 433.646 | 21.70 | 16.27 | 10.55 | 28.82 | 19.70 | 46.00 | 26.3 | Hori. | 200 | 261 | LA | |
| 7 | 434.194 | 22.50 | 16.28 | 10.56 | 28.82 | 20.52 | 46.00 | 25.4 | Hori. | 200 | 221 | LA | |
| 8 | 444.620 | 21.30 | 16.54 | 10.62 | 28.89 | 19.57 | 46.00 | 26.4 | Hori. | 200 | 176 | LA | |
| 9 | 70.021 | 34.70 | 8.91 | 7.75 | 28.56 | 22.80 | 40.00 | 17.2 | Vert. | 100 | 273 | BA | |
| 10 | 156.065 | 33.60 | 12.33 | 8.62 | 28.29 | 26.26 | 43.50 | 17.2 | Vert. | 100 | 356 | BA | |
| 11 | 172.162 | 33.80 | 13.15 | 8.75 | 28.20 | 27.50 | 43.50 | 16.0 | Vert. | 100 | 3 | BA | |
| 12 | 182.421 | 33.40 | 13.67 | 8.84 | 28.15 | 27.76 | 43.50 | 15.7 | Vert. | 100 | 151 | BA | |
| 13 | 423.220 | 21.50 | 16.17 | 10.49 | 28.74 | 19.42 | 46.00 | 26.5 | Vert. | 100 | 17 | LA | |
| 14 | 433.646 | 22.30 | 16.27 | 10.55 | 28.82 | 20.30 | 46.00 | 25.7 | Vert. | 100 | 358 | LA | |
| 15 | 434.194 | 22.10 | 16.28 | 10.56 | 28.82 | 20.12 | 46.00 | 25.8 | Vert. | 100 | 256 | LA | |
| 16 | 444.620 | 22.60 | 16.54 | 10.62 | 28.89 | 20.87 | 46.00 | 25.1 | Vert. | 100 | 187 | LA | |

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

# Radiated Emission
(Above 1 GHz)

| | |
|---|---|
| Report No. | 13487461H |
| Test place | Ise EMC Lab. |
| Semi Anechoic Chamber | No.4 |
| Date | September 6, 2020 |
| Temperature / Humidity | 23 deg. C / 51 % RH |
| Engineer | Ken Fujita |
| Mode | Mode 1 |

Limit : FCC_Part 15 Subpart B(15.109)_Class B




| No. | Freq. | Reading | | Ant.Fac | Loss | Gain | Result | | Limit | | Margin | | Pola. | Height | Angle | Ant. Type | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (AV) | (PK) | | | | (AV) | (PK) | (AV) | (PK) | (AV) | (PK) | | | | | |
| | [MHz] | [dBuV] | [dBuV] | [dB/m] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dBuV/m] | [dBuV/m] | [dB] | [dB] | [H/V] | [cm] | [deg] | | |
| 1 | 2836.692 | 28.40 | 41.10 | 28.58 | 3.56 | 32.55 | 27.99 | 40.69 | 53.90 | 73.90 | 25.91 | 33.21 | Hori. | 100 | 0 | H20 | |
| 2 | 2836.692 | 28.90 | 41.00 | 28.58 | 3.56 | 32.55 | 28.49 | 40.59 | 53.90 | 73.90 | 25.41 | 33.31 | Vert. | 100 | 0 | H20 | |

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + D-factor) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

# APPENDIX 2: Test instruments

**Test equipment**

| Test Item | Local ID | LIMS ID | Description | Manufacturer | Model | Serial | Last Calibration Date | Cal Int |
|---|---|---|---|---|---|---|---|---|
| RE | MAEC-04 | 142011 | AC4_Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | 05/25/2020 | 24 |
| RE | MOS-15 | 141562 | Thermo-Hygrometer | CUSTOM. Inc | CTH-201 | 0010 | 01/07/2020 | 12 |
| RE | MMM-10 | 141545 | DIGITAL HiTESTER | Hioki | 3805 | 51201148 | 01/06/2020 | 12 |
| RE | MJM-26 | 142227 | Measure | KOMELON | KMC-36 | - | - | - |
| RE | COTS-ME MI-02 | 178648 | EMI measurement program | TSJ (Techno Science Japan) | TEPTO-DV | - | - | - |
| RE | MAEC-04-SVSWR | 142017 | AC4_Semi Anechoic Chamber(SVSWR) | TDK | Semi Anechoic Chamber 3m | DA-10005 | 04/04/2019 | 24 |
| RE | MAT-34 | 141331 | Attenuator(6dB) | TME | UFA-01 | - | 02/05/2020 | 12 |
| RE | MBA-05 | 141425 | Biconical Antenna | Schwarzbeck Mess - Elektronik | VHA9103+BBA9106 | VHA 91031302 | 08/31/2020 | 12 |
| RE | MCC-50 | 141397 | Coaxial Cable | UL Japan | - | - | 03/24/2020 | 12 |
| RE | MLA-23 | 141267 | Logperiodic Antenna (200-1000MHz) | Schwarzbeck Mess - Elektronik | VUSLP9111B | 9111B-192 | 09/02/2020 | 12 |
| RE | MPA-14 | 141583 | Pre Amplifier | SONOMA INSTRUMENT | 310 | 260833 | 02/18/2020 | 12 |
| RE | MHA-21 | 141508 | Horn Antenna 1-18GHz | Schwarzbeck Mess - Elektronik | BBHA9120D | 557 | 05/22/2020 | 12 |
| RE | MPA-12 | 141581 | MicroWave System Amplifier | Keysight Technologies Inc | 83017A | 650 | 10/16/2019 | 12 |
| RE | MCC-141 | 141412 | Microwave Cable | Junkosha | MWX221 | 1305S002R(1m) / 1405S146(5m) | - | - |
| RE | MTR-09 | 141950 | EMI Test Receiver | Rohde & Schwarz | ESU26 | 100412 | 2020/06/03 | 12 |

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

**The expiration date of the calibration is the end of the expired month.**
**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

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

**Test item:**

**RE: Radiated emission**