



# RADIO TEST REPORT

Test Report No.: 14689046S-A-R1

|                     |  |
|---------------------|--|
| Customer            | Sony Global Manufacturing & Operations Corporation |
| Description of EUT  | CONTACTLESS IC CARD READER/WRITER                  |
| Model Number of EUT | RC-S300  |
| FCC ID              | AK8RCS300  |
| Test Regulation     | FCC Part 15 Subpart C                              |
| Test Result         | Complied (Refer to SECTION 3)                      |
| Issue Date          | May 10, 2023                                       |
| Remarks             | -  |

Representative test engineer

Yosuke Murakami  
Engineer

Approved by

Toyokazu Imamura  
Leader



CERTIFICATE 5107.02

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

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

## ANNOUNCEMENT

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

## REVISION HISTORY

### Original Test Report No.: 14689046S-A

This report is a revised version of 14689046S-A. 14689046S-A is replaced with this report.

| Revision  | Test Report No.   | Date           | Page Revised Contents   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
|---|---|----------------|---|-----------|----------------|--------------------|------------------------------|---|--|---------------|--|---|------------------------------|--|------------------------------|---------------------|--------------------------------|-----------|----------------|--------------------|---|---|---|---------------|---|---|------------------------------|--|---|---------------------|--------------------------------|
| -<br>(Original)                                 | 14689046S-A   | April 26, 2023 | -   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| 1   | 14689046S-A-R1  | May 10, 2023   | <p>Page 9</p> <p>Added tag type information and the reason for using those tags.</p> <p>[Before correction]</p> <table><tr><th>Test Item</th><th>Operating mode</th></tr><tr><td>Conducted Emission</td><td>NFC Communication (with Tag)</td></tr><tr><td>Electric Field Strength of Fundamental Emission</td><td>NFC Communication (with Tag)<br/>NFC Transmitting (without Tag)</td></tr><tr><td>Spectrum Mask</td><td>NFC Communication (with Tag)<br/>NFC Transmitting (without Tag)</td></tr><tr><td>20 dB Bandwidth and 99 % Occupied Bandwidth</td><td>NFC Communication (with Tag)</td></tr><tr><td>Electric Field Strength of Spurious Emission</td><td>NFC Communication (with Tag)</td></tr><tr><td>Frequency Tolerance</td><td>NFC Transmitting (Unmodulated)</td></tr></table> <p>[After correction]</p> <table><tr><th>Test Item</th><th>Operating mode</th></tr><tr><td>Conducted Emission</td><td>NFC Communication (with Tag / Type F) *1)</td></tr><tr><td>Electric Field Strength of Fundamental Emission</td><td>NFC Communication (with Tag / Type F) *1)<br/>NFC Transmitting (without Tag)</td></tr><tr><td>Spectrum Mask</td><td>NFC Communication (with Tag / Type F) *1)<br/>NFC Transmitting (without Tag)</td></tr><tr><td>20 dB Bandwidth and 99 % Occupied Bandwidth</td><td>NFC Communication (with Tag)</td></tr><tr><td>Electric Field Strength of Spurious Emission</td><td>NFC Communication *1)<br/>Below 30 MHz (with Tag / Type F)<br/>Above 30 MHz (with Tag / Type B)</td></tr><tr><td>Frequency Tolerance</td><td>NFC Transmitting (Unmodulated)</td></tr></table> <p>*1) As a result of comparing without / with tag and Tag type at pre-check, test was performed with the worst case as representative.</p> <p>Page 13</p> <p>Corrected the table size from “0.5 m by 1.0 m” to “1.0 m by 1.5 m”.</p> | Test Item | Operating mode | Conducted Emission | NFC Communication (with Tag) | Electric Field Strength of Fundamental Emission | NFC Communication (with Tag)<br>NFC Transmitting (without Tag) | Spectrum Mask | NFC Communication (with Tag)<br>NFC Transmitting (without Tag) | 20 dB Bandwidth and 99 % Occupied Bandwidth | NFC Communication (with Tag) | Electric Field Strength of Spurious Emission | NFC Communication (with Tag) | Frequency Tolerance | NFC Transmitting (Unmodulated) | Test Item | Operating mode | Conducted Emission | NFC Communication (with Tag / Type F) *1) | Electric Field Strength of Fundamental Emission | NFC Communication (with Tag / Type F) *1)<br>NFC Transmitting (without Tag) | Spectrum Mask | NFC Communication (with Tag / Type F) *1)<br>NFC Transmitting (without Tag) | 20 dB Bandwidth and 99 % Occupied Bandwidth | NFC Communication (with Tag) | Electric Field Strength of Spurious Emission | NFC Communication *1)<br>Below 30 MHz (with Tag / Type F)<br>Above 30 MHz (with Tag / Type B) | Frequency Tolerance | NFC Transmitting (Unmodulated) |
| Test Item                                       | Operating mode  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Conducted Emission                              | NFC Communication (with Tag)  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Electric Field Strength of Fundamental Emission | NFC Communication (with Tag)<br>NFC Transmitting (without Tag)                                |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Spectrum Mask                                   | NFC Communication (with Tag)<br>NFC Transmitting (without Tag)                                |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| 20 dB Bandwidth and 99 % Occupied Bandwidth     | NFC Communication (with Tag)  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Electric Field Strength of Spurious Emission    | NFC Communication (with Tag)  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Frequency Tolerance                             | NFC Transmitting (Unmodulated)  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Test Item                                       | Operating mode  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Conducted Emission                              | NFC Communication (with Tag / Type F) *1)   |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Electric Field Strength of Fundamental Emission | NFC Communication (with Tag / Type F) *1)<br>NFC Transmitting (without Tag)                   |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Spectrum Mask                                   | NFC Communication (with Tag / Type F) *1)<br>NFC Transmitting (without Tag)                   |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| 20 dB Bandwidth and 99 % Occupied Bandwidth     | NFC Communication (with Tag)  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Electric Field Strength of Spurious Emission    | NFC Communication *1)<br>Below 30 MHz (with Tag / Type F)<br>Above 30 MHz (with Tag / Type B) |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |
| Frequency Tolerance                             | NFC Transmitting (Unmodulated)  |                |   |           |                |                    |                              |   |  |               |  |   |                              |  |                              |                     |                                |           |                |                    |   |   |   |               |   |   |                              |  |   |                     |                                |

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

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

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## **SECTION 1: Customer Information**

|                  |  |
|------------------|--|
| Company Name     | Sony Global Manufacturing & Operations Corporation |
| Address          | 8-4, Shiomi Kisarazu-shi, Chiba, 292-0834 Japan.   |
| Telephone Number | +81-438-37-4704                                    |
| Contact Person   | Youhei Hisano                                      |

The information provided from the customer is as follows;

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
  - Operating/Test Mode(s) (Mode(s)) on all the relevant pages
  - SECTION 1: Customer Information
  - SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
  - SECTION 4: Operation of EUT during testing
- \* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

### **2.1 Identification of EUT**

|               |  |
|---------------|--|
| Description   | CONTACTLESS IC CARD READER/WRITER  |
| Model Number  | RC-S300  |
| Serial Number | Refer to SECTION 4.2   |
| Condition     | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | No Modification by the test lab  |
| Receipt Date  | March 8, 2023  |
| Test Date     | March 8 to April 20, 2023  |

### **2.2 Product Description**

#### **General Specification**

|                       |                         |
|-----------------------|-------------------------|
| Rating                | DC 5 V, 200 mA          |
| Operating Temperature | +5 deg. C to +35 deg. C |

#### **Radio Specification**

|                        |             |
|------------------------|-------------|
| Equipment Type         | Transceiver |
| Frequency of Operation | 13.56 MHz   |
| Type of Modulation     | ASK         |
| Antenna Gain           | -56.5 dBi   |

## SECTION 3: Test specification, procedures & results

### 3.1 Test Specification

|                    |   |
|--------------------|---|
| Test Specification | FCC Part 15 Subpart C<br>The latest version on the first day of the testing period  |
| Title              | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.207 Conducted limits<br>Section 15.225 Operation within the band 13.110-14.010 MHz. |

\* The customer has declared that the EUT has complied with FCC Part 15 Subpart B as SDoC.

### 3.2 Procedures and results

| Item  | Test Procedure  | Specification   | Worst margin  | Results        | Remarks  |
|---|---|---|---|----------------|----------|
| Conducted Emission                                    | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><ISED><br>RSS-Gen 8.8        | <FCC><br>Section 15.207<br>-----<br><ISED><br>RSS-Gen 8.8                                       | 17.2 dB<br>27.12 MHz<br>AV, N<br>Mode:<br>NFC Communication<br>(with Tag, Type-F)   | Complied<br>a) | -        |
| Electric Field Strength<br>of Fundamental<br>Emission | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><ISED><br>RSS-Gen 6.4, 6.12  | <FCC><br>Section 15.225(a)<br>-----<br><ISED><br>RSS-210 B.6                                    | 52.9 dB,<br>13.560 MHz,<br>QP, 0 deg.<br>Mode:<br>NFC Transmitting<br>(without Tag) | Complied<br>b) | Radiated |
| Spectrum Mask   | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><ISED><br>RSS-Gen 6.4, 6.13  | <FCC><br>Section 15.225(b)(c)<br>-----<br><ISED><br>RSS-210 B.6                                 | 34.0 dB,<br>13.553 MHz,<br>QP, 0 deg.<br>Mode:<br>NFC Transmitting<br>(without Tag) | Complied<br>b) | Radiated |
| 20 dB Bandwidth                                       | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><ISED> -                     | <FCC><br>Section15.215(c)<br>-----<br><ISED> -  | See data  | Complied<br>c) | Radiated |
| Electric Field Strength<br>of Spurious Emission       | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><ISED><br>RSS-Gen 6.4, 6.13  | <FCC><br>Section 15.209,<br>Section 15.225 (d)<br>-----<br><ISED><br>RSS-210 B.6<br>RSS-Gen 8.9 | 3.6 dB<br>40.68 MHz, Vertical,<br>QP<br>Mode:<br>NFC Communication<br>(without Tag) | Complied<br>d) | Radiated |
| Frequency Tolerance                                   | <FCC><br>ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><ISED><br>RSS-Gen 6.11, 8.11 | <FCC><br>Section 15.225(e)<br>-----<br><ISED><br>RSS-210 B.6                                    | See data  | Complied<br>e) | Radiated |

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

- a) Refer to APPENDIX 1 (data of Conducted Emission)
- b) Refer to APPENDIX 1 (data of Fundamental emission and Spectrum Mask)
- c) Refer to APPENDIX 1 (data of 20 dB Bandwidth and 99 % Occupied Bandwidth)
- d) Refer to APPENDIX 1 (data of Radiated Emission)
- e) Refer to APPENDIX 1 (data of Frequency Tolerance)

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

The stable voltage was supplied by the end product which was required to have a power supply regulator. Therefore, the EUT complies with the requirement.

However, the supply voltage was varied and tested at 85 % and 115 % of the nominal rated supply voltage during frequency tolerance test according to Section 15.225(e), since EUT cannot be operated at 110 % of the nominal rated voltage (the EUT will be damaged if a voltage of 110 % rated voltage is supplied).

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

It is impossible for end users to replace the antenna, because it is printed pattern circuit on the circuit board. Therefore, the equipment complies with the antenna requirement of Section 15.203.

## **3.3 Addition to standard**

| Item   | Test Procedure    | Specification | Worst margin | Results | Remarks  |
|--|-------------------|---------------|--------------|---------|----------|
| 99 % emission bandwidth  | <ISED>RSS-Gen 6.7 | -             | N/A          | -<br>a) | Radiated |
| Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.<br>a) Refer to APPENDIX 1 (data of 20 dB Bandwidth and 99 % Occupied Bandwidth) |                   |               |              |         |          |

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

## **3.4 Uncertainty**

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

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

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| Item   | Frequency range | Uncertainty (+/-) |
|--|-----------------|-------------------|
| Conducted emission (AC Mains) LISN               | 150 kHz-30 MHz  | 3.1 dB            |
| Radiated emission<br>(Measurement distance: 3 m) | 9 kHz-30 MHz    | 3.3 dB            |
|  | 30 MHz-200 MHz  | 4.8 dB            |
|  | 200 MHz-1 GHz   | 6.1 dB            |

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

| Other test                                | Uncertainty (+/-)    |
|---|----------------------|
| Bandwidth Measurement                     | 0.012 %              |
| Temperature_SCH-01                        | 0.87 deg.C.          |
| Humidity_SCH-01                           | 3.5 %                |
| Temperature_SCH-02                        | 2.0 deg.C.           |
| Humidity_SCH-02                           | 6.7 %                |
| Voltage                                   | 0.92 %               |
| Frequency Measurement (Spectrum Analyzer) | $1.4 \times 10^{-7}$ |
| Frequency Measurement (Frequency Counter) | $8.3 \times 10^{-8}$ |

### 3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan

Telephone: +81-463-50-6400

A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

| Test site                  | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|----------------------------|------------------------|----------------------------|--|------------------------------|
| No.1 Semi-anechoic chamber | 2973D-1                | 20.6 x 11.3 x 7.65         | 20.6 x 11.3  | 10 m                         |
| No.2 Semi-anechoic chamber | 2973D-2                | 20.6 x 11.3 x 7.65         | 20.6 x 11.3  | 10 m                         |
| No.3 Semi-anechoic chamber | 2973D-3                | 12.7 x 7.7 x 5.35          | 12.7 x 7.7   | 5 m                          |
| No.4 Semi-anechoic chamber | -                      | 8.1 x 5.1 x 3.55           | 8.1 x 5.1  | -                            |
| No.1 Shielded room         | -                      | 6.8 x 4.1 x 2.7            | 6.8 x 4.1  | -                            |
| No.2 Shielded room         | -                      | 6.8 x 4.1 x 2.7            | 6.8 x 4.1  | -                            |
| No.3 Shielded room         | -                      | 6.3 x 4.7 x 2.7            | 6.3 x 4.7  | -                            |
| No.4 Shielded room         | -                      | 4.4 x 4.7 x 2.7            | 4.4 x 4.7  | -                            |
| No.5 Shielded room         | -                      | 7.8 x 6.4 x 2.7            | 7.8 x 6.4  | -                            |
| No.6 Shielded room         | -                      | 7.8 x 6.4 x 2.7            | 7.8 x 6.4  | -                            |
| No.8 Shielded room         | -                      | 3.45 x 5.5 x 2.4           | 3.45 x 5.5   | -                            |
| No.1 Measurement room      | -                      | 2.55 x 4.1 x 2.5           | -  | -                            |

### 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)

The mode is used :

| Mode   | Operating mode                 | Tested frequency |
|--|--------------------------------|------------------|
| All items except for frequency tolerance, with tag   | NFC Communication              | 13.56 MHz        |
| All items except for frequency tolerance, without tag  | NFC Transmitting               | 13.56 MHz        |
| Frequency tolerance  | NFC Transmitting (Unmodulated) | 13.56 MHz        |
| The EUT was operated in a manner similar to typical use during the tests.                                  |                                |                  |
| *Power of the EUT was set by the software as follows;  |                                |                  |
| Power Setting: Fixed<br>Software: Version: 00000120<br>(Date: 2023.03 08, Storage location: EUT memory)    |                                |                  |
| *This setting of software is the worst case.   |                                |                  |
| Any conditions under the normal use do not exceed the condition of setting.                                |                                |                  |
| In addition, end users cannot change the settings of the output power of the product.                      |                                |                  |
| Justification: The system was configured in typical fashion (as a user would normally use it) for testing. |                                |                  |

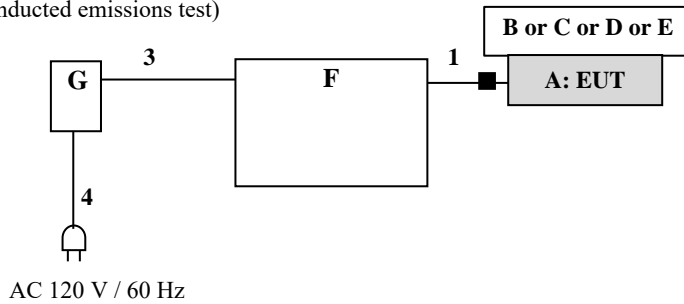
| Test Item                                       | Operating mode  |
|---|---|
| Conducted Emission                              | NFC Communication (with Tag / Type F) *1)   |
| Electric Field Strength of Fundamental Emission | NFC Communication (with Tag / Type F) *1)<br>NFC Transmitting (without Tag)                   |
| Spectrum Mask                                   | NFC Communication (with Tag / Type F) *1)<br>NFC Transmitting (without Tag)                   |
| 20 dB Bandwidth and 99 % Occupied Bandwidth     | NFC Communication (with Tag)  |
| Electric Field Strength of Spurious Emission    | NFC Communication *1)<br>Below 30 MHz (with Tag / Type F)<br>Above 30 MHz (with Tag / Type B) |
| Frequency Tolerance                             | NFC Transmitting (Unmodulated)  |

\*1) As a result of comparing without / with tag and Tag type at pre-check, test was performed with the worst case as representative.

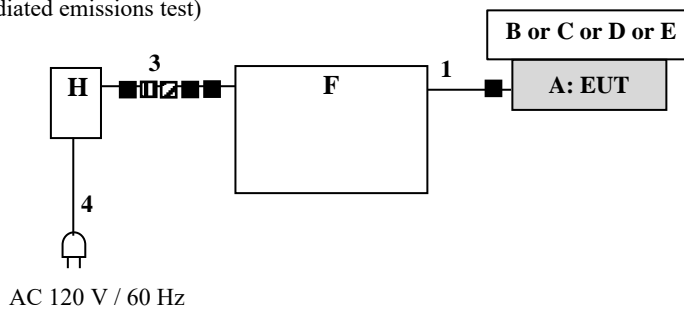
| Frequency Tolerance:  |   |
|---|---|
| Temperature   | -20 deg. C to +50 deg. C Step 10 deg. C   |
| Voltage   | Normal Voltage DC 5 V<br>Maximum Voltage DC 5.5 V (DC 5 V +10 %)<br>(The EUT will be damaged if a voltage of 115 % rated voltage is supplied)<br>Minimum Voltage DC 4.25 V (DC 5 V -15 %) |
| *This EUT provides stable voltage constantly to RF Part regardless of input voltage |   |

## 4.2 Configuration and peripherals

(For Conducted emissions test)



(For Radiated emissions test)



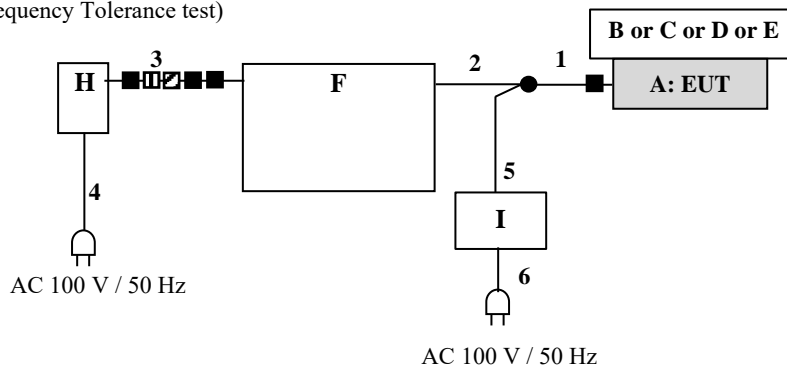
■: Standard ferrite core

▣: Ferrite Core (1 turn)  
(ZCAT2035-0930)

▢: Ferrite Core (1 turn)  
(ZCAT1730-0730)

■: Ferrite Core (1 turn)  
(ZCAT1325-0530)

(For Frequency Tolerance test)



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

\* The ferrite core attached to DC cable is not used to reduce the noise from the EUT. Therefore, that does not affect the emission level of the EUT.

\* As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

#### Description of EUT and Support equipment

| No. | Item                                 | Model number | Serial number          | Manufacturer | Remarks    |
|-----|--------------------------------------|--------------|------------------------|--------------|------------|
| A   | CONTACTLESS IC CARD<br>READER/WRITER | RC-S300      | 9999367<br>9999368 *1) | Sony         | EUT        |
| B   | IC Card                              | -            | -                      | -            | type-F *2) |
| C   | IC Card                              | -            | -                      | -            | type-A     |
| D   | IC Card                              | -            | -                      | -            | type-B     |
| E   | IC Card                              | -            | -                      | -            | type-V     |
| F   | Laptop PC                            | VGN-G1       | J001YGP3               | Sony         | -          |
| G   | AC Adapter                           | PCGA-AC16V6  | 147774951 0795512      | Sony         | -          |
| H   | AC Adapter                           | PCGA-AC16V6  | 147774951 0795514      | Sony         | -          |
| I   | Power Supply (DC)                    | PW18-2ATP    | 19050351               | TEXIO        | -          |

\*1) Used for Conducted emissions test. (Antenna Terminated)

\*2) RC-S300 is used with Type-F (FeliCa), Type-A, Type-B or Type V.

#### List of cables used

| No. | Name | Length (m) | Shield     |            | Remarks |
|-----|------|------------|------------|------------|---------|
|     |      |            | Cable      | Connector  |         |
| 1   | USB  | 0.7        | Shielded   | Shielded   | -       |
| 2   | USB  | 2.0        | Shielded   | Shielded   | -       |
| 3   | DC   | 1.8        | Unshielded | Unshielded | -       |
| 4   | AC   | 0.75       | Unshielded | Unshielded | -       |
| 5   | DC   | 0.8        | Unshielded | Unshielded | -       |
| 6   | AC   | 2.0        | Unshielded | Unshielded | -       |

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a wooden platform of nominal size 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane.

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

1) For the tests on EUT with other peripherals (as a whole system)

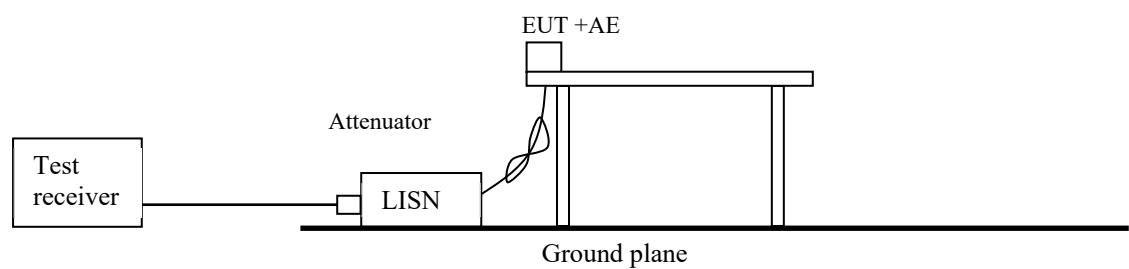
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous Disturbance Voltage has been measured with the EUT via AE (PC's AC Adapter) in a Shield room.

The EUT via AE (PC's AC Adapter) was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

Figure 1: Test Setup



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

|                   |                     |
|-------------------|---------------------|
| Detector          | : QP and CISPR AV   |
| Measurement range | : 0.15 MHz - 30 MHz |
| Test data         | : APPENDIX          |
| Test result       | : Pass              |

## **SECTION 6: Radiated emission (Fundamental, Spurious Emission and Spectrum Mask)**

### **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.

[Limit conversion]

The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to  $45.5 - 51.5 = -6.0$  dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

[Frequency: From 9 kHz to 30 MHz]

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

\*Refer to Figure 3 about Direction of the Loop Antenna.

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.

[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.

[Test instruments and test settings]

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

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.

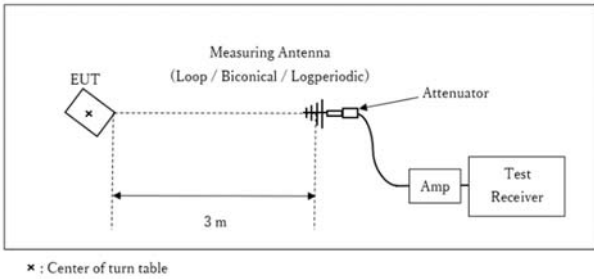
| Frequency       | From 9 kHz to 90 kHz and From 110 kHz to 150 kHz | From 90 kHz to 110 kHz | From 150 kHz to 490 kHz | From 490 kHz to 30 MHz | From 30 MHz to 1 GHz |
|-----------------|--|------------------------|-------------------------|------------------------|----------------------|
| Instrument 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:  $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Figure 2: Test Setup

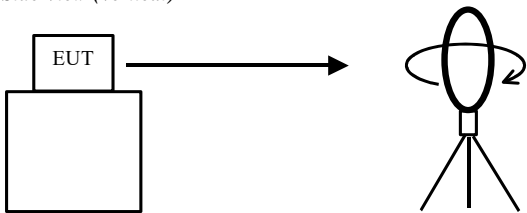
Below 1 GHz



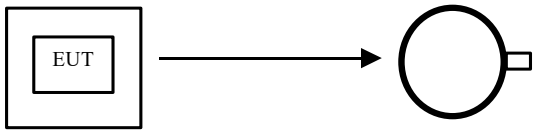
Test Distance: 3 m

Figure 3: Direction of the Loop Antenna

Side View (Vertical)

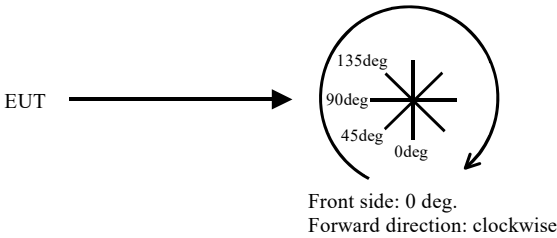


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



- 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.

Combinations of the worst case

|        | Frequency<br>Antenna<br>polarization | Below 30 MHz | Above 30 MHz |
|--------|--------------------------------------|--------------|--------------|
|        |                                      |              |              |
| Module | Horizontal                           | Y            | Y            |
|        | Vertical                             | Z            | Y            |

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

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

**Test data** : APPENDIX

**Test result** : Pass

---

## **SECTION 7: Other tests**

| Test   | Span                                    | RBW             | VBW                | Sweep | Detector | Trace        | Instrument used   |
|--|---|-----------------|--------------------|-------|----------|--------------|-------------------|
| 20 dB Bandwidth  | 100 kHz                                 | 1 kHz           | 3 kHz              | Auto  | Peak     | Max Hold     | Spectrum Analyzer |
| 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 |
| Frequency Tolerance  | -                                       | -               | -                  | -     | -        | -            | Frequency counter |
| *1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.<br>Peak hold was applied as Worst-case measurement. |   |                 |                    |       |          |              |                   |

**Test data** : APPENDIX  
**Test result** : Pass



APPENDIX 1: Test data

Conducted Emission

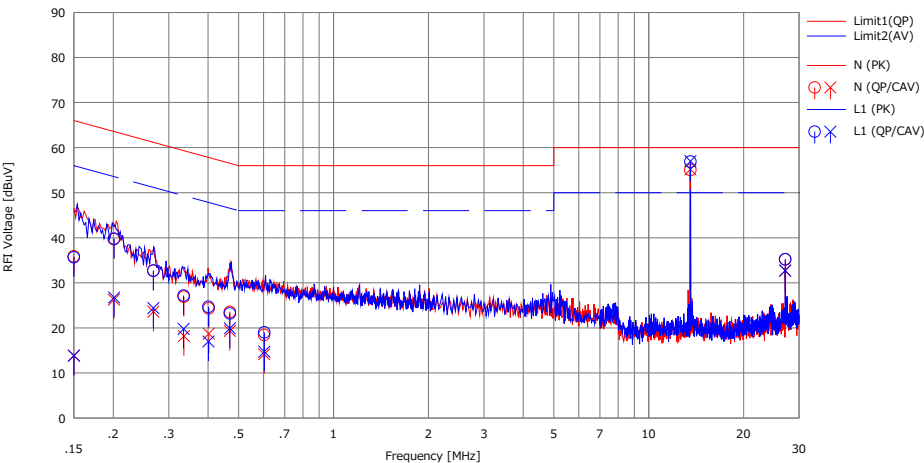
DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.1 Shielded Room  
Date : 2023/03/16

Mode : NFC Communication  
Power : DC 5.0 V (AC Adapter: 120 V / 60 Hz)  
Temp./Humi. : 24 deg.C / 34 %RH

Remarks : with Tag (Type F)

Limit : FCC\_Part 15 Subpart C(15.207) Engineer : Kouki Yamada

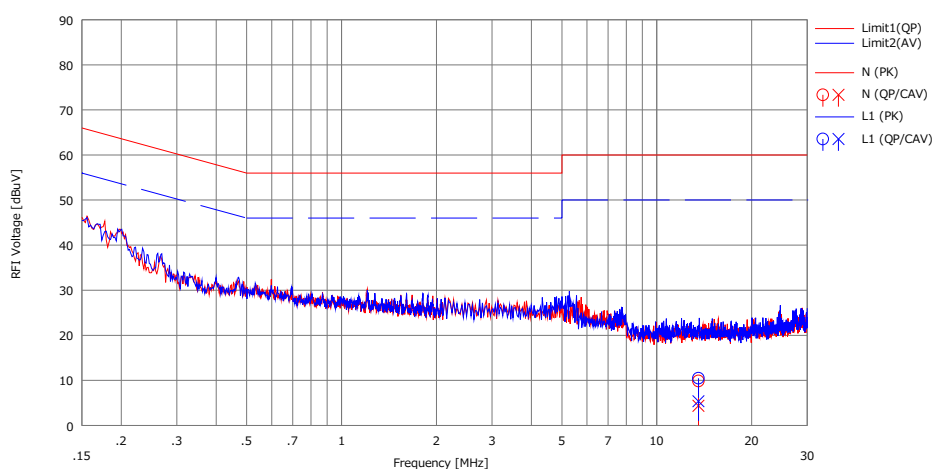


| No. | Freq.<br>[MHz] | Reading        |                 | C.Fac | Results        |                 | Limit          |                | Margin       |              | Phase | Comment                  |
|-----|----------------|----------------|-----------------|-------|----------------|-----------------|----------------|----------------|--------------|--------------|-------|--------------------------|
|     |                | <QP><br>[dBuV] | <CAV><br>[dBuV] |       | <QP><br>[dBuV] | <CAV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |                          |
| 1   | 0.15000        | 23.40          | 1.40            | 12.47 | 35.87          | 13.87           | 66.00          | 56.00          | 30.1         | 42.1         | N     |                          |
| 2   | 0.20095        | 27.20          | 13.80           | 12.49 | 39.69          | 26.29           | 63.57          | 53.57          | 23.8         | 27.2         | N     |                          |
| 3   | 0.26824        | 20.20          | 11.10           | 12.50 | 32.70          | 23.60           | 61.17          | 51.17          | 28.4         | 27.5         | N     |                          |
| 4   | 0.33526        | 14.40          | 5.70            | 12.50 | 26.90          | 18.20           | 59.32          | 49.32          | 32.4         | 31.1         | N     |                          |
| 5   | 0.40196        | 11.80          | 6.20            | 12.52 | 24.32          | 18.72           | 57.81          | 47.81          | 33.4         | 29.0         | N     |                          |
| 6   | 0.46910        | 11.00          | 6.80            | 12.54 | 23.54          | 19.34           | 56.53          | 46.53          | 32.9         | 27.1         | N     |                          |
| 7   | 0.60285        | 5.90           | 1.60            | 12.55 | 18.45          | 14.15           | 56.00          | 46.00          | 37.5         | 31.8         | N     |                          |
| 8   | 13.56000       | 41.80          | 41.90           | 13.26 | 55.06          | 55.16           | 60.00          | 50.00          | 4.9          | -5.2         | N     | carrier (Reference data) |
| 9   | 27.12000       | 21.50          | 19.00           | 13.74 | 35.24          | 32.74           | 60.00          | 50.00          | 24.7         | 17.2         | N     |                          |
| 10  | 0.15000        | 23.20          | 1.40            | 12.46 | 35.66          | 13.86           | 66.00          | 56.00          | 30.3         | 42.1         | L1    |                          |
| 11  | 0.20128        | 27.30          | 14.30           | 12.47 | 39.77          | 26.77           | 63.56          | 53.56          | 23.7         | 26.7         | L1    |                          |
| 12  | 0.26817        | 20.20          | 11.90           | 12.48 | 32.68          | 24.38           | 61.17          | 51.17          | 28.4         | 26.7         | L1    |                          |
| 13  | 0.33457        | 14.70          | 7.30            | 12.48 | 27.18          | 19.78           | 59.34          | 49.34          | 32.1         | 29.5         | L1    |                          |
| 14  | 0.40102        | 12.20          | 4.50            | 12.48 | 24.68          | 16.98           | 57.83          | 47.83          | 33.1         | 30.8         | L1    |                          |
| 15  | 0.46895        | 10.70          | 7.40            | 12.50 | 23.20          | 19.90           | 56.53          | 46.53          | 33.3         | 26.6         | L1    |                          |
| 16  | 0.60320        | 6.50           | 2.20            | 12.52 | 19.02          | 14.72           | 56.00          | 46.00          | 36.9         | 31.2         | L1    |                          |
| 17  | 13.56000       | 43.60          | 43.70           | 13.29 | 56.89          | 56.99           | 60.00          | 50.00          | 3.1          | -7.0         | L1    | carrier (Reference data) |
| 18  | 27.12000       | 21.20          | 18.70           | 14.00 | 35.20          | 32.70           | 60.00          | 50.00          | 24.8         | 17.3         | L1    |                          |

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]  
LISN(AMN)=SLS-01

### DATA OF CONDUCTED EMISSION TEST

Engineer : Kouki Yamada

[illegible]

## Data of Electric field strength of Fundamental emission and Spurious emission within the band

Test place Shonan EMC Lab.  
Semi Anechoic Chamber No.3  
Date April 20, 2023  
Temperature / Humidity 23 deg. C / 41 % RH  
Engineer Yohsuke Matsuzawa  
Mode NFC Communication (with Tag)  
NFC type F (Axis:Hor\_Y / Ver\_Z), Vertical polarization  
(antenna angle) of the worst case: 0 deg.

### Fundamental emission

| No. | FREQ<br>[MHz] | Test Receiver<br>Reading |               | Antenna<br>Factor<br>[dB/m] | Loss<br>[dB] | AMP<br>GAIN<br>[dB] | Distance<br>factor<br>[dB] | RESULT          |                 | LIMIT<br>(30 m)<br>[dBuV/m] | MARGIN      |             |
|-----|---------------|--------------------------|---------------|-----------------------------|--------------|---------------------|----------------------------|-----------------|-----------------|-----------------------------|-------------|-------------|
|     |               | Hor<br>[dBuV]            | Ver<br>[dBuV] |                             |              |                     |                            | Hor<br>[dBuV/m] | Ver<br>[dBuV/m] |                             | Hor<br>[dB] | Ver<br>[dB] |
| 1   | 13.560        | 61.3                     | 70.3          | 20.0                        | 6.4          | 32.2                | -40.0                      | 15.5            | 24.5            | 83.9                        | 68.4        | 59.4        |

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Distance factor: 40 x log (3 m/30 m) = -40 dB

Limits (30 m)

• 13.553 MHz to 13.567 MHz : 83.9 dBuV/m (FCC 15.225(a))

### Spurious emission within the band

| No. | FREQ<br>[MHz] | Test Receiver<br>Reading |               | Antenna<br>Factor<br>[dB/m] | Loss<br>[dB] | AMP<br>GAIN<br>[dB] | Distance<br>factor<br>[dB] | RESULT          |                 | LIMIT<br>(30 m)<br>[dBuV/m] | MARGIN      |             |
|-----|---------------|--------------------------|---------------|-----------------------------|--------------|---------------------|----------------------------|-----------------|-----------------|-----------------------------|-------------|-------------|
|     |               | Hor<br>[dBuV]            | Ver<br>[dBuV] |                             |              |                     |                            | Hor<br>[dBuV/m] | Ver<br>[dBuV/m] |                             | Hor<br>[dB] | Ver<br>[dB] |
| 1   | 12.660        | 30.6                     | 30.4          | 20.0                        | 6.4          | 32.2                | -40.0                      | -15.3           | -15.5           | 29.5                        | 44.8        | 45.0        |
| 2   | 12.925        | 31.0                     | 37.3          | 20.0                        | 6.4          | 32.2                | -40.0                      | -14.9           | -8.6            | 29.5                        | 44.4        | 38.1        |
| 3   | 13.110        | 30.5                     | 30.5          | 20.0                        | 6.4          | 32.2                | -40.0                      | -15.4           | -15.4           | 29.5                        | 44.9        | 44.9        |
| 4   | 13.349        | 37.5                     | 45.7          | 20.0                        | 6.4          | 32.2                | -40.0                      | -8.4            | -0.2            | 40.5                        | 48.9        | 40.7        |
| 5   | 13.410        | 30.6                     | 35.7          | 20.0                        | 6.4          | 32.2                | -40.0                      | -15.3           | -10.15          | 40.5                        | 55.8        | 50.7        |
| 6   | 13.417        | 31.1                     | 40.6          | 20.0                        | 6.4          | 32.2                | -40.0                      | -14.8           | -5.25           | 50.4                        | 65.2        | 55.7        |
| 7   | 13.553        | 48.6                     | 57.1          | 20.0                        | 6.4          | 32.2                | -40.0                      | 2.8             | 11.27           | 50.4                        | 47.6        | 39.1        |
| 8   | 13.567        | 48.1                     | 56.8          | 20.0                        | 6.4          | 32.2                | -40.0                      | 2.3             | 10.97           | 50.4                        | 48.1        | 39.4        |
| 9   | 13.705        | 30.7                     | 38.7          | 20.0                        | 6.4          | 32.2                | -40.0                      | -15.1           | -7.12           | 50.4                        | 65.5        | 57.5        |
| 10  | 13.710        | 31.0                     | 35.8          | 20.0                        | 6.4          | 32.2                | -40.0                      | -14.8           | -10.0           | 40.5                        | 55.3        | 50.5        |
| 11  | 13.771        | 34.2                     | 43.5          | 20.0                        | 6.4          | 32.2                | -40.0                      | -11.6           | -2.3            | 40.5                        | 52.1        | 42.8        |
| 12  | 14.010        | 30.7                     | 30.4          | 20.1                        | 6.4          | 32.2                | -40.0                      | -15.1           | -15.4           | 29.5                        | 44.6        | 44.9        |
| 13  | 14.198        | 30.8                     | 33.7          | 20.1                        | 6.4          | 32.2                | -40.0                      | -15.0           | -12.06          | 29.5                        | 44.5        | 41.6        |
| 14  | 14.460        | 30.6                     | 30.3          | 20.1                        | 6.4          | 32.2                | -40.0                      | -15.1           | -15.44          | 29.5                        | 44.6        | 44.9        |

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Outside filed strength frequencies

- Fc ± 7 kHz: 13.553 MHz to 13.567 MHz
- Fc ± 150 kHz: 13.410 MHz to 13.710 MHz
- Fc ± 450 kHz: 13.110 MHz to 14.010 MHz

Fc = 13.56 MHz

Limits (30 m)

- 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz : 50.4 dBuV/m (FCC 15.225(b))
- 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz : 40.5 dBuV/m (FCC 15.225(c))
- Below 13.110 MHz and Above 14.010 MHz : 29.5 dBuV/m (FCC 15.225(d) and FCC 15.209)

## Data of Electric field strength of Fundamental emission and Spurious emission within the band

Test place Shonan EMC Lab.  
Semi Anechoic Chamber No.2  
Date March 8, 2023  
Temperature / Humidity 23 deg. C / 30 % RH  
Engineer Shiro Kobayashi  
Mode NFC Transmitting (without Tag)  
NFC type F (Axis:Hor\_Y / Ver\_Z), Vertical polarization  
(antenna angle) of the worst case: 0 deg.

### Fundamental emission

| No. | FREQ<br>[MHz] | Test Receiver<br>Reading |               | Antenna<br>Factor<br>[dB/m] | Loss<br>[dB] | AMP<br>GAIN<br>[dB] | Distance<br>factor<br>[dB] | RESULT          |                 | LIMIT<br>(30 m)<br>[dBuV/m] | MARGIN      |             |
|-----|---------------|--------------------------|---------------|-----------------------------|--------------|---------------------|----------------------------|-----------------|-----------------|-----------------------------|-------------|-------------|
|     |               | Hor<br>[dBuV]            | Ver<br>[dBuV] |                             |              |                     |                            | Hor<br>[dBuV/m] | Ver<br>[dBuV/m] |                             | Hor<br>[dB] | Ver<br>[dB] |
| 1   | 13.560        | 66.8                     | 76.3          | 20.0                        | 6.6          | 31.9                | -40.0                      | 21.5            | 31.0            | 83.9                        | 62.4        | 52.9        |

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

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

Limits (30 m)

• 13.553 MHz to 13.567 MHz : 83.9 dBuV/m (FCC 15.225(a))

### Spurious emission within the band

| No. | FREQ<br>[MHz] | Test Receiver<br>Reading |               | Antenna<br>Factor<br>[dB/m] | Loss<br>[dB] | AMP<br>GAIN<br>[dB] | Distance<br>factor<br>[dB] | RESULT          |                 | LIMIT<br>(30 m)<br>[dBuV/m] | MARGIN      |             |
|-----|---------------|--------------------------|---------------|-----------------------------|--------------|---------------------|----------------------------|-----------------|-----------------|-----------------------------|-------------|-------------|
|     |               | Hor<br>[dBuV]            | Ver<br>[dBuV] |                             |              |                     |                            | Hor<br>[dBuV/m] | Ver<br>[dBuV/m] |                             | Hor<br>[dB] | Ver<br>[dB] |
| 1   | 12.660        | 29.9                     | 30.0          | 20.0                        | 6.5          | 31.9                | -40.0                      | -15.5           | -15.5           | 29.5                        | 45.0        | 45.0        |
| 2   | 12.924        | 30.0                     | 37.0          | 20.0                        | 6.5          | 31.9                | -40.0                      | -15.5           | -8.4            | 29.5                        | 45.0        | 37.9        |
| 3   | 13.110        | 30.0                     | 29.9          | 20.0                        | 6.5          | 31.9                | -40.0                      | -15.4           | -15.5           | 29.5                        | 44.9        | 45.0        |
| 4   | 13.347        | 39.3                     | 48.8          | 20.0                        | 6.5          | 31.9                | -40.0                      | -6.1            | 3.4             | 40.5                        | 46.6        | 37.1        |
| 5   | 13.410        | 30.6                     | 37.2          | 20.0                        | 6.6          | 31.9                | -40.0                      | -14.7           | -8.1            | 40.5                        | 55.2        | 48.6        |
| 6   | 13.416        | 30.9                     | 40.8          | 20.0                        | 6.6          | 31.9                | -40.0                      | -14.5           | -4.62           | 50.4                        | 64.9        | 55.0        |
| 7   | 13.553        | 51.8                     | 61.7          | 20.0                        | 6.6          | 31.9                | -40.0                      | 6.4             | 16.37           | 50.4                        | 44.0        | 34.0        |
| 8   | 13.567        | 51.2                     | 61.2          | 20.0                        | 6.6          | 31.9                | -40.0                      | 5.8             | 15.85           | 50.4                        | 44.6        | 34.6        |
| 9   | 13.705        | 33.4                     | 42.1          | 20.0                        | 6.6          | 31.9                | -40.0                      | -12.0           | -3.24           | 50.4                        | 62.4        | 53.6        |
| 10  | 13.710        | 31.3                     | 38.5          | 20.0                        | 6.6          | 31.9                | -40.0                      | -14.1           | -6.9            | 40.5                        | 54.6        | 47.4        |
| 11  | 13.772        | 40.9                     | 51.3          | 20.0                        | 6.6          | 31.9                | -40.0                      | -4.4            | 5.9             | 40.5                        | 44.9        | 34.6        |
| 12  | 14.010        | 29.9                     | 29.9          | 20.1                        | 6.6          | 31.9                | -40.0                      | -15.5           | -15.5           | 29.5                        | 45.0        | 45.0        |
| 13  | 14.193        | 30.5                     | 38.7          | 20.1                        | 6.6          | 31.9                | -40.0                      | -14.8           | -6.56           | 29.5                        | 44.3        | 36.1        |
| 14  | 14.460        | 29.9                     | 29.9          | 20.1                        | 6.6          | 31.9                | -40.0                      | -15.4           | -15.36          | 29.5                        | 44.9        | 44.9        |

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Outside filed strength frequencies

- $F_c \pm 7 \text{ kHz}$ : 13.553 MHz to 13.567 MHz
- $F_c \pm 150 \text{ kHz}$ : 13.410 MHz to 13.710 MHz
- $F_c \pm 450 \text{ kHz}$ : 13.110 MHz to 14.010 MHz

$F_c = 13.56 \text{ MHz}$

Limits (30 m)

- 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz : 50.4 dBuV/m (FCC 15.225(b))
- 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz : 40.5 dBuV/m (FCC 15.225(c))
- Below 13.110 MHz and Above 14.010 MHz : 29.5 dBuV/m (FCC 15.225(d) and FCC 15.209)

## Radiated Emission

|                        |   |                                   |
|------------------------|---|-----------------------------------|
| Test place             | Shonan EMC Lab.   |                                   |
| Semi Anechoic Chamber  | No.3  | No.2                              |
| Date                   | April 20, 2023  | March 29, 2023                    |
| Temperature / Humidity | 23 deg. C / 41 % RH   | 20 deg. C / 35 % RH               |
| Engineer               | Yohsuke Matsuzawa<br>(Below 30 MHz)                             | Yosuke Murakami<br>(Above 30 MHz) |
| Mode                   | NFC Communication (with Tag)                                    |                                   |
|                        | Below 30 MHz (Horizontal X-axis, Vertical Z-axis), NFC type F   |                                   |
|                        | Vertical polarization (antenna angle): worst case 90 deg.       |                                   |
|                        | Above 30 MHz (Horizontal: Y-axis, Vertical: Y-axis), NFC type B |                                   |

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg.] | Remark        |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|-----------------|---------------|
| Hori.    | 27.12              | QP       | 30.00             | 21.23              | 6.64         | 32.20        | -40.0                   | -14.3              | 29.5              | 43.8           | -              | 211             | * Limit: 30 m |
| Hori.    | 40.680             | QP       | 40.50             | 14.72              | 7.09         | 31.90        | 0.0                     | 30.4               | 40.0              | 9.5            | 290            | 139             |               |
| Hori.    | 67.800             | QP       | 49.90             | 6.88               | 7.20         | 31.89        | 0.0                     | 32.1               | 40.0              | 7.9            | 273            | 146             |               |
| Hori.    | 189.841            | QP       | 41.80             | 16.45              | 8.83         | 31.77        | 0.0                     | 35.3               | 43.5              | 8.1            | 170            | 317             |               |
| Hori.    | 216.960            | QP       | 51.70             | 11.27              | 5.86         | 31.74        | 0.0                     | 37.1               | 46.0              | 8.9            | 152            | 241             |               |
| Hori.    | 244.078            | QP       | 53.20             | 11.73              | 6.08         | 31.71        | 0.0                     | 39.3               | 46.0              | 6.7            | 134            | 258             |               |
| Hori.    | 257.639            | QP       | 49.70             | 12.14              | 6.19         | 31.70        | 0.0                     | 36.3               | 46.0              | 9.6            | 128            | 57              |               |
| Hori.    | 271.199            | QP       | 49.40             | 12.95              | 6.28         | 31.69        | 0.0                     | 36.9               | 46.0              | 9.0            | 120            | 44              |               |
| Hori.    | 298.320            | QP       | 50.00             | 13.72              | 6.48         | 31.68        | 0.0                     | 38.5               | 46.0              | 7.4            | 100            | 41              |               |
| Hori.    | 420.360            | QP       | 49.60             | 16.06              | 7.29         | 31.62        | 0.0                     | 41.3               | 46.0              | 4.6            | 100            | 8               |               |
| Hori.    | 648.639            | QP       | 38.30             | 19.28              | 8.53         | 31.59        | 0.0                     | 34.5               | 46.0              | 11.4           | 152            | 110             |               |
| Vert.    | 27.12              | QP       | 31.10             | 21.23              | 6.64         | 32.20        | -40.0                   | -13.2              | 29.5              | 42.7           | -              | 245             | * Limit: 30 m |
| Vert.    | 40.68              | QP       | 46.40             | 14.72              | 7.09         | 31.90        | 0.0                     | 36.3               | 40.0              | <b>3.6</b>     | 100            | 50              |               |
| Vert.    | 41.52              | QP       | 43.90             | 14.40              | 7.11         | 31.90        | 0.0                     | 33.5               | 40.0              | 6.4            | 100            | 62              |               |
| Vert.    | 49.60              | QP       | 49.60             | 6.88               | 7.20         | 31.89        | 0.0                     | 31.8               | 40.0              | 8.2            | 100            | 234             |               |

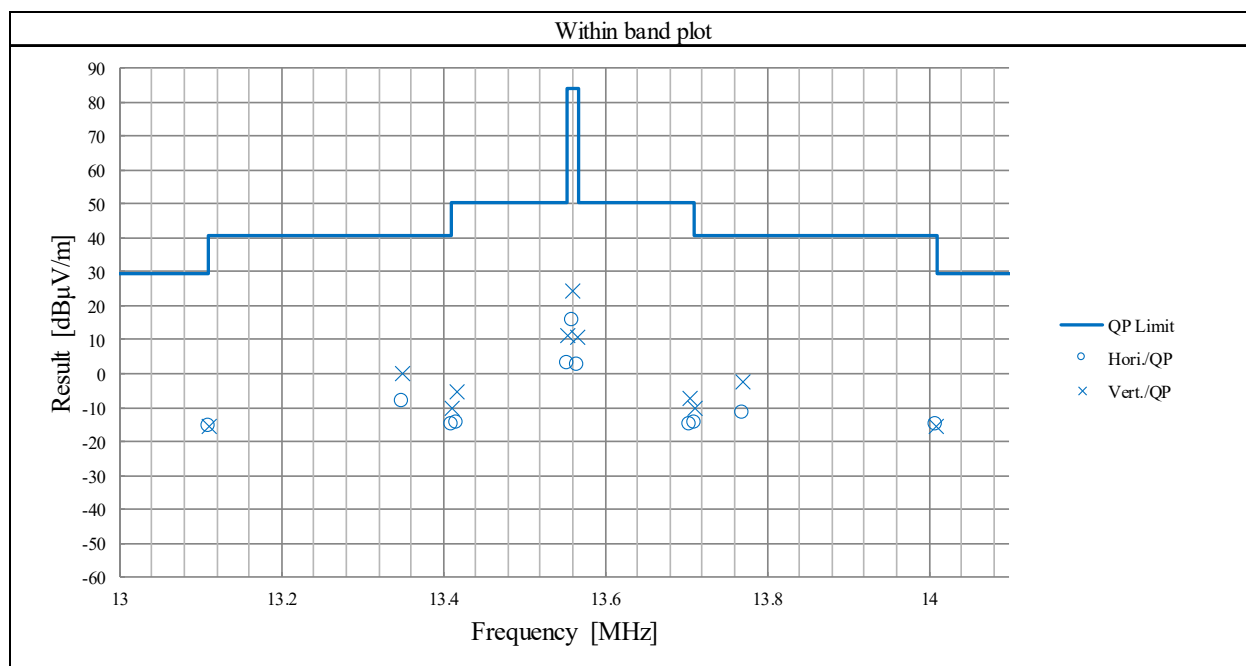
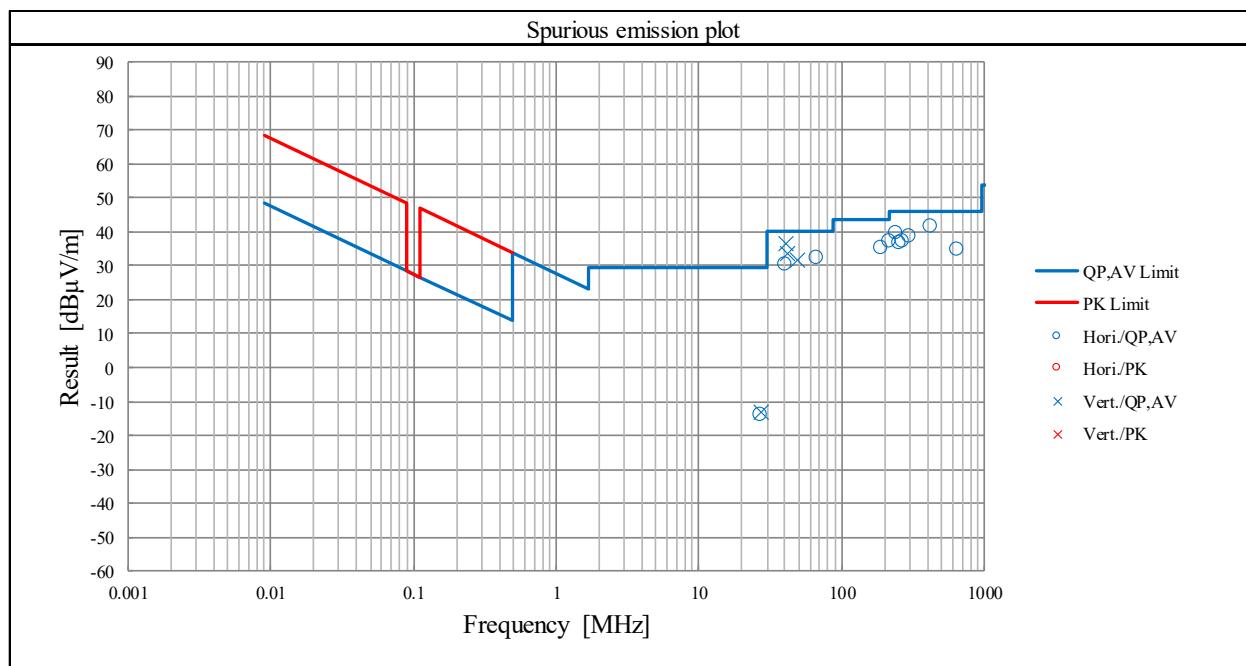
Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30 MHz)) - Gain(Amplifier) + Distance factor(below 30 MHz)

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

\* Carrier level (Result at 3 m): Hor= 55.5 dBuV/m, Ver= 64.5 dBuV/m

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

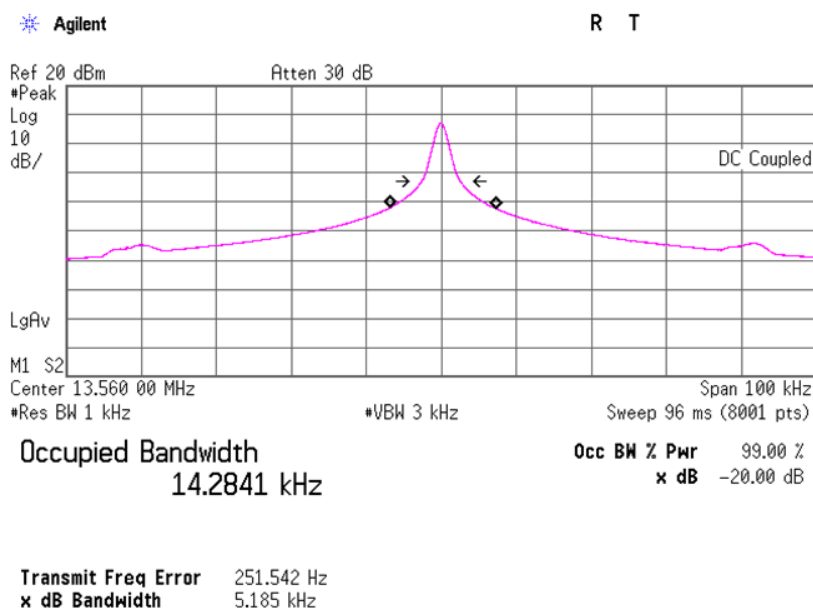
|                        |   |                                   |
|------------------------|---|-----------------------------------|
| Test place             | Shonan EMC Lab.   |                                   |
| Semi Anechoic Chamber  | No.3  | No.2                              |
| Date                   | April 20, 2023  | March 29, 2023                    |
| Temperature / Humidity | 23 deg. C / 41 % RH   | 20 deg. C / 35 % RH               |
| Engineer               | Yohsuke Matsuzawa<br>(Below 30 MHz)   | Yosuke Murakami<br>(Above 30 MHz) |
| Mode                   | NFC Communication (with Tag)<br>Below 30 MHz (Horizontal X-axis, Vertical Z-axis), NFC type F<br>Vertical polarization (antenna angle): worst case 90 deg.<br>Above 30 MHz (Horizontal: Y-axis, Vertical: Y-axis), NFC type B |                                   |



## 20 dB Bandwidth and 99 % Occupied Bandwidth

Test place Shonan EMC Lab.  
Shielded room No.5  
Date March 8, 2023  
Temperature / Humidity 22 deg. C / 26 % RH  
Engineer Miku Ikudome  
Mode NFC communication type-A

| FREQ<br>[MHz] | 20 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------|--------------------------|----------------------------------|
| 13.56         | 5.19                     | 14.28                            |

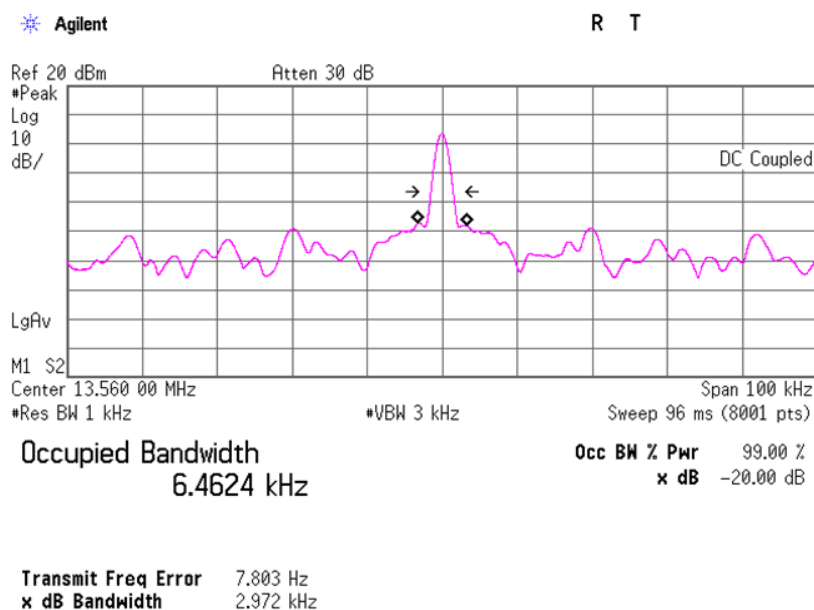


\*Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 – 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

## 20 dB Bandwidth and 99 % Occupied Bandwidth

Test place Shonan EMC Lab.  
Shielded room No.5  
Date March 8, 2023  
Temperature / Humidity 22 deg. C / 26 % RH  
Engineer Miku Ikudome  
Mode NFC communication type-B

| FREQ<br>[MHz] | 20 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------|--------------------------|----------------------------------|
| 13.56         | 2.97                     | 6.46                             |



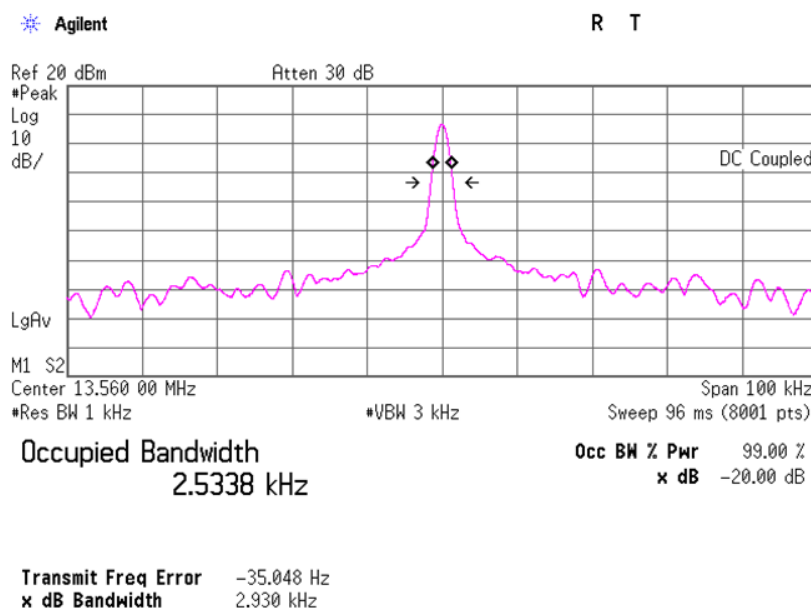
\*Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 – 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.



## 20 dB Bandwidth and 99 % Occupied Bandwidth

Test place Shonan EMC Lab.  
Shielded room No.5  
Date March 8, 2023  
Temperature / Humidity 22 deg. C / 26 % RH  
Engineer Miku Ikudome  
Mode NFC communication type-F

| FREQ<br>[MHz] | 20 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------|--------------------------|----------------------------------|
| 13.56         | 2.93                     | 2.53                             |

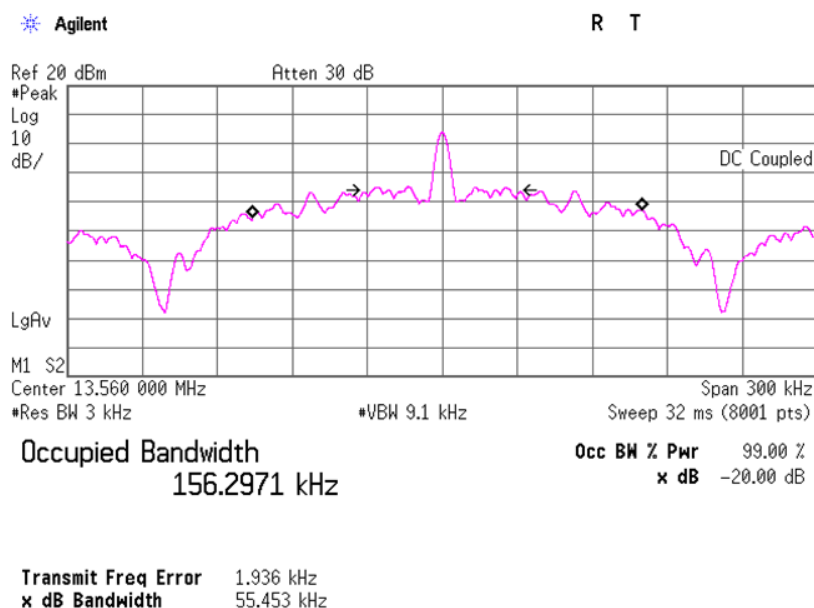


\*Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 – 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

## 20 dB Bandwidth and 99 % Occupied Bandwidth

Test place                      Shonan EMC Lab.  
Shielded room                No.5  
Date                              March 8, 2023  
Temperature / Humidity      22 deg. C / 26 % RH  
Engineer                        Miku Ikudome  
Mode                              NFC communication type-V

| FREQ<br>[MHz] | 20 dB Bandwidth<br>[kHz] | 99 % Occupied Bandwidth<br>[kHz] |
|---------------|--------------------------|----------------------------------|
| 13.56         | 55.45                    | 156.30                           |



\*Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 – 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

## Frequency Tolerance

|                        |                                |                     |
|------------------------|--------------------------------|---------------------|
| Test place             | Shonan EMC Lab.                | No.5                |
| Semi Anechoic Chamber  | No.5                           | No.5                |
| Date                   | March 8, 2023                  | March 9, 2023       |
| Temperature / Humidity | 22 deg. C / 26 % RH            | 25 deg. C / 40 % RH |
| Engineer               | Miku Ikudome                   | Miku Ikudome        |
| Mode                   | NFC Transmitting (Unmodulated) |                     |

| Test condition |                | Tested timing | Measured frequency [MHz] | Frequency error [MHz] | Result   |       | Limit |
|----------------|----------------|---------------|--------------------------|-----------------------|----------|-------|-------|
| Temp. [deg. C] | Voltage [V]    |               |                          |                       | [%]      | [ppm] |       |
| 50             | 5              | Power on      | 13.559981                | -0.000019             | -0.00014 | -1.4  | 0.01  |
|                |                | + 2 min.      | 13.559990                | -0.000010             | -0.00007 | -0.7  | 0.01  |
|                |                | + 5 min.      | 13.559993                | -0.000007             | -0.00005 | -0.5  | 0.01  |
|                |                | + 10 min.     | 13.559995                | -0.000005             | -0.00004 | -0.4  | 0.01  |
| 40             | 5              | Power on      | 13.559980                | -0.000020             | -0.00015 | -1.5  | 0.01  |
|                |                | + 2 min.      | 13.559980                | -0.000020             | -0.00015 | -1.5  | 0.01  |
|                |                | + 5 min.      | 13.559979                | -0.000021             | -0.00015 | -1.5  | 0.01  |
|                |                | + 10 min.     | 13.559980                | -0.000020             | -0.00015 | -1.5  | 0.01  |
| 30             | 5              | Power on      | 13.559992                | -0.000008             | -0.00006 | -0.6  | 0.01  |
|                |                | + 2 min.      | 13.559985                | -0.000015             | -0.00011 | -1.1  | 0.01  |
|                |                | + 5 min.      | 13.559983                | -0.000017             | -0.00013 | -1.3  | 0.01  |
|                |                | + 10 min.     | 13.559983                | -0.000017             | -0.00013 | -1.3  | 0.01  |
| 20             | 5              | Power on      | 13.560002                | 0.000002              | 0.00001  | 0.1   | 0.01  |
|                |                | + 2 min.      | 13.560000                | 0.000000              | 0.00000  | 0.0   | 0.01  |
|                |                | + 5 min.      | 13.559999                | -0.000001             | -0.00001 | -0.1  | 0.01  |
|                |                | + 10 min.     | 13.559999                | -0.000001             | -0.00001 | -0.1  | 0.01  |
| 20             | 4.25 (5V -15%) | Power on      | 13.559974                | -0.000026             | -0.00019 | -1.9  | 0.01  |
|                |                | + 2 min.      | 13.559972                | -0.000028             | -0.00021 | -2.1  | 0.01  |
|                |                | + 5 min.      | 13.559971                | -0.000029             | -0.00021 | -2.1  | 0.01  |
|                |                | + 10 min.     | 13.559972                | -0.000028             | -0.00021 | -2.1  | 0.01  |
| 20             | 5.5 (5V +10%)  | Power on      | 13.559982                | -0.000018             | -0.00013 | -1.3  | 0.01  |
|                |                | + 2 min.      | 13.559975                | -0.000025             | -0.00018 | -1.8  | 0.01  |
|                |                | + 5 min.      | 13.559971                | -0.000029             | -0.00021 | -2.1  | 0.01  |
|                |                | + 10 min.     | 13.559970                | -0.000030             | -0.00022 | -2.2  | 0.01  |
| 10             | 5              | Power on      | 13.560018                | 0.000018              | 0.00013  | 1.3   | 0.01  |
|                |                | + 2 min.      | 13.560017                | 0.000017              | 0.00013  | 1.3   | 0.01  |
|                |                | + 5 min.      | 13.560016                | 0.000016              | 0.00012  | 1.2   | 0.01  |
|                |                | + 10 min.     | 13.560015                | 0.000015              | 0.00011  | 1.1   | 0.01  |
| 0              | 5              | Power on      | 13.560016                | 0.000016              | 0.00012  | 1.2   | 0.01  |
|                |                | + 2 min.      | 13.560018                | 0.000018              | 0.00013  | 1.3   | 0.01  |
|                |                | + 5 min.      | 13.560018                | 0.000018              | 0.00013  | 1.3   | 0.01  |
|                |                | + 10 min.     | 13.560017                | 0.000017              | 0.00013  | 1.3   | 0.01  |
| -10            | 5              | Power on      | 13.559976                | -0.000024             | -0.00018 | -1.8  | 0.01  |
|                |                | + 2 min.      | 13.559995                | -0.000005             | -0.00004 | -0.4  | 0.01  |
|                |                | + 5 min.      | 13.559998                | -0.000002             | -0.00001 | -0.1  | 0.01  |
|                |                | + 10 min.     | 13.559999                | -0.000001             | -0.00001 | -0.1  | 0.01  |
| -20            | 5              | Power on      | 13.559915                | -0.000085             | -0.00063 | -6.3  | 0.01  |
|                |                | + 2 min.      | 13.559948                | -0.000052             | -0.00038 | -3.8  | 0.01  |
|                |                | + 5 min.      | 13.559952                | -0.000048             | -0.00035 | -3.5  | 0.01  |
|                |                | + 10 min.     | 13.559953                | -0.000047             | -0.00035 | -3.5  | 0.01  |

Calculation formula:

Frequency error = Measured frequency - Tested frequency

Result [%] = Frequency error / Tested frequency \* 100

Tested frequency:

13.56 MHz

Limit (+/-):

0.01 %

(± 100ppm)

\*The test was begun from 50 deg.C and the temperature was lowered each 10 deg.C.

## APPENDIX 2: Test instruments

### Test equipment

| Test Item | Local ID                        | LIMS ID | Description                      | Manufacturer                                | Model                                       | Serial                   | Last Calibration Date | Cal Int |
|-----------|---------------------------------|---------|----------------------------------|---|---|--------------------------|-----------------------|---------|
| CE        | SAT3-13                         | 150923  | Attenuator                       | JFW   | 50HF-003N                                   | -                        | 2023/02/09            | 12      |
| CE        | SCC-A12/A13 /SRSE-01            | 144966  | Coaxial Cable&RF Selector        | Suhner/Suhner/TOYO                          | RG223U/141PE/NS4906                         | -/0901-269 (RF Selector) | 2022/04/20            | 12      |
| CE        | SJM-22                          | 207279  | Tape Measure                     | ASKUL                                       | -   | -                        | -                     | -       |
| CE        | SLS-01                          | 145538  | LISN                             | Rohde & Schwarz                             | ENV216                                      | 100511                   | 2023/02/21            | 12      |
| CE        | SOS-16                          | 167990  | Thermo-Hygrometer                | CUSTOM. Inc                                 | CTH-202                                     | 708Q08R                  | 2022/10/18            | 12      |
| CE        | STR-01                          | 145790  | Test Receiver                    | Rohde & Schwarz                             | ESU40                                       | 100093                   | 2022/04/28            | 12      |
| CE        | STS-01                          | 145792  | Digital Hitester                 | HIOKI E.E. CORPORATION                      | 3805-50                                     | 80997812                 | 2022/09/20            | 12      |
| CE,RE     | COTS-SEMI-5                     | 170932  | EMI Software                     | TSJ (Techno Science Japan)                  | TEPTO-DV3(RE,CE,ME,PE)                      | -                        | -                     | -       |
| RE        | KJM-02                          | 146432  | Measure                          | TAJIMA                                      | GL19-55                                     | -                        | -                     | -       |
| RE        | SAEC-02(NSA)                    | 145563  | Semi-Anechoic Chamber            | TDK   | SAEC-02(NSA)                                | 2                        | 2023/03/28            | 12      |
| RE        | SAEC-03(NSA)                    | 145565  | Semi-Anechoic Chamber            | TDK   | SAEC-03(NSA)                                | 3                        | 2023/04/05            | 12      |
| RE        | SAEC-ALL                        | 145568  | Semi Anechoic Chamber(ME)        | TDK   | Semi Anechoic Chamber 3m/10m                | 1, 2, 3                  | 2022/12/24            | 24      |
| RE        | SAF-02                          | 145004  | Pre Amplifier                    | SONOMA                                      | 310N  | 290212                   | 2023/02/09            | 12      |
| RE        | SAF-03                          | 145126  | Pre Amplifier                    | SONOMA                                      | 310N  | 290213                   | 2023/02/09            | 12      |
| RE        | SAT3-11                         | 150921  | Attenuator                       | JFW   | 50HF-003N                                   | -                        | 2023/02/09            | 12      |
| RE        | SAT6-13                         | 167094  | Attenuator                       | JFW   | 50HF-006N                                   | -                        | 2023/02/09            | 12      |
| RE        | SAT6-14                         | 167095  | Attenuator                       | JFW   | 50HF-006N                                   | -                        | 2023/02/09            | 12      |
| RE        | SAT6-15                         | 167096  | Attenuator                       | JFW   | 50HF-006N                                   | -                        | 2023/02/09            | 12      |
| RE        | SBA-02                          | 145022  | Biconical Antenna                | Schwarzbeck Mess-Elektronik OHG             | BBA9106                                     | 91032665                 | 2023/04/12            | 12      |
| RE        | SCC-B1/B3/B5/B7/B8/ B13/SRSE-02 | 144975  | Coaxial Cable&RF Selector        | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/ 141PE/141PE/NS4906 | -/0901-270 (RF Selector) | 2022/04/20            | 12      |
| RE        | SCC-B2/B4/B6/B7/B8/ B13/SRSE-02 | 144976  | Coaxial Cable&RF Selector        | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/ 141PE/141PE/NS4906 | -/0901-270 (RF Selector) | 2022/04/20            | 12      |
| RE        | SCC-C1/C2/C3/C4/C5/ C10/SRSE-03 | 145171  | Coaxial Cable&RF Selector        | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/ 141PE/141PE/NS4906 | -/0901-271 (RF Selector) | 2022/04/20            | 12      |
| RE        | SCC-M1                          | 194601  | Coaxial Cable                    | Fujikura                                    | 5D-2W                                       | -                        | 2022/12/16            | 12      |
| RE        | SJM-20                          | 207277  | Measuring                        | ASKUL                                       | -   | -                        | -                     | -       |
| RE        | SLA-06                          | 145528  | Logperiodic Antenna              | Schwarzbeck Mess-Elektronik OHG             | VUSLP9111B                                  | 195                      | 2023/04/12            | 12      |
| RE        | SLP-02                          | 145536  | Loop Antenna                     | Rohde & Schwarz                             | HFH2-Z2                                     | 100218                   | 2023/04/10            | 12      |
| RE        | SOS-21                          | 191838  | Thermo-Hygrometer                | CUSTOM. Inc                                 | CTH-201                                     | -                        | 2022/08/08            | 12      |
| RE        | SOS-23                          | 191840  | Thermo-Hygrometer                | CUSTOM. Inc                                 | CTH-201                                     | -                        | 2022/08/08            | 12      |
| RE        | STR-07                          | 146209  | Test Receiver                    | Rohde & Schwarz                             | ESU26                                       | 100484                   | 2022/09/14            | 12      |
| RE        | STR-09                          | 213530  | Test Receiver                    | Rohde & Schwarz                             | ESW44                                       | 103068                   | 2023/01/12            | 12      |
| RE        | STS-02                          | 145793  | Digital Hitester                 | HIOKI E.E. CORPORATION                      | 3805-50                                     | 80997819                 | 2022/04/07            | 12      |
| RE        | STS-03                          | 146210  | Digital Hitester                 | HIOKI E.E. CORPORATION                      | 3805-50                                     | 80997823                 | 2022/09/20            | 12      |
| TF        | SCH-01                          | 145200  | Temperature and Humidity Chamber | Espec                                       | PL-1KT                                      | 14020837                 | 2022/04/05            | 12      |
| TF        | SFC-03                          | 183119  | Microwave Counter                | Keysight Technologies Inc                   | 53151A                                      | US40511493               | 2022/11/14            | 12      |
| TF        | SOS-27                          | 235735  | Thermo-Hygrometer                | CUSTOM. Inc                                 | CTH-230                                     | -                        | -                     | -       |
| TF        | SRENT-15                        | 160899  | Spectrum Analyzer                | Keysight Technologies Inc                   | E4440A                                      | MY46185516               | 2023/01/26            | 12      |
| TF        | SSCA-01                         | 146178  | Search coil                      | Langer                                      | RF-R 400-1                                  | 02-0634                  | -                     | -       |
| TF        | STS-05                          | 146212  | Digital Hitester                 | HIOKI E.E. CORPORATION                      | 3805-50                                     | 80997828                 | 2022/09/20            | 12      |

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

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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

#### Test item:

**CE: Conducted Emission**

**RE: Radiated Emission**

**TF: Test Fixture**