

# RADIO TEST REPORT

## Test Report No. 15681446H-A-R1

|                     |                               |
|---------------------|-------------------------------|
| Customer            | SINFONIA TECHNOLOGY CO., LTD. |
| Description of EUT  | Digital Photo Printer         |
| Model Number of EUT | CS360                         |
| FCC ID              | ZQU-D1151150                  |
| Test Regulation     | FCC Part 15 Subpart C         |
| Test Result         | Complied                      |
| Issue Date          | July 1, 2025                  |
| Remarks             | -                             |

**Representative test engineer**Junki Nagatomi  
Engineer**Approved by**Satofumi Matsuyama  
Engineer

CERTIFICATE 5107.02

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- ☒ There is no testing item of "Non-accreditation".

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## **REVISION HISTORY**

### **Original Test Report No. 15681446H-A**

This report is a revised version of 15681446H-A. 15681446H-A is replaced with this report.

| Revision     | Test Report No. | Date          | Page Revised Contents  |
|--------------|-----------------|---------------|--|
| - (Original) | 15681446H-A     | April 8, 2025 | -  |
| 1            | 15681446H-A-R1  | July 1, 2025  | <b>Section 2.2 Product Description</b><br><b><u>General Specification</u></b><br>-Modified item name.<br>Operating Temperature → Clock frequency (ies) in the system<br><br><b>Section 3.3 Summary of Test Result</b><br>-Modified worst margin for Electric Field Strength of Spurious Emission.<br>12.74 dB<br>269.920 MHz, Horizontal, QP<br>→<br>3.92 dB<br>38.637 MHz, Vertical, QP<br><br><b>SECTION 6: Radiated Emission (Fundamental, Spurious Emission and Spectrum Mask)</b><br>-Modified size of table.<br>0.5 m by 1.0 m → 1.0 m by 1.5 m<br><br><b>Appendix 2</b><br><b>Spurious Emission</b><br>-Added data of vertical 38.637MHz. |

## 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     | SINFONIA TECHNOLOGY CO., LTD.                       |
| Address          | 100-Takegahana-cho, Ise-shi, Mie-ken 516-8550 Japan |
| Telephone Number | +81-596-36-1286                                     |
| Contact Person   | Tomoaki Ueda  |

The information provided by 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

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

### **2.1 Identification of EUT**

|               |   |
|---------------|---|
| Description   | Digital Photo Printer   |
| Model Number  | CS360   |
| Serial Number | Refer to SECTION 4.2  |
| Condition     | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | No Modification by the test lab   |
| Receipt Date  | February 20, 2025   |
| Test Date     | March 12 to 16, 2025  |

### **2.2 Product Description**

#### **General Specification**

|                                     |  |
|-------------------------------------|--|
| Rating                              | AC 100 V to 240 V, 50 / 60 Hz  |
| Clock frequency (ies) in the system | External: 24 MHz, CPU: Internal 300 MHz, SDRAM: 500 MHz, FPGA: 60 MHz / 50 MHz, USB: Maximum 480 MHz |

#### **Radio Specification**

|                        |             |
|------------------------|-------------|
| Equipment Type         | Transceiver |
| Frequency of Operation | 13.56 MHz   |
| Type of Modulation     | ASK         |

## 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. |

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

### 3.2 Reference Standards

ANSI/USEMCSC C63.2-2023  
ANSI C63.4-2014+C63.4a-2017  
ANSI C63.5-2017  
ANSI C63.10-2020  
ANSI C63.25.1-2018  
RSS-Gen Issue 5/Amendment 1/Amendment 2 for ISED

### 3.3 Summary of Test Result

| Item   | Specification  | Worst margin   | Results  | Remarks  |
|--|--|--|----------|----------|
| Conducted Emission                                 | <FCC><br>Section 15.207<br>-----<br><ISED><br>RSS-Gen 8.8  | 7.59 dB,<br>0.73414 MHz, QP, N                       | Complied | -        |
| Electric Field Strength<br>of Fundamental Emission | <FCC><br>Section 15.225(a)<br>-----<br><ISED><br>RSS-210 B.6 (a)                                 | 89.30 dB,<br>13.56000 MHz, QP,<br>45 deg. (with Tag) | Complied | Radiated |
| Spectrum Mask                                      | <FCC><br>Section 15.225(b)(c)<br>-----<br><ISED><br>RSS-210 B.6 (a)                              | 38.55 dB,<br>14.01000 MHz, QP,<br>45 deg.            | Complied | Radiated |
| 20 dB Bandwidth                                    | <FCC><br>Section 15.215(c)<br>-----<br><ISED> -  | See data   | Complied | Radiated |
| Electric Field Strength<br>of Spurious Emission    | <FCC><br>Section 15.209,<br>Section 15.225 (d) -----<br><ISED><br>RSS-210 B.6 (a)<br>RSS-Gen 8.9 | 3.92 dB<br>38.637 MHz,<br>Vertical , QP              | Complied | Radiated |
| Frequency Tolerance                                | <FCC><br>Section 15.225(e)<br>-----<br><ISED><br>RSS-210 B.6 (b)                                 | See data   | Complied | Radiated |

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

**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).

**FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.

Therefore, the equipment complies with the antenna requirement of Section 15.203.

**3.4 Addition to standard**

| Item                   | Specification | Worst margin | Results | Remarks  |
|------------------------|---------------|--------------|---------|----------|
| 99% emission bandwidth | -             | N/A          | -       | Radiated |

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

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

### 3.5 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  $k = 2$ .

#### Conducted emission

| Item       | Frequency range    | Unit | Calculated Uncertainty (+/-) |
|------------|--------------------|------|------------------------------|
| AMN (LISN) | 0.15 MHz to 30 MHz | dB   | 3.3                          |

#### Radiated emission

| Measurement distance | Frequency range     | Unit       | Calculated Uncertainty (+/-) |
|----------------------|---------------------|------------|------------------------------|
| 3 m                  | 9 kHz to 30 MHz     | dB         | 3.3                          |
| 10 m                 |                     | dB         | 3.1                          |
| 3 m                  | 30 MHz to 200 MHz   | Horizontal | 5.0                          |
|                      |                     | Vertical   | 5.0                          |
|                      | 200 MHz to 1000 MHz | Horizontal | 5.2                          |
|                      |                     | Vertical   | 6.2                          |
| 10 m                 | 30 MHz to 200 MHz   | Horizontal | 5.5                          |
|                      |                     | Vertical   | 5.4                          |
|                      | 200 MHz to 1000 MHz | Horizontal | 5.5                          |
|                      |                     | Vertical   | 5.5                          |
| 3 m                  | 1 GHz to 6 GHz      | dB         | 5.1                          |
|                      | 6 GHz to 18 GHz     | dB         | 5.4                          |
| 1 m                  | 10 GHz to 18 GHz    | dB         | 5.4                          |
|                      | 18 GHz to 26.5 GHz  | dB         | 5.3                          |
|                      | 26.5 GHz to 40 GHz  | dB         | 4.8                          |
| 0.5 m                | 26.5 GHz to 40 GHz  | dB         | 5.0                          |

#### -20 dB Bandwidth and 99% Occupied Bandwidth, Frequency Tolerance

| Item   | Unit | Calculated Uncertainty (+/-) |
|--|------|------------------------------|
| Bandwidth (OBW)  | %    | 0.96                         |
| Frequency Readout (Frequency counter)                            | ppm  | 0.67                         |
| Frequency Readout (Spectrum analyzer frequency readout function) | ppm  | 2.13                         |



### 3.6 Test Location

UL Japan, Inc. Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan

Telephone: +81-596-24-8999

\*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

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

| Test site                  | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms            | Maximum measurement distance |
|----------------------------|----------------------------|--|------------------------|------------------------------|
| No.1 semi-anechoic chamber | 19.2 x 11.2 x 7.7          | 7.0 x 6.0  | No.1 Power source room | 10 m                         |
| No.2 semi-anechoic chamber | 7.5 x 5.8 x 5.2            | 4.0 x 4.0  | -                      | 3 m                          |
| No.3 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75   | No.3 Preparation room  | 3 m                          |
| No.3 shielded room         | 4.0 x 6.0 x 2.7            | N/A  | -                      | -                            |
| No.4 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75   | No.4 Preparation room  | 3 m                          |
| No.4 shielded room         | 4.0 x 6.0 x 2.7            | N/A  | -                      | -                            |
| No.5 semi-anechoic chamber | 6.0 x 6.0 x 3.9            | 6.0 x 6.0  | -                      | -                            |
| No.5 measurement room      | 6.4 x 6.4 x 3.0            | 6.4 x 6.4  | -                      | -                            |
| No.6 shielded room         | 4.0 x 4.5 x 2.7            | 4.0 x 4.5  | -                      | -                            |
| No.6 measurement room      | 4.75 x 5.4 x 3.0           | 4.75 x 4.15  | -                      | -                            |
| No.7 shielded room         | 4.7 x 7.5 x 2.7            | 4.7 x 7.5  | -                      | -                            |
| No.8 measurement room      | 3.1 x 5.0 x 2.7            | 3.1 x 5.0  | -                      | -                            |
| No.9 measurement room      | 8.8 x 4.6 x 2.8            | 2.4 x 2.4  | -                      | -                            |
| No.10 shielded room        | 3.8 x 2.8 x 2.8            | 3.8 x 2.8  | -                      | -                            |
| No.11 measurement room     | 4.0 x 3.4 x 2.5            | N/A  | -                      | -                            |
| No.12 measurement room     | 2.6 x 3.4 x 2.5            | N/A  | -                      | -                            |
| Large Chamber              | 16.9 x 22.1 x 10.17        | 16.9 x 22.1  | -                      | 10 m                         |
| Small Chamber              | 5.3 x 6.69 x 3.59          | 5.3 x 6.69   | -                      | -                            |

\* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 2.0 m for No.1, No.2, No.3, No.4, and No.5 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.7 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:

| Test mode   | Remarks   |
|---|---|
| 1) Transmitting mode (Tx)   | The EUT Transmits and Receives at the same time and there is no receiving mode. |
| *Power of the EUT was set by the software as follows;<br>Software:       gui Version: 1.0.0.0<br>(Date: 2025.03 07, Storage location: Driven by connected PC)<br><br>*This setting of software is the worst case.<br>Any conditions under the normal use do not exceed the condition of setting.<br>In addition, end users cannot change the settings of the output power of the product.<br>Justification: The system was configured in typical fashion (as a user would normally use it) for testing. |   |

| Test Item                                       | Operating mode*                  |
|---|----------------------------------|
| Conducted Emission                              | Tx Mod on, with Tag              |
| Electric Field Strength of Fundamental Emission | Tx Mod on, with Tag              |
| Spectrum Mask                                   | Tx Mod on, with Tag              |
| 20 dB Bandwidth and 99 % Occupied Bandwidth     | Tx Mod on, with Tag, without Tag |
| Electric Field Strength of Spurious Emission    | Tx Mod on, with Tag              |
| Frequency Tolerance                             | Tx Mod on, without Tag           |

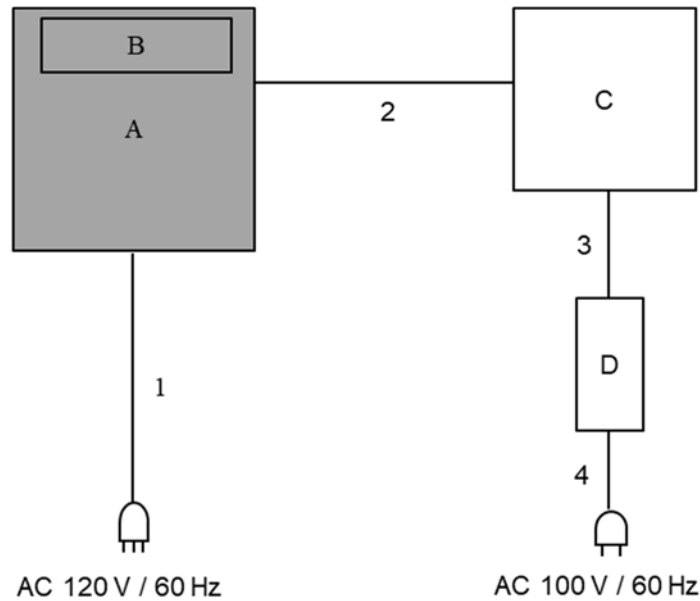
\* After the comparison of the test data between with Tag and without Tag, the tests were performed with the worst case.

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

| Frequency Tolerance:  |   |                           |
|---|---|---------------------------|
| Temperature   | +10 deg. C to +35 deg. C Step 10 deg. C *1) |                           |
| Voltage   | Normal Voltage                              | AC 120 V                  |
|   | Maximum Voltage                             | AC 138 V (AC 120 V +15 %) |
|   | Minimum Voltage                             | AC 102 V (AC 120 V -15 %) |
| *This EUT provides stable voltage (DC 3.3 V) constantly to RF Part regardless of input voltage. |   |                           |

\*1) Tests were performed within the operating range of the EUT as instructed by the customer.

## 4.2 Configuration and peripherals



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

\*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                   | Remark |
|-----|-----------------------|-----------------|---------------|--------------------------------|--------|
| A   | Digital Photo Printer | CS360           | EM001         | SINFONIA TECHNOLOGY CO., LTD.  | EUT    |
| B   | Ribbon Tag            | RI-I17-112A-03  | 001           | Texas Instruments Incorporated | EUT    |
| C   | Laptop PC             | PR63PBAA337AD7X | 6F053913H     | TOSHIBA                        | -      |
| D   | AC Adapter            | PA51770-1ACA    | FX10800NSKACC | TOSHIBA                        | -      |

### List of Cables Used

| No. | Name      | Length (m) | Shield     |            | Remark |
|-----|-----------|------------|------------|------------|--------|
|     |           |            | Cable      | Connector  |        |
| 1   | AC Cable  | 1.8        | Unshielded | Unshielded | -      |
| 2   | USB Cable | 3.0        | Shielded   | Shielded   | -      |
| 3   | DC Cable  | 1.7        | Unshielded | Unshielded |        |
| 4   | AC Cable  | 0.8        | Unshielded | Unshielded |        |

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

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 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)

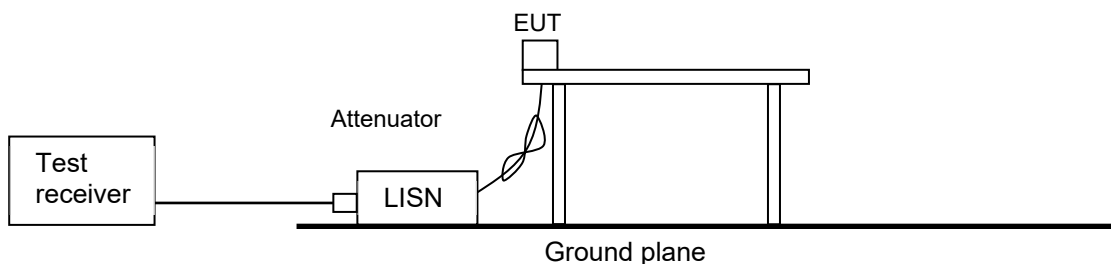
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected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

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT 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.

|                          |                             |
|--------------------------|-----------------------------|
| <b>Detector</b>          | <b>: QP and CISPR AV</b>    |
| <b>Measurement range</b> | <b>: 0.15 MHz to 30 MHz</b> |
| <b>Test data</b>         | <b>: APPENDIX</b>           |
| <b>Test result</b>       | <b>: Pass</b>               |

## **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.

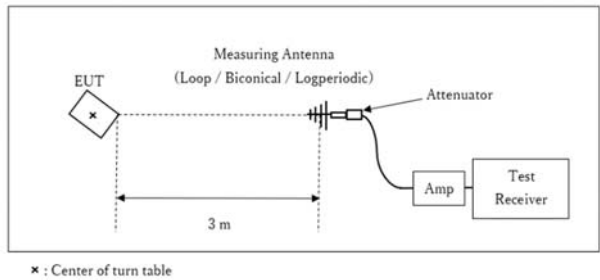
|                 |  |                        |                         |                        |                      |
|-----------------|--|------------------------|-------------------------|------------------------|----------------------|
| Frequency       | From 9 kHz to 90 kHz and From 110 kHz 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

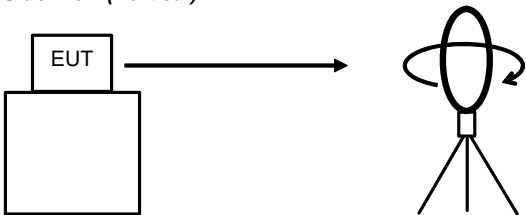
Below 1 GHz



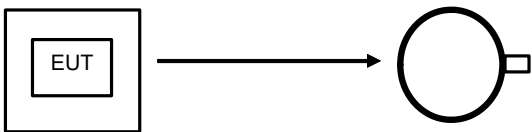
Test Distance: 3 m

Figure 3: Direction of the Loop Antenna

Side View (Vertical)

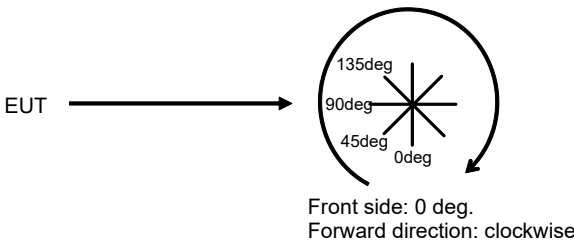


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



The test was made on EUT at the normal use position.

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         | 5 MHz                                   | 30 kHz          | 91 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     | -                                       | -               | -                  | -     | -        | -            | Spectrum Analyzer *2) |

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.

Peak hold was applied as Worst-case measurement.

\*2) The measurement was performed with Marker Frequency Counter Function.

Test data : APPENDIX

Test result : Pass

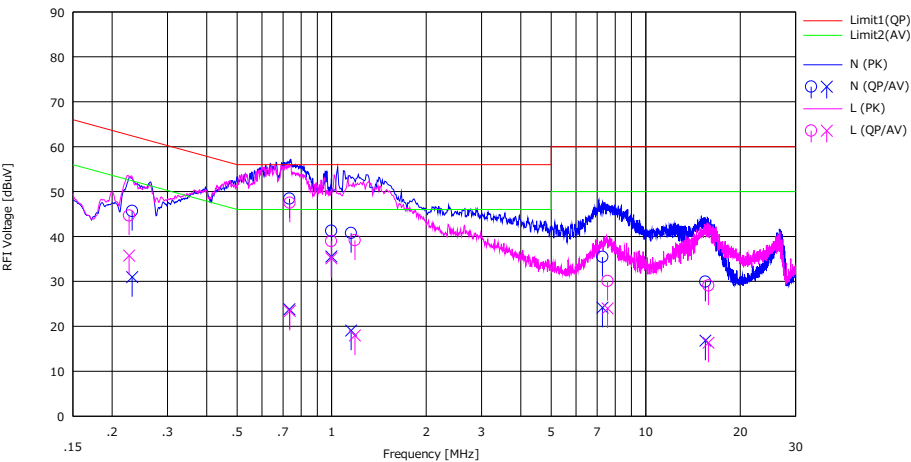
APPENDIX 1: Test data

Conducted Emission

Test place  
Semi Anechoic Chamber  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab.  
No.4  
March 16, 2025  
20 deg. C / 46 % RH  
Shousei Hamaguchi  
Mode 1

Limit : FCC\_Part 15 Subpart C(15.207)



| No. | Freq.<br>[MHz] | Reading        |                | USN<br>[dB] | LOSS<br>[dB] | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|-------------|--------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <AV><br>[dBuV] |             |              | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
| 1   | 0.23162        | 32.40          | 17.70          | 0.04        | 13.22        | 45.66          | 30.96          | 62.39          | 52.39          | 16.73        | 21.43        | N     |         |
| 2   | 0.73414        | 35.10          | 10.50          | 0.04        | 13.27        | 48.41          | 23.81          | 56.00          | 46.00          | 7.59         | 22.19        | N     |         |
| 3   | 0.99762        | 27.90          | 22.20          | 0.04        | 13.30        | 41.24          | 35.54          | 56.00          | 46.00          | 14.76        | 10.46        | N     |         |
| 4   | 1.15314        | 27.40          | 5.70           | 0.04        | 13.31        | 40.75          | 19.05          | 56.00          | 46.00          | 15.25        | 26.95        | N     |         |
| 5   | 7.28214        | 21.70          | 10.40          | 0.13        | 13.61        | 35.44          | 24.14          | 60.00          | 50.00          | 24.56        | 25.86        | N     |         |
| 6   | 15.48335       | 15.80          | 2.70           | 0.28        | 13.84        | 29.92          | 16.82          | 60.00          | 50.00          | 30.08        | 33.18        | N     |         |
| 7   | 0.22664        | 31.40          | 22.50          | 0.03        | 13.22        | 44.65          | 35.75          | 62.57          | 52.57          | 17.92        | 16.82        | L     |         |
| 8   | 0.73532        | 34.20          | 10.10          | 0.03        | 13.27        | 47.50          | 23.40          | 56.00          | 46.00          | 8.50         | 22.60        | L     |         |
| 9   | 0.99725        | 25.60          | 21.80          | 0.04        | 13.30        | 38.94          | 35.14          | 56.00          | 46.00          | 17.06        | 10.86        | L     |         |
| 10  | 1.18615        | 25.80          | 4.60           | 0.04        | 13.31        | 39.15          | 17.95          | 56.00          | 46.00          | 16.85        | 28.05        | L     |         |
| 11  | 7.56212        | 16.30          | 10.20          | 0.15        | 13.62        | 30.07          | 23.97          | 60.00          | 50.00          | 29.93        | 26.03        | L     |         |
| 12  | 15.83909       | 14.90          | 2.20           | 0.30        | 13.85        | 29.05          | 16.35          | 60.00          | 50.00          | 30.95        | 33.65        | L     |         |

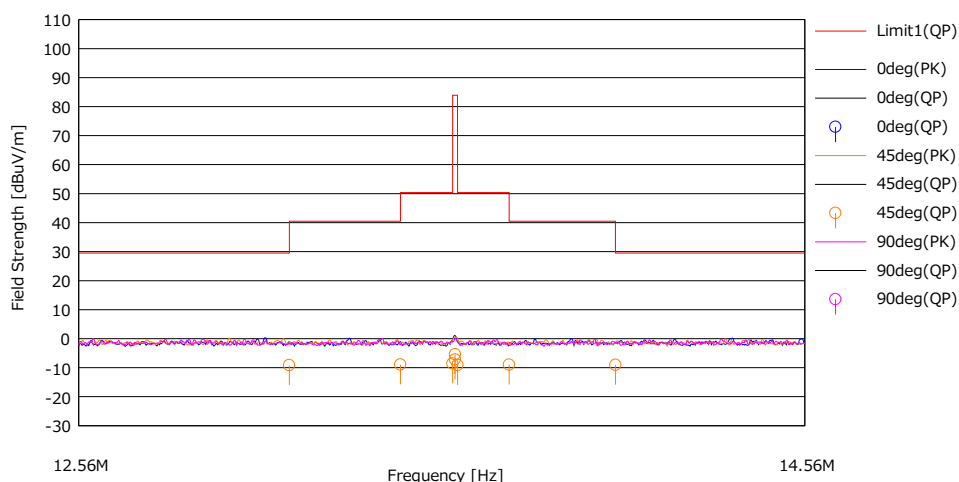
CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)  
Except for the above table: adequate margin data below the limits.



## Fundamental Emission and Spectrum Mask

|                        |                     |
|------------------------|---------------------|
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.4                |
| Date                   | March 13, 2025      |
| Temperature / Humidity | 20 deg. C / 40 % RH |
| Engineer               | Takeshi Hiyaji      |
| Mode                   | Mode 1              |

Limit : FCC15.225(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



| No. | Freq.<br>[MHz] | Reading | Ant.Fac<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result   | Limit    | Margin | Antenna | Table | Comment                   |
|-----|----------------|---------|-------------------|--------------|--------------|----------|----------|--------|---------|-------|---------------------------|
|     |                | <QP>    |                   |              |              | <QP>     | <QP>     | [deg]  |         |       |                           |
|     |                | [dBuV]  |                   |              |              | [dBuV/m] | [dBuV/m] | [dB]   |         |       |                           |
| 1   | 13.11000       | 36.10   | 20.27             | -33.39       | 32.13        | -9.15    | 29.50    | 38.65  | 45deg   | 63    | without Tag<br>with Tag * |
| 2   | 13.41000       | 36.30   | 20.30             | -33.38       | 32.13        | -8.91    | 40.50    | 49.41  | 45deg   | 63    |                           |
| 3   | 13.55300       | 36.60   | 20.31             | -33.38       | 32.13        | -8.60    | 50.40    | 59.00  | 45deg   | 63    |                           |
| 4   | 13.56000       | 38.00   | 20.31             | -33.38       | 32.13        | -7.20    | 83.90    | 91.10  | 45deg   | 140   |                           |
| 5   | 13.56000       | 39.80   | 20.31             | -33.38       | 32.13        | -5.40    | 83.90    | 89.30  | 45deg   | 63    |                           |
| 6   | 13.56700       | 36.10   | 20.31             | -33.38       | 32.13        | -9.10    | 50.40    | 59.50  | 45deg   | 63    |                           |
| 7   | 13.71000       | 36.20   | 20.32             | -33.37       | 32.13        | -8.98    | 40.50    | 49.48  | 45deg   | 63    |                           |
| 8   | 14.01000       | 36.10   | 20.35             | -33.37       | 32.13        | -9.05    | 29.50    | 38.55  | 45deg   | 63    |                           |
|     |                |         |                   |              |              |          |          |        |         |       |                           |

$$\text{RESULT} = \text{READING} + \text{ANT FACTOR} + \text{LOSS (CABLE + Attenuator + Distance Factor*)} - \text{GAIN(AMP)}$$

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

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

QP

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 45            | 13.56000           | QP       | 39.80             | 20.31                   | 6.62         | 32.13        | -                      | 34.60              | -                 | -              | Fundamental |

$$\text{Result} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter)} - \text{Gain(Amplifier)}$$

## Spurious Emission

|                        |                     |
|------------------------|---------------------|
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.4                |
| Date                   | March 13, 2025      |
| Temperature / Humidity | 20 deg. C / 40 % RH |
| Engineer               | Takeshi Hiyaji      |
| Mode                   | Mode 1              |

PK or QP

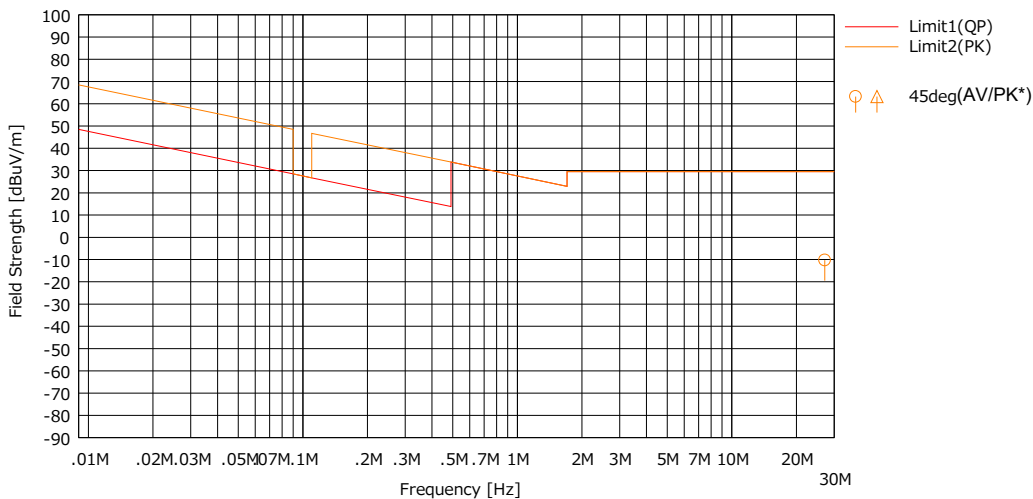
| Ant Deg [deg] or<br>Polarity [Hori/Vert] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--|--------------------|----------|-------------------|----------------------|--------------|--------------|---------------------|--------------------|-------------------|----------------|--------|
| 45deg                                    | 27.120             | QP       | 34.00             | 20.96                | -33.08       | 32.12        | -                   | -10.24             | 29.5              | 39.74          |        |
| Hori.                                    | 38.637             | QP       | 29.30             | 15.24                | 6.95         | 32.11        | -                   | 19.38              | 40.0              | 20.62          |        |
| Hori.                                    | 64.923             | QP       | 33.10             | 6.74                 | 7.30         | 32.09        | -                   | 15.05              | 40.0              | 24.95          |        |
| Hori.                                    | 71.418             | QP       | 25.90             | 6.40                 | 7.38         | 32.09        | -                   | 7.59               | 40.0              | 32.41          |        |
| Hori.                                    | 269.920            | QP       | 43.20             | 12.93                | 9.17         | 32.02        | -                   | 33.28              | 46.0              | 12.74          |        |
| Hori.                                    | 374.988            | QP       | 37.10             | 15.35                | 9.83         | 32.08        | -                   | 30.20              | 46.0              | 15.82          |        |
| Hori.                                    | 488.983            | QP       | 24.00             | 17.72                | 10.44        | 32.18        | -                   | 19.98              | 46.0              | 26.04          |        |
| Vert.                                    | 38.637             | QP       | 46.00             | 15.24                | 6.95         | 32.11        | -                   | 36.08              | 40.0              | 3.92           |        |
| Vert.                                    | 64.923             | QP       | 41.40             | 6.74                 | 7.30         | 32.09        | -                   | 23.35              | 40.0              | 16.65          |        |
| Vert.                                    | 71.418             | QP       | 35.10             | 6.40                 | 7.38         | 32.09        | -                   | 16.79              | 40.0              | 23.21          |        |
| Vert.                                    | 269.920            | QP       | 36.60             | 12.93                | 9.17         | 32.02        | -                   | 26.68              | 46.0              | 19.34          |        |
| Vert.                                    | 374.988            | QP       | 28.40             | 15.35                | 9.83         | 32.08        | -                   | 21.50              | 46.0              | 24.52          |        |
| Vert.                                    | 488.983            | QP       | 26.60             | 17.72                | 10.44        | 32.18        | -                   | 22.58              | 46.0              | 23.44          |        |

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

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

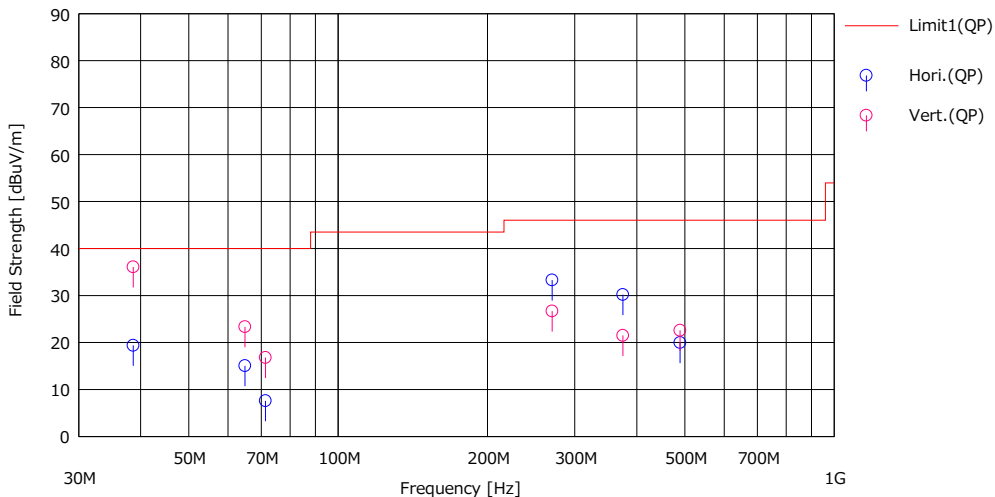
|                        |                     |
|------------------------|---------------------|
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.4                |
| Date                   | March 13, 2025      |
| Temperature / Humidity | 20 deg. C / 40 % RH |
| Engineer               | Takeshi Hiyaji      |
| Mode                   | Mode 1              |

**(below 30MHz)**



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

**(above 30MHz)**

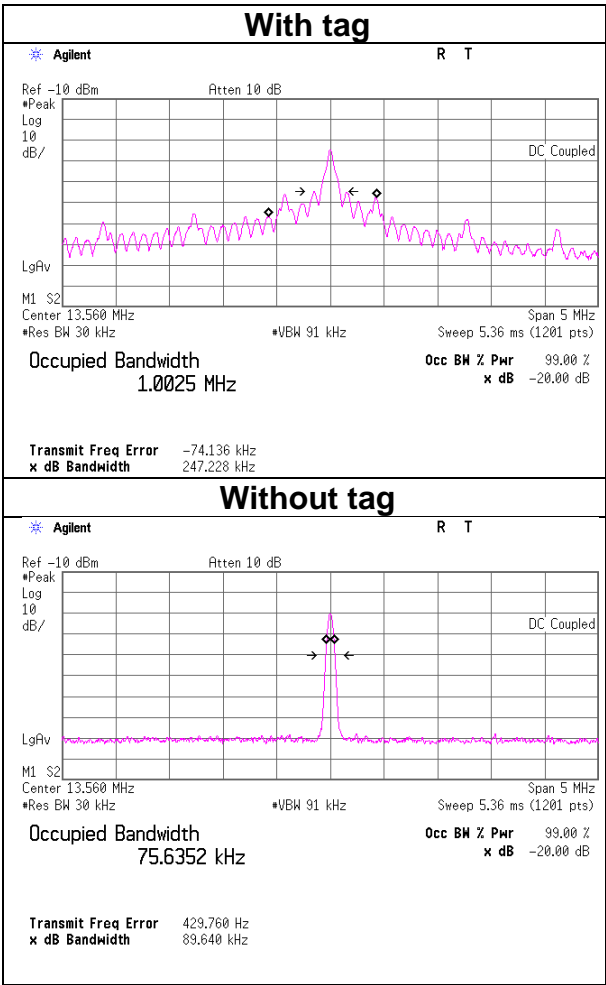


\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

20 dB Bandwidth and 99% Occupied Bandwidth

Test place                   Ise EMC Lab.  
                                  No.11 Measuremt Room  
Date                         March 14, 2025  
Temperature / Humidity    23 deg. C / 40 % RH  
Engineer                  Junki Nagatomi  
Mode                        Mode 1

| FREQ [MHz] | Mode        | 20dB Bandwidth [kHz] | 99% Occupied Bandwidth [kHz] |
|------------|-------------|----------------------|------------------------------|
| 13.56      | With Tag    | 247.228              | 1002.5                       |
|            | Without Tag | 89.640               | 75.6352                      |



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             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.6                |
| Date                   | March 12, 2025      |
| Temperature / Humidity | 24 deg. C / 45 % RH |
| Engineer               | Junki Nagatomi      |
| Mode                   | Mode 1              |

| Test condition    |                    | Tested timing | Measured frequency [MHz] | Frequency error [MHz] | Result   |       | Limit<br>[+/- %] |
|-------------------|--------------------|---------------|--------------------------|-----------------------|----------|-------|------------------|
| Temp.<br>[deg. C] | Voltage<br>[V]     |               |                          |                       | [%]      | [ppm] |                  |
| 35                | 120                | Power on      | 13.559533                | -0.000467             | -0.00345 | -34.5 | 0.01             |
|                   |                    | + 2 min.      | 13.559527                | -0.000473             | -0.00349 | -34.9 | 0.01             |
|                   |                    | + 5 min.      | 13.559523                | -0.000477             | -0.00352 | -35.2 | 0.01             |
|                   |                    | + 10 min.     | 13.559523                | -0.000477             | -0.00352 | -35.2 | 0.01             |
| 30                | 120                | Power on      | 13.559542                | -0.000458             | -0.00338 | -33.8 | 0.01             |
|                   |                    | + 2 min.      | 13.559535                | -0.000465             | -0.00343 | -34.3 | 0.01             |
|                   |                    | + 5 min.      | 13.559531                | -0.000469             | -0.00346 | -34.6 | 0.01             |
|                   |                    | + 10 min.     | 13.559528                | -0.000472             | -0.00348 | -34.8 | 0.01             |
| 20                | 120                | Power on      | 13.559536                | -0.000464             | -0.00343 | -34.3 | 0.01             |
|                   |                    | + 2 min.      | 13.559535                | -0.000465             | -0.00343 | -34.3 | 0.01             |
|                   |                    | + 5 min.      | 13.559535                | -0.000465             | -0.00343 | -34.3 | 0.01             |
|                   |                    | + 10 min.     | 13.559535                | -0.000465             | -0.00343 | -34.3 | 0.01             |
| 20                | 102<br>(120V -15%) | Power on      | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
|                   |                    | + 2 min.      | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
|                   |                    | + 5 min.      | 13.559537                | -0.000463             | -0.00342 | -34.2 | 0.01             |
|                   |                    | + 10 min.     | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
| 20                | 138<br>(120V +15%) | Power on      | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
|                   |                    | + 2 min.      | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
|                   |                    | + 5 min.      | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
|                   |                    | + 10 min.     | 13.559536                | -0.000464             | -0.00342 | -34.2 | 0.01             |
| 10                | 120                | Power on      | 13.559545                | -0.000455             | -0.00335 | -33.5 | 0.01             |
|                   |                    | + 2 min.      | 13.559549                | -0.000451             | -0.00333 | -33.3 | 0.01             |
|                   |                    | + 5 min.      | 13.559549                | -0.000451             | -0.00333 | -33.3 | 0.01             |
|                   |                    | + 10 min.     | 13.559549                | -0.000451             | -0.00333 | -33.3 | 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 started at 35 deg. C.

The temperature was reduced in 10°C increments starting from 30°C.

\*Tests were performed within the operating range of the EUT as instructed by the customer.

## APPENDIX 2: Test instruments

### Test Equipment

| Test Item | LIMS ID | Description                          | Manufacturer                    | Model  | Serial        | Last Calibration Date | Cal Int |
|-----------|---------|--------------------------------------|---------------------------------|--|---------------|-----------------------|---------|
| CE        | 141217  | Coaxial cable                        | Fujikura/Suhner/TSJ             | 5D-2W/SFM141/421-010/sucoform141-PE/RFM-E121(SW) | -/04178       | 06/14/2024            | 12      |
| CE        | 141248  | Attenuator                           | JFW Industries, Inc.            | 50FP-013H2 N                                     | -             | 12/03/2024            | 12      |
| CE        | 141358  | LISN(AMN)                            | Schwarzbeck Mess-Elektronik OHG | NSLK8127   | 8127-730      | 07/09/2024            | 12      |
| CE        | 141538  | LISN(AMN)                            | Schwarzbeck Mess-Elektronik OHG | NSLK8127   | 8127-732      | 07/14/2024            | 12      |
| CE        | 141545  | DIGITAL HiTESTER                     | HIOKI E. E. CORPORATION         | 3805   | 51201148      | 02/25/2025            | 12      |
| CE        | 141934  | Terminator                           | TME                             | CT-01BP  | -             | 04/01/2024            | 12      |
| CE        | 141951  | EMI Test Receiver                    | Rohde & Schwarz                 | ESR26  | 101408        | 05/17/2024            | 12      |
| CE        | 142230  | Measure, Tape, Steel                 | KOMELON                         | KMC-36   | -             | -                     | -       |
| CE        | 178648  | EMI measurement program              | TSJ (Techno Science Japan)      | TEPTO-DV   | -             | -                     | -       |
| CE        | 244710  | Thermo-Hygrometer                    | HIOKI E. E. CORPORATION         | LR5001   | 231202104     | 01/19/2025            | 12      |
| FT        | 141429  | Temperature and Humidity Chamber     | Espec                           | PL-2KP   | 14015723      | 08/23/2024            | 12      |
| FT        | 141558  | Digital Tester (TRUE RMS MULTIMETER) | Fluke Corporation               | 115  | 17930030      | 05/17/2024            | 12      |
| FT        | 141900  | Spectrum Analyzer                    | Keysight Technologies Inc       | E4440A   | MY46185823    | 11/13/2024            | 12      |
| FT        | 142645  | Loop Antenna                         | UL-ISE                          | -  | -             | -                     | -       |
| FT        | 244712  | Thermo-Hygrometer                    | HIOKI E. E. CORPORATION         | LR5001   | 231202106     | 01/19/2025            | 12      |
| RE        | 141198  | Biconical Antenna                    | Schwarzbeck Mess-Elektronik OHG | VHA9103+BBA9106                                  | 2513          | 07/10/2024            | 12      |
| RE        | 141217  | Coaxial cable                        | Fujikura/Suhner/TSJ             | 5D-2W/SFM141/421-010/sucoform141-PE/RFM-E121(SW) | -/04178       | 06/14/2024            | 12      |
| RE        | 141267  | Logperiodic Antenna (200-1000MHz)    | Schwarzbeck Mess-Elektronik OHG | VUSLP9111B                                       | 9111B-192     | 09/18/2024            | 12      |
| RE        | 141397  | Coaxial Cable                        | UL-ISE EMC                      | -  | -             | 11/29/2024            | 12      |
| RE        | 141545  | DIGITAL HiTESTER                     | HIOKI E. E. CORPORATION         | 3805   | 51201148      | 02/25/2025            | 12      |
| RE        | 141583  | Pre Amplifier                        | SONOMA INSTRUMENT               | 310  | 260833        | 04/04/2024            | 12      |
| RE        | 141951  | EMI Test Receiver                    | Rohde & Schwarz                 | ESR26  | 101408        | 05/17/2024            | 12      |
| RE        | 142011  | AC4_Semi Anechoic Chamber(NSA)       | TDK                             | Semi Anechoic Chamber 3m                         | DA-10005      | 12/13/2023            | 24      |
| RE        | 142230  | Measure, Tape, Steel                 | KOMELON                         | KMC-36   | -             | -                     | -       |
| RE        | 178648  | EMI measurement program              | TSJ (Techno Science Japan)      | TEPTO-DV   | -             | -                     | -       |
| RE        | 220646  | Attenuator                           | Huber+Suhner                    | 6806_N-50-1                                      | -             | 03/06/2025            | 12      |
| RE        | 244710  | Thermo-Hygrometer                    | HIOKI E. E. CORPORATION         | LR5001   | 231202104     | 01/19/2025            | 12      |
| RE        | 252514  | Active Loop Antenna                  | Schwarzbeck Mess-Elektronik OHG | FMZB 1519-60 D                                   | 1519-60 D-067 | 09/26/2024            | 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

FT: Frequency Tolerance

RE: Radiated Emission