



# EMI TEST REPORT

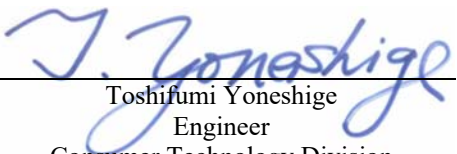
Test Report No. : 12821185H-E-R2

**Applicant** : CITIZEN SYSTEMS JAPAN CO., LTD.  
**Type of Equipment** : DIGITAL PHOTO PRINTER  
**Model No.** : DP-QW410  
**Test regulation** : FCC Part 15 Subpart C: 2019  
**FCC ID** : TLGH09C0  
**Test Result** : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12821185H-E-R1. 12821185H-E-R1 is replaced with this report.

**Date of test:** June 28 to November 17, 2019

**Representative test engineer:**

  
Toshifumi Yoneshige  
Engineer  
Consumer Technology Division

**Approved by:**

  
Satofumi Matsuyama  
Engineer  
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
[http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

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

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## **REVISION HISTORY**

### **Original Test Report No.: 12821185H-E**

| Revision        | Test report No. | Date              | Page revised | Contents                                                                                                                                                                                                            |
|-----------------|-----------------|-------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -<br>(Original) | 12821185H-E     | July 26, 2019     | -            | -                                                                                                                                                                                                                   |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.1          | Correction of “Date of test” in cover page                                                                                                                                                                          |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.3          | Addition of Abbreviations list                                                                                                                                                                                      |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.6          | Correction of worst margin of “Electric Field Strength of Spurious Emission” test in Clause 3.2 according to data correction;<br>From 3.54 dB, 36.240 MHz, Vertical, QP<br>To 14.39 dB 352.550 MHz, Horizontal, QP  |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.8          | Addition of the Uncertainty table after October 1, 2019 in Clause 3.4.                                                                                                                                              |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.20         | Replacing Spurious emission data (Above 30 MHz).                                                                                                                                                                    |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.23         | Addition of *1) in LIMS ID: 141949, 141901, 141254 and 141530 to Calibration Due Date.                                                                                                                              |
| 1               | 12821185H-E-R1  | November 18, 2019 | P.23         | Addition of *1) note sentence below the “Test Instruments” table.                                                                                                                                                   |
| 2               | 12821185H-E-R2  | November 20, 2019 | P.11         | Addition of the following note sentence in Clause 4.2;<br>*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. |
| 2               | 12821185H-E-R2  | November 20, 2019 | P.18         | Correction of Limit of “Result of the fundamental emission at 3 m without Distance factor” for Fundamental emission and Spectrum Mask test;<br>From 83.90 dBuV/m to “-“                                             |

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

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

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

| <b>CONTENTS</b>                                                                              | <b>PAGE</b> |
|----------------------------------------------------------------------------------------------|-------------|
| <b>SECTION 1: Customer information.....</b>                                                  | <b>5</b>    |
| <b>SECTION 2: Equipment under test (E.U.T.).....</b>                                         | <b>5</b>    |
| <b>SECTION 3: Test specification, procedures &amp; results.....</b>                          | <b>6</b>    |
| <b>SECTION 4: Operation of E.U.T. during testing.....</b>                                    | <b>10</b>   |
| <b>SECTION 5: Conducted Emission.....</b>                                                    | <b>12</b>   |
| <b>SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask).....</b> | <b>13</b>   |
| <b>SECTION 7: Other test.....</b>                                                            | <b>16</b>   |
| <b>APPENDIX 1: Test data .....</b>                                                           | <b>17</b>   |
| Conducted Emission .....                                                                     | 17          |
| Fundamental emission and Spectrum Mask.....                                                  | 18          |
| Spurious emission .....                                                                      | 19          |
| 20dB Bandwidth and 99% Occupied Bandwidth.....                                               | 21          |
| Frequency Tolerance.....                                                                     | 22          |
| <b>APPENDIX 2: Test instruments .....</b>                                                    | <b>23</b>   |
| <b>APPENDIX 3: Photographs of test setup .....</b>                                           | <b>24</b>   |
| Conducted Emission .....                                                                     | 24          |
| Radiated Emission.....                                                                       | 25          |

## **SECTION 1: Customer information**

|                  |                                                              |
|------------------|--------------------------------------------------------------|
| Company Name     | : CITIZEN SYSTEMS JAPAN CO., LTD.                            |
| Address          | : 6-1-12, Tanashi-cho, Nishi-Tokyo-shi, Tokyo 188-8511 Japan |
| Telephone Number | : +81-42-468-4609                                            |
| Facsimile Number | : +81-42-468-4644                                            |
| Contact Person   | : Shigeru Obata                                              |

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. 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 (E.U.T.)
  - SECTION 4: Operation of E.U.T. 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 (E.U.T.)**

### **2.1 Identification of E.U.T.**

|                                                        |                                                                                             |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Type of Equipment                                      | : DIGITAL PHOTO PRINTER                                                                     |
| Model No.                                              | : DP-QW410                                                                                  |
| Serial No.                                             | : Refer to Section 4, Clause 4.2                                                            |
| Rating                                                 | : AC 100 V - 240 V, 50 / 60 Hz                                                              |
| Receipt Date of Sample<br>(Information from test lab.) | : June 28, 2019                                                                             |
| Country of Mass-production                             | : China                                                                                     |
| Condition of EUT                                       | : Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification of EUT                                    | : No Modification by the test lab                                                           |

### **2.2 Product Description**

Model: DP-QW410 (referred to as the EUT in this report) is a DIGITAL PHOTO PRINTER.

Tested model: DP-QW410 has variant model: CZ-01.

The differences between variant models are only appearance color and front printing.

These differences cause no influence to radio specification.

These models are electrically identical.

Therefore, tests were performed on DP-QW410 as representative.

Feature of EUT:

|                                    |                  |
|------------------------------------|------------------|
| Clock frequency(ies) in the system | : 480 MHz (max.) |
|------------------------------------|------------------|

### **Radio Specification**

|                        |                           |
|------------------------|---------------------------|
| Radio Type             | : Transceiver             |
| Frequency of Operation | : 13.56 MHz               |
| Modulation             | : ASK                     |
| Antenna type           | : Integral                |
| Antenna Gain           | : -58.91 dBi              |
| Operating Temperature  | : +5 deg. C to +40 deg. C |

---

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.225 Operation within the band 13.110-14.010 MHz.

\* The revisions made after testing date do not affect the test specification applied to the EUT.

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

### **3.2 Procedures and results**

| Item                                               | Test Procedure                                                                 | Specification                                                     | Worst margin                               | Results        | Remarks  |
|----------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------|----------------|----------|
| Conducted emission                                 | ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><IC>RSS-Gen 8.8        | Section 15.207<br>-----<br><IC>RSS-Gen 8.8                        | 14.71 dB<br>0.32362 MHz<br>QP, Phase N     | Complied<br>a) | -        |
| Electric Field Strength<br>of Fundamental Emission | ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><IC> RSS-Gen 6.4, 6.12 | Section 15.225(a)<br>-----<br><IC>RSS-210 B.6                     | 92.03 dB,<br>13.56000 MHz,<br>QP, 0 deg.   | Complied<br>b) | Radiated |
| Spectrum Mask                                      | ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><IC>RSS-Gen 6.4, 6.13  | Section 15.225(b)(c)<br>-----<br><IC> RSS-210 B.6                 | 45.86 dB,<br>14.01000 MHz,<br>QP, 0 deg.   | Complied<br>b) | Radiated |
| 20dB Bandwidth                                     | ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><IC> -                 | Section15.215(c)<br>-----<br><IC> -                               | See data                                   | Complied<br>c) | Radiated |
| Electric Field Strength<br>of Spurious Emission    | ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><IC>RSS-Gen 6.4, 6.13  | Section 15.209,<br>Section 15.225 (d)<br>-----<br><IC>RSS-210 B.6 | 14.39 dB<br>352.550 MHz,<br>Horizontal, QP | Complied<br>d) | Radiated |
| Frequency Tolerance                                | ANSI C63.10:2013<br>6 Standard test methods<br>-----<br><IC>RSS-Gen 6.11, 8.11 | Section 15.225(e)<br>-----<br><IC> RSS-210 B.6                    | See data                                   | Complied<br>e) | Radiated |

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

- 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 20dB Bandwidth and 99% Occupied Bandwidth)  
d) Refer to APPENDIX 1 (data of Spurious emission)  
e) Refer to APPENDIX 1 (data of Frequency Tolerance)

Symbols:

|           |                                                                                                             |
|-----------|-------------------------------------------------------------------------------------------------------------|
| Complied  | The data of this test item has enough margin, more than the measurement uncertainty.                        |
| Complied# | The data of this test item meets the limits unless the measurement uncertainty is taken into consideration. |

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**FCC Part 15.31 (e)**

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

**3.3 Addition to standard**

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

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

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

### 3.4 Uncertainty

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

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

Test date: Before September 30, 2019

#### Conducted emission

| using Item | Frequency range       | Uncertainty (+/-) |
|------------|-----------------------|-------------------|
| AMN (LISN) | 0.009 MHz to 0.15 MHz | 3.8 dB            |
|            | 0.15 MHz to 30 MHz    | 3.4 dB            |

#### Radiated emission

| Measurement distance | Frequency range                                | Uncertainty (+/-) |
|----------------------|------------------------------------------------|-------------------|
| 3 m                  | 9 kHz to 30 MHz                                | 3.3 dB            |
| 10 m                 |                                                | 3.2 dB            |
| 3 m                  | 30 MHz to 200 MHz (Horizontal)<br>(Vertical)   | 4.8 dB            |
|                      |                                                | 5.0 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal)<br>(Vertical) | 5.2 dB            |
|                      |                                                | 6.3 dB            |
| 10 m                 | 30 MHz to 200 MHz (Horizontal)<br>(Vertical)   | 4.8 dB            |
|                      |                                                | 4.9 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal)<br>(Vertical) | 5.0 dB            |
|                      |                                                | 5.0 dB            |
| 3 m                  | 1 GHz to 6 GHz                                 | 5.0 dB            |
|                      | 6 GHz to 18 GHz                                | 5.3 dB            |
| 1 m                  | 10 GHz to 26.5 GHz                             | 5.8 dB            |
|                      | 26.5 GHz to 40 GHz                             | 5.8 dB            |

#### Antenna Terminal test

| Test Item                                | Uncertainty (+/-) |
|------------------------------------------|-------------------|
| Frequency Tolerance                      | 0.0154 ppm        |
| 20dB Bandwidth / 99 % Occupied Bandwidth | 0.96 %            |

Test date: After October 1, 2019

#### Radiated emission

| Measurement distance | Frequency range                                | Uncertainty (+/-) |
|----------------------|------------------------------------------------|-------------------|
| 3 m                  | 9 kHz to 30 MHz                                | 3.3 dB            |
| 10 m                 |                                                | 3.2 dB            |
| 3 m                  | 30 MHz to 200 MHz (Horizontal)<br>(Vertical)   | 4.8 dB            |
|                      |                                                | 5.0 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal)<br>(Vertical) | 5.2 dB            |
|                      |                                                | 6.3 dB            |
| 10 m                 | 30 MHz to 200 MHz (Horizontal)<br>(Vertical)   | 4.8 dB            |
|                      |                                                | 4.8 dB            |
|                      | 200 MHz to 1000 MHz (Horizontal)<br>(Vertical) | 5.0 dB            |
|                      |                                                | 5.0 dB            |
| 3 m                  | 1 GHz to 6 GHz                                 | 4.9 dB            |
|                      | 6 GHz to 18 GHz                                | 5.2 dB            |
| 1 m                  | 10 GHz to 26.5 GHz                             | 5.5 dB            |
|                      | 26.5 GHz to 40 GHz                             | 5.5 dB            |

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

\*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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

Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

| Test site                  | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms            | Maximum measurement distance |
|----------------------------|----------------------------|------------------------------------------------------------------|------------------------|------------------------------|
| No.1 semi-anechoic chamber | 19.2 x 11.2 x 7.7          | 7.0 x 6.0                                                        | No.1 Power source room | 10 m                         |
| No.2 semi-anechoic chamber | 7.5 x 5.8 x 5.2            | 4.0 x 4.0                                                        | -                      | 3 m                          |
| No.3 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.3 Preparation room  | 3 m                          |
| No.3 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.4 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.4 Preparation room  | 3 m                          |
| No.4 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.5 semi-anechoic chamber | 6.0 x 6.0 x 3.9            | 6.0 x 6.0                                                        | -                      | -                            |
| No.5 measurement room      | 6.4 x 6.4 x 3.0            | 6.4 x 6.4                                                        | -                      | -                            |
| No.6 shielded room         | 4.0 x 4.5 x 2.7            | 4.0 x 4.5                                                        | -                      | -                            |
| No.6 measurement room      | 4.75 x 5.4 x 3.0           | 4.75 x 4.15                                                      | -                      | -                            |
| No.7 shielded room         | 4.7 x 7.5 x 2.7            | 4.7 x 7.5                                                        | -                      | -                            |
| No.8 measurement room      | 3.1 x 5.0 x 2.7            | 3.1 x 5.0                                                        | -                      | -                            |
| No.9 measurement room      | 8.8 x 4.6 x 2.8            | 2.4 x 2.4                                                        | -                      | -                            |
| No.11 measurement room     | 6.2 x 4.7 x 3.0            | 4.8 x 4.6                                                        | -                      | -                            |

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

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

Refer to APPENDIX.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Mode(s)**

The mode is used :

| Mode                                                                                                                                                         | Remarks*                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 1) Transmitting mode (Tx)                                                                                                                                    | The EUT Transmits and Receives at the same time and there is no receiving mode. |
| The EUT was operated in a manner similar to typical use during the tests.<br>The EUT Transmits and Receives at the same time and there is no receiving mode. |                                                                                 |

| 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<br>99 % Occupied Bandwidth      | Tx Mod on, with Tag |
| Electric Field Strength of Spurious Emission    | Tx Mod on, with Tag |
| Frequency Tolerance                             | Tx Mod on, with Tag |

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

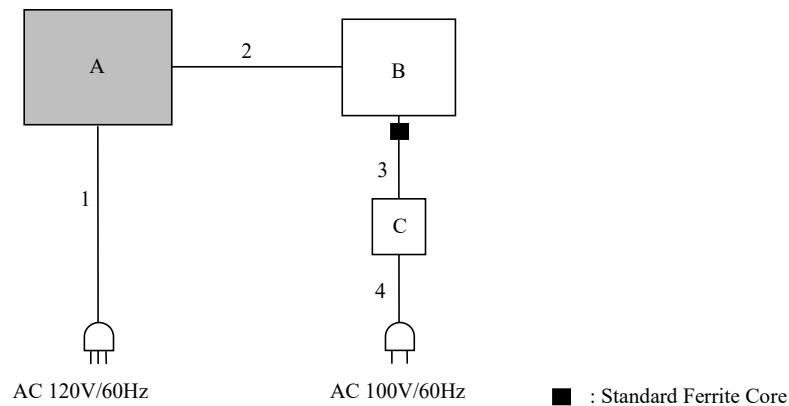
Justification: The system was configured in typical fashion (as a user would normally use it) for testing.

Frequency Tolerance:

Temperature : -20 deg. C to +50 deg. C Step 10 deg. C  
Voltage : Normal Voltage AC 120 V  
Maximum Voltage AC 102 V,  
Minimum Voltage AC 138 V (DC 120 V  $\pm 15$  %)

\*This EUT provides stable voltage constantly to RF Part regardless of input voltage

## 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                    | Remarks |
|-----|-----------------------|---------------|-------------------|---------------------------------|---------|
| A   | DIGITAL PHOTO PRINTER | DP-QW410      | CZ-PP021          | CITIZEN SYSTEMS JAPAN CO., LTD. | EUT     |
| B   | Laptop PC             | C18F0715      | 8HKSA95235        | Panasonic Corporation           | -       |
| C   | AC Adaptor            | CF-AA64L2C M1 | 64L2CM1187160 37A | Panasonic Corporation           | -       |

### List of cables used

| No. | Name      | Length (m) | Shield     |            | Remarks |
|-----|-----------|------------|------------|------------|---------|
|     |           |            | Cable      | Connector  |         |
| 1   | AC Cable  | 1.9        | Unshielded | Unshielded | -       |
| 2   | USB Cable | 1.8        | Shielded   | Shielded   | -       |
| 3   | DC Cable  | 1.0        | 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.

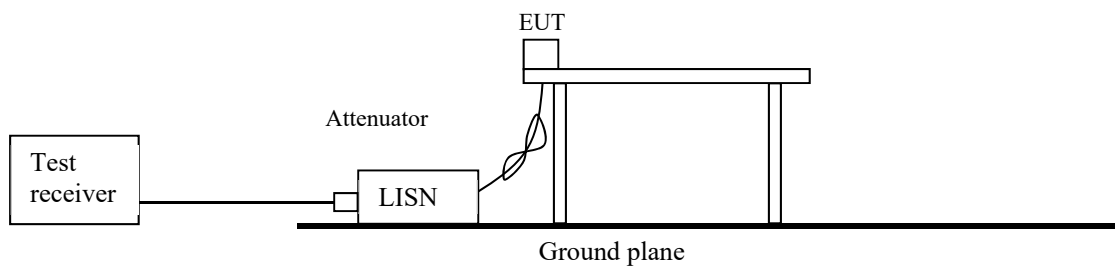
#### For the tests on EUT with other peripherals (as a whole system)

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.

[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

[For below 1GHz]

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.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

Frequency: From 9 kHz to 30 MHz

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

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

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

Frequency: From 30 MHz to 1 GHz

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

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

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### Test Antennas are used as below;

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

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

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

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

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

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

However test results were confirmed to pass against standard limit.

## **UL Japan, Inc.**

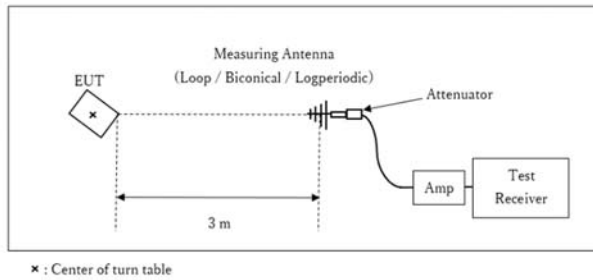
### **Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

[Test Setup]  
Below 1 GHz



Test Distance: 3 m

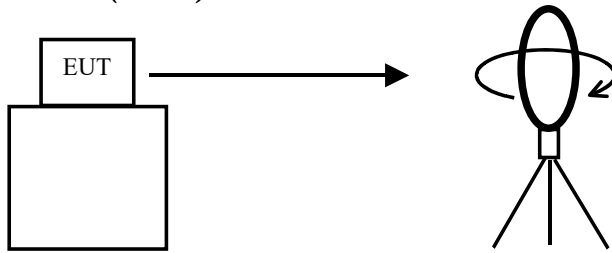
The test was made on EUT at the normal use position.

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

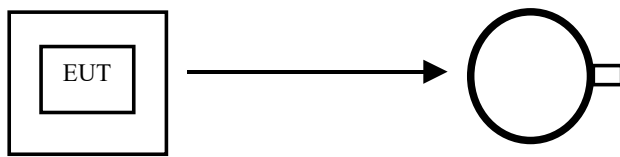
**Measurement range** : 9 kHz - 1 GHz  
**Test data** : APPENDIX 1  
**Test result** : Pass

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

*Side View (Vertical)*

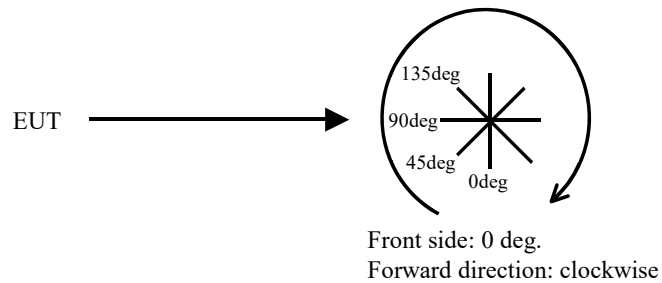


*Top View (Horizontal)*



Antenna was not rotated.

*Top View (Vertical)*



## **SECTION 7: Other test**

| Test                                                                                                                                                   | Span                                       | RBW             | VBW                | Sweep | Detector | Trace        | Instrument used       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|--------------------|-------|----------|--------------|-----------------------|
| 20 dB Bandwidth                                                                                                                                        | Between 2.0 times and 5.0 times of the OBW | 1 to 5 % of OBW | Three times of RBW | Auto  | Peak     | Max Hold     | Spectrum Analyzer     |
| 99 % Occupied Bandwidth                                                                                                                                | Between 1.5 times and 5.0 times of the OBW | 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 %.<br>Peak hold was applied as Worst-case measurement. |                                            |                 |                    |       |          |              |                       |
| *2) The measurement was performed with Marker Frequency Counter Function.                                                                              |                                            |                 |                    |       |          |              |                       |

**Test data** : APPENDIX

**Test result** : Pass

---

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

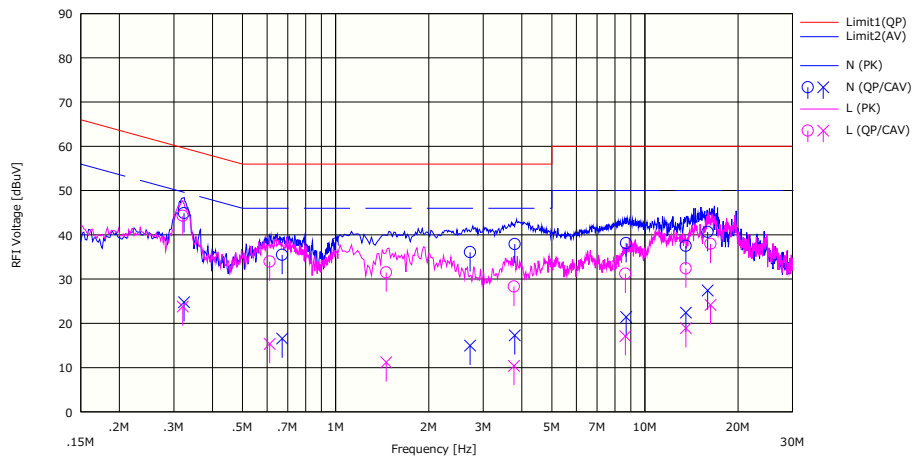
Facsimile : +81 596 24 8124

## APPENDIX 1: Test data

### Conducted Emission

Report No. 12821185H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.1  
Date June 28, 2019  
Temperature / Humidity 24 deg. C / 52 % RH  
Engineer Junki Nagatomi  
Mode Mode 1 with Tag

Limit : FCC\_Part 15 Subpart C(15.207)



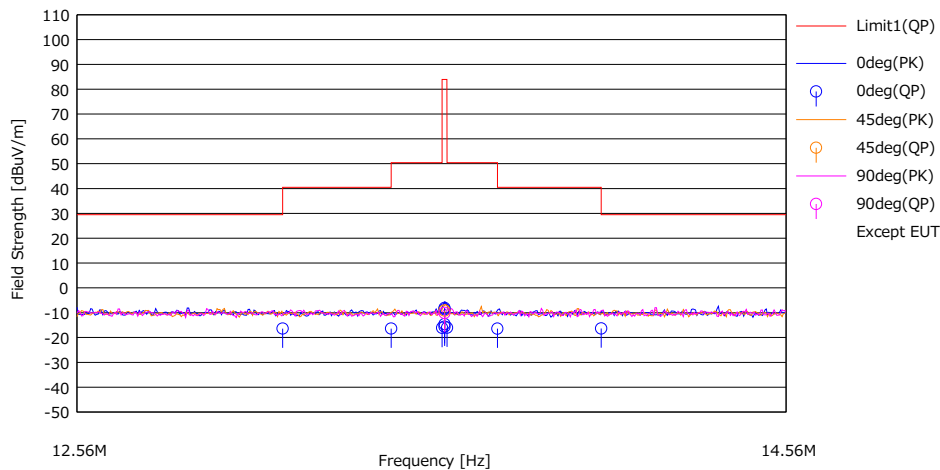
| No. | Freq.<br>[MHz] | Reading        |                 | LISN<br>[dB] | LOSS<br>[dB] | Results        |                 | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|-----------------|--------------|--------------|----------------|-----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <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   | 0.32362        | 31.70          | 11.60           | 0.05         | 13.14        | 44.89          | 24.79           | 59.60          | 49.60          | 14.71        | 24.81        | N     |         |
| 2   | 0.67161        | 22.20          | 3.30            | 0.06         | 13.21        | 35.47          | 16.57           | 56.00          | 46.00          | 20.53        | 29.43        | N     |         |
| 3   | 2.72101        | 22.50          | 1.40            | 0.10         | 13.47        | 36.07          | 14.97           | 56.00          | 46.00          | 19.93        | 31.03        | N     |         |
| 4   | 3.79441        | 24.20          | 3.60            | 0.13         | 13.57        | 37.90          | 17.30           | 56.00          | 46.00          | 18.10        | 28.70        | N     |         |
| 5   | 8.69690        | 24.00          | 7.30            | 0.23         | 13.89        | 38.12          | 21.42           | 60.00          | 50.00          | 21.88        | 28.58        | N     |         |
| 6   | 13.56000       | 23.10          | 8.00            | 0.30         | 14.12        | 37.52          | 22.42           | 60.00          | 50.00          | 22.48        | 27.58        | N     |         |
| 7   | 15.95002       | 26.10          | 12.90           | 0.32         | 14.22        | 40.64          | 27.44           | 60.00          | 50.00          | 19.36        | 22.56        | N     |         |
| 8   | 0.32040        | 31.10          | 10.60           | 0.05         | 13.14        | 44.29          | 23.79           | 59.70          | 49.70          | 15.41        | 25.91        | L     |         |
| 9   | 0.61241        | 20.70          | 2.10            | 0.06         | 13.20        | 33.96          | 15.36           | 56.00          | 46.00          | 22.04        | 30.64        | L     |         |
| 10  | 1.45741        | 18.10          | -2.20           | 0.08         | 13.32        | 31.50          | 11.20           | 56.00          | 46.00          | 24.50        | 34.80        | L     |         |
| 11  | 3.77356        | 14.60          | -3.30           | 0.13         | 13.57        | 28.30          | 10.40           | 56.00          | 46.00          | 27.70        | 35.60        | L     |         |
| 12  | 8.64880        | 17.10          | 3.00            | 0.23         | 13.89        | 31.22          | 17.12           | 60.00          | 50.00          | 28.78        | 32.88        | L     |         |
| 13  | 13.56000       | 18.00          | 4.50            | 0.30         | 14.12        | 32.42          | 18.92           | 60.00          | 50.00          | 27.58        | 31.08        | L     |         |
| 14  | 16.29781       | 23.40          | 9.60            | 0.32         | 14.23        | 37.95          | 24.15           | 60.00          | 50.00          | 22.05        | 25.85        | L     |         |

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

## Fundamental emission and Spectrum Mask

Report No. 12821185H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 7, 2019  
Temperature / Humidity 23 deg. C / 50 % RH  
Engineer Ken Fujita  
Mode Mode 1 with Tag

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



| No. | Freq.<br>[MHz] | Reading<br>(QP)<br>[dBuV] | Ant.Fac<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>(QP)<br>[dBuV/m] | Limit<br>(QP)<br>[dBuV/m] | Margin<br>(QP)<br>[dB] | Antenna | Table | Comment        |
|-----|----------------|---------------------------|-------------------|--------------|--------------|----------------------------|---------------------------|------------------------|---------|-------|----------------|
| 1   | 13.11000       | 29.80                     | 19.29             | -33.25       | 32.23        | -16.39                     | 29.50                     | 45.89                  | 0deg    | 0     |                |
| 2   | 13.41000       | 29.80                     | 19.26             | -33.24       | 32.23        | -16.41                     | 40.50                     | 56.91                  | 0deg    | 0     |                |
| 3   | 13.55300       | 30.10                     | 19.24             | -33.24       | 32.23        | -16.13                     | 50.40                     | 66.53                  | 0deg    | 109   |                |
| 4   | 13.56000       | 31.60                     | 19.24             | -33.24       | 32.23        | -14.63                     | 83.90                     | 98.53                  | 0deg    | 0     | without Tag    |
| 5   | 13.56000       | 37.60                     | 19.24             | -33.24       | 32.23        | -8.63                      | 83.90                     | 92.53                  | 0deg    | 118   | antenna 135deg |
| 6   | 13.56000       | 30.60                     | 19.24             | -33.24       | 32.23        | -15.63                     | 83.90                     | 99.53                  | 0deg    | 0     | HOR            |
| 7   | 13.56000       | 38.10                     | 19.24             | -33.24       | 32.23        | -8.13                      | 83.90                     | 92.03                  | 0deg    | 109   | *              |
| 8   | 13.56700       | 30.20                     | 19.24             | -33.24       | 32.23        | -16.03                     | 50.40                     | 66.43                  | 0deg    | 109   |                |
| 9   | 13.71000       | 29.80                     | 19.23             | -33.23       | 32.23        | -16.43                     | 40.50                     | 56.93                  | 0deg    | 0     |                |
| 10  | 14.01000       | 29.90                     | 19.20             | -33.23       | 32.23        | -16.36                     | 29.50                     | 45.86                  | 0deg    | 0     |                |
| 11  | 13.56000       | 37.10                     | 19.24             | -33.24       | 32.23        | -9.13                      | 83.90                     | 93.03                  | 45deg   | 233   |                |
| 12  | 13.56000       | 36.10                     | 19.24             | -33.24       | 32.23        | -10.13                     | 83.90                     | 94.03                  | 90deg   | 57    |                |

RESULT = READING + ANT FACTOR + LOSS (CABLE + Attenuator + Distance Factor) - GAIN(AMP)

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

| Ant Deg [deg] | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark      |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0             | 13.56              | QP       | 38.10             | 19.24                   | 6.76         | 32.23        | -                      | 31.87              | -                 | -              | Fundamental |

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

UL Japan, Inc.

Ise EMC Lab.

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

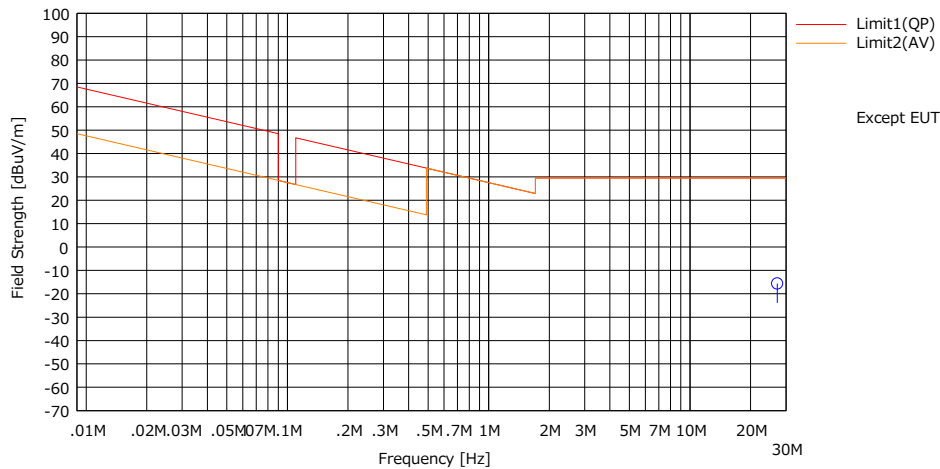
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Spurious emission

Report No. 12821185H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date July 7, 2019  
Temperature / Humidity 23 deg. C / 50 % RH  
Engineer Ken Fujita  
(Below 30 MHz)  
Mode Mode 1 with Tag

Limit : FCC15.209(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<br>[deg] | Table<br>[deg] | Comment |
|-----|----------------|----------------|----------------|-------------------|--------------|--------------|------------------|------------------|------------------|------------------|--------------|--------------|------------------|----------------|---------|
|     |                | (QP)<br>[dBuV] | (AV)<br>[dBuV] |                   |              |              | (QP)<br>[dBuV/m] | (AV)<br>[dBuV/m] | (QP)<br>[dBuV/m] | (AV)<br>[dBuV/m] | (QP)<br>[dB] | (AV)<br>[dB] |                  |                |         |
| 1   | 27.12000       | 29.40          | ---            | 20.13             | -32.93       | 32.22        | -15.62           | ---              | 29.50            | 29.50            | 45.12        | ---          | 0deg             | 109            |         |

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

**UL Japan, Inc.**

**Ise EMC Lab.**

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

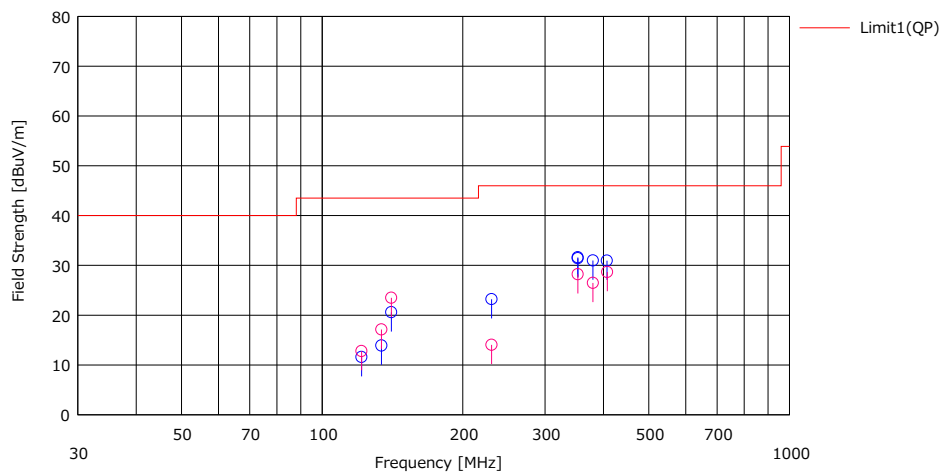
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Spurious emission

Report No. 12821185H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.1  
Date November 17, 2019  
Temperature / Humidity 22 deg. C / 38 % RH  
Engineer Junya Okuno  
(Above 30 MHz)  
Mode Mode 1 with Tag

Limit : FCC15.209 3 m, below 1 GHz:QP, above 1 GHz:AV/PK



| No. | Freq.<br>[MHz] | Reading<br>[QP]<br>[dBuV] | Ant Fac<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[QP]<br>[dBuV/m] | Limit<br>[QP]<br>[dBuV/m] | Margn<br>[QP]<br>[dB] | Pola.<br>[H/V] | Height<br>[cm] | Angle<br>[deg] | Ant.<br>Type | Comment     |
|-----|----------------|---------------------------|-------------------|--------------|--------------|----------------------------|---------------------------|-----------------------|----------------|----------------|----------------|--------------|-------------|
|     |                |                           |                   |              |              |                            |                           |                       |                |                |                |              |             |
| 1   | 121.457        | 28.90                     | 12.90             | 8.87         | 39.09        | 11.58                      | 43.50                     | 31.92                 | Hori.          | 121            | 54             | BA           |             |
| 2   | 133.962        | 30.00                     | 13.97             | 9.04         | 39.10        | 13.91                      | 43.50                     | 29.59                 | Hori.          | 110            | 12             | BA           |             |
| 3   | 140.645        | 36.10                     | 14.46             | 9.12         | 39.10        | 20.58                      | 43.50                     | 22.92                 | Hori.          | 115            | 7              | BA           |             |
| 4   | 230.516        | 40.88                     | 11.29             | 10.08        | 39.04        | 23.21                      | 46.00                     | 22.79                 | Hori.          | 100            | 291            | LA20         |             |
| 5   | 352.550        | 44.20                     | 15.01             | 11.15        | 38.75        | 31.61                      | 46.00                     | 14.39                 | Hori.          | 100            | 294            | LA20         |             |
| 6   | 352.550        | 44.00                     | 15.01             | 11.15        | 38.75        | 31.41                      | 46.00                     | 14.59                 | Hori.          | 100            | 294            | LA20         | without Tag |
| 7   | 379.684        | 43.10                     | 15.19             | 11.36        | 38.67        | 30.98                      | 46.00                     | 15.02                 | Hori.          | 100            | 294            | LA20         |             |
| 8   | 406.800        | 42.10                     | 15.88             | 11.58        | 38.61        | 30.95                      | 46.00                     | 15.05                 | Hori.          | 100            | 297            | LA20         |             |
| 9   | 121.457        | 30.10                     | 12.90             | 8.87         | 39.09        | 12.78                      | 43.50                     | 30.72                 | Vert.          | 133            | 9              | BA           |             |
| 10  | 133.962        | 33.20                     | 13.97             | 9.04         | 39.10        | 17.11                      | 43.50                     | 26.39                 | Vert.          | 121            | 31             | BA           |             |
| 11  | 140.645        | 39.00                     | 14.46             | 9.12         | 39.10        | 23.48                      | 43.50                     | 20.02                 | Vert.          | 105            | 29             | BA           |             |
| 12  | 230.516        | 31.70                     | 11.29             | 10.08        | 39.04        | 14.03                      | 46.00                     | 31.97                 | Vert.          | 134            | 10             | LA20         |             |
| 13  | 352.550        | 40.80                     | 15.01             | 11.15        | 38.75        | 28.21                      | 46.00                     | 17.79                 | Vert.          | 100            | 244            | LA20         |             |
| 14  | 379.684        | 38.60                     | 15.19             | 11.36        | 38.67        | 26.48                      | 46.00                     | 19.52                 | Vert.          | 129            | 251            | LA20         |             |
| 15  | 407.419        | 39.80                     | 15.89             | 11.58        | 38.61        | 28.66                      | 46.00                     | 17.34                 | Vert.          | 100            | 8              | LA20         |             |

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

**UL Japan, Inc.**

**Ise EMC Lab.**

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

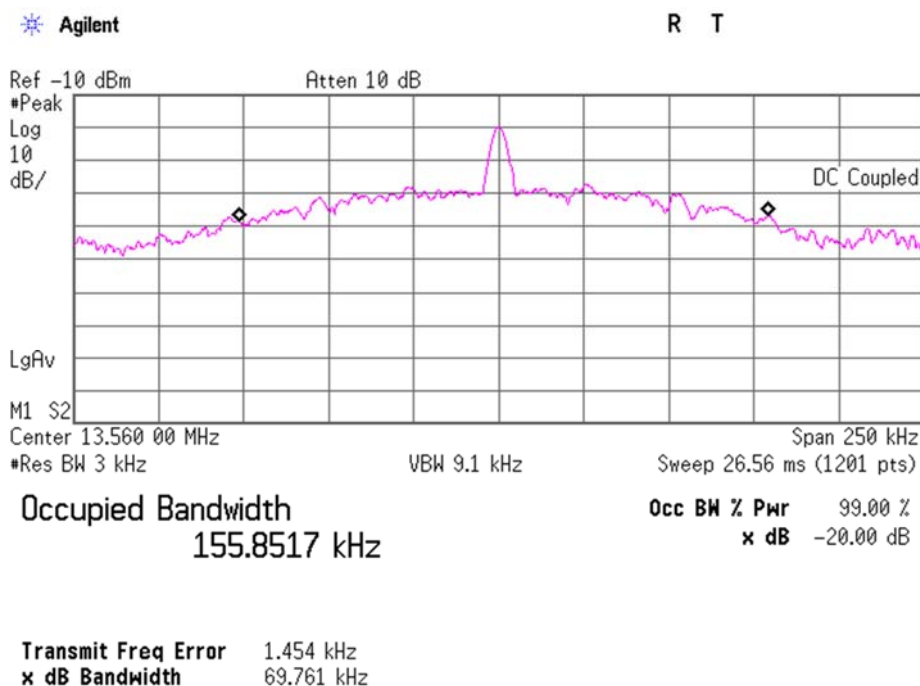
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## 20dB Bandwidth and 99% Occupied Bandwidth

|                        |                     |
|------------------------|---------------------|
| Report No.             | 12821185H           |
| Test place             | Ise EMC Lab.        |
| Semi Anechoic Chamber  | No.6                |
| Date                   | July 12, 2019       |
| Temperature / Humidity | 25 deg. C / 46 % RH |
| Engineer               | Junya Okuno         |
| Mode                   | Mode 1 with Tag     |

| FREQ<br>[MHz] | 20dB Bandwidth<br>[kHz] | 99% Occupied Bandwidth<br>[kHz] |
|---------------|-------------------------|---------------------------------|
| 13.56         | 69.761                  | 155.8517                        |



## Frequency Tolerance

Report No. 12821185H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.6  
Date July 12, 2019  
Temperature / Humidity 25 deg. C / 46 % RH  
Engineer Junya Okuno  
Mode Mode 1 with Tag

| Test condition<br>Temp.<br>[deg. C] | Voltage<br>[V]     | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit |
|-------------------------------------|--------------------|------------------|--------------------------------|-----------------------------|----------|-------|-------|
|                                     |                    |                  |                                |                             | [%]      | [ppm] |       |
| 50                                  | 120                | Power on         | 13.559944                      | -0.000056                   | -0.00041 | -4.1  | 0.01  |
|                                     |                    | + 2 min.         | 13.559930                      | -0.000070                   | -0.00051 | -5.1  | 0.01  |
|                                     |                    | + 5 min.         | 13.559928                      | -0.000072                   | -0.00053 | -5.3  | 0.01  |
|                                     |                    | + 10 min.        | 13.559927                      | -0.000073                   | -0.00054 | -5.4  | 0.01  |
| 40                                  | 120                | Power on         | 13.559951                      | -0.000049                   | -0.00036 | -3.6  | 0.01  |
|                                     |                    | + 2 min.         | 13.559967                      | -0.000033                   | -0.00025 | -2.5  | 0.01  |
|                                     |                    | + 5 min.         | 13.559943                      | -0.000057                   | -0.00042 | -4.2  | 0.01  |
|                                     |                    | + 10 min.        | 13.559943                      | -0.000057                   | -0.00042 | -4.2  | 0.01  |
| 30                                  | 120                | Power on         | 13.559968                      | -0.000032                   | -0.00023 | -2.3  | 0.01  |
|                                     |                    | + 2 min.         | 13.559968                      | -0.000032                   | -0.00024 | -2.4  | 0.01  |
|                                     |                    | + 5 min.         | 13.559962                      | -0.000038                   | -0.00028 | -2.8  | 0.01  |
|                                     |                    | + 10 min.        | 13.559962                      | -0.000038                   | -0.00028 | -2.8  | 0.01  |
| 20                                  | 120                | Power on         | 13.560040                      | 0.000040                    | 0.00029  | 2.9   | 0.01  |
|                                     |                    | + 2 min.         | 13.560037                      | 0.000037                    | 0.00027  | 2.7   | 0.01  |
|                                     |                    | + 5 min.         | 13.560059                      | 0.000059                    | 0.00044  | 4.4   | 0.01  |
|                                     |                    | + 10 min.        | 13.560036                      | 0.000036                    | 0.00027  | 2.7   | 0.01  |
| 20                                  | 102<br>(120V -15%) | Power on         | 13.559999                      | -0.000001                   | -0.00001 | -0.1  | 0.01  |
|                                     |                    | + 2 min.         | 13.559996                      | -0.000004                   | -0.00003 | -0.3  | 0.01  |
|                                     |                    | + 5 min.         | 13.559957                      | -0.000043                   | -0.00031 | -3.1  | 0.01  |
|                                     |                    | + 10 min.        | 13.559997                      | -0.000003                   | -0.00002 | -0.2  | 0.01  |
| 20                                  | 138<br>(120V +15%) | Power on         | 13.560050                      | 0.000050                    | 0.00037  | 3.7   | 0.01  |
|                                     |                    | + 2 min.         | 13.560037                      | 0.000037                    | 0.00027  | 2.7   | 0.01  |
|                                     |                    | + 5 min.         | 13.560028                      | 0.000028                    | 0.00020  | 2.0   | 0.01  |
|                                     |                    | + 10 min.        | 13.560050                      | 0.000050                    | 0.00037  | 3.7   | 0.01  |
| 10                                  | 120                | Power on         | 13.560051                      | 0.000051                    | 0.00038  | 3.8   | 0.01  |
|                                     |                    | + 2 min.         | 13.560019                      | 0.000019                    | 0.00014  | 1.4   | 0.01  |
|                                     |                    | + 5 min.         | 13.560041                      | 0.000041                    | 0.00030  | 3.0   | 0.01  |
|                                     |                    | + 10 min.        | 13.560050                      | 0.000050                    | 0.00037  | 3.7   | 0.01  |
| 0                                   | 120                | Power on         | 13.560038                      | 0.000038                    | 0.00028  | 2.8   | 0.01  |
|                                     |                    | + 2 min.         | 13.560051                      | 0.000051                    | 0.00037  | 3.7   | 0.01  |
|                                     |                    | + 5 min.         | 13.560037                      | 0.000037                    | 0.00027  | 2.7   | 0.01  |
|                                     |                    | + 10 min.        | 13.560036                      | 0.000036                    | 0.00027  | 2.7   | 0.01  |
| -10                                 | 120                | Power on         | 13.560057                      | 0.000057                    | 0.00042  | 4.2   | 0.01  |
|                                     |                    | + 2 min.         | 13.560038                      | 0.000038                    | 0.00028  | 2.8   | 0.01  |
|                                     |                    | + 5 min.         | 13.560039                      | 0.000039                    | 0.00029  | 2.9   | 0.01  |
|                                     |                    | + 10 min.        | 13.560045                      | 0.000045                    | 0.00033  | 3.3   | 0.01  |
| -20                                 | 120                | Power on         | 13.560012                      | 0.000012                    | 0.00009  | 0.9   | 0.01  |
|                                     |                    | + 2 min.         | 13.560012                      | 0.000012                    | 0.00009  | 0.9   | 0.01  |
|                                     |                    | + 5 min.         | 13.560032                      | 0.000032                    | 0.00024  | 2.4   | 0.01  |
|                                     |                    | + 10 min.        | 13.560025                      | 0.000025                    | 0.00018  | 1.8   | 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.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## APPENDIX 2: Test instruments

### Test Instruments

| Test item | LIMS ID | Description                      | Manufacturer             | Model                              | Serial             | Last Calibration Date | Calibration Due Date | Cal Int |
|-----------|---------|----------------------------------|--------------------------|------------------------------------|--------------------|-----------------------|----------------------|---------|
| CE        | 141922  | Terminator                       | TME                      | Termination                        | -                  | 09/06/2018            | 09/30/2019           | 12      |
| CE        | 141358  | LISN(AMN)                        | Schwarzbeck              | NSLK8127                           | 8127-730           | 07/05/2019            | 07/31/2020           | 12      |
| CE        | 141357  | LISN(AMN)                        | Schwarzbeck              | NSLK8127                           | 8127-729           | 07/05/2019            | 07/31/2020           | 12      |
| CE        | 141247  | Attenuator(13dB)                 | JFW Industries, Inc.     | 50FP-013H2 N                       | -                  | 12/06/2018            | 12/31/2019           | 12      |
| RE        | 142008  | AC3_Semi Anechoic Chamber(NSA)   | TDK                      | Semi Anechoic Chamber 3m           | DA-10005           | 06/26/2018            | 06/30/2020           | 24      |
| RE        | 141949  | Test Receiver                    | Rohde & Schwarz          | ESCI                               | 100767             | 08/06/2018            | 08/31/2019<br>*1)    | 12      |
| RE        | 141554  | Thermo-Hygrometer                | CUSTOM                   | CTH-180                            | 1301               | 01/11/2019            | 01/31/2020           | 12      |
| RE        | 141901  | Spectrum Analyzer                | AGILENT                  | E4440A                             | MY48250080         | 10/04/2018            | 10/31/2019<br>*1)    | 12      |
| RE        | 141213  | Attenuator(6dB)                  | Weinschel Corp           | 2                                  | BK7971             | 11/05/2018            | 11/30/2019           | 12      |
| RE        | 141198  | Biconical Antenna                | Schwarzbeck              | BBA9106                            | 2513               | 04/12/2019            | 04/30/2020           | 12      |
| RE        | 141350  | Coaxial Cable                    | Suhner/storm/Agilent/TSJ | -                                  | -                  | 06/27/2019            | 06/30/2020           | 12      |
| RE        | 141264  | Logperiodic Antenna(200-1000MHz) | Schwarzbeck              | VUSLP9111B                         | 911B-189           | 03/21/2019            | 03/30/2020           | 12      |
| RE        | 142226  | Measure                          | KOMELON                  | KMC-36                             | -                  | -                     | -                    | -       |
| RE        | 141585  | Pre Amplifier                    | MITEQ                    | MLA-10K01-B01-35                   | 1237616            | 02/08/2019            | 02/29/2020           | 12      |
| RE        | 141413  | Coaxial Cable                    | UL Japan                 | -                                  | -                  | 06/07/2019            | 06/30/2020           | 12      |
| RE        | 141216  | Coaxial cable                    | Fujikura/Suhner/TSJ      | 5D-2W/SFM14/sucoform141-PE/421-010 | -/00640            | 07/02/2019            | 07/31/2020           | 12      |
| RE        | 141254  | Loop Antenna                     | Rohde & Schwarz          | HFH2-Z2                            | 100017             | 10/11/2018            | 10/31/2019<br>*1)    | 12      |
| RE        | 141583  | Pre Amplifier                    | SONOMA INSTRUMENT        | 310                                | 260833             | 02/08/2019            | 02/29/2020           | 12      |
| RE/CE     | 141152  | EMI measurement program          | TSJ                      | TEPTO-DV                           | -                  | -                     | -                    | -       |
| RE/CE     | 141950  | EMI Test Receiver                | Rohde & Schwarz          | ESU26                              | 100412             | 06/27/2019            | 06/30/2020           | 12      |
| RE/CE     | 141530  | Digital Tester                   | Fluke Corporation        | FLUKE 26-3                         | 78030621           | 08/21/2018            | 08/31/2019<br>*1)    | 12      |
| RE/CE     | 141998  | AC1_Semi Anechoic Chamber(NSA)   | TDK                      | Semi Anechoic Chamber 10m          | DA-06881           | 06/18/2018            | 06/30/2020           | 24      |
| RE/CE     | 141566  | Thermo-Hygrometer                | CUSTOM                   | CTH-201                            | A08Q26             | 01/11/2019            | 01/31/2020           | 12      |
| RE/CE     | 141215  | Coaxial Cable                    | Fujikura/Suhner/TSJ      | 5D-2W/3D-2W/RG400u/RFM-E421(SW)    | -/01068 (Switcher) | 06/27/2019            | 06/30/2020           | 12      |
| FT        | 141492  | Electric Field Probe             | HOLADAY EMF MEASUREMENT  | HI-6005                            | 00035598           | 09/13/2018            | 09/30/2019           | 12      |
| FT        | 141547  | DIGITAL HiTESTER                 | HIOKI                    | 3805                               | 60500120           | 02/25/2019            | 02/29/2020           | 12      |
| FT        | 141903  | Spectrum Analyzer                | AGILENT                  | E4440A                             | MY46186390         | 09/20/2018            | 09/30/2019           | 12      |
| FT        | 141561  | Thermo-Hygrometer                | CUSTOM                   | CTH-201                            | 1401               | 01/11/2019            | 01/31/2020           | 12      |

\*1) This test equipment was used for the tests before the expiration date of the calibration.

\*Hyphens for Last Calibration Date, Calibration Due 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.

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

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

Test item:

CE: Conducted Emission,  
RE: Radiated Emission,  
FT: Frequency Tolerance

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124