



# **RADIO TEST REPORT**

**Test Report No. : 11299554M-A**

**Applicant** : Oki Data Corporation  
**Type of Equipment** : Embedded RFID Read/Write System  
**Model No.** : 4465875A  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**FCC ID** : B2K-4465875A  
**Test Result** : Complied

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)

**Date of test:** July 19, 20, 26, 2016

**Representative  
test operator:**

*K. Ando*

Kazuhiro Ando  
Engineer  
Consumer Technology Division

**Approved by :**

*Kenichi Suda*

Kenichi Suda  
Manager  
Consumer Technology Division



CERTIFICATE 1266.01

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

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**Kashima EMC Lab.**

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13-EM-F0429 2016/01/11 Issue # 11.0

## REVISION HISTORY

**Original Test Report No.: 11299554M-A**

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| <b>CONTENTS</b>                                                                                  | <b>PAGE</b> |
|--------------------------------------------------------------------------------------------------|-------------|
| <b>SECTION 1: Customer information</b> .....                                                     | <b>4</b>    |
| <b>SECTION 2: Equipment under test (E.U.T.)</b> .....                                            | <b>4</b>    |
| <b>SECTION 3: Test specification, procedures &amp; results</b> .....                             | <b>5</b>    |
| <b>SECTION 4: Operation of E.U.T. during testing</b> .....                                       | <b>8</b>    |
| <b>SECTION 5: Conducted emission</b> .....                                                       | <b>11</b>   |
| <b>SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask)</b><br>..... | <b>12</b>   |
| <b>SECTION 7: Other test</b> .....                                                               | <b>13</b>   |
| <b>APPENDIX 1: Test data</b> .....                                                               | <b>14</b>   |
| Conducted emission .....                                                                         | 14          |
| Fundamental emission and Spectrum Mask .....                                                     | 15          |
| Spurious emission .....                                                                          | 19          |
| 20dB Bandwidth and 99% Occupied Bandwidth .....                                                  | 23          |
| Frequency Tolerance .....                                                                        | 25          |
| <b>APPENDIX 2: Test instruments</b> .....                                                        | <b>26</b>   |
| <b>APPENDIX 3: Photographs of test setup</b> .....                                               | <b>27</b>   |
| Conducted emission .....                                                                         | 27          |
| Radiated emission .....                                                                          | 28          |

## **SECTION 1: Customer information**

Company Name : Oki Data Corporation  
Address : 3-1, Futaba-cho, Takasaki-city, Gunma-Pref 370-8585, Japan  
Telephone Number : +81-27-328-6399  
Facsimile Number : +81-27-328-6396  
Contact Person : Hidetoshi Okazaki

## **SECTION 2: Equipment under test (E.U.T.)**

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

Type of Equipment : Embedded RFID Read/Write System  
Model No. : 4465875A  
Serial No. : Refer to Clause 4.2  
Rating : DC 5 V, 0.2 W  
Receipt Date of Sample : July 15, 2016  
Country of Mass-production : Thailand  
Condition of EUT : Production prototype  
(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: 4465875A (refer to as the EUT in this report) is an Embedded RFID Read/Write System which is built in a printer and is used for checking remaining amount of the toner.

### **General Specification**

Clock frequency(ies) in the system : 13.56 MHz

### **Radio Specification**

Equipment Type : Transceiver  
Frequency of Operation : 13.56 MHz  
Modulation : ASK  
Power Supply (inner) : DC 4.0 V  
Antenna type : Printed Loop Coil  
Antenna connector type : PH  
Operation temperature range : 0 deg. C. to +50 deg. C

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

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC part 15 final revised on April 6, 2016.

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

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

| Item                                                                       | Test Procedure                              | Specification                         | Worst margin                                       | Results  | Remarks  |
|----------------------------------------------------------------------------|---------------------------------------------|---------------------------------------|----------------------------------------------------|----------|----------|
| Conducted emission                                                         | ANSI C63.10:2013<br>6 Standard test methods | Section 15.207                        | [QP]<br>15.3 dB,<br>0.50459 MHz, L                 | Complied | -        |
|                                                                            | <IC>RSS-Gen 8.8                             | <IC>RSS-Gen 8.8                       | [AV]<br>14.3 dB,<br>0.25299 MHz, N                 |          |          |
| Electric Field Strength<br>of Fundamental<br>Emission                      | ANSI C63.10:2013<br>6 Standard test methods | Section 15.225(a)                     | 90.2 dB,<br>13.56000 MHz, QP,                      | Complied | Radiated |
|                                                                            | <IC> RSS-Gen 6.4, 6.12                      | <IC>RSS-210 A2.6                      | 0 deg.                                             |          |          |
| Spectrum Mask                                                              | ANSI C63.10:2013<br>6 Standard test methods | Section 15.225(b)(c)                  | 44.3 dB,<br>13.11000 MHz, QP,                      | Complied | Radiated |
|                                                                            | <IC>RSS-Gen 6.4, 6.13                       | <IC> RSS-210 A2.6                     | 0 deg.,<br>44.3 dB,<br>14.01000 MHz, QP,<br>0 deg. |          |          |
| 20dB Bandwidth                                                             | ANSI C63.10:2013<br>6 Standard test methods | Section15.215(c)                      | See data                                           | Complied | Radiated |
|                                                                            | <IC> -                                      | <IC> -                                |                                                    |          |          |
| Electric Field Strength<br>of Spurious Emission                            | ANSI C63.10:2013<br>6 Standard test methods | Section 15.209,<br>Section 15.225 (d) | 13.5 dB<br>298.320 MHz,<br>Horizontal, QP          | Complied | Radiated |
|                                                                            | <IC>RSS-Gen 6.4, 6.13                       | <IC>RSS-210 A2.6                      |                                                    |          |          |
| Frequency Tolerance                                                        | ANSI C63.10:2013<br>6 Standard test methods | Section 15.225(e)                     | See data                                           | Complied | Radiated |
|                                                                            | <IC>RSS-Gen 6.11, 8.11                      | <IC> RSS-210 A2.6                     |                                                    |          |          |
| Note: UL Japan, Inc.’s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422 |                                             |                                       |                                                    |          |          |

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

This EUT provides stable voltage (DC 4.0V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203/212 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 15.203/212.

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### 3.3 Addition to standard

| No. | Item                     | Test Procedure | Specification | Remarks  | Deviation | Worst margin | Results |
|-----|--------------------------|----------------|---------------|----------|-----------|--------------|---------|
| 1   | 99 % Occupied Band Width | RSS-Gen 6.6    | -             | Radiated | N/A       | N/A          | N/A     |

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

### 3.4 Uncertainty

#### EMI

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

| Test Items                                    | Frequency range  | Uncertainty(+/-) |
|-----------------------------------------------|------------------|------------------|
| Conducted emission (AC Mains) AMN             | 0.15 MHz-30 MHz  | 2.8 dB           |
| Radiated emission (Measurement distance: 3 m) | 0.009 MHz-30 MHz | 2.7 dB           |
|                                               | 30 MHz-1000 MHz  | 6.3 dB           |

#### Conducted emission test

The data listed in this test report has enough margin, more than the site margin.

#### Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

#### Frequency tolerance

Frequency Measurement uncertainty for this test was:  $(\pm) 7.9 \times 10^{-8}$

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### 3.5 Test Location

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A2LA Accreditation No. : 1266-01

|                             | IC Registration No. | Width x Depth x Height (m) | Size of reference ground plane/horizontal conducting plane (m) | Maximum measurement distance |
|-----------------------------|---------------------|----------------------------|----------------------------------------------------------------|------------------------------|
| No.1 Open site              | IC 4659A-1          | 6.0 x 5.5 x 2.5            | 20 x 40                                                        | 10 m                         |
| No.2 Open site              | IC 4659A-2          | 4.4 x 4.4 x 2.15           | 18 x 20                                                        | 10 m                         |
| No.5 Open site              | IC 4659A-5          | 8.6 x 7.1 x 2.4            | 18 x 23                                                        | 10 m                         |
| No.1 Shielded room          | IC 4659A-1          | 5.4 x 4.5 x 2.3            | -                                                              | -                            |
| No.2 Shielded room          | IC 4659A-2          | 3.6 x 2.7 x 2.3            | -                                                              | -                            |
| No.3 Shielded room          | -                   | 5.4 x 3.6 x 2.3            | -                                                              | -                            |
| No.4 Shielded Room          | -                   | 6.1 x 6.1 x 3.1            | -                                                              | -                            |
| No.5 Shielded Room          | IC 4659A-5          | 4.2 x 3.1 x 2.5            | -                                                              | -                            |
| No.3 Fully Anechoic Chamber | -                   | 7.0 x 3.5 x 3.5            | -                                                              | -                            |
| No.6 Semi-anechoic Chamber  | IC 4659A-6          | 8.5 x 5.5 x 5.2            | -                                                              | 3 m                          |
| No.10 Semi-anechoic Chamber | IC 4659A-10         | 18.4 x 9.9 x 7.7           | -                                                              | 10 m                         |
| No.11 Semi-anechoic Chamber | IC 4659A-7          | 9.0 x 6.5 x 5.2            | -                                                              | 3 m                          |
| No.1 Measurement room       | -                   | 5.0 x 3.7 x 2.6            | -                                                              | -                            |
| No.2 Measurement room       | -                   | 4.3 x 4.4 x 2.7            | -                                                              | -                            |
| No.3 Measurement room       | -                   | 4.5 x 5.3 x 2.7            | -                                                              | -                            |

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

Refer to APPENDIX.

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

### **4.1 Operating Modes**

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

| Test item                                 | Operating mode                                                                                                                                                                                                   | Tested frequency |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| All items except for Frequency tolerances | Transmitting and Receiving mode (with Tag, without Tag)<br><br>• Modulation ASK10%<br>• Data transfer rate 106kbps<br>• 4ch serially transmitting<br>(Continuous Transmitting with switching 4 antenna in order) | 13.56MHz         |
| Frequency tolerances                      | Transmitting Unmodulated                                                                                                                                                                                         | 13.56MHz         |

The EUT has the power settings by the software as follows;

Power settings: High Power, Low Power \*1)

Software : Emi-4Ch-1Tag AFE-TP7 v4.70

\*1) There is Low Power setting for a security.

The Low Power setting test was performed only Electric Field Strength of Fundamental Emission.

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

Frequency Tolerance:

Temperature : -20 deg. C to +50 deg. C Step 10 deg. C

Voltage : Normal Voltage DC 5.0 V

Maximum Voltage DC 5.75 V, Minimum Voltage DC 4.25 V (DC 5.0 V  $\pm 15\%$ )

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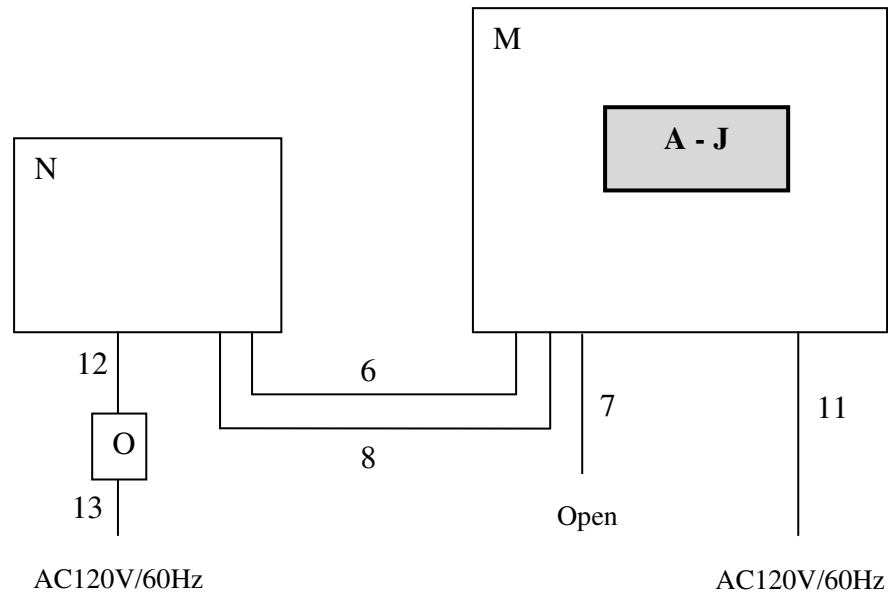
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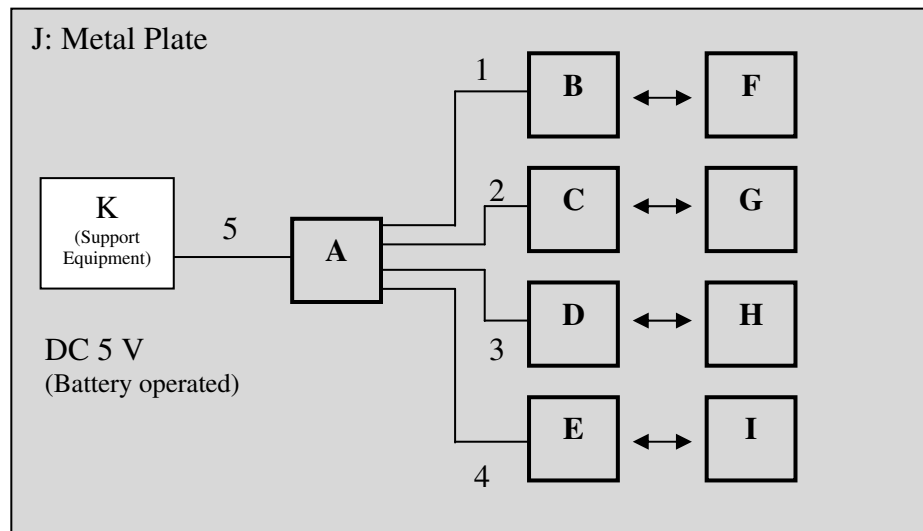
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## 4.2 Configuration and peripherals

### Conducted Emissions



### Radiated Emissions



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

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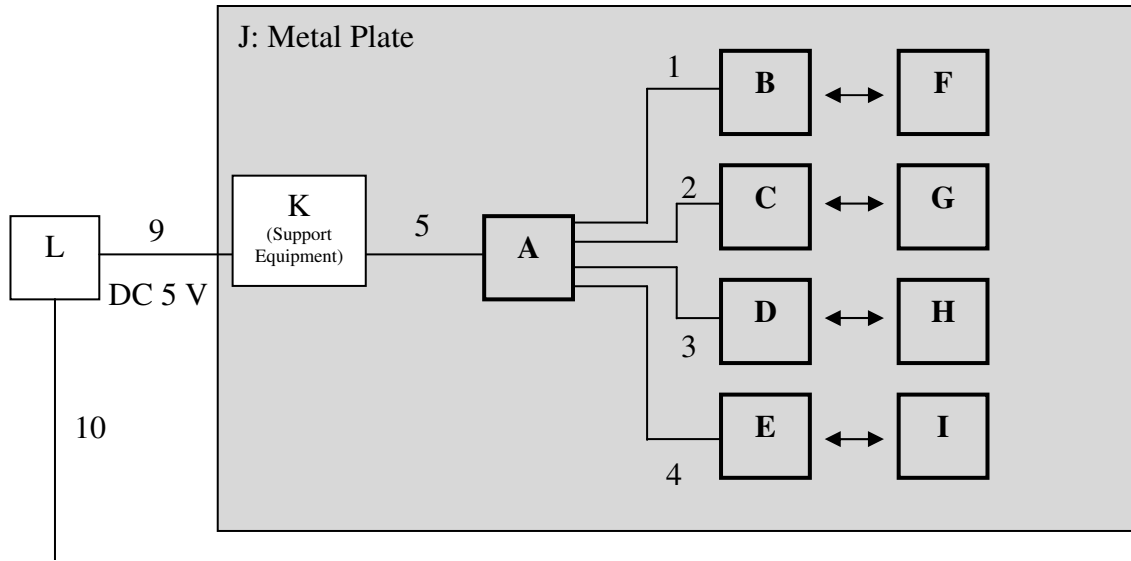
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Frequency stability Test condition



AC100V/50Hz

**Description of EUT and support equipment**

| No. | Item                    | Model number | Serial number              | Manufacturer         | Remarks                                                                |
|-----|-------------------------|--------------|----------------------------|----------------------|------------------------------------------------------------------------|
| A   | RFID Module             | 4465875A     | *1)                        | Oki Data Corporation | EUT                                                                    |
| B-E | Antenna Unit            | -            | -                          | Oki Data Corporation | EUT                                                                    |
| F-I | Tag                     | -            | -                          | Oki Data Corporation | EUT<br>Internal coil size:<br>15[mm]*20[mm]<br>Internal coil turns: 13 |
| J   | Metal Plate             | -            | -                          | Oki Data Corporation | EUT                                                                    |
| K   | Micro-Computer for Test | None         | None                       | Oki Data Corporation | Support equipment                                                      |
| L   | DC Power Supply         | PAD35-10L    | 1900700                    | KIKUSUI              | -                                                                      |
| M   | Printer                 | N31194A      | BETA100004A0               | Oki Data Corporation | -                                                                      |
| N   | PC                      | 3358-3VJ     | LR-L593L                   | lenovo               | -                                                                      |
| O   | AC Adapter              | 45N0121      | 11S45N0121Z1Z<br>HXU27RA9U | lenovo               | -                                                                      |

\*1) WMM16270013: Conducted emission test, WMM16270012: Other tests

**List of cables used**

| No. | Item            | Length(m) | Shield     |            | Remarks         |
|-----|-----------------|-----------|------------|------------|-----------------|
|     |                 |           | Cable      | Connector  |                 |
| 1   | Antenna cable 0 | 0.140     | Unshielded | Unshielded | 46407201YS      |
| 2   | Antenna cable 1 | 0.075     | Unshielded | Unshielded | 46407201YS      |
| 3   | Antenna cable 2 | 0.075     | Unshielded | Unshielded | 46407201YS      |
| 4   | Antenna cable 3 | 0.140     | Unshielded | Unshielded | 46407201YS      |
| 5   | Signal          | 0.907     | Unshielded | Unshielded | -               |
| 6   | USB             | 2.0       | Shielded   | Shielded   | -               |
| 7   | USB             | 2.0       | Shielded   | Shielded   | -               |
| 8   | LAN             | 3.0       | Unshielded | Unshielded | -               |
| 9   | DC              | 0.5       | Unshielded | Unshielded | -               |
| 10  | AC              | 3.0       | Unshielded | Unshielded | DC Power Supply |
| 11  | AC              | 1.8       | Unshielded | Unshielded | Printer         |
| 12  | DC              | 1.7       | Unshielded | Unshielded | AC Adapter      |
| 13  | AC              | 0.8       | Unshielded | Unshielded | AC Adapter      |

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## **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.

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.

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 - 30 MHz</b> |
| <b>Test data</b>         | <b>: APPENDIX</b>          |
| <b>Test result</b>       | <b>: Pass</b>              |

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

### Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency: From 9 kHz to 30 MHz

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

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., 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 1 GHz |
| Antenna Type | Loop         | Hybrid          |

|                 |                                                  |                        |                         |                        |                      |
|-----------------|--------------------------------------------------|------------------------|-------------------------|------------------------|----------------------|
| 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 937606.

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.

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**

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## SECTION 7: Other test

| Test                    | Span                                    | RBW             | VBW                | Sweep | Detector | Trace        | Instrument used   |
|-------------------------|-----------------------------------------|-----------------|--------------------|-------|----------|--------------|-------------------|
| 20 dB Bandwidth         | 50 kHz                                  | 1 kHz           | 3 kHz              | Auto  | Peak     | Max Hold     | Spectrum Analyzer |
| 99 % Occupied Bandwidth | Enough width to display emission skirts | 1 to 5 % of OBW | Three times of RBW | Auto  | Peak *1) | Max Hold *2) | Spectrum Analyzer |
| Frequency Tolerance*3)  | -                                       | -               | -                  | -     | -        | -            | Frequency counter |

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

\*2) The measurement was performed with Max Hold since the duty cycle was not 100 %.

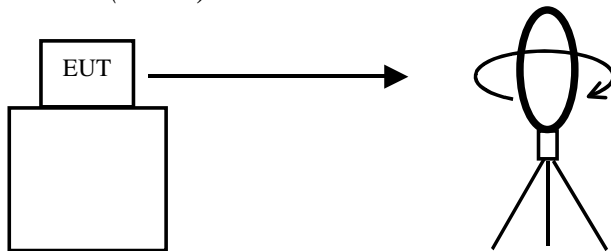
\*3) The temperature test was started after the temperature stabilization time of 30 minutes.

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

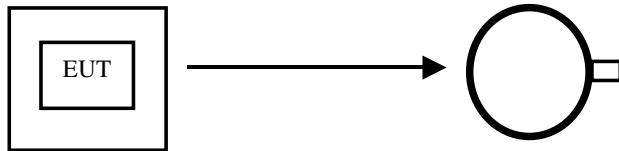
Test data : APPENDIX  
Test result : Pass

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

*Side View (Vertical)*

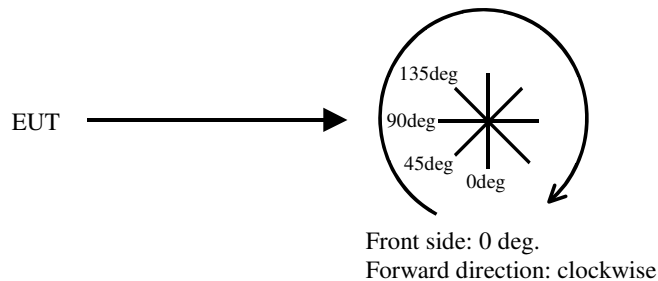


*Top View (Horizontal)*



Antenna was not rotated.

*Top View (Vertical)*



## APPENDIX 1: Test data

### Conducted emission

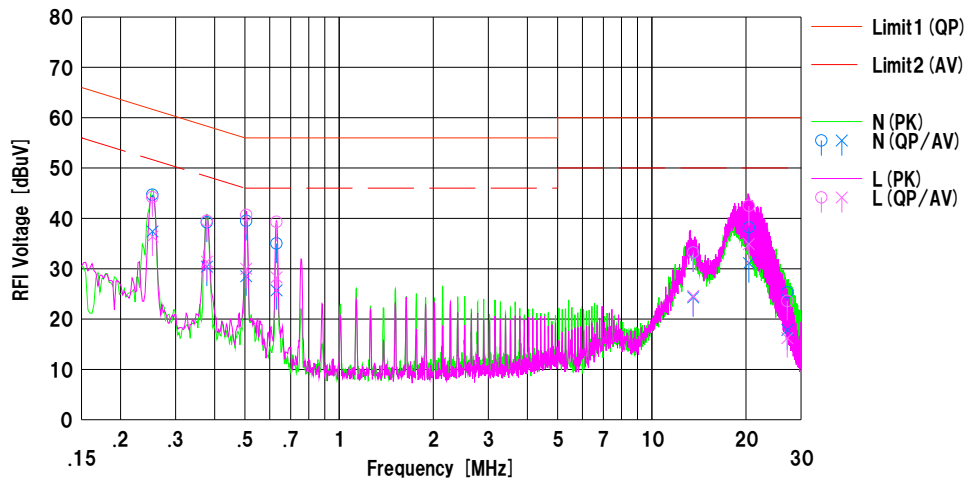
## DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/20

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V (Printer AC120V/60Hz)  
Temp./Humi. : 23deg.C / 50%RH

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Tested by : Kazuhiro Ando



| No. | Freq.<br>[MHz] | Reading        |                | C.Fac | 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   | 0.25299        | 34.5           | 27.2           | 10.2  | 44.7           | 37.4           | 61.7           | 51.7           | 17.0         | 14.3         | N     |         |
| 2   | 0.37783        | 29.0           | 20.2           | 10.2  | 39.2           | 30.4           | 58.3           | 48.3           | 19.1         | 17.9         | N     |         |
| 3   | 0.50459        | 29.3           | 18.3           | 10.2  | 39.5           | 28.5           | 56.0           | 46.0           | 16.5         | 17.5         | N     |         |
| 4   | 0.63070        | 24.7           | 15.4           | 10.3  | 35.0           | 25.7           | 56.0           | 46.0           | 21.0         | 20.3         | N     |         |
| 5   | 13.56000       | 21.7           | 12.8           | 11.5  | 33.2           | 24.3           | 60.0           | 50.0           | 26.8         | 25.7         | N     |         |
| 6   | 20.43426       | 26.2           | 19.1           | 12.0  | 38.2           | 31.1           | 60.0           | 50.0           | 21.8         | 18.9         | N     |         |
| 7   | 27.12000       | 13.0           | 5.5            | 12.3  | 25.3           | 17.8           | 60.0           | 50.0           | 34.7         | 32.2         | N     |         |
| 8   | 0.25299        | 34.0           | 26.2           | 10.2  | 44.2           | 36.4           | 61.7           | 51.7           | 17.5         | 15.3         | L     |         |
| 9   | 0.37783        | 29.3           | 21.2           | 10.2  | 39.5           | 31.4           | 58.3           | 48.3           | 18.8         | 16.9         | L     |         |
| 10  | 0.50459        | 30.5           | 19.8           | 10.2  | 40.7           | 30.0           | 56.0           | 46.0           | 15.3         | 16.0         | L     |         |
| 11  | 0.63070        | 29.0           | 18.0           | 10.3  | 39.3           | 28.3           | 56.0           | 46.0           | 16.7         | 17.7         | L     |         |
| 12  | 13.56000       | 21.7           | 13.1           | 11.5  | 33.2           | 24.6           | 60.0           | 50.0           | 26.8         | 25.4         | L     |         |
| 13  | 20.43426       | 30.5           | 22.9           | 12.0  | 42.5           | 34.9           | 60.0           | 50.0           | 17.5         | 15.1         | L     |         |
| 14  | 27.12000       | 11.3           | 3.9            | 12.3  | 23.6           | 16.2           | 60.0           | 50.0           | 36.4         | 33.8         | L     |         |

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN:CLS-07

## Fundamental emission and Spectrum Mask

(with tag, High power)

### DATA OF RADIATED EMISSION (below 30MHz) TEST

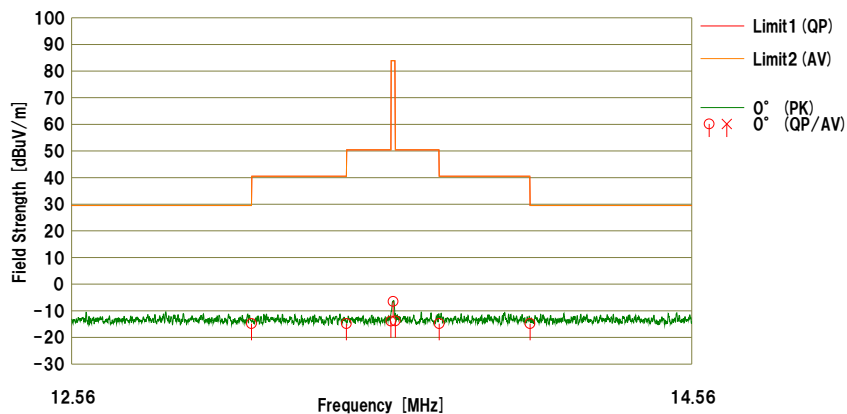
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : with tag

Limit 1 : FCC15.225\_PKQP, 9-90kHz:PK, 110-490kHz:PK  
Limit 2 : FCC15.225\_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



| 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   | 13.11000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 65             |         |
| 2   | 13.41000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 65             |         |
| 3   | 13.55300       | 37.9           | ---            | 19.7              | -39.2        | 32.3         | -13.9            | ---              | 50.4             | 50.4             | 64.3         | ---          | 0°               | 65             |         |
| 4   | 13.56000       | 45.3           | ---            | 19.7              | -39.2        | 32.3         | -6.5             | ---              | 83.9             | 83.9             | 90.4         | ---          | 0°               | 65             |         |
| 5   | 13.56700       | 38.0           | ---            | 19.7              | -39.2        | 32.3         | -13.8            | ---              | 50.4             | 50.4             | 64.2         | ---          | 0°               | 65             |         |
| 6   | 13.71000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 65             |         |
| 7   | 14.01000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 65             |         |

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]  
Ant.Type=LOOP: Loop Antenna

#### 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      |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0             | 13.56000           | QP       | 45.3              | 19.7                    | 0.8          | 32.3         | -                      | 33.5               | -                 | -              | Fundamental |

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

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## Fundamental emission and Spectrum Mask

(without tag, High power)

### DATA OF RADIATED EMISSION (below 30MHz) TEST

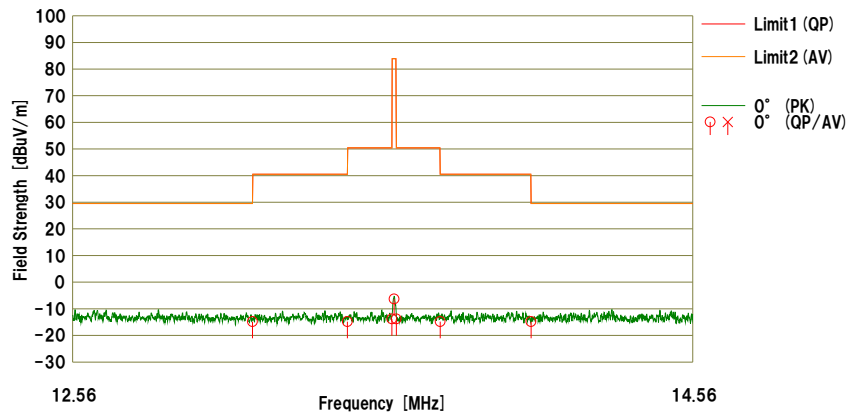
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag

Limit 1 : FCC15.225\_PKQP, 9-90kHz:PK, 110-490kHz:PK  
Limit 2 : FCC15.225\_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



| 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   | 13.11000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 80             |         |
| 2   | 13.41000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 80             |         |
| 3   | 13.55300       | 38.0           | ---            | 19.7              | -39.2        | 32.3         | -13.8            | ---              | 50.4             | 50.4             | 64.2         | ---          | 0°               | 80             |         |
| 4   | 13.56000       | 45.5           | ---            | 19.7              | -39.2        | 32.3         | -6.3             | ---              | 83.9             | 83.9             | 90.2         | ---          | 0°               | 80             |         |
| 5   | 13.56700       | 38.0           | ---            | 19.7              | -39.2        | 32.3         | -13.8            | ---              | 50.4             | 50.4             | 64.2         | ---          | 0°               | 80             |         |
| 6   | 13.71000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 80             |         |
| 7   | 14.01000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 80             |         |

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]  
Ant.Type=LOOP: Loop Antenna

#### 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      |
|---------------|--------------------|----------|-------------------|-------------------------|--------------|--------------|------------------------|--------------------|-------------------|----------------|-------------|
| 0             | 13.56000           | QP       | 45.5              | 19.7                    | 0.8          | 32.3         | -                      | 33.7               | -                 | -              | Fundamental |

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

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## Fundamental emission and Spectrum Mask

(with tag, Low power)

### DATA OF RADIATED EMISSION (below 30MHz) TEST

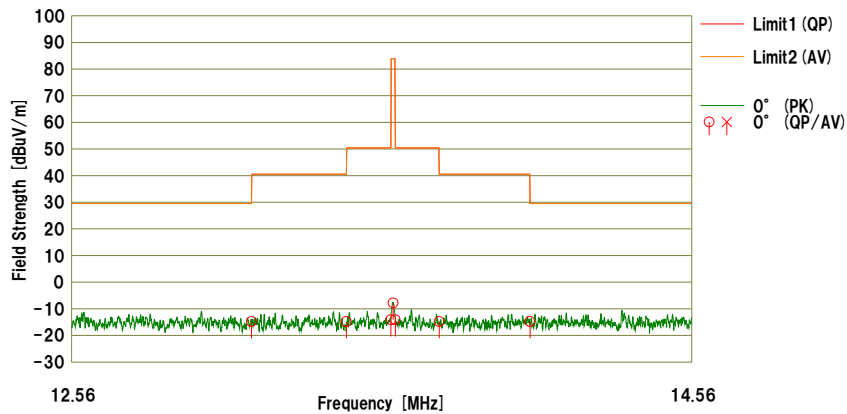
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : with tag (Low Power mode)

Limit 1 : FCC15.225\_PKQP, 9-90kHz:PK, 110-490kHz:PK  
Limit 2 : FCC15.225\_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



| 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   | 13.11000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 70             |         |
| 2   | 13.41000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 70             |         |
| 3   | 13.55300       | 37.7           | ---            | 19.7              | -39.2        | 32.3         | -14.1            | ---              | 50.4             | 50.4             | 64.5         | ---          | 0°               | 70             |         |
| 4   | 13.56000       | 44.0           | ---            | 19.7              | -39.2        | 32.3         | -7.8             | ---              | 83.9             | 83.9             | 91.7         | ---          | 0°               | 70             |         |
| 5   | 13.56700       | 37.7           | ---            | 19.7              | -39.2        | 32.3         | -14.1            | ---              | 50.4             | 50.4             | 64.5         | ---          | 0°               | 70             |         |
| 6   | 13.71000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 70             |         |
| 7   | 14.01000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 70             |         |

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]  
Ant.Type=LOOP: Loop Antenna

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

QP

| Ant Deg [deg] | Frequency | Detector | Reading | Ant Factor | Loss | Gain | Duty Factor | Result   | Limit    | Margin | Remark      |
|---------------|-----------|----------|---------|------------|------|------|-------------|----------|----------|--------|-------------|
|               | [MHz]     |          | [dBuV]  | [dB/m]     | [dB] | [dB] | [dB]        | [dBuV/m] | [dBuV/m] | [dB]   |             |
| 0             | 13.56000  | QP       | 44.0    | 19.7       | 0.8  | 32.3 | -           | 32.2     | -        | -      | Fundamental |

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

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## Fundamental emission and Spectrum Mask

(without tag, Low power)

### DATA OF RADIATED EMISSION (below 30MHz) TEST

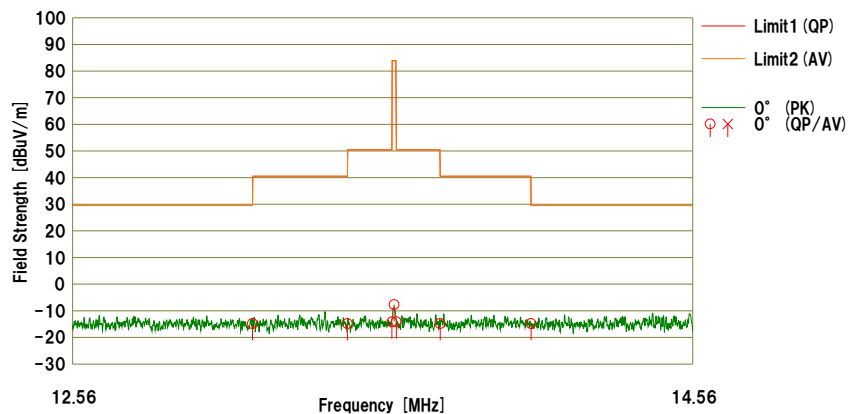
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag (Low Power mode)

Limit 1 : FCC15.225\_PKQP, 9-90kHz:PK, 110-490kHz:PK  
Limit 2 : FCC15.225\_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



| 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   | 13.11000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 80             |         |
| 2   | 13.41000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 80             |         |
| 3   | 13.55300       | 37.6           | ---            | 19.7              | -39.2        | 32.3         | -14.2            | ---              | 50.4             | 50.4             | 64.6         | ---          | 0°               | 80             |         |
| 4   | 13.56000       | 44.1           | ---            | 19.7              | -39.2        | 32.3         | -7.7             | ---              | 83.9             | 83.9             | 91.6         | ---          | 0°               | 80             |         |
| 5   | 13.56700       | 37.7           | ---            | 19.7              | -39.2        | 32.3         | -14.1            | ---              | 50.4             | 50.4             | 64.5         | ---          | 0°               | 80             |         |
| 6   | 13.71000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 40.5             | 40.5             | 55.3         | ---          | 0°               | 80             |         |
| 7   | 14.01000       | 37.0           | ---            | 19.7              | -39.2        | 32.3         | -14.8            | ---              | 29.5             | 29.5             | 44.3         | ---          | 0°               | 80             |         |

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]  
Ant.Type=LOOP: Loop Antenna

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

QP

| Ant Deg [deg] | Frequency | Detector | Reading | Ant Factor | Loss | Gain | Duty Factor | Result   | Limit    | Margin | Remark      |
|---------------|-----------|----------|---------|------------|------|------|-------------|----------|----------|--------|-------------|
|               | [MHz]     |          | [dBuV]  | [dB/m]     | [dB] | [dB] | [dB]        | [dBuV/m] | [dBuV/m] | [dB]   |             |
| 0             | 13.56000  | QP       | 44.1    | 19.7       | 0.8  | 32.3 | -           | 32.3     | -        | -      | Fundamental |

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

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**Spurious emission**  
(with tag)

**DATA OF RADIATED EMISSION (below 30MHz) TEST**

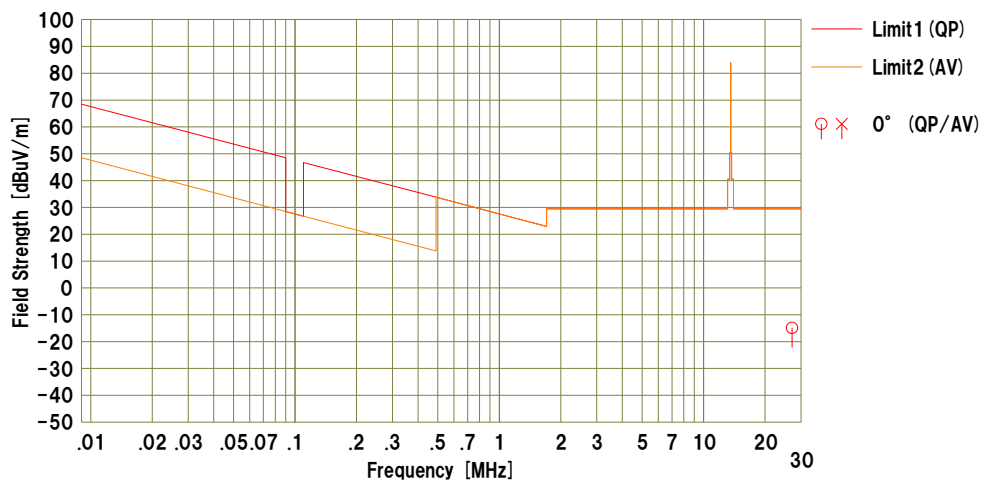
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : with tag

Limit1 : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK  
Limit2 : FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



| No. | Freq.<br>[MHz] | Reading        |                | Ant.Fac<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result           |                  | Limit            |                  | Margin       |              | Antenna | Table | 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       | 35.7           | ---            | 20.5              | -38.8        | 32.3         | -14.9            | ---              | 29.5             | 29.5             | 44.4         | ---          | 0°      | 58    | Floor noise |

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]  
Ant.Type=LOOP:Loop Antenna

**Spurious emission**  
(without tag)

**DATA OF RADIATED EMISSION (below 30MHz) TEST**

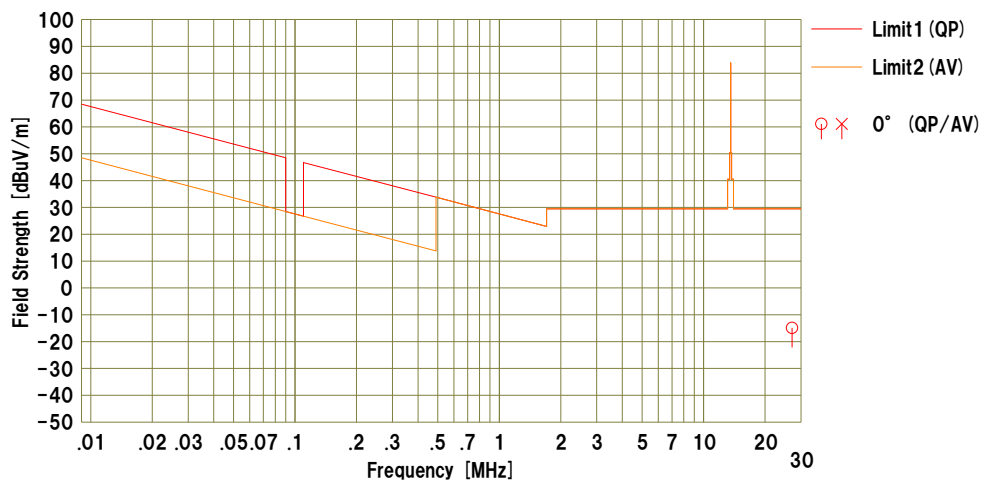
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag

Limit1 : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK  
Limit2 : FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



| 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       | 35.7           | ---            | 20.5              | -38.8        | 32.3         | -14.9            | ---              | 29.5             | 29.5             | 44.4         | ---          | 0°               | 80             | Floor noise |

Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable) [dB] +D.Fac [dB] -Gain (AMP) [dB]  
Ant.Type=LOOP:Loop Antenna

**Spurious emission**  
(with tag)

**DATA OF RADIATED EMISSION TEST**

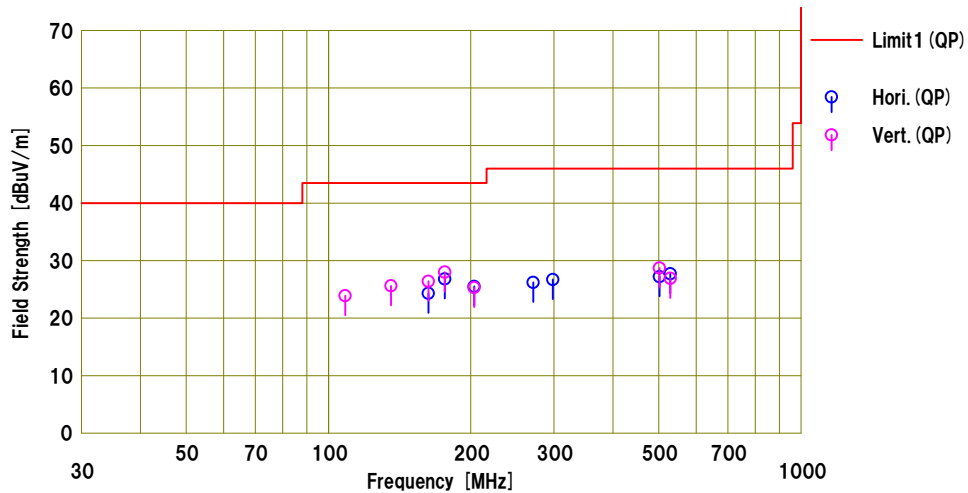
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/20

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 23deg.C / 50%RH

Remarks : with tag

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK

Tested by : Kazuhiro Ando



| No. | Freq.   | Reading | Ant.Fac | Loss | Gain | Result   | Limit    | Margin | Pola. | Height | Angle | Ant. | Comment |
|-----|---------|---------|---------|------|------|----------|----------|--------|-------|--------|-------|------|---------|
|     | [MHz]   | [dBuV]  | [dB/m]  | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB]   | [H/V] | [cm]   | [deg] | Type |         |
| 1   | 162.720 | 31.3    | 13.4    | 6.0  | 26.4 | 24.3     | 43.5     | 19.2   | Hori. | 173    | 103   | HB   |         |
| 2   | 176.280 | 34.6    | 12.5    | 6.1  | 26.4 | 26.8     | 43.5     | 16.7   | Hori. | 134    | 112   | HB   |         |
| 3   | 203.400 | 35.4    | 9.9     | 6.4  | 26.2 | 25.5     | 43.5     | 18.0   | Hori. | 100    | 108   | HB   |         |
| 4   | 271.200 | 32.5    | 12.6    | 7.1  | 26.0 | 26.2     | 46.0     | 19.8   | Hori. | 100    | 60    | HB   |         |
| 5   | 298.320 | 31.8    | 13.5    | 7.4  | 26.0 | 26.7     | 46.0     | 19.3   | Hori. | 100    | 0     | HB   |         |
| 6   | 501.720 | 28.0    | 17.8    | 8.8  | 27.4 | 27.2     | 46.0     | 18.8   | Hori. | 180    | 53    | HB   |         |
| 7   | 528.840 | 28.0    | 18.2    | 9.0  | 27.5 | 27.7     | 46.0     | 18.3   | Hori. | 163    | 28    | HB   |         |
| 8   | 108.480 | 34.8    | 10.4    | 5.3  | 26.6 | 23.9     | 43.5     | 19.6   | Vert. | 100    | 218   | HB   |         |
| 9   | 135.600 | 33.5    | 12.9    | 5.7  | 26.5 | 25.6     | 43.5     | 17.9   | Vert. | 100    | 200   | HB   |         |
| 10  | 162.720 | 33.4    | 13.4    | 6.0  | 26.4 | 26.4     | 43.5     | 17.1   | Vert. | 100    | 211   | HB   |         |
| 11  | 176.280 | 35.8    | 12.5    | 6.1  | 26.4 | 28.0     | 43.5     | 15.5   | Vert. | 100    | 208   | HB   |         |
| 12  | 203.400 | 35.2    | 9.9     | 6.4  | 26.2 | 25.3     | 43.5     | 18.2   | Vert. | 100    | 215   | HB   |         |
| 13  | 501.720 | 29.5    | 17.8    | 8.8  | 27.4 | 28.7     | 46.0     | 17.3   | Vert. | 124    | 114   | HB   |         |
| 14  | 528.840 | 27.2    | 18.2    | 9.0  | 27.5 | 26.9     | 46.0     | 19.1   | Vert. | 120    | 86    | HB   |         |

Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable+ATT) [dB] -Gain (AMP) [dB]  
Ant.Type=HB:Hybrid Antenna

**Spurious emission**  
(without tag)

**DATA OF RADIATED EMISSION TEST**

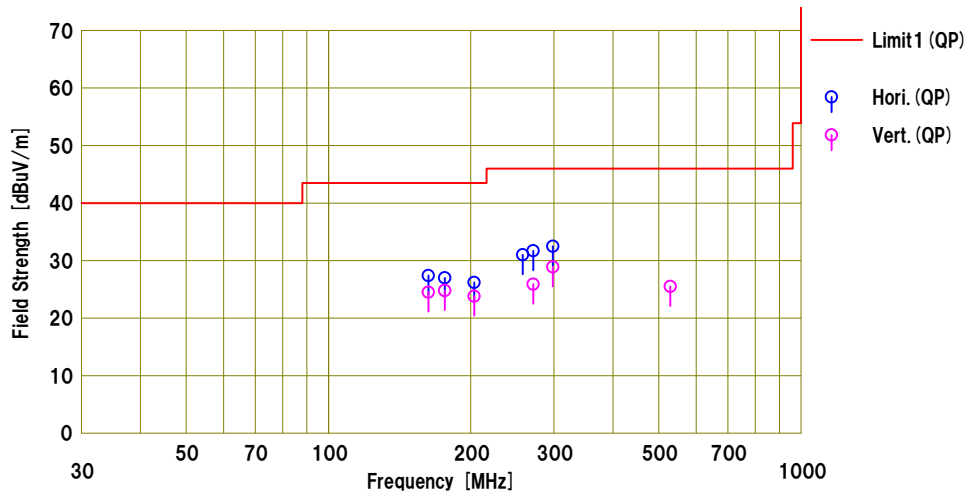
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber  
Date : 2016/07/19

Mode : Transmitting and Receiving  
Order No. : 11299554M  
Power : DC 5V  
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK

Tested by : Kazuhiro Ando



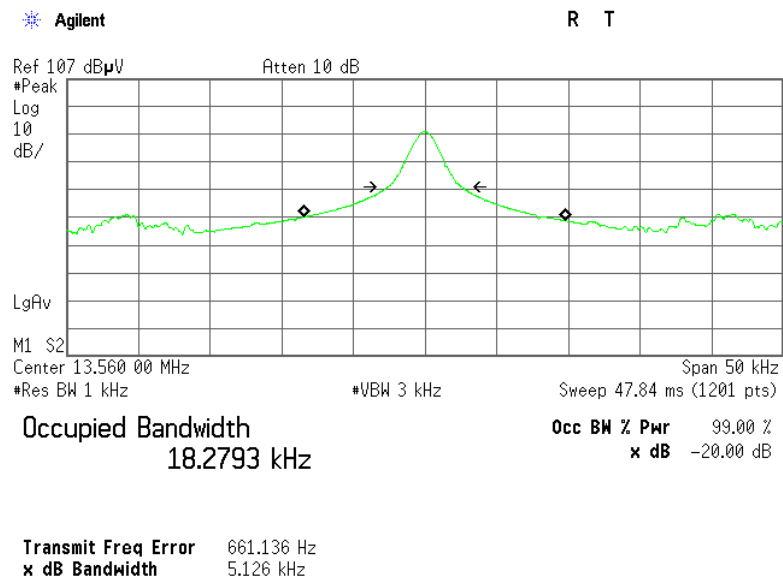
| No. | Freq.   | Reading | Ant.Fac | Loss | Gain | Result   | Limit    | Margin | Pol.  | Height | Angle | Ant. | Comment |
|-----|---------|---------|---------|------|------|----------|----------|--------|-------|--------|-------|------|---------|
|     | [MHz]   | [dBuV]  | [dB/m]  | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB]   | [H/V] | [cm]   | [deg] | Type |         |
| 1   | 162.720 | 34.4    | 13.4    | 6.0  | 26.4 | 27.4     | 43.5     | 16.1   | Hori. | 176    | 208   | HB   |         |
| 2   | 176.280 | 34.8    | 12.5    | 6.1  | 26.4 | 27.0     | 43.5     | 16.5   | Hori. | 173    | 219   | HB   |         |
| 3   | 203.400 | 36.1    | 9.9     | 6.4  | 26.2 | 26.2     | 43.5     | 17.3   | Hori. | 115    | 243   | HB   |         |
| 4   | 257.640 | 38.1    | 12.0    | 6.9  | 26.0 | 31.0     | 46.0     | 15.0   | Hori. | 100    | 284   | HB   |         |
| 5   | 271.200 | 38.0    | 12.6    | 7.1  | 26.0 | 31.7     | 46.0     | 14.3   | Hori. | 100    | 272   | HB   |         |
| 6   | 298.320 | 37.6    | 13.5    | 7.4  | 26.0 | 32.5     | 46.0     | 13.5   | Hori. | 100    | 44    | HB   |         |
| 7   | 162.720 | 31.5    | 13.4    | 6.0  | 26.4 | 24.5     | 43.5     | 19.0   | Vert. | 100    | 272   | HB   |         |
| 8   | 176.280 | 32.6    | 12.5    | 6.1  | 26.4 | 24.8     | 43.5     | 18.7   | Vert. | 100    | 297   | HB   |         |
| 9   | 203.400 | 33.7    | 9.9     | 6.4  | 26.2 | 23.8     | 43.5     | 19.7   | Vert. | 100    | 167   | HB   |         |
| 10  | 271.200 | 32.2    | 12.6    | 7.1  | 26.0 | 25.9     | 46.0     | 20.1   | Vert. | 262    | 205   | HB   |         |
| 11  | 298.320 | 34.0    | 13.5    | 7.4  | 26.0 | 28.9     | 46.0     | 17.1   | Vert. | 220    | 237   | HB   |         |
| 12  | 528.840 | 25.8    | 18.2    | 9.0  | 27.5 | 25.5     | 46.0     | 20.5   | Vert. | 110    | 35    | HB   |         |

Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable) [dB] -Gain (AMP) [dB]  
Ant.Type=HB-Hybrid Antenna

## 20dB Bandwidth and 99% Occupied Bandwidth

Test place Kashima EMC Lab. No.2 measurement room  
Report No. 11299554  
Date 07/26/2016  
Temperature/ Humidity 24 deg. C / 45 % RH  
Engineer Kazuhiro Ando  
Mode Tx Mod on with Tag

| FREQ<br>[MHz] | 20dB Bandwidth<br>[kHz] | 99% Occupied Bandwidth<br>[kHz] |
|---------------|-------------------------|---------------------------------|
| 13.56         | 5.13                    | 18.28                           |



**UL Japan, Inc.**

**Kashima EMC Lab.**

1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

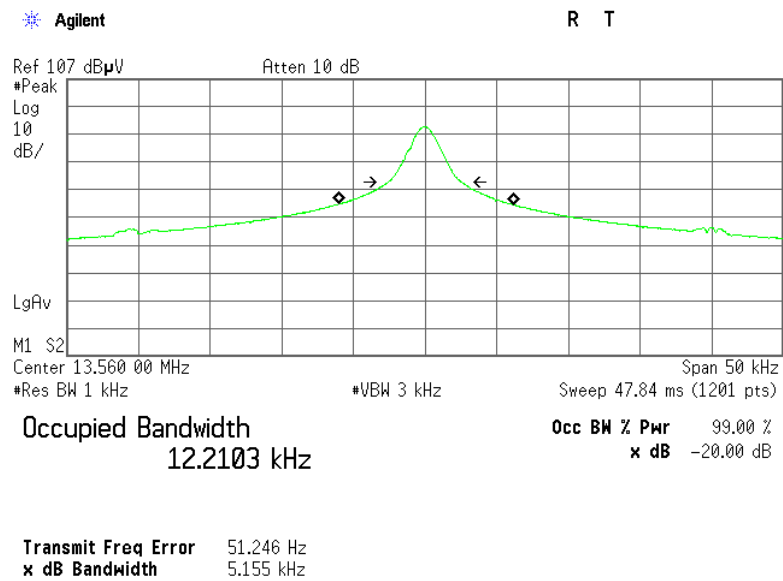
Telephone : +81-478-88-6500

Facsimile: +81-478-82-3373

## 20dB Bandwidth and 99% Occupied Bandwidth

Test place : Kashima EMC Lab. No.2 measurement room  
Report No. : 11299554  
Date : 07/26/2016  
Temperature/ Humidity : 24 deg. C / 45 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx Mod on without Tag

| FREQ<br>[MHz] | 20dB Bandwidth<br>[kHz] | 99% Occupied Bandwidth<br>[kHz] |
|---------------|-------------------------|---------------------------------|
| 13.56         | 5.16                    | 12.21                           |



## Frequency Tolerance

Test place                      Kashima EMC Lab. No.2 measurement room  
Report No.                      11299554  
Date                              07/26/2016  
Temperature/ Humidity      24 deg. C / 45 % RH  
Engineer                        Kazuhiro Ando  
Mode                              Tx Mod off

| Test condition |                   | Tested timing | Measured frequency [MHz] | Frequency error [MHz] | Result   |       | Limit |
|----------------|-------------------|---------------|--------------------------|-----------------------|----------|-------|-------|
| Temp. [deg. C] | Voltage [V]       |               |                          |                       | [%]      | [ppm] |       |
| 50             | 5                 | Power on      | 13.559942                | -0.000058             | -0.00043 | -4.3  | 0.01  |
|                |                   | + 2 min.      | 13.559939                | -0.000061             | -0.00045 | -4.5  | 0.01  |
|                |                   | + 5 min.      | 13.559939                | -0.000061             | -0.00045 | -4.5  | 0.01  |
|                |                   | + 10 min.     | 13.559939                | -0.000061             | -0.00045 | -4.5  | 0.01  |
| 40             | 5                 | Power on      | 13.559966                | -0.000034             | -0.00025 | -2.5  | 0.01  |
|                |                   | + 2 min.      | 13.559962                | -0.000038             | -0.00028 | -2.8  | 0.01  |
|                |                   | + 5 min.      | 13.559961                | -0.000039             | -0.00029 | -2.9  | 0.01  |
|                |                   | + 10 min.     | 13.559961                | -0.000039             | -0.00029 | -2.9  | 0.01  |
| 30             | 5                 | Power on      | 13.559997                | -0.000003             | -0.00002 | -0.2  | 0.01  |
|                |                   | + 2 min.      | 13.559993                | -0.000007             | -0.00005 | -0.5  | 0.01  |
|                |                   | + 5 min.      | 13.559992                | -0.000008             | -0.00006 | -0.6  | 0.01  |
|                |                   | + 10 min.     | 13.559992                | -0.000008             | -0.00006 | -0.6  | 0.01  |
| 20             | 5                 | Power on      | 13.560027                | 0.000027              | 0.00020  | 2.0   | 0.01  |
|                |                   | + 2 min.      | 13.560023                | 0.000023              | 0.00017  | 1.7   | 0.01  |
|                |                   | + 5 min.      | 13.560023                | 0.000023              | 0.00017  | 1.7   | 0.01  |
|                |                   | + 10 min.     | 13.560023                | 0.000023              | 0.00017  | 1.7   | 0.01  |
| 20             | 4.25<br>(5V -15%) | Power on      | 13.560027                | 0.000027              | 0.00020  | 2.0   | 0.01  |
|                |                   | + 2 min.      | 13.560024                | 0.000024              | 0.00018  | 1.8   | 0.01  |
|                |                   | + 5 min.      | 13.560023                | 0.000023              | 0.00017  | 1.7   | 0.01  |
|                |                   | + 10 min.     | 13.560023                | 0.000023              | 0.00017  | 1.7   | 0.01  |
| 20             | 5.75<br>(5V +15%) | Power on      | 13.560027                | 0.000027              | 0.00020  | 2.0   | 0.01  |
|                |                   | + 2 min.      | 13.560022                | 0.000022              | 0.00016  | 1.6   | 0.01  |
|                |                   | + 5 min.      | 13.560022                | 0.000022              | 0.00016  | 1.6   | 0.01  |
|                |                   | + 10 min.     | 13.560022                | 0.000022              | 0.00016  | 1.6   | 0.01  |
| 10             | 5                 | Power on      | 13.560049                | 0.000049              | 0.00036  | 3.6   | 0.01  |
|                |                   | + 2 min.      | 13.560046                | 0.000046              | 0.00034  | 3.4   | 0.01  |
|                |                   | + 5 min.      | 13.560046                | 0.000046              | 0.00034  | 3.4   | 0.01  |
|                |                   | + 10 min.     | 13.560046                | 0.000046              | 0.00034  | 3.4   | 0.01  |
| 0              | 5                 | Power on      | 13.560054                | 0.000054              | 0.00040  | 4.0   | 0.01  |
|                |                   | + 2 min.      | 13.560055                | 0.000055              | 0.00041  | 4.1   | 0.01  |
|                |                   | + 5 min.      | 13.560055                | 0.000055              | 0.00041  | 4.1   | 0.01  |
|                |                   | + 10 min.     | 13.560055                | 0.000055              | 0.00041  | 4.1   | 0.01  |
| -10            | 5                 | Power on      | 13.560036                | 0.000036              | 0.00027  | 2.7   | 0.01  |
|                |                   | + 2 min.      | 13.560040                | 0.000040              | 0.00029  | 2.9   | 0.01  |
|                |                   | + 5 min.      | 13.560041                | 0.000041              | 0.00030  | 3.0   | 0.01  |
|                |                   | + 10 min.     | 13.560041                | 0.000041              | 0.00030  | 3.0   | 0.01  |
| -20            | 5                 | Power on      | 13.559985                | -0.000015             | -0.00011 | -1.1  | 0.01  |
|                |                   | + 2 min.      | 13.559994                | -0.000006             | -0.00004 | -0.4  | 0.01  |
|                |                   | + 5 min.      | 13.559995                | -0.000005             | -0.00004 | -0.4  | 0.01  |
|                |                   | + 10 min.     | 13.559995                | -0.000005             | -0.00004 | -0.4  | 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)

## APPENDIX 2: Test instruments

### EMI test equipment

| Control No.                                      | Instrument                          | Manufacturer                                                                                 | Model No                                                              | Serial No                                                               | Test Item | Calibration Date<br>* Interval(month) |
|--------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------|-----------|---------------------------------------|
| KLP-01                                           | Loop Antenna                        | Rohde & Schwarz                                                                              | HFH2-Z2                                                               | 827779/008                                                              | ME        | 2015/08/28 * 12                       |
| CCC-M01                                          | Coaxial Cable                       | FUJIKURA                                                                                     | 3D2W                                                                  | none                                                                    | ME        | 2016/05/17 * 12                       |
| CAF-16                                           | Pre-Amplifier                       | Sonoma Instrument                                                                            | 310N                                                                  | 325015                                                                  | ME        | 2016/05/10 * 12                       |
| CLS-06                                           | A.M.N.                              | Rohde & Schwarz                                                                              | ESH3-Z5                                                               | 838576/017                                                              | CE        | 2015/07/31 * 12                       |
| CLS-07                                           | A.M.N.                              | Rohde & Schwarz                                                                              | ESH3-Z5                                                               | 844982/034                                                              | CE        | 2015/07/17 * 12                       |
| CAT10-26                                         | 10dB Fixed Atten.                   | Suhner                                                                                       | 6810.01.A                                                             | none                                                                    | CE        | 2015/07/17 * 12                       |
| CCC-S10-<br>C(3/9/10/11/12)                      | Coaxial Cable                       | FUJIKURA,FUJIKURA<br>,FUJIKURA,FUJIKUR<br>A,FUJIKURA                                         | 5D-2W,5D-<br>2W,5D-2W,5D-<br>2W,5D-2W,                                | -                                                                       | ME/CE     | 2015/08/11 * 12                       |
| CTM-31                                           | Terminator                          | Suhner                                                                                       | 65_BNC-50-0-<br>2/133_NE                                              | none                                                                    | CE        | 2015/11/19 * 12                       |
| CTR-09                                           | Test Receiver                       | Agilent                                                                                      | N9038A                                                                | MY53290016<br>Version<br>A.14.03                                        | ME/CE/RE  | 2016/06/19 * 12                       |
| CBL-08                                           | LOGBICON                            | Schwarzbeck                                                                                  | VULB 9168                                                             | 343                                                                     | RE        | 2015/11/15 * 12                       |
| CAT3-04                                          | 3dB Fixed Atten.                    | TAMAGAWA                                                                                     | UFA-01                                                                | none                                                                    | RE        | 2015/09/03 * 12                       |
| CCC-S10-<br>R(2/4/CATS-<br>11/5/6/7/8/11/12<br>) | Coaxial Cable                       | Fujikura,Fujikura,Agilen<br>t,Fujikura,Fujikura,Fujik<br>ura,Fuhjikura,Fujikura,F<br>ujikura | 5D-2W,5D-<br>2W,8494A,5D-<br>2W,5D-2W,5D-<br>2W,5D-2W,5D-<br>2W,5D-2W | MY41110200(S<br>tep Att)                                                | RE        | 2015/08/11 * 12                       |
| CAF-08                                           | Pre-Amplifier                       | Hewlett Packard                                                                              | 8447D                                                                 | 2944A09041                                                              | CE/RE     | 2015/08/11 * 12                       |
| CSCL-13                                          | Ruler                               | Tajima                                                                                       | L19-55                                                                | none                                                                    | CE/RE     | 2016/02/22 * 12                       |
| COS-10                                           | Temperature & Humidity<br>Indicator | HIOKI                                                                                        | 3641/9680-50                                                          | 090999895/090<br>905406                                                 | CE/RE     | 2016/05/24 * 12                       |
| CTS-14                                           | Digital Multimeter                  | FLUKE                                                                                        | 115                                                                   | 994460954                                                               | CE/RE     | 2015/10/01 * 12                       |
| COTS-CEMI-<br>02                                 | EMI Software                        | TSJ                                                                                          | TEPTO-<br>DV(RE,CE,MF,PE<br>)                                         | Ver,<br>RE: 2.5.0131,<br>CE: 2.5.0131,<br>ME: 2.5.0129,<br>PE: 2.5.0129 | CE/RE     | -                                     |
| CMS-07                                           | Near Field Probe                    | Langer                                                                                       | LF-R400                                                               | 02-0815                                                                 | FT        | Pre Check                             |
| CCH-04                                           | Temperature and<br>Humidity Chamber | ESPEC                                                                                        | PL-1J                                                                 | 15004059                                                                | FT        | 2016/06/30 * 12                       |
| CFC-02                                           | Frequency Counter                   | Agilent                                                                                      | 53151A                                                                | US40511823                                                              | FT        | 2016/04/08 * 12                       |
| CTS-18                                           | Digital Multimeter                  | FLUKE                                                                                        | 87-3                                                                  | 85220051                                                                | FT        | 2015/10/01 * 12                       |

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  
ME: Magnetic Emission

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