



# RADIO TEST REPORT

**Test Report No. : 11347416M-A-R1**

**Applicant** : TAIYO YUDEN CO., LTD.  
**Type of Equipment** : Bluetooth Smart / ANT Module  
**Model No.** : EYSHJN  
**FCC ID** : RYYEYSHJN  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**Test Result** : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11347416M-A. 11347416M-A is replaced with this report.

**Date of test:** July 6 - 8, 12, 2016

**Representative test operator:**

Kazuhiro Ando  
Engineer  
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**Approved by :**

Masanori Nishiyama  
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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## **SECTION 1: Customer information**

Company Name : TAIYO YUDEN CO., LTD.  
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Facsimile Number : +81- 27-324-2314  
Contact Person : Mitsuo Takagi

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

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

Type of Equipment : Bluetooth Smart / ANT Module  
Model No. : EYSHJN  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3 V, 1.7-3.6 V, 0.02 A, 0.1W  
Receipt Date of Sample : June 30, 2016  
Country of Mass-production : Japan  
Condition of EUT : Engineering 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: EYSHJN (referred to as the EUT in this report) is a Bluetooth Smart / ANT Module.

### **General Specification**

Clock frequency(ies) in the system : 32 MHz

## **Radio Specification**

### **< Bluetooth(BT) Low Energy (LE)>**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : GFSK  
Power Supply (radio part input) : DC 1.3 V  
Antenna type : Monopole Antenna  
Antenna Gain : -1.5 dBi

### **<ANT>**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : GFSK  
Power Supply (radio part input) : DC 1.3 V  
Antenna type : Monopole Antenna  
Antenna Gain : -1.5 dBi

### **<Nordic Original>**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : GFSK  
Power Supply (radio part input) : DC 1.3 V  
Antenna type : Monopole Antenna  
Antenna Gain : -1.5 dBi

## **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 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

### **3.2 Procedures and results**

| Item                                       | Test Procedure   | Specification  | Worst margin   | Results  | Remarks   |
|--|--|--|--|----------|---|
| Conducted Emission                         | FCC: ANSI C63.10-2013<br>6. Standard test methods<br>IC: RSS-Gen 8.8 | FCC: Section 15.207<br>IC: RSS-Gen 8.8                                   | QP<br>17.9 dB, 11.75800 MHz, N, L<br>AV<br>14.2 dB, 0.43940 MHz, L | Complied | -   |
| 6dB Bandwidth                              | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: -             | FCC: Section<br>15.247(a)(2)<br>IC: RSS-247 5.2(1)                       | See data.  | Complied | Conducted   |
| Maximum Peak<br>Output Power               | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: RSS-Gen 6.12  | FCC: Section<br>15.247(b)(3)<br>IC: RSS-247 5.4(4)                       |  | Complied | Conducted   |
| Power Density                              | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: -             | FCC: Section 15.247(e)<br>IC: RSS-247 5.2(2)                             |  | Complied | Conducted   |
| Spurious Emission<br>Restricted Band Edges | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: RSS-Gen 6.13  | FCC: Section 15.247(d)<br>IC: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 3.1 dB<br>2274.000 MHz, AV, Vert.                                  | Complied | Conducted<br>(below 30 MHz)<br>/Radiated<br>(above 30 MHz)<br>*1) |

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

\*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.

\* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

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

This EUT provides stable voltage (DC1.3 V) 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

| Item                   | Test Procedure  | Specification | Worst margin | Results | Remarks   |
|------------------------|-----------------|---------------|--------------|---------|-----------|
| 99% Occupied Bandwidth | IC: RSS-Gen 6.6 | IC: -         | N/A          | -       | Conducted |

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  $k = 2$ .

| Item   | Frequency range | Uncertainty (+/-) |
|--|-----------------|-------------------|
|  |                 | No. 10 SAC        |
| Radiated emission (Measurement distance: 3m) | 30MHz - 300MHz  | 4.7dB             |
|  | 300MHz - 1GHz   | 3.6dB             |
|  | 1GHz - 10GHz    | 5.1dB             |
| Radiated emission (Measurement distance: 1m) | 10GHz - 18GHz   | 5.7dB             |
|  | 18GHz - 26.5GHz | 5.1dB             |

| Antenna terminal test                         | Uncertainty (+/-) |
|---|-------------------|
| Power Measurement above 1GHz                  | 0.7dB             |
| Spurious emission (Conducted) below 1GHz      | 1.6dB             |
| Spurious emission (Conducted) 1GHz - 3GHz     | 1.4dB             |
| Spurious emission (Conducted) 3GHz - 18GHz    | 2.8dB             |
| Spurious emission (Conducted) 18GHz - 26.5GHz | 2.5dB             |
| Bandwidth Measurement                         | 5.4%              |

#### 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 report meets the limits unless the uncertainty is taken into consideration.

### 3.5 Test Location

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| Test site                   | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|-----------------------------|------------------------|----------------------------|--|------------------------------|
| No.1 Open site              | 4659A-1                | 6.0 x 5.5 x 2.5            | 20 x 40  | 10 m                         |
| No.2 Open site              | 4659A-2                | 4.4 x 4.4 x 2.15           | 18 x 20  | 10 m                         |
| No.5 Open site              | 4659A-5                | 8.6 x 7.1 x 2.4            | 18 x 23  | 10 m                         |
| No.1 Shielded room          | 4659A-1                | 5.4 x 4.5 x 2.3            | -  | -                            |
| No.2 Shielded room          | 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          | 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  | 4659A-6                | 8.5 x 5.5 x 5.2            | -  | 3 m                          |
| No.10 Semi-anechoic Chamber | 4659A-10               | 18.4 x 9.9 x 7.7           | -  | 10 m                         |
| No.11 Semi-anechoic Chamber | 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       | -                      | 4.3 x 4.4 x 2.7            | -  | -                            |

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

Refer to APPENDIX.

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

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

| <b>Mode</b>  | <b>Remarks*</b>            |
|--|----------------------------|
| Bluetooth(BT) Low Energy (LE)  | Maximum Packet Size, PRBS9 |
| ANT  | 1Mbps                      |
| Nordic Original  | 2Mbps                      |
| <p>*Power of the EUT was set by the software as follows;<br/> Power settings: +4dBm, -40dBm<br/> Software: BT LE: BLE_TEST_tool-52<br/> ANT, Nordic Original: ANT_TEST_tool-52</p> <p>*This setting of software is the worst case.<br/> Any conditions under the normal use do not exceed the condition of setting.<br/> In addition, end users cannot change the settings of the output power of the product.</p> |                            |

\*The details of Operating mode(s)

| <b>Test Item</b>  | <b>Operating Mode</b>        | <b>Tested frequency</b>          |
|---|------------------------------|----------------------------------|
| Conducted Emission,<br>Spurious Emission<br>(Radiated)                                | BT LE Tx                     | 2402 MHz<br>2440 MHz<br>2480 MHz |
|   | ANT Tx<br>Nordic Original Tx | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Spurious Emission above 1 GHz<br>(Radiated)   | BT LE Tx                     | 2402 MHz<br>2440 MHz<br>2480 MHz |
|   | ANT Tx<br>Nordic Original Tx | 2402 MHz<br>2441 MHz<br>2480 MHz |
| Spurious Emission below 1 GHz<br>(Radiated)   | BT LE Tx                     | 2440 MHz *1)                     |
|   | ANT Tx<br>Nordic Original Tx | 2441 MHz *1)                     |
| Spurious Emission (Conducted)   | BT LE Tx                     | 2440 MHz *1)                     |
|   | ANT Tx<br>Nordic Original Tx | 2441 MHz *1)                     |
| 6dB Bandwidth<br>Maximum Peak Output Power<br>Power Density<br>99% Occupied Bandwidth | BT LE Tx                     | 2402 MHz<br>2440 MHz<br>2480 MHz |
|   | ANT Tx<br>Nordic Original Tx | 2402 MHz<br>2441 MHz<br>2480 MHz |

\*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.

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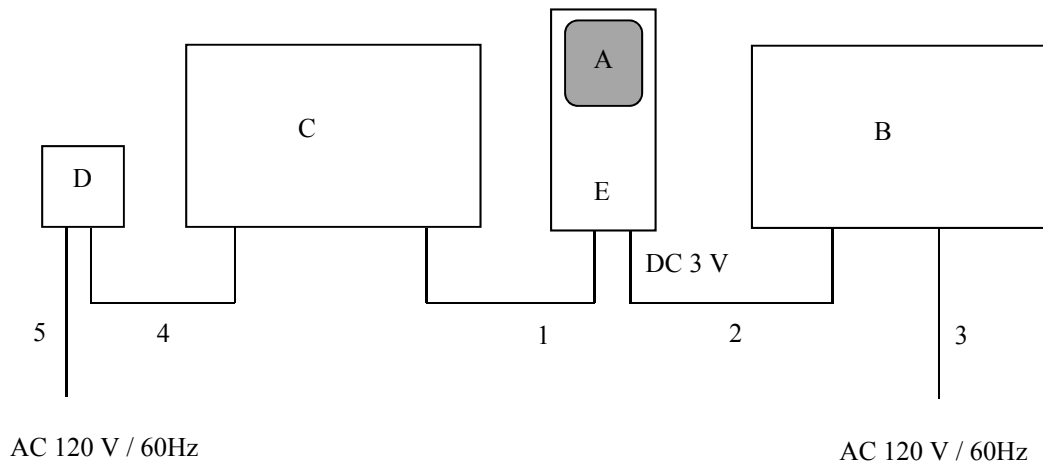
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## 4.2 Configuration and peripherals



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

### Description of EUT

| No. | Item                         | Model number | Serial number                             | Manufacturer    | Remarks |
|-----|------------------------------|--------------|---|-----------------|---------|
| A   | Bluetooth Smart / ANT Module | EYSHJN       | 1 *1)<br>2 *2)<br>3 *3)<br>4 *4)<br>5 *5) | TAIYO YUDEN     | EUT     |
| B   | DC Power Supply              | GSV3000      | 1303141419                                | DIAMOND ANTENNA | -       |
| C   | PC                           | CF-T2        | 4CKSA46826                                | Panasonic       | -       |
| D   | AC Adaptor                   | CF-AA1625A   | 1625AM406Z21913F                          | Panasonic       | -       |
| E   | Evaluation Board             | EBSHJNZXZ    | 1 *1)<br>2 *2)<br>3 *3)<br>4 *4)<br>5 *5) | TAIYO YUDEN     | -       |

\*1) Used for Antenna Terminal conducted tests (BT LE:+4dBm Setting)

\*2) Used for Antenna Terminal conducted tests (ANT, Nordic Original)

\*3) Used for Conducted Emission and Radiated Spurious Emission tests (BT LE)

\*4) Used for Conducted Emission and Radiated Spurious Emission tests (ANT, Nordic Original)

\*5) Used for Antenna Terminal conducted tests (BT LE:-40dBm Setting)

### List of cables used

| No. | Name      | Length (m) | Shield     |            | Remarks |
|-----|-----------|------------|------------|------------|---------|
|     |           |            | Cable      | Connector  |         |
| 1   | USB Cable | 1.8        | Shielded   | Shielded   | -       |
| 2   | DC Cable  | 0.5 + 1.5  | Unshielded | Unshielded | -       |
| 3   | AC Cable  | 1.7        | Unshielded | Unshielded | -       |
| 4   | DC Cable  | 1.2        | Unshielded | Unshielded | -       |
| 5   | AC Cable  | 0.8        | Unshielded | Unshielded | -       |

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a wooden table of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm 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 50ohm 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 shielded room. 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.

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

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## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r05".

[For below 1 GHz]

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.

[For above 1 GHz]

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.

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

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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 1 GHz | Above 1 GHz |
|--------------|-------------|-------------|
| Antenna Type | Hybrid      | Horn        |

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

### **20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).**

| Frequency       | Below 1 GHz   | Above 1 GHz  |  | 20 dBc   |
|-----------------|---------------|--|--|--|
| Instrument used | Test Receiver | Spectrum Analyzer  |  | Spectrum Analyzer  |
| Detector        | QP            | PK   | AV *3)   | PK   |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz                                     | Average Power Method:<br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (RMS)<br>Trace: 100 traces<br>If duty cycle was less than 98%, a duty factor was added to the results. | RBW: 100 kHz<br>VBW: 300kHz                                  |
| Test Distance   | 3.0 m         | 4.5 m *1) (1 GHz - 10 GHz),<br>1.0 m *2) (10 GHz - 26.5 GHz) |  | 4.5 m *1) (1 GHz - 10 GHz),<br>1.0 m *2) (10 GHz - 26.5 GHz) |

\*1) Distance Factor:  $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.5 \text{ dB}$

\*2) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

\*3) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r05"

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- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

**Measurement range** : 30 MHz – 26.5 GHz  
**Test data** : APPENDIX  
**Test result** : Pass

## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

| Test                            | Span                                    | RBW             | VBW                | Sweep time | Detector             | Trace    | Instrument used  |
|---------------------------------|---|-----------------|--------------------|------------|----------------------|----------|--|
| 6dB Bandwidth                   | 10 MHz                                  | 100 kHz         | 300 kHz            | Auto       | Peak                 | Max Hold | Spectrum Analyzer  |
| 99% Occupied Bandwidth *1)      | Enough width to display emission skirts | 1 to 5 % of OBW | Three times of RBW | Auto       | Peak                 | Max Hold | Spectrum Analyzer  |
| Maximum Peak Output Power       | -                                       | -               | -                  | Auto       | Peak/<br>Average *2) | -        | Power Meter<br>(Sensor:160 MHz BW)<br>Spectrum Analyzer<br>*5) |
| Peak Power Density              | 1.5 times the 6dB Bandwidth             | 3 kHz           | 9.1 kHz            | Auto       | Peak                 | Max Hold | Spectrum Analyzer<br>*3)                                       |
| Conducted Spurious Emission *4) | 9kHz to 150kHz                          | 200 Hz          | 620 Hz             | Auto       | Peak                 | Max Hold | Spectrum Analyzer  |
|                                 | 150kHz to 30MHz                         | 10 kHz          | 30 kHz             |            |                      |          |  |

\*1) Peak hold was applied as Worst-case measurement.

\*2) Reference data

\*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r05".

\*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.  
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

\*5) The setting of spectrum Analyzer used KDB 558074 D01 DTS Meas Guidance v03r05 Section 9.2.2.4 Method AVGSA-2.

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

**Test data : APPENDIX**

**Test result : Pass**

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**APPENDIX 1: Test data**

**Conducted Emission**

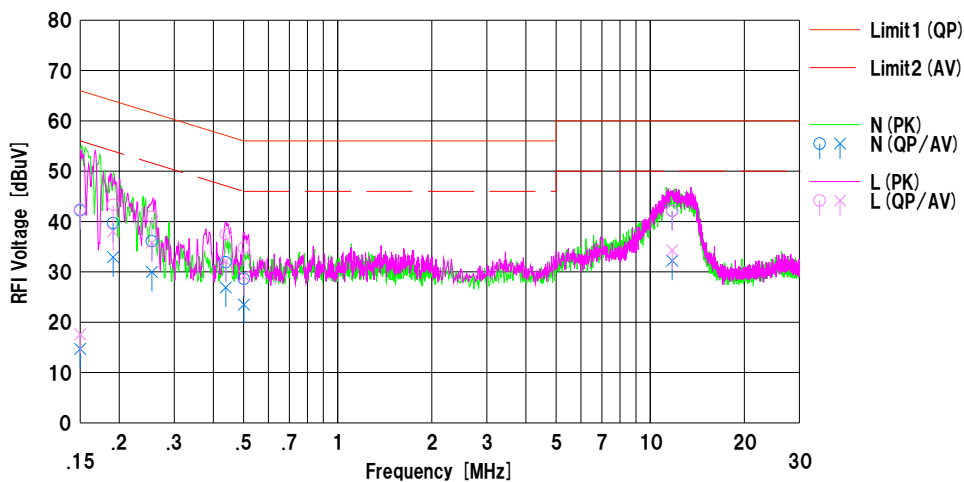
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Kashima EMC Lab. No.2 Shielded Room  
Date : 2016/07/08

Mode : Tx, Bluetooth LE, 2402MHz  
Order No. : 11347416M  
Power : DC 3V  
Temp./Humi. : 24deg.C / 53%RH

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

Tested by : Kazuhiro Ando



| No. | Freq.<br>[MHz] | Reading        |                | C.Fac<br>[dB] | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|---------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <AV><br>[dBuV] |               | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
| 1   | 0.15000        | 32.5           | 5.0            | 9.7           | 42.2           | 14.7           | 66.0           | 56.0           | 23.8         | 41.3         | N     |         |
| 2   | 0.19120        | 30.0           | 23.2           | 9.7           | 39.7           | 32.9           | 64.0           | 54.0           | 24.3         | 21.1         | N     |         |
| 3   | 0.25440        | 26.4           | 20.3           | 9.7           | 36.1           | 30.0           | 61.6           | 51.6           | 25.5         | 21.6         | N     |         |
| 4   | 0.43850        | 22.2           | 17.2           | 9.7           | 31.9           | 26.9           | 57.1           | 47.1           | 25.2         | 20.2         | N     |         |
| 5   | 0.50120        | 18.9           | 13.8           | 9.7           | 28.6           | 23.5           | 56.0           | 46.0           | 27.4         | 22.5         | N     |         |
| 6   | 11.75800       | 31.9           | 22.0           | 10.2          | 42.1           | 32.2           | 60.0           | 50.0           | 17.9         | 17.8         | N     |         |
| 7   | 0.15000        | 32.7           | 7.9            | 9.7           | 42.4           | 17.6           | 66.0           | 56.0           | 23.6         | 38.4         | L     |         |
| 8   | 0.19120        | 33.6           | 28.3           | 9.7           | 43.3           | 38.0           | 64.0           | 54.0           | 20.7         | 16.0         | L     |         |
| 9   | 0.25440        | 31.2           | 26.1           | 9.7           | 40.9           | 35.8           | 61.6           | 51.6           | 20.7         | 15.8         | L     |         |
| 10  | 0.43850        | 27.8           | 22.4           | 9.7           | 37.5           | 32.1           | 57.1           | 47.1           | 19.6         | 15.0         | L     |         |
| 11  | 0.50120        | 25.1           | 19.5           | 9.7           | 34.8           | 29.2           | 56.0           | 46.0           | 21.2         | 16.8         | L     |         |
| 12  | 11.75800       | 31.9           | 24.1           | 10.2          | 42.1           | 34.3           | 60.0           | 50.0           | 17.9         | 15.7         | L     |         |

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable) [dB]  
LISN:CLS-25

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**Kashima EMC Lab.**

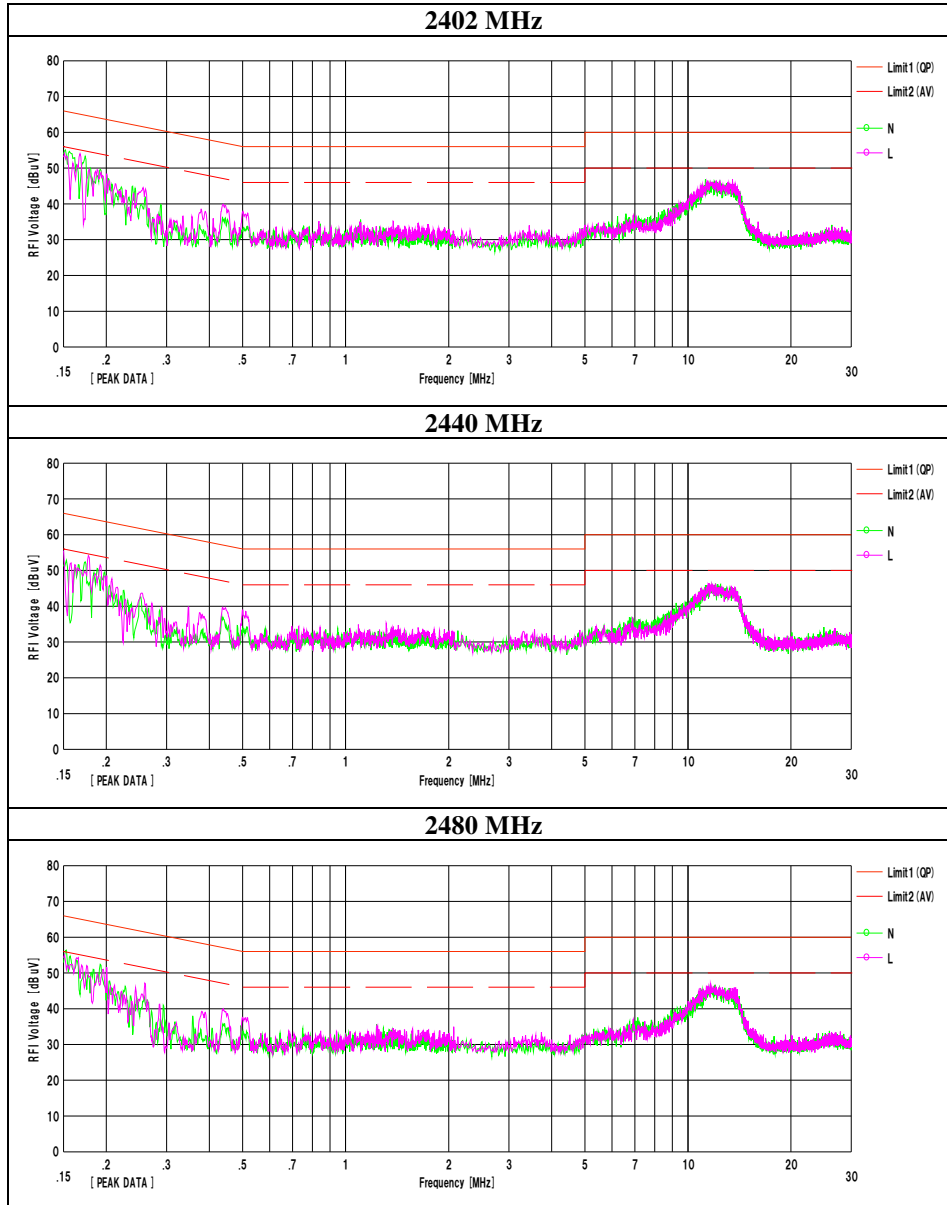
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

## Conducted Emission

Test place : Kashima EMC Lab. No.2 Shielded Room  
Report No. : 11347416M  
Date : July 8, 2016  
Temperature / Humidity : 24 deg. C / 53 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx BT LE



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## Conducted Emission

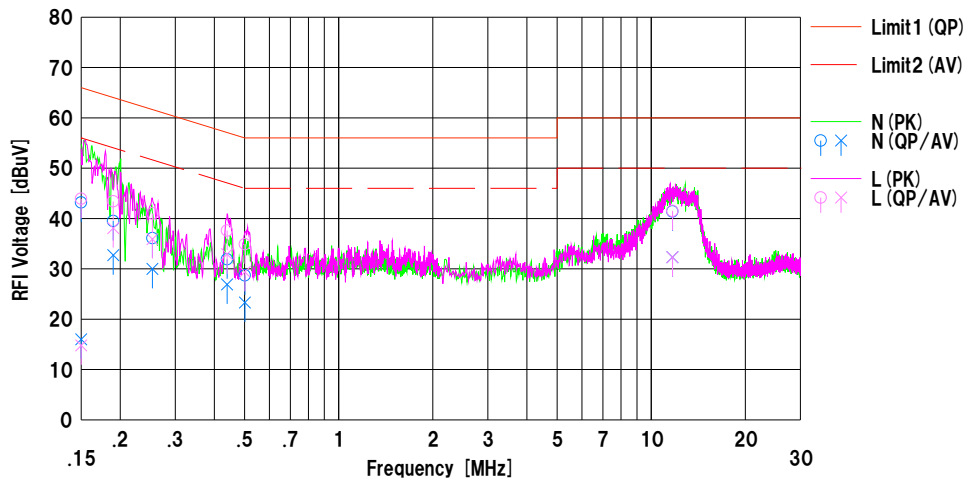
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.2 Shielded Room  
Date : 2016/07/08

Mode : Tx, ANT, 2402MHz  
Order No. : 11347416M  
Power : DC 3V  
Temp./Humi. : 24deg.C / 53%RH

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

Tested by : Kazuhiro Ando

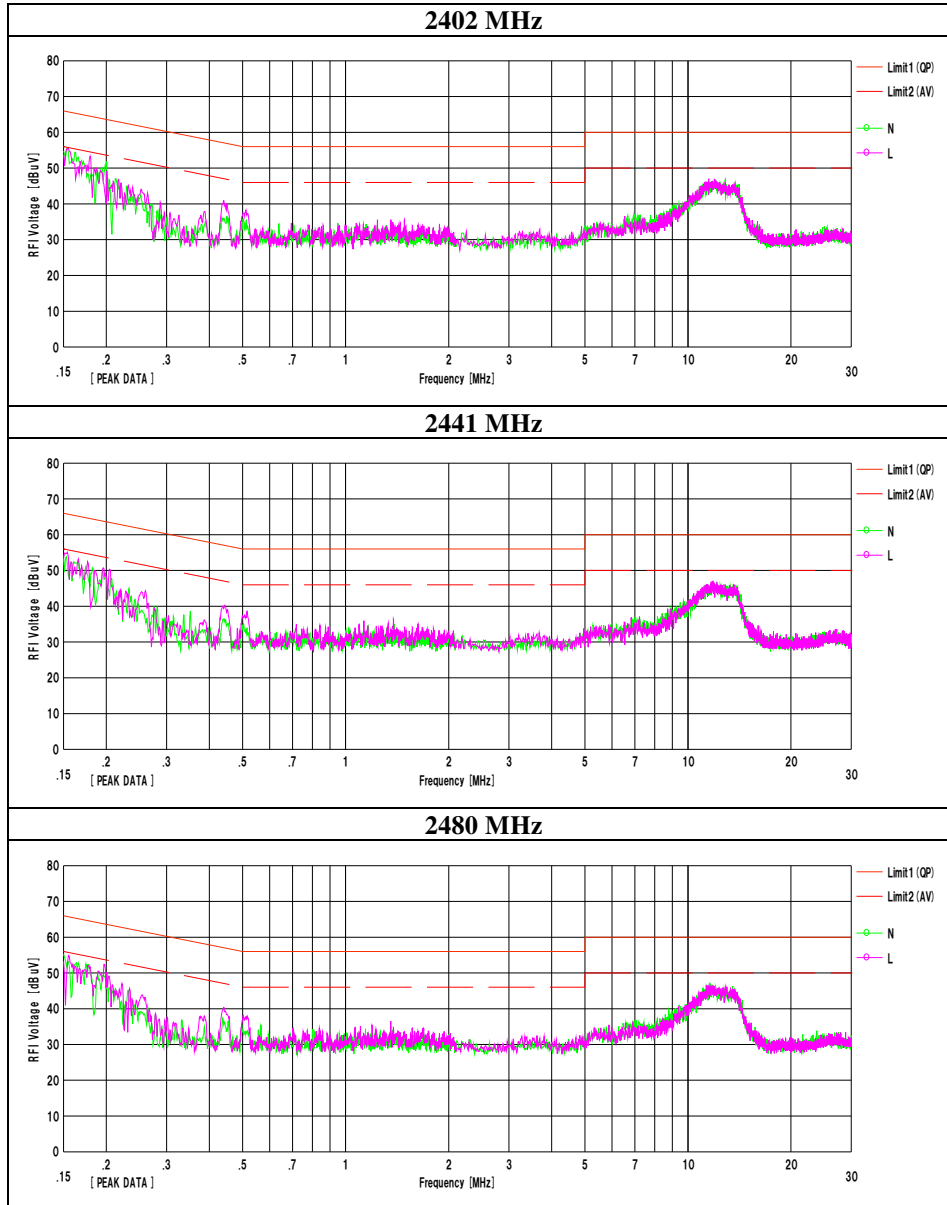


| No. | Freq.<br>[MHz] | Reading        |                | C.Fac | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <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   | 0.15000        | 33.5           | 6.3            | 9.7   | 43.2           | 15.0           | 66.0           | 56.0           | 22.8         | 40.0         | N     |         |
| 2   | 0.19000        | 29.8           | 23.0           | 9.7   | 39.5           | 32.7           | 64.0           | 54.0           | 24.5         | 21.3         | N     |         |
| 3   | 0.25360        | 26.4           | 20.3           | 9.7   | 36.1           | 30.0           | 61.6           | 51.6           | 25.5         | 21.6         | N     |         |
| 4   | 0.43940        | 22.2           | 17.2           | 9.7   | 31.9           | 26.9           | 57.1           | 47.1           | 25.2         | 20.2         | N     |         |
| 5   | 0.50100        | 19.0           | 13.6           | 9.7   | 28.7           | 23.3           | 56.0           | 46.0           | 27.3         | 22.7         | N     |         |
| 6   | 11.69070       | 31.2           | 22.1           | 10.2  | 41.4           | 32.3           | 60.0           | 50.0           | 18.6         | 17.7         | N     |         |
| 7   | 0.15000        | 34.2           | 5.1            | 9.7   | 43.9           | 14.8           | 66.0           | 56.0           | 22.1         | 41.2         | L     |         |
| 8   | 0.19000        | 33.7           | 28.4           | 9.7   | 43.4           | 38.1           | 64.0           | 54.0           | 20.6         | 15.9         | L     |         |
| 9   | 0.25360        | 31.3           | 26.2           | 9.7   | 41.0           | 35.9           | 61.6           | 51.6           | 20.6         | 15.7         | L     |         |
| 10  | 0.43940        | 27.9           | 23.2           | 9.7   | 37.6           | 32.9           | 57.1           | 47.1           | 19.5         | 14.2         | L     |         |
| 11  | 0.50100        | 25.2           | 19.7           | 9.7   | 34.9           | 29.4           | 56.0           | 46.0           | 21.1         | 16.6         | L     |         |
| 12  | 11.69070       | 31.3           | 22.1           | 10.2  | 41.5           | 32.3           | 60.0           | 50.0           | 18.5         | 17.7         | L     |         |

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable) [dB]  
LISN:CLS-25

## Conducted Emission

Test place : Kashima EMC Lab. No.2 Shielded Room  
Report No. : 11347416M  
Date : July 8, 2016  
Temperature / Humidity : 24 deg. C / 53 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx ANT



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## Conducted Emission

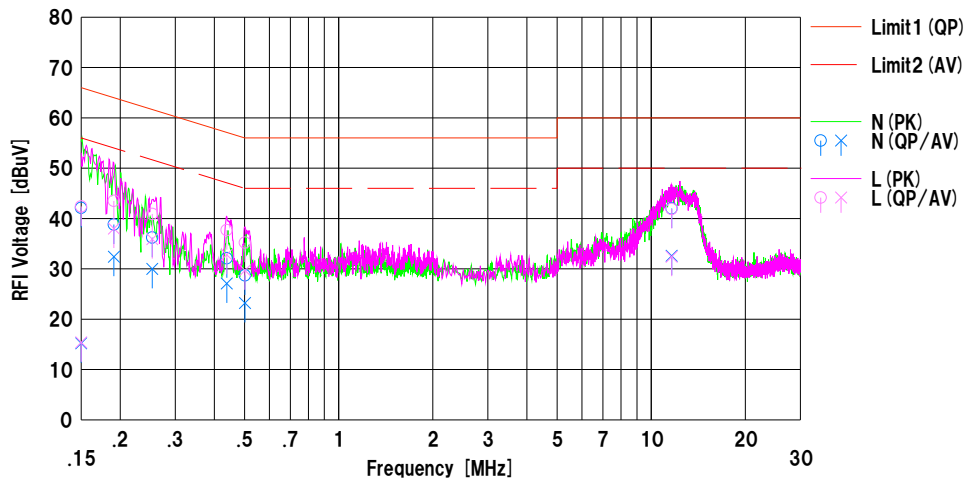
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.2 Shielded Room  
Date : 2016/07/08

Mode : Tx, Nordic, 2402MHz  
Order No. : 11347416M  
Power : DC 3V  
Temp./Humi. : 24deg.C / 53%RH

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

Tested by : Kazuhiro Ando

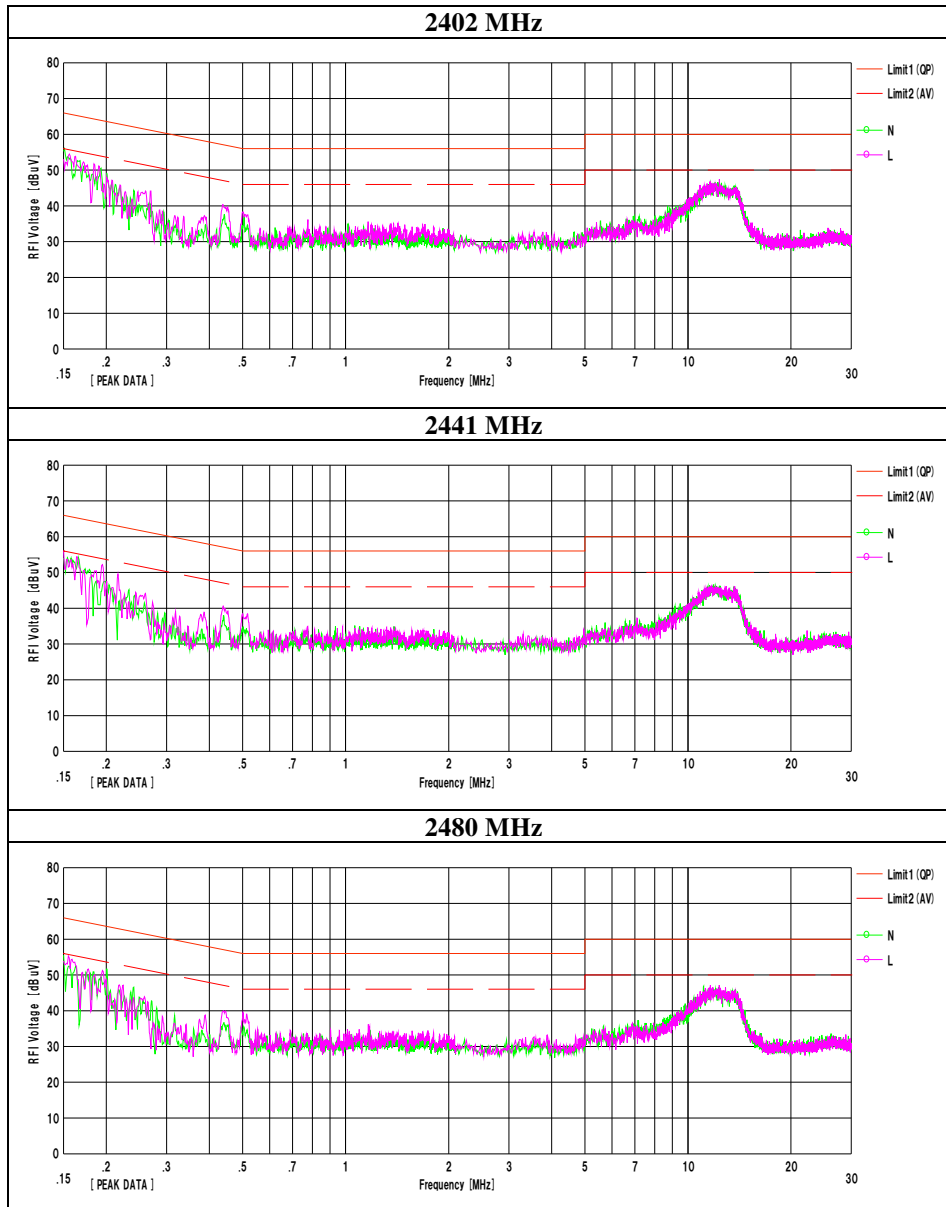


| No. | Freq.<br>[MHz] | Reading        |                | C.Fac | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|-------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <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   | 0.15000        | 32.4           | 5.5            | 9.7   | 42.1           | 15.2           | 66.0           | 56.0           | 23.9         | 40.8         | N     |         |
| 2   | 0.19100        | 29.1           | 22.7           | 9.7   | 38.8           | 32.4           | 64.0           | 54.0           | 25.2         | 21.6         | N     |         |
| 3   | 0.25320        | 26.5           | 20.3           | 9.7   | 36.2           | 30.0           | 61.7           | 51.7           | 25.5         | 21.7         | N     |         |
| 4   | 0.43870        | 22.4           | 17.4           | 9.7   | 32.1           | 27.1           | 57.1           | 47.1           | 25.0         | 20.0         | N     |         |
| 5   | 0.50150        | 19.0           | 13.5           | 9.7   | 28.7           | 23.2           | 56.0           | 46.0           | 27.3         | 22.8         | N     |         |
| 6   | 11.62860       | 31.8           | 22.4           | 10.2  | 42.0           | 32.6           | 60.0           | 50.0           | 18.0         | 17.4         | N     |         |
| 7   | 0.15000        | 32.7           | 5.7            | 9.7   | 42.4           | 15.4           | 66.0           | 56.0           | 23.6         | 40.6         | L     |         |
| 8   | 0.19100        | 33.8           | 28.3           | 9.7   | 43.5           | 38.0           | 64.0           | 54.0           | 20.5         | 16.0         | L     |         |
| 9   | 0.25320        | 31.2           | 26.2           | 9.7   | 40.9           | 35.9           | 61.7           | 51.7           | 20.8         | 15.8         | L     |         |
| 10  | 0.43870        | 28.0           | 23.1           | 9.7   | 37.7           | 32.8           | 57.1           | 47.1           | 19.4         | 14.3         | L     |         |
| 11  | 0.50150        | 25.5           | 20.0           | 9.7   | 35.2           | 29.7           | 56.0           | 46.0           | 20.8         | 16.3         | L     |         |
| 12  | 11.62860       | 31.7           | 22.2           | 10.2  | 41.9           | 32.4           | 60.0           | 50.0           | 18.1         | 17.6         | L     |         |

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable) [dB]  
LISN:CLS-25

## Conducted Emission

|                        |                                     |
|------------------------|-------------------------------------|
| Test place             | Kashima EMC Lab. No.2 Shielded Room |
| Report No.             | 11347416M                           |
| Date                   | July 8, 2016                        |
| Temperature / Humidity | 24 deg. C / 53 % RH                 |
| Engineer               | Kazuhiro Ando                       |
| Mode                   | Tx Nordic                           |



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**Kashima EMC Lab.**

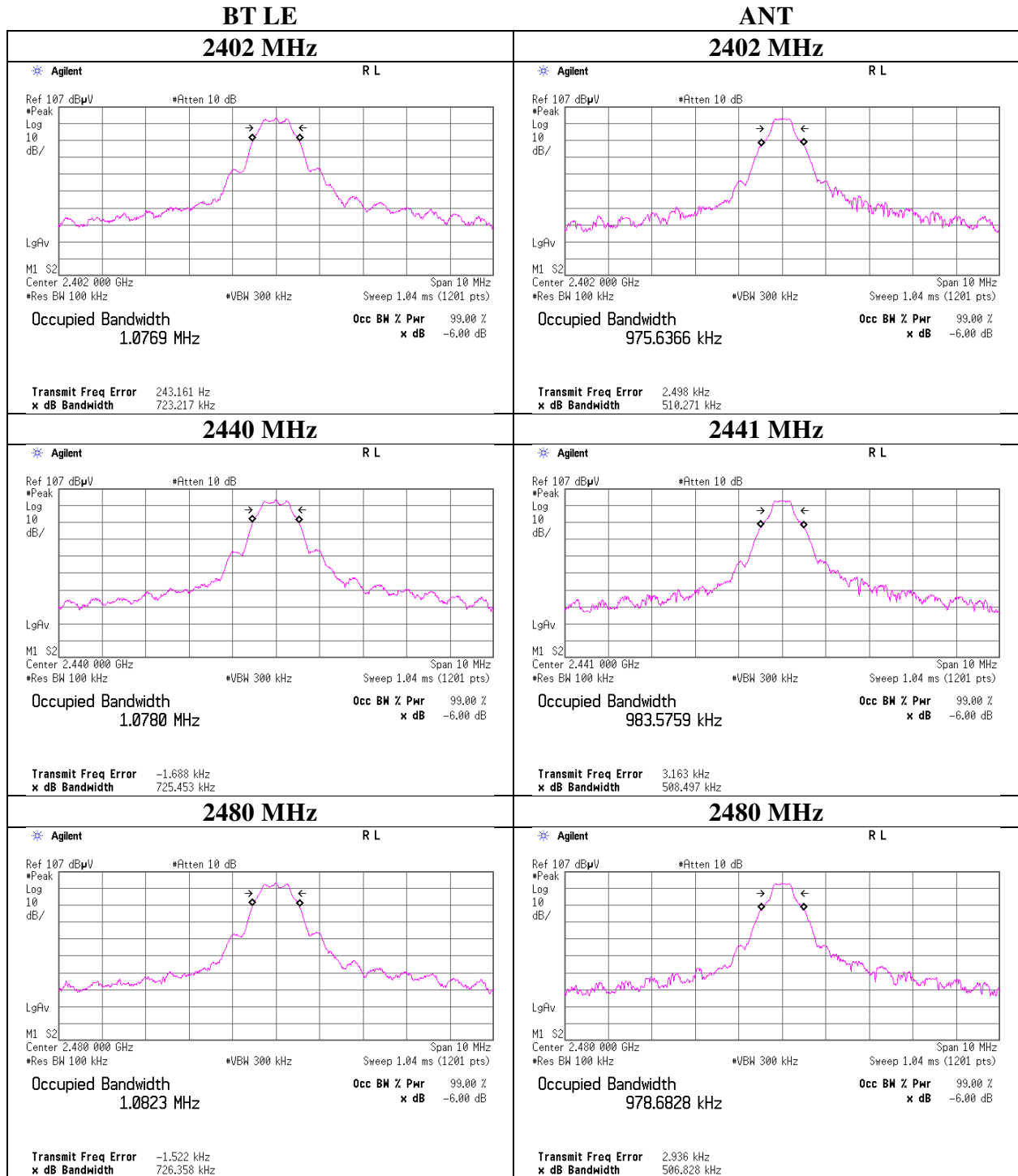
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Facsimile : +81 478 82 3373

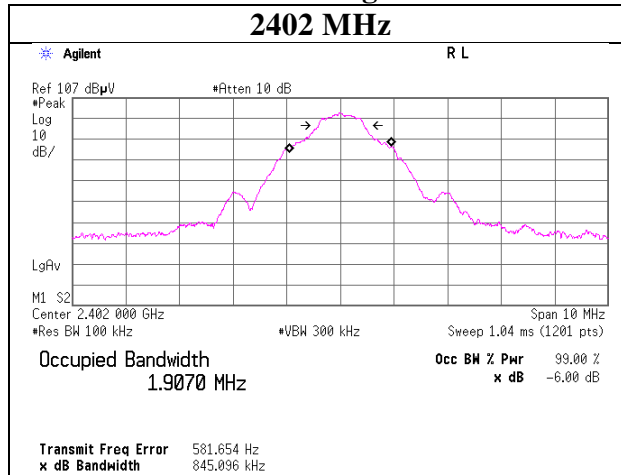


**6dB Bandwidth**

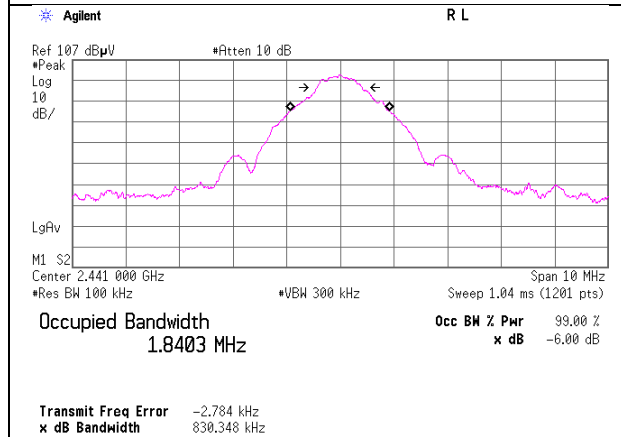


## 6dB Bandwidth

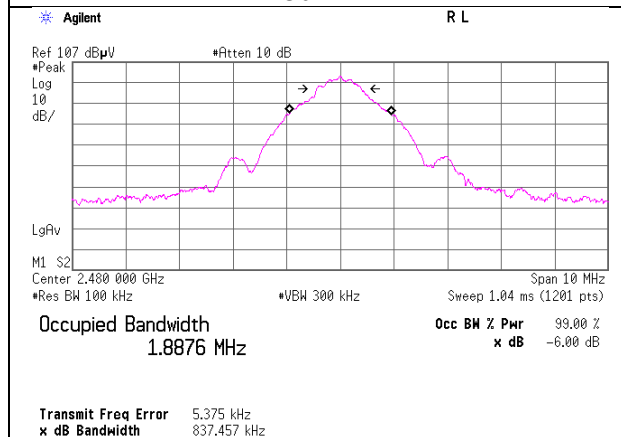
### Nordic Original 2402 MHz



### 2441 MHz



### 2480 MHz



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## Maximum Peak Output Power

Test place : Kashima EMC Lab. No. No.2 Measurement Room  
Report No. : 11347416M  
Date : July 6, 2016  
Temperature / Humidity : 23 deg. C / 54 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx (+4dBm setting)

### BT LE

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |      | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2402           | -6.65            | 1.51                  | 10.04                  | 4.90   | 3.09 | 30.00 | 1000 | 25.10          |
| 2440           | -6.62            | 1.51                  | 10.04                  | 4.93   | 3.11 | 30.00 | 1000 | 25.07          |
| 2480           | -6.74            | 1.52                  | 10.04                  | 4.82   | 3.03 | 30.00 | 1000 | 25.18          |

### ANT

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |      | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2402           | -6.93            | 1.51                  | 10.04                  | 4.62   | 2.90 | 30.00 | 1000 | 25.38          |
| 2441           | -6.89            | 1.51                  | 10.04                  | 4.66   | 2.92 | 30.00 | 1000 | 25.34          |
| 2480           | -6.99            | 1.52                  | 10.04                  | 4.57   | 2.86 | 30.00 | 1000 | 25.43          |

### Nordic Original

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |      | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2402           | -6.93            | 1.51                  | 10.04                  | 4.62   | 2.90 | 30.00 | 1000 | 25.38          |
| 2441           | -6.90            | 1.51                  | 10.04                  | 4.65   | 2.92 | 30.00 | 1000 | 25.35          |
| 2480           | -7.00            | 1.52                  | 10.04                  | 4.56   | 2.86 | 30.00 | 1000 | 25.44          |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

\*The equipment and cables were not used for factor 0 dB of the data sheets.



## Maximum Peak Output Power

Test place : Kashima EMC Lab. No. No.2 Measurement Room  
Report No. : 11347416M  
Date : July 6, 2016  
Temperature / Humidity : 23 deg. C / 54 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx (-40dBm setting)

### BT LE

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |         | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|---------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]    | [dBm] | [mW] |                |
| 2402           | -51.09           | 1.51                  | 10.04                  | -39.54 | 0.00011 | 30.00 | 1000 | 69.54          |
| 2440           | -50.91           | 1.51                  | 10.04                  | -39.36 | 0.00012 | 30.00 | 1000 | 69.36          |
| 2480           | -50.65           | 1.52                  | 10.04                  | -39.09 | 0.00012 | 30.00 | 1000 | 69.09          |

### ANT

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |         | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|---------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]    | [dBm] | [mW] |                |
| 2402           | -50.67           | 1.51                  | 10.04                  | -39.12 | 0.00012 | 30.00 | 1000 | 69.12          |
| 2441           | -50.65           | 1.51                  | 10.04                  | -39.10 | 0.00012 | 30.00 | 1000 | 69.10          |
| 2480           | -50.38           | 1.52                  | 10.04                  | -38.82 | 0.00013 | 30.00 | 1000 | 68.82          |

### Nordic Original

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |         | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|---------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]    | [dBm] | [mW] |                |
| 2402           | -50.90           | 1.51                  | 10.04                  | -39.35 | 0.00012 | 30.00 | 1000 | 69.35          |
| 2441           | -50.68           | 1.51                  | 10.04                  | -39.13 | 0.00012 | 30.00 | 1000 | 69.13          |
| 2480           | -50.32           | 1.52                  | 10.04                  | -38.76 | 0.00013 | 30.00 | 1000 | 68.76          |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

\*The equipment and cables were not used for factor 0 dB of the data sheets.

**Average Output Power (Reference data for)**

Test place : Kashima EMC Lab. No. No.2 Measurement Room  
Report No. : 11347416M  
Date : July 6, 2016  
Temperature / Humidity : 23 deg. C / 54 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx (+4dBm setting)

BT LE

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Frame power) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power) |      |
|----------------|------------------|-----------------------|------------------------|-------------------------|------|------------------------|-------------------------|------|
|                |                  |                       |                        | [dBm]                   | [mW] |                        | [dBm]                   | [mW] |
| 2402           | -8.89            | 1.51                  | 10.04                  | 2.66                    | 1.85 | 1.97                   | 4.63                    | 2.90 |
| 2440           | -8.85            | 1.51                  | 10.04                  | 2.70                    | 1.86 | 1.97                   | 4.67                    | 2.93 |
| 2480           | -8.97            | 1.52                  | 10.04                  | 2.59                    | 1.82 | 1.97                   | 4.56                    | 2.86 |

ANT

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Frame power) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power) |      |
|----------------|------------------|-----------------------|------------------------|-------------------------|------|------------------------|-------------------------|------|
|                |                  |                       |                        | [dBm]                   | [mW] |                        | [dBm]                   | [mW] |
| 2402           | -7.41            | 1.51                  | 10.04                  | 4.14                    | 2.59 | 0.23                   | 4.37                    | 2.74 |
| 2441           | -7.37            | 1.51                  | 10.04                  | 4.18                    | 2.62 | 0.23                   | 4.41                    | 2.76 |
| 2480           | -7.49            | 1.52                  | 10.04                  | 4.07                    | 2.55 | 0.23                   | 4.30                    | 2.69 |

Nordic Original

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Frame power) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power) |      |
|----------------|------------------|-----------------------|------------------------|-------------------------|------|------------------------|-------------------------|------|
|                |                  |                       |                        | [dBm]                   | [mW] |                        | [dBm]                   | [mW] |
| 2402           | -7.65            | 1.51                  | 10.04                  | 3.90                    | 2.45 | 0.45                   | 4.35                    | 2.72 |
| 2441           | -7.61            | 1.51                  | 10.04                  | 3.94                    | 2.48 | 0.45                   | 4.39                    | 2.75 |
| 2480           | -7.71            | 1.52                  | 10.04                  | 3.85                    | 2.43 | 0.45                   | 4.30                    | 2.69 |

Sample Calculation:

Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Result (Burst power) = Frame power + Duty factor

\*The equipment and cables were not used for factor 0 dB of the data sheets.

**Average Output Power (Reference data for)**

Test place : Kashima EMC Lab. No. No.2 Measurement Room  
Report No. : 11347416M  
Date : July 6, 2016  
Temperature / Humidity : 23 deg. C / 54 % RH  
Engineer : Kazuhiro Ando  
Mode : Tx (-40dBm setting)

BT LE

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Frame power) |         | Duty<br>factor<br>[dB] | Result<br>(Burst power) |         |
|----------------|------------------|-----------------------|------------------------|-------------------------|---------|------------------------|-------------------------|---------|
|                |                  |                       |                        | [dBm]                   | [mW]    |                        | [dBm]                   | [mW]    |
| 2402           | -53.79           | 1.51                  | 10.04                  | -42.24                  | 0.00006 | 1.97                   | -40.27                  | 0.00009 |
| 2440           | -53.65           | 1.51                  | 10.04                  | -42.10                  | 0.00006 | 1.97                   | -40.13                  | 0.00010 |
| 2480           | -53.35           | 1.52                  | 10.04                  | -41.79                  | 0.00007 | 1.97                   | -39.82                  | 0.00010 |

ANT

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Frame power) |         | Duty<br>factor<br>[dB] | Result<br>(Burst power) |         |
|----------------|------------------|-----------------------|------------------------|-------------------------|---------|------------------------|-------------------------|---------|
|                |                  |                       |                        | [dBm]                   | [mW]    |                        | [dBm]                   | [mW]    |
| 2402           | -51.77           | 1.51                  | 10.04                  | -40.22                  | 0.00010 | 0.23                   | -39.99                  | 0.00010 |
| 2441           | -51.66           | 1.51                  | 10.04                  | -40.11                  | 0.00010 | 0.23                   | -39.88                  | 0.00010 |
| 2480           | -51.39           | 1.52                  | 10.04                  | -39.83                  | 0.00010 | 0.23                   | -39.60                  | 0.00011 |

Nordic Original

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Frame power) |         | Duty<br>factor<br>[dB] | Result<br>(Burst power) |         |
|----------------|------------------|-----------------------|------------------------|-------------------------|---------|------------------------|-------------------------|---------|
|                |                  |                       |                        | [dBm]                   | [mW]    |                        | [dBm]                   | [mW]    |
| 2402           | -52.00           | 1.51                  | 10.04                  | -40.45                  | 0.00009 | 0.45                   | -40.00                  | 0.00010 |
| 2441           | -51.87           | 1.51                  | 10.04                  | -40.32                  | 0.00009 | 0.45                   | -39.87                  | 0.00010 |
| 2480           | -51.52           | 1.52                  | 10.04                  | -39.96                  | 0.00010 | 0.45                   | -39.51                  | 0.00011 |

Sample Calculation:

Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Result (Burst power) = Frame power + Duty factor

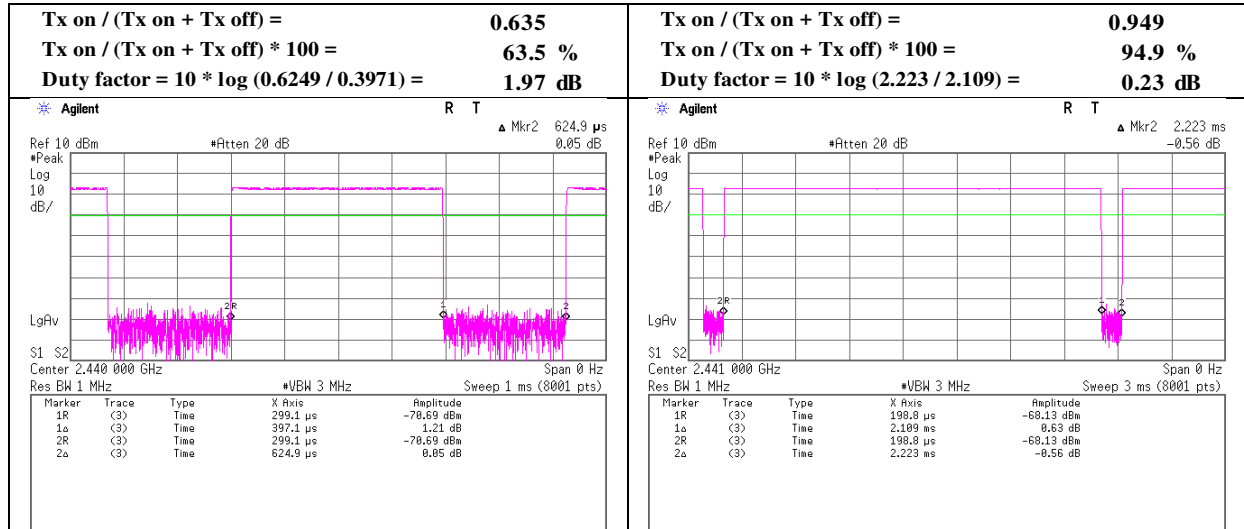
\*The equipment and cables were not used for factor 0 dB of the data sheets.

### Burst rate confirmation

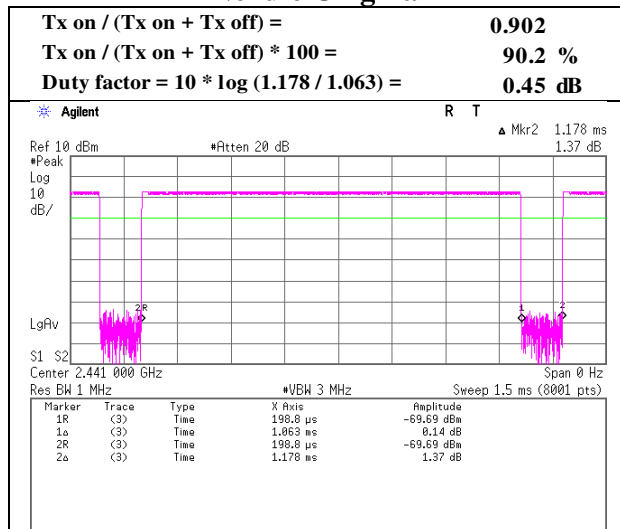
|                        |  |
|------------------------|--|
| Test place             | Kashima EMC Lab. No. No.2 Measurement Room |
| Report No.             | 11347416M                                  |
| Date                   | July 6, 2016                               |
| Temperature / Humidity | 23 deg. C / 54 % RH                        |
| Engineer               | Kazuhiro Ando                              |
| Mode                   | Tx   |

#### BT LE

#### ANT



#### Nordic Original



**UL Japan, Inc.**

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## Radiated Spurious Emission

|                        |  |                     |                     |
|------------------------|--|---------------------|---------------------|
| Test place             | Kashima EMC Lab. No.10 Semi Anechoic Chamber |                     |                     |
| Report No.             | 11347416M                                    |                     |                     |
| Date                   | July 7, 2016                                 | July 8, 2016        | July 12, 2016       |
| Temperature / Humidity | 23 deg. C / 56 % RH                          | 23 deg. C / 56 % RH | 22 deg. C / 54 % RH |
| Engineer               | Kazuhiro Ando                                | Kazuhiro Ando       | Kazuhiro Ando       |
|                        | (1-10GHz)                                    | (10-18GHz)          | (18-26.5GHz)        |
| Mode                   | Tx BT LE 2402 MHz                            |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 2390.000        | PK       | 49.7           | 27.6            | 14.5      | 44.4      | 3.5                  | 50.9            | 73.9           | 23.0        | 162         | 304         |        |
| Hori.    | 4804.000        | PK       | 52.5           | 31.3            | 6.7       | 46.1      | 3.5                  | 47.9            | 73.9           | 26.0        | 192         | 65          |        |
| Hori.    | 7206.000        | PK       | 52.1           | 36.3            | 8.1       | 44.7      | 3.5                  | 55.3            | 73.9           | 18.6        | 220         | 129         |        |
| Vert.    | 2390.000        | PK       | 50.2           | 27.6            | 14.5      | 44.4      | 3.5                  | 51.4            | 73.9           | 22.5        | 147         | 174         |        |
| Vert.    | 4804.000        | PK       | 53.0           | 31.3            | 6.7       | 46.1      | 3.5                  | 48.4            | 73.9           | 25.5        | 174         | 285         |        |
| Vert.    | 7206.000        | PK       | 52.3           | 36.3            | 8.1       | 44.7      | 3.5                  | 55.5            | 73.9           | 18.4        | 197         | 149         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log(4.5 m / 3.0 m) = 3.5 dB

10 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2390.000        | AV       | 41.0           | 27.6            | 14.5      | 44.4      | 2.0              | 3.5                  | 44.2            | 53.9           | 9.7         | *1)    |
| Hori.    | 4804.000        | AV       | 41.9           | 31.3            | 6.7       | 46.1      | 2.0              | 3.5                  | 39.3            | 53.9           | 14.6        |        |
| Hori.    | 7206.000        | AV       | 43.4           | 36.3            | 8.1       | 44.7      | 2.0              | 3.5                  | 48.6            | 53.9           | 5.3         |        |
| Vert.    | 2390.000        | AV       | 41.5           | 27.6            | 14.5      | 44.4      | 2.0              | 3.5                  | 44.7            | 53.9           | 9.2         | *1)    |
| Vert.    | 4804.000        | AV       | 44.8           | 31.3            | 6.7       | 46.1      | 2.0              | 3.5                  | 42.2            | 53.9           | 11.7        |        |
| Vert.    | 7206.000        | AV       | 43.5           | 36.3            | 8.1       | 44.7      | 2.0              | 3.5                  | 48.7            | 53.9           | 5.2         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log(4.5 m / 3.0 m) = 3.5 dB

10 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)

### 20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2402.000        | PK       | 93.2           | 27.6            | 14.5      | 44.4      | 3.5                  | 94.4            | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 48.6           | 27.6            | 14.5      | 44.4      | 3.5                  | 49.8            | 74.4           | 24.6        |         |
| Vert.    | 2402.000        | PK       | 92.4           | 27.6            | 14.5      | 44.4      | 3.5                  | 93.6            | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 46.3           | 27.6            | 14.5      | 44.4      | 3.5                  | 47.5            | 73.6           | 26.1        |         |

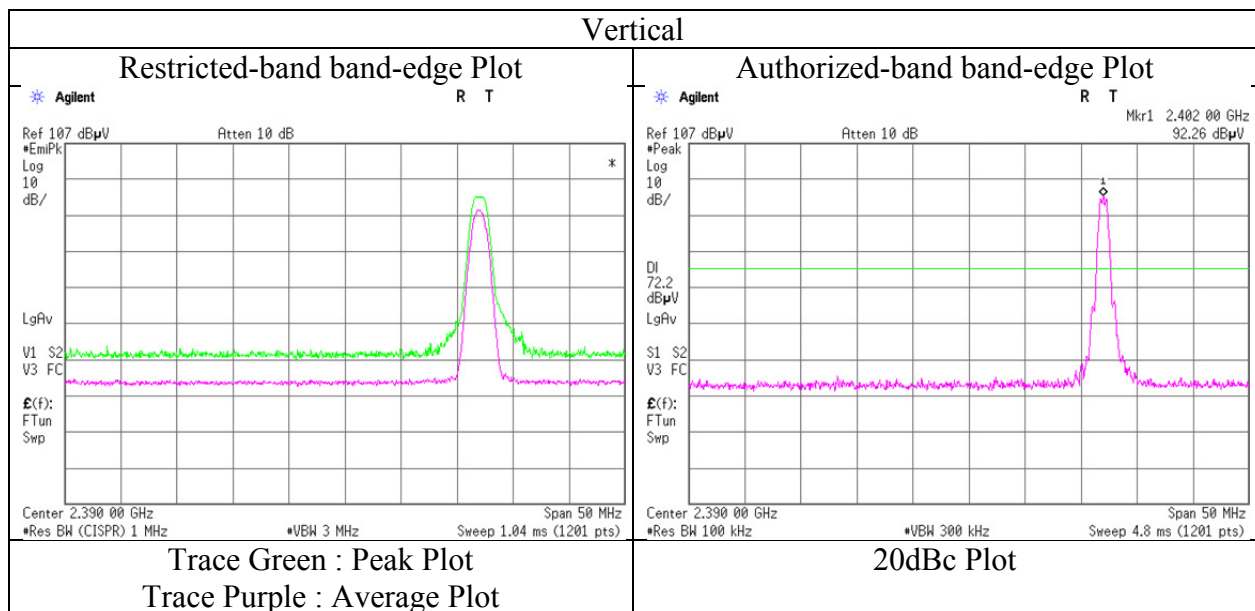
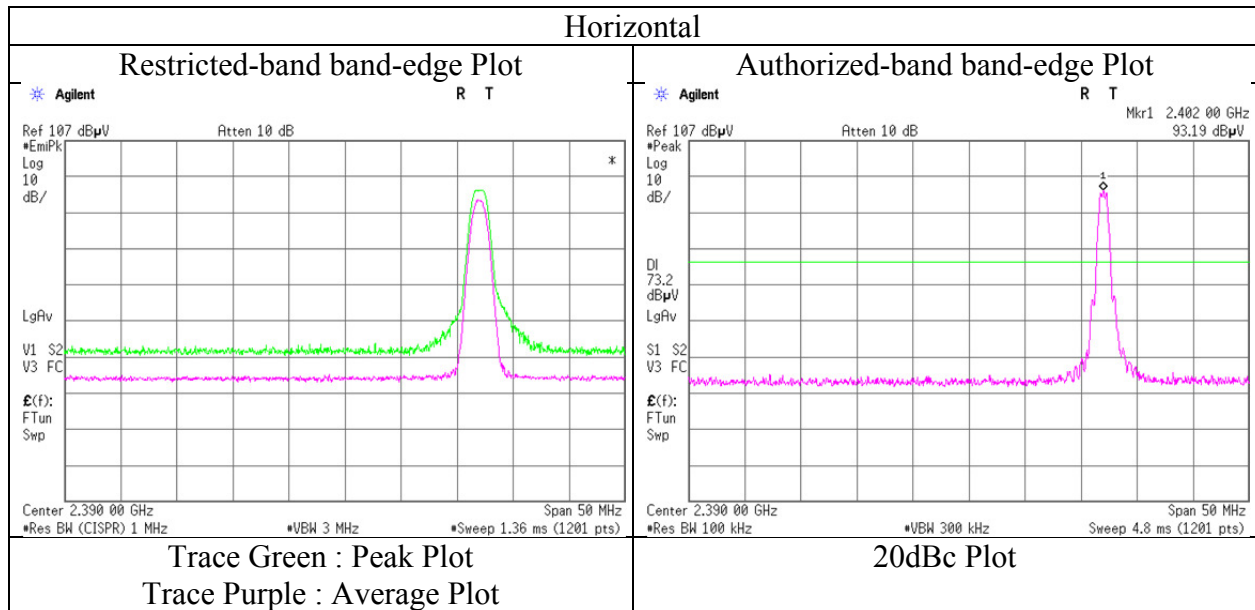
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log(4.5 m / 3.0 m) = 3.5 dB

10 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
Report No. : 11347416M  
Date : July 7, 2016  
Temperature / Humidity : 23 deg. C / 56 % RH  
Engineer : Kazuhiro Ando  
(1-10GHz)  
Mode : Tx BT LE 2402 MHz



\* Final result of restricted band edge was shown in tabular data.



## Radiated Spurious Emission

|                        |  |                     |                     |
|------------------------|--|---------------------|---------------------|
| Test place             | Kashima EMC Lab. No.10 Semi Anechoic Chamber |                     |                     |
| Report No.             | 11347416M                                    |                     |                     |
| Date                   | July 7, 2016                                 | July 8, 2016        | July 12, 2016       |
| Temperature / Humidity | 23 deg. C / 56 % RH                          | 23 deg. C / 56 % RH | 22 deg. C / 54 % RH |
| Engineer               | Kazuhiro Ando                                | Kazuhiro Ando       | Kazuhiro Ando       |
|                        | (1-10GHz)                                    | (10-18GHz)          | (18-26.5GHz)        |
| Mode                   | Tx BT LE 2480 MHz                            |                     |                     |

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 2483.500        | PK       | 59.3           | 27.5            | 14.5      | 44.3      | 3.5                  | 60.5            | 73.9           | 13.4        | 180         | 296         |        |
| Hori.    | 4960.000        | PK       | 52.8           | 31.4            | 6.8       | 46.1      | 3.5                  | 48.4            | 73.9           | 25.5        | 172         | 47          |        |
| Hori.    | 7440.000        | PK       | 50.9           | 36.7            | 8.2       | 44.2      | 3.5                  | 55.1            | 73.9           | 18.8        | 154         | 30          |        |
| Vert.    | 2483.500        | PK       | 55.1           | 27.5            | 14.5      | 44.3      | 3.5                  | 56.3            | 73.9           | 17.6        | 167         | 34          |        |
| Vert.    | 4960.000        | PK       | 52.9           | 31.4            | 6.8       | 46.1      | 3.5                  | 48.5            | 73.9           | 25.4        | 164         | 311         |        |
| Vert.    | 7440.000        | PK       | 51.2           | 36.7            | 8.2       | 44.2      | 3.5                  | 55.4            | 73.9           | 18.5        | 178         | 165         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.5\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2483.500        | AV       | 42.9           | 27.5            | 14.5      | 44.3      | 2.0              | 3.5                  | 46.1            | 53.9           | 7.8         | *1)    |
| Hori.    | 4960.000        | AV       | 43.8           | 31.4            | 6.8       | 46.1      | 2.0              | 3.5                  | 41.4            | 53.9           | 12.5        |        |
| Hori.    | 7440.000        | AV       | 40.7           | 36.7            | 8.2       | 44.2      | 2.0              | 3.5                  | 46.9            | 53.9           | 7.0         |        |
| Vert.    | 2483.500        | AV       | 41.3           | 27.5            | 14.5      | 44.3      | 2.0              | 3.5                  | 44.5            | 53.9           | 9.4         | *1)    |
| Vert.    | 4960.000        | AV       | 43.6           | 31.4            | 6.8       | 46.1      | 2.0              | 3.5                  | 41.2            | 53.9           | 12.7        |        |
| Vert.    | 7440.000        | AV       | 42.3           | 36.7            | 8.2       | 44.2      | 2.0              | 3.5                  | 48.5            | 53.9           | 5.4         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 10 GHz :  $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.5\text{ dB}$

10 GHz - 26.5 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

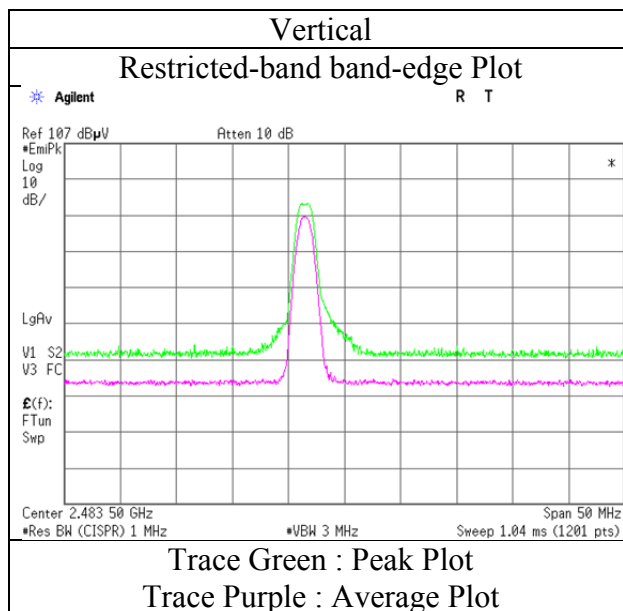
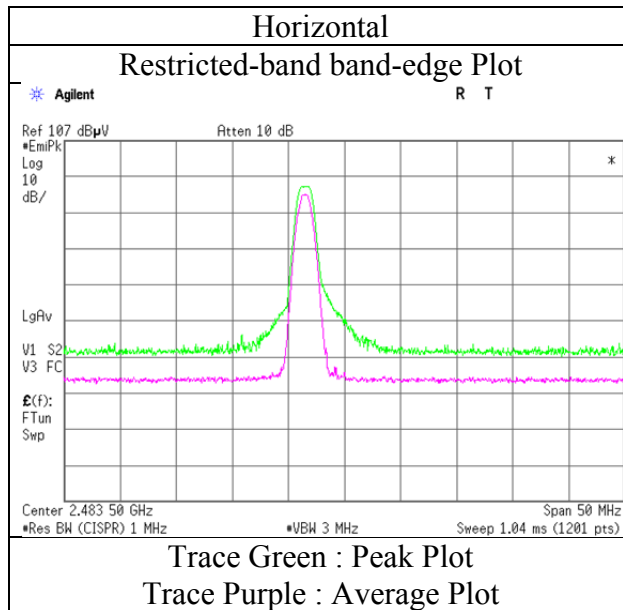
Duty factor refer to "Duty factor Calculation chart" sheet.

\*1) Not out of band emission (Leakage Power)



**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
Report No. : 11347416M  
Date : July 7, 2016  
Temperature / Humidity : 23 deg. C / 56 % RH  
Engineer : Kazuhiro Ando  
(1-10GHz)  
Mode : Tx BT LE 2480 MHz

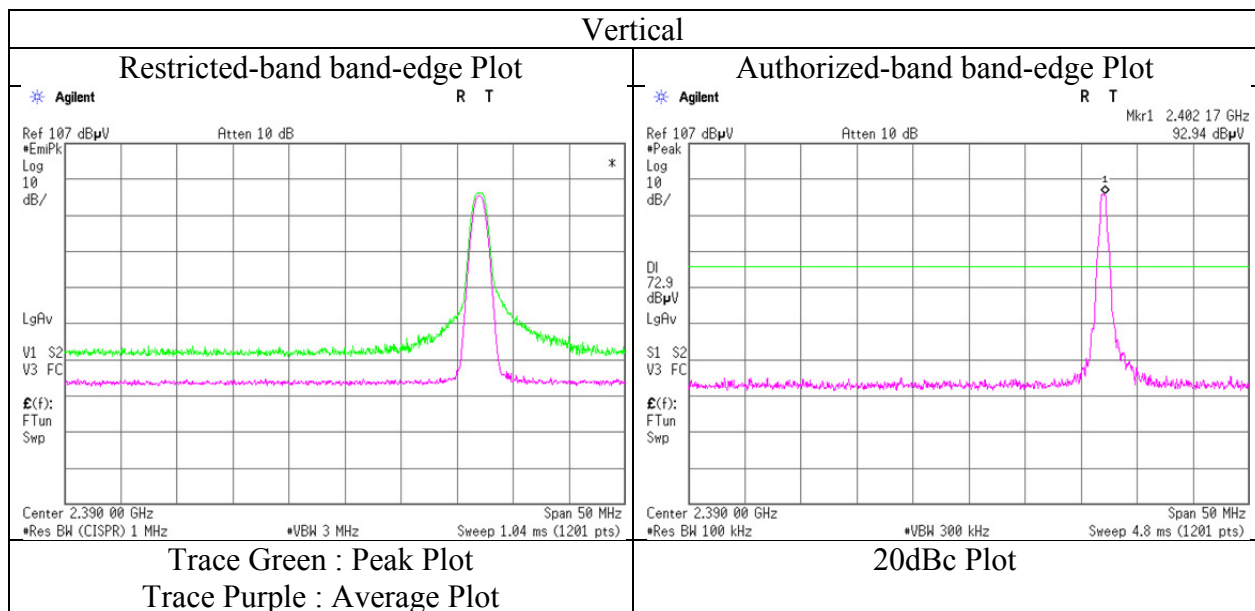
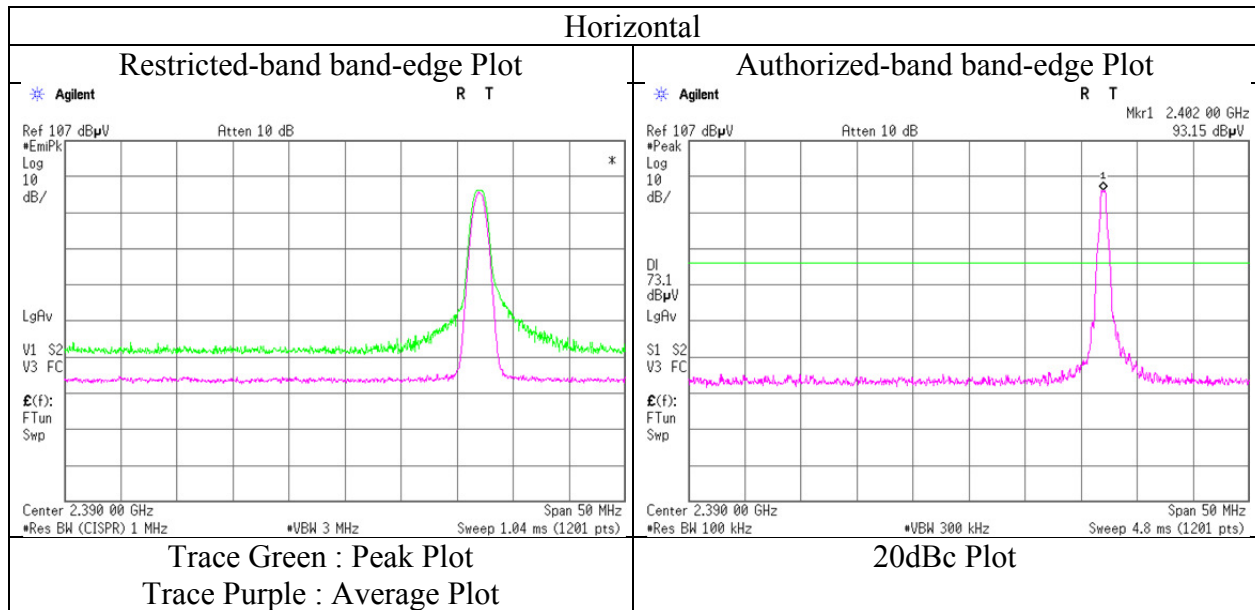


\* Final result of restricted band edge was shown in tabular data.



**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
Report No. : 11347416M  
Date : July 7, 2016  
Temperature / Humidity : 23 deg. C / 56 % RH  
Engineer : Kazuhiro Ando  
(1-10GHz)  
Mode : Tx ANT 2402 MHz



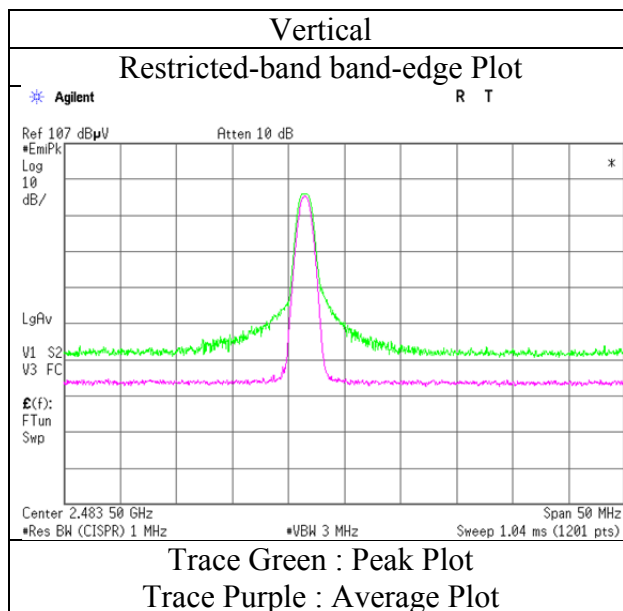
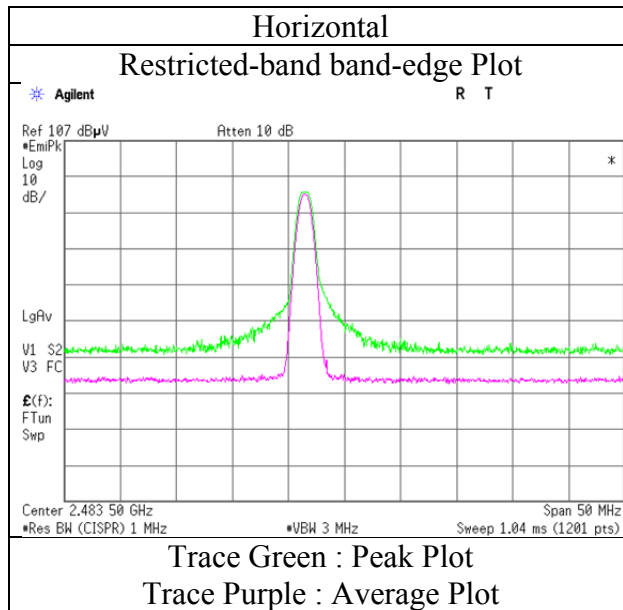
\* Final result of restricted band edge was shown in tabular data.





**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
Report No. : 11347416M  
Date : July 7, 2016  
Temperature / Humidity : 23 deg. C / 56 % RH  
Engineer : Kazuhiro Ando  
(1-10GHz)  
Mode : Tx ANT 2480 MHz

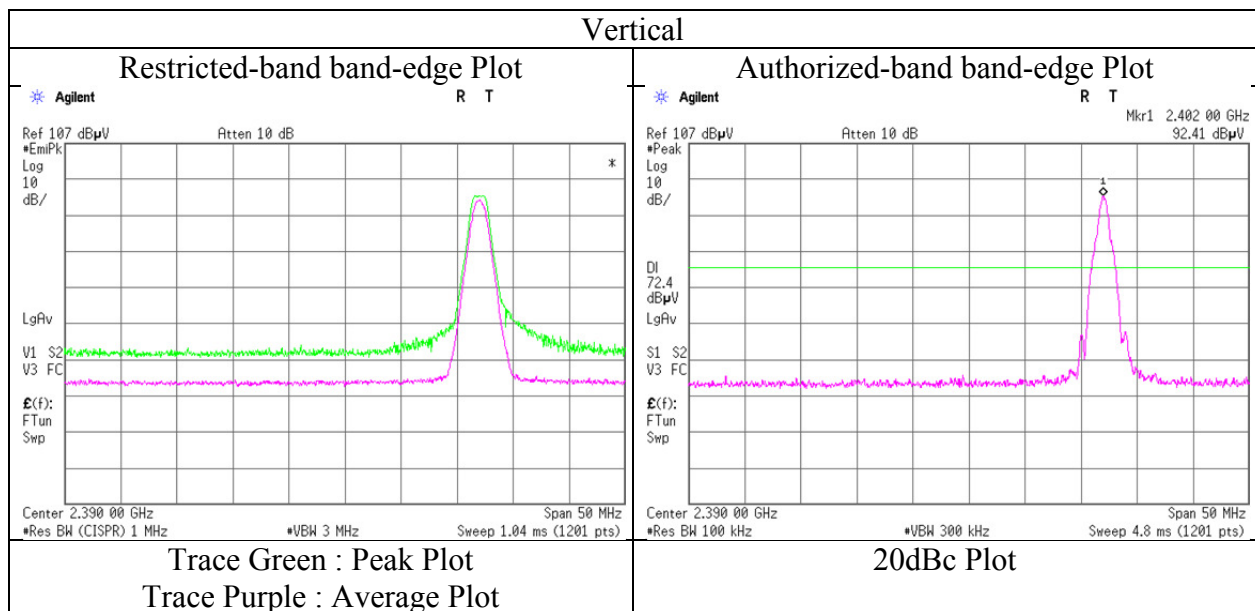
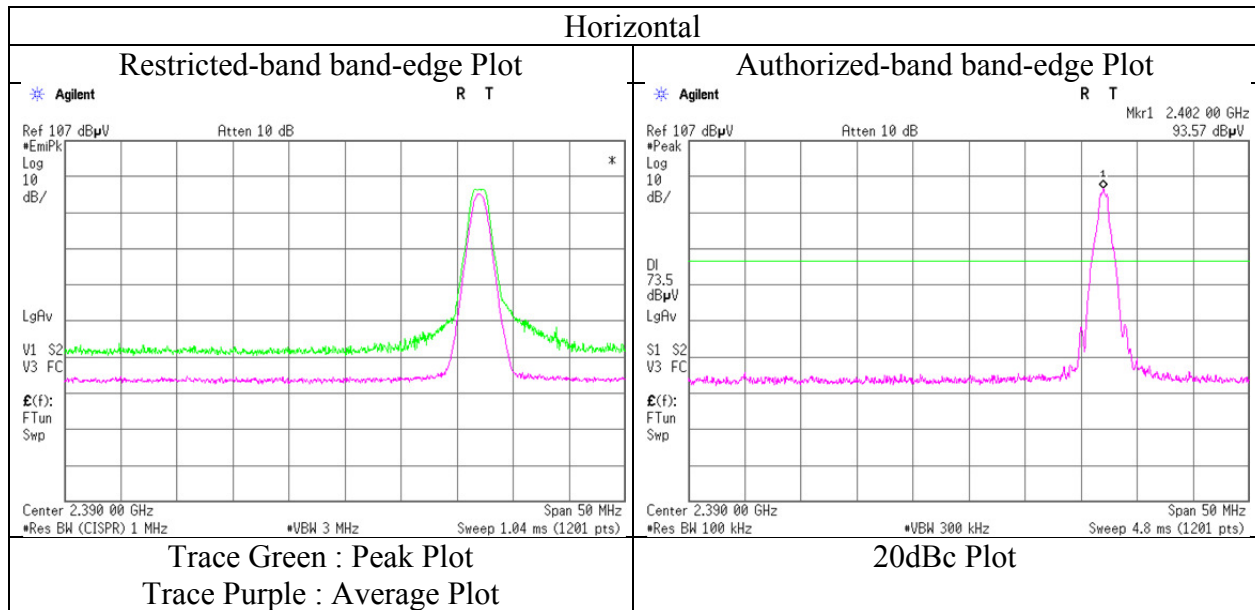


\* Final result of restricted band edge was shown in tabular data.



**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
 Report No. : 11347416M  
 Date : July 7, 2016  
 Temperature / Humidity : 23 deg. C / 56 % RH  
 Engineer : Kazuhiro Ando  
 (1-10GHz)  
 Mode : Tx Nordic 2402 MHz



\* Final result of restricted band edge was shown in tabular data.



## Radiated Spurious Emission

Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
Report No. : 11347416M  
Date : July 12, 2016      July 7, 2016      July 8, 2016      July 12, 2016  
Temperature / Humidity : 22 deg. C / 54 % RH    23 deg. C / 56 % RH    23 deg. C / 56 % RH    22 deg. C / 54 % RH  
Engineer : Kazuhiro Ando      Kazuhiro Ando      Kazuhiro Ando      Kazuhiro Ando  
              (30-1000MHz)      (1-10GHz)      (10-18GHz)      (18-26.5GHz)  
Mode : Tx Nordic 2441 MHz

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------|
| Hori.    | 86.017          | QP       | 43.0           | 7.9             | 5.1       | 26.7      | 0.0                  | 29.3            | 40.0           | 10.7        | 230         | 240         |        |
| Hori.    | 110.594         | QP       | 38.0           | 10.6            | 5.4       | 26.6      | 0.0                  | 27.4            | 43.5           | 16.1        | 290         | 250         |        |
| Hori.    | 2313.000        | PK       | 53.5           | 27.9            | 14.4      | 44.4      | 3.5                  | 54.9            | 73.9           | 19.0        | 176         | 302         |        |
| Hori.    | 2569.000        | PK       | 53.4           | 27.6            | 14.6      | 44.3      | 3.5                  | 54.8            | 73.9           | 19.1        | 168         | 292         |        |
| Hori.    | 4882.000        | PK       | 52.4           | 31.2            | 6.8       | 46.1      | 3.5                  | 47.8            | 73.9           | 26.1        | 142         | 53          |        |
| Hori.    | 7323.000        | PK       | 50.0           | 36.5            | 8.2       | 44.4      | 3.5                  | 53.8            | 73.9           | 20.1        | 148         | 140         |        |
| Hori.    | 2313.000        | AV       | 47.3           | 27.9            | 14.4      | 44.4      | 3.5                  | 48.7            | 53.9           | 5.2         | 176         | 302         |        |
| Hori.    | 2569.000        | AV       | 46.0           | 27.6            | 14.6      | 44.3      | 3.5                  | 47.4            | 53.9           | 6.5         | 168         | 292         |        |
| Vert.    | 61.441          | QP       | 40.9           | 12.9            | 4.7       | 26.8      | 0.0                  | 31.7            | 40.0           | 8.3         | 100         | 165         |        |
| Vert.    | 86.017          | QP       | 47.1           | 7.9             | 5.1       | 26.7      | 0.0                  | 33.4            | 40.0           | 6.6         | 100         | 180         |        |
| Vert.    | 110.594         | QP       | 40.0           | 10.6            | 5.4       | 26.6      | 0.0                  | 29.4            | 43.5           | 14.1        | 100         | 155         |        |
| Vert.    | 500.833         | QP       | 34.3           | 17.8            | 8.8       | 27.4      | 0.0                  | 33.5            | 46.0           | 12.5        | 100         | 260         |        |
| Vert.    | 2313.000        | PK       | 53.3           | 27.9            | 14.4      | 44.4      | 3.5                  | 54.7            | 73.9           | 19.2        | 176         | 315         |        |
| Vert.    | 2569.000        | PK       | 53.9           | 27.6            | 14.6      | 44.3      | 3.5                  | 55.3            | 73.9           | 18.6        | 15          | 330         |        |
| Vert.    | 4882.000        | PK       | 52.8           | 31.2            | 6.8       | 46.1      | 3.5                  | 48.2            | 73.9           | 25.7        | 146         | 197         |        |
| Vert.    | 7323.000        | PK       | 49.9           | 36.5            | 8.2       | 44.4      | 3.5                  | 53.7            | 73.9           | 20.2        | 146         | 148         |        |
| Vert.    | 2313.000        | AV       | 47.4           | 27.9            | 14.4      | 44.4      | 3.5                  | 48.8            | 53.9           | 5.1         | 176         | 315         |        |
| Vert.    | 2569.000        | AV       | 46.8           | 27.6            | 14.6      | 44.3      | 3.5                  | 48.2            | 53.9           | 5.7         | 15          | 330         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor  
Distance factor : 1 GHz - 10 GHz : 20log(4.5 m / 3.0 m) = 3.5 dB  
10 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4882.000        | AV       | 41.4           | 31.2            | 6.8       | 46.1      | 0.5              | 3.5                  | 37.3            | 53.9           | 16.7        |        |
| Hori.    | 7323.000        | AV       | 38.3           | 36.5            | 8.2       | 44.4      | 0.5              | 3.5                  | 42.6            | 53.9           | 11.4        |        |
| Vert.    | 4882.000        | AV       | 43.3           | 31.2            | 6.8       | 46.1      | 0.5              | 3.5                  | 39.2            | 53.9           | 14.8        |        |
| Vert.    | 7323.000        | AV       | 41.4           | 36.5            | 8.2       | 44.4      | 0.5              | 3.5                  | 45.7            | 53.9           | 8.2         |        |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor  
Distance factor : 1 GHz - 10 GHz : 20log(4.5 m / 3.0 m) = 3.5 dB  
10 GHz - 26.5 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB  
Duty factor refer to "Duty factor Calculation chart" sheet.

**UL Japan, Inc.**

**Kashima EMC Lab.**

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

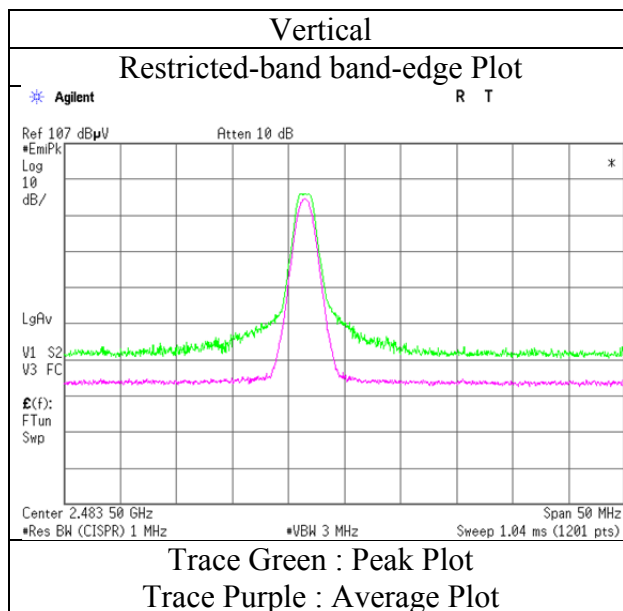
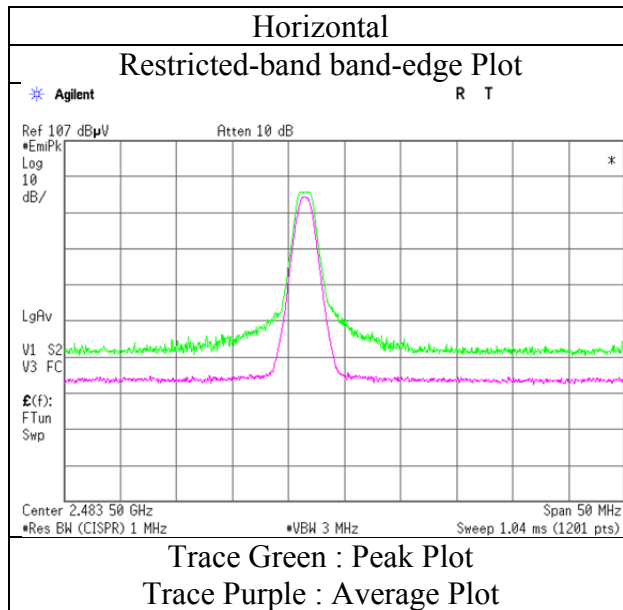
Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373



**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

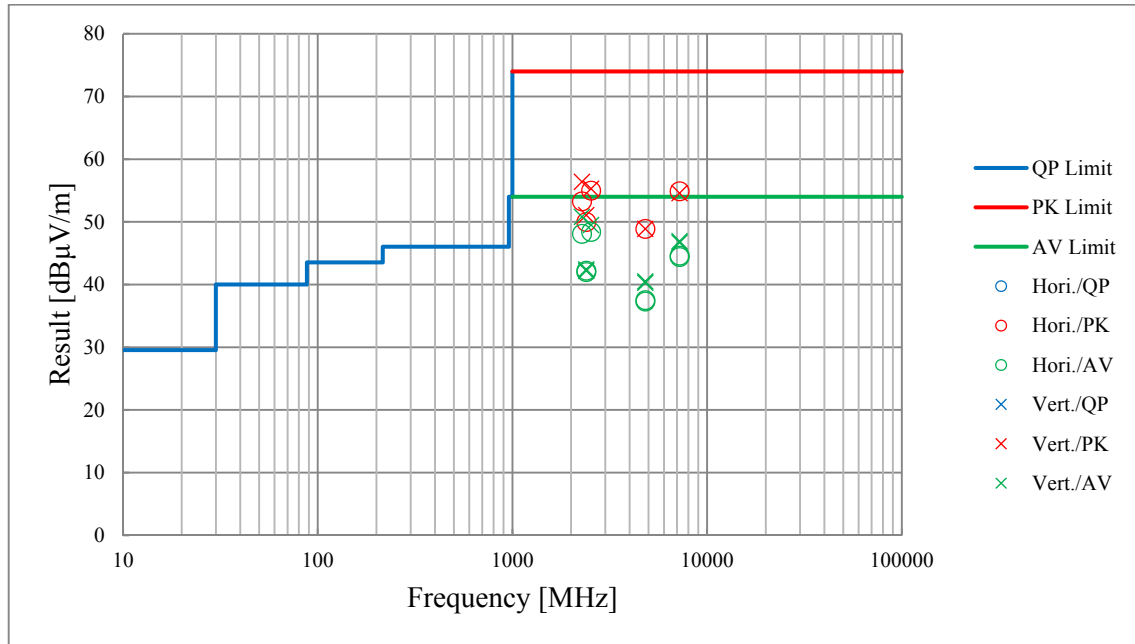
Test place : Kashima EMC Lab. No.10 Semi Anechoic Chamber  
Report No. : 11347416M  
Date : July 7, 2016  
Temperature / Humidity : 23 deg. C / 56 % RH  
Engineer : Kazuhiro Ando  
(1-10GHz)  
Mode : Tx Nordic 2480 MHz



\* Final result of restricted band edge was shown in tabular data.

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

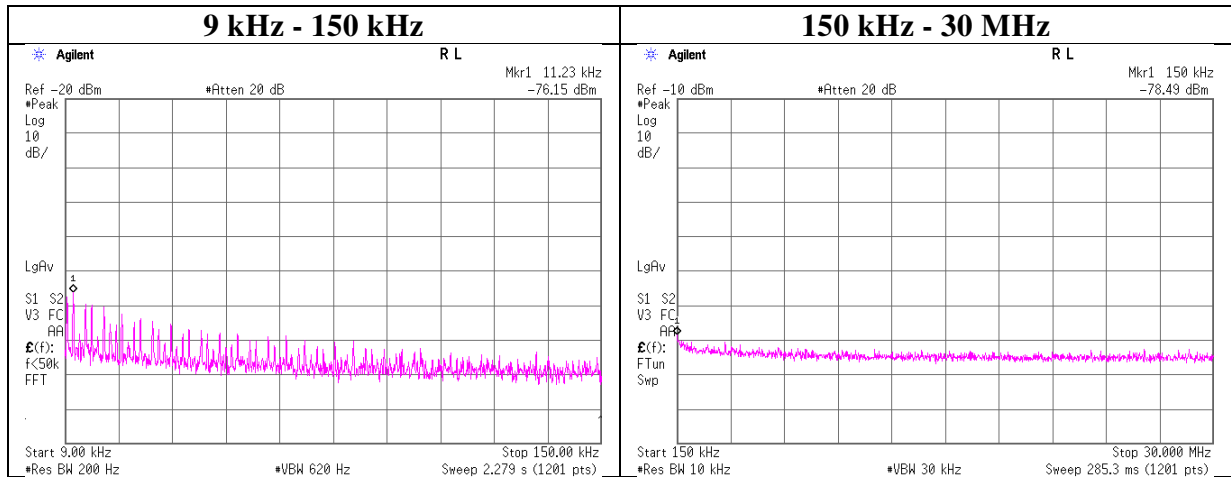
|                        |  |                             |                               |
|------------------------|--|-----------------------------|-------------------------------|
| Test place             | Kashima EMC Lab. No.10 Semi Anechoic Chamber |                             |                               |
| Report No.             | 11347416M                                    |                             |                               |
| Date                   | July 7, 2016                                 | July 8, 2016                | July 12, 2016                 |
| Temperature / Humidity | 23 deg. C / 56 % RH                          | 23 deg. C / 56 % RH         | 22 deg. C / 54 % RH           |
| Engineer               | Kazuhiro Ando<br>(1-10GHz)                   | Kazuhiro Ando<br>(10-18GHz) | Kazuhiro Ando<br>(18-26.5GHz) |
| Mode                   | Tx ANT 2402 MHz                              |                             |                               |



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

### Conducted Spurious Emission

Test place : Kashima EMC Lab. No.2 Measurement Room  
 Report No. : 11347416M  
 Date : July 6, 2016  
 Temperature / Humidity : 23 deg. C / 54 % RH  
 Engineer : Kazuhiro Ando  
 Mode : Tx BT LE 2440 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 11.23              | -76.2            | 0.01                  | 9.95                       | 2.0                      | 1                          | -64.2         | 300             | 6.0                      | -2.9                              | 46.5              | 49.4           |        |
| 150.00             | -78.5            | 0.01                  | 9.94                       | 2.0                      | 1                          | -66.5         | 300             | 6.0                      | -5.3                              | 24.0              | 29.3           |        |

$E = \text{EIRP} - 20 \log(D) + \text{Ground bounce} + 104.8 \text{ [dBuV/m]}$

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

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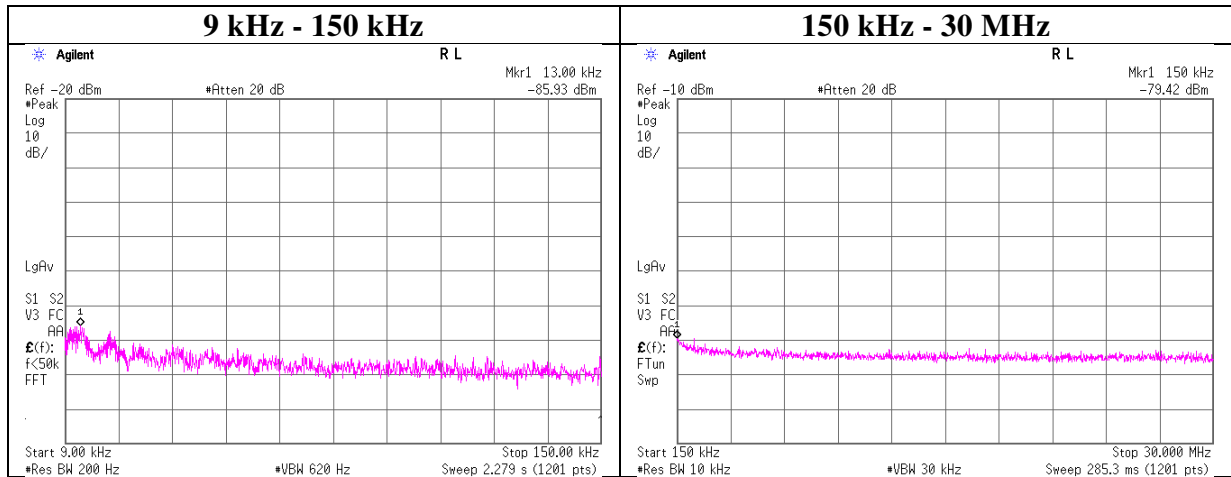
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

### Conducted Spurious Emission

Test place : Kashima EMC Lab. No.2 Measurement Room  
 Report No. : 11347416M  
 Date : July 6, 2016  
 Temperature / Humidity : 23 deg. C / 54 % RH  
 Engineer : Kazuhiro Ando  
 Mode : Tx ANT 2441 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 13.00              | -85.9            | 0.01                  | 10.0                       | 2.0                      | 1                          | -74.0         | 300             | 6.0                      | -12.7                             | 45.3              | 58.0           |        |
| 150.00             | -79.4            | 0.01                  | 9.9                        | 2.0                      | 1                          | -67.5         | 300             | 6.0                      | -6.2                              | 24.0              | 30.2           |        |

$E = \text{EIRP} - 20 \log(D) + \text{Ground bounce} + 104.8 \text{ [dBuV/m]}$

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

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**Kashima EMC Lab.**

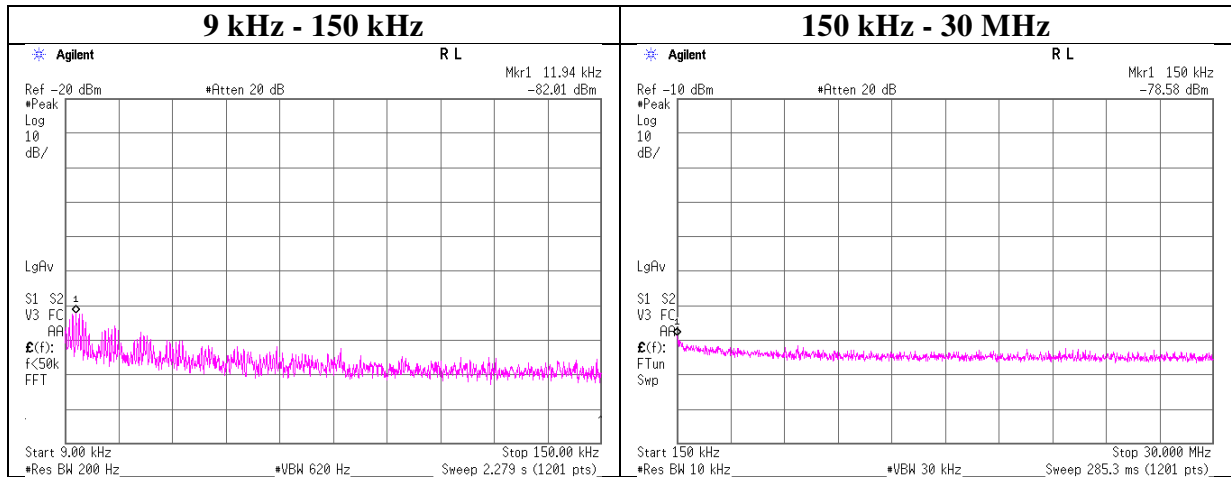
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Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

### Conducted Spurious Emission

Test place : Kashima EMC Lab. No.2 Measurement Room  
 Report No. : 11347416M  
 Date : July 6, 2016  
 Temperature / Humidity : 23 deg. C / 54 % RH  
 Engineer : Kazuhiro Ando  
 Mode : Tx Nordic 2441 MHz



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 11.94              | -82.0            | 0.01                  | 9.95                       | 2.0                      | 1                          | -70.1         | 300             | 6.0                      | -8.8                              | 46.0              | 54.8           |        |
| 150.00             | -78.6            | 0.01                  | 9.94                       | 2.0                      | 1                          | -66.6         | 300             | 6.0                      | -5.4                              | 24.0              | 29.4           |        |

$E = \text{EIRP} - 20 \log(D) + \text{Ground bounce} + 104.8 \text{ [dBuV/m]}$

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

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## Power Density

Test place                      Kashima EMC Lab. No.2 Measurement Room  
Report No.                      11347416M  
Date                              July 6, 2016  
Temperature / Humidity        23 deg. C / 54 % RH  
Engineer                        Kazuhiro Ando  
Mode                              Tx

### BT LE

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|-----------------|----------------|----------------|
| 2402.00        | -22.19           | 1.51                  | 10.04                  | -10.64          | 8.00           | 18.64          |
| 2440.00        | -22.17           | 1.51                  | 10.04                  | -10.62          | 8.00           | 18.62          |
| 2480.00        | -22.20           | 1.52                  | 10.04                  | -10.64          | 8.00           | 18.64          |

### ANT

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|-----------------|----------------|----------------|
| 2402.00        | -16.80           | 1.51                  | 10.04                  | -5.25           | 8.00           | 13.25          |
| 2441.00        | -17.03           | 1.51                  | 10.04                  | -5.48           | 8.00           | 13.48          |
| 2480.00        | -16.56           | 1.52                  | 10.04                  | -5.00           | 8.00           | 13.00          |

### Nordic Original

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|-----------------|----------------|----------------|
| 2402.00        | -20.41           | 1.51                  | 10.04                  | -8.86           | 8.00           | 16.86          |
| 2441.00        | -20.61           | 1.51                  | 10.04                  | -9.06           | 8.00           | 17.06          |
| 2480.00        | -20.41           | 1.52                  | 10.04                  | -8.85           | 8.00           | 16.85          |

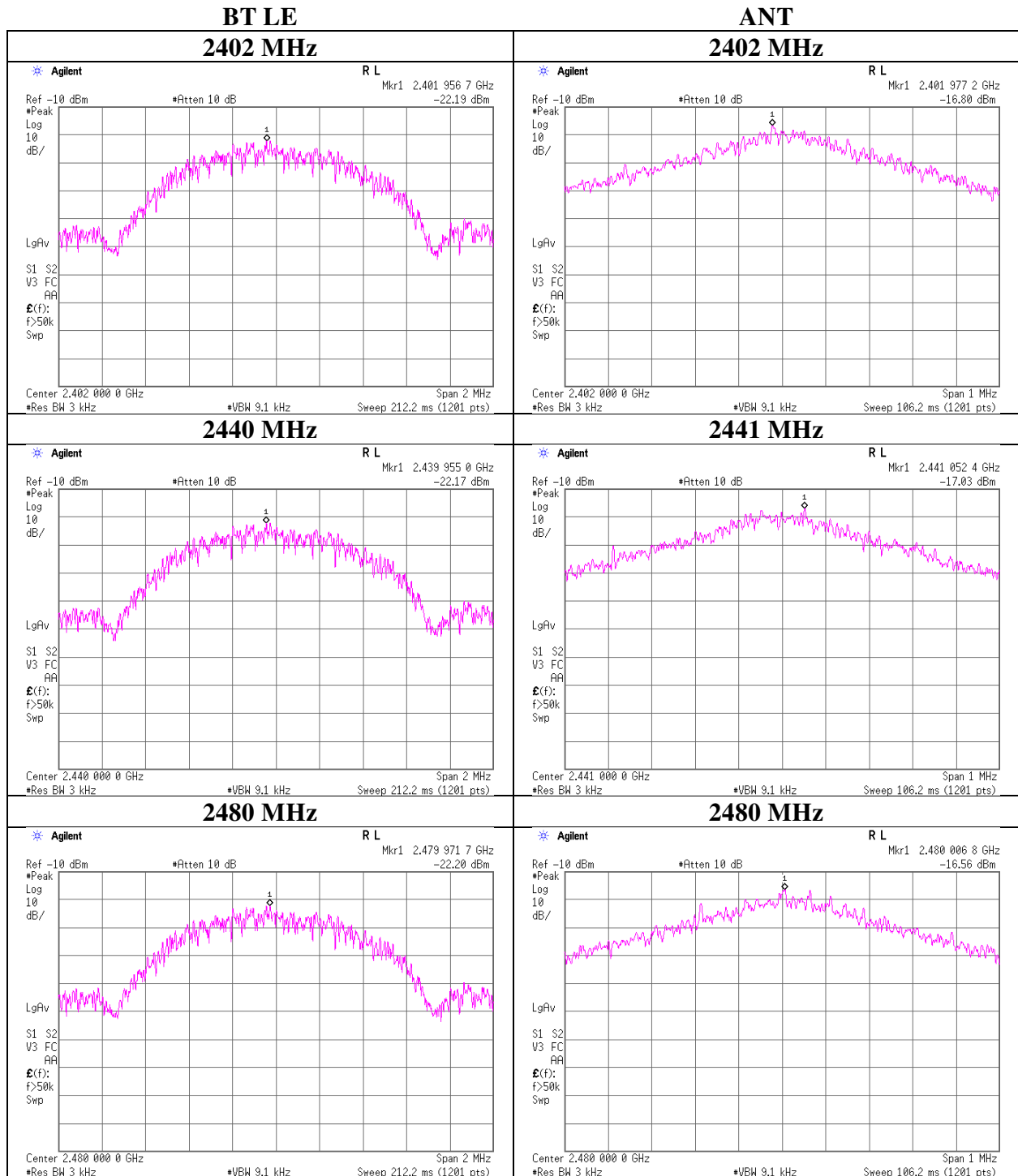
Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

\*The equipment and cables were not used for factor 0 dB of the data sheets.

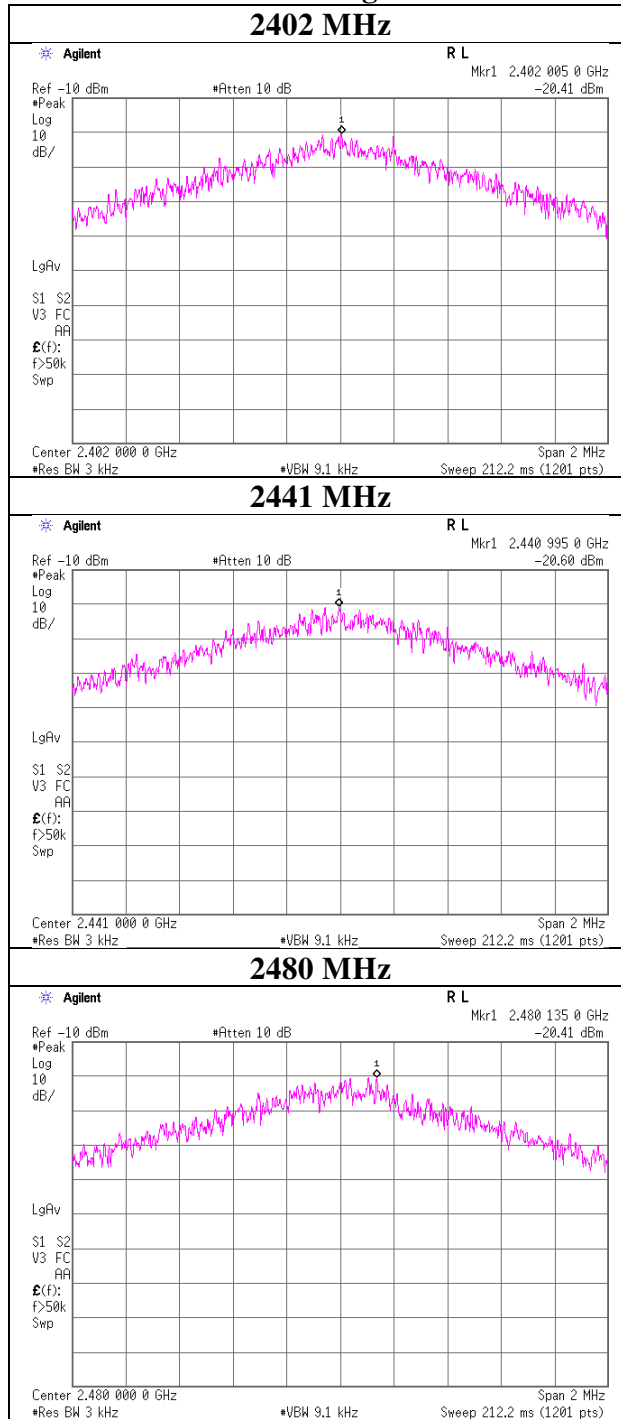


**Power Density**



## Power Density

### Nordic Original



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Kashima EMC Lab.

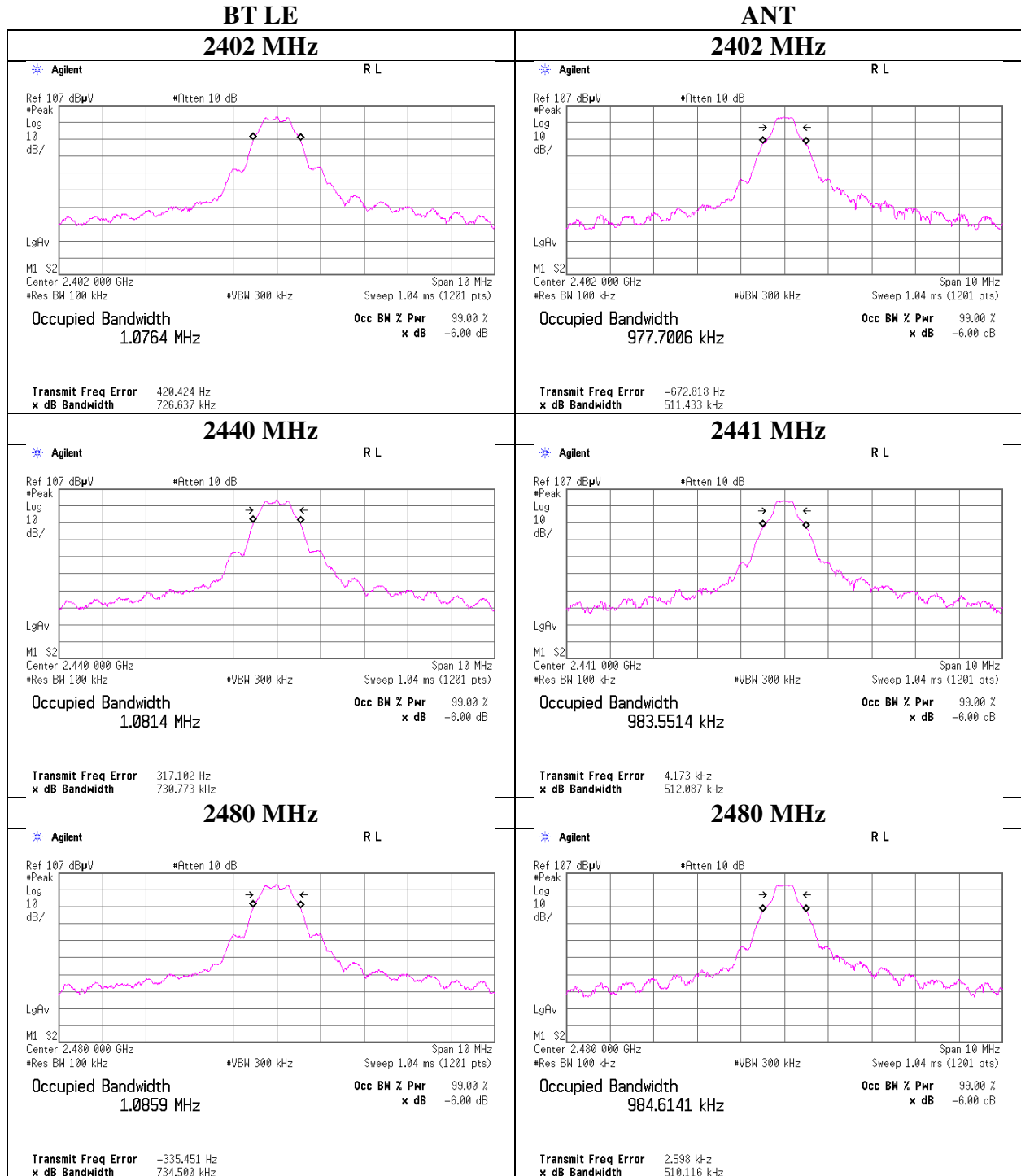
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### 99% Occupied Bandwidth

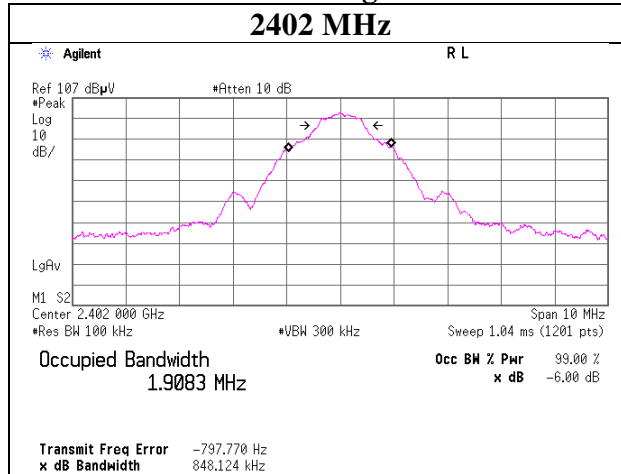
|                        |  |
|------------------------|--|
| Test place             | Kashima EMC Lab. No.2 Measurement Room |
| Report No.             | 11347416M                              |
| Date                   | July 6, 2016                           |
| Temperature / Humidity | 23 deg. C / 54 % RH                    |
| Engineer               | Kazuhiro Ando                          |
| Mode                   | Tx                                     |



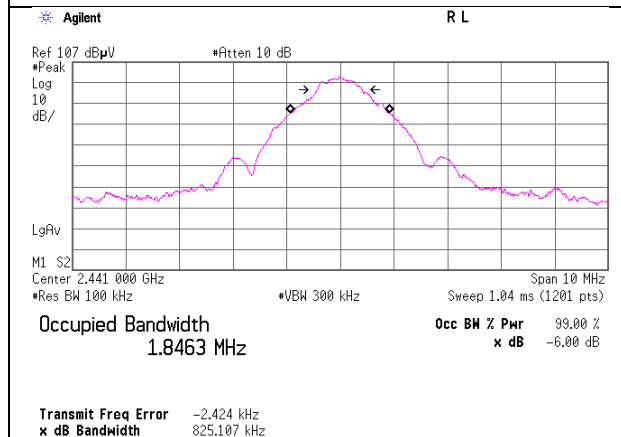
## 99% Occupied Bandwidth

|                        |  |
|------------------------|--|
| Test place             | Kashima EMC Lab. No.2 Measurement Room |
| Report No.             | 11347416M                              |
| Date                   | July 6, 2016                           |
| Temperature / Humidity | 23 deg. C / 54 % RH                    |
| Engineer               | Kazuhiro Ando                          |
| Mode                   | Tx                                     |

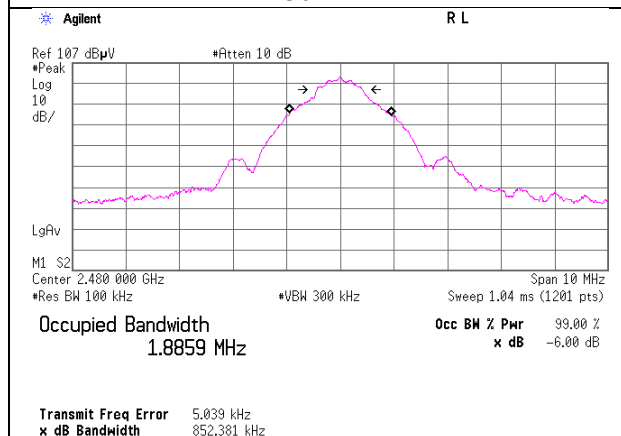
### Nordic Original 2402 MHz



### 2441 MHz



### 2480 MHz



## **APPENDIX 2: Test instruments**

### **Test equipment**

| <b>Control No.</b>                   | <b>Instrument</b>                | <b>Manufacturer</b>  | <b>Model No</b>                                 | <b>Serial No</b>                | <b>Test Item</b> | <b>Calibration Date *<br/>Interval(month)</b> |
|--------------------------------------|----------------------------------|--|---|---------------------------------|------------------|---|
| CLS-25                               | A.M.N.                           | Rohde & Schwarz  | ENV216  | 101042                          | CE               | 2015/08/06 * 12                               |
| CCC-S2-C(2/6<br>/7/8)                | Coaxial Cable                    | Fujikura,Fujikura,Fujikura,Fujikura                                    | 5D-2W,5D-2W,5D-2W,5D-2W                         | -                               | CE               | 2015/07/14 * 12                               |
| CTR-05                               | Test Receiver                    | Rohde & Schwarz  | ESCI  | 100608 Rev 4.32                 | CE               | 2015/09/24 * 12                               |
| COS-02                               | Temperature & Humidity Indicator | A&D  | AD-5681   | 6878345                         | CE               | 2015/07/13 * 12                               |
| CTS-06                               | Digital Multimeter               | FLUKE  | 112   | 89790159                        | CE               | 2015/09/08 * 12                               |
| COTS-CEMI-02                         | EMI Software                     | TSJ  | TEPTO-DV(RE,CE, MF,PE)                          | Ver, RE: 2.5.0131, CE: 2.5.0131 | CE/RE            | -   |
| CTR-09                               | Test Receiver                    | Agilent  | N9038A  | MY53290016<br>Version A.14.03   | 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-R(2/4/CATS-11/5/6/7/8/11/12) | Coaxial Cable                    | Fujikura,Fujikura,Agilent,Fujikura,Fujikura,Fujikura,Fujikura,Fujikura | 5D-2W,5D-2W,8494A,5D-2W,5D-2W,5D-2W,5D-2W,5D-2W | MY41110200(Step Att)            | RE               | 2015/08/11 * 12                               |
| CAF-08                               | Pre-Amplifier                    | Hewlett Packard  | 8447D   | 2944A09041                      | RE               | 2015/08/11 * 12                               |
| CSCL-13                              | Ruler                            | Tajima   | L19-55  | none                            | RE               | 2016/02/22 * 12                               |
| COS-10                               | Temperature & Humidity Indicator | HIOKI  | 3641/9680-50                                    | 090999895/090905406             | RE               | 2016/05/24 * 12                               |
| CTS-14                               | Digital Multimeter               | FLUKE  | 115   | 994460954                       | RE               | 2015/10/01 * 12                               |
| CSA-06                               | Spectrum Analyzer                | Agilent  | N9030A  | MY53310670<br>Version A.13.12   | RE               | 2016/05/26 * 12                               |
| CSA-07                               | Spectrum Analyzer                | Agilent  | E4448A  | MY52490024<br>Version A.11.21   | RE/AT            | 2016/05/11 * 12                               |
| CHA-20                               | Broad Band Horn                  | Schwarzbeck  | BBHA 9120D                                      | 9120D-1270                      | RE               | 2015/07/31 * 12                               |
| CHA-07                               | Double Ridged Horn               | ETS-Lindgren   | 3160-09   | 00166043                        | RE               | 2016/06/24 * 12                               |
| CAF-19                               | Pre-Amplifier                    | TOYO   | HAP18-26W                                       | 00000035                        | RE               | 2016/06/30 * 12                               |
| CAF-21                               | Pre-Amplifier                    | Micro Wave Factory   | MPR-1G26.5-35                                   | 161398                          | RE               | 2016/05/06 * 12                               |
| CAT10-16                             | 10dB Fixed Atten.                | Weinschel  | 54A-10  | 56246                           | RE               | 2016/05/13 * 12                               |
| CHF-03                               | HPF                              | Micro-Tronics  | HPM50111-02                                     | 008                             | RE               | 2016/05/13 * 12                               |
| CCC-W03                              | Micro Wave Cable                 | SUHNER   | SUCOFLEX102                                     | MY3772/2                        | RE               | 2016/05/12 * 12                               |
| CCC-W05                              | Micro Wave Cable                 | Junkosha   | MWX241  | MRA-12-14-145                   | RE               | 2016/05/13 * 12                               |
| CCC-W09                              | Micro Wave Cable                 | SUHNER   | SUCOFLEX104                                     | MY588/4                         | RE               | 2015/07/13 * 12                               |

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| Control No. | Instrument                          | Manufacturer | Model No    | Serial No  | Test Item | Calibration Date *<br>Interval(month) |
|-------------|-------------------------------------|--------------|-------------|------------|-----------|---------------------------------------|
| CAT10-17    | 10dB Fixed Atten.                   | Weinschel    | 54A-10      | 56251      | AT        | 2016/05/13 * 12                       |
| CCC-W01     | Micro Wave Cable                    | SUHNER       | SUCOFLEX102 | MY3662/2   | AT        | 2016/05/13 * 12                       |
| CPM-16      | Peak Power Analyzer                 | Agilent      | 8990B       | MY51000276 | AT        | 2016/06/01 * 12                       |
| CPSO-24     | Power Sensor                        | Agilent      | N1923A      | MY54070024 | AT        | 2016/06/01 * 12                       |
| COS-12      | Temperature &<br>Humidity Indicator | A&D          | AD-5681     | 6876017    | AT        | 2015/07/13 * 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 test**  
**RE: Radiated Emission test**  
**AT: Antenna Terminal Conducted test**

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