# RADIO TEST REPORT

## Test Report No. : 11106101H-B-R1

| | | |
|---|---|---|
| **Applicant** | : | **Nikon Corporation** |
| **Type of Equipment** | : | **Wireless Remote Controller** |
| **Model No.** | : | **N1544** |
| **FCC ID** | : | **CGJ8152EB** |
| **Test regulation** | : | **FCC Part 15 Subpart C: 2015** |
| **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.
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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 11106101H-B. 11106101H-B is replaced with this report.

**Date of test:** February 29 and March 1, 2016

**Representative test engineer:**
Shinichi Miyazono
Engineer
Consumer Technology Division

**Approved by:**
Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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# REVISION HISTORY

## Original Test Report No.: 11106101H-B

| Revision | Test report No. | Date | Page revised | Contents |
|---|---|---|---|---|
| - (Original) | 11106101H-B | March 16, 2016 | - | - |
| 1 | 11106101H-B-R1 | April 5, 2016 | P.17 | Addition of following sentence<br>*The carrier was continually transmitted as the Burst that refers to Page 16. |
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**CONTENTS** **PAGE**

**SECTION 1: Customer information....4**
**SECTION 2: Equipment under test (E.U.T.)....4**
**SECTION 3: Test specification, procedures & results....5**
**SECTION 4: Operation of E.U.T. during testing....8**
**SECTION 5: Radiated Spurious Emission....9**
**SECTION 6: Antenna Terminal Conducted Tests....11**
**APPENDIX 1: Test data....12**
6dB Bandwidth....12
Maximum Peak Output Power....14
Average Output Power....15
Radiated Spurious Emission....18
Conducted Spurious Emission....24
Power Density....27
99%Occupied Bandwidth....29
**APPENDIX 2: Test instruments....30**
**APPENDIX 3: Photographs of test setup....31**
Radiated Spurious Emission....31
Worst Case Position....32

# SECTION 1: Customer information

| | | |
|---|---|---|
| Company Name | : | Nikon Corporation |
| Address | : | 2-15-3, Konan Minato-ku, Tokyo 108-6290 Japan |
| Telephone Number | : | +81-36-433-3873 |
| Facsimile Number | : | +81-36-433-3871 |
| Contact Person | : | Ryuichi Mori |

*Remark
Nikon Corporation designates Hoshiden Corporation as manufacturer of the product (Wireless Remote Controller)

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

## 2.1 Identification of E.U.T.

| | | |
|---|---|---|
| Type of Equipment | : | Wireless Remote Controller |
| Model No. | : | N1544 |
| Serial No. | : | Refer to Section 4, Clause 4.2 |
| Rating | : | DC 3.0 V(CR2032) |
| Receipt Date of Sample | : | February 28, 2016 |
| Country of Mass-production | : | China |
| Condition of EUT | : | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification of EUT | : | No Modification by the test lab |

## 2.2 Product Description

Model: N1544 (referred to as the EUT in this report) is a Wireless Remote Controller.

**General Specification**

| | | |
|---|---|---|
| Clock frequency(ies) in the system | : | CPU: 16 MHz(Max) |

**Radio Specification**

| | | |
|---|---|---|
| Radio Type | : | Transceiver |
| Frequency of Operation | : | 2402 MHz to 2480 MHz |
| Modulation | : | GFSK |
| Power Supply (radio part input) | : | DC 1.56 V |
| Antenna type | : | Inverted-F antenna pattern |
| Antenna Gain | : | 4.05 dBi |

# SECTION 3: Test specification, procedures & results

## 3.1 Test Specification

| | | |
|---|---|---|
| Test Specification | : | FCC Part 15 Subpart C: 2015, final revised on November 23, 2015<br>*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT. |
| Title | : | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.207 Conducted limits<br>Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz |

* The EUT complies with FCC Part 15 Subpart B: 2015, final revised on November 23, 2015

## 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 | - | N/A *1) | - |
| 6dB Bandwidth | **FCC:** KDB 558074 D01 DTS Meas Guidance v03r04<br>**IC:** - | **FCC:** Section 15.247(a)(2)<br>**IC:** RSS-247 5.2(1) | See data. | Complied | Conducted |
| Maximum Peak Output Power | **FCC:** KDB 558074 D01 DTS Meas Guidance v03r04<br>**IC:** RSS-Gen 6.12 | **FCC:** Section 15.247(b)(3)<br>**IC:** RSS-247 5.4(4) | | Complied | Conducted |
| Power Density | **FCC:** KDB 558074 D01 DTS Meas Guidance v03r04<br>**IC:** - | **FCC:** Section 15.247(e)<br>**IC:** RSS-247 5.2(2) | | Complied | Conducted |
| Spurious Emission Restricted Band Edges | **FCC:** KDB 558074 D01 DTS Meas Guidance v03r04<br>**IC:** RSS-Gen 6.13 | **FCC:** Section15.247(d)<br>**IC:** RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 3.5 dB<br>7320.000 MHz, AV, Vertical. | Complied | Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2) |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r04 12.2.7.

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

**FCC Part 15.31 (e)**
voltage (DC 1.56 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

**FCC Part 15.203 Antenna requirement**
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

## 3.3 Addition to standard

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|---|---|---|---|
| 99% Occupied 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 $k = 2$.

Ise EMC Lab.

| Antenna terminal test Uncertainty (+/-) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power meter | | Conducted emission and Power density | | | Conducted emission | | Channel power |
| Below 1 GHz | Above 1 GHz | Below 1 GHz | 1 GHz -3 GHz | 3 GHz -18 GHz | 18 GHz -26.5 GHz | 26.5 GHz -40 GHz | |
| 0.9 dB | 1.0 dB | 1.4 dB | 1.7 dB | 2.8 dB | 2.8 dB | 2.9 dB | 2.6 dB |

| Test distance | Radiated emission (±dB) 9 kHz - 30 MHz |
|---|---|
| 3m | 3.8 dB |
| 10m | 3.7 dB |

| Polarity | Radiated emission (Below 1GHz) | | | |
|---|---|---|---|---|
| | (3 m*)(±dB) | | (10 m*)(±dB) | |
| | 30 – 300 MHz | 300 – 1000MHz | 30 – 300 MHz | 300 – 1000MHz |
| Horizontal | 4.8 dB | 5.2 dB | 4.8 dB | 5.0 dB |
| Vertical | 4.5 dB | 5.9 dB | 4.8 dB | 5.1 dB |

| Radiated emission | | | | |
|---|---|---|---|---|
| (3 m*)(±dB) | | (1 m*)(±dB) | (0.5 m*)(±dB) | (10 m*)(±dB) |
| 1 – 6GHz | 6 – 18GHz | 10 – 26.5 GHz | 26.5 – 40GHz | 1 -18 GHz |
| 5.1 dB | 5.3 dB | 5.1 dB | 5.1 dB | 5.3 dB |

*Measurement distance

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

| Test site | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms | Maximum measurement distance |
|---|---|---|---|---|---|
| No.1 semi-anechoic chamber | 2973C-1 | 19.2 x 11.2 x 7.7 | 7.0 x 6.0 | No.1 Power source room | 10 m |
| No.2 semi-anechoic chamber | 2973C-2 | 7.5 x 5.8 x 5.2 | 4.0 x 4.0 | - | 3 m |
| No.3 semi-anechoic chamber | 2973C-3 | 12.0 x 8.5 x 5.9 | 6.8 x 5.75 | No.3 Preparation room | 3 m |
| No.3 shielded room | - | 4.0 x 6.0 x 2.7 | N/A | - | - |
| No.4 semi-anechoic chamber | 2973C-4 | 12.0 x 8.5 x 5.9 | 6.8 x 5.75 | No.4 Preparation room | 3 m |
| No.4 shielded room | - | 4.0 x 6.0 x 2.7 | N/A | - | - |
| No.5 semi-anechoic chamber | - | 6.0 x 6.0 x 3.9 | 6.0 x 6.0 | - | - |
| No.6 shielded room | - | 4.0 x 4.5 x 2.7 | 4.0 x 4.5 | - | - |
| No.6 measurement room | - | 4.75 x 5.4 x 3.0 | 4.75 x 4.15 | - | - |
| No.7 shielded room | - | 4.7 x 7.5 x 2.7 | 4.7 x 7.5 | - | - |
| No.8 measurement room | - | 3.1 x 5.0 x 2.7 | N/A | - | - |
| No.9 measurement room | - | 8.8 x 4.6 x 2.8 | 2.4 x 2.4 | - | - |
| No.11 measurement room | - | 6.2 x 4.7 x 3.0 | 4.8 x 4.6 | - | - |

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

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

Refer to APPENDIX.

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

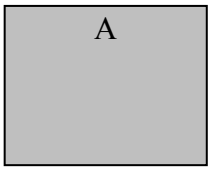
## 4.1 Operating Mode(s)

Bluetooth (BT) Low Energy (LE): Transmitting (Tx)

Details of Operating Mode(s)

| Test Item | Operating Mode | Tested Frequency |
|---|---|---|
| Conducted Emission<br>Spurious Emission<br>6dB Bandwidth<br>Maximum Peak Output Power<br>Power Density<br>99% Occupied Bandwidth | Tx BT LE | 2402MHz<br>2440MHz<br>2480MHz |
| *The power value of the EUT was set for testing as follows (setting value might be different from product specification value);<br>Power settings: + 4 dBm<br>Software: nRFgo Studio Version : 1.2.1.1.3<br>This setting of software is the worst case.<br>Any conditions under the normal use do not exceed the condition of setting.<br>In addition, end users cannot change the settings of the output power of the product. | | |

## 4.2 Configuration and peripherals




* Setup was taken into consideration and test data was taken under worse case conditions.

**Description of EUT**

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|---|---|---|---|---|---|
| A | Wireless Remote Controller | N1544 | G *1)<br>H *2) | Hoshiden Corporation | EUT |

*1) Used for Radiated Emission test
*2) Used for Antenna Terminal conducted test

## SECTION 5: Radiated Spurious Emission

**Test Procedure**

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r04".

[For below 1GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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 | 30 MHz to 300 MHz | 300 MHz to 1 GHz | Above 1 GHz |
|---|---|---|---|
| Antenna Type | Biconical | Logperiodic | 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 *1) | PK |
| IF Bandwidth | BW 120 kHz | RBW: 1 MHz<br>VBW: 3 MHz | Average Power Method:<br>12.2.5.2<br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (RMS)<br>Trace: 100 traces<br>Duty factor was added to the results.<br>15.35(c) Peak with Duty factor *4) | RBW: 100 kHz<br>VBW: 300 kHz |
| Test Distance | 3m | 4.5 m *2) (1 GHz – 10GHz),<br>1 m *3) (10 GHz – 26.5 GHz) | | 4.5 m *2) (1 GHz – 10GHz),<br>1 m *3) (10 GHz – 26.5 GHz) |

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r04"
*2) Distance Factor: 20 x log (4.5 m / 3.0 m) = 3.5 dB
*3) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*****4) The test was performed that the Spurious evaluation as Peak with Duty factor since the pulse emission which is synchronous the worst duty cycle of Bluetooth Low Energy.

- 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 M - 26.5 GHz**
**Test data : APPENDIX**
**Test result : Pass**

# SECTION 6: 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 | 2 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/ Average *2) | - | Power Meter (Sensor: 50 MHz BW) |
| Peak Power Density | 1.5 times the 6dB Bandwidth | 3 kHz | 10 kHz | Auto | Peak | Max Hold | Spectrum Analyzer *3) |
| Conducted Spurious Emission *4) | 9kHz to 150kHz | 200 Hz | 620 Hz | Auto | Peak | Max Hold | Spectrum Analyzer |
| | 150kHz to 30MHz | 9.1 kHz | 27 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 v03r04".
*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 not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

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

# APPENDIX 1: Test data

## 6dB Bandwidth

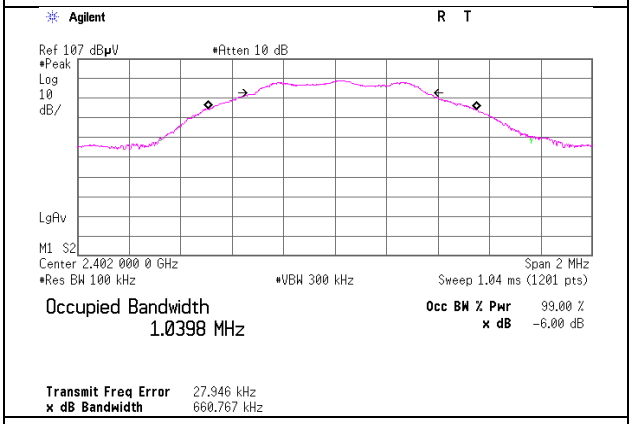
| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

| Mode | Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [kHz] |
|---|---|---|---|
| BTLE | 2402 | 0.661 | > 500 |
| | 2440 | 0.659 | > 500 |
| | 2480 | 0.656 | > 500 |

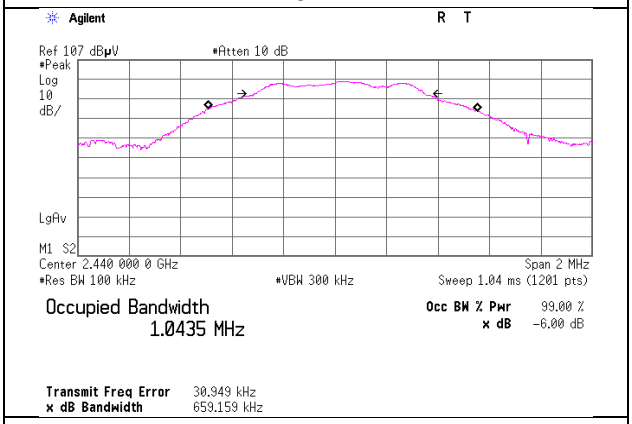
# 6dB Bandwidth

## BTLE

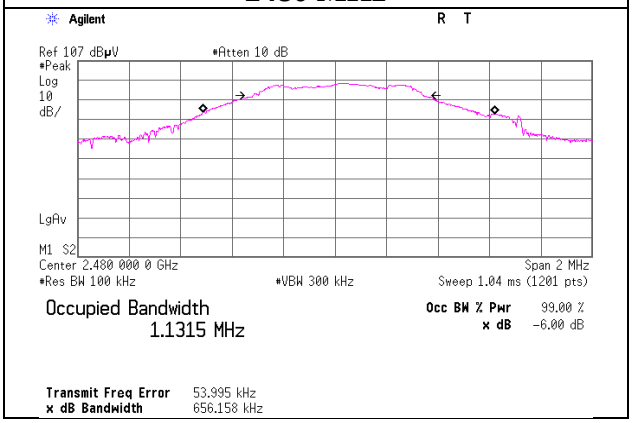
### 2402 MHz




### 2440 MHz




### 2480 MHz



# Maximum Peak Output Power

| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

| Freq. | Reading | Cable Loss | Atten. Loss | Result | | Limit | | Margin |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dBm] | [mW] | [dB] |
| 2402 | -11.01 | 1.03 | 10.08 | 0.10 | 1.02 | 30.00 | 1000 | 29.90 |
| 2440 | -11.08 | 1.03 | 10.08 | 0.03 | 1.01 | 30.00 | 1000 | 29.97 |
| 2480 | -11.37 | 1.04 | 10.08 | -0.25 | 0.94 | 30.00 | 1000 | 30.25 |

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

# Average Output Power
# (Reference data for RF Exposure)

| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

| Freq. | Reading | Cable Loss | Atten. Loss | Result (Frame power) | | Duty factor | Result (Burst power) | |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dB] | [dBm] | [mW] |
| 2402 | -12.96 | 1.03 | 10.08 | -1.85 | 0.65 | 1.13 | -0.72 | 0.85 |
| 2440 | -12.97 | 1.03 | 10.08 | -1.86 | 0.65 | 1.13 | -0.73 | 0.85 |
| 2480 | -13.33 | 1.04 | 10.08 | -2.21 | 0.60 | 1.13 | -1.08 | 0.78 |

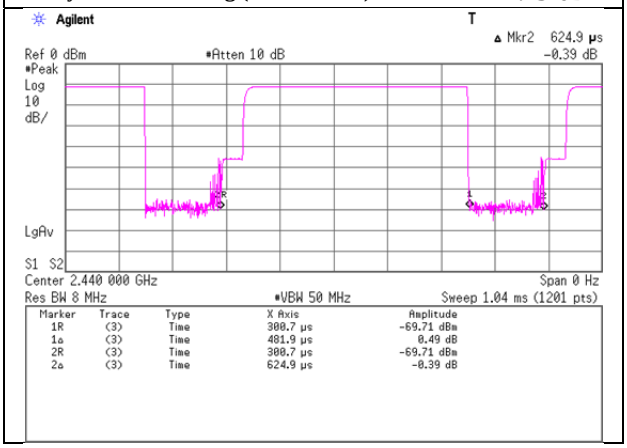
Sample Calculation:
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Result (Burst power) = Frame power + Duty factor

# Burst rate confirmation

| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

## BT LE

| | |
|---|---|
| **Tx on / (Tx on + Tx off) =** | **0.771** |
| **Tx on / (Tx on + Tx off) * 100 =** | **77.1 %** |
| **Duty factor = 10 * log (624.9 / 481.9) =** | **1.13 dB** |

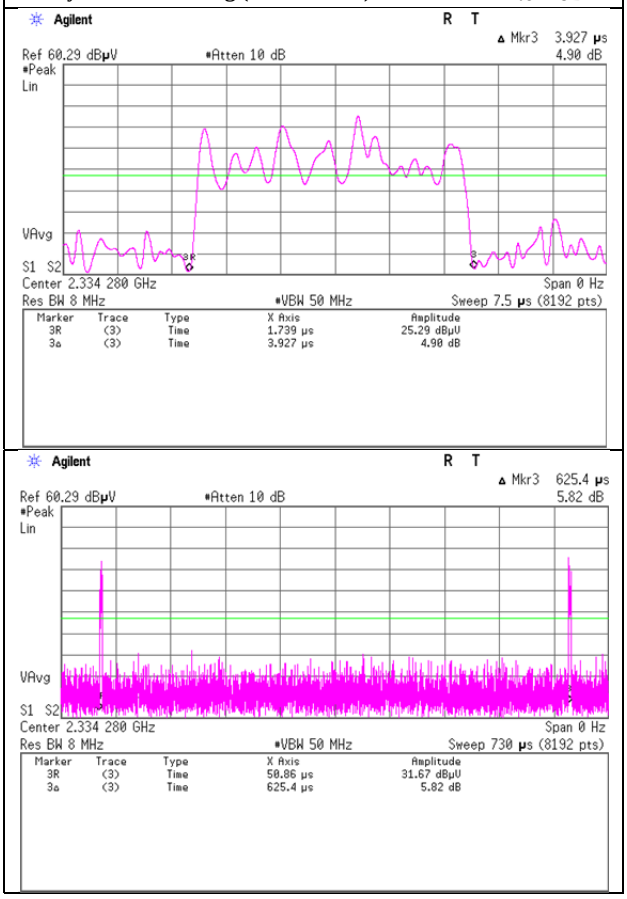


# Burst rate confirmation
## (Reference data for Peak with Duty factor)

| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | February 29, 2016 |
| Temperature / Humidity | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi |
| Mode | Tx BT LE |

## BT LE

**Tx on / (Tx on + Tx off) = 0.006**
**Tx on / (Tx on + Tx off) * 100 = 0.6 %**
**Duty factor = 10 * log (625.4 / 3.927) = 22.02 dB**




*The carrier was continually transmitted as the Burst that refers to Page 16.

# Radiated Spurious Emission

| | | |
|---|---|---|
| Report No. | 11106101H | |
| Test place | Ise EMC Lab. | |
| Semi Anechoic Chamber | No.1 | No.4 |
| Date | February 29, 2016 | February 29, 2016 |
| Temperature / Humidity | 23 deg. C / 31% RH | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi (Below 1GHz) | Takafumi Noguchi (Above 1GHz) |
| Mode | Tx BT LE 2402MHz | |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 52.714 | QP | 28.5 | 9.7 | 7.7 | 38.8 | - | 7.1 | 40.0 | 32.9 | |
| Hori | 149.914 | QP | 28.5 | 14.8 | 9.1 | 38.8 | - | 13.6 | 43.5 | 29.9 | |
| Hori | 292.512 | QP | 28.5 | 19.5 | 10.5 | 38.8 | - | 19.7 | 46.0 | 26.3 | |
| Hori | 324.135 | QP | 28.6 | 15.1 | 10.7 | 38.7 | - | 15.7 | 46.0 | 30.3 | |
| Hori | 586.223 | QP | 27.5 | 19.2 | 12.5 | 38.1 | - | 21.1 | 46.0 | 24.9 | |
| Hori | 972.001 | QP | 27.8 | 23.1 | 14.6 | 37.5 | - | 28.0 | 53.9 | 25.9 | |
| Hori | 2334.280 | PK | 50.4 | 27.9 | 6.8 | 32.2 | - | 52.9 | 73.9 | 21.0 | |
| Hori | 2390.000 | PK | 55.7 | 27.9 | 6.8 | 32.1 | - | 58.3 | 73.9 | 15.6 | |
| Hori | 4804.000 | PK | 45.6 | 32.8 | 9.2 | 31.3 | - | 56.3 | 73.9 | 17.6 | |
| Hori | 7206.000 | PK | 43.2 | 36.8 | 10.4 | 32.6 | - | 57.8 | 73.9 | 16.1 | |
| Hori | 9608.000 | PK | 41.9 | 38.1 | 11.1 | 32.6 | - | 58.5 | 73.9 | 15.4 | Floor noise |
| Hori | 4804.000 | AV | 33.0 | 32.8 | 9.2 | 31.3 | 1.1 | 44.8 | 53.9 | 9.1 | |
| Hori | 7206.000 | AV | 33.1 | 36.8 | 10.4 | 32.6 | 1.1 | 48.8 | 53.9 | 5.1 | |
| Hori | 9608.000 | AV | 32.5 | 38.1 | 11.1 | 32.6 | - | 49.1 | 53.9 | 4.8 | Floor noise |
| Vert | 52.714 | QP | 28.8 | 9.7 | 7.7 | 38.8 | - | 7.4 | 40.0 | 32.6 | |
| Vert | 149.914 | QP | 28.4 | 14.8 | 9.1 | 38.8 | - | 13.5 | 43.5 | 30.0 | |
| Vert | 292.512 | QP | 28.5 | 19.5 | 10.5 | 38.8 | - | 19.7 | 46.0 | 26.3 | |
| Vert | 324.135 | QP | 28.3 | 15.1 | 10.7 | 38.7 | - | 15.4 | 46.0 | 30.6 | |
| Vert | 586.223 | QP | 27.8 | 19.2 | 12.5 | 38.1 | - | 21.4 | 46.0 | 24.6 | |
| Vert | 972.001 | QP | 27.7 | 23.1 | 14.6 | 37.5 | - | 27.9 | 53.9 | 26.0 | |
| Vert | 2334.280 | PK | 55.9 | 27.9 | 6.8 | 32.2 | - | 58.4 | 73.9 | 15.5 | |
| Vert | 2390.000 | PK | 57.6 | 27.9 | 6.8 | 32.1 | - | 60.2 | 73.9 | 13.7 | |
| Vert | 4804.000 | PK | 44.9 | 32.8 | 9.2 | 31.3 | - | 55.6 | 73.9 | 18.3 | |
| Vert | 7206.000 | PK | 42.5 | 36.8 | 10.4 | 32.6 | - | 57.1 | 73.9 | 16.8 | |
| Vert | 9608.000 | PK | 41.7 | 38.1 | 11.1 | 32.6 | - | 58.3 | 73.9 | 15.6 | Floor noise |
| Vert | 4804.000 | AV | 34.2 | 32.8 | 9.2 | 31.3 | 1.1 | 46.0 | 53.9 | 7.9 | |
| Vert | 7206.000 | AV | 33.8 | 36.8 | 10.4 | 32.6 | 1.1 | 49.5 | 53.9 | 4.4 | |
| Vert | 9608.000 | AV | 32.6 | 38.1 | 11.1 | 32.6 | - | 49.2 | 53.9 | 4.7 | Floor noise |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty Factor)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

**20dBc Data Sheet**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 2402.000 | PK | 98.9 | 28.0 | 6.8 | 32.1 | 101.6 | - | - | Carrier |
| Hori | 2390.441 | PK | 53.8 | 27.9 | 6.8 | 32.1 | 56.4 | 81.6 | 25.2 | |
| Hori | 2400.000 | PK | 53.7 | 28.0 | 6.8 | 32.1 | 56.4 | 81.6 | 25.2 | |
| Vert | 2402.000 | PK | 97.7 | 28.0 | 6.8 | 32.1 | 100.4 | - | - | Carrier |
| Vert | 2390.421 | PK | 53.4 | 27.9 | 6.8 | 32.1 | 56.0 | 80.4 | 24.4 | |
| Vert | 2400.000 | PK | 54.6 | 28.0 | 6.8 | 32.1 | 57.3 | 80.4 | 23.1 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

**PK with Duty factor**

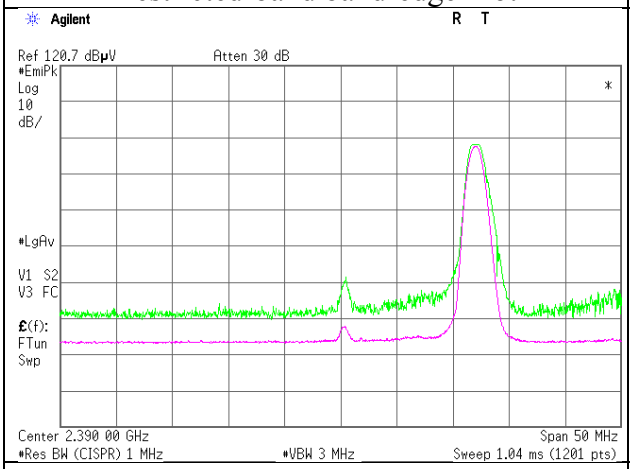
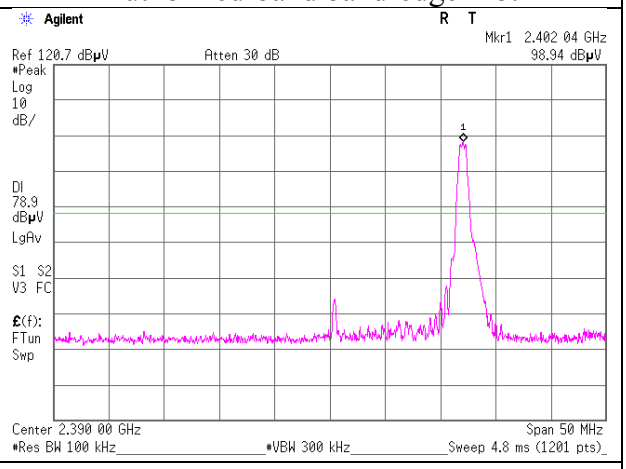
| Frequency [MHz] | Detector | Reading [dBuV] Hor | Reading [dBuV] Ver | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] Hor | Result [dBuV/m] Ver | Limit [dBuV/m] | Margin [dB] Hor | Margin [dB] Ver | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2334.280 | PK | 50.4 | 55.9 | 27.9 | 6.8 | 32.2 | -22.0 | 30.9 | 36.4 | 53.9 | 23.0 | 17.5 | |
| 2390.000 | PK | 55.7 | 57.6 | 27.9 | 6.8 | 32.1 | -22.0 | 36.3 | 38.2 | 53.9 | 17.6 | 15.7 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier) + Duty factor (Refer to Burst rate confirmation sheet)

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

| | |
|---|---|
| Test place | Ise EMC Lab. No.4 Semi Anechoic Chamber |
| Report No. | 11106101H |
| Date | February 29, 2016 |
| Temperature / Humidity | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi (Above 1GHz) |
| Mode | Tx BT LE 2402 MHz |

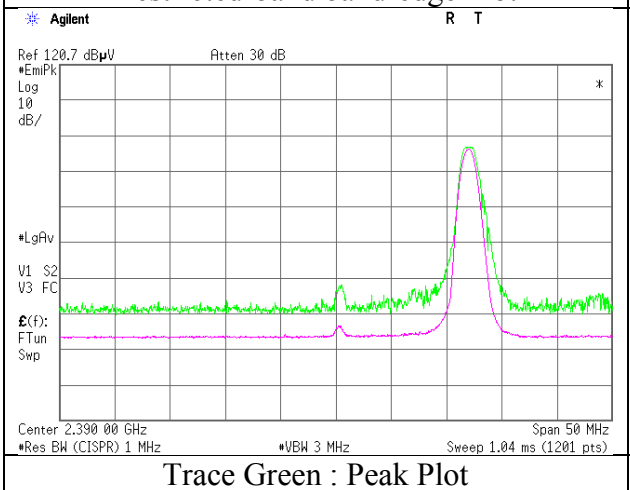
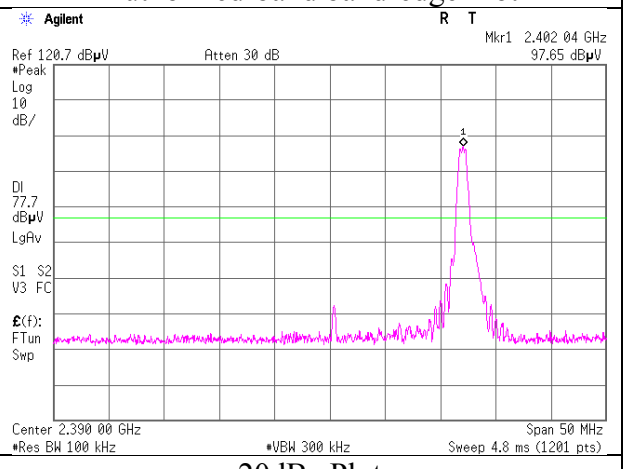
### Horizontal

| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|---|---|
|  |  |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |





### Vertical

| Restricted-band band-edge Plot | Authorized-band band-edge Plot |
|---|---|
|  |  |
| Trace Green : Peak Plot<br>Trace Purple : Average Plot | 20dBc Plot |





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

# Radiated Spurious Emission

| | | |
|---|---|---|
| Report No. | 11106101H | |
| Test place | Ise EMC Lab. | |
| Semi Anechoic Chamber | No.1 | No.4 |
| Date | February 29, 2016 | February 29, 2016 |
| Temperature / Humidity | 23 deg. C / 31% RH | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi (Below 1GHz) | Takafumi Noguchi (Above 1GHz) |
| Mode | Tx BT LE 2440MHz | |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 52.725 | QP | 28.6 | 9.7 | 7.7 | 38.8 | - | 7.2 | 40.0 | 32.8 | |
| Hori | 149.943 | QP | 28.4 | 14.8 | 9.1 | 38.8 | - | 13.5 | 43.5 | 30.0 | |
| Hori | 292.586 | QP | 28.3 | 19.5 | 10.5 | 38.8 | - | 19.5 | 46.0 | 26.5 | |
| Hori | 324.191 | QP | 28.4 | 15.1 | 10.7 | 38.7 | - | 15.5 | 46.0 | 30.5 | |
| Hori | 586.229 | QP | 27.8 | 19.2 | 12.5 | 38.1 | - | 21.4 | 46.0 | 24.6 | |
| Hori | 972.035 | QP | 27.2 | 23.1 | 14.6 | 37.5 | - | 27.4 | 53.9 | 26.5 | |
| Hori | 2334.867 | PK | 52.7 | 27.9 | 6.8 | 32.2 | - | 55.2 | 73.9 | 18.7 | |
| Hori | 2390.000 | PK | 50.5 | 27.9 | 6.8 | 32.1 | - | 53.1 | 73.9 | 20.8 | |
| Hori | 4880.000 | PK | 44.5 | 33.1 | 9.3 | 31.3 | - | 55.6 | 73.9 | 18.3 | |
| Hori | 7320.000 | PK | 42.7 | 36.8 | 10.4 | 32.6 | - | 57.3 | 73.9 | 16.6 | |
| Hori | 9760.000 | PK | 41.5 | 38.2 | 11.2 | 32.7 | - | 58.2 | 73.9 | 15.7 | Floor noise |
| Hori | 4880.000 | AV | 36.2 | 33.1 | 9.3 | 31.3 | 1.1 | 48.4 | 53.9 | 5.5 | |
| Hori | 7320.000 | AV | 34.4 | 36.8 | 10.4 | 32.6 | 1.1 | 50.1 | 53.9 | 3.8 | |
| Hori | 9760.000 | AV | 32.8 | 38.2 | 11.2 | 32.7 | - | 49.5 | 53.9 | 4.4 | Floor noise |
| Vert | 52.725 | QP | 28.7 | 9.7 | 7.7 | 38.8 | - | 7.3 | 40.0 | 32.7 | |
| Vert | 149.943 | QP | 28.4 | 14.8 | 9.1 | 38.8 | - | 13.5 | 43.5 | 30.0 | |
| Vert | 292.586 | QP | 28.4 | 19.5 | 10.5 | 38.8 | - | 19.6 | 46.0 | 26.4 | |
| Vert | 324.191 | QP | 28.4 | 15.1 | 10.7 | 38.7 | - | 15.5 | 46.0 | 30.5 | |
| Vert | 586.229 | QP | 27.7 | 19.2 | 12.5 | 38.1 | - | 21.3 | 46.0 | 24.7 | |
| Vert | 972.035 | QP | 27.1 | 23.1 | 14.6 | 37.5 | - | 27.3 | 53.9 | 26.6 | |
| Vert | 2334.867 | PK | 56.1 | 27.9 | 6.8 | 32.2 | - | 58.6 | 73.9 | 15.3 | |
| Vert | 2390.000 | PK | 51.3 | 27.9 | 6.8 | 32.1 | - | 53.9 | 73.9 | 20.0 | |
| Vert | 4880.000 | PK | 43.7 | 33.1 | 9.3 | 31.3 | - | 54.8 | 73.9 | 19.1 | |
| Vert | 7320.000 | PK | 43.1 | 36.8 | 10.4 | 32.6 | - | 57.7 | 73.9 | 16.2 | |
| Vert | 9760.000 | PK | 41.4 | 38.2 | 11.2 | 32.7 | - | 58.1 | 73.9 | 15.8 | Floor noise |
| Vert | 4880.000 | AV | 34.9 | 33.1 | 9.3 | 31.3 | 1.1 | 47.1 | 53.9 | 6.8 | |
| Vert | 7320.000 | AV | 34.7 | 36.8 | 10.4 | 32.6 | 1.1 | 50.4 | 53.9 | 3.5 | |
| Vert | 9760.000 | AV | 32.8 | 38.2 | 11.2 | 32.7 | - | 49.5 | 53.9 | 4.4 | Floor noise |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + duty Factor)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

**20dBc Data Sheet**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit dBuV/m | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 2440.000 | PK | 98.6 | 28.0 | 6.9 | 32.1 | 101.4 | - | - | Carrier |
| Hori | 2390.647 | PK | 51.6 | 27.9 | 6.8 | 32.1 | 54.2 | 81.4 | 27.2 | |
| Vert | 2440.000 | PK | 97.6 | 28.0 | 6.9 | 32.1 | 100.4 | - | - | Carrier |
| Vert | 2390.590 | PK | 51.6 | 27.9 | 6.8 | 32.1 | 54.2 | 80.4 | 26.2 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

**PK with Duty factor**

| Frequency [MHz] | Detector | Reading [dBuV] Hor | Reading [dBuV] Ver | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] Hor | Result [dBuV/m] Ver | Limit [dBuV/m] | Margin [dB] Hor | Margin [dB] Ver | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2334.867 | PK | 52.7 | 56.1 | 27.9 | 6.8 | 32.2 | -22.0 | 33.2 | 36.6 | 53.9 | 20.7 | 17.3 | |
| 2390.000 | PK | 50.5 | 51.3 | 27.9 | 6.8 | 32.1 | -22.0 | 31.1 | 31.9 | 53.9 | 22.8 | 22.0 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier) + Duty factor (Refer to Burst rate confirmation sheet)

# Radiated Spurious Emission

| | | |
|---|---|---|
| Report No. | 11106101H | |
| Test place | Ise EMC Lab. | |
| Semi Anechoic Chamber | No.1 | No.4 |
| Date | February 29, 2016 | February 29, 2016 |
| Temperature / Humidity | 23 deg. C / 31% RH | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi (Below 1GHz) | Takafumi Noguchi (Above 1GHz) |
| Mode | Tx BT LE 2480MHz | |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 52.783 | QP | 28.8 | 9.7 | 7.7 | 38.8 | - | 7.4 | 40.0 | 32.6 | |
| Hori | 149.993 | QP | 28.3 | 14.8 | 9.1 | 38.8 | - | 13.4 | 43.5 | 30.1 | |
| Hori | 292.782 | QP | 28.4 | 19.5 | 10.5 | 38.8 | - | 19.6 | 46.0 | 26.4 | |
| Hori | 324.258 | QP | 28.3 | 15.1 | 10.7 | 38.7 | - | 15.4 | 46.0 | 30.6 | |
| Hori | 586.811 | QP | 27.7 | 19.2 | 12.5 | 38.1 | - | 21.3 | 46.0 | 24.7 | |
| Hori | 972.221 | QP | 27.1 | 23.1 | 14.6 | 37.5 | - | 27.3 | 53.9 | 26.6 | |
| Hori | 2483.500 | PK | 64.5 | 28.1 | 6.9 | 32.1 | - | 67.4 | 73.9 | 6.5 | |
| Hori | 4960.000 | PK | 44.2 | 33.4 | 9.3 | 31.2 | - | 55.7 | 73.9 | 18.2 | |
| Hori | 7440.000 | PK | 42.4 | 36.8 | 10.4 | 32.7 | - | 56.9 | 73.9 | 17.0 | |
| Hori | 9920.000 | PK | 40.9 | 38.3 | 11.2 | 32.8 | - | 57.6 | 73.9 | 16.3 | Floor noise |
| Hori | 4960.000 | AV | 36.5 | 33.4 | 9.3 | 31.2 | 1.1 | 49.1 | 53.9 | 4.8 | |
| Hori | 7440.000 | AV | 33.8 | 36.8 | 10.4 | 32.7 | 1.1 | 49.4 | 53.9 | 4.5 | |
| Hori | 9920.000 | AV | 33.1 | 38.3 | 11.2 | 32.8 | - | 49.8 | 53.9 | 4.1 | Floor noise |
| Vert | 52.783 | QP | 28.9 | 9.7 | 7.7 | 38.8 | - | 7.5 | 40.0 | 32.5 | |
| Vert | 149.993 | QP | 28.3 | 14.8 | 9.1 | 38.8 | - | 13.4 | 43.5 | 30.1 | |
| Vert | 292.782 | QP | 28.3 | 19.5 | 10.5 | 38.8 | - | 19.5 | 46.0 | 26.5 | |
| Vert | 324.258 | QP | 28.2 | 15.1 | 10.7 | 38.7 | - | 15.3 | 46.0 | 30.7 | |
| Vert | 586.811 | QP | 27.7 | 19.2 | 12.5 | 38.1 | - | 21.3 | 46.0 | 24.7 | |
| Vert | 972.221 | QP | 27.2 | 23.1 | 14.6 | 37.5 | - | 27.4 | 53.9 | 26.5 | |
| Vert | 2483.500 | PK | 63.8 | 28.1 | 6.9 | 32.1 | - | 66.7 | 73.9 | 7.2 | |
| Vert | 4960.000 | PK | 43.0 | 33.4 | 9.3 | 31.2 | - | 54.5 | 73.9 | 19.4 | |
| Vert | 7440.000 | PK | 42.9 | 36.8 | 10.4 | 32.7 | - | 57.4 | 73.9 | 16.5 | |
| Vert | 9920.000 | PK | 41.3 | 38.3 | 11.2 | 32.8 | - | 58.0 | 73.9 | 15.9 | Floor noise |
| Vert | 4960.000 | AV | 35.1 | 33.4 | 9.3 | 31.2 | 1.1 | 47.7 | 53.9 | 6.2 | |
| Vert | 7440.000 | AV | 34.0 | 36.8 | 10.4 | 32.7 | 1.1 | 49.6 | 53.9 | 4.3 | |
| Vert | 9920.000 | AV | 32.9 | 38.3 | 11.2 | 32.8 | - | 49.6 | 53.9 | 4.3 | Floor noise |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty Factor)
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

**20dBc Data Sheet**

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 2480.000 | PK | 99.1 | 28.0 | 6.9 | 32.1 | 101.9 | - | - | Carrier |
| Hori | 2510.770 | PK | 53.2 | 28.1 | 6.9 | 32.1 | 56.1 | 81.9 | 25.8 | |
| Hori | 2579.071 | PK | 47.0 | 28.1 | 6.9 | 32.1 | 49.9 | 81.9 | 32.0 | |
| Vert | 2480.000 | PK | 98.2 | 28.0 | 6.9 | 32.1 | 101.0 | - | - | Carrier |
| Vert | 2510.686 | PK | 53.0 | 28.1 | 6.9 | 32.1 | 55.9 | 81.0 | 25.1 | |
| Vert | 2579.082 | PK | 50.0 | 28.1 | 6.9 | 32.1 | 52.9 | 81.0 | 28.1 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

**PK with Duty factor**

| Frequency [MHz] | Detector | Reading [dBuV] Hor | Reading [dBuV] Ver | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Result [dBuV/m] Hor | Result [dBuV/m] Ver | Limit [dBuV/m] | Margin [dB] Hor | Margin [dB] Ver | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2483.500 | PK | 64.5 | 63.8 | 28.1 | 6.9 | 32.1 | -22.0 | 45.4 | 44.7 | 53.9 | 8.5 | 9.2 | |

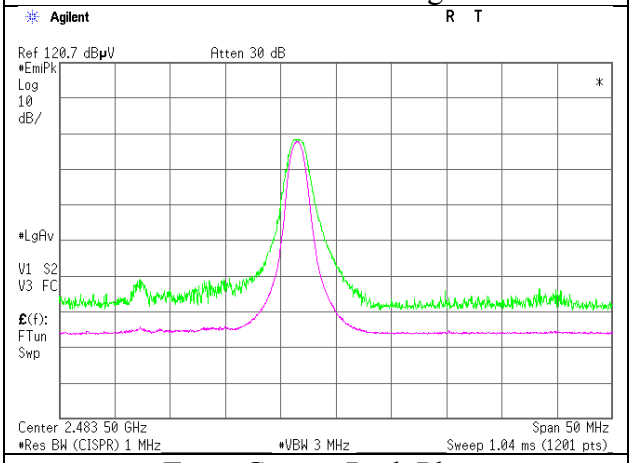
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier) + Duty factor (Refer to Burst rate confirmation sheet)

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

| | |
|---|---|
| Test place | Ise EMC Lab. No.4 Semi Anechoic Chamber |
| Report No. | 11106101H |
| Date | February 29, 2016 |
| Temperature / Humidity | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi<br>(Above 1GHz) |
| Mode | Tx BT LE 2480 MHz |

Horizontal

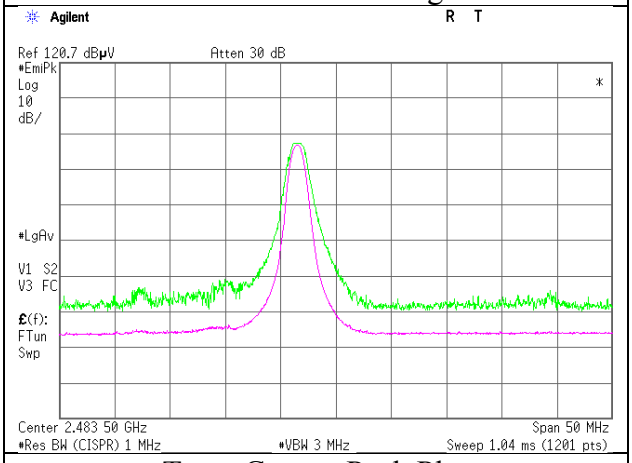
Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

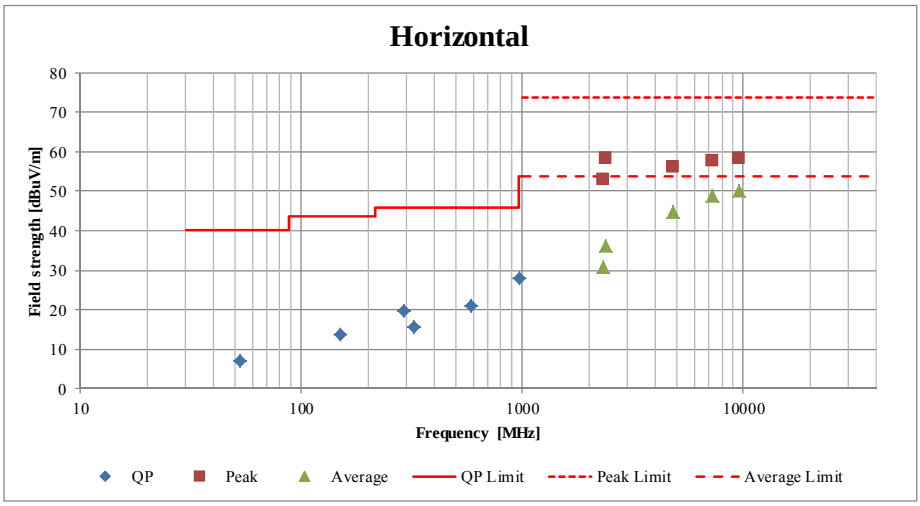


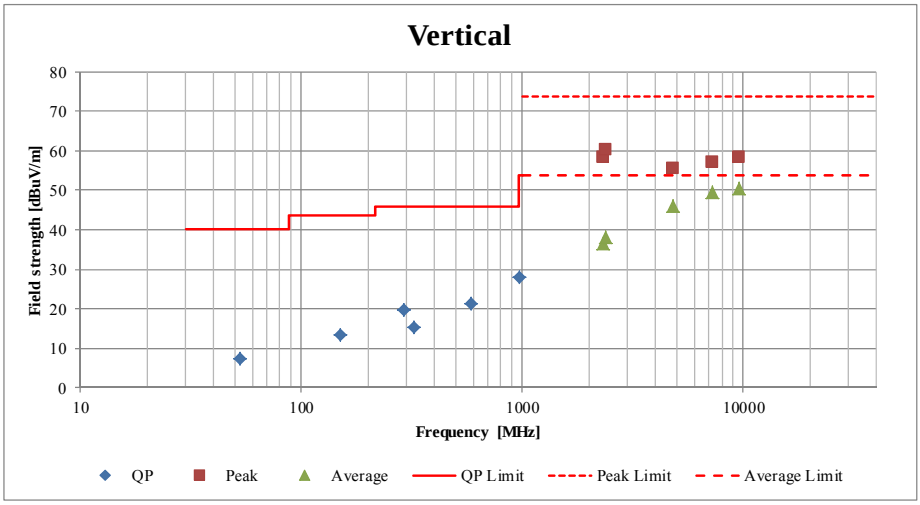

Trace Green : Peak Plot
Trace Purple : Average Plot

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

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

| | | |
|---|---|---|
| Report No. | 11106101H | |
| Test place | Ise EMC Lab. | |
| Semi Anechoic Chamber | No.1 | No.4 |
| Date | February 29, 2016 | February 29, 2016 |
| Temperature / Humidity | 23 deg. C / 31% RH | 24 deg. C / 35% RH |
| Engineer | Takafumi Noguchi (Below 1GHz) | Takafumi Noguchi (Above 1GHz) |
| Mode | Tx BT LE 2402MHz | |



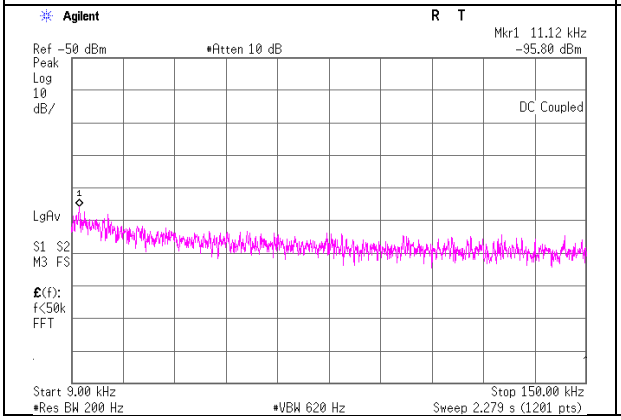

*These plots data contains sufficient number to show the trend of characteristic features for EUT.

# Conducted Spurious Emission

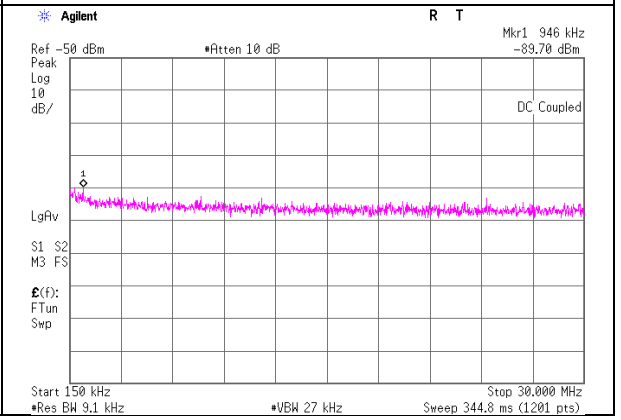
| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

## 2402MHz

### 9 kHz - 150 kHz




### 150 kHz - 30 MHz




| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenator Loss [dB] | Antenna Gain [dBi] | N (Number of Output | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.12 | -95.8 | 1.21 | 10.1 | 4.05 | 1 | -80.5 | 300 | 6.0 | -19.2 | 46.6 | 65.8 | |
| 946.00 | -89.7 | 1.21 | 10.1 | 4.05 | 1 | -74.4 | 30 | 6.0 | 6.9 | 28.0 | 21.1 | |

E = EIRP - 20 log (D) + Ground bounce + 104.8 [dBuV/m]

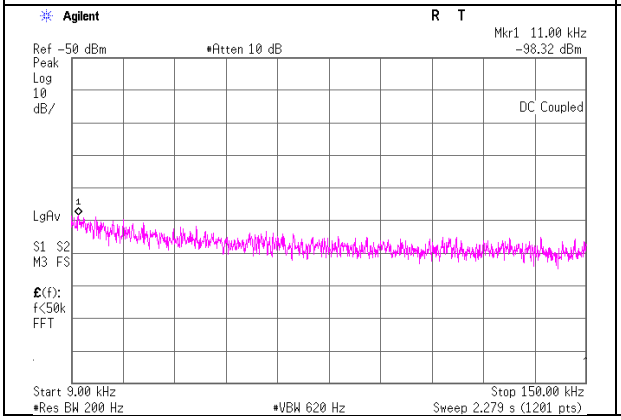
EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

# Conducted Spurious Emission

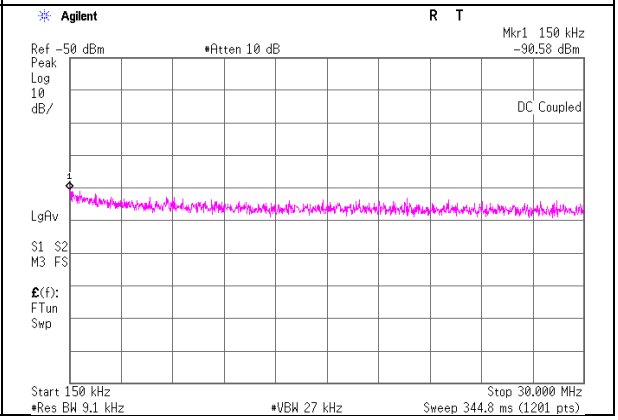
| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

## 2440MHz

### 9 kHz - 150 kHz




### 150 kHz - 30 MHz




| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenator Loss [dB] | Antenna Gain [dBi] | N (Number of Output | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.00 | -98.3 | 1.21 | 10.1 | 4.05 | 4.05 | -76.9 | 300 | 6.0 | -15.7 | 46.7 | 62.4 | |
| 150.00 | -90.6 | 1.21 | 10.1 | 4.05 | 4.05 | -69.2 | 300 | 6.0 | -7.9 | 24.0 | 31.9 | |

E = EIRP - 20 log (D) + Ground bounce + 104.8 [dBuV/m]

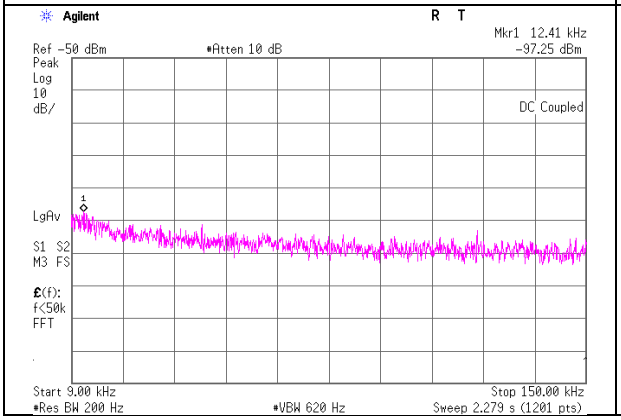
EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

# Conducted Spurious Emission

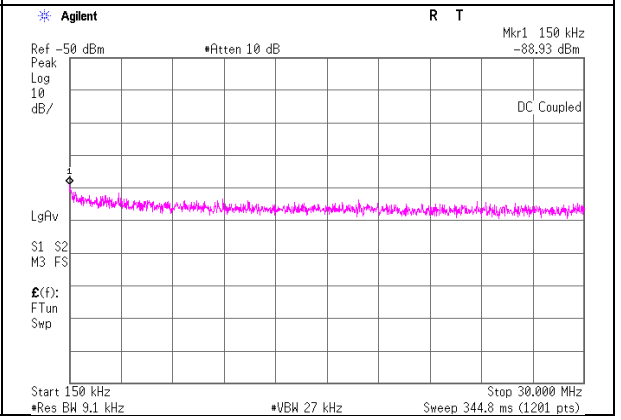
| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

## 2480MHz

### 9 kHz - 150 kHz




### 150 kHz - 30 MHz




| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenator Loss [dB] | Antenna Gain [dBi] | N (Number of Output | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.41 | -97.3 | 1.21 | 10.1 | 4.05 | 1 | -81.9 | 300 | 6.0 | -20.7 | 45.7 | 66.4 | |
| 150.00 | -88.9 | 1.21 | 10.1 | 4.05 | 1 | -73.6 | 300 | 6.0 | -12.4 | 24.0 | 36.4 | |

E = EIRP - 20 log (D) + Ground bounce + 104.8 [dBuV/m]

EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

# Power Density

| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

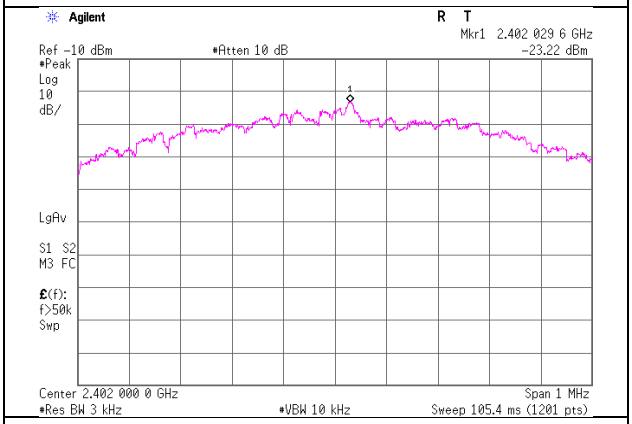
| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. Loss [dB] | Result [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|
| 2402.00 | -23.22 | 1.38 | 10.08 | -11.76 | 8.00 | 19.76 |
| 2440.00 | -25.14 | 1.38 | 10.08 | -13.68 | 8.00 | 21.68 |
| 2480.00 | -24.87 | 1.39 | 10.08 | -13.40 | 8.00 | 21.40 |

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

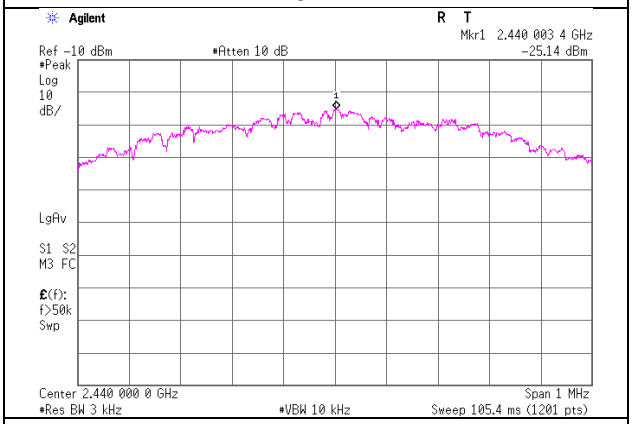
# Power Density

## BTLE

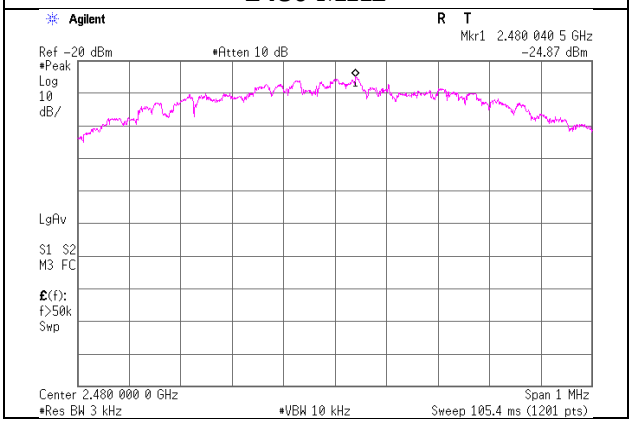
### 2402 MHz




### 2440 MHz




### 2480 MHz

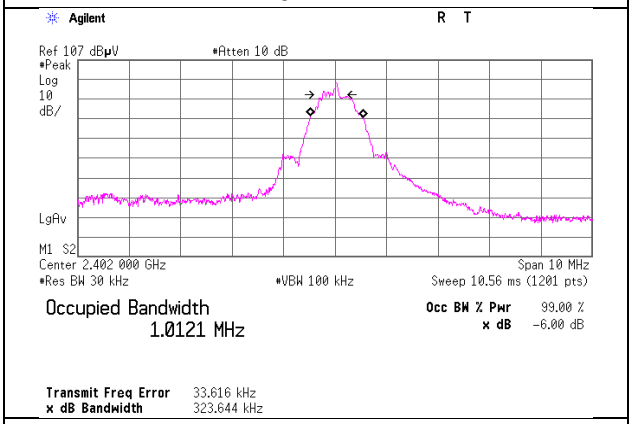


# 99%Occupied Bandwidth

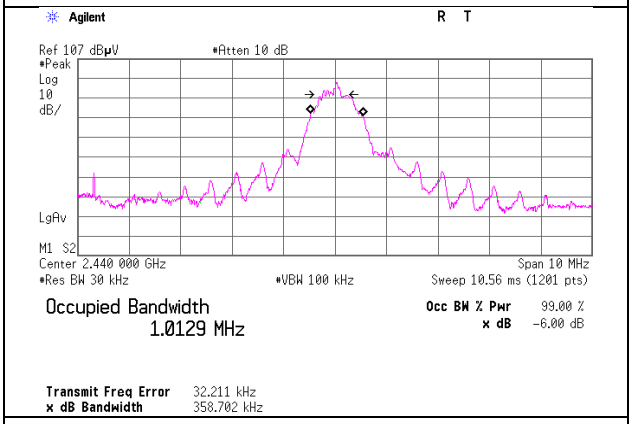
| | |
|---|---|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 11106101H |
| Date | March 1, 2016 |
| Temperature / Humidity | 22 deg. C / 32 % RH |
| Engineer | Shinichi Miyazono |
| Mode | Tx BT LE |

## BTLE

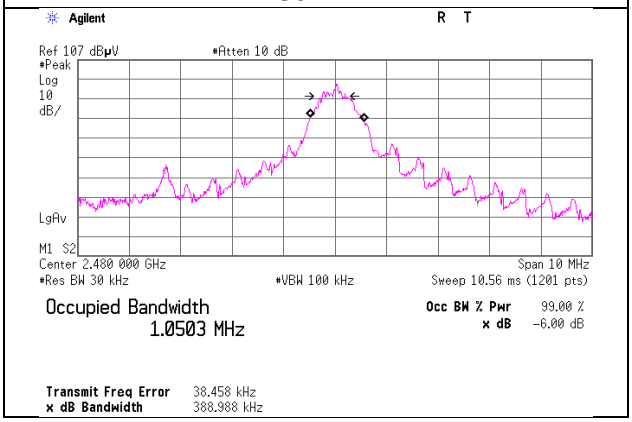
### 2402 MHz




### 2440 MHz




### 2480 MHz



# APPENDIX 2: Test instruments

**Test equipment**

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|---|---|---|---|---|---|---|
| MSA-15 | Spectrum Analyzer | Agilent | E4440A | MY46187105 | AT/RE | 2015/11/11 * 12 |
| MPM-12 | Power Meter | Anritsu | ML2495A | 0825002 | AT | 2015/06/09 * 12 |
| MPSE-17 | Power sensor | Anritsu | MA2411B | 0738285 | AT | 2015/06/09 * 12 |
| MCC-172 | Microwave Cable | Junkosha | MWX221 | 1409S495 | AT | 2015/03/04 * 12 |
| MAT-20 | Attenuator(10dB)(above 1GHz) | HIROSE ELECTRIC CO.,LTD. | AT-110 | - | AT | 2016/01/08 * 12 |
| MMM-17 | DIGIITAL HiTESTER | Hioki | 3805 | 070900530 | AT | 2016/01/13 * 12 |
| MOS-19 | Thermo-Hygrometer | Custom | CTH-201 | 0001 | AT | 2015/12/08 * 12 |
| MAEC-01 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 10m | DA-06881 | RE | 2015/09/19 * 12 |
| MOS-27 | Thermo-Hygrometer | CUSTOM | CTH-201 | A08Q26 | RE | 2016/01/21 * 12 |
| MJM-25 | Measure | KOMELON | KMC-36 | - | RE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | RE | - |
| MTR-09 | EMI Test Receiver | Rohde & Schwarz | ESU26 | 100412 | RE | 2015/06/08 * 12 |
| KBA-05 | Biconical Antenna | Schwarzbeck | BBA9106 | 2513 | RE | 2015/11/02 * 12 |
| KLA-04 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 361 | RE | 2015/11/03 * 12 |
| MAT-08 | Attenuator(6dB) | Weinschel Corp | 2 | BK7971 | RE | 2015/11/10 * 12 |
| MCC-02 | Coaxial Cable | Suhner/storm/Agilent/TSJ | - | - | RE | 2015/09/29 * 12 |
| MPA-19 | Pre Amplifier | MITEQ | MLA-10K01-B01-35 | 1237616 | RE | 2016/02/25 * 12 |
| MMM-03 | Digital Tester | Fluke | FLUKE 26-3 | 78030621 | RE | 2015/08/19 * 12 |
| MAEC-04 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | RE | 2015/10/02 * 12 |
| MOS-15 | Thermo-Hygrometer | Custom | CTH-180 | 1501 | RE | 2016/01/21 * 12 |
| MJM-26 | Measure | KOMELON | KMC-36 | - | RE | - |
| MHA-21 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 9120D-557 | RE | 2015/08/10 * 12 |
| MCC-141 | Microwave Cable | Junkosha | MWX221 | 1305S002R(1m) / 1405S146(5m) | RE | 2015/06/22 * 12 |
| MPA-12 | MicroWave System Amplifier | Agilent | 83017A | 00650 | RE | 2015/10/01 * 12 |
| MHA-17 | Horn Antenna 15-40GHz | Schwarzbeck | BBHA9170 | BBHA9170307 | RE | 2015/06/06 * 12 |
| MMM-10 | DIGITAL HiTESTER | Hioki | 3805 | 051201148 | RE | 2016/01/18 * 12 |
| MHF-26 | High Pass Filter 3.5-18.0GHz | UL Japan | HPF SELECTOR | 002 | RE | 2015/09/17 * 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: RE: Radiated Emission test**
**AT: Antenna Terminal Conducted test**