



RADIO TEST REPORT

Test Report No. : 10478909H-B

Applicant : Braveridge Co., Ltd.
Type of Equipment : Bluetooth Low Energy Module
Model No. : BVMCN5111
FCC ID : 2ABXRBVMCN5111
Test regulation : FCC Part 15 Subpart C: 2014
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. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: August 27 to September 8, 2014


Representative test engineer:



Hiroshi Kukita
Engineer

Consumer Technology Division

Approved by:



Takayuki Shimada
Engineer

Consumer Technology Division



NVLAP LAB CODE: 200572-0

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*As for the range of Accreditation in NVLAP, you may refer to the WEB address,

<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Braveridge Co., Ltd.
Address : 3-27-2 Shusenji Nishi-ku, Fukuoka-city, Fukuoka, Japan 819-0373
Telephone Number : +81-92-834-5789
Facsimile Number : +81-92-807-7718
Contact Person : Yasunari Kohashi

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

2.1 Identification of E.U.T.

Type of Equipment : Bluetooth Low Energy Module
Model No. : BVMCN5111
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC3.1V – 5.25V (Typ. DC3.7V)
Receipt Date of Sample : August 25, 2014
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

General Specification

Clock frequency(ies) in the system : 32MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402-2480MHz
Modulation : GFSK
Power Supply (radio part input) : DC 1.6V
Antenna type : Chip Antenna
Antenna Gain : 0.9dBi

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 2014

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 C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4 | FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4 | QP 13.1dB, 0.15105MHz, L AV 23.7dB, 0.17985MHz, L | Complied | - |
| 6dB Bandwidth | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 4.6.2 | FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a) | See data. | Complied | Conducted |
| Maximum Peak Output Power | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 4.8 | FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4) | | Complied | Conducted |
| Power Density | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: - | FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b) | | Complied | Conducted |
| Spurious Emission Restricted Band Edges | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 4.9 | FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3 | 7.9dB 9920.000MHz, AV, Vert. | Complied | Conducted/ Radiated |

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

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

This EUT provides stable voltage (DC1.6V) 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 it is soldered on the circuit board. Therefore the equipment complies with the requirement of 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 4.6.1 | IC: RSS-Gen 4.6.1 | 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.

| Test room (semi-anechoic chamber) | Conducted emission (+dB) |
|--------------------------------------|-----------------------------|
| | 150kHz-30MHz |
| No.1 | 3.5dB |
| No.2 | 3.5dB |
| No.3 | 3.6dB |
| No.4 | 3.5dB |

| Test room (semi-anechoic chamber) | Radiated emission | | | | | | |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
| | (3m*)(+dB) | | | | (1m*)(+dB) | | (0.5m*)(+dB) |
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz |
| No.1 | 4.0dB | 5.1dB | 5.0dB | 5.1dB | 6.0dB | 4.9dB | 4.3dB |
| No.2 | 3.9dB | 5.2dB | 5.0dB | 4.9dB | 5.9dB | 4.7dB | 4.2dB |
| No.3 | 4.3dB | 5.1dB | 5.2dB | 5.2dB | 6.0dB | 4.8dB | 4.2dB |
| No.4 | 4.6dB | 5.2dB | 5.0dB | 5.2dB | 6.0dB | 5.7dB | 4.2dB |

*3m/1m/0.5m = Measurement distance

| Power meter (+dB) | |
|-------------------|------------|
| Below 1GHz | Above 1GHz |
| 0.7dB | 1.5dB |

| Antenna terminal conducted emission and Power density (+dB) | | | Antenna terminal conducted emission (+dB) | | Channel power (±dB) |
|--|-----------|------------|--|---------------|------------------------|
| Below 1GHz | 1GHz-3GHz | 3GHz-18GHz | 18GHz-26.5GHz | 26.5GHz-40GHz | |
| 1.5dB | 1.7dB | 2.8dB | 2.8dB | 2.9dB | 2.6dB |

Conducted Emission test

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

Radiated emission test(3m)

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

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3.5 Test Location

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| | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|----------------------------|------------------------|----------------------------|--|------------------------|
| No.1 semi-anechoic chamber | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | 4.0 x 4.5 x 2.7m | 4.0 x 4.5 m | - |
| No.6 measurement room | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | 8.0 x 4.6 x 2.8m | 2.4 x 2.4m | - |
| No.11 measurement room | - | 6.2 x 4.7 x 3.0m | 4.8 x 4.6m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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 Data of EMI, 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)

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

Details of Operating Mode(s)

| Test Item | Operating Mode | Tested Frequency |
|--|----------------|-------------------------------|
| Conducted Emission Spurious Emission 6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth | BT LE Tx | 2402MHz 2440MHz 2480MHz |

Power of the EUT was set by the software as follows;

Power settings *1): +4dBm (all tests), -30dBm (Maximum Peak Output Power test only)

Software: nRF Studio Ver.1.17.0.3211

*1) All tests were performed with +4dBm power setting as a representative which was the worst condition after having compared with other power settings.

This setting of software is the worst case.

Any conditions under the normal use do not exceed the condition of setting.

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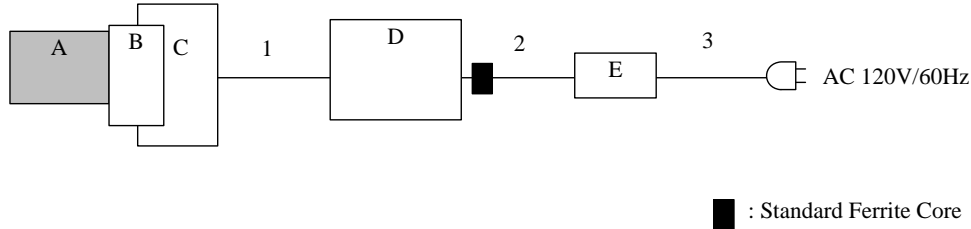
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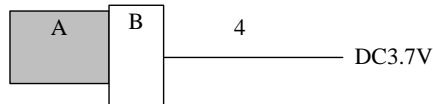
Facsimile : +81 596 24 8124

4.2 Configuration and peripherals

[Conducted emission test]



[Radiated emission test]



* 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 Low Energy Module | BVMCN5111 | 4dBm: 001, -30dBm: 003 *1) 002 *2) | Braveridge Co., Ltd. | EUT |
| B | Jig | - | - | Braveridge Co., Ltd. | - |
| C | Jig | - | - | Braveridge Co., Ltd. | - |
| D | Laptop PC | P5WE0 | LXR9702196206172FB1601 | Acer | - |
| E | AC Adapter | ADP-65VHB | AP065010331520621BP102 | DELTA ELECTRONICS, INC. | - |

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

| No. | Name | Length (m) | Shield | | Remarks |
|-----|-----------|------------|------------|------------|---------|
| | | | Cable | Connector | |
| 1 | USB Cable | 2.0 | Shielded | Shielded | - |
| 2 | DC Cable | 1.8 | Unshielded | Unshielded | - |
| 3 | AC Cable | 1.8 | Unshielded | Unshielded | - |
| 4 | DC Cable | 3.0 | Unshielded | Unshielded | - |

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40cm 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 80cm 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 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

| | |
|--------------------------|--------------------------|
| Detector | : QP and CISPR AV |
| Measurement range | : 0.15-30MHz |
| 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 v03r02 (Issued on June 5, 2014)".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

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

The height of the measuring antenna varied between 1 and 4m 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 30MHz | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
|--------------|-------------|-----------------|----------------|------------|
| Antenna Type | Loop | Biconical | Logperiodic | Horn |

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

| Frequency | Below 1GHz | Above 1GHz | | 20dBc |
|-----------------|---------------|---|--|---|
| Instrument used | Test Receiver | Spectrum Analyzer | | Spectrum Analyzer |
| Detector | QP | PK | AV *1) | PK |
| IF Bandwidth | BW 120kHz | RBW: 1MHz VBW: 3MHz | Average Power Method: 12.2.5.2 RBW: 1MHz VBW: 3MHz Trace: Free Run Detector: Power Averaging (RMS) Duty factor was added to the results. | RBW: 100kHz VBW: 300kHz |
| Test Distance | 3m | 3m (below 10GHz), 1m *2) (above 10GHz) | | 3m (below 10GHz), 1m *2) (above 10GHz) |

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)"

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

- 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 | : 30M-26.5GHz |
| Test data | : APPENDIX |
| Test result | : Pass |

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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 | 3MHz | 100kHz | 300kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 to 3% of Span | Three times of RBW | Auto | Peak | Max Hold*1) | Spectrum Analyzer |
| Maximum Peak Output Power | - | - | - | Auto | Peak/Average *2) | - | Power Meter (Sensor: 50MHz BW) |
| Peak Power Density | 1.5 times the 6dB Bandwidth | 3kHz | 10kHz | Auto | Peak | Max Hold | Spectrum Analyzer *3) |
| Conducted Spurious Emission *4) | 9kHz to 150kHz 150kHz to 30MHz | 200Hz 9.1kHz | 620Hz 27kHz | Auto | Peak | Max Hold | Spectrum Analyzer |

*1) The measurement was performed with Max Hold since the duty cycle was not 100%.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".
*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.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

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: Data of EMI test

Conducted Emission

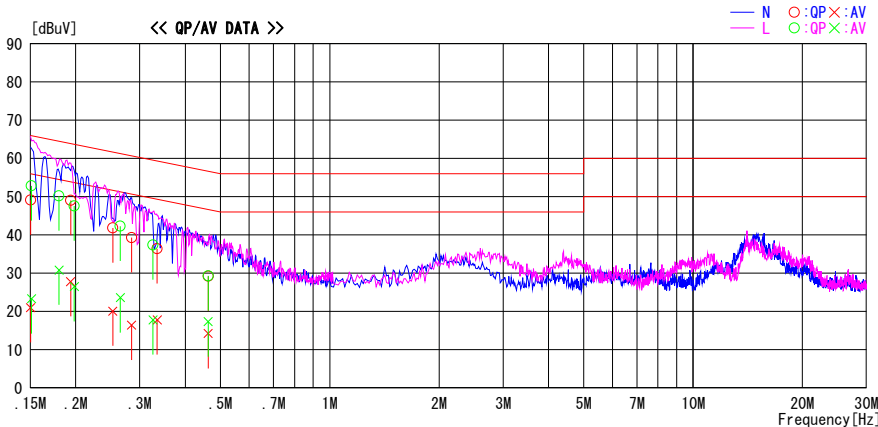
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/09/08

Report No. : 10478909H
Temp./Humi. : 22deg. C / 66% RH
Engineer : Keisuke Kawamura

Mode / Remarks : Tx BLE 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



| Frequency | Reading Level | | Corr. | Results | | Limit | | Margin | | Phase | Comment |
|-----------|---------------|--------|-------|---------|--------|--------|--------|--------|------|-------|---------|
| | QP | AV | | QP | AV | QP | AV | QP | AV | | |
| [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 0.15023 | 35.9 | 7.8 | 13.2 | 49.1 | 21.0 | 66.0 | 56.0 | 16.9 | 35.0 | N | |
| 0.19354 | 35.8 | 14.6 | 13.2 | 49.0 | 27.8 | 63.9 | 53.9 | 14.9 | 26.1 | N | |
| 0.25286 | 28.6 | 6.9 | 13.2 | 41.8 | 20.1 | 61.7 | 51.7 | 19.9 | 31.6 | N | |
| 0.28485 | 26.1 | 3.2 | 13.2 | 39.3 | 16.4 | 60.7 | 50.7 | 21.4 | 34.3 | N | |
| 0.33504 | 23.2 | 4.6 | 13.2 | 36.4 | 17.8 | 59.3 | 49.3 | 22.9 | 31.5 | N | |
| 0.46276 | 16.0 | 1.0 | 13.2 | 29.2 | 14.2 | 56.6 | 46.6 | 27.4 | 32.4 | N | |
| 0.15105 | 39.6 | 10.1 | 13.2 | 52.8 | 23.3 | 65.9 | 55.9 | 13.1 | 32.6 | L | |
| 0.17985 | 37.0 | 17.6 | 13.2 | 50.2 | 30.8 | 64.5 | 54.5 | 14.3 | 23.7 | L | |
| 0.19811 | 34.4 | 13.3 | 13.2 | 47.6 | 26.5 | 63.7 | 53.7 | 16.1 | 27.2 | L | |
| 0.26505 | 29.1 | 10.4 | 13.2 | 42.3 | 23.6 | 61.3 | 51.3 | 19.0 | 27.7 | L | |
| 0.32621 | 24.2 | 4.6 | 13.2 | 37.4 | 17.8 | 59.5 | 49.5 | 22.1 | 31.7 | L | |
| 0.46276 | 16.1 | 4.1 | 13.2 | 29.3 | 17.3 | 56.6 | 46.6 | 27.3 | 29.3 | L | |

CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (1SN + ATT CABLE)
Except for the above table : adequate margin data below the limits.

Conducted Emission

Test place

Report No.

Date

Temperature/ Humidity

Engineer

Mode

Ise EMC Lab. No.2 Semi Anechoic Chamber

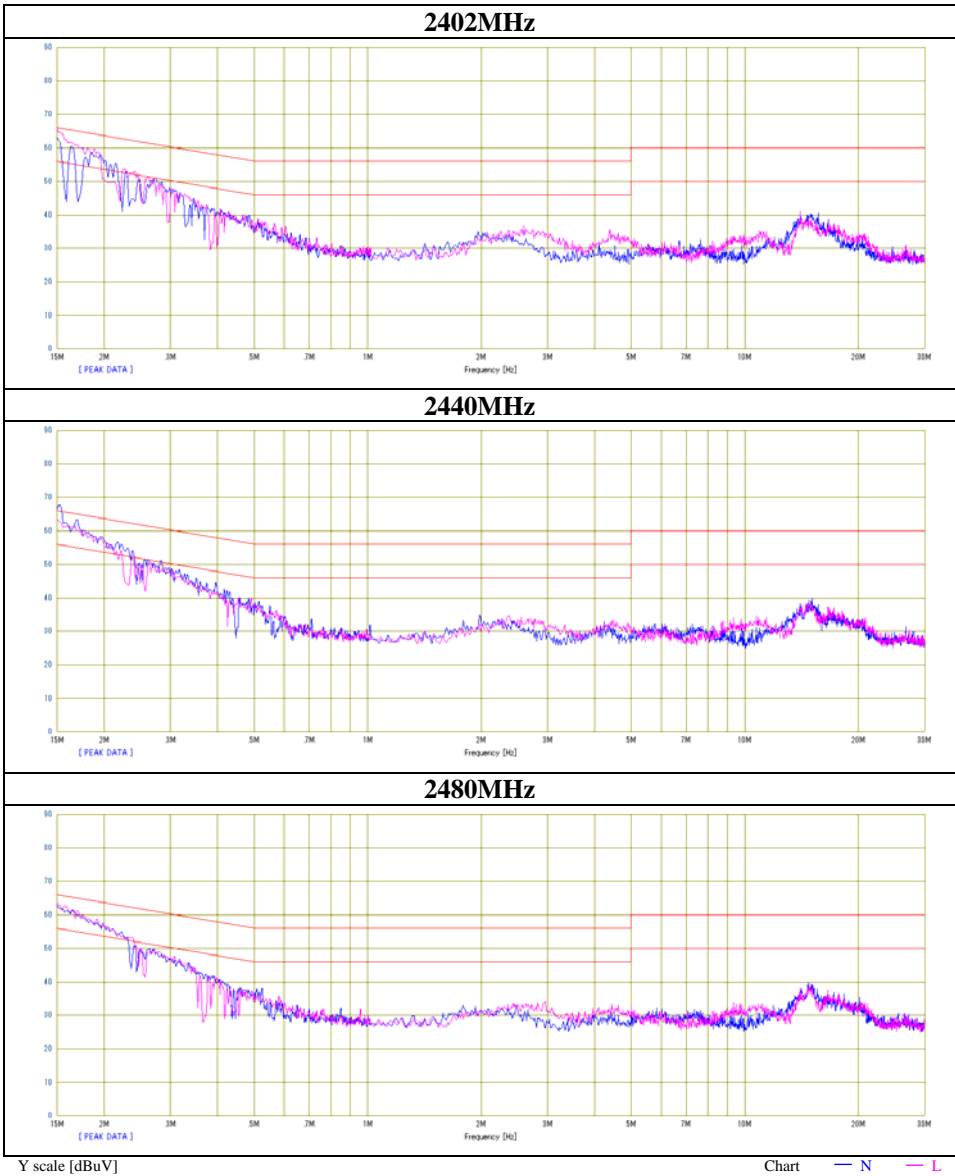
10478909H

09/08/2014

22 deg. C / 63% RH

Keisuke Kawamura

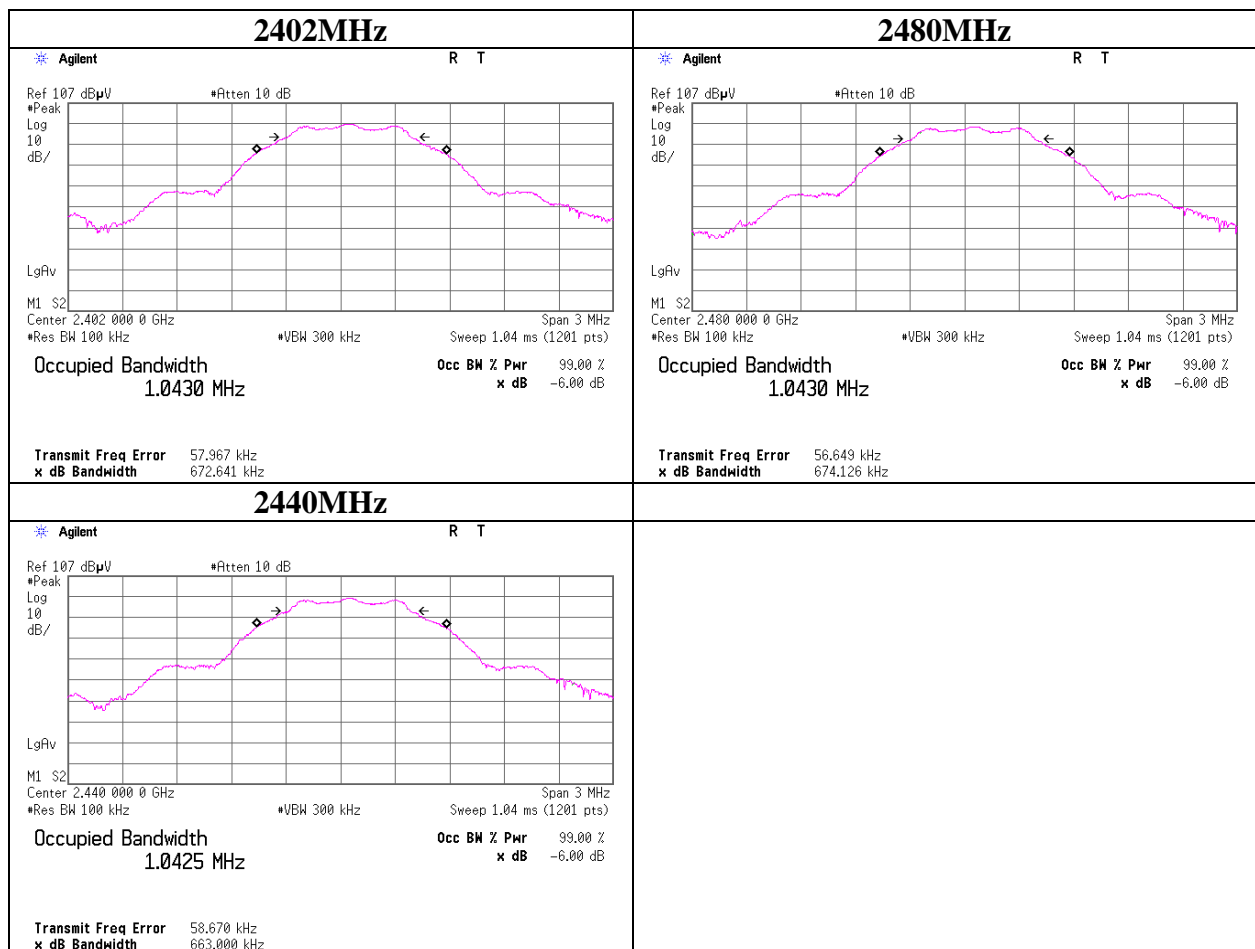
BT LE Tx



6dB Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10478909H
Date 08/27/2014
Temperature/ Humidity 23 deg. C / 57% RH
Engineer Hiroshi Kukita
Mode BT LE Tx

| Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [kHz] |
|-----------------|---------------------|-------------|
| 2402 | 0.673 | >500 |
| 2440 | 0.663 | >500 |
| 2480 | 0.674 | >500 |



Maximum Peak Output Power

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10478909H
Date 08/27/2014
Temperature/ Humidity 23 deg. C / 57% RH
Engineer Hiroshi Kukita
Mode BT LE Tx

Setting value 4dBm

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|----------------|------------------|-----------------------|----------------|--------|------|-------|------|----------------|
| | | | | [dBm] | [mW] | [dBm] | [mW] | |
| 2402 | -10.16 | 5.61 | 10.00 | 5.45 | 3.51 | 30.00 | 1000 | 24.55 |
| 2440 | -10.61 | 5.62 | 10.00 | 5.01 | 3.17 | 30.00 | 1000 | 24.99 |
| 2480 | -11.01 | 5.63 | 10.00 | 4.62 | 2.90 | 30.00 | 1000 | 25.38 |

Setting value -30dBm

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|----------------|------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
| | | | | [dBm] | [mW] | [dBm] | [mW] | |
| 2402 | -33.04 | 4.30 | 0.00 | -28.74 | 0.0013 | 30.00 | 1000 | 58.74 |
| 2440 | -32.23 | 4.30 | 0.00 | -27.93 | 0.0016 | 30.00 | 1000 | 57.93 |
| 2480 | -32.45 | 4.30 | 0.00 | -28.15 | 0.0015 | 30.00 | 1000 | 58.15 |

Sample Calculation:

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

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Ise EMC Lab.

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Maximum Average Output Power (Reference data for RF EXposure)

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10478909H
Date 08/27/2014
Temperature/ Humidity 23 deg. C / 57% RH
Engineer Hiroshi Kukita
Mode BT LE Tx

Setting value 4dBm

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. [dB] | Result | |
|----------------|------------------|-----------------------|----------------|--------|------|
| | | | | [dBm] | [mW] |
| 2402 | -12.01 | 5.61 | 10.00 | 3.60 | 2.29 |
| 2440 | -12.56 | 5.62 | 10.00 | 3.06 | 2.02 |
| 2480 | -13.01 | 5.63 | 10.00 | 2.62 | 1.83 |

Setting value -30dBm

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. [dB] | Result | |
|----------------|------------------|-----------------------|----------------|--------|---------|
| | | | | [dBm] | [mW] |
| 2402 | -37.54 | 4.30 | 0.00 | -33.24 | 0.00047 |
| 2440 | -38.25 | 4.30 | 0.00 | -33.95 | 0.00040 |
| 2480 | -38.81 | 4.30 | 0.00 | -34.51 | 0.00035 |

Sample Calculation:

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10478909H
Date : 08/31/2014
Temperature/ Humidity : 23 deg. C / 55% RH
Engineer : Hiroshi Kukita
Mode : BT LE Tx 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 | 36.000 | QP | 23.2 | 15.9 | 6.8 | 28.6 | - | 17.3 | 40.0 | 22.7 | |
| Hori | 72.000 | QP | 23.1 | 6.5 | 7.2 | 28.6 | - | 8.2 | 40.0 | 31.8 | |
| Hori | 108.000 | QP | 22.9 | 11.2 | 7.5 | 28.4 | - | 13.2 | 43.5 | 30.3 | |
| Hori | 144.000 | QP | 22.3 | 14.6 | 7.8 | 28.3 | - | 16.4 | 43.5 | 27.1 | |
| Hori | 180.000 | QP | 22.3 | 16.1 | 8.0 | 28.0 | - | 18.4 | 43.5 | 25.1 | |
| Hori | 216.000 | QP | 22.0 | 16.8 | 8.2 | 27.8 | - | 19.2 | 43.5 | 24.3 | |
| Hori | 2319.664 | PK | 57.4 | 27.1 | 2.4 | 34.7 | - | 52.2 | 73.9 | 21.7 | |
| Hori | 2374.808 | PK | 58.8 | 27.0 | 2.4 | 34.7 | - | 53.5 | 73.9 | 20.4 | |
| Hori | 2390.000 | PK | 53.4 | 27.0 | 2.4 | 34.7 | - | 48.1 | 73.9 | 25.8 | |
| Hori | 4804.000 | PK | 43.7 | 31.8 | 4.5 | 33.9 | - | 46.1 | 73.9 | 27.8 | |
| Hori | 7206.000 | PK | 43.4 | 35.7 | 5.1 | 33.8 | - | 50.4 | 73.9 | 23.5 | |
| Hori | 9608.000 | PK | 43.0 | 38.0 | 6.0 | 34.4 | - | 52.6 | 73.9 | 21.3 | |
| Hori | 2319.664 | AV | 40.9 | 27.1 | 2.4 | 34.7 | 0.8 | 36.5 | 53.9 | 17.4 | |
| Hori | 2374.808 | AV | 43.2 | 27.0 | 2.4 | 34.7 | 0.8 | 38.7 | 53.9 | 15.2 | |
| Hori | 2390.000 | AV | 39.2 | 27.0 | 2.4 | 34.7 | 0.8 | 34.7 | 53.9 | 19.2 | *1) |
| Hori | 4804.000 | AV | 34.7 | 31.8 | 4.5 | 33.9 | 0.8 | 37.9 | 53.9 | 16.0 | |
| Hori | 7206.000 | AV | 35.0 | 35.7 | 5.1 | 33.8 | 0.8 | 42.8 | 53.9 | 11.1 | |
| Hori | 9608.000 | AV | 34.3 | 38.0 | 6.0 | 34.4 | 0.8 | 44.7 | 53.9 | 9.2 | |
| Vert | 36.000 | QP | 23.0 | 15.9 | 6.8 | 28.6 | - | 17.1 | 40.0 | 22.9 | |
| Vert | 72.000 | QP | 23.1 | 6.5 | 7.2 | 28.6 | - | 8.2 | 40.0 | 31.8 | |
| Vert | 108.000 | QP | 22.7 | 11.2 | 7.5 | 28.4 | - | 13.0 | 43.5 | 30.5 | |
| Vert | 144.000 | QP | 22.3 | 14.6 | 7.8 | 28.3 | - | 16.4 | 43.5 | 27.1 | |
| Vert | 180.000 | QP | 22.2 | 16.1 | 8.0 | 28.0 | - | 18.3 | 43.5 | 25.2 | |
| Vert | 216.000 | QP | 21.9 | 16.8 | 8.2 | 27.8 | - | 19.1 | 43.5 | 24.4 | |
| Vert | 2318.105 | PK | 55.4 | 27.1 | 2.4 | 34.7 | - | 50.2 | 73.9 | 23.7 | |
| Vert | 2374.998 | PK | 56.9 | 27.0 | 2.4 | 34.7 | - | 51.6 | 73.9 | 22.3 | |
| Vert | 2390.000 | PK | 50.3 | 27.0 | 2.4 | 34.7 | - | 45.0 | 73.9 | 28.9 | |
| Vert | 4804.000 | PK | 42.8 | 31.8 | 4.5 | 33.9 | - | 45.2 | 73.9 | 28.7 | |
| Vert | 7206.000 | PK | 43.3 | 35.7 | 5.1 | 33.8 | - | 50.3 | 73.9 | 23.6 | |
| Vert | 9608.000 | PK | 43.0 | 38.0 | 6.0 | 34.4 | - | 52.6 | 73.9 | 21.3 | |
| Vert | 2318.105 | AV | 40.0 | 27.1 | 2.4 | 34.7 | 0.8 | 35.6 | 53.9 | 18.3 | |
| Vert | 2374.998 | AV | 42.0 | 27.0 | 2.4 | 34.7 | 0.8 | 37.5 | 53.9 | 16.4 | |
| Vert | 2390.000 | AV | 37.3 | 27.0 | 2.4 | 34.7 | 0.8 | 32.8 | 53.9 | 21.1 | *1) |
| Vert | 4804.000 | AV | 35.0 | 31.8 | 4.5 | 33.9 | 0.8 | 38.2 | 53.9 | 15.7 | |
| Vert | 7206.000 | AV | 34.9 | 35.7 | 5.1 | 33.8 | 0.8 | 42.7 | 53.9 | 11.2 | |
| Vert | 9608.000 | AV | 34.7 | 38.0 | 6.0 | 34.4 | 0.8 | 45.1 | 53.9 | 8.8 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty Factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

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

*1) Not Out of Band emission (Leakage Power)

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 | 97.9 | 27.0 | 2.4 | 34.7 | 92.6 | - | - | Carrier |
| Hori | 2400.000 | PK | 49.1 | 27.0 | 2.4 | 34.7 | 43.8 | 72.6 | 28.8 | |
| Vert | 2402.000 | PK | 96.1 | 27.0 | 2.4 | 34.7 | 90.8 | - | - | Carrier |
| Vert | 2400.000 | PK | 47.3 | 27.0 | 2.4 | 34.7 | 42.0 | 70.8 | 28.8 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10478909H
Date : 08/31/2014
Temperature/ Humidity : 23 deg. C / 55% RH
Engineer : Hiroshi Kukita
Mode : BT LE Tx 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 | 36.000 | QP | 23.1 | 15.9 | 6.8 | 28.6 | - | 17.2 | 40.0 | 22.8 | |
| Hori | 72.000 | QP | 23.1 | 6.5 | 7.2 | 28.6 | - | 8.2 | 40.0 | 31.8 | |
| Hori | 108.000 | QP | 22.8 | 11.2 | 7.5 | 28.4 | - | 13.1 | 43.5 | 30.4 | |
| Hori | 144.000 | QP | 22.2 | 14.6 | 7.8 | 28.3 | - | 16.3 | 43.5 | 27.2 | |
| Hori | 180.000 | QP | 22.1 | 16.1 | 8.0 | 28.0 | - | 18.2 | 43.5 | 25.3 | |
| Hori | 216.000 | QP | 22.0 | 16.8 | 8.2 | 27.8 | - | 19.2 | 43.5 | 24.3 | |
| Hori | 2498.270 | PK | 59.6 | 26.9 | 2.5 | 34.7 | - | 54.3 | 73.9 | 19.6 | |
| Hori | 4880.000 | PK | 43.4 | 32.0 | 4.4 | 33.9 | - | 45.9 | 73.9 | 28.0 | |
| Hori | 7320.000 | PK | 43.7 | 35.8 | 5.2 | 33.8 | - | 50.9 | 73.9 | 23.0 | |
| Hori | 9760.000 | PK | 43.4 | 38.3 | 6.2 | 34.5 | - | 53.4 | 73.9 | 20.5 | |
| Hori | 2498.270 | AV | 43.9 | 26.9 | 2.5 | 34.7 | 0.8 | 39.4 | 53.9 | 14.5 | |
| Hori | 4880.000 | AV | 34.7 | 32.0 | 4.4 | 33.9 | 0.8 | 38.0 | 53.9 | 15.9 | |
| Hori | 7320.000 | AV | 34.9 | 35.8 | 5.2 | 33.8 | 0.8 | 42.9 | 53.9 | 11.0 | |
| Hori | 9760.000 | AV | 34.9 | 38.3 | 6.2 | 34.5 | 0.8 | 45.7 | 53.9 | 8.2 | |
| Vert | 36.000 | QP | 23.1 | 15.9 | 6.8 | 28.6 | - | 17.2 | 40.0 | 22.8 | |
| Vert | 72.000 | QP | 23.0 | 6.5 | 7.2 | 28.6 | - | 8.1 | 40.0 | 31.9 | |
| Vert | 108.000 | QP | 22.8 | 11.2 | 7.5 | 28.4 | - | 13.1 | 43.5 | 30.4 | |
| Vert | 144.000 | QP | 22.3 | 14.6 | 7.8 | 28.3 | - | 16.4 | 43.5 | 27.1 | |
| Vert | 180.000 | QP | 22.2 | 16.1 | 8.0 | 28.0 | - | 18.3 | 43.5 | 25.2 | |
| Vert | 216.000 | QP | 22.0 | 16.8 | 8.2 | 27.8 | - | 19.2 | 43.5 | 24.3 | |
| Vert | 2497.980 | PK | 58.3 | 26.9 | 2.5 | 34.7 | - | 53.0 | 73.9 | 20.9 | |
| Vert | 4880.000 | PK | 43.5 | 32.0 | 4.4 | 33.9 | - | 46.0 | 73.9 | 27.9 | |
| Vert | 7320.000 | PK | 43.5 | 35.8 | 5.2 | 33.8 | - | 50.7 | 73.9 | 23.2 | |
| Vert | 9760.000 | PK | 43.5 | 38.3 | 6.2 | 34.5 | - | 53.5 | 73.9 | 20.4 | |
| Vert | 2497.980 | AV | 41.9 | 26.9 | 2.5 | 34.7 | 0.8 | 37.4 | 53.9 | 16.5 | |
| Vert | 4880.000 | AV | 34.6 | 32.0 | 4.4 | 33.9 | 0.8 | 37.9 | 53.9 | 16.0 | |
| Vert | 7320.000 | AV | 34.7 | 35.8 | 5.2 | 33.8 | 0.8 | 42.7 | 53.9 | 11.2 | |
| Vert | 9760.000 | AV | 34.8 | 38.3 | 6.2 | 34.5 | 0.8 | 45.6 | 53.9 | 8.3 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty Factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

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

UL Japan, Inc.

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Radiated Spurious Emission

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10478909H
Date 08/31/2014
Temperature/ Humidity 23 deg. C / 55% RH
Engineer Hiroshi Kukita
Mode BT LE Tx 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 | 36.000 | QP | 23.2 | 15.9 | 6.8 | 28.6 | - | 17.3 | 40.0 | 22.7 | |
| Hori | 72.000 | QP | 23.1 | 6.5 | 7.2 | 28.6 | - | 8.2 | 40.0 | 31.8 | |
| Hori | 108.000 | QP | 22.9 | 11.2 | 7.5 | 28.4 | - | 13.2 | 43.5 | 30.3 | |
| Hori | 144.000 | QP | 22.3 | 14.6 | 7.8 | 28.3 | - | 16.4 | 43.5 | 27.1 | |
| Hori | 180.000 | QP | 22.3 | 16.1 | 8.0 | 28.0 | - | 18.4 | 43.5 | 25.1 | |
| Hori | 216.000 | QP | 22.1 | 16.8 | 8.2 | 27.8 | - | 19.3 | 43.5 | 24.2 | |
| Hori | 2483.500 | PK | 52.9 | 26.9 | 2.5 | 34.7 | - | 47.6 | 73.9 | 26.3 | |
| Hori | 2567.475 | PK | 58.9 | 27.0 | 2.5 | 34.6 | - | 53.8 | 73.9 | 20.1 | |
| Hori | 4960.000 | PK | 43.1 | 32.2 | 4.4 | 34.0 | - | 45.7 | 73.9 | 28.2 | |
| Hori | 7440.000 | PK | 44.0 | 35.8 | 5.2 | 33.9 | - | 51.1 | 73.9 | 22.8 | |
| Hori | 9920.000 | PK | 43.3 | 38.7 | 6.2 | 34.5 | - | 53.7 | 73.9 | 20.2 | |
| Hori | 2483.500 | AV | 40.0 | 26.9 | 2.5 | 34.7 | 0.8 | 35.5 | 53.9 | 18.4 | *1) |
| Hori | 2567.475 | AV | 43.4 | 27.0 | 2.5 | 34.6 | 0.8 | 39.1 | 53.9 | 14.8 | |
| Hori | 4960.000 | AV | 34.3 | 32.2 | 4.4 | 34.0 | 0.8 | 37.7 | 53.9 | 16.2 | |
| Hori | 7440.000 | AV | 35.3 | 35.8 | 5.2 | 33.9 | 0.8 | 43.2 | 53.9 | 10.7 | |
| Hori | 9920.000 | AV | 34.7 | 38.7 | 6.2 | 34.5 | 0.8 | 45.9 | 53.9 | 8.0 | |
| Vert | 36.000 | QP | 23.1 | 15.9 | 6.8 | 28.6 | - | 17.2 | 40.0 | 22.8 | |
| Vert | 72.000 | QP | 23.0 | 6.5 | 7.2 | 28.6 | - | 8.1 | 40.0 | 31.9 | |
| Vert | 108.000 | QP | 22.8 | 11.2 | 7.5 | 28.4 | - | 13.1 | 43.5 | 30.4 | |
| Vert | 144.000 | QP | 22.2 | 14.6 | 7.8 | 28.3 | - | 16.3 | 43.5 | 27.2 | |
| Vert | 180.000 | QP | 22.4 | 16.1 | 8.0 | 28.0 | - | 18.5 | 43.5 | 25.0 | |
| Vert | 216.000 | QP | 21.9 | 16.8 | 8.2 | 27.8 | - | 19.1 | 43.5 | 24.4 | |
| Vert | 2483.500 | PK | 50.4 | 26.9 | 2.5 | 34.7 | - | 45.1 | 73.9 | 28.8 | |
| Vert | 2568.633 | PK | 58.9 | 27.0 | 2.5 | 34.6 | - | 53.8 | 73.9 | 20.1 | |
| Vert | 4960.000 | PK | 43.3 | 32.2 | 4.4 | 34.0 | - | 45.9 | 73.9 | 28.0 | |
| Vert | 7440.000 | PK | 43.8 | 35.8 | 5.2 | 33.9 | - | 50.9 | 73.9 | 23.0 | |
| Vert | 9920.000 | PK | 43.1 | 38.7 | 6.2 | 34.5 | - | 53.5 | 73.9 | 20.4 | |
| Vert | 2483.500 | AV | 38.3 | 26.9 | 2.5 | 34.7 | 0.8 | 33.8 | 53.9 | 20.1 | *1) |
| Vert | 2568.633 | AV | 42.6 | 27.0 | 2.5 | 34.6 | 0.8 | 38.3 | 53.9 | 15.6 | |
| Vert | 4960.000 | AV | 34.4 | 32.2 | 4.4 | 34.0 | 0.8 | 37.8 | 53.9 | 16.1 | |
| Vert | 7440.000 | AV | 35.4 | 35.8 | 5.2 | 33.9 | 0.8 | 43.3 | 53.9 | 10.6 | |
| Vert | 9920.000 | AV | 34.8 | 38.7 | 6.2 | 34.5 | 0.8 | 46.0 | 53.9 | 7.9 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty Factor

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

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

*1) Not Out of Band emission(Leakage Power)

UL Japan, Inc.

Ise EMC Lab.

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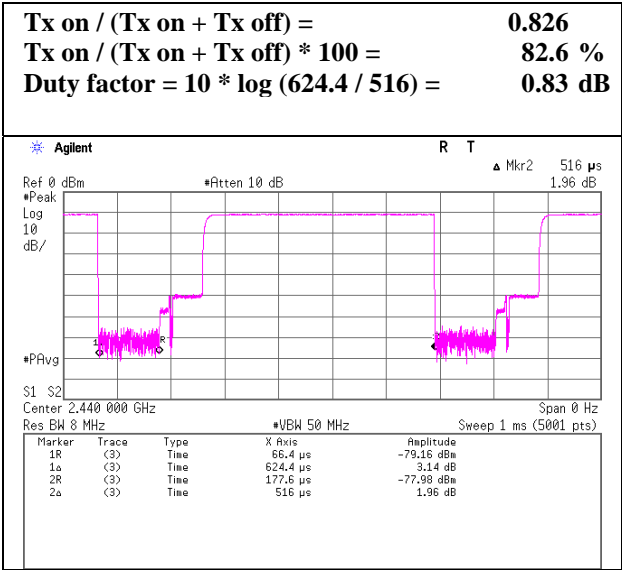
Telephone : +81 596 24 8999

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Burst rate confirmation

Test place
Report No.
Date
Temperature/ Humidity
Engineer
Mode

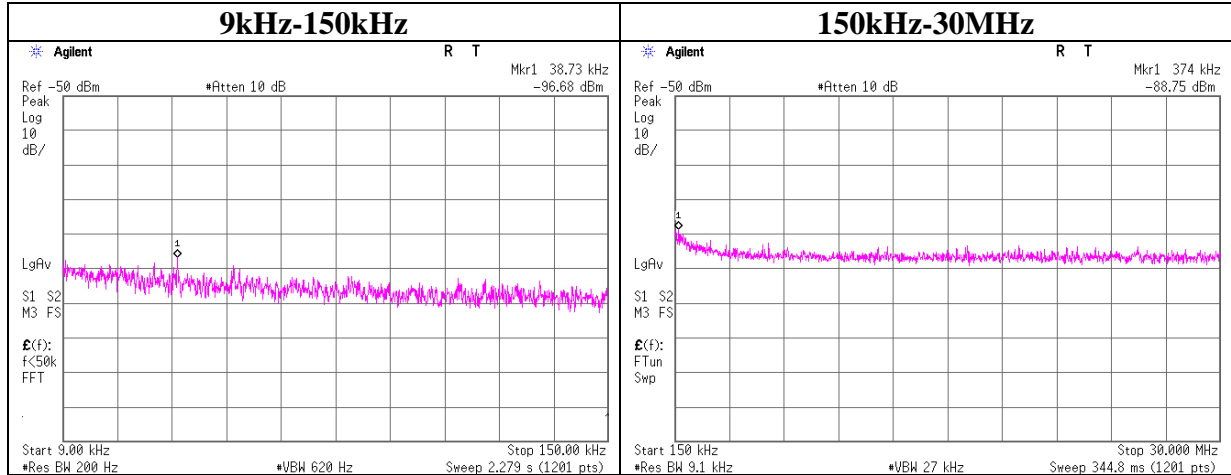
Ise EMC Lab. No.11 Measurement Room
10478909H
08/27/2014
23 deg. C / 57% RH
Hiroshi Kukita
BT LE Tx



Conducted Spurious Emission

| | |
|-----------------------|-------------------------------------|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 10478909H |
| Date | 08/27/2014 |
| Temperature/ Humidity | 23 deg. C / 57% RH |
| Engineer | Hiroshi Kukita |
| Mode | BT LE Tx |

Tx 2402MHz



| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dBi] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|--------------------|------------------|-----------------------|--------------------|--------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|
| 38.73 | -96.7 | 4.31 | 9.9 | 2.0 | -80.5 | 300.0 | 6.0 | -19.2 | 35.8 |
| 374 | -88.8 | 4.32 | 9.9 | 2.0 | -72.5 | 300.0 | 6.0 | -11.3 | 16.1 |

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

UL Japan, Inc.

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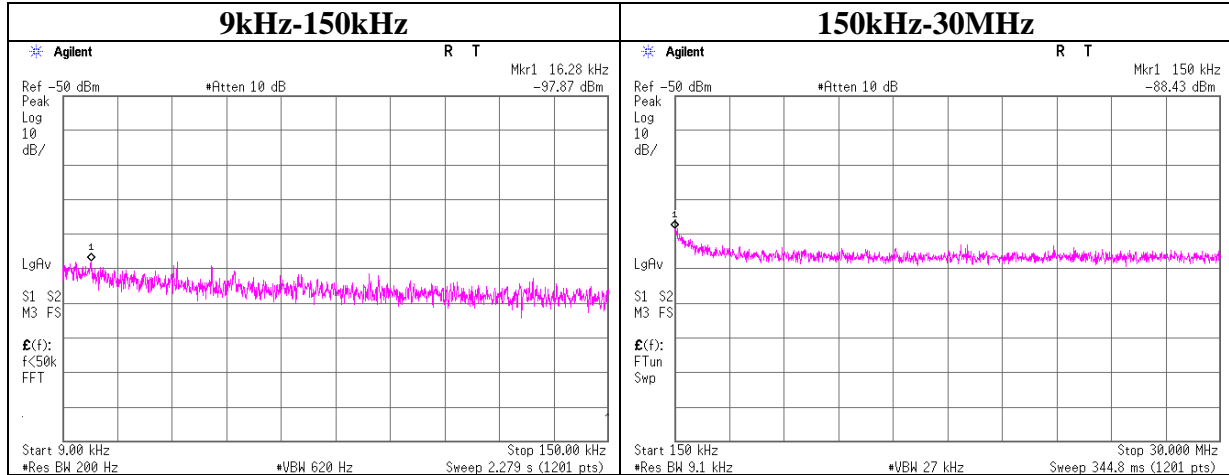
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Facsimile : +81 596 24 8124

Conducted Spurious Emission

| | |
|-----------------------|-------------------------------------|
| Test place | Ise EMC Lab. No.11 Measurement Room |
| Report No. | 10478909H |
| Date | 08/27/2014 |
| Temperature/ Humidity | 23 deg. C / 57% RH |
| Engineer | Hiroshi Kukita |
| Mode | BT LE Tx |

Tx 2440MHz



| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dBi] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|--------------------|------------------|-----------------------|--------------------|--------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|
| 16.28 | -97.9 | 4.31 | 9.9 | 2.0 | -81.7 | 300.0 | 6.0 | -20.4 | 43.3 |
| 150 | -88.4 | 4.32 | 9.9 | 2.0 | -72.3 | 300.0 | 6.0 | -11.0 | 24.0 |

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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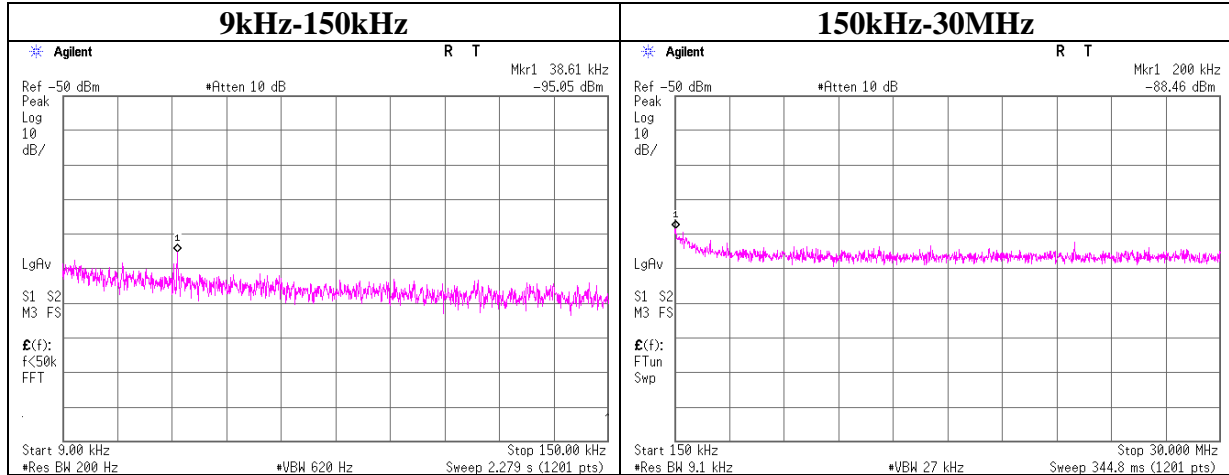
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Conducted Spurious Emission

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 10478909H
Date : 08/27/2014
Temperature/ Humidity : 23 deg.C./ 57%
Engineer : Hiroshi Kukita
Mode : BT LE Tx

Tx 2480MHz



| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dBi] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|--------------------|------------------|-----------------------|--------------------|--------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|
| 38.61 | -95.1 | 4.31 | 9.9 | 2.0 | -78.9 | 300.0 | 6.0 | -17.6 | 35.8 |
| 200 | -88.5 | 4.32 | 9.9 | 2.0 | -72.3 | 300.0 | 6.0 | -11.0 | 21.5 |

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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Power Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10478909H
Date 08/27/2014
Temperature/ Humidity 23 deg. C / 57% RH
Engineer Hiroshi Kukita
Mode BT LE Tx

| Freq. | Reading | Cable Loss | Atten. | Result | Limit | Margin |
|---------|---------|---------------|--------|--------|-------|--------|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [dBm] | [dB] |
| 2402.00 | -20.98 | 5.61 | 10.00 | -5.37 | 8.00 | 13.37 |
| 2440.00 | -21.96 | 5.62 | 10.00 | -6.34 | 8.00 | 14.34 |
| 2480.00 | -24.11 | 5.63 | 10.00 | -8.48 | 8.00 | 16.48 |

Sample Calculation:

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

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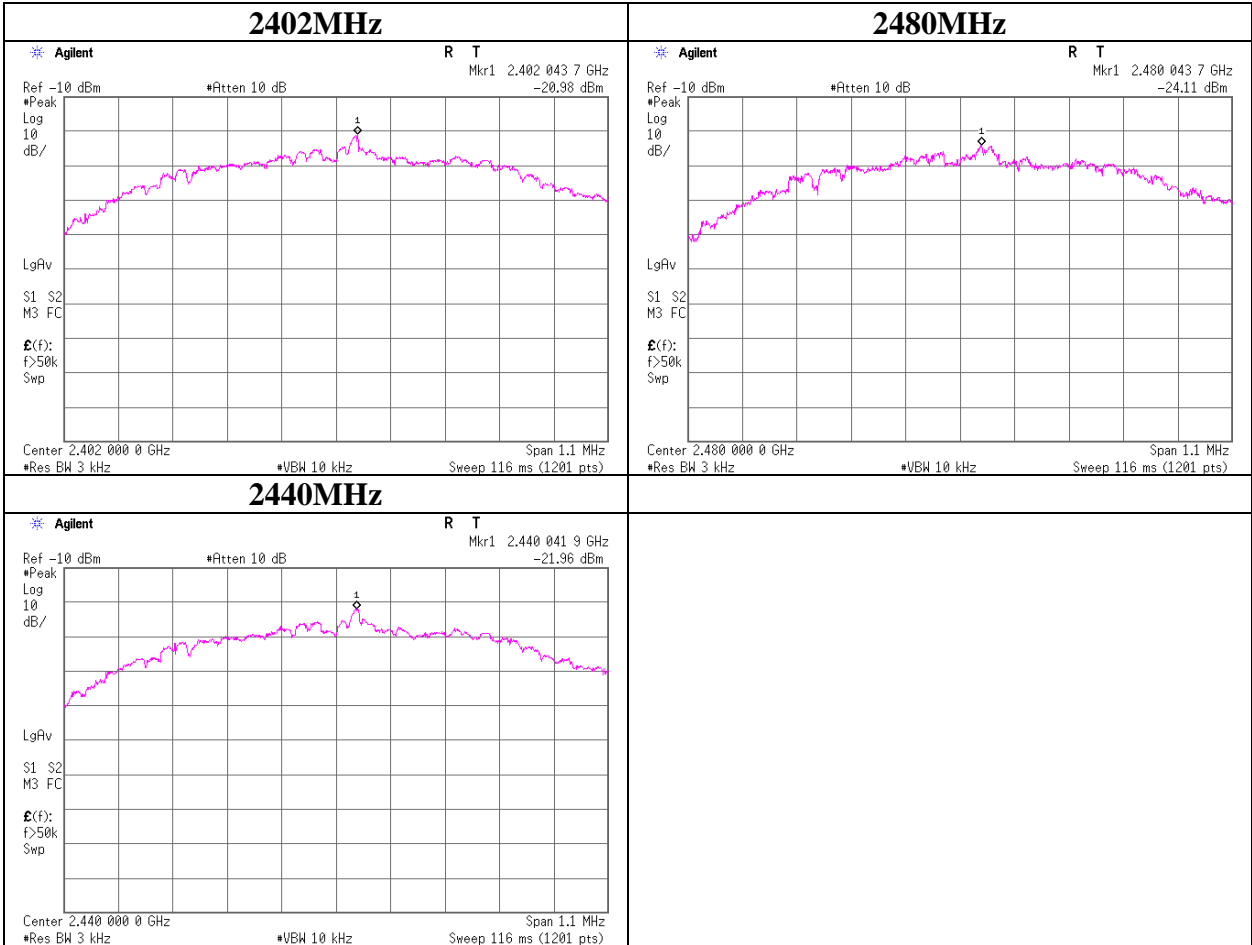
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Power Density



99% Occupied Bandwidth

Test place

Report No.

Date

Temperature/ Humidity

Engineer

Mode

Ise EMC Lab. No.11 Measurement Room

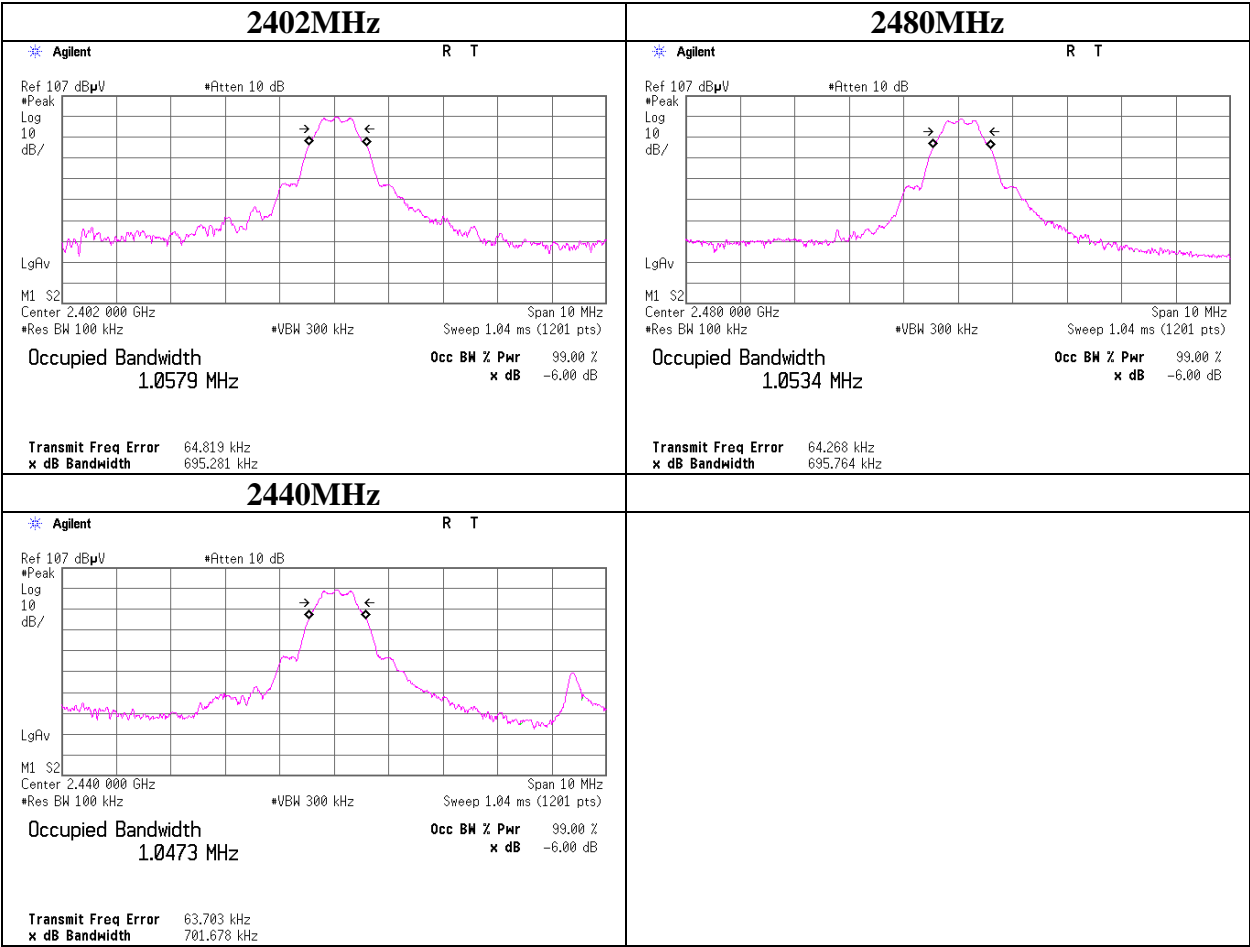
10478909H

08/27/2014

23 deg. C / 57% RH

Hiroshi Kukita

BT LE Tx



APPENDIX 2: Test instruments

EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|-------------|----------------------------|----------------------|--|-----------------------------|-----------|---------------------------------------|
| MAEC-02 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-06902 | CE/RE | 2014/06/25 * 12 |
| MOS-22 | Thermo-Hygrometer | Custom | CTH-201 | 0003 | CE/RE | 2014/02/20 * 12 |
| MJM-14 | Measure | KOMELON | KMC-36 | - | CE/RE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | CE/RE | - |
| MSA-10 | Spectrum Analyzer | Agilent | E4448A | MY46180655 | CE/RE | 2014/02/20 * 12 |
| MTR-03 | Test Receiver | Rohde & Schwarz | ESCI | 100300 | CE/RE | 2014/06/03 * 12 |
| MLS-23 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127-729 | CE(EUT) | 2014/07/10 * 12 |
| MCC-13 | Coaxial Cable | Fujikura | 3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m) | - | CE | 2014/02/20 * 12 |
| MAT-65 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | CE | 2014/01/29 * 12 |
| MBM-12 | Barometer | Sunoh | SBR121 | 873 | AT | 2012/02/20 * 36 |
| MOS-19 | Thermo-Hygrometer | Custom | CTH-201 | 0001 | AT | 2013/12/17 * 12 |
| MSA-03 | Spectrum Analyzer | Agilent | E4448A | MY44020357 | AT | 2014/04/08 * 12 |
| MPM-01 | Power Meter | Agilent | E4417A | GB41290639 | AT | 2014/04/23 * 12 |
| MPSE-03 | Power sensor | Agilent | E9327A | US40440576 | AT | 2014/04/22 * 12 |
| MPM-13 | Power Meter | Anritsu | ML2495A | 0824014 | AT | 2013/11/15 * 12 |
| MPSE-18 | Power sensor | Anritsu | MA2411B | 0738174 | AT | 2013/11/15 * 12 |
| MCC-64 | Coaxial Cable | UL Japan | - | - | AT | 2014/03/28 * 12 |
| MAT-10 | Attenuator(10dB) | Weinschel Corp | 2 | BL1173 | AT | 2013/11/26 * 12 |
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | VHA91032008 | RE | 2013/10/13 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 201 | RE | 2013/10/13 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | - | RE | 2014/02/20 * 12 |
| MAT-07 | Attenuator(6dB) | Weinschel Corp | 2 | BK7970 | RE | 2013/11/26 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | 2944A10845 | RE | 2013/09/12 * 12 |
| MHA-06 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 254 | RE | 2014/02/21 * 12 |
| MCC-166 | Microwave Cable | Junkosha | MWX221 | 1303S120(1m) / 1311S167(5m) | RE | 2013/11/27 * 12 |
| MPA-10 | Pre Amplifier | Agilent | 8449B | 3008A02142 | RE | 2014/01/21 * 12 |
| MHA-02 | Horn Antenna 18-26.5GHz | EMCO | 3160-09 | 1265 | RE | 2014/02/21 * 12 |
| MHF-06 | High Pass Filter 3.5-24GHz | TOKIMEC | TF323DCA | 601 | RE | 2014/05/21 * 12 |

The expiration date of the calibration is the end of the expired month.

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

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

Test Item: CE: Conducted Emission, RE: Radiated Emission
AT: Antenna Terminal Conducted test

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