# RADIO TEST REPORT

## Test Report No. : 11242579M-A

| | | |
|---|---|---|
| **Applicant** | : | **CASIO COMPUTER CO., LTD.** |
| **Type of Equipment** | : | **Handheld Terminal** |
| **Model No.** | : | **IT-G500-C21E-US** |
| **FCC ID** | : | **BBQITG500** |
| **Test regulation** | : | **FCC Part 15 Subpart C: 2016 (Wireless LAN part)** |
| **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)

**Date of test:** May 12, 16, 18, 19, 20, 22, 26-28, 2016

**Representative test engineer:**

Kazuhiro Ando
Engineer
Consumer Technology Division

**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".

# REVISION HISTORY

## Original Test Report No.: 11242579M-A

| Revision | Test report No. | Date | Page revised | Contents |
|---|---|---|---|---|
| - (Original) | 11242579M-A | June 17, 2016 | - | - |
| 1 | 11242579M-A | June 23, 2016 | P.13 | Modification of the description |
| 2 | 11242579M-A | June 27, 2016 | P.10 | Add a description of supported equipment |
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**Kashima EMC Lab.**
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**CONTENTS** **PAGE**

## SECTION 1: Customer information

| | | |
|---|---|---|
| Company Name | : | CASIO COMPUTER CO., LTD. |
| Address | : | 2951-5, Ishikawa-Machi, Hachioji-shi Tokyo 192-8556, Japan |
| Telephone Number | : | +81-42-639-5188 |
| Facsimile Number | : | +81-42-639-5046 |
| Contact Person | : | KATSUMASA MOTOKI |

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

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

| | | |
|---|---|---|
| Type of Equipment | : | Handheld Terminal |
| Model No. | : | IT-G500-C21E-US |
| Serial No. | : | Refer to Section 4, Clause 4.2 |
| Rating | : | Li-ion battery DC3.7V 1850mAh/6.9Wh, M/N:HA-D20BAT-A |
| Option Battery | : | Li-ion battery DC3.7V 3700mAh/14Wh, M/N:HA-D21LBAT-A |
| Receipt Date of Sample | : | April 18, 2016 |
| Country of Mass-production | : | Japan |
| 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: IT-G500-C21E-US (referred to as the EUT in this report) is a Handheld Terminal.

**General Specification**

| | |
|---|---|
| Clock frequency(ies) in the system | CPU: 1.5 GHz |
| Power Supply (inner) | DC 3.3 V / 1.8 V |

**Radio Specification**

**WLAN (IEEE802.11b/g/a/n-20)**

| | |
|---|---|
| Equipment Type | Transceiver |
| Frequency of Operation | 2412-2462MHz, 5180-5825MHz |
| Type of Modulation | DSSS, OFDM |
| Antenna type | Inverted F antenna (IEEE802.11b/g/n)<br>Dipole antenna (IEEE802.11a/n) |
| Antenna Gain | 0.79dBi (2412-2462MHz)<br>1.05dBi (5180-5825MHz) |

**BT**

| | |
|---|---|
| Equipment Type | Transceiver |
| Frequency of Operation | 2402-2480MHz |
| Type of Modulation | FHSS |
| Antenna type | Inverted F antenna |
| Antenna Gain | 0.79dBi |

**RFID**

| | |
|---|---|
| Equipment Type | Transceiver |
| Frequency of Operation | 13.56MHz |
| Type of Modulation | ASK |
| Antenna type | Loop antenna |

* Refer to the test reports: 11242579M-B for 2.4 GHz band (Bluetooth part).
* Refer to the test reports: 11242579M-C and 11242579M-D for 5 GHz band.
* Refer to the test reports: 11242579M-E for 13.56 MHz band (RFID).

# 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

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

## 3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|---|---|---|---|
| Conducted Emission | **FCC:** ANSI C63.10-2013 6. Standard test methods<br>**IC:** RSS-Gen 8.8 | **FCC:** Section 15.207<br>**IC:** RSS-Gen 8.8 | **QP** 14.4 dB, 0.47705 MHz, N<br>**AV** 11.4 dB, 0.50000 MHz, N | Complied | - |
| 6dB Bandwidth | **FCC:** KDB 558074 D01 DTS Meas Guidance v03r05<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 v03r05<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 v03r05<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 v03r05<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 | 0.5 dB<br>2483.500 MHz, AV, Hori. | Complied | Conducted (below 30 MHz)/ Radiated (above 30 MHz) *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 (DC 1.8V) constantly to RF Part 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 $k = 2$.

| Item | Frequency range | Uncertainty (+/-) |
|---|---|---|
| | | No. 1 SAC / SR |
| 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

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
A2LA Accreditation No. 1266.01

| 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.

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

## 4.1 Operating Mode(s)

Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

| Mode | Remarks* |
|---|---|
| IEEE 802.11b (11b) | 2 Mbps, PN9 |
| IEEE 802.11g (11g) | 6 Mbps, PN9 |
| IEEE 802.11n SISO 20 MHz BW (11n-20) | MCS 0, PN9 |
| *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) | |
| *Power of the EUT was set by the software as follows;<br>Power settings: 11b (2412 MHz: 11000, 2437 MHz: 11000, 2462 MHz: 11000)<br>11g (2412 MHz: 11000, 2437 MHz: 25000, 2462 MHz: 11000)<br>11n-20 (2412 MHz: 11000, 2437 MHz: 25000, 2462 MHz: 11000)<br>Software: WL127X_TOOL<br><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. | |

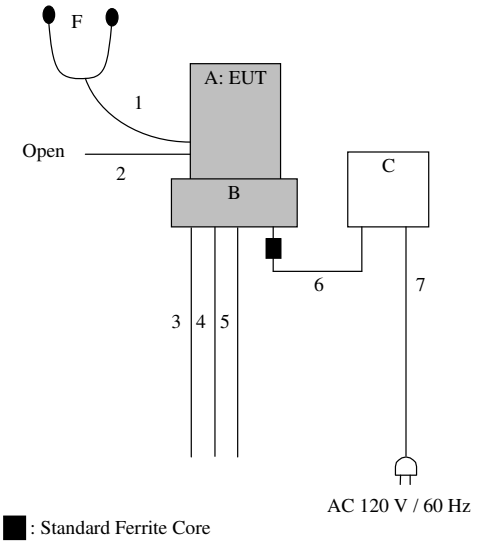
*The details of Operating mode(s)

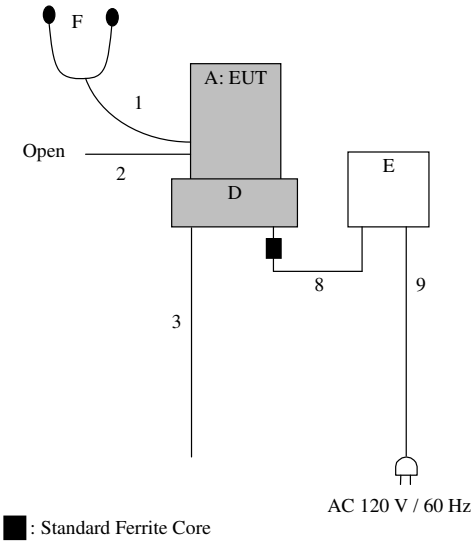
| Test Item | Operating Mode | Tested frequency |
|---|---|---|
| Conducted Emission<br>*1) | 11n-20 Tx | 2437 MHz |
| Spurious Emission above 1 GHz (Radiated) | 11b Tx<br>11g Tx<br>11n-20 Tx | 2412 MHz<br>2437 MHz<br>2462 MHz |
| Spurious Emission below 1 GHz (Radiated)<br>*1) | 11n-20 Tx | 2437 MHz |
| 6dB Bandwidth,<br>Maximum Peak Output Power,<br>Power Density,<br>99% Occupied Bandwidth | 11b Tx<br>11g Tx<br>11n-20 Tx | 2412 MHz<br>2437 MHz<br>2462 MHz |
| Spurious Emission (Conducted)<br>*1) | 11n-20 Tx | 2437 MHz |

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

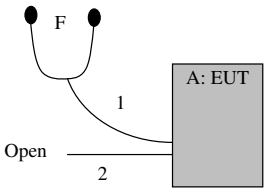
## 4.2 Configuration and peripherals

For Conduction




For Radiation




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

**Description of EUT and Support equipment**

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|---|---|---|---|---|---|
| A | Handheld Terminal | IT-G500-C21E-US | 024SE LG6200795IAAD1 *1)<br>024SE LG6100692IAAC1 *2) | CASIO COMPUTER CO., LTD. | EUT |
| B | Cradle | HA-P62IO | 244AA JX4B00502 GAAA1 | CASIO COMPUTER CO., LTD. | EUT |
| C | AC Adapter | AD-S42120C | 0915C | CASIO COMPUTER CO., LTD. | - |
| D | Cradle | HA-P60IO | 241AA JW4B00501 GAAA1 | CASIO COMPUTER CO., LTD. | EUT |
| E | AC Adapter | AD-S15050B | 0711C | CASIO COMPUTER CO., LTD. | - |
| F | Ear phone | - | - | - | - |

*1) Used for Antenna Terminal conducted tests
*2) Used for Conducted Emission test and Radiated Spurious Emission tests

**List of cables used**

| No. | Name | Length (m) | Shield | | Remarks |
|---|---|---|---|---|---|
| | | | Cable | Connector | |
| 1 | Ear phone | 1.2 | Unshielded | Unshielded | - |
| 2 | USB | 1.8 | Shielded | Shielded | - |
| 3 | USB | 1.8 | Shielded | Shielded | - |
| 4 | USB | 2.0 | Shielded | Shielded | - |
| 5 | LAN | 1.0 | Unshielded | Unshielded | - |
| 6 | DC | 1.5 | Unshielded | Unshielded | - |
| 7 | AC | 2.0 | Unshielded | Unshielded | - |
| 8 | DC | 1.5 | Unshielded | Unshielded | - |
| 9 | AC | 2.0 | Unshielded | Unshielded | - |

## 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 0.8m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

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 MHz - 30 MHz**
**Test data : APPENDIX**
**Test result : Pass**

## 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 x log (4.5 m / 3.0 m) = 3.5 dB
*2) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB
*3) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r05"

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT and EUT on the cradle 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 | 50 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: 160 MHz BW) |
| Peak Power Density | 1.5 times the 6dB Bandwidth | 3 kHz | 9.1 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 | 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 not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 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

### Conducted Emission

(Cradle: HA-P62IO)

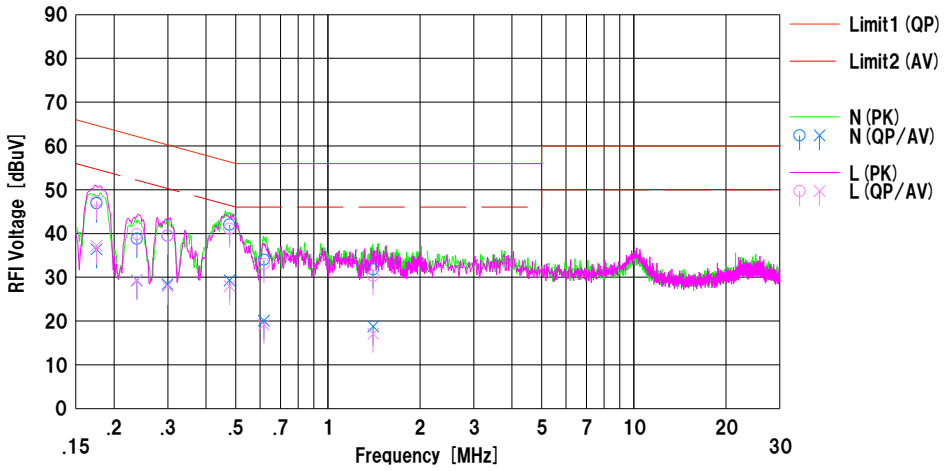
## DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.2 Shielded Room
Date : 2016/05/26

Mode : Tx, 11n-20, MCS0, 2437MHz
Order No. : 11242579M
Power : AC 120V / 60Hz
Temp./Humi. : 22deg.C / 59%RH

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

Tested by : Kazuhiro Ando




| No. | Freq. | Reading | | C.Fac | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <QP> | <AV> | | <QP> | <AV> | <QP> | <AV> | <QP> | <AV> | | |
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 1 | 0.17530 | 37.2 | 26.7 | 9.7 | 46.9 | 36.4 | 64.7 | 54.7 | 17.8 | 18.3 | N | |
| 2 | 0.23732 | 29.1 | 19.6 | 9.7 | 38.8 | 29.3 | 62.2 | 52.2 | 23.4 | 22.9 | N | |
| 3 | 0.29907 | 29.8 | 18.7 | 9.7 | 39.5 | 28.4 | 60.3 | 50.3 | 20.8 | 21.9 | N | |
| 4 | 0.47705 | 32.3 | 19.6 | 9.7 | 42.0 | 29.3 | 56.4 | 46.4 | 14.4 | 17.1 | N | |
| 5 | 0.61800 | 24.3 | 10.4 | 9.7 | 34.0 | 20.1 | 56.0 | 46.0 | 22.0 | 25.9 | N | |
| 6 | 1.40636 | 22.0 | 9.0 | 9.8 | 31.8 | 18.8 | 56.0 | 46.0 | 24.2 | 27.2 | N | |
| 7 | 0.17530 | 37.7 | 27.5 | 9.7 | 47.4 | 37.2 | 64.7 | 54.7 | 17.3 | 17.5 | L | |
| 8 | 0.23732 | 30.1 | 19.5 | 9.7 | 39.8 | 29.2 | 62.2 | 52.2 | 22.4 | 23.0 | L | |
| 9 | 0.29907 | 29.8 | 18.3 | 9.7 | 39.5 | 28.0 | 60.3 | 50.3 | 20.8 | 22.3 | L | |
| 10 | 0.47705 | 31.4 | 18.3 | 9.7 | 41.1 | 28.0 | 56.4 | 46.4 | 15.3 | 18.4 | L | |
| 11 | 0.61800 | 23.3 | 9.4 | 9.7 | 33.0 | 19.1 | 56.0 | 46.0 | 23.0 | 26.9 | L | |
| 12 | 1.40636 | 20.5 | 7.3 | 9.8 | 30.3 | 17.1 | 56.0 | 46.0 | 25.7 | 28.9 | L | |

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

## Conducted Emission
(Cradle: HA-P60IO)

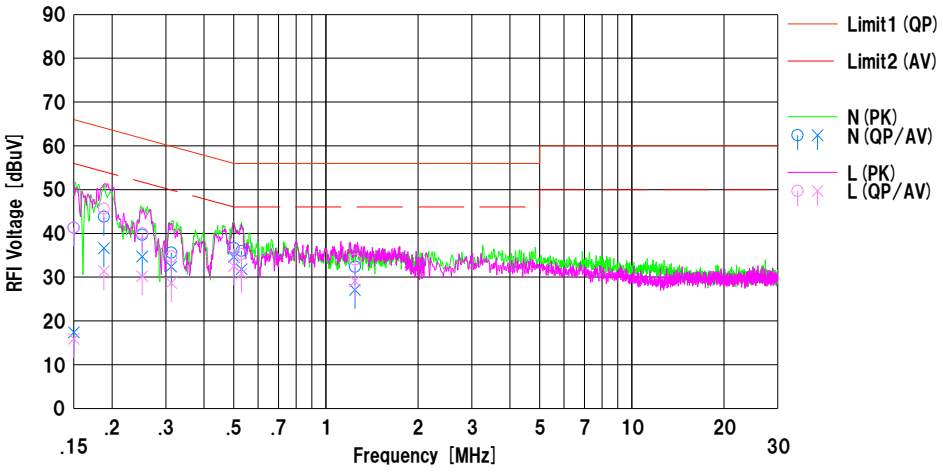
# DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.2 Shielded Room
Date : 2016/05/26

Mode : Tx, 11n-20, MCS0, 2437MHz
Order No. : 11242579M
Power : AC 120V / 60Hz
Temp./Humi. : 22deg.C / 59%RH

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

Tested by : Kazuhiro Ando




| No. | Freq. | Reading | | C.Fac | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <QP> | <AV> | | <QP> | <AV> | <QP> | <AV> | <QP> | <AV> | | |
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 1 | 0.15000 | 31.6 | 7.7 | 9.7 | 41.3 | 17.4 | 66.0 | 56.0 | 24.7 | 38.6 | N | |
| 2 | 0.18820 | 34.1 | 26.9 | 9.7 | 43.8 | 36.6 | 64.1 | 54.1 | 20.3 | 17.5 | N | |
| 3 | 0.25115 | 30.0 | 25.0 | 9.7 | 39.7 | 34.7 | 61.7 | 51.7 | 22.0 | 17.0 | N | |
| 4 | 0.31225 | 25.9 | 22.7 | 9.7 | 35.6 | 32.4 | 59.9 | 49.9 | 24.3 | 17.5 | N | |
| 5 | 0.50000 | 27.0 | 24.9 | 9.7 | 36.7 | 34.6 | 56.0 | 46.0 | 19.3 | 11.4 | N | |
| 6 | 0.53025 | 26.3 | 22.1 | 9.7 | 36.0 | 31.8 | 56.0 | 46.0 | 20.0 | 14.2 | N | |
| 7 | 1.24447 | 22.6 | 17.3 | 9.8 | 32.4 | 27.1 | 56.0 | 46.0 | 23.6 | 18.9 | N | |
| 8 | 0.15000 | 31.6 | 6.2 | 9.7 | 41.3 | 15.9 | 66.0 | 56.0 | 24.7 | 40.1 | L | |
| 9 | 0.18820 | 35.9 | 21.7 | 9.7 | 45.6 | 31.4 | 64.1 | 54.1 | 18.5 | 22.7 | L | |
| 10 | 0.25115 | 30.3 | 20.5 | 9.7 | 40.0 | 30.2 | 61.7 | 51.7 | 21.7 | 21.5 | L | |
| 11 | 0.31225 | 25.0 | 19.0 | 9.7 | 34.7 | 28.7 | 59.9 | 49.9 | 25.2 | 21.2 | L | |
| 12 | 0.50000 | 26.8 | 22.8 | 9.7 | 36.5 | 32.5 | 56.0 | 46.0 | 19.5 | 13.5 | L | |
| 13 | 0.53025 | 25.5 | 21.1 | 9.7 | 35.2 | 30.8 | 56.0 | 46.0 | 20.8 | 15.2 | L | |
| 14 | 1.24447 | 24.2 | 19.3 | 9.8 | 34.0 | 29.1 | 56.0 | 46.0 | 22.0 | 16.9 | L | |

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

# 6dB Bandwidth

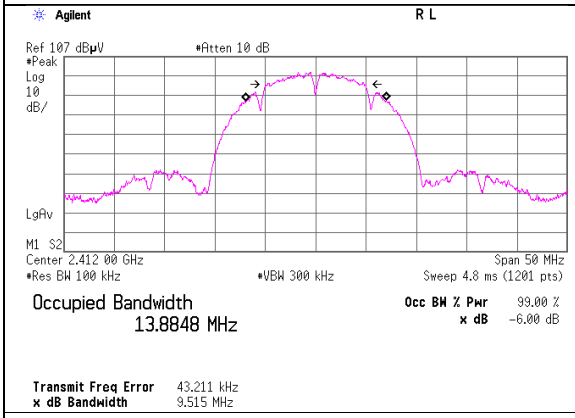
| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

| Mode | Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [kHz] |
|---|---|---|---|
| 11b | 2412 | 9.515 | > 500 |
| | 2437 | 9.619 | > 500 |
| | 2462 | 9.660 | > 500 |
| 11g | 2412 | 15.193 | > 500 |
| | 2437 | 15.194 | > 500 |
| | 2462 | 15.331 | > 500 |
| 11n-20 | 2412 | 15.336 | > 500 |
| | 2437 | 15.292 | > 500 |
| | 2462 | 15.291 | > 500 |

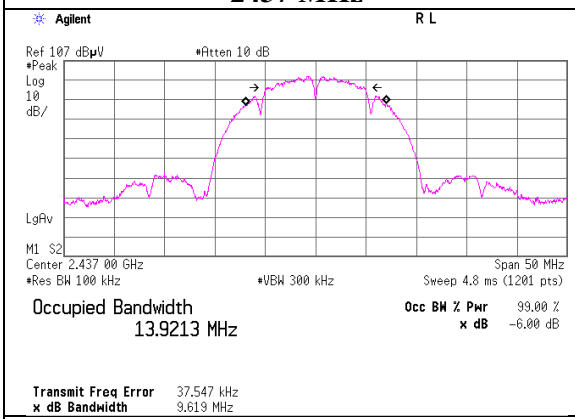
# 6dB Bandwidth

## 11b

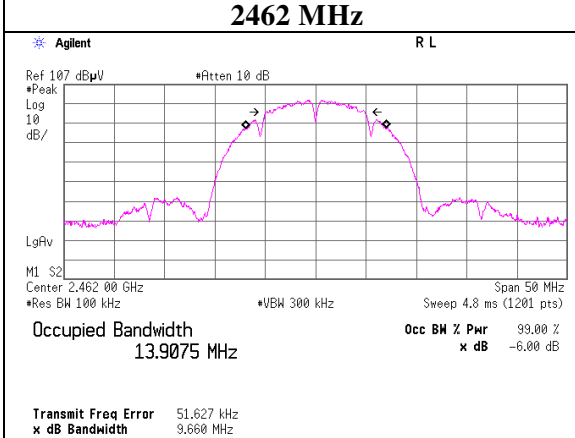
### 2412 MHz




### 2437 MHz

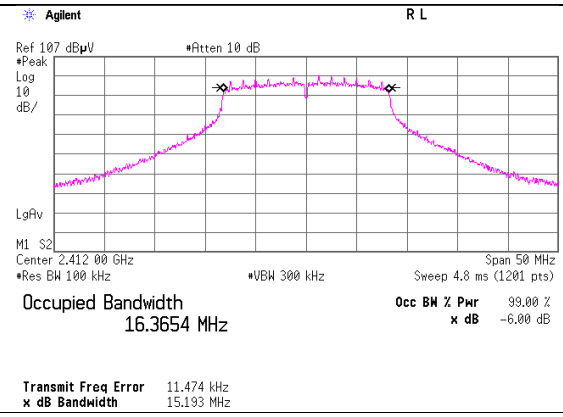



### 2462 MHz

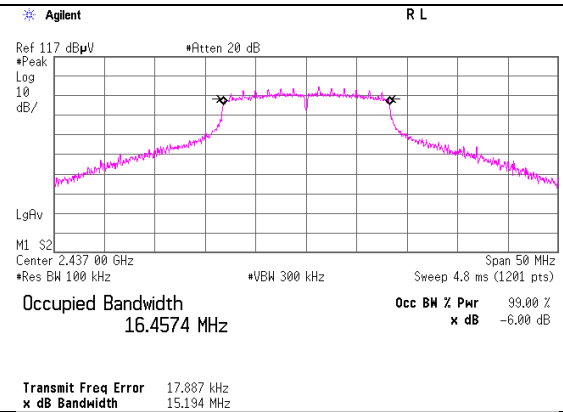



## 11g

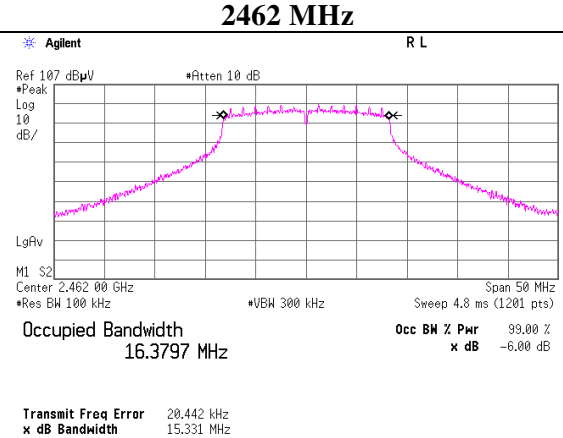
### 2412 MHz




### 2437 MHz



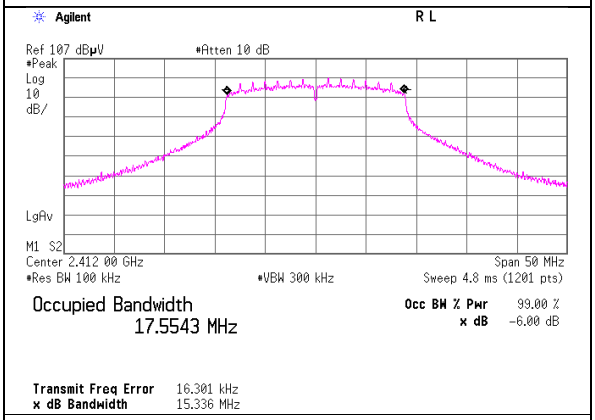

### 2462 MHz



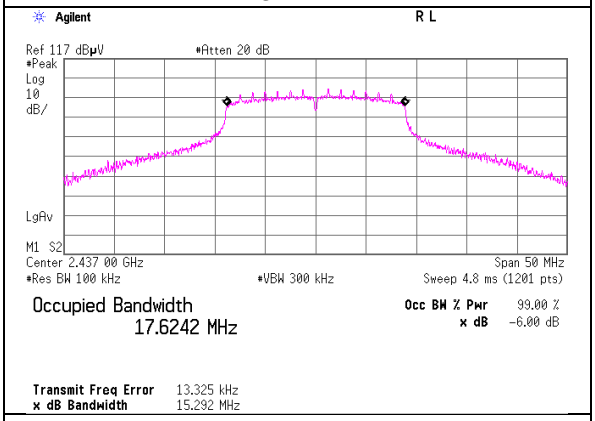
# 6dB Bandwidth

## 11n-20

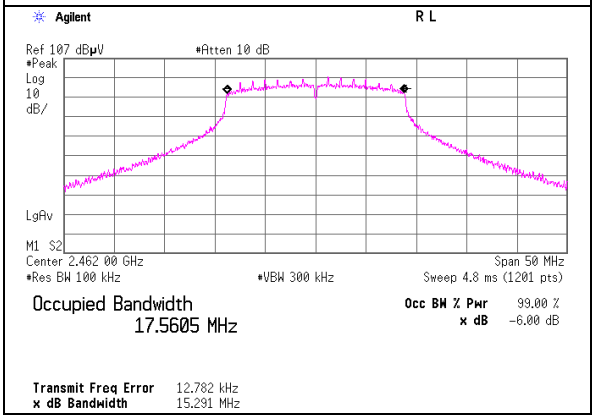
### 2412 MHz




### 2437 MHz




### 2462 MHz



# Maximum Peak Output Power

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx 11b |

| Freq. | Reading | Cable Loss | Atten. Loss | Result | | Limit | | Margin |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dBm] | [mW] | [dB] |
| 2412 | 2.73 | 1.28 | 10.03 | 14.04 | 25.35 | 30.00 | 1000 | 15.96 |
| 2437 | 2.91 | 1.28 | 10.03 | 14.22 | 26.42 | 30.00 | 1000 | 15.78 |
| 2462 | 3.07 | 1.28 | 10.03 | 14.38 | 27.42 | 30.00 | 1000 | 15.62 |

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.

2437MHz

| Rate | Reading | Remark |
|---|---|---|
| [Mbps] | [dBm] | |
| 1 | 2.85 | |
| 2 | 2.91 | * |
| 5.5 | 2.68 | |
| 11 | 2.56 | |

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

# Maximum Peak Output Power

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx 11g |

| Freq. | Reading | Cable Loss | Atten. Loss | Result | | Limit | | Margin |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dBm] | [mW] | [dB] |
| 2412 | 10.65 | 1.28 | 10.03 | 21.96 | 157.04 | 30.00 | 1000 | 8.04 |
| 2437 | 11.61 | 1.28 | 10.03 | 22.92 | 195.88 | 30.00 | 1000 | 7.08 |
| 2462 | 10.64 | 1.28 | 10.03 | 21.95 | 156.68 | 30.00 | 1000 | 8.05 |

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.

2437 MHz

| Rate | Reading | Remark |
|---|---|---|
| [Mbps] | [dBm] | |
| 6 | 11.61 | * |
| 9 | 11.58 | |
| 12 | 11.58 | |
| 18 | 11.57 | |
| 24 | 11.59 | |
| 36 | 11.39 | |
| 48 | 11.45 | |
| 54 | 11.50 | |

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

# Maximum Peak Output Power

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx 11n-20 |

| Freq. | Reading | Cable Loss | Atten. Loss | Result | | Limit | | Margin |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dBm] | [mW] | [dB] |
| 2412 | 10.71 | 1.28 | 10.03 | 22.02 | 159.22 | 30.00 | 1000 | 7.98 |
| 2437 | 11.76 | 1.28 | 10.03 | 23.07 | 202.77 | 30.00 | 1000 | 6.93 |
| 2462 | 10.79 | 1.28 | 10.03 | 22.10 | 162.18 | 30.00 | 1000 | 7.90 |

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.

2437 MHz

| MCS Number | Reading [dBm] | Remark |
|---|---|---|
| 0 | 11.76 | * |
| 1 | 11.75 | |
| 2 | 11.74 | |
| 3 | 11.63 | |
| 4 | 11.58 | |
| 5 | 11.59 | |
| 6 | 11.52 | |
| 7 | 11.40 | |

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

# Average Output Power
# (Reference data)

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

11b **2 Mbps**

| Freq. | Reading | Cable Loss | Atten. Loss | Result (Frame power) | | Duty factor | Result (Burst power) | |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dB] | [dBm] | [mW] |
| 2412 | 0.35 | 1.28 | 10.03 | 11.66 | 14.66 | 0.02 | 11.68 | 14.72 |
| 2437 | 0.57 | 1.28 | 10.03 | 11.88 | 15.42 | 0.02 | 11.90 | 15.49 |
| 2462 | 0.74 | 1.28 | 10.03 | 12.05 | 16.03 | 0.02 | 12.07 | 16.11 |

11g **6 Mbps**

| Freq. | Reading | Cable Loss | Atten. Loss | Result (Frame power) | | Duty factor | Result (Burst power) | |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dB] | [dBm] | [mW] |
| 2412 | 0.05 | 1.28 | 10.03 | 11.36 | 13.68 | 0.08 | 11.44 | 13.93 |
| 2437 | 4.66 | 1.28 | 10.03 | 15.97 | 39.54 | 0.08 | 16.05 | 40.27 |
| 2462 | 0.35 | 1.28 | 10.03 | 11.66 | 14.66 | 0.08 | 11.74 | 14.93 |

11n-20 **MCS 0**

| Freq. | Reading | Cable Loss | Atten. Loss | Result (Frame power) | | Duty factor | Result (Burst power) | |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dB] | [dBm] | [mW] |
| 2412 | -0.05 | 1.28 | 10.03 | 11.26 | 13.37 | 0.09 | 11.35 | 13.65 |
| 2437 | 4.71 | 1.28 | 10.03 | 16.02 | 39.99 | 0.09 | 16.11 | 40.83 |
| 2462 | 0.27 | 1.28 | 10.03 | 11.58 | 14.39 | 0.09 | 11.67 | 14.69 |

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

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

2437 MHz

| Mode | Rate<br>Mbps | Reading<br>[dBm] | Duty factor<br>[dB] | Burst power<br>[dBm] | Remarks |
|---|---|---|---|---|---|
| 11b | 1 | 0.56 | 0.01 | 0.57 | |
| | 2 | 0.57 | 0.02 | 0.59 | * |
| | 5.5 | 0.55 | 0.06 | 0.61 | |
| | 11 | 0.37 | 0.10 | 0.47 | |
| 11g | 6 | 4.66 | 0.09 | 4.75 | * |
| | 9 | 4.56 | 0.13 | 4.69 | |
| | 12 | 4.08 | 0.17 | 4.25 | |
| | 18 | 3.97 | 0.25 | 4.22 | |
| | 24 | 2.04 | 0.32 | 2.36 | |
| | 36 | 1.89 | 0.45 | 2.34 | |
| | 48 | 1.82 | 0.56 | 2.38 | |
| | 54 | 1.75 | 0.64 | 2.39 | |

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

All comparison were carried out on same frequency and measurement factors.

2437 MHz

| Mode | Rate<br>MCS | Reading<br>[dBm] | Duty factor<br>[dB] | Burst power<br>[dBm] | Remarks |
|---|---|---|---|---|---|
| 11n-20 | 0 | 4.71 | 0.09 | 4.80 | * |
| | 1 | 4.18 | 0.17 | 4.35 | |
| | 2 | 4.04 | 0.25 | 4.29 | |
| | 3 | 2.11 | 0.33 | 2.44 | |
| | 4 | 2.06 | 0.47 | 2.53 | |
| | 5 | 1.86 | 0.57 | 2.43 | |
| | 6 | 1.86 | 0.62 | 2.48 | |
| | 7 | 0.83 | 0.68 | 1.51 | |

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

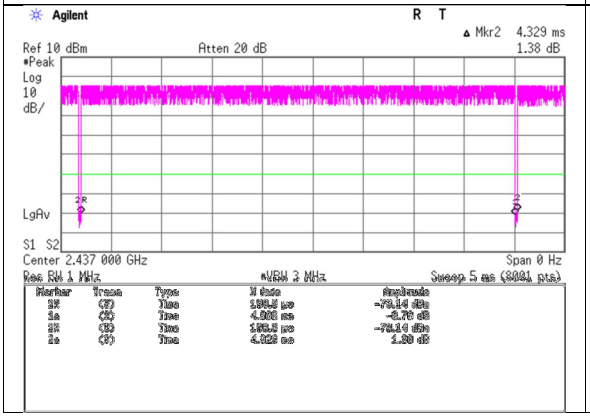
All comparison were carried out on same frequency and measurement factors.

# Burst rate confirmation

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

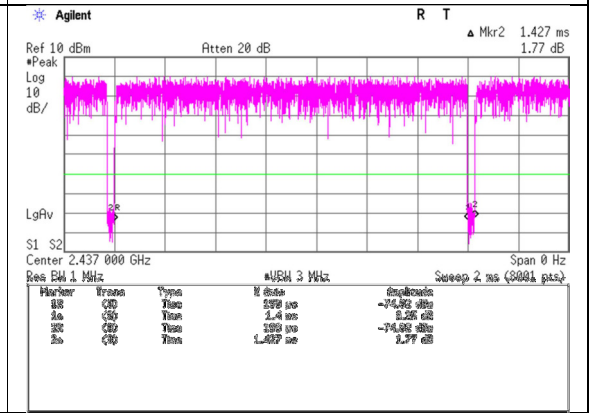
## 11b 2 Mbps

| | |
|---|---|
| **Tx on / (Tx on + Tx off) =** | **0.995** |
| **Tx on / (Tx on + Tx off) * 100 =** | **99.5 %** |
| **Duty factor = 10 * log (4.329 / 4.308) =** | **0.02 dB** |



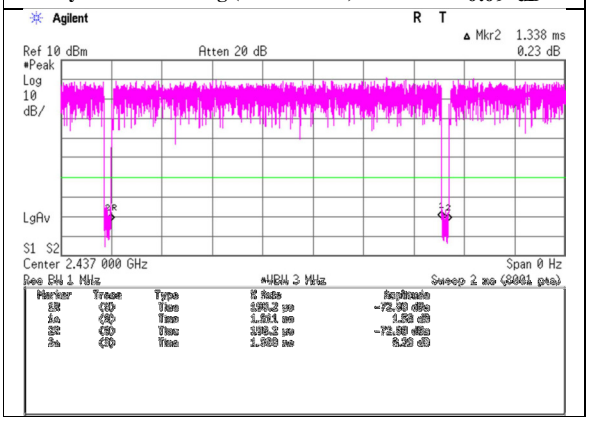

## 11g 6 Mbps

| | |
|---|---|
| **Tx on / (Tx on + Tx off) =** | **0.981** |
| **Tx on / (Tx on + Tx off) * 100 =** | **98.1 %** |
| **Duty factor = 10 * log (1.427 / 1.4) =** | **0.08 dB** |




## 11n-20 MCS 0

| | |
|---|---|
| **Tx on / (Tx on + Tx off) =** | **0.980** |
| **Tx on / (Tx on + Tx off) * 100 =** | **98.0 %** |
| **Duty factor = 10 * log (1.338 / 1.311) =** | **0.09 dB** |



# Radiated Spurious Emission

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,6 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 20, 2016 | May 12, 2016 | May 16, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH | 21 deg. C / 47 % RH | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC10) | (18-26.5GHz) (AC6) |
| Mode | Tx 11b 2412 MHz | | |

| 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 | 50.6 | 27.6 | 13.9 | 44.4 | 3.5 | 51.2 | 73.9 | 22.7 | 188 | 220 | |
| Hori. | 4824.000 | PK | 58.8 | 31.3 | 6.2 | 46.1 | 3.5 | 53.7 | 73.9 | 20.2 | 170 | 217 | |
| Hori. | 7236.000 | PK | 50.0 | 36.3 | 7.7 | 44.6 | 3.5 | 52.9 | 73.9 | 21.0 | 150 | 0 | Floor noise |
| Hori. | 19296.000 | PK | 52.1 | 40.4 | 6.2 | 46.0 | -9.5 | 43.2 | 73.9 | 30.7 | 163 | 174 | |
| Hori. | 24120.000 | PK | 49.1 | 40.2 | 7.0 | 47.5 | -9.5 | 39.3 | 73.9 | 34.6 | 155 | 180 | |
| Hori. | 2390.000 | AV | 41.7 | 27.6 | 13.9 | 44.4 | 3.5 | 42.3 | 53.9 | 11.6 | 188 | 220 | |
| Hori. | 4824.000 | AV | 53.4 | 31.3 | 6.2 | 46.1 | 3.5 | 48.3 | 53.9 | **5.6** | 170 | 217 | |
| Hori. | 7236.000 | AV | 40.3 | 36.3 | 7.7 | 44.6 | 3.5 | 43.2 | 53.9 | 10.7 | 150 | 0 | Floor noise |
| Hori. | 19296.000 | AV | 51.3 | 40.4 | 6.2 | 46.0 | -9.5 | 42.4 | 53.9 | 11.5 | 163 | 174 | |
| Hori. | 24120.000 | AV | 48.7 | 40.2 | 7.0 | 47.5 | -9.5 | 38.9 | 53.9 | 15.0 | 155 | 180 | |
| Vert. | 2390.000 | PK | 50.4 | 27.6 | 13.9 | 44.4 | 3.5 | 51.0 | 73.9 | 22.9 | 194 | 118 | |
| Vert. | 4824.000 | PK | 56.3 | 31.3 | 6.2 | 46.1 | 3.5 | 51.2 | 73.9 | 22.7 | 182 | 203 | |
| Vert. | 7236.000 | PK | 48.5 | 36.3 | 7.7 | 44.6 | 3.5 | 51.4 | 73.9 | 22.5 | 150 | 0 | Floor noise |
| Vert. | 19296.000 | PK | 51.1 | 40.4 | 6.2 | 46.0 | -9.5 | 42.2 | 73.9 | 31.7 | 155 | 186 | |
| Vert. | 24120.000 | PK | 50.5 | 40.2 | 7.0 | 47.5 | -9.5 | 40.7 | 73.9 | 33.2 | 150 | 180 | |
| Vert. | 2390.000 | AV | 41.3 | 27.6 | 13.9 | 44.4 | 3.5 | 41.9 | 53.9 | 12.0 | 194 | 118 | |
| Vert. | 4824.000 | AV | 51.4 | 31.3 | 6.2 | 46.1 | 3.5 | 46.3 | 53.9 | 7.6 | 182 | 203 | |
| Vert. | 7236.000 | AV | 40.3 | 36.3 | 7.7 | 44.6 | 3.5 | 43.2 | 53.9 | 10.7 | 150 | 0 | Floor noise |
| Vert. | 19296.000 | AV | 49.5 | 40.4 | 6.2 | 46.0 | -9.5 | 40.6 | 53.9 | 13.3 | 155 | 186 | |
| Vert. | 24120.000 | AV | 49.5 | 40.2 | 7.0 | 47.5 | -9.5 | 39.7 | 53.9 | 14.2 | 150 | 180 | |

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

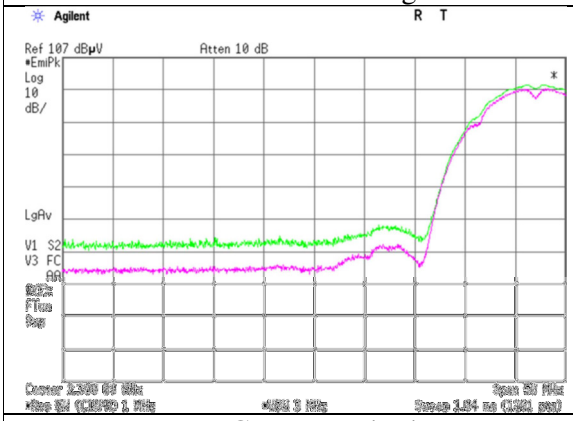
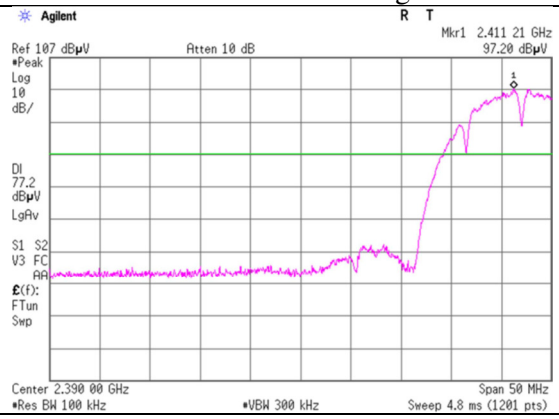
**20 dBc Data Sheet** **(RBW 100 kHz, VBW 300 kHz)**

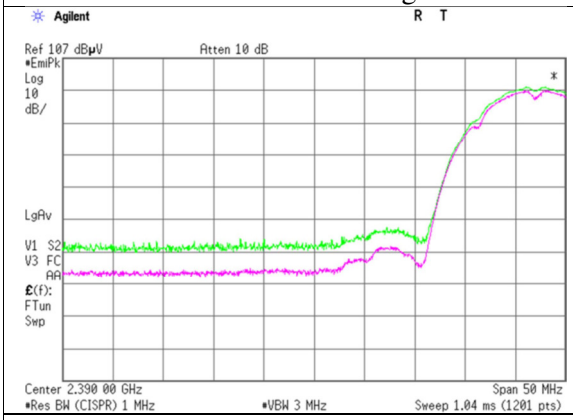
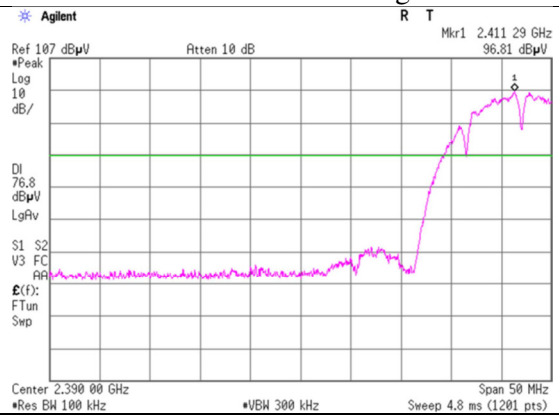
| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 2412.000 | PK | 97.0 | 27.6 | 14.0 | 44.4 | 3.5 | 97.7 | - | - | Carrier |
| Hori. | 2400.000 | PK | 46.1 | 27.6 | 13.9 | 44.4 | 3.5 | 46.7 | 77.7 | 31.0 | |
| Vert. | 2412.000 | PK | 96.5 | 27.6 | 14.0 | 44.4 | 3.5 | 97.2 | - | - | Carrier |
| Vert. | 2400.000 | PK | 45.8 | 27.6 | 13.9 | 44.4 | 3.5 | 46.4 | 77.2 | 30.8 | |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + 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. | 11242579M |
| Date | May 20, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) |
| Mode | Tx 11b 2412 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

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,6 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 20, 2016 | May 12, 2016 | May 16, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH | 21 deg. C / 47 % RH | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC10) | (18-26.5GHz) (AC6) |
| Mode | Tx 11b 2437 MHz | | |

| 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. | 4874.000 | PK | 59.5 | 31.2 | 6.4 | 46.1 | 3.5 | 54.5 | 73.9 | 19.4 | 180 | 227 | |
| Hori. | 7311.000 | PK | 48.0 | 36.4 | 7.9 | 44.5 | 3.5 | 51.3 | 73.9 | 22.6 | 150 | 0 | Floor noise |
| Hori. | 19496.000 | PK | 51.7 | 40.4 | 6.3 | 46.1 | -9.5 | 42.8 | 73.9 | 31.1 | 158 | 178 | |
| Hori. | 24370.000 | PK | 50.5 | 40.2 | 7.0 | 47.4 | -9.5 | 40.8 | 73.9 | 33.1 | 160 | 184 | |
| Hori. | 4874.000 | AV | 54.4 | 31.2 | 6.4 | 46.1 | 3.5 | 49.4 | 53.9 | **4.5** | 180 | 227 | |
| Hori. | 7311.000 | AV | 39.9 | 36.4 | 7.9 | 44.5 | 3.5 | 43.2 | 53.9 | 10.7 | 150 | 0 | Floor noise |
| Hori. | 19496.000 | AV | 51.2 | 40.4 | 6.3 | 46.1 | -9.5 | 42.3 | 53.9 | 11.6 | 158 | 178 | |
| Hori. | 24370.000 | AV | 49.3 | 40.2 | 7.0 | 47.4 | -9.5 | 39.6 | 53.9 | 14.3 | 160 | 184 | |
| Vert. | 4874.000 | PK | 57.2 | 31.2 | 6.4 | 46.1 | 3.5 | 52.2 | 73.9 | 21.7 | 197 | 201 | |
| Vert. | 7311.000 | PK | 48.3 | 36.4 | 7.9 | 44.5 | 3.5 | 51.6 | 73.9 | 22.3 | 150 | 0 | Floor noise |
| Vert. | 19496.000 | PK | 52.0 | 40.4 | 6.3 | 46.1 | -9.5 | 43.1 | 73.9 | 30.8 | 153 | 184 | |
| Vert. | 24370.000 | PK | 49.8 | 40.2 | 7.0 | 47.4 | -9.5 | 40.1 | 73.9 | 33.8 | 150 | 193 | |
| Vert. | 4874.000 | AV | 53.0 | 31.2 | 6.4 | 46.1 | 3.5 | 48.0 | 53.9 | 5.9 | 197 | 201 | |
| Vert. | 7311.000 | AV | 39.5 | 36.4 | 7.9 | 44.5 | 3.5 | 42.8 | 53.9 | 11.1 | 150 | 0 | Floor noise |
| Vert. | 19496.000 | AV | 51.0 | 40.4 | 6.3 | 46.1 | -9.5 | 42.1 | 53.9 | 11.8 | 153 | 184 | |
| Vert. | 24370.000 | AV | 48.7 | 40.2 | 7.0 | 47.4 | -9.5 | 39.0 | 53.9 | 14.9 | 150 | 193 | |

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

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,11 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 19, 2016 | May 28, 2016 | May 28, 2016 |
| Temperature / Humidity | 23 deg. C / 56 % RH | 22 deg. C / 55 % RH | 22 deg. C / 55 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC11) | (18-26.5GHz) (AC11) |
| Mode | Tx 11b 2462 MHz | | |

| 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 | 50.5 | 27.5 | 14.0 | 44.3 | 3.5 | 51.2 | 73.9 | 22.7 | 155 | 215 | |
| Hori. | 4924.000 | PK | 60.0 | 31.3 | 6.4 | 46.1 | 3.5 | 55.1 | 73.9 | 18.8 | 163 | 0 | |
| Hori. | 7386.000 | PK | 48.5 | 36.7 | 7.9 | 44.3 | 3.5 | 52.3 | 73.9 | 21.6 | 150 | 0 | Floor noise |
| Hori. | 19696.000 | PK | 48.0 | 40.2 | 6.3 | 46.2 | -9.5 | 38.8 | 73.9 | 35.1 | 150 | 171 | |
| Hori. | 24620.000 | PK | 46.7 | 40.3 | 7.0 | 47.4 | -9.5 | 37.1 | 73.9 | 36.8 | 150 | 175 | |
| Hori. | 2483.500 | AV | 42.0 | 27.5 | 14.0 | 44.3 | 3.5 | 42.7 | 53.9 | 11.2 | 155 | 215 | |
| Hori. | 4924.000 | AV | 56.3 | 31.3 | 6.4 | 46.1 | 3.5 | 51.4 | 53.9 | 2.5 | 163 | 0 | |
| Hori. | 7386.000 | AV | 40.0 | 36.7 | 7.9 | 44.3 | 3.5 | 43.8 | 53.9 | 10.1 | 150 | 0 | Floor noise |
| Hori. | 19696.000 | AV | 43.8 | 40.2 | 6.3 | 46.2 | -9.5 | 34.6 | 53.9 | 19.3 | 150 | 171 | |
| Hori. | 24620.000 | AV | 41.5 | 40.3 | 7.0 | 47.4 | -9.5 | 31.9 | 53.9 | 22.0 | 150 | 175 | |
| Vert. | 2483.500 | PK | 51.5 | 27.5 | 14.0 | 44.3 | 3.5 | 52.2 | 73.9 | 21.7 | 167 | 135 | |
| Vert. | 4924.000 | PK | 60.7 | 31.3 | 6.4 | 46.1 | 3.5 | 55.8 | 73.9 | 18.1 | 153 | 202 | |
| Vert. | 7386.000 | PK | 41.0 | 36.7 | 7.9 | 44.3 | 3.5 | 44.8 | 73.9 | 29.1 | 150 | 0 | Floor noise |
| Vert. | 19696.000 | PK | 48.7 | 40.2 | 6.3 | 46.2 | -9.5 | 39.5 | 73.9 | 34.4 | 150 | 157 | |
| Vert. | 24620.000 | PK | 47.5 | 40.3 | 7.0 | 47.4 | -9.5 | 37.9 | 73.9 | 36.0 | 150 | 200 | |
| Vert. | 2483.500 | AV | 41.5 | 27.5 | 14.0 | 44.3 | 3.5 | 42.2 | 53.9 | 11.7 | 167 | 135 | |
| Vert. | 4924.000 | AV | 57.9 | 31.3 | 6.4 | 46.1 | 3.5 | 53.0 | 53.9 | **0.9** | 153 | 202 | |
| Vert. | 7386.000 | AV | 39.8 | 36.7 | 7.9 | 44.3 | 3.5 | 43.6 | 53.9 | 10.3 | 150 | 0 | Floor noise |
| Vert. | 19696.000 | AV | 45.0 | 40.2 | 6.3 | 46.2 | -9.5 | 35.8 | 53.9 | 18.1 | 150 | 157 | |
| Vert. | 24620.000 | AV | 42.3 | 40.3 | 7.0 | 47.4 | -9.5 | 32.7 | 53.9 | 21.2 | 150 | 200 | |

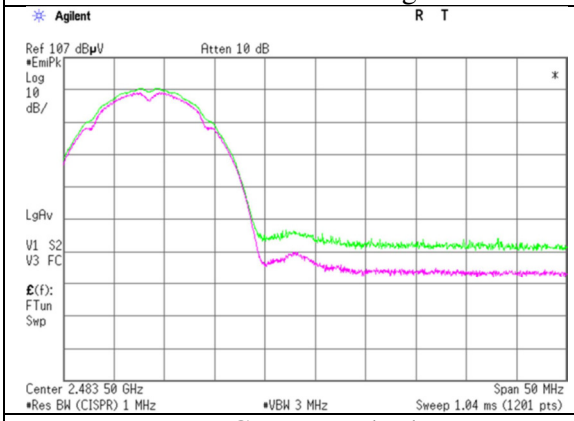
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (4.5 m / 3.0 m) = 3.5 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

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

| | |
|---|---|
| Test place | Kashima EMC Lab. No.10 Semi Anechoic Chamber |
| Report No. | 11242579M |
| Date | May 19, 2016 |
| Temperature / Humidity | 23 deg. C / 56 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) (AC10) |
| Mode | Tx 11b 2462 MHz |

Horizontal

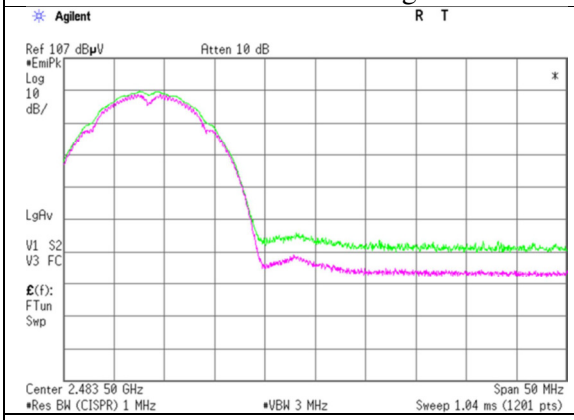
Restricted-band band-edge Plot




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

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 20, 2016 | May 12, 2016 | May 16, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH | 21 deg. C / 47 % RH | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC10) | (18-26.5GHz) (AC6) |
| Mode | Tx 11g 2412 MHz | | |

| 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 | 68.0 | 27.6 | 13.9 | 44.4 | 3.5 | 68.6 | 73.9 | 5.3 | 160 | 210 | |
| Hori. | 2390.000 | AV | 52.7 | 27.6 | 13.9 | 44.4 | 3.5 | 53.3 | 53.9 | **0.6** | 160 | 210 | |
| Vert. | 2390.000 | PK | 67.8 | 27.6 | 13.9 | 44.4 | 3.5 | 68.4 | 73.9 | 5.5 | 160 | 127 | |
| Vert. | 2390.000 | AV | 52.6 | 27.6 | 13.9 | 44.4 | 3.5 | 53.2 | 53.9 | 0.7 | 160 | 127 | |

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

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

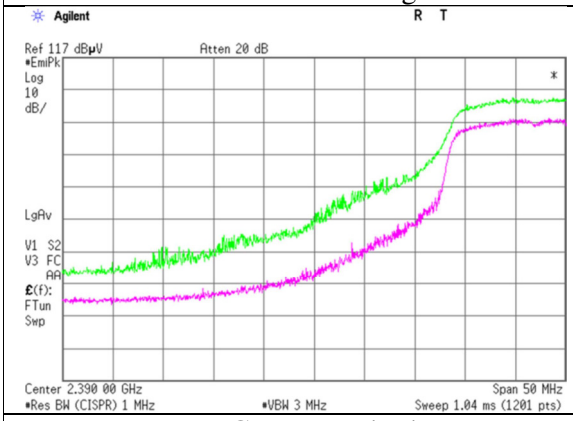
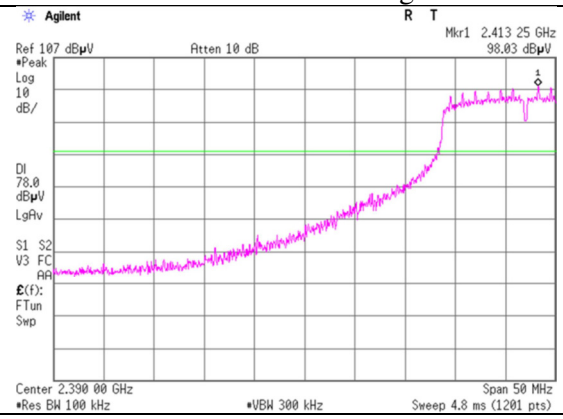
| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 2412.000 | PK | 98.0 | 27.6 | 14.0 | 44.4 | 3.5 | 98.7 | - | - | Carrier |
| Hori. | 2400.000 | PK | 68.5 | 27.6 | 13.9 | 44.4 | 3.5 | 69.1 | 78.7 | 9.6 | |
| Vert. | 2412.000 | PK | 97.5 | 27.6 | 14.0 | 44.4 | 3.5 | 98.2 | - | - | Carrier |
| Vert. | 2400.000 | PK | 68.4 | 27.6 | 13.9 | 44.4 | 3.5 | 69.0 | 78.2 | 9.2 | |

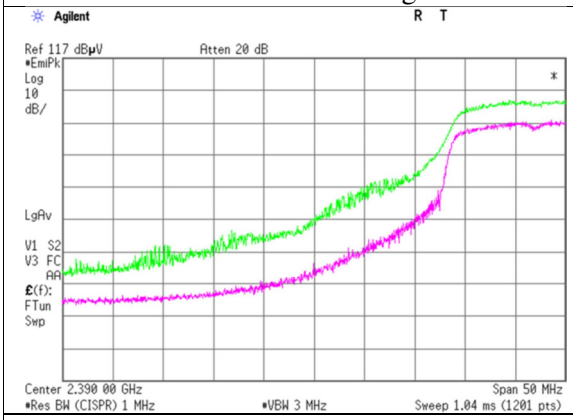
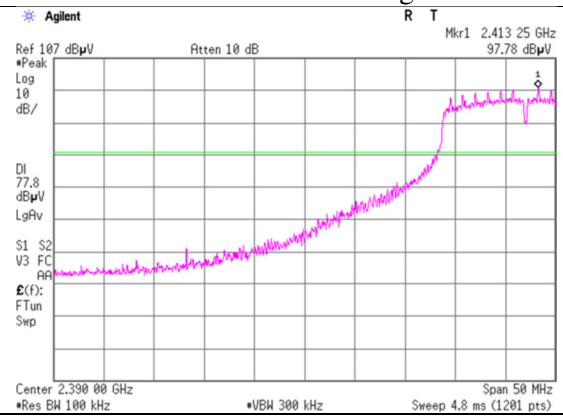
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (4.5 m / 3.0 m) = 3.5 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

*This mode was performed only band edge measurement.

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

| | |
|---|---|
| Test place | Kashima EMC Lab. No.10 Semi Anechoic Chamber |
| Report No. | 11242579M |
| Date | May 20, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) (AC10) |
| Mode | Tx 11g 2412 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

| | |
|---|---|
| Test place | Kashima EMC Lab. No.10 Semi Anechoic Chamber |
| Report No. | 11242579M |
| Date | May 20, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) (AC10) |
| Mode | Tx 11g 2462 MHz |

| 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 | 70.1 | 27.5 | 14.0 | 44.3 | 3.5 | 70.8 | 73.9 | 3.1 | 160 | 220 | |
| Hori. | 2483.500 | AV | 51.4 | 27.5 | 14.0 | 44.3 | 3.5 | 52.1 | 53.9 | **1.8** | 160 | 220 | |
| Vert. | 2483.500 | PK | 69.3 | 27.5 | 14.0 | 44.3 | 3.5 | 70.0 | 73.9 | 3.9 | 150 | 215 | |
| Vert. | 2483.500 | AV | 51.0 | 27.5 | 14.0 | 44.3 | 3.5 | 51.7 | 53.9 | 2.2 | 150 | 215 | |

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

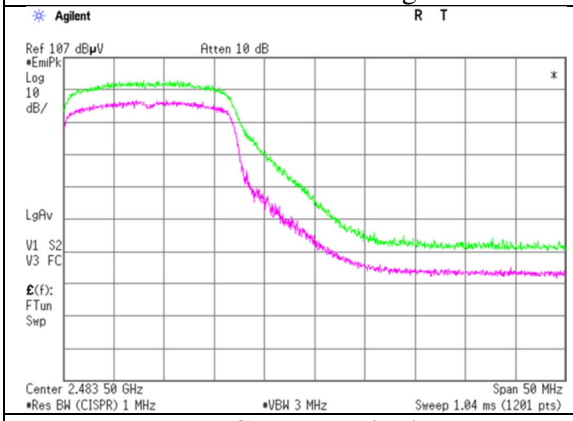
*This mode was performed only band edge measurement.

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

| | |
|---|---|
| Test place | Kashima EMC Lab. No.10 Semi Anechoic Chamber |
| Report No. | 11242579M |
| Date | May 20, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) (AC10) |
| Mode | Tx 11g 2462 MHz |

Horizontal

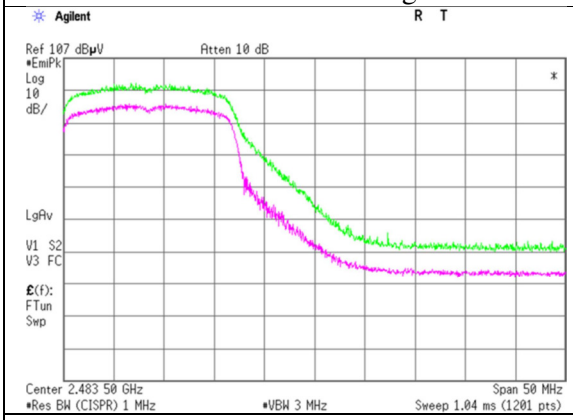
Restricted-band band-edge Plot




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

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,6 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 20, 2016 | May 12, 2016 | May 16, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH | 21 deg. C / 47 % RH | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC10) | (18-26.5GHz) (AC6) |
| Mode | Tx 11n-20 2412 MHz | | |

| 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 | 70.3 | 27.6 | 14.0 | 44.4 | 3.5 | 71.0 | 73.9 | 2.9 | 195 | 210 | |
| Hori. | 2493.235 | PK | 53.8 | 27.5 | 14.1 | 44.3 | 3.5 | 54.6 | 73.9 | 19.3 | 150 | 215 | |
| Hori. | 4824.000 | PK | 63.0 | 31.3 | 6.1 | 46.1 | 3.5 | 57.8 | 73.9 | 16.1 | 150 | 240 | |
| Hori. | 7236.000 | PK | 48.6 | 36.3 | 7.5 | 44.6 | 3.5 | 51.3 | 73.9 | 22.6 | 150 | 0 | Floor noise |
| Hori. | 19296.000 | PK | 51.7 | 40.4 | 6.2 | 46.0 | -9.5 | 42.8 | 73.9 | 31.1 | 159 | 176 | |
| Hori. | 24120.000 | PK | 49.5 | 40.2 | 7.0 | 47.5 | -9.5 | 39.7 | 73.9 | 34.2 | 158 | 180 | |
| Hori. | 2390.000 | AV | 52.5 | 27.6 | 14.0 | 44.4 | 3.5 | 53.2 | 53.9 | **0.7** | 195 | 210 | |
| Hori. | 2493.235 | AV | 41.6 | 27.5 | 14.1 | 44.3 | 3.5 | 42.4 | 53.9 | 11.5 | 150 | 215 | |
| Hori. | 4824.000 | AV | 55.5 | 31.3 | 6.1 | 46.1 | 3.5 | 50.3 | 53.9 | 3.6 | 150 | 240 | |
| Hori. | 7236.000 | AV | 40.8 | 36.3 | 7.5 | 44.6 | 3.5 | 43.5 | 53.9 | 10.4 | 150 | 0 | Floor noise |
| Hori. | 19296.000 | AV | 51.3 | 40.4 | 6.2 | 46.0 | -9.5 | 42.4 | 53.9 | 11.5 | 159 | 176 | |
| Hori. | 24120.000 | AV | 49.0 | 40.2 | 7.0 | 47.5 | -9.5 | 39.2 | 53.9 | 14.7 | 158 | 180 | |
| Vert. | 2390.000 | PK | 69.0 | 27.6 | 14.0 | 44.4 | 3.5 | 69.7 | 73.9 | 4.2 | 180 | 130 | |
| Vert. | 2537.020 | PK | 42.6 | 27.5 | 14.1 | 44.3 | 3.5 | 43.4 | 73.9 | 30.5 | 150 | 240 | |
| Vert. | 4824.000 | PK | 60.7 | 31.3 | 6.1 | 46.1 | 3.5 | 55.5 | 73.9 | 18.4 | 150 | 210 | |
| Vert. | 7236.000 | PK | 49.4 | 36.3 | 7.5 | 44.6 | 3.5 | 52.1 | 73.9 | 21.8 | 150 | 0 | Floor noise |
| Vert. | 19296.000 | PK | 50.8 | 40.4 | 6.2 | 46.0 | -9.5 | 41.9 | 73.9 | 32.0 | 100 | 159 | |
| Vert. | 24120.000 | PK | 51.7 | 40.2 | 7.0 | 47.5 | -9.5 | 41.9 | 73.9 | 32.0 | 100 | 196 | |
| Vert. | 2390.000 | AV | 49.8 | 27.6 | 14.0 | 44.4 | 3.5 | 50.5 | 53.9 | 3.4 | 180 | 130 | |
| Vert. | 2537.020 | AV | 41.0 | 27.5 | 14.1 | 44.3 | 3.5 | 41.8 | 53.9 | 12.1 | 150 | 240 | |
| Vert. | 4824.000 | AV | 51.0 | 31.3 | 6.1 | 46.1 | 3.5 | 45.8 | 53.9 | 8.1 | 150 | 210 | |
| Vert. | 7236.000 | AV | 40.9 | 36.3 | 7.5 | 44.6 | 3.5 | 43.6 | 53.9 | 10.3 | 150 | 0 | Floor noise |
| Vert. | 19296.000 | AV | 49.3 | 40.4 | 6.2 | 46.0 | -9.5 | 40.4 | 53.9 | 13.5 | 100 | 159 | |
| Vert. | 24120.000 | AV | 50.5 | 40.2 | 7.0 | 47.5 | -9.5 | 40.7 | 53.9 | 13.2 | 100 | 196 | |

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

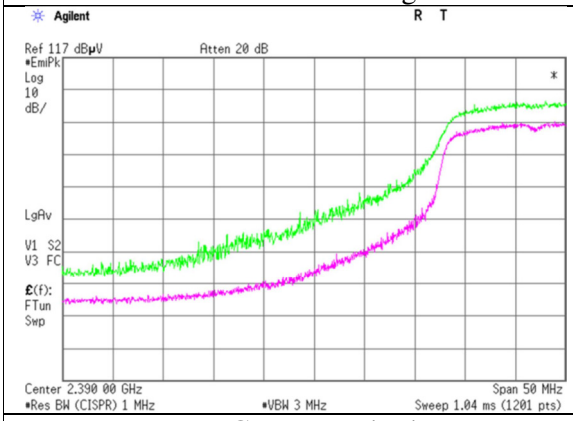
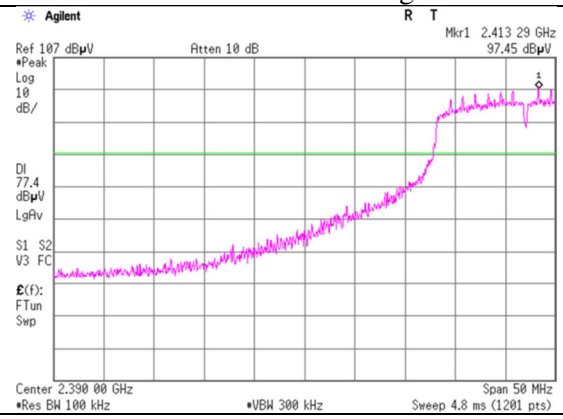
**20 dBc Data Sheet** **(RBW 100 kHz, VBW 300 kHz)**

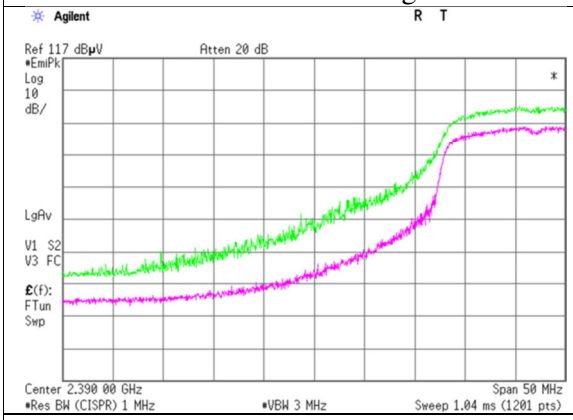
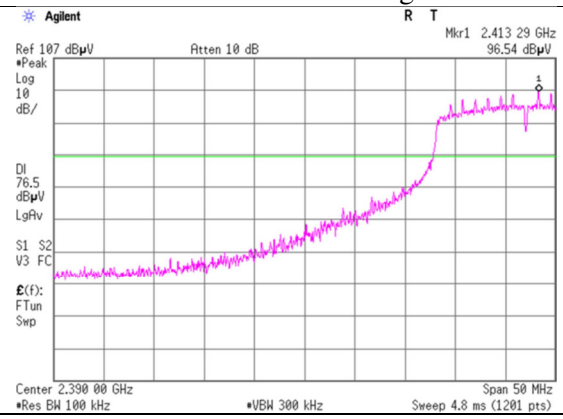
| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori. | 2412.000 | PK | 97.3 | 27.6 | 14.1 | 44.4 | 3.5 | 98.1 | - | - | Carrier |
| Hori. | 2400.000 | PK | 69.7 | 27.6 | 14.0 | 44.4 | 3.5 | 70.4 | 78.1 | 7.7 | |
| Vert. | 2412.000 | PK | 96.3 | 27.6 | 14.1 | 44.4 | 3.5 | 97.1 | - | - | Carrier |
| Vert. | 2400.000 | PK | 69.4 | 27.6 | 14.0 | 44.4 | 3.5 | 70.1 | 77.1 | 7.0 | |

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + 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. | 11242579M |
| Date | May 20, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) (AC10) |
| Mode | Tx 11n-20 2412 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

| | | | | |
|---|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,6 Semi Anechoic Chamber | | | |
| Report No. | 11242579M | | | |
| Date | May 22, 2016 | May 20, 2016 | May 12, 2016 | May 16, 2016 |
| Temperature / Humidity | 22 deg. C / 45 % RH | 24 deg. C / 49 % RH | 21 deg. C / 47 % RH | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (30-1000MHz) (AC10) | (1-10GHz) (AC10) | (10-18GHz) (AC10) | (18-26.5GHz) (AC6) |
| Mode | Tx 11n-20 2437 MHz | | | |

| 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. | 182.832 | QP | 38.2 | 11.3 | 5.3 | 32.4 | 0.0 | 22.4 | 43.5 | 21.1 | 100 | 0 | |
| Hori. | 560.762 | QP | 35.8 | 19.1 | 7.2 | 32.3 | 0.0 | 29.8 | 46.0 | 16.2 | 130 | 165 | |
| Hori. | 4874.000 | PK | 65.3 | 31.2 | 6.2 | 46.1 | 3.5 | 60.1 | 73.9 | 13.8 | 130 | 240 | |
| Hori. | 7311.000 | PK | 48.3 | 36.4 | 7.8 | 44.5 | 3.5 | 51.5 | 73.9 | 22.4 | 150 | 0 | Floor noise |
| Hori. | 19496.000 | PK | 51.5 | 40.4 | 6.3 | 46.1 | -9.5 | 42.6 | 73.9 | 31.3 | 154 | 181 | |
| Hori. | 24370.000 | PK | 50.0 | 40.2 | 7.0 | 47.4 | -9.5 | 40.3 | 73.9 | 33.6 | 160 | 180 | |
| Hori. | 4874.000 | AV | 56.1 | 31.2 | 6.2 | 46.1 | 3.5 | 50.9 | 53.9 | **3.0** | 130 | 240 | |
| Hori. | 7311.000 | AV | 40.1 | 36.4 | 7.8 | 44.5 | 3.5 | 43.3 | 53.9 | 10.6 | 150 | 0 | Floor noise |
| Hori. | 19496.000 | AV | 51.1 | 40.4 | 6.3 | 46.1 | -9.5 | 42.2 | 53.9 | 11.7 | 154 | 181 | |
| Hori. | 24370.000 | AV | 48.5 | 40.2 | 7.0 | 47.4 | -9.5 | 38.8 | 53.9 | 15.1 | 160 | 180 | |
| Vert. | 109.690 | QP | 46.2 | 10.1 | 4.7 | 32.4 | 0.0 | 28.6 | 43.5 | 14.9 | 100 | 280 | |
| Vert. | 182.832 | QP | 46.2 | 11.3 | 5.3 | 32.4 | 0.0 | 30.4 | 43.5 | 13.1 | 100 | 180 | |
| Vert. | 207.214 | QP | 43.2 | 10.1 | 5.4 | 32.4 | 0.0 | 26.3 | 43.5 | 17.2 | 100 | 0 | |
| Vert. | 512.000 | QP | 39.2 | 18.1 | 6.9 | 32.3 | 0.0 | 31.9 | 46.0 | 14.1 | 100 | 280 | |
| Vert. | 4874.000 | PK | 64.4 | 31.2 | 6.2 | 46.1 | 3.5 | 59.2 | 73.9 | 14.7 | 145 | 210 | |
| Vert. | 7311.000 | PK | 49.4 | 36.4 | 7.8 | 44.5 | 3.5 | 52.6 | 73.9 | 21.3 | 150 | 0 | Floor noise |
| Vert. | 19496.000 | PK | 50.8 | 40.4 | 6.3 | 46.1 | -9.5 | 41.9 | 73.9 | 32.0 | 150 | 183 | |
| Vert. | 24370.000 | PK | 51.3 | 40.2 | 7.0 | 47.4 | -9.5 | 41.6 | 73.9 | 32.3 | 150 | 180 | |
| Vert. | 4874.000 | AV | 53.5 | 31.2 | 6.2 | 46.1 | 3.5 | 48.3 | 53.9 | 5.6 | 145 | 210 | |
| Vert. | 7311.000 | AV | 40.2 | 36.4 | 7.8 | 44.5 | 3.5 | 43.4 | 53.9 | 10.5 | 150 | 0 | Floor noise |
| Vert. | 19496.000 | AV | 49.3 | 40.4 | 6.3 | 46.1 | -9.5 | 40.4 | 53.9 | 13.5 | 150 | 183 | |
| Vert. | 24370.000 | AV | 49.7 | 40.2 | 7.0 | 47.4 | -9.5 | 40.0 | 53.9 | 13.9 | 150 | 180 | |

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

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,11 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 20, 2016 | May 18, 2016 | May 28, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH | 22 deg. C / 55 % RH | 22 deg. C / 55 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC11) | (18-26.5GHz) (AC11) |
| Mode | Tx 11n-20 2462 MHz | | |

| 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 | 71.0 | 27.5 | 14.0 | 44.3 | 3.5 | 71.7 | 73.9 | 2.2 | 156 | 215 | |
| Hori. | 4924.000 | PK | 61.5 | 31.3 | 6.4 | 46.1 | 3.5 | 56.6 | 73.9 | 17.3 | 173 | 107 | |
| Hori. | 7386.000 | PK | 49.3 | 36.7 | 7.9 | 44.3 | 3.5 | 53.1 | 73.9 | 20.8 | 150 | 0 | Floor noise |
| Hori. | 19696.000 | PK | 48.5 | 40.2 | 6.3 | 46.2 | -9.5 | 39.3 | 73.9 | 34.6 | 150 | 167 | |
| Hori. | 24620.000 | PK | 45.3 | 40.3 | 7.0 | 47.4 | -9.5 | 35.7 | 73.9 | 38.2 | 150 | 180 | |
| Hori. | 2483.500 | AV | 52.7 | 27.5 | 14.0 | 44.3 | 3.5 | 53.4 | 53.9 | **0.5** | 156 | 215 | |
| Hori. | 4924.000 | AV | 51.5 | 31.3 | 6.4 | 46.1 | 3.5 | 46.6 | 53.9 | 7.3 | 173 | 107 | |
| Hori. | 7386.000 | AV | 40.3 | 36.7 | 7.9 | 44.3 | 3.5 | 44.1 | 53.9 | 9.8 | 150 | 0 | Floor noise |
| Hori. | 19696.000 | AV | 42.7 | 40.2 | 6.3 | 46.2 | -9.5 | 33.5 | 53.9 | 20.4 | 150 | 167 | |
| Hori. | 24620.000 | AV | 39.3 | 40.3 | 7.0 | 47.4 | -9.5 | 29.7 | 53.9 | 24.2 | 150 | 180 | |
| Vert. | 2483.500 | PK | 70.7 | 27.5 | 14.0 | 44.3 | 3.5 | 71.4 | 73.9 | 2.5 | 160 | 7 | |
| Vert. | 4924.000 | PK | 63.8 | 31.3 | 6.4 | 46.1 | 3.5 | 58.9 | 73.9 | 15.0 | 155 | 210 | |
| Vert. | 7386.000 | PK | 49.0 | 36.7 | 7.9 | 44.3 | 3.5 | 52.8 | 73.9 | 21.1 | 150 | 0 | Floor noise |
| Vert. | 19696.000 | PK | 47.7 | 40.2 | 6.3 | 46.2 | -9.5 | 38.5 | 73.9 | 35.4 | 150 | 170 | |
| Vert. | 24620.000 | PK | 48.0 | 40.3 | 7.0 | 47.4 | -9.5 | 38.4 | 73.9 | 35.5 | 150 | 200 | |
| Vert. | 2483.500 | AV | 51.7 | 27.5 | 14.0 | 44.3 | 3.5 | 52.4 | 53.9 | 1.5 | 160 | 7 | |
| Vert. | 4924.000 | AV | 54.3 | 31.3 | 6.4 | 46.1 | 3.5 | 49.4 | 53.9 | 4.5 | 155 | 210 | |
| Vert. | 7386.000 | AV | 40.0 | 36.7 | 7.9 | 44.3 | 3.5 | 43.8 | 53.9 | 10.1 | 150 | 0 | Floor noise |
| Vert. | 19696.000 | AV | 43.0 | 40.2 | 6.3 | 46.2 | -9.5 | 33.8 | 53.9 | 20.1 | 150 | 170 | |
| Vert. | 24620.000 | AV | 42.3 | 40.3 | 7.0 | 47.4 | -9.5 | 32.7 | 53.9 | 21.2 | 150 | 200 | |

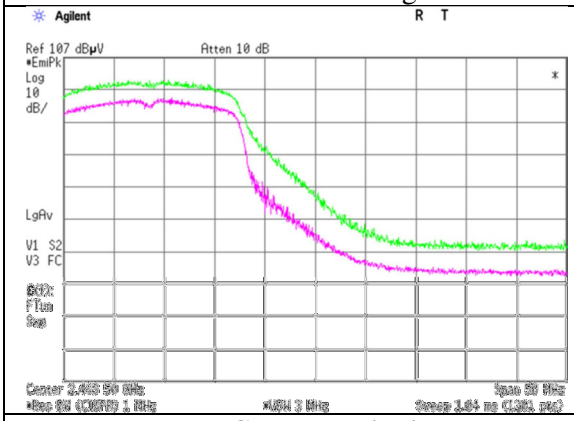
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (4.5 m / 3.0 m) = 3.5 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

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

| | |
|---|---|
| Test place | Kashima EMC Lab. No.10 Semi Anechoic Chamber |
| Report No. | 11242579M |
| Date | May 20, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH |
| Engineer | Kazuhiro Ando |
| | (1-10GHz) (AC10) |
| Mode | Tx 11n-20 2462 MHz |

Horizontal

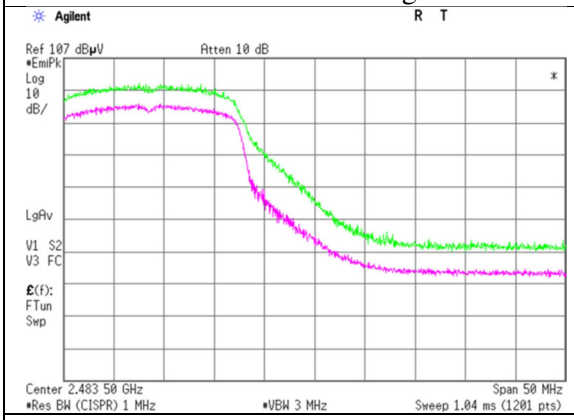
Restricted-band band-edge Plot




Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

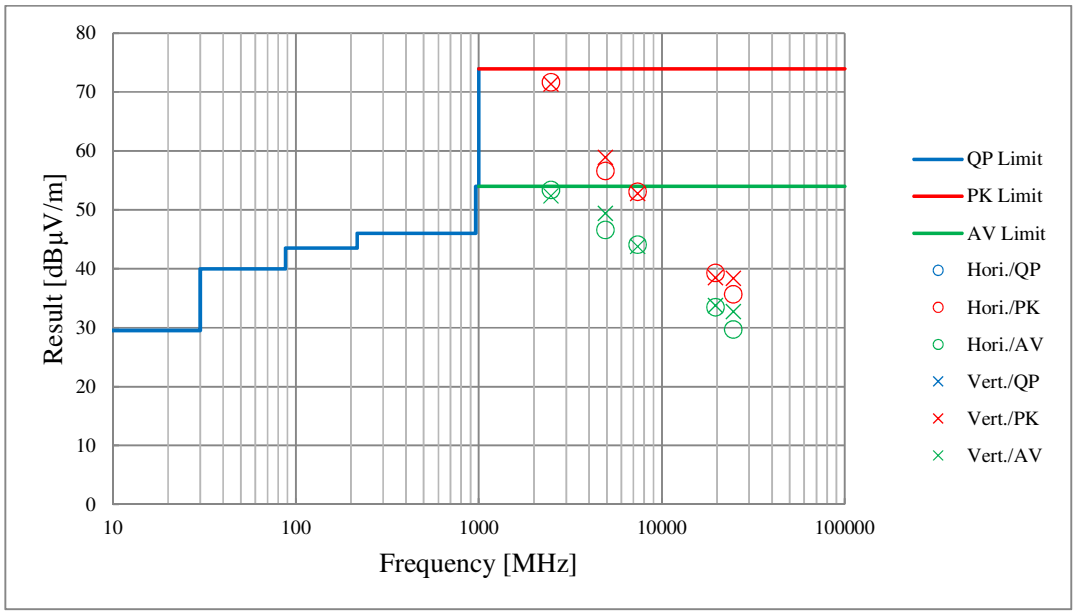



Trace Green : Peak Plot
Trace Purple : Average Plot

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

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

| | | | |
|---|---|---|---|
| Test place | Kashima EMC Lab. No.10,11 Semi Anechoic Chamber | | |
| Report No. | 11242579M | | |
| Date | May 20, 2016 | May 28, 2016 | May 28, 2016 |
| Temperature / Humidity | 24 deg. C / 49 % RH | 22 deg. C / 55 % RH | 22 deg. C / 55 % RH |
| Engineer | Kazuhiro Ando | Kazuhiro Ando | Kazuhiro Ando |
| | (1-10GHz) (AC10) | (10-18GHz) (AC10) | (18-26.5GHz) (AC11) |
| Mode | Tx 11n-20 2462 MHz | | |

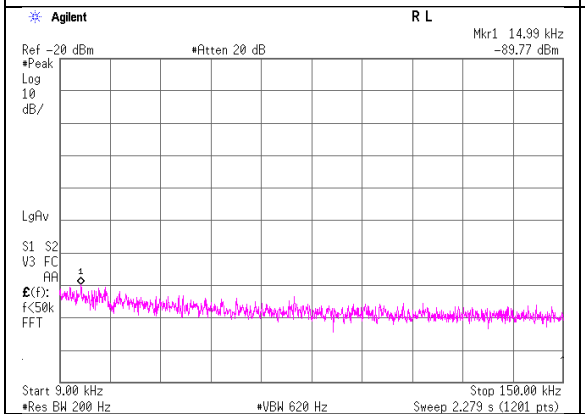



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

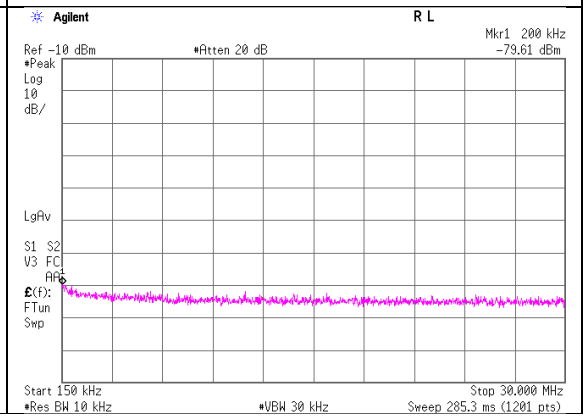
# Conducted Spurious Emission

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx 11n-20 2437 MHz |

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.99 | -89.8 | 0.01 | 9.97 | 2.0 | 1 | -77.8 | 300 | 6.0 | -16.5 | 44.0 | 60.5 | |
| 200.00 | -79.6 | 0.01 | 9.97 | 2.0 | 1 | -67.6 | 300 | 6.0 | -6.4 | 21.5 | 27.9 | |

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 | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

11b

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. Loss [dB] | Result [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|
| 2412.00 | -20.91 | 1.28 | 10.03 | -9.60 | 8.00 | 17.60 |
| 2437.00 | -21.37 | 1.28 | 10.03 | -10.06 | 8.00 | 18.06 |
| 2462.00 | -20.99 | 1.28 | 10.03 | -9.68 | 8.00 | 17.68 |

11g

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. Loss [dB] | Result [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|
| 2412.00 | -24.26 | 1.28 | 10.03 | -12.95 | 8.00 | 20.95 |
| 2437.00 | -17.52 | 1.28 | 10.03 | -6.21 | 8.00 | 14.21 |
| 2462.00 | -23.90 | 1.28 | 10.03 | -12.59 | 8.00 | 20.59 |

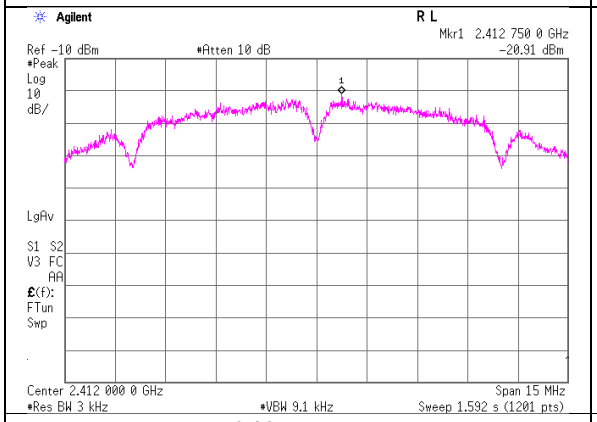
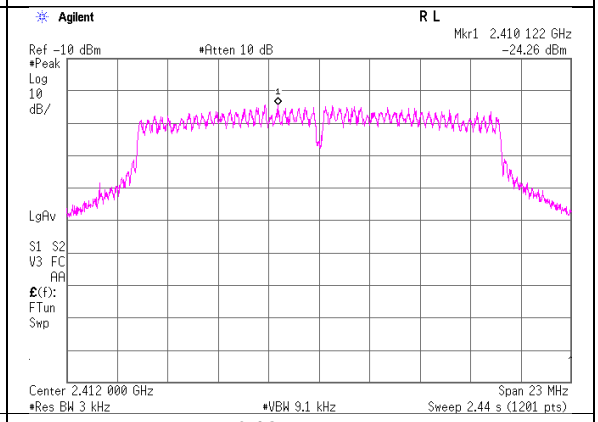
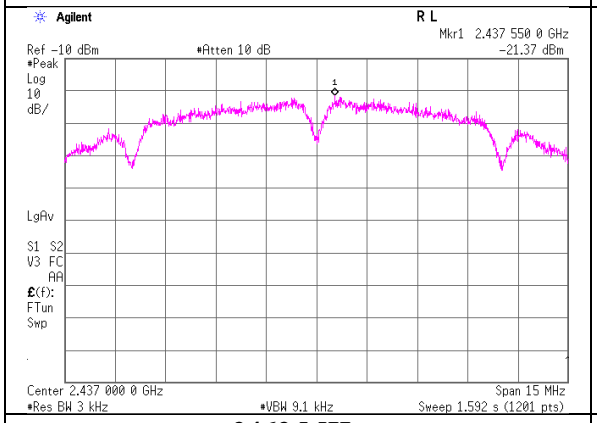
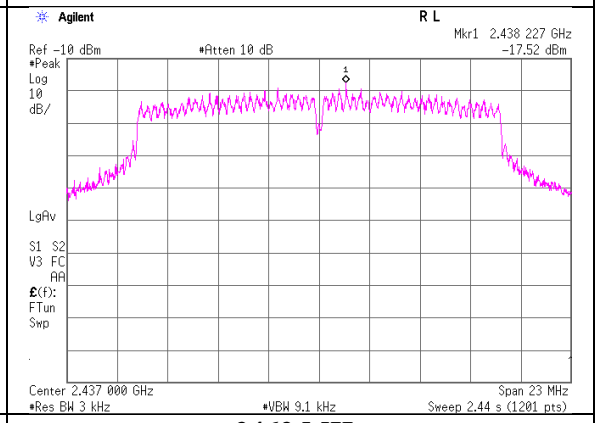
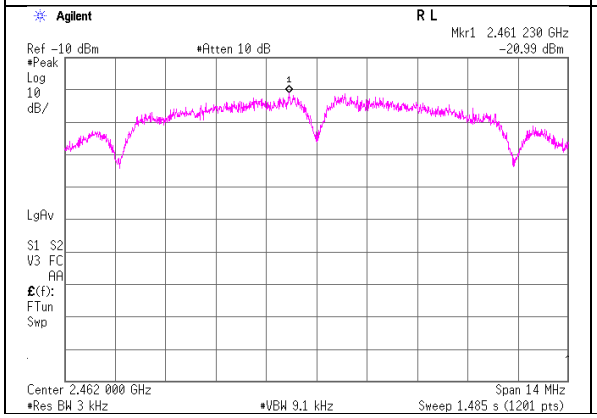
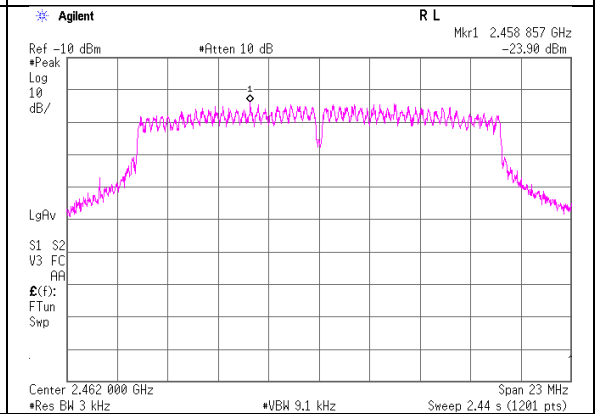
11n-20Tx

| Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. Loss [dB] | Result [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|
| 2412.00 | -24.55 | 1.28 | 10.03 | -13.24 | 8.00 | 21.24 |
| 2437.00 | -18.99 | 1.28 | 10.03 | -7.68 | 8.00 | 15.68 |
| 2462.00 | -23.88 | 1.28 | 10.03 | -12.57 | 8.00 | 20.57 |

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

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

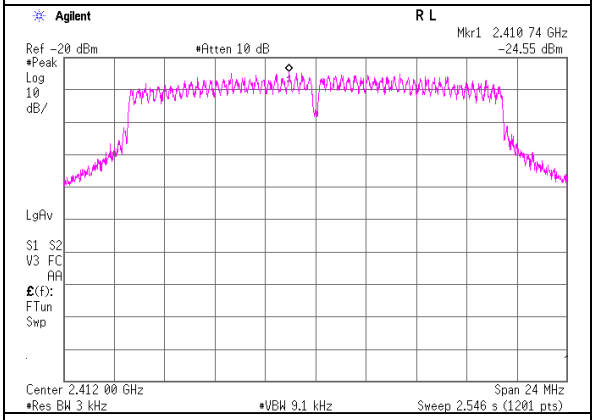
# Power Density

| 11b | 11g |
|---|---|
| **2412 MHz** | **2412 MHz** |
|  |  |
| **2437 MHz** | **2437 MHz** |
|  |  |
| **2462 MHz** | **2462 MHz** |
|  |  |

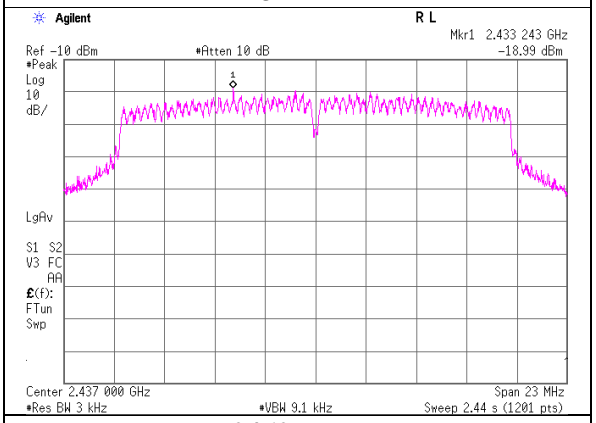
# Power Density

## 11n-20

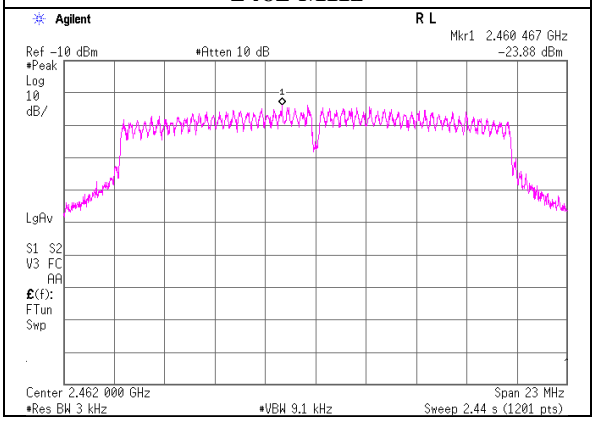
### 2412 MHz




### 2437 MHz

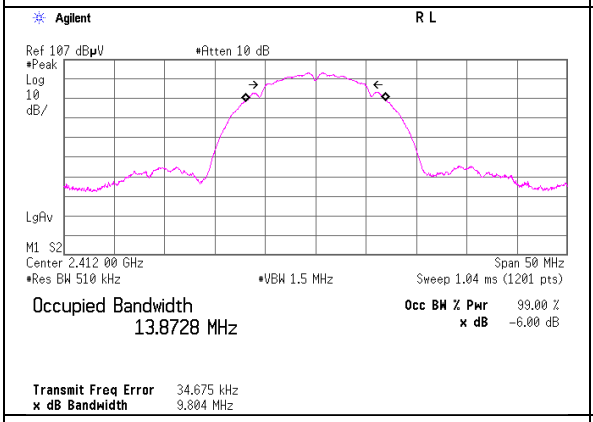
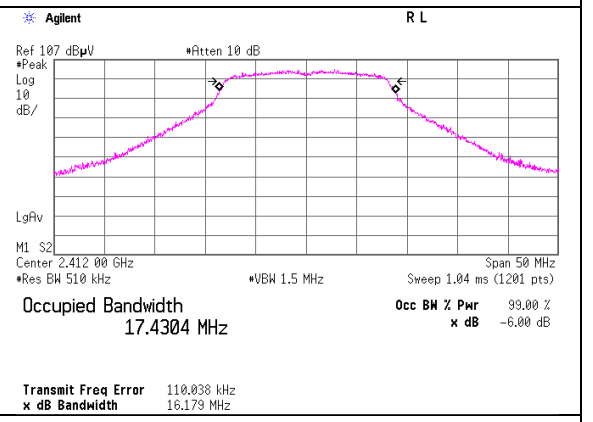
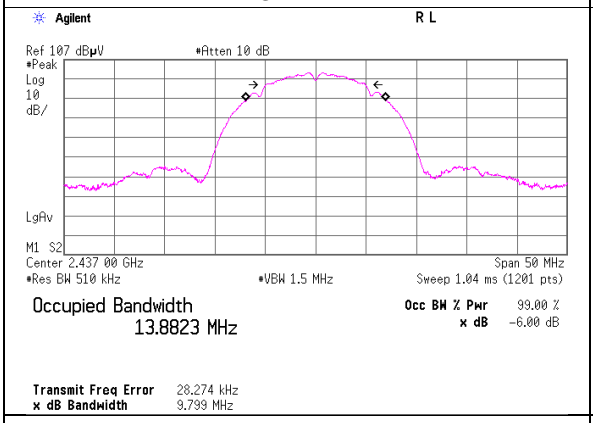
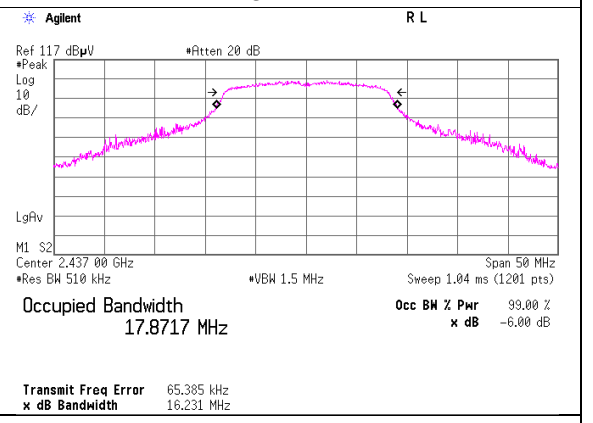
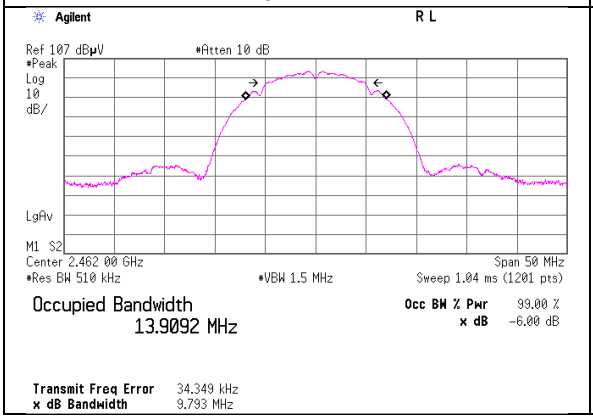
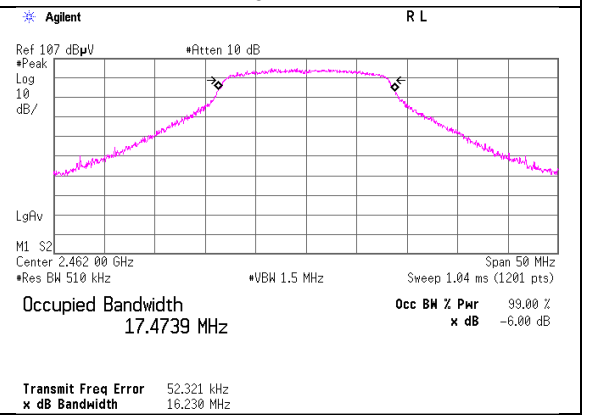



### 2462 MHz



# 99%Occupied Bandwidth

| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

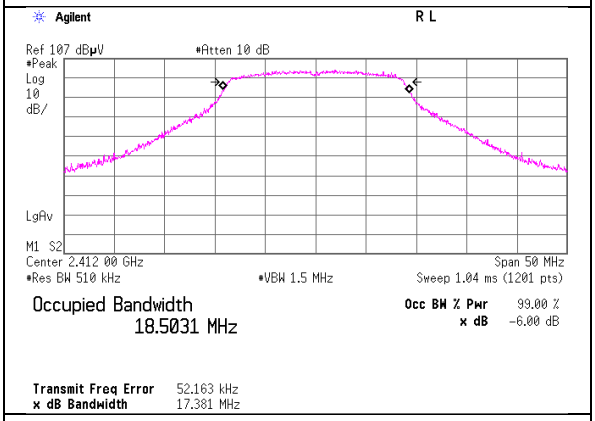
| 11b | 11g |
|---|---|
| **2412 MHz** | **2412 MHz** |
|  |  |
| **2437 MHz** | **2437 MHz** |
|  |  |
| **2462 MHz** | **2462 MHz** |
|  |  |

# 99% Occupied Bandwidth

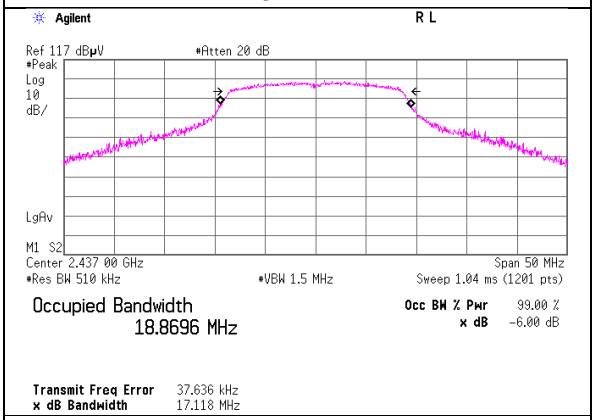
| | |
|---|---|
| Test place | Kashima EMC Lab. No.2 Measurement Room |
| Report No. | 11242579M |
| Date | May 27, 2016 |
| Temperature / Humidity | 23 deg. C / 41 % RH |
| Engineer | Kazuhiro Ando |
| Mode | Tx |

## 11n-20

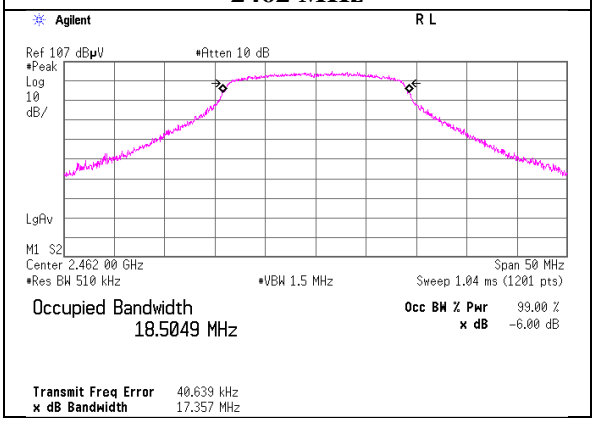
### 2412 MHz




### 2437 MHz




### 2462 MHz



## APPENDIX 2: Test instruments

**Test equipment**

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|---|---|---|---|---|---|---|
| CSA-07 | Spectrum Analyzer | Agilent | E4448A | MY52490024 Version A.11.21 | AT | 2015/05/28 * 12 |
| CAT10-17 | 10dB Fixed Atten. | Weinschel | 54A-10 | 56251 | AT | 2015/05/26 * 12 |
| CCC-W01 | Micro Wave Cable | SUHNER | SUCOFLEX102 | MY3662/2 | AT | 2015/05/26 * 12 |
| CPM-16 | Peak Power Analyzer | Agilent | 8990B | MY51000276 | AT | 2015/06/16 * 12 |
| CPSO-24 | Power Sensor | Agilent | N1923A | MY54070024 | AT | 2015/06/16 * 12 |
| COS-12 | Temperature & Humidity Indicator | A&D | AD-5681 | 6876017 | AT | 2015/07/13 * 12 |
| CLS-25 | A.M.N. | Rohde & Schwarz | ENV216 | 101042 | CE | 2015/08/06 * 12 |
| CCC-S2-C(2/6/7/8) | Coaxial Cable | Fujikura,Fujikura, Fujikura,Fujikura | 5D-2W,5D-2W,5D-2W,5D-2W | - | CE | 2015/07/14 * 12 |
| CTM-32 | Terminator | Suhner | 65_BNC-50-0-2/133_NE | none | CE | 2015/11/19 * 12 |
| CTR-05 | Test Receiver | Rohde & Schwarz | ESCI | 100608 Rev 4.32 | CE | 2015/09/24 * 12 |
| CSCL-02 | Ruler | Tajima | L19-55 | none | CE | 2016/02/22 * 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 |
| CTR-09 | Test Receiver | Agilent | N9038A | MY53290016 Version A.14.03 | RE | 2015/06/28 * 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,Fuhjikura,Fujikura, Fujikura | 5D-2W,5D-2W,8494A,5D-2W,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 | 2015/05/17 * 12 |
| CTS-14 | Digital Multimeter | FLUKE | 115 | 994460954 | RE | 2015/10/01 * 12 |
| COTS-CEMI-02 | EMI Software | TSJ | TEPTO-DV(RE, CE,MF,PE) | Ver, RE: 2.5.0131, CE: 2.5.0131 | RE | - |

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|---|---|---|---|---|---|---|
| CSA-06 | Spectrum Analyzer | Agilent | N9030A | MY53310670 Version A.13.12 | RE | 2015/05/28 * 12 |
| CSA-07 | Spectrum Analyzer | Agilent | E4448A | MY52490024 Version A.11.21 | RE | 2015/05/28 * 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 | 2015/06/28 * 12 |
| CAF-21 | Pre-Amplifier | Micro Wave Factory | MPR-1G26.5-35 | 161398 | RE | 2016/05/06 * 12 |
| CAF-19 | Pre-Amplifier | TOYO | HAP18-26W | 00000035 | RE | 2015/06/28 * 12 |
| CAT10-16 | 10dB Fixed Atten. | Weinschel | 54A-10 | 56246 | RE | 2015/05/26 * 12 |
| CHF-03 | HPF | Micro-Tronics | HPM50111-02 | 008 | RE | 2015/05/25 * 12 |
| CCC-W05 | Micro Wave Cable | Junkosha | MWX241 | MRA-12-14-145 | RE | 2015/05/26 * 12 |
| CCC-W07 | Micro Wave Cable | Junkosha | MWX221 | MRA-12-14-148 | RE | 2015/05/26 * 12 |
| CCC-W09 | Micro Wave Cable | SUHNER | SUCOFLEX104 | MY588/4 | RE | 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**