



# **RADIO TEST REPORT**

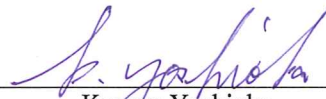
**Test Report No. : 10229481H-A-R2**

**Applicant** : Panasonic Corporation of North America  
**Type of Equipment** : Wireless LAN Module  
**Model No.** : WJ-VR3004  
**FCC ID** : ACJ9TAWJ-VR3004  
**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.
6. This report is a revised version of 10229481H-A-R1. 10229481H-A-R1 is replaced with this report.

**Date of test:** March 26 to May 14, 2014

**Representative test engineer:**

  
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**Approved by:**

  
Takahiro Hatakeda  
Leader  
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*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 : Panasonic System Networks Co., Ltd.\*  
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 Contact Person : Yukio Kaneko

\* Panasonic System Networks Co., Ltd. is on behalf of the applicant: Panasonic Corporation of North America.

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

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

Type of Equipment : Wireless LAN Module  
 Model No. : WJ-VR3004  
 Serial No. : Refer to Section 4, Clause 4.2  
 Rating : DC10.5V  
 Receipt Date of Sample : March 24, 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 : 32.768kHz, 38.4MHz

#### **Radio Specification**

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

|                              |                                                                          |                                        |
|------------------------------|--------------------------------------------------------------------------|----------------------------------------|
| Equipment Type               | Transceiver                                                              |                                        |
| Frequency of Operation       | 2412-2462MHz                                                             | W53: 5280-5320MHz<br>W58: 5745-5825MHz |
| Type of Modulation           | DSSS, OFDM                                                               | OFDM                                   |
| Antenna Type                 | Dual (Planar patch)                                                      | Dual (Inverted F)                      |
| Antenna connector type       | Module side: Rectangular Coaxial Connector (SMT)<br>Antenna side: RP-SMA |                                        |
| Antenna Gain with cable loss | 0.58dBi (2.4GHz)                                                         | -0.98dBi (5GHz)                        |

##### **[WLAN (IEEE802.11n-40)]**

|                              |                                                                          |                                   |
|------------------------------|--------------------------------------------------------------------------|-----------------------------------|
| Equipment Type               | Transceiver                                                              |                                   |
| Frequency of Operation       | 2422-2452MHz                                                             | W53: 5310MHz<br>W58: 5755-5795MHz |
| Type of Modulation           | OFDM                                                                     | OFDM                              |
| Antenna Type                 | Dual (Planar patch)                                                      | Dual (Inverted F)                 |
| Antenna connector type       | Module side: Rectangular Coaxial Connector (SMT)<br>Antenna side: RP-SMA |                                   |
| Antenna Gain with cable loss | 0.58dBi (2.4GHz)                                                         | -0.98dBi (5GHz)                   |

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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

\* The revision on May 1, 2014 does not affect the test specification applied to the EUT.

### 3.2 Procedures and results

| Item                                    | Test Procedure                                                                                                                                                     | Specification                                              | Worst margin                                               | Results  | Remarks                |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------|----------|------------------------|
| Conducted Emission                      | FCC: ANSI C63.4:2003<br>7. AC powerline Conducted Emission measurements<br>IC: RSS-Gen 7.2.4                                                                       | FCC: Section 15.207<br>IC: RSS-Gen 7.2.4                   | QP<br>17.8dB, 1.25592MHz, L<br>AV<br>18.9dB, 1.25592MHz, L | Complied | -                      |
| 6dB Bandwidth                           | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)"<br>IC: RSS-Gen 4.6.2 | FCC: Section 15.247(a)(2)<br>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 April 9, 2013)"<br>IC: RSS-Gen 4.8   | FCC: Section 15.247(b)(3)<br>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 April 9, 2013)"<br>IC: -             | FCC: Section 15.247 (e)<br>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 April 9, 2013)"<br>IC: RSS-Gen 4.9   | FCC: Section15.247(d)<br>IC: RSS-210 A8.5<br>RSS-Gen 7.2.3 | 1.6B<br>2390.000MHz, AV, Hori.                             | Complied | Conducted/<br>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)

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC3.3/1.8V) through the regulator regardless of input voltage.  
Therefore, this EUT complies with the requirement.

#### FCC Part 15.203/212 Antenna requirement

The EUT has a unique coupling/antenna connector (Module side: Rectangular Coaxial Connector (SMT), Antenna side: RP-SMA). 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<br>(semi-anechoic chamber) | Conducted emission<br>(+dB) |
|--------------------------------------|-----------------------------|
|                                      | 150kHz-30MHz                |
| No.1                                 | 3.5dB                       |
| No.2                                 | 3.5dB                       |
| No.3                                 | 3.6dB                       |
| No.4                                 | 3.5dB                       |

| Test room<br>(semi-anechoic chamber) | Radiated emission |                  |                 |                |                 |                   |                   |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
|                                      | (3m*)(+dB)        |                  |                 |                | (1m*)(+dB)      |                   | (0.5m*)(+dB)      |
|                                      | 9kHz<br>-30MHz    | 30MHz<br>-300MHz | 300MHz<br>-1GHz | 1GHz<br>-10GHz | 10GHz<br>-18GHz | 18GHz<br>-26.5GHz | 26.5GHz<br>-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<br>and Power density (+dB) |           |            | Antenna terminal conducted emission<br>(+dB) |               | Channel power<br>(+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 report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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|                            | FCC Registration Number | 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 | 313583                  | 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 | 655103                  | 2973C-2                | 7.5 x 5.8 x 5.2m           | 4.0 x 4.0m                                                       | -                      |
| No.3 semi-anechoic chamber | 148738                  | 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 | 134570                  | 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           | 2.4 x 3.4m                                                       | -                      |

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.5m 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.

## **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.

| <b>Mode</b>                                                                                                                                                                                                                                                                                                                                                   | <b>Remarks*</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| IEEE 802.11b (11b)                                                                                                                                                                                                                                                                                                                                            | 11Mbps, PN9     |
| IEEE 802.11g (11g)                                                                                                                                                                                                                                                                                                                                            | 6Mbps, PN9      |
| IEEE 802.11n MIMO 20MHz BW (11n-20): 2.4GHz Band                                                                                                                                                                                                                                                                                                              | MCS 13, PN9     |
| IEEE 802.11n MIMO 40MHz BW (11n-40) : 2.4GHz Band                                                                                                                                                                                                                                                                                                             | MCS 11, PN9     |
| IEEE 802.11a (11a)                                                                                                                                                                                                                                                                                                                                            | 6Mbps, PN9      |
| IEEE 802.11nMIMO 20MHz BW (11n-20): 5GHz Band                                                                                                                                                                                                                                                                                                                 | MCS 8, PN9      |
| IEEE 802.11n MIMO 40MHz BW (11n-40) : 5GHz Band                                                                                                                                                                                                                                                                                                               | MCS 11, 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: 12dBm<br>- Software: Dut Wlan BT Labtool Version 1.0.8.1.6<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. |                 |

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\*Details of Operating mode(s): 2.4GHz Band

| Test Item                                                                                            | Operating Mode | Antenna | Tested frequency              |
|------------------------------------------------------------------------------------------------------|----------------|---------|-------------------------------|
| Conducted Emission<br>Spurious Emission<br>(Conducted)<br>Spurious Emission below 1GHz<br>(Radiated) | 11n-40 *1)     | A+B     | 2437MHz                       |
| 6dB Bandwidth,<br>Power Density,<br>99% Occupied Bandwidth,                                          | 11b Tx,        | B       | 2412MHz                       |
|                                                                                                      | 11g Tx         |         | 2437MHz                       |
|                                                                                                      | 11n-20 Tx      | B       | 2462MHz                       |
|                                                                                                      | 11n-40 Tx      | A       | 2422MHz<br>2437MHz<br>2452MHz |
| Maximum Peak Output Power                                                                            | 11b Tx,        | A, B    | 2412MHz                       |
|                                                                                                      | 11g Tx,        |         | 2437MHz                       |
|                                                                                                      | 11n-20 Tx      |         | 2462MHz                       |
|                                                                                                      | 11n-40 Tx      |         | 2422MHz<br>2437MHz<br>2452MHz |
| Spurious Emission above 1GHz<br>(Radiated)                                                           | 11b Tx         | B       | 2412MHz                       |
|                                                                                                      | 11n-20 Tx *2)  | A+B     | 2437MHz<br>2462MHz            |
|                                                                                                      | 11n-40 Tx      | A+B     | 2422MHz<br>2437MHz<br>2452MHz |

\*Details of Operating mode(s): 5GHz Band

| Test Item                                  | Operating Mode | Antenna | Tested frequency              |
|--------------------------------------------|----------------|---------|-------------------------------|
| Spurious Emission<br>(Conducted)           | 11n-40 Tx *1)  | A+B     | 5755MHz                       |
| 6dB Bandwidth,<br>99% Occupied Bandwidth   | 11a Tx         | A       | 5745MHz                       |
|                                            | 11n-20 Tx      | B       | 5785MHz<br>5825MHz            |
|                                            | 11n-40 Tx      | B       | 5755MHz<br>5795MHz            |
| Maximum Peak Output Power                  | 11a Tx         | A, B    | 5745MHz<br>5785MHz            |
|                                            | 11n-20 Tx      | A+B     | 5825MHz                       |
|                                            | 11n-40 Tx      | A+B     | 5755MHz<br>5795MHz            |
| Power Density                              | 11a Tx         | A       | 5745MHz                       |
|                                            | 11n-20 Tx      | A+B     | 5785MHz<br>5825MHz            |
|                                            | 11n-40 Tx      | A+B     | 5755MHz<br>5795MHz            |
| Spurious Emission above 1GHz<br>(Radiated) | 11n-20 Tx *3)  | A+B     | 5745MHz<br>5785MHz<br>5825MHz |
|                                            | 11n-40 Tx      | A+B     | 5755MHz<br>5795MHz            |

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

\*2) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.

\*3) Since 11a and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.

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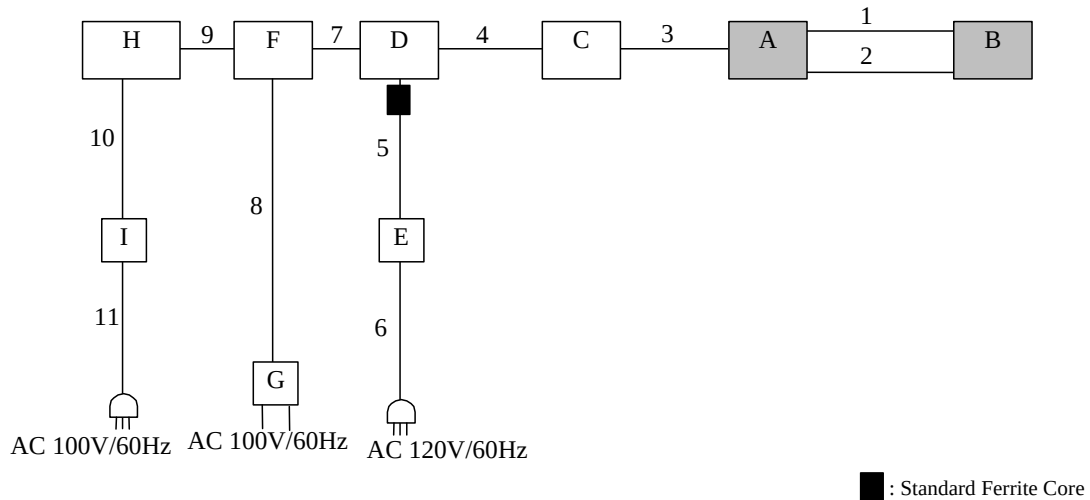
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## 4.2 Configuration and peripherals



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

\* No difference was confirmed with and without a standard ferrite core in Conducted emission test.

### Description of EUT

| No. | Item                   | Model number  | Serial number           | Manufacturer                        | Remarks |
|-----|------------------------|---------------|-------------------------|-------------------------------------|---------|
| A   | Wireless LAN Module    | WJ-VR3004     | ES2-8 *1)<br>ES2-10 *2) | Panasonic System Networks Co., Ltd. | EUT     |
| B   | AP-Double WiFi Antenna | APP-WW        | -                       | Antenna Plus LLC                    | EUT     |
| C   | Jig board              | -             | -                       | -                                   | -       |
| D   | Laptop PC              | CF-31         | OLKSA37565              | Panasonic System Networks Co., Ltd. | -       |
| E   | AC Adaptor             | CF-AA5713A    | 5713AM110808682A        | Panasonic System Networks Co., Ltd. | -       |
| F   | Switching HUB          | LAN-SW08/P    | 72L203004509B           | Logitech                            | -       |
| G   | AC Adaptor             | LA-6W7L       | 5106HB                  | Logitech                            | -       |
| H   | Laptop PC              | ProBook 6560P | 1673609                 | HP                                  | -       |
| I   | AC Adaptor             | PPP009L-E     | WBGST0A4L0U2WT          | HP                                  | -       |

\*1) Used except for Antenna Terminal Conducted Tests

\*2) Used for Antenna Terminal Conducted Tests

### List of cables used

| No. | Name          | Length (m) | Shield     |            | Remarks |
|-----|---------------|------------|------------|------------|---------|
|     |               |            | Cable      | Connector  |         |
| 1   | Antenna Cable | 5.6        | Shielded   | Shielded   | -       |
| 2   | Antenna Cable | 5.6        | Shielded   | Shielded   | -       |
| 3   | USB Cable     | 0.4        | Shielded   | Shielded   | -       |
| 4   | USB Cable     | 2.0        | Shielded   | Shielded   | -       |
| 5   | DC Cable      | 1.8        | Unshielded | Unshielded | -       |
| 6   | AC Cable      | 1.9        | Unshielded | Unshielded | -       |
| 7   | LAN Cable     | 1.0        | Unshielded | Unshielded | -       |
| 8   | DC Cable      | 1.8        | Unshielded | Unshielded | -       |
| 9   | LAN Cable     | 1.0        | Unshielded | Unshielded | -       |
| 10  | DC Cable      | 1.8        | Unshielded | Unshielded | -       |
| 11  | AC Cable      | 1.8        | Unshielded | Unshielded | -       |

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0m by 2.0m, 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.

#### 1) 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.

|                          |                          |
|--------------------------|--------------------------|
| <b>Detector</b>          | <b>: QP and CISPR AV</b> |
| <b>Measurement range</b> | <b>: 0.15-30MHz</b>      |
| <b>Test data</b>         | <b>: APPENDIX</b>        |
| <b>Test result</b>       | <b>: Pass</b>            |

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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 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".

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    | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
| Antenna Type | 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(T/R) | RBW: 1MHz<br>VBW: 3MHz                                                | RBW: 1MHz<br>VBW: 10MHz | RBW: 100kHz<br>VBW: 300kHz (S/A)                                      |
| Test Distance   | 3m             | 3m (below 10GHz),<br>1m *2) (above 10GHz)<br>0.5m *3) (above 26.5GHz) |                         | 3m (below 10GHz),<br>1m *2) (above 10GHz)<br>0.5m *3) (above 26.5GHz) |

\*1) Average Power Measurement was performed based on 12.2.7 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"

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

\*3) Distance Factor:  $20 \times \log(3.0\text{m}/0.5\text{m}) = 15.6\text{dB}$

- 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-40GHz

**Test data** : APPENDIX

**Test result** : Pass

**UL Japan, Inc.**

**Ise EMC Lab.**

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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                                                                                                                                                                          | 20MHz, 30MHz, 50MHz                    | 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       | Sample               | Clear write | Spectrum Analyzer                 |
| Maximum Peak Output Power                                                                                                                                                              | -                                      | -               | -                  | Auto       | Peak/<br>Average *1) | -           | Power Meter<br>(Sensor: 50MHz BW) |
| Peak Power Density                                                                                                                                                                     | 1.5 times the 6dB Bandwidth            | 3kHz            | 10kHz              | Auto       | Peak                 | Max Hold    | Spectrum Analyzer *2)             |
| Conducted Spurious Emission                                                                                                                                                            | 9kHz to 150kHz                         | 200Hz           | 620Hz              | Auto       | Peak                 | Max Hold    | Spectrum Analyzer                 |
|                                                                                                                                                                                        | 150kHz to 30MHz                        | 9.1kHz          | 27kHz              |            |                      |             |                                   |
| *1) Reference data                                                                                                                                                                     |                                        |                 |                    |            |                      |             |                                   |
| *2) Section 10.2 Method PKPSD (peak PSD) of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)". |                                        |                 |                    |            |                      |             |                                   |

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

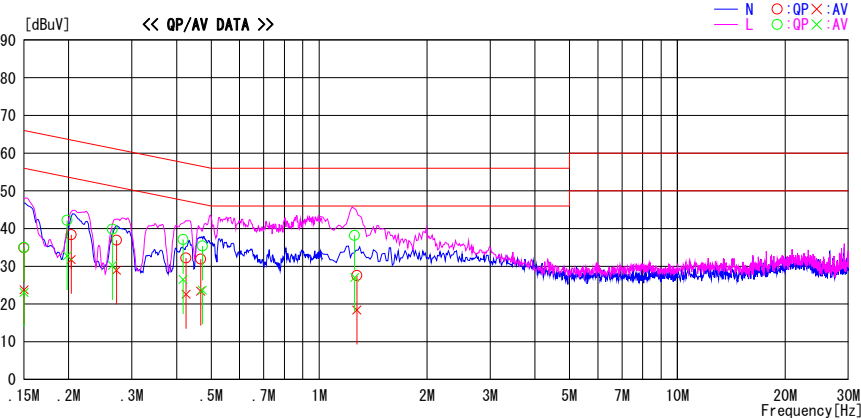
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2014/04/01

Report No. : 10229481H

Temp./Humi. : 23deg. C / 35% RH  
Engineer : Kazuya Yoshioka

Mode / Remarks : WLAN Tx 11n40 MCS11 MIMO 2437MHz

LIMIT : FCC15.207 QP  
FCC15.207 AV



| Frequency<br>[MHz] | Reading Level |              | Corr.<br>Factor | Results      |              | Limit        |              | Margin     |            | Phase | Comment |
|--------------------|---------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
|                    | QP<br>[dBuV]  | AV<br>[dBuV] |                 | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dB] | AV<br>[dB] |       |         |
| 0.15000            | 21.7          | 10.6         | 13.2            | 34.9         | 23.8         | 66.0         | 56.0         | 31.1       | 32.2       | N     |         |
| 0.20333            | 25.2          | 18.6         | 13.2            | 38.4         | 31.8         | 63.5         | 53.5         | 25.1       | 21.7       | N     |         |
| 0.27210            | 23.7          | 15.8         | 13.2            | 36.9         | 29.0         | 61.1         | 51.1         | 24.2       | 22.1       | N     |         |
| 0.42511            | 19.0          | 9.4          | 13.2            | 32.2         | 22.6         | 57.3         | 47.3         | 25.1       | 24.7       | N     |         |
| 0.46721            | 18.7          | 10.2         | 13.2            | 31.9         | 23.4         | 56.6         | 46.6         | 24.7       | 23.2       | N     |         |
| 1.27516            | 14.2          | 5.0          | 13.4            | 27.6         | 18.4         | 56.0         | 46.0         | 28.4       | 27.6       | N     |         |
| 0.15000            | 21.8          | 9.9          | 13.2            | 35.0         | 23.1         | 66.0         | 56.0         | 31.0       | 32.9       | L     |         |
| 0.19820            | 29.0          | 19.6         | 13.2            | 42.2         | 32.8         | 63.7         | 53.7         | 21.5       | 20.9       | L     |         |
| 0.26485            | 26.6          | 17.0         | 13.2            | 39.8         | 30.2         | 61.3         | 51.3         | 21.5       | 21.1       | L     |         |
| 0.41740            | 23.9          | 13.3         | 13.2            | 37.1         | 26.5         | 57.5         | 47.5         | 20.4       | 21.0       | L     |         |
| 0.47210            | 22.2          | 10.5         | 13.2            | 35.4         | 23.7         | 56.5         | 46.5         | 21.1       | 22.8       | L     |         |
| 1.25592            | 24.8          | 13.7         | 13.4            | 38.2         | 27.1         | 56.0         | 46.0         | 17.8       | 18.9       | L     |         |

CHART:WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F.(L1SN LOSS + ATT LOSS + CABLE LOSS)  
Except for the above table : adequate margin data below the limits.

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### **6dB Bandwidth**

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 10229481H  
Date 3/28/2014  
Temperature/ Humidity 24deg. C / 31% RH  
Engineer Shinya Watanabe  
Mode 11b/g/n-20/n-40 Tx (2.4GHz Band)

11b

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 2412               | 9.568                  | >500           |
| 2437               | 9.533                  | >500           |
| 2462               | 9.543                  | >500           |

11g

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 2412               | 16.356                 | >500           |
| 2437               | 16.380                 | >500           |
| 2462               | 16.376                 | >500           |

11n-20 (MIMO ANT B)

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 2412               | 15.991                 | >500           |
| 2437               | 15.986                 | >500           |
| 2462               | 15.739                 | >500           |

11n-40 (MIMO ANT A)

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 2422               | 35.975                 | >500           |
| 2437               | 36.344                 | >500           |
| 2452               | 36.265                 | >500           |

### **6dB Bandwidth**

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 10229481H  
Date 04/02/2014  
Temperature/ Humidity 25deg. C / 29% RH  
Engineer Yutaka Yoshida  
Mode 11a/n-20/n-40 Tx (5GHz Band)

11a

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 5745               | 16.403                 | >500           |
| 5785               | 16.406                 | >500           |
| 5825               | 16.394                 | >500           |

11n-20

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 5745               | 15.975                 | >500           |
| 5785               | 15.962                 | >500           |
| 5825               | 15.948                 | >500           |

11n-40

| Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|--------------------|------------------------|----------------|
| 5755               | 36.339                 | >500           |
| 5795               | 36.098                 | >500           |

---

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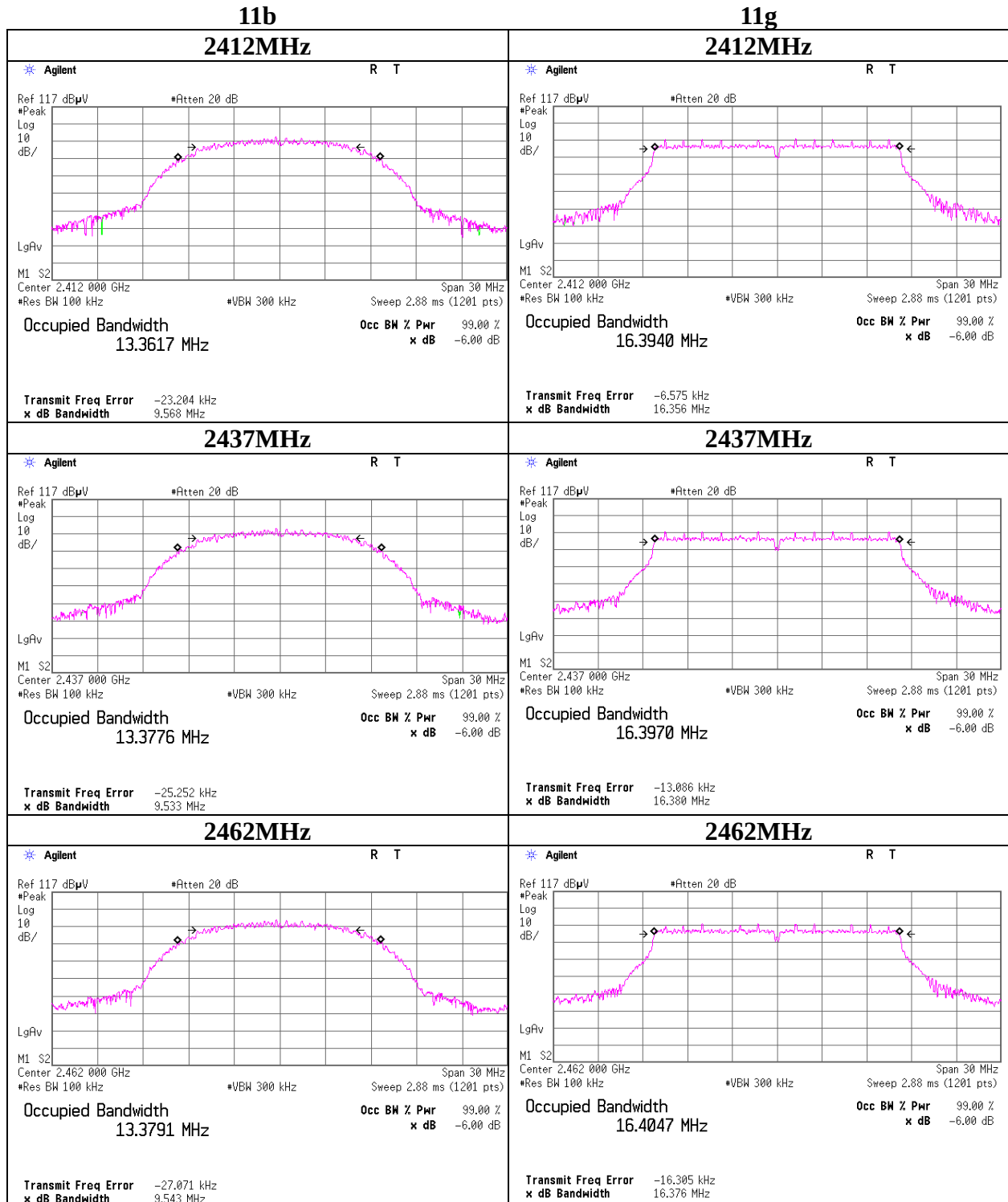
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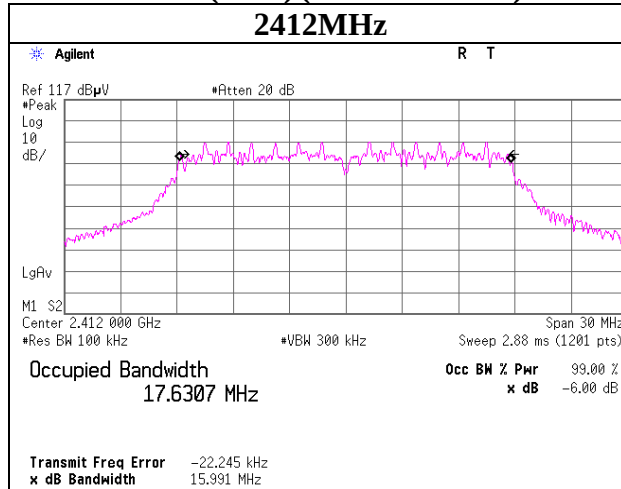
Facsimile : +81 596 24 8124

## 6dB Bandwidth

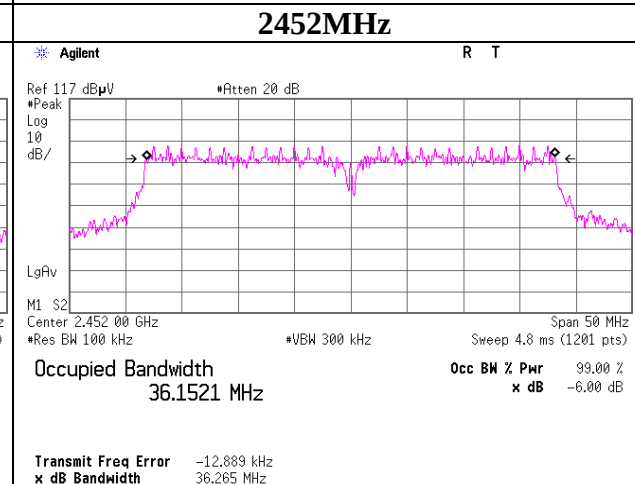
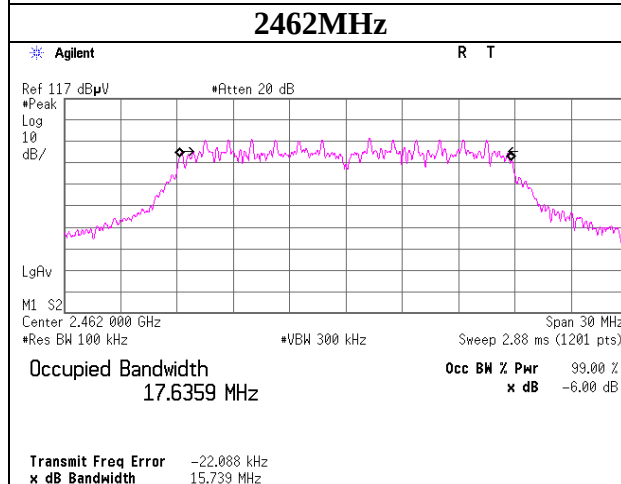
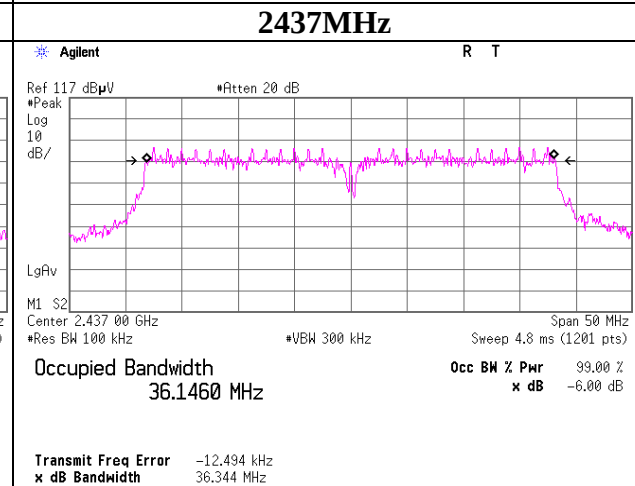
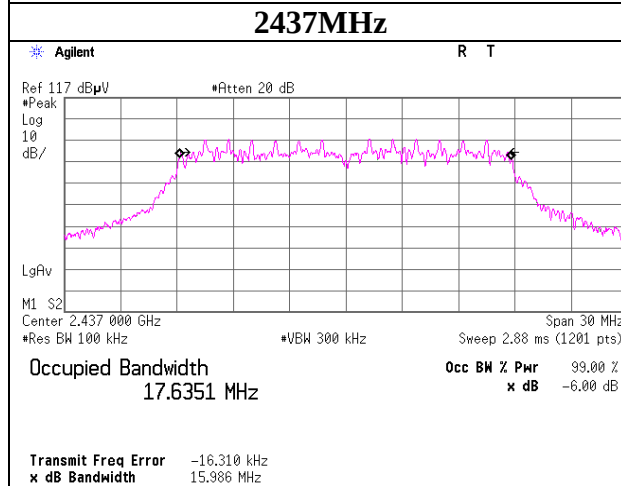
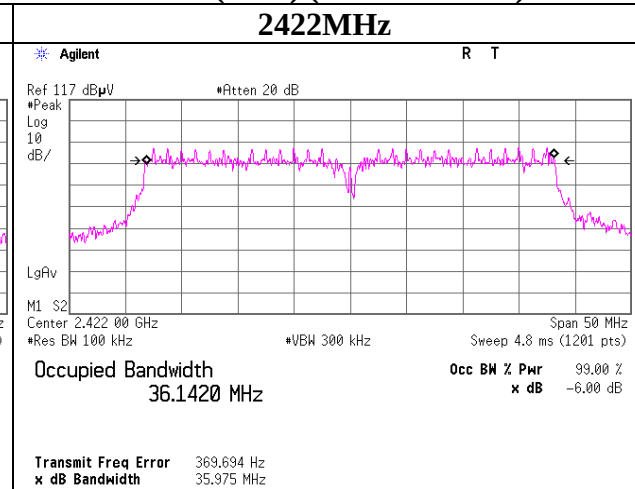


## 6dB Bandwidth

### 11n-20(2.4G) (MIMO ANT B)



### 11n-40(2.4G) (MIMO ANTA)



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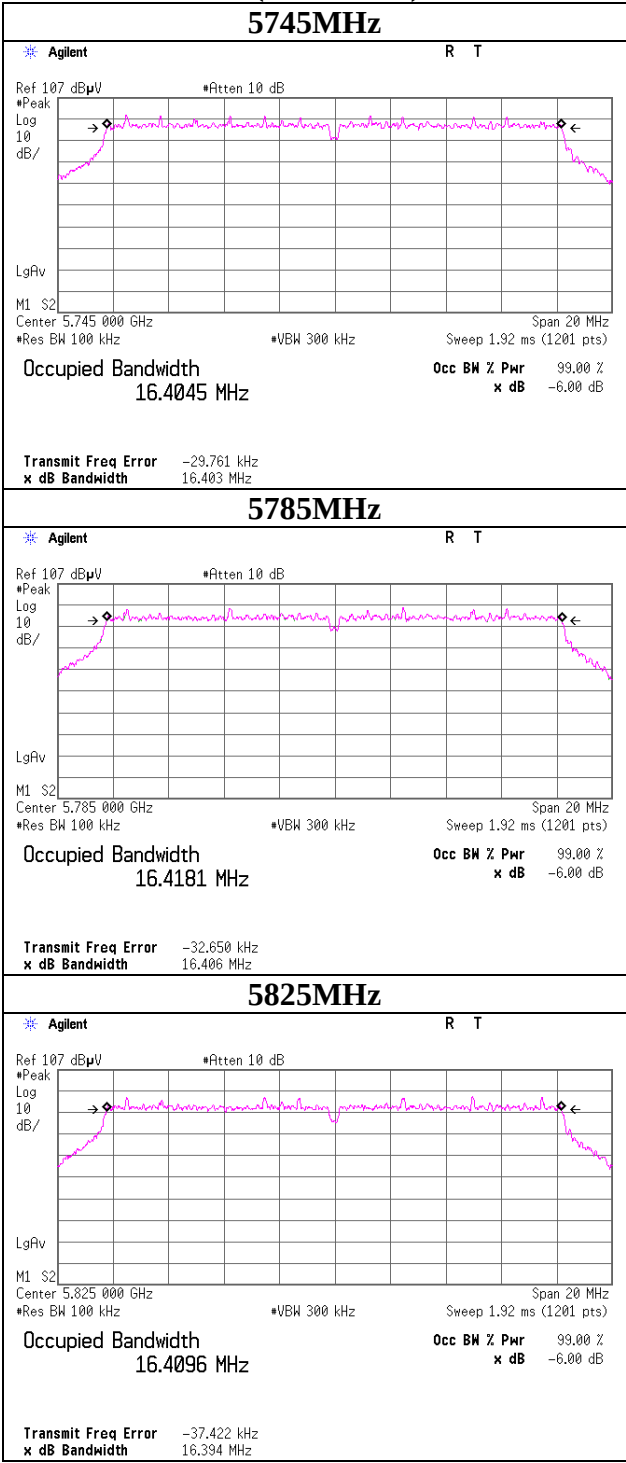
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6dB Bandwidth

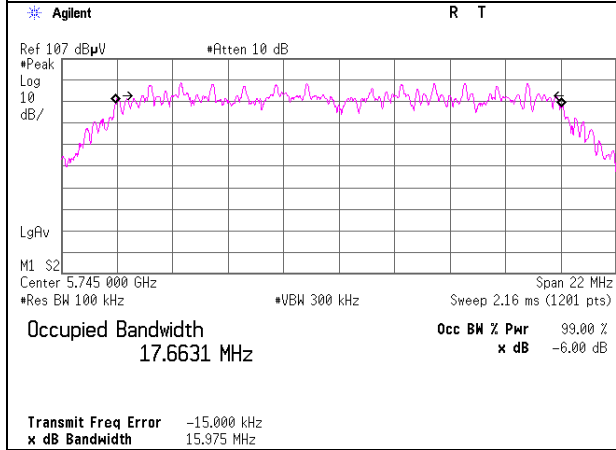
11a(Antenna A)



## 6dB Bandwidth

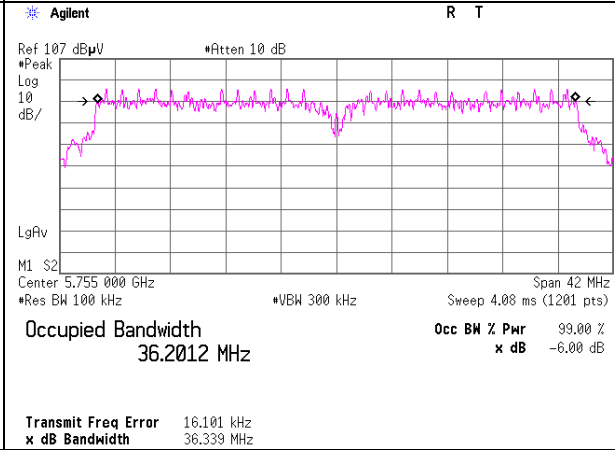
### 11n-20(5G)(MIMO Antenna B)

5745MHz

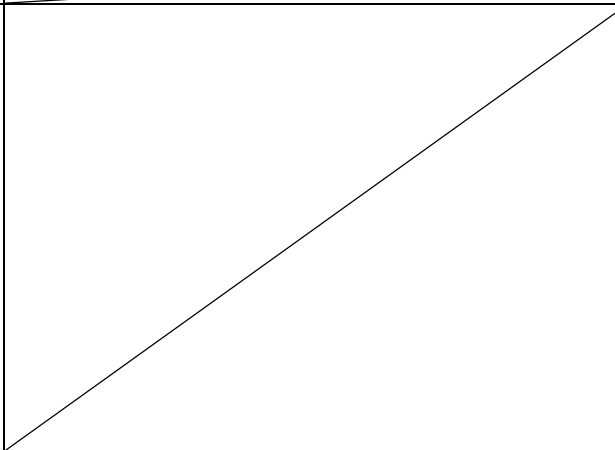
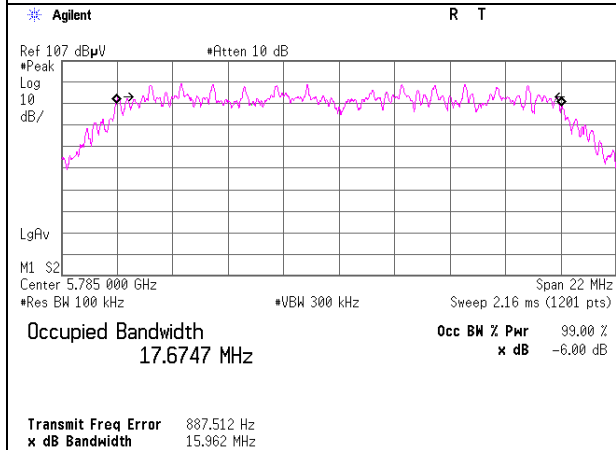


### 11n-40(5G)(MIMO Antenna B)

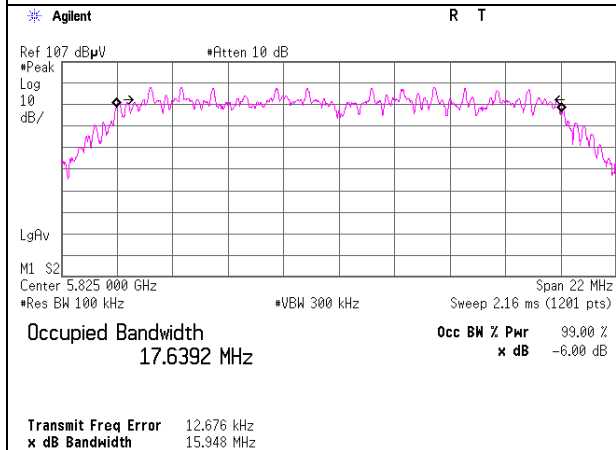
5755MHz



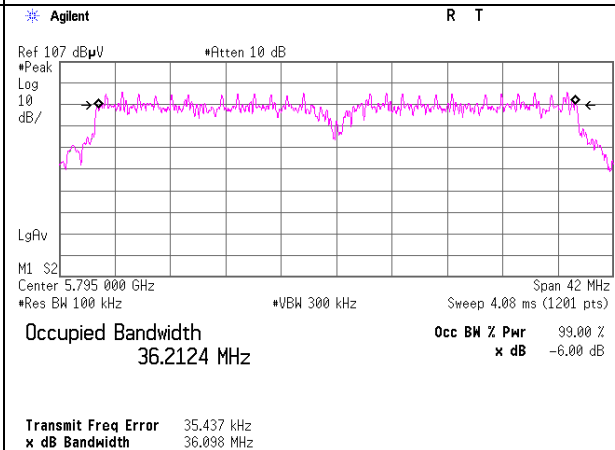
5785MHz



5825MHz



5795MHz



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### Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/26/2014  
Temperature/ Humidity : 24 deg. C / 41% RH  
Engineer : Satofumi Matsuyama  
Mode : Worst data rate check

2437MHz

| Rate<br>11b<br>[Mbps] | ant.A<br>Reading<br>PK<br>[dBm] | Remark |
|-----------------------|---------------------------------|--------|
| 1                     | 4.52                            |        |
| 2                     | 4.05                            |        |
| 5.5                   | 4.39                            |        |
| 11                    | 4.58                            | *      |

\*: Worst Rate

2437MHz

| Rate<br>11g<br>[Mbps] | ant.A<br>Reading<br>PK<br>[dBm] | Remark |
|-----------------------|---------------------------------|--------|
| 6                     | 11.71                           | *      |
| 9                     | 10.83                           |        |
| 12                    | 11.53                           |        |
| 18                    | 11.10                           |        |
| 24                    | 11.59                           |        |
| 36                    | 11.67                           |        |
| 48                    | 11.26                           |        |
| 54                    | 11.19                           |        |

\*: Worst Rate

2437MHz

| Rate<br>11n20<br>[MCS] | ant.A<br>Reading<br>PK<br>[dBm] | ant.B<br>Reading<br>PK<br>[dBm] | Total<br>Reading<br>PK<br>[dBm] | Remark |
|------------------------|---------------------------------|---------------------------------|---------------------------------|--------|
| 0                      | 11.69                           | -                               | -                               |        |
| 1                      | 11.28                           | -                               | -                               |        |
| 2                      | 11.33                           | -                               | -                               |        |
| 3                      | 11.03                           | -                               | -                               |        |
| 4                      | 11.59                           | -                               | -                               |        |
| 5                      | 11.63                           | -                               | -                               |        |
| 6                      | 11.35                           | -                               | -                               |        |
| 7                      | 11.48                           | -                               | -                               |        |
| 8                      | 11.87                           | 11.98                           | 14.94                           |        |
| 9                      | 11.63                           | 11.87                           | 14.76                           |        |
| 10                     | 11.68                           | 11.91                           | 14.81                           |        |
| 11                     | 11.75                           | 11.87                           | 14.82                           |        |
| 12                     | 11.78                           | 12.03                           | 14.92                           |        |
| 13                     | 11.97                           | 12.21                           | 15.10                           | *      |
| 14                     | 11.85                           | 11.97                           | 14.92                           |        |
| 15                     | 11.53                           | 11.67                           | 14.61                           |        |

\*: Worst Rate

2437MHz

| Rate<br>11n40<br>[MCS] | ant.A<br>Reading<br>PK<br>[dBm] | ant.B<br>Reading<br>PK<br>[dBm] | Total<br>Reading<br>PK<br>[dBm] | Remark |
|------------------------|---------------------------------|---------------------------------|---------------------------------|--------|
| 0                      | 11.69                           | -                               | -                               |        |
| 1                      | 11.75                           | -                               | -                               |        |
| 2                      | 10.19                           | -                               | -                               |        |
| 3                      | 10.30                           | -                               | -                               |        |
| 4                      | 13.47                           | -                               | -                               |        |
| 5                      | 13.14                           | -                               | -                               |        |
| 6                      | 13.17                           | -                               | -                               |        |
| 7                      | 13.09                           | -                               | -                               |        |
| 8                      | 12.28                           | 12.57                           | 15.44                           |        |
| 9                      | 10.98                           | 11.17                           | 14.09                           |        |
| 10                     | 11.43                           | 13.02                           | 15.31                           |        |
| 11                     | 14.41                           | 13.75                           | 17.10                           | *      |
| 12                     | 14.43                           | 13.70                           | 17.09                           |        |
| 13                     | 12.96                           | 13.30                           | 16.14                           |        |
| 14                     | 12.87                           | 13.29                           | 16.10                           |        |
| 15                     | 12.78                           | 13.15                           | 15.98                           |        |

\*: Worst Rate

All comparison were carried out on same frequency and measurement factors.  
Difference between worst rate check data and formal test result is due to the different test condition.

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## Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/26/2014  
Temperature/ Humidity : 24 deg. C / 41% RH  
Engineer : Satofumi Matsuyama  
Mode : Worst data rate check

5785MHz

| Rate<br>11a<br>[Mbps] | ant.A<br>Reading<br>PK<br>[dBm] | Remark |
|-----------------------|---------------------------------|--------|
| 6                     | 10.16                           | *      |
| 9                     | 9.93                            |        |
| 12                    | 10.02                           |        |
| 18                    | 9.45                            |        |
| 24                    | 10.12                           |        |
| 36                    | 10.02                           |        |
| 48                    | 9.53                            |        |
| 54                    | 10.15                           |        |

\*: Worst Rate

5785MHz

| Rate<br>11n20<br>[MCS] | ant.A<br>Reading<br>PK<br>[dBm] | ant.B<br>Reading<br>PK<br>[dBm] | Total<br>Reading<br>PK<br>[dBm] | Remark |
|------------------------|---------------------------------|---------------------------------|---------------------------------|--------|
| 0                      | 10.13                           | -                               | -                               |        |
| 1                      | 10.10                           | -                               | -                               |        |
| 2                      | 9.96                            | -                               | -                               |        |
| 3                      | 9.87                            | -                               | -                               |        |
| 4                      | 9.97                            | -                               | -                               |        |
| 5                      | 9.87                            | -                               | -                               |        |
| 6                      | 9.76                            | -                               | -                               |        |
| 7                      | 10.12                           | -                               | -                               |        |
| 8                      | 10.68                           | 11.24                           | 13.98                           | *      |
| 9                      | 10.34                           | 10.88                           | 13.63                           |        |
| 10                     | 10.08                           | 10.56                           | 13.34                           |        |
| 11                     | 10.11                           | 10.70                           | 13.43                           |        |
| 12                     | 10.05                           | 10.67                           | 13.38                           |        |
| 13                     | 10.19                           | 10.73                           | 13.48                           |        |
| 14                     | 10.30                           | 10.82                           | 13.58                           |        |
| 15                     | 10.14                           | 10.73                           | 13.46                           |        |

\*: Worst Rate

5755MHz

| Rate<br>11n40<br>[MCS] | ant.A<br>Reading<br>PK<br>[dBm] | ant.B<br>Reading<br>PK<br>[dBm] | Total<br>Reading<br>PK<br>[dBm] | Remark |
|------------------------|---------------------------------|---------------------------------|---------------------------------|--------|
| 0                      | 10.47                           | -                               | -                               |        |
| 1                      | 10.62                           | -                               | -                               |        |
| 2                      | 9.55                            | -                               | -                               |        |
| 3                      | 9.75                            | -                               | -                               |        |
| 4                      | 11.48                           | -                               | -                               |        |
| 5                      | 11.08                           | -                               | -                               |        |
| 6                      | 11.06                           | -                               | -                               |        |
| 7                      | 11.22                           | -                               | -                               |        |
| 8                      | 10.74                           | 11.24                           | 14.01                           |        |
| 9                      | 9.93                            | 10.23                           | 13.09                           |        |
| 10                     | 10.46                           | 11.35                           | 13.94                           |        |
| 11                     | 11.72                           | 11.75                           | 14.75                           | *      |
| 12                     | 11.64                           | 11.72                           | 14.69                           |        |
| 13                     | 11.07                           | 11.76                           | 14.44                           |        |
| 14                     | 11.08                           | 11.71                           | 14.42                           |        |
| 15                     | 11.05                           | 11.78                           | 14.44                           |        |

\*: Worst Rate

All comparison were carried out on same frequency and measurement factors.  
Difference between worst rate check data and formal test result is due to the different test condition.

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Facsimile : +81 596 24 8124

## Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/27/2014 03/28/2014  
Temperature/ Humidity : 24deg. C / 35% RH 24deg. C / 35% RH  
Engineer : Yutaka Yoshida Shinya Watanabe  
Mode : 11b/g Tx (2.4GHz Band)

11b 11Mbps Antenna A

| Freq.<br>[MHz] | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------------|-----------------------|----------------|--------|-------|-------|------|----------------|
|                |                        |                       |                | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 2.55                   | 0.40                  | 10.00          | 12.95  | 19.72 | 30.00 | 1000 | 17.05          |
| 2437           | 4.58                   | 0.40                  | 10.00          | 14.98  | 31.48 | 30.00 | 1000 | 15.02          |
| 2462           | 4.83                   | 0.40                  | 10.00          | 15.23  | 33.34 | 30.00 | 1000 | 14.77          |

11b 11Mbps Antenna B

| Freq.<br>[MHz] | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------------|-----------------------|----------------|--------|-------|-------|------|----------------|
|                |                        |                       |                | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 4.84                   | 0.40                  | 10.00          | 15.24  | 33.42 | 30.00 | 1000 | 14.76          |
| 2437           | 5.23                   | 0.40                  | 10.00          | 15.63  | 36.56 | 30.00 | 1000 | 14.37          |
| 2462           | 5.24                   | 0.40                  | 10.00          | 15.64  | 36.64 | 30.00 | 1000 | 14.36          |

11g 6Mbps Antenna A

| Freq.<br>[MHz] | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Limit |      | Margin<br>[dB] |
|----------------|------------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
|                |                        |                       |                | [dBm]  | [mW]   | [dBm] | [mW] |                |
| 2412           | 11.88                  | 0.40                  | 10.00          | 22.28  | 169.04 | 30.00 | 1000 | 7.72           |
| 2437           | 11.71                  | 0.40                  | 10.00          | 22.11  | 162.55 | 30.00 | 1000 | 7.89           |
| 2462           | 12.23                  | 0.40                  | 10.00          | 22.63  | 183.23 | 30.00 | 1000 | 7.37           |

11g 6Mbps Antenna B

| Freq.<br>[MHz] | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Limit |      | Margin<br>[dB] |
|----------------|------------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
|                |                        |                       |                | [dBm]  | [mW]   | [dBm] | [mW] |                |
| 2412           | 12.57                  | 0.40                  | 10.00          | 22.97  | 198.15 | 30.00 | 1000 | 7.03           |
| 2437           | 12.51                  | 0.40                  | 10.00          | 22.91  | 195.43 | 30.00 | 1000 | 7.09           |
| 2462           | 12.78                  | 0.40                  | 10.00          | 23.18  | 207.97 | 30.00 | 1000 | 6.82           |

Sample Calculation:

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

Difference between worst rate check data and formal test result is due to the different test cond

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**Ise EMC Lab.**

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## Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/27/2014 03/28/2014  
Temperature/ Humidity : 24deg. C / 35% RH 24deg. C / 35% RH  
Engineer : Yutaka Yoshida Shinya Watanabe  
Mode : 11n-20/n-40 Tx (2.4GHz Band)

### 11n-20 MCS13 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Total Result |        | Limit |      | Margin<br>[dB] |
|----------------|---------|------------------------|-----------------------|----------------|--------|--------|--------------|--------|-------|------|----------------|
|                |         |                        |                       |                | [dBm]  | [mW]   | [dBm]        | [mW]   | [dBm] | [mW] |                |
| 2412           | A       | 10.98                  | 0.40                  | 10.00          | 21.38  | 137.40 | 24.54        | 284.30 | 30.00 | 1000 | 5.46           |
|                | B       | 11.26                  | 0.40                  | 10.01          | 21.67  | 146.89 |              |        |       |      |                |
| 2437           | A       | 11.97                  | 0.40                  | 10.00          | 22.37  | 172.58 | 25.51        | 355.39 | 30.00 | 1000 | 4.49           |
|                | B       | 12.21                  | 0.40                  | 10.01          | 22.62  | 182.81 |              |        |       |      |                |
| 2462           | A       | 12.14                  | 0.40                  | 10.00          | 22.54  | 179.47 | 25.58        | 361.02 | 30.00 | 1000 | 4.42           |
|                | B       | 12.18                  | 0.40                  | 10.01          | 22.59  | 181.55 |              |        |       |      |                |

### 11n-40 MCS11 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Total Result |        | Limit |      | Margin<br>[dB] |
|----------------|---------|------------------------|-----------------------|----------------|--------|--------|--------------|--------|-------|------|----------------|
|                |         |                        |                       |                | [dBm]  | [mW]   | [dBm]        | [mW]   | [dBm] | [mW] |                |
| 2422           | A       | 12.53                  | 0.40                  | 10.00          | 22.93  | 196.34 | 26.45        | 441.24 | 30.00 | 1000 | 3.55           |
|                | B       | 13.48                  | 0.40                  | 10.01          | 23.89  | 244.91 |              |        |       |      |                |
| 2437           | A       | 14.41                  | 0.40                  | 10.00          | 24.81  | 302.69 | 27.51        | 563.31 | 30.00 | 1000 | 2.49           |
|                | B       | 13.75                  | 0.40                  | 10.01          | 24.16  | 260.62 |              |        |       |      |                |
| 2452           | A       | 12.35                  | 0.40                  | 10.00          | 22.75  | 188.36 | 26.13        | 410.18 | 30.00 | 1000 | 3.87           |
|                | B       | 13.05                  | 0.40                  | 10.01          | 23.46  | 221.82 |              |        |       |      |                |

Sample Calculation:

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

Difference between worst rate check data and formal test result is due to the different test condition.

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## Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/27/2014  
Temperature/ Humidity : 24deg. C / 35% RH  
Engineer : Yutaka Yoshida  
Mode : 11a/n-20/n-40 Tx (5GHz Band)

11a 6Mbps Antenna A

| Freq.<br>[MHz] | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Limit |      | Margin<br>[dB] |
|----------------|------------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
|                |                        |                       |                | [dBm]  | [mW]   | [dBm] | [mW] |                |
| 5745           | 11.58                  | 1.20                  | 10.04          | 22.82  | 191.43 | 30.00 | 1000 | 7.18           |
| 5785           | 10.16                  | 1.20                  | 10.04          | 21.40  | 138.04 | 30.00 | 1000 | 8.60           |
| 5825           | 9.20                   | 1.20                  | 10.04          | 20.44  | 110.66 | 30.00 | 1000 | 9.56           |

11a 6Mbps Antenna B

| Freq.<br>[MHz] | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Limit |      | Margin<br>[dB] |
|----------------|------------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
|                |                        |                       |                | [dBm]  | [mW]   | [dBm] | [mW] |                |
| 5745           | 10.98                  | 1.20                  | 10.04          | 22.22  | 166.72 | 30.00 | 1000 | 7.78           |
| 5785           | 10.35                  | 1.20                  | 10.04          | 21.59  | 144.21 | 30.00 | 1000 | 8.41           |
| 5825           | 10.71                  | 1.20                  | 10.04          | 21.95  | 156.68 | 30.00 | 1000 | 8.05           |

11n-20 MCS8 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Result |        | Limit |      | Margin<br>[dB] |
|----------------|---------|------------------------|-----------------------|----------------|--------|--------|--------|--------|-------|------|----------------|
|                |         |                        |                       |                | [dBm]  | [mW]   | [dBm]  | [mW]   | [dBm] | [mW] |                |
| 5745           | A       | 10.63                  | 1.20                  | 10.04          | 21.87  | 153.82 | 25.45  | 350.60 | 30.00 | 1000 | 4.55           |
|                | B       | 11.72                  | 1.20                  | 10.02          | 22.94  | 196.79 |        |        |       |      |                |
| 5785           | A       | 10.68                  | 1.20                  | 10.04          | 21.92  | 155.60 | 25.21  | 331.79 | 30.00 | 1000 | 4.79           |
|                | B       | 11.24                  | 1.20                  | 10.02          | 22.46  | 176.20 |        |        |       |      |                |
| 5825           | A       | 9.46                   | 1.20                  | 10.04          | 20.70  | 117.49 | 24.35  | 272.37 | 30.00 | 1000 | 5.65           |
|                | B       | 10.68                  | 1.20                  | 10.02          | 21.90  | 154.88 |        |        |       |      |                |

11n-40 MCS11 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>PK<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |        | Result |        | Limit |      | Margin<br>[dB] |
|----------------|---------|------------------------|-----------------------|----------------|--------|--------|--------|--------|-------|------|----------------|
|                |         |                        |                       |                | [dBm]  | [mW]   | [dBm]  | [mW]   | [dBm] | [mW] |                |
| 5755           | A       | 11.72                  | 1.20                  | 10.04          | 22.96  | 197.70 | 25.98  | 395.85 | 30.00 | 1000 | 4.02           |
|                | B       | 11.75                  | 1.20                  | 10.02          | 22.97  | 198.15 |        |        |       |      |                |
| 5795           | A       | 10.48                  | 1.20                  | 10.04          | 21.72  | 148.59 | 25.28  | 336.96 | 30.00 | 1000 | 4.72           |
|                | B       | 11.53                  | 1.20                  | 10.02          | 22.75  | 188.36 |        |        |       |      |                |

Sample Calculation:

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

Difference between worst rate check data and formal test result is due to the different test condition.

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**Average Output Power**  
(for reporting purpose only)

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/27/2014  
Temperature/ Humidity : 24 deg. C / 35% RH  
Engineer : Yutaka Yoshida  
Mode : 11b/g Tx

11b 11Mbps Antenna A

| Freq.<br>[MHz] | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       |
|----------------|------------------------|-----------------------|----------------|--------|-------|
|                |                        |                       |                | [dBm]  | [mW]  |
| 2412           | -0.18                  | 0.40                  | 10.00          | 10.22  | 10.52 |
| 2437           | 1.86                   | 0.40                  | 10.00          | 12.26  | 16.83 |
| 2462           | 2.07                   | 0.40                  | 10.00          | 12.47  | 17.66 |

11b 11Mbps Antenna B

| Freq.<br>[MHz] | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       |
|----------------|------------------------|-----------------------|----------------|--------|-------|
|                |                        |                       |                | [dBm]  | [mW]  |
| 2412           | -1.49                  | 1.20                  | 10.04          | 9.75   | 9.44  |
| 2437           | 1.27                   | 1.20                  | 10.04          | 12.51  | 17.82 |
| 2462           | 1.74                   | 1.20                  | 10.04          | 12.98  | 19.86 |

11g 6Mbps Antenna A

| Freq.<br>[MHz] | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       |
|----------------|------------------------|-----------------------|----------------|--------|-------|
|                |                        |                       |                | [dBm]  | [mW]  |
| 2412           | 1.46                   | 0.40                  | 10.00          | 11.86  | 15.35 |
| 2437           | 1.42                   | 0.40                  | 10.00          | 11.82  | 15.21 |
| 2462           | 2.06                   | 0.40                  | 10.00          | 12.46  | 17.62 |

11g 6Mbps Antenna B

| Freq.<br>[MHz] | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       |
|----------------|------------------------|-----------------------|----------------|--------|-------|
|                |                        |                       |                | [dBm]  | [mW]  |
| 2412           | 1.46                   | 0.40                  | 10.00          | 11.86  | 15.35 |
| 2437           | 1.10                   | 0.40                  | 10.00          | 11.50  | 14.13 |
| 2462           | 1.43                   | 0.40                  | 10.00          | 11.83  | 15.24 |

Sample Calculation:

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

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**Average Output Power**  
(for reporting purpose only)

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/27/2014  
Temperature/ Humidity : 24deg. C / 35% RH  
Engineer : Yutaka Yoshida  
Mode : 11n-20/n-40 Tx

11n-20 MCS13 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       | Result |       |
|----------------|---------|------------------------|-----------------------|----------------|--------|-------|--------|-------|
|                |         |                        |                       |                | [dBm]  | [mW]  | [dBm]  | [mW]  |
| 2412           | A       | 0.52                   | 0.40                  | 10.00          | 10.92  | 12.36 | 14.21  | 26.36 |
|                | B       | 1.05                   | 0.40                  | 10.01          | 11.46  | 14.00 |        |       |
| 2437           | A       | 1.75                   | 0.40                  | 10.00          | 12.15  | 16.41 | 15.36  | 34.35 |
|                | B       | 2.13                   | 0.40                  | 10.01          | 12.54  | 17.95 |        |       |
| 2462           | A       | 2.03                   | 0.40                  | 10.00          | 12.43  | 17.50 | 15.53  | 35.74 |
|                | B       | 2.20                   | 0.40                  | 10.01          | 12.61  | 18.24 |        |       |

11n-40 MCS11 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       | Result |       |
|----------------|---------|------------------------|-----------------------|----------------|--------|-------|--------|-------|
|                |         |                        |                       |                | [dBm]  | [mW]  | [dBm]  | [mW]  |
| 2412           | A       | 0.75                   | 0.40                  | 10.00          | 11.15  | 13.03 | 14.76  | 29.94 |
|                | B       | 1.87                   | 0.40                  | 10.01          | 12.28  | 16.90 |        |       |
| 2437           | A       | 1.67                   | 0.40                  | 10.00          | 12.07  | 16.11 | 15.38  | 34.51 |
|                | B       | 2.24                   | 0.40                  | 10.01          | 12.65  | 18.41 |        |       |
| 2462           | A       | 0.79                   | 0.40                  | 10.00          | 11.19  | 13.15 | 14.79  | 30.10 |
|                | B       | 1.88                   | 0.40                  | 10.01          | 12.29  | 16.94 |        |       |

Sample Calculation:

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

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**Average Output Power**  
(for reporting purpose only)

Test place : Ise EMC Lab. No.3 Measurement Room  
Report No. : 10229481H  
Date : 03/27/2014  
Temperature/ Humidity : 24deg. C / 35% RH  
Engineer : Yutaka Yoshida  
Mode : 11a/n-20/n-40 Tx

11a 6Mbps Antenna A

| Freq.<br>[MHz] | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       |
|----------------|------------------------|-----------------------|----------------|--------|-------|
|                |                        |                       |                | [dBm]  | [mW]  |
| 5745           | 4.08                   | 1.20                  | 10.04          | 15.32  | 34.04 |
| 5785           | 0.86                   | 1.20                  | 10.04          | 12.10  | 16.22 |
| 5825           | -0.53                  | 1.20                  | 10.04          | 10.71  | 11.78 |

Sample Calculation:

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

11a 6Mbps Antenna B

| Freq.<br>[MHz] | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       |
|----------------|------------------------|-----------------------|----------------|--------|-------|
|                |                        |                       |                | [dBm]  | [mW]  |
| 5745           | 1.93                   | 1.20                  | 10.04          | 13.17  | 20.75 |
| 5785           | 0.71                   | 1.20                  | 10.04          | 11.95  | 15.67 |
| 5825           | 1.30                   | 1.20                  | 10.04          | 12.54  | 17.95 |

Sample Calculation:

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

11n-20 MCS8 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       | Result |       |
|----------------|---------|------------------------|-----------------------|----------------|--------|-------|--------|-------|
|                |         |                        |                       |                | [dBm]  | [mW]  | [dBm]  | [mW]  |
| 5745           | A       | 1.47                   | 1.20                  | 10.04          | 12.71  | 18.66 | 16.88  | 48.72 |
|                | B       | 3.56                   | 1.20                  | 10.02          | 14.78  | 30.06 |        |       |
| 5785           | A       | 1.97                   | 1.20                  | 10.04          | 13.21  | 20.94 | 16.53  | 44.93 |
|                | B       | 2.58                   | 1.20                  | 10.02          | 13.80  | 23.99 |        |       |
| 5825           | A       | -0.25                  | 1.20                  | 10.04          | 10.99  | 12.56 | 15.02  | 31.79 |
|                | B       | 1.62                   | 1.20                  | 10.02          | 12.84  | 19.23 |        |       |

11n-40 MCS11 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>AV<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |       | Result |       |
|----------------|---------|------------------------|-----------------------|----------------|--------|-------|--------|-------|
|                |         |                        |                       |                | [dBm]  | [mW]  | [dBm]  | [mW]  |
| 5755           | A       | 0.75                   | 1.20                  | 10.04          | 11.99  | 15.81 | 15.59  | 36.18 |
|                | B       | 1.87                   | 1.20                  | 10.02          | 13.09  | 20.37 |        |       |
| 5795           | A       | -0.12                  | 1.20                  | 10.04          | 11.12  | 12.94 | 14.88  | 30.77 |
|                | B       | 1.29                   | 1.20                  | 10.02          | 12.51  | 17.82 |        |       |

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. 10229481H  
Date 03/27/2014 03/28/2014  
Temperature/ Humidity 22 deg. C / 32% RH 23 deg. C / 31% RH  
Engineer Tsubasa Takayama Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2412MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 2390.000           | PK       | 65.8              | 27.0               | 2.4          | 34.7         | 60.5               | 73.9              | 13.4           |        |
| Hori     | 4824.000           | PK       | 51.1              | 31.9               | 3.7          | 33.9         | 52.8               | 73.9              | 21.1           |        |
| Hori     | 7236.000           | PK       | 45.5              | 35.7               | 4.5          | 33.8         | 51.9               | 73.9              | 22.0           |        |
| Hori     | 9648.000           | PK       | 43.8              | 38.1               | 5.2          | 34.4         | 52.7               | 73.9              | 21.2           |        |
| Hori     | 2390.000           | AV       | 45.7              | 27.0               | 2.4          | 34.7         | 40.4               | 53.9              | 13.5           |        |
| Hori     | 4824.000           | AV       | 40.2              | 31.9               | 3.7          | 33.9         | 41.9               | 53.9              | 12.0           |        |
| Hori     | 7236.000           | AV       | 34.6              | 35.7               | 4.5          | 33.8         | 41.0               | 53.9              | 12.9           |        |
| Hori     | 9648.000           | AV       | 33.2              | 38.1               | 5.2          | 34.4         | 42.1               | 53.9              | 11.8           |        |
| Vert     | 2390.000           | PK       | 61.4              | 27.0               | 2.4          | 34.7         | 56.1               | 73.9              | 17.8           |        |
| Vert     | 4824.000           | PK       | 49.7              | 31.9               | 3.7          | 33.9         | 51.4               | 73.9              | 22.5           |        |
| Vert     | 7236.000           | PK       | 46.2              | 35.7               | 4.5          | 33.8         | 52.6               | 73.9              | 21.3           |        |
| Vert     | 9648.000           | PK       | 43.9              | 38.1               | 5.2          | 34.4         | 52.8               | 73.9              | 21.1           |        |
| Vert     | 2390.000           | AV       | 42.8              | 27.0               | 2.4          | 34.7         | 37.5               | 53.9              | 16.4           |        |
| Vert     | 4824.000           | AV       | 37.8              | 31.9               | 3.7          | 33.9         | 39.5               | 53.9              | 14.4           |        |
| Vert     | 7236.000           | AV       | 34.5              | 35.7               | 4.5          | 33.8         | 40.9               | 53.9              | 13.0           |        |
| Vert     | 9648.000           | AV       | 33.1              | 38.1               | 5.2          | 34.4         | 42.0               | 53.9              | 11.9           |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

### 20dBc Data Sheet

| Polarity | Frequency | Detector | Reading | Ant.Fac. | Loss | Gain | Result | Limit | Margin | Remark  |
|----------|-----------|----------|---------|----------|------|------|--------|-------|--------|---------|
| Hori     | 2412.000  | PK       | 111.0   | 27.0     | 2.4  | 34.7 | 105.7  | -     | -      | Carrier |
| Hori     | 2400.000  | PK       | 66.3    | 27.0     | 2.4  | 34.7 | 61.0   | 85.7  | 24.7   |         |
| Vert     | 2412.000  | PK       | 107.4   | 27.0     | 2.4  | 34.7 | 102.1  | -     | -      | Carrier |
| Vert     | 2400.000  | PK       | 61.4    | 27.0     | 2.4  | 34.7 | 56.1   | 82.1  | 26.0   |         |

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. : 10229481H  
Date : 03/27/2014      03/28/2014  
Temperature/ Humidity : 22 deg. C / 32% RH      23 deg. C / 31% RH  
Engineer : Tsubasa Takayama      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11b Tx 2437MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 4874.000           | PK       | 48.2              | 32.0               | 4.4          | 33.9         | 50.7               | 73.9              | 23.2           |        |
| Hori     | 7311.000           | PK       | 36.7              | 35.8               | 5.3          | 33.8         | 44.0               | 73.9              | 29.9           |        |
| Hori     | 9748.000           | PK       | 45.8              | 38.3               | 6.1          | 34.5         | 55.7               | 73.9              | 18.2           |        |
| Hori     | 4874.000           | AV       | 35.7              | 32.0               | 4.4          | 33.9         | 38.2               | 53.9              | 15.7           |        |
| Hori     | 7311.000           | AV       | 34.4              | 35.8               | 5.3          | 33.8         | 41.7               | 53.9              | 12.2           |        |
| Hori     | 9748.000           | AV       | 33.1              | 38.3               | 6.1          | 34.5         | 43.0               | 53.9              | 10.9           |        |
| Vert     | 4874.000           | PK       | 48.1              | 32.0               | 4.4          | 33.9         | 50.6               | 73.9              | 23.3           |        |
| Vert     | 7311.000           | PK       | 46.7              | 35.8               | 5.3          | 33.8         | 54.0               | 73.9              | 19.9           |        |
| Vert     | 9748.000           | PK       | 45.9              | 38.3               | 6.1          | 34.5         | 55.8               | 73.9              | 18.1           |        |
| Vert     | 4874.000           | AV       | 36.9              | 32.0               | 4.4          | 33.9         | 39.4               | 53.9              | 14.5           |        |
| Vert     | 7311.000           | AV       | 33.0              | 35.8               | 5.3          | 33.8         | 40.3               | 53.9              | 13.6           |        |
| Vert     | 9748.000           | AV       | 32.3              | 38.3               | 6.1          | 34.5         | 42.2               | 53.9              | 11.7           |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/27/2014                      03/28/2014  
Temperature/ Humidity : 22 deg. C / 32% RH      23 deg. C / 31% RH  
Engineer : Tsubasa Takayama      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11b Tx 2462MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 2483.500           | PK       | 62.4              | 26.9               | 2.5          | 34.7         | 57.1               | 73.9              | 16.8           |        |
| Hori     | 4924.000           | PK       | 47.9              | 32.1               | 4.4          | 33.9         | 50.5               | 73.9              | 23.4           |        |
| Hori     | 7386.000           | PK       | 45.6              | 35.8               | 5.3          | 33.8         | 52.9               | 73.9              | 21.0           |        |
| Hori     | 9848.000           | PK       | 44.1              | 38.5               | 6.1          | 34.5         | 54.2               | 73.9              | 19.7           |        |
| Hori     | 2483.500           | AV       | 41.5              | 26.9               | 2.5          | 34.7         | 36.2               | 53.9              | 17.7           |        |
| Hori     | 4924.000           | AV       | 36.6              | 32.1               | 4.4          | 33.9         | 39.2               | 53.9              | 14.7           |        |
| Hori     | 7386.000           | AV       | 34.2              | 35.8               | 5.3          | 33.8         | 41.5               | 53.9              | 12.4           |        |
| Hori     | 9848.000           | AV       | 33.2              | 38.5               | 6.1          | 34.5         | 43.3               | 53.9              | 10.6           |        |
| Vert     | 2483.500           | PK       | 57.9              | 26.9               | 2.5          | 34.7         | 52.6               | 73.9              | 21.3           |        |
| Vert     | 4924.000           | PK       | 47.4              | 32.1               | 4.4          | 33.9         | 50.0               | 73.9              | 23.9           |        |
| Vert     | 7386.000           | PK       | 45.9              | 35.8               | 5.3          | 33.8         | 53.2               | 73.9              | 20.7           |        |
| Vert     | 9848.000           | PK       | 45.5              | 38.5               | 6.1          | 34.5         | 55.6               | 73.9              | 18.3           |        |
| Vert     | 2483.500           | AV       | 38.7              | 26.9               | 2.5          | 34.7         | 33.4               | 53.9              | 20.5           |        |
| Vert     | 4924.000           | AV       | 35.6              | 32.1               | 4.4          | 33.9         | 38.2               | 53.9              | 15.7           |        |
| Vert     | 7386.000           | AV       | 34.6              | 35.8               | 5.3          | 33.8         | 41.9               | 53.9              | 12.0           |        |
| Vert     | 9848.000           | AV       | 33.2              | 38.5               | 6.1          | 34.5         | 43.3               | 53.9              | 10.6           |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/27/2014                      03/28/2014  
Temperature/ Humidity : 22 deg. C / 32% RH      23 deg. C / 31% RH  
Engineer : Tsubasa Takayama      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11n-20 Tx 2412MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 2390.000           | PK       | 61.8              | 27.0               | 2.4          | 34.7         | 56.5               | 73.9              | 17.4           |        |
| Hori     | 4824.000           | PK       | 44.3              | 31.9               | 4.4          | 33.9         | 46.7               | 73.9              | 27.2           |        |
| Hori     | 7236.000           | PK       | 42.6              | 35.7               | 5.2          | 33.8         | 49.7               | 73.9              | 24.2           |        |
| Hori     | 9648.000           | PK       | 43.5              | 38.1               | 6.0          | 34.4         | 53.2               | 73.9              | 20.7           |        |
| Hori     | 2390.000           | AV       | 51.7              | 27.0               | 2.4          | 34.7         | 46.4               | 53.9              | 7.5            |        |
| Hori     | 4824.000           | AV       | 32.9              | 31.9               | 4.4          | 33.9         | 35.3               | 53.9              | 18.6           |        |
| Hori     | 7236.000           | AV       | 32.8              | 35.7               | 5.2          | 33.8         | 39.9               | 53.9              | 14.0           |        |
| Hori     | 9648.000           | AV       | 32.5              | 38.1               | 6.0          | 34.4         | 42.2               | 53.9              | 11.7           |        |
| Vert     | 2390.000           | PK       | 66.8              | 27.0               | 2.4          | 34.7         | 61.5               | 73.9              | 12.4           |        |
| Vert     | 4824.000           | PK       | 45.4              | 31.9               | 4.4          | 33.9         | 47.8               | 73.9              | 26.1           |        |
| Vert     | 7236.000           | PK       | 42.9              | 35.7               | 5.2          | 33.8         | 50.0               | 73.9              | 23.9           |        |
| Vert     | 9648.000           | PK       | 43.2              | 38.1               | 6.0          | 34.4         | 52.9               | 73.9              | 21.0           |        |
| Vert     | 2390.000           | AV       | 51.2              | 27.0               | 2.4          | 34.7         | 45.9               | 53.9              | 8.0            |        |
| Vert     | 4824.000           | AV       | 32.9              | 31.9               | 4.4          | 33.9         | 35.3               | 53.9              | 18.6           |        |
| Vert     | 7236.000           | AV       | 32.3              | 35.7               | 5.2          | 33.8         | 39.4               | 53.9              | 14.5           |        |
| Vert     | 9648.000           | AV       | 32.8              | 38.1               | 6.0          | 34.4         | 42.5               | 53.9              | 11.4           |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

### 20dBc Data Sheet

| Polarity | Frequency | Detector | Reading | Ant.Fac. | Loss | Gain | Result | Limit | Margin | Remark  |
|----------|-----------|----------|---------|----------|------|------|--------|-------|--------|---------|
| Hori     | 2412.000  | PK       | 106.6   | 27.0     | 2.4  | 34.7 | 101.3  | -     | -      | Carrier |
| Hori     | 2400.000  | PK       | 61.2    | 27.0     | 2.4  | 34.7 | 55.9   | 81.3  | 25.4   |         |
| Vert     | 2412.000  | PK       | 104.0   | 27.0     | 2.4  | 34.7 | 98.7   | -     | -      | Carrier |
| Vert     | 2400.000  | PK       | 64.2    | 27.0     | 2.4  | 34.7 | 58.9   | 78.7  | 19.8   |         |

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. : 10229481H  
Date : 03/27/2014      03/28/2014  
Temperature/ Humidity : 22 deg. C / 32% RH      23 deg. C / 31% RH  
Engineer : Tsubasa Takayama      Tsubasa Takayama  
Mode : (1-10GHz)      (10-26.5GHz)  
11n-20 Tx 2437MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 4874.000           | PK       | 44.6              | 32.0               | 4.4          | 33.9         | 47.1               | 73.9              | 26.8           |        |
| Hori     | 7311.000           | PK       | 44.9              | 35.8               | 5.3          | 33.8         | 52.2               | 73.9              | 21.7           |        |
| Hori     | 9748.000           | PK       | 44.8              | 38.3               | 6.1          | 34.5         | 54.7               | 73.9              | 19.2           |        |
| Hori     | 4874.000           | AV       | 32.7              | 32.0               | 4.4          | 33.9         | 35.2               | 53.9              | 18.7           |        |
| Hori     | 7311.000           | AV       | 32.7              | 35.8               | 5.3          | 33.8         | 40.0               | 53.9              | 13.9           |        |
| Hori     | 9748.000           | AV       | 32.5              | 38.3               | 6.1          | 34.5         | 42.4               | 53.9              | 11.5           |        |
| Vert     | 4874.000           | PK       | 44.2              | 32.0               | 4.4          | 33.9         | 46.7               | 73.9              | 27.2           |        |
| Vert     | 7311.000           | PK       | 44.5              | 35.8               | 5.3          | 33.8         | 51.8               | 73.9              | 22.1           |        |
| Vert     | 9748.000           | PK       | 44.9              | 38.3               | 6.1          | 34.5         | 54.8               | 73.9              | 19.1           |        |
| Vert     | 4874.000           | AV       | 32.8              | 32.0               | 4.4          | 33.9         | 35.3               | 53.9              | 18.6           |        |
| Vert     | 7311.000           | AV       | 32.5              | 35.8               | 5.3          | 33.8         | 39.8               | 53.9              | 14.1           |        |
| Vert     | 9748.000           | AV       | 34.5              | 38.3               | 6.1          | 34.5         | 44.4               | 53.9              | 9.5            |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/27/2014      03/28/2014  
Temperature/ Humidity : 22 deg. C / 32% RH      23 deg. C / 31% RH  
Engineer : Tsubasa Takayama      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11n-20 Tx 2462MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 2483.500           | PK       | 65.5              | 26.9               | 2.5          | 34.7         | 60.2               | 73.9              | 13.7           |        |
| Hori     | 4924.000           | PK       | 44.1              | 32.1               | 4.4          | 33.9         | 46.7               | 73.9              | 27.2           |        |
| Hori     | 7386.000           | PK       | 43.9              | 35.8               | 5.3          | 33.8         | 51.2               | 73.9              | 22.7           |        |
| Hori     | 9848.000           | PK       | 43.2              | 38.5               | 6.1          | 34.5         | 53.3               | 73.9              | 20.6           |        |
| Hori     | 2483.500           | AV       | 52.5              | 26.9               | 2.5          | 34.7         | 47.2               | 53.9              | 6.7            |        |
| Hori     | 4924.000           | AV       | 32.9              | 32.1               | 4.4          | 33.9         | 35.5               | 53.9              | 18.4           |        |
| Hori     | 7386.000           | AV       | 32.4              | 35.8               | 5.3          | 33.8         | 39.7               | 53.9              | 14.2           |        |
| Hori     | 9848.000           | AV       | 32.6              | 38.5               | 6.1          | 34.5         | 42.7               | 53.9              | 11.2           |        |
| Vert     | 2483.500           | PK       | 65.7              | 26.9               | 2.5          | 34.7         | 60.4               | 73.9              | 13.5           |        |
| Vert     | 4924.000           | PK       | 44.6              | 32.1               | 4.4          | 33.9         | 47.2               | 73.9              | 26.7           |        |
| Vert     | 7386.000           | PK       | 45.3              | 35.8               | 5.3          | 33.8         | 52.6               | 73.9              | 21.3           |        |
| Vert     | 9848.000           | PK       | 44.3              | 38.5               | 6.1          | 34.5         | 54.4               | 73.9              | 19.5           |        |
| Vert     | 2483.500           | AV       | 51.4              | 26.9               | 2.5          | 34.7         | 46.1               | 53.9              | 7.8            |        |
| Vert     | 4924.000           | AV       | 32.7              | 32.1               | 4.4          | 33.9         | 35.3               | 53.9              | 18.6           |        |
| Vert     | 7386.000           | AV       | 32.7              | 35.8               | 5.3          | 33.8         | 40.0               | 53.9              | 13.9           |        |
| Vert     | 9848.000           | AV       | 32.8              | 38.5               | 6.1          | 34.5         | 42.9               | 53.9              | 11.0           |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/27/2014      03/28/2014  
Temperature/ Humidity : 22 deg. C / 32% RH      23 deg. C / 31% RH  
Engineer : Takumi Shimada      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11n-40 Tx 2422MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 2390.000           | PK       | 73.7              | 27.0               | 2.4          | 34.7         | 68.4               | 73.9              | 5.5            |        |
| Hori     | 4844.000           | PK       | 43.7              | 31.9               | 4.4          | 33.9         | 46.1               | 73.9              | 27.8           |        |
| Hori     | 7266.000           | PK       | 43.0              | 35.7               | 5.2          | 33.8         | 50.1               | 73.9              | 23.8           |        |
| Hori     | 9688.000           | PK       | 43.1              | 38.2               | 6.1          | 34.4         | 53.0               | 73.9              | 20.9           |        |
| Hori     | 2390.000           | AV       | 57.6              | 27.0               | 2.4          | 34.7         | 52.3               | 53.9              | 1.6            |        |
| Hori     | 4844.000           | AV       | 31.1              | 31.9               | 4.4          | 33.9         | 33.5               | 53.9              | 20.4           |        |
| Hori     | 7266.000           | AV       | 30.5              | 35.7               | 5.2          | 33.8         | 37.6               | 53.9              | 16.3           |        |
| Hori     | 9688.000           | AV       | 31.2              | 38.2               | 6.1          | 34.4         | 41.1               | 53.9              | 12.8           |        |
| Vert     | 2390.000           | PK       | 67.7              | 27.0               | 2.4          | 34.7         | 62.4               | 73.9              | 11.5           |        |
| Vert     | 4844.000           | PK       | 42.5              | 31.9               | 4.4          | 33.9         | 44.9               | 73.9              | 29.0           |        |
| Vert     | 7266.000           | PK       | 43.9              | 35.7               | 5.2          | 33.8         | 51.0               | 73.9              | 22.9           |        |
| Vert     | 9688.000           | PK       | 43.4              | 38.2               | 6.1          | 34.4         | 53.3               | 73.9              | 20.6           |        |
| Vert     | 2390.000           | AV       | 49.9              | 27.0               | 2.4          | 34.7         | 44.6               | 53.9              | 9.3            |        |
| Vert     | 4844.000           | AV       | 30.7              | 31.9               | 4.4          | 33.9         | 33.1               | 53.9              | 20.8           |        |
| Vert     | 7266.000           | AV       | 31.7              | 35.7               | 5.2          | 33.8         | 38.8               | 53.9              | 15.1           |        |
| Vert     | 9688.000           | AV       | 31.2              | 38.2               | 6.1          | 34.4         | 41.1               | 53.9              | 12.8           |        |

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

\*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

\*The 10th harmonic was not seen so the result was its base noise level.

### 20dBc Data Sheet

| Polarity | Frequency | Detector | Reading | Ant.Fac. | Loss | Gain | Result | Limit | Margin | Remark  |
|----------|-----------|----------|---------|----------|------|------|--------|-------|--------|---------|
| Hori     | 2422.000  | PK       | 103.8   | 27.0     | 2.5  | 34.7 | 98.6   | -     | -      | Carrier |
| Hori     | 2400.000  | PK       | 64.9    | 27.0     | 2.4  | 34.7 | 59.6   | 78.6  | 19.0   |         |
| Vert     | 2422.000  | PK       | 97.7    | 27.0     | 2.5  | 34.7 | 92.5   | -     | -      | Carrier |
| Vert     | 2400.000  | PK       | 57.7    | 27.0     | 2.4  | 34.7 | 52.4   | 72.5  | 20.1   |         |

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. : 10229481H  
Date : 03/28/2014      03/28/2014      04/01/2014  
Temperature/ Humidity : 22 deg. C / 32% RH    23 deg. C / 31% RH    23 deg. C / 35% RH  
Engineer : Takumi Shimada    Tsubasa Takayama    Kazuya Yoshioka  
Mode : (1-10GHz)    (10-26.5GHz)    (30-1000MHz)  
11n-40 Tx 2437MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 199.677            | QP       | 35.0              | 16.6               | 8.1          | 27.8         | 31.9               | 43.5              | 11.6           |        |
| Hori     | 205.821            | QP       | 35.3              | 16.7               | 8.2          | 27.8         | 32.4               | 43.5              | 11.1           |        |
| Hori     | 244.729            | QP       | 34.0              | 17.0               | 8.4          | 27.7         | 31.7               | 46.0              | 14.3           |        |
| Hori     | 247.094            | QP       | 37.0              | 17.0               | 8.4          | 27.7         | 34.7               | 46.0              | 11.3           |        |
| Hori     | 249.999            | QP       | 40.3              | 17.1               | 8.4          | 27.7         | 38.1               | 46.0              | 7.9            |        |
| Hori     | 875.024            | QP       | 30.8              | 22.1               | 11.0         | 28.0         | 35.9               | 46.0              | 10.1           |        |
| Hori     | 4874.000           | PK       | 44.4              | 32.0               | 4.4          | 33.9         | 46.9               | 73.9              | 27.0           |        |
| Hori     | 7311.000           | PK       | 42.6              | 35.8               | 5.3          | 33.8         | 49.9               | 73.9              | 24.0           |        |
| Hori     | 9748.000           | PK       | 43.5              | 38.3               | 6.1          | 34.5         | 53.4               | 73.9              | 20.5           |        |
| Hori     | 4874.000           | AV       | 31.9              | 32.0               | 4.4          | 33.9         | 34.4               | 53.9              | 19.5           |        |
| Hori     | 7311.000           | AV       | 30.5              | 35.8               | 5.3          | 33.8         | 37.8               | 53.9              | 16.1           |        |
| Hori     | 9748.000           | AV       | 31.6              | 38.3               | 6.1          | 34.5         | 41.5               | 53.9              | 12.4           |        |
| Vert     | 199.676            | QP       | 38.5              | 16.6               | 8.1          | 27.8         | 35.4               | 43.5              | 8.1            |        |
| Vert     | 205.822            | QP       | 38.1              | 16.7               | 8.2          | 27.8         | 35.2               | 43.5              | 8.3            |        |
| Vert     | 244.729            | QP       | 37.3              | 17.0               | 8.4          | 27.7         | 35.0               | 46.0              | 11.0           |        |
| Vert     | 247.094            | QP       | 36.0              | 17.0               | 8.4          | 27.7         | 33.7               | 46.0              | 12.3           |        |
| Vert     | 250.006            | QP       | 41.6              | 17.1               | 8.4          | 27.7         | 39.4               | 46.0              | 6.6            |        |
| Vert     | 875.024            | QP       | 28.6              | 22.1               | 11.0         | 28.0         | 33.7               | 46.0              | 12.3           |        |
| Vert     | 4874.000           | PK       | 42.9              | 32.0               | 4.4          | 33.9         | 45.4               | 73.9              | 28.5           |        |
| Vert     | 7311.000           | PK       | 43.8              | 35.8               | 5.3          | 33.8         | 51.1               | 73.9              | 22.8           |        |
| Vert     | 9748.000           | PK       | 43.9              | 38.3               | 6.1          | 34.5         | 53.8               | 73.9              | 20.1           |        |
| Vert     | 4874.000           | AV       | 31.1              | 32.0               | 4.4          | 33.9         | 33.6               | 53.9              | 20.3           |        |
| Vert     | 7311.000           | AV       | 31.1              | 35.8               | 5.3          | 33.8         | 38.4               | 53.9              | 15.5           |        |
| Vert     | 9748.000           | AV       | 31.5              | 38.3               | 6.1          | 34.5         | 41.4               | 53.9              | 12.5           |        |

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

\*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  
26.5GHz-40GHz    20log(3.0m/0.5m)=15.6dB

**UL Japan, Inc.**

**Ise EMC Lab.**

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/27/2014      03/28/2014  
Temperature/ Humidity : 23 deg. C / 31% RH      23 deg. C / 31% RH  
Engineer : Tsubasa Takayama      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11n-40 Tx 2452MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 2483.500           | PK       | 68.9              | 26.9               | 2.5          | 34.7         | 63.6               | 73.9              | 10.3           |        |
| Hori     | 4904.000           | PK       | 42.1              | 32.0               | 4.4          | 33.9         | 44.6               | 73.9              | 29.3           |        |
| Hori     | 7356.000           | PK       | 42.7              | 35.8               | 5.3          | 33.8         | 50.0               | 73.9              | 23.9           |        |
| Hori     | 9808.000           | PK       | 43.3              | 38.4               | 6.1          | 34.5         | 53.3               | 73.9              | 20.6           |        |
| Hori     | 2483.500           | AV       | 55.1              | 26.9               | 2.5          | 34.7         | 49.8               | 53.9              | 4.1            |        |
| Hori     | 4904.000           | AV       | 30.3              | 32.0               | 4.4          | 33.9         | 32.8               | 53.9              | 21.1           |        |
| Hori     | 7356.000           | AV       | 31.0              | 35.8               | 5.3          | 33.8         | 38.3               | 53.9              | 15.6           |        |
| Hori     | 9808.000           | AV       | 31.4              | 38.4               | 6.1          | 34.5         | 41.4               | 53.9              | 12.5           |        |
| Vert     | 2483.500           | PK       | 65.8              | 26.9               | 2.5          | 34.7         | 60.5               | 73.9              | 13.4           |        |
| Vert     | 4904.000           | PK       | 42.5              | 32.0               | 4.4          | 33.9         | 45.0               | 73.9              | 28.9           |        |
| Vert     | 7356.000           | PK       | 43.9              | 35.8               | 5.3          | 33.8         | 51.2               | 73.9              | 22.7           |        |
| Vert     | 9808.000           | PK       | 43.0              | 38.4               | 6.1          | 34.5         | 53.0               | 73.9              | 20.9           |        |
| Vert     | 2483.500           | AV       | 52.9              | 26.9               | 2.5          | 34.7         | 47.6               | 53.9              | 6.3            |        |
| Vert     | 4904.000           | AV       | 30.6              | 32.0               | 4.4          | 33.9         | 33.1               | 53.9              | 20.8           |        |
| Vert     | 7356.000           | AV       | 31.2              | 35.8               | 5.3          | 33.8         | 38.5               | 53.9              | 15.4           |        |
| Vert     | 9808.000           | AV       | 31.3              | 38.4               | 6.1          | 34.5         | 41.3               | 53.9              | 12.6           |        |

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

\*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

26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/28/2014  
Temperature/ Humidity : 23 deg. C / 31% RH  
Engineer : Tsubasa Takayama  
Mode : 11n-20 Tx 5745MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 11490.000          | PK       | 45.7              | 39.7               | -2.0         | 33.7         | 49.7               | 73.9              | 24.2           |        |
| Hori     | 17235.000          | PK       | 45.9              | 42.3               | -0.3         | 32.5         | 55.4               | 73.9              | 18.5           |        |
| Hori     | 11490.000          | AV       | 33.6              | 39.7               | -2.0         | 33.7         | 37.6               | 53.9              | 16.3           |        |
| Hori     | 17235.000          | AV       | 33.4              | 42.3               | -0.3         | 32.5         | 42.9               | 53.9              | 11.0           |        |
| Vert     | 11490.000          | PK       | 46.0              | 39.7               | -2.0         | 33.7         | 50.0               | 73.9              | 23.9           |        |
| Vert     | 17235.000          | PK       | 46.5              | 42.3               | -0.3         | 32.5         | 56.0               | 73.9              | 17.9           |        |
| Vert     | 11490.000          | AV       | 33.5              | 39.7               | -2.0         | 33.7         | 37.5               | 53.9              | 16.4           |        |
| Vert     | 17235.000          | AV       | 33.4              | 42.3               | -0.3         | 32.5         | 42.9               | 53.9              | 11.0           |        |

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

\*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

26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

\*The 10th harmonic was not seen so the result was its base noise level.

### 20dBc Data Sheet

| Polarity | Frequency | Detector | Reading | Ant.Fac. | Loss | Gain | Result | Limit | Margin | Remark  |
|----------|-----------|----------|---------|----------|------|------|--------|-------|--------|---------|
| Hori     | 5745.000  | PK       | 95.2    | 32.7     | 4.0  | 33.7 | 98.2   | -     | -      | Carrier |
| Hori     | 5725.000  | PK       | 51.2    | 32.7     | 4.0  | 33.7 | 54.2   | 78.2  | 24.0   |         |
| Vert     | 5745.000  | PK       | 94.3    | 32.7     | 4.0  | 33.7 | 97.3   | -     | -      | Carrier |
| Vert     | 5725.000  | PK       | 49.5    | 32.7     | 4.0  | 33.7 | 52.5   | 77.3  | 24.8   |         |

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. : 10229481H  
Date : 03/28/2014  
Temperature/ Humidity : 23 deg. C / 31% RH  
Engineer : Tsubasa Takayama  
Mode : 11n-20 Tx 5785MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 11570.000          | PK       | 45.3              | 39.7               | -1.9         | 33.7         | 49.4               | 73.9              | 24.5           |        |
| Hori     | 17355.000          | PK       | 45.6              | 43.3               | -0.2         | 32.4         | 56.3               | 73.9              | 17.6           |        |
| Hori     | 11570.000          | AV       | 33.3              | 39.7               | -1.9         | 33.7         | 37.4               | 53.9              | 16.5           |        |
| Hori     | 17355.000          | AV       | 33.1              | 43.3               | -0.2         | 32.4         | 43.8               | 53.9              | 10.1           |        |
| Vert     | 11570.000          | PK       | 46.7              | 39.7               | -1.9         | 33.7         | 50.8               | 73.9              | 23.1           |        |
| Vert     | 17355.000          | PK       | 46.1              | 43.3               | -0.2         | 32.4         | 56.8               | 73.9              | 17.1           |        |
| Vert     | 11570.000          | AV       | 33.3              | 39.7               | -1.9         | 33.7         | 37.4               | 53.9              | 16.5           |        |
| Vert     | 17355.000          | AV       | 33.9              | 43.3               | -0.2         | 32.4         | 44.6               | 53.9              | 9.3            |        |

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

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

Distance factor:      10GHz-26.5GHz     $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$   
                                 26.5GHz-40GHz     $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/28/2014  
Temperature/ Humidity : 23 deg. C / 31% RH  
Engineer : Tsubasa Takayama  
Mode : 11n-20 Tx 5825MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 5850.000           | PK       | 50.6              | 32.9               | 4.0          | 33.7         | 53.8               | 73.9              | 20.1           |        |
| Hori     | 11650.000          | PK       | 45.3              | 39.7               | -1.8         | 33.7         | 49.5               | 73.9              | 24.4           |        |
| Hori     | 17475.000          | PK       | 45.7              | 44.3               | -0.2         | 32.4         | 57.4               | 73.9              | 16.5           |        |
| Hori     | 5850.000           | AV       | 34.6              | 32.9               | 4.0          | 33.7         | 37.8               | 53.9              | 16.1           |        |
| Hori     | 11650.000          | AV       | 33.4              | 39.7               | -1.8         | 33.7         | 37.6               | 53.9              | 16.3           |        |
| Hori     | 17475.000          | AV       | 33.3              | 44.3               | -0.2         | 32.4         | 45.0               | 53.9              | 8.9            |        |
| Vert     | 5850.000           | PK       | 51.4              | 32.9               | 4.0          | 33.7         | 54.6               | 73.9              | 19.3           |        |
| Vert     | 11650.000          | PK       | 45.8              | 39.7               | -1.8         | 33.7         | 50.0               | 73.9              | 23.9           |        |
| Vert     | 17475.000          | PK       | 45.6              | 44.3               | -0.2         | 32.4         | 57.3               | 73.9              | 16.6           |        |
| Vert     | 5850.000           | AV       | 38.0              | 32.9               | 4.0          | 33.7         | 41.2               | 53.9              | 12.7           |        |
| Vert     | 11650.000          | AV       | 33.4              | 39.7               | -1.8         | 33.7         | 37.6               | 53.9              | 16.3           |        |
| Vert     | 17475.000          | AV       | 33.2              | 44.3               | -0.2         | 32.4         | 44.9               | 53.9              | 9.0            |        |

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

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

Distance factor: 10GHz-26.5GHz  $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$   
26.5GHz-40GHz  $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

\*The 10th harmonic was not seen so the result was its base noise level.

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## Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
Report No. : 10229481H  
Date : 03/28/2014  
Temperature/ Humidity : 23 deg. C / 31% RH  
Engineer : Tsubasa Takayama  
Mode : 11n-40 Tx 5755MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 11510.000          | PK       | 45.3              | 39.7               | -2.0         | 33.7         | 49.3               | 73.9              | 24.6           |        |
| Hori     | 17265.000          | PK       | 45.3              | 42.6               | -0.2         | 32.5         | 55.2               | 73.9              | 18.7           |        |
| Hori     | 11510.000          | AV       | 34.1              | 39.7               | -2.0         | 33.7         | 38.1               | 53.9              | 15.8           |        |
| Hori     | 17265.000          | AV       | 33.3              | 42.6               | -0.2         | 32.5         | 43.2               | 53.9              | 10.7           |        |
| Vert     | 11510.000          | PK       | 45.8              | 39.7               | -2.0         | 33.7         | 49.8               | 73.9              | 24.1           |        |
| Vert     | 17265.000          | PK       | 46.9              | 42.6               | -0.2         | 32.5         | 56.8               | 73.9              | 17.1           |        |
| Vert     | 11510.000          | AV       | 33.4              | 39.7               | -2.0         | 33.7         | 37.4               | 53.9              | 16.5           |        |
| Vert     | 17265.000          | AV       | 34.9              | 42.6               | -0.2         | 32.5         | 44.8               | 53.9              | 9.1            |        |

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

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

Distance factor: 10GHz-26.5GHz  $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$   
26.5GHz-40GHz  $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

\*The 10th harmonic was not seen so the result was its base noise level.

### 20dBc Data Sheet

| Polarity | Frequency | Detector | Reading | Ant.Fac. | Loss | Gain | Result | Limit | Margin | Remark  |
|----------|-----------|----------|---------|----------|------|------|--------|-------|--------|---------|
| Hori     | 5755.000  | PK       | 91.2    | 32.7     | 4.0  | 33.7 | 94.2   | -     | -      | Carrier |
| Hori     | 5725.000  | PK       | 53.8    | 32.7     | 4.0  | 33.7 | 56.8   | 74.2  | 17.4   |         |
| Vert     | 5755.000  | PK       | 90.6    | 32.7     | 4.0  | 33.7 | 93.6   | -     | -      | Carrier |
| Vert     | 5725.000  | PK       | 57.1    | 32.7     | 4.0  | 33.7 | 60.1   | 73.6  | 13.5   |         |

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. : 10229481H  
Date : 03/28/2014  
Temperature/ Humidity : 23 deg. C / 31% RH  
Engineer : Tsubasa Takayama  
Mode : 11n-40 Tx 5795MHz

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori     | 5850.000           | PK       | 46.3              | 32.9               | 4.0          | 33.7         | 49.5               | 73.9              | 24.4           |        |
| Hori     | 11590.000          | PK       | 45.7              | 39.7               | -1.8         | 33.7         | 49.9               | 73.9              | 24.0           |        |
| Hori     | 17385.000          | PK       | 45.8              | 43.6               | -0.2         | 32.4         | 56.8               | 73.9              | 17.1           |        |
| Hori     | 5850.000           | AV       | 33.2              | 32.9               | 4.0          | 33.7         | 36.4               | 53.9              | 17.5           |        |
| Hori     | 11590.000          | AV       | 33.4              | 39.7               | -1.8         | 33.7         | 37.6               | 53.9              | 16.3           |        |
| Hori     | 17385.000          | AV       | 33.5              | 43.6               | -0.2         | 32.4         | 44.5               | 53.9              | 9.4            |        |
| Vert     | 5850.000           | PK       | 46.8              | 32.9               | 4.0          | 33.7         | 50.0               | 73.9              | 23.9           |        |
| Vert     | 11590.000          | PK       | 45.6              | 39.7               | -1.8         | 33.7         | 49.8               | 73.9              | 24.1           |        |
| Vert     | 17385.000          | PK       | 46.5              | 43.6               | -0.2         | 32.4         | 57.5               | 73.9              | 16.4           |        |
| Vert     | 5850.000           | AV       | 34.9              | 32.9               | 4.0          | 33.7         | 38.1               | 53.9              | 15.8           |        |
| Vert     | 11590.000          | AV       | 33.5              | 39.7               | -1.8         | 33.7         | 37.7               | 53.9              | 16.2           |        |
| Vert     | 17385.000          | AV       | 33.4              | 43.6               | -0.2         | 32.4         | 44.4               | 53.9              | 9.5            |        |

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

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

Distance factor: 10GHz-26.5GHz  $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$   
26.5GHz-40GHz  $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

\*The 10th harmonic was not seen so the result was its base noise level.

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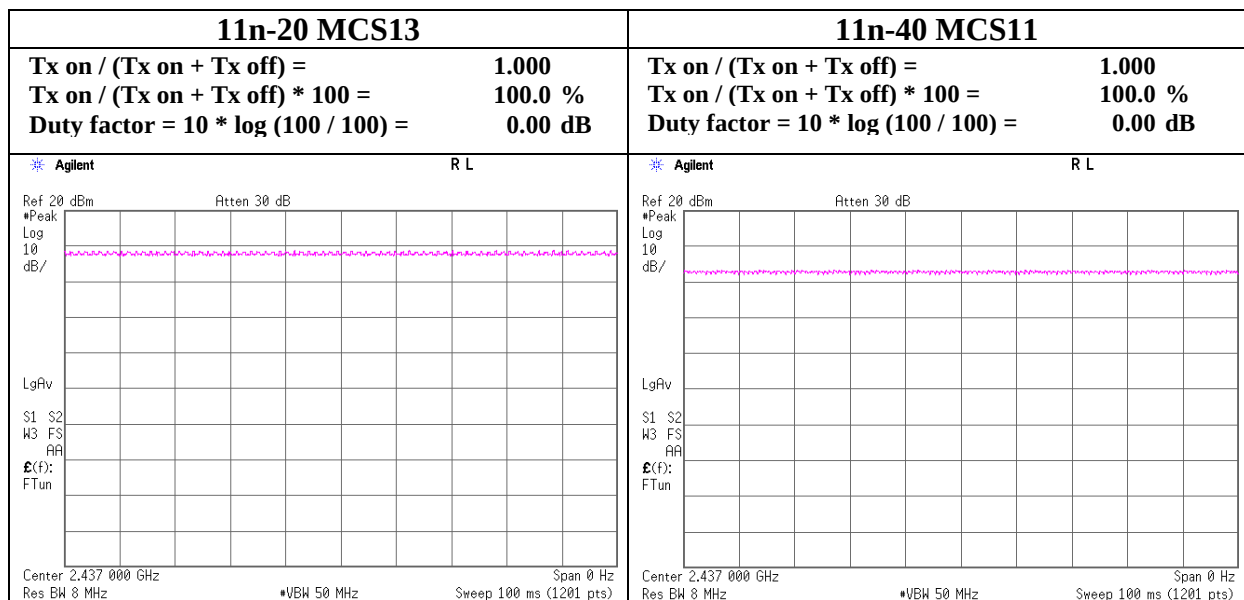
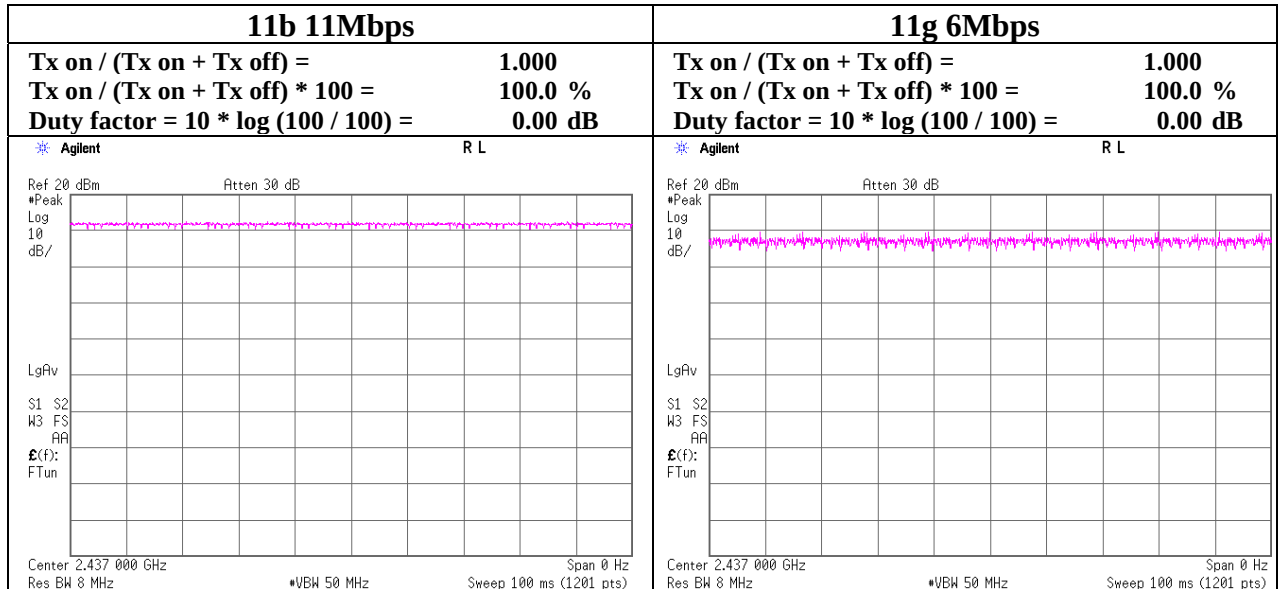
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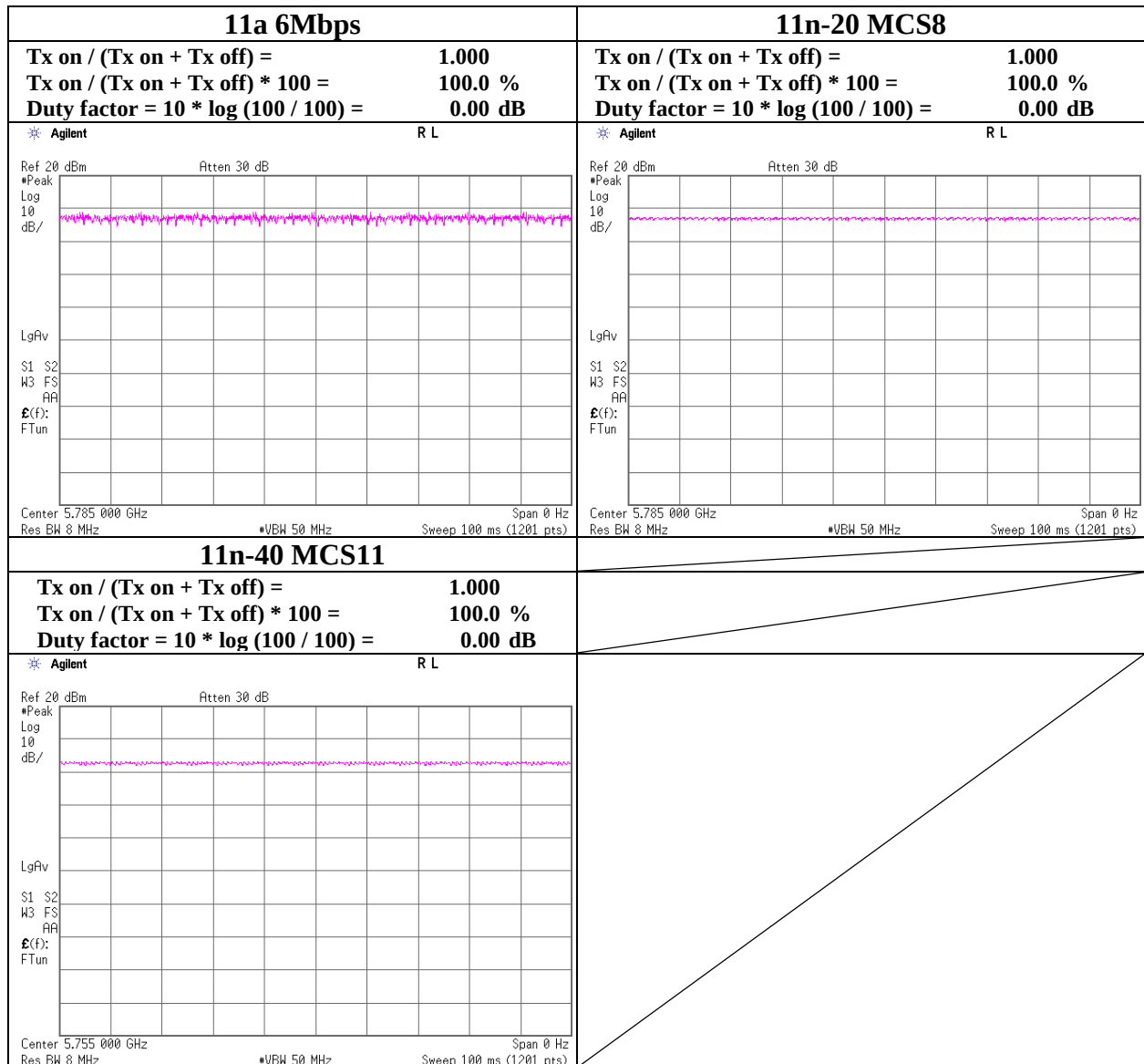
### Burst rate confirmation

|                       |                                      |
|-----------------------|--------------------------------------|
| Test place            | Ise EMC Lab. No.11 Measurement Room  |
| Report No.            | 10229481H                            |
| Date                  | 04/02/2014                           |
| Temperature/ Humidity | 25deg. C / 29% RH                    |
| Engineer              | Yutaka Yoshida                       |
| Mode                  | 11b/11g/11n-20(2.4G)/11n-40(2.4G) Tx |



## Burst rate confirmation

|                       |                                     |
|-----------------------|-------------------------------------|
| Test place            | Ise EMC Lab. No.11 Measurement Room |
| Report No.            | 10229481H                           |
| Date                  | 04/02/2014                          |
| Temperature/ Humidity | 25deg. C / 29% RH                   |
| Engineer              | Yutaka Yoshida                      |
| Mode                  | 11a/11n-20/11n-40(5GHz Band) Tx     |



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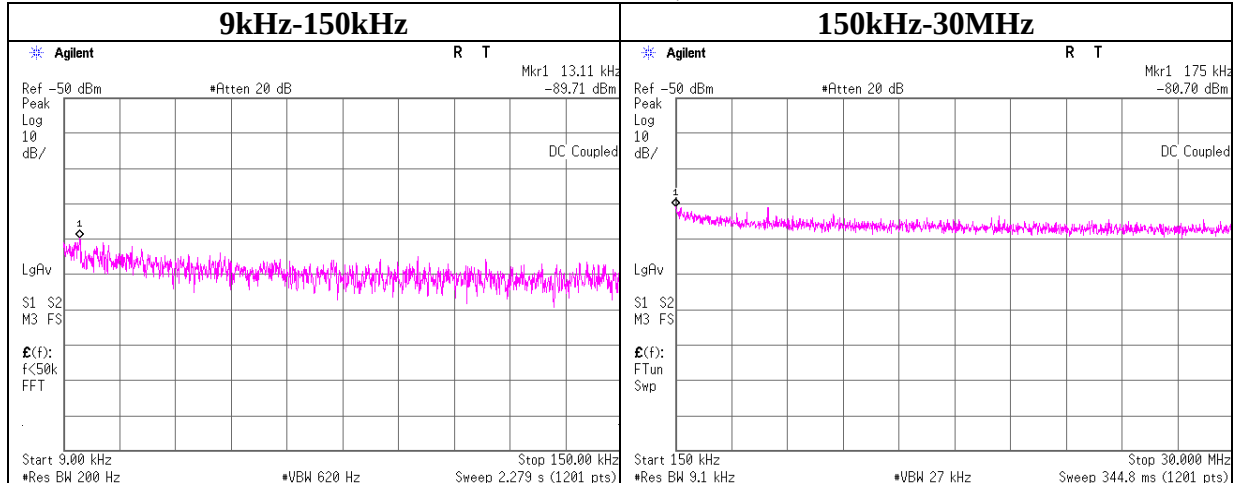
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Conducted Spurious Emission

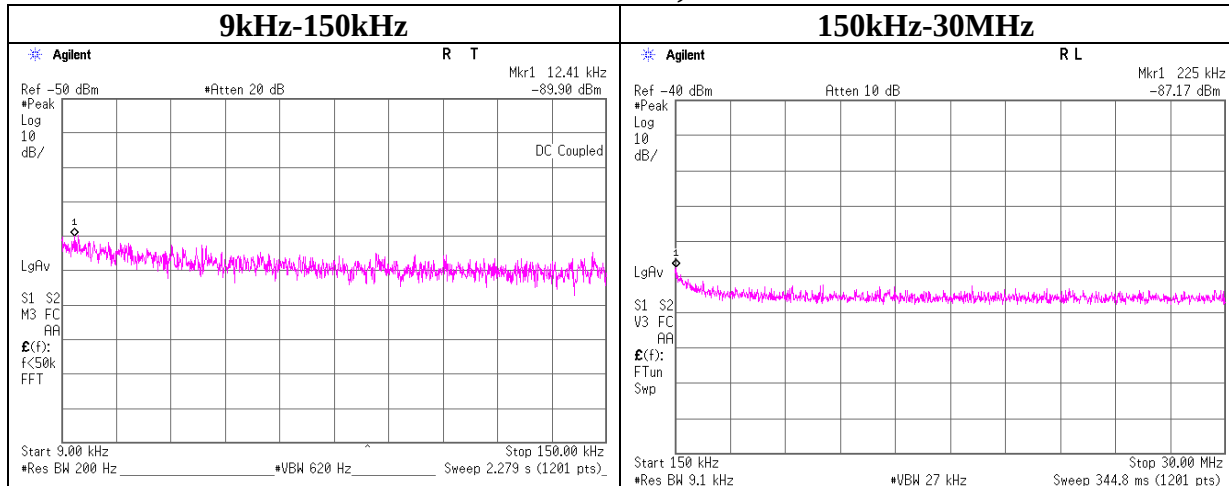
Test place : Ise EMC Lab. No.11 Measurement Room  
Report No. : 10229481H  
Date : 03/28/2014  
Temperature/ Humidity : 24deg. C / 31% RH  
Engineer : Shinya Watanabe  
Mode : 11n-40(2.4G Band)/11a Tx

### 11n-40 Tx 2437MHz, Antenna A



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>[dB] | Antenna<br>Gain<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] |
|--------------------|------------------|-----------------------|--------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|
| 13.11              | -89.71           | 0.40                  | 10.00              | 2.00                     | 2                          | -74.30        | 300.00          | 6.00                     | -13.04                            | 45.25             |
| 175.00             | -80.70           | 0.40                  | 10.00              | 2.00                     | 2                          | -65.29        | 300.00          | 6.00                     | -4.03                             | 22.74             |

### 11n-40 Tx 5755MHz, Antenna B



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>[dB] | Antenna<br>Gain<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] |
|--------------------|------------------|-----------------------|--------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|
| 12.41              | -89.90           | 0.40                  | 10.00              | 2.00                     | 2                          | -74.49        | 300.00          | 6.00                     | -13.23                            | 45.73             |
| 598.00             | -87.17           | 0.40                  | 10.00              | 2.00                     | 2                          | -71.76        | 30.00           | 6.00                     | 9.50                              | 12.07             |

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

EIRP=Reading+Cable Loss+Attenuator+Antenna Gain+10Log(N)

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## Power Density

|                       |                                     |                   |
|-----------------------|-------------------------------------|-------------------|
| Test place            | Ise EMC Lab. No.11 Measurement Room |                   |
| Report No.            | 10229481H                           |                   |
| Date                  | 3/28/2014                           | 04/02/2014        |
| Temperature/ Humidity | 24deg. C / 31% RH                   | 25deg. C / 29% RH |
| Engineer              | Sinya Watanabe                      | Yutaka Yoshida    |
| Mode                  | 11b/g/n-20/n-40 Tx (2.4GHz Band)    |                   |

11b

| Freq.   | Reading | Cable Loss | Atten. | Result | Limit | Margin |
|---------|---------|------------|--------|--------|-------|--------|
| [MHz]   | [dBm]   | [dB]       | [dB]   | [dBm]  | [dBm] | [dB]   |
| 2412.00 | -21.17  | 0.40       | 10.00  | -10.77 | 8.00  | 18.77  |
| 2437.00 | -21.52  | 0.40       | 10.00  | -11.12 | 8.00  | 19.12  |
| 2462.00 | -21.14  | 0.40       | 10.00  | -10.74 | 8.00  | 18.74  |

11g

| Freq.   | Reading | Cable Loss | Atten. | Result | Limit | Margin |
|---------|---------|------------|--------|--------|-------|--------|
| [MHz]   | [dBm]   | [dB]       | [dB]   | [dBm]  | [dBm] | [dB]   |
| 2412.00 | -13.82  | 0.40       | 10.00  | -3.42  | 8.00  | 11.42  |
| 2437.00 | -16.39  | 0.40       | 10.00  | -5.99  | 8.00  | 13.99  |
| 2462.00 | -15.56  | 0.40       | 10.00  | -5.16  | 8.00  | 13.16  |

Sample Calculation:

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

11n-20 MIMO

| Freq.   | Antenna | Reading | Cable Loss | Atten. | Result | Result | Total Result | Total Result | Limit | Margin |
|---------|---------|---------|------------|--------|--------|--------|--------------|--------------|-------|--------|
| [MHz]   |         | [dBm]   | [dB]       | [dB]   | [dBm]  | [mW]   | [dBm]        | [mW]         | [dBm] | [dB]   |
| 2412.00 | A       | -15.33  | 0.40       | 10.00  | -4.93  | 0.32   | -2.21        | 0.60         | 8.00  | 10.21  |
|         | B       | -15.94  | 0.40       | 10.00  | -5.54  | 0.28   |              |              |       |        |
| 2437.00 | A       | -15.57  | 0.40       | 10.00  | -5.17  | 0.30   | -2.36        | 0.58         | 8.00  | 10.36  |
|         | B       | -15.98  | 0.40       | 10.00  | -5.58  | 0.28   |              |              |       |        |
| 2462.00 | A       | -14.67  | 0.40       | 10.00  | -4.27  | 0.37   | -1.86        | 0.65         | 8.00  | 9.86   |
|         | B       | -15.97  | 0.40       | 10.00  | -5.57  | 0.28   |              |              |       |        |

11n-40 MIMO

| Freq.   | Antenna | Reading | Cable Loss | Atten. | Result | Result | Total Result | Total Result | Limit | Margin |
|---------|---------|---------|------------|--------|--------|--------|--------------|--------------|-------|--------|
| [MHz]   |         | [dBm]   | [dB]       | [dB]   | [dBm]  | [mW]   | [dBm]        | [mW]         | [dBm] | [dB]   |
| 2422.00 | A       | -17.42  | 0.40       | 10.00  | -7.02  | 0.20   | -3.85        | 0.41         | 8.00  | 11.85  |
|         | B       | -17.10  | 0.40       | 10.00  | -6.70  | 0.21   |              |              |       |        |
| 2437.00 | A       | -17.16  | 0.40       | 10.00  | -6.76  | 0.21   | -3.42        | 0.46         | 8.00  | 11.42  |
|         | B       | -16.52  | 0.40       | 10.00  | -6.12  | 0.24   |              |              |       |        |
| 2452.00 | A       | -17.13  | 0.40       | 10.00  | -6.73  | 0.21   | -3.34        | 0.46         | 8.00  | 11.34  |
|         | B       | -16.41  | 0.40       | 10.00  | -6.01  | 0.25   |              |              |       |        |

Sample Calculation:

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

Total Result = 10Log(10^(Antenna A Result/10)+10^(Antenna B Result/10))

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## Power Density

Test place : Ise EMC Lab. No.11 Measurement Room  
Report No. : 10229481H  
Date : 04/02/2014  
Temperature/ Humidity : 25deg. C / 29% RH  
Engineer : Yutaka Yoshida  
Mode : 11a/n-20/n-40 Tx (5GHz Band)

### 11a

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|----------------|------------------|-----------------------|----------------|-----------------|----------------|----------------|
| 5745.00        | -13.40           | 1.20                  | 10.04          | -2.16           | 8.00           | 10.16          |
| 5785.00        | -15.84           | 1.20                  | 10.04          | -4.60           | 8.00           | 12.60          |
| 5825.00        | -17.25           | 1.20                  | 10.04          | -6.01           | 8.00           | 14.01          |

### 11n-20 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result<br>[dBm] | Result<br>[mW] | Total<br>Result<br>[dBm] | Total<br>Result<br>[mW] | Limit<br>[dBm] | Margin<br>[dB] |
|----------------|---------|------------------|-----------------------|----------------|-----------------|----------------|--------------------------|-------------------------|----------------|----------------|
| 5745.00        | A       | -16.17           | 1.20                  | 10.04          | -4.93           | 0.32           | -1.53                    | 0.70                    | 8.00           | 9.53           |
|                | B       | -15.42           | 1.20                  | 10.04          | -4.18           | 0.38           |                          |                         |                |                |
| 5785.00        | A       | -16.32           | 1.20                  | 10.04          | -5.08           | 0.31           | -2.35                    | 0.58                    | 8.00           | 10.35          |
|                | B       | -16.89           | 1.20                  | 10.04          | -5.65           | 0.27           |                          |                         |                |                |
| 5825.00        | A       | -17.64           | 1.20                  | 10.04          | -6.40           | 0.23           | -2.82                    | 0.52                    | 8.00           | 10.82          |
|                | B       | -16.56           | 1.20                  | 10.04          | -5.32           | 0.29           |                          |                         |                |                |

### 11n-40 MIMO

| Freq.<br>[MHz] | Antenna | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result<br>[dBm] | Result<br>[mW] | Total<br>Result<br>[dBm] | Total<br>Result<br>[mW] | Limit<br>[dBm] | Margin<br>[dB] |
|----------------|---------|------------------|-----------------------|----------------|-----------------|----------------|--------------------------|-------------------------|----------------|----------------|
| 5755.00        | A       | -18.33           | 1.20                  | 10.04          | -7.09           | 0.20           | -3.42                    | 0.45                    | 8.00           | 11.42          |
|                | B       | -17.10           | 1.20                  | 10.04          | -5.86           | 0.26           |                          |                         |                |                |
| 5795.00        | A       | -18.60           | 1.20                  | 10.04          | -7.36           | 0.18           | -4.30                    | 0.37                    | 8.00           | 12.30          |
|                | B       | -18.50           | 1.20                  | 10.04          | -7.26           | 0.19           |                          |                         |                |                |

Sample Calculation:

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

Total Result =  $10\log(10^{(\text{Antenna A Result}/10)} + 10^{(\text{Antenna B Result}/10)})$

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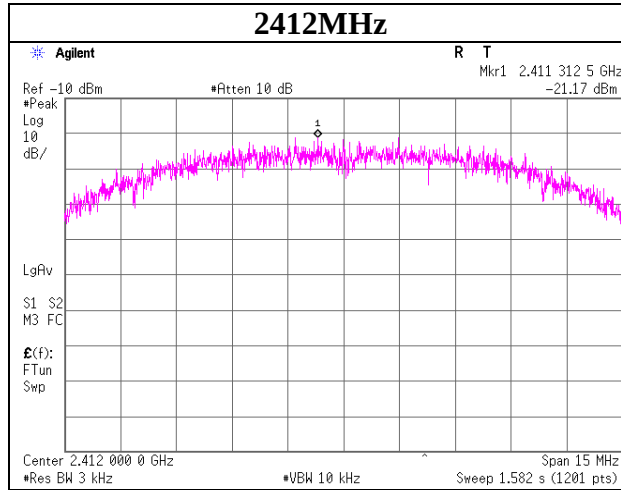
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Telephone : +81 596 24 8999

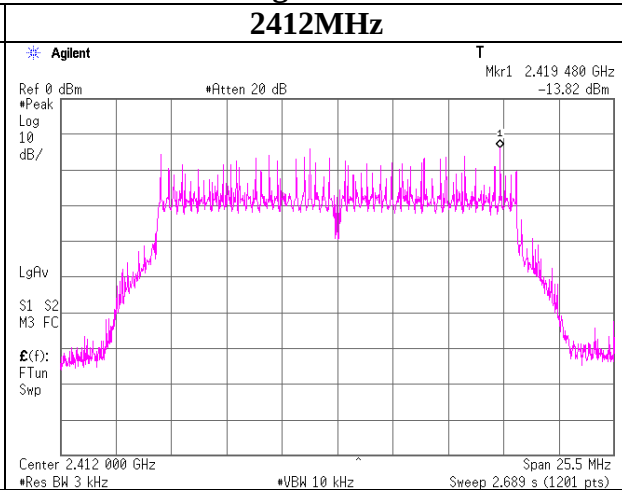
Facsimile : +81 596 24 8124

## Power Density

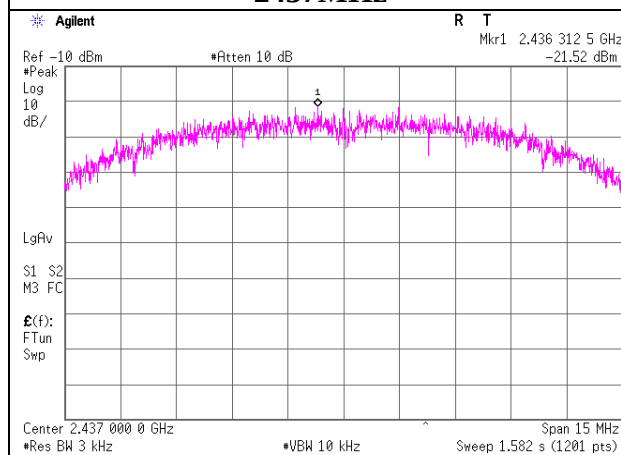
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**2412MHz**



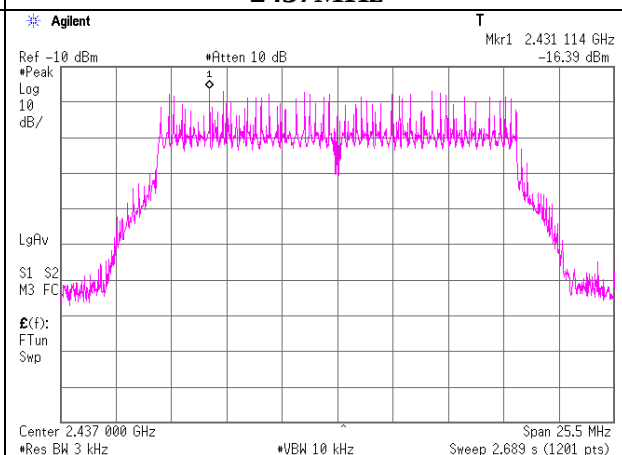
**11g ANT B**  
**2412MHz**



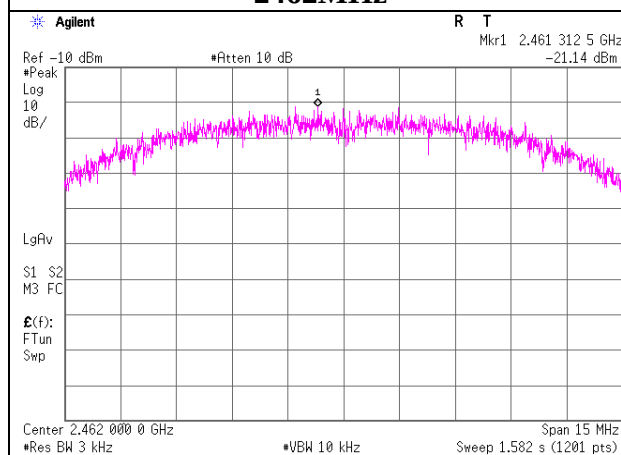
**2437MHz**



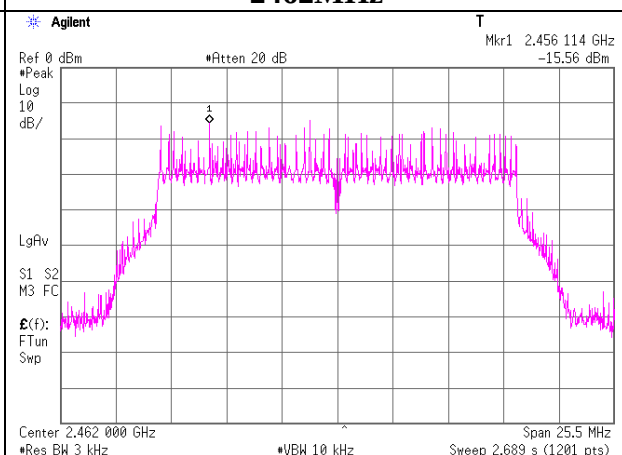
**2437MHz**



**2462MHz**



**2462MHz**



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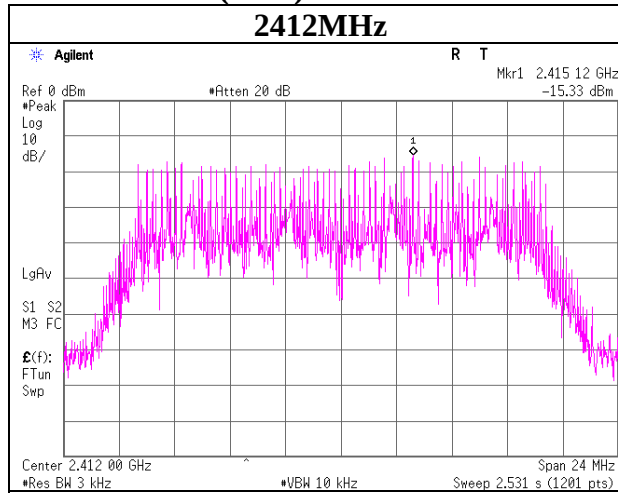
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Telephone : +81 596 24 8999

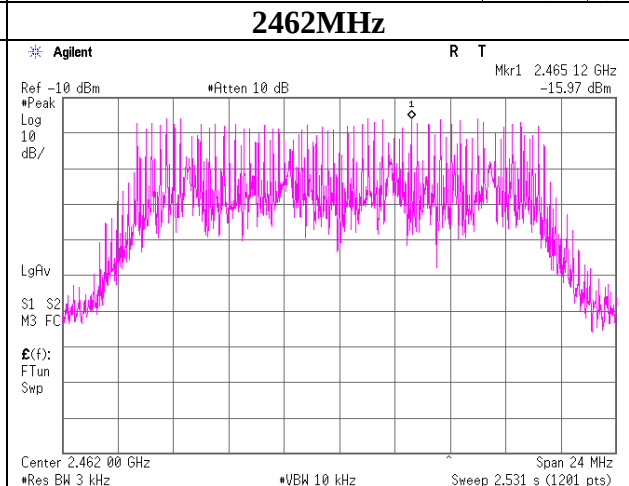
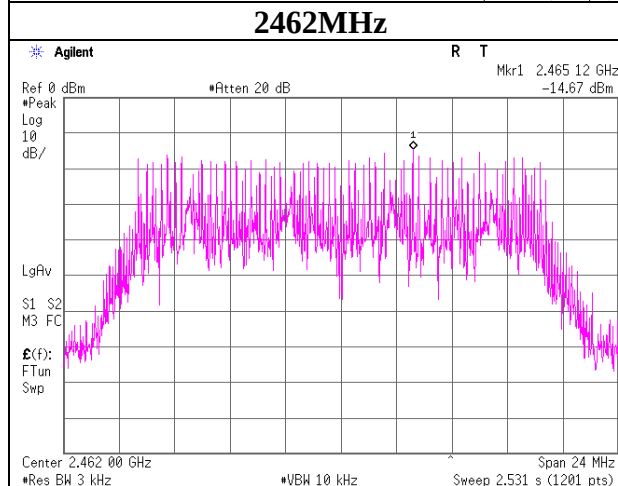
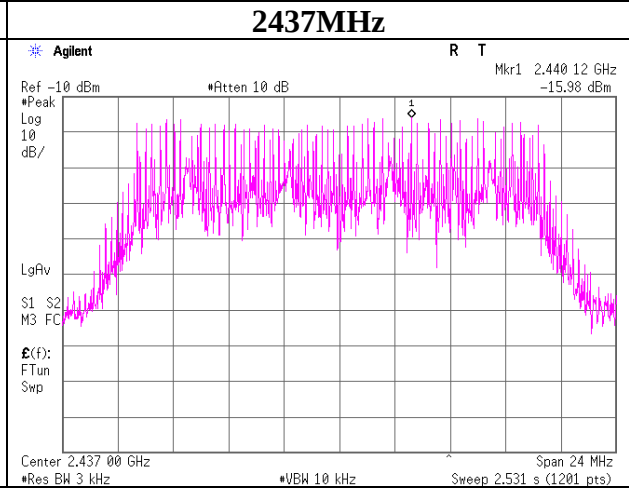
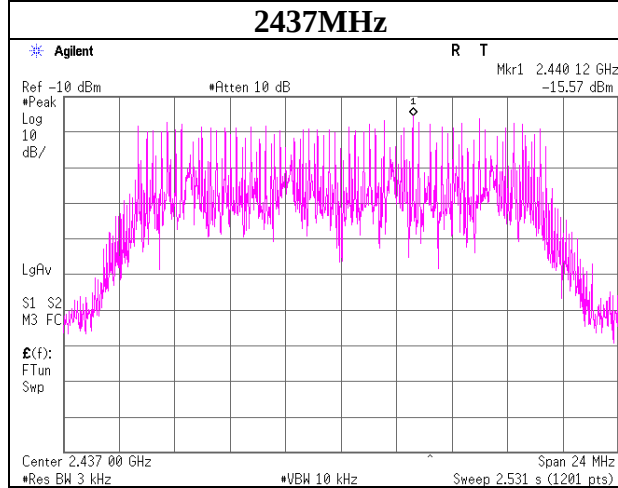
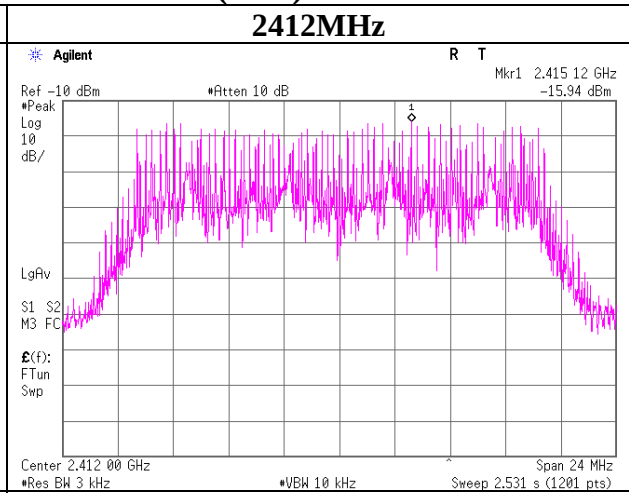
Facsimile : +81 596 24 8124

## Power Density

11n-20(2.4G) MIMO ANT A



11n-20(2.4G) MIMO ANT B



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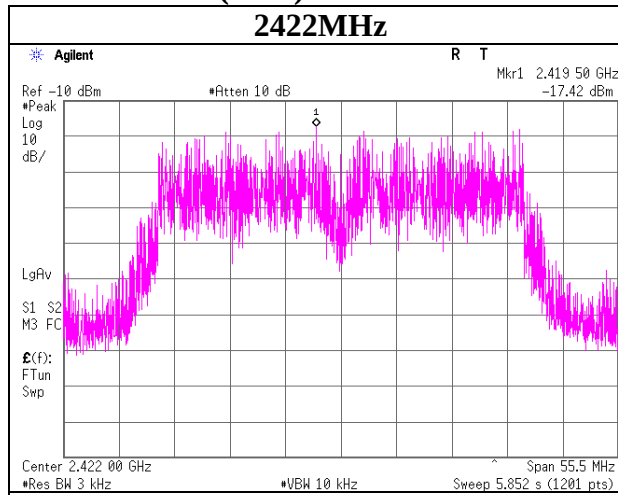
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Telephone : +81 596 24 8999

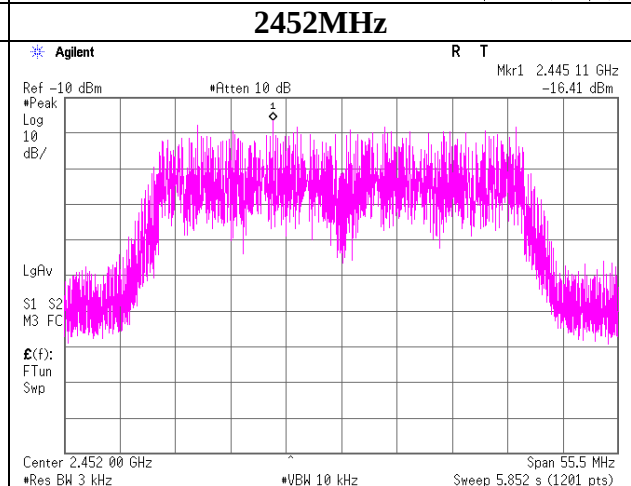
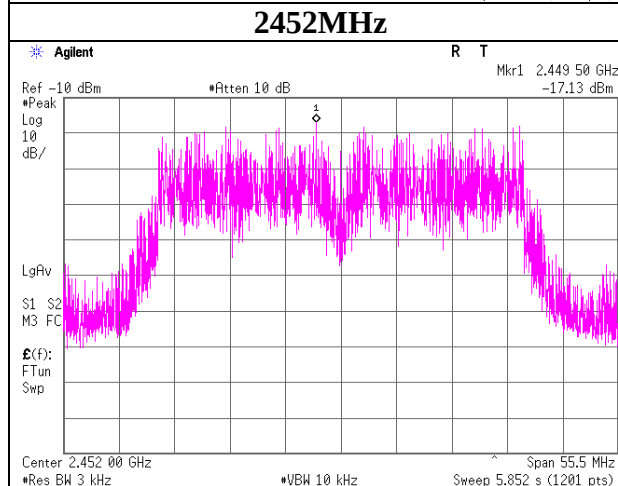
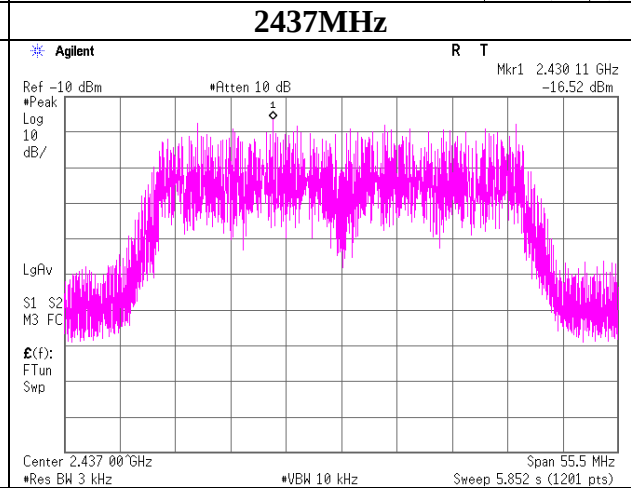
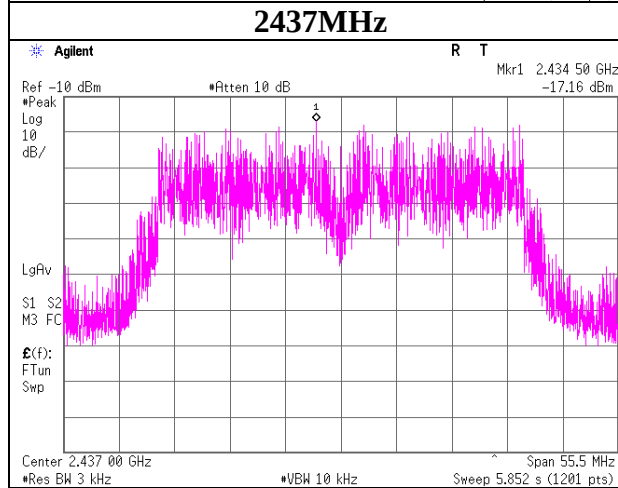
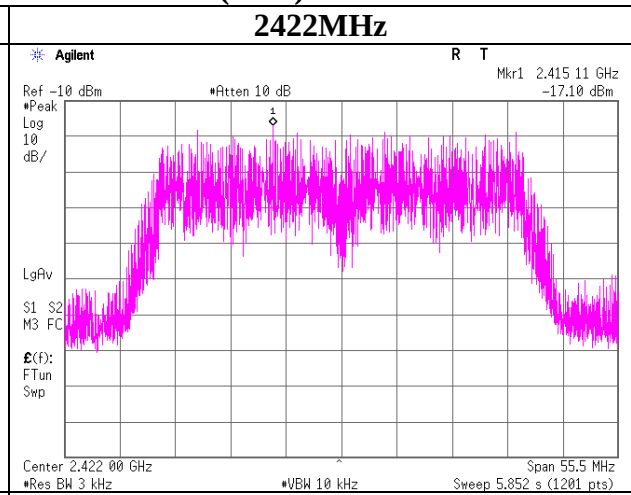
Facsimile : +81 596 24 8124

## Power Density

11n-40(2.4G) MIMO ANT A



11n-40(2.4G) MIMO ANT B



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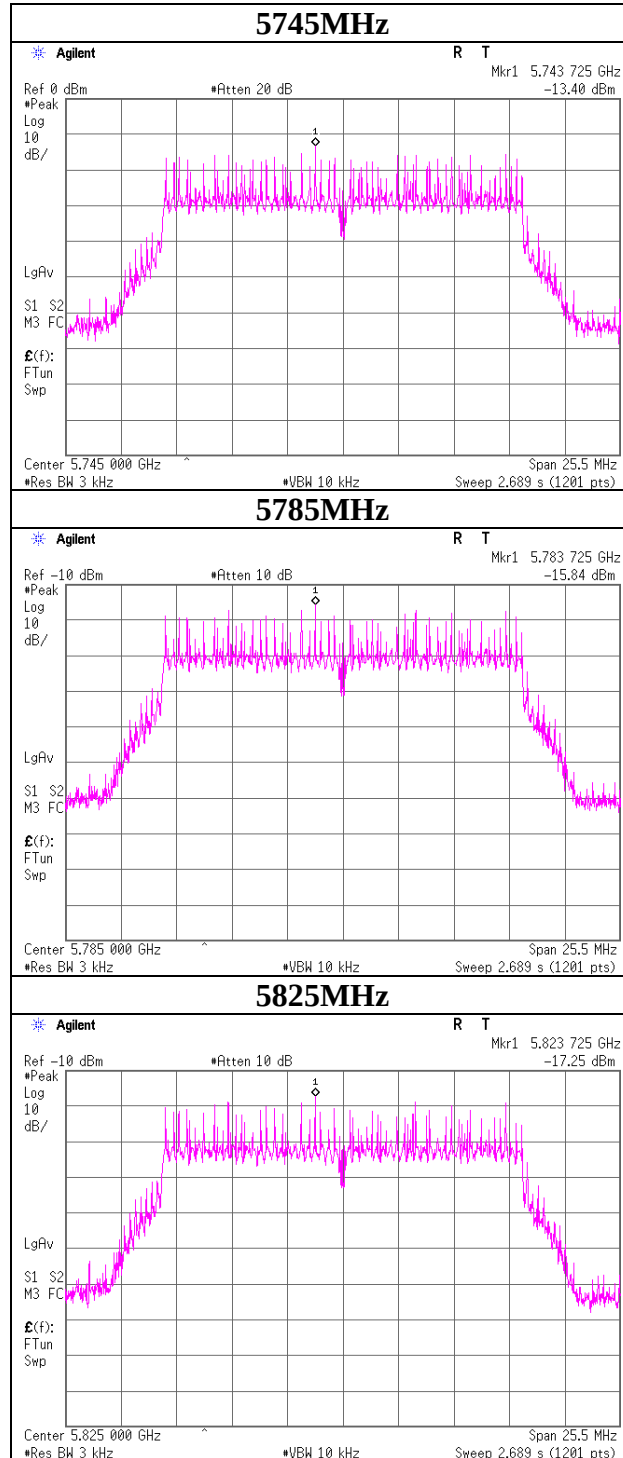
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## Power Density

11a



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**Ise EMC Lab.**

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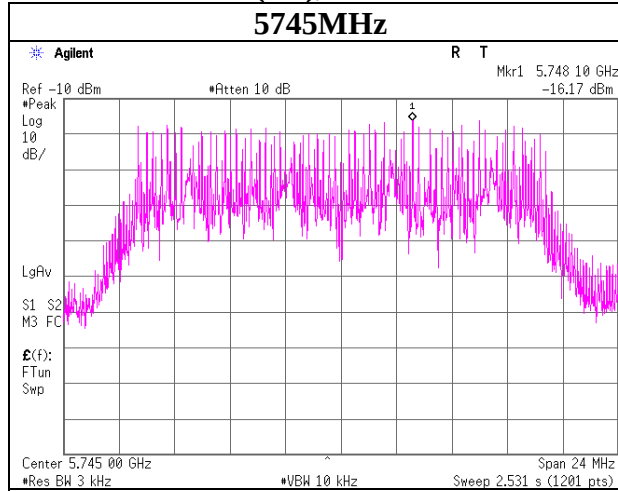
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Power Density

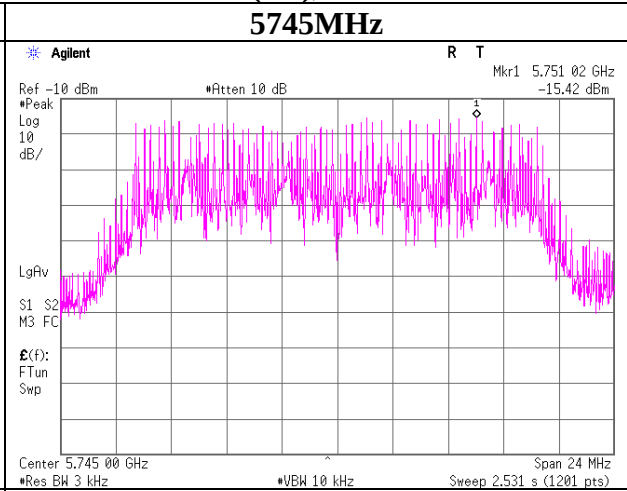
11n-20(5G), Antenna A

5745MHz

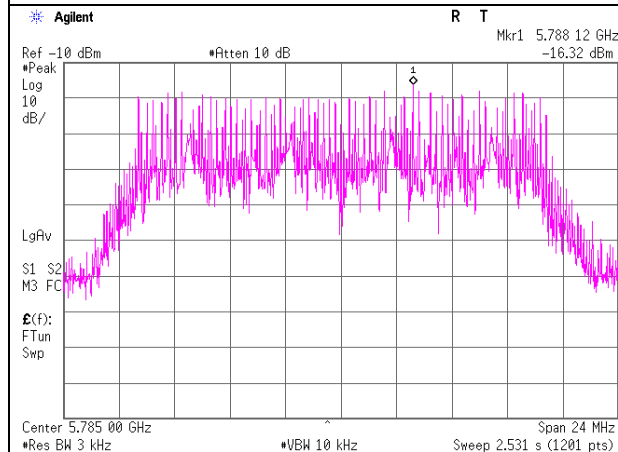


11n-20(5G), Antenna B

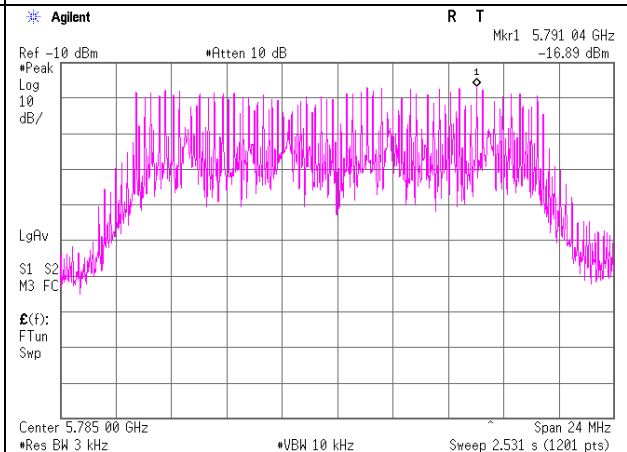
5745MHz



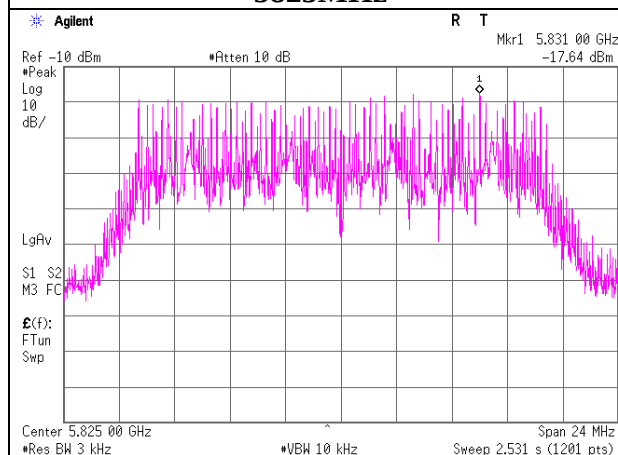
5785MHz



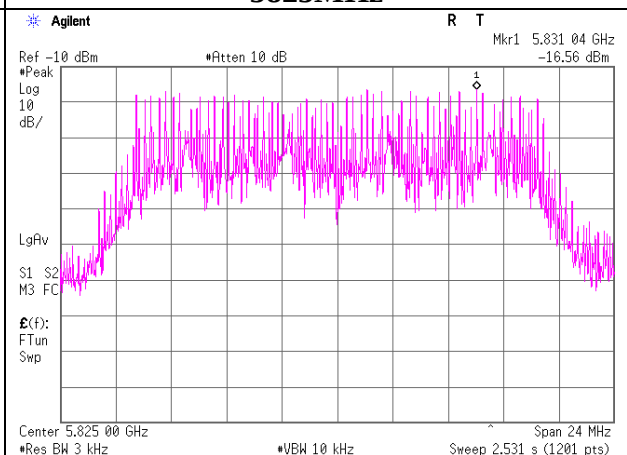
5785MHz



5825MHz



5825MHz



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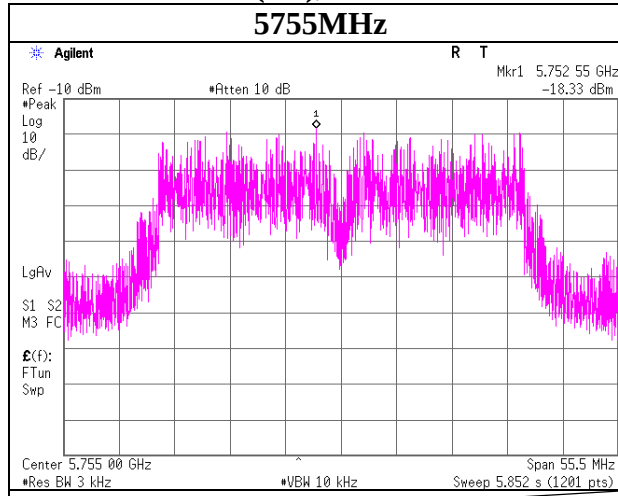
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Power Density

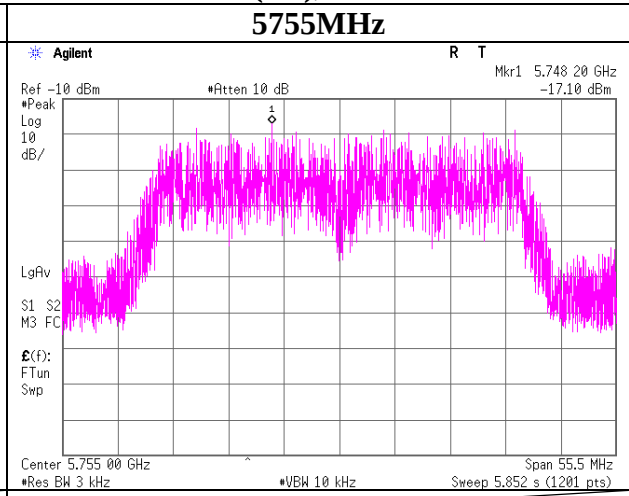
11n-40(5G), Antenna A

5755MHz

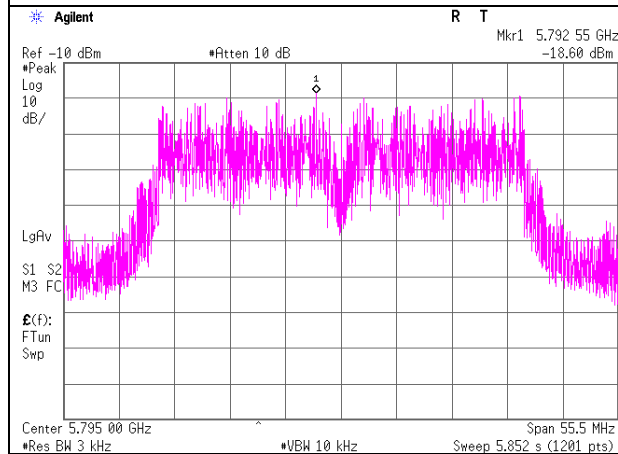


11n-40(5G), Antenna B

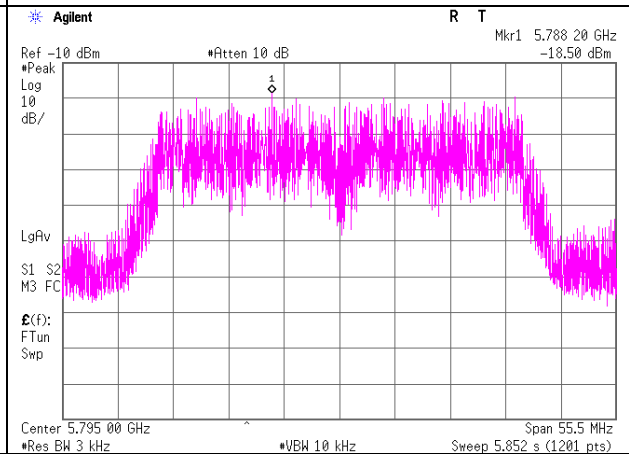
5755MHz



5795MHz



5795MHz



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Ise EMC Lab.

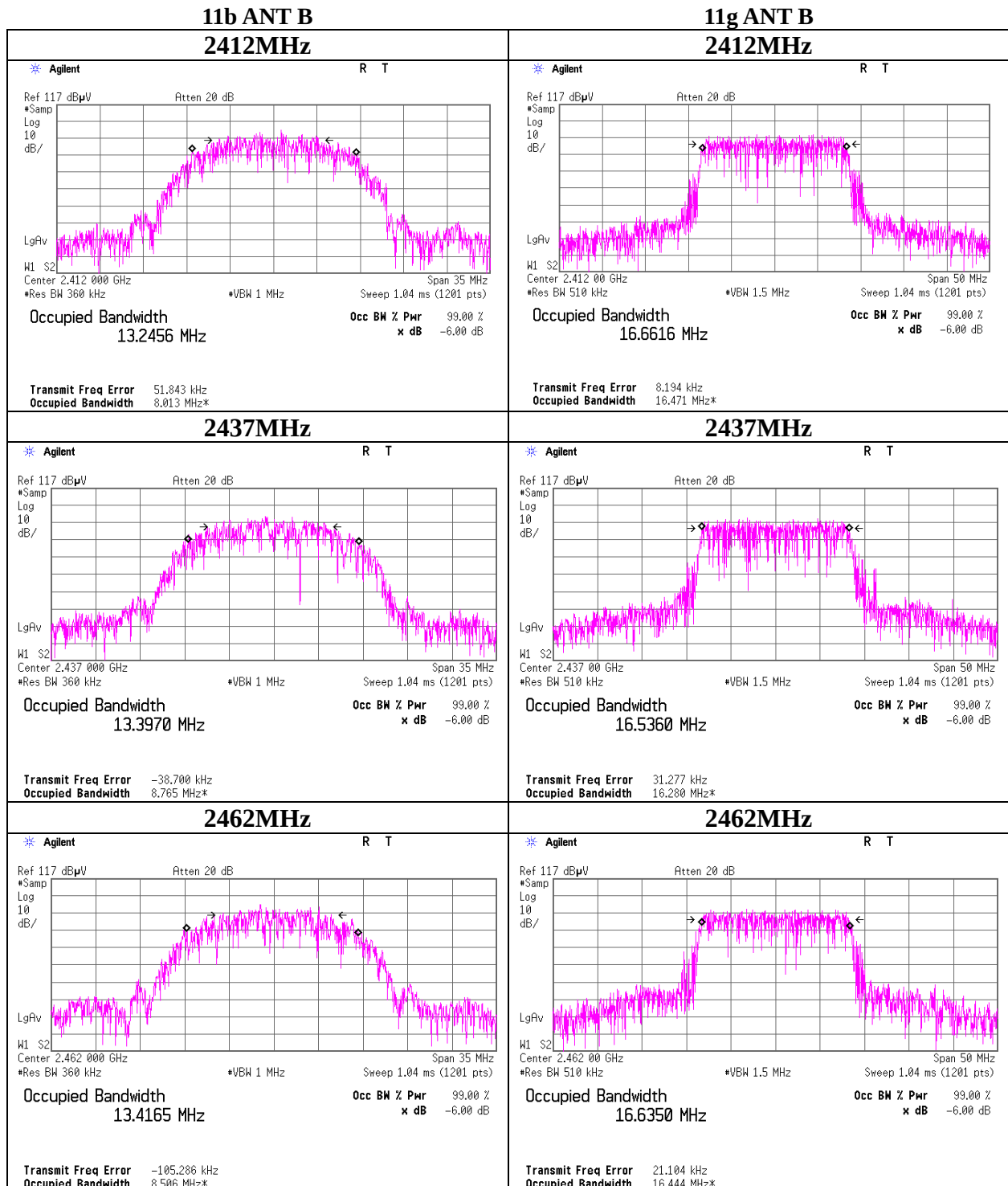
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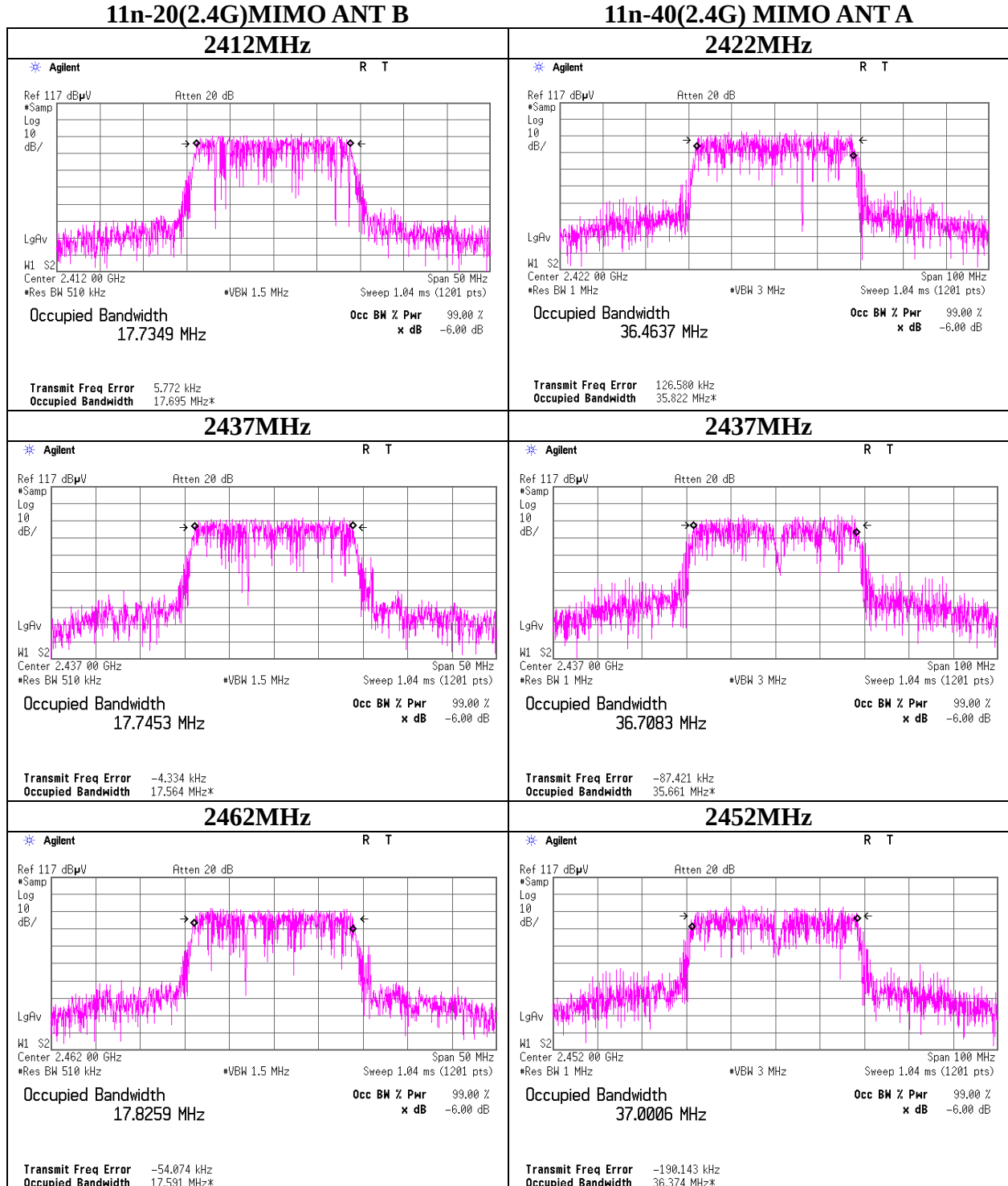
## 99% Occupied Bandwidth

|                       |                                     |
|-----------------------|-------------------------------------|
| Test place            | Ise EMC Lab. No.11 Measurement Room |
| Report No.            | 10229481H                           |
| Date                  | 05/14/2014                          |
| Temperature/ Humidity | 24deg. C / 42% RH                   |
| Engineer              | Takumi Shimada                      |
| Mode                  | 11b/g Tx                            |



## 99% Occupied Bandwidth

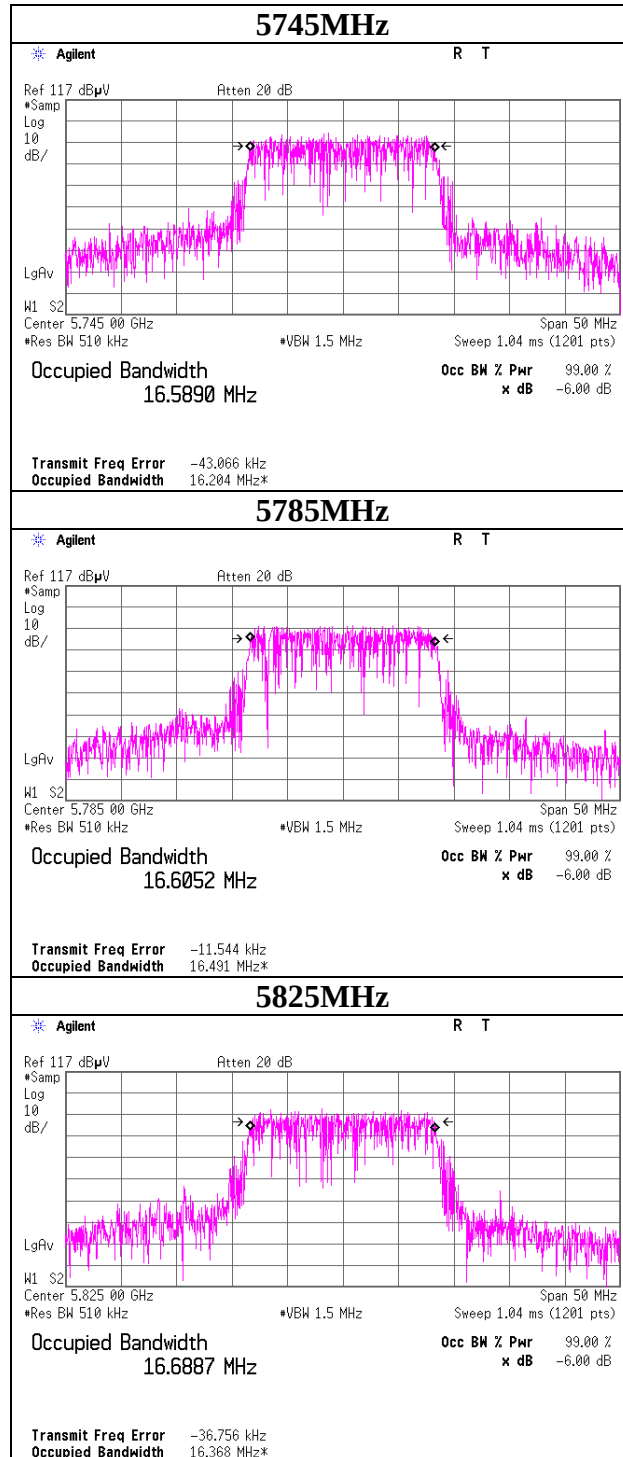
|                       |                                     |
|-----------------------|-------------------------------------|
| Test place            | Ise EMC Lab. No.11 Measurement Room |
| Report No.            | 10229481H                           |
| Date                  | 05/14/2014                          |
| Temperature/ Humidity | 24deg. C / 42% RH                   |
| Engineer              | Takumi Shimada                      |
| Mode                  | 11n-20/n-40 Tx (2.4GHz Band)        |



### 99%Occupied Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room  
Report No. 10229481H  
Date 05/14/2014  
Temperature/ Humidity 24deg. C / 42% RH  
Engineer Takumi Shimada  
Mode 11a Tx

#### 11a



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Ise EMC Lab.

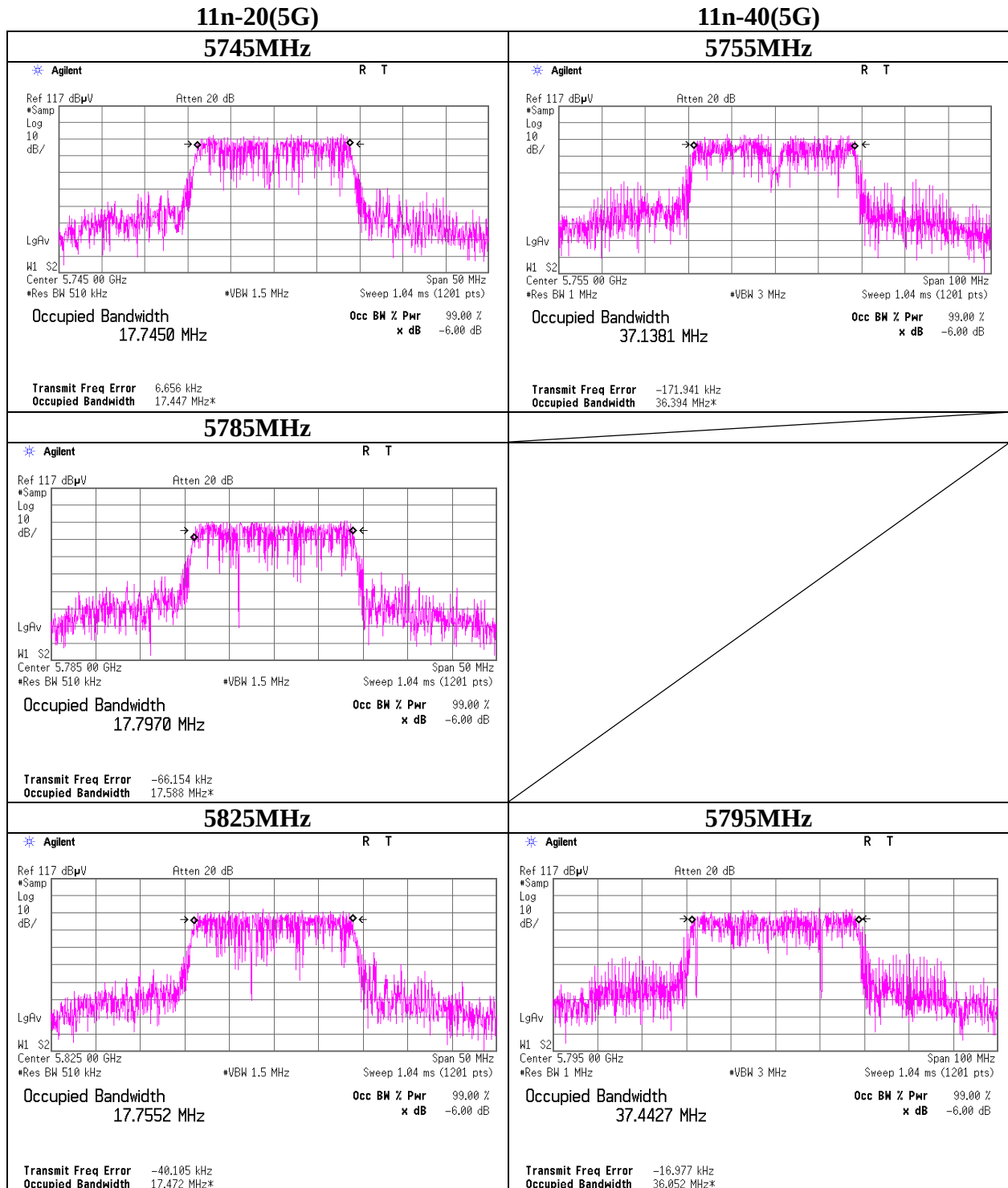
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## 99% Occupied Bandwidth

Test place : Ise EMC Lab. No.11 Measurement Room  
Report No. : 10229481H  
Date : 05/14/2014  
Temperature/ Humidity : 24deg. C / 42% RH  
Engineer : Takumi Shimada  
Mode : 11n-20/n-40 Tx (5GHz Band)



## APPENDIX 2: Test instruments

### EMI test equipment(1/2)

| Control No. | Instrument                       | Manufacturer     | Model No                 | Serial No                      | Test Item | Calibration Date *<br>Interval(month) |
|-------------|----------------------------------|------------------|--------------------------|--------------------------------|-----------|---------------------------------------|
| MPM-08      | Power Meter                      | Anritsu          | ML2495A                  | 6K00003338                     | AT        | 2013/10/15 * 12                       |
| MPM-09      | Power Meter                      | Anritsu          | ML2495A                  | 6K00003348                     | AT        | 2013/10/21 * 12                       |
| MPSE-11     | Power sensor                     | Anritsu          | MA2411B                  | 011737                         | AT        | 2013/10/15 * 12                       |
| MPSE-12     | Power sensor                     | Anritsu          | MA2411B                  | 011598                         | AT        | 2013/10/21 * 12                       |
| MAT-22      | Attenuator(10dB) 1-18GHz         | Orient Microwave | BX10-0476-00             | -                              | AT        | 2014/03/13 * 12                       |
| MAT-25      | Attenuator(10dB)(above 1GHz)     | Agilent          | 8493C                    | 71642                          | AT        | 2013/06/20 * 12                       |
| MRENT-115   | Spectrum Analyzer                | Agilent          | E4440A                   | MY4618390                      | AT        | 2014/02/28 * 12                       |
| MAEC-02     | Semi Anechoic Chamber(NSA)       | TDK              | Semi Anechoic Chamber 3m | DA-06902                       | RE/CE     | 2013/06/30 * 12                       |
| MOS-22      | Thermo-Hygrometer                | Custom           | CTH-201                  | 0003                           | RE/CE     | 2014/02/20 * 12                       |
| MJM-14      | Measure                          | KOMELON          | KMC-36                   | -                              | RE/CE     | -                                     |
| COTS-MEMI   | EMI measurement program          | TSJ              | TEPTO-DV                 | -                              | RE/CE     | -                                     |
| MSA-13      | Spectrum Analyzer                | Agilent          | E4440A                   | MY46185823                     | RE        | 2013/06/14 * 12                       |
| MHA-06      | Horn Antenna 1-18GHz             | Schwarzbeck      | BBHA9120D                | 254                            | RE        | 2014/02/21 * 12                       |
| MCC-166     | Microwave Cable                  | Junkosha         | MWX221                   | 1303S120(1m) /<br>1311S167(5m) | RE        | 2013/11/27 * 12                       |
| MPA-10      | Pre Amplifier                    | Agilent          | 8449B                    | 3008A02142                     | RE        | 2014/01/21 * 12                       |
| MHF-06      | High Pass Filter 3.5-24GHz       | TOKIMEC          | TF323DCA                 | 601                            | RE        | 2013/05/30 * 12                       |
| MOS-19      | Thermo-Hygrometer                | Custom           | CTH-201                  | 0001                           | AT        | 2013/12/17 * 12                       |
| MHA-02      | Horn Antenna 18-26.5GHz          | EMCO             | 3160-09                  | 1265                           | RE        | 2014/02/21 * 12                       |
| MHA-04      | Horn Antenna 26.5-40GHz          | EMCO             | 3160-10                  | 1140                           | RE        | 2013/11/25 * 12                       |
| MPA-03      | Microwave System Power Amplifier | Agilent          | 83050A                   | 3950M00205                     | RE        | 2013/06/20 * 12                       |
| MCC-54      | Microwave Cable                  | Suhner           | SUCOFLEX101              | 2873(1m) /<br>2876(5m)         | RE        | 2014/03/11 * 12                       |
| MSA-03      | Spectrum Analyzer                | Agilent          | E4448A                   | MY44020357                     | RE        | 2013/11/15 * 12                       |
| MHF-16      | High Pass Filter 7-20GHz         | TOKIMEC          | TF37NCCA                 | 7001                           | RE        | 2013/09/25 * 12                       |
| MCC-79      | Microwave Cable 1G-26.5GHz       | Suhner           | SUCOFLEX104              | 278923/4                       | RE        | 2013/12/24 * 12                       |
| MSA-10      | Spectrum Analyzer                | Agilent          | E4448A                   | MY46180655                     | RE/CE     | 2014/02/20 * 12                       |
| MTR-03      | Test Receiver                    | Rohde & Schwarz  | ESCI                     | 100300                         | RE/CE     | 2013/06/11 * 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                       |

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**EMI test equipment(2/2)**

| Control No. | Instrument        | Manufacturer         | Model No                                   | Serial No  | Test Item | Calibration Date *<br>Interval(month) |
|-------------|-------------------|----------------------|--------------------------------------------|------------|-----------|---------------------------------------|
| MLS-07      | LISN(AMN)         | Schwarzbeck          | NSLK8127                                   | 8127364    | CE(EUT)   | 2014/01/27 * 12                       |
| MLS-06      | LISN(AMN)         | Schwarzbeck          | NSLK8127                                   | 8127363    | CE(AE)    | 2014/01/27 * 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                       |
| MTA-31      | Terminator        | TME                  | CT-01                                      | -          | CE        | 2014/01/20 * 12                       |
| MTA-24      | Terminator        | Weinschel            | M1459A                                     | P6087      | AT        | Pre Check                             |
| MSA-04      | Spectrum Analyzer | Agilent              | E4448A                                     | US44300523 | AT        | 2013/11/25 * 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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