



# **RADIO TEST REPORT**

**Test Report No. : 11504641S-B**

**Applicant** : JVC KENWOOD Corporation  
**Type of Equipment** : GPS Navigation System  
**Model No.** : ECI1-MC100K  
**FCC ID** : IOMKC014  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**Test Result** : Complied

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

**Date of test:** November 3 to December 15, 2016

**Representative test engineer:**



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**Approved by:**



Toyokazu Imamura  
Leader  
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

## REVISION HISTORY

**Original Test Report No.: 11504641S-B**

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## **SECTION 1: Customer information**

|                  |   |                                                           |
|------------------|---|-----------------------------------------------------------|
| Company Name     | : | JVC KENWOOD Corporation                                   |
| Address          | : | 2967-3, Ishikawa-mach, Hachioji-shi, Tokyo 192-8525 Japan |
| Telephone Number | : | +81-42-646-5525                                           |
| Facsimile Number | : | +81-42-646-7801                                           |
| Contact Person   | : | Hitoshi Aiso                                              |

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

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

|                            |   |                                                                                           |
|----------------------------|---|-------------------------------------------------------------------------------------------|
| Type of Equipment          | : | GPS Navigation System                                                                     |
| Model No.                  | : | ECI1-MC100K                                                                               |
| Serial No.                 | : | Refer to Section 4, Clause 4.2                                                            |
| Rating                     | : | DC 12 V                                                                                   |
| Receipt Date of Sample     | : | October 28, 2016                                                                          |
| Country of Mass-production | : | Japan                                                                                     |
| Condition of EUT           | : | Production prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification of EUT        | : | No Modification by the test lab                                                           |

### **2.2 Product Description**

Model: ECI1-MC100K (referred to as the EUT in this report) is a GPS Navigation System.

## **Radio Specification**

### **[WLAN]**

|                                 |   |                                             |
|---------------------------------|---|---------------------------------------------|
| Radio Type                      | : | Transceiver                                 |
| Frequency of Operation          | : | 2412 MHz - 2462 MHz                         |
| Modulation                      | : | DSSS                                        |
| Power Supply (radio part input) | : | DC 3.3 V/ 1.8 V                             |
| Antenna type                    | : | Inverted F Pattern Antenna                  |
| Antenna Gain                    | : | Antenna 1 : -2.2 dBi    Antenna 2 : 1.5 dBi |
| Clock frequency (Maximum)       | : | 6.3 GHz                                     |

### **[Bluetooth]**

|                                 |   |                            |
|---------------------------------|---|----------------------------|
| Radio Type                      | : | Transceiver                |
| Frequency of Operation          | : | 2402 MHz - 2480 MHz        |
| Modulation                      | : | FHSS                       |
| Power Supply (radio part input) | : | DC 3.3 V/ 1.8 V            |
| Antenna type                    | : | Inverted F Pattern Antenna |
| Antenna Gain                    | : | 1.5 dBi (Antenna 2)        |
| Clock frequency (Maximum)       | : | 6.3 GHz                    |

### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

\* The revision on November 14, 2016, 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 C63.10-2013<br>6. Standard test methods<br>IC: RSS-Gen 8.8 | FCC: Section 15.207<br>IC: RSS-Gen 8.8                                   |                                                              | N/A      | *1)                                                               |
| 6dB Bandwidth                              | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: -             | FCC: Section<br>15.247(a)(2)<br>IC: RSS-247 5.2(1)                       | See data.                                                    | Complied | Conducted                                                         |
| Maximum Peak<br>Output Power               | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: RSS-Gen 6.12  | FCC: Section<br>15.247(b)(3)<br>IC: RSS-247 5.4(4)                       |                                                              | Complied | Conducted                                                         |
| Power Density                              | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: -             | FCC: Section 15.247(e)<br>IC: RSS-247 5.2(2)                             |                                                              | Complied | Conducted                                                         |
| Spurious Emission<br>Restricted Band Edges | FCC: KDB 558074 D01 DTS Meas<br>Guidance v03r05<br>IC: RSS-Gen 6.13  | FCC: Section 15.247(d)<br>IC: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 5.2 dB<br>2483.500 MHz, AV, Vert.<br>Tx 11n-20 MIMO 2462 MHz | Complied | Conducted<br>(below 30 MHz)/<br>Radiated<br>(above 30 MHz)<br>*2) |

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

\*1) The test is not applicable since the EUT has no AC mains.

\*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.

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

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

The equipment provides the wireless transmitter with stable power supply (DC 3.3 V / 1.8 V). Instead of a new battery, DC power supply was used for the test. That does not affect the test result. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

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

### 3.3 Addition to standard

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

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

#### EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k = 2$ .  
Shonan EMC Lab.

| Item                                             | Frequency range | Uncertainty (+/-) |                |                |                |              |
|--------------------------------------------------|-----------------|-------------------|----------------|----------------|----------------|--------------|
|                                                  |                 | No. 1 SAC / SR    | No. 2 SAC / SR | No. 3 SAC / SR | No. 4 SAC / SR | No. 5,6,8 SR |
| Conducted emission (AC Mains) LISN               | 150 kHz-30 MHz  | 2.6 dB            | 2.5 dB         | 2.6 dB         | 2.5 dB         | 2.5 dB       |
| Radiated emission<br>(Measurement distance: 3 m) | 9 kHz-30 MHz    | 3.1 dB            | 3.1 dB         | 3.1 dB         | -              | -            |
|                                                  | 30 MHz-200 MHz  | 4.6 dB            | 4.4 dB         | 4.6 dB         | -              | -            |
|                                                  | 200 MHz-1 GHz   | 5.8 dB            | 5.7 dB         | 5.8 dB         | -              | -            |
|                                                  | 1 GHz-13 GHz    | 4.9 dB            | 4.9 dB         | 4.9 dB         | -              | -            |
| Radiated emission<br>(Measurement distance: 1 m) | 13 GHz-18 GHz   | 4.6 dB            | 4.6 dB         | 4.6 dB         | -              | -            |
|                                                  | 18 GHz-40 GHz   | 4.9 dB            | 4.9 dB         | 4.9 dB         | -              | -            |

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

| Antenna terminal test                                   | Uncertainty (+/-) |
|---------------------------------------------------------|-------------------|
| Power Measurement above 1 GHz (Average Detector)_SPM-06 | 0.72 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-06    | 0.85 dB           |
| Power Measurement above 1 GHz (Average Detector)_SPM-07 | 0.74 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-07    | 0.91 dB           |
| Spurious emission (Conducted) below 1GHz                | 1.6 dB            |
| Spurious emission (Conducted) 1 GHz-3 GHz               | 1.3 dB            |
| Spurious emission (Conducted) 3 GHz-18 GHz              | 2.2 dB            |
| Spurious emission (Conducted) 18 GHz-26.5 GHz           | 2.3 dB            |
| Spurious emission (Conducted) 26.5 GHz-40 GHz           | 2.4 dB            |
| Bandwidth Measurement                                   | 1.01 %            |
| Duty cycle and Time Measurement                         | 0.012 %           |

#### Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

### 3.5 Test Location

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 JAB Accreditation No. RTL02610

| Test site                  | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|----------------------------|------------------------|----------------------------|------------------------------------------------------------------|------------------------------|
| No.1 Semi-anechoic chamber | 2973D-1                | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.2 Semi-anechoic chamber | 2973D-2                | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.3 Semi-anechoic chamber | 2973D-3                | 12.7 x 7.7 x 5.35          | 12.7 x 7.7                                                       | 5 m                          |
| No.4 Semi-anechoic chamber | -                      | 8.1 x 5.1 x 3.55           | 8.1 x 5.1                                                        | -                            |
| No.1 Shielded room         | -                      | 6.8 x 4.1 x 2.7            | 6.8 x 4.1                                                        | -                            |
| No.2 Shielded room         | -                      | 6.8 x 4.1 x 2.7            | 6.8 x 4.1                                                        | -                            |
| No.3 Shielded room         | -                      | 6.3 x 4.7 x 2.7            | 6.3 x 4.7                                                        | -                            |
| No.4 Shielded room         | -                      | 4.4 x 4.7 x 2.7            | 4.4 x 4.7                                                        | -                            |
| No.5 Shielded room         | -                      | 7.8 x 6.4 x 2.7            | 7.8 x 6.4                                                        | -                            |
| No.6 Shielded room         | -                      | 7.8 x 6.4 x 2.7            | 7.8 x 6.4                                                        | -                            |
| No.8 shielded room         | -                      | 3.45 x 5.5 x 2.4           | 3.45 x 5.5                                                       | -                            |
| No.1 Measurement room      | -                      | 2.55 x 4.1 x 2.5           | -                                                                | -                            |

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

Refer to APPENDIX.

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

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

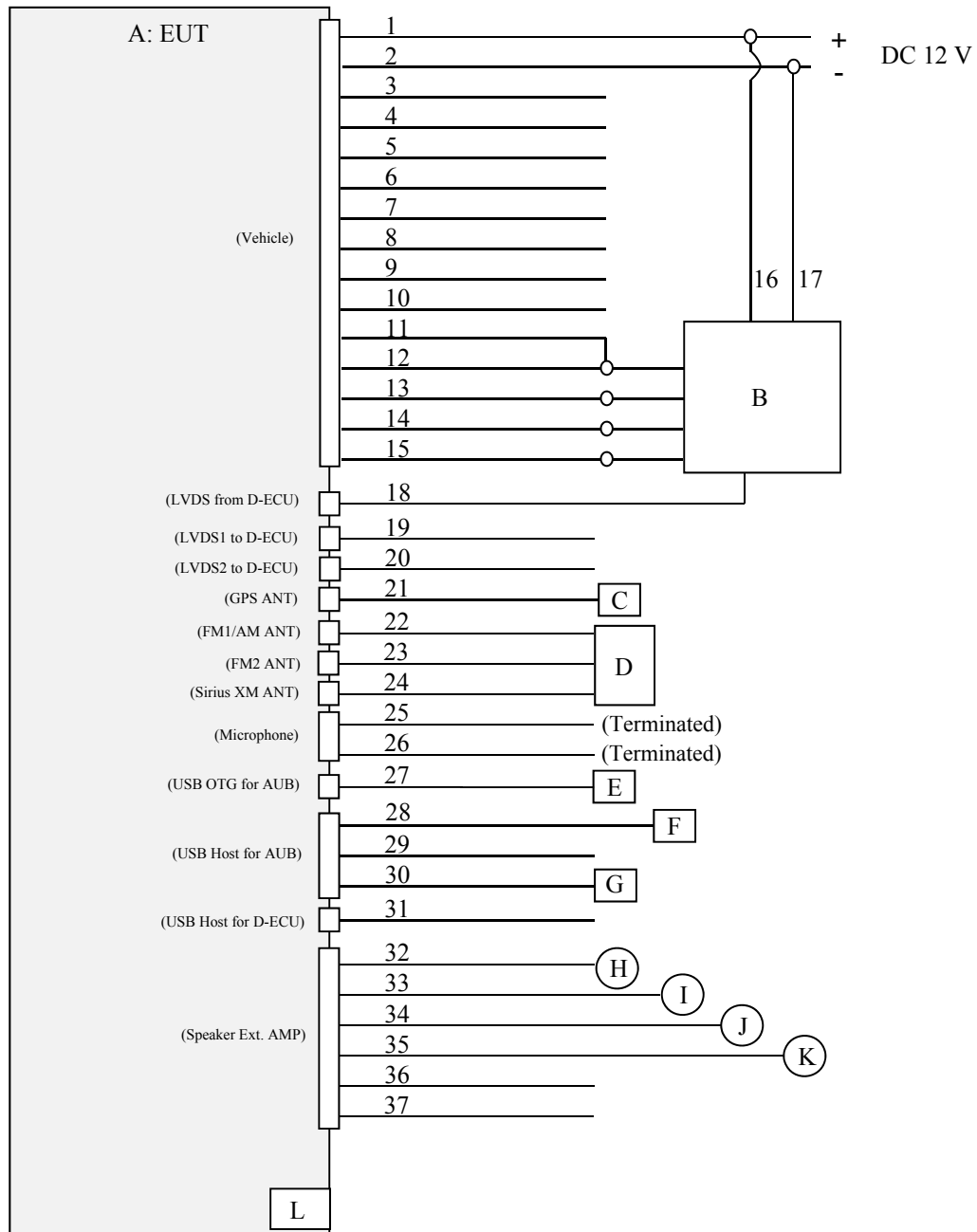
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

| Mode                                                                                                                                                                                                                                                                                                                                                                                  | Remarks*     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| IEEE 802.11b (11b)                                                                                                                                                                                                                                                                                                                                                                    | 11 Mbps, PN9 |
| IEEE 802.11g (11g)                                                                                                                                                                                                                                                                                                                                                                    | 18 Mbps, PN9 |
| IEEE 802.11n SISO 20 MHz BW (11n-20)                                                                                                                                                                                                                                                                                                                                                  | MCS 7        |
| IEEE 802.11n MIMO 20 MHz BW (11n-20)                                                                                                                                                                                                                                                                                                                                                  | MCS 11       |
| *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: Fixed<br>Software: JVCKENWOOD BT WiFi Certification Test iMX_MC_2016 Version: V0.991<br>*This setting of software is the worst case.<br>Any conditions under the normal use do not exceed the condition of setting.<br>In addition, end users cannot change the settings of the output power of the product. |              |

\*The details of Operating mode(s)

| Test Item                                                                             | Operating Mode | Tested Antenna | Tested frequency                 |
|---------------------------------------------------------------------------------------|----------------|----------------|----------------------------------|
| Spurious Emission                                                                     | 11b Tx         | 1              | 2412 MHz                         |
|                                                                                       | 11g Tx         |                | 2437 MHz                         |
|                                                                                       | 11n-20 SISO Tx |                | 2462 MHz                         |
|                                                                                       | 11n-20 MIMO Tx | 1-2            | 2412 MHz<br>2437 MHz<br>2462 MHz |
| 6dB Bandwidth<br>Maximum Peak Output Power<br>Power Density<br>99% Occupied Bandwidth | 11b Tx         | 1-2            | 2412 MHz                         |
|                                                                                       | 11g Tx         |                | 2437 MHz                         |
|                                                                                       | 11n-20 SISO Tx |                | 2462 MHz                         |
|                                                                                       | 11n-20 MIMO Tx | 1-2            | 2412 MHz<br>2437 MHz<br>2462 MHz |

## 4.2 Configuration and peripherals



#### Description of EUT and support equipment

| No. | Item                  | Model number | Serial number | Manufacturer            | Remarks |
|-----|-----------------------|--------------|---------------|-------------------------|---------|
| A   | GPS Navigation System | ECI1-MC100K  | 67900011      | JVC KENWOOD Corporation | EUT     |
| B   | Display               | DDR2-MC100W  | 67900046      | JVC KENWOOD Corporation | -       |
| C   | Jig                   | -            | -             | JVC KENWOOD Corporation | -       |
| D   | Jig                   | -            | -             | JVC KENWOOD Corporation | -       |
| E   | USB Memory            | SDK-USM1GL   | 08N18HDDDB    | Sony                    | -       |
| F   | USB Memory            | AH312        | -             | Apacer                  | -       |
| G   | iPod                  | A1320        | YM005VWJ71Y   | Apple                   | -       |
| H   | Speaker               | KFC-RS160    | -             | JVC KENWOOD Corporation | -       |
| I   | Speaker               | KFC-RS160    | -             | JVC KENWOOD Corporation | -       |
| J   | Speaker               | KFC-RS160    | -             | JVC KENWOOD Corporation | -       |
| K   | Speaker               | KFC-RS160    | -             | JVC KENWOOD Corporation | -       |
| L   | micro SDHC Card       | 4GB          | -             | TDK                     | -       |

#### List of cable used

| No. | Item                   | Length (m) | Shield (Cable) | Shield (Connector) | Remarks |
|-----|------------------------|------------|----------------|--------------------|---------|
| 1   | KL30 BATT              | 2.0 + 1.9  | Unshielded     | Unshielded         | -       |
| 2   | KL30 GND               | 2.0 + 1.9  | Unshielded     | Unshielded         | -       |
| 3   | LIN                    | 2.0        | Unshielded     | Unshielded         | -       |
| 4   | LIN +12V               | 2.0        | Unshielded     | Unshielded         | -       |
| 5   | LIN GND                | 2.0        | Unshielded     | Unshielded         | -       |
| 6   | C-SW +12V              | 2.0        | Unshielded     | Unshielded         | -       |
| 7   | C-SW GND               | 2.0        | Unshielded     | Unshielded         | -       |
| 8   | KL15 Ignition          | 2.0        | Unshielded     | Unshielded         | -       |
| 9   | Priv Vehicle L         | 2.0        | Unshielded     | Unshielded         | -       |
| 10  | Priv Vehicle H         | 2.0        | Unshielded     | Unshielded         | -       |
| 11  | BU 5U                  | 2.0        | Unshielded     | Unshielded         | -       |
| 12  | ECU ON                 | 2.0 + 0.5  | Unshielded     | Unshielded         | -       |
| 13  | Priv Control L         | 2.0 + 0.5  | Unshielded     | Unshielded         | -       |
| 14  | Priv Control H         | 2.0 + 0.5  | Unshielded     | Unshielded         | -       |
| 15  | Safe Shutdown          | 2.0 + 0.5  | Unshielded     | Unshielded         | -       |
| 16  | KL30 BATT              | 0.5        | Unshielded     | Unshielded         | -       |
| 17  | KL30 GND               | 0.5        | Unshielded     | Unshielded         | -       |
| 18  | LVDS from D-ECU        | 1.0        | Shielded       | Shielded           | -       |
| 19  | LVDS1 to D-ECU         | 2.8        | Shielded       | Shielded           | -       |
| 20  | LVDS2 to D-ECU         | 2.8        | Shielded       | Shielded           | -       |
| 21  | GPS ANT                | 3.2        | Shielded       | Shielded           | -       |
| 22  | FM1/AM ANT             | 2.8        | Shielded       | Shielded           | -       |
| 23  | FM2 ANT                | 2.8        | Shielded       | Shielded           | -       |
| 24  | Sirius XM ANT          | 2.8        | Shielded       | Shielded           | -       |
| 25  | MIC 1                  | 2.8        | Shielded       | Unshielded         | -       |
| 26  | MIC 2                  | 2.8        | Shielded       | Unshielded         | -       |
| 27  | USB (USB OTG for AUB)  | 2.8        | Shielded       | Shielded           | -       |
| 28  | USB (USB Host for AUB) | 2.8        | Unshielded     | Shielded           | -       |
| 29  | USB Host GND           | 2.8        | Unshielded     | Unshielded         | -       |
| 30  | Audio                  | 2.8 + 3.0  | Unshielded     | Shielded           | -       |
| 31  | USB Host for D-ECU     | 2.8        | Shielded       | Shielded           | -       |
| 32  | Speaker Front L        | 2.8 + 1.9  | Unshielded     | Unshielded         | -       |
| 33  | Speaker Front R        | 2.8 + 1.9  | Unshielded     | Unshielded         | -       |
| 34  | Speaker Rear L         | 2.8 + 1.9  | Unshielded     | Unshielded         | -       |
| 35  | Speaker Rear R         | 2.8 + 1.9  | Unshielded     | Unshielded         | -       |
| 36  | Info CAN L             | 2.8        | Unshielded     | Unshielded         | -       |
| 37  | Info CAN H             | 2.8        | Unshielded     | Unshielded         | -       |

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## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

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

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

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

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### **Test Antennas are used as below;**

|              |                   |                  |             |
|--------------|-------------------|------------------|-------------|
| Frequency    | 30 MHz to 200 MHz | 200 MHz to 1 GHz | Above 1 GHz |
| Antenna Type | Biconical         | Logperiodic      | Horn        |

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

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

|                 |               |                                                          |                                                                                                                                                                                     |                                                          |
|-----------------|---------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz                                              |                                                                                                                                                                                     | 20 dBc                                                   |
| Instrument used | Test Receiver | Spectrum Analyzer                                        |                                                                                                                                                                                     | Spectrum Analyzer                                        |
| Detector        | QP            | PK                                                       | AV *3)                                                                                                                                                                              | PK                                                       |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz                                 | Average Power Method:<br><u>12.2.5.2</u><br>RBW: 1 MHz<br>VBW: 3 MHz<br>Detector:<br>Power Averaging (Linear voltage)<br>Trace: 100 traces<br>Duty factor was added to the results. | RBW: 100 kHz<br>VBW: 300 kHz                             |
| Test Distance   | 3 m           | 3 m *1) (1 GHz – 13 GHz),<br>1 m *2) (13 GHz – 31.5 GHz) |                                                                                                                                                                                     | 3 m *1) (1 GHz – 13 GHz),<br>1 m *2) (13 GHz – 31.5 GHz) |

\*1) Distance Factor:  $20 \times \log(3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

\*2) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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

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The test was made on EUT at the normal use position.

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

|                   |                     |
|-------------------|---------------------|
| Measurement range | : 30 MHz – 31.5 GHz |
| Test data         | : APPENDIX          |
| Test result       | : Pass              |

## **SECTION 6: Antenna Terminal Conducted Tests**

### **Test Procedure**

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

| Test                                                                                                                                                                                                                                                                                  | Span                                    | RBW             | VBW                | Sweep time | Detector          | Trace    | Instrument used                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|--------------------|------------|-------------------|----------|---------------------------------|
| 6dB Bandwidth                                                                                                                                                                                                                                                                         | 50 MHz                                  | 100 kHz         | 300 kHz            | Auto       | Peak              | Max Hold | Spectrum Analyzer               |
| 99% Occupied Bandwidth *1)                                                                                                                                                                                                                                                            | Enough width to display emission skirts | 1 to 5 % of OBW | Three times of RBW | Auto       | Sample            | Max Hold | Spectrum Analyzer               |
| Maximum Peak Output Power                                                                                                                                                                                                                                                             | -                                       | -               | -                  | Auto       | Peak/ Average *2) | -        | Power Meter (Sensor: 50 MHz BW) |
| Peak Power Density                                                                                                                                                                                                                                                                    | 1.5 times the 6dB Bandwidth             | 3 kHz           | 9.1 kHz            | Auto       | Peak              | Max Hold | Spectrum Analyzer *3)           |
| Conducted Spurious Emission *4)                                                                                                                                                                                                                                                       | 9kHz to 150kHz                          | 200 Hz          | 620 Hz             | Auto       | Peak              | Max Hold | Spectrum Analyzer               |
|                                                                                                                                                                                                                                                                                       | 150kHz to 30MHz                         | 10 kHz          | 30 kHz             |            |                   |          |                                 |
| *1) Peak hold was applied as Worst-case measurement.                                                                                                                                                                                                                                  |                                         |                 |                    |            |                   |          |                                 |
| *2) Reference data                                                                                                                                                                                                                                                                    |                                         |                 |                    |            |                   |          |                                 |
| *3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r05".                                                                                                                                                                                                |                                         |                 |                    |            |                   |          |                                 |
| *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.<br>Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.<br>(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz) |                                         |                 |                    |            |                   |          |                                 |

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

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

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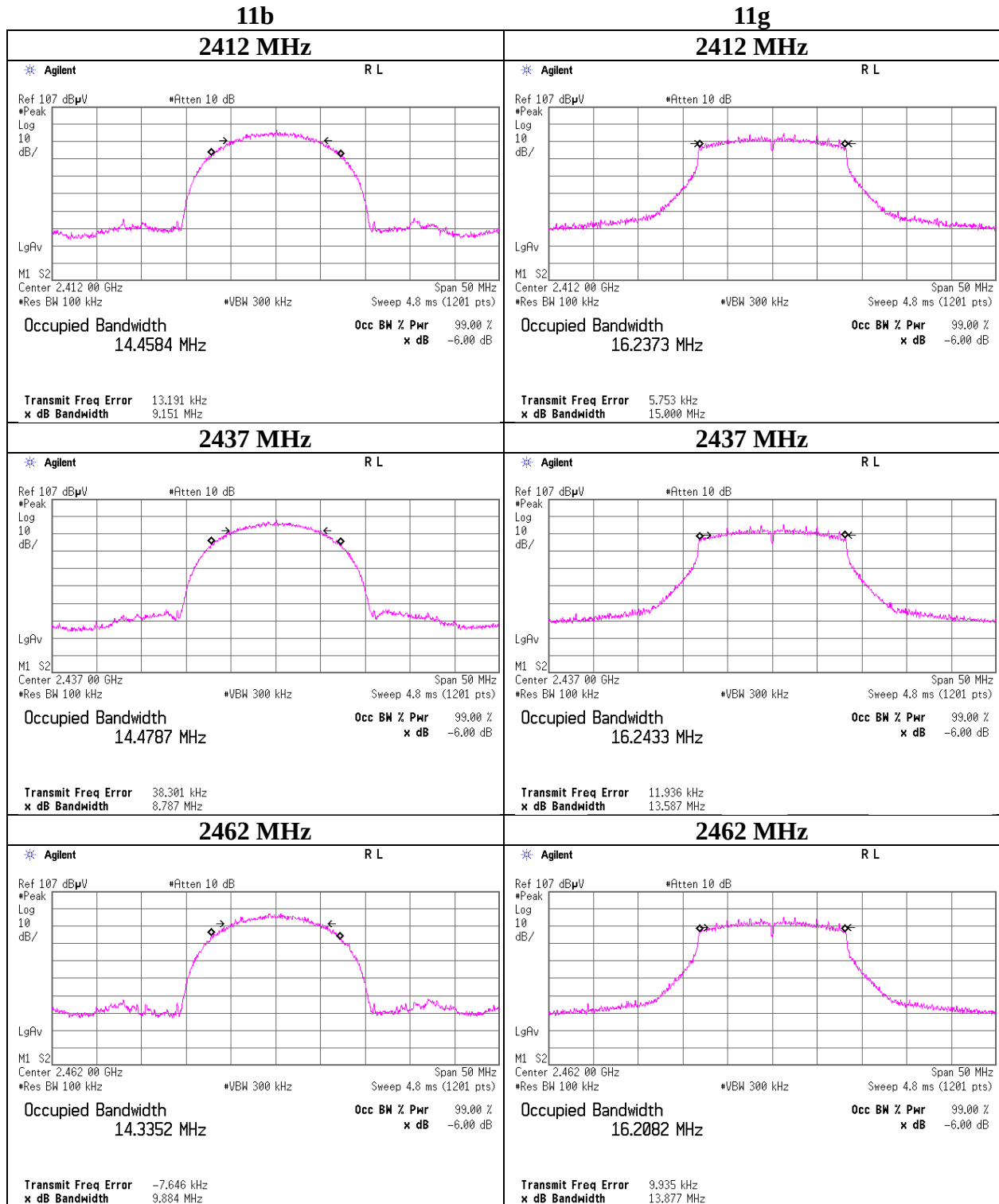
## **APPENDIX 1: Test data**

### **6dB Bandwidth**

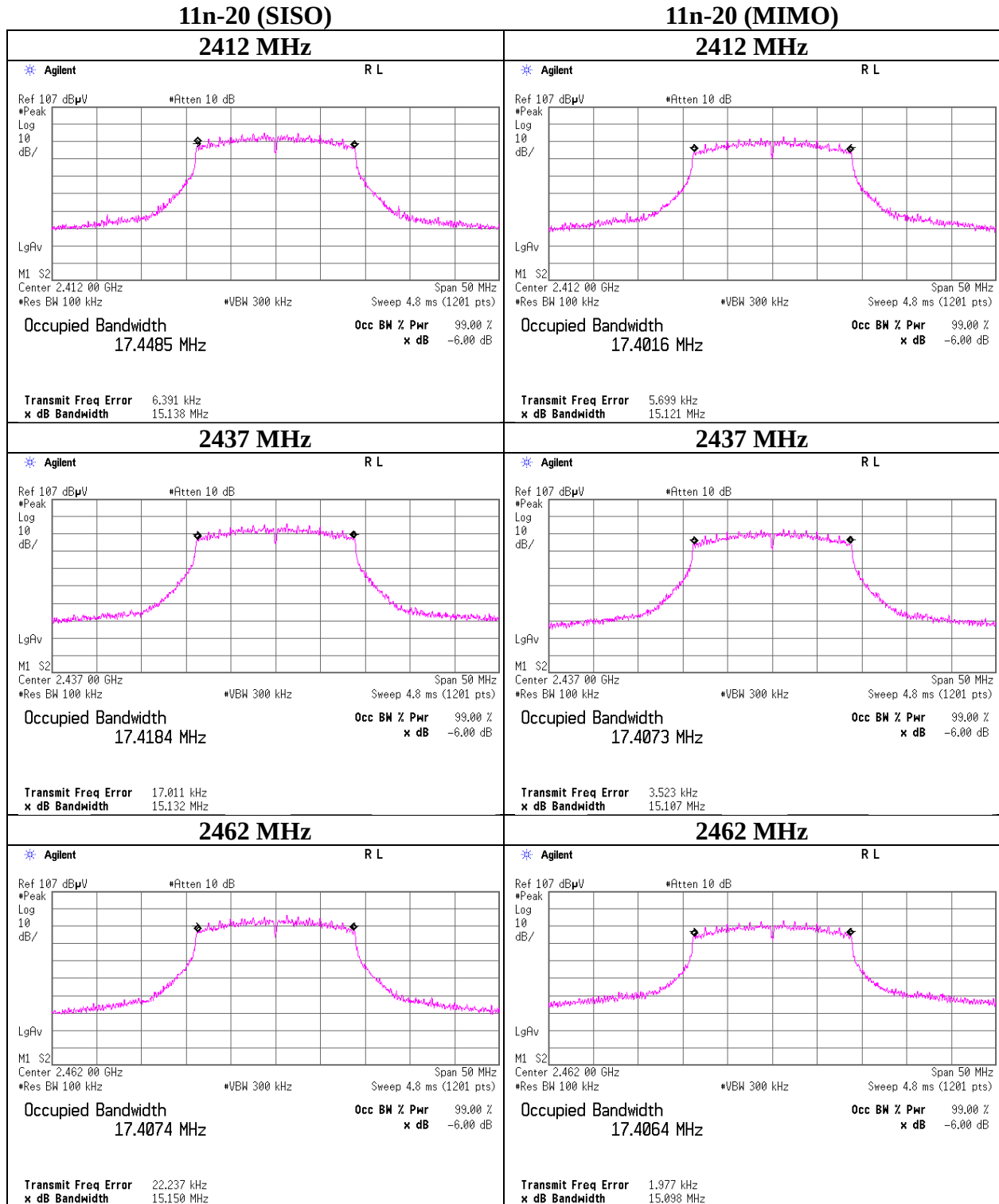
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11504641S-B                        |
| Date                   | December 15, 2016                  |
| Temperature / Humidity | 24 deg. C / 35 % RH                |
| Engineer               | Hiroyuki Morikawa                  |
| Mode                   | Tx                                 |

| Mode                          | Frequency<br>[MHz] | 6dB Bandwidth<br>[MHz] | Limit<br>[kHz] |
|-------------------------------|--------------------|------------------------|----------------|
| 11b<br>Antenna 1              | 2412               | 9.151                  | > 500          |
|                               | 2437               | 8.787                  | > 500          |
|                               | 2462               | 9.884                  | > 500          |
| 11g<br>Antenna 1              | 2412               | 15.000                 | > 500          |
|                               | 2437               | 13.587                 | > 500          |
|                               | 2462               | 13.877                 | > 500          |
| 11n-20<br>(SISO)<br>Antenna 1 | 2412               | 15.138                 | > 500          |
|                               | 2437               | 15.132                 | > 500          |
|                               | 2462               | 15.150                 | > 500          |
| 11n-20<br>(MIMO)<br>Antenna 1 | 2412               | 15.121                 | > 500          |
|                               | 2437               | 15.107                 | > 500          |
|                               | 2462               | 15.098                 | > 500          |

## 6dB Bandwidth



## 6dB Bandwidth



## Maximum Peak Output Power

|                        |                                    |                     |
|------------------------|------------------------------------|---------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |
| Report No.             | 11504641S-B                        |                     |
| Date                   | November 3, 2016                   | December 15, 2016   |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |
| Mode                   | Tx 11b                             |                     |

Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|-------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | -2.11            | 2.32                  | 9.67                   | 9.88   | 9.73  | 30.00 | 1000 | 20.12          |
| 2437           | -1.77            | 2.32                  | 9.67                   | 10.22  | 10.52 | 30.00 | 1000 | 19.78          |
| 2462           | -1.63            | 2.33                  | 9.67                   | 10.37  | 10.89 | 30.00 | 1000 | 19.63          |

Sample Calculation:

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

Antenna 1, 2412MHz

| Rate   | Reading | Remark |
|--------|---------|--------|
| [Mbps] | [dBm]   |        |
| 1      | -2.61   |        |
| 2      | -2.47   |        |
| 5.5    | -2.24   |        |
| 11     | -2.11   | *      |

Antenna 2, 2412MHz

| Rate   | Reading | Remark |
|--------|---------|--------|
| [Mbps] | [dBm]   |        |
| 1      | -2.65   |        |
| 2      | -2.63   |        |
| 5.5    | -2.47   |        |
| 11     | -2.35   |        |

\*: Worst Rate

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

## Maximum Peak Output Power

|                        |                                    |                     |
|------------------------|------------------------------------|---------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |
| Report No.             | 11504641S-B                        |                     |
| Date                   | November 3, 2016                   | December 15, 2016   |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |
| Mode                   | Tx 11g                             |                     |

Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|-------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 5.98             | 2.32                  | 9.67                   | 17.97  | 62.66 | 30.00 | 1000 | 12.03          |
| 2437           | 6.09             | 2.32                  | 9.67                   | 18.08  | 64.27 | 30.00 | 1000 | 11.92          |
| 2462           | 6.21             | 2.33                  | 9.67                   | 18.21  | 66.22 | 30.00 | 1000 | 11.79          |

Sample Calculation:

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

Antenna 1, 2412 MHz

| Rate<br>[Mbps] | Reading<br>[dBm] | Remark |
|----------------|------------------|--------|
| 6              | 5.86             |        |
| 9              | 5.87             |        |
| 12             | 5.77             |        |
| 18             | 5.98             | *      |
| 24             | 5.88             |        |
| 36             | 5.74             |        |
| 48             | 5.86             |        |
| 54             | 5.95             |        |

Antenna 2, 2412 MHz

| Rate<br>[Mbps] | Reading<br>[dBm] | Remark |
|----------------|------------------|--------|
| 6              | 5.38             |        |
| 9              | 5.49             |        |
| 12             | 5.56             |        |
| 18             | 5.60             |        |
| 24             | 5.55             |        |
| 36             | 5.41             |        |
| 48             | 5.50             |        |
| 54             | 5.62             |        |

\*: Worst Rate

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

## Maximum Peak Output Power

|                        |                                    |                     |
|------------------------|------------------------------------|---------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |
| Report No.             | 11504641S-B                        |                     |
| Date                   | November 3, 2016                   | December 15, 2016   |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |
| Mode                   | Tx 11n-20 (SISO)                   |                     |

Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|-------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 6.32             | 2.32                  | 9.67                   | 18.31  | 67.76 | 30.00 | 1000 | 11.69          |
| 2437           | 6.58             | 2.32                  | 9.67                   | 18.57  | 71.94 | 30.00 | 1000 | 11.43          |
| 2462           | 6.41             | 2.33                  | 9.67                   | 18.41  | 69.34 | 30.00 | 1000 | 11.59          |

Sample Calculation:

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

Antenna 1, 2412 MHz

| Rate | Reading | Remark |
|------|---------|--------|
| MCS  | [dBm]   |        |
| 0    | 6.01    |        |
| 1    | 5.46    |        |
| 2    | 4.78    |        |
| 3    | 5.96    |        |
| 4    | 5.24    |        |
| 5    | 6.02    |        |
| 6    | 5.74    |        |
| 7    | 6.32    | *      |

Antenna 2, 2412 MHz

| Rate | Reading | Remark |
|------|---------|--------|
| MCS  | [dBm]   |        |
| 0    | 6.24    |        |
| 1    | 5.97    |        |
| 2    | 4.94    |        |
| 3    | 6.01    |        |
| 4    | 5.65    |        |
| 5    | 5.93    |        |
| 6    | 5.85    |        |
| 7    | 6.25    |        |

\*: Worst Rate

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

## Maximum Peak Output Power

|                        |                                    |                     |
|------------------------|------------------------------------|---------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |
| Report No.             | 11504641S-B                        |                     |
| Date                   | November 3, 2016                   | December 15, 2016   |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |
| Mode                   | Tx 11n-20 (MIMO)                   |                     |

### Antenna 1 + 2

| Freq.<br>[MHz] | Antenna 1<br>Result<br>[mW] | Antenna 2<br>Result<br>[mW] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|-----------------------------|-----------------------------|--------|-------|-------|------|----------------|
|                |                             |                             | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 35.16                       | 34.20                       | 18.41  | 69.35 | 30.00 | 1000 | 11.59          |
| 2437           | 36.31                       | 35.73                       | 18.58  | 72.04 | 30.00 | 1000 | 11.42          |
| 2462           | 35.65                       | 35.48                       | 18.52  | 71.13 | 30.00 | 1000 | 11.48          |

Sample Calculation:

Result = Antenna 1 + 2

### Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|-------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 3.47             | 2.32                  | 9.67                   | 15.46  | 35.16 | 30.00 | 1000 | 14.54          |
| 2437           | 3.61             | 2.32                  | 9.67                   | 15.60  | 36.31 | 30.00 | 1000 | 14.40          |
| 2462           | 3.52             | 2.33                  | 9.67                   | 15.52  | 35.65 | 30.00 | 1000 | 14.48          |

### Antenna 2

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin<br>[dB] |
|----------------|------------------|-----------------------|------------------------|--------|-------|-------|------|----------------|
|                |                  |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] |                |
| 2412           | 3.35             | 2.32                  | 9.67                   | 15.34  | 34.20 | 30.00 | 1000 | 14.66          |
| 2437           | 3.54             | 2.32                  | 9.67                   | 15.53  | 35.73 | 30.00 | 1000 | 14.47          |
| 2462           | 3.50             | 2.33                  | 9.67                   | 15.50  | 35.48 | 30.00 | 1000 | 14.50          |

Sample Calculation:

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

### **Maximum Peak Output Power**

|                        |                                    |                     |  |
|------------------------|------------------------------------|---------------------|--|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |  |
| Report No.             | 11504641S-B                        |                     |  |
| Date                   | November 3, 2016                   | December 15, 2016   |  |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |  |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |  |
| Mode                   | Tx 11n-20 (MIMO)                   |                     |  |

2412 MHz

| MCS<br>Number | Reading<br>Antenna 1 |      | Reading<br>Antenna 2 |      | Reading<br>Antenna 1 + Antenna 2 |      | Remark |
|---------------|----------------------|------|----------------------|------|----------------------------------|------|--------|
|               | [dBm]                | [mW] | [dBm]                | [mW] | [dBm]                            | [mW] |        |
| 8             | 3.29                 | 2.13 | 3.32                 | 2.15 | 6.31                             | 4.28 |        |
| 9             | 3.58                 | 2.28 | 3.13                 | 2.06 | 6.37                             | 4.34 |        |
| 10            | 3.42                 | 2.20 | 2.92                 | 1.96 | 6.19                             | 4.16 |        |
| 11            | 3.47                 | 2.22 | 3.35                 | 2.16 | 6.41                             | 4.38 | *      |
| 12            | 3.19                 | 2.08 | 3.13                 | 2.06 | 6.17                             | 4.14 |        |
| 13            | 3.46                 | 2.22 | 3.31                 | 2.14 | 6.39                             | 4.36 |        |
| 14            | 2.91                 | 1.95 | 2.55                 | 1.80 | 5.74                             | 3.75 |        |
| 15            | 2.58                 | 1.81 | 2.81                 | 1.91 | 5.71                             | 3.72 |        |

\*worst rate

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

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11504641S-B  
Date : November 3, 2016  
Temperature / Humidity : 24 deg. C / 47 % RH  
Engineer : Hiroyuki Morikawa  
Mode : Tx  
December 15, 2016  
24 deg. C / 35 % RH  
Hiroyuki Morikawa

11b **11 Mbps** Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2412           | -6.55            | 2.32                  | 9.67                   | 5.44                     | 3.50 | 2.66                   | 8.10                            | 6.46 |
| 2437           | -6.21            | 2.32                  | 9.67                   | 5.78                     | 3.78 | 2.66                   | 8.44                            | 6.98 |
| 2462           | -6.10            | 2.33                  | 9.67                   | 5.90                     | 3.89 | 2.66                   | 8.56                            | 7.18 |

11g **18 Mbps** Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2412           | -5.48            | 2.32                  | 9.67                   | 6.51                     | 4.48 | 0.86                   | 7.37                            | 5.46 |
| 2437           | -5.09            | 2.32                  | 9.67                   | 6.90                     | 4.90 | 0.86                   | 7.76                            | 5.97 |
| 2462           | -4.85            | 2.33                  | 9.67                   | 7.15                     | 5.19 | 0.86                   | 8.01                            | 6.32 |

11n-20 (SISO) **MCS 7** Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2412           | -7.19            | 2.32                  | 9.67                   | 4.80                     | 3.02 | 2.92                   | 7.72                            | 5.92 |
| 2437           | -6.84            | 2.32                  | 9.67                   | 5.15                     | 3.27 | 2.92                   | 8.07                            | 6.41 |
| 2462           | -6.69            | 2.33                  | 9.67                   | 5.31                     | 3.40 | 2.92                   | 8.23                            | 6.65 |

Sample Calculation:

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

Result (Burst power average) = Time average + Duty factor

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

|                        |                                    |                     |  |
|------------------------|------------------------------------|---------------------|--|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |  |
| Report No.             | 11504641S-B                        |                     |  |
| Date                   | November 3, 2016                   | December 15, 2016   |  |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |  |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |  |
| Mode                   | Tx                                 |                     |  |

Antenna 1 + Antenna 2

| Freq.<br>[MHz] | Antenna 1<br>Result<br>[mW] | Antenna 2<br>Result<br>[mW] | Result |      | Limit |      | Margin<br>[dB] |
|----------------|-----------------------------|-----------------------------|--------|------|-------|------|----------------|
|                |                             |                             | [dBm]  | [mW] | [dBm] | [mW] |                |
| 2412           | 3.05                        | 3.02                        | 7.83   | 6.07 | 30.00 | 1000 | 22.17          |
| 2437           | 3.20                        | 2.82                        | 7.80   | 6.02 | 30.00 | 1000 | 22.20          |
| 2462           | 3.23                        | 3.30                        | 8.15   | 6.53 | 30.00 | 1000 | 21.85          |

Sample Calculation:

Result = Main antenna + Sub antenna

11n-20 (MIMO) MCS11 Antenna 1

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2412           | -9.64            | 2.32                  | 9.67                   | 2.35                     | 1.72 | 2.50                   | 4.85                            | 3.05 |
| 2437           | -9.44            | 2.32                  | 9.67                   | 2.55                     | 1.80 | 2.50                   | 5.05                            | 3.20 |
| 2462           | -9.41            | 2.33                  | 9.67                   | 2.59                     | 1.82 | 2.50                   | 5.09                            | 3.23 |

11n-20 (MIMO) MCS 11 Antenna 2

| Freq.<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result<br>(Time average) |      | Duty<br>factor<br>[dB] | Result<br>(Burst power average) |      |
|----------------|------------------|-----------------------|------------------------|--------------------------|------|------------------------|---------------------------------|------|
|                |                  |                       |                        | [dBm]                    | [mW] |                        | [dBm]                           | [mW] |
| 2412           | -9.69            | 2.32                  | 9.67                   | 2.30                     | 1.70 | 2.50                   | 4.80                            | 3.02 |
| 2437           | -9.98            | 2.32                  | 9.67                   | 2.01                     | 1.59 | 2.50                   | 4.51                            | 2.82 |
| 2462           | -9.31            | 2.33                  | 9.67                   | 2.69                     | 1.86 | 2.50                   | 5.19                            | 3.30 |

Sample Calculation:

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

Result (Burst power average) = Time average + Duty factor

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

|                        |                                    |                     |
|------------------------|------------------------------------|---------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |
| Report No.             | 11504641S-B                        |                     |
| Date                   | November 3, 2016                   | December 15, 2016   |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |
| Mode                   | Tx                                 |                     |

2412 MHz

| Mode             | Rate<br>Mbps | Reading<br>[dBm] | Duty<br>factor<br>[dB] | Burst<br>power<br>[dBm] | Remarks |
|------------------|--------------|------------------|------------------------|-------------------------|---------|
| 11b<br>Antenna 1 | 1            | -4.94            | 0.45                   | -4.49                   |         |
|                  | 2            | -5.41            | 0.84                   | -4.57                   |         |
|                  | 5.5          | -5.99            | 1.79                   | -4.20                   |         |
|                  | 11           | -6.46            | 2.66                   | -3.80                   | *       |
| 11b<br>Antenna 2 | 1            | -5.21            | 0.45                   | -4.76                   |         |
|                  | 2            | -5.61            | 0.84                   | -4.77                   |         |
|                  | 5.5          | -6.27            | 1.79                   | -4.48                   |         |
|                  | 11           | -6.89            | 2.66                   | -4.23                   |         |
| 11g<br>Antenna 1 | 6            | -5.18            | 0.30                   | -4.88                   |         |
|                  | 9            | -5.18            | 0.45                   | -4.73                   |         |
|                  | 12           | -5.40            | 0.59                   | -4.81                   |         |
|                  | 18           | -5.48            | 0.86                   | -4.62                   | *       |
|                  | 24           | -6.02            | 1.10                   | -4.92                   |         |
|                  | 36           | -6.49            | 1.53                   | -4.96                   |         |
|                  | 48           | -6.59            | 1.96                   | -4.63                   |         |
|                  | 54           | -7.08            | 2.15                   | -4.93                   |         |
| 11g<br>Antenna 2 | 6            | -5.34            | 0.30                   | -5.04                   |         |
|                  | 9            | -5.44            | 0.45                   | -4.99                   |         |
|                  | 12           | -5.58            | 0.59                   | -4.99                   |         |
|                  | 18           | -5.82            | 0.86                   | -4.96                   |         |
|                  | 24           | -6.25            | 1.10                   | -5.15                   |         |
|                  | 36           | -6.57            | 1.53                   | -5.04                   |         |
|                  | 48           | -6.89            | 1.96                   | -4.93                   |         |
|                  | 54           | -7.16            | 2.15                   | -5.01                   |         |

\* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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

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

|                        |                                    |                     |
|------------------------|------------------------------------|---------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |                     |
| Report No.             | 11504641S-B                        |                     |
| Date                   | November 3, 2016                   | December 15, 2016   |
| Temperature / Humidity | 24 deg. C / 47 % RH                | 24 deg. C / 35 % RH |
| Engineer               | Hiroyuki Morikawa                  | Hiroyuki Morikawa   |
| Mode                   | Tx                                 |                     |

2412 MHz

| Mode                          | Rate<br>MCS | Reading<br>[dBm] | Duty<br>factor<br>[dB] | Burst<br>power<br>[dBm] | Remarks |
|-------------------------------|-------------|------------------|------------------------|-------------------------|---------|
| 11n-20<br>(SISO)<br>Antenna 1 | 0           | -5.10            | 0.43                   | -4.67                   |         |
|                               | 1           | -5.51            | 0.82                   | -4.69                   |         |
|                               | 2           | -5.75            | 1.14                   | -4.61                   |         |
|                               | 3           | -5.86            | 1.46                   | -4.40                   |         |
|                               | 4           | -6.57            | 2.04                   | -4.53                   |         |
|                               | 5           | -6.81            | 2.51                   | -4.30                   |         |
|                               | 6           | -7.09            | 2.67                   | -4.42                   |         |
|                               | 7           | -7.19            | 2.92                   | -4.27                   | *       |
| 11n-20<br>(SISO)<br>Antenna 2 | 0           | -5.18            | 0.43                   | -4.75                   |         |
|                               | 1           | -5.32            | 0.82                   | -4.50                   |         |
|                               | 2           | -5.60            | 1.14                   | -4.46                   |         |
|                               | 3           | -5.95            | 1.46                   | -4.49                   |         |
|                               | 4           | -6.55            | 2.04                   | -4.51                   |         |
|                               | 5           | -7.18            | 2.51                   | -4.67                   |         |
|                               | 6           | -7.14            | 2.67                   | -4.47                   |         |
|                               | 7           | -7.32            | 2.92                   | -4.40                   |         |

\* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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

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

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11504641S-B  
Date : November 3, 2016  
Temperature / Humidity : 24 deg. C / 47 % RH  
Engineer : Hiroyuki Morikawa  
Mode : Tx  
December 15, 2016  
24 deg. C / 35 % RH  
Hiroyuki Morikawa

| Mode                          | Mode<br>(MCS) | Duty<br>factor<br>[dB] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Reading<br>[dBm] | Antenna 1<br>Result<br>[dBm] | [mW] |
|-------------------------------|---------------|------------------------|-----------------------|------------------------|------------------|------------------------------|------|
| 11n-20<br>(MIMO)<br>Antenna 1 | 8             | 0.80                   | 2.32                  | 9.67                   | -8.58            | 4.21                         | 2.64 |
|                               | 9             | 1.46                   | 2.32                  | 9.67                   | -8.73            | 4.72                         | 2.96 |
|                               | 10            | 1.99                   | 2.32                  | 9.67                   | -9.23            | 4.75                         | 2.99 |
|                               | 11            | 2.50                   | 2.32                  | 9.67                   | -9.64            | 4.85                         | 3.05 |
|                               | 12            | 3.26                   | 2.32                  | 9.67                   | -10.35           | 4.90                         | 3.09 |
|                               | 13            | 3.79                   | 2.32                  | 9.67                   | -10.97           | 4.81                         | 3.03 |
|                               | 14            | 4.06                   | 2.32                  | 9.67                   | -12.74           | 3.31                         | 2.14 |
|                               | 15            | 4.28                   | 2.32                  | 9.67                   | -13.83           | 2.44                         | 1.75 |

| Mode                          | Mode<br>(MCS) | Duty<br>factor<br>[dB] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Reading<br>[dBm] | Antenna 2<br>Result<br>[dBm] | [mW] |
|-------------------------------|---------------|------------------------|-----------------------|------------------------|------------------|------------------------------|------|
| 11n-20<br>(MIMO)<br>Antenna 2 | 8             | 0.80                   | 2.32                  | 9.67                   | -8.55            | 4.24                         | 2.65 |
|                               | 9             | 1.46                   | 2.32                  | 9.67                   | -8.88            | 4.57                         | 2.86 |
|                               | 10            | 1.99                   | 2.32                  | 9.67                   | -9.35            | 4.63                         | 2.90 |
|                               | 11            | 2.50                   | 2.32                  | 9.67                   | -9.69            | 4.80                         | 3.02 |
|                               | 12            | 3.26                   | 2.32                  | 9.67                   | -10.53           | 4.72                         | 2.96 |
|                               | 13            | 3.79                   | 2.32                  | 9.67                   | -11.09           | 4.69                         | 2.94 |
|                               | 14            | 4.06                   | 2.32                  | 9.67                   | -12.82           | 3.23                         | 2.10 |
|                               | 15            | 4.28                   | 2.32                  | 9.67                   | -13.97           | 2.30                         | 1.70 |

| Mode             | Mode<br>(MCS) | Antenna 1 + 2<br>Result |      | Remarks |
|------------------|---------------|-------------------------|------|---------|
|                  |               | [dBm]                   | [mW] |         |
| 11n-20<br>(MIMO) | 8             | 7.23                    | 5.29 |         |
|                  | 9             | 7.65                    | 5.82 |         |
|                  | 10            | 7.70                    | 5.89 |         |
|                  | 11            | 7.83                    | 6.07 | *       |
|                  | 12            | 7.82                    | 6.05 |         |
|                  | 13            | 7.76                    | 5.97 |         |
|                  | 14            | 6.27                    | 4.24 |         |
|                  | 15            | 5.38                    | 3.45 |         |

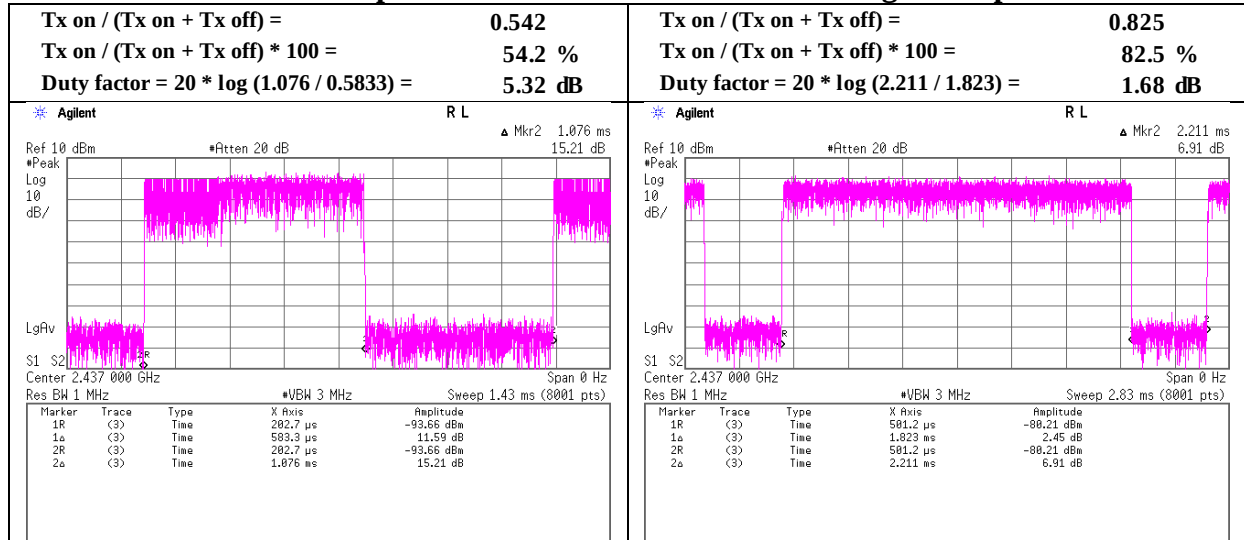
\* Worst rate

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

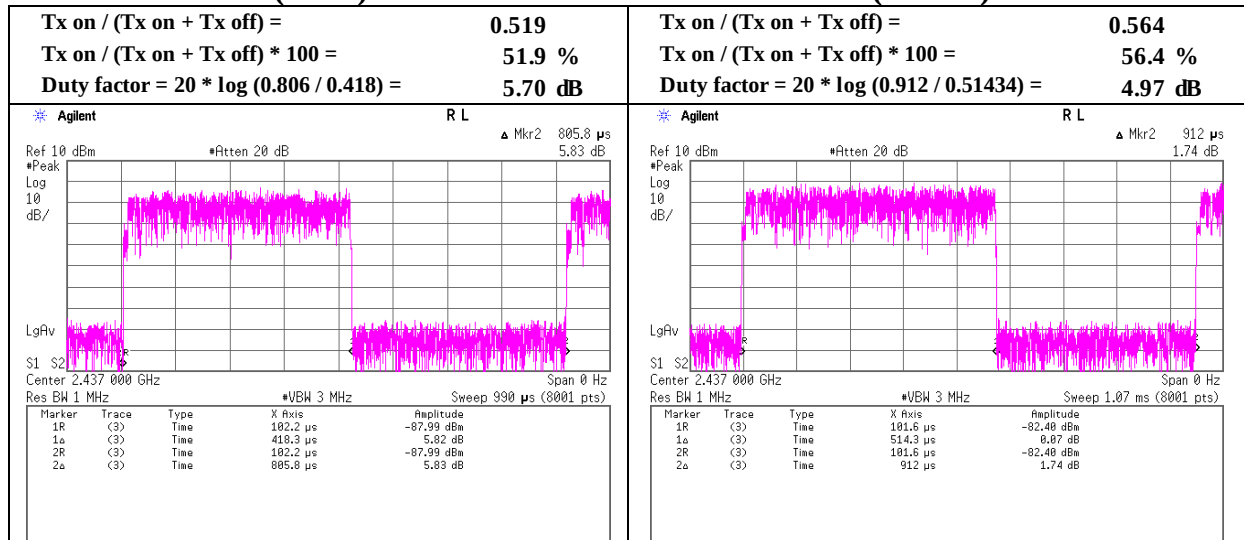
## Burst rate confirmation

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11504641S-B  
Date : November 3, 2016  
Temperature / Humidity : 24 deg. C / 47 % RH  
Engineer : Hiroyuki Morikawa  
Mode : Tx

### 11b 11 Mbps



### 11n-20 (SISO) MCS7



## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11504641S-B  
Date : December 10, 2016      November 4, 2016      November 18, 2016  
Temperature / Humidity : 23 deg. C / 34 % RH      25 deg. C / 41 % RH      23 deg. C / 46 % RH  
Engineer : Shinichi Takano      Shinichi Takano      Kenichi Adachi  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (26.5 GHz -31.5 GHz)  
Mode : Tx 11b 2412 MHz

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2390.000        | PK       | 43.84          | 27.41           | 13.77     | 37.06     | 2.24                 | 50.20           | 73.90          | 23.7        | 188         | 123         |             |
| Hori.    | 3833.608        | PK       | 47.73          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.13           | 73.90          | 25.7        | 113         | 111         |             |
| Hori.    | 4824.000        | PK       | 43.96          | 31.17           | 5.95      | 37.13     | 2.24                 | 46.19           | 73.90          | 27.7        | 150         | 0           |             |
| Hori.    | 7236.000        | PK       | 44.50          | 36.52           | 7.38      | 37.86     | 2.24                 | 52.78           | 73.90          | 21.1        | 150         | 0           | Floor Noise |
| Hori.    | 3833.608        | AV       | 42.83          | 29.36           | 5.65      | 36.85     | 2.24                 | 43.23           | 53.90          | 10.6        | 113         | 111         |             |
| Hori.    | 7236.000        | AV       | 34.80          | 36.52           | 7.38      | 37.86     | 2.24                 | 43.08           | 53.90          | 10.8        | 150         | 0           | Floor Noise |
| Vert.    | 2390.000        | PK       | 43.38          | 27.41           | 13.77     | 37.06     | 2.24                 | 49.74           | 73.90          | 24.1        | 224         | 132         |             |
| Vert.    | 3833.320        | PK       | 45.11          | 29.36           | 5.65      | 36.85     | 2.24                 | 45.51           | 73.90          | 28.3        | 226         | 334         |             |
| Vert.    | 4824.000        | PK       | 44.32          | 31.17           | 5.95      | 37.13     | 2.24                 | 46.55           | 73.90          | 27.3        | 154         | 315         |             |
| Vert.    | 7236.000        | PK       | 44.14          | 36.52           | 7.38      | 37.86     | 2.24                 | 52.42           | 73.90          | 21.4        | 150         | 0           | Floor Noise |
| Vert.    | 3833.320        | AV       | 41.47          | 29.36           | 5.65      | 36.85     | 2.24                 | 41.87           | 53.90          | 12.0        | 226         | 334         |             |
| Vert.    | 7236.000        | AV       | 35.09          | 36.52           | 7.38      | 37.86     | 2.24                 | 43.37           | 53.90          | 10.5        | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2390.000        | AV       | 34.51          | 27.41           | 13.77     | 37.06     | 5.32             | 2.24                 | 46.19           | 53.90          | 7.7         | *1)    |
| Hori.    | 4824.000        | AV       | 34.15          | 31.17           | 5.95      | 37.13     | 5.32             | 2.24                 | 41.70           | 53.90          | 12.2        |        |
| Vert.    | 2390.000        | AV       | 34.29          | 27.41           | 13.77     | 37.06     | 5.32             | 2.24                 | 45.97           | 53.90          | 7.9         | *1)    |
| Vert.    | 4824.000        | AV       | 34.75          | 31.17           | 5.95      | 37.13     | 5.32             | 2.24                 | 42.30           | 53.90          | 11.6        |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2412.000        | PK       | 77.54          | 27.50           | 13.79     | 37.04     | 2.24                 | 84.03           | -              | -           | Carrier |
| Hori.    | 2396.112        | PK       | 37.78          | 27.43           | 13.78     | 37.05     | 2.24                 | 44.18           | 64.03          | 19.9        |         |
| Hori.    | 2400.000        | PK       | 34.91          | 27.45           | 13.78     | 37.05     | 2.24                 | 41.33           | 64.03          | 22.7        |         |
| Hori.    | 9648.000        | PK       | 39.41          | 38.66           | 8.33      | 39.15     | 2.24                 | 49.49           | 64.03          | 14.5        |         |
| Vert.    | 2412.000        | PK       | 80.51          | 27.50           | 13.79     | 37.04     | 2.24                 | 87.00           | -              | -           | Carrier |
| Vert.    | 2397.475        | PK       | 36.56          | 27.44           | 13.78     | 37.05     | 2.24                 | 42.97           | 67.00          | 24.0        |         |
| Vert.    | 2400.000        | PK       | 36.35          | 27.45           | 13.78     | 37.05     | 2.24                 | 42.77           | 67.00          | 24.2        |         |
| Vert.    | 9648.000        | PK       | 42.18          | 38.66           | 8.33      | 39.15     | 2.24                 | 52.26           | 67.00          | 14.7        |         |

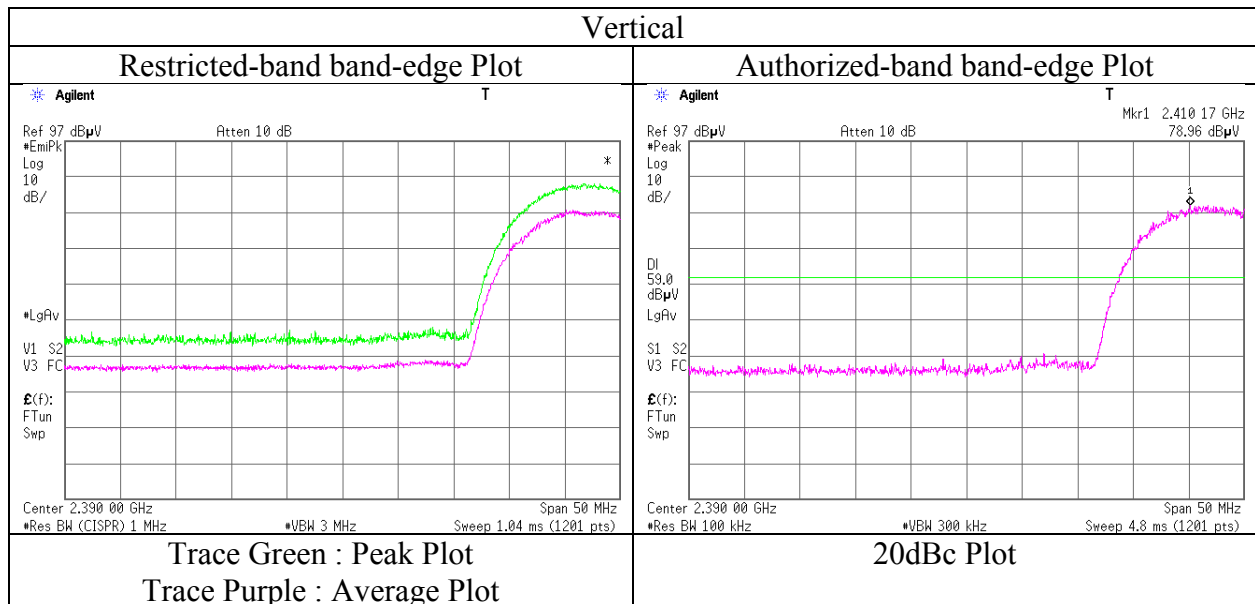
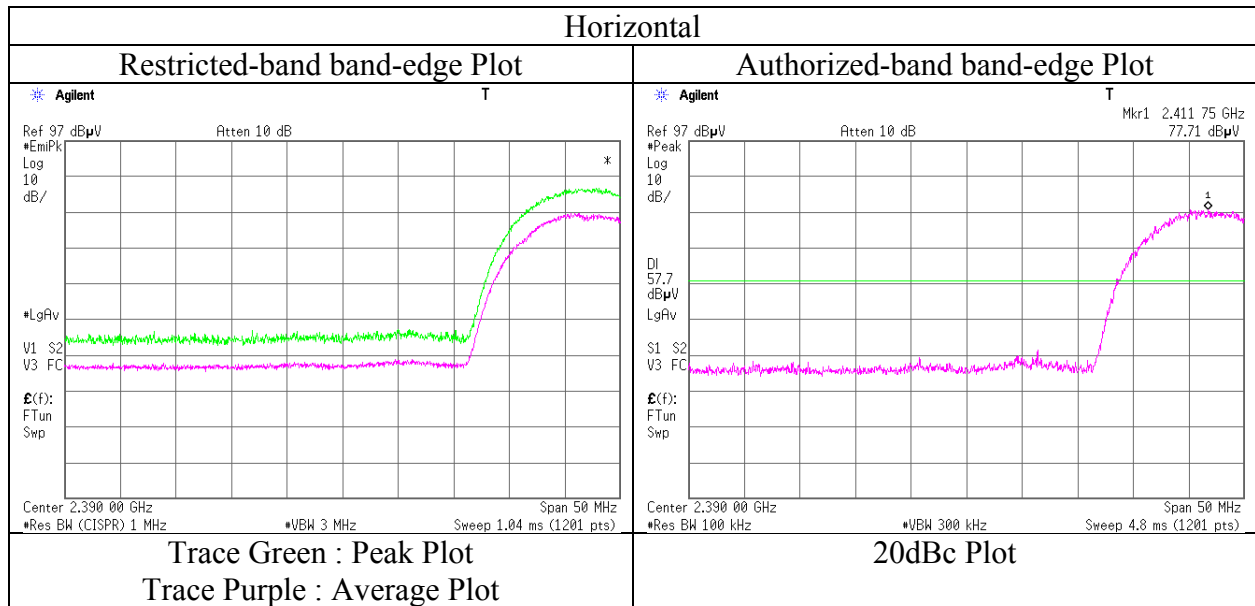
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano                            |
|                        | (1 GHz -13 GHz)                            |
| Mode                   | Tx 11b 2412 MHz                            |



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11504641S-B  
Date : December 10, 2016      November 4, 2016      November 18, 2016  
Temperature / Humidity : 23 deg. C / 34 % RH      25 deg. C / 41 % RH      23 deg. C / 46 % RH  
Engineer : Shinichi Takano      Shinichi Takano      Kenichi Adachi  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (26.5 GHz -31.5 GHz)  
Mode : Tx 11b 2437 MHz

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 3833.531        | PK       | 48.09          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.49           | 73.90          | 25.4        | 110         | 110         |             |
| Hori.    | 4874.000        | PK       | 43.20          | 31.28           | 5.96      | 37.15     | 2.24                 | 45.53           | 73.90          | 28.3        | 150         | 0           |             |
| Hori.    | 7311.000        | PK       | 43.87          | 36.74           | 7.36      | 37.91     | 2.24                 | 52.30           | 73.90          | 21.6        | 150         | 0           | Floor Noise |
| Hori.    | 3833.531        | AV       | 42.93          | 29.36           | 5.65      | 36.85     | 2.24                 | 43.33           | 53.90          | 10.5        | 110         | 110         |             |
| Hori.    | 7311.000        | AV       | 34.90          | 36.74           | 7.36      | 37.91     | 2.24                 | 43.33           | 53.90          | 10.5        | 150         | 0           | Floor Noise |
| Vert.    | 3833.319        | PK       | 47.15          | 29.36           | 5.65      | 36.85     | 2.24                 | 47.55           | 73.90          | 26.3        | 265         | 332         |             |
| Vert.    | 4874.000        | PK       | 44.31          | 31.28           | 5.96      | 37.15     | 2.24                 | 46.64           | 73.90          | 27.2        | 100         | 318         |             |
| Vert.    | 7311.000        | PK       | 44.74          | 36.74           | 7.36      | 37.91     | 2.24                 | 53.17           | 73.90          | 20.7        | 150         | 0           | Floor Noise |
| Vert.    | 3833.319        | AV       | 41.44          | 29.36           | 5.65      | 36.85     | 2.24                 | 41.84           | 53.90          | 12.0        | 265         | 332         |             |
| Vert.    | 7311.000        | AV       | 34.78          | 36.74           | 7.36      | 37.91     | 2.24                 | 43.21           | 53.90          | 10.6        | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 4874.000        | AV       | 33.85          | 31.28           | 5.96      | 37.15     | 5.32             | 2.24                 | 41.50           | 53.90          | 12.4        |        |
| Vert.    | 4874.000        | AV       | 34.33          | 31.28           | 5.96      | 37.15     | 5.32             | 2.24                 | 41.98           | 53.90          | 11.9        |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2437.000        | PK       | 78.88          | 27.60           | 13.81     | 37.03     | 2.24                 | 85.50           | -              | -           | Carrier |
| Hori.    | 9748.000        | PK       | 39.22          | 38.74           | 8.35      | 39.19     | 2.24                 | 49.36           | 65.50          | 16.1        |         |
| Vert.    | 2437.000        | PK       | 82.32          | 27.60           | 13.81     | 37.03     | 2.24                 | 88.94           | -              | -           | Carrier |
| Vert.    | 9748.000        | PK       | 42.28          | 38.74           | 8.35      | 39.19     | 2.24                 | 52.42           | 68.94          | 16.5        |         |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88 \text{ m} / 3.0 \text{ m}) = 2.24 \text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11504641S-B  
Date : December 10, 2016      November 4, 2016      November 18, 2016  
Temperature / Humidity : 23 deg. C / 34 % RH      25 deg. C / 41 % RH      23 deg. C / 46 % RH  
Engineer : Shinichi Takano      Shinichi Takano      Kenichi Adachi  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (26.5 GHz -31.5 GHz)  
Mode : Tx 11b 2462 MHz

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2483.500        | PK       | 44.69          | 27.79           | 13.86     | 37.01     | 2.24                 | 51.57           | 73.90          | 22.3        | 166         | 44          |             |
| Hori.    | 3833.612        | PK       | 47.94          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.34           | 73.90          | 25.5        | 110         | 112         |             |
| Hori.    | 4924.000        | PK       | 42.97          | 31.38           | 5.97      | 37.18     | 2.24                 | 45.38           | 73.90          | 28.5        | 150         | 0           |             |
| Hori.    | 7386.000        | PK       | 43.98          | 36.95           | 7.34      | 37.96     | 2.24                 | 52.55           | 73.90          | 21.3        | 150         | 0           | Floor Noise |
| Hori.    | 3833.612        | AV       | 42.91          | 29.36           | 5.65      | 36.85     | 2.24                 | 43.31           | 53.90          | 10.5        | 110         | 112         |             |
| Hori.    | 7386.000        | AV       | 34.85          | 36.95           | 7.34      | 37.96     | 2.24                 | 43.42           | 53.90          | 10.4        | 150         | 0           | Floor Noise |
| Vert.    | 2483.500        | PK       | 43.46          | 27.79           | 13.86     | 37.01     | 2.24                 | 50.34           | 73.90          | 23.5        | 167         | 142         |             |
| Vert.    | 3833.196        | PK       | 47.67          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.07           | 73.90          | 25.8        | 263         | 334         |             |
| Vert.    | 4924.000        | PK       | 44.32          | 31.38           | 5.97      | 37.18     | 2.24                 | 46.73           | 73.90          | 27.1        | 156         | 208         |             |
| Vert.    | 7386.000        | PK       | 43.91          | 36.95           | 7.34      | 37.96     | 2.24                 | 52.48           | 73.90          | 21.4        | 150         | 0           | Floor Noise |
| Vert.    | 3833.196        | AV       | 41.50          | 29.36           | 5.65      | 36.85     | 2.24                 | 41.90           | 53.90          | 12.0        | 263         | 334         |             |
| Vert.    | 7386.000        | AV       | 34.81          | 36.95           | 7.34      | 37.96     | 2.24                 | 43.38           | 53.90          | 10.5        | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2483.500        | AV       | 35.47          | 27.79           | 13.86     | 37.01     | 5.32             | 2.24                 | 47.67           | 53.90          | 6.2         | *1)    |
| Hori.    | 4924.000        | AV       | 33.97          | 31.38           | 5.97      | 37.18     | 5.32             | 2.24                 | 41.70           | 53.90          | 12.2        |        |
| Vert.    | 2483.500        | AV       | 34.51          | 27.79           | 13.86     | 37.01     | 5.32             | 2.24                 | 46.71           | 53.90          | 7.2         | *1)    |
| Vert.    | 4924.000        | AV       | 34.63          | 31.38           | 5.97      | 37.18     | 5.32             | 2.24                 | 42.36           | 53.90          | 11.5        |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2462.000        | PK       | 77.06          | 27.70           | 13.84     | 37.02     | 2.24                 | 83.82           | -              | -           | Carrier |
| Hori.    | 9848.000        | PK       | 39.33          | 38.81           | 8.37      | 39.23     | 2.24                 | 49.52           | 63.82          | 14.3        |         |
| Vert.    | 2462.000        | PK       | 82.25          | 27.70           | 13.84     | 37.02     | 2.24                 | 89.01           | -              | -           | Carrier |
| Vert.    | 9848.000        | PK       | 43.58          | 38.81           | 8.37      | 39.23     | 2.24                 | 53.77           | 69.01          | 15.2        |         |

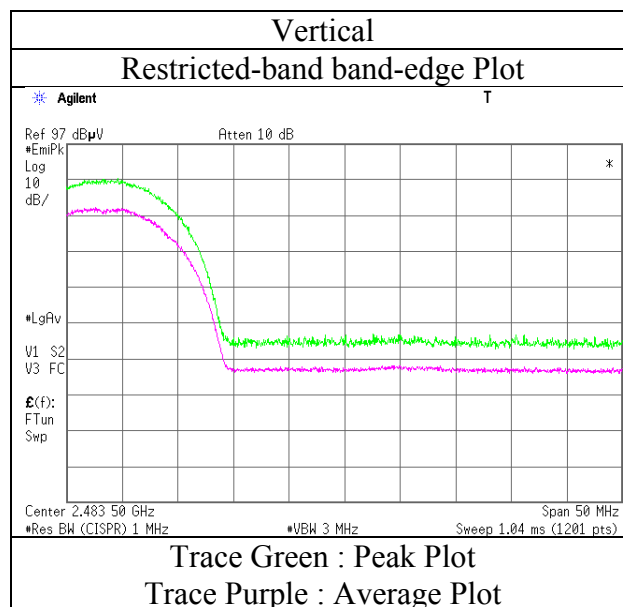
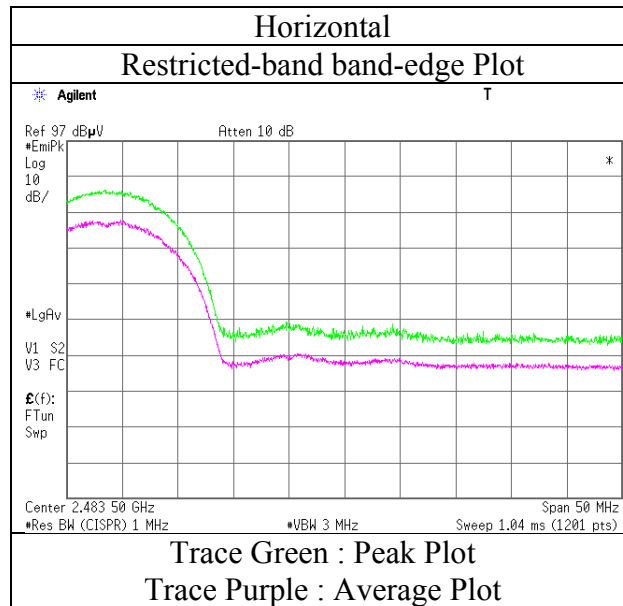
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano                            |
|                        | (1 GHz -13 GHz)                            |
| Mode                   | Tx 11b 2462 MHz                            |



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

## Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11504641S-B  
Date : December 10, 2016      November 4, 2016      November 18, 2016  
Temperature / Humidity : 23 deg. C / 34 % RH      25 deg. C / 41 % RH      23 deg. C / 46 % RH  
Engineer : Shinichi Takano      Shinichi Takano      Kenichi Adachi  
(1 GHz -13 GHz)      (13 GHz -26.5 GHz)      (26.5 GHz -31.5 GHz)  
Mode : Tx 11g 2412 MHz

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark             |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|--------------------|
| Hori.    | 2390.000        | PK       | 44.51          | 27.41           | 13.77     | 37.06     | 2.24                 | 50.87           | 73.90          | 23.0        | 197         | 122         | Floor Noise<br>*1) |
| Hori.    | 3833.614        | PK       | 47.92          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.32           | 73.90          | 25.5        | 115         | 110         |                    |
| Hori.    | 4824.000        | PK       | 44.16          | 31.17           | 5.95      | 37.13     | 2.24                 | 46.39           | 73.90          | 27.5        | 150         | 0           |                    |
| Hori.    | 7236.000        | PK       | 44.58          | 36.52           | 7.38      | 37.86     | 2.24                 | 52.86           | 73.90          | 21.0        | 150         | 0           |                    |
| Hori.    | 3833.614        | AV       | 42.81          | 29.36           | 5.65      | 36.85     | 2.24                 | 43.21           | 53.90          | 10.6        | 115         | 110         |                    |
| Hori.    | 4824.000        | AV       | 33.99          | 31.17           | 5.95      | 37.13     | 2.24                 | 36.22           | 53.90          | 17.6        | 150         | 0           |                    |
| Hori.    | 7236.000        | AV       | 34.81          | 36.52           | 7.38      | 37.86     | 2.24                 | 43.09           | 53.90          | 10.8        | 150         | 0           |                    |
| Vert.    | 2390.000        | PK       | 44.33          | 27.41           | 13.77     | 37.06     | 2.24                 | 50.69           | 73.90          | 23.2        | 247         | 137         |                    |
| Vert.    | 3833.175        | PK       | 47.43          | 29.36           | 5.65      | 36.85     | 2.24                 | 47.83           | 73.90          | 26.0        | 266         | 327         |                    |
| Vert.    | 4824.000        | PK       | 44.47          | 31.17           | 5.95      | 37.13     | 2.24                 | 46.70           | 73.90          | 27.2        | 104         | 315         |                    |
| Vert.    | 7236.000        | PK       | 44.12          | 36.52           | 7.38      | 37.86     | 2.24                 | 52.40           | 73.90          | 21.5        | 150         | 0           | Floor Noise        |
| Vert.    | 3833.175        | AV       | 41.54          | 29.36           | 5.65      | 36.85     | 2.24                 | 41.94           | 53.90          | 11.9        | 266         | 327         | *1)                |
| Vert.    | 4824.000        | AV       | 34.65          | 31.17           | 5.95      | 37.13     | 2.24                 | 36.88           | 53.90          | 17.0        | 104         | 315         |                    |
| Vert.    | 7236.000        | AV       | 34.73          | 36.52           | 7.38      | 37.86     | 2.24                 | 43.01           | 53.90          | 10.8        | 150         | 0           | Floor Noise        |

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2390.000        | AV       | 34.51          | 27.41           | 13.77     | 37.06     | 1.68             | 2.24                 | 42.55           | 53.90          | 11.3        | *1)    |
| Vert.    | 2390.000        | AV       | 34.89          | 27.41           | 13.77     | 37.06     | 1.68             | 2.24                 | 42.93           | 53.90          | 11.0        | *1)    |

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

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2412.000        | PK       | 76.13          | 27.50           | 13.79     | 37.04     | 2.24                 | 82.62           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 39.19          | 27.45           | 13.78     | 37.05     | 2.24                 | 45.61           | 62.62          | 17.0        | Carrier |
| Hori.    | 9648.000        | PK       | 39.91          | 38.66           | 8.33      | 39.15     | 2.24                 | 49.99           | 62.62          | 12.6        |         |
| Vert.    | 2412.000        | PK       | 77.10          | 27.50           | 13.79     | 37.04     | 2.24                 | 83.59           | -              | -           |         |
| Vert.    | 2400.000        | PK       | 40.73          | 27.45           | 13.78     | 37.05     | 2.24                 | 47.15           | 63.59          | 16.4        |         |
| Vert.    | 9648.000        | PK       | 41.82          | 38.66           | 8.33      | 39.15     | 2.24                 | 51.90           | 63.59          | 11.7        |         |

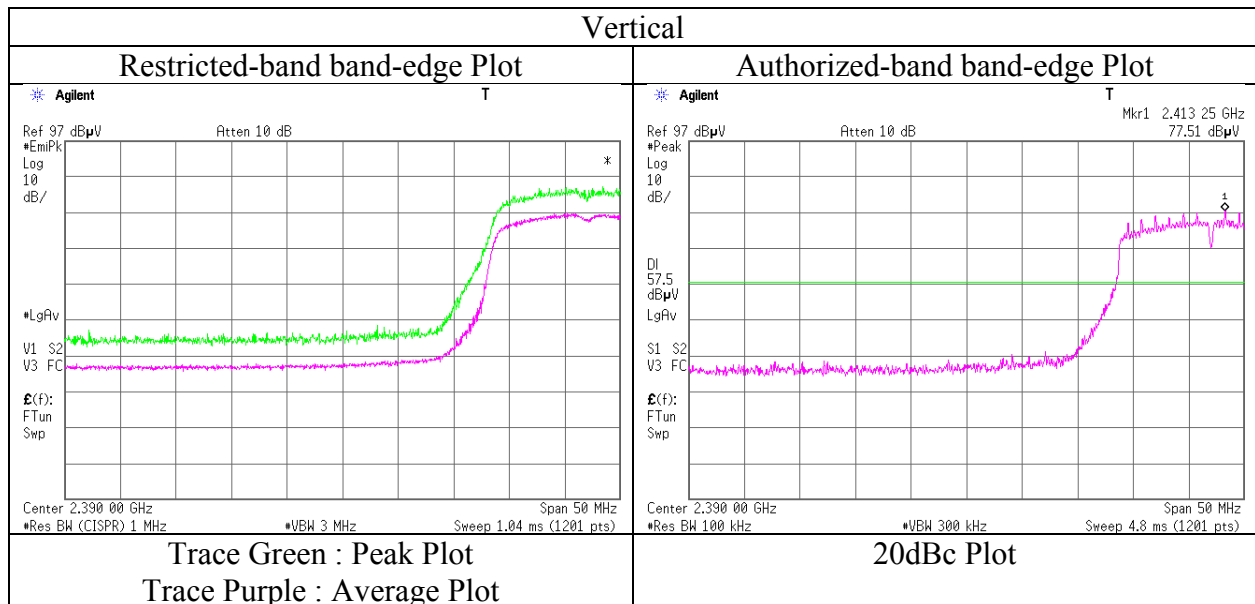
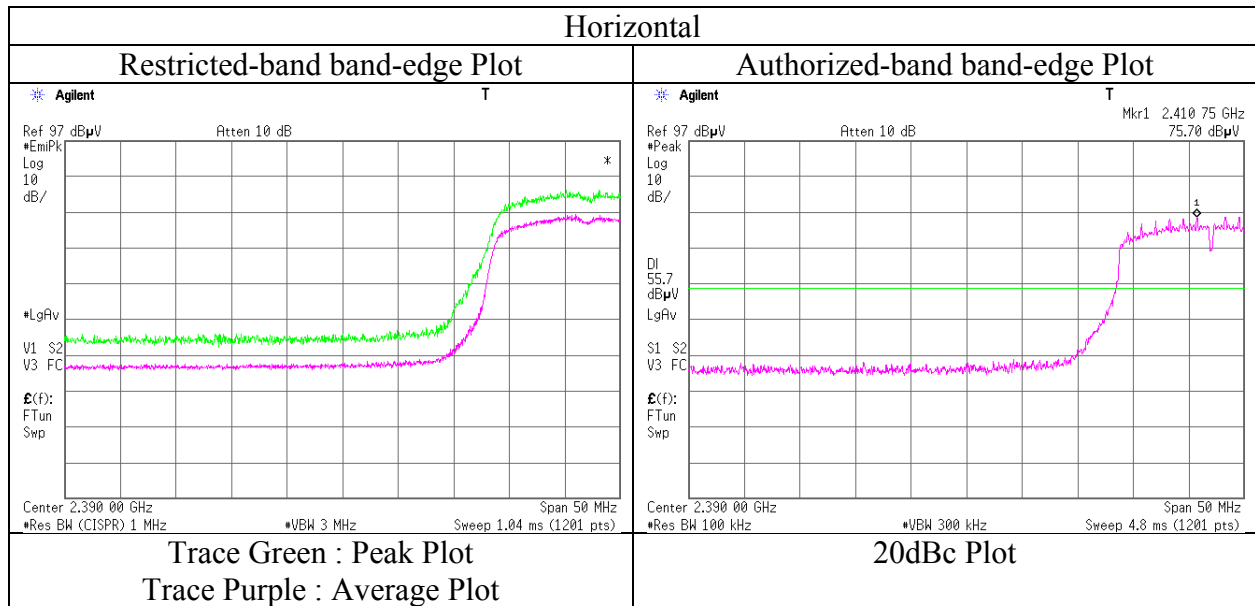
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano<br>(1 GHz -13 GHz)         |
| Mode                   | Tx 11g 2412 MHz                            |



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

## Radiated Spurious Emission

|                        |                                            |                     |                      |
|------------------------|--------------------------------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |                     |                      |
| Report No.             | 11504641S-B                                |                     |                      |
| Date                   | December 10, 2016                          | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH                        | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano                            | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -13 GHz)                            | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11g 2437 MHz                            |                     |                      |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 3833.623        | PK       | 48.04          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.44           | 73.90          | 25.4        | 114         | 117         |             |
| Hori.    | 4874.000        | PK       | 43.66          | 31.28           | 5.96      | 37.15     | 2.24                 | 45.99           | 73.90          | 27.9        | 150         | 0           |             |
| Hori.    | 7311.000        | PK       | 44.13          | 36.74           | 7.36      | 37.91     | 2.24                 | 52.56           | 73.90          | 21.3        | 150         | 0           | Floor Noise |
| Hori.    | 3833.623        | AV       | 42.43          | 29.36           | 5.65      | 36.85     | 2.24                 | 42.83           | 53.90          | 11.0        | 114         | 117         |             |
| Hori.    | 4874.000        | AV       | 34.00          | 31.28           | 5.96      | 37.15     | 2.24                 | 36.33           | 53.90          | 17.5        | 150         | 0           | *1)         |
| Hori.    | 7311.000        | AV       | 34.66          | 36.74           | 7.36      | 37.91     | 2.24                 | 43.09           | 53.90          | 10.8        | 150         | 0           | Floor Noise |
| Vert.    | 3833.096        | PK       | 47.66          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.06           | 73.90          | 25.8        | 266         | 334         |             |
| Vert.    | 4874.000        | PK       | 44.11          | 31.28           | 5.96      | 37.15     | 2.24                 | 46.44           | 73.90          | 27.4        | 121         | 314         |             |
| Vert.    | 7311.000        | PK       | 45.49          | 36.74           | 7.36      | 37.91     | 2.24                 | 53.92           | 73.90          | 19.9        | 150         | 0           | Floor Noise |
| Vert.    | 3833.096        | AV       | 41.78          | 29.36           | 5.65      | 36.85     | 2.24                 | 42.18           | 53.90          | 11.7        | 266         | 334         |             |
| Vert.    | 4874.000        | AV       | 34.66          | 31.28           | 5.96      | 37.15     | 2.24                 | 36.99           | 53.90          | 16.9        | 121         | 314         | *1)         |
| Vert.    | 7311.000        | AV       | 35.31          | 36.74           | 7.36      | 37.91     | 2.24                 | 43.74           | 53.90          | 10.1        | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2437.000        | PK       | 77.54          | 27.60           | 13.81     | 37.03     | 2.24                 | 84.16           | -              | -           | Carrier |
| Hori.    | 9748.000        | PK       | 38.23          | 38.74           | 8.35      | 39.19     | 2.24                 | 48.37           | 64.16          | 15.8        |         |
| Vert.    | 2437.000        | PK       | 80.27          | 27.60           | 13.81     | 37.03     | 2.24                 | 86.89           | -              | -           | Carrier |
| Vert.    | 9748.000        | PK       | 41.68          | 38.74           | 8.35      | 39.19     | 2.24                 | 51.82           | 66.89          | 15.1        |         |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

## Radiated Spurious Emission

|                        |                                            |                     |                      |
|------------------------|--------------------------------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |                     |                      |
| Report No.             | 11504641S-B                                |                     |                      |
| Date                   | December 10, 2016                          | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH                        | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano                            | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -13 GHz)                            | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11g 2462 MHz                            |                     |                      |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2483.500        | PK       | 45.60          | 27.79           | 13.86     | 37.01     | 2.24                 | 52.48           | 73.90          | 21.4        | 232         | 125         |             |
| Hori.    | 3833.298        | PK       | 47.85          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.25           | 73.90          | 25.6        | 110         | 112         |             |
| Hori.    | 4924.000        | PK       | 43.53          | 31.38           | 5.97      | 37.18     | 2.24                 | 45.94           | 73.90          | 27.9        | 150         | 0           |             |
| Hori.    | 7386.000        | PK       | 44.18          | 36.95           | 7.34      | 37.96     | 2.24                 | 52.75           | 73.90          | 21.1        | 150         | 0           | Floor Noise |
| Hori.    | 3833.298        | AV       | 42.71          | 29.36           | 5.65      | 36.85     | 2.24                 | 43.11           | 53.90          | 10.7        | 110         | 112         |             |
| Hori.    | 4924.000        | AV       | 34.03          | 31.38           | 5.97      | 37.18     | 2.24                 | 36.44           | 53.90          | 17.4        | 150         | 0           | *1)         |
| Hori.    | 7386.000        | AV       | 34.78          | 36.95           | 7.34      | 37.96     | 2.24                 | 43.35           | 53.90          | 10.5        | 150         | 0           | Floor Noise |
| Vert.    | 2483.500        | PK       | 47.85          | 27.79           | 13.86     | 37.01     | 2.24                 | 54.73           | 73.90          | 19.1        | 166         | 144         |             |
| Vert.    | 3833.197        | PK       | 47.82          | 29.36           | 5.65      | 36.85     | 2.24                 | 48.22           | 73.90          | 25.6        | 265         | 326         |             |
| Vert.    | 4924.000        | PK       | 44.87          | 31.38           | 5.97      | 37.18     | 2.24                 | 47.28           | 73.90          | 26.6        | 206         | 204         |             |
| Vert.    | 7386.000        | PK       | 43.80          | 36.95           | 7.34      | 37.96     | 2.24                 | 52.37           | 73.90          | 21.5        | 100         | 0           | Floor Noise |
| Vert.    | 3833.197        | AV       | 41.67          | 29.36           | 5.65      | 36.85     | 2.24                 | 42.07           | 53.90          | 11.8        | 265         | 326         |             |
| Vert.    | 4924.000        | AV       | 34.89          | 31.38           | 5.97      | 37.18     | 2.24                 | 37.30           | 53.90          | 16.6        | 206         | 204         | *1)         |
| Vert.    | 7386.000        | AV       | 34.78          | 36.95           | 7.34      | 37.96     | 2.24                 | 43.35           | 53.90          | 10.5        | 100         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2483.500        | AV       | 35.32          | 27.79           | 13.86     | 37.01     | 1.68             | 2.24                 | 43.88           | 53.90          | 10.0        | *1)    |
| Vert.    | 2483.500        | AV       | 36.67          | 27.79           | 13.86     | 37.01     | 1.68             | 2.24                 | 45.23           | 53.90          | 8.7         | *1)    |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2462.000        | PK       | 75.81          | 27.70           | 13.84     | 37.02     | 2.24                 | 82.57           | -              | -           | Carrier |
| Hori.    | 9848.000        | PK       | 38.88          | 38.81           | 8.37      | 39.23     | 2.24                 | 49.07           | 62.57          | 13.5        |         |
| Vert.    | 2462.000        | PK       | 79.47          | 27.70           | 13.84     | 37.02     | 2.24                 | 86.23           | -              | -           | Carrier |
| Vert.    | 9848.000        | PK       | 42.89          | 38.81           | 8.37      | 39.23     | 2.24                 | 53.08           | 66.23          | 13.2        |         |

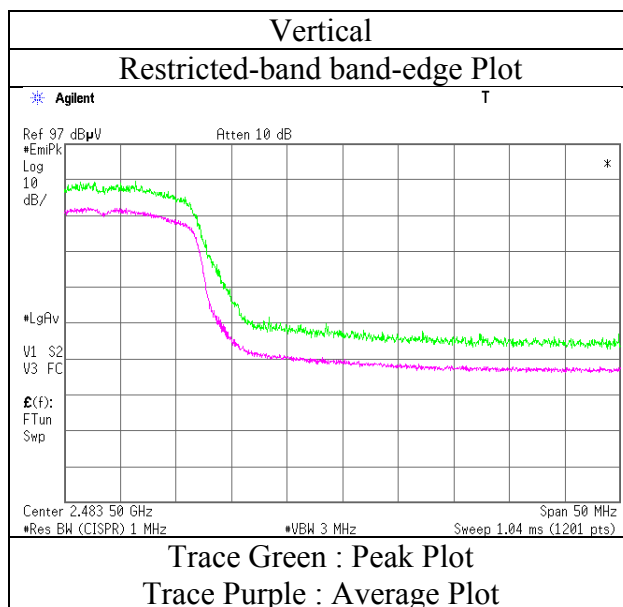
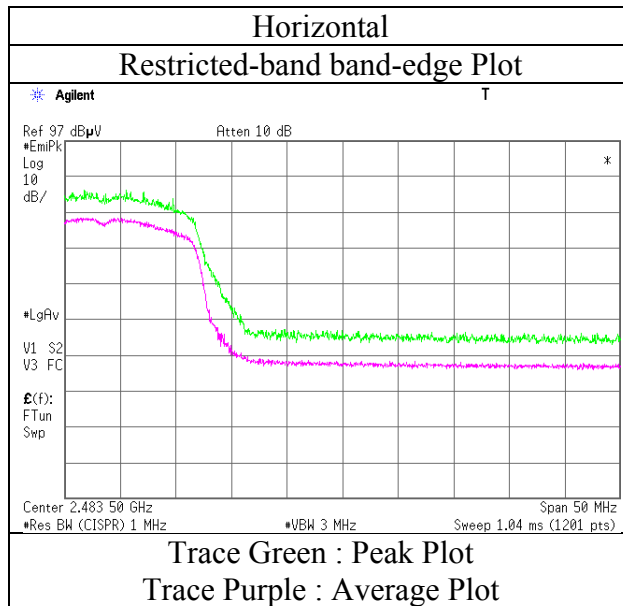
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano<br>(1 GHz -13 GHz)         |
| Mode                   | Tx 11g 2462 MHz                            |



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

## Radiated Spurious Emission

|                        |                         |                     |                     |                      |
|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.         |                     |                     |                      |
| Report No.             | 11504641S-B             |                     |                     |                      |
| Semi Anechoic Chamber  | No.3                    | No.2                | No.3                | No.3                 |
| Date                   | December 10, 2016       | December 11, 2016   | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH     | 20 deg. C / 56 % RH | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano         | Shinichi Takano     | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -2.8 GHz)        | (2.8 GHz -13 GHz)   | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11n-20 SISO 2412 MHz |                     |                     |                      |

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark      |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|----------------|----------------|-------------|
| Hori.    | 2390.000           | PK       | 44.30             | 27.41              | 13.77        | 37.06        | 2.24                    | 50.66              | 73.90             | 23.2           | 195            | 121            |             |
| Hori.    | 3833.617           | PK       | 48.67             | 29.34              | 7.96         | 36.85        | 2.24                    | 51.36              | 73.90             | 22.5           | 292            | 91             |             |
| Hori.    | 4824.000           | PK       | 44.41             | 31.17              | 8.46         | 37.13        | 2.24                    | 49.15              | 73.90             | 24.8           | 208            | 226            |             |
| Hori.    | 7236.000           | PK       | 45.58             | 36.49              | 9.50         | 37.86        | 2.24                    | 55.95              | 73.90             | 18.0           | 150            | 0              | Floor Noise |
| Hori.    | 3833.617           | AV       | 43.04             | 29.34              | 7.96         | 36.85        | 2.24                    | 45.73              | 53.90             | 8.2            | 292            | 91             |             |
| Hori.    | 4824.000           | AV       | 34.15             | 31.17              | 8.46         | 37.13        | 2.24                    | 38.89              | 53.90             | 15.0           | 208            | 226            | *1)         |
| Hori.    | 7236.000           | AV       | 35.27             | 36.49              | 9.50         | 37.86        | 2.24                    | 45.64              | 53.90             | 8.3            | 150            | 0              | Floor Noise |
| Vert.    | 2390.000           | PK       | 44.34             | 27.41              | 13.77        | 37.06        | 2.24                    | 50.70              | 73.90             | 23.2           | 249            | 137            |             |
| Vert.    | 3833.452           | PK       | 46.21             | 29.34              | 7.96         | 36.85        | 2.24                    | 48.90              | 73.90             | 25.0           | 304            | 333            |             |
| Vert.    | 4824.000           | PK       | 44.28             | 31.17              | 8.46         | 37.13        | 2.24                    | 49.02              | 73.90             | 24.9           | 276            | 197            |             |
| Vert.    | 7236.000           | PK       | 44.34             | 36.49              | 9.50         | 37.86        | 2.24                    | 54.71              | 73.90             | 19.2           | 150            | 0              | Floor Noise |
| Vert.    | 3833.452           | AV       | 39.87             | 29.34              | 7.96         | 36.85        | 2.24                    | 42.56              | 53.90             | 11.3           | 304            | 333            |             |
| Vert.    | 4824.000           | AV       | 34.13             | 31.17              | 8.46         | 37.13        | 2.24                    | 38.87              | 53.90             | 15.0           | 276            | 197            | *1)         |
| Vert.    | 7236.000           | AV       | 34.90             | 36.49              | 9.50         | 37.86        | 2.24                    | 45.27              | 53.90             | 8.6            | 150            | 0              | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

### Average measurement value with duty factor

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor [dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|---------------------|-------------------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2390.000           | AV       | 34.73             | 27.41              | 13.77        | 37.06        | 5.70                | 2.24                    | 46.79              | 53.90             | 7.1            | *1)    |
| Vert.    | 2390.000           | AV       | 34.75             | 27.41              | 13.77        | 37.06        | 5.70                | 2.24                    | 46.81              | 53.90             | 7.1            | *1)    |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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

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

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

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Distance<br>Factor [dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark  |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|-------------------------|--------------------|-------------------|----------------|---------|
| Hori.    | 2412.000           | PK       | 76.43             | 27.50              | 13.79        | 37.04        | 2.24                    | 82.92              | -                 | -              | Carrier |
| Hori.    | 2400.000           | PK       | 40.90             | 27.45              | 13.78        | 37.05        | 2.24                    | 47.32              | 62.92             | 15.6           |         |
| Hori.    | 9648.000           | PK       | 38.89             | 38.34              | 10.14        | 39.15        | 2.24                    | 50.46              | 65.16             | 14.7           |         |
| Vert.    | 2412.000           | PK       | 77.43             | 27.50              | 13.79        | 37.04        | 2.24                    | 83.92              | -                 | -              | Carrier |
| Vert.    | 2400.000           | PK       | 42.53             | 27.45              | 13.78        | 37.05        | 2.24                    | 48.95              | 63.92             | 15.0           |         |
| Vert.    | 9648.000           | PK       | 40.74             | 38.34              | 10.14        | 39.15        | 2.24                    | 52.31              | 66.16             | 13.9           |         |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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**Shonan EMC Lab.**

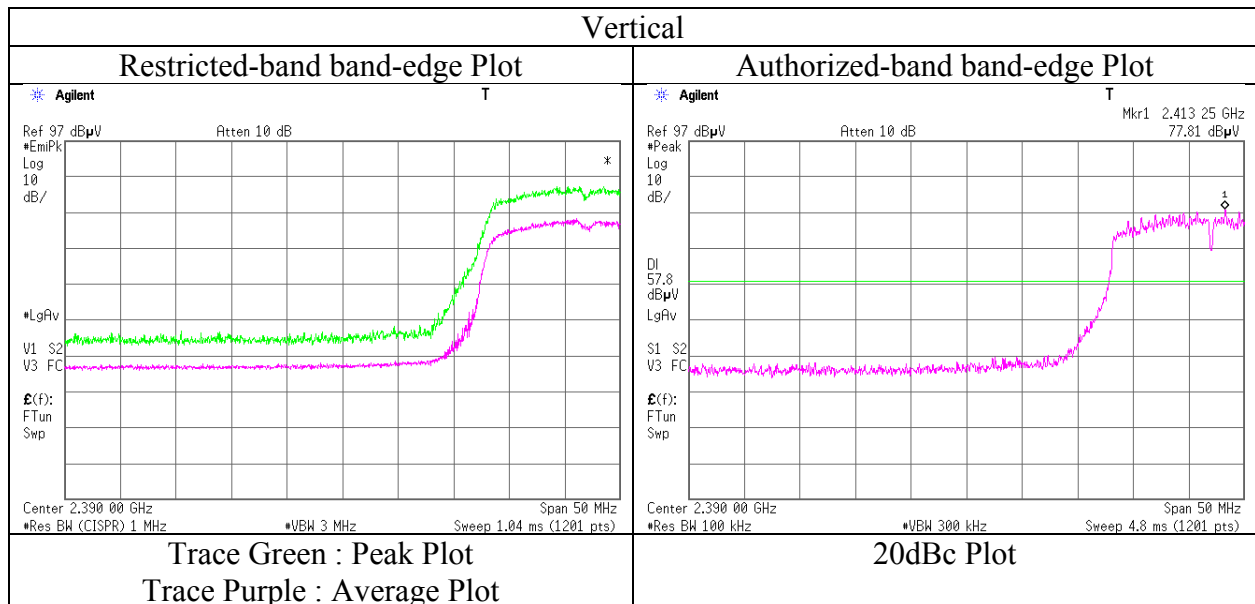
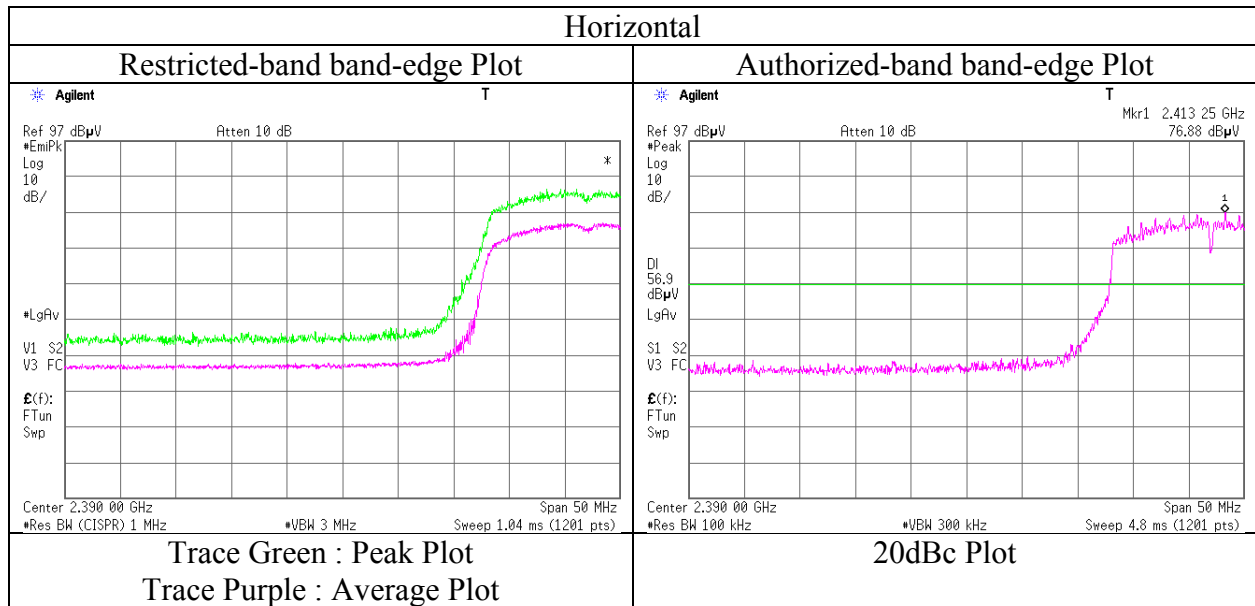
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano                            |
|                        | (1 GHz -2.8 GHz)                           |
| Mode                   | Tx 11n-20 SISO 2412 MHz                    |



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

## Radiated Spurious Emission

|                        |                         |                     |                     |                      |
|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.         |                     |                     |                      |
| Report No.             | 11504641S-B             |                     |                     |                      |
| Semi Anechoic Chamber  | No.3                    | No.2                | No.3                | No.3                 |
| Date                   | December 10, 2016       | December 11, 2016   | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH     | 20 deg. C / 56 % RH | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano         | Shinichi Takano     | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -2.8 GHz)        | (2.8 GHz -13 GHz)   | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11n-20 SISO 2437 MHz |                     |                     |                      |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 3833.774        | PK       | 47.40          | 29.34           | 7.96      | 36.85     | 2.24                 | 50.09           | 73.90          | 23.8        | 292         | 89          |             |
| Hori.    | 4874.000        | PK       | 43.00          | 31.28           | 8.48      | 37.15     | 2.24                 | 47.85           | 73.90          | 26.1        | 204         | 210         |             |
| Hori.    | 7311.000        | PK       | 44.21          | 36.62           | 9.51      | 37.91     | 2.24                 | 54.67           | 73.90          | 19.2        | 150         | 0           | Floor Noise |
| Hori.    | 3833.774        | AV       | 41.42          | 29.34           | 7.96      | 36.85     | 2.24                 | 44.11           | 53.90          | 9.8         | 292         | 89          |             |
| Hori.    | 4874.000        | AV       | 33.95          | 31.28           | 8.48      | 37.15     | 2.24                 | 38.80           | 53.90          | 15.1        | 204         | 210         | *1)         |
| Hori.    | 7311.000        | AV       | 34.81          | 36.62           | 9.51      | 37.91     | 2.24                 | 45.27           | 53.90          | 8.6         | 150         | 0           | Floor Noise |
| Vert.    | 3834.288        | PK       | 46.07          | 29.34           | 7.96      | 36.85     | 2.24                 | 48.76           | 73.90          | 25.1        | 299         | 344         |             |
| Vert.    | 4874.000        | PK       | 43.73          | 31.28           | 8.48      | 37.15     | 2.24                 | 48.58           | 73.90          | 25.3        | 217         | 203         |             |
| Vert.    | 7311.000        | PK       | 43.92          | 36.62           | 9.51      | 37.91     | 2.24                 | 54.38           | 73.90          | 19.5        | 150         | 0           | Floor Noise |
| Vert.    | 3834.288        | AV       | 38.17          | 29.34           | 7.96      | 36.85     | 2.24                 | 40.86           | 53.90          | 13.0        | 299         | 344         |             |
| Vert.    | 4874.000        | AV       | 34.67          | 31.28           | 8.48      | 37.15     | 2.24                 | 39.52           | 53.90          | 14.4        | 217         | 203         | *1)         |
| Vert.    | 7311.000        | AV       | 34.34          | 36.62           | 9.51      | 37.91     | 2.24                 | 44.80           | 53.90          | 9.1         | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2437.000        | PK       | 77.99          | 27.60           | 13.81     | 37.03     | 2.24                 | 84.61           | -              | -           | Carrier |
| Hori.    | 9748.000        | PK       | 37.57          | 38.50           | 10.19     | 39.19     | 2.24                 | 49.31           | 66.85          | 17.5        |         |
| Vert.    | 2437.000        | PK       | 79.95          | 27.60           | 13.81     | 37.03     | 2.24                 | 86.57           | -              | -           | Carrier |
| Vert.    | 9748.000        | PK       | 40.14          | 38.50           | 10.19     | 39.19     | 2.24                 | 51.88           | 68.81          | 16.9        |         |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

## Radiated Spurious Emission

|                        |                         |                     |                     |                      |
|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.         |                     |                     |                      |
| Report No.             | 11504641S-B             |                     |                     |                      |
| Semi Anechoic Chamber  | No.3                    | No.2                | No.3                | No.3                 |
| Date                   | December 10, 2016       | December 11, 2016   | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH     | 20 deg. C / 56 % RH | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano         | Shinichi Takano     | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -2.8 GHz)        | (2.8 GHz -13 GHz)   | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11n-20 SISO 2462 MHz |                     |                     |                      |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2483.500        | PK       | 44.32          | 27.79           | 13.86     | 37.01     | 2.24                 | 51.20           | 73.90          | 22.7        | 134         | 40          |             |
| Hori.    | 3834.492        | PK       | 49.47          | 29.34           | 7.96      | 36.85     | 2.24                 | 52.16           | 73.90          | 21.7        | 326         | 95          |             |
| Hori.    | 4924.000        | PK       | 43.04          | 31.38           | 8.51      | 37.18     | 2.24                 | 47.99           | 73.90          | 25.9        | 217         | 199         |             |
| Hori.    | 7386.000        | PK       | 43.21          | 36.75           | 9.52      | 37.96     | 2.24                 | 53.76           | 73.90          | 20.1        | 150         | 0           | Floor Noise |
| Hori.    | 3834.492        | AV       | 44.51          | 29.34           | 7.96      | 36.85     | 2.24                 | 47.20           | 53.90          | 6.7         | 326         | 95          |             |
| Hori.    | 4924.000        | AV       | 33.98          | 31.38           | 8.51      | 37.18     | 2.24                 | 38.93           | 53.90          | 15.0        | 217         | 199         | *1)         |
| Hori.    | 7386.000        | AV       | 34.94          | 36.75           | 9.52      | 37.96     | 2.24                 | 45.49           | 53.90          | 8.4         | 150         | 0           | Floor Noise |
| Vert.    | 2483.500        | PK       | 45.21          | 27.79           | 13.86     | 37.01     | 2.24                 | 52.09           | 73.90          | 21.8        | 156         | 172         |             |
| Vert.    | 3834.492        | PK       | 45.88          | 29.34           | 7.96      | 36.85     | 2.24                 | 48.57           | 73.90          | 25.3        | 302         | 343         |             |
| Vert.    | 4924.000        | PK       | 43.99          | 31.38           | 8.51      | 37.18     | 2.24                 | 48.94           | 73.90          | 25.0        | 261         | 305         |             |
| Vert.    | 7386.000        | PK       | 43.92          | 36.75           | 9.52      | 37.96     | 2.24                 | 54.47           | 73.90          | 19.4        | 150         | 0           | Floor Noise |
| Vert.    | 3834.492        | AV       | 38.99          | 29.34           | 7.96      | 36.85     | 2.24                 | 41.68           | 53.90          | 12.2        | 302         | 343         |             |
| Vert.    | 4924.000        | AV       | 34.48          | 31.38           | 8.51      | 37.18     | 2.24                 | 39.43           | 53.90          | 14.5        | 261         | 305         | *1)         |
| Vert.    | 7386.000        | AV       | 34.64          | 36.75           | 9.52      | 37.96     | 2.24                 | 45.19           | 53.90          | 8.7         | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2483.500        | AV       | 34.90          | 27.79           | 13.86     | 37.01     | 5.70             | 2.24                 | 47.48           | 53.90          | 6.4         | *1)    |
| Vert.    | 2483.500        | AV       | 35.01          | 27.79           | 13.86     | 37.01     | 5.70             | 2.24                 | 47.59           | 53.90          | 6.3         | *1)    |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2462.000        | PK       | 75.71          | 27.70           | 13.84     | 37.02     | 2.24                 | 82.47           | -              | -           | Carrier |
| Hori.    | 9848.000        | PK       | 37.41          | 38.65           | 10.24     | 39.23     | 2.24                 | 49.31           | 64.71          | 15.4        |         |
| Vert.    | 2462.000        | PK       | 79.57          | 27.70           | 13.84     | 37.02     | 2.24                 | 86.33           | -              | -           | Carrier |
| Vert.    | 9848.000        | PK       | 46.99          | 38.65           | 10.24     | 39.23     | 2.24                 | 58.89           | 68.57          | 9.7         |         |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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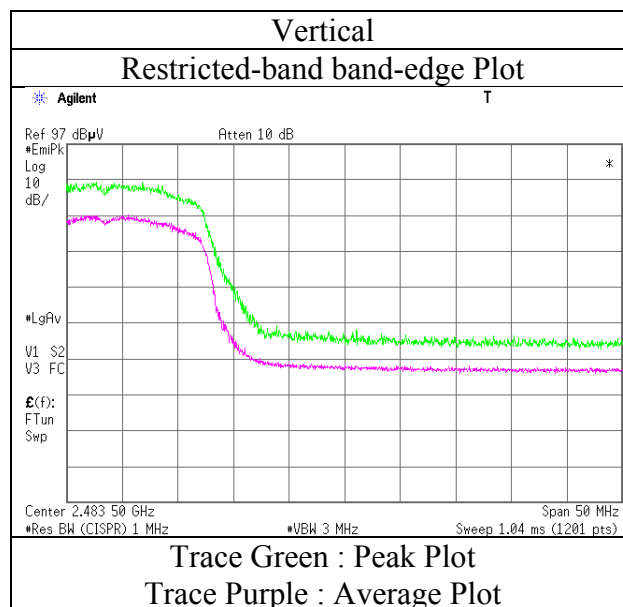
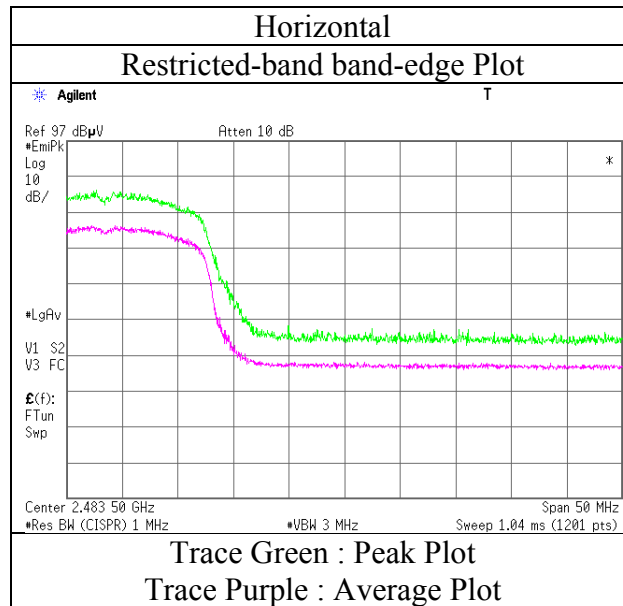
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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

Test place Shonan EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11504641S-B  
Date November 5, 2016  
Temperature / Humidity 23 deg. C / 44 % RH  
Engineer Yosuke Ishikawa  
(1 GHz -2.8 GHz)  
Mode Tx 11n-20 SISO 2462 MHz



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

## Radiated Spurious Emission

|                        |                         |                     |                     |                      |
|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.         |                     |                     |                      |
| Report No.             | 11504641S-B             |                     |                     |                      |
| Semi Anechoic Chamber  | No.3                    | No.2                | No.3                | No.3                 |
| Date                   | December 10, 2016       | December 11, 2016   | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH     | 20 deg. C / 56 % RH | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano         | Shinichi Takano     | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -2.8 GHz)        | (2.8 GHz -13 GHz)   | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11n-20 MIMO 2412 MHz |                     |                     |                      |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2390.000        | PK       | 43.24          | 27.41           | 13.77     | 37.06     | 2.24                 | 49.60           | 73.90          | 24.3        | 182         | 255         |             |
| Hori.    | 3834.683        | PK       | 46.41          | 29.34           | 7.96      | 36.85     | 2.24                 | 49.10           | 73.90          | 24.8        | 288         | 101         |             |
| Hori.    | 4824.000        | PK       | 43.59          | 31.17           | 8.46      | 37.13     | 2.24                 | 48.33           | 73.90          | 25.6        | 207         | 305         |             |
| Hori.    | 7236.000        | PK       | 43.88          | 36.49           | 9.50      | 37.86     | 2.24                 | 54.25           | 73.90          | 19.7        | 150         | 0           | Floor Noise |
| Hori.    | 3834.683        | AV       | 39.16          | 29.34           | 7.96      | 36.85     | 2.24                 | 41.85           | 53.90          | 12.1        | 288         | 101         |             |
| Hori.    | 4824.000        | AV       | 34.73          | 31.17           | 8.46      | 37.13     | 2.24                 | 39.47           | 53.90          | 14.4        | 207         | 305         | *1)         |
| Hori.    | 7236.000        | AV       | 35.41          | 36.49           | 9.50      | 37.86     | 2.24                 | 45.78           | 53.90          | 8.1         | 150         | 0           | Floor Noise |
| Vert.    | 2390.000        | PK       | 43.55          | 27.41           | 13.77     | 37.06     | 2.24                 | 49.91           | 73.90          | 23.9        | 243         | 249         |             |
| Vert.    | 3834.706        | PK       | 46.45          | 29.34           | 7.96      | 36.85     | 2.24                 | 49.14           | 73.90          | 24.8        | 331         | 358         |             |
| Vert.    | 4824.000        | PK       | 44.30          | 31.17           | 8.46      | 37.13     | 2.24                 | 49.04           | 73.90          | 24.9        | 307         | 186         |             |
| Vert.    | 7236.000        | PK       | 43.68          | 36.49           | 9.50      | 37.86     | 2.24                 | 54.05           | 73.90          | 19.9        | 150         | 0           | Floor Noise |
| Vert.    | 3834.706        | AV       | 40.15          | 29.34           | 7.96      | 36.85     | 2.24                 | 42.84           | 53.90          | 11.1        | 331         | 358         |             |
| Vert.    | 4824.000        | AV       | 35.62          | 31.17           | 8.46      | 37.13     | 2.24                 | 40.36           | 53.90          | 13.5        | 307         | 186         | *1)         |
| Vert.    | 7236.000        | AV       | 34.74          | 36.49           | 9.50      | 37.86     | 2.24                 | 45.11           | 53.90          | 8.8         | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2390.000        | AV       | 34.52          | 27.41           | 13.77     | 37.06     | 4.97             | 2.24                 | 45.85           | 53.90          | 8.0         | *1)    |
| Vert.    | 2390.000        | AV       | 34.47          | 27.41           | 13.77     | 37.06     | 4.97             | 2.24                 | 45.80           | 53.90          | 8.1         | *1)    |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2412.000        | PK       | 75.27          | 27.50           | 13.79     | 37.04     | 2.24                 | 81.76           | -              | -           |        |
| Hori.    | 2400.000        | PK       | 39.78          | 27.45           | 13.78     | 37.05     | 2.24                 | 46.20           | 61.76          | 15.6        |        |
| Hori.    | 9648.000        | PK       | 38.71          | 38.34           | 10.14     | 39.15     | 2.24                 | 50.28           | 64.00          | 13.7        |        |
| Vert.    | 2412.000        | PK       | 81.05          | 27.50           | 13.79     | 37.04     | 2.24                 | 87.54           | -              | -           |        |
| Vert.    | 2400.000        | PK       | 41.52          | 27.45           | 13.78     | 37.05     | 2.24                 | 47.94           | 67.54          | 19.6        |        |
| Vert.    | 9648.000        | PK       | 43.02          | 38.34           | 10.14     | 39.15     | 2.24                 | 54.59           | 69.78          | 15.2        |        |

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

Distance factor : 1 GHz - 13 GHz : 20log (3.88 m / 3.0 m) = 2.24 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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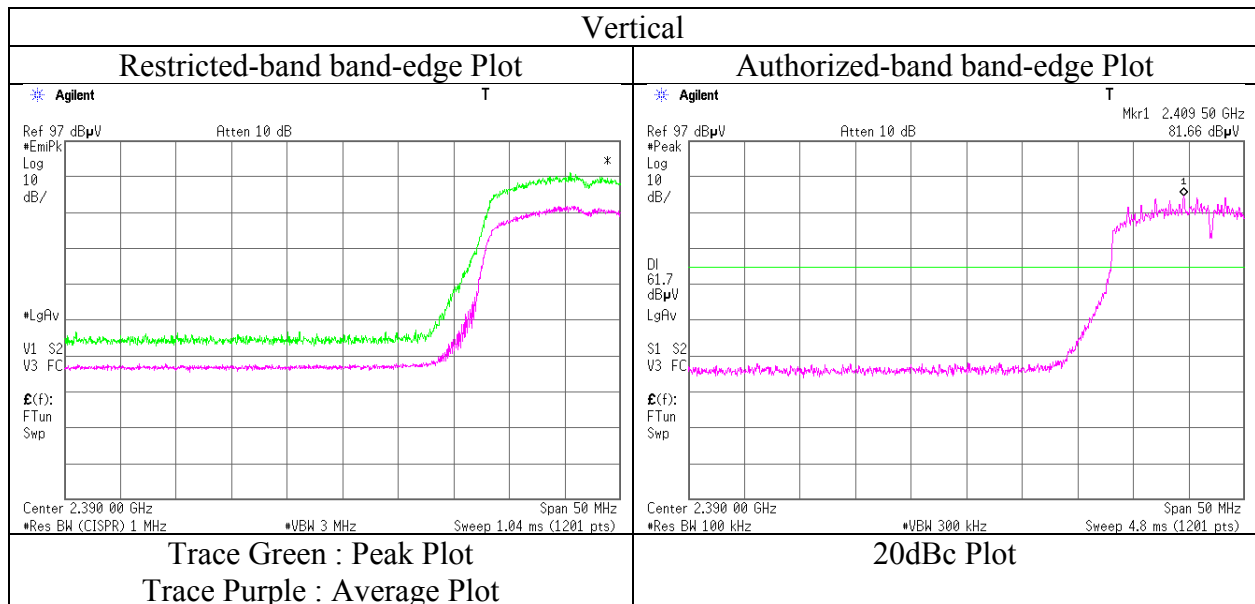
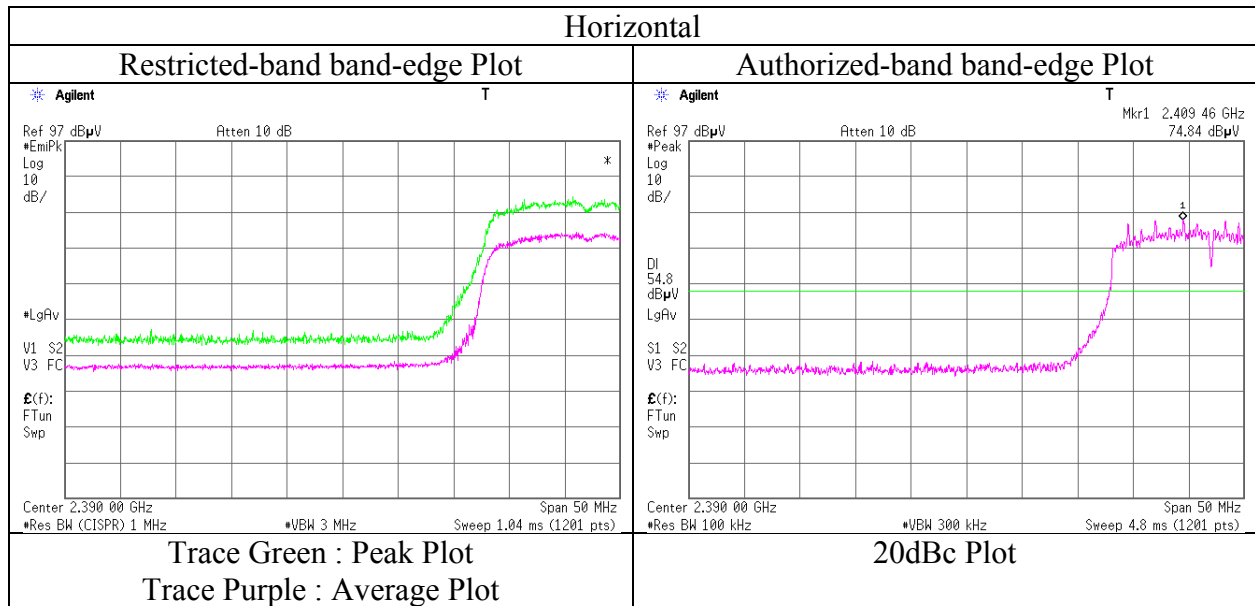
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano<br>(1 GHz -2.8 GHz)        |
| Mode                   | Tx 11n-20 MIMO 2412 MHz                    |



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

## Radiated Spurious Emission

Test place Shonan EMC Lab.  
Report No. 11504641S-B  
Semi Anechoic Chamber No.2 No.3 No.2 No.3 No.3  
Date November 8, 2016 December 10, 2016 December 11, 2016 November 4, 2016 November 18, 2016  
Temperature / Humidity 23 deg. C / 38 % RH 23 deg. C / 34 % RH 20 deg. C / 56 % RH 25 deg. C / 41 % RH 23 deg. C / 46 % RH  
Engineer Takahiro Suzuki Shinichi Takano Shinichi Takano Shinichi Takano Kenichi Adachi  
(30 MHz -1 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 GHz) (13 GHz -26.5 GHz) (26.5 GHz -31.5 GHz)  
Mode Tx 11n-20 MIMO 2437 MHz

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 145.000         | QP       | 37.30          | 14.51           | 8.49      | 31.81     | 0.00                 | 28.49           | 43.50          | 15.0        | 224         | 28          |             |
| Hori.    | 152.407         | QP       | 39.00          | 14.76           | 8.62      | 31.81     | 0.00                 | 30.57           | 43.50          | 12.9        | 226         | 255         |             |
| Hori.    | 155.000         | QP       | 35.60          | 14.85           | 8.66      | 31.81     | 0.00                 | 27.30           | 43.50          | 16.2        | 190         | 105         |             |
| Hori.    | 316.103         | QP       | 41.70          | 13.73           | 6.67      | 31.66     | 0.00                 | 30.44           | 46.00          | 15.5        | 152         | 263         |             |
| Hori.    | 735.107         | QP       | 29.60          | 20.09           | 9.04      | 31.47     | 0.00                 | 27.26           | 46.00          | 18.7        | 153         | 160         |             |
| Hori.    | 960.278         | QP       | 37.00          | 22.14           | 10.10     | 30.42     | 0.00                 | 38.82           | 53.90          | 15.0        | 100         | 170         |             |
| Hori.    | 3834.896        | PK       | 46.52          | 29.34           | 7.96      | 36.85     | 2.24                 | 49.21           | 73.90          | 24.7        | 283         | 106         |             |
| Hori.    | 4874.000        | PK       | 43.94          | 31.28           | 8.48      | 37.15     | 2.24                 | 48.79           | 73.90          | 25.1        | 239         | 306         |             |
| Hori.    | 7311.000        | PK       | 43.96          | 36.62           | 9.51      | 37.91     | 2.24                 | 54.42           | 73.90          | 19.5        | 150         | 0           | Floor Noise |
| Hori.    | 3834.896        | AV       | 40.38          | 29.34           | 7.96      | 36.85     | 2.24                 | 43.07           | 53.90          | 10.8        | 283         | 106         |             |
| Hori.    | 4874.000        | AV       | 34.65          | 31.28           | 8.48      | 37.15     | 2.24                 | 39.50           | 53.90          | 14.4        | 239         | 306         | *1)         |
| Hori.    | 7311.000        | AV       | 34.82          | 36.62           | 9.51      | 37.91     | 2.24                 | 45.28           | 53.90          | 8.6         | 150         | 0           | Floor Noise |
| Vert.    | 67.739          | QP       | 49.10          | 6.57            | 7.14      | 31.88     | 0.00                 | 30.93           | 40.00          | 9.0         | 100         | 95          |             |
| Vert.    | 107.260         | QP       | 40.50          | 11.20           | 7.92      | 31.84     | 0.00                 | 27.78           | 43.50          | 15.7        | 100         | 181         |             |
| Vert.    | 112.903         | QP       | 45.00          | 12.05           | 7.91      | 31.84     | 0.00                 | 33.12           | 43.50          | 10.3        | 100         | 72          |             |
| Vert.    | 114.032         | QP       | 40.50          | 12.22           | 7.90      | 31.84     | 0.00                 | 28.78           | 43.50          | 14.7        | 100         | 122         |             |
| Vert.    | 3835.050        | PK       | 45.67          | 29.34           | 7.97      | 36.85     | 2.24                 | 48.37           | 73.90          | 25.5        | 334         | 356         |             |
| Vert.    | 4874.000        | PK       | 43.76          | 31.28           | 8.48      | 37.15     | 2.24                 | 48.61           | 73.90          | 25.3        | 305         | 196         |             |
| Vert.    | 7311.000        | PK       | 44.17          | 36.62           | 9.51      | 37.91     | 2.24                 | 54.63           | 73.90          | 19.3        | 150         | 0           | Floor Noise |
| Vert.    | 3835.050        | AV       | 40.01          | 29.34           | 7.97      | 36.85     | 2.24                 | 42.71           | 53.90          | 11.2        | 334         | 356         |             |
| Vert.    | 4874.000        | AV       | 34.97          | 31.28           | 8.48      | 37.15     | 2.24                 | 39.82           | 53.90          | 14.1        | 305         | 196         | *1)         |
| Vert.    | 7311.000        | AV       | 34.58          | 36.62           | 9.51      | 37.91     | 2.24                 | 45.04           | 53.90          | 8.9         | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2437.000        | PK       | 78.21          | 27.60           | 13.81     | 37.03     | 2.24                 | 84.83           | -              | -           | Carrier |
| Hori.    | 9748.000        | PK       | 37.60          | 38.50           | 10.19     | 39.19     | 2.24                 | 49.34           | 67.07          | 17.7        |         |
| Vert.    | 2437.000        | PK       | 83.75          | 27.60           | 13.81     | 37.03     | 2.24                 | 90.37           | -              | -           | Carrier |
| Vert.    | 9748.000        | PK       | 42.09          | 38.50           | 10.19     | 39.19     | 2.24                 | 53.83           | 72.61          | 18.8        |         |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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## Radiated Spurious Emission

|                        |                         |                     |                     |                      |
|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Test place             | Shonan EMC Lab.         |                     |                     |                      |
| Report No.             | 11504641S-B             |                     |                     |                      |
| Semi Anechoic Chamber  | No.3                    | No.2                | No.3                | No.3                 |
| Date                   | December 10, 2016       | December 11, 2016   | November 4, 2016    | November 18, 2016    |
| Temperature / Humidity | 23 deg. C / 34 % RH     | 20 deg. C / 56 % RH | 25 deg. C / 41 % RH | 23 deg. C / 46 % RH  |
| Engineer               | Shinichi Takano         | Shinichi Takano     | Shinichi Takano     | Kenichi Adachi       |
|                        | (1 GHz -2.8 GHz)        | (2.8 GHz -13 GHz)   | (13 GHz -26.5 GHz)  | (26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11n-20 MIMO 2462 MHz |                     |                     |                      |

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg] | Remark      |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|-------------|-------------|-------------|
| Hori.    | 2483.500        | PK       | 43.59          | 27.79           | 13.86     | 37.01     | 2.24                 | 50.47           | 73.90          | 23.4        | 161         | 329         |             |
| Hori.    | 3835.083        | PK       | 45.57          | 29.34           | 7.97      | 36.85     | 2.24                 | 48.27           | 73.90          | 25.6        | 264         | 100         |             |
| Hori.    | 4924.000        | PK       | 43.73          | 31.38           | 8.51      | 37.18     | 2.24                 | 48.68           | 73.90          | 25.2        | 300         | 224         |             |
| Hori.    | 7386.000        | PK       | 44.01          | 36.75           | 9.52      | 37.96     | 2.24                 | 54.56           | 73.90          | 19.3        | 150         | 0           | Floor Noise |
| Hori.    | 3835.083        | AV       | 39.45          | 29.34           | 7.97      | 36.85     | 2.24                 | 42.15           | 53.90          | 11.8        | 264         | 100         |             |
| Hori.    | 4924.000        | AV       | 35.38          | 31.38           | 8.51      | 37.18     | 2.24                 | 40.33           | 53.90          | 13.6        | 300         | 224         | *1)         |
| Hori.    | 7386.000        | AV       | 35.60          | 36.75           | 9.52      | 37.96     | 2.24                 | 46.15           | 53.90          | 7.8         | 150         | 0           | Floor Noise |
| Vert.    | 2483.500        | PK       | 47.94          | 27.79           | 13.86     | 37.01     | 2.24                 | 54.82           | 73.90          | 19.0        | 161         | 142         |             |
| Vert.    | 3835.398        | PK       | 47.80          | 29.34           | 7.97      | 36.85     | 2.24                 | 50.50           | 73.90          | 23.4        | 342         | 347         |             |
| Vert.    | 4924.000        | PK       | 45.16          | 31.38           | 8.51      | 37.18     | 2.24                 | 50.11           | 73.90          | 23.8        | 284         | 196         |             |
| Vert.    | 7386.000        | PK       | 43.89          | 36.75           | 9.52      | 37.96     | 2.24                 | 54.44           | 73.90          | 19.5        | 150         | 0           | Floor Noise |
| Vert.    | 3835.398        | AV       | 41.43          | 29.34           | 7.97      | 36.85     | 2.24                 | 44.13           | 53.90          | 9.8         | 342         | 347         |             |
| Vert.    | 4924.000        | AV       | 35.36          | 31.38           | 8.51      | 37.18     | 2.24                 | 40.31           | 53.90          | 13.6        | 284         | 196         | *1)         |
| Vert.    | 7386.000        | AV       | 34.88          | 36.75           | 9.52      | 37.96     | 2.24                 | 45.43           | 53.90          | 8.5         | 150         | 0           | Floor Noise |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

\*1) Not apply duty factor, because duty cycle of this noise was above 98 %.

### Average measurement value with duty factor

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Duty Factor [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|------------------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2483.500        | AV       | 34.33          | 27.79           | 13.86     | 37.01     | 4.97             | 2.24                 | 46.18           | 53.90          | 7.7         | *1)    |
| Vert.    | 2483.500        | AV       | 36.87          | 27.79           | 13.86     | 37.01     | 4.97             | 2.24                 | 48.72           | 53.90          | 5.2         | *1)    |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|--------|
| Hori.    | 2462.000        | PK       | 77.06          | 27.70           | 13.84     | 37.02     | 2.24                 | 83.82           | -              | -           |        |
| Hori.    | 9848.000        | PK       | 38.26          | 38.65           | 10.24     | 39.23     | 2.24                 | 50.16           | 66.06          | 15.9        |        |
| Vert.    | 2462.000        | PK       | 77.87          | 27.70           | 13.84     | 37.02     | 2.24                 | 84.63           | -              | -           |        |
| Vert.    | 9848.000        | PK       | 42.73          | 38.65           | 10.24     | 39.23     | 2.24                 | 54.63           | 66.87          | 12.2        |        |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.88\text{ m} / 3.0\text{ m}) = 2.24\text{ dB}$

13 GHz - 40 GHz :  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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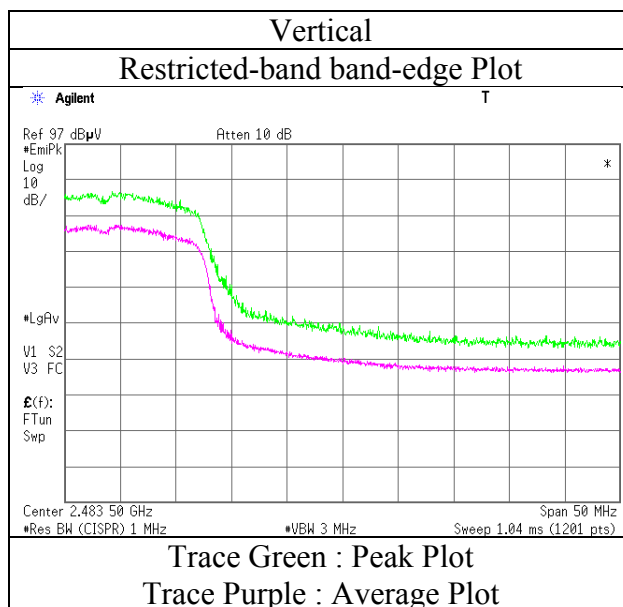
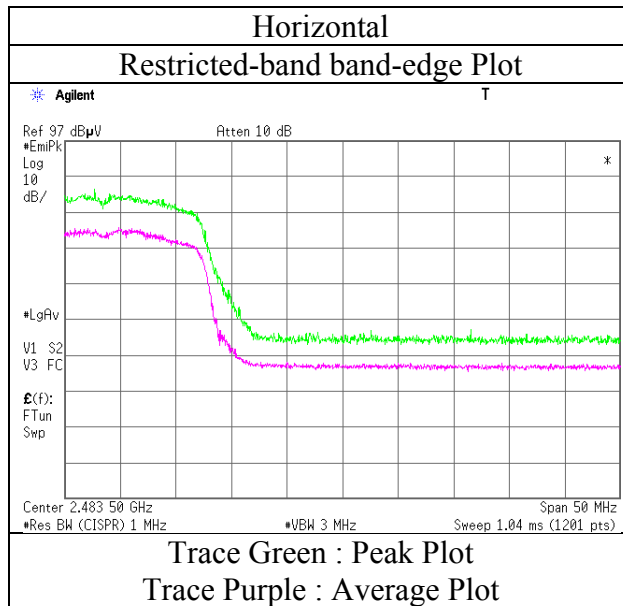
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## Radiated Spurious Emission (Reference Plot for band-edge)

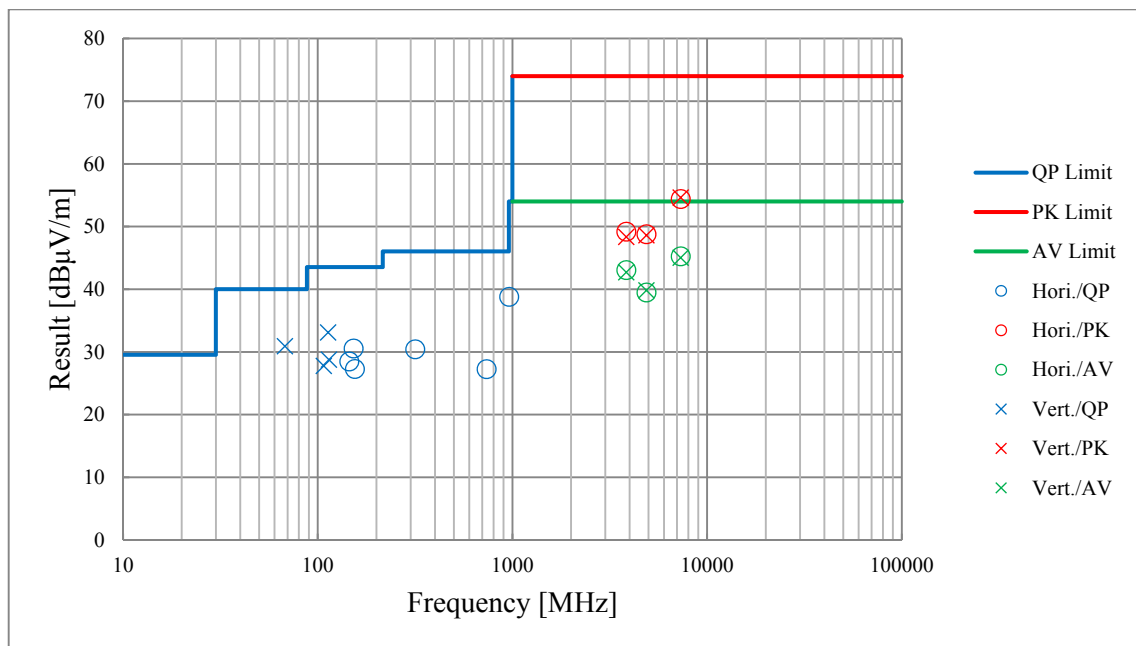
|                        |                                            |
|------------------------|--------------------------------------------|
| Test place             | Shonan EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.             | 11504641S-B                                |
| Date                   | December 10, 2016                          |
| Temperature / Humidity | 23 deg. C / 34 % RH                        |
| Engineer               | Shinichi Takano                            |
|                        | (1 GHz -2.8 GHz)                           |
| Mode                   | Tx 11n-20 MIMO 2462 MHz                    |



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

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

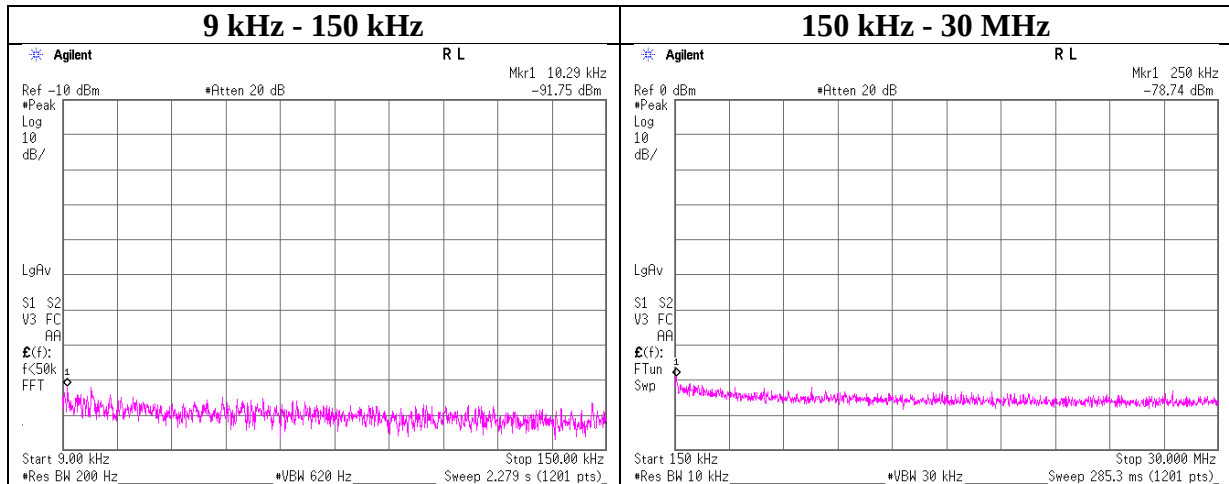
|                        |                                    |                                     |                                      |                                       |                                        |
|------------------------|------------------------------------|-------------------------------------|--------------------------------------|---------------------------------------|----------------------------------------|
| Test place             | Shonan EMC Lab.                    |                                     |                                      |                                       |                                        |
| Report No.             | 11504641S-B                        |                                     |                                      |                                       |                                        |
| Semi Anechoic Chamber  | No.2                               | No.3                                | No.2                                 | No.3                                  | No.3                                   |
| Date                   | November 8, 2016                   | December 10, 2016                   | December 11, 2016                    | November 4, 2016                      | November 18, 2016                      |
| Temperature / Humidity | 23 deg. C / 38 % RH                | 23 deg. C / 34 % RH                 | 20 deg. C / 56 % RH                  | 25 deg. C / 41 % RH                   | 23 deg. C / 46 % RH                    |
| Engineer               | Takahiro Suzuki<br>(30 MHz -1 GHz) | Shinichi Takano<br>(1 GHz -2.8 GHz) | Shinichi Takano<br>(2.8 GHz -13 GHz) | Shinichi Takano<br>(13 GHz -26.5 GHz) | Kenichi Adachi<br>(26.5 GHz -31.5 GHz) |
| Mode                   | Tx 11n-20 MIMO 2437 MHz            |                                     |                                      |                                       |                                        |



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

## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11504641S-B                        |
| Date                   | November 17, 2016                  |
| Temperature / Humidity | 25 deg. C / 48 % RH                |
| Engineer               | Hiroyuki Morikawa                  |
| Mode                   | Tx 11n-20 (MIMO) 2437 MHz          |



| Frequency<br>[kHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Attenuator<br>Loss<br>[dB] | Antenna<br>Gain<br>[dBi] | N<br>(Number<br>of Output) | EIRP<br>[dBm] | Distance<br>[m] | Ground<br>bounce<br>[dB] | E<br>(field strength)<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|--------------------|------------------|-----------------------|----------------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 10.29              | -91.8            | 0.01                  | 9.8                        | 2.0                      | 1                          | -79.9         | 300             | 6.0                      | -18.6                             | 47.3              | 65.9           |        |
| 250.00             | -78.7            | 0.02                  | 9.8                        | 2.0                      | 1                          | -66.9         | 300             | 6.0                      | -5.6                              | 19.6              | 25.2           |        |

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

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

### **Power Density**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11504641S-B  
Date December 15, 2016  
Temperature / Humidity 24 deg. C / 35 % RH  
Engineer Hiroyuki Morikawa  
Mode Tx 11b

11b Antenna 1

| Freq.   | Reading | Cable<br>Loss | Atten.<br>Loss | Result | Limit | Margin |
|---------|---------|---------------|----------------|--------|-------|--------|
| [MHz]   | [dBm]   | [dB]          | [dB]           | [dBm]  | [dBm] | [dB]   |
| 2412.00 | -28.85  | 2.32          | 9.67           | -16.86 | 8.00  | 24.86  |
| 2437.00 | -27.27  | 2.32          | 9.67           | -15.28 | 8.00  | 23.28  |
| 2462.00 | -27.08  | 2.33          | 9.67           | -15.08 | 8.00  | 23.08  |

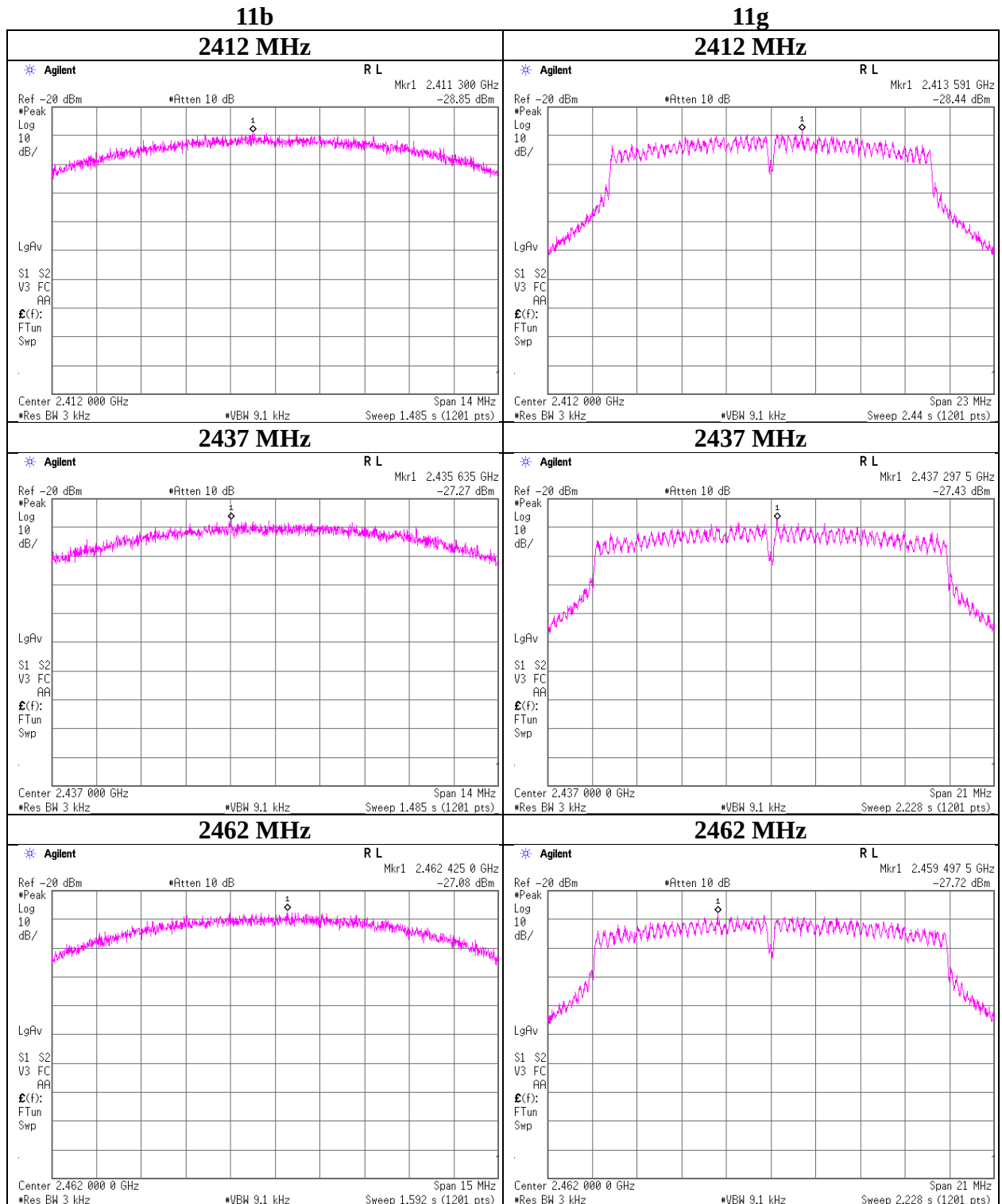
11g Antenna 1

| Freq.   | Reading | Cable<br>Loss | Atten.<br>Loss | Result | Limit | Margin |
|---------|---------|---------------|----------------|--------|-------|--------|
| [MHz]   | [dBm]   | [dB]          | [dB]           | [dBm]  | [dBm] | [dB]   |
| 2412.00 | -28.44  | 2.32          | 9.67           | -16.45 | 8.00  | 24.45  |
| 2437.00 | -27.43  | 2.32          | 9.67           | -15.44 | 8.00  | 23.44  |
| 2462.00 | -27.72  | 2.33          | 9.67           | -15.72 | 8.00  | 23.72  |

Sample Calculation:

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

## Power Density



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Telephone : +81 463 50 6400

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### **Power Density**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11504641S-B  
Date December 15, 2016  
Temperature / Humidity 24 deg. C / 35 % RH  
Engineer Hiroyuki Morikawa  
Mode Tx 11n-20 (SISO)

11n-20(SISO) Antenna 1

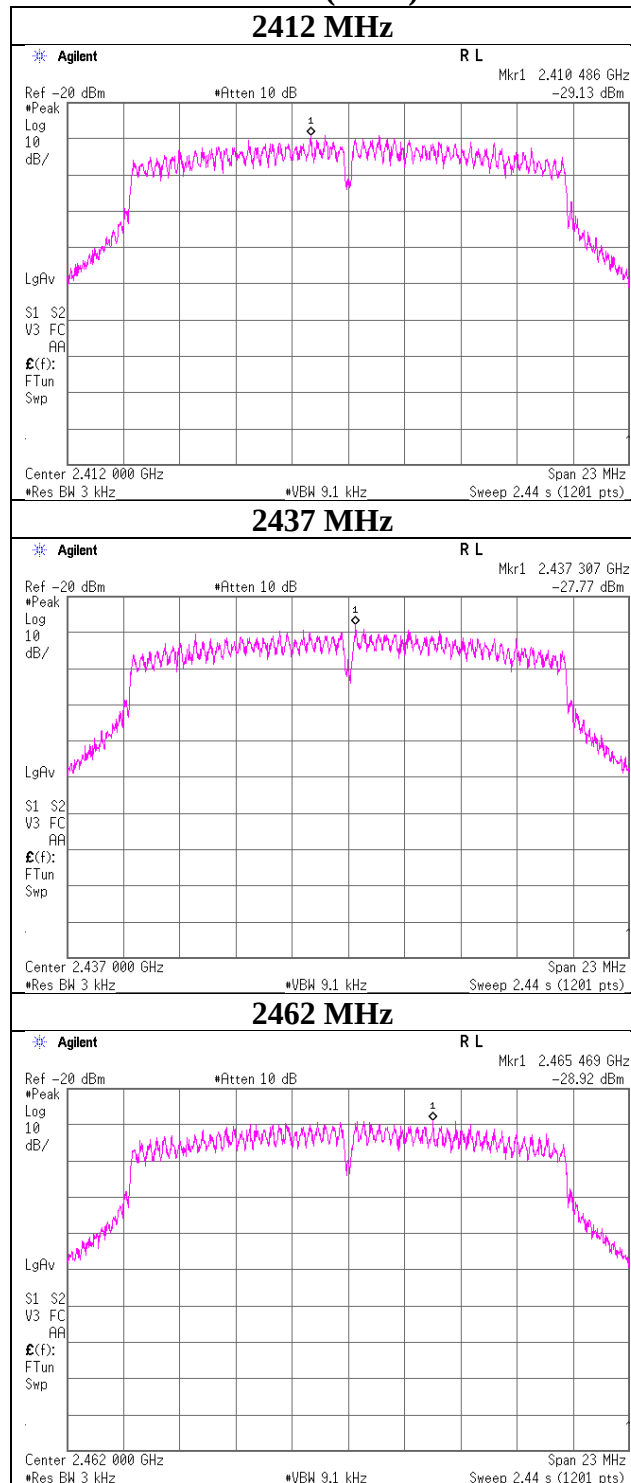
| Freq.   | Reading | Cable<br>Loss | Atten.<br>Loss | Result | Limit | Margin |
|---------|---------|---------------|----------------|--------|-------|--------|
| [MHz]   | [dBm]   | [dB]          | [dB]           | [dBm]  | [dBm] | [dB]   |
| 2412.00 | -29.13  | 2.32          | 9.67           | -17.14 | 8.00  | 25.14  |
| 2437.00 | -27.77  | 2.32          | 9.67           | -15.78 | 8.00  | 23.78  |
| 2462.00 | -28.92  | 2.33          | 9.67           | -16.92 | 8.00  | 24.92  |

Sample Calculation:

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

## Power Density

### 11n-20 (SISO)



### **Power Density**

Test place Shonan EMC Lab. No.5 Shielded Room  
Report No. 11504641S-B  
Date December 15, 2016  
Temperature / Humidity 24 deg. C / 35 % RH  
Engineer Hiroyuki Morikawa  
Mode Tx 11n-20 (MIMO)

#### Antenna 1 + 2

| Freq.<br>[MHz] | Antenna 1<br>Result | Antenna 2<br>Result | Result |      | Limit | Margin |
|----------------|---------------------|---------------------|--------|------|-------|--------|
|                | [mW]                | [mW]                | [dBm]  | [mW] | [dBm] | [dB]   |
| 2412.00        | 0.01                | 0.01                | -16.44 | 0.02 | 8.00  | 24.44  |
| 2437.00        | 0.02                | 0.01                | -16.13 | 0.02 | 8.00  | 24.13  |
| 2462.00        | 0.01                | 0.01                | -16.00 | 0.03 | 8.00  | 24.00  |

Sample Calculation:

Result = Antenna 1 + 2

#### Antenna 1

| Freq.<br>[MHz] | Reading | Cable<br>Loss | Atten.<br>Loss | Result |      | Limit | Margin |
|----------------|---------|---------------|----------------|--------|------|-------|--------|
|                | [dBm]   | [dB]          | [dB]           | [dBm]  | [mW] | [dBm] | [dB]   |
| 2412.00        | -32.17  | 2.32          | 9.67           | -20.18 | 0.01 | 8.00  | 28.18  |
| 2437.00        | -30.13  | 2.32          | 9.67           | -18.14 | 0.02 | 8.00  | 26.14  |
| 2462.00        | -30.61  | 2.33          | 9.67           | -18.61 | 0.01 | 8.00  | 26.61  |

#### Antenna 2

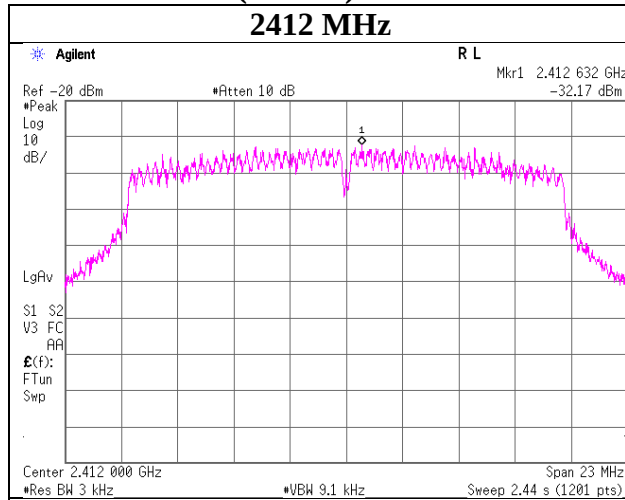
| Freq.<br>[MHz] | Reading | Cable<br>Loss | Atten.<br>Loss | Result |      | Limit | Margin |
|----------------|---------|---------------|----------------|--------|------|-------|--------|
|                | [dBm]   | [dB]          | [dB]           | [dBm]  | [mW] | [dBm] | [dB]   |
| 2412.00        | -30.81  | 2.32          | 9.67           | -18.82 | 0.01 | 8.00  | 26.82  |
| 2437.00        | -32.43  | 2.32          | 9.67           | -20.44 | 0.01 | 8.00  | 28.44  |
| 2462.00        | -31.47  | 2.33          | 9.67           | -19.47 | 0.01 | 8.00  | 27.47  |

Sample Calculation:

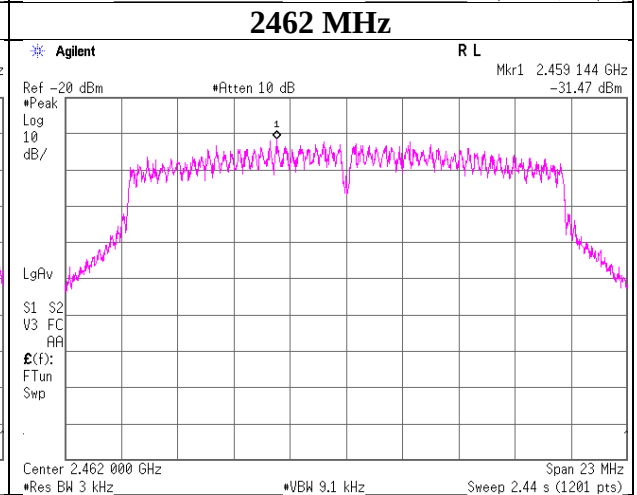
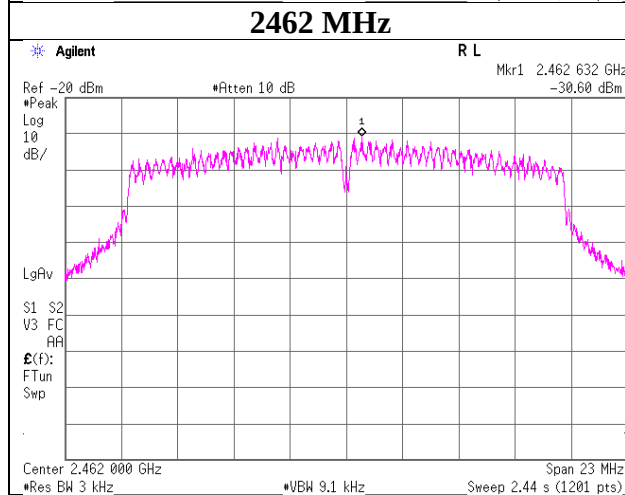
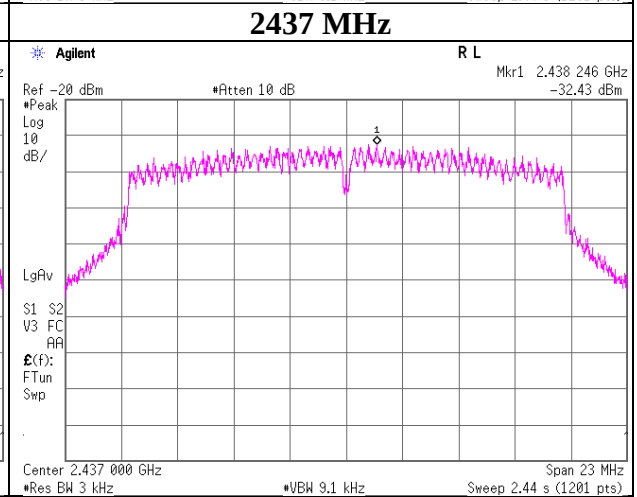
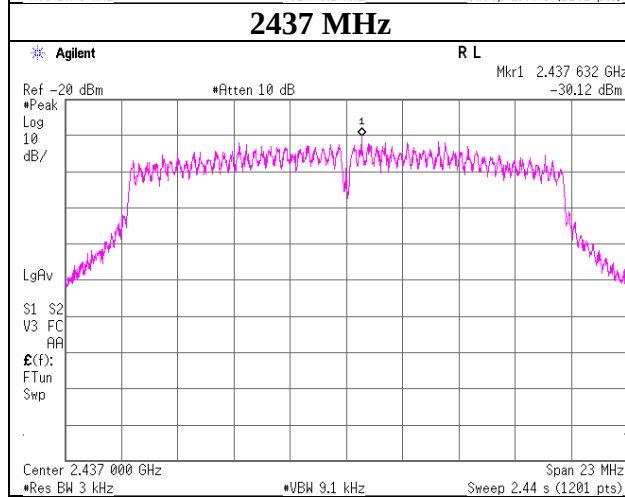
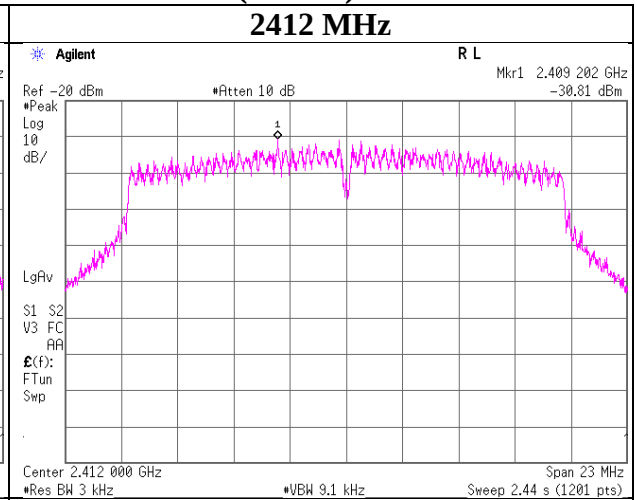
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

## Power Density

11n-20 (MIMO) Antenna 1



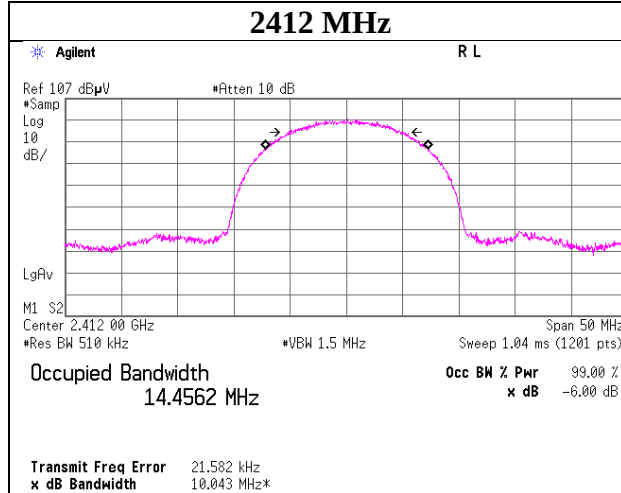
11n-20 (MIMO) Antenna 2



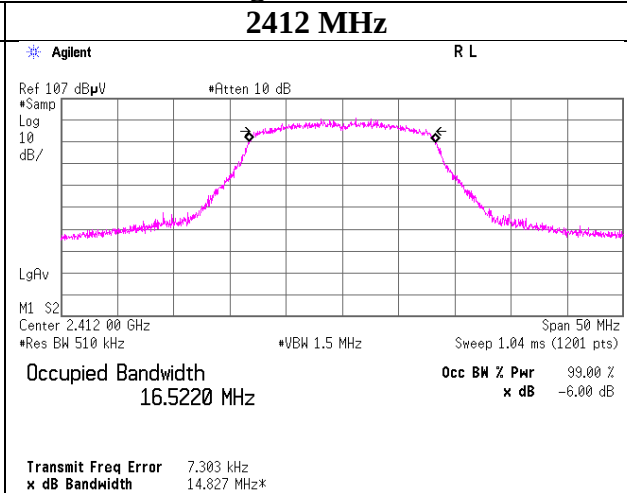
## 99% Occupied Bandwidth

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Shonan EMC Lab. No.5 Shielded Room |
| Report No.             | 11504641S-B                        |
| Date                   | December 15, 2016                  |
| Temperature / Humidity | 24 deg. C / 35 % RH                |
| Engineer               | Hiroyuki Morikawa                  |
| Mode                   | Tx                                 |

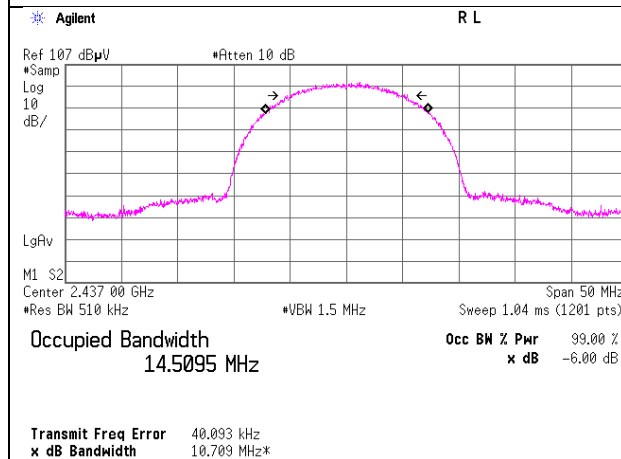
### 11b Antenna 1 2412 MHz



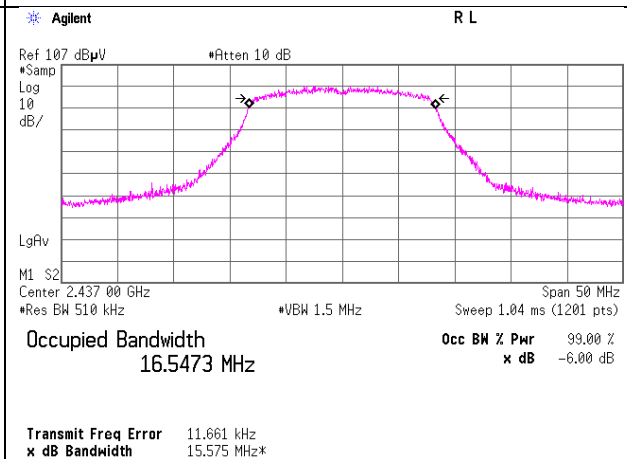
### 11g Antenna 1 2412 MHz



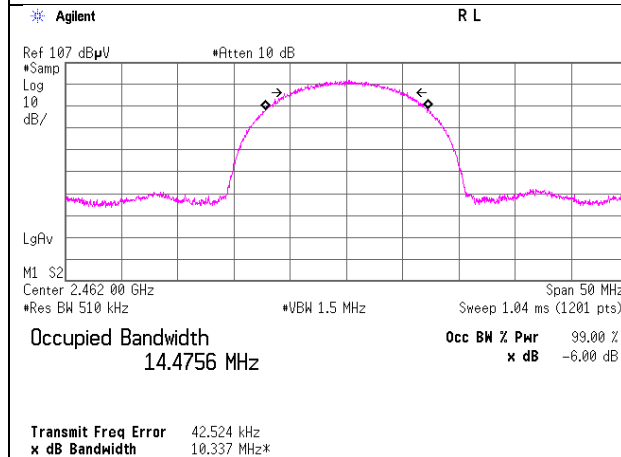
### 2437 MHz



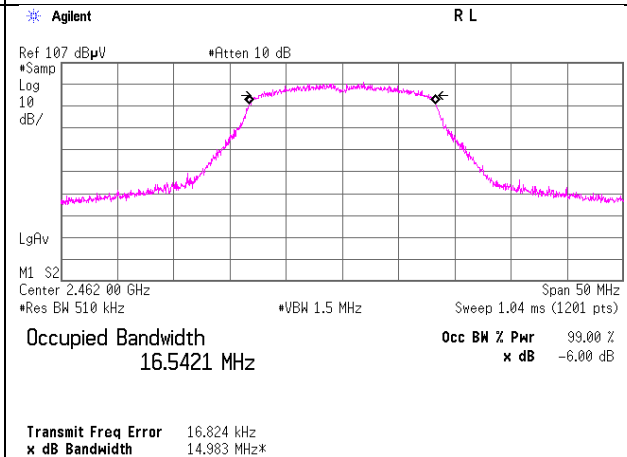
### 2437 MHz



### 2462 MHz



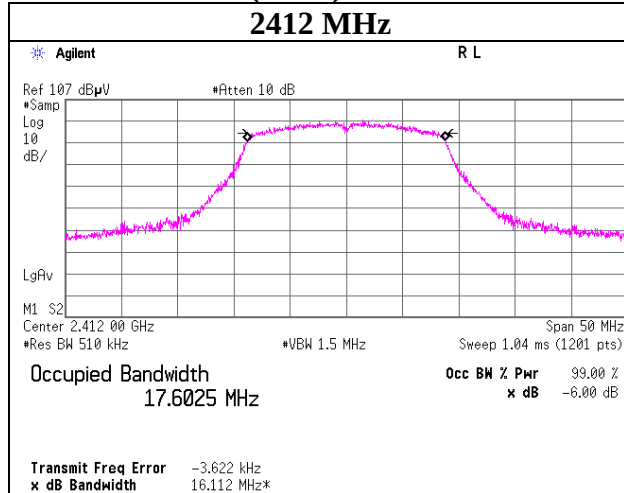
### 2462 MHz



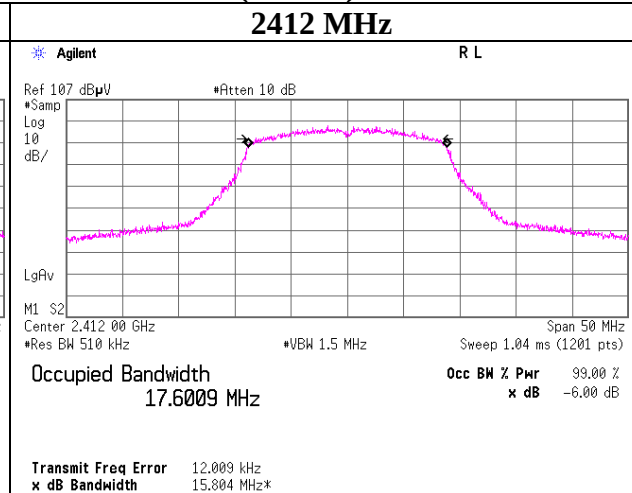
## 99% Occupied Bandwidth

Test place : Shonan EMC Lab. No.5 Shielded Room  
Report No. : 11504641S-B  
Date : December 15, 2016  
Temperature / Humidity : 24 deg. C / 35 % RH  
Engineer : Hiroyuki Morikawa  
Mode : Tx

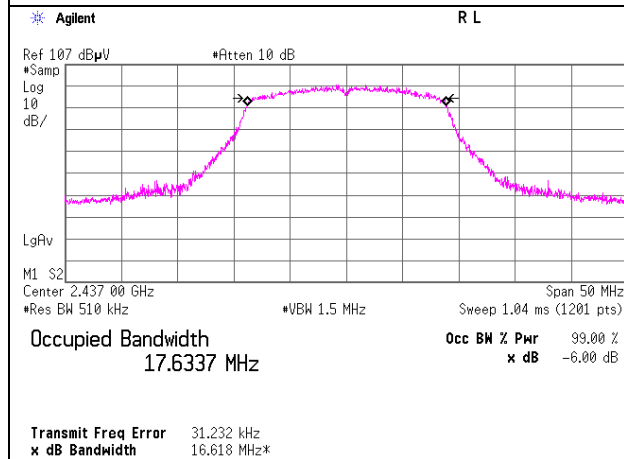
### 11n-20 (SISO) Antenna 1



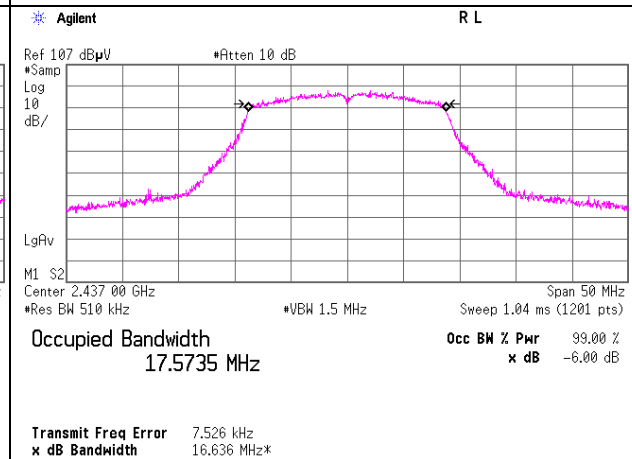
### 11n-20 (MIMO) Antenna 1



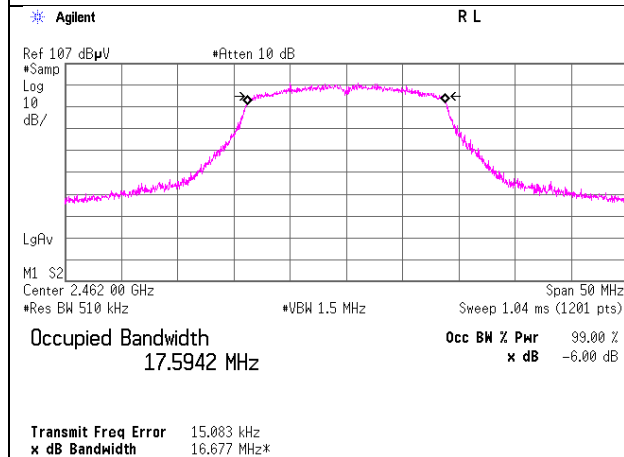
### 2437 MHz



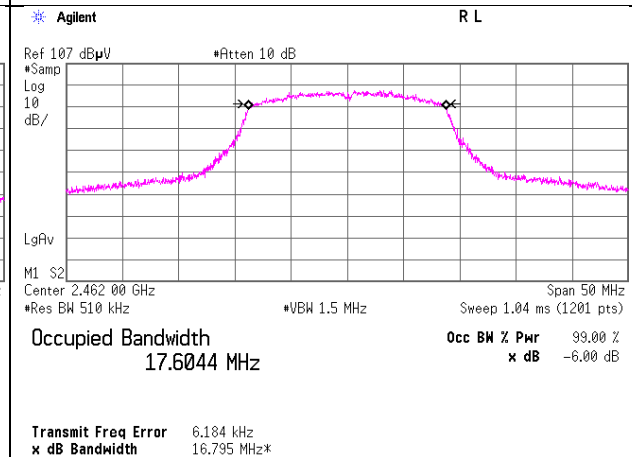
### 2437 MHz



### 2462 MHz



### 2462 MHz



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## APPENDIX 2: Test instruments

### Test equipment

| Control No.                    | Instrument                | Manufacturer                                  | Model No                                     | Serial No               | Test Item | Calibration Date * Interval(month) |
|--------------------------------|---------------------------|-----------------------------------------------|----------------------------------------------|-------------------------|-----------|------------------------------------|
| MSA-16                         | Spectrum Analyzer         | Agilent                                       | E4440A                                       | MY46186390              | AT        | 2016/02/08 * 12                    |
| SRENT-10                       | Spectrum Analyzer         | Agilent                                       | E4440A                                       | US41421511              | AT        | 2016/12/05 * 12                    |
| SPM-06                         | Power Meter               | Anritsu                                       | ML2495A                                      | 0850009                 | AT        | 2016/04/01 * 12                    |
| SPSS-03                        | Power sensor              | Anritsu                                       | MA2411B                                      | 0917063                 | AT        | 2016/04/01 * 12                    |
| SCC-G13                        | Coaxial Cable             | Suhner                                        | SUCOFLEX 102                                 | 31599/2                 | AT        | 2016/03/23 * 12                    |
| SCC-G14                        | Coaxial Cable             | Suhner                                        | SUCOFLEX 102                                 | 31600/2                 | AT        | 2016/03/23 * 12                    |
| SAT10-10                       | Attenuator                | Weinschel Corp.                               | 54A-10                                       | 37584                   | AT        | 2016/04/18 * 12                    |
| SAT10-09                       | Attenuator                | Weinschel Corp.                               | 54A-10                                       | W5692                   | AT        | 2016/11/07 * 12                    |
| STM-G3                         | Terminator                | Weinschel                                     | M1459A                                       | U6569                   | AT        | 2016/07/27 * 12                    |
| SOS-09                         | Humidity Indicator        | A&D                                           | AD-5681                                      | 4061484                 | AT *1)    | 2015/12/07 * 12                    |
| SOS-10                         | Humidity Indicator        | A&D                                           | AD-5681                                      | 4064561                 | AT        | 2016/10/12 * 12                    |
| KTS-07                         | Digital Tester            | SANWA                                         | PC500                                        | 7019232                 | AT        | 2016/10/17 * 12                    |
| SAF-04                         | Pre Amplifier             | TOYO Corporation                              | TPA0118-36                                   | 1440489                 | RE        | 2016/03/22 * 12                    |
| SCC-G04                        | Coaxial Cable             | Junkosha                                      | J12J102207-00                                | JUN-12-14-018           | RE        | 2016/06/23 * 12                    |
| SCC-G23                        | Coaxial Cable             | Suhner                                        | SUCOFLEX 104                                 | 297342/4                | RE        | 2016/05/11 * 12                    |
| SHA-03                         | Horn Antenna              | Schwarzbeck                                   | BBHA9120D                                    | 9120D-739               | RE        | 2016/08/22 * 12                    |
| SOS-05                         | Humidity Indicator        | A&D                                           | AD-5681                                      | 4062518                 | RE        | 2016/10/12 * 12                    |
| STR-01                         | Test Receiver             | Rohde & Schwarz                               | ESU40                                        | 100093                  | RE *1)    | 2015/11/06 * 12                    |
| SJM-02                         | Measure                   | KOMELON                                       | KMC-36                                       | -                       | RE        | -                                  |
| SAEC-03(SVSWR)                 | Semi-Anechoic Chamber     | TDK                                           | SAEC-03(SVSWR)                               | 3                       | RE        | 2016/07/25 * 12                    |
| COTS-SEMI-1                    | EMI Software              | TSJ                                           | TEPTO-DV(RE,CE,R<br>FI,MF)                   | -                       | RE        | -                                  |
| STS-03                         | Digital Hitester          | Hioki                                         | 3805-50                                      | 080997823               | RE        | 2016/10/17 * 12                    |
| SSA-02                         | Spectrum Analyzer         | Agilent                                       | E4448A                                       | MY48250106              | RE, AT    | 2016/03/23 * 12                    |
| SCC-G15                        | Coaxial Cable             | Suhner                                        | SUCOFLEX 102                                 | 32703/2                 | RE        | 2016/03/08 * 12                    |
| SHA-04                         | Horn Antenna              | ETS LINDGREN                                  | 3160-09                                      | LM3640                  | RE        | 2016/03/15 * 12                    |
| SAF-08                         | Pre Amplifier             | TOYO Corporation                              | HAP18-26W                                    | 00000019                | RE        | 2016/03/23 * 12                    |
| SAT10-05                       | Attenuator(above1GHz)     | Agilent                                       | 8493C-010                                    | 74864                   | RE        | 2016/11/07 * 12                    |
| SFL-02                         | Highpass Filter           | MICRO-TRONICS                                 | HPM50111                                     | 051                     | RE *1)    | 2015/11/16 * 12                    |
| SSA-03                         | Spectrum Analyzer         | Agilent                                       | E4448A                                       | MY48250152              | RE        | 2016/09/26 * 12                    |
| SAF-02                         | Pre Amplifier             | SONOMA                                        | 310N                                         | 290212                  | RE        | 2016/02/19 * 12                    |
| SAT6-02                        | Attenuator                | JFW                                           | 50HF-006N                                    | -                       | RE        | 2016/02/25 * 12                    |
| KAT3-10                        | Attenuator                | JFW IND. INC.                                 | 50HF-003N                                    | -                       | RE        | 2016/07/26 * 12                    |
| SBA-02                         | Biconical Antenna         | Schwarzbeck                                   | BBA9106                                      | 91032665                | RE *1)    | 2015/11/02 * 12                    |
| SCC-B1/B3/B5/B7/B8/B13/SRSE-02 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner /Suhner/Suhner/T OYO | 8D2W/12DSFA/141P E/141PE/141PE/141P E/NS4906 | -/0901-270(RF Selector) | RE        | 2016/04/22 * 12                    |
| SCC-B2/B4/B6/B7/B8/B13/SRSE-02 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner /Suhner/Suhner/T OYO | 8D2W/12DSFA/141P E/141PE/141PE/141P E/NS4906 | -/0901-270(RF Selector) | RE        | 2016/04/22 * 12                    |
| SLA-06                         | Logperiodic Antenna       | Schwarzbeck                                   | VUSLP9111B                                   | 195                     | RE        | 2016/01/30 * 12                    |
| SOS-03                         | Humidity Indicator        | A&D                                           | AD-5681                                      | 4063325                 | RE        | 2016/10/12 * 12                    |
| TR-09                          | Test Receiver             | Rohde & Schwarz                               | ESCI                                         | 100769                  | RE        | 2016/10/07 * 12                    |
| SJM-09                         | Measure                   | PROMART                                       | SEN1935                                      | -                       | RE        | -                                  |
| SAEC-02(NSA)                   | Semi-Anechoic Chamber     | TDK                                           | SAEC-02(NSA)                                 | 2                       | RE        | 2016/07/13 * 12                    |
| STS-02                         | Digital Hitester          | Hioki                                         | 3805-50                                      | 080997819               | RE        | 2016/03/22 * 12                    |
| KSA-08                         | Spectrum Analyzer         | Agilent                                       | E4446A                                       | MY46180525              | RE        | 2016/10/11 * 12                    |
| SHA-06                         | Horn Antenna              | ETS LINDGREN                                  | 3160-10                                      | LM3459                  | RE        | 2016/03/24 * 12                    |
| SAF-10                         | Pre Amplifier             | TOYO Corporation                              | HAP26-40W                                    | 00000010                | RE        | 2016/03/23 * 12                    |
| SCC-G19                        | Coaxial Cable             | Suhner                                        | SUCOFLEX 102A                                | 1188/2A                 | RE        | 2016/03/08 * 12                    |
| SCC-G33                        | Coaxial Cable             | Junkosha                                      | MWX241-01000KM SKMS                          | -                       | RE        | 2016/04/18 * 12                    |
| SAT10-06                       | Attenuator                | Agilent                                       | 8493C-010                                    | 74865                   | RE        | 2016/11/07 * 12                    |
| SFL-18                         | Highpass Filter           | MICRO-TRONICS                                 | HPM50111                                     | 119                     | RE        | 2016/04/18 * 12                    |

\*1) This test equipment was used for the tests before the expiration date of the calibration.

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

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

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

Test Item: RE: Radiated Emission test

AT: Antenna Terminal Conducted test

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