



# **RADIO TEST REPORT**

**Test Report No. : 12979151S-A-R1**

**Applicant** : Panasonic Corporation  
**Type of Equipment** : Car Display  
**Model No.** : AT1806  
**FCC ID** : ACJ932AT1806  
**Test regulation** : FCC Part 15 Subpart C: 2019  
**Test Result** : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements.  
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 12979151S-A. 12979151S-A is replaced with this report.

**Date of test:** October 28 to November 1, 2019

**Representative test engineer:**

*H. Sato*

Hiromasa Sato  
Engineer  
Consumer Technology Division

**Approved by:**

*S. Takano*

Shinichi Takano  
Engineer  
Consumer Technology Division



CERTIFICATE 1266.03

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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN  
Telephone : +81 463 50 6400  
Facsimile : +81 463 50 6401

## **REVISION HISTORY**

### **Original Test Report No.: 12979151S-A**

| Revision     | Test report No. | Date              | Page revised   | Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|-----------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - (Original) | 12979151S-A     | November 25, 2019 | -              | -                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1            | 12979151S-A-R1  | December 12, 2019 | 9              | Correction:<br>“This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.” to<br>“The test was conducted with the settings of each sample to be as close as possible to the target power according to the customer requirements. End users cannot change the settings of the output power of the product.” |
|              |                 |                   | 24             | Correction of Duty factor of 11n-20 MCS 3:<br>“0.15 dB” to “>98 %”                                                                                                                                                                                                                                                                                                                                                                                             |
|              |                 |                   | 35,37,39,40,42 | Deletion the table of “Average measurement value with duty factor”,<br>Addition the data to the upper table                                                                                                                                                                                                                                                                                                                                                    |

## Reference: Abbreviations (Including words undescribed in this report)

|                |                                                                 |         |                                                     |
|----------------|-----------------------------------------------------------------|---------|-----------------------------------------------------|
| A2LA           | The American Association for Laboratory Accreditation           | MCS     | Modulation and Coding Scheme                        |
| AC             | Alternating Current                                             | MRA     | Mutual Recognition Arrangement                      |
| AFH            | Adaptive Frequency Hopping                                      | N/A     | Not Applicable                                      |
| AM             | Amplitude Modulation                                            | NIST    | National Institute of Standards and Technology      |
| Amp, AMP       | Amplifier                                                       | NS      | No signal detect.                                   |
| ANSI           | American National Standards Institute                           | NSA     | Normalized Site Attenuation                         |
| Ant, ANT       | Antenna                                                         | NVLAP   | National Voluntary Laboratory Accreditation Program |
| AP             | Access Point                                                    | OBW     | Occupied Band Width                                 |
| ASK            | Amplitude Shift Keying                                          | OFDM    | Orthogonal Frequency Division Multiplexing          |
| Atten., ATT    | Attenuator                                                      | P/M     | Power meter                                         |
| AV             | Average                                                         | PCB     | Printed Circuit Board                               |
| BPSK           | Binary Phase-Shift Keying                                       | PER     | Packet Error Rate                                   |
| BR             | Bluetooth Basic Rate                                            | PHY     | Physical Layer                                      |
| BT             | Bluetooth                                                       | PK      | Peak                                                |
| BT LE          | Bluetooth Low Energy                                            | PN      | Pseudo random Noise                                 |
| BW             | BandWidth                                                       | PRBS    | Pseudo-Random Bit Sequence                          |
| Cal Int        | Calibration Interval                                            | PSD     | Power Spectral Density                              |
| CCK            | Complementary Code Keying                                       | QAM     | Quadrature Amplitude Modulation                     |
| Ch., CH        | Channel                                                         | QP      | Quasi-Peak                                          |
| CISPR          | Comite International Special des Perturbations Radioelectriques | QPSK    | Quadri-Phase Shift Keying                           |
| CW             | Continuous Wave                                                 | RBW     | Resolution Band Width                               |
| DBPSK          | Differential BPSK                                               | RDS     | Radio Data System                                   |
| DC             | Direct Current                                                  | RE      | Radio Equipment                                     |
| D-factor       | Distance factor                                                 | RF      | Radio Frequency                                     |
| DFS            | Dynamic Frequency Selection                                     | RMS     | Root Mean Square                                    |
| DQPSK          | Differential QPSK                                               | RSS     | Radio Standards Specifications                      |
| DSSS           | Direct Sequence Spread Spectrum                                 | Rx      | Receiving                                           |
| EDR            | Enhanced Data Rate                                              | SA, S/A | Spectrum Analyzer                                   |
| EIRP, e.i.r.p. | Equivalent Isotropically Radiated Power                         | SG      | Signal Generator                                    |
| EMC            | ElectroMagnetic Compatibility                                   | SVSWR   | Site-Voltage Standing Wave Ratio                    |
| EMI            | ElectroMagnetic Interference                                    | TR      | Test Receiver                                       |
| EN             | European Norm                                                   | Tx      | Transmitting                                        |
| ERP, e.r.p.    | Effective Radiated Power                                        | VBW     | Video BandWidth                                     |
| EU             | European Union                                                  | Vert.   | Vertical                                            |
| EUT            | Equipment Under Test                                            | WLAN    | Wireless LAN                                        |
| Fac.           | Factor                                                          |         |                                                     |
| FCC            | Federal Communications Commission                               |         |                                                     |
| FHSS           | Frequency Hopping Spread Spectrum                               |         |                                                     |
| FM             | Frequency Modulation                                            |         |                                                     |
| Freq.          | Frequency                                                       |         |                                                     |
| FSK            | Frequency Shift Keying                                          |         |                                                     |
| GFSK           | Gaussian Frequency-Shift Keying                                 |         |                                                     |
| GNSS           | Global Navigation Satellite System                              |         |                                                     |
| GPS            | Global Positioning System                                       |         |                                                     |
| Hori.          | Horizontal                                                      |         |                                                     |
| ICES           | Interference-Causing Equipment Standard                         |         |                                                     |
| IEC            | International Electrotechnical Commission                       |         |                                                     |
| IEEE           | Institute of Electrical and Electronics Engineers               |         |                                                     |
| IF             | Intermediate Frequency                                          |         |                                                     |
| ILAC           | International Laboratory Accreditation Conference               |         |                                                     |
| ISED           | Innovation, Science and Economic Development Canada             |         |                                                     |
| ISO            | International Organization for Standardization                  |         |                                                     |
| JAB            | Japan Accreditation Board                                       |         |                                                     |
| LAN            | Local Area Network                                              |         |                                                     |
| LIMS           | Laboratory Information Management System                        |         |                                                     |

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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## **SECTION 1: Customer information**

|                  |   |                                                                               |
|------------------|---|-------------------------------------------------------------------------------|
| Company Name     | : | Panasonic Corporation                                                         |
| Address          | : | 4261, Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa-ken,<br>224-8520, Japan |
| Telephone Number | : | +81-50-3689-6795                                                              |
| Facsimile Number | : | +81-45-931-0806                                                               |
| Contact Person   | : | Yuta Mouri                                                                    |

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

\* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

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

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

|                                                        |   |                                                                                           |
|--------------------------------------------------------|---|-------------------------------------------------------------------------------------------|
| Type of Equipment                                      | : | Car Display                                                                               |
| Model No.                                              | : | AT1806                                                                                    |
| Serial No.                                             | : | Refer to SECTION 4.2                                                                      |
| Rating                                                 | : | DC 10.5 V - 16.0 V (Typ: 13.2 V)                                                          |
| Receipt Date of Sample<br>(Information from test lab.) | : | October 28, 2019                                                                          |
| 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: AT1806 (referred to as the EUT in this report) is a Car Display.

## **Radio Specification**

|                           |   |                     |
|---------------------------|---|---------------------|
| Radio Type                | : | Transceiver         |
| Frequency of Operation    | : | 2412 MHz - 2462 MHz |
| Modulation                | : | DSSS, OFDM          |
| Antenna type              | : | Dipole              |
| Antenna Gain              | : | 2.15 dBi            |
| Clock frequency (Maximum) | : | 48 MHz              |

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,  
and 5725-5850 MHz

### **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>ISED: RSS-Gen 8.8      | FCC: Section 15.207<br>ISED: RSS-Gen 8.8                                   | -                                                           | N/A                 | *1)                                                               |
| 6dB Bandwidth                                 | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: -            | FCC: Section<br>15.247(a)(2)<br>ISED: RSS-247 5.2(a)                       | See data.                                                   | Complied<br>a)      | Conducted                                                         |
| Maximum Peak<br>Output Power                  | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.12 | FCC: Section<br>15.247(b)(3)<br>ISED: RSS-247 5.4(d)                       |                                                             | Complied<br>b)      | Conducted                                                         |
| Power Density                                 | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: -            | FCC: Section 15.247(e)<br>ISED: RSS-247 5.2(b)                             |                                                             | Complied<br>c)      | Conducted                                                         |
| Spurious Emission<br>Restricted Band<br>Edges | FCC: KDB 558074 D01<br>15.247<br>Meas Guidance v05r02<br>ISED: RSS-Gen 6.13 | FCC: Section 15.247(d)<br>ISED: RSS-247 5.5<br>RSS-Gen 8.9<br>RSS-Gen 8.10 | 3.2 dB<br>291.753 MHz, QP,<br>Horizontal<br>Tx 11g 2462 MHz | Complied#<br>d), e) | 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 and 13-EM-W0422.

\*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 15.247 Meas Guidance v05r02 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)

b) Refer to APPENDIX 1 (data of Maximum Peak Output Power)

c) Refer to APPENDIX 1 (data of Power Density)

d) Refer to APPENDIX 1 (data of Conducted Spurious Emission)

e) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

\* 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.

Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the 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.

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

### 3.3 Addition to standard

| Item                                                                        | Test Procedure | Specification | Worst margin | Results   | Remarks   |
|-----------------------------------------------------------------------------|----------------|---------------|--------------|-----------|-----------|
| 99% Occupied Bandwidth                                                      | RSS-Gen 6.7    | ISED: -       | N/A          | N/A<br>a) | Conducted |
| a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth) |                |               |              |           |           |

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

### 3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

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

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| Item                                             | Frequency range | Uncertainty (+/-) |                |                |                |
|--------------------------------------------------|-----------------|-------------------|----------------|----------------|----------------|
|                                                  |                 | No. 1 SAC / SR    | No. 2 SAC / SR | No. 3 SAC / SR | No. 4,5,6,8 SR |
| Conducted emission (AC Mains) LISN               | 150 kHz-30 MHz  | 2.6 dB            | 2.6 dB         | 2.5 dB         | 2.6 dB         |
| Radiated emission<br>(Measurement distance: 3 m) | 9 kHz-30 MHz    | 3.0 dB            | 3.0 dB         | 3.0 dB         | -              |
|                                                  | 30 MHz-200 MHz  | 4.6 dB            | 4.6 dB         | 4.6 dB         | -              |
|                                                  | 200 MHz-1 GHz   | 6.0 dB            | 6.0 dB         | 6.0 dB         | -              |
|                                                  | 1 GHz-6 GHz     | 4.9 dB            | 4.9 dB         | 4.9 dB         | -              |
|                                                  | 6 GHz-18 GHz    | 5.5 dB            | 5.5 dB         | 5.5 dB         | -              |
|                                                  | 18 GHz-40 GHz   | 5.4 dB            | 5.4 dB         | 5.4 dB         | -              |
| Radiated emission<br>(Measurement distance: 1 m) | 1 GHz-18 GHz    | 5.8 dB            | 5.8 dB         | 5.8 dB         | -              |
|                                                  | 18 GHz-40 GHz   | 5.7 dB            | 5.7 dB         | 5.7 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 | 0.98 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-06    | 1.75 dB           |
| Power Measurement above 1 GHz (Average Detector)_SPM-07 | 0.89 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-07    | 1.12 dB           |
| Power Measurement above 1 GHz (Average Detector)_SPM-13 | 1.06 dB           |
| Power Measurement above 1 GHz (Peak Detector)_SPM-13    | 1.24 dB           |
| Spurious emission (Conducted) below 1GHz                | 0.9 dB            |
| Spurious emission (Conducted) 1 GHz-3 GHz               | 0.9 dB            |
| Spurious emission (Conducted) 3 GHz-18 GHz              | 2.9 dB            |
| Spurious emission (Conducted) 18 GHz-26.5 GHz           | 2.6 dB            |
| Spurious emission (Conducted) 26.5 GHz-40 GHz           | 2.0 dB            |
| Bandwidth Measurement                                   | 0.07 %            |
| Duty cycle and Time Measurement                         | 0.262 %           |
| Temperature                                             | 0.95 deg.C.       |
| Voltage                                                 | 0.83 %            |

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

### 3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

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

Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401

A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

| Test site                  | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|----------------------------|----------------------------|------------------------------------------------------------------|------------------------------|
| No.1 Semi-anechoic chamber | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.2 Semi-anechoic chamber | 20.6 x 11.3 x 7.65         | 20.6 x 11.3                                                      | 10 m                         |
| No.3 Semi-anechoic chamber | 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.

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**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401



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

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

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

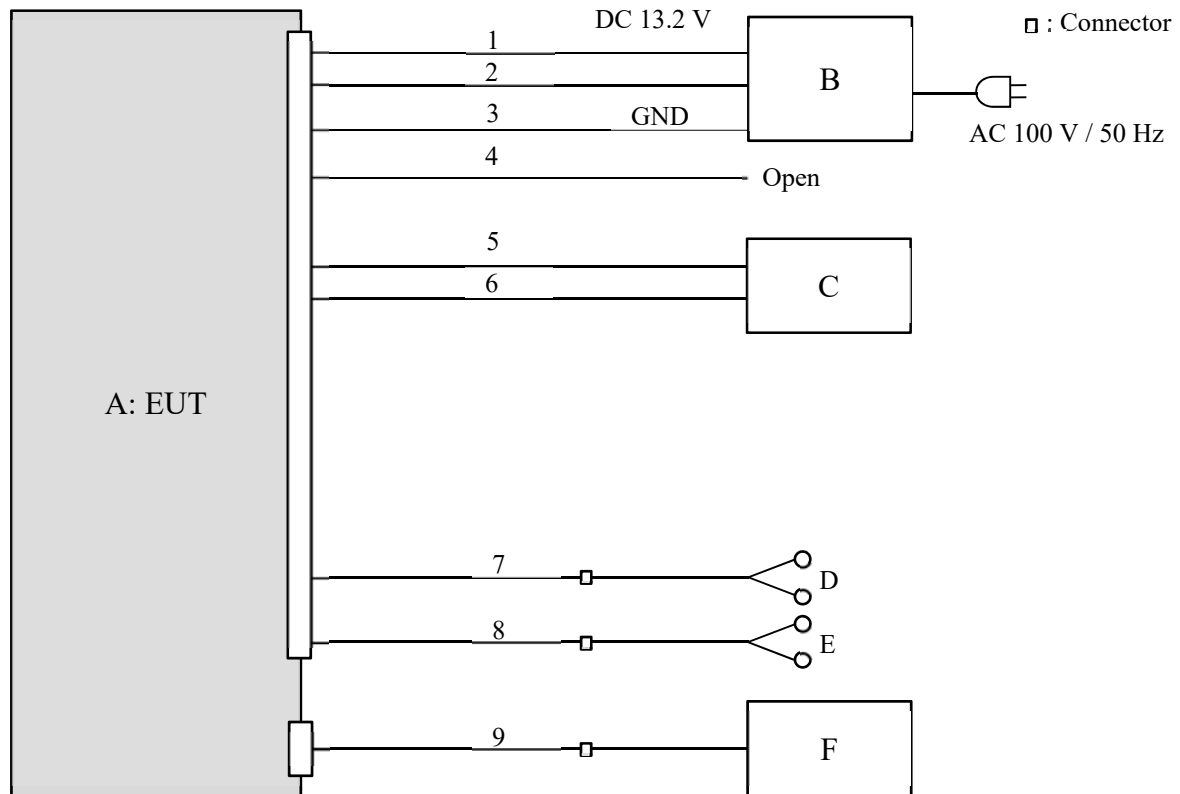
| Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remarks*     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| IEEE 802.11b (11b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2 Mbps, PN9  |
| IEEE 802.11g (11g)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 36 Mbps, PN9 |
| IEEE 802.11n 20 MHz BW (11n-20)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | MCS 3, PN9   |
| *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |
| *Power of the EUT was set by the software as follows;<br>Power settings for Antenna Terminal conducted test:<br>11b: 12 dBm<br>11g: 12 dBm<br>11n-20: 11 dBm (1 and 11 channel), 12 dBm (other channels)<br>Power settings for Radiated Emission test:<br>11b: 11 dBm<br>11g: 11 dBm<br>11n-20: 10 dBm (1 and 11 channel), 11 dBm (other channels)<br><br>Software:           WIFI Diag ver.9.76<br>* The test was conducted with the settings of each sample to be as close as possible to the target power according to the customer requirements. End users cannot change the settings of the output power of the product. |              |

\*The details of Operating mode(s)

| Test Item                       | Operating Mode                | Tested frequency                                               |
|---------------------------------|-------------------------------|----------------------------------------------------------------|
| Spurious Emission (below 1 GHz) | 11g Tx                        | 2462 MHz                                                       |
| 6dB Bandwidth                   | 11b Tx                        | 2412 MHz                                                       |
| Maximum Peak Output Power       | 11g Tx                        | 2437 MHz                                                       |
| Power Density                   | 11n-20 Tx                     | 2462 MHz                                                       |
| 99% Occupied Bandwidth          |                               |                                                                |
| Spurious Emission (above 1 GHz) | 11b Tx<br>11g Tx<br>11n-20 Tx | 2412 MHz<br>2417 MHz *)<br>2437 MHz<br>2457 MHz *)<br>2462 MHz |

\*) Bandedge measurement of 11n-20 only.

## 4.2 Configuration and peripherals



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

### Description of EUT and Support equipment

| No. | Item             | Model number | Serial number                    | Manufacturer | Remarks |
|-----|------------------|--------------|----------------------------------|--------------|---------|
| A   | Car Display      | AT1806       | 500B-2S-050*1)<br>500B-2S-057*2) | Panasonic    | EUT     |
| B   | Power Supply(DC) | PAN35-10A    | NA000955                         | Kikusui      | -       |
| C   | DCU              | AT1603       | 102020                           | Panasonic    | -       |
| D   | Earphone         | -            | -                                | -            | -       |
| E   | Earphone         | -            | -                                | -            | -       |
| F   | Tablet Computer  | ME571-16G    | 07924744                         | ASUS         | -       |

\*1) Used for Antenna Terminal conducted test

\*2) Used for Radiated Emission test

### List of cables used

| No. | Name   | Length (m) | Shield     |            | Remarks |
|-----|--------|------------|------------|------------|---------|
|     |        |            | Cable      | Connector  |         |
| 1   | ACC    | 2.0        | Unshielded | Unshielded | -       |
| 2   | +B     | 2.0        | Unshielded | Unshielded | -       |
| 3   | GND    | 2.0        | Unshielded | Unshielded | -       |
| 4   | ILL+   | 2.0        | Unshielded | Unshielded | -       |
| 5   | Signal | 2.0        | Unshielded | Unshielded | -       |
| 6   | Signal | 2.0        | Unshielded | Unshielded | -       |
| 7   | HP1    | 2.0 + 1.0  | Unshielded | Unshielded | -       |
| 8   | HP2    | 2.0 + 1.0  | Unshielded | Unshielded | -       |
| 9   | HDMI   | 2.0 + 1.0  | Shielded   | Shielded   | -       |

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

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

### **Test Procedure**

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

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 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

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.

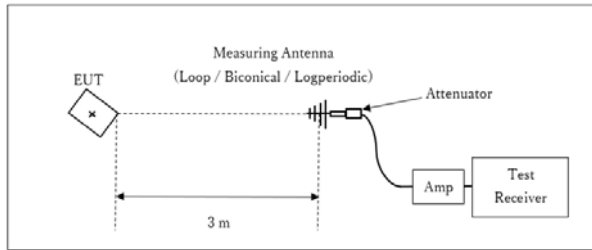
**20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).**

|                 |               |                          |                                                                                                                                                        |                              |
|-----------------|---------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Frequency       | Below 1 GHz   | Above 1 GHz              |                                                                                                                                                        | 20 dBc                       |
| Instrument used | Test Receiver | Spectrum Analyzer        |                                                                                                                                                        | Spectrum Analyzer            |
| Detector        | QP            | PK                       | AV *1)                                                                                                                                                 | PK                           |
| IF Bandwidth    | BW 120 kHz    | RBW: 1 MHz<br>VBW: 3 MHz | 11.12.2.5.2<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 |

\*1) Average Power Measurement was performed based on ANSI C63.10-2013.

**Figure 1: Test Setup**

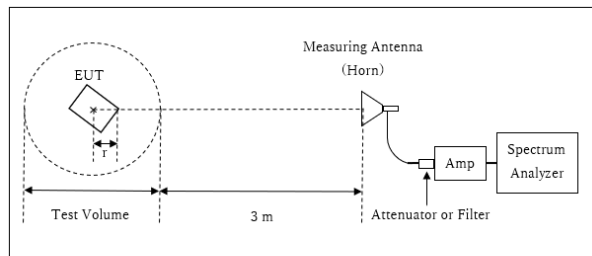
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor:  $20 \times \log (3.69 \text{ m} / 3.0 \text{ m}) = 1.80 \text{ dB}$

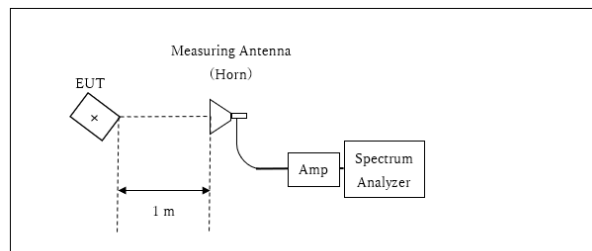
\* Test Distance:  $(3 + \text{Test Volume} / 2) - r = 3.69 \text{ m}$

Test Volume : 2.0 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.31 \text{ m}$

13 GHz - 26.5 GHz



x : Center of turn table

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

\*Test Distance: 1 m

-The carrier level and noise levels were confirmed at Display angle of 0 deg., 90 deg. and 130 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

| Antenna polarization | Carrier | Spurious (Below 1 GHz) | Spurious (1 GHz – 2.8 GHz) | Spurious (2.8 GHz – 13 GHz) | Spurious (13 GHz – 26.5 GHz) |
|----------------------|---------|------------------------|----------------------------|-----------------------------|------------------------------|
| Horizontal           | 90 deg. | 130 deg.               | 90 deg.                    | 90 deg.                     | 0 deg.                       |
| Vertical             | 90 deg. | 130 deg.               | 90 deg.                    | 90 deg.                     | 0 deg.                       |

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

**Measurement range** : 30 MHz - 26.5 GHz

**Test data** : APPENDIX

**Test result** : Pass

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## **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       | Peak                 | Max Hold | Spectrum Analyzer                  |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                 | -                                       | -               | -                  | Auto       | Peak/<br>Average *2) | -        | Power Meter<br>(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.<br>*2) Reference data<br>*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".<br>*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.  
 The equipment and cables were not used for factor 0 dB of the data sheets.

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

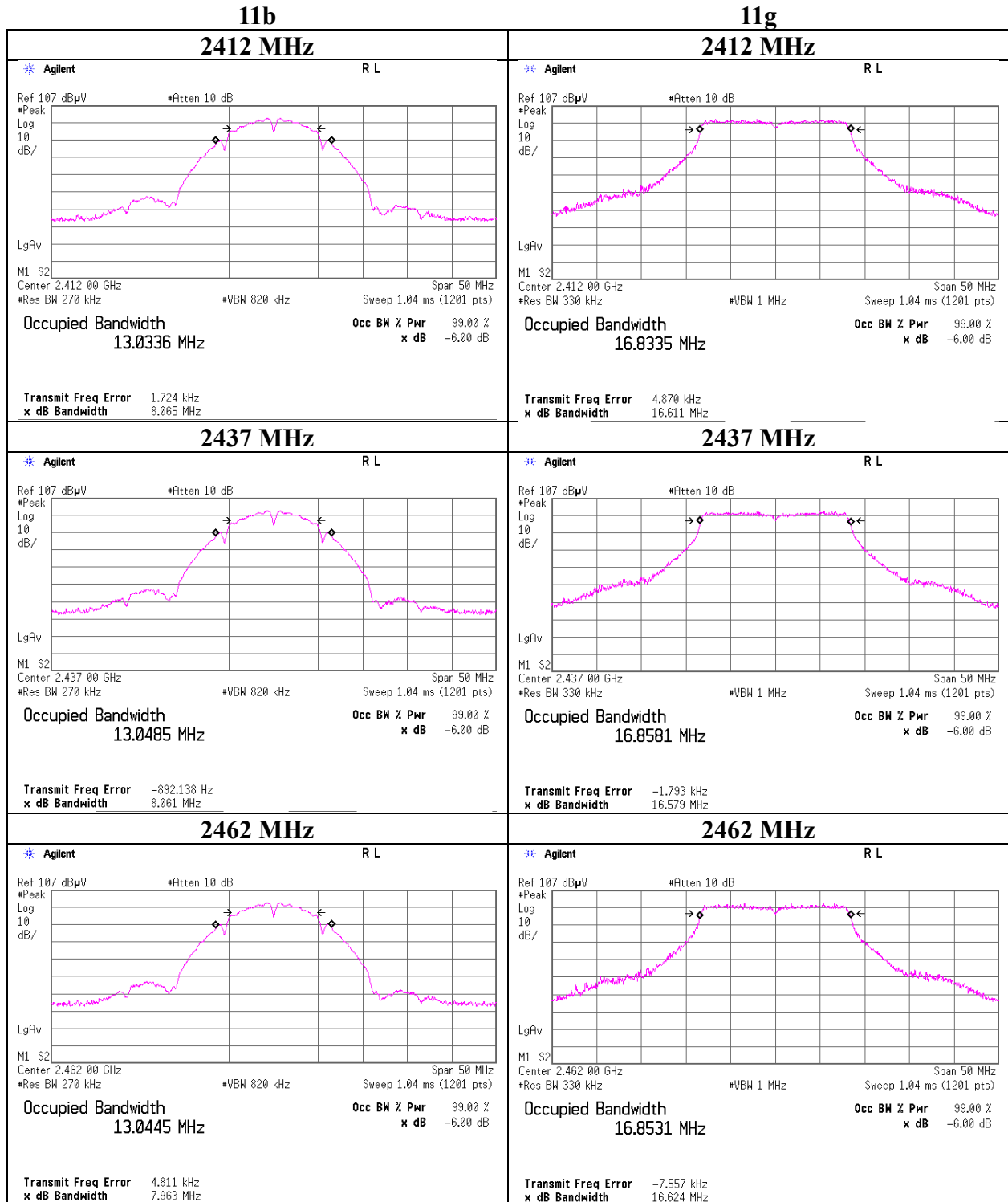
## **APPENDIX 1: Test data**

### **6 dB Bandwidth and 99 % Occupied Bandwidth**

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Report No.             | 12979151S-A         |                     |
| Test place             | Shonan EMC Lab.     |                     |
|                        | No.6 Shielded Room  | No.5 Shielded Room  |
| Date                   | October 28, 2019    | October 29, 2019    |
| Temperature / Humidity | 24 deg. C / 43 % RH | 26 deg. C / 53 % RH |
| Engineer               | Makoto Hosaka       |                     |
| Mode                   | Tx                  |                     |

| Mode   | Frequency<br>[MHz] | 99% Occupied<br>Bandwidth<br>[kHz] | 6dB Bandwidth<br>[MHz] | Limit for<br>6dB Bandwidth<br>[MHz] |
|--------|--------------------|------------------------------------|------------------------|-------------------------------------|
| 11b    | 2412               | 13033.6                            | 7.835                  | > 0.5000                            |
|        | 2437               | 13048.5                            | 7.892                  | > 0.5000                            |
|        | 2462               | 13044.5                            | 7.890                  | > 0.5000                            |
| 11g    | 2412               | 16833.5                            | 16.555                 | > 0.5000                            |
|        | 2437               | 16858.1                            | 16.544                 | > 0.5000                            |
|        | 2462               | 16853.1                            | 16.539                 | > 0.5000                            |
| 11n-20 | 2412               | 18043.4                            | 17.761                 | > 0.5000                            |
|        | 2437               | 18046.6                            | 17.754                 | > 0.5000                            |
|        | 2462               | 18049.6                            | 17.762                 | > 0.5000                            |

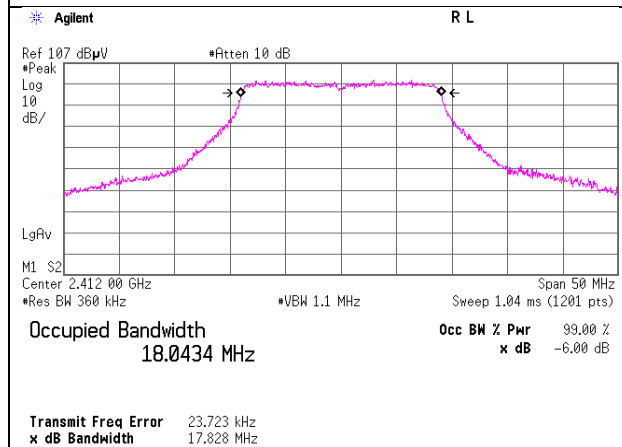
## 99%Occupied Bandwidth



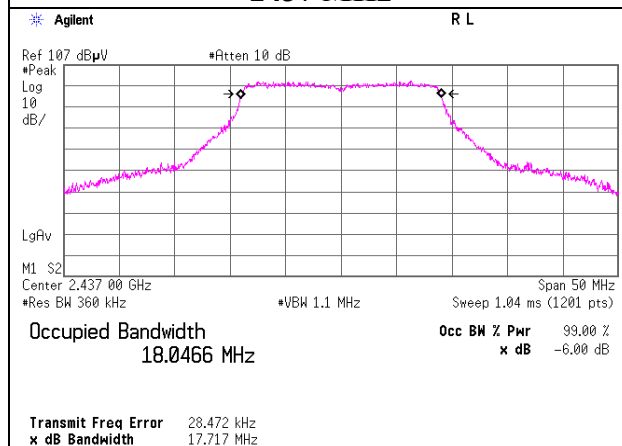
## 99% Occupied Bandwidth

11n-20

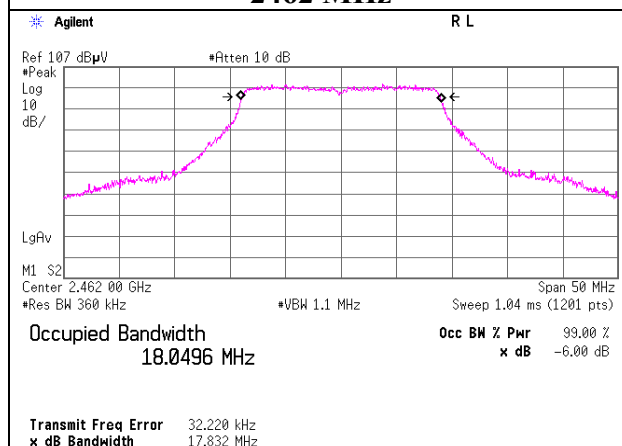
2412 MHz



2437 MHz

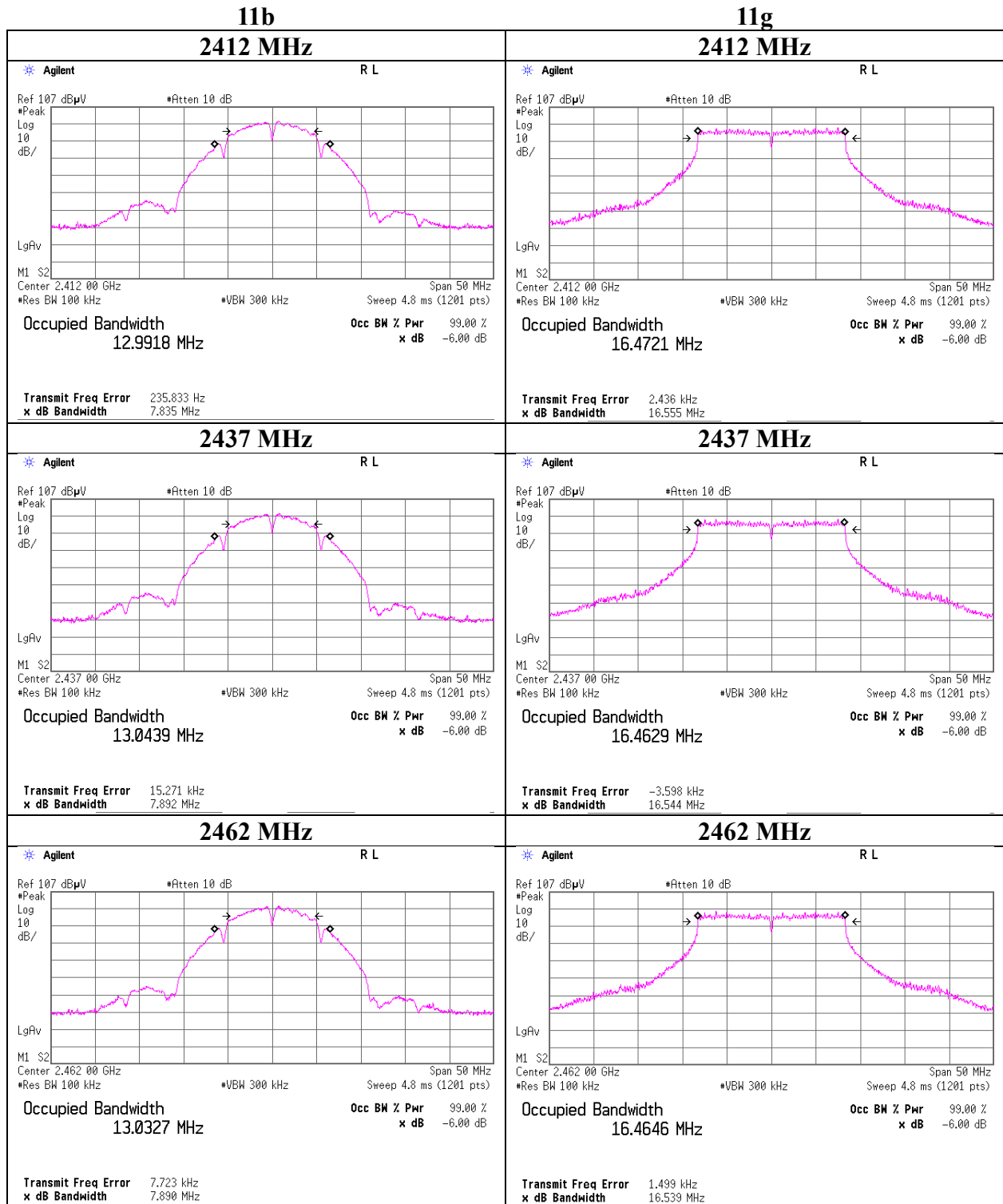


2462 MHz





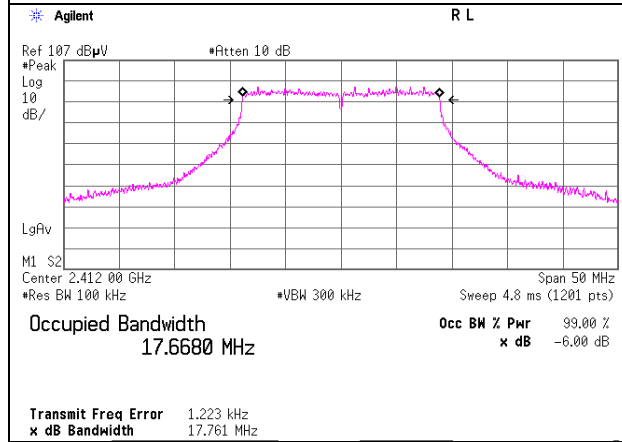
## 6dB Bandwidth



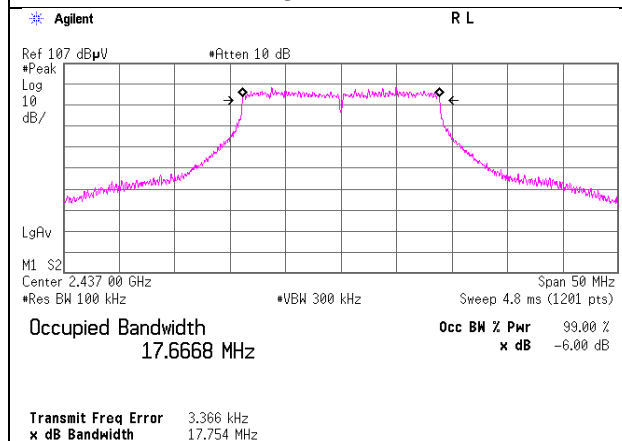
## 6dB Bandwidth

11n-20

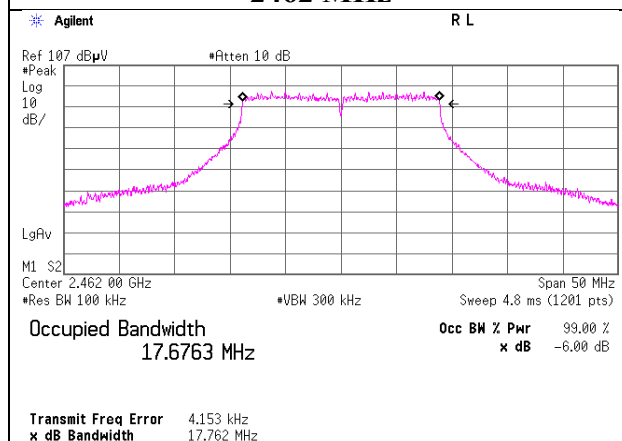
2412 MHz



2437 MHz



2462 MHz



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Telephone : +81 463 50 6400

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## Maximum Peak Output Power

Report No. 12979151S-A  
Test place Shonan EMC Lab. No.5 Shielded Room  
Date October 29, 2019  
Temperature / Humidity 26 deg. C / 53 % RH  
Engineer Makoto Hosaka  
Mode Tx 11b

|       |         |            |             | Conducted Power |       |       |      |        | e.i.r.p. for RSS-247 |        |       |       |      |        |  |
|-------|---------|------------|-------------|-----------------|-------|-------|------|--------|----------------------|--------|-------|-------|------|--------|--|
| Freq. | Reading | Cable Loss | Atten. Loss | Result          |       | Limit |      | Margin | Antenna Gain         | Result |       | Limit |      | Margin |  |
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW]  | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW]  | [dBm] | [mW] | [dB]   |  |
| 2412  | 2.50    | 1.82       | 9.89        | 14.21           | 26.36 | 30.00 | 1000 | 15.79  | 2.15                 | 16.36  | 43.25 | 36.02 | 4000 | 19.66  |  |
| 2437  | 2.62    | 1.83       | 9.89        | 14.34           | 27.16 | 30.00 | 1000 | 15.66  | 2.15                 | 16.49  | 44.57 | 36.02 | 4000 | 19.53  |  |
| 2462  | 2.61    | 1.84       | 9.89        | 14.34           | 27.16 | 30.00 | 1000 | 15.66  | 2.15                 | 16.49  | 44.57 | 36.02 | 4000 | 19.53  |  |

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

2437MHz

| Rate   | Reading | Remark |
|--------|---------|--------|
| [Mbps] | [dBm]   |        |
| 1      | 2.30    | -      |
| 2      | 2.62    | *      |
| 5.5    | 2.60    | -      |
| 11     | 2.56    | -      |

\*: Worst Rate

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

## Maximum Peak Output Power

Report No. 12979151S-A  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 28, 2019  
Temperature / Humidity 24 deg. C / 43 % RH  
Engineer Makoto Hosaka  
Mode Tx 11g

|       |         |            |             | Conducted Power |        |       |      |        | e.i.r.p. for RSS-247 |        |        |       |      |        |  |
|-------|---------|------------|-------------|-----------------|--------|-------|------|--------|----------------------|--------|--------|-------|------|--------|--|
| Freq. | Reading | Cable Loss | Atten. Loss | Result          |        | Limit |      | Margin | Antenna Gain         | Result |        | Limit |      | Margin |  |
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]           | [mW]   | [dBm] | [mW] | [dB]   | [dBi]                | [dBm]  | [mW]   | [dBm] | [mW] | [dB]   |  |
| 2412  | 9.91    | 1.82       | 9.89        | 21.62           | 145.21 | 30.00 | 1000 | 8.38   | 2.15                 | 23.77  | 238.23 | 36.02 | 4000 | 12.25  |  |
| 2437  | 10.00   | 1.83       | 9.89        | 21.72           | 148.59 | 30.00 | 1000 | 8.28   | 2.15                 | 23.87  | 243.78 | 36.02 | 4000 | 12.15  |  |
| 2462  | 10.13   | 1.84       | 9.89        | 21.86           | 153.46 | 30.00 | 1000 | 8.14   | 2.15                 | 24.01  | 251.77 | 36.02 | 4000 | 12.01  |  |

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

2437 MHz

| Rate   | Reading | Remark |
|--------|---------|--------|
| [Mbps] | [dBm]   |        |
| 6      | 5.79    | -      |
| 9      | 5.95    | -      |
| 12     | 5.83    | -      |
| 18     | 6.05    | -      |
| 24     | 9.77    | -      |
| 36     | 10.00   | *      |
| 48     | 9.16    | -      |
| 54     | 9.79    | -      |

\*: Worst Rate

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

## Maximum Peak Output Power

Report No. 12979151S-A  
Test place Shonan EMC Lab. No.6 Shielded Room  
Date October 28, 2019  
Temperature / Humidity 24 deg. C / 43 % RH  
Engineer Makoto Hosaka  
Mode Tx 11n-20

| Freq. | Reading | Cable Loss | Atten. Loss | Conducted Power |        |       |      |        | e.i.r.p. for RSS-247 |        |        |       |      |        |  |
|-------|---------|------------|-------------|-----------------|--------|-------|------|--------|----------------------|--------|--------|-------|------|--------|--|
|       |         |            |             | Result          |        | Limit |      | Margin | Antenna Gain         | Result |        | Limit |      | Margin |  |
|       |         |            |             | [dBm]           | [mW]   | [dBm] | [mW] | [dB]   |                      | [dBm]  | [mW]   | [dBm] | [mW] | [dB]   |  |
| 2412  | 9.40    | 1.82       | 9.89        | 21.11           | 129.12 | 30.00 | 1000 | 8.89   | 2.15                 | 23.26  | 211.84 | 36.02 | 4000 | 12.76  |  |
| 2437  | 9.98    | 1.83       | 9.89        | 21.70           | 147.91 | 30.00 | 1000 | 8.30   | 2.15                 | 23.85  | 242.66 | 36.02 | 4000 | 12.17  |  |
| 2462  | 9.49    | 1.84       | 9.89        | 21.22           | 132.43 | 30.00 | 1000 | 8.78   | 2.15                 | 23.37  | 217.27 | 36.02 | 4000 | 12.65  |  |

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

2437 MHz

| Rate  | Reading | Remark |
|-------|---------|--------|
| [MCS] | [dBm]   |        |
| 0     | 5.98    | -      |
| 1     | 5.87    | -      |
| 2     | 6.06    | -      |
| 3     | 9.98    | *      |
| 4     | 9.90    | -      |
| 5     | 9.60    | -      |
| 6     | 9.88    | -      |
| 7     | 9.81    | -      |

\*: Worst Rate

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

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Report No.             | 12979151S-A         |                     |
| Test place             | Shonan EMC Lab.     |                     |
|                        | No.6 Shielded Room  | No.5 Shielded Room  |
| Date                   | October 28, 2019    | October 29, 2019    |
| Temperature / Humidity | 24 deg. C / 43 % RH | 26 deg. C / 53 % RH |
| Engineer               | Makoto Hosaka       |                     |
| Mode                   | Tx                  |                     |

### 11b 2 Mbps

| 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           | -0.21            | 1.82                  | 9.89                   | 11.50                    | 14.13 | 0.01                   | 11.51                           | 14.16 |
| 2437           | -0.11            | 1.83                  | 9.89                   | 11.61                    | 14.49 | 0.01                   | 11.62                           | 14.52 |
| 2462           | -0.11            | 1.84                  | 9.89                   | 11.62                    | 14.52 | 0.01                   | 11.63                           | 14.55 |

### 11g 36 Mbps

| 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           | -0.50            | 1.82                  | 9.89                   | 11.21                    | 13.21 | 0.11                   | 11.32                           | 13.55 |
| 2437           | -0.39            | 1.83                  | 9.89                   | 11.33                    | 13.58 | 0.11                   | 11.44                           | 13.93 |
| 2462           | -0.35            | 1.84                  | 9.89                   | 11.38                    | 13.74 | 0.11                   | 11.49                           | 14.09 |

### 11n-20 MCS 3

| 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           | -1.46            | 1.82                  | 9.89                   | 10.25                    | 10.59 | 0.07                   | 10.32                           | 10.76 |
| 2437           | -0.38            | 1.83                  | 9.89                   | 11.34                    | 13.61 | 0.07                   | 11.41                           | 13.84 |
| 2462           | -1.32            | 1.84                  | 9.89                   | 10.41                    | 10.99 | 0.07                   | 10.48                           | 11.17 |

Sample Calculation:

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

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

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

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Report No.             | 12979151S-A         |                     |
| Test place             | Shonan EMC Lab.     |                     |
|                        | No.6 Shielded Room  | No.5 Shielded Room  |
| Date                   | October 28, 2019    | October 29, 2019    |
| Temperature / Humidity | 24 deg. C / 43 % RH | 26 deg. C / 53 % RH |
| Engineer               | Makoto Hosaka       |                     |
| Mode                   | Tx                  |                     |

2437 MHz

| Mode   | Rate<br>Mbps | Reading<br>[dBm] | Duty<br>factor<br>[dB] | Burst<br>power<br>[dBm] | Remarks |
|--------|--------------|------------------|------------------------|-------------------------|---------|
| 11b    | 1            | -0.38            | 0.01                   | -0.37                   | -       |
|        | 2            | -0.11            | 0.01                   | -0.10                   | *       |
|        | 5.5          | -0.13            | 0.01                   | -0.12                   | -       |
|        | 11           | -0.15            | 0.03                   | -0.12                   | -       |
| 11g    | 6            | -0.75            | 0.02                   | -0.73                   | -       |
|        | 9            | -0.75            | 0.02                   | -0.73                   | -       |
|        | 12           | -0.70            | 0.04                   | -0.66                   | -       |
|        | 18           | -0.76            | 0.05                   | -0.71                   | -       |
|        | 24           | -0.41            | 0.07                   | -0.34                   | -       |
|        | 36           | -0.39            | 0.11                   | -0.28                   | *       |
|        | 48           | -0.44            | 0.14                   | -0.30                   | -       |
|        | 54           | -0.49            | 0.16                   | -0.33                   | -       |
| 11n-20 | 0            | -0.93            | 0.02                   | -0.91                   | -       |
|        | 1            | -0.95            | 0.04                   | -0.91                   | -       |
|        | 2            | -0.95            | 0.05                   | -0.90                   | -       |
|        | 3            | -0.38            | 0.07                   | -0.31                   | *       |
|        | 4            | -0.45            | 0.11                   | -0.34                   | -       |
|        | 5            | -0.48            | 0.15                   | -0.33                   | -       |
|        | 6            | -0.50            | 0.17                   | -0.33                   | -       |
|        | 7            | -0.52            | 0.19                   | -0.33                   | -       |

\* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

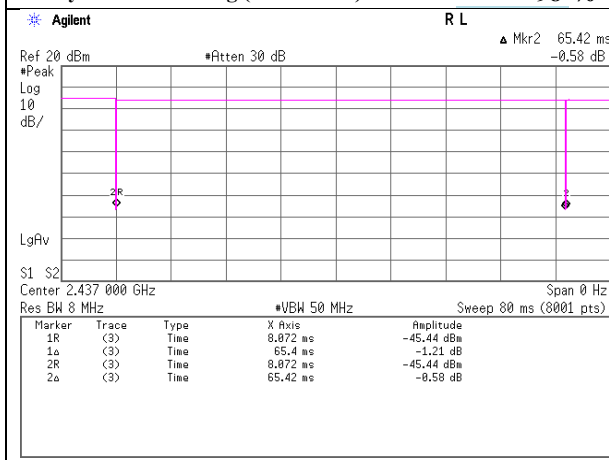
All comparison were carried out on same frequency and measurement factors.

## Burst rate confirmation

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
No.6 Shielded Room  
Date October 28, 2019 No.5 Shielded Room  
Temperature / Humidity 24 deg. C / 43 % RH October 29, 2019  
Engineer Makoto Hosaka  
Mode Tx 26 deg. C / 53 % RH

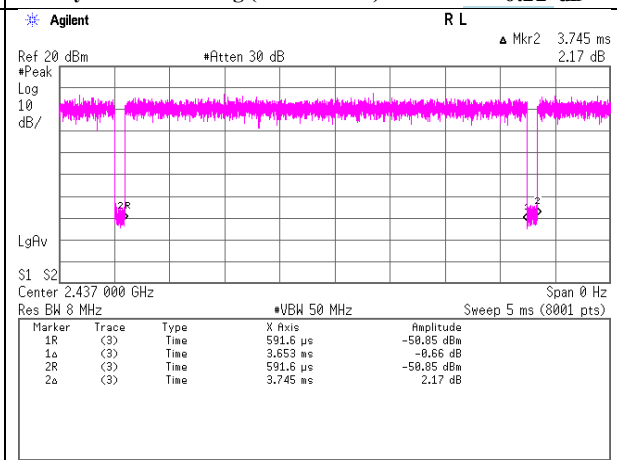
### 11b 2 Mbps

$Tx\ on / (Tx\ on + Tx\ off) = 0.999$   
 $Tx\ on / (Tx\ on + Tx\ off) * 100 = 99.9\ %$   
for Average output power  
 $Duty\ factor = 10 * \log (65.42 / 65.4) = 0.01\ dB$   
for Radiated spurious emission  
 $Duty\ factor = 20 * \log (65.42 / 65.4) > 98\ %$



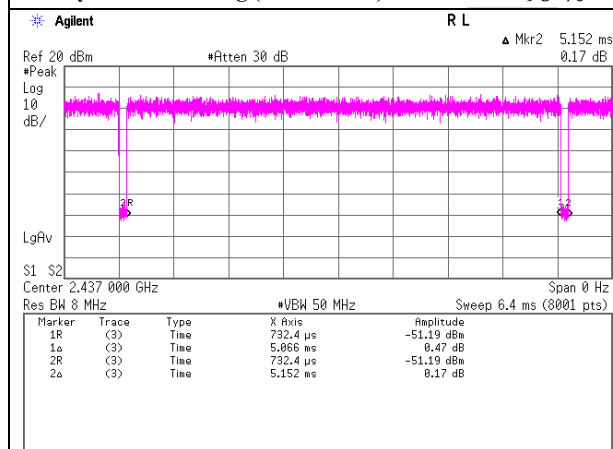
### 11g 36 Mbps

$Tx\ on / (Tx\ on + Tx\ off) = 0.975$   
 $Tx\ on / (Tx\ on + Tx\ off) * 100 = 97.5\ %$   
for Average output power  
 $Duty\ factor = 10 * \log (3.745 / 3.653) = 0.11\ dB$   
for Radiated spurious emission  
 $Duty\ factor = 20 * \log (3.745 / 3.653) = 0.22\ dB$



### 11n-20 MCS 3

$Tx\ on / (Tx\ on + Tx\ off) = 0.983$   
 $Tx\ on / (Tx\ on + Tx\ off) * 100 = 98.3\ %$   
for Average output power  
 $Duty\ factor = 10 * \log (5.152 / 5.066) = 0.07\ dB$   
for Radiated spurious emission  
 $Duty\ factor = 20 * \log (5.152 / 5.066) > 98\ %$



\* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.



## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 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       | 49.95          | 28.33           | 14.16     | 41.59     | 1.80                 | 52.65           | 73.9           | 21.2        | 106         | 356         | -      |
| Hori.    | 2877.402        | PK       | 59.26          | 28.86           | 6.19      | 41.77     | 1.80                 | 54.34           | 73.9           | 19.5        | 125         | 45          | -      |
| Hori.    | 3330.016        | PK       | 52.73          | 28.73           | 5.69      | 42.01     | 1.80                 | 46.94           | 73.9           | 26.9        | 131         | 316         | -      |
| Hori.    | 4824.000        | PK       | 51.18          | 31.64           | 6.46      | 42.88     | 1.80                 | 48.20           | 73.9           | 25.7        | 117         | 353         | -      |
| Hori.    | 7236.000        | PK       | 48.16          | 37.25           | 7.89      | 42.98     | 1.80                 | 52.12           | 73.9           | 21.7        | 150         | 0           | -      |
| Hori.    | 9648.000        | PK       | 47.83          | 38.97           | 9.18      | 43.13     | 1.80                 | 54.65           | 73.9           | 19.2        | 150         | 0           | -      |
| Hori.    | 2390.000        | AV       | 40.86          | 28.33           | 14.16     | 41.59     | 1.80                 | 43.56           | 53.9           | 10.3        | 106         | 356         | -      |
| Hori.    | 2877.402        | AV       | 45.42          | 28.86           | 6.19      | 41.77     | 1.80                 | 40.50           | 53.9           | 13.4        | 125         | 45          | -      |
| Hori.    | 3330.016        | AV       | 40.83          | 28.73           | 5.69      | 42.01     | 1.80                 | 35.04           | 53.9           | 18.8        | 131         | 316         | -      |
| Hori.    | 4824.000        | AV       | 40.62          | 31.64           | 6.46      | 42.88     | 1.80                 | 37.64           | 53.9           | 16.2        | 117         | 353         | -      |
| Hori.    | 7236.000        | AV       | 39.54          | 37.25           | 7.89      | 42.98     | 1.80                 | 43.50           | 53.9           | 10.4        | 150         | 0           | -      |
| Hori.    | 9648.000        | AV       | 39.44          | 38.97           | 9.18      | 43.13     | 1.80                 | 46.26           | 53.9           | 7.6         | 150         | 0           | -      |
| Vert.    | 2390.000        | PK       | 48.67          | 28.33           | 14.16     | 41.59     | 1.80                 | 51.37           | 73.9           | 22.5        | 119         | 144         | -      |
| Vert.    | 2877.401        | PK       | 64.48          | 28.86           | 6.19      | 41.77     | 1.80                 | 59.56           | 73.9           | 14.3        | 148         | 183         | -      |
| Vert.    | 3330.134        | PK       | 59.33          | 28.73           | 5.69      | 42.01     | 1.80                 | 53.54           | 73.9           | 20.3        | 140         | 265         | -      |
| Vert.    | 3493.783        | PK       | 56.12          | 29.11           | 5.73      | 42.12     | 1.80                 | 50.64           | 73.9           | 23.2        | 108         | 356         | -      |
| Vert.    | 3904.789        | PK       | 58.62          | 30.01           | 5.80      | 42.13     | 1.80                 | 54.10           | 73.9           | 19.8        | 150         | 335         | -      |
| Vert.    | 4824.000        | PK       | 50.36          | 31.64           | 6.46      | 42.88     | 1.80                 | 47.38           | 73.9           | 26.5        | 124         | 30          | -      |
| Vert.    | 7236.000        | PK       | 48.12          | 37.25           | 7.89      | 42.98     | 1.80                 | 52.08           | 73.9           | 21.8        | 150         | 0           | -      |
| Vert.    | 9648.000        | PK       | 48.82          | 38.97           | 9.18      | 43.13     | 1.80                 | 55.64           | 73.9           | 18.2        | 150         | 0           | -      |
| Vert.    | 2390.000        | AV       | 39.50          | 28.33           | 14.16     | 41.59     | 1.80                 | 42.20           | 53.9           | 11.7        | 119         | 144         | -      |
| Vert.    | 2877.401        | AV       | 50.57          | 28.86           | 6.19      | 41.77     | 1.80                 | 45.65           | 53.9           | 8.2         | 148         | 183         | -      |
| Vert.    | 3330.134        | AV       | 49.94          | 28.73           | 5.69      | 42.01     | 1.80                 | 44.15           | 53.9           | 9.7         | 140         | 265         | -      |
| Vert.    | 3493.783        | AV       | 40.78          | 29.11           | 5.73      | 42.12     | 1.80                 | 35.30           | 53.9           | 18.6        | 108         | 356         | -      |
| Vert.    | 3904.789        | AV       | 45.51          | 30.01           | 5.80      | 42.13     | 1.80                 | 40.99           | 53.9           | 12.9        | 150         | 335         | -      |
| Vert.    | 4824.000        | AV       | 39.83          | 31.64           | 6.46      | 42.88     | 1.80                 | 36.85           | 53.9           | 17.0        | 124         | 30          | -      |
| Vert.    | 7236.000        | AV       | 39.34          | 37.25           | 7.89      | 42.98     | 1.80                 | 43.30           | 53.9           | 10.6        | 150         | 0           | -      |
| Vert.    | 9648.000        | AV       | 39.59          | 38.97           | 9.18      | 43.13     | 1.80                 | 46.41           | 53.9           | 7.4         | 150         | 0           | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69 \text{ m} / 3.0 \text{ m}) = 1.80 \text{ dB}$

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2412.000        | PK       | 96.88          | 28.29           | 14.17     | 41.60     | 1.80                 | 99.54           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 46.22          | 28.31           | 14.16     | 41.60     | 1.80                 | 48.89           | 79.54          | 30.6        | -       |
| Vert.    | 2412.000        | PK       | 94.65          | 28.29           | 14.17     | 41.60     | 1.80                 | 97.31           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 43.29          | 28.31           | 14.16     | 41.60     | 1.80                 | 45.96           | 77.31          | 31.3        | -       |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69 \text{ m} / 3.0 \text{ m}) = 1.80 \text{ dB}$

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

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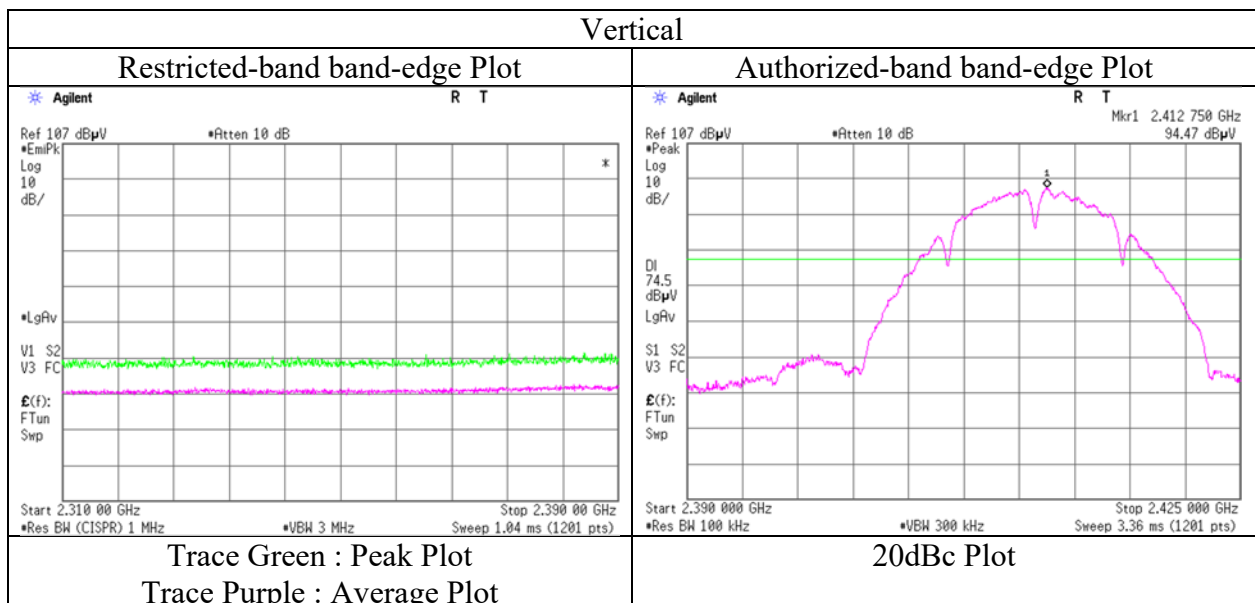
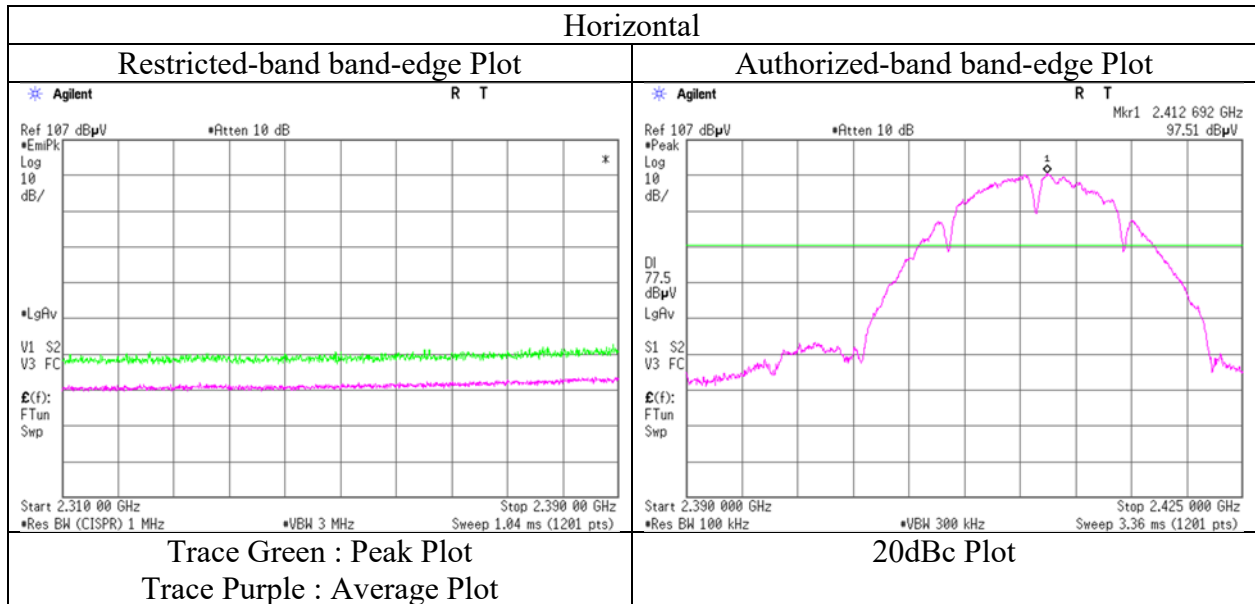
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

|                        |                     |
|------------------------|---------------------|
| Report No.             | 12979151S-A         |
| Test place             | Shonan EMC Lab.     |
| Semi Anechoic Chamber  | 3                   |
| Date                   | October 30, 2019    |
| Temperature / Humidity | 25 deg. C / 51 % RH |
| Engineer               | Hiromasa Sato       |
|                        | (1 GHz – 2.8 GHz)   |
| Mode                   | Tx 11b 2412 MHz     |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Spurious Emission

|                        |                     |                      |
|------------------------|---------------------|----------------------|
| Report No.             | 12979151S-A         |                      |
| Test place             | Shonan EMC Lab.     |                      |
| Semi Anechoic Chamber  | 3                   | 3                    |
| Date                   | October 30, 2019    | October 31, 2019     |
| Temperature / Humidity | 25 deg. C / 51 % RH | 24 deg. C / 54 % RH  |
| Engineer               | Hiromasa Sato       | Hiromasa Sato        |
|                        | (1 GHz – 2.8 GHz)   | (2.8 GHz – 26.5 GHz) |
| Mode                   | Tx 11b 2437 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.    | 2877.396           | PK       | 53.29             | 28.86              | 6.19         | 41.77        | 1.80                    | 48.37              | 73.9              | 25.5           | 121            | 233            | -      |
| Hori.    | 3329.824           | PK       | 53.28             | 28.73              | 5.69         | 42.01        | 1.80                    | 47.49              | 73.9              | 26.4           | 124            | 308            | -      |
| Hori.    | 4874.000           | PK       | 51.40             | 31.70              | 6.49         | 42.89        | 1.80                    | 48.50              | 73.9              | 25.4           | 116            | 348            | -      |
| Hori.    | 7311.000           | PK       | 47.42             | 37.36              | 7.95         | 43.13        | 1.80                    | 51.40              | 73.9              | 22.5           | 150            | 0              | -      |
| Hori.    | 9748.000           | PK       | 48.74             | 39.31              | 9.21         | 43.02        | 1.80                    | 56.04              | 73.9              | 17.8           | 150            | 0              | -      |
| Hori.    | 2877.396           | AV       | 40.86             | 28.86              | 6.19         | 41.77        | 1.80                    | 35.94              | 53.9              | 17.9           | 121            | 233            | -      |
| Hori.    | 3329.824           | AV       | 43.35             | 28.73              | 5.69         | 42.01        | 1.80                    | 37.56              | 53.9              | 16.3           | 124            | 308            | -      |
| Hori.    | 4874.000           | AV       | 42.60             | 31.70              | 6.49         | 42.89        | 1.80                    | 39.70              | 53.9              | 14.2           | 116            | 348            | -      |
| Hori.    | 7311.000           | AV       | 39.21             | 37.36              | 7.95         | 43.13        | 1.80                    | 43.19              | 53.9              | 10.7           | 150            | 0              | -      |
| Hori.    | 9748.000           | AV       | 39.13             | 39.31              | 9.21         | 43.02        | 1.80                    | 46.43              | 53.9              | 7.4            | 150            | 0              | -      |
| Vert.    | 2877.332           | PK       | 65.12             | 28.86              | 6.19         | 41.77        | 1.80                    | 60.20              | 73.9              | 13.7           | 100            | 9              | -      |
| Vert.    | 3330.021           | PK       | 55.62             | 28.73              | 5.69         | 42.01        | 1.80                    | 49.83              | 73.9              | 24.0           | 100            | 289            | -      |
| Vert.    | 3493.799           | PK       | 53.58             | 29.11              | 5.73         | 42.12        | 1.80                    | 48.10              | 73.9              | 25.8           | 146            | 358            | -      |
| Vert.    | 3904.531           | PK       | 53.71             | 30.01              | 5.80         | 42.13        | 1.80                    | 49.19              | 73.9              | 24.7           | 117            | 321            | -      |
| Vert.    | 4874.000           | PK       | 50.70             | 31.70              | 6.49         | 42.89        | 1.80                    | 47.80              | 73.9              | 26.1           | 115            | 27             | -      |
| Vert.    | 7311.000           | PK       | 47.49             | 37.36              | 7.95         | 43.13        | 1.80                    | 51.47              | 73.9              | 22.4           | 150            | 0              | -      |
| Vert.    | 9748.000           | PK       | 48.45             | 39.31              | 9.21         | 43.02        | 1.80                    | 55.75              | 73.9              | 18.1           | 150            | 0              | -      |
| Vert.    | 2877.332           | AV       | 51.28             | 28.86              | 6.19         | 41.77        | 1.80                    | 46.36              | 53.9              | 7.5            | 100            | 9              | -      |
| Vert.    | 3330.021           | AV       | 45.16             | 28.73              | 5.69         | 42.01        | 1.80                    | 39.37              | 53.9              | 14.5           | 100            | 289            | -      |
| Vert.    | 3493.799           | AV       | 41.95             | 29.11              | 5.73         | 42.12        | 1.80                    | 36.47              | 53.9              | 17.4           | 146            | 358            | -      |
| Vert.    | 3904.531           | AV       | 41.18             | 30.01              | 5.80         | 42.13        | 1.80                    | 36.66              | 53.9              | 17.2           | 117            | 321            | -      |
| Vert.    | 4874.000           | AV       | 41.13             | 31.70              | 6.49         | 42.89        | 1.80                    | 38.23              | 53.9              | 15.6           | 115            | 27             | -      |
| Vert.    | 7311.000           | AV       | 39.28             | 37.36              | 7.95         | 43.13        | 1.80                    | 43.26              | 53.9              | 10.6           | 150            | 0              | -      |
| Vert.    | 9748.000           | AV       | 39.41             | 39.31              | 9.21         | 43.02        | 1.80                    | 46.71              | 53.9              | 7.1            | 150            | 0              | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 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       | 49.10          | 28.24           | 14.24     | 41.62     | 1.80                 | 51.76           | 73.9           | 22.1        | 108         | 354         | -      |
| Hori.    | 2877.371        | PK       | 58.15          | 28.86           | 6.19      | 41.77     | 1.80                 | 53.23           | 73.9           | 20.6        | 122         | 48          | -      |
| Hori.    | 3328.794        | PK       | 54.62          | 28.73           | 5.69      | 42.01     | 1.80                 | 48.83           | 73.9           | 25.0        | 129         | 326         | -      |
| Hori.    | 4924.000        | PK       | 50.91          | 31.82           | 6.52      | 42.90     | 1.80                 | 48.15           | 73.9           | 25.7        | 112         | 351         | -      |
| Hori.    | 7386.000        | PK       | 47.48          | 37.49           | 8.00      | 43.28     | 1.80                 | 51.49           | 73.9           | 22.4        | 150         | 0           | -      |
| Hori.    | 9848.000        | PK       | 48.02          | 39.33           | 9.24      | 42.92     | 1.80                 | 55.47           | 73.9           | 18.4        | 150         | 0           | -      |
| Hori.    | 2483.500        | AV       | 39.82          | 28.24           | 14.24     | 41.62     | 1.80                 | 42.48           | 53.9           | 11.4        | 108         | 354         | -      |
| Hori.    | 2877.371        | AV       | 44.96          | 28.86           | 6.19      | 41.77     | 1.80                 | 40.04           | 53.9           | 13.8        | 122         | 48          | -      |
| Hori.    | 3328.794        | AV       | 44.47          | 28.73           | 5.69      | 42.01     | 1.80                 | 38.68           | 53.9           | 15.2        | 129         | 326         | -      |
| Hori.    | 4924.000        | AV       | 42.82          | 31.82           | 6.52      | 42.90     | 1.80                 | 40.06           | 53.9           | 13.8        | 112         | 351         | -      |
| Hori.    | 7386.000        | AV       | 38.83          | 37.49           | 8.00      | 43.28     | 1.80                 | 42.84           | 53.9           | 11.0        | 150         | 0           | -      |
| Hori.    | 9848.000        | AV       | 39.27          | 39.33           | 9.24      | 42.92     | 1.80                 | 46.72           | 53.9           | 7.1         | 150         | 0           | -      |
| Vert.    | 2483.500        | PK       | 47.92          | 28.24           | 14.24     | 41.62     | 1.80                 | 50.58           | 73.9           | 23.3        | 115         | 143         | -      |
| Vert.    | 2877.117        | PK       | 64.32          | 28.86           | 6.19      | 41.77     | 1.80                 | 59.40           | 73.9           | 14.5        | 104         | 3           | -      |
| Vert.    | 3329.886        | PK       | 57.79          | 28.73           | 5.69      | 42.01     | 1.80                 | 52.00           | 73.9           | 21.9        | 130         | 270         | -      |
| Vert.    | 3493.803        | PK       | 54.94          | 29.11           | 5.73      | 42.12     | 1.80                 | 49.46           | 73.9           | 24.4        | 112         | 328         | -      |
| Vert.    | 3904.889        | PK       | 57.45          | 30.01           | 5.80      | 42.13     | 1.80                 | 52.93           | 73.9           | 20.9        | 152         | 337         | -      |
| Vert.    | 4924.000        | PK       | 49.79          | 31.82           | 6.52      | 42.90     | 1.80                 | 47.03           | 73.9           | 26.8        | 125         | 3           | -      |
| Vert.    | 7386.000        | PK       | 48.49          | 37.49           | 8.00      | 43.28     | 1.80                 | 52.50           | 73.9           | 21.4        | 150         | 0           | -      |
| Vert.    | 9848.000        | PK       | 48.44          | 39.33           | 9.24      | 42.92     | 1.80                 | 55.89           | 73.9           | 18.0        | 150         | 0           | -      |
| Vert.    | 2483.500        | AV       | 39.55          | 28.24           | 14.24     | 41.62     | 1.80                 | 42.21           | 53.9           | 11.7        | 115         | 143         | -      |
| Vert.    | 2877.117        | AV       | 51.36          | 28.86           | 6.19      | 41.77     | 1.80                 | 46.44           | 53.9           | 7.4         | 104         | 3           | -      |
| Vert.    | 3329.886        | AV       | 49.89          | 28.73           | 5.69      | 42.01     | 1.80                 | 44.10           | 53.9           | 9.8         | 130         | 270         | -      |
| Vert.    | 3493.803        | AV       | 42.43          | 29.11           | 5.73      | 42.12     | 1.80                 | 36.95           | 53.9           | 16.9        | 112         | 328         | -      |
| Vert.    | 3904.889        | AV       | 43.51          | 30.01           | 5.80      | 42.13     | 1.80                 | 38.99           | 53.9           | 14.9        | 152         | 337         | -      |
| Vert.    | 4924.000        | AV       | 41.72          | 31.82           | 6.52      | 42.90     | 1.80                 | 38.96           | 53.9           | 14.9        | 125         | 3           | -      |
| Vert.    | 7386.000        | AV       | 38.76          | 37.49           | 8.00      | 43.28     | 1.80                 | 42.77           | 53.9           | 11.1        | 150         | 0           | -      |
| Vert.    | 9848.000        | AV       | 38.87          | 39.33           | 9.24      | 42.92     | 1.80                 | 46.32           | 53.9           | 7.5         | 150         | 0           | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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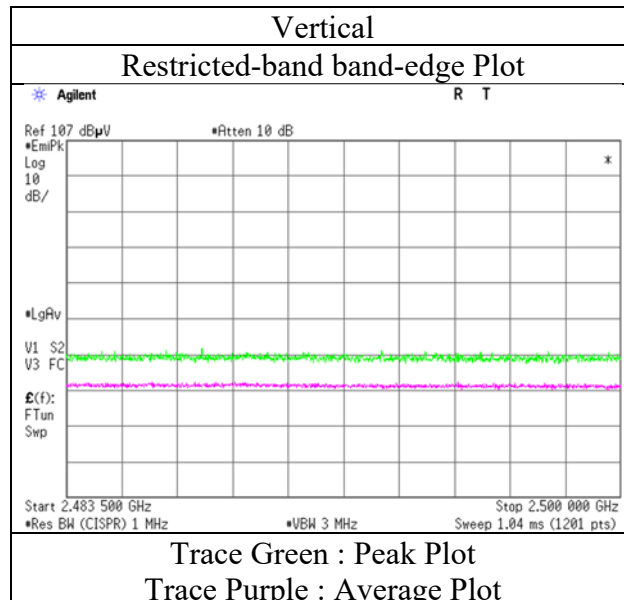
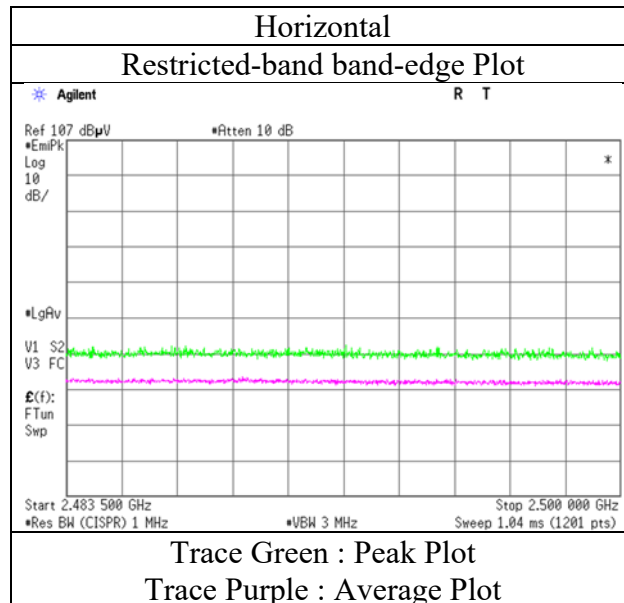
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 12979151S-A                        |
| Test place             | Shonan EMC Lab.                    |
| Semi Anechoic Chamber  | 3                                  |
| Date                   | October 30, 2019                   |
| Temperature / Humidity | 25 deg. C / 51 % RH                |
| Engineer               | Hiromasa Sato<br>(1 GHz – 2.8 GHz) |
| Mode                   | Tx 11b 2462 MHz                    |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 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       | 53.80          | 28.33           | 14.16     | 41.59     | 1.80                 | 56.50           | 73.9           | 17.4        | 109         | 358         | -      |
| Hori.    | 2877.299        | PK       | 58.88          | 28.86           | 6.19      | 41.77     | 1.80                 | 53.96           | 73.9           | 19.9        | 125         | 49          | -      |
| Hori.    | 3331.163        | PK       | 54.61          | 28.73           | 5.70      | 42.02     | 1.80                 | 48.82           | 73.9           | 25.0        | 154         | 324         | -      |
| Hori.    | 4824.000        | PK       | 48.50          | 31.64           | 6.46      | 42.88     | 1.80                 | 45.52           | 73.9           | 28.3        | 150         | 0           | -      |
| Hori.    | 7236.000        | PK       | 48.42          | 37.25           | 7.89      | 42.98     | 1.80                 | 52.38           | 73.9           | 21.5        | 150         | 0           | -      |
| Hori.    | 9648.000        | PK       | 48.59          | 38.97           | 9.18      | 43.13     | 1.80                 | 55.41           | 73.9           | 18.4        | 150         | 0           | -      |
| Hori.    | 2877.299        | AV       | 45.13          | 28.86           | 6.19      | 41.77     | 1.80                 | 40.21           | 53.9           | 13.6        | 125         | 49          | -      |
| Hori.    | 3331.163        | AV       | 44.96          | 28.73           | 5.70      | 42.02     | 1.80                 | 39.17           | 53.9           | 14.7        | 154         | 324         | -      |
| Vert.    | 2390.000        | PK       | 50.91          | 28.33           | 14.16     | 41.59     | 1.80                 | 53.61           | 73.9           | 20.2        | 115         | 145         | -      |
| Vert.    | 2877.157        | PK       | 65.26          | 28.86           | 6.19      | 41.77     | 1.80                 | 60.34           | 73.9           | 13.5        | 100         | 11          | -      |
| Vert.    | 3329.994        | PK       | 58.46          | 28.73           | 5.69      | 42.01     | 1.80                 | 52.67           | 73.9           | 21.2        | 139         | 272         | -      |
| Vert.    | 3493.846        | PK       | 54.71          | 29.11           | 5.73      | 42.12     | 1.80                 | 49.23           | 73.9           | 24.6        | 113         | 357         | -      |
| Vert.    | 3904.910        | PK       | 55.82          | 30.01           | 5.80      | 42.13     | 1.80                 | 51.30           | 73.9           | 22.6        | 146         | 333         | -      |
| Vert.    | 4824.000        | PK       | 48.19          | 31.64           | 6.46      | 42.88     | 1.80                 | 45.21           | 73.9           | 28.6        | 150         | 0           | -      |
| Vert.    | 7236.000        | PK       | 48.61          | 37.25           | 7.89      | 42.98     | 1.80                 | 52.57           | 73.9           | 21.3        | 150         | 0           | -      |
| Vert.    | 9648.000        | PK       | 48.80          | 38.97           | 9.18      | 43.13     | 1.80                 | 55.62           | 73.9           | 18.2        | 150         | 0           | -      |
| Vert.    | 2877.157        | AV       | 50.67          | 28.86           | 6.19      | 41.77     | 1.80                 | 45.75           | 53.9           | <b>8.1</b>  | 100         | 11          | -      |
| Vert.    | 3329.994        | AV       | 49.52          | 28.73           | 5.69      | 42.01     | 1.80                 | 43.73           | 53.9           | 10.1        | 139         | 272         | -      |
| Vert.    | 3493.846        | AV       | 42.39          | 29.11           | 5.73      | 42.12     | 1.80                 | 36.91           | 53.9           | 16.9        | 113         | 357         | -      |
| Vert.    | 3904.910        | AV       | 42.22          | 30.01           | 5.80      | 42.13     | 1.80                 | 37.70           | 53.9           | 16.2        | 146         | 333         | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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       | 42.84          | 28.33           | 14.16     | 41.59     | 0.22             | 1.80                 | 45.76           | 53.9           | 8.1         | *1)    |
| Hori.    | 4824.000        | AV       | 39.44          | 31.64           | 6.46      | 42.88     | 0.22             | 1.80                 | 36.68           | 53.9           | 17.2        | -      |
| Hori.    | 7236.000        | AV       | 39.43          | 37.25           | 7.89      | 42.98     | 0.22             | 1.80                 | 43.61           | 53.9           | 10.2        | -      |
| Hori.    | 9648.000        | AV       | 39.53          | 38.97           | 9.18      | 43.13     | 0.22             | 1.80                 | 46.57           | 53.9           | 7.3         | -      |
| Vert.    | 2390.000        | AV       | 40.97          | 28.33           | 14.16     | 41.59     | 0.22             | 1.80                 | 43.89           | 53.9           | 10.0        | *1)    |
| Vert.    | 4824.000        | AV       | 39.11          | 31.64           | 6.46      | 42.88     | 0.22             | 1.80                 | 36.35           | 53.9           | 17.5        | -      |
| Vert.    | 7236.000        | AV       | 39.45          | 37.25           | 7.89      | 42.98     | 0.22             | 1.80                 | 43.63           | 53.9           | 10.2        | -      |
| Vert.    | 9648.000        | AV       | 39.64          | 38.97           | 9.18      | 43.13     | 0.22             | 1.80                 | 46.68           | 53.9           | <b>7.2</b>  | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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       | 93.27          | 28.29           | 14.17     | 41.60     | 1.80                 | 95.93           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 58.92          | 28.31           | 14.16     | 41.60     | 1.80                 | 61.59           | 75.93          | 14.3        | -       |
| Vert.    | 2412.000        | PK       | 90.72          | 28.29           | 14.17     | 41.60     | 1.80                 | 93.38           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 54.83          | 28.31           | 14.16     | 41.60     | 1.80                 | 57.50           | 73.38          | 15.8        | -       |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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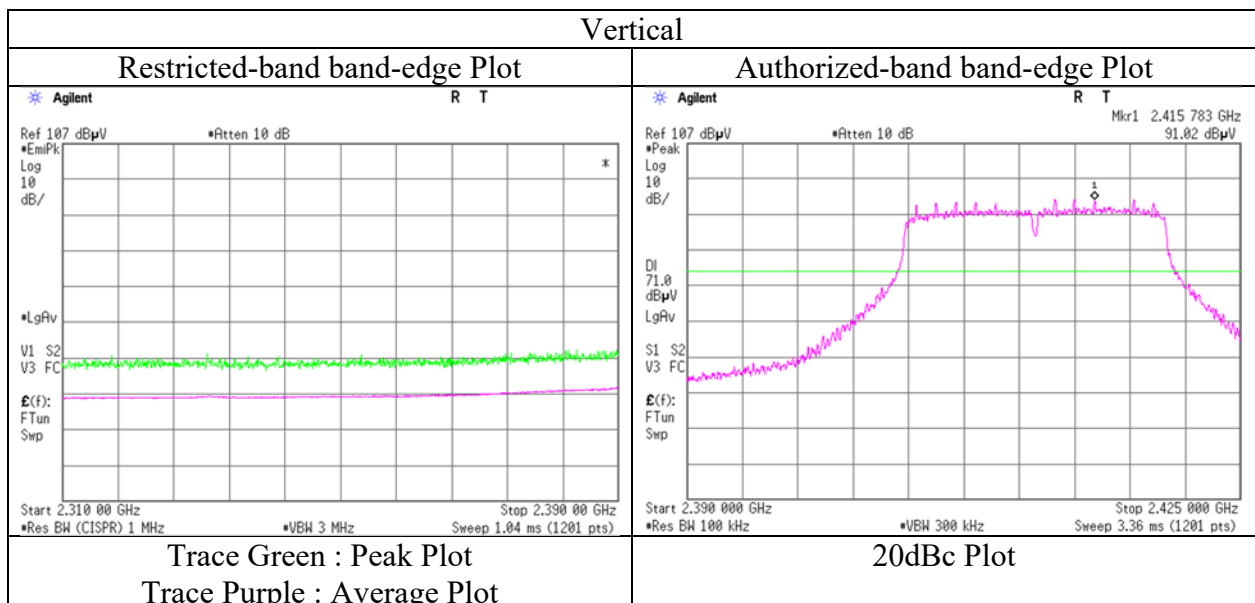
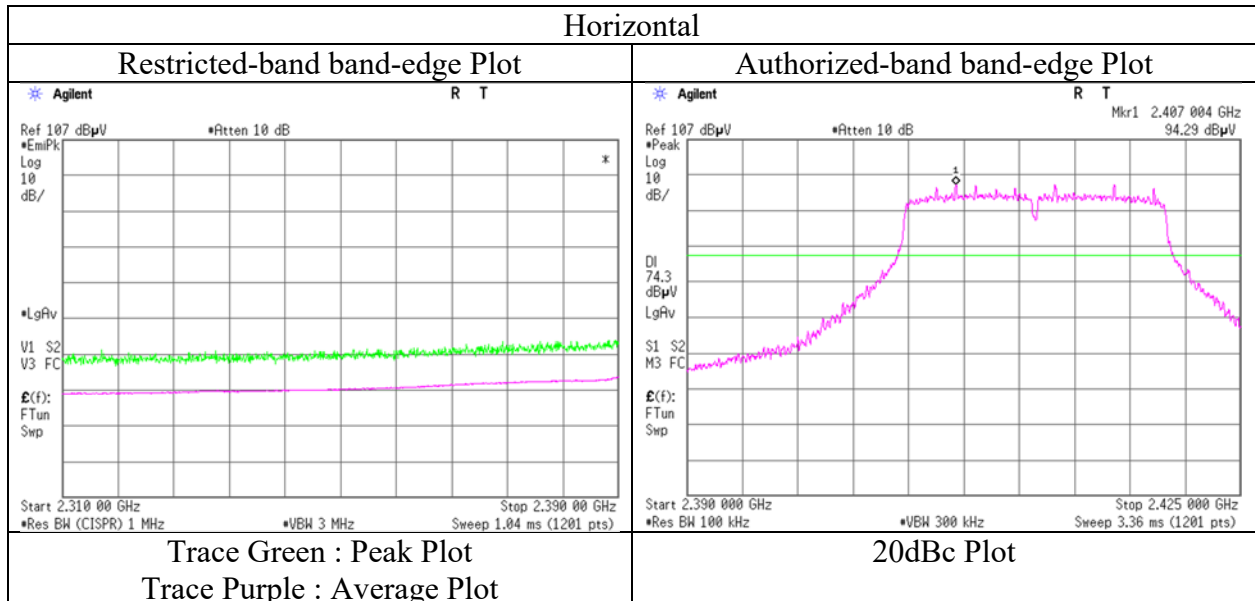
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

|                        |                     |
|------------------------|---------------------|
| Report No.             | 12979151S-A         |
| Test place             | Shonan EMC Lab.     |
| Semi Anechoic Chamber  | 3                   |
| Date                   | October 30, 2019    |
| Temperature / Humidity | 25 deg. C / 51 % RH |
| Engineer               | Hiromasa Sato       |
|                        | (1 GHz – 2.8 GHz)   |
| Mode                   | Tx 11g 2412 MHz     |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

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**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 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.    | 2877.125        | PK       | 58.63          | 28.86           | 6.19      | 41.77     | 1.80                 | 53.71           | 73.9           | 20.1        | 131         | 26          | -      |
| Hori.    | 3331.102        | PK       | 53.95          | 28.73           | 5.70      | 42.02     | 1.80                 | 48.16           | 73.9           | 25.7        | 133         | 321         | -      |
| Hori.    | 4874.000        | PK       | 48.11          | 31.70           | 6.49      | 42.89     | 1.80                 | 45.21           | 73.9           | 28.6        | 150         | 0           | -      |
| Hori.    | 7311.000        | PK       | 48.64          | 37.36           | 7.95      | 43.13     | 1.80                 | 52.62           | 73.9           | 21.2        | 150         | 0           | -      |
| Hori.    | 9748.000        | PK       | 48.39          | 39.31           | 9.21      | 43.02     | 1.80                 | 55.69           | 73.9           | 18.2        | 150         | 0           | -      |
| Hori.    | 2877.125        | AV       | 44.88          | 28.86           | 6.19      | 41.77     | 1.80                 | 39.96           | 53.9           | 13.9        | 131         | 26          | -      |
| Hori.    | 3331.102        | AV       | 44.20          | 28.73           | 5.70      | 42.02     | 1.80                 | 38.41           | 53.9           | 15.4        | 133         | 321         | -      |
| Vert.    | 2877.326        | PK       | 64.88          | 28.86           | 6.19      | 41.77     | 1.80                 | 59.96           | 73.9           | 13.9        | 100         | 21          | -      |
| Vert.    | 3331.214        | PK       | 57.31          | 28.73           | 5.70      | 42.02     | 1.80                 | 51.52           | 73.9           | 22.3        | 138         | 270         | -      |
| Vert.    | 3493.554        | PK       | 53.22          | 29.11           | 5.73      | 42.12     | 1.80                 | 47.74           | 73.9           | 26.1        | 124         | 358         | -      |
| Vert.    | 3905.196        | PK       | 56.83          | 30.01           | 5.81      | 42.13     | 1.80                 | 52.32           | 73.9           | 21.5        | 148         | 336         | -      |
| Vert.    | 4874.000        | PK       | 48.03          | 31.70           | 6.49      | 42.89     | 1.80                 | 45.13           | 73.9           | 28.7        | 150         | 0           | -      |
| Vert.    | 7311.000        | PK       | 48.81          | 37.36           | 7.95      | 43.13     | 1.80                 | 52.79           | 73.9           | 21.1        | 150         | 0           | -      |
| Vert.    | 9748.000        | PK       | 48.79          | 39.31           | 9.21      | 43.02     | 1.80                 | 56.09           | 73.9           | 17.8        | 150         | 0           | -      |
| Vert.    | 2877.326        | AV       | 51.05          | 28.86           | 6.19      | 41.77     | 1.80                 | 46.13           | 53.9           | 7.7         | 100         | 21          | -      |
| Vert.    | 3331.214        | AV       | 49.73          | 28.73           | 5.70      | 42.02     | 1.80                 | 43.94           | 53.9           | 9.9         | 138         | 270         | -      |
| Vert.    | 3493.554        | AV       | 43.18          | 29.11           | 5.73      | 42.12     | 1.80                 | 37.70           | 53.9           | 16.2        | 124         | 358         | -      |
| Vert.    | 3905.196        | AV       | 43.21          | 30.01           | 5.81      | 42.13     | 1.80                 | 38.70           | 53.9           | 15.2        | 148         | 336         | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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       | 39.44          | 31.70           | 6.49      | 42.89     | 0.22             | 1.80                 | 36.76           | 53.9           | 17.1        | -      |
| Hori.    | 7311.000        | AV       | 39.78          | 37.36           | 7.95      | 43.13     | 0.22             | 1.80                 | 43.98           | 53.9           | 9.9         | -      |
| Hori.    | 9748.000        | AV       | 39.77          | 39.31           | 9.21      | 43.02     | 0.22             | 1.80                 | 47.29           | 53.9           | 6.6         | -      |
| Vert.    | 4874.000        | AV       | 39.53          | 31.70           | 6.49      | 42.89     | 0.22             | 1.80                 | 36.85           | 53.9           | 17.0        | -      |
| Vert.    | 7311.000        | AV       | 39.71          | 37.36           | 7.95      | 43.13     | 0.22             | 1.80                 | 43.91           | 53.9           | 9.9         | -      |
| Vert.    | 9748.000        | AV       | 39.44          | 39.31           | 9.21      | 43.02     | 0.22             | 1.80                 | 46.96           | 53.9           | 6.9         | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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.

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401



## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3 3  
Date November 1, 2019 October 30, 2019 October 31, 2019  
Temperature / Humidity 26 deg. C / 53 % RH 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato Hiromasa Sato  
(30 MHz – 1000 MHz) (1 GHz – 2.8 GHz) (2.8 GHz – 26.5 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.    | 74.233          | QP       | 45.57          | 6.16            | 7.16      | 32.17     | 0.00                 | 26.72           | 40.0           | 13.2        | 131         | 117         | -      |
| Hori.    | 148.499         | QP       | 36.74          | 14.63           | 7.80      | 32.12     | 0.00                 | 27.05           | 43.5           | 16.4        | 100         | 357         | -      |
| Hori.    | 291.753         | QP       | 52.70          | 13.40           | 8.72      | 32.02     | 0.00                 | 42.80           | 46.0           | 3.2         | 123         | 107         | -      |
| Hori.    | 338.462         | QP       | 44.66          | 14.48           | 9.00      | 31.96     | 0.00                 | 36.18           | 46.0           | 9.8         | 100         | 282         | -      |
| Hori.    | 542.866         | QP       | 36.19          | 17.57           | 9.80      | 31.98     | 0.00                 | 31.58           | 46.0           | 14.4        | 150         | 170         | -      |
| Hori.    | 896.802         | QP       | 32.83          | 21.53           | 11.00     | 31.11     | 0.00                 | 34.25           | 46.0           | 11.7        | 120         | 56          | -      |
| Hori.    | 2483.500        | PK       | 51.43          | 28.24           | 14.24     | 41.62     | 1.80                 | 54.09           | 73.9           | 19.8        | 108         | 353         | -      |
| Hori.    | 2877.406        | PK       | 56.43          | 28.86           | 6.19      | 41.77     | 1.80                 | 51.51           | 73.9           | 22.3        | 113         | 22          | -      |
| Hori.    | 3330.168        | PK       | 51.78          | 28.73           | 5.69      | 42.01     | 1.80                 | 45.99           | 73.9           | 27.9        | 148         | 350         | -      |
| Hori.    | 4924.000        | PK       | 48.62          | 31.82           | 6.52      | 42.90     | 1.80                 | 45.86           | 73.9           | 28.0        | 150         | 0           | -      |
| Hori.    | 7386.000        | PK       | 48.70          | 37.49           | 8.00      | 43.28     | 1.80                 | 52.71           | 73.9           | 21.1        | 150         | 0           | -      |
| Hori.    | 9848.000        | PK       | 48.71          | 39.33           | 9.24      | 42.92     | 1.80                 | 56.16           | 73.9           | 17.7        | 150         | 0           | -      |
| Hori.    | 2877.406        | AV       | 43.22          | 28.86           | 6.19      | 41.77     | 1.80                 | 38.30           | 53.9           | 15.6        | 113         | 22          | -      |
| Hori.    | 3330.168        | AV       | 42.13          | 28.73           | 5.69      | 42.01     | 1.80                 | 36.34           | 53.9           | 17.5        | 148         | 350         | -      |
| Vert.    | 74.186          | QP       | 41.83          | 6.16            | 7.16      | 32.17     | 0.00                 | 22.98           | 40.0           | 17.0        | 137         | 122         | -      |
| Vert.    | 148.501         | QP       | 37.11          | 14.63           | 7.81      | 32.12     | 0.00                 | 27.43           | 43.5           | 16.0        | 103         | 4           | -      |
| Vert.    | 291.755         | QP       | 49.23          | 13.40           | 8.72      | 32.02     | 0.00                 | 39.33           | 46.0           | 6.6         | 100         | 96          | -      |
| Vert.    | 445.401         | QP       | 35.68          | 16.13           | 9.45      | 31.97     | 0.00                 | 29.29           | 46.0           | 16.7        | 100         | 140         | -      |
| Vert.    | 482.628         | QP       | 36.91          | 17.11           | 9.57      | 31.95     | 0.00                 | 31.64           | 46.0           | 14.3        | 153         | 189         | -      |
| Vert.    | 896.783         | QP       | 35.58          | 21.53           | 11.00     | 31.11     | 0.00                 | 37.00           | 46.0           | 9.0         | 100         | 58          | -      |
| Vert.    | 924.641         | QP       | 33.66          | 21.69           | 11.09     | 30.87     | 0.00                 | 35.57           | 46.0           | 10.4        | 100         | 358         | -      |
| Vert.    | 2483.500        | PK       | 49.47          | 28.24           | 14.24     | 41.62     | 1.80                 | 52.13           | 73.9           | 21.7        | 150         | 141         | -      |
| Vert.    | 2877.158        | PK       | 64.66          | 28.86           | 6.19      | 41.77     | 1.80                 | 59.74           | 73.9           | 14.1        | 100         | 2           | -      |
| Vert.    | 3331.183        | PK       | 58.21          | 28.73           | 5.70      | 42.02     | 1.80                 | 52.42           | 73.9           | 21.4        | 148         | 263         | -      |
| Vert.    | 3493.912        | PK       | 55.89          | 29.11           | 5.73      | 42.12     | 1.80                 | 50.41           | 73.9           | 23.4        | 110         | 359         | -      |
| Vert.    | 3904.705        | PK       | 55.40          | 30.01           | 5.80      | 42.13     | 1.80                 | 50.88           | 73.9           | 23.0        | 139         | 320         | -      |
| Vert.    | 4924.000        | PK       | 48.24          | 31.82           | 6.52      | 42.90     | 1.80                 | 45.48           | 73.9           | 28.4        | 150         | 0           | -      |
| Vert.    | 7386.000        | PK       | 48.74          | 37.49           | 8.00      | 43.28     | 1.80                 | 52.75           | 73.9           | 21.1        | 150         | 0           | -      |
| Vert.    | 9848.000        | PK       | 48.65          | 39.33           | 9.24      | 42.92     | 1.80                 | 56.10           | 73.9           | 17.8        | 150         | 0           | -      |
| Vert.    | 2877.158        | AV       | 50.53          | 28.86           | 6.19      | 41.77     | 1.80                 | 45.61           | 53.9           | 8.2         | 100         | 2           | -      |
| Vert.    | 3331.183        | AV       | 49.88          | 28.73           | 5.70      | 42.02     | 1.80                 | 44.09           | 53.9           | 9.8         | 148         | 263         | -      |
| Vert.    | 3493.912        | AV       | 40.71          | 29.11           | 5.73      | 42.12     | 1.80                 | 35.23           | 53.9           | 18.6        | 110         | 359         | -      |
| Vert.    | 3904.705        | AV       | 44.36          | 30.01           | 5.80      | 42.13     | 1.80                 | 39.84           | 53.9           | 14.0        | 139         | 320         | -      |

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

Distance factor : 1 GHz - 13 GHz : 20log(3.69 m / 3.0 m) = 1.80 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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       | 42.39          | 28.24           | 14.24     | 41.62     | 0.22             | 1.80                 | 45.27           | 53.9           | 8.6         | *1)    |
| Hori.    | 4924.000        | AV       | 39.40          | 31.82           | 6.52      | 42.90     | 0.22             | 1.80                 | 36.86           | 53.9           | 17.0        | -      |
| Hori.    | 7386.000        | AV       | 39.79          | 37.49           | 8.00      | 43.28     | 0.22             | 1.80                 | 44.02           | 53.9           | 9.8         | -      |
| Hori.    | 9848.000        | AV       | 39.68          | 39.33           | 9.24      | 42.92     | 0.22             | 1.80                 | 47.35           | 53.9           | 6.5         | -      |
| Vert.    | 2483.500        | AV       | 40.42          | 28.24           | 14.24     | 41.62     | 0.22             | 1.80                 | 43.30           | 53.9           | 10.6        | *1)    |
| Vert.    | 4924.000        | AV       | 39.23          | 31.82           | 6.52      | 42.90     | 0.22             | 1.80                 | 36.69           | 53.9           | 17.2        | -      |
| Vert.    | 7386.000        | AV       | 39.39          | 37.49           | 8.00      | 43.28     | 0.22             | 1.80                 | 43.62           | 53.9           | 10.2        | -      |
| Vert.    | 9848.000        | AV       | 39.83          | 39.33           | 9.24      | 42.92     | 0.22             | 1.80                 | 47.50           | 53.9           | 6.4         | -      |

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(3.69 m / 3.0 m) = 1.80 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)

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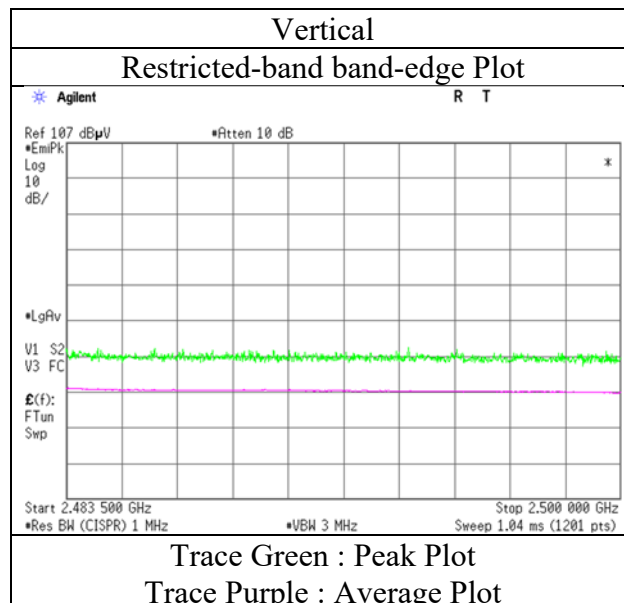
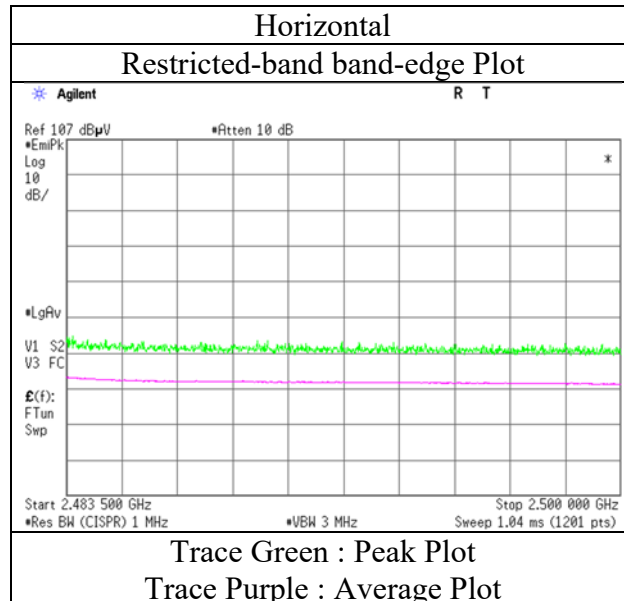
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3  
Date October 30, 2019  
Temperature / Humidity 25 deg. C / 51 % RH  
Engineer Hiromasa Sato  
(1 GHz – 2.8 GHz)  
Mode Tx 11g 2462 MHz



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 GHz)  
Mode Tx 11n-20 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       | 55.16          | 28.33           | 14.16     | 41.59     | 1.80                 | 57.86           | 73.9           | 16.0        | 111         | 356         | -      |
| Hori.    | 2877.249        | PK       | 56.81          | 28.86           | 6.19      | 41.77     | 1.80                 | 51.89           | 73.9           | 22.0        | 145         | 31          | -      |
| Hori.    | 3330.365        | PK       | 51.20          | 28.73           | 5.69      | 42.01     | 1.80                 | 45.41           | 73.9           | 28.4        | 150         | 332         | -      |
| Hori.    | 4824.000        | PK       | 48.66          | 31.64           | 6.46      | 42.88     | 1.80                 | 45.68           | 73.9           | 28.2        | 150         | 0           | -      |
| Hori.    | 7236.000        | PK       | 48.35          | 37.25           | 7.89      | 42.98     | 1.80                 | 52.31           | 73.9           | 21.5        | 150         | 0           | -      |
| Hori.    | 9648.000        | PK       | 48.31          | 38.97           | 9.18      | 43.13     | 1.80                 | 55.13           | 73.9           | 18.7        | 150         | 0           | -      |
| Hori.    | 2390.000        | AV       | 44.04          | 28.33           | 14.16     | 41.59     | 1.80                 | 46.74           | 53.9           | 7.1         | 111         | 356         | -      |
| Hori.    | 2877.249        | AV       | 44.33          | 28.86           | 6.19      | 41.77     | 1.80                 | 39.41           | 53.9           | 14.4        | 145         | 31          | -      |
| Hori.    | 3330.365        | AV       | 41.86          | 28.73           | 5.69      | 42.01     | 1.80                 | 36.07           | 53.9           | 17.8        | 150         | 332         | -      |
| Hori.    | 4824.000        | AV       | 39.33          | 31.64           | 6.46      | 42.88     | 1.80                 | 36.35           | 53.9           | 17.5        | 150         | 0           | -      |
| Hori.    | 7236.000        | AV       | 39.70          | 37.25           | 7.89      | 42.98     | 1.80                 | 43.66           | 53.9           | 10.2        | 150         | 0           | -      |
| Hori.    | 9648.000        | AV       | 39.57          | 38.97           | 9.18      | 43.13     | 1.80                 | 46.39           | 53.9           | 7.5         | 150         | 0           | -      |
| Vert.    | 2390.000        | PK       | 52.43          | 28.33           | 14.16     | 41.59     | 1.80                 | 55.13           | 73.9           | 18.7        | 116         | 139         | -      |
| Vert.    | 2877.400        | PK       | 64.83          | 28.86           | 6.19      | 41.77     | 1.80                 | 59.91           | 73.9           | 13.9        | 102         | 31          | -      |
| Vert.    | 3332.663        | PK       | 59.16          | 28.72           | 5.70      | 42.02     | 1.80                 | 53.36           | 73.9           | 20.5        | 146         | 271         | -      |
| Vert.    | 3494.023        | PK       | 56.01          | 29.11           | 5.73      | 42.12     | 1.80                 | 50.53           | 73.9           | 23.3        | 109         | 349         | -      |
| Vert.    | 3904.965        | PK       | 55.73          | 30.01           | 5.80      | 42.13     | 1.80                 | 51.21           | 73.9           | 22.6        | 154         | 330         | -      |
| Vert.    | 4824.000        | PK       | 48.33          | 31.64           | 6.46      | 42.88     | 1.80                 | 45.35           | 73.9           | 28.5        | 150         | 0           | -      |
| Vert.    | 7236.000        | PK       | 48.97          | 37.25           | 7.89      | 42.98     | 1.80                 | 52.93           | 73.9           | 20.9        | 150         | 0           | -      |
| Vert.    | 9648.000        | PK       | 48.73          | 38.97           | 9.18      | 43.13     | 1.80                 | 55.55           | 73.9           | 18.3        | 150         | 0           | -      |
| Vert.    | 2390.000        | AV       | 41.18          | 28.33           | 14.16     | 41.59     | 1.80                 | 43.88           | 53.9           | 10.0        | 116         | 139         | -      |
| Vert.    | 2877.400        | AV       | 50.24          | 28.86           | 6.19      | 41.77     | 1.80                 | 45.32           | 53.9           | 8.5         | 102         | 31          | -      |
| Vert.    | 3332.663        | AV       | 49.31          | 28.72           | 5.70      | 42.02     | 1.80                 | 43.51           | 53.9           | 10.3        | 146         | 271         | -      |
| Vert.    | 3494.023        | AV       | 40.81          | 29.11           | 5.73      | 42.12     | 1.80                 | 35.33           | 53.9           | 18.5        | 109         | 349         | -      |
| Vert.    | 3904.965        | AV       | 44.51          | 30.01           | 5.80      | 42.13     | 1.80                 | 39.99           | 53.9           | 13.9        | 154         | 330         | -      |
| Vert.    | 4824.000        | AV       | 39.28          | 31.64           | 6.46      | 42.88     | 1.80                 | 36.30           | 53.9           | 17.6        | 150         | 0           | -      |
| Vert.    | 7236.000        | AV       | 39.61          | 37.25           | 7.89      | 42.98     | 1.80                 | 43.57           | 53.9           | 10.3        | 150         | 0           | -      |
| Vert.    | 9648.000        | AV       | 39.66          | 38.97           | 9.18      | 43.13     | 1.80                 | 46.48           | 53.9           | 7.4         | 150         | 0           | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2412.000        | PK       | 92.47          | 28.29           | 14.17     | 41.60     | 1.80                 | 95.13           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 58.61          | 28.31           | 14.16     | 41.60     | 1.80                 | 61.28           | 75.13          | 13.8        | -       |
| Vert.    | 2412.000        | PK       | 89.91          | 28.29           | 14.17     | 41.60     | 1.80                 | 92.57           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 55.22          | 28.31           | 14.16     | 41.60     | 1.80                 | 57.89           | 72.57          | 14.6        | -       |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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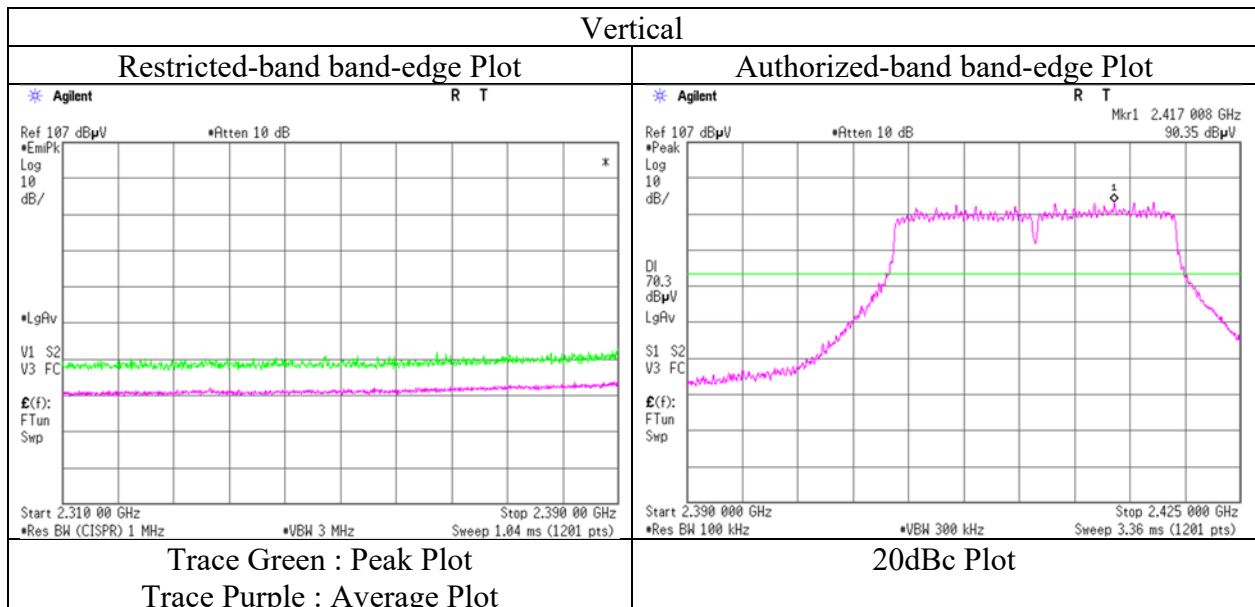
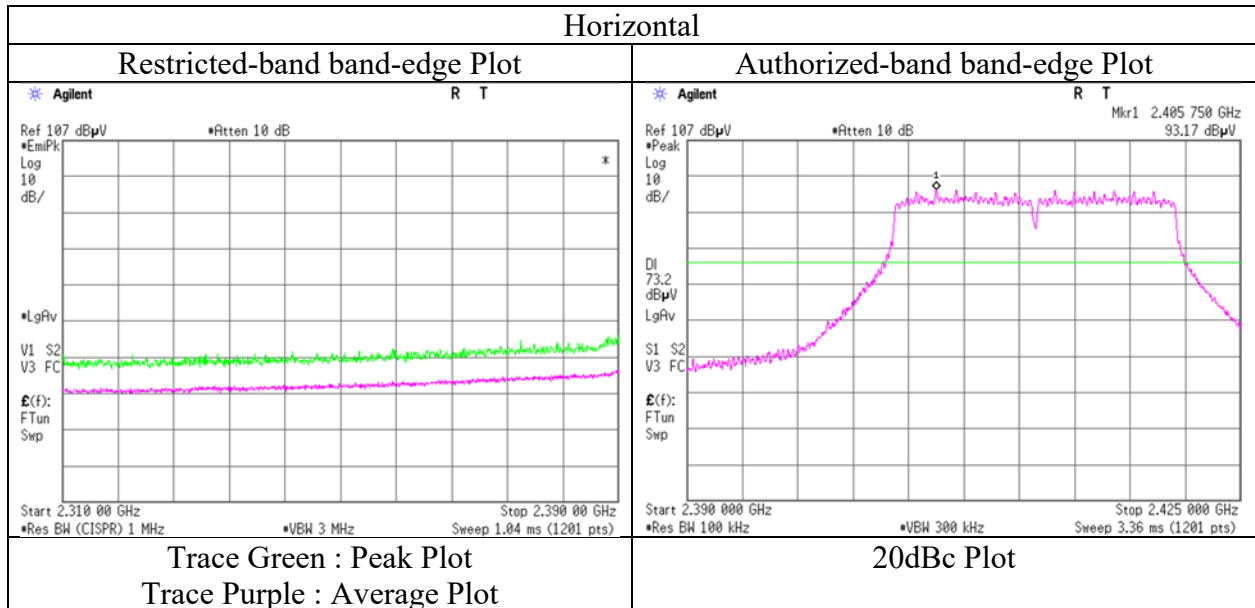
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

|                        |                     |
|------------------------|---------------------|
| Report No.             | 12979151S-A         |
| Test place             | Shonan EMC Lab.     |
| Semi Anechoic Chamber  | 3                   |
| Date                   | October 30, 2019    |
| Temperature / Humidity | 25 deg. C / 51 % RH |
| Engineer               | Hiromasa Sato       |
|                        | (1 GHz – 2.8 GHz)   |
| Mode                   | Tx 11n-20 2412 MHz  |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 GHz)  
Mode Tx 11n-20 2417 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       | 52.00          | 28.33           | 14.16     | 41.59     | 1.80                 | 54.70           | 73.9           | 19.2        | 115         | 358         | -      |
| Hori.    | 2390.000        | AV       | 41.93          | 28.33           | 14.16     | 41.59     | 1.80                 | 44.63           | 53.9           | 9.2         | 115         | 358         | -      |
| Vert.    | 2390.000        | PK       | 51.33          | 28.33           | 14.16     | 41.59     | 1.80                 | 54.03           | 73.9           | 19.8        | 113         | 143         | -      |
| Vert.    | 2390.000        | AV       | 40.67          | 28.33           | 14.16     | 41.59     | 1.80                 | 43.37           | 53.9           | 10.5        | 113         | 143         | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Distance Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|----------------------|-----------------|----------------|-------------|---------|
| Hori.    | 2417.000        | PK       | 93.08          | 28.28           | 14.19     | 41.60     | 1.80                 | 95.75           | -              | -           | Carrier |
| Hori.    | 2400.000        | PK       | 46.39          | 28.31           | 14.16     | 41.60     | 1.80                 | 49.06           | 75.75          | 26.6        | -       |
| Vert.    | 2417.000        | PK       | 90.75          | 28.28           | 14.19     | 41.60     | 1.80                 | 93.42           | -              | -           | Carrier |
| Vert.    | 2400.000        | PK       | 44.19          | 28.31           | 14.16     | 41.60     | 1.80                 | 46.86           | 73.42          | 26.5        | -       |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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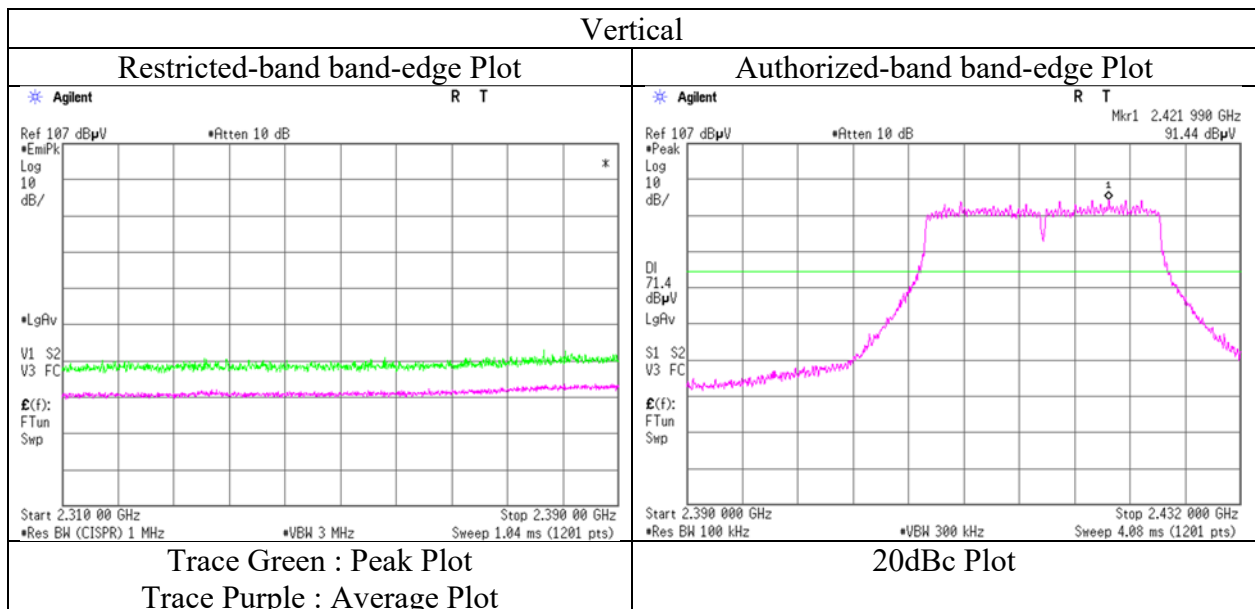
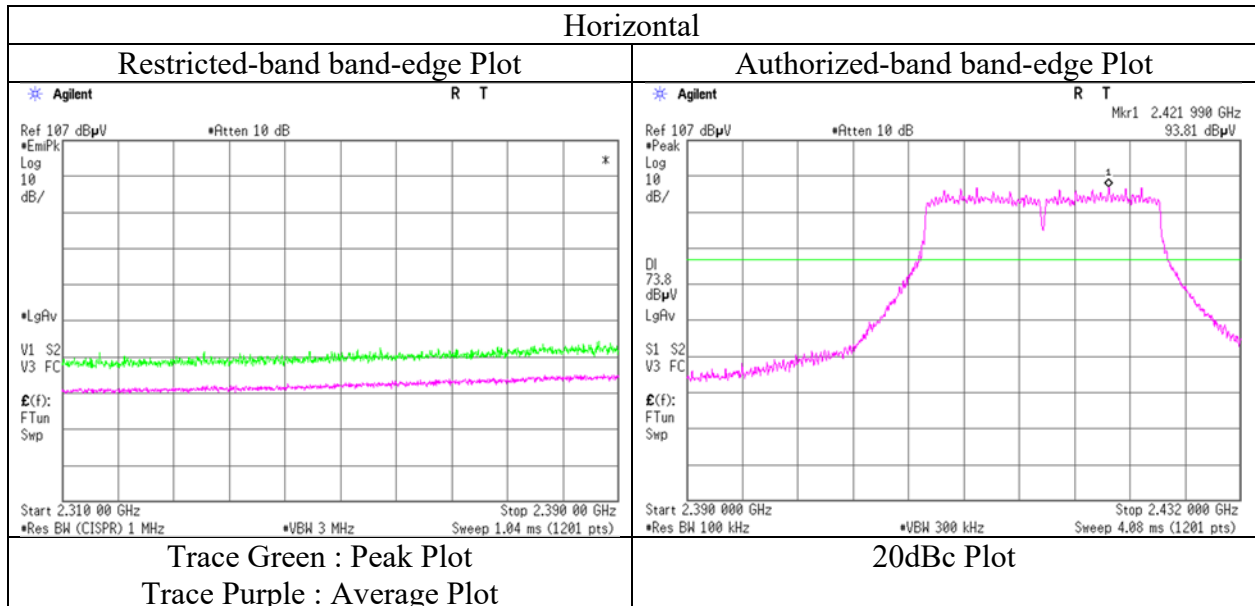
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

|                        |                     |
|------------------------|---------------------|
| Report No.             | 12979151S-A         |
| Test place             | Shonan EMC Lab.     |
| Semi Anechoic Chamber  | 3                   |
| Date                   | October 30, 2019    |
| Temperature / Humidity | 25 deg. C / 51 % RH |
| Engineer               | Hiromasa Sato       |
|                        | (1 GHz – 2.8 GHz)   |
| Mode                   | Tx 11n-20 2417 MHz  |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.

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

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**Shonan EMC Lab.**

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Facsimile : +81 463 50 6401

## Radiated Spurious Emission

|                        |                     |                      |
|------------------------|---------------------|----------------------|
| Report No.             | 12979151S-A         |                      |
| Test place             | Shonan EMC Lab.     |                      |
| Semi Anechoic Chamber  | 3                   | 3                    |
| Date                   | October 30, 2019    | October 31, 2019     |
| Temperature / Humidity | 25 deg. C / 51 % RH | 24 deg. C / 54 % RH  |
| Engineer               | Hiromasa Sato       | Hiromasa Sato        |
|                        | (1 GHz – 2.8 GHz)   | (2.8 GHz – 26.5 GHz) |
| Mode                   | Tx 11n-20 2437 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.    | 2877.386           | PK       | 58.77             | 28.86              | 6.19         | 41.77        | 1.80                    | 53.85              | 73.9              | 20.0           | 142            | 41             | -      |
| Hori.    | 3332.335           | PK       | 51.61             | 28.73              | 5.70         | 42.02        | 1.80                    | 45.82              | 73.9              | 28.0           | 135            | 342            | -      |
| Hori.    | 4874.000           | PK       | 48.77             | 31.70              | 6.49         | 42.89        | 1.80                    | 45.87              | 73.9              | 28.0           | 150            | 0              | -      |
| Hori.    | 7311.000           | PK       | 47.93             | 37.36              | 7.95         | 43.13        | 1.80                    | 51.91              | 73.9              | 21.9           | 150            | 0              | -      |
| Hori.    | 9748.000           | PK       | 48.37             | 39.31              | 9.21         | 43.02        | 1.80                    | 55.67              | 73.9              | 18.2           | 150            | 0              | -      |
| Hori.    | 2877.386           | AV       | 44.87             | 28.86              | 6.19         | 41.77        | 1.80                    | 39.95              | 53.9              | 13.9           | 142            | 41             | -      |
| Hori.    | 3332.335           | AV       | 42.74             | 28.73              | 5.70         | 42.02        | 1.80                    | 36.95              | 53.9              | 16.9           | 135            | 342            | -      |
| Hori.    | 4874.000           | AV       | 39.73             | 31.70              | 6.49         | 42.89        | 1.80                    | 36.83              | 53.9              | 17.0           | 150            | 0              | -      |
| Hori.    | 7311.000           | AV       | 39.34             | 37.36              | 7.95         | 43.13        | 1.80                    | 43.32              | 53.9              | 10.5           | 150            | 0              | -      |
| Hori.    | 9748.000           | AV       | 39.04             | 39.31              | 9.21         | 43.02        | 1.80                    | 46.34              | 53.9              | 7.5            | 150            | 0              | -      |
| Vert.    | 2877.161           | PK       | 64.41             | 28.86              | 6.19         | 41.77        | 1.80                    | 59.49              | 73.9              | 14.4           | 103            | 10             | -      |
| Vert.    | 3328.974           | PK       | 59.33             | 28.73              | 5.69         | 42.01        | 1.80                    | 53.54              | 73.9              | 20.3           | 144            | 275            | -      |
| Vert.    | 3531.510           | PK       | 55.89             | 29.28              | 5.73         | 42.12        | 1.80                    | 50.58              | 73.9              | 23.3           | 103            | 357            | -      |
| Vert.    | 3904.816           | PK       | 58.34             | 30.01              | 5.80         | 42.13        | 1.80                    | 53.82              | 73.9              | 20.0           | 146            | 313            | -      |
| Vert.    | 4874.000           | PK       | 48.43             | 31.70              | 6.49         | 42.89        | 1.80                    | 45.53              | 73.9              | 28.3           | 150            | 0              | -      |
| Vert.    | 7311.000           | PK       | 48.44             | 37.36              | 7.95         | 43.13        | 1.80                    | 52.42              | 73.9              | 21.4           | 150            | 0              | -      |
| Vert.    | 9748.000           | PK       | 48.53             | 39.31              | 9.21         | 43.02        | 1.80                    | 55.83              | 73.9              | 18.0           | 150            | 0              | -      |
| Vert.    | 2877.161           | AV       | 50.40             | 28.86              | 6.19         | 41.77        | 1.80                    | 45.48              | 53.9              | 8.4            | 103            | 10             | -      |
| Vert.    | 3328.974           | AV       | 49.23             | 28.73              | 5.69         | 42.01        | 1.80                    | 43.44              | 53.9              | 10.4           | 144            | 275            | -      |
| Vert.    | 3531.510           | AV       | 40.55             | 29.28              | 5.73         | 42.12        | 1.80                    | 35.24              | 53.9              | 18.6           | 103            | 357            | -      |
| Vert.    | 3904.816           | AV       | 42.87             | 30.01              | 5.80         | 42.13        | 1.80                    | 38.35              | 53.9              | 15.5           | 146            | 313            | -      |
| Vert.    | 4874.000           | AV       | 39.31             | 31.70              | 6.49         | 42.89        | 1.80                    | 36.41              | 53.9              | 17.4           | 150            | 0              | -      |
| Vert.    | 7311.000           | AV       | 39.67             | 37.36              | 7.95         | 43.13        | 1.80                    | 43.65              | 53.9              | 10.2           | 150            | 0              | -      |
| Vert.    | 9748.000           | AV       | 39.12             | 39.31              | 9.21         | 43.02        | 1.80                    | 46.42              | 53.9              | 7.4            | 150            | 0              | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Spurious Emission

|                        |                     |                      |
|------------------------|---------------------|----------------------|
| Report No.             | 12979151S-A         |                      |
| Test place             | Shonan EMC Lab.     |                      |
| Semi Anechoic Chamber  | 3                   | 3                    |
| Date                   | October 30, 2019    | October 31, 2019     |
| Temperature / Humidity | 25 deg. C / 51 % RH | 24 deg. C / 54 % RH  |
| Engineer               | Hiromasa Sato       | Hiromasa Sato        |
|                        | (1 GHz – 2.8 GHz)   | (2.8 GHz – 26.5 GHz) |
| Mode                   | Tx 11n-20 2457 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.    | 2483.500           | PK       | 49.77             | 28.24              | 14.24        | 41.62        | 1.80                    | 52.43              | 73.9              | 21.4           | 137            | 356            | -      |
| Hori.    | 2483.500           | AV       | 40.58             | 28.24              | 14.24        | 41.62        | 1.80                    | 43.24              | 53.9              | <b>10.6</b>    | 137            | 356            | -      |
| Vert.    | 2483.500           | PK       | 49.27             | 28.24              | 14.24        | 41.62        | 1.80                    | 51.93              | 73.9              | 21.9           | 114            | 145            | -      |
| Vert.    | 2483.500           | AV       | 40.58             | 28.24              | 14.24        | 41.62        | 1.80                    | 43.24              | 53.9              | <b>10.6</b>    | 114            | 145            | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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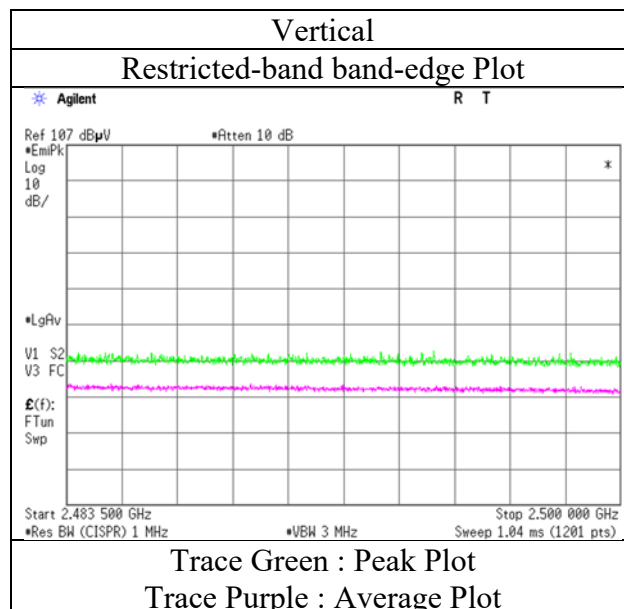
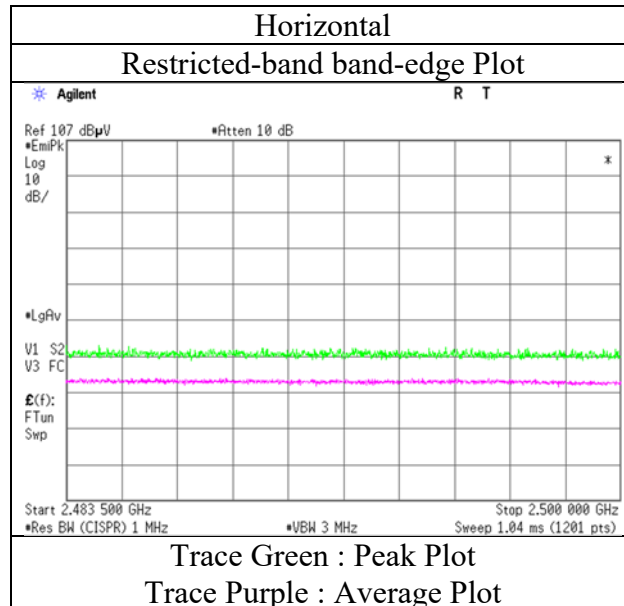
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## Radiated Spurious Emission (Reference Plot for band-edge)

|                        |                     |
|------------------------|---------------------|
| Report No.             | 12979151S-A         |
| Test place             | Shonan EMC Lab.     |
| Semi Anechoic Chamber  | 3                   |
| Date                   | October 30, 2019    |
| Temperature / Humidity | 25 deg. C / 51 % RH |
| Engineer               | Hiromasa Sato       |
|                        | (1 GHz – 2.8 GHz)   |
| Mode                   | Tx 11n-20 2457 MHz  |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

Report No. 12979151S-A  
Test place Shonan EMC Lab.  
Semi Anechoic Chamber 3 3  
Date October 30, 2019 October 31, 2019  
Temperature / Humidity 25 deg. C / 51 % RH 24 deg. C / 54 % RH  
Engineer Hiromasa Sato Hiromasa Sato  
(1 GHz – 2.8 GHz) (2.8 GHz – 26.5 GHz)  
Mode Tx 11n-20 2462 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.    | 2483.500           | PK       | 55.52             | 28.24              | 14.24        | 41.62        | 1.80                    | 58.18              | 73.9              | 15.7           | 104            | 355            | -      |
| Hori.    | 2877.201           | PK       | 58.73             | 28.86              | 6.19         | 41.77        | 1.80                    | 53.81              | 73.9              | 20.0           | 135            | 64             | -      |
| Hori.    | 3327.570           | PK       | 52.81             | 28.74              | 5.69         | 42.01        | 1.80                    | 47.03              | 73.9              | 26.8           | 121            | 330            | -      |
| Hori.    | 4924.000           | PK       | 47.93             | 31.82              | 6.52         | 42.90        | 1.80                    | 45.17              | 73.9              | 28.7           | 150            | 0              | -      |
| Hori.    | 7386.000           | PK       | 48.36             | 37.49              | 8.00         | 43.28        | 1.80                    | 52.37              | 73.9              | 21.5           | 150            | 0              | -      |
| Hori.    | 9848.000           | PK       | 48.27             | 39.33              | 9.24         | 42.92        | 1.80                    | 55.72              | 73.9              | 18.1           | 150            | 0              | -      |
| Hori.    | 2483.500           | AV       | 43.40             | 28.24              | 14.24        | 41.62        | 1.80                    | 46.06              | 53.9              | 7.8            | 104            | 355            | -      |
| Hori.    | 2877.201           | AV       | 44.99             | 28.86              | 6.19         | 41.77        | 1.80                    | 40.07              | 53.9              | 13.8           | 135            | 64             | -      |
| Hori.    | 3327.570           | AV       | 40.78             | 28.74              | 5.69         | 42.01        | 1.80                    | 35.00              | 53.9              | 18.9           | 121            | 330            | -      |
| Hori.    | 4924.000           | AV       | 39.24             | 31.82              | 6.52         | 42.90        | 1.80                    | 36.48              | 53.9              | 17.4           | 150            | 0              | -      |
| Hori.    | 7386.000           | AV       | 39.84             | 37.49              | 8.00         | 43.28        | 1.80                    | 43.85              | 53.9              | 10.0           | 150            | 0              | -      |
| Hori.    | 9848.000           | AV       | 39.60             | 39.33              | 9.24         | 42.92        | 1.80                    | 47.05              | 53.9              | <b>6.8</b>     | 150            | 0              | -      |
| Vert.    | 2483.500           | PK       | 51.90             | 28.24              | 14.24        | 41.62        | 1.80                    | 54.56              | 73.9              | 19.3           | 150            | 142            | -      |
| Vert.    | 2877.282           | PK       | 65.42             | 28.86              | 6.19         | 41.77        | 1.80                    | 60.50              | 73.9              | 13.4           | 111            | 23             | -      |
| Vert.    | 3331.083           | PK       | 59.22             | 28.73              | 5.70         | 42.02        | 1.80                    | 53.43              | 73.9              | 20.4           | 130            | 273            | -      |
| Vert.    | 3493.942           | PK       | 55.73             | 29.11              | 5.73         | 42.12        | 1.80                    | 50.25              | 73.9              | 23.6           | 107            | 357            | -      |
| Vert.    | 3907.241           | PK       | 57.98             | 30.01              | 5.81         | 42.13        | 1.80                    | 53.47              | 73.9              | 20.4           | 149            | 329            | -      |
| Vert.    | 4924.000           | PK       | 48.52             | 31.82              | 6.52         | 42.90        | 1.80                    | 45.76              | 73.9              | 28.1           | 150            | 0              | -      |
| Vert.    | 7386.000           | PK       | 48.55             | 37.49              | 8.00         | 43.28        | 1.80                    | 52.56              | 73.9              | 21.3           | 150            | 0              | -      |
| Vert.    | 9848.000           | PK       | 48.71             | 39.33              | 9.24         | 42.92        | 1.80                    | 56.16              | 73.9              | 17.7           | 150            | 0              | -      |
| Vert.    | 2483.500           | AV       | 41.42             | 28.24              | 14.24        | 41.62        | 1.80                    | 44.08              | 53.9              | 9.8            | 150            | 142            | -      |
| Vert.    | 2877.282           | AV       | 50.04             | 28.86              | 6.19         | 41.77        | 1.80                    | 45.12              | 53.9              | 8.7            | 111            | 23             | -      |
| Vert.    | 3331.083           | AV       | 49.83             | 28.73              | 5.70         | 42.02        | 1.80                    | 44.04              | 53.9              | 9.8            | 130            | 273            | -      |
| Vert.    | 3493.942           | AV       | 40.55             | 29.11              | 5.73         | 42.12        | 1.80                    | 35.07              | 53.9              | 18.8           | 107            | 357            | -      |
| Vert.    | 3907.241           | AV       | 45.33             | 30.01              | 5.81         | 42.13        | 1.80                    | 40.82              | 53.9              | 13.0           | 149            | 329            | -      |
| Vert.    | 4924.000           | AV       | 39.47             | 31.82              | 6.52         | 42.90        | 1.80                    | 36.71              | 53.9              | 17.1           | 150            | 0              | -      |
| Vert.    | 7386.000           | AV       | 39.11             | 37.49              | 8.00         | 43.28        | 1.80                    | 43.12              | 53.9              | 10.7           | 150            | 0              | -      |
| Vert.    | 9848.000           | AV       | 39.23             | 39.33              | 9.24         | 42.92        | 1.80                    | 46.68              | 53.9              | 7.2            | 150            | 0              | -      |

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

Distance factor : 1 GHz - 13 GHz :  $20\log(3.69\text{ m} / 3.0\text{ m}) = 1.80\text{ dB}$

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

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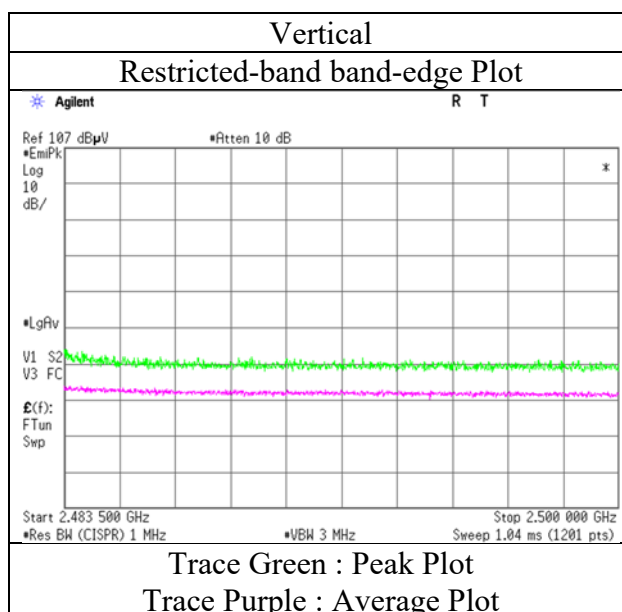
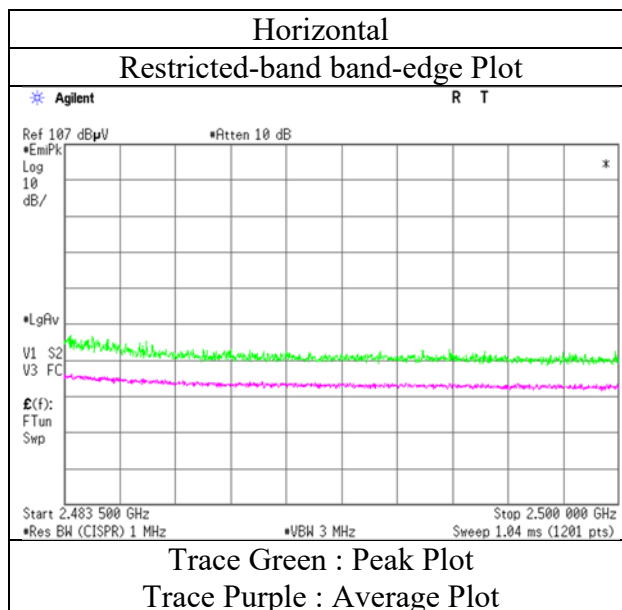
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## Radiated Spurious Emission (Reference Plot for band-edge)

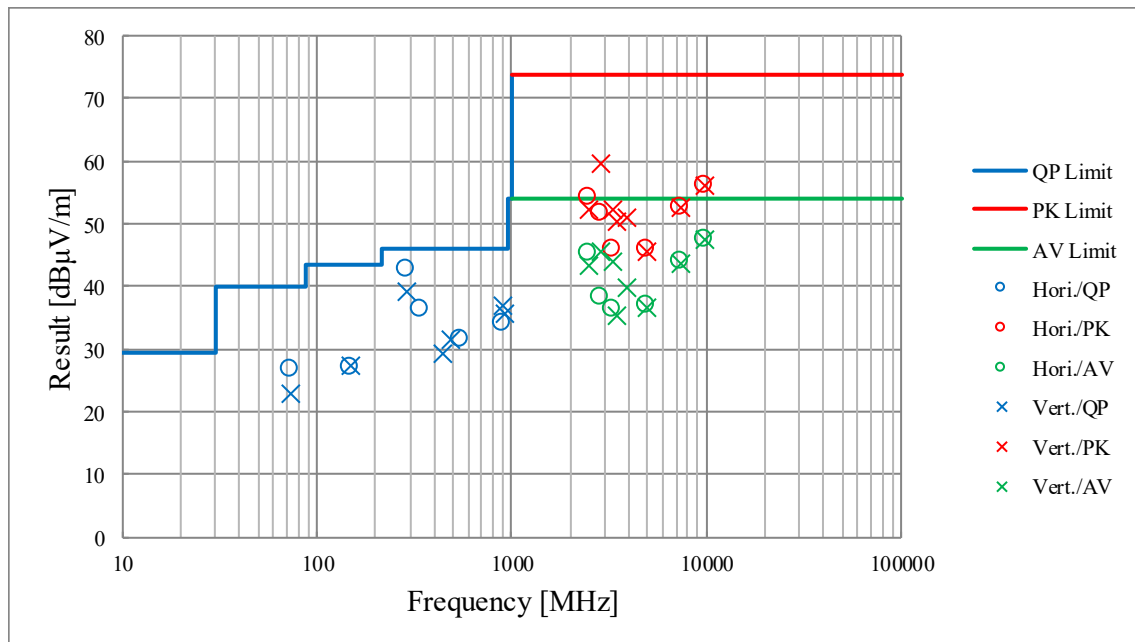
|                        |                     |
|------------------------|---------------------|
| Report No.             | 12979151S-A         |
| Test place             | Shonan EMC Lab.     |
| Semi Anechoic Chamber  | 3                   |
| Date                   | October 30, 2019    |
| Temperature / Humidity | 25 deg. C / 51 % RH |
| Engineer               | Hiromasa Sato       |
|                        | (1 GHz – 2.8 GHz)   |
| Mode                   | Tx 11g 2462 MHz     |



\* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.  
Final result of restricted band edge was shown in tabular data.

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

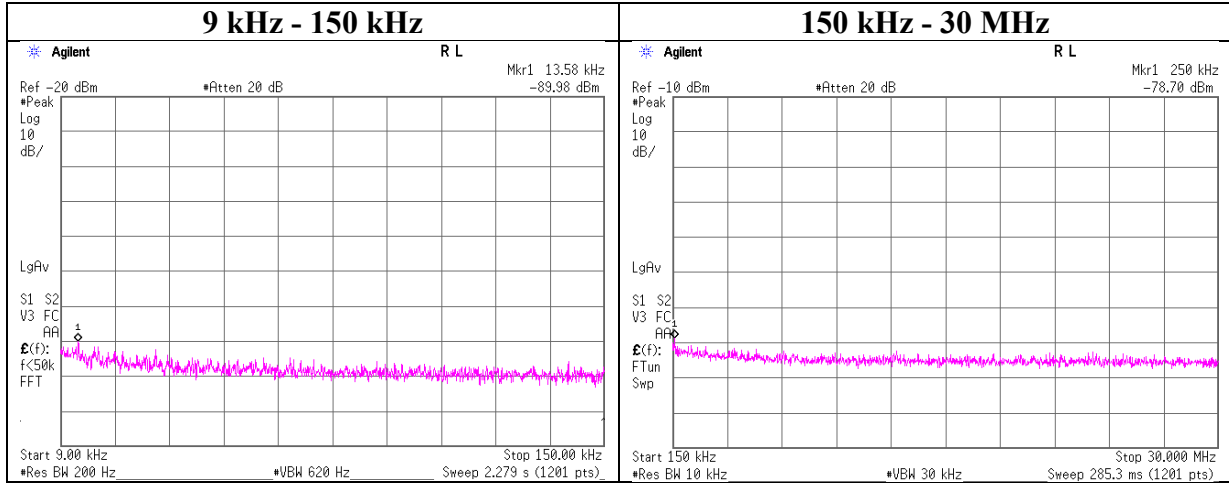
|                        |                     |                     |                      |
|------------------------|---------------------|---------------------|----------------------|
| Report No.             | 12979151S-A         |                     |                      |
| Test place             | Shonan EMC Lab.     |                     |                      |
| Semi Anechoic Chamber  | 3                   | 3                   | 3                    |
| Date                   | November 1, 2019    | October 30, 2019    | October 31, 2019     |
| Temperature / Humidity | 26 deg. C / 53 % RH | 25 deg. C / 51 % RH | 24 deg. C / 54 % RH  |
| Engineer               | Hiromasa Sato       | Hiromasa Sato       | Hiromasa Sato        |
|                        | (30 MHz – 1000 MHz) | (1 GHz – 2.8 GHz)   | (2.8 GHz – 26.5 GHz) |
| Mode                   | Tx 11g 2462 MHz     |                     |                      |



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

## Conducted Spurious Emission

|                        |                                    |
|------------------------|------------------------------------|
| Report No.             | 12979151S-A                        |
| Test place             | Shonan EMC Lab. No.6 Shielded Room |
| Date                   | October 28, 2019                   |
| Temperature / Humidity | 24 deg. C / 43 % RH                |
| Engineer               | Makoto Hosaka                      |
| Mode                   | Tx 11g 2462 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 |
|--------------------|------------------|-----------------------|----------------------------|--------------------------|----------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|----------------|--------|
| 13.58              | -89.98           | 0.02                  | 9.80                       | 2.15                     | 1                          | -78.0         | 300             | 6.0                      | -16.8                             | 44.9              | 61.7           | -      |
| 250.00             | -78.70           | 0.02                  | 9.80                       | 2.15                     | 1                          | -66.7         | 300             | 6.0                      | -5.5                              | 19.6              | 25.1           | -      |

$E [dBuV/m] = EIRP [dBm] - 20 \log (Distance [m]) + Ground\ bounce [dB] + 104.8 [dBuV/m]$

$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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## Power Density

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Report No.             | 12979151S-A         |                     |
| Test place             | Shonan EMC Lab.     |                     |
|                        | No.6 Shielded Room  | No.5 Shielded Room  |
| Date                   | October 28, 2019    | October 29, 2019    |
| Temperature / Humidity | 24 deg. C / 43 % RH | 26 deg. C / 53 % RH |
| Engineer               | Makoto Hosaka       |                     |
| Mode                   | Tx                  |                     |

### 11b

| Freq. | Reading | Cable Loss | Atten. Loss | Result | Limit | Margin |
|-------|---------|------------|-------------|--------|-------|--------|
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]  | [dBm] | [dB]   |
| 2412  | -18.45  | 1.82       | 9.89        | -6.74  | 8.00  | 14.74  |
| 2437  | -18.49  | 1.83       | 9.89        | -6.77  | 8.00  | 14.77  |
| 2462  | -19.83  | 1.84       | 9.89        | -8.10  | 8.00  | 16.10  |

### 11g

| Freq. | Reading | Cable Loss | Atten. Loss | Result | Limit | Margin |
|-------|---------|------------|-------------|--------|-------|--------|
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]  | [dBm] | [dB]   |
| 2412  | -25.30  | 1.82       | 9.89        | -13.59 | 8.00  | 21.59  |
| 2437  | -25.33  | 1.83       | 9.89        | -13.61 | 8.00  | 21.61  |
| 2462  | -25.18  | 1.84       | 9.89        | -13.45 | 8.00  | 21.45  |

### 11n-20

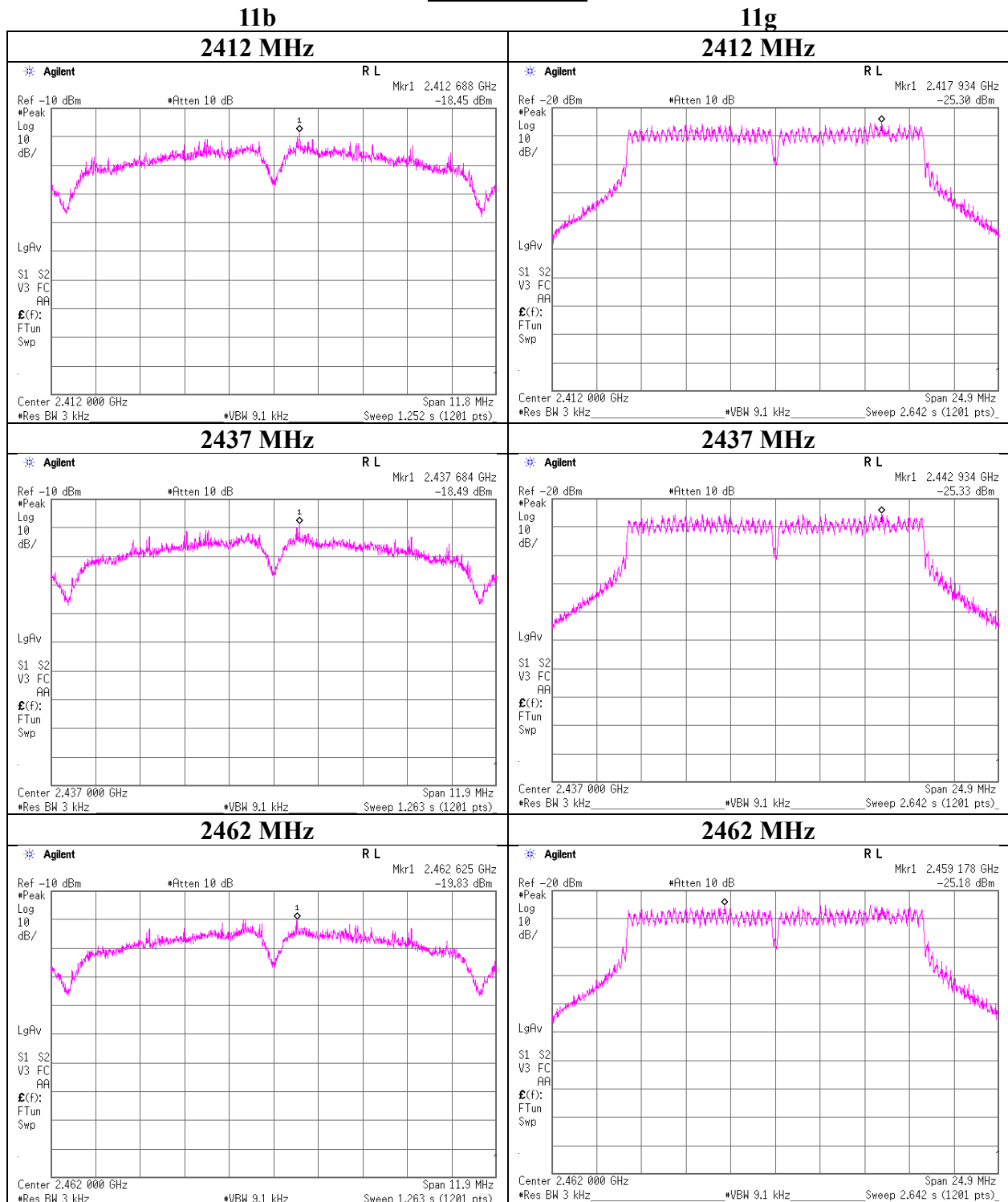
| Freq. | Reading | Cable Loss | Atten. Loss | Result | Limit | Margin |
|-------|---------|------------|-------------|--------|-------|--------|
| [MHz] | [dBm]   | [dB]       | [dB]        | [dBm]  | [dBm] | [dB]   |
| 2412  | -26.34  | 1.82       | 9.89        | -14.63 | 8.00  | 22.63  |
| 2437  | -25.56  | 1.83       | 9.89        | -13.84 | 8.00  | 21.84  |
| 2462  | -26.36  | 1.84       | 9.89        | -14.63 | 8.00  | 22.63  |

Sample Calculation:

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

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

## Power Density



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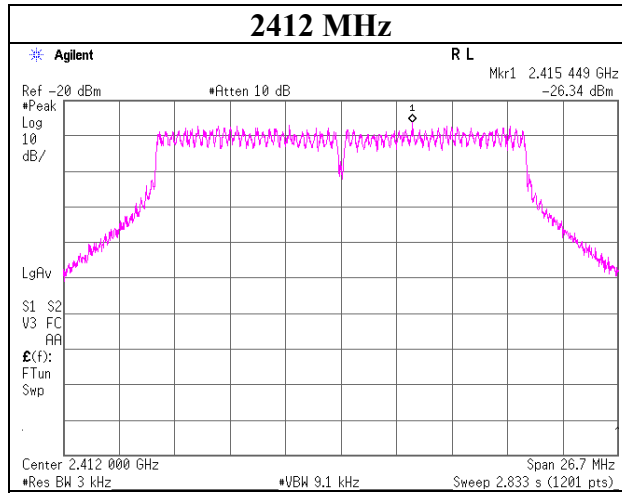
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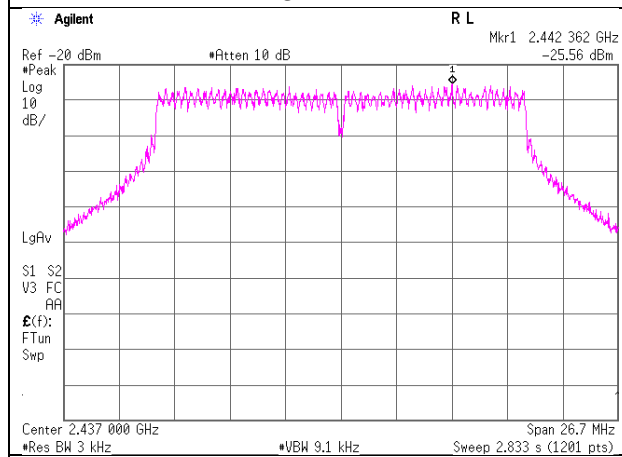
## Power Density

11n-20

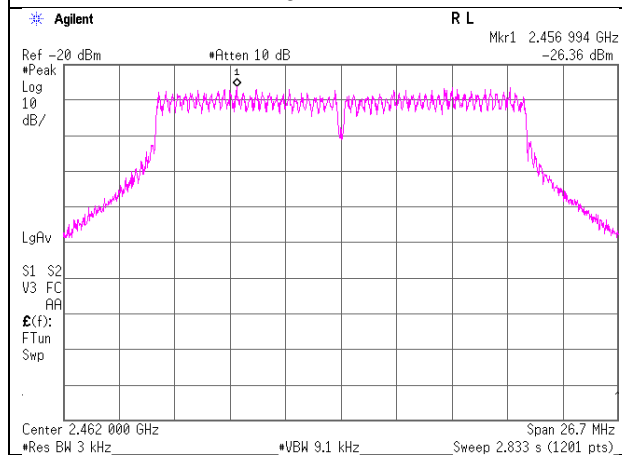
2412 MHz



2437 MHz



2462 MHz



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## **APPENDIX 2: Test instruments**

### **Test Instruments (1 / 2)**

| Local ID       | Test Name | LIMS ID | Description           | Manufacturer                | Model                  | Serial        | Last Calibration Date | Calibration Due Date | Calibration Interval (Month) |
|----------------|-----------|---------|-----------------------|-----------------------------|------------------------|---------------|-----------------------|----------------------|------------------------------|
| KSA-08         | AT        | 145089  | Spectrum Analyzer     | AGILENT                     | E4446A                 | MY46180525    | 2018/10/7             | 2019/10/31           | 12*1)                        |
| KTS-06         | AT        | 145110  | Digital Tester        | SANWA                       | PC500                  | 7019240       | 2019/4/2              | 2020/4/30            | 12                           |
| SAT10-16       | AT        | 160494  | Attenuator            | Weinschel Corp.             | 54A-10                 | 83406         | 2018/12/6             | 2019/12/30           | 12                           |
| SCC-G32        | AT        | 145183  | Coaxial Cable         | Junkosha                    | MWX241-02000KMSK MS    | OCT-09-13-005 | 2018/11/25            | 2019/11/30           | 12                           |
| SOS-09         | AT        | 146318  | Humidity Indicator    | A&D                         | AD-5681                | 4061484       | 2018/12/5             | 2019/12/31           | 12                           |
| SOS-18         | AT        | 175822  | Humidity Indicator    | CUSTOM                      | CTH-201                | -             | 2018/12/5             | 2019/12/31           | 12                           |
| SPM-13         | AT        | 169910  | Power Meter           | EMC Instruments Corporation | 8990B                  | MY51000448    | 2019/3/6              | 2020/3/31            | 12                           |
| SPSS-06        | AT        | 169911  | Power sensor          | EMC Instruments Corporation | N1923A                 | MY57270004    | 2019/3/6              | 2020/3/31            | 12                           |
| STS-05         | AT        | 146212  | Digital Hitester      | HIOKI                       | 3805-50                | 80997828      | 2019/10/1             | 2020/10/31           | 12                           |
| SSA-02         | AT,RE     | 145800  | Spectrum Analyzer     | AGILENT                     | E4448A                 | MY48250106    | 2019/4/4              | 2020/4/30            | 12                           |
| COTS-SEMI-5    | RE        | 170932  | EMI Software          | TSJ                         | TEPTO-DV3(RE,CE,ME,PE) | -             | -                     | -                    | -                            |
| KJM-02         | RE        | 146432  | Measure               | TAJIMA                      | GL19-55                | -             | -                     | -                    | -                            |
| SAEC-03(NSA)   | RE        | 145565  | Semi-Anechoic Chamber | TDK                         | SAEC-03(NSA)           | 3             | 2019/4/8              | 2020/4/30            | 12                           |
| SAEC-03(SVSWR) | RE        | 145566  | Semi-Anechoic Chamber | TDK                         | SAEC-03(SVSWR)         | 3             | 2019/5/3              | 2020/5/31            | 12                           |

## Test Instruments (2 / 2)

| Local ID                       | Test Name | LIMS ID | Description               | Manufacturer                                | Model                              | Serial                  | Last Calibration Date | Calibration Due Date | Calibration Interval (Month) |
|--------------------------------|-----------|---------|---------------------------|---------------------------------------------|------------------------------------|-------------------------|-----------------------|----------------------|------------------------------|
| SAF-03                         | RE        | 145126  | Pre Amplifier             | SONOMA                                      | 310N                               | 290213                  | 2019/2/5              | 2020/2/29            | 12                           |
| SAF-06                         | RE        | 145005  | Pre Amplifier             | Toyo Corporation                            | TPA0118-36                         | 1440491                 | 2019/2/8              | 2020/2/29            | 12                           |
| SAF-08                         | RE        | 145007  | Pre Amplifier             | Toyo Corporation                            | HAP18-26W                          | 19                      | 2019/3/5              | 2020/3/31            | 12                           |
| SAT10-05                       | RE        | 145136  | Attenuator(above 1GHz)    | AGILENT                                     | 8493C-010                          | 74864                   | 2018/11/25            | 2019/11/30           | 12                           |
| SAT6-13                        | RE        | 167094  | Attenuator                | JFW                                         | 50HF-006N                          | -                       | 2019/2/5              | 2020/2/29            | 12                           |
| SBA-03                         | RE        | 145023  | Biconical Antenna         | Schwarzbeck                                 | BBA9106                            | 91032666                | 2019/5/7              | 2020/5/31            | 12                           |
| SCC-C1/C2/C3/C4/C5/C10/SRSE-03 | RE        | 145171  | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141P | -/0901-271(RF Selector) | 2019/4/19             | 2020/4/30            | 12                           |
| SCC-G15                        | RE        | 145176  | Coaxial Cable             | Suhner                                      | SUCOFLEX 102                       | 32703/2                 | 2019/3/27             | 2020/3/31            | 12                           |
| SCC-G40                        | RE        | 166491  | Coaxial Cable             | Junkosha                                    | MWX221-01000NFSN MS/B              | 1612S005                | 2019/1/25             | 2020/1/31            | 12                           |
| SCC-G43                        | RE        | 156380  | Coaxial Cable             | HUBER+SUNER                                 | SUCOFLEX_104 E                     | SN MY 13406/4E          | 2019/7/3              | 2020/7/31            | 12                           |
| SCC-G57                        | RE        | 179540  | Coaxial Cable             | Huber+Suhner                                | SUCOFLEX 102                       | 802815/2                | 2019/5/16             | 2020/5/31            | 12                           |
| SCC-G58                        | RE        | 183047  | Coaxial Cable             | HUBER+SUNER                                 | SUCOFLEX 104                       | 800287/4A               | 2019/7/23             | 2020/7/31            | 12                           |
| SFL-18                         | RE        | 145305  | Highpass Filter           | MICRO-TRONICS                               | HPM50111                           | 119                     | 2019/4/16             | 2020/4/30            | 12                           |
| SHA-03                         | RE        | 145501  | Horn Antenna              | Schwarzbeck                                 | BBHA9120D                          | 9120D-739               | 2019/6/26             | 2020/6/30            | 12                           |
| SHA-04                         | RE        | 145512  | Horn Antenna              | ETS LINDGREN                                | 3160-09                            | 94868                   | 2019/6/26             | 2020/6/30            | 12                           |
| SLA-07                         | RE        | 145529  | Logperiodic Antenna       | Schwarzbeck                                 | VUSLP9111B                         | 196                     | 2019/5/7              | 2020/5/31            | 12                           |
| SOS-05                         | RE        | 146293  | Humidity Indicator        | A&D                                         | AD-5681                            | 4062518                 | 2019/10/8             | 2020/10/31           | 12                           |
| STR-08                         | RE        | 150463  | Test Receiver             | Rohde & Schwarz                             | ESW44                              | 101581                  | 2018/11/28            | 2019/11/30           | 12                           |
| STS-03                         | RE        | 146210  | Digital Hitester          | HIOKI                                       | 3805-50                            | 80997823                | 2019/10/1             | 2020/10/31           | 12                           |

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

\*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

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

**UL Japan, Inc.**

**Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401