



# RADIO TEST REPORT

**Test Report No. : 12455993H-A-R1**

**Applicant** : AIPHONE CO., LTD.  
**Type of Equipment** : Master monitor station  
**Model No.** : JO-1MDW  
**FCC ID** : 2ALNEJO1MDW  
**Test regulation** : FCC Part 15 Subpart C: 2018  
**Test Result** : Complied

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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. This report is a revised version of 12455993H-A. 12455993H-A is replaced with this report.

**Date of test:** September 12 to October 23, 2018

**Representative test engineer:** Takafumi Noguchi  
Takafumi Noguchi  
Engineer  
Consumer Technology Division

**Approved by:** Takayuki Shimada  
Takayuki Shimada  
Leader  
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation. \*As for the range of Accreditation in NVLAP, you may refer to the WEB address, [http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

- 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.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

13-EM-F0429



<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information.....</b>	<b>4</b>
<b>SECTION 2: Equipment under test (E.U.T.).....</b>	<b>4</b>
<b>SECTION 3: Test specification, procedures &amp; results.....</b>	<b>5</b>
<b>SECTION 4: Operation of E.U.T. during testing.....</b>	<b>8</b>
<b>SECTION 5: Conducted Emission.....</b>	<b>11</b>
<b>SECTION 6: Radiated Spurious Emission .....</b>	<b>12</b>
<b>SECTION 7: Antenna Terminal Conducted Tests.....</b>	<b>15</b>
<b>APPENDIX 1: Test data .....</b>	<b>16</b>
Conducted Emission .....	16
6 dB Bandwidth and 99 % Occupied Bandwidth.....	17
Maximum Peak Output Power .....	22
Average Output Power .....	25
Radiated Spurious Emission .....	29
Conducted Spurious Emission .....	43
Power Density .....	44
<b>APPENDIX 2: Test instruments .....</b>	<b>48</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>49</b>
Conducted Emission .....	49
Radiated Spurious Emission .....	50
Worst Case Position (Horizontal: Y-axis/ Vertical:X-axis).....	51

**SECTION 1: Customer information**

Company Name : AIPHONE CO., LTD.  
Address : 2-18, Jinnō-cho, Atsuta-ku, Nagoya 456-8666, JAPAN  
Telephone Number : +81-52-681-8721  
Facsimile Number : +81-52-681-5476  
Contact Person : Shusaku Ichikawa

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

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

Type of Equipment : Master monitor station  
Model No. : JO-1MDW  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 18 V(Master monitor station)  
AC 120 V / 60 Hz (AC Adapter)  
Receipt Date of Sample : August 9, 2018  
Country of Mass-production : THAILAND  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

**2.2 Product Description**

Model: JO-1MDW (referred to as the EUT in this report) is a Master monitor station.

**General Specification**

Clock frequency(ies) in the system : 26 MHz, 25 MHz, 33.33 MHz, 12.288 MHz

**Radio Specification**

**Specification of Wireless LAN (IEEE802.11b/g/n-20)**

Type of radio	IEEE802.11b	IEEE802.11g/n (20 M band)
Equipment Type	Transceiver	
Frequency of operation	2412 MHz - 2472 MHz	2412 MHz - 2472 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)
Antenna type	Dipole antenna	
Antenna Gain	2.1 dBi	
Operating temperature range	-20 deg. C - +70 deg. C	

\* This test report applies to Wireless LAN (2.4 GHz band).

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C

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

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

#### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods	FCC: Section 15.207	QP 17.0 dB, 0.15000 MHz, N AV 23.2 dB, 0.59189 MHz, N	Complied	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05	FCC: Section 15.247(a)(2)	See data.	Complied	Conducted
	IC: -	IC: RSS-247 5.2(a)			
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05	FCC: Section 15.247(b)(3)			
	IC: RSS-Gen 6.12	IC: RSS-247 5.4(d)			
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05	FCC: Section 15.247(e)	Complied	Conducted	
	IC: -	IC: RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05	FCC: Section15.247(d)	0.1 dB 2483.500 MHz, AV, Hori.	Complied#	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	IC: RSS-Gen 6.13	IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

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

1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05 8.5 and 8.6.

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)**

This EUT provides stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

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

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

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.7	IC: -	N/A	Complied	Conducted

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

### 3.4 Uncertainty

#### EMI

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

#### Antenna Terminal test

Test Item	Uncertainty (+/-)
6 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.3 dB
Burst Rate	0.10 %
Power Density	2.7 dB
Conducted Spurious Emission	2.7 dB

#### Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

#### Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.9 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 dB

### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.  
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124  
NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

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

Refer to APPENDIX.

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

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

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

<b>Mode</b>	<b>Remarks*</b>
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 6 , PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*EUT has the power settings by the software as follows (power setting value might be different from product specification value); Power settings: 11b: 13 dBm(1-11 ch), 11 dBm(12,13 ch) 11g: 11 dBm(1-12 ch), 2 dBm(13 ch) 11n: 11 dBm(1-12 ch), 3 dBm(13 ch) Software: Realtime Tuning Tool Version 2.0.0.5.5 *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.	

\*The details of Operating mode(s)

<b>Test Item</b>	<b>Operating Mode</b>	<b>Tested Antenna Port</b>	<b>Tested frequency</b>
Conducted Emission Radiated Spurious Emission below 1 GHz Conducted Spurious Emission	11n-20 Tx *1)	B	2467 MHz
Radiated Spurious Emission above 1 GHz	11b Tx 11n-20 Tx *2)	B	2412 MHz 2442 MHz 2462 MHz (11b only) 2467 MHz (11n-20 only) 2472 MHz
6dB Bandwidth 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	B	2412 MHz 2442 MHz 2472 MHz
Maximum Peak Output Power Average Output Power	11b Tx 11g Tx 11n-20 Tx	A, B	2412 MHz 2442 MHz 2462 MHz 2467 MHz 2472 MHz
Power Density	11b Tx 11g Tx 11n-20 Tx	B	2412 MHz 2442 MHz 2462 MHz 2467 MHz 2472 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) The test was performed on 11n-20 Tx mode according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009, as the 11n-20 Tx mode had higher power than 11g mode at antenna terminal test.			

**UL Japan, Inc.**

**Ise EMC Lab.**

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

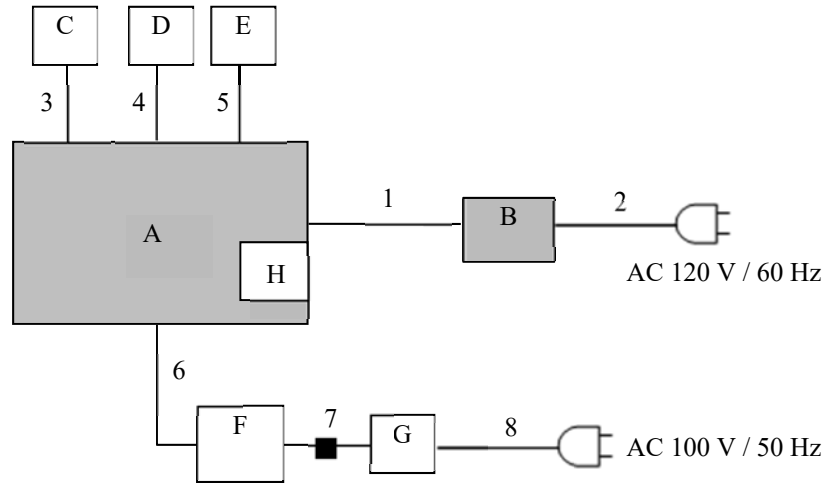
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



## 4.2 Configuration and peripherals

### Antenna Terminal Conducted test



■ : Standard Ferrite Core

\* 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	Remark
A	Master monitor station	JO-1MDW	J047-S2-027	AIPHONE CO., LTD.	EUT
B	AC Adapter	PS-1820	J047-S2-035	AIPHONE CO., LTD.	EUT
C	Swich	-	-	AIPHONE CO., LTD.	-
D	Antenna Swich	-	-	AIPHONE CO., LTD.	-
E	Jig	-	-	AIPHONE CO., LTD.	-
F	Laptop PC	CF-N8	9LKSA04645	Panasonic	-
G	AC Adapter	CF-6372B	6372BM610214975E	-	-
H	Micro SD	XCI	TWLN002936296	BLECOM	-

### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.80	Unshielded	Unshielded	-
2	AC Cable	1.80	Unshielded	Unshielded	-
3	Signal Cable	0.15	Unshielded	Unshielded	-
4	Signal Cable	0.15	Unshielded	Unshielded	-
5	Signal Cable	0.15	Unshielded	Unshielded	-
6	USB Cable	1.00	Shielded	Shielded	-
7	DC Cable	1.00	Shielded	Shielded	-
8	AC Cable	0.90	Shielded	Shielded	-

**UL Japan, Inc.**

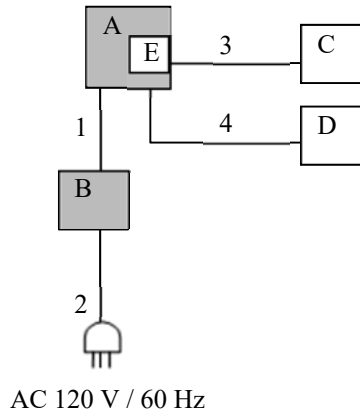
**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Conducted Emission test and Radiated Emission test**



\* 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	Remark
A	Master monitor station	JO-1MDW	J047-017	AIPHONE CO., LTD.	EUT
B	AC Adapter	PS-1820	J047-035	AIPHONE CO., LTD.	EUT
C	Speaker	IER-2	HG0917Y	AIPHONE CO., LTD.	-
D	Camera	JO-DVF	TM8617Z	AIPHONE CO., LTD.	-
E	Micro SD	XCI	TWLN002936296	BLECOM	-

**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	AC Cable	1.8	Unshielded	Unshielded	-
3	AC Cable	2.0	Unshielded	Unshielded	-
4	DC Cable	2.0	Unshielded	Unshielded	-

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

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

#### 1) For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

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

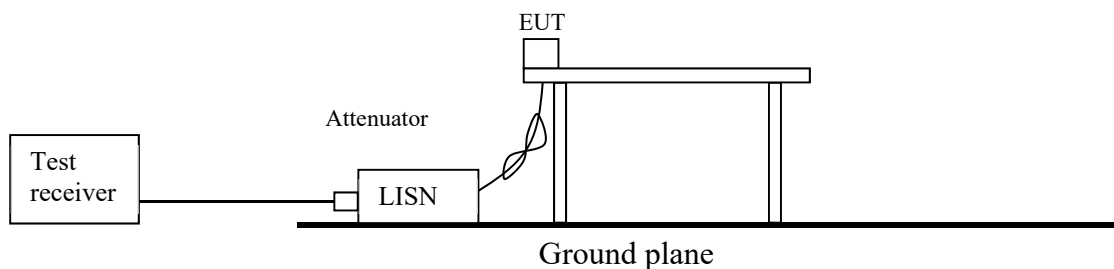
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

**Detector** : QP and CISPR AV  
**Measurement range** : 0.15 MHz - 30 MHz  
**Test data** : APPENDIX  
**Test result** : Pass

**Figure 1: Test Setup**



## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05".

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

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

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

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

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

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

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

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

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

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

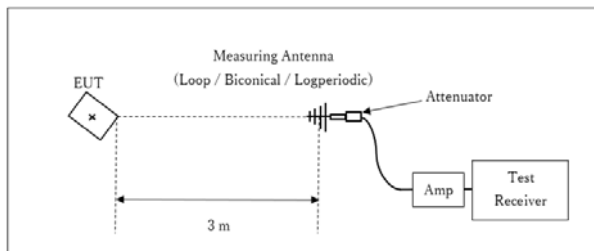
**20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).**

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.  Integration Method: <u>11.13.3.4</u> RBW: 100 kHz VBW: 300 kHz Span: 2 MHz Band Power: 1 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz

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

**Figure 2: Test Setup**

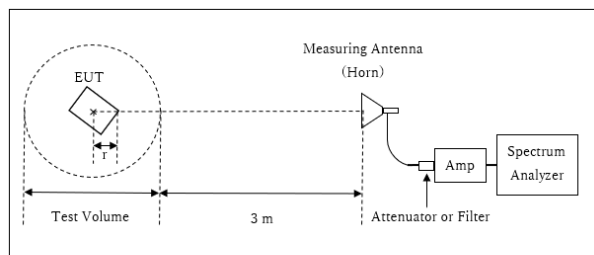
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



r : Radius of an outer periphery of EUT  
 × : Center of turn table

Distance Factor:  $20 \times \log(3.9 \text{ m} / 3.0 \text{ m}) = 2.28 \text{ dB}$

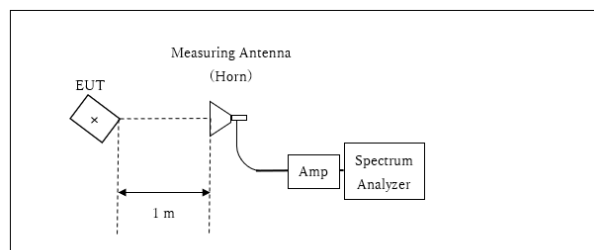
\* Test Distance:  $(3 + \text{Test Volume} / 2) - r = 3.9 \text{ m}$

Test Volume : 2.0 m

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

r = 0.1 m

10 GHz - 26.5 GHz



× : Center of turn table

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

\*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

**Measurement range** : 30 MHz - 26.5 GHz  
**Test data** : APPENDIX  
**Test result** : Pass

## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 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	9.1 kHz	27 kHz				

\*1) Peak hold was applied as Worst-case measurement.  
\*2) Reference data  
\*3) ) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".  
\*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.  
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.  
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

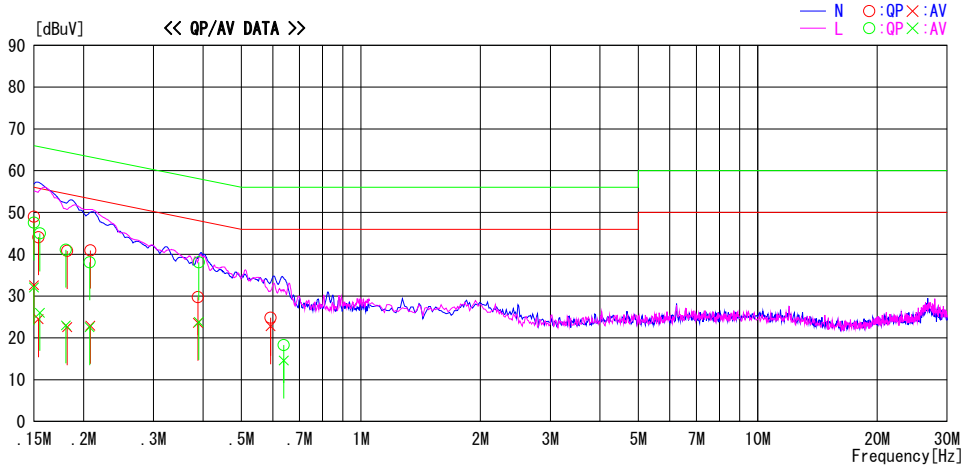
**Test data : APPENDIX**  
**Test result : Pass**

**APPENDIX 1: Test data**

**Conducted Emission**

Report No. 12455993H  
Test place Ise EMC Lab. No.4 Semi Anechoic Chamber  
Date October 23, 2018  
Temperature / Humidity 25 deg. C / 43 % RH  
Engineer Ryota Yamanaka  
Mode Tx 11n-20

LIMIT : FCC15.207 QP  
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	35.6	19.2	13.4	49.0	32.6	66.0	56.0	17.0	23.4	N	
0.15402	30.7	11.1	13.4	44.1	24.5	65.8	55.8	21.7	31.3	N	
0.18201	27.4	9.2	13.4	40.8	22.6	64.4	54.4	23.6	31.8	N	
0.20800	27.5	9.5	13.4	40.9	22.9	63.3	53.3	22.4	30.4	N	
0.38842	16.3	10.2	13.4	29.7	23.6	58.1	48.1	28.4	24.5	N	
0.59189	11.3	9.3	13.5	24.8	22.8	56.0	46.0	31.2	23.2	N	
0.15000	34.2	18.7	13.4	47.6	32.1	66.0	56.0	18.4	23.9	L	
0.15521	31.6	12.6	13.4	45.0	26.0	65.7	55.7	20.7	29.7	L	
0.18061	27.7	9.6	13.4	41.1	23.0	64.5	54.5	23.4	31.5	L	
0.20721	24.7	9.2	13.4	38.1	22.6	63.3	53.3	25.2	30.7	L	
0.39022	24.7	10.4	13.4	38.1	23.8	58.1	48.1	20.0	24.3	L	
0.63888	4.8	1.1	13.5	18.3	14.6	56.0	46.0	37.7	31.4	L	

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



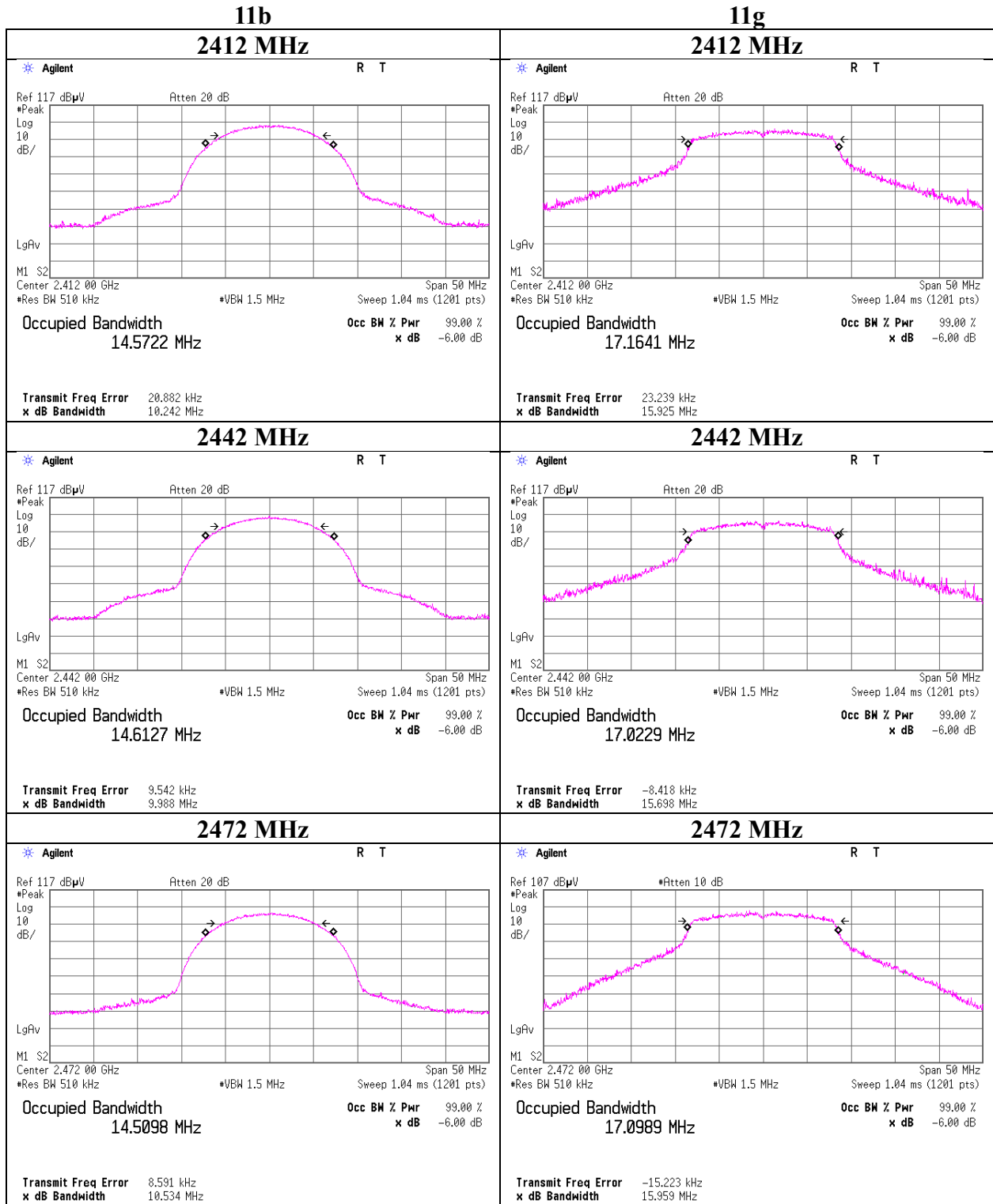
### **6 dB Bandwidth and 99 % Occupied Bandwidth**

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx

#### Antenna port B

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	14572.2	10.117	> 0.5000
	2442	14612.7	10.342	> 0.5000
	2472	14509.8	10.207	> 0.5000
11g	2412	17164.1	15.428	> 0.5000
	2442	17022.9	15.119	> 0.5000
	2472	17098.9	15.712	> 0.5000
11n-20	2412	18246.9	16.686	> 0.5000
	2442	18023.7	15.754	> 0.5000
	2472	18172.3	16.886	> 0.5000

**99 % Occupied Bandwidth**



**UL Japan, Inc.**

**Ise EMC Lab.**

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

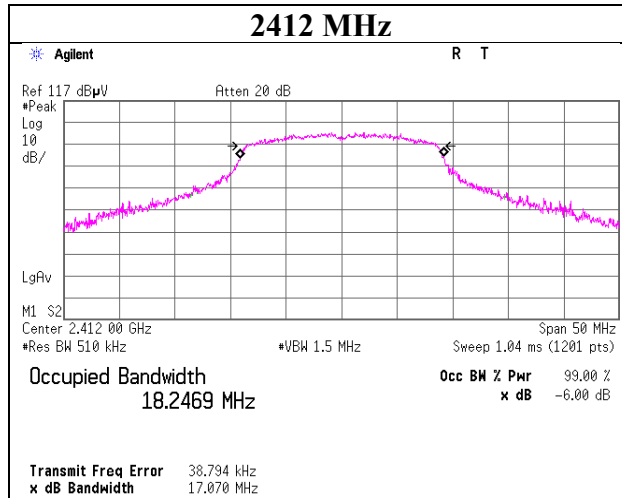
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

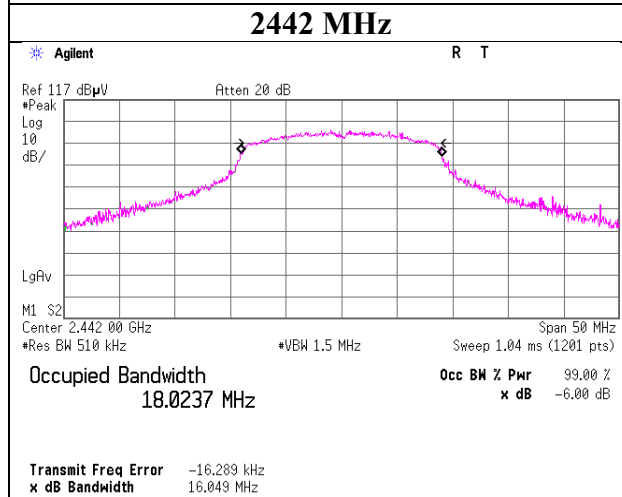
## 99 % Occupied Bandwidth

**11n-20**

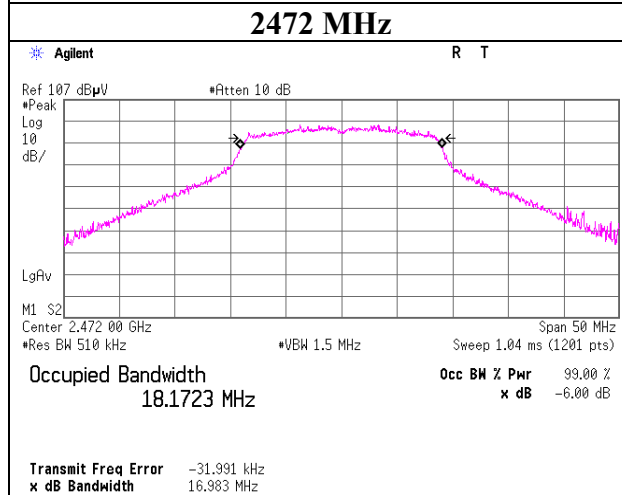
**2412 MHz**



**2442 MHz**



**2472 MHz**



**UL Japan, Inc.**

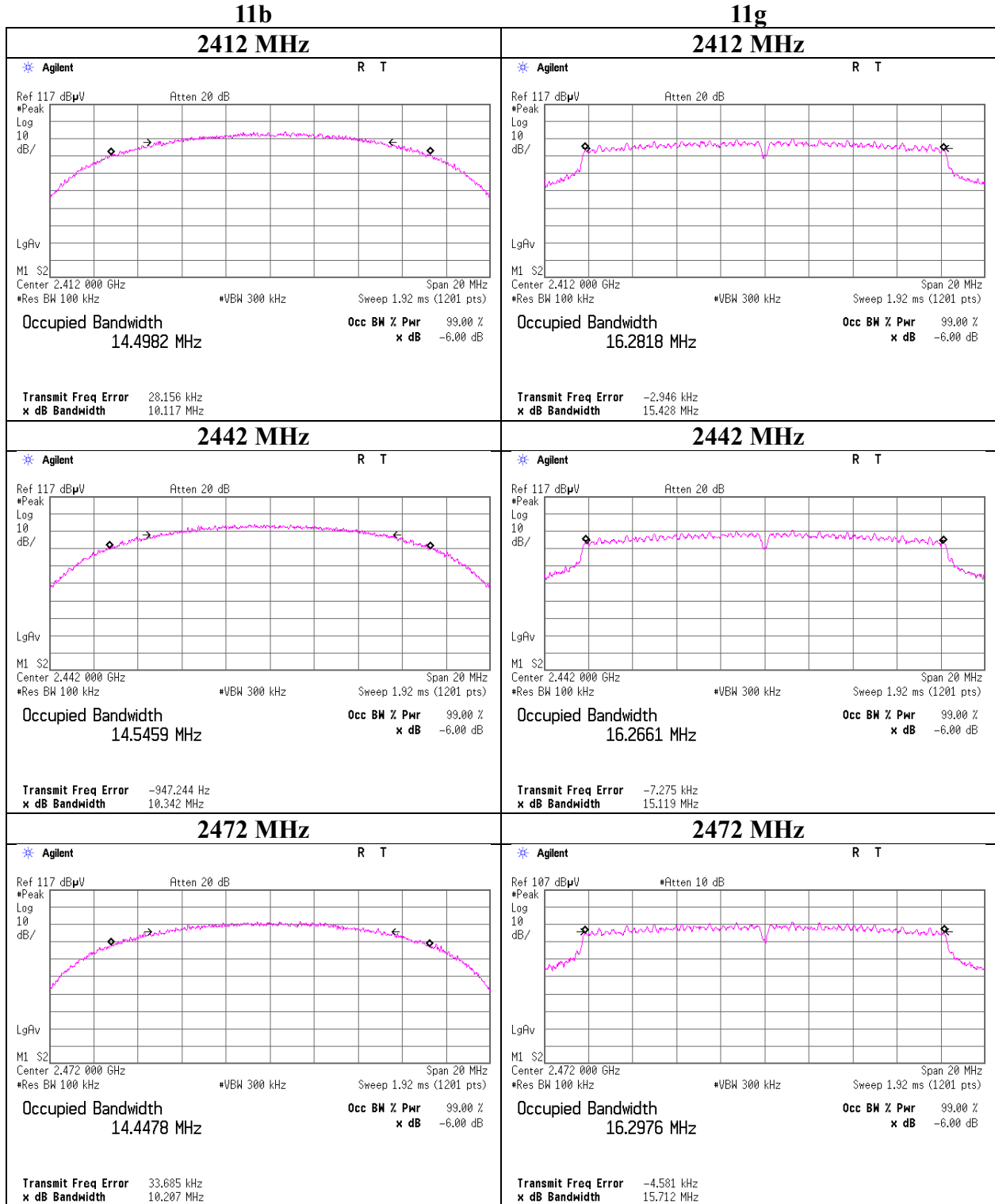
**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### 6 dB Bandwidth



**UL Japan, Inc.**

**Ise EMC Lab.**

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

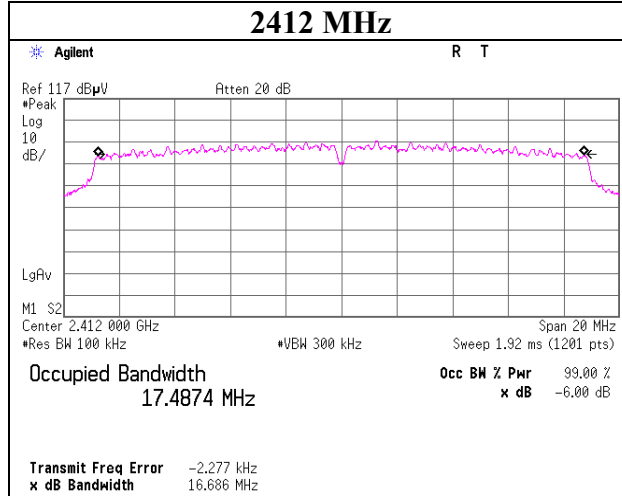
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

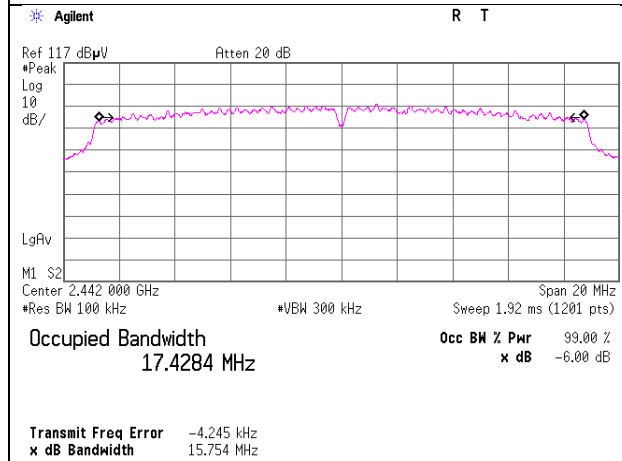
## 6 dB Bandwidth

**11n-20**

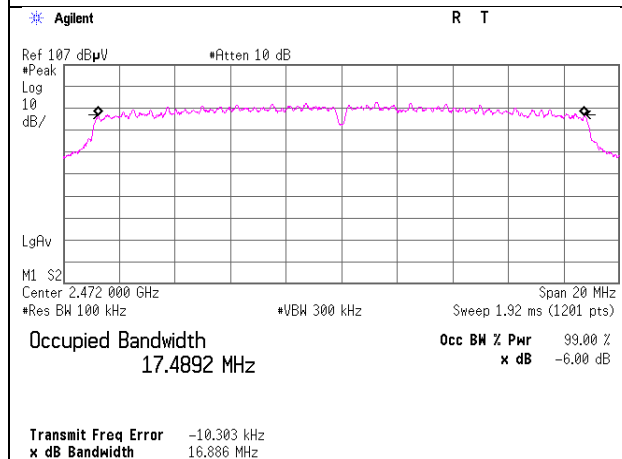
**2412 MHz**



**2442 MHz**



**2472 MHz**



**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Maximum Peak Output Power

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx 11b

Antenna port A				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	4.27	2.48	10.03	16.78	47.64	30.00	1000	13.22	2.10	18.88	77.27	36.02	4000	17.14
2442	4.68	2.48	10.03	17.19	52.36	30.00	1000	12.81	2.10	19.29	84.92	36.02	4000	16.73
2462	4.85	2.48	10.03	17.36	54.45	30.00	1000	12.64	2.10	19.46	88.31	36.02	4000	16.56
2467	2.78	2.48	10.03	15.29	33.81	30.00	1000	14.71	2.10	17.39	54.83	36.02	4000	18.63
2472	2.87	2.48	10.03	15.38	34.51	30.00	1000	14.62	2.10	17.48	55.98	36.02	4000	18.54

Antenna port B				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	4.70	2.24	10.06	17.00	50.12	30.00	1000	13.00	2.10	19.10	81.28	36.02	4000	16.92
2442	5.11	2.24	10.06	17.41	55.08	30.00	1000	12.59	2.10	19.51	89.33	36.02	4000	16.51
2462	5.24	2.24	10.06	17.54	56.75	30.00	1000	12.46	2.10	19.64	92.04	36.02	4000	16.38
2467	3.14	2.24	10.06	15.44	34.99	30.00	1000	14.56	2.10	17.54	56.75	36.02	4000	18.48
2472	3.22	2.24	10.06	15.52	35.65	30.00	1000	14.48	2.10	17.62	57.81	36.02	4000	18.40

**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.

**2442 MHz**

Rate [Mbps]	Port A Reading [dBm]	Port B Reading [dBm]	Preamble
1	4.63	-	Long
2	4.62	-	Long
5.5	4.64	-	Long
11	4.68	5.11	Long*
11	4.67	5.10	Short

\*: Worst Rate

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

## Maximum Peak Output Power

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx 11g

Antenna port A				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	8.09	2.48	10.03	20.60	114.82	30.00	1000	9.40	2.10	22.70	186.21	36.02	4000	13.32
2442	8.42	2.48	10.03	20.93	123.88	30.00	1000	9.07	2.10	23.03	200.91	36.02	4000	12.99
2462	8.60	2.48	10.03	21.11	129.12	30.00	1000	8.89	2.10	23.21	209.41	36.02	4000	12.81
2467	8.58	2.48	10.03	21.09	128.53	30.00	1000	8.91	2.10	23.19	208.45	36.02	4000	12.83
2472	2.42	2.48	10.03	14.93	31.12	30.00	1000	15.07	2.10	17.03	50.47	36.02	4000	18.99

Antenna port B				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	8.41	2.24	10.06	20.71	117.76	30.00	1000	9.29	2.10	22.81	190.99	36.02	4000	13.21
2442	8.79	2.24	10.06	21.09	128.53	30.00	1000	8.91	2.10	23.19	208.45	36.02	4000	12.83
2462	8.92	2.24	10.06	21.22	132.43	30.00	1000	8.78	2.10	23.32	214.78	36.02	4000	12.70
2467	8.96	2.24	10.06	21.26	133.66	30.00	1000	8.74	2.10	23.36	216.77	36.02	4000	12.66
2472	2.69	2.24	10.06	14.99	31.55	30.00	1000	15.01	2.10	17.09	51.17	36.02	4000	18.93

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.

Antenna A, 2442 MHz

Rate [Mbps]	Port A Reading [dBm]	Port B Reading [dBm]	Remark
6	8.14	-	
9	8.18	-	
12	8.23	-	
18	8.25	-	
24	8.32	-	
36	8.22	-	
48	8.28	-	
54	8.42	8.79	*

\*: Worst Rate

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

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Maximum Peak Output Power

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx 11n-20

Antenna port A				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	8.10	2.48	10.03	20.61	115.08	30.00	1000	9.39	2.10	22.71	186.64	36.02	4000	13.31
2442	8.42	2.48	10.03	20.93	123.88	30.00	1000	9.07	2.10	23.03	200.91	36.02	4000	12.99
2462	8.61	2.48	10.03	21.12	129.42	30.00	1000	8.88	2.10	23.22	209.89	36.02	4000	12.80
2467	8.62	2.48	10.03	21.13	129.72	30.00	1000	8.87	2.10	23.23	210.38	36.02	4000	12.79
2472	2.90	2.48	10.03	15.41	34.75	30.00	1000	14.59	2.10	17.51	56.36	36.02	4000	18.51

Antenna port B				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	8.46	2.24	10.06	20.76	119.12	30.00	1000	9.24	2.10	22.86	193.20	36.02	4000	13.16
2442	8.82	2.24	10.06	21.12	129.42	30.00	1000	8.88	2.10	23.22	209.89	36.02	4000	12.80
2462	8.93	2.24	10.06	21.23	132.74	30.00	1000	8.77	2.10	23.33	215.28	36.02	4000	12.69
2467	8.97	2.24	10.06	21.27	133.97	30.00	1000	8.73	2.10	23.37	217.27	36.02	4000	12.65
2472	3.23	2.24	10.06	15.53	35.73	30.00	1000	14.47	2.10	17.63	57.94	36.02	4000	18.39

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.

Antenna A, 2442 MHz, Mix Mode (Long)

MCS Number	Port A Reading [dBm]	Port B Reading [dBm]	Remark
0	8.19	-	
1	8.22	-	
2	8.28	-	
3	8.30	-	
4	8.31	-	
5	8.37	-	
6	-	8.81	Greenfield (Long)
6	-	8.81	Sounding (Long)
6	-	8.81	Mix Mode (Short)
6	8.42	8.82	Mix Mode (Long)*
7	8.37	-	

\* Worst Condition

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

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



**Average Output Power**  
**(Reference data for RF Exposure / SAR testing)**

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx

**11b 1 Mbps Antenna port A**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	2.13	2.48	10.03	14.64	29.11	0.08	14.72	29.65
2442	2.41	2.48	10.03	14.92	31.05	0.08	15.00	31.62
2462	2.64	2.48	10.03	15.15	32.73	0.08	15.23	33.34
2467	0.25	2.48	10.03	12.76	18.88	0.08	12.84	19.23
2472	0.53	2.48	10.03	13.04	20.14	0.08	13.12	20.51

**11g 6 Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-0.36	2.48	10.03	12.15	16.41	0.45	12.60	18.20
2442	-0.24	2.48	10.03	12.27	16.87	0.45	12.72	18.71
2462	-0.03	2.48	10.03	12.48	17.70	0.45	12.93	19.63
2467	-0.10	2.48	10.03	12.41	17.42	0.45	12.86	19.32
2472	-8.74	2.48	10.03	3.77	2.38	0.45	4.22	2.64

**11n-20 MCS 0**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-0.38	2.48	10.03	12.13	16.33	0.48	12.61	18.24
2442	-0.21	2.48	10.03	12.30	16.98	0.48	12.78	18.97
2462	-0.05	2.48	10.03	12.46	17.62	0.48	12.94	19.68
2467	-0.08	2.48	10.03	12.43	17.50	0.48	12.91	19.54
2472	-7.63	2.48	10.03	4.88	3.08	0.48	5.36	3.44

Sample Calculation:

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

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

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

**The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.**

**Average Output Power**  
**(Reference data for RF Exposure / SAR testing)**

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx

**11b 1 Mbps Antenna port B**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	2.52	2.24	10.06	14.82	30.34	0.08	14.90	30.90
2442	2.91	2.24	10.06	15.21	33.19	0.08	15.29	33.81
2462	3.00	2.24	10.06	15.30	33.88	0.08	15.38	34.51
2467	0.69	2.24	10.06	12.99	19.91	0.08	13.07	20.28
2472	0.84	2.24	10.06	13.14	20.61	0.08	13.22	20.99

**11g 6 Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.04	2.24	10.06	12.34	17.14	0.45	12.79	19.01
2442	0.24	2.24	10.06	12.54	17.95	0.45	12.99	19.91
2462	0.34	2.24	10.06	12.64	18.37	0.45	13.09	20.37
2467	0.29	2.24	10.06	12.59	18.16	0.45	13.04	20.14
2472	-8.49	2.24	10.06	3.81	2.40	0.45	4.26	2.67

**11n-20 MCS 0**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.02	2.24	10.06	12.32	17.06	0.48	12.80	19.05
2442	0.30	2.24	10.06	12.60	18.20	0.48	13.08	20.32
2462	0.33	2.24	10.06	12.63	18.32	0.48	13.11	20.46
2467	0.29	2.24	10.06	12.59	18.16	0.48	13.07	20.28
2472	-7.32	2.24	10.06	4.98	3.15	0.48	5.46	3.52

Sample Calculation:

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

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

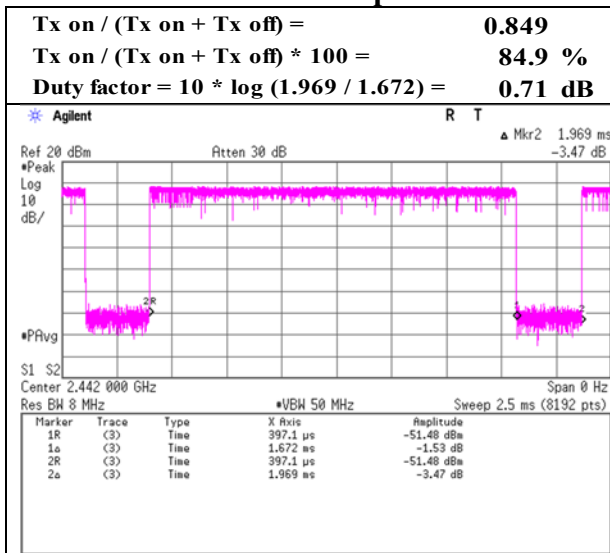
\*The equipment and cables were not used for factor 0 dB of the data sheets.

**The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.**

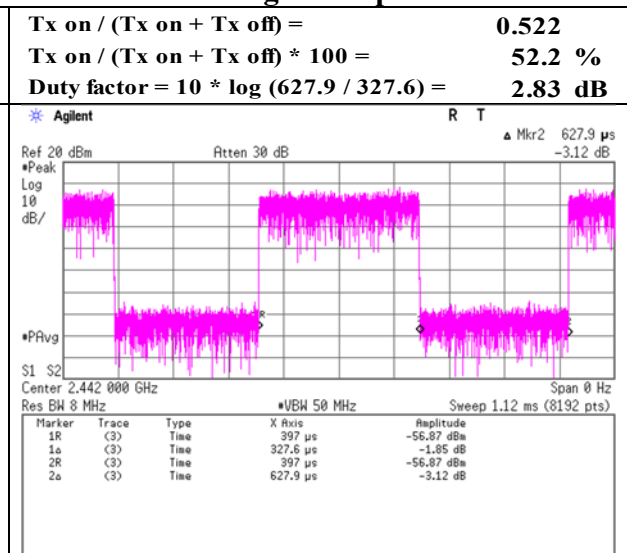
**Burst rate confirmation**

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx

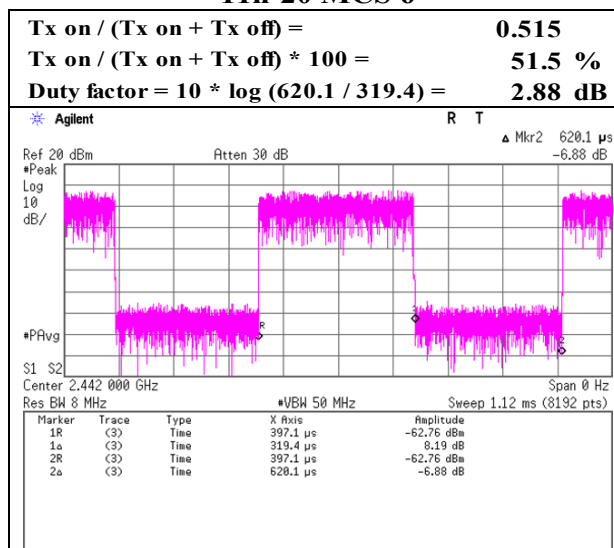
**11b 11 Mbps**



**11g 54 Mbps**



**11n-20 MCS 6**

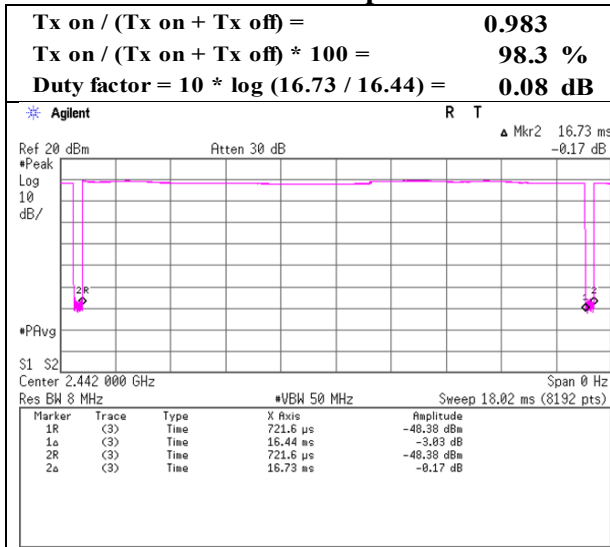


\* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

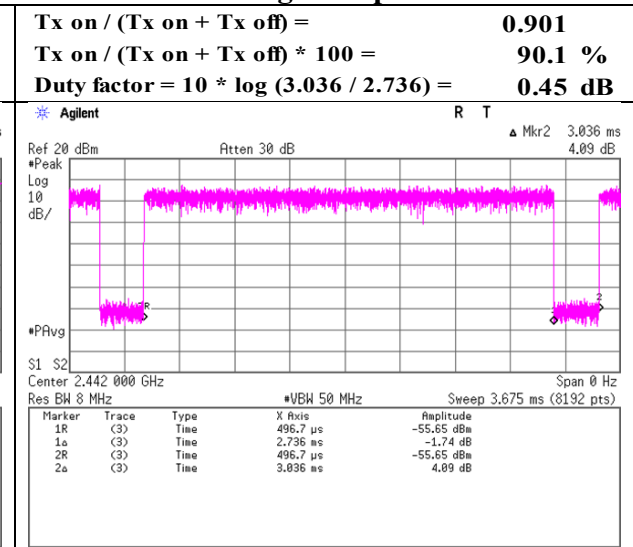
**Burst rate confirmation**

Report No. 12455993H  
 Test place Ise EMC Lab. No.6 Measurement Room  
 Date September 12, 2018  
 Temperature / Humidity 23 deg. C / 69 % RH  
 Engineer Takafumi Noguchi  
 Mode Tx

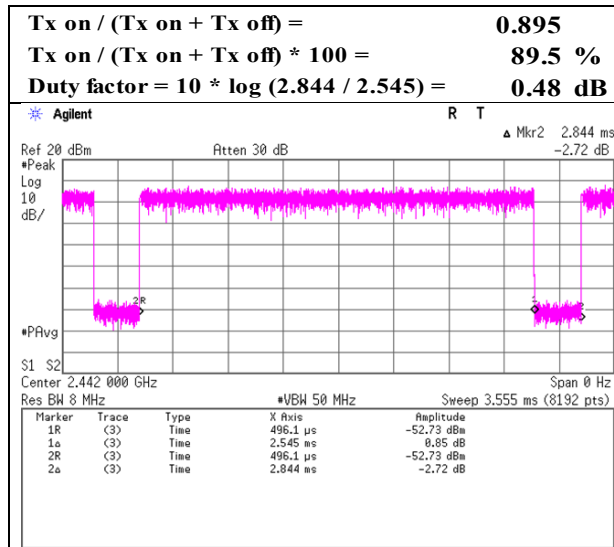
**11b 1 Mbps**



**11g 6 Mbps**



**11n-20 MCS 0**



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

## Radiated Spurious Emission

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.4  
Date October 22, 2018 October 23, 2018  
Temperature / Humidity 23 deg. C / 48 % RH 24 deg. C / 47 % RH  
Engineer Tomohsia Nakagawa Takafumi Noguchi  
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz)  
Mode Tx 11b 2412 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	49.9	27.6	5.7	32.1	-	51.1	73.9	22.8	
Hori	4824.000	PK	46.5	31.4	7.9	31.3	-	54.5	73.9	19.4	
Hori	7236.000	PK	42.0	36.2	8.9	32.4	-	54.7	73.9	19.2	Floor noise
Hori	9648.000	PK	41.7	38.0	10.2	32.6	-	57.3	73.9	16.6	Floor noise
Hori	2390.000	AV	41.1	27.6	5.7	32.1	0.7	43.0	53.9	10.9	*1)
Hori	4824.000	AV	35.4	31.4	7.9	31.3	0.7	44.1	53.9	9.8	
Hori	7236.000	AV	33.9	36.2	8.9	32.4	-	46.6	53.9	7.3	Floor noise
Hori	9648.000	AV	31.3	38.0	10.2	32.6	-	46.9	53.9	7.0	Floor noise
Vert	2390.000	PK	50.1	27.6	5.7	32.1	-	51.3	73.9	22.6	
Vert	4824.000	PK	49.5	31.4	7.9	31.3	-	57.5	73.9	16.4	
Vert	7236.000	PK	42.5	36.2	8.9	32.4	-	55.2	73.9	18.7	Floor noise
Vert	9648.000	PK	41.5	38.0	10.2	32.6	-	57.1	73.9	16.8	Floor noise
Vert	2390.000	AV	37.8	27.6	5.7	32.1	0.7	39.7	53.9	14.2	*1)
Vert	4824.000	AV	36.5	31.4	7.9	31.3	0.7	45.2	53.9	8.7	
Vert	7236.000	AV	32.5	36.2	8.9	32.4	-	45.2	53.9	8.7	Floor noise
Vert	9648.000	AV	31.2	38.0	10.2	32.6	-	46.8	53.9	7.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz  $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.1	27.5	5.7	32.1	101.2	-	-	Carrier
Hori	2400.000	PK	55.4	27.6	5.7	32.1	56.6	81.2	24.6	
Vert	2412.000	PK	99.1	27.5	5.7	32.1	100.2	-	-	Carrier
Vert	2400.000	PK	55.0	27.6	5.7	32.1	56.2	80.2	24.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

**UL Japan, Inc.**

**Ise EMC Lab.**

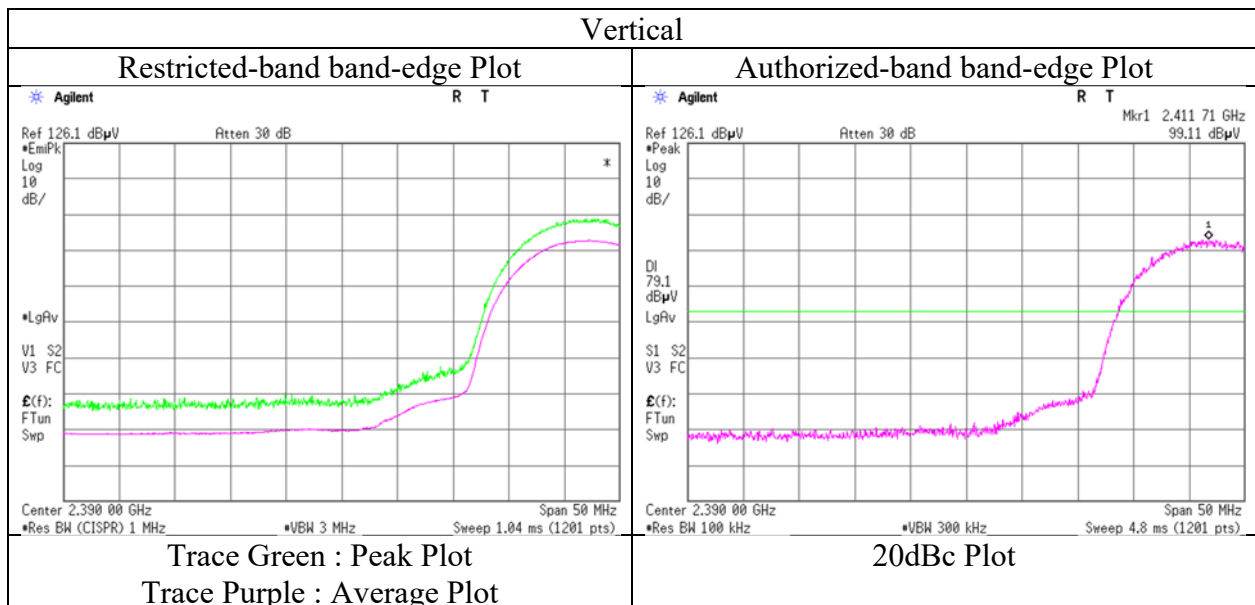
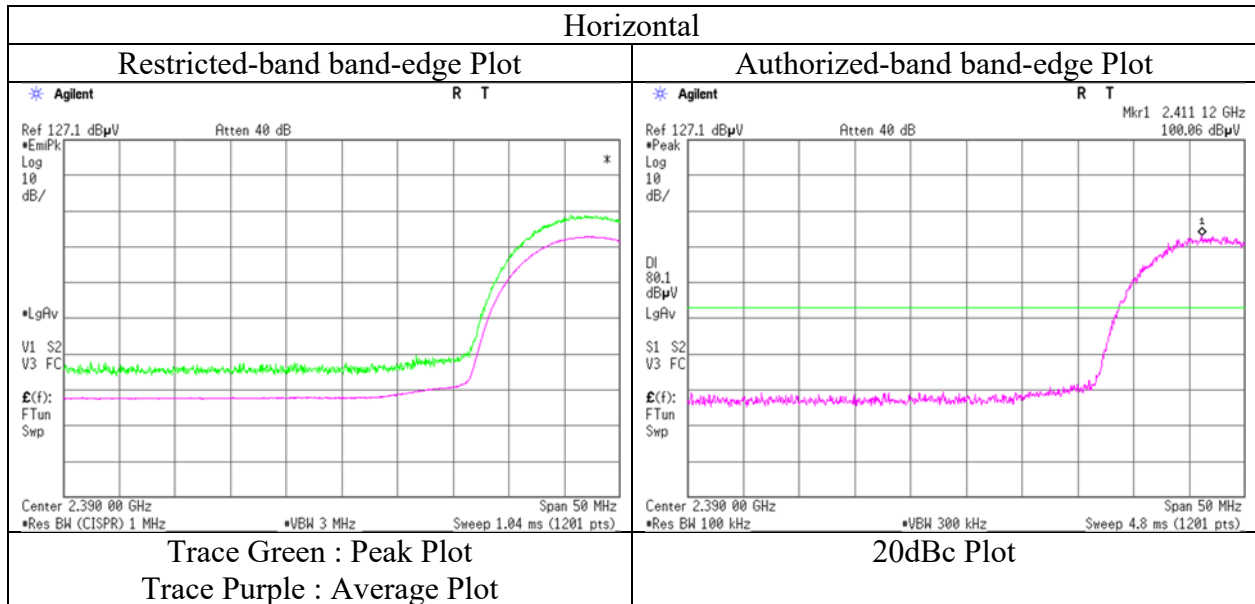
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 22, 2018  
Temperature / Humidity 23 deg. C / 48 % RH  
Engineer Tomohisa Nakagawa  
(1 GHz - 10 GHz)  
Mode Tx 11b 2412 MHz



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

## Radiated Spurious Emission

Report No.	12455993H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 22, 2018	October 23, 2018
Temperature / Humidity	25 deg. C / 44 % RH	24 deg. C / 47 % RH
Engineer	Ryota Yamanaka	Takafumi Noguchi
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11b 2442 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4884.000	PK	46.3	31.5	7.9	31.2	-	54.5	73.9	19.4	
Hori	7326.000	PK	42.7	36.3	8.9	32.4	-	55.5	73.9	18.4	Floor noise
Hori	9768.000	PK	41.6	38.3	10.2	32.7	-	57.4	73.9	16.5	Floor noise
Hori	4884.000	AV	36.8	31.5	7.9	31.2	0.7	45.7	53.9	8.2	
Hori	7326.000	AV	35.0	36.3	8.9	32.4	-	47.8	53.9	6.1	Floor noise
Hori	9768.000	AV	32.0	38.3	10.2	32.7	-	47.8	53.9	6.1	Floor noise
Vert	4884.000	PK	47.6	31.5	7.9	31.2	-	55.8	73.9	18.1	
Vert	7326.000	PK	41.9	36.3	8.9	32.4	-	54.7	73.9	19.2	Floor noise
Vert	9768.000	PK	41.4	38.3	10.2	32.7	-	57.2	73.9	16.7	Floor noise
Vert	4884.000	AV	38.7	31.5	7.9	31.2	0.7	47.6	53.9	6.3	
Vert	7326.000	AV	34.3	36.3	8.9	32.4	-	47.1	53.9	6.8	Floor noise
Vert	9768.000	AV	32.0	38.3	10.2	32.7	-	47.8	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor:      1 GHz - 10 GHz     $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
                              10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

## Radiated Spurious Emission

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 22, 2018  
Temperature / Humidity 25 deg. C / 44 % RH  
Engineer Ryota Yamanaka  
(1 GHz - 10 GHz)  
Mode Tx 11b 2462 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	44.0	27.5	5.7	32.0	-	45.2	73.9	28.7	
Hori	2483.500	AV	33.0	27.5	5.7	32.0	0.7	34.9	53.9	19.0	*1)
Vert	2483.500	PK	45.3	27.5	5.7	32.0	-	46.5	73.9	27.4	
Vert	2483.500	AV	33.5	27.5	5.7	32.0	0.7	35.4	53.9	18.5	*1)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz  $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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



## Radiated Spurious Emission

Report No.	12455993H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 22, 2018	October 23, 2018
Temperature / Humidity	25 deg. C / 44 % RH	24 deg. C / 47 % RH
Engineer	Ryota Yamanaka	Takafumi Noguchi
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11b 2472 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	52.2	27.5	5.7	32.0	-	53.4	73.9	20.5	
Hori	4944.000	PK	44.1	31.6	7.9	31.2	-	52.4	73.9	21.5	
Hori	7416.000	PK	43.4	36.3	8.9	32.5	-	56.1	73.9	17.8	Floor noise
Hori	9888.000	PK	43.2	38.4	10.3	32.8	-	59.1	73.9	14.8	Floor noise
Hori	2483.500	AV	40.8	27.5	5.7	32.0	0.7	42.7	53.9	11.2	*1)
Hori	4944.000	AV	33.5	31.6	7.9	31.2	0.7	42.5	53.9	11.4	
Hori	7416.000	AV	33.8	36.3	8.9	32.5	-	46.5	53.9	7.4	Floor noise
Hori	9888.000	AV	32.0	38.4	10.3	32.8	-	47.9	53.9	6.0	Floor noise
Vert	2483.500	PK	50.2	27.5	5.7	32.0	-	51.4	73.9	22.5	
Vert	4944.000	PK	41.0	31.6	7.9	31.2	-	49.3	73.9	24.6	
Vert	7416.000	PK	43.4	36.3	8.9	32.5	-	56.1	73.9	17.8	Floor noise
Vert	9888.000	PK	43.4	38.4	10.3	32.8	-	59.3	73.9	14.6	Floor noise
Vert	2483.500	AV	38.9	27.5	5.7	32.0	0.7	40.8	53.9	13.1	*1)
Vert	4944.000	AV	31.0	31.6	7.9	31.2	0.7	40.0	53.9	13.9	
Vert	7416.000	AV	33.7	36.3	8.9	32.5	-	46.4	53.9	7.5	Floor noise
Vert	9888.000	AV	31.8	38.4	10.3	32.8	-	47.7	53.9	6.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

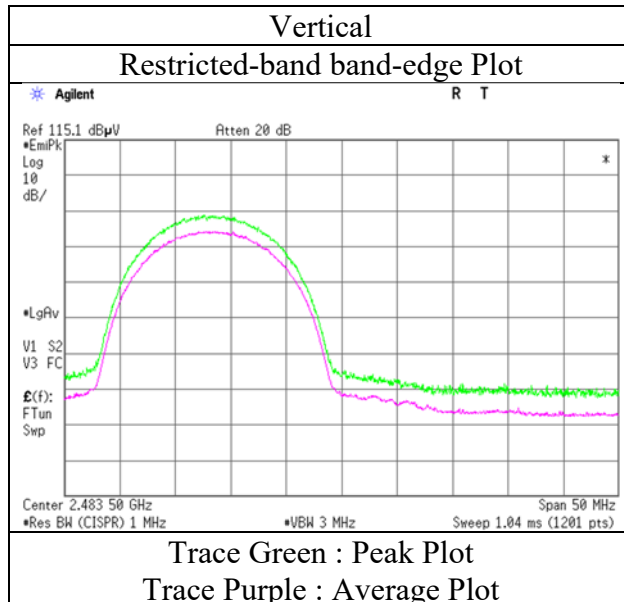
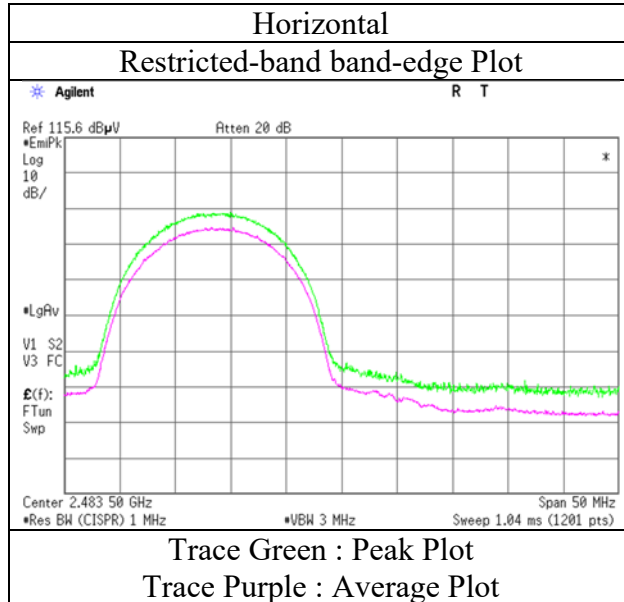
Distance factor: 1 GHz - 10 GHz  $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

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

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 22, 2018  
Temperature / Humidity 25 deg. C / 44 % RH  
Engineer Ryota Yamanaka  
(1 GHz - 10 GHz)  
Mode Tx 11b 2472 MHz



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

## Radiated Spurious Emission

Report No.	12455993H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 22, 2018	October 23, 2018
Temperature / Humidity	25 deg. C / 44 % RH	24 deg. C / 47 % RH
Engineer	Ryota Yamanaka	Takafumi Noguchi
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	58.4	27.6	5.7	32.1	-	59.6	73.9	14.3	
Hori	4824.000	PK	41.7	31.4	7.9	31.3	-	49.7	73.9	24.2	Floor noise
Hori	7236.000	PK	42.5	36.2	8.9	32.4	-	55.2	73.9	18.7	Floor noise
Hori	9648.000	PK	41.5	38.0	10.2	32.6	-	57.1	73.9	16.8	Floor noise
Hori	2390.000	AV	34.9	27.6	5.7	32.1	2.9	39.0	53.9	14.9	*1)
Hori	4824.000	AV	31.0	31.4	7.9	31.3	-	39.0	53.9	14.9	Floor noise
Hori	7236.000	AV	32.3	36.2	8.9	32.4	-	45.0	53.9	8.9	Floor noise
Hori	9648.000	AV	32.0	38.0	10.2	32.6	-	47.6	53.9	6.3	Floor noise
Vert	2390.000	PK	59.8	27.6	5.7	32.1	-	61.0	73.9	12.9	
Vert	4824.000	PK	41.5	31.4	7.9	31.3	-	49.5	73.9	24.4	Floor noise
Vert	7236.000	PK	42.5	36.2	8.9	32.4	-	55.2	73.9	18.7	Floor noise
Vert	9648.000	PK	41.4	38.0	10.2	32.6	-	57.0	73.9	16.9	Floor noise
Vert	2390.000	AV	35.5	27.6	5.7	32.1	2.9	39.6	53.9	14.3	*1)
Vert	4824.000	AV	30.6	31.4	7.9	31.3	-	38.6	53.9	15.3	Floor noise
Vert	7236.000	AV	32.8	36.2	8.9	32.4	-	45.5	53.9	8.4	Floor noise
Vert	9648.000	AV	31.9	38.0	10.2	32.6	-	47.5	53.9	6.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz  $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

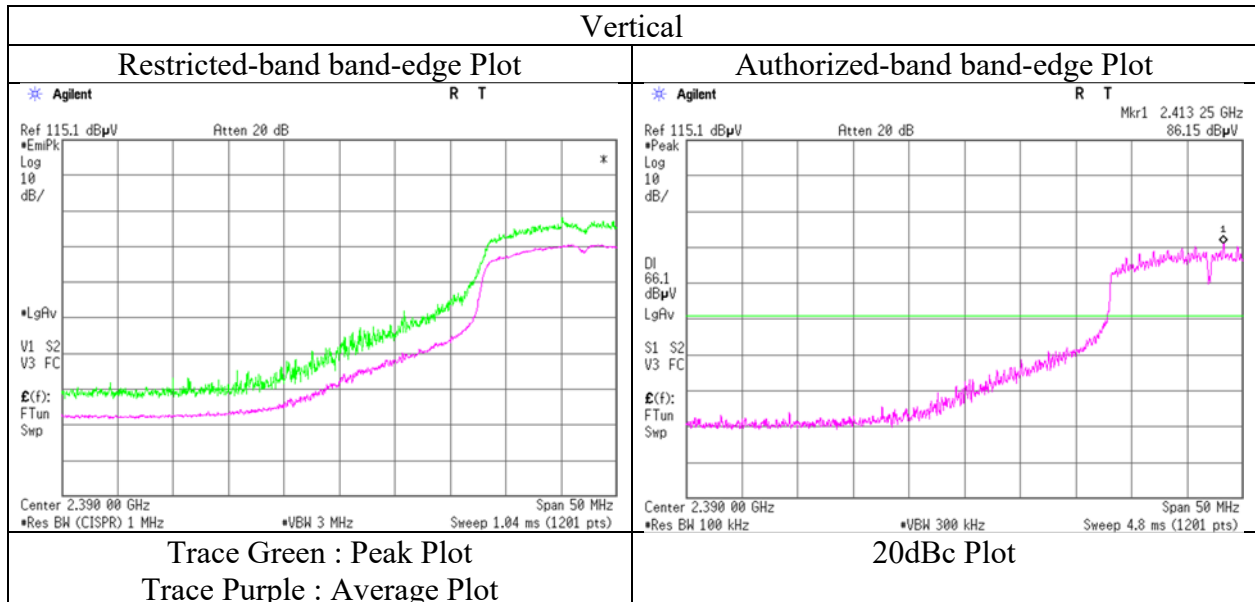
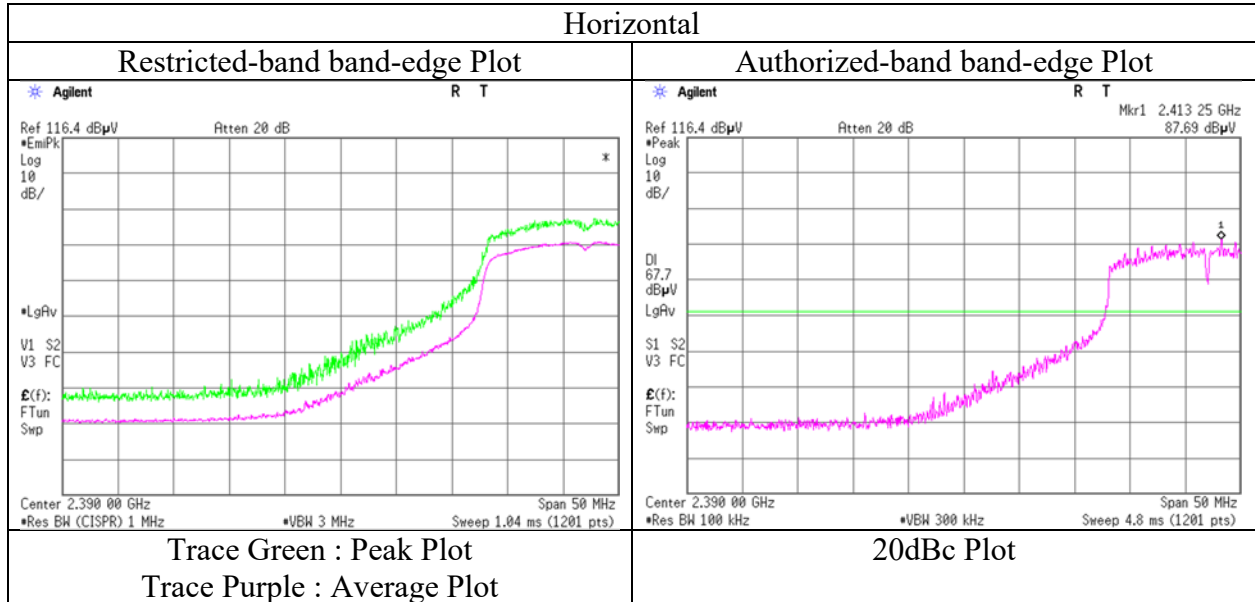
### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	87.7	27.5	5.7	32.1	88.8	-	-	Carrier
Hori	2400.000	PK	58.5	27.6	5.7	32.1	59.7	68.8	9.1	
Vert	2412.000	PK	86.2	27.5	5.7	32.1	87.3	-	-	Carrier
Vert	2400.000	PK	57.3	27.6	5.7	32.1	58.5	67.3	8.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 22, 2018  
Temperature / Humidity 25 deg. C / 44 % RH  
Engineer Ryota Yamanaka  
(1 GHz - 10 GHz)  
Mode Tx 11n-20 2412 MHz



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

## Radiated Spurious Emission

Report No.	12455993H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	October 22, 2018	October 23, 2018
Temperature / Humidity	25 deg. C / 44 % RH	24 deg. C / 47 % RH
Engineer	Ryota Yamanaka	Takafumi Noguchi
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 2442 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4884.000	PK	40.3	31.5	7.9	31.2	-	48.5	73.9	25.4	Floor noise
Hori	7326.000	PK	41.8	36.3	8.9	32.4	-	54.6	73.9	19.3	Floor noise
Hori	9768.000	PK	41.0	38.3	10.2	32.7	-	56.8	73.9	17.1	Floor noise
Hori	4884.000	AV	33.1	31.5	7.9	31.2	-	41.3	53.9	12.6	Floor noise
Hori	7326.000	AV	34.6	36.3	8.9	32.4	-	47.4	53.9	6.5	Floor noise
Hori	9768.000	AV	31.8	38.3	10.2	32.7	-	47.6	53.9	6.3	Floor noise
Vert	4884.000	PK	41.0	31.5	7.9	31.2	-	49.2	73.9	24.7	Floor noise
Vert	7326.000	PK	42.0	36.3	8.9	32.4	-	54.8	73.9	19.1	Floor noise
Vert	9768.000	PK	41.2	38.3	10.2	32.7	-	57.0	73.9	16.9	Floor noise
Vert	4884.000	AV	33.0	31.5	7.9	31.2	-	41.2	53.9	12.7	Floor noise
Vert	7326.000	AV	34.6	36.3	8.9	32.4	-	47.4	53.9	6.5	Floor noise
Vert	9768.000	AV	32.0	38.3	10.2	32.7	-	47.8	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor:      1 GHz - 10 GHz       $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
                                 10 GHz - 26.5 GHz       $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

## Radiated Spurious Emission

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4 No.4  
Date October 22, 2018 October 23, 2018  
Temperature / Humidity 25 deg. C / 44 % RH 24 deg. C / 47 % RH  
Engineer Ryota Yamanaka Takafumi Noguchi  
(1 GHz - 10 GHz) (Below 1 GHz)  
Mode Tx 11n-20 2467 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	72.938	QP	23.8	6.2	7.9	32.1	-	5.8	40.0	34.2	
Hori	86.142	QP	25.8	7.8	8.0	32.1	-	9.5	40.0	30.5	
Hori	108.379	QP	25.5	11.5	8.3	32.1	-	13.2	43.5	30.3	
Hori	442.369	QP	22.7	16.6	10.9	32.0	-	18.2	46.0	27.8	
Hori	503.808	QP	23.2	18.1	11.3	32.1	-	20.5	46.0	25.5	
Hori	724.992	QP	23.0	20.1	12.4	32.1	-	23.4	46.0	22.6	
Hori	2483.500	PK	66.0	27.5	5.7	32.0	-	67.2	73.9	6.7	
Hori	2483.500	AV	39.6	27.5	5.7	32.0	2.9	43.7	53.9	10.2	*1)
Vert	72.938	QP	37.9	6.2	7.9	32.1	-	19.9	40.0	20.1	
Vert	86.142	QP	35.9	7.8	8.0	32.1	-	19.6	40.0	20.4	
Vert	108.379	QP	33.0	11.5	8.3	32.1	-	20.7	43.5	22.8	
Vert	442.369	QP	25.8	16.6	10.9	32.0	-	21.3	46.0	24.7	
Vert	503.808	QP	24.7	18.1	11.3	32.1	-	22.0	46.0	24.0	
Vert	724.992	QP	21.7	20.1	12.4	32.1	-	22.1	46.0	23.9	
Vert	2483.500	PK	63.1	27.5	5.7	32.0	-	64.3	73.9	9.6	
Vert	2483.500	AV	37.9	27.5	5.7	32.0	2.9	42.0	53.9	11.9	*1)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz  $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

## Radiated Spurious Emission

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 23, 2018  
Temperature / Humidity 24 deg. C / 47 % RH  
Engineer Takafumi Noguchi  
(1 GHz – 26.5 GHz)  
Mode Tx 11n-20 2472 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	68.7	27.5	5.7	32.0	-	69.9	73.9	4.0	
Hori	4944.000	PK	39.8	31.6	6.8	31.2	-	47.0	73.9	26.9	Floor noise
Hori	7416.000	PK	40.8	36.3	7.7	32.5	-	52.3	73.9	21.6	Floor noise
Hori	9888.000	PK	41.3	38.4	8.9	32.8	-	55.8	73.9	18.1	Floor noise
Hori	2483.500	AV	49.7	27.5	5.7	32.0	2.9	53.8	53.9	0.1	*1),*2)
Hori	4944.000	AV	31.2	31.6	6.8	31.2	-	38.4	53.9	15.5	Floor noise
Hori	7416.000	AV	32.6	36.3	7.7	32.5	-	44.1	53.9	9.8	Floor noise
Hori	9888.000	AV	33.0	38.4	8.9	32.8	-	47.5	53.9	6.4	Floor noise
Vert	2483.500	PK	68.4	27.5	5.7	32.0	-	69.6	73.9	4.3	
Vert	4944.000	PK	39.8	31.6	6.8	31.2	-	47.0	73.9	26.9	Floor noise
Vert	7416.000	PK	40.9	36.3	7.7	32.5	-	52.4	73.9	21.5	Floor noise
Vert	9888.000	PK	41.2	38.4	8.9	32.8	-	55.7	73.9	18.2	Floor noise
Vert	2483.500	AV	49.6	27.5	5.7	32.0	2.9	53.7	53.9	0.2	*1),*2)
Vert	4944.000	AV	31.3	31.6	6.8	31.2	-	38.5	53.9	15.4	Floor noise
Vert	7416.000	AV	32.7	36.3	7.7	32.5	-	44.2	53.9	9.7	Floor noise
Vert	9888.000	AV	33.0	38.4	8.9	32.8	-	47.5	53.9	6.4	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

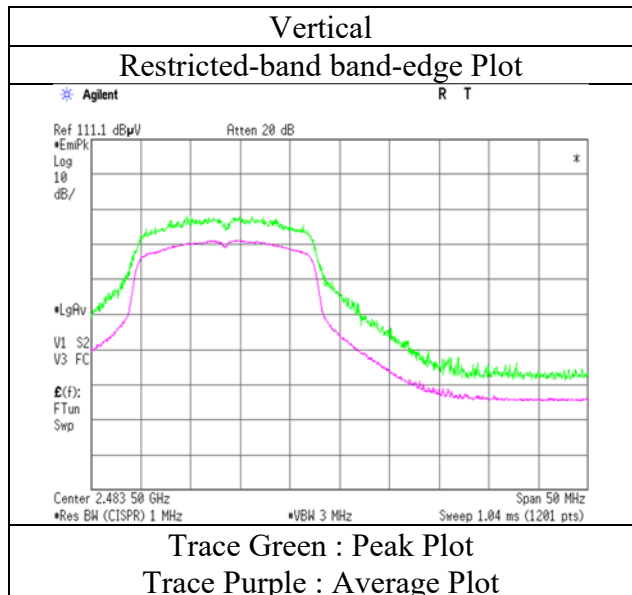
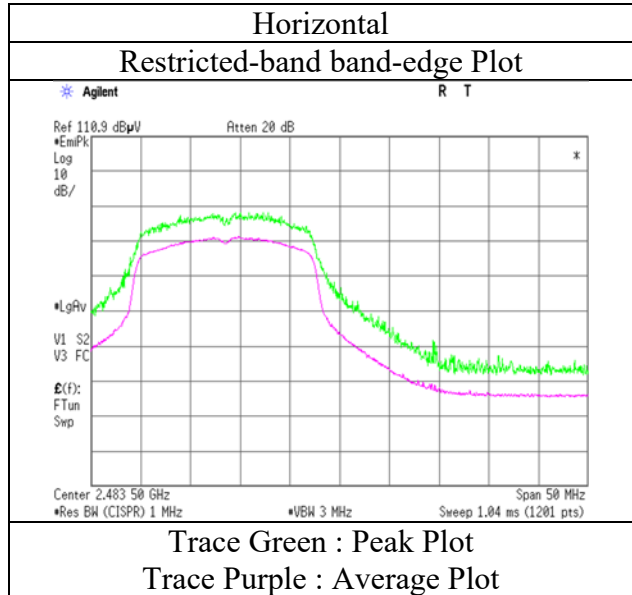
Distance factor: 1 GHz - 10 GHz  $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$   
10 GHz - 26.5 GHz  $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

\*2) Integration method

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

Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 23, 2018  
Temperature / Humidity 24 deg. C / 47 % RH  
Engineer Takafumi Noguchi  
(1 GHz – 26.5 GHz)  
Mode Tx 11n-20 2472 MHz

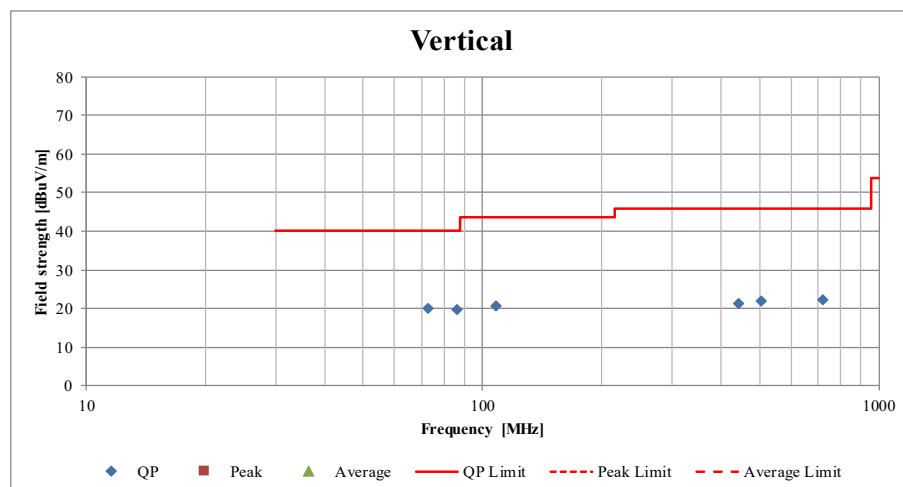
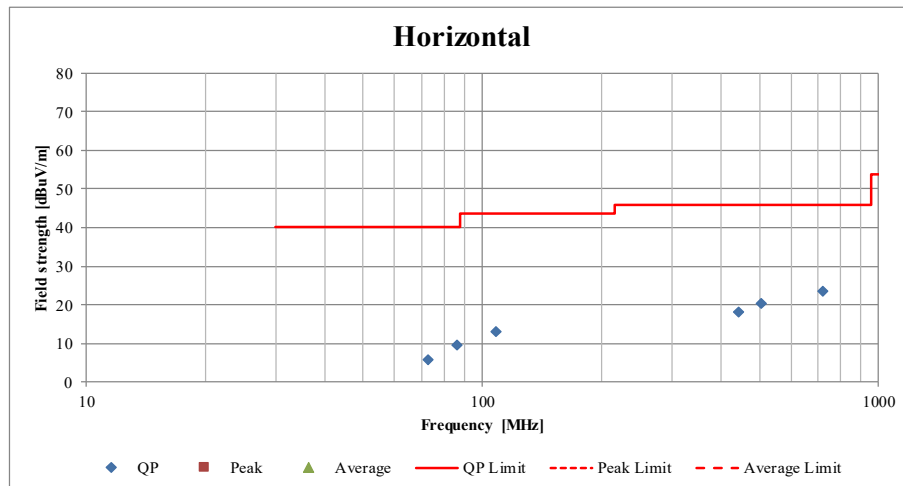


\* Final result of restricted band edge was shown in tabular data.



**Radiated Spurious Emission**  
**(Plot data, Worst case (Below 1 GHz))**

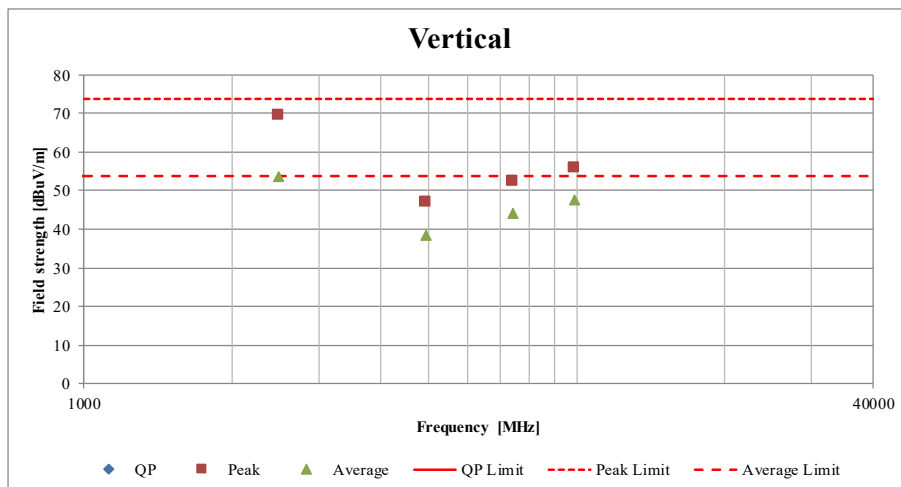
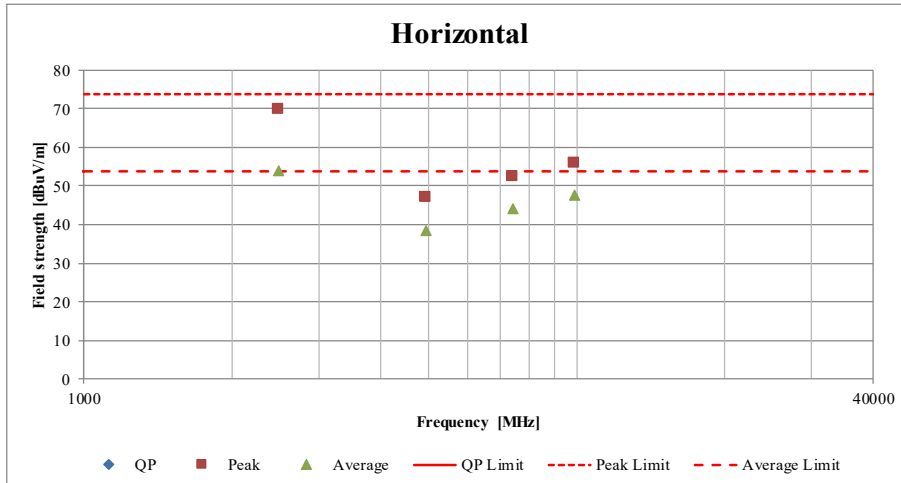
Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 23, 2018  
Temperature / Humidity 24 deg. C / 47 % RH  
Engineer Takafumi Noguchi  
(Below 1 GHz)  
Mode Tx 11n-20 2467 MHz



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

**Radiated Spurious Emission**  
**(Plot data, Worst case (Above 1 GHz))**

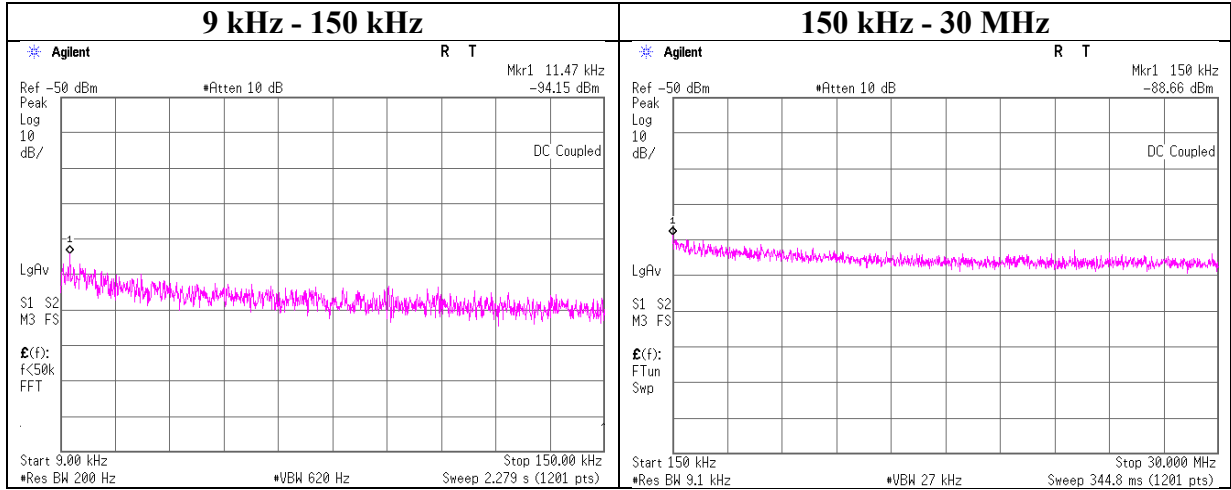
Report No. 12455993H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date October 23, 2018  
Temperature / Humidity 24 deg. C / 47 % RH  
Engineer Takafumi Noguchi  
(1 GHz - 26.5 GHz)  
Mode Tx 11n-20 2472 MHz



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

## Conducted Spurious Emission

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018  
Temperature / Humidity 23 deg. C / 69 % RH  
Engineer Takafumi Noguchi  
Mode Tx 11n-20 2467 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.47	-94.2	2.48	9.83	2.1	1	-79.7	300	6.0	-18.5	46.4	64.9	
150.00	-88.7	2.48	9.83	2.1	1	-74.3	300	6.0	-13.0	24.0	37.0	

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

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

N: Number of output

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Power Density

Report No. 12455993H  
Test place Ise EMC Lab. No.6 Measurement Room  
Date September 12, 2018 December 6, 2018  
Temperature / Humidity 23 deg. C / 69 % RH 24 deg. C / 32 % RH  
Engineer Takafumi Noguchi Takafumi Noguchi  
Mode Tx

11b Antenna port B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-20.56	2.24	10.06	-8.26	8.00	16.26
2442.00	-19.89	2.24	10.06	-7.59	8.00	15.59
2462.00	-19.28	2.24	10.06	-6.98	8.00	14.98
2472.00	-22.63	2.24	10.06	-10.33	8.00	18.33

11g Antenna port B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-25.16	2.24	10.06	-12.86	8.00	20.86
2442.00	-23.62	2.24	10.06	-11.32	8.00	19.32
2467.00	-23.59	2.24	10.06	-11.29	8.00	19.29
2472.00	-32.87	2.24	10.06	-20.57	8.00	28.57

11n-20 Antenna port B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-23.96	2.24	10.06	-11.66	8.00	19.66
2442.00	-23.61	2.24	10.06	-11.31	8.00	19.31
2467.00	-23.46	2.24	10.06	-11.16	8.00	19.16
2472.00	-32.47	2.24	10.06	-20.17	8.00	28.17

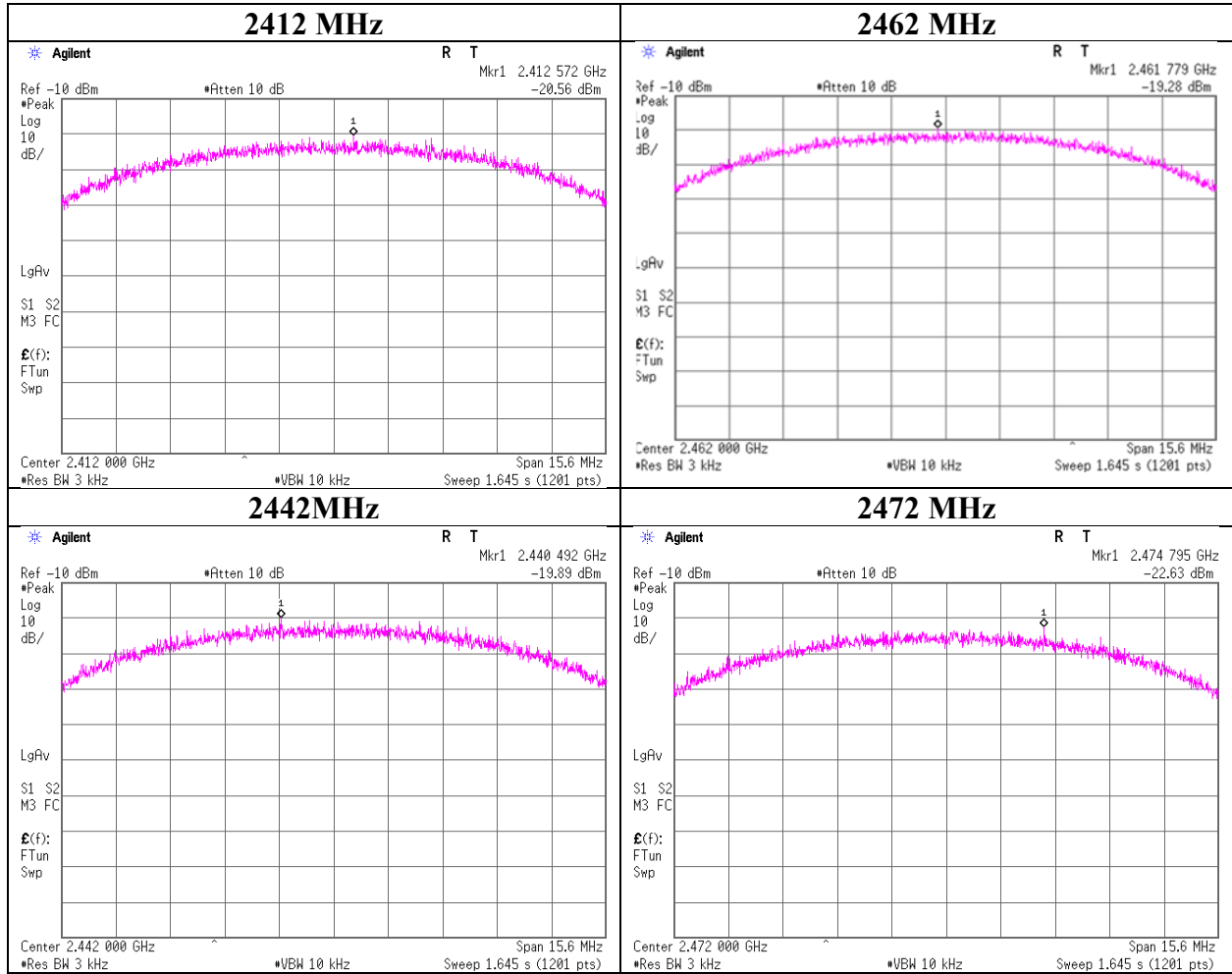
Sample Calculation:

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**

11b



**UL Japan, Inc.**

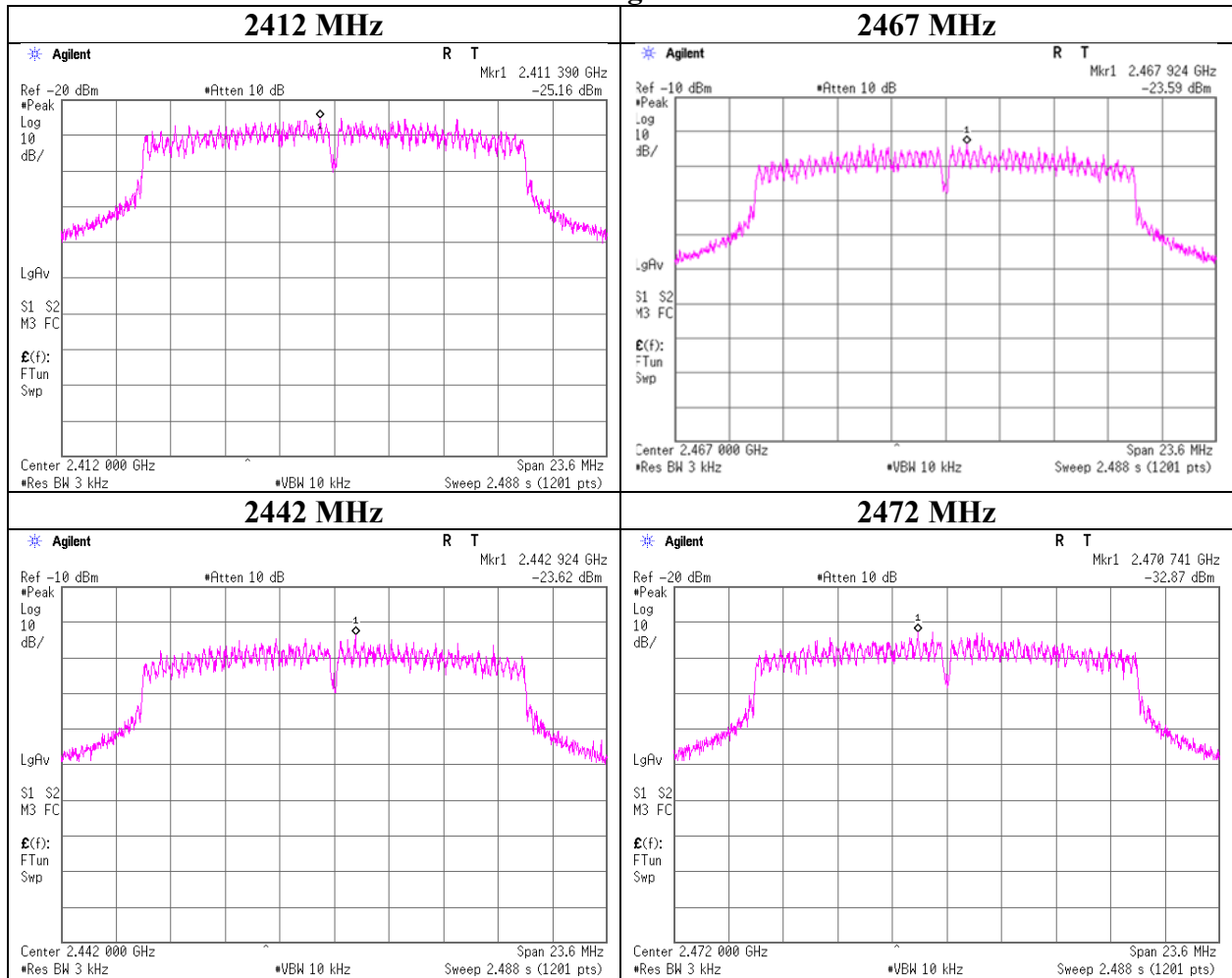
**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

11g



UL Japan, Inc.

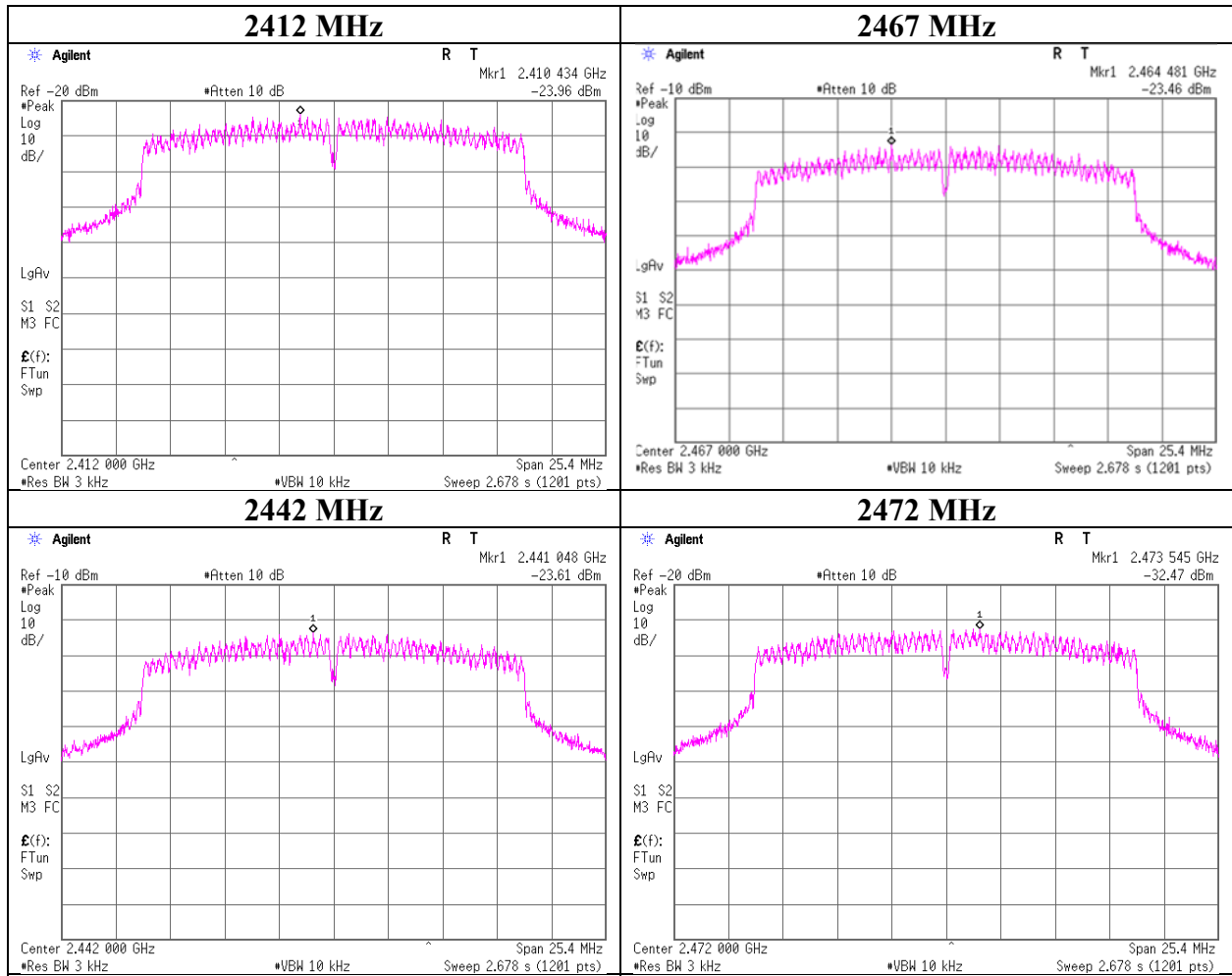
Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

11n-20



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## APPENDIX 2: Test instruments

### Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
AT	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/04/2017	12/31/2018	12
AT	141333	Attenuator(10dB)	Suhner	6810.19.A	-	12/04/2017	12/31/2018	12
AT	141842	Power sensor	AGILENT	N1923A	MY54070003	08/21/2018	08/31/2019	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	08/21/2018	08/31/2019	12
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/14/2017	11/30/2018	12
AT	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	01/24/2018	01/31/2019	12
AT	141835	Power sensor	AGILENT	N1923A	MY54070004	08/21/2018	08/31/2019	12
AT	141902	Spectrum Analyzer	AGILENT	E4440A	MY46187105	10/04/2018	10/31/2019	12
RE	142017	AC4 Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	4/7/2018	04/30/2019	12
RE/CE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/9/2018	01/31/2019	12
RE/CE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	6/8/2018	06/30/2019	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	6/8/2018	06/30/2019	12
RE/CE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/4/2018	10/31/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	6/14/2018	06/30/2019	12
RE	141325	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) 2876(5m)	3/19/2018	03/31/2019	12
RE	141577	Microwave System Power Amplifier	AGILENT	83050A	MY39500610	10/4/2018	10/31/2019	12
RE/CE	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/28/2018	06/30/2020	24
RE/CE	141562	Thermo-Hygrometer	CUSTOM	CTH-180	1501	1/24/2018	01/31/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	6/1/2018	06/30/2019	12
RE	141397	Coaxial Cable	UL Japan	-	-	6/13/2018	06/30/2019	12
RE/CE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	1/30/2018	01/31/2019	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	6/1/2018	06/30/2019	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260833	2/27/2018	02/28/2019	12
RE	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	9/19/2018	09/30/2019	12
RE	141404	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	5/14/2018	05/31/2019	12
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/3/2018	10/31/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	7/24/2018	07/31/2019	12
CE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421-010/sucoform141-P	-/04178	6/13/2018	06/30/2019	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/19/2017	12/31/2018	12

\*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: CE: Conducted Emission test  
RE: Radiated Emission test  
AT: Antenna Terminal Conducted test

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124