RADIO TEST REPORT

Test Report No. : 11830772H-A-R1

Applicant	:	**MITSUBISHI ELECTRIC CORPORATION SANDA WORKS**
Type of Equipment	:	**Rear Seat Infotainment**
Model No.	:	**SU-0G**
FCC ID	:	**UJHSU0G**
Test regulation	:	**FCC Part 15 Subpart C: 2017**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11830772H-A. 11830772H-A is replaced with this report.

Date of test: June 22 to August 10, 2017

Representative test engineer:

Hiroyuki Furutaka
Engineer
Consumer Technology Division

Approved by:

Tsubasa Takayama
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

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REVISION HISTORY

Original Test Report No.: 11830772H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11830772H-A	September 27, 2017	-	-
1	11830772H-A-R1	November 29, 2017	P.6	Update to FCC version
1	11830772H-A-R1	November 29, 2017	P.40	Correction of APPENDIX 2: Test instruments.

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS
Address	:	2-3-33, Miwa, Sanda-city, Hyogo, 669-1513, Japan
Telephone Number	:	+81-79-559-3607
Facsimile Number	:	+81-79-559-3875
Contact Person	:	Harutaka Nomura

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

2.1 Identification of E.U.T.

Type of Equipment	:	Rear Seat Infotainment
Model No.	:	SU-0G
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	June 21, 2017
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: SU-0G (referred to as the EUT in this report) is a Rear Seat Infotainment.

General Specification

Clock frequency(ies) in the system : 37.4 MHz

Radio Specification

Radio Type : Transceiver
Power Supply (inner) : DC 3.3 V

Specification of Wireless LAN (IEEE802.11b/g/a/n-20/n-40/11ac-20/11ac-40/11ac-80)

Type of radio	IEEE802.11b	IEEE802.11g/n-20	IEEE802.11a/n-20/ac-20	IEEE802.11n-40/ac-40	IEEE802.11ac-80
Frequency of operation	2412 MHz - 2462 MHz *1)	2412 MHz - 2462 MHz *1)	5180 MHz - 5240 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5755 MHz - 5795 MHz	5210 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		256QAM (MCS8, MCS9)
Channel spacing	5 MHz		20 MHz	40 MHz	80 MHz
Antenna type	Inverted F Antenna				
Antenna Gain	2.4 GHz : -0.13 dBi 5 GHz: 5150 MHz - 5350 MHz : 3.99 dBi 5470 MHz - 5875 MHz : 3.86 dBi				
Antenna Connector type	UFL-LP-066				

*1) 2412 MHz - 2462 MHz is applied for this test report.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on November 2, 2017
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* The revision on November 2, 2017, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	-	N/A *1)	-
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** -	**FCC:** Section 15.247(a)(2) **IC:** RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** RSS-Gen 6.12	**FCC:** Section 15.247(b)(3) **IC:** RSS-247 5.4(d)		Complied	Conducted
Power Density	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** -	**FCC:** Section 15.247(e) **IC:** RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	0.3 dB 1669.500 MHz, AV, Hori.	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *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 is not the device that is designed to be connected to the public utility (AC) power line.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.

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

FCC 15.31 (e)
This EUT provides stable voltage (DC 3.3 V) 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.

3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Antenna terminal test	Uncertainty (+/-)
RF output power	1.2 dB
Antenna terminal conducted emission / Power density / Burst power	3.1 dB
Adjacent channel power / Channel power	
Below 3 GHz	1.8 dB
3 GHz to 6 GHz	2.7 dB

Test distance	Radiated emission (+/-) 9 kHz - 30 MHz
3 m	3.8 dB
10 m	3.6 dB

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 GHz - 6 GHz	6 GHz - 18 GHz	10 GHz - 26.5 GHz	26.5 GHz - 40 GHz	1 GHz - 18 GHz
5.2 dB	5.5 dB	5.5 dB	5.4 dB	5.5 dB

*Measurement distance

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

3.5 Test Location

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

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	N/A	-	-
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 2.0 m 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)

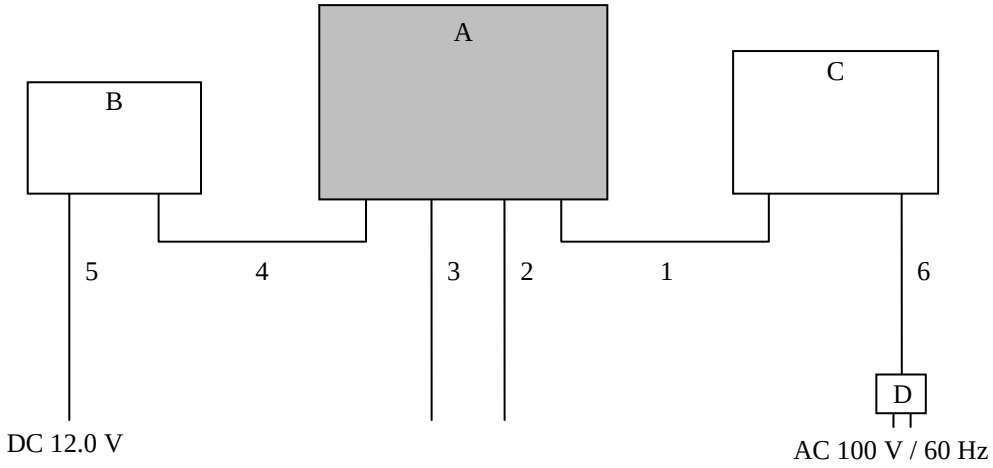
Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	12 Mbps, PN9
IEEE 802.11n 20MHz BW (11n-20)	MCS 1, 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; Power settings: 11b: 15 dBm, 11g: 11 dBm, 11n-20: 10 dBm Software: Wi-Fi_TEST_ver0.30 *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)

Test Item	Operating Mode	Tested frequency
6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
Spurious Emission (Conducted) *1)	11n-20 Tx	2412 MHz
Spurious Emission (Radiated)	11b Tx 11n-20 Tx *2)	2412 MHz 2437 MHz 2462 MHz
*1) The test was performed on the mode as a representative, because it had the highest power at antenna terminal test. *2) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.		

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	Rear Seat Infotainment	SU-0G	6117054AF7200009 *1) 6117054AF7200056 *2)	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	EUT
B	Jig board	NJ00044711	082	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	-
C	Display	-	099	MITSUBISHI ELECTRIC CORPORATION SANDA WORKS	-
D	AC Adapter	STD-05030U	-	Adapter Technology Co., Ltd.	-

*1) Used for Radiated Emission test
*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Display Cable	1.0	Shielded	Shielded	-
2	Dummy Cable	3.0	Shielded	Shielded	-
3	Dummy Cable	1.0	Shielded	Shielded	-
4	Jig Cable	0.5	Unshielded	Unshielded	-
5	DC Cable	2.0	Unshielded	Unshielded	-
6	DC Cable	1.6	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	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.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.45 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)		4.45 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)

*1) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".
*2) Distance Factor: 20 x log (4.45 m / 3.0 m) = 3.43 dB
*3) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 dB

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

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

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

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	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 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".
*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 low enough 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

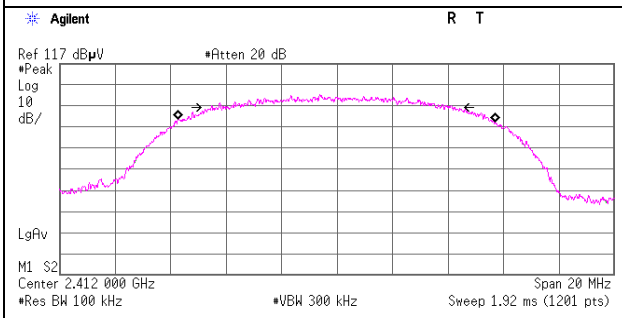
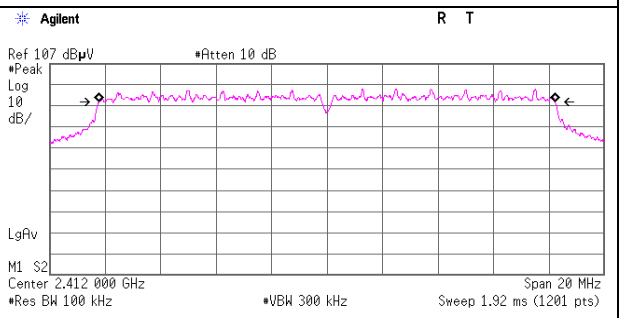
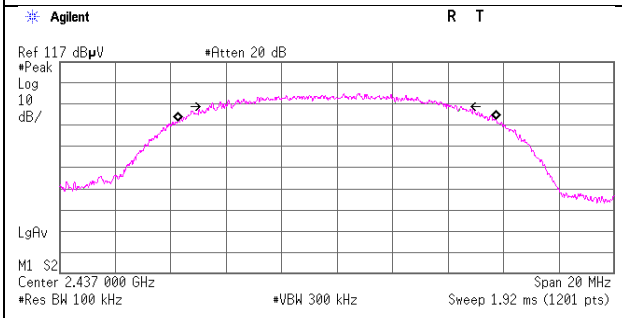
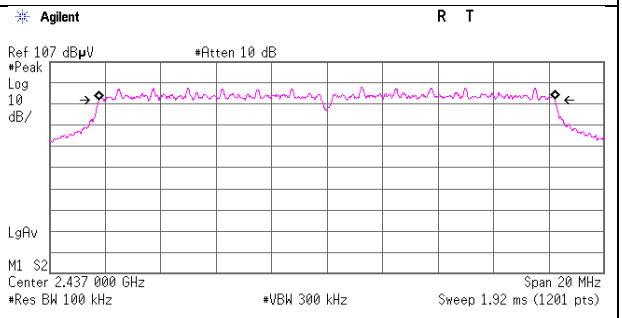
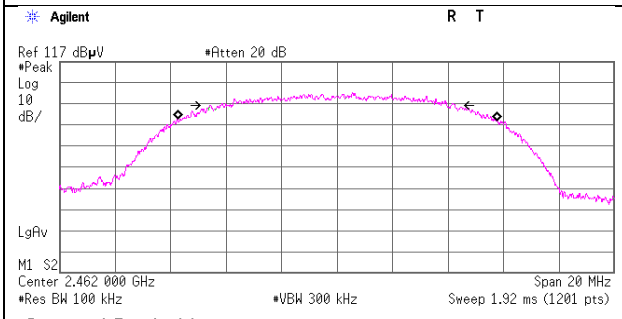
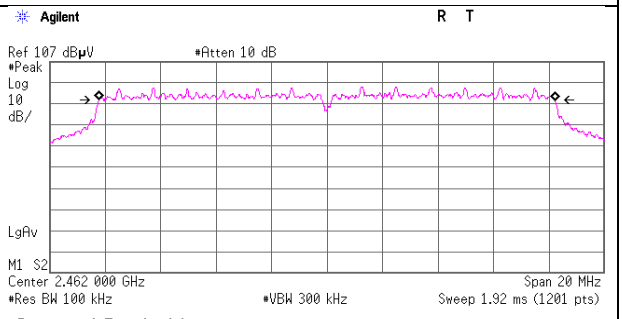
APPENDIX 1: Test data

6dB Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11830772H
Date	August 2, 2017
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Yuta Moriya
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	8.790	> 500
	2437	9.069	> 500
	2462	8.835	> 500
11g	2412	16.434	> 500
	2437	16.437	> 500
	2462	16.421	> 500
11n-20	2412	17.652	> 500
	2437	17.682	> 500
	2462	17.691	> 500

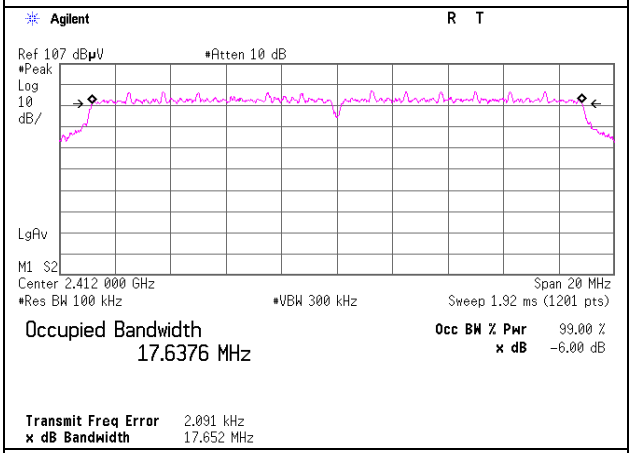
6dB Bandwidth

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

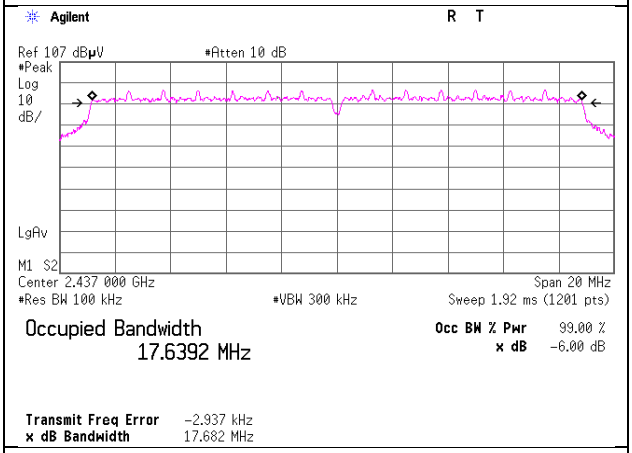
6dB Bandwidth

11n-20

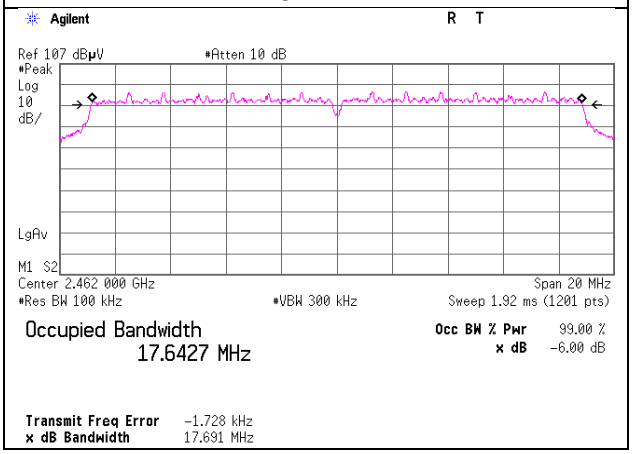
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.7 Shielded Room	
Report No.	11830772H	
Date	June 22, 2017	June 23, 2017
Temperature / Humidity	24 deg. C / 50 % RH	24 deg. C / 58 % RH
Engineer	Tomoki Matusi	Tomoki Matusi
Mode	Tx 11b	

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	11.02	1.00	10.05	22.07	161.06	30.00	1000	7.93
2437	10.92	1.00	10.05	21.97	157.40	30.00	1000	8.03
2462	11.01	1.00	10.05	22.06	160.69	30.00	1000	7.94

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

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	10.72	
2	10.70	
5.5	10.81	
11	10.90	*

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

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.7 Shielded Room	
Report No.	11830772H	
Date	June 22, 2017	June 23, 2017
Temperature / Humidity	24 deg. C / 50 % RH	24 deg. C / 58 % RH
Engineer	Tomoki Matusi	Tomoki Matusi
Mode	Tx 11g	

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	12.33	1.00	10.05	23.38	217.77	30.00	1000	6.62
2437	12.30	1.00	10.05	23.35	216.27	30.00	1000	6.65
2462	12.17	1.00	10.05	23.22	209.89	30.00	1000	6.78

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

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	11.92	
9	11.98	
12	12.19	*
18	12.09	
24	11.64	
36	11.78	
48	12.01	
54	11.33	

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

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.7 Shielded Room	
Report No.	11830772H	
Date	June 22, 2017	June 23, 2017
Temperature / Humidity	24 deg. C / 50 % RH	24 deg. C / 58 % RH
Engineer	Tomoki Matusi	Tomoki Matusi
Mode	Tx 11n-20	

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	12.48	1.00	10.05	23.53	225.42	30.00	1000	6.47
2437	12.43	1.00	10.05	23.48	222.84	30.00	1000	6.52
2462	12.21	1.00	10.05	23.26	211.84	30.00	1000	6.74

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

2437 MHz

MCS Number	Reading [dBm]	Remark
0	12.04	
1	12.44	*
2	12.22	
3	12.12	
4	11.90	
5	11.89	
6	12.10	
7	11.96	

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No. 11 Shielded Room
Report No.	11830772H
Date	August 10, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Ryota Yamanaka
Mode	Tx

11b **1 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	4.19	1.00	10.09	15.28	33.73	0.04	15.32	34.04
2437	4.32	1.00	10.09	15.41	34.75	0.04	15.45	35.08
2462	4.38	1.00	10.09	15.47	35.24	0.04	15.51	35.56

11g **6 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-0.16	1.00	10.09	10.93	12.39	0.28	11.21	13.21
2437	-0.13	1.00	10.09	10.96	12.47	0.28	11.24	13.30
2462	-0.05	1.00	10.09	11.04	12.71	0.28	11.32	13.55

11n-20 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-1.22	1.00	10.09	9.87	9.71	0.29	10.16	10.38
2437	-1.18	1.00	10.09	9.91	9.79	0.29	10.20	10.47
2462	-1.17	1.00	10.09	9.92	9.82	0.29	10.21	10.50

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

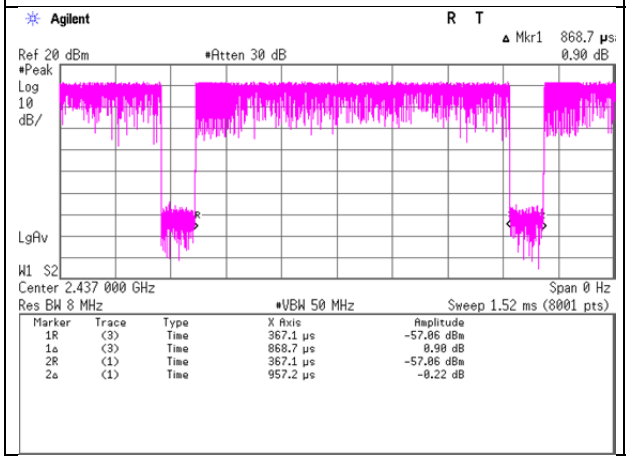
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11830772H
Date	June 23, 2017
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Tomoki Matusi
Mode	Tx

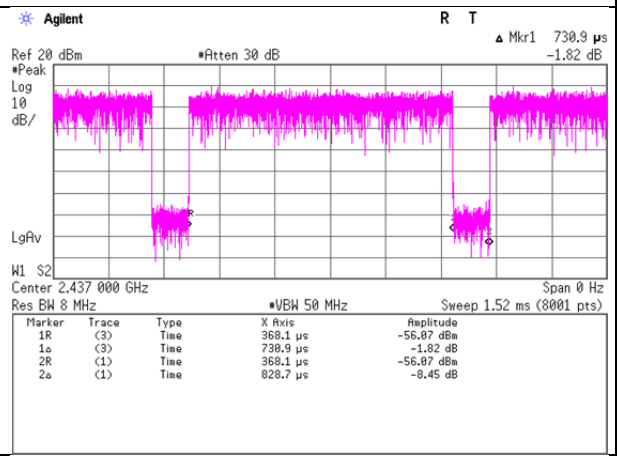
11b 11 Mbps

Tx on / (Tx on + Tx off) = 0.908
Tx on / (Tx on + Tx off) * 100 = 90.8 %
Duty factor = 10 * log (0.9572 / 0.8687) = 0.42 dB



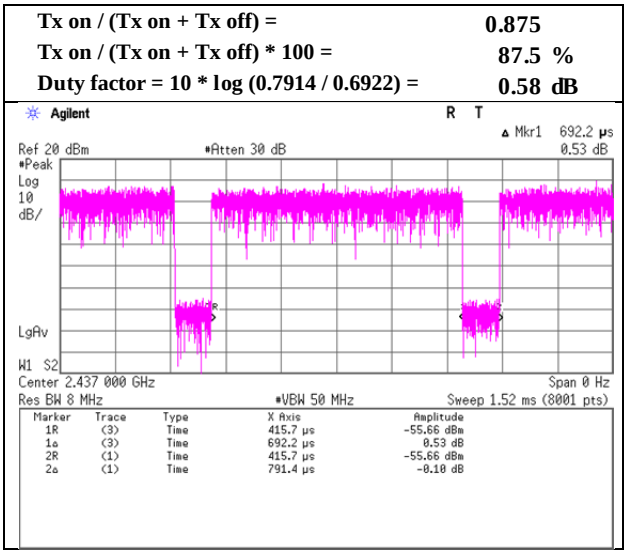
11g 12 Mbps

Tx on / (Tx on + Tx off) = 0.882
Tx on / (Tx on + Tx off) * 100 = 88.2 %
Duty factor = 10 * log (0.8287 / 0.7309) = 0.55 dB



11n-20 MCS 1

Tx on / (Tx on + Tx off) = 0.875
Tx on / (Tx on + Tx off) * 100 = 87.5 %
Duty factor = 10 * log (0.7914 / 0.6922) = 0.58 dB



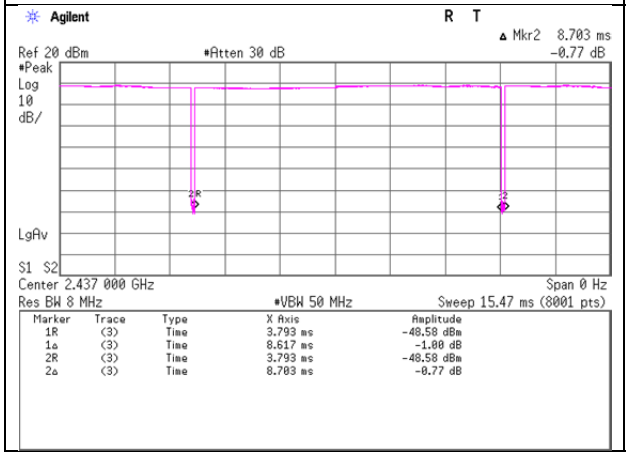
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Test place	Ise EMC Lab. No. 11 Shielded Room
Report No.	11830772H
Date	August 10, 2017
Temperature / Humidity	24 deg. C / 54 % RH
Engineer	Ryota Yamanaka
Mode	Tx

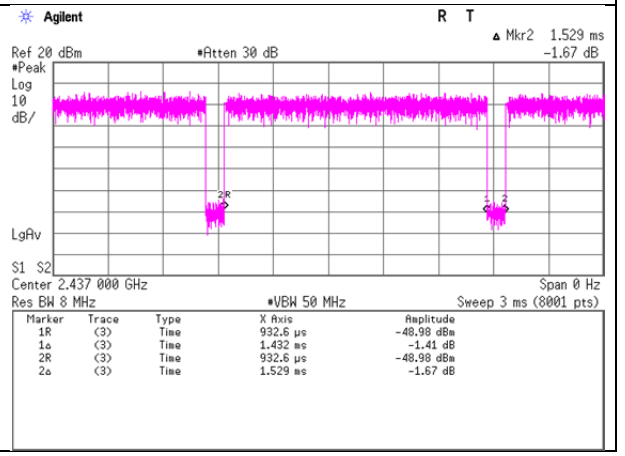
11b 1 Mbps

Tx on / (Tx on + Tx off) = 0.990
Tx on / (Tx on + Tx off) * 100 = 99.0 %
Duty factor = 10 * log (8.703 / 8.617) = 0.04 dB



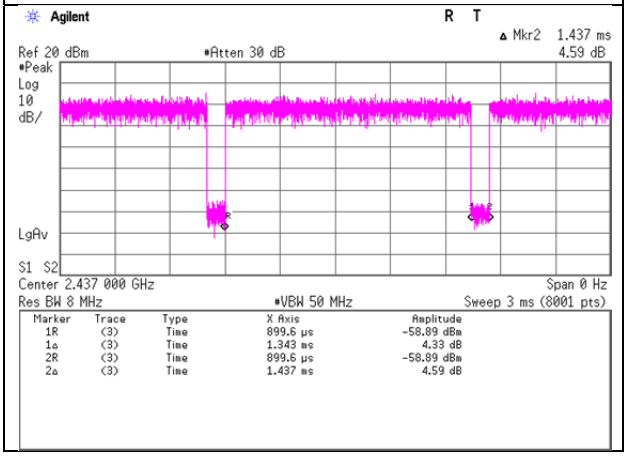
11g 6 Mbps

Tx on / (Tx on + Tx off) = 0.937
Tx on / (Tx on + Tx off) * 100 = 93.7 %
Duty factor = 10 * log (1.529 / 1.432) = 0.28 dB



11n-20 MCS 0

Tx on / (Tx on + Tx off) = 0.935
Tx on / (Tx on + Tx off) * 100 = 93.5 %
Duty factor = 10 * log (1.437 / 1.343) = 0.29 dB



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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11830772H	
Date	June 23, 2017	June 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui	Ken Fujita
	(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	1669.500	PK	60.3	26.1	6.1	33.3	-	59.2	73.9	14.7	
Hori	2386.438	PK	58.9	27.7	6.6	32.4	-	60.8	73.9	13.1	
Hori	2390.000	PK	58.0	27.7	6.6	32.4	-	59.9	73.9	14.0	
Hori	4824.000	PK	40.5	31.7	8.8	31.4	-	49.6	73.9	24.3	Floor noise
Hori	7236.000	PK	40.6	36.1	10.2	32.1	-	54.8	73.9	19.1	Floor noise
Hori	9648.000	PK	40.0	38.6	10.8	32.9	-	56.5	73.9	17.4	Floor noise
Hori	12060.000	PK	42.9	39.7	2.1	33.2	-	51.5	73.9	22.4	Floor noise
Hori	14472.000	PK	43.1	41.7	2.9	32.6	-	55.1	73.9	18.8	Floor noise
Hori	1669.500	AV	54.7	26.1	6.1	33.3	-	53.6	53.9	0.3	
Hori	2386.438	AV	47.4	27.7	6.6	32.4	0.4	49.7	53.9	4.2	
Hori	2390.000	AV	45.1	27.7	6.6	32.4	0.4	47.4	53.9	6.5	*1)
Hori	4824.000	AV	32.8	31.7	8.8	31.4	-	41.9	53.9	12.0	Floor noise
Hori	7236.000	AV	32.8	36.1	10.2	32.1	-	47.0	53.9	6.9	Floor noise
Hori	9648.000	AV	31.0	38.6	10.8	32.9	-	47.5	53.9	6.4	Floor noise
Hori	12060.000	AV	34.4	39.7	2.1	33.2	-	43.0	53.9	10.9	Floor noise
Hori	14472.000	AV	35.1	41.7	2.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	1669.500	PK	57.2	26.1	6.1	33.3	-	56.1	73.9	17.8	
Vert	2386.438	PK	59.0	27.7	6.6	32.4	-	60.9	73.9	13.0	
Vert	2390.000	PK	58.3	27.7	6.6	32.4	-	60.2	73.9	13.7	
Vert	4824.000	PK	40.5	31.7	8.8	31.4	-	49.6	73.9	24.3	Floor noise
Vert	7236.000	PK	40.6	36.1	10.2	32.1	-	54.8	73.9	19.1	Floor noise
Vert	9648.000	PK	40.0	38.6	10.8	32.9	-	56.5	73.9	17.4	Floor noise
Vert	12060.000	PK	42.8	39.7	2.1	33.2	-	51.4	73.9	22.5	Floor noise
Vert	14472.000	PK	42.2	41.7	2.9	32.6	-	54.2	73.9	19.7	Floor noise
Vert	1669.500	AV	51.5	26.1	6.1	33.3	-	50.4	53.9	3.5	
Vert	2386.438	AV	49.1	27.7	6.6	32.4	0.4	51.4	53.9	2.5	
Vert	2390.000	AV	46.1	27.7	6.6	32.4	0.4	48.4	53.9	5.5	*1)
Vert	4824.000	AV	32.8	31.7	8.8	31.4	-	41.9	53.9	12.0	Floor noise
Vert	7236.000	AV	32.8	36.1	10.2	32.1	-	47.0	53.9	6.9	Floor noise
Vert	9648.000	AV	31.0	38.6	10.8	32.9	-	47.5	53.9	6.4	Floor noise
Vert	12060.000	AV	34.8	39.7	2.1	33.2	-	43.4	53.9	10.5	Floor noise
Vert	14472.000	AV	34.9	41.7	2.9	32.6	-	46.9	53.9	7.0	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 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

20dBc Data Sheet

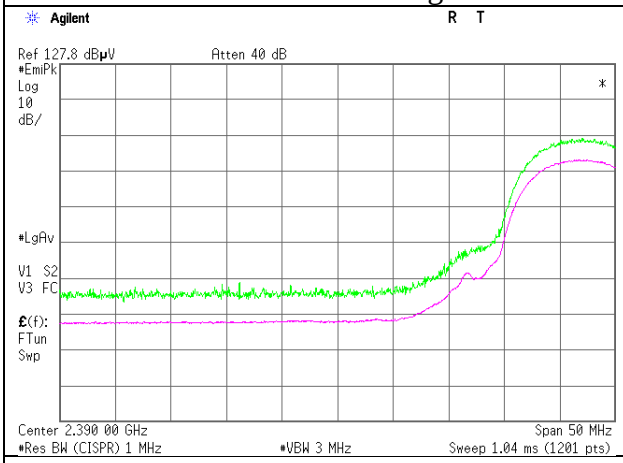
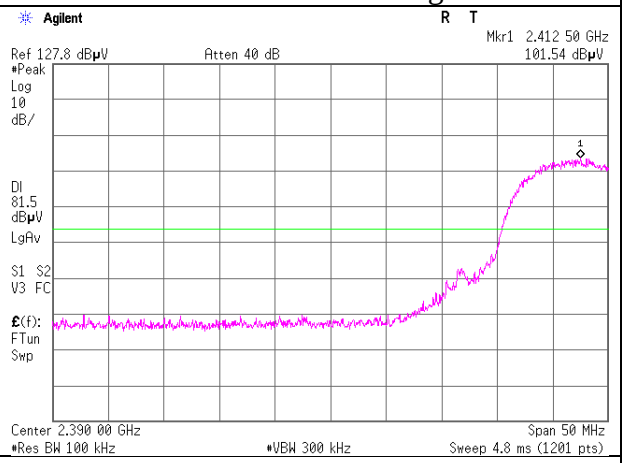
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	101.5	27.7	6.7	32.4	103.5	-	-	Carrier
Hori	2400.000	PK	63.2	27.7	6.7	32.4	65.2	83.5	18.3	
Vert	2412.000	PK	102.6	27.7	6.7	32.4	104.6	-	-	Carrier
Vert	2400.000	PK	64.1	27.7	6.7	32.4	66.1	84.6	18.5	

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

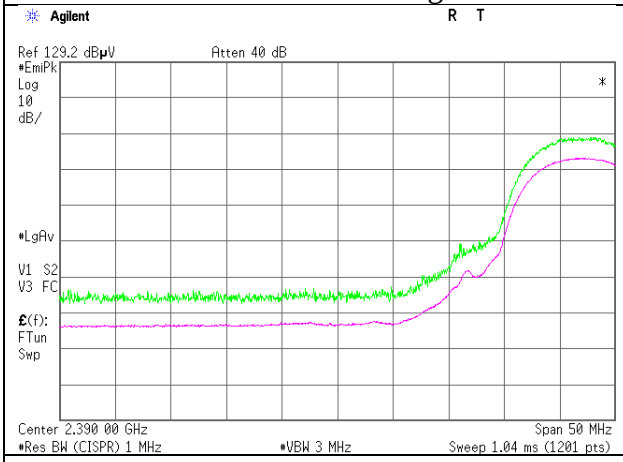
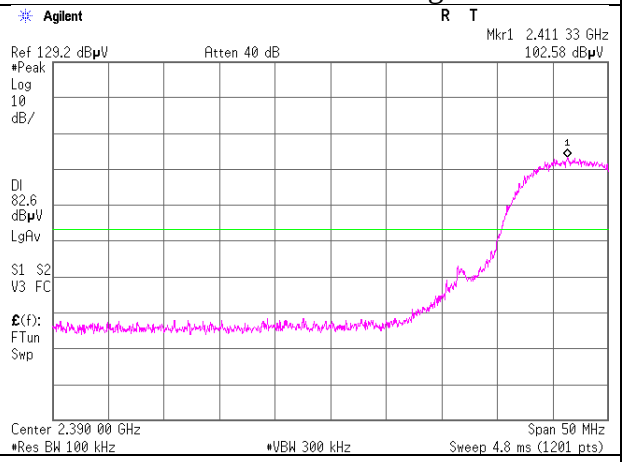
Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11830772H
Date	June 23, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Tomoki Matsui
	(1 GHz - 10 GHz)
Mode	Tx 11b 2412 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11830772H	
Date	June 23, 2017	June 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui	Ken Fujita
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11b 2437 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	1669.500	PK	60.4	26.1	6.2	33.3	-	59.4	73.9	14.5	
Hori	4874.000	PK	41.0	31.9	8.9	31.4	-	50.4	73.9	23.5	Floor noise
Hori	7311.000	PK	40.8	36.2	10.3	32.2	-	55.1	73.9	18.8	Floor noise
Hori	9748.000	PK	41.0	38.7	11.0	33.0	-	57.7	73.9	16.2	Floor noise
Hori	12185.000	PK	42.9	39.7	2.1	33.2	-	51.5	73.9	22.4	Floor noise
Hori	14622.000	PK	43.2	41.4	2.9	32.6	-	54.9	73.9	19.0	Floor noise
Hori	1669.500	AV	53.9	26.1	6.2	33.3	-	52.9	53.9	1.0	
Hori	4874.000	AV	31.6	31.9	8.9	31.4	-	41.0	53.9	12.9	Floor noise
Hori	7311.000	AV	32.4	36.2	10.3	32.2	-	46.7	53.9	7.2	Floor noise
Hori	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Hori	12185.000	AV	34.6	39.7	2.1	33.2	-	43.2	53.9	10.7	Floor noise
Hori	14622.000	AV	35.3	41.4	2.9	32.6	-	47.0	53.9	6.9	Floor noise
Vert	1669.500	PK	58.7	26.1	6.2	33.3	-	57.7	73.9	16.2	
Vert	4874.000	PK	41.0	31.9	8.9	31.4	-	50.4	73.9	23.5	Floor noise
Vert	7311.000	PK	40.8	36.2	10.3	32.2	-	55.1	73.9	18.8	Floor noise
Vert	9748.000	PK	41.0	38.7	11.0	33.0	-	57.7	73.9	16.2	Floor noise
Vert	12185.000	PK	42.7	39.7	2.1	33.2	-	51.3	73.9	22.6	Floor noise
Vert	14622.000	PK	42.4	41.4	2.9	32.6	-	54.1	73.9	19.8	Floor noise
Vert	1669.500	AV	52.6	26.1	6.2	33.3	-	51.6	53.9	2.3	
Vert	4874.000	AV	31.6	31.9	8.9	31.4	-	41.0	53.9	12.9	Floor noise
Vert	7311.000	AV	32.4	36.2	10.3	32.2	-	46.7	53.9	7.2	Floor noise
Vert	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	12185.000	AV	34.6	39.7	2.1	33.2	-	43.2	53.9	10.7	Floor noise
Vert	14622.000	AV	34.9	41.4	2.9	32.6	-	46.6	53.9	7.3	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 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11830772H	
Date	June 23, 2017	June 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui	Ken Fujita
	(1 GHz - 10 GHz)	(10 GHz - 26.5 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	1669.500	PK	60.6	26.1	6.2	33.3	-	59.6	73.9	14.3	
Hori	2483.500	PK	58.8	27.8	6.8	32.4	-	61.0	73.9	12.9	
Hori	4924.000	PK	40.6	32.0	9.0	31.3	-	50.3	73.9	23.6	Floor noise
Hori	7386.000	PK	42.1	36.3	10.2	32.2	-	56.4	73.9	17.5	Floor noise
Hori	9848.000	PK	41.1	38.8	11.0	33.0	-	57.9	73.9	16.0	Floor noise
Hori	12310.000	PK	43.0	39.7	2.1	33.1	-	51.7	73.9	22.2	Floor noise
Hori	14772.000	PK	43.5	41.1	3.1	32.6	-	55.1	73.9	18.8	Floor noise
Hori	1669.500	AV	54.0	26.1	6.2	33.3	-	53.0	53.9	0.9	
Hori	2483.500	AV	41.9	27.8	6.8	32.4	0.4	44.5	53.9	9.4	*1)
Hori	4924.000	AV	30.9	32.0	9.0	31.3	-	40.6	53.9	13.3	Floor noise
Hori	7386.000	AV	32.4	36.3	10.2	32.2	-	46.7	53.9	7.2	Floor noise
Hori	9848.000	AV	30.8	38.8	11.0	33.0	-	47.6	53.9	6.3	Floor noise
Hori	12310.000	AV	34.7	39.7	2.1	33.1	-	43.4	53.9	10.5	Floor noise
Hori	14772.000	AV	35.3	41.1	3.1	32.6	-	46.9	53.9	7.0	Floor noise
Vert	1669.500	PK	59.0	26.1	6.2	33.3	-	58.0	73.9	15.9	
Vert	2483.500	PK	61.2	27.8	6.8	32.4	-	63.4	73.9	10.5	
Vert	4924.000	PK	40.6	32.0	9.0	31.3	-	50.3	73.9	23.6	Floor noise
Vert	7386.000	PK	42.1	36.3	10.2	32.2	-	56.4	73.9	17.5	Floor noise
Vert	9848.000	PK	41.1	38.8	11.0	33.0	-	57.9	73.9	16.0	Floor noise
Vert	12310.000	PK	42.6	39.7	2.1	33.1	-	51.3	73.9	22.6	Floor noise
Vert	14772.000	PK	42.5	41.1	3.1	32.6	-	54.1	73.9	19.8	Floor noise
Vert	1669.500	AV	53.1	26.1	6.2	33.3	-	52.1	53.9	1.8	
Vert	2483.500	AV	43.8	27.8	6.8	32.4	0.4	46.4	53.9	7.5	*1)
Vert	4924.000	AV	30.9	32.0	9.0	31.3	-	40.6	53.9	13.3	Floor noise
Vert	7386.000	AV	32.4	36.3	10.2	32.2	-	46.7	53.9	7.2	Floor noise
Vert	9848.000	AV	30.8	38.8	11.0	33.0	-	47.6	53.9	6.3	Floor noise
Vert	12310.000	AV	34.4	39.7	2.1	33.1	-	43.1	53.9	10.8	Floor noise
Vert	14772.000	AV	34.7	41.1	3.1	32.6	-	46.3	53.9	7.6	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).

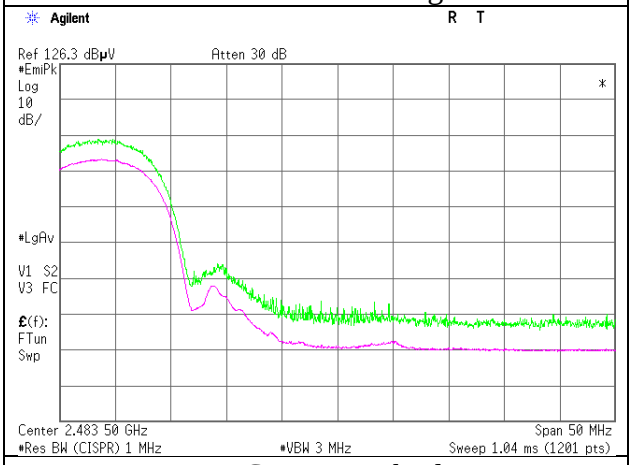
Distance factor: 1 GHz - 10 GHz 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11830772H
Date	June 23, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Tomoki Matsui
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

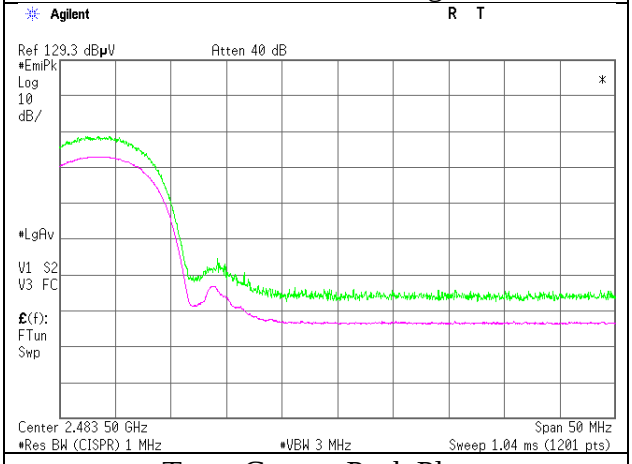
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11830772H		
Date	June 23, 2017	June 24, 2017	June 27, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH	24 deg. C / 58 % RH
Engineer	Tomoki Matsui	Ken Fujita	Hiroyuki Furutaka
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	(Below 1 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	182.458	QP	40.0	16.3	9.0	32.1	-	33.2	43.5	10.3	
Hori	337.324	QP	42.7	14.3	10.3	32.0	-	35.3	46.0	10.7	
Hori	674.642	QP	37.1	19.6	12.3	32.1	-	36.9	46.0	9.1	
Hori	809.558	QP	39.6	20.8	13.0	31.4	-	42.0	46.0	4.0	
Hori	877.022	QP	34.7	21.8	13.3	31.1	-	38.7	46.0	7.3	
Hori	944.487	QP	35.0	22.2	13.6	30.7	-	40.1	46.0	5.9	
Hori	1669.500	PK	60.1	26.1	6.2	33.3	-	59.1	73.9	14.8	
Hori	2390.000	PK	70.5	27.7	6.7	32.4	-	72.5	73.9	1.4	
Hori	4824.000	PK	40.5	31.7	8.9	31.4	-	49.7	73.9	24.2	Floor noise
Hori	7236.000	PK	40.6	36.1	10.3	32.1	-	54.9	73.9	19.0	Floor noise
Hori	9648.000	PK	40.0	38.6	10.9	32.9	-	56.6	73.9	17.3	Floor noise
Hori	12060.000	PK	42.7	39.7	2.1	33.2	-	51.3	73.9	22.6	Floor noise
Hori	14472.000	PK	43.3	41.7	2.9	32.6	-	55.3	73.9	18.6	Floor noise
Hori	1669.500	AV	54.5	26.1	6.2	33.3	-	53.5	53.9	0.4	
Hori	2390.000	AV	50.8	27.7	6.7	32.4	0.6	53.4	53.9	0.5	*1)
Hori	4824.000	AV	32.8	31.7	8.9	31.4	-	42.0	53.9	11.9	Floor noise
Hori	7236.000	AV	32.8	36.1	10.3	32.1	-	47.1	53.9	6.8	Floor noise
Hori	9648.000	AV	31.0	38.6	10.9	32.9	-	47.6	53.9	6.3	Floor noise
Hori	12060.000	AV	34.3	39.7	2.1	33.2	-	42.9	53.9	11.0	Floor noise
Hori	14472.000	AV	35.0	41.7	2.9	32.6	-	47.0	53.9	6.9	Floor noise
Vert	134.935	QP	46.1	14.1	8.6	32.1	-	36.7	43.5	6.8	
Vert	539.710	QP	38.7	18.2	11.5	32.0	-	36.4	46.0	9.6	
Vert	809.557	QP	37.6	20.8	13.0	31.4	-	40.0	46.0	6.0	
Vert	877.025	QP	34.4	21.8	13.3	31.1	-	38.4	46.0	7.6	
Vert	917.760	QP	32.7	22.2	13.5	30.9	-	37.5	46.0	8.5	
Vert	944.487	QP	33.2	22.2	13.6	30.7	-	38.3	46.0	7.7	
Vert	1701.167	PK	58.3	26.2	6.2	33.2	-	57.5	73.9	16.4	
Vert	2390.000	PK	70.6	27.7	6.7	32.4	-	72.6	73.9	1.3	
Vert	4824.000	PK	40.5	31.7	8.9	31.4	-	49.7	73.9	24.2	Floor noise
Vert	7236.000	PK	40.6	36.1	10.3	32.1	-	54.9	73.9	19.0	Floor noise
Vert	9648.000	PK	40.0	38.6	10.9	32.9	-	56.6	73.9	17.3	Floor noise
Vert	12060.000	PK	42.7	39.7	2.1	33.2	-	51.3	73.9	22.6	Floor noise
Vert	14472.000	PK	42.4	41.7	2.9	32.6	-	54.4	73.9	19.5	Floor noise
Vert	1701.167	AV	52.3	26.2	6.2	33.2	-	51.5	53.9	2.4	
Vert	2390.000	AV	50.6	27.7	6.7	32.4	0.6	53.2	53.9	0.7	*1)
Vert	4824.000	AV	32.8	31.7	8.9	31.4	-	42.0	53.9	11.9	Floor noise
Vert	7236.000	AV	32.8	36.1	10.3	32.1	-	47.1	53.9	6.8	Floor noise
Vert	9648.000	AV	31.0	38.6	10.9	32.9	-	47.6	53.9	6.3	Floor noise
Vert	12060.000	AV	34.7	39.7	2.1	33.2	-	43.3	53.9	10.6	Floor noise
Vert	14472.000	AV	34.6	41.7	2.9	32.6	-	46.6	53.9	7.3	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 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

20dBc Data Sheet

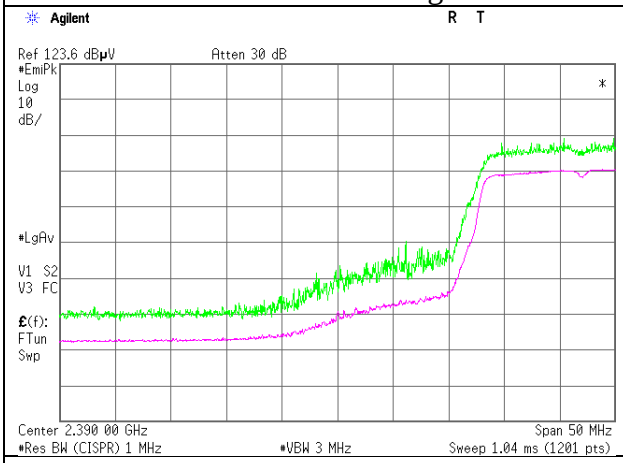
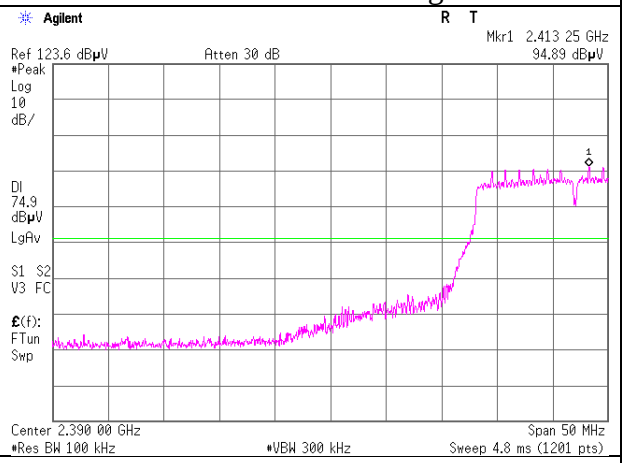
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	94.9	27.7	6.8	32.4	97.0	-	-	Carrier
Hori	2400.000	PK	58.9	27.7	6.8	32.4	61.0	77.0	16.0	
Vert	2412.000	PK	94.7	27.7	6.8	32.4	96.8	-	-	Carrier
Vert	2400.000	PK	59.9	27.7	6.8	32.4	62.0	76.8	14.8	

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

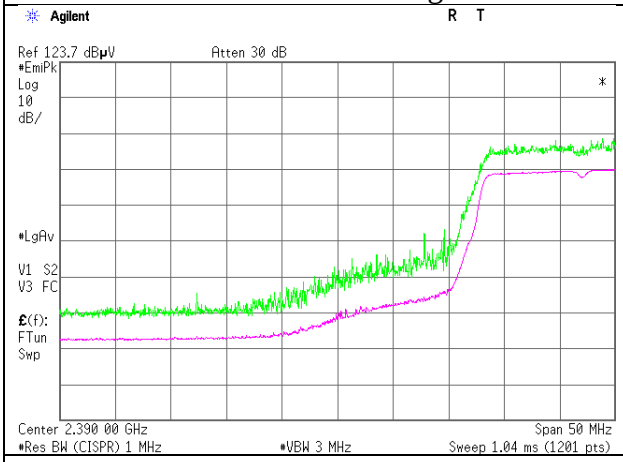
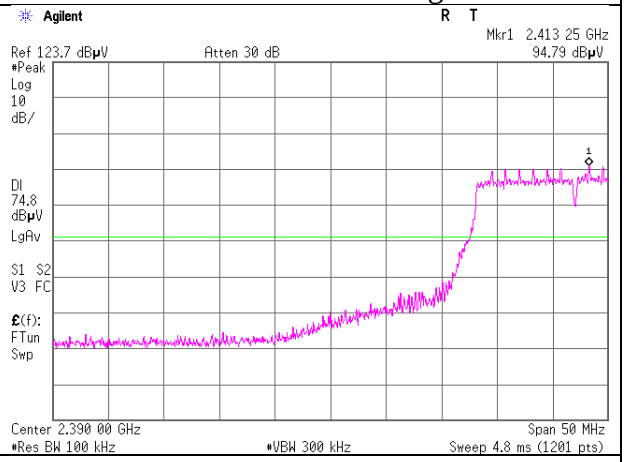
Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11830772H
Date	June 23, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Tomoki Matsui
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2412 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11830772H	
Date	June 23, 2017	June 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui	Ken Fujita
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 2437 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	1669.500	PK	61.5	26.1	6.2	33.3	-	60.5	73.9	13.4	
Hori	4874.000	PK	41.0	31.9	8.9	31.4	-	50.4	73.9	23.5	Floor noise
Hori	7311.000	PK	40.8	36.2	10.3	32.2	-	55.1	73.9	18.8	Floor noise
Hori	9748.000	PK	41.0	38.7	11.0	33.0	-	57.7	73.9	16.2	Floor noise
Hori	12185.000	PK	42.7	39.7	2.1	33.2	-	51.3	73.9	22.6	Floor noise
Hori	14622.000	PK	43.4	41.4	2.9	32.6	-	55.1	73.9	18.8	Floor noise
Hori	1669.500	AV	54.4	26.1	6.2	33.3	-	53.4	53.9	0.5	
Hori	4874.000	AV	31.6	31.9	8.9	31.4	-	41.0	53.9	12.9	Floor noise
Hori	7311.000	AV	32.4	36.2	10.3	32.2	-	46.7	53.9	7.2	Floor noise
Hori	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Hori	12185.000	AV	34.5	39.7	2.1	33.2	-	43.1	53.9	10.8	Floor noise
Hori	14622.000	AV	35.4	41.4	2.9	32.6	-	47.1	53.9	6.8	Floor noise
Vert	1670.783	PK	58.2	26.1	6.2	33.3	-	57.2	73.9	16.7	
Vert	4874.000	PK	41.0	31.9	8.9	31.4	-	50.4	73.9	23.5	Floor noise
Vert	7311.000	PK	40.8	36.2	10.3	32.2	-	55.1	73.9	18.8	Floor noise
Vert	9748.000	PK	41.0	38.7	11.0	33.0	-	57.7	73.9	16.2	Floor noise
Vert	12185.000	PK	42.8	39.7	2.1	33.2	-	51.4	73.9	22.5	Floor noise
Vert	14622.000	PK	42.3	41.4	2.9	32.6	-	54.0	73.9	19.9	Floor noise
Vert	1670.783	AV	52.5	26.1	6.2	33.3	-	51.5	53.9	2.4	
Vert	4874.000	AV	31.6	31.9	8.9	31.4	-	41.0	53.9	12.9	Floor noise
Vert	7311.000	AV	32.4	36.2	10.3	32.2	-	46.7	53.9	7.2	Floor noise
Vert	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	12185.000	AV	34.5	39.7	2.1	33.2	-	43.1	53.9	10.8	Floor noise
Vert	14622.000	AV	34.6	41.4	2.9	32.6	-	46.3	53.9	7.6	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 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11830772H	
Date	June 23, 2017	June 24, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui	Ken Fujita
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 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	1669.500	PK	59.7	26.1	6.2	33.3	-	58.7	73.9	15.2	
Hori	2483.500	PK	66.4	27.8	6.8	32.4	-	68.6	73.9	5.3	
Hori	4924.000	PK	40.6	32.0	9.0	31.3	-	50.3	73.9	23.6	Floor noise
Hori	7386.000	PK	42.1	36.3	10.2	32.2	-	56.4	73.9	17.5	Floor noise
Hori	9848.000	PK	41.1	38.8	11.0	33.0	-	57.9	73.9	16.0	Floor noise
Hori	12310.000	PK	43.2	39.7	2.1	33.1	-	51.9	73.9	22.0	Floor noise
Hori	14772.000	PK	43.4	41.1	3.1	32.6	-	55.0	73.9	18.9	Floor noise
Hori	1669.500	AV	54.0	26.1	6.2	33.3	-	53.0	53.9	0.9	
Hori	2483.500	AV	45.8	27.8	6.8	32.4	0.6	48.6	53.9	5.3	*1)
Hori	4924.000	AV	30.9	32.0	9.0	31.3	-	40.6	53.9	13.3	Floor noise
Hori	7386.000	AV	32.4	36.3	10.2	32.2	-	46.7	53.9	7.2	Floor noise
Hori	9848.000	AV	30.8	38.8	11.0	33.0	-	47.6	53.9	6.3	Floor noise
Hori	12310.000	AV	34.8	39.7	2.1	33.1	-	43.5	53.9	10.4	Floor noise
Hori	14772.000	AV	35.2	41.1	3.1	32.6	-	46.8	53.9	7.1	Floor noise
Vert	1669.500	PK	58.3	26.1	6.2	33.3	-	57.3	73.9	16.6	
Vert	2483.500	PK	66.8	27.8	6.8	32.4	-	69.0	73.9	4.9	
Vert	4924.000	PK	40.6	32.0	9.0	31.3	-	50.3	73.9	23.6	Floor noise
Vert	7386.000	PK	42.1	36.3	10.2	32.2	-	56.4	73.9	17.5	Floor noise
Vert	9848.000	PK	41.1	38.8	11.0	33.0	-	57.9	73.9	16.0	Floor noise
Vert	12310.000	PK	42.5	39.7	2.1	33.1	-	51.2	73.9	22.7	Floor noise
Vert	14772.000	PK	43.3	41.1	3.1	32.6	-	54.9	73.9	19.0	Floor noise
Vert	1669.500	AV	52.6	26.1	6.2	33.3	-	51.6	53.9	2.3	
Vert	2483.500	AV	47.8	27.8	6.8	32.4	0.6	50.6	53.9	3.3	*1)
Vert	4924.000	AV	30.9	32.0	9.0	31.3	-	40.6	53.9	13.3	Floor noise
Vert	7386.000	AV	32.4	36.3	10.2	32.2	-	46.7	53.9	7.2	Floor noise
Vert	9848.000	AV	30.8	38.8	11.0	33.0	-	47.6	53.9	6.3	Floor noise
Vert	12310.000	AV	34.5	39.7	2.1	33.1	-	43.2	53.9	10.7	Floor noise
Vert	14772.000	AV	34.6	41.1	3.1	32.6	-	46.2	53.9	7.7	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 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

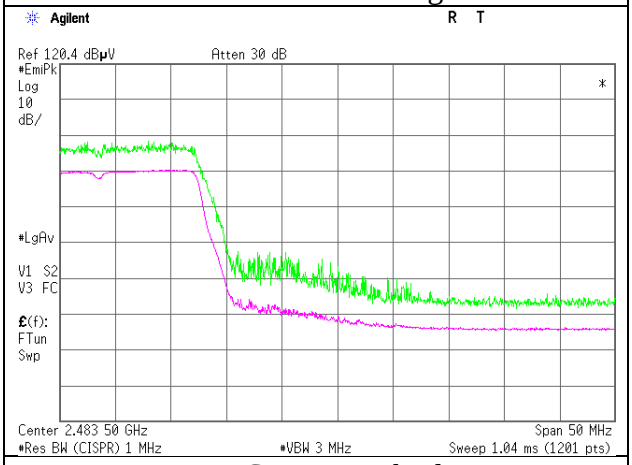
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11830772H
Date	June 23, 2017
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Tomoki Matsui
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

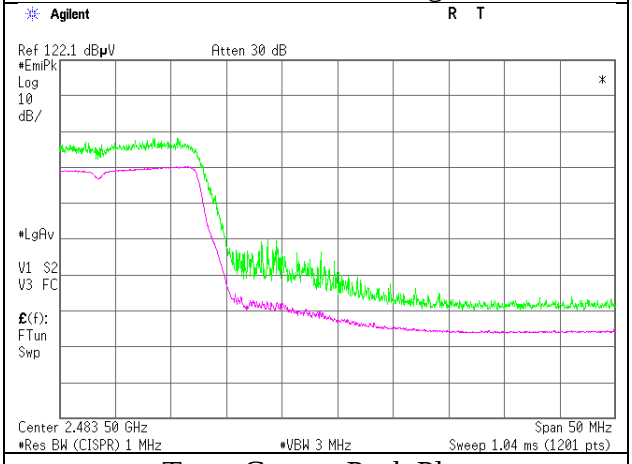
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

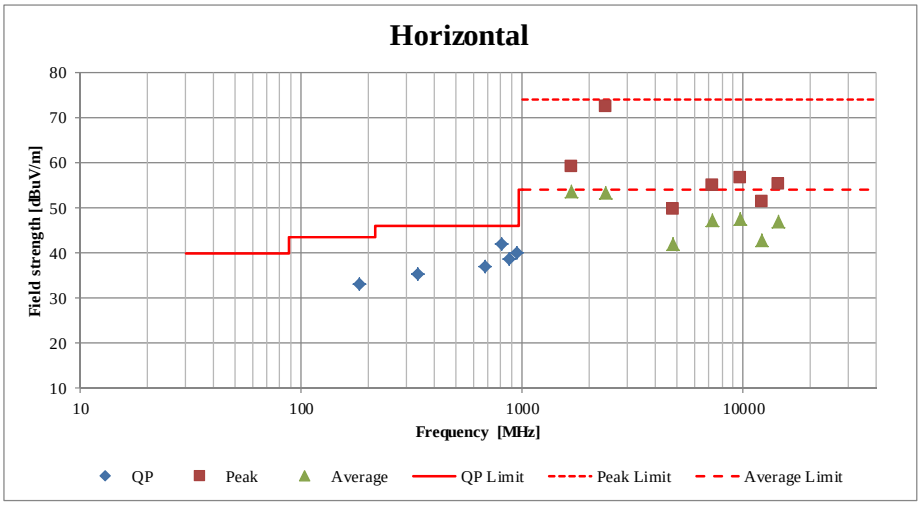


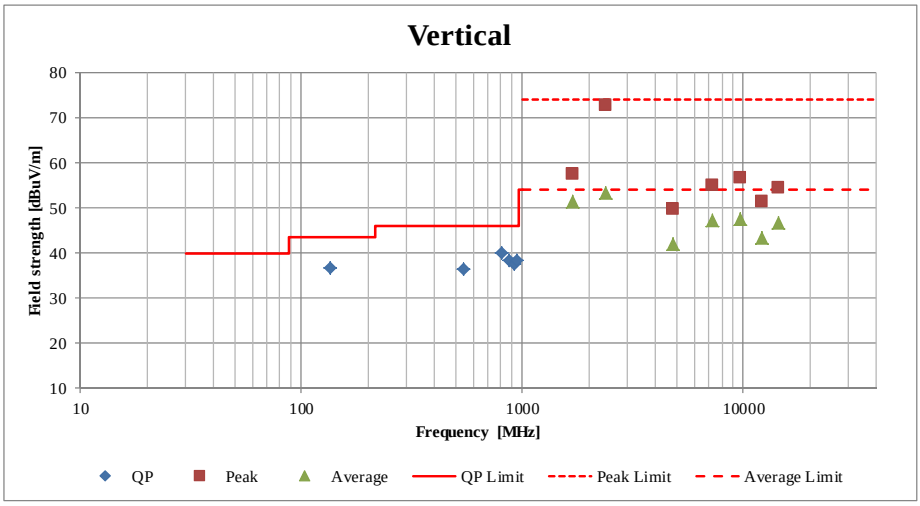
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11830772H		
Date	June 23, 2017	June 24, 2017	June 27, 2017
Temperature / Humidity	23 deg. C / 58 % RH	23 deg. C / 48 % RH	24 deg. C / 58 % RH
Engineer	Tomoki Matsui	Ken Fujita	Hiroyuki Furutaka
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 2412 MHz		



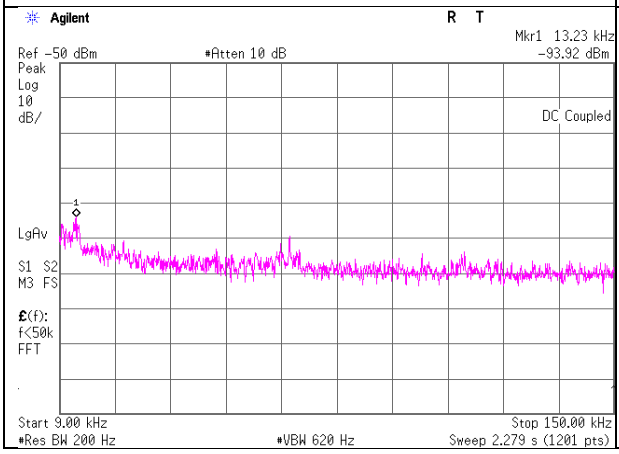


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

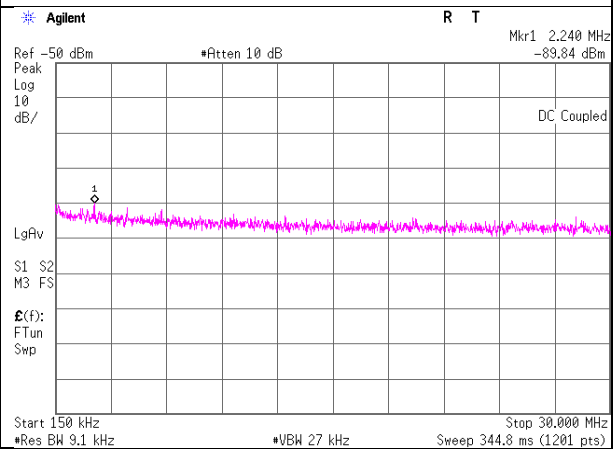
Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11830772H
Date	August 3, 2017
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Ryota Yamanaka
Mode	Tx 11n-20 2412 MHz

9 kHz - 150 kHz



150 kHz - 30 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
13.23	-93.9	1.00	9.8	2.0	1	-81.1	300	6.0	-19.8	45.1	64.9	
2240.00	-89.8	1.01	9.8	2.0	1	-77.0	30	6.0	4.3	29.5	25.3	

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

*2.0 dBi was applied to the test result based on KDB 558074 since antenna gain was less than 2.0 dBi.

Power Density

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	11830772H	
Date	August 2, 2017	August 24, 2017
Temperature / Humidity	24 deg. C / 46 % RH	24 deg. C / 62 % RH
Engineer	Yuta Moriya	Yuta Moriya
Mode	Tx	

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-19.28	1.95	10.09	-7.24	8.00	15.24
2437.00	-18.89	1.95	10.09	-6.85	8.00	14.85
2462.00	-19.41	1.96	10.09	-7.36	8.00	15.36

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-25.49	1.95	10.09	-13.45	8.00	21.45
2437.00	-25.53	1.95	10.09	-13.49	8.00	21.49
2462.00	-25.49	1.96	10.09	-13.44	8.00	21.44

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-27.51	1.90	10.09	-15.52	8.00	23.52
2437.00	-27.62	1.90	10.09	-15.63	8.00	23.63
2462.00	-27.98	1.90	10.09	-15.99	8.00	23.99

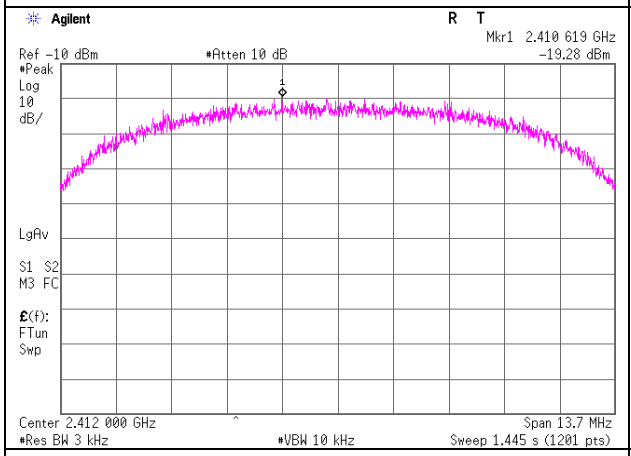
Sample Calculation:

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

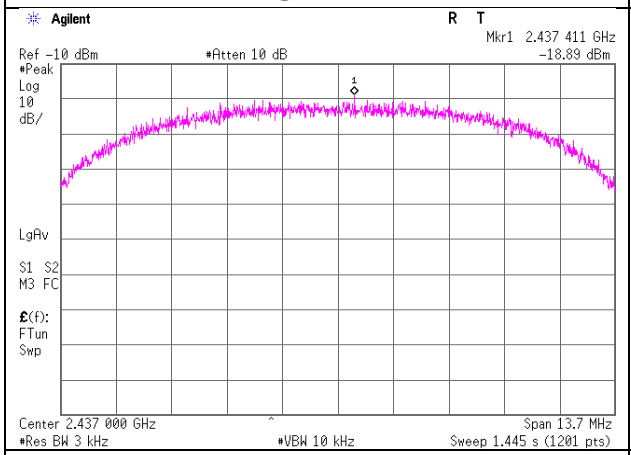
Power Density

11b

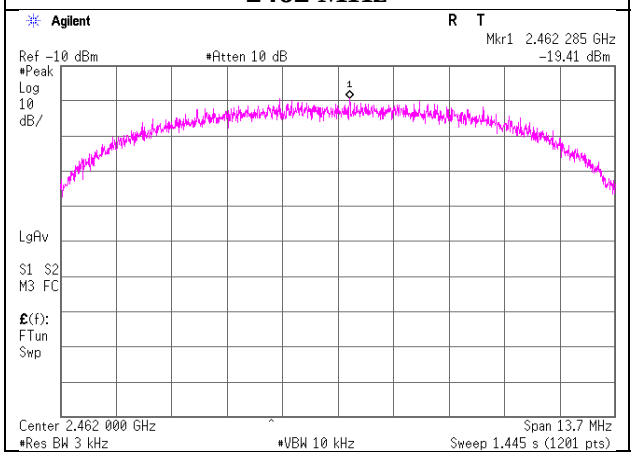
2412 MHz



2437 MHz

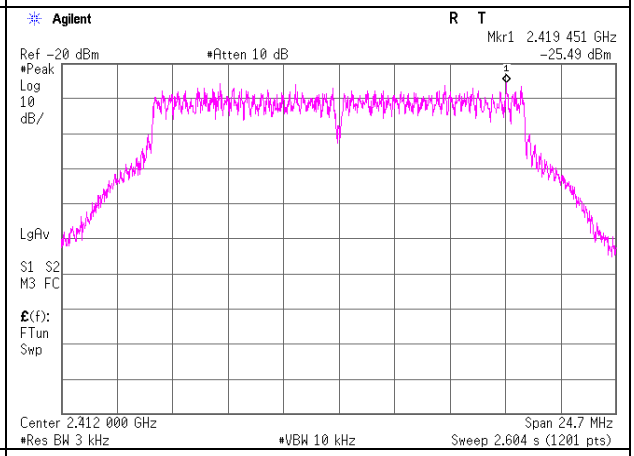


2462 MHz

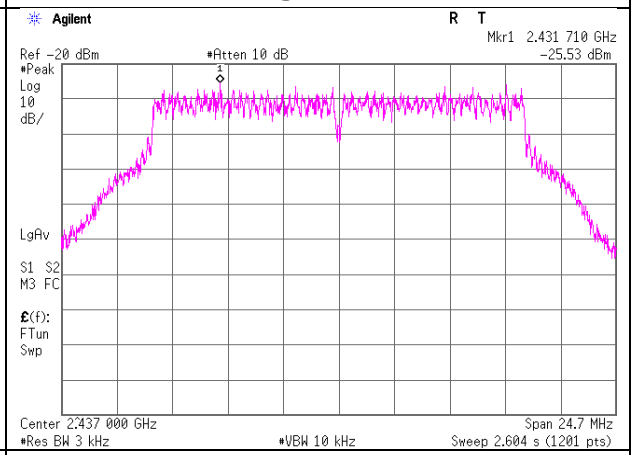


11g

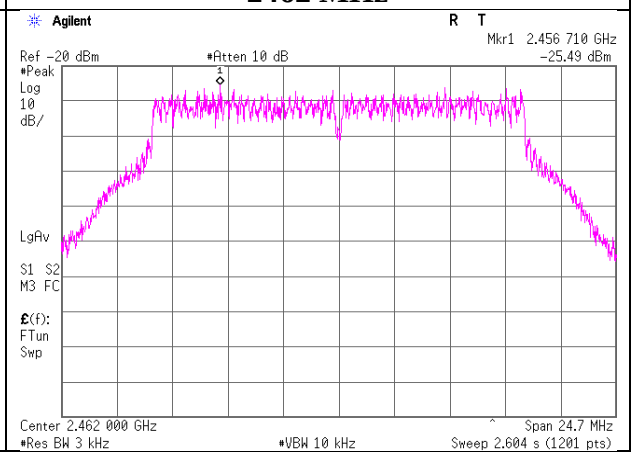
2412 MHz



2437 MHz



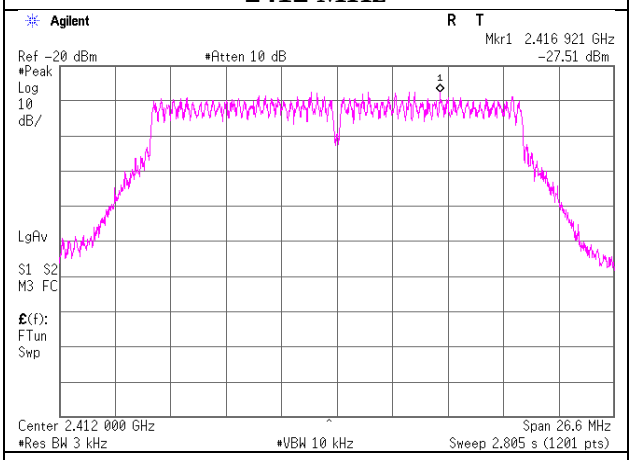
2462 MHz



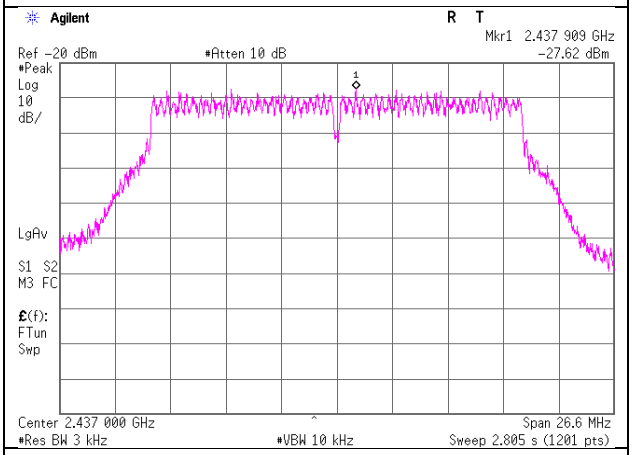
Power Density

11n-20

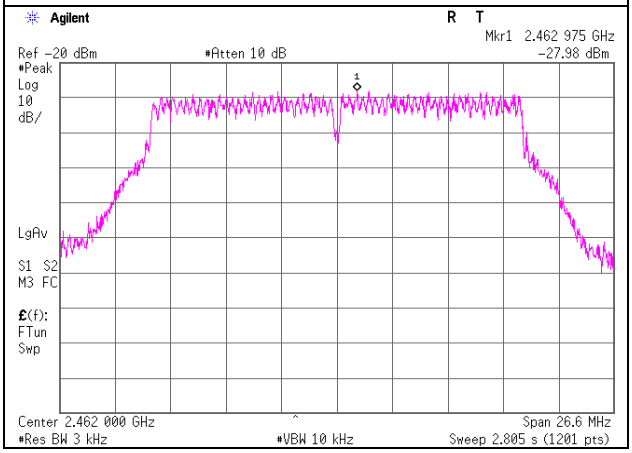
2412 MHz



2437 MHz



2462 MHz

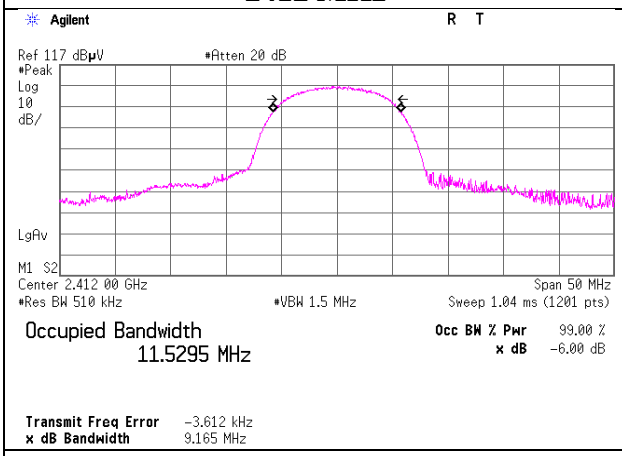


99%Occupied Bandwidth

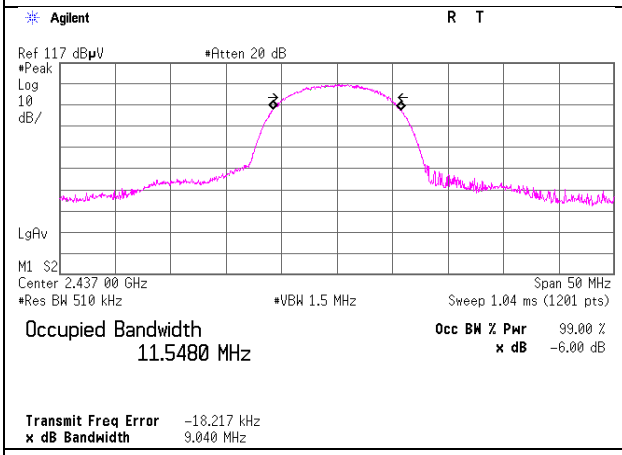
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11830772H
Date	August 2, 2017
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Yuta Moriya
Mode	Tx

11b

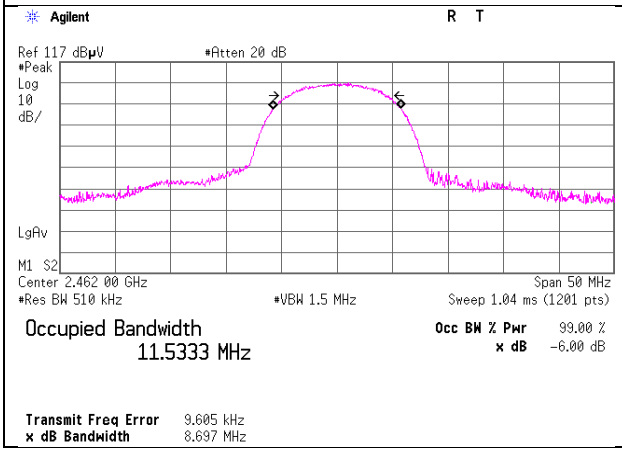
2412 MHz



2437 MHz

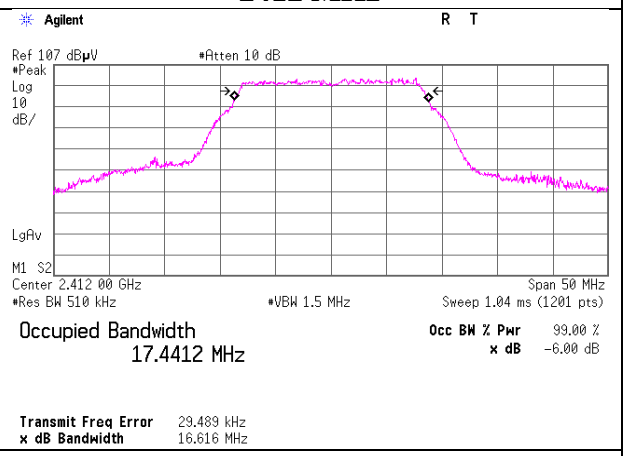


2462 MHz

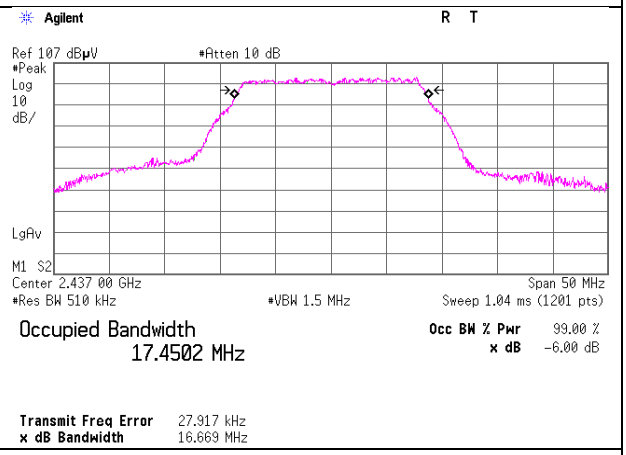


11g

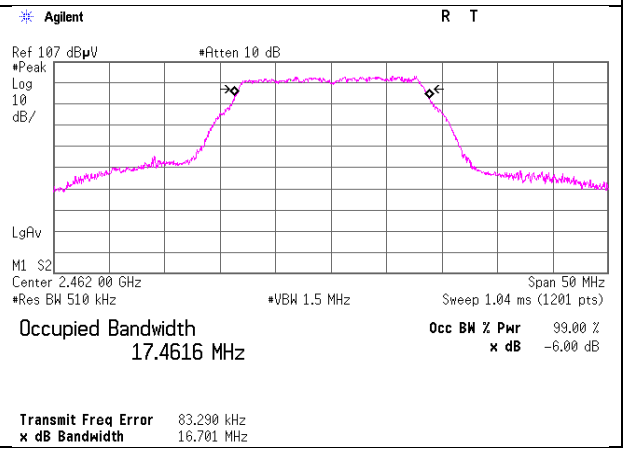
2412 MHz



2437 MHz



2462 MHz

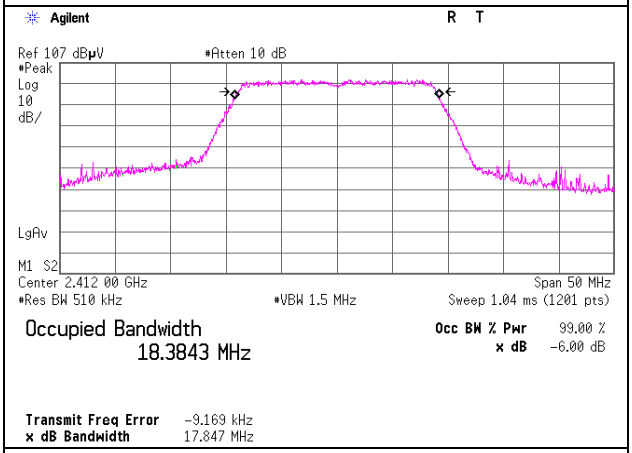


99% Occupied Bandwidth

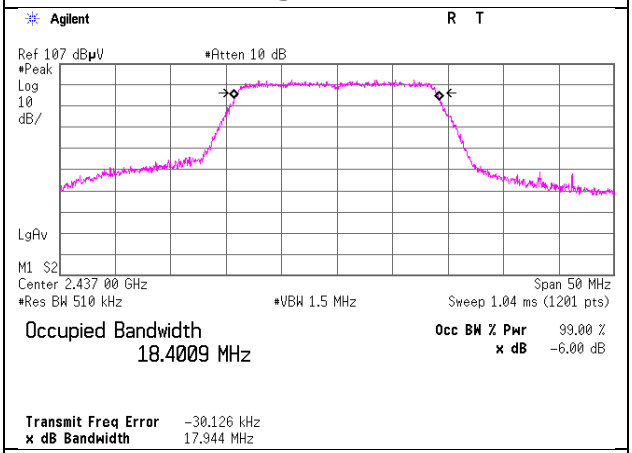
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11830772H
Date	August 2, 2017
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Yuta Moriya
Mode	Tx

11n-20

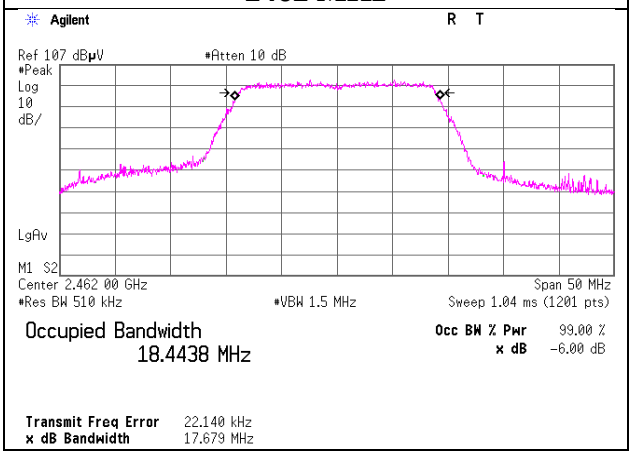
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MRENT-126	Spectrum Analyzer	KEYSIGHT	E4440A	MY46185516	AT	2016/07/01 * 12 *1)
MAT-57	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2016/12/15 * 12
MCC-174	Microwave Cable	Junkosha	MWX221	1409S497	AT	2017/03/13 * 12
MOS-34	Thermo-Hygrometer	Custom	CTH-201	3401	AT	2017/01/20 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2017/06/20 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2017/06/20 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2016/10/13 * 12
MCC-144	Microwave Cable	Junkosha	MWX221	1207S407	AT	2016/08/02 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2017/03/21 * 12
MMM-17	DIGIITAL HiTESTER	Hioki	3805	070900530	AT	2017/01/19 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2016/12/13 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2017/06/21 * 12
MCC-38	Coaxial Cable	UL Japan	-	-	AT	2016/12/06 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2016/11/28 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2017/01/20 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2016/11/10 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2017/05/22 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2017/03/21 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2016/09/21 * 12

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

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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

Test Item: RE: Radiated Emission test
AT: Antenna Terminal Conducted test