RADIO TEST REPORT

Test Report No. : 11420646H

Applicant	:	**PIONEER CORPORATION**
Type of Equipment	:	**Main Unit**
Model No.	:	**D171G5**
FCC ID	:	**AJDK099**
Test regulation	:	**FCC Part 15 Subpart C: 2016**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. 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)

Date of test: August 18 to 29, 2016

Representative test engineer:
Shinichi Miyazono
Engineer
Consumer Technology Division

Approved by:
Motoya Imura
Engineer
Consumer Technology Division

NVLAP TESTING
NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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REVISION HISTORY

Original Test Report No.: 11420646H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11420646H	September 14, 2016	-	-

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SECTION 1: Customer information

Company Name	:	PIONEER CORPORATION
Address	:	1-1 Shinogura, Saiwai-ku, Kawasaki-shi, Kanagawa-ken 212-0031, JAPAN
Telephone Number	:	+81-49-228-6415
Facsimile Number	:	+81-49-228-6493
Contact Person	:	Tomoyuki Tanaka

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

2.1 Identification of E.U.T.

Type of Equipment	:	Main Unit
Model No.	:	D171G5
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	August 18, 2016
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: D171G5 (referred to as the EUT in this report) is a Main Unit.

General Specification

Clock frequency(ies) in the system	:	Oscillator	(Module) 32.768 kHz, (System u-Com) 8 MHz
		Internal Communication	(Module) 195 MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS
Power Supply (radio part input)	:	DC 3.3 V / 1.8 V
Antenna type	:	Pattern inverted F type
Antenna Gain	:	2.29 dBi (max)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC part 15 final revised on April 6, 2016.
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

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	N/A	N/A*1)
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** -	**FCC:** Section 15.247(a)(2) **IC:** RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** RSS-Gen 6.12	**FCC:** Section 15.247(b)(3) **IC:** RSS-247 5.4(4)		Complied	Conducted
Power Density	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** -	**FCC:** Section 15.247(e) **IC:** RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.9 dB 1071.100 MHz, AV, Hori. 1071.213 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 does not have AC ports.
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.

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

FCC Part 15.31 (e)
The equipment provides the wireless transmitter with stable power supply (DC 3.3 V / 1.8 V). Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
The EUT has a unique coupling/antenna connector (U.FL). 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 (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz -3 GHz	3 GHz -18 GHz	18 GHz -26.5 GHz	26.5 GHz -40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

Test distance	Radiated emission (+/-) 9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

Polarity	Radiated emission (Below 1GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

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

*Measurement distance

Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

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 2.0m 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)

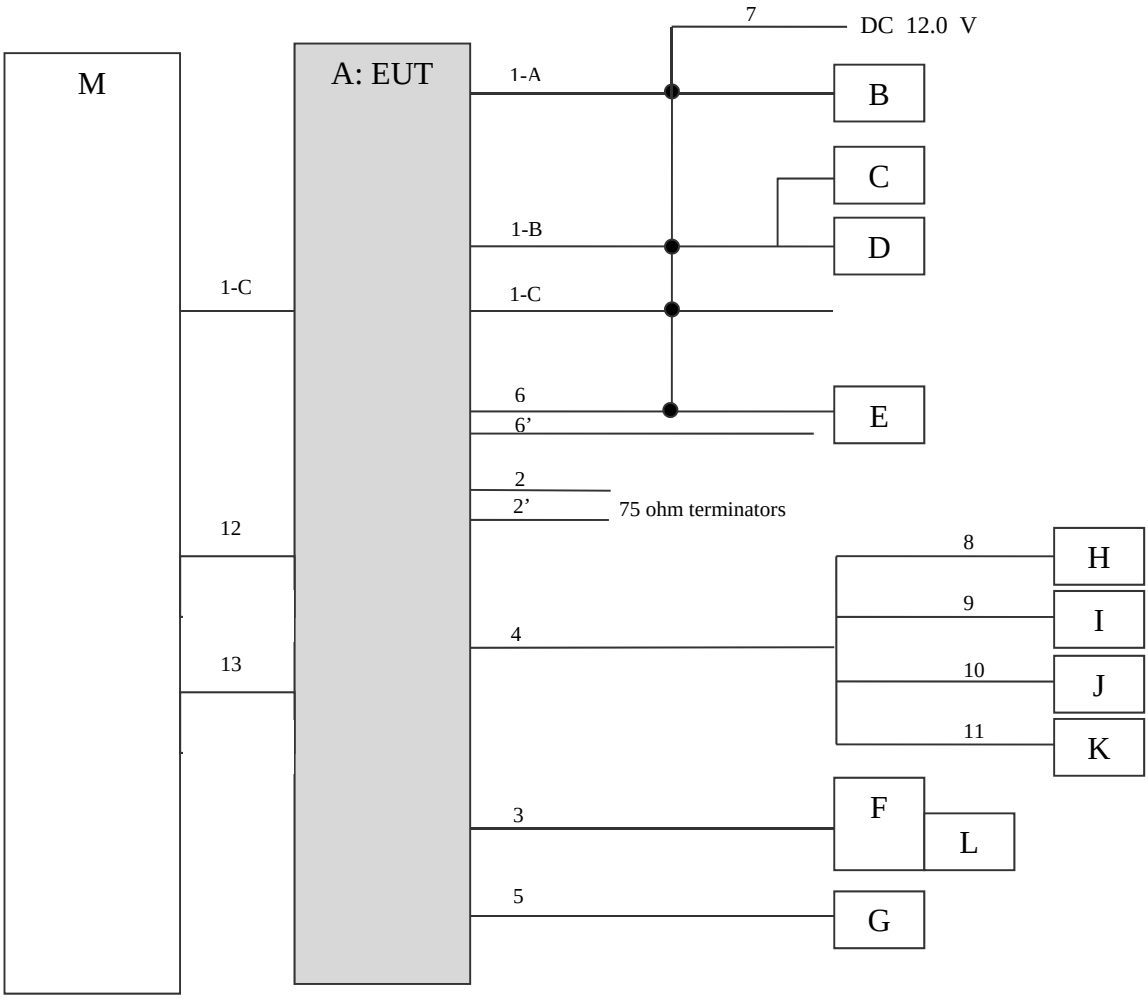
Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	2 Mbps, PN9
IEEE 802.11g (11g)	48 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 6 (Long GI), 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: 3, 11g: 4 , 11n-20: 4 Software: WLAN A113 *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
Conducted Spurious Emission, Radiated Spurious Emission (Below 1GHz)	11n-20 Tx	2437 MHz
Radiated Spurious Emission (Above 1GHz)	11b Tx 11n-20 Tx *1)	2412 MHz 2437 MHz 2462 MHz
6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
*1) The test was performed on 11n-20 Tx mode according to "Section 1 of 6 802.11 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.		

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
* The testing was performed with DC 12.0 V only.
The voltage which the car battery mounted in the car outputs was selected as a test voltage according to the customer's request.
As the stable voltage (DC 3.3 V/ 1.8 V) is provided to RF module via the internal regulator, it does not influence on the test result.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	MAIN UNIT	D171G5	PBPKTP0028CS *1) PBPKTP0053CS *2)	PIONEER	EUT
B	Steering SW	75E921LH/RH	-	-	-
C	Mic	-	-	-	-
D	Rear Camera	-	-	-	-
E	Air-con ECU	-	-	DENSO	-
F	USB	-	-	-	-
G	GPS Antenna	86860-71011	-	AISIN	-
H	Speaker	-	-	-	-
I	Dummy	-	-	-	-
J	Dummy	-	-	-	-
K	Dummy	-	-	-	-
L	USB Memory	-	-	-	-
M	Display	-	-	PIONEER	-

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

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1-A	Wire Harness Set Cable	1.1	Unshielded	Unshielded	-
1-B	Wire Harness Cable	1.1	Unshielded	Unshielded	-
1-C	Wire Harness Cable	1.1	Unshielded	Unshielded	-
2 2’	Radio antenna Cable	1.6	Shielded	Shielded	-
3	USB connector Cable	1.1	Shielded	Shielded	-
4	Speaker Cable	1.1	Unshielded	Unshielded	-
5	GPS antenna connector Cable	1.5	Shielded	Shielded	-
6 6’	Wire Harness (Air-con ECU) Cable	1.9	Unshielded	Unshielded	-
7	DC Cable	3.0	Shielded	Unshielded	-
8	Speaker Cable	1.9	Unshielded	Unshielded	-
9	Speaker Cable	1.9	Unshielded	Unshielded	-
10	Speaker Cable	1.9	Unshielded	Unshielded	-
11	Speaker Cable	1.9	Unshielded	Unshielded	-
12	Flat Cable	0.5	Unshielded	Unshielded	-
13	Flat Cable	0.5	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 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.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.4 m *2) (1 GHz - 10 GHz) 3.65 m *3) (2390 MHz, 2400 MHz, 2412 MHz and 2483.5 MHz only) 1 m *4) (10 GHz - 26.5 GHz)		4.4 m *2) (1 GHz - 10 GHz) 3.65 m *3) (2390 MHz, 2400 MHz, 2412 MHz and 2483.5 MHz only) 1 m *4) (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 v03r05".
*2) Distance Factor: 20 x log (4.4 m / 3.0 m) = 3.33 dB
*3) Distance Factor: 20 x log (3.65 m / 3.0 m) = 1.70 dB
*4) 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 M - 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 v03r05".
*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

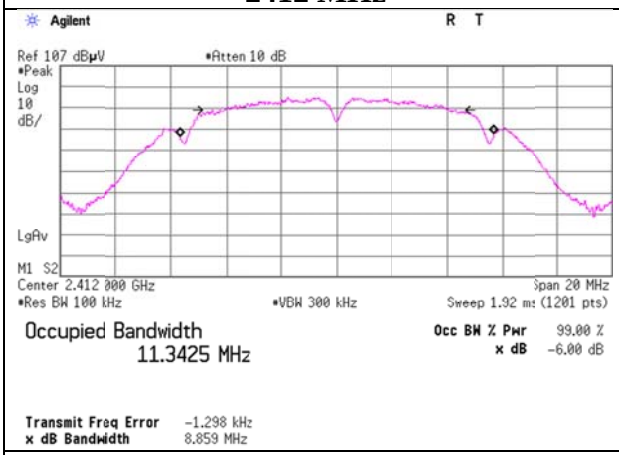
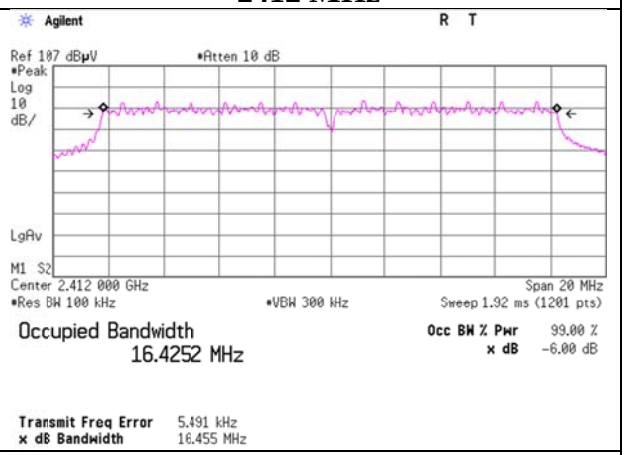
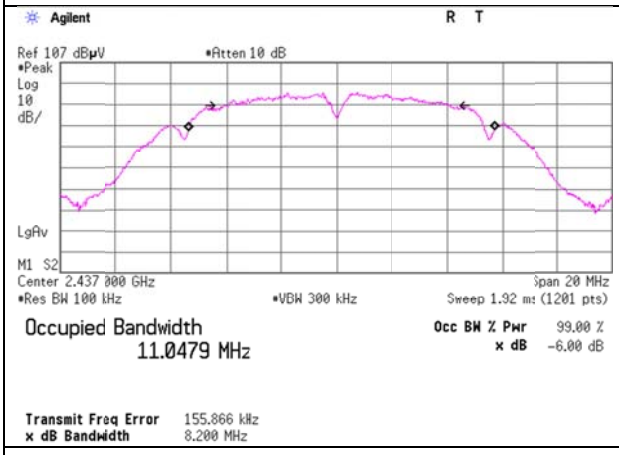
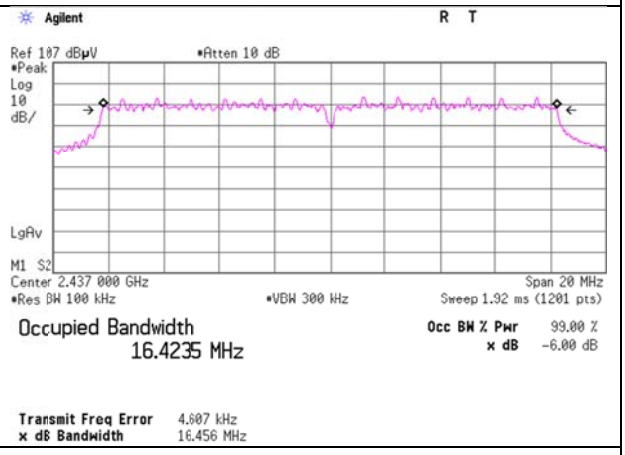
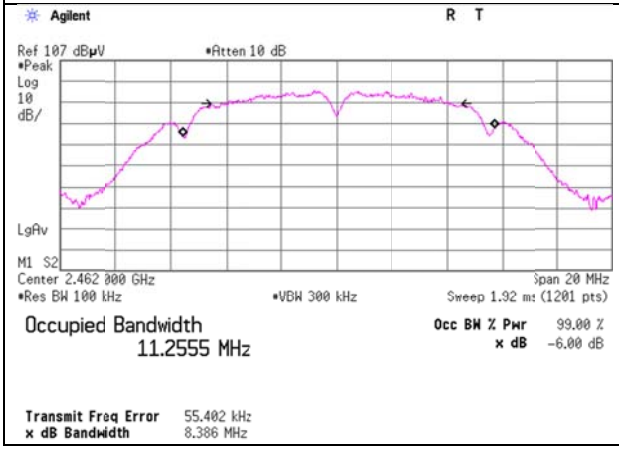
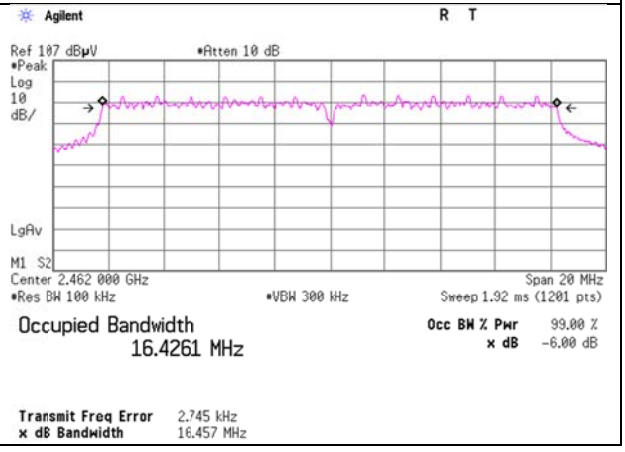
APPENDIX 1: Test data

6dB Bandwidth

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 23, 2016
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Shinichi Miyazono
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	8.859	> 500
	2437	8.200	> 500
	2462	8.386	> 500
11g	2412	16.455	> 500
	2437	16.456	> 500
	2462	16.457	> 500
11n-20	2412	17.743	> 500
	2437	17.738	> 500
	2462	17.733	> 500

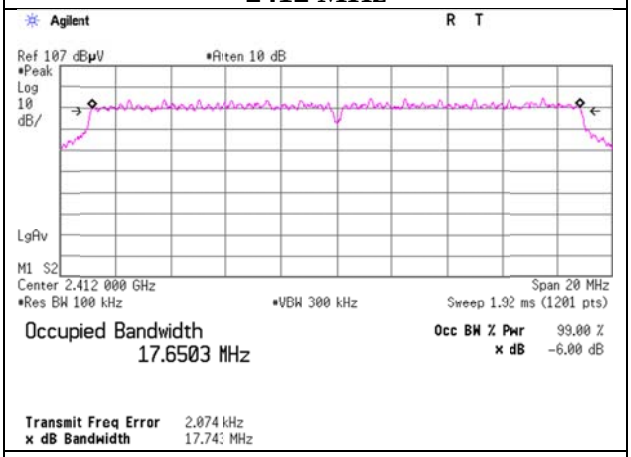
6dB Bandwidth

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

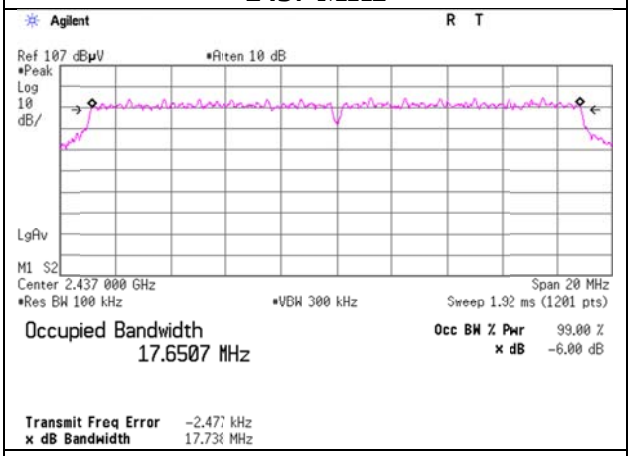
6dB Bandwidth

11n-20

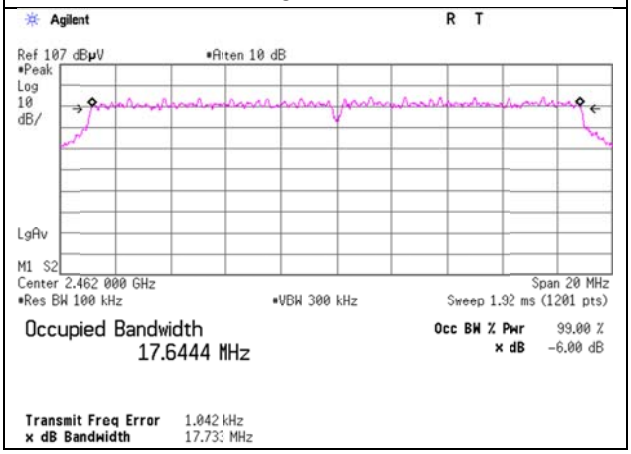
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.2 Measurement Room	
Report No.	11420646H	
Date	August 18, 2016	August 23, 2016
Temperature / Humidity	24 deg. C / 66 % RH	24 deg. C / 60 % RH
Engineer	Satofumi Matsuyama	Shinichi Miyazono
Mode	Tx 11b	

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	-4.28	1.54	10.03	7.29	5.35	30.00	1000	22.71
2437	-4.22	1.54	10.03	7.35	5.43	30.00	1000	22.65
2462	-4.13	1.55	10.03	7.45	5.55	30.00	1000	22.55

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

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	-1.65	
2	-1.48	*
5.5	-1.57	
11	-1.49	

*: 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.2 Measurement Room	
Report No.	11420646H	
Date	August 18, 2016	August 23, 2016
Temperature / Humidity	24 deg. C / 66 % RH	24 deg. C / 60 % RH
Engineer	Satofumi Matsuyama	Shinichi Miyazono
Mode	Tx 11g	

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	2.39	1.54	10.03	13.96	24.86	30.00	1000	16.04
2437	2.41	1.54	10.03	13.98	24.98	30.00	1000	16.02
2462	2.40	1.55	10.03	13.98	24.98	30.00	1000	16.02

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

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	3.02	
9	3.03	
12	2.84	
18	2.79	
24	5.01	
36	5.19	
48	5.89	*
54	5.18	

*: 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.2 Measurement Room	
Report No.	11420646H	
Date	August 18, 2016	August 23, 2016
Temperature / Humidity	24 deg. C / 66 % RH	24 deg. C / 60 % RH
Engineer	Satofumi Matsuyama	Shinichi Miyazono
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	2.40	1.54	10.03	13.97	24.92	30.00	1000	16.03
2437	2.43	1.54	10.03	14.00	25.09	30.00	1000	16.00
2462	2.40	1.55	10.03	13.98	24.98	30.00	1000	16.02

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

2437MHz

MCS Number	Reading [dBm]	Remark
0	4.68	
1	5.17	
2	4.76	
3	7.10	
4	7.07	
5	6.81	
6	7.17	*
7	6.99	

* Worst MCS

MCS Number	Reading [dBm]	GI	Remark
6	7.17	Long	*
6	7.03	Short	

* 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.2 Measurement Room
Report No.	11420646H
Date	August 23, 2016
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11b **2 Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
2412	-8.03	1.54	10.03	3.54	2.26	0.09	3.63	2.30
2437	-7.99	1.54	10.03	3.58	2.28	0.09	3.67	2.33
2462	-7.90	1.55	10.03	3.68	2.33	0.09	3.77	2.38

11g **48 Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
2412	-9.44	1.54	10.03	2.13	1.63	1.80	3.93	2.47
2437	-9.40	1.54	10.03	2.17	1.65	1.80	3.97	2.49
2462	-9.33	1.55	10.03	2.25	1.68	1.80	4.05	2.54

11n-20 **MCS 6**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average) [dBm]	Result (Time average) [mW]	Duty factor [dB]	Result (Burst power average) [dBm]	Result (Burst power average) [mW]
2412	-9.52	1.54	10.03	2.05	1.60	1.90	3.95	2.48
2437	-9.48	1.54	10.03	2.09	1.62	1.90	3.99	2.50
2462	-9.55	1.55	10.03	2.03	1.59	1.90	3.93	2.47

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

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 18, 2016
Temperature / Humidity	24 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	-5.15	0.05	-5.10	
	2	-5.02	0.09	-4.93	*
	5.5	-5.21	0.24	-4.97	
	11	-5.39	0.45	-4.94	
11g	6	-4.30	0.30	-4.00	
	9	-4.49	0.43	-4.06	
	12	-4.68	0.57	-4.11	
	18	-4.83	0.81	-4.02	
	24	-4.97	1.04	-3.93	
	36	-5.28	1.44	-3.84	
	48	-5.55	1.80	-3.75	*
	54	-5.75	1.93	-3.82	

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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.

2437 MHz

Mode	Rate MCS	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20	0	-3.46	0.32	-3.14	
	1	-3.78	0.60	-3.18	
	2	-4.01	0.84	-3.17	
	3	-3.96	1.06	-2.90	
	4	-4.38	1.45	-2.93	
	5	-4.65	1.78	-2.87	
	6	-4.73	1.90	-2.83	*
	7	-4.90	2.04	-2.86	

* Worst rate

MCS Number	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	GI	Remark
6	-4.73	1.90	-2.83	Long	*
6	-4.75	1.90	-2.85	Short	

* Worst Conditioin

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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

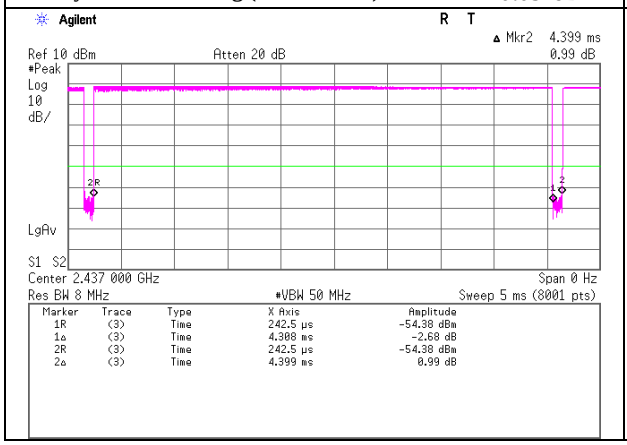
*Difference between worst rate check data and formal test result is due to the different test condition.

Burst rate confirmation

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 18, 2016
Temperature / Humidity	24 deg. C / 66 % RH
Engineer	Satofumi Matsuyama
Mode	Tx

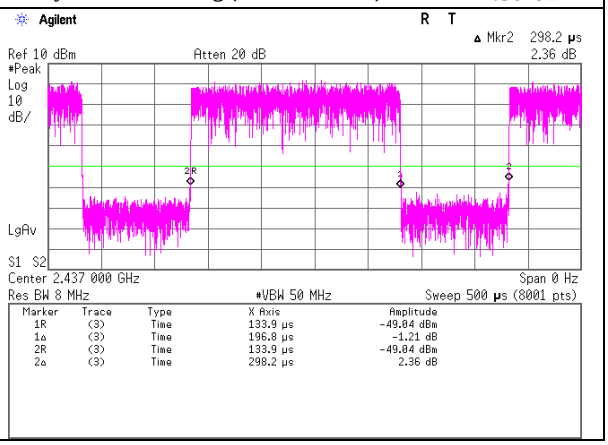
11b 2 Mbps

Tx on / (Tx on + Tx off) =	**0.979**
Tx on / (Tx on + Tx off) * 100 =	**97.9 %**
Duty factor = 10 * log (4.399 / 4.308) =	**0.09 dB**



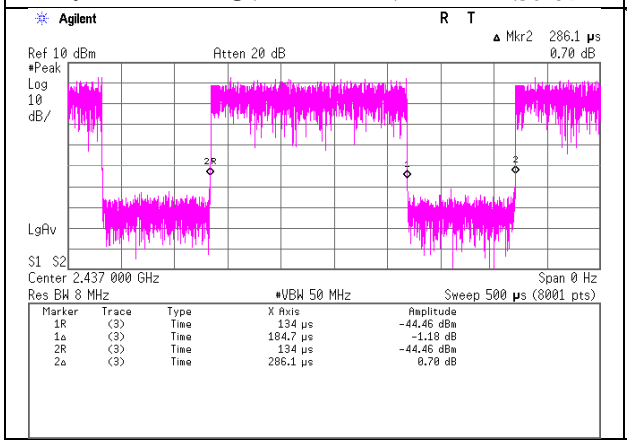
11g 48 Mbps

Tx on / (Tx on + Tx off) =	**0.660**
Tx on / (Tx on + Tx off) * 100 =	**66.0 %**
Duty factor = 10 * log (0.2982 / 0.1968) =	**1.80 dB**



11n-20 MCS 6

Tx on / (Tx on + Tx off) =	**0.646**
Tx on / (Tx on + Tx off) * 100 =	**64.6 %**
Duty factor = 10 * log (0.2861 / 0.1847) =	**1.90 dB**



Radiated Spurious Emission

Test place	Ise EMC Lab.	
Report No.	11420646H	
Semi Anechoic Chamber	No.4	No.2
Date	August 18, 2016	August 29, 2016
Temperature / Humidity	23 deg. C / 55 % RH	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 26.5 GHz)	Shinichi Miyazono (Bandedge)
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	1071.116	PK	61.0	24.6	5.5	34.9	-	56.2	73.9	17.7	
Hori	1345.000	PK	56.9	25.1	5.8	33.9	-	53.9	73.9	20.0	
Hori	1613.250	PK	50.6	25.9	6.0	33.2	-	49.3	73.9	24.6	
Hori	1875.400	PK	49.4	27.0	6.2	32.6	-	50.0	73.9	23.9	
Hori	2390.000	PK	46.3	27.6	4.4	34.8	-	43.5	73.9	30.4	
Hori	4824.000	PK	39.6	32.9	8.8	31.3	-	50.0	73.9	23.9	Floor noise
Hori	7236.000	PK	40.7	36.8	9.9	32.6	-	54.8	73.9	19.1	Floor noise
Hori	9648.000	PK	40.5	38.1	10.8	32.6	-	56.8	73.9	17.1	Floor noise
Hori	1071.116	AV	48.9	24.6	5.5	34.9	0.1	44.2	53.9	9.7	
Hori	1345.000	AV	34.3	25.1	5.8	33.9	0.1	31.4	53.9	22.5	
Hori	1613.250	AV	34.2	25.9	6.0	33.2	0.1	33.0	53.9	20.9	
Hori	1875.400	AV	35.7	27.0	6.2	32.6	0.1	36.4	53.9	17.5	
Hori	2390.000	AV	36.3	27.6	4.4	34.8	0.1	33.6	53.9	20.3	*1)
Hori	4824.000	AV	31.6	32.9	8.8	31.3	-	42.0	53.9	11.9	Floor noise
Hori	7236.000	AV	33.3	36.8	9.9	32.6	-	47.4	53.9	6.5	Floor noise
Hori	9648.000	AV	31.5	38.1	10.8	32.6	-	47.8	53.9	6.1	Floor noise
Vert	1070.283	PK	59.6	24.6	5.5	34.9	-	54.8	73.9	19.1	
Vert	1344.067	PK	54.3	25.1	5.8	33.9	-	51.3	73.9	22.6	
Vert	1609.208	PK	50.9	25.8	6.0	33.2	-	49.5	73.9	24.4	
Vert	1881.033	PK	46.8	27.0	6.2	32.6	-	47.4	73.9	26.5	
Vert	2390.000	PK	46.2	27.6	4.4	34.8	-	43.4	73.9	30.5	
Vert	4824.000	PK	39.6	32.9	8.8	31.3	-	50.0	73.9	23.9	Floor noise
Vert	7236.000	PK	40.7	36.8	9.9	32.6	-	54.8	73.9	19.1	Floor noise
Vert	9648.000	PK	40.5	38.1	10.8	32.6	-	56.8	73.9	17.1	Floor noise
Vert	1070.283	AV	45.3	24.6	5.5	34.9	0.1	40.6	53.9	13.3	
Vert	1344.067	AV	34.2	25.1	5.8	33.9	0.1	31.3	53.9	22.6	
Vert	1609.208	AV	33.3	25.8	6.0	33.2	0.1	32.0	53.9	21.9	
Vert	1881.033	AV	32.7	27.0	6.2	32.6	0.1	33.4	53.9	20.5	
Vert	2390.000	AV	36.2	27.6	4.4	34.8	0.1	33.5	53.9	20.4	*1)
Vert	4824.000	AV	31.6	32.9	8.8	31.3	-	42.0	53.9	11.9	Floor noise
Vert	7236.000	AV	33.3	36.8	9.9	32.6	-	47.4	53.9	6.5	Floor noise
Vert	9648.000	AV	31.5	38.1	10.8	32.6	-	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 20log (4.4 m / 3.0 m) = 3.33 dB 20log (3.65 m / 3.0 m) = 1.70 dB: 2390 MHz only
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

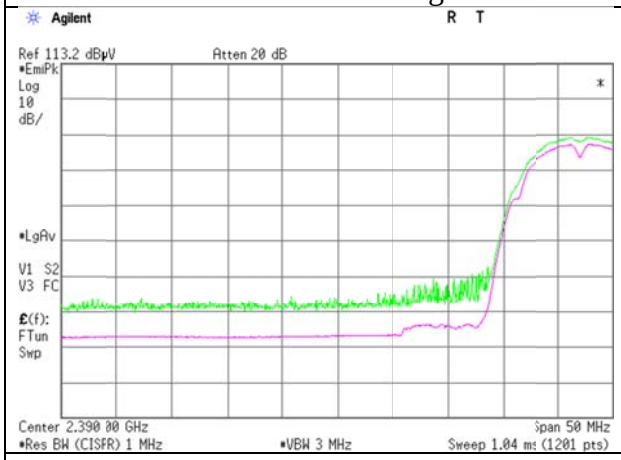
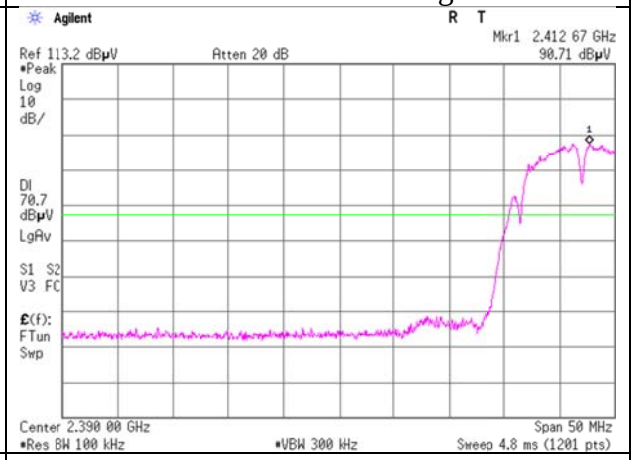
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	90.7	27.6	4.4	34.8	87.9	-	-	Carrier
Hori	2400.000	PK	39.8	27.6	4.4	34.8	37.0	67.9	30.9	
Vert	2412.000	PK	89.6	27.6	4.4	34.8	86.8	-	-	Carrier
Vert	2400.000	PK	39.5	27.6	4.4	34.8	36.7	66.8	30.1	

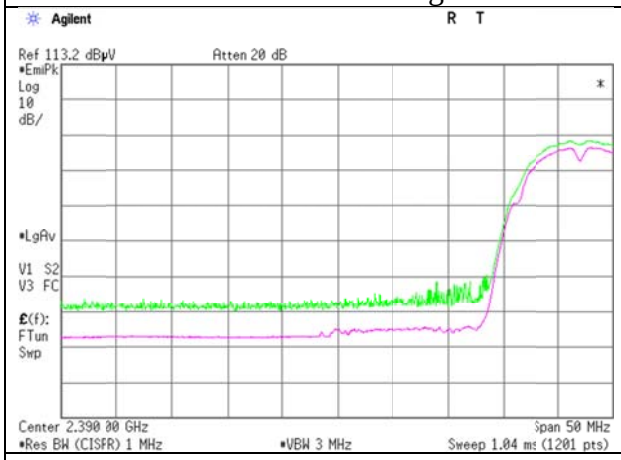
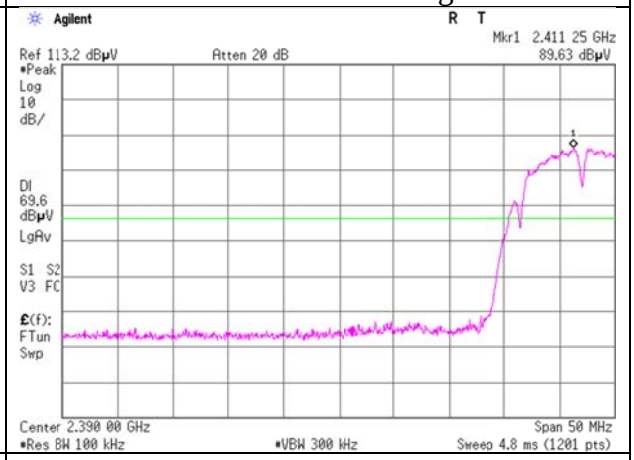
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 20log (3.65 m / 3.0 m) = 1.70 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11420646H
Date	August 29, 2016
Temperature / Humidity	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (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.

Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11420646H
Date	August 18, 2016
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Shinichi Miyazono (1 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	1071.111	PK	61.1	24.6	5.5	34.9	-	56.3	73.9	17.6	
Hori	1345.103	PK	57.0	25.1	5.8	33.9	-	54.0	73.9	19.9	
Hori	1613.258	PK	50.5	25.9	6.0	33.2	-	49.2	73.9	24.7	
Hori	1875.404	PK	49.3	27.0	6.2	32.6	-	49.9	73.9	24.0	
Hori	4874.000	PK	39.9	33.1	8.8	31.3	-	50.5	73.9	23.4	Floor noise
Hori	7311.000	PK	40.9	36.8	9.9	32.6	-	55.0	73.9	18.9	Floor noise
Hori	9748.000	PK	39.0	38.2	10.8	32.7	-	55.3	73.9	18.6	Floor noise
Hori	1071.111	AV	49.0	24.6	5.5	34.9	0.1	44.3	53.9	9.6	
Hori	1345.103	AV	34.4	25.1	5.8	33.9	0.1	31.5	53.9	22.4	
Hori	1613.258	AV	34.2	25.9	6.0	33.2	0.1	33.0	53.9	20.9	
Hori	1875.404	AV	35.5	27.0	6.2	32.6	0.1	36.2	53.9	17.7	
Hori	4874.000	AV	31.2	33.1	8.8	31.3	-	41.8	53.9	12.1	Floor noise
Hori	7311.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9748.000	AV	31.1	38.2	10.8	32.7	-	47.4	53.9	6.5	Floor noise
Vert	1070.277	PK	59.7	24.6	5.5	34.9	-	54.9	73.9	19.0	
Vert	1344.058	PK	54.5	25.1	5.8	33.9	-	51.5	73.9	22.4	
Vert	1609.221	PK	51.0	25.8	6.0	33.2	-	49.6	73.9	24.3	
Vert	1881.076	PK	46.7	27.0	6.2	32.6	-	47.3	73.9	26.6	
Vert	4874.000	PK	39.9	33.1	8.8	31.3	-	50.5	73.9	23.4	Floor noise
Vert	7311.000	PK	40.9	36.8	9.9	32.6	-	55.0	73.9	18.9	Floor noise
Vert	9748.000	PK	39.0	38.2	10.8	32.7	-	55.3	73.9	18.6	Floor noise
Vert	1070.277	AV	45.4	24.6	5.5	34.9	0.1	40.7	53.9	13.2	
Vert	1344.058	AV	34.3	25.1	5.8	33.9	0.1	31.4	53.9	22.5	
Vert	1609.221	AV	33.4	25.8	6.0	33.2	0.1	32.1	53.9	21.8	
Vert	1881.076	AV	32.6	27.0	6.2	32.6	0.1	33.3	53.9	20.6	
Vert	4874.000	AV	31.2	33.1	8.8	31.3	-	41.8	53.9	12.1	Floor noise
Vert	7311.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Vert	9748.000	AV	31.1	38.2	10.8	32.7	-	47.4	53.9	6.5	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 (4.4 m / 3.0 m) = 3.33 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.4 Semi Anechoic Chamber
Report No.	11420646H
Date	August 18, 2016
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Shinichi Miyazono (1 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	1071.121	PK	61.1	24.6	5.5	34.9	-	56.3	73.9	17.6	
Hori	1345.039	PK	57.0	25.1	5.8	33.9	-	54.0	73.9	19.9	
Hori	1613.244	PK	50.7	25.9	6.0	33.2	-	49.4	73.9	24.5	
Hori	1875.422	PK	49.5	27.0	6.2	32.6	-	50.1	73.9	23.8	
Hori	2483.500	PK	47.3	27.7	4.5	34.7	-	44.8	73.9	29.1	
Hori	4924.000	PK	40.1	33.3	8.9	31.3	-	51.0	73.9	22.9	Floor noise
Hori	7386.000	PK	40.6	36.8	9.9	32.6	-	54.7	73.9	19.2	Floor noise
Hori	9848.000	PK	41.1	38.2	10.8	32.7	-	57.4	73.9	16.5	Floor noise
Hori	1071.121	AV	49.0	24.6	5.5	34.9	0.1	44.3	53.9	9.6	
Hori	1345.039	AV	34.4	25.1	5.8	33.9	0.1	31.5	53.9	22.4	
Hori	1613.244	AV	34.3	25.9	6.0	33.2	0.1	33.1	53.9	20.8	
Hori	1875.422	AV	35.6	27.0	6.2	32.6	0.1	36.3	53.9	17.6	
Hori	2483.500	AV	37.3	27.7	4.5	34.7	0.1	34.9	53.9	19.0	*1)
Hori	4924.000	AV	29.7	33.3	8.9	31.3	-	40.6	53.9	13.3	Floor noise
Hori	7386.000	AV	31.0	36.8	9.9	32.6	-	45.1	53.9	8.8	Floor noise
Hori	9848.000	AV	31.5	38.2	10.8	32.7	-	47.8	53.9	6.1	Floor noise
Vert	1070.271	PK	59.5	24.6	5.5	34.9	-	54.7	73.9	19.2	
Vert	1344.071	PK	54.4	25.1	5.8	33.9	-	51.4	73.9	22.5	
Vert	1609.212	PK	51.0	25.8	6.0	33.2	-	49.6	73.9	24.3	
Vert	1881.058	PK	46.9	27.0	6.2	32.6	-	47.5	73.9	26.4	
Vert	2483.500	PK	47.4	27.7	4.5	34.7	-	44.9	73.9	29.0	
Vert	4924.000	PK	40.1	33.3	8.9	31.3	-	51.0	73.9	22.9	Floor noise
Vert	7386.000	PK	40.6	36.8	9.9	32.6	-	54.7	73.9	19.2	Floor noise
Vert	9848.000	PK	41.1	38.2	10.8	32.7	-	57.4	73.9	16.5	Floor noise
Vert	1070.271	AV	45.4	24.6	5.5	34.9	0.1	40.7	53.9	13.2	
Vert	1344.071	AV	34.3	25.1	5.8	33.9	0.1	31.4	53.9	22.5	
Vert	1609.212	AV	33.4	25.8	6.0	33.2	0.1	32.1	53.9	21.8	
Vert	1881.058	AV	32.8	27.0	6.2	32.6	0.1	33.5	53.9	20.4	
Vert	2483.500	AV	37.4	27.7	4.5	34.7	0.1	35.0	53.9	18.9	*1)
Vert	4924.000	AV	29.7	33.3	8.9	31.3	-	40.6	53.9	13.3	Floor noise
Vert	7386.000	AV	31.0	36.8	9.9	32.6	-	45.1	53.9	8.8	Floor noise
Vert	9848.000	AV	31.5	38.2	10.8	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 20log (4.4 m / 3.0 m) = 3.33 dB 20log (3.65 m / 3.0 m) = 1.70 dB: 2483.5 MHz only
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

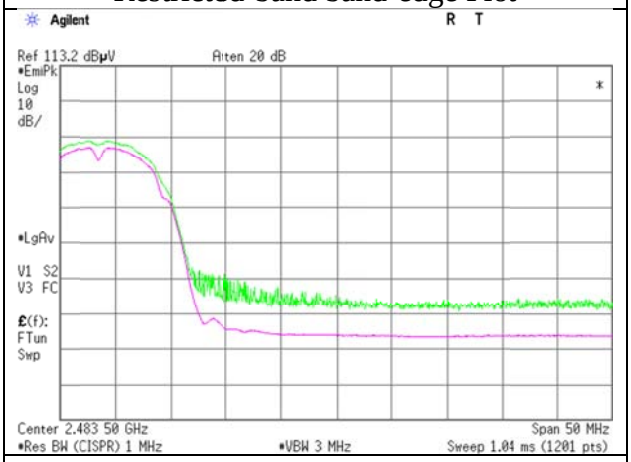
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11420646H
Date	August 29, 2016
Temperature / Humidity	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

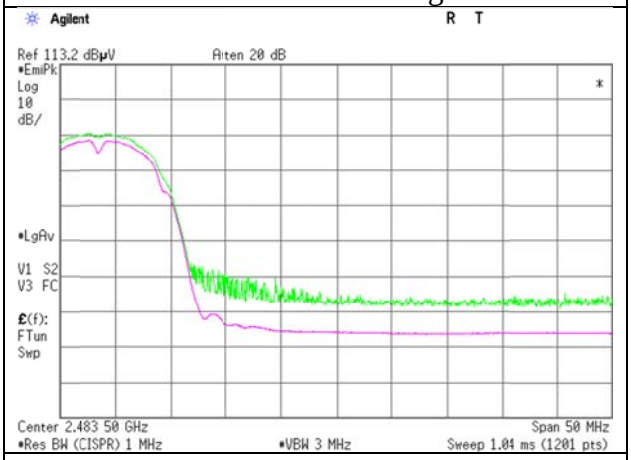
Restricted-band band-edge Plot



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.	
Report No.	11420646H	
Semi Anechoic Chamber	No.4	No.2
Date	August 18, 2016	August 29, 2016
Temperature / Humidity	23 deg. C / 55 % RH	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 26.5 GHz)	Shinichi Miyazono (Bandedge)
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	1071.225	PK	60.8	24.6	5.5	34.9	-	56.0	73.9	17.9	
Hori	1345.108	PK	57.0	25.1	5.8	33.9	-	54.0	73.9	19.9	
Hori	1613.367	PK	50.7	25.9	6.0	33.2	-	49.4	73.9	24.5	
Hori	1875.355	PK	49.5	27.0	6.2	32.6	-	50.1	73.9	23.8	
Hori	2390.000	PK	46.3	27.6	4.4	34.8	-	43.5	73.9	30.4	
Hori	4824.000	PK	39.6	32.9	8.8	31.3	-	50.0	73.9	23.9	Floor noise
Hori	7236.000	PK	40.7	36.8	9.9	32.6	-	54.8	73.9	19.1	Floor noise
Hori	9648.000	PK	40.5	38.1	10.8	32.6	-	56.8	73.9	17.1	Floor noise
Hori	1071.225	AV	48.8	24.6	5.5	34.9	1.9	45.9	53.9	8.0	
Hori	1345.108	AV	34.4	25.1	5.8	33.9	1.9	33.3	53.9	20.6	
Hori	1613.367	AV	34.3	25.9	6.0	33.2	1.9	34.9	53.9	19.0	
Hori	1875.355	AV	35.8	27.0	6.2	32.6	1.9	38.3	53.9	15.6	
Hori	2390.000	AV	36.6	27.6	4.4	34.8	1.9	35.7	53.9	18.2	*1)
Hori	4824.000	AV	31.6	32.9	8.8	31.3	-	42.0	53.9	11.9	Floor noise
Hori	7236.000	AV	33.3	36.8	9.9	32.6	-	47.4	53.9	6.5	Floor noise
Hori	9648.000	AV	31.5	38.1	10.8	32.6	-	47.8	53.9	6.1	Floor noise
Vert	1070.254	PK	59.7	24.6	5.5	34.9	-	54.9	73.9	19.0	
Vert	1344.071	PK	54.4	25.1	5.8	33.9	-	51.4	73.9	22.5	
Vert	1609.295	PK	51.0	25.8	6.0	33.2	-	49.6	73.9	24.3	
Vert	1881.069	PK	47.0	27.0	6.2	32.6	-	47.6	73.9	26.3	
Vert	2390.000	PK	46.1	27.6	4.4	34.8	-	43.3	73.9	30.6	
Vert	4824.000	PK	39.6	32.9	8.8	31.3	-	50.0	73.9	23.9	Floor noise
Vert	7236.000	PK	40.7	36.8	9.9	32.6	-	54.8	73.9	19.1	Floor noise
Vert	9648.000	PK	40.5	38.1	10.8	32.6	-	56.8	73.9	17.1	Floor noise
Vert	1070.254	AV	45.4	24.6	5.5	34.9	1.9	42.5	53.9	11.4	
Vert	1344.071	AV	34.3	25.1	5.8	33.9	1.9	33.2	53.9	20.7	
Vert	1609.295	AV	33.4	25.8	6.0	33.2	1.9	33.9	53.9	20.0	
Vert	1881.069	AV	32.8	27.0	6.2	32.6	1.9	35.3	53.9	18.6	
Vert	2390.000	AV	36.4	27.6	4.4	34.8	1.9	35.5	53.9	18.4	*1)
Vert	4824.000	AV	31.6	32.9	8.8	31.3	-	42.0	53.9	11.9	Floor noise
Vert	7236.000	AV	33.3	36.8	9.9	32.6	-	47.4	53.9	6.5	Floor noise
Vert	9648.000	AV	31.5	38.1	10.8	32.6	-	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 20log (4.4 m / 3.0 m) = 3.33 dB 20log (3.65 m / 3.0 m) = 1.70 dB: 2390 MHz only
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

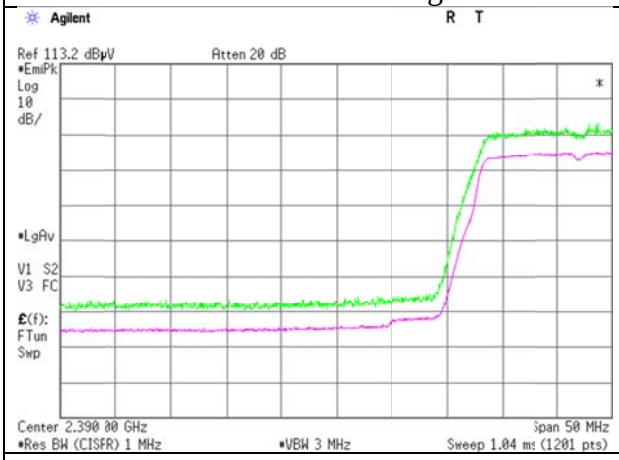
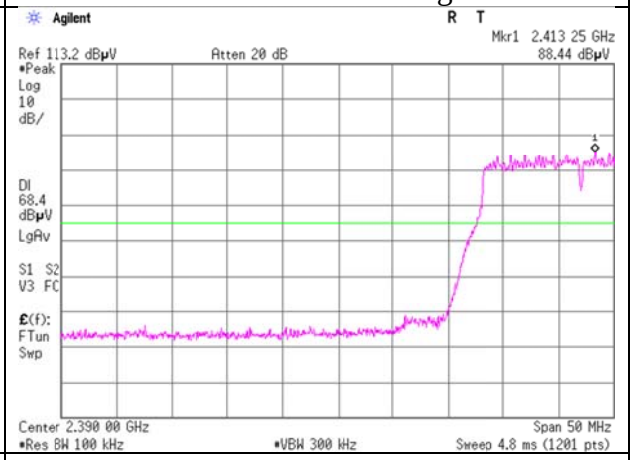
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	88.4	27.6	4.4	34.8	85.6	-	-	Carrier
Hori	2400.000	PK	44.8	27.6	4.4	34.8	42.0	65.6	23.6	
Vert	2412.000	PK	87.4	27.6	4.4	34.8	84.6	-	-	Carrier
Vert	2400.000	PK	43.5	27.6	4.4	34.8	40.7	64.6	23.9	

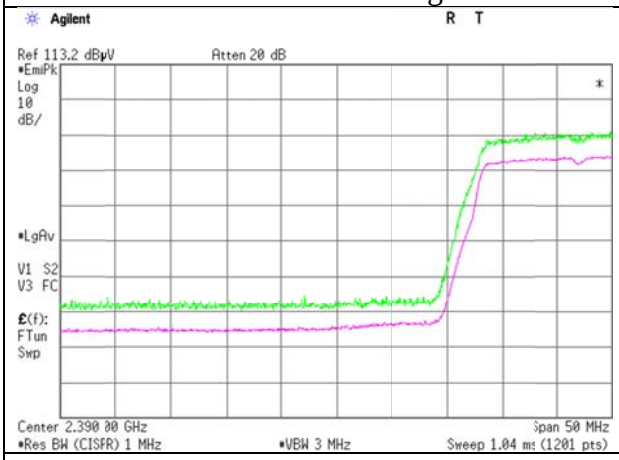
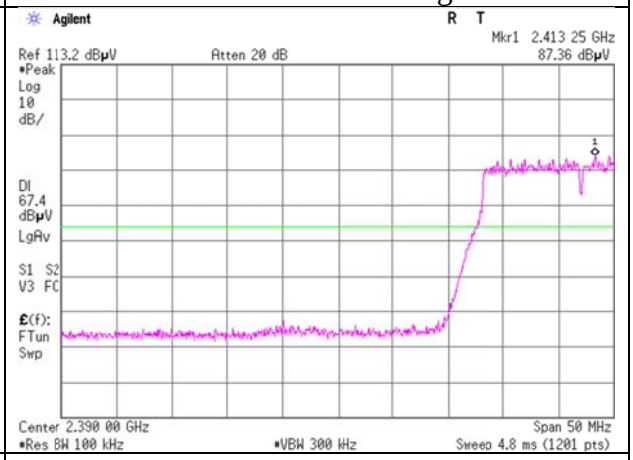
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor: 20log (3.65 m / 3.0 m) = 1.70 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11420646H
Date	August 29, 2016
Temperature / Humidity	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (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.	
Report No.	11420646H	
Semi Anechoic Chamber	No.4	No.2
Date	August 18, 2016	August 29, 2016
Temperature / Humidity	23 deg. C / 55 % RH	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 26.5 GHz)	Shinichi Miyazono (Below 1 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	60.000	QP	33.8	7.4	7.1	28.4	-	19.9	40.0	20.1	
Hori	66.240	QP	31.5	6.6	7.1	28.4	-	16.8	40.0	23.2	
Hori	74.014	QP	30.6	6.3	7.2	28.3	-	15.8	40.0	24.2	
Hori	111.022	QP	36.8	11.6	7.5	28.1	-	27.8	43.5	15.7	
Hori	148.029	QP	30.2	14.7	7.8	28.0	-	24.7	43.5	18.8	
Hori	259.049	QP	43.5	12.7	8.5	27.4	-	37.3	46.0	8.7	
Hori	1071.100	PK	61.0	24.6	5.5	34.9	-	56.2	73.9	17.7	
Hori	1345.087	PK	56.9	25.1	5.8	33.9	-	53.9	73.9	20.0	
Hori	1613.212	PK	50.3	25.9	6.0	33.2	-	49.0	73.9	24.9	
Hori	1875.331	PK	49.4	27.0	6.2	32.6	-	50.0	73.9	23.9	
Hori	4874.000	PK	39.9	33.1	8.8	31.3	-	50.5	73.9	23.4	Floor noise
Hori	7311.000	PK	40.9	36.8	9.9	32.6	-	55.0	73.9	18.9	Floor noise
Hori	9748.000	PK	39.0	38.2	10.8	32.7	-	55.3	73.9	18.6	Floor noise
Hori	1071.100	AV	48.9	24.6	5.5	34.9	1.9	46.0	53.9	7.9	
Hori	1345.087	AV	34.3	25.1	5.8	33.9	1.9	33.2	53.9	20.7	
Hori	1613.212	AV	34.1	25.9	6.0	33.2	1.9	34.7	53.9	19.2	
Hori	1875.331	AV	35.3	27.0	6.2	32.6	1.9	37.8	53.9	16.1	
Hori	4874.000	AV	31.2	33.1	8.8	31.3	-	41.8	53.9	12.1	Floor noise
Hori	7311.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Hori	9748.000	AV	31.1	38.2	10.8	32.7	-	47.4	53.9	6.5	Floor noise
Vert	60.000	QP	30.5	7.4	7.1	28.4	-	16.6	40.0	23.4	
Vert	74.016	QP	33.9	6.3	7.2	28.3	-	19.1	40.0	20.9	
Vert	111.020	QP	39.0	11.6	7.5	28.1	-	30.0	43.5	13.5	
Vert	120.270	QP	32.6	12.8	7.6	28.1	-	24.9	43.5	18.6	
Vert	148.030	QP	30.0	14.7	7.8	28.0	-	24.5	43.5	19.0	
Vert	259.049	QP	41.3	12.7	8.5	27.4	-	35.1	46.0	10.9	
Vert	1070.251	PK	59.8	24.6	5.5	34.9	-	55.0	73.9	18.9	
Vert	1344.099	PK	54.3	25.1	5.8	33.9	-	51.3	73.9	22.6	
Vert	1609.200	PK	51.1	25.8	6.0	33.2	-	49.7	73.9	24.2	
Vert	1881.095	PK	46.8	27.0	6.2	32.6	-	47.4	73.9	26.5	
Vert	4874.000	PK	39.9	33.1	8.8	31.3	-	50.5	73.9	23.4	Floor noise
Vert	7311.000	PK	40.9	36.8	9.9	32.6	-	55.0	73.9	18.9	Floor noise
Vert	9748.000	PK	39.0	38.2	10.8	32.7	-	55.3	73.9	18.6	Floor noise
Vert	1070.251	AV	45.2	24.6	5.5	34.9	1.9	42.3	53.9	11.6	
Vert	1344.099	AV	34.1	25.1	5.8	33.9	1.9	33.0	53.9	20.9	
Vert	1609.200	AV	33.3	25.8	6.0	33.2	1.9	33.8	53.9	20.1	
Vert	1881.095	AV	32.8	27.0	6.2	32.6	1.9	35.3	53.9	18.6	
Vert	4874.000	AV	31.2	33.1	8.8	31.3	-	41.8	53.9	12.1	Floor noise
Vert	7311.000	AV	32.8	36.8	9.9	32.6	-	46.9	53.9	7.0	Floor noise
Vert	9748.000	AV	31.1	38.2	10.8	32.7	-	47.4	53.9	6.5	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 (4.4 m / 3.0 m) = 3.33 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.4 Semi Anechoic Chamber	
Report No.	11420646H	
Date	August 18, 2016	August 29, 2016
Temperature / Humidity	23 deg. C / 55 % RH	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 10 GHz)	Shinichi Miyazono (Bandedge)
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	1071.213	PK	60.7	24.6	5.5	34.9	-	55.9	73.9	18.0	
Hori	1345.154	PK	56.9	25.1	5.8	33.9	-	53.9	73.9	20.0	
Hori	1613.138	PK	50.6	25.9	6.0	33.2	-	49.3	73.9	24.6	
Hori	1875.339	PK	49.4	27.0	6.2	32.6	-	50.0	73.9	23.9	
Hori	2483.500	PK	48.8	27.7	4.5	34.7	-	46.3	73.9	27.6	
Hori	4924.000	PK	40.1	33.3	8.9	31.3	-	51.0	73.9	22.9	Floor noise
Hori	7386.000	PK	40.6	36.8	9.9	32.6	-	54.7	73.9	19.2	Floor noise
Hori	9848.000	PK	41.1	38.2	10.8	32.7	-	57.4	73.9	16.5	Floor noise
Hori	1071.213	AV	48.9	24.6	5.5	34.9	1.9	46.0	53.9	7.9	
Hori	1345.154	AV	34.2	25.1	5.8	33.9	1.9	33.1	53.9	20.8	
Hori	1613.138	AV	34.1	25.9	6.0	33.2	1.9	34.7	53.9	19.2	
Hori	1875.339	AV	35.3	27.0	6.2	32.6	1.9	37.8	53.9	16.1	
Hori	2483.500	AV	39.1	27.7	4.5	34.7	1.9	38.5	53.9	15.4	*1)
Hori	4924.000	AV	29.7	33.3	8.9	31.3	-	40.6	53.9	13.3	Floor noise
Hori	7386.000	AV	31.0	36.8	9.9	32.6	-	45.1	53.9	8.8	Floor noise
Hori	9848.000	AV	31.5	38.2	10.8	32.7	-	47.8	53.9	6.1	Floor noise
Vert	1070.198	PK	59.4	24.6	5.5	34.9	-	54.6	73.9	19.3	
Vert	1344.115	PK	54.2	25.1	5.8	33.9	-	51.2	73.9	22.7	
Vert	1609.176	PK	50.8	25.8	6.0	33.2	-	49.4	73.9	24.5	
Vert	1881.086	PK	46.7	27.0	6.2	32.6	-	47.3	73.9	26.6	
Vert	2483.500	PK	49.5	27.7	4.5	34.7	-	47.0	73.9	26.9	
Vert	4924.000	PK	40.1	33.3	8.9	31.3	-	51.0	73.9	22.9	Floor noise
Vert	7386.000	PK	40.6	36.8	9.9	32.6	-	54.7	73.9	19.2	Floor noise
Vert	9848.000	PK	41.1	38.2	10.8	32.7	-	57.4	73.9	16.5	Floor noise
Vert	1070.198	AV	45.3	24.6	5.5	34.9	1.9	42.4	53.9	11.5	
Vert	1344.115	AV	34.2	25.1	5.8	33.9	1.9	33.1	53.9	20.8	
Vert	1609.176	AV	33.2	25.8	6.0	33.2	1.9	33.7	53.9	20.2	
Vert	1881.086	AV	32.6	27.0	6.2	32.6	1.9	35.1	53.9	18.8	
Vert	2483.500	AV	39.4	27.7	4.5	34.7	1.9	38.8	53.9	15.1	*1)
Vert	4924.000	AV	29.7	33.3	8.9	31.3	-	40.6	53.9	13.3	Floor noise
Vert	7386.000	AV	31.0	36.8	9.9	32.6	-	45.1	53.9	8.8	Floor noise
Vert	9848.000	AV	31.5	38.2	10.8	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 20log (4.4 m / 3.0 m) = 3.33 dB 20log (3.65 m / 3.0 m) = 1.70 dB: 2483.5 MHz only
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

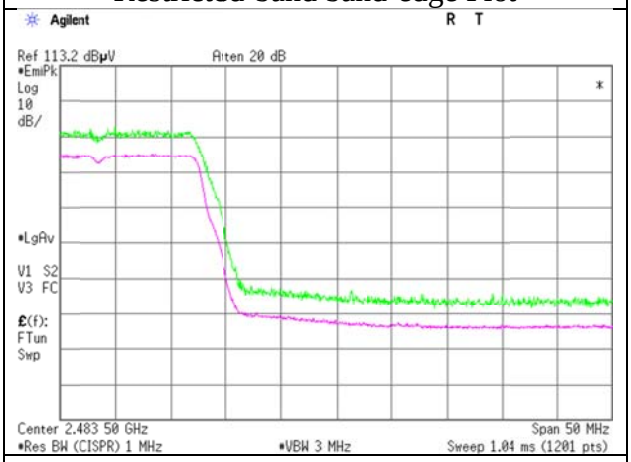
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11420646H
Date	August 29, 2016
Temperature / Humidity	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

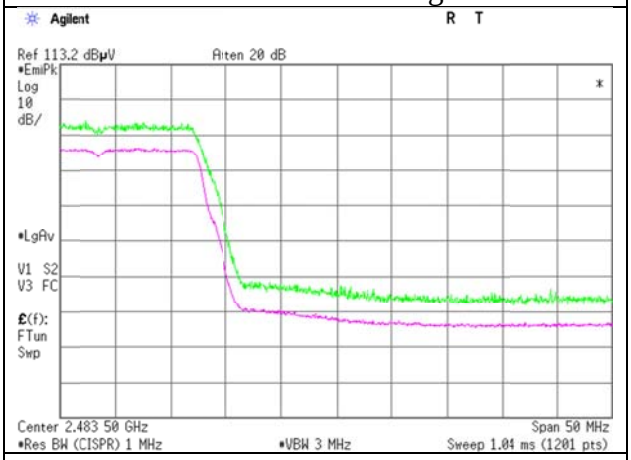
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

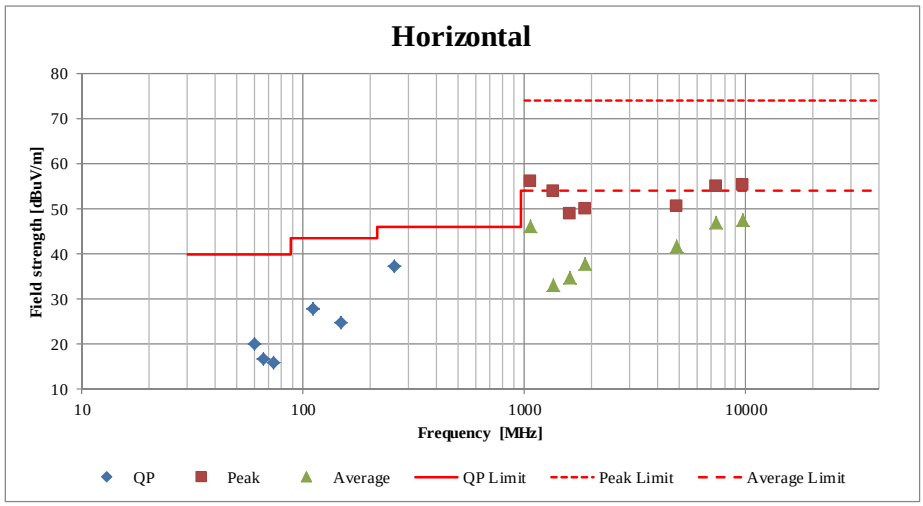


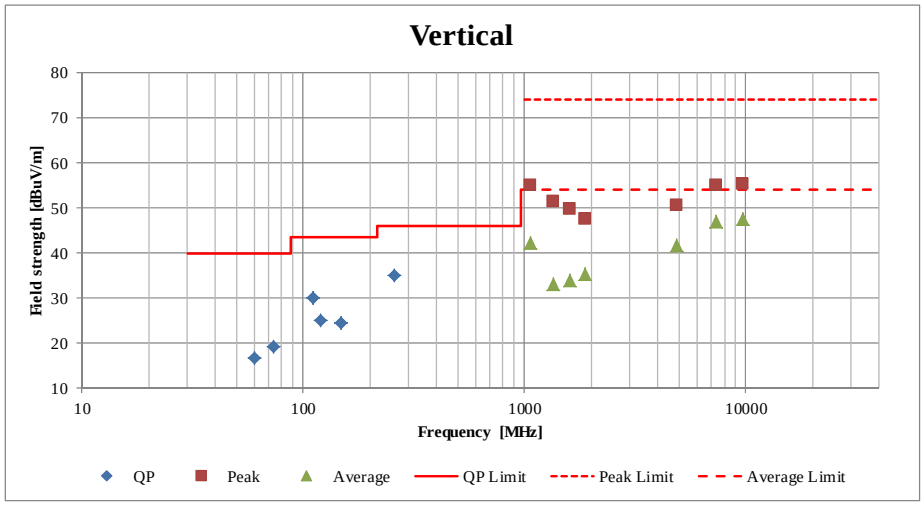
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11420646H	
Date	August 18, 2016	August 29, 2016
Temperature / Humidity	23 deg. C / 55 % RH	20 deg. C / 59 % RH
Engineer	Shinichi Miyazono (1 GHz - 10 GHz)	Shinichi Miyazono (Below 1 GHz)
Mode	Tx 11n-20 2437 MHz	



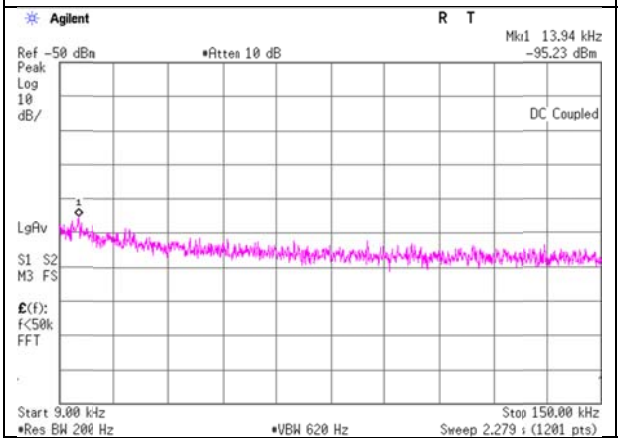


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

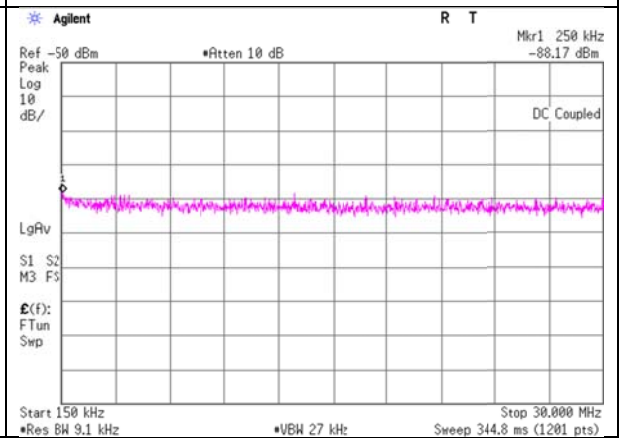
Conducted Spurious Emission

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 23, 2016
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Shinichi Miyazono
Mode	Tx 11n-20 2437 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenator 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
13.94	-95.2	0.00	9.8	2.3	1	-83.1	300	6.0	-21.9	44.7	66.6	
250.00	-88.2	0.01	9.9	2.3	1	-76.0	300	6.0	-14.8	19.6	34.4	

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

EIRP = Reading + Cable Loss + Attenator Loss + Antenna Gain + 10 * log (N)

Power Density

Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 23, 2016
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-29.31	1.54	10.03	-17.74	8.00	25.74
2437.00	-29.27	1.54	10.03	-17.70	8.00	25.70
2462.00	-30.41	1.55	10.03	-18.83	8.00	26.83

11g

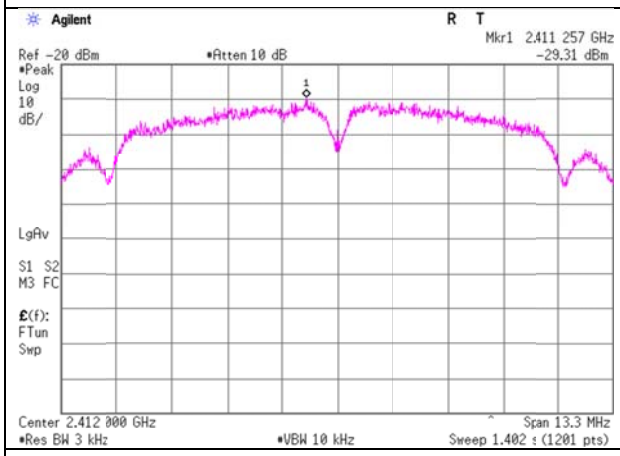
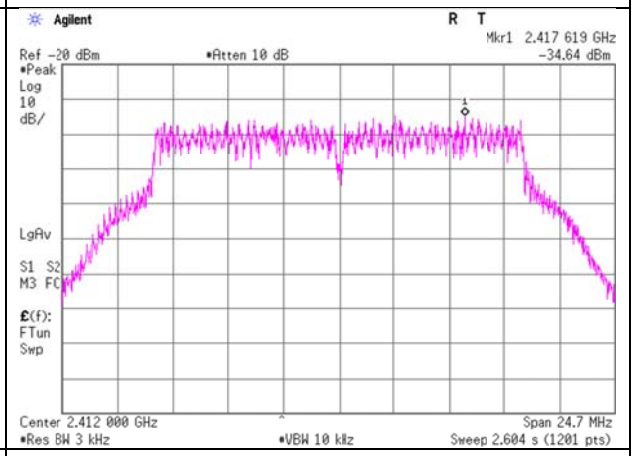
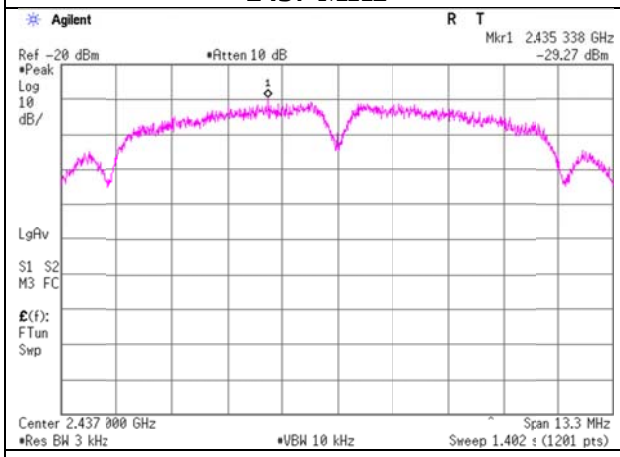
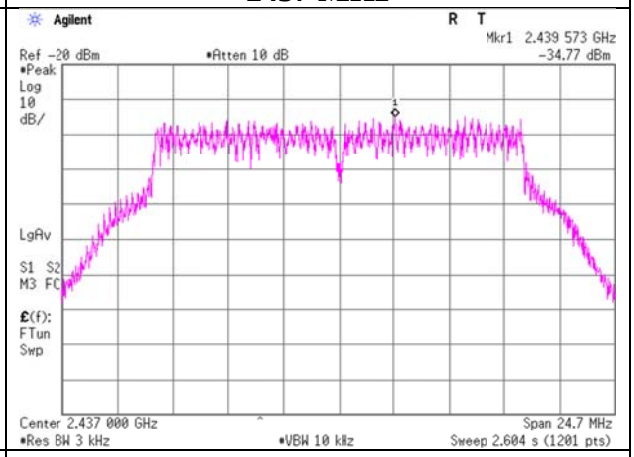
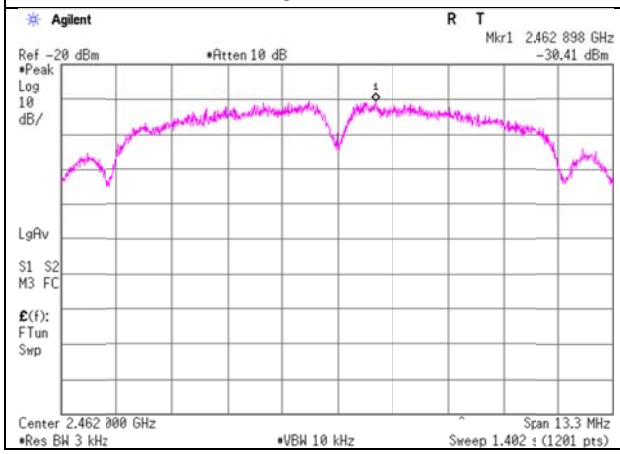
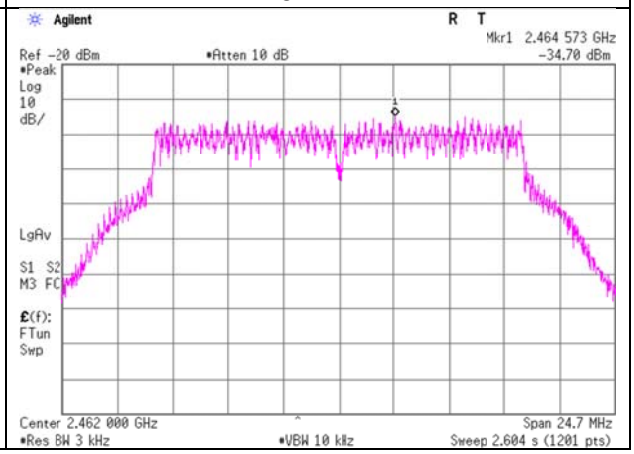
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-34.64	1.54	10.03	-23.07	8.00	31.07
2437.00	-34.77	1.54	10.03	-23.20	8.00	31.20
2462.00	-34.70	1.55	10.03	-23.12	8.00	31.12

11n20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-34.29	1.54	10.03	-22.72	8.00	30.72
2437.00	-32.96	1.54	10.03	-21.39	8.00	29.39
2462.00	-34.26	1.55	10.03	-22.68	8.00	30.68

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

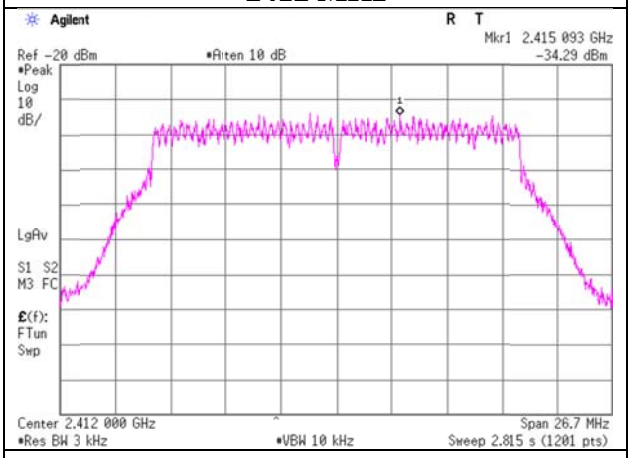
Power Density

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

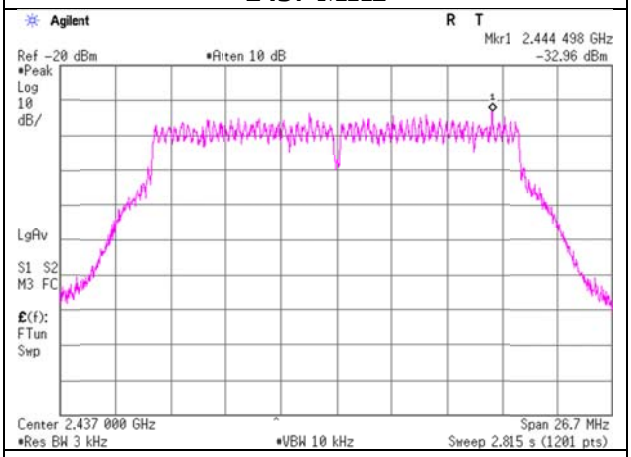
Power Density

11n-20

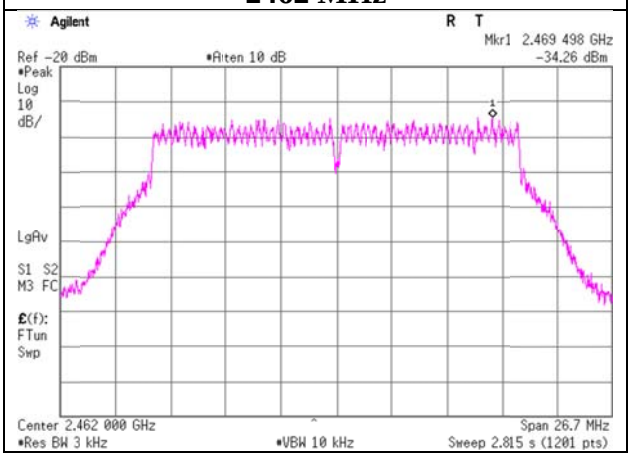
2412 MHz



2437 MHz



2462 MHz

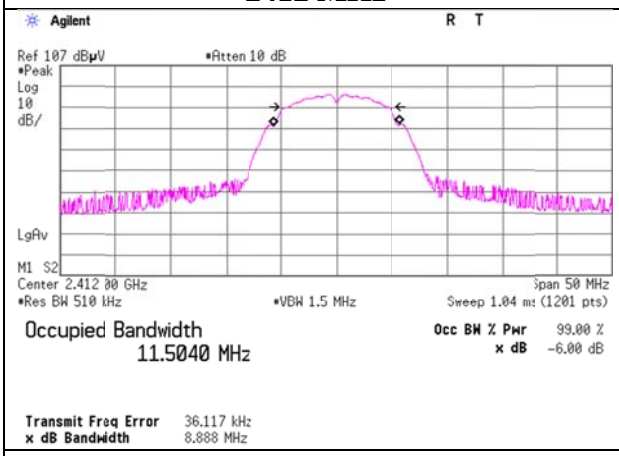


99%Occupied Bandwidth

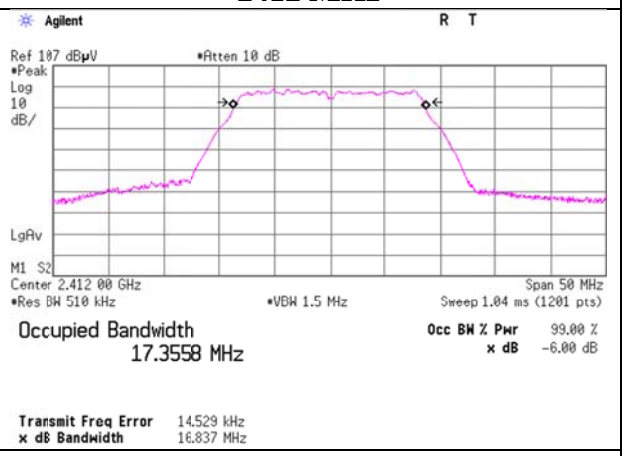
Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 23, 2016
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11b

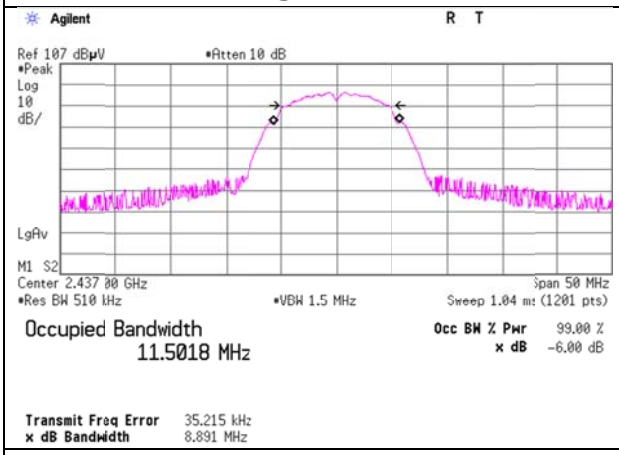
2412 MHz



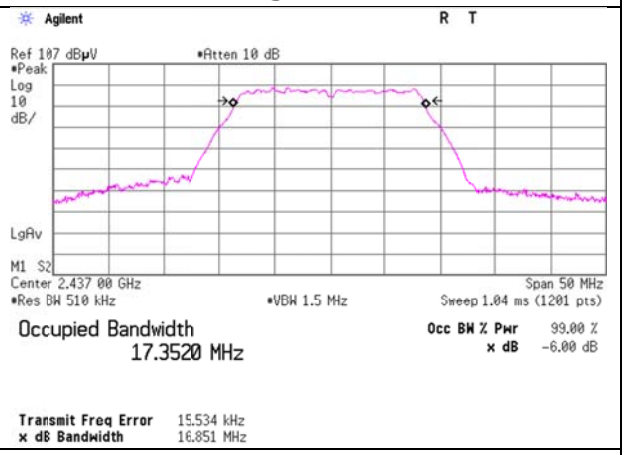
2412 MHz



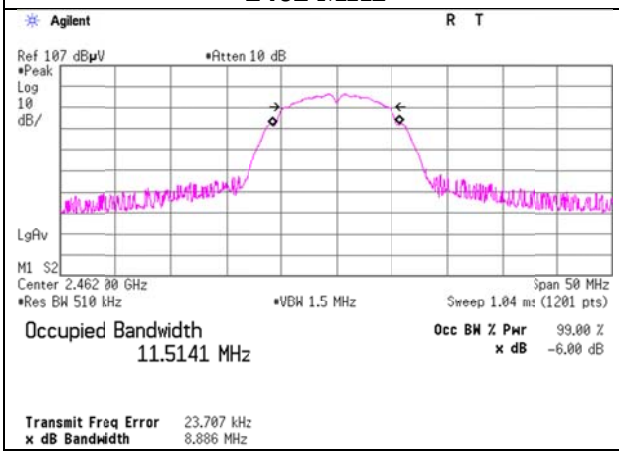
2437 MHz



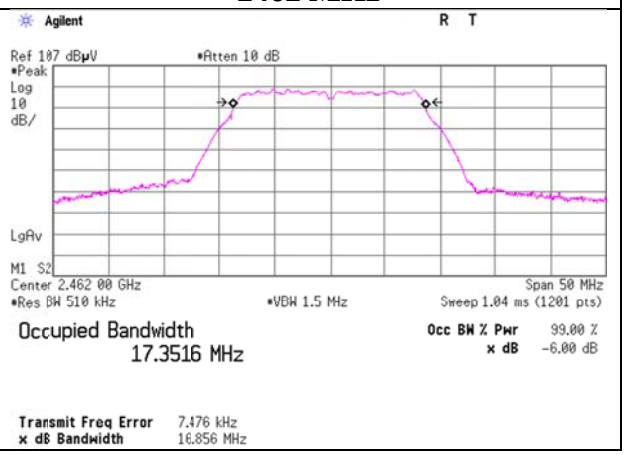
2437 MHz



2462 MHz



2462 MHz

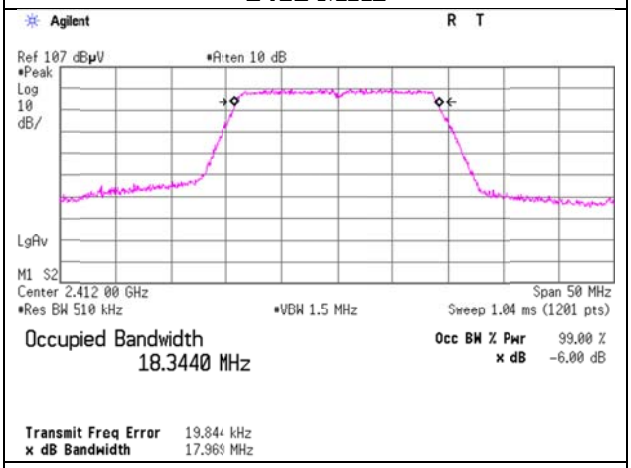


99% Occupied Bandwidth

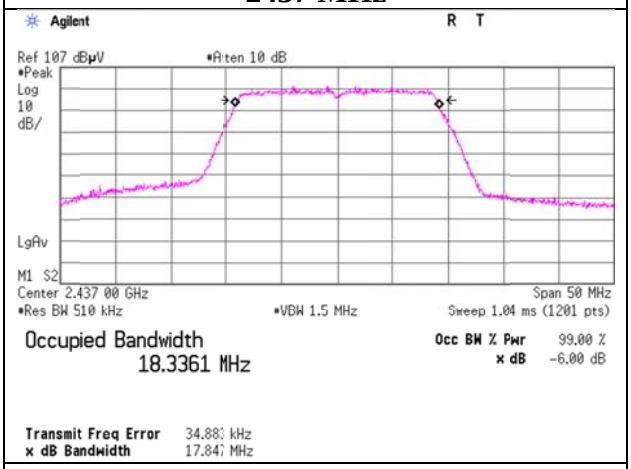
Test place	Ise EMC Lab. No.2 Measurement Room
Report No.	11420646H
Date	August 23, 2016
Temperature / Humidity	24 deg. C / 60 % RH
Engineer	Shinichi Miyazono
Mode	Tx

11n-20

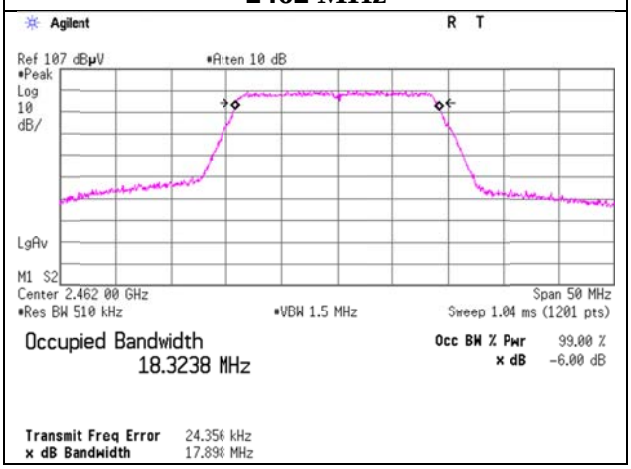
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2016/02/08 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2016/06/24 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	AT/RE	2016/01/21 * 12
MBM-09	Barometer	Sunoh	SBR121	826	AT	2013/12/17 * 36
MMM-18	Digital Tester(TRUE RMS MULTIMETER)	FlLUKE	115	17930030	AT	2016/05/31 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2015/11/11 * 12
MAT-25	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71642	AT	2016/06/15 * 12
MCC-144	Microwave Cable	Junkosha	MWX221	1207S407	AT	2016/08/02 * 12
MPM-16	Power Meter	Agilent	8990B	MY51000271	AT	2016/04/07 * 12
MPSE-23	Power sensor	Agilent	N1923A	MY54070004	AT	2016/04/07 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2015/11/10 * 12
MCC-38	Coaxial Cable	UL Japan	-	-	AT	2015/12/07 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2015/10/07 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2016/02/29 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2016/05/20 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2016/01/19 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2015/10/11 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2015/11/02 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2016/01/30 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2016/02/08 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2015/11/10 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2015/09/04 * 12

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

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

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