



RADIO TEST REPORT

Test Report No. : 11489808H-A

Applicant : Murata Manufacturing Co., Ltd.
Type of Equipment : Communication Module
Model No. : Type1KA
FCC ID : VPYLB1KA
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

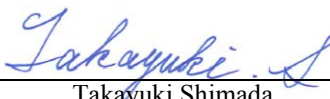
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not 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: October 25 to November 2, 2016

Representative test engineer:


Takafumi Noguchi
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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13-EM-F0429

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

* The revision on November 14, 2016, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 23.8 dB, 0.15000 MHz, L AV 25.9 dB, 19.67427 MHz, N	Complied	-
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: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	4.3 dB 2483.500 MHz, AV, Vertical	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 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)

This EUT provides stable voltage (DC 1.8 V) constantly to RF Module regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The antenna is not removable from the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

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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 $k = 2$.

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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

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz - 0.15 MHz	3.5 dB
0.15 MHz - 30MHz	3.0 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 MHz - 200 MHz	200 MHz - 1000MHz	30 MHz - 200 MHz	200 MHz - 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 GHz - 6 GHz	6 GHz - 18 GHz	10 GHz - 26.5 GHz	26.5 GHz - 40 GHz	1 GHz - 18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

*Measurement distance

Conducted Emission test

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

Radiated emission test

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

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3.5 Test Location

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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	-	-

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.

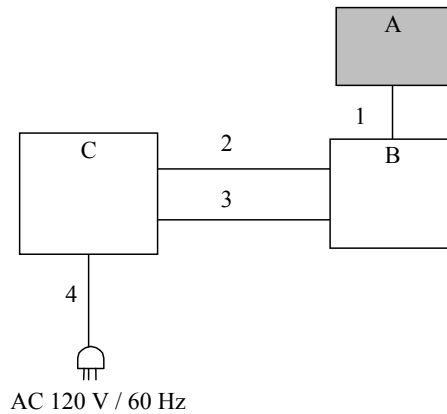
Mode	Remarks*
IEEE 802.11b (11b)	2 Mbps, PN9
IEEE 802.11g (11g)	6 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 6, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b: 13 dBm 11g/n-20: 10 dBm Software: Name: Dut labtool Version: 2.0.0.83 *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 Emission	11g Tx	2412 MHz
Radiated Spurious Emission	11b Tx	2412 MHz
	11g Tx	2437 MHz
		2462 MHz
	11n-20 Tx *1)	2412 MHz
		2462 MHz
6dB Bandwidth	11b Tx	2412 MHz
Maximum Peak Output Power	11g Tx	2437 MHz
Power Density	11n-20 Tx	2462 MHz
99% Occupied Bandwidth		

*1) The test was performed only band-edge.

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

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	Type1KA	1 for AT 2 for CE/RE	Murata Manufacturing Co., Ltd.	EUT
B	Jig	-	-	-	-
C	DC Power Supply	RW16-5ADP	171116437	TEXIO	-

CE : Conducted Emission.
 RE : Radiated Emission.
 AT : Antenna Terminal Conducted.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.12	Unshielded	Unshielded	-
2	DC Cable	2.00	Unshielded	Unshielded	-
3	DC Cable	2.00	Unshielded	Unshielded	-
4	AC Cable	2.00	Unshielded	Unshielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

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

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

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

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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

SECTION 6: 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 *3)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results. Integration Method: <u>13.3.2</u> RBW: 100 kHz VBW: 300 kHz Span: 2 MHz Band Power: 1 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.5 m *1) (1 GHz – 10 GHz), 1.0 m *2) (10 GHz – 26.5 GHz)		4.5 m *1) (1 GHz – 10 GHz), 1.0 m *2) (10 GHz – 26.5 GHz)

*1) Distance Factor: $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.53 \text{ dB}$

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

*3) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r05"

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

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				
*1) Peak hold was applied as Worst-case measurement. *2) Reference data *3) Section 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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/26

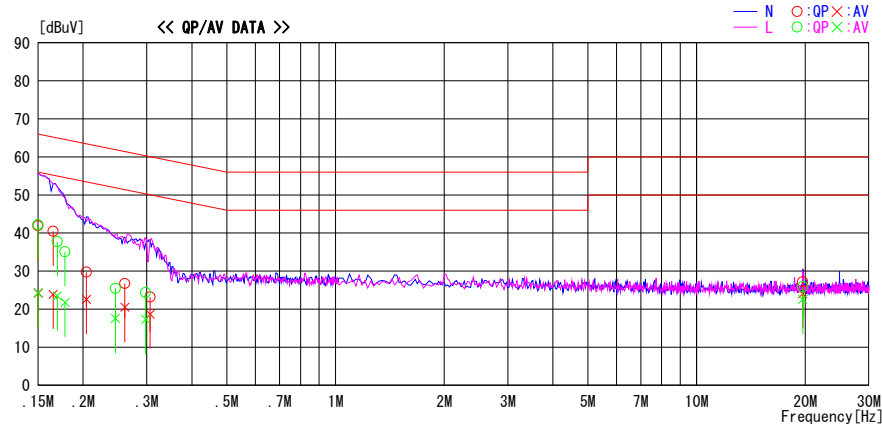
Report No. : 11489808H

Temp./Humi. : 24deg. C / 59% RH

Engineer : Ken Fujita

Mode / Remarks : Tx 11g 6Mbps 2412MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	28.7	11.0	13.2	41.9	24.2	66.0	56.0	24.1	31.8	N	
0.16523	27.3	10.7	13.2	40.5	23.9	65.2	55.2	24.7	31.3	N	
0.20438	16.5	9.4	13.2	29.7	22.6	63.4	53.4	33.7	30.8	N	
0.26093	13.4	7.2	13.3	26.7	20.5	61.4	51.4	34.7	30.9	N	
0.30660	9.9	5.4	13.3	23.2	18.7	60.1	50.1	36.9	31.4	N	
19.67427	12.8	9.7	14.4	27.2	24.1	60.0	50.0	32.8	25.9	N	
0.15000	29.0	11.1	13.2	42.2	24.3	66.0	56.0	23.8	31.7	L	
0.16958	24.5	10.3	13.2	37.7	23.5	65.0	55.0	27.3	31.5	L	
0.17828	21.9	8.6	13.2	35.1	21.8	64.6	54.6	29.5	32.8	L	
0.24570	12.2	4.3	13.3	25.5	17.6	61.9	51.9	36.4	34.3	L	
0.29790	11.1	4.0	13.3	24.4	17.3	60.3	50.3	35.9	33.0	L	
19.67427	11.5	8.2	14.4	25.9	22.6	60.0	50.0	34.1	27.4	L	

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

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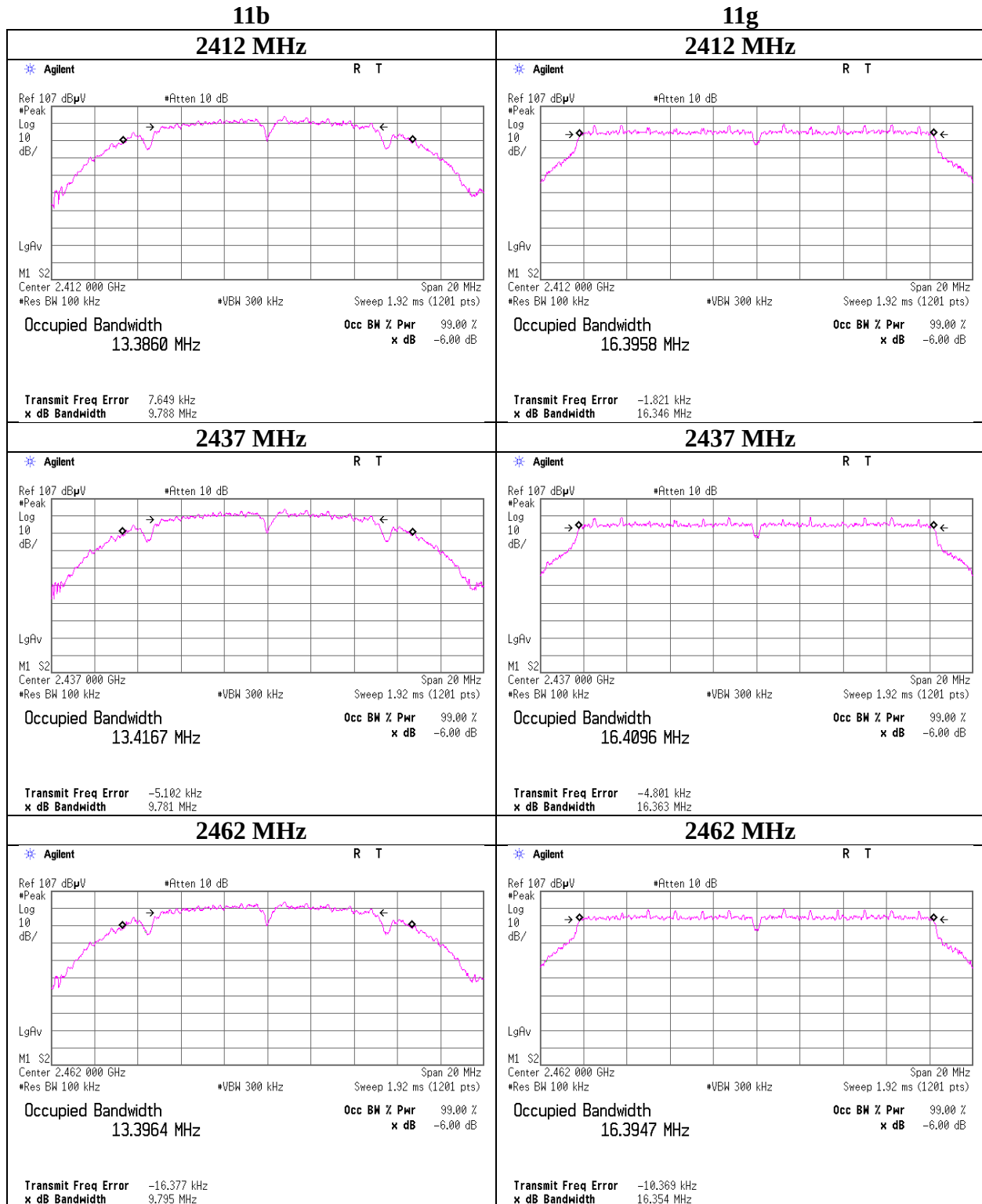
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6dB Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11489808H
Date	October 26, 2016
Temperature / Humidity	24 deg. C / 62 % RH
Engineer	Takafumi Noguchi
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	9.788	> 500
	2437	9.781	> 500
	2462	9.795	> 500
11g	2412	16.346	> 500
	2437	16.363	> 500
	2462	16.354	> 500
11n-20	2412	17.723	> 500
	2437	17.682	> 500
	2462	17.690	> 500

6dB Bandwidth



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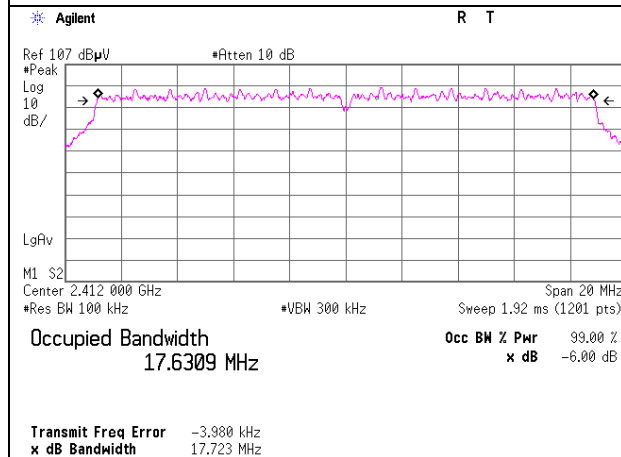
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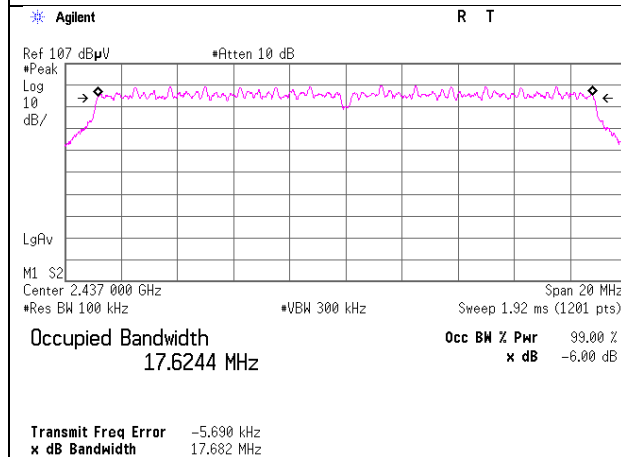
6dB Bandwidth

11n-20

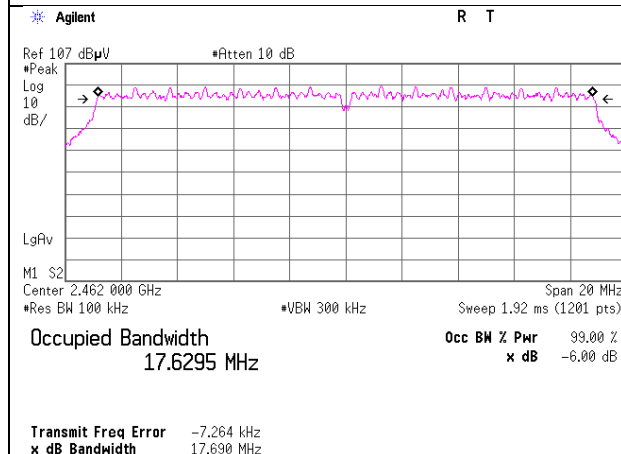
2412 MHz



2437 MHz



2462 MHz



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Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 25, 2016
Temperature / Humidity : 25 deg. C / 51 % RH
Engineer : Tomoki Matsui
Mode : Tx 11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.25	0.70	9.48	16.43	43.95	30.00	1000	13.57
2437	6.33	0.70	9.48	16.51	44.77	30.00	1000	13.49
2462	6.08	0.70	9.48	16.26	42.27	30.00	1000	13.74

Sample Calculation:

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

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	6.28	
2	6.33	*
5.5	5.81	
11	5.80	

*: Worst Rate

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

Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 25, 2016
Temperature / Humidity : 25 deg. C / 51 % RH
Engineer : Tomoki Matsui
Mode : Tx 11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	11.39	0.70	9.48	21.57	143.55	30.00	1000	8.43
2437	11.20	0.70	9.48	21.38	137.40	30.00	1000	8.62
2462	11.19	0.70	9.48	21.37	137.09	30.00	1000	8.63

Sample Calculation:

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

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	11.20	*
9	10.50	
12	10.42	
18	10.37	
24	10.98	
36	10.34	
48	10.94	
54	10.62	

*: Worst Rate

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

Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 25, 2016
Temperature / Humidity : 25 deg. C / 51 % RH
Engineer : Tomoki Matsui
Mode : Tx 11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	10.57	0.70	9.48	20.75	118.85	30.00	1000	9.25
2437	10.84	0.70	9.48	21.02	126.47	30.00	1000	8.98
2462	10.51	0.70	9.48	20.69	117.22	30.00	1000	9.31

Sample Calculation:

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

2437 MHz

MCS Number	Reading [dBm]	Remark
0	10.74	
1	10.78	
2	10.58	
3	10.20	
4	10.66	
5	10.60	
6	10.84	*
7	10.80	

*: Worst Rate

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

Average Output Power (Reference data for RF Exposure)

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11489808H
Date	October 26, 2016
Temperature / Humidity	24 deg. C / 62 % RH
Engineer	Takafumi Noguchi
Mode	Tx

11b 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	3.64	0.70	9.48	13.82	24.10	0.03	13.85	24.27
2437	3.47	0.70	9.48	13.65	23.17	0.03	13.68	23.33
2462	3.58	0.70	9.48	13.76	23.77	0.03	13.79	23.93

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.56	0.70	9.48	10.74	11.86	0.17	10.91	12.33
2437	0.53	0.70	9.48	10.71	11.78	0.17	10.88	12.25
2462	0.41	0.70	9.48	10.59	11.46	0.17	10.76	11.91

11n-20 MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.55	0.70	9.48	10.73	11.83	0.17	10.90	12.30
2437	0.52	0.70	9.48	10.70	11.75	0.17	10.87	12.22
2462	0.40	0.70	9.48	10.58	11.43	0.17	10.75	11.89

Sample Calculation:

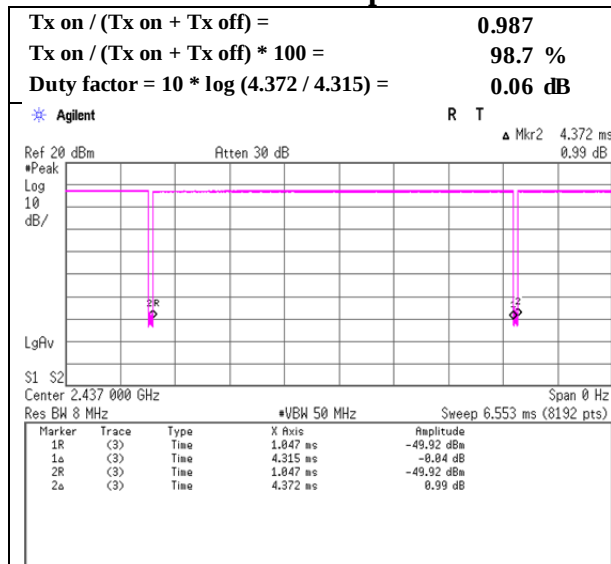
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

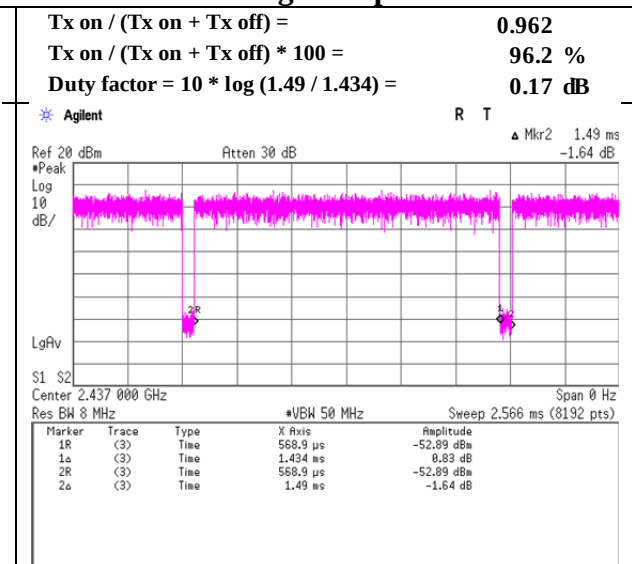
Burst rate confirmation

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 26, 2016
Temperature / Humidity : 24 deg. C / 62 % RH
Engineer : Takafumi Noguchi
Mode : Tx

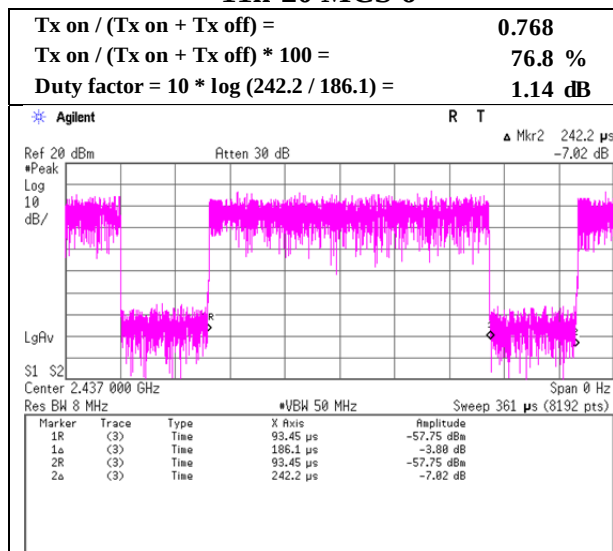
11b 2 Mbps



11g 6 Mbps



11n-20 MCS 6



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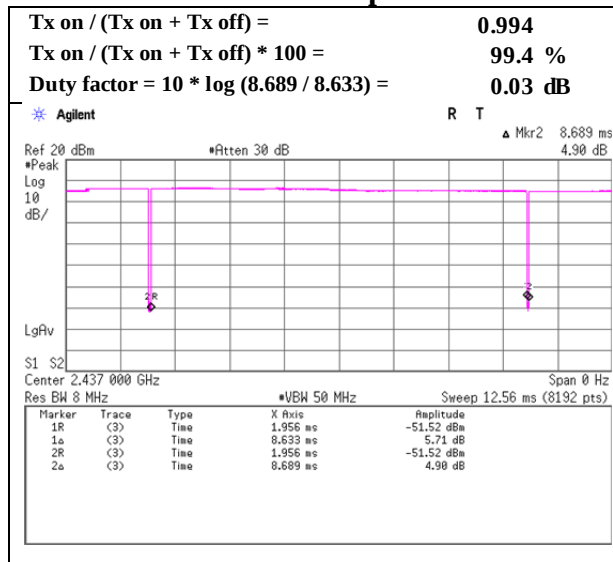
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

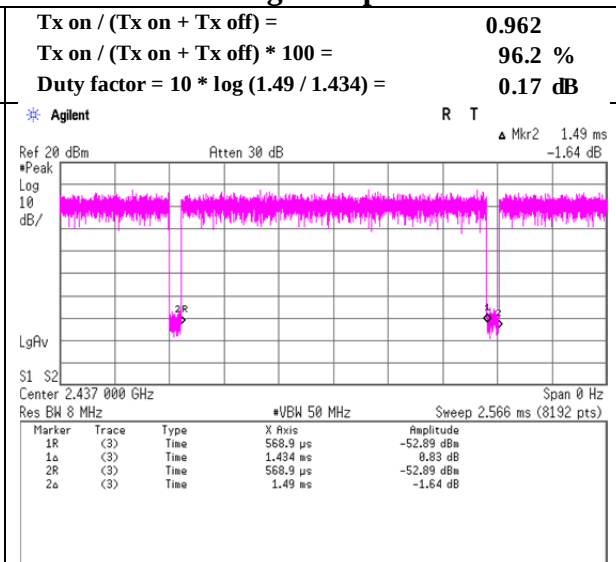
Burst rate confirmation

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 26, 2016
Temperature / Humidity : 24 deg. C / 62 % RH
Engineer : Takafumi Noguchi
Mode : Tx

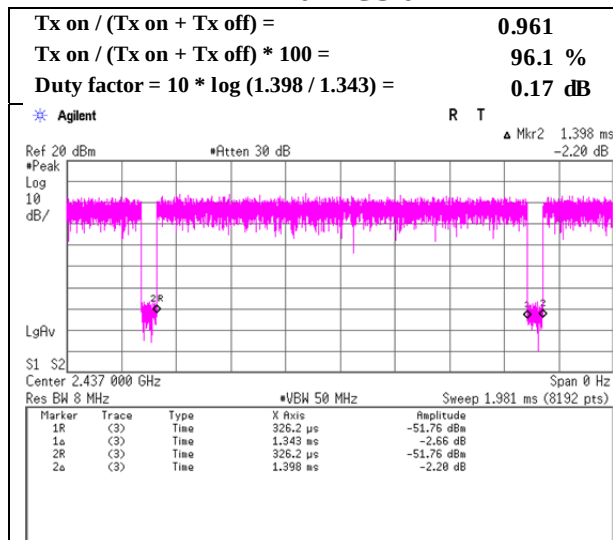
11b 1 Mbps



11g 6 Mbps



11n-20 MCS 0



Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11489808H
Date : November 1, 2016 November 2, 2016
Temperature / Humidity : 23 deg. C / 54 % RH 23 deg. C / 48 % RH
Engineer : Tomoki Matsui Ken Fujita
(1 GHz - 10 GHz) (Above 10 GHz)
Mode : Tx 11b 2412 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	58.9	26.7	6.9	32.7	-	59.8	73.9	14.1	
Hori	4824.000	PK	40.8	31.1	9.1	31.8	-	49.2	73.9	24.7	Floor noise
Hori	7236.000	PK	40.5	35.7	10.4	32.6	-	54.0	73.9	19.9	Floor noise
Hori	9648.000	PK	40.0	37.2	11.0	33.3	-	54.9	73.9	19.0	Floor noise
Hori	2390.000	AV	41.9	26.7	6.9	32.7	-	42.8	53.9	11.1	
Hori	4824.000	AV	30.9	31.1	9.1	31.8	-	39.3	53.9	14.6	Floor noise
Hori	7236.000	AV	32.0	35.7	10.4	32.6	-	45.5	53.9	8.4	Floor noise
Hori	9648.000	AV	31.4	37.2	11.0	33.3	-	46.3	53.9	7.6	Floor noise
Vert	2390.000	PK	59.0	26.7	6.9	32.7	-	59.9	73.9	14.0	
Vert	4824.000	PK	40.9	31.1	9.1	31.8	-	49.3	73.9	24.6	Floor noise
Vert	7236.000	PK	40.7	35.7	10.4	32.6	-	54.2	73.9	19.7	Floor noise
Vert	9648.000	PK	40.2	37.2	11.0	33.3	-	55.1	73.9	18.8	Floor noise
Vert	2390.000	AV	42.1	26.7	6.9	32.7	-	43.0	53.9	10.9	
Vert	4824.000	AV	30.9	31.1	9.1	31.8	-	39.3	53.9	14.6	Floor noise
Vert	7236.000	AV	32.2	35.7	10.4	32.6	-	45.7	53.9	8.2	Floor noise
Vert	9648.000	AV	31.4	37.2	11.0	33.3	-	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

20dBc Data Sheet

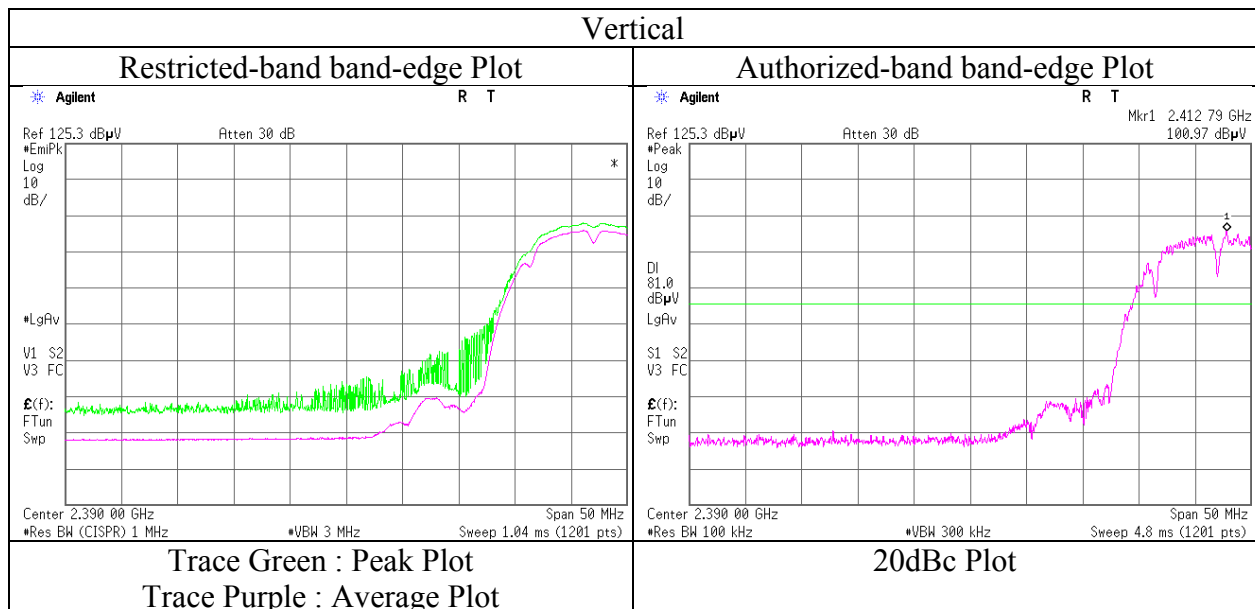
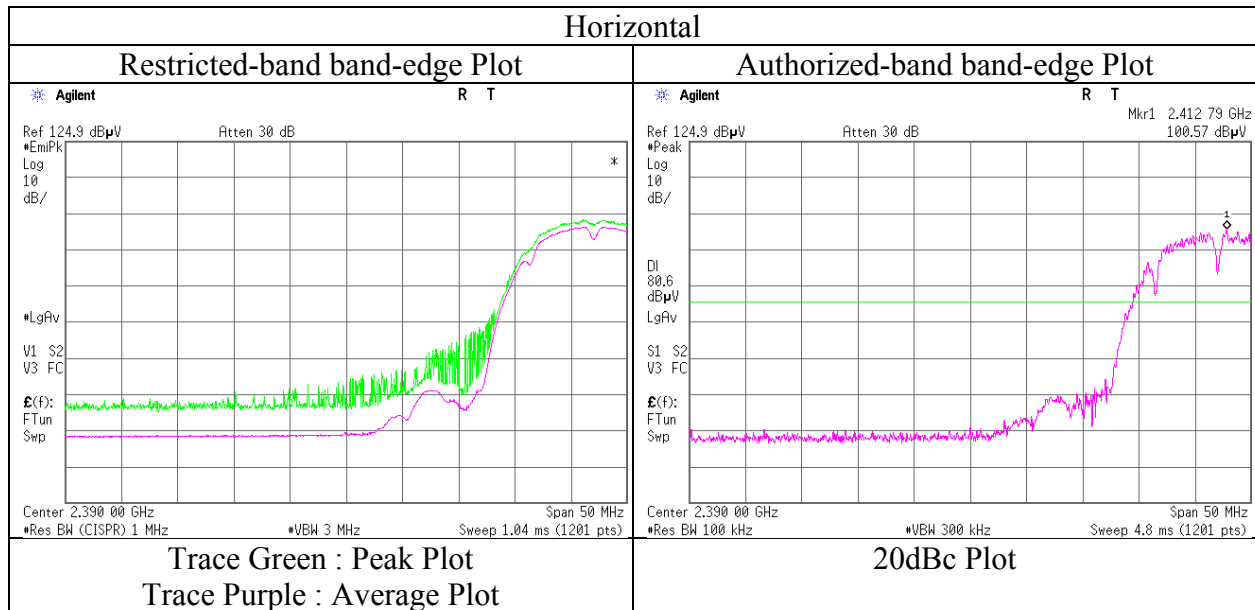
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.6	26.7	6.9	32.7	101.5	-	-	Carrier
Hori	2399.467	PK	54.7	26.7	6.9	32.7	55.6	81.5	25.9	
Hori	2400.000	PK	52.6	26.7	6.9	32.7	53.5	81.5	28.0	
Vert	2412.000	PK	101.0	26.7	6.9	32.7	101.9	-	-	Carrier
Vert	2398.100	PK	53.5	26.7	6.9	32.7	54.4	81.9	27.5	
Vert	2400.000	PK	52.6	26.7	6.9	32.7	53.5	81.9	28.4	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
Mode	Tx 11b 2412 MHz

November 2, 2016
23 deg. C / 48 % RH
Ken Fujita
(Above 10 GHz)



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

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Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11489808H	
Date	November 1, 2016	November 2, 2016
Temperature / Humidity	23 deg. C / 54 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Ken Fujita (Above 10 GHz)
Mode	Tx 11b 2437 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dBm]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	40.0	31.2	9.1	31.7	-	48.6	73.9	25.3	Floor noise
Hori	7311.000	PK	40.7	35.6	10.4	32.6	-	54.1	73.9	19.8	Floor noise
Hori	9748.000	PK	40.9	37.2	11.0	33.3	-	55.8	73.9	18.1	Floor noise
Hori	4874.000	AV	31.0	31.2	9.1	31.7	-	39.6	53.9	14.3	Floor noise
Hori	7311.000	AV	32.2	35.6	10.4	32.6	-	45.6	53.9	8.3	Floor noise
Hori	9748.000	AV	32.0	37.2	11.0	33.3	-	46.9	53.9	7.0	Floor noise
Vert	4874.000	PK	40.0	31.2	9.1	31.7	-	48.6	73.9	25.3	Floor noise
Vert	7311.000	PK	40.6	35.6	10.4	32.6	-	54.0	73.9	19.9	Floor noise
Vert	9748.000	PK	40.9	37.2	11.0	33.3	-	55.8	73.9	18.1	Floor noise
Vert	4874.000	AV	31.3	31.2	9.1	31.7	-	39.9	53.9	14.0	Floor noise
Vert	7311.000	AV	32.3	35.6	10.4	32.6	-	45.7	53.9	8.2	Floor noise
Vert	9748.000	AV	32.0	37.2	11.0	33.3	-	46.9	53.9	7.0	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11489808H	
Date	November 1, 2016	November 2, 2016
Temperature / Humidity	23 deg. C / 54 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Ken Fujita (Above 10 GHz)
Mode	Tx 11b 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	60.9	26.8	7.0	32.6	-	62.1	73.9	11.8	
Hori	4924.000	PK	39.2	31.4	9.1	31.7	-	48.0	73.9	25.9	Floor noise
Hori	7386.000	PK	41.6	35.5	10.3	32.7	-	54.7	73.9	19.2	Floor noise
Hori	9848.000	PK	41.0	37.2	11.1	33.3	-	56.0	73.9	17.9	Floor noise
Hori	2483.500	AV	44.3	26.8	7.0	32.6	-	45.5	53.9	8.4	
Hori	4924.000	AV	30.8	31.4	9.1	31.7	-	39.6	53.9	14.3	Floor noise
Hori	7386.000	AV	31.7	35.5	10.3	32.7	-	44.8	53.9	9.1	Floor noise
Hori	9848.000	AV	32.5	37.2	11.1	33.3	-	47.5	53.9	6.4	Floor noise
Vert	2483.500	PK	60.0	26.8	7.0	32.6	-	61.2	73.9	12.7	
Vert	4924.000	PK	39.4	31.4	9.1	31.7	-	48.2	73.9	25.7	Floor noise
Vert	7386.000	PK	41.6	35.5	10.3	32.7	-	54.7	73.9	19.2	Floor noise
Vert	9848.000	PK	41.0	37.2	11.1	33.3	-	56.0	73.9	17.9	Floor noise
Vert	2483.500	AV	43.1	26.8	7.0	32.6	-	44.3	53.9	9.6	
Vert	4924.000	AV	30.9	31.4	9.1	31.7	-	39.7	53.9	14.2	Floor noise
Vert	7386.000	AV	32.0	35.5	10.3	32.7	-	45.1	53.9	8.8	Floor noise
Vert	9848.000	AV	32.5	37.2	11.1	33.3	-	47.5	53.9	6.4	Floor noise

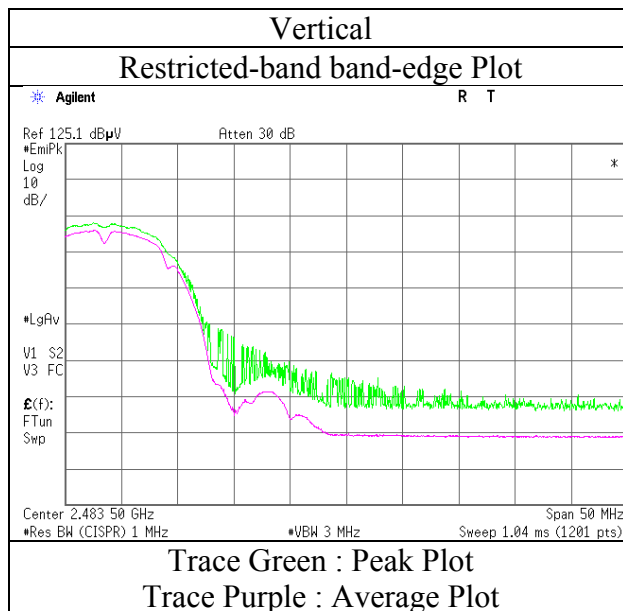
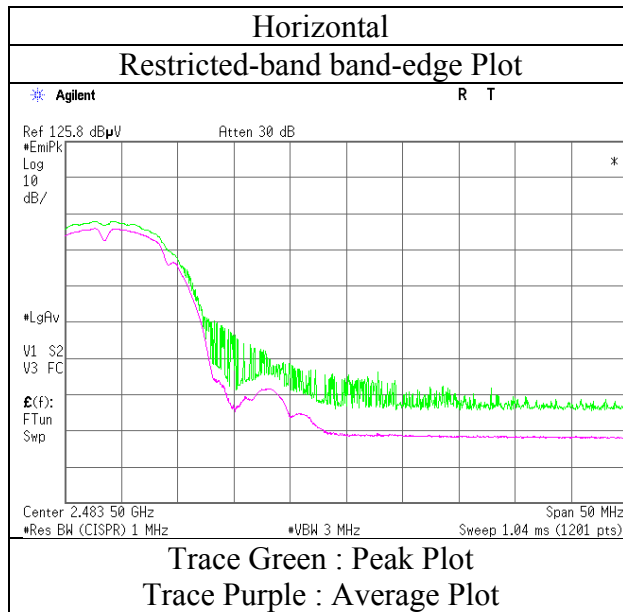
$$\text{Result} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz))} - \text{Gain(Amplifier)}$$

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5 \text{ m} / 3.0 \text{ m}) = 3.53 \text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz



* 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.	11489808H		
Date	November 1, 2016	November 2, 2016	
Temperature / Humidity	23 deg. C / 54 % RH	23 deg. C / 48 % RH	
Engineer	Tomoki Matsui	Ken Fujita	
	(1 GHz - 10 GHz)	(Above 10 GHz)	
Mode	Tx 11g 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	96.300	QP	25.7	9.0	8.0	32.2	-	10.5	43.5	33.0	
Hori	124.350	QP	34.4	13.0	8.3	32.2	-	23.5	43.5	20.0	
Hori	186.826	QP	32.6	16.4	9.0	32.1	-	25.9	43.5	17.6	
Hori	239.998	QP	38.4	12.3	9.4	32.0	-	28.1	46.0	17.9	
Hori	348.340	QP	42.4	14.6	10.2	31.9	-	35.3	46.0	10.7	
Hori	386.112	QP	39.1	15.3	10.5	31.9	-	33.0	46.0	13.0	
Hori	2390.000	PK	54.6	26.7	6.9	32.7	-	55.5	73.9	18.4	
Hori	4824.000	PK	40.8	31.1	9.1	31.8	-	49.2	73.9	24.7	Floor noise
Hori	7236.000	PK	40.5	35.7	10.4	32.6	-	54.0	73.9	19.9	Floor noise
Hori	9648.000	PK	40.0	37.2	11.0	33.3	-	54.9	73.9	19.0	Floor noise
Hori	2390.000	AV	41.6	26.7	6.9	32.7	0.2	42.7	53.9	11.2	*1)
Hori	4824.000	AV	30.9	31.1	9.1	31.8	-	39.3	53.9	14.6	Floor noise
Hori	7236.000	AV	32.0	35.7	10.4	32.6	-	45.5	53.9	8.4	Floor noise
Hori	9648.000	AV	31.4	37.2	11.0	33.3	-	46.3	53.9	7.6	Floor noise
Vert	96.300	QP	29.3	9.0	8.0	32.2	-	14.1	43.5	29.4	
Vert	125.200	QP	32.3	13.0	8.4	32.2	-	21.5	43.5	22.0	
Vert	186.401	QP	32.2	16.4	9.0	32.1	-	25.5	43.5	18.0	
Vert	240.000	QP	39.3	12.3	9.4	32.0	-	29.0	46.0	17.0	
Vert	348.121	QP	46.5	14.6	10.2	31.9	-	39.4	46.0	6.6	
Vert	386.132	QP	43.3	15.3	10.5	31.9	-	37.2	46.0	8.8	
Vert	2390.000	PK	53.2	26.7	6.9	32.7	-	54.1	73.9	19.8	
Vert	4824.000	PK	40.9	31.1	9.1	31.8	-	49.3	73.9	24.6	Floor noise
Vert	7236.000	PK	40.7	35.7	10.4	32.6	-	54.2	73.9	19.7	Floor noise
Vert	9648.000	PK	40.2	37.2	11.0	33.3	-	55.1	73.9	18.8	Floor noise
Vert	2390.000	AV	41.1	26.7	6.9	32.7	0.2	42.2	53.9	11.7	*1)
Vert	4824.000	AV	30.9	31.1	9.1	31.8	-	39.3	53.9	14.6	Floor noise
Vert	7236.000	AV	32.2	35.7	10.4	32.6	-	45.7	53.9	8.2	Floor noise
Vert	9648.000	AV	31.4	37.2	11.0	33.3	-	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(4.5 m / 3.0 m) = 3.53 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

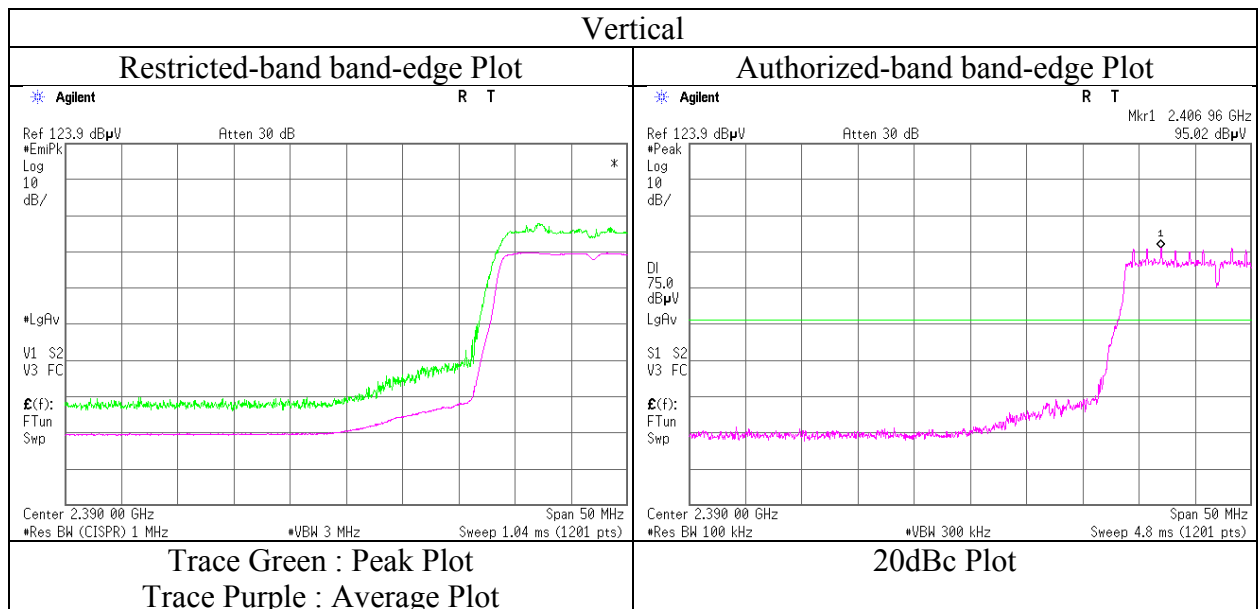
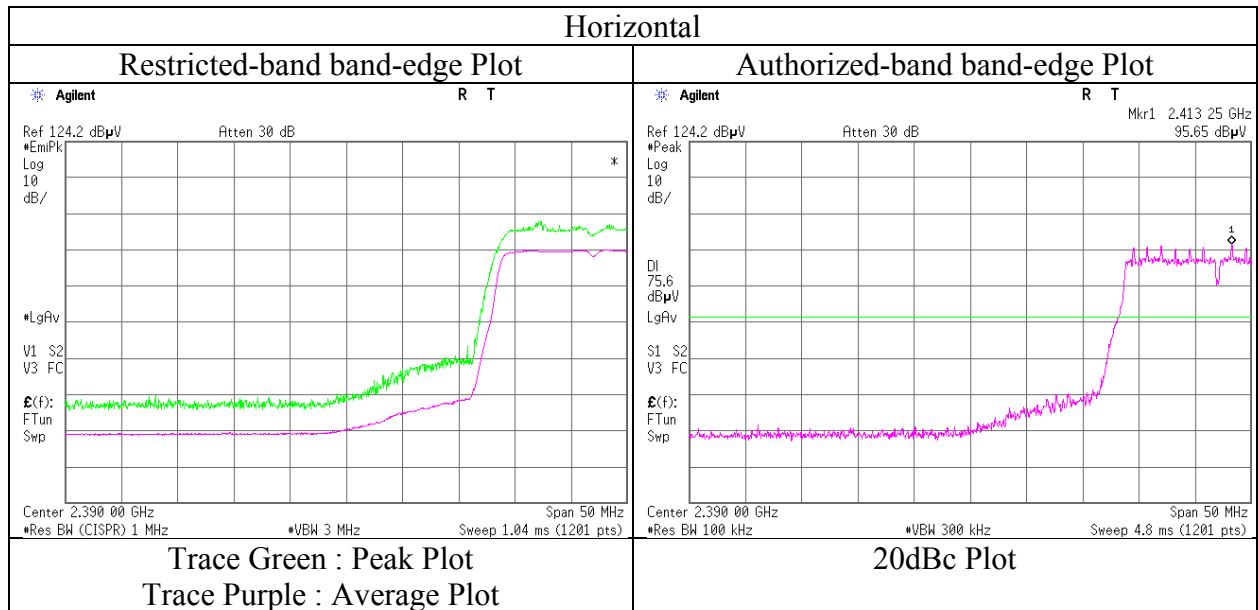
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	95.7	26.7	6.9	32.7	96.6	-	-	Carrier
Hori	2400.000	PK	53.8	26.7	6.9	32.7	54.7	76.6	21.9	
Vert	2412.000	PK	95.0	26.7	6.9	32.7	95.9	-	-	Carrier
Vert	2400.000	PK	53.0	26.7	6.9	32.7	53.9	75.9	22.0	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
Mode	Tx 11g 2412 MHz

November 2, 2016
23 deg. C / 48 % RH
Ken Fujita
(Above 10 GHz)



* 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. : 11489808H
Date : November 1, 2016 November 2, 2016
Temperature / Humidity : 23 deg. C / 54 % RH 23 deg. C / 48 % RH
Engineer : Tomoki Matsui Ken Fujita
(1 GHz - 10 GHz) (Above 10 GHz)
Mode : Tx 11g 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	4874.000	PK	40.0	31.2	9.1	31.7	-	48.6	73.9	25.3	Floor noise
Hori	7311.000	PK	40.7	35.6	10.4	32.6	-	54.1	73.9	19.8	Floor noise
Hori	9748.000	PK	40.9	37.2	11.0	33.3	-	55.8	73.9	18.1	Floor noise
Hori	4874.000	AV	31.0	31.2	9.1	31.7	-	39.6	53.9	14.3	Floor noise
Hori	7311.000	AV	32.2	35.6	10.4	32.6	-	45.6	53.9	8.3	Floor noise
Hori	9748.000	AV	32.0	37.2	11.0	33.3	-	46.9	53.9	7.0	Floor noise
Vert	4874.000	PK	40.0	31.2	9.1	31.7	-	48.6	73.9	25.3	Floor noise
Vert	7311.000	PK	40.6	35.6	10.4	32.6	-	54.0	73.9	19.9	Floor noise
Vert	9748.000	PK	40.9	37.2	11.0	33.3	-	55.8	73.9	18.1	Floor noise
Vert	4874.000	AV	31.3	31.2	9.1	31.7	-	39.9	53.9	14.0	Floor noise
Vert	7311.000	AV	32.3	35.6	10.4	32.6	-	45.7	53.9	8.2	Floor noise
Vert	9748.000	AV	32.0	37.2	11.0	33.3	-	46.9	53.9	7.0	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11489808H	
Date	November 1, 2016	November 2, 2016
Temperature / Humidity	23 deg. C / 54 % RH	23 deg. C / 48 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Ken Fujita (Above 10 GHz)
Mode	Tx 11g 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBUV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBUV/m]	Limit [dBUV/m]	Margin [dB]	Remark
Hori	2483.500	PK	62.1	26.8	7.0	32.6	-	63.3	73.9	10.6	
Hori	4924.000	PK	39.2	31.4	9.1	31.7	-	48.0	73.9	25.9	Floor noise
Hori	7386.000	PK	41.6	35.5	10.3	32.7	-	54.7	73.9	19.2	Floor noise
Hori	9848.000	PK	41.0	37.2	11.1	33.3	-	56.0	73.9	17.9	Floor noise
Hori	2483.500	AV	46.5	26.8	7.0	32.6	0.2	47.9	53.9	6.0	*)*(*)2)
Hori	4924.000	AV	30.8	31.4	9.1	31.7	-	39.6	53.9	14.3	
Hori	7386.000	AV	31.7	35.5	10.3	32.7	-	44.8	53.9	9.1	
Hori	9848.000	AV	32.5	37.2	11.1	33.3	-	47.5	53.9	6.4	
Vert	2483.500	PK	61.0	26.8	7.0	32.6	-	62.2	73.9	11.7	
Vert	4924.000	PK	39.4	31.4	9.1	31.7	-	48.2	73.9	25.7	Floor noise
Vert	7386.000	PK	41.6	35.5	10.3	32.7	-	54.7	73.9	19.2	Floor noise
Vert	9848.000	PK	41.0	37.2	11.1	33.3	-	56.0	73.9	17.9	Floor noise
Vert	2483.500	AV	45.9	26.8	7.0	32.6	0.2	47.3	53.9	6.6	*)*(*)2)
Vert	4924.000	AV	30.9	31.4	9.1	31.7	-	39.7	53.9	14.2	
Vert	7386.000	AV	32.0	35.5	10.3	32.7	-	45.1	53.9	8.8	
Vert	9848.000	AV	32.5	37.2	11.1	33.3	-	47.5	53.9	6.4	

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

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

Distance factor:

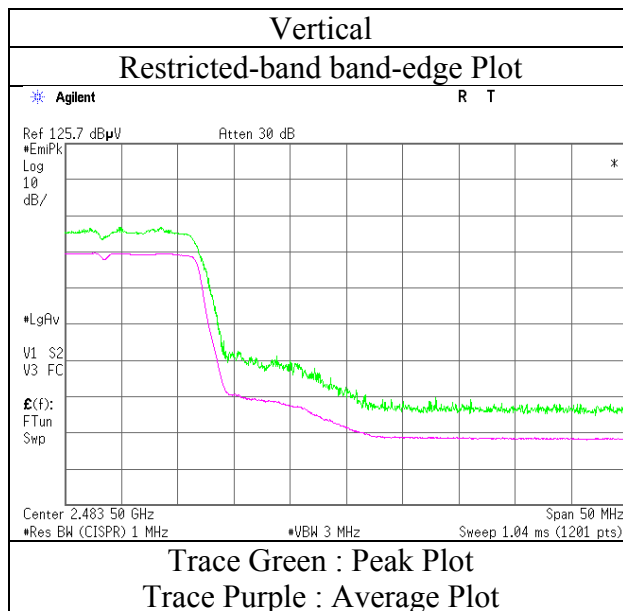
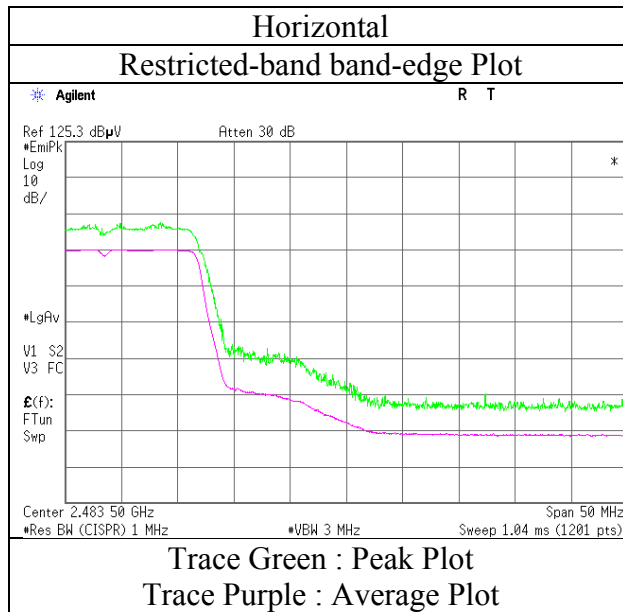
1 GHz - 10 GHz	$20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz	$20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

*2) Integration method

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
	(1 GHz - 10 GHz)
Mode	Tx 11g 2462 MHz



* 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.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
	(Band Edge)
Mode	Tx 11n-20 2412 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	56.4	26.7	6.9	32.7	-	57.3	73.9	16.6	
Hori	2390.000	AV	45.9	26.7	6.9	32.7	1.1	47.9	53.9	6.0	*1)
Vert	2390.000	PK	55.5	26.7	6.9	32.7	-	56.4	73.9	17.5	
Vert	2390.000	AV	45.2	26.7	6.9	32.7	1.1	47.2	53.9	6.7	*1)

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 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	96.9	26.7	6.9	32.7	97.8	-	-	Carrier
Hori	2400.000	PK	56.0	26.7	6.9	32.7	56.9	77.8	20.9	
Vert	2412.000	PK	96.2	26.7	6.9	32.7	97.1	-	-	Carrier
Vert	2400.000	PK	57.2	26.7	6.9	32.7	58.1	77.1	19.0	

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

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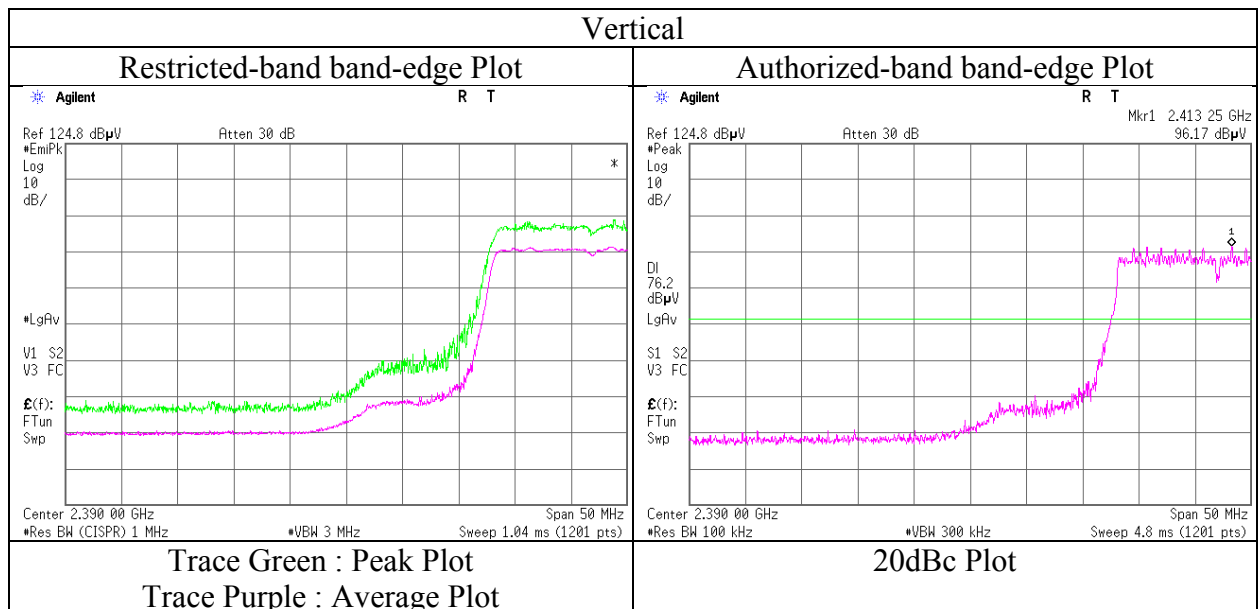
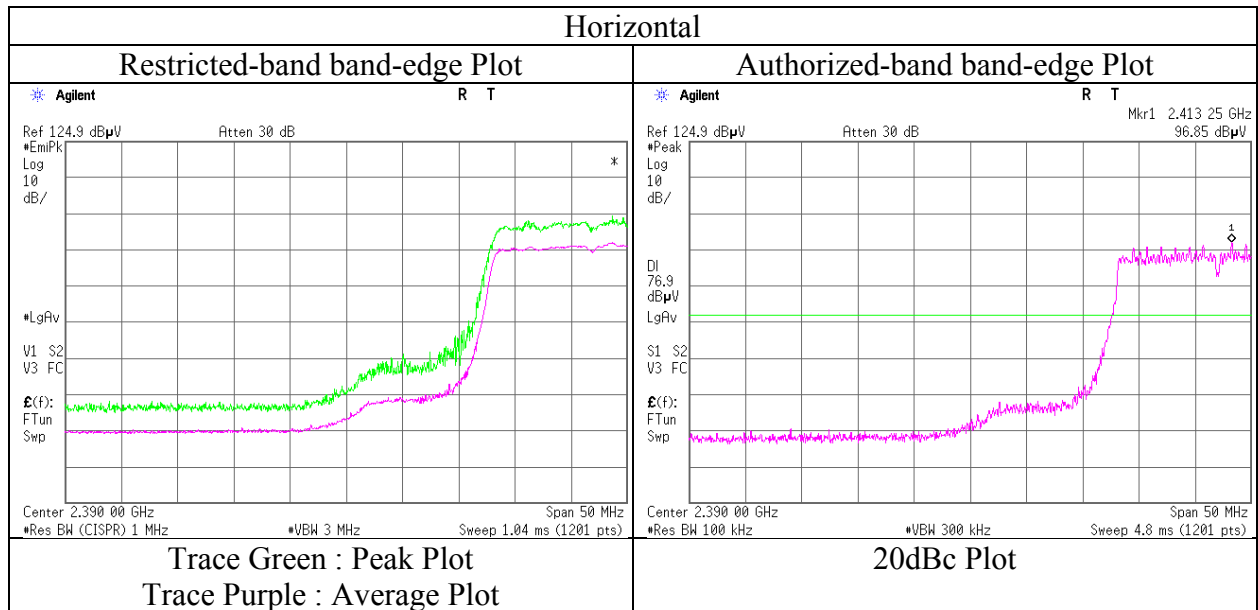
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
	(Band Edge)
Mode	Tx 11n-20 2412 MHz



* 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.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
	(Band Edge)
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	2483.500	PK	62.1	26.8	7.0	32.6	-	63.3	73.9	10.6	
Hori	2483.500	AV	46.8	26.8	7.0	32.6	1.1	49.1	53.9	4.8	*1),*2)
Vert	2483.500	PK	62.3	26.8	7.0	32.6	-	63.5	73.9	10.4	
Vert	2483.500	AV	47.3	26.8	7.0	32.6	1.1	49.6	53.9	4.3	*1),*2)

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).

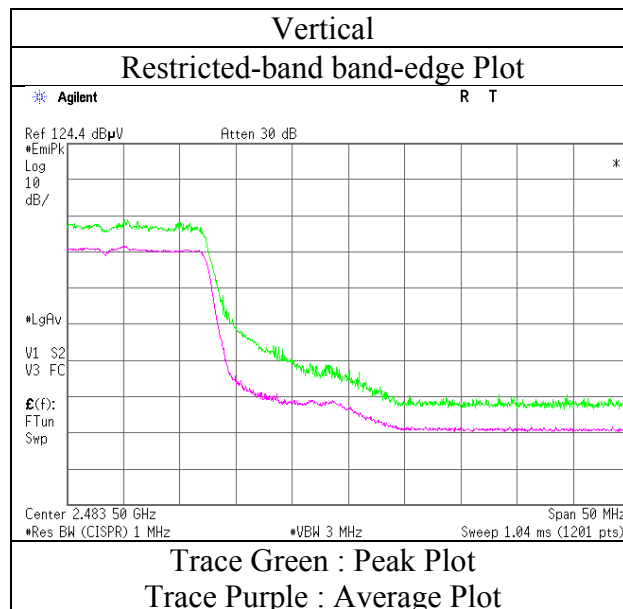
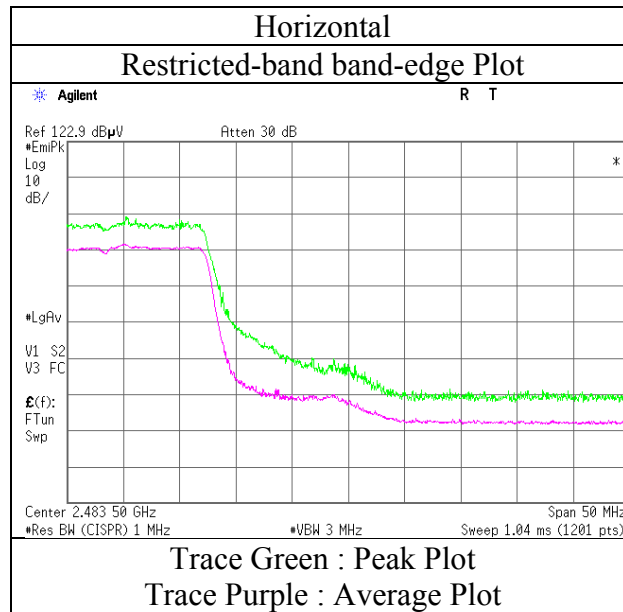
Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

*2) Integration method

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11489808H
Date	November 1, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
	(Band Edge)
Mode	Tx 11n-20 2462 MHz



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

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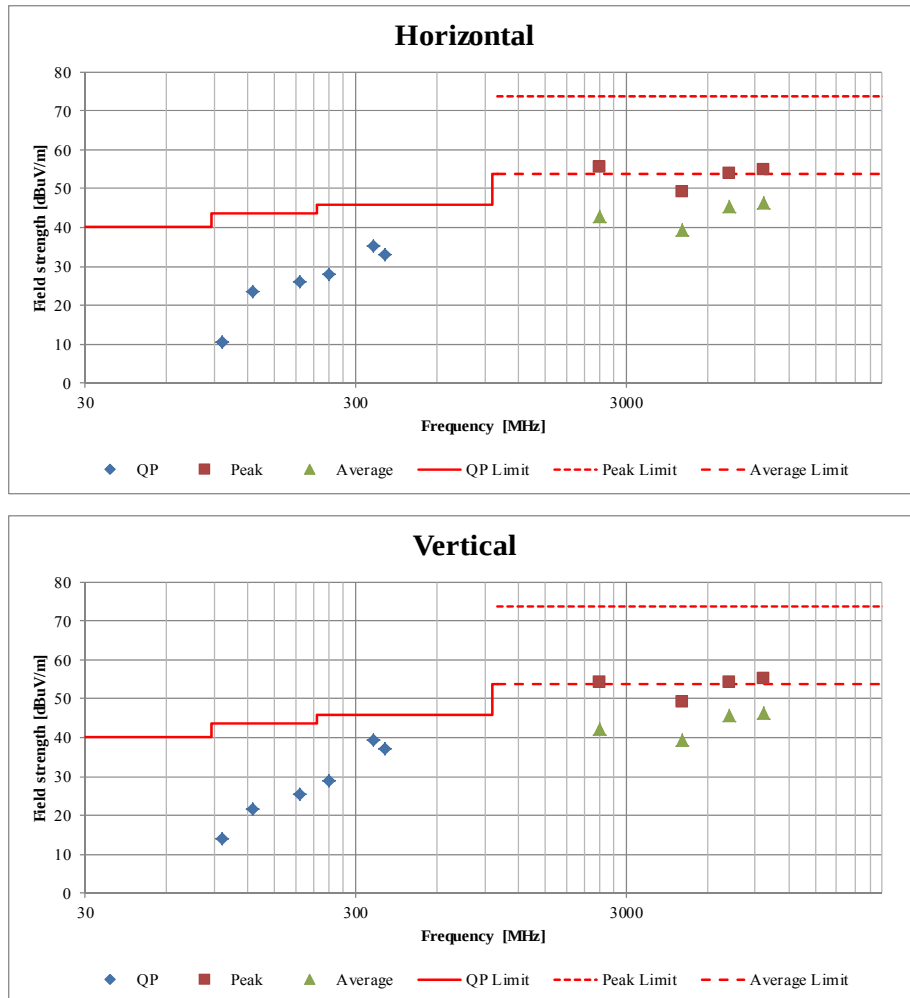
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Radiated Spurious Emission **(Plot data, Worst case)**

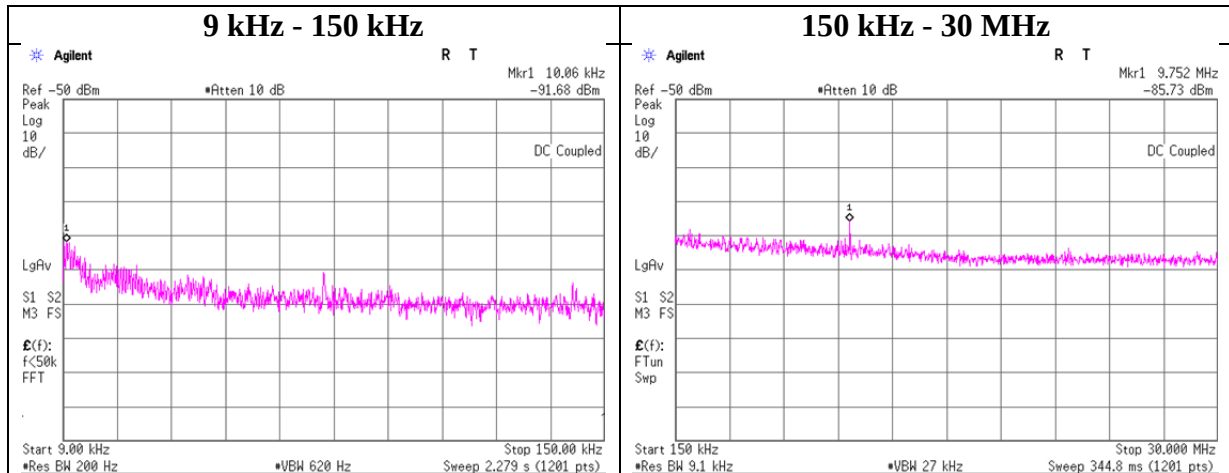
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11489808H		
Date	November 1, 2016	November 2, 2016	
Temperature / Humidity	23 deg. C / 54 % RH	23 deg. C / 48 % RH	
Engineer	Tomoki Matsui	Ken Fujita	
	(1 GHz - 10 GHz)	(Above 10 GHz)	
Mode	Tx 11g 2412 MHz		



*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. : 11489808H
Date : October 26, 2016
Temperature / Humidity : 24 deg. C / 62 % RH
Engineer : Takafumi Noguchi
Mode : Tx 11g 2412 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain	N	EIRP	Distance	Ground bounce	E	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	(Number of Output)	[dBm]	[m]	[dB]	(field strength) [dBuV/m]	[dBuV/m]	[dB]	
10.06	-91.7	0.07	9.8	2.0	1	-79.8	300	6.0	-18.5	47.5	66.0	
9752.00	-85.7	0.07	9.9	2.0	1	-73.7	30	6.0	7.5	29.5	22.0	

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

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

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Power Density

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11489808H
Date October 26, 2016
Temperature / Humidity 24 deg. C / 62 % RH
Engineer Takafumi Noguchi
Mode Tx

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-18.52	0.70	9.48	-8.34	8.00	16.34
2437	-18.61	0.70	9.48	-8.43	8.00	16.43
2462	-18.51	0.70	9.48	-8.33	8.00	16.33

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-26.88	0.70	9.48	-16.70	8.00	24.70
2437	-27.08	0.70	9.48	-16.90	8.00	24.90
2462	-27.12	0.70	9.48	-16.94	8.00	24.94

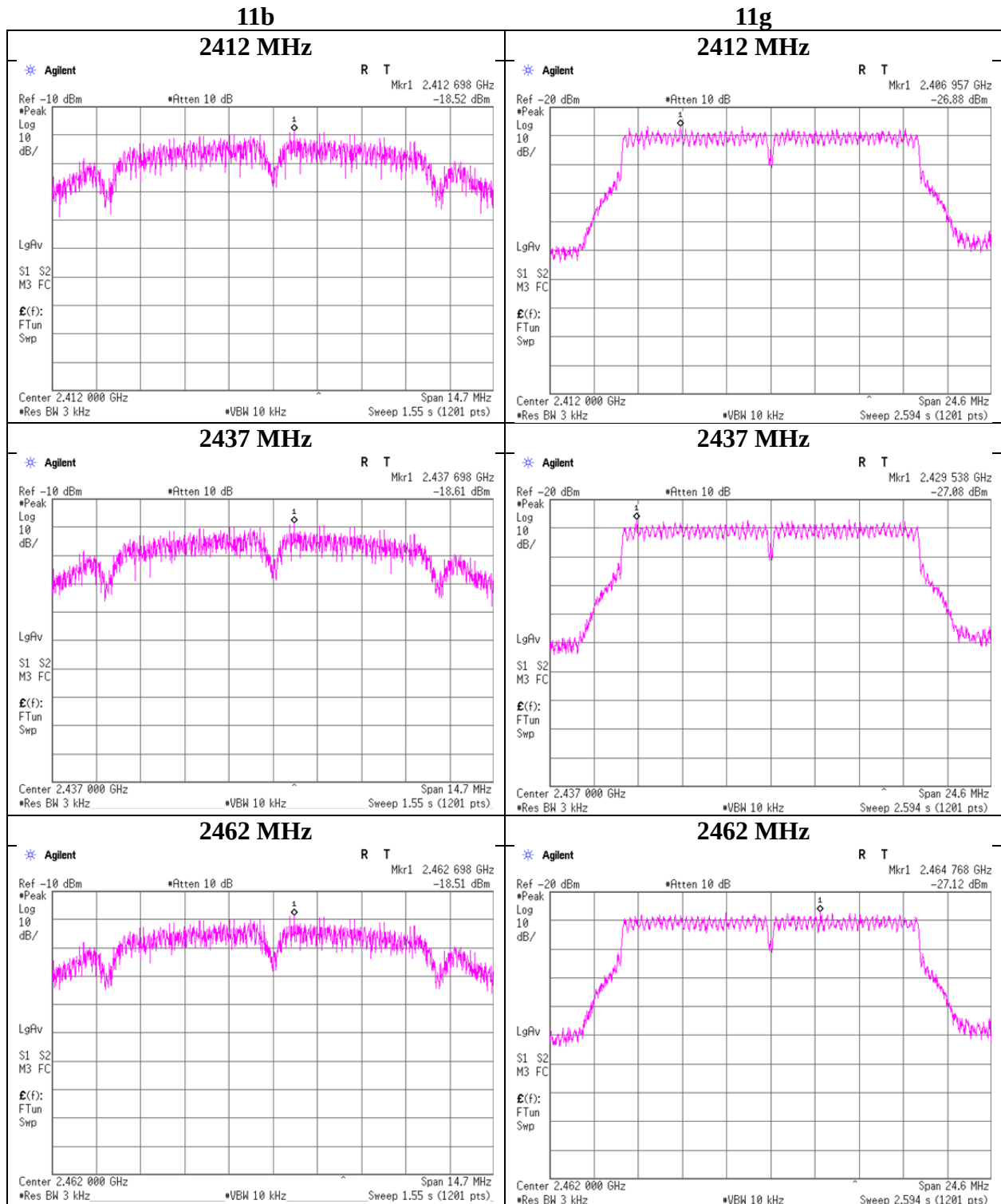
11n-20

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412	-25.10	0.70	9.48	-14.92	8.00	22.92
2437	-25.65	0.70	9.48	-15.47	8.00	23.47
2462	-25.22	0.70	9.48	-15.04	8.00	23.04

Sample Calculation:

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

Power Density



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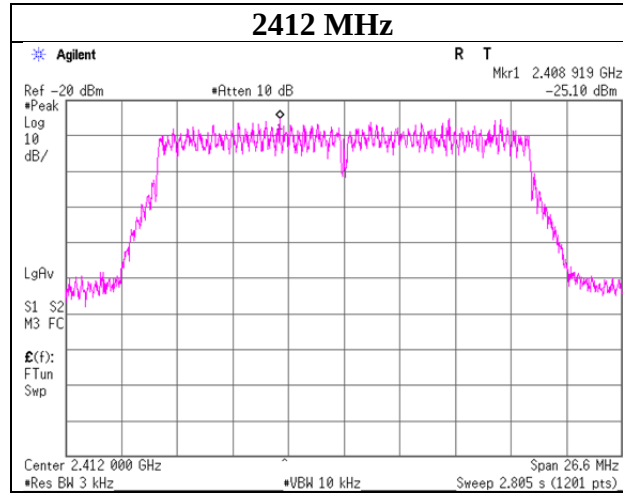
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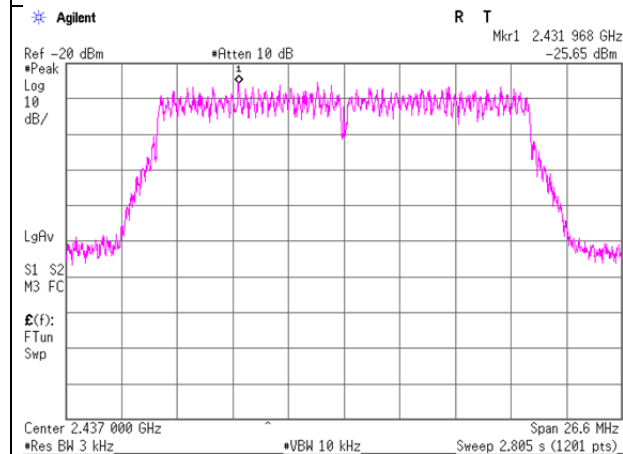
Power Density

11n-20

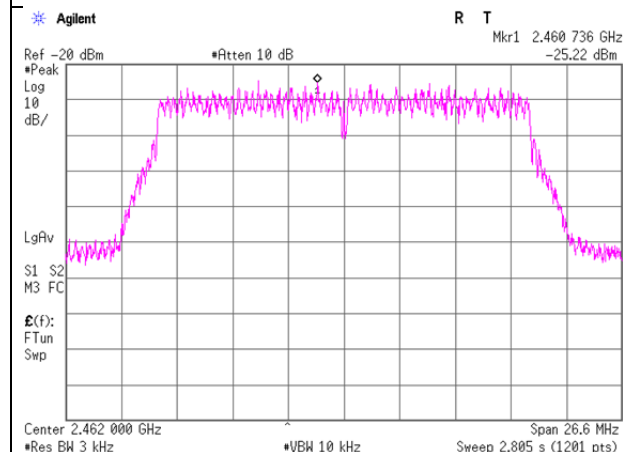
2412 MHz



2437 MHz



2462 MHz



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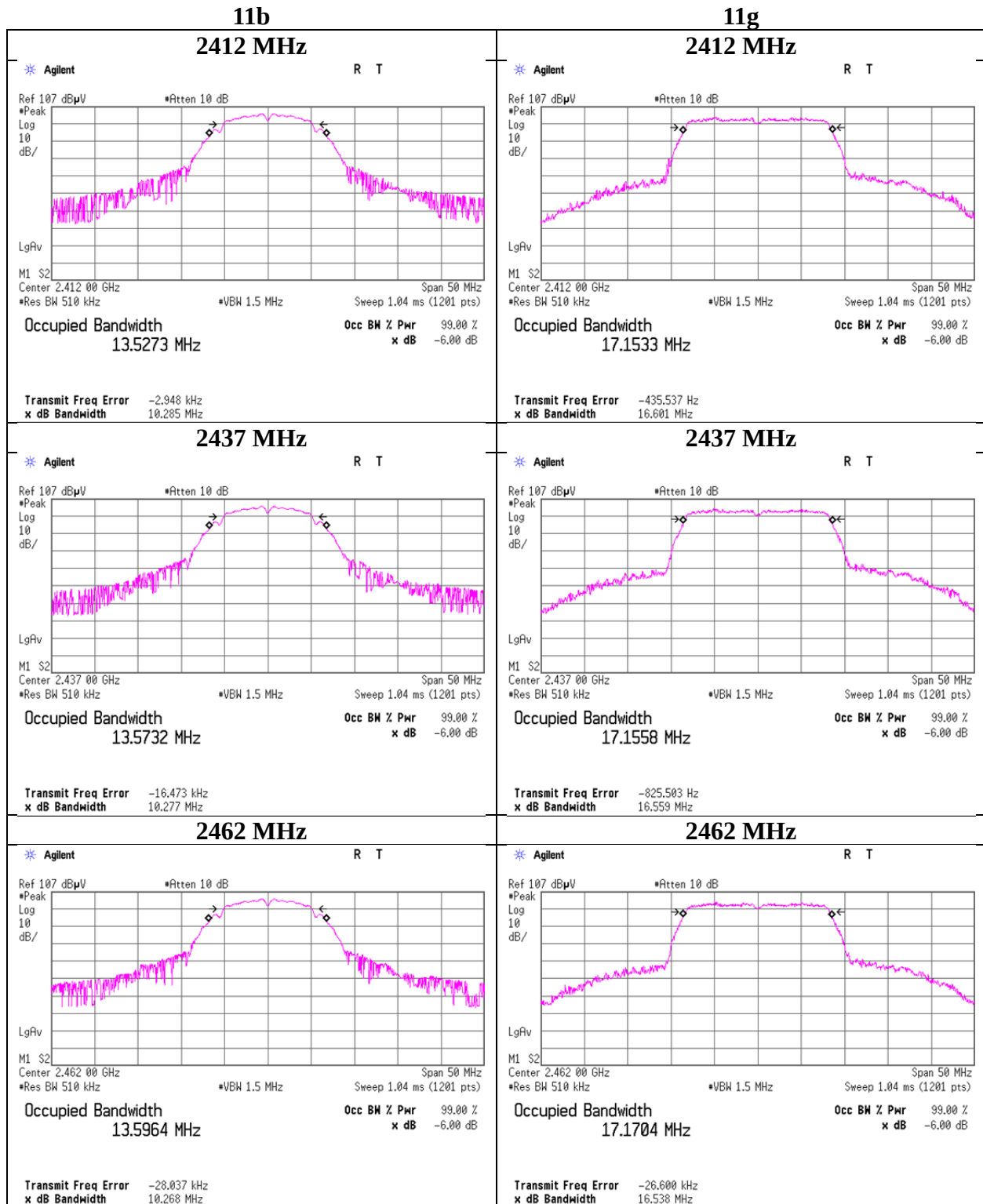
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Telephone : +81 596 24 8999

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99%Occupied Bandwidth

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 26, 2016
Temperature / Humidity : 24 deg. C / 62 % RH
Engineer : Takafumi Noguchi
Mode : Tx



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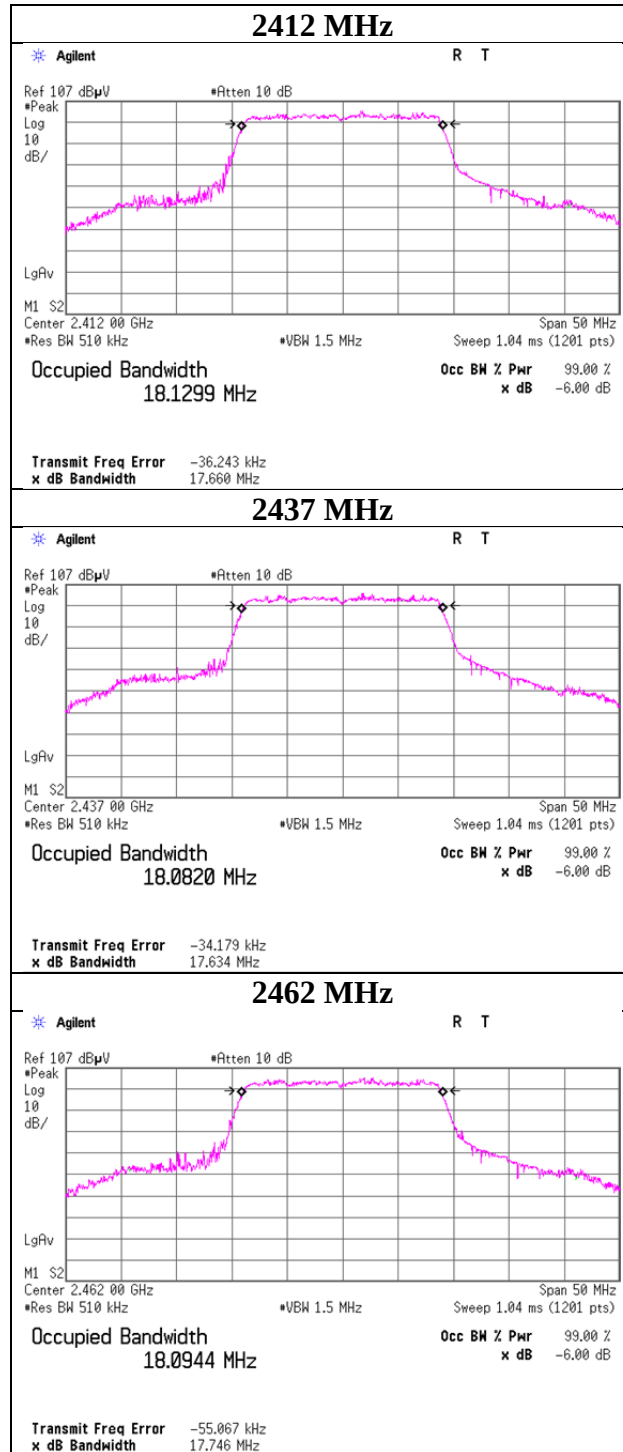
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99% Occupied Bandwidth

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11489808H
Date : October 26, 2016
Temperature / Humidity : 24 deg. C / 62 % RH
Engineer : Takafumi Noguchi
Mode : Tx

11n-20



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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2016/06/06 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2016/06/06 * 12
MAT-90	Attenuator	Weinschel Associates	WA56-10	56100306	AT	2016/06/09 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2016/01/21 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE/CE	2016/10/14 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2016/05/29 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2016/05/20 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2016/09/21 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2016/05/29 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2016/07/11 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2016/07/26 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MRENT-130	Spectrum Analyzer	Agilent	E4440A	MY46187750	AT	2016/06/03 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2015/11/10 * 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: CE: Conducted Emission test
RE: Radiated Emission test
AT: Antenna Terminal Conducted test

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