RADIO TEST REPORT

Test Report No. : 12051947S-C-R2

Applicant	:	**Panasonic Corporation**
Type of Equipment	:	**AV Control Unit for In-Vehicle Infotainment**
Model No.	:	**AM1701**
FCC ID	:	**ACJ932AM1701**
Test regulation	:	**FCC Part 15 Subpart C: 2018**
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. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 12051947S-C-R1.12051947S-C-R1 is replaced with this report.

Date of test: November 15, 2017 to January 25, 2018

Representative test engineer:

H. Morikawa

Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:

S. Takano

Shinichi Takano
Engineer
Consumer Technology Division

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

RTL02610

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

REVISION HISTORY

Original Test Report No.: 12051947S-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12051947S-C	February 28, 2018	-	-
1	12051947S-C-R1	May 28, 2018	4 5	Correction of Radio Specification Correction of FCC Part 15.31 (e)
2	12051947S-C-R2	May 30, 2018	4 5 6 47 8, 53	Correction of Radio Specification Correction of FCC Part 15.31 (e) Correction of Uncertainty Correction of Reading Update of 4.2 and Addition of Appendix 4

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

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SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Address	:	4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa 224-8520 Japan
Telephone Number	:	+81-50-3689-7389
Facsimile Number	:	+81-45-931-0806
Contact Person	:	Yoshinori Nagatani

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

2.1 Identification of E.U.T.

Type of Equipment	:	AV Control Unit for In-Vehicle Infotainment
Model No.	:	AM1701
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 13.2 V
Receipt Date of Sample	:	October 10, 2017
Country of Mass-production	:	Thailand, Mexico
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

Product Description

Model: AM1701 (referred to as the EUT in this report) is a AV Control Unit for In-Vehicle Infotainment.

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2412 MHz - 2462 MHz
Modulation	:	DSSS, CCK, OFDM
Power Supply (radio part input)	:	DC 3.3 V / 1.8 V
Antenna type	:	Pattern antenna
Antenna Gain	:	2 dBi
Clock frequency (Maximum)	:	48 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on January 2, 2018 and effective February 1, 2018
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

* The revision on January 2, 2018, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods **IC:** RSS-Gen 8.8	**FCC:** Section 15.207 **IC:** RSS-Gen 8.8	**N/A**	N/A	N/A *1)
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** -	**FCC:** Section 15.247(a)(2) **IC:** RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** RSS-Gen 6.12	**FCC:** Section 15.247(b)(3) **IC:** RSS-247 5.4(d)		Complied	Conducted
Power Density	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** -	**FCC:** Section 15.247(e) **IC:** RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v04 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.0 dB 40.132 MHz, QP, Hori Tx 11g 2437 MHz	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 power ports.

*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.

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

FCC 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 (DC 13.2 V) 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 equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users. 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.

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-300 MHz	4.3 dB	4.3 dB	4.3 dB	-	-
	300 MHz-1 GHz	5.9 dB	5.9 dB	5.9 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

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. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	48 Mbps, PN9
IEEE 802.11n HT20 (11n-20)	MCS 4 (800 ns 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: Fixed Software: 00584 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
6dB Bandwidth 99% Occupied Bandwidth Maximum Peak Output Power Power Density	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
Spurious Emission (Radiated, above 1 GHz)	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2417 MHz(11g, 11n-20) *1) 2437 MHz 2457 MHz(11g, 11n-20) *1) 2462 MHz
Spurious Emission (Radiated below 1 GHz) Spurious Emission (Conducted below 30 MHz)	11g Tx	2437 MHz

*1) Band-edge only

4.2 Configuration and peripherals

This page has been submitted for separate exhibit (refer to APPENDIX 4).

SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

[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 300 MHz	300 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	3.89 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3.89 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)

*1) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".
*2) Distance Factor: 20 x log (3.89 m / 3.0 m) = 2.25 dB
*3) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB

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

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

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

SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	50 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

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

Test data : APPENDIX
Test result : Pass

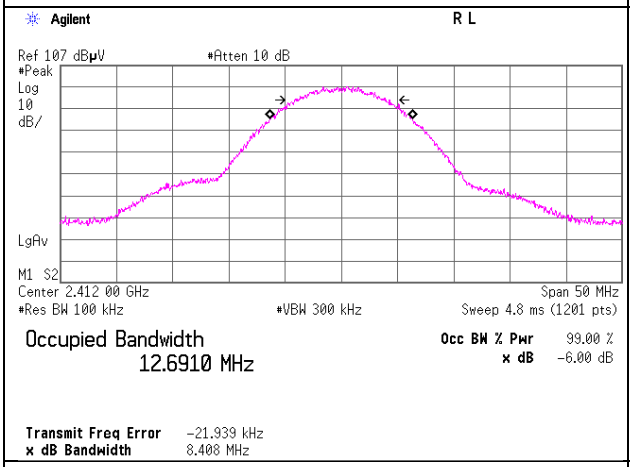
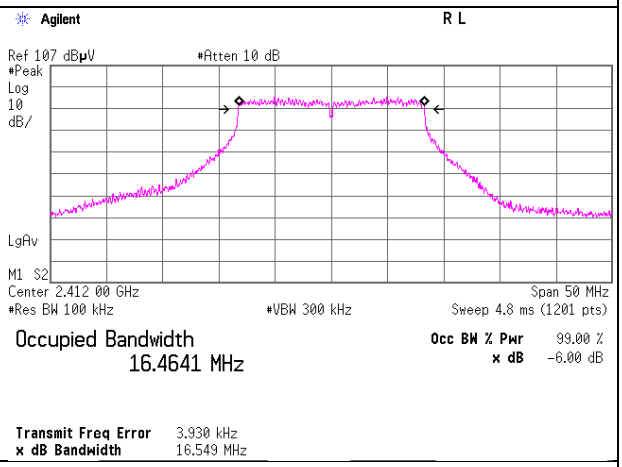
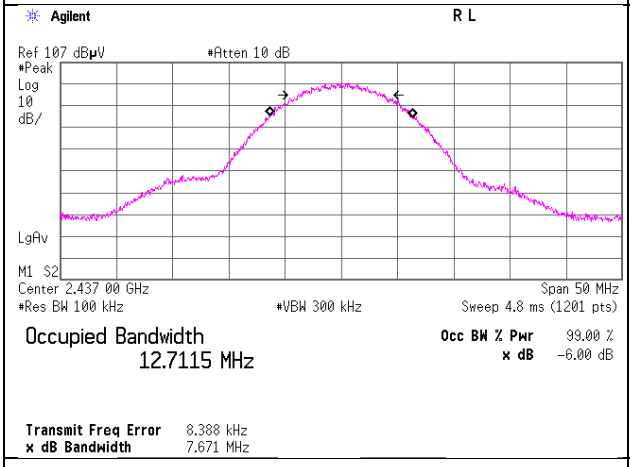
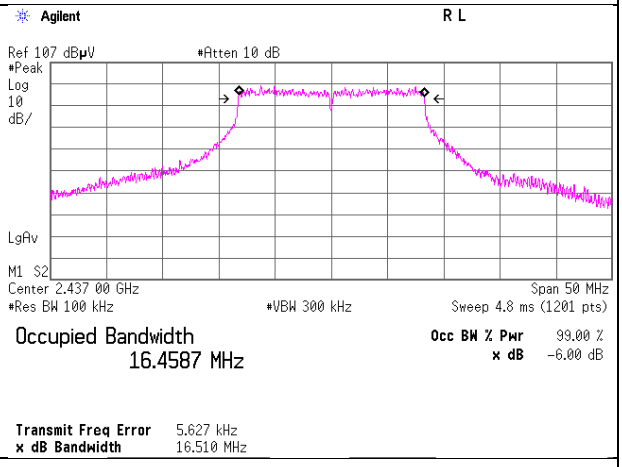
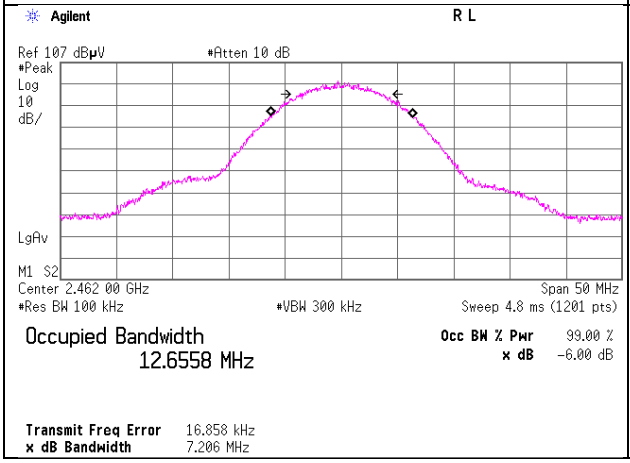
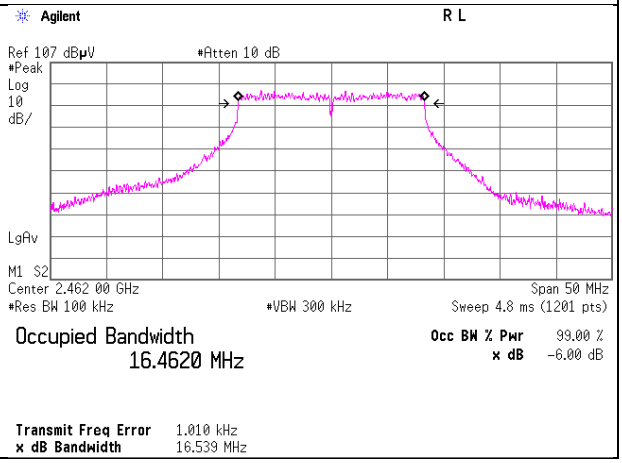
APPENDIX 1: Test data

6 dB Bandwidth and 99 % Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	12769.8	8.408	> 0.5000
	2437	12758.5	7.671	> 0.5000
	2462	12793.5	7.206	> 0.5000
11g	2412	16751.6	16.549	> 0.5000
	2437	16839.9	16.510	> 0.5000
	2462	16768.8	16.539	> 0.5000
11n-20	2412	18006.4	17.743	> 0.5000
	2437	17975.0	17.744	> 0.5000
	2462	17988.5	17.733	> 0.5000

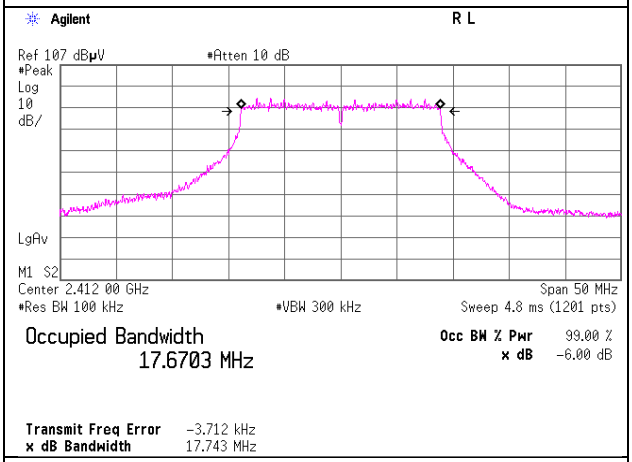
6dB Bandwidth

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

6dB Bandwidth

11n-20

2412 MHz



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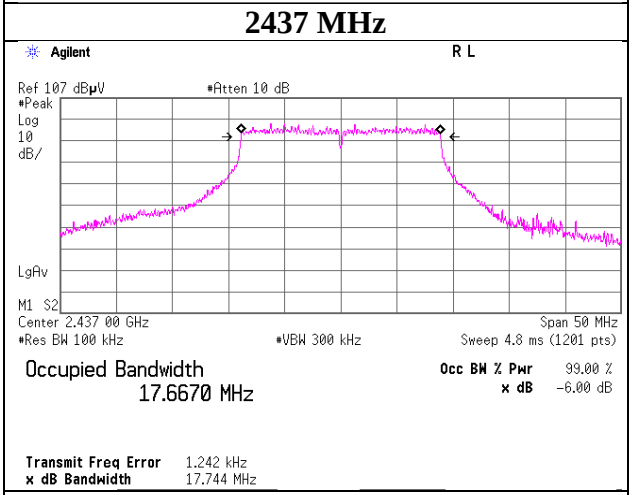

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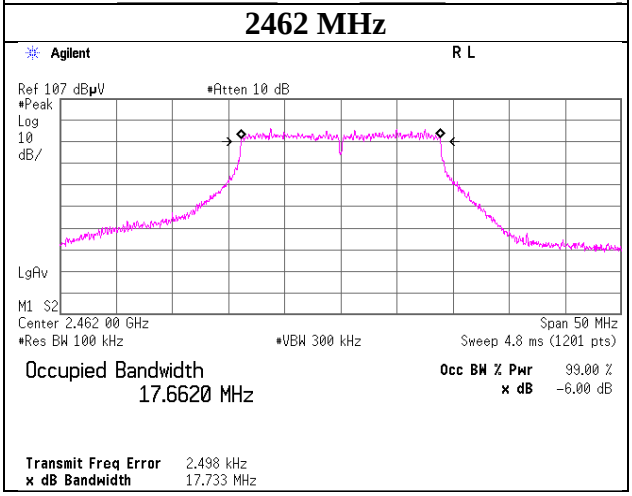
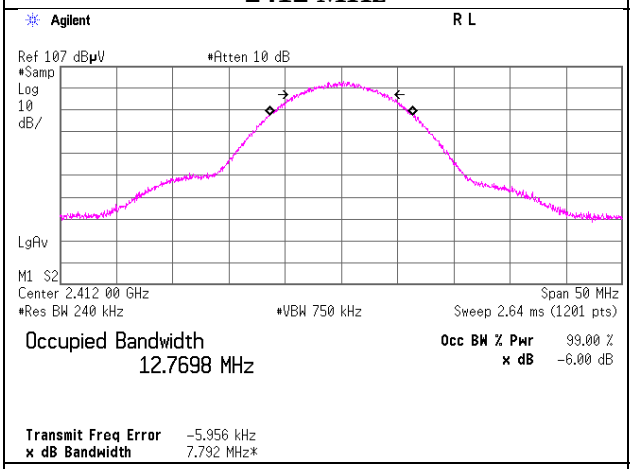


99%Occupied Bandwidth

11b

2412 MHz



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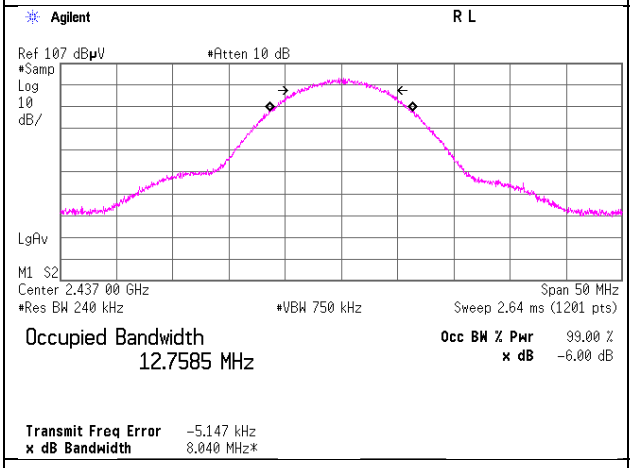

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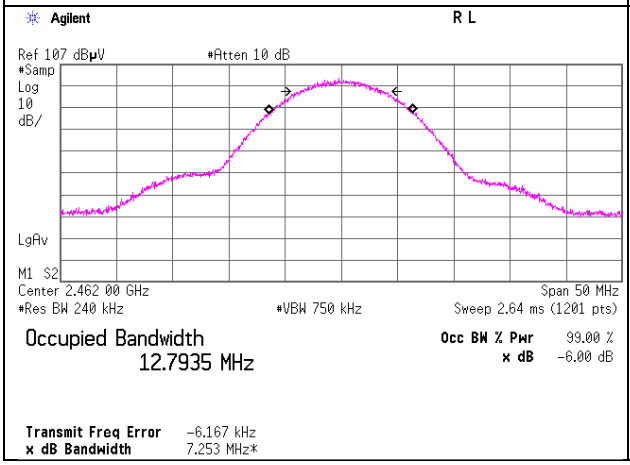
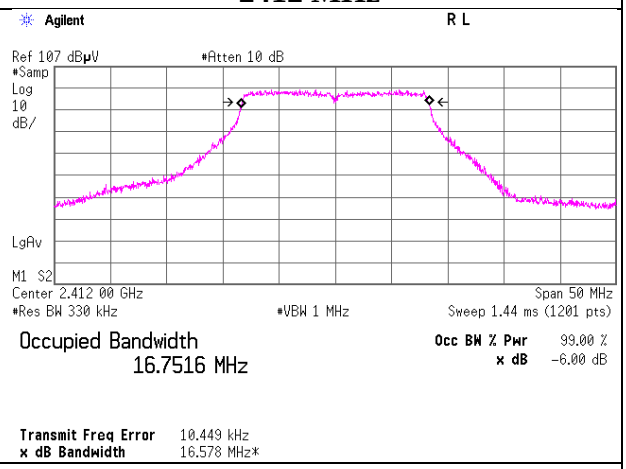
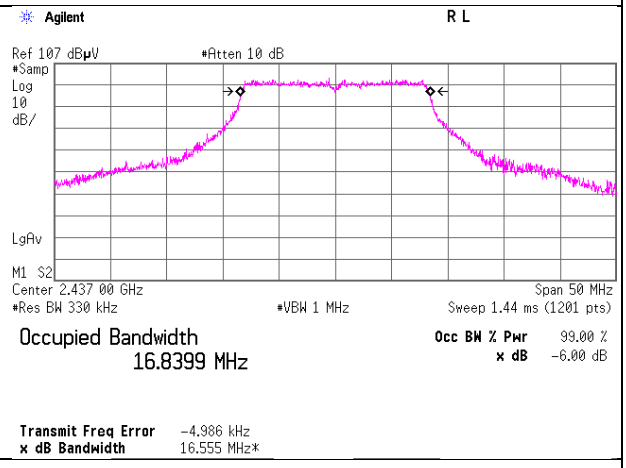


11g

2412 MHz



2437 MHz



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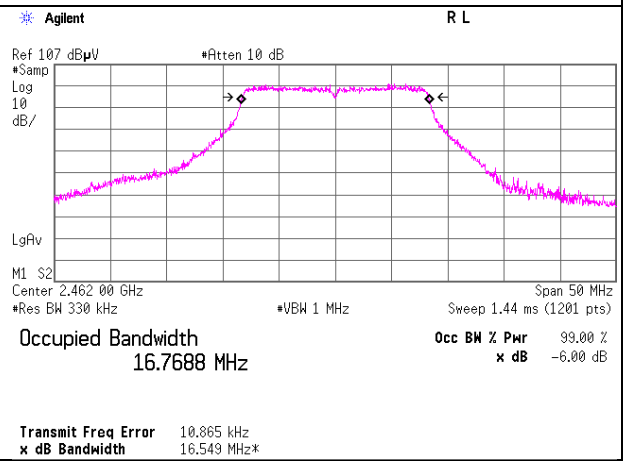
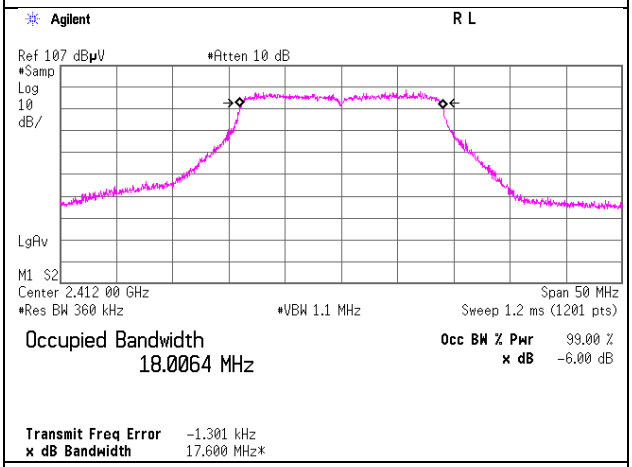


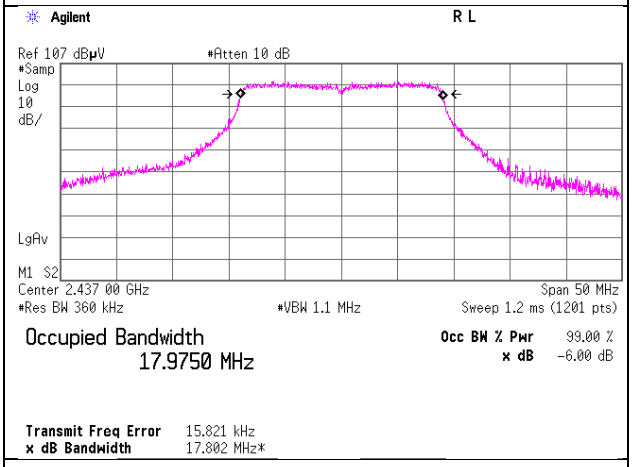
99% Occupied Bandwidth

11n-20

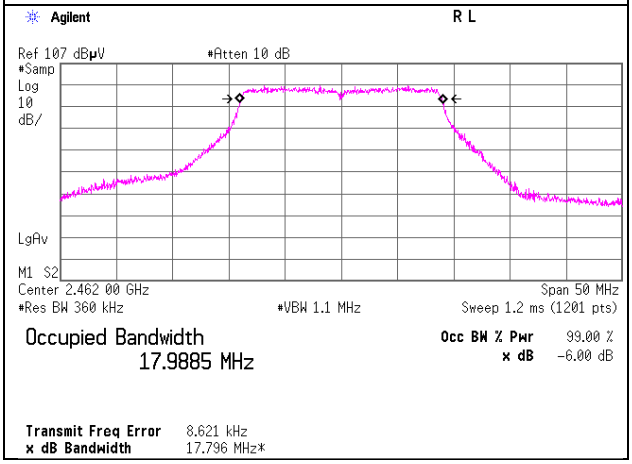
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx 11b

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	1.37	2.53	9.85	13.75	23.71	30.00	1000	16.25
2437	1.34	2.54	9.85	13.73	23.60	30.00	1000	16.27
2462	1.29	2.55	9.84	13.68	23.33	30.00	1000	16.32

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

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

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	1.02	
2	1.31	
5.5	1.20	
11	1.34	*

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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx 11g

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	7.78	2.53	9.85	20.16	103.75	30.00	1000	9.84
2437	10.30	2.54	9.85	22.69	185.78	30.00	1000	7.31
2462	9.26	2.55	9.84	21.65	146.22	30.00	1000	8.35

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

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

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	6.59	
9	6.66	
12	6.80	
18	6.76	
24	10.19	
36	10.02	
48	10.30	*
54	10.12	

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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx 11n-20

11n-20 800 ns GI

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	6.96	2.53	9.85	19.34	85.90	30.00	1000	10.66
2437	10.02	2.54	9.85	22.41	174.18	30.00	1000	7.59
2462	8.88	2.55	9.84	21.27	133.97	30.00	1000	8.73

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

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

800 ns GI, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
0	5.32	
1	5.61	
2	5.56	
3	9.26	
4	10.02	*
5	9.51	
6	9.77	
7	9.76	

400 ns GI, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
0	5.33	
1	5.53	
2	5.55	
3	9.23	
4	9.93	
5	9.24	
6	9.55	
7	9.61	

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

Average Output Power
(Reference data for SAR testing)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx

11b **2 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-1.50	2.53	9.85	10.88	12.25	0.00	10.88	12.25
2437	-1.55	2.54	9.85	10.84	12.13	0.00	10.84	12.13
2462	-1.56	2.55	9.84	10.83	12.11	0.00	10.83	12.11

11g **24 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-3.75	2.53	9.85	8.63	7.29	0.07	8.70	7.41
2437	0.26	2.54	9.85	12.65	18.41	0.07	12.72	18.71
2462	-1.77	2.55	9.84	10.62	11.53	0.07	10.69	11.72

11n-20 **MCS 4 (800 ns GI)**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-4.88	2.53	9.85	7.50	5.62	0.11	7.61	5.77
2437	-0.83	2.54	9.85	11.56	14.32	0.11	11.67	14.69
2462	-2.84	2.55	9.84	9.55	9.02	0.11	9.66	9.25

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	-1.85	0.00	-1.85	
	2	-1.55	0.00	-1.55	*
	5.5	-1.65	0.01	-1.64	
	11	-1.60	0.03	-1.57	
11g	6	-0.19	0.02	-0.17	
	9	-0.22	0.03	-0.19	
	12	-0.16	0.04	-0.12	
	18	-0.21	0.05	-0.16	
	24	0.26	0.07	0.33	*
	36	0.18	0.10	0.28	
	48	0.16	0.14	0.30	
	54	0.13	0.16	0.29	

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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

11n-20, 2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
800 ns GI	0	-1.42	0.02	-1.40	
	1	-1.45	0.04	-1.41	
	2	-1.43	0.06	-1.37	
	3	-0.87	0.07	-0.80	
	4	-0.83	0.11	-0.72	*
	5	-0.95	0.15	-0.80	
	6	-0.90	0.17	-0.73	
	7	-0.91	0.18	-0.73	
400 ns GI	0	-1.43	0.02	-1.41	
	1	-1.47	0.04	-1.43	
	2	-1.40	0.06	-1.34	
	3	-0.84	0.07	-0.77	
	4	-0.91	0.11	-0.80	
	5	-0.90	0.15	-0.75	
	6	-0.95	0.17	-0.78	
	7	-0.99	0.18	-0.81	

* Worst rate

Sample Calculation:

Burst power = Reading (timed average) + Duty factor

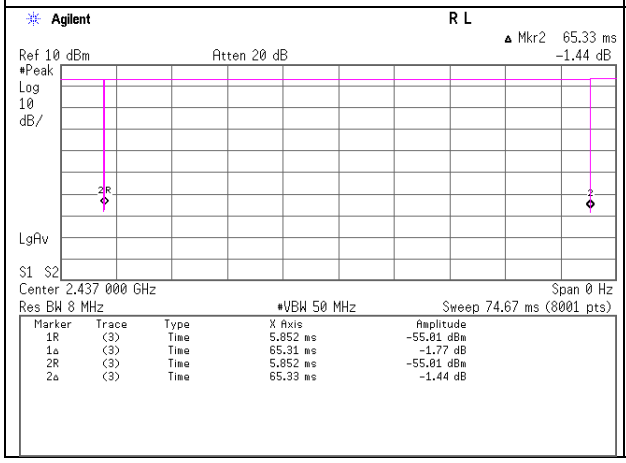
All comparison were carried out on same frequency and measurement factors.

Burst rate confirmation
(for Average output power)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx

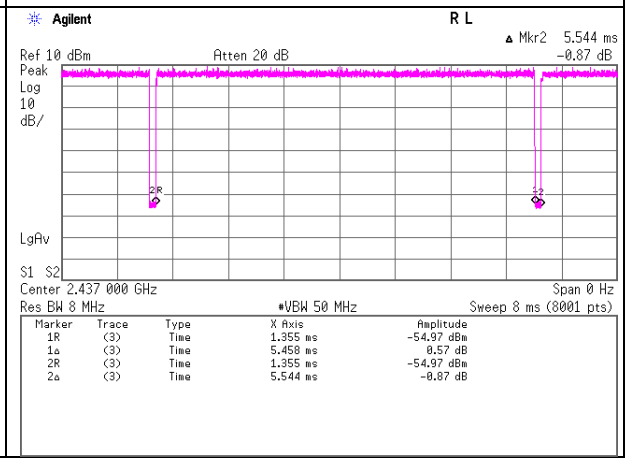
11b 2 Mbps

Tx on / (Tx on + Tx off) =	**1.000**
Tx on / (Tx on + Tx off) * 100 =	**99.9 %**
Duty factor = 10 * log (65.33 / 65.31) =	**0.00 dB**



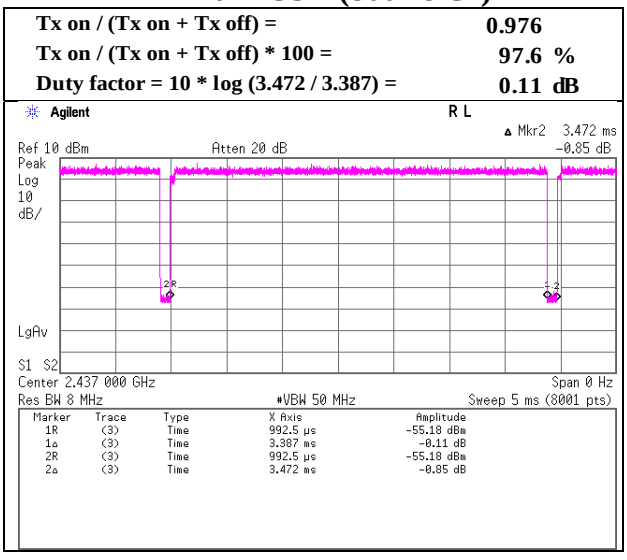
11g 24 Mbps

Tx on / (Tx on + Tx off) =	**0.984**
Tx on / (Tx on + Tx off) * 100 =	**98.4 %**
Duty factor = 10 * log (5.544 / 5.458) =	**0.07 dB**



11n-20 MCS 4 (800 ns GI)

Tx on / (Tx on + Tx off) =	**0.976**
Tx on / (Tx on + Tx off) * 100 =	**97.6 %**
Duty factor = 10 * log (3.472 / 3.387) =	**0.11 dB**



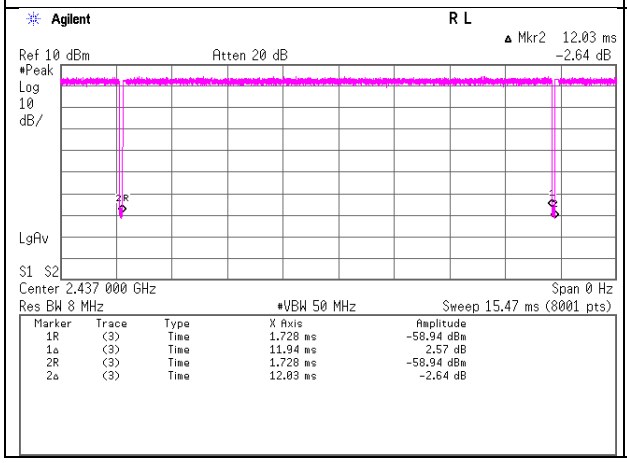
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation
(for Spurious emission)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx

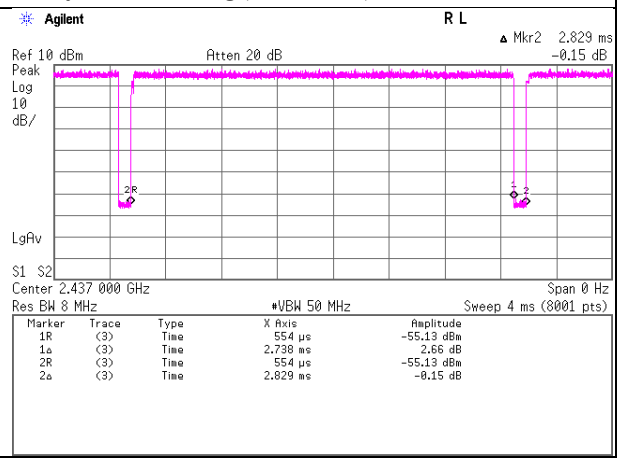
11b 11 Mbps

Tx on / (Tx on + Tx off) = 0.993
Tx on / (Tx on + Tx off) * 100 = 99.3 %



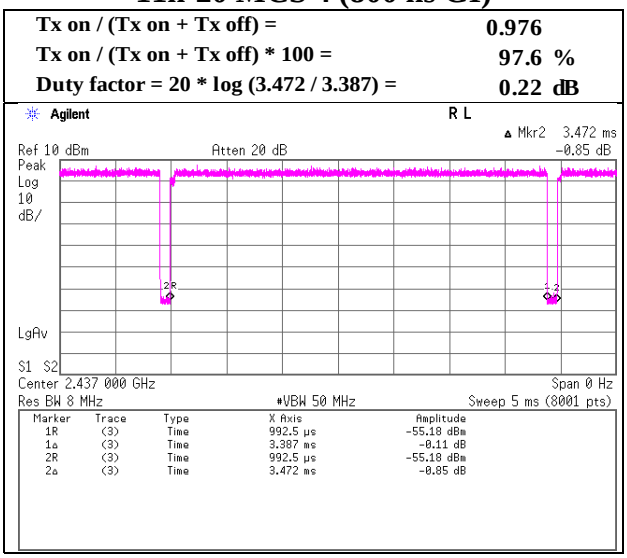
11g 48 Mbps

Tx on / (Tx on + Tx off) = 0.968
Tx on / (Tx on + Tx off) * 100 = 96.8 %
Duty factor = 20 * log (2.829 / 2.738) = 0.28 dB



11n-20 MCS 4 (800 ns GI)

Tx on / (Tx on + Tx off) = 0.976
Tx on / (Tx on + Tx off) * 100 = 97.6 %
Duty factor = 20 * log (3.472 / 3.387) = 0.22 dB



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

Radiated Spurious Emission

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11b 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	51.42	27.26	14.18	44.13	2.25	50.98	73.90	22.9	309	22	
Hori.	4824.000	PK	54.67	31.46	6.69	44.46	2.25	50.61	73.90	23.2	100	301	
Hori.	7236.000	PK	49.71	36.62	8.13	44.00	2.25	52.71	73.90	21.1	150	0	
Hori.	9648.000	PK	48.32	38.66	9.35	43.83	2.25	54.75	73.90	19.1	150	0	
Hori.	2390.000	AV	42.23	27.26	14.18	44.13	2.25	41.79	53.90	12.1	309	22	
Hori.	4824.000	AV	44.68	31.46	6.69	44.46	2.25	40.62	53.90	13.2	100	301	
Hori.	7236.000	AV	38.77	36.62	8.13	44.00	2.25	41.77	53.90	12.1	150	0	
Hori.	9648.000	AV	38.91	38.66	9.35	43.83	2.25	45.34	53.90	**8.5**	150	0	
Vert.	2390.000	PK	51.05	27.26	14.18	44.13	2.25	50.61	73.90	23.2	152	213	
Vert.	4824.000	PK	55.54	31.46	6.69	44.46	2.25	51.48	73.90	22.4	183	303	
Vert.	7236.000	PK	49.04	36.62	8.13	44.00	2.25	52.04	73.90	21.8	150	0	
Vert.	9648.000	PK	48.21	38.66	9.35	43.83	2.25	54.64	73.90	19.2	150	0	
Vert.	2390.000	AV	41.21	27.26	14.18	44.13	2.25	40.77	53.90	13.1	152	213	
Vert.	4824.000	AV	46.34	31.46	6.69	44.46	2.25	42.28	53.90	11.6	183	303	
Vert.	7236.000	AV	38.27	36.62	8.13	44.00	2.25	41.27	53.90	12.6	150	0	
Vert.	9648.000	AV	38.82	38.66	9.35	43.83	2.25	45.25	53.90	8.6	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

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

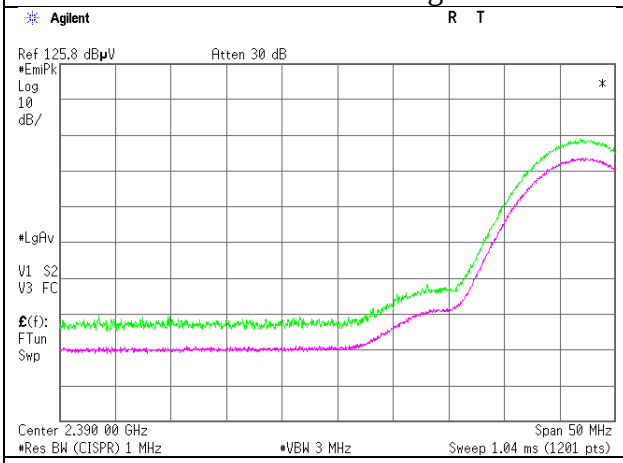
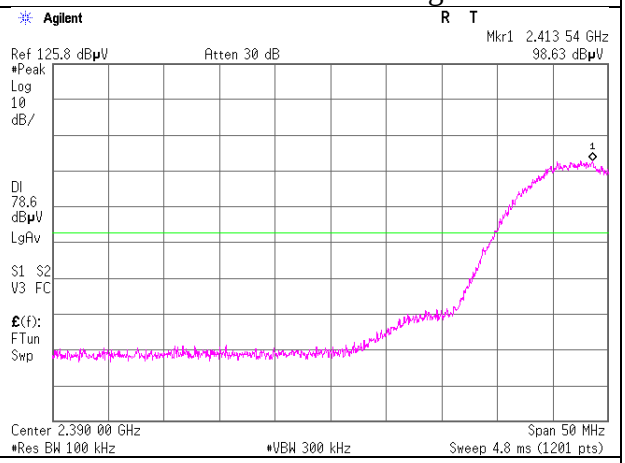
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	99.14	27.33	14.19	44.14	2.25	98.77	-	-	Carrier
Hori.	2400.000	PK	55.93	27.29	14.18	44.14	2.25	55.51	78.77	23.3	
Vert.	2412.000	PK	94.26	27.33	14.19	44.14	2.25	93.89	-	-	Carrier
Vert.	2400.000	PK	53.15	27.29	14.18	44.14	2.25	52.73	73.89	21.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

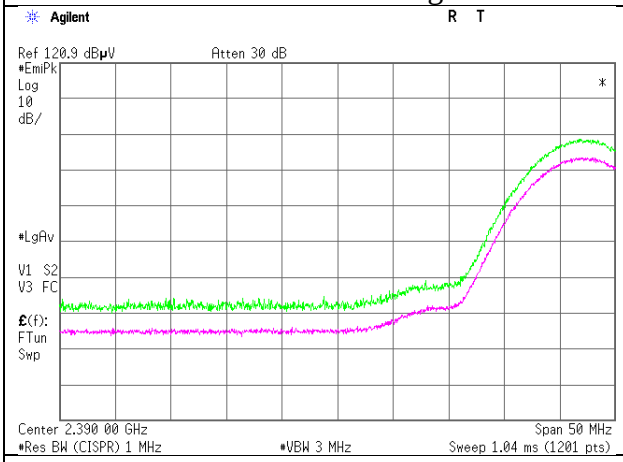
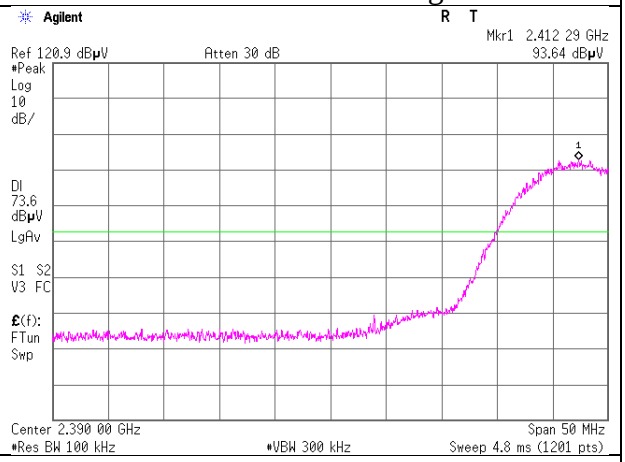
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -13 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

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11b 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	55.98	31.59	6.70	44.47	2.25	52.05	73.90	21.8	135	302	
Hori.	7311.000	PK	48.41	36.75	8.13	44.03	2.25	51.51	73.90	22.3	150	0	
Hori.	9748.000	PK	48.17	38.78	9.36	43.84	2.25	54.72	73.90	19.1	150	0	
Hori.	4874.000	AV	45.70	31.59	6.70	44.47	2.25	41.77	53.90	12.1	135	302	
Hori.	7311.000	AV	39.16	36.75	8.13	44.03	2.25	42.26	53.90	11.6	150	0	
Hori.	9748.000	AV	39.17	38.78	9.36	43.84	2.25	45.72	53.90	**8.1**	150	0	
Vert.	4874.000	PK	55.65	31.59	6.70	44.47	2.25	51.72	73.90	22.1	188	305	
Vert.	7311.000	PK	48.83	36.75	8.13	44.03	2.25	51.93	73.90	21.9	150	0	
Vert.	9748.000	PK	48.46	38.78	9.36	43.84	2.25	55.01	73.90	18.8	150	0	
Vert.	4874.000	AV	44.97	31.59	6.70	44.47	2.25	41.04	53.90	12.8	188	305	
Vert.	7311.000	AV	38.69	36.75	8.13	44.03	2.25	41.79	53.90	12.1	150	0	
Vert.	9748.000	AV	39.18	38.78	9.36	43.84	2.25	45.73	53.90	**8.1**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11b 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	51.71	27.55	14.25	44.16	2.25	51.60	73.90	22.3	301	18	
Hori.	4924.000	PK	56.12	31.73	6.72	44.49	2.25	52.33	73.90	21.5	100	301	
Hori.	7386.000	PK	48.86	36.88	8.14	44.06	2.25	52.07	73.90	21.8	150	0	
Hori.	9848.000	PK	48.89	38.90	9.38	43.86	2.25	55.56	73.90	18.3	150	0	
Hori.	2483.500	AV	42.31	27.55	14.25	44.16	2.25	42.20	53.90	11.7	301	18	
Hori.	4924.000	AV	44.60	31.73	6.72	44.49	2.25	40.81	53.90	13.0	100	301	
Hori.	7386.000	AV	37.74	36.88	8.14	44.06	2.25	40.95	53.90	12.9	150	0	
Hori.	9848.000	AV	37.82	38.90	9.38	43.86	2.25	44.49	53.90	**9.4**	150	0	
Vert.	2483.500	PK	49.95	27.55	14.25	44.16	2.25	49.84	73.90	24.0	152	15	
Vert.	4924.000	PK	55.88	31.73	6.72	44.49	2.25	52.09	73.90	21.8	203	310	
Vert.	7386.000	PK	48.62	36.88	8.14	44.06	2.25	51.83	73.90	22.0	150	0	
Vert.	9848.000	PK	49.04	38.90	9.38	43.86	2.25	55.71	73.90	18.1	150	0	
Vert.	2483.500	AV	41.20	27.55	14.25	44.16	2.25	41.09	53.90	12.8	152	15	
Vert.	4924.000	AV	43.82	31.73	6.72	44.49	2.25	40.03	53.90	13.8	203	310	
Vert.	7386.000	AV	37.38	36.88	8.14	44.06	2.25	40.59	53.90	13.3	150	0	
Vert.	9848.000	AV	37.69	38.90	9.38	43.86	2.25	44.36	53.90	9.5	150	0	

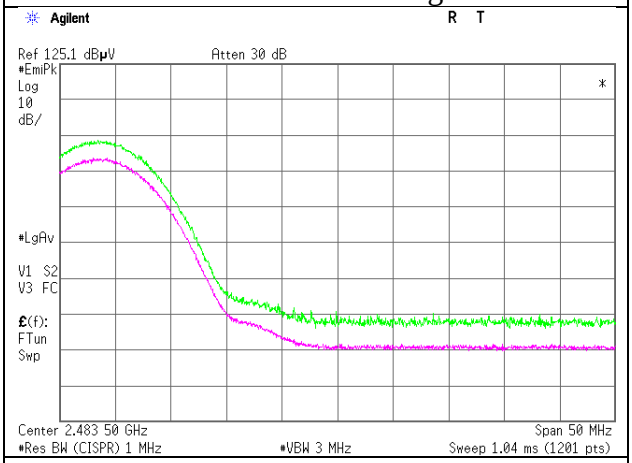
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -13 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

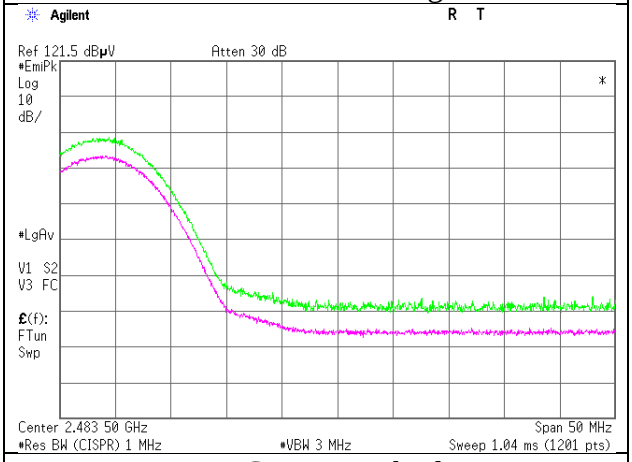
Restricted-band band-edge Plot



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

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11g 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	59.16	27.26	14.18	44.13	2.25	58.72	73.90	**15.1**	315	26	
Hori.	4824.000	PK	50.33	31.46	6.69	44.46	2.25	46.27	73.90	27.6	100	299	
Hori.	7236.000	PK	48.54	36.62	8.13	44.00	2.25	51.54	73.90	22.3	150	0	
Hori.	9648.000	PK	48.89	38.66	9.35	43.83	2.25	55.32	73.90	18.5	150	0	
Vert.	2390.000	PK	53.99	27.26	14.18	44.13	2.25	53.55	73.90	20.3	155	210	
Vert.	4824.000	PK	51.37	31.46	6.69	44.46	2.25	47.31	73.90	26.5	196	308	
Vert.	7236.000	PK	48.89	36.62	8.13	44.00	2.25	51.89	73.90	22.0	150	0	
Vert.	9648.000	PK	48.82	38.66	9.35	43.83	2.25	55.25	73.90	18.6	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	44.72	27.26	14.18	44.13	0.28	2.25	44.56	53.90	9.3	*1)
Hori.	4824.000	AV	41.23	31.46	6.69	44.46	0.28	2.25	37.45	53.90	16.4	
Hori.	7236.000	AV	38.39	36.62	8.13	44.00	0.28	2.25	41.67	53.90	12.2	
Hori.	9648.000	AV	39.25	38.66	9.35	43.83	0.28	2.25	45.96	53.90	**7.9**	
Vert.	2390.000	AV	41.26	27.26	14.18	44.13	0.28	2.25	41.10	53.90	12.8	*1)
Vert.	4824.000	AV	42.41	31.46	6.69	44.46	0.28	2.25	38.63	53.90	15.3	
Vert.	7236.000	AV	38.07	36.62	8.13	44.00	0.28	2.25	41.35	53.90	12.6	
Vert.	9648.000	AV	38.95	38.66	9.35	43.83	0.28	2.25	45.66	53.90	8.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

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

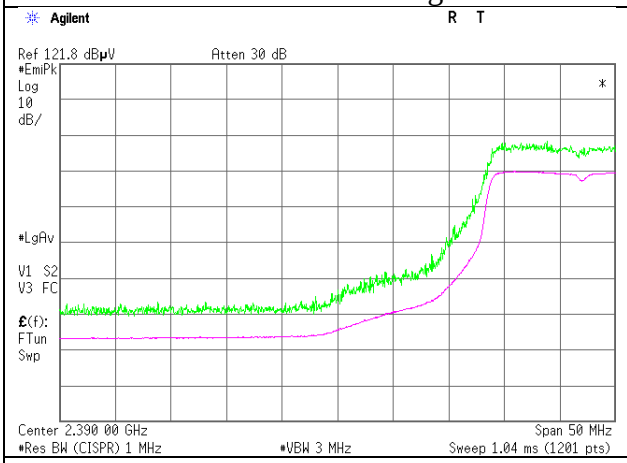
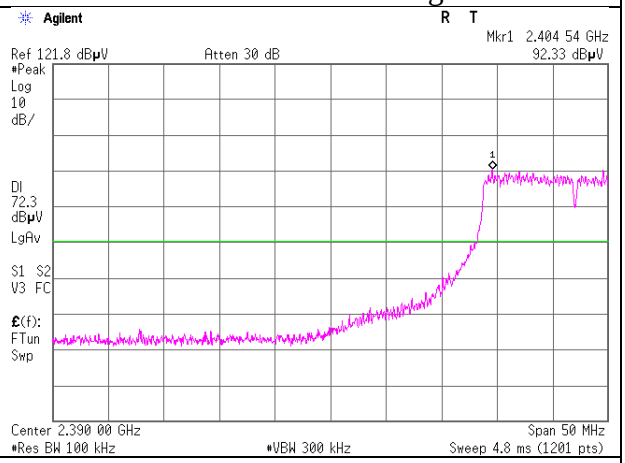
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	92.16	27.33	14.19	44.14	2.25	91.79	-	-	Carrier
Hori.	2400.000	PK	59.13	27.29	14.18	44.14	2.25	58.71	71.79	13.1	
Vert.	2412.000	PK	87.45	27.33	14.19	44.14	2.25	87.08	-	-	Carrier
Vert.	2400.000	PK	53.13	27.29	14.18	44.14	2.25	52.71	67.08	14.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

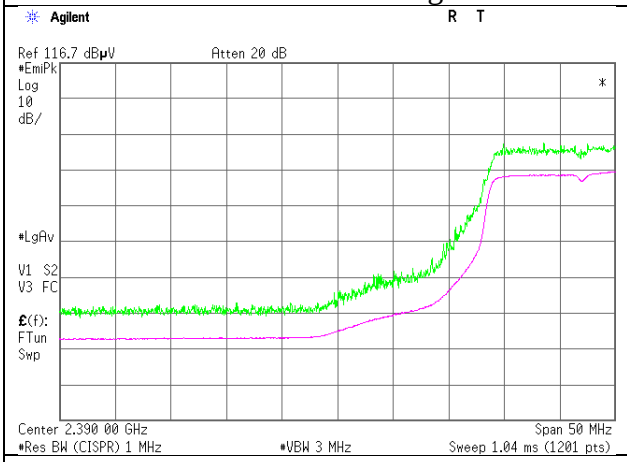
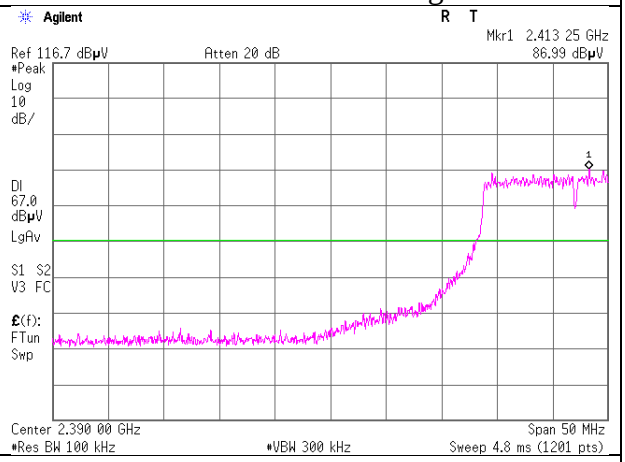
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -13 GHz)
Mode	Tx 11g 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

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11g 2417 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	63.04	27.26	14.18	44.13	2.25	62.60	73.90	**11.3**	309	26	
Vert.	2390.000	PK	58.90	27.26	14.18	44.13	2.25	58.46	73.90	15.4	154	208	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	46.61	27.26	14.18	44.13	0.28	2.25	46.45	53.90	**7.4**	*1)
Vert.	2390.000	AV	43.02	27.26	14.18	44.13	0.28	2.25	42.86	53.90	11.0	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

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

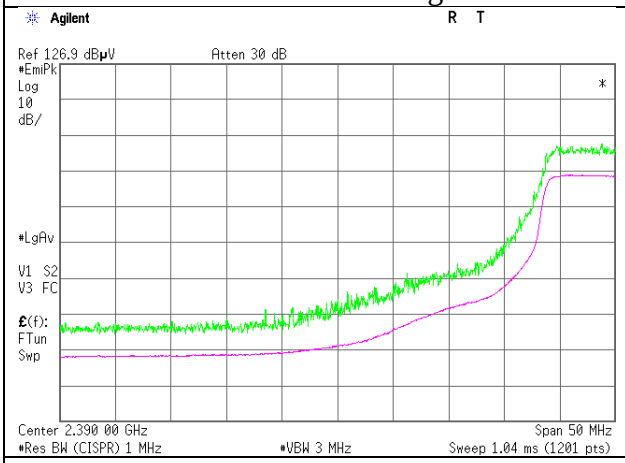
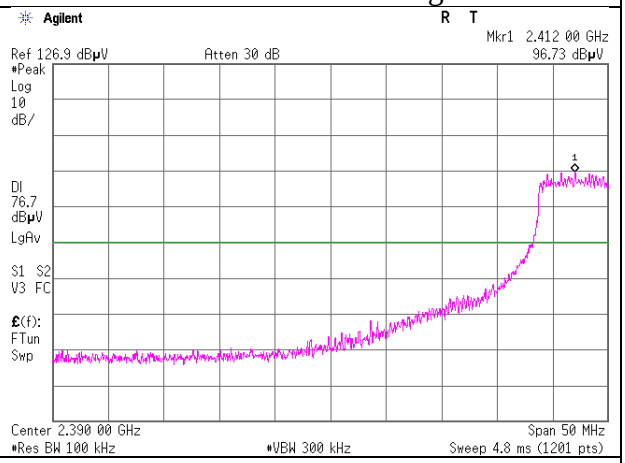
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2417.000	PK	96.78	27.34	14.20	44.14	2.25	96.43	-	-	Carrier
Hori.	2400.000	PK	58.03	27.29	14.18	44.14	2.25	57.61	76.43	18.8	
Vert.	2417.000	PK	91.64	27.34	14.20	44.14	2.25	91.29	-	-	Carrier
Vert.	2400.000	PK	52.41	27.29	14.18	44.14	2.25	51.99	71.29	19.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

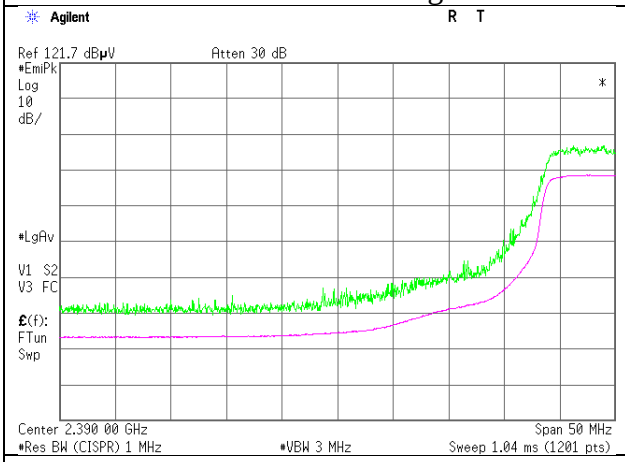
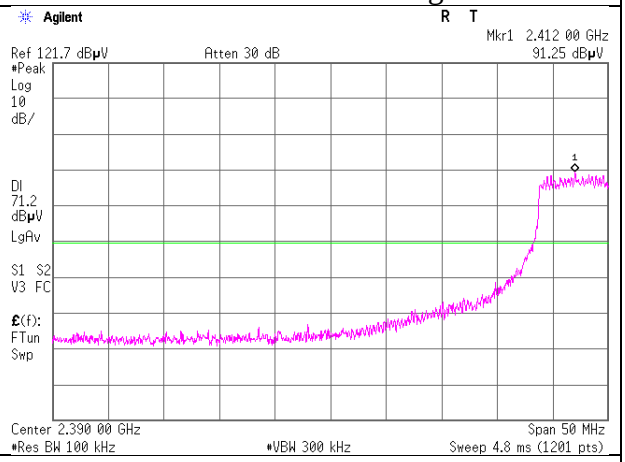
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11g 2417 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

Report No.	12051947S-C-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No. 3	No. 3	No. 3
Date	January 24, 2018	January 25, 2018	January 24, 2018
Temperature / Humidity	21 deg. C / 33 % RH	20 deg. C / 33 % RH	22 deg. C / 31 % RH
Engineer	Hiroyuki Morikawa (30 MHz -1000 MHz)	Hiroyuki Morikawa (1 GHz -13 GHz)	Kazuya Noda (13 GHz -26.5 GHz)
Mode	Tx 11g 2437 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	40.132	QP	44.06	14.23	6.82	32.12	0.00	32.99	40.00	**7.0**	386	167	
Hori.	234.666	QP	43.12	16.94	8.35	31.94	0.00	36.47	46.00	9.5	203	53	
Hori.	376.650	QP	44.38	15.91	9.11	31.86	0.00	37.54	46.00	8.4	100	330	
Hori.	450.832	QP	43.91	16.68	9.44	31.85	0.00	38.18	46.00	7.8	100	32	
Hori.	556.586	QP	37.45	17.89	9.85	31.88	0.00	33.31	46.00	12.6	100	331	
Hori.	747.124	QP	37.74	20.32	10.53	31.67	0.00	36.92	46.00	9.0	148	154	
Hori.	809.702	QP	36.89	20.78	10.74	31.42	0.00	36.99	46.00	9.0	141	147	
Hori.	891.817	QP	34.07	21.77	11.02	30.98	0.00	35.88	46.00	10.1	136	139	
Hori.	4874.000	PK	50.38	31.59	6.70	44.47	2.25	46.45	73.90	27.4	136	301	
Hori.	7311.000	PK	48.44	36.75	8.13	44.03	2.25	51.54	73.90	22.3	150	0	
Hori.	9748.000	PK	48.61	38.78	9.36	43.84	2.25	55.16	73.90	18.7	150	0	
Vert.	40.131	QP	39.41	14.23	6.82	32.12	0.00	28.34	40.00	11.6	100	231	
Vert.	742.387	QP	35.78	20.29	10.52	31.68	0.00	34.91	46.00	11.0	126	3	
Vert.	806.891	QP	34.71	20.74	10.73	31.43	0.00	34.75	46.00	11.2	100	318	
Vert.	4874.000	PK	49.66	31.59	6.70	44.47	2.25	45.73	73.90	28.1	234	308	
Vert.	7311.000	PK	48.27	36.75	8.13	44.03	2.25	51.37	73.90	22.5	150	0	
Vert.	9748.000	PK	48.87	38.78	9.36	43.84	2.25	55.42	73.90	18.4	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	42.02	31.59	6.70	44.47	0.28	2.25	38.37	53.90	15.5	
Hori.	7311.000	AV	38.82	36.75	8.13	44.03	0.28	2.25	42.20	53.90	11.7	
Hori.	9748.000	AV	39.14	38.78	9.36	43.84	0.28	2.25	45.97	53.90	**7.9**	
Vert.	4874.000	AV	41.81	31.59	6.70	44.47	0.28	2.25	38.16	53.90	15.7	
Vert.	7311.000	AV	38.62	36.75	8.13	44.03	0.28	2.25	42.00	53.90	11.9	
Vert.	9748.000	AV	39.05	38.78	9.36	43.84	0.28	2.25	45.88	53.90	8.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11g 2457 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	58.30	27.55	14.25	44.16	2.25	58.19	73.90	**15.7**	234	21	
Vert.	2483.500	PK	54.00	27.55	14.25	44.16	2.25	53.89	73.90	20.0	158	17	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	45.04	27.55	14.25	44.16	0.28	2.25	45.21	53.90	**8.7**	*1)
Vert.	2483.500	AV	42.50	27.55	14.25	44.16	0.28	2.25	42.67	53.90	11.2	*1)

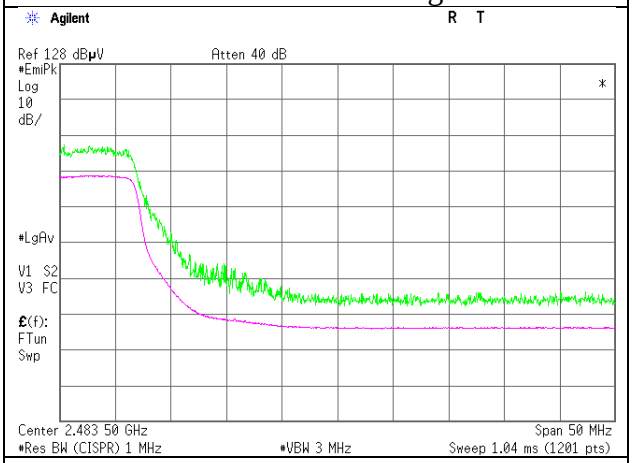
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11g 2457 MHz

Horizontal

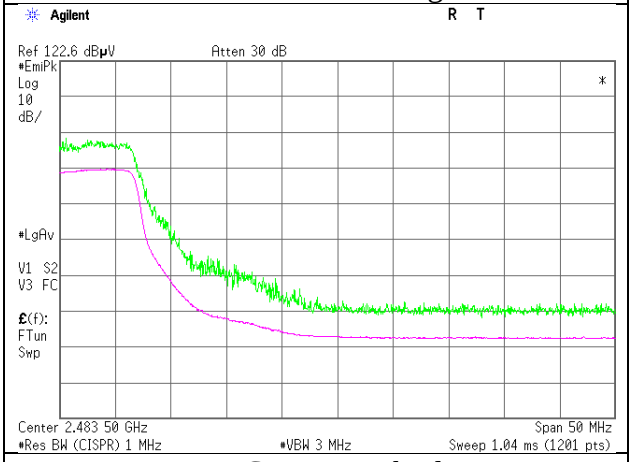
Restricted-band band-edge Plot



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

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11g 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	57.71	27.55	14.25	44.16	2.25	57.60	73.90	**16.3**	267	21	
Hori.	4924.000	PK	50.12	31.73	6.72	44.49	2.25	46.33	73.90	27.5	100	301	
Hori.	7386.000	PK	48.21	36.88	8.14	44.06	2.25	51.42	73.90	22.4	150	0	
Hori.	9848.000	PK	48.84	38.90	9.38	43.86	2.25	55.51	73.90	18.3	150	0	
Vert.	2483.500	PK	54.20	27.55	14.25	44.16	2.25	54.09	73.90	19.8	148	16	
Vert.	4924.000	PK	50.23	31.73	6.72	44.49	2.25	46.44	73.90	27.4	208	23	
Vert.	7386.000	PK	48.73	36.88	8.14	44.06	2.25	51.94	73.90	21.9	150	0	
Vert.	9848.000	PK	48.42	38.90	9.38	43.86	2.25	55.09	73.90	18.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	43.62	27.55	14.25	44.16	0.28	2.25	43.79	53.90	10.1	*1)
Hori.	4924.000	AV	41.42	31.73	6.72	44.49	0.28	2.25	37.91	53.90	16.0	
Hori.	7386.000	AV	38.53	36.88	8.14	44.06	0.28	2.25	42.02	53.90	11.9	
Hori.	9848.000	AV	38.63	38.90	9.38	43.86	0.28	2.25	45.58	53.90	**8.3**	
Vert.	2483.500	AV	41.71	27.55	14.25	44.16	0.28	2.25	41.88	53.90	12.0	*1)
Vert.	4924.000	AV	41.73	31.73	6.72	44.49	0.28	2.25	38.22	53.90	15.7	
Vert.	7386.000	AV	38.57	36.88	8.14	44.06	0.28	2.25	42.06	53.90	11.8	
Vert.	9848.000	AV	38.62	38.90	9.38	43.86	0.28	2.25	45.57	53.90	**8.3**	

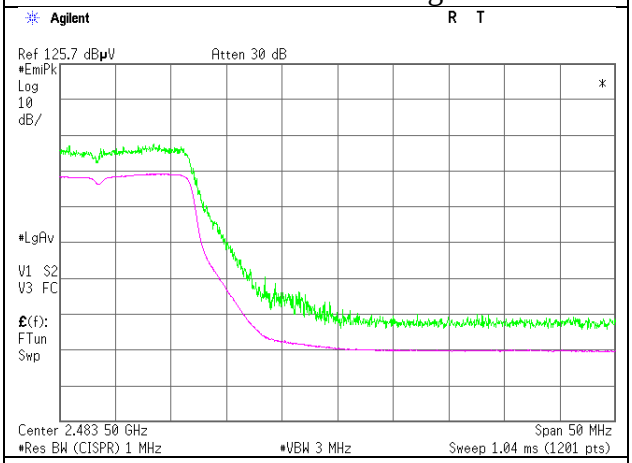
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -13 GHz)
Mode	Tx 11g 2462 MHz

Horizontal

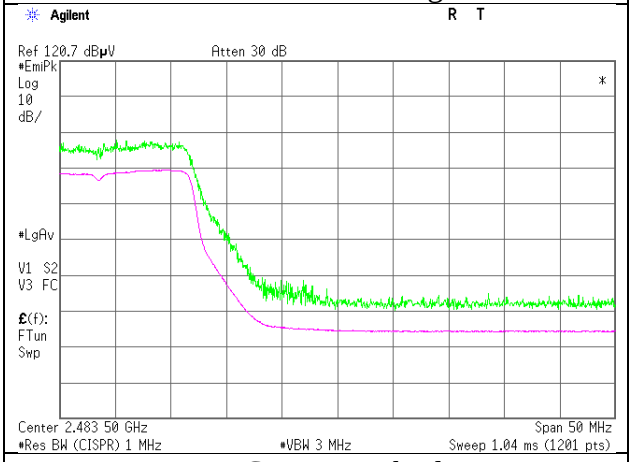
Restricted-band band-edge Plot



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

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11n-20 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	59.32	27.26	14.18	44.13	2.25	58.88	73.90	**15.0**	215	28	
Hori.	4824.000	PK	50.52	31.46	6.69	44.46	2.25	46.46	73.90	27.4	100	305	
Hori.	7236.000	PK	48.45	36.62	8.13	44.00	2.25	51.45	73.90	22.4	150	0	
Hori.	9648.000	PK	48.96	38.66	9.35	43.83	2.25	55.39	73.90	18.5	150	0	
Vert.	2390.000	PK	54.43	27.26	14.18	44.13	2.25	53.99	73.90	19.9	152	14	
Vert.	4824.000	PK	51.28	31.46	6.69	44.46	2.25	47.22	73.90	26.6	207	330	
Vert.	7236.000	PK	48.28	36.62	8.13	44.00	2.25	51.28	73.90	22.6	150	0	
Vert.	9648.000	PK	48.59	38.66	9.35	43.83	2.25	55.02	73.90	18.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	45.36	27.26	14.18	44.13	0.22	2.25	45.14	53.90	8.8	*1)
Hori.	4824.000	AV	41.59	31.46	6.69	44.46	0.22	2.25	37.75	53.90	16.2	
Hori.	7236.000	AV	38.81	36.62	8.13	44.00	0.22	2.25	42.03	53.90	11.9	
Hori.	9648.000	AV	39.33	38.66	9.35	43.83	0.22	2.25	45.98	53.90	7.9	
Vert.	2390.000	AV	41.60	27.26	14.18	44.13	0.22	2.25	41.38	53.90	12.5	*1)
Vert.	4824.000	AV	43.24	31.46	6.69	44.46	0.22	2.25	39.40	53.90	14.5	
Vert.	7236.000	AV	38.82	36.62	8.13	44.00	0.22	2.25	42.04	53.90	11.9	
Vert.	9648.000	AV	39.52	38.66	9.35	43.83	0.22	2.25	46.17	53.90	**7.7**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

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

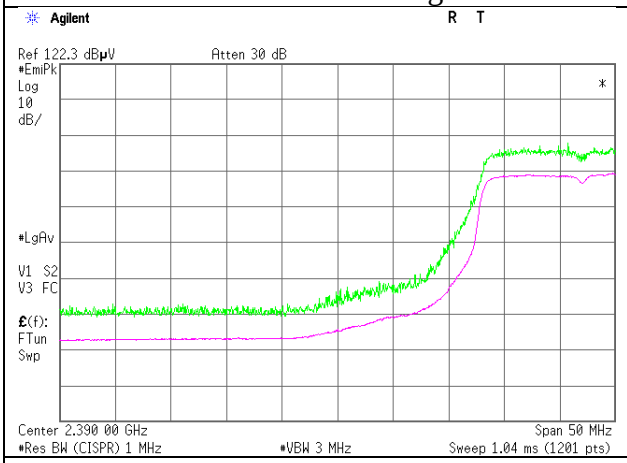
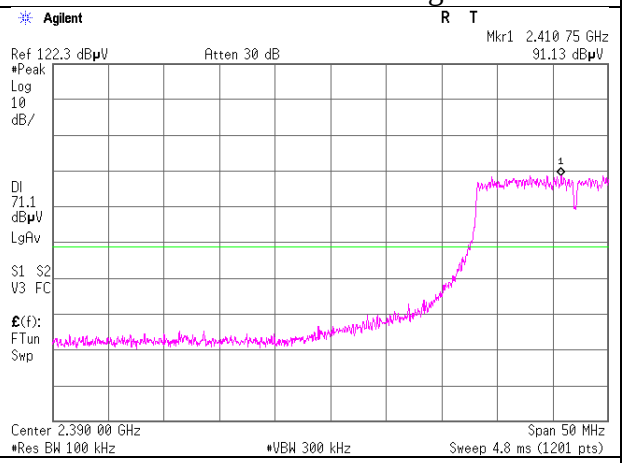
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.02	27.33	14.19	44.14	2.25	92.65	-	-	Carrier
Hori.	2400.000	PK	59.59	27.29	14.18	44.14	2.25	59.17	72.65	13.5	
Vert.	2412.000	PK	86.66	27.33	14.19	44.14	2.25	86.29	-	-	Carrier
Vert.	2400.000	PK	54.49	27.29	14.18	44.14	2.25	54.07	66.29	12.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

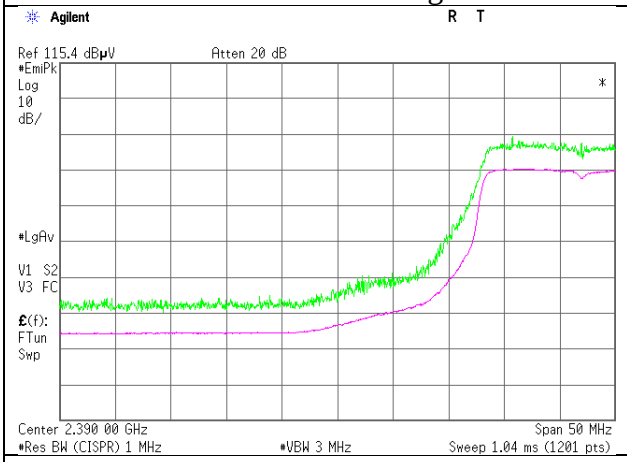
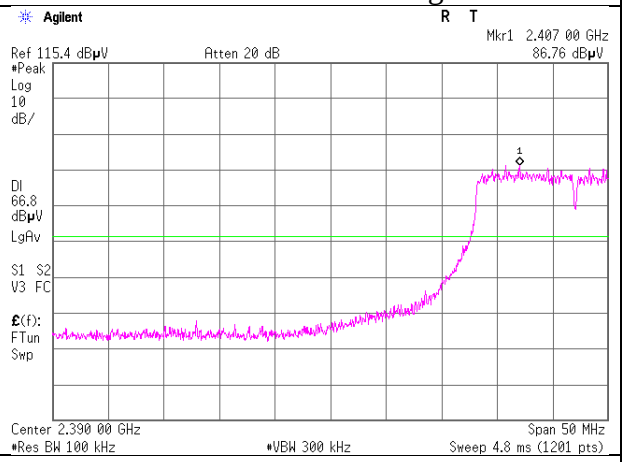
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -13 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

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11n-20 2417 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	59.00	27.26	14.18	44.13	2.25	58.56	73.90	**15.3**	308	25	
Vert.	2390.000	PK	58.37	27.26	14.18	44.13	2.25	57.93	73.90	15.9	154	223	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	45.09	27.26	14.18	44.13	0.22	2.25	44.87	53.90	**9.0**	*1)
Vert.	2390.000	AV	43.05	27.26	14.18	44.13	0.22	2.25	42.83	53.90	11.1	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

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

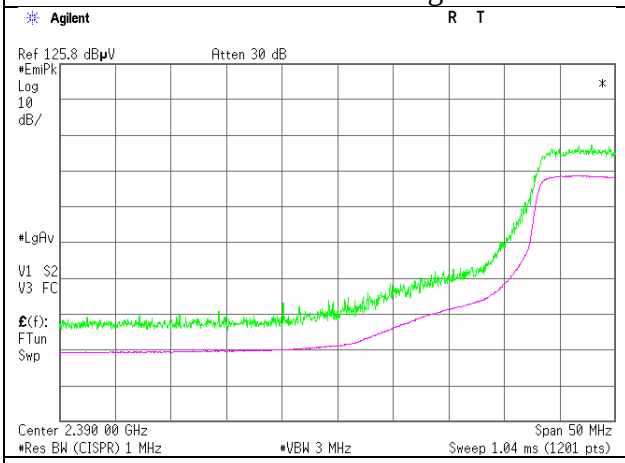
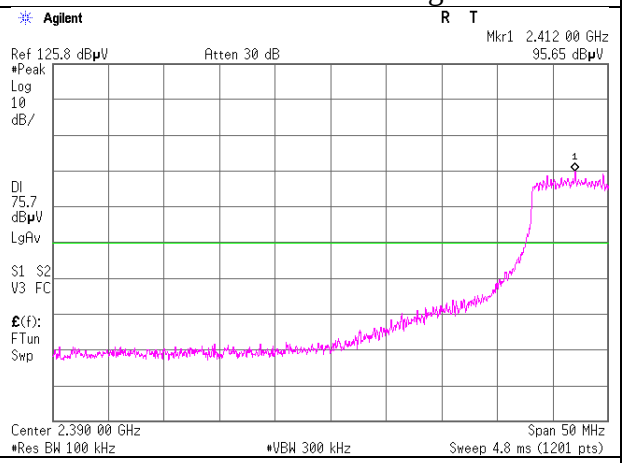
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2417.000	PK	96.37	27.34	14.20	44.14	2.25	96.02	-	-	Carrier
Hori.	2400.000	PK	57.43	27.29	14.18	44.14	2.25	57.01	76.02	19.0	
Vert.	2417.000	PK	91.56	27.34	14.20	44.14	2.25	91.21	-	-	Carrier
Vert.	2400.000	PK	54.52	27.29	14.18	44.14	2.25	54.10	71.21	17.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

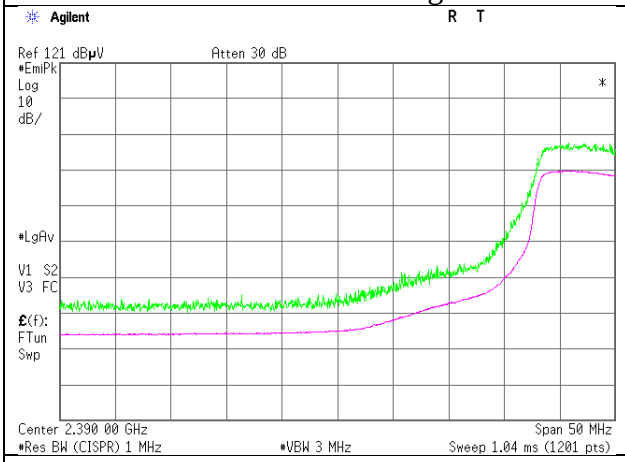
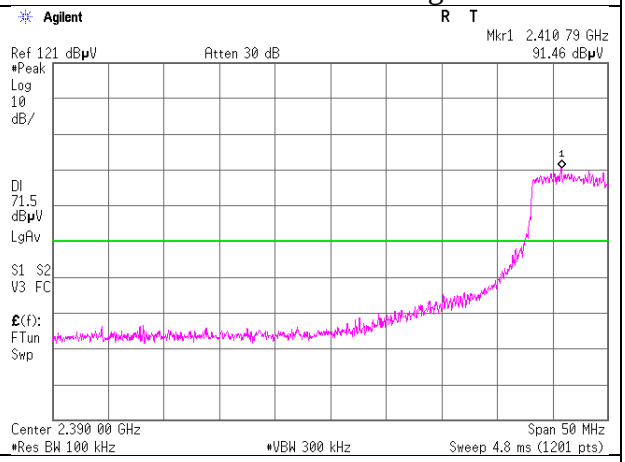
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11n-20 2417 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

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11n-20 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	50.92	31.59	6.70	44.47	2.25	46.99	73.90	26.9	134	300	
Hori.	7311.000	PK	48.55	36.75	8.13	44.03	2.25	51.65	73.90	22.2	150	0	
Hori.	9748.000	PK	48.32	38.78	9.36	43.84	2.25	54.87	73.90	19.0	150	0	
Vert.	4874.000	PK	50.52	31.59	6.70	44.47	2.25	46.59	73.90	27.3	228	307	
Vert.	7311.000	PK	48.70	36.75	8.13	44.03	2.25	51.80	73.90	22.1	150	0	
Vert.	9748.000	PK	48.86	38.78	9.36	43.84	2.25	55.41	73.90	**18.4**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	42.52	31.59	6.70	44.47	0.22	2.25	38.81	53.90	15.1	
Hori.	7311.000	AV	38.81	36.75	8.13	44.03	0.22	2.25	42.13	53.90	11.8	
Hori.	9748.000	AV	38.73	38.78	9.36	43.84	0.22	2.25	45.50	53.90	8.4	
Vert.	4874.000	AV	42.34	31.59	6.70	44.47	0.22	2.25	38.63	53.90	15.3	
Vert.	7311.000	AV	38.85	36.75	8.13	44.03	0.22	2.25	42.17	53.90	11.7	
Vert.	9748.000	AV	38.95	38.78	9.36	43.84	0.22	2.25	45.72	53.90	**8.2**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11n-20 2457 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	57.52	27.55	14.25	44.16	2.25	57.41	73.90	**16.4**	267	20	
Vert.	2483.500	PK	54.48	27.55	14.25	44.16	2.25	54.37	73.90	19.5	144	18	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	43.52	27.55	14.25	44.16	0.22	2.25	43.63	53.90	**10.3**	*1)
Vert.	2483.500	AV	41.64	27.55	14.25	44.16	0.22	2.25	41.75	53.90	12.2	*1)

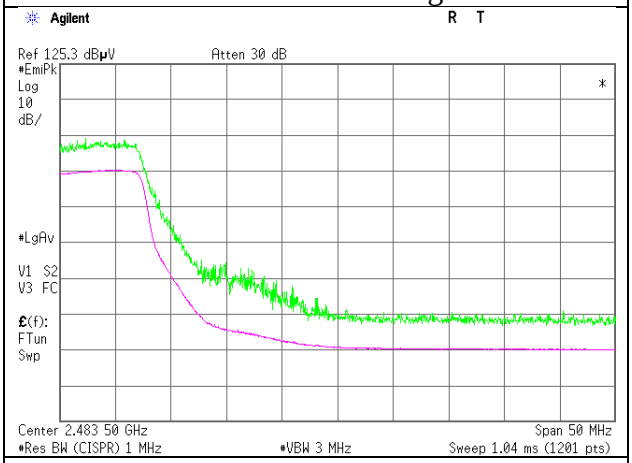
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -2.8 GHz)
Mode	Tx 11n-20 2457 MHz

Horizontal

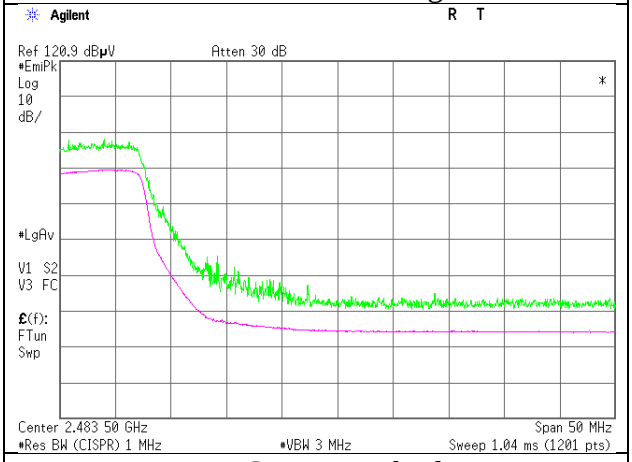
Restricted-band band-edge Plot



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

Report No.	12051947S-C-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No. 3	No. 3
Date	January 24, 2018	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH	21 deg. C / 33 % RH
Engineer	Kazuya Noda	Hiroyuki Morikawa
	(1 GHz -13 GHz)	(13 GHz -26.5 GHz)
Mode	Tx 11n-20 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	55.41	27.55	14.25	44.16	2.25	55.30	73.90	**18.6**	339	20	
Hori.	4924.000	PK	49.92	31.73	6.72	44.49	2.25	46.13	73.90	27.7	160	298	
Hori.	7386.000	PK	48.39	36.88	8.14	44.06	2.25	51.60	73.90	22.3	150	0	
Hori.	9848.000	PK	47.67	38.90	9.38	43.86	2.25	54.34	73.90	19.5	150	0	
Vert.	2483.500	PK	52.17	27.55	14.25	44.16	2.25	52.06	73.90	21.8	151	17	
Vert.	4924.000	PK	49.86	31.73	6.72	44.49	2.25	46.07	73.90	27.8	201	326	
Vert.	7386.000	PK	47.15	36.88	8.14	44.06	2.25	50.36	73.90	23.5	150	0	
Vert.	9848.000	PK	47.68	38.90	9.38	43.86	2.25	54.35	73.90	19.5	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	43.37	27.55	14.25	44.16	0.22	2.25	43.48	53.90	10.4	*1)
Hori.	4924.000	AV	41.41	31.73	6.72	44.49	0.22	2.25	37.84	53.90	16.1	
Hori.	7386.000	AV	38.87	36.88	8.14	44.06	0.22	2.25	42.30	53.90	11.6	
Hori.	9848.000	AV	38.91	38.90	9.38	43.86	0.22	2.25	45.80	53.90	**8.1**	
Vert.	2483.500	AV	41.23	27.55	14.25	44.16	0.22	2.25	41.34	53.90	12.6	*1)
Vert.	4924.000	AV	41.20	31.73	6.72	44.49	0.22	2.25	37.63	53.90	16.3	
Vert.	7386.000	AV	38.91	36.88	8.14	44.06	0.22	2.25	42.34	53.90	11.6	
Vert.	9848.000	AV	38.87	38.90	9.38	43.86	0.22	2.25	45.76	53.90	**8.1**	

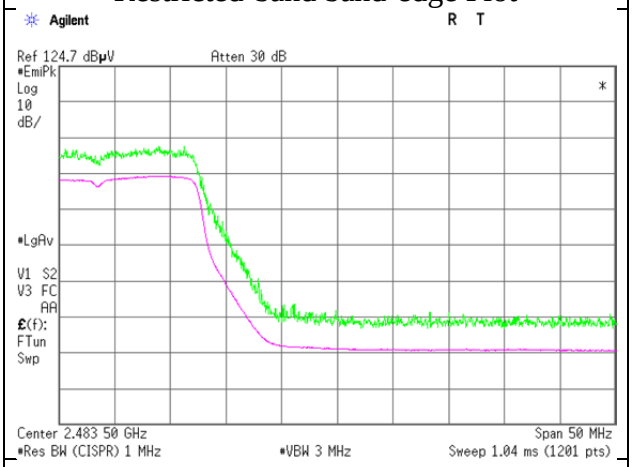
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.89 m / 3.0 m) = 2.25 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12051947S-C-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No. 3
Date	January 24, 2018
Temperature / Humidity	22 deg. C / 31 % RH
Engineer	Kazuya Noda
	(1 GHz -13 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

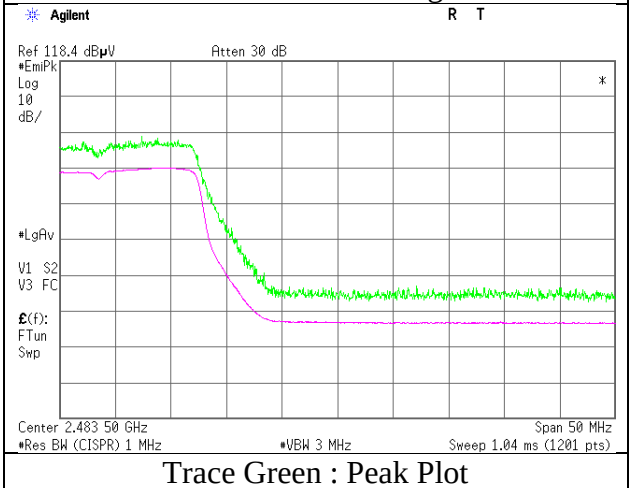
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

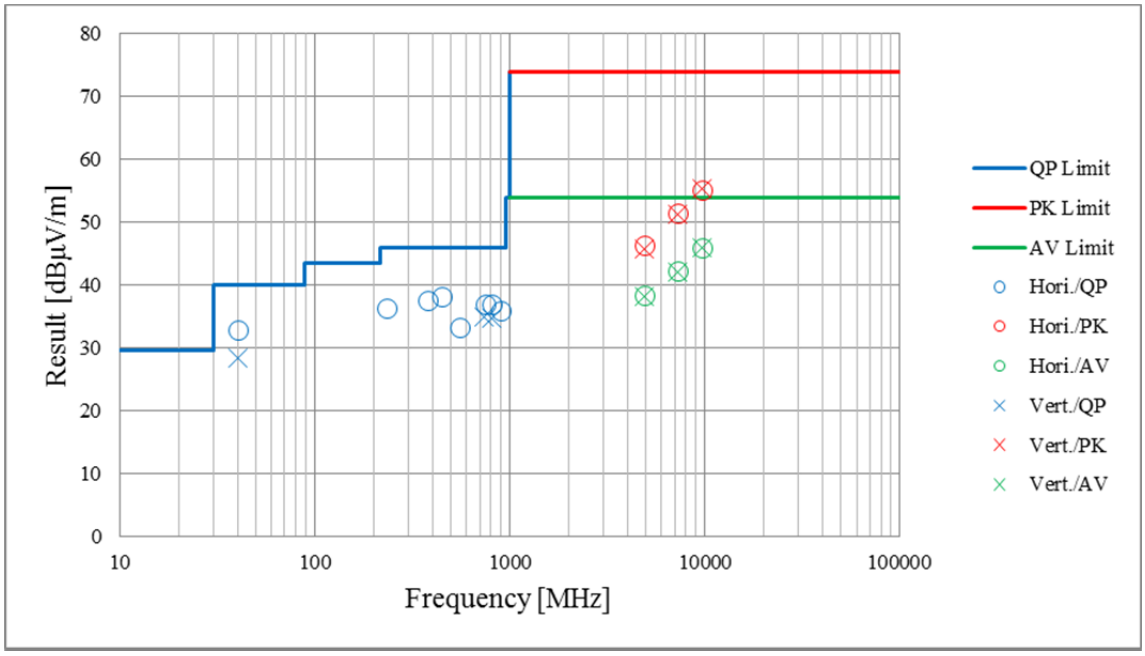


Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12051947S-C-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No. 3	No. 3	No. 3
Date	January 24, 2018	January 25, 2018	January 24, 2018
Temperature / Humidity	21 deg. C / 33 % RH	20 deg. C / 33 % RH	22 deg. C / 31 % RH
Engineer	Hiroyuki Morikawa (30 MHz -1000 MHz)	Hiroyuki Morikawa (1 GHz -13 GHz)	Kazuya Noda (13 GHz -26.5 GHz)
Mode	Tx 11g 2437 MHz		

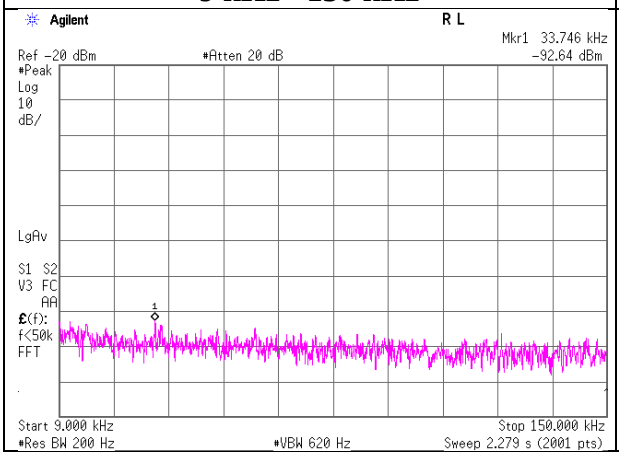


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

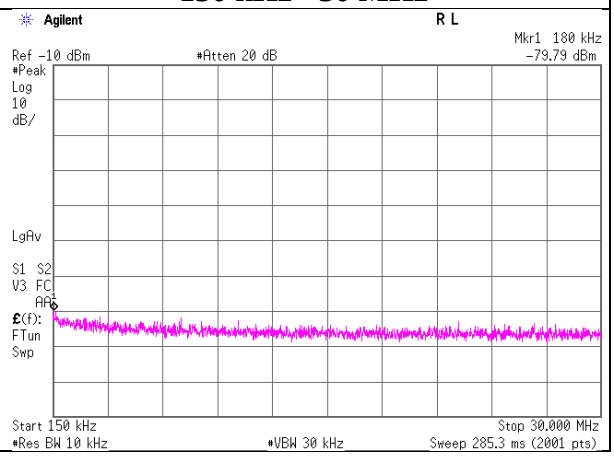
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx 11g 2437 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
33.75	-92.6	0.01	9.8	2.0	1	-80.8	300	6.0	-19.5	37.0	56.5	
180.00	-79.8	0.01	9.8	2.0	1	-67.9	300	6.0	-6.7	22.4	29.1	

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

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

N: Number of output

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

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12051947S-C-R2
Date	November 15, 2017
Temperature / Humidity	27 deg. C / 39 % RH
Engineer	Tatsuya Arai
Mode	Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-19.69	2.53	9.85	-7.31	8.00	15.31
2437.00	-17.05	2.54	9.85	-4.66	8.00	12.66
2462.00	-17.16	2.55	9.84	-4.77	8.00	12.77

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-27.51	2.53	9.85	-15.13	8.00	23.13
2437.00	-24.13	2.54	9.85	-11.74	8.00	19.74
2462.00	-26.64	2.55	9.84	-14.25	8.00	22.25

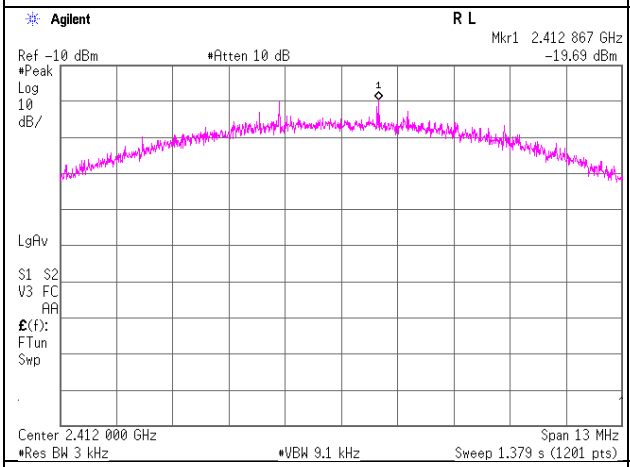
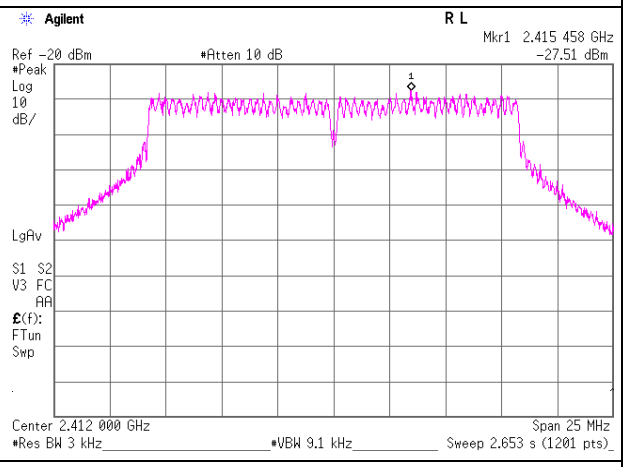
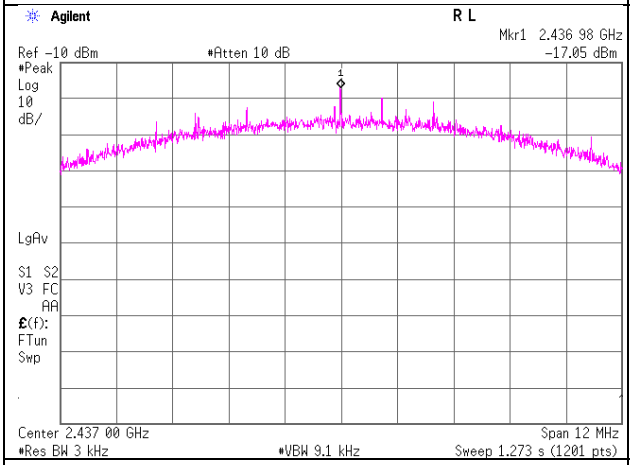
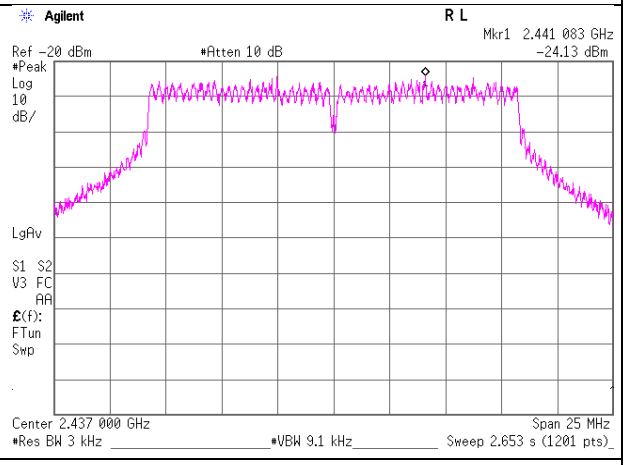
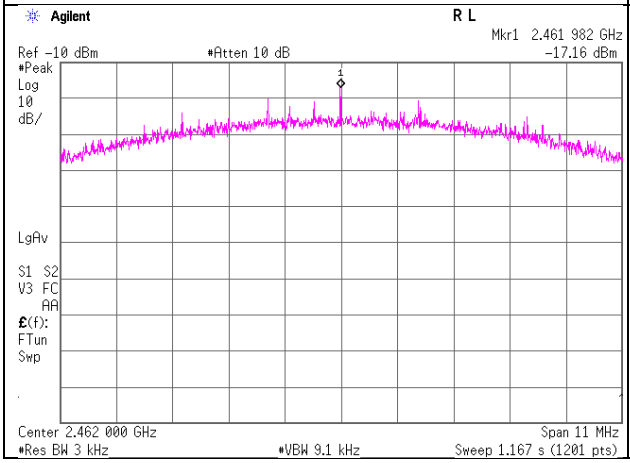
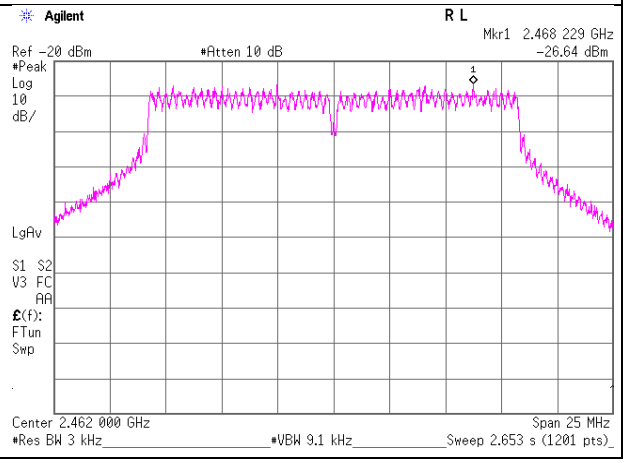
11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-29.96	2.53	9.85	-17.58	8.00	25.58
2437.00	-26.12	2.54	9.85	-13.73	8.00	21.73
2462.00	-27.47	2.55	9.84	-15.08	8.00	23.08

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

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

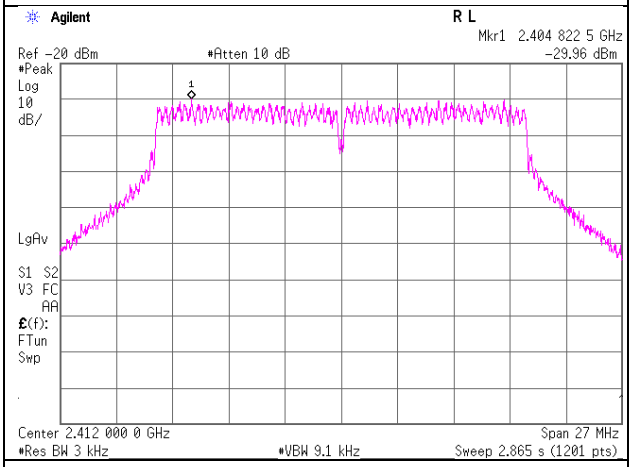
Power Density

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

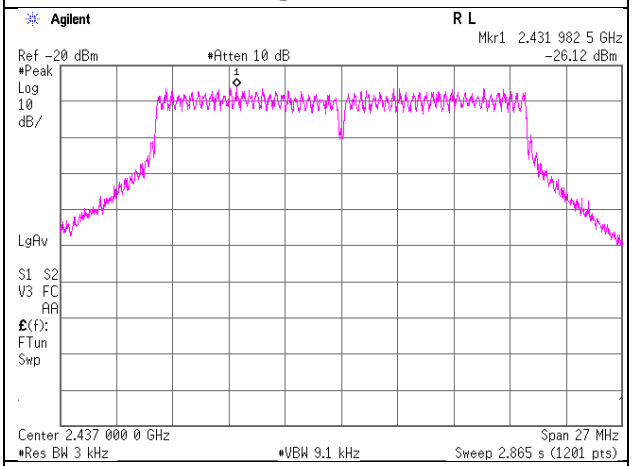
Power Density

11n-20

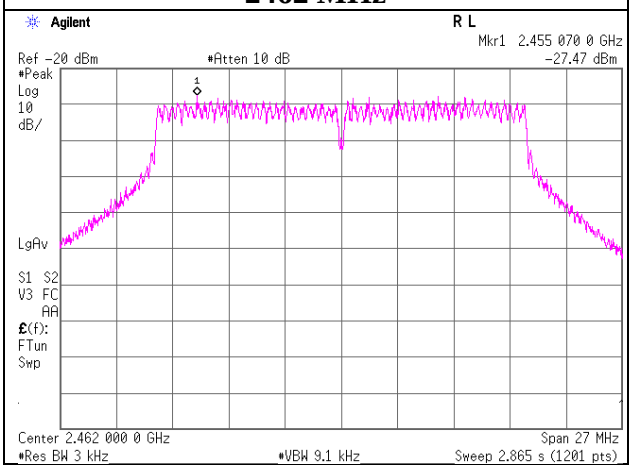
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test instruments

Test Equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT, RE	2017/03/07 * 12
SCC-G32	Coaxial Cable	Junkosha	MWX241-02000 KMSKMS	OCT-09-13-005	AT	2016/11/07 * 12 *1)
SAT10-12	Attenuator	Weinschel Corp.	54A-10	81601	AT	2017/03/23 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-05	Power sensor	Agilent	N1923A	MY5349008	AT	2017/05/01 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2017/10/11 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12 *1)
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-03 7	RE	2017/01/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000 NF SNMS/B	1612S006	RE	2017/01/08 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2017/10/16 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2017/04/20 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2017/03/23 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KM SKMS	-	RE	2017/04/20 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2017/03/17 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2017/10/21 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/C4/C5/C10/ SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-271(RF Selector)	RE	2017/04/07 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2017/02/09 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	RE	2017/11/24 * 12

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

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

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

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