



RADIO TEST REPORT

Test Report No. : 11253018S-A-R1

Applicant : KONICA MINOLTA, INC.
Type of Equipment : SKR 3000
Model No. : P-61
FCC ID : YR7SKR3000P6
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. 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 11253018S-A. 11253018S-A is replaced with this report.

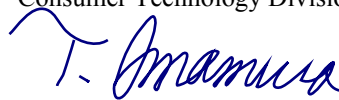
Date of test: July 6 to 17, 2016

Representative test engineer:



Hiroyuki Morikawa
Engineer
Consumer Technology Division

Approved by:



Toyokazu Imamura
Leader
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".

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

13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Radiated Spurious Emission	10
SECTION 6: Antenna Terminal Conducted Tests.....	12
APPENDIX 1: Test data	13
6dB Bandwidth	13
Maximum Peak Output Power	16
Burst rate confirmation	26
Radiated Spurious Emission	27
Conducted Spurious Emission	43
Power Density	44
99%Occupied Bandwidth	49
APPENDIX 2: Test instruments	51
APPENDIX 3: Photographs of test setup	52
Radiated Spurious Emission	52
Worst Case Position	53

SECTION 1: Customer information

Company Name : KONICA MINOLTA, INC.
Address : 1, Sakura-machi, Hino-shi, Tokyo, Japan 191-8511
Telephone Number : +81-42-589-8429
Facsimile Number : +81-42-589-8053
Contact Person : Masayoshi Inoue

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

2.1 Identification of E.U.T.

Type of Equipment : SKR 3000
Model No. : P-61
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 15 V
Receipt Date of Sample : June 17, 2016
Country of Mass-production : Japan
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

2.2 Product Description

Model: P-61 (referred to as the EUT in this report) is a SKR 3000.

Radio Specification

Radio Type : Transceiver
Clock frequency (Maximum) : 532 MHz

WLAN

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz-2462 MHz	2412 MHz-2462 MHz	5180 MHz-5240 MHz 5260 MHz-5320 MHz 5500 MHz-5700 MHz 5745 MHz-5825 MHz	2412 MHz-2462 MHz 5180 MHz-5240 MHz 5260 MHz-5320 MHz 5500 MHz-5700 MHz 5745 MHz-5825 MHz	5190 MHz-5230 MHz 5270 MHz-5310 MHz 5510 MHz-5670 MHz 5755 MHz-5795 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		
Channel spacing	5 MHz		20 MHz	2.4 GHz band 5 MHz 5 GHz band 20 MHz	40 MHz
Antenna type	[Main Antenna (chain 0)/Sub Antenna (chain 1)] PIFA (Planar Inverted F Antenna)				
Antenna Gain	Main Antenna (chain 0) -1.95 dBi (2.4 GHz Band), -0.98 dBi (5 GHz Band) Sub Antenna (chain 1) -2.21 dBi (2.4 GHz Band), -1.54 dBi (5 GHz Band)				
Antenna Connector type	[Main Antenna (chain 0)/Sub Antenna (chain 1)] Connector, PCB side: U.FL, Antenna side: soldered				

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

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	N/A	N/A*1)	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(1)	See data.	Complied	Complied
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	Complied
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(2)		Complied	Complied
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.4 dB 12060.000 MHz, AV, Vert. Tx 11n-20 2412 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 has no AC mains. Wireless LAN does not operate during charging.

*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3 V/1.8 V) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 dB	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 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	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

Radiated emission test

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

3.5 Test Location

UL Japan, Inc. 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

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	10m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
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

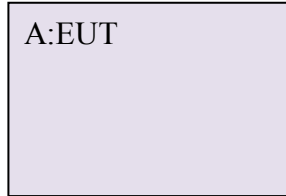
4.1 Operating Mode(s)

Mode	Remarks*	Power Setting (dBm)
IEEE 802.11b (11b)	11 Mbps, PN9	14
IEEE 802.11g (11g)	36 Mbps, PN9	8, 15, 11
IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 4 (Long GI) PN9	6, 14, 7
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 12 (Long GI) PN9	6, 14, 7
*Transmitting duty was 100 % on all tests.		
*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; - Software: WLAN Auth Tool ver.1.3.0 *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 Antenna	Tested frequency
Spurious Emission	11b Tx	Sub	2412 MHz
	11g Tx		2437 MHz
			2462 MHz
	11n-20 Tx	Sub	2412 MHz
11n-20 (MIMO) Tx	2437 MHz		
	2462 MHz		
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx	Sub	2412 MHz
	11g Tx		2437 MHz
			2462 MHz
	11n-20 (SISO) Tx	Sub	2412 MHz
11n-20 (MIMO) Tx	2437 MHz		
			2462 MHz

Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SKR 3000	P-61	A8CE-S002 *1) A8CE-S003 *2)	KONICA MINOLTA	EUT

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

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

[For above 1 GHz]

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

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

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

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

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

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

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

Test Antennas are used as below;

Frequency	30 MHz to 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	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: <u>12.2.5.2</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.705 m *1) (1 GHz – 13 GHz), 1 m *2) (13 GHz – 26.5 GHz)		3.705 m *1) (1 GHz – 13 GHz), 1 m *2) (13 GHz – 26.5 GHz)

*1) Distance Factor: $20 \times \log(3.705 \text{ m} / 3.0 \text{ m}) = 1.83 \text{ dB}$

*2) Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

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

The 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 representative X-axis since no difference was found among each 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: 50 MHz BW)
Conducted Spurious Emission *3)	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) 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**

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

APPENDIX 1: Test data

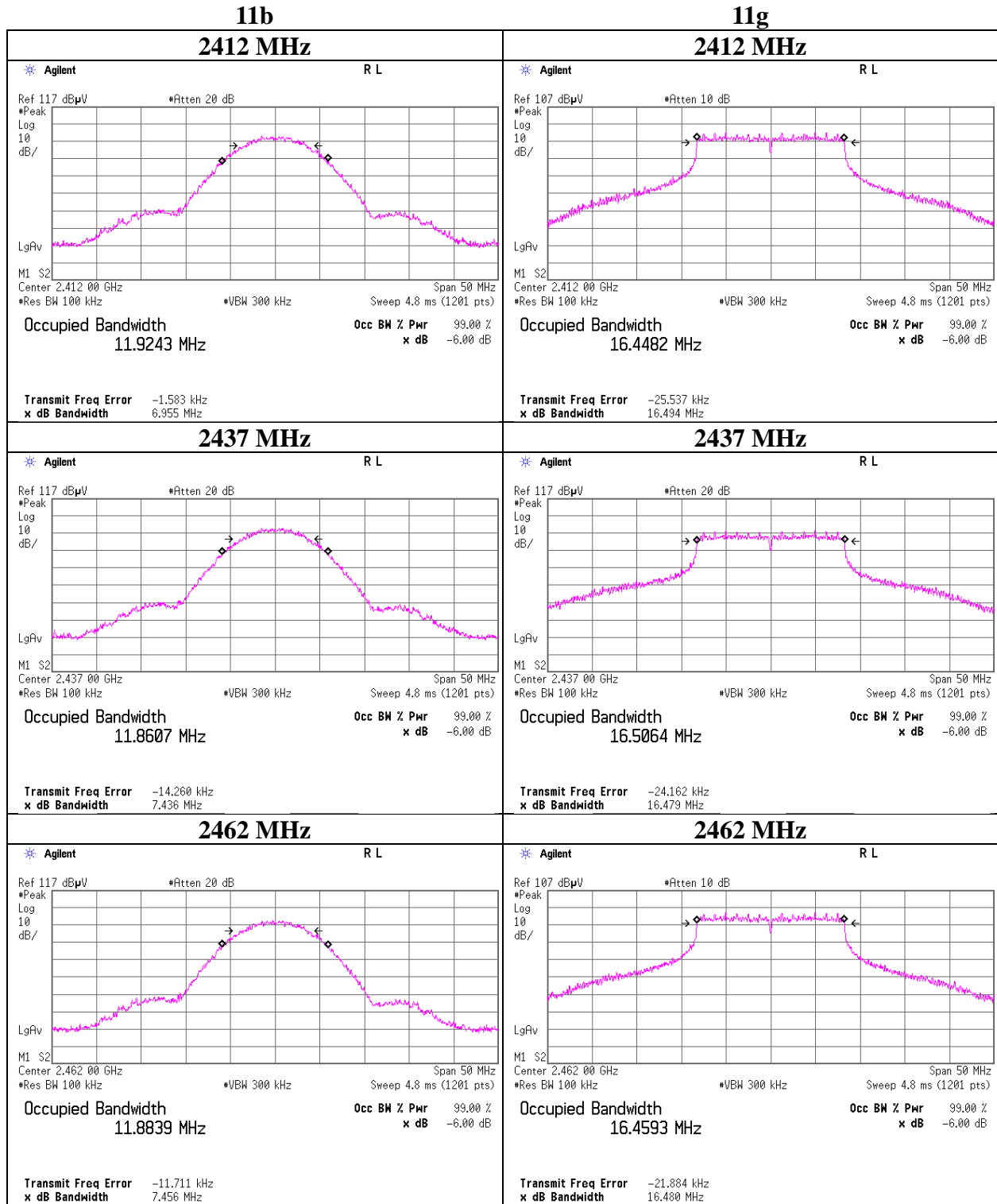
6dB Bandwidth

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11253018S-A-R1
Date July 8, 2016
Temperature / Humidity 25 deg. C / 56 % RH
Engineer Hiroyuki Morikawa
Mode Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	6.955	> 500
	2437	7.436	> 500
	2462	7.456	> 500
11g	2412	16.494	> 500
	2437	16.479	> 500
	2462	16.480	> 500
11n-20 (SISO)	2412	17.661	> 500
	2437	17.715	> 500
	2462	17.686	> 500
11n-20 (MIMO)	2412	17.678	> 500
	2437	17.674	> 500
	2462	17.663	> 500

* The test was carried out by worst antenna port.

6dB Bandwidth



UL Japan, Inc.

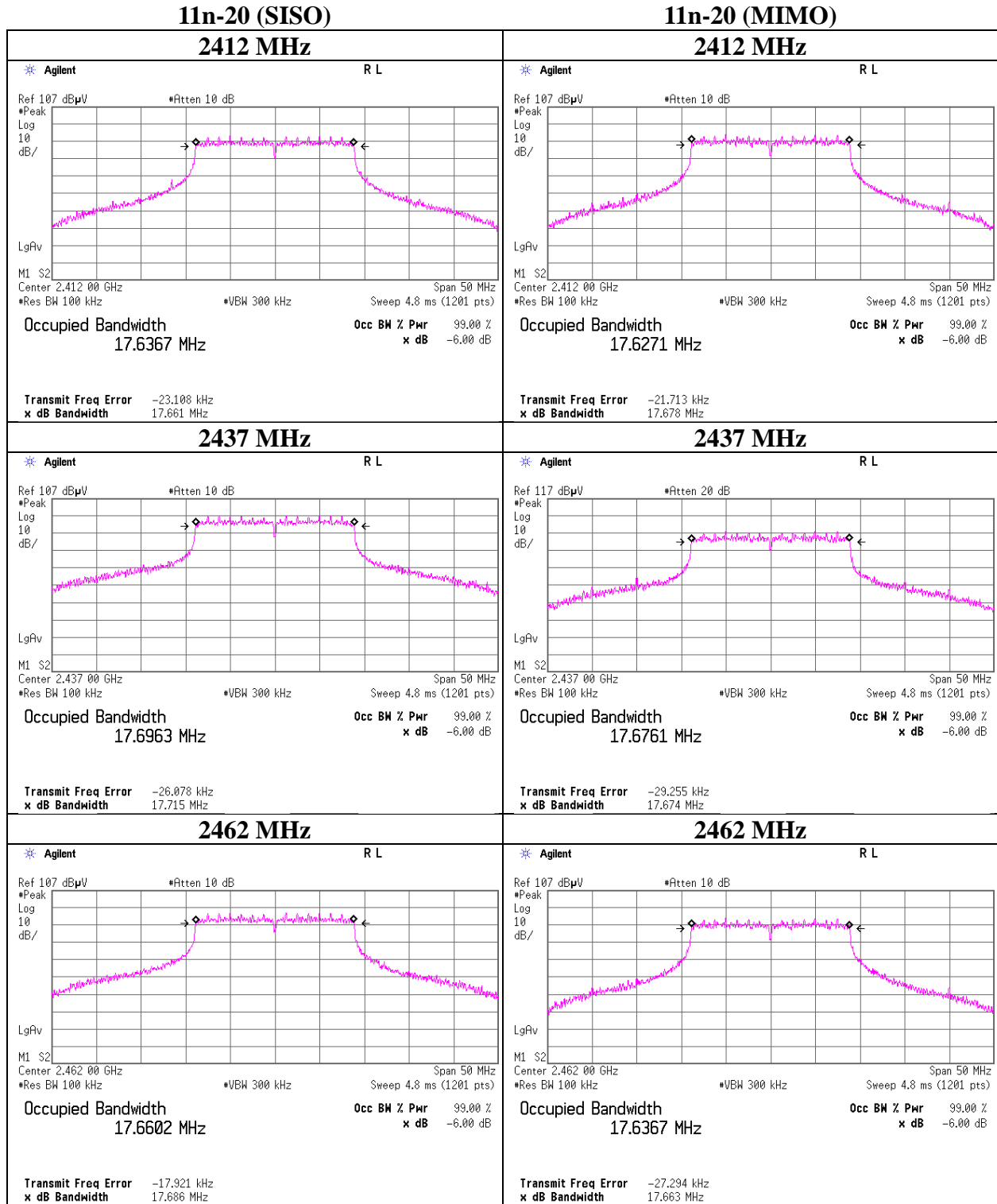
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

6dB Bandwidth



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11b

Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	4.71	3.42	9.92	18.05	63.83	30.00	1000	11.95
2437	4.14	3.42	9.92	17.48	55.98	30.00	1000	12.52
2462	4.02	3.43	9.92	17.37	54.58	30.00	1000	12.63

Sample Calculation:

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

Main antenna, 2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	3.92	
2	3.81	
5.5	3.68	
11	3.54	

Sub antenna, 2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	4.13	
2	4.13	
5.5	4.11	
11	4.14	*

*: 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.	11253018S-A-R1
Date	July 6, 2016
Temperature / Humidity	26 deg. C / 48 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx 11g

Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.64	3.42	9.92	18.98	79.07	30.00	1000	11.02
2437	9.22	3.42	9.92	22.56	180.30	30.00	1000	7.44
2462	7.47	3.43	9.92	20.82	120.78	30.00	1000	9.18

Sample Calculation:

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

Main antenna, 2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	7.08	
9	7.10	
12	7.11	
18	7.19	
24	9.02	
36	9.16	
48	8.51	
54	8.45	

Sub antenna, 2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	7.17	
9	7.22	
12	7.38	
18	7.22	
24	9.08	
36	9.22	*
48	8.60	
54	8.47	

*: 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. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11n-20 (SISO)

Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	4.15	3.42	9.92	17.49	56.10	30.00	1000	12.51
2437	9.13	3.42	9.92	22.47	176.60	30.00	1000	7.53
2462	4.46	3.43	9.92	17.81	60.39	30.00	1000	12.19

Sample Calculation:

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

Main antenna, 2437 MHz, Long GI

MCS Number	Reading [dBm]	Remark
0	6.50	
1	6.56	
2	6.51	
3	8.97	
4	8.75	
5	8.59	
6	8.20	
7	7.03	

Sub antenna, 2437 MHz, Long GI

MCS Number	Reading [dBm]	Remark
0	6.91	
1	6.89	
2	6.84	
3	9.11	
4	9.13	*
5	8.64	
6	8.57	
7	7.61	

Main antenna, 2437 MHz, Short GI

MCS Number	Reading [dBm]	Remark
0	6.56	
1	6.37	
2	6.48	
3	8.97	
4	8.93	
5	8.78	
6	8.76	
7	7.49	

Sub antenna, 2437 MHz, Short GI

MCS Number	Reading [dBm]	Remark
0	6.90	
1	6.88	
2	6.79	
3	9.00	
4	9.09	
5	8.85	
6	8.83	
7	7.74	

*: 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. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11n-20 (MIMO)

Main antenna + Sub antenna

Freq. [MHz]	Main Result [mW]	Sub Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	50.47	52.24	20.12	102.71	30.00	1000	9.88
2437	169.04	177.01	25.39	346.05	30.00	1000	4.61
2462	51.17	53.46	20.20	104.62	30.00	1000	9.80

Sample Calculation:

Result = Main antenna + Sub antenna

Main antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	3.69	3.42	9.92	17.03	50.47	30.00	1000	12.97
2437	8.94	3.42	9.92	22.28	169.04	30.00	1000	7.72
2462	3.74	3.43	9.92	17.09	51.17	30.00	1000	12.91

Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	3.84	3.42	9.92	17.18	52.24	30.00	1000	12.82
2437	9.14	3.42	9.92	22.48	177.01	30.00	1000	7.52
2462	3.93	3.43	9.92	17.28	53.46	30.00	1000	12.72

Sample Calculation:

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

Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11n-20 (MIMO)

2437 MHz, long GI

MCS Number	Reading Main antenna		Reading Sub antenna		Reading Main + Sub		Remark
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
8	6.54	4.51	6.73	4.71	9.65	9.22	
9	6.33	4.30	6.85	4.84	9.61	9.14	
10	6.50	4.47	6.59	4.56	9.56	9.03	
11	8.93	7.82	9.07	8.07	12.01	15.89	
12	8.94	7.83	9.14	8.20	12.05	16.03	*
13	8.22	6.64	8.58	7.21	11.41	13.85	
14	8.26	6.70	8.89	7.74	11.60	14.44	
15	7.34	5.42	7.71	5.90	10.54	11.32	

2437 MHz, Short GI

MCS Number	Reading Main antenna		Reading Sub antenna		Reading Main + Sub		Remark
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
8	6.59	4.56	6.62	4.59	9.61	9.15	
9	6.42	4.39	6.71	4.69	9.58	9.08	
10	6.46	4.43	6.59	4.56	9.54	8.99	
11	8.63	7.29	8.86	7.69	11.76	14.98	
12	8.76	7.52	9.07	8.07	11.93	15.59	
13	8.27	6.71	8.48	7.05	11.39	13.76	
14	8.50	7.08	8.77	7.53	11.65	14.61	
15	7.02	5.04	7.70	5.89	10.39	10.93	

* Worst MCS

Average Output Power
(Reference data for SAR testing)

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

11b **11 Mbps** Sub antenna

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	1.29	3.42	9.92	14.63	29.04	0.16	14.79	30.13
2437	1.03	3.42	9.92	14.37	27.35	0.16	14.53	28.38
2462	0.77	3.43	9.92	14.12	25.82	0.16	14.28	26.79

11g **36 Mbps** Sub antenna

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	-4.75	3.42	9.92	8.59	7.23	0.62	9.21	8.34
2437	1.02	3.42	9.92	14.36	27.29	0.62	14.98	31.48
2462	-2.77	3.43	9.92	10.58	11.43	0.62	11.20	13.18

11n-20 (SISO) **MCS 4** Sub antenna

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	-6.62	3.42	9.92	6.72	4.70	0.64	7.36	5.45
2437	0.51	3.42	9.92	13.85	24.27	0.64	14.49	28.12
2462	-6.48	3.43	9.92	6.87	4.86	0.64	7.51	5.64

Sample Calculation:

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

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

Average Output Power
(Reference data for SAR testing)

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

Main antenna + Sub antenna

Freq. [MHz]	Main Result [mW]	Sub Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	5.32	5.22	10.23	10.55	30.00	1000	19.77
2437	25.12	27.86	17.24	52.98	30.00	1000	12.76
2462	5.52	5.20	10.30	10.72	30.00	1000	19.70

Sample Calculation:

Result = Main antenna + Sub antenna

11n-20 (MIMO) MCS12 Main antenna

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	-7.16	3.42	9.92	6.18	4.15	1.08	7.26	5.32
2437	-0.42	3.42	9.92	12.92	19.59	1.08	14.00	25.12
2462	-7.01	3.43	9.92	6.34	4.31	1.08	7.42	5.52

11n-20 (MIMO) MCS 12 Sub antenna

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	-7.24	3.42	9.92	6.10	4.07	1.08	7.18	5.22
2437	0.03	3.42	9.92	13.37	21.73	1.08	14.45	27.86
2462	-7.27	3.43	9.92	6.08	4.06	1.08	7.16	5.20

Sample Calculation:

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

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

Average Output Power
(Reference data for SAR testing)

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b Main antenna	1	0.89	0.02	0.91	
	2	0.74	0.03	0.77	
	5.5	0.74	0.09	0.83	
	11	0.41	0.16	0.57	
11b Sub antenna	1	1.10	0.02	1.12	
	2	1.10	0.03	1.13	
	5.5	1.09	0.09	1.18	
	11	1.03	0.16	1.19	*
11g Main antenna	6	1.09	0.12	1.21	
	9	1.19	0.17	1.36	
	12	1.05	0.22	1.27	
	18	0.99	0.33	1.32	
	24	1.10	0.43	1.53	
	36	0.98	0.62	1.60	
	48	-1.21	0.80	-0.41	
	54	-1.32	0.88	-0.44	
11g sub antenna	6	1.34	0.12	1.46	
	9	1.32	0.17	1.49	
	12	1.34	0.22	1.56	
	18	1.20	0.33	1.53	
	24	1.14	0.43	1.57	
	36	1.02	0.62	1.64	*
	48	-1.07	0.80	-0.27	
54	-1.12	0.88	-0.24		

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

2437 MHz

Mode	Rate MCS	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20 (SISO) Main antenna Long GI	0	0.27	0.12	0.39	
	1	0.19	0.23	0.42	
	2	0.04	0.35	0.39	
	3	0.18	0.45	0.63	
	4	-0.21	0.64	0.43	
	5	-1.28	0.81	-0.47	
	6	-1.50	0.88	-0.62	
11n-20 (SISO) Sub antenna Long GI	0	0.73	0.12	0.85	
	1	0.62	0.23	0.85	
	2	0.51	0.35	0.86	
	3	0.66	0.45	1.11	
	4	0.51	0.64	1.15	*
	5	-0.80	0.81	0.01	
	6	-0.89	0.88	-0.01	
11n-20 (SISO) Main antenna Short GI	0	0.09	0.14	0.23	
	1	0.05	0.26	0.31	
	2	-0.13	0.38	0.25	
	3	0.36	0.50	0.86	
	4	0.00	0.68	0.68	
	5	-1.24	0.87	-0.37	
	6	-1.34	0.95	-0.39	
11n-20 (SISO) Sub antenna Short GI	0	0.45	0.14	0.59	
	1	0.52	0.26	0.78	
	2	0.43	0.38	0.81	
	3	0.50	0.50	1.00	
	4	0.46	0.68	1.14	
	5	-0.79	0.87	0.08	
	6	-0.82	0.95	0.13	
7	-2.82	1.03	-1.79		

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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. : 11253018S-A-R1
Date : July 6, 2016
Temperature / Humidity : 26 deg. C / 48 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

Long GI

Mode (MCS)	Freq. [MHz]	Duty factor [dB]	Main antenna			Sub antenna			Main + Sub		Remarks
			Reading [dBm]	Result [dBm]	Result [mW]	Reading [dBm]	Result [dBm]	Result [mW]	Result [dBm]	Result [mW]	
8	2437	0.24	0.16	0.40	1.10	0.61	0.85	1.22	3.65	2.32	
9	2437.0	0.44	-0.14	0.30	1.07	0.19	0.63	1.16	3.48	2.23	
10	2437.0	0.63	-0.14	0.49	1.12	-0.01	0.62	1.15	3.56	2.27	
11	2437.0	0.80	-0.14	0.66	1.16	0.20	1.00	1.26	3.84	2.42	
12	2437.0	1.08	-0.42	0.66	1.16	0.03	1.11	1.29	3.89	2.45	*
13	2437.0	1.30	-1.60	-0.30	0.93	-1.15	0.15	1.04	2.94	1.97	
14	2437.0	1.41	-1.60	-0.19	0.96	-1.39	0.02	1.00	2.92	1.96	
15	2437.0	1.48	-3.71	-2.23	0.60	-3.19	-1.71	0.67	1.04	1.27	

Short GI

Mode (MCS)	Freq. [MHz]	Duty factor [dB]	Main antenna			Sub antenna			Main + Sub		Remarks
			Reading [dBm]	Result [dBm]	Result [mW]	Reading [dBm]	Result [dBm]	Result [mW]	Result [dBm]	Result [mW]	
8	2437	0.26	0.21	0.47	1.11	0.50	0.76	1.19	3.62	2.30	
9	2437.0	0.49	-0.19	0.30	1.07	0.14	0.63	1.16	3.48	2.23	
10	2437.0	0.68	-0.17	0.51	1.12	-0.06	0.62	1.15	3.56	2.27	
11	2437.0	0.86	-0.47	0.39	1.09	0.13	0.99	1.26	3.71	2.35	
12	2437.0	1.16	-0.62	0.54	1.13	-0.11	1.05	1.27	3.80	2.40	
13	2437.0	1.40	-1.61	-0.21	0.95	-1.25	0.15	1.04	2.99	1.99	
14	2437.0	1.50	-1.71	-0.21	0.95	-1.48	0.02	1.00	2.90	1.95	
15	2437.0	1.57	-3.84	-2.27	0.59	-3.33	-1.76	0.67	1.00	1.26	

Sample Calculation:

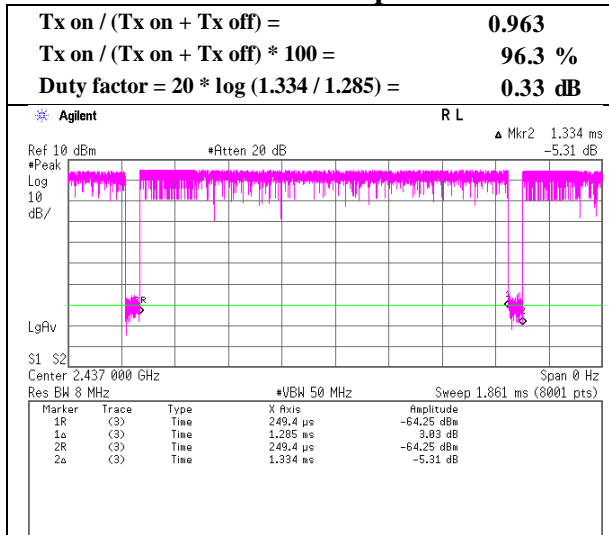
$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

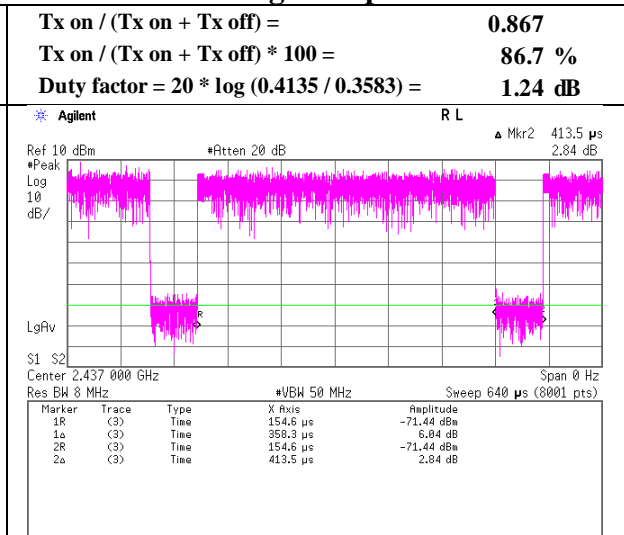
Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11253018S-A-R1
Date	July 8, 2016
Temperature / Humidity	25 deg. C / 56 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx

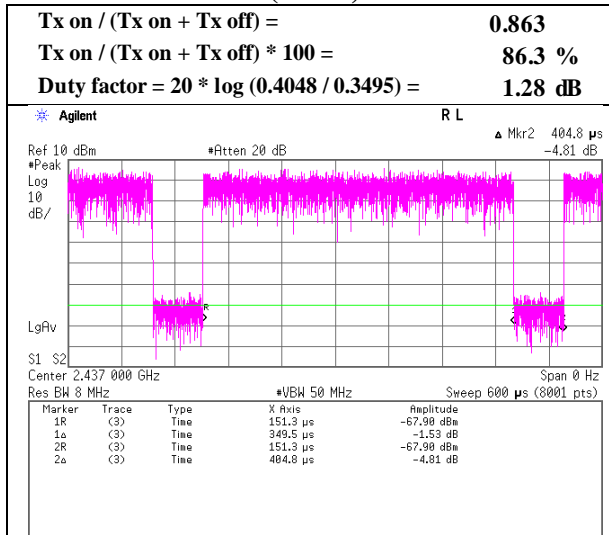
11b 11 Mbps



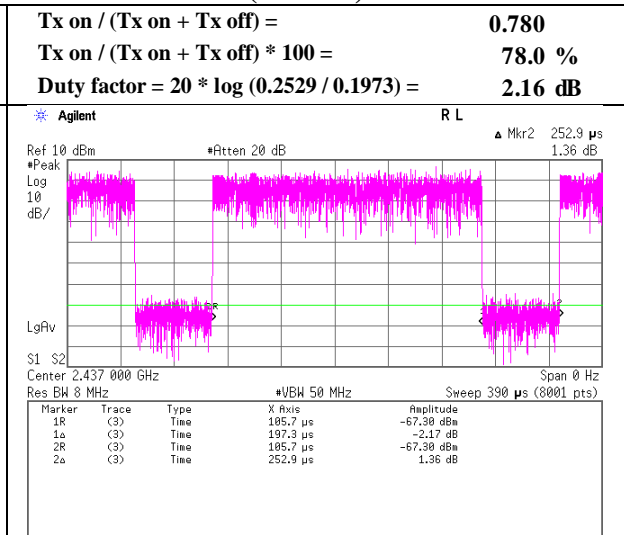
11g 6 Mbps



11n-20 (SISO) MCS 4



11n-20 (MIMO) MCS 12



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	46.70	27.68	13.77	40.70	1.83	49.28	73.9	24.6	151	178	
Hori.	4824.000	PK	48.87	31.40	5.94	41.50	1.83	46.54	73.9	27.4	204	72	
Hori.	7236.000	PK	47.52	36.63	7.16	41.16	1.83	51.98	73.9	21.9	100	0	
Hori.	9648.000	PK	45.72	37.95	8.06	40.47	1.83	53.09	73.9	20.8	100	0	
Hori.	12060.000	PK	46.83	39.60	9.05	39.85	1.83	57.46	73.9	16.4	100	0	
Vert.	2390.000	PK	45.60	27.68	13.77	40.70	1.83	48.18	73.9	25.7	211	268	
Vert.	4824.000	PK	49.84	31.40	5.94	41.50	1.83	47.51	73.9	26.4	144	298	
Vert.	7236.000	PK	48.73	36.63	7.16	41.16	1.83	53.19	73.9	20.7	100	0	
Vert.	9648.000	PK	46.57	37.95	8.06	40.47	1.83	53.94	73.9	20.0	100	0	
Vert.	12060.000	PK	45.93	39.60	9.05	39.85	1.83	56.56	73.9	17.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	35.75	27.68	13.77	40.70	0.33	1.83	38.66	53.9	15.2	*1)
Hori.	4824.000	AV	38.23	31.40	5.94	41.50	0.33	1.83	36.23	53.9	17.7	
Hori.	7236.000	AV	37.99	36.63	7.16	41.16	0.33	1.83	42.78	53.9	11.1	
Hori.	9648.000	AV	37.07	37.95	8.06	40.47	0.33	1.83	44.77	53.9	9.1	
Hori.	12060.000	AV	37.78	39.60	9.05	39.85	0.33	1.83	48.74	53.9	5.2	
Vert.	2390.000	AV	36.03	27.68	13.77	40.70	0.33	1.83	38.94	53.9	15.0	*1)
Vert.	4824.000	AV	40.50	31.40	5.94	41.50	0.33	1.83	38.50	53.9	15.4	
Vert.	7236.000	AV	37.42	36.63	7.16	41.16	0.33	1.83	42.21	53.9	11.7	
Vert.	9648.000	AV	37.05	37.95	8.06	40.47	0.33	1.83	44.75	53.9	9.2	
Vert.	12060.000	AV	37.56	39.60	9.05	39.85	0.33	1.83	48.52	53.9	5.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	83.75	27.72	13.79	40.70	1.83	86.4	-	-	Carrier
Hori.	2400.000	PK	42.01	27.70	13.78	40.70	1.83	44.6	66.4	21.8	
Vert.	2412.000	PK	87.28	27.72	13.79	40.70	1.83	89.9	-	-	Carrier
Vert.	2400.000	PK	44.87	27.70	13.78	40.70	1.83	47.5	69.9	22.4	

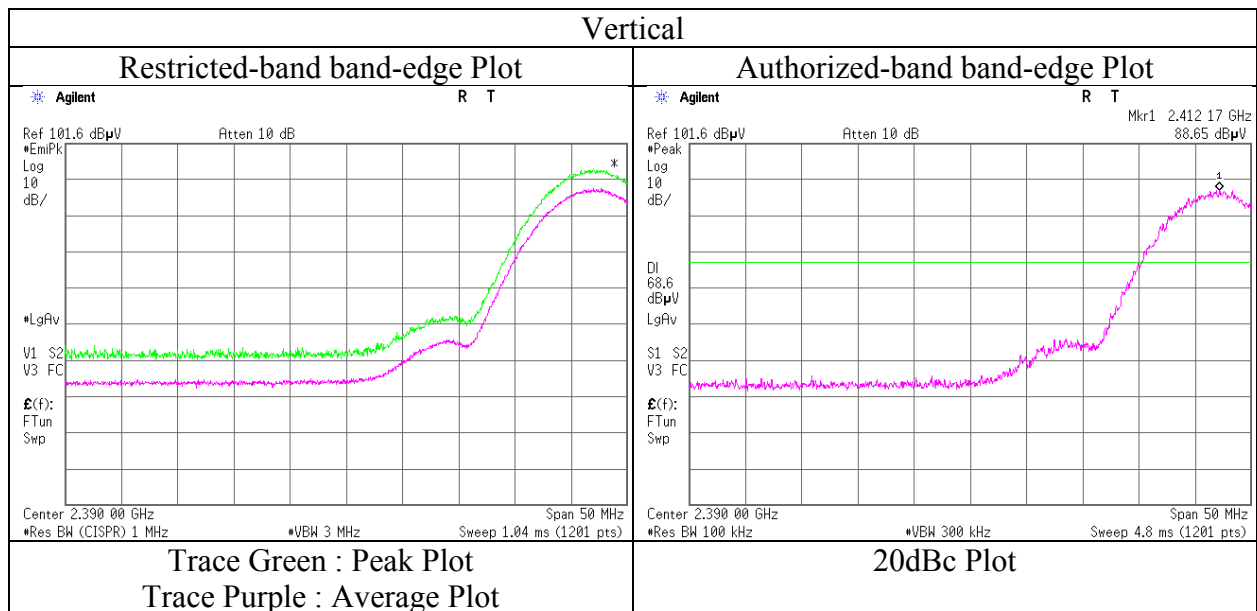
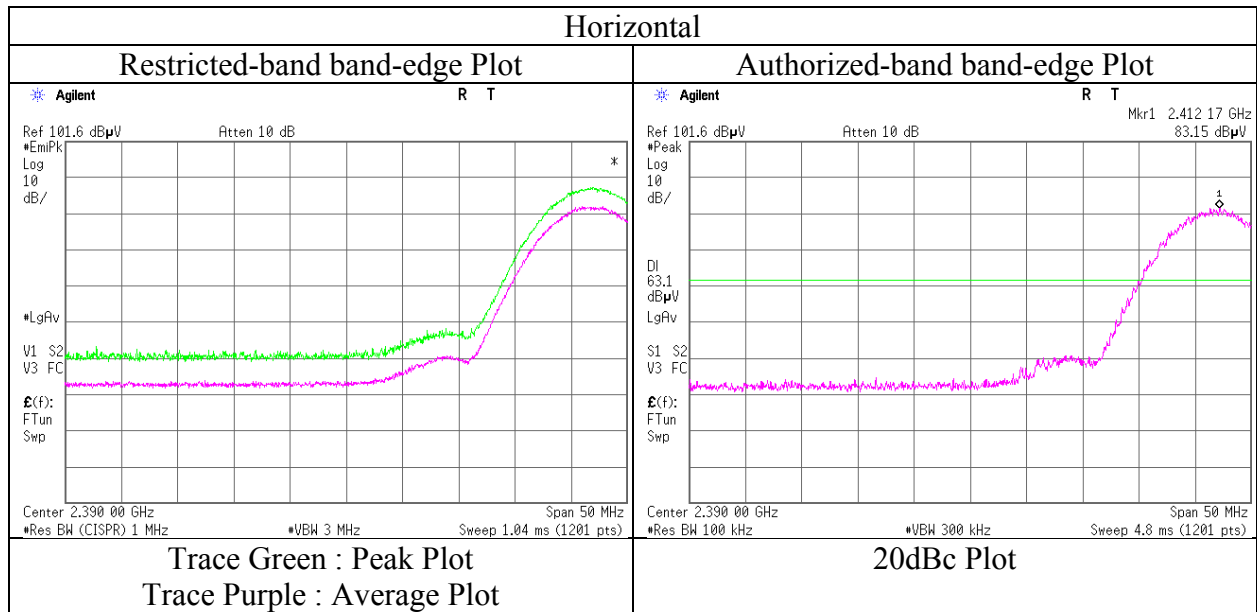
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016
Temperature / Humidity : 23 deg. C / 55 % RH
Engineer : Yosuke Ishikawa
(1-13GHz)
Mode : Tx 11b 2412 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	46.01	31.57	5.95	41.40	1.83	43.96	73.9	29.9	207	62	
Hori.	7311.000	PK	46.19	36.67	7.17	41.23	1.83	50.63	73.9	23.3	100	0	
Hori.	9748.000	PK	45.27	38.02	8.10	40.42	1.83	52.80	73.9	21.1	100	0	
Hori.	12185.000	PK	44.84	39.59	9.06	39.80	1.83	55.52	73.9	18.4	100	0	
Vert.	4874.000	PK	47.81	31.57	5.95	41.40	1.83	45.76	73.9	28.1	201	279	
Vert.	7311.000	PK	45.96	36.67	7.17	41.23	1.83	50.40	73.9	23.5	100	0	
Vert.	9748.000	PK	45.21	38.02	8.10	40.42	1.83	52.74	73.9	21.2	100	0	
Vert.	12185.000	PK	45.49	39.59	9.06	39.80	1.83	56.17	73.9	17.7	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : $20\log(3.705\text{ m} / 3.0\text{ m}) = 1.83\text{ dB}$
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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	37.86	31.57	5.95	41.40	0.33	1.83	36.14	53.9	17.8	
Hori.	7311.000	AV	37.42	36.67	7.17	41.23	0.33	1.83	42.19	53.9	11.7	
Hori.	9748.000	AV	36.60	38.02	8.10	40.42	0.33	1.83	44.46	53.9	9.4	
Hori.	12185.000	AV	36.31	39.59	9.06	39.80	0.33	1.83	47.32	53.9	6.6	
Vert.	4874.000	AV	39.64	31.57	5.95	41.40	0.33	1.83	37.92	53.9	16.0	
Vert.	7311.000	AV	37.37	36.67	7.17	41.23	0.33	1.83	42.14	53.9	11.8	
Vert.	9748.000	AV	36.67	38.02	8.10	40.42	0.33	1.83	44.53	53.9	9.4	
Vert.	12185.000	AV	36.41	39.59	9.06	39.80	0.33	1.83	47.42	53.9	6.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : $20\log(3.705\text{ m} / 3.0\text{ m}) = 1.83\text{ dB}$
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	44.46	27.83	13.86	40.69	1.83	47.29	73.9	26.6	298	61	
Hori.	4924.000	PK	46.55	31.74	5.97	41.30	1.83	44.79	73.9	29.1	152	102	
Hori.	7386.000	PK	46.44	36.71	7.19	41.31	1.83	50.86	73.9	23.0	100	0	
Hori.	9848.000	PK	44.25	38.08	8.14	40.36	1.83	51.94	73.9	22.0	100	0	
Hori.	12310.000	PK	44.33	39.58	9.06	39.75	1.83	55.05	73.9	18.9	100	0	
Hori.	12310.000	AV	35.19	39.58	9.06	39.75	1.83	45.91	53.9	8.0	100	0	
Vert.	2483.500	PK	45.13	27.83	13.86	40.69	1.83	47.96	73.9	25.9	199	265	
Vert.	4924.000	PK	49.30	31.74	5.97	41.30	1.83	47.54	73.9	26.4	168	288	
Vert.	7386.000	PK	45.58	36.71	7.19	41.31	1.83	50.00	73.9	23.9	100	0	
Vert.	9848.000	PK	44.82	38.08	8.14	40.36	1.83	52.51	73.9	21.4	100	0	
Vert.	12310.000	PK	43.57	39.58	9.06	39.75	1.83	54.29	73.9	19.6	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	35.01	27.83	13.86	40.69	0.33	1.83	38.17	53.9	15.7	*1)
Hori.	4924.000	AV	38.13	31.74	5.97	41.30	0.33	1.83	36.70	53.9	17.2	
Hori.	7386.000	AV	37.18	36.71	7.19	41.31	0.33	1.83	41.93	53.9	12.0	
Hori.	9848.000	AV	36.05	38.08	8.14	40.36	0.33	1.83	44.07	53.9	9.8	
Vert.	2483.500	AV	36.49	27.83	13.86	40.69	0.33	1.83	39.65	53.9	14.3	*1)
Vert.	4924.000	AV	39.76	31.74	5.97	41.30	0.33	1.83	38.33	53.9	15.6	
Vert.	7386.000	AV	36.95	36.71	7.19	41.31	0.33	1.83	41.70	53.9	12.2	
Vert.	9848.000	AV	36.13	38.08	8.14	40.36	0.33	1.83	44.15	53.9	9.7	
Vert.	12310.000	AV	35.27	39.58	9.06	39.75	0.33	1.83	46.32	53.9	7.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

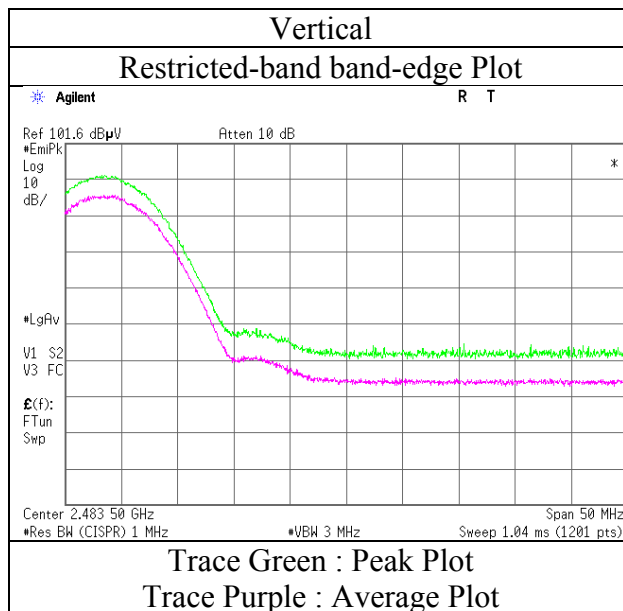
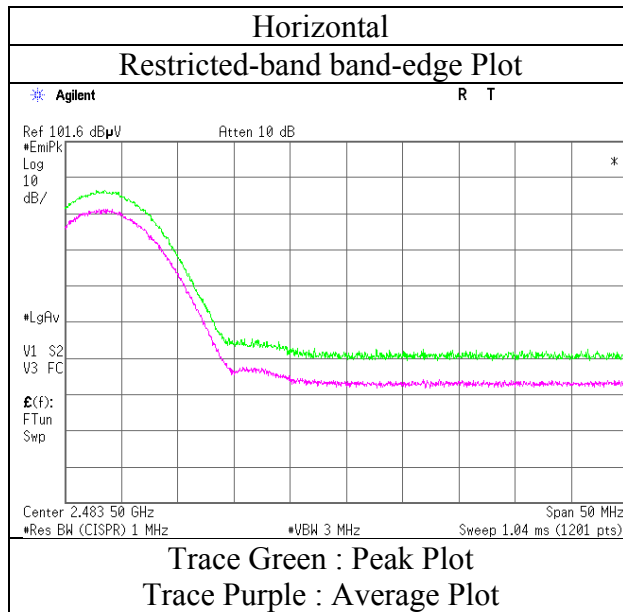
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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)

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016
Temperature / Humidity : 23 deg. C / 55 % RH
Engineer : Yosuke Ishikawa
(1-13GHz)
Mode : Tx 11b 2462 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	47.39	27.68	13.77	40.70	1.83	49.97	73.9	23.9	272	59	
Hori.	4824.000	PK	47.63	31.40	5.94	41.50	1.83	45.30	73.9	28.6	182	101	
Hori.	7236.000	PK	46.75	36.63	7.16	41.16	1.83	51.21	73.9	22.7	100	0	
Hori.	9648.000	PK	45.37	37.95	8.06	40.47	1.83	52.74	73.9	21.2	100	0	
Hori.	12060.000	PK	46.56	39.60	9.05	39.85	1.83	57.19	73.9	16.7	100	0	
Vert.	2390.000	PK	50.58	27.68	13.77	40.70	1.83	53.16	73.9	20.7	180	266	
Vert.	4824.000	PK	47.46	31.40	5.94	41.50	1.83	45.13	73.9	28.8	164	305	
Vert.	7236.000	PK	47.57	36.63	7.16	41.16	1.83	52.03	73.9	21.9	100	0	
Vert.	9648.000	PK	45.72	37.95	8.06	40.47	1.83	53.09	73.9	20.8	100	0	
Vert.	12060.000	PK	45.90	39.60	9.05	39.85	1.83	56.53	73.9	17.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	36.36	27.68	13.77	40.70	1.24	1.83	40.18	53.9	13.7	*1)
Hori.	4824.000	AV	37.35	31.40	5.94	41.50	1.24	1.83	36.26	53.9	17.6	
Hori.	7236.000	AV	37.92	36.63	7.16	41.16	1.24	1.83	43.62	53.9	10.3	
Hori.	9648.000	AV	36.45	37.95	8.06	40.47	1.24	1.83	45.06	53.9	8.8	
Hori.	12060.000	AV	37.53	39.60	9.05	39.85	1.24	1.83	49.40	53.9	4.5	
Vert.	2390.000	AV	37.86	27.68	13.77	40.70	1.24	1.83	41.68	53.9	12.2	*1)
Vert.	4824.000	AV	37.49	31.40	5.94	41.50	1.24	1.83	36.40	53.9	17.5	
Vert.	7236.000	AV	38.05	36.63	7.16	41.16	1.24	1.83	43.75	53.9	10.2	
Vert.	9648.000	AV	36.83	37.95	8.06	40.47	1.24	1.83	45.44	53.9	8.5	
Vert.	12060.000	AV	37.73	39.60	9.05	39.85	1.24	1.83	49.60	53.9	4.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	74.77	27.72	13.79	40.70	1.83	77.41	-	-	Carrier
Hori.	2400.000	PK	46.65	27.70	13.78	40.70	1.83	49.26	57.4	8.2	
Vert.	2412.000	PK	78.99	27.72	13.79	40.70	1.83	81.63	-	-	Carrier
Vert.	2400.000	PK	49.61	27.70	13.78	40.70	1.83	52.22	61.6	9.4	

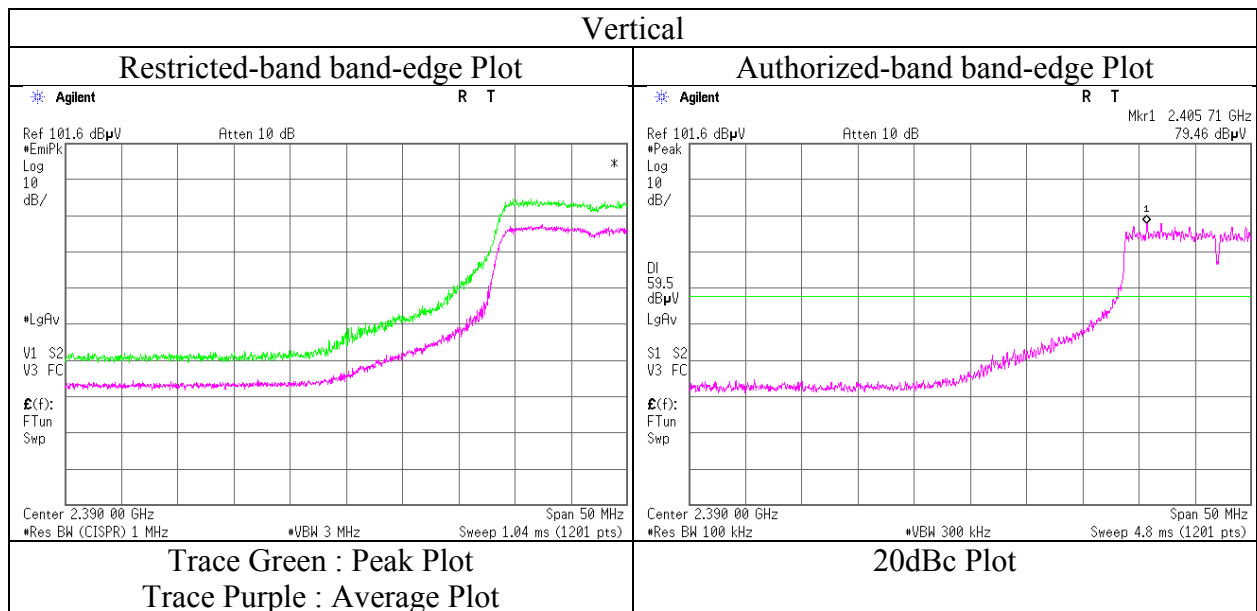
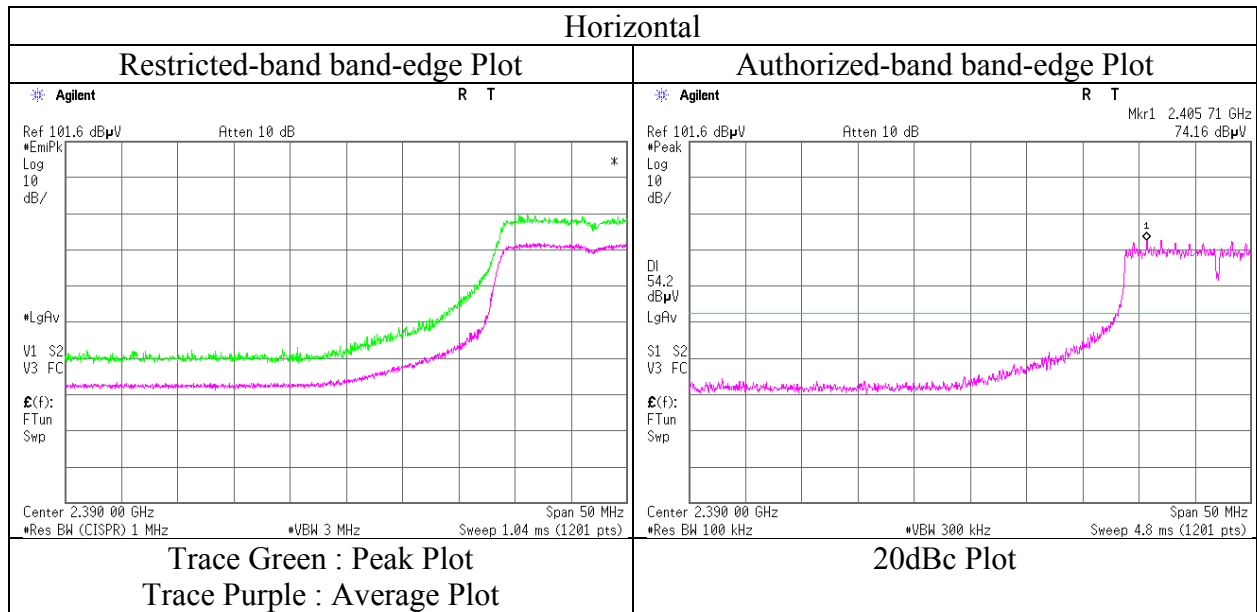
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016
Temperature / Humidity : 23 deg. C / 55 % RH
Engineer : Yosuke Ishikawa
(1-13GHz)
Mode : Tx 11g 2412 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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.	4874.000	PK	46.00	31.57	5.95	41.40	1.83	43.95	73.9	30.0	205	36	
Hori.	7311.000	PK	46.47	36.67	7.17	41.23	1.83	50.91	73.9	23.0	100	0	
Hori.	9748.000	PK	45.06	38.02	8.10	40.42	1.83	52.59	73.9	21.3	100	0	
Hori.	12185.000	PK	45.61	39.59	9.06	39.80	1.83	56.29	73.9	17.6	100	0	
Vert.	4874.000	PK	47.97	31.57	5.95	41.40	1.83	45.92	73.9	28.0	190	286	
Vert.	7311.000	PK	46.55	36.67	7.17	41.23	1.83	50.99	73.9	22.9	100	0	
Vert.	9748.000	PK	45.00	38.02	8.10	40.42	1.83	52.53	73.9	21.4	100	0	
Vert.	12185.000	PK	44.77	39.59	9.06	39.80	1.83	55.45	73.9	18.5	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : $20\log(3.705\text{ m} / 3.0\text{ m}) = 1.83\text{ dB}$
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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	37.76	31.57	5.95	41.40	1.24	1.83	37.0	53.9	17.0	
Hori.	7311.000	AV	37.66	36.67	7.17	41.23	1.24	1.83	43.3	53.9	10.6	
Hori.	9748.000	AV	36.53	38.02	8.10	40.42	1.24	1.83	45.3	53.9	8.6	
Hori.	12185.000	AV	36.21	39.59	9.06	39.80	1.24	1.83	48.1	53.9	5.8	
Vert.	4874.000	AV	38.65	31.57	5.95	41.40	1.24	1.83	37.8	53.9	16.1	
Vert.	7311.000	AV	37.56	36.67	7.17	41.23	1.24	1.83	43.2	53.9	10.7	
Vert.	9748.000	AV	36.65	38.02	8.10	40.42	1.24	1.83	45.4	53.9	8.5	
Vert.	12185.000	AV	36.48	39.59	9.06	39.80	1.24	1.83	48.4	53.9	5.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : $20\log(3.705\text{ m} / 3.0\text{ m}) = 1.83\text{ dB}$
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	45.51	27.83	13.86	40.69	1.83	48.34	73.9	25.6	297	63	
Hori.	4924.000	PK	46.56	31.74	5.97	41.30	1.83	44.80	73.9	29.1	198	60	
Hori.	7386.000	PK	45.97	36.71	7.19	41.31	1.83	50.39	73.9	23.5	100	0	
Hori.	9848.000	PK	44.95	38.08	8.14	40.36	1.83	52.64	73.9	21.3	100	0	
Hori.	12310.000	PK	44.74	39.58	9.06	39.75	1.83	55.46	73.9	18.4	100	0	
Vert.	2483.500	PK	51.13	27.83	13.86	40.69	1.83	53.96	73.9	19.9	148	276	
Vert.	4924.000	PK	46.55	31.74	5.97	41.30	1.83	44.79	73.9	29.1	100	0	
Vert.	7386.000	PK	46.28	36.71	7.19	41.31	1.83	50.70	73.9	23.2	100	0	
Vert.	9848.000	PK	45.34	38.08	8.14	40.36	1.83	53.03	73.9	20.9	100	0	
Vert.	12310.000	PK	45.10	39.58	9.06	39.75	1.83	55.82	73.9	18.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	35.13	27.83	13.86	40.69	1.24	1.83	39.20	53.9	14.7	*1)
Hori.	4924.000	AV	37.28	31.74	5.97	41.30	1.24	1.83	36.76	53.9	17.1	
Hori.	7386.000	AV	36.44	36.71	7.19	41.31	1.24	1.83	42.10	53.9	11.8	
Hori.	9848.000	AV	36.19	38.08	8.14	40.36	1.24	1.83	45.12	53.9	8.8	
Hori.	12310.000	AV	35.18	39.58	9.06	39.75	1.24	1.83	47.14	53.9	6.8	
Vert.	2483.500	AV	39.11	27.83	13.86	40.69	1.24	1.83	43.18	53.9	10.7	*1)
Vert.	4924.000	AV	37.59	31.74	5.97	41.30	1.24	1.83	37.07	53.9	16.8	
Vert.	7386.000	AV	36.90	36.71	7.19	41.31	1.24	1.83	42.56	53.9	11.3	
Vert.	9848.000	AV	36.37	38.08	8.14	40.36	1.24	1.83	45.30	53.9	8.6	
Vert.	12310.000	AV	35.17	39.58	9.06	39.75	1.24	1.83	47.13	53.9	6.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

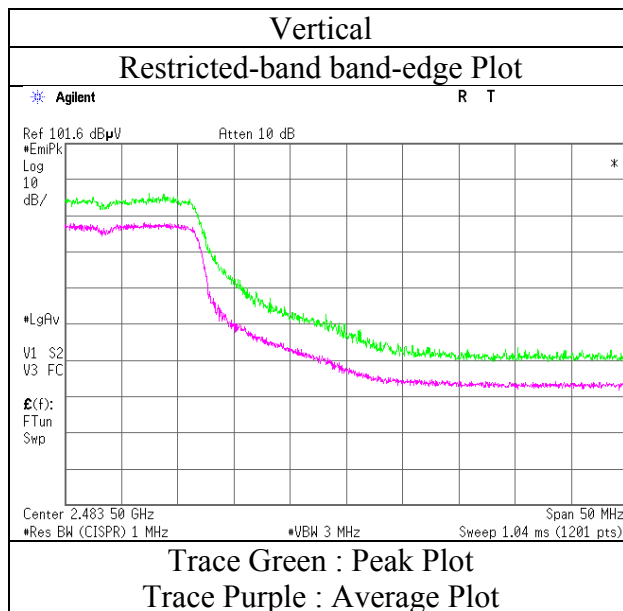
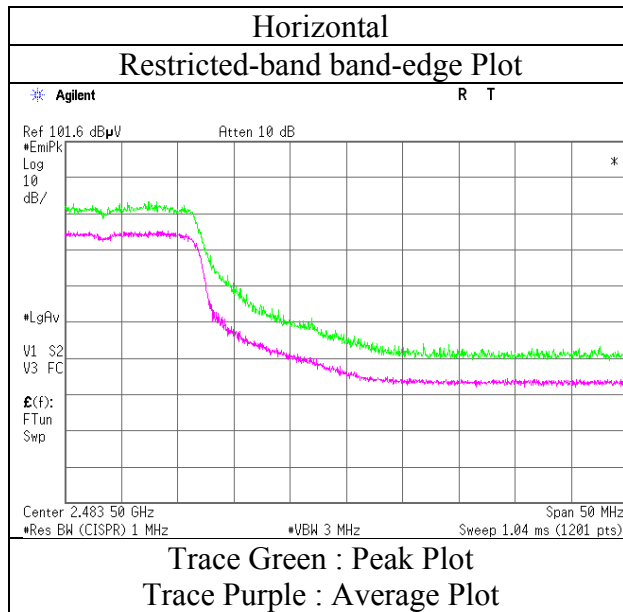
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11253018S-A-R1
Date	July 7, 2016
Temperature / Humidity	23 deg. C / 55 % RH
Engineer	Yosuke Ishikawa (1-13GHz)
Mode	Tx 11g 2462 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	49.40	27.68	13.77	40.70	1.83	51.98	73.9	21.9	175	60	
Hori.	4824.000	PK	46.76	31.40	5.94	41.50	1.83	44.43	73.9	29.5	154	23	
Hori.	7236.000	PK	47.53	36.63	7.16	41.16	1.83	51.99	73.9	21.9	100	0	
Hori.	9648.000	PK	46.01	37.95	8.06	40.47	1.83	53.38	73.9	20.5	100	0	
Hori.	12060.000	PK	46.75	39.60	9.05	39.85	1.83	57.38	73.9	16.5	100	0	
Vert.	2390.000	PK	49.99	27.68	13.77	40.70	1.83	52.57	73.9	21.3	220	13	
Vert.	4824.000	PK	47.98	31.40	5.94	41.50	1.83	45.65	73.9	28.3	174	30	
Vert.	7236.000	PK	47.36	36.63	7.16	41.16	1.83	51.82	73.9	22.1	100	0	
Vert.	9648.000	PK	46.00	37.95	8.06	40.47	1.83	53.37	73.9	20.5	100	0	
Vert.	12060.000	PK	47.04	39.60	9.05	39.85	1.83	57.67	73.9	16.2	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	36.27	27.68	13.77	40.70	2.16	1.83	41.01	53.9	12.9	*1)
Hori.	4824.000	AV	37.61	31.40	5.94	41.50	2.16	1.83	37.44	53.9	16.5	
Hori.	7236.000	AV	37.99	36.63	7.16	41.16	2.16	1.83	44.61	53.9	9.3	
Hori.	9648.000	AV	37.28	37.95	8.06	40.47	2.16	1.83	46.81	53.9	7.1	
Hori.	12060.000	AV	37.13	39.60	9.05	39.85	2.16	1.83	49.92	53.9	4.0	
Vert.	2390.000	AV	37.53	27.68	13.77	40.70	2.16	1.83	42.27	53.9	11.6	*1)
Vert.	4824.000	AV	37.84	31.40	5.94	41.50	2.16	1.83	37.67	53.9	16.2	
Vert.	7236.000	AV	37.83	36.63	7.16	41.16	2.16	1.83	44.45	53.9	9.5	
Vert.	9648.000	AV	36.81	37.95	8.06	40.47	2.16	1.83	46.34	53.9	7.6	
Vert.	12060.000	AV	37.74	39.60	9.05	39.85	2.16	1.83	50.53	53.9	3.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	80.38	27.72	13.79	40.70	1.83	83.02	-	-	Carrier
Hori.	2400.000	PK	48.72	27.70	13.78	40.70	1.83	51.33	63.0	11.7	
Vert.	2412.000	PK	80.22	27.72	13.79	40.70	1.83	82.86	-	-	Carrier
Vert.	2400.000	PK	48.24	27.70	13.78	40.70	1.83	50.85	62.9	12.0	

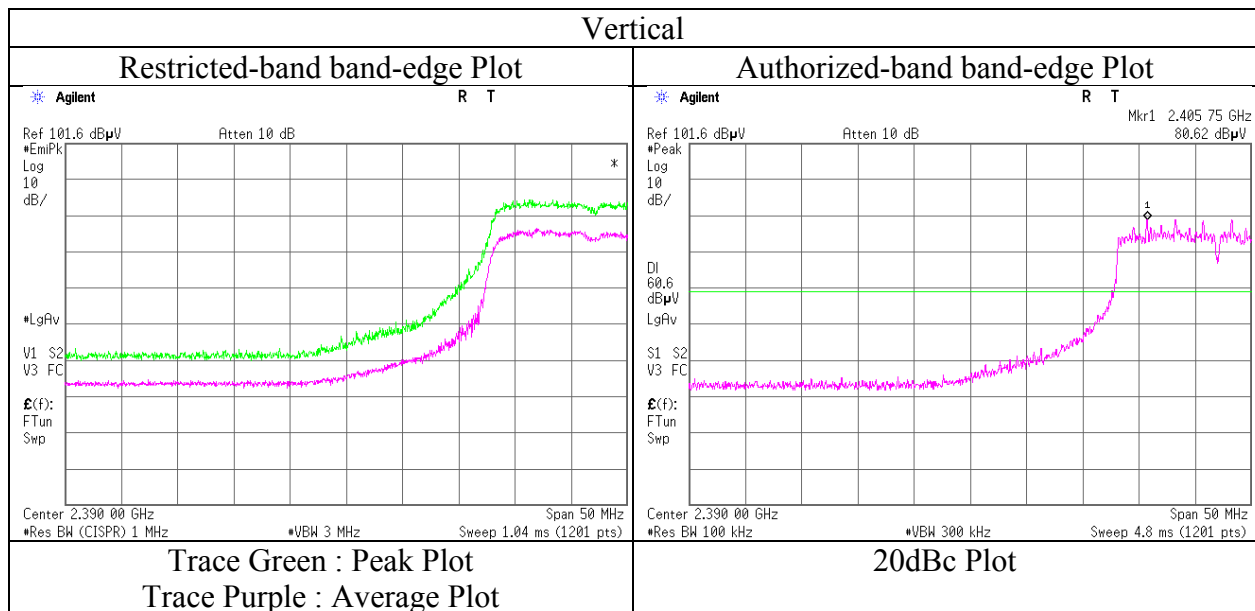
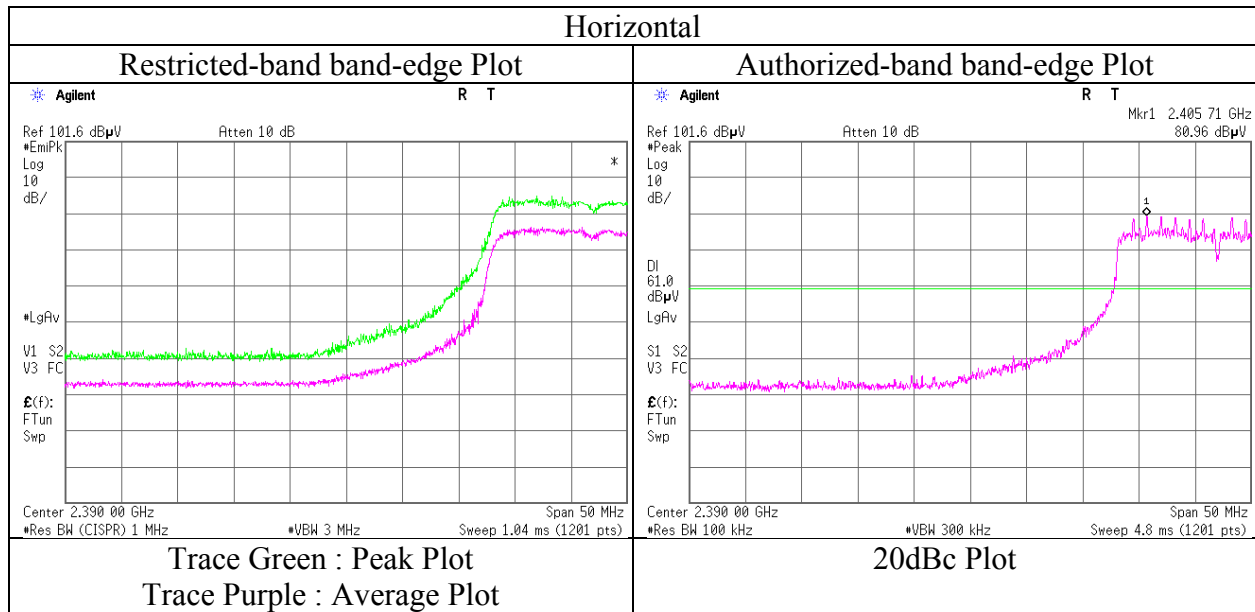
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016
Temperature / Humidity : 23 deg. C / 55 % RH
Engineer : Yosuke Ishikawa
(1-13GHz)
Mode : Tx 11n-20 2412 MHz



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

Radiated Spurious Emission

Test place Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. 11253018S-A-R1
Date July 17, 2016 July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity 24 deg. C / 58 % RH 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer Wataru Kojima Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
(30 MHz – 1 GHz) (1-13GHz) (13-18GHz) (18-26.5GHz)
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.	70.000	QP	22.90	5.88	7.17	32.16	0.00	3.79	40.0	36.2	200	330	
Hori.	100.000	QP	22.90	9.71	7.44	32.14	0.00	7.91	43.5	35.6	300	173	
Hori.	500.000	QP	22.00	17.39	9.58	31.92	0.00	17.05	46.0	29.0	150	113	
Hori.	700.000	QP	22.00	20.24	10.37	31.83	0.00	20.78	46.0	25.2	100	29	
Hori.	4874.000	PK	48.09	31.57	5.95	41.40	1.83	46.04	73.9	27.9	140	77	
Hori.	7311.000	PK	46.98	36.67	7.17	41.23	1.83	51.42	73.9	22.5	100	0	
Hori.	9748.000	PK	45.03	38.02	8.10	40.42	1.83	52.56	73.9	21.3	100	0	
Hori.	12185.000	PK	45.21	39.59	9.06	39.80	1.83	55.89	73.9	18.0	100	0	
Vert.	40.000	QP	22.20	13.85	6.87	32.18	0.00	10.74	40.0	29.3	100	143	
Vert.	70.000	QP	23.80	5.88	7.17	32.16	0.00	4.69	40.0	35.3	100	208	
Vert.	250.000	QP	22.40	17.10	8.41	31.99	0.00	15.92	46.0	30.1	100	154	
Vert.	366.594	QP	22.10	15.29	9.03	31.93	0.00	14.49	46.0	31.5	100	53	
Vert.	484.716	QP	21.90	17.18	9.52	31.93	0.00	16.67	46.0	29.4	100	59	
Vert.	4874.000	PK	48.10	31.57	5.95	41.40	1.83	46.05	73.9	27.9	196	358	
Vert.	7311.000	PK	46.73	36.67	7.17	41.23	1.83	51.17	73.9	22.7	100	0	
Vert.	9748.000	PK	46.31	38.02	8.10	40.42	1.83	53.84	73.9	20.1	100	0	
Vert.	12185.000	PK	44.47	39.59	9.06	39.80	1.83	55.15	73.9	18.8	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	38.56	31.57	5.95	41.40	2.16	1.83	38.67	53.9	15.2	
Hori.	7311.000	AV	37.44	36.67	7.17	41.23	2.16	1.83	44.04	53.9	9.9	
Hori.	9748.000	AV	36.47	38.02	8.10	40.42	2.16	1.83	46.16	53.9	7.7	
Hori.	12185.000	AV	36.03	39.59	9.06	39.80	2.16	1.83	48.87	53.9	5.0	
Vert.	4874.000	AV	39.04	31.57	5.95	41.40	2.16	1.83	39.15	53.9	14.8	
Vert.	7311.000	AV	37.67	36.67	7.17	41.23	2.16	1.83	44.27	53.9	9.6	
Vert.	9748.000	AV	36.66	38.02	8.10	40.42	2.16	1.83	46.35	53.9	7.6	
Vert.	12185.000	AV	36.84	39.59	9.06	39.80	2.16	1.83	49.68	53.9	4.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016 July 8, 2016 July 13, 2016
Temperature / Humidity : 23 deg. C / 55 % RH 25 deg. C / 62 % RH 24 deg. C / 62 % RH
Engineer : Yosuke Ishikawa Yosuke Ishikawa Shinichi Takano
 (1-13GHz) (13-18GHz) (18-26.5GHz)
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	46.97	27.83	13.86	40.69	1.83	49.80	73.9	24.1	186	56	
Hori.	4924.000	PK	48.37	31.74	5.97	41.30	1.83	46.61	73.9	27.3	174	4	
Hori.	7386.000	PK	45.87	36.71	7.19	41.31	1.83	50.29	73.9	23.6	100	0	
Hori.	9848.000	PK	45.23	38.08	8.14	40.36	1.83	52.92	73.9	21.0	100	0	
Hori.	12310.000	PK	44.20	39.58	9.06	39.75	1.83	54.92	73.9	19.0	100	0	
Vert.	2483.500	PK	46.16	27.83	13.86	40.69	1.83	48.99	73.9	24.9	247	8	
Vert.	4924.000	PK	46.18	31.74	5.97	41.30	1.83	44.42	73.9	29.5	160	12	
Vert.	7386.000	PK	45.47	36.71	7.19	41.31	1.83	49.89	73.9	24.0	100	0	
Vert.	9848.000	PK	44.75	38.08	8.14	40.36	1.83	52.44	73.9	21.5	100	0	
Vert.	12310.000	PK	43.28	39.58	9.06	39.75	1.83	54.00	73.9	19.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 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	36.95	27.83	13.86	40.69	2.16	1.83	41.94	53.9	12.0	*1)
Hori.	4924.000	AV	36.24	31.74	5.97	41.30	2.16	1.83	36.64	53.9	17.3	
Hori.	7386.000	AV	37.05	36.71	7.19	41.31	2.16	1.83	43.63	53.9	10.3	
Hori.	9848.000	AV	36.17	38.08	8.14	40.36	2.16	1.83	46.02	53.9	7.9	
Vert.	2483.500	AV	36.63	27.83	13.86	40.69	2.16	1.83	41.62	53.9	12.3	*1)
Vert.	4924.000	AV	37.43	31.74	5.97	41.30	2.16	1.83	37.83	53.9	16.1	
Vert.	7386.000	AV	37.14	36.71	7.19	41.31	2.16	1.83	43.72	53.9	10.2	
Vert.	9848.000	AV	36.01	38.08	8.14	40.36	2.16	1.83	45.86	53.9	8.0	
Vert.	12310.000	AV	35.13	39.58	9.06	39.75	2.16	1.83	48.01	53.9	5.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.705 m / 3.0 m) = 1.83 dB

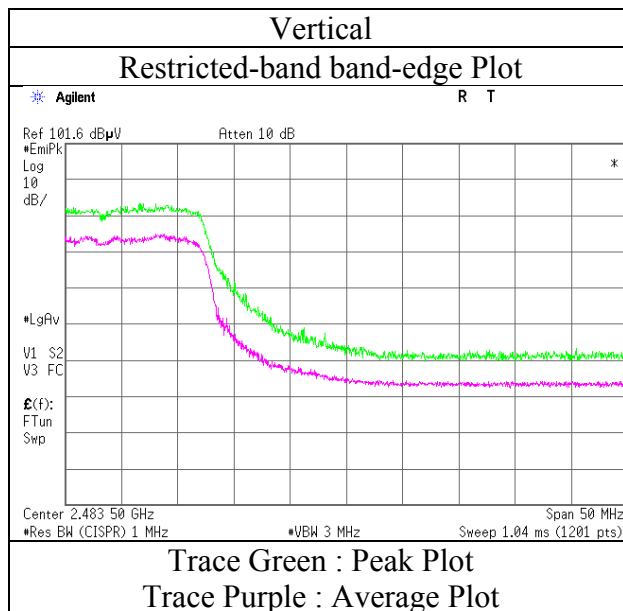
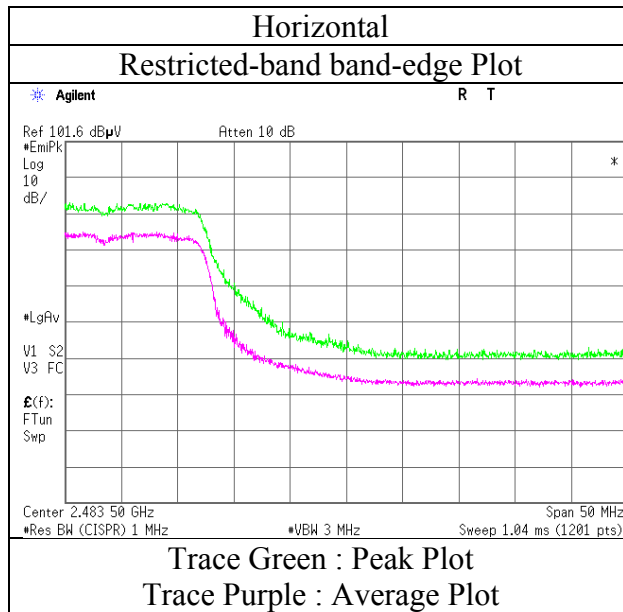
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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)

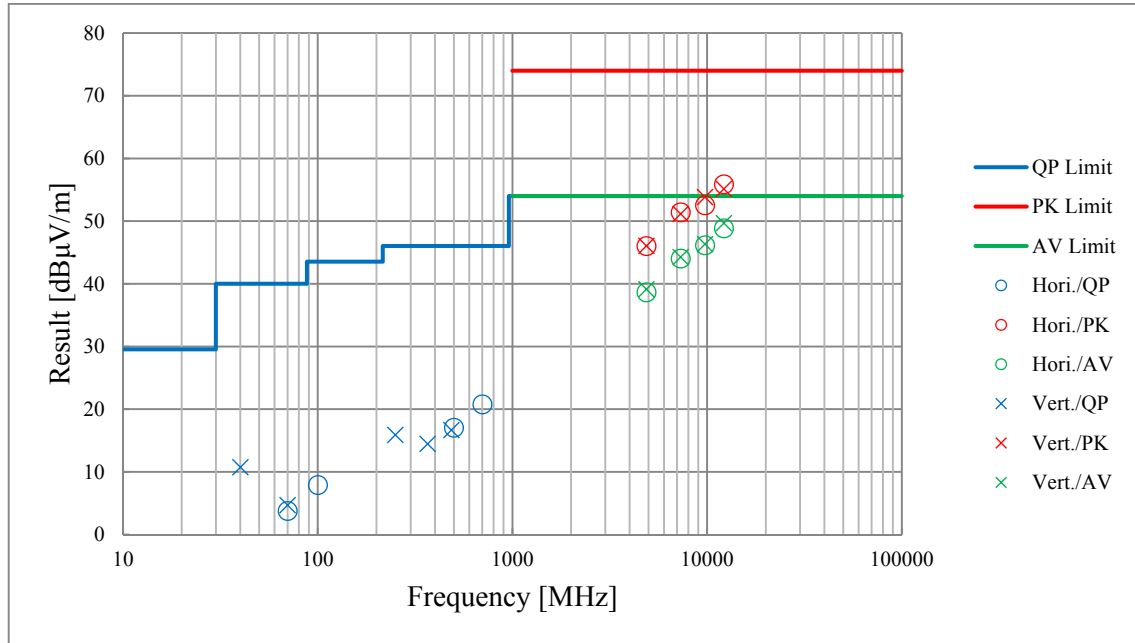
Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11253018S-A-R1
Date : July 7, 2016
Temperature / Humidity : 23 deg. C / 55 % RH
Engineer : Yosuke Ishikawa
(1-13GHz)
Mode : Tx 11n-20 2462 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

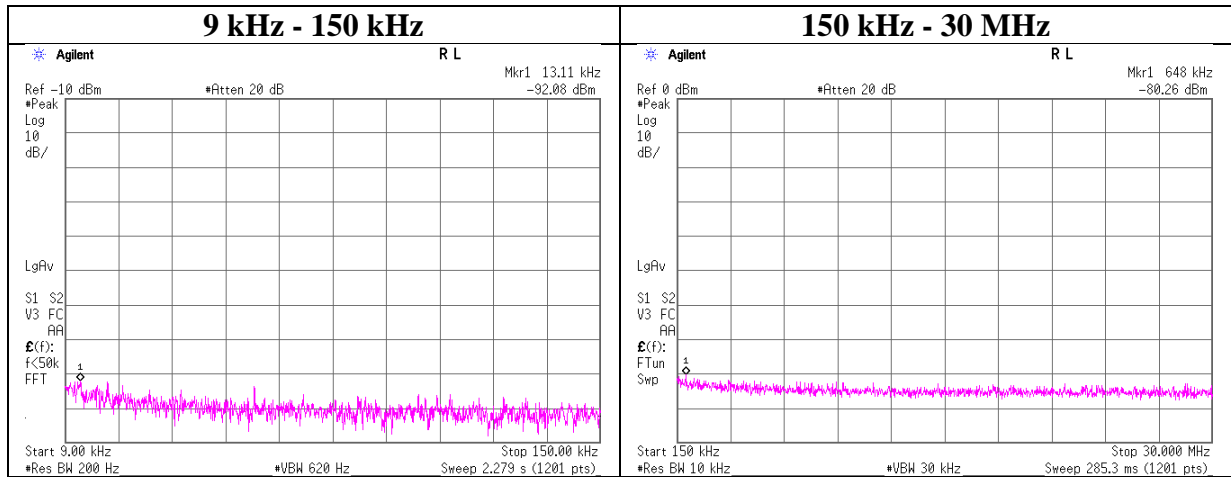
Test place	Shonan EMC Lab. No.1 and 3 Semi Anechoic Chamber			
Report No.	11253018S-A-R1			
Date	July 17, 2016	July 7, 2016	July 8, 2016	July 13, 2016
Temperature / Humidity	24 deg. C / 58 % RH	23 deg. C / 55 % RH	25 deg. C / 62 % RH	24 deg. C / 62 % RH
Engineer	Wataru Kojima (30 MHz – 1 GHz)	Yosuke Ishikawa (1-13GHz)	Yosuke Ishikawa (13-18GHz)	Shinichi Takano (18-26.5GHz)
Mode	Tx 11n-20 2437 MHz			



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

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11253018S-A-R1
Date	July 8, 2016
Temperature / Humidity	25 deg. C / 56 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx 11n-20 (MIMO) 2437 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
13.11	-92.1	0.01	9.8	2.0	2	-77.2	300	6.0	-16.0	45.2	61.2	
648.00	-80.3	0.02	9.8	2.0	2	-65.4	30	6.0	15.9	31.3	15.4	

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

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

Power Density

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11253018S-A-R1
Date July 8, 2016
Temperature / Humidity 25 deg. C / 56 % RH
Engineer Hiroyuki Morikawa
Mode Tx

11b Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-21.35	3.42	9.92	-8.01	8.00	16.01
2437.00	-21.52	3.42	9.92	-8.18	8.00	16.18
2462.00	-21.86	3.43	9.92	-8.51	8.00	16.51

11g Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-29.26	3.42	9.92	-15.92	8.00	23.92
2437.00	-23.12	3.42	9.92	-9.78	8.00	17.78
2462.00	-26.13	3.43	9.92	-12.78	8.00	20.78

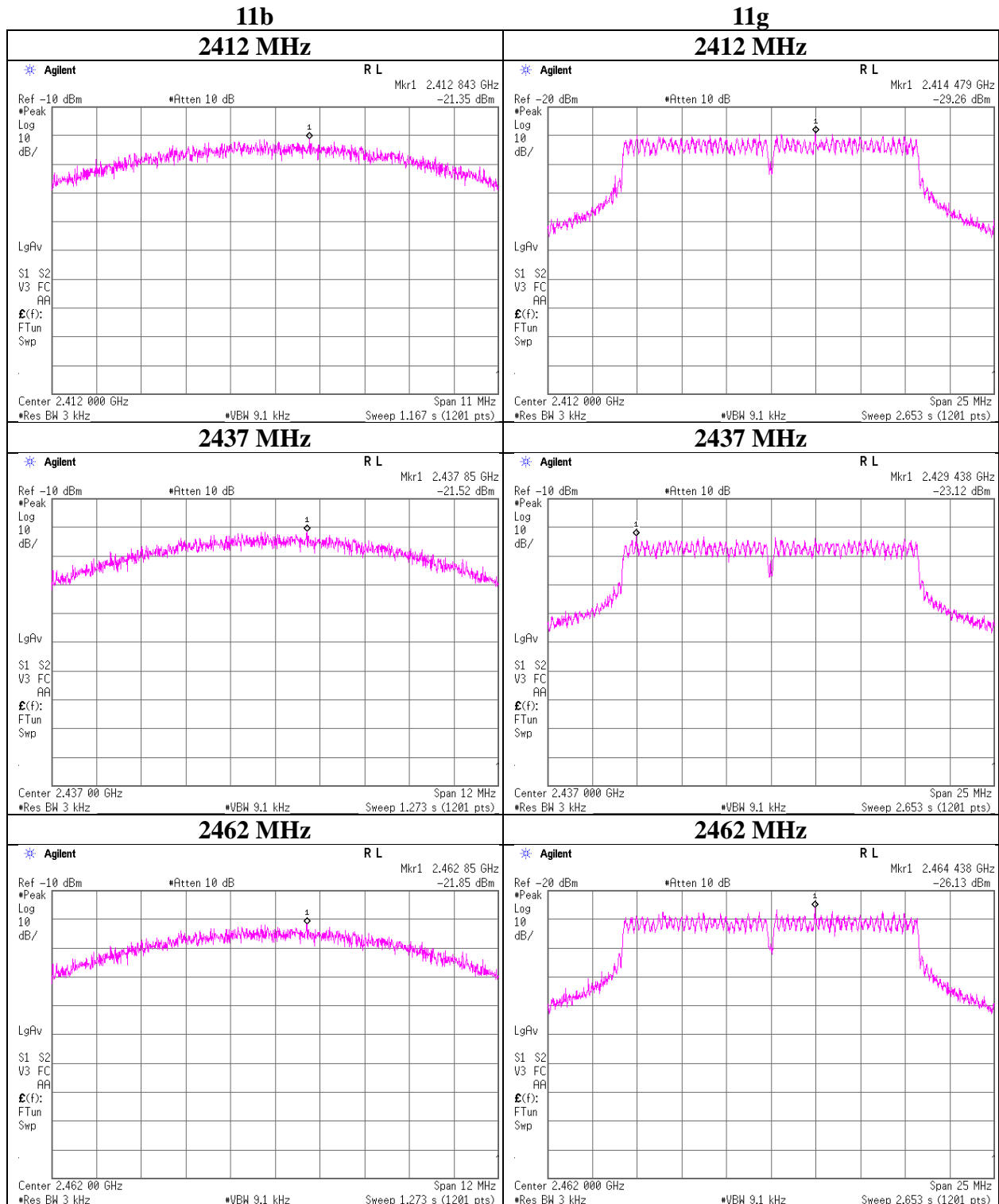
11n-20 (SISO) Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-32.12	3.42	9.92	-18.78	8.00	26.78
2437.00	-22.14	3.42	9.92	-8.80	8.00	16.80
2462.00	-26.97	3.43	9.92	-13.62	8.00	21.62

Sample Calculation:

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

Power Density



UL Japan, Inc.

Shonan EMC Lab.

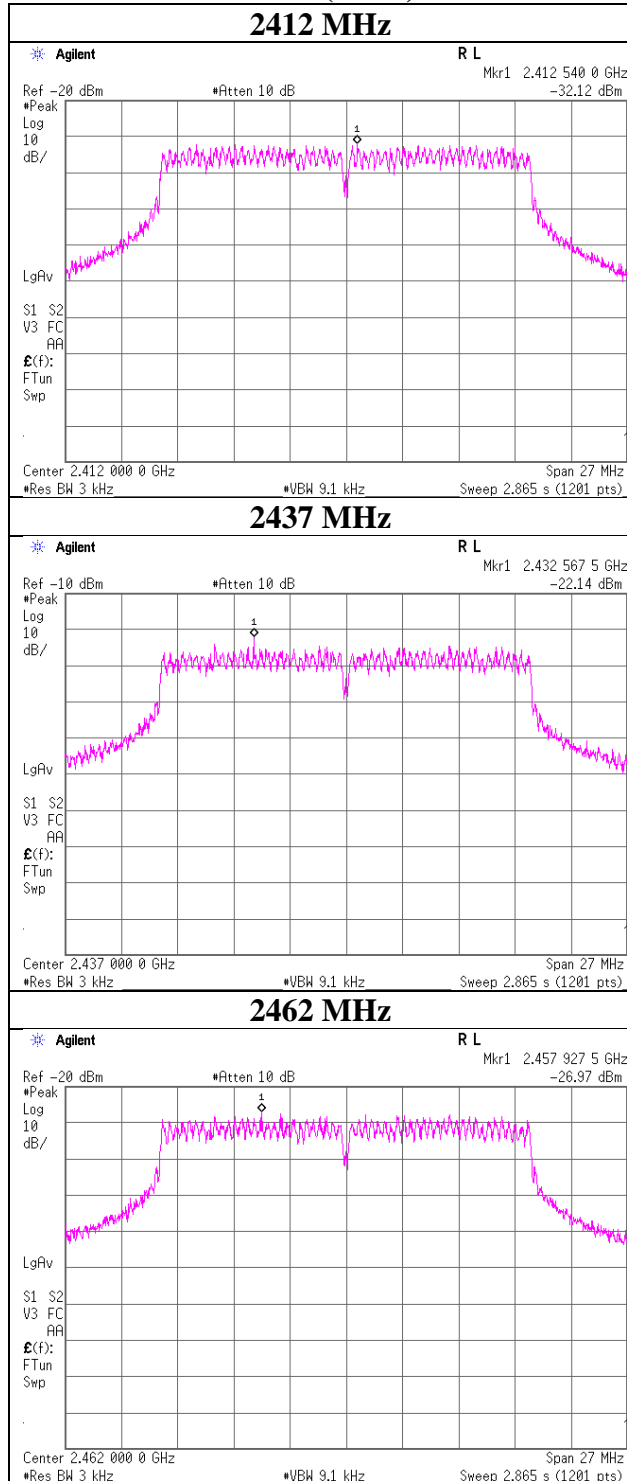
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Power Density

11n-20 (SISO)



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

Power Density

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 8, 2016
Temperature / Humidity : 25 deg. C / 56 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

Main antenna + Sub antenna

Freq. [MHz]	Main Result [mW]	Sub Result [mW]	Result		Limit [dBm]	Margin [dB]
			[dBm]	[mW]		
2412.00	0.01	0.02	-15.08	0.03	8.00	23.08
2437.00	0.07	0.08	-8.36	0.15	8.00	16.36
2462.00	0.01	0.02	-14.45	0.04	8.00	22.45

Sample Calculation:

Result = Main antenna + Sub antenna

Main antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-31.61	3.42	9.92	-18.27	0.01	8.00	26.27
2437.00	-25.08	3.42	9.92	-11.74	0.07	8.00	19.74
2462.00	-31.62	3.43	9.92	-18.27	0.01	8.00	26.27

Sub antenna

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-31.25	3.42	9.92	-17.91	0.02	8.00	25.91
2437.00	-24.37	3.42	9.92	-11.03	0.08	8.00	19.03
2462.00	-30.13	3.43	9.92	-16.78	0.02	8.00	24.78

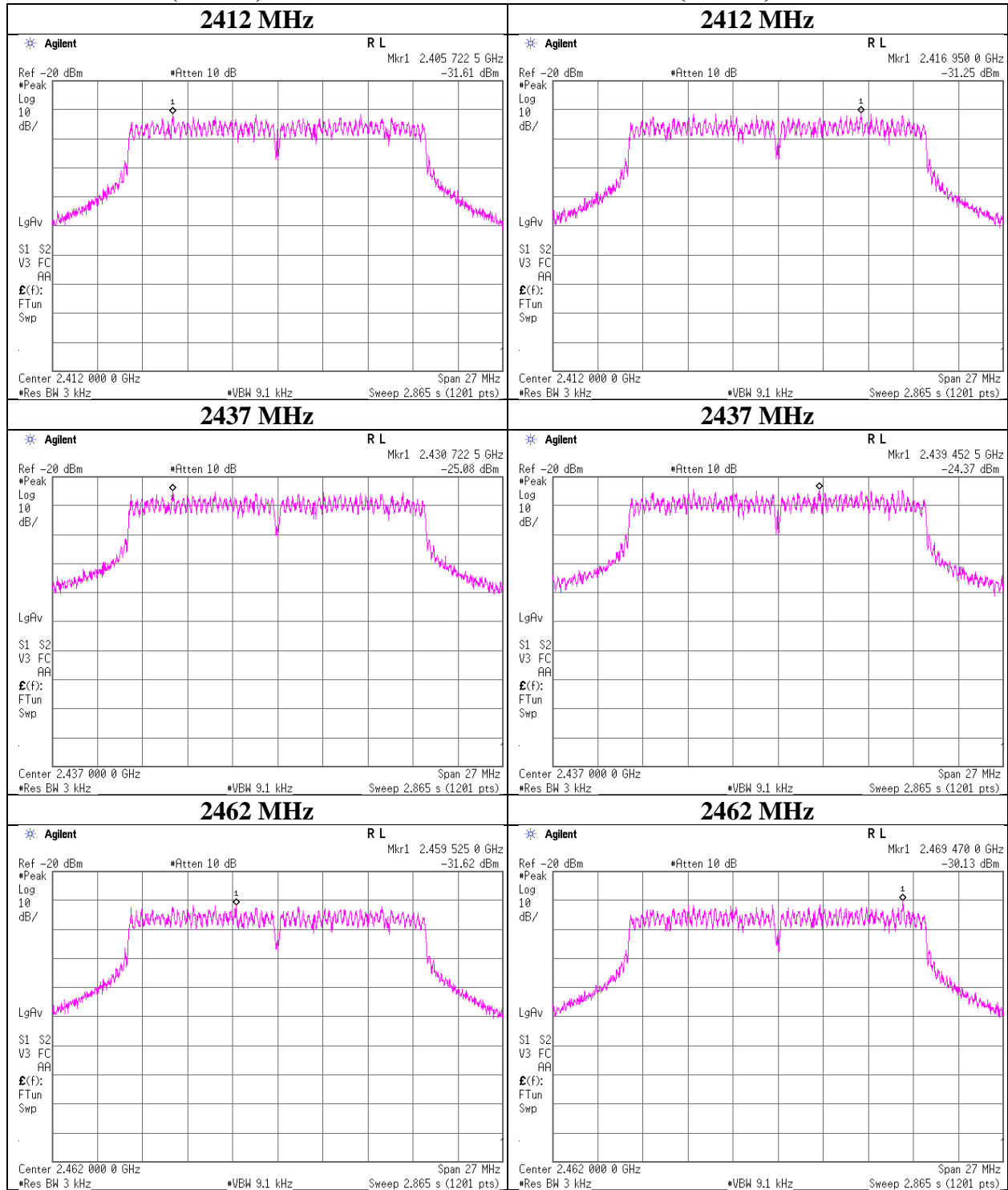
Sample Calculation:

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

Power Density

11n-20 (MIMO) Main antenna

11n-20 (MIMO) Sub antenna



UL Japan, Inc.

Shonan EMC Lab.

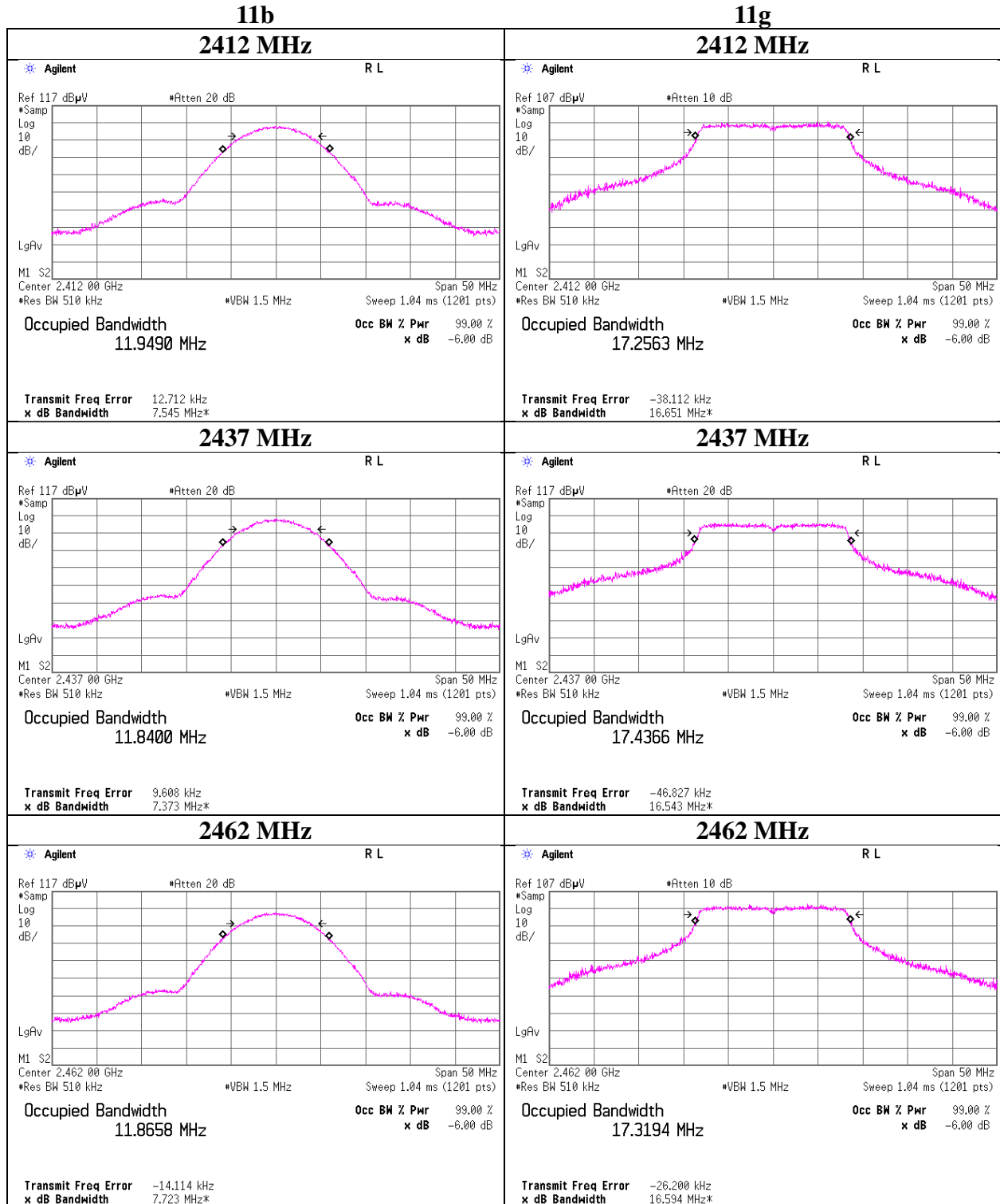
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

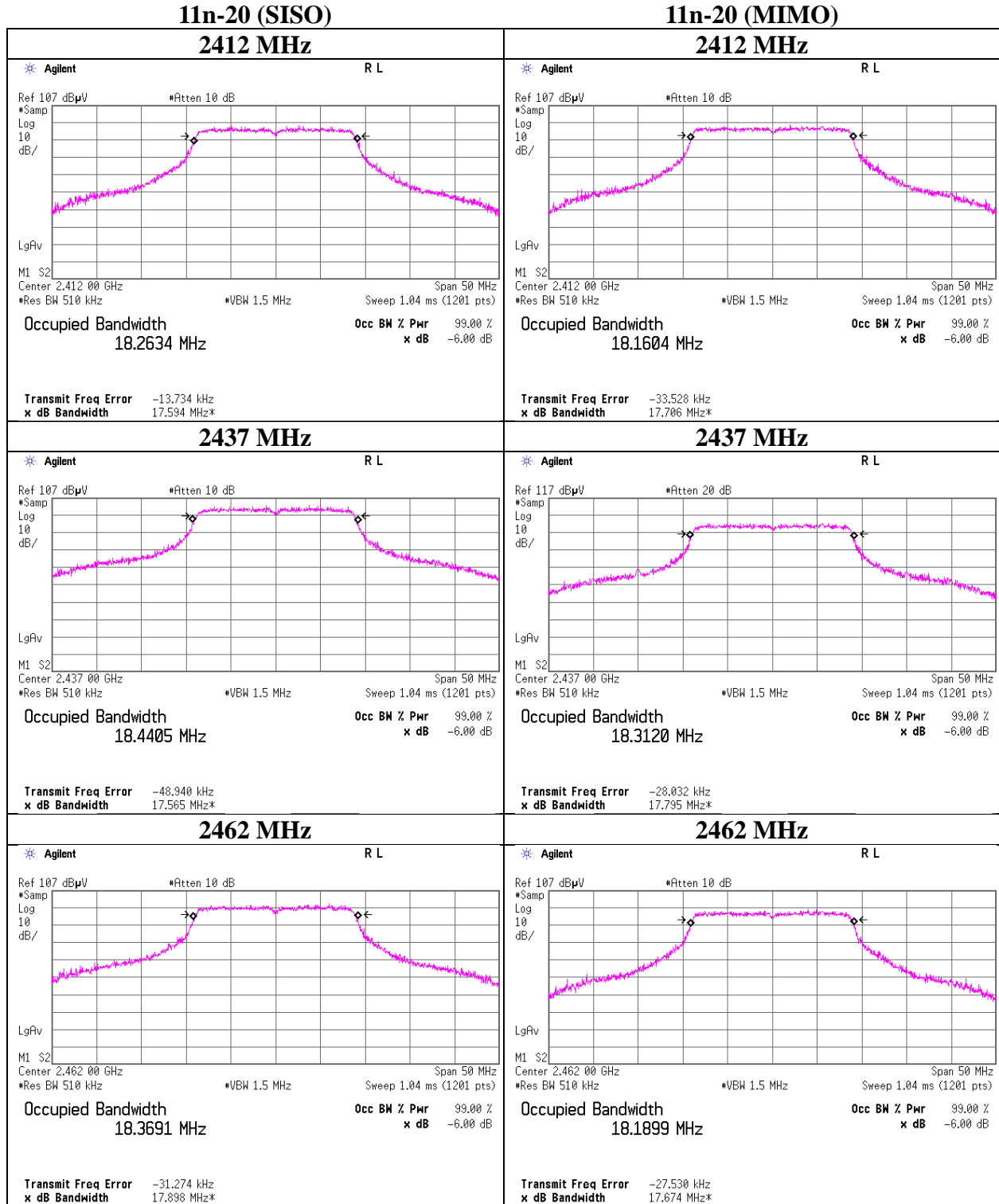
99%Occupied Bandwidth

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11253018S-A-R1
Date : July 8, 2016
Temperature / Humidity : 25 deg. C / 56 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx



99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11253018S-A-R1
Date	July 8, 2016
Temperature / Humidity	25 deg. C / 56 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx



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	MY4825010 6	AT,RE	2016/03/23 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2016/04/04 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2016/03/23 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2016/04/18 * 12
STM-G4	Terminator	Weinschel	M1459A	U6592	AT	2015/07/14 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2016/03/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16 -091	RE	2016/06/14 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2016/05/11 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2015/08/10 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2015/10/22 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2015/11/06 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVS WR)	1	RE	2015/07/08 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE ,CE,RFI,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2015/11/18 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2015/11/04 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2016/04/18 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY4618052 5	AT	2016/03/28 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-0100 0KMSKMS	-	RE	2016/04/18 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
SAEC-03(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVS WR)	3	RE	2015/08/28 * 12
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2015/11/18 * 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

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