



RADIO TEST REPORT

Test Report No. : 11552695S-A-R1

Applicant : Canon Inc.
Type of Equipment : WIRELESS LAN MODULE
Model No. : WM320
FCC ID : AZD320
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 11552695S-A. 11552695S-A is replaced with this report.

Date of test: December 20, 2016 to January 11, 2017

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

REVISION HISTORY

Original Test Report No.: 11552695S-A

[illegible]

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: Conducted Emission.....	10
SECTION 6: Radiated Spurious Emission	11
SECTION 7: Antenna Terminal Conducted Tests.....	13
APPENDIX 1: Test data	14
Conducted Emission	14
6dB Bandwidth	15
Maximum Peak Output Power	17
Average Output Power	19
Burst rate confirmation	20
Radiated Spurious Emission	21
Conducted Spurious Emission	32
Power Density	33
99%Occupied Bandwidth	35
APPENDIX 2: Test instruments	36
APPENDIX 3: Photographs of test setup	38
Conducted Emission	38
Radiated Spurious Emission	39
Pre-check of Worst Case Position.....	40

SECTION 1: Customer information

Company Name	:	Canon Inc.
Address	:	30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo 146-8501, Japan
Telephone Number	:	+81-3-3757-6798
Facsimile Number	:	+81-3-3757-8431
Contact Person	:	Hironobu Saida

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

2.1 Identification of E.U.T.

Type of Equipment	:	WIRELESS LAN MODULE
Model No.	:	WM320
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 24 V from AC adapter, DC 22.2 V from External Battery, (RF Block: DC 3.3 V)
Receipt Date of Sample	:	December 6, 2016
Country of Mass-production	:	China
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: WM320 (referred to as the EUT in this report) is a WIRELESS LAN MODULE.

General Specification

Clock frequency(ies) in the system	:	24 MHz (Other mode) / 40 MHz (Wi-Fi LAN)
------------------------------------	---	--

Radio Specification

WLAN

WLAN Module	:	WM320
Equipment type	:	Transceiver
Frequency of operation	:	2412 MHz - 2462 MHz
Type of modulation	:	DSSS : CCK,QPSK,BPSK / OFDM : 64QAM,16QAM,QPSK,BPSK
Antenna type	:	Pattern antenna (meander)
Antenna connector type	:	None
Antenna gain	:	-2.1 dBi
Operation temperature range	:	0 deg. C to +55 deg.C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 15.3 dB, 0.42782 MHz, N AV 5.4 dB, 0.42782 MHz, N	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(4)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.6 dB 2483.500 MHz, AV, Vert. Tx 11g 2462 MHz	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

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

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3 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	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 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	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.91 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Conducted Emission test

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

Radiated emission test

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

3.5 Test Location

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)

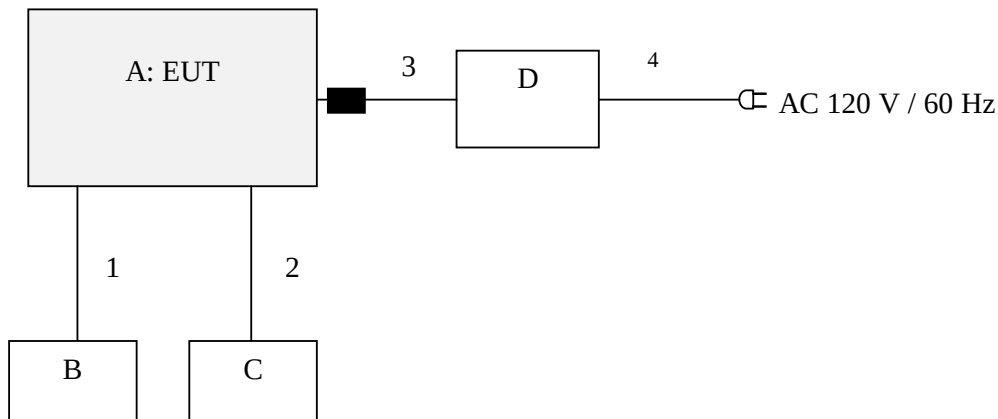
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	2 Mbps, PN9
IEEE 802.11g (11g)	6 Mbps, PN9
*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; Power settings: 10 dBm Software: RF TEST V7612 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	Tx (Transmitting),11g	2462 MHz
Spurious Emission	Tx (Transmitting),11b Tx (Transmitting),11g	2412 MHz 2437 MHz 2462 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	Tx (Transmitting),11b Tx (Transmitting),11g	2412 MHz 2437 MHz 2462 MHz

4.2 Configuration and peripherals



■: Ferrite Core *3)

* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Module	WM320	220 *1) 131 *2)	Canon	EUT
B	LCD Screen	-	-	Canon	-
C	Operation Panel	-	-	Canon	-
D	AC Adapter	CA-CP200 B	2012.04 I0	Canon	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Flat	0.08	Unshielded	Unshielded	-
2	Flat	0.06	Unshielded	Unshielded	-
3	DC	1.5	Unshielded	Unshielded	-
4	AC	1.9	Unshielded	Unshielded	-

*3) The core is a standard ferrite core attached to DC cable and not used to reduce the noise from the EUT. The core is equivalent to the one which is attached to the DC cable of host device the EUT is installed.

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 5: Conducted Emission

Test Procedure and conditions

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

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

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source.

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

SECTION 6: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 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 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

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

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

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

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

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98 %, a duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3 m *2) (1 GHz – 13 GHz), 1 m *3) (13 GHz – 26.5 GHz)		3 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 v03r05".

*2) Distance Factor: $20 \times \log(3.95 \text{ m} / 3.0 \text{ m}) = 2.38 \text{ dB}$

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

Test Antenna	Frequency Carrier	Spurious			
		30 MHz-1 GHz	1 GHz -13 GHz	13 GHz -18 GHz	18 GHz -26.5 GHz
Horizontal	Y	X	Y	Y	Y
Vertical	Y	X	Y	Y	Y

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

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

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	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)
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 v03r05". *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was 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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

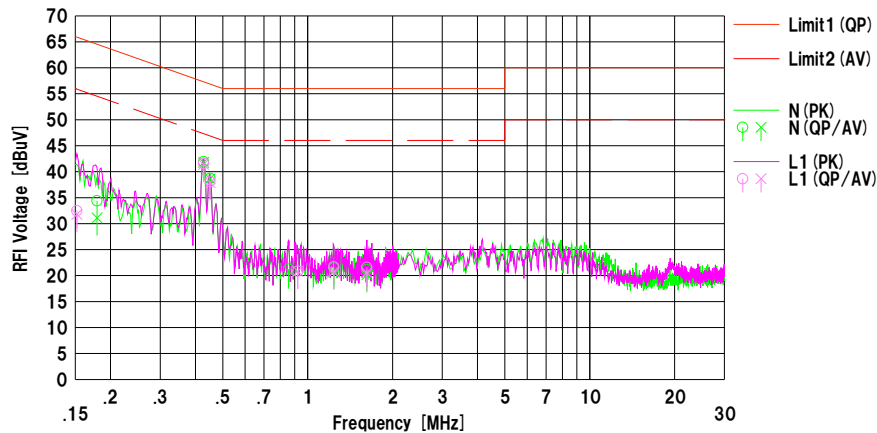
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2017/01/09

Mode : 11g Tx 2462 MHz
Power : AC 120 V / 60 Hz
Temp./Humi. : 22 deg.C / 30 %RH

Remarks :

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Hiroyuki Morikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.17919	22.00	18.70	12.39	34.39	31.09	64.52	54.52	30.1	23.4	N	
2	0.42782	29.50	29.40	12.40	41.90	41.80	57.29	47.29	15.3	5.4	N	
3	0.45057	26.30	26.20	12.40	38.70	38.60	56.86	46.86	18.1	8.2	N	
4	0.85523	8.80	8.40	12.44	21.24	20.84	56.00	46.00	34.7	25.1	N	
5	1.23822	9.00	8.20	12.47	21.47	20.67	56.00	46.00	34.5	25.3	N	
6	1.62149	8.70	7.70	12.47	21.17	20.17	56.00	46.00	34.8	25.8	N	
7	0.15195	20.10	19.40	12.38	32.48	31.78	65.89	55.89	33.4	24.1	L1	
8	0.42763	29.20	29.00	12.40	41.60	41.40	57.30	47.30	15.7	5.9	L1	
9	0.45102	25.70	25.50	12.40	38.10	37.90	56.86	46.86	18.7	8.9	L1	
10	0.92267	8.40	8.40	12.45	20.85	20.85	56.00	46.00	35.1	25.1	L1	
11	1.23811	9.20	8.30	12.47	21.67	20.77	56.00	46.00	34.3	25.2	L1	
12	1.62094	9.10	8.10	12.47	21.57	20.57	56.00	46.00	34.4	25.4	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
LISN: SLS-05

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

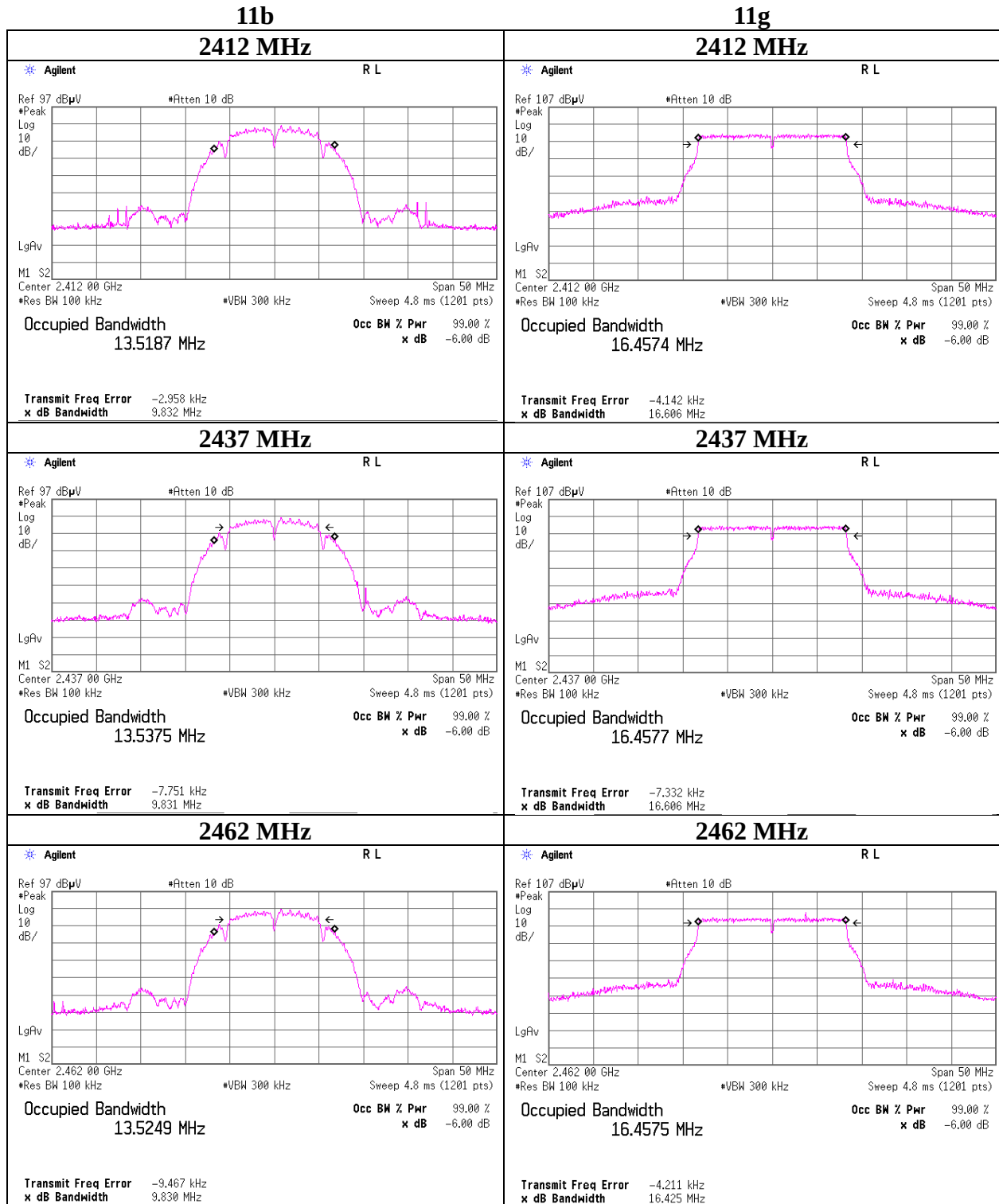
Facsimile : +81 463 50 6401

6dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room		
Report No.	11552695S-A-R1		
Date	December 21, 2016	January 11, 2017	
Temperature / Humidity	25 deg. C / 57 % RH	23 deg. C / 38 % RH	
Engineer	Hikaru Shirasawa	Hiroyuki Morikawa	
Mode	Tx		

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	9.832	> 500
	2437	9.831	> 500
	2462	9.830	> 500
11g	2412	16.606	> 500
	2437	16.606	> 500
	2462	16.425	> 500

6dB Bandwidth



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.2 Shielded Room
Report No. : 11552695S-A-R1
Date : December 20, 2016
Temperature / Humidity : 24 deg. C / 36 % RH
Engineer : Kenichi Adachi
Mode : Tx 11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-8.31	1.48	20.23	13.40	21.88	30.00	1000	16.60
2437	-7.86	1.49	20.23	13.86	24.32	30.00	1000	16.14
2462	-7.56	1.49	20.24	14.17	26.12	30.00	1000	15.83

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	-7.93	
2	-7.86	*
5.5	-8.03	
11	-7.93	

*: 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. : 11552695S-A-R1
Date : December 20, 2016
Temperature / Humidity : 24 deg. C / 36 % RH
Engineer : Kenichi Adachi
Mode : Tx 11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-0.97	1.48	20.23	20.74	118.58	30.00	1000	9.26
2437	-0.68	1.49	20.23	21.04	127.06	30.00	1000	8.96
2462	-0.57	1.49	20.24	21.16	130.62	30.00	1000	8.84

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 [Mbps]	Reading [dBm]	Remark
6	-0.68	*
9	-1.28	
12	-1.64	
18	-1.96	
24	-1.41	
36	-1.63	
48	-1.27	
54	-1.47	

*: Worst Rate

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

Average Output Power
(Reference data for RF Exposure / SAR testing)

Test place : Shonan EMC Lab. No.2 Shielded Room
Report No. : 11552695S-A-R1
Date : December 20, 2016
Temperature / Humidity : 24 deg. C / 36 % RH
Engineer : Kenichi Adachi
Mode : Tx

11b 2 Mbps (worst rate mode)

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	-10.83	1.48	20.23	10.88	12.25	0.00	10.88	12.25
2437	-10.38	1.49	20.23	11.34	13.61	0.00	11.34	13.61
2462	-10.11	1.49	20.24	11.62	14.52	0.00	11.62	14.52

11g 6 Mbps (worst rate mode)

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	-11.62	1.48	20.23	10.09	10.21	0.00	10.09	10.21
2437	-11.13	1.49	20.23	10.59	11.46	0.00	10.59	11.46
2462	-11.04	1.49	20.24	10.69	11.72	0.00	10.69	11.72

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.

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	-10.47	0.00	-10.47	
	2	-10.38	0.00	-10.38	*
	5.5	-10.47	0.00	-10.47	
	11	-10.43	0.00	-10.43	
11g	6	-11.13	0.00	-11.13	*
	9	-11.28	0.00	-11.28	
	12	-11.35	0.00	-11.35	
	18	-11.33	0.00	-11.33	
	24	-11.32	0.00	-11.32	
	36	-11.38	0.00	-11.38	
	48	-11.14	0.00	-11.14	
	54	-11.17	0.00	-11.17	

* Worst rate

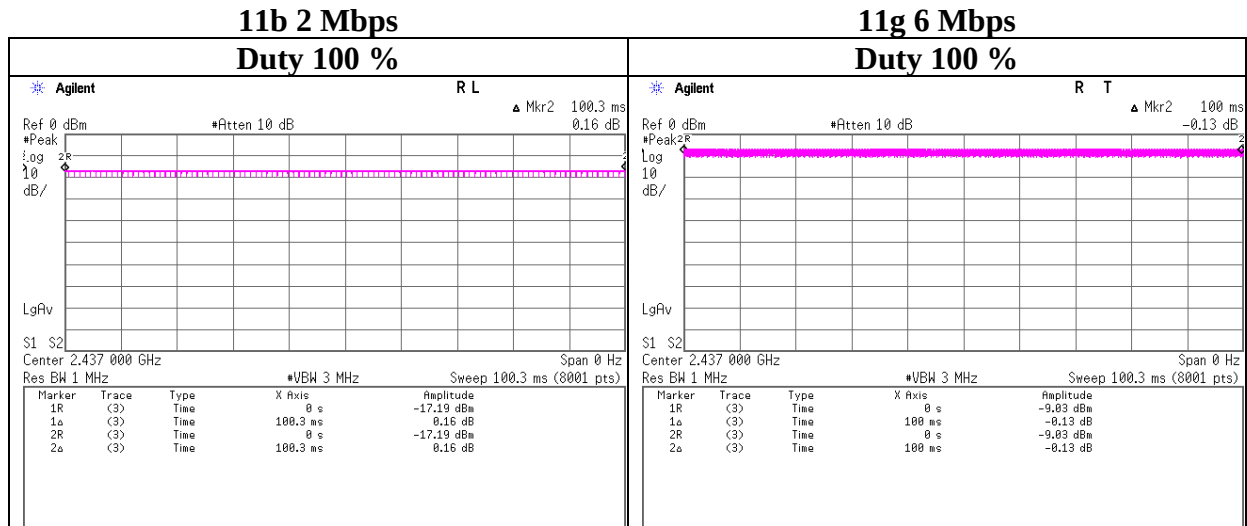
Sample Calculation:

Burst power = Reading (timed average) + Duty factor

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

Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room		
Report No.	11552695S-A-R1		
Date	December 21, 2016	January 11, 2017	
Temperature / Humidity	25 deg. C / 57 % RH	23 deg. C / 38 % RH	
Engineer	Hikaru Shirasawa	Hiroyuki Morikawa	
Mode	Tx		



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.2 and 3 Semi Anechoic Chamber
Report No. : 11552695S-A-R1
Date : December 23, 2016 December 24, 2016
Temperature / Humidity : 23 deg.C, 54 %RH 22 deg.C, 39 %RH
Engineer : Hiroyuki Morikawa Hikaru Shirasawa
(1 GHz -18 GHz) (18 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	47.22	27.41	13.81	40.70	2.38	50.12	73.90	23.7	375	310	
Hori.	4824.000	PK	47.00	31.17	5.96	41.50	2.38	45.01	73.90	28.8	100	79	
Hori.	7236.000	PK	46.11	36.52	7.50	41.16	2.38	51.35	73.90	22.5	150	0	
Hori.	9648.000	PK	45.54	38.66	8.42	40.47	2.38	54.53	73.90	19.3	150	0	
Hori.	2390.000	AV	37.93	27.41	13.81	40.70	2.38	40.83	53.90	13.0	375	310	
Hori.	4824.000	AV	38.38	31.17	5.96	41.50	2.38	36.39	53.90	17.5	100	79	
Hori.	7236.000	AV	37.69	36.52	7.50	41.16	2.38	42.93	53.90	10.9	150	0	
Hori.	9648.000	AV	36.37	38.66	8.42	40.47	2.38	45.36	53.90	8.5	150	0	
Vert.	2390.000	PK	48.73	27.41	13.81	40.70	2.38	51.63	73.90	22.2	150	218	
Vert.	4824.000	PK	47.82	31.17	5.96	41.50	2.38	45.83	73.90	28.0	100	31	
Vert.	7236.000	PK	45.95	36.52	7.50	41.16	2.38	51.19	73.90	22.7	150	0	
Vert.	9648.000	PK	45.55	38.66	8.42	40.47	2.38	54.54	73.90	19.3	150	0	
Vert.	2390.000	AV	38.89	27.41	13.81	40.70	2.38	41.79	53.90	12.1	150	218	
Vert.	4824.000	AV	39.04	31.17	5.96	41.50	2.38	37.05	53.90	16.8	100	31	
Vert.	7236.000	AV	37.22	36.52	7.50	41.16	2.38	42.46	53.90	11.4	150	0	
Vert.	9648.000	AV	36.43	38.66	8.42	40.47	2.38	45.42	53.90	8.4	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.38\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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	89.78	27.50	13.83	40.70	2.38	92.79	-	-	Carrier
Hori.	2397.758	PK	40.93	27.44	13.82	40.70	2.38	43.87	72.79	28.9	-
Hori.	2400.000	PK	39.68	27.45	13.82	40.70	2.38	42.63	72.79	30.2	-
Vert.	2412.000	PK	93.86	27.50	13.83	40.70	2.38	96.87	-	-	Carrier
Vert.	2396.810	PK	45.61	27.44	13.82	40.70	2.38	48.55	76.87	28.3	-
Vert.	2400.000	PK	41.40	27.45	13.82	40.70	2.38	44.35	76.87	32.5	-

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.38\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

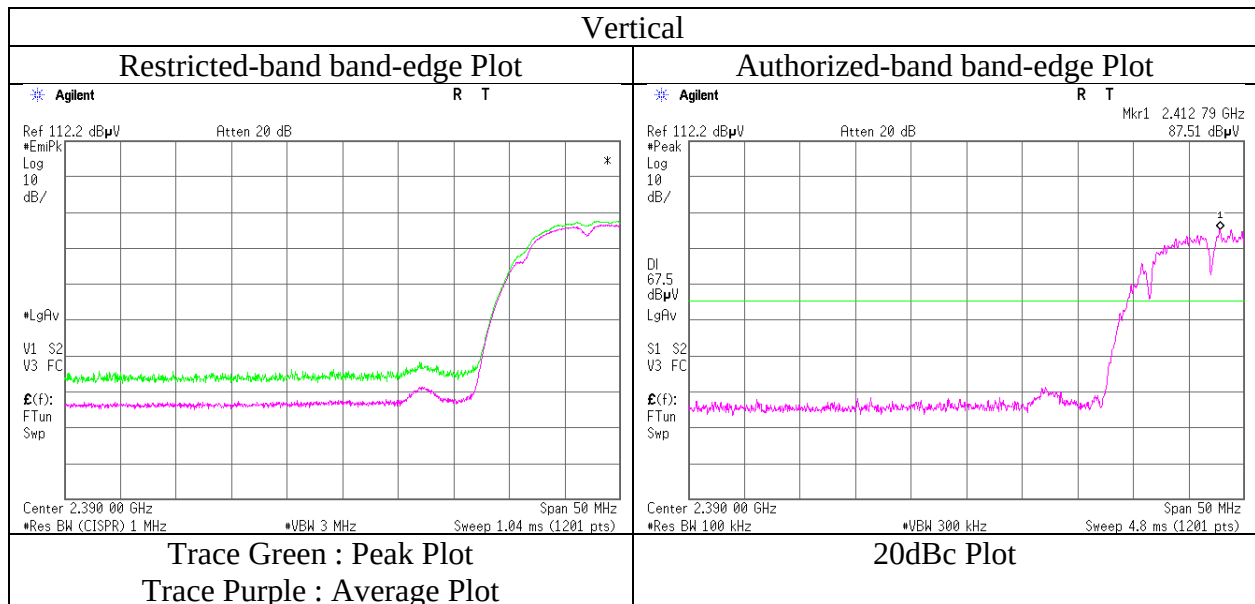
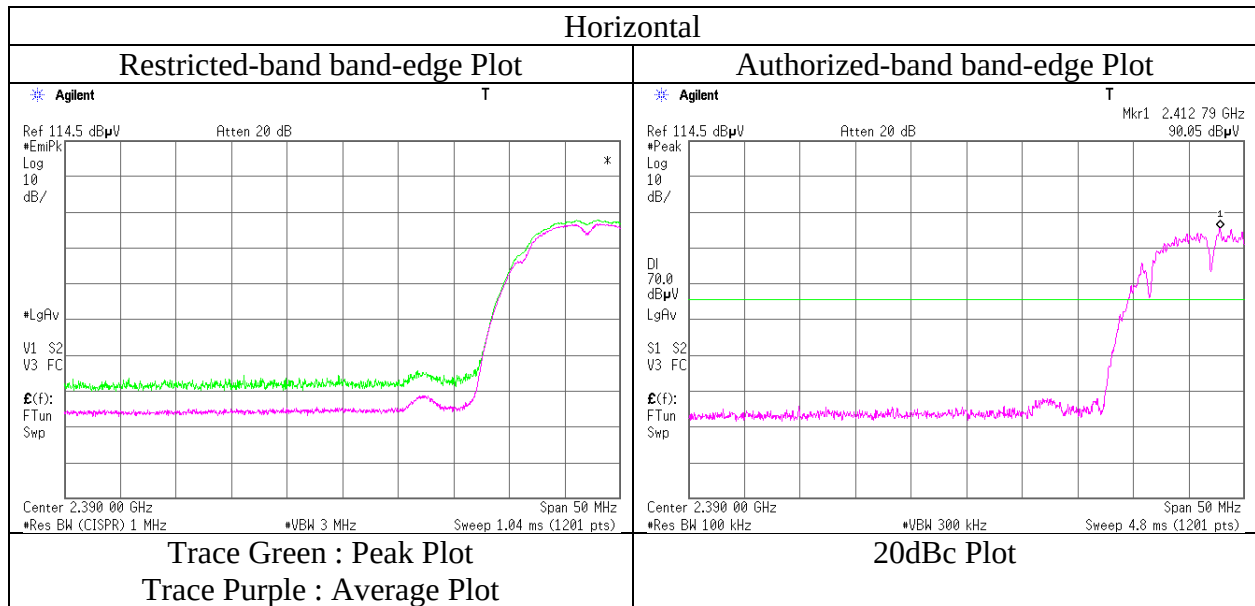
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11552695S-A-R1
Date	December 23, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Hiroyuki Morikawa
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.2 and 3 Semi Anechoic Chamber	
Report No.	11552695S-A-R1	
Date	December 23, 2016	December 24, 2016
Temperature / Humidity	23 deg.C, 54 %RH	22 deg.C, 39 %RH
Engineer	Hiroiyuki Morikawa	Hikaru Shirasawa
	(1 GHz -18 GHz)	(18 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	46.14	31.28	5.97	41.40	2.38	44.37	73.90	29.5	151	99	
Hori.	7311.000	PK	46.26	36.74	7.54	41.23	2.38	51.69	73.90	22.2	150	0	
Hori.	9748.000	PK	43.45	38.74	8.47	40.42	2.38	52.62	73.90	21.2	150	0	
Hori.	4874.000	AV	37.80	31.28	5.97	41.40	2.38	36.03	53.90	17.8	151	99	
Hori.	7311.000	AV	37.82	36.74	7.54	41.23	2.38	43.25	53.90	10.6	150	0	
Hori.	9748.000	AV	35.41	38.74	8.47	40.42	2.38	44.58	53.90	9.3	150	0	
Vert.	4874.000	PK	46.61	31.28	5.97	41.40	2.38	44.84	73.90	29.0	100	359	
Vert.	7311.000	PK	45.81	36.74	7.54	41.23	2.38	51.24	73.90	22.6	150	0	
Vert.	9748.000	PK	43.84	38.74	8.47	40.42	2.38	53.01	73.90	20.8	150	0	
Vert.	4874.000	AV	37.55	31.28	5.97	41.40	2.38	35.78	53.90	18.1	100	359	
Vert.	7311.000	AV	36.98	36.74	7.54	41.23	2.38	42.41	53.90	11.4	150	0	
Vert.	9748.000	AV	35.50	38.74	8.47	40.42	2.38	44.67	53.90	9.2	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.38 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.2 and 3 Semi Anechoic Chamber
Report No. : 11552695S-A-R1
Date : December 23, 2016 December 24, 2016
Temperature / Humidity : 23 deg.C, 54 %RH 22 deg.C, 39 %RH
Engineer : Hiroyuki Morikawa Hikaru Shirasawa
(1 GHz -18 GHz) (18 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	46.65	27.79	13.91	40.69	2.38	50.04	73.90	23.8	112	225	
Hori.	4924.000	PK	47.00	31.38	5.99	41.30	2.38	45.45	73.90	28.4	286	314	
Hori.	7386.000	PK	47.51	36.95	7.57	41.31	2.38	53.10	73.90	20.8	150	0	
Hori.	9848.000	PK	44.09	38.81	8.54	40.36	2.38	53.46	73.90	20.4	150	0	
Hori.	2483.500	AV	37.53	27.79	13.91	40.69	2.38	40.92	53.90	12.9	112	225	
Hori.	4924.000	AV	38.84	31.38	5.99	41.30	2.38	37.29	53.90	16.6	286	314	
Hori.	7386.000	AV	38.71	36.95	7.57	41.31	2.38	44.30	53.90	9.6	150	0	
Hori.	9848.000	AV	35.51	38.81	8.54	40.36	2.38	44.88	53.90	9.0	150	0	
Vert.	2483.500	PK	47.68	27.79	13.91	40.69	2.38	51.07	73.90	22.8	156	298	
Vert.	4924.000	PK	46.14	31.38	5.99	41.30	2.38	44.59	73.90	29.3	141	359	
Vert.	7386.000	PK	47.10	36.95	7.57	41.31	2.38	52.69	73.90	21.2	150	0	
Vert.	9848.000	PK	44.82	38.81	8.54	40.36	2.38	54.19	73.90	19.7	150	0	
Vert.	2483.500	AV	38.16	27.79	13.91	40.69	2.38	41.55	53.90	12.3	156	298	
Vert.	4924.000	AV	37.99	31.38	5.99	41.30	2.38	36.44	53.90	17.4	141	359	
Vert.	7386.000	AV	36.99	36.95	7.57	41.31	2.38	42.58	53.90	11.3	150	0	
Vert.	9848.000	AV	36.24	38.81	8.54	40.36	2.38	45.61	53.90	8.2	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.38\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

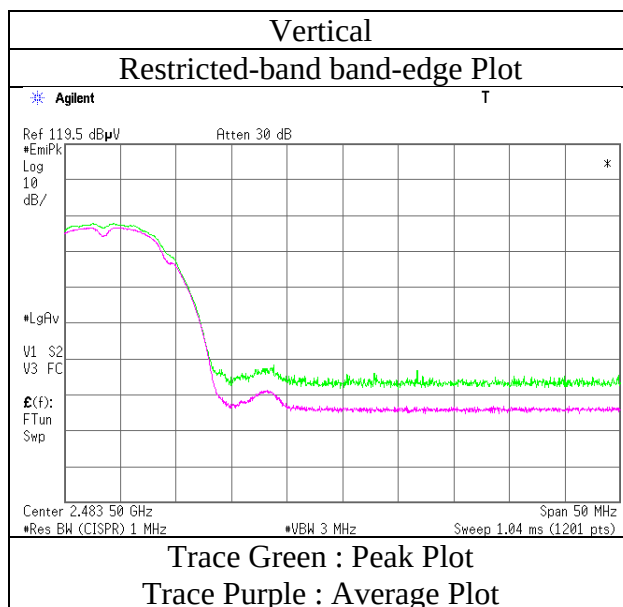
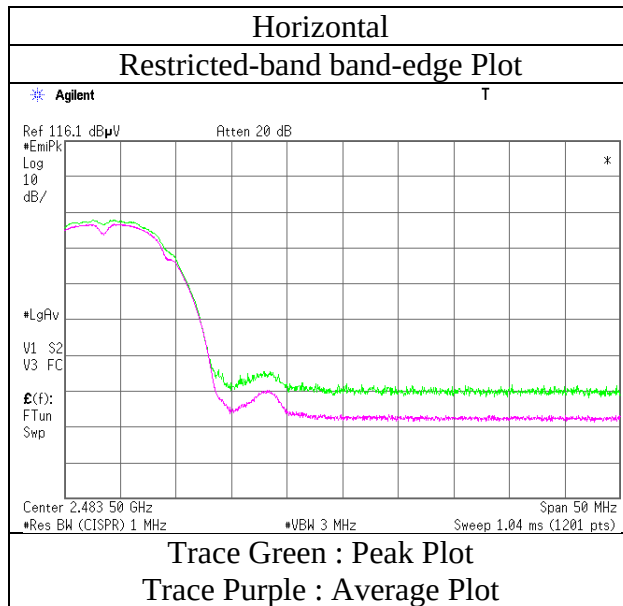
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11552695S-A-R1
Date	December 23, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Hiroyuki Morikawa
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.3 Semi Anechoic Chamber
Report No. : 11552695S-A-R1
Date : January 5, 2017 January 6, 2017
Temperature / Humidity : 23 deg.C, 54 %RH 22 deg.C, 30 %RH
Engineer : Hiroyuki Morikawa Hiroyuki Morikawa
(1 GHz -18 GHz) (18 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	49.58	27.41	13.81	36.87	2.38	56.31	73.90	17.5	149	229	
Hori.	4824.000	PK	43.68	31.17	5.96	36.53	2.38	46.66	73.90	27.2	150	0	
Hori.	7236.000	PK	44.97	36.52	7.50	36.59	2.38	54.78	73.90	19.1	150	0	
Hori.	9648.000	PK	44.85	38.66	8.42	36.52	2.38	57.79	73.90	16.1	150	0	
Hori.	2390.000	AV	40.66	27.41	13.81	36.87	2.38	47.39	53.90	6.5	149	229	
Hori.	4824.000	AV	35.10	31.17	5.96	36.53	2.38	38.08	53.90	15.8	150	0	
Hori.	7236.000	AV	36.42	36.52	7.50	36.59	2.38	46.23	53.90	7.6	150	0	
Hori.	9648.000	AV	36.47	38.66	8.42	36.52	2.38	49.41	53.90	4.4	150	0	
Vert.	2390.000	PK	51.82	27.41	13.81	36.87	2.38	58.55	73.90	15.3	142	290	
Vert.	4824.000	PK	43.26	31.17	5.96	36.53	2.38	46.24	73.90	27.6	150	0	
Vert.	7236.000	PK	44.33	36.52	7.50	36.59	2.38	54.14	73.90	19.7	150	0	
Vert.	9648.000	PK	45.05	38.66	8.42	36.52	2.38	57.99	73.90	15.9	150	0	
Vert.	2390.000	AV	42.19	27.41	13.81	36.87	2.38	48.92	53.90	4.9	142	290	
Vert.	4824.000	AV	35.26	31.17	5.96	36.53	2.38	38.24	53.90	15.6	150	0	
Vert.	7236.000	AV	36.21	36.52	7.50	36.59	2.38	46.02	53.90	7.8	150	0	
Vert.	9648.000	AV	36.63	38.66	8.42	36.52	2.38	49.57	53.90	4.3	150	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.38\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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	84.58	27.50	13.83	36.87	2.38	91.42	-	-	Carrier
Hori.	2400.000	PK	44.59	27.45	13.82	36.87	2.38	51.37	71.42	20.1	
Vert.	2412.000	PK	86.12	27.50	13.83	36.87	2.38	92.96	-	-	Carrier
Vert.	2400.000	PK	45.54	27.45	13.82	36.87	2.38	52.32	72.96	20.6	

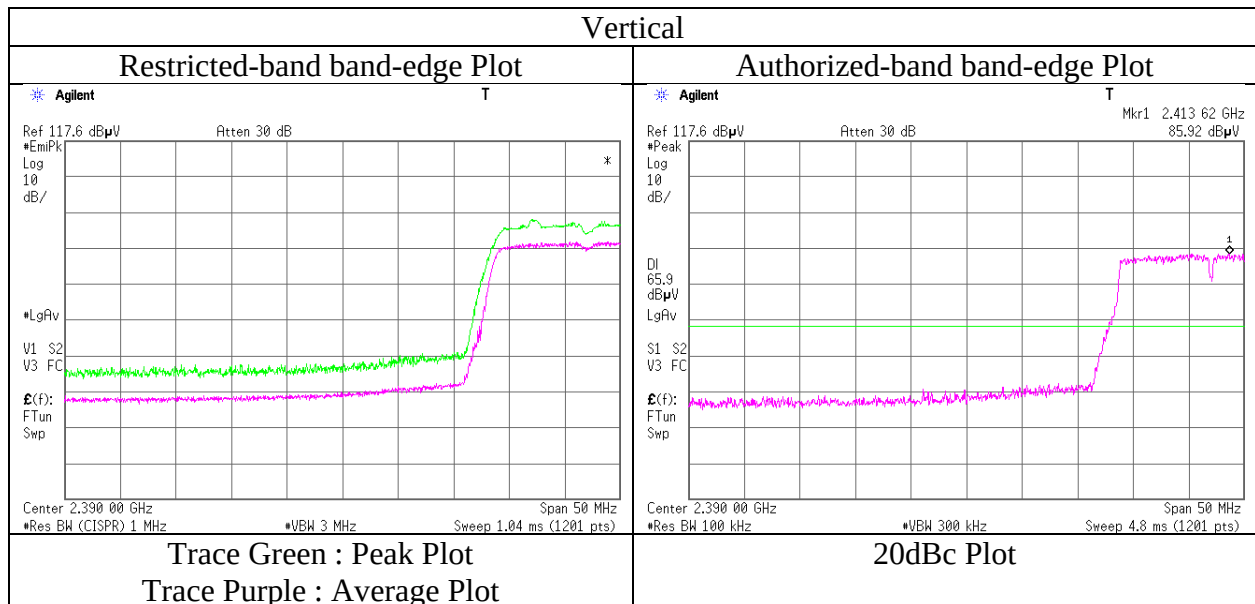
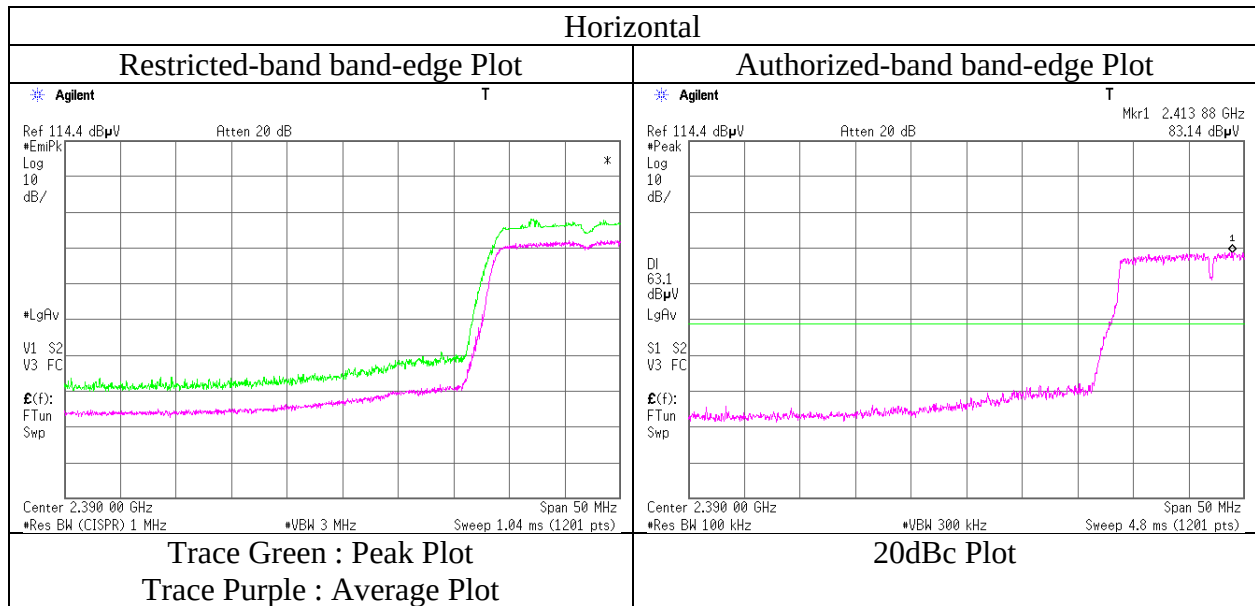
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.95\text{ m} / 3.0\text{ m}) = 2.38\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11552695S-A-R1
Date	January 5, 2017
Temperature / Humidity	23 deg.C, 54 %RH
Engineer	Hiroyuki Morikawa
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.3 Semi Anechoic Chamber
Report No. : 11552695S-A-R1
Date : January 5, 2017 January 6, 2017
Temperature / Humidity : 23 deg.C, 54 %RH 22 deg.C, 30 %RH
Engineer : Hiroyuki Morikawa Hiroyuki Morikawa
(1 GHz -18 GHz) (18 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.	4874.000	PK	44.19	31.28	5.97	36.53	2.38	47.29	73.90	26.6	150	0	
Hori.	7311.000	PK	44.46	36.74	7.54	36.64	2.38	54.48	73.90	19.4	150	0	
Hori.	9748.000	PK	45.14	38.74	8.47	36.49	2.38	58.24	73.90	15.6	150	0	
Hori.	4874.000	AV	34.88	31.28	5.97	36.53	2.38	37.98	53.90	15.9	150	0	
Hori.	7311.000	AV	36.20	36.74	7.54	36.64	2.38	46.22	53.90	7.6	150	0	
Hori.	9748.000	AV	36.20	38.74	8.47	36.49	2.38	49.30	53.90	4.6	150	0	
Vert.	4874.000	PK	42.97	31.28	5.97	36.53	2.38	46.07	73.90	27.8	150	0	
Vert.	7311.000	PK	44.05	36.74	7.54	36.64	2.38	54.07	73.90	19.8	150	0	
Vert.	9748.000	PK	45.65	38.74	8.47	36.49	2.38	58.75	73.90	15.1	150	0	
Vert.	4874.000	AV	34.79	31.28	5.97	36.53	2.38	37.89	53.90	16.0	150	0	
Vert.	7311.000	AV	35.47	36.74	7.54	36.64	2.38	45.49	53.90	8.4	150	0	
Vert.	9748.000	AV	36.26	38.74	8.47	36.49	2.38	49.36	53.90	4.5	150	0	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.38 dB

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

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11552695S-A-R1		
Date	January 6, 2017	January 5, 2017	January 6, 2017
Temperature / Humidity	22 deg.C, 30 %RH	23 deg.C, 54 %RH	22 deg.C, 30 %RH
Engineer	Hiroyuki Morikawa (30 MHz -1 GHz)	Hiroyuki Morikawa (1 GHz -18 GHz)	Hiroyuki Morikawa (18 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.	150.421	QP	28.00	14.87	7.81	32.09	0.00	18.59	43.50	24.9	106	318	
Hori.	182.831	QP	41.50	16.27	8.02	32.06	0.00	33.73	43.50	9.7	100	298	
Hori.	235.024	QP	43.30	11.65	8.33	32.01	0.00	31.27	46.00	14.7	100	1	
Hori.	2483.500	PK	49.80	27.79	13.91	36.85	2.38	57.03	73.90	16.8	131	229	
Hori.	4924.000	PK	43.68	31.38	5.99	36.52	2.38	46.91	73.90	26.9	150	0	
Hori.	7386.000	PK	45.87	36.95	7.57	36.69	2.38	56.08	73.90	17.8	150	0	
Hori.	9848.000	PK	44.05	38.81	8.54	36.45	2.38	57.33	73.90	16.5	150	0	
Hori.	2483.500	AV	40.33	27.79	13.91	36.85	2.38	47.56	53.90	6.3	131	229	
Hori.	4924.000	AV	34.69	31.38	5.99	36.52	2.38	37.92	53.90	15.9	150	0	
Hori.	7386.000	AV	36.78	36.95	7.57	36.69	2.38	46.99	53.90	6.9	150	0	
Hori.	9848.000	AV	36.04	38.81	8.54	36.45	2.38	49.32	53.90	4.5	150	0	
Vert.	49.069	QP	35.50	11.01	6.97	32.17	0.00	21.31	40.00	18.6	100	144	
Vert.	80.570	QP	46.30	6.31	7.27	32.15	0.00	27.73	40.00	12.2	100	182	
Vert.	148.008	QP	34.80	14.74	7.79	32.09	0.00	25.24	43.50	18.2	100	59	
Vert.	182.823	QP	38.30	16.27	8.02	32.06	0.00	30.53	43.50	12.9	100	77	
Vert.	2483.500	PK	52.66	27.79	13.91	36.85	2.38	59.89	73.90	14.0	159	215	
Vert.	4924.000	PK	43.12	31.38	5.99	36.52	2.38	46.35	73.90	27.5	150	0	
Vert.	7386.000	PK	43.42	36.95	7.57	36.69	2.38	53.63	73.90	20.2	150	0	
Vert.	9848.000	PK	43.94	38.81	8.54	36.45	2.38	57.22	73.90	16.6	150	0	
Vert.	2483.500	AV	43.03	27.79	13.91	36.85	2.38	50.26	53.90	3.6	159	215	
Vert.	4924.000	AV	34.87	31.38	5.99	36.52	2.38	38.10	53.90	15.8	150	0	
Vert.	7386.000	AV	35.68	36.95	7.57	36.69	2.38	45.89	53.90	8.0	150	0	
Vert.	9848.000	AV	35.95	38.81	8.54	36.45	2.38	49.23	53.90	4.6	150	0	

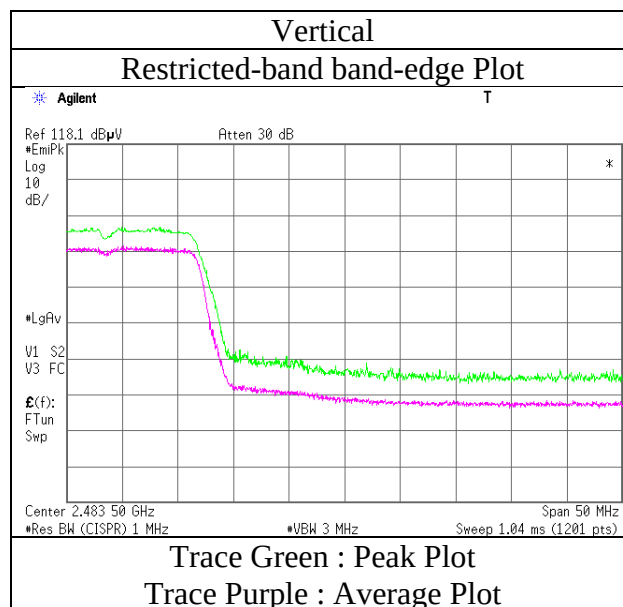
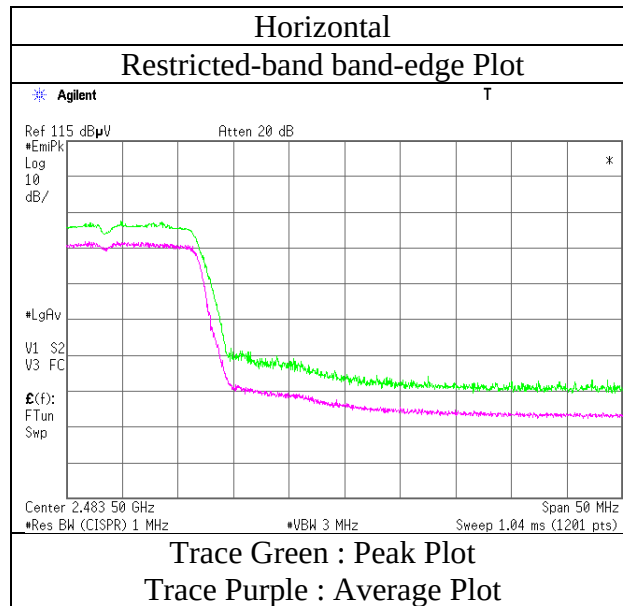
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.95 m / 3.0 m) = 2.38 dB

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

Radiated Spurious Emission (Reference Plot for band-edge)

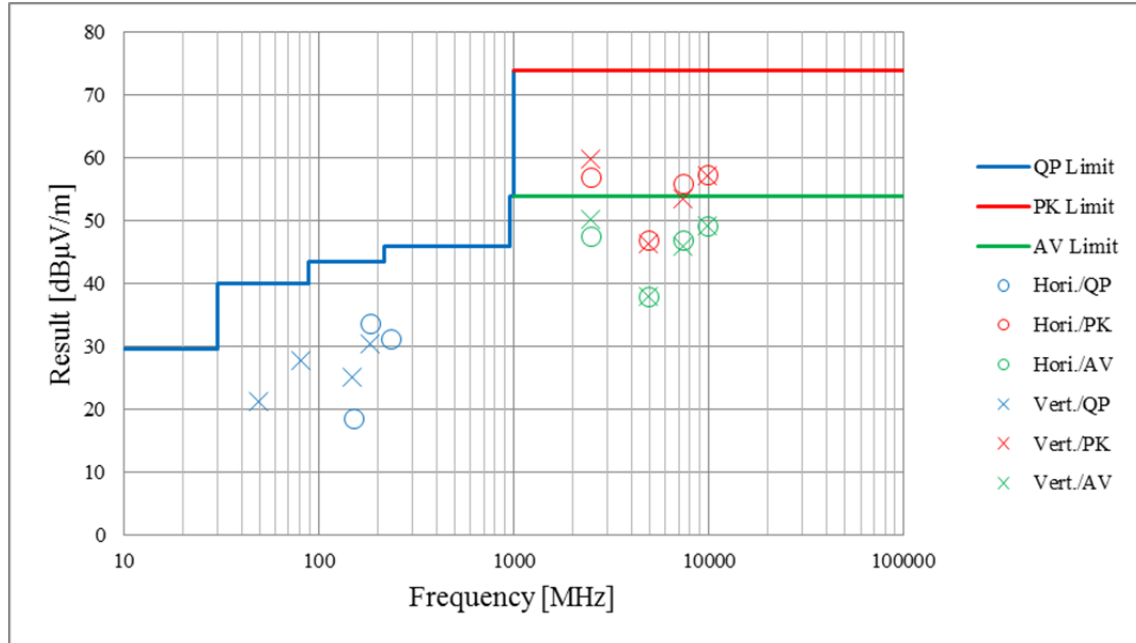
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11552695S-A-R1
Date	January 5, 2017
Temperature / Humidity	23 deg.C, 54 %RH
Engineer	Hiroyuki Morikawa
Mode	Tx 11g 2462 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

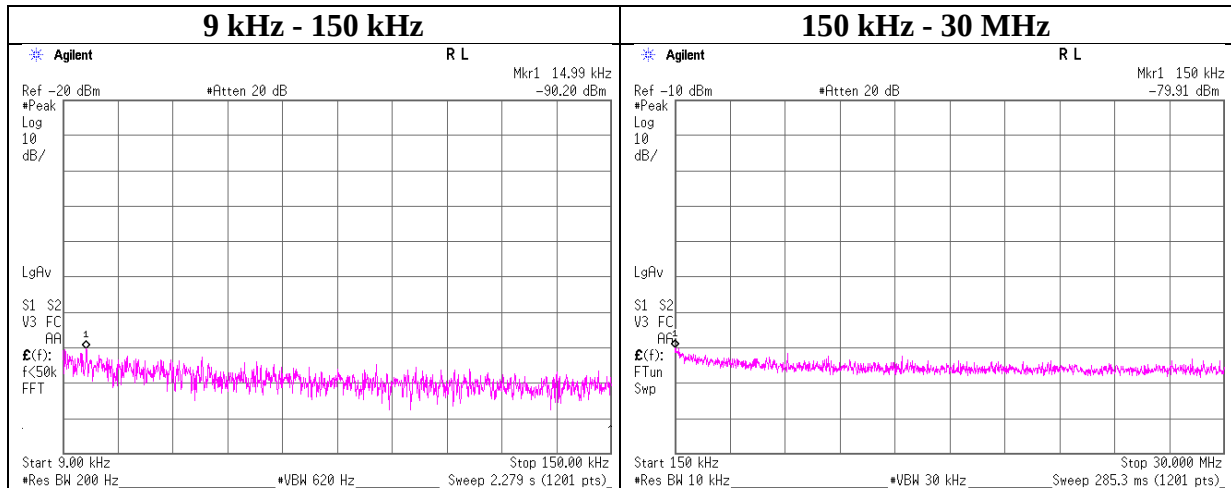
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11552695S-A-R1		
Date	January 6, 2017	January 5, 2017	January 6, 2017
Temperature / Humidity	22 deg.C, 30 %RH	23 deg.C, 54 %RH	22 deg.C, 30 %RH
Engineer	Hiroyuki Morikawa (30 MHz -1 GHz)	Hiroyuki Morikawa (1 GHz -18 GHz)	Hiroyuki Morikawa (18 GHz - 26.5 GHz)
Mode	Tx 11g 2462 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. : 11552695S-A-R1
Date : January 11, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11g 2462 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
14.99	-90.2	0.01	9.8	2.0	1	-78.3	300	6.0	-17.1	44.0	61.1	
150.00	-79.9	0.10	9.8	2.0	1	-68.0	300	6.0	-6.7	24.0	30.7	

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

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

N: Number of output

*If antenna gain is less than 2.0 dBi, 2.0 dBi is applied to the test result based on KDB 558074.

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Report No.	11552695S-A-R1	
Date	December 21, 2016	January 11, 2017
Temperature / Humidity	25 deg. C / 57 % RH	23 deg. C / 38 % RH
Engineer	Hikaru Shirasawa	Hiroyuki Morikawa
Mode	Tx	

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-33.27	1.48	20.23	-11.56	8.00	19.56
2437.00	-32.95	1.49	20.23	-11.23	8.00	19.23
2462.00	-32.69	1.49	20.24	-10.96	8.00	18.96

11g

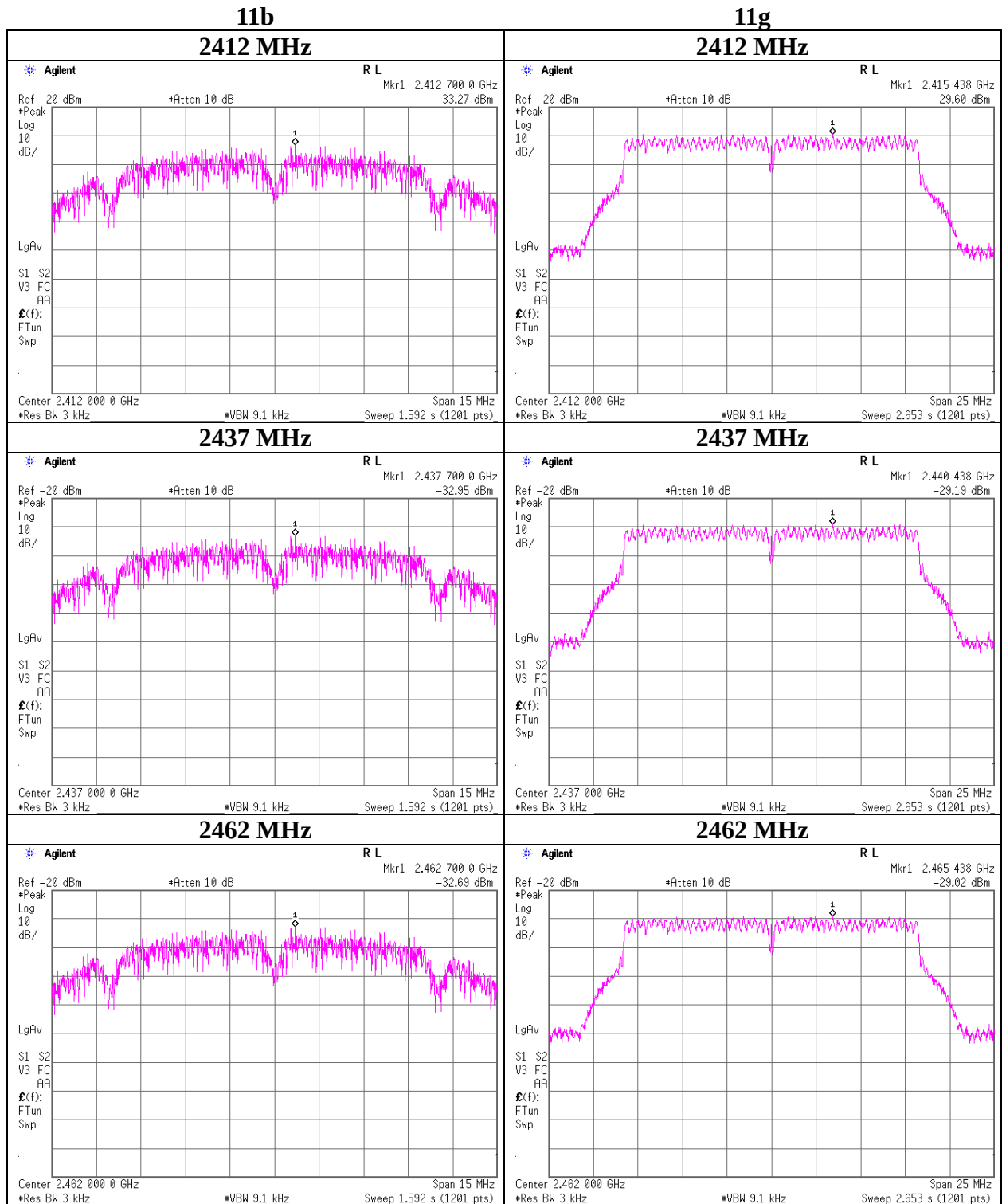
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-29.60	1.48	9.92	-18.20	8.00	26.20
2437.00	-29.19	1.49	9.92	-17.78	8.00	25.78
2462.00	-29.02	1.49	9.92	-17.61	8.00	25.61

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



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

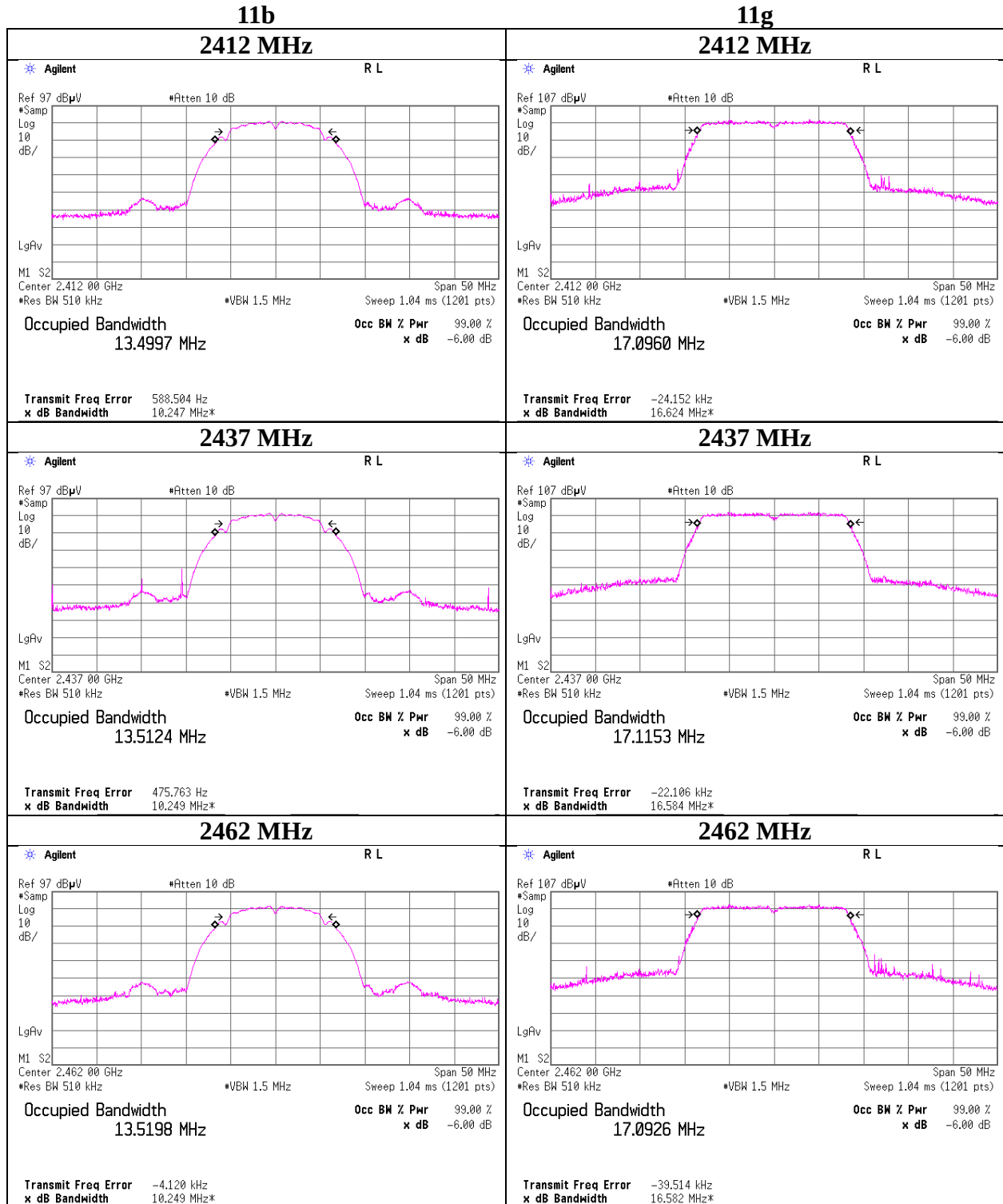
99%Occupied Bandwidth

Test place
Report No.

Date
Temperature / Humidity
Engineer
Mode

Shonan EMC Lab. No.5 Shielded Room
11552695S-A-R1
December 21, 2016
25 deg. C / 57 % RH
Hikaru Shirasawa
Tx

January 11, 2017
23 deg. C / 38 % RH
Hiroyuki Morikawa



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 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval (month)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	AT	2016/10/24 * 12
SAT20-05	Attenuator	Weinschel Corp.	54A-20	Y5649	AT	2016/11/07 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2016/03/23 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	AT	2016/12/13 * 12
STS-02	Digital Hitester	Hioki	3805-50	080997819	AT	2016/03/22 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2016/09/26 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2016/10/17 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2016/12/13 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2016/03/22 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2016/06/23 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2016/05/11 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2016/08/22 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2016/03/23 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2016/07/25 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE,CE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE	2016/10/17 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2016/11/07 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2016/11/29 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2016/07/15 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2016/10/18 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2016/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12
SCC-C1/C2/C3/C4/C5/C10/SRS E-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2016/04/22 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2016/02/25 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE, CE	2016/03/28 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE, CE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE, CE	2016/10/17 * 12
SCC-C9/C10/S RSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS 4906	-/0901-271(RF Selector)	CE	2016/04/22 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2016/02/09 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2016/09/23 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2016/12/13 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2016/04/18 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2016/10/12 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2016/03/22 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2016/10/11 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000K MSKMS	-	RE	2016/04/18 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2016/07/13 * 12

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 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