



RADIO TEST REPORT

Test Report No. : 10951582S-A-R2

Applicant : Canon Inc.
Type of Equipment : Wireless LAN Module
Model No. : FM1M948
FCC ID : AZDFM1M948
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10951582S-A-R1. 10951582S-A-R1 is replaced with this report.

Date of test: November 3 to December 19, 2015

Representative test engineer:

Yosuke Ishikawa
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".

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10951582S-A

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SECTION 1: Customer information

Company Name	:	Canon Inc.
Address	:	5-1, Hakusan 7-chome, Toride-shi, Ibaraki, 302-8501 Japan
Telephone Number	:	+81-297-74-2111
Facsimile Number	:	+81-297-73-5422
Contact Person	:	Hayato Taniguchi

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

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless LAN Module
Model No.	:	FM1M948
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 5 V
Receipt Date of Sample	:	October 1, 2015
Country of Mass-production	:	Japan, China
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: FM1M948 (referred to as the EUT in this report) is a Wireless LAN Module.

General Specification

Clock frequency(ies) in the system	:	38.4 MHz
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Radio Specification

WLAN (IEEE802.11b/g/n-20)

Radio Type	:	Transceiver
Frequency of Operation	:	2412 - 2462 MHz
Modulation	:	DSSS, OFDM
Antenna type	:	Pattern
Antenna Gain	:	+1.20 dBi
Operating Temperature	:	0 deg. C - +50 deg. C

Bluetooth Low Energy

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 - 2480MHz
Type of Modulation	:	GFSK
Antenna Type	:	Pattern
Antenna Gain	:	+1.20 dBi
Operating Temperature	:	0 deg. C - +50 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015
 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

* Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision 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	15.9 dB, 0.41900 MHz, L1 Tx 2402 MHz, BT LE	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r04 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 v03r04 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 v03r04 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 v03r04 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	6.0 dB 2400.000 MHz, PK, Horizontal Tx 2402 MHz, BT LE	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r04 12.2.7.

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred. (ANSI C63.10:2013 is Non-accreditation)

FCC Part 15.31 (e)

The RF transmitter is constantly provided with voltage (DC 3.3 V and DC 1.8 V). Therefore, the EUT complies with the requirement.

FCC Part 15.203

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

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.

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3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.6 dB	3.4 dB	3.4 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.7 dB	3.5 dB	3.5 dB
	30 MHz-300 MHz	4.9 dB	4.9 dB	4.7 dB
	300 MHz-1 GHz	5.0 dB	5.0 dB	4.8 dB
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	4.5 dB	4.3 dB	4.3 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 %

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

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 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)

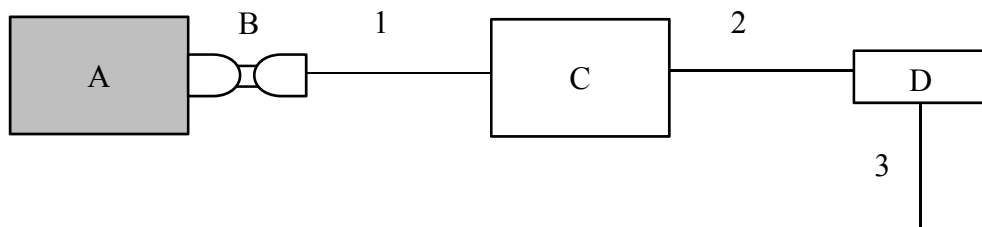
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	6 Mbps, PN9
IEEE 802.11n (11n-20)	MCS 0, PN9
Bluetooth Low Energy	PN9
* The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) - Power Setting: Fixed (IEEE 802.11b/g/n-20), 6 (Bluetooth Low Energy) - Software: Labtool This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	11g Tx	2412 MHz
Spurious Emission (below 1 GHz)	BLE Tx	2402 MHz, 2440 MHz, 2480 MHz
Spurious Emission (above 1 GHz)	11b Tx	2412 MHz, 2437 MHz, 2462 MHz
6dB Bandwidth	11g Tx	
Maximum Peak Output Power	11n-20 Tx	
Power Density	BLE Tx	2402 MHz, 2440 MHz, 2480 MHz
99% Occupied Bandwidth		

4.2 Configuration and peripherals



* Test data was taken under worst case conditions.

120 V/ 60 Hz

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless LAN Module	FM1M948	1509NK096	Canon	EUT
B	USB converted connector	AD-3DUSB14C	-	Sanwa Supply	-
C	Personal Computer	PB453MNBPR7AA71	ZE127518H	TOSHIBA	-
D	AC Adapter	PA3917U-1ACA	201140918507284	TOSHIBA	-

List of cable used

No.	Cable name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	2.0	Shielded	Shielded	-
2	DC	1.45	Unshielded	Unshielded	-
3	AC	0.8	Unshielded	Unshielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via host equipment in a Shielded Room.

The EUT via host equipment 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 v03r04".

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

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 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 *2)	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: 300kHz
Test Distance	3m	3 m (below 13 GHz), 1 m *1) (above 13 GHz)		3 m (below 13 GHz), 1 m *1) (above 13 GHz)

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

*2) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r04"

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.

Antenna polarization	Carrier (Band edge)	Spurious (Below 1 GHz)	Spurious (1 G -13 GHz)	Spurious (13 G -18 GHz)	Spurious (18 G -26.5 GHz)
Horizontal	X	X	Z	Z	X
Vertical	Z	X	Z	Z	X

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

Measurement range : 30 M - 26 GHz
Test data : APPENDIX
Test result : Pass

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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) The measurement was performed with Max Hold since the duty cycle was not 100 %.							
*2) Reference data							
*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r04".							
*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

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APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2015/12/19

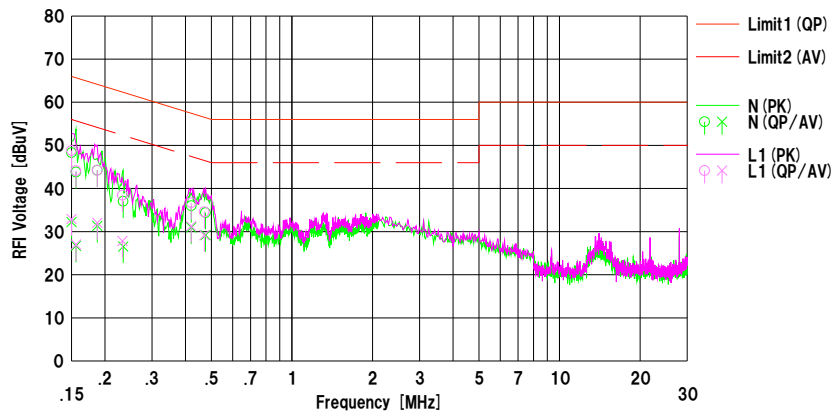
Mode : Tx 11a 2412MHz

Power : DC 5V
Temp./Humi. : 22 deg.C / 38 %RH

Remarks : (AC Adapter) AC 120V/ 60 Hz

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

Engineer : Tomohiro Hara



No.	Freq. [MHz]	Reading			C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]	[dB]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	35.80	19.70	12.51		48.31	32.21	66.00	56.00	17.6	23.7	N	
2	0.15585	31.30	14.20	12.51		43.81	26.71	65.68	55.68	21.8	28.9	N	
3	0.18725	31.70	18.80	12.52		44.22	31.32	64.16	54.16	19.9	22.8	N	
4	0.23395	24.50	14.00	12.53		37.03	26.53	62.31	52.31	25.2	25.7	N	
5	0.42054	23.40	18.40	12.57		35.97	30.97	57.44	47.44	21.4	16.4	N	
6	0.47523	21.80	16.60	12.58		34.38	29.18	56.42	46.42	22.0	17.2	N	
7	0.15000	36.30	20.40	12.51		48.81	32.91	66.00	56.00	17.1	23.0	L1	
8	0.15585	31.60	14.50	12.51		44.11	27.01	65.68	55.68	21.5	28.6	L1	
9	0.18725	31.70	19.50	12.52		44.21	32.01	64.16	54.16	19.9	22.1	L1	
10	0.23395	25.90	15.30	12.53		38.43	27.83	62.37	52.37	23.9	24.5	L1	
11	0.42034	24.10	18.70	12.57		36.61	31.21	57.44	47.44	20.7	16.1	L1	
12	0.47036	22.00	16.60	12.58		34.58	29.18	56.51	46.51	21.9	17.3	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

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Conducted Emission

DATA OF CONDUCTED EMISSION TEST

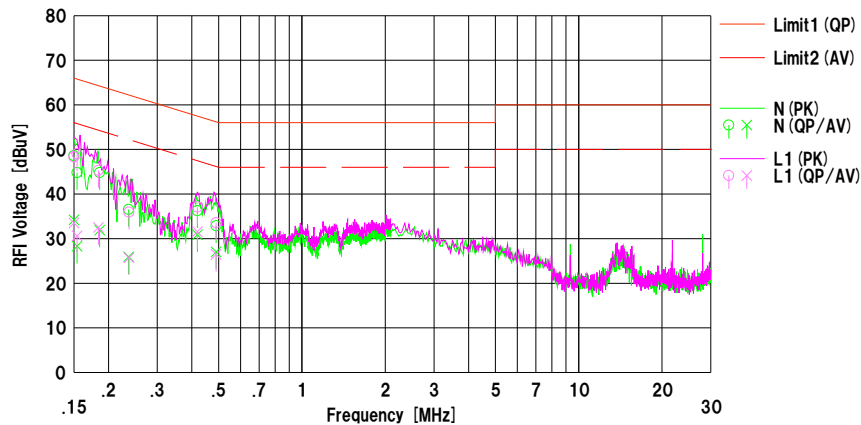
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2015/12/19

Mode : Tx, BLE, 2402 MHz
Power : DC 5V
Temp./Humi. : 22 deg.C / 38 %RH

Remarks : (AC Adapter) AC 120V/ 60 Hz

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

Engineer : Tomohiro Hara



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	0.15000	36.10	21.70	12.51	48.61	34.21	66.00	56.00	17.3	21.7	N	
2	0.15400	32.30	15.80	12.51	44.81	28.31	65.78	55.78	20.9	27.4	N	
3	0.18587	32.30	19.40	12.52	44.82	31.92	64.22	54.22	19.4	22.3	N	
4	0.23653	24.00	13.40	12.53	36.53	25.93	62.22	52.22	25.6	26.2	N	
5	0.41898	23.70	18.30	12.57	36.27	30.87	57.47	47.47	21.2	16.6	N	
6	0.48970	20.30	14.45	12.58	32.88	27.03	56.17	46.17	23.2	19.1	N	
7	0.15000	35.80	21.00	12.51	48.31	33.31	66.00	56.00	17.6	22.4	L1	
8	0.15397	36.50	18.10	12.51	49.01	30.61	65.78	55.78	16.7	25.1	L1	
9	0.18401	32.80	20.00	12.52	45.32	32.52	64.30	54.30	18.9	21.7	L1	
10	0.23715	23.40	13.20	12.53	35.93	25.73	62.20	52.20	26.2	26.4	L1	
11	0.41900	24.50	19.00	12.57	37.07	31.57	57.47	47.47	20.4	15.9	L1	
12	0.48970	21.00	13.90	12.58	33.58	26.48	56.17	46.17	22.5	19.6	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

Conducted Emission

2402 MHz

DATA OF CONDUCTED EMISSION TEST

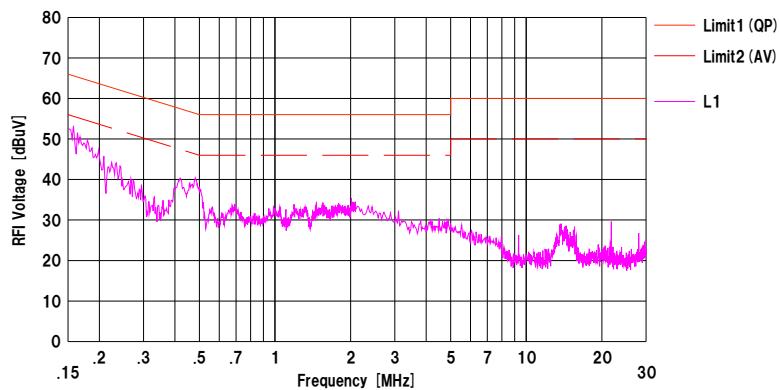
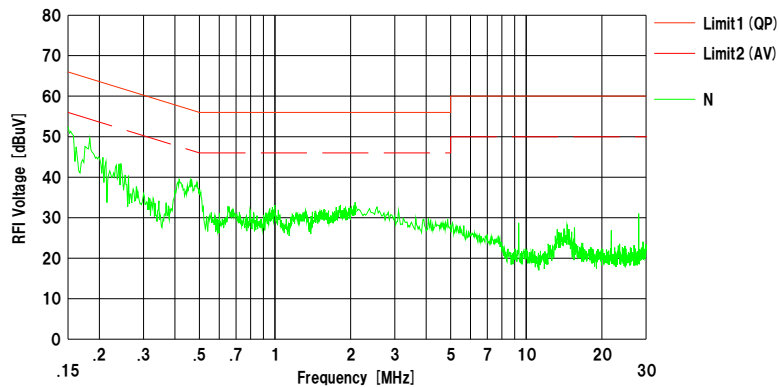
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2015/12/19

Mode : Tx. BLE. 2402 MHz
Power : DC 5V
Temp./Humi. : 22 deg.C / 38 %RH

Remarks : (AC Adapter) AC 120V/ 60 Hz

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

Engineer : Tomohiro Hara



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

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2440 MHz

DATA OF CONDUCTED EMISSION TEST

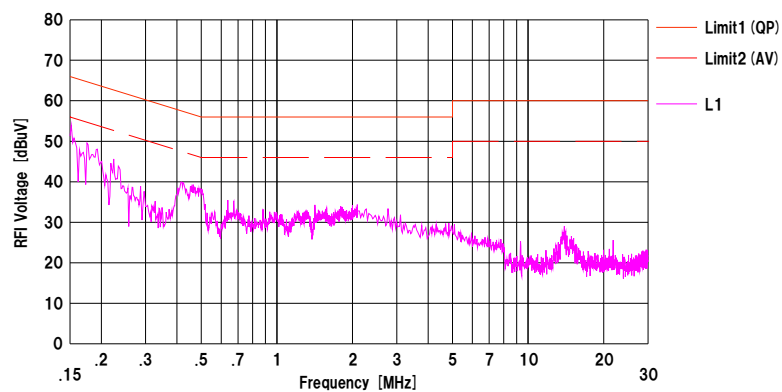
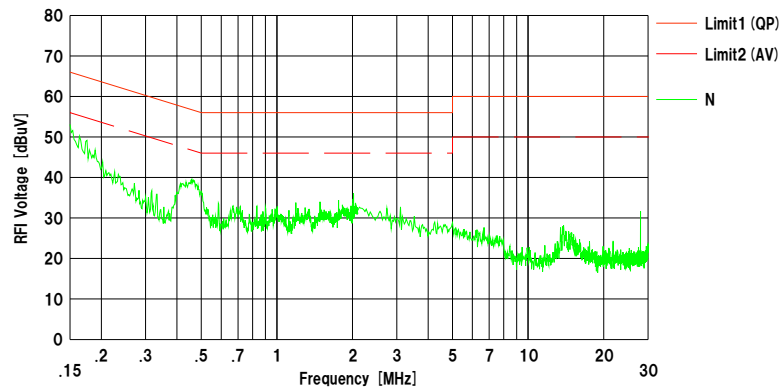
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2015/12/19

Mode : Tx. BLE. 2440 MHz
Power : DC 5V
Temp./Humi. : 22 deg.C / 38 %RH

Remarks : (AC Adapter) AC 120V/ 60 Hz

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

Engineer : Tomohiro Hara



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

2480 MHz

DATA OF CONDUCTED EMISSION TEST

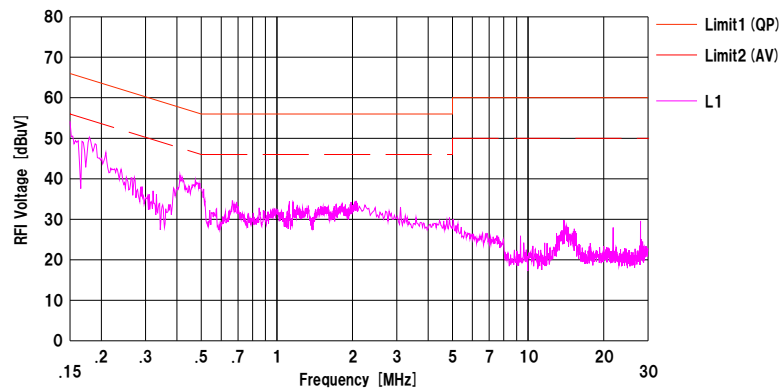
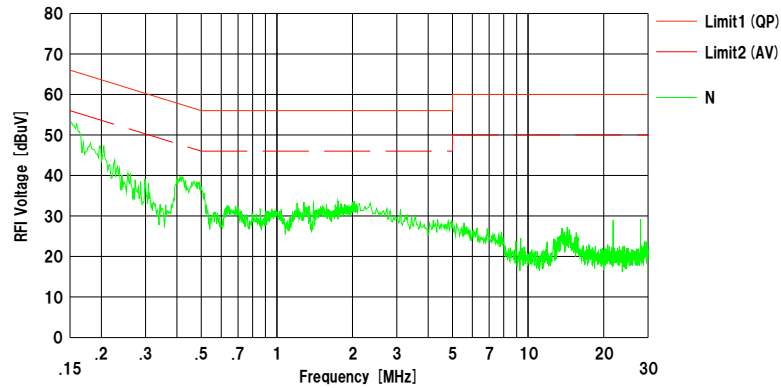
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2015/12/19

Mode : Tx. BLE. 2480 MHz
Power : DC 5V
Temp./Humi. : 22 deg.C / 38 %RH

Remarks : (AC Adapter) AC 120V/ 60 Hz

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

Engineer : Tomohiro Hara



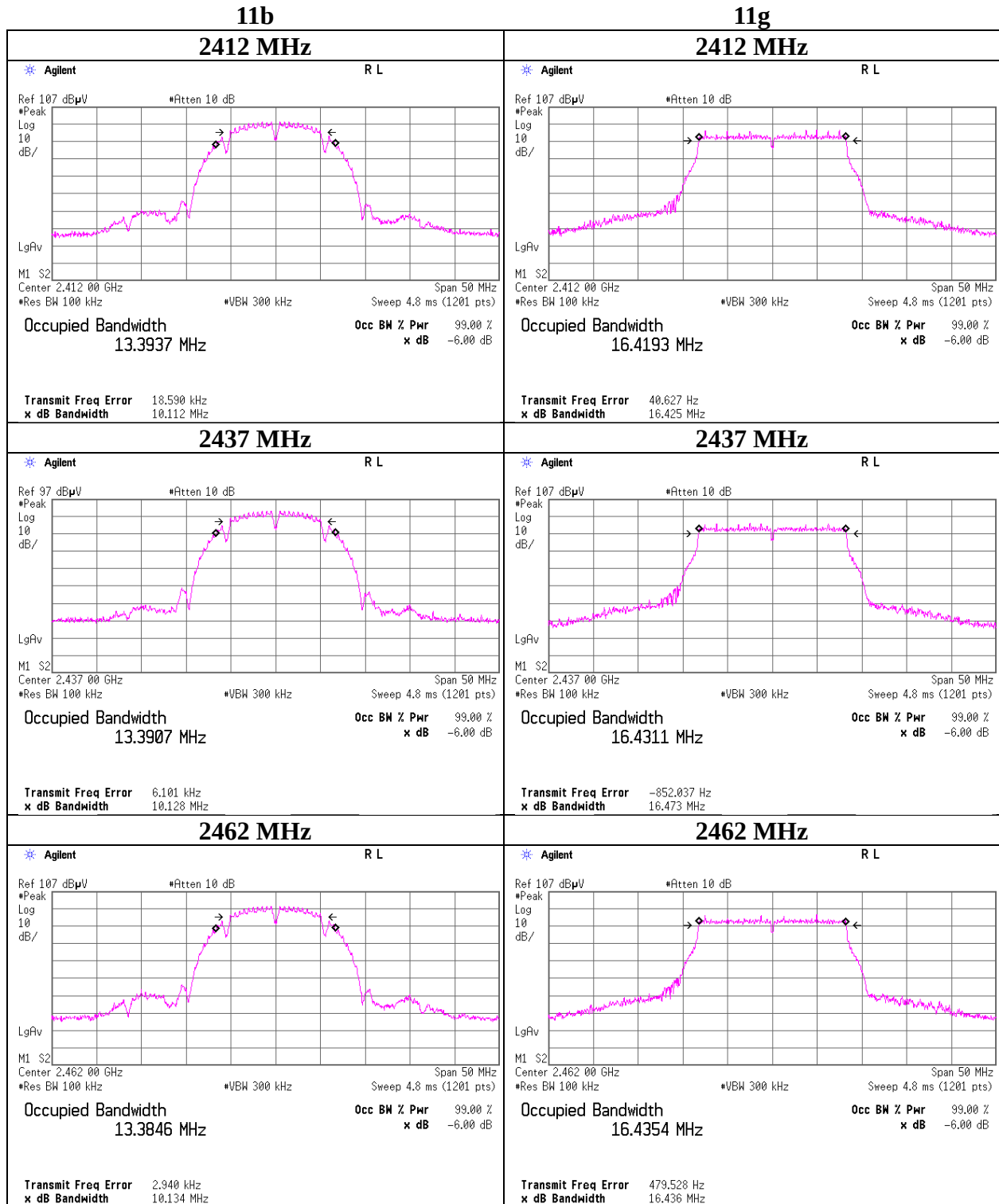
Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

6dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	10951582S-A-R2
Date	November 30, 2015
Temperature / Humidity	23 deg. C / 25 % RH
Engineer	Yosuke Ishikawa
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	10.112	> 500
	2437	10.128	> 500
	2462	10.134	> 500
11g	2412	16.425	> 500
	2437	16.473	> 500
	2462	16.436	> 500
11n-20	2412	17.661	> 500
	2437	17.663	> 500
	2462	17.683	> 500
Bluetooth Low Energy	2402	0.773	> 500
	2440	0.769	> 500
	2480	0.770	> 500

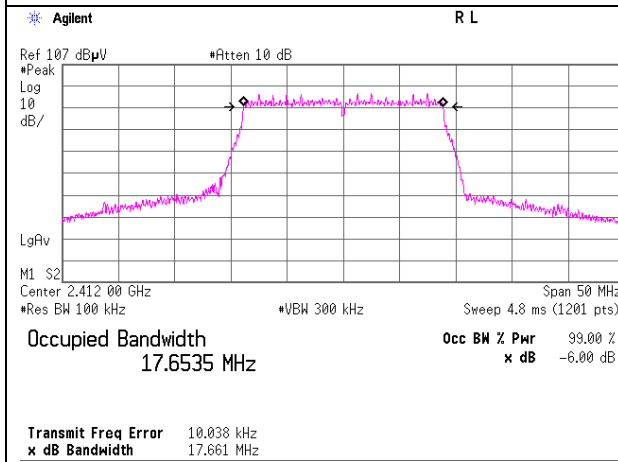
6dB Bandwidth



6dB Bandwidth

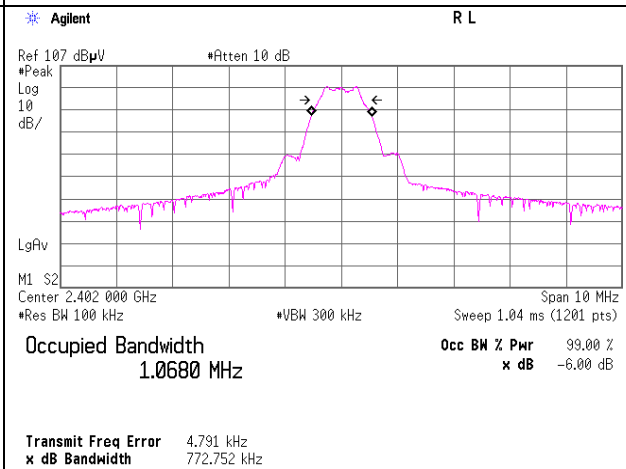
11n-20

2412 MHz

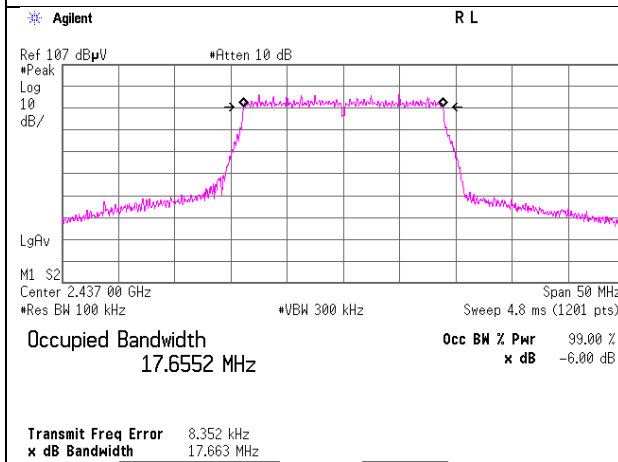


Bluetooth Low Energy

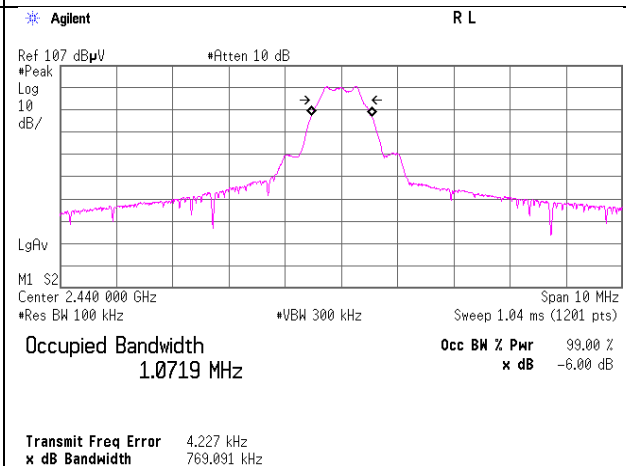
2402 MHz



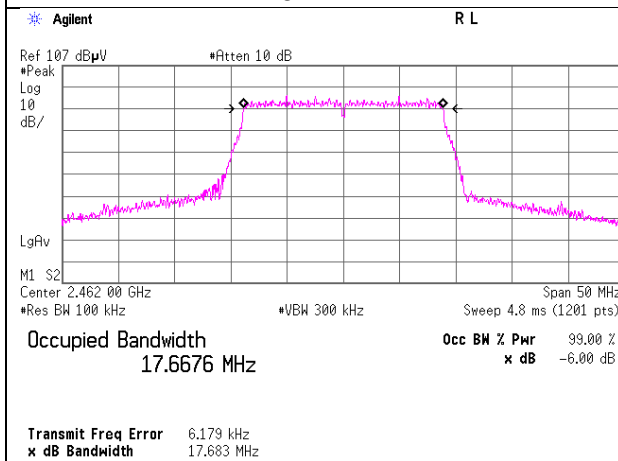
2437 MHz



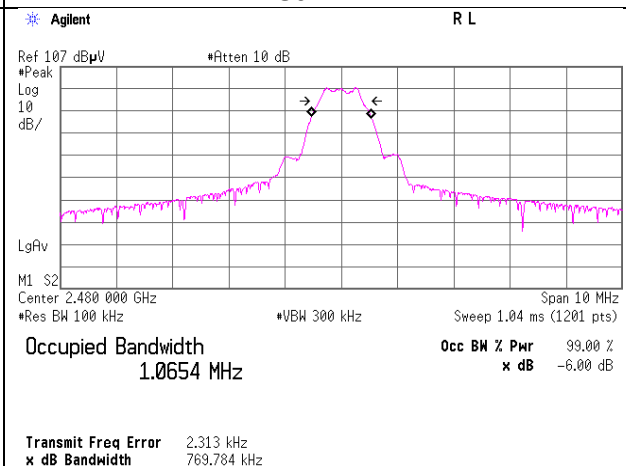
2440 MHz



2462 MHz



2480 MHz



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 10951582S-A-R2
Date : November 3, 2015
Temperature / Humidity : 23 deg. C / 50 % RH
Engineer : Kenichi Adachi
Mode : Tx 11b, Tx 11g

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-6.07	2.03	19.90	15.86	38.55	30.00	1000.00	14.14
2437	-6.14	2.03	19.90	15.79	37.93	30.00	1000.00	14.21
2462	-6.24	2.04	19.90	15.70	37.15	30.00	1000.00	14.30

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.

11b, 2437 MHz, Peak

Rate	Reading	Remark
[Mbps]	[dBm]	
1	-6.14	*
2	-6.18	
5.5	-6.23	
11	-6.25	

*: Worst Rate

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

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-1.32	2.03	19.90	20.61	115.08	30.00	1000.00	9.39
2437	-1.44	2.03	19.90	20.49	111.94	30.00	1000.00	9.51
2462	-1.51	2.04	19.90	20.43	110.41	30.00	1000.00	9.57

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.

11g, 2437 MHz, Peak

Rate	Reading	Remark
[Mbps]	[dBm]	
6	-1.44	*
9	-1.82	
12	-2.05	
18	-2.43	
24	-1.73	
36	-1.83	
48	-1.77	
54	-1.81	

*: Worst Rate

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

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Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 10951582S-A-R2
Date : November 3, 2015 November 30, 2015
Temperature / Humidity : 23 deg. C / 50 % RH 23 deg. C / 25 % RH
Engineer : Kenichi Adachi Yosuke Ishikawa
Mode : Tx 11n HT20, Bluetooth Low Energy

11n HT20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-1.81	2.03	19.90	20.12	102.80	30.00	1000.00	9.88
2437	-1.74	2.03	19.90	20.19	104.47	30.00	1000.00	9.81
2462	-2.03	2.04	19.90	19.91	97.95	30.00	1000.00	10.09

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.

11n HT20, 2437 MHz, Peak

Mode (MCS)	Reading [dBm]	Remark
0	-1.74	*
1	-1.92	
2	-2.01	
3	-2.65	
4	-2.98	
5	-2.26	
6	-1.79	
7	-1.77	

*: Worst Rate

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

Bluetooth Low Energy

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-8.71	1.99	9.93	3.21	2.09	30.00	1000.00	26.79
2440	-8.76	2.00	9.93	3.17	2.07	30.00	1000.00	26.83
2480	-8.71	2.01	9.93	3.23	2.10	30.00	1000.00	26.77

Bluetooth Low Energy (Low Power)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-18.68	2.77	10.01	-5.90	0.26	30.00	1000.00	35.90
2440	-18.79	2.74	10.01	-6.04	0.25	30.00	1000.00	36.04
2480	-18.91	2.76	10.01	-6.14	0.24	30.00	1000.00	36.14

Sample Calculation:

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

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

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 10951582S-A-R2
Date : November 3, 2015 November 30, 2015
Temperature / Humidity : 23 deg. C / 50 % RH 23 deg. C / 25 % RH
Engineer : Kenichi Adachi Yosuke Ishikawa
Mode : Tx

11b 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-8.74	2.03	19.90	13.19	20.84	0.00	13.19	20.86
2437	-8.83	2.03	19.90	13.10	20.42	0.00	13.10	20.44
2462	-8.98	2.04	19.90	12.96	19.77	0.00	12.96	19.79

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-11.74	2.03	19.90	10.19	10.45	0.03	10.22	10.52
2437	-11.78	2.03	19.90	10.15	10.35	0.03	10.18	10.42
2462	-12.18	2.04	19.90	9.76	9.46	0.03	9.79	9.53

11n HT20 MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-11.84	2.03	19.90	10.09	10.21	0.03	10.12	10.28
2437	-11.79	2.03	19.90	10.14	10.33	0.03	10.17	10.40
2462	-11.88	2.04	19.90	10.06	10.14	0.03	10.09	10.21

Bluetooth Low Energy

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-11.15	1.99	9.93	0.77	1.19	2.06	2.83	1.92
2440	-11.19	2.00	9.93	0.74	1.19	2.06	2.80	1.91
2480	-11.15	2.01	9.93	0.79	1.20	2.06	2.85	1.93

Bluetooth Low Energy (Low Power)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-23.92	2.77	10.01	-11.14	0.08	2.06	-9.08	0.12
2440	-23.95	2.74	10.01	-11.20	0.08	2.06	-9.14	0.12
2480	-24.07	2.76	10.01	-11.30	0.07	2.06	-9.24	0.12

Sample Calculation:

Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Result (Burst power) = Frame power + Duty factor

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

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

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	10951582S-A-R2
Date	November 3, 2015
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Kenichi Adachi
Mode	Tx

2437 MHz, Averse

Mode	Rate / Mode Mbps / MCS	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	-8.83	0.00	-8.83	*
	2	-8.88	0.01	-8.87	
	5.5	-8.89	0.03	-8.86	
	11	-8.90	0.05	-8.85	
11g	6	-11.78	0.03	-11.75	*
	9	-11.85	0.04	-11.81	
	12	-11.89	0.06	-11.83	
	18	-11.92	0.09	-11.83	
	24	-12.01	0.12	-11.89	
	36	-12.03	0.18	-11.85	
	48	-12.18	0.23	-11.95	
	54	-12.22	0.26	-11.96	
11n HT20	0	-11.79	0.03	-11.76	*
	1	-11.97	0.07	-11.90	
	2	-12.03	0.10	-11.93	
	3	-12.17	0.13	-12.04	
	4	-12.22	0.19	-12.03	
	5	-12.26	0.24	-12.02	
	6	-12.04	0.27	-11.77	
	7	-12.15	0.29	-11.86	

Caluculation: Burst power (reading) [dBm] = Reading [dBm] + Duty Factor [dB]

Burst rate confirmation

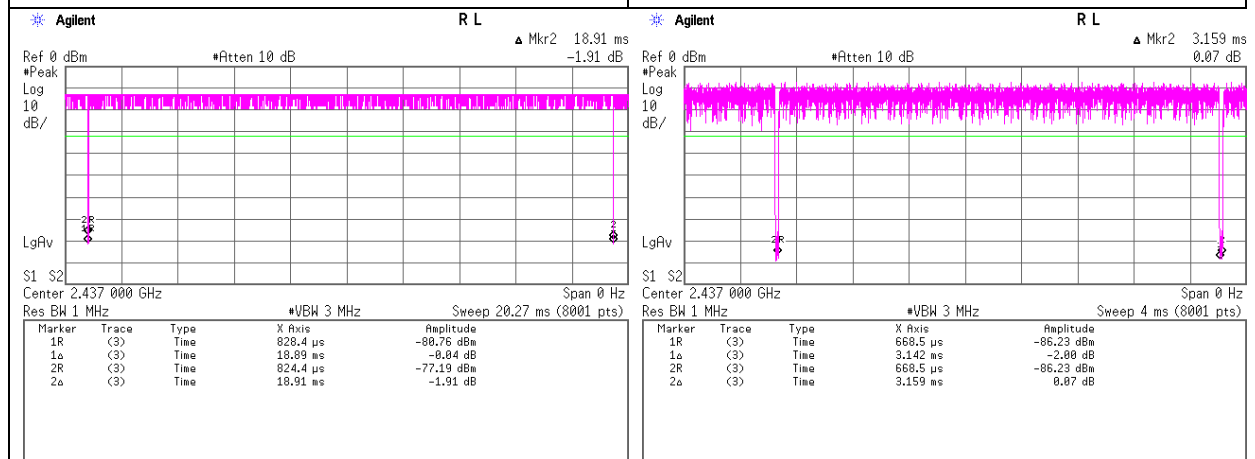
Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 10951582S-A-R2
Date : November 30, 2015
Temperature / Humidity : 23 deg. C / 25 % RH
Engineer : Yosuke Ishikawa
Mode : Tx

11b 1 Mbps

Tx on / (Tx on + Tx off) = **0.999**
Tx on / (Tx on + Tx off) * 100 = **99.9 %**

11g 6 Mbps

Tx on / (Tx on + Tx off) = **0.995**
Tx on / (Tx on + Tx off) * 100 = **99.5 %**

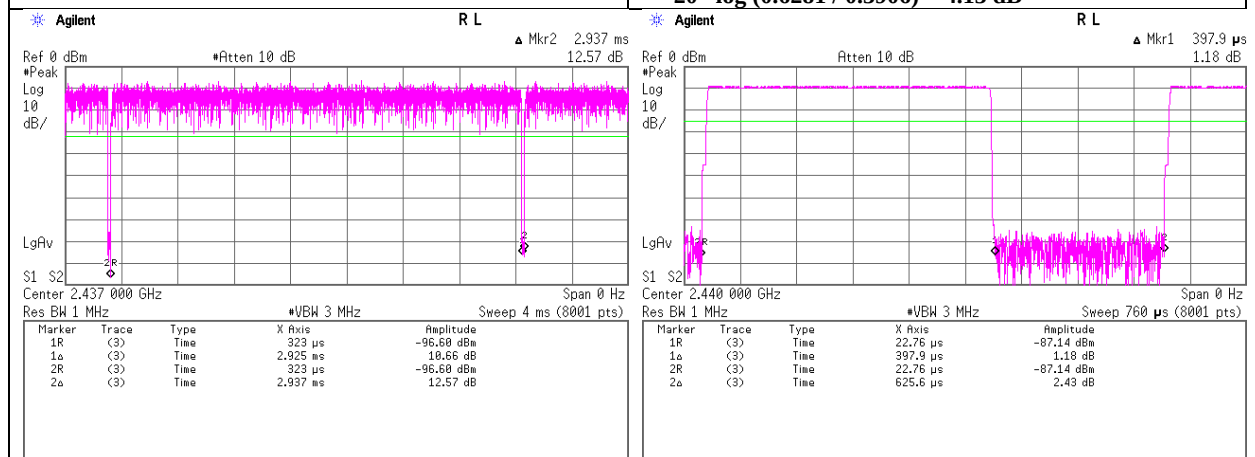


11n-20 MCS 0

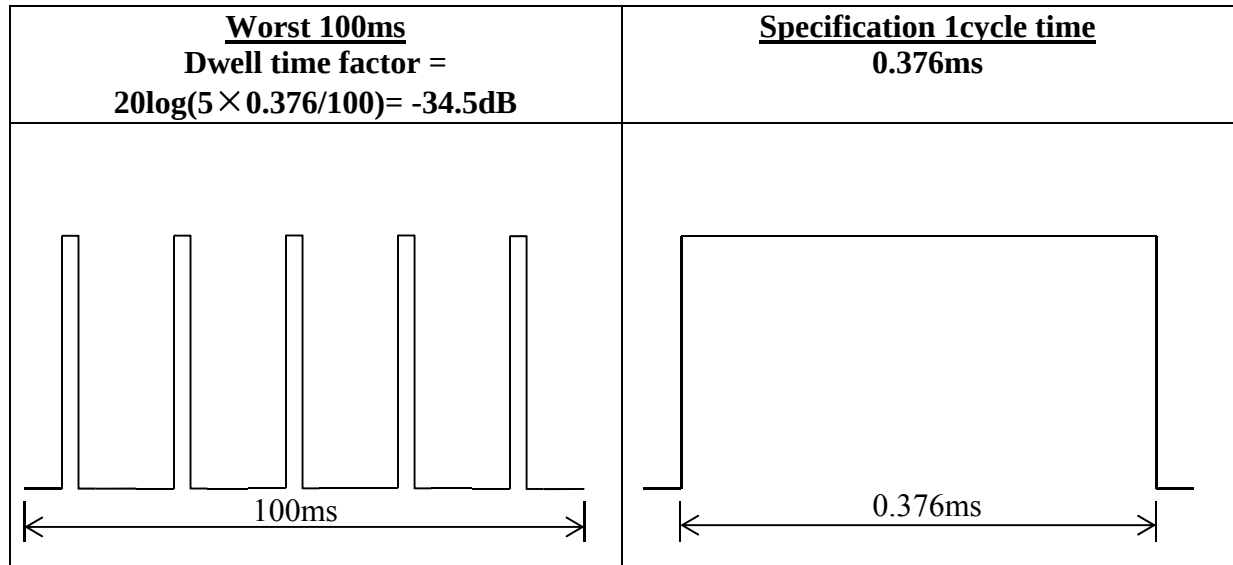
Tx on / (Tx on + Tx off) = **0.996**
Tx on / (Tx on + Tx off) * 100 = **99.6 %**

BTLE

Tx on / (Tx on + Tx off) = **0.622**
Tx on / (Tx on + Tx off) * 100 = **62.2 %**
Duty factor = 10 * log (0.6281 / 0.3906) = **2.06 dB**
Duty factor for Radiated spurious emission
= 20 * log (0.6281 / 0.3906) = **4.13 dB**



BT LE Averaging factor



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 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	45.6	27.7	14.8	40.7	2.4	49.8	73.9	24.1	142	156	
Hori.	4824.000	PK	47.9	31.4	7.5	41.6	2.4	47.6	73.9	26.3	123	222	
Hori.	7236.000	PK	47.4	36.6	9.1	41.2	2.4	54.3	73.9	19.6	177	156	
Hori.	9648.000	PK	45.1	38.0	9.9	40.1	2.4	55.3	73.9	18.6	150	0	
Hori.	2390.000	AV	36.3	27.7	14.8	40.7	2.4	40.5	53.9	13.4	142	156	
Hori.	4824.000	AV	40.2	31.4	7.5	41.6	2.4	39.9	53.9	14.0	123	222	
Hori.	7236.000	AV	38.8	36.6	9.1	41.2	2.4	45.7	53.9	8.2	177	156	
Hori.	9648.000	AV	35.1	38.0	9.9	40.1	2.4	45.3	53.9	8.6	150	0	
Vert.	2390.000	PK	45.4	27.7	14.8	40.7	2.4	49.6	73.9	24.3	106	194	
Vert.	4824.000	PK	48.2	31.4	7.5	41.6	2.4	47.9	73.9	26.0	182	353	
Vert.	7236.000	PK	48.3	36.6	9.1	41.2	2.4	55.2	73.9	18.7	252	159	
Vert.	9648.000	PK	46.1	38.0	9.9	40.1	2.4	56.3	73.9	17.6	143	204	
Vert.	2390.000	AV	36.6	27.7	14.8	40.7	2.4	40.8	53.9	13.1	106	194	
Vert.	4824.000	AV	40.5	31.4	7.5	41.6	2.4	40.2	53.9	13.7	182	353	
Vert.	7236.000	AV	39.4	36.6	9.1	41.2	2.4	46.3	53.9	7.6	252	159	
Vert.	9648.000	AV	36.2	38.0	9.9	40.1	2.4	46.4	53.9	7.5	143	204	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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	95.4	27.7	14.9	40.7	2.4	99.7	-	-	Carrier
Hori.	2397.185	PK	45.9	27.7	14.8	40.7	2.4	50.1	79.6	29.5	
Hori.	2400.000	PK	41.5	27.7	14.9	40.7	2.4	45.8	79.6	33.8	
Vert.	2412.000	PK	92.8	27.7	14.9	40.7	2.4	97.1	-	-	Carrier
Vert.	2396.952	PK	44.0	27.7	14.8	40.7	2.4	48.2	77.1	28.9	
Vert.	2400.000	PK	40.6	27.7	14.9	40.7	2.4	44.9	77.1	32.2	

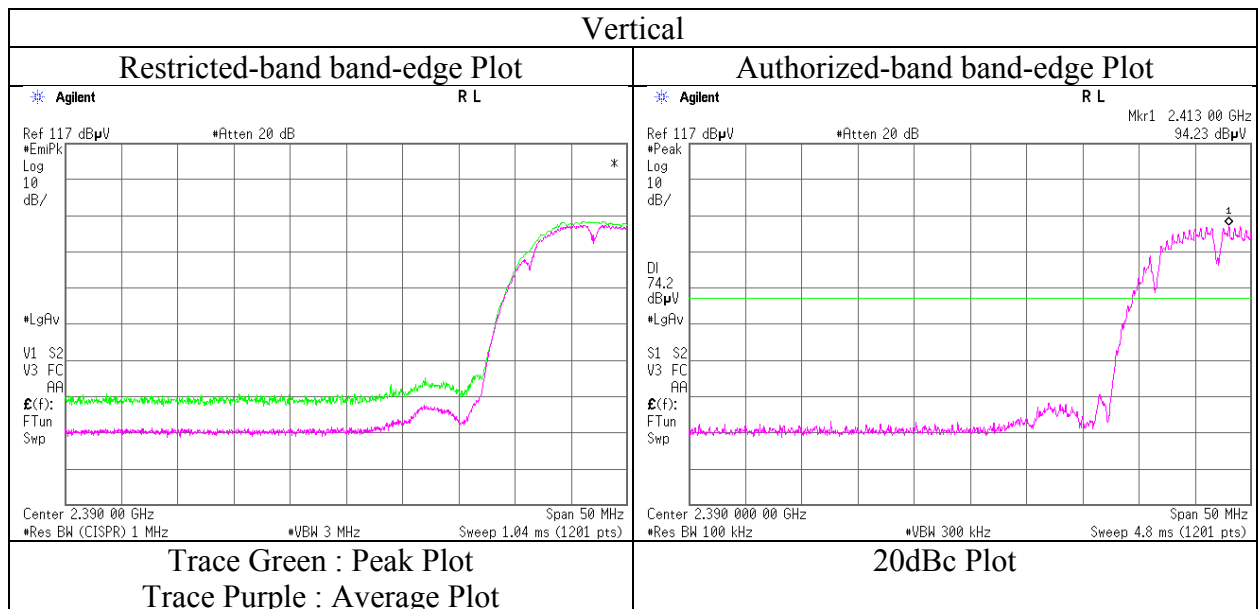
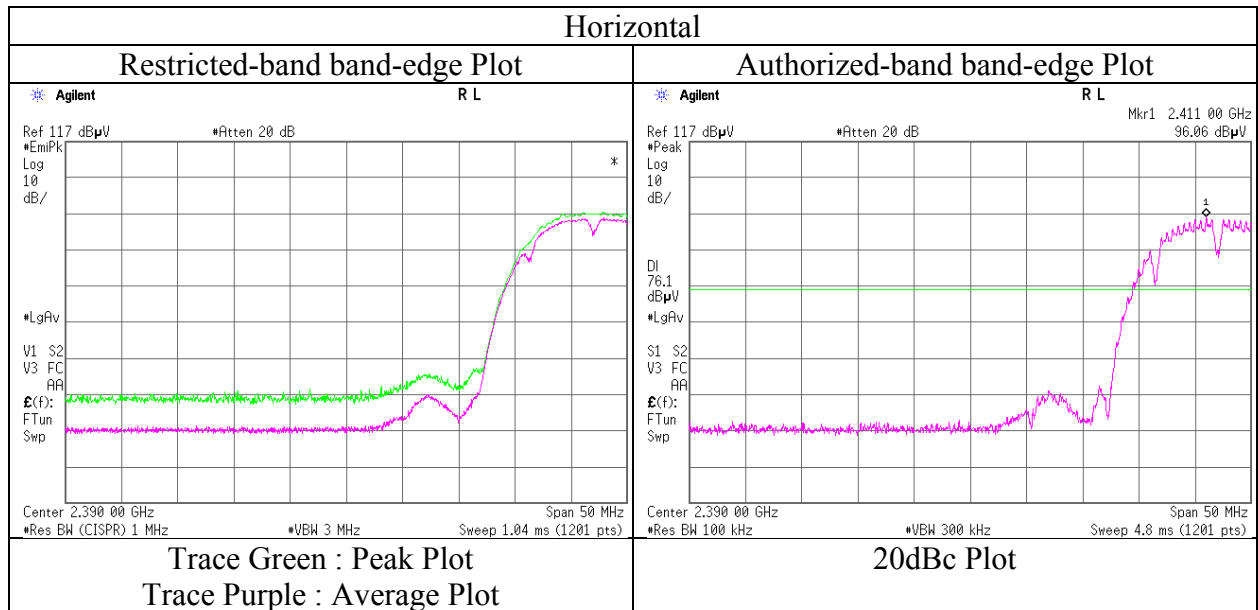
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No.	10951582S-A-R2
Date	December 3, 2015
Temperature / Humidity	20 deg. C / 39 % RH
Engineer	Akira Sato (1-13 GHz)
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 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara
 (1-13 GHz) (13-18 GHz) (18-26 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	47.2	31.6	7.5	41.6	2.4	47.1	73.9	26.8	100	0	
Hori.	7311.000	PK	48.3	36.7	9.1	41.3	2.4	55.2	73.9	18.7	100	0	
Hori.	9748.000	PK	44.6	38.0	10.0	40.1	2.4	54.9	73.9	19.0	100	0	
Hori.	4874.000	AV	37.2	31.6	7.5	41.6	2.4	37.1	53.9	16.8	100	0	
Hori.	7311.000	AV	37.6	36.7	9.1	41.3	2.4	44.5	53.9	9.4	100	0	
Hori.	9748.000	AV	35.4	38.0	10.0	40.1	2.4	45.7	53.9	8.2	100	0	
Vert.	4874.000	PK	47.7	31.6	7.5	41.6	2.4	47.6	73.9	26.3	100	104	
Vert.	7311.000	PK	47.6	36.7	9.1	41.3	2.4	54.5	73.9	19.4	100	0	
Vert.	9748.000	PK	45.2	38.0	10.0	40.1	2.4	55.5	73.9	18.4	100	0	
Vert.	4874.000	AV	39.1	31.6	7.5	41.6	2.4	39.0	53.9	14.9	100	104	
Vert.	7311.000	AV	37.3	36.7	9.1	41.3	2.4	44.2	53.9	9.7	100	0	
Vert.	9748.000	AV	35.5	38.0	10.0	40.1	2.4	45.8	53.9	8.1	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber		
Report No.	10951582S-A-R2		
Date	December 3, 2015	December 16, 2015	December 17, 2015
Temperature / Humidity	20 deg. C / 39 % RH	22 deg. C / 41 % RH	22 deg. C / 37 % RH
Engineer	Akira Sato (1-13 GHz)	Tomohiro Hara (13-18 GHz)	Tomohiro Hara (18-26 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	45.7	27.8	15.0	40.7	2.4	50.2	73.9	23.7	106	169	
Hori.	4924.000	PK	49.9	31.7	7.6	41.6	2.4	50.0	73.9	23.9	131	216	
Hori.	7386.000	PK	46.9	36.7	9.1	41.3	2.4	53.8	73.9	20.1	100	0	
Hori.	9848.000	PK	45.2	38.1	10.1	40.0	2.4	55.8	73.9	18.1	100	0	
Hori.	2483.500	AV	36.3	27.8	15.0	40.7	2.4	40.8	53.9	13.1	106	169	
Hori.	4924.000	AV	45.2	31.7	7.6	41.6	2.4	45.3	53.9	8.6	131	216	
Hori.	7386.000	AV	37.6	36.7	9.1	41.3	2.4	44.5	53.9	9.4	100	0	
Hori.	9848.000	AV	36.2	38.1	10.1	40.0	2.4	46.8	53.9	7.1	100	0	
Vert.	2483.500	PK	45.6	27.8	15.0	40.7	2.4	50.1	73.9	23.8	117	160	
Vert.	4924.000	PK	46.9	31.7	7.6	41.6	2.4	47.0	73.9	26.9	115	206	
Vert.	7386.000	PK	45.9	36.7	9.1	41.3	2.4	52.8	73.9	21.1	100	0	
Vert.	9848.000	PK	44.9	38.1	10.1	40.0	2.4	55.5	73.9	18.4	113	11	
Vert.	2483.500	AV	36.4	27.8	15.0	40.7	2.4	40.9	53.9	13.0	117	160	
Vert.	4924.000	AV	39.1	31.7	7.6	41.6	2.4	39.2	53.9	14.7	115	206	
Vert.	7386.000	AV	37.4	36.7	9.1	41.3	2.4	44.3	53.9	9.6	100	0	
Vert.	9848.000	AV	36.3	38.1	10.1	40.0	2.4	46.9	53.9	7.0	113	11	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Shonan EMC Lab.

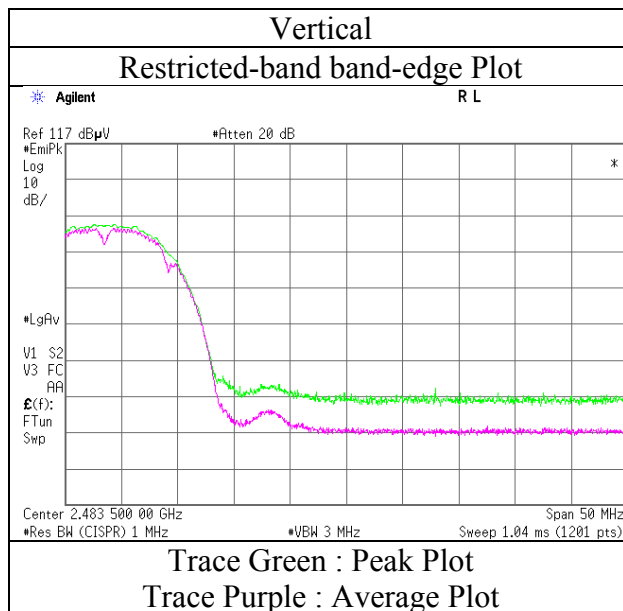
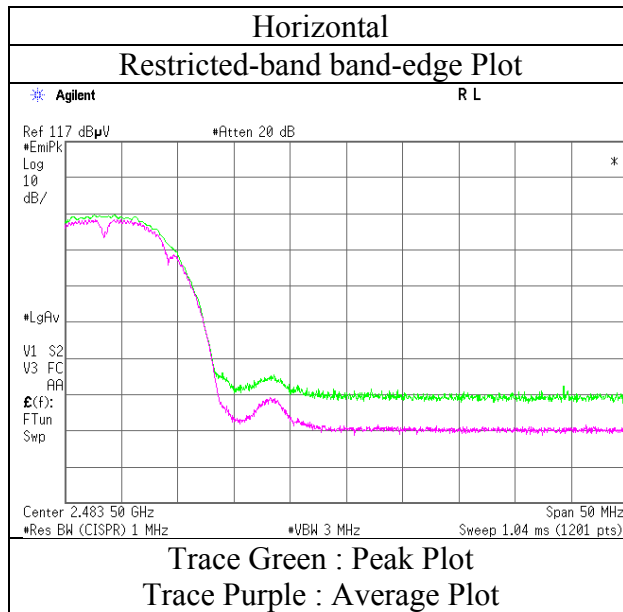
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. 10951582S-A-R2
Date December 3, 2015
Temperature / Humidity 20 deg. C / 39 % RH
Engineer Akira Sato
(1-13 GHz)
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 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015 December 18, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH 23 deg. C / 30 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 GHz) (30 M-1 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.	239.815	QP	33.0	17.5	9.3	31.7	0.0	28.1	46.0	17.9	150	206	
Hori.	722.174	QP	33.3	20.4	8.9	31.5	0.0	31.1	46.0	14.9	100	170	
Hori.	2390.000	PK	49.7	27.7	14.8	40.7	2.4	53.9	73.9	20.0	100	163	
Hori.	4824.000	PK	46.8	31.4	7.5	41.6	2.4	46.5	73.9	27.4	100	0	
Hori.	7236.000	PK	45.9	36.6	9.1	41.2	2.4	52.8	73.9	21.1	100	0	
Hori.	9648.000	PK	43.6	38.0	9.9	40.1	2.4	53.8	73.9	20.1	100	0	
Hori.	2390.000	AV	38.4	27.7	14.8	40.7	2.4	42.6	53.9	11.3	100	163	
Hori.	4824.000	AV	36.9	31.4	7.5	41.6	2.4	36.6	53.9	17.3	100	0	
Hori.	7236.000	AV	36.3	36.6	9.1	41.2	2.4	43.2	53.9	10.7	100	0	
Hori.	9648.000	AV	35.0	38.0	9.9	40.1	2.4	45.2	53.9	8.7	100	0	
Vert.	36.825	QP	43.0	15.5	7.0	31.9	0.0	33.6	40.0	6.4	100	238	
Vert.	83.648	QP	50.8	6.9	8.1	31.9	0.0	33.9	40.0	6.1	100	142	
Vert.	93.226	QP	49.0	8.8	8.1	31.9	0.0	34.0	43.5	9.5	100	147	
Vert.	575.007	QP	37.4	18.6	8.2	31.6	0.0	32.6	46.0	13.4	100	231	
Vert.	2390.000	PK	45.8	27.7	14.8	40.7	2.4	50.0	73.9	23.9	100	195	
Vert.	4824.000	PK	47.0	31.4	7.5	41.6	2.4	46.7	73.9	27.2	100	0	
Vert.	7236.000	PK	45.6	36.6	9.1	41.2	2.4	52.5	73.9	21.4	100	0	
Vert.	9648.000	PK	44.9	38.0	9.9	40.1	2.4	55.1	73.9	18.8	100	0	
Vert.	2390.000	AV	32.5	27.7	14.8	40.7	2.4	36.7	53.9	17.2	100	195	
Vert.	4824.000	AV	37.2	31.4	7.5	41.6	2.4	36.9	53.9	17.0	100	0	
Vert.	7236.000	AV	36.9	36.6	9.1	41.2	2.4	43.8	53.9	10.1	100	0	
Vert.	9648.000	AV	35.5	38.0	9.9	40.1	2.4	45.7	53.9	8.2	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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	90.9	27.7	14.9	40.7	2.4	95.2	-	-	Carrier
Hori.	2396.883	PK	47.9	27.7	14.8	40.7	2.4	52.1	75.1	23.0	
Hori.	2400.000	PK	47.9	27.7	14.9	40.7	2.4	52.2	75.1	22.9	
Vert.	2412.000	PK	87.1	27.7	14.9	40.7	2.4	91.4	-	-	Carrier
Vert.	2396.896	PK	44.2	27.7	14.8	40.7	2.4	48.4	71.4	23.0	
Vert.	2400.000	PK	44.7	27.7	14.9	40.7	2.4	49.0	71.4	22.4	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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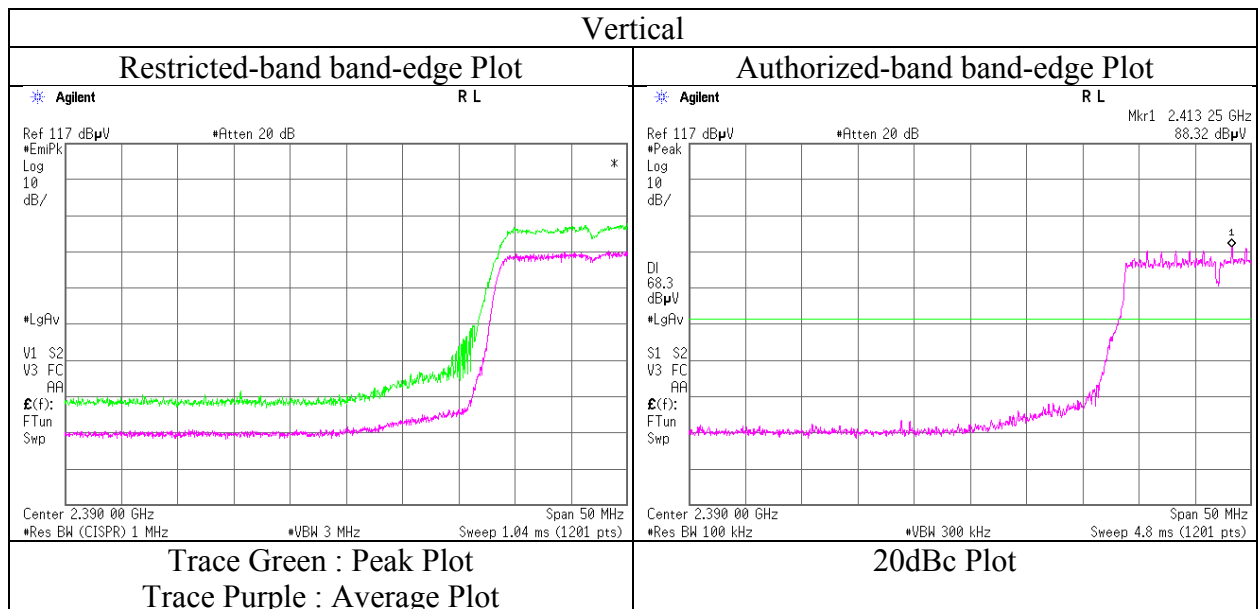
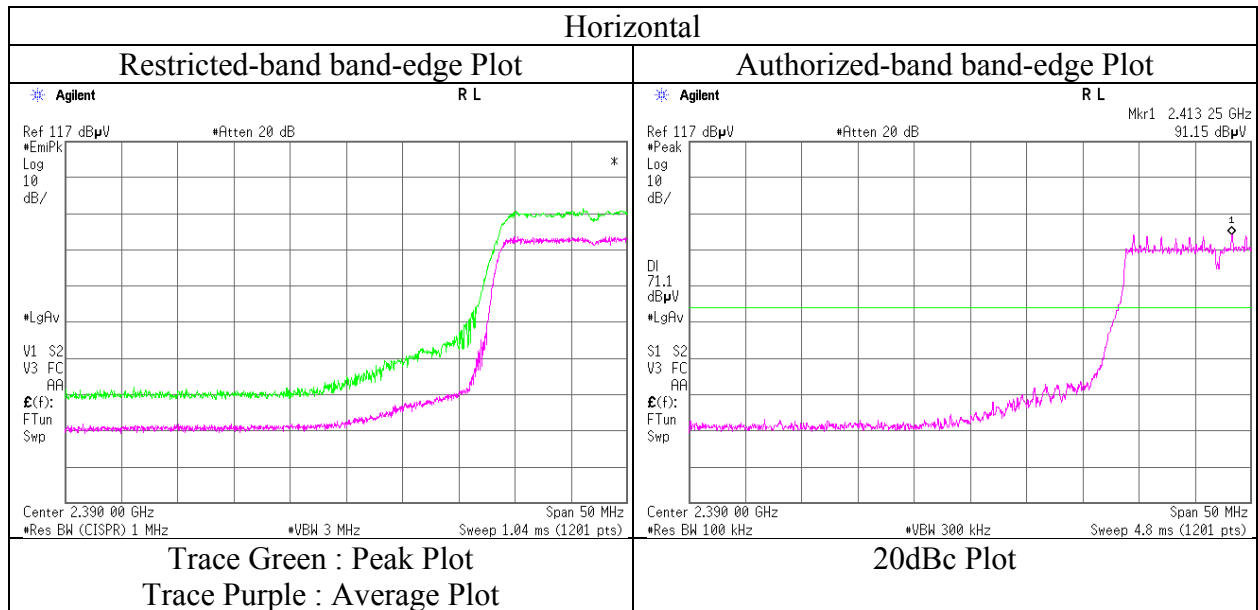
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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No.	10951582S-A-R2
Date	December 3, 2015
Temperature / Humidity	20 deg. C / 39 % RH
Engineer	Akira Sato (1-13 GHz)
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 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara
 (1-13 GHz) (13-18 GHz) (18-26 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	46.6	31.6	7.5	41.6	2.4	46.5	73.9	27.4	100	0	
Hori.	7311.000	PK	46.2	36.7	9.1	41.3	2.4	53.1	73.9	20.8	100	0	
Hori.	9748.000	PK	44.2	38.0	10.0	40.1	2.4	54.5	73.9	19.4	100	0	
Hori.	4874.000	AV	3.7	31.6	7.5	41.6	2.4	3.6	53.9	50.3	100	0	
Hori.	7311.000	AV	37.1	36.7	9.1	41.3	2.4	44.0	53.9	9.9	100	0	
Hori.	9748.000	AV	35.8	38.0	10.0	40.1	2.4	46.1	53.9	7.8	100	0	
Vert.	4874.000	PK	46.5	31.6	7.5	41.6	2.4	46.4	73.9	27.5	100	0	
Vert.	7311.000	PK	46.6	36.7	9.1	41.3	2.4	53.5	73.9	20.4	100	0	
Vert.	9748.000	PK	44.7	38.0	10.0	40.1	2.4	55.0	73.9	18.9	100	0	
Vert.	4874.000	AV	36.8	31.6	7.5	41.6	2.4	36.7	53.9	17.2	100	0	
Vert.	7311.000	AV	37.1	36.7	9.1	41.3	2.4	44.0	53.9	9.9	100	0	
Vert.	9748.000	AV	35.5	38.0	10.0	40.1	2.4	45.8	53.9	8.1	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 GHz)
Mode : Tx 11g 2462 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.4	27.8	15.0	40.7	2.4	52.9	73.9	21.0	100	165	
Hori.	4924.000	PK	46.4	31.7	7.6	41.6	2.4	46.5	73.9	27.4	100	0	
Hori.	7386.000	PK	42.1	36.7	9.1	41.3	2.4	49.0	73.9	24.9	100	0	
Hori.	9848.000	PK	45.0	38.1	10.1	40.0	2.4	55.6	73.9	18.3	100	0	
Hori.	2483.500	AV	37.7	27.8	15.0	40.7	2.4	42.2	53.9	11.7	100	165	
Hori.	7386.000	AV	32.8	36.7	9.1	41.3	2.4	39.7	53.9	14.2	100	0	
Hori.	9848.000	AV	35.7	38.1	10.1	40.0	2.4	46.3	53.9	7.6	100	0	
Vert.	2483.500	PK	46.3	27.8	15.0	40.7	2.4	50.8	73.9	23.1	107	163	
Vert.	4924.000	PK	46.7	31.7	7.6	41.6	2.4	46.8	73.9	27.1	100	0	
Vert.	7386.000	PK	45.9	36.7	9.1	41.3	2.4	52.8	73.9	21.1	100	0	
Vert.	9848.000	PK	44.8	38.1	10.1	40.0	2.4	55.4	73.9	18.5	100	0	
Vert.	2483.500	AV	36.8	27.8	15.0	40.7	2.4	41.3	53.9	12.6	107	163	
Vert.	4924.000	AV	37.2	31.7	7.6	41.6	2.4	37.3	53.9	16.6	100	0	
Vert.	7386.000	AV	37.2	36.7	9.1	41.3	2.4	44.1	53.9	9.8	100	0	
Vert.	9848.000	AV	35.9	38.1	10.1	40.0	2.4	46.5	53.9	7.4	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Shonan EMC Lab.

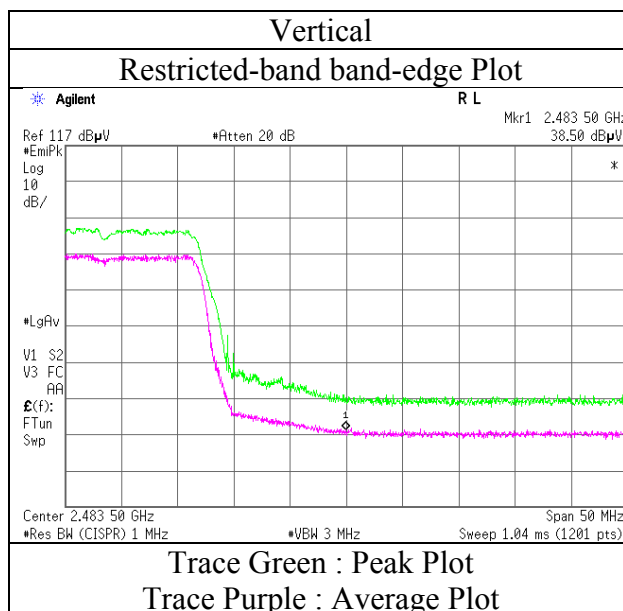
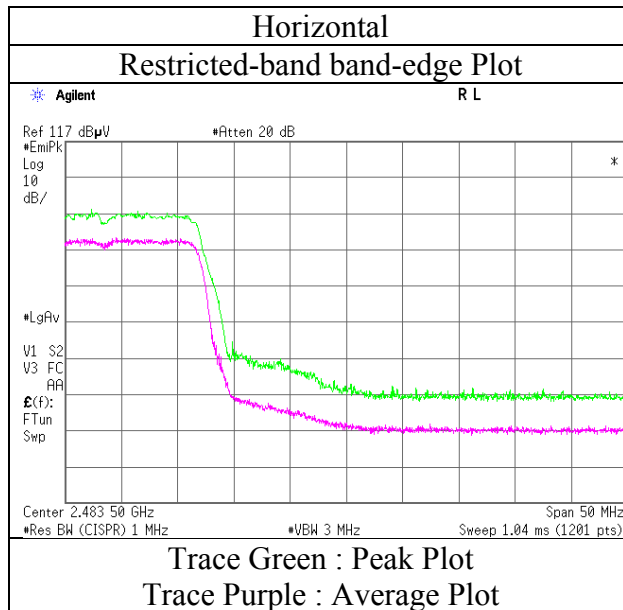
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No.	10951582S-A-R2
Date	December 3, 2015
Temperature / Humidity	20 deg. C / 39 % RH
Engineer	Akira Sato (1-13 GHz)
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 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 GHz)
Mode : Tx 11n-20 2412 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	51.5	27.7	14.8	40.7	2.4	55.7	73.9	18.2	100	163	
Hori.	4819.283	PK	44.8	31.4	7.5	41.6	2.4	44.5	73.9	29.4	100	0	
Hori.	4824.000	PK	47.0	31.4	7.5	41.6	2.4	46.7	73.9	27.2	100	0	
Hori.	7236.000	PK	46.3	36.6	9.1	41.2	2.4	53.2	73.9	20.7	100	0	
Hori.	2390.000	AV	39.9	27.7	14.8	40.7	2.4	44.1	53.9	9.8	100	163	
Hori.	4819.283	AV	35.5	31.4	7.5	41.6	2.4	35.2	53.9	18.7	100	0	
Hori.	4824.000	AV	37.1	31.4	7.5	41.6	2.4	36.8	53.9	17.1	100	0	
Hori.	7236.000	AV	36.6	36.6	9.1	41.2	2.4	43.5	53.9	10.4	100	0	
Vert.	2390.000	PK	48.9	27.7	14.8	40.7	2.4	53.1	73.9	20.8	100	202	
Vert.	4824.000	PK	46.6	31.4	7.5	41.6	2.4	46.3	73.9	27.6	100	0	
Vert.	7236.000	PK	45.3	36.6	9.1	41.2	2.4	52.2	73.9	21.7	100	0	
Vert.	9648.000	PK	45.4	38.0	9.9	40.1	2.4	55.6	73.9	18.3	100	0	
Vert.	2390.000	AV	38.5	27.7	14.8	40.7	2.4	42.7	53.9	11.2	100	202	
Vert.	4824.000	AV	36.9	31.4	7.5	41.6	2.4	36.6	53.9	17.3	100	0	
Vert.	7236.000	AV	36.4	36.6	9.1	41.2	2.4	43.3	53.9	10.6	100	0	
Vert.	9648.000	AV	35.5	38.0	9.9	40.1	2.4	45.7	53.9	8.2	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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	90.2	27.7	14.9	40.7	2.4	94.5	-	-	Carrier
Hori.	2400.000	PK	47.4	27.7	14.9	40.7	2.4	51.7	74.4	22.7	
Vert.	2412.000	PK	88.6	27.7	14.9	40.7	2.4	92.9	-	-	Carrier
Vert.	2400.000	PK	46.6	27.7	14.9	40.7	2.4	50.9	72.9	22.0	

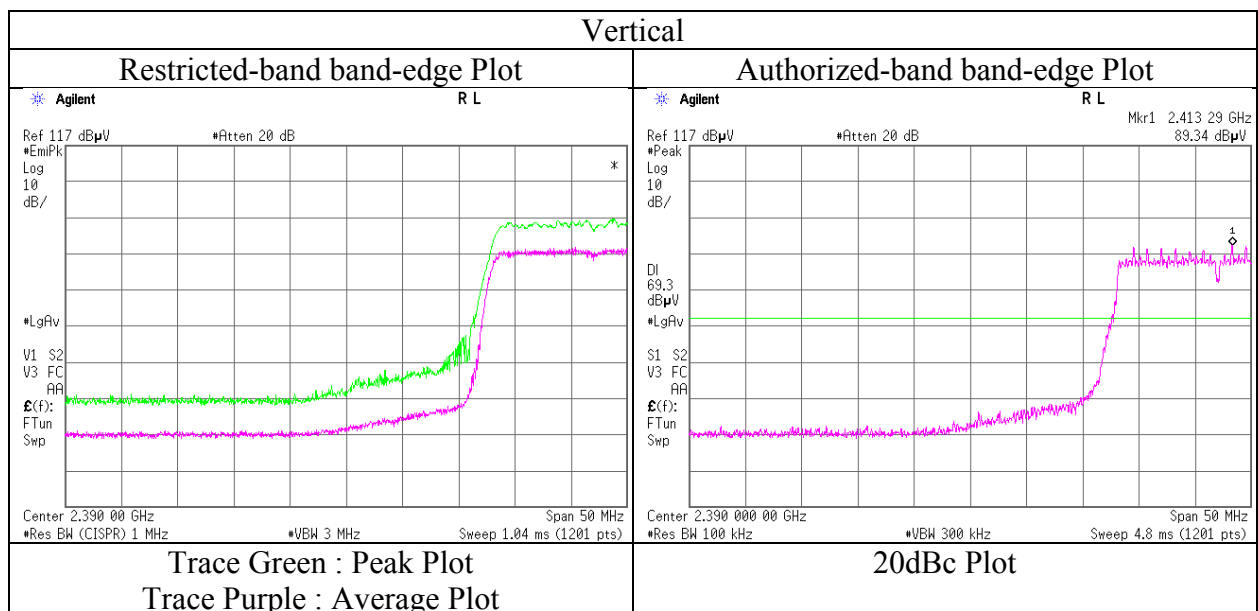
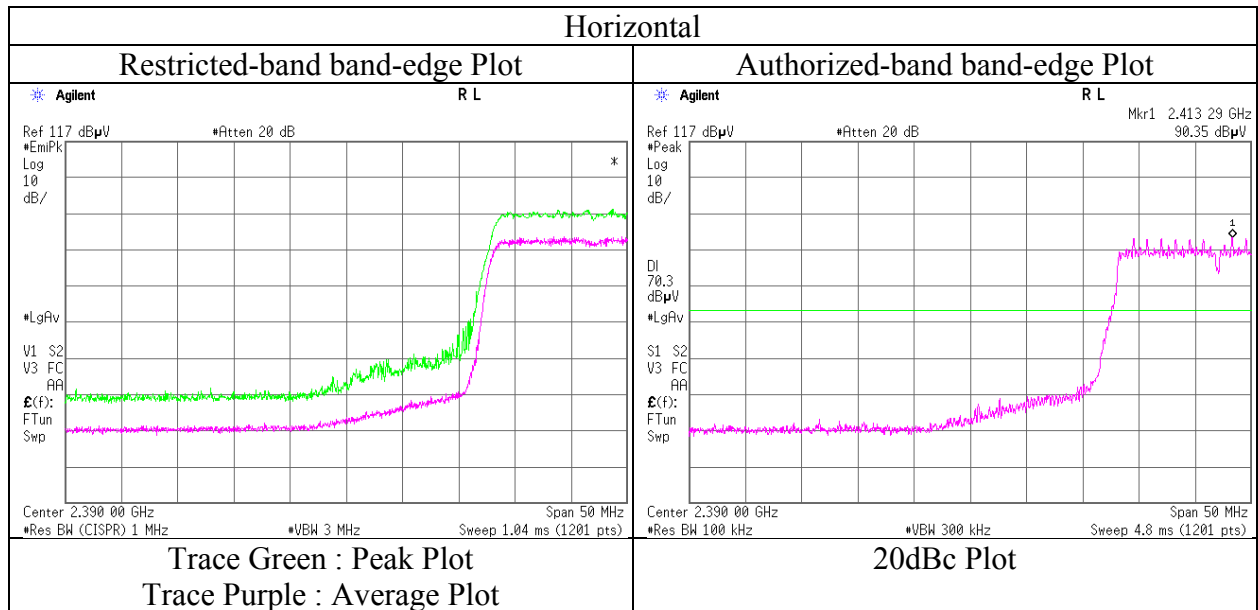
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No.	10951582S-A-R2
Date	December 3, 2015
Temperature / Humidity	20 deg. C / 39 % RH
Engineer	Akira Sato (1-13 GHz)
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 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 3, 2015 December 16, 2015 December 17, 2015
Temperature / Humidity : 20 deg. C / 39 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH
Engineer : Akira Sato Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 GHz)
Mode : Tx 11n-20 2437 MHz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	46.5	31.6	7.5	41.6	2.4	46.4	73.9	27.5	100	0	
Hori.	7311.000	PK	46.8	36.7	9.1	41.3	2.4	53.7	73.9	20.2	100	0	
Hori.	9748.000	PK	44.6	38.0	10.0	40.1	2.4	54.9	73.9	19.0	100	0	
Hori.	4874.000	AV	36.7	31.6	7.5	41.6	2.4	36.6	53.9	17.3	100	0	
Hori.	7311.000	AV	37.2	36.7	9.1	41.3	2.4	44.1	53.9	9.8	100	0	
Hori.	9748.000	AV	35.3	38.0	10.0	40.1	2.4	45.6	53.9	8.3	100	0	
Vert.	4874.000	PK	46.4	31.6	7.5	41.6	2.4	46.3	73.9	27.6	100	0	
Vert.	7311.000	PK	45.3	36.7	9.1	41.3	2.4	52.2	73.9	21.7	100	0	
Vert.	9748.000	PK	43.4	38.0	10.0	40.1	2.4	53.7	73.9	20.2	100	0	
Vert.	4874.000	AV	36.8	31.6	7.5	41.6	2.4	36.7	53.9	17.2	100	0	
Vert.	7311.000	AV	37.0	36.7	9.1	41.3	2.4	43.9	53.9	10.0	100	0	
Vert.	9748.000	AV	35.4	38.0	10.0	40.1	2.4	45.7	53.9	8.2	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber		
Report No.	10951582S-A-R2		
Date	December 3, 2015	December 16, 2015	December 17, 2015
Temperature / Humidity	20 deg. C / 39 % RH	22 deg. C / 41 % RH	22 deg. C / 37 % RH
Engineer	Akira Sato (1-13 GHz)	Tomohiro Hara (13-18 GHz)	Tomohiro Hara (18-26 GHz)
Mode	Tx 11n-20 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.2	27.8	15.0	40.7	2.4	53.7	73.9	20.2	100	161	
Hori.	4924.000	PK	47.2	31.7	7.6	41.6	2.4	47.3	73.9	26.6	100	0	
Hori.	7386.000	PK	45.8	36.7	9.1	41.3	2.4	52.7	73.9	21.2	100	0	
Hori.	9848.000	PK	45.2	38.1	10.1	40.0	2.4	55.8	73.9	18.1	100	0	
Hori.	2483.500	AV	38.9	27.8	15.0	40.7	2.4	43.4	53.9	10.5	100	161	
Hori.	4924.000	AV	37.1	31.7	7.6	41.6	2.4	37.2	53.9	16.7	100	0	
Hori.	7386.000	AV	37.3	36.7	9.1	41.3	2.4	44.2	53.9	9.7	100	0	
Hori.	9848.000	AV	35.8	38.1	10.1	40.0	2.4	46.4	53.9	7.5	100	0	
Vert.	2483.500	PK	46.6	27.8	15.0	40.7	2.4	51.1	73.9	22.8	100	156	
Vert.	4924.000	PK	46.5	31.7	7.6	41.6	2.4	46.6	73.9	27.3	100	0	
Vert.	7386.000	PK	46.0	36.7	9.1	41.3	2.4	52.9	73.9	21.0	100	0	
Vert.	9848.000	PK	43.7	38.1	10.1	40.0	2.4	54.3	73.9	19.6	100	0	
Vert.	2483.500	AV	37.4	27.8	15.0	40.7	2.4	41.9	53.9	12.0	100	156	
Vert.	4924.000	AV	37.3	31.7	7.6	41.6	2.4	37.4	53.9	16.5	100	0	
Vert.	7386.000	AV	37.0	36.7	9.1	41.3	2.4	43.9	53.9	10.0	100	0	
Vert.	9848.000	AV	35.4	38.1	10.1	40.0	2.4	46.0	53.9	7.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

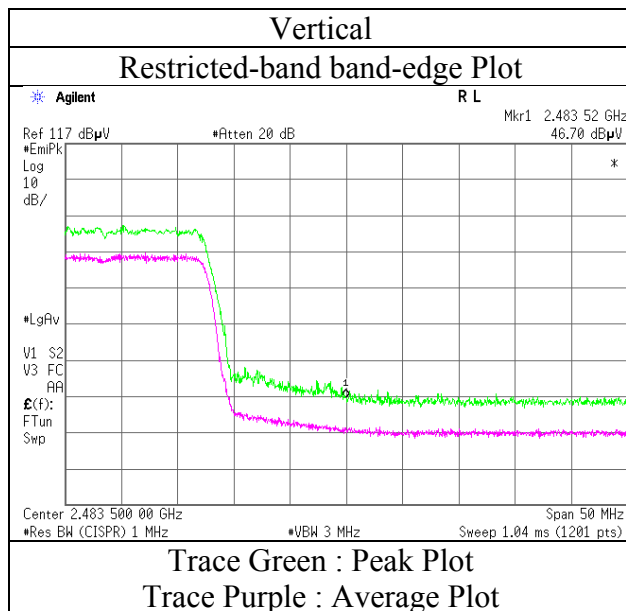
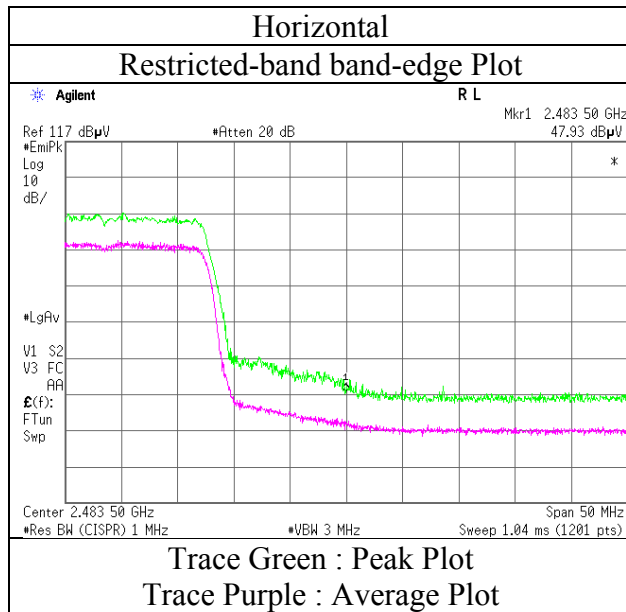
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission **(Reference Plot for band-edge)**

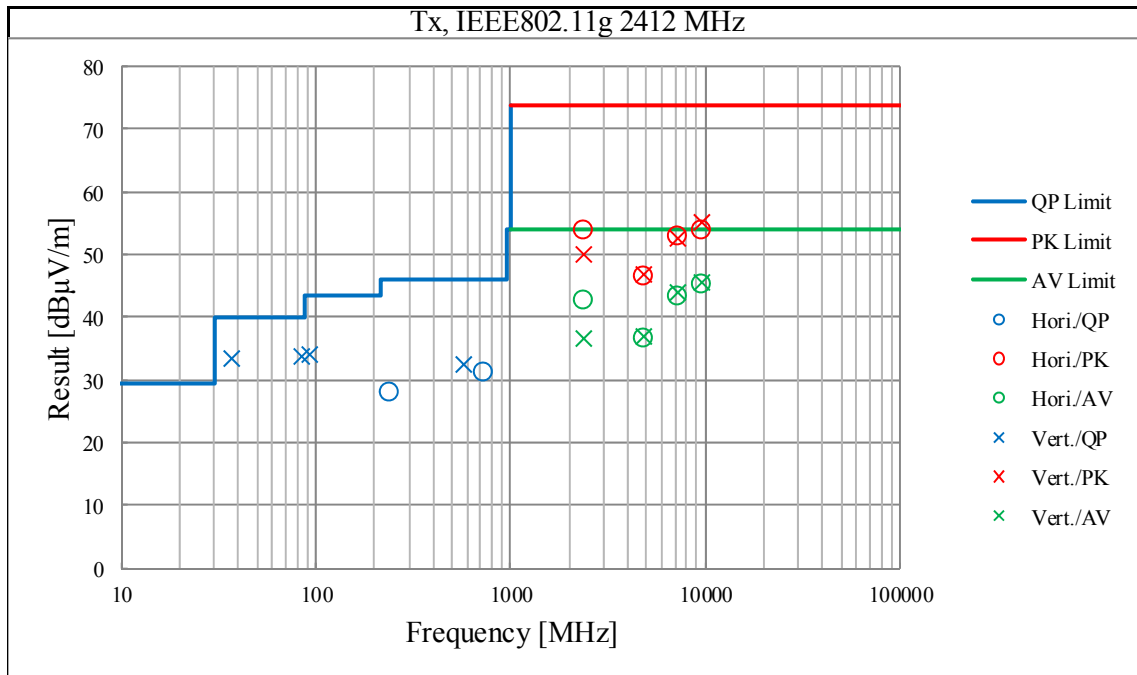
Test place Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. 10951582S-A-R2
Date December 3, 2015
Temperature / Humidity 20 deg. C / 39 % RH
Engineer Akira Sato
(1-13 GHz)
Mode Tx 11n-20 2462 MHz



* 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 2 Semi Anechoic Chamber		
Report No.	10951582S-A-R2		
Date	December 3, 2015	December 16, 2015	December 17, 2015
Temperature / Humidity	20 deg. C / 39 % RH	22 deg. C / 41 % RH	22 deg. C / 37 % RH
Engineer	Akira Sato (1-13 GHz)	Tomohiro Hara (13-18 GHz)	Tomohiro Hara (18-26 GHz)
Mode	Tx 11g 2412 MHz		



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 2, 2015 December 16, 2015 December 17, 2015 December 18, 2015
Temperature / Humidity : 20 deg. C / 37 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH 23 deg. C / 30 % RH
Engineer : Yosuke Ishikawa Tomohiro Hara Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 GHz) (30 M-1 GHz)
Mode : Tx BT LE 2402 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.	232.721	QP	37.8	17.3	9.2	31.7	0.0	32.6	46.0	13.4	138	208	
Hori.	723.638	QP	38.6	20.5	8.9	31.5	0.0	36.5	46.0	9.5	124	269	
Hori.	2390.000	PK	45.7	27.7	14.8	40.7	2.4	49.9	73.9	24.0	100	161	
Hori.	2400.000	PK	63.6	27.7	14.9	40.7	2.4	67.9	73.9	6.0	100	161	
Hori.	4804.000	PK	57.0	31.3	7.5	41.7	2.4	56.5	73.9	17.4	100	99	
Hori.	7206.000	PK	55.4	36.6	9.0	41.2	2.4	62.2	73.9	11.7	202	109	
Hori.	9608.000	PK	46.9	37.9	9.9	40.1	2.4	57.0	73.9	16.9	100	207	
Hori.	12010.000	PK	47.7	39.6	11.1	39.4	2.4	61.4	73.9	12.5	100	107	
Vert.	38.371	QP	43.6	15.0	7.0	31.9	0.0	33.7	40.0	6.3	100	249	
Vert.	84.853	QP	50.3	7.2	8.2	31.9	0.0	33.8	40.0	6.2	100	137	
Vert.	90.209	QP	47.7	8.3	8.1	31.9	0.0	32.2	43.5	11.3	100	155	
Vert.	609.640	QP	43.2	19.1	8.4	31.6	0.0	39.1	46.0	6.9	100	127	
Vert.	2390.000	PK	43.0	27.7	14.8	40.7	2.4	47.2	73.9	26.7	133	15	
Vert.	2400.000	PK	59.1	27.7	14.9	40.7	2.4	63.4	73.9	10.5	133	15	
Vert.	4804.000	PK	51.6	31.3	7.5	41.7	2.4	51.1	73.9	22.8	100	173	
Vert.	7206.000	PK	53.3	36.6	9.0	41.2	2.4	60.1	73.9	13.8	100	249	
Vert.	9608.000	PK	49.3	37.9	9.9	40.1	2.4	59.4	73.9	14.5	100	125	
Vert.	12010.000	PK	48.6	39.6	11.1	39.4	2.4	62.3	73.9	11.6	100	71	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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]	Averaging Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	
Hori.	2390.000	AV	31.4	27.7	14.8	40.7	4.1	2.4	-34.5	5.2	53.9	48.7	*1)
Hori.	2400.000	AV	34.4	27.7	14.9	40.7	4.1	2.4	-34.5	8.3	53.9	45.6	
Hori.	4804.000	AV	49.7	31.3	7.5	41.7	4.1	2.4	-34.5	18.8	53.9	35.1	
Hori.	7206.000	AV	48.6	36.6	9.0	41.2	4.1	2.4	-34.5	25.0	53.9	28.9	
Hori.	9608.000	AV	36.9	37.9	9.9	40.1	4.1	2.4	-34.5	16.6	53.9	37.3	
Hori.	12010.000	AV	37.1	39.6	11.1	39.4	4.1	2.4	-34.5	20.4	53.9	33.5	
Vert.	2390.000	AV	31.2	27.7	14.8	40.7	4.1	2.4	-34.5	5.0	53.9	48.9	*1)
Vert.	2400.000	AV	32.0	27.7	14.9	40.7	4.1	2.4	-34.5	5.9	53.9	48.0	
Vert.	4804.000	AV	42.6	31.3	7.5	41.7	4.1	2.4	-34.5	11.7	53.9	42.2	
Vert.	7206.000	AV	44.1	36.6	9.0	41.2	4.1	2.4	-34.5	20.5	53.9	33.4	
Vert.	9608.000	AV	38.4	37.9	9.9	40.1	4.1	2.4	-34.5	18.1	53.9	35.8	
Vert.	12010.000	AV	38.3	39.6	11.1	39.4	4.1	2.4	-34.5	21.6	53.9	32.3	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.97\text{ m} / 3.0\text{ m}) = 2.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

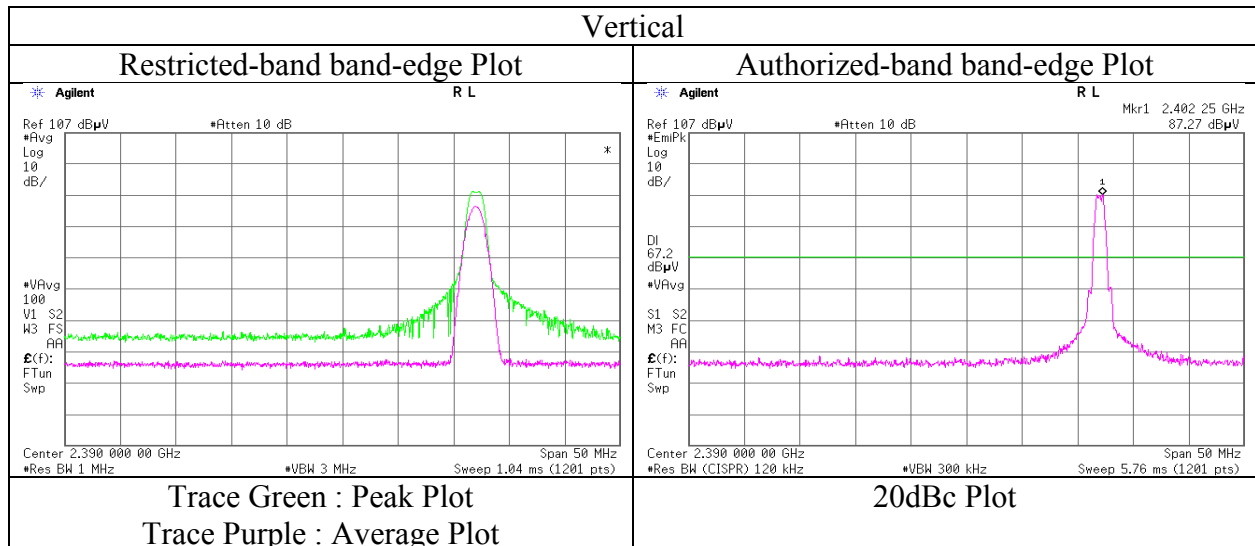
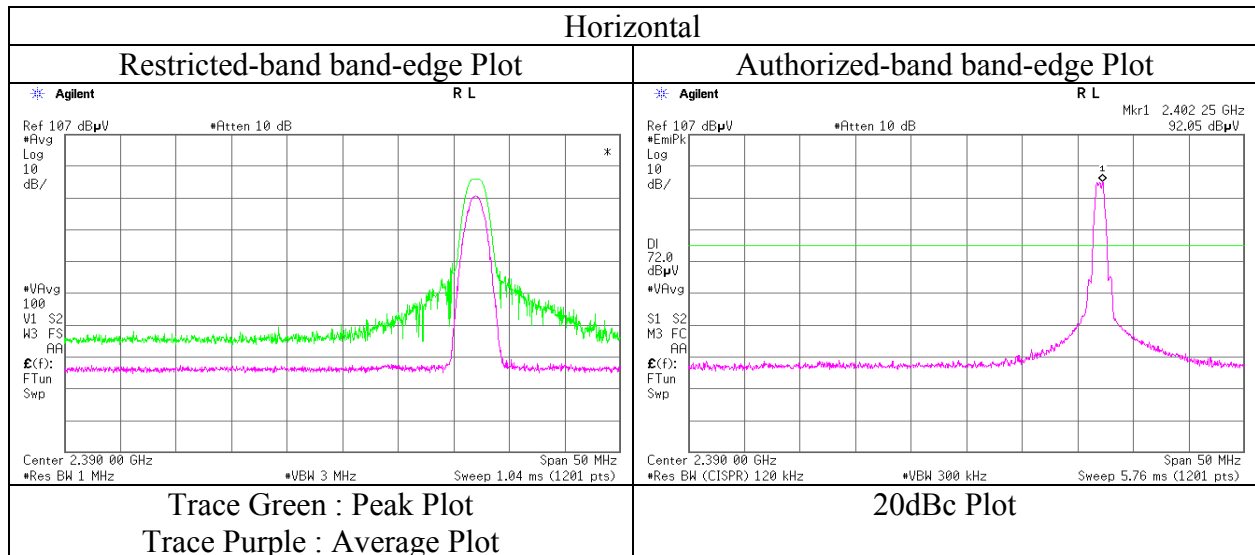
Duty factor refer to "Duty factor Calculation chart" sheet.

Averaging factor refer to "Averaging 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 and 2 Semi Anechoic Chamber
Report No.	10951582S-A-R2
Date	December 2, 2015
Temperature / Humidity	20 deg. C / 37 % RH
Engineer	Yosuke Ishikawa
	(1-13 GHz)
Mode	Tx BT LE 2402 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber			
Report No.	10951582S-A-R2			
Date	December 2, 2015	December 16, 2015	December 17, 2015	December 18, 2015
Temperature / Humidity	20 deg. C / 37 % RH	22 deg. C / 41 % RH	22 deg. C / 37 % RH	23 deg. C / 30 % RH
Engineer	Yosuke Ishikawa (1-13 GHz)	Tomohiro Hara (13-18 GHz)	Tomohiro Hara (18-26 GHz)	Tomohiro Hara (30 M-1 GHz)
Mode	Tx BT LE 2440 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.	235.290	QP	40.0	17.4	9.2	31.7	0.0	34.9	46.0	11.1	150	202	
Hori.	722.911	QP	41.0	20.4	8.9	31.5	0.0	38.8	46.0	7.2	122	284	
Hori.	4880.000	PK	55.3	31.6	7.6	41.6	2.4	55.3	73.9	18.6	100	117	
Hori.	7320.000	PK	55.2	36.7	9.1	41.3	2.4	62.1	73.9	11.8	187	110	
Hori.	9760.000	PK	46.6	38.0	10.0	40.1	2.4	56.9	73.9	17.0	100	351	
Hori.	12200.000	PK	48.0	39.6	11.2	39.2	2.4	62.0	73.9	11.9	100	138	
Vert.	38.638	QP	43.6	14.9	7.0	31.9	0.0	33.6	40.0	6.4	100	188	
Vert.	84.804	QP	49.2	7.1	8.2	31.9	0.0	32.6	40.0	7.4	100	151	
Vert.	89.702	QP	47.6	8.2	8.1	31.9	0.0	32.0	43.5	11.5	100	135	
Vert.	525.011	QP	37.6	17.9	8.0	31.6	0.0	31.9	46.0	14.1	100	204	
Vert.	4880.000	PK	50.1	31.6	7.6	41.6	2.4	50.1	73.9	23.8	100	137	
Vert.	7320.000	PK	52.6	36.7	9.1	41.3	2.4	59.5	73.9	14.4	100	101	
Vert.	9760.000	PK	47.7	38.0	10.0	40.1	2.4	58.0	73.9	15.9	100	351	
Vert.	12200.000	PK	49.5	39.6	11.2	39.2	2.4	63.5	73.9	10.4	100	52	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.4 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 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]	Averaging Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	
Hori.	4880.000	AV	48.0	31.6	7.6	41.6	4.1	2.4	-34.5	17.6	53.9	36.3	
Hori.	7320.000	AV	46.2	36.7	9.1	41.3	4.1	2.4	-34.5	22.7	53.9	31.2	
Hori.	9760.000	AV	36.3	38.0	10.0	40.1	4.1	2.4	-34.5	16.2	53.9	37.7	
Hori.	12200.000	AV	37.6	39.6	11.2	39.2	4.1	2.4	-34.5	21.2	53.9	32.7	
Vert.	4880.000	AV	41.0	31.6	7.6	41.6	4.1	2.4	-34.5	10.6	53.9	43.3	
Vert.	7320.000	AV	43.4	36.7	9.1	41.3	4.1	2.4	-34.5	19.9	53.9	34.0	
Vert.	9760.000	AV	36.2	38.0	10.0	40.1	4.1	2.4	-34.5	16.1	53.9	37.8	
Vert.	12200.000	AV	38.2	39.6	11.2	39.2	4.1	2.4	-34.5	21.8	53.9	32.1	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.4 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

Averaging factor refer to "Averaging factor Calculation chart" sheet

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 2, 2015 December 16, 2015 December 17, 2015 December 18, 2015
Temperature / Humidity : 20 deg. C / 37 % RH 22 deg. C / 41 % RH 22 deg. C / 37 % RH 23 deg. C / 30 % RH
Engineer : Yosuke Ishikawa Tomohiro Hara Tomohiro Hara Tomohiro Hara
(1-13 GHz) (13-18 GHz) (18-26 GHz) (30 M-1 GHz)
Mode : Tx BT LE 2480 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.	240.008	QP	42.0	17.5	9.3	31.7	0.0	37.1	46.0	8.9	133	209	
Hori.	719.997	QP	41.0	20.4	8.9	31.5	0.0	38.8	46.0	7.2	122	272	
Hori.	2483.500	PK	45.5	27.8	15.0	40.7	2.4	50.0	73.9	23.9	100	189	
Hori.	4960.000	PK	53.9	31.9	7.6	41.6	2.4	54.2	73.9	19.7	121	205	
Hori.	7440.000	PK	53.4	36.7	9.1	41.3	2.4	60.3	73.9	13.6	100	170	
Hori.	9920.000	PK	45.5	38.1	10.2	40.0	2.4	56.2	73.9	17.7	100	341	
Hori.	12400.000	PK	46.3	39.6	11.3	39.0	2.4	60.6	73.9	13.3	100	331	
Vert.	38.284	QP	43.7	15.0	7.0	31.9	0.0	33.8	40.0	6.2	100	213	
Vert.	84.812	QP	49.0	7.1	8.2	31.9	0.0	32.4	40.0	7.6	100	139	
Vert.	89.952	QP	46.5	8.2	8.1	31.9	0.0	30.9	43.5	12.6	100	155	
Vert.	525.008	QP	38.0	17.9	8.0	31.6	0.0	32.3	46.0	13.7	100	202	
Vert.	2483.500	PK	45.5	27.8	15.0	40.7	2.4	50.0	73.9	23.9	222	110	
Vert.	4960.000	PK	49.3	31.9	7.6	41.6	2.4	49.6	73.9	24.3	100	164	
Vert.	7440.000	PK	53.0	36.7	9.1	41.3	2.4	59.9	73.9	14.0	100	83	
Vert.	9920.000	PK	46.1	38.1	10.2	40.0	2.4	56.8	73.9	17.1	100	336	
Vert.	12400.000	PK	47.1	39.6	11.3	39.0	2.4	61.4	73.9	12.5	100	52	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.4 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 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]	Averaging Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	33.4	27.8	15.0	40.7	4.1	2.4	-34.5	7.5	53.9	46.4	*1)
Hori.	4960.000	AV	45.0	31.9	7.6	41.6	4.1	2.4	-34.5	14.9	53.9	39.0	
Hori.	7440.000	AV	43.7	36.7	9.1	41.3	4.1	2.4	-34.5	20.2	53.9	33.7	
Hori.	9920.000	AV	33.9	38.1	10.2	40.0	4.1	2.4	-34.5	14.2	53.9	39.7	
Hori.	12400.000	AV	36.2	39.6	11.3	39.0	4.1	2.4	-34.5	20.1	53.9	33.8	
Vert.	2483.500	AV	33.2	27.8	15.0	40.7	4.1	2.4	-34.5	7.3	53.9	46.6	*1)
Vert.	4960.000	AV	40.8	31.9	7.6	41.6	4.1	2.4	-34.5	10.7	53.9	43.2	
Vert.	7440.000	AV	44.1	36.7	9.1	41.3	4.1	2.4	-34.5	20.6	53.9	33.3	
Vert.	9920.000	AV	34.9	38.1	10.2	40.0	4.1	2.4	-34.5	15.2	53.9	38.7	
Vert.	12400.000	AV	37.1	39.6	11.3	39.0	4.1	2.4	-34.5	21.0	53.9	32.9	

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

Distance factor : 1 GHz - 13 GHz : 20log (3.97 m / 3.0 m) = 2.4 dB

13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.5 dB

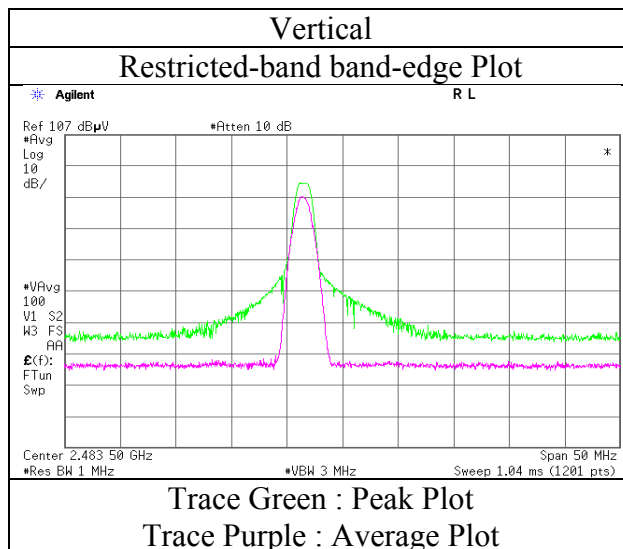
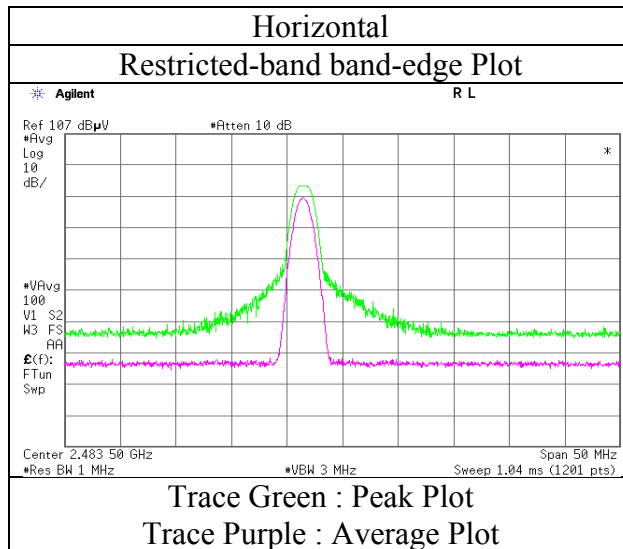
Duty factor refer to "Duty factor Calculation chart" sheet.

Averaging factor refer to "Averaging factor Calculation chart" sheet

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

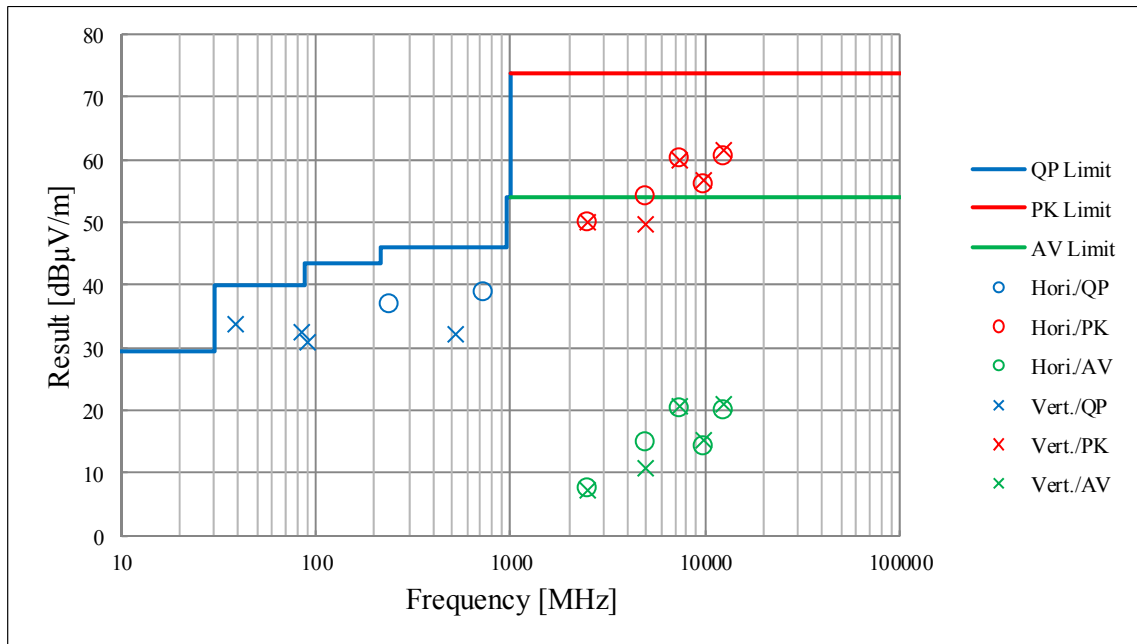
Test place : Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber
Report No. : 10951582S-A-R2
Date : December 2, 2015
Temperature / Humidity : 20 deg. C / 37 % RH
Engineer : Yosuke Ishikawa
Mode : (1-13 GHz)
Tx BT LE 2480 MHz



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

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

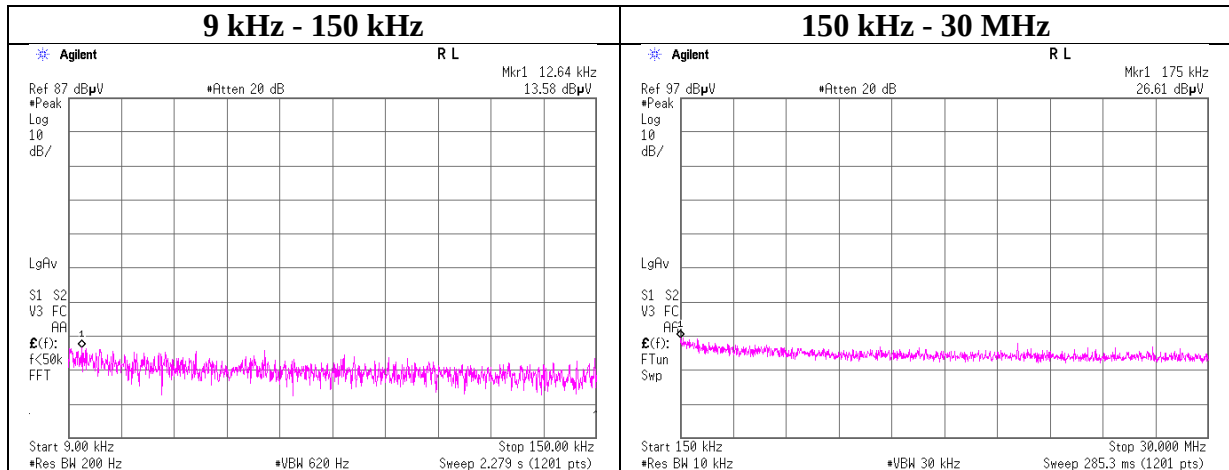
Test place	Shonan EMC Lab. No.1 and 2 Semi Anechoic Chamber			
Report No.	10951582S-A-R2			
Date	December 2, 2015	December 16, 2015	December 17, 2015	December 18, 2015
Temperature / Humidity	20 deg. C / 37 % RH	22 deg. C / 41 % RH	22 deg. C / 37 % RH	23 deg. C / 30 % RH
Engineer	Yosuke Ishikawa (1-13 GHz)	Tomohiro Hara (13-18 GHz)	Tomohiro Hara (18-26 GHz)	Tomohiro Hara (30 M-1 GHz)
Mode	Tx BT LE 2480 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. : 10951582S-A-R2
Date : November 30, 2015
Temperature / Humidity : 23 deg. C / 25 % RH
Engineer : Yosuke Ishikawa
Mode : Tx 11g 2412 MHz



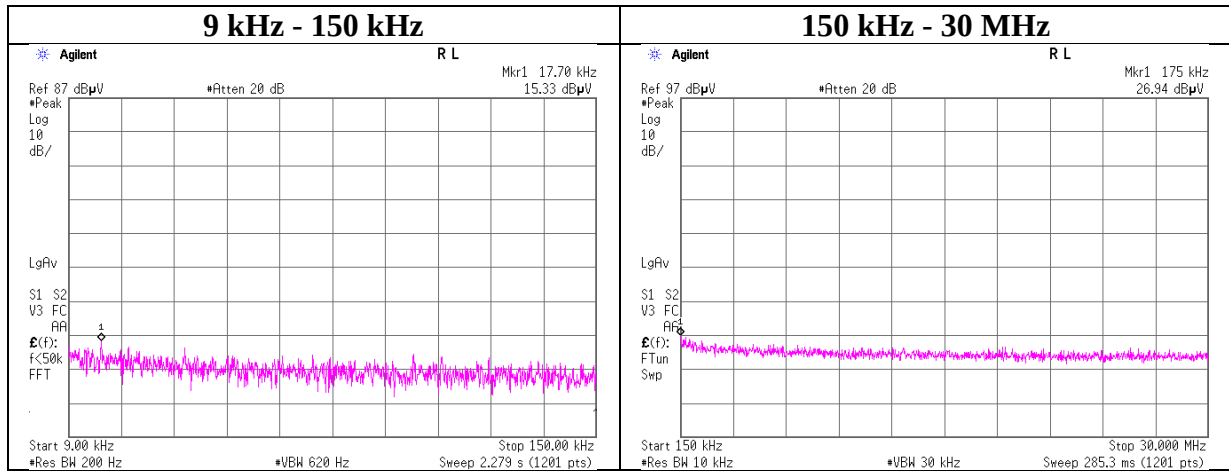
Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
12.64	-93.4	0.38	9.8	1.2	1	-82.0	300	6.0	-20.7	45.5	66.2	
175.00	-80.4	0.38	9.8	1.2	1	-69.0	300	6.0	-7.7	22.7	30.4	

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

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

Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	10951582S-A-R2
Date	November 30, 2015
Temperature / Humidity	23 deg. C / 25 % RH
Engineer	Yosuke Ishikawa
Mode	Tx BT LE 2480 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
17.70	-91.7	0.38	9.8	1.2	1	-80.3	300	6.0	-19.0	42.6	61.6	
175.00	-80.1	0.38	9.8	1.2	1	-68.6	300	6.0	-7.4	22.7	30.1	

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

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

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	10951582S-A-R2
Date	November 30, 2015
Temperature / Humidity	23 deg. C / 25 % RH
Engineer	Yosuke Ishikawa
Mode	Tx

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-21.75	1.99	9.93	-9.83	8.00	17.83
2437.00	-22.98	2.00	9.93	-11.05	8.00	19.05
2462.00	-23.01	2.01	9.93	-11.07	8.00	19.07

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-28.66	1.99	9.93	-16.74	8.00	24.74
2437.00	-28.41	2.00	9.93	-16.48	8.00	24.48
2462.00	-28.06	2.01	9.93	-16.12	8.00	24.12

11n HT20

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-27.74	1.99	9.93	-15.82	8.00	23.82
2437.00	-27.17	2.00	9.93	-15.24	8.00	23.24
2462.00	-29.07	2.01	9.93	-17.13	8.00	25.13

Bluetooth Low Energy

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402.00	-24.01	1.99	9.93	-12.09	8.00	20.09
2440.00	-24.00	2.00	9.93	-12.07	8.00	20.07
2480.00	-24.04	2.01	9.93	-12.10	8.00	20.10

Bluetooth Low Energy (Low Power)

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402.00	-36.78	2.77	10.01	-24.00	8.00	32.00
2440.00	-36.81	2.74	10.01	-24.06	8.00	32.06
2480.00	-36.92	2.76	10.01	-24.15	8.00	32.15

Sample Calculation:

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

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

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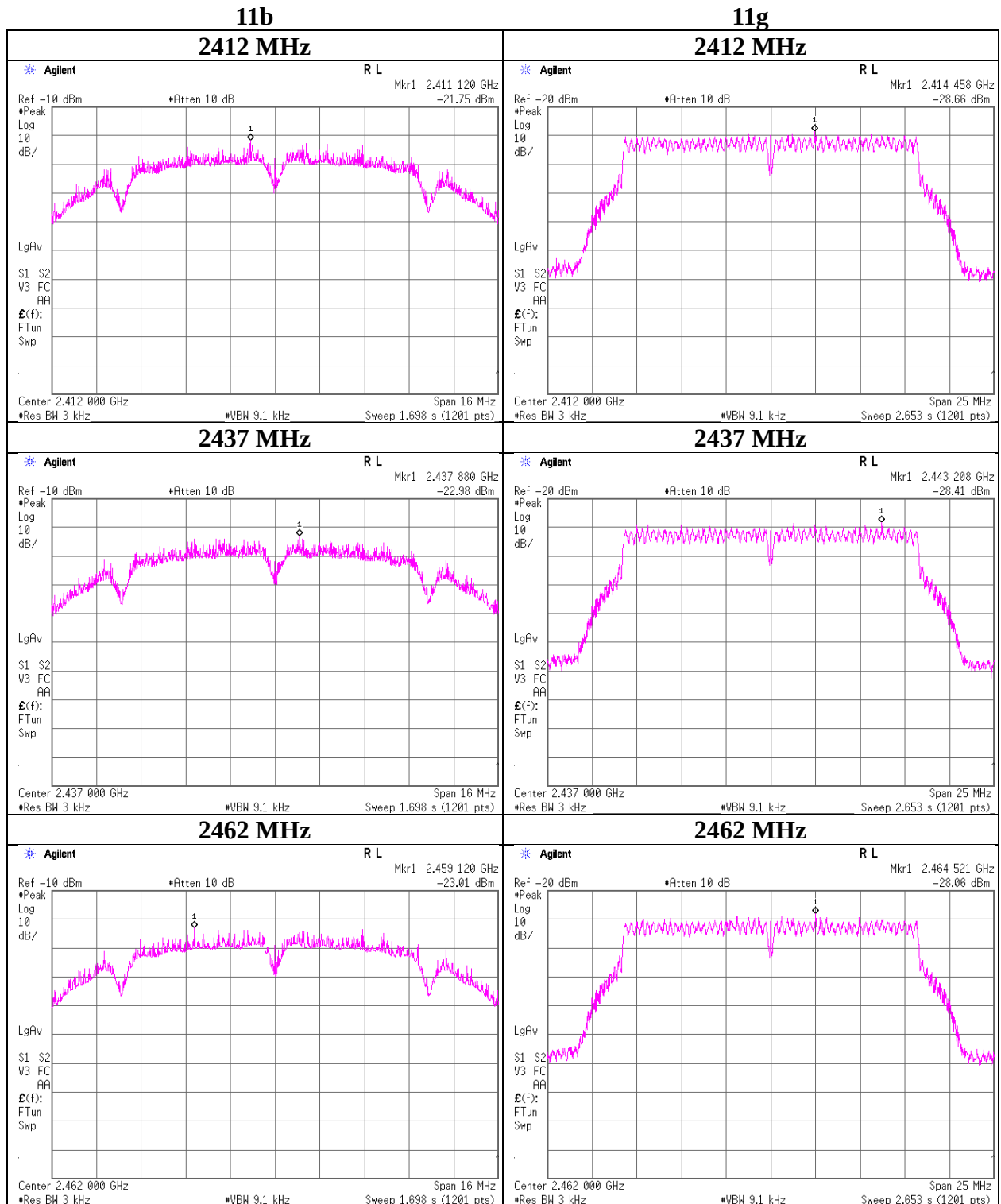
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Power Density



UL Japan, Inc.

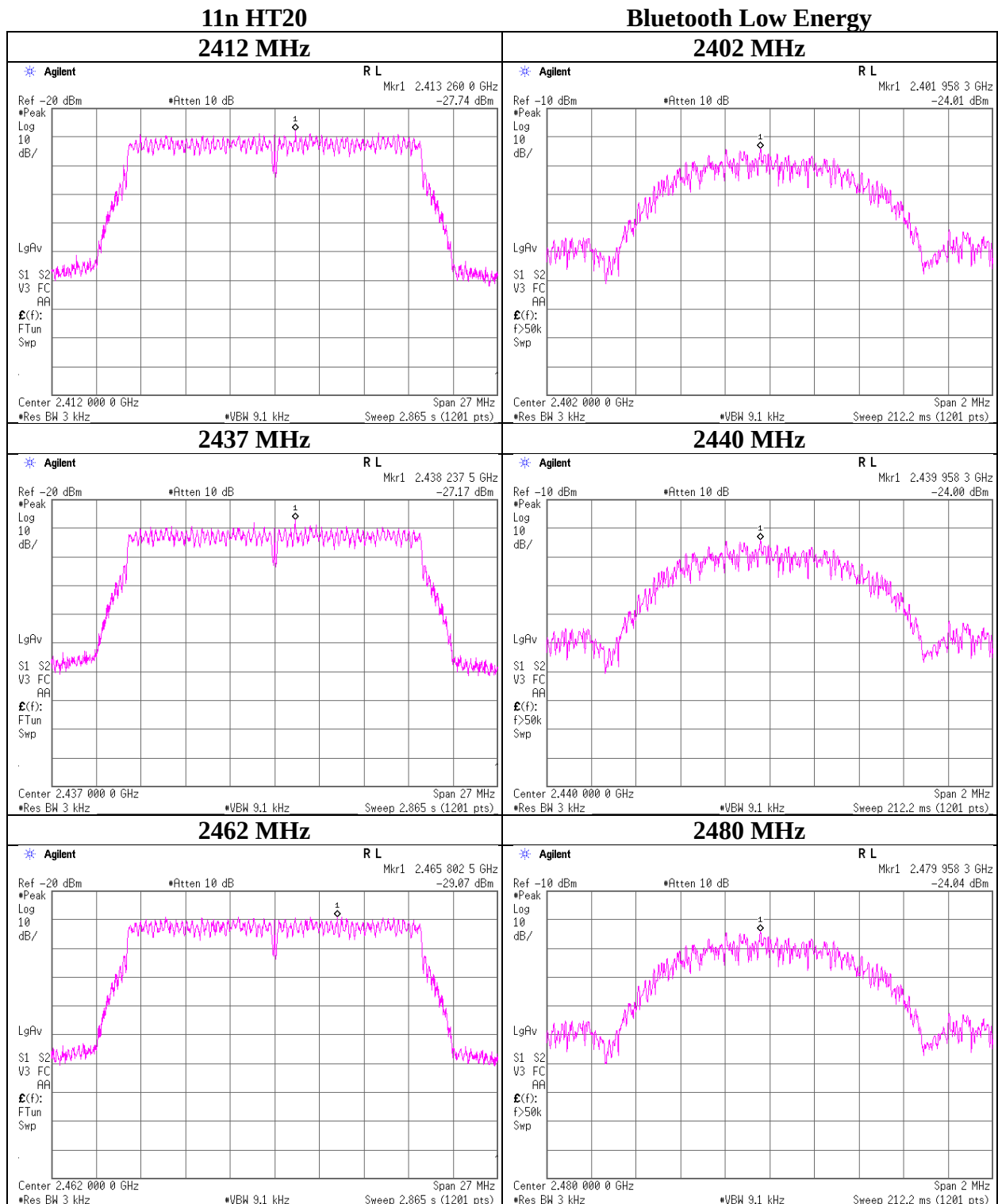
Shonan EMC Lab.

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

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Power Density



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Shonan EMC Lab.

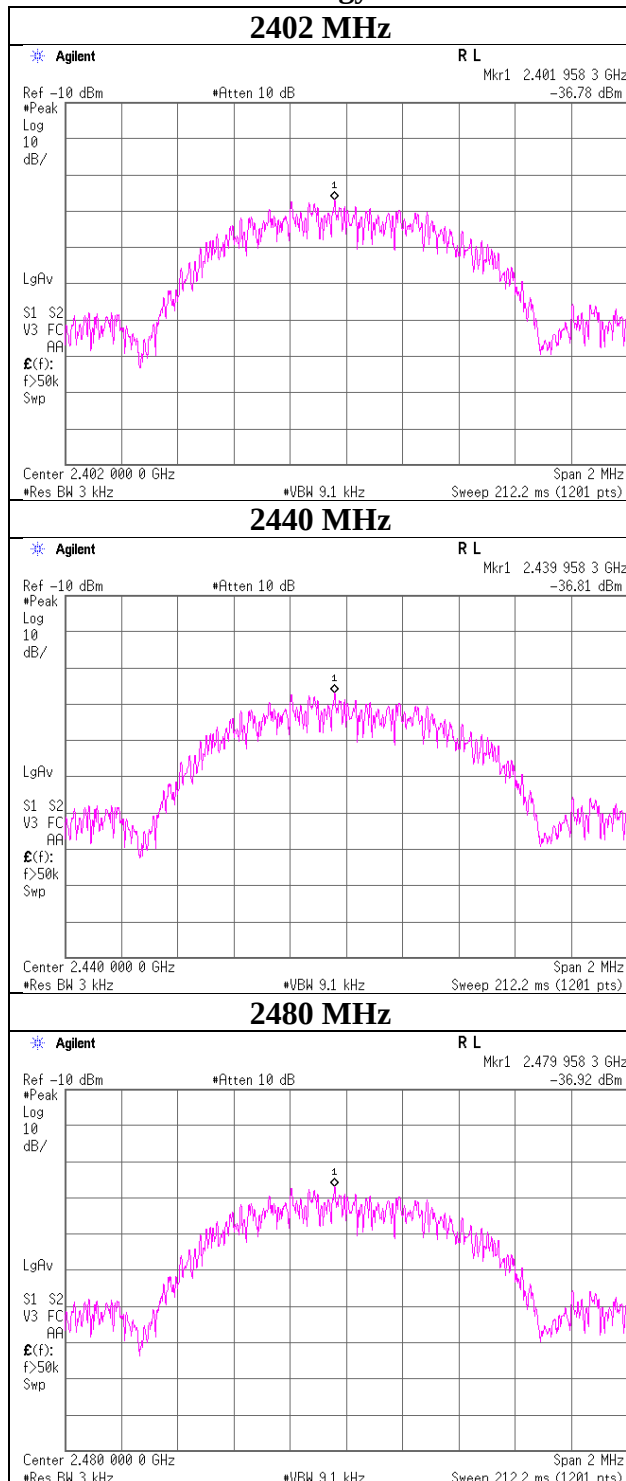
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Power Density

Bluetooth Low Energy (Low Power)



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Shonan EMC Lab.

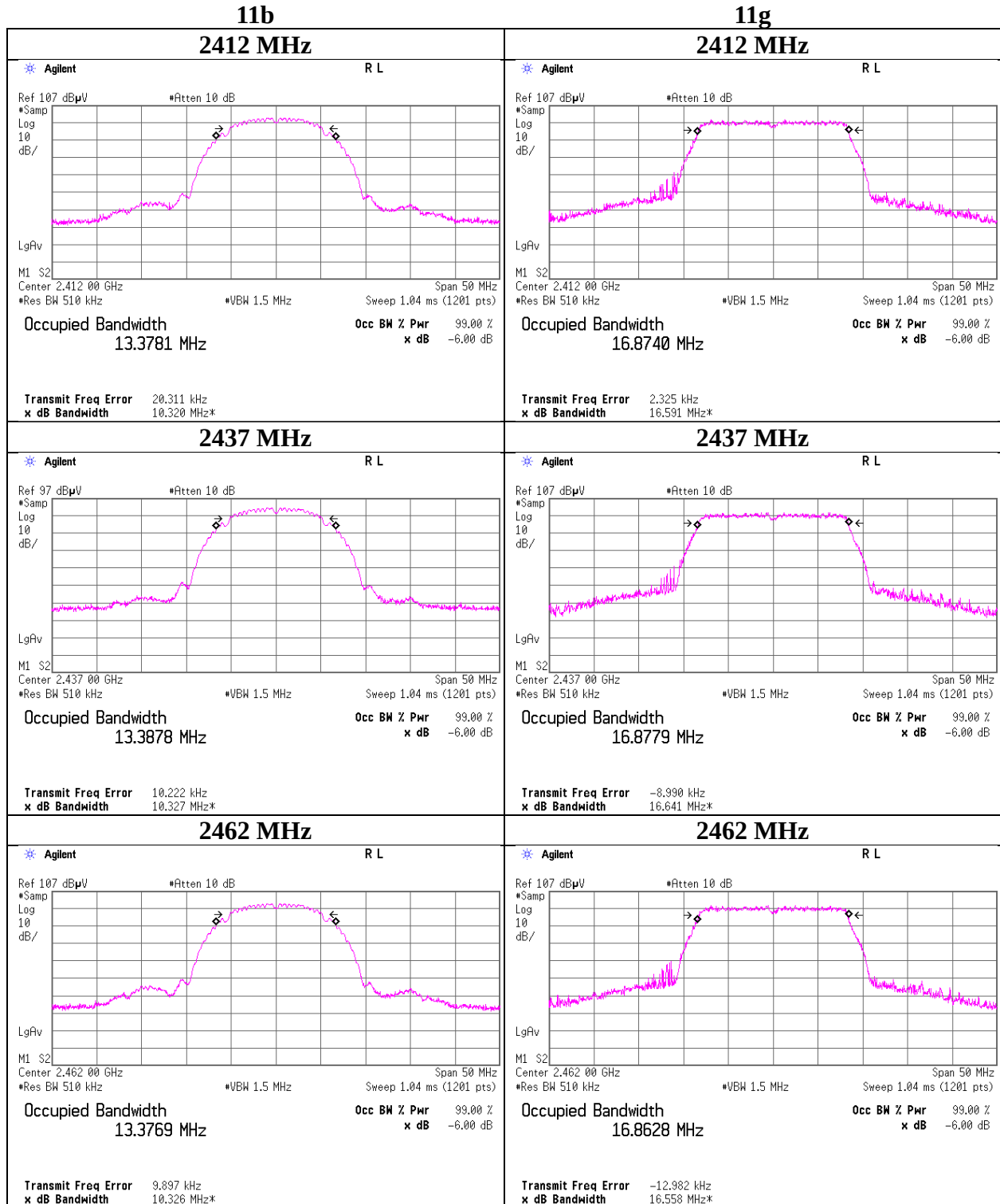
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99%Occupied Bandwidth

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 10951582S-A-R2
Date November 30, 2015
Temperature / Humidity 23 deg. C / 25 % RH
Engineer Yosuke Ishikawa
Mode Tx

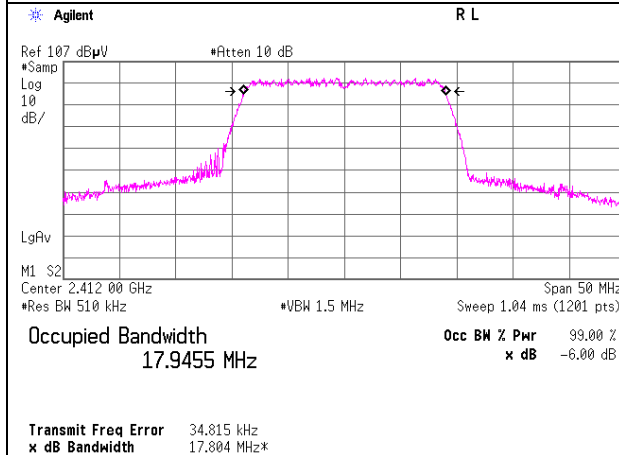


99% Occupied Bandwidth

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 10951582S-A-R2
Date : November 30, 2015
Temperature / Humidity : 23 deg. C / 25 % RH
Engineer : Yosuke Ishikawa
Mode : Tx

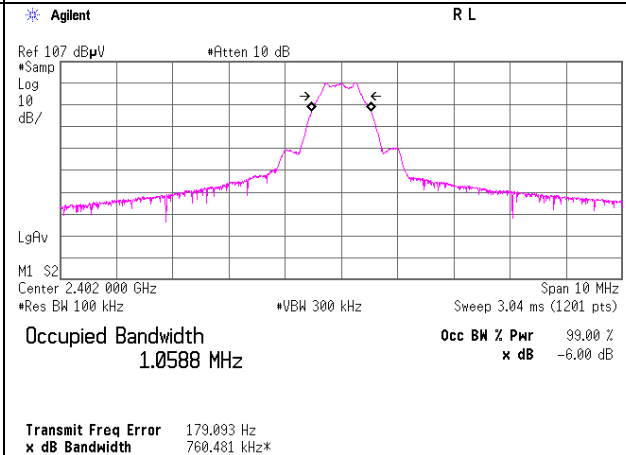
11n-20

2412 MHz

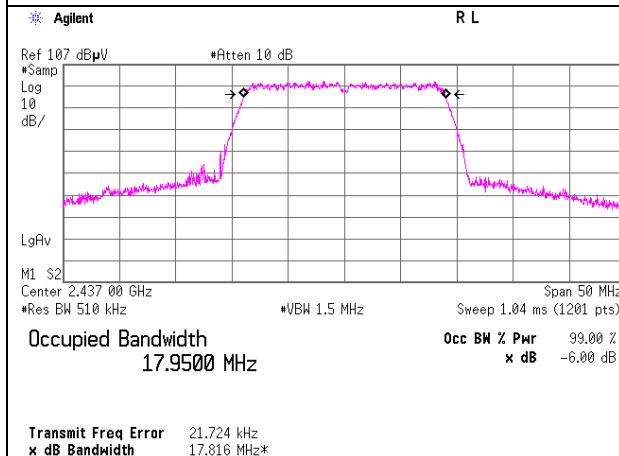


Bluetooth Low Energy

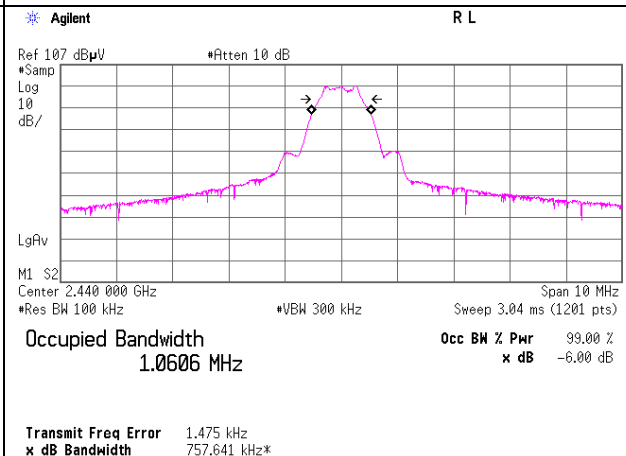
2402 MHz



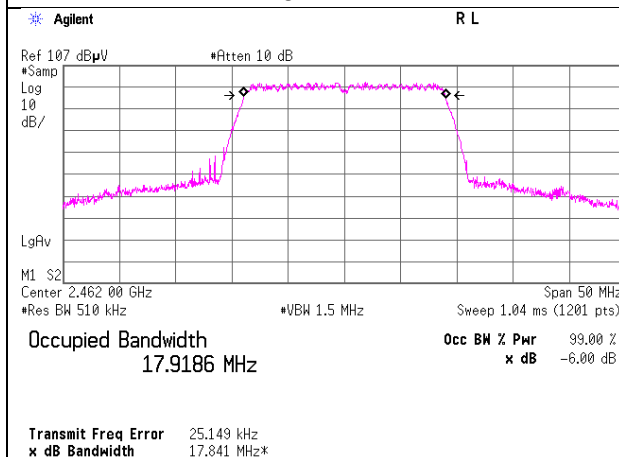
2437 MHz



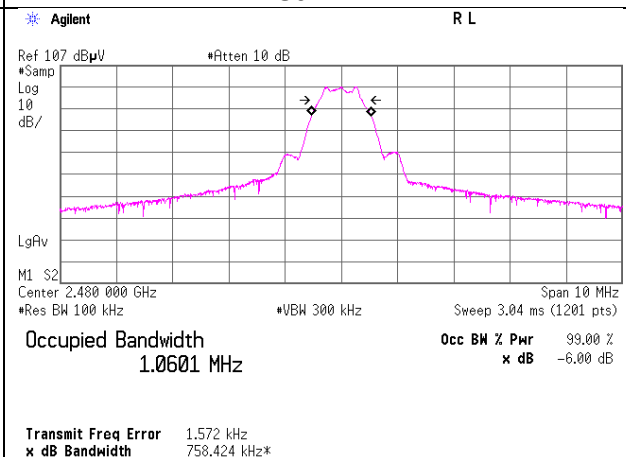
2440 MHz



2462 MHz



2480 MHz



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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2015/03/23 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2015/04/17 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2015/05/19 * 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
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2015/03/23 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVSW R)	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-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2015/04/02 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2015/04/02 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2015/04/09 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2015/03/11 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2015/07/15 * 12
KAF-04	Pre Amplifier	Agilent	8449B	3008A01600	RE	2015/04/28 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-0 37	RE	2015/05/11 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2015/05/19 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2015/08/10 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2015/10/22 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2015/03/23 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2015/03/10 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2015/03/17 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2015/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2015/03/11 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	RE	2015/03/11 * 12

SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2015/02/18 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2015/02/18 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2015/08/31 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2015/11/02 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(R F Selector)	RE	2015/04/17 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/T OYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(R F Selector)	RE	2015/04/17 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2015/11/03 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2015/10/22 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE,CE	2015/09/04 * 12
SJM-14	Measure	ASKUL	-	-	RE,CE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2015/07/15 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE,CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE,CE	2015/03/10 * 12
SCC-B12/B13/SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(R F Selector)	CE	2015/04/17 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE(EUT)	2015/02/25 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2015/02/18 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2015/12/07 * 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.

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