



RADIO TEST REPORT

Test Report No. : 11240438H-B-R1

Applicant : Sony Interactive Entertainment Inc.
Type of Equipment : Wireless communication module
Model No. : AW-CB262
FCC ID : AK8M16DAM2
Test regulation : FCC Part 15 Subpart C: 2015
*WLAN, Bluetooth Low Energy parts
Test Result : Complied

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3. This sample tested is in compliance with the above regulation.
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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 11240438H-B. 11240438H-B is replaced with this report.

Date of test: April 6 to 13, 2016

Representative test engineer:

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Takayuki Shimada
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Conducted Emission.....	12
SECTION 6: Radiated Spurious Emission	13
SECTION 7: Antenna Terminal Conducted Tests.....	15
APPENDIX 1: Test data	16
Conducted Emission	16
6dB Bandwidth	19
Maximum Peak Output Power	24
Maximum Average Output Power (Reference data for RF EXposure)	28
Radiated Spurious Emission	33
Conducted Spurious Emission	53
Power Density	57
99% Occupied Bandwidth	65
APPENDIX 2: Test instruments	68
APPENDIX 3: Photographs of test setup	69
Conducted Emission	69
Radiated Spurious Emission	70
Worst Case Position	72
Test Configuration and peripherals	75

SECTION 1: Customer information

Company Name	Sony Interactive Entertainment Inc.
Brand Name	SONY
Address	1-7-1 Konan, Minato-ku, Tokyo, 108-0075 Japan
Telephone Number	+81-3-6748-6333
Facsimile Number	+81-3-6748-6383
Contact Person	Kiyoto Sasaki

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

2.1 Identification of E.U.T.

Type of Equipment	Wireless communication module
Model No	AW-CB262
Serial No	Refer to Clause 4.2
Country of Manufacture	China/Japan
Receipt Date of Sample	April 12, 2016
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

AW-CB262 is the Wireless communication module.

Product Specification

Clock frequency in the system (radio part)	40MHz
Operating Temperature	-10 - +85 deg. C
Power Supply	DC 3.3 V / DC 1.8 V
Size	20 x 18 x 3.0mm , 55pin LGA

Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	Less than 20MHz & 5MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WA for 2.4GHz / Antenna port WB)
Antenna Gain: G _{ANT}	5.6dBi (Antenna port WA for 2.4GHz / Antenna port WB)
Directional Gain *1)	8.61dBi

WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)

Equipment Type	Transceiver
Frequency of Operation	W52: 5180-5240MHz W53: 5260-5320MHz W56: 5500-5700MHz W58: 5745-5825MHz
Type of Modulation	OFDM
Bandwidth & Channel spacing	Less than 20MHz/40MHz/80MHz&20MHz/40MHz/80MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WA for 5GHz / Antenna port WC for 5GHz)
Antenna Gain: G _{ANT}	5.0dBi (Antenna port WA for 5GHz) 3.5dBi (Antenna port WC for 5GHz)
Directional Gain *1)	7.29dBi

Bluetooth (BDR/EDR)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	79MHz & 1MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4dBi (Antenna port WC for 2.4 GHz)

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	1MHz & 2MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4dBi (Antenna port WC for 2.4 GHz)

*1) Directional antenna gain = $10 \log \left(\frac{G_{ANT1}}{10^{-20}} + \frac{G_{ANT2}}{10^{-20}} \right)^2 / 2$

*This test report applies to WLAN (2.4 GHz band) and Bluetooth Low Energy.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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 EUT complies with FCC Part 15 Subpart B: 2015, final revised on November 23, 2015

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 30.4dB, 0.15145 MHz, N 0.15000 MHz, L AV 35.3 dB, 22.48128 MHz, L	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: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.0 dB 2483.500 MHz, AV, Hori.	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

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

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

FCC Part 15.31 (e)

The EUT has the power supply regulator. However one of the input voltages to RF part doesn't go through the regulator. The stable voltage will be supplied by the end product, which will be required to have a power supply regulator. Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique coupling/antenna connector (U.FL). Therefore the equipment complies with the requirement of 15.203/212.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
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Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	

Frequency range	Conducted emission using AMN(LISN) (+dB)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	2.9 dB

Test distance	Radiated emission (+dB) 9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+dB)		(10 m*)(+dB)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

*Measurement distance

Conducted Emission test

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

Radiated emission test

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

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3.5 Test Location

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Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

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)	1Mbps, PN9
IEEE 802.11g (11g)	9Mbps, PN9
IEEE 802.11n MIMO 20MHz BW (11n-20)	MCS 0, PN9
Bluetooth Low Energy(BT LE)	Maximum Packet Size, PRBS9
*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: WLAN 8(dBm) Bluetooth (LE) Same as production model Software: Opro_DOS_Labtool_Ver2.0.0.88 *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.	

*Details of Operating mode for WLAN

Test Item	Operating Mode	Used Antenna port	Tested frequency
Conducted Emission	11n-20 Tx *1)	WA + WB	2462MHz
Spurious Emission (Conducted)	11n-20 Tx *1)	WA	2462MHz
6dB Bandwidth, 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	WA	2412MHz 2437MHz 2462MHz
Maximum Peak Output Power, Power Density	11b Tx 11g Tx 11n-20 Tx	WA + WB, WA, WB	2412MHz 2437MHz 2462MHz
Spurious Emission (Radiated)	11b Tx 11n-20 Tx *2)	WA + WB	2412MHz 2437MHz 2462MHz
*1) The test was performed on the mode as a representative, because it had the highest power at antenna terminal test. *2) The test was performed on 11n-20 Tx mode according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009, as the 11n-20 Tx mode had higher power than 11g mode at antenna terminal test.			

*Details of Operating mode for BT LE

Test Item	Operating Mode	Tested frequency
Conducted Emission, 6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth, Spurious Emission (Radiated / Conducted)	BT LE	2402MHz 2440MHz 2480MHz

*Simultaneously transmission

Test Item	Mode *1)
Spurious Emission (Radiated)	Tx BT LE 2402 MHz + 11a 5180 MHz Tx BT LE 2440 MHz + 11a 5180 MHz Tx BT LE 2480 MHz + 11a 5180 MHz
*1) The test was performed on the mode as a representative, because it had the highest power of 5GHz band at antenna terminal test.	

4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Conducted Emission

Test Procedure and conditions

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

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

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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

SECTION 6: Radiated Spurious Emission

Test Procedure

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

[For below 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 1.0 m, raised 1.5 m above the conducting ground plane.

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

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

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

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

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

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

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz	20 dBc
Instrument used	Test Receiver	Spectrum Analyzer	Spectrum Analyzer
Detector	QP	PK	AV *1)
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: <u>12.2.5.1 (11b/g/n-20)</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces <u>12.2.5.2 (BT LE)</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.
Test Distance	3m	4.45 m / 4.5 m *2) (1 GHz – 10GHz), 1 m *3) (10 GHz – 26.5 GHz)	4.45 m / 4.5 m *2) (1 GHz – 10GHz), 1 m *3) (10 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: $20 \times \log(4.45 \text{ m} / 3.0 \text{ m}) = 3.43 \text{ dB}$ (for WLAN) / $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.52 \text{ dB}$ (for BT LE)

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

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

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

Measurement range : 30 M - 26.5 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	2 MHz / 20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

*1) Peak hold was applied as Worst-case measurement.

*2) Reference data

*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r05".

*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.

(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)

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

Test data : APPENDIX

Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

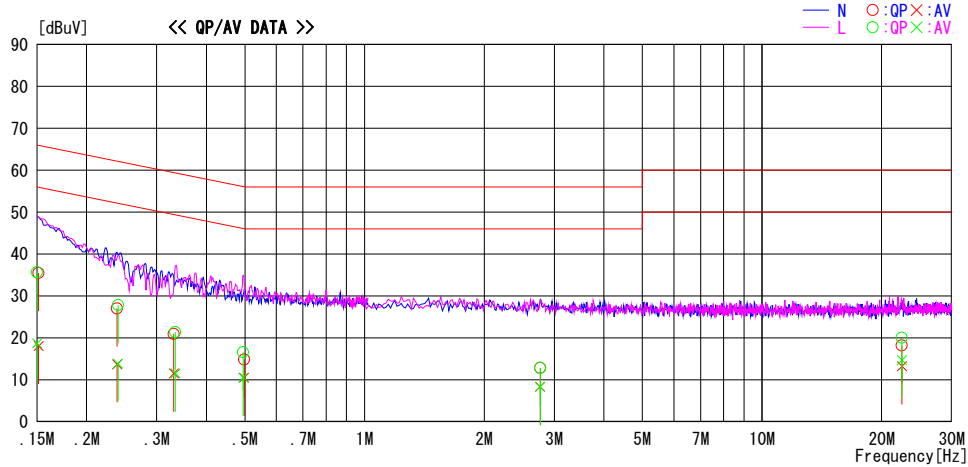
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/04/13

Report No. : 11240438H

Temp./Humi. : 24deg. C / 52% RH
Engineer : Yuta Moriya

Mode / Remarks : Tx WLAN 11n-20 2462MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV		QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15145	22.3	4.9	13.2	35.5	18.1	65.9	55.9	30.4	37.8	N	
0.23845	13.8	0.5	13.2	27.0	13.7	62.2	52.2	35.2	38.5	N	
0.33125	7.6	-1.8	13.3	20.9	11.5	59.4	49.4	38.5	37.9	N	
0.49800	1.5	-2.8	13.3	14.8	10.5	56.0	46.0	41.2	35.5	N	
2.76377	-0.7	-5.2	13.5	12.8	8.3	56.0	46.0	43.2	37.7	N	
22.48128	3.6	-1.4	14.6	18.2	13.2	60.0	50.0	41.8	36.8	N	
0.15000	22.4	5.5	13.2	35.6	18.7	66.0	56.0	30.4	37.3	L	
0.23990	14.6	0.7	13.2	27.8	13.9	62.1	52.1	34.3	38.2	L	
0.33415	8.1	-1.8	13.3	21.4	11.5	59.3	49.3	37.9	37.8	L	
0.49510	3.3	-2.8	13.3	16.6	10.5	56.1	46.1	39.5	35.6	L	
2.76377	-0.7	-5.2	13.5	12.8	8.3	56.0	46.0	43.2	37.7	L	
22.48128	5.4	0.1	14.6	20.0	14.7	60.0	50.0	40.0	35.3	L	

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

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Conducted Emission

DATA OF CONDUCTED EMISSION TEST

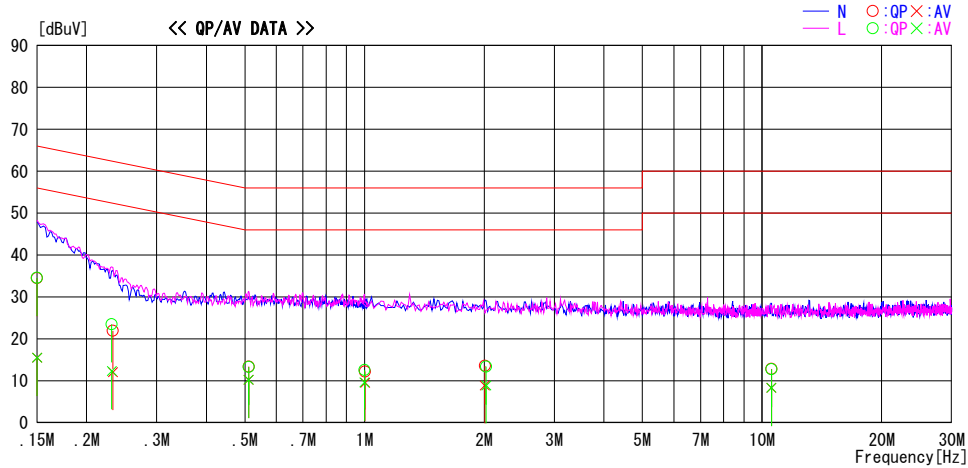
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/04/13

Report No. : 11240438H

Temp./Humi. : 24deg. C / 52% RH
Engineer : Yuta Moriya

Mode / Remarks : Tx BT LE 2402 MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	21.3	2.3	13.2	34.5	15.5	66.0	56.0	31.5	40.5	N	
0.23265	8.7	-1.1	13.2	21.9	12.1	62.4	52.4	40.5	40.3	N	
0.51105	0.1	-3.1	13.3	13.4	10.2	56.0	46.0	42.6	35.8	N	
1.00260	-1.1	-3.8	13.3	12.2	9.5	56.0	46.0	43.8	36.5	N	
2.00794	0.2	-4.5	13.4	13.6	8.9	56.0	46.0	42.4	37.1	N	
10.55150	-1.2	-5.7	14.0	12.8	8.3	60.0	50.0	47.2	41.7	N	
0.15000	21.4	2.3	13.2	34.6	15.5	66.0	56.0	31.4	40.5	L	
0.23120	10.3	-0.9	13.2	23.5	12.3	62.4	52.4	38.9	40.1	L	
0.51105	0.0	-3.1	13.3	13.3	10.2	56.0	46.0	42.7	35.8	L	
0.99970	-0.7	-3.7	13.3	12.6	9.6	56.0	46.0	43.4	36.4	L	
2.02305	0.0	-4.5	13.4	13.4	8.9	56.0	46.0	42.6	37.1	L	
10.55150	-1.3	-5.7	14.0	12.7	8.3	60.0	50.0	47.3	41.7	L	

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

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Ise EMC Lab.

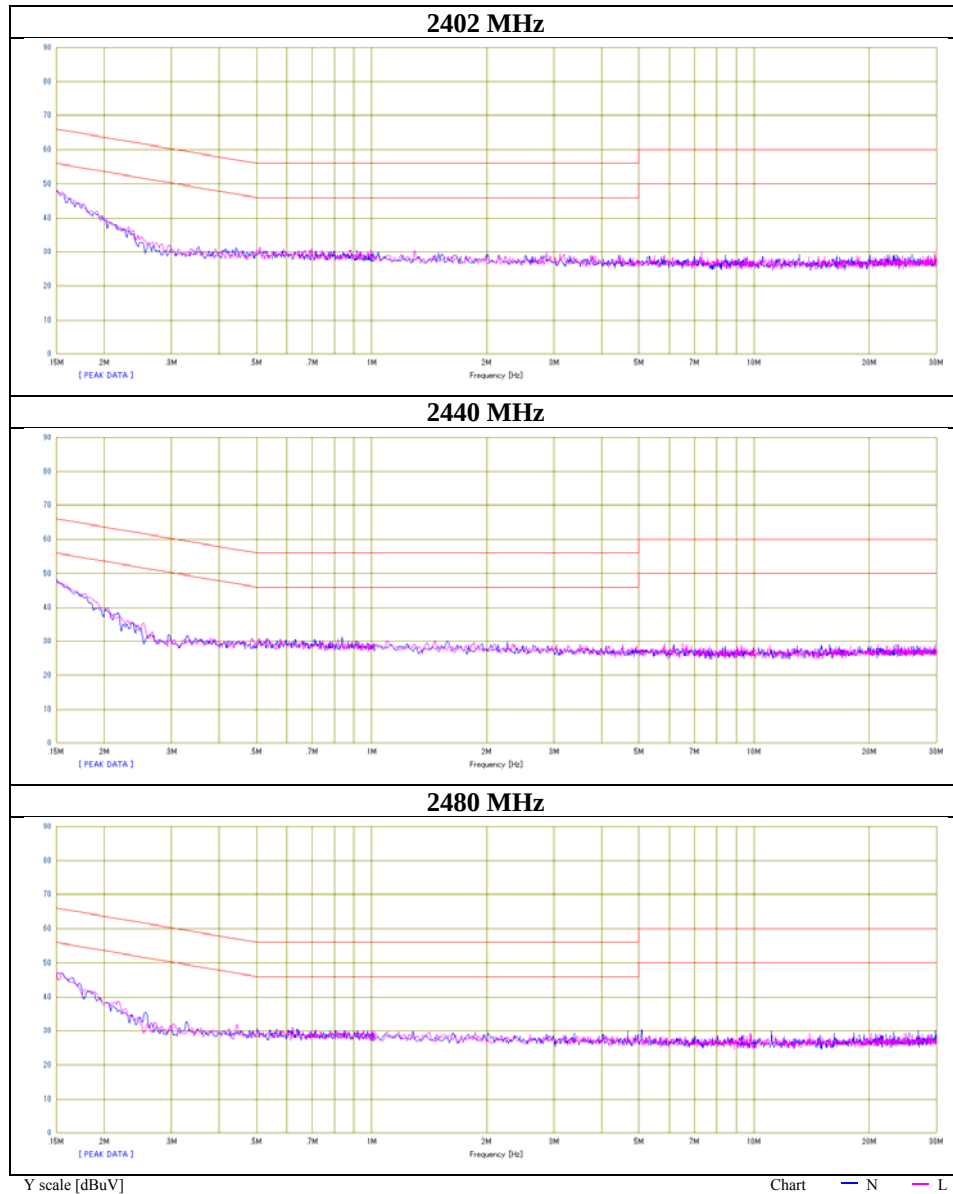
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Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 13, 2016
Temperature / Humidity	24 deg. C / 52 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE



6dB Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 11240438H
Date April 7, 2016
Temperature / Humidity 25deg. C / 40% RH
Engineer Takumi Shimada
Mode Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	10.024	> 500
	2437	10.070	> 500
	2462	10.059	> 500
11g	2412	16.375	> 500
	2437	16.393	> 500
	2462	16.398	> 500
11n-20	2412	17.563	> 500
	2437	17.580	> 500
	2462	17.623	> 500

6dB Bandwidth



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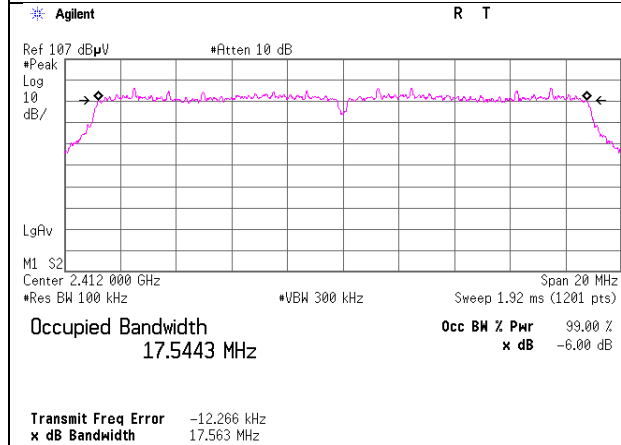
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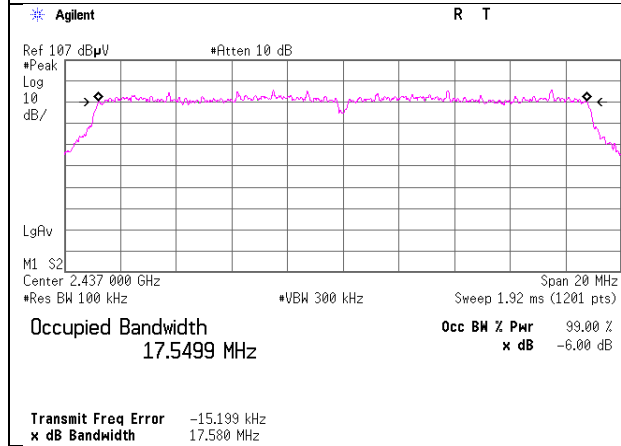
6dB Bandwidth

11n-20

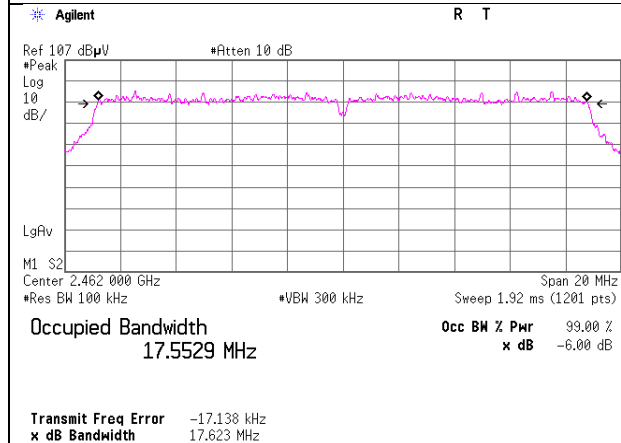
2412 MHz



2437 MHz



2462 MHz



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6dB Bandwidth

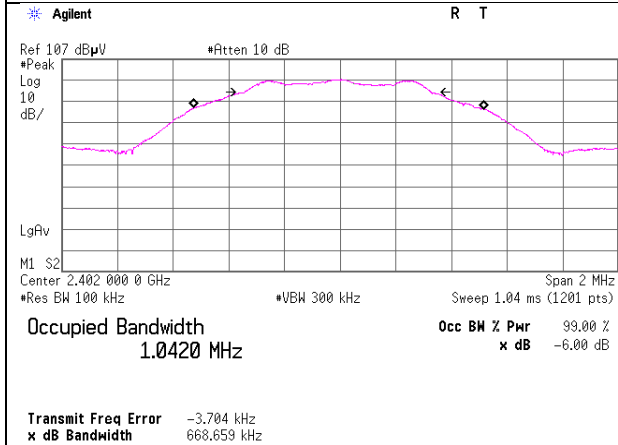
Test place Ise EMC Lab. No.11Measurement Room
Report No. 11240438H
Date April 7, 2016
Temperature / Humidity 25deg. C / 40% RH
Engineer Takumi Shimada
Mode Tx BT LE

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
BT LE	2402	0.669	> 500
	2440	0.666	> 500
	2480	0.677	> 500

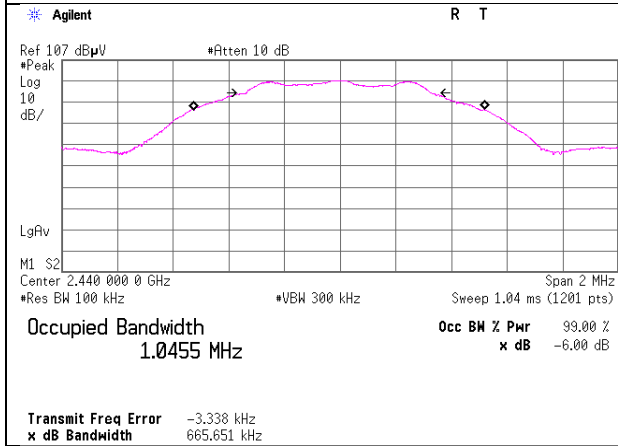
6dB Bandwidth

BT LE

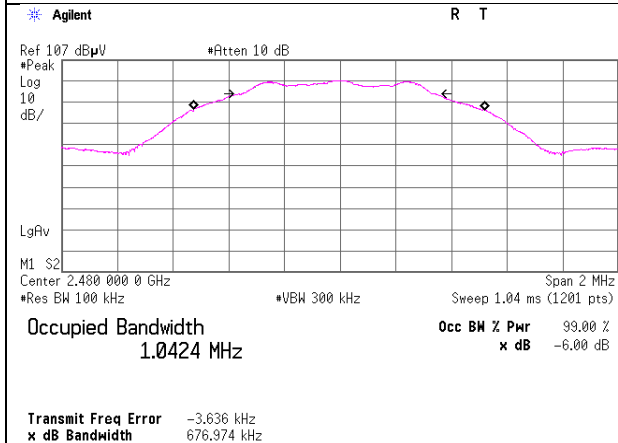
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 6, 2016
Temperature/ Humidity	23deg. C / 40 % RH
Engineer	Kazuya Yoshioka
Mode	11b Tx

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	14.45	14.32	14.59	28.78	27.39	548.27	12.80
2437	13.68	13.80	14.39	27.48	27.39	548.27	13.00
2462	14.19	14.79	14.62	28.98	27.39	548.27	12.77

Sample Calculation:

Result = Antenna port WA + WB

*This Limit was reduced by 2.61dB for directional gain of the antenna/antenna array exceeding 6 dBi.

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	1.36	0.50	9.74	11.60	14.45
2437	1.12	0.50	9.74	11.36	13.68
2462	1.28	0.50	9.74	11.52	14.19

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	1.32	0.50	9.74	11.56	14.32
2437	1.16	0.50	9.74	11.40	13.80
2462	1.46	0.50	9.74	11.70	14.79

Sample Calculation:

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

2437MHz

Rate [Mbps]	Antenna port WA Reading Peak		Antenna port WB Reading Peak		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
1	1.12	1.29	1.16	1.31	4.15	2.60	*
2	1.09	1.29	1.15	1.30	4.13	2.59	
5.5	0.58	1.14	0.67	1.17	3.64	2.31	
11	0.62	1.15	0.81	1.21	3.73	2.36	

*: Worst Rate

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 6, 2016
Temperature/ Humidity	23deg. C / 40 % RH
Engineer	Kazuya Yoshioka
Mode	11g Tx

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	102.80	138.68	23.83	241.48	27.39	548.27	3.56
2437	100.46	125.03	23.53	225.49	27.39	548.27	3.86
2462	108.64	123.88	23.66	232.52	27.39	548.27	3.73

Sample Calculation:

Result = Antenna port WA + WB

*This Limit was reduced by 2.61dB for directional gain of the antenna/antenna array exceeding 6 dBi.

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	9.88	0.50	9.74	20.12	102.80
2437	9.78	0.50	9.74	20.02	100.46
2462	10.12	0.50	9.74	20.36	108.64

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	11.18	0.50	9.74	21.42	138.68
2437	10.73	0.50	9.74	20.97	125.03
2462	10.69	0.50	9.74	20.93	123.88

Sample Calculation:

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

2437MHz

Rate [Mbps]	Antenna port WA Reading Peak		Antenna port WB Reading Peak		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
6	8.77	7.53	9.73	9.40	12.29	16.93	
9	9.78	9.51	10.73	11.83	13.29	21.34	*
12	7.79	6.01	8.56	7.18	11.20	13.19	
18	8.17	6.56	8.83	7.64	11.52	14.20	
24	9.09	8.11	9.44	8.79	12.28	16.90	
36	8.89	7.74	9.12	8.17	12.02	15.91	
48	8.54	7.14	9.23	8.38	11.91	15.52	
54	8.45	7.00	8.94	7.83	11.71	14.83	

*: Worst Rate

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 6, 2016
Temperature/ Humidity	23deg. C / 40 % RH
Engineer	Kazuya Yoshioka
Mode	11n-20 Tx

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	111.43	135.21	23.92	246.64	27.39	548.27	3.47
2437	98.40	121.06	23.41	219.46	27.39	548.27	3.98
2462	117.76	138.68	24.09	256.44	27.39	548.27	3.30

Sample Calculation:

Result = Antenna port WA + WB

*This Limit was reduced by 2.61dB for directional gain of the antenna/antenna array exceeding 6 dBi.

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	10.23	0.50	9.74	20.47	111.43
2437	9.69	0.50	9.74	19.93	98.40
2462	10.47	0.50	9.74	20.71	117.76

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	11.07	0.50	9.74	21.31	135.21
2437	10.59	0.50	9.74	20.83	121.06
2462	11.18	0.50	9.74	21.42	138.68

Sample Calculation:

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

2437MHz

MCS Number	Antenna port WA Reading Peak		Antenna port WB Reading Peak		Total Reading Power		Remark
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
0	9.69	9.31	10.59	11.46	13.17	20.77	*
1	9.33	8.57	9.96	9.91	12.67	18.48	
2	8.91	7.78	9.99	9.98	12.49	17.76	
3	8.71	7.43	9.27	8.45	12.01	15.88	
4	8.62	7.28	8.84	7.66	11.74	14.93	
5	9.00	7.94	9.04	8.02	12.03	15.96	
6	8.73	7.46	9.07	8.07	11.91	15.54	
7	8.95	7.85	9.18	8.28	12.08	16.13	
8	8.76	7.52	9.17	8.26	11.98	15.78	
9	7.75	5.96	9.08	8.09	11.48	14.05	
10	8.66	7.35	9.40	8.71	12.06	16.05	
11	9.00	7.94	9.02	7.98	12.02	15.92	
12	8.46	7.01	8.80	7.59	11.64	14.60	
13	8.43	6.97	8.67	7.36	11.56	14.33	
14	9.38	8.67	9.73	9.40	12.57	18.07	
15	9.02	7.98	9.26	8.43	12.15	16.41	

*Worst MCS

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

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Ise EMC Lab.

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Maximum Peak Output Power

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 11240438H
Date April 7, 2016
Temperature/ Humidity 25deg. C / 40% RH
Engineer Takumi Shimada
Mode Tx BT LE

Freq. [MHz]	Reading Peak [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-8.08	0.50	9.74	2.16	1.64	29.60	912	27.44
2440	-8.11	0.50	9.74	2.13	1.63	29.60	912	27.47
2480	-8.10	0.50	9.74	2.14	1.64	29.60	912	27.46

Sample Calculation:

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

*This Limit was reduced by 0.4 dB for directional gain of the antenna/antenna array exceeding

Maximum Average Output Power (Reference data for RF EXposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 6, 2016
Temperature/ Humidity	23deg. C / 40 % RH
Engineer	Kazuya Yoshioka
Mode	11b Tx

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Time average)	
			[dBm]	[mW]
2412	8.07	8.09	12.09	16.16
2437	7.36	7.74	11.79	15.11
2462	8.00	8.11	12.87	19.35

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2412	-1.17	0.50	9.74	9.07	8.07
2437	-1.57	0.50	9.74	8.67	7.36
2462	-1.21	0.50	9.74	9.03	8.00

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2412	-1.16	0.50	9.74	9.08	8.09
2437	-1.35	0.50	9.74	8.89	7.74
2462	-1.15	0.50	9.74	9.09	8.11

Sample Calculation:

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

Maximum Average Output Power (Reference data for RF EXposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 6, 2016
Temperature/ Humidity	23deg. C / 40 % RH
Engineer	Kazuya Yoshioka
Mode	11g Tx

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Time average)	
			[dBm]	[mW]
2412	7.16	7.29	11.60	14.46
2437	6.59	6.84	11.28	13.43
2462	6.85	6.98	11.41	13.84

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2412	-1.69	0.50	9.74	8.55	7.16
2437	-2.05	0.50	9.74	8.19	6.59
2462	-1.88	0.50	9.74	8.36	6.85

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2412	-1.61	0.50	9.74	8.63	7.29
2437	-1.89	0.50	9.74	8.35	6.84
2462	-1.80	0.50	9.74	8.44	6.98

Sample Calculation:

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

Maximum Average Output Power (Reference data for RF EXposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 6, 2016
Temperature/ Humidity	23deg. C / 40 % RH
Engineer	Kazuya Yoshioka
Mode	11n-20 Tx

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Time average)	
			[dBm]	[mW]
2412	7.28	7.41	11.67	14.69
2437	6.75	7.13	11.42	13.87
2462	6.95	7.00	11.45	13.95

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2412	-1.62	0.50	9.74	8.62	7.28
2437	-1.95	0.50	9.74	8.29	6.75
2462	-1.82	0.50	9.74	8.42	6.95

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2412	-1.54	0.50	9.74	8.70	7.41
2437	-1.71	0.50	9.74	8.53	7.13
2462	-1.79	0.50	9.74	8.45	7.00

Sample Calculation:

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

Maximum Average Output Power (Reference data for RF EXposure)

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 11240438H
Date : April 7, 2016
Temperature/ Humidity : 25deg. C / 40% RH
Engineer : Takumi Shimada
Mode : Tx BT LE

Freq. [MHz]	Reading Average [dBm]	Cable Loss [dB]	Atten. [dB]	Result (Time average)	
				[dBm]	[mW]
2402	-10.37	0.50	9.74	-0.13	0.97
2440	-10.39	0.50	9.74	-0.15	0.97
2480	-10.42	0.50	9.74	-0.18	0.96

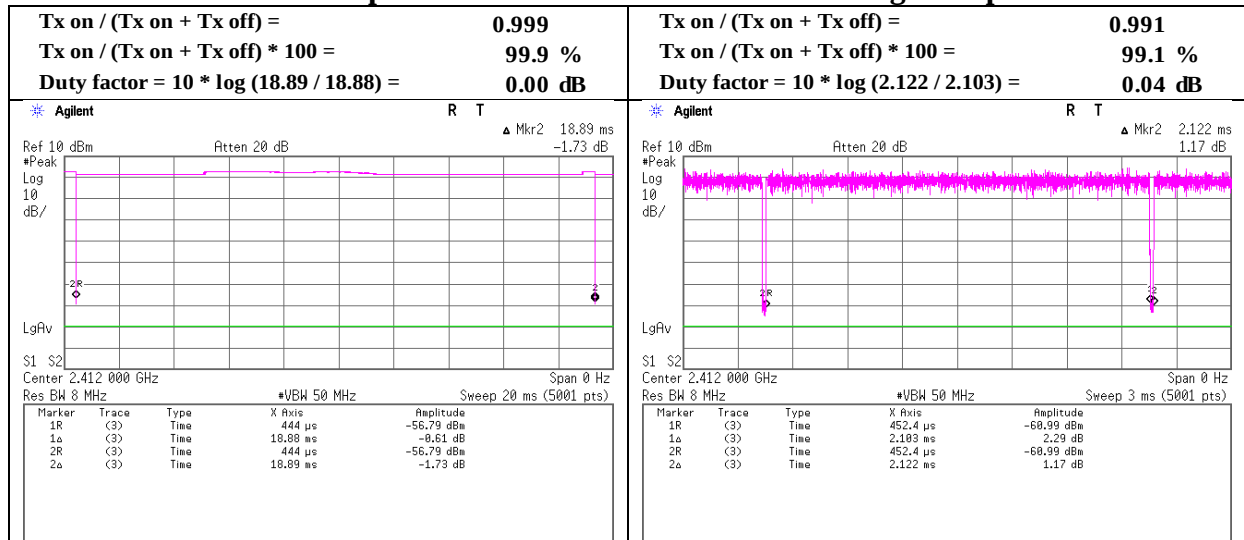
Sample Calculation:

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

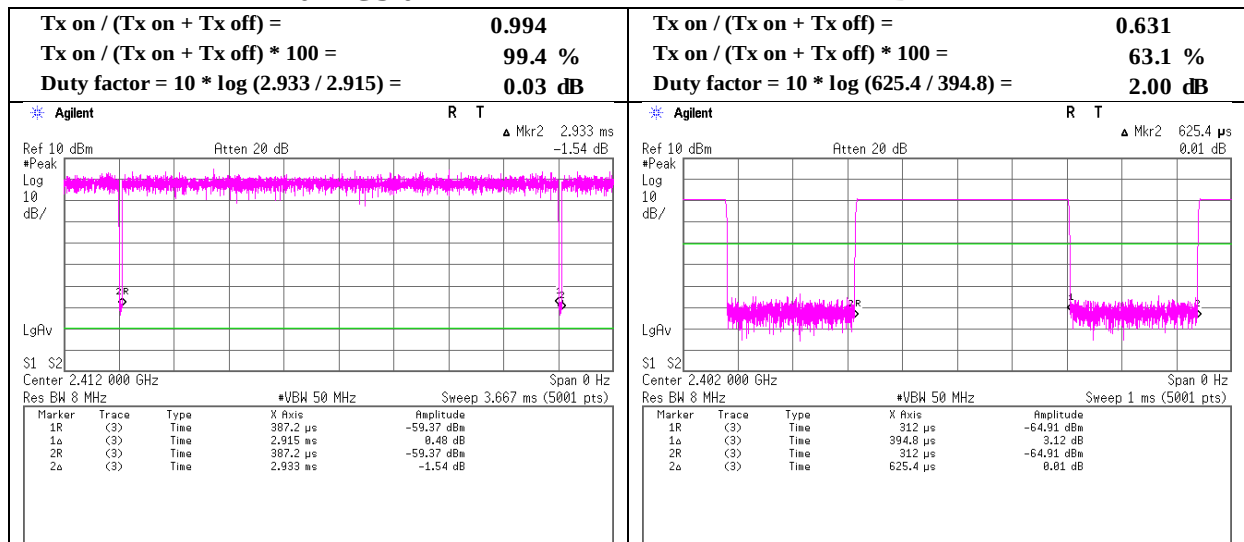
Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx

11b 1 Mbps



11n-20 MCS 0



Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11240438H	
Date	April 9, 2016	April 10, 2016
Temperature / Humidity	23 deg. C / 46 % RH	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka (1-10GHz)	Yuta Moriya (Above 10GHz)
Mode	Tx 11b 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	43.7	26.9	6.7	32.7	44.6	73.9	29.3	
Hori	4824.000	PK	42.2	31.8	8.9	31.8	51.1	73.9	22.8	
Hori	7236.000	PK	39.5	36.0	10.1	32.6	53.0	73.9	20.9	Floor Noise
Hori	9648.000	PK	40.7	38.2	9.5	33.3	55.1	73.9	18.8	Floor Noise
Hori	2390.000	AV	36.9	26.9	6.7	32.7	37.8	53.9	16.1	
Hori	4824.000	AV	35.9	31.8	8.9	31.8	44.8	53.9	9.1	
Hori	7236.000	AV	31.6	36.0	10.1	32.6	45.1	53.9	8.8	Floor Noise
Hori	9648.000	AV	32.7	38.2	9.5	33.3	47.1	53.9	6.8	Floor Noise
Vert	2390.000	PK	42.8	26.9	6.7	32.7	43.7	73.9	30.2	
Vert	4824.000	PK	42.4	31.8	8.9	31.8	51.3	73.9	22.6	
Vert	7236.000	PK	39.8	36.0	10.1	32.6	53.3	73.9	20.6	Floor Noise
Vert	9648.000	PK	40.9	38.2	9.5	33.3	55.3	73.9	18.6	Floor Noise
Vert	2390.000	AV	36.3	26.9	6.7	32.7	37.2	53.9	16.7	
Vert	4824.000	AV	36.7	31.8	8.9	31.8	45.6	53.9	8.3	
Vert	7236.000	AV	31.6	36.0	10.1	32.6	45.1	53.9	8.8	Floor Noise
Vert	9648.000	AV	32.7	38.2	9.5	33.3	47.1	53.9	6.8	Floor Noise

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

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

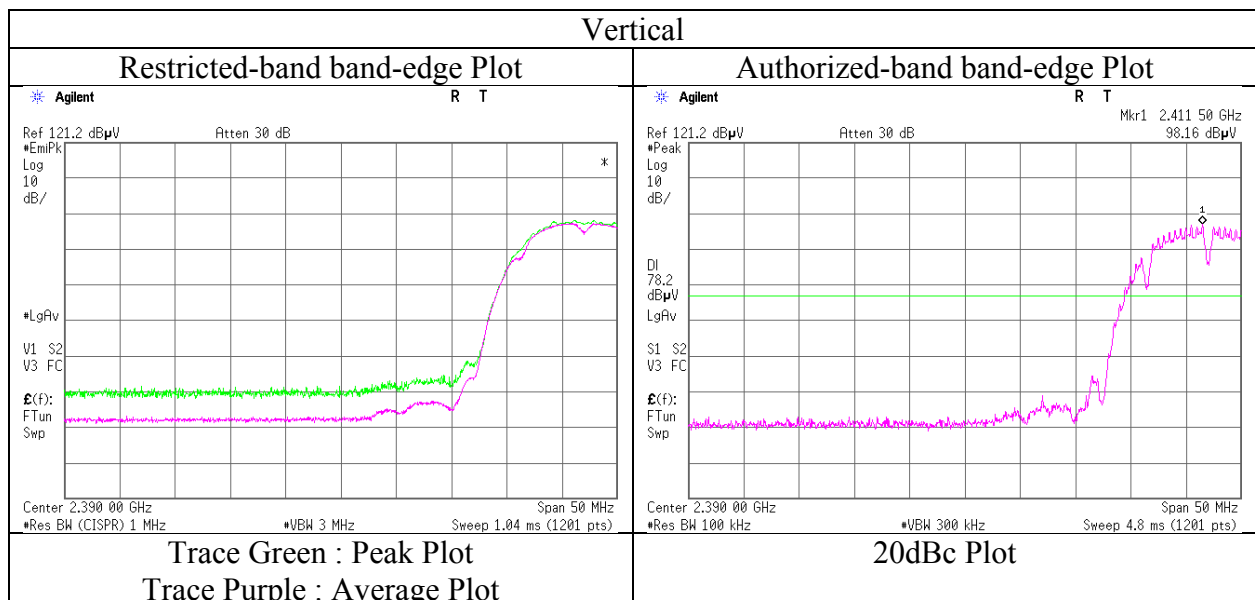
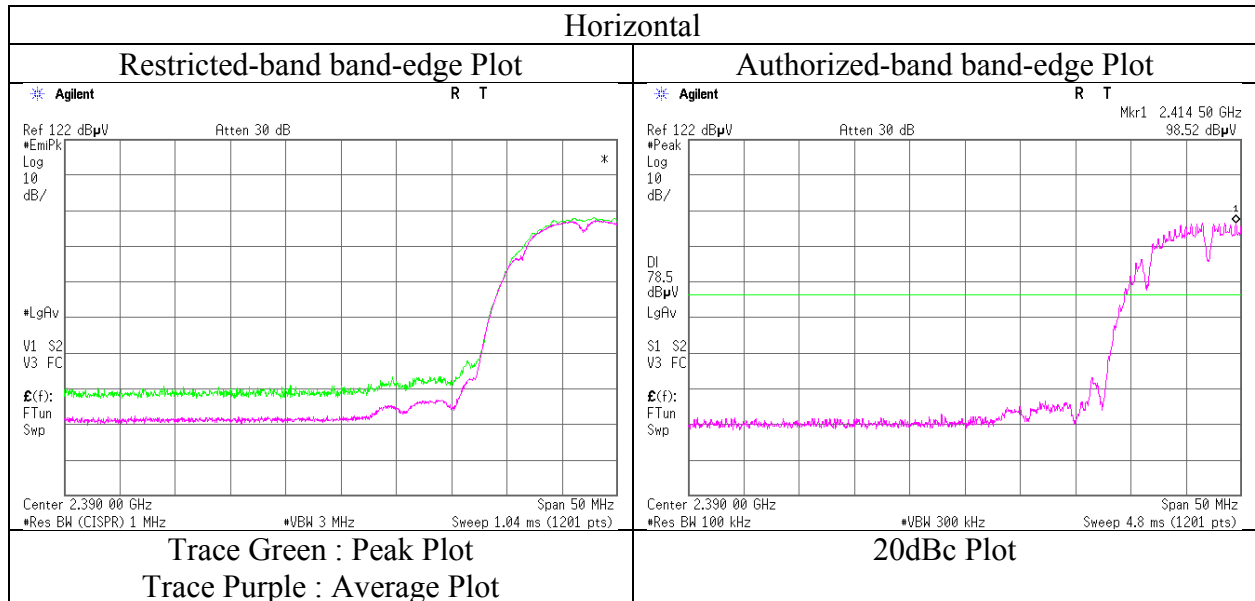
Distance factor: 1 GHz - 10 GHz 20log (4.45m / 3.0 m) = 3.43 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	98.5	26.9	6.7	32.7	99.4	-	-	Carrier
Hori	2400.000	PK	46.1	26.9	6.7	32.7	47.0	79.4	32.4	
Vert	2412.000	PK	98.2	26.9	6.7	32.7	99.1	-	-	Carrier
Vert	2400.000	PK	47.6	26.9	6.7	32.7	48.5	79.1	30.6	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 9, 2016
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Kazuya Yoshioka
Mode	Tx 11b 2412 MHz



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

UL Japan, Inc.

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 9, 2016 April 10, 2016
Temperature / Humidity	23 deg. C / 46 % RH 23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka Yuta Moriya
	(1-10GHz) (Above 10GHz)
Mode	Tx 11b 2437 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	39.8	31.9	8.9	31.7	48.9	73.9	25.0	
Hori	7311.000	PK	39.9	36.0	10.2	32.6	53.5	73.9	20.4	Floor Noise
Hori	9748.000	PK	40.5	38.2	9.5	33.3	54.9	73.9	19.0	Floor Noise
Hori	4874.000	AV	33.6	31.9	8.9	31.7	42.7	53.9	11.2	
Hori	7311.000	AV	31.8	36.0	10.2	32.6	45.4	53.9	8.5	Floor Noise
Hori	9748.000	AV	32.5	38.2	9.5	33.3	46.9	53.9	7.0	Floor Noise
Vert	4874.000	PK	40.0	31.9	8.9	31.7	49.1	73.9	24.8	
Vert	7311.000	PK	39.7	36.0	10.2	32.6	53.3	73.9	20.6	Floor Noise
Vert	9748.000	PK	40.3	38.2	9.5	33.3	54.7	73.9	19.2	Floor Noise
Vert	4874.000	AV	34.0	31.9	8.9	31.7	43.1	53.9	10.8	
Vert	7311.000	AV	31.8	36.0	10.2	32.6	45.4	53.9	8.5	Floor Noise
Vert	9748.000	AV	32.5	38.2	9.5	33.3	46.9	53.9	7.0	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.45m / 3.0 m) = 3.43 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11240438H
Date : April 9, 2016 April 10, 2016
Temperature / Humidity : 23 deg. C / 46 % RH 23 deg. C / 37 % RH
Engineer : Kazuya Yoshioka Yuta Moriya
 (1-10GHz) (Above 10GHz)
Mode : Tx 11b 2462 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	44.4	26.9	6.7	32.6	45.4	73.9	28.5	
Hori	4924.000	PK	40.4	32.0	8.8	31.7	49.5	73.9	24.4	
Hori	7386.000	PK	39.9	36.0	10.1	32.7	53.3	73.9	20.6	Floor Noise
Hori	9848.000	PK	41.0	38.2	9.5	33.3	55.4	73.9	18.5	Floor Noise
Hori	2483.500	AV	34.6	26.9	6.7	32.6	35.6	53.9	18.3	
Hori	4924.000	AV	31.8	32.0	8.8	31.7	40.9	53.9	13.0	
Hori	7386.000	AV	29.7	36.0	10.1	32.7	43.1	53.9	10.8	Floor Noise
Hori	9848.000	AV	30.6	38.2	9.5	33.3	45.0	53.9	8.9	Floor Noise
Vert	2483.500	PK	44.6	26.9	6.7	32.6	45.6	73.9	28.3	
Vert	4924.000	PK	40.6	32.0	8.8	31.7	49.7	73.9	24.2	
Vert	7386.000	PK	40.0	36.0	10.1	32.7	53.4	73.9	20.5	Floor Noise
Vert	9848.000	PK	41.2	38.2	9.5	33.3	55.6	73.9	18.3	Floor Noise
Vert	2483.500	AV	37.1	26.9	6.7	32.6	38.1	53.9	15.8	
Vert	4924.000	AV	32.8	32.0	8.8	31.7	41.9	53.9	12.0	
Vert	7386.000	AV	29.7	36.0	10.1	32.7	43.1	53.9	10.8	Floor Noise
Vert	9848.000	AV	30.6	38.2	9.5	33.3	45.0	53.9	8.9	Floor Noise

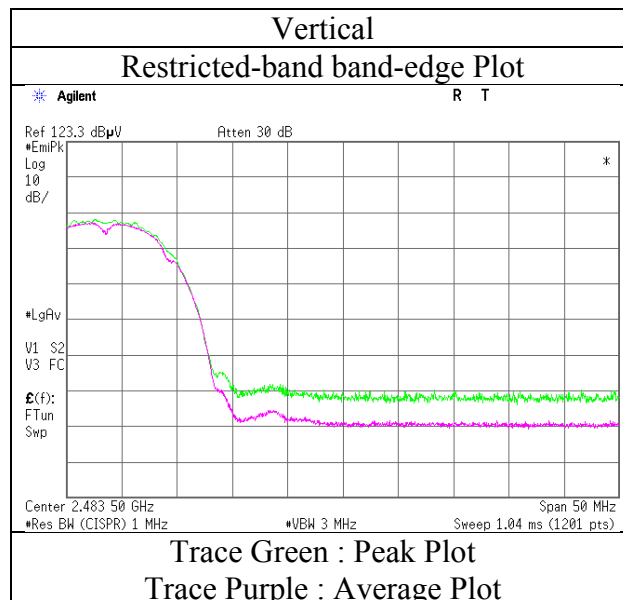
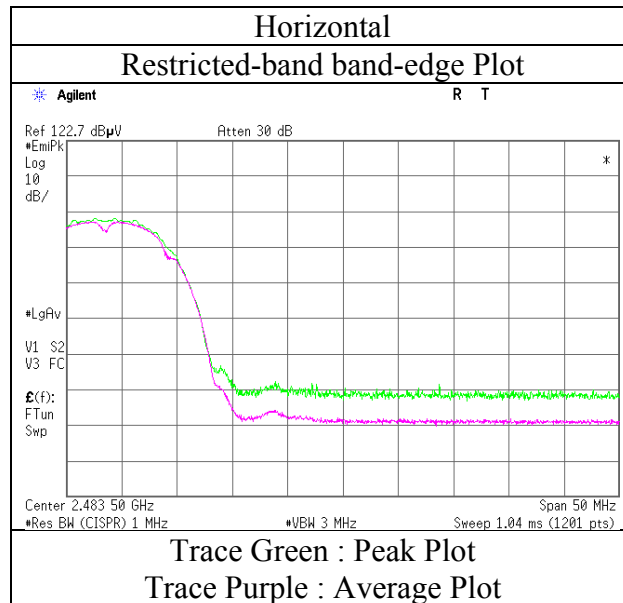
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 20log (4.45m / 3.0 m) = 3.43 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 9, 2016
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Kazuya Yoshioka
Mode	Tx 11b 2462 MHz



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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11240438H	
Date	April 9, 2016	April 10, 2016
Temperature / Humidity	23 deg. C / 46 % RH	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka (1-10GHz)	Yuta Moriya (Above 10GHz)
Mode	Tx 11n-20 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	58.6	26.9	6.7	32.7	59.5	73.9	14.4	
Hori	4824.000	PK	39.6	31.8	8.9	31.8	48.5	73.9	25.4	Floor Noise
Hori	7236.000	PK	38.6	36.0	10.1	32.6	52.1	73.9	21.8	Floor Noise
Hori	9648.000	PK	40.2	38.2	9.5	33.3	54.6	73.9	19.3	Floor Noise
Hori	2390.000	AV	41.4	26.9	6.7	32.7	42.3	53.9	11.6	
Hori	4824.000	AV	29.0	31.8	8.9	31.8	37.9	53.9	16.0	Floor Noise
Hori	7236.000	AV	29.5	36.0	10.1	32.6	43.0	53.9	10.9	Floor Noise
Hori	9648.000	AV	30.2	38.2	9.5	33.3	44.6	53.9	9.3	Floor Noise
Vert	2390.000	PK	58.1	26.9	6.7	32.7	59.0	73.9	14.9	
Vert	4824.000	PK	39.8	31.8	8.9	31.8	48.7	73.9	25.2	Floor Noise
Vert	7236.000	PK	38.9	36.0	10.1	32.6	52.4	73.9	21.5	Floor Noise
Vert	9648.000	PK	40.4	38.2	9.5	33.3	54.8	73.9	19.1	Floor Noise
Vert	2390.000	AV	47.1	26.9	6.7	32.7	48.0	53.9	5.9	
Vert	4824.000	AV	29.0	31.8	8.9	31.8	37.9	53.9	16.0	Floor Noise
Vert	7236.000	AV	29.5	36.0	10.1	32.6	43.0	53.9	10.9	Floor Noise
Vert	9648.000	AV	30.2	38.2	9.5	33.3	44.6	53.9	9.3	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.45m / 3.0 m) = 3.43 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	96.8	26.9	6.7	32.7	97.7	-	-	Carrier
Hori	2400.000	PK	55.7	26.9	6.7	32.7	56.6	77.7	21.1	
Vert	2412.000	PK	97.4	26.9	6.7	32.7	98.3	-	-	Carrier
Vert	2400.000	PK	53.5	26.9	6.7	32.7	54.4	78.3	23.9	

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

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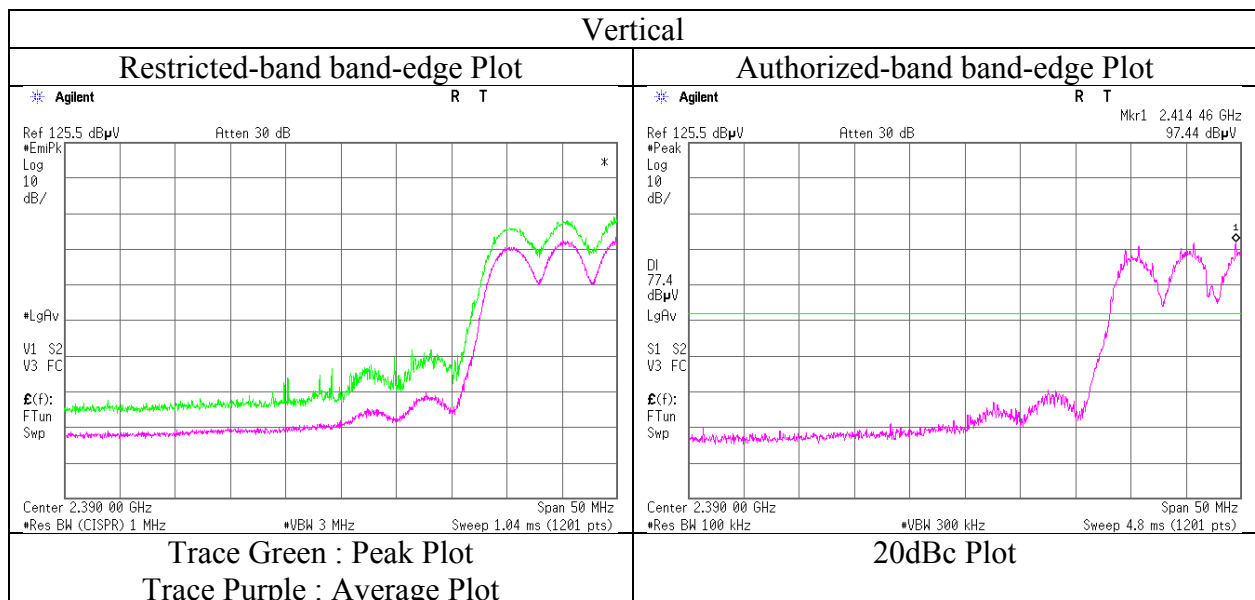
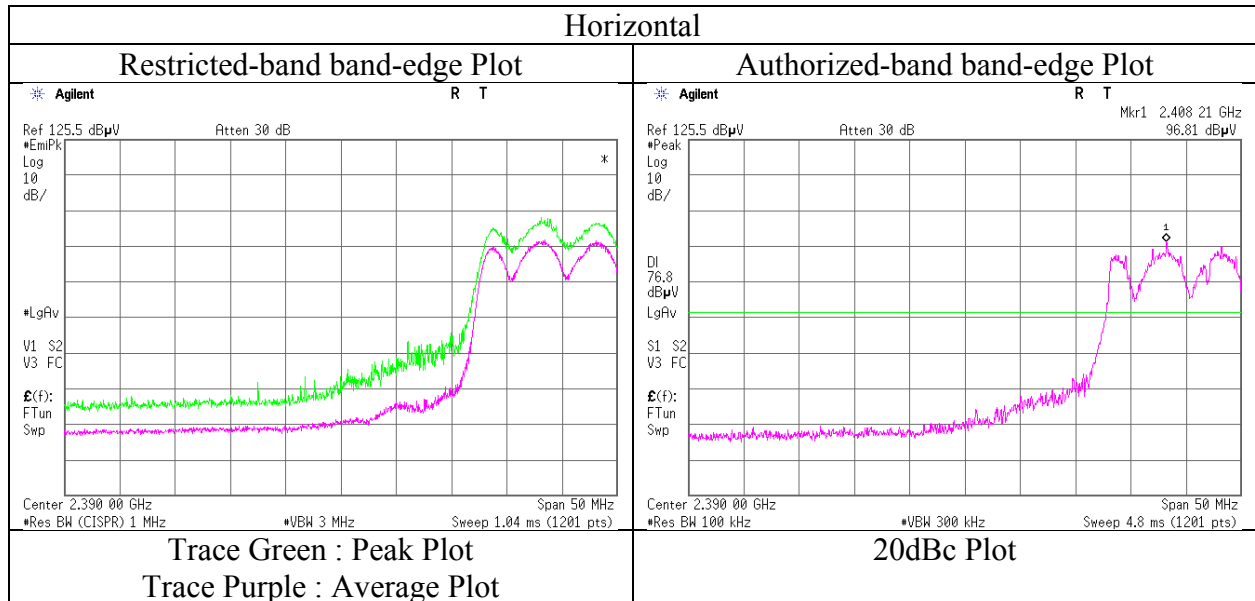
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 9, 2016
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Kazuya Yoshioka
Mode	Tx 11n-20 2412 MHz



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

UL Japan, Inc.

Ise EMC Lab.

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Telephone : +81 596 24 8999

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11240438H	
Date	April 9, 2016	April 10, 2016
Temperature / Humidity	23 deg. C / 46 % RH	23 deg. C / 37 % RH
Engineer	Kazuya Yoshioka (1-10GHz)	Yuta Moriya (Above 10GHz)
Mode	Tx 11n-20 2437 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	39.2	31.9	8.9	31.7	48.3	73.9	25.6	Floor Noise
Hori	7311.000	PK	39.3	36.0	10.2	32.6	52.9	73.9	21.0	Floor Noise
Hori	9748.000	PK	38.9	38.2	9.5	33.3	53.3	73.9	20.6	Floor Noise
Hori	4874.000	AV	31.0	31.9	8.9	31.7	40.1	53.9	13.8	Floor Noise
Hori	7311.000	AV	31.8	36.0	10.2	32.6	45.4	53.9	8.5	Floor Noise
Hori	9748.000	AV	32.0	38.2	9.5	33.3	46.4	53.9	7.5	Floor Noise
Vert	4874.000	PK	39.0	31.9	8.9	31.7	48.1	73.9	25.8	Floor Noise
Vert	7311.000	PK	39.5	36.0	10.2	32.6	53.1	73.9	20.8	Floor Noise
Vert	9748.000	PK	39.2	38.2	9.5	33.3	53.6	73.9	20.3	Floor Noise
Vert	4874.000	AV	31.0	31.9	8.9	31.7	40.1	53.9	13.8	Floor Noise
Vert	7311.000	AV	31.8	36.0	10.2	32.6	45.4	53.9	8.5	Floor Noise
Vert	9748.000	AV	32.0	38.2	9.5	33.3	46.4	53.9	7.5	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.45\text{m} / 3.0\text{m}) = 3.43\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{m} / 3.0\text{m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11240438H
Date : April 9, 2016 April 10, 2016 April 13, 2016
Temperature / Humidity : 23 deg. C / 46 % RH 23 deg. C / 37 % RH 24 deg. C / 51 % RH
Engineer : Kazuya Yoshioka Yuta Moriya Yuta Moriya
 (1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx 11n-20 2462 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	36.580	QP	22.6	15.1	7.1	32.2	12.6	40.0	27.4	
Hori	54.232	QP	22.5	8.8	7.4	32.2	6.5	40.0	33.5	
Hori	57.995	QP	22.5	7.6	7.5	32.2	5.4	40.0	34.6	
Hori	89.575	QP	23.4	8.1	7.9	32.2	7.2	43.5	36.3	
Hori	196.552	QP	22.1	16.5	9.0	32.1	15.5	43.5	28.0	
Hori	951.995	QP	21.2	22.3	13.6	30.7	26.4	46.0	19.6	
Hori	2483.500	PK	63.4	26.9	6.7	32.6	64.4	73.9	9.5	
Hori	4924.000	PK	38.2	32.0	8.8	31.7	47.3	73.9	26.6	Floor Noise
Hori	7386.000	PK	40.8	36.0	10.1	32.7	54.2	73.9	19.7	Floor Noise
Hori	9848.000	PK	40.2	38.2	9.5	33.3	54.6	73.9	19.3	Floor Noise
Hori	2483.500	AV	41.8	26.9	6.7	32.6	42.8	53.9	11.1	
Hori	4924.000	AV	28.5	32.0	8.8	31.7	37.6	53.9	16.3	Floor Noise
Hori	7386.000	AV	30.0	36.0	10.1	32.7	43.4	53.9	10.5	Floor Noise
Hori	9848.000	AV	30.1	38.2	9.5	33.3	44.5	53.9	9.4	Floor Noise
Vert	36.530	QP	32.2	15.1	7.1	32.2	22.2	40.0	17.8	
Vert	53.012	QP	28.6	9.2	7.4	32.2	13.0	40.0	27.0	
Vert	57.995	QP	35.3	7.6	7.5	32.2	18.2	40.0	21.8	
Vert	89.432	QP	24.5	8.1	7.9	32.2	8.3	43.5	35.2	
Vert	196.552	QP	22.4	16.5	9.0	32.1	15.8	43.5	27.7	
Vert	951.995	QP	21.2	22.3	13.6	30.7	26.4	46.0	19.6	
Vert	2483.500	PK	63.2	26.9	6.7	32.6	64.2	73.9	9.7	
Vert	4924.000	PK	38.5	32.0	8.8	31.7	47.6	73.9	26.3	Floor Noise
Vert	7386.000	PK	41.0	36.0	10.1	32.7	54.4	73.9	19.5	Floor Noise
Vert	9848.000	PK	40.5	38.2	9.5	33.3	54.9	73.9	19.0	Floor Noise
Vert	2483.500	AV	47.9	26.9	6.7	32.6	48.9	53.9	5.0	
Vert	4924.000	AV	28.5	32.0	8.8	31.7	37.6	53.9	16.3	Floor Noise
Vert	7386.000	AV	30.0	36.0	10.1	32.7	43.4	53.9	10.5	Floor Noise
Vert	9848.000	AV	30.1	38.2	9.5	33.3	44.5	53.9	9.4	Floor Noise

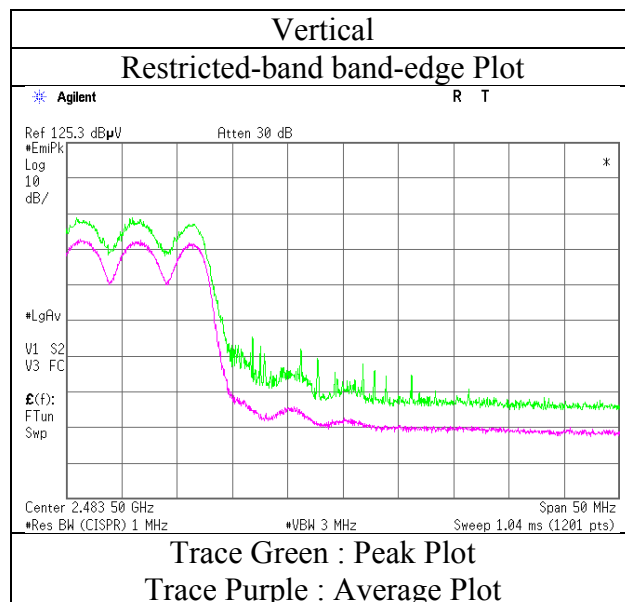
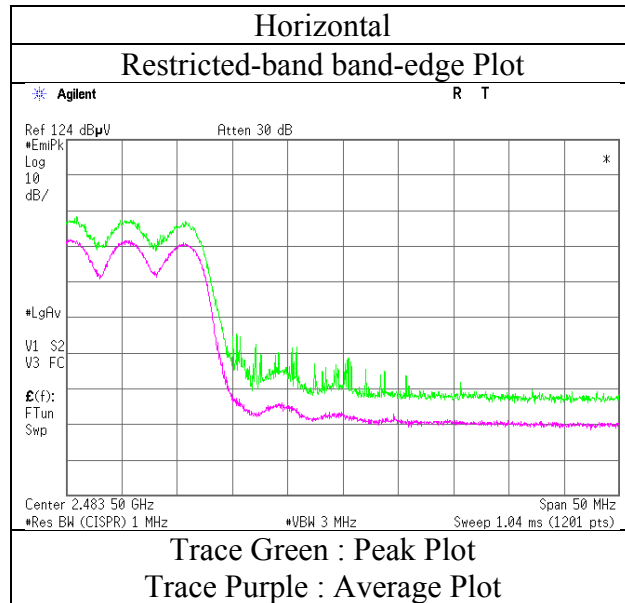
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz $20\log(4.45\text{m} / 3.0\text{m}) = 3.43\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{m} / 3.0\text{m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

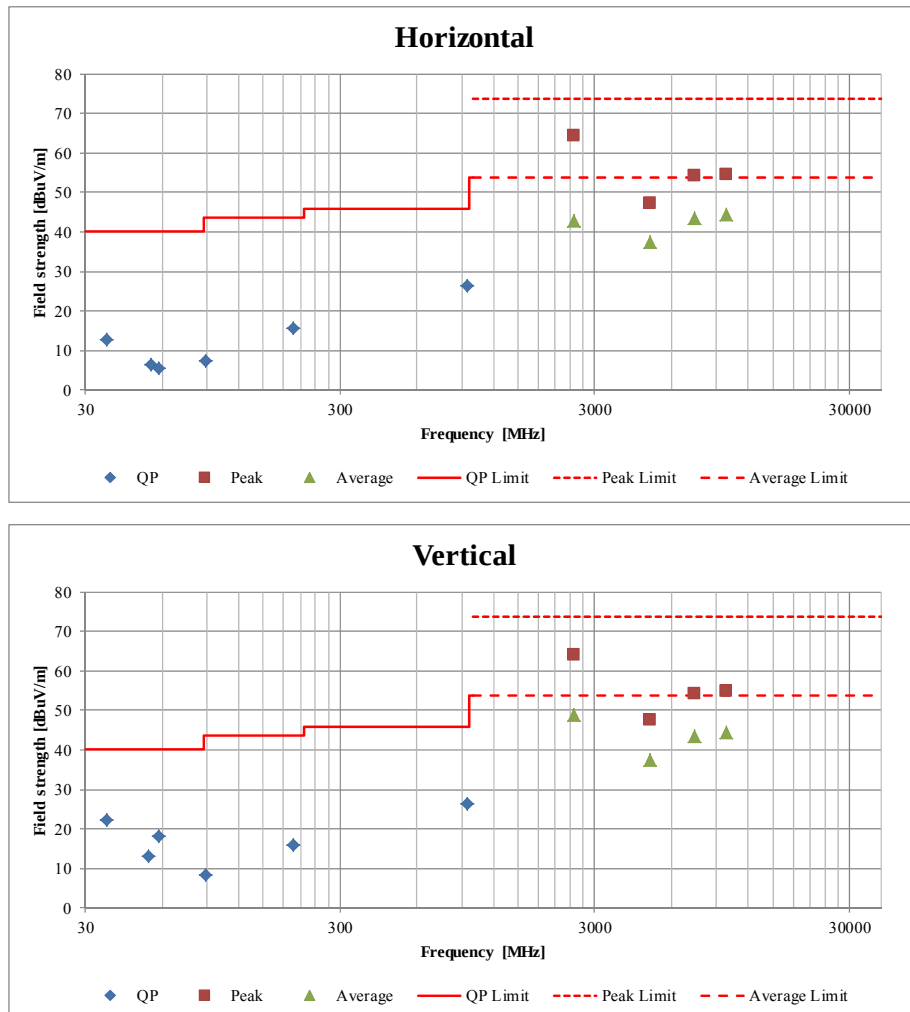
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 9, 2016
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Kazuya Yoshioka
Mode	Tx 11n-20 2462 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	11240438H		
Date	April 9, 2016	April 10, 2016	April 13, 2016
Temperature / Humidity	23 deg. C / 46 % RH	23 deg. C / 37 % RH	24 deg. C / 51 % RH
Engineer	Kazuya Yoshioka (1-10GHz)	Yuta Moriya (Above 10GHz)	Yuta Moriya (Below 1GHz)
Mode	Tx 11b 2462 MHz		



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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 10, 2016 April 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH 21 deg. C / 51 % RH
Engineer	Yuta Moriya Tomoki Matsui
	(Above 1GHz) (Below 1 GHz)
Mode	Tx BT LE 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	36.590	QP	22.8	15.1	7.1	32.2	-	12.8	40.0	27.2	
Hori	54.239	QP	22.5	8.8	7.4	32.2	-	6.5	40.0	33.5	
Hori	57.997	QP	22.5	7.6	7.5	32.2	-	5.4	40.0	34.6	
Hori	89.076	QP	27.7	8.0	7.9	32.2	-	11.4	43.5	32.1	
Hori	196.552	QP	22.0	16.5	9.0	32.1	-	15.4	43.5	28.1	
Hori	951.995	QP	21.1	22.3	13.6	30.7	-	26.3	46.0	19.7	
Hori	2390.000	PK	49.3	26.9	6.8	32.7	-	50.3	73.9	23.6	
Hori	4804.000	PK	40.2	31.8	9.0	31.8	-	49.2	73.9	24.7	
Hori	7206.000	PK	41.0	36.0	8.8	32.6	-	53.2	73.9	20.7	Floor Noise
Hori	9608.000	PK	40.0	38.2	9.6	33.2	-	54.6	73.9	19.3	Floor Noise
Hori	2390.000	AV	35.4	26.9	6.8	32.7	2.0	38.4	53.9	15.5	*1)
Hori	4804.000	AV	31.6	31.8	9.0	31.8	2.0	42.6	53.9	11.3	
Hori	7206.000	AV	31.7	36.0	8.8	32.6	-	43.9	53.9	10.0	Floor Noise
Hori	9608.000	AV	32.3	38.2	9.6	33.2	-	46.9	53.9	7.0	Floor Noise
Vert	36.740	QP	32.9	15.1	7.1	32.2	-	22.9	40.0	17.1	
Vert	53.010	QP	30.0	9.2	7.4	32.2	-	14.4	40.0	25.6	
Vert	58.004	QP	36.5	7.6	7.5	32.2	-	19.4	40.0	20.6	
Vert	89.436	QP	27.7	8.1	7.9	32.2	-	11.5	43.5	32.0	
Vert	196.552	QP	22.1	16.5	9.0	32.1	-	15.5	43.5	28.0	
Vert	951.995	QP	21.0	22.3	13.6	30.7	-	26.2	46.0	19.8	
Vert	2390.000	PK	47.8	26.9	6.8	32.7	-	48.8	73.9	25.1	
Vert	4804.000	PK	41.4	31.8	9.0	31.8	-	50.4	73.9	23.5	
Vert	7206.000	PK	40.8	36.0	8.8	32.6	-	53.0	73.9	20.9	Floor Noise
Vert	9608.000	PK	40.1	38.2	9.6	33.2	-	54.7	73.9	19.2	Floor Noise
Vert	2390.000	AV	35.0	26.9	6.8	32.7	2.0	38.0	53.9	15.9	*1)
Vert	4804.000	AV	32.0	31.8	9.0	31.8	2.0	43.0	53.9	10.9	
Vert	7206.000	AV	31.8	36.0	8.8	32.6	-	44.0	53.9	9.9	Floor Noise
Vert	9608.000	AV	32.4	38.2	9.6	33.2	-	47.0	53.9	6.9	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB

10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

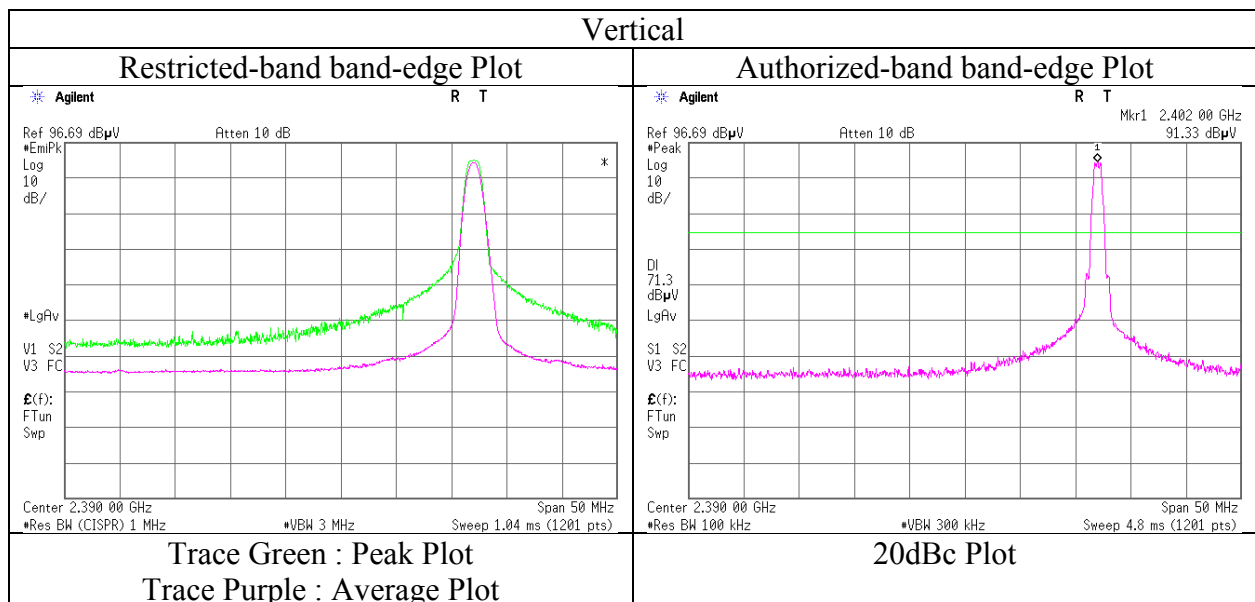
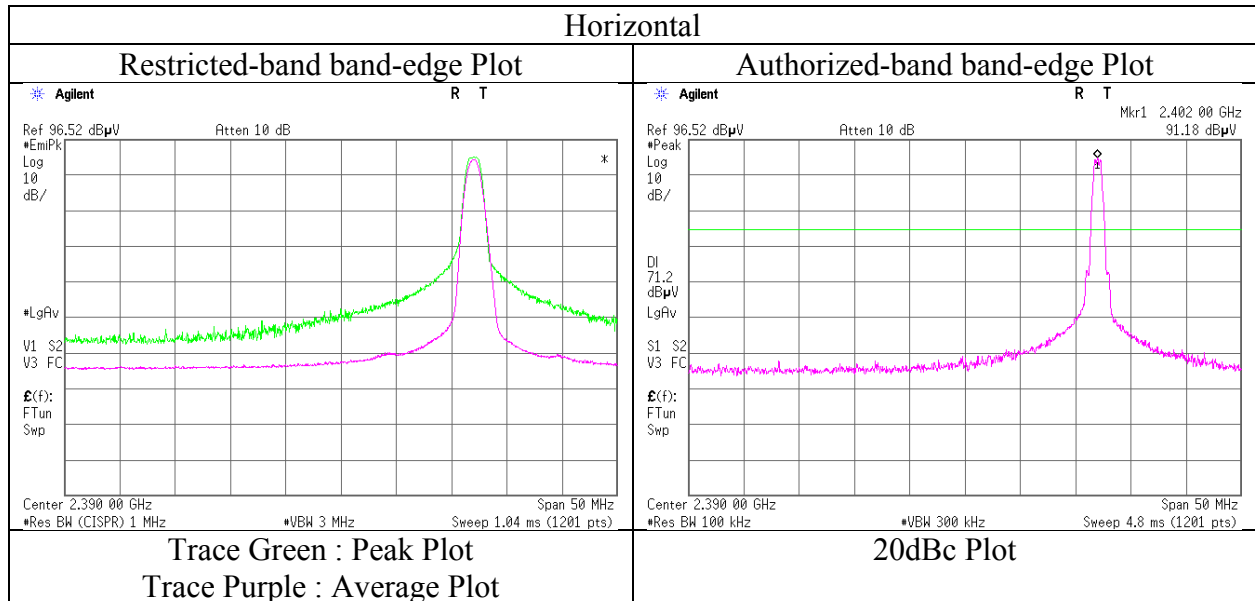
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	91.2	26.9	6.8	32.7	92.2	-	-	Carrier
Hori	2400.000	PK	48.3	26.9	6.8	32.7	49.3	72.2	22.9	
Vert	2402.000	PK	91.3	26.9	6.8	32.7	92.3	-	-	Carrier
Vert	2400.000	PK	47.5	26.9	6.8	32.7	48.5	72.3	23.8	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 10, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE 2402 MHz



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

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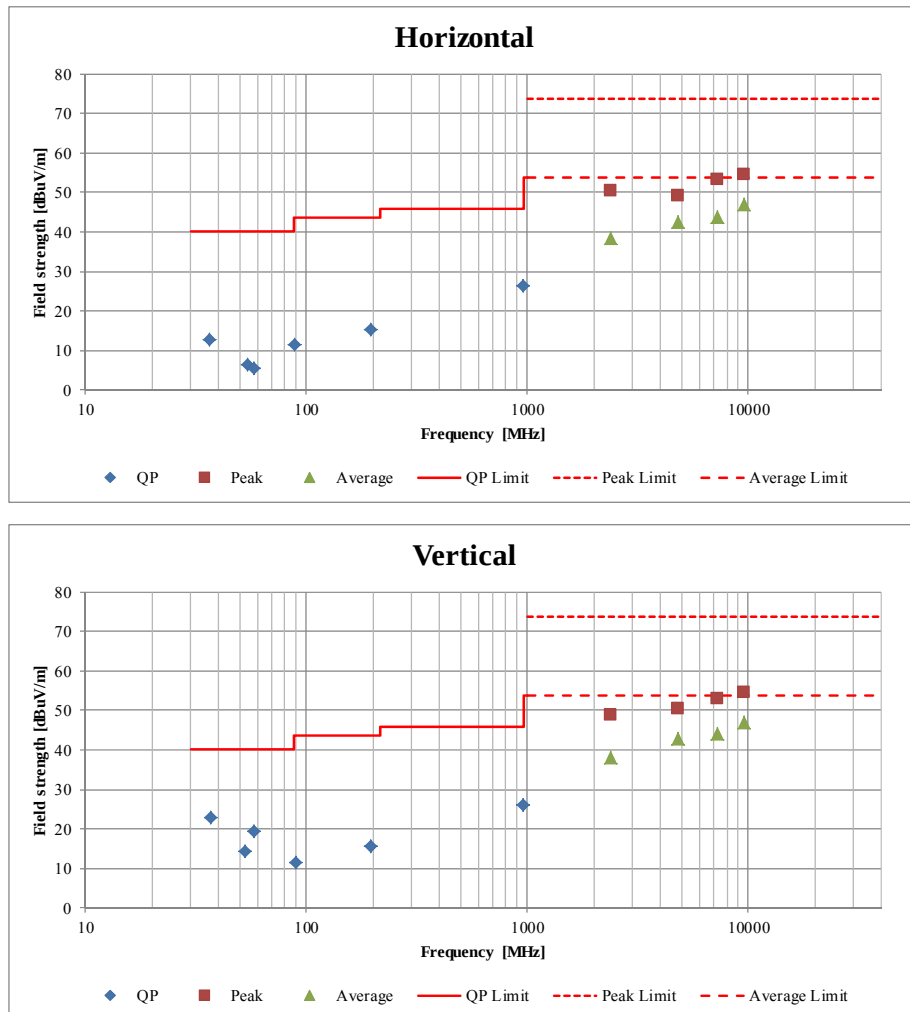
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Radiated Spurious Emission **(Plot data, Worst case)**

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11240438H	
Date	April 10, 2016	April 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH	21 deg. C / 51 % RH
Engineer	Yuta Moriya (Above 1GHz)	Tomoki Matsui (Below 1 GHz)
Mode	Tx BT LE 2402MHz	



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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	11240438H	
Date	April 10, 2016	April 13, 2016
Temperature / Humidity	23 deg. C / 37 % RH	21 deg. C / 51 % RH
Engineer	Yuta Moriya (Above 1GHz)	Tomoki Matsui (Below 1 GHz)
Mode	Tx BT LE 2440 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	36.590	QP	22.6	15.1	7.1	32.2	-	12.6	40.0	27.4	
Hori	54.239	QP	22.6	8.8	7.4	32.2	-	6.6	40.0	33.4	
Hori	57.997	QP	22.5	7.6	7.5	32.2	-	5.4	40.0	34.6	
Hori	89.076	QP	27.0	8.0	7.9	32.2	-	10.7	43.5	32.8	
Hori	196.552	QP	22.1	16.5	9.0	32.1	-	15.5	43.5	28.0	
Hori	951.995	QP	21.1	22.3	13.6	30.7	-	26.3	46.0	19.7	
Hori	4880.000	PK	39.0	31.9	9.0	31.7	-	48.2	73.9	25.7	
Hori	7320.000	PK	41.0	36.0	8.9	32.6	-	53.3	73.9	20.6	Floor Noise
Hori	9760.000	PK	40.1	38.2	9.6	33.3	-	54.6	73.9	19.3	Floor Noise
Hori	4880.000	AV	31.1	31.9	9.0	31.7	2.0	42.3	53.9	11.6	
Hori	7320.000	AV	31.0	36.0	8.9	32.6	-	43.3	53.9	10.6	Floor Noise
Hori	9760.000	AV	32.2	38.2	9.6	33.3	-	46.7	53.9	7.2	Floor Noise
Vert	36.740	QP	33.3	15.1	7.1	32.2	-	23.3	40.0	16.7	
Vert	53.010	QP	29.1	9.2	7.4	32.2	-	13.5	40.0	26.5	
Vert	57.996	QP	34.9	7.6	7.5	32.2	-	17.8	40.0	22.2	
Vert	89.436	QP	28.5	8.1	7.9	32.2	-	12.3	43.5	31.2	
Vert	196.552	QP	22.0	16.5	9.0	32.1	-	15.4	43.5	28.1	
Vert	951.995	QP	21.0	22.3	13.6	30.7	-	26.2	46.0	19.8	
Vert	4880.000	PK	39.6	31.9	9.0	31.7	-	48.8	73.9	25.1	
Vert	7320.000	PK	40.6	36.0	8.9	32.6	-	52.9	73.9	21.0	Floor Noise
Vert	9760.000	PK	40.0	38.2	9.6	33.3	-	54.5	73.9	19.4	Floor Noise
Vert	4880.000	AV	31.4	31.9	9.0	31.7	2.0	42.6	53.9	11.3	
Vert	7320.000	AV	31.2	36.0	8.9	32.6	-	43.5	53.9	10.4	Floor Noise
Vert	9760.000	AV	32.3	38.2	9.6	33.3	-	46.8	53.9	7.1	Floor Noise

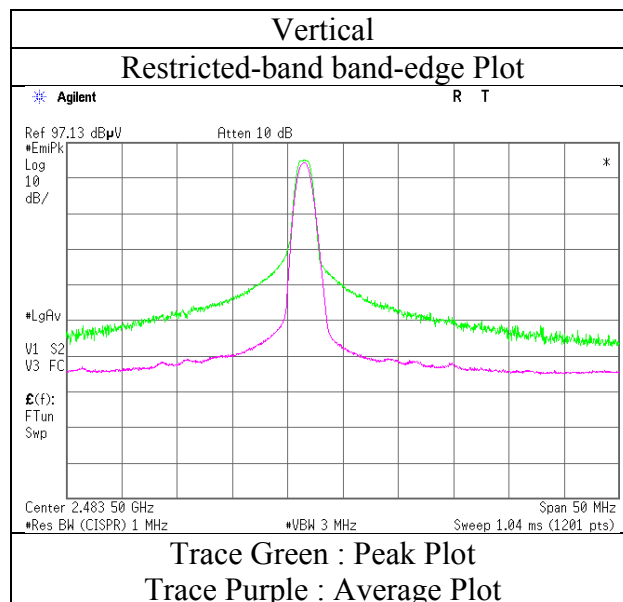
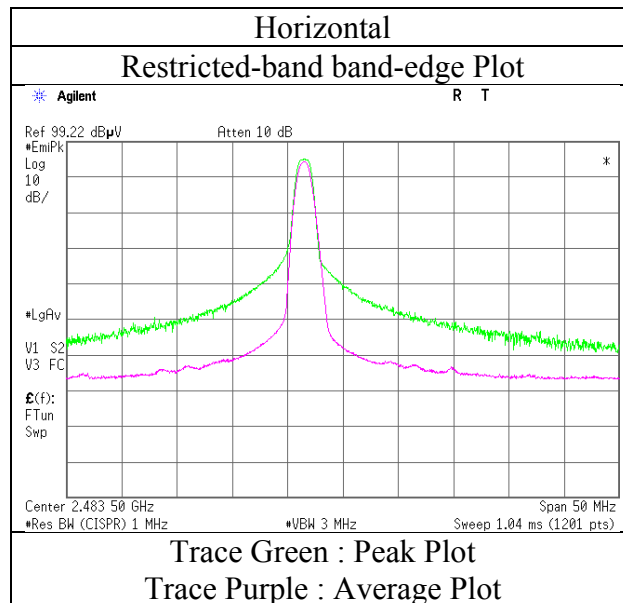
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 10, 2016
Temperature / Humidity	23 deg. C / 37 % RH
Engineer	Yuta Moriya
Mode	Tx BT LE 2480 MHz



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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 12, 2016
Temperature / Humidity	23 deg. C / 32 % RH
Engineer	Yuta Moriya (1-10GHz)
Mode	Tx BT LE 2402 MHz and 11a 5180MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	47.6	26.9	6.8	32.7	-	48.6	73.9	25.3	
Hori	2390.000	AV	34.5	26.9	6.8	32.7	2.0	37.5	53.9	16.4	*1)
Vert	2390.000	PK	46.8	26.9	6.8	32.7	-	47.8	73.9	26.1	
Vert	2390.000	AV	33.6	26.9	6.8	32.7	2.0	36.6	53.9	17.3	*1)

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.52\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	91.3	26.9	6.8	32.7	92.3	-	-	Carrier
Hori	2400.000	PK	45.2	26.9	6.8	32.7	46.2	72.3	26.1	
Vert	2402.000	PK	90.5	26.9	6.8	32.7	91.5	-	-	Carrier
Vert	2400.000	PK	45.2	26.9	6.8	32.7	46.2	71.5	25.3	

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11240438H
Date	April 12, 2016 April 13, 2016
Temperature / Humidity	23 deg. C / 32 % RH 24 deg. C / 51 % RH
Engineer	Yuta Moriya Yuta Moriya
	(Above 1GHz) (Below 1GHz)
Mode	Tx BT LE 2440 MHz and 11a 5180MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	36.535	QP	22.3	15.1	7.1	32.2	-	12.3	40.0	27.7	
Hori	54.223	QP	22.8	8.8	7.4	32.2	-	6.8	40.0	33.2	
Hori	57.955	QP	22.6	7.6	7.5	32.2	-	5.5	40.0	34.5	
Hori	89.569	QP	23.3	8.1	7.9	32.2	-	7.1	43.5	36.4	
Hori	196.554	QP	22.2	16.5	9.0	32.1	-	15.6	43.5	27.9	
Hori	951.991	QP	21.2	22.3	13.6	30.7	-	26.4	46.0	19.6	
Hori	4880.000	PK	40.6	31.9	9.0	31.7	-	49.8	73.9	24.1	
Hori	7320.000	PK	39.9	36.0	8.9	32.6	-	52.2	73.9	21.7	Floor Noise
Hori	9760.000	PK	40.5	38.2	9.6	33.3	-	55.0	73.9	18.9	Floor Noise
Hori	4880.000	AV	32.5	31.9	9.0	31.7	2.0	43.7	53.9	10.2	
Hori	7320.000	AV	32.1	36.0	8.9	32.6	-	44.4	53.9	9.5	Floor Noise
Hori	9760.000	AV	32.7	38.2	9.6	33.3	-	47.2	53.9	6.7	Floor Noise
Vert	36.524	QP	25.9	15.1	7.1	32.2	-	15.9	40.0	24.1	
Vert	53.045	QP	28.7	9.2	7.4	32.2	-	13.1	40.0	26.9	
Vert	57.955	QP	35.6	7.6	7.5	32.2	-	18.5	40.0	21.5	
Vert	89.488	QP	24.1	8.1	7.9	32.2	-	7.9	43.5	35.6	
Vert	196.554	QP	22.4	16.5	9.0	32.1	-	15.8	43.5	27.7	
Vert	951.991	QP	21.2	22.3	13.6	30.7	-	26.4	46.0	19.6	
Vert	4880.000	PK	40.5	31.9	9.0	31.7	-	49.7	73.9	24.2	
Vert	7320.000	PK	40.3	36.0	8.9	32.6	-	52.6	73.9	21.3	Floor Noise
Vert	9760.000	PK	41.0	38.2	9.6	33.3	-	55.5	73.9	18.4	Floor Noise
Vert	4880.000	AV	32.3	31.9	9.0	31.7	2.0	43.5	53.9	10.4	
Vert	7320.000	AV	32.0	36.0	8.9	32.6	-	44.3	53.9	9.6	Floor Noise
Vert	9760.000	AV	32.8	38.2	9.6	33.3	-	47.3	53.9	6.6	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11240438H
Date : April 12, 2016
Temperature / Humidity : 23 deg. C / 32 % RH
Engineer : Yuta Moriya
(1-10GHz)
Mode : Tx BT LE 2480 MHz and 11a 5180MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	57.9	26.9	6.8	32.6	-	59.0	73.9	14.9	
Hori	2483.500	AV	44.2	26.9	6.8	32.6	2.0	47.3	53.9	6.6	*1)
Vert	2483.500	PK	57.7	26.9	6.8	32.6	-	58.8	73.9	15.1	
Vert	2483.500	AV	42.9	26.9	6.8	32.6	2.0	46.0	53.9	7.9	*1)

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

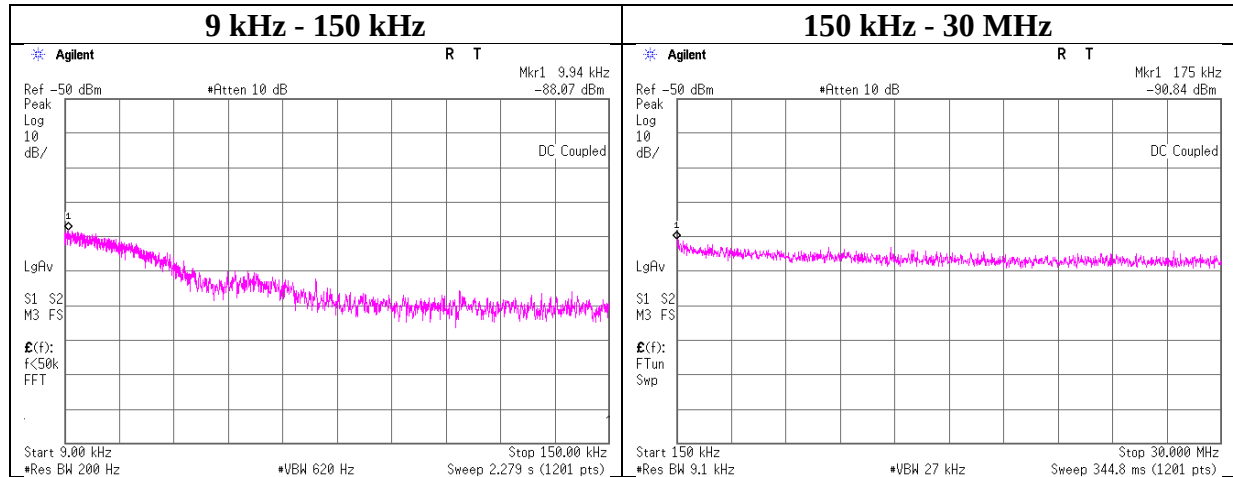
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.52 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx 11n-20 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
9.94	-88.1	0.50	9.8	8.6	2	-66.1	300	6.0	-4.9	47.6	52.5	
175.00	-90.8	0.50	9.8	8.6	2	-68.9	300	6.0	-7.6	22.7	30.3	

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

EIRP = Reading + Cable Loss + Attenuator Loss + Antenna Gain + 10 * log (N)

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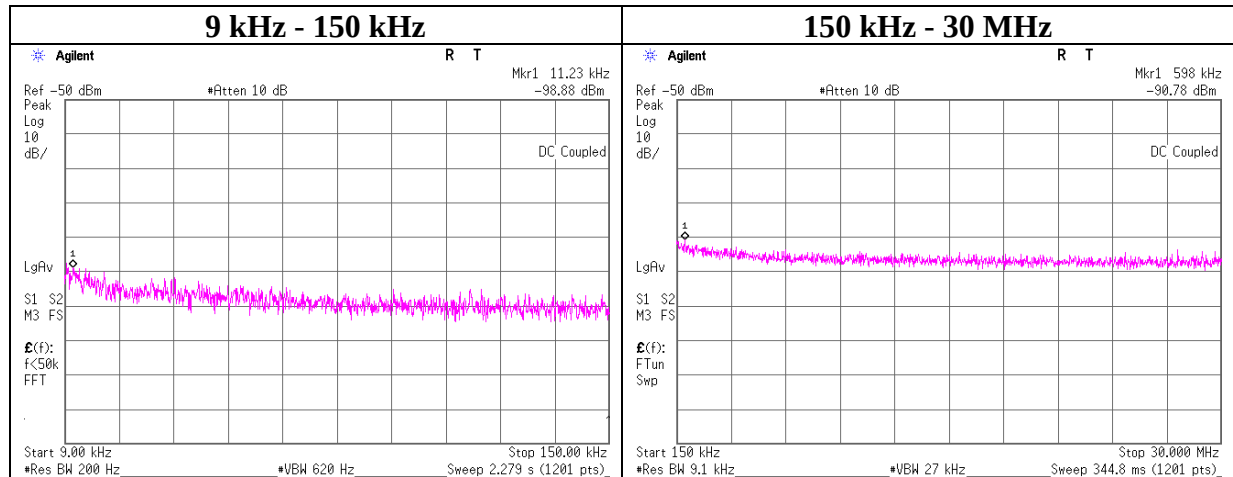
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx BT LE

2402MHz



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
11.23	-98.9	0.50	9.8	6.4	1	-82.2	300	6.0	-20.9	46.5	67.4	
598.00	-90.8	0.51	9.9	6.4	1	-74.0	30	6.0	7.3	32.0	24.7	

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

EIRP = Reading + Cable Loss + Attenuator Loss + Antenna Gain + 10 * log (N)

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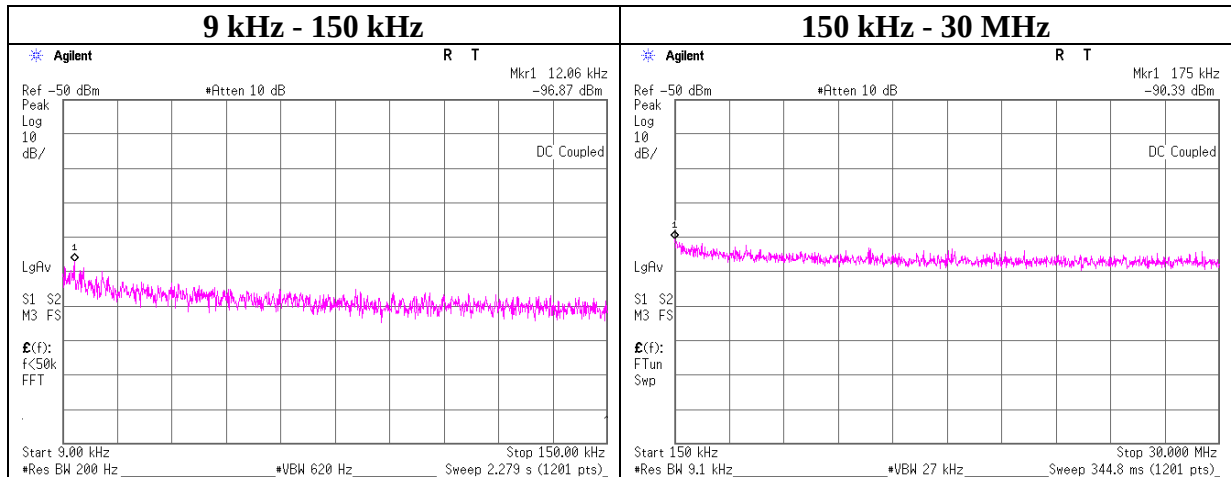
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx BT LE

2440MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain	N	EIRP	Distance	Ground bounce	E	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	(Number of Output	[dBm]	[m]	[dB]	(field strength) [dBuV/m]	[dBuV/m]	[dB]	
12.06	-96.9	0.50	9.8	6.4	1	-80.2	300	6.0	-18.9	45.9	64.8	
175.00	-90.4	0.50	9.8	6.4	1	-73.7	300	6.0	-12.4	22.7	35.1	

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

EIRP = Reading + Cable Loss + Attenuator Loss + Antenna Gain + 10 * log (N)

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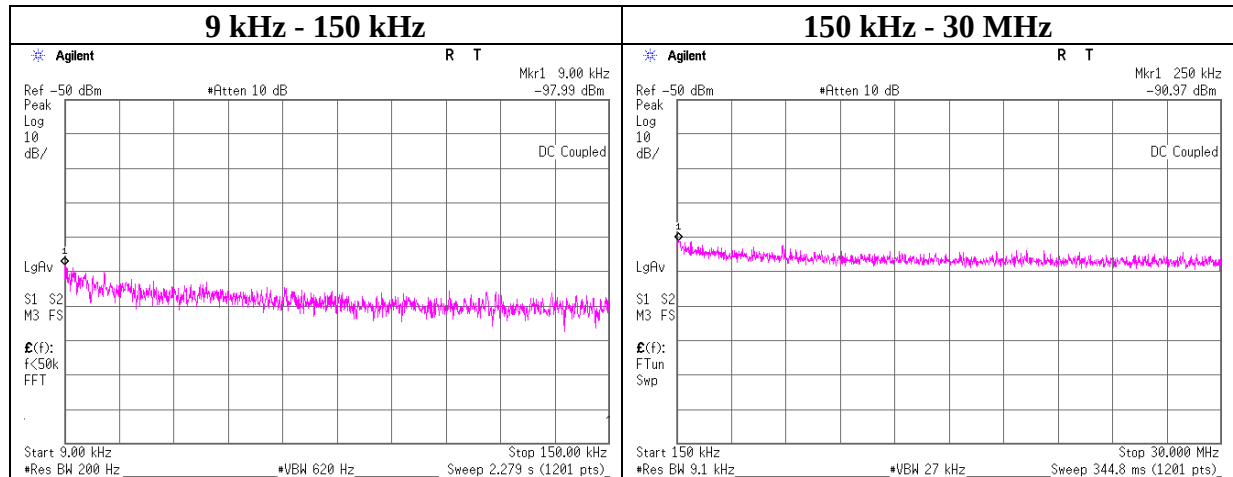
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx BT LE

2480MHz



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
9.00	-98.0	0.50	9.8	6.4	1	-81.3	300	6.0	-20.0	48.5	68.5	
250.00	-91.0	0.51	9.9	6.4	1	-74.2	300	6.0	-13.0	19.6	32.6	

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

EIRP = Reading + Cable Loss + Attenuator Loss + Antenna Gain + 10 * log (N)

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Ise EMC Lab.

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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx 11b

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit [dBm]	Margin [dB]
			[dBm]	[mW]		
2412.00	0.034	0.034	-11.71	0.067	8.00	19.71
2437.00	0.035	0.037	-11.43	0.072	8.00	19.43
2462.00	0.034	0.038	-11.44	0.072	8.00	19.44

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-26.33	1.86	9.74	-14.73	0.03	8.00	22.73
2437.00	-26.15	1.87	9.74	-14.54	0.04	8.00	22.54
2462.00	-26.28	1.87	9.74	-14.67	0.03	8.00	22.67

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-26.31	1.86	9.74	-14.71	0.03	8.00	22.71
2437.00	-25.95	1.87	9.74	-14.34	0.04	8.00	22.34
2462.00	-25.86	1.87	9.74	-14.25	0.04	8.00	22.25

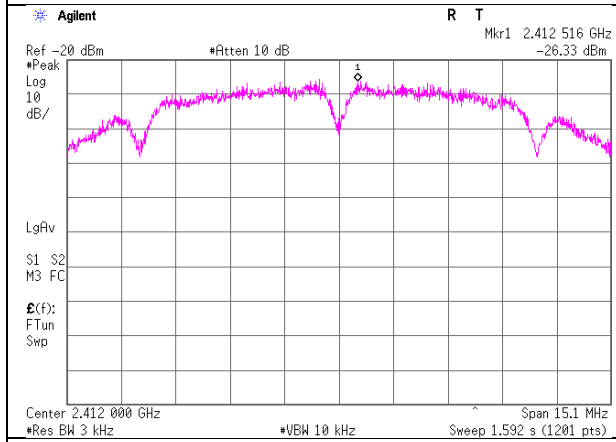
Sample Calculation:

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

Power Density

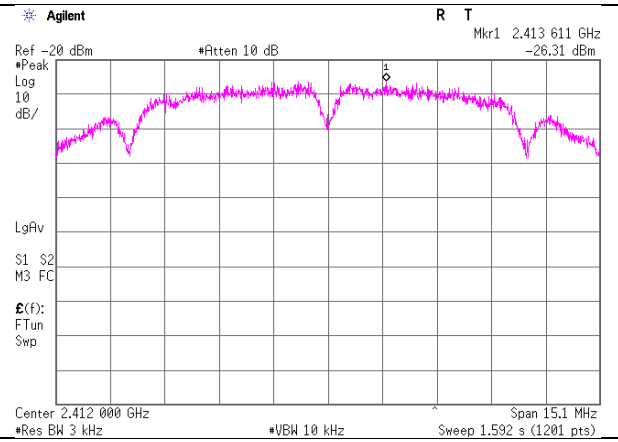
11b Antenna port WA

2412 MHz

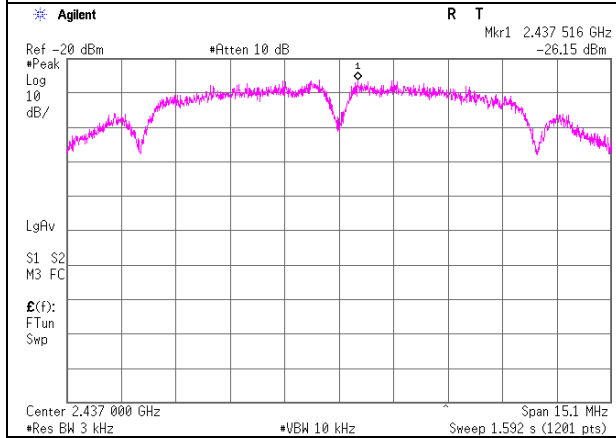


11b Antenna port WB

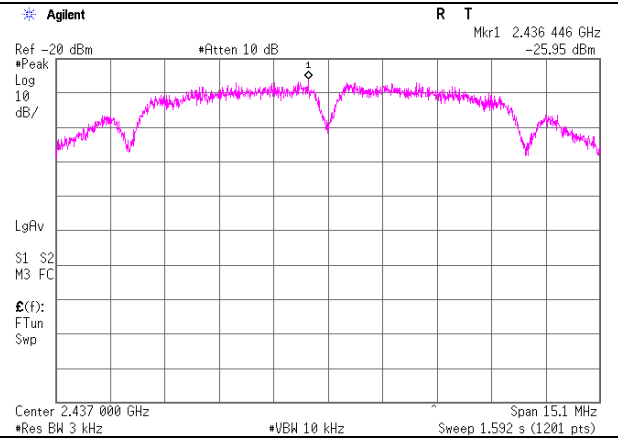
2412 MHz



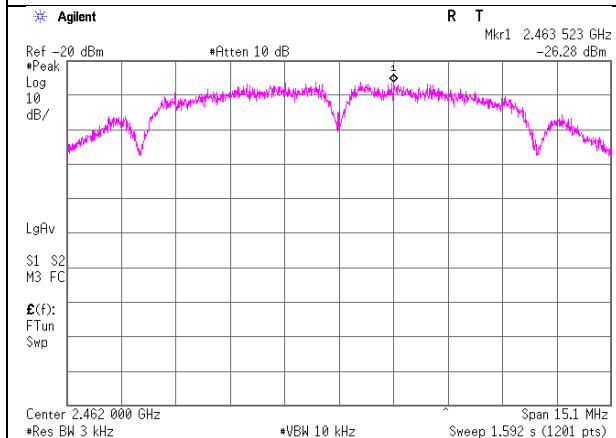
2437 MHz



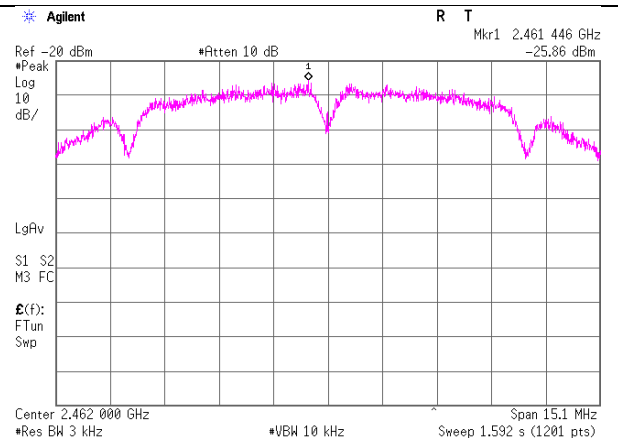
2437 MHz



2462 MHz



2462 MHz



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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx 11g

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result	Antenna port WB Result	Result		Limit	Margin
	[mW]	[mW]	[dBm]	[mW]	[dBm]	[dB]
2412.00	0.018	0.019	-14.38	0.036	8.00	22.38
2437.00	0.017	0.020	-14.34	0.037	8.00	22.34
2462.00	0.018	0.020	-14.22	0.038	8.00	22.22

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading	Cable Loss	Atten.	Result		Limit	Margin
	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[dB]
2412.00	-29.08	1.86	9.74	-17.48	0.02	8.00	25.48
2437.00	-29.27	1.87	9.74	-17.66	0.02	8.00	25.66
2462.00	-29.10	1.87	9.74	-17.49	0.02	8.00	25.49

Antenna port WB

Freq. [MHz]	Reading	Cable Loss	Atten.	Result		Limit	Margin
	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[dB]
2412.00	-28.91	1.86	9.74	-17.31	0.02	8.00	25.31
2437.00	-28.67	1.87	9.74	-17.06	0.02	8.00	25.06
2462.00	-28.60	1.87	9.74	-16.99	0.02	8.00	24.99

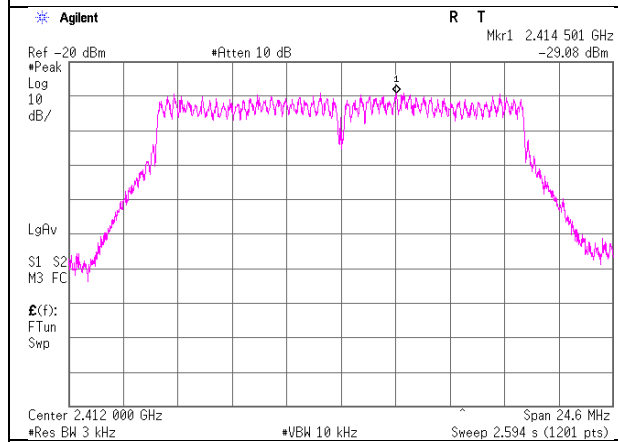
Sample Calculation:

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

Power Density

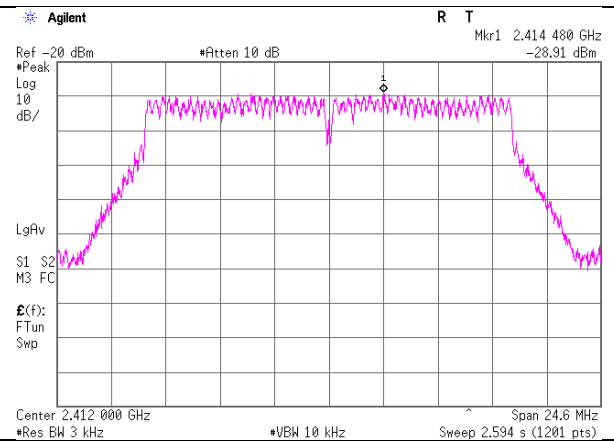
11g Antenna port WA

2412 MHz

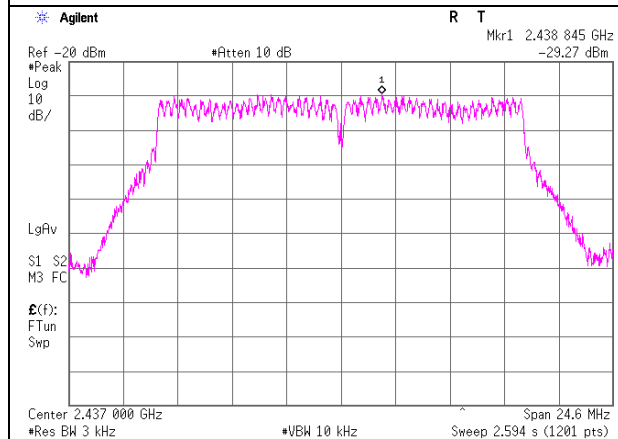


11g Antenna port WB

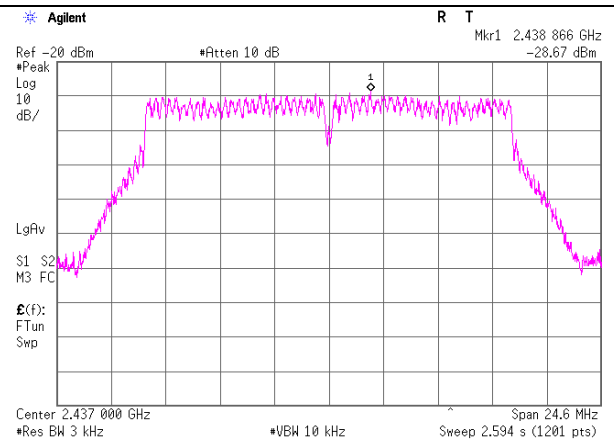
2412 MHz



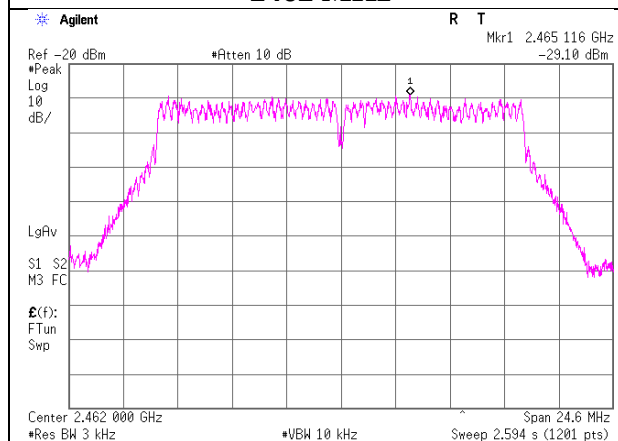
2437 MHz



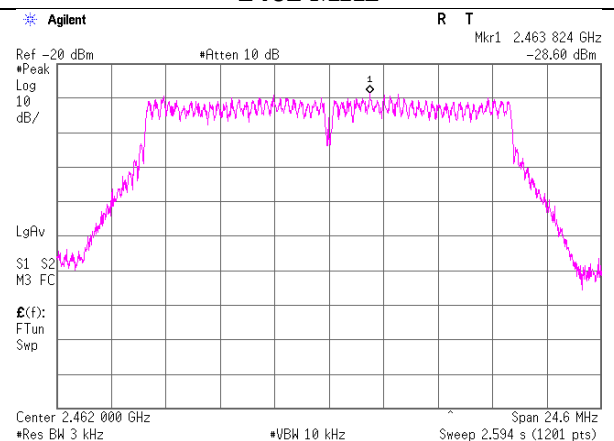
2437 MHz



2462 MHz



2462 MHz



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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx 11n-20

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit	Margin
			[dBm]	[mW]	[dBm]	[dB]
2412.00	0.022	0.022	-13.54	0.044	8.00	21.54
2437.00	0.016	0.019	-14.47	0.036	8.00	22.47
2462.00	0.019	0.017	-14.40	0.036	8.00	22.40

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-28.11	1.86	9.74	-16.51	0.02	8.00	24.51
2437.00	-29.45	1.87	9.74	-17.84	0.02	8.00	25.84
2462.00	-28.86	1.87	9.74	-17.25	0.02	8.00	25.25

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-28.19	1.86	9.74	-16.59	0.02	8.00	24.59
2437.00	-28.75	1.87	9.74	-17.14	0.02	8.00	25.14
2462.00	-29.18	1.87	9.74	-17.57	0.02	8.00	25.57

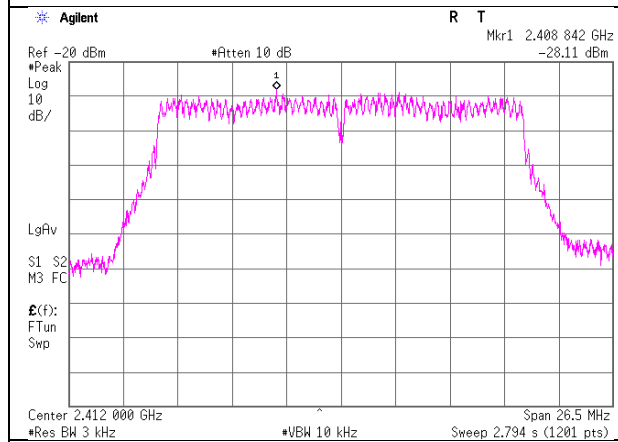
Sample Calculation:

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

Power Density

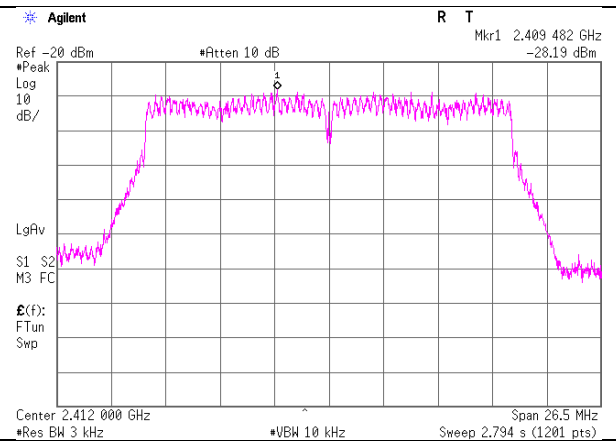
11n-20 Antenna port WA

2412 MHz

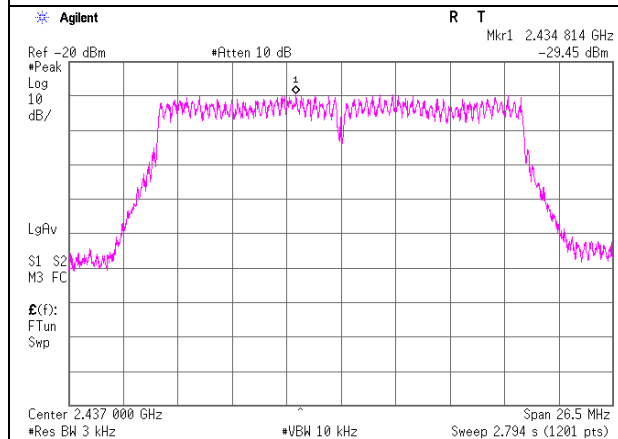


11n-20 Antenna port WB

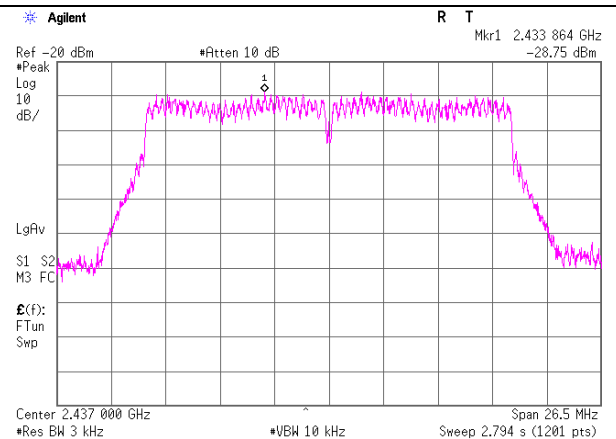
2412 MHz



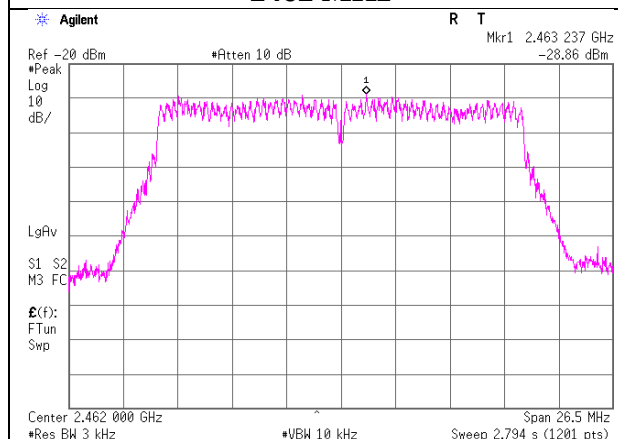
2437 MHz



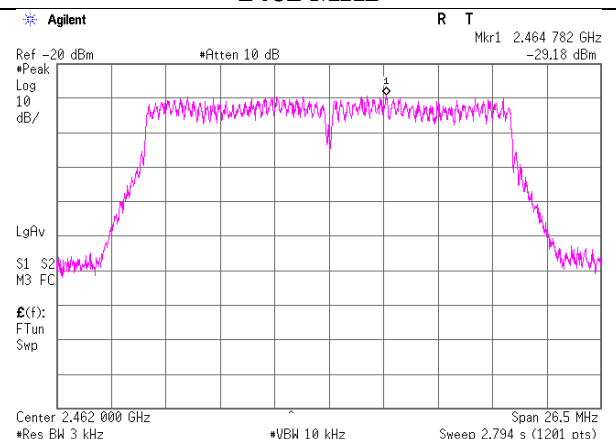
2437 MHz



2462 MHz



2462 MHz



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Power Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 11240438H
Date April 7, 2016
Temperature / Humidity 25deg. C / 40% RH
Engineer Takumi Shimada
Mode Tx BT LE

Freq.	Reading	Cable Loss	Atten.	Result		Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[dB]
2402	-23.61	1.86	9.74	-12.01	0.06	8.00	20.01
2440	-23.80	1.87	9.74	-12.19	0.06	8.00	20.19
2480	-23.93	1.88	9.74	-12.31	0.06	8.00	20.31

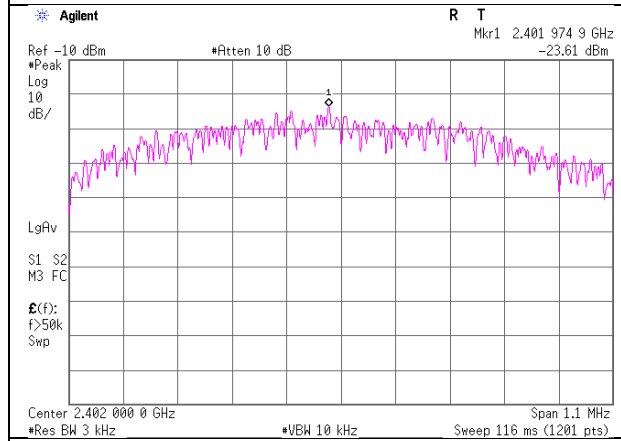
Sample Calculation:

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

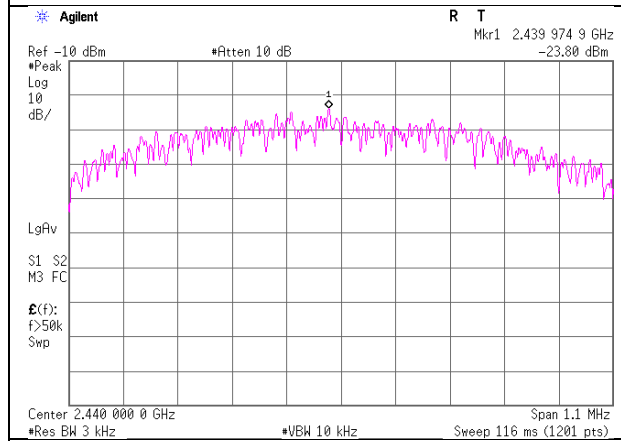
Power Density

BT LE

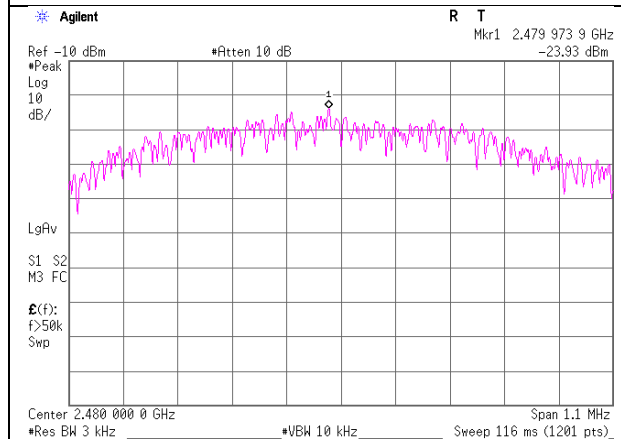
2402 MHz



2440 MHz



2480 MHz



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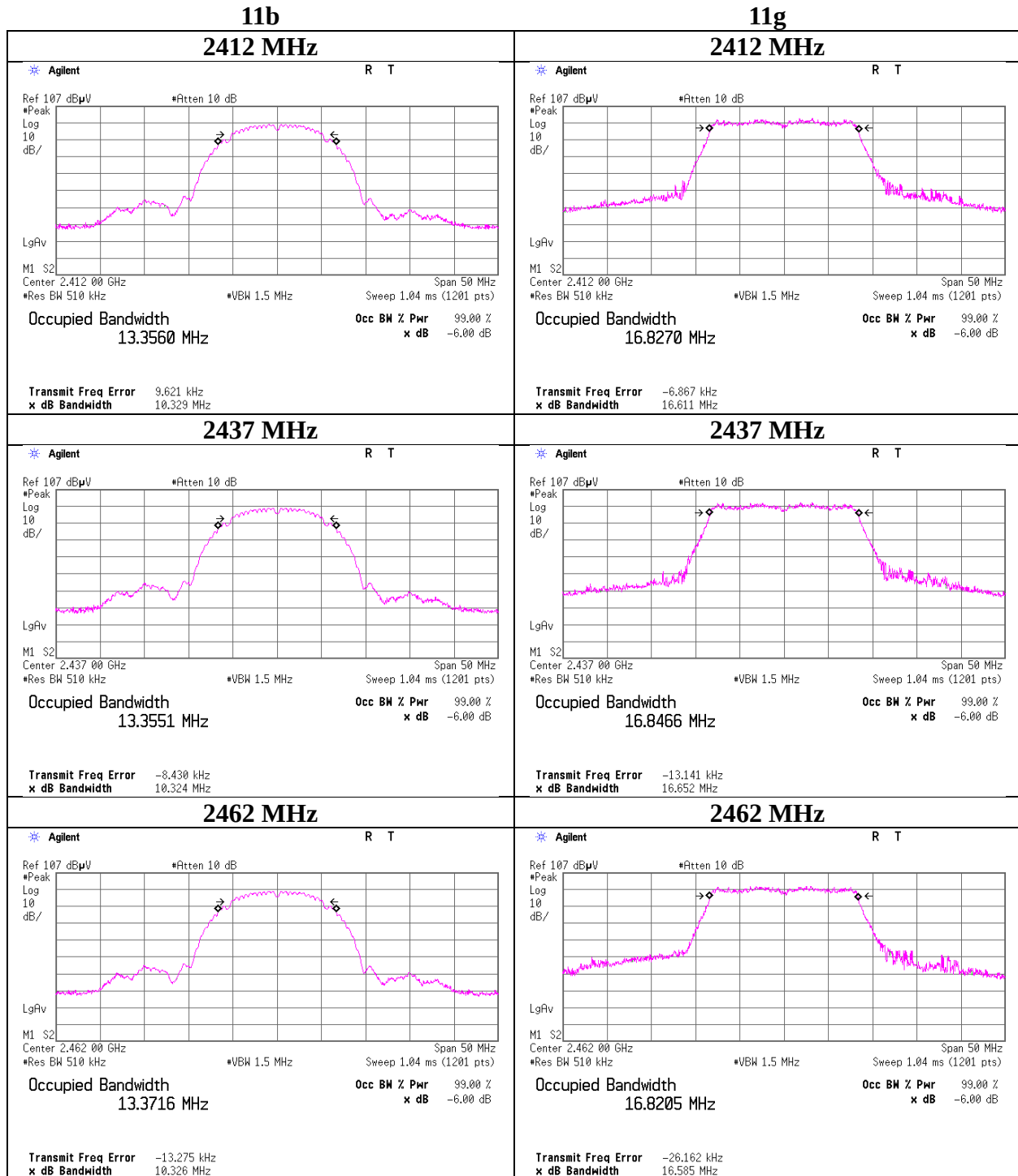
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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx



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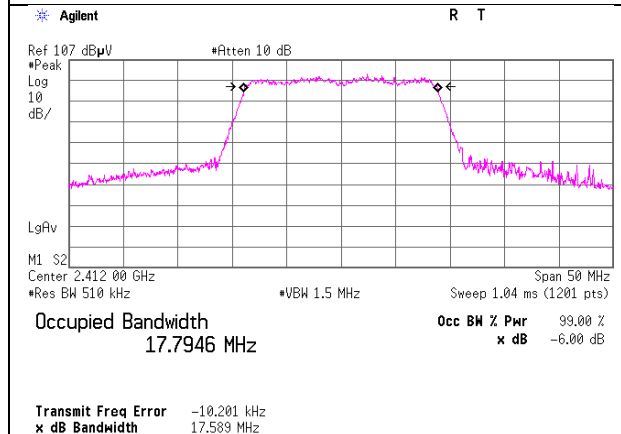
Facsimile : +81 596 24 8124

99% Occupied Bandwidth

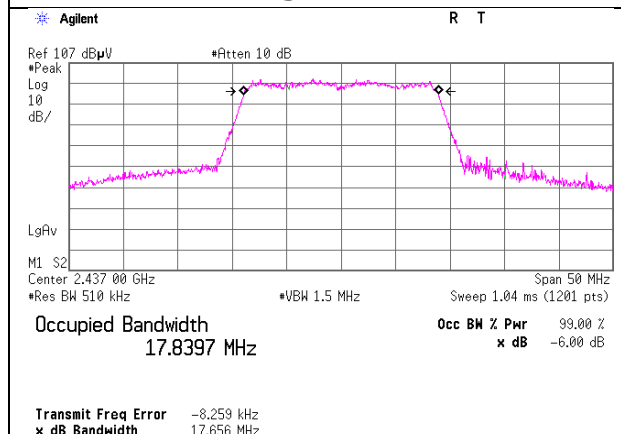
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx

11n-20

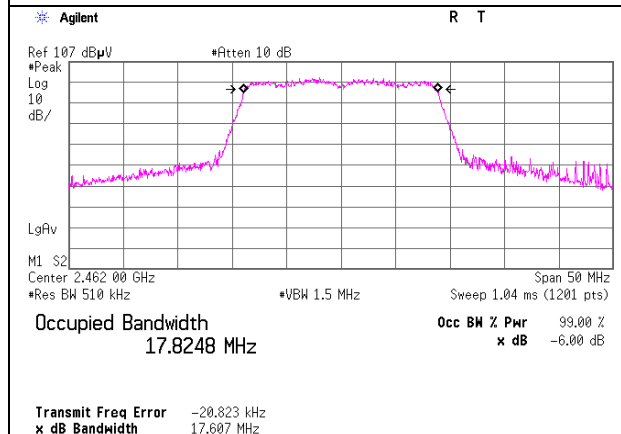
2412 MHz



2437 MHz



2462 MHz



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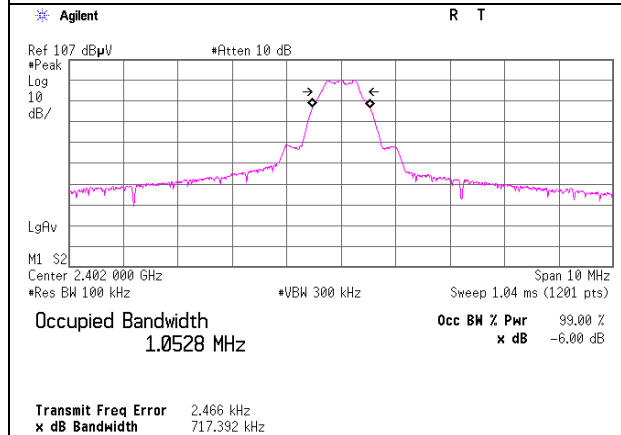
Facsimile : +81 596 24 8124

99% Occupied Bandwidth

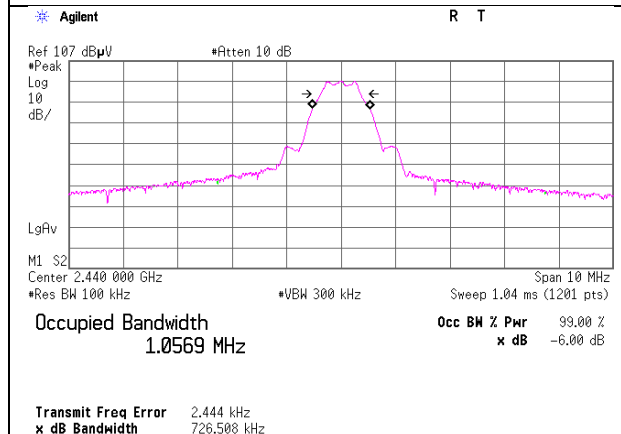
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	11240438H
Date	April 7, 2016
Temperature / Humidity	25deg. C / 40% RH
Engineer	Takumi Shimada
Mode	Tx BT LE

BT LE

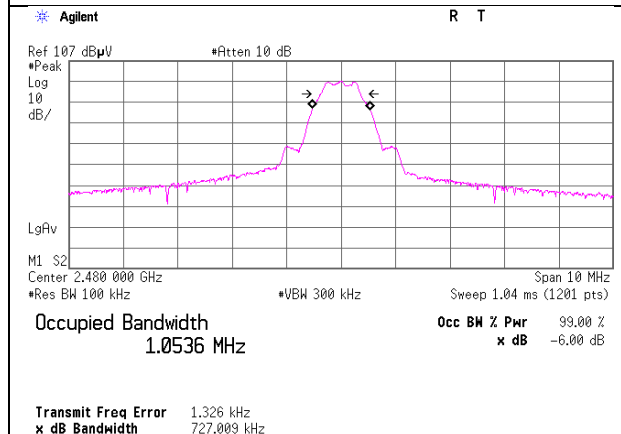
2402 MHz



2440 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)
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2015/10/19 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2015/10/19 * 12
MAT-88	Attenuator	Weinschel Associates	WA56-10	56100304	AT	2015/06/01 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2015/12/08 * 12
MTA-45	Terminator	Mini-Circuits	ANNE-50X+	MUU3460142	AT	Pre Check
MTA-38	Terminator	OMC	BL01-6118-00 (50Ω SMA)	-	AT	Pre Check
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2015/10/08 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2016/02/08 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/CE	2016/01/13 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2015/09/16 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2015/05/15 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2015/05/19 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2016/02/24 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2015/09/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2015/07/10 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2015/07/02 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

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

Test Item: CE: Conducted Emission test
RE: Radiated Emission test
AT: Antenna Terminal Conducted test

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