



RADIO TEST REPORT

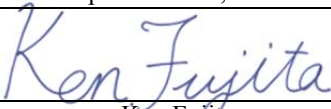
Test Report No. : 11706542H-A-R1

Applicant : Canon Inc.
Type of Equipment : Wireless Module
Model No. : WM600
FCC ID : AZD600
Test regulation : FCC Part 15 Subpart C: 2017
(WLAN, Bluetooth (Low Energy) parts)
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. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
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 11706542H-A. 11706542H-A is replaced with this report.

Date of test: April 14 to 29, 2017

Representative test engineer:


Ken Fujita
Engineer
Consumer Technology Division

Approved by:


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

REVISION HISTORY

Original Test Report No.: 11706542H-A

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SECTION 1: Customer information

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

***Remarks:**

Canon Inc. designates Murata Manufacturing Co., Ltd. as manufacturer of the product (Wireless Module).

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

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless Module
Model No.	:	WM600
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	VDD : Typ. 3.3 V, Min. 3.0 V, Max. 4.8 V *VIO : Typ. 3.3 V, Min. 1.71 V, Max. 3.63 V *VIO does not influence the RF characteristic.
Receipt Date of Sample	:	April 14, 2017
Country of Mass-production	:	China, Japan
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: WM600 (referred to as the EUT in this report) is a Wireless Module.

General Specification

Clock frequency(ies) in the system	:	37.4 MHz
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Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz - 2462 MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20 MHz & 5 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	PA : 3.0 V to 3.3 V LNA : 2.5 V
Antenna Type	Pattern Antenna
Antenna Gain	1.7 dBi

Bluetooth (Ver. 4.1 with EDR function)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK) LE: GFSK
Bandwidth & Channel spacing	BT: 1 MHz & 1 MHz LE: 1 MHz & 2 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	PA : 3.0 V to 3.3 V LNA : 2.5 V
Antenna Type	Pattern Antenna
Antenna Gain	1.7 dBi

*This test report applies for WLAN and Bluetooth Low Energy parts.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017

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

* The revision on June 14, 2017, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 30.3 dB, 0.15000 MHz, L AV 35.6 dB, 0.34000 MHz, N/ 0.34200 MHz, L	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(d)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	2.1 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 v04 12.2.7.					

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

FCC Part 15.31 (e)

The worst case stable voltage was provided to the EUT during the all tests.
And maximum and minimum voltage were provided to the EUT during the output power measurement test.
Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The antenna is not removable from the EUT.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

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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	1.5 dB	2.8 dB	2.8 dB	2.9 dB	2.6 dB

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz - 0.15 MHz	3.5 dB
0.15 MHz - 30 MHz	3.0 dB

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

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1 GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 GHz - 6 GHz	6 GHz - 18 GHz	10 GHz - 26.5 GHz	26.5 GHz - 40 GHz	1 GHz - 18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 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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NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

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)	11 Mbps, PN9
IEEE 802.11g (11g)	48 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 4, 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: 11b: 8 11g: 8 11n20: 7 BT LE: 7.5 Software: WLAN: MFG tool Version 7.13.52.6 BT LE: Blue tool 1.8.9.3 *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 *1)	2412 MHz
Radiated Spurious Emission (Below 1GHz)	BT LE Tx	2402 MHz
Conducted Spurious Emission		2440 MHz
		2480 MHz
Radiated Spurious Emission (Above 1GHz)	11b Tx	2412 MHz
	11g Tx *2)	2437 MHz
		2462 MHz
	BT LE Tx	2402 MHz
		2440 MHz
		2480 MHz
Band edge of Radiated Spurious Emission (Above 1GHz)	11n-20 Tx *3)	2412 MHz
		2462 MHz
6dB Bandwidth	11b Tx	2412 MHz
99% Occupied Bandwidth	11g Tx	2437 MHz
	11n-20 Tx	2462 MHz
	BT LE Tx	2402 MHz
		2440 MHz
		2480 MHz
Maximum Peak Output Power	11b Tx	2412 MHz
Power Density	11g Tx	2437 MHz
	11n-20 Tx	2462 MHz
	BT LE Tx	2402 MHz
		2440 MHz
		2480 MHz
Conducted Spurious Emission	11g Tx *1)	2412 MHz
	BT LE Tx	2402 MHz
		2440 MHz
		2480 MHz
*1) The operating mode and tested frequency were tested as a representative, because it had the highest power at antenna terminal test. *2) Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power *3) Only band edge test was tested on this mode, because the 11g Tx mode had the higher power at antenna terminal test.		

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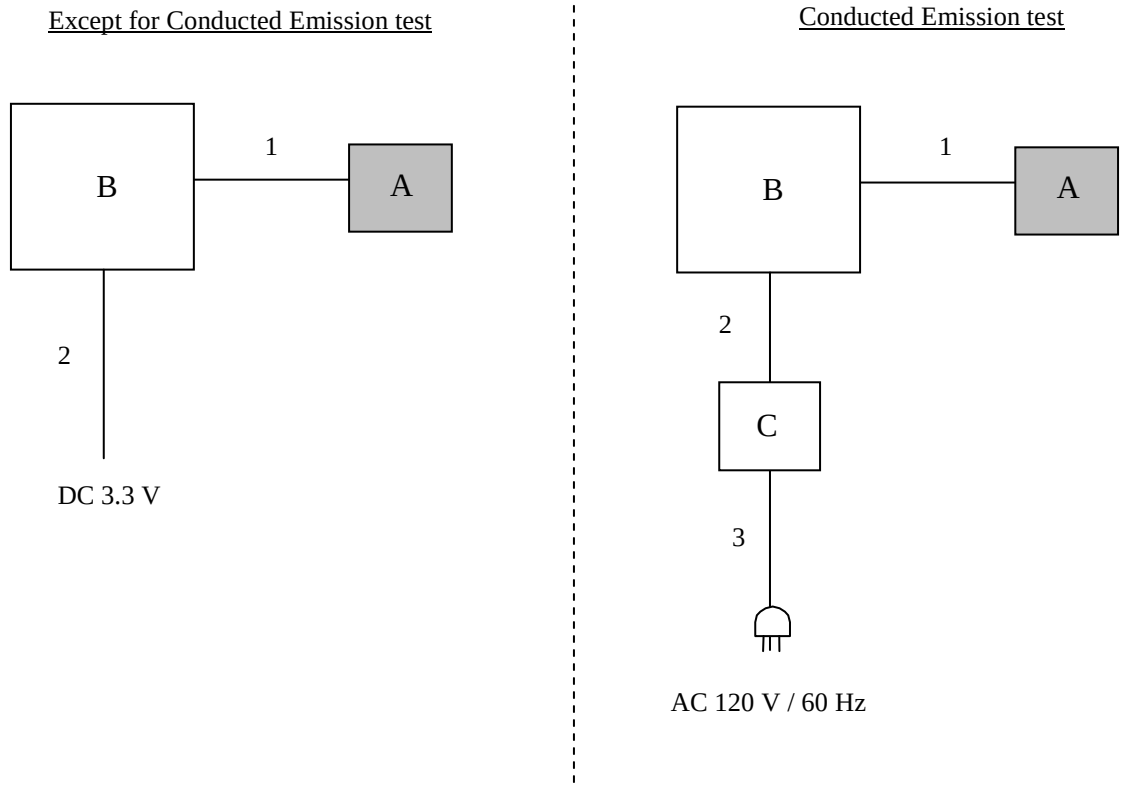
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4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Module	WM600	3	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	-	-	Murata Manufacturing Co., Ltd.	*1)
C	Power Supply	DMC35-2A	13090501	KIKUSUI	-

*1) The input voltage was supplied to the EUT (A) through the jig board, but the voltage was not regulated inside the Jig board.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Flat Cable	0.1	Unshielded	Unshielded	-
2	DC Cable	2.0	Unshielded	Unshielded	-
3	AC Cable	2.0	Unshielded	Unshielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

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

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 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 v04".

[For below 1 GHz]

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

[For above 1 GHz]

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

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

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

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

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

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

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

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	3.75 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)		3.75 m *2) (1 GHz – 10 GHz), 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 v04".

*2) Distance Factor: $20 \times \log(3.75 \text{ m} / 3.0 \text{ m}) = 1.94 \text{ dB}$

*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 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 MHz - 26.5 GHz
Test data	: APPENDIX
Test result	: Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	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 v04". *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

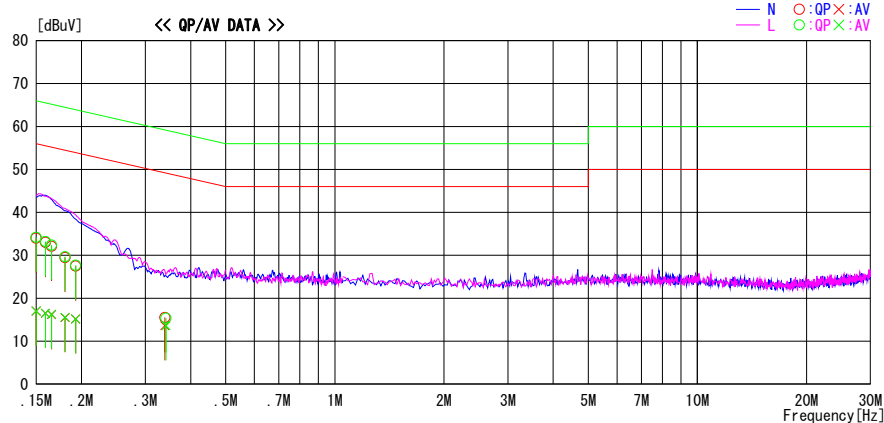
UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2017/04/29

Report No. : 11706542H

Temp./Humi. : 23deg. C / 40% RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx BT LE 2402MHz

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	20.5	3.5	13.5	34.0	17.0	66.0	56.0	32.0	39.0	N	
0.15912	19.5	3.0	13.5	33.0	16.5	65.5	55.5	32.5	39.0	N	
0.16543	18.6	2.7	13.5	32.1	16.2	65.2	55.2	33.1	39.0	N	
0.18016	16.0	2.0	13.5	29.5	15.5	64.5	54.5	35.0	39.0	N	
0.19279	14.0	1.7	13.5	27.5	15.2	63.9	53.9	36.4	38.7	N	
0.34000	2.0	0.1	13.5	15.5	13.6	59.2	49.2	43.7	35.6	N	
0.15000	20.7	3.5	13.5	34.2	17.0	66.0	56.0	31.8	39.0	L	
0.15912	19.7	3.0	13.5	33.2	16.5	65.5	55.5	32.3	39.0	L	
0.16543	18.9	2.8	13.5	32.4	16.3	65.2	55.2	32.8	38.9	L	
0.18016	16.2	2.1	13.5	29.7	15.6	64.5	54.5	34.8	38.9	L	
0.19279	14.2	1.7	13.5	27.7	15.2	63.9	53.9	36.2	38.7	L	
0.34200	1.9	0.1	13.5	15.4	13.6	59.2	49.2	43.8	35.6	L	

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

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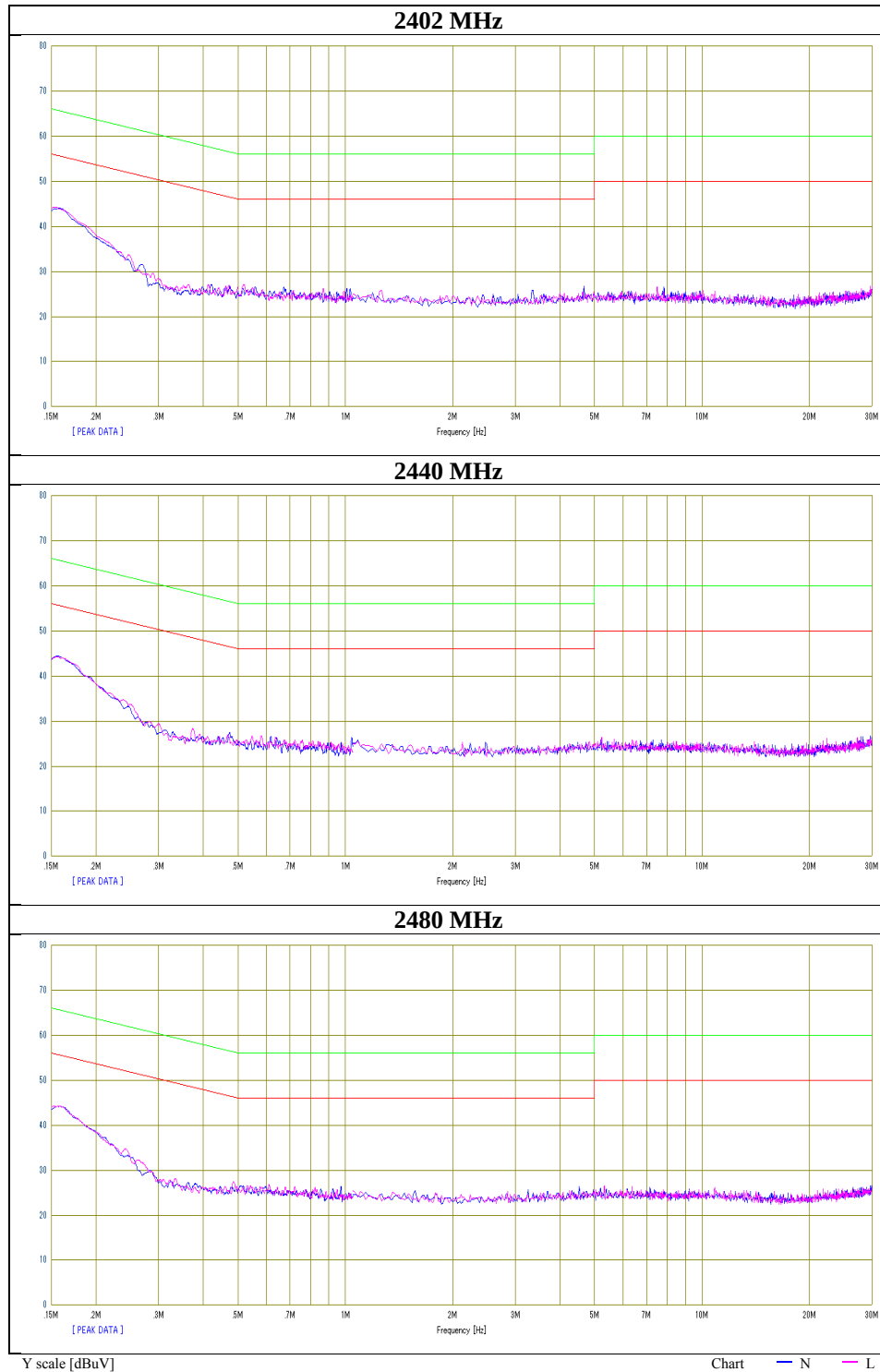
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Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11706542H
Date	April 29, 2017
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE



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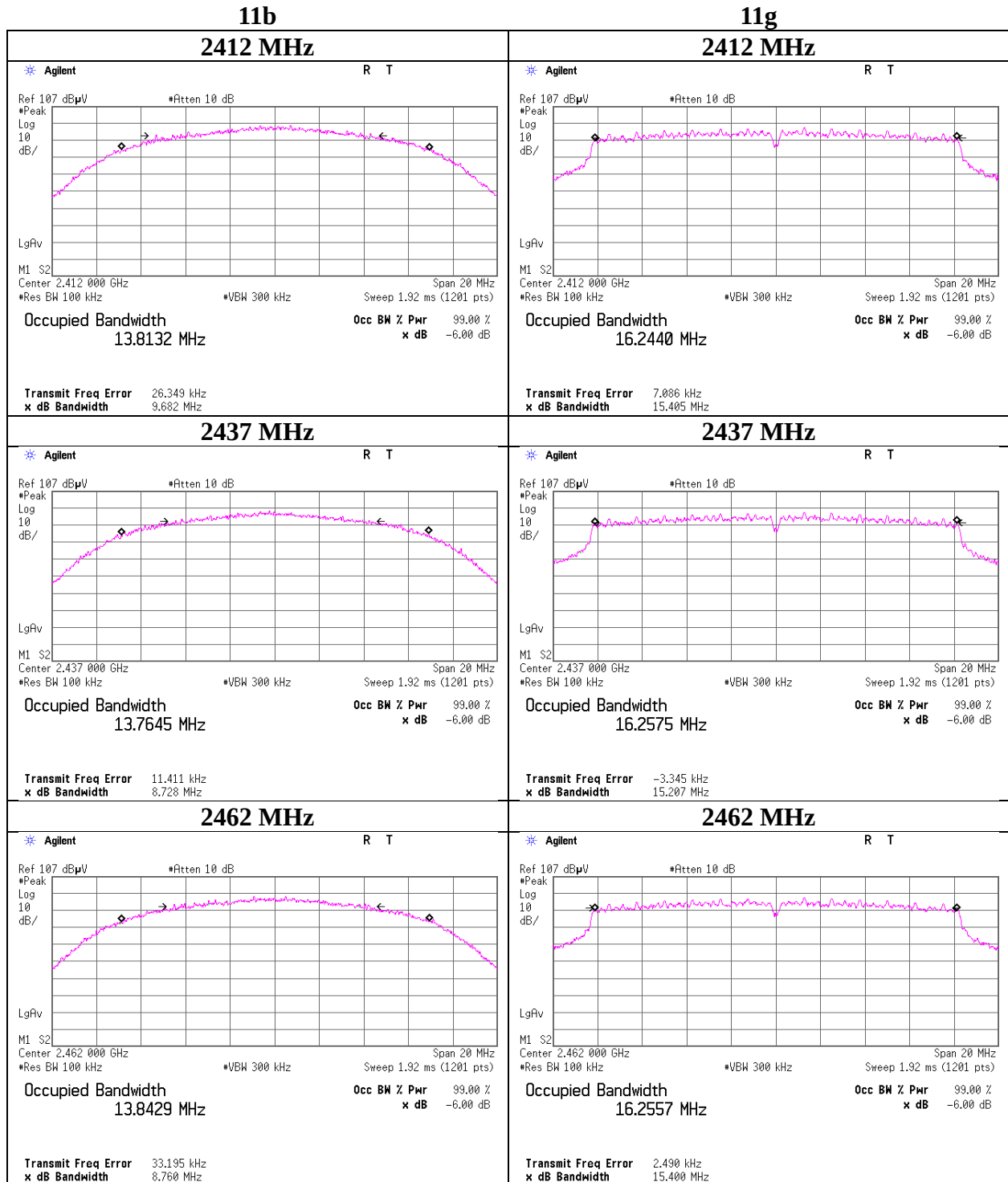
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6dB Bandwidth

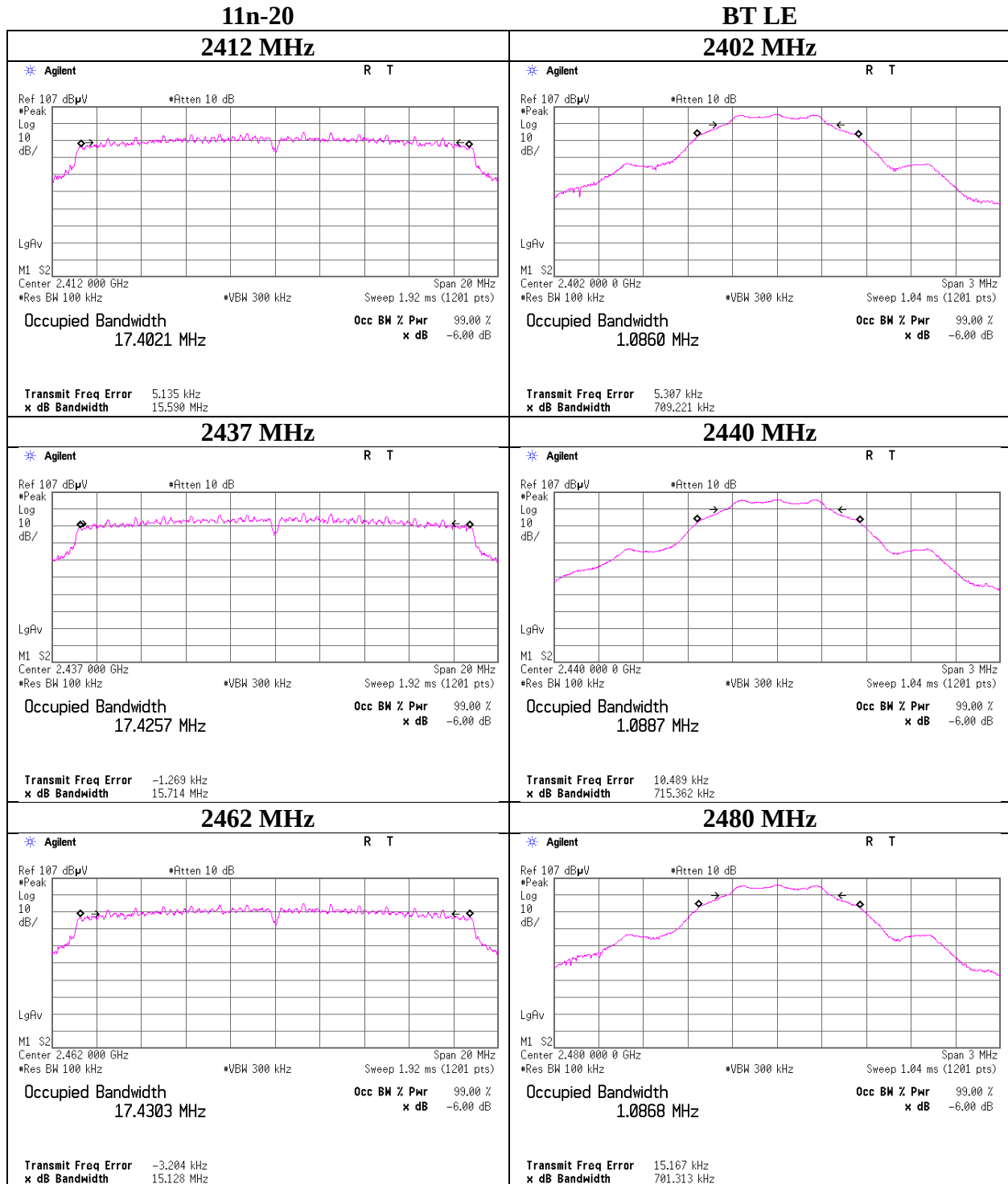
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	9.682	> 500
	2437	8.728	> 500
	2462	8.760	> 500
11g	2412	15.405	> 500
	2437	15.207	> 500
	2462	15.400	> 500
11n-20	2412	15.590	> 500
	2437	15.714	> 500
	2462	15.128	> 500
BT LE	2402	0.709	> 500
	2440	0.715	> 500
	2480	0.701	> 500

6dB Bandwidth



6dB Bandwidth



Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx 11b

3.3V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	0.20	1.67	9.48	11.35	13.65	30.00	1000	18.65
2437	-0.22	1.68	9.48	10.94	12.42	30.00	1000	19.06
2462	-0.14	1.69	9.48	11.03	12.68	30.00	1000	18.97

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	1.06	0.30	9.48	10.84	12.13	30.00	1000	19.16
2437	0.63	0.30	9.48	10.41	10.99	30.00	1000	19.59
2462	0.65	0.30	9.48	10.43	11.04	30.00	1000	19.57

4.8V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	1.44	0.30	9.48	11.22	13.24	30.00	1000	18.78
2437	1.15	0.30	9.48	10.93	12.39	30.00	1000	19.07
2462	0.92	0.30	9.48	10.70	11.75	30.00	1000	19.30

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.

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	0.98	
2	0.97	
5.5	0.95	
11	1.16	*

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx 11g

3.3V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	7.03	1.67	9.48	18.18	65.77	30.00	1000	11.82
2437	6.68	1.68	9.48	17.84	60.81	30.00	1000	12.16
2462	6.94	1.69	9.48	18.11	64.71	30.00	1000	11.89

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.92	0.30	9.48	16.70	46.77	30.00	1000	13.30
2437	6.27	0.30	9.48	16.05	40.27	30.00	1000	13.95
2462	6.85	0.30	9.48	16.63	46.03	30.00	1000	13.37

4.8V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.53	0.30	9.48	16.31	42.76	30.00	1000	13.69
2437	6.46	0.30	9.48	16.24	42.07	30.00	1000	13.76
2462	6.49	0.30	9.48	16.27	42.36	30.00	1000	13.73

Sample Calculation:

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

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

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	6.93	
9	6.85	
12	6.91	
18	6.90	
24	6.94	
36	6.93	
48	6.98	*
54	6.94	

*: Worst Rate

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

*Difference between worst rate check data and formal test result is due to the different test condition.

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Ise EMC Lab.

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Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx 11n-20

3.3V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.63	1.67	9.48	17.78	59.98	30.00	1000	12.22
2437	6.39	1.68	9.48	17.55	56.89	30.00	1000	12.45
2462	6.61	1.69	9.48	17.78	59.98	30.00	1000	12.22

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.22	0.30	9.48	16.00	39.81	30.00	1000	14.00
2437	6.18	0.30	9.48	15.96	39.45	30.00	1000	14.04
2462	6.43	0.30	9.48	16.21	41.78	30.00	1000	13.79

4.8V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.88	0.30	9.48	16.66	46.34	30.00	1000	13.34
2437	6.73	0.30	9.48	16.51	44.77	30.00	1000	13.49
2462	6.70	0.30	9.48	16.48	44.46	30.00	1000	13.52

Sample Calculation:

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

*The equipment and cables were not used for factor 0.0 dB of the data sheets.

2437 MHz

MCS Number	Reading [dBm]	Remark
0	7.00	
1	6.92	
2	7.01	
3	6.91	
4	7.10	*
5	6.96	
6	7.04	
7	6.98	

* Worst MCS

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

*Difference between worst rate check data and formal test result is due to the different test condition.

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Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	11706542H
Date	April 25, 2016
Temperature / Humidity	22 deg. C / 54 % RH
Engineer	Yutaka Yoshida
Mode	Tx BT LE

BT LE

3.3V

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-4.14	2.07	9.48	7.41	5.51	30.00	1000	22.59
2440	-4.21	2.08	9.48	7.35	5.43	30.00	1000	22.65
2480	-3.65	2.09	9.48	7.92	6.19	30.00	1000	22.08

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-3.21	0.30	9.48	6.57	4.54	30.00	1000	23.43
2440	-3.13	0.30	9.48	6.65	4.62	30.00	1000	23.35
2480	-3.17	0.30	9.48	6.61	4.58	30.00	1000	23.39

4.8V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-2.75	0.30	9.48	7.03	5.05	30.00	1000	22.97
2440	-2.99	0.30	9.48	6.79	4.78	30.00	1000	23.21
2480	-3.01	0.30	9.48	6.77	4.75	30.00	1000	23.23

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx 11b

3.3V 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-2.73	1.67	9.48	8.42	6.95	0.01	8.43	6.97
2437	-3.07	1.68	9.48	8.09	6.44	0.01	8.10	6.46
2462	-3.03	1.69	9.48	8.14	6.52	0.01	8.15	6.53

3.0V 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-2.10	0.30	9.48	7.68	5.86	0.01	7.69	5.87
2437	-2.43	0.30	9.48	7.35	5.43	0.01	7.36	5.45
2462	-2.29	0.30	9.48	7.49	5.61	0.01	7.50	5.62

4.8V 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-1.87	0.30	9.48	7.91	6.18	0.01	7.92	6.19
2437	-1.96	0.30	9.48	7.82	6.05	0.01	7.83	6.07
2462	-2.23	0.30	9.48	7.55	5.69	0.01	7.56	5.70

Sample Calculation:

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

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

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

**The average output power was measured with the lowest order modulation and
lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.**

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

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
Mode	Tx 11g

3.3V 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-2.21	1.20	10.08	9.07	8.07	0.06	9.13	8.18
2437	-2.51	1.20	10.08	8.77	7.53	0.06	8.83	7.64
2462	-2.60	1.20	10.08	8.68	7.38	0.06	8.74	7.48

3.0V 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-2.36	1.20	10.08	8.92	7.80	0.06	8.98	7.91
2437	-2.54	1.20	10.08	8.74	7.48	0.06	8.80	7.59
2462	-2.64	1.20	10.08	8.64	7.31	0.06	8.70	7.41

4.8V 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-2.31	1.20	10.08	8.97	7.89	0.06	9.03	8.00
2437	-2.41	1.20	10.08	8.87	7.71	0.06	8.93	7.82
2462	-2.56	1.20	10.08	8.72	7.45	0.06	8.78	7.55

Sample Calculation:

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

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

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

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

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

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
Mode	Tx 11n-20

3.3V MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-3.01	1.67	9.48	8.14	6.52	0.05	8.19	6.59
2437	-3.22	1.68	9.48	7.94	6.22	0.05	7.99	6.30
2462	-3.34	1.69	9.48	7.83	6.07	0.05	7.88	6.14

3.0V MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-1.89	0.30	9.48	7.89	6.15	0.05	7.94	6.22
2437	-2.10	0.30	9.48	7.68	5.86	0.05	7.73	5.93
2462	-1.93	0.30	9.48	7.85	6.10	0.05	7.90	6.17

4.8V MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-1.67	0.30	9.48	8.11	6.47	0.05	8.16	6.55
2437	-1.89	0.30	9.48	7.89	6.15	0.05	7.94	6.22
2462	-1.97	0.30	9.48	7.81	6.04	0.05	7.86	6.11

Sample Calculation:

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

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

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

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

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

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx BT LE

3.3V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-6.25	1.67	9.48	4.90	3.09	1.80	6.70	4.68
2440	-6.29	1.68	9.48	4.87	3.07	1.80	6.67	4.65
2480	-5.98	1.69	9.48	5.19	3.30	1.80	6.99	5.00

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-5.37	0.30	9.48	4.41	2.76	1.80	6.21	4.18
2440	-5.67	0.30	9.48	4.11	2.58	1.80	5.91	3.90
2480	-5.54	0.30	9.48	4.24	2.65	1.80	6.04	4.02

4.8V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-4.97	0.30	9.48	4.81	3.03	1.80	6.61	4.58
2440	-5.12	0.30	9.48	4.66	2.92	1.80	6.46	4.43
2480	-5.22	0.30	9.48	4.56	2.86	1.80	6.36	4.33

Sample Calculation:

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

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

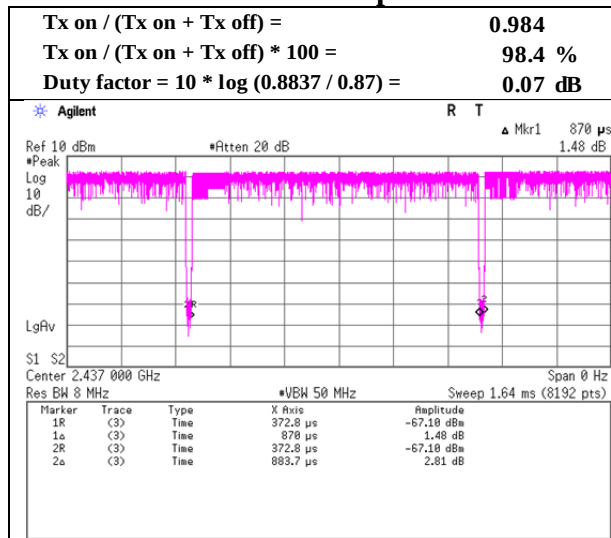
*The equipment and cables were not used for factor 0 dB of the data sheets.

**The average output power was measured with the lowest order modulation and
lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.**

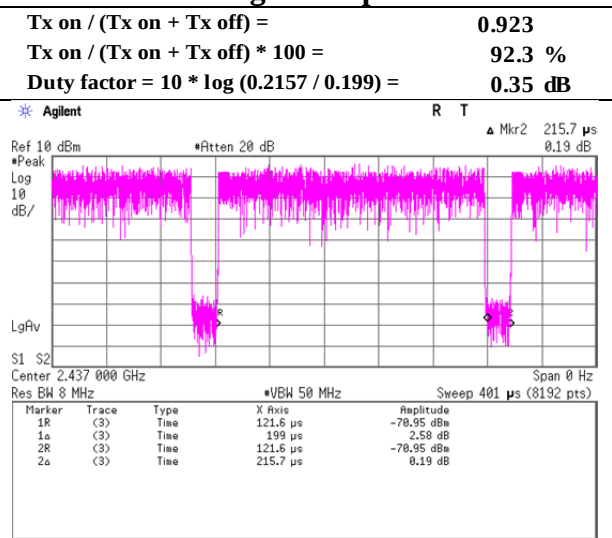
Burst rate confirmation

Test place Ise EMC Lab. No.2 Measurement Room
Report No. 11706542H
Date April 14, 2017
Temperature / Humidity 23 deg. C / 41 % RH
Engineer Koji Yamamoto
Mode Tx

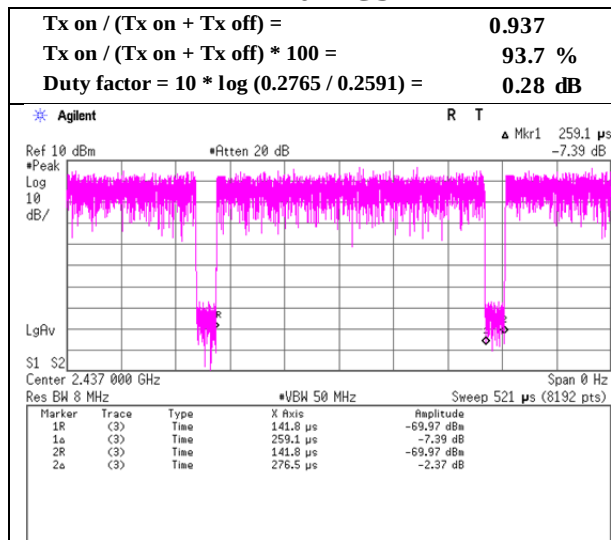
11b 11 Mbps



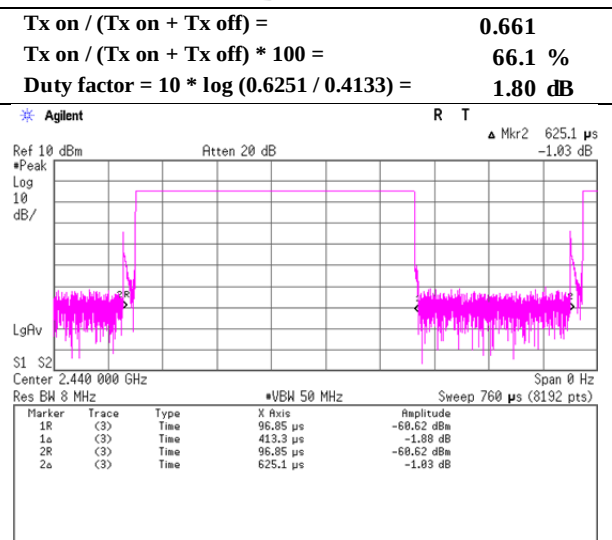
11g 48 Mbps



11n-20 MCS 4



BT LE

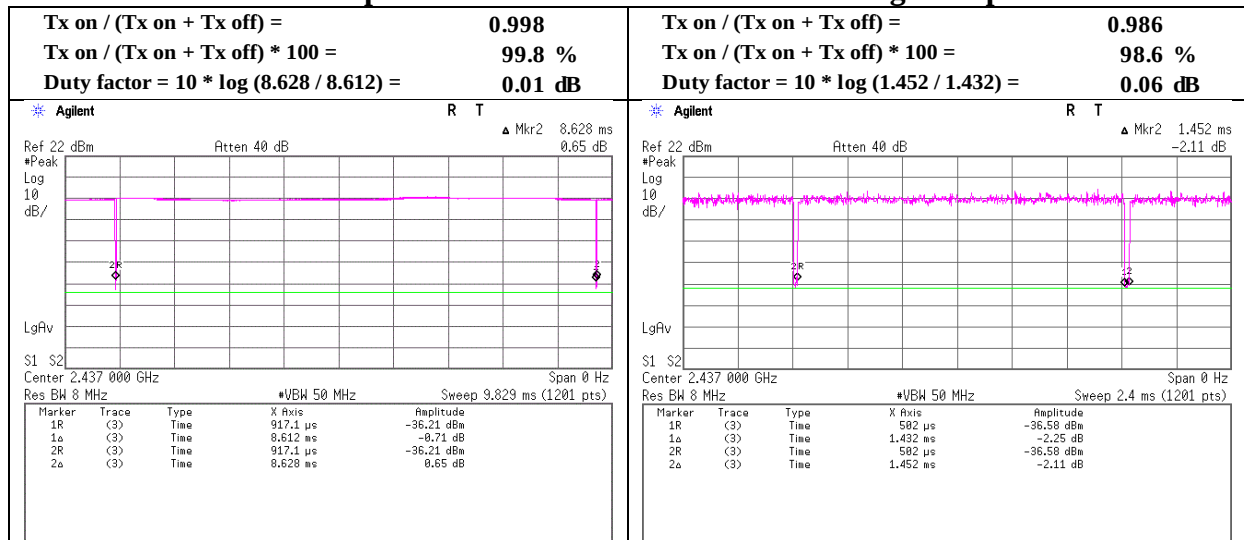


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

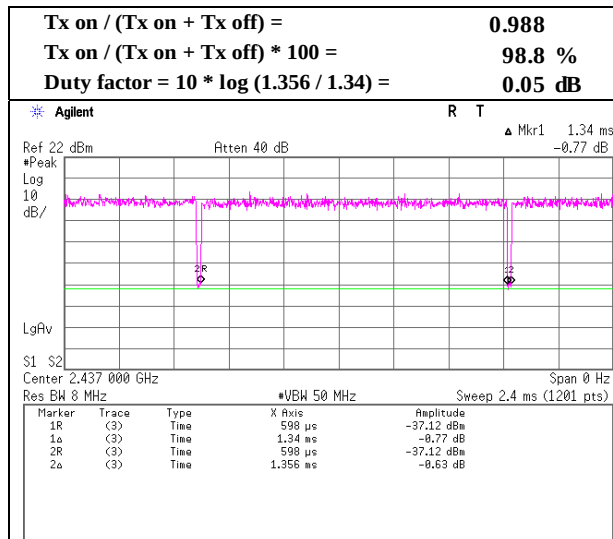
Burst rate confirmation

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx

11b 1Mbps



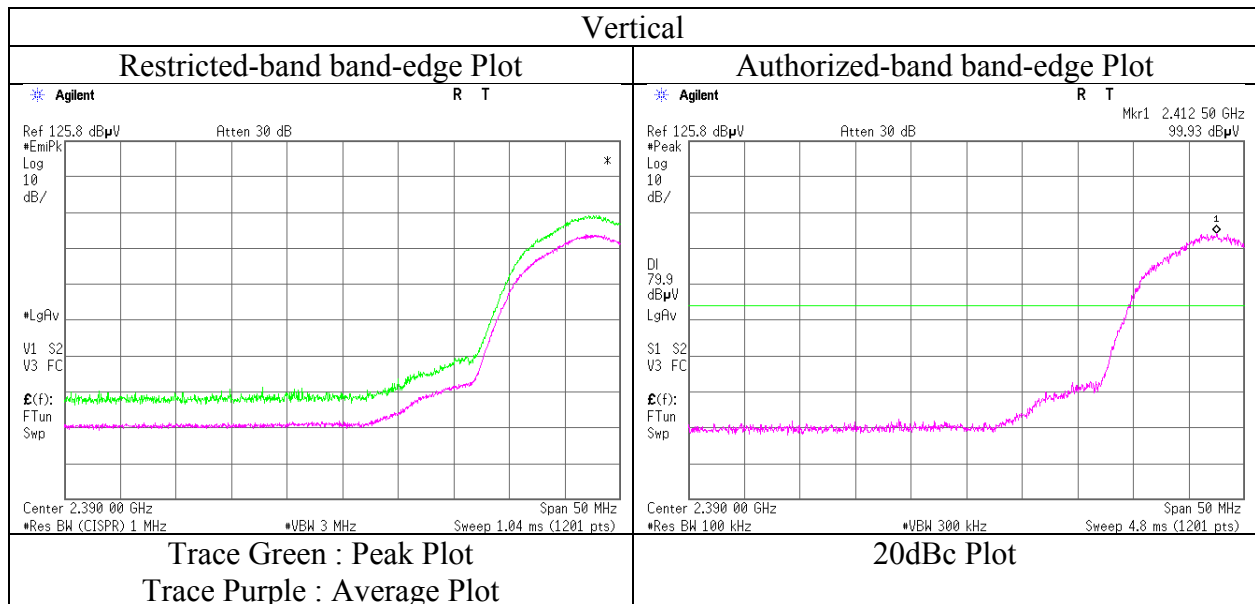
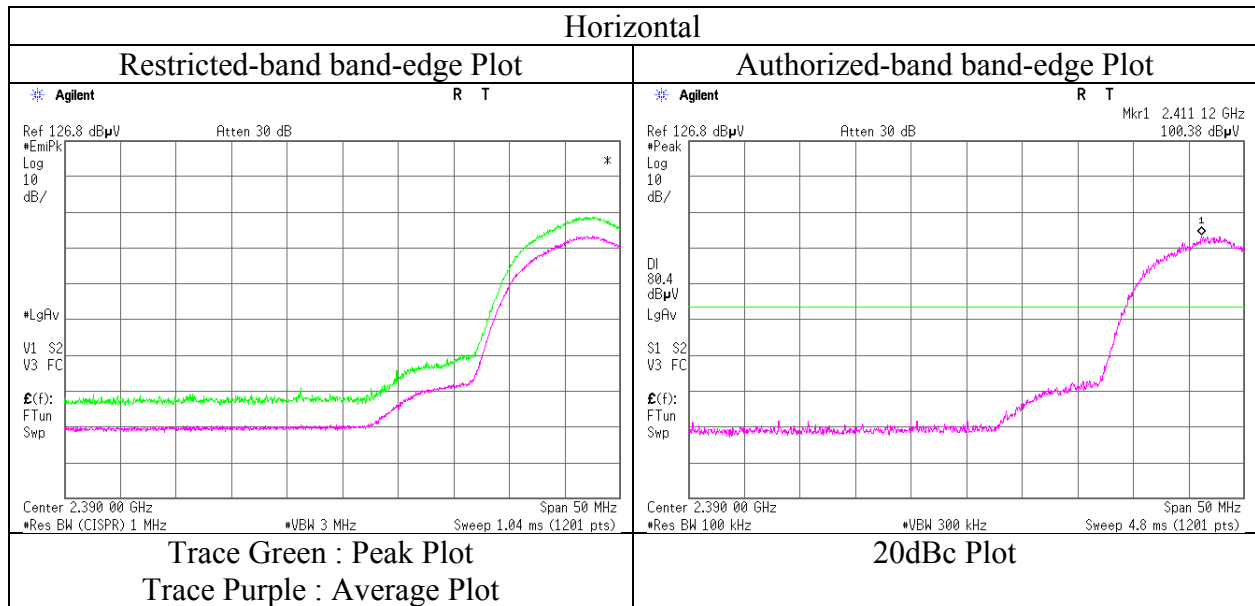
11n-20 MCS 0



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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Hironobu Ohnishi (1 GHz -10 GHz)
Mode	Tx 11b 2412 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.2 Semi Anechoic Chamber
Report No. : 11706542H
Date : April 20, 2017 April 21, 2017
Temperature / Humidity : 24 deg. C / 30 % RH 24 deg. C / 33 % RH
Engineer : Hironobu Ohnishi Hiroyuki Furutaka
 (1 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode : Tx 11b 2437 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	4874.000	PK	42.5	31.4	7.6	33.8	-	47.7	73.9	26.2	Floor noise
Hori	7311.000	PK	42.8	35.7	8.5	33.9	-	53.1	73.9	20.8	Floor noise
Hori	9748.000	PK	44.5	38.2	9.2	34.5	-	57.4	73.9	16.5	Floor noise
Hori	4874.000	AV	33.7	31.4	7.6	33.8	-	38.9	53.9	15.0	Floor noise
Hori	7311.000	AV	34.1	35.7	8.5	33.9	-	44.4	53.9	9.5	Floor noise
Hori	9748.000	AV	34.8	38.2	9.2	34.5	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	42.6	31.4	7.6	33.8	-	47.8	73.9	26.1	Floor noise
Vert	7311.000	PK	43.1	35.7	8.5	33.9	-	53.4	73.9	20.5	Floor noise
Vert	9748.000	PK	43.5	38.2	9.2	34.5	-	56.4	73.9	17.5	Floor noise
Vert	4874.000	AV	34.1	31.4	7.6	33.8	-	39.3	53.9	14.6	Floor noise
Vert	7311.000	AV	34.7	35.7	8.5	33.9	-	45.0	53.9	8.9	Floor noise
Vert	9748.000	AV	35.1	38.2	9.2	34.5	-	48.0	53.9	5.9	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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
 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.2 Semi Anechoic Chamber
Report No. : 11706542H
Date : April 20, 2017 April 21, 2017
Temperature / Humidity : 24 deg. C / 33 % RH 24 deg. C / 33 % RH
Engineer : Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode : Tx 11b 2462 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	2483.500	PK	50.5	27.0	5.1	34.6	-	48.0	73.9	25.9	
Hori	4924.000	PK	42.0	31.5	7.5	33.8	-	47.2	73.9	26.7	Floor noise
Hori	7386.000	PK	43.8	35.8	8.5	34.0	-	54.1	73.9	19.8	Floor noise
Hori	9848.000	PK	43.9	38.2	9.2	34.5	-	56.8	73.9	17.1	Floor noise
Hori	2483.500	AV	42.0	27.0	5.1	34.6	-	39.5	53.9	14.4	
Hori	4924.000	AV	33.7	31.5	7.5	33.8	-	38.9	53.9	15.0	Floor noise
Hori	7386.000	AV	34.7	35.8	8.5	34.0	-	45.0	53.9	8.9	Floor noise
Hori	9848.000	AV	35.3	38.2	9.2	34.5	-	48.2	53.9	5.7	Floor noise
Vert	2483.500	PK	45.9	27.0	5.1	34.6	-	43.4	73.9	30.5	
Vert	4924.000	PK	42.5	31.5	7.5	33.8	-	47.7	73.9	26.2	Floor noise
Vert	7386.000	PK	43.3	35.8	8.5	34.0	-	53.6	73.9	20.3	Floor noise
Vert	9848.000	PK	44.5	38.2	9.2	34.5	-	57.4	73.9	16.5	Floor noise
Vert	2483.500	AV	37.5	27.0	5.1	34.6	-	35.0	53.9	18.9	
Vert	4924.000	AV	34.0	31.5	7.5	33.8	-	39.2	53.9	14.7	Floor noise
Vert	7386.000	AV	34.3	35.8	8.5	34.0	-	44.6	53.9	9.3	Floor noise
Vert	9848.000	AV	35.9	38.2	9.2	34.5	-	48.8	53.9	5.1	Floor noise

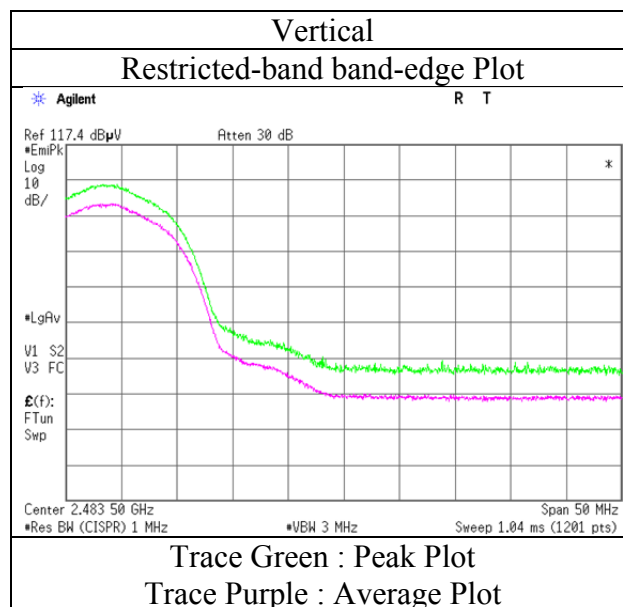
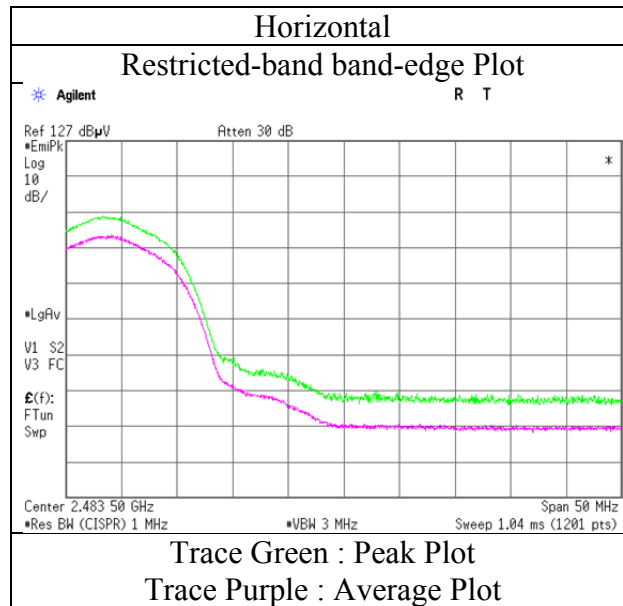
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*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 (3.75 m / 3.0 m) = 1.94 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.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Hiroyuki Furutaka (1 GHz -10 GHz)
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.2 Semi Anechoic Chamber		
Report No.	11706542H		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	April 20, 2017	April 21, 2017	April 28, 2017
Temperature / Humidity	24 deg. C / 30 % RH	24 deg. C / 33 % RH	22 deg. C / 31 % RH
Engineer	Hironobu Ohnishi (1 GHz -10 GHz)	Hiroyuki Furutaka (10 GHz -26.5 GHz)	Takafumi Noguchi (Below 1 GHz)
Mode	Tx 11g 2412 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	36.020	QP	23.9	15.8	7.2	32.2	-	14.7	40.0	25.3	
Hori	39.316	QP	27.5	14.6	7.3	32.2	-	17.2	40.0	22.8	
Hori	176.768	QP	22.3	16.2	9.0	32.1	-	15.4	43.5	28.1	
Hori	196.885	QP	22.3	16.6	9.2	32.1	-	16.0	43.5	27.5	
Hori	609.334	QP	21.9	19.1	12.0	32.0	-	21.0	46.0	25.0	
Hori	986.661	QP	20.8	22.4	13.8	30.6	-	26.4	53.9	27.5	
Hori	2390.000	PK	68.7	27.0	4.9	34.6	-	66.0	73.9	7.9	
Hori	4824.000	PK	42.9	31.3	7.6	33.8	-	48.0	73.9	25.9	Floor noise
Hori	7236.000	PK	43.1	35.7	8.4	33.9	-	53.3	73.9	20.6	Floor noise
Hori	9648.000	PK	43.1	38.2	9.3	34.5	-	56.1	73.9	17.8	Floor noise
Hori	2390.000	AV	50.5	27.0	4.9	34.6	0.4	48.2	53.9	5.7	*1)
Hori	4824.000	AV	34.0	31.3	7.6	33.8	-	39.1	53.9	14.8	Floor noise
Hori	7236.000	AV	34.6	35.7	8.4	33.9	-	44.8	53.9	9.1	Floor noise
Hori	9648.000	AV	35.5	38.2	9.3	34.5	-	48.5	53.9	5.4	Floor noise
Vert	36.020	QP	25.8	15.8	7.2	32.2	-	16.6	40.0	23.4	
Vert	39.316	QP	31.4	14.6	7.3	32.2	-	21.1	40.0	18.9	
Vert	176.768	QP	22.1	16.2	9.0	32.1	-	15.2	43.5	28.3	
Vert	196.885	QP	21.8	16.6	9.2	32.1	-	15.5	43.5	28.0	
Vert	609.334	QP	21.9	19.1	12.0	32.0	-	21.0	46.0	25.0	
Vert	986.661	QP	20.8	22.4	13.8	30.6	-	26.4	53.9	27.5	
Vert	2390.000	PK	69.4	27.0	4.9	34.6	-	66.7	73.9	7.2	
Vert	4824.000	PK	42.5	31.3	7.6	33.8	-	47.6	73.9	26.3	Floor noise
Vert	7236.000	PK	44.2	35.7	8.4	33.9	-	54.4	73.9	19.5	Floor noise
Vert	9648.000	PK	43.9	38.2	9.3	34.5	-	56.9	73.9	17.0	Floor noise
Vert	2390.000	AV	50.2	27.0	4.9	34.6	0.4	47.9	53.9	6.0	*1)
Vert	4824.000	AV	34.3	31.3	7.6	33.8	-	39.4	53.9	14.5	Floor noise
Vert	7236.000	AV	34.4	35.7	8.4	33.9	-	44.6	53.9	9.3	Floor noise
Vert	9648.000	AV	35.3	38.2	9.3	34.5	-	48.3	53.9	5.6	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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$

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	2412.000	PK	98.2	27.0	5.1	34.6	95.7	-	-	Carrier
Hori	2400.000	PK	66.0	27.0	5.0	34.6	63.4	75.7	12.3	
Vert	2412.000	PK	98.2	27.0	5.1	34.6	95.7	-	-	Carrier
Vert	2400.000	PK	64.7	27.0	5.0	34.6	62.1	75.7	13.6	

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

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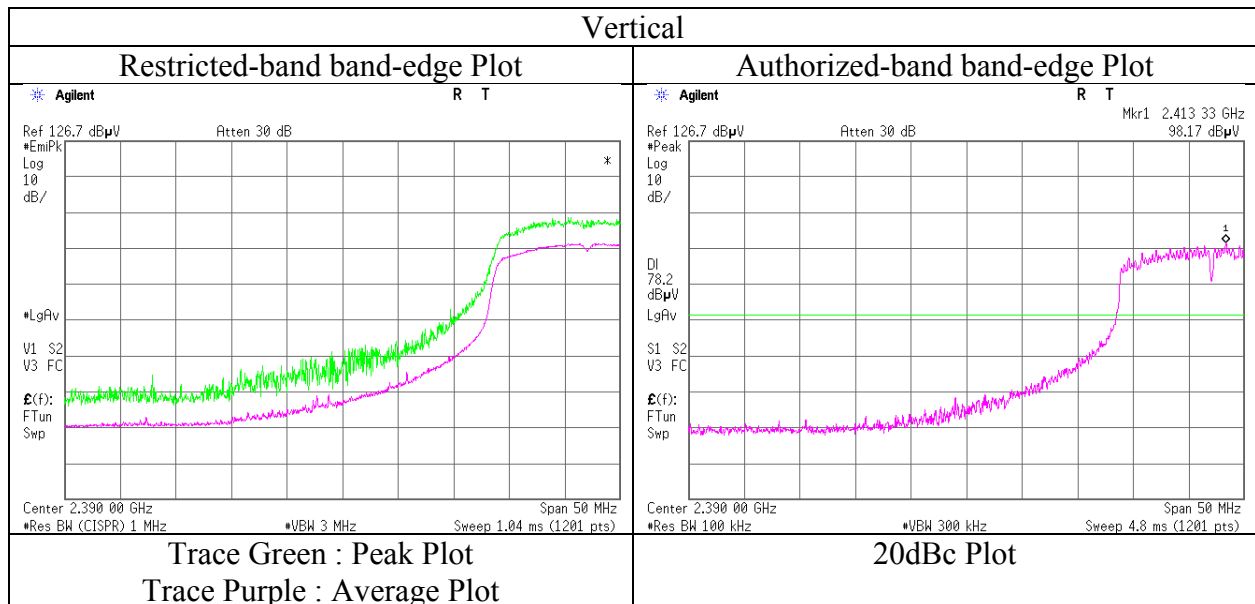
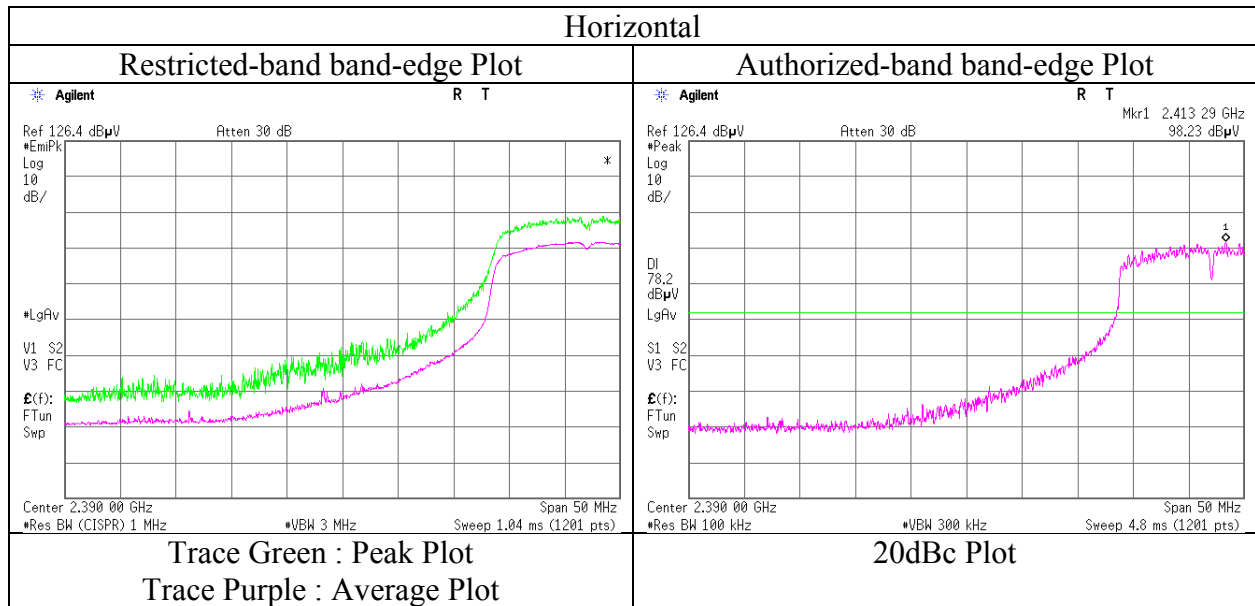
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Hironobu Ohnishi (1 GHz -10 GHz)
Mode	Tx 11g 2412 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.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017 April 21, 2017
Temperature / Humidity	24 deg. C / 30 % RH 24 deg. C / 33 % RH
Engineer	Hironobu Ohnishi Hiroyuki Furutaka
	(1 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode	Tx 11g 2437 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	4874.000	PK	43.9	31.4	7.6	33.8	-	49.1	73.9	24.8	Floor noise
Hori	7311.000	PK	42.8	35.7	8.5	33.9	-	53.1	73.9	20.8	Floor noise
Hori	9748.000	PK	44.4	38.2	9.2	34.5	-	57.3	73.9	16.6	Floor noise
Hori	4874.000	AV	34.0	31.4	7.6	33.8	-	39.2	53.9	14.7	Floor noise
Hori	7311.000	AV	34.1	35.7	8.5	33.9	-	44.4	53.9	9.5	Floor noise
Hori	9748.000	AV	34.8	38.2	9.2	34.5	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	43.0	31.4	7.6	33.8	-	48.2	73.9	25.7	Floor noise
Vert	7311.000	PK	43.3	35.7	8.5	33.9	-	53.6	73.9	20.3	Floor noise
Vert	9748.000	PK	43.7	38.2	9.2	34.5	-	56.6	73.9	17.3	Floor noise
Vert	4874.000	AV	34.2	31.4	7.6	33.8	-	39.4	53.9	14.5	Floor noise
Vert	7311.000	AV	34.4	35.7	8.5	33.9	-	44.7	53.9	9.2	Floor noise
Vert	9748.000	AV	35.4	38.2	9.2	34.5	-	48.3	53.9	5.6	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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11706542H
Date : April 20, 2017 April 21, 2017
Temperature / Humidity : 24 deg. C / 33 % RH 24 deg. C / 33 % RH
Engineer : Hiroyuki Furutaka Hiroyuki Furutaka
(1 GHz -10 GHz) (10 GHz -26.5 GHz)
Mode : Tx 11g 2462 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	2483.500	PK	69.3	27.0	5.1	34.6	-	66.8	73.9	7.1	
Hori	4924.000	PK	42.3	31.5	7.5	33.8	-	47.5	73.9	26.4	Floor noise
Hori	7386.000	PK	43.2	35.8	8.5	34.0	-	53.5	73.9	20.4	Floor noise
Hori	9848.000	PK	45.2	38.2	9.2	34.5	-	58.1	73.9	15.8	Floor noise
Hori	2483.500	AV	53.2	27.0	5.1	34.6	0.4	51.1	53.9	2.9	*1)
Hori	4924.000	AV	34.1	31.5	7.5	33.8	-	39.3	53.9	14.6	Floor noise
Hori	7386.000	AV	34.3	35.8	8.5	34.0	-	44.6	53.9	9.3	Floor noise
Hori	9848.000	AV	35.0	38.2	9.2	34.5	-	47.9	53.9	6.0	Floor noise
Vert	2483.500	PK	70.0	27.0	5.1	34.6	-	67.5	73.9	6.4	
Vert	4924.000	PK	42.8	31.5	7.5	33.8	-	48.0	73.9	25.9	Floor noise
Vert	7386.000	PK	43.0	35.8	8.5	34.0	-	53.3	73.9	20.6	Floor noise
Vert	9848.000	PK	45.1	38.2	9.2	34.5	-	58.0	73.9	15.9	Floor noise
Vert	2483.500	AV	52.0	27.0	5.1	34.6	0.4	49.9	53.9	4.1	*1)
Vert	4924.000	AV	34.2	31.5	7.5	33.8	-	39.4	53.9	14.5	Floor noise
Vert	7386.000	AV	34.8	35.8	8.5	34.0	-	45.1	53.9	8.8	Floor noise
Vert	9848.000	AV	34.6	38.2	9.2	34.5	-	47.5	53.9	6.4	Floor noise

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

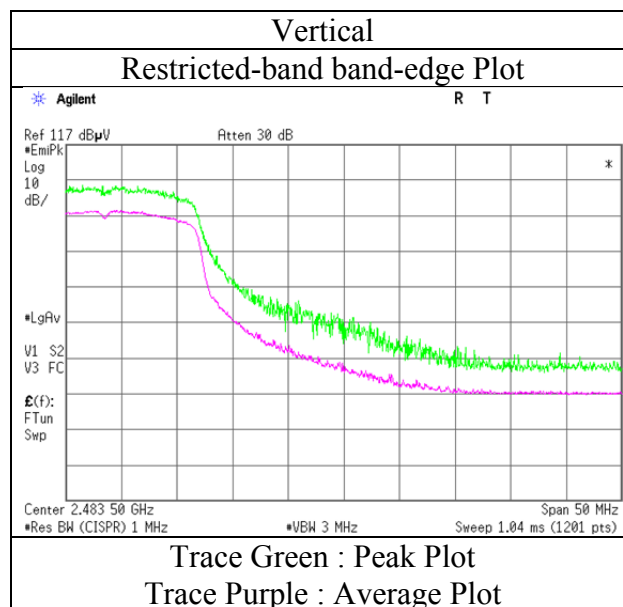
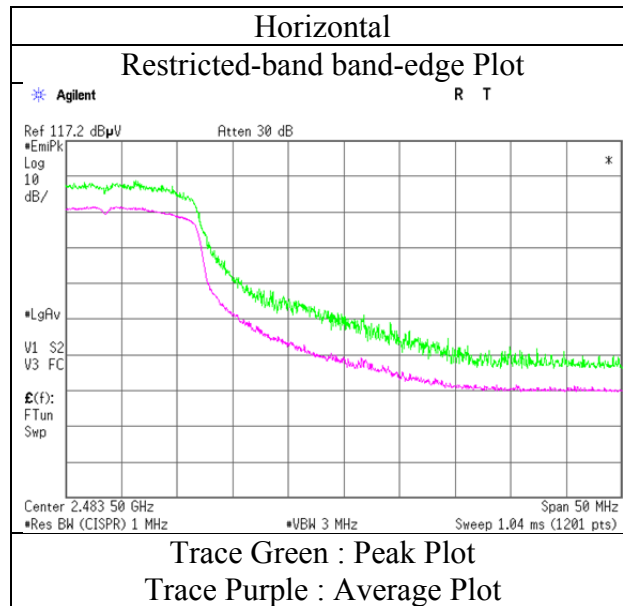
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
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)

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Hiroyuki Furutaka (1 GHz -10 GHz)
Mode	Tx 11g 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.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Hironobu Ohnishi
	(Band edge)
Mode	Tx 11n-20 2412 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	2390.000	PK	63.8	27.0	4.9	34.6	-	61.1	73.9	12.8	
Hori	2390.000	AV	47.2	27.0	4.9	34.6	0.3	44.8	53.9	9.1	*1)
Vert	2390.000	PK	65.9	27.0	4.9	34.6	-	63.2	73.9	10.7	
Vert	2390.000	AV	47.6	27.0	4.9	34.6	0.3	45.2	53.9	8.7	*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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
 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	2412.000	PK	97.6	27.0	5.1	34.6	95.1	-	-	Carrier
Hori	2400.000	PK	64.6	27.0	5.0	34.6	62.0	75.1	13.1	
Vert	2412.000	PK	96.9	27.0	5.1	34.6	94.4	-	-	Carrier
Vert	2400.000	PK	63.9	27.0	5.0	34.6	61.3	74.4	13.1	

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

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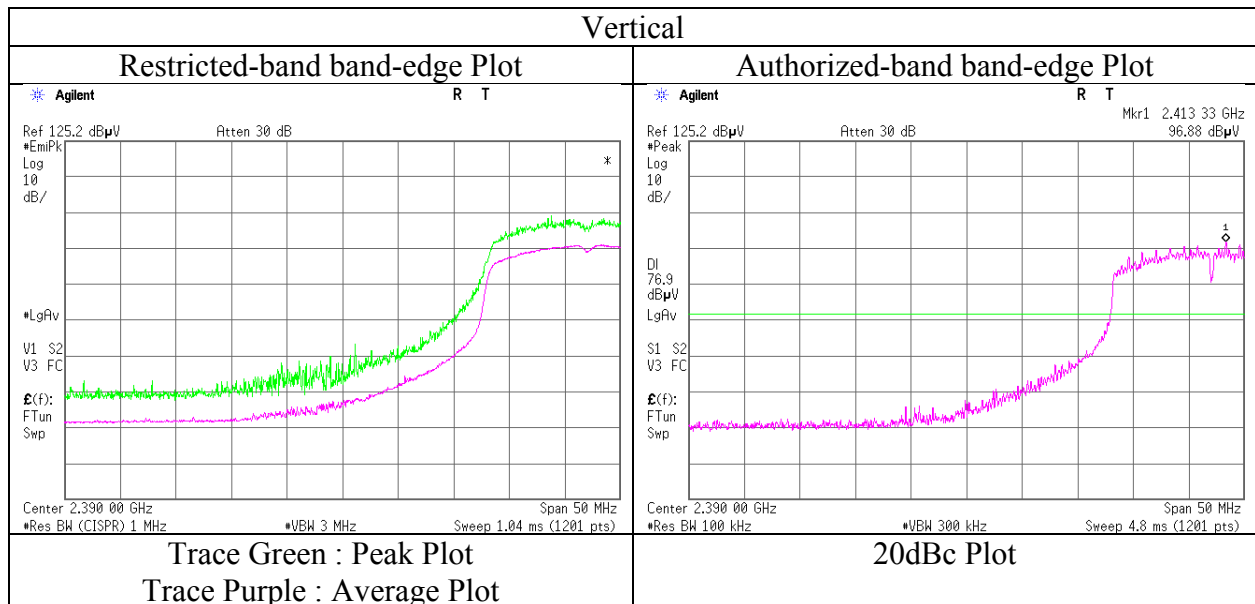
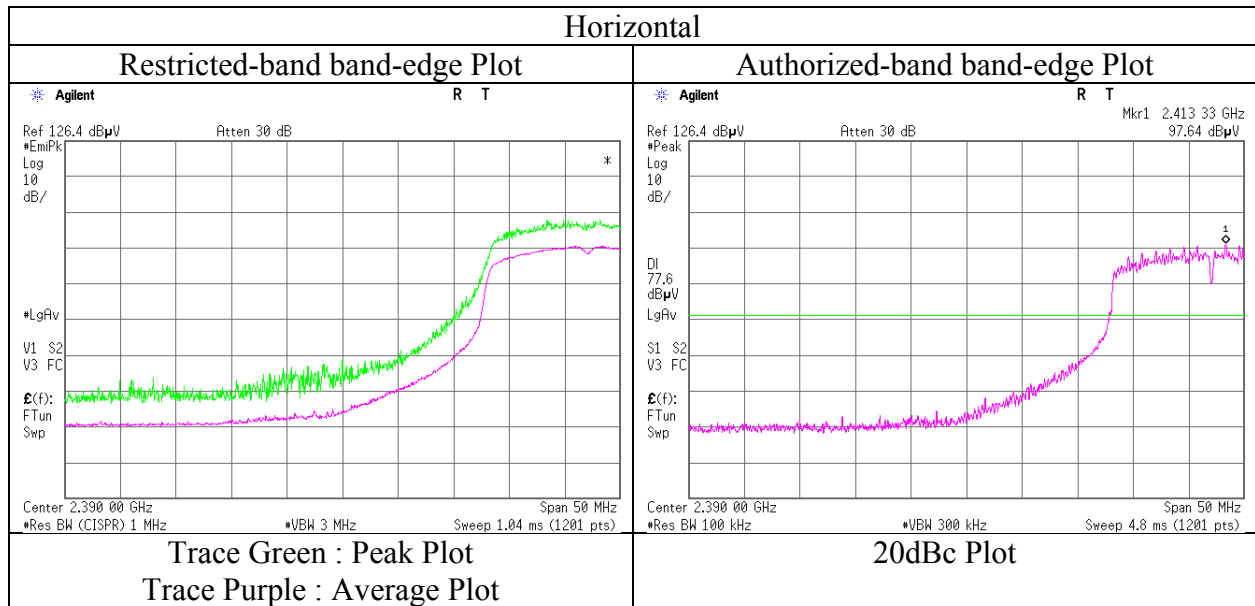
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Hironobu Ohnishi (Band edge)
Mode	Tx 11n-20 2412 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.2 Semi Anechoic Chamber
Report No. : 11706542H
Date : April 20, 2017
Temperature / Humidity : 24 deg. C / 33 % RH
Engineer : Hiroyuki Furutaka
(Band edge)
Mode : Tx 11n-20 2462 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	2483.500	PK	71.2	27.0	5.1	34.6	-	68.7	73.9	5.2	
Hori	2483.500	AV	54.0	27.0	5.1	34.6	0.3	51.8	53.9	2.1	*1)
Vert	2483.500	PK	69.0	27.0	5.1	34.6	-	66.5	73.9	7.4	
Vert	2483.500	AV	52.7	27.0	5.1	34.6	0.3	50.5	53.9	3.4	*1)

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

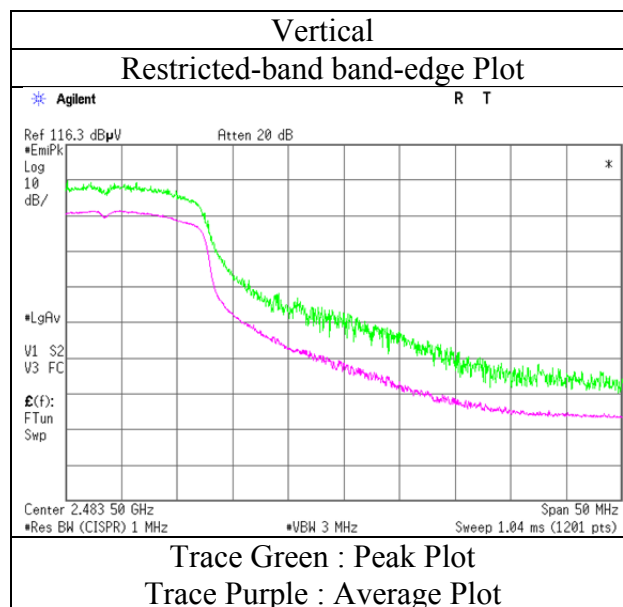
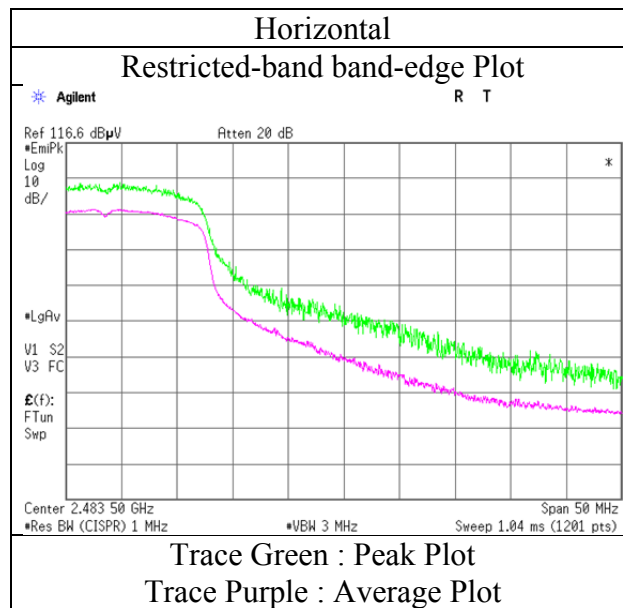
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 20, 2017
Temperature / Humidity	24 deg. C / 33 % RH
Engineer	Hiroyuki Furutaka (Band edge)
Mode	Tx 11n-20 2462 MHz



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

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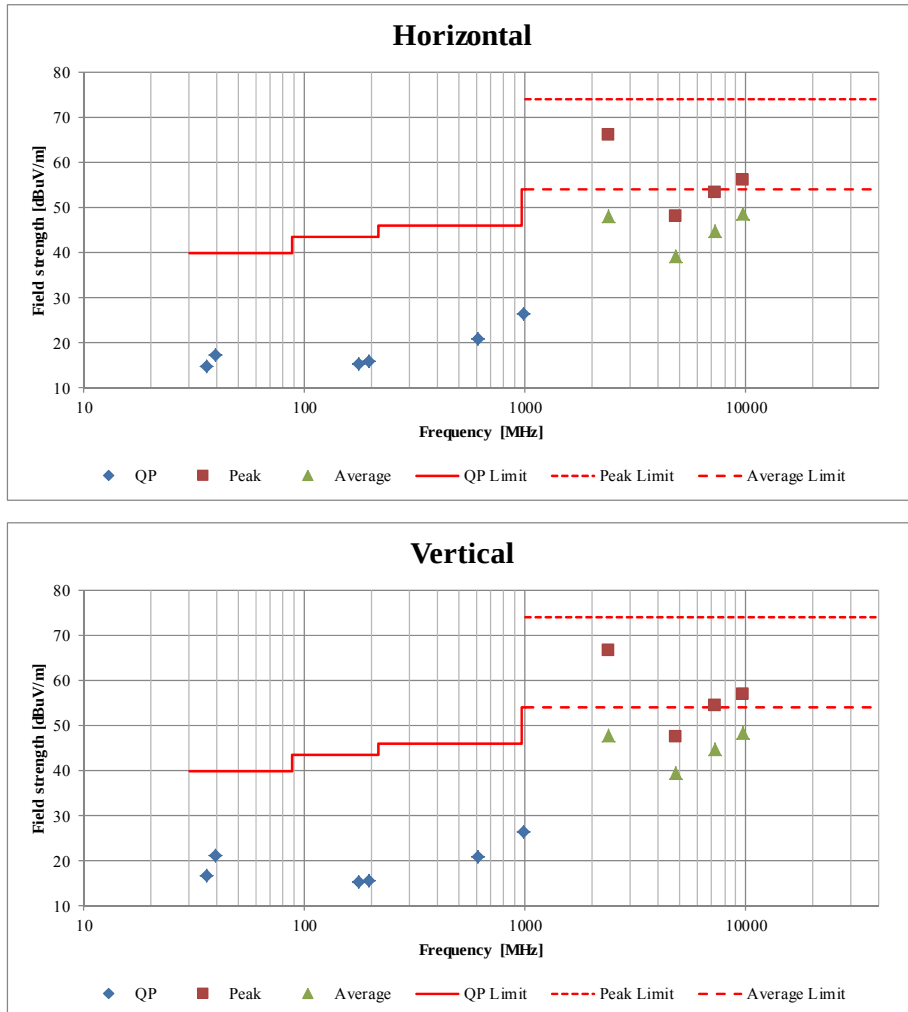
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Radiated Spurious Emission (Plot data, Worst case)

Test place	Ise EMC Lab.		
Report No.	11706542H		
Semi Anechoic Chamber	No.2	No.2	No.3
Date	April 20, 2017	April 21, 2017	April 28, 2017
Temperature / Humidity	24 deg. C / 30 % RH	24 deg. C / 33 % RH	22 deg. C / 31 % RH
Engineer	Hironobu Ohnishi (1 GHz -10 GHz)	Hiroyuki Furutaka (10 GHz -26.5 GHz)	Takafumi Noguchi (Below 1 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	Ise EMC Lab.		
Report No.	11706542H		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	April 19, 2017	April 21, 2017	April 29, 2017
Temperature / Humidity	22 deg. C / 44 % RH	24 deg. C / 33 % RH	23 deg. C / 40 % RH
Engineer	Shuichi Ohyama (1 GHz -10 GHz)	Hiroyuki Furutaka (10 GHz -26.5 GHz)	Hiroyuki Furutaka (Below 1GHz)
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	40.000	QP	21.6	14.4	7.5	32.1	-	11.4	40.0	28.6	
Hori	68.000	QP	21.4	6.3	7.9	32.1	-	3.5	40.0	36.5	
Hori	96.000	QP	26.2	9.4	8.2	32.1	-	11.7	43.5	31.8	
Hori	199.000	QP	20.5	16.3	9.1	31.9	-	14.0	43.5	29.5	
Hori	564.000	QP	20.2	18.6	11.4	32.1	-	18.1	46.0	27.9	
Hori	814.000	QP	20.6	20.9	12.6	31.5	-	22.6	46.0	23.4	
Hori	2390.000	PK	44.5	27.0	4.9	34.6	-	41.8	73.9	32.1	
Hori	4804.000	PK	42.5	31.3	7.6	33.8	-	47.6	73.9	26.3	Floor noise
Hori	7206.000	PK	43.1	35.6	8.4	33.9	-	53.2	73.9	20.7	Floor noise
Hori	9608.000	PK	42.0	38.2	9.3	34.5	-	55.0	73.9	18.9	Floor noise
Hori	2390.000	AV	35.8	27.0	4.9	34.6	1.8	34.9	53.9	19.0	*1)
Hori	4804.000	AV	34.3	31.3	7.6	33.8	-	39.4	53.9	14.5	Floor noise
Hori	7206.000	AV	35.3	35.6	8.4	33.9	-	45.4	53.9	8.5	Floor noise
Hori	9608.000	AV	34.4	38.2	9.3	34.5	-	47.4	53.9	6.5	Floor noise
Vert	40.000	QP	21.5	14.4	7.5	32.1	-	11.3	40.0	28.7	
Vert	68.000	QP	21.5	6.3	7.9	32.1	-	3.6	40.0	36.4	
Vert	96.000	QP	28.0	9.4	8.2	32.1	-	13.5	43.5	30.0	
Vert	199.000	QP	20.4	16.3	9.1	31.9	-	13.9	43.5	29.6	
Vert	564.000	QP	20.3	18.6	11.4	32.1	-	18.2	46.0	27.8	
Vert	814.000	QP	20.7	20.9	12.6	31.5	-	22.7	46.0	23.3	
Vert	2390.000	PK	44.7	27.0	4.9	34.6	-	42.0	73.9	31.9	
Vert	4804.000	PK	42.5	31.3	7.6	33.8	-	47.6	73.9	26.3	Floor noise
Vert	7206.000	PK	42.9	35.6	8.4	33.9	-	53.0	73.9	20.9	Floor noise
Vert	9608.000	PK	42.4	38.2	9.3	34.5	-	55.4	73.9	18.5	Floor noise
Vert	2390.000	AV	35.9	27.0	4.9	34.6	1.8	35.0	53.9	18.9	*1)
Vert	4804.000	AV	34.2	31.3	7.6	33.8	-	39.3	53.9	14.6	Floor noise
Vert	7206.000	AV	35.5	35.6	8.4	33.9	-	45.6	53.9	8.3	Floor noise
Vert	9608.000	AV	34.0	38.2	9.3	34.5	-	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 $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$

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)

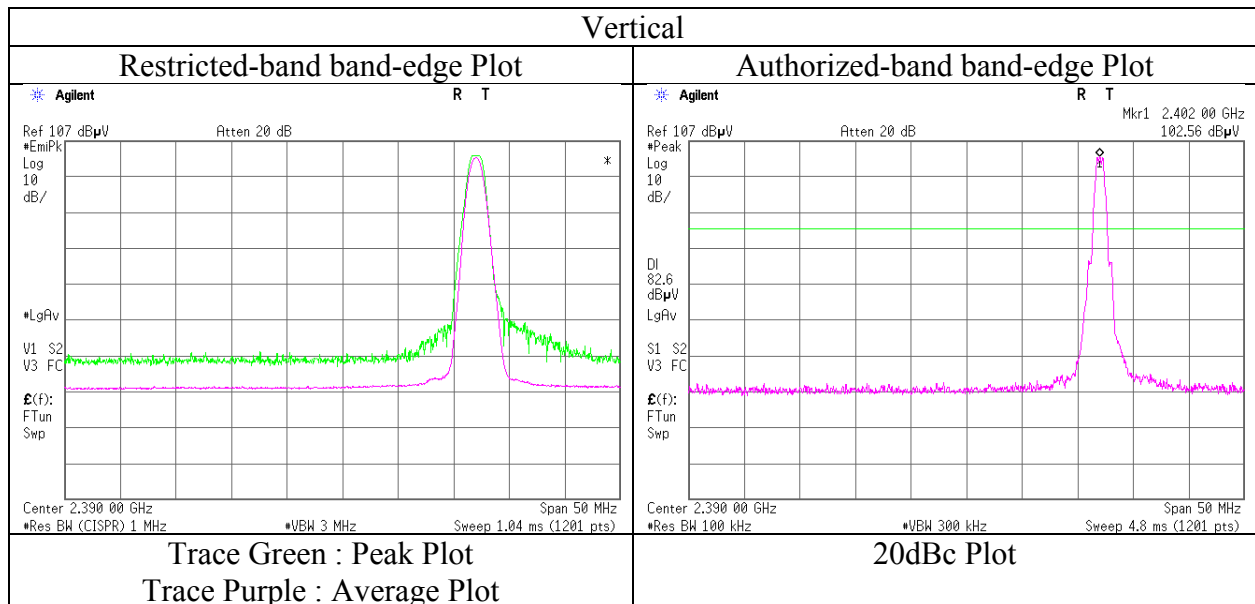
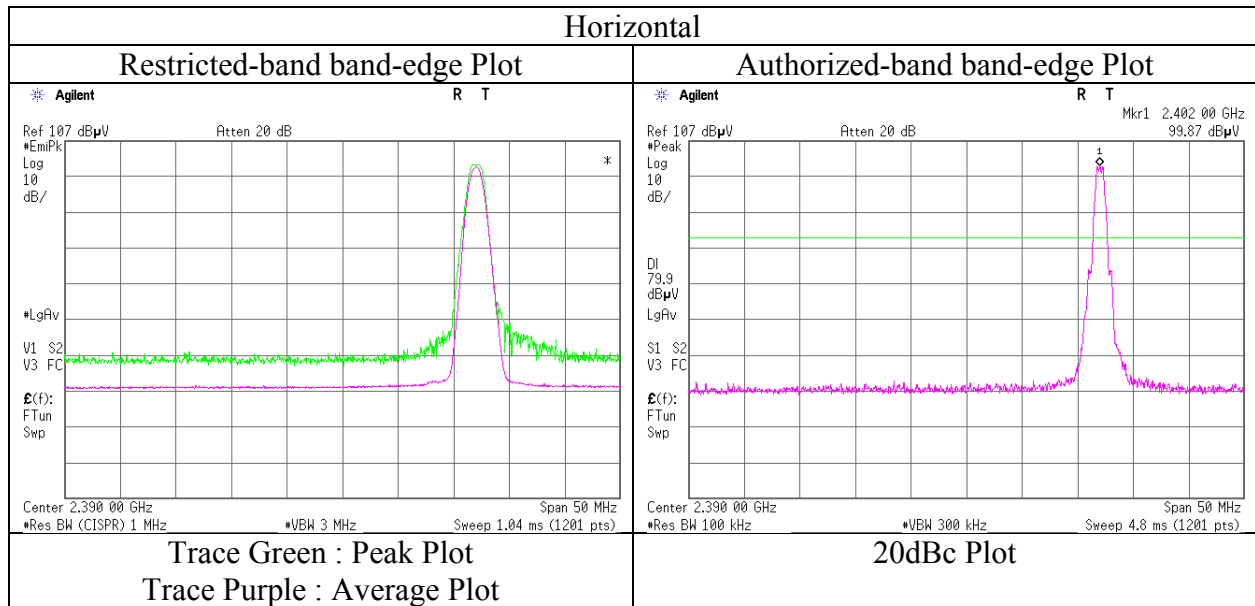
20dBc Data Sheet

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	99.9	27.0	5.0	34.6	97.3	-	-	Carrier
Hori	2400.000	PK	42.4	27.0	5.0	34.6	39.8	77.3	37.5	
Vert	2402.000	PK	102.6	27.0	5.0	34.6	100.0	-	-	Carrier
Vert	2400.000	PK	43.8	27.0	5.0	34.6	41.2	80.0	38.8	

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.2 Semi Anechoic Chamber
Report No.	11706542H
Date	April 19, 2017
Temperature / Humidity	22 deg. C / 44 % RH
Engineer	Shuichi Ohyama (1 GHz -10 GHz)
Mode	Tx BT LE 2402 MHz



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

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Ise EMC Lab.

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Radiated Spurious Emission

Test place	Ise EMC Lab.		
Report No.	11706542H		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	April 19, 2017	April 21, 2017	April 29, 2017
Temperature / Humidity	22 deg. C / 44 % RH	24 deg. C / 33 % RH	23 deg. C / 40 % RH
Engineer	Shuichi Ohyama (1 GHz -10 GHz)	Hiroyuki Furutaka (10 GHz -26.5 GHz)	Hiroyuki Furutaka (Below 1GHz)
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	41.000	QP	21.7	14.0	7.5	32.1	-	11.1	40.0	28.9	
Hori	65.000	QP	21.5	6.7	7.8	32.1	-	3.9	40.0	36.1	
Hori	96.000	QP	26.3	9.4	8.2	32.1	-	11.8	43.5	31.7	
Hori	199.000	QP	20.5	16.3	9.1	31.9	-	14.0	43.5	29.5	
Hori	443.000	QP	20.2	16.6	10.8	32.1	-	15.5	46.0	30.5	
Hori	823.000	QP	20.3	21.0	12.7	31.5	-	22.5	46.0	23.5	
Hori	4880.000	PK	43.2	31.4	7.5	33.8	-	48.3	73.9	25.6	Floor noise
Hori	7320.000	PK	43.5	35.8	8.5	33.9	-	53.9	73.9	20.0	Floor noise
Hori	9760.000	PK	42.6	38.2	9.2	34.5	-	55.5	73.9	18.4	Floor noise
Hori	4880.000	AV	34.4	31.4	7.5	33.8	-	39.5	53.9	14.4	Floor noise
Hori	7320.000	AV	34.8	35.8	8.5	33.9	-	45.2	53.9	8.7	Floor noise
Hori	9760.000	AV	34.1	38.2	9.2	34.5	-	47.0	53.9	6.9	Floor noise
Vert	41.000	QP	21.5	14.0	7.5	32.1	-	10.9	40.0	29.1	
Vert	65.000	QP	21.6	6.7	7.8	32.1	-	4.0	40.0	36.0	
Vert	96.000	QP	28.1	9.4	8.2	32.1	-	13.6	43.5	29.9	
Vert	199.000	QP	20.4	16.3	9.1	31.9	-	13.9	43.5	29.6	
Vert	443.000	QP	20.2	16.6	10.8	32.1	-	15.5	46.0	30.5	
Vert	823.000	QP	20.4	21.0	12.7	31.5	-	22.6	46.0	23.4	
Vert	4880.000	PK	43.0	31.4	7.5	33.8	-	48.1	73.9	25.8	Floor noise
Vert	7320.000	PK	43.7	35.8	8.5	33.9	-	54.1	73.9	19.8	Floor noise
Vert	9760.000	PK	42.6	38.2	9.2	34.5	-	55.5	73.9	18.4	Floor noise
Vert	4880.000	AV	34.4	31.4	7.5	33.8	-	39.5	53.9	14.4	Floor noise
Vert	7320.000	AV	35.3	35.8	8.5	33.9	-	45.7	53.9	8.2	Floor noise
Vert	9760.000	AV	34.1	38.2	9.2	34.5	-	47.0	53.9	6.9	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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Report No.	11706542H		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	April 19, 2017	April 21, 2017	April 29, 2017
Temperature / Humidity	22 deg. C / 44 % RH	24 deg. C / 33 % RH	23 deg. C / 40 % RH
Engineer	Shuichi Ohyama (1 GHz -10 GHz)	Hiroyuki Furutaka (10 GHz -26.5 GHz)	Hiroyuki Furutaka (Below 1GHz)
Mode	Tx BT LE 2480 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	40.890	QP	21.3	14.1	7.5	32.1	-	10.8	40.0	29.2	
Hori	65.231	QP	21.5	6.7	7.8	32.1	-	3.9	40.0	36.1	
Hori	96.000	QP	26.4	9.4	8.2	32.1	-	11.9	43.5	31.6	
Hori	187.343	QP	20.5	16.3	9.0	32.0	-	13.8	43.5	29.7	
Hori	442.145	QP	20.2	16.6	10.7	32.1	-	15.4	46.0	30.6	
Hori	763.169	QP	20.2	20.3	12.4	31.8	-	21.1	46.0	24.9	
Hori	2483.500	PK	57.3	27.0	5.1	34.6	-	54.8	73.9	19.1	
Hori	4960.000	PK	43.3	31.6	7.6	33.8	-	48.7	73.9	25.2	Floor noise
Hori	7440.000	PK	43.0	35.9	8.5	34.0	-	53.4	73.9	20.5	Floor noise
Hori	9920.000	PK	42.7	38.2	9.3	34.6	-	55.6	73.9	18.3	Floor noise
Hori	2483.500	AV	43.3	27.0	5.1	34.6	1.8	42.6	53.9	11.3	*1)
Hori	4960.000	AV	34.5	31.6	7.6	33.8	-	39.9	53.9	14.0	Floor noise
Hori	7440.000	AV	34.4	35.9	8.5	34.0	-	44.8	53.9	9.1	Floor noise
Hori	9920.000	AV	34.5	38.2	9.3	34.6	-	47.4	53.9	6.5	Floor noise
Vert	40.890	QP	21.2	14.1	7.5	32.1	-	10.7	40.0	29.3	
Vert	65.231	QP	21.4	6.7	7.8	32.1	-	3.8	40.0	36.2	
Vert	96.000	QP	28.0	9.4	8.2	32.1	-	13.5	43.5	30.0	
Vert	187.343	QP	20.4	16.3	9.0	32.0	-	13.7	43.5	29.8	
Vert	442.145	QP	20.2	16.6	10.7	32.1	-	15.4	46.0	30.6	
Vert	763.169	QP	20.3	20.3	12.4	31.8	-	21.2	46.0	24.8	
Vert	2483.500	PK	57.9	27.0	5.1	34.6	-	55.4	73.9	18.5	
Vert	4960.000	PK	43.6	31.6	7.6	33.8	-	49.0	73.9	24.9	Floor noise
Vert	7440.000	PK	42.8	35.9	8.5	34.0	-	53.2	73.9	20.7	Floor noise
Vert	9920.000	PK	42.7	38.2	9.3	34.6	-	55.6	73.9	18.3	Floor noise
Vert	2483.500	AV	42.9	27.0	5.1	34.6	1.8	42.2	53.9	11.7	*1)
Vert	4960.000	AV	34.6	31.6	7.6	33.8	-	40.0	53.9	13.9	Floor noise
Vert	7440.000	AV	34.7	35.9	8.5	34.0	-	45.1	53.9	8.8	Floor noise
Vert	9920.000	AV	34.4	38.2	9.3	34.6	-	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).

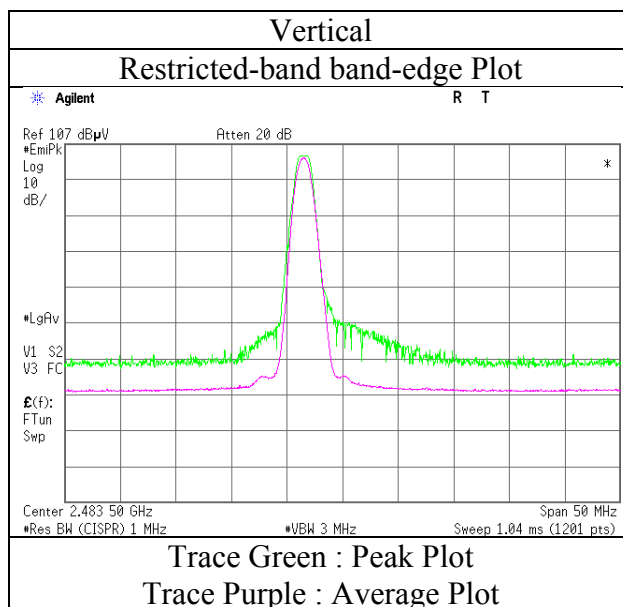
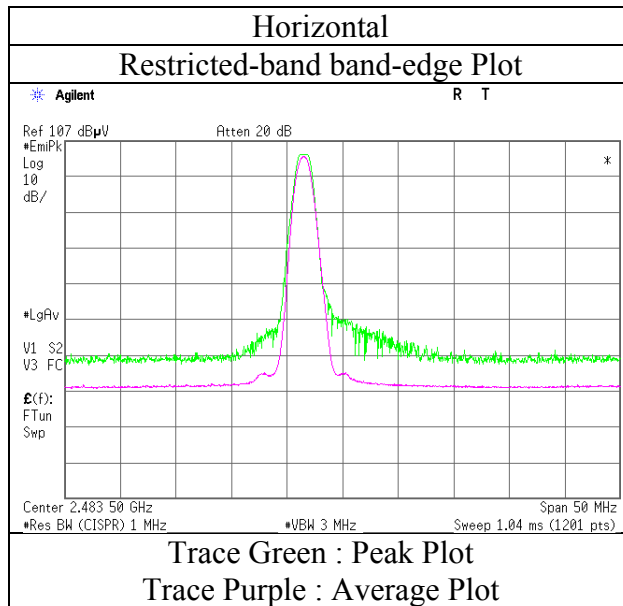
Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB

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

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 11706542H
Date : April 19, 2017
Temperature / Humidity : 22 deg. C / 44 % RH
Engineer : Shuichi Ohyama
(1 GHz -10 GHz)
Mode : Tx BT LE 2480 MHz



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

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Ise EMC Lab.

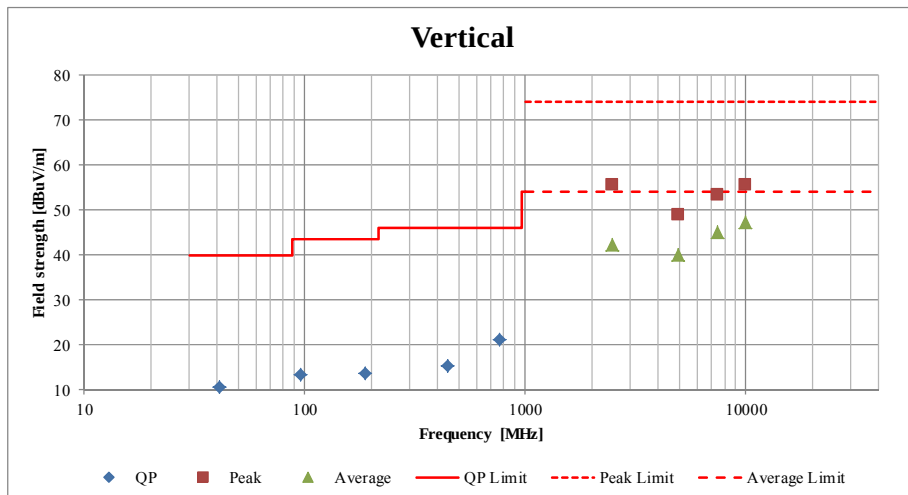
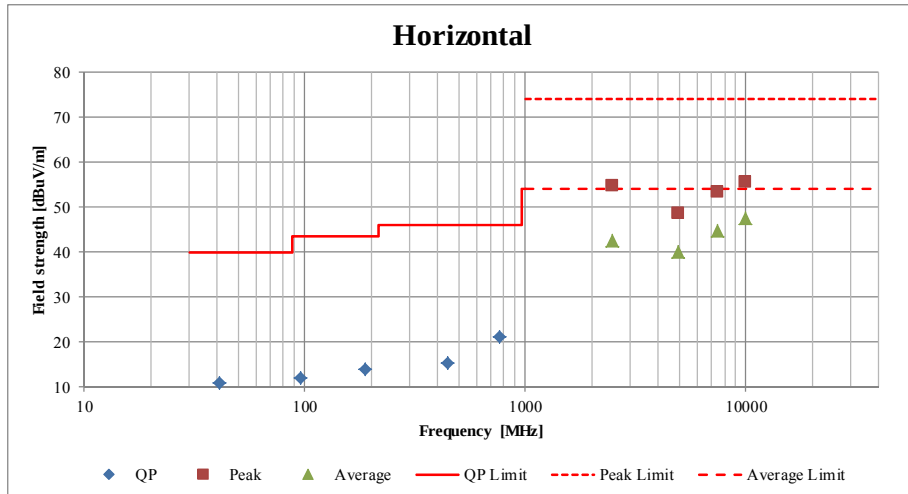
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Radiated Spurious Emission (Plot data, Worst case)

Test place	Ise EMC Lab.		
Report No.	11706542H		
Semi Anechoic Chamber	No.2	No.2	No.4
Date	April 19, 2017	April 21, 2017	April 29, 2017
Temperature / Humidity	22 deg. C / 44 % RH	24 deg. C / 33 % RH	23 deg. C / 40 % RH
Engineer	Shuichi Ohyama (1 GHz -10 GHz)	Hiroyuki Furutaka (10 GHz -26.5 GHz)	Hiroyuki Furutaka (Below 1GHz)
Mode	Tx BT LE 2480 MHz		



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

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Ise EMC Lab.

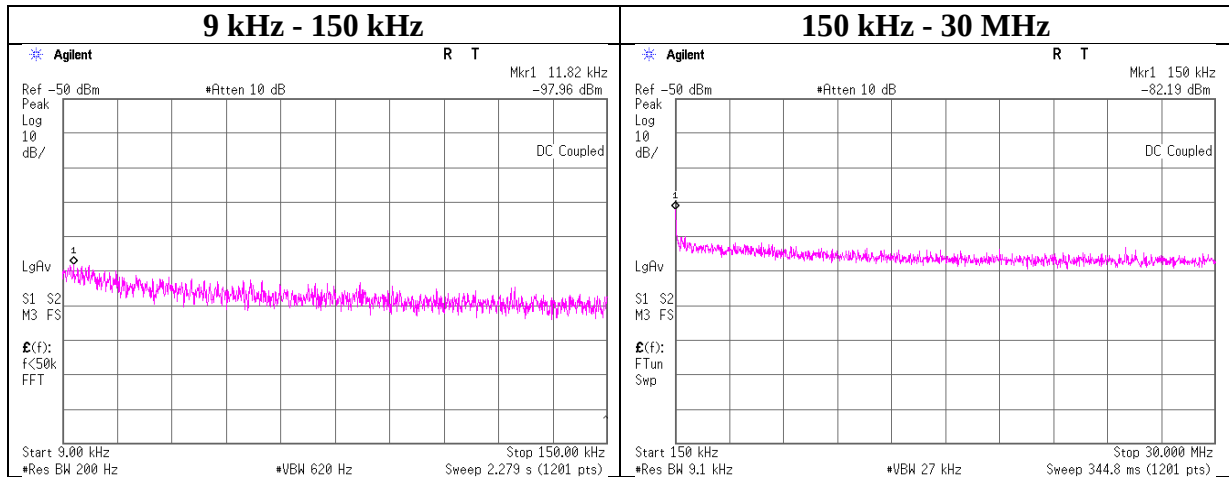
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
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
11.82	-98.0	0.64	10.0	2.0	1	-85.3	300	6.0	-24.1	46.1	70.2	
150.00	-82.2	0.64	10.0	2.0	1	-69.5	300	6.0	-8.3	24.0	32.3	

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

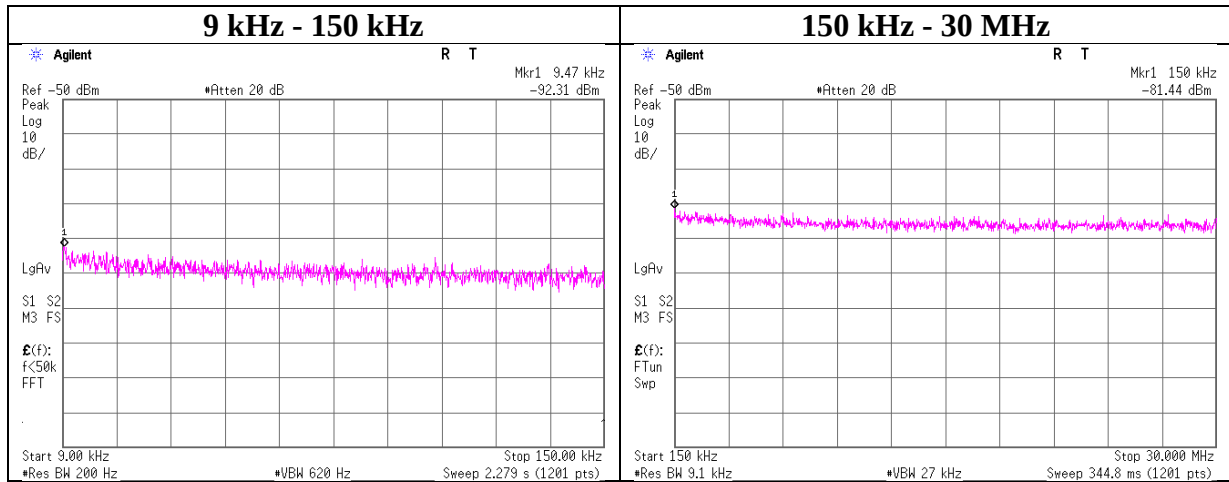
$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} (\text{including the cable(s) customer supplied}) + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
Mode	Tx BT LE 2402 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
9.47	-92.3	0.64	10.0	2.0	1	-79.7	300	6.0	-18.4	48.0	66.4	
150.00	-81.4	0.64	10.0	2.0	1	-68.8	300	6.0	-7.5	24.0	31.5	

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

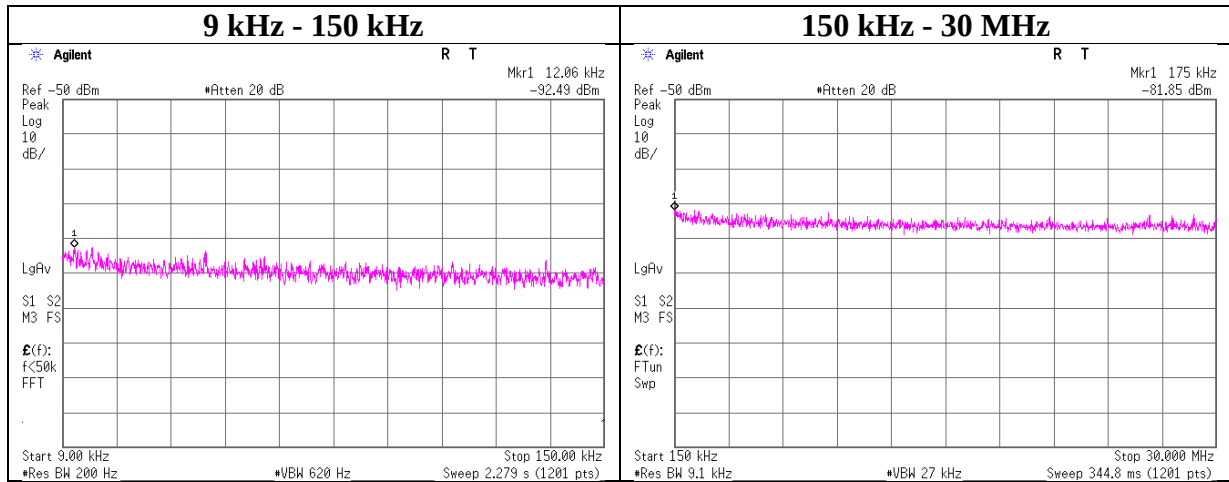
$EIRP [dBm] = Reading [dBm] + Cable\ loss [dB] (including\ the\ cable\ customer\ supplied) + Attenuator\ Loss [dB] + Antenna\ gain [dBi] + 10 * \log (N)$

N: Number of output

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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
Mode	Tx BT LE 2440 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
12.06	-92.5	0.64	10.0	2.0	1	-79.8	300	6.0	-18.6	45.9	64.5	
175.00	-81.9	0.64	10.0	2.0	1	-69.2	300	6.0	-7.9	22.7	30.6	

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

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

N: Number of output

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

UL Japan, Inc.

Ise EMC Lab.

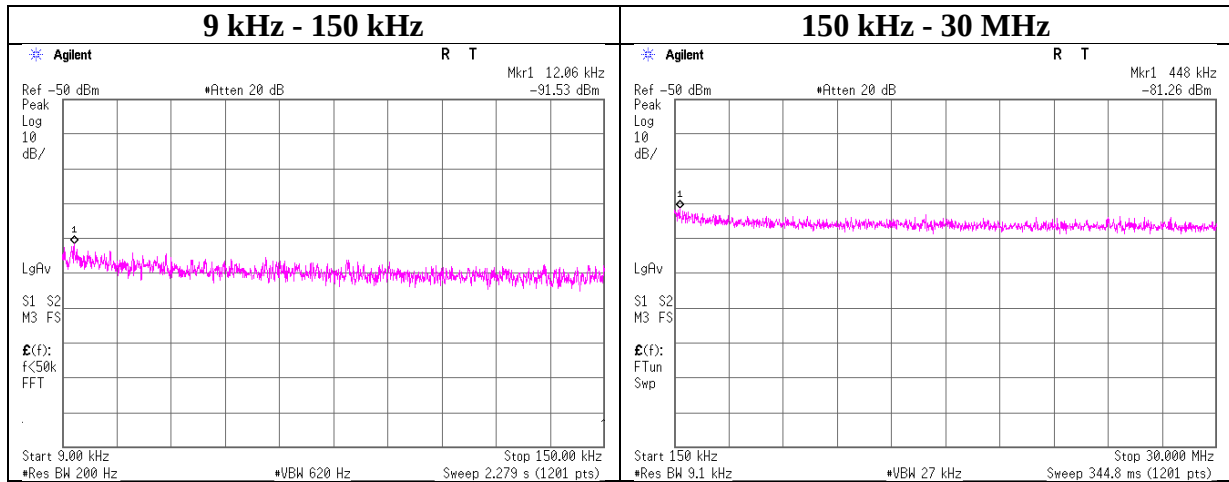
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Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
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
12.06	-91.5	0.64	10.0	2.0	1	-78.9	300	6.0	-17.6	45.9	63.5	
448.00	-81.3	0.64	10.0	2.0	1	-68.6	300	6.0	-7.4	14.5	21.9	

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

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

N: Number of output

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

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Power Density

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11706542H
Date	April 26, 2017
Temperature / Humidity	23 deg. C / 38 % RH
Engineer	Ken Fujita
Mode	Tx

11b

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-25.86	1.67	9.48	-14.71	8.00	22.71
2437.00	-26.94	1.68	9.48	-15.78	8.00	23.78
2462.00	-27.34	1.69	9.48	-16.17	8.00	24.17

11g

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-27.45	1.67	9.48	-16.30	8.00	24.30
2437.00	-28.43	1.68	9.48	-17.27	8.00	25.27
2462.00	-27.70	1.69	9.48	-16.53	8.00	24.53

11n-20

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-29.36	1.67	9.48	-18.21	8.00	26.21
2437.00	-29.45	1.68	9.48	-18.29	8.00	26.29
2462.00	-28.03	1.69	9.48	-16.86	8.00	24.86

BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402.00	-18.81	1.55	10.03	-7.23	8.00	15.23
2440.00	-18.66	1.56	10.03	-7.07	8.00	15.07
2480.00	-18.19	1.58	10.03	-6.58	8.00	14.58

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.

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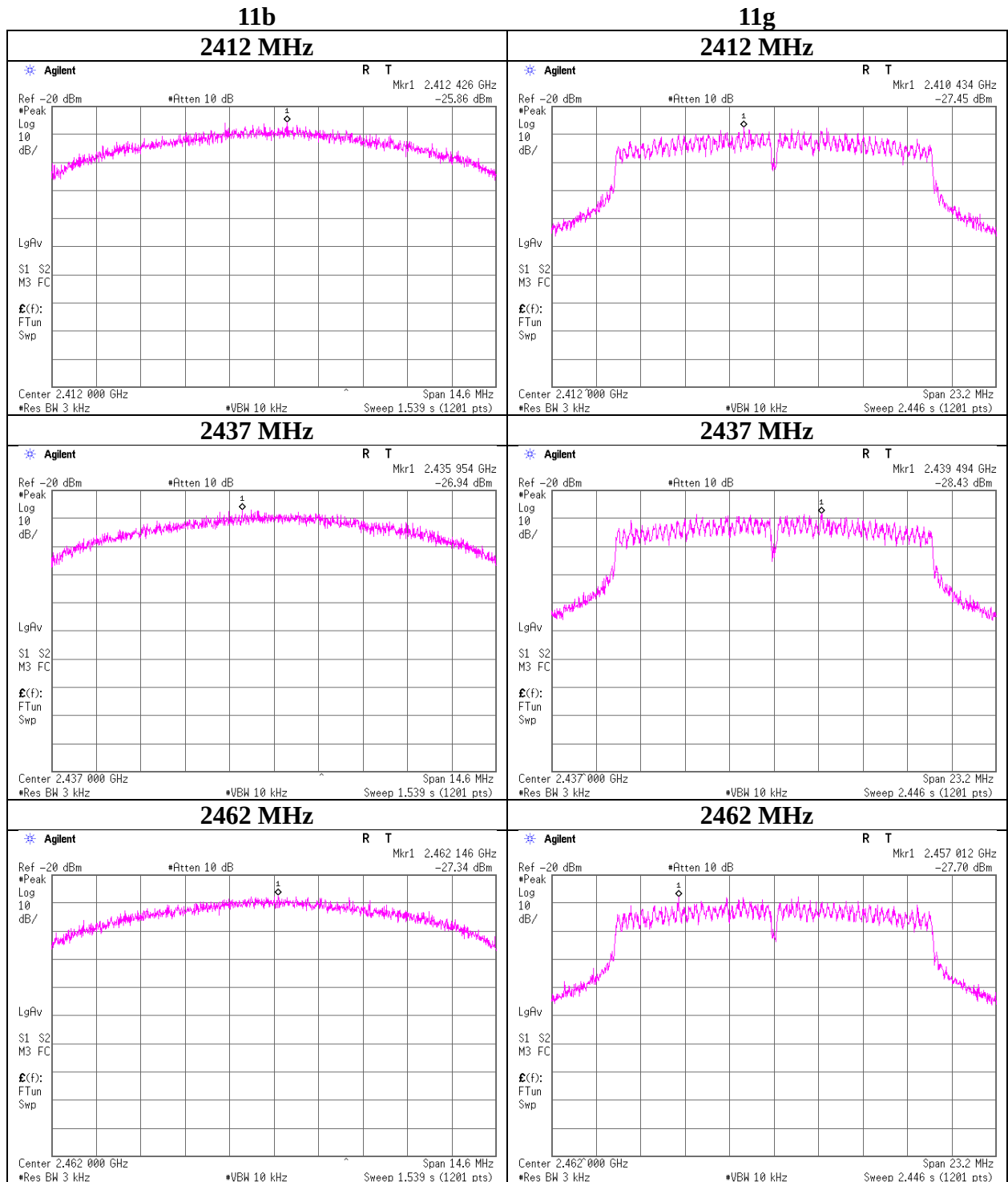
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Power Density



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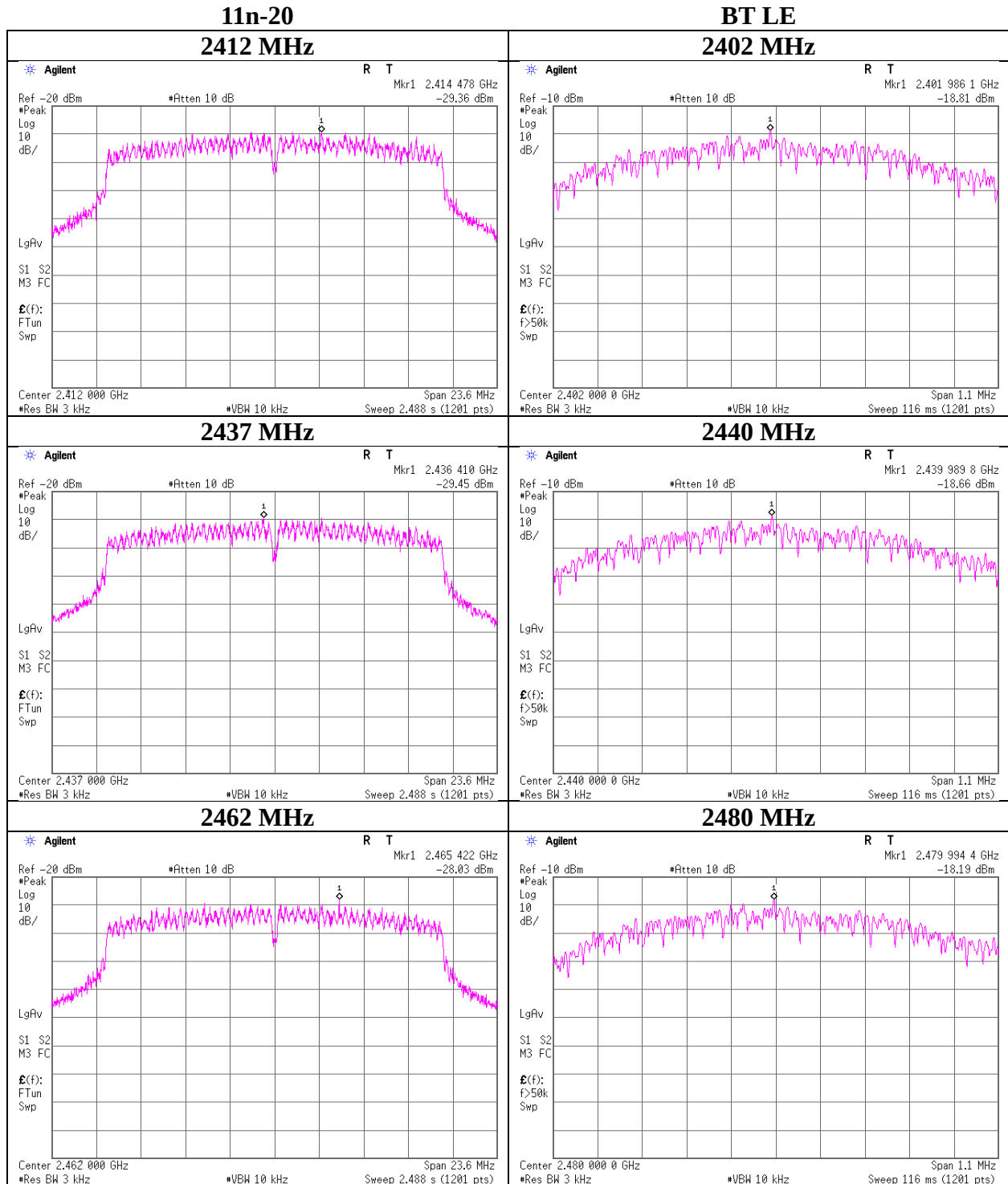
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Power Density



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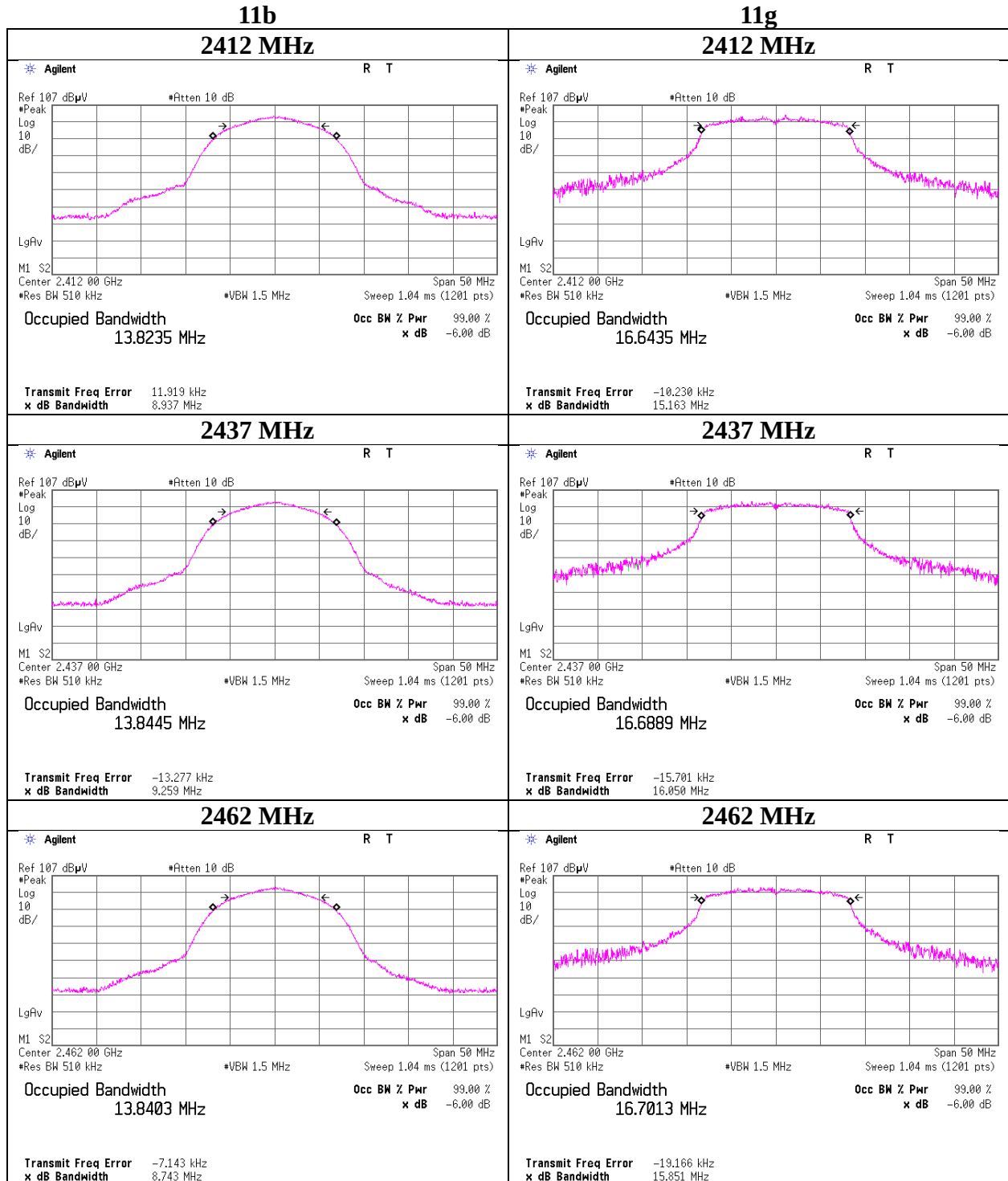
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99% Occupied Bandwidth

Test place
Report No.
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab. No.6 Measurement Room
11706542H
April 26, 2017
23 deg. C / 38 % RH
Ken Fujita
Tx



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Ise EMC Lab.

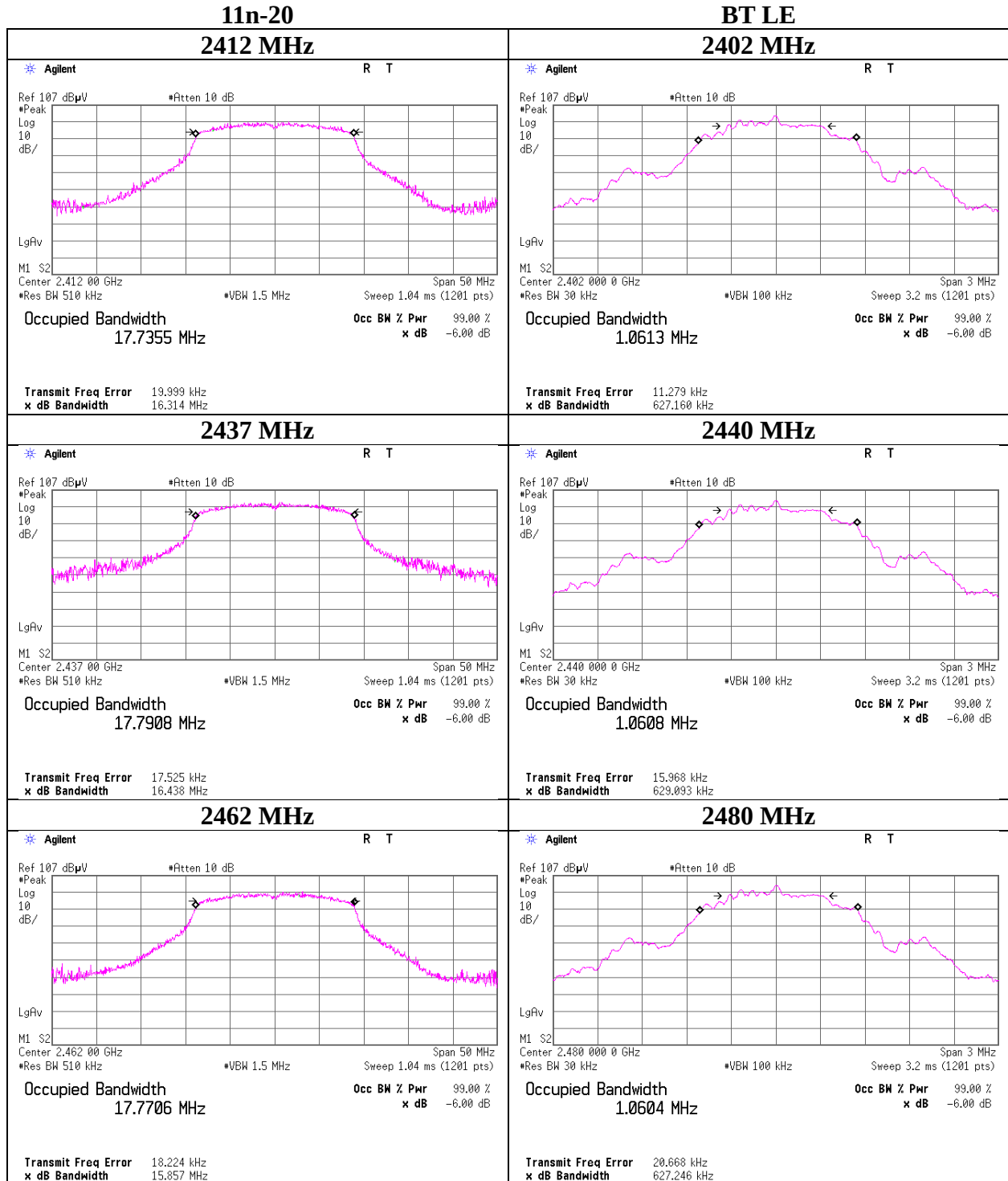
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99% Occupied Bandwidth

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11706542H
Date : April 26, 2017
Temperature / Humidity : 23 deg. C / 38 % RH
Engineer : Ken Fujita
Mode : Tx



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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	AT/RE	2016/12/13 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	AT/RE	2016/08/23 * 12
MCC-172	Microwave Cable	Junkosha	MWX221	1409S495	AT	2017/03/13 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2016/11/10 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2017/02/24 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2016/08/29 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2016/09/19 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2016/06/24 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2017/02/21 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2017/01/26 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2016/10/19 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE/CE	2017/01/20 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE/CE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	CE	2017/01/12 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2016/07/07 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/12/24 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SF M141(5m)/421-0 10(1m)/suciform 141-PE(1m)/RFM -E121(Switcher)	-/04178	CE	2016/07/20 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE/CE	2017/01/19 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2017/01/20 * 12
MMM-12	DIGITAL HiTESTER	Hioki	3805	060500120	AT	2017/02/15 * 12
MRENT-126	Spectrum Analyzer	KEYSIGHT	E4440A	MY46185516	AT	2016/07/01 * 12
MAT-90	Attenuator	Weinschel Associates	WA56-10	56100306	AT	2016/06/09 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2017/04/04 * 12
MPM-16	Power Meter	Agilent	8990B	MY51000271	AT	2017/04/28 * 12
MPSE-23	Power sensor	Agilent	N1923A	MY54070004	AT	2017/04/28 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2016/11/10 * 12

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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