



RADIO TEST REPORT

Test Report No. : 11400529H-A

Applicant : FUJITSU LIMITED
Type of Equipment : Remote Monitoring Station
Model No. : IOT008
FCC ID : EJE-IOT008
Test regulation : FCC Part 15 Subpart C: 2016
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)

Date of test: August 22 to September 2, 2016

Representative test engineer:

Satofumi Matsuyama

Engineer

Consumer Technology Division

Approved by:

Tsubasa Takayama

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.: 11400529H-A

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SECTION 1: Customer information

Company Name	:	FUJITSU LIMITED
Address	:	1-1, kamikodanaka 4-chome, Nakahara-ku, Kawasaki, JAPAN
Telephone Number	:	+81-44-754-2145
Facsimile Number	:	+81-44-754-3547
Contact Person	:	Hiroshi Mori

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

2.1 Identification of E.U.T.

Type of Equipment	:	Remote Monitoring Station
Model No.	:	IOT008
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5.0 V
Receipt Date of Sample	:	August 17, 2016
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: IOT008 (referred to as the EUT in this report) is a Remote Monitoring Station.

General Specification

Clock frequency(ies) in the system	:	CPU: 166 MHz
------------------------------------	---	--------------

Radio Specification

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

Radio Type	:	Transceiver
Frequency of Operation	:	2412 - 2462 MHz
Modulation	:	DSSS (11b), OFDM (11g/n-20)
Power Supply (inner)	:	DC 3.3 V
Antenna type	:	Pattern Antenna
Antenna Gain	:	1.8 dBi
Operating Temperature	:	0 deg. C - +40 deg. C
Clock frequency (crystal)	:	40 MHz

Bluetooth Low Energy (Ver.4.1 LE Dual mode)

Equipment Type	:	Transceiver
Frequency of Operation	:	2402 - 2480MHz
Type of Modulation	:	GFSK
Power Supply (inner)	:	DC 1.2 V
Antenna Type	:	Pattern Antenna
Antenna Gain	:	2.5 dBi
Operating Temperature	:	0 deg. C - +40 deg. C
Clock frequency (crystal)	:	26 MHz

*WLAN and Bluetooth Low Energy do not transmit simultaneously.

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Variant model

This EUT has variant model which is same product name (Type of Equipment) as the EUT.

The difference of the EUT and variant model is the presence or absence of camera.

Two models are identical in RF characteristics. Therefore the test was performed with model had camera as a representative.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 2016.

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

* Also the EUT complies with FCC Part 15 Subpart B.

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 20.2 dB, 0.51677 MHz, L AV 14.6 dB, 0.51621 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: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	0.3 dB 4874.000 MHz / 4924.000 MHz, AV, Vert.	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)

This EUT provides stable voltage (WLAN: DC 3.3 V, BT LE: DC 1.2 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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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) (+/-)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	3.0 dB

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

Polarity	Radiated emission (Below 1GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
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 1GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -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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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.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps (Long preamble), PN9
IEEE 802.11g (11g)	12 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 2 (Long GI), 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: Please see following table. Software: WLAN: UI mptool Ver1.0.0.1, BT LE: ATBTLC1000 Ver 1.0.0.0 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

Power settings

	Channel		
Mode	1	6	11
11b	31	33	35
11g	45	46	48
11n-20	43	44	46
BT LE	Same as product	Same as product	Same as product

*Details of Operating mode for WLAN

Test Item	Operating Mode	Tested frequency
Conducted Emission	11g Tx *1)	2412MHz
Spurious Emission (Conducted)	11g Tx *1)	2412MHz
6dB Bandwidth, 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
Maximum Peak Output Power, Power Density	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
Spurious Emission (Radiated)	11b Tx 11g Tx *2)	2412MHz 2437MHz 2462MHz
Band Edge Confirmation	11b Tx 11g Tx 11n-20 Tx	2412MHz 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 11g 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 11g Tx mode had higher power than 11n-20 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
Band Edge Confirmation	BT LE	2402MHz 2480MHz

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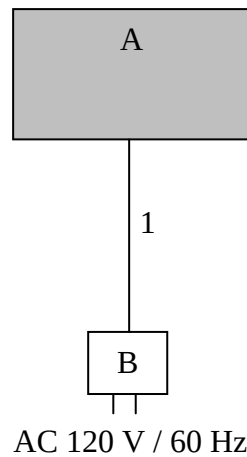
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4.2 Configuration and peripherals



* 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	Remote Monitoring Station	IOT008	DR6200019 for CE, RE* DF6200017 for other tests	FUJITSU LIMITED	EUT
B	AC Adapter	W12-010N3A	15YI00LJ01	FUJITSU LIMITED	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	0.9	Shielded	Shielded	-

*CE: Conducted Emission test, RE: Radiated Spurious Emission test

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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 v03r05".

[For below 1 GHz]

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 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: 300kHz
Test Distance	3 m	4.45 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)		4.45 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 v03r05".

*2) Distance Factor: $20 \times \log(4.45 \text{ m} / 3.0 \text{ m}) = 3.43 \text{ dB}$

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

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- 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 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

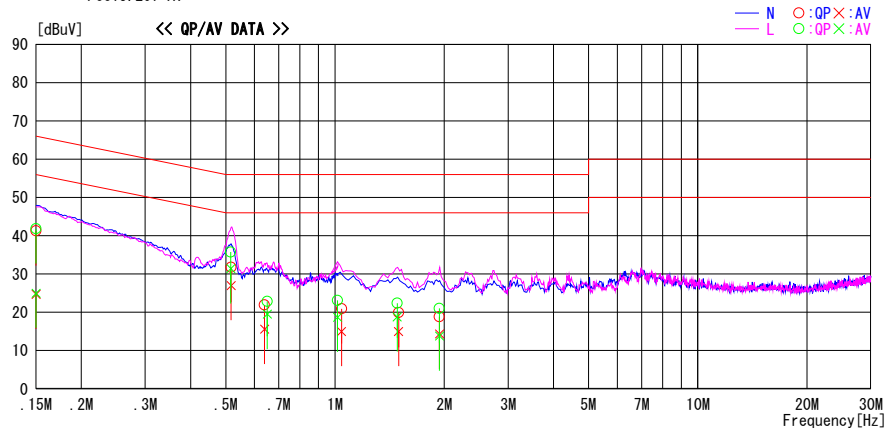
UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2016/09/02

Report No. : 11400529H

Temp./Humi. : 24deg. C / 50% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 11g 2412MHz

LIMIT : FCC15.207 QP
FCC15.207 AV

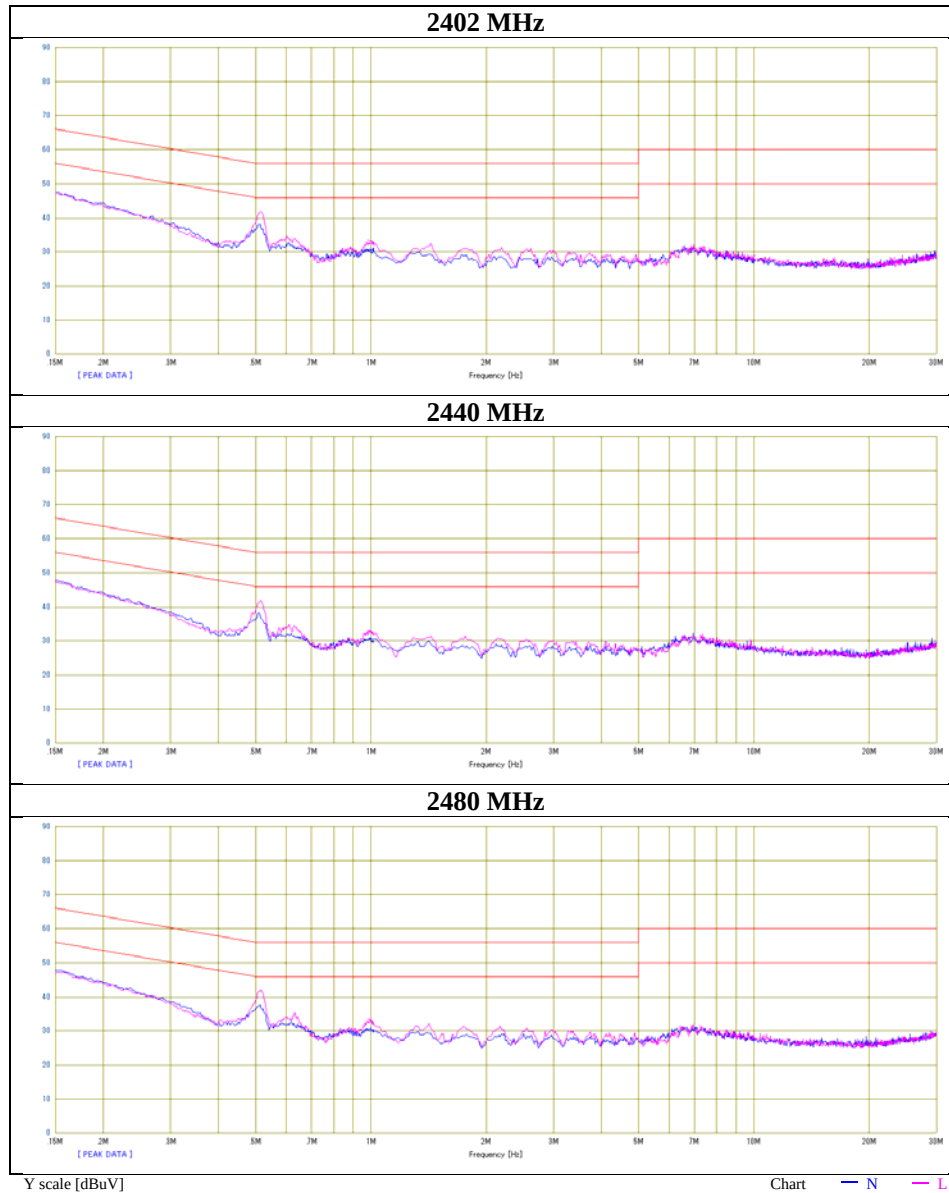


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	27.7	11.1	13.6	41.3	24.7	66.0	56.0	24.7	31.3	N	
0.15000	28.2	11.4	13.6	41.8	25.0	66.0	56.0	24.2	31.0	L	
0.51621	22.1	17.8	13.6	35.7	31.4	56.0	46.0	20.3	14.6	L	
0.51717	18.1	13.4	13.6	31.7	27.0	56.0	46.0	24.3	19.0	N	
0.63965	8.3	2.0	13.6	21.9	15.6	56.0	46.0	34.1	30.4	N	
0.65100	9.2	5.9	13.6	22.8	19.5	56.0	46.0	33.2	26.5	L	
1.01647	9.4	5.0	13.7	23.1	18.7	56.0	46.0	32.9	27.3	L	
1.04211	7.2	1.3	13.7	20.9	15.0	56.0	46.0	35.1	31.0	N	
1.48478	8.7	5.1	13.7	22.4	18.8	56.0	46.0	33.6	27.2	L	
1.49679	6.1	1.2	13.8	19.9	15.0	56.0	46.0	36.1	31.0	N	
1.93946	7.2	0.0	13.8	21.0	13.8	56.0	46.0	35.0	32.2	L	
1.93982	5.0	0.5	13.8	18.8	14.3	56.0	46.0	37.2	31.7	N	

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

Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11400529H
Date	September 2, 2016
Temperature / Humidity	24 deg. C / 50 % RH
Engineer	Tomoki Matsui
Mode	Tx BT LE



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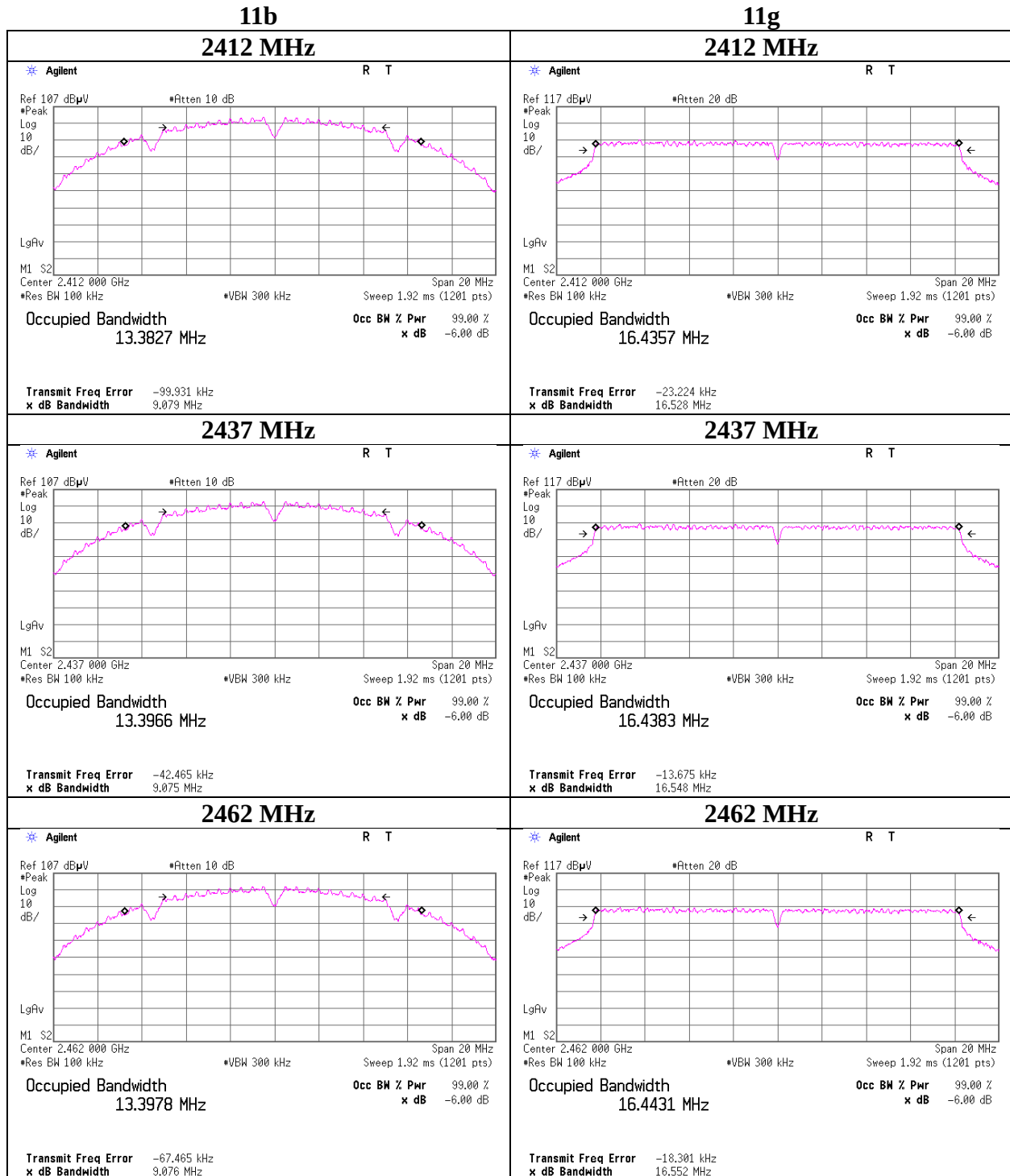
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6dB Bandwidth

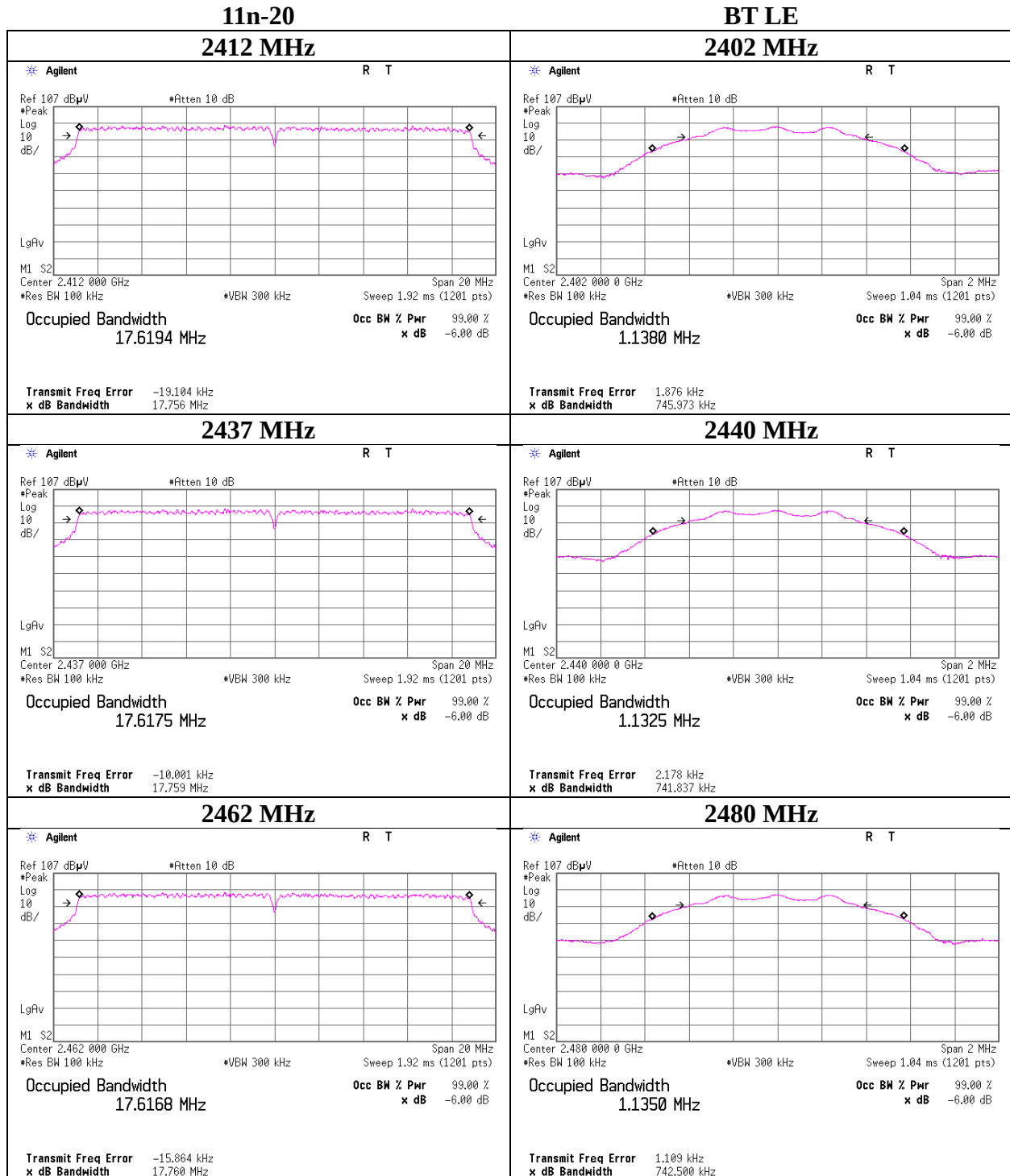
Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 23, 2016
Temperature / Humidity	25 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	9.079	> 500
	2437	9.075	> 500
	2462	9.076	> 500
11g	2412	16.528	> 500
	2437	16.548	> 500
	2462	16.552	> 500
11n-20	2412	17.756	> 500
	2437	17.759	> 500
	2462	17.760	> 500
BT LE	2402	0.746	> 500
	2440	0.742	> 500
	2480	0.742	> 500

6dB Bandwidth



6dB Bandwidth



Maximum Peak Output Power

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11400529H
Date August 22, 2016
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Tomoki Matsui
Mode Tx 11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.18	1.20	10.03	16.41	43.75	30.00	1000	13.59
2437	5.01	1.19	10.03	16.23	42.00	30.00	1000	13.77
2462	5.34	1.21	10.03	16.58	45.53	30.00	1000	13.42

Sample Calculation:

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

2437MHz

Rate [Mbps]	Reading Long Preamble [dBm]	Reading Short Preamble [dBm]
1	5.01*	4.96
2	4.98	
5.5	4.99	
11	4.98	

*: Worst Rate

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

Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11400529H
Date : August 22, 2016
Temperature / Humidity : 26 deg. C / 54 % RH
Engineer : Tomoki Matsui
Mode : Tx 11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	13.22	1.20	10.03	24.45	278.61	30.00	1000	5.55
2437	12.68	1.19	10.03	23.90	245.64	30.00	1000	6.10
2462	12.83	1.21	10.03	24.07	255.45	30.00	1000	5.93

Sample Calculation:

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

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	12.36	
9	12.23	
12	12.68	*
18	10.91	
24	12.31	
36	11.69	
48	10.63	
54	10.72	

*: Worst Rate

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 22, 2016
Temperature / Humidity	26 deg. C / 54 % RH
Engineer	Tomoki Matsui
Mode	Tx 11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.73	1.20	10.03	23.96	248.89	30.00	1000	6.04
2437	12.32	1.19	10.03	23.54	226.10	30.00	1000	6.46
2462	12.42	1.21	10.03	23.66	232.43	30.00	1000	6.34

Sample Calculation:

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

2437 MHz

Rate [MCS]	Reading Long_GI [dBm]	Reading Short_GI [dBm]
0	11.51	
1	11.49	
2	12.32*	12.26
3	10.02	
4	10.37	
5	9.89	
6	10.63	
7	9.34	

*: Worst Rate

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

Maximum Peak Output Power

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11400529H
Date August 22, 2016
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Tomoki Matsui
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-11.71	1.17	10.03	-0.51	0.89	30.00	1000	30.51
2440	-12.05	1.17	10.03	-0.85	0.82	30.00	1000	30.85
2480	-12.39	1.19	10.03	-1.17	0.76	30.00	1000	31.17

Sample Calculation:

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

Average Output Power
(Reference data for RF Exposure)

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 11400529H
Date : August 22, 2016
Temperature / Humidity : 26 deg. C / 54 % RH
Engineer : Tomoki Matsui
Mode : Tx

11b 1Mbps Long Preamble

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	2.52	1.20	10.03	13.75	23.71	0.00	13.75	23.71
2437	2.45	1.19	10.03	13.67	23.30	0.00	13.67	23.30
2462	2.69	1.21	10.03	13.93	24.73	0.00	13.93	24.73

11g 6Mbps

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	3.62	1.20	10.03	14.85	30.55	0.00	14.85	30.55
2437	3.26	1.19	10.03	14.48	28.07	0.00	14.48	28.07
2462	3.37	1.21	10.03	14.61	28.93	0.00	14.61	28.93

11n-20 MCS0 Long_GI

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	2.46	1.20	10.03	13.69	23.39	0.00	13.69	23.39
2437	2.14	1.19	10.03	13.36	21.69	0.00	13.36	21.69
2462	2.33	1.21	10.03	13.57	22.77	0.00	13.57	22.77

BT LE

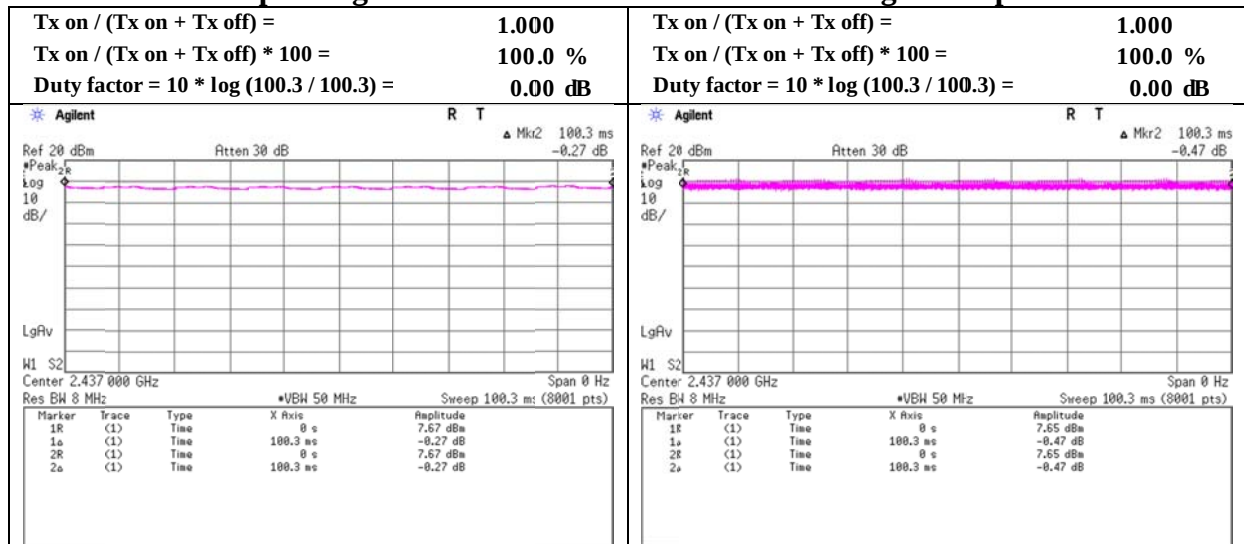
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2402	-13.84	1.17	10.03	-2.64	0.54	2.00	-0.64	0.86
2440	-14.21	1.17	10.03	-3.01	0.50	2.00	-1.01	0.79
2480	-14.64	1.19	10.03	-3.42	0.45	2.00	-1.42	0.72

The test was performed with condition that obtained the maximum Time average power in pre-check.

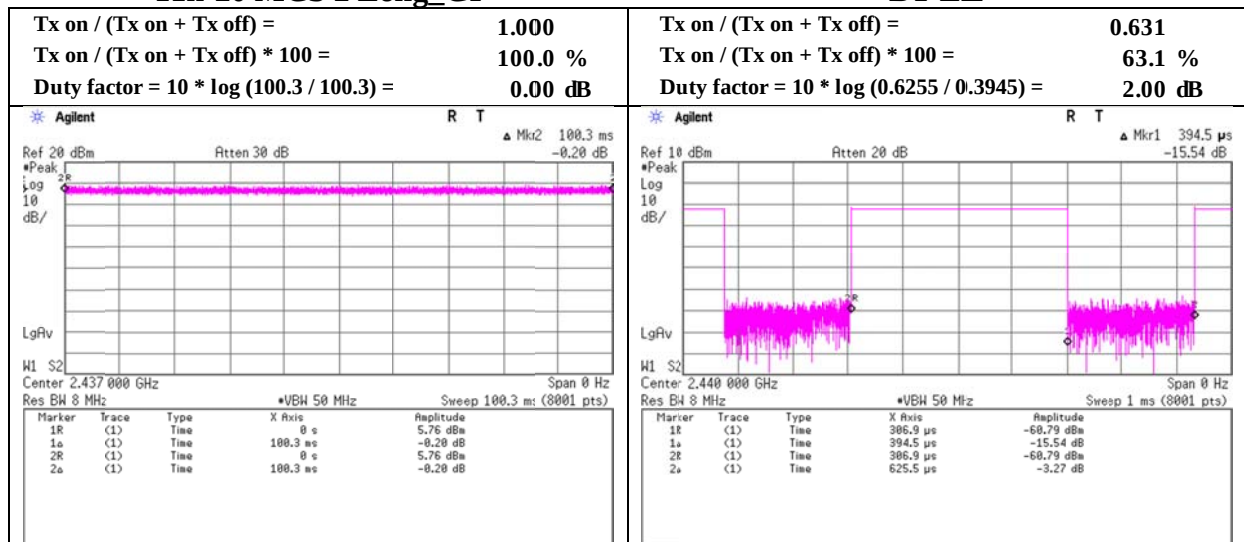
Burst rate confirmation

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11400529H
Date August 22, 2016
Temperature / Humidity 26 deg. C / 54 % RH
Engineer Tomoki Matsui
Mode Tx

11b 1 Mbps Long Preamble



11n-20 MCS 2 Long_GI



Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11400529H
Date : August 24, 2016 August 25, 2016
Temperature / Humidity : 24 deg. C / 58 % RH 23 deg. C / 53 % RH
Engineer : Satofumi Matsuyama Satofumi Matsuyama
(1 GHz - 10 GHz) (Above 10 GHz)
Mode : Tx 11b 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	48.4	27.9	6.6	32.1	-	50.8	73.9	23.1	
Hori	4824.000	PK	45.8	32.9	8.9	31.3	-	56.3	73.9	17.6	
Hori	7236.000	PK	42.7	36.8	10.0	32.6	-	56.9	73.9	17.0	Floor noise
Hori	2390.000	AV	38.8	27.9	6.6	32.1	-	41.2	53.9	12.7	
Hori	4824.000	AV	39.9	32.9	8.9	31.3	-	50.4	53.9	3.5	
Hori	7236.000	AV	30.8	36.8	10.0	32.6	-	45.0	53.9	8.9	Floor noise
Vert	2390.000	PK	48.8	27.9	6.6	32.1	-	51.2	73.9	22.7	
Vert	4824.000	PK	47.5	32.9	8.9	31.3	-	58.0	73.9	15.9	
Vert	7236.000	PK	43.3	36.8	10.0	32.6	-	57.5	73.9	16.4	Floor noise
Vert	2390.000	AV	36.3	27.9	6.6	32.1	-	38.7	53.9	15.2	
Vert	4824.000	AV	41.1	32.9	8.9	31.3	-	51.6	53.9	2.3	
Vert	7236.000	AV	30.8	36.8	10.0	32.6	-	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 (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

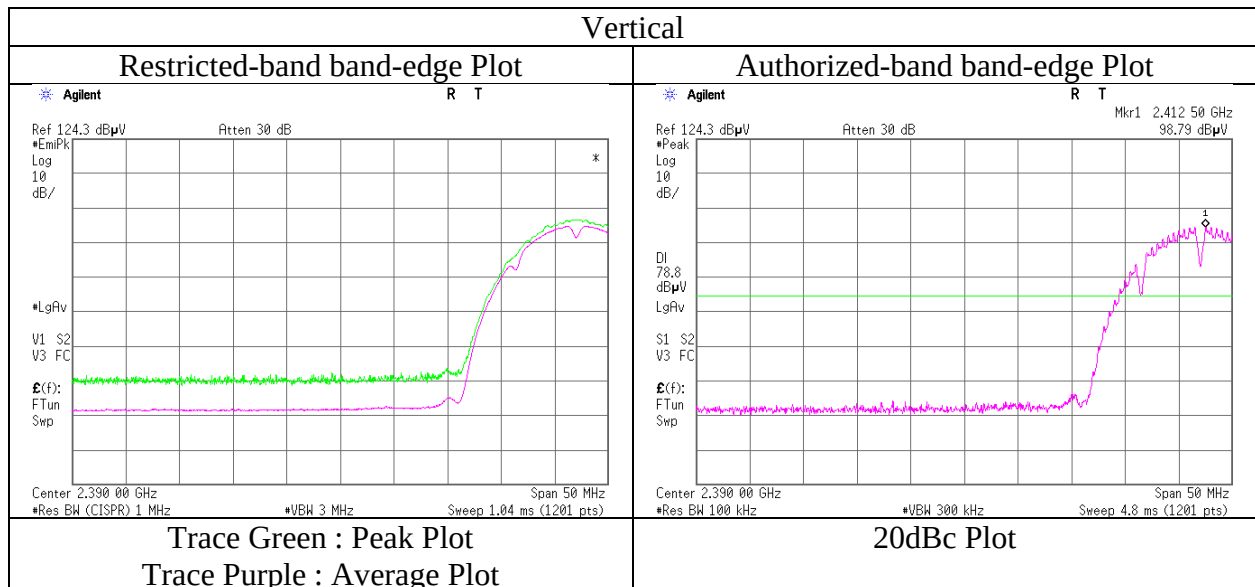
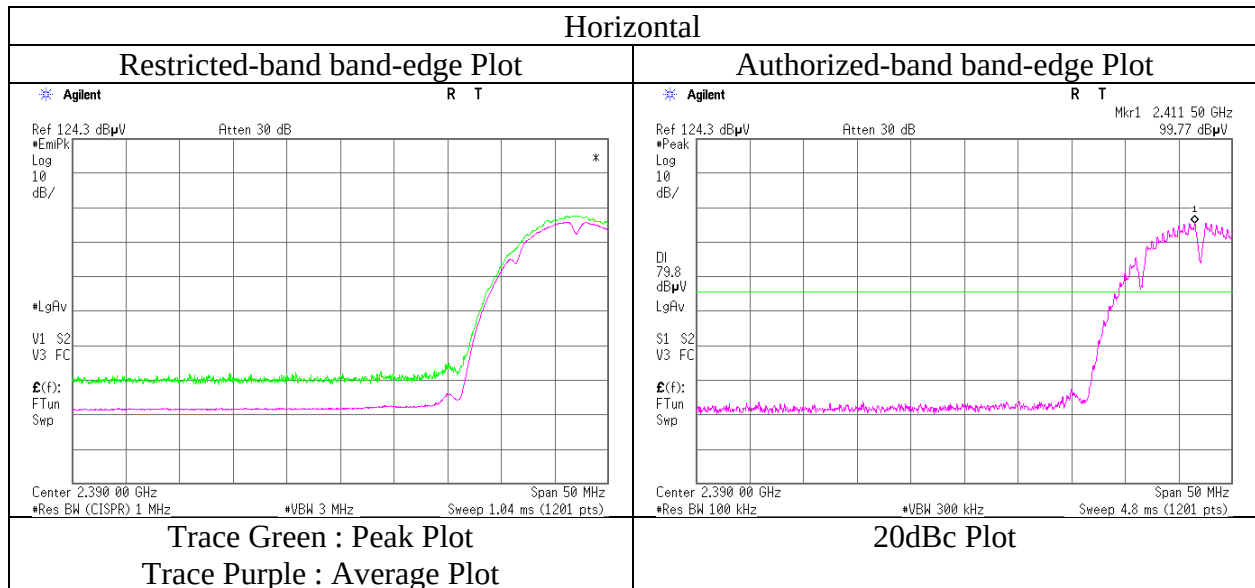
20dBc Data Sheet

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	99.8	28.0	6.6	32.1	102.3	-	-	Carrier
Hori	2400.000	PK	51.2	28.0	6.6	32.1	53.7	82.3	28.6	
Hori	9648.000	PK	37.5	38.1	10.9	32.6	53.9	82.3	28.4	
Vert	2412.000	PK	98.8	28.0	6.6	32.1	101.3	-	-	Carrier
Vert	2400.000	PK	50.1	28.0	6.6	32.1	52.6	81.3	28.7	
Vert	9648.000	PK	43.8	38.1	10.9	32.6	60.2	81.3	21.1	

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.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Satofumi Matsuyama
	(1 GHz - 10 GHz)
Mode	Tx 11b 2412 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Report No.	11400529H		
Semi Anechoic Chamber	No.4	No.4	No.2
Date	August 24, 2016	August 25, 2016	August 26, 2016
Temperature / Humidity	24 deg. C / 58 % RH	23 deg. C / 53 % RH	21 deg. C / 63 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (Above 10 GHz)	Satofumi Matsuyama (Below 1 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	49.828	QP	23.1	10.8	7.0	28.5	-	12.4	40.0	27.6	
Hori	166.673	QP	27.2	15.4	7.9	27.9	-	22.6	43.5	20.9	
Hori	280.008	QP	27.8	13.1	8.6	27.4	-	22.1	46.0	23.9	
Hori	333.334	QP	43.5	14.2	9.0	27.7	-	39.0	46.0	7.0	
Hori	666.669	QP	27.1	19.5	10.3	28.2	-	28.7	46.0	17.3	
Hori	960.001	QP	22.6	22.2	11.3	27.1	-	29.0	53.9	24.9	
Hori	2239.961	PK	49.2	27.8	6.5	32.2	-	51.3	73.9	22.6	
Hori	4874.000	PK	46.3	33.1	8.9	31.3	-	57.0	73.9	16.9	
Hori	7311.000	PK	40.9	36.8	10.0	32.6	-	55.1	73.9	18.8	Floor noise
Hori	2239.961	AV	41.8	27.8	6.5	32.2	-	43.9	53.9	10.0	
Hori	4874.000	AV	41.1	33.1	8.9	31.3	-	51.8	53.9	2.1	
Hori	7311.000	AV	31.8	36.8	10.0	32.6	-	46.0	53.9	7.9	Floor noise
Vert	49.828	QP	33.2	10.8	7.0	28.5	-	22.5	40.0	17.5	
Vert	166.672	QP	30.5	15.4	7.9	27.9	-	25.9	43.5	17.6	
Vert	280.003	QP	26.8	13.1	8.6	27.4	-	21.1	46.0	24.9	
Vert	333.333	QP	40.8	14.2	9.0	27.7	-	36.3	46.0	9.7	
Vert	666.668	QP	28.9	19.5	10.3	28.2	-	30.5	46.0	15.5	
Vert	960.001	QP	25.6	22.2	11.3	27.1	-	32.0	53.9	21.9	
Vert	2355.875	PK	50.6	27.9	6.6	32.1	-	53.0	73.9	20.9	
Vert	4874.000	PK	47.0	33.1	8.9	31.3	-	57.7	73.9	16.2	
Vert	7311.000	PK	40.5	36.8	10.0	32.6	-	54.7	73.9	19.2	Floor noise
Vert	2355.875	AV	42.9	27.9	6.6	32.1	-	45.3	53.9	8.6	
Vert	4874.000	AV	42.9	33.1	8.9	31.3	-	53.6	53.9	0.3	
Vert	7311.000	AV	31.8	36.8	10.0	32.6	-	46.0	53.9	7.9	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 (4.45 m / 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	2437.000	PK	99.8	28.0	6.6	32.1	102.3	-	-	Carrier
Hori	9748.000	PK	32.7	38.2	10.9	32.7	49.1	82.3	33.2	
Vert	2437.000	PK	98.5	28.0	6.6	32.1	101.0	-	-	Carrier
Vert	9748.000	PK	42.3	38.2	10.9	32.7	58.7	81.0	22.3	

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11400529H
Date : August 24, 2016 August 25, 2016
Temperature / Humidity : 24 deg. C / 58 % RH 23 deg. C / 53 % RH
Engineer : Satofumi Matsuyama Satofumi Matsuyama
(1 GHz - 10 GHz) (Above 10 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	2240.025	PK	49.3	27.8	6.5	32.2	-	51.4	73.9	22.5	
Hori	2483.500	PK	45.0	28.1	6.7	32.1	-	47.7	73.9	26.2	
Hori	4924.000	PK	45.6	33.3	9.0	31.3	-	56.6	73.9	17.3	
Hori	7386.000	PK	40.5	36.8	10.0	32.6	-	54.7	73.9	19.2	Floor noise
Hori	2240.025	AV	42.0	27.8	6.5	32.2	-	44.1	53.9	9.8	
Hori	2483.500	AV	36.3	28.1	6.7	32.1	-	39.0	53.9	14.9	
Hori	4924.000	AV	39.9	33.3	9.0	31.3	-	50.9	53.9	3.0	
Hori	7386.000	AV	32.2	36.8	10.0	32.6	-	46.4	53.9	7.5	Floor noise
Vert	2381.075	PK	50.5	27.9	6.6	32.1	-	52.9	73.9	21.0	
Vert	2483.500	PK	43.7	28.1	6.7	32.1	-	46.4	73.9	27.5	
Vert	4924.000	PK	46.3	33.3	9.0	31.3	-	57.3	73.9	16.6	
Vert	7386.000	PK	40.6	36.8	10.0	32.6	-	54.8	73.9	19.1	Floor noise
Vert	2381.075	AV	41.3	27.9	6.6	32.1	-	43.7	53.9	10.2	
Vert	2483.500	AV	34.9	28.1	6.7	32.1	-	37.6	53.9	16.3	
Vert	4924.000	AV	42.6	33.3	9.0	31.3	-	53.6	53.9	0.3	
Vert	7386.000	AV	32.2	36.8	10.0	32.6	-	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 $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

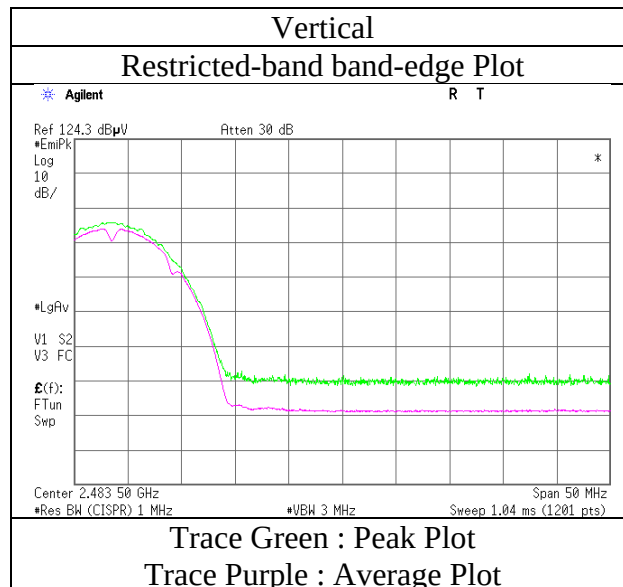
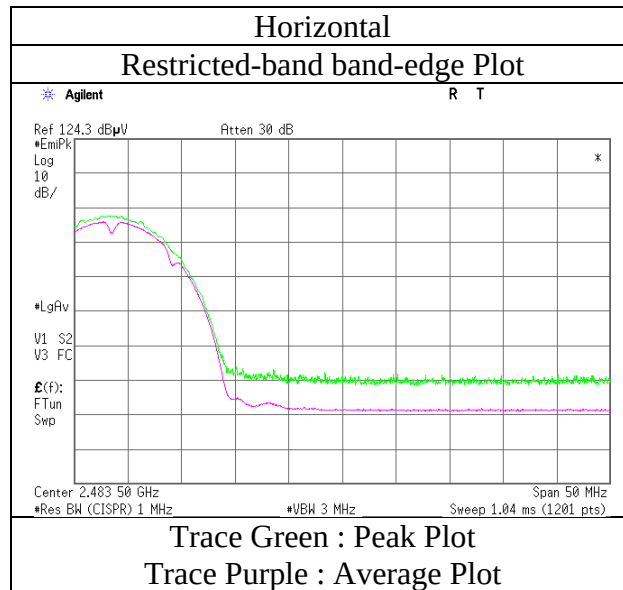
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2462.000	PK	99.8	28.0	6.6	32.1	102.3	-	-	Carrier
Hori	9848.000	PK	39.4	38.2	10.9	32.7	55.8	82.3	26.5	
Vert	2462.000	PK	97.9	28.0	6.6	32.1	100.4	-	-	Carrier
Vert	9848.000	PK	43.7	38.2	10.9	32.7	60.1	80.4	20.3	

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.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Satofumi Matsuyama
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz



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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11400529H
Date : August 24, 2016 August 25, 2016
Temperature / Humidity : 24 deg. C / 58 % RH 23 deg. C / 53 % RH
Engineer : Satofumi Matsuyama Satofumi Matsuyama
(1 GHz - 10 GHz) (Above 10 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	2331.881	PK	56.1	27.9	6.6	32.2	-	58.4	73.9	15.5	
Hori	2390.000	PK	58.5	27.9	6.6	32.1	-	60.9	73.9	13.0	
Hori	4824.000	PK	40.9	32.9	8.9	31.3	-	51.4	73.9	22.5	Floor noise
Hori	7236.000	PK	41.1	36.8	10.0	32.6	-	55.3	73.9	18.6	Floor noise
Hori	2331.881	AV	46.1	27.9	6.6	32.2	-	48.4	53.9	5.5	
Hori	2390.000	AV	44.9	27.9	6.6	32.1	-	47.3	53.9	6.6	
Hori	4824.000	AV	30.9	32.9	8.9	31.3	-	41.4	53.9	12.5	Floor noise
Hori	7236.000	AV	31.2	36.8	10.0	32.6	-	45.4	53.9	8.5	Floor noise
Vert	2331.881	PK	55.1	27.9	6.6	32.2	-	57.4	73.9	16.5	
Vert	2390.000	PK	57.8	27.9	6.6	32.1	-	60.2	73.9	13.7	
Vert	4824.000	PK	44.1	32.9	8.9	31.3	-	54.6	73.9	19.3	
Vert	7236.000	PK	42.2	36.8	10.0	32.6	-	56.4	73.9	17.5	Floor noise
Vert	2331.881	AV	44.6	27.9	6.6	32.2	-	46.9	53.9	7.0	
Vert	2390.000	AV	44.7	27.9	6.6	32.1	-	47.1	53.9	6.8	
Vert	4824.000	AV	32.8	32.9	8.9	31.3	-	43.3	53.9	10.6	
Vert	7236.000	AV	31.2	36.8	10.0	32.6	-	45.4	53.9	8.5	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 $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

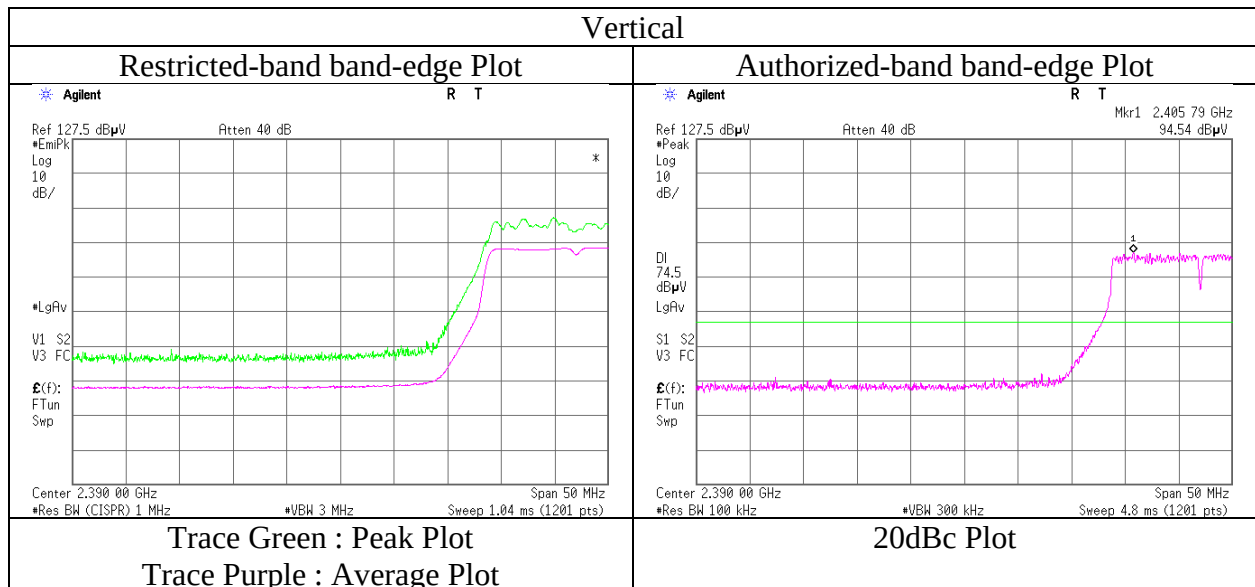
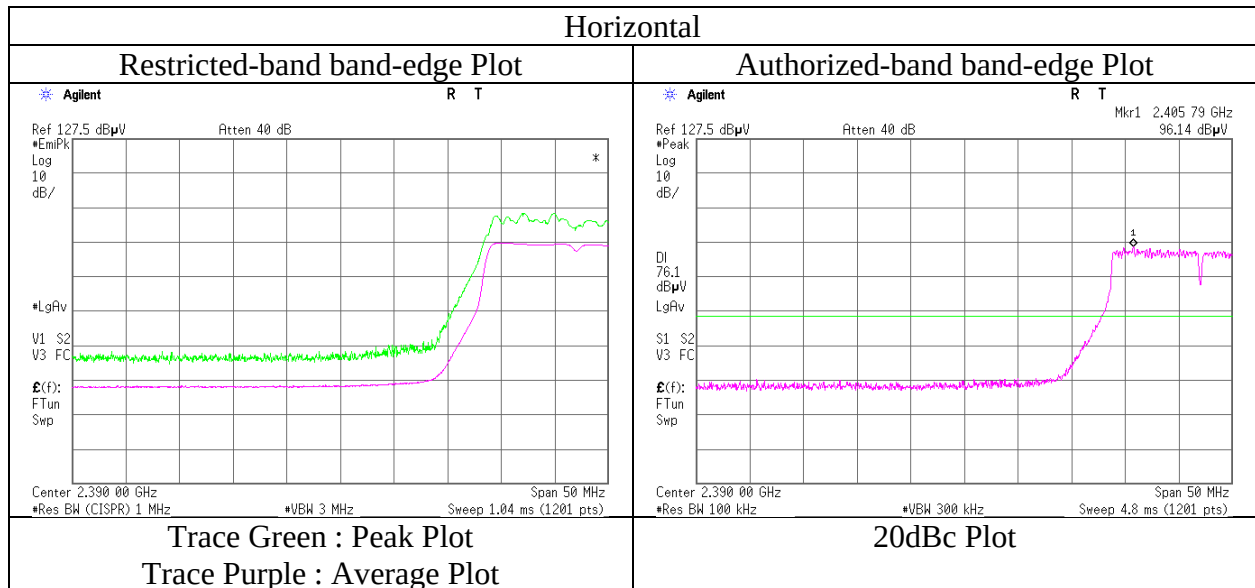
20dBc Data Sheet

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	96.1	28.0	6.6	32.1	98.6	-	-	Carrier
Hori	2400.000	PK	60.5	28.0	6.6	32.1	63.0	78.6	15.6	
Hori	9648.000	PK	36.1	38.1	10.9	32.6	52.5	78.6	26.1	
Vert	2412.000	PK	94.5	28.0	6.6	32.1	97.0	-	-	Carrier
Vert	2400.000	PK	59.1	28.0	6.6	32.1	61.6	77.0	15.4	
Vert	9648.000	PK	44.9	38.1	10.9	32.6	61.3	77.0	15.7	

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.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Satofumi Matsuyama
	(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.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016 August 25, 2016
Temperature / Humidity	24 deg. C / 58 % RH 23 deg. C / 53 % RH
Engineer	Satofumi Matsuyama Satofumi Matsuyama
	(1 GHz - 10 GHz) (Above 10 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	2355.875	PK	55.3	27.9	6.6	32.1	-	57.7	73.9	16.2	
Hori	4874.000	PK	41.1	33.1	8.9	31.3	-	51.8	73.9	22.1	
Hori	7311.000	PK	40.5	36.8	10.0	32.6	-	54.7	73.9	19.2	Floor noise
Hori	2355.875	AV	45.3	27.9	6.6	32.1	-	47.7	53.9	6.2	
Hori	4874.000	AV	32.9	33.1	8.9	31.3	-	43.6	53.9	10.3	
Hori	7311.000	AV	31.4	36.8	10.0	32.6	-	45.6	53.9	8.3	Floor noise
Vert	2355.875	PK	55.2	27.9	6.6	32.1	-	57.6	73.9	16.3	
Vert	4874.000	PK	43.7	33.1	8.9	31.3	-	54.4	73.9	19.5	
Vert	7311.000	PK	40.7	36.8	10.0	32.6	-	54.9	73.9	19.0	Floor noise
Vert	2355.875	AV	45.2	27.9	6.6	32.1	-	47.6	53.9	6.3	
Vert	4874.000	AV	33.9	33.1	8.9	31.3	-	44.6	53.9	9.3	
Vert	7311.000	AV	31.4	36.8	10.0	32.6	-	45.6	53.9	8.3	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 (4.45 m / 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	2437.000	PK	95.8	28.0	6.6	32.1	98.3	-	-	Carrier
Hori	9748.000	PK	40.8	38.2	10.9	32.7	57.2	78.3	21.1	
Vert	2437.000	PK	94.1	28.0	6.6	32.1	96.6	-	-	Carrier
Vert	9748.000	PK	43.9	38.2	10.9	32.7	60.3	76.6	16.3	

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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11400529H
Date : August 24, 2016 August 25, 2016
Temperature / Humidity : 24 deg. C / 58 % RH 23 deg. C / 53 % RH
Engineer : Satofumi Matsuyama Satofumi Matsuyama
(1 GHz - 10 GHz) (Above 10 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	2240.045	PK	53.5	27.8	6.5	32.2	-	55.6	73.9	18.3	
Hori	2483.500	PK	57.8	28.1	6.7	32.1	-	60.5	73.9	13.4	
Hori	4924.000	PK	40.6	33.3	9.0	31.3	-	51.6	73.9	22.3	Floor noise
Hori	7386.000	PK	43.8	36.8	10.0	32.6	-	58.0	73.9	15.9	Floor noise
Hori	2240.045	AV	43.2	27.8	6.5	32.2	-	45.3	53.9	8.6	
Hori	2483.500	AV	44.7	28.1	6.7	32.1	-	47.4	53.9	6.5	
Hori	4924.000	AV	28.5	33.3	9.0	31.3	-	39.5	53.9	14.4	Floor noise
Hori	7386.000	AV	30.8	36.8	10.0	32.6	-	45.0	53.9	8.9	Floor noise
Vert	2381.075	PK	55.0	27.9	6.6	32.1	-	57.4	73.9	16.5	
Vert	2483.500	PK	57.4	28.1	6.7	32.1	-	60.1	73.9	13.8	
Vert	4924.000	PK	43.5	33.3	9.0	31.3	-	54.5	73.9	19.4	
Vert	7386.000	PK	43.6	36.8	10.0	32.6	-	57.8	73.9	16.1	Floor noise
Vert	2381.075	AV	43.1	27.9	6.6	32.1	-	45.5	53.9	8.4	
Vert	2483.500	AV	42.9	28.1	6.7	32.1	-	45.6	53.9	8.3	
Vert	4924.000	AV	32.7	33.3	9.0	31.3	-	43.7	53.9	10.2	
Vert	7386.000	AV	30.8	36.8	10.0	32.6	-	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 $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.43\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

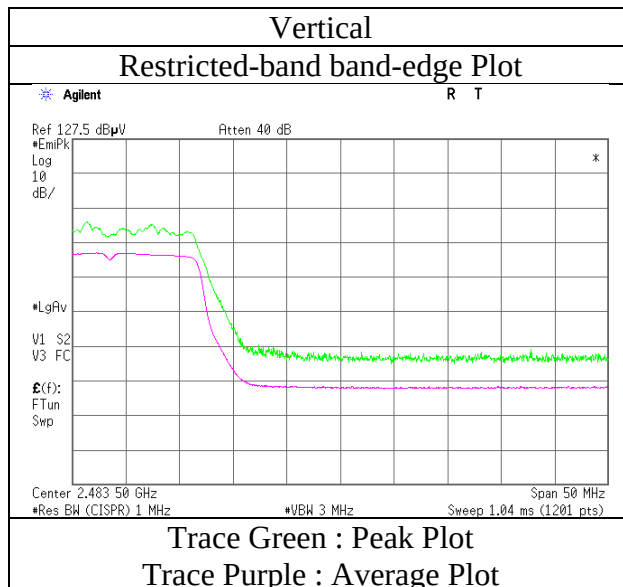
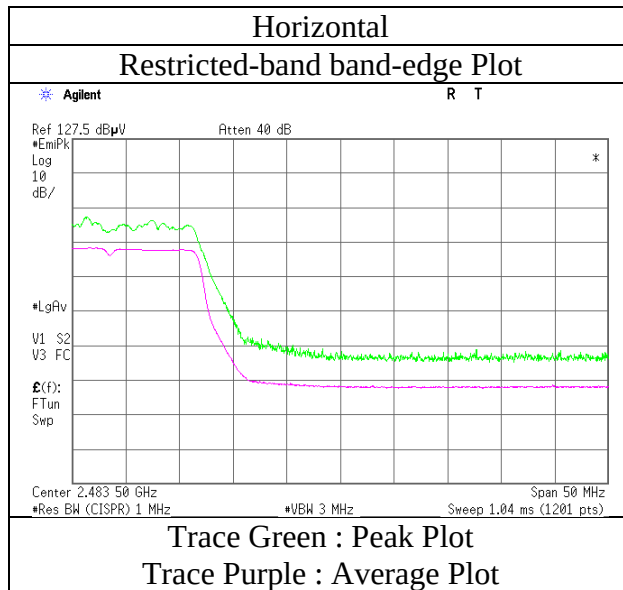
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2462.000	PK	94.9	28.0	6.6	32.1	97.4	-	-	Carrier
Hori	9848.000	PK	40.4	38.2	10.9	32.7	56.8	77.4	20.6	
Vert	2462.000	PK	93.0	28.0	6.6	32.1	95.5	-	-	Carrier
Vert	9848.000	PK	44.4	38.2	10.9	32.7	60.8	75.5	14.7	

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.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Satofumi Matsuyama
z	(1 GHz - 10 GHz)
Mode	Tx 11g 2462 MHz



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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11400529H
Date : August 24, 2016
Temperature / Humidity : 24 deg. C / 58 % RH
Engineer : Satofumi Matsuyama
(1 GHz - 10 GHz)
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	55.2	27.9	6.6	32.1	-	57.6	73.9	16.3	
Hori	2390.000	AV	43.8	27.9	6.6	32.1	-	46.2	53.9	7.7	
Vert	2390.000	PK	56.0	27.9	6.6	32.1	-	58.4	73.9	15.5	
Vert	2390.000	AV	41.4	27.9	6.6	32.1	-	43.8	53.9	10.1	

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 $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.43\text{ dB}$

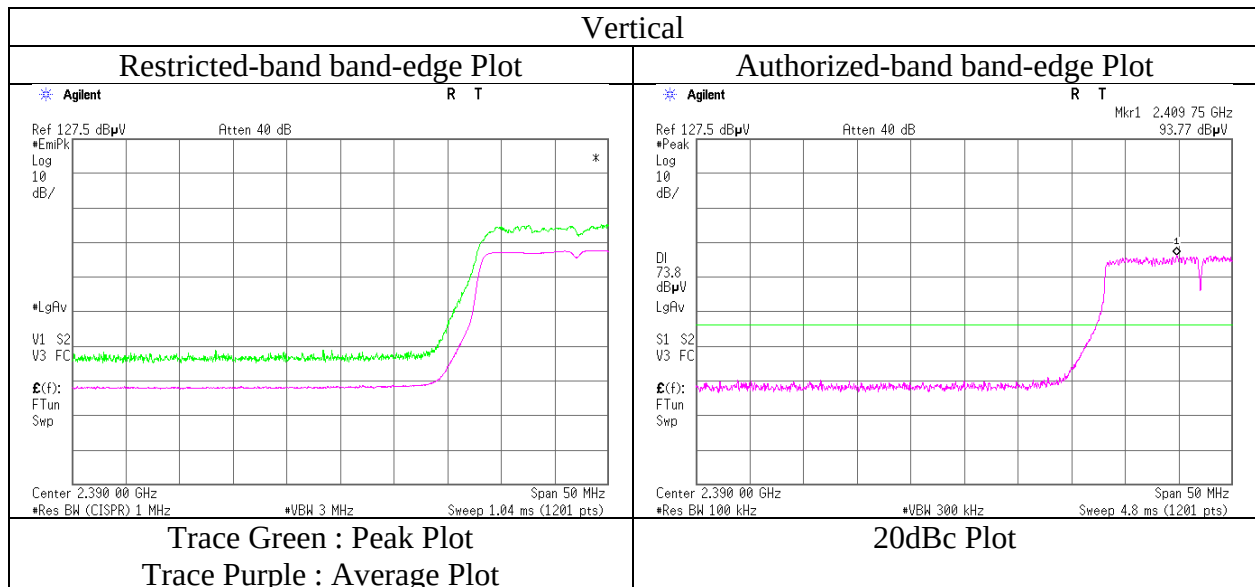
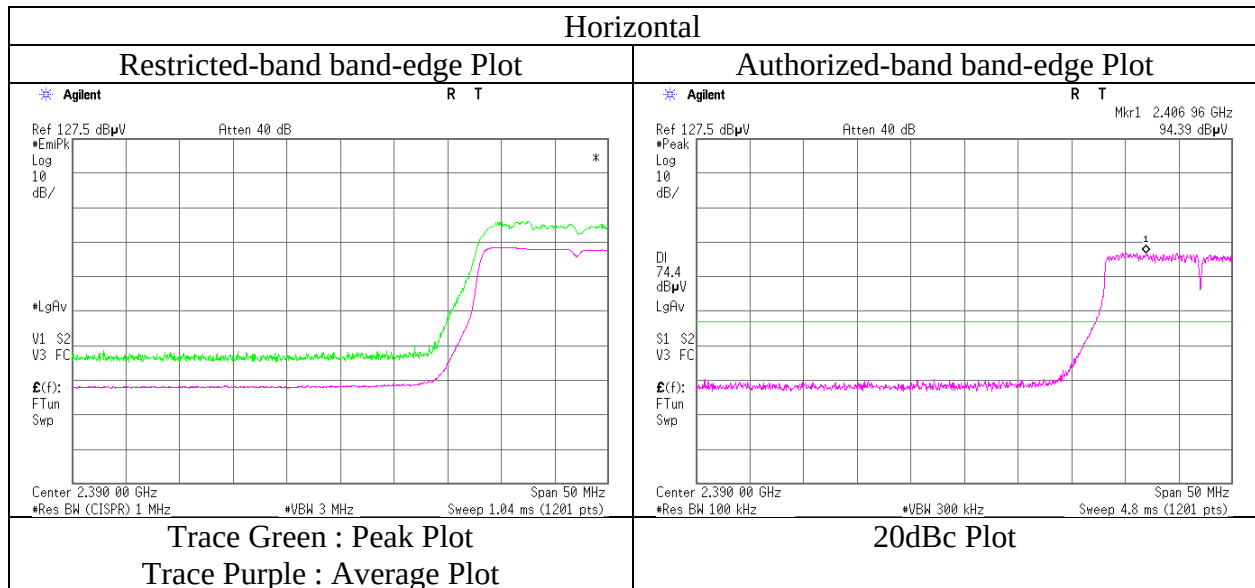
20dBc Data Sheet

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	94.4	28.0	6.6	32.1	96.9	-	-	Carrier
Hori	2400.000	PK	60.5	28.0	6.6	32.1	63.0	76.9	13.9	
Vert	2412.000	PK	93.8	28.0	6.6	32.1	96.3	-	-	Carrier
Vert	2400.000	PK	59.5	28.0	6.6	32.1	62.0	76.3	14.3	

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.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)
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.4 Semi Anechoic Chamber
Report No. 11400529H
Date August 24, 2016
Temperature / Humidity 24 deg. C / 58 % RH
Engineer Satofumi Matsuyama
 (1 GHz - 10 GHz)
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	56.5	28.1	6.7	32.1	-	59.2	73.9	14.7	
Hori	2483.500	AV	41.9	28.1	6.7	32.1	-	44.6	53.9	9.3	
Vert	2483.500	PK	55.5	28.1	6.7	32.1	-	58.2	73.9	15.7	
Vert	2483.500	AV	36.3	28.1	6.7	32.1	-	39.0	53.9	14.9	

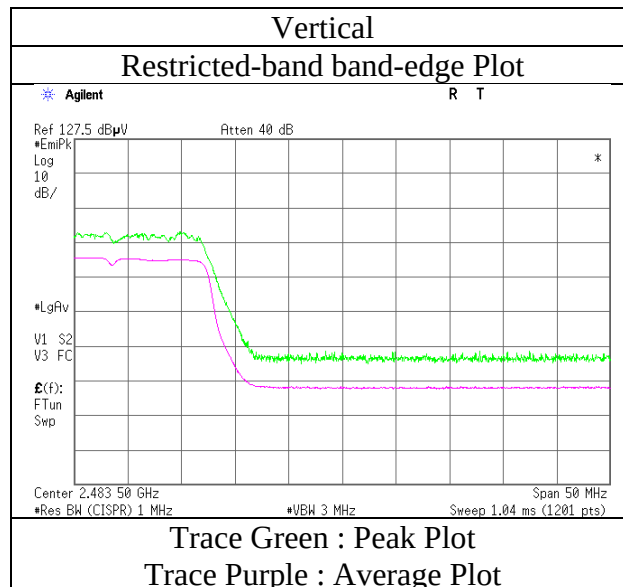
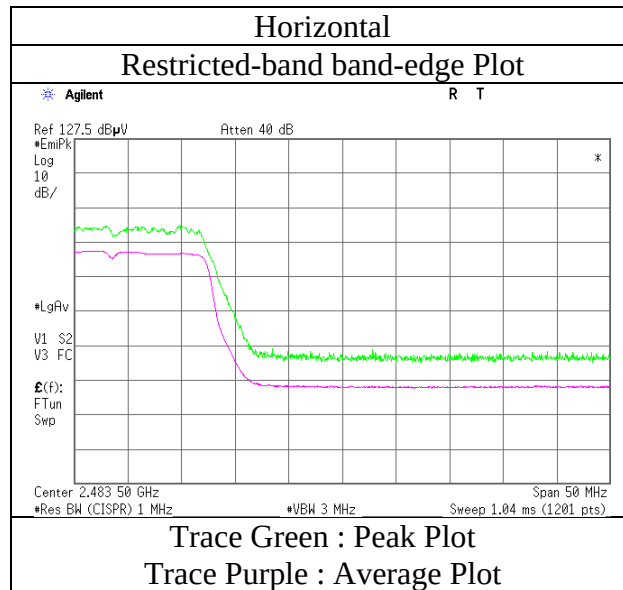
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*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 (4.45 m / 3.0 m) = 3.43 dB

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 24, 2016
Temperature / Humidity	24 deg. C / 58 % RH
Engineer	Satofumi Matsuyama
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Report No.	11400529H	
Semi Anechoic Chamber	No.4	No.2
Date	August 25, 2016	August 26, 2016
Temperature / Humidity	23 deg. C / 53 % RH	21 deg. C / 63 % RH
Engineer	Satofumi Matsuyama (Above 1GHz)	Satofumi Matsuyama (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	172.032	QP	32.7	15.6	8.0	27.8	-	28.5	43.5	15.0	
Hori	212.996	QP	41.9	11.8	8.2	27.6	-	34.3	43.5	9.2	
Hori	315.399	QP	48.5	13.8	8.9	27.5	-	43.7	46.0	2.3	
Hori	320.001	QP	50.4	13.9	8.9	27.6	-	45.6	46.0	0.4	
Hori	323.587	QP	49.5	14.0	9.0	27.6	-	44.9	46.0	1.1	
Hori	573.448	QP	38.6	18.5	10.0	28.5	-	38.6	46.0	7.4	
Hori	2390.000	PK	60.8	27.9	6.6	32.1	-	63.2	73.9	10.7	
Hori	4804.000	PK	44.8	32.8	8.9	31.3	-	55.2	73.9	18.7	
Hori	7206.000	PK	45.0	36.8	10.0	32.6	-	59.2	73.9	14.7	
Hori	9608.000	PK	42.3	38.1	10.8	32.6	-	58.6	73.9	15.3	Floor noise
Hori	12010.000	PK	45.0	39.9	2.1	33.2	-	53.8	73.9	20.1	
Hori	2390.000	AV	40.1	27.9	6.6	32.1	2.0	44.5	53.9	9.4	*1)
Hori	4804.000	AV	34.5	32.8	8.9	31.3	2.0	46.9	53.9	7.0	
Hori	7206.000	AV	34.1	36.8	10.0	32.6	2.0	50.3	53.9	3.6	
Hori	9608.000	AV	31.0	38.1	10.8	32.6	-	47.3	53.9	6.6	Floor noise
Hori	12010.000	AV	35.2	39.9	2.1	33.2	2.0	46.0	53.9	7.9	
Vert	172.035	QP	38.6	15.6	8.0	27.8	-	34.4	43.5	9.1	
Vert	212.994	QP	41.3	11.8	8.2	27.6	-	33.7	43.5	9.8	
Vert	307.202	QP	45.8	13.6	8.8	27.5	-	40.7	46.0	5.3	
Vert	315.398	QP	45.3	13.8	8.9	27.5	-	40.5	46.0	5.5	
Vert	320.008	QP	46.0	13.9	8.9	27.6	-	41.2	46.0	4.8	
Vert	573.451	QP	37.5	18.5	10.0	28.5	-	37.5	46.0	8.5	
Vert	2390.000	PK	58.1	27.9	6.6	32.1	-	60.5	73.9	13.4	
Vert	4804.000	PK	46.2	32.8	8.9	31.3	-	56.6	73.9	17.3	
Vert	7206.000	PK	44.4	36.8	10.0	32.6	-	58.6	73.9	15.3	
Vert	9608.000	PK	42.2	38.1	10.8	32.6	-	58.5	73.9	15.4	Floor noise
Vert	12010.000	PK	47.9	39.9	2.1	33.2	-	56.7	73.9	17.2	
Vert	2390.000	AV	38.6	27.9	6.6	32.1	2.0	43.0	53.9	10.9	*1)
Vert	4804.000	AV	36.1	32.8	8.9	31.3	2.0	48.5	53.9	5.4	
Vert	7206.000	AV	32.5	36.8	10.0	32.6	2.0	48.7	53.9	5.2	
Vert	9608.000	AV	31.0	38.1	10.8	32.6	-	47.3	53.9	6.6	Floor noise
Vert	12010.000	AV	40.1	39.9	2.1	33.2	2.0	50.9	53.9	3.0	

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 (4.45 m / 3.0 m) = 3.43 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	96.9	28.0	6.6	32.1	99.4	-	-	Carrier
Hori	2400.000	PK	59.5	28.0	6.6	32.1	62.0	79.4	17.4	
Hori	9648.025	PK	42.0	38.1	10.9	32.6	58.4	79.4	21.0	
Vert	2402.000	PK	95.0	28.0	6.6	32.1	97.5	-	-	Carrier
Vert	2400.000	PK	57.1	28.0	6.6	32.1	59.6	77.5	17.9	
Vert	9648.025	PK	44.1	38.1	10.9	32.6	60.5	77.5	17.0	

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

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Ise EMC Lab.

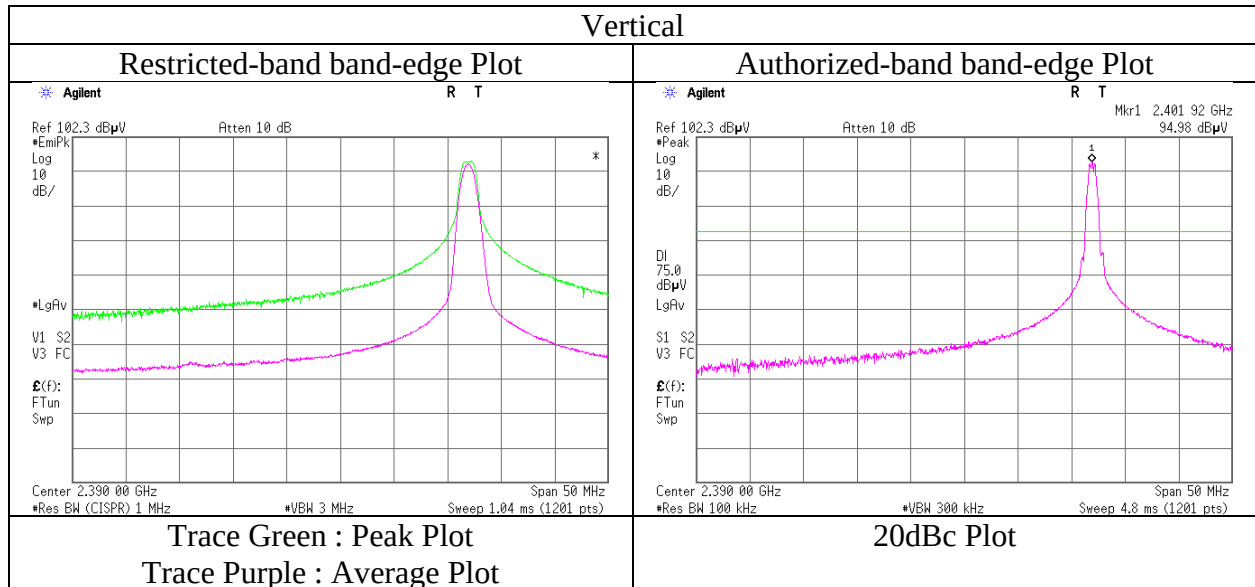
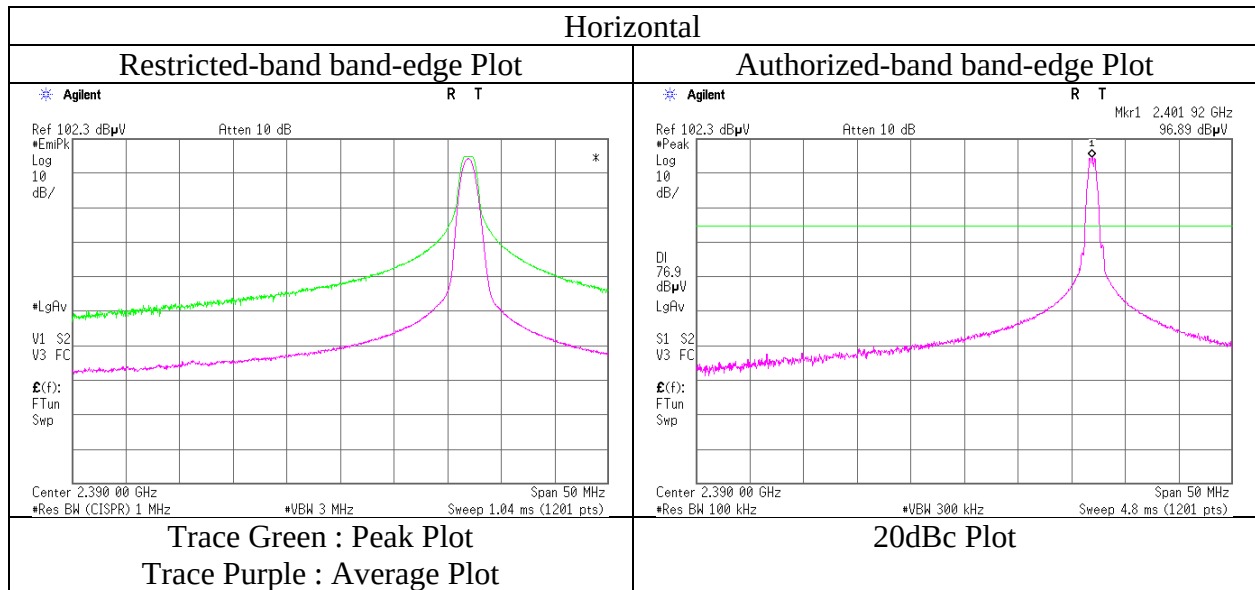
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 25, 2016
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Satofumi Matsuyama (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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Radiated Spurious Emission

Test place	Ise EMC Lab.	
Report No.	11400529H	
Semi Anechoic Chamber	No.4	No.2
Date	August 25, 2016	August 26, 2016
Temperature / Humidity	23 deg. C / 53 % RH	21 deg. C / 63 % RH
Engineer	Satofumi Matsuyama (Above 1 GHz)	Satofumi Matsuyama (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	196.614	QP	30.3	16.4	8.1	27.7	-	27.1	43.5	16.4	
Hori	212.988	QP	42.1	11.8	8.2	27.6	-	34.5	43.5	9.0	
Hori	290.816	QP	43.0	13.3	8.7	27.4	-	37.6	46.0	8.4	
Hori	307.205	QP	44.1	13.6	8.8	27.5	-	39.0	46.0	7.0	
Hori	311.296	QP	42.5	13.7	8.9	27.5	-	37.6	46.0	8.4	
Hori	364.544	QP	41.7	14.9	9.2	27.9	-	37.9	46.0	8.1	
Hori	4880.000	PK	43.8	33.1	8.9	31.3	-	54.5	73.9	19.4	
Hori	7320.000	PK	42.8	36.8	10.0	32.6	-	57.0	73.9	16.9	
Hori	9760.000	PK	41.4	38.2	10.9	32.7	-	57.8	73.9	16.1	Floor noise
Hori	12200.000	PK	45.8	39.9	2.2	33.0	-	54.9	73.9	19.0	
Hori	4880.000	AV	35.4	33.1	8.9	31.3	2.0	48.1	53.9	5.8	
Hori	7320.000	AV	34.5	36.8	10.0	32.6	2.0	50.7	53.9	3.2	
Hori	9760.000	AV	31.2	38.2	10.9	32.7	-	47.6	53.9	6.3	Floor noise
Hori	12200.000	AV	36.2	39.9	2.2	33.0	2.0	47.3	53.9	6.6	
Vert	188.417	QP	33.8	16.2	8.1	27.7	-	30.4	43.5	13.1	
Vert	212.989	QP	40.1	11.8	8.2	27.6	-	32.5	43.5	11.0	
Vert	303.108	QP	42.9	13.5	8.8	27.4	-	37.8	46.0	8.2	
Vert	307.202	QP	43.8	13.6	8.8	27.5	-	38.7	46.0	7.3	
Vert	315.397	QP	41.6	13.8	8.9	27.5	-	36.8	46.0	9.2	
Vert	573.449	QP	38.1	18.5	10.0	28.5	-	38.1	46.0	7.9	
Vert	4880.000	PK	45.9	33.1	8.9	31.3	-	56.6	73.9	17.3	
Vert	7320.000	PK	44.3	36.8	10.0	32.6	-	58.5	73.9	15.4	
Vert	9760.000	PK	41.3	38.2	10.9	32.7	-	57.7	73.9	16.2	Floor noise
Vert	12200.000	PK	48.6	39.9	2.2	33.0	-	57.7	73.9	16.2	
Vert	4880.000	AV	39.1	33.1	8.9	31.3	2.0	51.8	53.9	2.1	
Vert	7320.000	AV	35.1	36.8	10.0	32.6	2.0	51.3	53.9	2.6	
Vert	9760.000	AV	31.2	38.2	10.9	32.7	-	47.6	53.9	6.3	Floor noise
Vert	12200.000	AV	39.1	39.9	2.2	33.0	2.0	50.2	53.9	3.7	

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 (4.45 m / 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	2440.000	PK	92.6	28.0	6.6	32.1	95.1	-	-	Carrier
Hori	9648.009	PK	40.7	38.1	10.9	32.6	57.1	75.1	18.0	
Vert	2440.000	PK	92.9	28.0	6.6	32.1	95.4	-	-	Carrier
Vert	9648.009	PK	44.7	38.1	10.9	32.6	61.1	75.4	14.3	

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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Test place	Ise EMC Lab.	
Report No.	11400529H	
Semi Anechoic Chamber	No.4	No.2
Date	August 25, 2016	August 26, 2016
Temperature / Humidity	23 deg. C / 53 % RH	21 deg. C / 63 % RH
Engineer	Satofumi Matsuyama (Above 1 GHz)	Satofumi Matsuyama (Below 1 GHz)
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	212.995	QP	41.4	11.8	8.2	27.6	-	33.8	43.5	9.7	
Hori	303.104	QP	43.0	13.5	8.8	27.4	-	37.9	46.0	8.1	
Hori	307.206	QP	44.9	13.6	8.8	27.5	-	39.8	46.0	6.2	
Hori	311.301	QP	43.4	13.7	8.9	27.5	-	38.5	46.0	7.5	
Hori	364.548	QP	42.6	14.9	9.2	27.9	-	38.8	46.0	7.2	
Hori	372.746	QP	41.8	15.1	9.3	28.0	-	38.2	46.0	7.8	
Hori	2483.500	PK	66.4	28.1	6.7	32.1	-	69.1	73.9	4.8	
Hori	4960.000	PK	43.2	33.4	9.0	31.2	-	54.4	73.9	19.5	
Hori	7440.000	PK	42.9	36.8	10.0	32.7	-	57.0	73.9	16.9	
Hori	9920.000	PK	42.3	38.3	11.0	32.8	-	58.8	73.9	15.1	Floor noise
Hori	12400.000	PK	44.3	39.8	2.2	32.9	-	53.4	73.9	20.5	
Hori	2483.500	AV	45.9	28.1	6.7	32.1	2.0	50.6	53.9	3.3	*1)
Hori	4960.000	AV	35.9	33.4	9.0	31.2	2.0	49.1	53.9	4.8	
Hori	7440.000	AV	33.6	36.8	10.0	32.7	2.0	49.7	53.9	4.2	
Hori	9920.000	AV	31.5	38.3	11.0	32.8	-	48.0	53.9	5.9	Floor noise
Hori	12400.000	AV	35.0	39.8	2.2	32.9	2.0	46.1	53.9	7.8	
Vert	188.421	QP	33.8	16.2	8.1	27.7	-	30.4	43.5	13.1	
Vert	212.996	QP	39.9	11.8	8.2	27.6	-	32.3	43.5	11.2	
Vert	303.108	QP	42.7	13.5	8.8	27.4	-	37.6	46.0	8.4	
Vert	307.206	QP	43.5	13.6	8.8	27.5	-	38.4	46.0	7.6	
Vert	315.396	QP	41.7	13.8	8.9	27.5	-	36.9	46.0	9.1	
Vert	573.449	QP	39.2	18.5	10.0	28.5	-	39.2	46.0	6.8	
Vert	2483.500	PK	64.8	28.1	6.7	32.1	-	67.5	73.9	6.4	
Vert	4960.000	PK	46.7	33.4	9.0	31.2	-	57.9	73.9	16.0	
Vert	7440.000	PK	44.6	36.8	10.0	32.7	-	58.7	73.9	15.2	
Vert	9920.000	PK	41.3	38.3	11.0	32.8	-	57.8	73.9	16.1	Floor noise
Vert	12400.000	PK	47.5	39.8	2.2	32.9	-	56.6	73.9	17.3	
Vert	2483.500	AV	44.6	28.1	6.7	32.1	2.0	49.3	53.9	4.6	*1)
Vert	4960.000	AV	40.1	33.4	9.0	31.2	2.0	53.3	53.9	0.6	
Vert	7440.000	AV	36.7	36.8	10.0	32.7	2.0	52.8	53.9	1.1	
Vert	9920.000	AV	31.5	38.3	11.0	32.8	-	48.0	53.9	5.9	Floor noise
Vert	12400.000	AV	39.4	39.8	2.2	32.9	2.0	50.5	53.9	3.4	

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 (4.45 m / 3.0 m) = 3.43 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	2480.000	PK	92.8	28.0	6.7	32.1	95.4	-	-	Carrier
Hori	9648.021	PK	40.3	38.1	10.9	32.6	56.7	75.4	18.7	
Vert	2480.000	PK	91.1	28.0	6.7	32.1	93.7	-	-	Carrier
Vert	9648.021	PK	44.6	38.1	10.9	32.6	61.0	73.7	12.7	

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

UL Japan, Inc.

Ise EMC Lab.

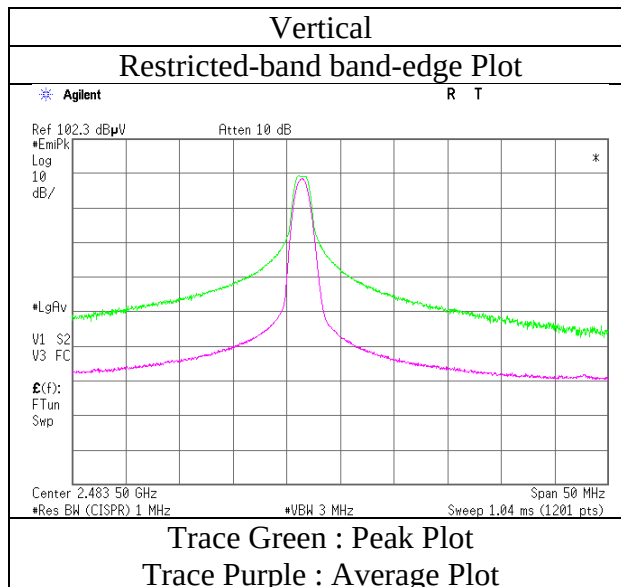
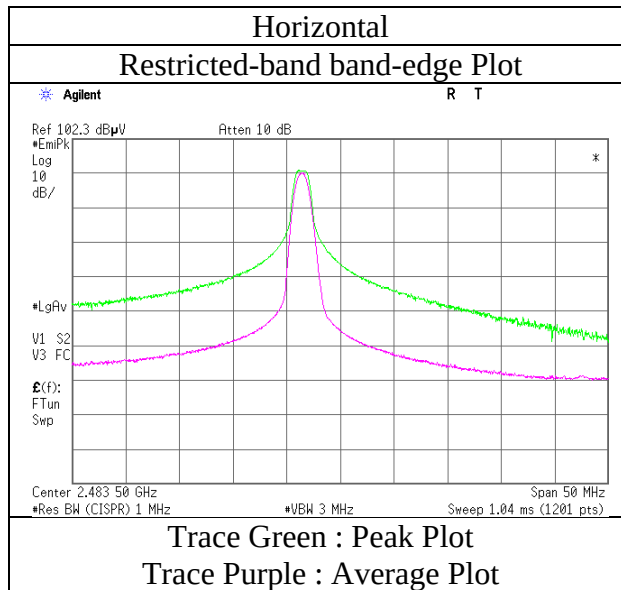
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Radiated Spurious Emission (Reference Plot for band-edge)

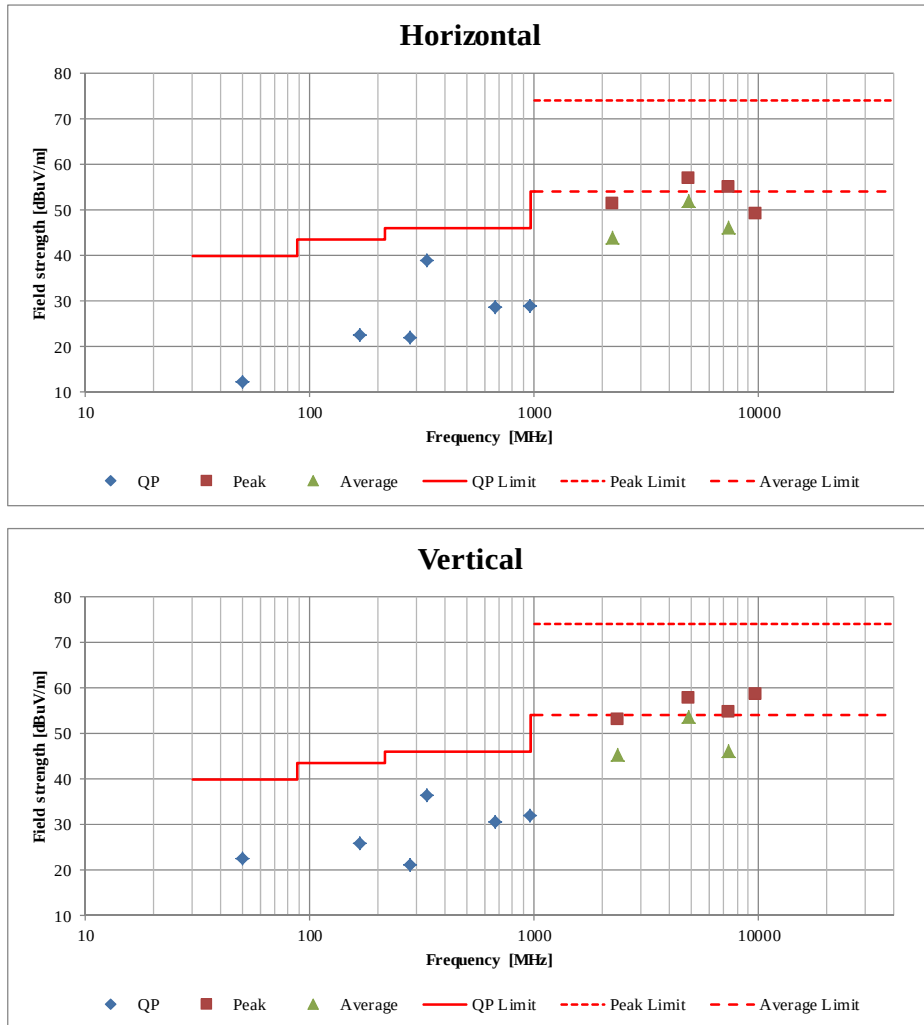
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11400529H
Date	August 25, 2016
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Satofumi Matsuyama
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

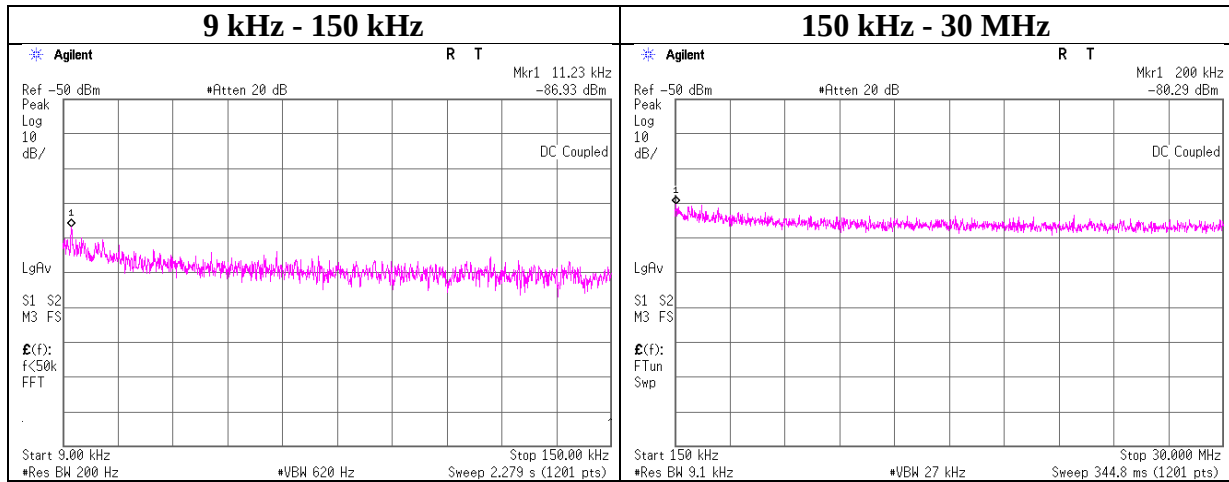
Test place	Ise EMC Lab.		
Report No.	11400529H		
Semi Anechoic Chamber	No.4	No.4	No.2
Date	August 24, 2016	August 25, 2016	August 26, 2016
Temperature / Humidity	24 deg. C / 58 % RH	23 deg. C / 53 % RH	21 deg. C / 63 % RH
Engineer	Satofumi Matsuyama (1 GHz - 10 GHz)	Satofumi Matsuyama (Above 10 GHz)	Satofumi Matsuyama (Below 1 GHz)
Mode	Tx 11b 2437 MHz		



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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 23, 2016
Temperature / Humidity	25 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11g 2412 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain	N	EIRP	Distance	Ground bounce	E (field strength)	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	(Number of Output	[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
11.23	-86.9	0.05	9.9	2.0	1	-74.9	300	6.0	-13.7	46.5	60.2	
200.00	-80.3	0.19	10.0	2.0	1	-68.2	300	6.0	-6.9	21.5	28.4	

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

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

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Ise EMC Lab.

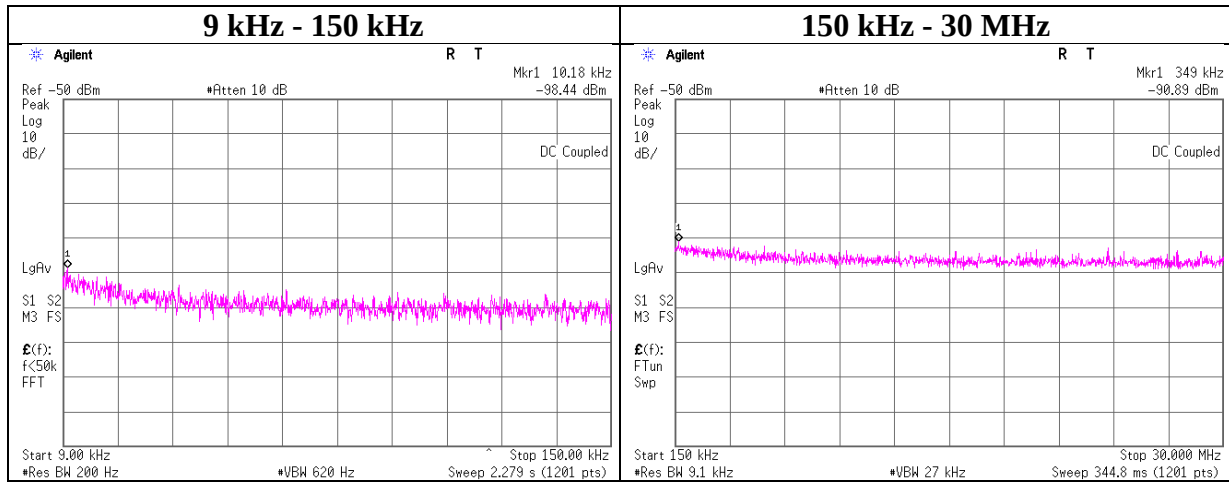
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 23, 2016
Temperature / Humidity	25 deg. C / 59 % RH
Engineer	Takafumi Noguchi
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
10.18	-98.4	0.05	9.9	2.5	1	-86.0	300	6.0	-24.7	47.4	72.1	
349.00	-90.9	0.30	9.9	2.5	1	-78.2	300	6.0	-16.9	16.7	33.6	

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

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

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Ise EMC Lab.

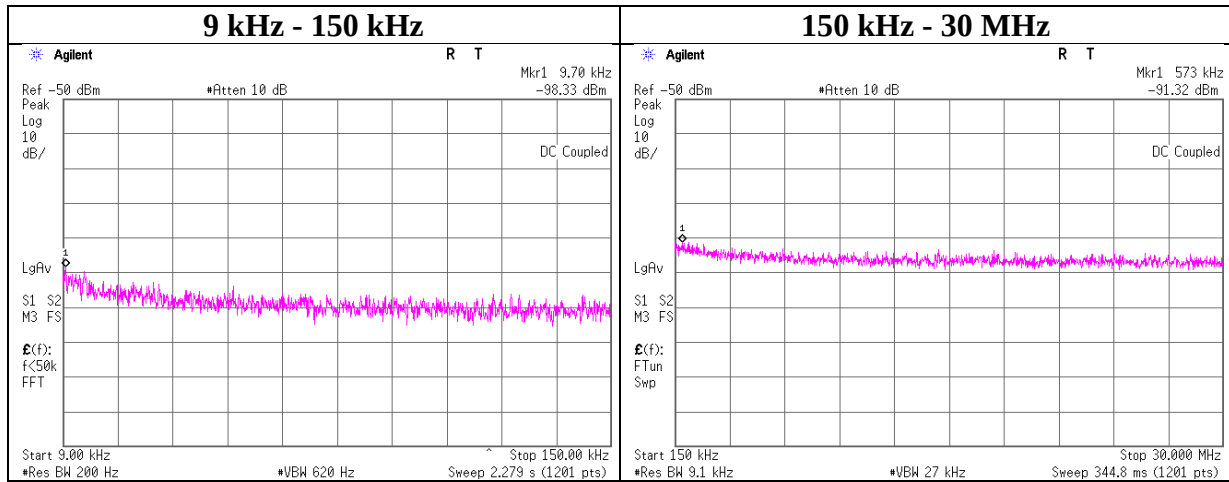
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 23, 2016
Temperature / Humidity	25 deg. C / 59 % RH
Engineer	Takafumi Noguchi
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
9.70	-98.3	0.05	9.9	2.5	1	-85.9	300	6.0	-24.6	47.8	72.4	
573.00	-91.3	0.39	9.9	2.5	1	-78.5	30	6.0	2.7	32.4	29.7	

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

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

UL Japan, Inc.

Ise EMC Lab.

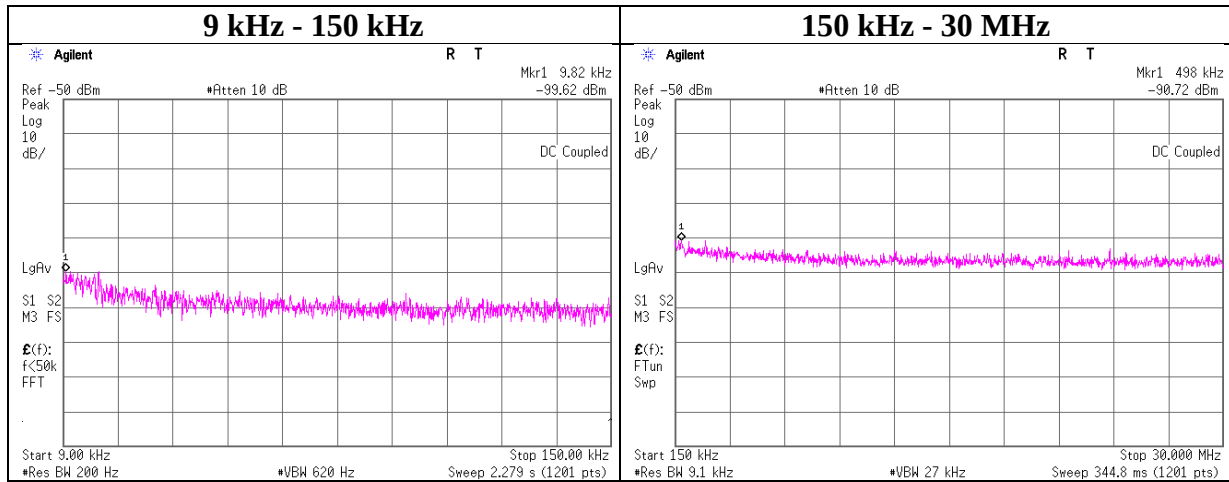
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 23, 2016
Temperature / Humidity	25 deg. C / 59 % RH
Engineer	Takafumi Noguchi
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
9.82	-99.6	0.05	9.9	2.5	1	-87.1	300	6.0	-25.9	47.7	73.6	
498.00	-90.7	0.37	9.9	2.5	1	-77.9	30	6.0	3.3	33.6	30.3	

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

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

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Power Density

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 11400529H
Date August 23, 2016
Temperature / Humidity 25 deg. C / 59 % RH
Engineer Takafumi Noguchi
Mode Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.44	1.20	10.03	-15.21	8.00	23.21
2437.00	-27.53	1.19	10.03	-16.31	8.00	24.31
2462.00	-28.15	1.21	10.03	-16.91	8.00	24.91

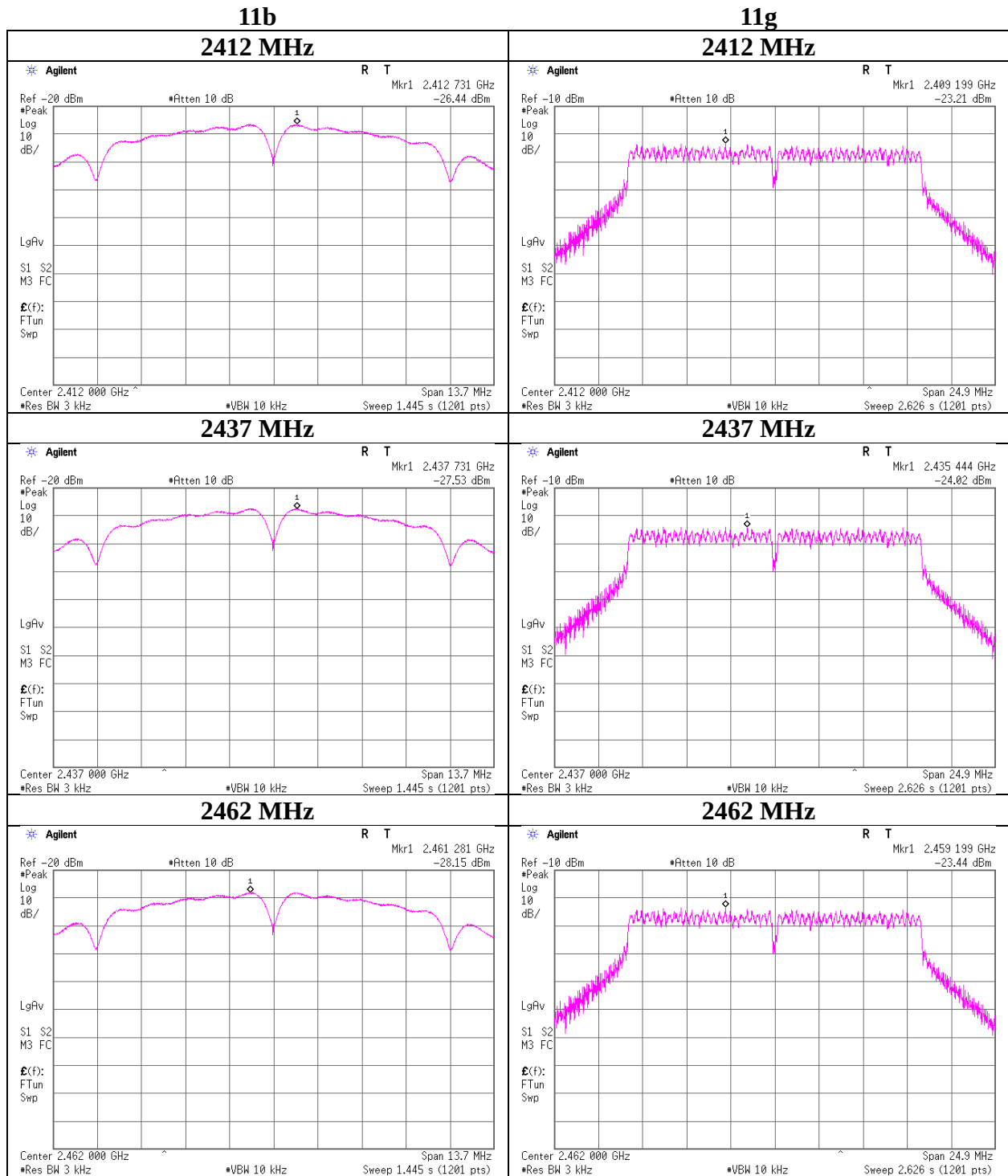
11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-23.21	1.20	10.03	-11.98	8.00	19.98
2437.00	-24.02	1.19	10.03	-12.80	8.00	20.80
2462.00	-23.44	1.21	10.03	-12.20	8.00	20.20

Sample Calculation:

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

Power Density



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Power Density

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	11400529H
Date	August 23, 2016
Temperature / Humidity	25 deg. C / 59 % RH
Engineer	Takafumi Noguchi
Mode	Tx

11n20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-24.49	1.20	10.03	-13.26	8.00	21.26
2437.00	-24.90	1.19	10.03	-13.68	8.00	21.68
2462.00	-24.61	1.21	10.03	-13.37	8.00	21.37

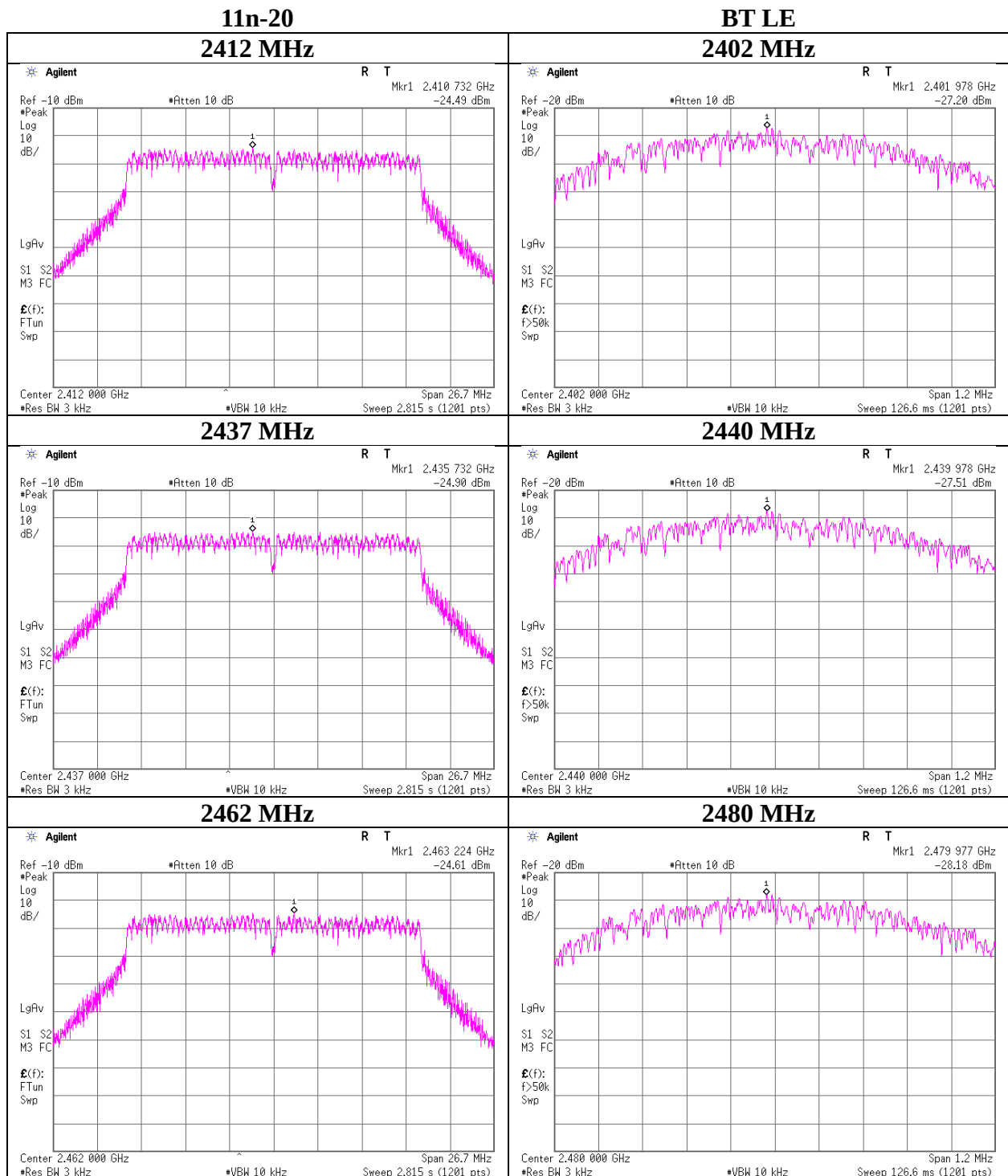
BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-27.20	1.17	10.03	-16.00	8.00	24.00
2440.00	-27.51	1.17	10.03	-16.31	8.00	24.31
2480.00	-28.18	1.19	10.03	-16.96	8.00	24.96

Sample Calculation:

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

Power Density



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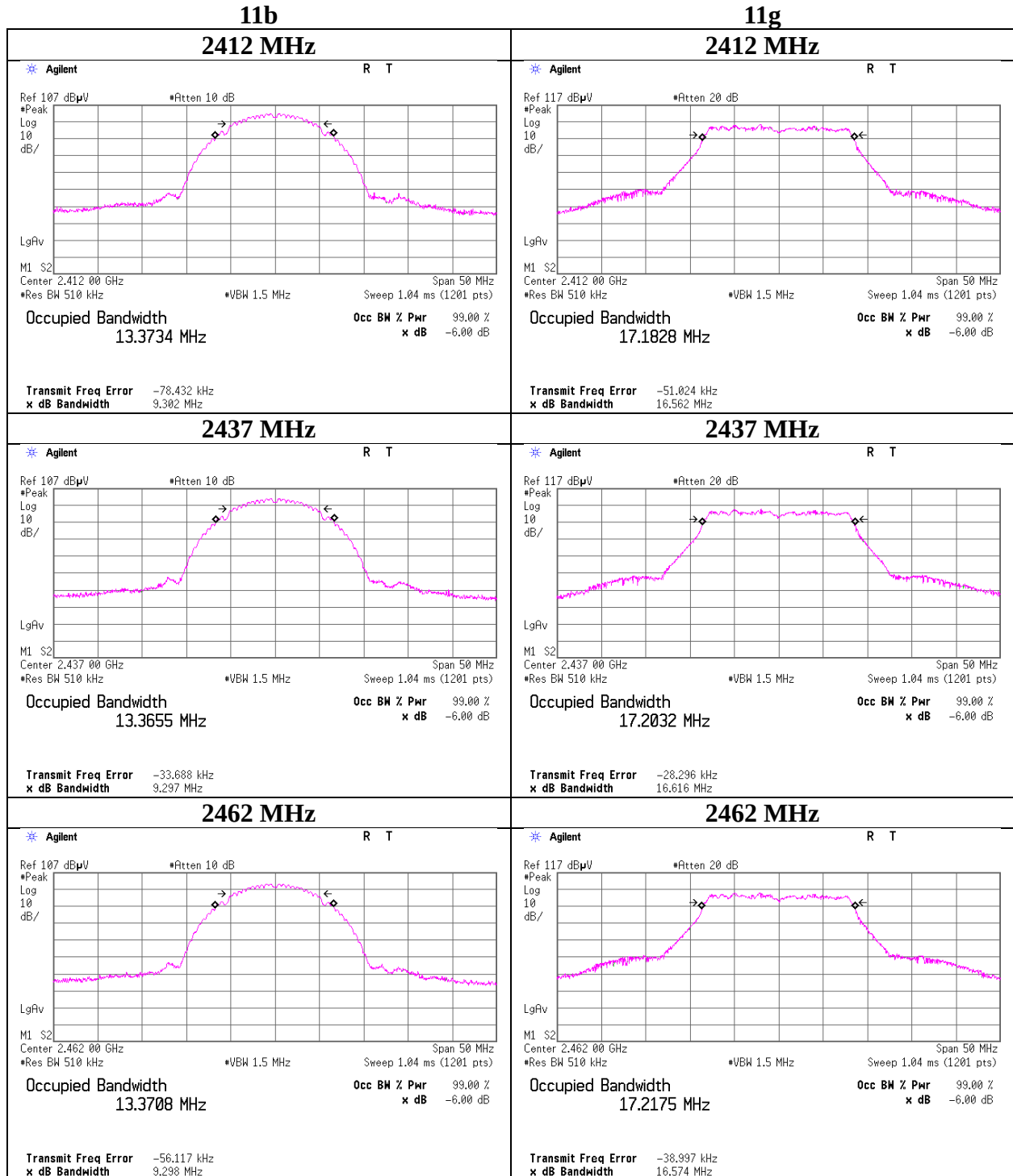
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99% Occupied Bandwidth

Test place
Report No.
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab. No.6 Measurement Room
11400529H
August 23, 2016
25 deg. C / 59 % RH
Takafumi Noguchi
Tx



UL Japan, Inc.

Ise EMC Lab.

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99% Occupied Bandwidth

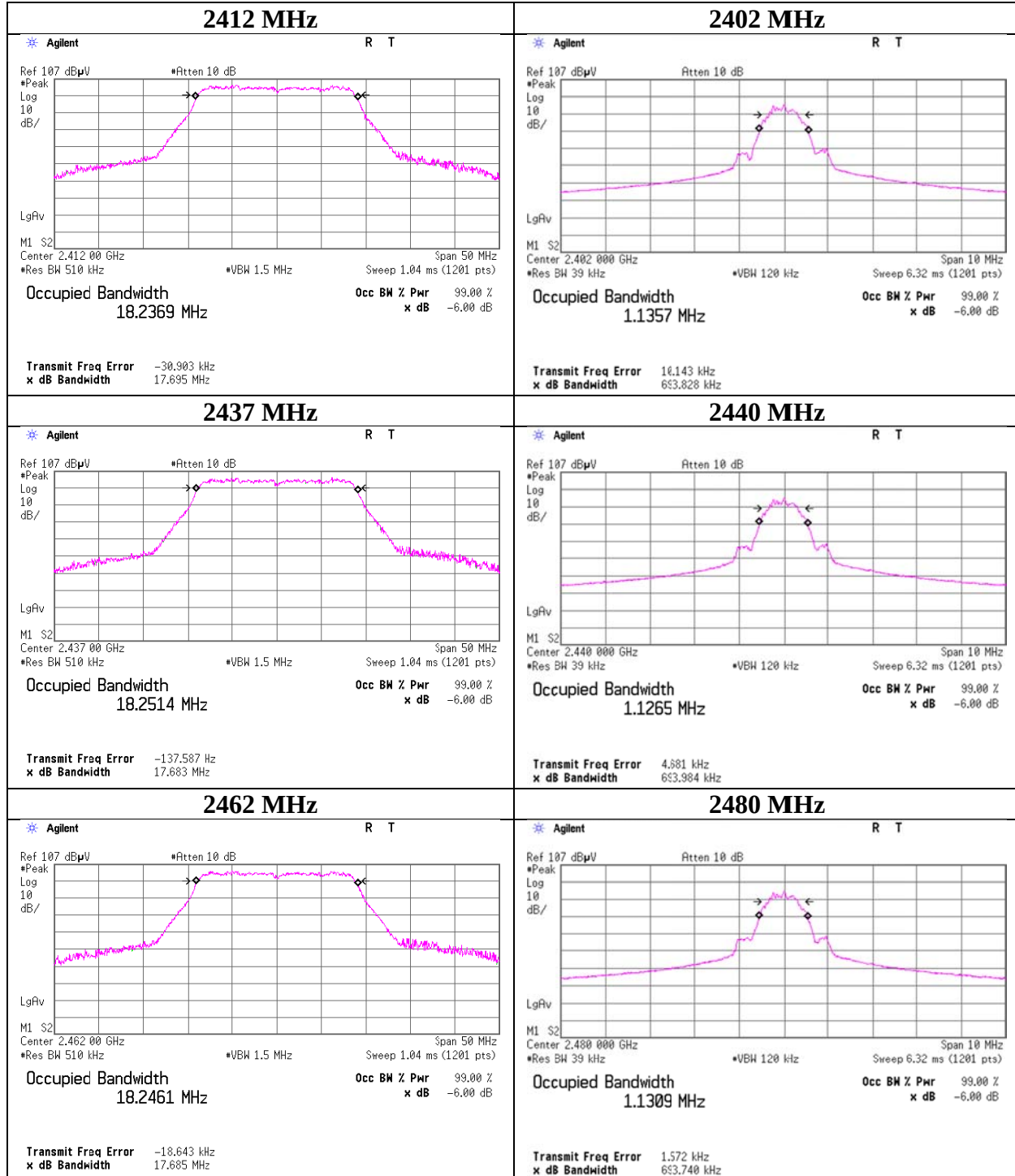
Test place
Report No.

Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab. No.6 Measurement Room
11400529H
August 23, 2016
25 deg. C / 59 % RH
Takafumi Noguchi
Tx

11n-20

BT LE



UL Japan, Inc.

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APPENDIX 2: Test instruments

Test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2015/11/06 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2016/06/24 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/01/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2015/10/07 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2015/10/11 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2015/11/02 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2016/01/30 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2016/02/08 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2015/11/10 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2015/09/04 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12

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Test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2016/01/21 * 12
MRENT-126	Spectrum Analyzer	KEYSIGHT	E4440A	MY46185516	AT	2016/07/01 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2016/06/06 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2016/06/06 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2016/03/18 * 12
MCC-173	Microwave Cable	Junkosha	MWX221	1409S496	AT	2016/03/11 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2015/11/10 * 12
MCC-38	Coaxial Cable	UL Japan	-	-	AT	2015/12/07 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	CE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	CE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	CE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	CE	2016/01/29 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2016/07/07 * 12
MAT-67	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM1 41(5m)/421-010(1m)/sucoform141-PE(1 m)/RFM-E121(Swit cher)	-/04178	CE	2016/07/20 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	CE	2016/01/18 * 12

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

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

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

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

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