



RADIO TEST REPORT

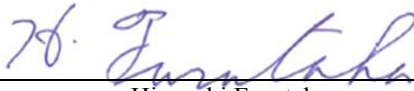
Test Report No. : 11469126H-A-R1

Applicant : Murata Manufacturing Co., Ltd.
Type of Equipment : Communication Module
Model No. : Type1JS
FCC ID : VPYLB1JS955
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

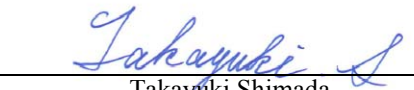
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not 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)
7. This report is a revised version of 11469126H-A. 11469126H-A is replaced with this report.

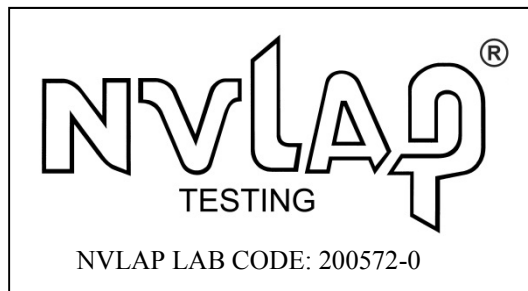
Date of test: September 29 to October 24, 2016

Representative test engineer:


Hiroyuki Furutaka
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
Engineer
Consumer Technology Division



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13-EM-F0429

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Radio Specification

Radio Type : Transceiver
Power Supply (inner) : DC 3.0 V - 3.5 V

Specification of Wireless LAN (IEEE802.11b/g/a/n-20/n-40/11ac-20/11ac-40/11ac-80)

Type of radio	IEEE802.11b *1)	IEEE802.11g/n (20 M band) *1)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5720 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5710 MHz 5755 MHz - 5795 MHz	5210 MHz 5290 MHz 5530 MHz - 5690 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5 MHz		20 MHz	40 MHz	80 MHz
Antenna type	Pattern Antenna				
Antenna Gain	2.4 GHz: 2.1 dBi 5 GHz: 2.0 dBi				

Specification of Bluetooth (Low Energy: LE)

	Bluetooth Ver.4.1 with EDR function *1)
Frequency of operation	2402 MHz -2480 MHz
Type of modulation	GFSK
Channel spacing	2 MHz
Antenna type	Pattern Antenna
Antenna Gain	2.1 dBi

*1) This test report applies to Wireless LAN (2.4GHz Band) and Bluetooth (Low Energy).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 28.2 dB, 0.15000 MHz, N, 0.15000 MHz, L AV 24.7 dB, 24.87982 MHz, N, 24.88012 MHz, N	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(4)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.2 dB 4960.000 MHz, , AV, Vertical	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

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

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

FCC Part 15.31 (e)

The 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 $k = 2$.
Ise EMC Lab.

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	2.6 dB

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

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)	11 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 0, PN9
Bluetooth Low Energy (BT LE)	Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*EUT has the power settings by the software as follows (power setting value might be different from product specification value); Power settings: WLAN: 11b: Setting Parameter value 8, 11g: Setting Parameter value 8, 11n: Setting Parameter value 8 BT LE: Setting Parameter value 05 Software: CPM_P162170_F159430 *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) for WLAN

Test Item	Operating Mode	Tested frequency
Conducted Emission, Radiated Spurious Emission (Below 1GHz) Conducted Spurious Emission	Tx 11n-20 *1)	2462 MHz
Radiated Spurious Emission (Above 1GHz)	Tx 11b Tx 11n-20 *2)	2412 MHz 2437 MHz 2462 MHz
6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	Tx 11b Tx 11g Tx 11n-20	2412 MHz 2437 MHz 2462 MHz
*1) The mode was 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 output power.		

*The details of Operating mode(s) 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)	Tx BT LE	2402 MHz 2440 MHz 2480 MHz

*Simultaneously transmission

Test Item	Operating Mode *1)
Radiated Spurious Emission	Tx BT LE 2402 MHz + Tx 11a 5825 MHz Tx BT LE 2440 MHz + Tx 11a 5825 MHz Tx BT LE 2480 MHz + Tx 11a 5825 MHz
*1) The test was performed on the mode as a representative, because it had the highest power of 5GHz band at antenna terminal test.	

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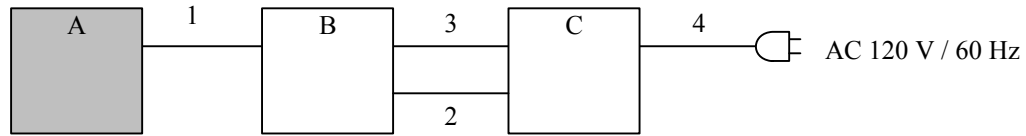
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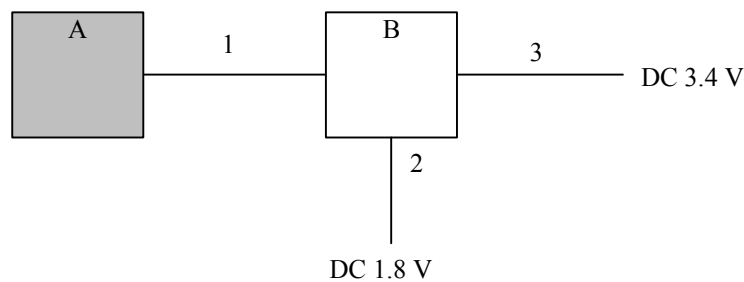
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4.2 Configuration and peripherals

For Conducted Emission test



For all tests other than Conducted Emission test



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	Type1JS	RE: 7 AT: 14	Murata Manufacturing Co., Ltd.	EUT
B	Jig	-	-	Murata Manufacturing Co., Ltd.	-
C	DC Power supply	RW16-5ADP	171116437	TEXIO	-

RE : Radiated Emission
AT : Antenna Terminal Conducted

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.05	Unshielded	Unshielded	-
2	DC Cable	0.40 *1) 2.00 *2)	Unshielded	Unshielded	-
3	DC Cable	0.40 *1) 2.00 *2)	Unshielded	Unshielded	-
4	AC Cable	2.00	Unshielded	Unshielded	-

*1) Used for Conducted emission test

*2) Used for Radiated 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	4.5 m *2) (1 GHz – 10 GHz), 1.0 m *3) (10 GHz – 26.5 GHz)		4.5 m *2) (1 GHz – 10 GHz), 1.0 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: $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.53 \text{ dB}$

*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 / 2 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 low enough 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

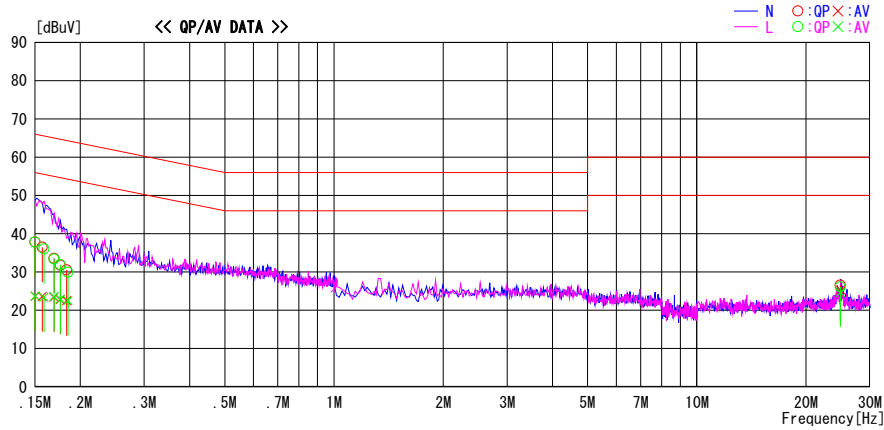
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2016/10/11

Report No. : 11469126H
Temp./Humi. : 23deg. C / 58% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 11n-20 2462 MHz

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	24.4	10.3	13.4	37.8	23.7	66.0	56.0	28.2	32.3	N	
0.15697	23.1	10.2	13.4	36.5	23.6	65.6	55.6	29.1	32.0	N	
0.16918	20.2	10.0	13.4	33.6	23.4	65.0	55.0	31.4	31.6	N	
0.17615	18.3	9.4	13.4	31.7	22.8	64.7	54.7	33.0	31.9	N	
0.18313	17.2	9.1	13.4	30.6	22.5	64.3	54.3	33.7	31.8	N	
24.88012	12.4	11.1	14.2	26.6	25.3	60.0	50.0	33.4	24.7	N	
0.15000	24.4	10.3	13.4	37.8	23.7	66.0	56.0	28.2	32.3	L	
0.15872	22.6	10.0	13.4	36.0	23.4	65.5	55.5	29.5	32.1	L	
0.16918	20.0	10.2	13.4	33.4	23.6	65.0	55.0	31.6	31.4	L	
0.17615	18.5	9.6	13.4	31.9	23.0	64.7	54.7	32.8	31.7	L	
0.18487	16.5	9.1	13.4	29.9	22.5	64.3	54.3	34.4	31.8	L	
24.88012	11.9	10.5	14.2	26.1	24.7	60.0	50.0	33.9	25.3	L	

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

Conducted Emission

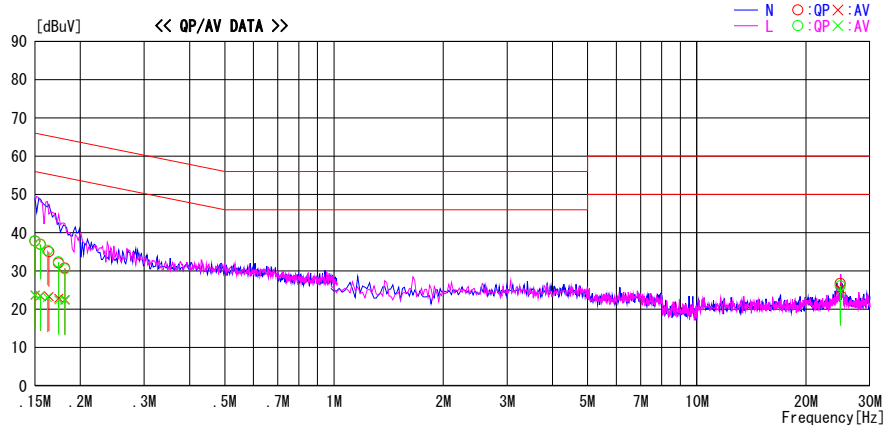
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2016/10/11

Report No. : 11469126H
 Temp./Humi. : 23deg. C / 58% RH
 Engineer : Takafumi Noguchi

Mode / Remarks : Tx BT LE 2402 MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV

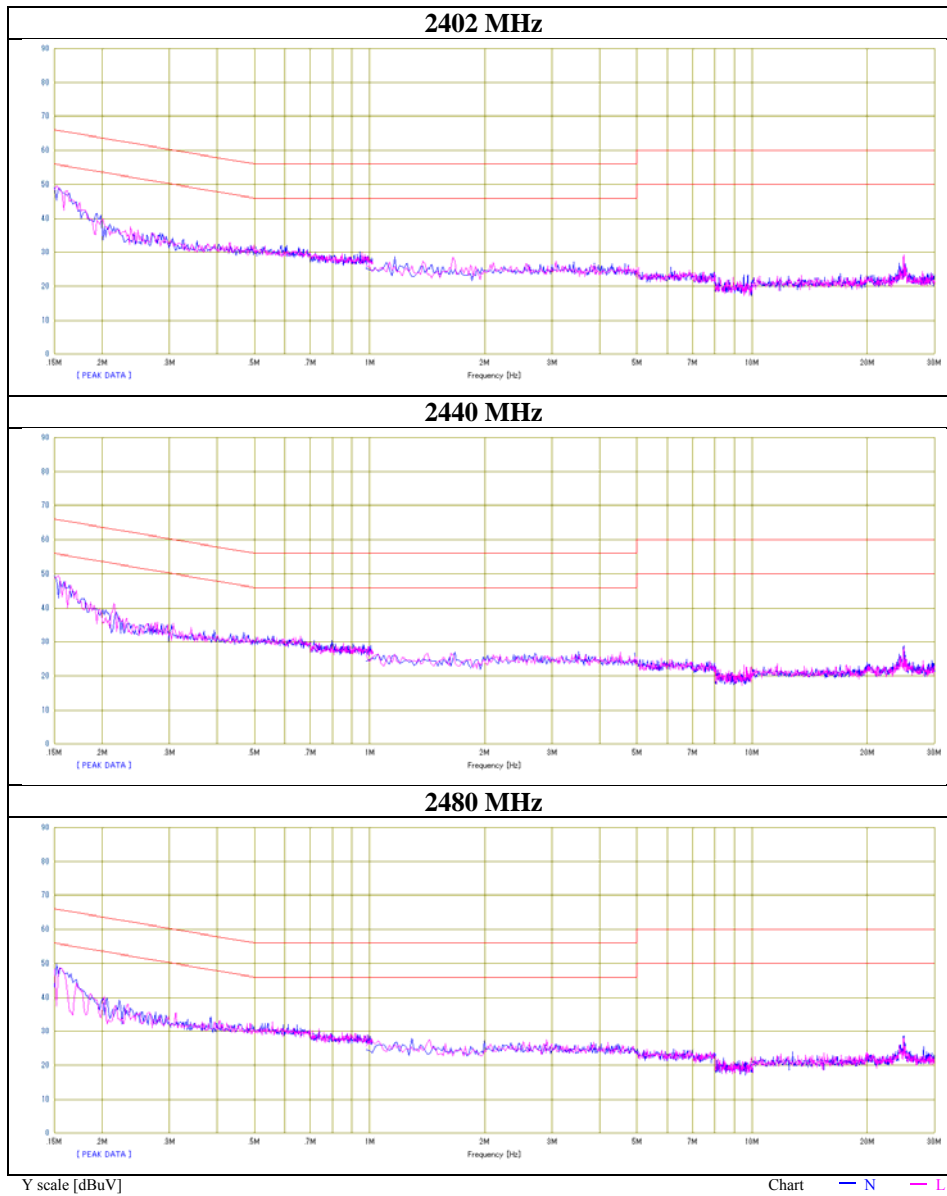


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	24.4	10.3	13.4	37.8	23.7	66.0	56.0	28.2	32.3	N	
0.15523	23.5	10.1	13.4	36.9	23.5	65.7	55.7	28.8	32.2	N	
0.16395	21.6	9.9	13.4	35.0	23.3	65.3	55.3	30.3	32.0	N	
0.17441	18.7	9.5	13.4	32.1	22.9	64.7	54.7	32.6	31.8	N	
0.18138	17.3	9.1	13.4	30.7	22.5	64.4	54.4	33.7	31.9	N	
24.87982	12.5	11.1	14.2	26.7	25.3	60.0	50.0	33.3	24.7	N	
0.15000	24.4	10.3	13.4	37.8	23.7	66.0	56.0	28.2	32.3	L	
0.15523	23.5	10.2	13.4	36.9	23.6	65.7	55.7	28.8	32.1	L	
0.16220	22.0	9.7	13.4	35.4	23.1	65.4	55.4	30.0	32.3	L	
0.17441	19.0	9.0	13.4	32.4	22.4	64.7	54.7	32.3	32.3	L	
0.18138	17.2	8.9	13.4	30.6	22.3	64.4	54.4	33.8	32.1	L	
24.87982	11.9	10.5	14.2	26.1	24.7	60.0	50.0	33.9	25.3	L	

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

Conducted Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11469126H
Date	October 11, 2016
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE



UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

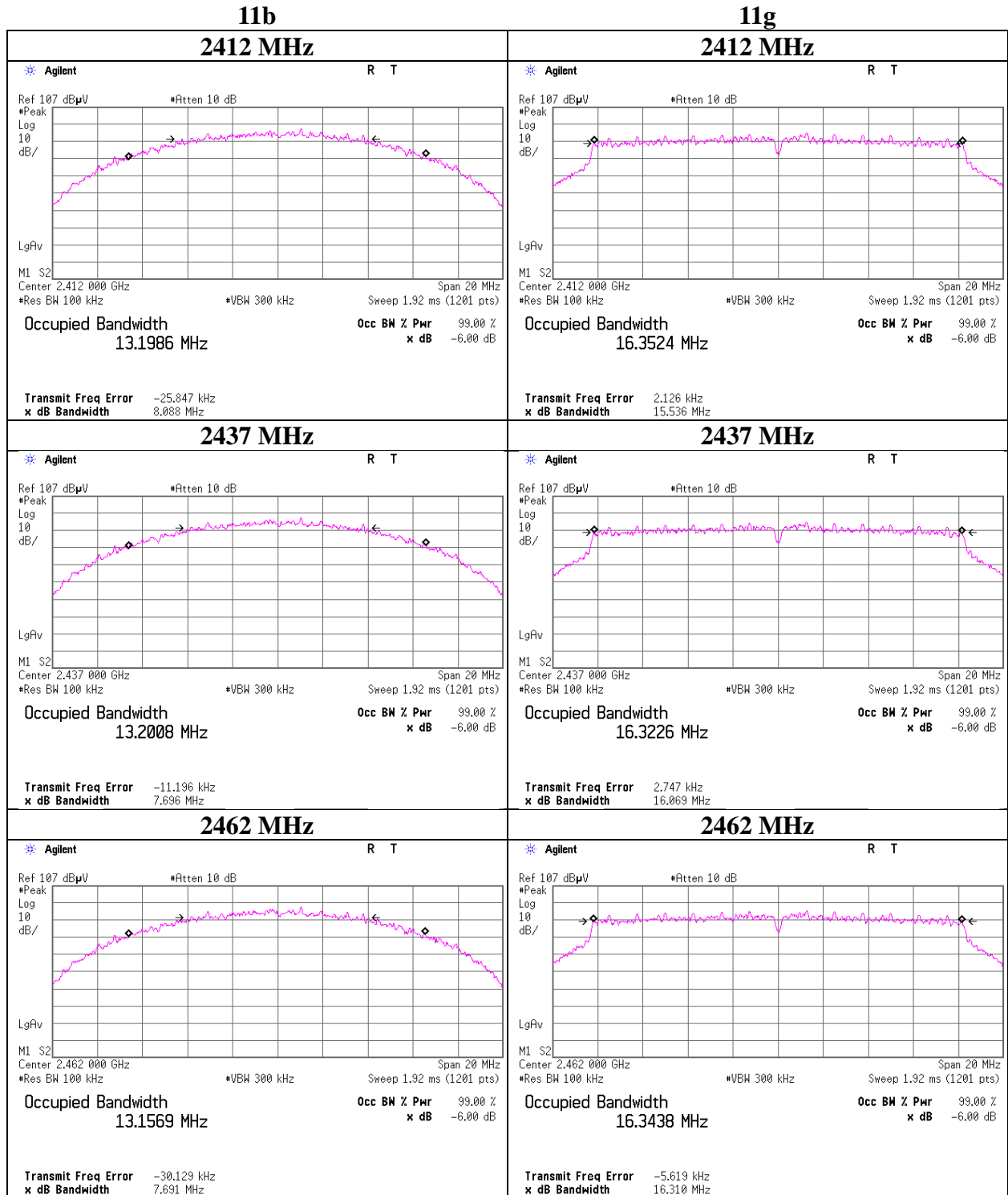
Facsimile : +81 596 24 8124

6dB Bandwidth

Test place Ise EMC Lab. No.4 Measurement Room
Report No. 11469126H
Date September 30, 2016
Temperature / Humidity 23 deg. C / 60 % RH
Engineer Tomoki Matsui
Mode Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	8.088	> 500
	2437	7.696	> 500
	2462	7.691	> 500
11g	2412	15.536	> 500
	2437	16.069	> 500
	2462	16.310	> 500
11n-20	2412	15.466	> 500
	2437	15.149	> 500
	2462	15.468	> 500

6dB Bandwidth



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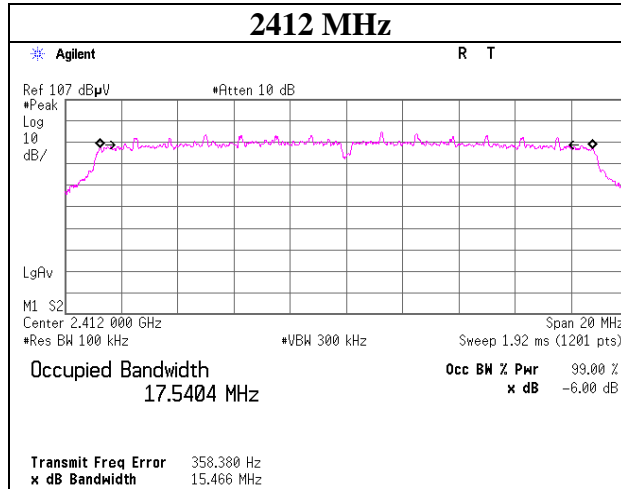
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

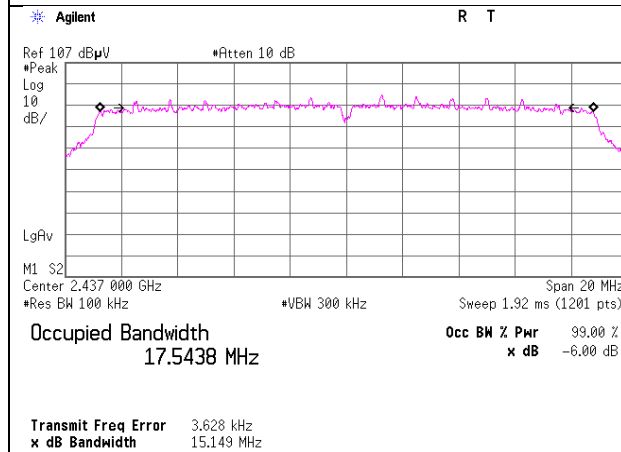
6dB Bandwidth

11n-20

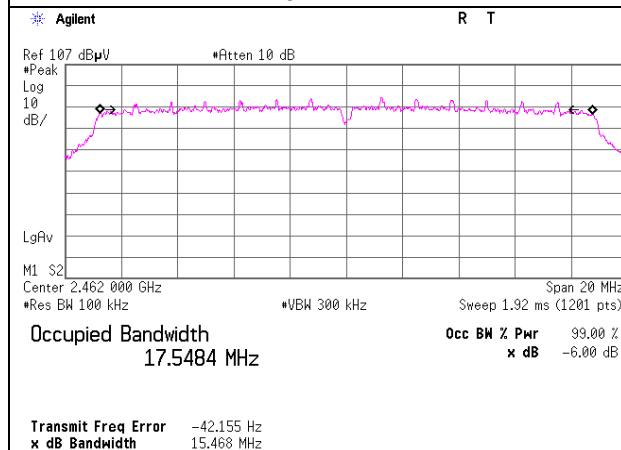
2412 MHz



2437 MHz



2462 MHz



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6dB Bandwidth

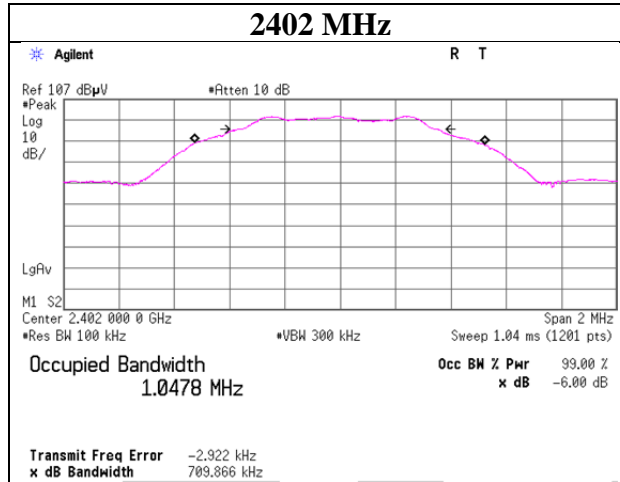
Test place Ise EMC Lab. No.4 Measurement Room
Report No. 11469126H
Date September 29, 2016
Temperature / Humidity 23 deg. C / 50 % RH
Engineer Hiroyuki Furutaka
Mode Tx BT LE

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
BT LE	2402	0.710	> 500
	2440	0.707	> 500
	2480	0.711	> 500

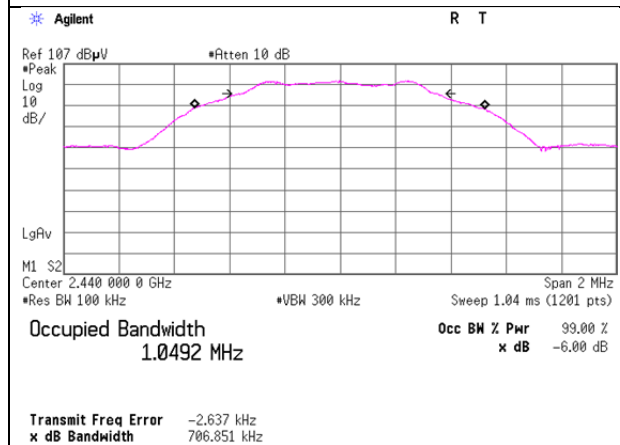
6dB Bandwidth

BT LE

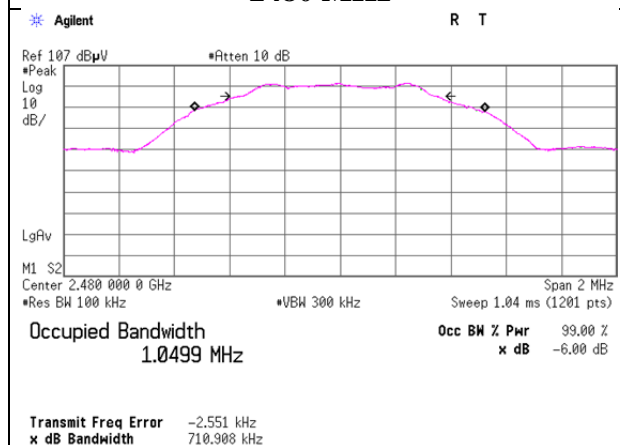
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 30, 2016 September 30, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 50 % RH 23 deg. C / 54 % RH 23 deg. C / 41 % RH
Engineer : Hiroyuki Furutaka Tomoki Matsui Takafumi Noguchi
Mode : Tx 11b

3.4V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-2.83	1.46	10.08	8.71	7.43	30.00	1000	21.29
2437	-2.95	1.47	10.08	8.60	7.25	30.00	1000	21.40
2462	-2.75	1.47	10.08	8.80	7.59	30.00	1000	21.20

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-1.98	1.46	10.08	9.56	9.04	30.00	1000	20.44
2437	-1.93	1.47	10.08	9.62	9.17	30.00	1000	20.38
2462	-1.84	1.47	10.08	9.71	9.36	30.00	1000	20.29

3.93V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-2.85	1.46	10.08	8.69	7.40	30.00	1000	21.31
2437	-3.13	1.47	10.08	8.42	6.95	30.00	1000	21.58
2462	-2.95	1.47	10.08	8.60	7.25	30.00	1000	21.40

Sample Calculation:

$$\text{Result} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss}$$

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	-3.01	
2	-2.98	
5.5	-2.98	
11	-2.95	*

*: Worst Rate

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

Maximum Peak Output Power

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 30, 2016 September 30, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 50 % RH 23 deg. C / 54 % RH 23 deg. C / 41 % RH
Engineer : Hiroyuki Furutaka Tomoki Matsui Takafumi Noguchi
Mode : Tx 11g

3.4V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.37	1.46	10.08	16.91	49.11	30.00	1000	13.09
2437	5.21	1.47	10.08	16.76	47.44	30.00	1000	13.24
2462	5.76	1.47	10.08	17.31	53.85	30.00	1000	12.69

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.05	1.46	10.08	17.59	57.43	30.00	1000	12.41
2437	6.16	1.47	10.08	17.71	59.04	30.00	1000	12.29
2462	6.28	1.47	10.08	17.83	60.70	30.00	1000	12.17

3.93V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.08	1.46	10.08	16.62	45.94	30.00	1000	13.38
2437	5.03	1.47	10.08	16.58	45.52	30.00	1000	13.42
2462	5.36	1.47	10.08	16.91	49.11	30.00	1000	13.09

Sample Calculation:

$$\text{Result} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss}$$

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	5.11	
9	4.31	
12	4.68	
18	4.07	
24	4.83	
36	4.32	
48	4.84	
54	5.21	*

*: Worst Rate

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

Maximum Peak Output Power

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 30, 2016 September 30, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 50 % RH 23 deg. C / 54 % RH 23 deg. C / 41 % RH
Engineer : Hiroyuki Furutaka Tomoki Matsui Takafumi Noguchi
Mode : Tx 11n-20

3.4V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.65	1.46	10.08	18.19	65.94	30.00	1000	11.81
2437	6.59	1.47	10.08	18.14	65.19	30.00	1000	11.86
2462	6.72	1.47	10.08	18.27	67.17	30.00	1000	11.73

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	7.23	1.46	10.08	18.77	75.36	30.00	1000	11.23
2437	7.32	1.47	10.08	18.87	77.12	30.00	1000	11.13
2462	7.27	1.47	10.08	18.82	76.24	30.00	1000	11.18

3.93V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.55	1.46	10.08	18.09	64.44	30.00	1000	11.91
2437	6.49	1.47	10.08	18.04	63.70	30.00	1000	11.96
2462	6.70	1.47	10.08	18.25	66.86	30.00	1000	11.75

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

2437 MHz

Rate	Reading	Remark
[MCS]	[dBm]	
0	6.59	*
1	4.36	
2	4.69	
3	4.83	
4	4.37	
5	4.02	
6	4.86	
7	4.20	

*: Worst Rate

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.4 and No.11 Measurement Room	
Report No.	11469126H	
Date	September 29, 2016	October 24, 2016
Temperature / Humidity	23 deg. C / 50 % RH	23 deg. C / 41 % RH
Engineer	Hiroyuki Furutaka	Takafumi Noguchi
Mode	Tx BT LE	

3.4V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-7.31	1.38	10.08	4.15	2.60	30.00	1000	25.85
2440	-7.35	1.39	10.08	4.12	2.58	30.00	1000	25.88
2480	-7.59	1.40	10.08	3.89	2.45	30.00	1000	26.11

3.0V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-7.81	1.38	10.08	3.65	2.32	30.00	1000	26.35
2440	-7.69	1.39	10.08	3.78	2.39	30.00	1000	26.22
2480	-7.99	1.40	10.08	3.49	2.23	30.00	1000	26.51

3.93V

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-7.25	1.46	10.08	4.29	2.69	30.00	1000	25.71
2440	-7.30	1.47	10.08	4.25	2.66	30.00	1000	25.75
2480	-7.49	1.48	10.08	4.07	2.55	30.00	1000	25.93

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 30, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 54 % RH 23 deg. C / 41 % RH
Engineer : Tomoki Matsui Takafumi Noguchi
Mode : Tx 11b

3.4V 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	-5.13	1.46	10.08	6.41	4.38	0.09	6.50	4.47
2437	-4.99	1.47	10.08	6.56	4.53	0.09	6.65	4.63
2462	-4.95	1.47	10.08	6.60	4.57	0.09	6.69	4.67

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	-4.54	1.46	10.08	7.00	5.01	0.09	7.09	5.12
2437	-4.47	1.47	10.08	7.08	5.11	0.09	7.17	5.21
2462	-4.39	1.47	10.08	7.16	5.20	0.09	7.25	5.31

3.93V 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	-5.21	1.46	10.08	6.33	4.30	0.09	6.42	4.39
2437	-5.21	1.47	10.08	6.34	4.31	0.09	6.43	4.40
2462	-5.20	1.47	10.08	6.35	4.32	0.09	6.44	4.41

Sample Calculation:

Result (Time average) = Reading + Cable Loss + Attenuator Loss

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

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 30, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 54 % RH 23 deg. C / 41 % RH
Engineer : Tomoki Matsui Takafumi Noguchi
Mode : Tx 11g

3.4V 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	-5.22	1.46	10.08	6.32	4.29	0.27	6.59	4.56
2437	-5.13	1.47	10.08	6.42	4.39	0.27	6.69	4.67
2462	-5.07	1.47	10.08	6.48	4.45	0.27	6.75	4.73

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	-4.63	1.46	10.08	6.91	4.91	0.27	7.18	5.23
2437	-4.55	1.47	10.08	7.00	5.01	0.27	7.27	5.34
2462	-4.48	1.47	10.08	7.07	5.10	0.27	7.34	5.42

3.93V 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	-5.40	1.46	10.08	6.14	4.11	0.27	6.41	4.38
2437	-5.36	1.47	10.08	6.19	4.16	0.27	6.46	4.43
2462	-5.27	1.47	10.08	6.28	4.25	0.27	6.55	4.52

Sample Calculation:
Result (Time average) = Reading + Cable Loss + Attenuator Loss

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

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 30, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 54 % RH 23 deg. C / 41 % RH
Engineer : Tomoki Matsui Takafumi Noguchi
Mode : Tx 11n-20

3.4V 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	-5.31	1.46	10.08	6.23	4.20	0.28	6.51	4.48
2437	-5.19	1.47	10.08	6.36	4.33	0.28	6.64	4.61
2462	-5.10	1.47	10.08	6.45	4.42	0.28	6.73	4.71

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	-4.82	1.46	10.08	6.72	4.70	0.28	7.00	5.01
2437	-4.72	1.47	10.08	6.83	4.82	0.28	7.11	5.14
2462	-4.66	1.47	10.08	6.89	4.89	0.28	7.17	5.21

3.93V 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	-5.50	1.46	10.08	6.04	4.02	0.28	6.32	4.29
2437	-5.46	1.47	10.08	6.09	4.07	0.28	6.37	4.34
2462	-5.37	1.47	10.08	6.18	4.15	0.28	6.46	4.43

Sample Calculation:
Result (Time average) = Reading + Cable Loss + Attenuator Loss

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

Test place : Ise EMC Lab. No.4 and No.11 Measurement Room
Report No. : 11469126H
Date : September 29, 2016 October 24, 2016
Temperature / Humidity : 23 deg. C / 50 % RH 23 deg. C / 41 % RH
Engineer : Hiroyuki Furutaka Takafumi Noguchi
Mode : Tx BT LE

3.4V

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	-9.71	1.46	10.08	1.83	1.52	1.98	3.81	2.41
2440	-9.77	1.47	10.08	1.78	1.51	1.98	3.76	2.38
2480	-10.03	1.47	10.08	1.52	1.42	1.98	3.50	2.24

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	-10.25	1.46	10.08	1.29	1.35	1.98	3.27	2.12
2440	-10.14	1.47	10.08	1.41	1.38	1.98	3.39	2.18
2480	-10.44	1.47	10.08	1.11	1.29	1.98	3.09	2.04

3.93V

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	-9.66	1.46	10.08	1.88	1.54	1.98	3.86	2.43
2440	-9.72	1.47	10.08	1.83	1.52	1.98	3.81	2.41
2480	-9.93	1.47	10.08	1.62	1.45	1.98	3.60	2.29

Sample Calculation:

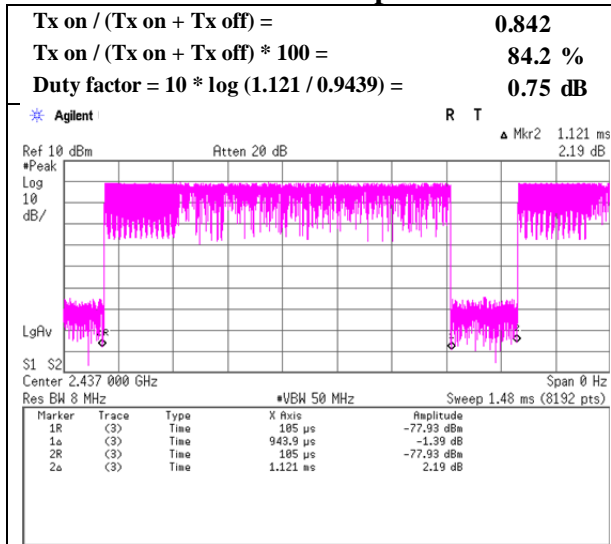
$$\text{Result (Time average)} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss}$$

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

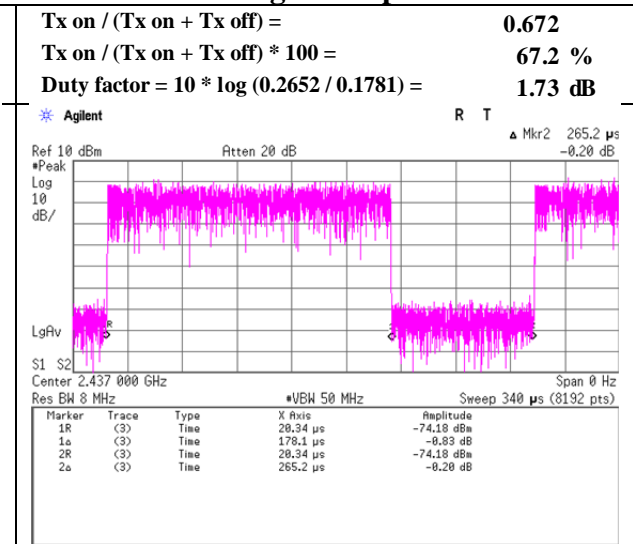
Burst rate confirmation

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx

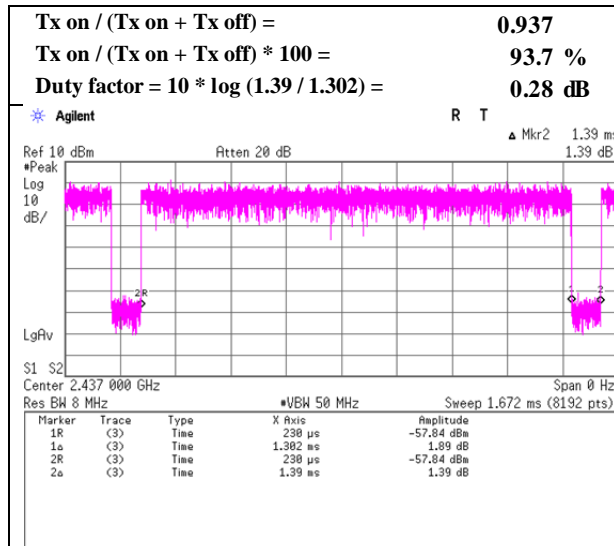
11b 11 Mbps



11g 54 Mbps



11n-20 MCS 0

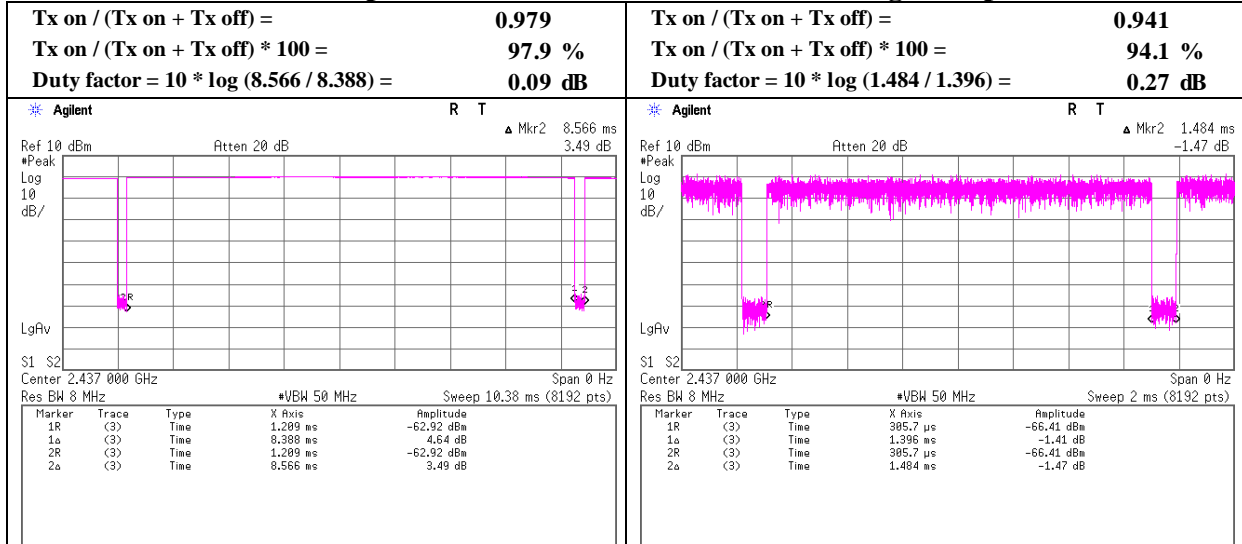


Burst rate confirmation

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	23 deg. C / 60 % RH
Engineer	Tomoki Matsui
Mode	Tx

11b 1 Mbps

11g 6 Mbps



UL Japan, Inc.

Ise EMC Lab.

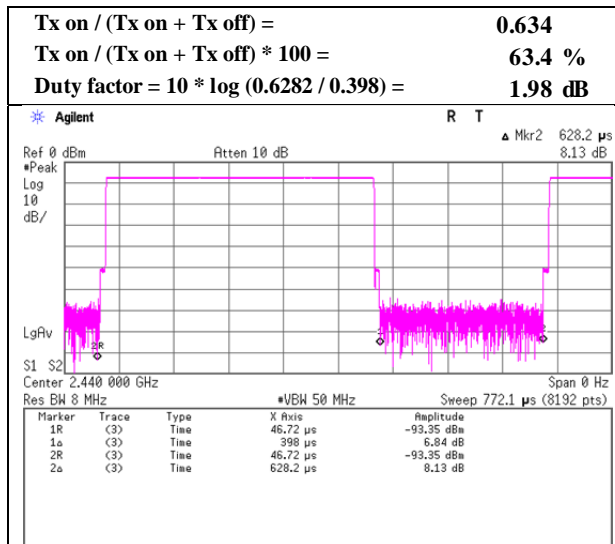
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

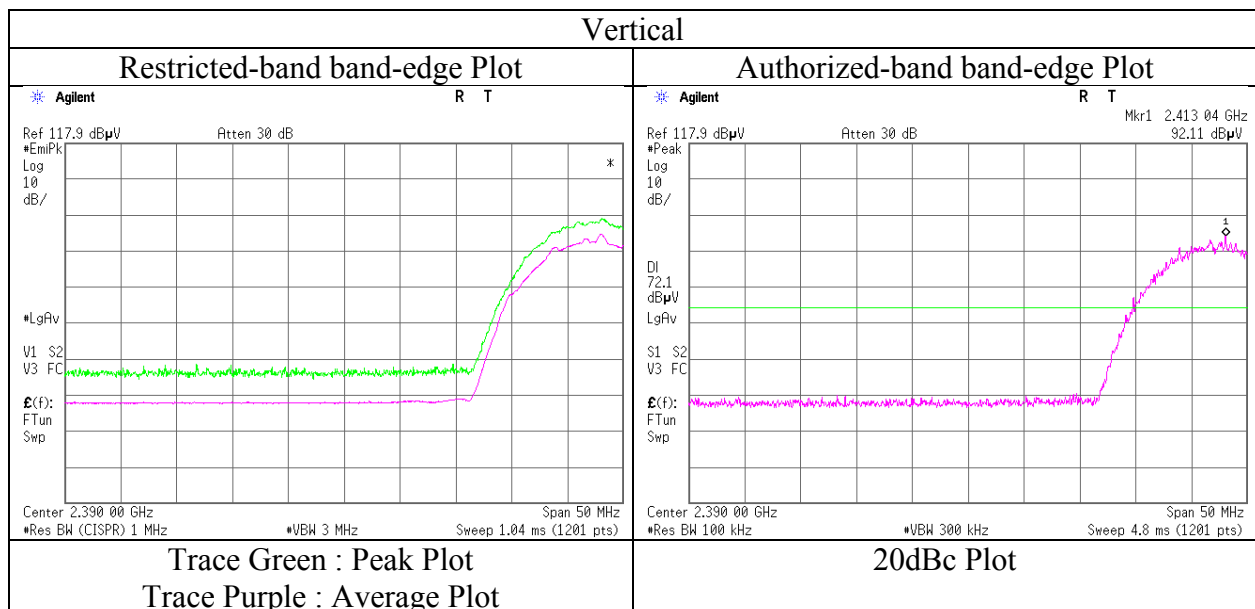
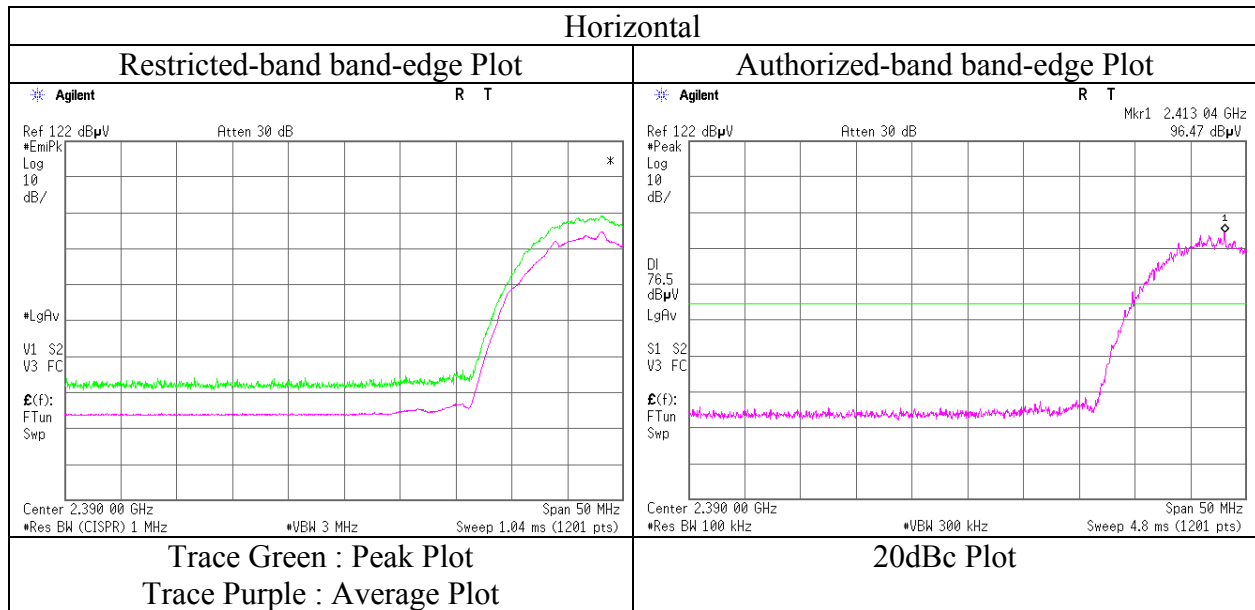
Burst rate confirmation

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE



Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	24 deg. C / 63 % RH
Engineer	Takafumi Noguchi
	(1 GHz - 10 GHz)
Mode	Tx 11b 2412 MHz



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

UL Japan, Inc.

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11469126H	
Date	September 30, 2016	September 30, 2016
Temperature / Humidity	24 deg. C / 63 % RH	24 deg. C / 66 % RH
Engineer	Takafumi Noguchi	Yuta Moriya
	(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	40.0	31.2	8.1	31.3	-	48.0	73.9	25.9	Floor noise
Hori	7311.000	PK	40.2	35.6	8.9	32.6	-	52.1	73.9	21.8	Floor noise
Hori	9748.000	PK	42.2	37.2	9.6	32.7	-	56.3	73.9	17.6	Floor noise
Hori	4874.000	AV	31.4	31.2	8.1	31.3	-	39.4	53.9	14.5	Floor noise
Hori	7311.000	AV	32.0	35.6	8.9	32.6	-	43.9	53.9	10.0	Floor noise
Hori	9748.000	AV	33.8	37.2	9.6	32.7	-	47.9	53.9	6.0	Floor noise
Vert	4874.000	PK	39.5	31.2	8.1	31.3	-	47.5	73.9	26.4	Floor noise
Vert	7311.000	PK	40.6	35.6	8.9	32.6	-	52.5	73.9	21.4	Floor noise
Vert	9748.000	PK	42.0	37.2	9.6	32.7	-	56.1	73.9	17.8	Floor noise
Vert	4874.000	AV	31.2	31.2	8.1	31.3	-	39.2	53.9	14.7	Floor noise
Vert	7311.000	AV	32.6	35.6	8.9	32.6	-	44.5	53.9	9.4	Floor noise
Vert	9748.000	AV	33.8	37.2	9.6	32.7	-	47.9	53.9	6.0	Floor noise

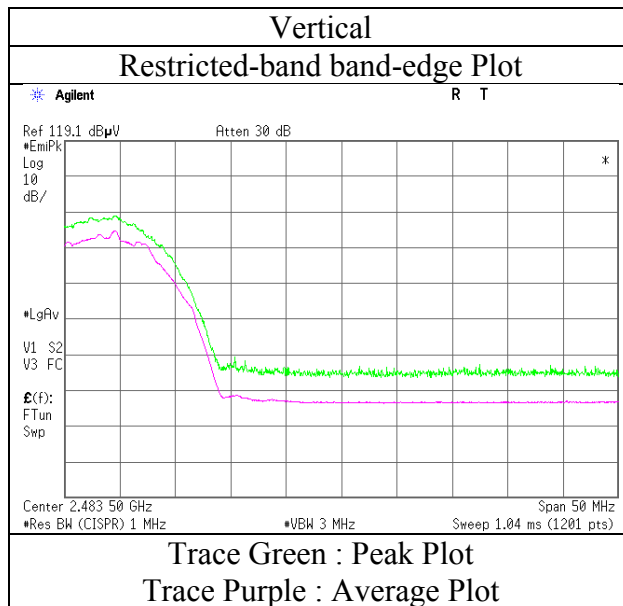
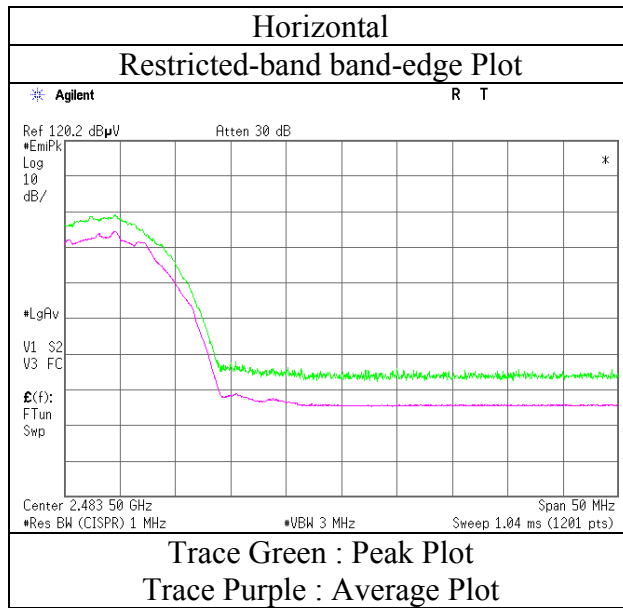
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 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.4 Semi Anechoic Chamber
Report No. : 11469126H
Date : September 30, 2016
Temperature / Humidity : 24 deg. C / 63 % RH
Engineer : Takafumi Noguchi
(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. : 11469126H
Date : September 30, 2016
Temperature / Humidity : 24 deg. C / 66 % RH
Engineer : Yuta Moriya
(Above 1 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	52.2	26.7	6.8	32.1	-	53.6	73.9	20.3	
Hori	4824.000	PK	41.0	31.1	8.1	31.3	-	48.9	73.9	25.0	Floor noise
Hori	7236.000	PK	41.3	35.7	8.9	32.6	-	53.3	73.9	20.6	Floor noise
Hori	9648.000	PK	41.0	37.2	9.6	32.6	-	55.2	73.9	18.7	Floor noise
Hori	2390.000	AV	40.0	26.7	6.8	32.1	0.3	41.7	53.9	12.2	*1)
Hori	4824.000	AV	32.5	31.1	8.1	31.3	-	40.4	53.9	13.5	Floor noise
Hori	7236.000	AV	32.7	35.7	8.9	32.6	-	44.7	53.9	9.2	Floor noise
Hori	9648.000	AV	33.0	37.2	9.6	32.6	-	47.2	53.9	6.7	Floor noise
Vert	2390.000	PK	48.5	26.7	6.8	32.1	-	49.9	73.9	24.0	
Vert	4824.000	PK	40.0	31.1	8.1	31.3	-	47.9	73.9	26.0	Floor noise
Vert	7236.000	PK	40.8	35.7	8.9	32.6	-	52.8	73.9	21.1	Floor noise
Vert	9648.000	PK	42.2	37.2	9.6	32.6	-	56.4	73.9	17.5	Floor noise
Vert	2390.000	AV	38.0	26.7	6.8	32.1	0.3	39.7	53.9	14.2	*1)
Vert	4824.000	AV	32.1	31.1	8.1	31.3	-	40.0	53.9	13.9	Floor noise
Vert	7236.000	AV	32.6	35.7	8.9	32.6	-	44.6	53.9	9.3	Floor noise
Vert	9648.000	AV	33.1	37.2	9.6	32.6	-	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
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

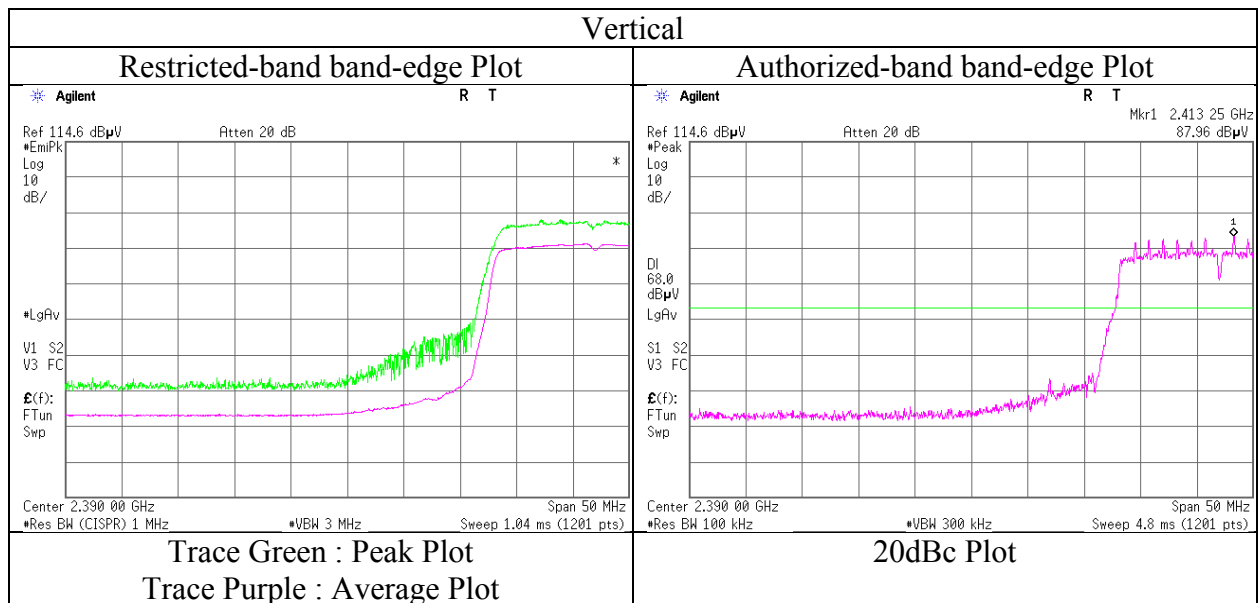
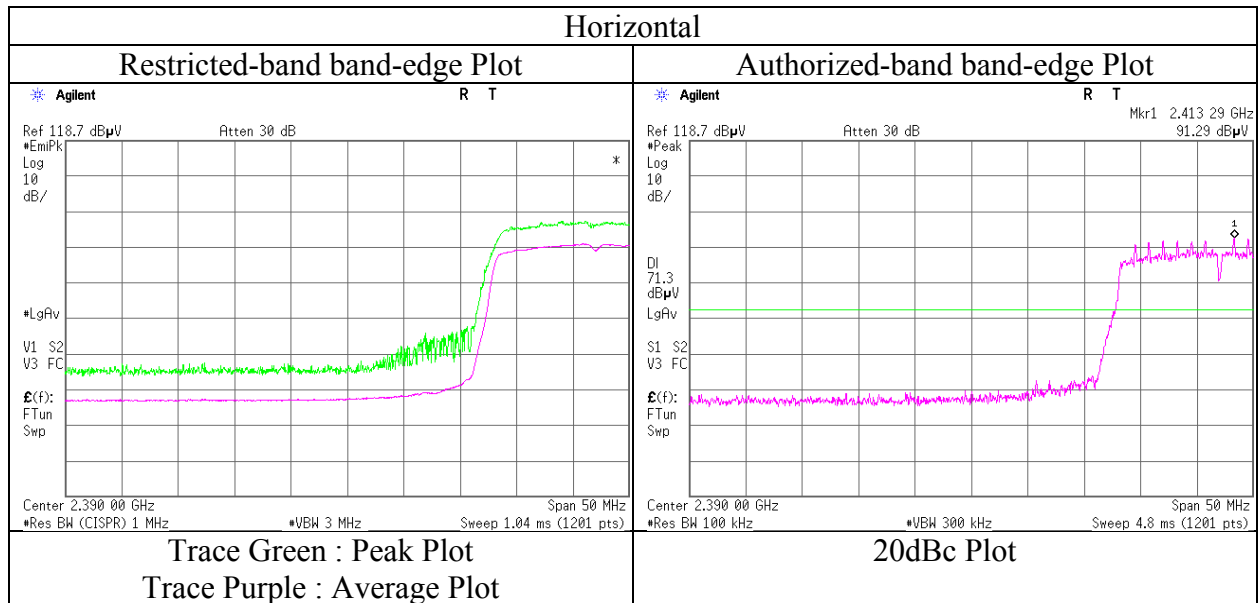
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	91.3	26.7	6.9	32.1	92.8	-	-	Carrier
Hori	2400.000	PK	49.2	26.7	6.8	32.1	50.6	72.8	22.2	
Vert	2412.000	PK	88.0	26.7	6.9	32.1	89.5	-	-	Carrier
Vert	2400.000	PK	46.2	26.7	6.8	32.1	47.6	69.5	21.9	

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	24 deg. C / 66 % RH
Engineer	Yuta Moriya (Above 1 GHz)
Mode	Tx 11n-20 2412 MHz



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

UL Japan, Inc.

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11469126H
Date : September 30, 2016
Temperature / Humidity : 24 deg. C / 66 % RH
Engineer : Yuta Moriya
(Above 1 GHz)
Mode : Tx 11n-20 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	41.1	31.2	8.1	31.3	-	49.1	73.9	24.8	Floor noise
Hori	7311.000	PK	41.1	35.6	8.9	32.6	-	53.0	73.9	20.9	Floor noise
Hori	9748.000	PK	41.2	37.2	9.6	32.7	-	55.3	73.9	18.6	Floor noise
Hori	4874.000	AV	32.4	31.2	8.1	31.3	-	40.4	53.9	13.5	Floor noise
Hori	7311.000	AV	32.5	35.6	8.9	32.6	-	44.4	53.9	9.5	Floor noise
Hori	9748.000	AV	33.2	37.2	9.6	32.7	-	47.3	53.9	6.6	Floor noise
Vert	4874.000	PK	40.5	31.2	8.1	31.3	-	48.5	73.9	25.4	Floor noise
Vert	7311.000	PK	40.9	35.6	8.9	32.6	-	52.8	73.9	21.1	Floor noise
Vert	9748.000	PK	42.0	37.2	9.6	32.7	-	56.1	73.9	17.8	Floor noise
Vert	4874.000	AV	32.2	31.2	8.1	31.3	-	40.2	53.9	13.7	Floor noise
Vert	7311.000	AV	32.5	35.6	8.9	32.6	-	44.4	53.9	9.5	Floor noise
Vert	9748.000	AV	33.0	37.2	9.6	32.7	-	47.1	53.9	6.8	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
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.4 Semi Anechoic Chamber
Report No.	11469126H
Date	September 30, 2016 October 3, 2016
Temperature / Humidity	24 deg. C / 66 % RH 24 deg. C / 72 % RH
Engineer	Yuta Moriya Takumi Shimada
	(Above 1 GHz) (Below 1 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	56.740	QP	20.0	8.5	7.7	32.1	-	4.1	40.0	35.9	
Hori	102.800	QP	20.9	10.4	8.3	32.1	-	7.5	43.5	36.0	
Hori	176.812	QP	20.1	15.9	8.9	32.0	-	12.9	43.5	30.6	
Hori	240.000	QP	24.1	12.1	9.4	31.9	-	13.7	46.0	32.3	
Hori	308.399	QP	23.1	13.6	9.9	31.8	-	14.8	46.0	31.2	
Hori	952.627	QP	19.2	22.1	13.3	30.9	-	23.7	46.0	22.3	
Hori	2483.500	PK	45.9	26.8	7.0	32.1	-	47.6	73.9	26.3	
Hori	4924.000	PK	41.0	31.4	8.1	31.3	-	49.2	73.9	24.7	Floor noise
Hori	7386.000	PK	41.1	35.5	8.9	32.6	-	52.9	73.9	21.0	Floor noise
Hori	9848.000	PK	41.3	37.2	9.7	32.7	-	55.5	73.9	18.4	Floor noise
Hori	2483.500	AV	36.5	26.8	7.0	32.1	0.3	38.5	53.9	15.4	*1)
Hori	4924.000	AV	32.2	31.4	8.1	31.3	-	40.4	53.9	13.5	Floor noise
Hori	7386.000	AV	32.4	35.5	8.9	32.6	-	44.2	53.9	9.7	Floor noise
Hori	9848.000	AV	33.1	37.2	9.7	32.7	-	47.3	53.9	6.6	Floor noise
Vert	56.740	QP	26.0	8.5	7.7	32.1	-	10.1	40.0	29.9	
Vert	102.800	QP	22.2	10.4	8.3	32.1	-	8.8	43.5	34.7	
Vert	176.812	QP	20.1	15.9	8.9	32.0	-	12.9	43.5	30.6	
Vert	240.000	QP	26.4	12.1	9.4	31.9	-	16.0	46.0	30.0	
Vert	308.399	QP	20.8	13.6	9.9	31.8	-	12.5	46.0	33.5	
Vert	952.627	QP	19.1	22.1	13.3	30.9	-	23.6	46.0	22.4	
Vert	2483.500	PK	46.0	26.8	7.0	32.1	-	47.7	73.9	26.2	
Vert	4924.000	PK	40.5	31.4	8.4	31.3	-	49.0	73.9	24.9	Floor noise
Vert	7386.000	PK	40.7	35.5	8.9	32.6	-	52.5	73.9	21.4	Floor noise
Vert	9848.000	PK	41.1	37.2	9.7	32.7	-	55.3	73.9	18.6	Floor noise
Vert	2483.500	AV	36.6	26.8	7.0	32.1	0.3	38.6	53.9	15.3	*1)
Vert	4924.000	AV	32.1	31.4	8.1	31.3	-	40.3	53.9	13.6	Floor noise
Vert	7386.000	AV	32.3	35.5	8.9	32.6	-	44.1	53.9	9.8	Floor noise
Vert	9848.000	AV	33.1	37.2	9.7	32.7	-	47.3	53.9	6.6	Floor noise

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

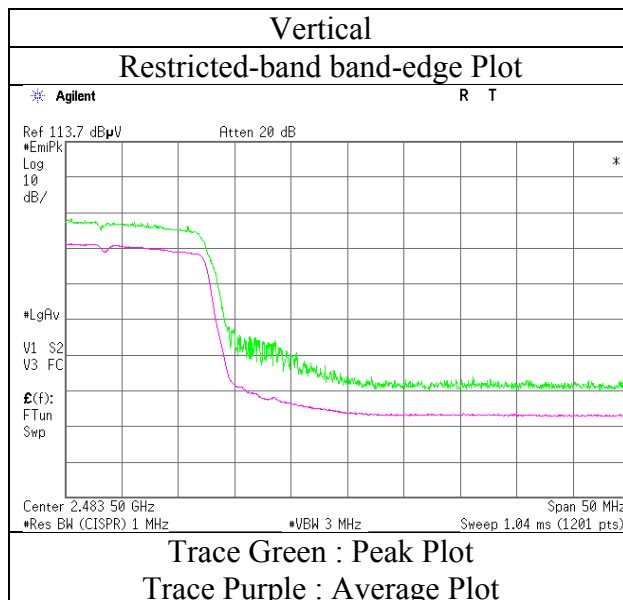
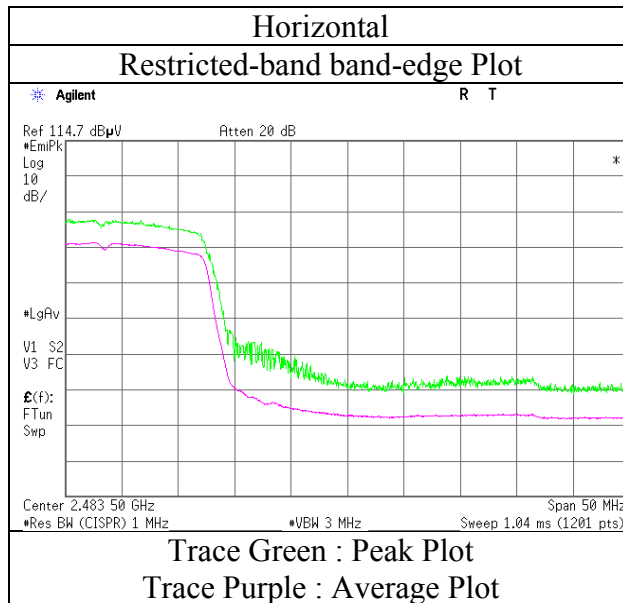
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 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)

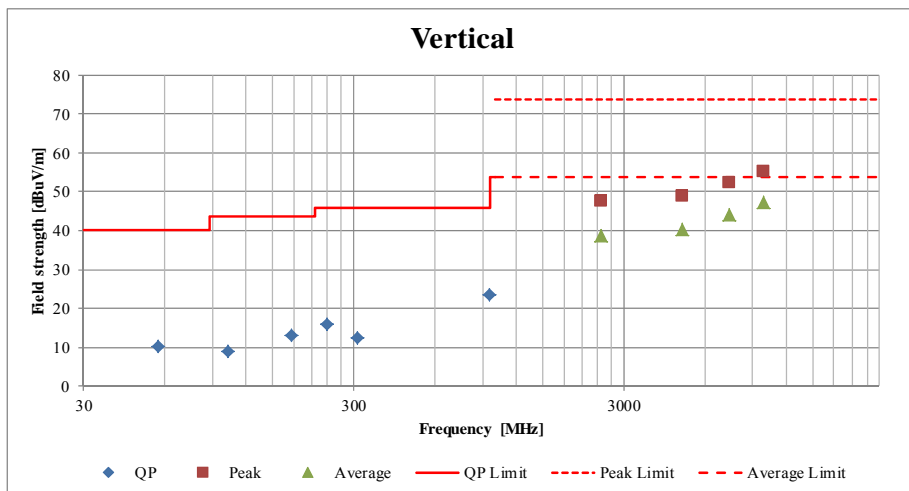
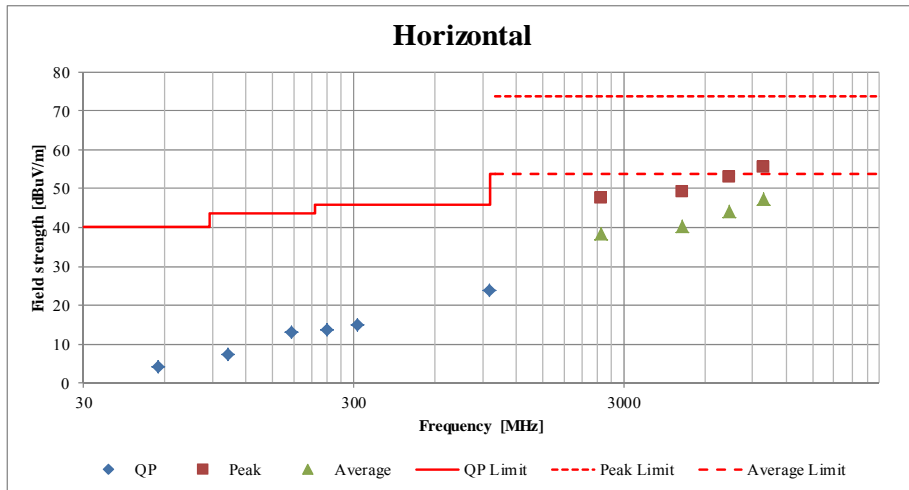
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	24 deg. C / 66 % RH
Engineer	Yuta Moriya (Above 1 GHz)
Mode	Tx 11n-20 2462 MHz



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

Radiated Spurious Emission
(Plot data, Worst case)

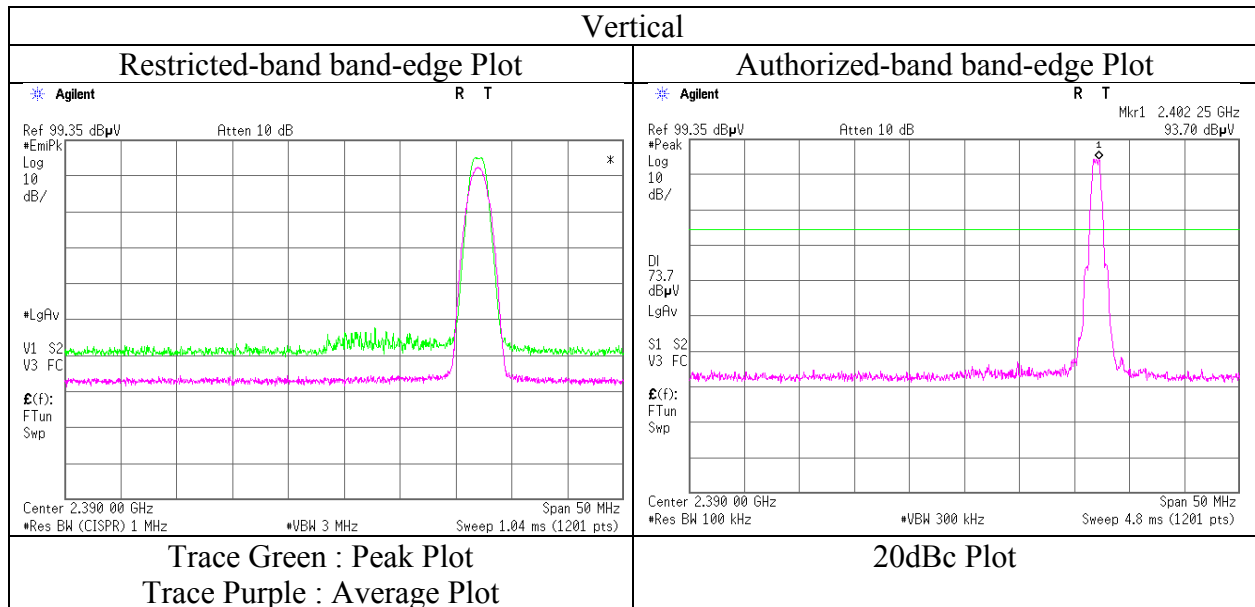
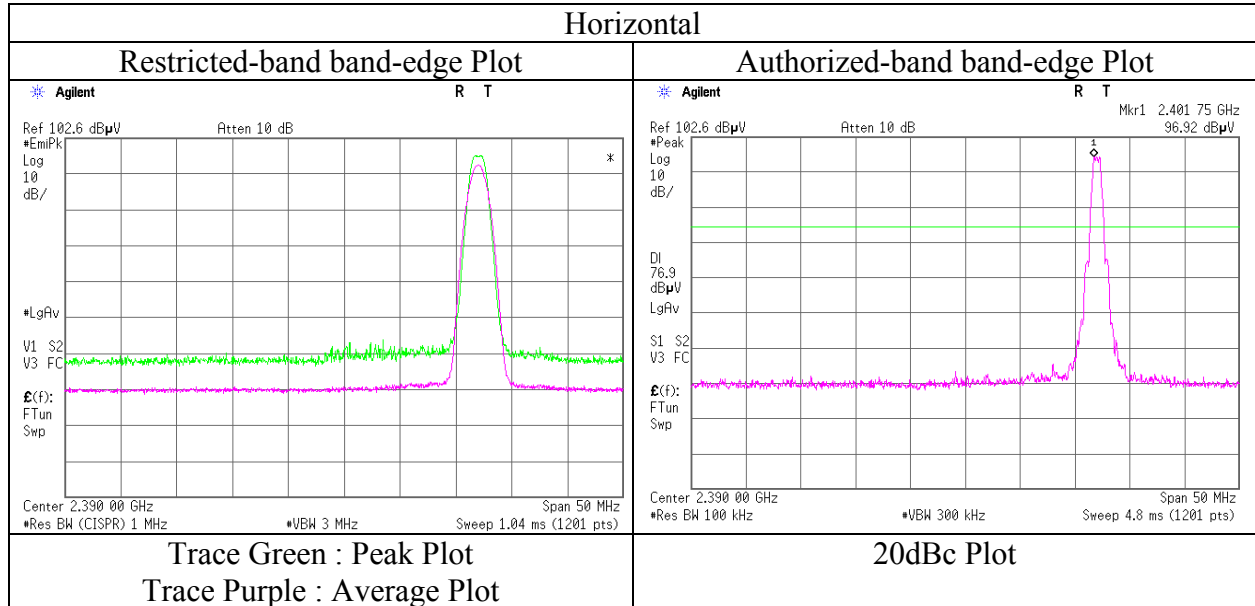
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber	
Report No.	11469126H	
Date	September 30, 2016	October 3, 2016
Temperature / Humidity	24 deg. C / 66 % RH	24 deg. C / 72 % RH
Engineer	Yuta Moriya (Above 1 GHz)	Takumi Shimada (Below 1 GHz)
Mode	Tx 11n-20 2462 MHz	



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

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	22 deg. C / 69 % RH
Engineer	Takafumi Noguchi (1 GHz - 18 GHz)
Mode	Tx BT LE 2402 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. : 11469126H
Date : September 29, 2016 September 29, 2016 October 3, 2016
Temperature / Humidity : 22 deg. C / 69 % RH 22 deg. C / 58 % RH 24 deg. C / 72 % RH
Engineer : Takafumi Noguchi Tomoki Matsui Takumi Shimada
(1 GHz - 18 GHz) (Above 18 GHz) (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	56.356	QP	20.0	8.6	7.7	32.1	-	4.2	40.0	35.8	
Hori	94.804	QP	20.3	9.1	8.2	32.1	-	5.5	43.5	38.0	
Hori	173.626	QP	19.8	15.8	8.9	32.0	-	12.5	43.5	31.0	
Hori	240.752	QP	19.7	12.1	9.5	31.9	-	9.4	46.0	36.6	
Hori	375.640	QP	19.7	15.1	10.3	32.0	-	13.1	46.0	32.9	
Hori	959.183	QP	19.0	22.2	13.3	30.9	-	23.6	46.0	22.4	
Hori	4880.000	PK	40.6	31.3	8.1	31.3	-	48.7	73.9	25.2	Floor noise
Hori	7320.000	PK	41.8	35.6	8.9	32.6	-	53.7	73.9	20.2	Floor noise
Hori	9760.000	PK	43.0	37.2	9.6	32.7	-	57.1	73.9	16.8	Floor noise
Hori	4880.000	AV	31.8	31.3	8.1	31.3	-	39.9	53.9	14.0	Floor noise
Hori	7320.000	AV	32.9	35.6	8.9	32.6	-	44.8	53.9	9.1	Floor noise
Hori	9760.000	AV	33.8	37.2	9.6	32.7	-	47.9	53.9	6.0	Floor noise
Vert	56.356	QP	24.6	8.6	7.7	32.1	-	8.8	40.0	31.2	
Vert	94.804	QP	23.5	9.1	8.2	32.1	-	8.7	43.5	34.8	
Vert	173.626	QP	19.9	15.8	8.9	32.0	-	12.6	43.5	30.9	
Vert	240.752	QP	19.9	12.1	9.5	31.9	-	9.6	46.0	36.4	
Vert	375.640	QP	19.6	15.1	10.3	32.0	-	13.0	46.0	33.0	
Vert	959.183	QP	19.0	22.2	13.3	30.9	-	23.6	46.0	22.4	
Vert	4880.000	PK	41.3	31.3	8.1	31.3	-	49.4	73.9	24.5	Floor noise
Vert	7320.000	PK	42.9	35.6	8.9	32.6	-	54.8	73.9	19.1	Floor noise
Vert	9760.000	PK	43.6	37.2	9.6	32.7	-	57.7	73.9	16.2	Floor noise
Vert	4880.000	AV	32.9	31.3	8.1	31.3	-	41.0	53.9	12.9	Floor noise
Vert	7320.000	AV	33.8	35.6	8.9	32.6	-	45.7	53.9	8.2	Floor noise
Vert	9760.000	AV	33.8	37.2	9.6	32.7	-	47.9	53.9	6.0	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. 11469126H
Date September 29, 2016 September 29, 2016 October 3, 2016
Temperature / Humidity 22 deg. C / 69 % RH 22 deg. C / 58 % RH 24 deg. C / 72 % RH
Engineer Takafumi Noguchi Tomoki Matsui Takumi Shimada
(1 GHz - 18 GHz) (Above 18 GHz) (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	56.815	QP	19.9	8.5	7.7	32.1	-	4.0	40.0	36.0	
Hori	91.630	QP	20.2	8.6	8.2	32.1	-	4.9	43.5	38.6	
Hori	176.812	QP	20.1	15.9	8.9	32.0	-	12.9	43.5	30.6	
Hori	277.180	QP	23.6	13.0	9.7	31.8	-	14.5	46.0	31.5	
Hori	370.768	QP	19.7	15.0	10.3	32.0	-	13.0	46.0	33.0	
Hori	956.146	QP	19.1	22.1	13.3	30.9	-	23.6	46.0	22.4	
Hori	2483.500	PK	43.9	26.8	7.0	32.1	-	45.6	73.9	28.3	
Hori	4960.000	PK	39.6	31.5	8.1	31.2	-	48.0	73.9	25.9	Floor noise
Hori	7440.000	PK	40.3	35.5	9.0	32.7	-	52.1	73.9	21.8	Floor noise
Hori	9920.000	PK	42.6	37.2	9.7	32.8	-	56.7	73.9	17.2	Floor noise
Hori	2483.500	AV	32.7	26.8	7.0	32.1	2.0	36.4	53.9	17.5	*1)
Hori	4960.000	AV	31.3	31.5	8.1	31.2	-	39.7	53.9	14.2	Floor noise
Hori	7440.000	AV	31.7	35.5	9.0	32.7	-	43.5	53.9	10.4	Floor noise
Hori	9920.000	AV	33.7	37.2	9.7	32.8	-	47.8	53.9	6.1	Floor noise
Vert	56.815	QP	26.2	8.5	7.7	32.1	-	10.3	40.0	29.7	
Vert	91.630	QP	21.0	8.6	8.2	32.1	-	5.7	43.5	37.8	
Vert	176.812	QP	20.2	15.9	8.9	32.0	-	13.0	43.5	30.5	
Vert	277.180	QP	22.5	13.0	9.7	31.8	-	13.4	46.0	32.6	
Vert	370.768	QP	19.6	15.0	10.3	32.0	-	12.9	46.0	33.1	
Vert	956.146	QP	19.0	22.1	13.3	30.9	-	23.5	46.0	22.5	
Vert	2483.500	PK	41.2	26.8	7.0	32.1	-	42.9	73.9	31.0	
Vert	4960.000	PK	39.5	31.5	8.1	31.2	-	47.9	73.9	26.0	Floor noise
Vert	7440.000	PK	40.2	35.5	9.0	32.7	-	52.0	73.9	21.9	Floor noise
Vert	9920.000	PK	42.0	37.2	9.7	32.8	-	56.1	73.9	17.8	Floor noise
Vert	2483.500	AV	33.0	26.8	7.0	32.1	2.0	36.7	53.9	17.2	*1)
Vert	4960.000	AV	31.4	31.5	8.1	31.2	-	39.8	53.9	14.1	Floor noise
Vert	7440.000	AV	32.0	35.5	9.0	32.7	-	43.8	53.9	10.1	Floor noise
Vert	9920.000	AV	33.8	37.2	9.7	32.8	-	47.9	53.9	6.0	Floor noise

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

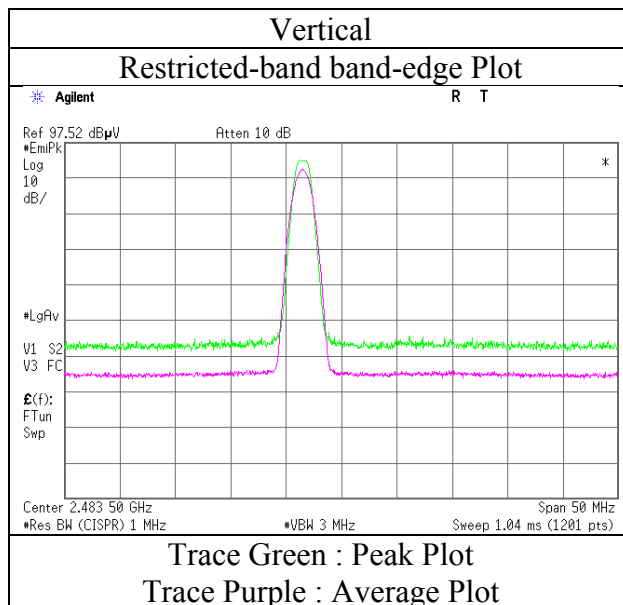
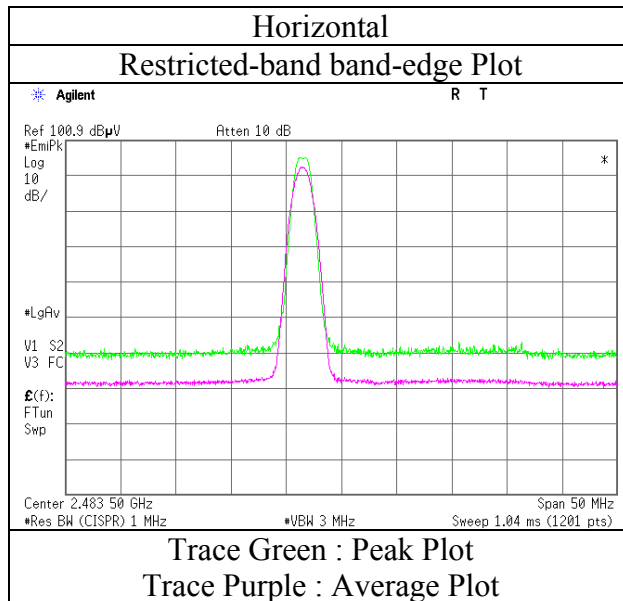
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4.5 m / 3.0 m) = 3.53 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)

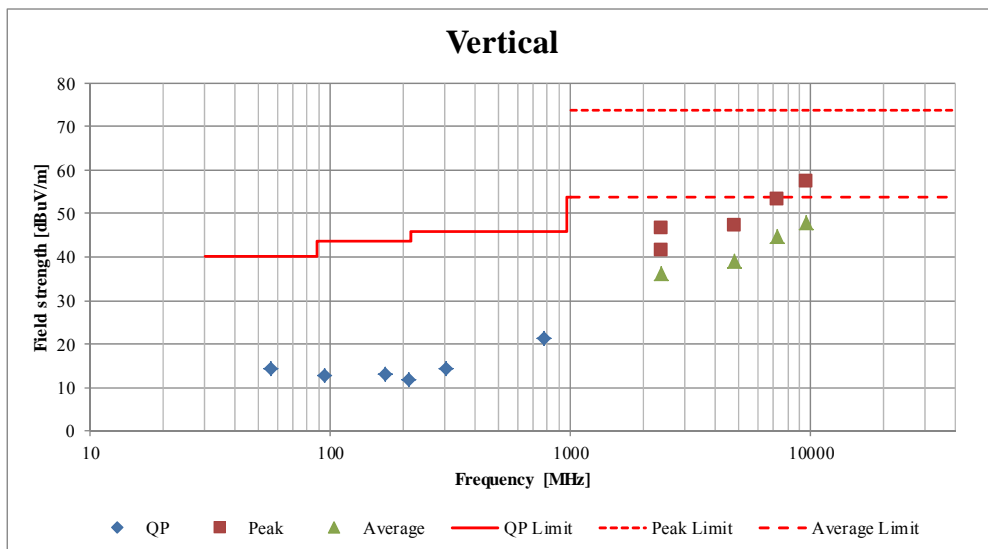
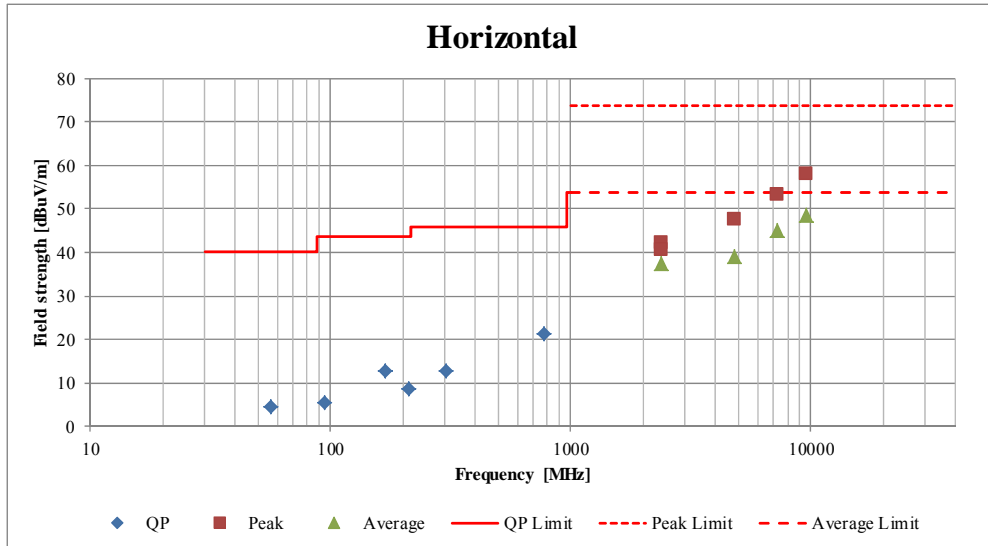
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	22 deg. C / 69 % RH
Engineer	Takafumi Noguchi
	(1 GHz - 18 GHz)
Mode	Tx BT LE 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber		
Report No.	11469126H		
Date	September 29, 2016	September 29, 2016	October 3, 2016
Temperature / Humidity	22 deg. C / 69 % RH	22 deg. C / 58 % RH	24 deg. C / 72 % RH
Engineer	Takafumi Noguchi (1 GHz - 18 GHz)	Tomoki Matsui (Above 18 GHz)	Takumi Shimada (Below 1 GHz)
Mode	Tx BT LE 2402 MHz		



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

Radiated Spurious Emission

Test place Ise EMC Lab. No.4 and No.3 Semi Anechoic Chamber
Report No. 11469126H
Date October 6, 2016 October 6, 2016 October 10, 2016 October 11, 2016
Temperature / Humidity 24 deg. C / 64 % RH 24 deg. C / 63 % RH 24 deg. C / 45 % RH 23 deg. C / 55 % RH
Engineer Takafumi Noguchi Satofumi Matsuyama Yuta Moriya Tomoki Matsui
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (Below 1 GHz) (18 GHz - 26.5 GHz)
Mode Tx BT LE 2440 MHz + Tx 11a 5825 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	33.666	QP	22.2	16.0	7.1	32.2	-	13.1	40.0	26.9	
Hori	36.522	QP	22.3	15.1	7.1	32.2	-	12.3	40.0	27.7	
Hori	104.000	QP	22.1	10.3	8.1	32.2	-	8.3	43.5	35.2	
Hori	216.000	QP	21.5	11.8	9.2	32.0	-	10.5	43.5	33.0	
Hori	530.670	QP	21.6	18.1	11.5	32.0	-	19.2	46.0	26.8	
Hori	953.333	QP	21.2	22.3	13.7	30.6	-	26.6	46.0	19.4	
Hori	4880.000	PK	42.8	31.1	9.2	31.3	-	51.8	73.9	22.1	
Hori	7320.000	PK	40.3	36.4	8.8	32.6	-	52.9	73.9	21.0	Floor noise
Hori	9760.000	PK	42.3	38.6	9.5	32.7	-	57.7	73.9	16.2	Floor noise
Hori	4880.000	AV	33.5	31.1	9.2	31.3	2.0	44.5	53.9	9.4	
Hori	7320.000	AV	31.8	36.4	8.8	32.6	-	44.4	53.9	9.5	Floor noise
Hori	9760.000	AV	32.5	38.6	9.5	32.7	-	47.9	53.9	6.0	Floor noise
Vert	33.666	QP	25.6	16.0	7.1	32.2	-	16.5	40.0	23.5	
Vert	36.522	QP	27.9	15.1	7.1	32.2	-	17.9	40.0	22.1	
Vert	104.000	QP	22.2	10.3	8.1	32.2	-	8.4	43.5	35.1	
Vert	216.000	QP	21.5	11.8	9.2	32.0	-	10.5	43.5	33.0	
Vert	530.670	QP	21.6	18.1	11.5	32.0	-	19.2	46.0	26.8	
Vert	953.333	QP	21.2	22.3	13.7	30.6	-	26.6	46.0	19.4	
Vert	4880.000	PK	44.8	31.1	9.2	31.3	-	53.8	73.9	20.1	
Vert	7320.000	PK	40.1	36.4	8.8	32.6	-	52.7	73.9	21.2	Floor noise
Vert	9760.000	PK	41.7	38.6	9.5	32.7	-	57.1	73.9	16.8	Floor noise
Vert	4880.000	AV	35.8	31.1	9.2	31.3	2.0	46.8	53.9	7.1	
Vert	7320.000	AV	31.9	36.4	8.8	32.6	-	44.5	53.9	9.4	Floor noise
Vert	9760.000	AV	32.5	38.6	9.5	32.7	-	47.9	53.9	6.0	Floor noise

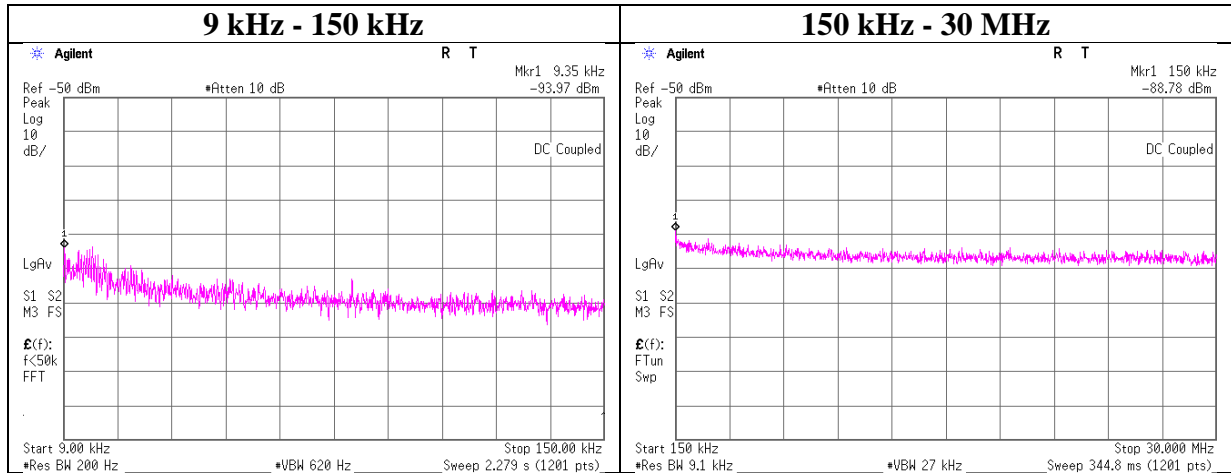
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Conducted Spurious Emission

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
Mode	Tx 11n-20 2462 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.35	-94.0	0.09	9.8	2.1	1	-82.0	300	6.0	-20.7	48.1	68.8	
150.00	-88.8	0.09	9.8	2.1	1	-76.8	300	6.0	-15.5	24.0	39.5	

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

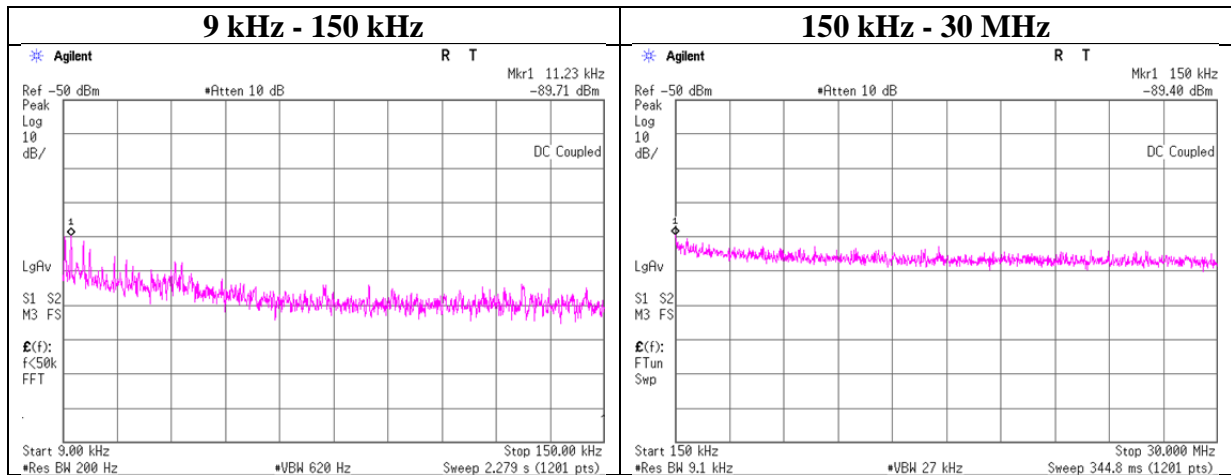
$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$$

N: Number of output

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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE 2402MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-89.7	0.09	9.8	2.1	1	-77.7	300	6.0	-16.4	46.5	62.9	
150.00	-89.4	0.09	9.8	2.1	1	-77.4	300	6.0	-16.1	24.0	40.1	

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

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

N: Number of output

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

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Ise EMC Lab.

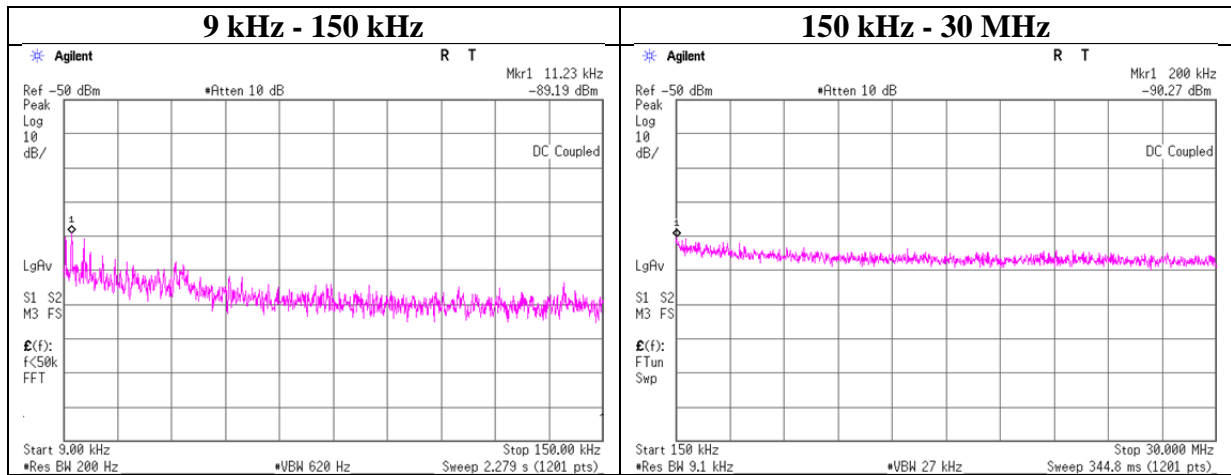
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE 2440MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-89.2	0.09	9.8	2.1	1	-77.2	300	6.0	-15.9	46.5	62.4	
200.00	-90.3	0.09	9.8	2.1	1	-78.3	300	6.0	-17.0	21.5	38.5	

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

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

N: Number of output

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

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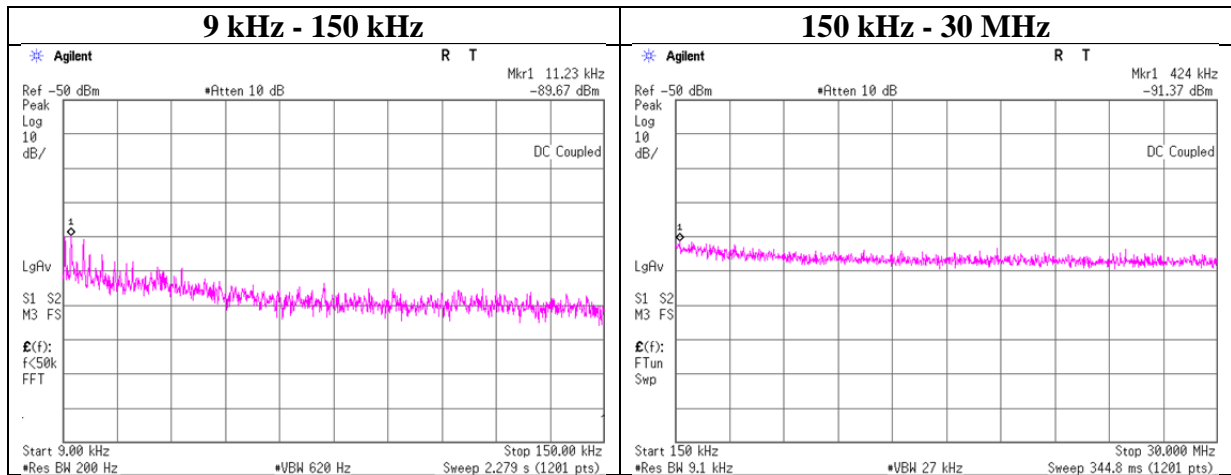
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Conducted Spurious Emission

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx BT LE 2480MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-89.7	0.09	9.8	2.1	1	-77.7	300	6.0	-16.4	46.5	62.9	
424.00	-91.4	0.09	9.8	2.1	1	-79.4	300	6.0	-18.1	15.0	33.1	

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

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

N: Number of output

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

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Power Density

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
Mode	Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-12.40	1.46	10.08	-0.86	8.00	8.86
2437.00	-12.67	1.47	10.08	-1.12	8.00	9.12
2462.00	-12.56	1.47	10.08	-1.01	8.00	9.01

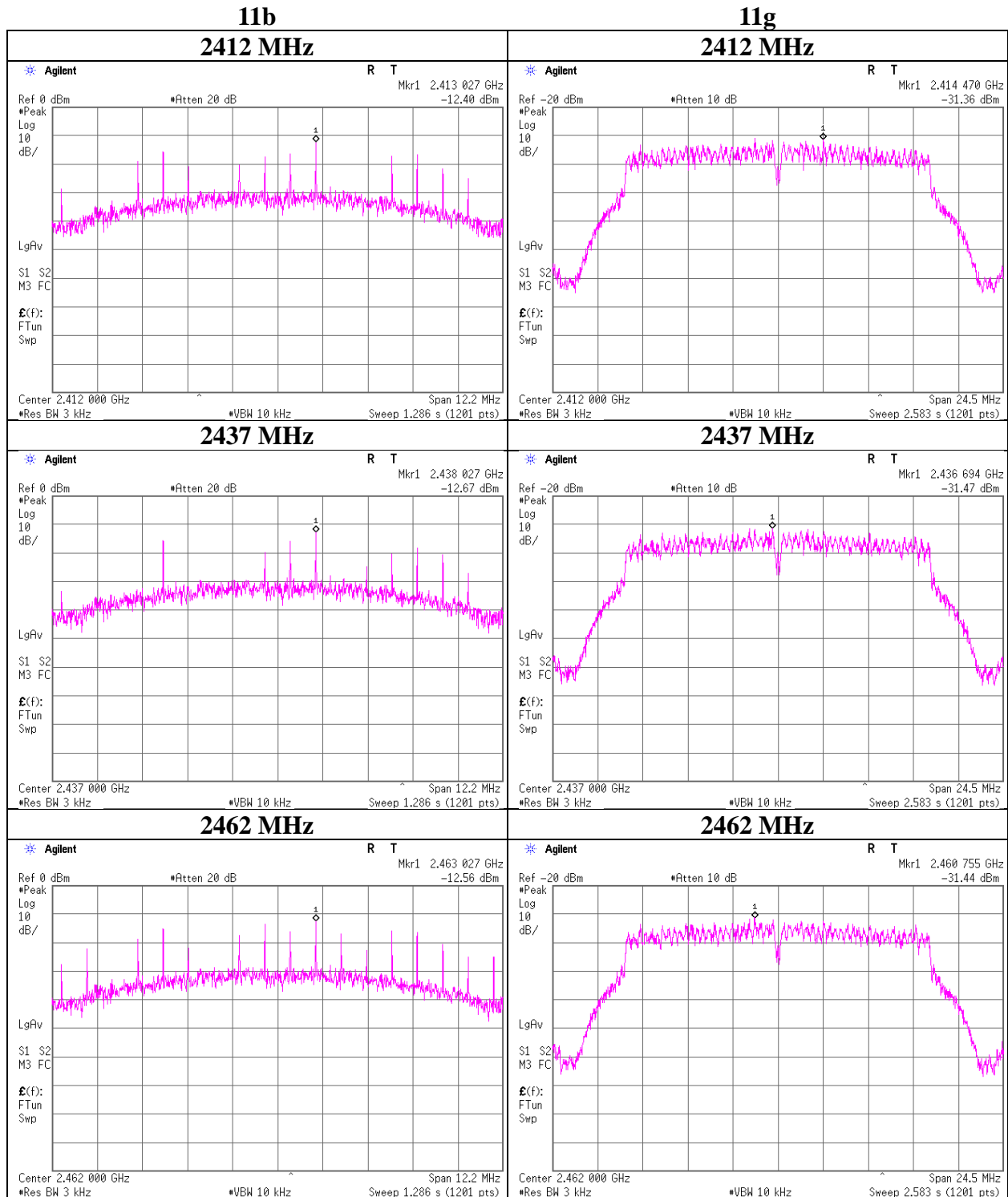
11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-31.36	1.46	10.08	-19.82	8.00	27.82
2437.00	-31.47	1.47	10.08	-19.92	8.00	27.92
2462.00	-31.44	1.47	10.08	-19.89	8.00	27.89

Sample Calculation:

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

Power Density



Power Density

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 30, 2016
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Tomoki Matsui
Mode	Tx

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-31.78	1.46	10.08	-20.24	0.01	8.00	28.24
2437.00	-32.24	1.47	10.08	-20.69	0.01	8.00	28.69
2462.00	-32.15	1.47	10.08	-20.60	0.01	8.00	28.60

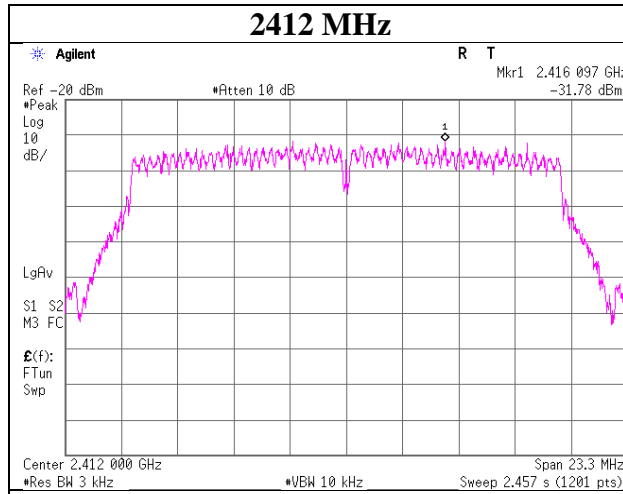
Sample Calculation:

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

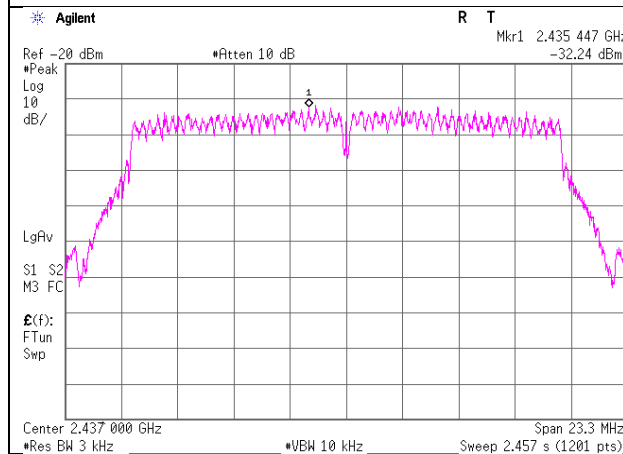
Power Density

11n-20

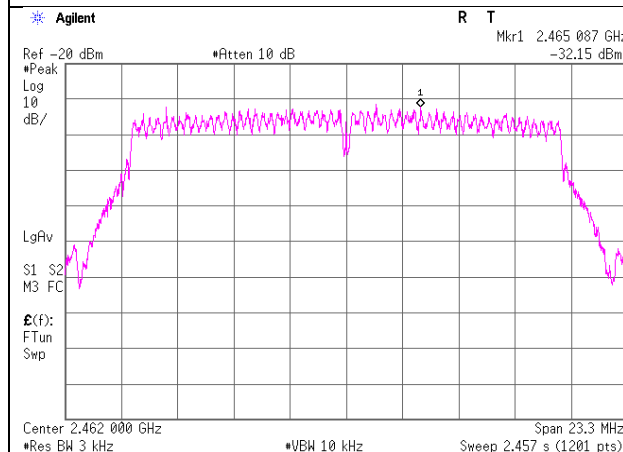
2412 MHz



2437 MHz



2462 MHz



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Power Density

Test place Ise EMC Lab. No.4 Measurement Room
Report No. 11469126H
Date September 29, 2016
Temperature / Humidity 23 deg. C / 50 % RH
Engineer Hiroyuki Furutaka
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2402.00	-22.66	1.46	10.08	-11.12	0.08	8.00	19.12
2440.00	-22.77	1.47	10.08	-11.22	0.08	8.00	19.22
2480.00	-23.14	1.47	10.08	-11.59	0.07	8.00	19.59

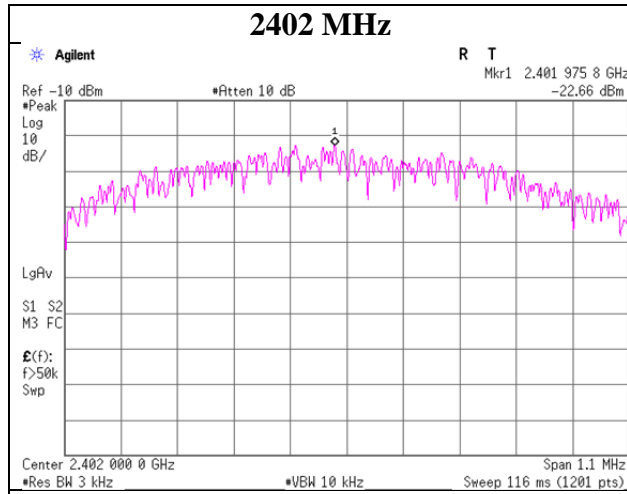
Sample Calculation:

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

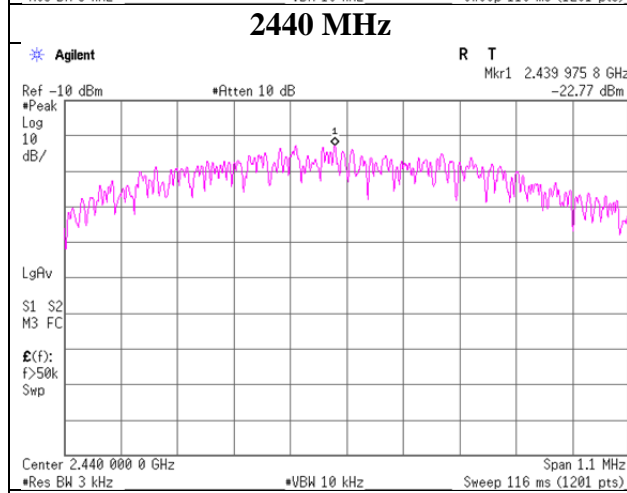
Power Density

BT LE

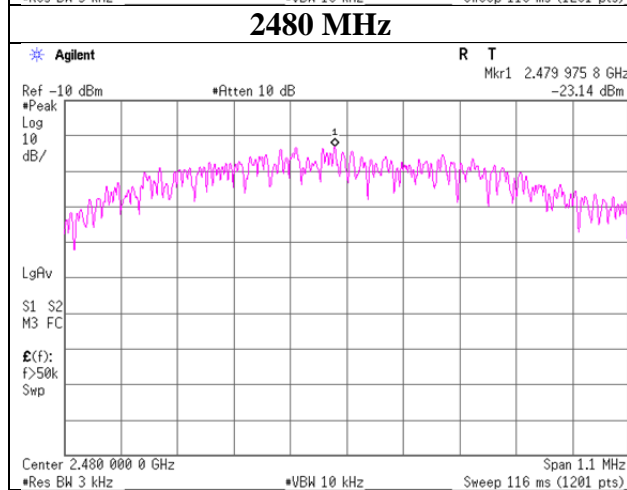
2402 MHz



2440 MHz



2480 MHz



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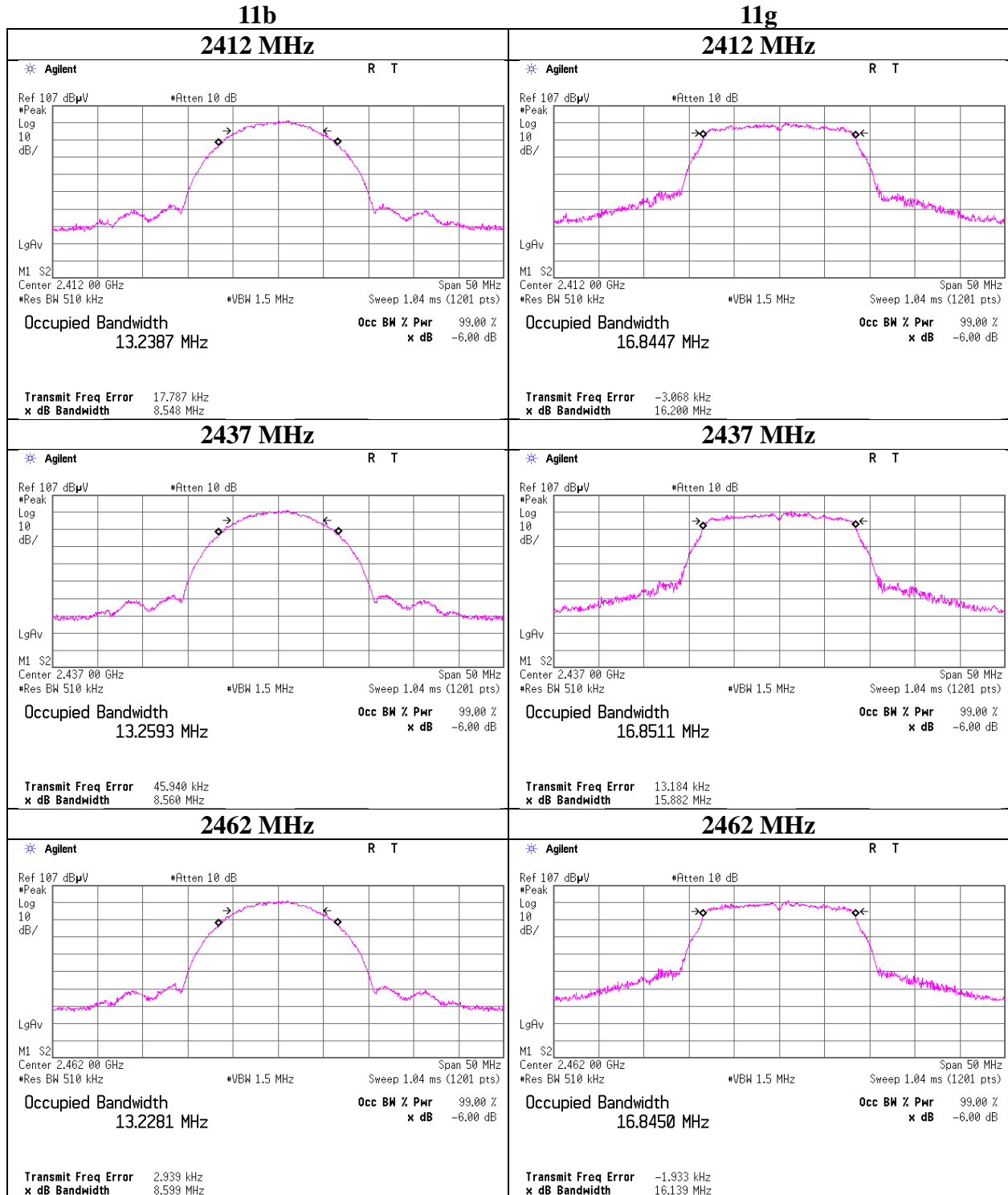
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99% Occupied Bandwidth

Test place Report No. Date Temperature / Humidity Engineer Mode	Ise EMC Lab. No.4 Measurement Room 11469126H September 30, 2016 23 deg. C / 54 % RH Tomoki Matsui Tx
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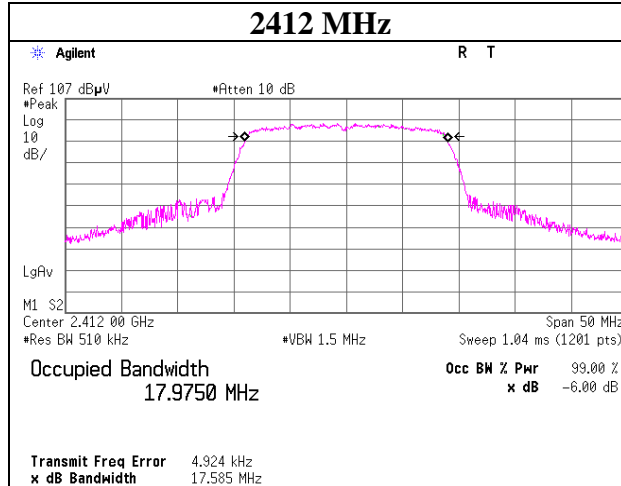


99% Occupied Bandwidth

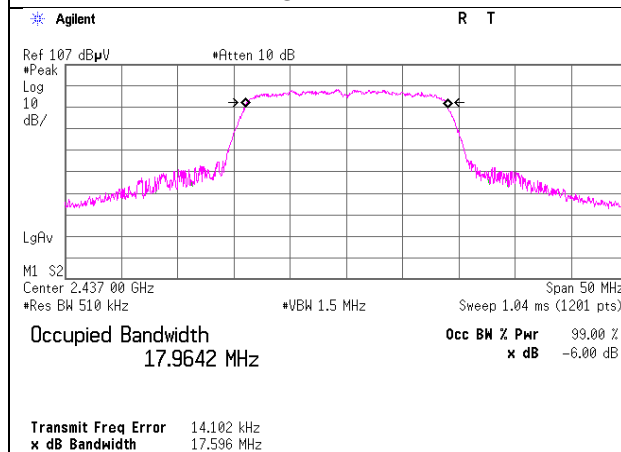
Test place Ise EMC Lab. No.4 Measurement Room
Report No. 11469126H
Date September 30, 2016
Temperature / Humidity 23 deg. C / 54 % RH
Engineer Tomoki Matsui
Mode Tx

11n-20

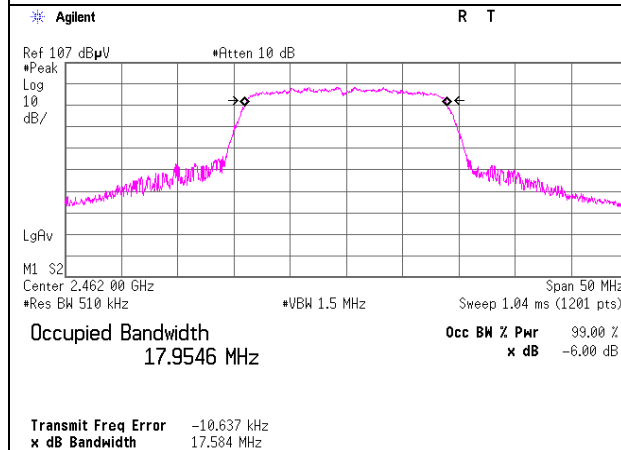
2412 MHz



2437 MHz



2462 MHz



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Ise EMC Lab.

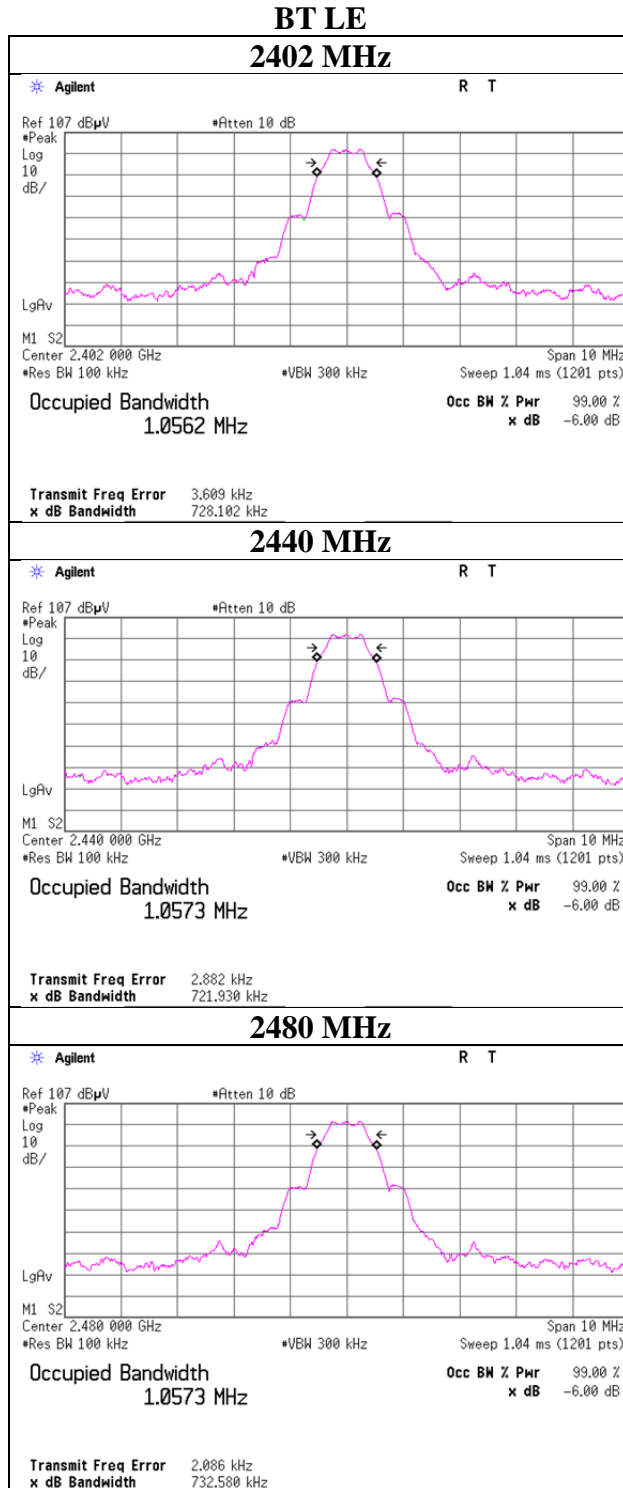
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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.4 Measurement Room
Report No.	11469126H
Date	September 29, 2016
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx



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Ise EMC Lab.

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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)
MPSE-22	Power sensor	Agilent	N1923A	MY54070003	AT	2016/04/07 * 12
MPM-16	Power Meter	Agilent	8990B	MY51000271	AT	2016/04/07 * 12
MAT-20	Attenuator(10dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2016/01/08 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2016/06/17 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2016/04/18 * 12
MOS-23	Thermo-Hygrometer	Custom	CTH-201	0004	AT	2015/12/08 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	AT/RE/CE	2016/01/18 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2015/11/10 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	AT	2016/03/10 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE/CE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2015/11/06 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2016/05/29 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2016/05/20 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2016/09/19 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2016/05/16 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE/CE	2016/06/24 * 12
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE/CE	2016/01/29 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2016/01/30 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2016/03/18 * 12
MHF-23	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	RE	2016/01/19 * 12
MCC-178	Microwave Cable	Junkosha	MMX221-00500DMS DMS	1502S305	RE	2016/03/10 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2015/10/07 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12

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Test equipment(2/2)

MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE	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)/SFM141 (5m)/421-010(1m)/suco form141-PE(1m)/RFM- E121(Switcher)	-/04178	CE	2016/07/20 * 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