



RADIO TEST REPORT

Test Report No. : 12079942H-B-R1

Applicant : Sony Interactive Entertainment Inc.
Type of Equipment : Wireless communication module
Model No. : J20H096
FCC ID : AK8M18DFT1
Test regulation : FCC Part 15 Subpart C: 2018
*WLAN, Bluetooth Low Energy parts
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 12079942H-B. 12079942H-B is replaced with this report.

Date of test: January 23 to February 7, 2018

Representative test engineer:


Takumi Shimada
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
Leader
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Conducted Emission.....	11
SECTION 6: Radiated Spurious Emission	12
SECTION 7: Antenna Terminal Conducted Tests.....	14
APPENDIX 1: Test data	15
Conducted Emission	15
6 dB Bandwidth and 99 % Occupied Bandwidth.....	18
Maximum Peak Output Power	23
Average Output Power	27
Radiated Spurious Emission	33
Conducted Spurious Emission	53
Power Density	57
APPENDIX 2: Test instruments	65
APPENDIX 3: Photographs of test setup	66
Conducted Emission	66
Radiated Spurious Emission	67
Worst Case Position	68
Test Configuration and peripherals.....	70

SECTION 1: Customer information

Company Name	Sony Interactive Entertainment Inc.
Brand Name	SONY
Address	1-7-1 Konan, Minato-ku, Tokyo, 108-0075 Japan
Telephone Number	+81-50-3807-5639
Facsimile Number	+81-50-3807-9594
Contact Person	Kiyoto Sasaki

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

2.1 Identification of E.U.T.

Type of Equipment	Wireless communication module
Model No	J20H096
Serial No	Refer to Clause 4.2
Country of Manufacture	China/Japan
Receipt Date of Sample	January 20, 2018
Condition of EUT	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	No modification by the test lab.

2.2 Product Description

J20H096 is the Wireless communication module.

Product Specification

Clock frequency in the system (radio part)	26 MHz
Operating Temperature	-10 - +85 deg. C
Power Supply	DC 3.3 V, DC 1.8 V
Size	20 x 18 x 3.0 mm, 55pin LGA

Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz - 2462 MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	Less than 20 MHz & 5 MHz
Method of frequency generation	Synthesizer
Antenna Type	IFA (Antenna port WA for 2.4 GHz / Antenna port WB for 2.4 GHz)
Antenna Gain: G _{ANT}	4.0 dBi (Antenna port WA for 2.4 GHz), 4.2 dBi (Antenna port WB for 2.4 GHz)
Directional Gain *1)	7.11 dBi

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

Equipment Type	Transceiver
Frequency of Operation	U-NII-1: 5180 MHz - 5240 MHz U-NII-2A: 5260 MHz - 5320 MHz U-NII-2C: 5500 MHz - 5700 MHz U-NII-3: 5745 MHz - 5825 MHz
Type of Modulation	OFDM
Bandwidth & Channel spacing	Less than 20 MHz / 40 MHz / 80 MHz & 20 MHz / 40 MHz / 80 MHz
Method of frequency generation	Synthesizer
Antenna Type	IFA (Antenna port WA for 5 GHz), PIFA (Antenna port WC for 5 GHz)
Antenna Gain: G _{ANT}	5.0 dBi (Antenna port WA for 5 GHz), 3.5 dBi (Antenna port WC for 5 GHz)
Directional Gain *1)	7.29 dBi

Bluetooth (BDR/EDR)

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

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	1 MHz & 2 MHz
Method of frequency generation	Synthesizer
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4 dBi (Antenna port WC for 2.4 GHz)

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

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

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on February 2, 2018 and effective March 5, 2018

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 February 2, 2018, does not affect the test specification applied to the EUT.

* 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 27.7 dB, 0.15000 MHz, L AV 28.6 dB, 0.15000 MHz, L	Complied	-
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(d)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	7.0 dB 4824.00 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 v04 12.2.7.					

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

FCC Part 15.31 (e)

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

FCC Part 15.203/212 Antenna requirement

The EUT has unique coupling/antenna connectors (U.FL) for antenna ports WC and also has a pattern antenna (Antenna port WA and WB) that is not removable from the EUT.
Therefore the equipment complies with the requirement of 15.203/212.

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3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

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Antenna Terminal test

Test Item	Uncertainty (+/-)
RF output power	1.3 dB
Antenna terminal conducted emission / Power density / Burst power	2.7 dB
Adjacent channel power / Channel power	
Below 3GHz	1.9 dB
3 GHz ot 6 GHz	2.1 dB

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	30 MHz to 200 MHz (Vertical)	5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
	200 MHz to 1000 MHz (Vertical)	6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	30 MHz to 200 MHz (Vertical)	4.9 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
	200 MHz to 1000 MHz (Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 dB

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 test report has enough margin, more than the site margin.

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3.5 Test Location

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 NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 4, PN9
Bluetooth Low Energy(BT LE)	Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: WLAN value = 16 Bluetooth (LE) Same as production model Software: MT_TEST_Tool_Ver6.3 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*Details of Operating mode for WLAN

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

*Details of Operating mode for BT LE

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

*Simultaneously transmission

Test Item	Mode *1)
Spurious Emission (Radiated)	Tx BT LE 2402 MHz + 11ac-40 5550 MHz Tx BT LE 2440 MHz + 11ac-40 5550 MHz Tx BT LE 2480 MHz + 11ac-40 5550 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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4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane.

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

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 "KDB 558074 D01 DTS Meas Guidance v04".

[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 m *3) (10 GHz - 26.5 GHz)		4.5 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)

*1) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

*2) Distance Factor: $20 \times \log(4.5 \text{ m} / 3.0 \text{ m}) = 3.53 \text{ dB}$

*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	3 MHz / 20 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				
*1) Peak hold was applied as Worst-case measurement. *2) Reference data *3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04". *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was 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

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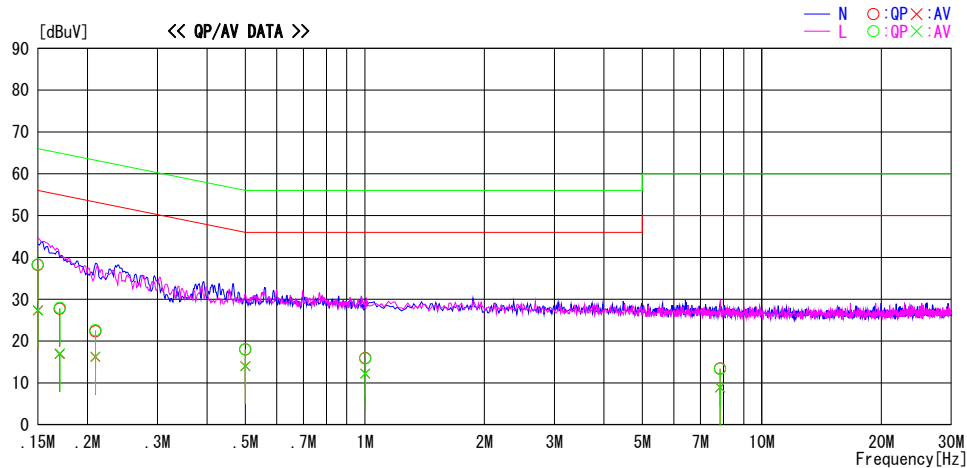
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APPENDIX 1: Test data

Conducted Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 12079942H
Date : February 7, 2018
Temperature / Humidity : 24 deg. C / 30 % RH
Engineer : Takafumi Noguchi
Mode : Tx 11n-20 2437 MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15000	25.0	14.1	13.2	38.2	27.3	66.0	56.0	27.8	28.7	N
0.17038	14.5	3.7	13.2	27.7	16.9	64.9	54.9	37.2	38.0	N
0.20941	9.1	3.0	13.2	22.3	16.2	63.2	53.2	40.9	37.0	N
0.50000	4.7	0.7	13.3	18.0	14.0	56.0	46.0	38.0	32.0	N
1.00202	2.6	-1.1	13.3	15.9	12.2	56.0	46.0	40.1	33.8	N
7.84832	-0.4	-4.9	13.8	13.4	8.9	60.0	50.0	46.6	41.1	N
0.15000	25.1	14.2	13.2	38.3	27.4	66.0	56.0	27.7	28.6	L
0.17046	14.7	3.9	13.2	27.9	17.1	64.9	54.9	37.0	37.8	L
0.20936	9.4	3.1	13.2	22.6	16.3	63.2	53.2	40.6	36.9	L
0.50000	4.7	0.7	13.3	18.0	14.0	56.0	46.0	38.0	32.0	L
1.00116	2.5	-1.1	13.3	15.8	12.2	56.0	46.0	40.2	33.8	L
7.84880	-0.5	-4.9	13.8	13.3	8.9	60.0	50.0	46.7	41.1	L

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

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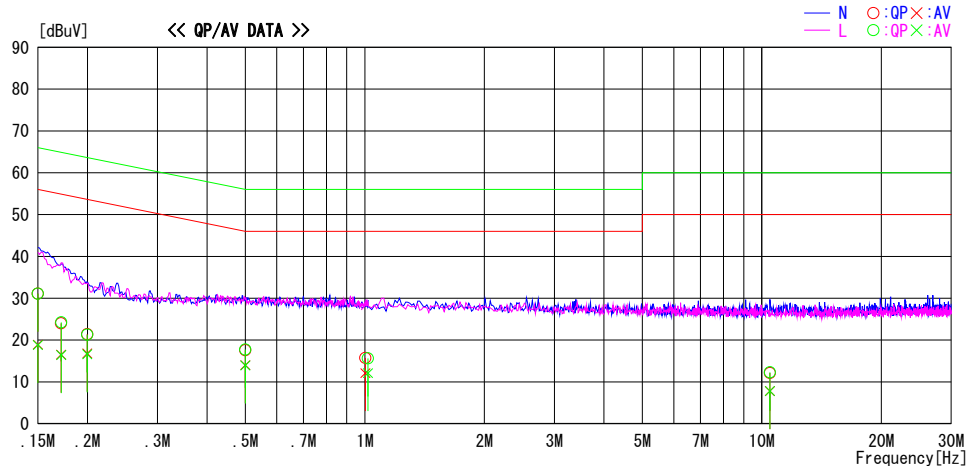
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Conducted Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 12079942H
Date : February 7, 2018
Temperature / Humidity : 24 deg. C / 30 % RH
Engineer : Takafumi Noguchi
Mode : Tx BT LE 2402 MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15000	17.9	5.7	13.2	31.1	18.9	66.0	56.0	34.9	37.1	N
0.17165	10.8	3.3	13.2	24.0	16.5	64.9	54.9	40.9	38.4	N
0.19971	8.2	3.6	13.2	21.4	16.8	63.6	53.6	42.2	36.8	N
0.50000	4.3	0.7	13.3	17.6	14.0	56.0	46.0	38.4	32.0	N
1.00280	2.4	-1.2	13.3	15.7	12.1	56.0	46.0	40.3	33.9	N
10.48305	-1.8	-6.1	13.9	12.1	7.8	60.0	50.0	47.9	42.2	N
0.15000	17.9	5.6	13.2	31.1	18.8	66.0	56.0	34.9	37.2	L
0.17184	11.0	3.2	13.2	24.2	16.4	64.9	54.9	40.7	38.5	L
0.19981	8.1	3.4	13.2	21.3	16.6	63.6	53.6	42.3	37.0	L
0.50000	4.4	0.6	13.3	17.7	13.9	56.0	46.0	38.3	32.1	L
1.01706	2.3	-1.2	13.3	15.6	12.1	56.0	46.0	40.4	33.9	L
10.48280	-1.6	-6.1	13.9	12.3	7.8	60.0	50.0	47.7	42.2	L

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

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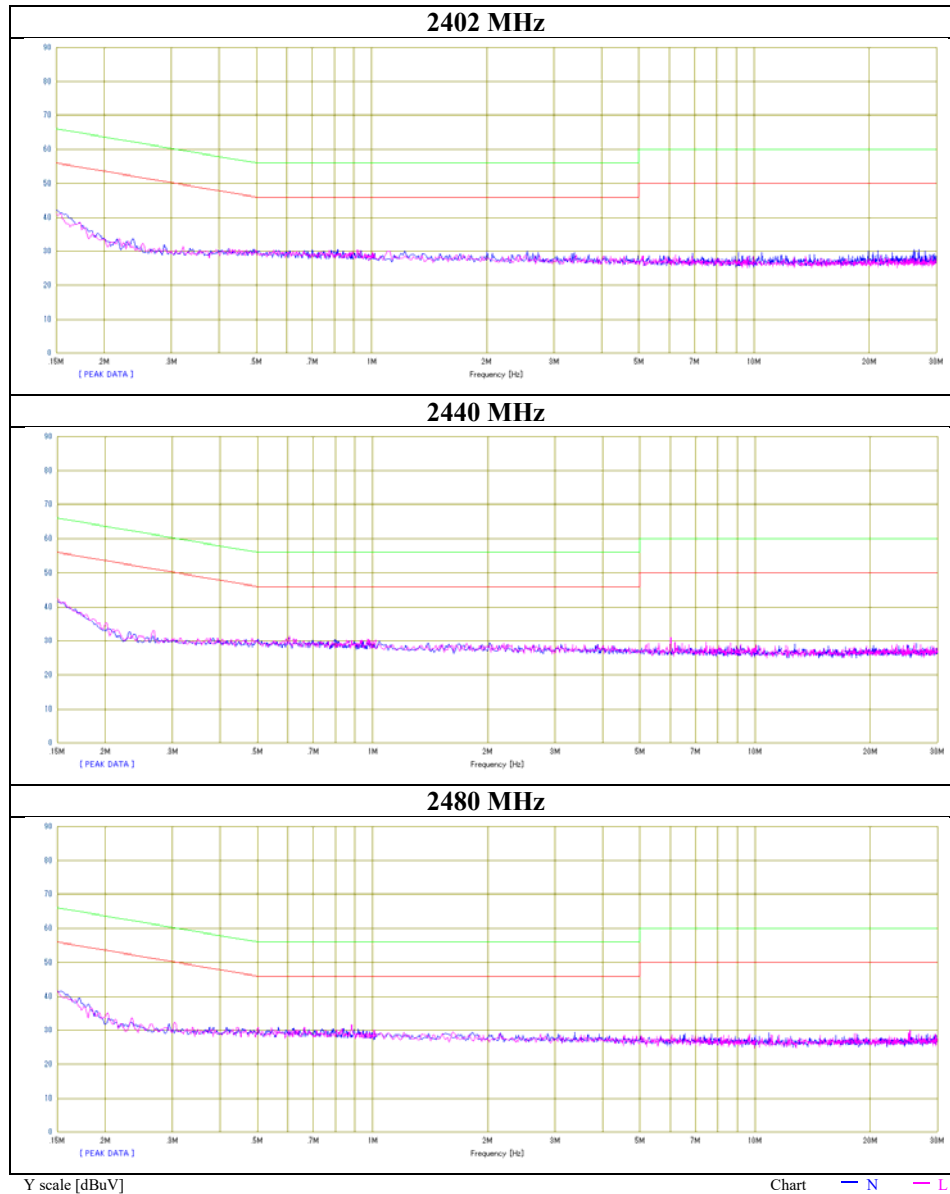
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12079942H
Date	February 7, 2018
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE



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6 dB Bandwidth and 99 % Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079942H	
Date	January 24, 2018	January 26, 2018
Temperature / Humidity	23 deg. C / 20 % RH	23 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takumi Shimada
Mode	Tx	

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	14806.8	9.868	> 0.500
	2437	14815.9	9.830	> 0.500
	2462	14824.4	9.723	> 0.500
11g	2412	16760.0	16.422	> 0.500
	2437	16804.6	16.380	> 0.500
	2462	16783.3	16.371	> 0.500
11n-20	2412	17806.1	17.620	> 0.500
	2437	17766.7	17.134	> 0.500
	2462	17817.9	17.628	> 0.500
BT LE	2402	1037.6	0.701	> 0.500
	2440	1037.4	0.705	> 0.500
	2480	1038.5	0.706	> 0.500

6dB Bandwidth



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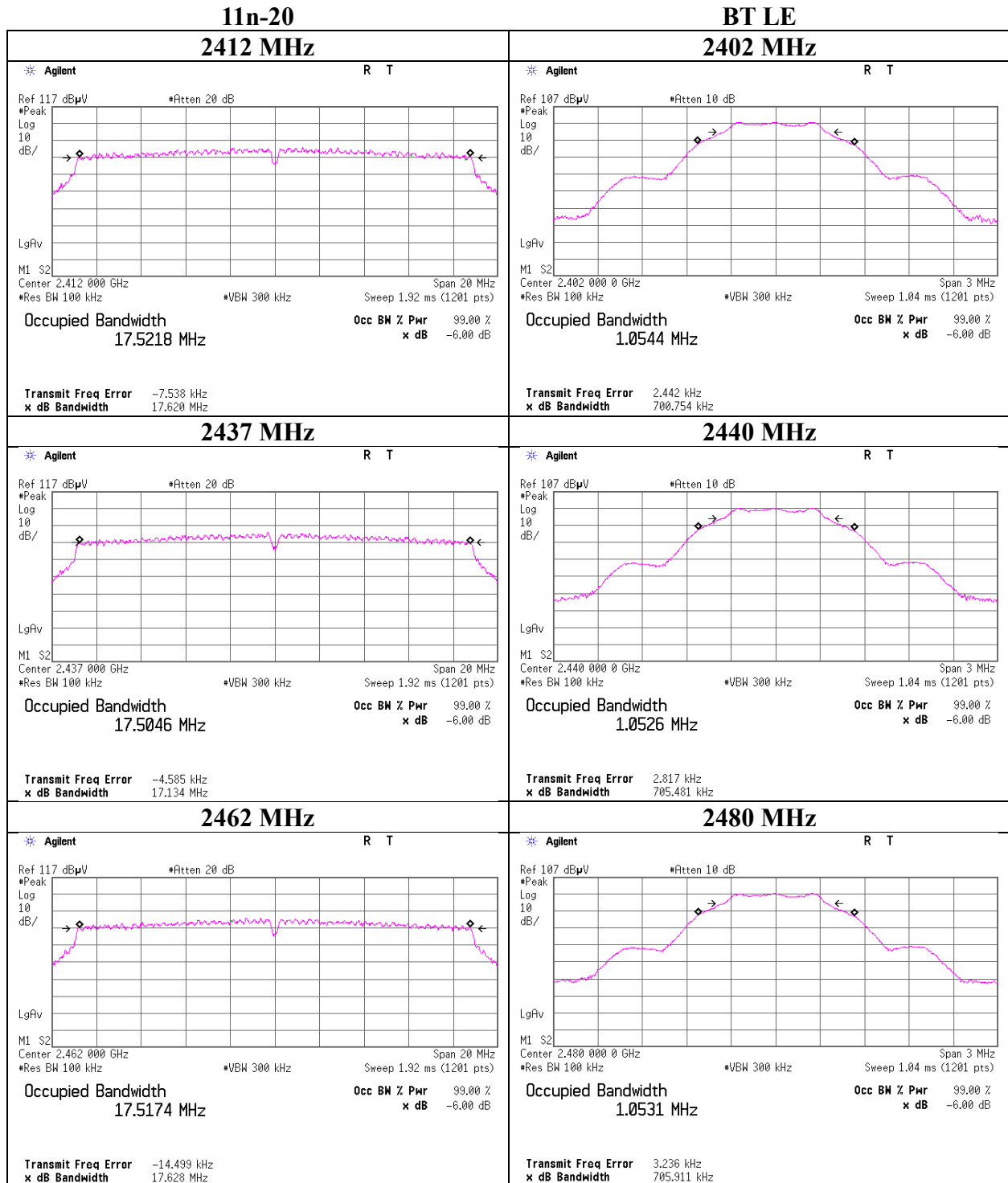
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6dB Bandwidth



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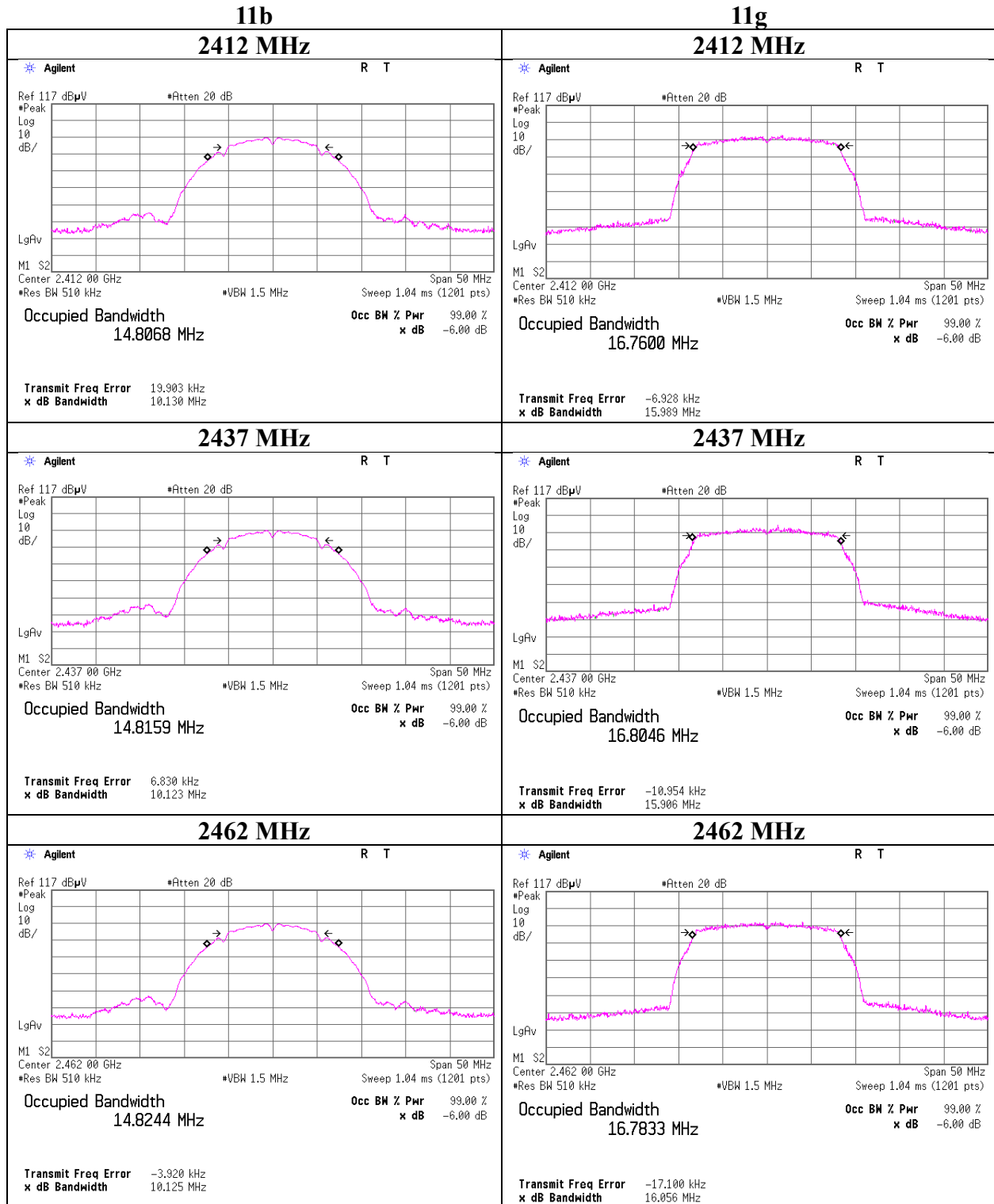
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99%Occupied Bandwidth



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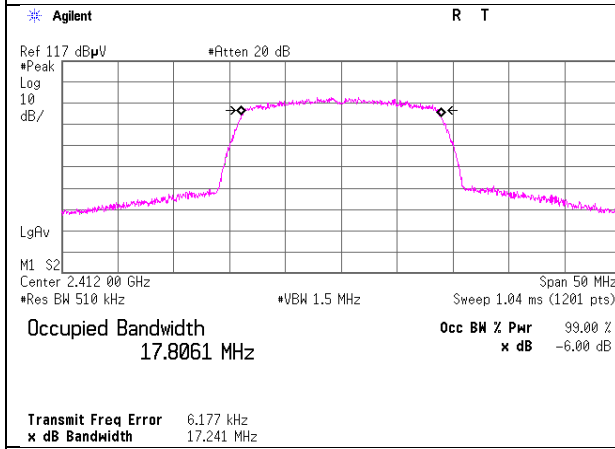
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99% Occupied Bandwidth

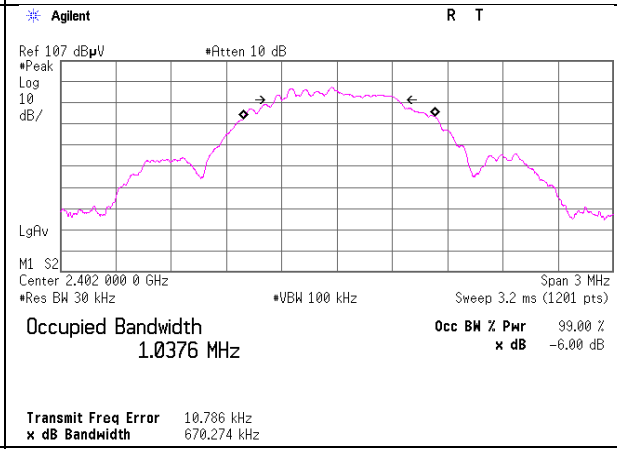
11n-20

2412 MHz

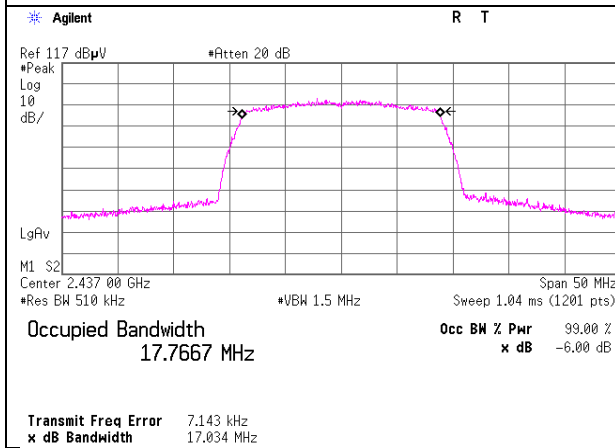


BT LE

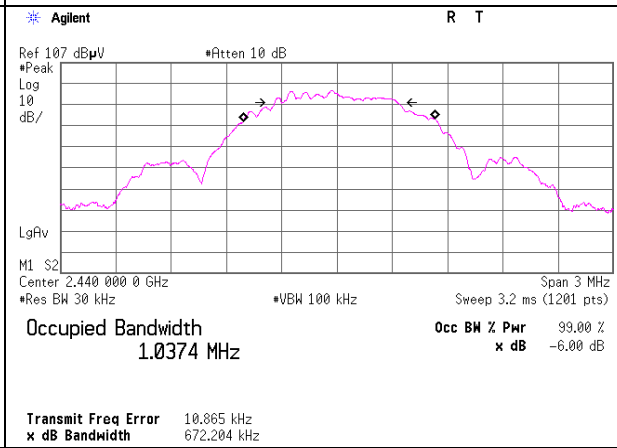
2402 MHz



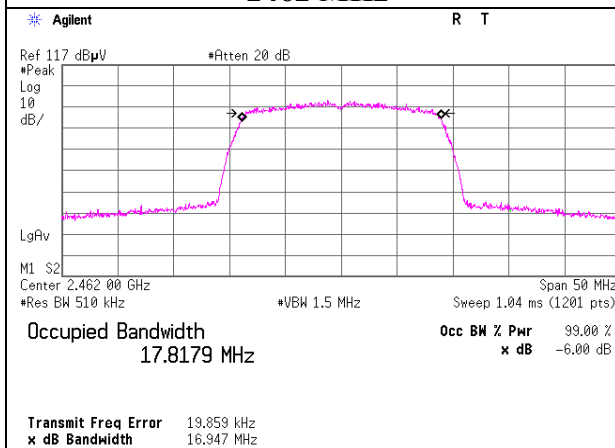
2437 MHz



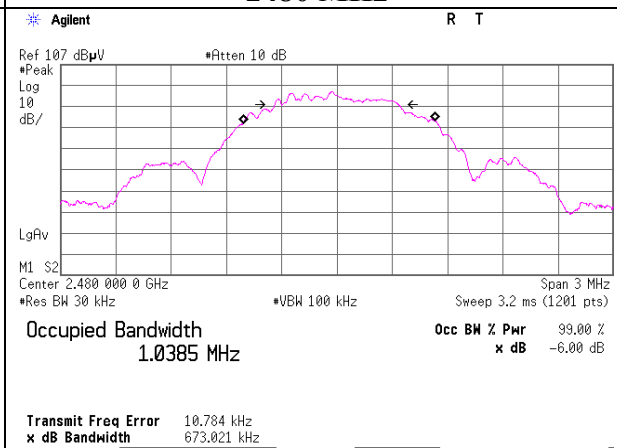
2440 MHz



2462 MHz



2480 MHz



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Maximum Peak Output Power

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 12079942H
Date : January 23, 2018 January 25, 2018
Temperature / Humidity : 23 deg. C / 34 % RH 23 deg. C / 20 % RH
Engineer : Takumi Shimada Takumi Shimada
Mode : Tx 11b

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	10.62	8.39	12.79	19.01	28.89	774.46	16.10
2437	10.91	9.98	13.20	20.89	28.89	774.46	15.69
2462	11.02	9.77	13.18	20.79	28.89	774.46	15.71

Sample Calculation:

Result = Antenna port WA + WB

*This Limit was reduced by the amount in dB (1.11 dB)

that the directional gain of the antenna/antenna array exceeding 6 dBi.

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	0.02	0.50	9.74	10.26	10.62
2437	0.14	0.50	9.74	10.38	10.91
2462	0.18	0.50	9.74	10.42	11.02

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	-0.97	0.50	9.71	9.24	8.39
2437	-0.22	0.50	9.71	9.99	9.98
2462	-0.31	0.50	9.71	9.90	9.77

Sample Calculation:

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

2437MHz

Rate [Mbps]	Antenna port WA Reading Peak		Antenna port WB Reading Peak		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
1	0.14	1.03	-0.22	0.95	2.97	1.98	*
2	0.12	1.03	-0.29	0.94	2.93	1.96	
5.5	0.11	1.03	-0.35	0.92	2.90	1.95	
11	0.10	1.02	-0.30	0.93	2.91	1.96	

*: Worst Rate

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

Maximum Peak Output Power

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 12079942H
Date : January 23, 2018 January 25, 2018
Temperature / Humidity : 23 deg. C / 34 % RH 23 deg. C / 20 % RH
Engineer : Takumi Shimada Takumi Shimada
Mode : Tx 11g

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	76.56	66.07	21.54	142.63	28.89	774.46	7.35
2437	76.03	71.78	21.70	147.81	28.89	774.46	7.19
2462	79.98	67.76	21.70	147.75	28.89	774.46	7.19

Sample Calculation:

Result = Antenna port WA + WB

*This Limit was reduced by the amount in dB (1.11 dB)

that the directional gain of the antenna/antenna array exceeding 6 dBi.

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	8.60	0.50	9.74	18.84	76.56
2437	8.57	0.50	9.74	18.81	76.03
2462	8.79	0.50	9.74	19.03	79.98

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	7.99	0.50	9.71	18.20	66.07
2437	8.35	0.50	9.71	18.56	71.78
2462	8.10	0.50	9.71	18.31	67.76

Sample Calculation:

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

2437MHz

Rate [Mbps]	Antenna port WA Reading Peak		Antenna port WB Reading Peak		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
6	8.32	6.79	7.77	5.98	11.06	12.78	
9	8.57	7.19	7.74	5.94	11.19	13.14	
12	7.95	6.24	7.49	5.61	10.74	11.85	
18	8.06	6.40	7.59	5.74	10.84	12.14	
24	8.31	6.78	7.66	5.83	11.01	12.61	
36	8.51	7.10	8.30	6.76	11.42	13.86	
48	8.53	7.13	8.32	6.79	11.44	13.92	
54	8.57	7.19	8.35	6.84	11.47	14.03	*

*: Worst Rate

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 25, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-20

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	83.56	68.39	21.82	151.95	28.89	774.46	7.07
2437	82.60	76.21	22.01	158.81	28.89	774.46	6.88
2462	78.89	66.99	21.64	145.87	28.89	774.46	7.25

Sample Calculation:

Result = Antenna port WA + WB

*This Limit was reduced by the amount in dB (1.11 dB)

that the directional gain of the antenna/antenna array exceeding 6 dBi.

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	8.98	0.50	9.74	19.22	83.56
2437	8.93	0.50	9.74	19.17	82.60
2462	8.73	0.50	9.74	18.97	78.89

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	8.14	0.50	9.71	18.35	68.39
2437	8.61	0.50	9.71	18.82	76.21
2462	8.05	0.50	9.71	18.26	66.99

Sample Calculation:

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

2437MHz

MCS Number	Antenna port WA Reading Peak		Antenna port WB Reading Peak		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
0	8.77	7.53	8.24	6.67	11.52	14.20	
1	8.42	6.95	7.90	6.17	11.18	13.12	
2	8.43	6.97	7.95	6.24	11.21	13.20	
3	8.48	7.05	7.96	6.25	11.24	13.30	
4	8.93	7.82	8.61	7.26	11.78	15.08	*
5	8.90	7.76	8.53	7.13	11.73	14.89	
6	8.93	7.82	8.56	7.18	11.76	14.99	
7	8.91	7.78	8.38	6.89	11.66	14.67	
8	8.80	7.59	8.12	6.49	11.48	14.07	
9	8.43	6.97	7.91	6.18	11.19	13.15	
10	8.37	6.87	7.67	5.85	11.04	12.72	
11	8.22	6.64	7.75	5.96	11.00	12.59	
12	8.64	7.31	8.33	6.81	11.50	14.12	
13	8.63	7.29	8.44	6.98	11.55	14.28	
14	8.48	7.05	8.33	6.81	11.42	13.85	
15	8.72	7.45	8.23	6.65	11.49	14.10	

*: Worst Rate

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

Maximum Peak Output Power

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 12079942H
Date January 24, 2018
Temperature / Humidity 23 deg. C / 20 % RH
Engineer Takafumi Noguchi
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-7.38	0.50	9.71	2.83	1.92	29.60	912.01	26.77
2440	-7.83	0.50	9.71	2.38	1.73	29.60	912.01	27.22
2480	-7.66	0.50	9.71	2.55	1.80	29.60	912.01	27.05

Sample Calculation:

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

*This Limit was reduced by the amount in dB (0.4 dB) that the directional gain of the antenna exceeding 6 dBi.

Average Output Power (Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 25, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takumi Shimada
Mode	Tx 11b

Antenna port WA + Antenna port WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Burst average)	
			[dBm]	[mW]
2412	7.19	5.68	11.10	12.87
2437	7.16	6.00	11.19	13.16
2462	7.21	5.85	11.16	13.06

Sample Calculation:

Result = Antenna port WA + Antenna port WB

11b 1 Mbps Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average)	
				[dBm]	[mW]
2412	-1.67	0.50	9.74	8.57	7.19
2437	-1.69	0.50	9.74	8.55	7.16
2462	-1.66	0.50	9.74	8.58	7.21

11b 1 Mbps Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average)	
				[dBm]	[mW]
2412	-2.67	0.50	9.71	7.54	5.68
2437	-2.43	0.50	9.71	7.78	6.00
2462	-2.54	0.50	9.71	7.67	5.85

Sample Calculation:

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

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

Average Output Power **(Reference data for RF Exposure)**

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 25, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takumi Shimada
Mode	Tx 11g

Antenna port WA + Antenna port WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Burst average)	
			[dBm]	[mW]
2412	6.49	5.45	10.77	11.93
2437	6.87	6.12	11.14	12.99
2462	6.82	5.70	10.98	12.53

Sample Calculation:

Result = Antenna port WA + Antenna port WB

11g 6 Mbps Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average)	
				[dBm]	[mW]
2412	-2.12	0.50	9.74	8.12	6.49
2437	-1.87	0.50	9.74	8.37	6.87
2462	-1.90	0.50	9.74	8.34	6.82

11g 6 Mbps Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average)	
				[dBm]	[mW]
2412	-2.85	0.50	9.71	7.36	5.45
2437	-2.34	0.50	9.71	7.87	6.12
2462	-2.65	0.50	9.71	7.56	5.70

Sample Calculation:

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

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

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Average Output Power (Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 25, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-20

Antenna port WA + Antenna port WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Burst average)	
			[dBm]	[mW]
2412	6.84	5.36	10.86	12.20
2437	6.97	6.22	11.20	13.19
2462	6.90	5.71	11.01	12.62

Sample Calculation:

Result = Antenna port WA + Antenna port WB

11n-20 MCS 0 Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average)	
				[dBm]	[mW]
2412	-1.89	0.50	9.74	8.35	6.84
2437	-1.81	0.50	9.74	8.43	6.97
2462	-1.85	0.50	9.74	8.39	6.90

11n-20 MCS 0 Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average)	
				[dBm]	[mW]
2412	-2.92	0.50	9.71	7.29	5.36
2437	-2.27	0.50	9.71	7.94	6.22
2462	-2.64	0.50	9.71	7.57	5.71

Sample Calculation:

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

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

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Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

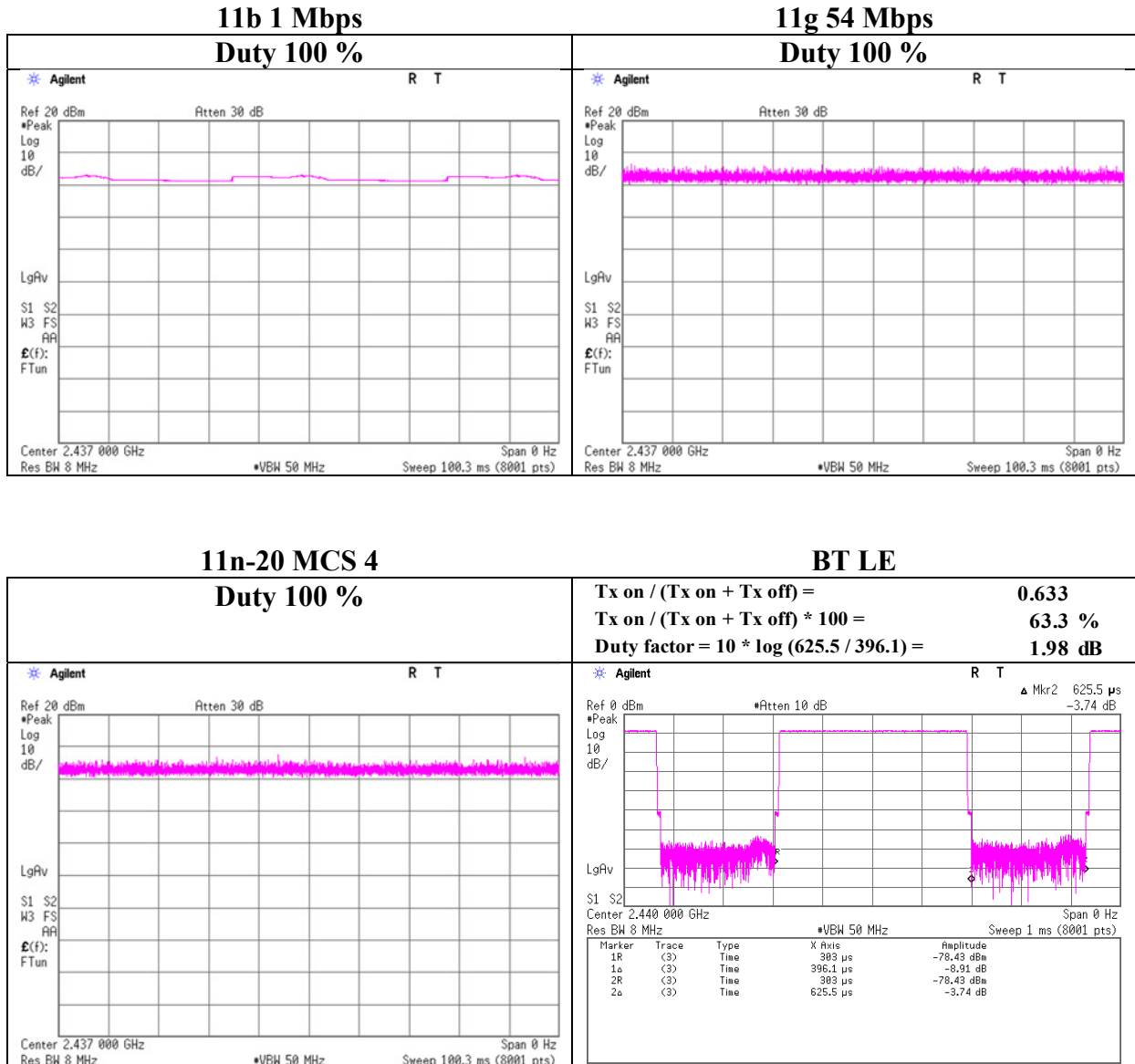
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)	
				[dBm]	[mW]
2402	-9.97	0.50	9.71	0.24	1.06
2440	-10.43	0.50	9.71	-0.22	0.95
2480	-10.20	0.50	9.71	0.01	1.00

Sample Calculation:

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

Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079942H	
Date	January 24, 2018	January 26, 2018
Temperature / Humidity	23 deg. C / 20 % RH	23 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takumi Shimada
Mode	Tx	



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

UL Japan, Inc.

Ise EMC Lab.

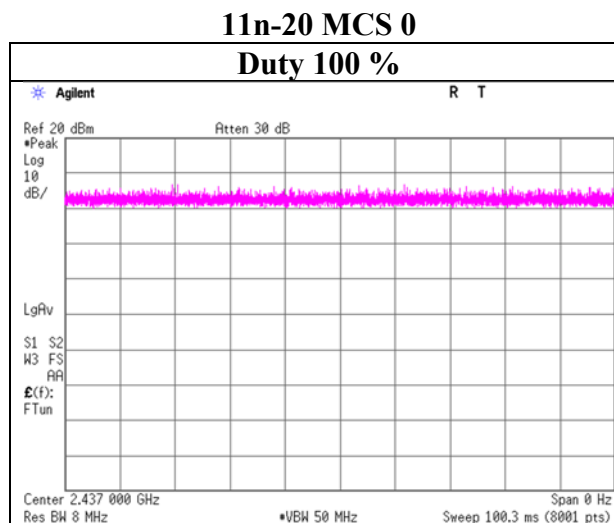
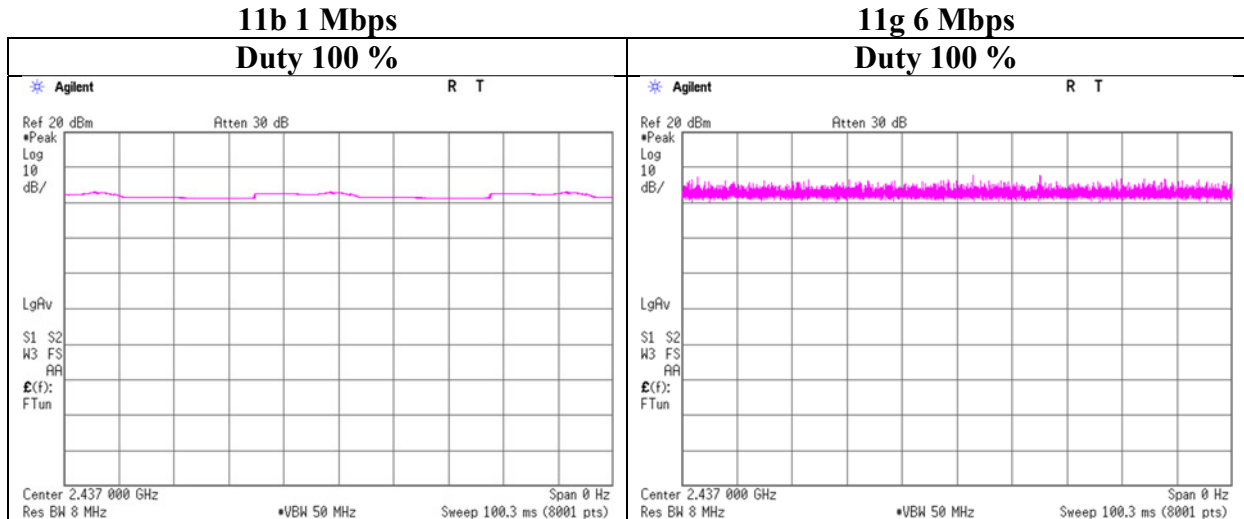
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079942H	
Date	January 24, 2018	January 26, 2018
Temperature / Humidity	23 deg. C / 20 % RH	23 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takumi Shimada
Mode	Tx	



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

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Radiated Spurious Emission

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 24, 2018 February 2, 2018
Temperature / Humidity 21 deg. C / 32 % RH 23 deg. C / 32 % RH
Engineer Yuta Moriya Tomoki Matsui
(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	43.0	27.7	6.7	32.4	-	45.0	73.9	28.9	
Hori	4824.000	PK	43.3	31.7	9.0	31.4	-	52.6	73.9	21.3	
Hori	7236.000	PK	41.8	36.1	10.4	32.1	-	56.2	73.9	17.7	Floor noise
Hori	9648.000	PK	42.5	38.6	10.9	32.9	-	59.1	73.9	14.8	Floor noise
Hori	2390.000	AV	34.8	27.7	6.7	32.4	-	36.8	53.9	17.1	
Hori	4824.000	AV	36.0	31.7	9.0	31.4	-	45.3	53.9	8.6	
Hori	7236.000	AV	31.4	36.1	10.4	32.1	-	45.8	53.9	8.1	Floor noise
Hori	9648.000	AV	31.2	38.6	10.9	32.9	-	47.8	53.9	6.1	Floor noise
Vert	2390.000	PK	43.6	27.7	6.7	32.4	-	45.6	73.9	28.3	
Vert	4824.000	PK	44.0	31.7	9.0	31.4	-	53.3	73.9	20.6	
Vert	7236.000	PK	42.1	36.1	10.4	32.1	-	56.5	73.9	17.4	Floor noise
Vert	9648.000	PK	41.9	38.6	10.9	32.9	-	58.5	73.9	15.4	Floor noise
Vert	2390.000	AV	33.2	27.7	6.7	32.4	-	35.2	53.9	18.7	
Vert	4824.000	AV	37.6	31.7	9.0	31.4	-	46.9	53.9	7.0	
Vert	7236.000	AV	32.0	36.1	10.4	32.1	-	46.4	53.9	7.5	Floor noise
Vert	9648.000	AV	31.0	38.6	10.9	32.9	-	47.6	53.9	6.3	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

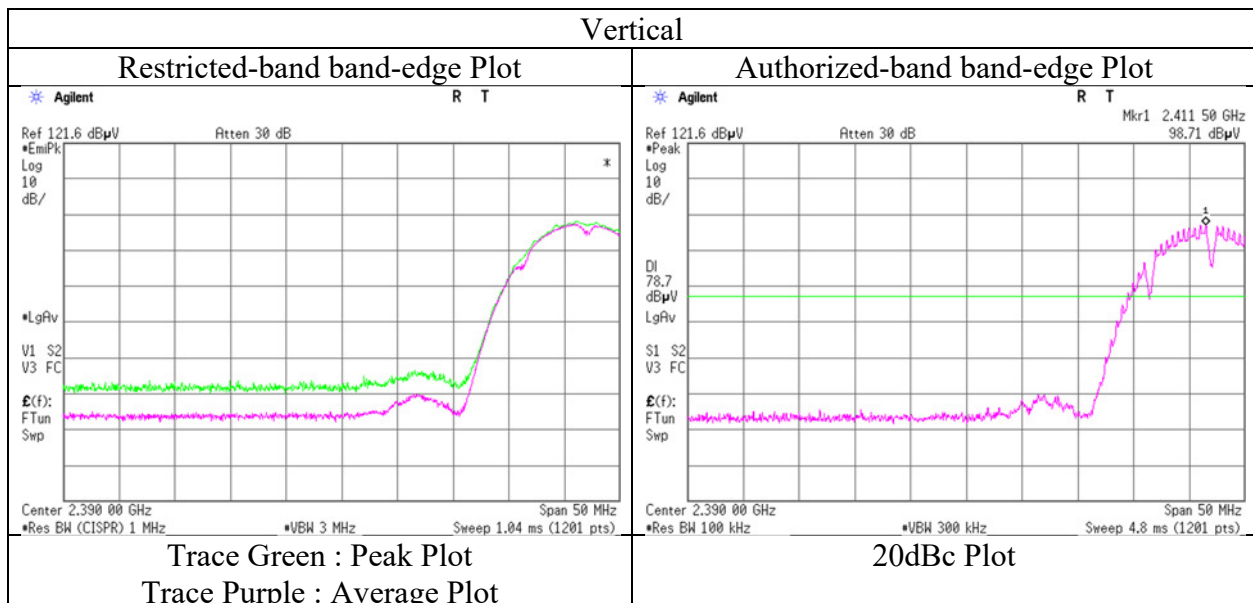
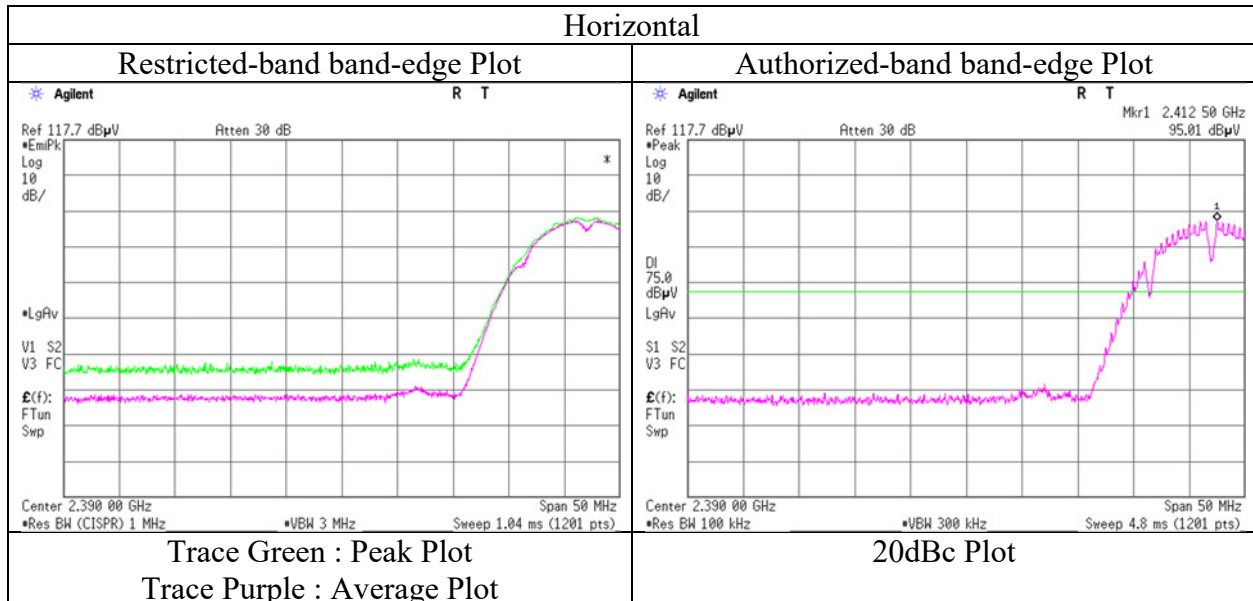
20dBc Data Sheet

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	95.0	27.7	6.8	32.4	97.1	-	-	Carrier
Hori	2400.000	PK	40.7	27.7	6.8	32.4	42.8	77.1	34.3	
Vert	2412.000	PK	98.7	27.7	6.8	32.4	100.8	-	-	Carrier
Vert	2400.000	PK	40.4	27.7	6.8	32.4	42.5	80.8	38.3	

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

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12079942H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 24, 2018
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Yuta Moriya
	(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

Report No.	12079942H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 24, 2018	February 2, 2018
Temperature / Humidity	21 deg. C / 32 % RH	23 deg. C / 32 % RH
Engineer	Yuta Moriya	Tomoki Matsui
	(1 GHz - 10 GHz)	(Above 10 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	43.4	31.9	9.0	31.4	-	52.9	73.9	21.0	
Hori	7311.000	PK	42.1	36.2	10.4	32.2	-	56.5	73.9	17.4	Floor noise
Hori	9748.000	PK	42.1	38.7	11.0	33.0	-	58.8	73.9	15.1	Floor noise
Hori	4874.000	AV	36.6	31.9	9.0	31.4	-	46.1	53.9	7.8	
Hori	7311.000	AV	32.3	36.2	10.4	32.2	-	46.7	53.9	7.2	Floor noise
Hori	9748.000	AV	31.2	38.7	11.0	33.0	-	47.9	53.9	6.0	Floor noise
Vert	4874.000	PK	43.4	31.9	9.0	31.4	-	52.9	73.9	21.0	
Vert	7311.000	PK	42.0	36.2	10.4	32.2	-	56.4	73.9	17.5	Floor noise
Vert	9748.000	PK	43.0	38.7	11.0	33.0	-	59.7	73.9	14.2	Floor noise
Vert	4874.000	AV	36.7	31.9	9.0	31.4	-	46.2	53.9	7.7	
Vert	7311.000	AV	32.0	36.2	10.4	32.2	-	46.4	53.9	7.5	Floor noise
Vert	9748.000	AV	31.2	38.7	11.0	33.0	-	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Ise EMC Lab.

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Radiated Spurious Emission

Report No.	12079942H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 24, 2018	February 2, 2018
Temperature / Humidity	21 deg. C / 32 % RH	23 deg. C / 32 % RH
Engineer	Yuta Moriya	Tomoki Matsui
	(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	2483.500	PK	43.6	27.8	6.8	32.4	-	45.8	73.9	28.1	
Hori	4924.000	PK	43.6	32.0	9.1	31.3	-	53.4	73.9	20.5	
Hori	7386.000	PK	41.7	36.3	10.4	32.2	-	56.2	73.9	17.7	Floor noise
Hori	9848.000	PK	42.4	38.8	11.0	33.0	-	59.2	73.9	14.7	Floor noise
Hori	2483.500	AV	35.9	27.8	6.8	32.4	-	38.1	53.9	15.8	
Hori	4924.000	AV	36.5	32.0	9.1	31.3	-	46.3	53.9	7.6	
Hori	7386.000	AV	31.7	36.3	10.4	32.2	-	46.2	53.9	7.7	Floor noise
Hori	9848.000	AV	29.8	38.8	11.0	33.0	-	46.6	53.9	7.3	Floor noise
Vert	2483.500	PK	44.2	27.8	6.8	32.4	-	46.4	73.9	27.5	
Vert	4924.000	PK	43.4	32.0	9.1	31.3	-	53.2	73.9	20.7	
Vert	7386.000	PK	42.0	36.3	10.4	32.2	-	56.5	73.9	17.4	Floor noise
Vert	9848.000	PK	41.4	38.8	11.0	33.0	-	58.2	73.9	15.7	Floor noise
Vert	2483.500	AV	33.2	27.8	6.8	32.4	-	35.4	53.9	18.5	
Vert	4924.000	AV	35.0	32.0	9.1	31.3	-	44.8	53.9	9.1	
Vert	7386.000	AV	31.9	36.3	10.4	32.2	-	46.4	53.9	7.5	Floor noise
Vert	9848.000	AV	30.2	38.8	11.0	33.0	-	47.0	53.9	6.9	Floor noise

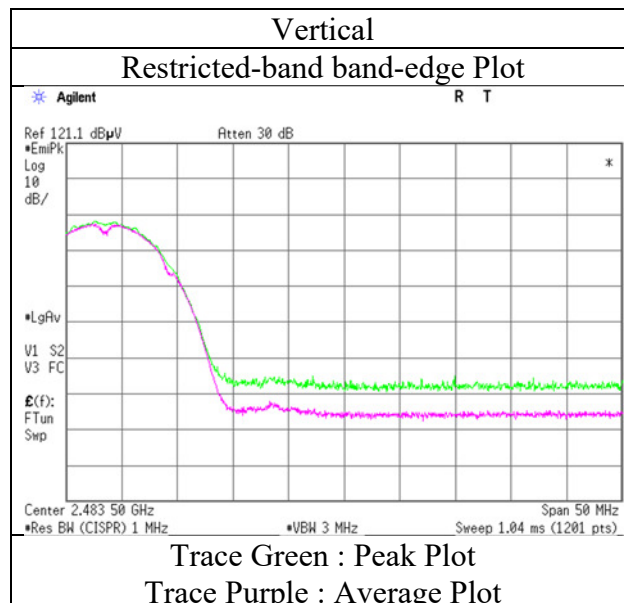
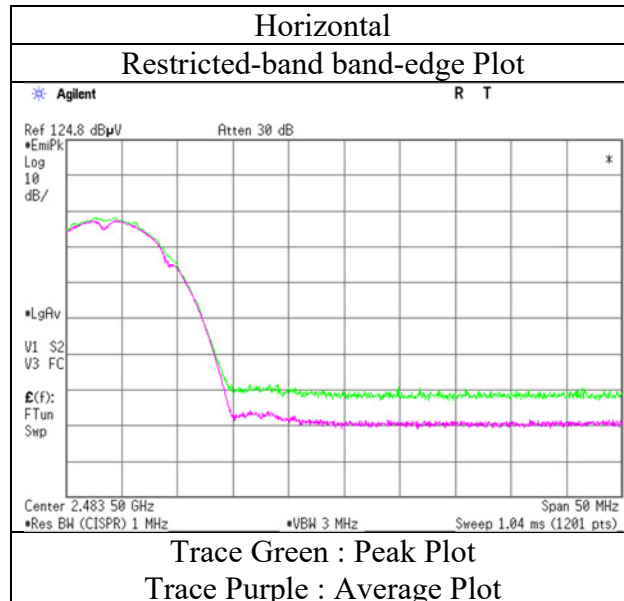
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

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

Report No.	12079942H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 24, 2018
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Yuta Moriya
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz



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

Radiated Spurious Emission

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 23, 2018 February 2, 2018
Temperature / Humidity 22 deg. C / 33 % RH 23 deg. C / 32 % RH
Engineer Ken Fujita Tomoki Matsui
(1 GHz - 10 GHz) (Above 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	54.3	27.7	6.7	32.4	-	56.3	73.9	17.6	
Hori	4824.000	PK	41.1	31.7	9.0	31.4	-	50.4	73.9	23.5	Floor noise
Hori	7236.000	PK	41.3	36.1	10.4	32.1	-	55.7	73.9	18.2	Floor noise
Hori	9648.000	PK	41.4	38.6	10.9	32.9	-	58.0	73.9	15.9	Floor noise
Hori	2390.000	AV	43.1	27.7	6.7	32.4	-	45.1	53.9	8.8	
Hori	4824.000	AV	29.9	31.7	9.0	31.4	-	39.2	53.9	14.7	Floor noise
Hori	7236.000	AV	29.8	36.1	10.4	32.1	-	44.2	53.9	9.7	Floor noise
Hori	9648.000	AV	29.7	38.6	10.9	32.9	-	46.3	53.9	7.6	Floor noise
Vert	2390.000	PK	46.8	27.7	6.7	32.4	-	48.8	73.9	25.1	
Vert	4824.000	PK	40.9	31.7	9.0	31.4	-	50.2	73.9	23.7	Floor noise
Vert	7236.000	PK	40.6	36.1	10.4	32.1	-	55.0	73.9	18.9	Floor noise
Vert	9648.000	PK	40.4	38.6	10.9	32.9	-	57.0	73.9	16.9	Floor noise
Vert	2390.000	AV	36.1	27.7	6.7	32.4	-	38.1	53.9	15.8	
Vert	4824.000	AV	30.1	31.7	9.0	31.4	-	39.4	53.9	14.5	Floor noise
Vert	7236.000	AV	30.2	36.1	10.4	32.1	-	44.6	53.9	9.3	Floor noise
Vert	9648.000	AV	29.9	38.6	10.9	32.9	-	46.5	53.9	7.4	Floor noise

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

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

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

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	92.5	27.7	6.8	32.4	94.6	-	-	Carrier
Hori	2400.000	PK	51.1	27.7	6.8	32.4	53.2	74.6	21.4	
Vert	2412.000	PK	89.4	27.7	6.8	32.4	91.5	-	-	Carrier
Vert	2400.000	PK	46.6	27.7	6.8	32.4	48.7	71.5	22.8	

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

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Ise EMC Lab.

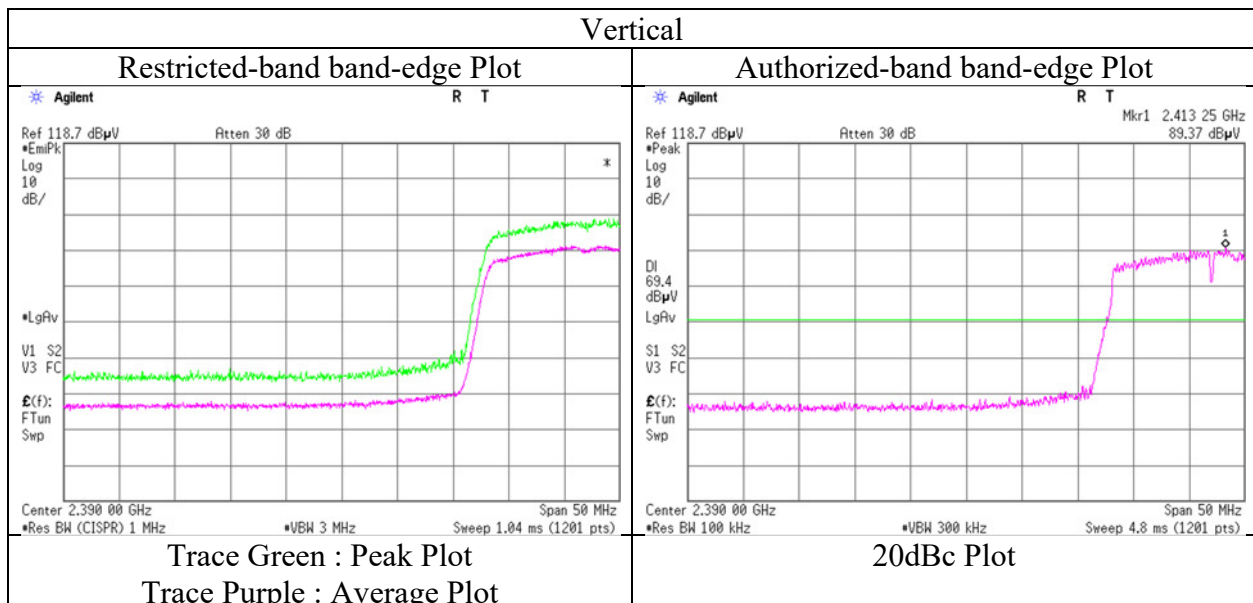
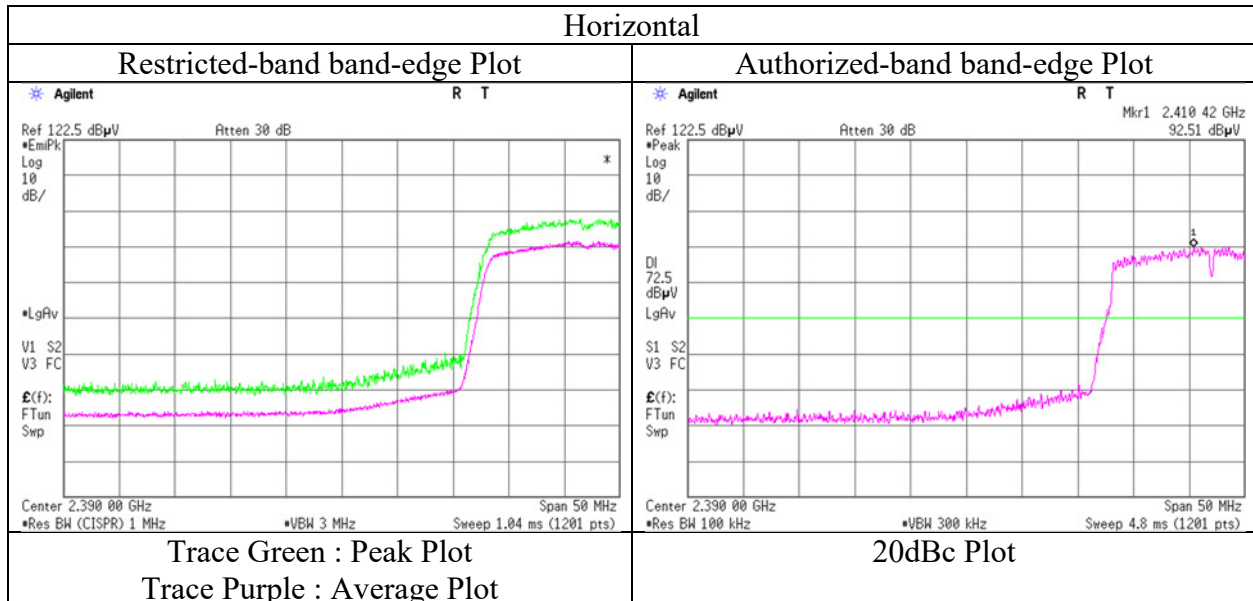
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12079942H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 23, 2018
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Ken Fujita
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2412 MHz



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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 23, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 33 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takumi Shimada (Below 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	51.999	QP	21.6	10.1	7.5	32.2	-	7.0	40.0	33.0	
Hori	131.864	QP	36.3	13.8	8.5	32.2	-	26.4	43.5	17.1	
Hori	185.723	QP	30.5	16.5	9.1	32.1	-	24.0	43.5	19.5	
Hori	219.139	QP	35.2	11.3	9.4	32.1	-	23.8	46.0	22.2	
Hori	391.845	QP	26.5	15.4	10.6	32.0	-	20.5	46.0	25.5	
Hori	913.720	QP	20.5	21.9	13.5	30.9	-	25.0	46.0	21.0	
Hori	4874.000	PK	41.4	31.9	9.0	31.4	-	50.9	73.9	23.0	Floor noise
Hori	7311.000	PK	41.5	36.2	10.4	32.2	-	55.9	73.9	18.0	Floor noise
Hori	9748.000	PK	41.1	38.7	11.0	33.0	-	57.8	73.9	16.1	Floor noise
Hori	4874.000	AV	30.8	31.9	9.0	31.4	-	40.3	53.9	13.6	Floor noise
Hori	7311.000	AV	30.9	36.2	10.4	32.2	-	45.3	53.9	8.6	Floor noise
Hori	9748.000	AV	30.6	38.7	11.0	33.0	-	47.3	53.9	6.6	Floor noise
Vert	51.999	QP	28.9	10.1	7.5	32.2	-	14.3	40.0	25.7	
Vert	131.854	QP	30.2	13.8	8.5	32.2	-	20.3	43.5	23.2	
Vert	185.720	QP	32.0	16.5	9.1	32.1	-	25.5	43.5	18.0	
Vert	224.707	QP	28.8	11.4	9.4	32.1	-	17.5	46.0	28.5	
Vert	386.281	QP	30.3	15.2	10.6	32.0	-	24.1	46.0	21.9	
Vert	913.720	QP	20.6	21.9	13.5	30.9	-	25.1	46.0	20.9	
Vert	4874.000	PK	41.3	31.9	9.0	31.4	-	50.8	73.9	23.1	Floor noise
Vert	7311.000	PK	41.6	36.2	10.4	32.2	-	56.0	73.9	17.9	Floor noise
Vert	9748.000	PK	41.8	38.7	11.0	33.0	-	58.5	73.9	15.4	Floor noise
Vert	4874.000	AV	31.8	31.9	9.0	31.4	-	41.3	53.9	12.6	Floor noise
Vert	7311.000	AV	32.0	36.2	10.4	32.2	-	46.4	53.9	7.5	Floor noise
Vert	9748.000	AV	31.1	38.7	11.0	33.0	-	47.8	53.9	6.1	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (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

Report No.	12079942H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 23, 2018	February 2, 2018
Temperature / Humidity	22 deg. C / 33 % RH	23 deg. C / 32 % RH
Engineer	Ken Fujita	Tomoki Matsui
	(1 GHz - 10 GHz)	(Above 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	53.1	27.8	6.8	32.4	-	55.3	73.9	18.6	
Hori	4924.000	PK	41.7	32.0	9.1	31.3	-	51.5	73.9	22.4	Floor noise
Hori	7386.000	PK	41.4	36.3	10.4	32.2	-	55.9	73.9	18.0	Floor noise
Hori	9848.000	PK	41.6	38.8	11.0	33.0	-	58.4	73.9	15.5	Floor noise
Hori	2483.500	AV	38.9	27.8	6.8	32.4	-	41.1	53.9	12.8	
Hori	4924.000	AV	30.4	32.0	9.1	31.3	-	40.2	53.9	13.7	Floor noise
Hori	7386.000	AV	31.3	36.3	10.4	32.2	-	45.8	53.9	8.1	Floor noise
Hori	9848.000	AV	31.1	38.8	11.0	33.0	-	47.9	53.9	6.0	Floor noise
Vert	2483.500	PK	52.9	27.8	6.8	32.4	-	55.1	73.9	18.8	
Vert	4924.000	PK	41.1	32.0	9.1	31.3	-	50.9	73.9	23.0	Floor noise
Vert	7386.000	PK	41.5	36.3	10.4	32.2	-	56.0	73.9	17.9	Floor noise
Vert	9848.000	PK	41.5	38.8	11.0	33.0	-	58.3	73.9	15.6	Floor noise
Vert	2483.500	AV	40.7	27.8	6.8	32.4	-	42.9	53.9	11.0	
Vert	4924.000	AV	31.5	32.0	9.1	31.3	-	41.3	53.9	12.6	Floor noise
Vert	7386.000	AV	31.3	36.3	10.4	32.2	-	45.8	53.9	8.1	Floor noise
Vert	9848.000	AV	30.7	38.8	11.0	33.0	-	47.5	53.9	6.4	Floor noise

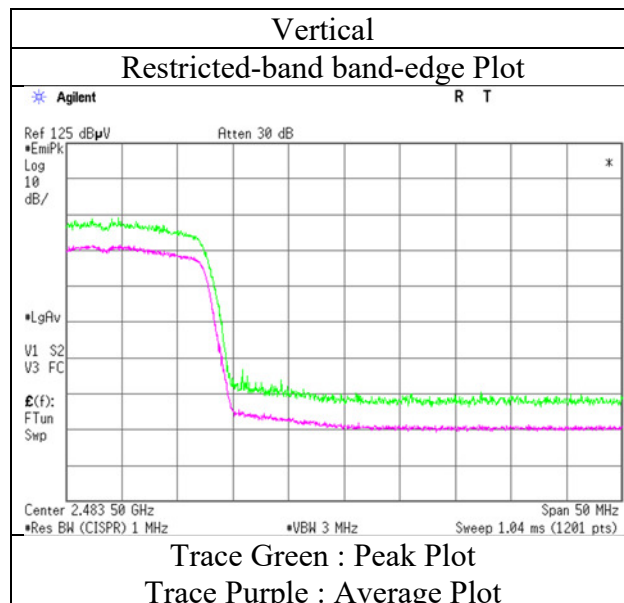
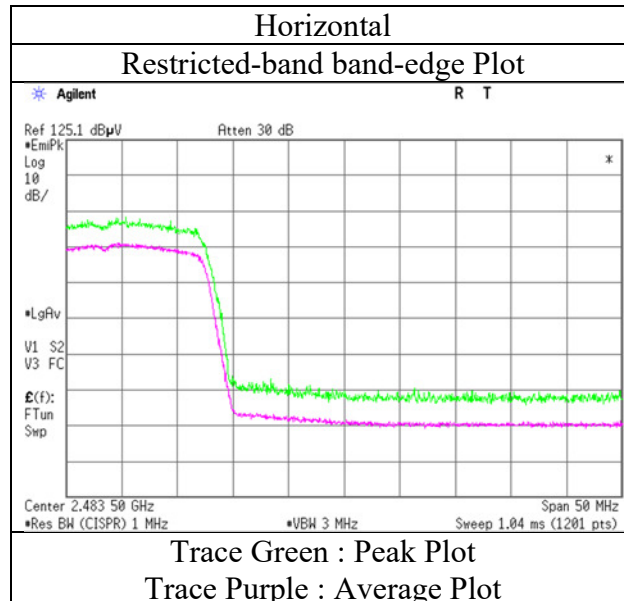
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 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)

Report No.	12079942H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 23, 2018
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Ken Fujita
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz



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

UL Japan, Inc.

Ise EMC Lab.

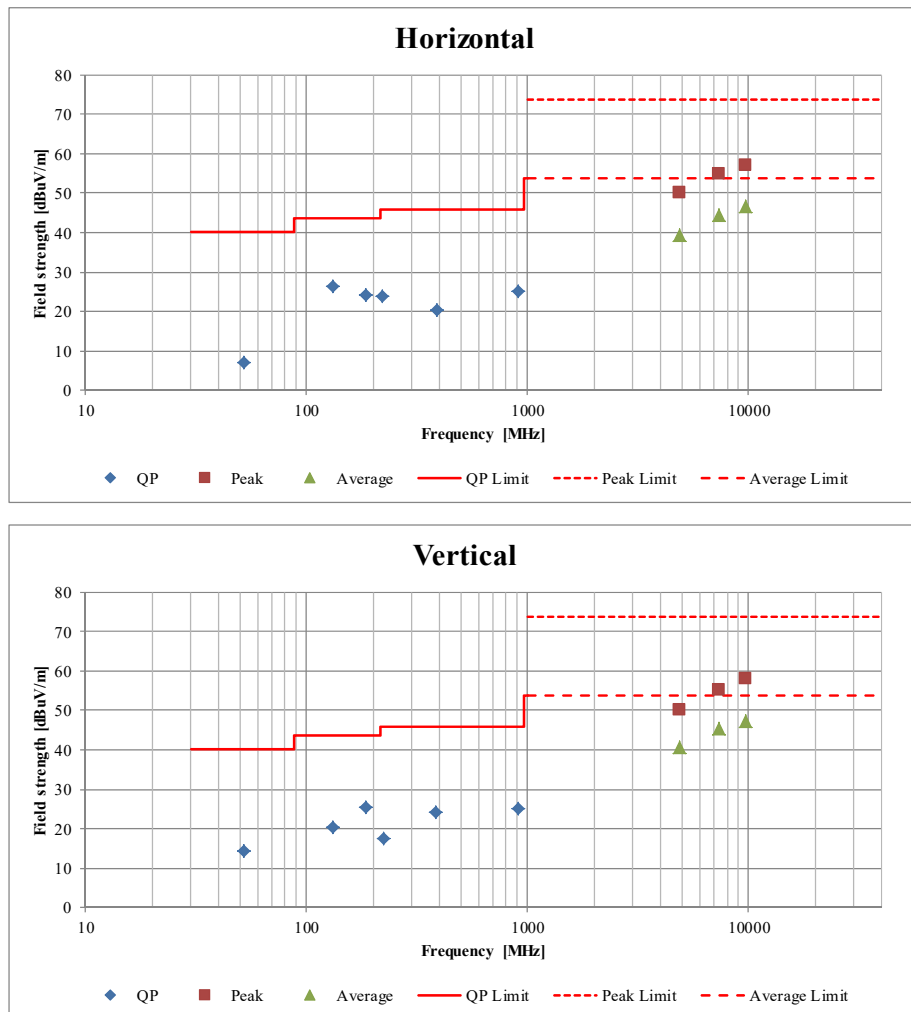
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12079942H	No.3	No.3
Test place	Ise EMC Lab.	February 2, 2018	February 6, 2018
Semi Anechoic Chamber	No.3	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Date	January 23, 2018	Tomoki Matsui	Takumi Shimada
Temperature / Humidity	22 deg. C / 33 % RH	(Above 10 GHz)	(Below 1 GHz)
Engineer	Ken Fujita		
Mode	(1 GHz - 10 GHz) Tx 11n-20 2437 MHz		



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

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Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 23, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 33 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takumi Shimada (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	46.220	QP	22.1	11.9	7.4	32.2	-	9.2	40.0	30.8	
Hori	139.102	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Hori	199.220	QP	23.4	16.6	9.2	32.1	-	17.1	43.5	26.4	
Hori	248.978	QP	29.4	11.6	9.6	32.0	-	18.6	46.0	27.4	
Hori	606.282	QP	20.9	19.1	12.0	32.0	-	20.0	46.0	26.0	
Hori	865.929	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Hori	2390.000	PK	42.5	27.7	6.7	32.4	-	44.5	73.9	29.4	
Hori	3602.347	PK	45.3	29.5	7.6	31.9	-	50.5	73.9	23.4	
Hori	4804.000	PK	42.1	31.6	8.2	31.4	-	50.5	73.9	23.4	Floor noise
Hori	7206.000	PK	42.1	36.0	9.5	32.1	-	55.5	73.9	18.4	Floor noise
Hori	9608.000	PK	42.3	38.5	10.3	32.9	-	58.2	73.9	15.7	Floor noise
Hori	2390.000	AV	31.1	27.7	6.7	32.4	2.0	35.1	53.9	18.8	*1)
Hori	3602.347	AV	35.5	29.5	7.6	31.9	2.0	42.7	53.9	11.2	*2)
Hori	4804.000	AV	29.2	31.6	8.2	31.4	-	37.6	53.9	16.3	Floor noise
Hori	7206.000	AV	30.1	36.0	9.5	32.1	-	43.5	53.9	10.4	Floor noise
Hori	9608.000	AV	29.9	38.5	10.3	32.9	-	45.8	53.9	8.1	Floor noise
Vert	46.220	QP	21.9	11.9	7.4	32.2	-	9.0	40.0	31.0	
Vert	139.102	QP	21.4	14.3	8.6	32.1	-	12.2	43.5	31.3	
Vert	199.220	QP	21.5	16.6	9.2	32.1	-	15.2	43.5	28.3	
Vert	248.978	QP	29.7	11.6	9.6	32.0	-	18.9	46.0	27.1	
Vert	606.282	QP	20.9	19.1	12.0	32.0	-	20.0	46.0	26.0	
Vert	865.929	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Vert	2390.000	PK	43.0	27.7	6.7	32.4	-	45.0	73.9	28.9	
Vert	3602.347	PK	45.9	29.5	7.6	31.9	-	51.1	73.9	22.8	
Vert	4804.000	PK	42.2	31.6	8.2	31.4	-	50.6	73.9	23.3	Floor noise
Vert	7206.000	PK	42.2	36.0	9.5	32.1	-	55.6	73.9	18.3	Floor noise
Vert	9608.000	PK	42.1	38.5	10.3	32.9	-	58.0	73.9	15.9	Floor noise
Vert	2390.000	AV	28.4	27.7	6.7	32.4	2.0	32.4	53.9	21.5	*1)
Vert	3602.347	AV	35.1	29.5	7.6	31.9	2.0	42.3	53.9	11.6	*2)
Vert	4804.000	AV	30.2	31.6	8.2	31.4	-	38.6	53.9	15.3	Floor noise
Vert	7206.000	AV	29.8	36.0	9.5	32.1	-	43.2	53.9	10.7	Floor noise
Vert	9608.000	AV	30.1	38.5	10.3	32.9	-	46.0	53.9	7.9	Floor noise

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

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

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

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

*2) Noise synchronized with duty of carrier frequency.

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	92.0	27.7	6.8	32.4	94.1	-	-	Carrier
Hori	2400.000	PK	46.3	27.7	6.8	32.4	48.4	74.1	25.7	
Vert	2402.000	PK	89.1	27.7	6.8	32.4	91.2	-	-	Carrier
Vert	2400.000	PK	47.1	27.7	6.8	32.4	49.2	71.2	22.0	

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

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Ise EMC Lab.

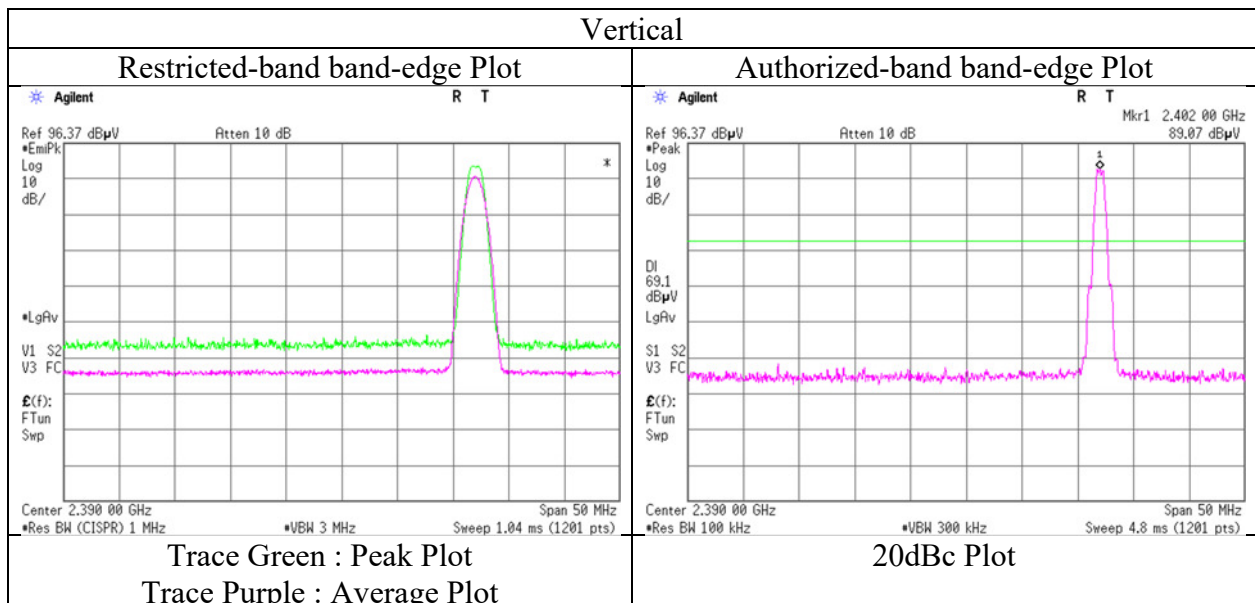
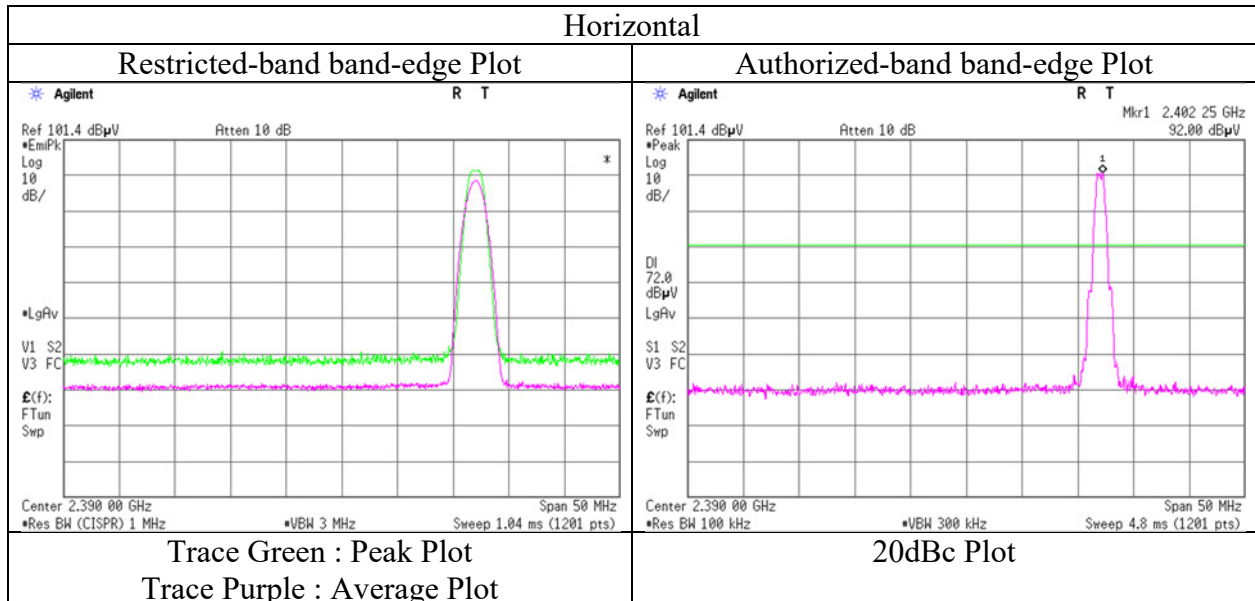
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	12079942H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 23, 2018
Temperature / Humidity	22 deg. C / 33 % RH
Engineer	Ken Fujita
	(1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz



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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 23, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 33 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takumi Shimada (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	46.180	QP	21.9	11.9	7.4	32.2	-	9.0	40.0	31.0	
Hori	139.104	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Hori	199.220	QP	21.8	16.6	9.2	32.1	-	15.5	43.5	28.0	
Hori	248.985	QP	29.0	11.6	9.6	32.0	-	18.2	46.0	27.8	
Hori	606.305	QP	20.9	19.1	12.0	32.0	-	20.0	46.0	26.0	
Hori	865.930	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Hori	3657.848	PK	44.8	29.6	7.6	31.8	-	50.2	73.9	23.7	
Hori	4880.000	PK	41.1	31.9	8.2	31.4	-	49.8	73.9	24.1	Floor noise
Hori	7320.000	PK	40.8	36.2	9.5	32.2	-	54.3	73.9	19.6	Floor noise
Hori	9760.000	PK	41.0	38.7	10.4	33.0	-	57.1	73.9	16.8	Floor noise
Hori	3657.848	AV	33.6	29.6	7.6	31.8	2.0	41.0	53.9	12.9	*1)
Hori	4880.000	AV	28.9	31.9	8.2	31.4	-	37.6	53.9	16.3	Floor noise
Hori	7320.000	AV	29.0	36.2	9.5	32.2	-	42.5	53.9	11.4	Floor noise
Hori	9760.000	AV	29.2	38.7	10.4	33.0	-	45.3	53.9	8.6	Floor noise
Vert	46.180	QP	22.1	11.9	7.4	32.2	-	9.2	40.0	30.8	
Vert	139.104	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Vert	199.220	QP	24.3	16.6	9.2	32.1	-	18.0	43.5	25.5	
Vert	248.985	QP	27.5	11.6	9.6	32.0	-	16.7	46.0	29.3	
Vert	606.305	QP	20.9	19.1	12.0	32.0	-	20.0	46.0	26.0	
Vert	865.930	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Vert	3657.848	PK	42.1	29.6	7.6	31.8	-	47.5	73.9	26.4	
Vert	4880.000	PK	41.2	31.9	8.2	31.4	-	49.9	73.9	24.0	Floor noise
Vert	7320.000	PK	41.0	36.2	9.5	32.2	-	54.5	73.9	19.4	Floor noise
Vert	9760.000	PK	40.9	38.7	10.4	33.0	-	57.0	73.9	16.9	Floor noise
Vert	3657.848	AV	31.8	29.6	7.6	31.8	2.0	39.2	53.9	14.7	*1)
Vert	4880.000	AV	29.3	31.9	8.2	31.4	-	38.0	53.9	15.9	Floor noise
Vert	7320.000	AV	29.1	36.2	9.5	32.2	-	42.6	53.9	11.3	Floor noise
Vert	9760.000	AV	29.3	38.7	10.4	33.0	-	45.4	53.9	8.5	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) Noise synchronized with duty of carrier frequency.

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 23, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 33 % RH	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takumi Shimada
	(1 GHz - 10 GHz)	(Above 10 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	46.180	QP	21.9	11.9	7.4	32.2	-	9.0	40.0	31.0	
Hori	139.103	QP	21.6	14.3	8.6	32.1	-	12.4	43.5	31.1	
Hori	199.202	QP	21.9	16.6	9.2	32.1	-	15.6	43.5	27.9	
Hori	248.977	QP	24.8	11.6	9.6	32.0	-	14.0	46.0	32.0	
Hori	606.326	QP	21.0	19.1	12.0	32.0	-	20.1	46.0	25.9	
Hori	865.932	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Hori	2483.500	PK	44.9	27.8	6.8	32.4	-	47.1	73.9	26.8	
Hori	4960.000	PK	40.4	32.1	8.3	31.3	-	49.5	73.9	24.4	Floor noise
Hori	7440.000	PK	42.8	36.4	9.5	32.2	-	56.5	73.9	17.4	Floor noise
Hori	9920.000	PK	42.3	38.9	10.4	33.1	-	58.5	73.9	15.4	Floor noise
Hori	2483.500	AV	30.8	27.8	6.8	32.4	2.0	35.0	53.9	18.9	*1)
Hori	4960.000	AV	27.7	32.1	8.3	31.3	-	36.8	53.9	17.1	Floor noise
Hori	7440.000	AV	29.6	36.4	9.5	32.2	-	43.3	53.9	10.6	Floor noise
Hori	9920.000	AV	29.1	38.9	10.4	33.1	-	45.3	53.9	8.6	Floor noise
Vert	46.180	QP	21.9	11.9	7.4	32.2	-	9.0	40.0	31.0	
Vert	139.103	QP	21.5	14.3	8.6	32.1	-	12.3	43.5	31.2	
Vert	199.202	QP	24.3	16.6	9.2	32.1	-	18.0	43.5	25.5	
Vert	248.977	QP	24.8	11.6	9.6	32.0	-	14.0	46.0	32.0	
Vert	606.326	QP	20.9	19.1	12.0	32.0	-	20.0	46.0	26.0	
Vert	865.932	QP	21.0	21.5	13.3	31.1	-	24.7	46.0	21.3	
Vert	2483.500	PK	44.6	27.8	6.8	32.4	-	46.8	73.9	27.1	
Vert	4960.000	PK	43.5	32.1	8.3	31.3	-	52.6	73.9	21.3	Floor noise
Vert	7440.000	PK	43.0	36.4	9.5	32.2	-	56.7	73.9	17.2	Floor noise
Vert	9920.000	PK	42.2	38.9	10.4	33.1	-	58.4	73.9	15.5	Floor noise
Vert	2483.500	AV	31.8	27.8	6.8	32.4	2.0	36.0	53.9	17.9	*1)
Vert	4960.000	AV	29.9	32.1	8.3	31.3	-	39.0	53.9	14.9	Floor noise
Vert	7440.000	AV	30.2	36.4	9.5	32.2	-	43.9	53.9	10.0	Floor noise
Vert	9920.000	AV	30.3	38.9	10.4	33.1	-	46.5	53.9	7.4	Floor noise

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

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

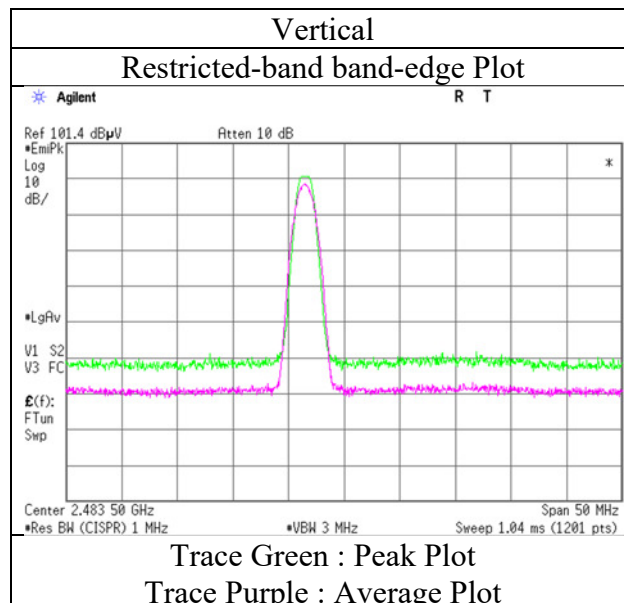
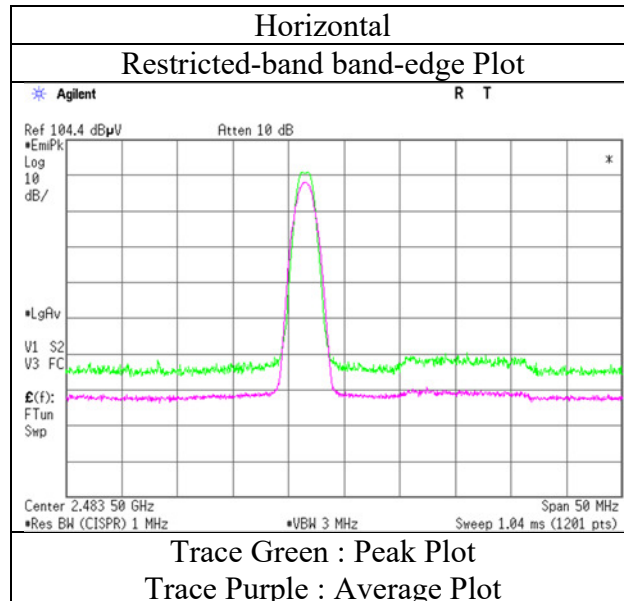
Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB

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)

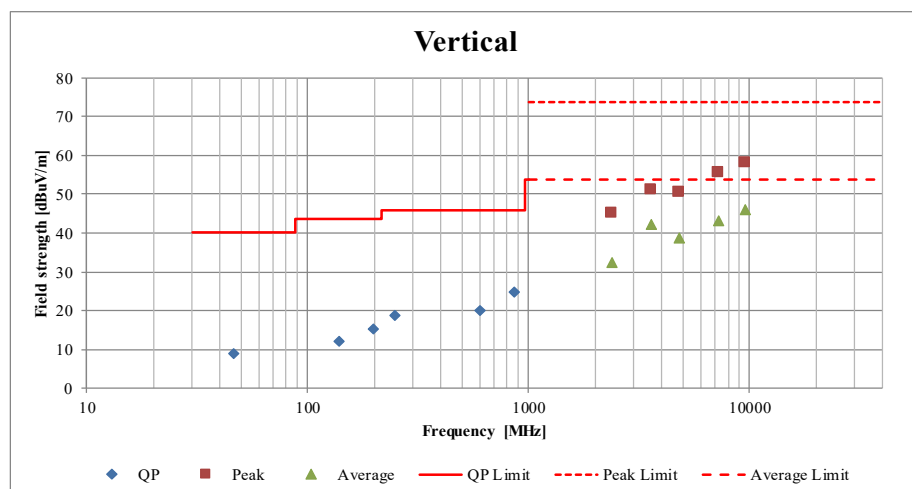
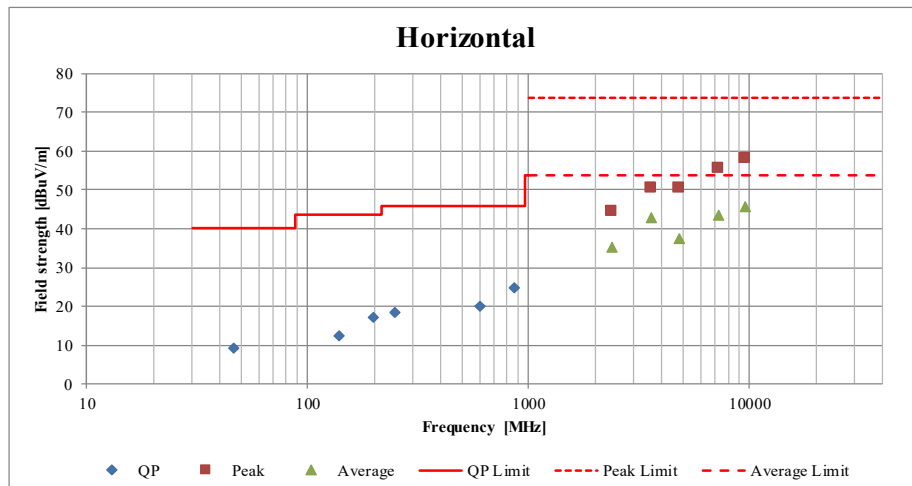
Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 23, 2018
Temperature / Humidity 22 deg. C / 33 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx BT LE 2480 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

Report No.	12079942H	No.3	No.3
Test place	Ise EMC Lab.	February 2, 2018	February 6, 2018
Semi Anechoic Chamber	No.3	23 deg. C / 32 % RH	20 deg. C / 30 % RH
Date	January 23, 2018	Tomoki Matsui	Takumi Shimada
Temperature / Humidity	22 deg. C / 33 % RH	(Above 10 GHz)	(Below 1 GHz)
Engineer	Ken Fujita		
Mode	(1 GHz - 10 GHz) Tx BT LE 2402 MHz		



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

Radiated Spurious Emission

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 23, 2018 February 2, 2018
Temperature / Humidity 22 deg. C / 33 % RH 23 deg. C / 32 % RH
Engineer Ken Fujita Tomoki Matsui
(1 GHz - 10 GHz) (Above 10 GHz)
Mode Tx BT LE 2402 MHz + Tx 11ac-40 5550 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	42.4	27.7	6.7	32.4	-	44.4	73.9	29.5	
Hori	2390.000	AV	31.0	27.7	6.7	32.4	2.0	35.0	53.9	18.9	*1)
Vert	2390.000	PK	43.1	27.7	6.7	32.4	-	45.1	73.9	28.8	
Vert	2390.000	AV	29.1	27.7	6.7	32.4	2.0	33.1	53.9	20.8	*1)

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

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

Distance factor: 1 GHz - 10 GHz $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
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	2402.000	PK	94.8	27.7	6.8	32.4	96.9	-	-	Carrier
Hori	2400.000	PK	38.8	27.7	6.8	32.4	40.9	76.9	36.0	
Vert	2402.000	PK	92.2	27.7	6.8	32.4	94.3	-	-	Carrier
Vert	2400.000	PK	47.0	27.7	6.8	32.4	49.1	76.9	27.8	

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

Radiated Spurious Emission

Report No.	12079942H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 23, 2018	February 2, 2018	February 6, 2018
Temperature / Humidity	22 deg. C / 33 % RH	23 deg. C / 32 % RH	22 deg. C / 29 % RH
Engineer	Ken Fujita	Tomoki Matsui	Takafumi Noguchi
	(1 GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx BT LE 2440 MHz + Tx 11ac-40 5550 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	52.000	QP	22.1	10.0	7.5	32.2	-	7.4	40.0	32.6	
Hori	96.574	QP	27.3	9.5	8.1	32.2	-	12.7	43.5	30.8	
Hori	150.429	QP	29.3	15.0	8.7	32.1	-	20.9	43.5	22.6	
Hori	174.573	QP	26.5	16.1	9.0	32.1	-	19.5	43.5	24.0	
Hori	215.429	QP	38.7	11.3	9.3	32.1	-	27.2	43.5	16.3	
Hori	341.717	QP	25.9	14.3	10.3	32.0	-	18.5	46.0	27.5	
Hori	4880.000	PK	41.1	31.9	8.2	31.4	-	49.8	73.9	24.1	Floor noise
Hori	7320.000	PK	40.8	36.2	9.5	32.2	-	54.3	73.9	19.6	Floor noise
Hori	9760.000	PK	41.0	38.7	10.4	33.0	-	57.1	73.9	16.8	Floor noise
Hori	4880.000	AV	28.9	31.9	8.2	31.4	-	37.6	53.9	16.3	Floor noise
Hori	7320.000	AV	29.0	36.2	9.5	32.2	-	42.5	53.9	11.4	Floor noise
Hori	9760.000	AV	29.2	38.7	10.4	33.0	-	45.3	53.9	8.6	Floor noise
Vert	52.000	QP	32.4	10.0	7.5	32.2	-	17.7	40.0	22.3	
Vert	96.574	QP	32.2	9.5	8.1	32.2	-	17.6	43.5	25.9	
Vert	150.429	QP	33.5	15.0	8.7	32.1	-	25.1	43.5	18.4	
Vert	174.573	QP	29.5	16.1	9.0	32.1	-	22.5	43.5	21.0	
Vert	215.429	QP	31.3	11.3	9.3	32.1	-	19.8	43.5	23.7	
Vert	341.717	QP	25.9	14.3	10.3	32.0	-	18.5	46.0	27.5	
Vert	4880.000	PK	41.2	31.9	8.2	31.4	-	49.9	73.9	24.0	Floor noise
Vert	7320.000	PK	41.0	36.2	9.5	32.2	-	54.5	73.9	19.4	Floor noise
Vert	9760.000	PK	40.9	38.7	10.4	33.0	-	57.0	73.9	16.9	Floor noise
Vert	4880.000	AV	29.3	31.9	8.2	31.4	-	38.0	53.9	15.9	Floor noise
Vert	7320.000	AV	29.1	36.2	9.5	32.2	-	42.6	53.9	11.3	Floor noise
Vert	9760.000	AV	29.3	38.7	10.4	33.0	-	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
 10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Radiated Spurious Emission

Report No. 12079942H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date January 23, 2018
Temperature / Humidity 22 deg. C / 33 % RH
Engineer Ken Fujita
(1 GHz - 10 GHz)
Mode Tx BT LE 2480 MHz + Tx 11ac-40 5550 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	44.8	27.8	6.8	32.4	-	47.0	73.9	26.9	
Hori	2483.500	AV	31.4	27.8	6.8	32.4	2.0	35.6	53.9	18.3	*1)
Vert	2483.500	PK	44.7	27.8	6.8	32.4	-	46.9	73.9	27.0	
Vert	2483.500	AV	30.7	27.8	6.8	32.4	2.0	34.9	53.9	19.0	*1)

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

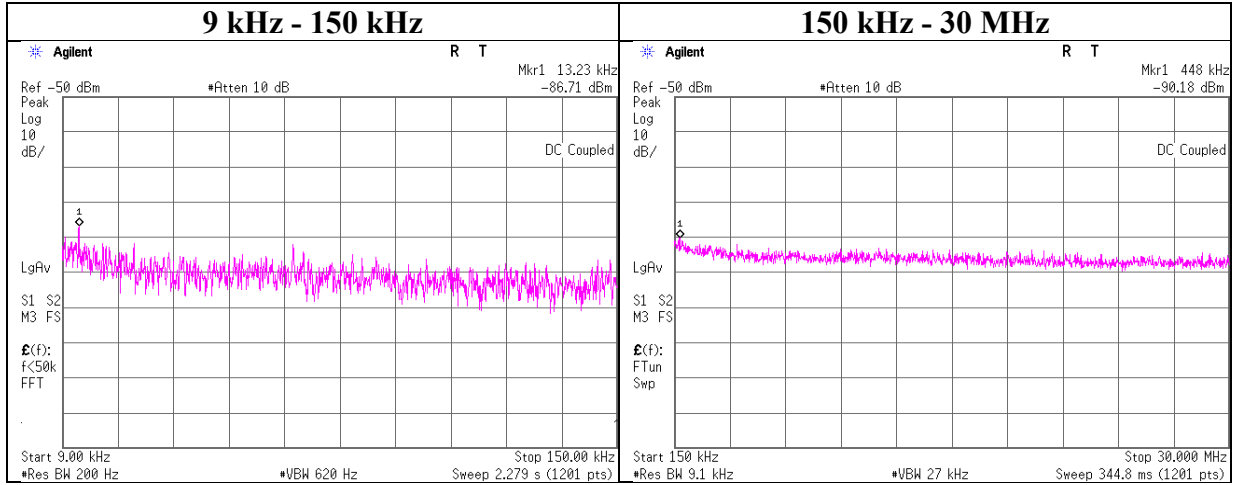
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

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

Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 26, 2018
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-20 2437 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
13.23	-86.7	0.50	9.8	7.1	2	-66.3	300	6.0	-5.0	45.1	50.1	
448.00	-90.2	0.50	9.8	7.1	2	-69.8	300	6.0	-8.5	14.5	23.0	

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

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

N: Number of output

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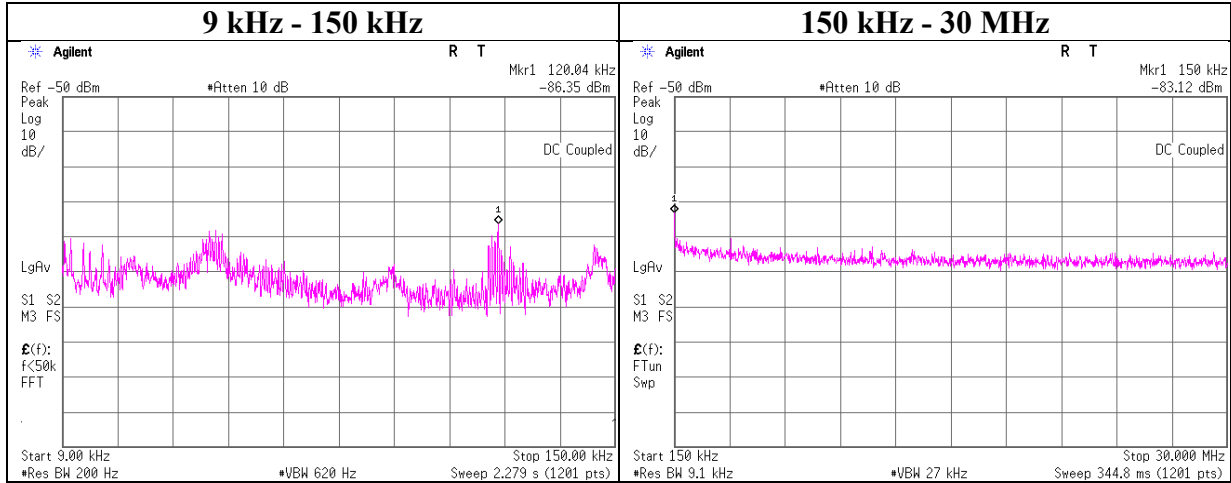
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % 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
120.04	-86.4	0.74	9.9	6.4	1	-69.4	300	6.0	-8.1	26.0	34.1	
150.00	-83.1	0.77	9.9	6.4	1	-66.1	300	6.0	-4.8	24.0	28.8	

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

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

N: Number of output

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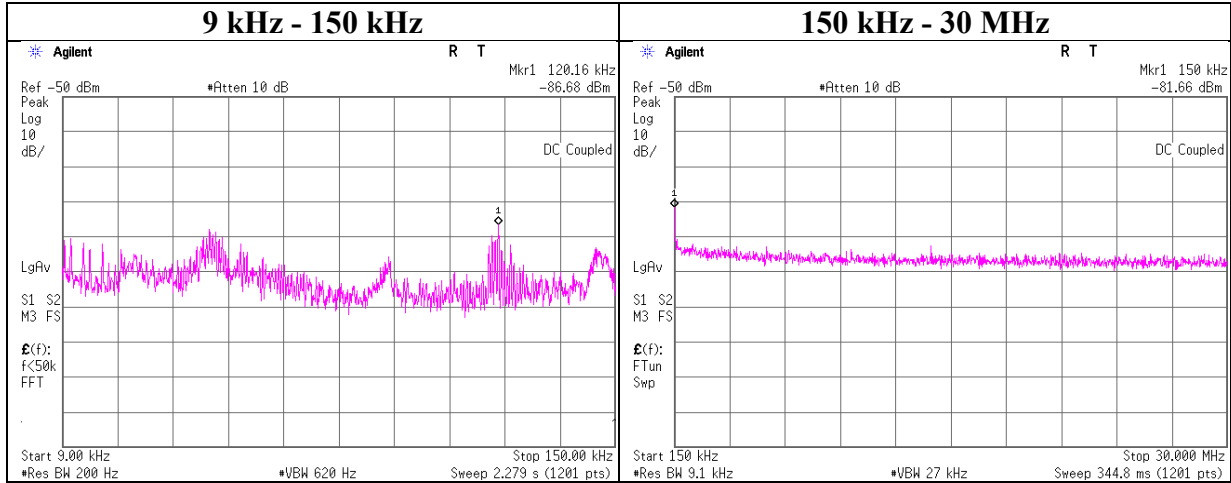
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % 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
120.16	-86.7	0.74	9.9	6.4	1	-69.7	300	6.0	-8.4	26.0	34.4	
150.00	-81.7	0.77	9.9	6.4	1	-64.6	300	6.0	-3.4	24.0	27.4	

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

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

N: Number of output

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Ise EMC Lab.

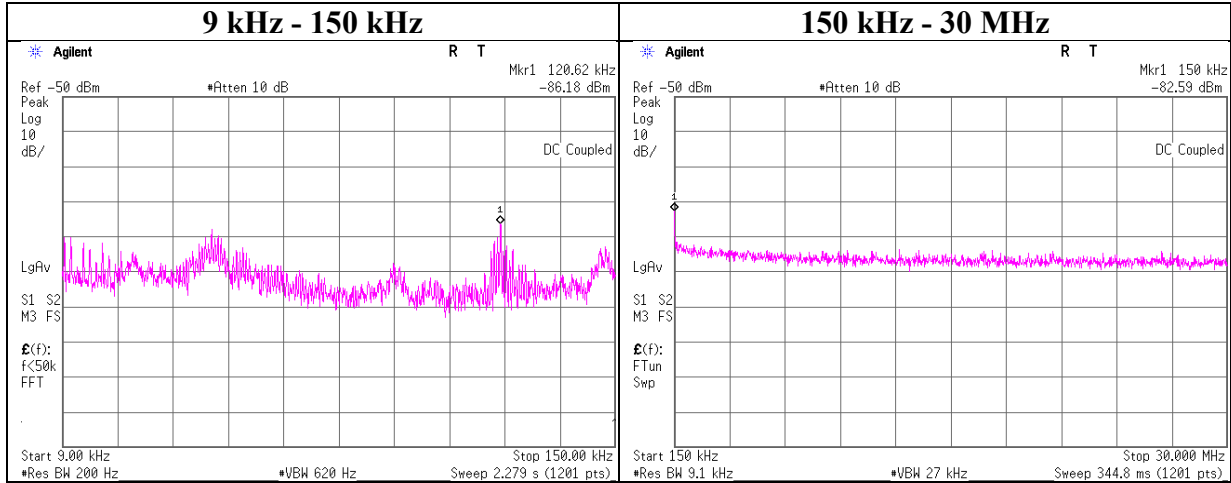
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % 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
120.62	-86.2	0.74	9.9	6.4	1	-69.2	300	6.0	-7.9	25.9	33.8	
150.00	-82.6	0.77	9.9	6.4	1	-65.6	300	6.0	-4.3	24.0	28.3	

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

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

N: Number of output

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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 26, 2018
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Takumi Shimada
Mode	Tx 11b

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result	Antenna port WB Result	Result		Limit	Margin
	[mW]	[mW]	[dBm]	[mW]	[dBm]	[dB]
2412.00	0.029	0.029	-12.37	0.058	8.00	20.37
2437.00	0.034	0.031	-11.87	0.065	8.00	19.87
2462.00	0.032	0.029	-12.13	0.061	8.00	20.13

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-26.53	1.40	9.74	-15.39	0.029	8.00	23.39
2437.00	-25.82	1.40	9.74	-14.68	0.034	8.00	22.68
2462.00	-26.10	1.41	9.74	-14.95	0.032	8.00	22.95

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-26.52	1.40	9.74	-15.38	0.029	8.00	23.38
2437.00	-26.23	1.40	9.74	-15.09	0.031	8.00	23.09
2462.00	-26.48	1.41	9.74	-15.33	0.029	8.00	23.33

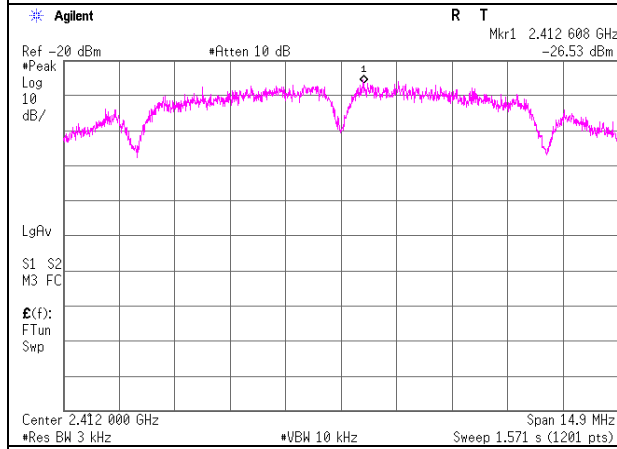
Sample Calculation:

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

Power Density

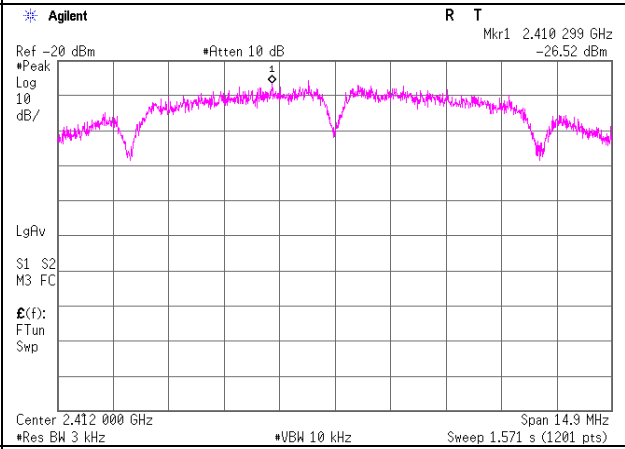
11b Antenna port WA

2412 MHz

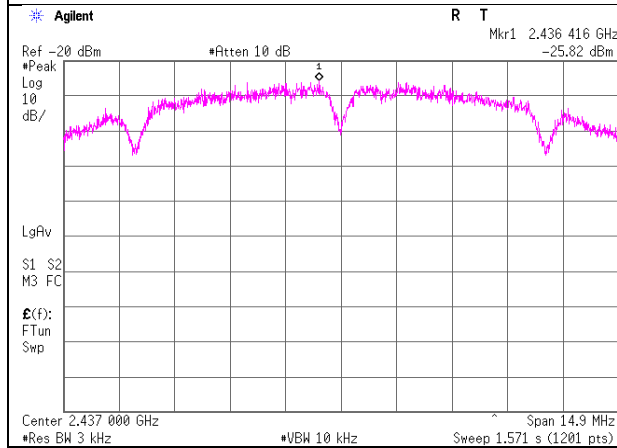


11b Antenna port WB

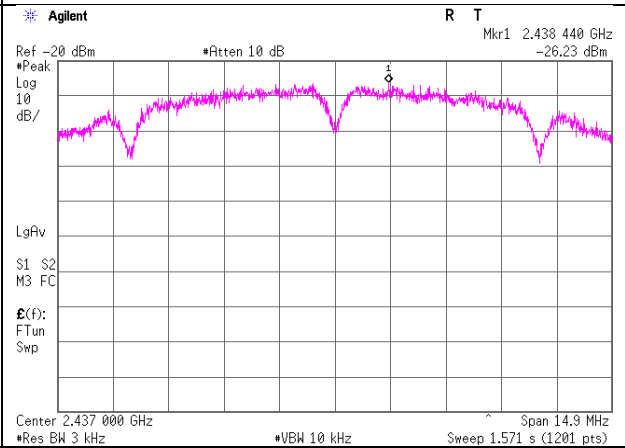
2412 MHz



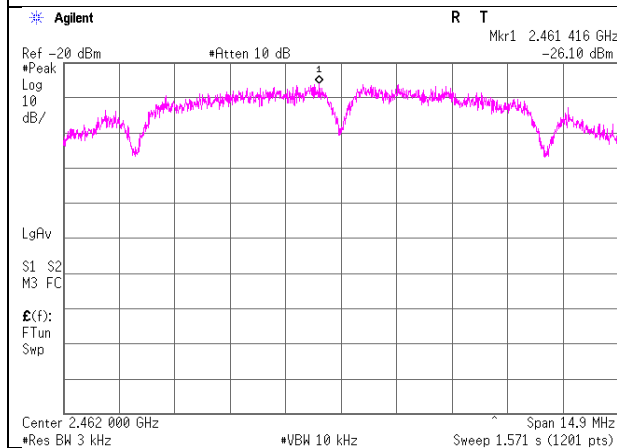
2437 MHz



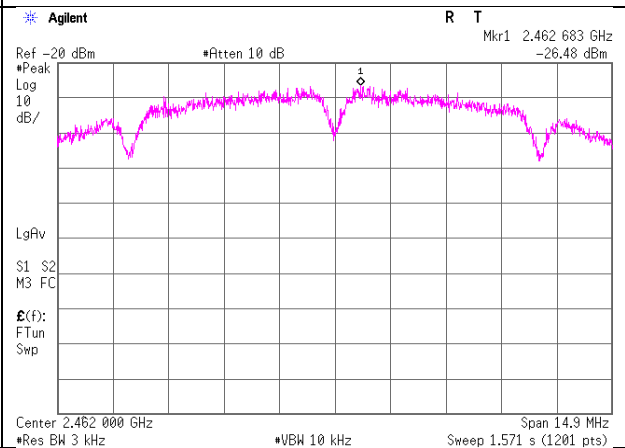
2437 MHz



2462 MHz



2462 MHz



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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 26, 2018
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Takumi Shimada
Mode	Tx 11g

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result	Antenna port WB Result	Result		Limit	Margin
	[mW]	[mW]	[dBm]	[mW]	[dBm]	[dB]
2412.00	0.023	0.023	-13.39	0.046	8.00	21.39
2437.00	0.023	0.027	-13.04	0.050	8.00	21.04
2462.00	0.027	0.020	-13.24	0.047	8.00	21.24

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-27.47	1.40	9.74	-16.33	0.023	8.00	24.33
2437.00	-27.60	1.40	9.74	-16.46	0.023	8.00	24.46
2462.00	-26.78	1.41	9.74	-15.63	0.027	8.00	23.63

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-27.61	1.40	9.74	-16.47	0.023	8.00	24.47
2437.00	-26.81	1.40	9.74	-15.67	0.027	8.00	23.67
2462.00	-28.12	1.41	9.74	-16.97	0.020	8.00	24.97

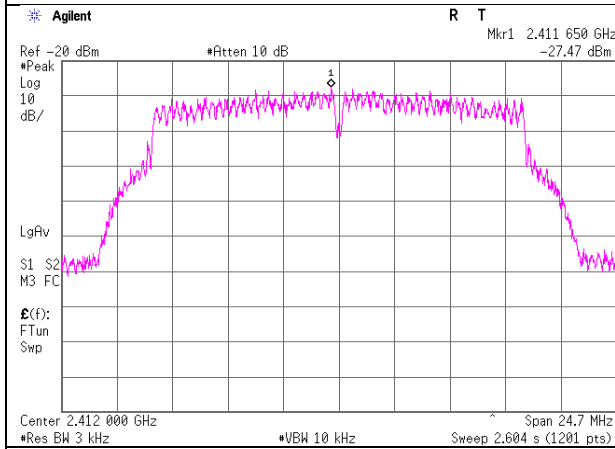
Sample Calculation:

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

Power Density

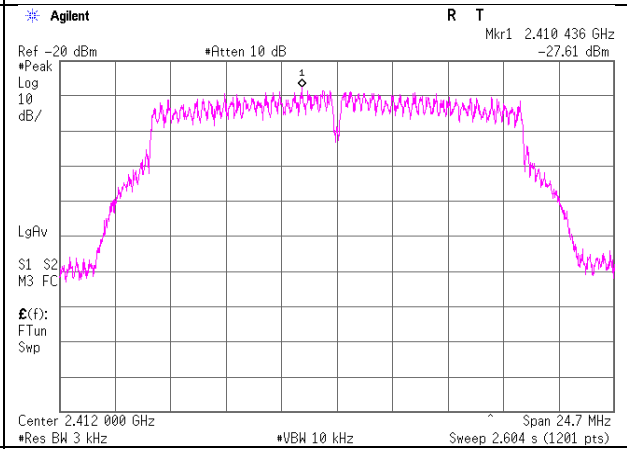
11g Antenna port WA

2412 MHz

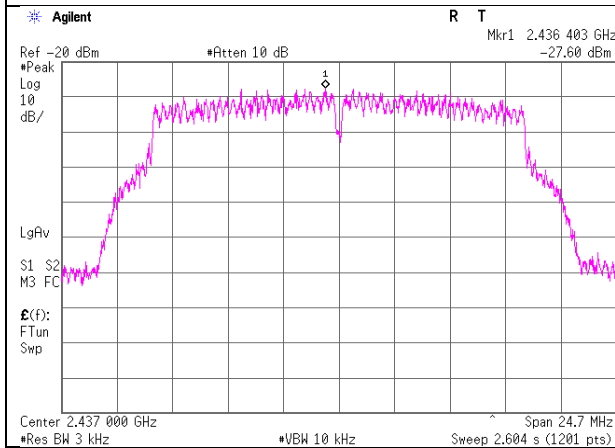


11g Antenna port WB

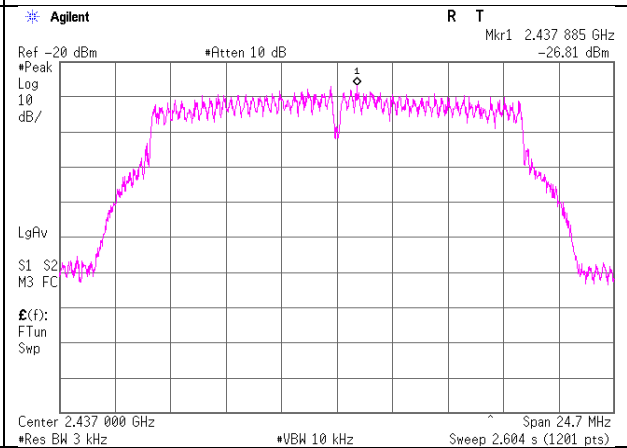
2412 MHz



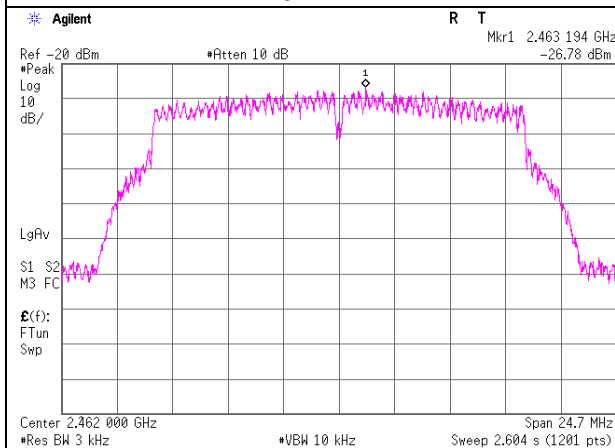
2437 MHz



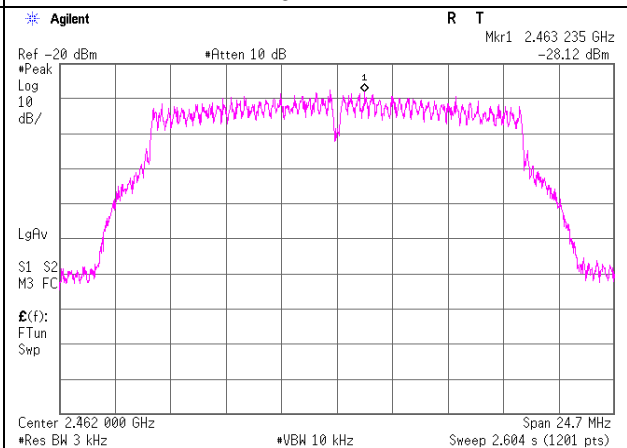
2437 MHz



2462 MHz



2462 MHz



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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079942H
Date	January 26, 2018
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-20

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result	Antenna port WB Result	Result		Limit	Margin
	[mW]	[mW]	[dBm]	[mW]	[dBm]	[dB]
2412.00	0.026	0.021	-13.27	0.047	8.00	21.27
2437.00	0.023	0.032	-12.63	0.055	8.00	20.63
2462.00	0.025	0.018	-13.65	0.043	8.00	21.65

Sample Calculation:

Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-26.99	1.40	9.74	-15.85	0.026	8.00	23.85
2437.00	-27.55	1.40	9.74	-16.41	0.023	8.00	24.41
2462.00	-27.22	1.41	9.74	-16.07	0.025	8.00	24.07

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit	Margin
				[dBm]	[mW]	[dBm]	[dB]
2412.00	-27.90	1.40	9.74	-16.76	0.021	8.00	24.76
2437.00	-26.13	1.40	9.74	-14.99	0.032	8.00	22.99
2462.00	-28.50	1.41	9.74	-17.35	0.018	8.00	25.35

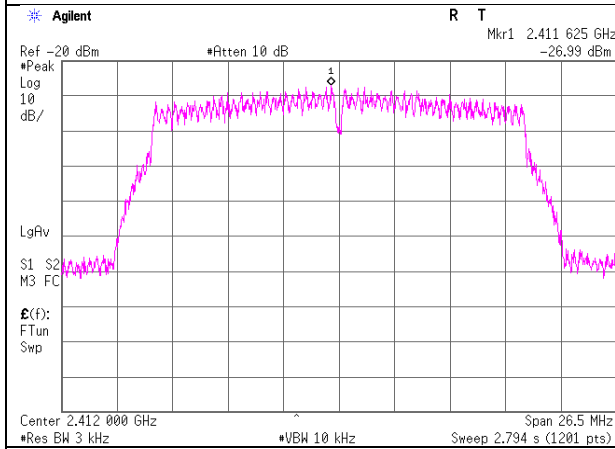
Sample Calculation:

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

Power Density

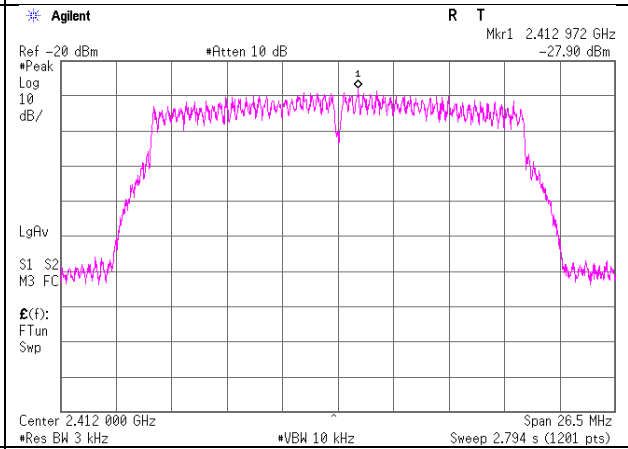
11n-20 Antenna port WA

2412 MHz

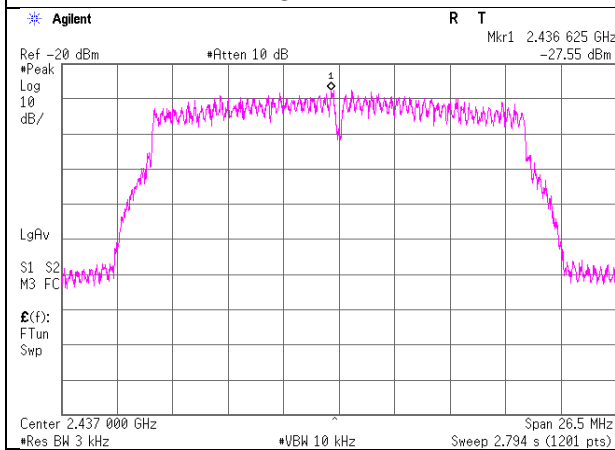


11n-20 Antenna port WB

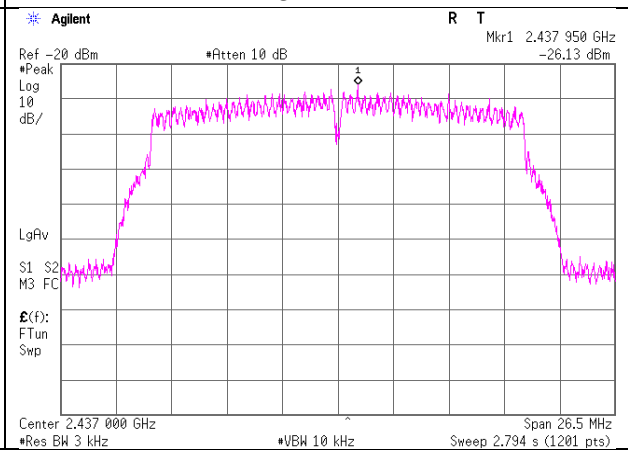
2412 MHz



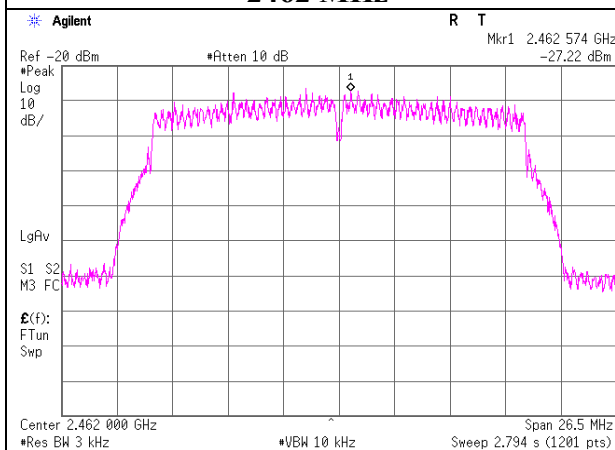
2437 MHz



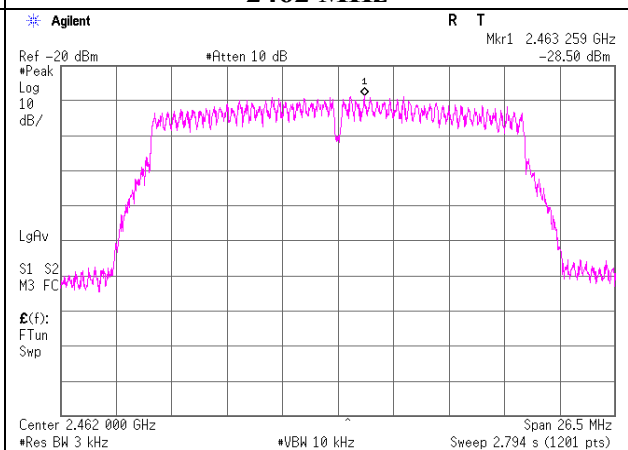
2437 MHz



2462 MHz



2462 MHz



Power Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 12079942H
Date January 24, 2018
Temperature / Humidity 23 deg. C / 20 % RH
Engineer Takafumi Noguchi
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-23.76	1.40	9.71	-12.65	8.00	20.65
2440.00	-24.22	1.40	9.71	-13.11	8.00	21.11
2480.00	-24.06	1.41	9.71	-12.94	8.00	20.94

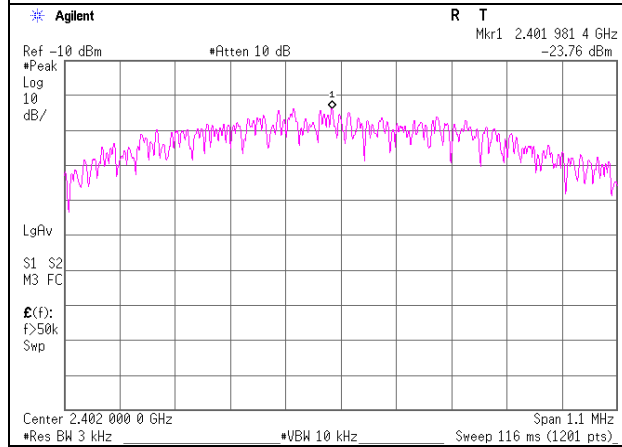
Sample Calculation:

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

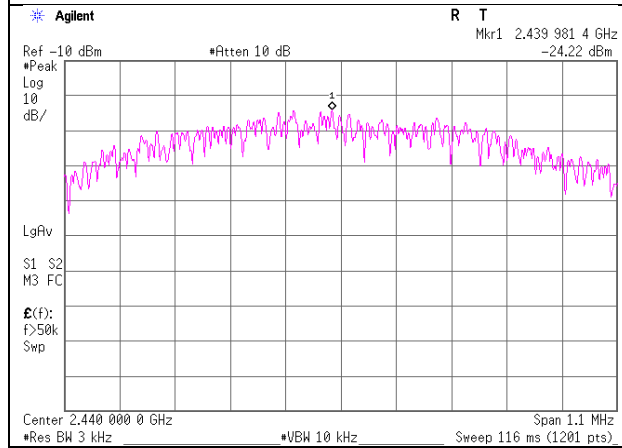
Power Density

BT LE

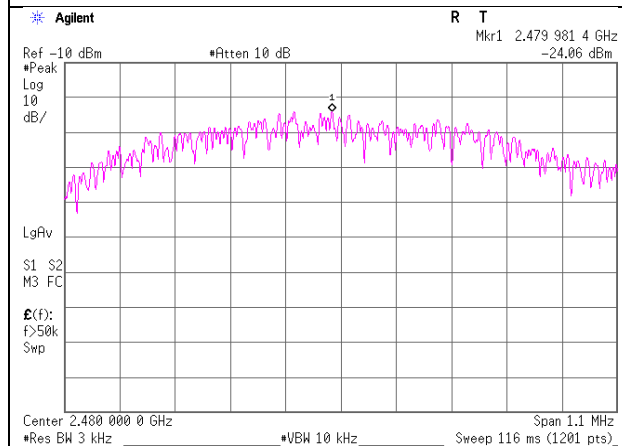
2402 MHz



2440 MHz



2480 MHz



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APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE	2017/07/20 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	CE	2017/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2017/12/19 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2017/10/31 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2018/01/24 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2017/08/22 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2017/05/22 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2017/03/21 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/CE	2018/01/09 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2017/09/22 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2017/08/22 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2017/10/02 * 12
MLA-22	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2018/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2017/07/12 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2017/12/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2017/10/13 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2017/10/13 * 12
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2017/06/20 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2017/06/20 * 12
MAT-88	Attenuator	Weinschel Associates	WA56-10	56100304	AT	2017/06/12 * 12
MAT-89	Attenuator	Weinschel Associates	WA56-10	56100305	AT	2017/06/12 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2017/12/21 * 12
MCC-174	Microwave Cable	Junkosha	MWX221	1409S497	AT	2017/03/13 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2017/11/14 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2017/11/16 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	AT	2017/03/24 * 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
RE: Radiated Spurious Emission
AT: Antenna Terminal Conducted test

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