RADIO TEST REPORT

Test Report No. : 12079941H-B-R1

Applicant	:	**Sony Interactive Entertainment Inc.**
Type of Equipment	:	**Wireless communication module**
Model No.	:	**AW-CB319**
FCC ID	:	**AK8M18DAQ1**
Test regulation	:	**FCC Part 15 Subpart C: 2018** ***WLAN, Bluetooth Low Energy parts**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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 12079941H-B. 12079941H-B is replaced with this report.

Date of test: January 23 to February 7, 2018

Representative test engineer:
Ken Fujita
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
Leader
Consumer Technology Division

NVLAP TESTING
NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

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

REVISION HISTORY

Original Test Report No.: 12079941H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12079941H-B	March 8, 2018	-	-
1	12079941H-B-R1	March 13, 2018	P.23, 24, 25	Correction of note pertaining to the limit.
1	12079941H-B-R1	March 13, 2018	P.23, 24, 25	Correction of limit: from 29.00 [dBm] to 28.89 [dBm] from 794 [mW] to 774.46 [mW]
1	12079941H-B-R1	March 13, 2018	P.26	Correction of limit: from 912 [mW] to 912.01 [mW]

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	AW-CB319
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

AW-CB319 is the Wireless communication module.

Product Specification

Clock frequency in the system (radio part)	26 MHz
Operating Temperature	-10 deg. C - +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, π/4DQPSK, 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 = $10\log\left(\left(10^{\frac{G_{ANT1}}{20}}+10^{\frac{G_{ANT2}}{20}}\right)^2/2\right)$

*This test report applies to WLAN (2.4 GHz 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 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** 27.6 dB, 0.15000 MHz, N **AV** 28.5 dB, 0.15000 MHz, N	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	3.9 dB 3603.002 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.

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

Test Item		Uncertainty (+/-)
RF output power		1.3 dB
Antenna terminal conducted emission / Power dencity / Burst power		2.7 dB
Adjacent channnel power / Channnel 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

Test 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

* 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

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

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n MIMO 20MHz BW (11n-20)	MCS 5, 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)	
*The power value of the EUT was set for testing as follows (setting value might be different from product specification value); 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	2462 MHz
Spurious Emission (Conducted)	11n-20 Tx *1)	WA	2462 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-20 5700 MHz Tx BT LE 2440 MHz + 11ac-20 5700 MHz Tx BT LE 2480 MHz + 11ac-20 5700 MHz
*1) The test was performed on the mode as a representative, because it had the highest power of 5GHz band at antenna terminal test.	

4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane.
The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

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	3 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)		3 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 x log (4.5 m / 3.0 m) = 3.5 dB
*3) Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 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).

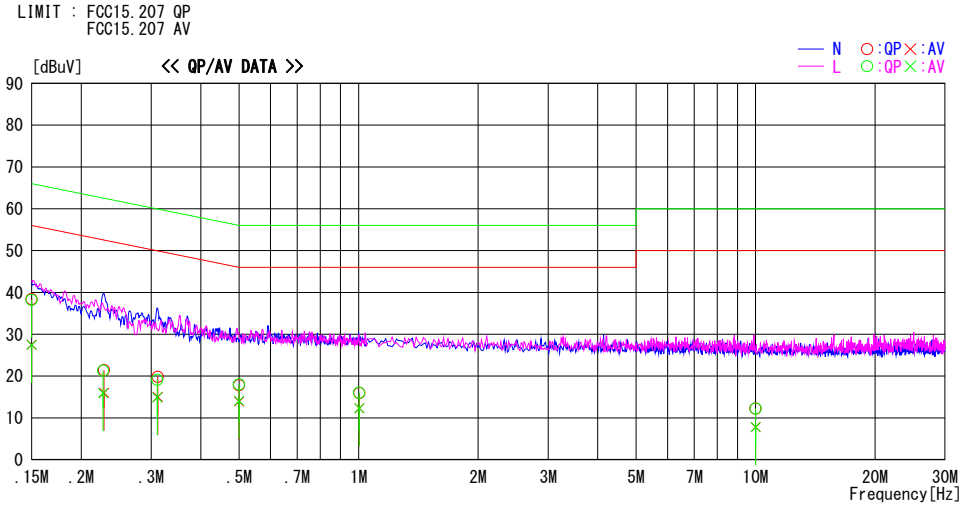
The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : **APPENDIX**
Test result : **Pass**

APPENDIX 1: Test data

Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12079941H
Date	February 7, 2018
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11n-20 2462 MHz

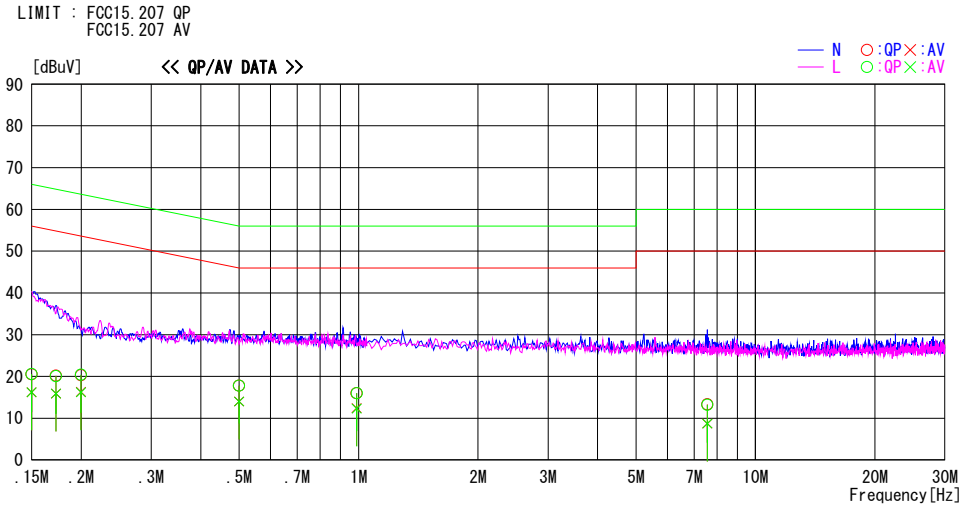


Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15000	25.2	14.3	13.2	38.4	27.5	66.0	56.0	27.6	28.5	N
0.22827	8.2	2.8	13.2	21.4	16.0	62.5	52.5	41.1	36.5	N
0.31183	6.6	1.8	13.2	19.8	15.0	59.9	49.9	40.1	34.9	N
0.50000	4.5	0.6	13.3	17.8	13.9	56.0	46.0	38.2	32.1	N
1.00418	2.6	-1.0	13.3	15.9	12.3	56.0	46.0	40.1	33.7	N
9.99674	-1.7	-6.1	13.9	12.2	7.8	60.0	50.0	47.8	42.2	N
0.15000	25.0	14.2	13.2	38.2	27.4	66.0	56.0	27.8	28.6	L
0.22718	8.1	2.7	13.2	21.3	15.9	62.6	52.6	41.3	36.7	L
0.31105	5.9	1.7	13.2	19.1	14.9	59.9	49.9	40.8	35.0	L
0.50000	4.7	0.8	13.3	18.0	14.1	56.0	46.0	38.0	31.9	L
1.00358	2.7	-1.0	13.3	16.0	12.3	56.0	46.0	40.0	33.7	L
10.00454	-1.7	-6.1	13.9	12.2	7.8	60.0	50.0	47.8	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.

Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12079941H
Date	February 7, 2018
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2480 MHz



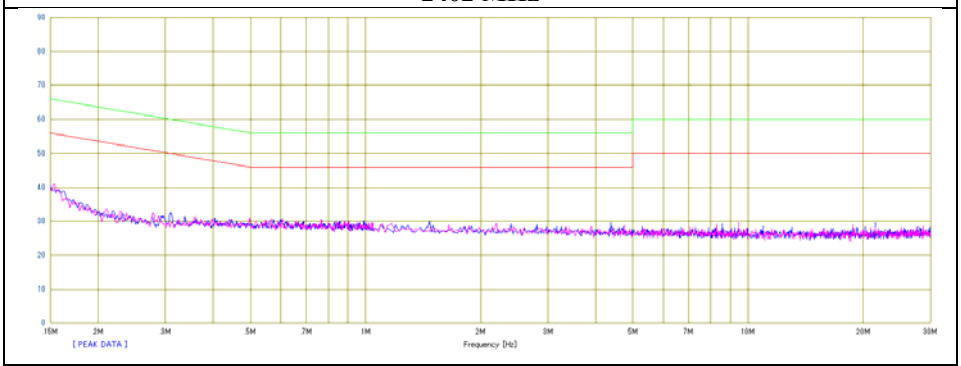
Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15000	7.3	3.0	13.2	20.5	16.2	66.0	56.0	45.5	39.8	N
0.17272	7.0	2.7	13.2	20.2	15.9	64.8	54.8	44.6	38.9	N
0.19982	7.1	3.1	13.2	20.3	16.3	63.6	53.6	43.3	37.3	N
0.50000	4.5	0.7	13.3	17.8	14.0	56.0	46.0	38.2	32.0	N
0.98860	2.7	-0.9	13.3	16.0	12.4	56.0	46.0	40.0	33.6	N
7.56302	-0.5	-5.1	13.8	13.3	8.7	60.0	50.0	46.7	41.3	N
0.15000	7.4	3.0	13.2	20.6	16.2	66.0	56.0	45.4	39.8	L
0.17273	6.9	2.7	13.2	20.1	15.9	64.8	54.8	44.7	38.9	L
0.19982	7.2	3.0	13.2	20.4	16.2	63.6	53.6	43.2	37.4	L
0.50000	4.5	0.7	13.3	17.8	14.0	56.0	46.0	38.2	32.0	L
0.98895	2.7	-1.0	13.3	16.0	12.3	56.0	46.0	40.0	33.7	L
7.56305	-0.6	-5.1	13.8	13.2	8.7	60.0	50.0	46.8	41.3	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.

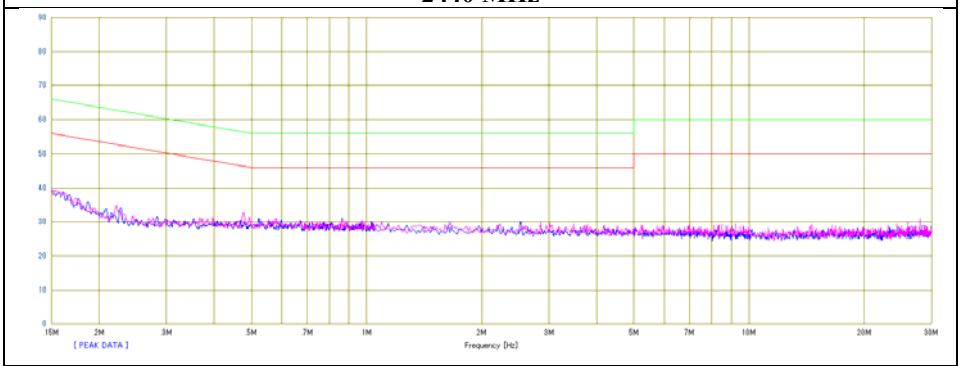
Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12079941H
Date	February 7, 2018
Temperature / Humidity	24 deg. C / 30 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

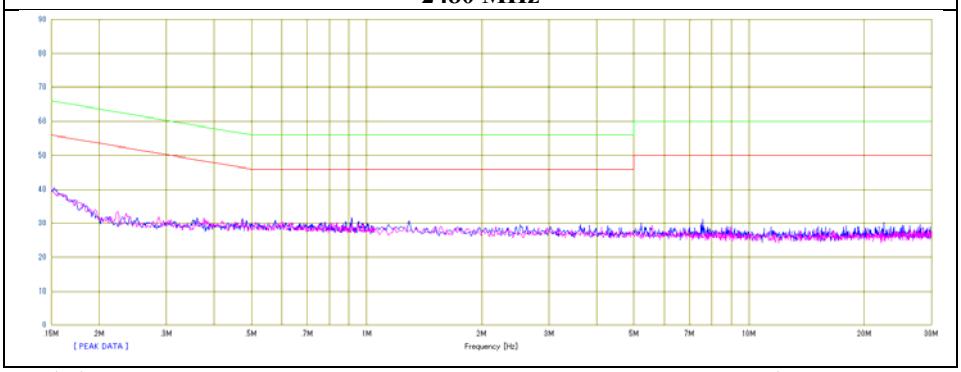
2402 MHz



2440 MHz



2480 MHz



Y scale [dBuV]

Chart — N — L

6 dB Bandwidth and 99 % Occupied Bandwidth

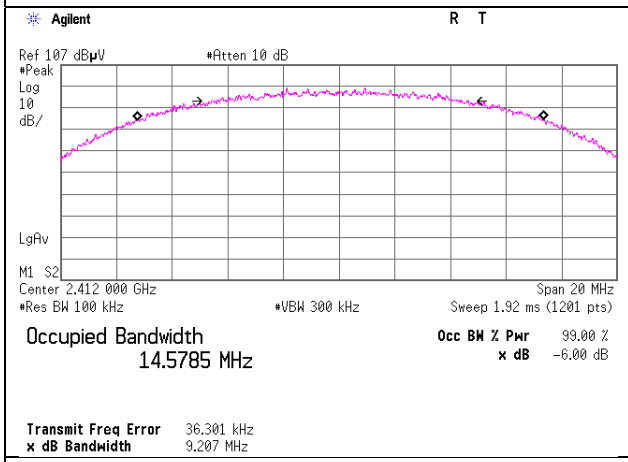
Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079941H	
Date	January 24, 2018	January 26, 2018
Temperature / Humidity	23 deg. C / 20 % RH	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
Mode	Tx	

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	14659.2	9.207	> 0.500
	2437	14651.9	9.396	> 0.500
	2462	14671.3	9.893	> 0.500
11g	2412	16801.3	16.424	> 0.500
	2437	16776.7	16.292	> 0.500
	2462	16817.8	16.380	> 0.500
11n-20	2412	17866.8	17.530	> 0.500
	2437	17811.1	17.244	> 0.500
	2462	17795.4	17.573	> 0.500
BT LE	2402	1038.1	0.697	> 0.500
	2440	1037.8	0.704	> 0.500
	2480	1037.5	0.696	> 0.500

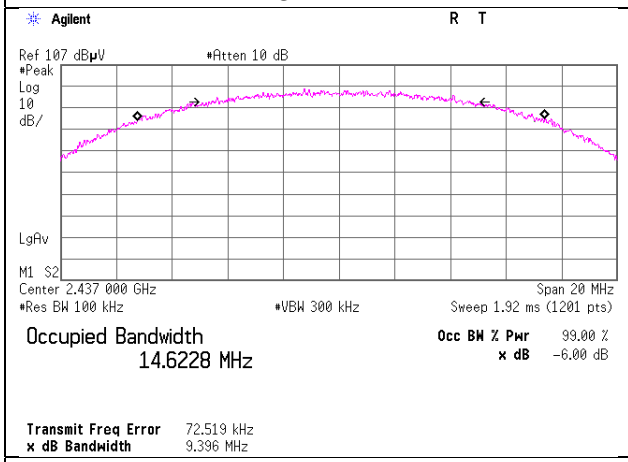
6dB Bandwidth

11b

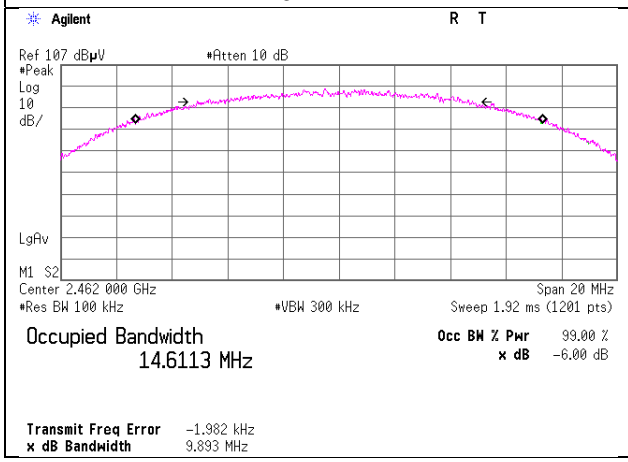
2412 MHz



2437 MHz

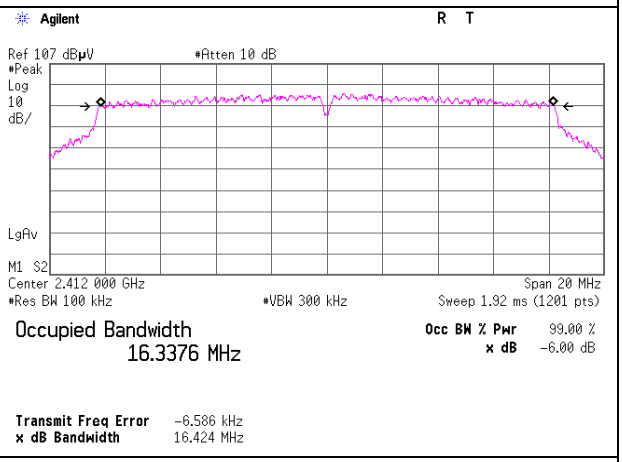


2462 MHz

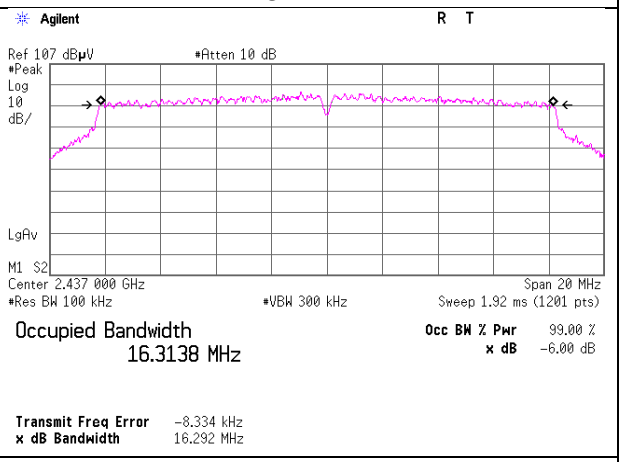


11g

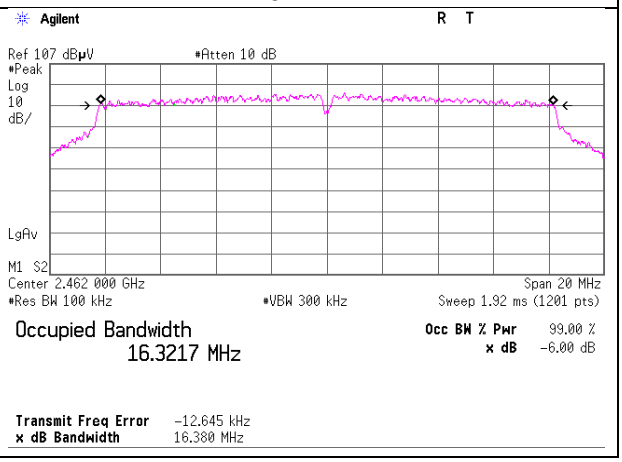
2412 MHz



2437 MHz



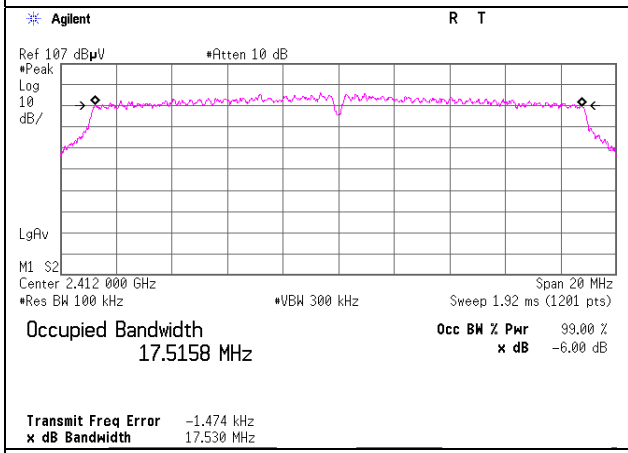
2462 MHz



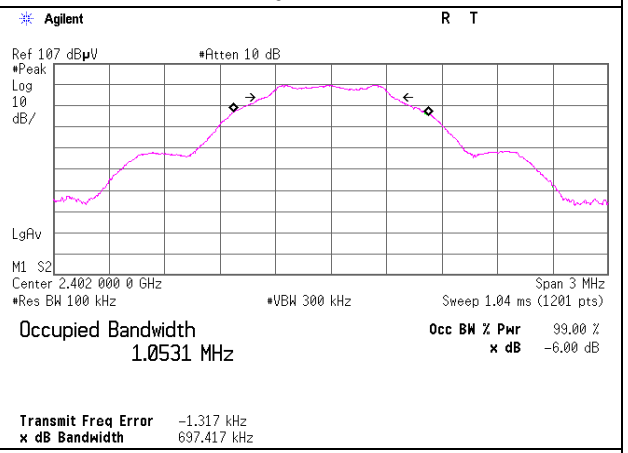
6dB Bandwidth

11n-20

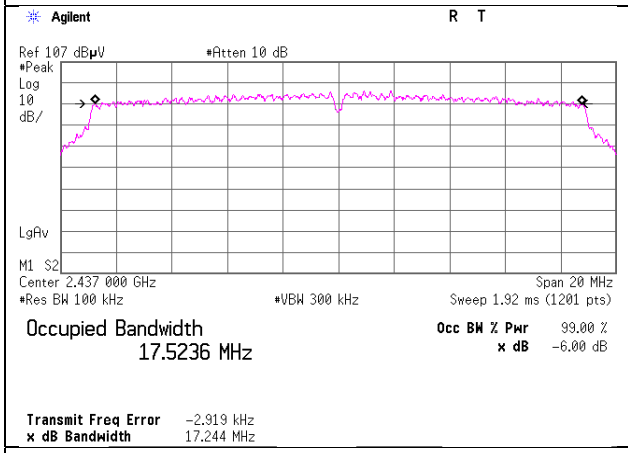
2412 MHz



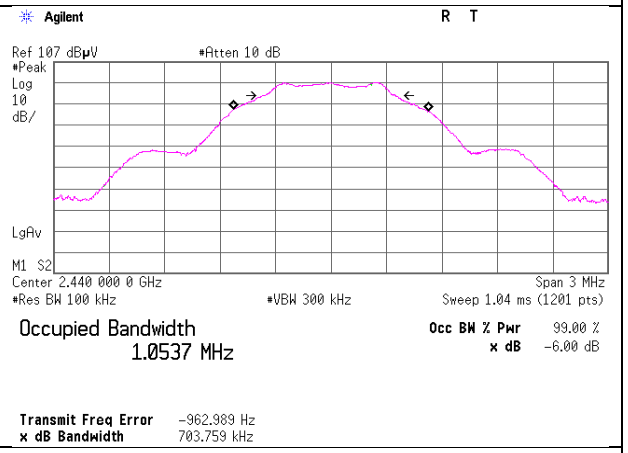
2402 MHz



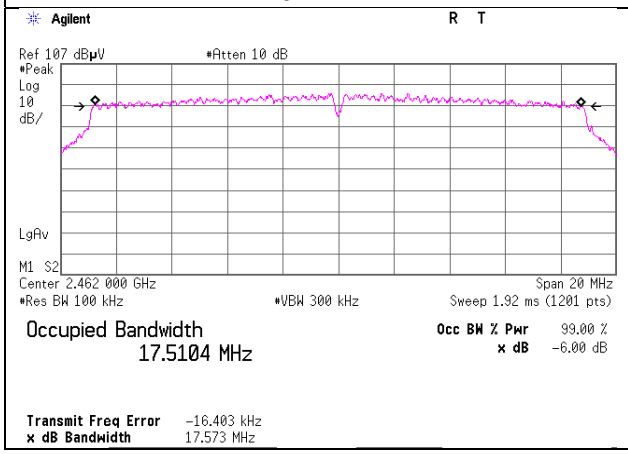
2437 MHz



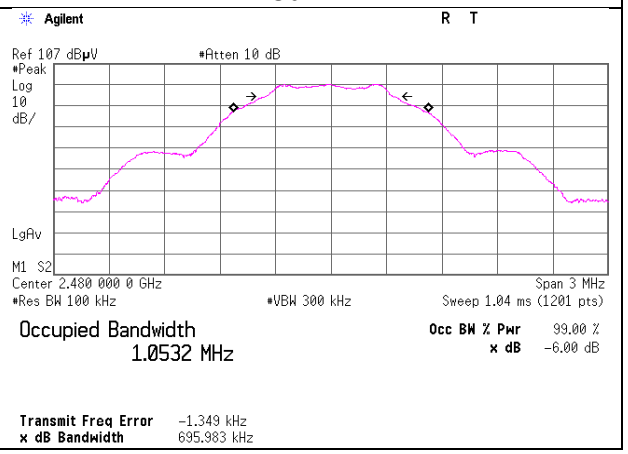
2440 MHz



2462 MHz



2480 MHz

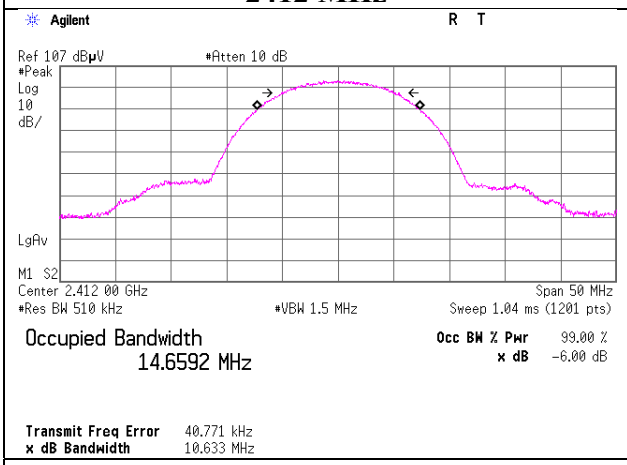


BT LE

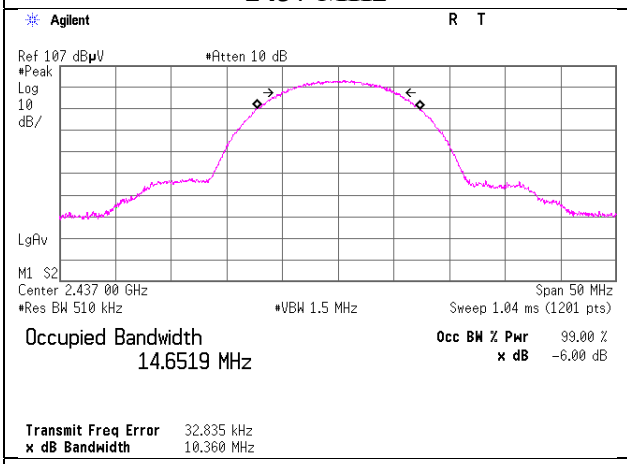
99%Occupied Bandwidth

11b

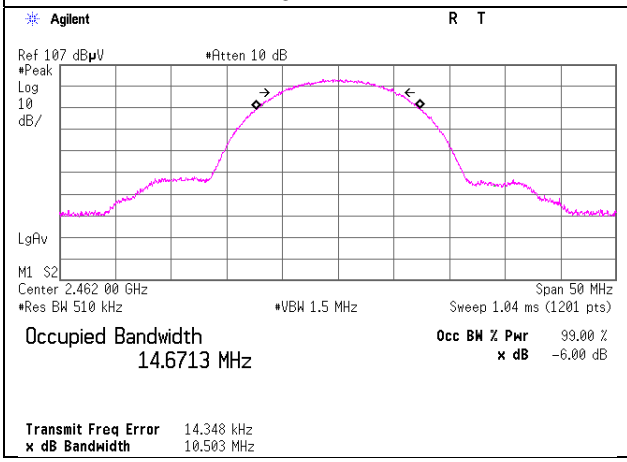
2412 MHz



2437 MHz

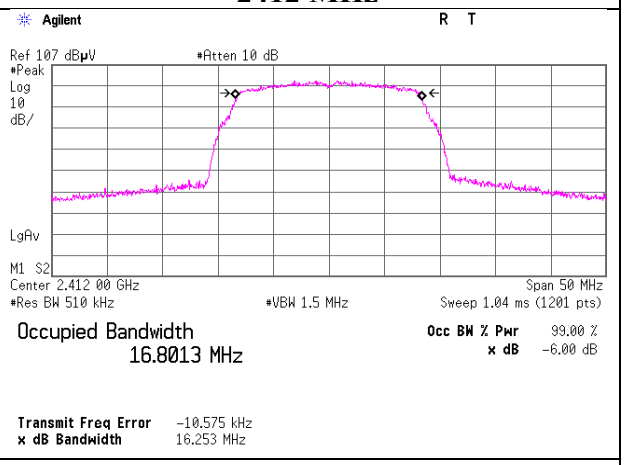


2462 MHz

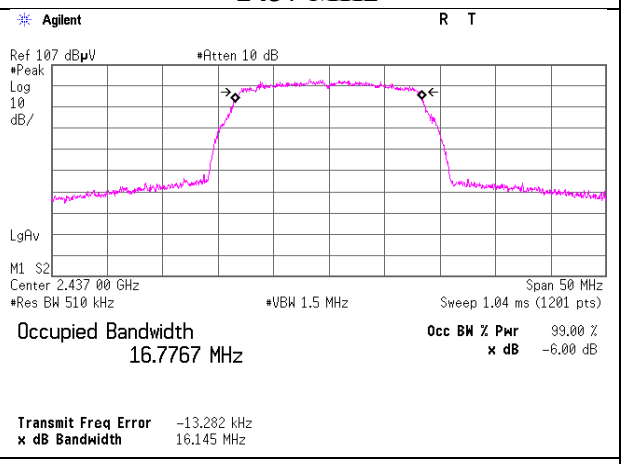


11g

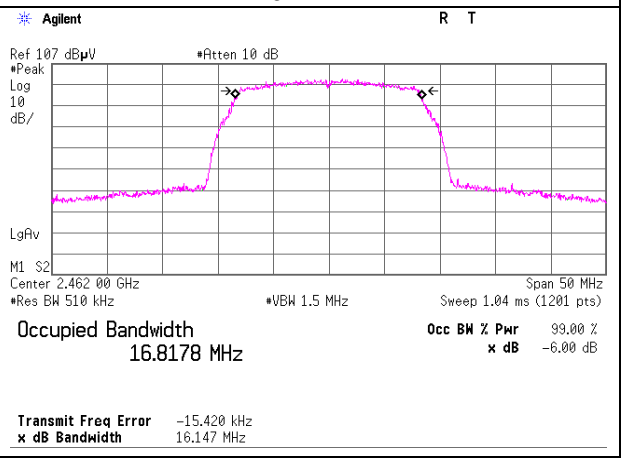
2412 MHz



2437 MHz



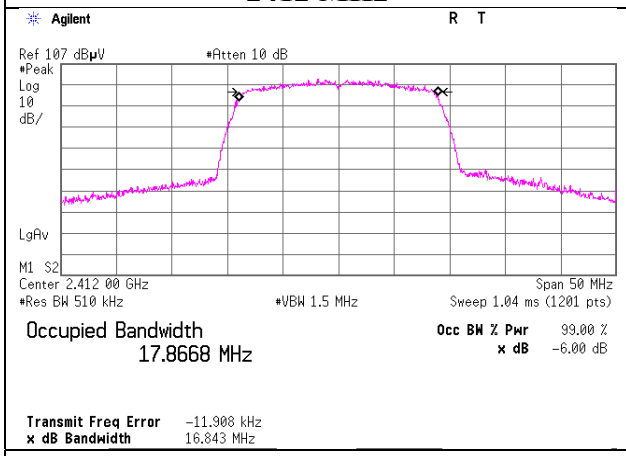
2462 MHz



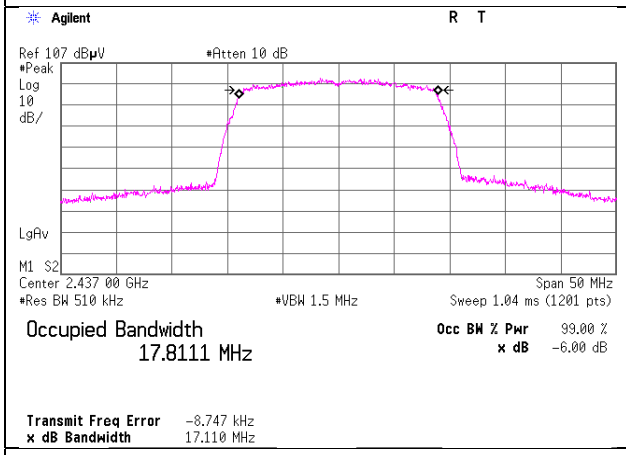
99% Occupied Bandwidth

11n-20

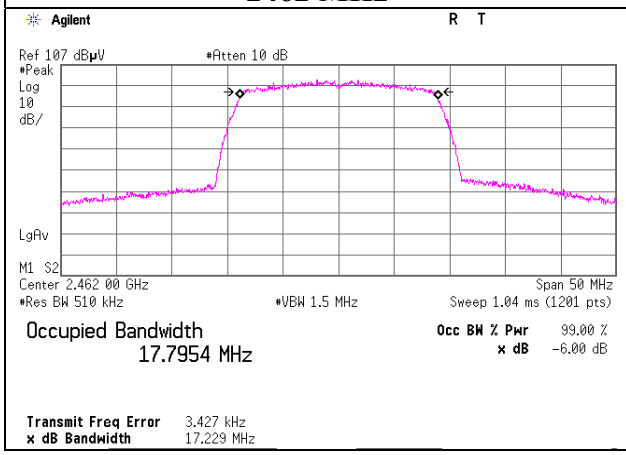
2412 MHz



2437 MHz

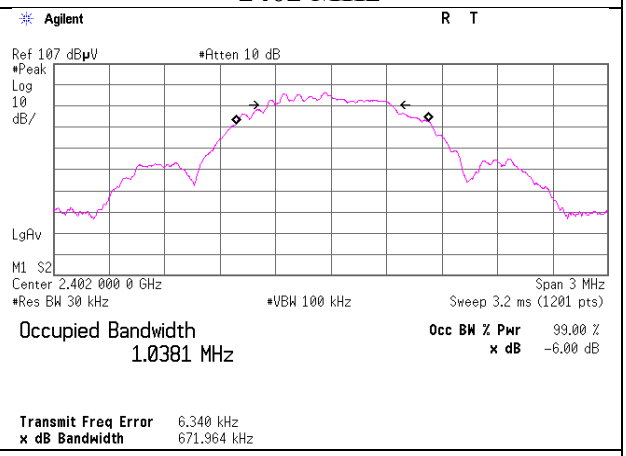


2462 MHz

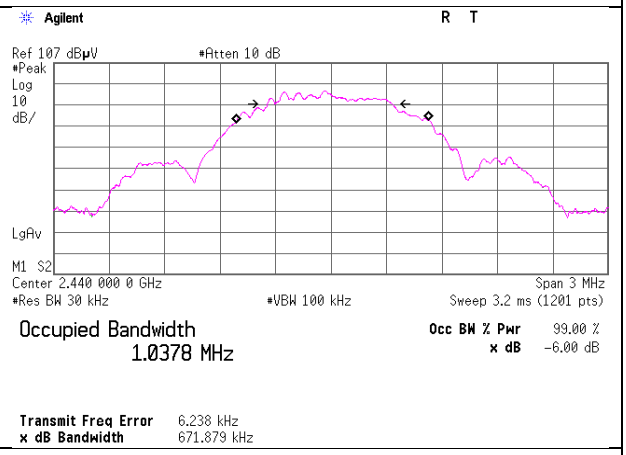


BT LE

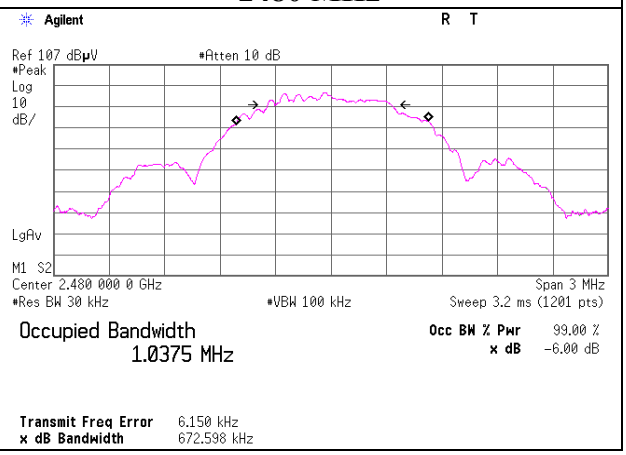
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079941H	
Date	January 23, 2018	January 25, 2018
Temperature / Humidity	24deg. C / 22 % RH	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi	Takumi Shimada
Mode	Tx 11b	

Antenna port WA + Antenna port WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	9.59	9.44	12.80	19.03	28.89	774.46	16.09
2437	9.93	9.33	12.85	19.26	28.89	774.46	16.04
2462	9.75	9.66	12.88	19.41	28.89	774.46	16.01

Sample Calculation:
Result = Antenna port WA + Antenna port 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. Loss [dB]	Result [dBm]	Result [mW]
2412	-0.69	0.50	10.01	9.82	9.59
2437	-0.54	0.50	10.01	9.97	9.93
2462	-0.62	0.50	10.01	9.89	9.75

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]
2412	-0.84	0.50	10.09	9.75	9.44
2437	-0.89	0.50	10.09	9.70	9.33
2462	-0.74	0.50	10.09	9.85	9.66

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

2437MHz

Rate [Mbps]	Antenna port WA Reading Peak [dBm]	Antenna port WA Reading Peak [mW]	Antenna port WB Reading Peak [dBm]	Antenna port WB Reading Peak [mW]	Total Reading Power [dBm]	Total Reading Power [mW]	Remark [dB]
1	-0.78	0.84	-0.73	0.85	2.26	1.68	
2	-0.69	0.85	-0.79	0.83	2.27	1.69	
5.5	-0.95	0.80	-0.90	0.81	2.09	1.62	
11	-0.65	0.86	-0.72	0.85	2.33	1.71	*

*: 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.	12079941H	
Date	January 24, 2018	January 25, 2018
Temperature / Humidity	23deg. C / 28 % RH	23 deg. C / 20 % RH
Engineer	Yuta Moriya	Takumi Shimada
Mode	Tx 11g	

Antenna port WA + Antenna port WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	91.83	91.41	22.63	183.24	28.89	774.46	6.26
2437	87.30	87.10	22.42	174.39	28.89	774.46	6.47
2462	89.13	88.31	22.49	177.43	28.89	774.46	6.40

Sample Calculation:
Result = Antenna port WA + Antenna port 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. Loss [dB]	Result [dBm]	Result [mW]
2412	9.12	0.50	10.01	19.63	91.83
2437	8.90	0.50	10.01	19.41	87.30
2462	8.99	0.50	10.01	19.50	89.13

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]
2412	9.02	0.50	10.09	19.61	91.41
2437	8.81	0.50	10.09	19.40	87.10
2462	8.87	0.50	10.09	19.46	88.31

Sample Calculation:

2437MHz

Rate [Mbps]	Antenna port WA Reading Peak [dBm]	Antenna port WA Reading Peak [mW]	Antenna port WB Reading Peak [dBm]	Antenna port WB Reading Peak [mW]	Total Reading Power [dBm]	Total Reading Power [mW]	Remark [dB]
6	8.20	6.61	8.09	6.44	11.16	13.05	
9	8.52	7.11	8.00	6.31	11.28	13.42	
12	8.02	6.34	7.79	6.01	10.92	12.35	
18	7.73	5.93	7.44	5.55	10.60	11.48	
24	8.17	6.56	7.88	6.14	11.04	12.70	
36	8.80	7.59	8.31	6.78	11.57	14.36	
48	8.23	6.65	8.19	6.59	11.22	13.24	
54	8.65	7.33	8.57	7.19	11.62	14.52	*

*: 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.	12079941H	
Date	January 24, 2018	January 25, 2018
Temperature / Humidity	23deg. C / 28 % RH	23 deg. C / 20 % RH
Engineer	Yuta Moriya	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 [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	97.95	96.16	22.88	194.11	28.89	774.46	6.01
2437	100.00	93.33	22.86	193.33	28.89	774.46	6.03
2462	112.98	110.15	23.49	223.13	28.89	774.46	5.40

Sample Calculation:
Result = Antenna port WA + Antenna port 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. Loss [dB]	Result [dBm]	Result [mW]
2412	9.40	0.50	10.01	19.91	97.95
2437	9.49	0.50	10.01	20.00	100.00
2462	10.02	0.50	10.01	20.53	112.98

Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]
2412	9.24	0.50	10.09	19.83	96.16
2437	9.11	0.50	10.09	19.70	93.33
2462	9.83	0.50	10.09	20.42	110.15

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

2437MHz

MCS Number	Antenna port WA Reading Peak [dBm]	Antenna port WA Reading Peak [mW]	Antenna port WB Reading Peak [dBm]	Antenna port WB Reading Peak [mW]	Total Reading Power [dBm]	Total Reading Power [mW]	Remark
0	8.85	7.67	8.60	7.24	11.74	14.92	
1	8.35	6.84	8.16	6.55	11.27	13.39	
2	8.21	6.62	8.19	6.59	11.21	13.21	
3	8.33	6.81	8.15	6.53	11.25	13.34	
4	8.56	7.18	8.45	7.00	11.52	14.18	
5	9.36	8.63	8.81	7.60	12.10	16.23	*
6	8.89	7.74	8.78	7.55	11.85	15.30	
7	8.73	7.46	8.24	6.67	11.50	14.13	
8	8.55	7.16	8.41	6.93	11.49	14.10	
9	8.45	7.00	8.23	6.65	11.35	13.65	
10	8.64	7.31	8.42	6.95	11.54	14.26	
11	8.54	7.14	8.29	6.75	11.43	13.89	
12	8.86	7.69	8.24	6.67	11.57	14.36	
13	8.66	7.35	8.10	6.46	11.40	13.80	
14	8.53	7.13	8.43	6.97	11.49	14.09	
15	8.44	6.98	8.18	6.58	11.32	13.56	

*Worst MCS
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.	12079941H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-9.10	0.50	10.09	1.49	1.41	29.60	912.01	28.11
2440	-8.85	0.50	10.09	1.74	1.49	29.60	912.01	27.86
2480	-8.70	0.50	10.09	1.89	1.55	29.60	912.01	27.71

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/antenna array exceeding 6 dBi.

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
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	6.15	6.41	10.99	12.56
2437	6.24	6.37	11.01	12.61
2462	6.27	6.53	11.07	12.80

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	-2.62	0.50	10.01	7.89	6.15
2437	-2.56	0.50	10.01	7.95	6.24
2462	-2.54	0.50	10.01	7.97	6.27

11b **1 Mbps** Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average) [dBm]	[mW]
2412	-2.52	0.50	10.09	8.07	6.41
2437	-2.55	0.50	10.09	8.04	6.37
2462	-2.44	0.50	10.09	8.15	6.53

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.	12079941H
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	6.14	6.15	10.90	12.29
2437	5.96	6.08	10.81	12.04
2462	5.83	6.10	10.77	11.93

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	-2.63	0.50	10.01	7.88	6.14
2437	-2.76	0.50	10.01	7.75	5.96
2462	-2.85	0.50	10.01	7.66	5.83

11g **6 Mbps** Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average) [dBm]	[mW]
2412	-2.70	0.50	10.09	7.89	6.15
2437	-2.75	0.50	10.09	7.84	6.08
2462	-2.74	0.50	10.09	7.85	6.10

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.	12079941H
Date	January 25, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takumi Shimada
Mode	Tx 11n-20 MCS 0

Antenna port WA + Antenna port WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result (Burst average) [dBm]	[mW]
2412	6.11	5.92	10.80	12.03
2437	5.98	5.94	10.77	11.93
2462	6.17	5.98	10.85	12.15

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	-2.65	0.50	10.01	7.86	6.11
2437	-2.74	0.50	10.01	7.77	5.98
2462	-2.61	0.50	10.01	7.90	6.17

11n-20 **MCS 0** Antenna port WB

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Burst average) [dBm]	[mW]
2412	-2.87	0.50	10.09	7.72	5.92
2437	-2.85	0.50	10.09	7.74	5.94
2462	-2.82	0.50	10.09	7.77	5.98

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.	12079941H
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	-11.78	0.50	10.09	-1.19	0.76
2440	-11.49	0.50	10.09	-0.90	0.81
2480	-11.34	0.50	10.09	-0.75	0.84

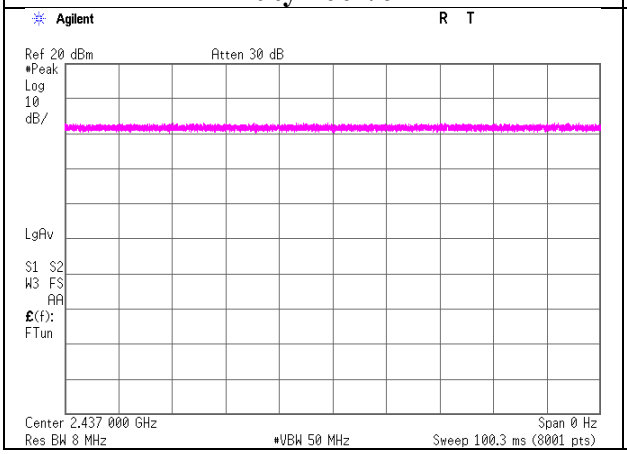
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atte

Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079941H	
Date	January 24, 2018	January 26, 2018
Temperature / Humidity	23 deg. C / 20 % RH	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
Mode	Tx	

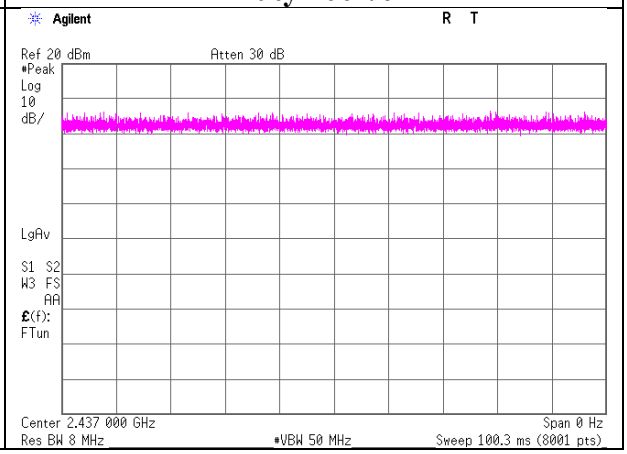
11b 11 Mbps

Duty 100 %



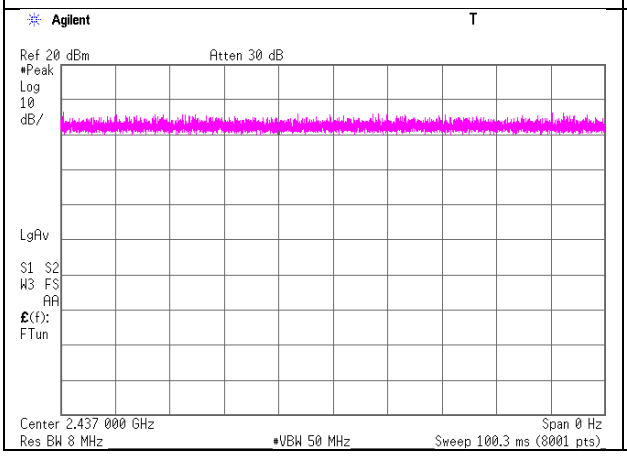
11g 54 Mbps

Duty 100 %



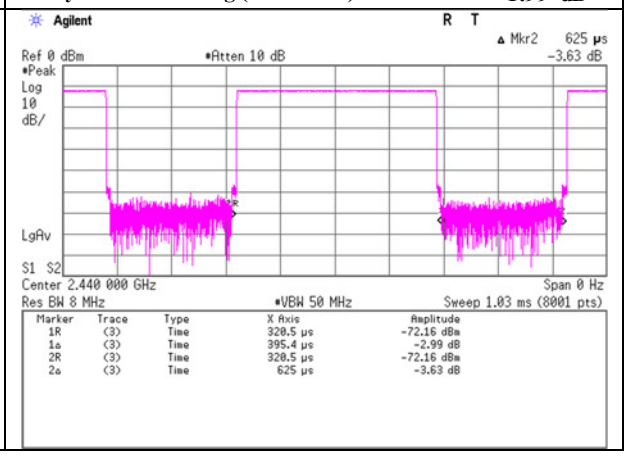
11n-20 MCS 5

Duty 100 %



BT LE

Tx on / (Tx on + Tx off) =	**0.633**
Tx on / (Tx on + Tx off) * 100 =	**63.3 %**
Duty factor = 10 * log (625 / 395.4) =	**1.99 dB**



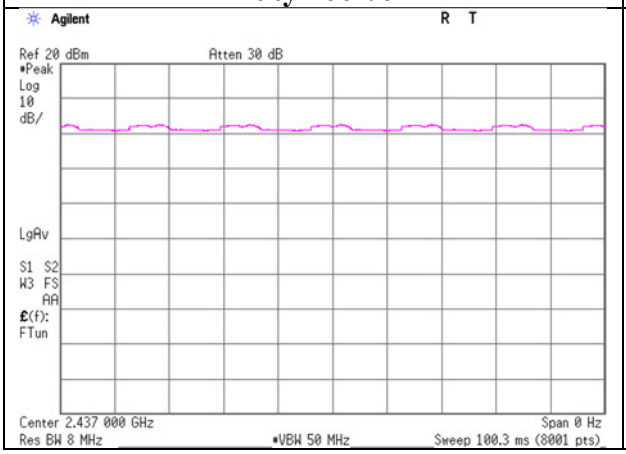
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	12079941H	
Date	January 24, 2018	January 26, 2018
Temperature / Humidity	23 deg. C / 20 % RH	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
Mode	Tx	

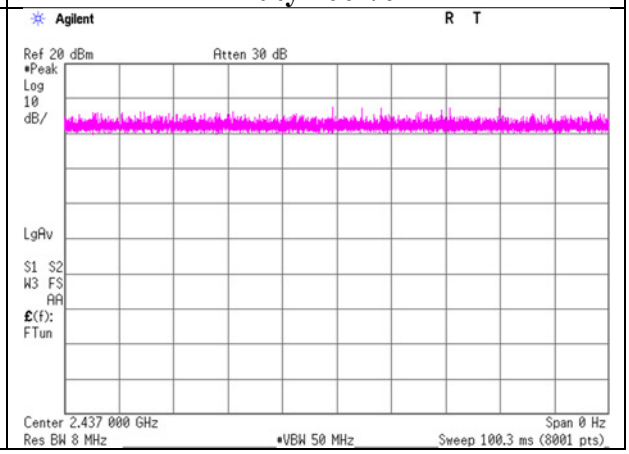
11b 1 Mbps

Duty 100 %



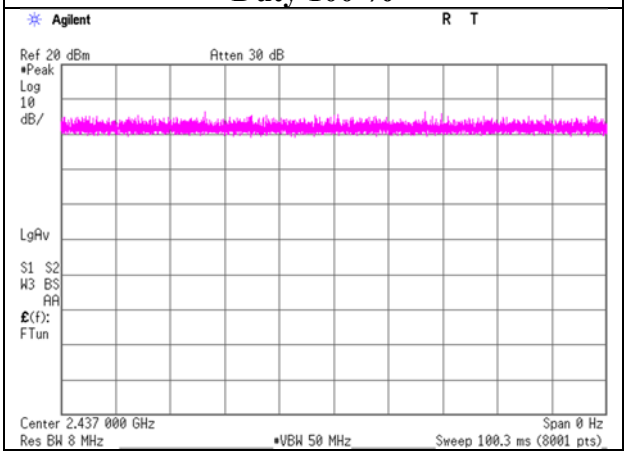
11g 6 Mbps

Duty 100 %



11n-20 MCS 0

Duty 100 %



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

Radiated Spurious Emission

Report No.	12079941H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 24, 2018	February 1, 2018
Temperature / Humidity	21 deg. C / 32 % RH	23 deg. C / 28 % RH
Engineer	Yuta Moriya (1 GHz - 10 GHz)	Tomoki Matsui (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	44.5	27.7	6.7	32.4	-	46.5	73.9	27.4	
Hori	4824.000	PK	41.1	31.7	9.0	31.4	-	50.4	73.9	23.5	
Hori	7236.000	PK	41.7	36.1	10.4	32.1	-	56.1	73.9	17.8	Floor noise
Hori	9648.000	PK	41.6	38.6	10.9	32.9	-	58.2	73.9	15.7	Floor noise
Hori	2390.000	AV	36.2	27.7	6.7	32.4	-	38.2	53.9	15.7	
Hori	4824.000	AV	30.6	31.7	9.0	31.4	-	39.9	53.9	14.0	
Hori	7236.000	AV	31.6	36.1	10.4	32.1	-	46.0	53.9	7.9	Floor noise
Hori	9648.000	AV	31.3	38.6	10.9	32.9	-	47.9	53.9	6.0	Floor noise
Vert	2390.000	PK	44.1	27.7	6.7	32.4	-	46.1	73.9	27.8	
Vert	4824.000	PK	42.0	31.7	9.0	31.4	-	51.3	73.9	22.6	
Vert	7236.000	PK	42.4	36.1	10.4	32.1	-	56.8	73.9	17.1	Floor noise
Vert	9648.000	PK	42.0	38.6	10.9	32.9	-	58.6	73.9	15.3	Floor noise
Vert	2390.000	AV	35.4	27.7	6.7	32.4	-	37.4	53.9	16.5	
Vert	4824.000	AV	31.1	31.7	9.0	31.4	-	40.4	53.9	13.5	
Vert	7236.000	AV	31.4	36.1	10.4	32.1	-	45.8	53.9	8.1	Floor noise
Vert	9648.000	AV	31.2	38.6	10.9	32.9	-	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

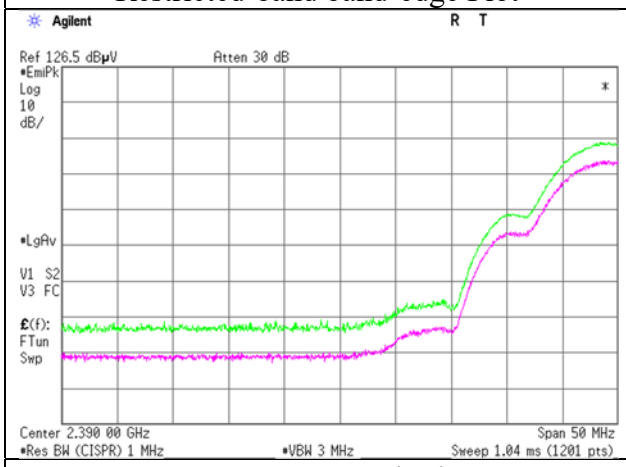
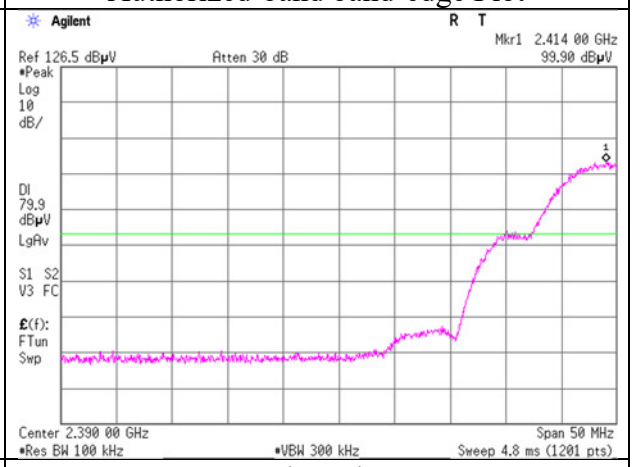
20dBc Data Sheet

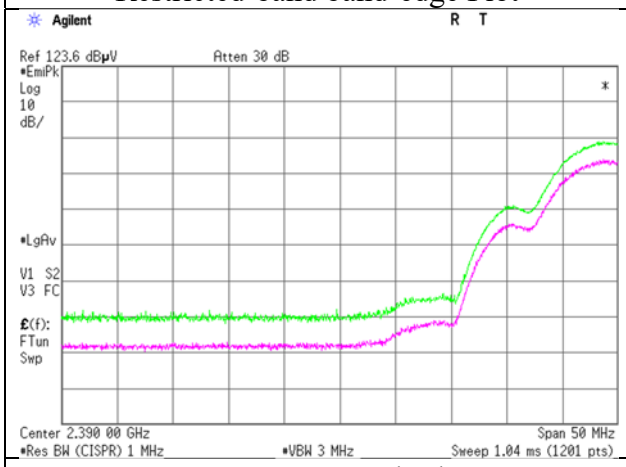
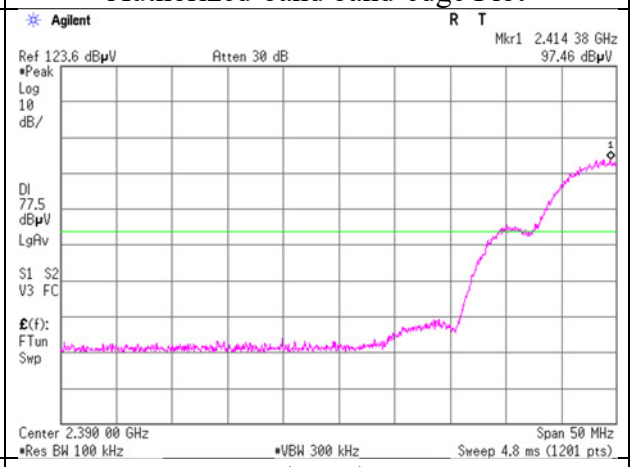
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	99.9	27.7	6.8	32.4	102.0	-	-	Carrier
Hori	2400.000	PK	51.9	27.7	6.8	32.4	54.0	82.0	28.0	
Vert	2412.000	PK	97.5	27.7	6.8	32.4	99.6	-	-	Carrier
Vert	2400.000	PK	49.8	27.7	6.8	32.4	51.9	79.6	27.7	

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12079941H
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

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	12079941H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 24, 2018	February 1, 2018
Temperature / Humidity	21 deg. C / 32 % RH	23 deg. C / 28 % RH
Engineer	Yuta Moriya (1 GHz - 10 GHz)	Tomoki Matsui (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	41.7	31.9	9.0	31.4	-	51.2	73.9	22.7	
Hori	7311.000	PK	41.0	36.2	10.4	32.2	-	55.4	73.9	18.5	Floor noise
Hori	9748.000	PK	42.5	38.7	11.0	33.0	-	59.2	73.9	14.7	Floor noise
Hori	4874.000	AV	33.2	31.9	9.0	31.4	-	42.7	53.9	11.2	
Hori	7311.000	AV	33.4	36.2	10.4	32.2	-	47.8	53.9	6.1	Floor noise
Hori	9748.000	AV	31.1	38.7	11.0	33.0	-	47.8	53.9	6.1	Floor noise
Vert	4874.000	PK	41.1	31.9	9.0	31.4	-	50.6	73.9	23.3	
Vert	7311.000	PK	42.0	36.2	10.4	32.2	-	56.4	73.9	17.5	Floor noise
Vert	9748.000	PK	42.0	38.7	11.0	33.0	-	58.7	73.9	15.2	Floor noise
Vert	4874.000	AV	32.2	31.9	9.0	31.4	-	41.7	53.9	12.2	
Vert	7311.000	AV	33.5	36.2	10.4	32.2	-	47.9	53.9	6.0	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 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.	12079941H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 24, 2018	February 1, 2018
Temperature / Humidity	21 deg. C / 32 % RH	23 deg. C / 28 % RH
Engineer	Yuta Moriya (1 GHz - 10 GHz)	Tomoki Matsui (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	45.6	27.8	6.8	32.4	-	47.8	73.9	26.1	
Hori	4924.000	PK	41.7	32.0	9.1	31.3	-	51.5	73.9	22.4	
Hori	7386.000	PK	42.5	36.3	10.4	32.2	-	57.0	73.9	16.9	Floor noise
Hori	9848.000	PK	42.6	38.8	11.0	33.0	-	59.4	73.9	14.5	Floor noise
Hori	2483.500	AV	36.7	27.8	6.8	32.4	-	38.9	53.9	15.0	
Hori	4924.000	AV	30.4	32.0	9.1	31.3	-	40.2	53.9	13.7	
Hori	7386.000	AV	31.9	36.3	10.4	32.2	-	46.4	53.9	7.5	Floor noise
Hori	9848.000	AV	31.0	38.8	11.0	33.0	-	47.8	53.9	6.1	Floor noise
Vert	2483.500	PK	45.5	27.8	6.8	32.4	-	47.7	73.9	26.2	
Vert	4924.000	PK	41.6	32.0	9.1	31.3	-	51.4	73.9	22.5	
Vert	7386.000	PK	42.9	36.3	10.4	32.2	-	57.4	73.9	16.5	Floor noise
Vert	9848.000	PK	41.9	38.8	11.0	33.0	-	58.7	73.9	15.2	Floor noise
Vert	2483.500	AV	36.3	27.8	6.8	32.4	-	38.5	53.9	15.4	
Vert	4924.000	AV	30.7	32.0	9.1	31.3	-	40.5	53.9	13.4	
Vert	7386.000	AV	31.5	36.3	10.4	32.2	-	46.0	53.9	7.9	Floor noise
Vert	9848.000	AV	31.1	38.8	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).

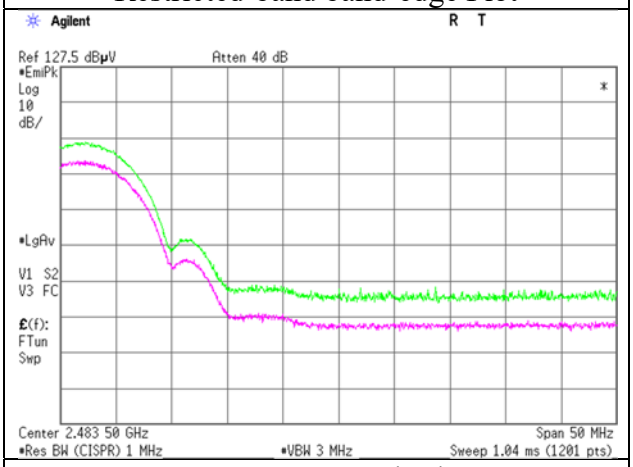
Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12079941H
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

Horizontal

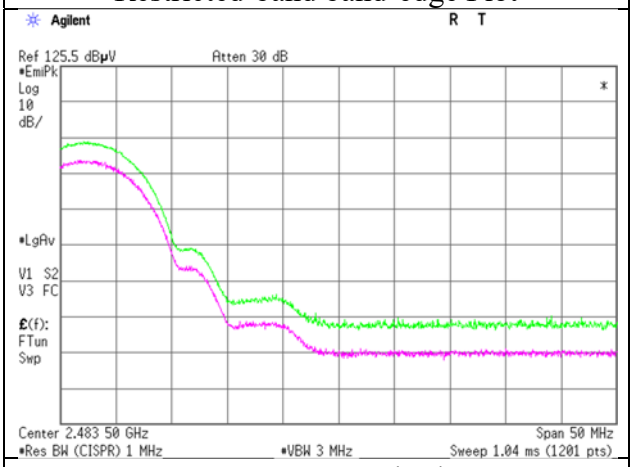
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Report No.	12079941H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 25, 2018	February 1, 2018
Temperature / Humidity	21 deg. C / 34 % RH	23 deg. C / 28 % 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	51.0	27.7	6.7	32.4	-	53.0	73.9	20.9	
Hori	4824.000	PK	41.6	31.7	9.0	31.4	-	50.9	73.9	23.0	Floor noise
Hori	7236.000	PK	41.7	36.1	10.4	32.1	-	56.1	73.9	17.8	Floor noise
Hori	9648.000	PK	41.8	38.6	10.9	32.9	-	58.4	73.9	15.5	Floor noise
Hori	2390.000	AV	40.5	27.7	6.7	32.4	-	42.5	53.9	11.4	
Hori	4824.000	AV	30.1	31.7	9.0	31.4	-	39.4	53.9	14.5	Floor noise
Hori	7236.000	AV	31.8	36.1	10.4	32.1	-	46.2	53.9	7.7	Floor noise
Hori	9648.000	AV	31.3	38.6	10.9	32.9	-	47.9	53.9	6.0	Floor noise
Vert	2390.000	PK	49.6	27.7	6.7	32.4	-	51.6	73.9	22.3	
Vert	4824.000	PK	40.7	31.7	9.0	31.4	-	50.0	73.9	23.9	Floor noise
Vert	7236.000	PK	40.4	36.1	10.4	32.1	-	54.8	73.9	19.1	Floor noise
Vert	9648.000	PK	40.7	38.6	10.9	32.9	-	57.3	73.9	16.6	Floor noise
Vert	2390.000	AV	39.7	27.7	6.7	32.4	-	41.7	53.9	12.2	
Vert	4824.000	AV	30.9	31.7	9.0	31.4	-	40.2	53.9	13.7	Floor noise
Vert	7236.000	AV	31.2	36.1	10.4	32.1	-	45.6	53.9	8.3	Floor noise
Vert	9648.000	AV	31.1	38.6	10.9	32.9	-	47.7	53.9	6.2	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

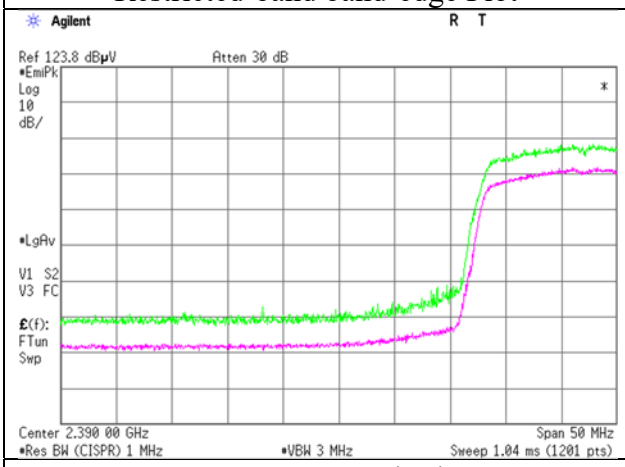
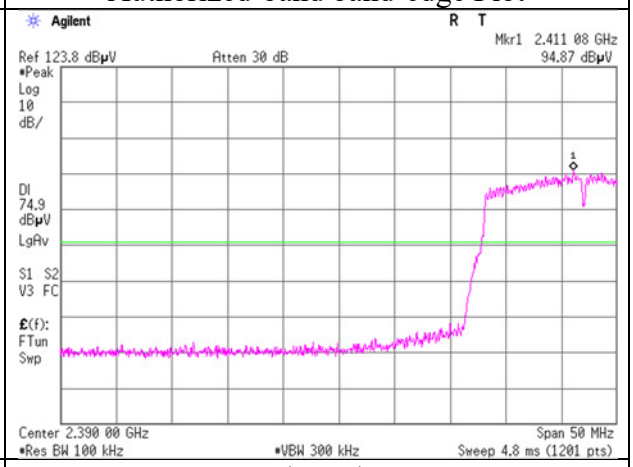
20dBc Data Sheet

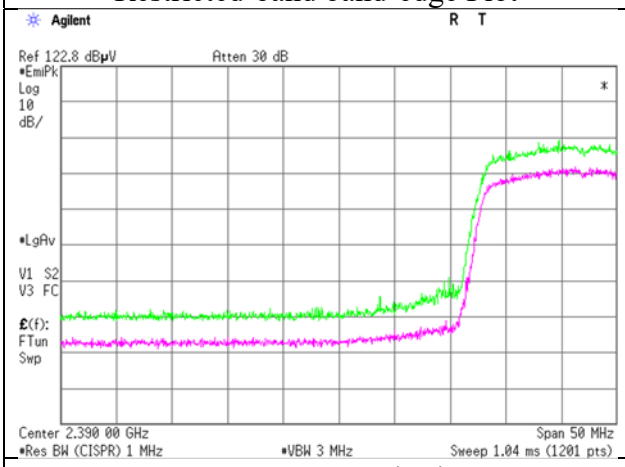
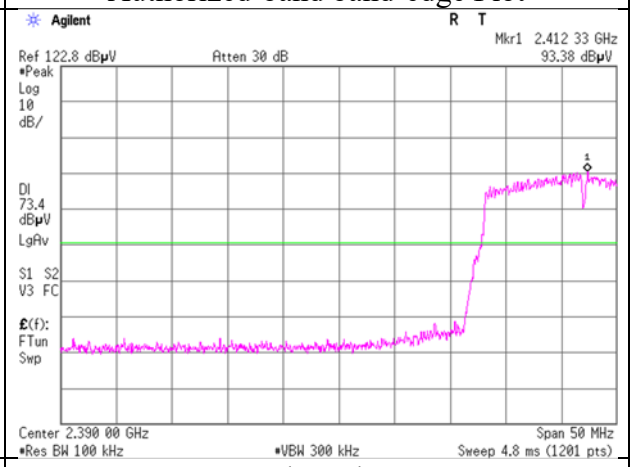
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m	Limit [dBuV/m	Margin [dB]	Remark
Hori	2412.000	PK	94.9	27.7	6.8	32.4	97.0	-	-	Carrier
Hori	2400.000	PK	49.8	27.7	6.8	32.4	51.9	77.0	25.1	
Vert	2412.000	PK	93.4	27.7	6.8	32.4	95.5	-	-	Carrier
Vert	2400.000	PK	49.4	27.7	6.8	32.4	51.5	75.5	24.0	

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12079941H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 25, 2018
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Ken Fujita (1 GHz -10 GHz)
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	12079941H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 25, 2018	February 1, 2018
Temperature / Humidity	21 deg. C / 34 % RH	23 deg. C / 28 % RH
Engineer	Ken Fujita	Tomoki Matsui
	(1 GHz - 10 GHz)	(Above 10 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	41.2	31.9	9.0	31.4	-	50.7	73.9	23.2	Floor noise
Hori	7311.000	PK	41.9	36.2	10.4	32.2	-	56.3	73.9	17.6	Floor noise
Hori	9748.000	PK	41.0	38.7	11.0	33.0	-	57.7	73.9	16.2	Floor noise
Hori	4874.000	AV	33.0	31.9	9.0	31.4	-	42.5	53.9	11.4	Floor noise
Hori	7311.000	AV	33.1	36.2	10.4	32.2	-	47.5	53.9	6.4	Floor noise
Hori	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	41.9	31.9	9.0	31.4	-	51.4	73.9	22.5	Floor noise
Vert	7311.000	PK	41.9	36.2	10.4	32.2	-	56.3	73.9	17.6	Floor noise
Vert	9748.000	PK	41.7	38.7	11.0	33.0	-	58.4	73.9	15.5	Floor noise
Vert	4874.000	AV	32.7	31.9	9.0	31.4	-	42.2	53.9	11.7	Floor noise
Vert	7311.000	AV	33.3	36.2	10.4	32.2	-	47.7	53.9	6.2	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.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 25, 2018	February 1, 2018	February 6, 2018
Temperature / Humidity	21 deg. C / 34 % RH	23 deg. C / 28 % RH	22 deg. C / 29 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takafumi Noguchi (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	50.143	QP	22.3	10.6	7.5	32.2	-	8.2	40.0	31.8	
Hori	94.714	QP	24.7	9.2	8.1	32.2	-	9.8	43.5	33.7	
Hori	144.857	QP	32.9	14.6	8.7	32.1	-	24.1	43.5	19.4	
Hori	180.142	QP	27.3	16.3	9.0	32.1	-	20.5	43.5	23.0	
Hori	215.429	QP	32.7	11.3	9.3	32.1	-	21.2	43.5	22.3	
Hori	341.717	QP	27.5	14.3	10.3	32.0	-	20.1	46.0	25.9	
Hori	2483.500	PK	55.7	27.8	6.8	32.4	-	57.9	73.9	16.0	
Hori	4924.000	PK	41.4	32.0	9.1	31.3	-	51.2	73.9	22.7	Floor noise
Hori	7386.000	PK	41.5	36.3	10.4	32.2	-	56.0	73.9	17.9	Floor noise
Hori	9848.000	PK	41.8	38.8	11.0	33.0	-	58.6	73.9	15.3	Floor noise
Hori	2483.500	AV	39.1	27.8	6.8	32.4	-	41.3	53.9	12.6	
Hori	4924.000	AV	30.9	32.0	9.1	31.3	-	40.7	53.9	13.2	Floor noise
Hori	7386.000	AV	31.8	36.3	10.4	32.2	-	46.3	53.9	7.6	Floor noise
Hori	9848.000	AV	31.0	38.8	11.0	33.0	-	47.8	53.9	6.1	Floor noise
Vert	50.143	QP	32.0	10.6	7.5	32.2	-	17.9	40.0	22.1	
Vert	94.714	QP	31.0	9.2	8.1	32.2	-	16.1	43.5	27.4	
Vert	144.857	QP	34.0	14.6	8.7	32.1	-	25.2	43.5	18.3	
Vert	180.142	QP	27.8	16.3	9.0	32.1	-	21.0	43.5	22.5	
Vert	215.429	QP	27.1	11.3	9.3	32.1	-	15.6	43.5	27.9	
Vert	341.717	QP	26.6	14.3	10.3	32.0	-	19.2	46.0	26.8	
Vert	2483.500	PK	55.9	27.8	6.8	32.4	-	58.1	73.9	15.8	
Vert	4924.000	PK	41.2	32.0	9.1	31.3	-	51.0	73.9	22.9	Floor noise
Vert	7386.000	PK	41.7	36.3	10.4	32.2	-	56.2	73.9	17.7	Floor noise
Vert	9848.000	PK	41.6	38.8	11.0	33.0	-	58.4	73.9	15.5	Floor noise
Vert	2483.500	AV	40.2	27.8	6.8	32.4	-	42.4	53.9	11.5	
Vert	4924.000	AV	31.8	32.0	9.1	31.3	-	41.6	53.9	12.3	Floor noise
Vert	7386.000	AV	31.5	36.3	10.4	32.2	-	46.0	53.9	7.9	Floor noise
Vert	9848.000	AV	30.9	38.8	11.0	33.0	-	47.7	53.9	6.2	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).

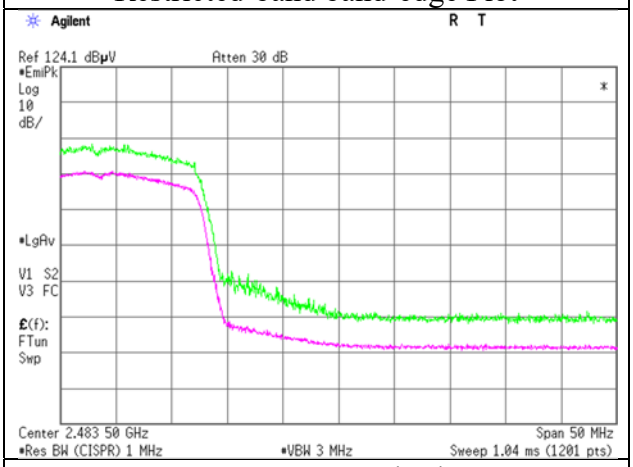
Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12079941H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 25, 2018
Temperature / Humidity	21 deg. C / 34 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

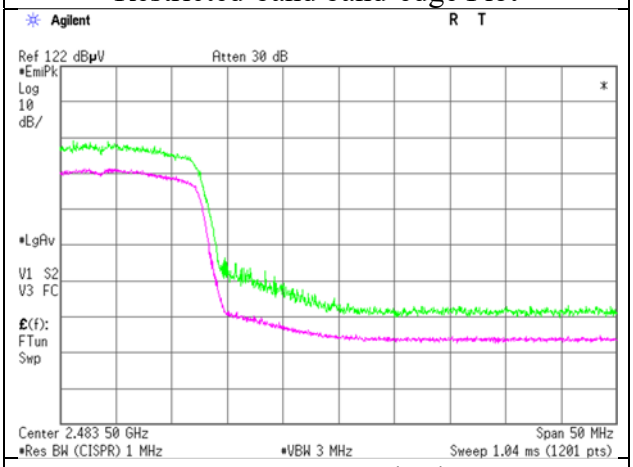
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

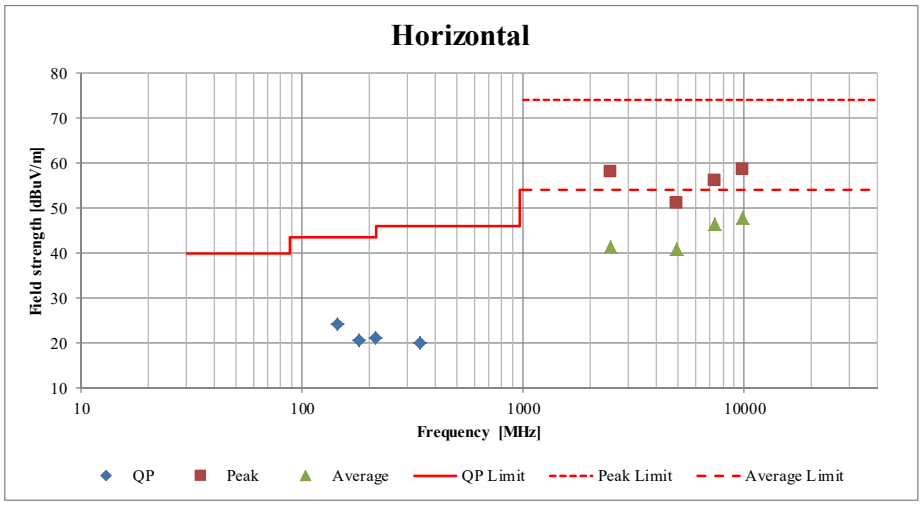


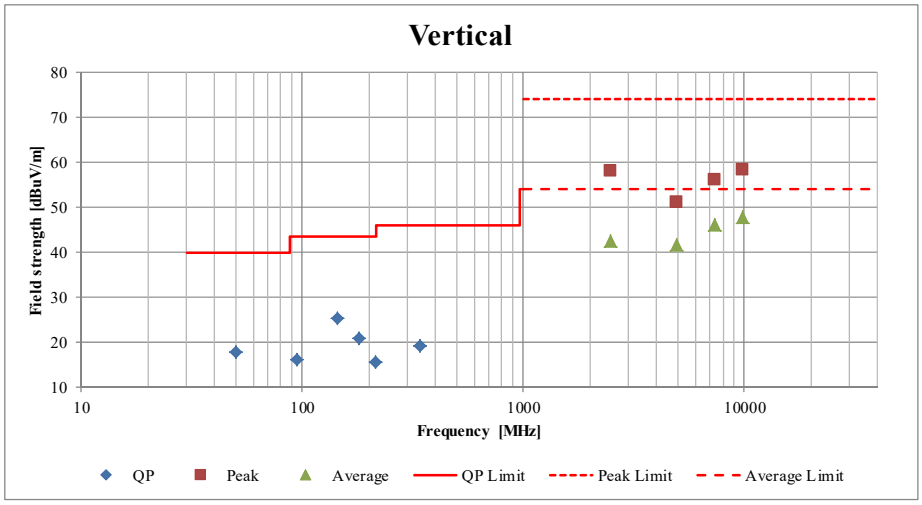
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 25, 2018	February 1, 2018	February 6, 2018
Temperature / Humidity	21 deg. C / 34 % RH	23 deg. C / 28 % RH	22 deg. C / 29 % RH
Engineer	Ken Fujita (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takafumi Noguchi (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

Report No.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 30, 2018	February 1, 2018	February 5, 2018
Temperature / Humidity	21 deg. C / 29 % RH	23 deg. C / 28 % RH	22 deg. C / 30 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Tomoki Matsui (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	44.081	QP	21.5	12.6	7.4	32.2	-	9.3	40.0	30.7	
Hori	99.282	QP	21.5	9.9	8.2	32.2	-	7.4	43.5	36.1	
Hori	199.240	QP	21.2	16.5	9.2	32.1	-	14.8	43.5	28.7	
Hori	410.120	QP	20.9	15.7	10.8	32.0	-	15.4	46.0	30.6	
Hori	542.505	QP	21.0	18.2	11.6	32.0	-	18.8	46.0	27.2	
Hori	929.891	QP	20.5	22.0	13.6	30.8	-	25.3	46.0	20.7	
Hori	2390.000	PK	42.4	27.7	6.7	32.4	-	44.4	73.9	29.5	
Hori	3603.002	PK	48.6	29.5	7.6	31.9	-	53.8	73.9	20.1	
Hori	4804.000	PK	40.5	31.6	9.0	31.4	-	49.7	73.9	24.2	Floor noise
Hori	7206.000	PK	42.6	36.0	10.4	32.1	-	56.9	73.9	17.0	Floor noise
Hori	9608.000	PK	41.7	38.5	10.9	32.9	-	58.2	73.9	15.7	Floor noise
Hori	2390.000	AV	33.5	27.7	6.7	32.4	2.0	37.5	53.9	16.4	*1)
Hori	3603.002	AV	41.1	29.5	7.6	31.9	2.0	48.3	53.9	5.6	*2)
Hori	4804.000	AV	32.4	31.6	9.0	31.4	-	41.6	53.9	12.3	Floor noise
Hori	7206.000	AV	33.2	36.0	10.4	32.1	-	47.5	53.9	6.4	Floor noise
Hori	9608.000	AV	31.2	38.5	10.9	32.9	-	47.7	53.9	6.2	Floor noise
Vert	44.081	QP	21.5	12.6	7.4	32.2	-	9.3	40.0	30.7	
Vert	99.282	QP	21.8	9.9	8.2	32.2	-	7.7	43.5	35.8	
Vert	199.240	QP	26.6	16.5	9.2	32.1	-	20.2	43.5	23.3	
Vert	410.120	QP	20.9	15.7	10.8	32.0	-	15.4	46.0	30.6	
Vert	542.505	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Vert	929.891	QP	20.5	22.0	13.6	30.8	-	25.3	46.0	20.7	
Vert	2390.000	PK	42.5	27.7	6.7	32.4	-	44.5	73.9	29.4	
Vert	3603.002	PK	49.5	29.5	7.6	31.9	-	54.7	73.9	19.2	
Vert	4804.000	PK	40.5	31.6	9.0	31.4	-	49.7	73.9	24.2	Floor noise
Vert	7206.000	PK	42.6	36.0	10.4	32.1	-	56.9	73.9	17.0	Floor noise
Vert	9608.000	PK	41.7	38.5	10.9	32.9	-	58.2	73.9	15.7	Floor noise
Vert	2390.000	AV	33.5	27.7	6.7	32.4	2.0	37.5	53.9	16.4	*1)
Vert	3603.002	AV	42.8	29.5	7.6	31.9	2.0	50.0	53.9	3.9	*2)
Vert	4804.000	AV	32.4	31.6	9.0	31.4	-	41.6	53.9	12.3	Floor noise
Vert	7206.000	AV	33.2	36.0	10.4	32.1	-	47.5	53.9	6.4	Floor noise
Vert	9608.000	AV	31.2	38.5	10.9	32.9	-	47.7	53.9	6.2	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.

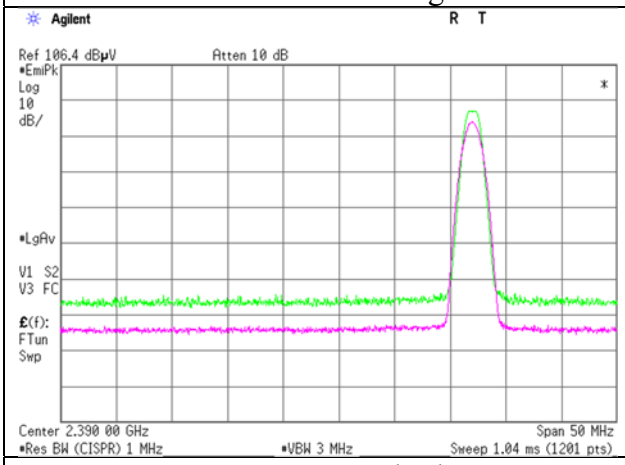
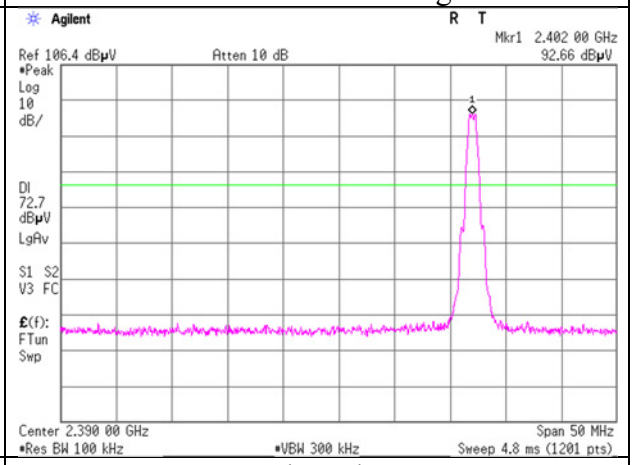
20dBc Data Sheet

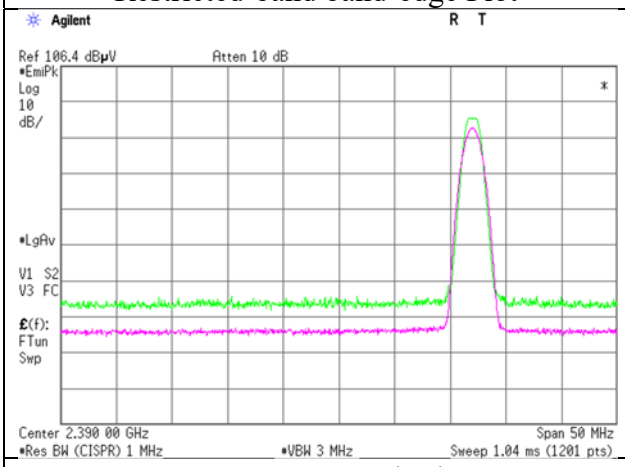
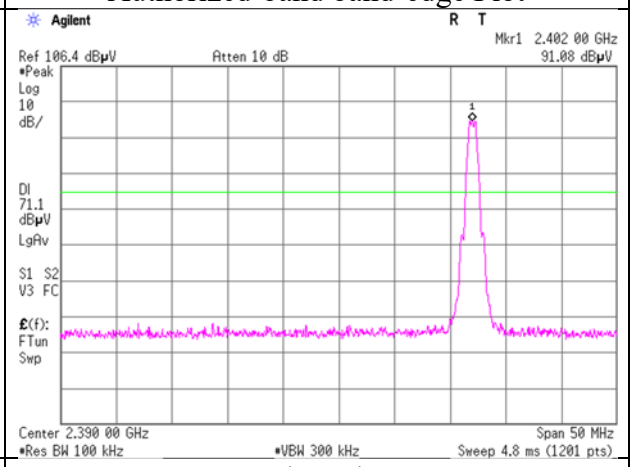
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	92.7	27.7	6.8	32.4	94.8	-	-	Carrier
Hori	2400.000	PK	37.4	27.7	6.8	32.4	39.5	74.8	35.3	
Vert	2402.000	PK	91.1	27.7	6.8	32.4	93.2	-	-	Carrier
Vert	2400.000	PK	37.1	27.7	6.8	32.4	39.2	73.2	34.0	

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12079941H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 30, 2018
Temperature / Humidity	21 deg. C / 29 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

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

Radiated Spurious Emission

Report No.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 30, 2018	February 1, 2018	February 5, 2018
Temperature / Humidity	21 deg. C / 29 % RH	23 deg. C / 28 % RH	22 deg. C / 30 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Tomoki Matsui (Below 1 GHz)
Mode	Tx BT LE 2440 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	45.321	QP	22.0	12.2	7.4	32.2	-	9.4	40.0	30.6	
Hori	99.683	QP	21.6	10.0	8.2	32.2	-	7.6	43.5	35.9	
Hori	199.240	QP	21.3	16.5	9.2	32.1	-	14.9	43.5	28.6	
Hori	410.839	QP	20.9	15.7	10.8	32.0	-	15.4	46.0	30.6	
Hori	542.510	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Hori	930.881	QP	20.6	22.0	13.6	30.8	-	25.4	46.0	20.6	
Hori	3659.889	PK	46.5	29.6	7.6	31.8	-	51.9	73.9	22.0	
Hori	4880.000	PK	40.7	31.9	9.0	31.4	-	50.2	73.9	23.7	Floor noise
Hori	7320.000	PK	42.5	36.2	10.4	32.2	-	56.9	73.9	17.0	Floor noise
Hori	9760.000	PK	42.3	38.7	11.0	33.0	-	59.0	73.9	14.9	Floor noise
Hori	3659.889	AV	38.6	29.6	7.6	31.8	2.0	46.0	53.9	7.9	*1)
Hori	4880.000	AV	32.0	31.9	9.0	31.4	-	41.5	53.9	12.4	Floor noise
Hori	7320.000	AV	33.2	36.2	10.4	32.2	-	47.6	53.9	6.3	Floor noise
Hori	9760.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	45.321	QP	22.0	12.2	7.4	32.2	-	9.4	40.0	30.6	
Vert	99.683	QP	21.9	10.0	8.2	32.2	-	7.9	43.5	35.6	
Vert	199.240	QP	26.1	16.5	9.2	32.1	-	19.7	43.5	23.8	
Vert	410.839	QP	20.9	15.7	10.8	32.0	-	15.4	46.0	30.6	
Vert	542.510	QP	20.9	18.2	11.6	32.0	-	18.7	46.0	27.3	
Vert	930.881	QP	20.5	22.0	13.6	30.8	-	25.3	46.0	20.7	
Vert	3659.889	PK	47.8	29.6	7.6	31.8	-	53.2	73.9	20.7	
Vert	4880.000	PK	40.7	31.9	9.0	31.4	-	50.2	73.9	23.7	Floor noise
Vert	7320.000	PK	42.5	36.2	10.4	32.2	-	56.9	73.9	17.0	Floor noise
Vert	9760.000	PK	42.3	38.7	11.0	33.0	-	59.0	73.9	14.9	Floor noise
Vert	3659.889	AV	39.7	29.6	7.6	31.8	2.0	47.1	53.9	6.8	*1)
Vert	4880.000	AV	32.0	31.9	9.0	31.4	-	41.5	53.9	12.4	Floor noise
Vert	7320.000	AV	33.2	36.2	10.4	32.2	-	47.6	53.9	6.3	Floor noise
Vert	9760.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	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.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 30, 2018	February 1, 2018	February 5, 2018
Temperature / Humidity	21 deg. C / 29 % RH	23 deg. C / 28 % RH	22 deg. C / 30 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Tomoki Matsui (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	44.645	QP	21.7	12.4	7.4	32.2	-	9.3	40.0	30.7	
Hori	94.348	QP	21.6	9.2	8.1	32.2	-	6.7	43.5	36.8	
Hori	199.240	QP	21.2	16.5	9.2	32.1	-	14.8	43.5	28.7	
Hori	410.812	QP	20.9	15.7	10.8	32.0	-	15.4	46.0	30.6	
Hori	539.890	QP	20.9	18.1	11.6	32.0	-	18.6	46.0	27.4	
Hori	932.360	QP	20.5	22.0	13.6	30.8	-	25.3	46.0	20.7	
Hori	2483.500	PK	46.1	27.8	6.8	32.4	-	48.3	73.9	25.6	
Hori	3719.996	PK	45.3	29.6	7.7	31.8	-	50.8	73.9	23.1	
Hori	4960.000	PK	40.7	32.1	9.1	31.3	-	50.6	73.9	23.3	Floor noise
Hori	7440.000	PK	43.4	36.4	10.3	32.2	-	57.9	73.9	16.0	Floor noise
Hori	9920.000	PK	42.5	38.9	11.0	33.1	-	59.3	73.9	14.6	Floor noise
Hori	2483.500	AV	35.3	27.8	6.8	32.4	2.0	39.5	53.9	14.4	*1)
Hori	3719.996	AV	36.6	29.6	7.7	31.8	2.0	44.1	53.9	9.8	*2)
Hori	4960.000	AV	32.3	32.1	9.1	31.3	-	42.2	53.9	11.7	Floor noise
Hori	7440.000	AV	32.9	36.4	10.3	32.2	-	47.4	53.9	6.5	Floor noise
Hori	9920.000	AV	31.0	38.9	11.0	33.1	-	47.8	53.9	6.1	Floor noise
Vert	44.645	QP	22.0	12.4	7.4	32.2	-	9.6	40.0	30.4	
Vert	94.348	QP	22.2	9.2	8.1	32.2	-	7.3	43.5	36.2	
Vert	199.240	QP	28.0	16.5	9.2	32.1	-	21.6	43.5	21.9	
Vert	410.812	QP	20.9	15.7	10.8	32.0	-	15.4	46.0	30.6	
Vert	539.890	QP	20.9	18.1	11.6	32.0	-	18.6	46.0	27.4	
Vert	932.360	QP	20.5	22.0	13.6	30.8	-	25.3	46.0	20.7	
Vert	2483.500	PK	45.0	27.8	6.8	32.4	-	47.2	73.9	26.7	
Vert	3719.996	PK	45.9	29.6	7.7	31.8	-	51.4	73.9	22.5	
Vert	4960.000	PK	40.7	32.1	9.1	31.3	-	50.6	73.9	23.3	Floor noise
Vert	7440.000	PK	43.4	36.4	10.3	32.2	-	57.9	73.9	16.0	Floor noise
Vert	9920.000	PK	42.5	38.9	11.0	33.1	-	59.3	73.9	14.6	Floor noise
Vert	2483.500	AV	34.8	27.8	6.8	32.4	2.0	39.0	53.9	14.9	*1)
Vert	3719.996	AV	37.3	29.6	7.7	31.8	2.0	44.8	53.9	9.1	*2)
Vert	4960.000	AV	32.3	32.1	9.1	31.3	-	42.2	53.9	11.7	Floor noise
Vert	7440.000	AV	32.9	36.4	10.3	32.2	-	47.4	53.9	6.5	Floor noise
Vert	9920.000	AV	31.0	38.9	11.0	33.1	-	47.8	53.9	6.1	Floor noise

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

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

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

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

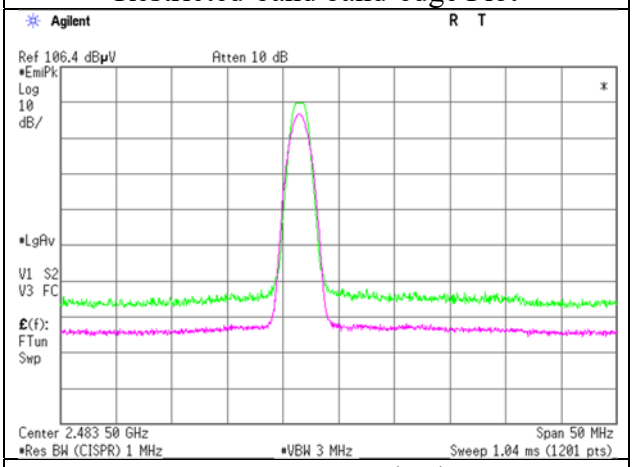
*2) Noise synchronized with duty of carrier frequency.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12079941H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 30, 2018
Temperature / Humidity	21 deg. C / 29 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

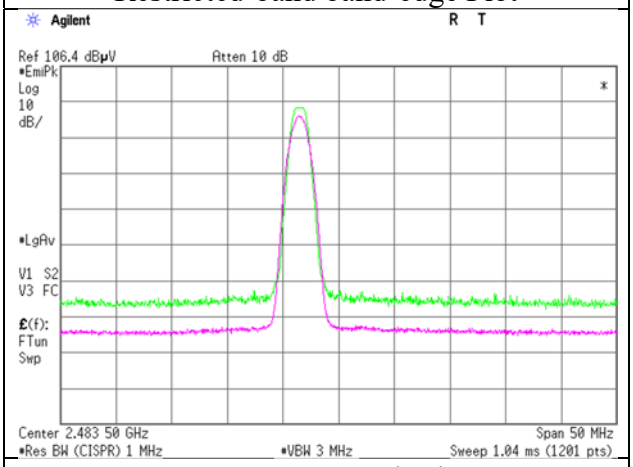
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

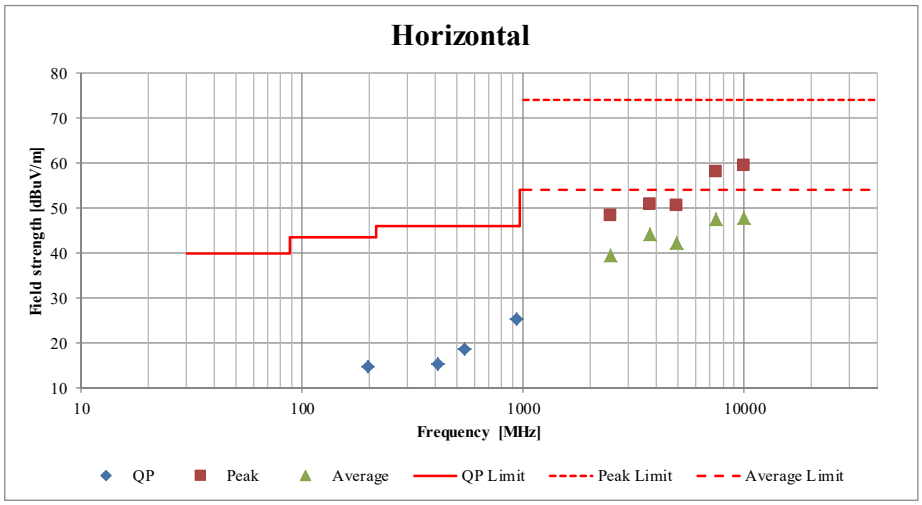


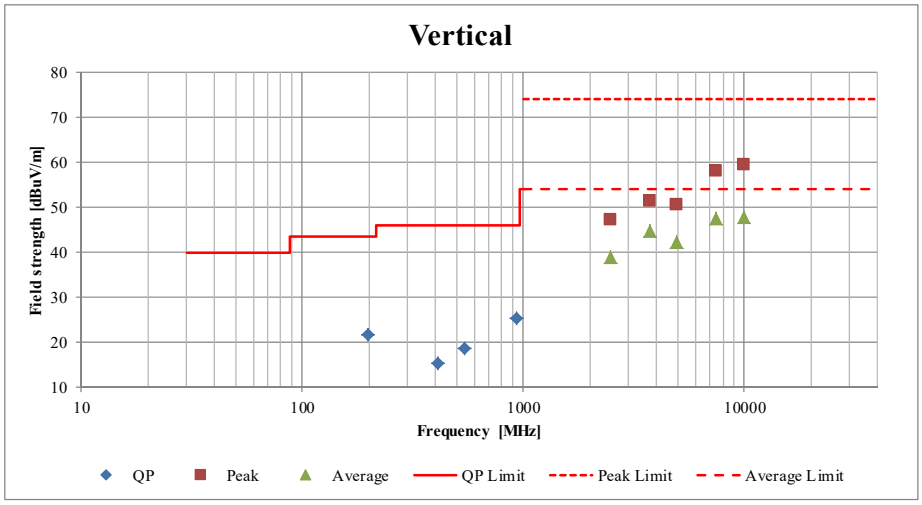
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 30, 2018	February 1, 2018	February 5, 2018
Temperature / Humidity	21 deg. C / 29 % RH	23 deg. C / 28 % RH	22 deg. C / 30 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Tomoki Matsui (Below 1 GHz)
Mode	Tx BT LE 2480 MHz		





Radiated Spurious Emission

Report No.	12079941H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 30, 2018
Temperature / Humidity	21 deg. C / 29 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)
Mode	Tx BT LE 2402 MHz + Tx 11ac-20 5700 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	42.6	27.7	6.7	32.4	-	44.6	73.9	29.3	
Hori	2390.000	AV	33.4	27.7	6.7	32.4	2.0	37.4	53.9	16.5	*1)
Vert	2390.000	PK	42.7	27.7	6.7	32.4	-	44.7	73.9	29.2	
Vert	2390.000	AV	33.6	27.7	6.7	32.4	2.0	37.6	53.9	16.3	*1)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 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)

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	93.2	27.7	6.8	32.4	95.3	-	-	Carrier
Hori	2400.000	PK	37.8	27.7	6.8	32.4	39.9	75.3	35.4	
Vert	2402.000	PK	92.0	27.7	6.8	32.4	94.1	-	-	Carrier
Vert	2400.000	PK	37.5	27.7	6.8	32.4	39.6	74.1	34.5	

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

Radiated Spurious Emission

Report No.	12079941H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	January 30, 2018	February 1, 2018	February 6, 2018
Temperature / Humidity	21 deg. C / 29 % RH	23 deg. C / 28 % RH	22 deg. C / 29 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)	Tomoki Matsui (Above 10 GHz)	Takafumi Noguchi (Below 1 GHz)
Mode	Tx BT LE 2440 MHz + Tx 11ac-20 5700 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	50.143	QP	22.4	10.6	7.5	32.2	-	8.3	40.0	31.7	
Hori	94.714	QP	24.9	9.2	8.1	32.2	-	10.0	43.5	33.5	
Hori	144.857	QP	32.9	14.6	8.7	32.1	-	24.1	43.5	19.4	
Hori	178.285	QP	27.5	16.3	9.0	32.1	-	20.7	43.5	22.8	
Hori	215.429	QP	35.1	11.3	9.3	32.1	-	23.6	43.5	19.9	
Hori	341.717	QP	28.6	14.3	10.3	32.0	-	21.2	46.0	24.8	
Hori	3659.889	PK	46.1	29.6	7.6	31.8	-	51.5	73.9	22.4	
Hori	3799.996	PK	44.7	29.6	7.7	31.8	-	50.2	73.9	23.7	
Hori	4880.000	PK	40.7	31.9	9.0	31.4	-	50.2	73.9	23.7	Floor noise
Hori	7320.000	PK	42.5	36.2	10.4	32.2	-	56.9	73.9	17.0	Floor noise
Hori	9760.000	PK	42.3	38.7	11.0	33.0	-	59.0	73.9	14.9	Floor noise
Hori	3659.889	AV	38.2	29.6	7.6	31.8	2.0	45.6	53.9	8.3	*1)
Hori	3799.996	AV	38.5	29.6	7.7	31.8	2.0	46.0	53.9	7.9	*1)
Hori	4880.000	AV	32.0	31.9	9.0	31.4	-	41.5	53.9	12.4	Floor noise
Hori	7320.000	AV	33.2	36.2	10.4	32.2	-	47.6	53.9	6.3	Floor noise
Hori	9760.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	50.143	QP	31.4	10.6	7.5	32.2	-	17.3	40.0	22.7	
Vert	94.714	QP	33.0	9.2	8.1	32.2	-	18.1	43.5	25.4	
Vert	144.857	QP	35.5	14.6	8.7	32.1	-	26.7	43.5	16.8	
Vert	178.285	QP	28.0	16.3	9.0	32.1	-	21.2	43.5	22.3	
Vert	215.429	QP	28.1	11.3	9.3	32.1	-	16.6	43.5	26.9	
Vert	341.717	QP	27.7	14.3	10.3	32.0	-	20.3	46.0	25.7	
Vert	3659.889	PK	47.5	29.6	7.6	31.8	-	52.9	73.9	21.0	
Vert	3799.996	PK	45.5	29.6	7.7	31.8	-	51.0	73.9	22.9	
Vert	4880.000	PK	40.7	31.9	9.0	31.4	-	50.2	73.9	23.7	Floor noise
Vert	7320.000	PK	42.5	36.2	10.4	32.2	-	56.9	73.9	17.0	Floor noise
Vert	9760.000	PK	42.3	38.7	11.0	33.0	-	59.0	73.9	14.9	Floor noise
Vert	3659.889	AV	40.2	29.6	7.6	31.8	2.0	47.6	53.9	6.3	*1)
Vert	3799.996	AV	40.0	29.6	7.7	31.8	2.0	47.5	53.9	6.4	*1)
Vert	4880.000	AV	32.0	31.9	9.0	31.4	-	41.5	53.9	12.4	Floor noise
Vert	7320.000	AV	33.2	36.2	10.4	32.2	-	47.6	53.9	6.3	Floor noise
Vert	9760.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	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 BT LE.

Radiated Spurious Emission

Report No.	12079941H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 30, 2018
Temperature / Humidity	21 deg. C / 29 % RH
Engineer	Tomoki Matsui (1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz + Tx 11ac-20 5700 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	45.3	27.8	6.8	32.4	-	47.5	73.9	26.4	
Hori	2483.500	AV	35.5	27.8	6.8	32.4	2.0	39.7	53.9	14.2	*1)
Vert	2483.500	PK	43.9	27.8	6.8	32.4	-	46.1	73.9	27.8	
Vert	2483.500	AV	34.9	27.8	6.8	32.4	2.0	39.1	53.9	14.8	*1)

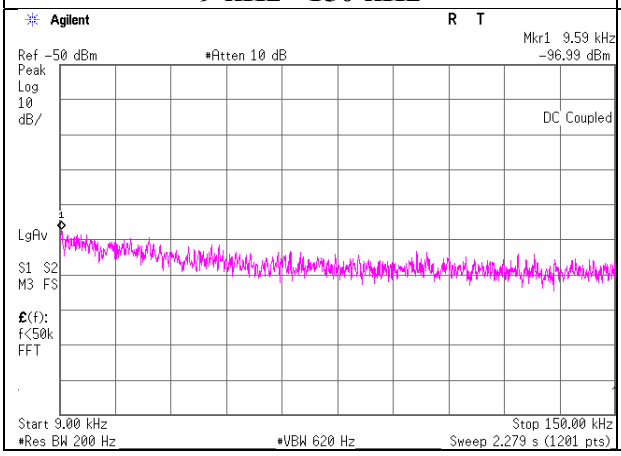
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 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)

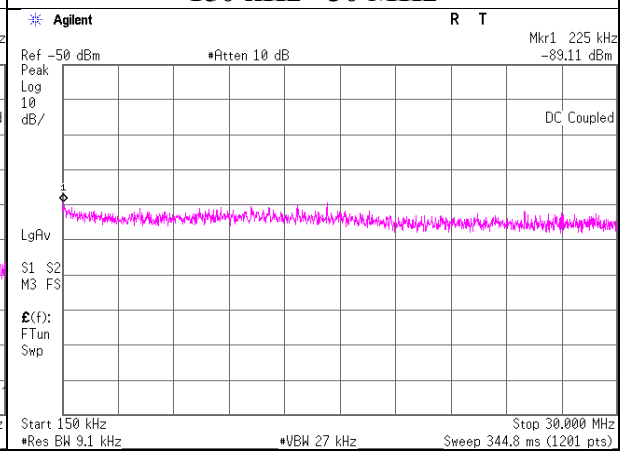
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 26, 2018
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11n-20 2462 MHz

9 kHz - 150 kHz



150 kHz - 30 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
9.59	-97.0	0.50	9.8	7.1	2	-76.5	300	6.0	-15.3	47.9	63.2	
225.00	-89.1	0.50	9.8	7.1	2	-68.7	300	6.0	-7.4	20.5	27.9	

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

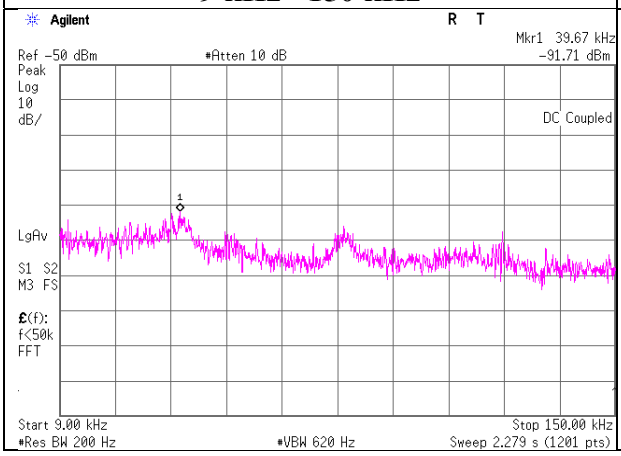
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

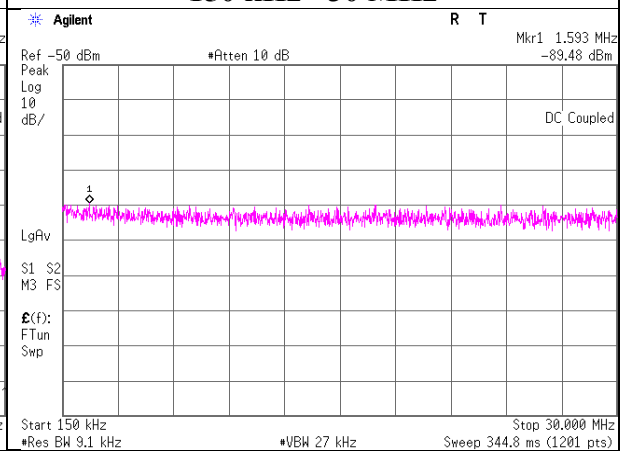
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 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
39.67	-91.7	0.50	9.8	6.4	1	-75.0	300	6.0	-13.7	35.6	49.3	
1593.00	-89.5	0.50	9.8	6.4	1	-72.7	30	6.0	8.5	23.5	15.0	

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

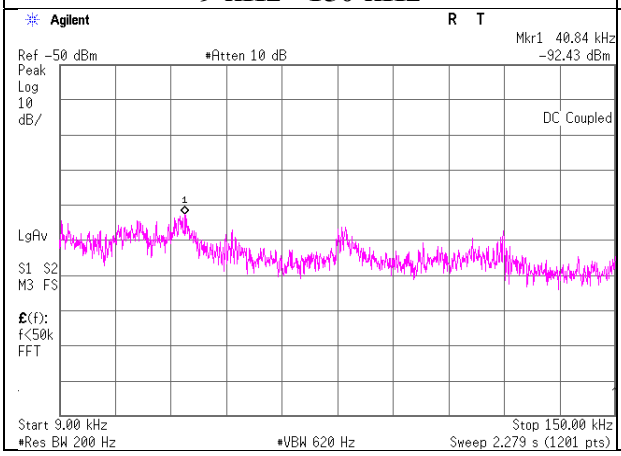
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

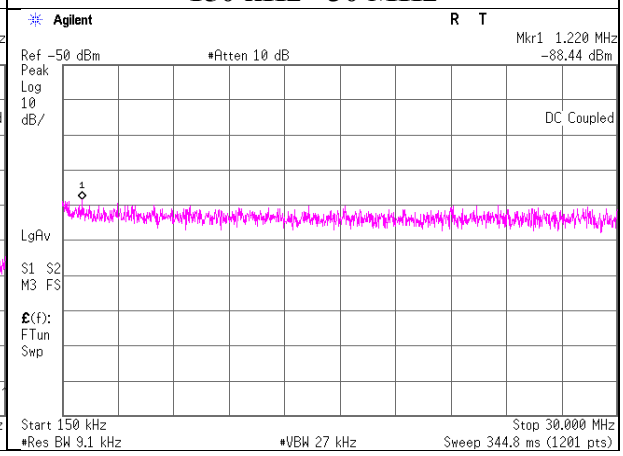
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 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
40.84	-92.4	0.50	9.8	6.4	1	-75.7	300	6.0	-14.4	35.3	49.7	
1220.00	-88.4	0.50	9.8	6.4	1	-71.7	30	6.0	9.6	25.8	16.2	

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

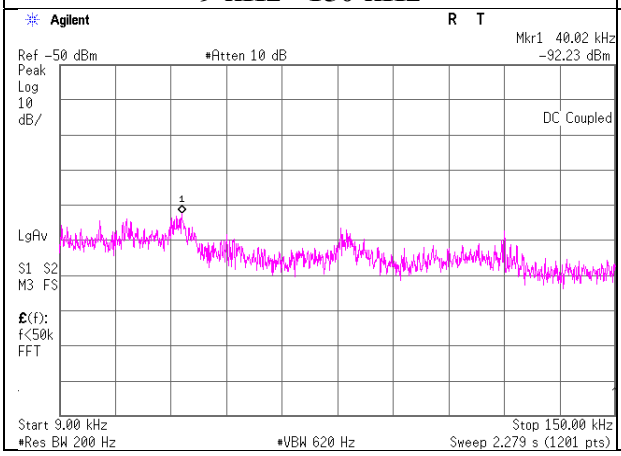
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

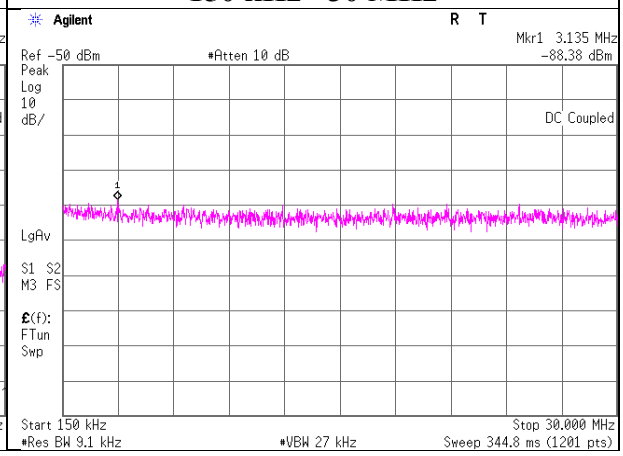
Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 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
40.02	-92.2	0.50	9.8	6.4	1	-75.5	300	6.0	-14.2	35.5	49.7	
3135.00	-88.4	0.50	9.8	6.4	1	-71.6	30	6.0	9.6	29.5	19.9	

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

Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 26, 2018
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11b

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	0.026	0.029	-12.59	0.055	8.00	20.59
2437.00	0.027	0.031	-12.42	0.057	8.00	20.42
2462.00	0.026	0.030	-12.51	0.056	8.00	20.51

Sample Calculation:
Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	-26.28	0.50	10.01	-15.77	0.026	8.00	23.77
2437.00	-26.26	0.50	10.01	-15.75	0.027	8.00	23.75
2462.00	-26.31	0.50	10.01	-15.80	0.026	8.00	23.80

Antenna port WB

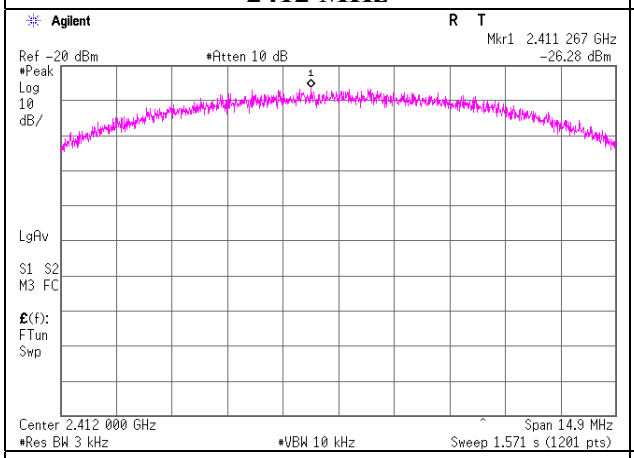
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	-26.02	0.50	10.09	-15.43	0.029	8.00	23.43
2437.00	-25.73	0.50	10.09	-15.14	0.031	8.00	23.14
2462.00	-25.85	0.50	10.09	-15.26	0.030	8.00	23.26

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

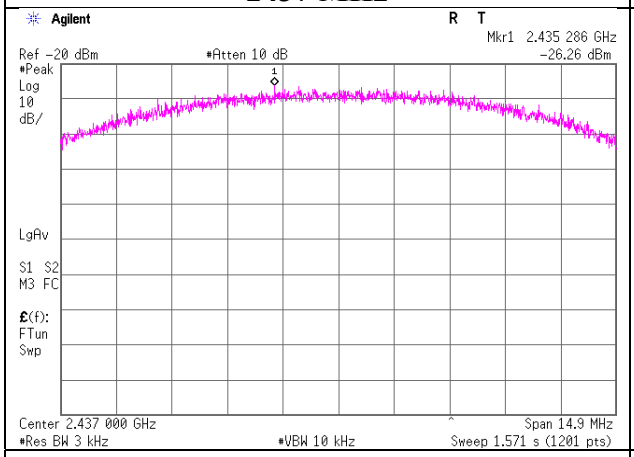
Power Density

11b Antenna port WA

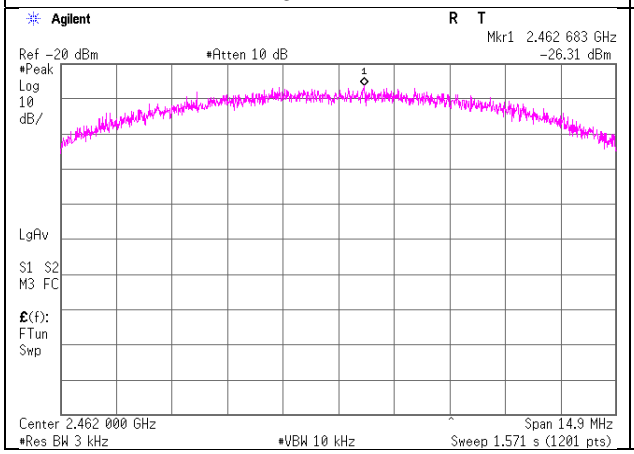
2412 MHz



2437 MHz

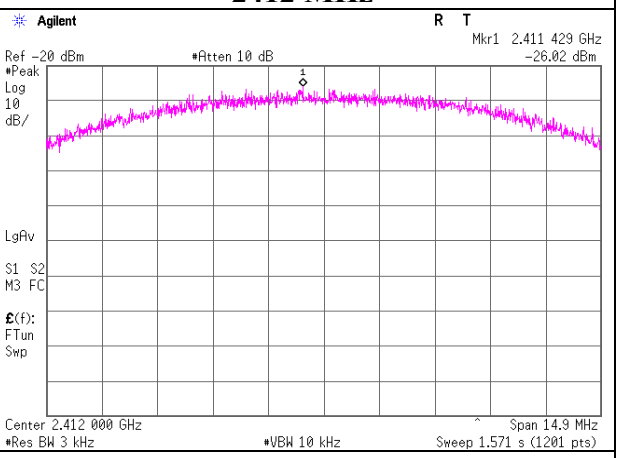


2462 MHz

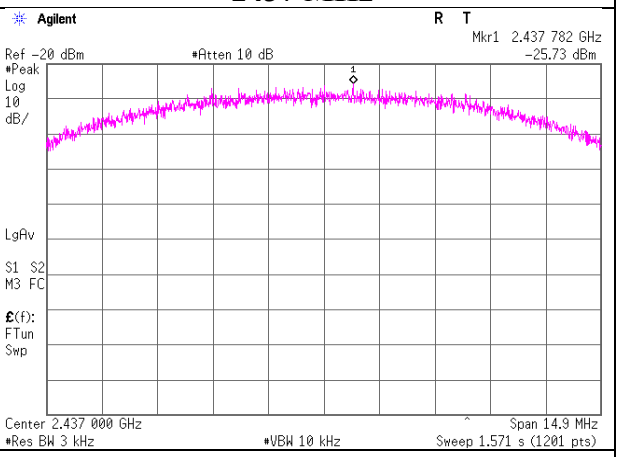


11b Antenna port WB

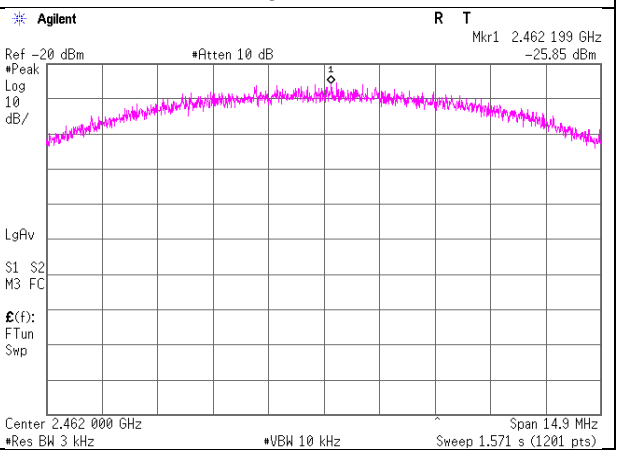
2412 MHz



2437 MHz



2462 MHz



Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 26, 2018
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11g

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	0.022	0.019	-13.88	0.041	8.00	21.88
2437.00	0.024	0.024	-13.23	0.047	8.00	21.23
2462.00	0.022	0.020	-13.75	0.042	8.00	21.75

Sample Calculation:
Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	-27.12	0.50	10.01	-16.61	0.022	8.00	24.61
2437.00	-26.75	0.50	10.01	-16.24	0.024	8.00	24.24
2462.00	-26.99	0.50	10.01	-16.48	0.022	8.00	24.48

Antenna port WB

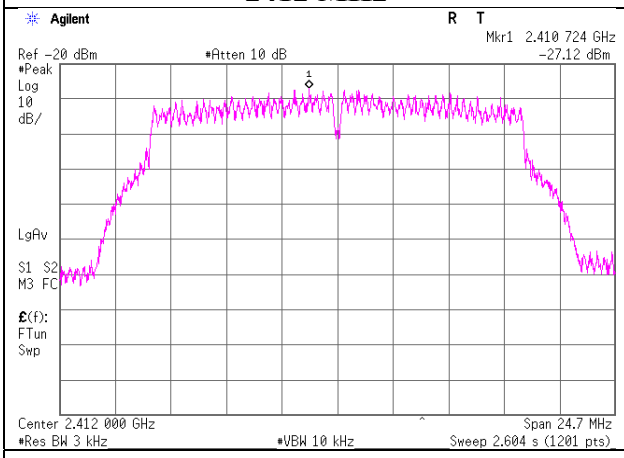
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	-27.78	0.50	10.09	-17.19	0.019	8.00	25.19
2437.00	-26.84	0.50	10.09	-16.25	0.024	8.00	24.25
2462.00	-27.65	0.50	10.09	-17.06	0.020	8.00	25.06

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

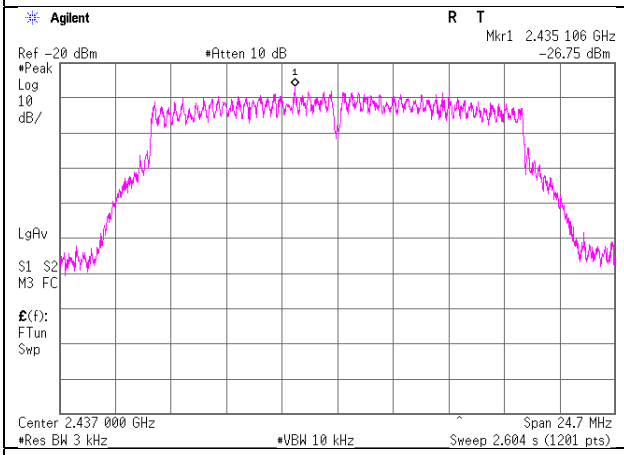
Power Density

11g Antenna port WA

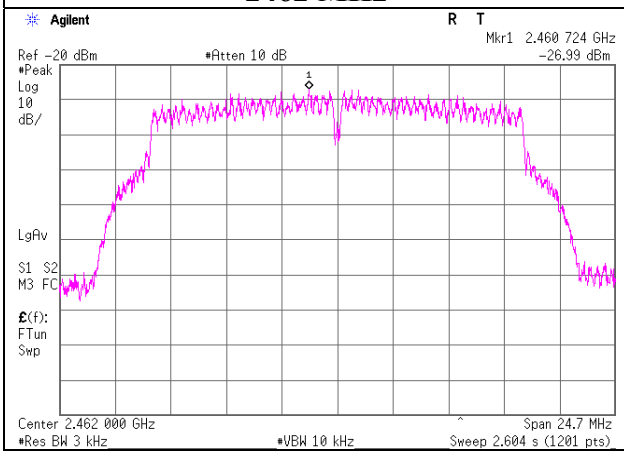
2412 MHz



2437 MHz

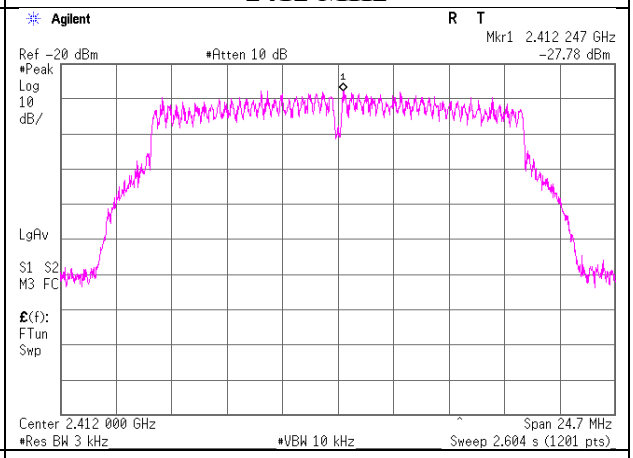


2462 MHz

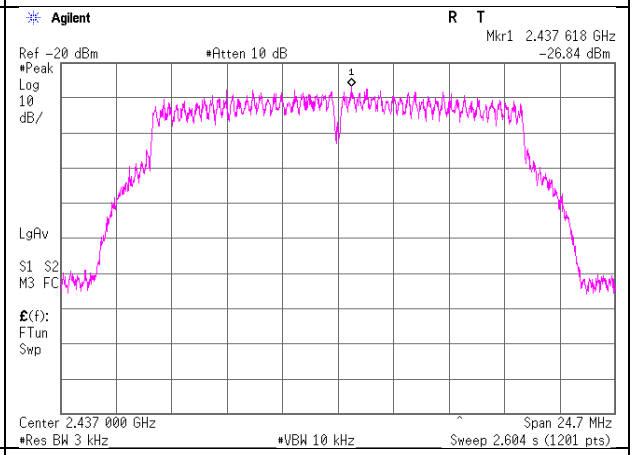


11g Antenna port WB

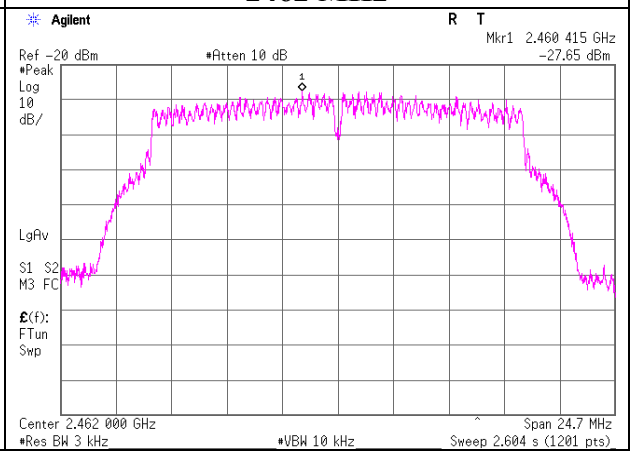
2412 MHz



2437 MHz



2462 MHz



Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 26, 2018
Temperature / Humidity	22 deg. C / 34 % RH
Engineer	Takafumi Noguchi
Mode	Tx 11n-20

Antenna port WA + WB

Freq. [MHz]	Antenna port WA Result [mW]	Antenna port WB Result [mW]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	0.022	0.021	-13.64	0.043	8.00	21.64
2437.00	0.026	0.019	-13.50	0.045	8.00	21.50
2462.00	0.024	0.024	-13.16	0.048	8.00	21.16

Sample Calculation:
Result = Antenna port WA + WB

Antenna port WA

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	-27.04	0.50	10.01	-16.53	0.022	8.00	24.53
2437.00	-26.44	0.50	10.01	-15.93	0.026	8.00	23.93
2462.00	-26.70	0.50	10.01	-16.19	0.024	8.00	24.19

Antenna port WB

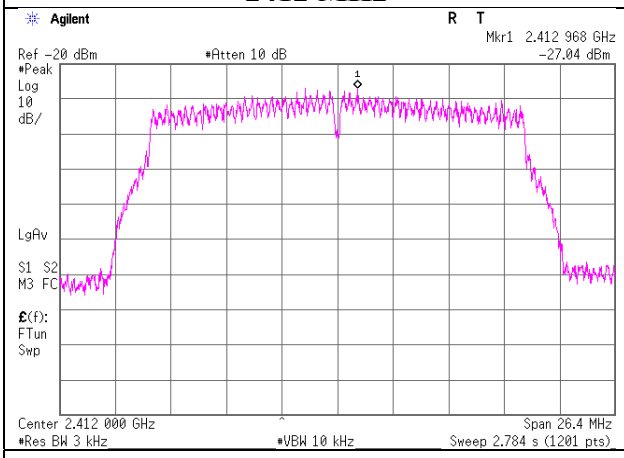
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Margin [dB]
2412.00	-27.37	0.50	10.09	-16.78	0.021	8.00	24.78
2437.00	-27.77	0.50	10.09	-17.18	0.019	8.00	25.18
2462.00	-26.75	0.50	10.09	-16.16	0.024	8.00	24.16

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

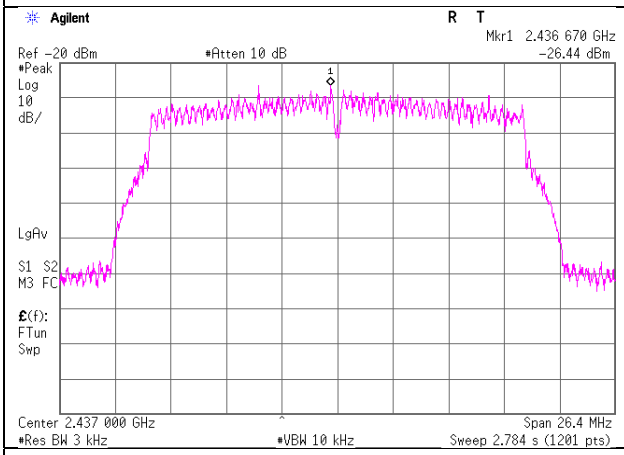
Power Density

11n-20 Antenna port WA

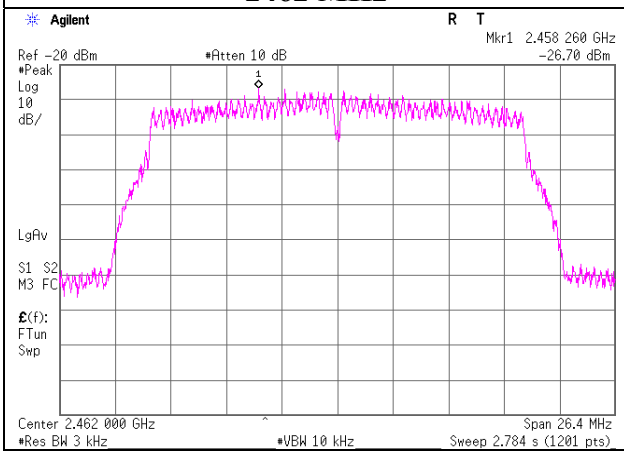
2412 MHz



2437 MHz

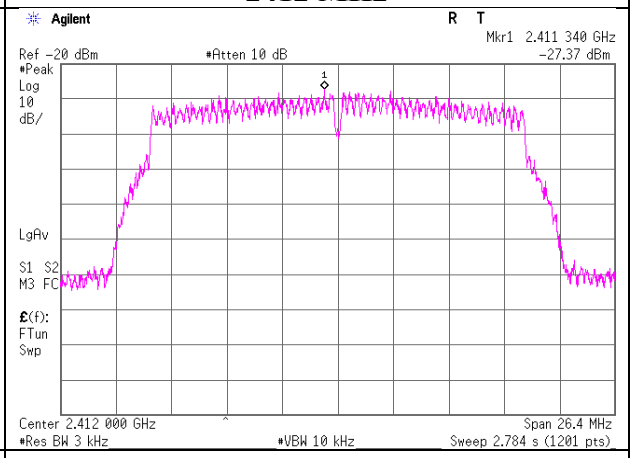


2462 MHz

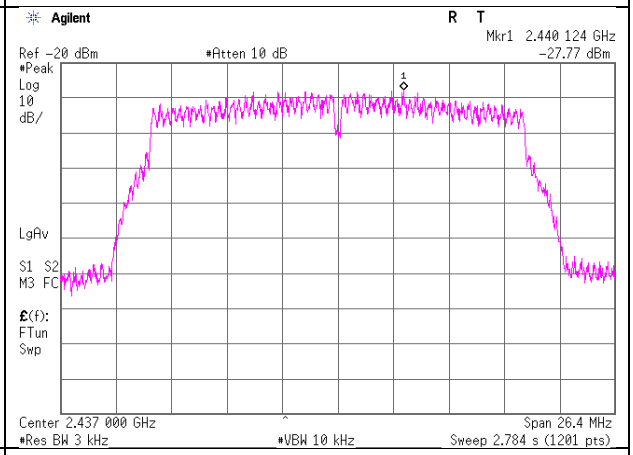


11n-20 Antenna port WB

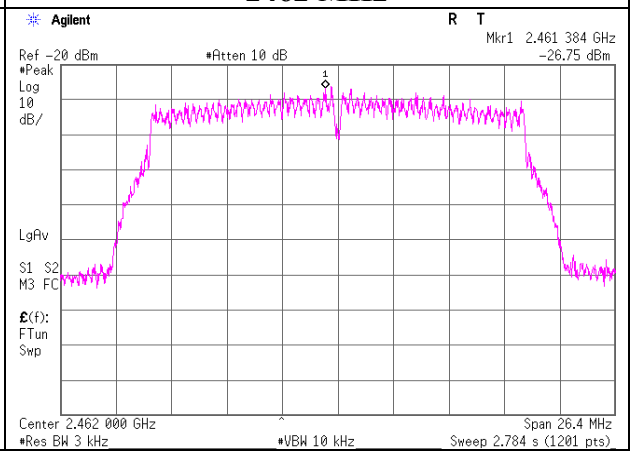
2412 MHz



2437 MHz



2462 MHz



Power Density

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	12079941H
Date	January 24, 2018
Temperature / Humidity	23 deg. C / 20 % RH
Engineer	Takafumi Noguchi
Mode	Tx BT LE

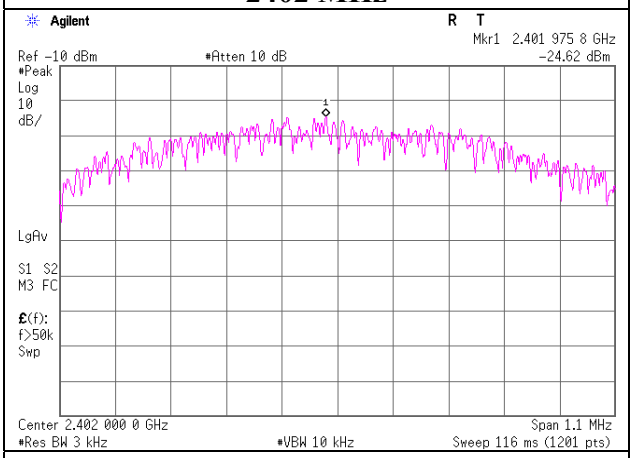
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-24.62	0.50	10.09	-14.03	8.00	22.03
2440.00	-24.33	0.50	10.09	-13.74	8.00	21.74
2480.00	-24.22	0.50	10.09	-13.63	8.00	21.63

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

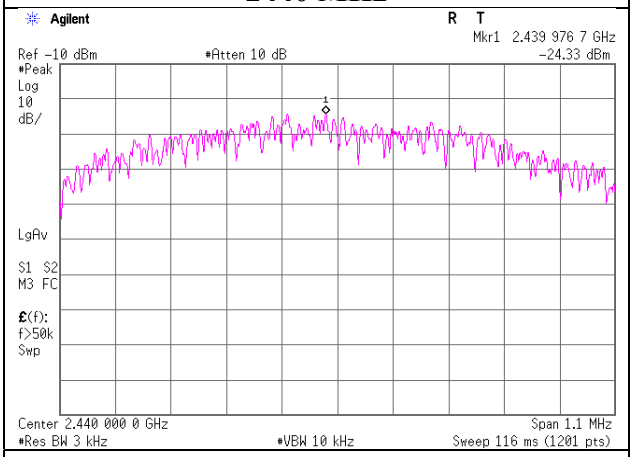
Power Density

BT LE

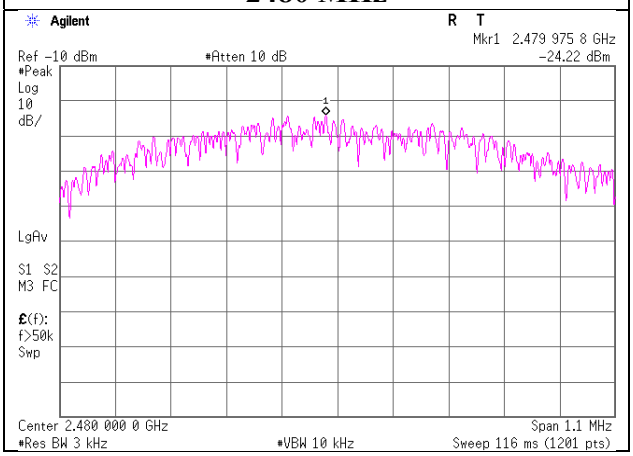
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2017/10/16 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2017/03/21 * 12
MPM-16	Power Meter	Agilent	8990B	MY51000271	AT	2017/04/28 * 12
MPSE-23	Power sensor	Agilent	N1923A	MY54070004	AT	2017/04/28 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2017/11/14 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2017/12/21 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2017/03/21 * 12
MPSE-22	Power sensor	Agilent	N1923A	MY54070003	AT	2017/04/28 * 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
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2018/01/09 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2017/09/22 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	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
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
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2017/07/20 * 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**
RE: Radiated Spurious Emission
AT: Antenna Terminal Conducted test