RADIO TEST REPORT

Test Report No. : 12219844H-B

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** **For Permissive Change** ***WLAN, Bluetooth Low Energy parts** **(Maximum Peak Output Power and Radiated Spurious Emission tests only)**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. 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.

Date of test: January 23 to March 28, 2018

Representative test engineer: T. Shimada

Takumi Shimada
Engineer
Consumer Technology Division

Approved by: Takayuki. S

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.
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☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 12219844H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12219844H-B	May 11, 2018	-	-

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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	PIFA (Antenna port WA for 2.4 GHz / Antenna port WB)
Antenna Gain: G_{ANT}	5.6 dBi (Antenna port WA for 2.4 GHz / Antenna port WB)
Directional Gain *1)	8.61 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	PIFA (Antenna port WA for 5 GHz / Antenna port WC for 5 GHz)
Antenna Gain: G_{ANT}	5.0 dBi (Antenna port WA for 5 GHz), 5.6 dBi (Antenna port WC for 5 GHz)
Directional Gain *1)	8.32 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	7.0 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	7.0 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.

<Contents of the change from original model>
Test Report Number of original model is 12079941H-B-R1(issued by UL Japan, Inc.)
Antenna was only changed from the original model, and other radio specification is identical to it.
In this report, Radiated Spurious Emission test was performed.
For Maximum Peak Output Power test, test result from the original report and new antenna gain were used in the test data.
Information of antenna was updated in Section 2.2.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on March 12, 2018 and effective April 11, 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 March 12, 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
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)	See data.	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	0.6 dB 3603.002 MHz Vertical, AV	Complied#	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.					
Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

* 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 a unique coupling/antenna connector (U.FL). Therefore the equipment complies with the requirement of 15.203/212.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

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

Antenna Terminal test

Test Item		Uncertainty (+/-)
RF output power		1.3 dB
Antenna terminal conducted emission / Power dencity /		2.7 dB
Adjacent channnel power / Channnel power		
	Below 3GHz	1.9 dB
	3 GHz ot 6 GHz	2.1 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
	(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	4.9 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
	(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

3.5 Test Location

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

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

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m 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
Maximum Peak Output Power	11b Tx 11g Tx 11n-20 Tx	WA + WB, WA, WB	2412 MHz 2437 MHz 2462 MHz
Radiated Spurious Emission (Below 1 GHz)	11n-20 Tx *1)	WA + WB	2462 MHz
Radiated Spurious Emission (Above 1 GHz)	11b Tx 11n-20 Tx *2)	WA + WB	2412 MHz 2437 MHz 2462 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) 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
Maximum Peak Output Power, Radiated Spurious Emission	BT LE	2402 MHz 2440 MHz 2480 MHz

*Simultaneously transmission

Test Item	Mode *1)
Radiated Spurious Emission	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 5 GHz band at antenna terminal test.	

4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.5 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)		4.5 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)

*1) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".
*2) Distance Factor: 20 x log (4.5 m / 3.0 m) = 3.53 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 (Antenna and Module) 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 6: 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
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50 MHz BW)

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

Maximum Peak Output Power

Report No.	12219844H	
Test place	Ise EMC Lab. No.11 Measurement Room	
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	27.39	548.28	14.59
2437	9.93	9.33	12.85	19.26	27.39	548.28	14.54
2462	9.75	9.66	12.88	19.41	27.39	548.28	14.51

Sample Calculation:
Result = Antenna port WA + Antenna port WB
*This Limit was reduced by the amount in dB (2.61 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

Report No.	12219844H	
Test place	Ise EMC Lab. No.11 Measurement Room	
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	27.39	548.28	4.76
2437	87.30	87.10	22.42	174.39	27.39	548.28	4.97
2462	89.13	88.31	22.49	177.43	27.39	548.28	4.90

Sample Calculation:
Result = Antenna port WA + Antenna port WB
*This Limit was reduced by the amount in dB (2.61 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

Report No.	12219844H	
Test place	Ise EMC Lab. No.11 Measurement Room	
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	27.39	548.28	4.51
2437	100.00	93.33	22.86	193.33	27.39	548.28	4.53
2462	112.98	110.15	23.49	223.13	27.39	548.28	3.90

Sample Calculation:
Result = Antenna port WA + Antenna port WB
*This Limit was reduced by the amount in dB (2.61 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

Report No.	12219844H
Test place	Ise EMC Lab. No.11 Measurement Room
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	29.00	794.33	27.51
2440	-8.85	0.50	10.09	1.74	1.49	29.00	794.33	27.26
2480	-8.70	0.50	10.09	1.89	1.55	29.00	794.33	27.11

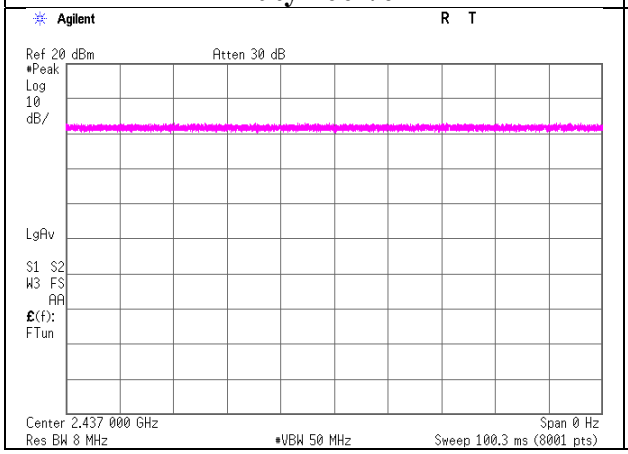
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
*This Limit was reduced by the amount in dB (1.0 dB)
that the directional gain of the antenna/antenna array exceeding 6 dBi.

Burst rate confirmation

Report No.	12219844H	
Test place	Ise EMC Lab. No.11 Measurement Room	
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	

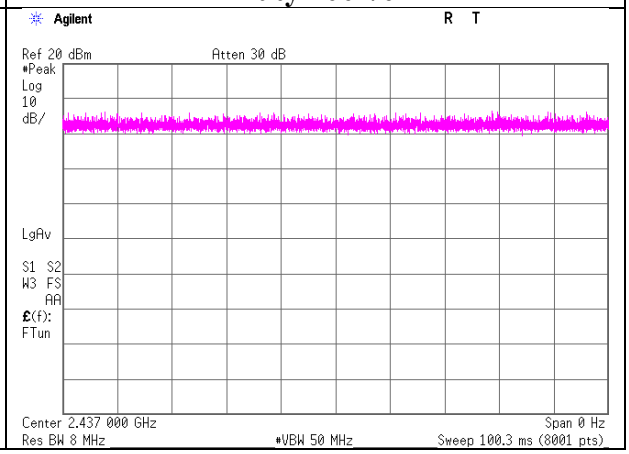
11b 11 Mbps

Duty 100 %



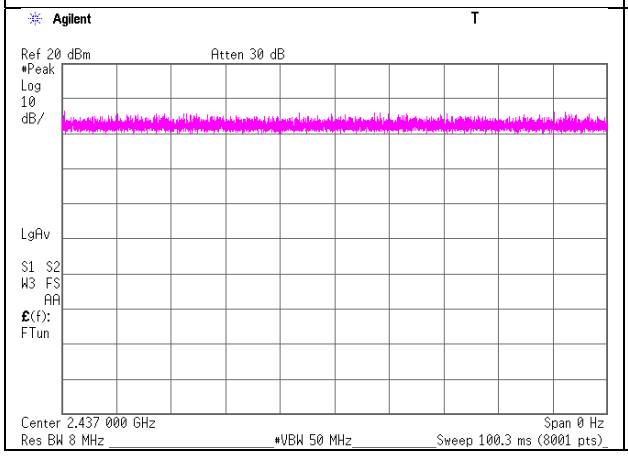
11g 54 Mbps

Duty 100 %



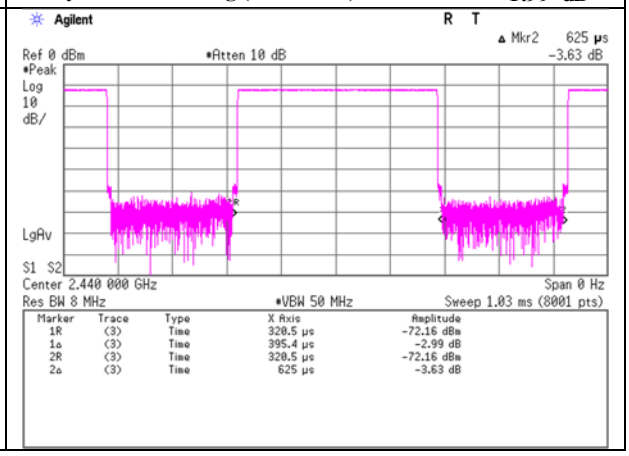
11n-20 MCS 5

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.

Radiated Spurious Emission

Report No.	12219844H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)
Mode	Tx 11b 2412 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	43.2	27.7	6.5	32.7	-	44.7	73.9	29.2	
Hori	4824.000	PK	41.1	31.7	8.8	31.8	-	49.8	73.9	24.1	
Hori	7236.000	PK	42.7	36.1	10.2	32.6	-	56.4	73.9	17.5	Floor noise
Hori	9648.000	PK	41.5	38.6	10.7	33.3	-	57.5	73.9	16.4	Floor noise
Hori	2390.000	AV	33.3	27.7	6.5	32.7	-	34.8	53.9	19.1	
Hori	4824.000	AV	30.7	31.7	8.8	31.8	-	39.4	53.9	14.5	
Hori	7236.000	AV	30.2	36.1	10.2	32.6	-	43.9	53.9	10.0	Floor noise
Hori	9648.000	AV	31.3	38.6	10.7	33.3	-	47.3	53.9	6.6	Floor noise
Vert	2390.000	PK	44.6	27.7	6.5	32.7	-	46.1	73.9	27.8	
Vert	4824.000	PK	47.7	31.7	8.8	31.8	-	56.4	73.9	17.5	
Vert	7236.000	PK	40.7	36.1	10.2	32.6	-	54.4	73.9	19.5	Floor noise
Vert	9648.000	PK	40.7	38.6	10.7	33.3	-	56.7	73.9	17.2	Floor noise
Vert	2390.000	AV	35.2	27.7	6.5	32.7	-	36.7	53.9	17.2	
Vert	4824.000	AV	34.2	31.7	8.8	31.8	-	42.9	53.9	11.0	
Vert	7236.000	AV	30.4	36.1	10.2	32.6	-	44.1	53.9	9.8	Floor noise
Vert	9648.000	AV	31.1	38.6	10.7	33.3	-	47.1	53.9	6.8	Floor noise

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

Distance factor: 1 GHz - 10 GHz 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

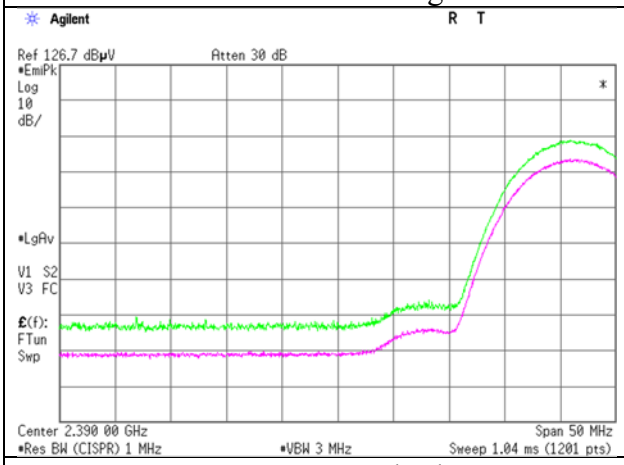
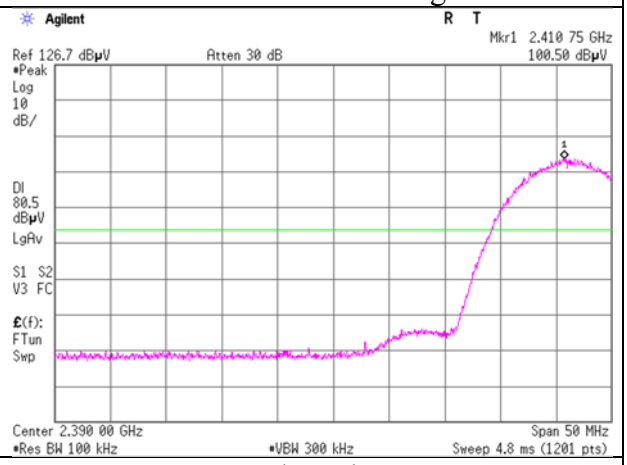
20dBc Data Sheet

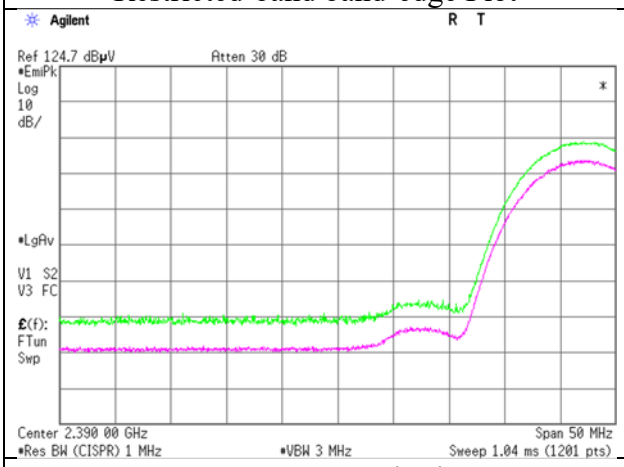
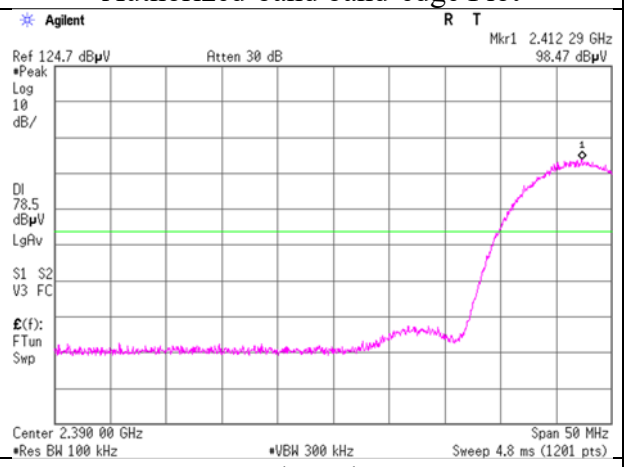
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.5	27.7	6.6	32.7	102.1	-	-	Carrier
Hori	2400.000	PK	51.1	27.7	6.6	32.7	52.7	82.1	29.4	
Vert	2412.000	PK	98.5	27.7	6.6	32.7	100.1	-	-	Carrier
Vert	2400.000	PK	48.1	27.7	6.6	32.7	49.7	80.1	30.4	

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.	12219844H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 16, 2018
Temperature / Humidity	21 deg. C / 48 % RH
Engineer	Takumi Shimada (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.	12219844H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)
Mode	Tx 11b 2437 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	40.7	31.9	8.8	31.7	-	49.7	73.9	24.2	
Hori	7311.000	PK	41.7	36.2	10.2	32.7	-	55.4	73.9	18.5	Floor noise
Hori	9748.000	PK	40.3	38.7	10.8	33.4	-	56.4	73.9	17.5	Floor noise
Hori	4874.000	AV	32.8	31.9	8.8	31.7	-	41.8	53.9	12.1	
Hori	7311.000	AV	32.3	36.2	10.2	32.7	-	46.0	53.9	7.9	Floor noise
Hori	9748.000	AV	31.6	38.7	10.8	33.4	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	40.6	31.9	8.8	31.7	-	49.6	73.9	24.3	
Vert	7311.000	PK	41.5	36.2	10.2	32.7	-	55.2	73.9	18.7	Floor noise
Vert	9748.000	PK	41.4	38.7	10.8	33.4	-	57.5	73.9	16.4	Floor noise
Vert	4874.000	AV	32.6	31.9	8.8	31.7	-	41.6	53.9	12.3	
Vert	7311.000	AV	32.6	36.2	10.2	32.7	-	46.3	53.9	7.6	Floor noise
Vert	9748.000	AV	31.6	38.7	10.8	33.4	-	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

Radiated Spurious Emission

Report No.	12219844H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)
Mode	Tx 11b 2462 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	44.1	27.8	6.6	32.7	-	45.8	73.9	28.1	
Hori	4924.000	PK	41.1	32.0	8.9	31.7	-	50.3	73.9	23.6	
Hori	7386.000	PK	41.6	36.3	10.2	32.7	-	55.4	73.9	18.5	Floor noise
Hori	9848.000	PK	41.5	38.8	10.8	33.4	-	57.7	73.9	16.2	Floor noise
Hori	2483.500	AV	34.3	27.8	6.6	32.7	-	36.0	53.9	17.9	
Hori	4924.000	AV	30.5	32.0	8.9	31.7	-	39.7	53.9	14.2	
Hori	7386.000	AV	31.5	36.3	10.2	32.7	-	45.3	53.9	8.6	Floor noise
Hori	9848.000	AV	31.2	38.8	10.8	33.4	-	47.4	53.9	6.5	Floor noise
Vert	2483.500	PK	44.9	27.8	6.6	32.7	-	46.6	73.9	27.3	
Vert	4924.000	PK	44.4	32.0	8.9	31.7	-	53.6	73.9	20.3	
Vert	7386.000	PK	43.1	36.3	10.2	32.7	-	56.9	73.9	17.0	Floor noise
Vert	9848.000	PK	41.8	38.8	10.8	33.4	-	58.0	73.9	15.9	Floor noise
Vert	2483.500	AV	36.1	27.8	6.6	32.7	-	37.8	53.9	16.1	
Vert	4924.000	AV	32.1	32.0	8.9	31.7	-	41.3	53.9	12.6	
Vert	7386.000	AV	31.7	36.3	10.2	32.7	-	45.5	53.9	8.4	Floor noise
Vert	9848.000	AV	31.4	38.8	10.8	33.4	-	47.6	53.9	6.3	Floor noise

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

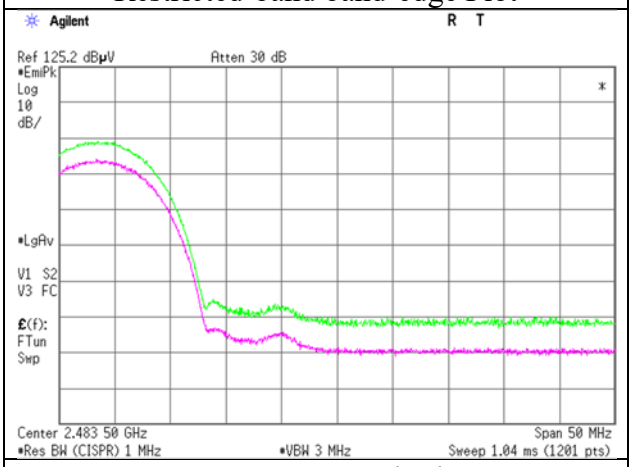
Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12219844H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 16, 2018
Temperature / Humidity	21 deg. C / 48 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

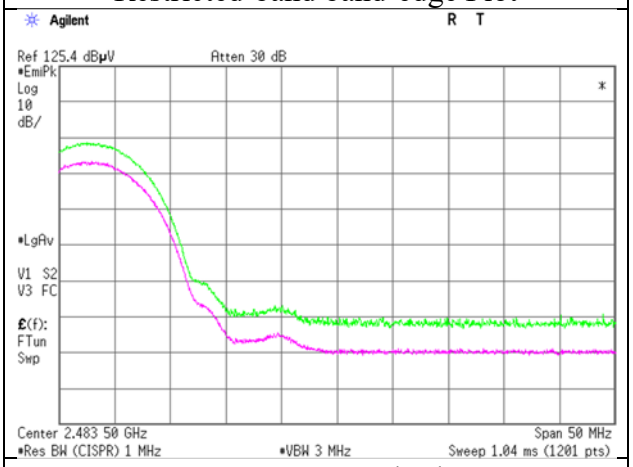
Restricted-band band-edge Plot



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.	12219844H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 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	49.8	27.7	6.5	32.7	-	51.3	73.9	22.6	
Hori	4824.000	PK	41.1	31.7	8.8	31.8	-	49.8	73.9	24.1	Floor noise
Hori	7236.000	PK	42.6	36.1	10.2	32.6	-	56.3	73.9	17.6	Floor noise
Hori	9648.000	PK	41.4	38.6	10.7	33.3	-	57.4	73.9	16.5	Floor noise
Hori	2390.000	AV	39.0	27.7	6.5	32.7	-	40.5	53.9	13.4	
Hori	4824.000	AV	30.7	31.7	8.8	31.8	-	39.4	53.9	14.5	Floor noise
Hori	7236.000	AV	30.3	36.1	10.2	32.6	-	44.0	53.9	9.9	Floor noise
Hori	9648.000	AV	31.6	38.6	10.7	33.3	-	47.6	53.9	6.3	Floor noise
Vert	2390.000	PK	46.6	27.7	6.5	32.7	-	48.1	73.9	25.8	
Vert	4824.000	PK	41.3	31.7	8.8	31.8	-	50.0	73.9	23.9	Floor noise
Vert	7236.000	PK	40.6	36.1	10.2	32.6	-	54.3	73.9	19.6	Floor noise
Vert	9648.000	PK	40.8	38.6	10.7	33.3	-	56.8	73.9	17.1	Floor noise
Vert	2390.000	AV	38.8	27.7	6.5	32.7	-	40.3	53.9	13.6	
Vert	4824.000	AV	30.6	31.7	8.8	31.8	-	39.3	53.9	14.6	Floor noise
Vert	7236.000	AV	30.5	36.1	10.2	32.6	-	44.2	53.9	9.7	Floor noise
Vert	9648.000	AV	31.3	38.6	10.7	33.3	-	47.3	53.9	6.6	Floor noise

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

Distance factor: 1 GHz - 10 GHz 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

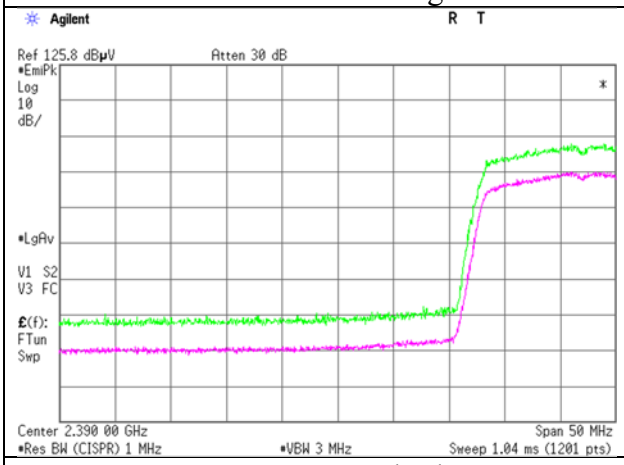
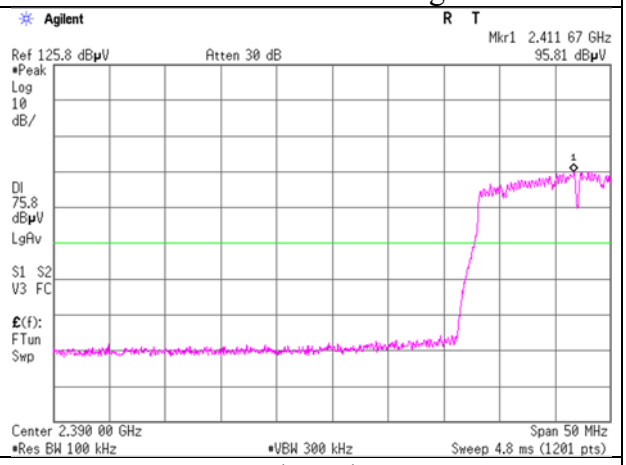
20dBc Data Sheet

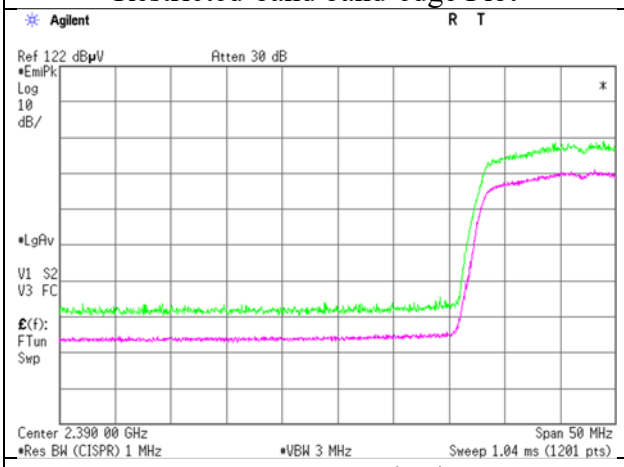
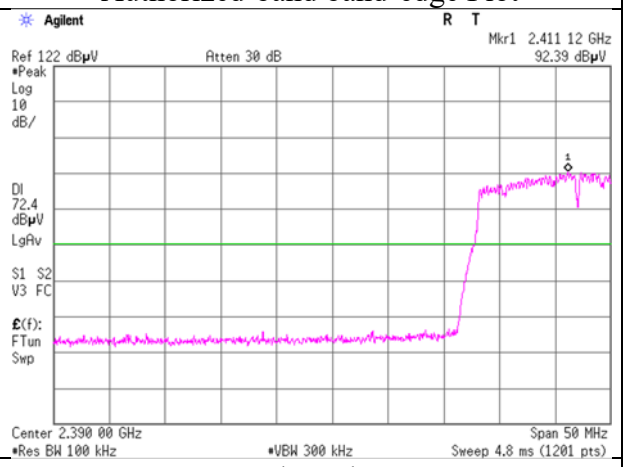
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	95.8	27.7	6.6	32.7	97.4	-	-	Carrier
Hori	2400.000	PK	45.3	27.7	6.6	32.7	46.9	77.4	30.5	
Vert	2412.000	PK	92.4	27.7	6.6	32.7	94.0	-	-	Carrier
Vert	2400.000	PK	42.3	27.7	6.6	32.7	43.9	74.0	30.1	

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.	12219844H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 16, 2018
Temperature / Humidity	21 deg. C / 48 % RH
Engineer	Takumi Shimada (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.	12219844H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 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	8.8	31.7	-	50.2	73.9	23.7	Floor noise
Hori	7311.000	PK	41.6	36.2	10.2	32.7	-	55.3	73.9	18.6	Floor noise
Hori	9748.000	PK	41.6	38.7	10.8	33.4	-	57.7	73.9	16.2	Floor noise
Hori	4874.000	AV	32.8	31.9	8.8	31.7	-	41.8	53.9	12.1	Floor noise
Hori	7311.000	AV	32.4	36.2	10.2	32.7	-	46.1	53.9	7.8	Floor noise
Hori	9748.000	AV	31.6	38.7	10.8	33.4	-	47.7	53.9	6.2	Floor noise
Vert	4874.000	PK	41.0	31.9	8.8	31.7	-	50.0	73.9	23.9	Floor noise
Vert	7311.000	PK	41.6	36.2	10.2	32.7	-	55.3	73.9	18.6	Floor noise
Vert	9748.000	PK	41.7	38.7	10.8	33.4	-	57.8	73.9	16.1	Floor noise
Vert	4874.000	AV	32.8	31.9	8.8	31.7	-	41.8	53.9	12.1	Floor noise
Vert	7311.000	AV	32.5	36.2	10.2	32.7	-	46.2	53.9	7.7	Floor noise
Vert	9748.000	AV	31.4	38.7	10.8	33.4	-	47.5	53.9	6.4	Floor noise

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

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

Radiated Spurious Emission

Report No.	12219844H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018	March 28, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH	25 deg. C / 33 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Masafumi Niwa (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	50.145	QP	24.1	10.6	7.5	32.2	-	10.0	40.0	30.0	
Hori	105.858	QP	33.8	10.9	8.2	32.2	-	20.7	43.5	22.8	
Hori	130.017	QP	32.8	13.6	8.5	32.2	-	22.7	43.5	20.8	
Hori	189.432	QP	33.7	16.4	9.1	32.1	-	27.1	43.5	16.4	
Hori	243.296	QP	33.2	11.5	9.6	32.0	-	22.3	46.0	23.7	
Hori	304.000	QP	36.7	13.4	10.0	32.0	-	28.1	46.0	17.9	
Hori	2483.500	PK	53.2	27.8	6.6	32.7	-	54.9	73.9	19.0	
Hori	4924.000	PK	41.3	32.0	8.9	31.7	-	50.5	73.9	23.4	Floor noise
Hori	7386.000	PK	41.7	36.3	10.2	32.7	-	55.5	73.9	18.4	Floor noise
Hori	9848.000	PK	41.6	38.8	10.8	33.4	-	57.8	73.9	16.1	Floor noise
Hori	2483.500	AV	40.7	27.8	6.6	32.7	-	42.4	53.9	11.5	
Hori	4924.000	AV	30.8	32.0	8.9	31.7	-	40.0	53.9	13.9	Floor noise
Hori	7386.000	AV	31.6	36.3	10.2	32.7	-	45.4	53.9	8.5	Floor noise
Hori	9848.000	AV	31.3	38.8	10.8	33.4	-	47.5	53.9	6.4	Floor noise
Vert	50.145	QP	33.2	10.6	7.5	32.2	-	19.1	40.0	20.9	
Vert	105.858	QP	33.4	10.9	8.2	32.2	-	20.3	43.5	23.2	
Vert	130.017	QP	34.8	13.6	8.5	32.2	-	24.7	43.5	18.8	
Vert	189.432	QP	27.9	16.4	9.1	32.1	-	21.3	43.5	22.2	
Vert	243.296	QP	29.3	11.5	9.6	32.0	-	18.4	46.0	27.6	
Vert	304.000	QP	29.4	13.4	10.0	32.0	-	20.8	46.0	25.2	
Vert	2483.500	PK	51.3	27.8	6.6	32.7	-	53.0	73.9	20.9	
Vert	4924.000	PK	41.2	32.0	8.9	31.7	-	50.4	73.9	23.5	Floor noise
Vert	7386.000	PK	42.0	36.3	10.2	32.7	-	55.8	73.9	18.1	Floor noise
Vert	9848.000	PK	41.5	38.8	10.8	33.4	-	57.7	73.9	16.2	Floor noise
Vert	2483.500	AV	42.4	27.8	6.6	32.7	-	44.1	53.9	9.8	
Vert	4924.000	AV	30.6	32.0	8.9	31.7	-	39.8	53.9	14.1	Floor noise
Vert	7386.000	AV	31.8	36.3	10.2	32.7	-	45.6	53.9	8.3	Floor noise
Vert	9848.000	AV	31.5	38.8	10.8	33.4	-	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).

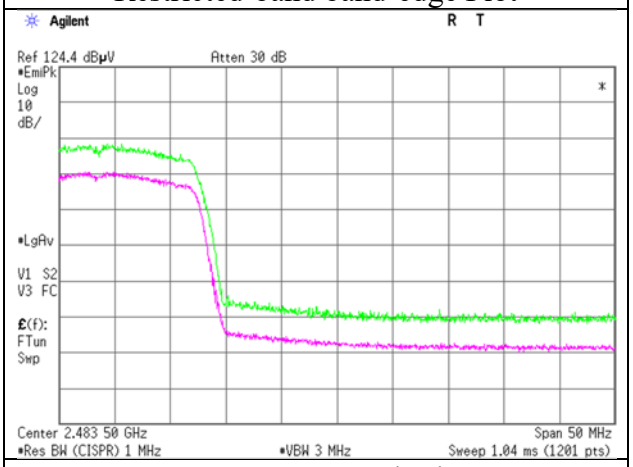
Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12219844H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	December 8, 2017
Temperature / Humidity	21 deg. C / 48 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

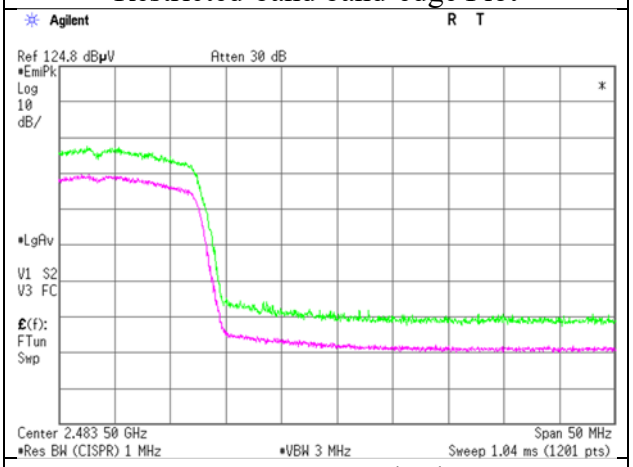
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

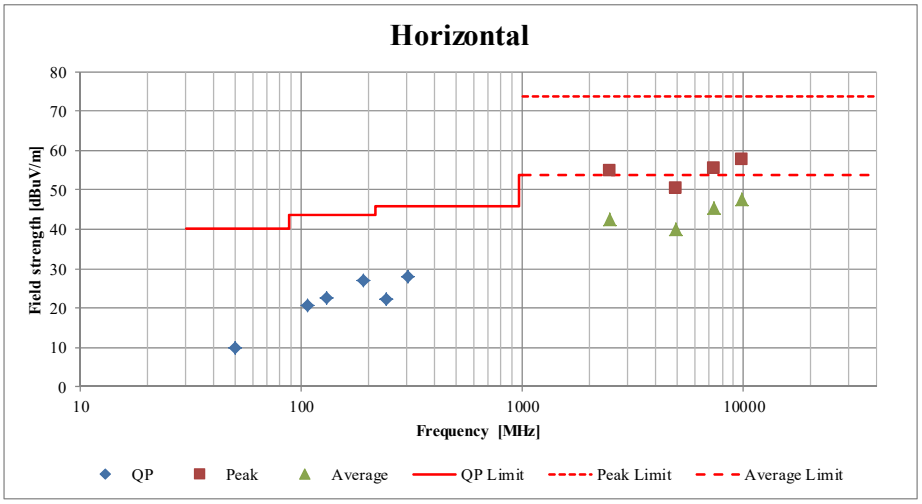


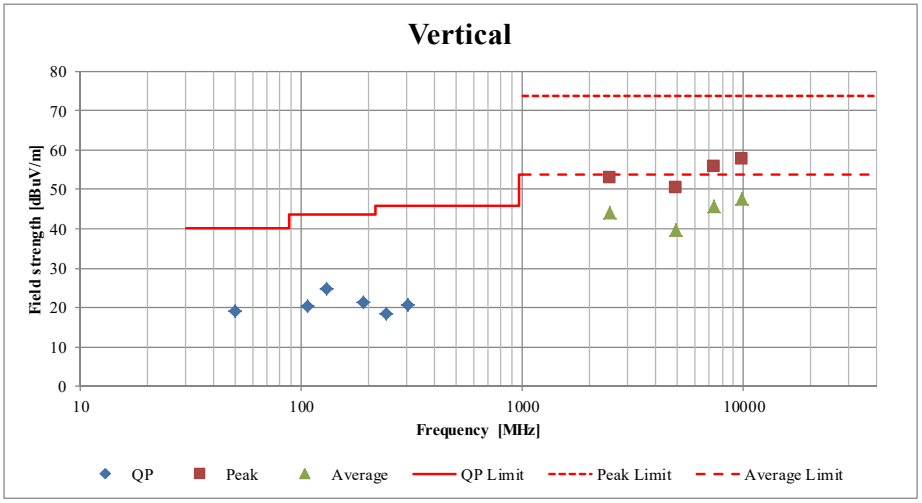
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12219844H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	March 16, 2018	March 21, 2018	March 25, 2018	March 28, 2018
Temperature / Humidity	21 deg. C / 48 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH	25 deg. C / 33 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Masafumi Niwa (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.	12219844H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	March 15, 2018	March 21, 2018	March 25, 2018	March 28, 2018
Temperature / Humidity	21 deg. C / 41 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH	25 deg. C / 33 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Masafumi Niwa (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	43.317	QP	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Hori	125.483	QP	22.1	13.2	8.5	32.2	-	11.6	43.5	31.9	
Hori	246.667	QP	21.9	11.5	9.6	32.0	-	11.0	46.0	35.0	
Hori	505.335	QP	21.6	17.6	11.4	32.0	-	18.6	46.0	27.4	
Hori	853.330	QP	21.3	21.3	13.3	31.2	-	24.7	46.0	21.3	
Hori	990.661	QP	20.5	22.3	13.9	30.5	-	26.2	53.9	27.7	
Hori	2390.000	PK	46.4	27.7	6.7	32.7	-	48.1	73.9	25.8	
Hori	3603.002	PK	50.8	29.5	9.0	32.2	-	57.1	73.9	16.8	
Hori	4804.000	PK	39.9	31.6	9.0	31.8	-	48.7	73.9	25.2	Floor noise
Hori	7206.000	PK	42.0	36.0	10.4	32.6	-	55.8	73.9	18.1	Floor noise
Hori	9608.000	PK	41.5	38.5	10.9	33.3	-	57.6	73.9	16.3	Floor noise
Hori	2390.000	AV	38.1	27.7	6.7	32.7	2.0	41.8	53.9	12.1	*1)
Hori	3603.002	AV	44.9	29.5	9.0	32.2	2.0	53.2	53.9	0.7	*2)
Hori	4804.000	AV	32.6	31.6	9.0	31.8	-	41.4	53.9	12.5	Floor noise
Hori	7206.000	AV	34.0	36.0	10.4	32.6	-	47.8	53.9	6.1	Floor noise
Hori	9608.000	AV	31.7	38.5	10.9	33.3	-	47.8	53.9	6.1	Floor noise
Vert	43.317	QP	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Vert	125.483	QP	22.3	13.2	8.5	32.2	-	11.8	43.5	31.7	
Vert	246.667	QP	21.2	11.5	9.6	32.0	-	10.3	46.0	35.7	
Vert	505.335	QP	21.6	17.6	11.4	32.0	-	18.6	46.0	27.4	
Vert	853.330	QP	21.3	21.3	13.3	31.2	-	24.7	46.0	21.3	
Vert	990.661	QP	20.4	22.3	13.9	30.5	-	26.1	53.9	27.8	
Vert	2390.000	PK	41.8	27.7	6.7	32.7	-	43.5	73.9	30.4	
Vert	3603.002	PK	50.5	29.5	9.0	32.2	-	56.8	73.9	17.1	
Vert	4804.000	PK	40.5	31.6	9.0	31.8	-	49.3	73.9	24.6	Floor noise
Vert	7206.000	PK	41.6	36.0	10.4	32.6	-	55.4	73.9	18.5	Floor noise
Vert	9608.000	PK	41.5	38.5	10.9	33.3	-	57.6	73.9	16.3	Floor noise
Vert	2390.000	AV	33.8	27.7	6.7	32.7	2.0	37.5	53.9	16.4	*1)
Vert	3603.002	AV	45.0	29.5	9.0	32.2	2.0	53.3	53.9	0.6	*2)
Vert	4804.000	AV	30.7	31.6	9.0	31.8	-	39.5	53.9	14.4	Floor noise
Vert	7206.000	AV	32.5	36.0	10.4	32.6	-	46.3	53.9	7.6	Floor noise
Vert	9608.000	AV	31.7	38.5	10.9	33.3	-	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.

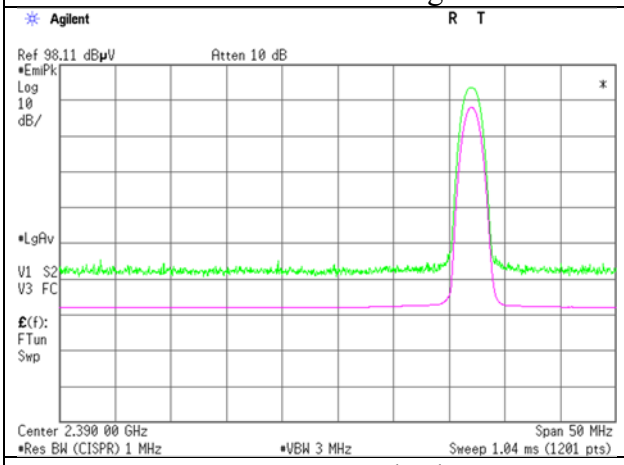
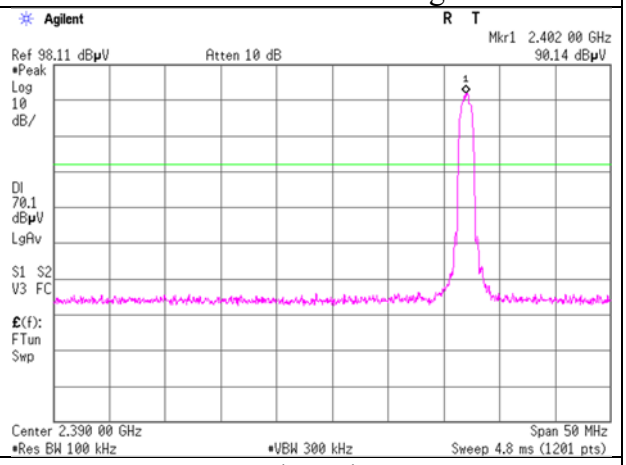
20dBc Data Sheet

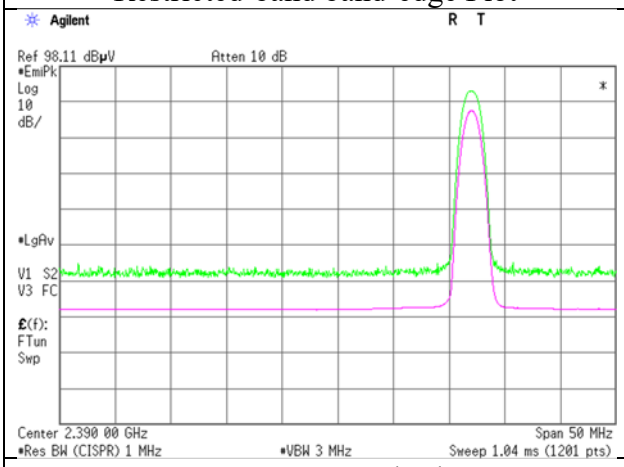
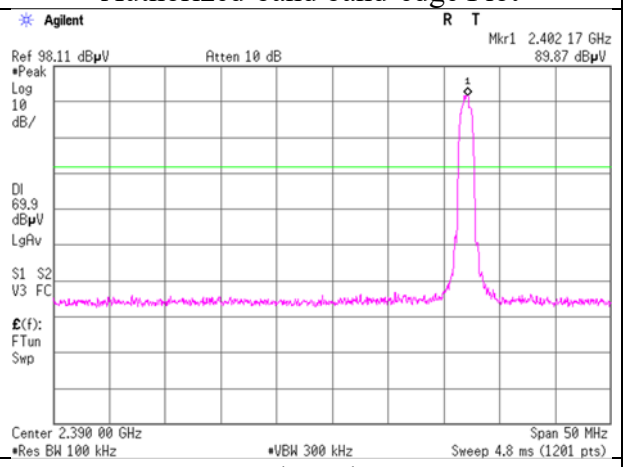
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	90.1	27.7	6.8	32.7	91.9	-	-	Carrier
Hori	2400.000	PK	38.3	27.7	6.8	32.7	40.1	71.9	31.8	
Vert	2402.000	PK	89.9	27.7	6.8	32.7	91.7	-	-	Carrier
Vert	2400.000	PK	34.0	27.7	6.8	32.7	35.8	71.7	35.9	

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.	12219844H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 15, 2018
Temperature / Humidity	21 deg. C / 41 % RH
Engineer	Takumi Shimada (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.	12219844H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	March 15, 2018	March 21, 2018	March 25, 2018	March 28, 2018
Temperature / Humidity	21 deg. C / 41 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH	25 deg. C / 33 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Masafumi Niwa (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	43.317	QP	21.8	12.9	7.4	32.2	-	9.9	40.0	30.1	
Hori	125.483	QP	22.2	13.2	8.5	32.2	-	11.7	43.5	31.8	
Hori	246.667	QP	22.0	11.5	9.6	32.0	-	11.1	46.0	34.9	
Hori	505.335	QP	21.6	17.6	11.4	32.0	-	18.6	46.0	27.4	
Hori	853.330	QP	21.3	21.3	13.3	31.2	-	24.7	46.0	21.3	
Hori	990.661	QP	20.4	22.3	13.9	30.5	-	26.1	53.9	27.8	
Hori	3659.889	PK	48.1	29.6	8.9	32.2	-	54.4	73.9	19.5	
Hori	4880.000	PK	39.9	31.9	9.0	31.7	-	49.1	73.9	24.8	Floor noise
Hori	7320.000	PK	41.8	36.2	10.4	32.7	-	55.7	73.9	18.2	Floor noise
Hori	9760.000	PK	41.8	38.7	11.0	33.4	-	58.1	73.9	15.8	Floor noise
Hori	3659.889	AV	41.9	29.6	8.9	32.2	2.0	50.2	53.9	3.7	*1)
Hori	4880.000	AV	32.3	31.9	9.0	31.7	-	41.5	53.9	12.4	Floor noise
Hori	7320.000	AV	33.9	36.2	10.4	32.7	-	47.8	53.9	6.1	Floor noise
Hori	9760.000	AV	31.5	38.7	11.0	33.4	-	47.8	53.9	6.1	Floor noise
Vert	43.317	QP	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Vert	125.483	QP	22.3	13.2	8.5	32.2	-	11.8	43.5	31.7	
Vert	246.667	QP	21.1	11.5	9.6	32.0	-	10.2	46.0	35.8	
Vert	505.335	QP	21.6	17.6	11.4	32.0	-	18.6	46.0	27.4	
Vert	853.330	QP	21.4	21.3	13.3	31.2	-	24.8	46.0	21.2	
Vert	990.661	QP	20.3	22.3	13.9	30.5	-	26.0	53.9	27.9	
Vert	3659.889	PK	49.7	29.6	8.9	32.2	-	56.0	73.9	17.9	
Vert	4880.000	PK	41.2	31.9	9.0	31.7	-	50.4	73.9	23.5	Floor noise
Vert	7320.000	PK	42.3	36.2	10.4	32.7	-	56.2	73.9	17.7	Floor noise
Vert	9760.000	PK	41.4	38.7	11.0	33.4	-	57.7	73.9	16.2	Floor noise
Vert	3659.889	AV	43.6	29.6	8.9	32.2	2.0	51.9	53.9	2.0	*1)
Vert	4880.000	AV	32.4	31.9	9.0	31.7	-	41.6	53.9	12.3	Floor noise
Vert	7320.000	AV	33.9	36.2	10.4	32.7	-	47.8	53.9	6.1	Floor noise
Vert	9760.000	AV	31.4	38.7	11.0	33.4	-	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.	12219844H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	March 15, 2018	March 21, 2018	March 25, 2018	March 28, 2018
Temperature / Humidity	21 deg. C / 41 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH	25 deg. C / 33 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Masafumi Niwa (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	43.317	QP	21.7	12.9	7.4	32.2	-	9.8	40.0	30.2	
Hori	125.483	QP	22.2	13.2	8.5	32.2	-	11.7	43.5	31.8	
Hori	246.667	QP	21.9	11.5	9.6	32.0	-	11.0	46.0	35.0	
Hori	505.335	QP	21.5	17.6	11.4	32.0	-	18.5	46.0	27.5	
Hori	853.330	QP	21.4	21.3	13.3	31.2	-	24.8	46.0	21.2	
Hori	990.661	QP	20.4	22.3	13.9	30.5	-	26.1	53.9	27.8	
Hori	2483.500	PK	44.5	27.8	6.8	32.7	-	46.4	73.9	27.5	
Hori	3720.000	PK	46.0	29.6	9.0	32.2	-	52.4	73.9	21.5	
Hori	4960.000	PK	40.3	32.1	9.1	31.7	-	49.8	73.9	24.1	Floor noise
Hori	7440.000	PK	42.2	36.4	10.3	32.7	-	56.2	73.9	17.7	Floor noise
Hori	9920.000	PK	41.9	38.9	11.0	33.4	-	58.4	73.9	15.5	Floor noise
Hori	2483.500	AV	33.4	27.8	6.8	32.7	2.0	37.3	53.9	16.6	*1)
Hori	3720.000	AV	39.3	29.6	9.0	32.2	2.0	47.7	53.9	6.2	*2)
Hori	4960.000	AV	32.0	32.1	9.1	31.7	-	41.5	53.9	12.4	Floor noise
Hori	7440.000	AV	33.9	36.4	10.3	32.7	-	47.9	53.9	6.0	Floor noise
Hori	9920.000	AV	31.3	38.9	11.0	33.4	-	47.8	53.9	6.1	Floor noise
Vert	43.317	QP	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Vert	125.483	QP	22.2	13.2	8.5	32.2	-	11.7	43.5	31.8	
Vert	246.667	QP	21.5	11.5	9.6	32.0	-	10.6	46.0	35.4	
Vert	505.335	QP	21.6	17.6	11.4	32.0	-	18.6	46.0	27.4	
Vert	853.330	QP	21.4	21.3	13.3	31.2	-	24.8	46.0	21.2	
Vert	990.661	QP	20.5	22.3	13.9	30.5	-	26.2	53.9	27.7	
Vert	2483.500	PK	42.7	27.8	6.8	32.7	-	44.6	73.9	29.3	
Vert	3720.000	PK	47.6	29.6	9.0	32.2	-	54.0	73.9	19.9	
Vert	4960.000	PK	40.6	32.1	9.1	31.7	-	50.1	73.9	23.8	Floor noise
Vert	7440.000	PK	42.4	36.4	10.3	32.7	-	56.4	73.9	17.5	Floor noise
Vert	9920.000	PK	41.5	38.9	11.0	33.4	-	58.0	73.9	15.9	Floor noise
Vert	2483.500	AV	34.0	27.8	6.8	32.7	2.0	37.9	53.9	16.0	*1)
Vert	3720.000	AV	41.4	29.6	9.0	32.2	2.0	49.8	53.9	4.1	*2)
Vert	4960.000	AV	32.2	32.1	9.1	31.7	-	41.7	53.9	12.2	Floor noise
Vert	7440.000	AV	33.8	36.4	10.3	32.7	-	47.8	53.9	6.1	Floor noise
Vert	9920.000	AV	31.2	38.9	11.0	33.4	-	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)

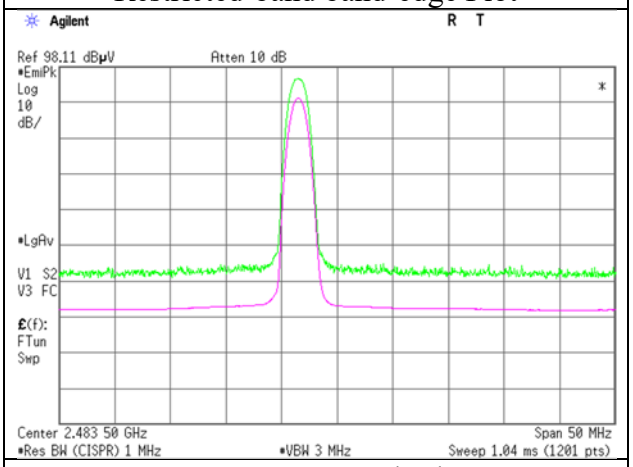
*2) Noise synchronized with duty of carrier frequency.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12219844H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	March 15, 2018
Temperature / Humidity	21 deg. C / 41 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

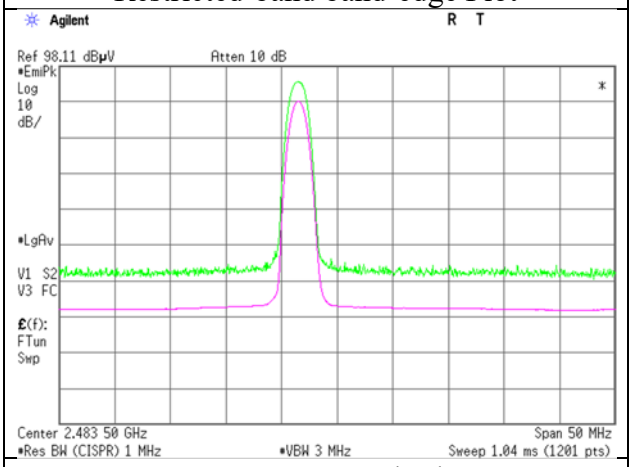
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

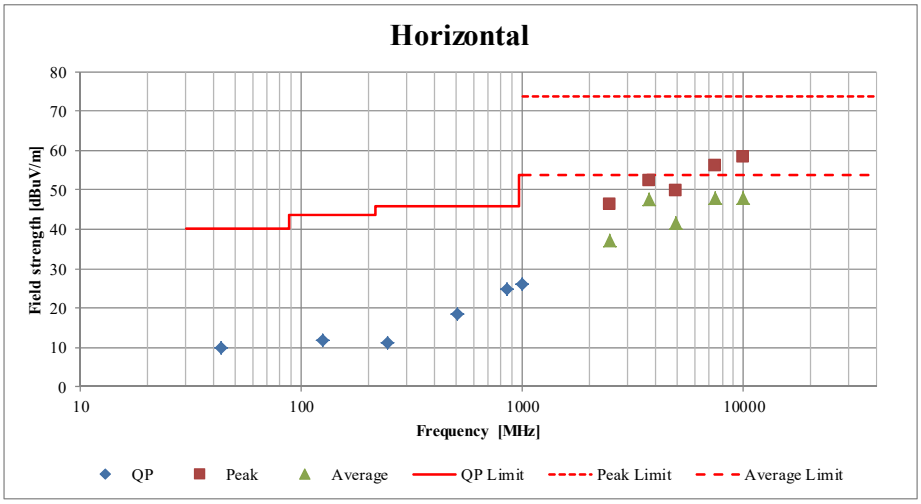


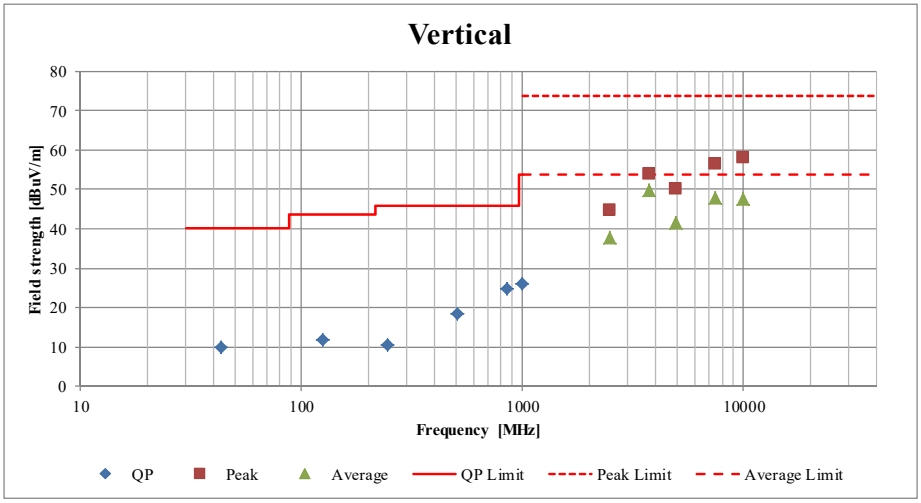
Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12219844H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	March 15, 2018	March 21, 2018	March 25, 2018	March 28, 2018
Temperature / Humidity	21 deg. C / 41 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH	25 deg. C / 33 % RH
Engineer	Takumi Shimada (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Masafumi Niwa (Below 1 GHz)
Mode	Tx BT LE 2480 MHz			





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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12219844H
Date	March 21, 2018
Temperature / Humidity	20 deg. C / 46 % RH
Engineer	Takumi Shimada (1 GHz -10 GHz)
Mode	Tx BT LE 2402 MHz + 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	41.8	27.7	6.7	32.7	-	43.5	73.9	30.4	
Hori	2390.000	AV	32.2	27.7	6.7	32.7	2.0	35.9	53.9	18.0	*1)
Vert	2390.000	PK	41.5	27.7	6.7	32.7	-	43.2	73.9	30.7	
Vert	2390.000	AV	31.7	27.7	6.7	32.7	2.0	35.4	53.9	18.5	*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
*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	89.1	27.7	6.8	32.7	90.9	-	-	Carrier
Hori	2400.000	PK	36.3	27.7	6.8	32.7	38.1	70.9	32.8	
Vert	2402.000	PK	90.1	27.7	6.8	32.7	91.9	-	-	Carrier
Vert	2400.000	PK	36.4	27.7	6.8	32.7	38.2	71.9	33.7	

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	12219844H		
Date	March 21, 2018	March 25, 2018	March 29, 2018
Temperature / Humidity	20 deg. C / 46 % RH	22 deg. C / 31 % RH	20 deg. C / 37 % RH
Engineer	Takumi Shimada (1 GHz -18 GHz)	Takafumi Noguchi (18 GHz - 26.5 GHz)	Takumi Shimada (Below 1 GHz)
Mode	Tx BT LE 2440 MHz + 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	52.002	QP	22.7	10.0	7.5	32.2	-	8.0	40.0	32.0	
Hori	107.709	QP	35.0	11.1	8.3	32.2	-	22.2	43.5	21.3	
Hori	131.608	QP	26.8	13.7	8.5	32.2	-	16.8	43.5	26.7	
Hori	252.577	QP	36.4	11.7	9.6	32.0	-	25.7	46.0	20.3	
Hori	332.417	QP	29.6	14.1	10.2	32.0	-	21.9	46.0	24.1	
Hori	391.845	QP	29.4	15.4	10.6	32.0	-	23.4	46.0	22.6	
Hori	3659.978	PK	48.4	29.6	8.9	32.2	-	54.7	73.9	19.2	
Hori	3799.998	PK	44.7	29.6	8.9	32.1	-	51.1	73.9	22.8	
Hori	4882.000	PK	41.1	31.9	9.0	31.7	-	50.3	73.9	23.6	Floor noise
Hori	7323.000	PK	42.3	36.2	10.4	32.7	-	56.2	73.9	17.7	Floor noise
Hori	9764.000	PK	41.3	38.7	11.0	33.4	-	57.6	73.9	16.3	Floor noise
Hori	3659.978	AV	42.1	29.6	8.9	32.2	2.0	50.4	53.9	3.5	*1)
Hori	3799.998	AV	39.7	29.6	8.9	32.1	2.0	48.1	53.9	5.8	*1)
Hori	4882.000	AV	32.2	31.9	9.0	31.7	-	41.4	53.9	12.5	Floor noise
Hori	7323.000	AV	33.8	36.2	10.4	32.7	-	47.7	53.9	6.2	Floor noise
Hori	9764.000	AV	31.5	38.7	11.0	33.4	-	47.8	53.9	6.1	Floor noise
Vert	52.002	QP	33.5	10.0	7.5	32.2	-	18.8	40.0	21.2	
Vert	107.709	QP	33.7	11.1	8.3	32.2	-	20.9	43.5	22.6	
Vert	131.608	QP	34.7	13.7	8.5	32.2	-	24.7	43.5	18.8	
Vert	252.577	QP	42.4	11.7	9.6	32.0	-	31.7	46.0	14.3	
Vert	332.417	QP	35.4	14.1	10.2	32.0	-	27.7	46.0	18.3	
Vert	391.845	QP	32.0	15.4	10.6	32.0	-	26.0	46.0	20.0	
Vert	3659.978	PK	50.7	29.6	8.9	32.2	-	57.0	73.9	16.9	
Vert	3799.998	PK	46.1	29.6	8.9	32.1	-	52.5	73.9	21.4	
Vert	4880.000	PK	40.8	31.9	9.0	31.7	-	50.0	73.9	23.9	Floor noise
Vert	7320.000	PK	42.0	36.2	10.4	32.7	-	55.9	73.9	18.0	Floor noise
Vert	9760.000	PK	41.9	38.7	11.0	33.4	-	58.2	73.9	15.7	Floor noise
Vert	3659.978	AV	44.9	29.6	8.9	32.2	2.0	53.2	53.9	0.7	*1)
Vert	3799.998	AV	41.1	29.6	8.9	32.1	2.0	49.5	53.9	4.4	*1)
Vert	4880.000	AV	32.4	31.9	9.0	31.7	-	41.6	53.9	12.3	Floor noise
Vert	7320.000	AV	33.9	36.2	10.4	32.7	-	47.8	53.9	6.1	Floor noise
Vert	9760.000	AV	31.4	38.7	11.0	33.4	-	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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	12219844H
Date	March 21, 2018
Temperature / Humidity	20 deg. C / 46 % RH
Engineer	Takumi Shimada (1 GHz -10 GHz)
Mode	Tx BT LE 2480 MHz + 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	43.4	27.8	6.8	32.7	-	45.3	73.9	28.6	
Hori	2483.500	AV	32.5	27.8	6.8	32.7	2.0	36.4	53.9	17.5	*1)
Vert	2483.500	PK	43.1	27.8	6.8	32.7	-	45.0	73.9	28.9	
Vert	2483.500	AV	32.3	27.8	6.8	32.7	2.0	36.2	53.9	17.7	*1)

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

Distance factor: 1 GHz - 10 GHz 20log (4.5 m / 3.0 m) = 3.53 dB
*1) Not Out of Band emission(Leakage Power)

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2017/10/31 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2018/01/24 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2017/11/07 * 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	2018/03/13 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2017/05/14 * 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
MCC-224						
MPA-03	Microwave System Power Amplifier	Agilent	83050A	MY39500610	RE	2017/10/12 * 12
MHA-29	Horn Antenna 26.5-40GHz	ETS LINDGREN	3160-10	00152399	RE	2017/09/15 * 12
MPA-22	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 /1871328	RE	2017/09/07 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2017/06/30 * 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
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

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: **RE: Radiated Emission test**
AT: Antenna Terminal Conducted test