



RADIO TEST REPORT

Test Report No. : 12219844H-A

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
***Bluetooth part**
(Maximum Peak Output Power and Radiated Spurious Emission tests only)

Test Result : **Complied**

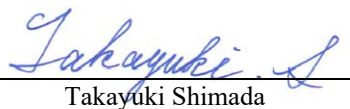
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers 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.
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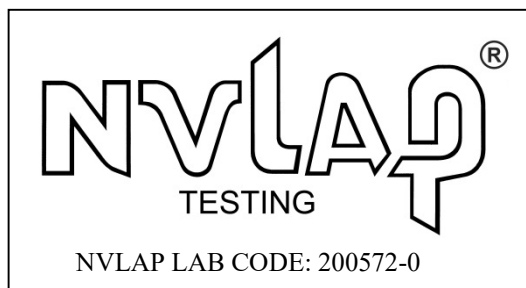
Date of test: January 24 to March 29, 2018

Representative test engineer:


Takumi Shimada
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
Leader
Consumer Technology Division



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- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

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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, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	79 MHz & 1 MHz
Method of frequency generation	Synthesizer
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	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 = $10 \log \left(\frac{G_{ANT1}}{10^{20}} + \frac{G_{ANT2}}{10^{20}} \right)^2 / 2$

*This test report applies to Bluetooth.

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<Contents of the change from original model>

Test Report Number of original model is 12079941H-A-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: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(a)(b)(1) IC: RSS-247 5.4 (b)	See data	Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.6 dB 3603.000 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).

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 $k=2$.

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

Radiated emission

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

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)

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Radiated Spurious Emission	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. * It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: 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.		

Simultaneously transmission

Test Item	Mode *1)
Radiated Spurious Emission	Tx (Hopping Off) 3DH5 2402 MHz + 11ac-20 5700 MHz Tx (Hopping Off) 3DH5 2441 MHz + 11ac-20 5700 MHz Tx (Hopping Off) 3DH5 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: Radiated Spurious Emission

Test Procedure

[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	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
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) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.

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

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

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT (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

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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: 50MHz 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 24, 2018
Temperature / Humidity 23 deg. C / 20 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-8.99	0.50	10.09	1.60	1.45	19.96	99.08	18.36
DH5	2441.0	-8.73	0.50	10.09	1.86	1.53	19.96	99.08	18.10
DH5	2480.0	-8.64	0.50	10.09	1.95	1.57	19.96	99.08	18.01
2DH5	2402.0	-6.61	0.50	10.09	3.98	2.50	19.96	99.08	15.98
2DH5	2441.0	-6.33	0.50	10.09	4.26	2.67	19.96	99.08	15.70
2DH5	2480.0	-6.20	0.50	10.09	4.39	2.75	19.96	99.08	15.57
3DH5	2402.0	-6.30	0.50	10.09	4.29	2.69	19.96	99.08	15.67
3DH5	2441.0	-6.02	0.50	10.09	4.57	2.86	19.96	99.08	15.39
3DH5	2480.0	-5.87	0.50	10.09	4.72	2.96	19.96	99.08	15.24

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 exceeding 6 dBi.

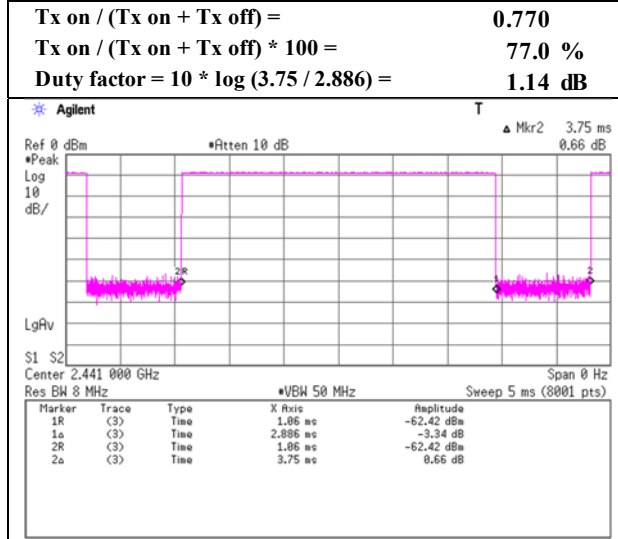
Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.

As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

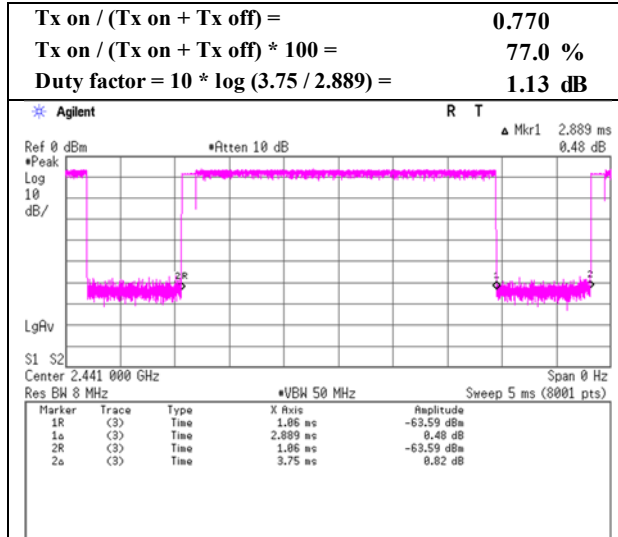
Burst Rate Confirmation

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, Hopping Off

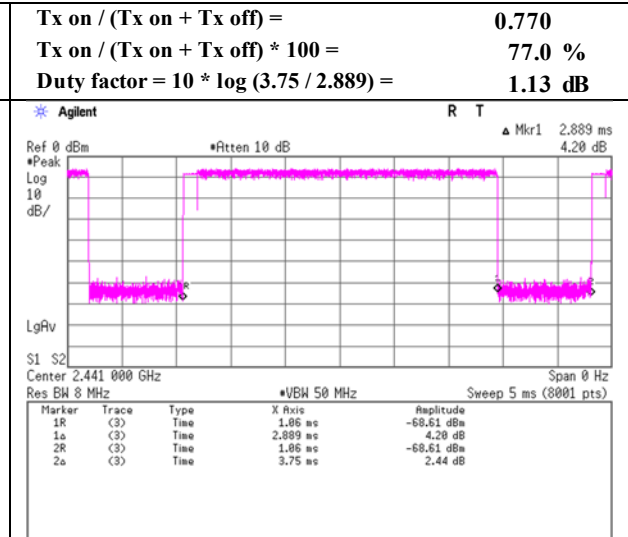
DH5



2DH5



3DH5



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	Takumi Shimada	Takafumi Noguchi	Masafumi Niwa
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, DH5 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	22.2	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	21.4	17.6	11.4	32.0	-	18.4	46.0	27.6	
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	2390.000	PK	41.9	27.7	6.7	32.7	-	43.6	73.9	30.3	
Hori	3603.000	PK	49.6	29.5	9.0	32.2	-	55.9	73.9	18.0	
Hori	4804.000	PK	41.7	31.6	9.0	31.8	-	50.5	73.9	23.4	Floor noise
Hori	7206.000	PK	42.8	36.0	10.4	32.6	-	56.6	73.9	17.3	Floor noise
Hori	9608.000	PK	42.2	38.5	10.9	33.3	-	58.3	73.9	15.6	Floor noise
Hori	2390.000	AV	30.2	27.7	6.7	32.7	-	31.9	53.9	22.0	
Hori	3603.000	AV	43.0	29.5	9.0	32.2	-	49.3	53.9	4.6	
Hori	4804.000	AV	29.2	31.6	9.0	31.8	-	38.0	53.9	15.9	Floor noise
Hori	7206.000	AV	30.7	36.0	10.4	32.6	-	44.5	53.9	9.4	Floor noise
Hori	9608.000	AV	30.8	38.5	10.9	33.3	-	46.9	53.9	7.0	Floor noise
Vert	43.317	QP	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Vert	125.483	QP	22.1	13.2	8.5	32.2	-	11.6	43.5	31.9	
Vert	246.667	QP	21.6	11.5	9.6	32.0	-	10.7	46.0	35.3	
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	20.6	22.3	13.9	30.5	-	26.3	53.9	27.6	
Vert	2390.000	PK	42.8	27.7	6.7	32.7	-	44.5	73.9	29.4	
Vert	3603.000	PK	50.2	29.5	9.0	32.2	-	56.5	73.9	17.4	
Vert	4804.000	PK	40.8	31.6	9.0	31.8	-	49.6	73.9	24.3	Floor noise
Vert	7206.000	PK	42.2	36.0	10.4	32.6	-	56.0	73.9	17.9	Floor noise
Vert	9608.000	PK	42.3	38.5	10.9	33.3	-	58.4	73.9	15.5	Floor noise
Vert	2390.000	AV	30.6	27.7	6.7	32.7	-	32.3	53.9	21.6	
Vert	3603.000	AV	44.0	29.5	9.0	32.2	-	50.3	53.9	3.6	
Vert	4804.000	AV	29.2	31.6	9.0	31.8	-	38.0	53.9	15.9	Floor noise
Vert	7206.000	AV	30.8	36.0	10.4	32.6	-	44.6	53.9	9.3	Floor noise
Vert	9608.000	AV	30.6	38.5	10.9	33.3	-	46.7	53.9	7.2	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	2402.000	PK	90.2	27.7	6.8	32.7	92.0	-	-	Carrier
Hori	2400.000	PK	36.8	27.7	6.8	32.7	38.6	72.0	33.4	
Vert	2402.000	PK	90.7	27.7	6.8	32.7	92.5	-	-	Carrier
Vert	2400.000	PK	36.2	27.7	6.8	32.7	38.0	72.5	34.5	

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

***These results have sufficient margin without taking account Dwell time factor.**

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Ise EMC Lab.

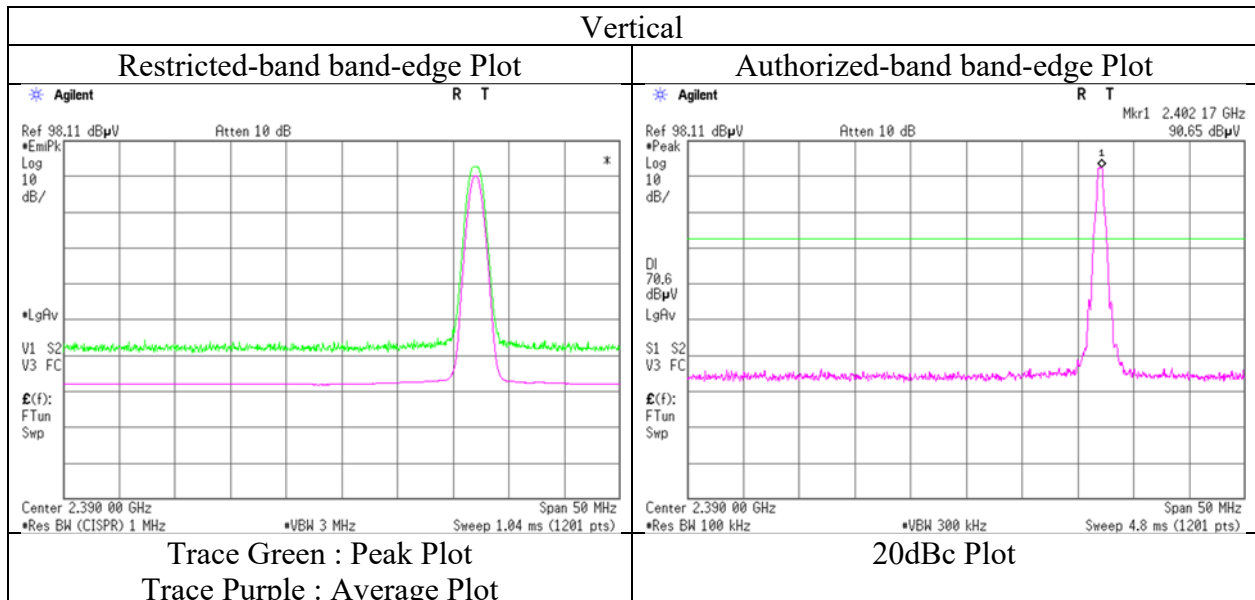
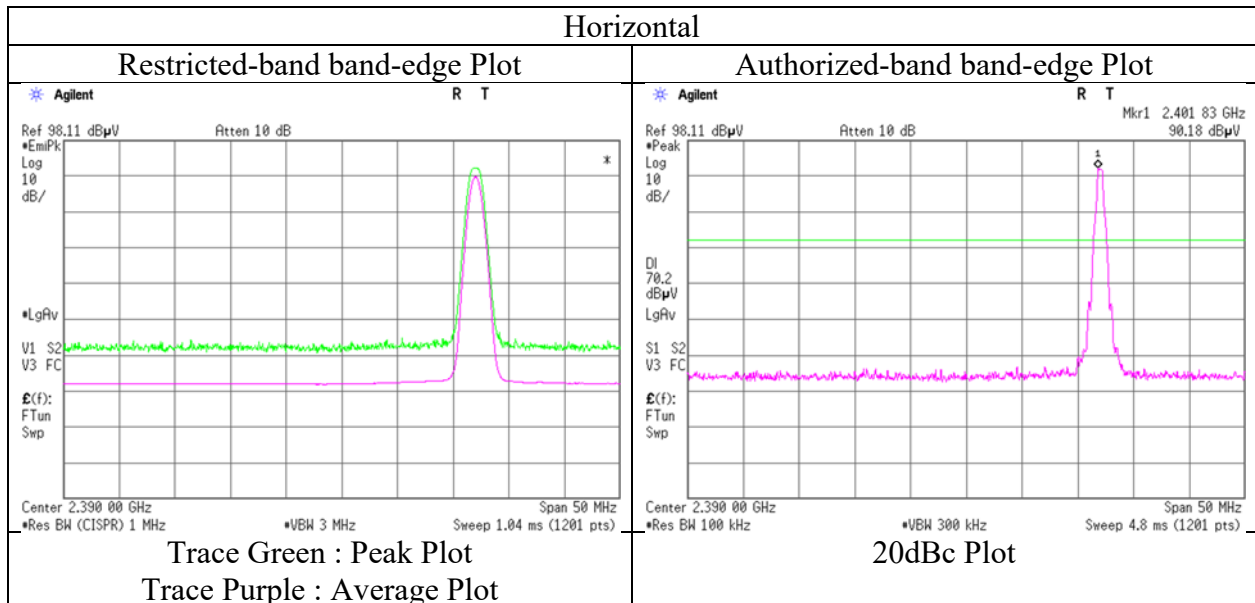
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Radiated Spurious Emission (Reference Plot for band-edge)

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, Hopping Off, DH5 2402 MHz



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

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

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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 Takumi Shimada Takafumi Noguchi Masafumi Niwa
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, DH5 2441 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	21.5	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	20.5	22.3	13.9	30.5	-	26.2	53.9	27.7	
Hori	3661.490	PK	49.2	29.6	8.9	32.2	-	55.5	73.9	18.4	
Hori	4882.000	PK	41.0	31.9	9.0	31.7	-	50.2	73.9	23.7	Floor noise
Hori	7323.000	PK	42.6	36.2	10.4	32.7	-	56.5	73.9	17.4	Floor noise
Hori	9764.000	PK	41.6	38.7	11.0	33.4	-	57.9	73.9	16.0	Floor noise
Hori	3661.490	AV	41.8	29.6	8.9	32.2	-	48.1	53.9	5.8	
Hori	4882.000	AV	28.2	31.9	9.0	31.7	-	37.4	53.9	16.5	Floor noise
Hori	7323.000	AV	29.7	36.2	10.4	32.7	-	43.6	53.9	10.3	Floor noise
Hori	9764.000	AV	29.6	38.7	11.0	33.4	-	45.9	53.9	8.0	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	21.5	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	21.2	21.3	13.3	31.2	-	24.6	46.0	21.4	
Vert	990.661	QP	20.6	22.3	13.9	30.5	-	26.3	53.9	27.6	
Vert	3661.490	PK	48.7	29.6	8.9	32.2	-	55.0	73.9	18.9	
Vert	4882.000	PK	40.4	31.9	9.0	31.7	-	49.6	73.9	24.3	Floor noise
Vert	7323.000	PK	42.1	36.2	10.4	32.7	-	56.0	73.9	17.9	Floor noise
Vert	9764.000	PK	41.7	38.7	11.0	33.4	-	58.0	73.9	15.9	Floor noise
Vert	3661.490	AV	41.5	29.6	8.9	32.2	-	47.8	53.9	6.1	
Vert	4882.000	AV	28.2	31.9	9.0	31.7	-	37.4	53.9	16.5	Floor noise
Vert	7323.000	AV	29.8	36.2	10.4	32.7	-	43.7	53.9	10.2	Floor noise
Vert	9764.000	AV	29.6	38.7	11.0	33.4	-	45.9	53.9	8.0	Floor noise

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

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

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

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

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
Mode Tx, Hopping Off, DH5 2480 MHz

No.3
March 21, 2018
20 deg. C / 46 % RH
Takumi Shimada
(10 GHz - 18 GHz)

No.3
March 25, 2018
22 deg. C / 31 % RH
Takafumi Noguchi
(18 GHz - 26.5 GHz)

No.3
March 28, 2018
25 deg. C / 33 % RH
Masafumi Niwa
(Below 1 GHz)

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	22.1	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	21.5	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	20.5	22.3	13.9	30.5	-	26.2	53.9	27.7	
Hori	2483.500	PK	43.8	27.8	6.8	32.7	-	45.7	73.9	28.2	
Hori	3720.000	PK	47.3	29.6	9.0	32.2	-	53.7	73.9	20.2	
Hori	4960.000	PK	40.6	32.1	9.1	31.7	-	50.1	73.9	23.8	Floor noise
Hori	7440.000	PK	42.1	36.4	10.3	32.7	-	56.1	73.9	17.8	Floor noise
Hori	9920.000	PK	41.6	38.9	11.0	33.4	-	58.1	73.9	15.8	Floor noise
Hori	2483.500	AV	31.9	27.8	6.8	32.7	-	33.8	53.9	20.1	
Hori	3720.000	AV	38.9	29.6	9.0	32.2	-	45.3	53.9	8.6	
Hori	4960.000	AV	29.0	32.1	9.1	31.7	-	38.5	53.9	15.4	Floor noise
Hori	7440.000	AV	30.8	36.4	10.3	32.7	-	44.8	53.9	9.1	Floor noise
Hori	9920.000	AV	30.5	38.9	11.0	33.4	-	47.0	53.9	6.9	Floor noise
Vert	43.317	QP	22.0	12.9	7.4	32.2	-	10.1	40.0	29.9	
Vert	125.483	QP	22.3	13.2	8.5	32.2	-	11.8	43.5	31.7	
Vert	246.667	QP	21.6	11.5	9.6	32.0	-	10.7	46.0	35.3	
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	20.5	22.3	13.9	30.5	-	26.2	53.9	27.7	
Vert	2483.500	PK	45.1	27.8	6.8	32.7	-	47.0	73.9	26.9	
Vert	3720.000	PK	47.4	29.6	9.0	32.2	-	53.8	73.9	20.1	
Vert	4960.000	PK	40.3	32.1	9.1	31.7	-	49.8	73.9	24.1	Floor noise
Vert	7440.000	PK	41.6	36.4	10.3	32.7	-	55.6	73.9	18.3	Floor noise
Vert	9920.000	PK	41.8	38.9	11.0	33.4	-	58.3	73.9	15.6	Floor noise
Vert	2483.500	AV	33.0	27.8	6.8	32.7	-	34.9	53.9	19.0	
Vert	3720.000	AV	40.3	29.6	9.0	32.2	-	46.7	53.9	7.2	
Vert	4960.000	AV	29.0	32.1	9.1	31.7	-	38.5	53.9	15.4	Floor noise
Vert	7440.000	AV	30.8	36.4	10.3	32.7	-	44.8	53.9	9.1	Floor noise
Vert	9920.000	AV	30.5	38.9	11.0	33.4	-	47.0	53.9	6.9	Floor noise

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

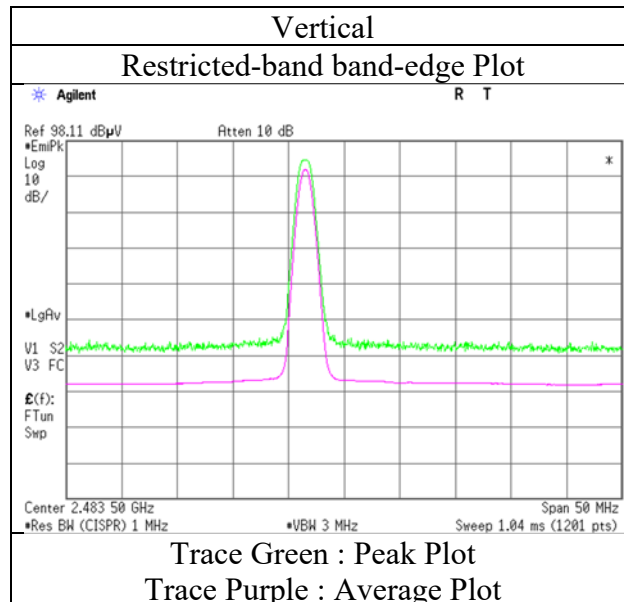
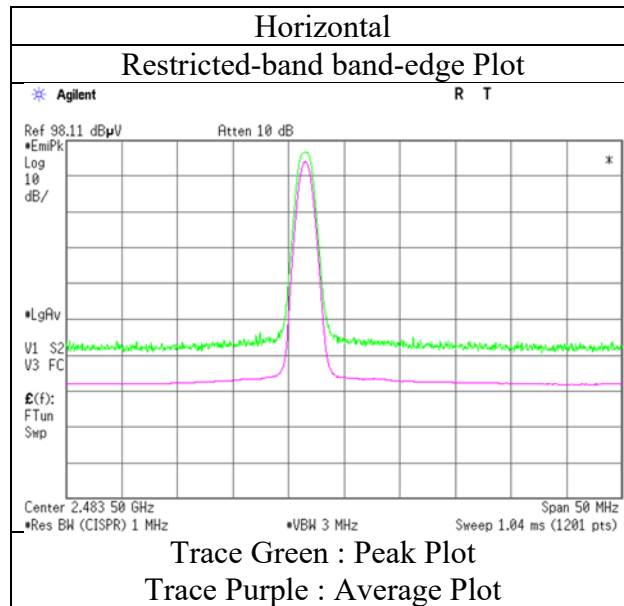
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 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

***These results have sufficient margin without taking account Dwell time factor.**

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, Hopping Off, DH5 2480 MHz



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

UL Japan, Inc.

Ise EMC Lab.

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Telephone : +81 596 24 8999

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Radiated Spurious Emission

Report No. 12219844H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date March 15, 2018 No.3 March 21, 2018 No.3 March 25, 2018 No.3 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 Takumi Shimada Takafumi Noguchi Masafumi Niwa
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 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	21.8	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	21.8	11.5	9.6	32.0	-	10.9	46.0	35.1	
Hori	505.335	QP	21.4	17.6	11.4	32.0	-	18.4	46.0	27.6	
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	2390.000	PK	42.8	27.7	6.7	32.7	-	44.5	73.9	29.4	
Hori	3603.000	PK	49.9	29.5	9.0	32.2	-	56.2	73.9	17.7	
Hori	4804.000	PK	40.5	31.6	9.0	31.8	-	49.3	73.9	24.6	Floor noise
Hori	7206.000	PK	43.0	36.0	10.4	32.6	-	56.8	73.9	17.1	Floor noise
Hori	9608.000	PK	42.5	38.5	10.9	33.3	-	58.6	73.9	15.3	Floor noise
Hori	2390.000	AV	30.2	27.7	6.7	32.7	-	31.9	53.9	22.0	
Hori	3603.000	AV	42.2	29.5	9.0	32.2	-	48.5	53.9	5.4	
Hori	4804.000	AV	29.2	31.6	9.0	31.8	-	38.0	53.9	15.9	Floor noise
Hori	7206.000	AV	30.9	36.0	10.4	32.6	-	44.7	53.9	9.2	Floor noise
Hori	9608.000	AV	30.7	38.5	10.9	33.3	-	46.8	53.9	7.1	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	21.5	11.5	9.6	32.0	-	10.6	46.0	35.4	
Vert	505.335	QP	21.4	17.6	11.4	32.0	-	18.4	46.0	27.6	
Vert	853.330	QP	21.3	21.3	13.3	31.2	-	24.7	46.0	21.3	
Vert	990.661	QP	20.5	22.3	13.9	30.5	-	26.2	53.9	27.7	
Vert	2390.000	PK	42.1	27.7	6.7	32.7	-	43.8	73.9	30.1	
Vert	3603.000	PK	51.3	29.5	9.0	32.2	-	57.6	73.9	16.3	
Vert	4804.000	PK	40.8	31.6	9.0	31.8	-	49.6	73.9	24.3	Floor noise
Vert	7206.000	PK	42.2	36.0	10.4	32.6	-	56.0	73.9	17.9	Floor noise
Vert	9608.000	PK	41.6	38.5	10.9	33.3	-	57.7	73.9	16.2	Floor noise
Vert	2390.000	AV	30.1	27.7	6.7	32.7	-	31.8	53.9	22.1	
Vert	3603.000	AV	43.0	29.5	9.0	32.2	-	49.3	53.9	4.6	
Vert	4804.000	AV	29.2	31.6	9.0	31.8	-	38.0	53.9	15.9	Floor noise
Vert	7206.000	AV	30.8	36.0	10.4	32.6	-	44.6	53.9	9.3	Floor noise
Vert	9608.000	AV	30.6	38.5	10.9	33.3	-	46.7	53.9	7.2	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	2402.000	PK	90.1	27.7	6.8	32.7	91.9	-	-	Carrier
Hori	2400.000	PK	36.5	27.7	6.8	32.7	38.3	71.9	33.6	
Vert	2402.000	PK	89.9	27.7	6.8	32.7	91.7	-	-	Carrier
Vert	2400.000	PK	36.4	27.7	6.8	32.7	38.2	71.7	33.5	

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

*These results have sufficient margin without taking account Dwell time factor.

UL Japan, Inc.

Ise EMC Lab.

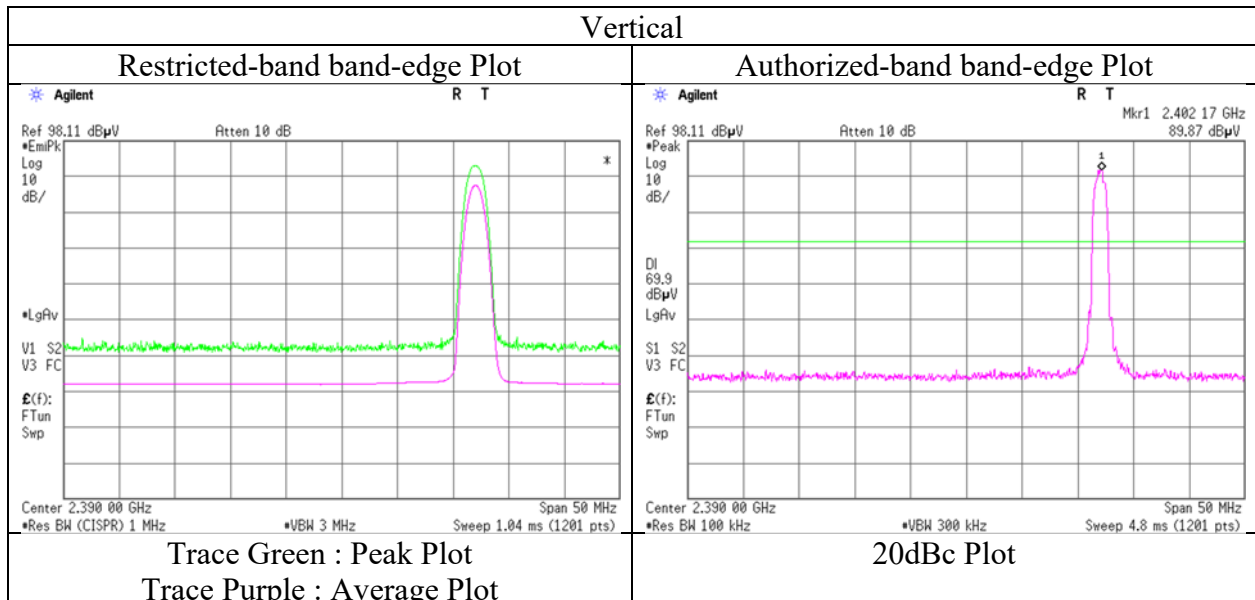
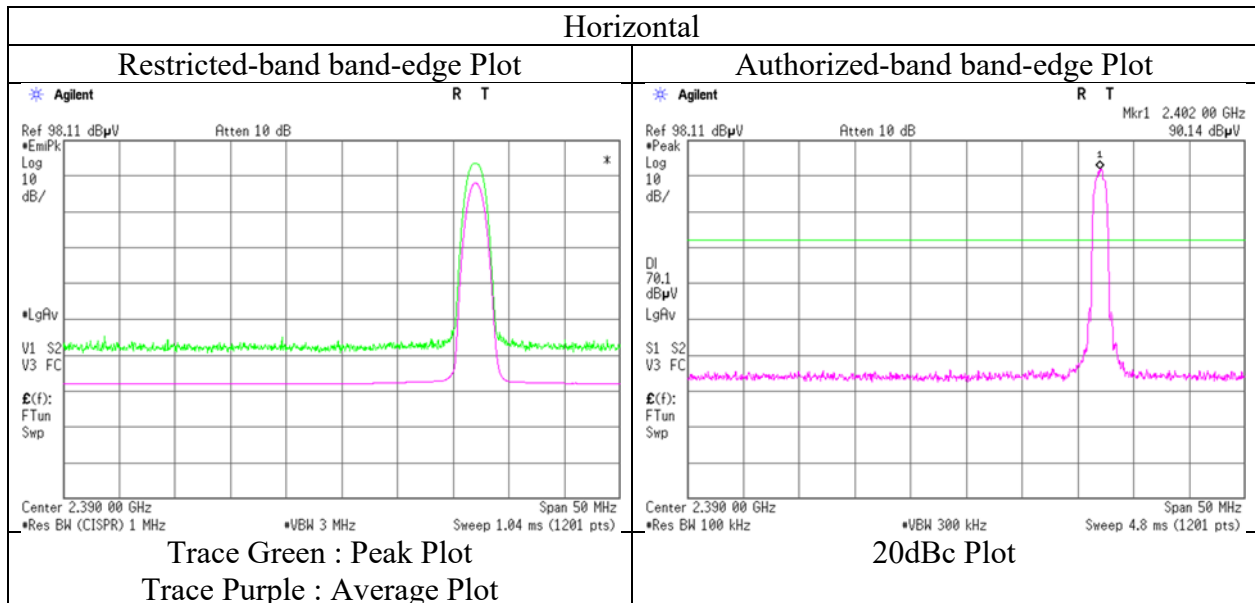
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Radiated Spurious Emission (Reference Plot for band-edge)

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, Hopping Off, 3DH5 2402 MHz



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

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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 Takumi Shimada Takafumi Noguchi Masafumi Niwa
(1 GHz - 10 GHz) (10 GHz - 18 GHz) (18 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 2441 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	21.7	11.5	9.6	32.0	-	10.8	46.0	35.2	
Hori	505.335	QP	21.5	17.6	11.4	32.0	-	18.5	46.0	27.5	
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	3661.490	PK	48.2	29.6	8.9	32.2	-	54.5	73.9	19.4	
Hori	4882.000	PK	40.7	31.9	9.0	31.7	-	49.9	73.9	24.0	Floor noise
Hori	7323.000	PK	41.8	36.2	10.4	32.7	-	55.7	73.9	18.2	Floor noise
Hori	9764.000	PK	41.6	38.7	11.0	33.4	-	57.9	73.9	16.0	Floor noise
Hori	3661.490	AV	39.5	29.6	8.9	32.2	-	45.8	53.9	8.1	
Hori	4882.000	AV	29.0	31.9	9.0	31.7	-	38.2	53.9	15.7	Floor noise
Hori	7323.000	AV	30.8	36.2	10.4	32.7	-	44.7	53.9	9.2	Floor noise
Hori	9764.000	AV	30.5	38.7	11.0	33.4	-	46.8	53.9	7.1	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	
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Vert	505.335	QP	21.5	17.6	11.4	32.0	-	18.5	46.0	27.5	
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	3661.490	PK	50.3	29.6	8.9	32.2	-	56.6	73.9	17.3	
Vert	4882.000	PK	40.1	31.9	9.0	31.7	-	49.3	73.9	24.6	Floor noise
Vert	7323.000	PK	42.3	36.2	10.4	32.7	-	56.2	73.9	17.7	Floor noise
Vert	9764.000	PK	40.7	38.7	11.0	33.4	-	57.0	73.9	16.9	Floor noise
Vert	3661.490	AV	42.5	29.6	8.9	32.2	-	48.8	53.9	5.1	
Vert	4882.000	AV	29.0	31.9	9.0	31.7	-	38.2	53.9	15.7	Floor noise
Vert	7323.000	AV	30.7	36.2	10.4	32.7	-	44.6	53.9	9.3	Floor noise
Vert	9764.000	AV	30.4	38.7	11.0	33.4	-	46.7	53.9	7.2	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 $20\log(4.5\text{ m} / 3.0\text{ m}) = 3.53\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

***These results have sufficient margin without taking account Dwell time factor.**

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	Takumi Shimada	Takafumi Noguchi	Masafumi Niwa
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 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	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Hori	125.483	QP	22.2	13.2	8.5	32.2	-	11.7	43.5	31.8	
Hori	246.667	QP	21.7	11.5	9.6	32.0	-	10.8	46.0	35.2	
Hori	505.335	QP	21.4	17.6	11.4	32.0	-	18.4	46.0	27.6	
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	2483.500	PK	44.0	27.8	6.8	32.7	-	45.9	73.9	28.0	
Hori	3720.000	PK	47.7	29.6	9.0	32.2	-	54.1	73.9	19.8	
Hori	4960.000	PK	40.6	32.1	9.1	31.7	-	50.1	73.9	23.8	Floor noise
Hori	7440.000	PK	42.5	36.4	10.3	32.7	-	56.5	73.9	17.4	Floor noise
Hori	9920.000	PK	42.0	38.9	11.0	33.4	-	58.5	73.9	15.4	Floor noise
Hori	2483.500	AV	31.3	27.8	6.8	32.7	-	33.2	53.9	20.7	
Hori	3720.000	AV	38.4	29.6	9.0	32.2	-	44.8	53.9	9.1	
Hori	4960.000	AV	29.0	32.1	9.1	31.7	-	38.5	53.9	15.4	Floor noise
Hori	7440.000	AV	30.8	36.4	10.3	32.7	-	44.8	53.9	9.1	Floor noise
Hori	9920.000	AV	30.5	38.9	11.0	33.4	-	47.0	53.9	6.9	Floor noise
Vert	43.317	QP	21.9	12.9	7.4	32.2	-	10.0	40.0	30.0	
Vert	125.483	QP	22.1	13.2	8.5	32.2	-	11.6	43.5	31.9	
Vert	246.667	QP	21.6	11.5	9.6	32.0	-	10.7	46.0	35.3	
Vert	505.335	QP	21.5	17.6	11.4	32.0	-	18.5	46.0	27.5	
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	2483.500	PK	43.1	27.8	6.8	32.7	-	45.0	73.9	28.9	
Vert	3720.000	PK	48.9	29.6	9.0	32.2	-	55.3	73.9	18.6	
Vert	4960.000	PK	40.2	32.1	9.1	31.7	-	49.7	73.9	24.2	Floor noise
Vert	7440.000	PK	42.6	36.4	10.3	32.7	-	56.6	73.9	17.3	Floor noise
Vert	9920.000	PK	41.7	38.9	11.0	33.4	-	58.2	73.9	15.7	Floor noise
Vert	2483.500	AV	30.6	27.8	6.8	32.7	-	32.5	53.9	21.4	
Vert	3720.000	AV	40.5	29.6	9.0	32.2	-	46.9	53.9	7.0	
Vert	4960.000	AV	29.0	32.1	9.1	31.7	-	38.5	53.9	15.4	Floor noise
Vert	7440.000	AV	30.8	36.4	10.3	32.7	-	44.8	53.9	9.1	Floor noise
Vert	9920.000	AV	30.5	38.9	11.0	33.4	-	47.0	53.9	6.9	Floor noise

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

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

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

***These results have sufficient margin without taking account Dwell time factor.**

UL Japan, Inc.

Ise EMC Lab.

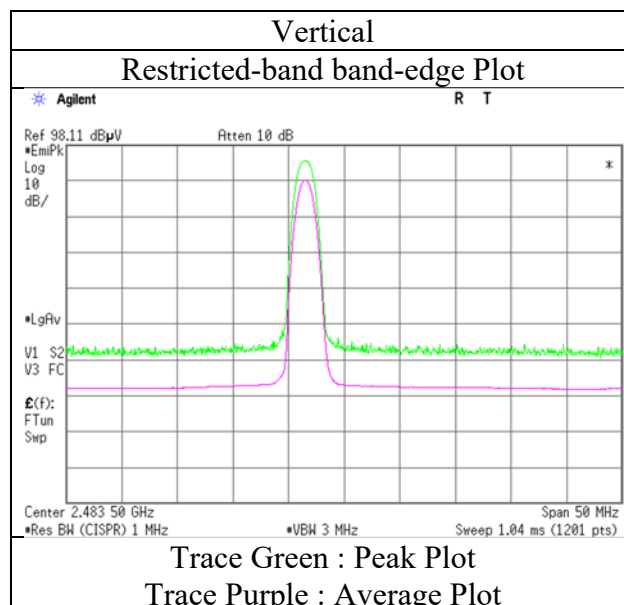
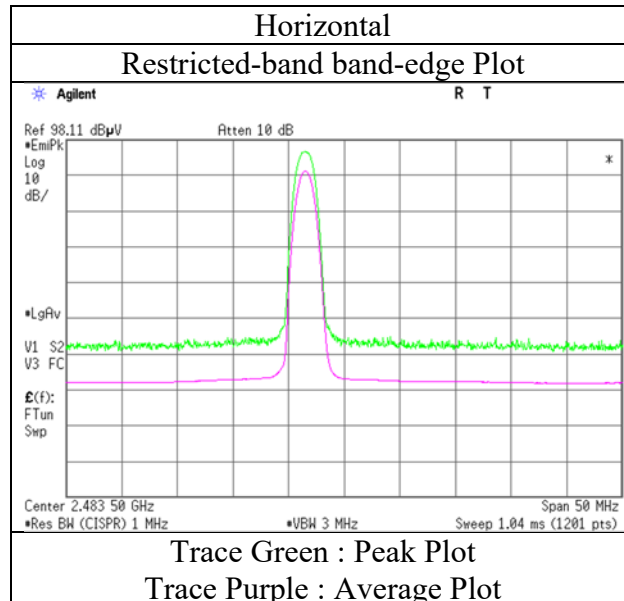
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Facsimile : +81 596 24 8124

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, Hopping Off, 3DH5 2480 MHz



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

UL Japan, Inc.

Ise EMC Lab.

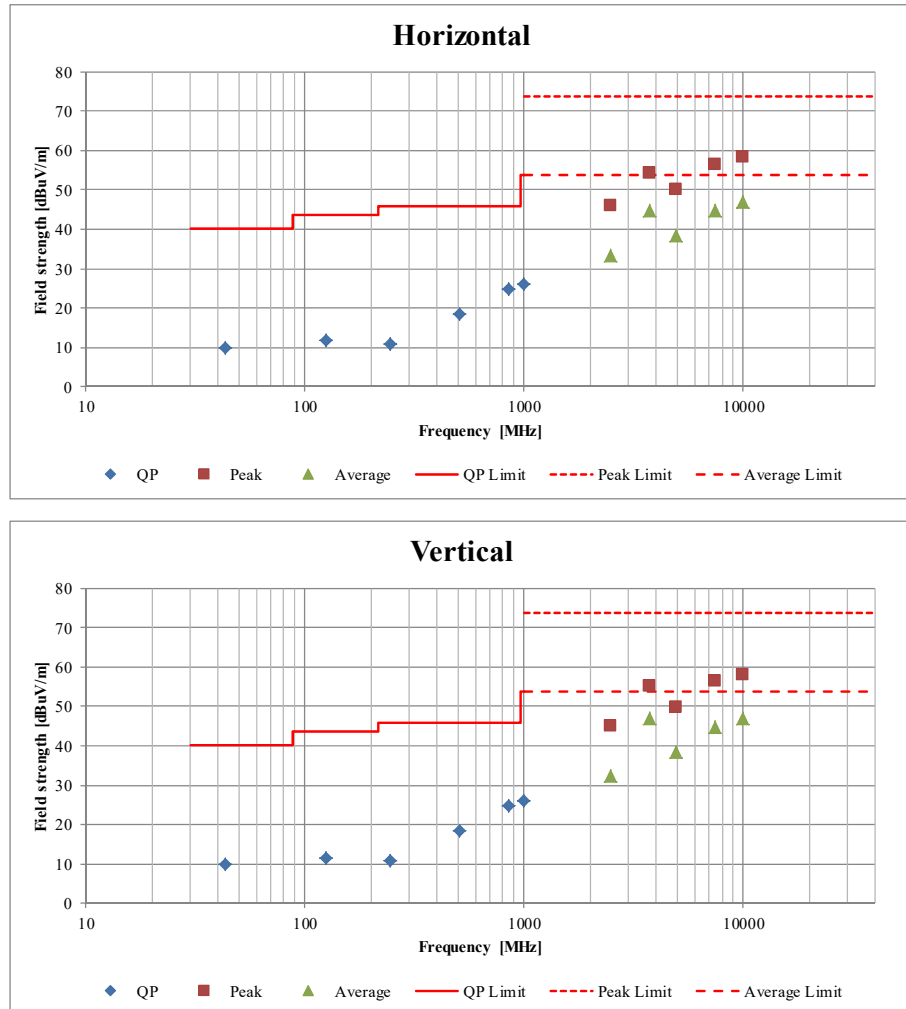
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Radiated Spurious Emission (Plot data, Worst case)

Report No.	12219844H	No.3	No.3	No.3
Test place	Ise EMC Lab.	March 15, 2018	March 21, 2018	March 25, 2018
Semi Anechoic Chamber	No.3	21 deg. C / 41 % RH	20 deg. C / 46 % RH	22 deg. C / 31 % RH
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, Hopping Off, 3DH5 2480 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. No.3 Semi Anechoic Chamber
Date March 21, 2018
Temperature / Humidity 20deg. C / 46 % RH
Engineer Takumi Shimada
(1 GHz -10 GHz)
Mode Tx, Hopping Off, 3DH5 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	42.0	27.7	6.7	32.7	-	43.7	73.9	30.2	
Hori	2390.000	AV	31.8	27.7	6.7	32.7	-	33.5	53.9	20.4	
Vert	2390.000	PK	42.4	27.7	6.7	32.7	-	44.1	73.9	29.8	
Vert	2390.000	AV	31.9	27.7	6.7	32.7	-	33.6	53.9	20.3	

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

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	PK	91.5	27.7	6.8	32.7	93.3	-	-	Carrier
Hori	2400	PK	36.9	27.7	6.8	32.7	38.7	73.3	34.6	
Vert	2402	PK	88.6	27.7	6.8	32.7	90.4	-	-	Carrier
Vert	2400	PK	35.6	27.7	6.8	32.7	37.4	70.4	33.0	

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

***These results have sufficient margin without taking account Dwell time factor.**

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Report No. 12219844H
Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Date March 21, 2018 March 25, 2018 March 29, 2018
Temperature / Humidity 20deg. C / 46 % RH 22 deg. C / 31 % RH 20 deg. C / 37 % RH
Engineer Takumi Shimada Takafumi Noguchi Takumi Shimada
(1 GHz -18 GHz) (18 GHz - 26.5 GHz) (Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 2441 MHz and 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	50.147	QP	23.3	10.6	7.5	32.2	-	9.2	40.0	30.8	
Hori	107.709	QP	33.5	11.1	8.3	32.2	-	20.7	43.5	22.8	
Hori	135.573	QP	35.1	14.0	8.6	32.1	-	25.6	43.5	17.9	
Hori	252.577	QP	35.9	11.7	9.6	32.0	-	25.2	46.0	20.8	
Hori	300.848	QP	37.4	13.3	10.0	32.0	-	28.7	46.0	17.3	
Hori	332.417	QP	30.2	14.1	10.2	32.0	-	22.5	46.0	23.5	
Hori	3661.480	PK	48.8	29.6	8.9	32.2	-	55.1	73.9	18.8	
Hori	3799.998	PK	44.6	29.6	8.9	32.1	-	51.0	73.9	22.9	
Hori	4882.000	PK	40.6	31.9	9.0	31.7	-	49.8	73.9	24.1	Floor noise
Hori	7323.000	PK	43.3	36.2	10.4	32.7	-	57.2	73.9	16.7	Floor noise
Hori	9764.000	PK	42.3	38.7	11.0	33.4	-	58.6	73.9	15.3	Floor noise
Hori	3661.480	AV	39.7	29.6	8.9	32.2	-	46.0	53.9	7.9	
Hori	3799.998	AV	38.6	29.6	8.9	32.1	-	45.0	53.9	8.9	
Hori	4882.000	AV	28.2	31.9	9.0	31.7	-	37.4	53.9	16.5	Floor noise
Hori	7323.000	AV	29.9	36.2	10.4	32.7	-	43.8	53.9	10.1	Floor noise
Hori	9764.000	AV	29.8	38.7	11.0	33.4	-	46.1	53.9	7.8	Floor noise
Vert	50.147	QP	34.2	10.6	7.5	32.2	-	20.1	40.0	19.9	
Vert	107.709	QP	32.8	11.1	8.3	32.2	-	20.0	43.5	23.5	
Vert	135.573	QP	35.0	14.0	8.6	32.1	-	25.5	43.5	18.0	
Vert	252.577	QP	38.6	11.7	9.6	32.0	-	27.9	46.0	18.1	
Vert	332.417	QP	35.4	14.1	10.2	32.0	-	27.7	46.0	18.3	
Vert	391.845	QP	31.8	15.4	10.6	32.0	-	25.8	46.0	20.2	
Vert	3661.480	PK	50.7	29.6	8.9	32.2	-	57.0	73.9	16.9	
Vert	3799.998	PK	46.2	29.6	8.9	32.1	-	52.6	73.9	21.3	
Vert	4882.000	PK	40.6	31.9	9.0	31.7	-	49.8	73.9	24.1	Floor noise
Vert	7323.000	PK	43.1	36.2	10.4	32.7	-	57.0	73.9	16.9	Floor noise
Vert	9764.000	PK	42.2	38.7	11.0	33.4	-	58.5	73.9	15.4	Floor noise
Vert	3661.480	AV	42.7	29.6	8.9	32.2	-	49.0	53.9	4.9	
Vert	3799.998	AV	39.9	29.6	8.9	32.1	-	46.3	53.9	7.6	
Vert	4882.000	AV	28.4	31.9	9.0	31.7	-	37.6	53.9	16.3	Floor noise
Vert	7323.000	AV	29.9	36.2	10.4	32.7	-	43.8	53.9	10.1	Floor noise
Vert	9764.000	AV	29.9	38.7	11.0	33.4	-	46.2	53.9	7.7	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

***These results have sufficient margin without taking account Dwell time factor.**

Radiated Spurious Emission

Report No.	12219844H
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	March 21, 2018
Temperature / Humidity	20deg. C / 46 % RH
Engineer	Takumi Shimada
	(1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 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	43.0	27.8	6.8	32.7	-	44.9	73.9	29.0	
Hori	2483.500	AV	32.8	27.8	6.8	32.7	-	34.7	53.9	19.2	
Vert	2483.500	PK	43.9	27.8	6.8	32.7	-	45.8	73.9	28.1	
Vert	2483.500	AV	33.1	27.8	6.8	32.7	-	35.0	53.9	18.9	

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

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

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

***These results have sufficient margin without taking account Dwell time factor.**

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
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

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

UL Japan, Inc.

Ise EMC Lab.

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