RADIO TEST REPORT

Test Report No. : 11653095H-B-R1

Applicant	:	**Sony Interactive Entertainment Inc.**
Type of Equipment	:	**Wireless communication module**
Model No.	:	**J20H091**
FCC ID	:	**AK8M16DFL1**
Test regulation	:	**FCC Part 15 Subpart C: 2016** **Class II Permissive Change** ***WLAN, Bluetooth Low Energy parts** **(Radiated Spurious Emission test only)**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11653095H-B. 11653095H-B is replaced with this report.

Date of test: February 14 to 26, 2017

Representative test engineer:
Tomoki Matsui
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP TESTING
NVLAP LAB CODE: 200572-0

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

REVISION HISTORY

Original Test Report No.: 11653095H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11653095H-B	March 24, 2017	-	-
1	11653095H-B-R1	April 5, 2017	P39	Correction of Worst Case Position (Module)

CONTENTS **PAGE**

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	J20H091
Serial No	Refer to Clause 4.2
Country of Manufacture	China/Japan
Receipt Date of Sample	February 9, 2017
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

J20H091 is the Wireless communication module.

Product Specification

Clock frequency in the system (radio part)	40MHz
Operating Temperature	-10 - +85 deg. C
Power Supply	DC 3.3 V, DC 1.8 V
Size	20 x 18 x 3.6 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
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WA for 2.4 GHz), IFA (Antenna port WB for 2.4 GHz)
Antenna Gain: G_{ANT}	5.6 dBi (Antenna port WA for 2.4 GHz), 4.2 dBi (Antenna port WB for 2.4 GHz)
Directional Gain *1)	7.93 dBi

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

Equipment Type	Transceiver
Frequency of Operation	W52: 5180 MHz - 5240 MHz W53: 5260 MHz - 5320 MHz W56: 5500 MHz - 5700 MHz W58: 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
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
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)
	3.5 dBi (Antenna port WC for 5 GHz)
Directional Gain *1)	7.29 dBi

Bluetooth (BDR/EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	FHSS (GFSK, π/4DQPSK, 8DPSK)
Bandwidth & Channel spacing	79 MHz & 1 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4 dBi (Antenna port WC for 2.4 GHz)

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	1 MHz & 2 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3 V / DC 1.8 V / DC 1.1 V
Antenna Type	PIFA (Antenna port WC for 2.4 GHz)
Antenna Gain	6.4 dBi (Antenna port WC for 2.4 GHz)

*1) Directional antenna gain = $10\log\left(\left(10^{\frac{G_{ANT1}}{20}}+10^{\frac{G_{ANT2}}{20}}\right)^2/2\right)$

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

<Contents of the change from original model>
Test Report Number of original model is 11155194H-B-R3 (issued by UL Japan, Inc.).
Specification was changed from the original model as follows:
Antenna of the EUT was modified.
The radio specification is identical to the original.
Therefore only Radiated Spurious Emission test were performed in this report.
Additionally, only the information of modified antenna is described in this report.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v03r05 **IC:** RSS-Gen 6.13	**FCC:** Section15.247(d) **IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	3.2 dB 2483.500 MHz, Horizontal, AV	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.					

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

FCC Part 15.31 (e)

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

FCC Part 15.203/212 Antenna requirement

The EUT has unique coupling/antenna connectors (U.FL) for antenna ports WA and WC and also has a pattern antenna (Antenna port WB) that is not removable from the EUT.
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

EMI

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

Polarity	Radiated emission (Below 1GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 GHz - 6GHz	6 GHz - 18GHz	10 GHz - 26.5 GHz	26.5 GHz - 40GHz	1 GHz - 18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

*Measurement distance

Radiated emission test
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	2Mbps, PN9
IEEE 802.11n MIMO 20MHz BW (11n-20)	MCS 0, PN9
Bluetooth Low Energy(BT LE)	Maximum Packet Size, PRBS9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*The power value of the EUT was set for testing as follows (setting value might be different from product specification value); Power settings: WLAN 8(dBm) Bluetooth (LE) Same as production model Software: Opro_DOS_Labtool_Ver2.0.0.84 *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
Radiated Spurious Emission (Below 1 GHz)	11n-20 Tx *1)	WA + WB	2437MHz
Radiated Spurious Emission (Above 1 GHz)	11b Tx 11n-20 Tx *2)	WA + WB	2412MHz 2437MHz 2462MHz
*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
Radiated Spurious Emission	BT LE	2402MHz 2440MHz 2480MHz

*Simultaneously transmission

Test Item	Mode *1)
Radiated Spurious Emission	Tx BT LE 2402 MHz + 11n-20 5180 MHz Tx BT LE 2440 MHz + 11n-20 5180 MHz Tx BT LE 2480 MHz + 11n-20 5180 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

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r05".

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

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

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

Test Antennas are used as below;

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

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

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

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	3.7 m *2) (1 GHz – 10 GHz), 1 m *3) (10 GHz – 26.5 GHz)		3.7 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 v03r05".
*2) Distance Factor: 20 x log (3.7 m / 3.0 m) = 1.83 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

APPENDIX 1: Test data

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11653095H		
Date	February 14, 2017	February 22, 2017	February 24, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (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	47.5	27.6	4.8	34.6	-	45.3	73.9	28.6	
Hori	4824.000	PK	45.2	31.6	7.5	33.8	-	50.5	73.9	23.4	
Hori	7236.000	PK	42.0	36.1	8.3	33.9	-	52.5	73.9	21.4	Floor noise
Hori	9648.000	PK	43.5	38.5	9.2	34.5	-	56.7	73.9	17.2	Floor noise
Hori	2390.000	AV	39.2	27.6	4.8	34.6	-	37.0	53.9	16.9	
Hori	4824.000	AV	39.7	31.6	7.5	33.8	-	45.0	53.9	8.9	
Hori	7236.000	AV	33.4	36.1	8.3	33.9	-	43.9	53.9	10.0	Floor noise
Hori	9648.000	AV	34.6	38.5	9.2	34.5	-	47.8	53.9	6.1	Floor noise
Vert	2390.000	PK	47.7	27.6	4.8	34.6	-	45.5	73.9	28.4	
Vert	4824.000	PK	45.8	31.6	7.5	33.8	-	51.1	73.9	22.8	
Vert	7236.000	PK	42.0	36.1	8.3	33.9	-	52.5	73.9	21.4	Floor noise
Vert	9648.000	PK	43.5	38.5	9.2	34.5	-	56.7	73.9	17.2	Floor noise
Vert	2390.000	AV	39.1	27.6	4.8	34.6	-	36.9	53.9	17.0	
Vert	4824.000	AV	40.5	31.6	7.5	33.8	-	45.8	53.9	8.1	
Vert	7236.000	AV	33.4	36.1	8.3	33.9	-	43.9	53.9	10.0	Floor noise
Vert	9648.000	AV	34.6	38.5	9.2	34.5	-	47.8	53.9	6.1	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (3.7 m / 3.0 m) = 1.83 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	102.3	27.6	4.9	34.6	100.2	-	-	Carrier
Hori	2400.000	PK	44.4	27.6	4.9	34.6	42.3	80.2	37.9	
Vert	2412.000	PK	100.9	27.6	4.9	34.6	98.8	-	-	Carrier
Vert	2400.000	PK	47.2	27.6	4.9	34.6	45.1	78.8	33.7	

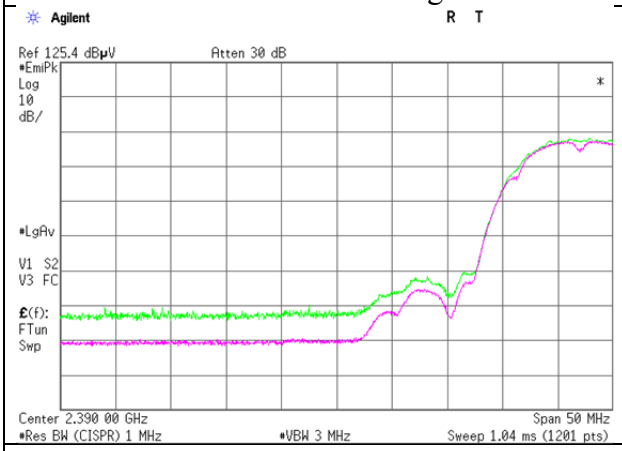
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 14, 2017
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)
Mode	Tx 11b 2412 MHz

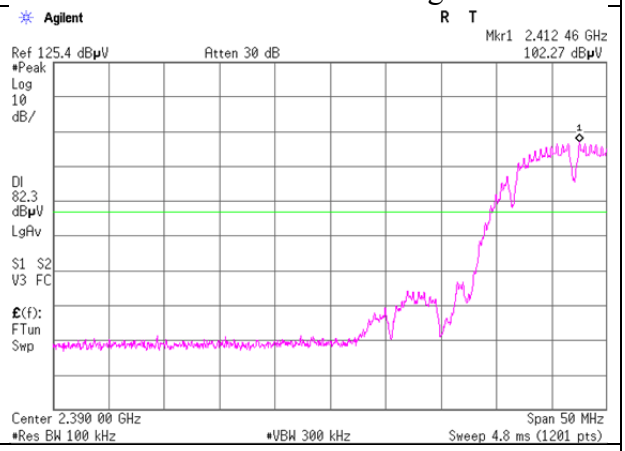
Horizontal

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

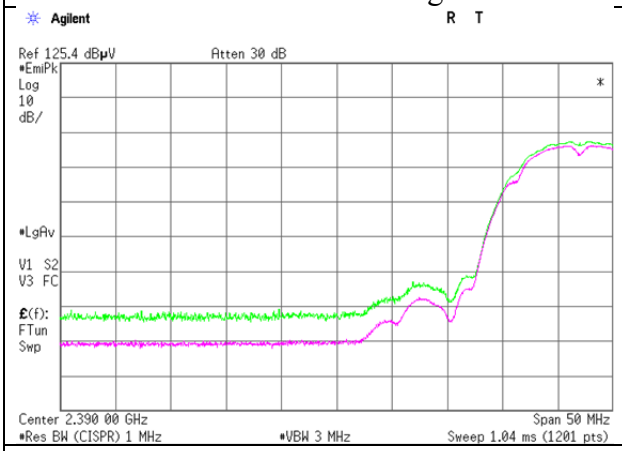
Authorized-band band-edge Plot



20dBc Plot

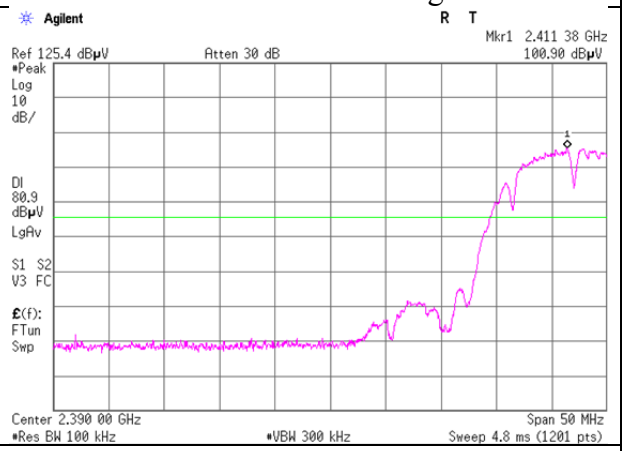
Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Authorized-band band-edge Plot



20dBc Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11653095H		
Date	February 14, 2017	February 22, 2017	February 24, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (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	46.0	31.7	7.5	33.8	-	51.4	73.9	22.5	
Hori	7311.000	PK	42.1	36.2	8.4	33.9	-	52.8	73.9	21.1	Floor noise
Hori	9748.000	PK	42.4	38.5	9.1	34.5	-	55.5	73.9	18.4	Floor noise
Hori	4874.000	AV	40.4	31.7	7.5	33.8	-	45.8	53.9	8.1	
Hori	7311.000	AV	34.2	36.2	8.4	33.9	-	44.9	53.9	9.0	Floor noise
Hori	9748.000	AV	34.4	38.5	9.1	34.5	-	47.5	53.9	6.4	Floor noise
Vert	4874.000	PK	46.8	31.7	7.5	33.8	-	52.2	73.9	21.7	
Vert	7311.000	PK	42.1	36.2	8.4	33.9	-	52.8	73.9	21.1	Floor noise
Vert	9748.000	PK	42.4	38.5	9.1	34.5	-	55.5	73.9	18.4	Floor noise
Vert	4874.000	AV	41.7	31.7	7.5	33.8	-	47.1	53.9	6.8	
Vert	7311.000	AV	34.2	36.2	8.4	33.9	-	44.9	53.9	9.0	Floor noise
Vert	9748.000	AV	34.4	38.5	9.1	34.5	-	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 (3.7 m / 3.0 m) = 1.83 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11653095H		
Date	February 14, 2017	February 22, 2017	February 24, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH
Engineer	Shinichi MIyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (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	49.8	27.7	5.0	34.6	-	47.9	73.9	26.0	
Hori	4924.000	PK	46.0	31.9	7.4	33.8	-	51.5	73.9	22.4	
Hori	7386.000	PK	42.4	36.3	8.4	34.0	-	53.1	73.9	20.8	Floor noise
Hori	9848.000	PK	42.5	38.5	9.1	34.5	-	55.6	73.9	18.3	Floor noise
Hori	2483.500	AV	41.9	27.7	5.0	34.6	-	40.0	53.9	13.9	
Hori	4924.000	AV	40.7	31.9	7.4	33.8	-	46.2	53.9	7.7	
Hori	7386.000	AV	34.1	36.3	8.4	34.0	-	44.8	53.9	9.1	Floor noise
Hori	9848.000	AV	34.5	38.5	9.1	34.5	-	47.6	53.9	6.3	Floor noise
Vert	2483.500	PK	49.0	27.7	5.0	34.6	-	47.1	73.9	26.8	
Vert	4924.000	PK	47.7	31.9	7.4	33.8	-	53.2	73.9	20.7	
Vert	7386.000	PK	42.4	36.3	8.4	34.0	-	53.1	73.9	20.8	Floor noise
Vert	9848.000	PK	42.5	38.5	9.1	34.5	-	55.6	73.9	18.3	Floor noise
Vert	2483.500	AV	40.9	27.7	5.0	34.6	-	39.0	53.9	14.9	
Vert	4924.000	AV	42.3	31.9	7.4	33.8	-	47.8	53.9	6.1	
Vert	7386.000	AV	34.1	36.3	8.4	34.0	-	44.8	53.9	9.1	Floor noise
Vert	9848.000	AV	34.5	38.5	9.1	34.5	-	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).

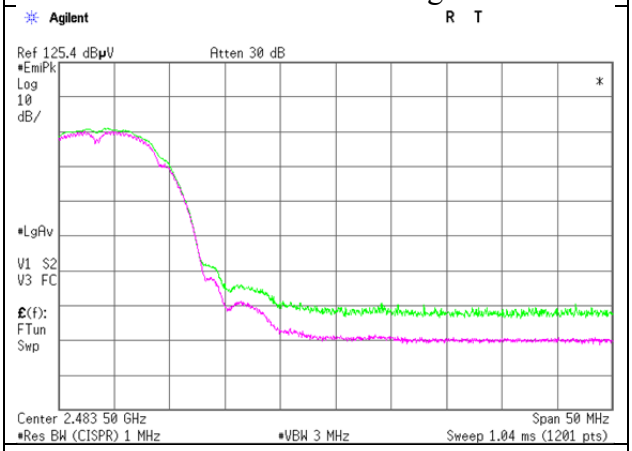
Distance factor: 1 GHz - 10 GHz 20log (3.7 m / 3.0 m) = 1.83 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 14, 2017
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

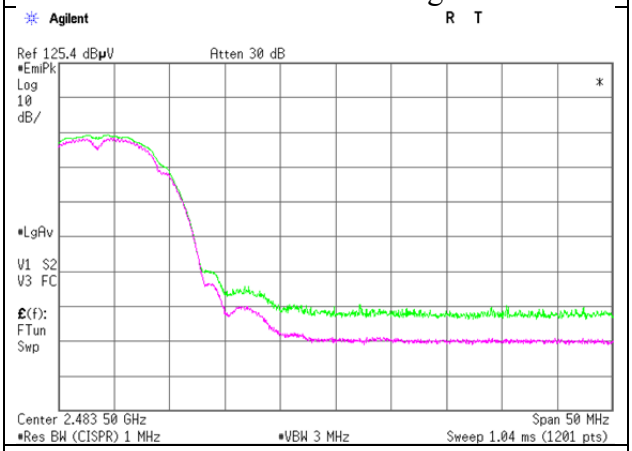
Restricted-band band-edge Plot



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

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11653095H		
Date	February 14, 2017	February 22, 2017	February 24, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (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	63.9	27.6	4.8	34.6	-	61.7	73.9	12.2	
Hori	4824.000	PK	42.3	31.6	7.5	33.8	-	47.6	73.9	26.3	Floor noise
Hori	7236.000	PK	42.0	36.1	8.3	33.9	-	52.5	73.9	21.4	Floor noise
Hori	9648.000	PK	43.5	38.5	9.2	34.5	-	56.7	73.9	17.2	Floor noise
Hori	2390.000	AV	51.7	27.6	4.8	34.6	-	49.5	53.9	4.4	
Hori	4824.000	AV	33.6	31.6	7.5	33.8	-	38.9	53.9	15.0	Floor noise
Hori	7236.000	AV	33.4	36.1	8.3	33.9	-	43.9	53.9	10.0	Floor noise
Hori	9648.000	AV	34.6	38.5	9.2	34.5	-	47.8	53.9	6.1	Floor noise
Vert	2390.000	PK	56.8	27.6	4.8	34.6	-	54.6	73.9	19.3	
Vert	4824.000	PK	42.3	31.6	7.5	33.8	-	47.6	73.9	26.3	Floor noise
Vert	7236.000	PK	42.0	36.1	8.3	33.9	-	52.5	73.9	21.4	Floor noise
Vert	9648.000	PK	43.5	38.5	9.2	34.5	-	56.7	73.9	17.2	Floor noise
Vert	2390.000	AV	46.1	27.6	4.8	34.6	-	43.9	53.9	10.0	
Vert	4824.000	AV	33.6	31.6	7.5	33.8	-	38.9	53.9	15.0	Floor noise
Vert	7236.000	AV	33.4	36.1	8.3	33.9	-	43.9	53.9	10.0	Floor noise
Vert	9648.000	AV	34.6	38.5	9.2	34.5	-	47.8	53.9	6.1	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (3.7 m / 3.0 m) = 1.83 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

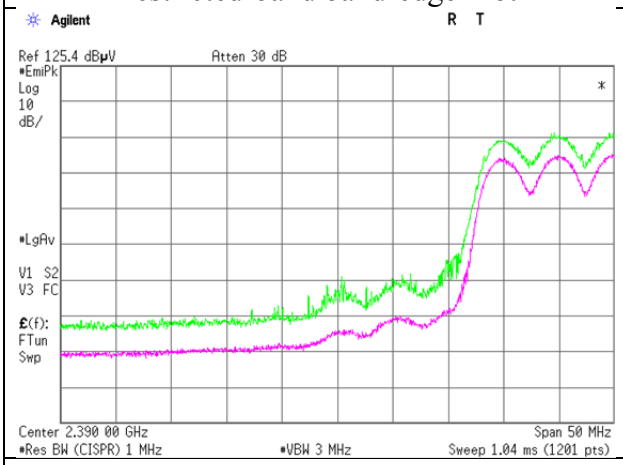
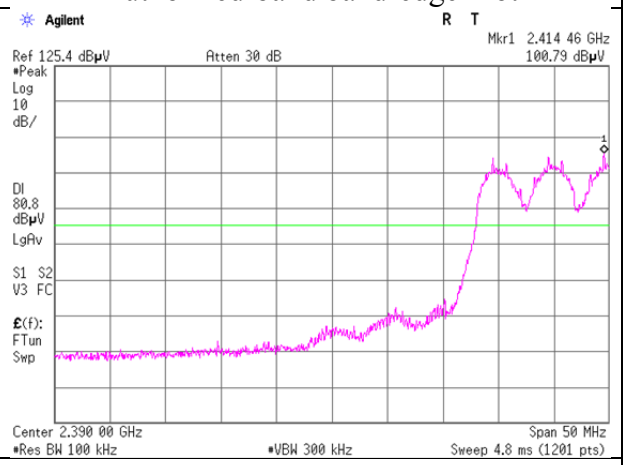
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.8	27.6	4.9	34.6	98.7	-	-	Carrier
Hori	2400.000	PK	57.2	27.6	4.9	34.6	55.1	78.7	23.6	
Vert	2412.000	PK	98.9	27.6	4.9	34.6	96.8	-	-	Carrier
Vert	2400.000	PK	51.3	27.6	4.9	34.6	49.2	76.8	27.6	

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

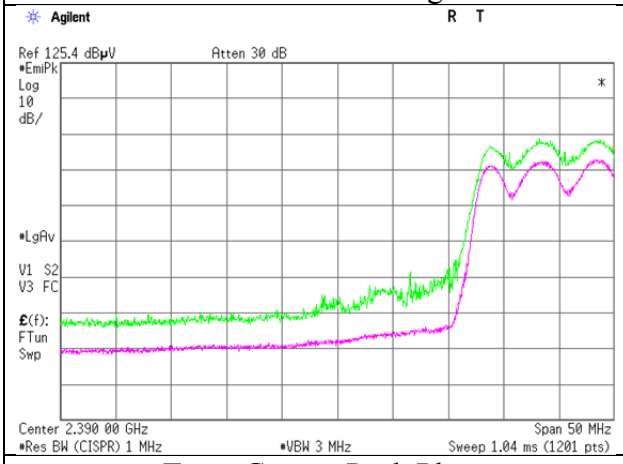
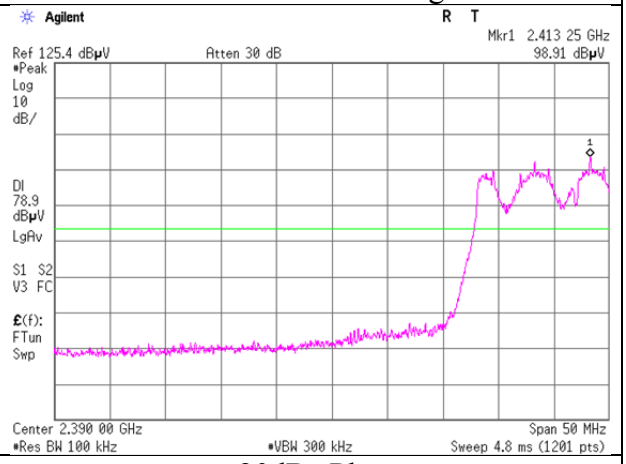
Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 14, 2017
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Shinichi Miyazono
	(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

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 14, 2017	February 22, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (18 GHz-26.5 GHz)	Tomoki Matsui (Below 1GHz)
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	49.152	QP	25.2	11.1	7.0	28.1	-	15.2	40.0	24.8	
Hori	78.647	QP	27.1	6.5	7.2	28.0	-	12.8	40.0	27.2	
Hori	88.000	QP	24.4	8.0	7.3	28.0	-	11.7	40.0	28.3	
Hori	92.270	QP	26.2	8.7	7.4	28.0	-	14.3	43.5	29.2	
Hori	114.238	QP	24.4	12.1	7.6	27.9	-	16.2	43.5	27.3	
Hori	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Hori	4874.000	PK	41.5	31.7	7.5	33.8	-	46.9	73.9	27.0	Floor noise
Hori	7311.000	PK	42.1	36.2	8.4	33.9	-	52.8	73.9	21.1	Floor noise
Hori	9748.000	PK	42.4	38.5	9.1	34.5	-	55.5	73.9	18.4	Floor noise
Hori	4874.000	AV	33.7	31.7	7.5	33.8	-	39.1	53.9	14.8	Floor noise
Hori	7311.000	AV	34.2	36.2	8.4	33.9	-	44.9	53.9	9.0	Floor noise
Hori	9748.000	AV	34.4	38.5	9.1	34.5	-	47.5	53.9	6.4	Floor noise
Vert	49.152	QP	29.7	11.1	7.0	28.1	-	19.7	40.0	20.3	
Vert	76.970	QP	27.4	6.5	7.2	28.0	-	13.1	40.0	26.9	
Vert	88.000	QP	25.7	8.0	7.3	28.0	-	13.0	40.0	27.0	
Vert	92.270	QP	29.3	8.7	7.4	28.0	-	17.4	43.5	26.1	
Vert	110.900	QP	24.6	11.6	7.5	27.9	-	15.8	43.5	27.7	
Vert	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Vert	4874.000	PK	41.5	31.7	7.5	33.8	-	46.9	73.9	27.0	Floor noise
Vert	7311.000	PK	42.1	36.2	8.4	33.9	-	52.8	73.9	21.1	Floor noise
Vert	9748.000	PK	42.4	38.5	9.1	34.5	-	55.5	73.9	18.4	Floor noise
Vert	4874.000	AV	33.7	31.7	7.5	33.8	-	39.1	53.9	14.8	Floor noise
Vert	7311.000	AV	34.2	36.2	8.4	33.9	-	44.9	53.9	9.0	Floor noise
Vert	9748.000	AV	34.4	38.5	9.1	34.5	-	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 (3.7 m / 3.0 m) = 1.83 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	11653095H		
Date	February 14, 2017	February 22, 2017	February 24, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (18 GHz-26.5 GHz)
Mode	Tx 11n-20 2462 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	67.4	27.7	5.0	34.6	-	65.5	73.9	8.4	
Hori	4924.000	PK	41.2	31.9	7.4	33.8	-	46.7	73.9	27.2	Floor noise
Hori	7386.000	PK	42.4	36.3	8.4	34.0	-	53.1	73.9	20.8	Floor noise
Hori	9848.000	PK	42.5	38.5	9.1	34.5	-	55.6	73.9	18.3	Floor noise
Hori	2483.500	AV	52.6	27.7	5.0	34.6	-	50.7	53.9	3.2	
Hori	4924.000	AV	33.5	31.9	7.4	33.8	-	39.0	53.9	14.9	Floor noise
Hori	7386.000	AV	34.1	36.3	8.4	34.0	-	44.8	53.9	9.1	Floor noise
Hori	9848.000	AV	34.5	38.5	9.1	34.5	-	47.6	53.9	6.3	Floor noise
Vert	2483.500	PK	70.4	27.7	5.0	34.6	-	68.5	73.9	5.4	
Vert	4924.000	PK	41.2	31.9	7.4	33.8	-	46.7	73.9	27.2	Floor noise
Vert	7386.000	PK	42.4	36.3	8.4	34.0	-	53.1	73.9	20.8	Floor noise
Vert	9848.000	PK	42.5	38.5	9.1	34.5	-	55.6	73.9	18.3	Floor noise
Vert	2483.500	AV	52.4	27.7	5.0	34.6	-	50.5	53.9	3.4	
Vert	4924.000	AV	33.5	31.9	7.4	33.8	-	39.0	53.9	14.9	Floor noise
Vert	7386.000	AV	34.1	36.3	8.4	34.0	-	44.8	53.9	9.1	Floor noise
Vert	9848.000	AV	34.5	38.5	9.1	34.5	-	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).

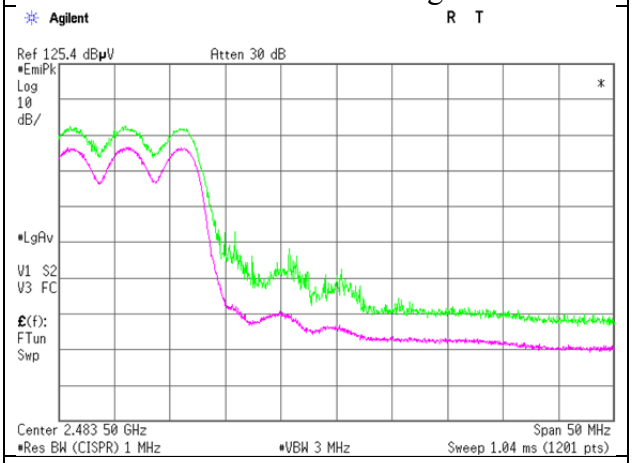
Distance factor: 1 GHz - 10 GHz 20log (3.7 m / 3.0 m) = 1.83 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 14, 2017
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

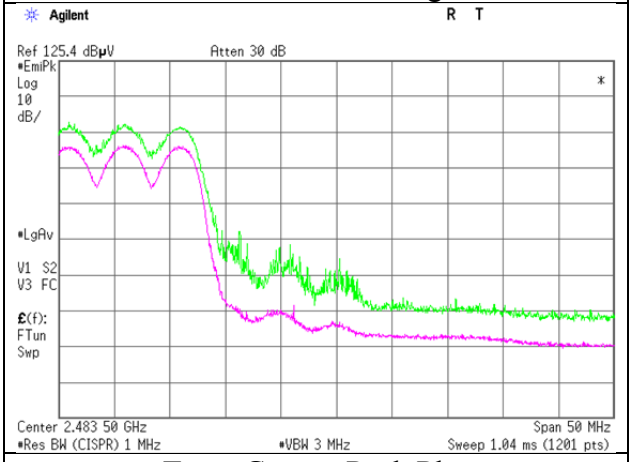
Restricted-band band-edge Plot



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

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 15, 2017	February 22, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	23 deg. C / 31 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Tomoki Matsui (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (18 GHz-26.5 GHz)	Tomoki Matsui (Below 1GHz)
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	49.152	QP	25.2	11.1	7.0	28.1	-	15.2	40.0	24.8	
Hori	78.647	QP	27.3	6.5	7.2	28.0	-	13.0	40.0	27.0	
Hori	88.000	QP	24.4	8.0	7.3	28.0	-	11.7	40.0	28.3	
Hori	92.270	QP	26.4	8.7	7.4	28.0	-	14.5	43.5	29.0	
Hori	114.238	QP	24.4	12.1	7.6	27.9	-	16.2	43.5	27.3	
Hori	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Hori	2390.000	PK	51.0	27.6	4.9	34.6	-	48.9	73.9	25.0	
Hori	4804.000	PK	42.6	31.5	7.6	33.8	-	47.9	73.9	26.0	Floor noise
Hori	7206.000	PK	41.3	36.1	8.4	33.9	-	51.9	73.9	22.0	Floor noise
Hori	9608.000	PK	43.7	38.5	9.3	34.5	-	57.0	73.9	16.9	Floor noise
Hori	2390.000	AV	37.8	27.6	4.9	34.6	2.0	37.7	53.9	16.2	*1)
Hori	4804.000	AV	34.1	31.5	7.6	33.8	-	39.4	53.9	14.5	Floor noise
Hori	7206.000	AV	33.0	36.1	8.4	33.9	-	43.6	53.9	10.3	Floor noise
Hori	9608.000	AV	34.1	38.5	9.3	34.5	-	47.4	53.9	6.5	Floor noise
Vert	49.152	QP	30.5	11.1	7.0	28.1	-	20.5	40.0	19.5	
Vert	78.647	QP	31.4	6.5	7.2	28.0	-	17.1	40.0	22.9	
Vert	88.000	QP	25.4	8.0	7.3	28.0	-	12.7	40.0	27.3	
Vert	92.270	QP	29.4	8.7	7.4	28.0	-	17.5	43.5	26.0	
Vert	110.900	QP	24.7	11.6	7.5	27.9	-	15.9	43.5	27.6	
Vert	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Vert	2390.000	PK	49.7	27.6	4.9	34.6	-	47.6	73.9	26.3	
Vert	4804.000	PK	42.6	31.5	7.6	33.8	-	47.9	73.9	26.0	Floor noise
Vert	7206.000	PK	41.3	36.1	8.4	33.9	-	51.9	73.9	22.0	Floor noise
Vert	9608.000	PK	43.7	38.5	9.3	34.5	-	57.0	73.9	16.9	Floor noise
Vert	2390.000	AV	36.6	27.6	4.9	34.6	2.0	36.5	53.9	17.4	*1)
Vert	4804.000	AV	34.1	31.5	7.6	33.8	-	39.4	53.9	14.5	Floor noise
Vert	7206.000	AV	33.0	36.1	8.4	33.9	-	43.6	53.9	10.3	Floor noise
Vert	9608.000	AV	34.1	38.5	9.3	34.5	-	47.4	53.9	6.5	Floor noise

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

Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

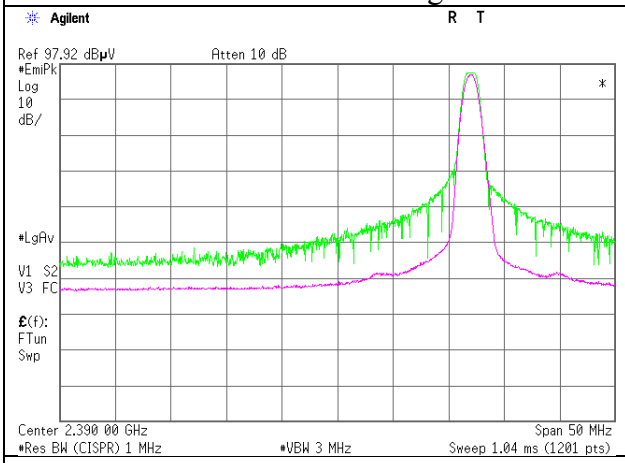
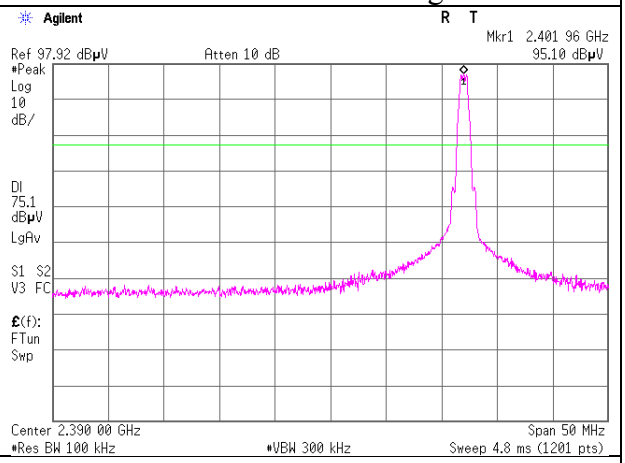
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	95.1	27.6	5.0	34.6	93.1	-	-	Carrier
Hori	2400.000	PK	49.3	27.6	5.0	34.6	47.3	73.1	25.8	
Vert	2402.000	PK	92.1	27.6	5.0	34.6	90.1	-	-	Carrier
Vert	2400.000	PK	46.7	27.6	5.0	34.6	44.7	70.1	25.4	

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

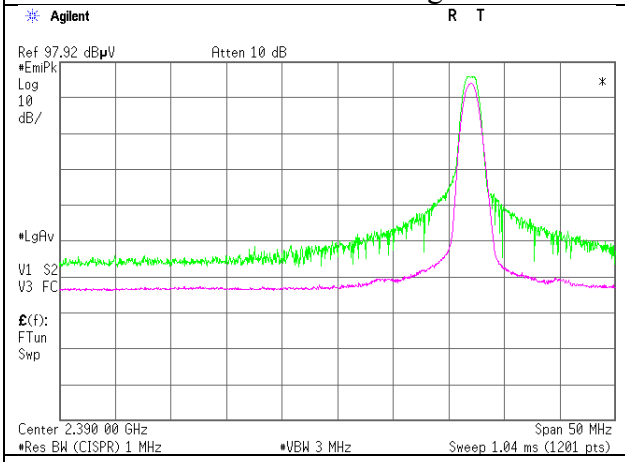
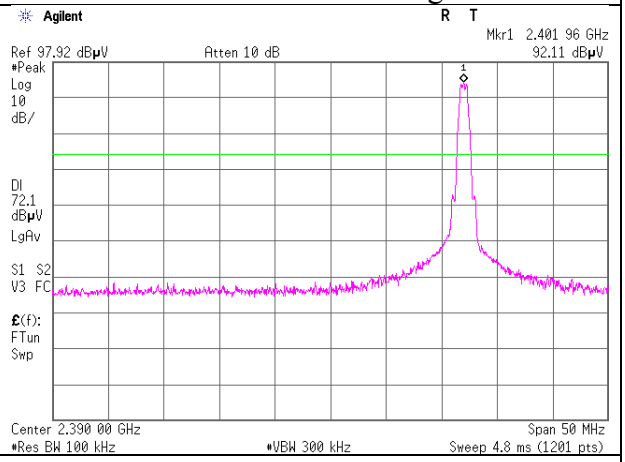
Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 15, 2017
Temperature / Humidity	23 deg. C / 31 % RH
Engineer	Tomoki Matsui
	(1 GHz -10 GHz)
Mode	Tx BT LE 2402 MHz

Horizontal

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

Vertical

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 15, 2017	February 22, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	23 deg. C / 31 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Tomoki Matsui	Yuta Moriya	Yuta Moriya	Tomoki Matsui
	(1 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz-26.5 GHz)	(Below 1GHz)
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	49.152	QP	25.3	11.1	7.0	28.1	-	15.3	40.0	24.7	
Hori	78.647	QP	27.5	6.5	7.2	28.0	-	13.2	40.0	26.8	
Hori	88.000	QP	25.4	8.0	7.3	28.0	-	12.7	40.0	27.3	
Hori	92.270	QP	26.8	8.7	7.4	28.0	-	14.9	43.5	28.6	
Hori	114.238	QP	24.5	12.1	7.6	27.9	-	16.3	43.5	27.2	
Hori	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Hori	4880.000	PK	41.5	31.7	7.6	33.8	-	47.0	73.9	26.9	Floor noise
Hori	7320.000	PK	41.8	36.3	8.5	33.9	-	52.7	73.9	21.2	Floor noise
Hori	9760.000	PK	42.4	38.5	9.2	34.5	-	55.6	73.9	18.3	Floor noise
Hori	4880.000	AV	33.1	31.7	7.6	33.8	-	38.6	53.9	15.3	Floor noise
Hori	7320.000	AV	33.2	36.3	8.5	33.9	-	44.1	53.9	9.8	Floor noise
Hori	9760.000	AV	33.8	38.5	9.2	34.5	-	47.0	53.9	6.9	Floor noise
Vert	49.152	QP	29.8	11.1	7.0	28.1	-	19.8	40.0	20.2	
Vert	78.647	QP	31.5	6.5	7.2	28.0	-	17.2	40.0	22.8	
Vert	88.000	QP	25.4	8.0	7.3	28.0	-	12.7	40.0	27.3	
Vert	92.270	QP	29.2	8.7	7.4	28.0	-	17.3	43.5	26.2	
Vert	110.900	QP	24.4	11.6	7.5	27.9	-	15.6	43.5	27.9	
Vert	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Vert	4880.000	PK	41.5	31.7	7.6	33.8	-	47.0	73.9	26.9	Floor noise
Vert	7320.000	PK	41.8	36.3	8.5	33.9	-	52.7	73.9	21.2	Floor noise
Vert	9760.000	PK	42.4	38.5	9.2	34.5	-	55.6	73.9	18.3	Floor noise
Vert	4880.000	AV	33.1	31.7	7.6	33.8	-	38.6	53.9	15.3	Floor noise
Vert	7320.000	AV	33.2	36.3	8.5	33.9	-	44.1	53.9	9.8	Floor noise
Vert	9760.000	AV	33.8	38.5	9.2	34.5	-	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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 15, 2017	February 22, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	23 deg. C / 31 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Tomoki Matsui	Yuta Moriya	Yuta Moriya	Tomoki Matsui
	(1 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz-26.5 GHz)	(Below 1GHz)
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	49.152	QP	25.2	11.1	7.0	28.1	-	15.2	40.0	24.8	
Hori	78.647	QP	27.5	6.5	7.2	28.0	-	13.2	40.0	26.8	
Hori	88.000	QP	24.4	8.0	7.3	28.0	-	11.7	40.0	28.3	
Hori	92.270	QP	26.4	8.7	7.4	28.0	-	14.5	43.5	29.0	
Hori	114.238	QP	24.3	12.1	7.6	27.9	-	16.1	43.5	27.4	
Hori	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Hori	2483.500	PK	60.8	27.7	5.1	34.6	-	59.0	73.9	14.9	
Hori	4960.000	PK	41.0	32.0	7.6	33.8	-	46.8	73.9	27.1	Floor noise
Hori	7440.000	PK	42.2	36.4	8.5	34.0	-	53.1	73.9	20.8	Floor noise
Hori	9920.000	PK	43.2	38.6	9.3	34.6	-	56.5	73.9	17.4	Floor noise
Hori	2483.500	AV	45.9	27.7	5.1	34.6	2.0	46.1	53.9	7.8	*1)
Hori	4960.000	AV	32.9	32.0	7.6	33.8	-	38.7	53.9	15.2	Floor noise
Hori	7440.000	AV	33.2	36.4	8.5	34.0	-	44.1	53.9	9.8	Floor noise
Hori	9920.000	AV	34.3	38.6	9.3	34.6	-	47.6	53.9	6.3	Floor noise
Vert	49.152	QP	30.9	11.1	7.0	28.1	-	20.9	40.0	19.1	
Vert	78.647	QP	31.7	6.5	7.2	28.0	-	17.4	40.0	22.6	
Vert	88.000	QP	25.4	8.0	7.3	28.0	-	12.7	40.0	27.3	
Vert	92.270	QP	29.2	8.7	7.4	28.0	-	17.3	43.5	26.2	
Vert	110.900	QP	24.5	11.6	7.5	27.9	-	15.7	43.5	27.8	
Vert	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Vert	2483.500	PK	59.4	27.7	5.1	34.6	-	57.6	73.9	16.3	
Vert	4960.000	PK	41.0	32.0	7.6	33.8	-	46.8	73.9	27.1	Floor noise
Vert	7440.000	PK	42.2	36.4	8.5	34.0	-	53.1	73.9	20.8	Floor noise
Vert	9920.000	PK	43.2	38.6	9.3	34.6	-	56.5	73.9	17.4	Floor noise
Vert	2483.500	AV	44.6	27.7	5.1	34.6	2.0	44.8	53.9	9.1	*1)
Vert	4960.000	AV	32.9	32.0	7.6	33.8	-	38.7	53.9	15.2	Floor noise
Vert	7440.000	AV	33.2	36.4	8.5	34.0	-	44.1	53.9	9.8	Floor noise
Vert	9920.000	AV	34.3	38.6	9.3	34.6	-	47.6	53.9	6.3	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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

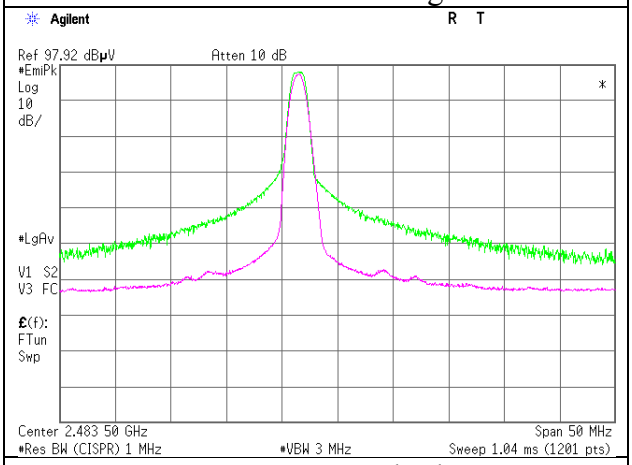
*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 15, 2017
Temperature / Humidity	23 deg. C / 31 % RH
Engineer	Tomoki Matsui (1 GHz -10 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

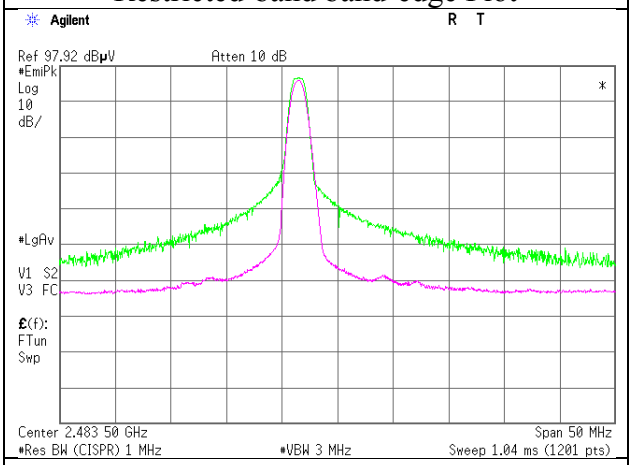
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 21, 2017
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx BT LE 2402 MHz and 11n-20 5180MHz

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	49.6	27.6	4.9	34.6	-	47.5	73.9	26.4	
Hori.	2776.000	PK	47.9	28.1	5.3	34.6	-	46.7	73.9	27.2	
Hori.	2390.000	AV	36.5	27.6	4.9	34.6	2.0	36.4	53.9	17.5	*1)
Hori.	2776.000	AV	37.0	28.1	5.3	34.6	2.0	37.8	53.9	16.1	
Vert.	2390.000	PK	50.9	27.6	4.9	34.6	-	48.8	73.9	25.1	
Vert.	2776.000	PK	49.8	28.1	5.3	34.6	-	48.6	73.9	25.3	
Vert.	2390.000	AV	37.3	27.6	4.9	34.6	2.0	37.2	53.9	16.7	*1)
Vert.	2776.000	AV	38.0	28.1	5.3	34.6	2.0	38.8	53.9	15.1	

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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB
*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	93.4	27.6	5.0	34.6	91.4	-	-	Carrier
Hori	2400.000	PK	47.9	27.6	5.0	34.6	45.9	71.4	25.5	
Vert	2402.000	PK	94.4	27.6	5.0	34.6	92.4	-	-	Carrier
Vert	2400.000	PK	48.7	27.6	5.0	34.6	46.7	72.4	25.7	

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 21, 2017	February 23, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	25 deg. C / 30 % RH	22 deg. C / 30 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Yuta Moriya	Takumi Shimada	Yuta Moriya	Tomoki Matsui
	(1 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz-26.5 GHz)	(Below 1GHz)
Mode	Tx BT LE 2440 MHz and 11n-20 5180MHz			

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	49.152	QP	24.5	11.1	7.0	28.1	-	14.5	40.0	25.5	
Hori	78.647	QP	26.5	6.5	7.2	28.0	-	12.2	40.0	27.8	
Hori	88.000	QP	24.4	8.0	7.3	28.0	-	11.7	40.0	28.3	
Hori	92.270	QP	25.3	8.7	7.4	28.0	-	13.4	43.5	30.1	
Hori	114.238	QP	24.4	12.1	7.6	27.9	-	16.2	43.5	27.3	
Hori	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Hori	2741.570	PK	50.6	28.0	5.2	34.6	-	49.2	73.9	24.7	
Hori	4880.000	PK	41.8	31.7	6.5	33.8	-	46.2	73.9	27.7	Floor noise
Hori	7320.000	PK	42.1	36.3	7.8	33.9	-	52.3	73.9	21.6	Floor noise
Hori	9760.000	PK	43.1	38.5	8.6	34.5	-	55.7	73.9	18.2	Floor noise
Hori	2741.570	AV	42.6	28.0	5.2	34.6	-	41.2	53.9	12.7	
Hori	4880.000	AV	34.6	31.7	6.5	33.8	-	39.0	53.9	14.9	Floor noise
Hori	7320.000	AV	34.2	36.3	7.8	33.9	-	44.4	53.9	9.5	Floor noise
Hori	9760.000	AV	34.5	38.5	8.6	34.5	-	47.1	53.9	6.8	Floor noise
Vert	49.152	QP	30.9	11.1	7.0	28.1	-	20.9	40.0	19.1	
Vert	78.880	QP	25.2	6.5	7.3	28.0	-	11.0	40.0	29.0	
Vert	88.000	QP	25.7	8.0	7.3	28.0	-	13.0	40.0	27.0	
Vert	92.270	QP	27.4	8.7	7.4	28.0	-	15.5	43.5	28.0	
Vert	110.900	QP	24.6	11.6	7.5	27.9	-	15.8	43.5	27.7	
Vert	960.000	QP	21.9	22.4	11.4	26.5	-	29.2	46.0	16.8	
Vert	2741.570	PK	48.3	28.0	5.2	34.6	-	46.9	73.9	27.0	
Vert	4880.000	PK	41.6	31.7	6.5	33.8	-	46.0	73.9	27.9	Floor noise
Vert	7320.000	PK	41.9	36.3	7.8	33.9	-	52.1	73.9	21.8	Floor noise
Vert	9760.000	PK	42.2	38.5	8.6	34.5	-	54.8	73.9	19.1	Floor noise
Vert	2741.570	AV	40.1	28.0	5.2	34.6	-	38.7	53.9	15.2	
Vert	4880.000	AV	33.5	31.7	6.5	33.8	-	37.9	53.9	16.0	Floor noise
Vert	7320.000	AV	34.6	36.3	7.8	33.9	-	44.8	53.9	9.1	Floor noise
Vert	9760.000	AV	34.6	38.5	8.6	34.5	-	47.2	53.9	6.7	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 (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 21, 2017
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Yuta Moriya
	(1 GHz -10 GHz)
Mode	Tx BT LE 2480 MHz and 11n-20 5180MHz

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	63.5	27.7	5.1	34.6	-	61.7	73.9	12.2	
Hori.	2702.814	PK	54.6	28.0	5.2	34.6	-	53.2	73.9	20.7	
Hori.	2483.500	AV	47.7	27.7	5.1	34.6	2.0	47.9	53.9	6.0	*1)
Hori.	2702.814	AV	46.6	28.0	5.2	34.6	2.0	47.2	53.9	6.7	
Vert.	2483.500	PK	60.0	27.7	5.1	34.6	-	58.2	73.9	15.7	
Vert.	2702.814	PK	50.2	28.0	5.2	34.6	-	48.8	73.9	25.1	
Vert.	2483.500	AV	44.0	27.7	5.1	34.6	2.0	44.2	53.9	9.7	*1)
Vert.	2702.814	AV	42.7	28.0	5.2	34.6	2.0	43.3	53.9	10.6	

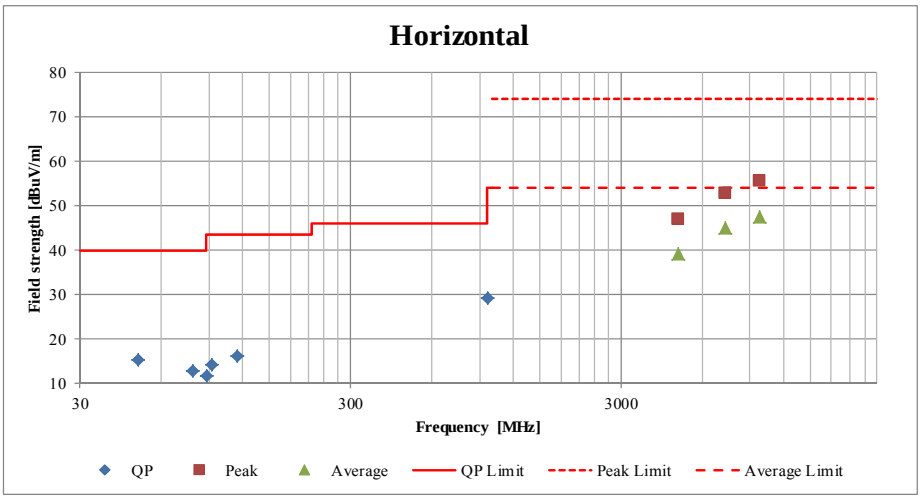
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

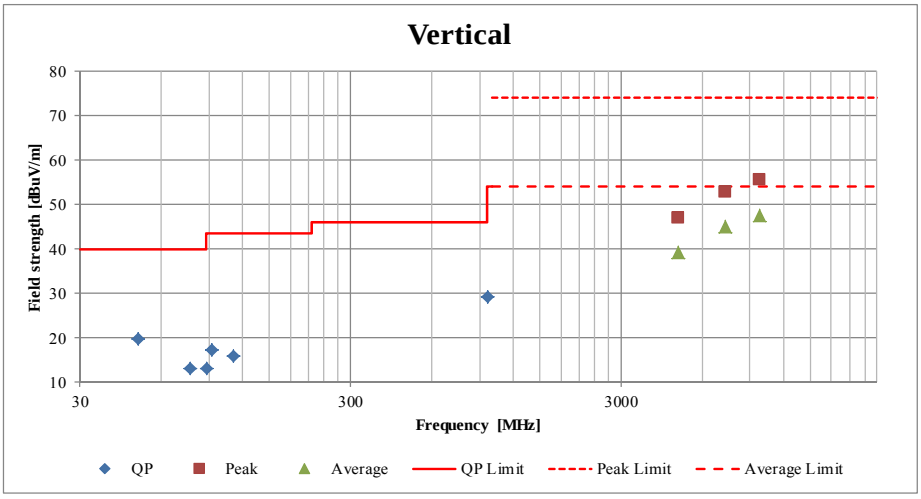
Distance factor: 1 GHz - 10 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 14, 2017	February 22, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	23 deg. C / 30 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Shinichi Miyazono (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (18 GHz-26.5 GHz)	Tomoki Matsui (Below 1GHz)
Mode	Tx 11n-20 2437 MHz			

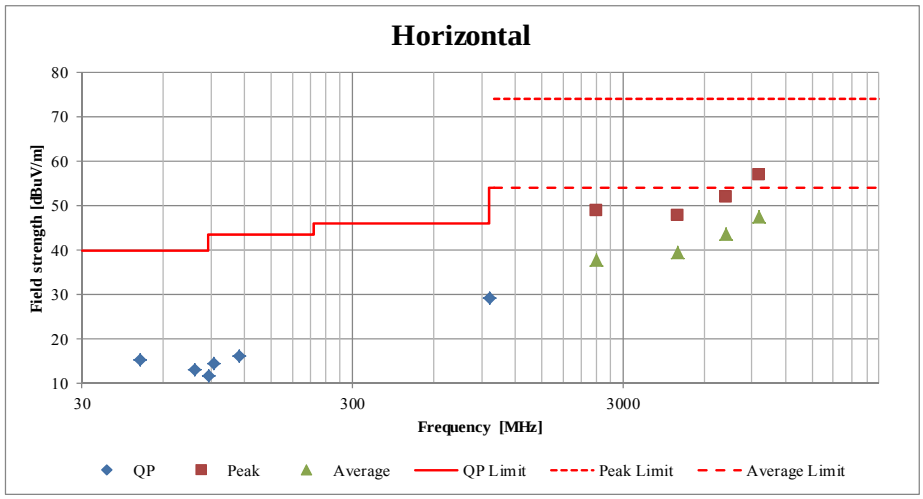


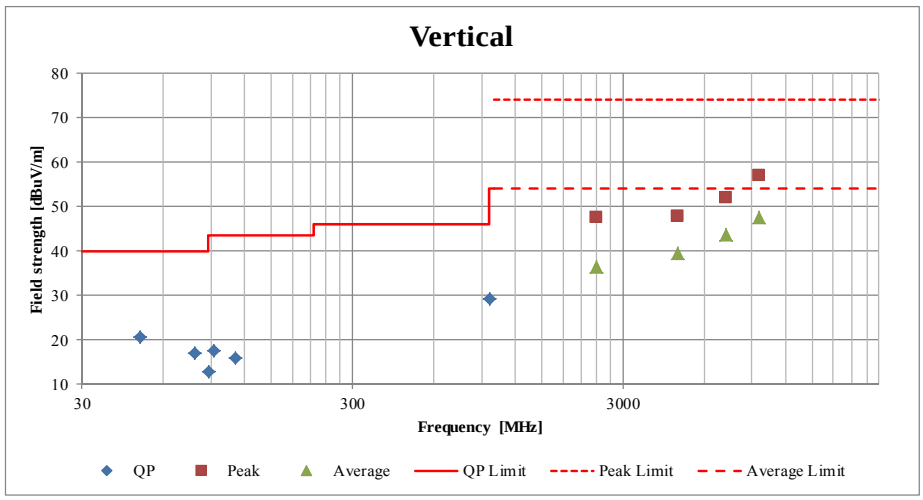


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber			
Report No.	11653095H			
Date	February 15, 2017	February 22, 2017	February 24, 2017	February 26, 2017
Temperature / Humidity	23 deg. C / 31 % RH	24 deg. C / 31 % RH	23deg. C / 32 % RH	21 deg. C / 27 % RH
Engineer	Tomoki Matsui (1 GHz -10 GHz)	Yuta Moriya (10 GHz -18 GHz)	Yuta Moriya (18 GHz-26.5 GHz)	Tomoki Matsui (Below 1GHz)
Mode	Tx BT LE 2402 MHz			





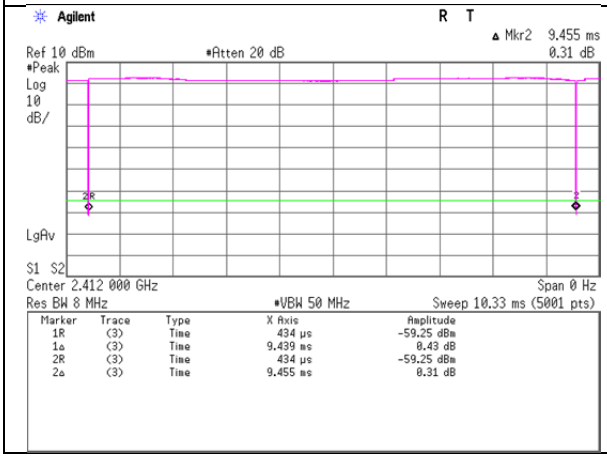
*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Burst rate confirmation

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	11653095H
Date	February 14, 2017
Temperature / Humidity	23 deg. C / 30 % RH
Engineer	Sinichi Miyazono
Mode	Tx

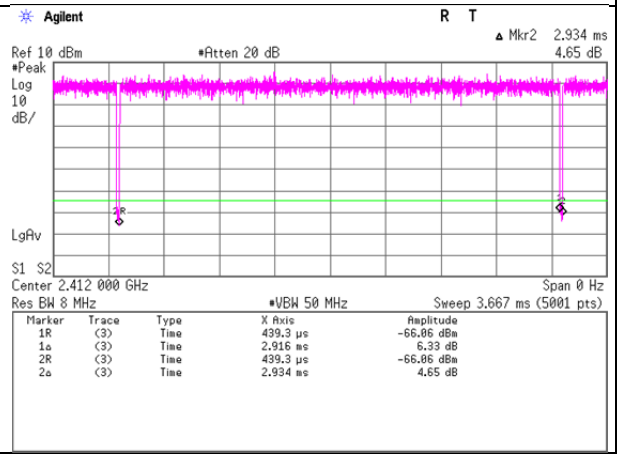
11b 2 Mbps

Tx on / (Tx on + Tx off) = 0.998
Tx on / (Tx on + Tx off) * 100 = 99.8 %
Duty factor = 10 * log (9.455 / 9.439) = 0.01 dB



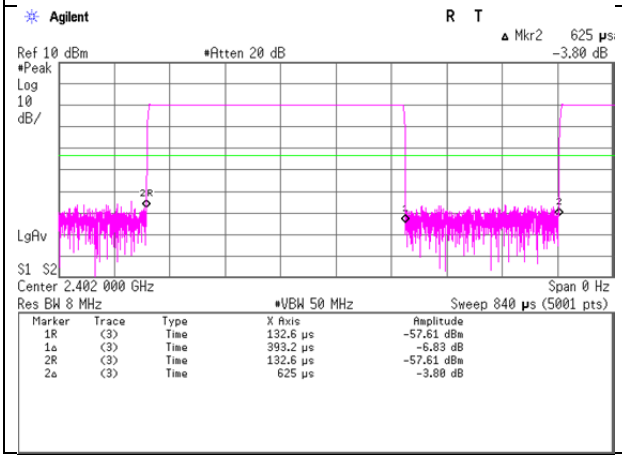
11n-20 MCS 0

Tx on / (Tx on + Tx off) = 0.994
Tx on / (Tx on + Tx off) * 100 = 99.4 %
Duty factor = 10 * log (2.934 / 2.916) = 0.03 dB



BT LE

Tx on / (Tx on + Tx off) = 0.629
Tx on / (Tx on + Tx off) * 100 = 62.9 %
Duty factor = 10 * log (625 / 393.2) = 2.01 dB



APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/12/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-126	Spectrum Analyzer	KEYSIGHT	E4440A	MY46185516	RE	2016/07/01 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2016/02/29 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2016/08/29 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2016/09/19 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2016/09/28 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2016/06/24 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2016/10/21 * 12
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2016/09/29 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/01/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2016/02/08 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2016/11/28 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 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