



RADIO TEST REPORT

Test Report No. : 11160421H-B-R1

Applicant : Yamaha Corporation

Type of Equipment : Network Module

Model No. : NW-01

FCC ID : A6RNW01A

Test regulation : FCC Part 15 Subpart C: 2015
*Bluetooth part (Radiated Spurious Emission test only)
(Permissive Change Class II Application)

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 11160421H-B. 11160421H-B is replaced with this report.

Date of test: March 11 to 14, 2016

Representative test engineer:

S. Matsuyama

Satofumi Matsuyama
Engineer
Consumer Technology Division

Approved by:

Takayuki S.

Takayuki Shimada
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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13-EM-F0429

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SECTION 1: Customer information

Company Name	:	Yamaha Corporation
Address	:	10-1 Nakazawa-Cho, Naka-ku, Hamamatsu, Shizuoka, 430-8650, Japan
Telephone Number	:	+81-53-460-2407
Facsimile Number	:	+81-53-460-2878
Contact Person	:	Hideyuki Suzuki

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

2.1 Identification of E.U.T.

Type of Equipment	:	Network Module
Model No.	:	NW-01
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5.0 V
Receipt Date of Sample	:	January 10, 2015(Sample used on January 13, 2015) March 7, 2016 (Sample used on March 11 to 14, 2016)
Country of Mass-production	:	Malaysia
Condition of EUT	:	Engineering 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

Model: NW-01 (referred to as the EUT in this report) is a Network Module.

General Specification

Clock frequency(ies) in the system : 32.768 kHz, 2.25 MHz, 6 MHz, 22.5792 MHz, 24.576 MHz, 25 MHz, 26 MHz, 50 MHz, 400 MHz

Operating temperature : 0deg. C to + 67deg. C

Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20MHz & 5MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3V
Antenna Type	Dipole Antenna
Antenna Gain	4.8 dBi including connector and cable

Bluetooth (Ver. 2.1 with EDR function)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	1MHz & 1MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3V
Antenna Type	Dipole Antenna
Antenna Gain	4.8 dBi including connector and cable

*This test report applies for Bluetooth.

<Contents of the change from original model>

Original test report number of this report is 10646854H-B-R2.

The EUT is changed the specification from original model as below.

* The form change of the antenna design.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015
 *Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
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	7.6 dB 7440.000 MHz, AV, Vertical.	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).

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique antenna connector (U.FL on the Module). Therefore the equipment complies with the requirement of Section 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 $k = 2$.
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Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+dB)		(10 m*)(+dB)	
	30 – 300 MHz	300 – 1000MHz	30 – 300 MHz	300 – 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

*Measurement distance

Radiated emission test

The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

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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

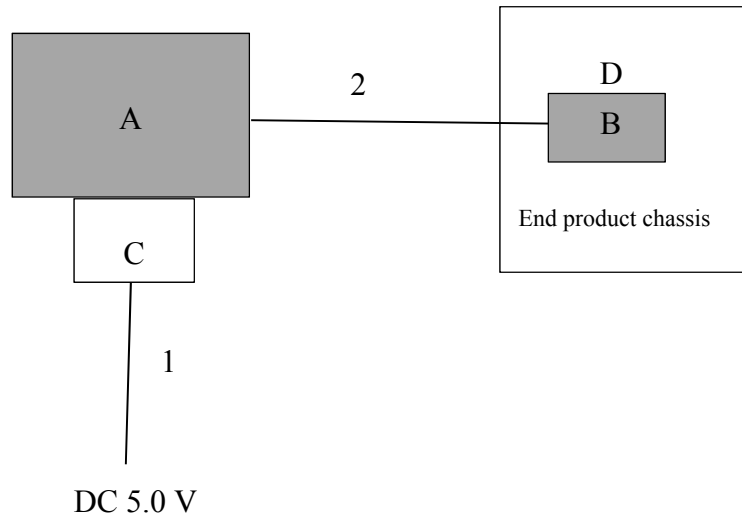
4.1 Operating Mode(s)

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
*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 (2 Mb/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: -1.75dBm Software: Ver.4.3.1 *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.		

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Module	NW-01	8	Yamaha Corporation	EUT
B	Antenna	RFDPA240416IMA B303	001	Walsin Technology Corporation	EUT
C	Jig board	-	-	-	-
D	WIRELESS STREAMING SPEAKER	WX-010	G19	Yamaha Corporation	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.5	Unshielded	Unshielded	-
2	Antenna Cable	0.05	Shielded	Shielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1GHz]

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 1GHz]

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 300 MHz	300 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	4.3 m*2) (1 GHz – 10 GHz), 1 m*3) (10 GHz – 26.5 GHz)		4.3 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: $20 \times \log (4.3 \text{ m}/3.0 \text{ m}) = 3.1 \text{ dB}$

*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 (Module) to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test was made on Speaker at the normal position, because antenna was built into Speaker and Speaker was intended to be used as horizontally mounted.

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.4 Semi Anechoic Chamber
Report No. : 11160421H
Date : March 11, 2016 March 12, 2016 March 14, 2016
Temperature / Humidity : 24 deg. C / 34 % RH 20 deg. C / 38 % RH 23 deg. C / 34 % RH
Engineer : Satofumi Matsuyama Tomohisa Nakagawa Hironobu Ohnishi
(1-10GHz) (10-26.5GHz) (Below 1 GHz)
Mode : Tx, Hopping Off, DH5 2402 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	50.000	QP	23.2	10.7	7.4	32.1	9.2	40.0	30.8	
Hori	248.365	QP	23.9	17.9	9.5	31.8	19.5	46.0	26.5	
Hori	293.541	QP	31.8	19.5	9.8	31.8	29.3	46.0	16.7	
Hori	400.000	QP	24.8	18.4	10.6	31.9	21.9	46.0	24.1	
Hori	492.006	QP	30.3	19.4	11.2	32.0	28.9	46.0	17.1	
Hori	500.000	QP	33.5	19.5	11.2	32.0	32.2	46.0	13.8	
Hori	880.582	QP	28.4	24.0	13.2	31.2	34.4	46.0	11.6	
Hori	2390.000	PK	43.8	27.9	6.4	37.1	41.0	73.9	32.9	
Hori	4804.000	PK	41.6	32.8	8.8	37.1	46.1	73.9	27.8	Floor Noise
Hori	7206.000	PK	44.3	36.8	10.0	37.8	53.3	73.9	20.6	
Hori	9608.000	PK	43.7	38.1	10.7	39.1	53.4	73.9	20.5	Floor Noise
Hori	2390.000	AV	31.4	27.9	6.4	37.1	28.6	53.9	25.3	
Hori	4804.000	AV	30.6	32.8	8.8	37.1	35.1	53.9	18.8	Floor Noise
Hori	7206.000	AV	33.0	36.8	10.0	37.8	42.0	53.9	11.9	
Hori	9608.000	AV	31.9	38.1	10.7	39.1	41.6	53.9	12.3	Floor Noise
Vert	50.000	QP	25.4	10.7	7.4	32.1	11.4	40.0	28.6	
Vert	248.365	QP	26.8	17.9	9.5	31.8	22.4	46.0	23.6	
Vert	293.541	QP	31.6	19.5	9.8	31.8	29.1	46.0	16.9	
Vert	400.000	QP	26.5	18.4	10.6	31.9	23.6	46.0	22.4	
Vert	492.006	QP	25.2	19.4	11.2	32.0	23.8	46.0	22.2	
Vert	500.000	QP	26.7	19.5	11.2	32.0	25.4	46.0	20.6	
Vert	880.582	QP	26.5	24.0	13.2	31.2	32.5	46.0	13.5	
Vert	2390.000	PK	45.1	27.9	6.4	37.1	42.3	73.9	31.6	
Vert	4804.000	PK	41.8	32.8	8.8	37.1	46.3	73.9	27.6	Floor Noise
Vert	7206.000	PK	46.0	36.8	10.0	37.8	55.0	73.9	18.9	
Vert	9608.000	PK	43.4	38.1	10.7	39.1	53.1	73.9	20.8	Floor Noise
Vert	2390.000	AV	31.7	27.9	6.4	37.1	28.9	53.9	25.0	
Vert	4804.000	AV	30.6	32.8	8.8	37.1	35.1	53.9	18.8	Floor Noise
Vert	7206.000	AV	36.5	36.8	10.0	37.8	45.5	53.9	8.4	
Vert	9608.000	AV	31.9	38.1	10.7	39.1	41.6	53.9	12.3	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.3 m / 3.0 m) = 3.1 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	95.5	28.0	6.4	37.0	92.9	-	-	Carrier
Hori	2400.000	PK	40.2	28.0	6.4	37.0	37.6	72.9	35.3	
Vert	2402.000	PK	99.4	28.0	6.4	37.0	96.8	-	-	Carrier
Vert	2400.000	PK	43.6	28.0	6.4	37.0	41.0	76.8	35.8	

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

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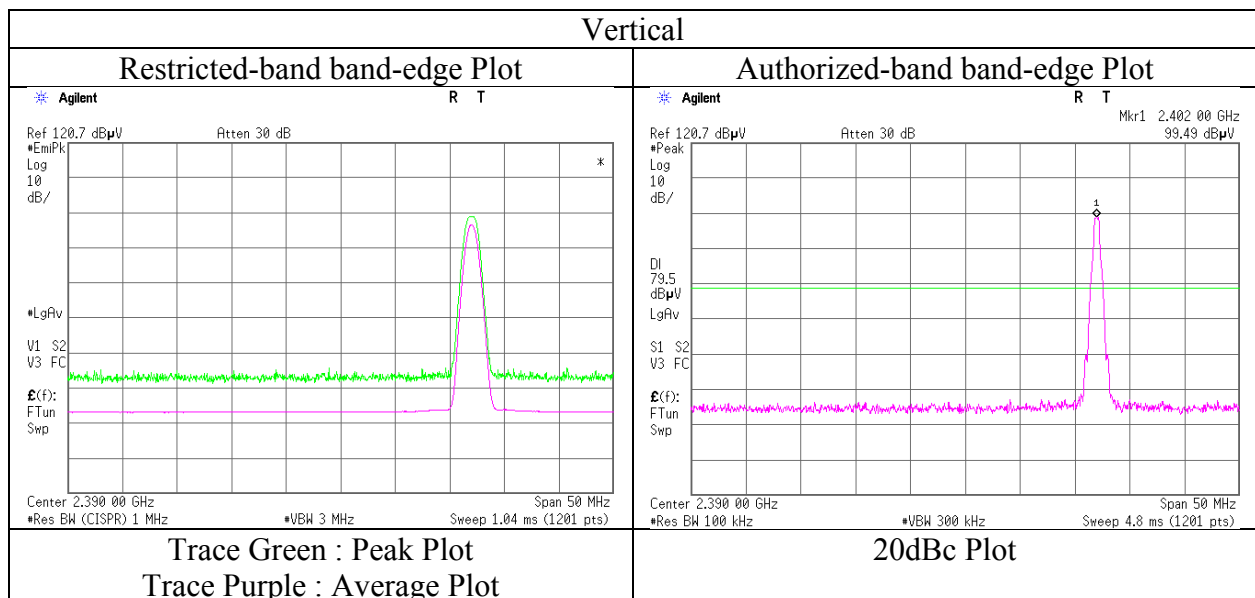
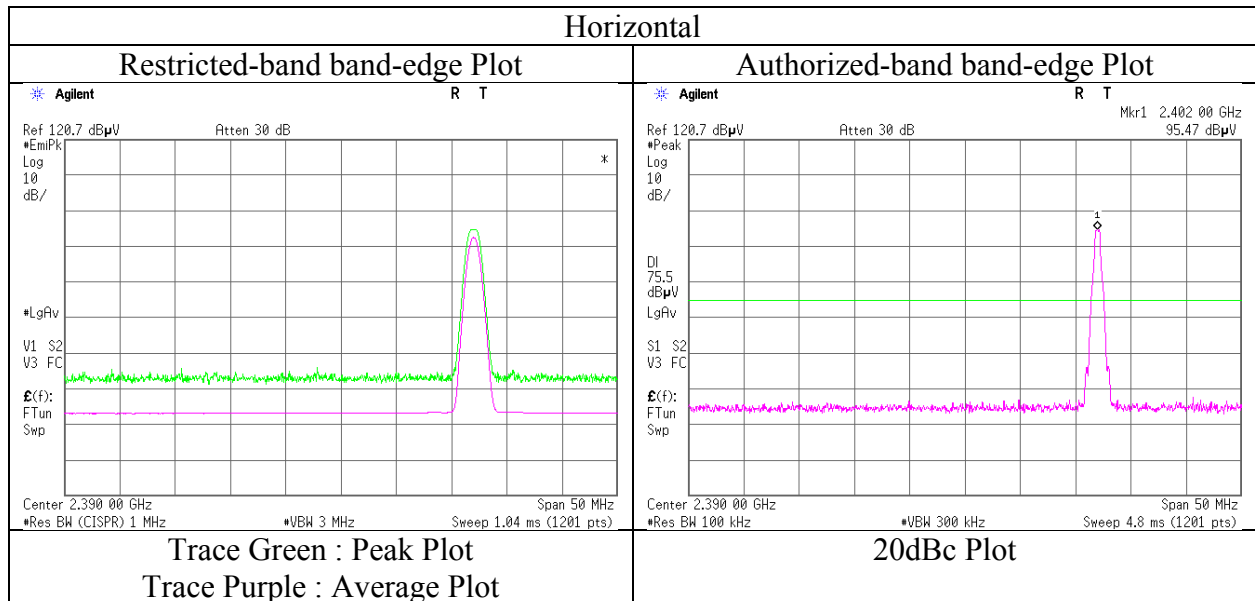
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11160421H
Date	March 11, 2016
Temperature / Humidity	24 deg. C / 34 % RH
Engineer	Satofumi Matsuyama (1-10GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

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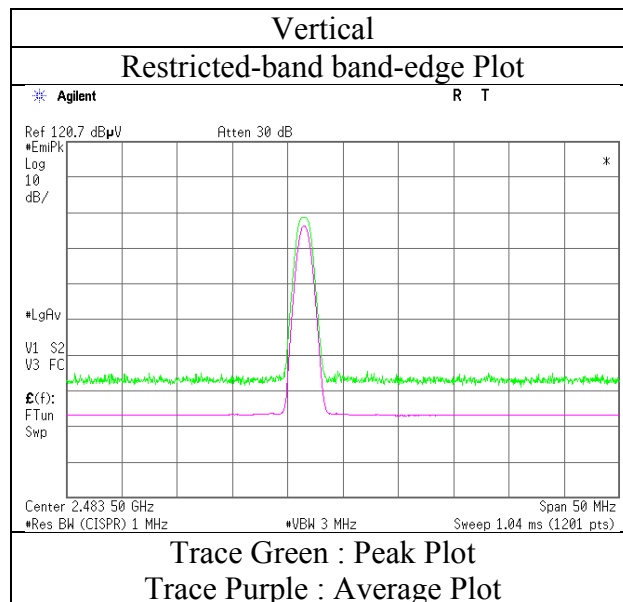
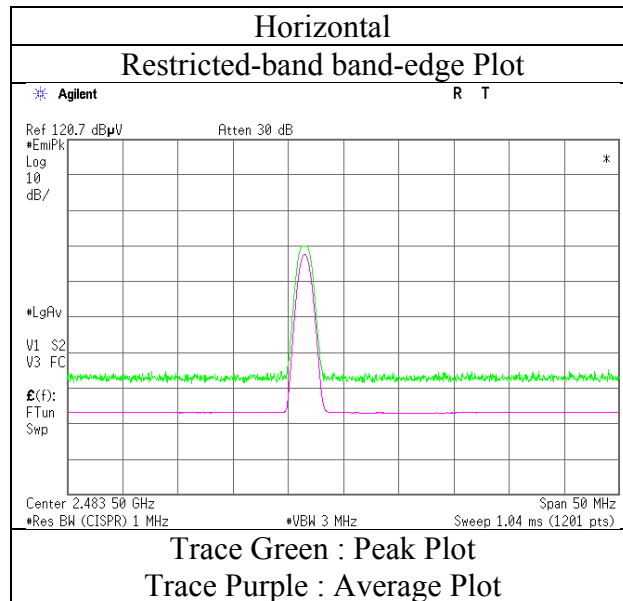
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Radiated Spurious Emission **(Reference Plot for band-edge)**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11160421H
Date : March 11, 2016
Temperature / Humidity : 24 deg. C / 34 % RH
Engineer : Satofumi Matsuyama
(1-10GHz)
Mode : Tx, Hopping Off, DH5 2480 MHz



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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber		
Report No.	11160421H		
Date	March 11, 2016	March 12, 2016	March 14, 2016
Temperature / Humidity	24 deg. C / 34 % RH	20 deg. C / 38 % RH	23 deg. C / 34 % RH
Engineer	Satofumi Matsuyama (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Hironobu Ohnishi (Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	50.000	QP	23.3	10.7	7.4	32.1	9.3	40.0	30.7	
Hori	248.365	QP	23.8	17.9	9.5	31.8	19.4	46.0	26.6	
Hori	293.538	QP	32.3	19.5	9.8	31.8	29.8	46.0	16.2	
Hori	400.000	QP	26.0	18.4	10.6	31.9	23.1	46.0	22.9	
Hori	492.005	QP	31.0	19.4	11.2	32.0	29.6	46.0	16.4	
Hori	500.000	QP	34.0	19.5	11.2	32.0	32.7	46.0	13.3	
Hori	880.581	QP	28.2	24.0	13.2	31.2	34.2	46.0	11.8	
Hori	2390.000	PK	45.6	27.9	6.4	37.1	42.8	73.9	31.1	
Hori	4804.000	PK	42.4	32.8	8.8	37.1	46.9	73.9	27.0	Floor Noise
Hori	7206.000	PK	43.3	36.8	10.0	37.8	52.3	73.9	21.6	
Hori	9608.000	PK	44.4	38.1	10.7	39.1	54.1	73.9	19.8	Floor Noise
Hori	2390.000	AV	32.2	27.9	6.4	37.1	29.4	53.9	24.5	
Hori	4804.000	AV	30.2	32.8	8.8	37.1	34.7	53.9	19.2	Floor Noise
Hori	7206.000	AV	32.4	36.8	10.0	37.8	41.4	53.9	12.5	
Hori	9608.000	AV	31.6	38.1	10.7	39.1	41.3	53.9	12.6	Floor Noise
Vert	50.000	QP	25.6	10.7	7.4	32.1	11.6	40.0	28.4	
Vert	248.365	QP	27.1	17.9	9.5	31.8	22.7	46.0	23.3	
Vert	293.538	QP	32.2	19.5	9.8	31.8	29.7	46.0	16.3	
Vert	400.000	QP	27.3	18.4	10.6	31.9	24.4	46.0	21.6	
Vert	492.005	QP	26.1	19.4	11.2	32.0	24.7	46.0	21.3	
Vert	500.000	QP	27.5	19.5	11.2	32.0	26.2	46.0	19.8	
Vert	880.581	QP	26.7	24.0	13.2	31.2	32.7	46.0	13.3	
Vert	2390.000	PK	48.8	27.9	6.4	37.1	46.0	73.9	27.9	
Vert	4804.000	PK	42.8	32.8	8.8	37.1	47.3	73.9	26.6	Floor Noise
Vert	7206.000	PK	46.6	36.8	10.0	37.8	55.6	73.9	18.3	
Vert	9608.000	PK	44.2	38.1	10.7	39.1	53.9	73.9	20.0	Floor Noise
Vert	2390.000	AV	31.9	27.9	6.4	37.1	29.1	53.9	24.8	
Vert	4804.000	AV	30.2	32.8	8.8	37.1	34.7	53.9	19.2	Floor Noise
Vert	7206.000	AV	36.4	36.8	10.0	37.8	45.4	53.9	8.5	
Vert	9608.000	AV	31.6	38.1	10.7	39.1	41.3	53.9	12.6	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.3 m / 3.0 m) = 3.1 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	96.1	28.0	6.4	37.0	93.5	-	-	Carrier
Hori	2400.000	PK	40.8	28.0	6.4	37.0	38.2	73.5	35.3	
Vert	2402.000	PK	99.9	28.0	6.4	37.0	97.3	-	-	Carrier
Vert	2400.000	PK	45.1	28.0	6.4	37.0	42.5	77.3	34.8	

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

UL Japan, Inc.

Ise EMC Lab.

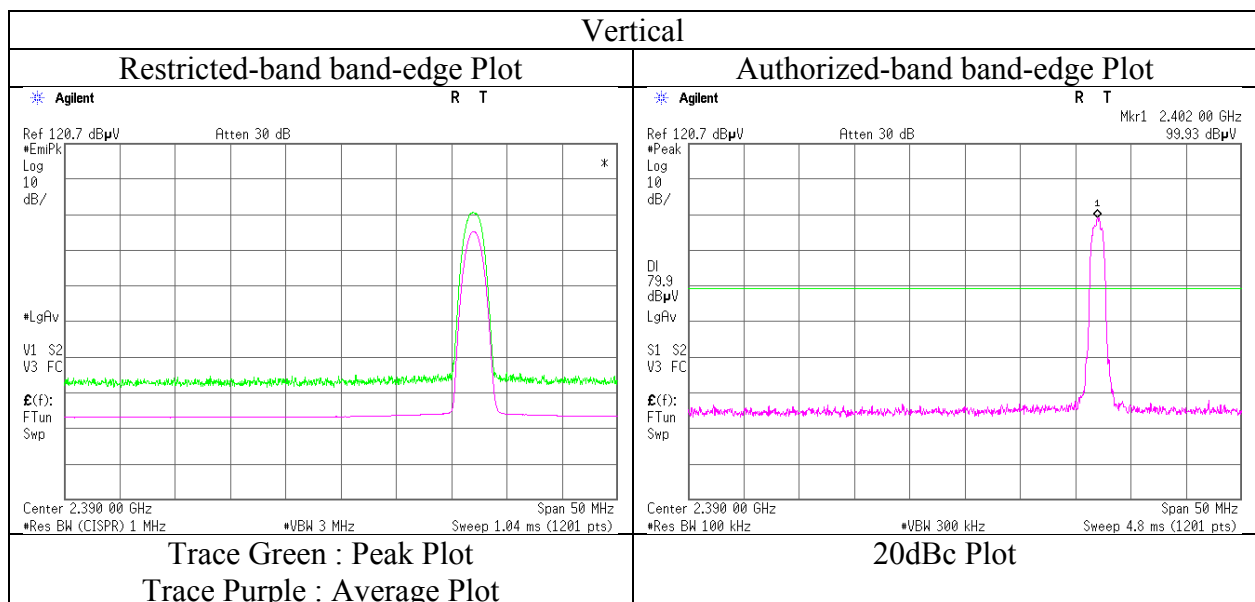
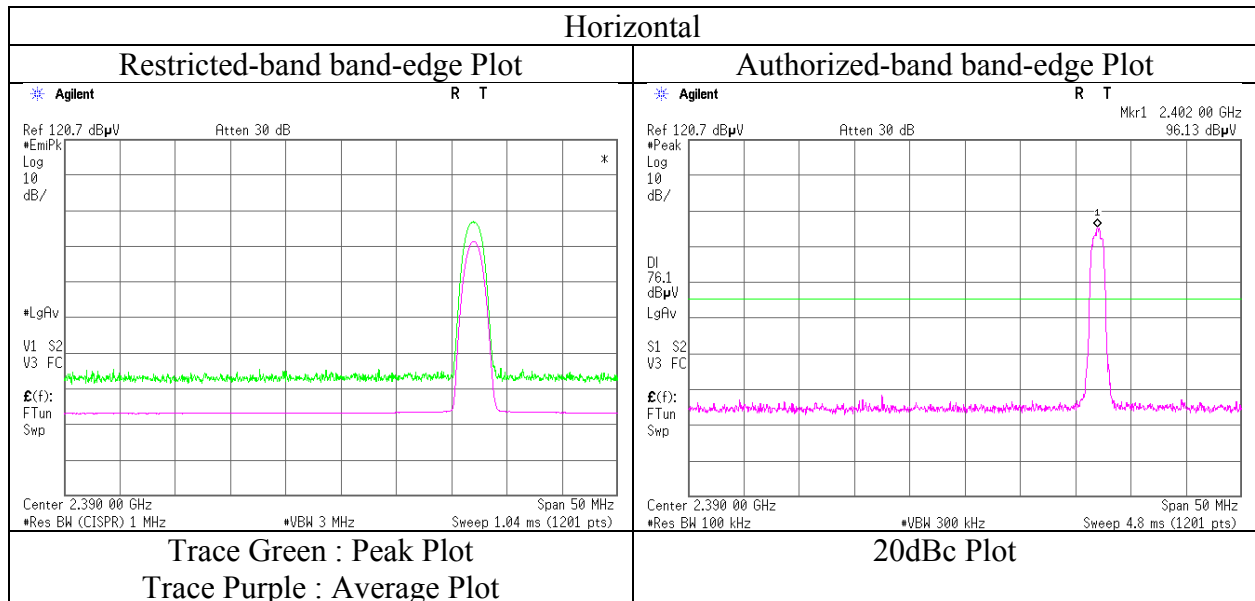
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Telephone : +81 596 24 8999

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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11160421H
Date	March 11, 2016
Temperature / Humidity	24 deg. C / 34 % RH
Engineer	Satofumi Matsuyama (1-10GHz)
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

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 11160421H
Date : March 11, 2016 March 12, 2016 March 14, 2016
Temperature / Humidity : 24 deg. C / 34 % RH 20 deg. C / 38 % RH 23 deg. C / 34 % RH
Engineer : Satofumi Matsuyama Tomohisa Nakagawa Hironobu Ohnishi
(1-10GHz) (10-26.5GHz) (Below 1 GHz)
Mode : Tx, Hopping Off, 3DH5 2441 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	50.000	QP	23.3	10.7	7.4	32.1	9.3	40.0	30.7	
Hori	248.365	QP	23.8	17.9	9.5	31.8	19.4	46.0	26.6	
Hori	293.539	QP	32.1	19.5	9.8	31.8	29.6	46.0	16.4	
Hori	400.000	QP	26.7	18.4	10.6	31.9	23.8	46.0	22.2	
Hori	492.006	QP	31.1	19.4	11.2	32.0	29.7	46.0	16.3	
Hori	500.000	QP	34.7	19.5	11.2	32.0	33.4	46.0	12.6	
Hori	880.581	QP	28.2	24.0	13.2	31.2	34.2	46.0	11.8	
Hori	4882.000	PK	42.0	33.1	8.9	37.2	46.8	73.9	27.1	Floor Noise
Hori	7323.000	PK	43.1	36.8	10.0	37.9	52.0	73.9	21.9	
Hori	9764.000	PK	43.9	38.2	10.8	39.2	53.7	73.9	20.2	Floor Noise
Hori	4882.000	AV	29.9	33.1	8.9	37.2	34.7	53.9	19.2	Floor Noise
Hori	7323.000	AV	32.0	36.8	10.0	37.9	40.9	53.9	13.0	
Hori	9764.000	AV	31.3	38.2	10.8	39.2	41.1	53.9	12.8	Floor Noise
Vert	50.000	QP	25.7	10.7	7.4	32.1	11.7	40.0	28.3	
Vert	248.365	QP	27.0	17.9	9.5	31.8	22.6	46.0	23.4	
Vert	293.539	QP	32.2	19.5	9.8	31.8	29.7	46.0	16.3	
Vert	400.000	QP	27.9	18.4	10.6	31.9	25.0	46.0	21.0	
Vert	492.006	QP	26.3	19.4	11.2	32.0	24.9	46.0	21.1	
Vert	500.000	QP	27.2	19.5	11.2	32.0	25.9	46.0	20.1	
Vert	880.581	QP	26.8	24.0	13.2	31.2	32.8	46.0	13.2	
Vert	4882.000	PK	42.7	33.1	8.9	37.2	47.5	73.9	26.4	Floor Noise
Vert	7323.000	PK	45.5	36.8	10.0	37.9	54.4	73.9	19.5	
Vert	9764.000	PK	44.2	38.2	10.8	39.2	54.0	73.9	19.9	Floor Noise
Vert	4882.000	AV	29.9	33.1	8.9	37.2	34.7	53.9	19.2	Floor Noise
Vert	7323.000	AV	35.0	36.8	10.0	37.9	43.9	53.9	10.0	
Vert	9764.000	AV	31.3	38.2	10.8	39.2	41.1	53.9	12.8	Floor Noise

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

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

Distance factor: 1 GHz - 10 GHz 20log (4.3 m / 3.0 m) = 3.1 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.4 Semi Anechoic Chamber		
Report No.	11160421H		
Date	March 11, 2016	March 12, 2016	March 14, 2016
Temperature / Humidity	24 deg. C / 34 % RH	20 deg. C / 38 % RH	23 deg. C / 34 % RH
Engineer	Satofumi Matsuyama (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Hironobu Ohnishi (Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	50.000	QP	23.2	10.7	7.4	32.1	9.2	40.0	30.8	
Hori	248.367	QP	24.4	17.9	9.5	31.8	20.0	46.0	26.0	
Hori	293.539	QP	32.2	19.5	9.8	31.8	29.7	46.0	16.3	
Hori	400.000	QP	26.6	18.4	10.6	31.9	23.7	46.0	22.3	
Hori	492.006	QP	31.5	19.4	11.2	32.0	30.1	46.0	15.9	
Hori	500.000	QP	34.2	19.5	11.2	32.0	32.9	46.0	13.1	
Hori	880.582	QP	28.1	24.0	13.2	31.2	34.1	46.0	11.9	
Hori	2483.500	PK	46.0	28.1	6.5	37.0	43.6	73.9	30.3	
Hori	4960.000	PK	42.9	33.4	8.9	37.2	48.0	73.9	25.9	Floor Noise
Hori	7440.000	PK	45.1	36.8	10.0	38.0	53.9	73.9	20.0	
Hori	9920.000	PK	44.6	38.3	10.8	39.3	54.4	73.9	19.5	Floor Noise
Hori	2483.500	AV	31.9	28.1	6.5	37.0	29.5	53.9	24.4	
Hori	4960.000	AV	30.5	33.4	8.9	37.2	35.6	53.9	18.3	Floor Noise
Hori	7440.000	AV	33.9	36.8	10.0	38.0	42.7	53.9	11.2	
Hori	9920.000	AV	32.4	38.3	10.8	39.3	42.2	53.9	11.7	Floor Noise
Vert	50.000	QP	25.8	10.7	7.4	32.1	11.8	40.0	28.2	
Vert	248.367	QP	27.2	17.9	9.5	31.8	22.8	46.0	23.2	
Vert	293.539	QP	32.2	19.5	9.8	31.8	29.7	46.0	16.3	
Vert	400.000	QP	28.0	18.4	10.6	31.9	25.1	46.0	20.9	
Vert	492.006	QP	26.5	19.4	11.2	32.0	25.1	46.0	20.9	
Vert	500.000	QP	27.7	19.5	11.2	32.0	26.4	46.0	19.6	
Vert	880.582	QP	26.7	24.0	13.2	31.2	32.7	46.0	13.3	
Vert	2483.500	PK	52.1	28.1	6.5	37.0	49.7	73.9	24.2	
Vert	4960.000	PK	42.8	33.4	8.9	37.2	47.9	73.9	26.0	Floor Noise
Vert	7440.000	PK	46.4	36.8	10.0	38.0	55.2	73.9	18.7	
Vert	9920.000	PK	44.5	38.3	10.8	39.3	54.3	73.9	19.6	Floor Noise
Vert	2483.500	AV	37.0	28.1	6.5	37.0	34.6	53.9	19.3	
Vert	4960.000	AV	30.5	33.4	8.9	37.2	35.6	53.9	18.3	Floor Noise
Vert	7440.000	AV	36.5	36.8	10.0	38.0	45.3	53.9	8.6	
Vert	9920.000	AV	32.4	38.3	10.8	39.3	42.2	53.9	11.7	Floor Noise

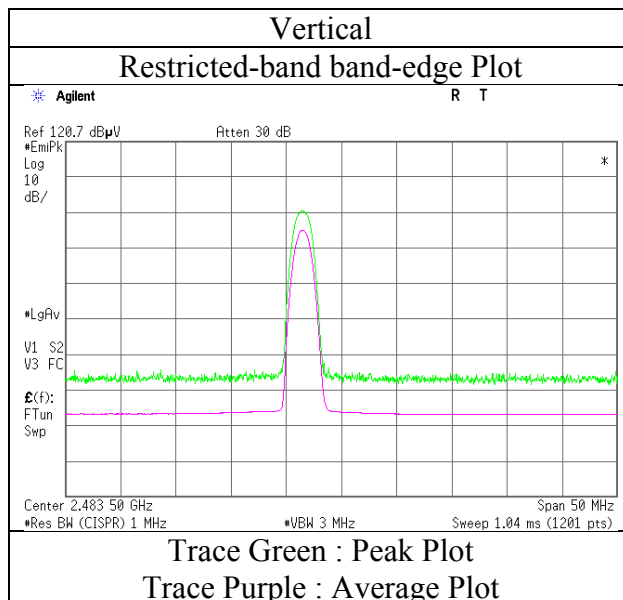
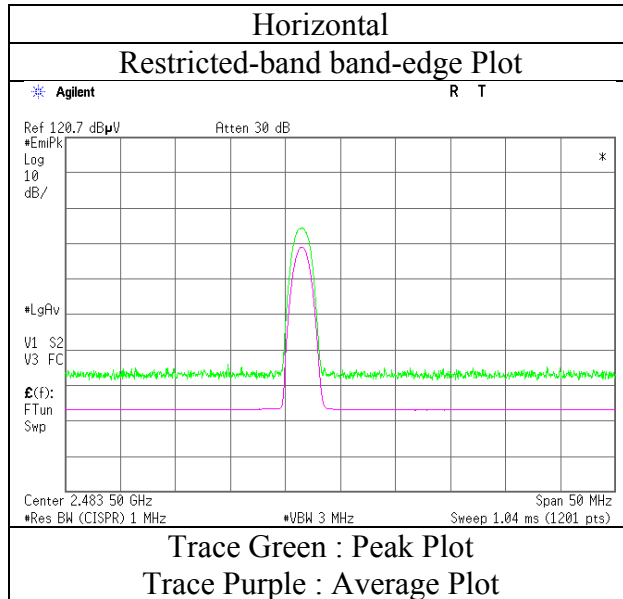
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

*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 (4.3 m / 3.0 m) = 3.1 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission (Reference Plot for band-edge)

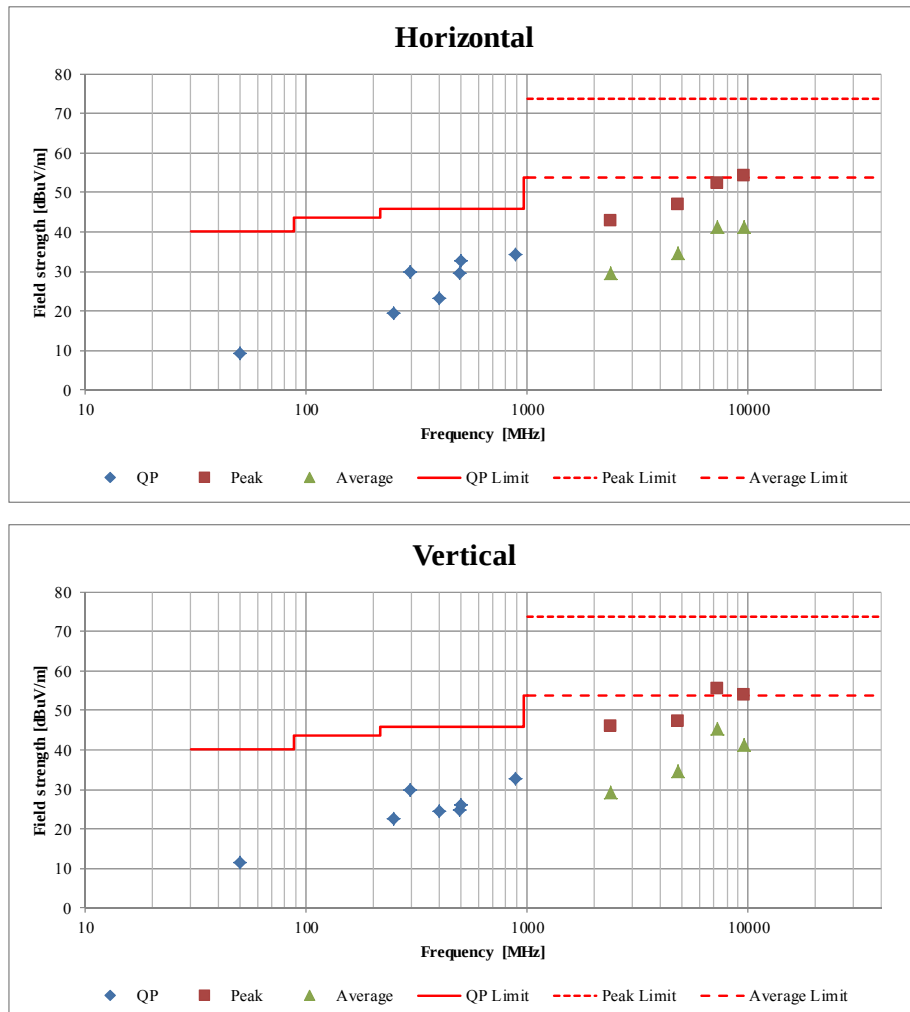
Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11160421H
Date	March 11, 2016
Temperature / Humidity	24 deg. C / 34 % RH
Engineer	Satofumi Matsuyama (1-10GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

Radiated Spurious Emission **(Plot data, Worst case)**

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber		
Report No.	11160421H		
Date	March 11, 2016	March 12, 2016	March 14, 2016
Temperature / Humidity	24 deg. C / 34 % RH	20 deg. C / 38 % RH	23 deg. C / 34 % RH
Engineer	Satofumi Matsuyama (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Hironobu Ohnishi (Below 1 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz		



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

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2015/11/06 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2015/06/22 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2016/02/10 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2015/09/17 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHF-17	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCA	7001	RE	2015/09/17 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2015/11/28 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2015/11/03 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 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

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