



RADIO TEST REPORT

Test Report No. : 10800614H-B-R2

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)
*Class II Permissive change
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 10800614H-B-R1. 10800614H-B-R1 is replaced with this report.

Date of test: June 4 and 5, 2015

Representative test engineer:


Satofumi Matsuyama

Engineer
Consumer Technology Division

Approved by:


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.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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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 : Hideki Konishi

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 5.0V
Receipt Date of Sample : Radiated test sample
Module: June 3, 2015 (Sample used on June 4 and 5, 2015)
Antenna: June 3, 2015 (Sample used on June 4 and 5, 2015)
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

General Specification

Clock frequency(ies) in the system : 32.768kHz, 2.25MHz, 6MHz, 22.5792MHz, 24.576MHz, 25MHz,
26MHz, 50MHz, 400MHz
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	PIFA Antenna
Antenna Gain	5.0 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	PIFA Antenna
Antenna Gain	5.0 dBi including connector and cable

*This test report applies to Bluetooth.

<Contents of the change from original model>

Test Report Number of original model is 10646854H-B-R2 (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 Conducted emission test and 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: 2015, final revised on January 21, 2015

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	8.6 dB 474.826 MHz / 474.812 MHz, Horizontal, QP	Complied	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

* In case any questions arise about test procedure, ANSI C63.4: 2009 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

Other than above, no addition, exclusion nor deviation has been made from the standard.

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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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Test site (semi anechoic chamber)	Radiated emission Uncertainty (+/-)						
	Measurement distance: 3 m				1 m		0.5 m
	9 kHz - 30 MHz	30 MHz - 300 MHz	300 MHz - 1 GHz	1 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
No. 1	4.3 dB	5.5 dB	6.3 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No. 2	4.2 dB	5.4 dB	6.3 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No. 3	4.4 dB	5.4 dB	6.4 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No. 4	4.7 dB	5.6 dB	6.4 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

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.

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

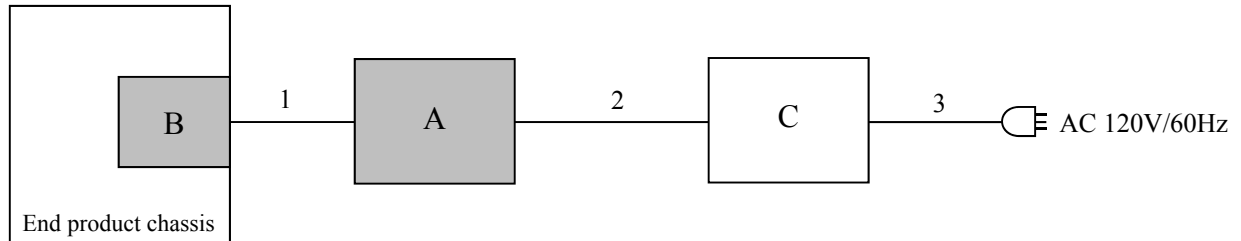
4.1 Operating Mode(s)

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

Details of Operating Mode(s)

Test Item	Mode	Tested frequency
Radiated Spurious Emission	Tx (Hopping off) DH5, 3DH5	2402MHz 2441MHz 2480MHz
<p>*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)</p> <p>*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.</p> <p>*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.</p>		

4.2 Configuration and peripherals



- * Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
- * The end product chassis was used for this test in order to ensure the capability of PIFA antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Network Module	NW-01	3	Yamaha Corporation	EUT
B	Antenna	81EAAY15 G09	-	Wistron NeWeb Corp.	EUT
C	DC Power Supply	PMC35-2A	13090501	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.2	Shielded	Shielded	-
2	DC Cable	2.7	Unshielded	Unshielded	-
3	AC Cable	0.8	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

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.

The height of the measuring antenna varied between 1 m 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	3 m (below 10 GHz), 1 m*2) (above 10 GHz)		3 m (below 10 GHz), 1 m*2) (above 10 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: $20 \times \log(3.0 \text{ m} / 1.0 \text{ m}) = 9.5 \text{ dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT 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 M - 26.5 GHz
Test data : APPENDIX
Test result : Pass

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APPENDIX 1: Test data

Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10800614H
Date June 4, 2015 June 4, 2015 June 5, 2015
Temperature / Humidity 21 deg. C / 47 % RH 23 deg. C / 51 % RH 23 deg. C / 54 % RH
Engineer Ken Fujita Satofumi Matsuyama Ken Fujita
(1-10GHz) (Above 10GHz) (Below 1GHz)
Mode Tx 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	67.723	QP	31.1	6.7	7.6	32.1	13.3	40.0	26.7	
Hori	85.593	QP	29.2	7.3	7.9	32.1	12.3	40.0	27.7	
Hori	150.149	QP	32.3	14.9	8.6	32.2	23.6	43.5	19.9	
Hori	424.713	QP	37.7	17.7	10.8	32.1	34.1	46.0	11.9	
Hori	474.826	QP	40.4	18.0	11.1	32.1	37.4	46.0	8.6	
Hori	925.748	QP	31.5	22.7	13.3	30.9	36.6	46.0	9.4	
Hori	2390.000	PK	43.4	26.9	3.4	32.0	41.7	73.9	32.2	
Hori	4804.000	PK	40.7	31.8	5.5	31.3	46.7	73.9	27.2	Floor Noise
Hori	7206.000	PK	41.6	36.0	6.8	32.0	52.4	73.9	21.5	Floor Noise
Hori	9608.000	PK	42.1	38.2	7.3	32.4	55.2	73.9	18.7	Floor Noise
Hori	2390.000	AV	30.2	26.9	3.4	32.0	28.5	53.9	25.4	
Hori	4804.000	AV	27.2	31.8	5.5	31.3	33.2	53.9	20.7	Floor Noise
Hori	7206.000	AV	29.3	36.0	6.8	32.0	40.1	53.9	13.8	Floor Noise
Hori	9608.000	AV	28.8	38.2	7.3	32.4	41.9	53.9	12.0	Floor Noise
Vert	67.722	QP	33.2	6.7	7.6	32.1	15.4	40.0	24.6	
Vert	85.361	QP	32.4	7.3	7.9	32.1	15.5	40.0	24.5	
Vert	150.332	QP	29.5	14.9	8.6	32.2	20.8	43.5	22.7	
Vert	424.422	QP	31.9	17.7	10.8	32.1	28.3	46.0	17.7	
Vert	474.899	QP	35.8	18.0	11.1	32.1	32.8	46.0	13.2	
Vert	925.751	QP	29.3	22.7	13.3	30.9	34.4	46.0	11.6	
Vert	2390.000	PK	42.3	26.9	3.4	32.0	40.6	73.9	33.3	
Vert	4804.000	PK	39.8	31.8	4.6	31.3	44.9	73.9	29.0	Floor Noise
Vert	7206.000	PK	41.7	36.0	5.8	32.0	51.5	73.9	22.4	Floor Noise
Vert	9608.000	PK	41.7	38.2	6.7	32.4	54.2	73.9	19.7	Floor Noise
Vert	2390.000	AV	29.6	26.9	3.4	32.0	27.9	53.9	26.0	
Vert	4804.000	AV	27.2	31.8	5.5	31.3	33.2	53.9	20.7	Floor Noise
Vert	7206.000	AV	29.3	36.0	6.8	32.0	40.1	53.9	13.8	Floor Noise
Vert	9608.000	AV	28.8	38.2	7.3	32.4	41.9	53.9	12.0	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

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

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	99.6	26.9	3.4	32.0	97.9	-	-	Carrier
Hori	2400.000	PK	41.7	26.9	3.4	32.0	40.0	77.9	37.9	
Vert	2402.000	PK	94.8	26.9	3.4	32.0	93.1	-	-	Carrier
Vert	2400.000	PK	37.7	26.9	3.4	32.0	36.0	73.1	37.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10800614H
Date : June 4, 2015 June 4, 2015 June 5, 2015
Temperature / Humidity : 21 deg. C / 47 % RH 23 deg. C / 51 % RH 23 deg. C / 54 % RH
Engineer : Ken Fujita Satofumi Matsuyama Ken Fujita
 (1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx DH5 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	67.723	QP	32.7	6.7	7.6	32.1	14.9	40.0	25.1	
Hori	113.212	QP	29.8	12.0	8.2	32.2	17.8	43.5	25.7	
Hori	150.114	QP	31.2	14.9	8.6	32.2	22.5	43.5	21.0	
Hori	424.712	QP	37.4	17.7	10.8	32.1	33.8	46.0	12.2	
Hori	474.821	QP	40.3	18.0	11.1	32.1	37.3	46.0	8.7	
Hori	925.744	QP	31.4	22.7	13.3	30.9	36.5	46.0	9.5	
Hori	4882.000	PK	41.3	31.9	5.5	31.3	47.4	73.9	26.5	Floor Noise
Hori	7323.000	PK	44.7	36.0	6.8	32.0	55.5	73.9	18.4	
Hori	9764.000	PK	40.9	38.2	7.3	32.5	53.9	73.9	20.0	Floor Noise
Hori	4882.000	AV	27.6	31.9	5.5	31.3	33.7	53.9	20.2	Floor Noise
Hori	7323.000	AV	33.9	36.0	6.8	32.0	44.7	53.9	9.2	
Hori	9764.000	AV	28.4	38.2	7.3	32.5	41.4	53.9	12.5	Floor Noise
Vert	67.722	QP	33.1	6.7	7.6	32.1	15.3	40.0	24.7	
Vert	113.121	QP	32.8	12.0	8.2	32.2	20.8	43.5	22.7	
Vert	150.404	QP	28.3	14.9	8.6	32.2	19.6	43.5	23.9	
Vert	424.444	QP	31.7	17.7	10.8	32.1	28.1	46.0	17.9	
Vert	474.931	QP	35.9	18.0	11.1	32.1	32.9	46.0	13.1	
Vert	925.751	QP	29.2	22.7	13.3	30.9	34.3	46.0	11.7	
Vert	4882.000	PK	40.6	31.9	4.6	31.3	45.8	73.9	28.1	Floor Noise
Vert	7323.000	PK	44.6	36.0	5.9	32.0	54.5	73.9	19.4	
Vert	9764.000	PK	41.1	38.2	6.7	32.5	53.5	73.9	20.4	Floor Noise
Vert	4882.000	AV	27.6	31.9	5.5	31.3	33.7	53.9	20.2	Floor Noise
Vert	7323.000	AV	31.9	36.0	5.9	32.0	41.8	53.9	12.1	
Vert	9764.000	AV	28.4	38.2	7.3	32.5	41.4	53.9	12.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

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

Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10800614H
Date June 4, 2015 June 4, 2015 June 5, 2015
Temperature / Humidity 21 deg. C / 47 % RH 23 deg. C / 51 % RH 23 deg. C / 54 % RH
Engineer Ken Fujita Satofumi Matsuyama Ken Fujita
(1-10GHz) (Above 10GHz) (Below 1GHz)
Mode Tx DH5 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	67.562	QP	31.5	6.7	7.6	32.1	13.7	40.0	26.3	
Hori	112.122	QP	29.9	11.9	8.2	32.2	17.8	43.5	25.7	
Hori	150.335	QP	30.8	14.9	8.6	32.2	22.1	43.5	21.4	
Hori	424.699	QP	37.2	17.7	10.8	32.1	33.6	46.0	12.4	
Hori	474.812	QP	40.4	18.0	11.1	32.1	37.4	46.0	8.6	
Hori	925.733	QP	31.1	22.7	13.3	30.9	36.2	46.0	9.8	
Hori	2483.500	PK	46.7	26.9	3.4	32.0	45.0	73.9	28.9	
Hori	4960.000	PK	41.8	32.1	5.4	31.2	48.1	73.9	25.8	Floor Noise
Hori	7440.000	PK	42.6	36.0	6.8	32.1	53.3	73.9	20.6	Floor Noise
Hori	9920.000	PK	41.5	38.2	7.4	32.5	54.6	73.9	19.3	Floor Noise
Hori	2483.500	AV	33.4	26.9	3.4	32.0	31.7	53.9	22.2	
Hori	4960.000	AV	27.7	32.1	5.4	31.2	34.0	53.9	19.9	Floor Noise
Hori	7440.000	AV	29.3	36.0	6.8	32.1	40.0	53.9	13.9	Floor Noise
Hori	9920.000	AV	28.7	38.2	7.4	32.5	41.8	53.9	12.1	Floor Noise
Vert	67.412	QP	32.2	6.7	7.6	32.1	14.4	40.0	25.6	
Vert	112.146	QP	32.9	11.9	8.2	32.2	20.8	43.5	22.7	
Vert	150.150	QP	27.9	14.9	8.6	32.2	19.2	43.5	24.3	
Vert	424.439	QP	31.6	17.7	10.8	32.1	28.0	46.0	18.0	
Vert	474.923	QP	35.7	18.0	11.1	32.1	32.7	46.0	13.3	
Vert	925.749	QP	28.8	22.7	13.3	30.9	33.9	46.0	12.1	
Vert	2483.500	PK	43.6	26.9	3.4	32.0	41.9	73.9	32.0	
Vert	4960.000	PK	41.4	32.1	4.6	31.2	46.9	73.9	27.0	Floor Noise
Vert	7440.000	PK	42.9	36.0	5.9	32.1	52.7	73.9	21.2	Floor Noise
Vert	9920.000	PK	41.8	38.2	6.8	32.5	54.3	73.9	19.6	Floor Noise
Vert	2483.500	AV	30.4	26.9	3.4	32.0	28.7	53.9	25.2	
Vert	4960.000	AV	27.7	32.1	5.4	31.2	34.0	53.9	19.9	Floor Noise
Vert	7440.000	AV	29.3	36.0	6.8	32.1	40.0	53.9	13.9	Floor Noise
Vert	9920.000	AV	28.7	38.2	7.4	32.5	41.8	53.9	12.1	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10800614H
Date : June 4, 2015 June 4, 2015 June 5, 2015
Temperature / Humidity : 21 deg. C / 47 % RH 23 deg. C / 51 % RH 23 deg. C / 54 % RH
Engineer : Ken Fujita Satofumi Matsuyama Ken Fujita
 (1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx 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	67.899	QP	32.5	6.6	7.6	32.1	14.6	40.0	25.4	
Hori	112.335	QP	30.1	11.9	8.2	32.2	18.0	43.5	25.5	
Hori	150.147	QP	31.1	14.9	8.6	32.2	22.4	43.5	21.1	
Hori	424.776	QP	36.9	17.7	10.8	32.1	33.3	46.0	12.7	
Hori	474.867	QP	40.2	18.0	11.1	32.1	37.2	46.0	8.8	
Hori	925.749	QP	29.6	22.7	13.3	30.9	34.7	46.0	11.3	
Hori	2390.000	PK	49.2	26.9	3.4	32.0	47.5	73.9	26.4	
Hori	4804.000	PK	41.1	31.8	5.5	31.3	47.1	73.9	26.8	Floor Noise
Hori	7206.000	PK	42.6	36.0	6.8	32.0	53.4	73.9	20.5	Floor Noise
Hori	9608.000	PK	42.1	38.2	7.3	32.4	55.2	73.9	18.7	Floor Noise
Hori	2390.000	AV	32.6	26.9	3.4	32.0	30.9	53.9	23.0	
Hori	4804.000	AV	27.4	31.8	5.5	31.3	33.4	53.9	20.5	Floor Noise
Hori	7206.000	AV	29.7	36.0	6.8	32.0	40.5	53.9	13.4	Floor Noise
Hori	9608.000	AV	29.0	38.2	7.3	32.4	42.1	53.9	11.8	Floor Noise
Vert	67.899	QP	32.2	6.6	7.6	32.1	14.3	40.0	25.7	
Vert	112.341	QP	32.5	11.9	8.2	32.2	20.4	43.5	23.1	
Vert	150.145	QP	27.7	14.9	8.6	32.2	19.0	43.5	24.5	
Vert	424.443	QP	32.5	17.7	10.8	32.1	28.9	46.0	17.1	
Vert	474.997	QP	36.7	18.0	11.1	32.1	33.7	46.0	12.3	
Vert	925.450	QP	28.0	22.7	13.3	30.9	33.1	46.0	12.9	
Vert	2390.000	PK	45.3	26.9	3.4	32.0	43.6	73.9	30.3	
Vert	4804.000	PK	39.9	31.8	4.6	31.3	45.0	73.9	28.9	Floor Noise
Vert	7206.000	PK	41.9	36.0	5.8	32.0	51.7	73.9	22.2	Floor Noise
Vert	9608.000	PK	41.7	38.2	6.7	32.4	54.2	73.9	19.7	Floor Noise
Vert	2390.000	AV	29.2	26.9	3.4	32.0	27.5	53.9	26.4	
Vert	4804.000	AV	27.4	31.8	5.5	31.3	33.4	53.9	20.5	Floor Noise
Vert	7206.000	AV	29.7	36.0	6.8	32.0	40.5	53.9	13.4	Floor Noise
Vert	9608.000	AV	29.0	38.2	7.3	32.4	42.1	53.9	11.8	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

Distance factor: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 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	100.3	26.9	3.4	32.0	98.6	-	-	Carrier
Hori	2400.000	PK	44.7	26.9	3.4	32.0	43.0	78.6	35.6	
Vert	2402.000	PK	95.4	26.9	3.4	32.0	93.7	-	-	Carrier
Vert	2400.000	PK	45.9	26.9	3.4	32.0	44.2	73.7	29.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

Radiated Spurious Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10800614H
Date : June 4, 2015 June 4, 2015 June 5, 2015
Temperature / Humidity : 21 deg. C / 47 % RH 23 deg. C / 51 % RH 23 deg. C / 54 % RH
Engineer : Ken Fujita Satofumi Matsuyama Ken Fujita
 (1-10GHz) (Above 10GHz) (Below 1GHz)
Mode : Tx 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	67.539	QP	32.3	6.7	7.6	32.1	14.5	40.0	25.5	
Hori	112.695	QP	29.7	11.9	8.2	32.2	17.6	43.5	25.9	
Hori	150.150	QP	31.0	14.9	8.6	32.2	22.3	43.5	21.2	
Hori	424.773	QP	37.0	17.7	10.8	32.1	33.4	46.0	12.6	
Hori	474.859	QP	40.3	18.0	11.1	32.1	37.3	46.0	8.7	
Hori	925.751	QP	30.0	22.7	13.3	30.9	35.1	46.0	10.9	
Hori	4882.000	PK	41.1	31.9	5.5	31.3	47.2	73.9	26.7	Floor Noise
Hori	7323.000	PK	42.0	36.0	6.8	32.0	52.8	73.9	21.1	Floor Noise
Hori	9764.000	PK	42.7	38.2	7.3	32.5	55.7	73.9	18.2	Floor Noise
Hori	4882.000	AV	27.6	31.9	5.5	31.3	33.7	53.9	20.2	Floor Noise
Hori	7323.000	AV	29.2	36.0	6.8	32.0	40.0	53.9	13.9	Floor Noise
Hori	9764.000	AV	28.3	38.2	7.3	32.5	41.3	53.9	12.6	Floor Noise
Vert	67.538	QP	32.0	6.7	7.6	32.1	14.2	40.0	25.8	
Vert	112.569	QP	32.7	11.9	8.2	32.2	20.6	43.5	22.9	
Vert	150.150	QP	28.2	14.9	8.6	32.2	19.5	43.5	24.0	
Vert	424.447	QP	33.0	17.7	10.8	32.1	29.4	46.0	16.6	
Vert	474.958	QP	36.1	18.0	11.1	32.1	33.1	46.0	12.9	
Vert	925.765	QP	28.2	22.7	13.3	30.9	33.3	46.0	12.7	
Vert	4882.000	PK	40.6	31.9	4.6	31.3	45.8	73.9	28.1	Floor Noise
Vert	7323.000	PK	42.6	36.0	5.9	32.0	52.5	73.9	21.4	Floor Noise
Vert	9764.000	PK	41.2	38.2	6.7	32.5	53.6	73.9	20.3	Floor Noise
Vert	4882.000	AV	27.6	31.9	5.5	31.3	33.7	53.9	20.2	Floor Noise
Vert	7323.000	AV	29.2	36.0	6.8	32.0	40.0	53.9	13.9	Floor Noise
Vert	9764.000	AV	28.3	38.2	7.3	32.5	41.3	53.9	12.6	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

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

Radiated Spurious Emission

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10800614H
Date June 4, 2015 June 4, 2015 June 5, 2015
Temperature / Humidity 21 deg. C / 47 % RH 23 deg. C / 51 % RH 23 deg. C / 54 % RH
Engineer Ken Fujita Satofumi Matsuyama Ken Fujita
(1-10GHz) (Above 10GHz) (Below 1GHz)
Mode Tx 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	68.093	QP	32.1	6.6	7.6	32.1	14.2	40.0	25.8	
Hori	113.254	QP	29.1	12.0	8.2	32.2	17.1	43.5	26.4	
Hori	150.012	QP	31.5	14.9	8.6	32.2	22.8	43.5	20.7	
Hori	424.732	QP	36.7	17.7	10.8	32.1	33.1	46.0	12.9	
Hori	474.843	QP	40.2	18.0	11.1	32.1	37.2	46.0	8.8	
Hori	925.744	QP	31.0	22.7	13.3	30.9	36.1	46.0	9.9	
Hori	2483.500	PK	49.8	26.9	3.4	32.0	48.1	73.9	25.8	
Hori	4960.000	PK	40.5	32.1	5.4	31.2	46.8	73.9	27.1	Floor Noise
Hori	7440.000	PK	42.1	36.0	6.8	32.1	52.8	73.9	21.1	Floor Noise
Hori	9920.000	PK	42.7	38.2	7.4	32.5	55.8	73.9	18.1	Floor Noise
Hori	2483.500	AV	34.4	26.9	3.4	32.0	32.7	53.9	21.2	
Hori	4960.000	AV	27.8	32.1	5.4	31.2	34.1	53.9	19.8	Floor Noise
Hori	7440.000	AV	29.5	36.0	6.8	32.1	40.2	53.9	13.7	Floor Noise
Hori	9920.000	AV	28.9	38.2	7.4	32.5	42.0	53.9	11.9	Floor Noise
Vert	67.991	QP	31.7	6.6	7.6	32.1	13.8	40.0	26.2	
Vert	113.212	QP	32.8	12.0	8.2	32.2	20.8	43.5	22.7	
Vert	149.993	QP	27.7	14.9	8.6	32.2	19.0	43.5	24.5	
Vert	424.443	QP	31.9	17.7	10.8	32.1	28.3	46.0	17.7	
Vert	474.943	QP	35.8	18.0	11.1	32.1	32.8	46.0	13.2	
Vert	925.758	QP	29.0	22.7	13.3	30.9	34.1	46.0	11.9	
Vert	2483.500	PK	47.3	26.9	3.4	32.0	45.6	73.9	28.3	
Vert	4960.000	PK	41.3	32.1	4.6	31.2	46.8	73.9	27.1	Floor Noise
Vert	7440.000	PK	42.5	36.0	5.9	32.1	52.3	73.9	21.6	Floor Noise
Vert	9920.000	PK	41.3	38.2	6.8	32.5	53.8	73.9	20.1	Floor Noise
Vert	2483.500	AV	31.4	26.9	3.4	32.0	29.7	53.9	24.2	
Vert	4960.000	AV	27.8	32.1	5.4	31.2	34.1	53.9	19.8	Floor Noise
Vert	7440.000	AV	29.5	36.0	6.8	32.1	40.2	53.9	13.7	Floor Noise
Vert	9920.000	AV	28.9	38.2	7.4	32.5	42.0	53.9	11.9	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 GHz)) - Gain(Amplifier)

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

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

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	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2014/10/17 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2015/03/19 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2015/05/19 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2014/09/22 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 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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