



RADIO TEST REPORT

Test Report No. : 10800614H-A-R1

Applicant : Yamaha Corporation
Type of Equipment : Network Module
Model No. : NW-01
FCC ID : A6RNW01A
Test regulation : FCC Part 15 Subpart C: 2015
*WLAN 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-A. 10800614H-A is replaced with this report.

Date of test: January 13 to June 5, 2015

Representative test engineer:

S. Matsuyama

Satofumi Matsuyama
Engineer
Consumer Technology Division

Approved by:

Takayuki Shimada

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>

UL Japan, Inc.

Ise EMC Lab.

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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	:	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	:	Conducted test sample Module: January 10, 2015 (Sample used on January 13, 2015) 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 WLAN.

<Contents of the change from original model>

Test Report Number of original model is 10646854H-A-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 Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r03 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.5 dB 2483.500 MHz, Horizontal, AV	Complied	Radiated (above 30 MHz) *1)

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

*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r03 12.2.7.

* 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 the above, 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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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 2.0m 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.

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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.

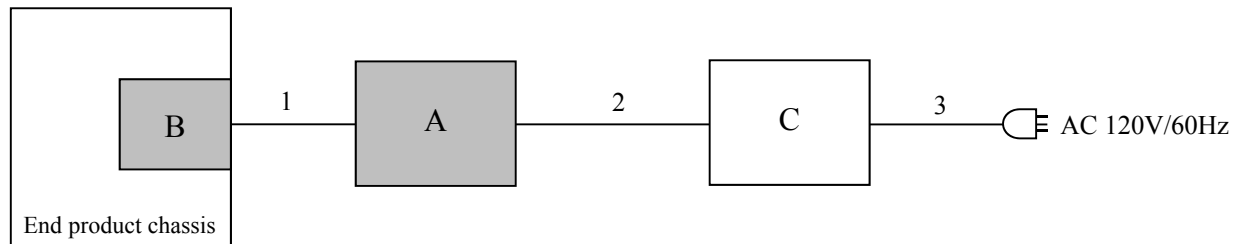
Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	54Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 6, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b: 11dBm, 11g/11n: 6dBm (1ch/11ch), 10dBm (2ch-10ch *1) Software: Ver.8.4.1 *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. *1) Band edge compliance was confirmed at pre-check.	

Test Item	Operating Mode	Tested frequency
Radiated Spurious Emission (Below 1GHz) *1)	11n-20 Tx	2437MHz
Radiated Spurious Emission (Above 1GHz)	11b Tx 11n-20 Tx *2)	2412MHz 2437MHz 2462MHz

*1) The test was performed on the representative mode/frequency that 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.

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	-

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 v03r03".

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 *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: 12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3m	3 m (below 10 GHz), 1 m *2) (above 10 GHz)		3 m (below 10 GHz), 1 m *2) (above 10 GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "558074 D01 DTS Meas Guidance v03r03"

*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
Temperature / Humidity	21 deg. C / 47 % RH
Engineer	Ken Fujita
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	53.3	26.9	3.4	32.0	-	51.6	73.9	22.3	
Hori	4824.000	PK	46.0	31.8	5.5	31.3	-	52.0	73.9	21.9	
Hori	7236.000	PK	41.9	36.0	6.8	32.0	-	52.7	73.9	21.2	Floor Noise
Hori	9648.000	PK	41.2	38.2	7.3	32.4	-	54.3	73.9	19.6	Floor Noise
Hori	2390.000	AV	44.2	26.9	3.4	32.0	0.8	43.3	53.9	10.6	*1)
Hori	4824.000	AV	36.6	31.8	5.5	31.3	0.8	43.4	53.9	10.5	
Hori	7236.000	AV	33.2	36.0	6.8	32.0	-	44.0	53.9	9.9	Floor Noise
Hori	9648.000	AV	34.2	38.2	7.3	32.4	-	47.3	53.9	6.6	Floor Noise
Vert	2390.000	PK	50.8	26.9	3.4	32.0	-	49.1	73.9	24.8	
Vert	4824.000	PK	43.9	31.8	4.6	31.3	-	49.0	73.9	24.9	
Vert	7236.000	PK	42.2	36.0	5.8	32.0	-	52.0	73.9	21.9	Floor Noise
Vert	9648.000	PK	42.0	38.2	6.7	32.4	-	54.5	73.9	19.4	Floor Noise
Vert	2390.000	AV	41.6	26.9	3.4	32.0	0.8	40.7	53.9	13.2	*1)
Vert	4824.000	AV	35.3	31.8	4.6	31.3	0.8	41.2	53.9	12.7	
Vert	7236.000	AV	33.2	36.0	6.8	32.0	-	44.0	53.9	9.9	Floor Noise
Vert	9648.000	AV	34.2	38.2	7.3	32.4	-	47.3	53.9	6.6	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 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	2412.000	PK	104.3	26.9	3.4	32.0	102.6	-	-	Carrier
Hori	2400.000	PK	55.0	26.9	3.4	32.0	53.3	82.6	29.3	
Vert	2412.000	PK	97.5	26.9	3.4	32.0	95.8	-	-	Carrier
Vert	2400.000	PK	52.4	26.9	3.4	32.0	50.7	75.8	25.1	

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
Temperature / Humidity	21 deg. C / 47 % RH	23 deg. C / 51 % RH
Engineer	Ken Fujita	Satofumi Matsuyama
	(1-10GHz)	(Above 10GHz)
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	47.0	31.9	5.5	31.3	-	53.1	73.9	20.8	
Hori	7311.000	PK	41.9	36.0	6.8	32.0	-	52.7	73.9	21.2	Floor Noise
Hori	9748.000	PK	41.5	38.2	7.3	32.4	-	54.6	73.9	19.3	Floor Noise
Hori	4874.000	AV	38.1	31.9	5.5	31.3	0.8	45.0	53.9	8.9	
Hori	7311.000	AV	34.2	36.0	6.8	32.0	-	45.0	53.9	8.9	Floor Noise
Hori	9748.000	AV	33.6	38.2	7.3	32.4	-	46.7	53.9	7.2	Floor Noise
Vert	4874.000	PK	45.9	31.9	4.6	31.3	-	51.1	73.9	22.8	
Vert	7311.000	PK	41.8	36.0	5.9	32.0	-	51.7	73.9	22.2	Floor Noise
Vert	9748.000	PK	42.1	38.2	6.7	32.4	-	54.6	73.9	19.3	Floor Noise
Vert	4874.000	AV	37.1	31.9	4.6	31.3	0.8	43.1	53.9	10.8	
Vert	7311.000	AV	34.2	36.0	6.8	32.0	-	45.0	53.9	8.9	Floor Noise
Vert	9748.000	AV	33.6	38.2	7.3	32.4	-	46.7	53.9	7.2	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

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Radiated Spurious Emission

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Report No.	10800614H	
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Engineer	Ken Fujita	Satofumi Matsuyama
	(1-10GHz)	(Above 10GHz)
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	55.6	26.9	3.4	32.0	-	53.9	73.9	20.0	
Hori	4924.000	PK	46.9	32.0	5.5	31.3	-	53.1	73.9	20.8	
Hori	7386.000	PK	41.7	36.0	6.8	32.1	-	52.4	73.9	21.5	Floor Noise
Hori	9848.000	PK	41.9	38.2	7.4	32.5	-	55.0	73.9	18.9	Floor Noise
Hori	2483.500	AV	46.2	26.9	3.4	32.0	0.8	45.3	53.9	8.6	*1)
Hori	4924.000	AV	37.7	32.0	5.5	31.3	0.8	44.7	53.9	9.2	
Hori	7386.000	AV	32.4	36.0	6.8	32.1	-	43.1	53.9	10.8	Floor Noise
Hori	9848.000	AV	33.2	38.2	7.4	32.5	-	46.3	53.9	7.6	Floor Noise
Vert	2483.500	PK	52.5	26.9	3.4	32.0	-	50.8	73.9	23.1	
Vert	4924.000	PK	43.5	32.0	4.6	31.3	-	48.8	73.9	25.1	
Vert	7386.000	PK	42.1	36.0	5.9	32.1	-	51.9	73.9	22.0	Floor Noise
Vert	9848.000	PK	42.0	38.2	6.8	32.5	-	54.5	73.9	19.4	Floor Noise
Vert	2483.500	AV	45.5	26.9	3.4	32.0	0.8	44.6	53.9	9.3	*1)
Vert	4924.000	AV	34.7	32.0	4.6	31.3	0.8	40.8	53.9	13.1	
Vert	7386.000	AV	32.4	36.0	6.8	32.1	-	43.1	53.9	10.8	Floor Noise
Vert	9848.000	AV	33.2	38.2	7.4	32.5	-	46.3	53.9	7.6	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10800614H	
Date	June 4, 2015	June 4, 2015
Temperature / Humidity	21 deg. C / 47 % RH	23 deg. C / 51 % RH
Engineer	Ken Fujita	Satofumi Matsuyama
	(1-10GHz)	(Above 10GHz)
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	66.2	26.9	3.4	32.0	-	64.5	73.9	9.4	
Hori	4824.000	PK	41.0	31.8	5.5	31.3	-	47.0	73.9	26.9	Floor Noise
Hori	7236.000	PK	42.2	36.0	6.8	32.0	-	53.0	73.9	20.9	Floor Noise
Hori	9648.000	PK	42.4	38.2	7.3	32.4	-	55.5	73.9	18.4	Floor Noise
Hori	2390.000	AV	46.7	26.9	3.4	32.0	3.3	48.3	53.9	5.6	*1)
Hori	4824.000	AV	32.2	31.8	5.5	31.3	-	38.2	53.9	15.7	Floor Noise
Hori	7236.000	AV	32.8	36.0	6.8	32.0	-	43.6	53.9	10.3	Floor Noise
Hori	9648.000	AV	33.1	38.2	7.3	32.4	-	46.2	53.9	7.7	Floor Noise
Vert	2390.000	PK	61.2	26.9	3.4	32.0	-	59.5	73.9	14.4	
Vert	4824.000	PK	40.8	31.8	4.6	31.3	-	45.9	73.9	28.0	Floor Noise
Vert	7236.000	PK	41.5	36.0	5.8	32.0	-	51.3	73.9	22.6	Floor Noise
Vert	9648.000	PK	42.0	38.2	6.7	32.4	-	54.5	73.9	19.4	Floor Noise
Vert	2390.000	AV	44.2	26.9	3.4	32.0	3.3	45.8	53.9	8.1	*1)
Vert	4824.000	AV	32.2	31.8	5.5	31.3	-	38.2	53.9	15.7	Floor Noise
Vert	7236.000	AV	32.8	36.0	6.8	32.0	-	43.6	53.9	10.3	Floor Noise
Vert	9648.000	AV	33.1	38.2	7.3	32.4	-	46.2	53.9	7.7	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 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	2412.000	PK	98.1	26.9	3.4	32.0	96.4	-	-	Carrier
Hori	2400.000	PK	67.8	26.9	3.4	32.0	66.1	76.4	10.3	
Vert	2412.000	PK	93.1	26.9	3.4	32.0	91.4	-	-	Carrier
Vert	2400.000	PK	62.5	26.9	3.4	32.0	60.8	71.4	10.6	

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 / 53 % RH
Engineer	Ken Fujita (1-10GHz)	Satofumi Matsuyama (Above 10GHz)	Ken Fujita (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	61.500	QP	32.2	7.5	7.5	32.1	-	15.1	40.0	24.9	
Hori	91.200	QP	29.2	8.3	7.9	32.2	-	13.2	43.5	30.3	
Hori	150.150	QP	30.9	14.9	8.6	32.2	-	22.2	43.5	21.3	
Hori	424.832	QP	37.8	17.7	10.8	32.1	-	34.2	46.0	11.8	
Hori	474.999	QP	40.5	18.0	11.1	32.1	-	37.5	46.0	8.5	
Hori	925.750	QP	29.3	22.7	13.3	30.9	-	34.4	46.0	11.6	
Hori	4874.000	PK	40.7	31.9	5.5	31.3	-	46.8	73.9	27.1	Floor Noise
Hori	7311.000	PK	42.4	36.0	6.8	32.0	-	53.2	73.9	20.7	Floor Noise
Hori	9748.000	PK	41.5	38.2	7.3	32.4	-	54.6	73.9	19.3	Floor Noise
Hori	4874.000	AV	33.1	31.9	5.5	31.3	-	39.2	53.9	14.7	Floor Noise
Hori	7311.000	AV	32.3	36.0	6.8	32.0	-	43.1	53.9	10.8	Floor Noise
Hori	9748.000	AV	32.5	38.2	7.3	32.4	-	45.6	53.9	8.3	Floor Noise
Vert	61.500	QP	32.2	7.5	7.5	32.1	-	15.1	40.0	24.9	
Vert	89.850	QP	32.9	8.1	7.9	32.1	-	16.8	43.5	26.7	
Vert	150.150	QP	27.9	14.9	8.6	32.2	-	19.2	43.5	24.3	
Vert	424.832	QP	32.2	17.7	10.8	32.1	-	28.6	46.0	17.4	
Vert	474.999	QP	34.0	18.0	11.1	32.1	-	31.0	46.0	15.0	
Vert	925.339	QP	27.6	22.7	13.3	30.9	-	32.7	46.0	13.3	
Vert	4874.000	PK	41.1	31.9	4.6	31.3	-	46.3	73.9	27.6	Floor Noise
Vert	7311.000	PK	41.4	36.0	5.9	32.0	-	51.3	73.9	22.6	Floor Noise
Vert	9748.000	PK	42.3	38.2	6.7	32.4	-	54.8	73.9	19.1	Floor Noise
Vert	4874.000	AV	33.1	31.9	5.5	31.3	-	39.2	53.9	14.7	Floor Noise
Vert	7311.000	AV	32.3	36.0	6.8	32.0	-	43.1	53.9	10.8	Floor Noise
Vert	9748.000	AV	32.5	38.2	7.3	32.4	-	45.6	53.9	8.3	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
Temperature / Humidity	21 deg. C / 47 % RH	23 deg. C / 51 % RH
Engineer	Ken Fujita	Satofumi Matsuyama
	(1-10GHz)	(Above 10GHz)
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	64.3	26.9	3.4	32.0	-	62.6	73.9	11.3	
Hori	4924.000	PK	40.9	32.0	5.5	31.3	-	47.1	73.9	26.8	Floor Noise
Hori	7386.000	PK	42.1	36.0	6.8	32.1	-	52.8	73.9	21.1	Floor Noise
Hori	9848.000	PK	42.9	38.2	7.4	32.5	-	56.0	73.9	17.9	Floor Noise
Hori	2483.500	AV	46.8	26.9	3.4	32.0	3.3	48.4	53.9	5.5	*1)
Hori	4924.000	AV	33.2	32.0	5.5	31.3	-	39.4	53.9	14.5	Floor Noise
Hori	7386.000	AV	32.4	36.0	6.8	32.1	-	43.1	53.9	10.8	Floor Noise
Hori	9848.000	AV	33.2	38.2	7.4	32.5	-	46.3	53.9	7.6	Floor Noise
Vert	2483.500	PK	60.1	26.9	3.4	32.0	-	58.4	73.9	15.5	
Vert	4924.000	PK	41.5	32.0	4.6	31.3	-	46.8	73.9	27.1	Floor Noise
Vert	7386.000	PK	42.2	36.0	5.9	32.1	-	52.0	73.9	21.9	Floor Noise
Vert	9848.000	PK	42.0	38.2	7.4	32.5	-	55.1	73.9	18.8	Floor Noise
Vert	2483.500	AV	44.2	26.9	3.4	32.0	3.3	45.8	53.9	8.1	*1)
Vert	4924.000	AV	34.9	32.0	5.5	31.3	-	41.1	53.9	12.8	Floor Noise
Vert	7386.000	AV	32.4	36.0	6.8	32.1	-	43.1	53.9	10.8	Floor Noise
Vert	9848.000	AV	33.2	38.2	7.4	32.5	-	46.3	53.9	7.6	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10 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: 10 GHz - 26.5 GHz 20log (3.0 m / 1.0 m) = 9.5 dB

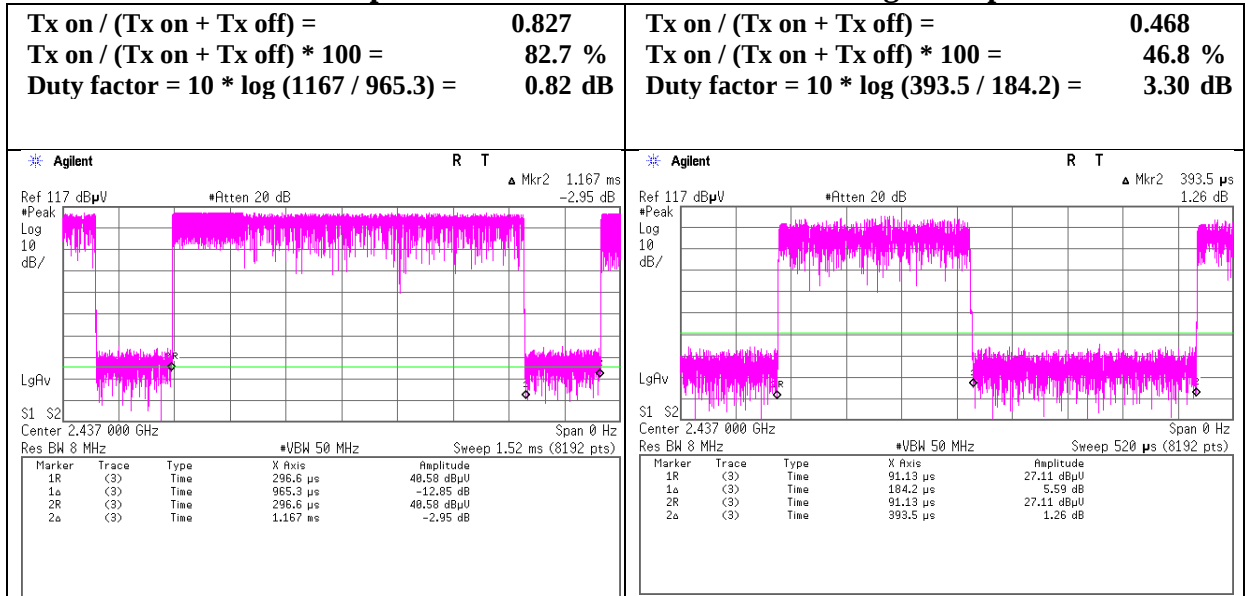
*1) Not Out of Band emission (Leakage Power)

Burst rate confirmation

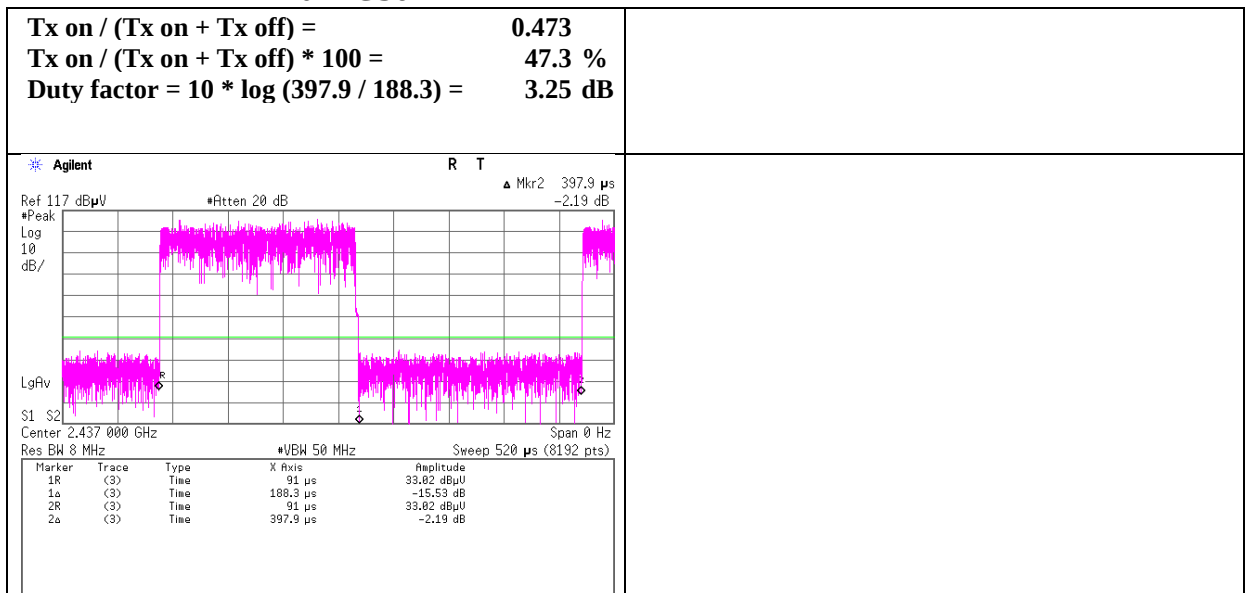
(Reference data)

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10646854H
Date	01/13/2015
Temperature/ Humidity	27deg. C / 20% RH
Engineer	Tomoki Matsui
Mode	11b/g/n-20 Tx

11b 11Mbps



11n-20 MCS6



APPENDIX 2: Test instruments

Test equipment (used on January 13, 2015)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2014/10/17 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	RE	2014/10/06 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	RE	2014/10/06 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	RE	2014/10/02 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	RE	2014/03/13 * 12

Test equipment (used on June 4 and 5, 2015)

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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