RADIO TEST REPORT

Test Report No. : 10182178H-A

Applicant	:	**Murata Manufacturing Co., Ltd.**
Type of Equipment	:	**Communication Module**
Model No.	:	**Type XN**
FCC ID	:	**VPYLBXN604**
Test regulation	:	**FCC Part 15 Subpart C: 2013** ***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.

Date of test: January 8 to 11, 2014

Representative test engineer:

Hironobu Ohnishi
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service

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.
Head Office EMC Lab.
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REVISION HISTORY

Original Test Report No.: 10182178H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10182178H-A	January 20, 2014	-	-

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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SECTION 1: Customer information

Company Name	:	Murata Manufacturing Co., Ltd.
Address	:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	:	+81-75-955-6735
Facsimile Number	:	+81-75-955-6634
Contact Person	:	TAKAHARU KAWAKATSU

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

2.1 Identification of E.U.T.

Type of Equipment	:	Communication Module
Model No.	:	Type XN
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.8V
Receipt Date of Sample	:	January 6, 2014
Country of Mass-production	:	China
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

General Specification

The EUT is Communication Module which is installed in Compact Digital camera.

Specification of WLAN (IEEE802.11b/g/n)

Type of radio	Wireless LAN (IEEE802.11b/g)	Wireless LAN (IEEE802.11n) 2.4G Band SISO (20M Band)
Equipment Type	Transceiver	
Frequency of Operation	2412MHz - 2462MHz	
Bandwidth & Channel spacing	Bandwidth : 20MHz Ch spacing : 5MHz	
Type of Modulation	11b: DSSS 11g: OFDM	OFDM
Antenna Type / Antenna Gain	Monopole Antenna: +1.2dBi	
Power Supply (inner)	DC 3.8V	
Operating temperature range	-20 to +55 deg. C.	

<Contents of the change from original model>
Original tes report number of this report is 33AE0057-HO-01-A-R1.
The EUT is changed the specification from original model as below.
*The change of Antenna type
*The change of Antenna Gain
The radio specification is identical to the original.
Therefore only Radiated Spurious Emission test was performed in this report.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators 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:** "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)"	**FCC:** Section15.247(d)	6.9dB 6498.659MHz, AV, Vert.	Complied	Radiated
	IC: RSS-Gen 4.9	**IC:** RSS-210 A8.5 RSS-Gen 7.2.3			
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: 2003 is also referred.

FCC 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

It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore, the equipment complies with the antenna 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.

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test(3m)
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Japan, Inc. Head Office 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

	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

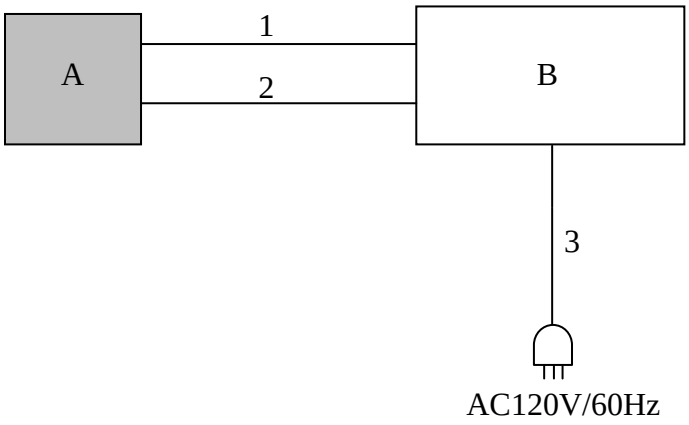
Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	2Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 0, PN9
*Power of the EUT was set by the software as follows; Power settings: 5dBm Software: wifitest, Version: 0.5, WIFI_RAM_CODE FIX:2013/12/13(Last Modified:2013/11/11/17:11:06) *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(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Radiated)	11b Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
*The formal test was performed with the above mode based on original model's report.		

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 and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	Type XN	FCC1	Murata Manufacturing Co., Ltd.	EUT
B	DC Power supply	PW8-3ATP	09067054	JVC KENWOOD	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.2	Unshielded	Unshielded	-
2	DC Cable	1.2	Unshielded	Unshielded	-
3	AC Cable	2.2	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".
EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m 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 and 4m 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	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Average Power Method: WLAN: 12.2.5.1 RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m *2) (above 10GHz)		3m (below 10GHz), 1m *2) (above 10GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"
*2) Distance Factor: 20 x log (3.0m/1.0m) = 9.5dB

- 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 : 30M-26.5GHz
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10182178H		
Date	01/08/2014	01/10/2014	01/11/2014
Temperature/ Humidity	26 deg. C / 30%	20 deg. C / 30%	26 deg. C / 30%
Engineer	Hiroshi Kukita (1-10GHz)	Hironobu Ohnishi (Above 10GHz)	Tsubasa Takayama (1-10GHz)
Mode	11b Tx 2412MHz		

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	48.0	26.8	2.4	35.7	0.0	41.5	73.9	32.4	
Hori	4824.000	PK	46.2	30.7	4.4	34.9	0.0	46.4	73.9	27.5	
Hori	6432.000	PK	46.9	33.9	5.0	34.7	0.0	51.1	73.9	22.8	
Hori	7236.000	PK	44.4	35.6	5.2	34.9	0.0	50.3	73.9	23.6	
Hori	9648.000	PK	42.7	38.2	6.0	35.4	0.0	51.5	73.9	22.4	
Hori	2390.000	AV	38.7	26.8	2.4	35.7	0.0	32.2	53.9	21.7	
Hori	4824.000	AV	38.1	30.7	4.4	34.9	0.0	38.3	53.9	15.6	
Hori	6432.000	AV	39.9	33.9	5.0	34.7	0.0	44.1	53.9	9.8	
Hori	7236.000	AV	37.0	35.6	5.2	34.9	0.0	42.9	53.9	11.0	
Hori	9648.000	AV	36.3	38.2	6.0	35.4	0.0	45.1	53.9	8.8	
Vert	2390.000	PK	47.5	26.8	2.4	35.7	0.0	41.0	73.9	32.9	
Vert	4824.000	PK	44.8	30.7	4.4	34.9	0.0	45.0	73.9	28.9	
Vert	6432.000	PK	46.9	33.9	5.0	34.7	0.0	51.1	73.9	22.8	
Vert	7236.000	PK	43.5	35.6	5.2	34.9	0.0	49.4	73.9	24.5	
Vert	9648.000	PK	43.3	38.2	6.0	35.4	0.0	52.1	73.9	21.8	
Vert	2390.000	AV	38.8	26.8	2.4	35.7	0.0	32.3	53.9	21.6	
Vert	4824.000	AV	36.9	30.7	4.4	34.9	0.0	37.1	53.9	16.8	
Vert	6432.000	AV	39.7	33.9	5.0	34.7	0.0	43.9	53.9	10.0	
Vert	7236.000	AV	34.2	35.6	5.2	34.9	0.0	40.1	53.9	13.8	
Vert	9648.000	AV	33.8	38.2	6.0	35.4	0.0	42.6	53.9	11.3	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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	100.4	26.8	2.4	35.7	93.9	-	-	Carrier
Hori	2400.000	PK	46.0	26.8	2.4	35.7	39.5	73.9	34.4	
Vert	2412.000	PK	99.6	26.8	2.4	35.7	93.1	-	-	Carrier
Vert	2400.000	PK	46.0	26.8	2.4	35.7	39.5	73.1	33.6	

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

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10182178H
Date	01/10/2014
Temperature/ Humidity	20 deg. C / 30%
Engineer	Hironobu Ohnishi (Above 1GHz)
Mode	11b Tx 2437MHz

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	44.2	30.8	4.4	34.9	0.0	44.5	73.9	29.4	
Hori	6498.659	PK	46.6	34.1	5.1	34.7	0.0	51.1	73.9	22.8	
Hori	4874.000	AV	36.3	30.8	4.4	34.9	0.0	36.6	53.9	17.3	
Hori	6498.659	AV	42.2	34.1	5.1	34.7	0.0	46.7	53.9	7.2	
Vert	4874.000	PK	43.4	30.8	4.4	34.9	0.0	43.7	73.9	30.2	
Vert	6498.659	PK	47.0	34.1	5.1	34.7	0.0	51.5	73.9	22.4	
Vert	4874.000	AV	36.9	30.8	4.4	34.9	0.0	37.2	53.9	16.7	
Vert	6498.659	AV	42.5	34.1	5.1	34.7	0.0	47.0	53.9	6.9	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10182178H		
Date	01/08/2014	01/10/2014	01/11/2014
Temperature/ Humidity	26 deg. C / 30%	20 deg. C / 30%	26 deg. C / 30%
Engineer	Hiroshi Kukita (1-10GHz)	Hironobu Ohnishi (Above 10GHz)	Tsubasa Takayama (1-10GHz)
Mode	11b Tx 2462MHz		

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	50.9	26.7	2.5	35.7	0.0	44.4	73.9	29.5	
Hori	4924.000	PK	46.5	31.0	4.4	34.9	0.0	47.0	73.9	26.9	
Hori	6565.500	PK	46.5	34.3	5.1	34.7	0.0	51.2	73.9	22.7	
Hori	2483.500	AV	41.8	26.7	2.5	35.7	0.0	35.3	53.9	18.6	
Hori	4924.000	AV	39.1	31.0	4.4	34.9	0.0	39.6	53.9	14.3	
Hori	6565.500	AV	41.4	34.3	5.1	34.7	0.0	46.1	53.9	7.8	
Vert	2483.500	PK	49.2	26.7	2.5	35.7	0.0	42.7	73.9	31.2	
Vert	4924.000	PK	45.5	31.0	4.4	34.9	0.0	46.0	73.9	27.9	
Vert	6565.500	PK	46.1	34.3	5.1	34.7	0.0	50.8	73.9	23.1	
Vert	2483.500	AV	39.9	26.7	2.5	35.7	0.0	33.4	53.9	20.5	
Vert	4924.000	AV	38.1	31.0	4.4	34.9	0.0	38.6	53.9	15.3	
Vert	6565.500	AV	38.9	34.3	5.1	34.7	0.0	43.6	53.9	10.3	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10182178H		
Date	01/08/2014	01/10/2014	01/11/2014
Temperature/ Humidity	26 deg. C / 30%	20 deg. C / 30%	26 deg. C / 30%
Engineer	Hiroshi Kukita (1-10GHz)	Hironobu Ohnishi (Above 10GHz)	Tsubasa Takayama (1-10GHz)
Mode	11n-20 Tx 2412MHz		

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	63.8	26.8	2.4	35.7	0.0	57.3	73.9	16.6	
Hori	4824.000	PK	45.0	30.7	4.4	34.9	0.0	45.2	73.9	28.7	
Hori	6432.000	PK	47.0	33.9	5.0	34.7	0.0	51.2	73.9	22.7	
Hori	7236.000	PK	43.5	35.6	5.2	34.9	0.0	49.4	73.9	24.5	
Hori	9648.000	PK	43.2	38.2	6.0	35.4	0.0	52.0	73.9	21.9	
Hori	2390.000	AV	48.8	26.8	2.4	35.7	0.0	42.3	53.9	11.6	
Hori	4824.000	AV	37.6	30.7	4.4	34.9	0.0	37.8	53.9	16.1	
Hori	6432.000	AV	40.4	33.9	5.0	34.7	0.0	44.6	53.9	9.3	
Hori	7236.000	AV	33.8	35.6	5.2	34.9	0.0	39.7	53.9	14.2	
Hori	9648.000	AV	33.4	38.2	6.0	35.4	0.0	42.2	53.9	11.7	
Vert	2390.000	PK	62.9	26.8	2.4	35.7	0.0	56.4	73.9	17.5	
Vert	4824.000	PK	44.8	30.7	4.4	34.9	0.0	45.0	73.9	28.9	
Vert	6432.000	PK	47.5	33.9	5.0	34.7	0.0	51.7	73.9	22.2	
Vert	7236.000	PK	43.5	35.6	5.2	34.9	0.0	49.4	73.9	24.5	
Vert	9648.000	PK	43.3	38.2	6.0	35.4	0.0	52.1	73.9	21.8	
Vert	2390.000	AV	48.3	26.8	2.4	35.7	0.0	41.8	53.9	12.1	
Vert	4824.000	AV	37.1	30.7	4.4	34.9	0.0	37.3	53.9	16.6	
Vert	6432.000	AV	41.8	33.9	5.0	34.7	0.0	46.0	53.9	7.9	
Vert	7236.000	AV	33.4	35.6	5.2	34.9	0.0	39.3	53.9	14.6	
Vert	9648.000	AV	33.2	38.2	6.0	35.4	0.0	42.0	53.9	11.9	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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	100.1	26.8	2.4	35.7	93.6	-	-	Carrier
Hori	2400.000	PK	58.0	26.8	2.4	35.7	51.5	73.6	22.1	
Vert	2412.000	PK	99.5	26.8	2.4	35.7	93.0	-	-	Carrier
Vert	2400.000	PK	57.1	26.8	2.4	35.7	50.6	73.0	22.4	

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

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Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10182178H
Date	01/10/2014
Temperature/ Humidity	20 deg. C / 30%
Engineer	Hironobu Ohnishi
	(Above 1GHz)
Mode	11n-20 Tx 2437MHz

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	43.2	30.8	4.4	34.9	0.0	43.5	73.9	30.4	
Hori	6498.659	PK	46.4	34.1	5.1	34.7	0.0	50.9	73.9	23.0	
Hori	4874.000	AV	35.1	30.8	4.4	34.9	0.0	35.4	53.9	18.5	
Hori	6498.659	AV	41.7	34.1	5.1	34.7	0.0	46.2	53.9	7.7	
Vert	4874.000	PK	43.7	30.8	4.4	34.9	0.0	44.0	73.9	29.9	
Vert	6498.659	PK	47.1	34.1	5.1	34.7	0.0	51.6	73.9	22.3	
Vert	4874.000	AV	36.5	30.8	4.4	34.9	0.0	36.8	53.9	17.1	
Vert	6498.659	AV	41.8	34.1	5.1	34.7	0.0	46.3	53.9	7.6	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10182178H		
Date	01/08/2014	01/10/2014	01/11/2014
Temperature/ Humidity	26 deg. C / 30%	20 deg. C / 30%	21 deg. C / 32%
Engineer	Hiroshi Kukita (1-10GHz)	Hironobu Ohnishi (Above 10GHz)	Tsubasa Takayama (Below 1GHz)
Mode	11n-20 Tx 2462MHz		

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	174.650	QP	25.6	15.9	8.0	28.0	0.0	21.5	43.5	22.0	
Hori	249.508	QP	25.8	17.1	8.5	27.7	0.0	23.7	46.0	22.3	
Hori	311.879	QP	25.6	14.6	8.9	27.7	0.0	21.4	46.0	24.6	
Hori	324.358	QP	26.0	15.0	8.9	27.8	0.0	22.1	46.0	23.9	
Hori	336.831	QP	26.4	15.4	9.0	27.9	0.0	22.9	46.0	23.1	
Hori	349.308	QP	25.2	15.8	9.0	28.0	0.0	22.0	46.0	24.0	
Hori	2483.500	PK	62.2	26.7	2.5	35.7	0.0	55.7	73.9	18.2	
Hori	4924.000	PK	45.7	31.0	4.4	34.9	0.0	46.2	73.9	27.7	
Hori	6565.500	PK	46.7	34.3	5.1	34.7	0.0	51.4	73.9	22.5	
Hori	2483.500	AV	51.0	26.7	2.5	35.7	0.0	44.5	53.9	9.4	
Hori	4924.000	AV	38.8	31.0	4.4	34.9	0.0	39.3	53.9	14.6	
Hori	6565.500	AV	41.9	34.3	5.1	34.7	0.0	46.6	53.9	7.3	
Vert	174.899	QP	31.2	15.9	8.0	28.0	0.0	27.1	43.5	16.4	
Vert	249.510	QP	28.2	17.1	8.5	27.7	0.0	26.1	46.0	19.9	
Vert	311.882	QP	25.3	14.6	8.9	27.7	0.0	21.1	46.0	24.9	
Vert	324.354	QP	26.2	15.0	8.9	27.8	0.0	22.3	46.0	23.7	
Vert	336.833	QP	27.9	15.4	9.0	27.9	0.0	24.4	46.0	21.6	
Vert	349.307	QP	25.0	15.8	9.0	28.0	0.0	21.8	46.0	24.2	
Vert	2483.500	PK	61.1	26.7	2.5	35.7	0.0	54.6	73.9	19.3	
Vert	4924.000	PK	44.5	31.0	4.4	34.9	0.0	45.0	73.9	28.9	
Vert	6565.500	PK	46.9	34.3	5.1	34.7	0.0	51.6	73.9	22.3	
Vert	2483.500	AV	49.6	26.7	2.5	35.7	0.0	43.1	53.9	10.8	
Vert	4924.000	AV	36.8	31.0	4.4	34.9	0.0	37.3	53.9	16.6	
Vert	6565.500	AV	39.4	34.3	5.1	34.7	0.0	44.1	53.9	9.8	

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

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

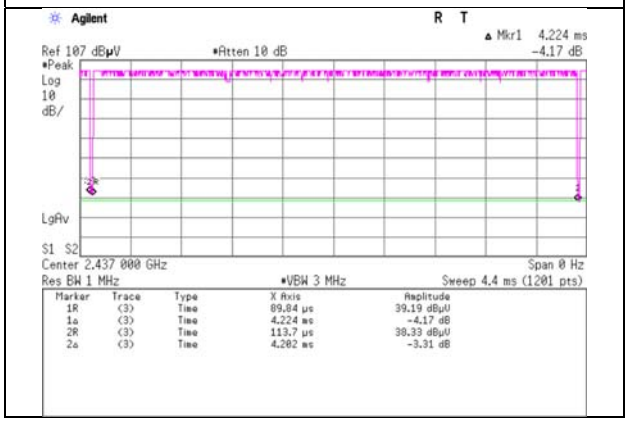
*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Burst rate confirmation

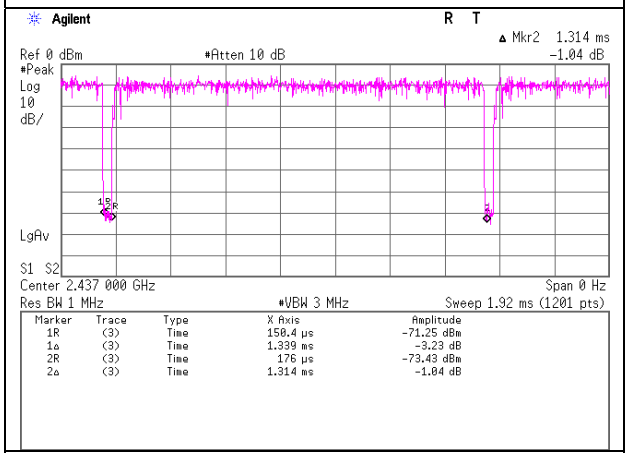
11b 2Mbps

Tx on / (Tx on + Tx off) = 0.995
Tx on / (Tx on + Tx off) * 100 = 99.5 %
Duty factor = 10 * log (4.224 / 4.202) = 0.02 dB



11n-20 MCS0

Tx on / (Tx on + Tx off) = 0.981
Tx on / (Tx on + Tx off) * 100 = 98.1 %
Duty factor = 10 * log (1.339 / 1.314) = 0.08 dB



APPENDIX 2: Test instruments

EMI 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	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2013/11/25 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2013/02/15 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2013/01/10 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2013/05/30 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2013/06/14 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2013/02/15 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2013/06/11 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2013/10/13 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2013/10/13 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2013/11/26 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 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