



RADIO TEST REPORT


Test Report No. : 10327698H-A-R1

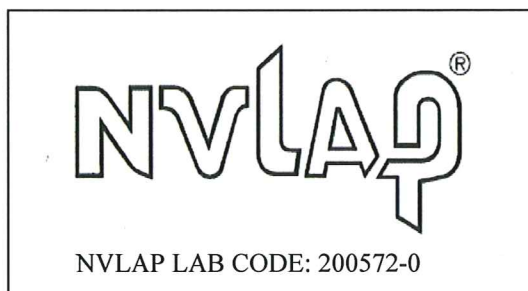
Applicant : Murata Manufacturing Co., Ltd.
Type of Equipment : Communication Module
Model No. : Type XN
FCC ID : VPYLBXN604
Test regulation : FCC Part 15 Subpart C: 2014
*Radiated Spurious Emission test only
*Class II Permissive change
Test Result : Complied

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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 report is a revised version of 10327698H-A. 10327698H-A is replaced with this report.

Date of test: July 9 and 14, 2014

Representative test engineer: 
Keisuke Kawamura
Engineer
Consumer Technology Division

Approved by: 
Takayuki Shimada
Engineer
Consumer Technology Division



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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Ise EMC Lab.

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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 : +81-75-955-6604
Facsimile Number : +81-75-955-6634
Contact Person : Karun Malhotra

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 3.6V
Receipt Date of Sample : July 3, 2014
Country of Mass-production : China/Japan
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

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	FPC Antenna: -1.8dBi (Peak)	
Power Supply (inner)	DC 3.6V	
Operating temperature range	-20 to +55 deg. C	

<Contents of the change from original model>

Original test report number of this report is 33AE0057-HO-01-A-R1 (issued by UL Japan, Inc.).

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

*The change of Antenna pattern

*The change of Antenna Gain

The radio specification is identical to original.

Therefore only Radiated Spurious Emission test was performed in this report.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 2014

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: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" IC: RSS-Gen 4.9	FCC: Section15.247(d) IC: RSS-210 A8.5 RSS-Gen 7.2.3	1.3dB 4824.000MHz, AV, Horizontal	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: 2003 is also referred.

*All tests except for Spurious Emission and Restricted Band Edges tests are not applicable since no difference between rating DC 3.1V to 4.3V was confirmed.

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.

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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.

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 report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

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	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	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	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	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	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	4.8 x 4.6m	-

* 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.

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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)	2Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 0, PN9
*The worst condition was determined based on the test result of original report.	
*Power of the EUT was set by the software as follows; Power settings: 5dBm Software: wifitest, Version: 0.5 *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	2412MHz
	11n-20 Tx	2437MHz
		2462MHz
*The formal test was performed with the above mode based on original model's report.		

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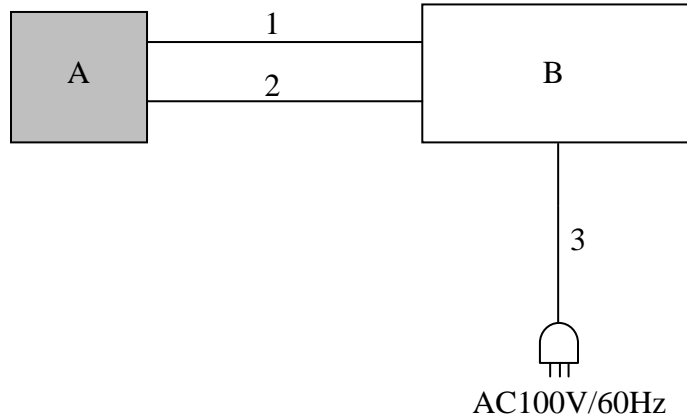
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4.2 Configuration and peripherals



* 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	1	Murata Manufacturing Co., Ltd.	EUT
B	DC Power supply	PL330QMD	48943	Thurlby Thandar	-

*1) Used for Conducted Emission test and Radiated Emission test

*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.8	Unshielded	Unshielded	-
2	DC Cable	1.3	Unshielded	Unshielded	-
3	AC Cable	1.3	Unshielded	Unshielded	-

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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	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz	RBW: 100kHz VBW: 300kHz
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 & 12.2.7 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"

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

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APPENDIX 1: Data of EMI test

Radiated Spurious Emission

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10327698H
Date 07/09/2014 07/09/2014
Temperature/ Humidity 19 deg. C / 67% RH 22 deg. C / 66% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(1-10GHz) (10G-26.5GHz)
Mode 11b Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	45.5	27.0	2.4	34.7	40.2	73.9	33.7	
Hori	4824.000	PK	52.3	31.9	4.5	33.9	54.8	73.9	19.1	
Hori	7236.000	PK	42.0	35.7	5.1	33.8	49.0	73.9	24.9	
Hori	9648.000	PK	42.5	38.1	6.0	34.4	52.2	73.9	21.7	
Hori	2390.000	AV	32.8	27.0	2.4	34.7	27.5	53.9	26.4	
Hori	4824.000	AV	50.1	31.9	4.5	33.9	52.6	53.9	1.3	
Hori	7236.000	AV	31.0	35.7	5.1	33.8	38.0	53.9	15.9	
Hori	9648.000	AV	31.7	38.1	6.0	34.4	41.4	53.9	12.5	
Vert	2390.000	PK	49.9	27.0	2.4	34.7	44.6	73.9	29.3	
Vert	4824.000	PK	50.4	31.9	4.5	33.9	52.9	73.9	21.0	
Vert	7236.000	PK	42.7	35.7	5.1	33.8	49.7	73.9	24.2	
Vert	9648.000	PK	42.9	38.1	6.0	34.4	52.6	73.9	21.3	
Vert	2390.000	AV	38.2	27.0	2.4	34.7	32.9	53.9	21.0	
Vert	4824.000	AV	46.9	31.9	4.5	33.9	49.4	53.9	4.5	
Vert	7236.000	AV	31.1	35.7	5.1	33.8	38.1	53.9	15.8	
Vert	9648.000	AV	31.8	38.1	6.0	34.4	41.5	53.9	12.4	

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

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	95.3	27.0	2.4	34.7	90.0	-	-	Carrier
Hori	2400.000	PK	44.9	27.0	2.4	34.7	39.6	70.0	30.4	
Hori	6431.962	PK	53.1	34.2	4.9	33.7	58.5	70.0	11.5	
Vert	2412.000	PK	92.9	27.0	2.4	34.7	87.6	-	-	Carrier
Vert	2400.000	PK	42.3	27.0	2.4	34.7	37.0	67.6	30.6	
Vert	6431.962	PK	54.3	34.2	4.9	33.7	59.7	67.6	7.9	

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.2 Semi Anechoic Chamber
Report No. 10327698H
Date 07/09/2014 07/09/2014
Temperature/ Humidity 19 deg. C / 67% RH 22 deg. C / 66% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(1-10GHz) (10G-26.5GHz)
Mode 11b Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	51.9	32.0	4.4	33.9	54.4	73.9	19.5	
Hori	7311.000	PK	43.4	35.8	5.2	33.8	50.6	73.9	23.3	
Hori	9748.000	PK	42.3	38.3	6.2	34.5	52.3	73.9	21.6	
Hori	4874.000	AV	48.8	32.0	4.4	33.9	51.3	53.9	2.6	
Hori	7311.000	AV	29.6	35.8	5.2	33.8	36.8	53.9	17.1	
Hori	9748.000	AV	31.1	38.3	6.2	34.5	41.1	53.9	12.8	
Vert	4874.000	PK	51.2	32.0	4.4	33.9	53.7	73.9	20.2	
Vert	7311.000	PK	43.2	35.8	5.2	33.8	50.4	73.9	23.5	
Vert	9748.000	PK	43.6	38.3	6.2	34.5	53.6	73.9	20.3	
Vert	4874.000	AV	47.5	32.0	4.4	33.9	50.0	53.9	3.9	
Vert	7311.000	AV	30.9	35.8	5.2	33.8	38.1	53.9	15.8	
Vert	9748.000	AV	30.9	38.3	6.2	34.5	40.9	53.9	13.0	

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

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

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

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	2437.000	PK	95.6	27.0	2.5	34.7	90.4	-	-	Carrier
Hori	6498.628	PK	54.3	34.3	5.0	33.7	59.9	70.4	10.5	
Vert	2437.000	PK	95.6	27.0	2.5	34.7	90.4	-	-	Carrier
Vert	6498.628	PK	53.6	34.3	5.0	33.7	59.2	70.4	11.2	

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

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Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10327698H
Date 07/09/2014 07/09/2014
Temperature/ Humidity 19 deg. C / 67% RH 22 deg. C / 66% RH
Engineer Keisuke Kawamura Masatoshi Nishiguchi
(1-10GHz) (10G-26.5GHz)
Mode 11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	47.8	26.9	2.5	34.7	42.5	73.9	31.4	
Hori	4924.000	PK	52.5	32.1	4.4	33.9	55.1	73.9	18.8	
Hori	7386.000	PK	42.6	35.8	5.2	33.8	49.8	73.9	24.1	
Hori	9848.000	PK	42.9	38.5	6.2	34.5	53.1	73.9	20.8	
Hori	2483.500	AV	35.8	26.9	2.5	34.7	30.5	53.9	23.4	
Hori	4924.000	AV	48.9	32.1	4.4	33.9	51.5	53.9	2.4	
Hori	7386.000	AV	31.1	35.8	5.2	33.8	38.3	53.9	15.6	
Hori	9848.000	AV	31.6	38.5	6.2	34.5	41.8	53.9	12.1	
Vert	2483.500	PK	47.5	26.9	2.5	34.7	42.2	73.9	31.7	
Vert	4924.000	PK	50.4	32.1	4.4	33.9	53.0	73.9	20.9	
Vert	7386.000	PK	42.5	35.8	5.2	33.8	49.7	73.9	24.2	
Vert	9848.000	PK	42.6	38.5	6.2	34.5	52.8	73.9	21.1	
Vert	2483.500	AV	33.1	26.9	2.5	34.7	27.8	53.9	26.1	
Vert	4924.000	AV	45.8	32.1	4.4	33.9	48.4	53.9	5.5	
Vert	7386.000	AV	31.1	35.8	5.2	33.8	38.3	53.9	15.6	
Vert	9848.000	AV	31.7	38.5	6.2	34.5	41.9	53.9	12.0	

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

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	2462.000	PK	97.7	26.9	2.5	34.7	92.4	-	-	Carrier
Hori	6565.295	PK	53.3	34.5	4.9	33.7	59.0	72.4	13.4	
Vert	2462.000	PK	96.4	26.9	2.5	34.7	91.1	-	-	Carrier
Vert	6565.295	PK	53.4	34.5	4.9	33.7	59.1	71.1	12.0	

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

Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10327698H
Date : 07/09/2014
Temperature/ Humidity : 22 deg. C / 66% RH
Engineer : Masatoshi Nishiguchi
(Above 1GHz)
Mode : 11n-20 Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	55.8	27.0	2.4	34.7	50.5	73.9	23.4	
Hori	4824.000	PK	53.6	31.9	3.7	33.9	55.3	73.9	18.7	
Hori	2390.000	AV	40.0	27.0	2.4	34.7	34.7	53.9	19.2	
Hori	4824.000	AV	50.2	31.9	3.7	33.9	51.9	53.9	2.1	
Vert	2390.000	PK	58.9	27.0	2.4	34.7	53.6	73.9	20.3	
Vert	4824.000	PK	49.7	31.9	4.5	33.9	52.2	73.9	21.7	
Vert	2390.000	AV	40.4	27.0	2.4	34.7	35.1	53.9	18.8	
Vert	4824.000	AV	44.9	31.9	4.5	33.9	47.4	53.9	6.5	

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

*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

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	92.7	27.0	2.4	34.7	87.4	-	-	Carrier
Hori	2400.000	PK	50.3	27.0	2.4	34.7	45.0	67.4	22.4	
Hori	6431.969	PK	52.2	34.2	4.2	33.7	56.9	67.4	10.5	
Vert	2412.000	PK	94.4	27.0	2.4	34.7	89.1	-	-	Carrier
Vert	2400.000	PK	50.7	27.0	2.4	34.7	45.4	69.1	23.7	
Vert	6431.967	PK	51.0	34.2	4.9	33.7	56.4	69.1	12.7	

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

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Telephone : +81 596 24 8999

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
 Report No. : 10327698H
 Date : 07/09/2014
 Temperature/ Humidity : 22 deg. C / 66% RH
 Engineer : Masatoshi Nishiguchi
 (Above 1GHz)
 Mode : 11n-20 Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	53.3	32.0	4.4	33.9	55.8	73.9	18.1	
Hori	4874.000	AV	46.4	32.0	4.4	33.9	48.9	53.9	5.0	
Vert	4874.000	PK	49.8	32.0	4.4	33.9	52.3	73.9	21.6	
Vert	4874.000	AV	42.9	32.0	4.4	33.9	45.4	53.9	8.5	

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

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

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

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	2437.000	PK	94.2	27.0	2.5	34.7	89.0	-	-	Carrier
Hori	6498.000	PK	51.9	34.3	5.0	33.7	57.5	69.0	11.5	
Vert	2437.000	PK	91.5	27.0	2.5	34.7	86.3	-	-	Carrier
Vert	6498.620	PK	53.2	34.3	5.0	33.7	58.8	66.3	7.5	

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.2 Semi Anechoic Chamber
Report No. : 10327698H
Date : 07/09/2014 07/14/2014
Temperature/ Humidity : 22 deg. C / 66% RH 24 deg. C / 69% RH
Engineer : Masatoshi Nishiguchi Satofumi Matsuyama
(Above 1GHz) (Below 1GHz)
Mode : 11n-20 Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	63.750	QP	22.8	7.3	7.1	28.5	8.7	40.0	31.3	
Hori	101.704	QP	22.4	10.3	7.5	28.5	11.7	43.5	31.8	
Hori	159.348	QP	22.3	15.2	7.9	28.1	17.3	43.5	26.2	
Hori	165.000	QP	22.0	15.5	7.9	28.1	17.3	43.5	26.2	
Hori	186.600	QP	21.9	16.3	8.1	27.9	18.4	43.5	25.1	
Hori	562.500	QP	22.2	19.0	9.7	28.8	22.1	46.0	23.9	
Hori	2483.500	PK	58.3	26.9	2.5	34.7	53.0	73.9	20.9	
Hori	4924.000	PK	49.2	32.1	4.4	33.9	51.8	73.9	22.1	
Hori	2483.500	AV	44.1	26.9	2.5	34.7	38.8	53.9	15.1	
Hori	4924.000	AV	44.4	32.1	4.4	33.9	47.0	53.9	6.9	
Vert	64.936	QP	26.8	7.2	7.1	28.5	12.6	40.0	27.4	
Vert	102.000	QP	22.5	10.3	7.5	28.4	11.9	43.5	31.6	
Vert	160.002	QP	26.9	15.3	7.9	28.1	22.0	43.5	21.5	
Vert	165.500	QP	22.1	15.5	7.9	28.1	17.4	43.5	26.1	
Vert	186.600	QP	21.9	16.3	8.1	27.9	18.4	43.5	25.1	
Vert	561.332	QP	22.2	19.0	9.7	28.8	22.1	46.0	23.9	
Vert	2483.500	PK	54.0	26.9	2.5	34.7	48.7	73.9	25.2	
Vert	4924.000	PK	50.1	32.1	4.4	33.9	52.7	73.9	21.2	
Vert	2483.500	AV	43.8	26.9	2.5	34.7	38.5	53.9	15.4	
Vert	4924.000	AV	46.1	32.1	4.4	33.9	48.7	53.9	5.2	

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

*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

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	2462.000	PK	92.3	26.9	2.5	34.7	87.0	-	-	Carrier
Hori	6565.291	PK	47.1	34.5	4.9	33.7	52.8	67.0	14.2	
Vert	2462.000	PK	90.3	26.9	2.5	34.7	85.0	-	-	Carrier
Vert	6565.290	PK	48.7	34.5	4.9	33.7	54.4	65.0	10.6	

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

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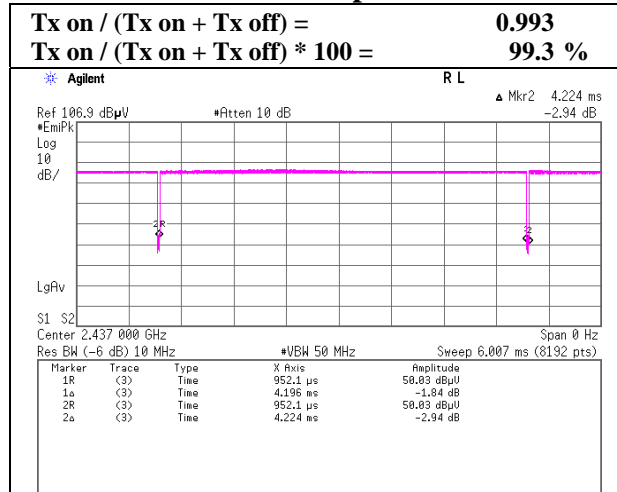
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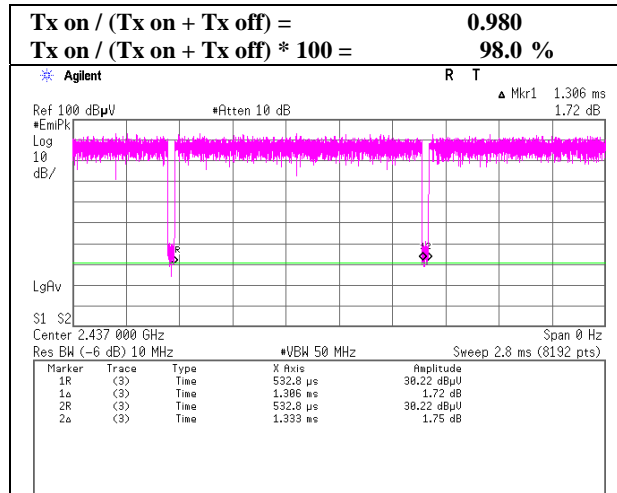
Burst rate confirmation

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10327698H
Date	07/14/2014
Temperature/ Humidity	24 deg. C / 69% RH
Engineer	Satofumi Matsuyama
Mode	Tx

11b 2Mbps



11n-20 MCS0



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	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2014/03/05 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2014/05/21 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2014/06/03 * 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	2014/02/20 * 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 test

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