

Test report No.

Page

Issued date

: 10124906H-A-R1 : 1 of 39

: January 24, 2014 : January 28, 2014

Revised date FCC ID

: VPYLBYD

RADIO TEST REPORT

Test Report No.: 10124906H-A-R1

Applicant

Murata Manufacturing Company, Ltd.

Type of Equipment

Communication Module

Model No.

TypeYD

FCC ID

VPYLBYD

Test regulation

FCC Part 15 Subpart C: 2013

Test Result

Complied

- This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
- The results in this report apply only to the sample tested.
- This sample tested is in compliance with the above regulation.
- The test results in this report are traceable to the national or international standards.
- 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.
- This report is a revised version of 10124906H-A. 10124906H-A is replaced with this report.

Date of test:

December 25 to January 17, 2014

Representative test engineer:

Takumi Shimada Engineer of WiSE Japan, **UL Verification Service**

Approved by:

Leader of WiSE Japan, UL Verification Service



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/ma

rk1/index.jsp#nvlap NVLAP LAB CODE: 200572-0

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REVISION HISTORY

Original Test Report No.: 10124906H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10124906H-A	January 24, 2014	-	-
1	10124906H-A-R1	January 28, 2014	11	Added "12.2.5.2" to item: IF Bandwidth of table in section 6.

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SECTION 1: Customer information

Company Name : Murata Manufacturing Company, Ltd.

Address : 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555 Japan

Telephone Number : +81-75-955-6375 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. : TypeYD

Serial No. : Refer to Section 4, Clause 4.2

Rating : DC3.3V

Receipt Date of Sample : December 11, 2013 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

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	Trans	ceiver		
Frequency of Operation	2412MHz	- 2462MHz		
Bandwidth & Channel	Bandwidth: 20MHz			
spacing	Ch spacing: 5MHz			
Type of Modulation	11b: DSSS	OFDM		
	11g: OFDM			
Antenna Type / Antenna Gain	Pattern antenna (Monopole antenna): -1.6dBi (Peak)			
Power Supply (inner)	DC 3.3V			
Operating temperature range	-20 to +7	70 deg. C.		

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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 15.207 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
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 IC: RSS-Gen 7.2.4	QP 10.6dB 4.83943MHz, N 4.84157MHz, L	Complied	_
Conducted Zanassion			AV 11.0dB 4.83943MHz, N	Compiled	
6dB Bandwidth	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)"			Complied	Conducted
	IC: RSS-Gen 4.6.2	IC: RSS-210 A8.2(a)			
Maximum Peak Output Power	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)"		See data.	Complied	Conducted
	IC: RSS-Gen 4.8	IC: RSS-210 A8.4(4)			
Power Density	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)"	FCC: Section 15.247 (e)		Complied	Conducted
	IC: -	IC: RSS-210 A8.2(b)			
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)	0.5dB 456.016MHz, QP, Vert.	Complied	Conducted/ Radiated
	IC: RSS-Gen 4.9	IC: RSS-210 A8.5 RSS-Gen 7.2.3			

^{*} In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

The stable voltage (DC3.3V) is constantly supplied to the EUT by the end product.

Therefore, this 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.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied	IC: RSS-Gen	IC: RSS-Gen 4.6.1	N/A	-	Conducted
Bandwidth	4.6.1				

Other than 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.

Test room	Conducted emission
(semi-	(<u>+</u> dB)
anechoic	150kHz-30MHz
chamber)	
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

Test room		Radiated emission					
(semi-		(3m*)((<u>+</u> dB)		(1m*)	$(0.5\text{m}^*)(\underline{+}\text{dB})$	
anechoic	9kHz	30MHz	300MHz	1GHz	10GHz	18GHz	26.5GHz
chamber)	-30MHz	-300MHz	-1GHz	-10GHz	-18GHz	-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

^{*3}m/1m/0.5m = Measurement distance

Power meter (<u>+</u> dB)					
Below 1GHz	Above 1GHz				
0.7dB	1.5dB				

Antenna terminal conducted emission			Antenna terminal	Channel power	
and Power density (<u>+</u> dB)			(<u>+</u> d	(<u>+</u> dB)	
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.5dB	1.7dB	2.8dB	2.8dB	2.9dB	2.6dB

<u>Conducted Emission test</u>
The data listed in this test report has enough margin, more than the site margin.

Radiated emission test (3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test Location

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

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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)	5.5Mbps, PN9
IEEE 802.11g (11g)	36Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 0, 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: 17dBm

11g: 13dBm 11n: 12dBm mfgtest

Software : mfgtest *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
Conducted Emission	11g Tx *1)	2412MHz
Spurious Emission (Conducted)		
Spurious Emission (Radiated below		
1GHz)		
Spurious Emission (Radiated above	11b Tx	2412MHz
1GHz)	11g Tx *2)	2437MHz
		2462MHz
Spurious Emission (Band Edge)	11b Tx	2412MHz
	11g Tx	2462MHz
	11n-20 Tx	
6dB Bandwidth	11b Tx	2412MHz
Maximum Peak Output Power	11g Tx	2437MHz
Power Density	11n-20 Tx	2462MHz
99% Occupied Bandwidth		

^{*1)} The mode was tested as a representative, because it had the highest power at antenna terminal test.

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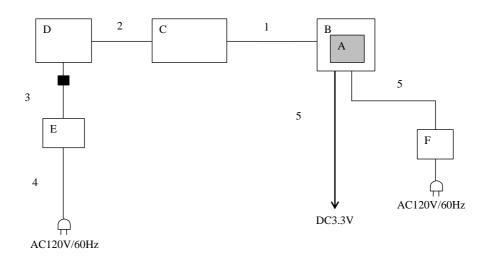
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^{*2)} Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the higher peak output power.

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4.2 Configuration and peripherals



: Standard Ferrite Core

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	TypeYD	001 for AT* 002 for CE/RE*	MURATA	EUT
В	Jig board	-	-	-	-
С	Jig board	-	-	-	-
Ъ	Laptop PC	T60	L3PM301	Lenovo	For CE*
D	Laptop PC	FMV-C8230	R7305017	Fujitsu	For RE/AT*
Е	AC Adaptor	92P1160	11S92P1160Z1ZBG H6B6DMX	Lenovo	For CE*
	AC Adaptor	FMV-AC319	05904888A	Fujitsu	For RE/AT*
F	DC Power Supply	PW18-1.3AT	08016530	KENWOOD TMI	For CE*

List of cables used

No.	Name	Length (m)	Shi	Remarks	
			Cable	Connector	
1	Signal Cable	0.1	Unshielded	Unshielded	-
2	USB Cable	1.5	Shielded	Shielded	-
3	DC Cable	1.9 for CE* 1.8 for RE/AT*	Unshielded	Unshielded	-
4	AC Cable	1.0 for CE* 1.9 for RE/AT*	Unshielded	Unshielded	-
5	DC Cable	2.8	Unshielded	Unshielded	-
6	AC Cable	2.2	Unshielded	Unshielded	-

^{*}CE: Conducted Emission, RE: Radiated Emission, AT: Antenna Terminal Conducted Test

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

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector : QP and CISPR AV

Measurement range : 0.15-30MHz Test data : APPENDIX

Test result : Pass

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SECTION 6: 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	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	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 Analy	zer	Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz	Average Power Method:	RBW: 100kHz
		VBW: 3MHz	WLAN: 12.2.5.1/12.2.5.2	VBW: 300kHz (S/A)
			RBW: 1MHz	
			VBW: 3MHz	
			Detector:	
			Power Averaging (RMS)	
			Trace:	
			Free Run	
Test Distance	3m	3m (below 10GI	Hz),	3m (below 10GHz),
		1m *2) (above 1	0GHz)	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

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold*1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3kHz	10kHz	1.339sec 2.488sec	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
Emission *4)	150kHz to 30MHz	9.1kHz	27kHz				

^{*1)} The measurement was performed with Max Hold since the duty cycle was not 100%.

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX

Test result : Pass

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^{*2)} Reference data

^{*3)} Section 10.2 Method PKPSD (peak PSD) of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operatin Under §15.247 (Issued on April 9, 2013)".

^{*4)} In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

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APPENDIX 1: Data of EMI test

Conducted Emission

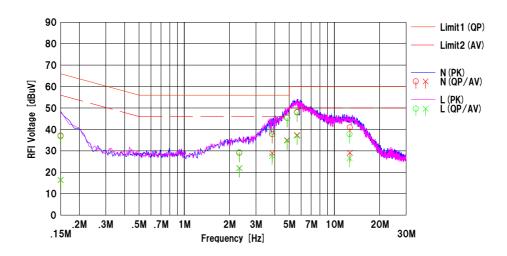
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber Date: 2014/01/17

| Report No. | 10124906H | Power | AC 120V / 60Hz | Temp./Humi. | 22deg. C / 33% RH | Engineer | Kazuya Yoshioka

Mode / Remarks : Tx 11g 2412MHz 36Mbps

Limit1 : FCC15.207 QP Limit2 : FCC15.207 AV



	_	Rea	ding		Res	ults	Lin	nit	Mar	gin		
No.	Freq.	<qp></qp>	<av></av>	C.Fac	<qp></qp>	<av></av>	<qp></qp>	<av></av>	<qp></qp>	<av></av>	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	23.9	3.2	13.2	37.1	16.4	66.0	56.0	28.9	39.6	N	
2	2.32869	15.6	8.4	13.5	29.1	21.9	56.0	46.0	26.9	24.1	N	
3	3.85160	24.0	15.1	13.8	37.8	28.9	56.0	46.0	18.2	17.1	N	
4	4.83943	31.5	21.1	13.9	45.4	35.0		46.0	10.6			
5	5.64335	33.9	23.4	14.0	47.9	37.4	60.0	50.0	12.1	12.6		
6	12.67043	26.3	14.5	14.6	40.9	29.1	60.0	50.0	19.1	20.9		
7	0.15000	23.6	3.2	13.2	36.8	16.4	66.0	56.0	29.2	39.6		
8	2.32945	15.8	8.5	13.5	29.3		56.0	46.0	26.7	24.0		
9	3.84402	25.2	13.8	13.8	39.0		56.0	46.0	17.0	18.4	L	
10	4.84157	31.5	20.8	13.9	45.4	34.7	56.0	46.0	10.6	11.3	L	
11	5.63745	34.2	23.0	14.0	48.2	37.0	60.0	50.0	11.8	13.0	L	
12	12.61023	23.2	12.0	14.6	37.8	26.6	60.0	50.0	22.2	23.4	L	

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F (LISN LOSS+ATT LOSS +CABLE LOSS) Except for the above table : adequate margin data below the limits.

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6dB Bandwidth

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura

Mode Tx

11b

110		
Frequency	6dB Bandwidth	Limit
[MHz]	[MHz]	[kHz]
2412	7.910	>500
2437	8.460	>500
2462	8.005	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.702	>500
2437	15.432	>500
2462	15.717	>500

11n-20

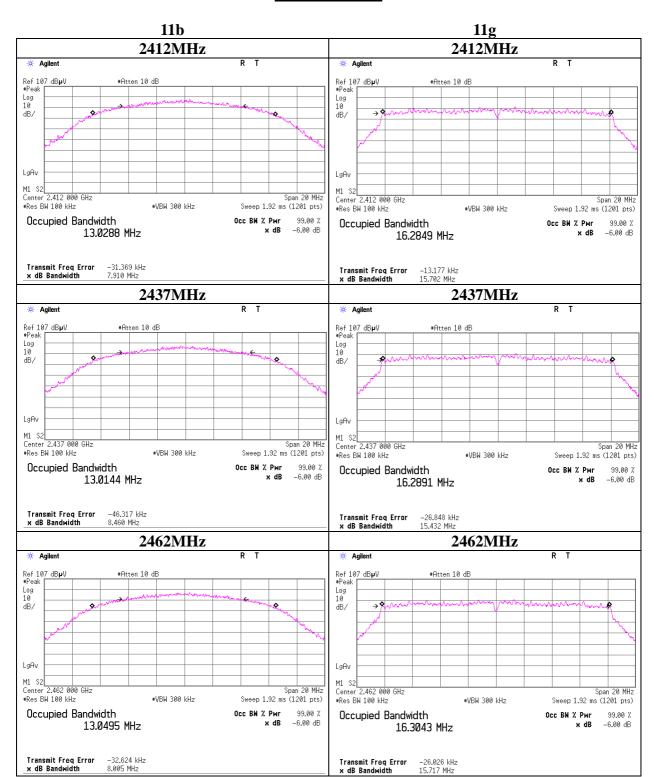
Frequency	6dB Bandwidth	Limit
[MHz]	[MHz]	[kHz]
2412	15.983	>500
2437	15.127	>500
2462	15.098	>500

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6dB Bandwidth



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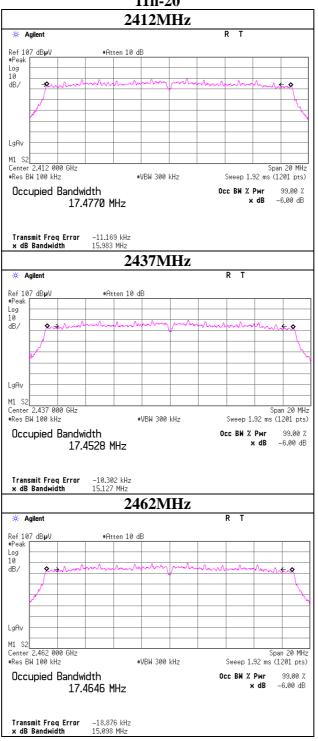
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6dB Bandwidth

11n-20



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Maximum Peak Output Power

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura

Mode 11b Tx

Freq.	Reading	Cable	Atten.	Result		Limit		Margin
		Loss						
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	7.78	1.77	10.01	19.56	90.36	30.00	1000	10.44
2437	7.58	1.77	10.01	19.36	86.30	30.00	1000	10.64
2462	7.66	1.78	10.01	19.45	88.10	30.00	1000	10.55

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	7.51	
2	7.56	
5.5	7.58	*
11	7.53	

^{*:} Worst Rate

All comparizon were carried out on same frequency and measurement factors.

UL Japan, Inc. Head Office EMC Lab.

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Maximum Peak Output Power

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura

Mode 11g Tx

Freq.	Reading	Cable	Atten.	Result		Limit		Margin
		Loss						
[MHz]	[dBm]	[dB]	[dB]	[dBm] [mW]		[dBm]	[mW]	[dB]
2412	11.95	1.77	10.01	23.73	236.05	30.00	1000	6.27
2437	11.74	1.77	10.01	23.52	224.91	30.00	1000	6.48
2462	11.41	1.78	10.01	23.20	208.93	30.00	1000	6.80

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

2437MHz

Rate	Reading	Remark
5.6.3	. ID 3	
[Mbps]	[dBm]	
6	11.41	
9	11.35	
12	11.13	
18	11.20	
24	11.10	
36	11.74	*
48	11.36	
54	11.02	

^{*:} Worst Rate

All comparison were carried out on same frequency and measurement factors.

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Maximum Peak Output Power

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura

Mode 11n-20 Tx

Freq.	Reading	Cable	Atten.	Result		Liı	Margin	
		Loss						
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm] [mW]		[dB]
2412	11.28	1.77	10.01	23.06	202.30	30.00	1000	6.94
2437	11.21	1.77	10.01	22.99	199.07	30.00	1000	7.01
2462	10.54	1.78	10.01	22.33	171.00	30.00	1000	7.67

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

2437MHz

Rate	Reading	Remark
[MCS]	[dBm]	
0	10.64	
1	11.21	*
2	10.44	
3	10.74	
4	10.51	
5	10.36	
6	10.61	
7	10.61	

^{*:} Worst Rate

All comparison were carried out on same frequency and measurement factors.

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Average Output Power

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura
Mode 11b/g/n-20 Tx

[AV]

11b **5.5Mbps**

Freq.	Reading	Cable	Atten.	Result		Liı	mit	Margin
		Loss						
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.24	1.77	10.01	17.02	50.35	30.00	1000	12.98
2437	4.98	1.77	10.01	16.76	47.42	30.00	1000	13.24
2462	5.02	1.78	10.01	16.81	47.97	30.00	1000	13.19

11g **36Mbps**

I	Freq.	Reading	Cable	Atten.	Re	sult	Liı	Margin	
	-		Loss					_	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
ı	2412	1.15	1.77	10.01	12.93	19.63	30.00	1000	17.07
Ī	2437	1.04	1.77	10.01	12.82	19.14	30.00	1000	17.18
	2462	0.89	1.78	10.01	12.68	18.54	30.00	1000	17.32

11n-20 MCS1

Ī	Freq.	Reading	Cable	Atten.	Result		Liı	Margin	
			Loss						
L	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
Ī	2412	0.16	1.77	10.01	11.94	15.63	30.00	1000	18.06
Ī	2437	0.03	1.77	10.01	11.81	15.17	30.00	1000	18.19
I	2462	0.01	1.78	10.01	11.80	15.14	30.00	1000	18.20

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H
Date 01/16/2014
Temperature/ Humidity 23 deg.C./ 35%RH
Engineer Takumi Shimada
Mode 11b Tx 2412MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2390.000	PK	58.1	26.8	3.0	35.7	52.2	73.9	21.7	
Hori	4824.000	PK	45.0	30.7	5.4	34.9	46.2	73.9	27.7	
Hori	7236.000	PK	43.2	35.6	6.5	34.9	50.4	73.9	23.5	
Hori	9648.000	PK	43.7	38.2	7.2	35.4	53.7	73.9	20.2	
Hori	2390.000	AV	48.6	26.8	3.0	35.7	42.7	53.9	11.2	
Hori	4824.000	AV	34.8	30.7	5.4	34.9	36.0	53.9	17.9	
Hori	7236.000	AV	34.0	35.6	6.5	34.9	41.2	53.9	12.7	
Hori	9648.000	AV	34.8	38.2	7.2	35.4	44.8	53.9	9.1	
Vert	2390.000	PK	55.3	26.8	3.0	35.7	49.4	73.9	24.5	
Vert	4824.000	PK	45.6	30.7	5.4	34.9	46.8	73.9	27.1	
Vert	7236.000	PK	42.8	35.6	6.5	34.9	50.0	73.9	23.9	
Vert	9648.000	PK	44.6	38.2	7.2	35.4	54.6	73.9	19.3	
Vert	2390.000	AV	46.7	26.8	3.0	35.7	40.8	53.9	13.1	
Vert	4824.000	AV	35.5	30.7	5.4	34.9	36.7	53.9	17.2	
Vert	7236.000	AV	34.1	35.6	6.5	34.9	41.3	53.9	12.6	
Vert	9648.000	AV	34.8	38.2	7.2	35.4	44.8	53.9	9.1	

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

 $\begin{array}{lll} \mbox{Distance factor:} & 10\mbox{GHz-}26.5\mbox{GHz} & 20\mbox{log}(3.0\mbox{m/}1.0\mbox{m})=9.5\mbox{dB} \\ 26.5\mbox{GHz-}40\mbox{GHz} & 20\mbox{log}(3.0\mbox{m/}0.5\mbox{m})=15.6\mbox{dB} \end{array}$

20dBc Data Sheet

20abe Da	oube Data Siect													
Polarity	Frequency	Detector	Reading	Ant	Loss	Gain	Result	Limit	Margin	Remark				
				Factor										
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]					
Hori	2412.000	PK	106.8	26.8	3.0	35.7	100.9	-	-	Carrier				
Hori	2400.000	PK	63.1	26.8	3.0	35.7	57.2	80.9	23.7					
Vert	2412.000	PK	104.1	26.8	3.0	35.7	98.2	-	-	Carrier				
Vert	2400.000	PK	63.0	26.8	3.0	35.7	57.1	78.2	21.1					

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

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H
Date 01/16/2014
Temperature/ Humidity 23 deg. C./ 35% RH
Engineer Takumi Shimada
Mode 11b Tx 2437MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	_	
Hori	4874.000	PK	44.6	30.8	5.4	34.9	45.9	73.9	28.0	
Hori	7311.000	PK	42.1	35.7	6.6	34.9	49.5	73.9	24.4	
Hori	9748.000	PK	43.8	38.4	7.3	35.4	54.1	73.9	19.8	
Hori	4874.000	AV	34.6	30.8	5.4	34.9	35.9	53.9	18.0	
Hori	7311.000	AV	34.0	35.7	6.6	34.9	41.4	53.9	12.5	
Hori	9748.000	AV	34.9	38.4	7.3	35.4	45.2	53.9	8.7	
Vert	4874.000	PK	46.5	30.8	5.4	34.9	47.8	73.9	26.1	
Vert	7311.000	PK	42.9	35.7	6.6	34.9	50.3	73.9	23.6	
Vert	9748.000	PK	43.8	38.4	7.3	35.4	54.1	73.9	19.8	
Vert	4874.000	AV	35.9	30.8	5.4	34.9	37.2	53.9	16.7	
Vert	7311.000	AV	33.8	35.7	6.6	34.9	41.2	53.9	12.7	
Vert	9748.000	AV	35.0	38.4	7.3	35.4	45.3	53.9	8.6	

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

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

 $26.5 GHz - 40 GHz \qquad 20 log (3.0 m/0.5 m) \!\!=\!\! 15.6 dB$

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H
Date 01/16/2014
Temperature/ Humidity 23 deg.C./ 35%RH
Engineer Takumi Shimada
Mode 11b Tx 2462MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
-	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2483.500	PK	52.2	26.7	3.1	35.7	46.3	73.9	27.6	
Hori	4924.000	PK	42.8	31.0	5.4	34.9	44.3	73.9	29.6	
Hori	7386.000	PK	44.2	35.8	6.6	34.9	51.7	73.9	22.2	
Hori	9848.000	PK	43.5	38.6	7.3	35.4	54.0	73.9	19.9	
Hori	2483.500	AV	43.6	26.7	3.1	35.7	37.7	53.9	16.2	
Hori	4924.000	AV	33.8	31.0	5.4	34.9	35.3	53.9	18.6	
Hori	7386.000	AV	34.1	35.8	6.6	34.9	41.6	53.9	12.3	
Hori	9848.000	AV	34.3	38.6	7.3	35.4	44.8	53.9	9.1	
Vert	2483.500	PK	51.9	26.7	3.1	35.7	46.0	73.9	27.9	
Vert	4924.000	PK	44.5	31.0	5.4	34.9	46.0	73.9	27.9	
Vert	7386.000	PK	43.2	35.8	6.6	34.9	50.7	73.9	23.2	
Vert	9848.000	PK	43.7	38.6	7.3	35.4	54.2	73.9	19.7	
Vert	2483.500	AV	42.4	26.7	3.1	35.7	36.5	53.9	17.4	
Vert	4924.000	AV	34.4	31.0	5.4	34.9	35.9	53.9	18.0	
Vert	7386.000	AV	34.5	35.8	6.6	34.9	42.0	53.9	11.9	
Vert	9848.000	AV	34.5	38.6	7.3	35.4	45.0	53.9	8.9	

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

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

26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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

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Issued date : January 24, 2014 Revised date : January 28, 2014 FCC ID : VPYLBYD

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H

Date 01/16/2014 01/17/2014 22 deg.C./ 33%RH Kazuya Yoshioka Temperature/ Humidity 23 deg.C./ 35%RH Takumi Shimada Engineer

(Above 1GHz) (Below 1GHz)

Mode 11g Tx 2412MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	120.002	QP	36.9	12.9	7.6	28.4	-	29.0	43.5	14.5	
Hori	240.009	QP	32.1	17.0	8.4	27.7	-	29.8	46.0	16.2	
Hori	336.010	QP	41.6	15.4	9.0	27.9	-	38.1	46.0	7.9	
Hori	360.012	QP	41.9	16.1	9.1	28.1	-	39.0	46.0	7.0	
Hori	432.020	QP	36.8	17.6	9.4	28.5	-	35.3	46.0	10.7	
Hori	456.012	QP	40.4	17.8	9.6	28.6	-	39.2	46.0	6.8	
Hori	2390.000	PK	69.8	26.8	3.0	35.7	-	63.9	73.9	10.0	
Hori	4824.000	PK	42.7	30.7	5.4	34.9	-	43.9	73.9	30.0	
Hori	7236.000	PK	43.4	35.6	6.5	34.9	-	50.6	73.9	23.3	
Hori	9648.000	PK	44.5	38.2	7.2	35.4	-	54.5	73.9	19.4	
Hori	2390.000	AV	53.3	26.8	3.0	35.7	0.3	47.7	53.9	6.2	*1)
Hori	4824.000	AV	33.6	30.7	5.4	34.9	0.3	35.1	53.9	18.8	
Hori	7236.000	AV	34.0	35.6	6.5	34.9	0.3	41.5	53.9	12.4	
Hori	9648.000	AV	34.8	38.2	7.2	35.4	0.3	45.1	53.9	8.8	
Vert	120.001	QP	40.5	12.9	7.6	28.4	-	32.6	43.5	10.9	
Vert	240.009	QP	38.3	17.0	8.4	27.7	-	36.0	46.0	10.0	
Vert	335.998	QP	39.4	15.4	9.0	27.9	-	35.9	46.0	10.1	
Vert	360.012	QP	40.4	16.1	9.1	28.1	-	37.5	46.0	8.5	
Vert	432.016	QP	41.0	17.6	9.4	28.5	-	39.5	46.0	6.5	
Vert	456.016	QP	46.7	17.8	9.6	28.6	-	45.5	46.0	0.5	
Vert	2390.000	PK	68.6	26.8	3.0	35.7	-	62.7	73.9	11.2	
Vert	4824.000	PK	42.6	30.7	5.4	34.9	-	43.8	73.9	30.1	
Vert	7236.000	PK	42.5	35.6	6.5	34.9	-	49.7	73.9	24.2	
Vert	9648.000	PK	43.9	38.2	7.2	35.4	-	53.9	73.9	20.0	
Vert	2390.000	AV	52.7	26.8	3.0	35.7	0.3	47.1	53.9	6.8	*1)
Vert	4824.000	AV	33.6	30.7	5.4	34.9	0.3	35.1	53.9	18.8	
Vert	7236.000	AV	34.1	35.6	6.5	34.9	0.3	41.6	53.9	12.3	
Vert	9648.000	AV	35.0	38.2	7.2	35.4	0.3	45.3	53.9	8.6	

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

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

*)1 Not out of band emission (Leakage Power)

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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

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: January 24, 2014 **Issued date** Revised date : January 28, 2014 FCC ID : VPYLBYD

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H Date 01/16/2014 Temperature/ Humidity 23 deg.C./ 35%RH Engineer Takumi Shimada Mode 11g Tx 2437MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	4874.000	PK	43.3	30.8	5.4	34.9	-	44.6	73.9	29.3	
Hori	7311.000	PK	43.0	35.7	6.6	34.9	-	50.4	73.9	23.5	
Hori	9748.000	PK	44.7	38.4	7.3	35.4	-	55.0	73.9	18.9	
Hori	4874.000	AV	33.7	30.8	5.4	34.9	0.3	35.3	53.9	18.6	
Hori	7311.000	AV	33.8	35.7	6.6	34.9	0.3	41.5	53.9	12.4	
Hori	9748.000	AV	35.0	38.4	7.3	35.4	0.3	45.6	53.9	8.3	
Vert	4874.000	PK	42.6	30.8	5.4	34.9	-	43.9	73.9	30.0	
Vert	7311.000	PK	43.1	35.7	6.6	34.9	-	50.5	73.9	23.4	
Vert	9748.000	PK	44.8	38.4	7.3	35.4	-	55.1	73.9	18.8	
Vert	4874.000	AV	33.6	30.8	5.4	34.9	0.3	35.2	53.9	18.7	
Vert	7311.000	AV	33.8	35.7	6.6	34.9	0.3	41.5	53.9	12.4	
Vert	9748.000	AV	35.1	38.4	7.3	35.4	0.3	45.7	53.9	8.2	

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).

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

UL Japan, Inc. **Head Office EMC Lab.**

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Issued date : January 24, 2014 Revised date : January 28, 2014 FCC ID : VPYLBYD

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H
Date 01/16/2014
Temperature/ Humidity 23 deg.C./ 35%RH
Engineer Takumi Shimada
Mode 11g Tx 2462MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2483.500	PK	70.4	26.7	3.1	35.7	-	64.5	73.9	9.4	
Hori	4924.000	PK	42.3	31.0	5.4	34.9	-	43.8	73.9	30.1	
Hori	7386.000	PK	44.0	35.8	6.6	34.9	-	51.5	73.9	22.4	
Hori	9848.000	PK	43.7	38.6	7.3	35.4	-	54.2	73.9	19.7	
Hori	2483.500	AV	56.0	26.7	3.1	35.7	0.3	50.4	53.9	3.5	*1)
Hori	4924.000	AV	33.3	31.0	5.4	34.9	0.3	35.1	53.9	18.8	
Hori	7386.000	AV	34.4	35.8	6.6	34.9	0.3	42.2	53.9	11.7	
Hori	9848.000	AV	34.6	38.6	7.3	35.4	0.3	45.4	53.9	8.5	
Vert	2483.500	PK	76.4	26.7	3.1	35.7	-	70.5	73.9	3.4	
Vert	4924.000	PK	42.3	31.0	5.4	34.9	-	43.8	73.9	30.1	
Vert	7386.000	PK	43.8	35.8	6.6	34.9	-	51.3	73.9	22.6	
Vert	9848.000	PK	43.6	38.6	7.3	35.4	-	54.1	73.9	19.8	
Vert	2483.500	AV	56.6	26.7	3.1	35.7	0.3	51.0	53.9	2.9	*1)
Vert	4924.000	AV	33.4	31.0	5.4	34.9	0.3	35.2	53.9	18.7	
Vert	7386.000	AV	34.4	35.8	6.6	34.9	0.3	42.2	53.9	11.7	
Vert	9848.000	AV	34.9	38.6	7.3	35.4	0.3	45.7	53.9	8.2	

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

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

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

^{*)1} Not out of band emission (Leakage Power)

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H
Date 01/16/2014
Temperature/ Humidity 23 deg.C./ 35%RH
Engineer Takumi Shimada
Mode 11n-20 Tx 2412MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2390.000	PK	67.6	26.8	3.0	35.7	-	61.7	73.9	12.2	
Hori	2390.000	AV	51.6	26.8	3.0	35.7	0.1	45.8	53.9	8.1	*1)
Vert	2390.000	PK	65.8	26.8	3.0	35.7	-	59.9	73.9	14.0	
Vert	2390.000	AV	50.8	26.8	3.0	35.7	0.1	45.0	53.9	8.9	*1)

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

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant	Loss	Gain	Result	Limit	Margin	Remark
				Factor						
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2412.000	PK	99.7	26.8	3.0	35.7	93.8	-	-	Carrier
Hori	2400.000	PK	63.6	26.8	3.0	35.7	57.7	73.8	16.1	
Vert	2412.000	PK	97.4	26.8	3.0	35.7	91.5	-	-	Carrier
Vert	2400.000	PK	62.4	26.8	3.0	35.7	56.5	71.5	15.0	

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

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

^{*)1} Not out of band emission (Leakage Power)

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber

Report No. 10124906H
Date 01/16/2014
Temperature/ Humidity 23 deg.C./ 35%RH
Engineer Takumi Shimada
Mode 11n-20 Tx 2462MHz

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2483.500	PK	64.6	26.7	3.1	35.7	•	58.7	73.9	15.2	
Hori	2483.500	AV	51.1	26.7	3.1	35.7	0.1	45.3	53.9	8.6	*1)
Vert	2483.500	PK	65.3	26.7	3.1	35.7	-	59.4	73.9	14.5	
Vert	2483.500	AV	50.2	26.7	3.1	35.7	0.1	44.4	53.9	9.5	*1)

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

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

^{*)1} Not out of band emission (Leakage Power)

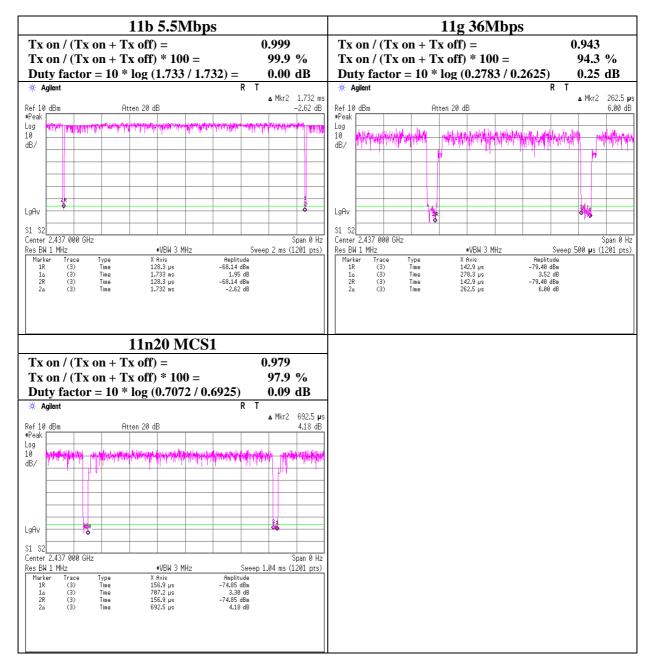
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Burst rate confirmation

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura
Mode 11b/g/n-20 Tx



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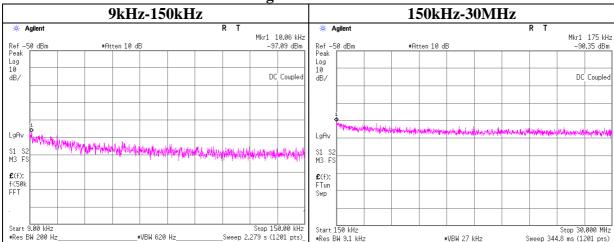
Issued date : January 24, 2014
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Conducted Spurious Emission

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura
Mode 11g Tx 2412MHz

11g Tx 2412MHz



Fre	equency	Reading	Cable	Attenator	Antenna	EIRP	Distance	Ground	E	Limit
			Loss		Gain			bounce	(field strength)	
	kHz]	[dBm]	[dB]	[dB]	[dBi]	[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]
	10.06	-97.1	0.01	20.0	-1.6	-78.7	300.0	6.0	-17.4	47.6
	175	-90.4	0.01	20.0	-1.6	-71.9	300.0	6.0	-10.7	22.7

E=EIRP-20log(D)+Ground bounce +104.8[dBuV/m] EIRP=Reading+Cable Loss+Attenator+Antenna Gain

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Power Density

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura
Mode 11b/g/n-20 Tx

11b

110						
Freq.	Reading	Cable	Atten.	Result	Limit	Margin
		Loss				
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-27.58	1.77	19.96	-5.85	8.00	13.85
2437.00	-27.76	1.77	19.96	-6.03	8.00	14.03
2462.00	-28.29	1.78	19.96	-6.55	8.00	14.55

11g

Freq.	Reading	Cable	Atten.	Result	Limit	Margin
		Loss				
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-33.27	1.77	19.96	-11.54	8.00	19.54
2437.00	-33.58	1.77	19.96	-11.85	8.00	19.85
2462.00	-32.03	1.78	19.96	-10.29	8.00	18.29

11n-20

Freq.	Reading	Cable	Atten.	Result	Limit	Margin
		Loss				
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-35.20	1.77	19.96	-13.47	8.00	21.47
2437.00	-34.13	1.77	19.96	-12.40	8.00	20.40
2462.00	-34.76	1.78	19.96	-13.02	8.00	21.02

Sample Calculation:

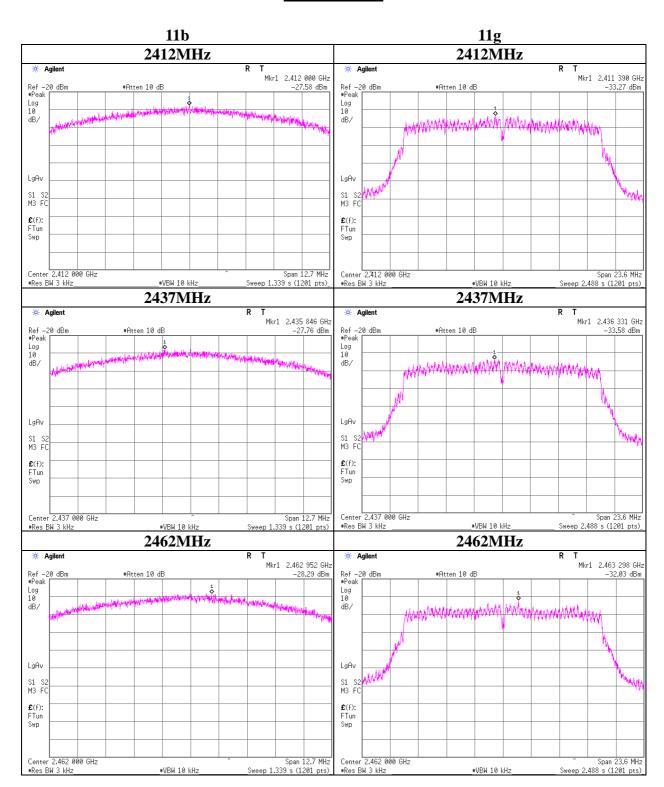
 $Result = Reading + Cable\ Loss\ (including\ the\ cable(s)\ customer\ supplied) + Attenuator$

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Power Density



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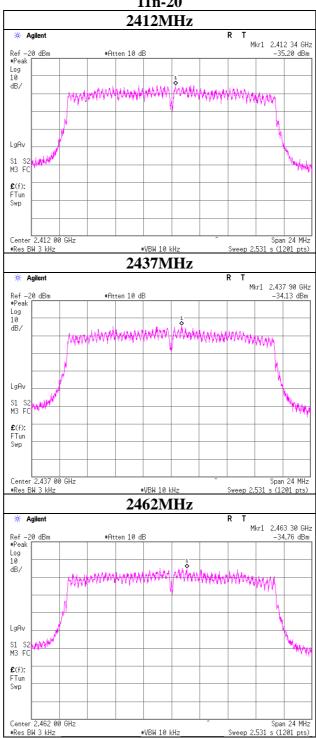
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Power Density

11n-20



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99%Occupied Bandwidth

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura
Mode 11g Tx 2412MHz

11b **11g** 2412MHz 2412MHz Ref 107 dBµV Ref 107 dBpV •Peak #Atten 10 dE Atten 10 dB Log 10 dB/ Log 10 dB/ M1 \$2 Center 2.412 00 *Res BW 510 kHz Center 2.412 00 *Res BN 510 kHz *VBW 1.5 MHz Sweep 1.04 ms (1201 pts) *VBW 1.5 MHz Sweep 1.04 ms (1201 pts) Occ BW % Pwr × dB Occ BN Z Pwr 99.00 Z x dB -6.00 dB Occupied Bandwidth 99.00 % Occupied Bandwidth 99.00 % 13.0778 MHz 16.7126 MHz 2437MHz 2437MHz * Agilent * Agilent Ref 107 dBpV Log 10 dB/ M1 S2 Center 2.437 00 GHz •Res BW 510 kHz 2.437 ØB GH Span 50 MHz (Sweep 1.04 ms (1201 pts Span 50 MHz Sweep 1.04 ms (1201 pts) Occupied Bandwidth Occupied Bandwidth 0cc ВМ % Рыг х dB Осс ВМ % Рыг х dB 99.00 X 99.00 % 13.0397 MHz -6.00 dB -6.00 dB 16.6191 MHz Transmit Freq Error -60.318 kHz Transmit Freq Error × dB Bandwidth -36.238 kHz 2462MHz 2462MHz LgAv LaAv Center 2.462 00 *Res BW 510 kHz 2.462 00 GH n 50 MH: *Res BW 510 kHz *VBW 1.5 MHz Sweep 1.04 ms (1201 pts) *VBW 1.5 MHz Sweep 1.04 ms (1201 pts) Occ BW % PHr × dB Occ BN % Pwr 99.00 % x dB -6.00 dB Occupied Bandwidth 99.00 Z Occupied Bandwidth 13.0306 MHz -6.00 dB 16.7223 MHz Transmit Freq Error -50.985 kHz x dB Bandwidth 8.591 MHz Transmit Freq Error -25,812 kHz x dB Bandwidth 15,736 MHz

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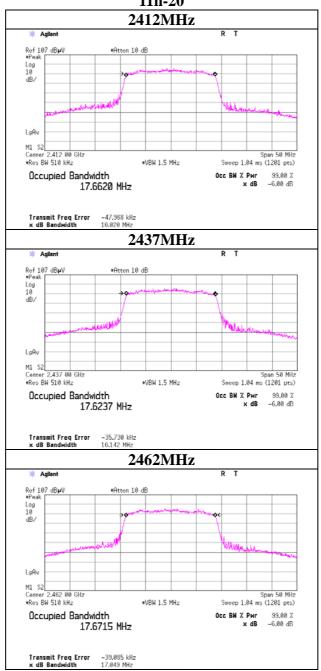
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99% Occupied Bandwidth

Test place Head Office EMC Lab. No.6 Measurement Room

Report No. 10124906H
Date 12/25/2013
Temperature/ Humidity 20 deg.C./ 31%
Engineer Keisuke Kawamura
Mode 11g Tx 2412MHz

11n-20



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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2013/02/26 * 12
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	AT	2013/11/11 * 12
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2013/10/18 * 12
MAT-22	Attenuator(10dB) 1- 18GHz	Orient Microwave	BX10-0476-00	-	AT	2013/03/21 * 12
MAT-21	Attenuator(20dB)(above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-120	901247	AT	2014/01/15 * 12
MPM-13	Power Meter	Anritsu	ML2495A	0824014	AT	2013/11/15 * 12
MPSE-18	Power sensor	Anritsu	MA2411B	0738174	AT	2013/11/15 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE/CE	2013/06/14 * 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
MHA-02	Horn Antenna 18- 26.5GHz	EMCO	3160-09	1265	RE	2013/02/15 * 12
MHF-26	High Pass Filter 3.5- 18.0GHz	UL Japan	HPF SELECTOR	002	RE	2013/09/01 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2013/06/11 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2013/01/07 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(AE)	2013/01/07 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2013/01/21 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D- 2W(5m)/5D- 2W(0.8m)/5D- 2W(1m)	-	CE	2013/02/06 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/09 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: CE: Conducted Emission

RE: Radiated Emission

AT: Antenna Terminal Conducted test

UL Japan, Inc. **Head Office EMC Lab.**

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