



RADIO TEST REPORT


Test Report No. : 10009666H-A-R2

Applicant : Murata Manufacturing Company, Ltd.
Type of Equipment : Communication Module
Model No. : LBWA1U5YR1
FCC ID : VPYLBYR650
Test regulation : FCC Part 15 Subpart C: 2012
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 10009666H-A-R1. 10009666H-A-R1 is replaced with this report.

Date of test: April 22 to May 2, 2013

Representative test engineer:


Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by:


Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

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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. : LBWA1U5YR1
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0V
Receipt Date of Sample : April 22, 2013
Country of Mass-production : China
Condition of EUT : Production 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 WLAN Module which is installed in 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 (pattern) Antenna: -2.7dBi (Peak)	
Power Supply (inner)	DC 5.0V	
Operating temperature range	-10 to +50 deg. C.	

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 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

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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 23.2dB, 24.94906MHz, L AV 13.1dB, 24.94906MHz, L	Complied	-
6dB Bandwidth	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 8, 2013)" ----- IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 8, 2013)" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 8, 2013)" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 8, 2013)" ----- IC: RSS-Gen 4.9	FCC: Section 15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3	9.5dB 240.00MHz, QP, Vert.	Complied	Conducted/ 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.

FCC 15.31 (e)

This EUT provides stable voltage (DC3.3V) constantly to RF Module regardless of input voltage. 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 Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	N/A	-	Conducted

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 (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

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

Power meter (+dB)	
Below 1GHz	Above 1GHz
0.7dB	1.5dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+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

Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test (3m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

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	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	4.75 x 5.4 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 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 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)	6Mbps, 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: 10 Software: WMA version 00.09.0a07 *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 Spurious Emission (Conducted) Spurious Emission (Radiated below 1GHz)	11g Tx *1)	2462MHz
Spurious Emission (Radiated above 1GHz)	11b Tx 11g Tx *2)	2412MHz 2437MHz 2462MHz
Spurious Emission (Band Edge)	11b Tx 11g Tx 11n-20 Tx	2412MHz 2462MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *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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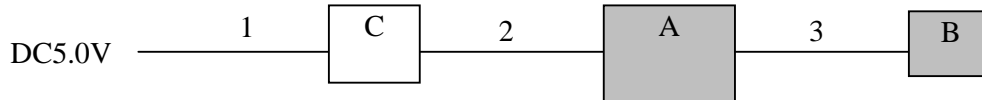
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4.2 Configuration and peripherals



* 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	LBWA1U5YR1	9999F6F97D	MURATA	EUT
B	Antenna	ANZM12G44SNK001TD1	001	MURATA	EUT
C	Jig	-	-	MURATA	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.5	Unshielded	Unshielded	-
2	Signal Cable	0.2	Unshielded	Unshielded	-
3	Antenna Cable	0.16	Unshielded	Unshielded	-

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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 8, 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 Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Average Power Method: Alternative 1 *2) RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m *1) (above 10GHz)		3m (below 10GHz), 1m *1) (above 10GHz)

*1) Distance Factor: $20 \times \log(3.0m/1.0m) = 9.5dB$

*2) Average Power Measurement was performed based on 6.0 & 12.2.4.1 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 8, 2013)"

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT (Module and Antenna) 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	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *1)	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	12.5MHz, 23.5MHz, 24.5MHz	3kHz	9.1kHz	Auto	Peak	Max Hold	Spectrum Analyzer *2)
Conducted Spurious Emission *3)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				

*1) Testing using an average detector was performed in order to confirm that the output power of the EUT met the exclusion limits stated in FCC Part 2

Section 2.1093 and FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET 65 and the EUT was exempt from RF exposure SAR

*2) Power spectral density was performed based on 10.2 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 8, 2013)".

*3) 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)

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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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

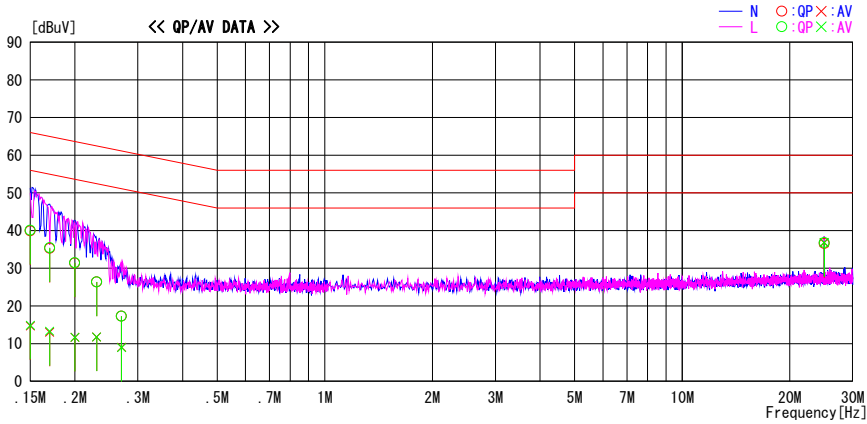
05/02/2013

Report No. : 10009666H

Temp./Humi. : 22deg. C / 37% RH
 Engineer : Takumi Shimada

Mode / Remarks : WLAN 11g Tx 2462MHz 6Mbps

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	26.7	-1.5	13.2	39.9	14.7	66.0	56.0	26.1	41.3	N	
0.17000	22.1	-0.1	13.2	35.3	13.1	65.0	55.0	29.7	41.9	N	
0.20000	18.2	-1.5	13.2	31.4	11.7	63.6	53.6	32.2	41.9	N	
0.23000	13.2	-1.4	13.2	26.4	11.8	62.4	52.4	36.0	40.6	N	
0.27000	4.1	-4.1	13.2	17.3	9.1	61.1	51.1	43.8	42.0	N	
24.94894	21.1	21.3	15.5	36.6	36.8	60.0	50.0	23.4	13.2	N	
0.15000	26.9	1.7	13.2	40.1	14.9	66.0	56.0	25.9	41.1	L	
0.17000	22.3	0.1	13.2	35.5	13.3	65.0	55.0	29.5	41.7	L	
0.20000	18.3	-1.5	13.2	31.5	11.7	63.6	53.6	32.1	41.9	L	
0.23000	13.2	-1.4	13.2	26.4	11.8	62.4	52.4	36.0	40.6	L	
0.27000	4.1	-4.2	13.2	17.3	9.0	61.1	51.1	43.8	42.1	L	
24.94906	21.3	21.4	15.5	36.8	36.9	60.0	50.0	23.2	13.1	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.7 Shielded Room / Semi
Report No. 10009666H
Date 04/22/2013
Temperature/ Humidity 21deg. C / 35% RH
Engineer Takumi Shimada
Mode Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	7.562	>500
2437	8.265	>500
2462	8.128	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.140	>500
2437	15.447	>500
2462	15.085	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.099	>500
2437	15.112	>500
2462	15.121	>500

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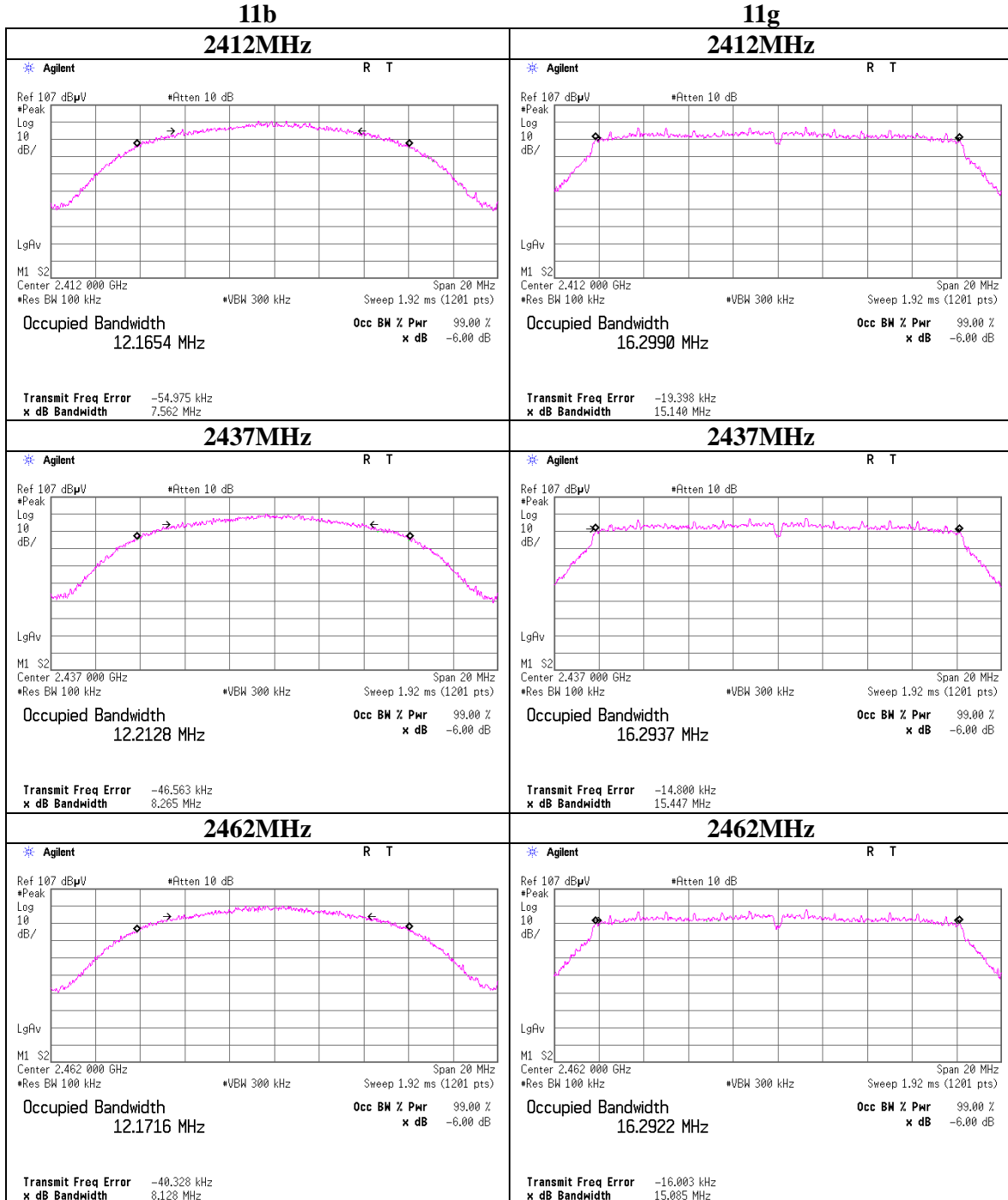
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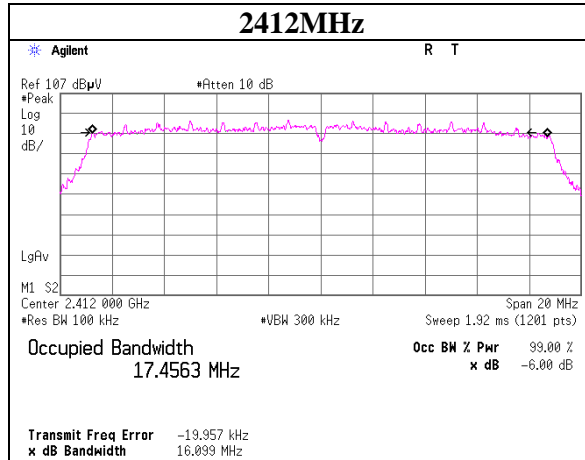
6dB Bandwidth



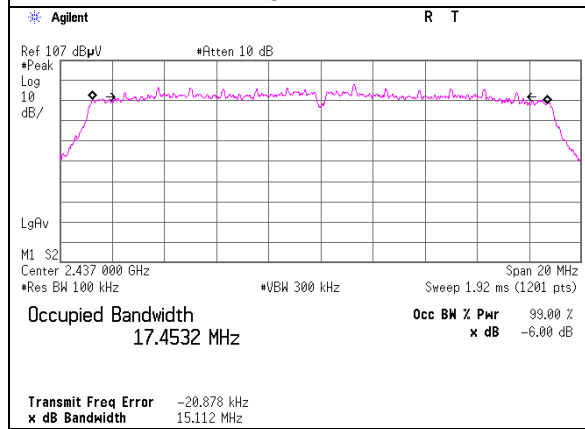
6dB Bandwidth

11n-20

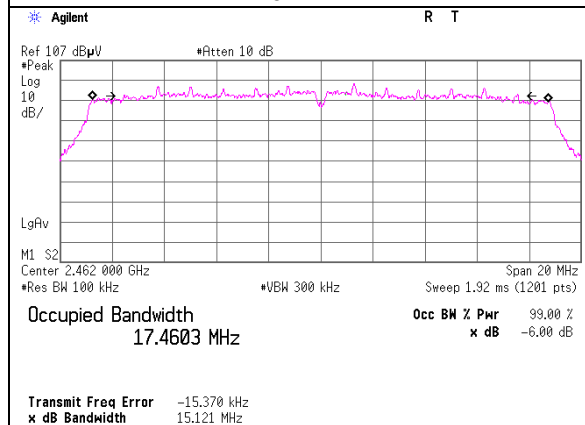
2412MHz



2437MHz



2462MHz



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Maximum Peak Output Power

Test place : Head Office EMC Lab. No.7 Shielded Room
 Report No. : 10009666H
 Date : 04/22/2013
 Temperature/ Humidity : 21deg. C / 35% RH
 Engineer : Takumi Shimada
 Mode : 11b Tx

11b 5.5Mbps

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	0.60	0.50	9.95	11.05	12.74	30.00	1000	18.95
2437	0.85	0.50	9.95	11.30	13.49	30.00	1000	18.70
2462	0.93	0.50	9.95	11.38	13.74	30.00	1000	18.62

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading PK [dBm]	Remark
1	0.79	
2	0.81	
5.5	0.85	*
11	0.84	

*: Worst Rate

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

UL Japan, Inc.

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Maximum Peak Output Power

Test place	Head Office EMC Lab. No.7 Measurement Room
Report No.	10009666H
Date	04/22/2013
Temperature/ Humidity	21deg. C / 35% RH
Engineer	Takumi Shimada
Mode	11g Tx

11g 6Mbps

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	7.86	0.50	9.95	18.31	67.76	30.00	1000	11.69
2437	7.55	0.50	9.95	18.00	63.10	30.00	1000	12.00
2462	8.02	0.50	9.95	18.47	70.31	30.00	1000	11.53

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading PK [dBm]	Remark
6	7.55	*
9	7.43	
12	7.12	
18	7.15	
24	7.16	
36	7.36	
48	7.29	
54	7.08	

*: Worst Rate

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

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Maximum Peak Output Power

Test place	Head Office EMC Lab. No.7 Measurement Room
Report No.	10009666H
Date	04/22/2013
Temperature/ Humidity	21deg. C / 35% RH
Engineer	Takumi Shimada
Mode	11n-20 Tx

11n-20 MCS0

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	7.66	0.50	9.95	18.11	64.71	30.00	1000	11.89
2437	7.25	0.50	9.95	17.70	58.88	30.00	1000	12.30
2462	7.53	0.50	9.95	17.98	62.81	30.00	1000	12.02

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

MCS Number	Reading PK [dBm]	Remark
0	7.25	*
1	7.23	
2	6.86	
3	6.95	
4	7.15	
5	6.88	
6	7.11	
7	7.20	

*: Worst Rate

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

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Maximum Average Output Power (Reference data for SAR testing)

IEEE802.11b 5.5Mbps

Ch	Frequency [MHz]	P/M Reading	Cable Loss [dB]	Atten. [dB]	Result	
		AVG			[dBm] AVG	[mW] AVG
1	2412	-2.45	0.50	9.95	8.00	6.31
6	2437	-2.32	0.50	9.95	8.13	6.50
11	2462	-2.17	0.50	9.95	8.28	6.73

Sample Calculation: Result = Reading + Cable Loss + Attenuator

2437MHz

11b Data Rate	Reading AVG [dBm]	Remark
1	-2.47	
2	-2.46	
5.5	-2.32	*
11	-2.41	

*: Worst Rate

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

IEEE802.11g 6Mbps

Ch	Frequency [MHz]	P/M Reading	Cable Loss [dB]	Atten. [dB]	Result	
		AVG			[dBm] AVG	[mW] AVG
1	2412	-2.31	0.50	9.95	8.14	6.52
6	2437	-2.58	0.50	9.95	7.87	6.12
11	2462	-2.04	0.50	9.95	8.41	6.93

Sample Calculation: Result = Reading + Cable Loss + Attenuator

2437MHz

11g Data Rate	Reading AVG [dBm]	Remark
6	-2.58	*
9	-2.66	
12	-2.67	
18	-2.74	
24	-2.74	
36	-2.84	
48	-2.96	
54	-2.99	

*: Worst Rate

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Maximum Average Output Power (Reference data for SAR testing)

IEEE802.11n-20 MCS0

Ch	Frequency [MHz]	P/M Reading	Cable Loss [dB]	Atten. [dB]	Result	
		AVG			[dBm] AVG	[mW] AVG
1	2412	-2.36	0.50	9.95	8.09	6.44
6	2437	-2.77	0.50	9.95	7.68	5.86
11	2462	-2.43	0.50	9.95	8.02	6.34

Sample Calculation: Result = Reading + Cable Loss + Attenuator

2437MHz

11n-20 MCS Number	Reading AVG [dBm]	Remark
0	-2.77	*
1	-2.86	
2	-2.89	
3	-2.95	
4	-2.99	
5	-3.02	
6	-3.11	
7	-3.14	

*: Worst MCS

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Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10009666H
Date : 05/01/2013 05/02/2013
Temperature/ Humidity : 21 deg. C / 35% RH 22 deg. C / 37% RH
Engineer : Takumi Shimada Takumi Shimada
(1-10GHz) (10-26.5GHz/30-1000MHz)
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	2251.940	PK	54.3	26.9	2.3	35.7	-	47.8	73.9	26.1	
Hori	2390.000	PK	45.0	26.8	2.4	35.7	-	38.5	73.9	35.4	
Hori	4824.000	PK	41.0	30.7	4.3	34.9	-	41.1	73.9	32.8	
Hori	7236.000	PK	41.5	35.6	4.9	34.9	-	47.1	73.9	26.8	
Hori	2251.940	AV	46.8	26.9	2.3	35.7	-	40.3	53.9	13.6	
Hori	2390.000	AV	37.2	26.8	2.4	35.7	-	30.7	53.9	23.2	
Hori	4824.000	AV	32.7	30.7	4.3	34.9	0.0	32.8	53.9	21.1	
Hori	7236.000	AV	33.0	35.6	4.9	34.9	0.0	38.6	53.9	15.3	
Vert	2251.940	PK	51.1	26.9	2.3	35.7	-	44.6	73.9	29.3	
Vert	2390.000	PK	43.1	26.8	2.4	35.7	-	36.6	73.9	37.3	
Vert	4824.000	PK	40.5	30.7	4.3	34.9	-	40.6	73.9	33.3	
Vert	7236.000	PK	40.8	35.6	4.9	34.9	-	46.4	73.9	27.5	
Vert	2251.940	AV	42.9	26.9	2.3	35.7	-	36.4	53.9	17.5	
Vert	2390.000	AV	34.4	26.8	2.4	35.7	-	27.9	53.9	26.0	
Vert	4824.000	AV	31.3	30.7	4.3	34.9	0.0	31.4	53.9	22.5	
Vert	7236.000	AV	31.6	35.6	4.9	34.9	0.0	37.2	53.9	16.7	

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

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	95.0	26.8	2.4	35.7	88.5	-	-	Carrier
Hori	2400.000	PK	40.6	26.8	2.4	35.7	34.1	68.5	34.4	
Vert	2412.000	PK	93.0	26.8	2.4	35.7	86.5	-	-	Carrier
Vert	2400.000	PK	39.0	26.8	2.4	35.7	32.5	66.5	34.0	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
 Report No. 10009666H
 Date 05/01/2013 05/02/2013
 Temperature/ Humidity 21 deg. C / 35% RH 22 deg. C / 37% RH
 Engineer Takumi Shimada Takumi Shimada
 (1-10GHz) (10-26.5GHz/30-1000MHz)
 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	2276.970	PK	48.6	26.8	2.3	35.7	-	42.0	73.9	31.9	
Hori	4874.000	PK	39.6	30.8	4.2	34.9	-	39.7	73.9	34.2	
Hori	7311.000	PK	38.9	35.7	4.9	34.9	-	44.6	73.9	29.3	
Hori	2276.970	AV	42.1	26.8	2.3	35.7	-	35.5	53.9	18.4	
Hori	4874.000	AV	33.6	30.8	4.2	34.9	0.0	33.7	53.9	20.2	
Hori	7311.000	AV	33.0	35.7	4.9	34.9	0.0	38.7	53.9	15.2	
Vert	2276.970	PK	46.4	26.8	2.3	35.7	-	39.8	73.9	34.1	
Vert	4874.000	PK	40.5	30.8	4.2	34.9	-	40.6	73.9	33.3	
Vert	7311.000	PK	40.5	35.7	4.9	34.9	-	46.2	73.9	27.7	
Vert	2276.970	AV	38.1	26.8	2.3	35.7	-	31.5	53.9	22.4	
Vert	4874.000	AV	33.3	30.8	4.2	34.9	0.0	33.4	53.9	20.5	
Vert	7311.000	AV	33.3	35.7	4.9	34.9	0.0	39.0	53.9	14.9	

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

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Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10009666H
Date : 05/01/2013 05/02/2013
Temperature/ Humidity : 21 deg. C / 35% RH 22 deg. C / 37% RH
Engineer : Takumi Shimada Takumi Shimada
Mode : (1-10GHz) (10-26.5GHz/30-1000MHz)
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	2302.021	PK	47.4	26.8	2.3	35.7	-	40.8	73.9	33.1	
Hori	4924.000	PK	42.0	31.0	4.2	34.9	-	42.3	73.9	31.6	
Hori	7386.000	PK	41.3	35.8	5.0	34.9	-	47.2	73.9	26.7	
Hori	2302.021	AV	40.7	26.8	2.3	35.7	-	34.1	53.9	19.8	
Hori	4924.000	AV	33.0	31.0	4.2	34.9	0.0	33.3	53.9	20.6	
Hori	7386.000	AV	33.0	35.8	5.0	34.9	0.0	38.9	53.9	15.0	
Vert	2302.021	PK	45.1	26.8	2.3	35.7	-	38.5	73.9	35.4	
Vert	4924.000	PK	40.6	31.0	4.2	34.9	-	40.9	73.9	33.0	
Vert	7386.000	PK	40.2	35.8	5.0	34.9	-	46.1	73.9	27.8	
Vert	2302.021	AV	36.8	26.8	2.3	35.7	-	30.2	53.9	23.7	
Vert	4924.000	AV	33.0	31.0	4.2	34.9	0.0	33.3	53.9	20.6	
Vert	7386.000	AV	33.4	35.8	5.0	34.9	0.0	39.3	53.9	14.6	

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

Marker-Delta Method Data Sheet (RBW:30kHz)

FREQ [MHz]	Field strength of band-edge*		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
	HOR [dBuV]	VER [dBuV]					HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
PK DETECT											
2483.5	39.4	38.9	26.5	32.6	2.6	0.0	35.9	35.4	73.9	38.0	38.5
AV DETECT											
2483.5	35.2	35.0	26.5	32.6	2.6	0.0	31.7	31.5	53.9	22.2	22.4

*Field Strength of band-edge
Spectrum Analyzer Reading

	Polarity	Hor [dBuV]						Ver [dBuV]		
		Detector	PK	AV(RMS)			PK	PK	AV(RMS)	
				3MHz	3MHz	100kHz			3MHz	3MHz
Step 1)	Fundamental(2462MHz)	RRW	1MHz	95.1	90.9	-	93.4	89.5	-	
Step 2)	Fundamental(2462MHz)	VBW	30kHz	-	-	88.2	-	-	87.4	
	Band-edge(2483.5MHz)		30kHz	-	-	32.5	-	-	32.9	
	Amplitude delta *1		-	-	-	55.7	-	-	54.5	
Step 3)	Field strength of band-edge *2		-	39.4	35.2	-	38.9	35.0	-	

*1 Amplitude delta = Fundamental(RBW:30kHz) - Band-edge(RBW:30kHz)
*2 Field strength of band-edge = Fundamental(RBW:1MHz) - Amplitude delta

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Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10009666H
Date : 05/01/2013 05/02/2013
Temperature/ Humidity : 21 deg. C / 35% RH 22 deg. C / 37% RH
Engineer : Takumi Shimada Takumi Shimada
Mode : (1-10GHz) (10-26.5GHz/30-1000MHz)
11g 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	2252.000	PK	54.4	26.9	2.3	35.7	-	47.9	73.9	26.0	
Hori	2390.000	PK	49.5	26.8	2.4	35.7	-	43.0	73.9	30.9	
Hori	4824.000	PK	41.8	30.7	4.3	34.9	-	41.9	73.9	32.0	
Hori	7236.000	PK	40.6	35.6	4.9	34.9	-	46.2	73.9	27.7	
Hori	2252.000	AV	46.2	26.9	2.3	35.7	-	39.7	53.9	14.2	
Hori	2390.000	AV	41.9	26.8	2.4	35.7	-	35.4	53.9	18.5	
Hori	4824.000	AV	33.0	30.7	4.3	34.9	0.1	33.2	53.9	20.8	
Hori	7236.000	AV	33.4	35.6	4.9	34.9	0.1	39.1	53.9	14.9	
Vert	2252.000	PK	50.6	26.9	2.3	35.7	-	44.1	73.9	29.8	
Vert	2390.000	PK	47.4	26.8	2.4	35.7	-	40.9	73.9	33.0	
Vert	4824.000	PK	41.2	30.7	4.3	34.9	-	41.3	73.9	32.6	
Vert	7236.000	PK	40.7	35.6	4.9	34.9	-	46.3	73.9	27.6	
Vert	2252.000	AV	42.3	26.9	2.3	35.7	-	35.8	53.9	18.1	
Vert	2390.000	AV	36.6	26.8	2.4	35.7	-	30.1	53.9	23.8	
Vert	4824.000	AV	33.0	30.7	4.3	34.9	0.1	33.2	53.9	20.8	
Vert	7236.000	AV	33.5	35.6	4.9	34.9	0.1	39.2	53.9	14.8	

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).

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	92.3	26.8	2.4	35.7	85.8	-	-	Carrier
Hori	2400.000	PK	52.9	26.8	2.4	35.7	46.4	65.8	19.4	
Vert	2412.000	PK	88.5	26.8	2.4	35.7	82.0	-	-	Carrier
Vert	2400.000	PK	44.3	26.8	2.4	35.7	37.8	62.0	24.2	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
 Report No. 10009666H
 Date 05/01/2013 05/02/2013
 Temperature/ Humidity 21 deg. C / 35% RH 22 deg. C / 37% RH
 Engineer Takumi Shimada Takumi Shimada
 (1-10GHz) (10-26.5GHz/30-1000MHz)
 Mode 11g 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	2240.000	PK	49.3	26.9	2.3	35.7	-	42.8	73.9	31.1	
Hori	4874.000	PK	41.1	30.8	4.2	34.9	-	41.2	73.9	32.7	
Hori	7311.000	PK	41.0	35.7	4.9	34.9	-	46.7	73.9	27.2	
Hori	2240.000	AV	41.9	26.9	2.3	35.7	-	35.4	53.9	18.5	
Hori	4874.000	AV	33.7	30.8	4.2	34.9	0.1	33.9	53.9	20.1	
Hori	7311.000	AV	32.8	35.7	4.9	34.9	0.1	38.6	53.9	15.4	
Vert	2240.000	PK	45.7	26.9	2.3	35.7	-	39.2	73.9	34.7	
Vert	4874.000	PK	40.1	30.8	4.2	34.9	-	40.2	73.9	33.7	
Vert	7311.000	PK	40.1	35.7	4.9	34.9	-	45.8	73.9	28.1	
Vert	2240.000	AV	38.0	26.9	2.3	35.7	-	31.5	53.9	22.4	
Vert	4874.000	AV	33.7	30.8	4.2	34.9	0.1	33.9	53.9	20.1	
Vert	7311.000	AV	34.1	35.7	4.9	34.9	0.1	39.9	53.9	14.1	

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

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Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10009666H
Date : 05/01/2013 05/02/2013
Temperature/ Humidity : 21 deg. C / 35% RH 22 deg. C / 37% RH
Engineer : Takumi Shimada Takumi Shimada
Mode : (1-10GHz) (10-26.5GHz/30-1000MHz)
11g 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	56.450	QP	27.9	8.9	7.1	28.6	-	15.3	40.0	24.7	
Hori	180.000	QP	32.9	16.1	8.0	28.0	-	29.0	43.5	14.5	
Hori	240.000	QP	33.5	17.1	8.4	27.6	-	31.4	46.0	14.6	
Hori	311.200	QP	38.6	14.4	8.9	27.7	-	34.2	46.0	11.8	
Hori	376.320	QP	36.8	16.7	9.2	28.2	-	34.5	46.0	11.5	
Hori	468.004	QP	36.0	17.8	9.6	28.7	-	34.7	46.0	11.3	
Hori	2240.000	PK	46.4	26.9	2.3	35.7	-	39.9	73.9	34.0	
Hori	4924.000	PK	40.0	31.0	4.2	34.9	-	40.3	73.9	33.6	
Hori	7386.000	PK	39.9	35.8	5.0	34.9	-	45.8	73.9	28.1	
Hori	2240.000	AV	39.2	26.9	2.3	35.7	-	32.7	53.9	21.2	
Hori	4924.000	AV	33.0	31.0	4.2	34.9	0.1	33.4	53.9	20.6	
Hori	7386.000	AV	33.3	35.8	5.0	34.9	0.1	39.3	53.9	14.7	
Vert	56.450	QP	42.9	8.9	7.1	28.6	-	30.3	40.0	9.7	
Vert	180.000	QP	34.0	16.1	8.0	28.0	-	30.1	43.5	13.4	
Vert	240.000	QP	38.6	17.1	8.4	27.6	-	36.5	46.0	9.5	
Vert	312.000	QP	30.1	14.5	8.9	27.7	-	25.8	46.0	20.2	
Vert	373.960	QP	30.3	16.6	9.2	28.2	-	27.9	46.0	18.1	
Vert	468.004	QP	28.8	17.8	9.6	28.7	-	27.5	46.0	18.5	
Vert	2240.000	PK	45.7	26.9	2.3	35.7	-	39.2	73.9	34.7	
Vert	4924.000	PK	40.3	31.0	4.2	34.9	-	40.6	73.9	33.3	
Vert	7386.000	PK	41.7	35.8	5.0	34.9	-	47.6	73.9	26.3	
Vert	2240.000	AV	38.7	26.9	2.3	35.7	-	32.2	53.9	21.7	
Vert	4924.000	AV	33.0	31.0	4.2	34.9	0.1	33.4	53.9	20.6	
Vert	7386.000	AV	32.9	35.8	5.0	34.9	0.1	38.9	53.9	15.1	

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

Marker-Delta Method Data Sheet (RBW:30kHz)

FREQ [MHz]	Field strength of band-edge*		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
	HOR [dBuV]	VER [dBuV]					HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
PK DETECT											
2483.5	46.8	45.4	26.5	32.6	2.6	0.0	43.3	41.9	73.9	30.6	32.0
AV DETECT											
2483.5	40.5	39.2	26.5	32.6	2.6	0.0	37.0	35.7	53.9	16.9	18.2

*Field Strength of band-edge
Spectrum Analyzer Reading

	Polarity	Detector	Hor [dBuV]			Ver [dBuV]			
			PK	AV(RMS)	PK	PK	AV(RMS)	PK	
			1MHz	3MHz	100kHz	3MHz	3MHz	100kHz	
Step 1)	Fundamental(2462MHz)	RBW	1MHz	94.8	88.5	-	93.3	87.1	-
Step 2)	Fundamental(2462MHz)	30kHz	-	-	85.1	-	-	83.8	
	Band-edge(2483.5MHz)	30kHz	-	-	37.1	-	-	35.9	
	Amplitude delta *1	-	-	-	48.0	-	-	47.9	
Step 3)	Field strength of band-edge *2	-	46.8	40.5	-	45.4	39.2	-	

*1 Amplitude delta = Fundamental(RBW:30kHz) - Band-edge(RBW:30kHz)
*2 Field strength of band-edge = Fundamental(RBW:1MHz) - Amplitude delta

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10009666H
Date 05/01/2013
Temperature/ Humidity 21 deg. C / 35% RH
Engineer Takumi Shimada
(1-10GHz)
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	46.9	26.8	2.4	35.7	40.4	73.9	33.5	
Hori	2390.000	AV	40.6	26.8	2.4	35.7	34.1	53.9	19.8	
Vert	2390.000	PK	46.3	26.8	2.4	35.7	39.8	73.9	34.1	
Vert	2390.000	AV	39.3	26.8	2.4	35.7	32.8	53.9	21.1	

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	90.4	26.8	2.4	35.7	83.9	-	-	Carrier
Hori	2400.000	PK	44.8	26.8	2.4	35.7	38.3	63.9	25.6	
Vert	2412.000	PK	88.4	26.8	2.4	35.7	81.9	-	-	Carrier
Vert	2400.000	PK	45.6	26.8	2.4	35.7	39.1	61.9	22.8	

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

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Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10009666H
Date : 05/01/2013
Temperature/ Humidity : 21 deg. C / 35% RH
Engineer : Takumi Shimada
(1-10GHz)
Mode : 11n-20 Tx 2462MHz

Marker-Delta Method Data Sheet (RBW:30kHz)

FREQ [MHz]	Field strength of band-edge*		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
	HOR [dBuV]	VER [dBuV]					HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
PK DETECT											
2483.5	45.5	44.9	26.5	32.6	2.6	0.0	42.0	41.4	73.9	31.9	32.5
AV DETECT											
2483.5	39.6	36.9	26.5	32.6	2.6	0.0	36.1	33.4	53.9	17.8	20.5

*Field Strength of band-edge
Spectrum Analyzer Reading

		Polarity Detector RBW / VBW	Hor [dBuV]			Ver [dBuV]		
			PK	AV(RMS)	PK	PK	AV(RMS)	PK
			3MHz	3MHz	100kHz	3MHz	3MHz	100kHz
Step 1)	Fundamental(2462MHz)	1MHz	95.4	89.5	-	92.3	84.3	-
Step 2)	Fundamental(2462MHz)	30kHz	-	-	86.5	-	-	81.3
	Band-edge(2483.5MHz)	30kHz	-	-	36.6	-	-	33.9
	Amplitude delta *1	-	-	-	49.9	-	-	47.4
Step 3)	Field strength of band-edge *2	-	45.5	39.6	-	44.9	36.9	-

*1 Amplitude delta = Fundamental(RBW:30kHz) - Band-edge(RBW:30kHz)

*2 Field strength of band-edge = Fundamental(RBW:1MHz) - Amplitude delta

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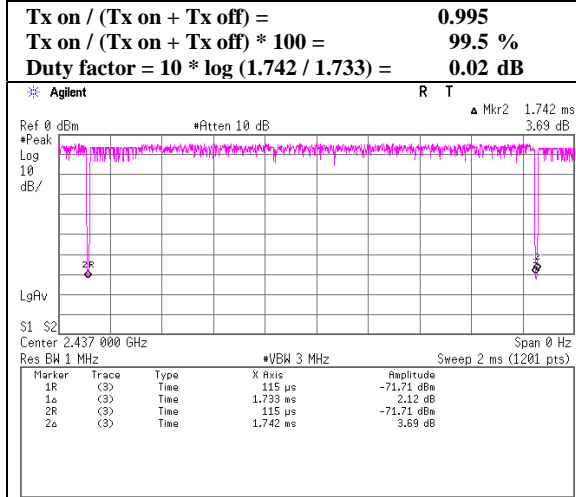
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Telephone : +81 596 24 8999

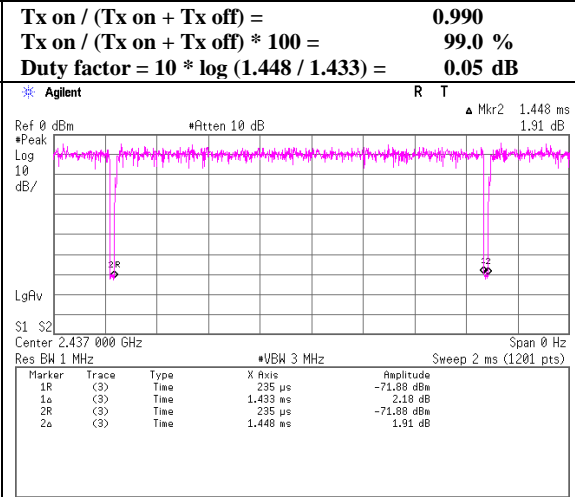
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Duty rate confirmation

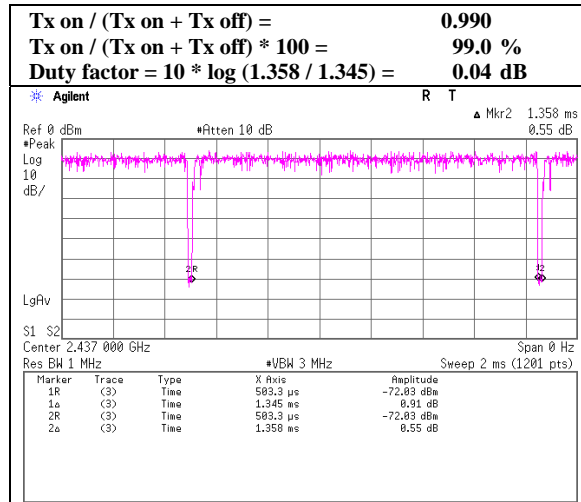
11b 5.5Mbps



11g 6Mbps



11n-20 MCS0



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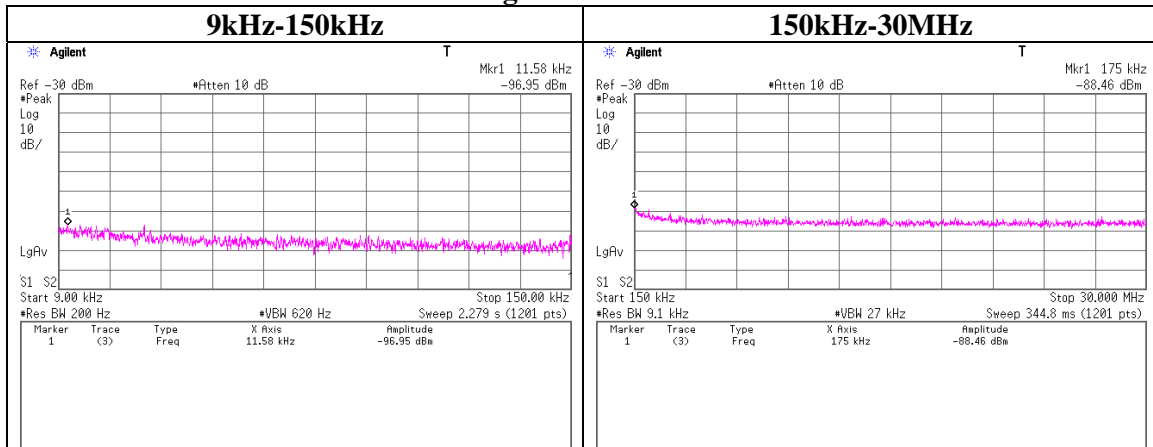
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Conducted Spurious Emission

11g Tx 2462MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dB]	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
11.580	-97.0	0.50	10.0	2.0	-84.5	300.0	6.0	-23.2	46.3
175.000	-88.5	0.50	10.0	2.0	-76.0	300.0	6.0	-14.8	22.7

$E = \text{EIRP} - 20 \log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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Power Density

Test place Head Office EMC Lab. No.7 Shielded Room
Report No. 10009666H
Date 04/22/2013
Temperature/ Humidity 21deg. C / 35% RH
Engineer Takumi Shimada
Mode 11b Tx, 11g Tx, 11n-20 Tx

11b 5.5Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-24.39	0.50	9.95	-13.94	8.00	21.94
2437	-23.70	0.50	9.95	-13.25	8.00	21.25
2462	-23.61	0.50	9.95	-13.16	8.00	21.16

11g 6Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-25.62	0.50	9.95	-15.17	8.00	23.17
2437	-25.62	0.50	9.95	-15.17	8.00	23.17
2462	-25.82	0.50	9.95	-15.37	8.00	23.37

11n-20 MCS0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-26.71	0.50	9.95	-16.26	8.00	24.26
2437	-25.81	0.50	9.95	-15.36	8.00	23.36
2462	-25.34	0.50	9.95	-14.89	8.00	22.89

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

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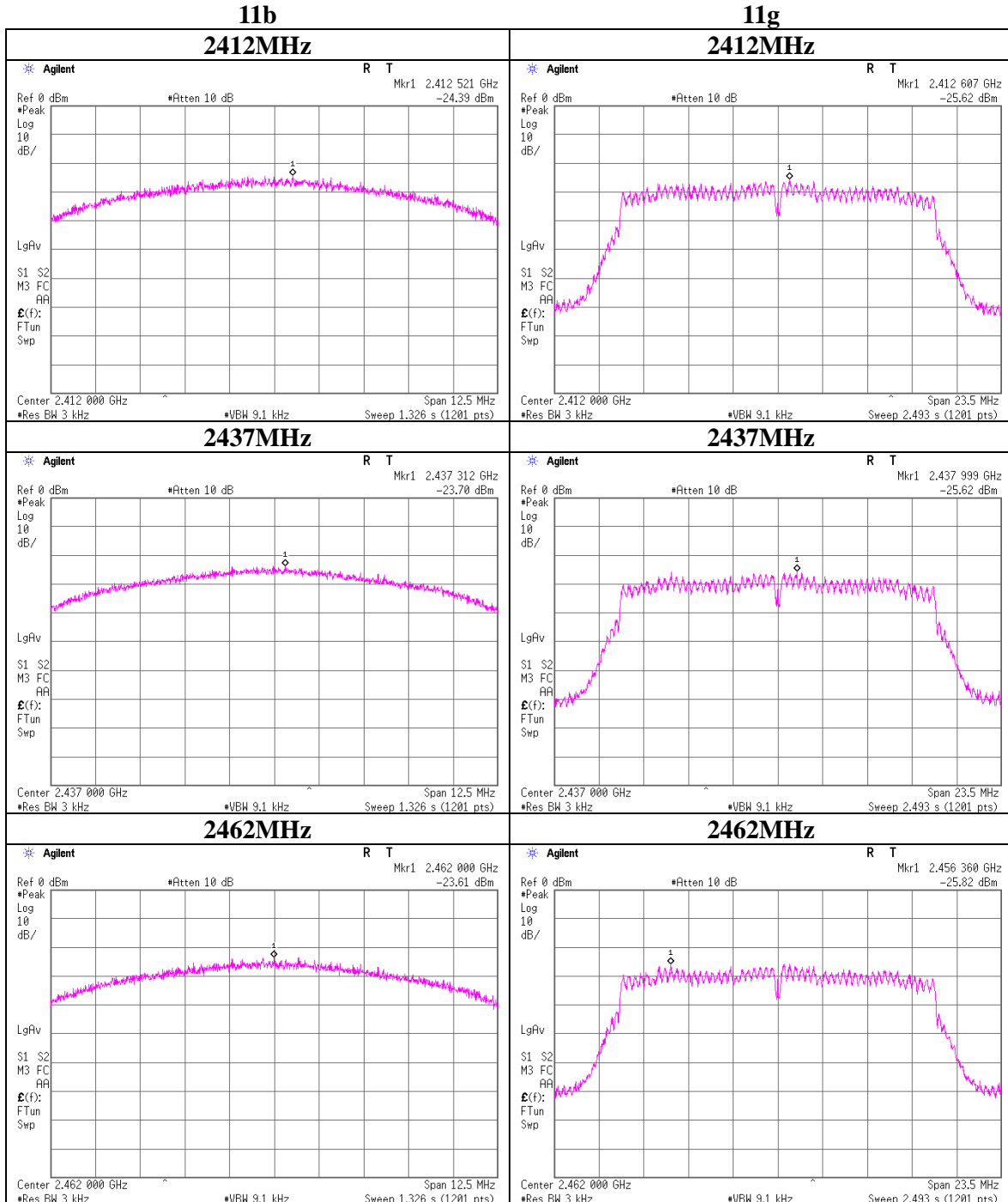
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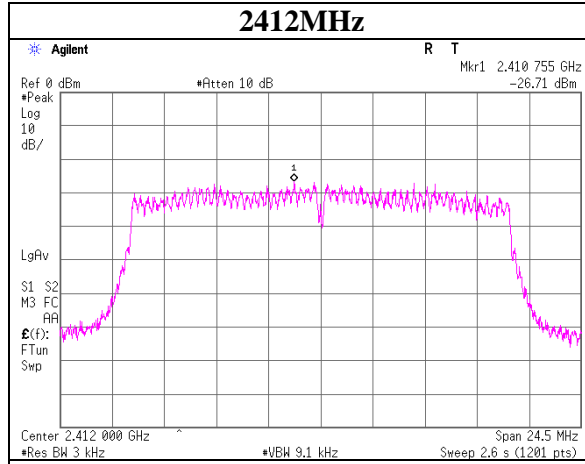
Power Density



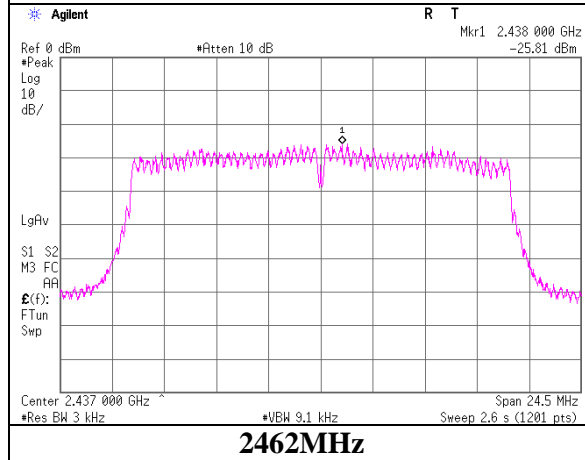
Power Density

11n-20

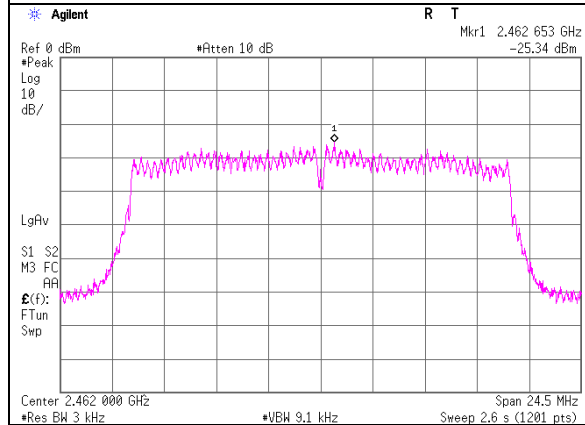
2412MHz



2437MHz



2462MHz



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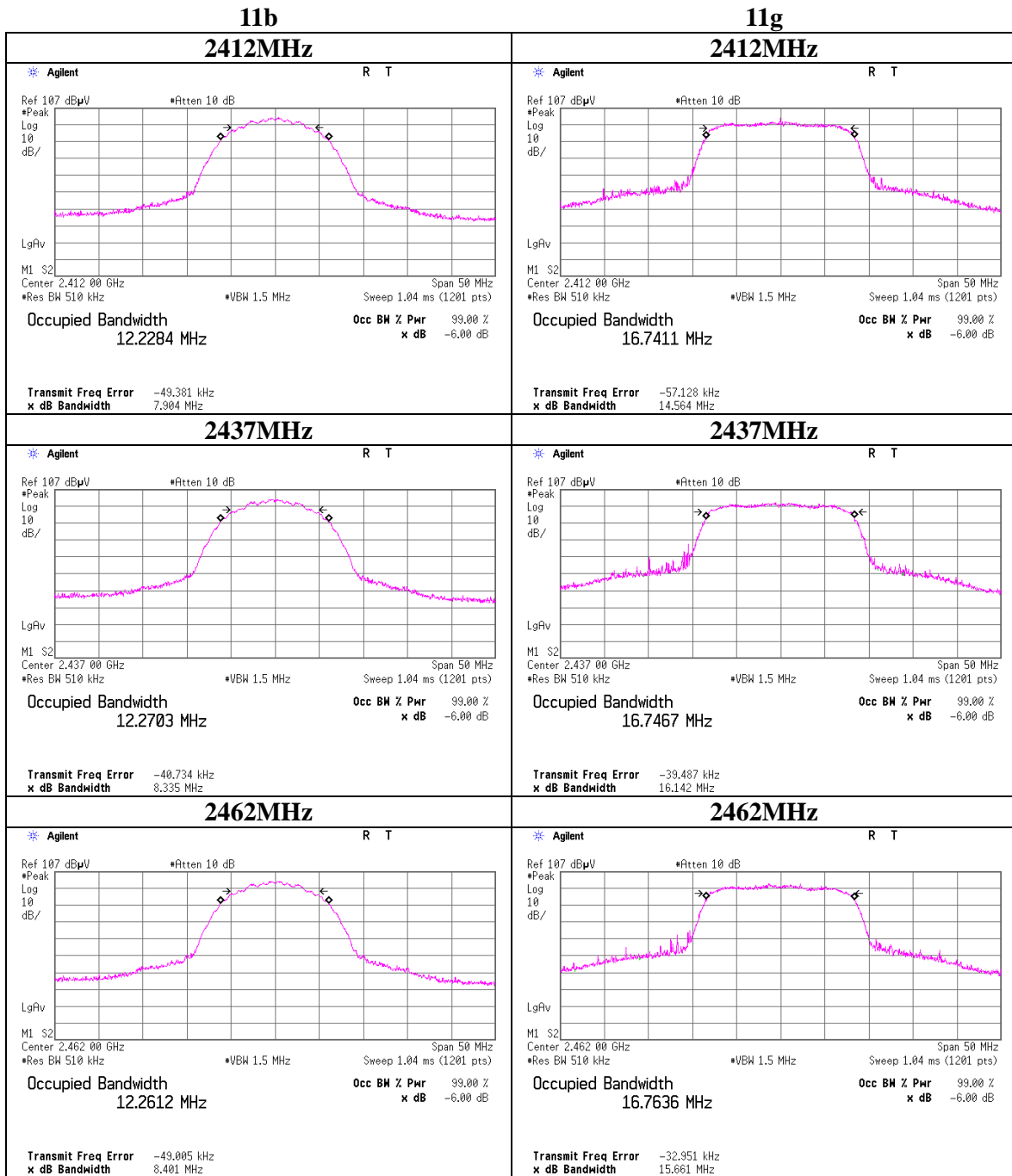
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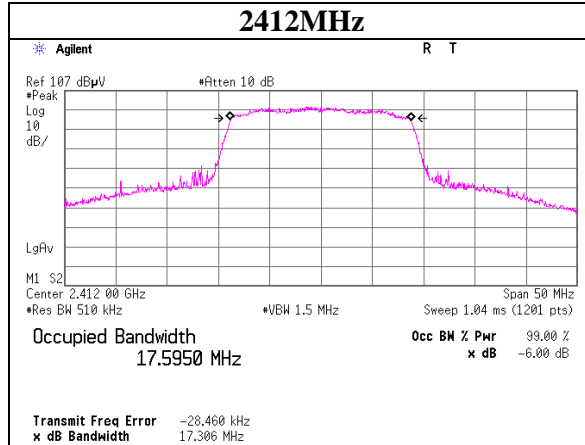
99% Occupied Bandwidth



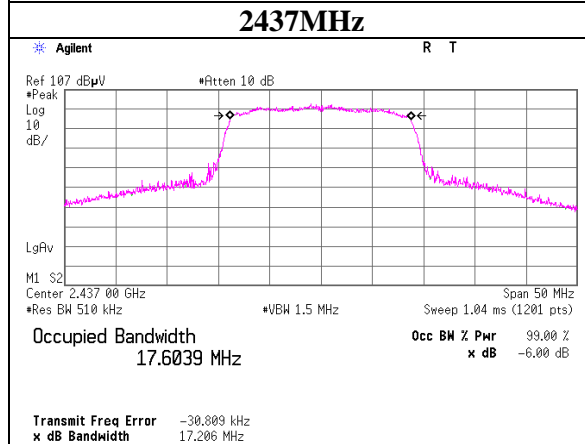
99% Occupied Bandwidth

11n-20

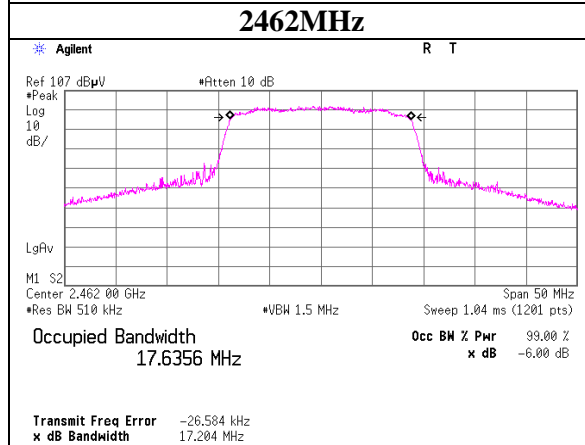
2412MHz



2437MHz



2462MHz



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT/RE/CE	2013/04/03 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2012/10/08 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2012/10/08 * 12
MAT-24	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71389	AT	2012/06/27 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2012/06/29 * 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	-
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-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2012/09/05 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2012/05/30 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE/CE	2013/04/10 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	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
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2012/10/08 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2012/10/08 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2012/11/06 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2012/09/11 * 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

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