



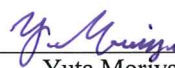
RADIO TEST REPORT


Test Report No. : 10512882H-A-R1

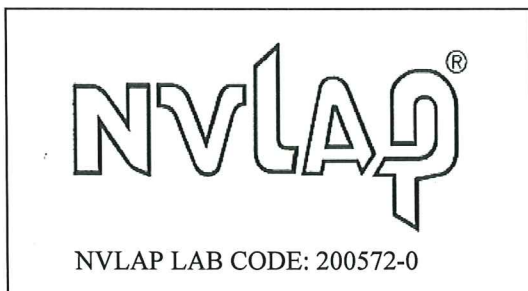
Applicant : MITSUBISHI ELECTRIC CORPORATION SANDA WORKS
Type of Equipment : Blu-Ray Disc Player
Model No. : BD-1G
FCC ID : UJHBD1G
Test regulation : FCC Part 15 Subpart C: 2015
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10512882H-A. 10512882H-A is replaced with this report.

Date of test: October 31 to November 11, 2014

Representative test engineer: 
Yuta Moriya
Engineer
Consumer Technology Division

Approved by: 
Masanori Nishiyama
Manager
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation. *As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name : MITSUBISHI ELECTRIC CORPORATION SANDA WORKS
Address : 2-3-33, Miwa, Sanda-city, Hyogo, 669-1513, Japan
Telephone Number : +81-79-559-3820
Facsimile Number : +81-79-559-3876
Contact Person : Yoshihisa Araki

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

2.1 Identification of E.U.T.

Type of Equipment : Blu-Ray Disc Player
Model No. : BD-1G
Serial No. : Refer to Clause 4.2
Rating : DC 12.0V
Receipt Date of Sample : October 11, 2014
Country of Mass-production : Thailand
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product description

General Specification

Clock frequency(ies) in the system : 24.576MHz, 37.4MHz (Radio part)

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Radio Specification

Radio Type : Transceiver
Power Supply (inner) : DC3.3V

Specification of Wireless LAN (IEEE802.11b/g/a/n-20/n-40/11ac-20/11ac-40/11ac-80)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band) / IEEE802.11ac (20 M band)	IEEE802.11n (40 M band) / IEEE802.11ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412-2462MHz *1)	2412-2462MHz *1)	5180-5240MHz 5745-5825MHz	2412-2462MHz *1) 5180-5240MHz 5745-5825MHz	5190-5230MHz 5755-5795MHz	5210MHz 5775MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)			256QAM (MCS8, MCS9)
Channel spacing	5MHz		20MHz	2.4GHz band 5MHz 5GHz band 20MHz	40MHz	80MHz
Antenna type	Inverted F Antenna					
Antenna Gain	2.4GHz: -0.15dBi 5GHz: 5150-5350MHz :1.23dBi 5470-5875MHz :1.56dBi					
Antenna Connector type	U.FL-LP-066					

*1) 2412-2462MHz is applied for this test report.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

* The revision on January 21, 2015 does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2009 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	N/A	N/A *1)	-
6dB Bandwidth	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: -	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 June 5, 2014)" ----- IC: RSS-Gen 6.12	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 June 5, 2014)" ----- 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 June 5, 2014)" ----- IC: RSS-Gen 6.13	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 8.9 RSS-Gen 8.10	1.1dB 4722.145MHz, AV, Vert.	Complied	Conducted/ Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.
* In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

FCC 15.31 (e)

The EUT is a battery-operated device and test was performed with the full-charged battery voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	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)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

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

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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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	18Mbps, PN9
IEEE 802.11n 20MHz BW (11n-20)	MCS 1, 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 Setting: default - Software: Same as production model *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.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Conducted) *1)	11n-20 Tx	2462MHz
6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
Spurious Emission (Radiated)	11b Tx 11n-20 Tx *2)	2412MHz 2437MHz 2462MHz

*1) The test was performed on the mode 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 highest peak output power.

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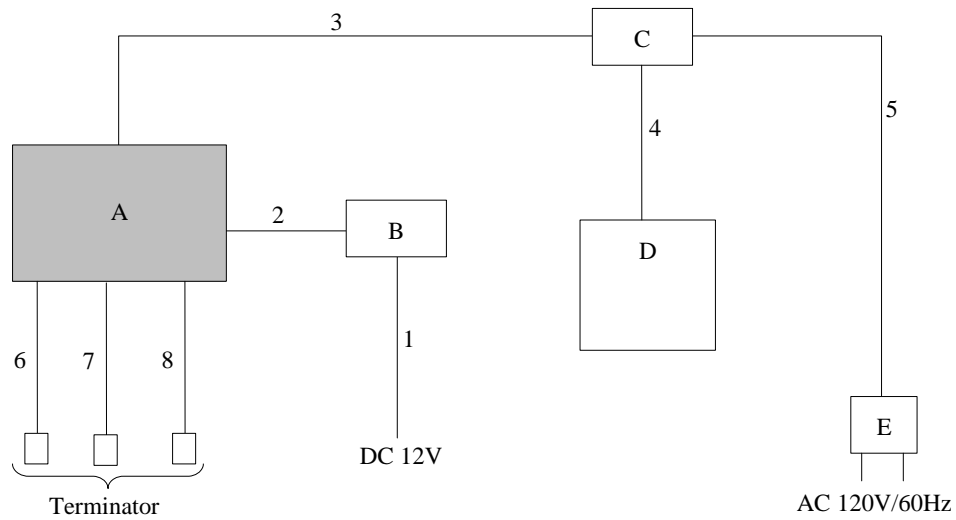
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4.2 Configuration and peripherals



* Cabling and setup 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	Blu-Ray Disc Player	BD-1G	6114155AE6100034 *1) 6114104AE6100012 *2)	mitsubishi ELECTRIC CORPORATION SANDA WORKS	EUT
B	Jig board	-	184	mitsubishi ELECTRIC CORPORATION SANDA WORKS	-
C	LVDS board	-	2	mitsubishi ELECTRIC CORPORATION SANDA WORKS	-
D	Display	HSD070PWW1	B0E010S2603414	HannStar	-
E	AC Adapter	STD-05030U	3	ADAPTER TEC	-

*1) Used for antenna terminal conducted tests

*2) Used for spurious emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	Control and DC Cable	0.5	Unshielded	Unshielded	-
3	Control Cable	2.0	Shielded	Shielded	-
4	Flat Cable	0.15	Unshielded	Unshielded	-
5	DC Cable	1.8	Unshielded	Unshielded	-
6	USB Cable	1.7	Shielded	Shielded	-
7	HDMI Cable	1.0	Shielded	Shielded	-
8	Video Cable	1.0	Shielded	Shielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".

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

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120kHz	RBW: 1MHz VBW: 3MHz	Average Power Method: <u>WLAN: 12.2.5.2</u> RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the results.	RBW: 100kHz VBW: 300kHz
Test Distance	3m	3m (below 10GHz), 1m *2) (above 10GHz)		3m (below 10GHz), 1m *2) (above 10GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)"

*2) Distance Factor: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

The test was made on EUT at the normal use position.

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 6: 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	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				

*1) The measurement was performed with Max Hold since the duty cycle was not 100%.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".
*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 low enough 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

APPENDIX 1: Data of EMI test

6dB Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10512882H
Date 11/04/2014
Temperature/ Humidity 25deg. C / 32% RH
Engineer Hironobu Ohnishi
Mode 11b/11g/11n-20 Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	7.845	>500
2437	7.725	>500
2462	7.526	>500

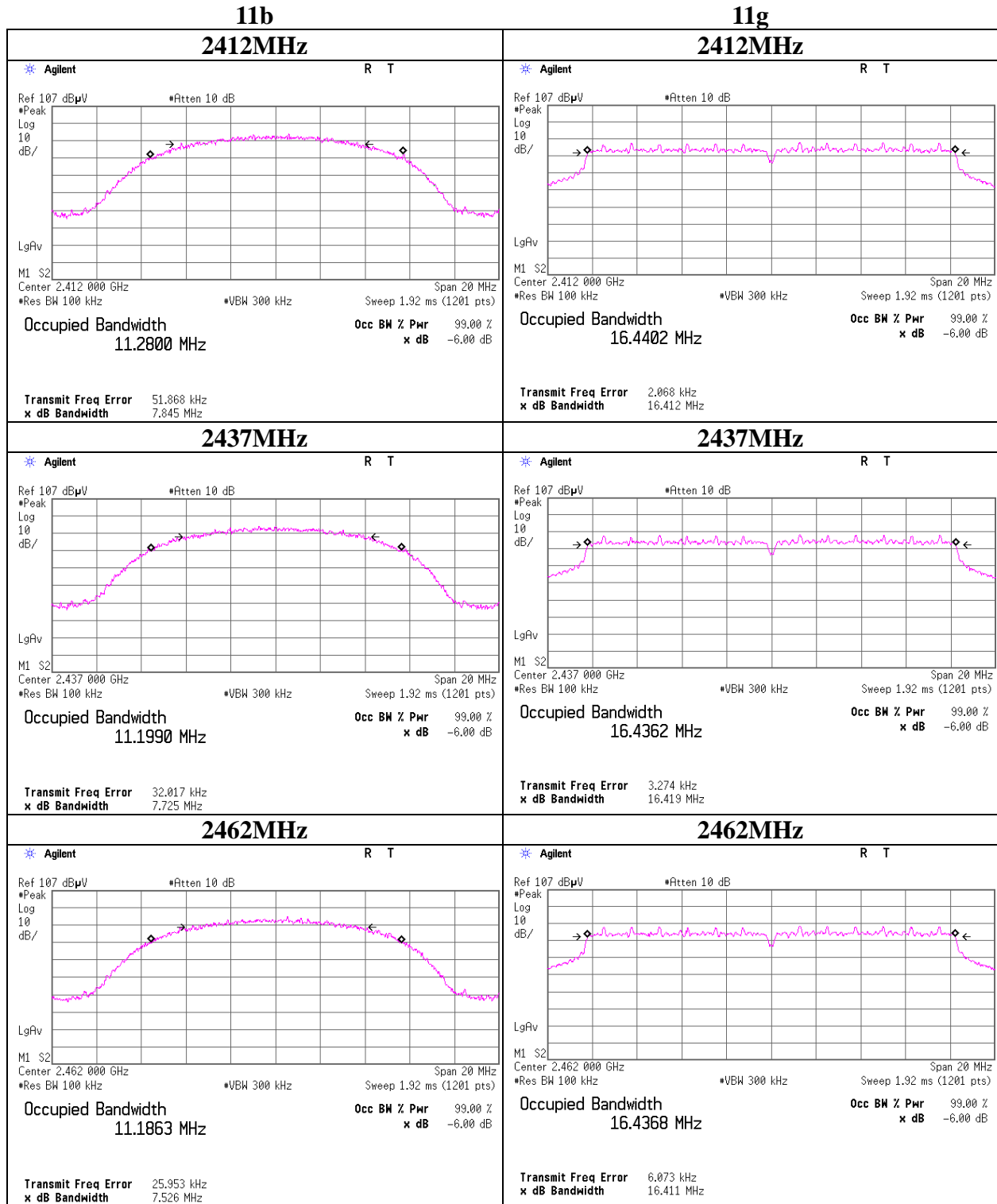
11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.412	>500
2437	16.419	>500
2462	16.411	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	17.681	>500
2437	17.658	>500
2462	17.681	>500

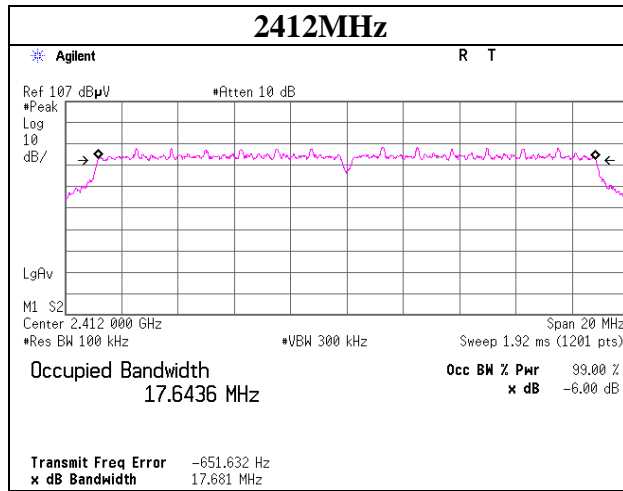
6dB Bandwidth



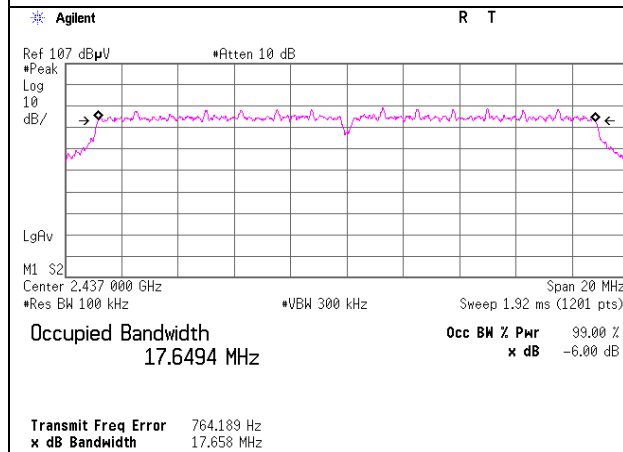
6dB Bandwidth

11n-20

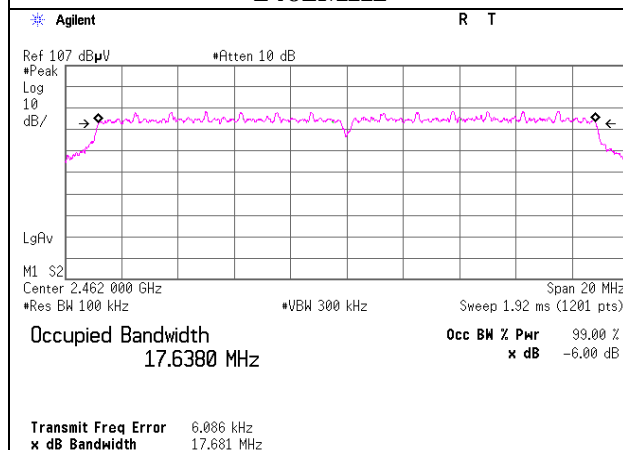
2412MHz



2437MHz



2462MHz



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Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	10512882H
Date	10/31/2014
Temperature/ Humidity	24deg. C / 61% RH
Engineer	Satofumi Matsuyama
Mode	11b Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.04	2.31	10.08	17.43	55.34	30.00	1000	12.57
2437	5.30	2.32	10.08	17.70	58.88	30.00	1000	12.30
2462	5.61	2.33	10.08	18.02	63.39	30.00	1000	11.98

Sample Calculation:

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

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	4.91	
2	5.14	
5.5	5.08	
11	5.30	*

*: Worst Rate

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

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Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	10512882H
Date	10/31/2014
Temperature/ Humidity	24deg. C / 61% RH
Engineer	Satofumi Matsuyama
Mode	11g Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	9.24	2.31	10.08	21.63	145.55	30.00	1000	8.37
2437	9.45	2.32	10.08	21.85	153.11	30.00	1000	8.15
2462	9.72	2.33	10.08	22.13	163.31	30.00	1000	7.87

Sample Calculation:

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

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	8.68	
9	8.61	
12	9.36	
18	9.45	*
24	8.75	
36	8.73	
48	9.14	
54	7.82	

*: Worst Rate

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

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Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	10512882H
Date	10/31/2014
Temperature/ Humidity	24deg. C / 61% RH
Engineer	Satofumi Matsuyama
Mode	11n-20 Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	9.64	2.31	10.08	22.03	159.59	30.00	1000	7.97
2437	9.91	2.32	10.08	22.31	170.22	30.00	1000	7.69
2462	10.17	2.33	10.08	22.58	181.13	30.00	1000	7.42

Sample Calculation:

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

2437MHz

MCS Number	Reading [dBm]	Remark
0	9.53	
1	9.91	*
2	9.85	
3	9.54	
4	9.50	
5	9.36	
6	9.57	
7	9.35	

*: Worst Rate

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

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Average Output Power

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10512882H
Date	11/20/2014
Temperature/ Humidity	25deg. C / 24% RH
Engineer	Tomohisa Nakagawa
Mode	11b/g/n-20 Tx

[AV]

11b **11Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	0.92	2.32	10.08	13.32	21.48	30.00	1000	16.68
2437	1.35	2.32	10.08	13.75	23.71	30.00	1000	16.25
2462	1.38	2.33	10.08	13.79	23.93	30.00	1000	16.21

11g **18Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-1.71	2.32	10.08	10.69	11.72	30.00	1000	19.31
2437	-1.35	2.32	10.08	11.05	12.74	30.00	1000	18.95
2462	-1.31	2.33	10.08	11.10	12.88	30.00	1000	18.90

11n-20 **MCS1**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-0.99	2.32	10.08	11.41	13.84	30.00	1000	18.59
2437	-0.72	2.32	10.08	11.68	14.72	30.00	1000	18.32
2462	-0.61	2.33	10.08	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	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10512882H	
Date	11/01/2014	11/06/2014
Temperature/ Humidity	22deg. C / 57% RH	23deg. C / 51% RH
Engineer	Kazuya Yoshioka	Yuta Moriya
	(1-10GHz)	(10-26.5GHz)
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	1079.206	PK	60.2	24.2	2.2	35.1	-	51.5	73.9	22.4	
Hori	1349.312	PK	62.4	25.0	2.5	34.3	-	55.6	73.9	18.3	
Hori	1416.653	PK	61.2	25.2	2.5	34.2	-	54.7	73.9	19.2	
Hori	2390.000	PK	58.7	26.8	3.2	32.7	-	56.0	73.9	17.9	*1)
Hori	4722.497	PK	49.9	30.4	5.2	31.8	-	53.7	73.9	20.2	
Hori	4824.000	PK	40.7	30.6	5.3	31.8	-	44.8	73.9	29.1	Floor Noise
Hori	7236.000	PK	40.8	35.9	6.6	32.7	-	50.6	73.9	23.3	Floor Noise
Hori	9648.000	PK	41.6	38.5	7.0	33.4	-	53.7	73.9	20.2	Floor Noise
Hori	1079.206	AV	56.9	24.2	2.2	35.1	-	48.2	53.9	5.7	
Hori	1349.312	AV	58.3	25.0	2.5	34.3	-	51.5	53.9	2.4	
Hori	1416.653	AV	55.8	25.2	2.5	34.2	-	49.3	53.9	4.6	
Hori	2390.000	AV	44.2	26.8	3.2	32.7	0.5	42.0	53.9	11.9	*1)
Hori	4722.497	AV	47.4	30.4	5.2	31.8	-	51.2	53.9	2.7	
Hori	4824.000	AV	33.1	30.6	5.3	31.8	-	37.2	53.9	16.7	Floor Noise
Hori	7236.000	AV	34.1	35.9	6.6	32.7	-	43.9	53.9	10.0	Floor Noise
Hori	9648.000	AV	34.4	38.5	7.0	33.4	-	46.5	53.9	7.4	Floor Noise
Vert	1079.308	PK	62.9	24.2	2.2	35.1	-	54.2	73.9	19.7	
Vert	1349.267	PK	59.9	25.0	2.5	34.3	-	53.1	73.9	20.8	
Vert	1416.621	PK	60.0	25.2	2.5	34.2	-	53.5	73.9	20.4	
Vert	2390.000	PK	56.7	26.8	3.2	32.7	-	54.0	73.9	19.9	*1)
Vert	4722.300	PK	50.5	30.4	5.2	31.8	-	54.3	73.9	19.6	
Vert	4824.000	PK	40.9	30.6	5.3	31.8	-	45.0	73.9	28.9	Floor Noise
Vert	7236.000	PK	41.0	35.9	6.6	32.7	-	50.8	73.9	23.1	Floor Noise
Vert	9648.000	PK	41.8	38.5	7.0	33.4	-	53.9	73.9	20.0	Floor Noise
Vert	1079.308	AV	59.8	24.2	2.2	35.1	-	51.1	53.9	2.8	
Vert	1349.267	AV	54.7	25.0	2.5	34.3	-	47.9	53.9	6.0	
Vert	1416.621	AV	56.1	25.2	2.5	34.2	-	49.6	53.9	4.3	
Vert	2390.000	AV	43.3	26.8	3.2	32.7	0.5	41.1	53.9	12.8	*1)
Vert	4722.300	AV	47.9	30.4	5.2	31.8	-	51.7	53.9	2.2	
Vert	4824.000	AV	33.1	30.6	5.3	31.8	-	37.2	53.9	16.7	Floor Noise
Vert	7236.000	AV	34.1	35.9	6.6	32.7	-	43.9	53.9	10.0	Floor Noise
Vert	9648.000	AV	34.4	38.5	7.0	33.4	-	46.5	53.9	7.4	Floor Noise

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

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	102.8	26.8	3.2	32.7	100.1	-	-	Carrier
Hori	2400.000	PK	54.5	26.8	3.2	32.7	51.8	80.1	28.3	
Vert	2412.000	PK	102.1	26.8	3.2	32.7	99.4	-	-	Carrier
Vert	2400.000	PK	53.3	26.8	3.2	32.7	50.6	79.4	28.8	

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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber		
Report No.	10512882H		
Date	11/01/2014	11/06/2014	11/04/2014
Temperature/ Humidity	22deg. C / 57% RH	23deg. C / 51% RH	24deg. C / 50% RH
Engineer	Kazuya Yoshioka	Yuta Moriya	Tsubasa Takayama
	(1-10GHz)	(10-26.5GHz)	(30-1000MHz)
Mode	11n-20 Tx 2462MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	78.120	QP	45.0	6.8	8.1	38.8	-	21.1	40.0	18.9	
Hori	159.690	QP	41.9	15.5	9.1	38.9	-	27.6	43.5	15.9	
Hori	169.565	QP	42.0	15.8	9.2	39.0	-	28.0	43.5	15.5	
Hori	270.780	QP	45.1	18.4	10.2	38.7	-	35.0	46.0	11.0	
Hori	539.710	QP	48.3	18.7	12.2	38.3	-	40.9	46.0	5.1	
Hori	607.156	QP	46.9	19.5	12.5	38.1	-	40.8	46.0	5.2	
Hori	674.624	QP	46.0	20.0	12.9	38.1	-	40.8	46.0	5.2	
Hori	809.556	QP	42.5	22.0	13.7	38.2	-	40.0	46.0	6.0	
Hori	877.022	QP	41.2	22.0	14.0	38.0	-	39.2	46.0	6.8	
Hori	944.471	QP	43.1	22.7	14.4	37.8	-	42.4	46.0	3.6	
Hori	1349.161	PK	61.6	25.0	2.5	34.3	-	54.8	73.9	19.1	
Hori	1416.506	PK	60.9	25.2	2.5	34.2	-	54.4	73.9	19.5	
Hori	2483.500	PK	67.9	26.9	3.2	32.7	-	65.3	73.9	8.6	
Hori	4722.444	PK	49.2	30.4	5.2	31.8	-	53.0	73.9	20.9	
Hori	4924.000	PK	40.6	30.8	5.3	31.7	-	45.0	73.9	28.9	Floor Noise
Hori	7386.000	PK	41.1	35.9	6.5	32.7	-	50.8	73.9	23.1	Floor Noise
Hori	9848.000	PK	41.0	38.8	7.1	33.5	-	53.4	73.9	20.5	Floor Noise
Hori	1079.590	AV	58.3	24.2	2.2	35.1	-	49.6	53.9	4.3	
Hori	1349.161	AV	57.8	25.0	2.5	34.3	-	51.0	53.9	2.9	
Hori	1416.506	AV	56.4	25.2	2.5	34.2	-	49.9	53.9	4.0	
Hori	2483.500	AV	51.3	26.9	3.2	32.7	0.6	49.3	53.9	4.6	
Hori	4722.444	AV	45.7	30.4	5.2	31.8	-	49.5	53.9	4.4	
Hori	4924.000	AV	32.9	30.8	5.3	31.7	-	37.3	53.9	16.6	Floor Noise
Hori	7386.000	AV	34.3	35.9	6.5	32.7	-	44.0	53.9	9.9	Floor Noise
Hori	9848.000	AV	34.2	38.8	7.1	33.5	-	46.6	53.9	7.3	Floor Noise
Vert	40.281	QP	50.2	14.4	7.5	38.7	-	33.4	40.0	6.6	
Vert	52.438	QP	49.8	10.0	7.7	38.7	-	28.8	40.0	11.2	
Vert	110.621	QP	44.3	11.7	8.6	38.8	-	25.8	43.5	17.7	
Vert	134.970	QP	50.1	14.1	8.9	38.9	-	34.2	43.5	9.3	
Vert	168.670	QP	47.2	15.8	9.2	39.0	-	33.2	43.5	10.3	
Vert	202.605	QP	47.8	16.4	9.6	39.1	-	34.7	43.5	8.8	
Vert	674.630	QP	46.4	20.0	12.9	38.1	-	41.2	46.0	4.8	
Vert	877.012	QP	40.2	22.0	14.0	38.0	-	38.2	46.0	7.8	
Vert	944.481	QP	40.1	22.7	14.4	37.8	-	39.4	46.0	6.6	
Vert	1349.210	PK	57.7	25.0	2.5	34.3	-	50.9	73.9	23.0	
Vert	1416.479	PK	58.0	25.2	2.5	34.2	-	51.5	73.9	22.4	
Vert	2483.500	PK	65.8	26.9	3.2	32.7	-	63.2	73.9	10.7	
Vert	4722.424	PK	51.9	30.4	5.2	31.8	-	55.7	73.9	18.2	
Vert	4924.000	PK	40.8	30.8	5.3	31.7	-	45.2	73.9	28.7	Floor Noise
Vert	7386.000	PK	41.0	35.9	6.5	32.7	-	50.7	73.9	23.2	Floor Noise
Vert	9848.000	PK	41.3	38.8	7.1	33.5	-	53.7	73.9	20.2	Floor Noise
Vert	1349.210	AV	53.2	25.0	2.5	34.3	-	46.4	53.9	7.5	
Vert	1416.479	AV	54.2	25.2	2.5	34.2	-	47.7	53.9	6.2	
Vert	2483.500	AV	48.5	26.9	3.2	32.7	0.6	46.5	53.9	7.4	
Vert	4722.424	AV	48.9	30.4	5.2	31.8	-	52.7	53.9	1.2	
Vert	4924.000	AV	32.9	30.8	5.3	31.7	-	37.3	53.9	16.6	Floor Noise
Vert	7386.000	AV	34.3	35.9	6.5	32.7	-	44.0	53.9	9.9	Floor Noise
Vert	9848.000	AV	34.2	38.8	7.1	33.5	-	46.6	53.9	7.3	Floor Noise

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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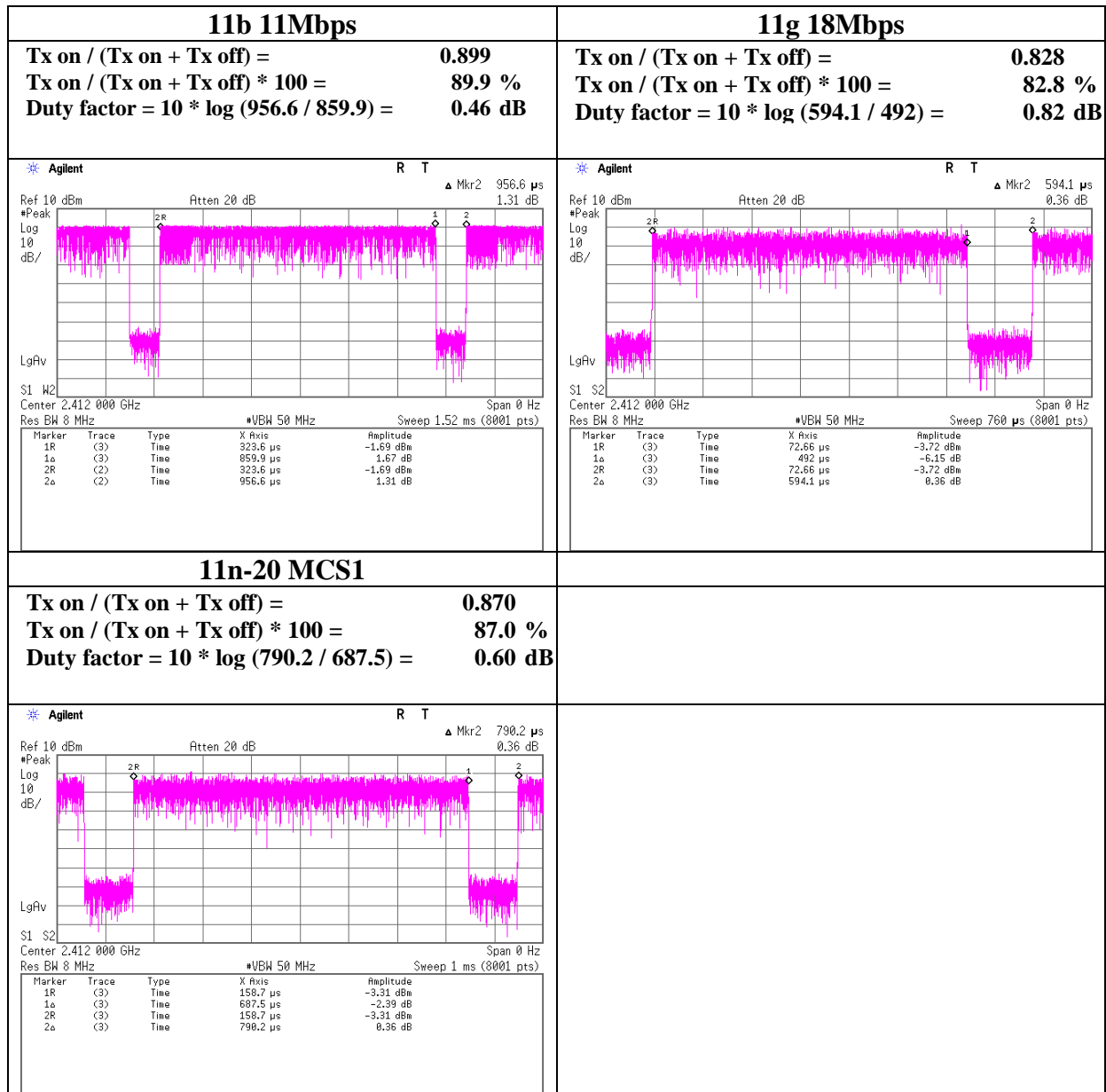
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Burst rate confirmation

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10512882H
Date	11/01/2014
Temperature/ Humidity	22deg. C / 57% RH
Engineer	Kazuya Yoshioka
Mode	Tx 11b/11g/11n-20



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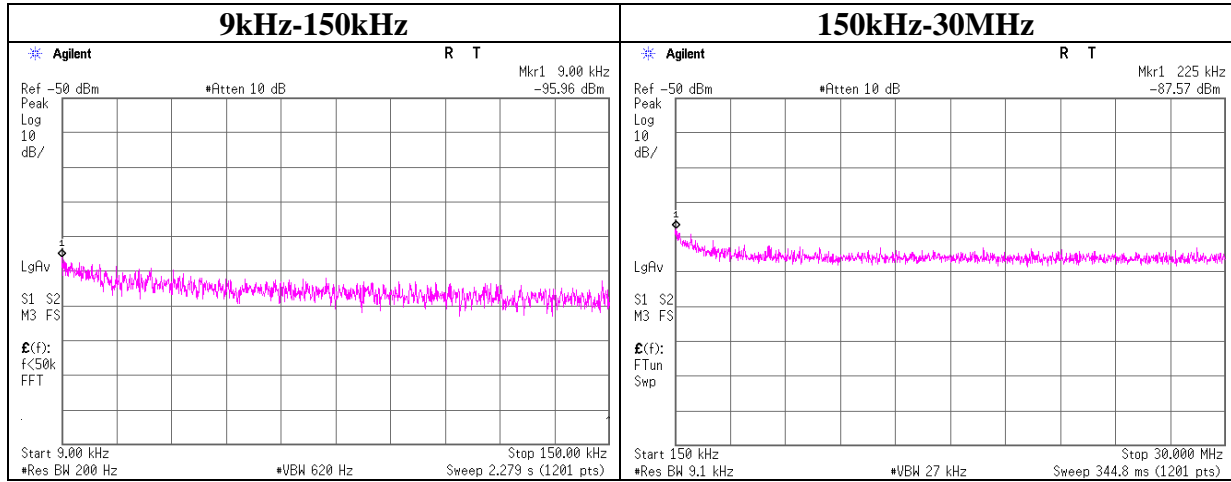
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10512882H
Date	11/11/2014
Temperature/ Humidity	26deg. C / 30% RH
Engineer	Yuta Moriya
Mode	11n-20 Tx

11n-20 Tx 2462MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
9.00	-96.0	0.01	10.0	2.0	-84.0	300.0	6.0	-22.7	48.5
225	-87.6	0.01	10.0	2.0	-75.6	300.0	6.0	-14.3	20.5

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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Power Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10512882H
Date 11/04/2014
Temperature/ Humidity 25deg. C / 32% RH
Engineer Hironobu Ohnishi
Mode 11b/11g/11n-20 Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-30.30	2.28	19.96	-8.06	8.00	16.06
2437.00	-29.97	2.29	19.96	-7.72	8.00	15.72
2462.00	-30.15	2.30	19.96	-7.89	8.00	15.89

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-36.21	2.28	19.96	-13.97	8.00	21.97
2437.00	-36.00	2.29	19.96	-13.75	8.00	21.75
2462.00	-36.10	2.30	19.96	-13.84	8.00	21.84

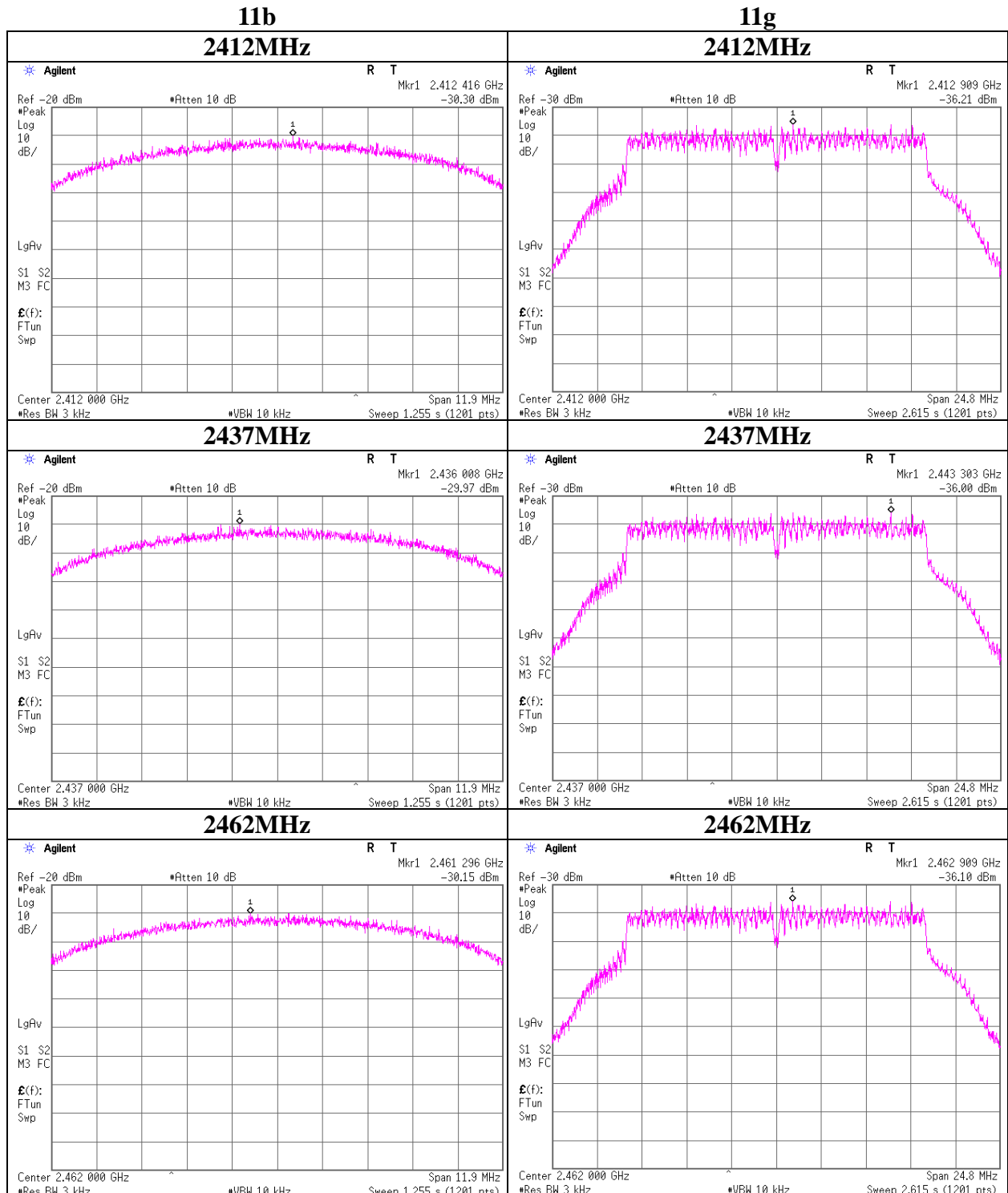
11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-35.78	2.28	19.96	-13.54	8.00	21.54
2437.00	-35.26	2.29	19.96	-13.01	8.00	21.01
2462.00	-34.62	2.30	19.96	-12.36	8.00	20.36

Sample Calculation:

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

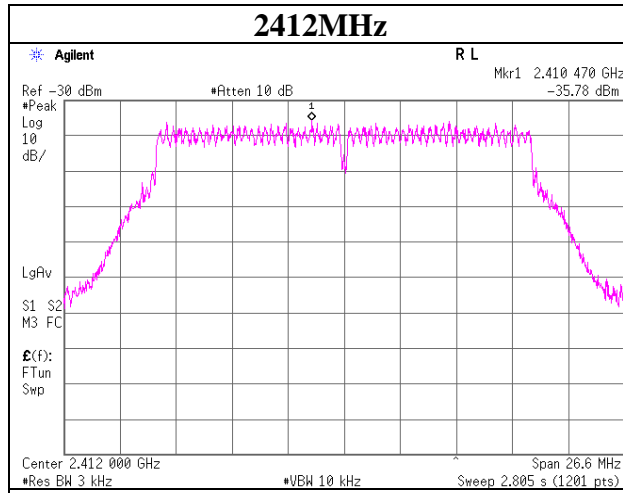
Power Density



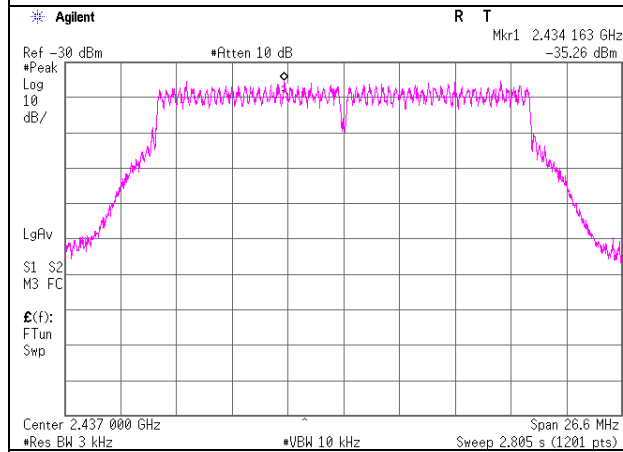
Power Density

11n-20

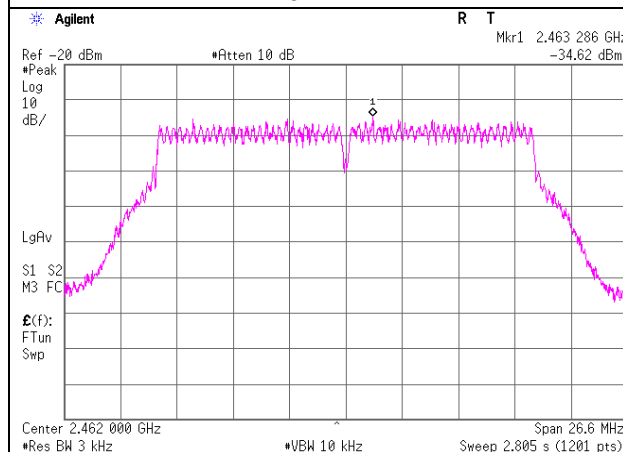
2412MHz



2437MHz



2462MHz



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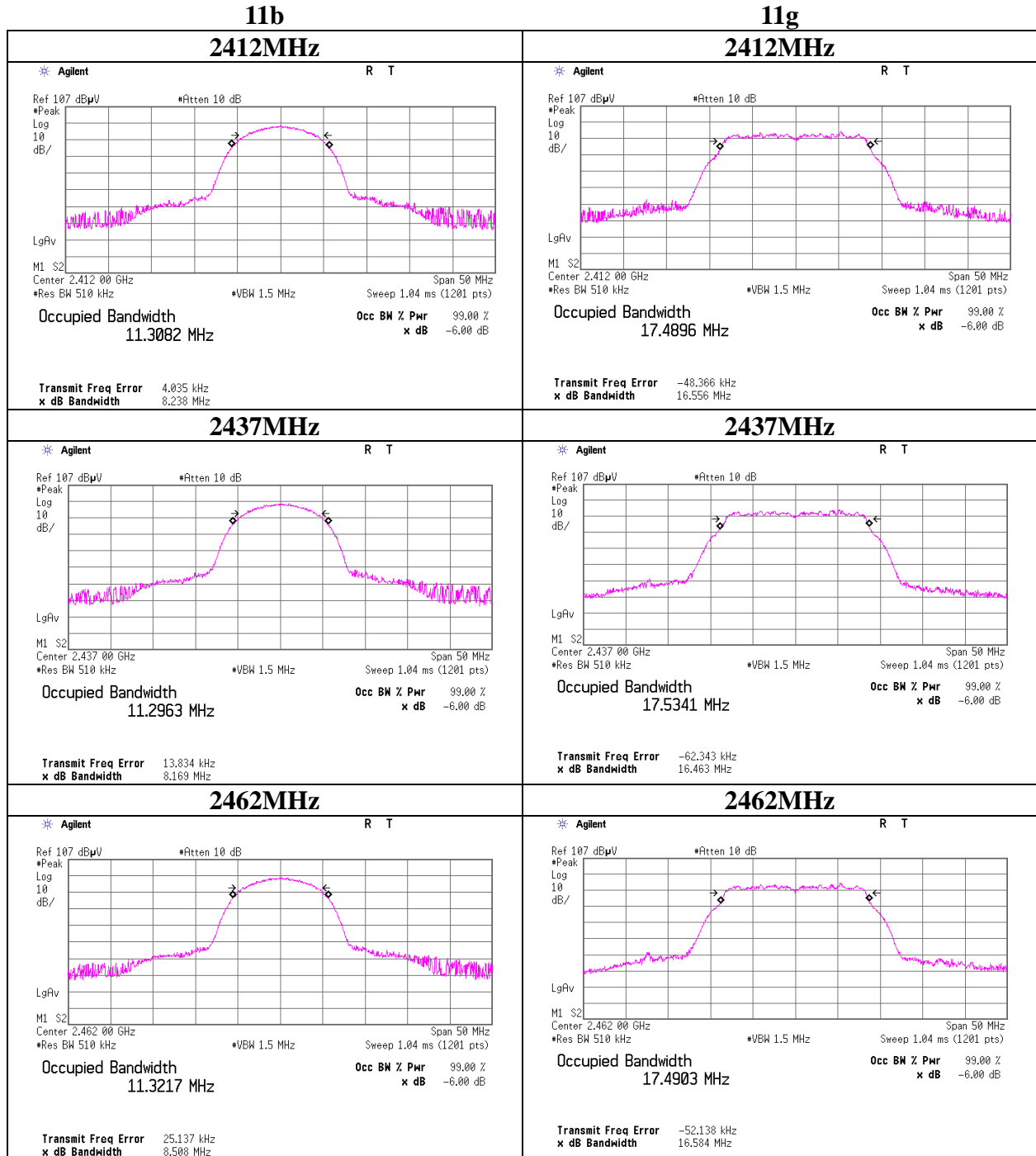
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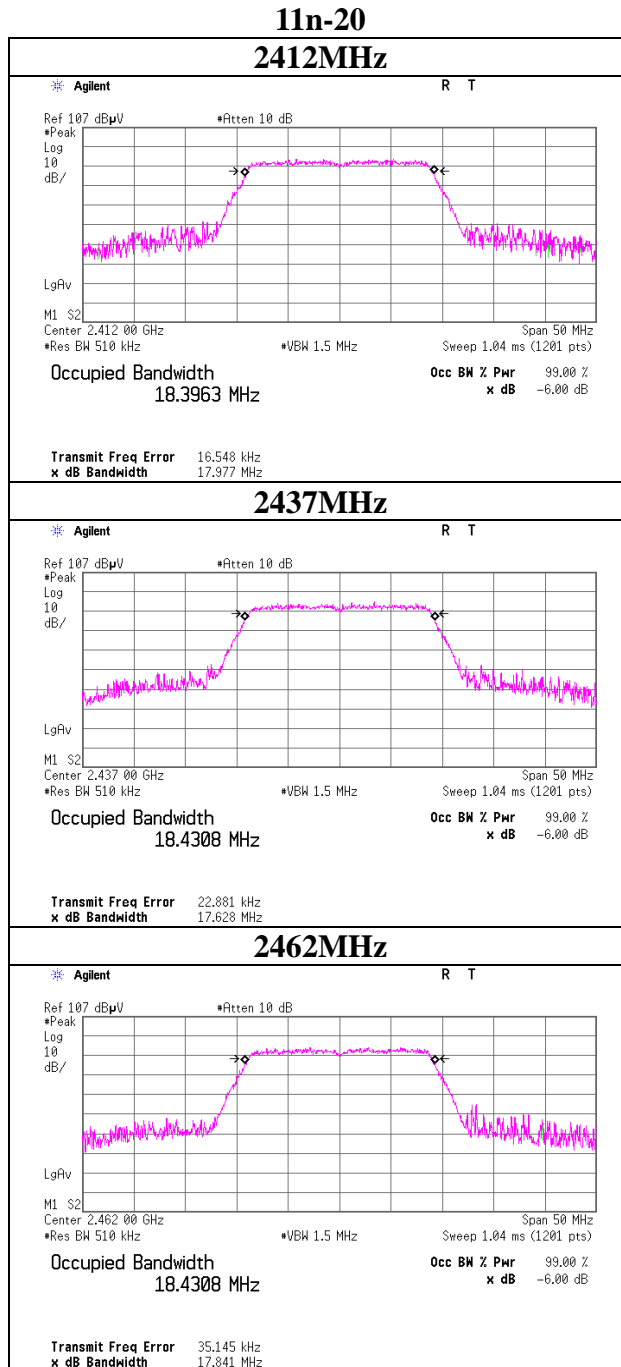
99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10512882H
Date	11/04/2014
Temperature/ Humidity	25deg. C / 32% RH
Engineer	Hironobu Ohnishi
Mode	11b/11g Tx



99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10512882H
Date	11/04/2014
Temperature/ Humidity	25deg. C / 32% RH
Engineer	Hironobu Ohnishi
Mode	11n-20 Tx



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2014/06/16 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2014/06/16 * 12
MCC-67	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28635/2	AT	2014/04/14 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MOS-12	Thermo-Hygrometer	Custom	CTH-180	1201	AT	2014/01/14 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2014/03/05 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2014/05/26 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2014/05/26 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2013/12/17 * 12
MRENT-114						
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2014/10/02 * 12
MAT-21	Attenuator(20dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-120	901247	AT	2014/01/15 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2014/09/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2014/02/20 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2014/06/06 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2013/11/24 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2013/11/24 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2013/11/26 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2014/09/12 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2014/02/17 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2014/05/26 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2014/03/11 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2014/06/30 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2013/11/25 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2014/04/09 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	AT	2014/03/28 * 12

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

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

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

Test Item: RE: Radiated Emission
AT: Antenna Terminal Conducted test

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