



RADIO TEST REPORT

Test Report No. : 10589154H-A-R1

Applicant : KYOCERA Document Solutions Inc.
Type of Equipment : Communication Module
Model No. : LBWA1ZZ1CA
FCC ID : E52LBWA1ZZ1CA
Test regulation : FCC Part 15 Subpart C: 2014
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 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 10589154H-A. 10589154H-A is replaced with this report.

Date of test: December 3 to 5, 2014

Representative test engineer:

T. Nakagawa

Tomohisa Nakagawa
Engineer
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Approved by:

Takayuki Shimada

Takayuki Shimada
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10589154H-A

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SECTION 1: Customer information

Company Name	:	KYOCERA Document Solutions Inc.
Address	:	2-28 1-Chome Tamatsukuri Chuo-Ku, Osaka, Japan 540-8585
Telephone Number	:	+81-6-6764-3333
Facsimile Number	:	+81-6-6764-3493
Contact Person	:	Yukio Okajo

***Remarks:**

Murata Manufacturing Company, Ltd. designates KYOCERA Document Solutions Inc. as manufacturer of the product (Communication Module).

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

2.1 Identification of E.U.T.

Type of Equipment	:	Communication Module
Model No.	:	LBWA1ZZ1CA
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	VBAT Typ. 3.3V, Min. 3.0V, Max. 3.6V PAVDD Typ. 3.3V, Min.3.0V, Max.3.6V VIO Typ.3.3V, Min.3.0V, Max.3.63V (This doesn't influence the RF Characteristic.)
Receipt Date of Sample	:	December 2, 2014
Country of Mass-production	:	China, Japan, Vietnam
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	:	20MHz
------------------------------------	---	-------

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: 1.9dBi	
Power Supply (inner)	DC 3.3V	
Operating temperature range	0 to +80 deg. C	

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on December 23, 2014

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

* The revision on December 23, 2014 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 C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	QP 13.2dB, 8.78000MHz, N AV 9.4dB, 15.31700MHz, N	Complied	-
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	0.3dB 2390.000MHz AV, Vertical	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)

The EUT has the power supply regulator. However one of the input voltages to RF part doesn't go through the regulator. The stable voltage will be supplied by the end product, which will be required to have a power supply regulator. Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The antenna is not removable from the EUT. 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 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)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

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

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 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)	9Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 5, 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: 15.5dBm, 11g: 13dBm, 11n-20: 13dBm Software: 1.42 RC0.0/ 6.10.198.69 *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
Conducted Emission	11b Tx *1)	2437MHz *1)
Spurious Emission (Conducted)		
Spurious Emission (Radiated)	11b Tx 11g Tx	2412MHz 2437MHz 2462MHz
	11n-20 Tx *2)	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 test was performed on the representative mode/frequency that had the highest power at antenna terminal test. *2) Only band edge was tested on this mode according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009, as the 11g Tx mode had the higher power at antenna terminal test.		

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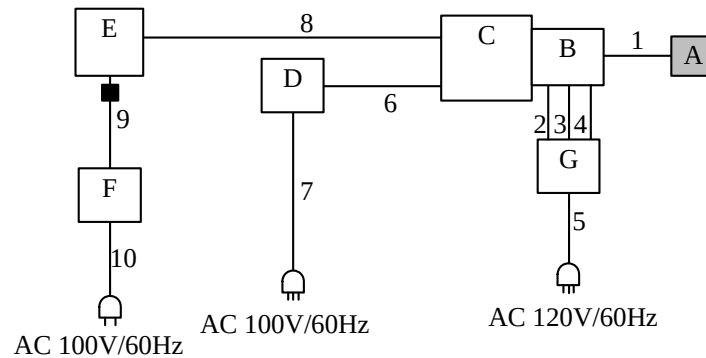
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4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Communication Module	LBWA1ZZ1CA	14 for RE* 11 for AT*	Murata Manufacturing Company, Ltd.	EUT
B	Jig	-	-	Murata Manufacturing Company, Ltd.	-
C	Jig	-	-	Murata Manufacturing Company, Ltd.	-
D	DC Power Supply	PW18-1.3AT	08016530	KENWOOD	for Jig
E	Laptop PC	1952	41V9539JS	lenovo	-
F	AC Adapter	92P1156	11S92P1156Z1ZD XN12ED9Z	lenovo	-
G	DC Power Supply	PMG35-2A	13090501	KIKUSUI	for EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.1	Unshielded	Unshielded	-
2	DC Cable	1.0	Unshielded	Unshielded	-
3	DC Cable	1.0	Unshielded	Unshielded	-
4	DC Cable	1.0	Unshielded	Unshielded	-
5	AC Cable	2.0	Unshielded	Unshielded	-
6	DC Cable	3.0	Unshielded	Unshielded	-
7	AC Cable	2.0	Unshielded	Unshielded	-
8	RS-232C Cable	2.5	Shielded	Shielded	-
9	DC Cable	1.8	Unshielded	Unshielded	-
10	AC Cable	1.0	Unshielded	Unshielded	-

*RE: Radiated Spurious Emission test, AT: Antenna Terminal Conducted Tests

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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 "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

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

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

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

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

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

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

Test Antennas are used as below;

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

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

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 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: WLAN: 12.2.5.1 (11b/g) RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run WLAN: 12.2.5.2 (11n-20) RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run 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: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

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- 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	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

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APPENDIX 1: Data of EMI test

Conducted Emission

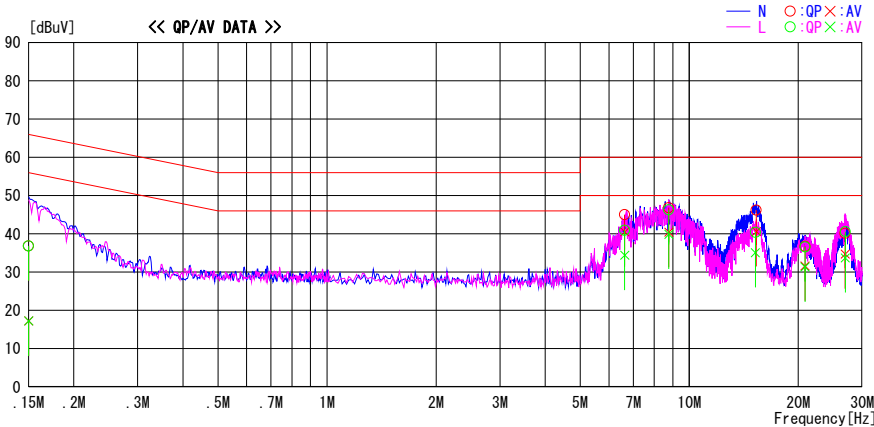
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/12/05

Report No. : 10589154H
Power : AC 120V / 60Hz
Temp./Humi. : 22deg. C / 30% RH
Engineer : Takumi Shimada

Mode / Remarks : WLAN Tx 11g 2437MHz

LIMIT : FCC15. 207 QP
FCC15. 207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	23.6	4.0	13.2	36.8	17.2	66.0	56.0	29.2	38.8	N	
6.63610	31.0	26.5	14.0	45.0	40.5	60.0	50.0	15.0	9.5	N	
8.78000	32.6	26.2	14.2	46.8	40.4	60.0	50.0	13.2	9.6	N	
15.31700	31.7	26.1	14.5	46.2	40.6	60.0	50.0	13.8	9.4	N	
20.87500	21.8	16.7	14.9	36.7	31.6	60.0	50.0	23.3	18.4	N	
26.92500	24.9	19.5	15.2	40.1	34.7	60.0	50.0	19.9	15.3	N	
0.15000	23.6	4.0	13.2	36.8	17.2	66.0	56.0	29.2	38.8	L	
6.63450	26.9	20.4	14.0	40.9	34.4	60.0	50.0	19.1	15.6	L	
8.78000	32.1	25.7	14.2	46.3	39.9	60.0	50.0	13.7	10.1	L	
15.21700	25.9	20.6	14.5	40.4	35.1	60.0	50.0	19.6	14.9	L	
20.87800	21.7	16.4	14.9	36.6	31.3	60.0	50.0	23.4	18.7	L	
26.95000	25.4	18.5	15.2	40.6	33.7	60.0	50.0	19.4	16.3	L	

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

6dB Bandwidth

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 10589154H
Date 12/03/2014 12/04/2014
Temperature/ Humidity 20 deg. C / 32% RH 20 deg. C / 40% RH
Engineer Tomohisa Nakagawa Tomohisa Nakagawa
Mode Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	8.045	>500
2437	8.044	>500
2462	6.996	>500

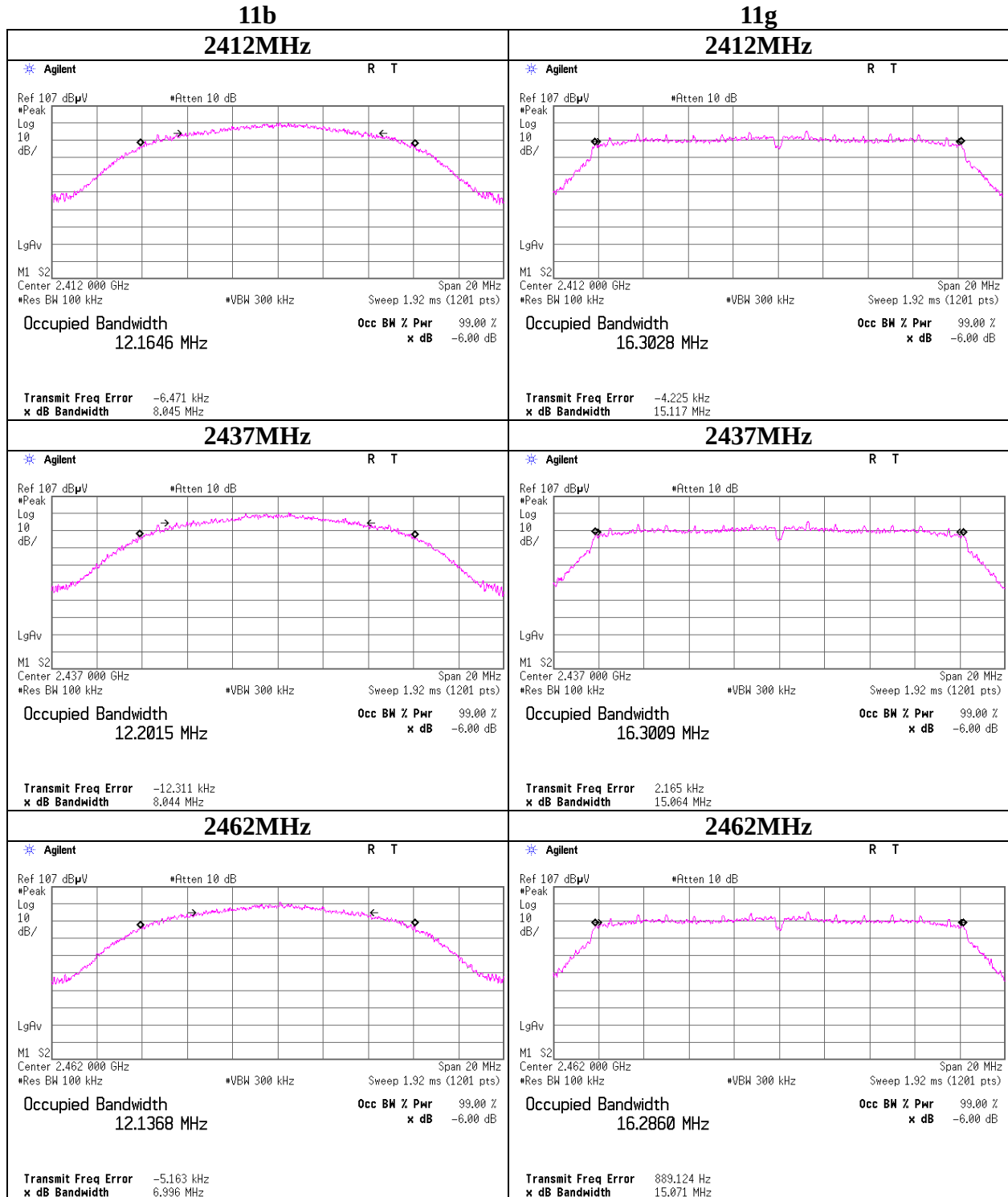
11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.117	>500
2437	15.064	>500
2462	15.071	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	17.288	>500
2437	17.121	>500
2462	17.581	>500

6dB Bandwidth



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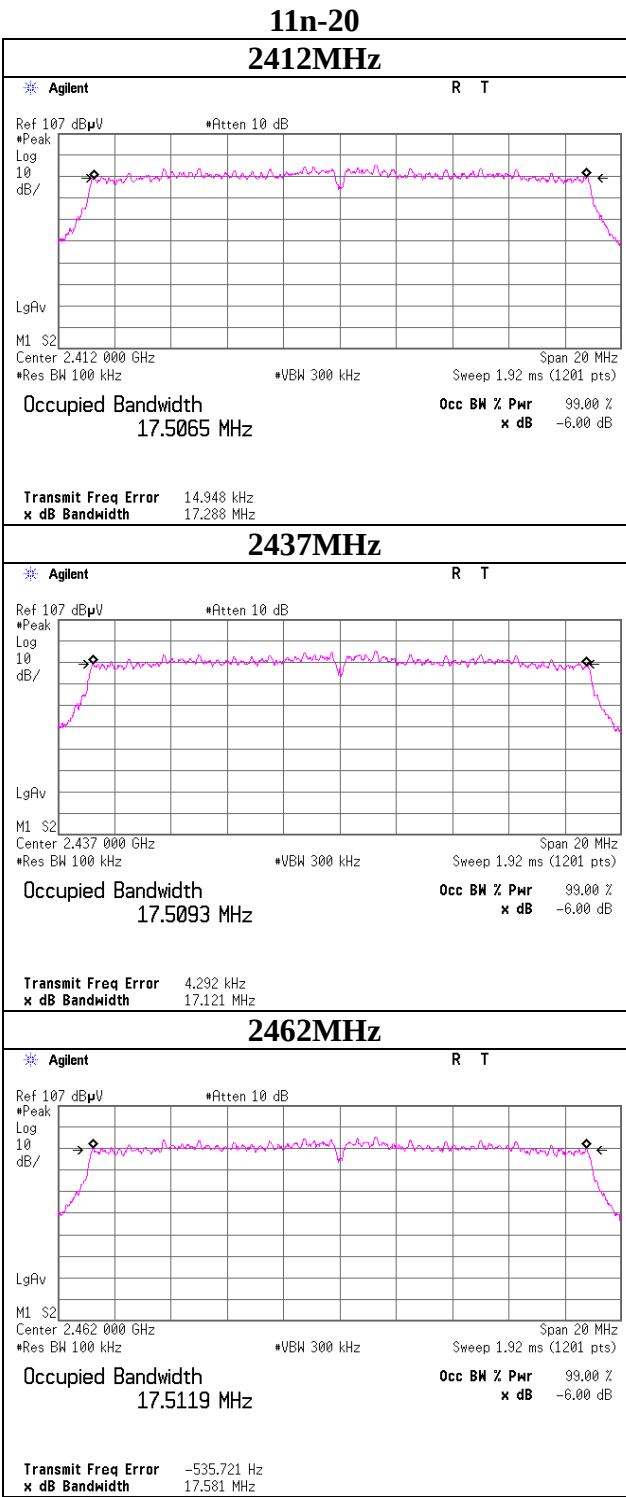
Ise EMC Lab.

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6dB Bandwidth



Maximum Peak Output Power

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 10589154H
Date : 12/04/2014
Temperature/ Humidity : 20 deg. C / 40% RH
Engineer : Tomohisa Nakagawa
Mode : 11b Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	7.02	1.78	10.08	18.88	77.27	30.00	1000	11.12
2437	7.04	1.78	10.08	18.90	77.62	30.00	1000	11.10
2462	7.07	1.79	10.08	18.94	78.34	30.00	1000	11.06

Sample Calculation:

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

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	6.72	
2	6.90	
5.5	6.91	
11	7.04	*

*: 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.6 Measurement Room
Report No. : 10589154H
Date : 12/03/2014
Temperature/ Humidity : 20 deg. C / 32% RH
Engineer : Tomohisa Nakagawa
Mode : 11g Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.27	1.78	10.08	24.13	258.82	30.00	1000	5.87
2437	12.34	1.78	10.08	24.20	263.03	30.00	1000	5.80
2462	12.17	1.79	10.08	24.04	253.51	30.00	1000	5.96

Sample Calculation:

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

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	12.30	
9	12.34	*
12	12.02	
18	11.77	
24	12.12	
36	12.10	
48	11.94	
54	12.09	

*: 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.6 Measurement Room
Report No. : 10589154H
Date : 12/03/2014
Temperature/ Humidity : 20 deg. C / 32% RH
Engineer : Tomohisa Nakagawa
Mode : 11n-20 Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.25	1.78	10.08	24.11	257.63	30.00	1000	5.89
2437	12.17	1.78	10.08	24.03	252.93	30.00	1000	5.97
2462	12.12	1.79	10.08	23.99	250.61	30.00	1000	6.01

Sample Calculation:

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

2437MHz

MCS Number	Reading [dBm]	Remark
0	12.05	
1	11.73	
2	11.75	
3	11.76	
4	11.94	
5	12.17	*
6	12.05	
7	11.97	

*: 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.6 Measurement Room	
Report No.	10589154H	
Date	12/03/2014	12/04/2014
Temperature/ Humidity	20 deg. C / 32% RH	20 deg. C / 40% RH
Engineer	Tomohisa Nakagawa	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	3.93	1.78	10.08	15.79	37.93	30.00	1000	14.21
2437	4.00	1.78	10.08	15.86	38.55	30.00	1000	14.14
2462	3.96	1.79	10.08	15.83	38.28	30.00	1000	14.17

11g **9Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	1.56	1.78	10.08	13.42	21.98	30.00	1000	16.58
2437	1.60	1.78	10.08	13.46	22.18	30.00	1000	16.54
2462	1.49	1.79	10.08	13.36	21.68	30.00	1000	16.64

11n-20 **MCS5**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	1.12	1.78	10.08	12.98	19.86	30.00	1000	17.02
2437	1.09	1.78	10.08	12.95	19.72	30.00	1000	17.05
2462	1.09	1.79	10.08	12.96	19.77	30.00	1000	17.04

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.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day) 12/04/2014(Night)
Temperature/ Humidity : 22deg. C / 30% RH 22deg. C / 30% RH
Engineer : Yuta Moriya Takumi Shimada
(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	2390.000	PK	63.8	27.0	2.8	34.7	-	58.9	73.9	15.0	
Hori	4824.000	PK	42.6	31.9	4.8	33.9	-	45.4	73.9	28.5	
Hori	7236.000	PK	44.0	35.7	5.7	33.8	-	51.6	73.9	22.3	
Hori	9648.000	PK	43.9	38.1	6.8	34.4	-	54.4	73.9	19.5	
Hori	2390.000	AV	49.5	27.0	2.8	34.7	-	44.6	53.9	9.3	
Hori	4824.000	AV	34.5	31.9	4.8	33.9	-	37.3	53.9	16.6	
Hori	7236.000	AV	34.4	35.7	5.7	33.8	-	42.0	53.9	11.9	
Hori	9648.000	AV	35.4	38.1	6.8	34.4	-	45.9	53.9	8.0	
Vert	2390.000	PK	59.8	27.0	2.8	34.7	-	54.9	73.9	19.0	
Vert	4824.000	PK	43.7	31.9	4.8	33.9	-	46.5	73.9	27.4	
Vert	7236.000	PK	43.3	35.7	5.7	33.8	-	50.9	73.9	23.0	
Vert	9648.000	PK	44.0	38.1	6.8	34.4	-	54.5	73.9	19.4	
Vert	2390.000	AV	45.3	27.0	2.8	34.7	-	40.4	53.9	13.5	
Vert	4824.000	AV	33.8	31.9	4.8	33.9	-	36.6	53.9	17.3	
Vert	7236.000	AV	34.3	35.7	5.7	33.8	-	41.9	53.9	12.0	
Vert	9648.000	AV	34.5	38.1	6.8	34.4	-	45.0	53.9	8.9	

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).

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

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

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	107.8	27.0	2.8	34.7	102.9	-	-	Carrier
Hori	2400.000	PK	64.8	27.0	2.8	34.7	59.9	82.9	23.0	
Vert	2412.000	PK	105.9	27.0	2.8	34.7	101.0	-	-	Carrier
Vert	2400.000	PK	65.2	27.0	2.8	34.7	60.3	81.0	20.7	

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day) 12/04/2014(Night)
Temperature/ Humidity : 22deg. C / 30% RH 22deg. C / 30% RH
Engineer : Yuta Moriya Takumi Shimada
(1-10GHz) (10-26.5GHz)
Mode : 11b Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	42.9	32.0	4.8	33.9	-	45.8	73.9	28.1	
Hori	7311.000	PK	42.8	35.8	5.7	33.8	-	50.5	73.9	23.4	
Hori	9748.000	PK	42.7	38.3	6.9	34.5	-	53.4	73.9	20.5	
Hori	4874.000	AV	34.3	32.0	4.8	33.9	-	37.2	53.9	16.7	
Hori	7311.000	AV	34.4	35.8	5.7	33.8	-	42.1	53.9	11.8	
Hori	9748.000	AV	34.2	38.3	6.9	34.5	-	44.9	53.9	9.0	
Vert	4874.000	PK	42.7	32.0	4.8	33.9	-	45.6	73.9	28.3	
Vert	7311.000	PK	43.4	35.8	5.7	33.8	-	51.1	73.9	22.8	
Vert	9748.000	PK	43.8	38.3	6.9	34.5	-	54.5	73.9	19.4	
Vert	4874.000	AV	34.2	32.0	4.8	33.9	-	37.1	53.9	16.8	
Vert	7311.000	AV	34.5	35.8	5.7	33.8	-	42.2	53.9	11.7	
Vert	9748.000	AV	34.8	38.3	6.9	34.5	-	45.5	53.9	8.4	

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

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

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

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

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Ise EMC Lab.

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day) 12/04/2014(Night)
Temperature/ Humidity : 22deg. C / 30% RH 22deg. C / 30% RH
Engineer : Yuta Moriya Takumi Shimada
(1-10GHz) (10-26.5GHz)
Mode : 11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	60.4	26.9	2.8	34.7	-	55.4	73.9	18.5	
Hori	4924.000	PK	43.2	32.1	4.8	33.9	-	46.2	73.9	27.7	
Hori	7386.000	PK	42.9	35.8	5.7	33.8	-	50.6	73.9	23.3	
Hori	9848.000	PK	42.2	38.5	6.9	34.5	-	53.1	73.9	20.8	
Hori	2483.500	AV	48.7	26.9	2.8	34.7	-	43.7	53.9	10.2	
Hori	4924.000	AV	34.3	32.1	4.8	33.9	-	37.3	53.9	16.6	
Hori	7386.000	AV	34.5	35.8	5.7	33.8	-	42.2	53.9	11.7	
Hori	9848.000	AV	35.0	38.5	6.9	34.5	-	45.9	53.9	8.0	
Vert	2483.500	PK	58.1	26.9	2.8	34.7	-	53.1	73.9	20.8	
Vert	4924.000	PK	43.2	32.1	4.8	33.9	-	46.2	73.9	27.7	
Vert	7386.000	PK	43.5	35.8	5.7	33.8	-	51.2	73.9	22.7	
Vert	9848.000	PK	44.2	38.5	6.9	34.5	-	55.1	73.9	18.8	
Vert	2483.500	AV	43.9	26.9	2.8	34.7	-	38.9	53.9	15.0	
Vert	4924.000	AV	33.4	32.1	4.8	33.9	-	36.4	53.9	17.5	
Vert	7386.000	AV	34.1	35.8	5.7	33.8	-	41.8	53.9	12.1	
Vert	9848.000	AV	34.4	38.5	6.9	34.5	-	45.3	53.9	8.6	

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).

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

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

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Radiated Spurious Emission

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
 Report No. 10589154H
 Date 12/04/2014(Day) 12/04/2014(Night)
 Temperature/ Humidity 22deg. C / 30% RH 22deg. C / 30% RH
 Engineer Yuta Moriya Takumi Shimada
 (1-10GHz) (10-26.5GHz)
 Mode 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	2390.000	PK	73.2	27.0	2.8	34.7	-	68.3	73.9	5.6	
Hori	4824.000	PK	42.1	31.9	4.8	33.9	-	44.9	73.9	29.0	
Hori	7236.000	PK	42.9	35.7	5.7	33.8	-	50.5	73.9	23.4	
Hori	9648.000	PK	42.6	38.1	6.8	34.4	-	53.1	73.9	20.8	
Hori	2390.000	AV	58.3	27.0	2.8	34.7	-	53.4	53.9	0.5	
Hori	4824.000	AV	33.9	31.9	4.8	33.9	-	36.7	53.9	17.2	
Hori	7236.000	AV	34.3	35.7	5.7	33.8	-	41.9	53.9	12.0	
Hori	9648.000	AV	34.5	38.1	6.8	34.4	-	45.0	53.9	8.9	
Vert	2390.000	PK	71.6	27.0	2.8	34.7	-	66.7	73.9	7.2	
Vert	4824.000	PK	42.5	31.9	4.8	33.9	-	45.3	73.9	28.6	
Vert	7236.000	PK	42.5	35.7	5.7	33.8	-	50.1	73.9	23.8	
Vert	9648.000	PK	42.7	38.1	6.8	34.4	-	53.2	73.9	20.7	
Vert	2390.000	AV	58.5	27.0	2.8	34.7	-	53.6	53.9	0.3	
Vert	4824.000	AV	34.0	31.9	4.8	33.9	-	36.8	53.9	17.1	
Vert	7236.000	AV	34.4	35.7	5.7	33.8	-	42.0	53.9	11.9	
Vert	9648.000	AV	35.1	38.1	6.8	34.4	-	45.6	53.9	8.3	

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).

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

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

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	103.0	27.0	2.8	34.7	98.1	-	-	Carrier
Hori	2400.000	PK	66.0	27.0	2.8	34.7	61.1	78.1	17.0	
Vert	2412.000	PK	101.2	27.0	2.8	34.7	96.3	-	-	Carrier
Vert	2400.000	PK	64.6	27.0	2.8	34.7	59.7	76.3	16.6	

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

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Facsimile : +81 596 24 8124

Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day) 12/04/2014(Night) 12/03/2014(Night)
Temperature/ Humidity : 22deg. C / 30% RH 22deg. C / 30% RH 25deg. C / 30% RH
Engineer : Yuta Moriya Takumi Shimada Takumi Shimada
(1-10GHz) (10-26.5GHz) (Below 1GHz)
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	31.800	QP	23.8	16.8	6.7	28.5	-	18.8	40.0	21.2	
Hori	112.350	QP	23.0	11.9	7.5	28.2	-	14.2	43.5	29.3	
Hori	280.649	QP	21.8	18.7	8.6	27.5	-	21.6	46.0	24.4	
Hori	556.666	QP	22.8	19.3	9.7	28.5	-	23.3	46.0	22.7	
Hori	713.002	QP	22.3	20.8	10.5	28.0	-	25.6	46.0	20.4	
Hori	882.171	QP	22.0	22.4	11.2	27.3	-	28.3	46.0	17.7	
Hori	4874.000	PK	41.8	32.0	4.8	33.9	-	44.7	73.9	29.2	
Hori	7311.000	PK	42.5	35.8	5.7	33.8	-	50.2	73.9	23.7	
Hori	9748.000	PK	42.5	38.3	6.9	34.5	-	53.2	73.9	20.7	
Hori	4874.000	AV	33.9	32.0	4.8	33.9	-	36.8	53.9	17.1	
Hori	7311.000	AV	34.4	35.8	5.7	33.8	-	42.1	53.9	11.8	
Hori	9748.000	AV	34.4	38.3	6.9	34.5	-	45.1	53.9	8.8	
Vert	32.267	QP	30.1	16.6	6.8	28.5	-	25.0	40.0	15.0	
Vert	40.742	QP	29.5	14.2	6.9	28.5	-	22.1	40.0	17.9	
Vert	299.100	QP	22.4	19.6	8.7	27.4	-	23.3	46.0	22.7	
Vert	483.165	QP	23.2	18.5	9.4	28.5	-	22.6	46.0	23.4	
Vert	697.835	QP	22.8	20.6	10.5	28.1	-	25.8	46.0	20.2	
Vert	940.506	QP	21.9	22.9	11.3	27.1	-	29.0	46.0	17.0	
Vert	4874.000	PK	42.1	32.0	4.8	33.9	-	45.0	73.9	28.9	
Vert	7311.000	PK	42.3	35.8	5.7	33.8	-	50.0	73.9	23.9	
Vert	9748.000	PK	42.6	38.3	6.9	34.5	-	53.3	73.9	20.6	
Vert	4874.000	AV	34.1	32.0	4.8	33.9	-	37.0	53.9	16.9	
Vert	7311.000	AV	34.3	35.8	5.7	33.8	-	42.0	53.9	11.9	
Vert	9748.000	AV	34.4	38.3	6.9	34.5	-	45.1	53.9	8.8	

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).

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

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day) 12/04/2014(Night)
Temperature/ Humidity : 22deg. C / 30% RH 22deg. C / 30% RH
Engineer : Yuta Moriya Takumi Shimada
(1-10GHz) (10-26.5GHz)
Mode : 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	2483.500	PK	70.0	26.9	2.8	34.7	-	65.0	73.9	8.9	
Hori	4924.000	PK	43.1	32.1	4.8	33.9	-	46.1	73.9	27.8	
Hori	7386.000	PK	44.2	35.8	5.7	33.8	-	51.9	73.9	22.0	
Hori	9848.000	PK	43.5	38.5	6.9	34.5	-	54.4	73.9	19.5	
Hori	2483.500	AV	54.0	26.9	2.8	34.7	-	49.0	53.9	4.9	
Hori	4924.000	AV	33.9	32.1	4.8	33.9	-	36.9	53.9	17.0	
Hori	7386.000	AV	34.6	35.8	5.7	33.8	-	42.3	53.9	11.6	
Hori	9848.000	AV	34.9	38.5	6.9	34.5	-	45.8	53.9	8.1	
Vert	2483.500	PK	69.0	26.9	2.8	34.7	-	64.0	73.9	9.9	
Vert	4924.000	PK	42.7	32.1	4.8	33.9	-	45.7	73.9	28.2	
Vert	7386.000	PK	43.3	35.8	5.7	33.8	-	51.0	73.9	22.9	
Vert	9848.000	PK	43.9	38.5	6.9	34.5	-	54.8	73.9	19.1	
Vert	2483.500	AV	52.1	26.9	2.8	34.7	-	47.1	53.9	6.8	
Vert	4924.000	AV	33.4	32.1	4.8	33.9	-	36.4	53.9	17.5	
Vert	7386.000	AV	34.3	35.8	5.7	33.8	-	42.0	53.9	11.9	
Vert	9848.000	AV	34.4	38.5	6.9	34.5	-	45.3	53.9	8.6	

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).

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

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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day)
Temperature/ Humidity : 22deg. C / 30% RH
Engineer : Yuta Moriya
(1-10GHz)
Mode : 11n-20 Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	71.9	27.0	2.8	34.7	-	67.0	73.9	6.9	
Hori	2390.000	AV	55.4	27.0	2.8	34.7	0.4	50.9	53.9	3.0	*1)
Vert	2390.000	PK	68.3	27.0	2.8	34.7	-	63.4	73.9	10.5	
Vert	2390.000	AV	54.3	27.0	2.8	34.7	0.4	49.8	53.9	4.1	*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).

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

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

*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	108.1	27.0	2.8	34.7	103.2	-	-	Carrier
Hori	2400.000	PK	67.2	27.0	2.8	34.7	62.3	83.2	20.9	
Vert	2412.000	PK	106.6	27.0	2.8	34.7	101.7	-	-	Carrier
Vert	2400.000	PK	64.2	27.0	2.8	34.7	59.3	81.7	22.4	

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10589154H
Date : 12/04/2014(Day)
Temperature/ Humidity : 22deg. C / 30% RH
Engineer : Yuta Moriya
(1-10GHz)
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	2483.500	PK	71.9	26.9	2.8	34.7	-	66.9	73.9	7.0	
Hori	2483.500	AV	57.7	26.9	2.8	34.7	0.4	53.1	53.9	0.8	*1)
Vert	2483.500	PK	66.4	26.9	2.8	34.7	-	61.4	73.9	12.5	
Vert	2483.500	AV	52.3	26.9	2.8	34.7	0.4	47.7	53.9	6.2	*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).

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

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

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

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Telephone : +81 596 24 8999

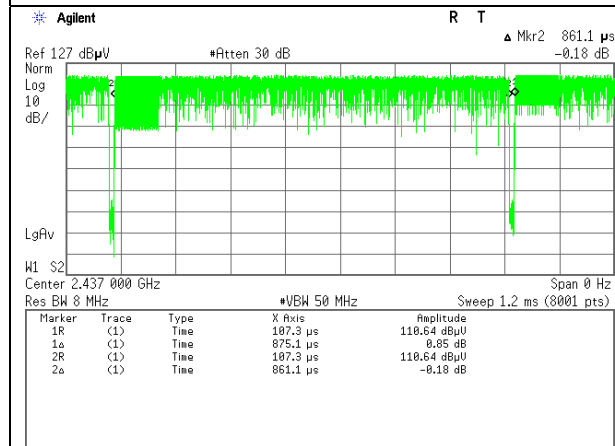
Facsimile : +81 596 24 8124

Burst rate confirmation

Test place Ise EMC Lab. No.2 Measurement Room
Report No. 10589154H
Date 12/04/2014
Temperature/ Humidity 22 deg. C / 30% RH
Engineer Yuta Moriya
Mode Tx 11b/g

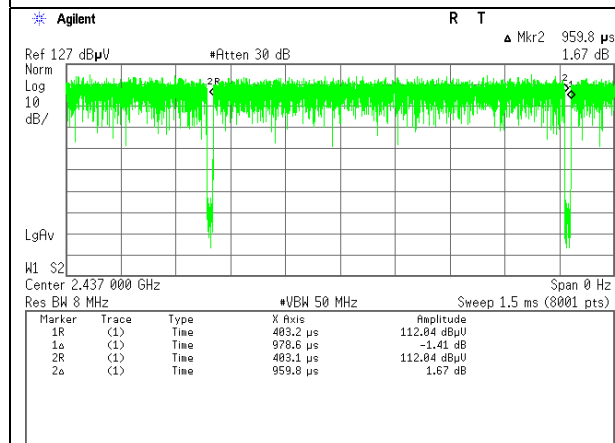
11b 11Mbps

Tx on / (Tx on + Tx off) = 0.984
Tx on / (Tx on + Tx off) * 100 = 98.4 %
Duty factor = $10 * \log(0.8751 / 0.8611)$ 0.07 dB



11g 9Mbps

Tx on / (Tx on + Tx off) = 0.981
Tx on / (Tx on + Tx off) * 100 = 98.1 %
Duty factor = $10 * \log(0.9786 / 0.9598)$ 0.08 dB



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Burst rate confirmation

Test place

Report No.

Date

Temperature/ Humidity

Engineer

Mode

Ise EMC Lab. No.2 Measurement Room

10589154H

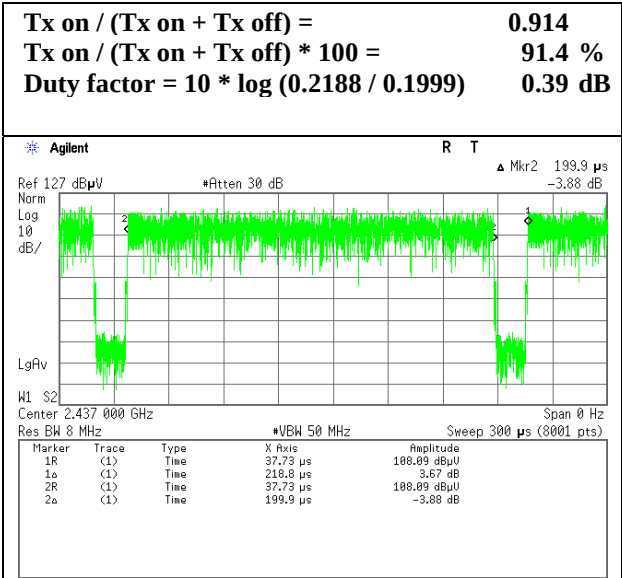
12/04/2014

22 deg. C / 30% RH

Yuta Moriya

Tx 11n-20

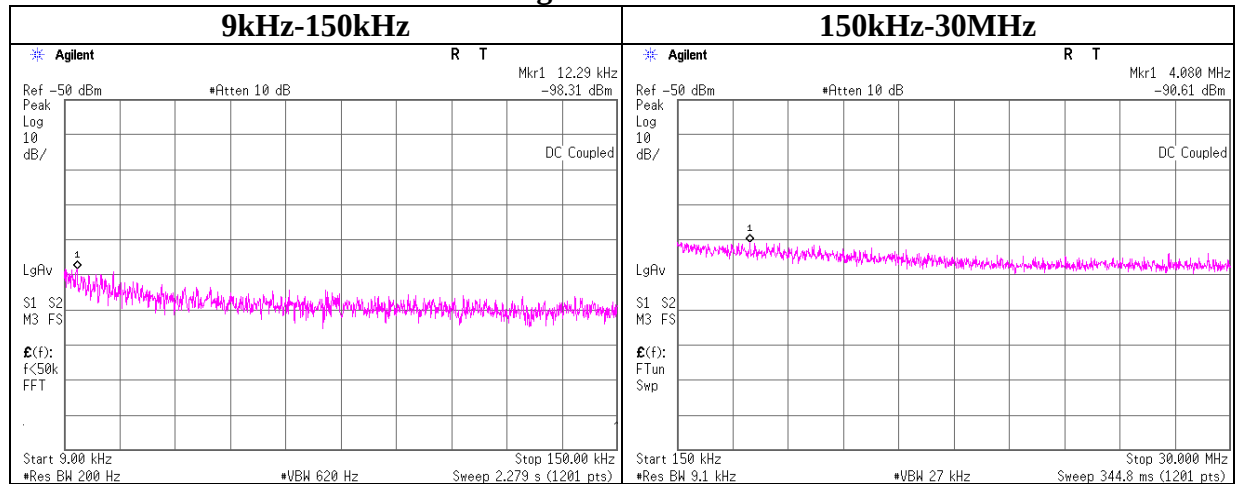
11n-20 MCS5



Conducted Spurious Emission

Test place : Ise EMC Lab. No.6 Measurement Room
Report No. : 10589154H
Date : 12/03/2014
Temperature/ Humidity : 20 deg. C / 32% RH
Engineer : Tomohisa Nakagawa
Mode : Tx 11g

11g Tx 2437MHz



Frequency	Reading	Cable Loss	Attenuator	Antenna Gain	EIRP	Distance	Ground bounce	E (field strength)	Limit
[kHz]	[dBm]	[dB]	[dB]	[dBi]	[dBm]	[m]	[dB]	[dBuV/m]	[dBuV/m]
12.29	-98.3	0.01	10.1	2.0	-86.2	300	6.0	-25.0	45.8
4080.00	-90.6	0.01	10.1	2.0	-78.5	30	6.0	2.7	29.5

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain} + 10 * \log(N)$

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Power Density

Test place Ise EMC Lab. No.6 Measurement Room
Report No. 10589154H
Date 12/03/2014 12/04/2014
Temperature/ Humidity 20 deg. C / 32% RH 20 deg. C / 40% RH
Engineer Tomohisa Nakagawa Tomohisa Nakagawa
Mode Tx 11b/g

11b

Freq.	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-24.43	1.78	16.19	-6.46	8.00	14.46
2437.00	-24.63	1.78	16.19	-6.66	8.00	14.66
2462.00	-24.61	1.79	16.19	-6.63	8.00	14.63

11g

Freq.	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-28.93	1.78	16.19	-10.96	8.00	18.96
2437.00	-28.40	1.78	16.19	-10.43	8.00	18.43
2462.00	-28.57	1.79	16.19	-10.59	8.00	18.59

Sample Calculation:

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

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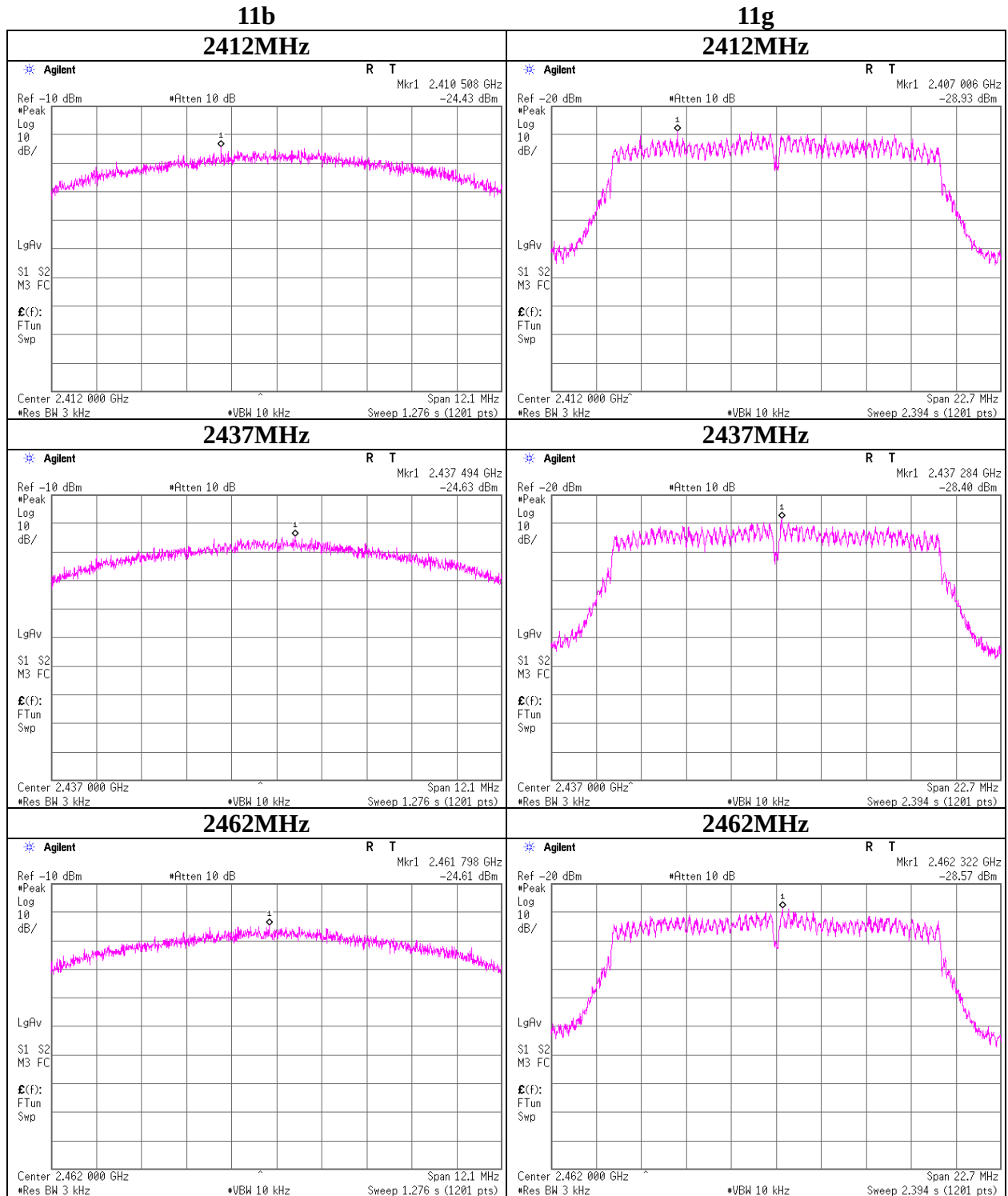
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Power Density



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Power Density

Test place	Ise EMC Lab. No.6 Measurement Room
Report No.	10589154H
Date	12/03/2014
Temperature/ Humidity	20 deg. C / 32% RH
Engineer	Tomohisa Nakagawa
Mode	11n-20 Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-28.99	1.78	16.19	-11.02	0.08	8.00	19.02
2437.00	-28.93	1.78	16.19	-10.96	0.08	8.00	18.96
2462.00	-29.00	1.79	16.19	-11.02	0.08	8.00	19.02

Sample Calculation:

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

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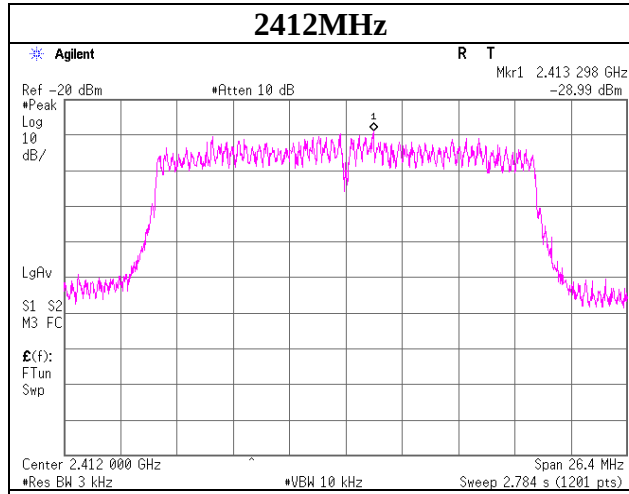
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

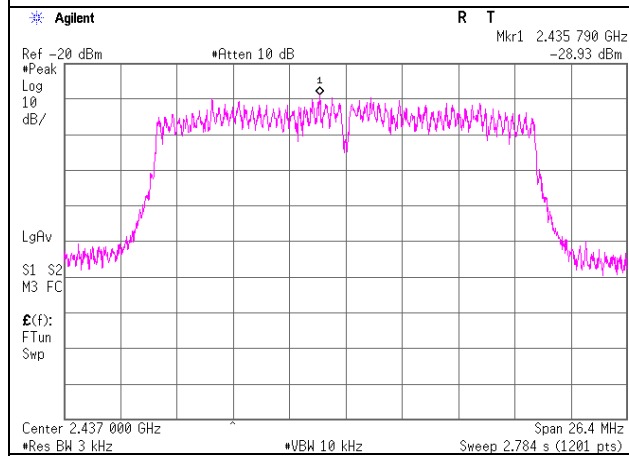
Power Density

11n-20

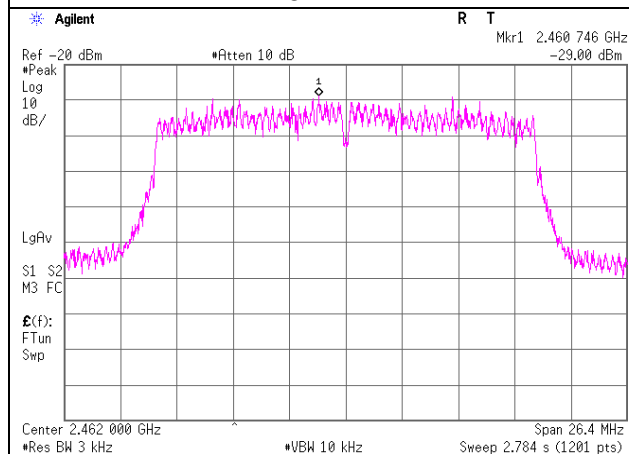
2412MHz



2437MHz



2462MHz



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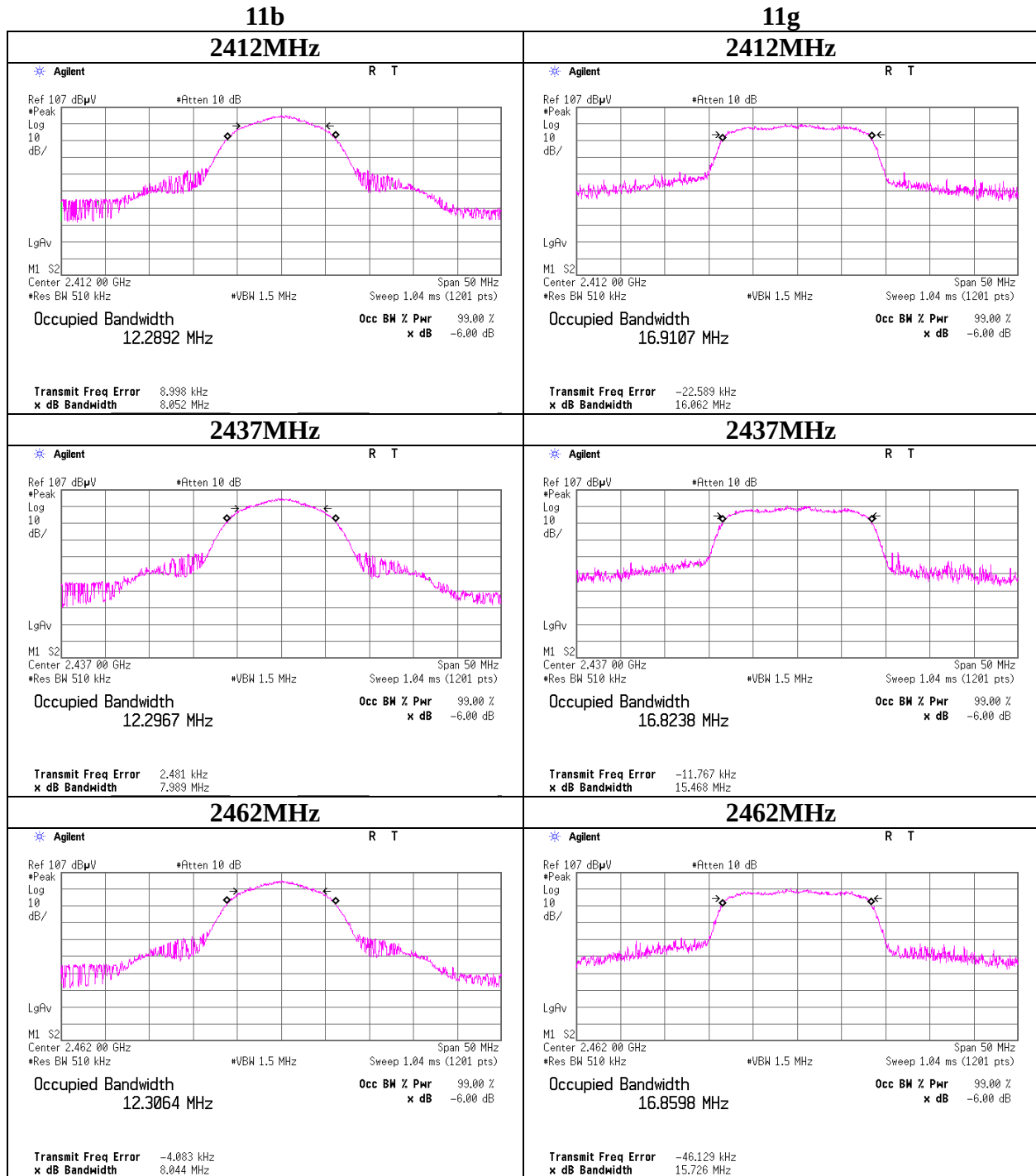
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99%Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement Room	
Report No.	10589154H	
Date	12/03/2014	12/04/2014
Temperature/ Humidity	20 deg. C / 32% RH	20 deg. C / 40% RH
Engineer	Tomohisa Nakagawa	Tomohisa Nakagawa
Mode	Tx 11b/g	

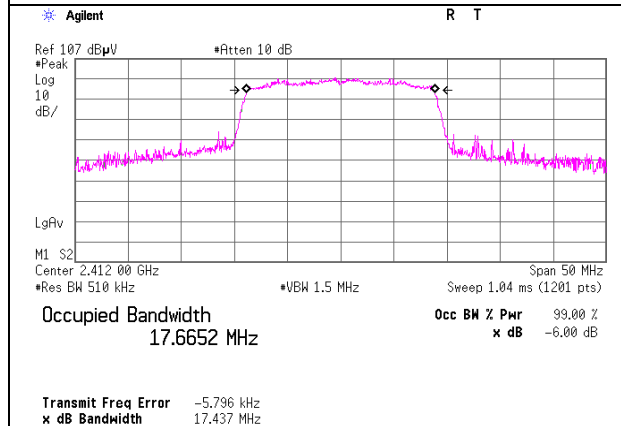


99% Occupied Bandwidth

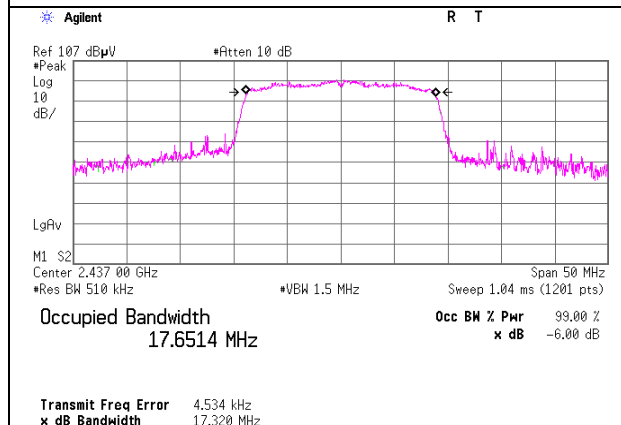
Test place Ise EMC Lab. No.6 Measurement Room
Report No. 10589154H
Date 12/03/2014
Temperature/ Humidity 20 deg. C / 32% RH
Engineer Tomohisa Nakagawa
Mode Tx 11n-20

11n-20

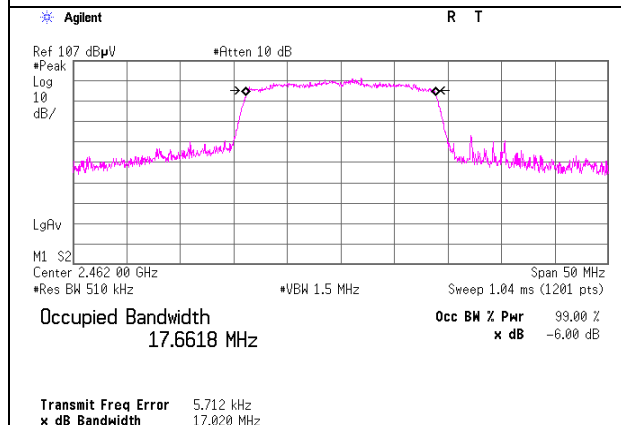
2412MHz



2437MHz



2462MHz



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2014/02/20 * 12
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	AT	2014/02/28 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2014/10/16 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2014/10/15 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	AT	2014/10/02 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MAT-19	Attenuator(6dB)(above1 GHz)	HIROSE ELECTRIC CO.,LTD.	AT-106	-	AT	2014/01/15 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2014/02/20 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2014/06/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2014/11/11 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2014/09/26 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2014/05/21 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE(MW)	2014/02/21 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2014/07/10 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(AE)	2014/07/10 * 12
MTA-05	Terminator	MCL	NTRM-50	932211	CE	2014/01/20 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2014/02/20 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 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.

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