



Test report No. : 10203419H-A-R1
Page : 1 of 44
Issued date : April 14, 2014
Revised date : April 17, 2014
FCC ID : B3Q8V9404

RADIO TEST REPORT

Test Report No. : 10203419H-A-R1

Applicant : BROTHER INDUSTRIES, LTD.
Type of Equipment : Mobile Printer
Model No. : RJ-3150
FCC ID : B3Q8V9404
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.
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6. This report is a revised version of 10203419H-A. 10203419H-A is replaced with this report.

Date of test: November 27 and December 5, 2013
March 31 and April 1, 2014

Representative test engineer:

T. Nakagawa

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Engineer

Consumer Technology Division

Approved by:

T. Hatahara

Takahiro Hatahara
Leader

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.: 10203419H-A

[illegible]

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SECTION 1: Customer information

Company Name : BROTHER INDUSTRIES, LTD.
Trade Name : brother
Address : 15-1, Naeshiro-cho, Mizuho-ku, Nagoya, Aihchi-ken, 467-8561 Japan
Telephone Number : +81-52-824-2345
Facsimile Number : +81-52-821-1068
Contact Person : Shuhei Nohara

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

2.1 Identification of E.U.T.

Type of Equipment : Mobile Printer
Model No. : RJ-3150 (Tested model)
RJ-3050 (Variant model)
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12.0V
* Test was performed with the EUT connected to AC Adaptor.
Receipt Date of Sample : November 27, 2013 and March 14, 2014
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

Clock frequency(ies) in the system : CPU:96MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2412-2462MHz
Modulation : DSSS / OFDM
Power Supply (radio part input) : DC 3.3V
Antenna type : PCB Antenna
Antenna Gain : 2.03dBi

RJ-3150 has some model variation as follows:

RJ-3150
RJ-3050

The difference between these models are shown below;

Model name	LCD	USB HOST	Transmissive sensor	Reflective sensor for peeler	Peeler	Remark
RJ-3150	Yes	Yes	Yes	Yes	Yes	EUT
RJ-3050	No	No	No	No	No	-

Electrical performances / specifications does not differ from tested sample model RJ-3150

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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 March 6, 2014 and effective April 7, 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 EUT complies with FCC Part 15 Subpart B: 2014, final revised on March 6, 2014 and effective April 7, 2014.

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 17.4dB, 0.63120MHz, N AV 10.3dB, 0.63120MHz, N	Complied	-
6dB Bandwidth	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied *1)	Conducted
Maximum Peak Output Power	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied *1)	Conducted
Power Density	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied *1)	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3	1.8dB 2319.664MHz, AV, Vertical.	Complied	Conducted *1)/ Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test result of UL Japan Report No. 10129391H-A-R1 was used for this report, because the EUT has the same radio module as the equipment tested in the Report.

* 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 Part regardless of input 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 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	3.5dB
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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	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	4.0 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)	1Mbps, 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: 11b : 17.0dBm, 11g : 13.0dBm, 11n-20 :12.0dBm - Software: Printer Setting Tool Version 1.2.001 Write PTUSB Version 2.1.0 This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*Details of Operating mode(s)

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

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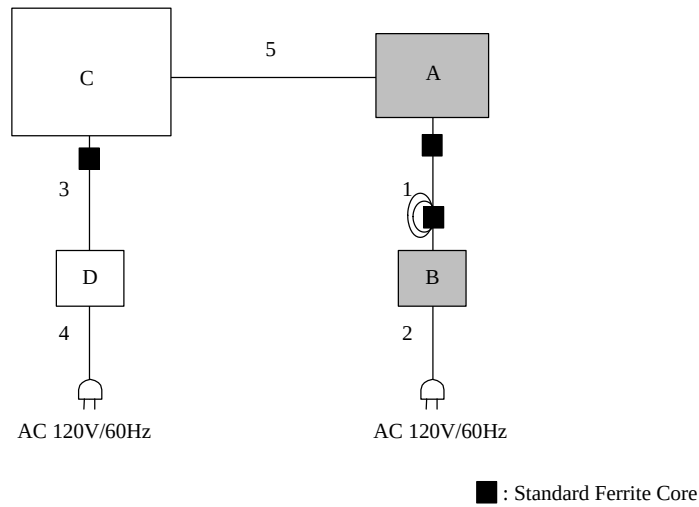
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4.2 Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Mobile Printer	RJ-3150	U63836-B4Z556940	BROTHER INDUSTRIES, LTD.	EUT
B	AC Adaptor	PA-AD-600	NU60-F150400-I3	BROTHER INDUSTRIES, LTD.	EUT
C	Laptop PC	CF-R6MW4AJS	7BKSA01009R	Panasonic Corporation	-
D	AC Adaptor	CF-AA6282A	6282AM107708152A	Panasonic Corporation	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.8	Unshielded	Unshielded	-
2	AC Cable	1.8	Unshielded	Unshielded	-
3	DC Cable	1.4	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-
5	USB Cable	1.0	Shielded	Shielded	-

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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 0.5m, raised 0.8m above the conducting ground plane.

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

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

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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector	: QP and CISPR AV
Measurement range	: 0.15-30MHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".

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

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

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

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

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

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

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

Test Antennas are used as below;

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

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

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Average Power Method: <u>WLAN: 12.2.5.1</u> RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run	RBW: 100kHz VBW: 300kHz (S/A)
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 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"

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

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

Measurement range : 30M-26.5GHz
Test data : APPENDIX
Test result : Pass

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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 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

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

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

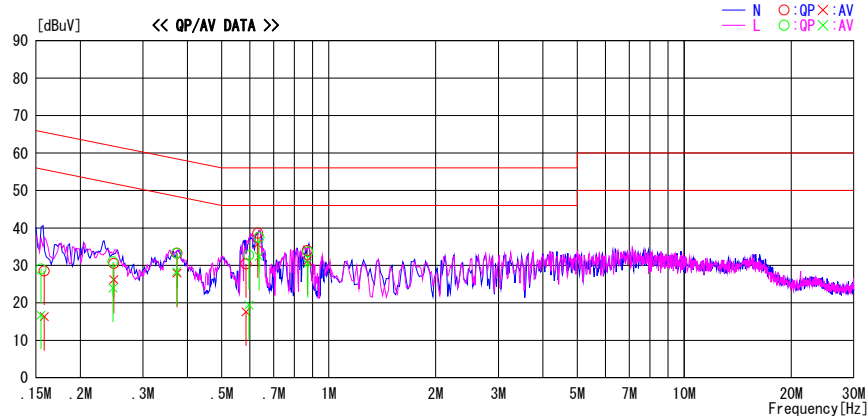
UL Japan, Inc. Ise HQ EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2014/04/01

Report No. : 10203419H

Temp./Humi. : 23deg.C / 42 % RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : 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]		
0.15832	15.2	3.0	13.3	28.5	16.3	65.6	55.6	37.1	39.3	N	
0.24850	17.2	12.9	13.3	30.5	26.2	61.8	51.8	31.3	25.6	N	
0.37435	19.9	14.6	13.3	33.2	27.9	58.4	48.4	25.2	20.5	N	
0.58501	17.0	4.2	13.4	30.4	17.6	56.0	46.0	25.6	28.4	N	
0.63120	25.2	22.3	13.4	38.6	35.7	56.0	46.0	17.4	10.3	N	
0.87074	20.5	17.8	13.4	33.9	31.2	56.0	46.0	22.1	14.8	N	
0.15502	15.7	3.4	13.3	29.0	16.7	65.7	55.7	36.7	39.0	L	
0.24709	17.6	10.7	13.3	30.9	24.0	61.9	51.9	31.0	28.0	L	
0.37355	20.0	15.0	13.3	33.3	28.3	58.4	48.4	25.1	20.1	L	
0.59559	19.3	6.0	13.4	32.7	19.4	56.0	46.0	23.4	26.6	L	
0.63627	24.1	19.0	13.4	37.5	32.4	56.0	46.0	18.5	13.6	L	
0.87255	20.2	17.1	13.4	33.6	30.5	56.0	46.0	22.4	15.5	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 Ise HQ EMC Lab. No.11 Measurement Room
Report No. 10203419H
Date 12/05/2013
Temperature/ Humidity 24deg. C / 48% RH
Engineer Takumi Shimada
Mode Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	7.575	>500
2437	7.095	>500
2462	7.533	>500

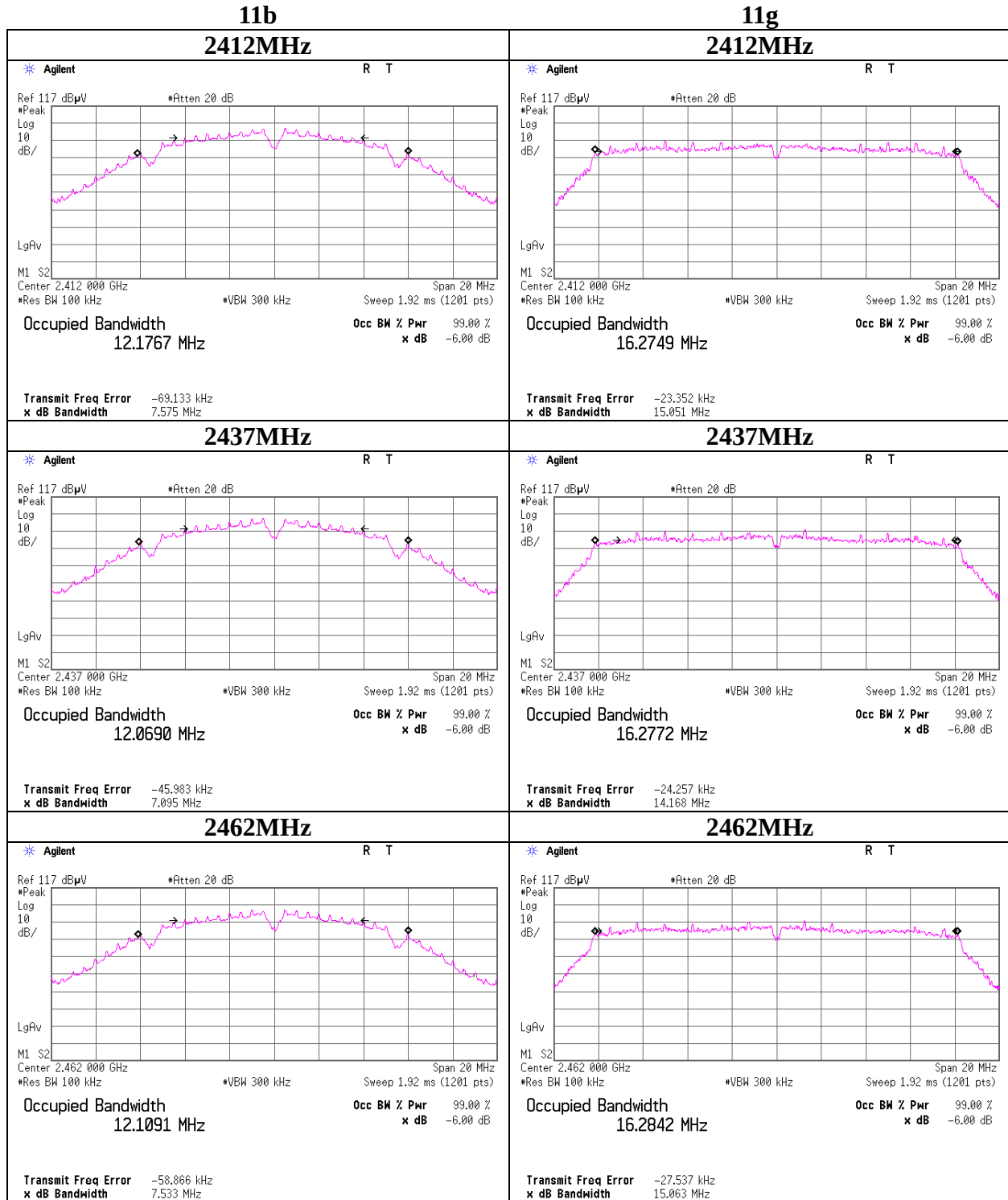
11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.051	>500
2437	14.168	>500
2462	15.063	>500

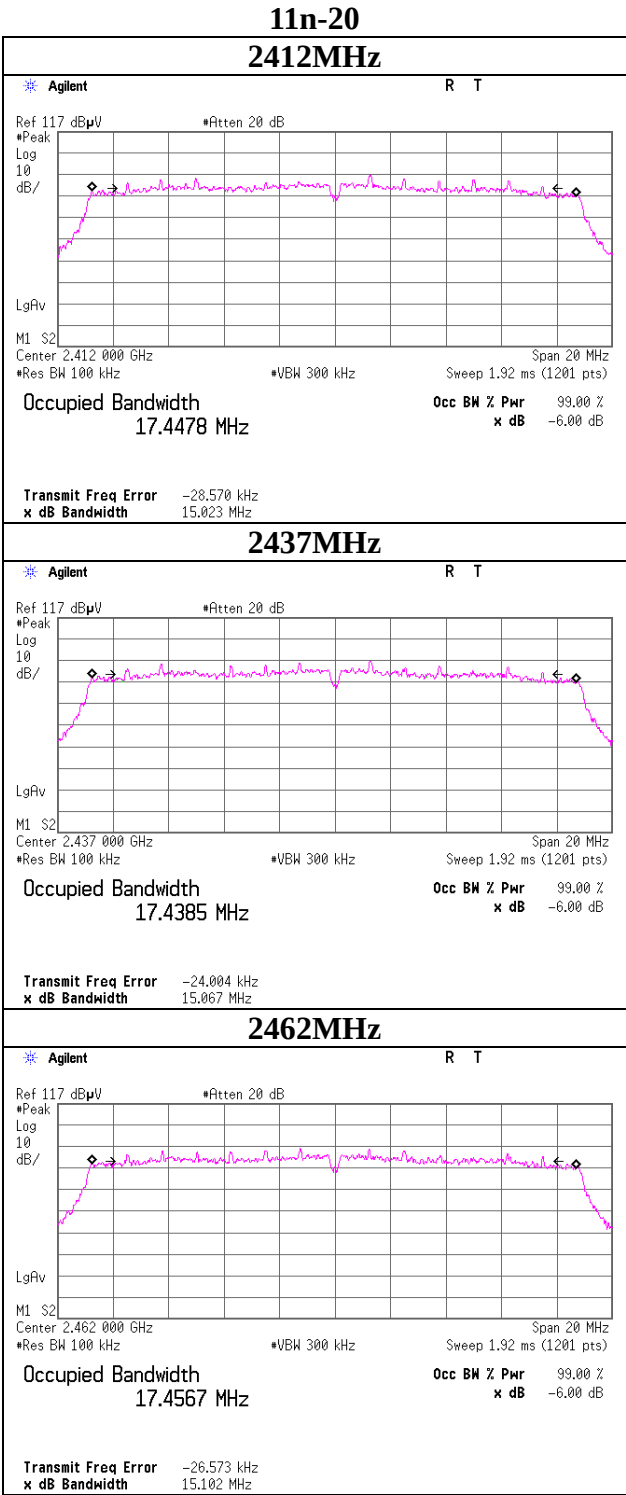
11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.023	>500
2437	15.067	>500
2462	15.102	>500

6dB Bandwidth



6dB Bandwidth



Maximum Peak Output Power

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10203419H
Date : 11/27/2013
Temperature/ Humidity : 24deg.C / 31% RH
Engineer : Yutaka Yoshida
Mode : 11b Tx

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	8.32	0.93	10.01	19.26	84.33	30.00	1000	10.74
2437	8.79	0.94	10.01	19.74	94.19	30.00	1000	10.26
2462	8.23	0.95	10.01	19.19	82.99	30.00	1000	10.81

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading PK [dBm]	Remark
1	8.79	*
2	8.64	
5.5	8.67	
11	8.77	

*: Worst Rate

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

[For reporting purpose only]

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	4.98	0.93	10.01	15.92	39.08
2437	5.27	0.94	10.01	16.22	41.88
2462	4.90	0.95	10.01	15.86	38.55

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading AV [dBm]	Remark
1	5.27	*
2	4.83	
5.5	3.92	
11	2.73	

*: Worst Rate

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

UL Japan, Inc.

Ise HQ EMC Lab.

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

Telephone : +81 596 24 8999

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Maximum Peak Output Power

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10203419H
Date : 11/27/2013
Temperature/ Humidity : 24deg.C / 31% RH
Engineer : Yutaka Yoshida
Mode : 11g Tx

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.05	0.93	10.01	22.99	199.07	30.00	1000	7.01
2437	12.51	0.94	10.01	23.46	221.82	30.00	1000	6.54
2462	12.43	0.95	10.01	23.39	218.27	30.00	1000	6.61

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading PK [dBm]	Remark
6	12.51	*
9	11.96	
12	11.93	
18	11.71	
24	11.76	
36	11.72	
48	11.82	
54	11.76	

*: Worst Rate

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

[For reporting purpose only]

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	-0.92	0.93	10.01	10.02	10.05
2437	-0.49	0.94	10.01	10.46	11.12
2462	-0.37	0.95	10.01	10.59	11.46

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading AV [dBm]	Remark
6	-0.49	*
9	-1.97	
12	-1.92	
18	-3.02	
24	-3.84	
36	-5.00	
48	-5.98	
54	-6.29	

*: Worst Rate

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

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Maximum Peak Output Power

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10203419H
Date : 11/27/2013
Temperature/ Humidity : 24deg.C / 31% RH
Engineer : Yutaka Yoshida
Mode : 11n-20 Tx

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	10.40	0.93	10.01	21.34	136.14	30.00	1000	8.66
2437	11.10	0.94	10.01	22.05	160.32	30.00	1000	7.95
2462	10.92	0.95	10.01	21.88	154.17	30.00	1000	8.12

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

MCS Index	Reading PK [dBm]	Remark
0	11.10	*
1	10.72	
2	10.52	
3	10.46	
4	10.62	
5	10.24	
6	10.25	
7	10.36	

*: Worst Rate

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

[For reporting purpose only]

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	-2.30	0.93	10.01	8.64	7.31
2437	-1.82	0.94	10.01	9.13	8.18
2462	-1.81	0.95	10.01	9.15	8.22

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

MCS Index	Reading AV [dBm]	Remark
0	-1.82	*
1	-3.41	
2	-4.36	
3	-5.15	
4	-6.23	
5	-7.21	
6	-7.59	
7	-7.87	

*: Worst Rate

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

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 10GHz)
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	2319.664	PK	51.0	28.1	3.2	32.8	-	49.5	73.9	24.4	
Hori	2390.000	PK	53.6	28.3	3.2	32.8	-	52.3	73.9	21.6	
Hori	3620.847	PK	45.8	29.9	5.3	32.3	-	48.7	73.9	25.2	
Hori	4824.000	PK	42.5	32.3	5.4	31.9	-	48.3	73.9	25.6	
Hori	2319.664	AV	42.6	28.1	3.2	32.8	0.44	41.5	53.9	12.4	*1)
Hori	2390.000	AV	42.2	28.3	3.2	32.8	0.44	41.3	53.9	12.6	
Hori	3620.847	AV	40.7	29.9	5.3	32.3	0.44	44.0	53.9	9.9	
Hori	4824.000	AV	32.2	32.3	5.4	31.9	0.44	38.4	53.9	15.5	
Vert	2319.664	PK	50.2	28.1	3.2	32.8	-	48.7	73.9	25.2	
Vert	2390.000	PK	49.8	28.3	3.2	32.8	-	48.5	73.9	25.4	
Vert	3620.847	PK	42.8	29.9	5.3	32.3	-	45.7	73.9	28.2	
Vert	4824.000	PK	41.4	32.3	5.4	31.9	-	47.2	73.9	26.7	
Vert	2319.664	AV	41.9	28.1	3.2	32.8	0.44	40.8	53.9	13.1	*1)
Vert	2390.000	AV	40.1	28.3	3.2	32.8	0.44	39.2	53.9	14.7	
Vert	3620.847	AV	35.3	29.9	5.3	32.3	0.44	38.6	53.9	15.3	
Vert	4824.000	AV	32.2	32.3	5.4	31.9	0.44	38.4	53.9	15.5	

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)

NS: No signal detected

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	100.2	28.4	3.2	32.8	99.0	-	-	Carrier
Hori	2400.000	PK	50.4	28.4	3.2	32.8	49.2	79.0	29.8	
Vert	2412.000	PK	98.1	28.4	3.2	32.8	96.9	-	-	Carrier
Vert	2400.000	PK	47.8	28.4	3.2	32.8	46.6	76.9	24.8	

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

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 10GHz)
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	2319.664	PK	55.6	28.1	3.2	32.8	-	54.1	73.9	19.8	
Hori	3657.848	PK	48.6	30.1	5.3	32.3	-	51.7	73.9	22.2	
Hori	4874.000	PK	48.4	32.4	5.4	31.9	-	54.3	73.9	19.6	
Hori	2319.664	AV	48.1	28.1	3.2	32.8	0.44	47.0	53.9	6.9	
Hori	3657.848	AV	38.6	30.1	5.3	32.3	0.44	42.1	53.9	11.8	
Hori	4874.000	AV	35.3	32.4	5.4	31.9	0.44	41.6	53.9	12.3	
Vert	2319.664	PK	61.3	28.1	3.2	32.8	-	59.8	73.9	14.1	
Vert	3657.848	PK	48.6	30.1	5.3	32.3	-	51.7	73.9	22.2	
Vert	4874.000	PK	46.9	32.4	5.4	31.9	-	52.8	73.9	21.1	
Vert	2319.664	AV	51.1	28.1	3.2	32.8	0.44	50.0	53.9	3.9	
Vert	3657.848	AV	37.4	30.1	5.3	32.3	0.44	40.9	53.9	13.0	
Vert	4874.000	AV	35.5	32.4	5.4	31.9	0.44	41.8	53.9	12.1	

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

NS: No signal detected

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 10GHz)
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	2319.664	PK	50.7	28.1	3.2	32.8	-	49.2	73.9	24.7	
Hori	2483.500	PK	50.9	28.7	3.3	32.7	-	50.2	73.9	23.7	
Hori	3694.848	PK	45.3	30.2	5.3	32.2	-	48.6	73.9	25.3	
Hori	4924.000	PK	41.1	32.6	5.5	31.9	-	47.3	73.9	26.6	
Hori	2319.664	AV	44.1	28.1	3.2	32.8	0.44	43.0	53.9	10.9	
Hori	2483.500	AV	40.0	28.7	3.3	32.7	0.44	39.7	53.9	14.2	*1)
Hori	3694.848	AV	40.6	30.2	5.3	32.2	0.44	44.3	53.9	9.6	
Hori	4924.000	AV	33.1	32.6	5.5	31.9	0.44	39.7	53.9	14.2	
Vert	2319.664	PK	55.8	28.1	3.2	32.8	-	54.3	73.9	19.6	
Vert	2483.500	PK	49.2	28.7	3.3	32.7	-	48.5	73.9	25.4	
Vert	3694.848	PK	41.6	30.2	5.3	32.2	-	44.9	73.9	29.0	
Vert	4924.000	PK	40.9	32.6	5.5	31.9	-	47.1	73.9	26.8	
Vert	2319.664	AV	48.9	28.1	3.2	32.8	0.44	47.8	53.9	6.1	
Vert	2483.500	AV	39.2	28.7	3.3	32.7	0.44	38.9	53.9	15.0	*1)
Vert	3694.848	AV	33.2	30.2	5.3	32.2	0.44	36.9	53.9	17.0	
Vert	4924.000	AV	32.4	32.6	5.5	31.9	0.44	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

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

NS: No signal detected

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 10GHz)
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	2319.664	PK	50.8	28.1	3.2	32.8	-	49.3	73.9	24.6	
Hori	2390.000	PK	53.4	28.3	3.2	32.8	-	52.1	73.9	21.8	
Hori	3620.847	PK	45.6	29.9	5.3	32.3	-	48.5	73.9	25.4	
Hori	4824.000	PK	43.1	32.3	5.4	31.9	-	48.9	73.9	25.0	
Hori	2319.664	AV	42.4	28.1	3.2	32.8	2.26	43.2	53.9	10.7	
Hori	2390.000	AV	42.1	28.3	3.2	32.8	2.26	43.1	53.9	10.8	*1)
Hori	3620.847	AV	40.4	29.9	5.3	32.3	2.26	45.6	53.9	8.3	
Hori	4824.000	AV	32.5	32.3	5.4	31.9	2.26	40.6	53.9	13.3	
Vert	2319.664	PK	50.3	28.1	3.2	32.8	-	48.8	73.9	25.1	
Vert	2390.000	PK	49.9	28.3	3.2	32.8	-	48.6	73.9	25.3	
Vert	3620.847	PK	42.5	29.9	5.3	32.3	-	45.4	73.9	28.5	
Vert	4824.000	PK	41.5	32.3	5.4	31.9	-	47.3	73.9	26.6	
Vert	2319.664	AV	42.0	28.1	3.2	32.8	2.26	42.8	53.9	11.1	
Vert	2390.000	AV	40.0	28.3	3.2	32.8	2.26	41.0	53.9	12.9	*1)
Vert	3620.847	AV	35.5	29.9	5.3	32.3	2.26	40.7	53.9	13.2	
Vert	4824.000	AV	32.3	32.3	5.4	31.9	2.26	40.4	53.9	13.5	

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)

NS: No signal detected

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	100.3	28.4	3.2	32.8	99.1	-	-	Carrier
Hori	2400.000	PK	50.3	28.4	3.2	32.8	49.1	73.9	24.8	
Vert	2412.000	PK	98.0	28.4	3.2	32.8	96.8	-	-	Carrier
Vert	2400.000	PK	46.8	28.4	3.2	32.8	45.6	73.9	28.3	

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 HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Below 1GHz, Above 10GHz)
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	51.643	QP	33.6	10.4	7.5	32.1	-	19.4	40.0	20.6	
Hori	308.417	QP	44.6	16.3	9.9	31.9	-	38.9	46.0	7.1	
Hori	382.765	QP	43.2	17.3	10.5	31.9	-	39.1	46.0	6.9	
Hori	518.837	QP	35.7	19.4	11.3	32.0	-	34.4	46.0	11.6	
Hori	584.770	QP	38.2	19.9	11.7	32.1	-	37.7	46.0	8.3	
Hori	2319.664	PK	55.5	28.1	3.2	32.8	-	54.0	73.9	19.9	
Hori	3657.848	PK	48.2	30.1	5.3	32.3	-	51.3	73.9	22.6	
Hori	2319.664	AV	47.9	28.1	3.2	32.8	2.26	48.7	53.9	5.2	
Hori	3657.848	AV	38.3	30.1	5.3	32.3	2.26	43.7	53.9	10.2	
Hori	4874.000	AV	35.1	32.4	5.4	31.9	2.26	43.3	53.9	10.6	
Vert	52.725	QP	41.4	10.1	7.5	32.1	-	26.9	40.0	13.1	
Vert	100.376	QP	45.0	10.3	8.1	32.1	-	31.3	43.5	12.2	
Vert	308.417	QP	41.7	16.3	9.9	31.9	-	36.0	46.0	10.0	
Vert	382.765	QP	38.0	17.3	10.5	31.9	-	33.9	46.0	12.1	
Vert	520.240	QP	36.3	19.4	11.3	32.0	-	35.0	46.0	11.0	
Vert	584.770	QP	35.3	19.9	11.7	32.1	-	34.8	46.0	11.2	
Vert	2319.664	PK	61.1	28.1	3.2	32.8	-	59.6	73.9	14.3	
Vert	3657.848	PK	48.5	30.1	5.3	32.3	-	51.6	73.9	22.3	
Vert	4874.000	PK	46.3	32.4	5.4	31.9	-	52.2	73.9	21.7	
Vert	2319.664	AV	51.3	28.1	3.2	32.8	2.26	52.1	53.9	1.8	
Vert	3657.848	AV	37.2	30.1	5.3	32.3	2.26	42.6	53.9	11.3	
Vert	4874.000	AV	35.4	32.4	5.4	31.9	2.26	43.6	53.9	10.3	

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

NS: No signal detected

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 10GHz)
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	2319.664	PK	50.8	28.1	3.2	32.8	-	49.3	73.9	24.6	
Hori	2483.500	PK	50.6	28.7	3.3	32.7	-	49.9	73.9	24.0	
Hori	3694.848	PK	45.1	30.2	5.3	32.2	-	48.4	73.9	25.5	
Hori	4924.000	PK	41.0	32.6	5.5	31.9	-	47.2	73.9	26.7	
Hori	2319.664	AV	44.2	28.1	3.2	32.8	2.26	45.0	53.9	8.9	
Hori	2483.500	AV	39.8	28.7	3.3	32.7	2.26	41.4	53.9	12.5	*1)
Hori	3694.848	AV	40.3	30.2	5.3	32.2	2.26	45.9	53.9	8.0	
Hori	4924.000	AV	33.1	32.6	5.5	31.9	2.26	41.6	53.9	12.3	
Vert	2319.664	PK	55.6	28.1	3.2	32.8	-	54.1	73.9	19.8	
Vert	2483.500	PK	48.7	28.7	3.3	32.7	-	48.0	73.9	25.9	
Vert	3694.848	PK	41.3	30.2	5.3	32.2	-	44.6	73.9	29.3	
Vert	4924.000	PK	40.8	32.6	5.5	31.9	-	47.0	73.9	26.9	
Vert	2319.664	AV	48.6	28.1	3.2	32.8	2.26	49.4	53.9	4.5	
Vert	2483.500	AV	39.4	28.7	3.3	32.7	2.26	41.0	53.9	12.9	*1)
Vert	3694.848	AV	33.3	30.2	5.3	32.2	2.26	38.9	53.9	15.0	
Vert	4924.000	AV	33.1	32.6	5.5	31.9	2.26	41.6	53.9	12.3	

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)

NS: No signal detected

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 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	2319.664	PK	53.7	28.1	3.2	32.8	-	52.2	73.9	21.7	
Hori	2390.000	PK	55.4	28.3	3.2	32.8	-	54.1	73.9	19.8	
Hori	3620.847	PK	46.1	29.9	5.3	32.3	-	49.0	73.9	24.9	
Hori	4824.000	PK	44.0	32.3	5.4	31.9	-	49.8	73.9	24.1	
Hori	2319.664	AV	44.6	28.1	3.2	32.8	2.39	43.1	53.9	10.8	
Hori	2390.000	AV	43.2	28.3	3.2	32.8	2.39	41.9	53.9	12.0	*1)
Hori	3620.847	AV	41.0	29.9	5.3	32.3	2.39	43.9	53.9	10.0	
Hori	4824.000	AV	33.2	32.3	5.4	31.9	2.39	39.0	53.9	14.9	
Vert	2319.664	PK	52.3	28.1	3.2	32.8	-	50.8	73.9	23.1	
Vert	2390.000	PK	52.1	28.3	3.2	32.8	-	50.8	73.9	23.1	
Vert	3620.847	PK	42.5	29.9	5.3	32.3	-	45.4	73.9	28.5	
Vert	4824.000	PK	42.3	32.3	5.4	31.9	-	48.1	73.9	25.8	
Vert	2319.664	AV	43.7	28.1	3.2	32.8	2.39	42.2	53.9	11.7	
Vert	2390.000	AV	41.8	28.3	3.2	32.8	2.39	40.5	53.9	13.4	*1)
Vert	3620.847	AV	36.2	29.9	5.3	32.3	2.39	39.1	53.9	14.8	
Vert	4824.000	AV	33.5	32.3	5.4	31.9	2.39	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).

*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	2400.000	PK	51.2	28.4	3.2	32.8	50.0	82.2	32.2	
Hori	2412.000	PK	103.4	28.4	3.2	32.8	102.2	-	-	Carrier
Vert	2400.000	PK	47.1	28.4	3.2	32.8	45.9	78.1	32.2	
Vert	2412.000	PK	99.3	28.4	3.2	32.8	98.1	-	-	Carrier

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

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Radiated Spurious Emission

Test place : Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. : 10203419H
Date : 03/31/2014 04/01/2014
Temperature/ Humidity : 22 deg. C / 41% RH 23 deg. C / 42% RH
Engineer : Takumi Shimada Tomohisa Nakagawa
(1-10GHz) (Above 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	2319.664	PK	50.3	28.1	3.2	32.8	-	48.8	73.9	25.1	
Hori	2483.500	PK	49.7	28.7	3.3	32.7	-	49.0	73.9	24.9	
Hori	3694.848	PK	44.5	30.2	5.3	32.2	-	47.8	73.9	26.1	
Hori	4924.000	PK	40.8	32.6	5.5	31.9	-	47.0	73.9	26.9	
Hori	2319.664	AV	43.9	28.1	3.2	32.8	2.39	42.4	53.9	11.5	
Hori	2483.500	AV	38.9	28.7	3.3	32.7	2.39	38.2	53.9	15.7	*1)
Hori	3694.848	AV	39.8	30.2	5.3	32.2	2.39	43.1	53.9	10.8	
Hori	4924.000	AV	32.7	32.6	5.5	31.9	2.39	38.9	53.9	15.0	
Vert	2319.664	PK	54.2	28.1	3.2	32.8	-	52.7	73.9	21.2	
Vert	2483.500	PK	47.8	28.7	3.3	32.7	-	47.1	73.9	26.8	
Vert	3694.848	PK	40.9	30.2	5.3	32.2	-	44.2	73.9	29.7	
Vert	4924.000	PK	40.7	32.6	5.5	31.9	-	46.9	73.9	27.0	
Vert	2319.664	AV	47.9	28.1	3.2	32.8	2.39	46.4	53.9	7.5	
Vert	2483.500	AV	39.0	28.7	3.3	32.7	2.39	38.3	53.9	15.6	*1)
Vert	3694.848	AV	32.8	30.2	5.3	32.2	2.39	36.1	53.9	17.8	
Vert	4924.000	AV	33.0	32.6	5.5	31.9	2.39	39.2	53.9	14.7	

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).

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

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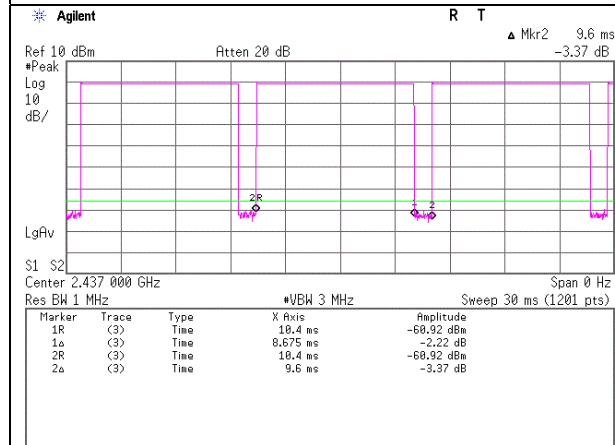
Facsimile : +81 596 24 8124

Radiated Spurious Emission

Test place Ise HQ EMC Lab. No.4Semi Anechoic Chamber
Report No. 10203419H
Date 03/31/2014
Temperature/ Humidity 22 deg. C / 41% RH
Engineer Takumi Shimada
Mode 11b / 11g Tx

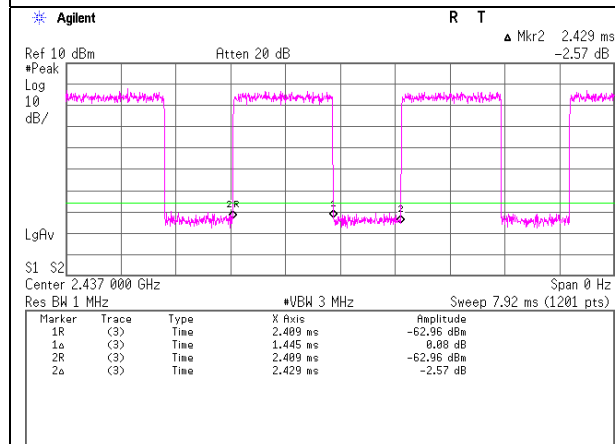
11b 1Mbps

Tx on / (Tx on + Tx off) = 0.904
Tx on / (Tx on + Tx off) * 100 = 90.4 %
Duty factor = 10 * log (9.6 / 8.675) = 0.44 dB



11g 6Mbps

Tx on / (Tx on + Tx off) = 0.595
Tx on / (Tx on + Tx off) * 100 = 59.5 %
Duty factor = 10 * log (2.429 / 1.445) = 2.26 dB



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Radiated Spurious Emission

Test place

Report No.

Date

Temperature/ Humidity

Engineer

Mode

Ise HQ EMC Lab. No.4Semi Anechoic Chamber

10203419H

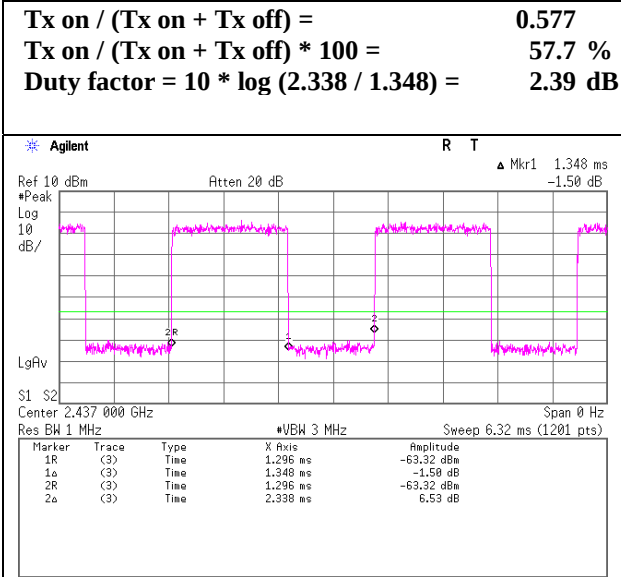
03/31/2014

22 deg. C / 41% RH

Takumi Shimada

11n-20 Tx

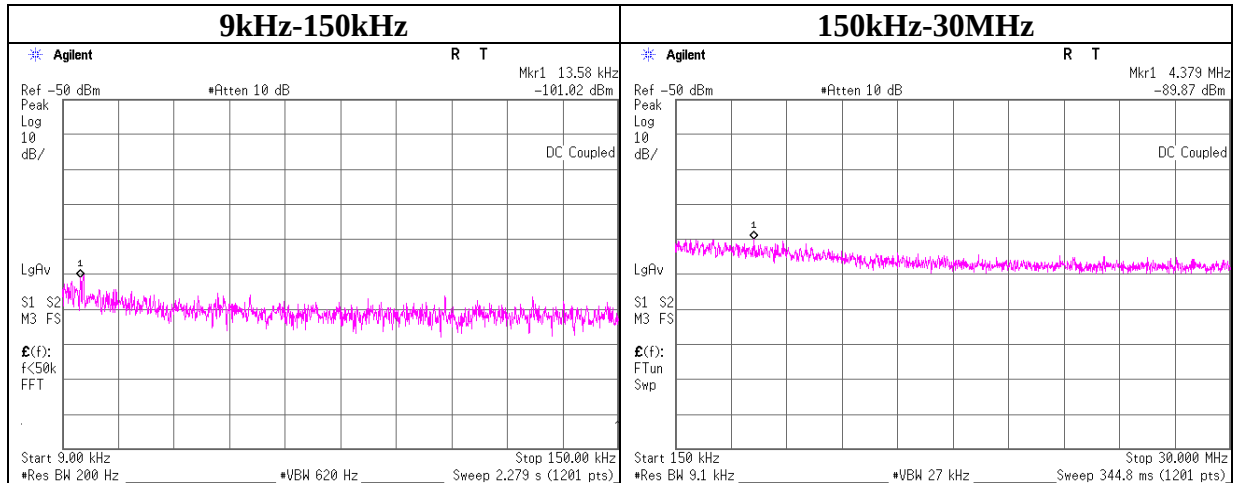
11n-20 MCS0



Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11b Tx 2412MHz



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]
13.58	-101.0	0.01	10.0	2.03	-89.0	300.0	6.0	-27.7	44.9
4379	-89.9	0.01	10.0	2.03	-77.8	300.0	6.0	-16.6	-5.2

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

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

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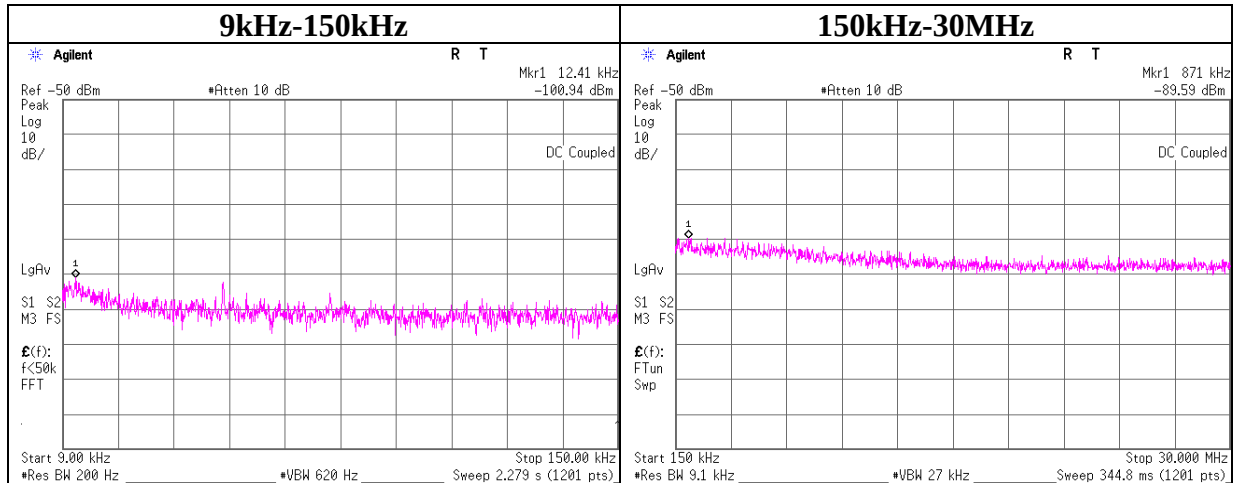
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11b 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]
12.41	-100.9	0.01	10.0	2.03	-88.9	300.0	6.0	-27.6	45.7
871	-89.6	0.01	10.0	2.03	-77.6	300.0	6.0	-16.3	8.8

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

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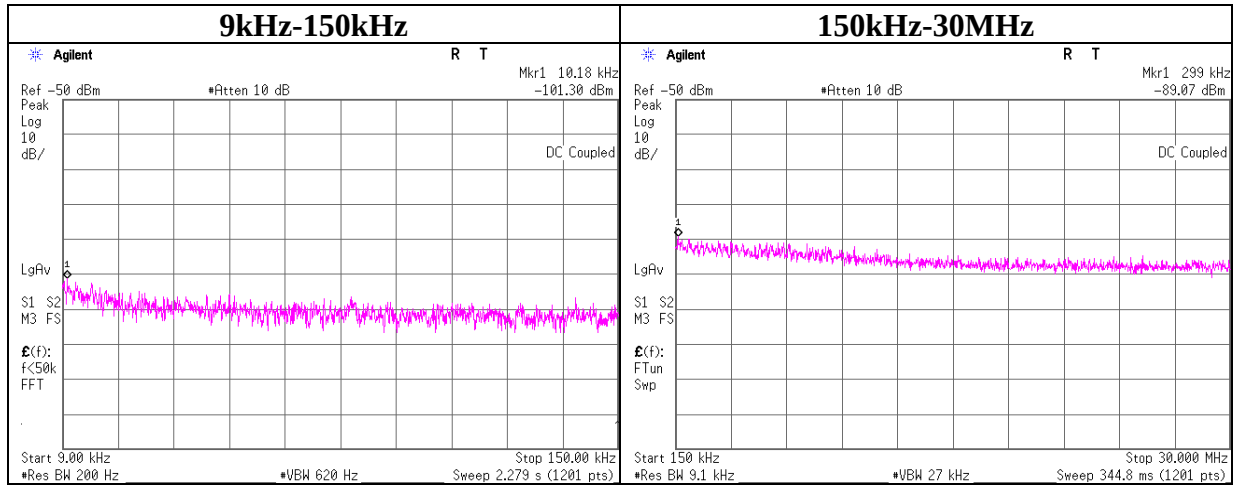
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11b Tx 2462MHz



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]
10.18	-101.3	0.01	10.0	2.03	-89.3	300.0	6.0	-28.0	47.4
299	-89.1	0.01	10.0	2.03	-77.0	300.0	6.0	-15.8	18.1

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

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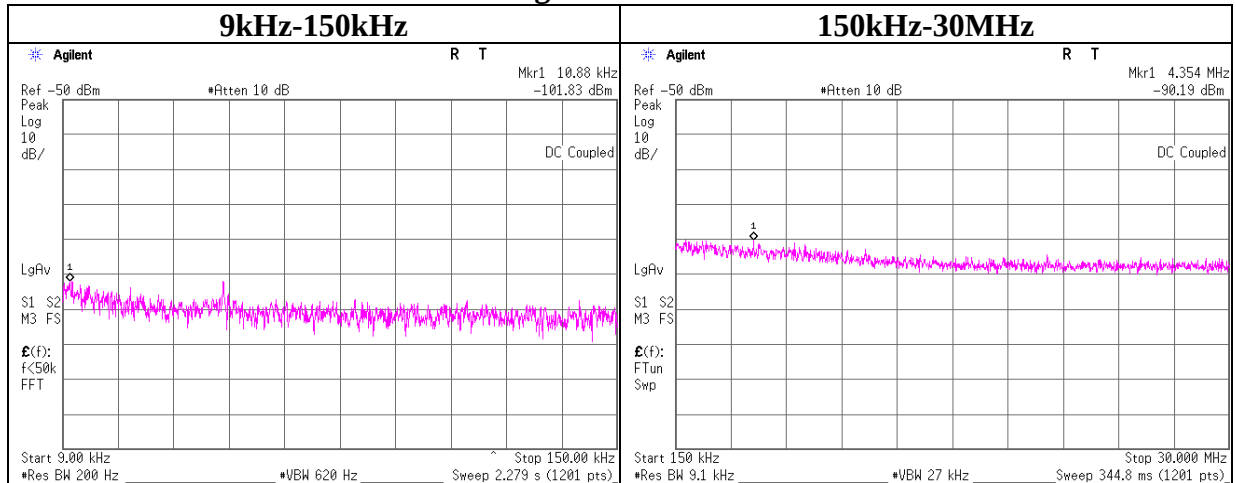
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11g Tx 2412MHz



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]
10.88	-101.8	0.01	10.0	2.03	-89.8	300.0	6.0	-28.5	46.9
4354	-90.2	0.01	10.0	2.03	-78.2	300.0	6.0	-16.9	-5.2

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

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

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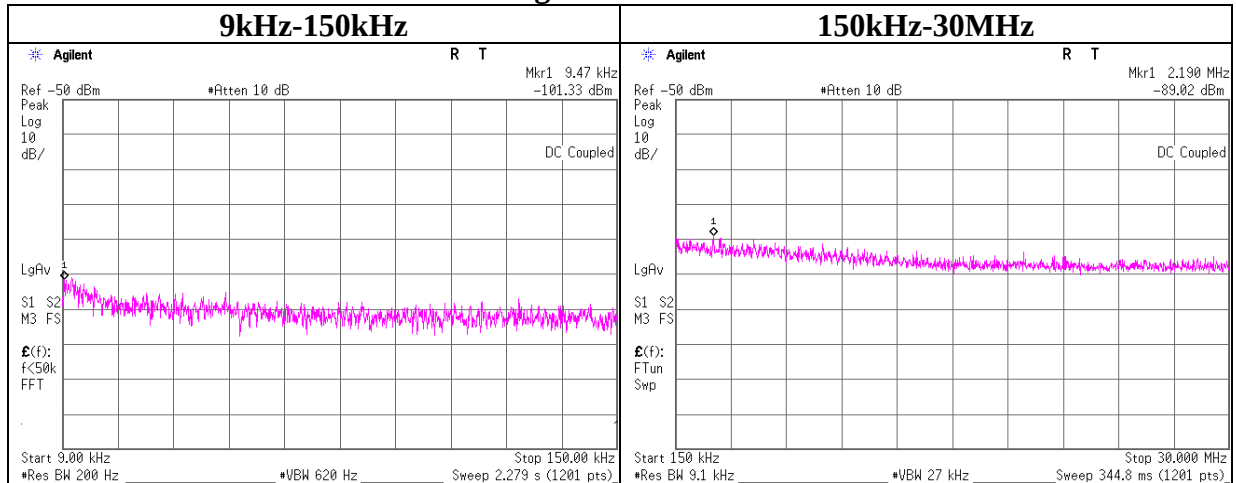
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11g Tx 2437MHz



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]
9.47	-101.3	0.01	10.0	2.03	-89.3	300.0	6.0	-28.0	48.1
2190	-89.0	0.01	10.0	2.03	-77.0	300.0	6.0	-15.7	0.8

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

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

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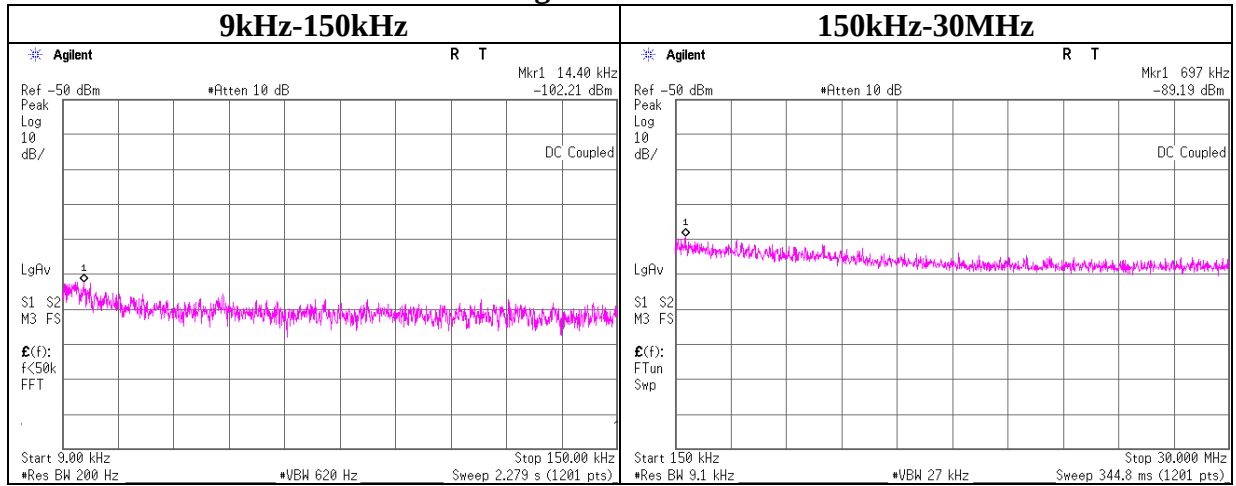
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11g Tx 2462MHz



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]
14.40	-102.2	0.01	10.0	2.03	-90.2	300.0	6.0	-28.9	44.4
697	-89.2	0.01	10.0	2.03	-77.2	300.0	6.0	-15.9	10.7

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

Power Density

Test place Ise HQ EMC Lab. No.11 Measurement Room
Report No. 10203419H
Date 12/05/2013
Temperature/ Humidity 24deg. C / 48% RH
Engineer Takumi Shimada
Mode 11b Tx, 11g Tx

11b

Freq.	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-17.25	2.21	9.97	-5.07	8.00	13.07
2437.00	-16.81	2.22	9.97	-4.62	8.00	12.62
2462.00	-15.89	2.24	9.97	-3.68	8.00	11.68

11g

Freq.	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-24.45	2.21	9.97	-12.27	8.00	20.27
2437.00	-24.46	2.22	9.97	-12.27	8.00	20.27
2462.00	-24.69	2.24	9.97	-12.48	8.00	20.48

Sample Calculation:

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

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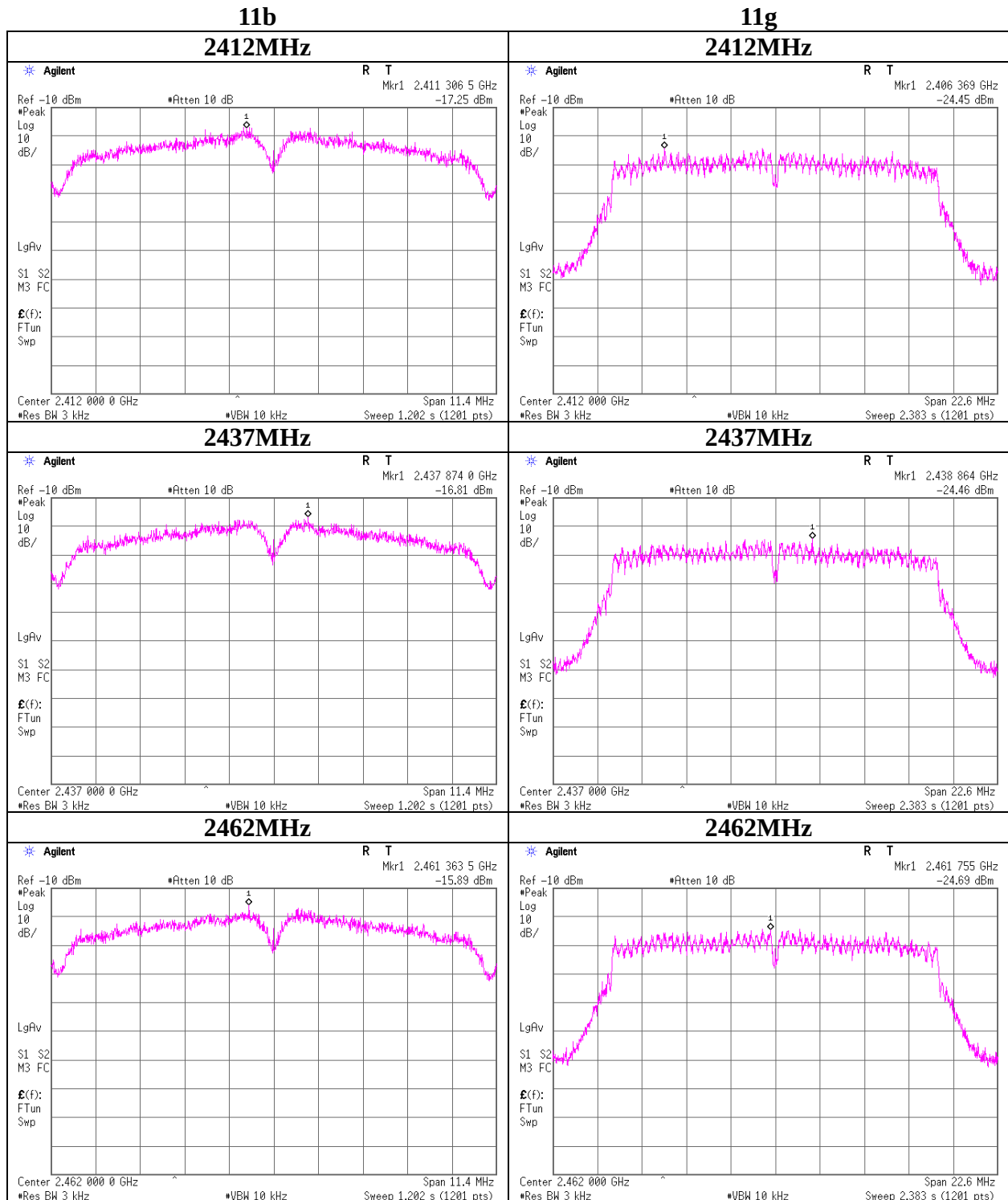
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Power Density



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Ise HQ EMC Lab.

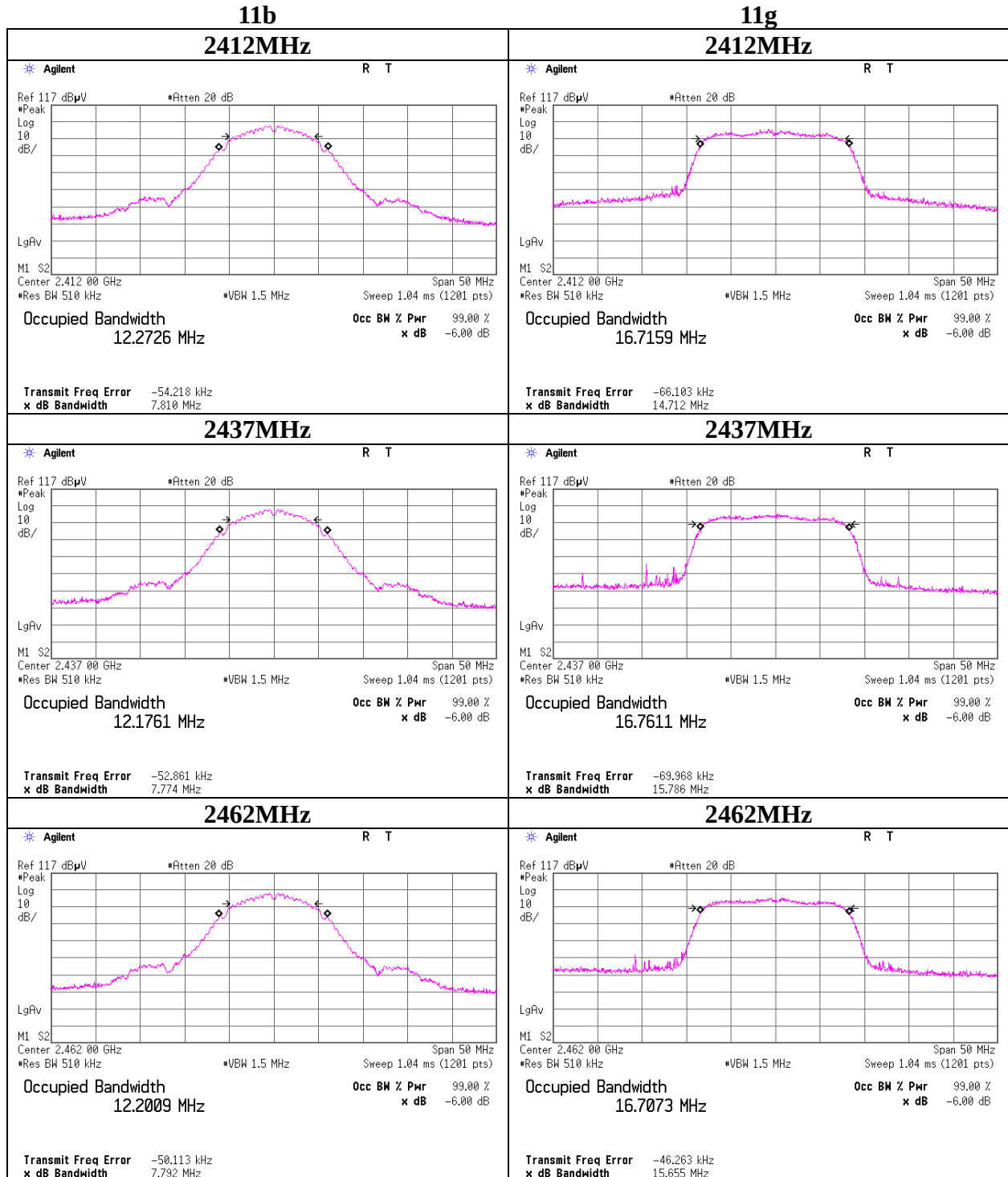
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99%Occupied Bandwidth

Test place Ise HQ EMC Lab. No.11 Measurement Room
Report No. 10203419H
Date 12/05/2013
Temperature/ Humidity 24deg. C / 48% RH
Engineer Takumi Shimada
Mode Tx

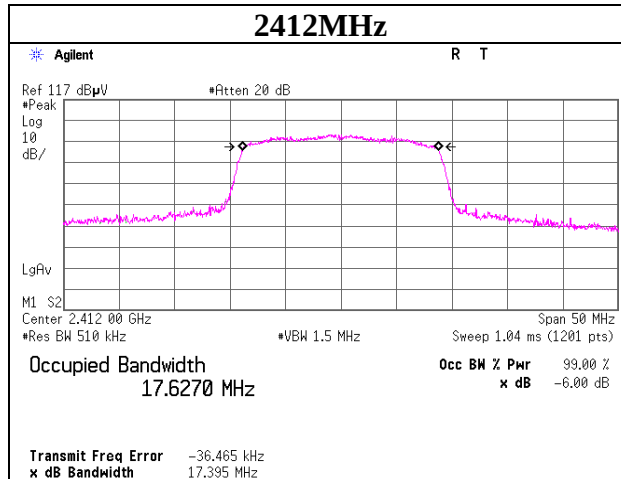


99% Occupied Bandwidth

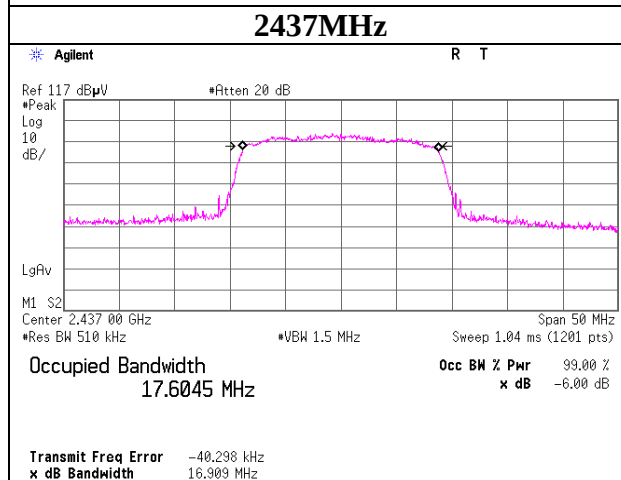
Test place : Ise HQ EMC Lab. No.11 Measurement Room
Report No. : 10203419H
Date : 12/05/2013
Temperature/ Humidity : 24deg. C / 48% RH
Engineer : Takumi Shimada
Mode : Tx

11n-20

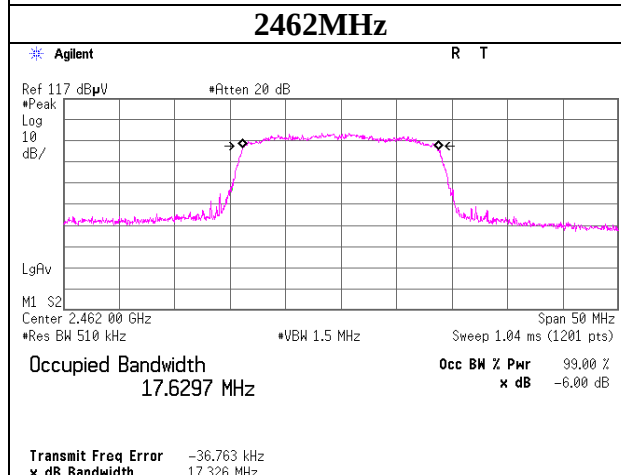
2412MHz



2437MHz



2462MHz



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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2013/02/22 * 12 *1)
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2013/10/15 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2013/10/15 * 12
MAT-25	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71642	AT	2013/06/20 * 12
MCC-163	Microwave Cable	Murata	MXGS83RK3000	-	AT	2013/11/08 * 12
MRENT-112	Spectrum Analyzer	Agilent	E4440A	MY48250080	AT	2013/10/04 * 12
MAT-24	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71389	AT	2013/06/05 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	AT	2013/10/18 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE/CE	2014/02/20 * 12
MJM-09	Measure	KDS	E19-55	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MRENT-115	Spectrum Analyzer	Agilent	E4440A	MY4618390	RE/CE	2014/02/28 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2013/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1204S062(5m)	RE	2013/05/28 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2014/03/11 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2013/09/01 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE/CE	2013/11/12 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2013/11/24 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2013/11/24 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2013/06/18 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2013/11/26 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2014/03/14 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2013/06/30 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(AE)	2014/01/27 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(EUT)	2014/01/27 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2014/01/20 * 12
MAT-67	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ ucoform141-PE(1m)/ RFM-E121(Switcher)	-/04178	CE	2013/07/23 * 12

*1) This test equipment was used for the tests before the expiration date of the calibration.

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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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