



RADIO TEST REPORT

Test Report No. : 10229481H-A-R2

Applicant : **Panasonic Corporation of North America**
Type of Equipment : **Wireless LAN Module**
Model No. : **WJ-VR3004**
FCC ID : **ACJ9TAWJ-VR3004**
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 report is a revised version of 10229481H-A-R1. 10229481H-A-R1 is replaced with this report.

Date of test: March 26 to May 14, 2014

Representative test engineer:

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

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CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	8
SECTION 5: Conducted Emission	11
SECTION 6: Radiated Spurious Emission	12
SECTION 7: Antenna Terminal Conducted Tests	13
APPENDIX 1: Data of EMI test	14
Conducted Emission	14
6dB Bandwidth	15
Maximum Peak Output Power	21
Average Output Power	26
Radiated Spurious Emission	29
Conducted Spurious Emission	45
Power Density	46
99% Occupied Bandwidth	54
APPENDIX 2: Test instruments	58
APPENDIX 3: Photographs of test setup	60
Conducted Emission	60
Radiated Spurious Emission	61
Worst Case Position	62

SECTION 1: Customer information

Company Name : Panasonic System Networks Co., Ltd.*
Address : 1-62, 4-chome, Minoshima, Hakata-ku, Fukuoka 812-853 Japan
Telephone Number : +81-50-3380-6162
Facsimile Number : +81-92-477-1487
Contact Person : Yukio Kaneko

* Panasonic System Networks Co., Ltd. is on behalf of the applicant: Panasonic Corporation of North America.

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless LAN Module
Model No. : WJ-VR3004
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC10.5V
Receipt Date of Sample : March 24, 2014
Country of Mass-production : Japan
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 : 32.768kHz, 38.4MHz

Radio Specification

[WLAN (IEEE802.11a/b/g/n-20)]

Equipment Type	Transceiver	
Frequency of Operation	2412-2462MHz	W53: 5280-5320MHz W58: 5745-5825MHz
Type of Modulation	DSSS, OFDM	OFDM
Antenna Type	Dual (Planar patch)	Dual (Inverted F)
Antenna connector type	Module side: Rectangular Coaxial Connector (SMT) Antenna side: RP-SMA	
Antenna Gain with cable loss	0.58dBi (2.4GHz)	-0.98dBi (5GHz)

[WLAN (IEEE802.11n-40)]

Equipment Type	Transceiver	
Frequency of Operation	2422-2452MHz	W53: 5310MHz W58: 5755-5795MHz
Type of Modulation	OFDM	OFDM
Antenna Type	Dual (Planar patch)	Dual (Inverted F)
Antenna connector type	Module side: Rectangular Coaxial Connector (SMT) Antenna side: RP-SMA	
Antenna Gain with cable loss	0.58dBi (2.4GHz)	-0.98dBi (5GHz)

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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 May 1, 2014 and effective June 2, 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 May 1, 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 7.2.4	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4	QP 17.8dB, 1.25592MHz, L AV 18.9dB, 1.25592MHz, L	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	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	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	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	1.6B 2390.000MHz, AV, Hori.	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 RF Module has its own regulator.

The RF Module is constantly provided voltage (DC3.3/1.8V) through the regulator regardless of input voltage.

Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique coupling/antenna connector (Module side: Rectangular Coaxial Connector (SMT), Antenna side: RP-SMA). Therefore the equipment complies with the requirement of 15.203/212.

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3.3 Addition to standard

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

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
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	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.5m 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)	6Mbps, PN9
IEEE 802.11n MIMO 20MHz BW (11n-20): 2.4GHz Band	MCS 13, PN9
IEEE 802.11n MIMO 40MHz BW (11n-40) : 2.4GHz Band	MCS 11, PN9
IEEE 802.11a (11a)	6Mbps, PN9
IEEE 802.11nMIMO 20MHz BW (11n-20): 5GHz Band	MCS 8, PN9
IEEE 802.11n MIMO 40MHz BW (11n-40) : 5GHz Band	MCS 11, 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: 12dBm - Software: Dut Wlan BT Labtool Version 1.0.8.1.6 *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.	

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*Details of Operating mode(s): 2.4GHz Band

Test Item	Operating Mode	Antenna	Tested frequency
Conducted Emission Spurious Emission (Conducted) Spurious Emission below 1GHz (Radiated)	11n-40 *1)	A+B	2437MHz
6dB Bandwidth, Power Density, 99% Occupied Bandwidth,	11b Tx,	B	2412MHz
	11g Tx		2437MHz
	11n-20 Tx	B	2462MHz
	11n-40 Tx	A	2422MHz 2437MHz 2452MHz
Maximum Peak Output Power	11b Tx,	A, B	2412MHz
	11g Tx,		2437MHz
	11n-20 Tx		2462MHz
	11n-40 Tx		2422MHz 2437MHz 2452MHz
Spurious Emission above 1GHz (Radiated)	11b Tx	B	2412MHz
	11n-20 Tx *2)	A+B	2437MHz 2462MHz
	11n-40 Tx	A+B	2422MHz 2437MHz 2452MHz

*Details of Operating mode(s): 5GHz Band

Test Item	Operating Mode	Antenna	Tested frequency
Spurious Emission (Conducted)	11n-40 Tx *1)	A+B	5755MHz
6dB Bandwidth, 99% Occupied Bandwidth	11a Tx	A	5745MHz
	11n-20 Tx	B	5785MHz 5825MHz
	11n-40 Tx	B	5755MHz 5795MHz
Maximum Peak Output Power	11a Tx	A, B	5745MHz 5785MHz
	11n-20 Tx	A+B	5825MHz
	11n-40 Tx	A+B	5755MHz 5795MHz
Power Density	11a Tx	A	5745MHz
	11n-20 Tx	A+B	5785MHz 5825MHz
	11n-40 Tx	A+B	5755MHz 5795MHz
Spurious Emission above 1GHz (Radiated)	11n-20 Tx *3)	A+B	5745MHz 5785MHz 5825MHz
	11n-40 Tx	A+B	5755MHz 5795MHz

*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.

*3) Since 11a 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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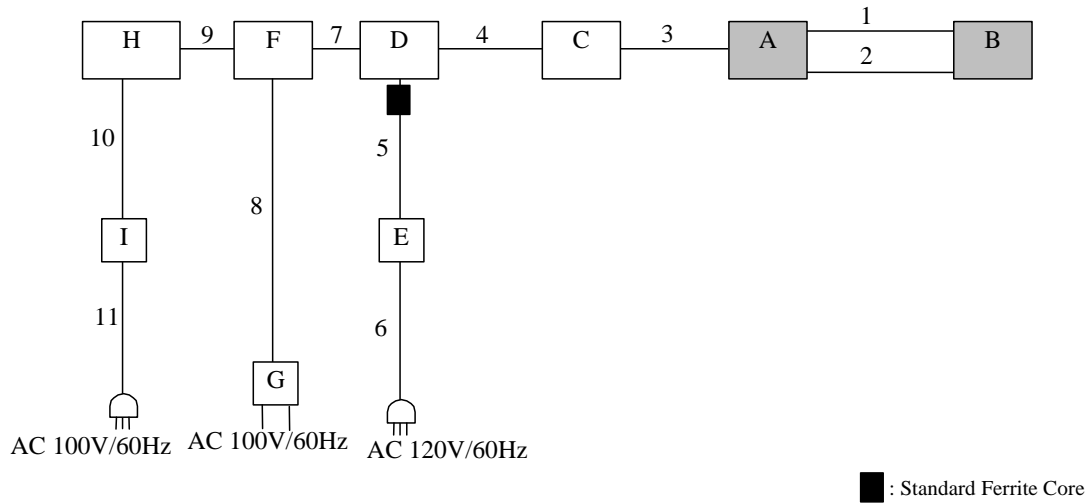
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4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
* No difference was confirmed with and without a standard ferrite core in Conducted emission test.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless LAN Module	WJ-VR3004	ES2-8 *1)	Panasonic System Networks Co., Ltd.	EUT
			ES2-10 *2)		
B	AP-Double WiFi Antenna	APP-WW	-	Antenna Plus LLC	EUT
C	Jig board	-	-	-	-
D	Laptop PC	CF-31	OLKSA37565	Panasonic System Networks Co., Ltd.	-
E	AC Adaptor	CF-AA5713A	5713AM110808682A	Panasonic System Networks Co., Ltd.	-
F	Switching HUB	LAN-SW08/P	72L203004509B	Logitec	-
G	AC Adaptor	LA-6W7L	5106HB	Logitec	-
H	Laptop PC	ProBook 6560P	1673609	HP	-
I	AC Adaptor	PPP009L-E	WBGST0A4L0U2WT	HP	-

*1) Used except for Antenna Terminal Conducted Tests

*2) Used for Antenna Terminal Conducted Tests

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	5.6	Shielded	Shielded	-
2	Antenna Cable	5.6	Shielded	Shielded	-
3	USB Cable	0.4	Shielded	Shielded	-
4	USB Cable	2.0	Shielded	Shielded	-
5	DC Cable	1.8	Unshielded	Unshielded	-
6	AC Cable	1.9	Unshielded	Unshielded	-
7	LAN Cable	1.0	Unshielded	Unshielded	-
8	DC Cable	1.8	Unshielded	Unshielded	-
9	LAN Cable	1.0	Unshielded	Unshielded	-
10	DC Cable	1.8	Unshielded	Unshielded	-
11	AC Cable	1.8	Unshielded	Unshielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 2.0m, 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.

1) 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	RBW: 1MHz VBW: 10MHz	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m *2) (above 10GHz) 0.5m *3) (above 26.5GHz)		3m (below 10GHz), 1m *2) (above 10GHz) 0.5m *3) (above 26.5GHz)

*1) Average Power Measurement was performed based on 12.2.7 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"

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

*3) Distance Factor: $20 \times \log(3.0\text{m}/0.5\text{m}) = 15.6\text{dB}$

- 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-40GHz
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, 30MHz, 50MHz	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	Sample	Clear write	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *1)	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer *2)
Conducted Spurious Emission	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
*1) Reference data							
*2) 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)".							

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

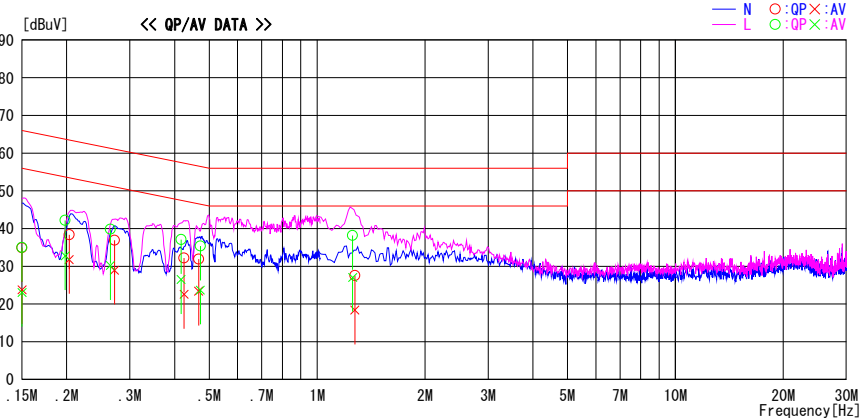
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date : 2014/04/01

Report No. : 10229481H

Temp./Humi. : 23deg. C / 35% RH
 Engineer : Kazuya Yoshioka

Mode / Remarks : WLAN Tx 11n40 MCS11 MIMO 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	21.7	10.6	13.2	34.9	23.8	66.0	56.0	31.1	32.2	N	
0.20333	25.2	18.6	13.2	38.4	31.8	63.5	53.5	25.1	21.7	N	
0.27210	23.7	15.8	13.2	36.9	29.0	61.1	51.1	24.2	22.1	N	
0.42511	19.0	9.4	13.2	32.2	22.6	57.3	47.3	25.1	24.7	N	
0.46721	18.7	10.2	13.2	31.9	23.4	56.6	46.6	24.7	23.2	N	
1.27516	14.2	5.0	13.4	27.6	18.4	56.0	46.0	28.4	27.6	N	
0.15000	21.8	9.9	13.2	35.0	23.1	66.0	56.0	31.0	32.9	L	
0.19820	29.0	19.6	13.2	42.2	32.8	63.7	53.7	21.5	20.9	L	
0.26485	26.6	17.0	13.2	39.8	30.2	61.3	51.3	21.5	21.1	L	
0.41740	23.9	13.3	13.2	37.1	26.5	57.5	47.5	20.4	21.0	L	
0.47210	22.2	10.5	13.2	35.4	23.7	56.5	46.5	21.1	22.8	L	
1.25592	24.8	13.7	13.4	38.2	27.1	56.0	46.0	17.8	18.9	L	

CHART:WITH FACTOR, Peak hold data. CALCULATION:RESULT=READING+C.F(L1SN LOSS + ATT LOSS + CABLE LOSS)
 Except for the above table : adequate margin data below the limits.

6dB Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10229481H
Date 3/28/2014
Temperature/ Humidity 24deg. C / 31% RH
Engineer Shinya Watanabe
Mode 11b/g/n-20/n-40 Tx (2.4GHz Band)

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	9.568	>500
2437	9.533	>500
2462	9.543	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.356	>500
2437	16.380	>500
2462	16.376	>500

11n-20 (MIMO ANT B)

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.991	>500
2437	15.986	>500
2462	15.739	>500

11n-40 (MIMO ANT A)

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2422	35.975	>500
2437	36.344	>500
2452	36.265	>500

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6dB Bandwidth

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10229481H
Date 04/02/2014
Temperature/ Humidity 25deg. C / 29% RH
Engineer Yutaka Yoshida
Mode 11a/n-20/n-40 Tx (5GHz Band)

11a

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
5745	16.403	>500
5785	16.406	>500
5825	16.394	>500

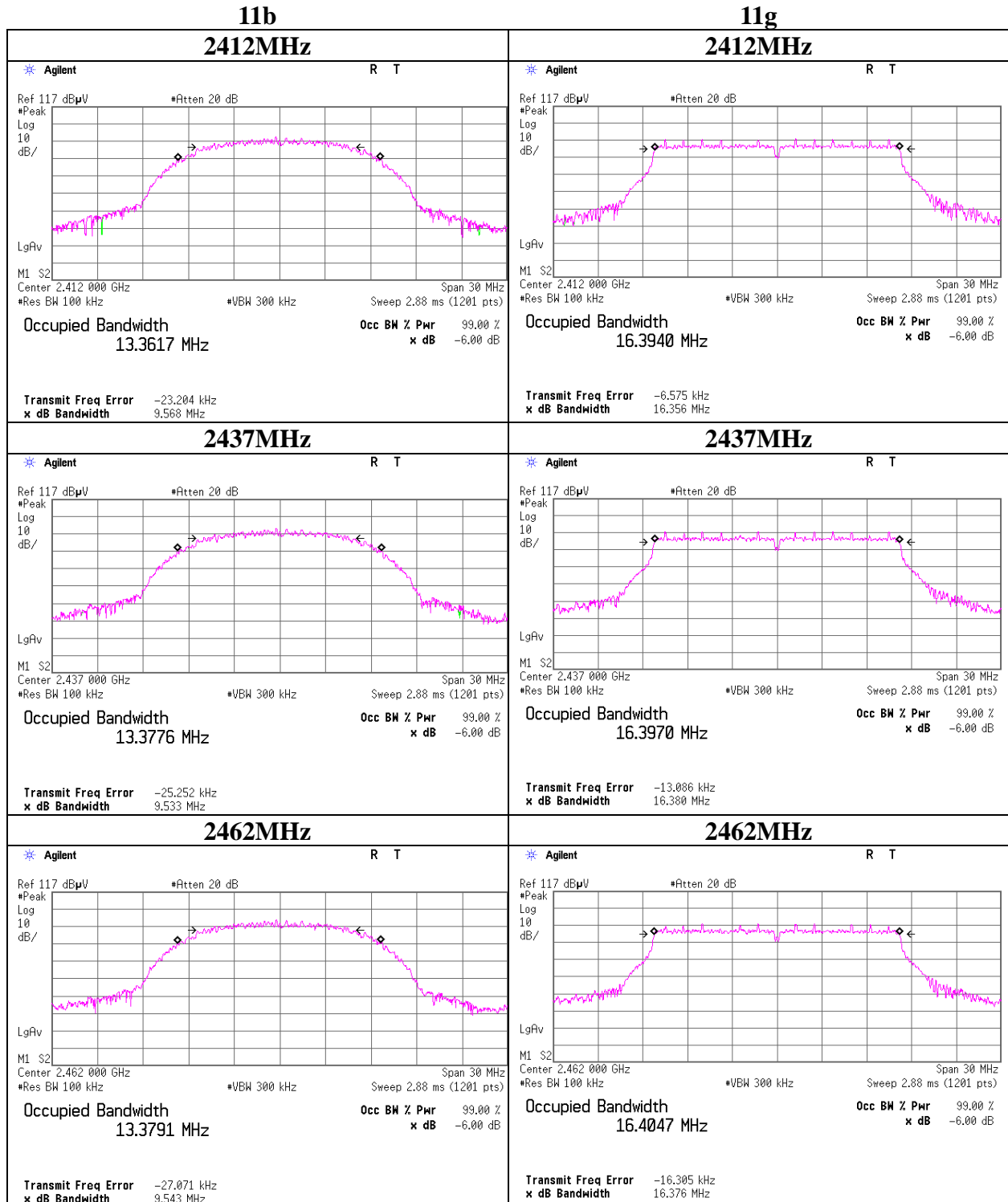
11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
5745	15.975	>500
5785	15.962	>500
5825	15.948	>500

11n-40

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
5755	36.339	>500
5795	36.098	>500

6dB Bandwidth



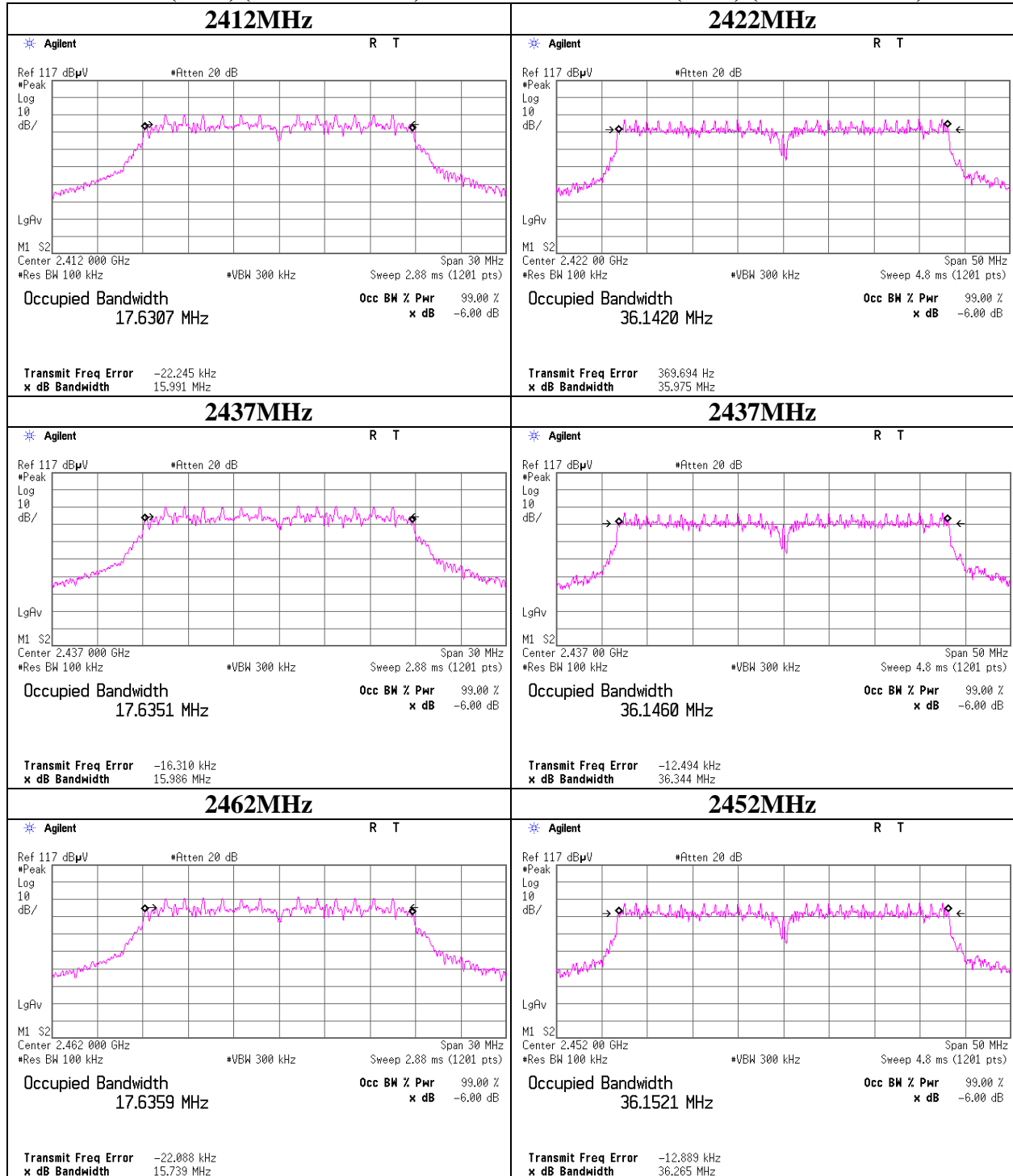
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6dB Bandwidth

11n-20(2.4G) (MIMO ANT B)

11n-40(2.4G) (MIMO ANTA)



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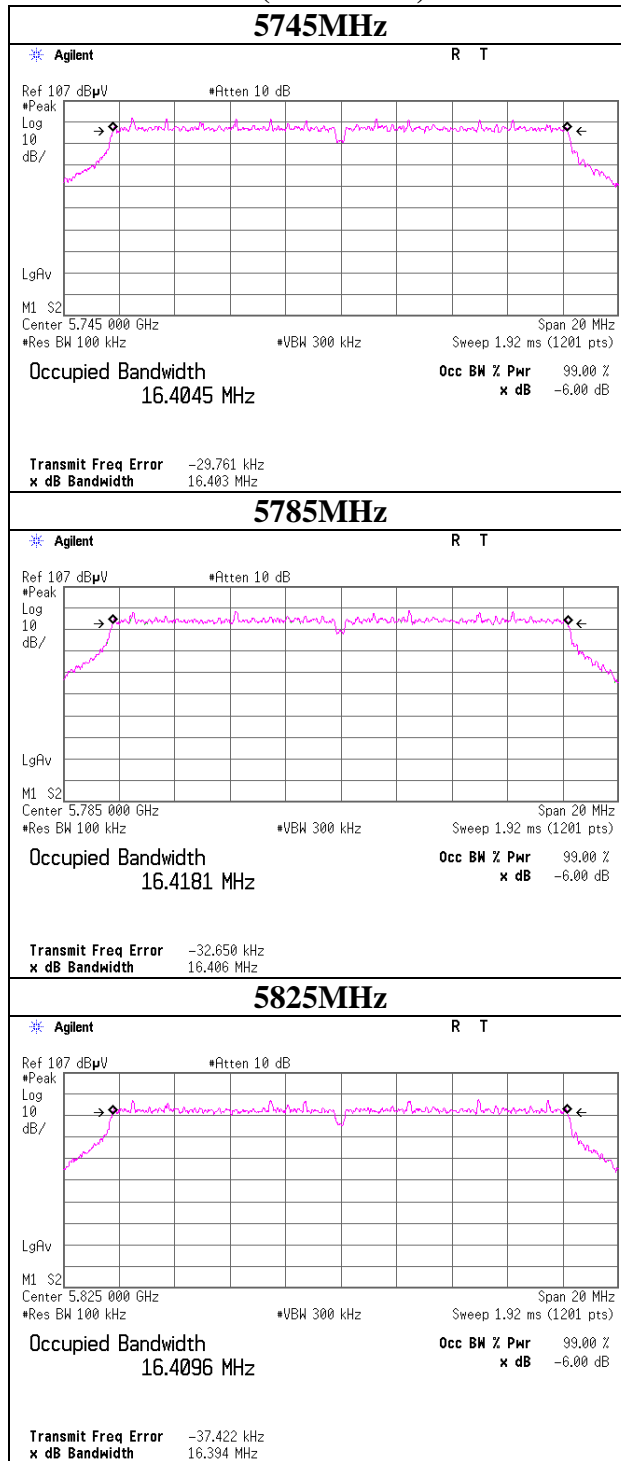
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6dB Bandwidth

11a(Antenna A)



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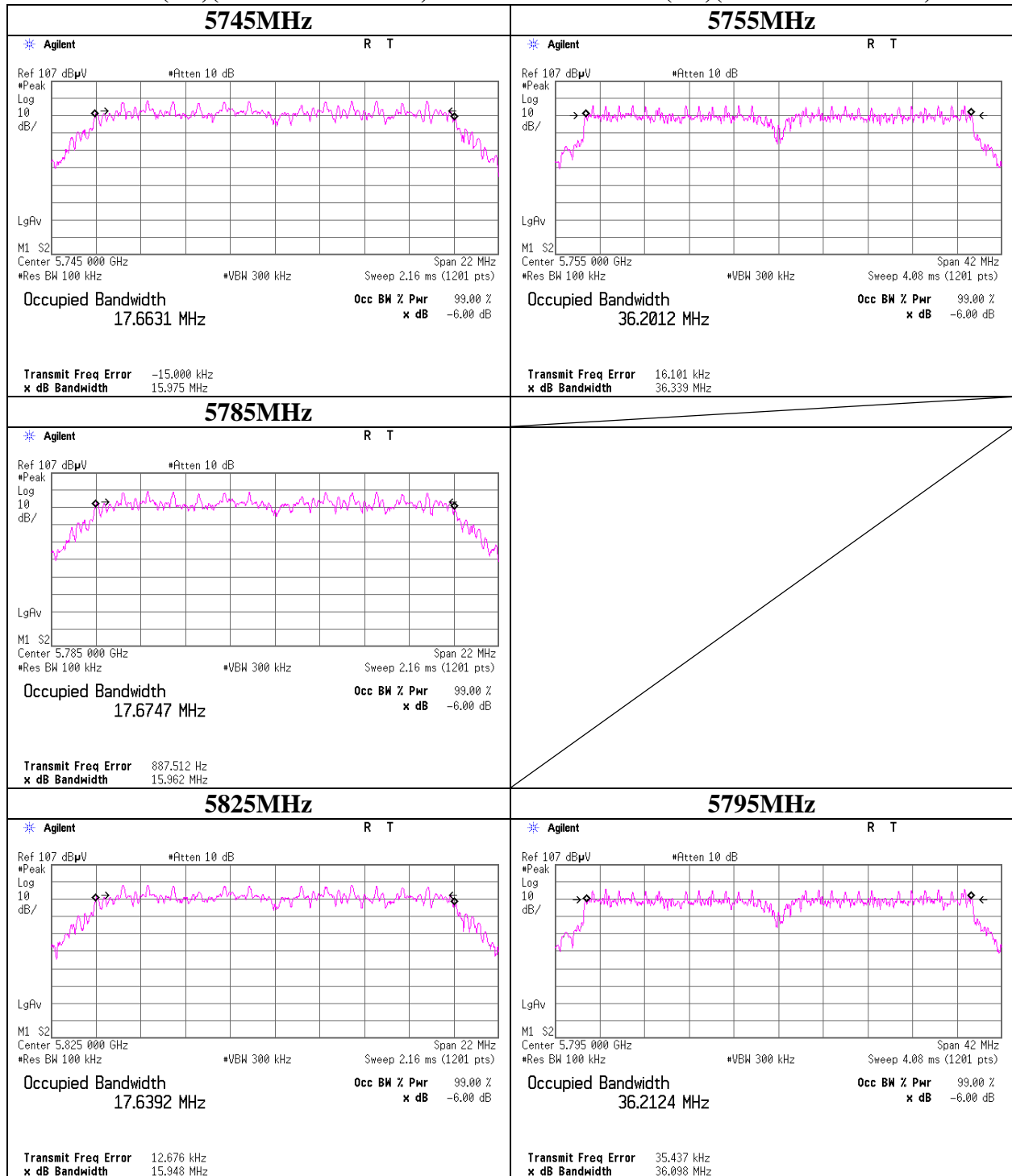
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Facsimile : +81 596 24 8124

6dB Bandwidth

11n-20(5G)(MIMO Antenna B)

11n-40(5G)(MIMO Antenna B)



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Ise EMC Lab.

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Telephone : +81 596 24 8999

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Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 10229481H
Date : 03/26/2014
Temperature/ Humidity : 24 deg. C / 41% RH
Engineer : Satofumi Matsuyama
Mode : Worst data rate check

2437MHz

Rate 11b [Mbps]	ant.A Reading PK [dBm]	Remark
1	4.52	
2	4.05	
5.5	4.39	
11	4.58	*

*: Worst Rate

2437MHz

Rate 11g [Mbps]	ant.A Reading PK [dBm]	Remark
6	11.71	*
9	10.83	
12	11.53	
18	11.10	
24	11.59	
36	11.67	
48	11.26	
54	11.19	

*: Worst Rate

2437MHz

Rate 11n20 [MCS]	ant.A Reading PK [dBm]	ant.B Reading PK [dBm]	Total Reading PK [dBm]	Remark
0	11.69	-	-	
1	11.28	-	-	
2	11.33	-	-	
3	11.03	-	-	
4	11.59	-	-	
5	11.63	-	-	
6	11.35	-	-	
7	11.48	-	-	
8	11.87	11.98	14.94	
9	11.63	11.87	14.76	
10	11.68	11.91	14.81	
11	11.75	11.87	14.82	
12	11.78	12.03	14.92	
13	11.97	12.21	15.10	*
14	11.85	11.97	14.92	
15	11.53	11.67	14.61	

*: Worst Rate

2437MHz

Rate 11n40 [MCS]	ant.A Reading PK [dBm]	ant.B Reading PK [dBm]	Total Reading PK [dBm]	Remark
0	11.69	-	-	
1	11.75	-	-	
2	10.19	-	-	
3	10.30	-	-	
4	13.47	-	-	
5	13.14	-	-	
6	13.17	-	-	
7	13.09	-	-	
8	12.28	12.57	15.44	
9	10.98	11.17	14.09	
10	11.43	13.02	15.31	
11	14.41	13.75	17.10	*
12	14.43	13.70	17.09	
13	12.96	13.30	16.14	
14	12.87	13.29	16.10	
15	12.78	13.15	15.98	

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.
Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 10229481H
Date : 03/26/2014
Temperature/ Humidity : 24 deg. C / 41% RH
Engineer : Satofumi Matsuyama
Mode : Worst data rate check

5785MHz

Rate 11a [Mbps]	ant.A Reading PK [dBm]	Remark
6	10.16	*
9	9.93	
12	10.02	
18	9.45	
24	10.12	
36	10.02	
48	9.53	
54	10.15	

*: Worst Rate

5785MHz

Rate 11n20 [MCS]	ant.A Reading PK [dBm]	ant.B Reading PK [dBm]	Total Reading PK [dBm]	Remark
0	10.13	-	-	
1	10.10	-	-	
2	9.96	-	-	
3	9.87	-	-	
4	9.97	-	-	
5	9.87	-	-	
6	9.76	-	-	
7	10.12	-	-	
8	10.68	11.24	13.98	*
9	10.34	10.88	13.63	
10	10.08	10.56	13.34	
11	10.11	10.70	13.43	
12	10.05	10.67	13.38	
13	10.19	10.73	13.48	
14	10.30	10.82	13.58	
15	10.14	10.73	13.46	

*: Worst Rate

5755MHz

Rate 11n40 [MCS]	ant.A Reading PK [dBm]	ant.B Reading PK [dBm]	Total Reading PK [dBm]	Remark
0	10.47	-	-	
1	10.62	-	-	
2	9.55	-	-	
3	9.75	-	-	
4	11.48	-	-	
5	11.08	-	-	
6	11.06	-	-	
7	11.22	-	-	
8	10.74	11.24	14.01	
9	9.93	10.23	13.09	
10	10.46	11.35	13.94	
11	11.72	11.75	14.75	*
12	11.64	11.72	14.69	
13	11.07	11.76	14.44	
14	11.08	11.71	14.42	
15	11.05	11.78	14.44	

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.
Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Test place Ise EMC Lab. No.3 Measurement Room
Report No. 10229481H
Date 03/27/2014 03/28/2014
Temperature/ Humidity 24deg. C / 35% RH 24deg. C / 35% RH
Engineer Yutaka Yoshida Shinya Watanabe
Mode 11b/g Tx (2.4GHz Band)

11b 11Mbps Antenna A

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	2.55	0.40	10.00	12.95	19.72	30.00	1000	17.05
2437	4.58	0.40	10.00	14.98	31.48	30.00	1000	15.02
2462	4.83	0.40	10.00	15.23	33.34	30.00	1000	14.77

11b 11Mbps Antenna B

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	4.84	0.40	10.00	15.24	33.42	30.00	1000	14.76
2437	5.23	0.40	10.00	15.63	36.56	30.00	1000	14.37
2462	5.24	0.40	10.00	15.64	36.64	30.00	1000	14.36

11g 6Mbps Antenna A

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	11.88	0.40	10.00	22.28	169.04	30.00	1000	7.72
2437	11.71	0.40	10.00	22.11	162.55	30.00	1000	7.89
2462	12.23	0.40	10.00	22.63	183.23	30.00	1000	7.37

11g 6Mbps Antenna B

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.57	0.40	10.00	22.97	198.15	30.00	1000	7.03
2437	12.51	0.40	10.00	22.91	195.43	30.00	1000	7.09
2462	12.78	0.40	10.00	23.18	207.97	30.00	1000	6.82

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Difference between worst rate check data and formal test result is due to the different test cond

Maximum Peak Output Power

Test place Ise EMC Lab. No.3 Measurement Room
Report No. 10229481H
Date 03/27/2014 03/28/2014
Temperature/ Humidity 24deg. C / 35% RH 24deg. C / 35% RH
Engineer Yutaka Yoshida Shinya Watanabe
Mode 11n-20/n-40 Tx (2.4GHz Band)

11n-20 MCS13 MIMO

Freq. [MHz]	Antenna	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Total Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
2412	A	10.98	0.40	10.00	21.38	137.40	24.54	284.30	30.00	1000	5.46
	B	11.26	0.40	10.01	21.67	146.89					
2437	A	11.97	0.40	10.00	22.37	172.58	25.51	355.39	30.00	1000	4.49
	B	12.21	0.40	10.01	22.62	182.81					
2462	A	12.14	0.40	10.00	22.54	179.47	25.58	361.02	30.00	1000	4.42
	B	12.18	0.40	10.01	22.59	181.55					

11n-40 MCS11 MIMO

Freq. [MHz]	Antenna	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Total Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
2422	A	12.53	0.40	10.00	22.93	196.34	26.45	441.24	30.00	1000	3.55
	B	13.48	0.40	10.01	23.89	244.91					
2437	A	14.41	0.40	10.00	24.81	302.69	27.51	563.31	30.00	1000	2.49
	B	13.75	0.40	10.01	24.16	260.62					
2452	A	12.35	0.40	10.00	22.75	188.36	26.13	410.18	30.00	1000	3.87
	B	13.05	0.40	10.01	23.46	221.82					

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Difference between worst rate check data and formal test result is due to the different test condition.

Maximum Peak Output Power

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 10229481H
Date : 03/27/2014
Temperature/ Humidity : 24deg. C / 35% RH
Engineer : Yutaka Yoshida
Mode : 11a/n-20/n-40 Tx (5GHz Band)

11a 6Mbps Antenna A

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
5745	11.58	1.20	10.04	22.82	191.43	30.00	1000	7.18
5785	10.16	1.20	10.04	21.40	138.04	30.00	1000	8.60
5825	9.20	1.20	10.04	20.44	110.66	30.00	1000	9.56

11a 6Mbps Antenna B

Freq. [MHz]	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
5745	10.98	1.20	10.04	22.22	166.72	30.00	1000	7.78
5785	10.35	1.20	10.04	21.59	144.21	30.00	1000	8.41
5825	10.71	1.20	10.04	21.95	156.68	30.00	1000	8.05

11n-20 MCS8 MIMO

Freq. [MHz]	Antenna	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
5745	A	10.63	1.20	10.04	21.87	153.82	25.45	350.60	30.00	1000	4.55
	B	11.72	1.20	10.02	22.94	196.79					
5785	A	10.68	1.20	10.04	21.92	155.60	25.21	331.79	30.00	1000	4.79
	B	11.24	1.20	10.02	22.46	176.20					
5825	A	9.46	1.20	10.04	20.70	117.49	24.35	272.37	30.00	1000	5.65
	B	10.68	1.20	10.02	21.90	154.88					

11n-40 MCS11 MIMO

Freq. [MHz]	Antenna	Reading PK [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
5755	A	11.72	1.20	10.04	22.96	197.70	25.98	395.85	30.00	1000	4.02
	B	11.75	1.20	10.02	22.97	198.15					
5795	A	10.48	1.20	10.04	21.72	148.59	25.28	336.96	30.00	1000	4.72
	B	11.53	1.20	10.02	22.75	188.36					

Sample Calculation:

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

Difference between worst rate check data and formal test result is due to the different test condition.

UL Japan, Inc.

Ise EMC Lab.

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Average Output Power
(for reporting purpose only)

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 10229481H
Date : 03/27/2014
Temperature/ Humidity : 24 deg. C / 35% RH
Engineer : Yutaka Yoshida
Mode : 11b/g Tx

11b 11Mbps Antenna A

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	-0.18	0.40	10.00	10.22	10.52
2437	1.86	0.40	10.00	12.26	16.83
2462	2.07	0.40	10.00	12.47	17.66

11b 11Mbps Antenna B

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	-1.49	1.20	10.04	9.75	9.44
2437	1.27	1.20	10.04	12.51	17.82
2462	1.74	1.20	10.04	12.98	19.86

11g 6Mbps Antenna A

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	1.46	0.40	10.00	11.86	15.35
2437	1.42	0.40	10.00	11.82	15.21
2462	2.06	0.40	10.00	12.46	17.62

11g 6Mbps Antenna B

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
2412	1.46	0.40	10.00	11.86	15.35
2437	1.10	0.40	10.00	11.50	14.13
2462	1.43	0.40	10.00	11.83	15.24

Sample Calculation:

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

Average Output Power
(for reporting purpose only)

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 10229481H
Date : 03/27/2014
Temperature/ Humidity : 24deg. C / 35% RH
Engineer : Yutaka Yoshida
Mode : 11n-20/n-40 Tx

11n-20 MCS13 MIMO

Freq. [MHz]	Antenna	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Result	
					[dBm]	[mW]	[dBm]	[mW]
2412	A	0.52	0.40	10.00	10.92	12.36	14.21	26.36
	B	1.05	0.40	10.01	11.46	14.00		
2437	A	1.75	0.40	10.00	12.15	16.41	15.36	34.35
	B	2.13	0.40	10.01	12.54	17.95		
2462	A	2.03	0.40	10.00	12.43	17.50	15.53	35.74
	B	2.20	0.40	10.01	12.61	18.24		

11n-40 MCS11 MIMO

Freq. [MHz]	Antenna	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Result	
					[dBm]	[mW]	[dBm]	[mW]
2412	A	0.75	0.40	10.00	11.15	13.03	14.76	29.94
	B	1.87	0.40	10.01	12.28	16.90		
2437	A	1.67	0.40	10.00	12.07	16.11	15.38	34.51
	B	2.24	0.40	10.01	12.65	18.41		
2462	A	0.79	0.40	10.00	11.19	13.15	14.79	30.10
	B	1.88	0.40	10.01	12.29	16.94		

Sample Calculation:

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

UL Japan, Inc.

Ise EMC Lab.

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Average Output Power
(for reporting purpose only)

Test place : Ise EMC Lab. No.3 Measurement Room
Report No. : 10229481H
Date : 03/27/2014
Temperature/ Humidity : 24deg. C / 35% RH
Engineer : Yutaka Yoshida
Mode : 11a/n-20/n-40 Tx

11a 6Mbps Antenna A

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
5745	4.08	1.20	10.04	15.32	34.04
5785	0.86	1.20	10.04	12.10	16.22
5825	-0.53	1.20	10.04	10.71	11.78

Sample Calculation:

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

11a 6Mbps Antenna B

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				[dBm]	[mW]
5745	1.93	1.20	10.04	13.17	20.75
5785	0.71	1.20	10.04	11.95	15.67
5825	1.30	1.20	10.04	12.54	17.95

Sample Calculation:

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

11n-20 MCS8 MIMO

Freq. [MHz]	Antenna	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Result	
					[dBm]	[mW]	[dBm]	[mW]
5745	A	1.47	1.20	10.04	12.71	18.66	16.88	48.72
	B	3.56	1.20	10.02	14.78	30.06		
5785	A	1.97	1.20	10.04	13.21	20.94	16.53	44.93
	B	2.58	1.20	10.02	13.80	23.99		
5825	A	-0.25	1.20	10.04	10.99	12.56	15.02	31.79
	B	1.62	1.20	10.02	12.84	19.23		

11n-40 MCS11 MIMO

Freq. [MHz]	Antenna	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Result	
					[dBm]	[mW]	[dBm]	[mW]
5755	A	0.75	1.20	10.04	11.99	15.81	15.59	36.18
	B	1.87	1.20	10.02	13.09	20.37		
5795	A	-0.12	1.20	10.04	11.12	12.94	14.88	30.77
	B	1.29	1.20	10.02	12.51	17.82		

Sample Calculation:

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

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber	
Report No.	10229481H	
Date	03/27/2014	03/28/2014
Temperature/ Humidity	22 deg. C / 32% RH	23 deg. C / 31% RH
Engineer	Tsubasa Takayama	Tsubasa Takayama
	(1-10GHz)	(10-26.5GHz)
Mode	11b Tx 2437MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	48.2	32.0	4.4	33.9	50.7	73.9	23.2	
Hori	7311.000	PK	36.7	35.8	5.3	33.8	44.0	73.9	29.9	
Hori	9748.000	PK	45.8	38.3	6.1	34.5	55.7	73.9	18.2	
Hori	4874.000	AV	35.7	32.0	4.4	33.9	38.2	53.9	15.7	
Hori	7311.000	AV	34.4	35.8	5.3	33.8	41.7	53.9	12.2	
Hori	9748.000	AV	33.1	38.3	6.1	34.5	43.0	53.9	10.9	
Vert	4874.000	PK	48.1	32.0	4.4	33.9	50.6	73.9	23.3	
Vert	7311.000	PK	46.7	35.8	5.3	33.8	54.0	73.9	19.9	
Vert	9748.000	PK	45.9	38.3	6.1	34.5	55.8	73.9	18.1	
Vert	4874.000	AV	36.9	32.0	4.4	33.9	39.4	53.9	14.5	
Vert	7311.000	AV	33.0	35.8	5.3	33.8	40.3	53.9	13.6	
Vert	9748.000	AV	32.3	38.3	6.1	34.5	42.2	53.9	11.7	

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

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

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

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

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. 10229481H
Date 03/27/2014 03/28/2014
Temperature/ Humidity 22 deg. C / 32% RH 23 deg. C / 31% RH
Engineer Tsubasa Takayama Tsubasa Takayama
(1-10GHz) (10-26.5GHz)
Mode 11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	62.4	26.9	2.5	34.7	57.1	73.9	16.8	
Hori	4924.000	PK	47.9	32.1	4.4	33.9	50.5	73.9	23.4	
Hori	7386.000	PK	45.6	35.8	5.3	33.8	52.9	73.9	21.0	
Hori	9848.000	PK	44.1	38.5	6.1	34.5	54.2	73.9	19.7	
Hori	2483.500	AV	41.5	26.9	2.5	34.7	36.2	53.9	17.7	
Hori	4924.000	AV	36.6	32.1	4.4	33.9	39.2	53.9	14.7	
Hori	7386.000	AV	34.2	35.8	5.3	33.8	41.5	53.9	12.4	
Hori	9848.000	AV	33.2	38.5	6.1	34.5	43.3	53.9	10.6	
Vert	2483.500	PK	57.9	26.9	2.5	34.7	52.6	73.9	21.3	
Vert	4924.000	PK	47.4	32.1	4.4	33.9	50.0	73.9	23.9	
Vert	7386.000	PK	45.9	35.8	5.3	33.8	53.2	73.9	20.7	
Vert	9848.000	PK	45.5	38.5	6.1	34.5	55.6	73.9	18.3	
Vert	2483.500	AV	38.7	26.9	2.5	34.7	33.4	53.9	20.5	
Vert	4924.000	AV	35.6	32.1	4.4	33.9	38.2	53.9	15.7	
Vert	7386.000	AV	34.6	35.8	5.3	33.8	41.9	53.9	12.0	
Vert	9848.000	AV	33.2	38.5	6.1	34.5	43.3	53.9	10.6	

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).

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

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

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Radiated Spurious Emission

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10229481H
Date 03/27/2014 03/28/2014
Temperature/ Humidity 22 deg. C / 32% RH 23 deg. C / 31% RH
Engineer Tsubasa Takayama Tsubasa Takayama
(1-10GHz) (10-26.5GHz)
Mode 11n-20 Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	61.8	27.0	2.4	34.7	56.5	73.9	17.4	
Hori	4824.000	PK	44.3	31.9	4.4	33.9	46.7	73.9	27.2	
Hori	7236.000	PK	42.6	35.7	5.2	33.8	49.7	73.9	24.2	
Hori	9648.000	PK	43.5	38.1	6.0	34.4	53.2	73.9	20.7	
Hori	2390.000	AV	51.7	27.0	2.4	34.7	46.4	53.9	7.5	
Hori	4824.000	AV	32.9	31.9	4.4	33.9	35.3	53.9	18.6	
Hori	7236.000	AV	32.8	35.7	5.2	33.8	39.9	53.9	14.0	
Hori	9648.000	AV	32.5	38.1	6.0	34.4	42.2	53.9	11.7	
Vert	2390.000	PK	66.8	27.0	2.4	34.7	61.5	73.9	12.4	
Vert	4824.000	PK	45.4	31.9	4.4	33.9	47.8	73.9	26.1	
Vert	7236.000	PK	42.9	35.7	5.2	33.8	50.0	73.9	23.9	
Vert	9648.000	PK	43.2	38.1	6.0	34.4	52.9	73.9	21.0	
Vert	2390.000	AV	51.2	27.0	2.4	34.7	45.9	53.9	8.0	
Vert	4824.000	AV	32.9	31.9	4.4	33.9	35.3	53.9	18.6	
Vert	7236.000	AV	32.3	35.7	5.2	33.8	39.4	53.9	14.5	
Vert	9648.000	AV	32.8	38.1	6.0	34.4	42.5	53.9	11.4	

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).

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

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

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	2412.000	PK	106.6	27.0	2.4	34.7	101.3	-	-	Carrier
Hori	2400.000	PK	61.2	27.0	2.4	34.7	55.9	81.3	25.4	
Vert	2412.000	PK	104.0	27.0	2.4	34.7	98.7	-	-	Carrier
Vert	2400.000	PK	64.2	27.0	2.4	34.7	58.9	78.7	19.8	

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

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Radiated Spurious Emission

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10229481H
Date 03/27/2014 03/28/2014
Temperature/ Humidity 22 deg. C / 32% RH 23 deg. C / 31% RH
Engineer Tsubasa Takayama Tsubasa Takayama
(1-10GHz) (10-26.5GHz)
Mode 11n-20 Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	65.5	26.9	2.5	34.7	60.2	73.9	13.7	
Hori	4924.000	PK	44.1	32.1	4.4	33.9	46.7	73.9	27.2	
Hori	7386.000	PK	43.9	35.8	5.3	33.8	51.2	73.9	22.7	
Hori	9848.000	PK	43.2	38.5	6.1	34.5	53.3	73.9	20.6	
Hori	2483.500	AV	52.5	26.9	2.5	34.7	47.2	53.9	6.7	
Hori	4924.000	AV	32.9	32.1	4.4	33.9	35.5	53.9	18.4	
Hori	7386.000	AV	32.4	35.8	5.3	33.8	39.7	53.9	14.2	
Hori	9848.000	AV	32.6	38.5	6.1	34.5	42.7	53.9	11.2	
Vert	2483.500	PK	65.7	26.9	2.5	34.7	60.4	73.9	13.5	
Vert	4924.000	PK	44.6	32.1	4.4	33.9	47.2	73.9	26.7	
Vert	7386.000	PK	45.3	35.8	5.3	33.8	52.6	73.9	21.3	
Vert	9848.000	PK	44.3	38.5	6.1	34.5	54.4	73.9	19.5	
Vert	2483.500	AV	51.4	26.9	2.5	34.7	46.1	53.9	7.8	
Vert	4924.000	AV	32.7	32.1	4.4	33.9	35.3	53.9	18.6	
Vert	7386.000	AV	32.7	35.8	5.3	33.8	40.0	53.9	13.9	
Vert	9848.000	AV	32.8	38.5	6.1	34.5	42.9	53.9	11.0	

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

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

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

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10229481H
Date : 03/27/2014 03/28/2014
Temperature/ Humidity : 22 deg. C / 32% RH 23 deg. C / 31% RH
Engineer : Takumi Shimada Tsubasa Takayama
(1-10GHz) (10-26.5GHz)
Mode : 11n-40 Tx 2422MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	73.7	27.0	2.4	34.7	68.4	73.9	5.5	
Hori	4844.000	PK	43.7	31.9	4.4	33.9	46.1	73.9	27.8	
Hori	7266.000	PK	43.0	35.7	5.2	33.8	50.1	73.9	23.8	
Hori	9688.000	PK	43.1	38.2	6.1	34.4	53.0	73.9	20.9	
Hori	2390.000	AV	57.6	27.0	2.4	34.7	52.3	53.9	1.6	
Hori	4844.000	AV	31.1	31.9	4.4	33.9	33.5	53.9	20.4	
Hori	7266.000	AV	30.5	35.7	5.2	33.8	37.6	53.9	16.3	
Hori	9688.000	AV	31.2	38.2	6.1	34.4	41.1	53.9	12.8	
Vert	2390.000	PK	67.7	27.0	2.4	34.7	62.4	73.9	11.5	
Vert	4844.000	PK	42.5	31.9	4.4	33.9	44.9	73.9	29.0	
Vert	7266.000	PK	43.9	35.7	5.2	33.8	51.0	73.9	22.9	
Vert	9688.000	PK	43.4	38.2	6.1	34.4	53.3	73.9	20.6	
Vert	2390.000	AV	49.9	27.0	2.4	34.7	44.6	53.9	9.3	
Vert	4844.000	AV	30.7	31.9	4.4	33.9	33.1	53.9	20.8	
Vert	7266.000	AV	31.7	35.7	5.2	33.8	38.8	53.9	15.1	
Vert	9688.000	AV	31.2	38.2	6.1	34.4	41.1	53.9	12.8	

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).

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

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

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	2422.000	PK	103.8	27.0	2.5	34.7	98.6	-	-	Carrier
Hori	2400.000	PK	64.9	27.0	2.4	34.7	59.6	78.6	19.0	
Vert	2422.000	PK	97.7	27.0	2.5	34.7	92.5	-	-	Carrier
Vert	2400.000	PK	57.7	27.0	2.4	34.7	52.4	72.5	20.1	

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. 10229481H
Date 03/28/2014 03/28/2014 04/01/2014
Temperature/ Humidity 22 deg. C / 32% RH 23 deg. C / 31% RH 23 deg. C / 35% RH
Engineer Takumi Shimada Tsubasa Takayama Kazuya Yoshioka
(1-10GHz) (10-26.5GHz) (30-1000MHz)
Mode 11n-40 Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	199.677	QP	35.0	16.6	8.1	27.8	31.9	43.5	11.6	
Hori	205.821	QP	35.3	16.7	8.2	27.8	32.4	43.5	11.1	
Hori	244.729	QP	34.0	17.0	8.4	27.7	31.7	46.0	14.3	
Hori	247.094	QP	37.0	17.0	8.4	27.7	34.7	46.0	11.3	
Hori	249.999	QP	40.3	17.1	8.4	27.7	38.1	46.0	7.9	
Hori	875.024	QP	30.8	22.1	11.0	28.0	35.9	46.0	10.1	
Hori	4874.000	PK	44.4	32.0	4.4	33.9	46.9	73.9	27.0	
Hori	7311.000	PK	42.6	35.8	5.3	33.8	49.9	73.9	24.0	
Hori	9748.000	PK	43.5	38.3	6.1	34.5	53.4	73.9	20.5	
Hori	4874.000	AV	31.9	32.0	4.4	33.9	34.4	53.9	19.5	
Hori	7311.000	AV	30.5	35.8	5.3	33.8	37.8	53.9	16.1	
Hori	9748.000	AV	31.6	38.3	6.1	34.5	41.5	53.9	12.4	
Vert	199.676	QP	38.5	16.6	8.1	27.8	35.4	43.5	8.1	
Vert	205.822	QP	38.1	16.7	8.2	27.8	35.2	43.5	8.3	
Vert	244.729	QP	37.3	17.0	8.4	27.7	35.0	46.0	11.0	
Vert	247.094	QP	36.0	17.0	8.4	27.7	33.7	46.0	12.3	
Vert	250.006	QP	41.6	17.1	8.4	27.7	39.4	46.0	6.6	
Vert	875.024	QP	28.6	22.1	11.0	28.0	33.7	46.0	12.3	
Vert	4874.000	PK	42.9	32.0	4.4	33.9	45.4	73.9	28.5	
Vert	7311.000	PK	43.8	35.8	5.3	33.8	51.1	73.9	22.8	
Vert	9748.000	PK	43.9	38.3	6.1	34.5	53.8	73.9	20.1	
Vert	4874.000	AV	31.1	32.0	4.4	33.9	33.6	53.9	20.3	
Vert	7311.000	AV	31.1	35.8	5.3	33.8	38.4	53.9	15.5	
Vert	9748.000	AV	31.5	38.3	6.1	34.5	41.4	53.9	12.5	

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

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

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

Radiated Spurious Emission

Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10229481H
Date 03/27/2014 03/28/2014
Temperature/ Humidity 23 deg. C / 31% RH 23 deg. C / 31% RH
Engineer Tsubasa Takayama Tsubasa Takayama
(1-10GHz) (10-26.5GHz)
Mode 11n-40 Tx 2452MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	68.9	26.9	2.5	34.7	63.6	73.9	10.3	
Hori	4904.000	PK	42.1	32.0	4.4	33.9	44.6	73.9	29.3	
Hori	7356.000	PK	42.7	35.8	5.3	33.8	50.0	73.9	23.9	
Hori	9808.000	PK	43.3	38.4	6.1	34.5	53.3	73.9	20.6	
Hori	2483.500	AV	55.1	26.9	2.5	34.7	49.8	53.9	4.1	
Hori	4904.000	AV	30.3	32.0	4.4	33.9	32.8	53.9	21.1	
Hori	7356.000	AV	31.0	35.8	5.3	33.8	38.3	53.9	15.6	
Hori	9808.000	AV	31.4	38.4	6.1	34.5	41.4	53.9	12.5	
Vert	2483.500	PK	65.8	26.9	2.5	34.7	60.5	73.9	13.4	
Vert	4904.000	PK	42.5	32.0	4.4	33.9	45.0	73.9	28.9	
Vert	7356.000	PK	43.9	35.8	5.3	33.8	51.2	73.9	22.7	
Vert	9808.000	PK	43.0	38.4	6.1	34.5	53.0	73.9	20.9	
Vert	2483.500	AV	52.9	26.9	2.5	34.7	47.6	53.9	6.3	
Vert	4904.000	AV	30.6	32.0	4.4	33.9	33.1	53.9	20.8	
Vert	7356.000	AV	31.2	35.8	5.3	33.8	38.5	53.9	15.4	
Vert	9808.000	AV	31.3	38.4	6.1	34.5	41.3	53.9	12.6	

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).

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

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10229481H
Date : 03/28/2014
Temperature/ Humidity : 23 deg. C / 31% RH
Engineer : Tsubasa Takayama
Mode : 11n-20 Tx 5745MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	11490.000	PK	45.7	39.7	-2.0	33.7	49.7	73.9	24.2	
Hori	17235.000	PK	45.9	42.3	-0.3	32.5	55.4	73.9	18.5	
Hori	11490.000	AV	33.6	39.7	-2.0	33.7	37.6	53.9	16.3	
Hori	17235.000	AV	33.4	42.3	-0.3	32.5	42.9	53.9	11.0	
Vert	11490.000	PK	46.0	39.7	-2.0	33.7	50.0	73.9	23.9	
Vert	17235.000	PK	46.5	42.3	-0.3	32.5	56.0	73.9	17.9	
Vert	11490.000	AV	33.5	39.7	-2.0	33.7	37.5	53.9	16.4	
Vert	17235.000	AV	33.4	42.3	-0.3	32.5	42.9	53.9	11.0	

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

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

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

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

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	5745.000	PK	95.2	32.7	4.0	33.7	98.2	-	-	Carrier
Hori	5725.000	PK	51.2	32.7	4.0	33.7	54.2	78.2	24.0	
Vert	5745.000	PK	94.3	32.7	4.0	33.7	97.3	-	-	Carrier
Vert	5725.000	PK	49.5	32.7	4.0	33.7	52.5	77.3	24.8	

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

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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. : 10229481H
Date : 03/28/2014
Temperature/ Humidity : 23 deg. C / 31% RH
Engineer : Tsubasa Takayama
Mode : 11n-20 Tx 5785MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	11570.000	PK	45.3	39.7	-1.9	33.7	49.4	73.9	24.5	
Hori	17355.000	PK	45.6	43.3	-0.2	32.4	56.3	73.9	17.6	
Hori	11570.000	AV	33.3	39.7	-1.9	33.7	37.4	53.9	16.5	
Hori	17355.000	AV	33.1	43.3	-0.2	32.4	43.8	53.9	10.1	
Vert	11570.000	PK	46.7	39.7	-1.9	33.7	50.8	73.9	23.1	
Vert	17355.000	PK	46.1	43.3	-0.2	32.4	56.8	73.9	17.1	
Vert	11570.000	AV	33.3	39.7	-1.9	33.7	37.4	53.9	16.5	
Vert	17355.000	AV	33.9	43.3	-0.2	32.4	44.6	53.9	9.3	

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).

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

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10229481H
Date : 03/28/2014
Temperature/ Humidity : 23 deg. C / 31% RH
Engineer : Tsubasa Takayama
Mode : 11n-20 Tx 5825MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	5850.000	PK	50.6	32.9	4.0	33.7	53.8	73.9	20.1	
Hori	11650.000	PK	45.3	39.7	-1.8	33.7	49.5	73.9	24.4	
Hori	17475.000	PK	45.7	44.3	-0.2	32.4	57.4	73.9	16.5	
Hori	5850.000	AV	34.6	32.9	4.0	33.7	37.8	53.9	16.1	
Hori	11650.000	AV	33.4	39.7	-1.8	33.7	37.6	53.9	16.3	
Hori	17475.000	AV	33.3	44.3	-0.2	32.4	45.0	53.9	8.9	
Vert	5850.000	PK	51.4	32.9	4.0	33.7	54.6	73.9	19.3	
Vert	11650.000	PK	45.8	39.7	-1.8	33.7	50.0	73.9	23.9	
Vert	17475.000	PK	45.6	44.3	-0.2	32.4	57.3	73.9	16.6	
Vert	5850.000	AV	38.0	32.9	4.0	33.7	41.2	53.9	12.7	
Vert	11650.000	AV	33.4	39.7	-1.8	33.7	37.6	53.9	16.3	
Vert	17475.000	AV	33.2	44.3	-0.2	32.4	44.9	53.9	9.0	

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

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

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

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

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Radiated Spurious Emission

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10229481H
Date : 03/28/2014
Temperature/ Humidity : 23 deg. C / 31% RH
Engineer : Tsubasa Takayama
Mode : 11n-40 Tx 5755MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	11510.000	PK	45.3	39.7	-2.0	33.7	49.3	73.9	24.6	
Hori	17265.000	PK	45.3	42.6	-0.2	32.5	55.2	73.9	18.7	
Hori	11510.000	AV	34.1	39.7	-2.0	33.7	38.1	53.9	15.8	
Hori	17265.000	AV	33.3	42.6	-0.2	32.5	43.2	53.9	10.7	
Vert	11510.000	PK	45.8	39.7	-2.0	33.7	49.8	73.9	24.1	
Vert	17265.000	PK	46.9	42.6	-0.2	32.5	56.8	73.9	17.1	
Vert	11510.000	AV	33.4	39.7	-2.0	33.7	37.4	53.9	16.5	
Vert	17265.000	AV	34.9	42.6	-0.2	32.5	44.8	53.9	9.1	

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

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

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

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

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant.Fac.	Loss	Gain	Result	Limit	Margin	Remark
Hori	5755.000	PK	91.2	32.7	4.0	33.7	94.2	-	-	Carrier
Hori	5725.000	PK	53.8	32.7	4.0	33.7	56.8	74.2	17.4	
Vert	5755.000	PK	90.6	32.7	4.0	33.7	93.6	-	-	Carrier
Vert	5725.000	PK	57.1	32.7	4.0	33.7	60.1	73.6	13.5	

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. : 10229481H
Date : 03/28/2014
Temperature/ Humidity : 23 deg. C / 31% RH
Engineer : Tsubasa Takayama
Mode : 11n-40 Tx 5795MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	5850.000	PK	46.3	32.9	4.0	33.7	49.5	73.9	24.4	
Hori	11590.000	PK	45.7	39.7	-1.8	33.7	49.9	73.9	24.0	
Hori	17385.000	PK	45.8	43.6	-0.2	32.4	56.8	73.9	17.1	
Hori	5850.000	AV	33.2	32.9	4.0	33.7	36.4	53.9	17.5	
Hori	11590.000	AV	33.4	39.7	-1.8	33.7	37.6	53.9	16.3	
Hori	17385.000	AV	33.5	43.6	-0.2	32.4	44.5	53.9	9.4	
Vert	5850.000	PK	46.8	32.9	4.0	33.7	50.0	73.9	23.9	
Vert	11590.000	PK	45.6	39.7	-1.8	33.7	49.8	73.9	24.1	
Vert	17385.000	PK	46.5	43.6	-0.2	32.4	57.5	73.9	16.4	
Vert	5850.000	AV	34.9	32.9	4.0	33.7	38.1	53.9	15.8	
Vert	11590.000	AV	33.5	39.7	-1.8	33.7	37.7	53.9	16.2	
Vert	17385.000	AV	33.4	43.6	-0.2	32.4	44.4	53.9	9.5	

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

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

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

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

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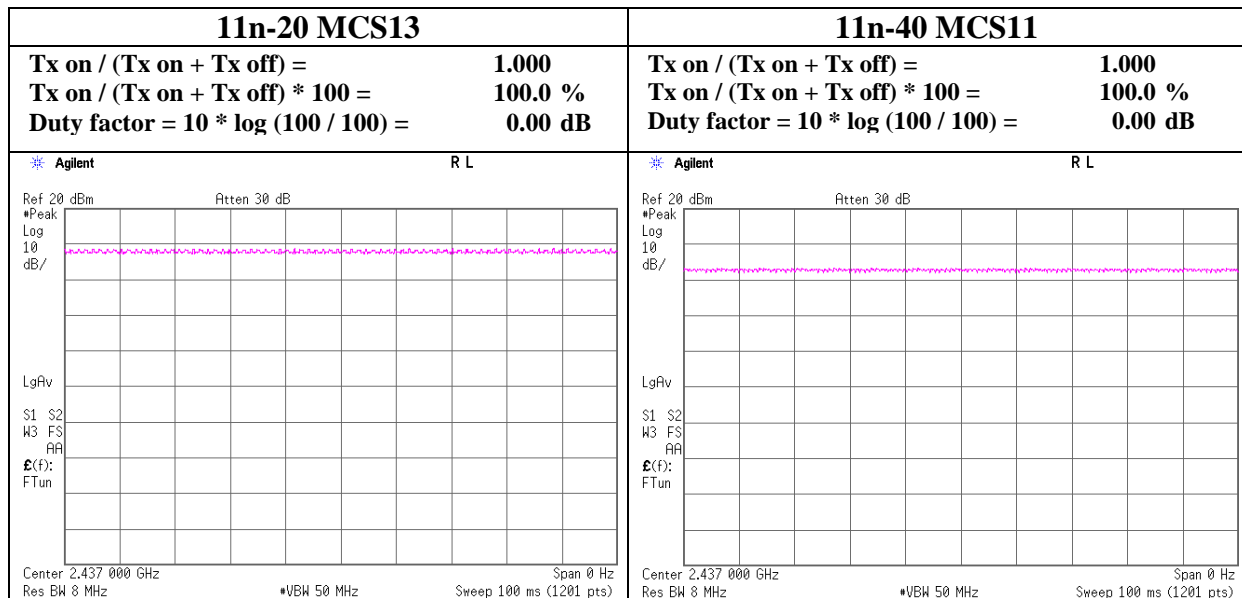
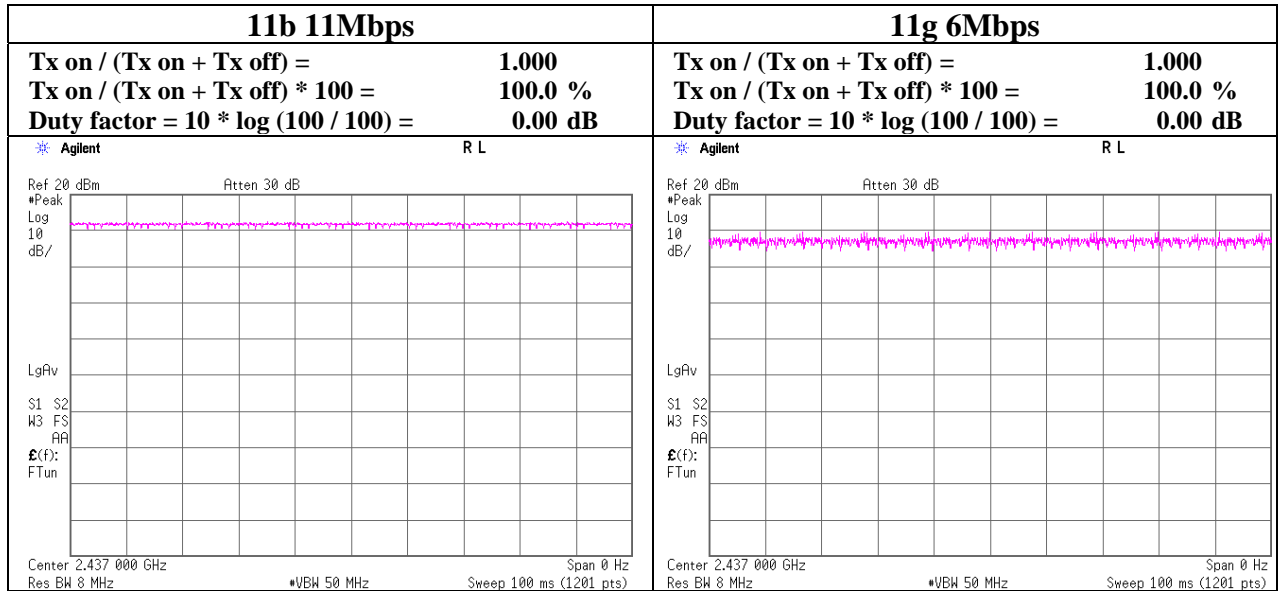
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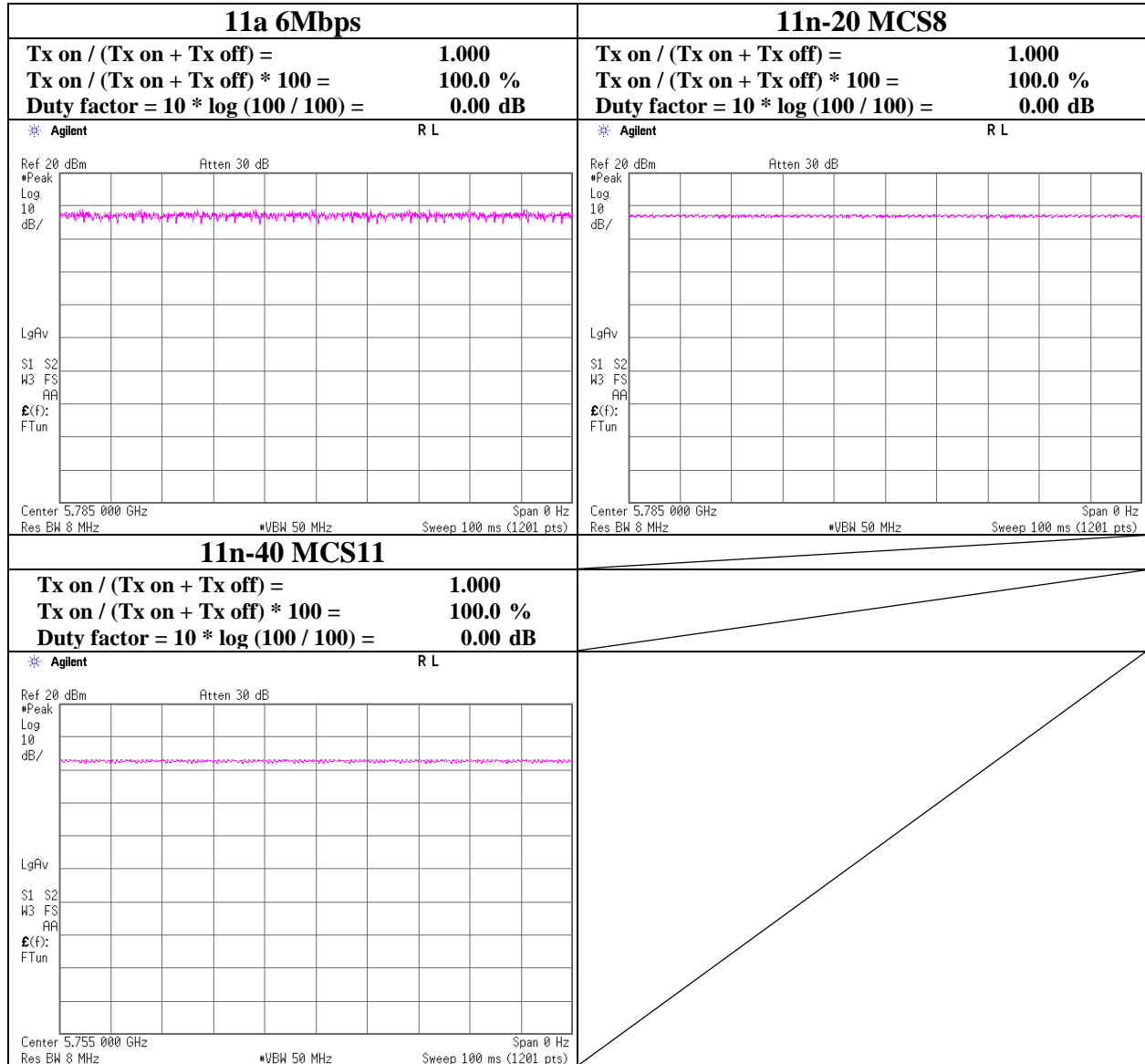
Burst rate confirmation

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10229481H
Date	04/02/2014
Temperature/ Humidity	25deg. C / 29% RH
Engineer	Yutaka Yoshida
Mode	11b/11g/11n-20(2.4G)/11n-40(2.4G) Tx



Burst rate confirmation

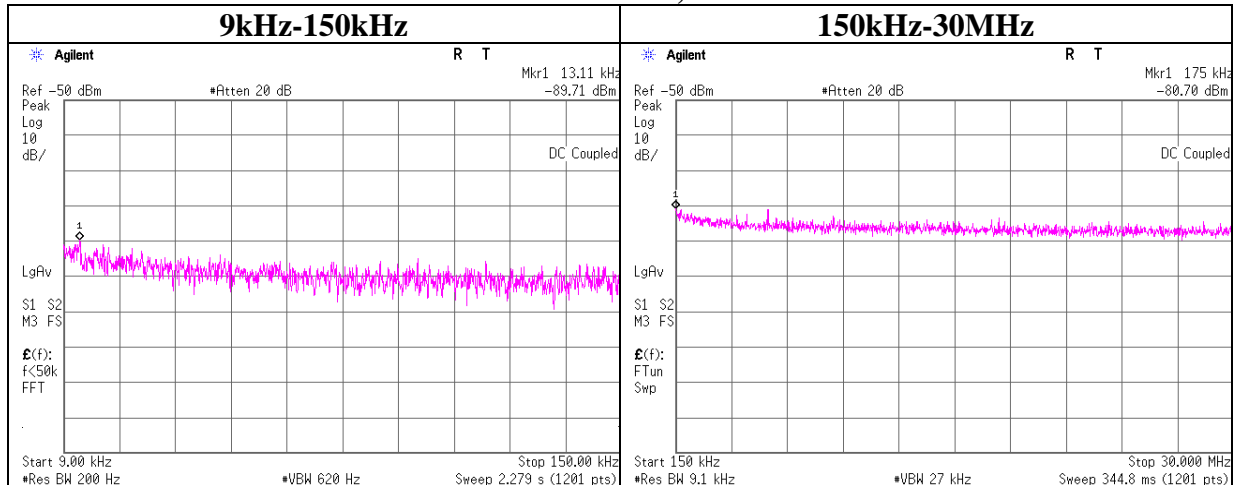
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10229481H
Date	04/02/2014
Temperature/ Humidity	25deg. C / 29% RH
Engineer	Yutaka Yoshida
Mode	11a/11n-20/11n-40(5GHz Band) Tx



Conducted Spurious Emission

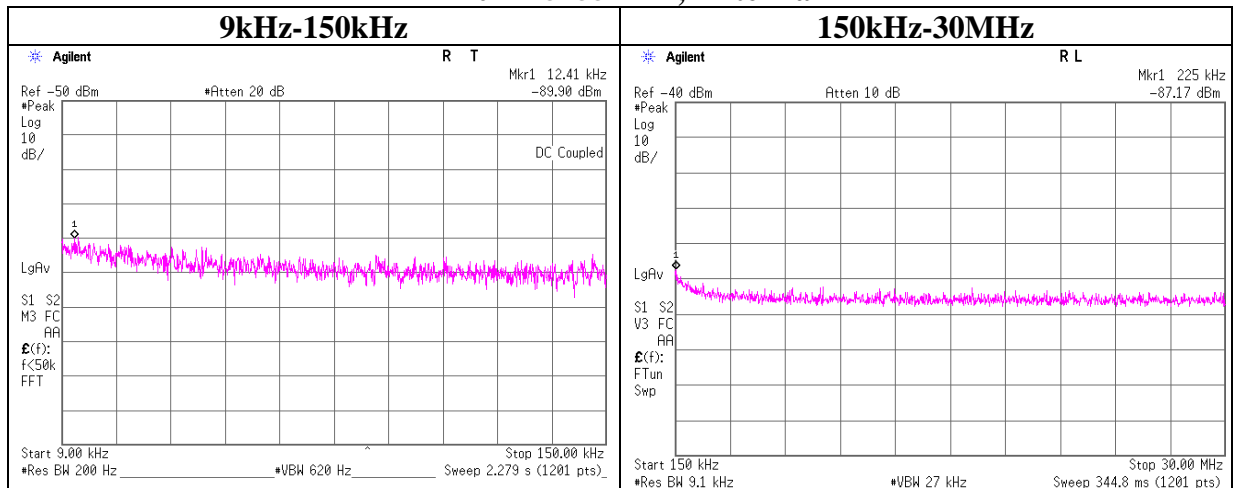
Test place : Ise EMC Lab. No.11 Measurement Room
 Report No. : 10229481H
 Date : 03/28/2014
 Temperature/ Humidity : 24deg. C / 31% RH
 Engineer : Shinya Watanabe
 Mode : 11n-40(2.4G Band)/11a Tx

11n-40 Tx 2437MHz, Antenna A



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
13.11	-89.71	0.40	10.00	2.00	2	-74.30	300.00	6.00	-13.04	45.25
175.00	-80.70	0.40	10.00	2.00	2	-65.29	300.00	6.00	-4.03	22.74

11n-40 Tx 5755MHz, Antenna B



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
12.41	-89.90	0.40	10.00	2.00	2	-74.49	300.00	6.00	-13.23	45.73
598.00	-87.17	0.40	10.00	2.00	2	-71.76	30.00	6.00	9.50	12.07

$E = \text{EIRP} - 20 \log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain} + 10 \log(N)$

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Power Density

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	10229481H	
Date	3/28/2014	04/02/2014
Temperature/ Humidity	24deg. C / 31% RH	25deg. C / 29% RH
Engineer	Sinya Watanabe	Yutaka Yoshida
Mode	11b/g/n-20/n-40 Tx (2.4GHz Band)	

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-21.17	0.40	10.00	-10.77	8.00	18.77
2437.00	-21.52	0.40	10.00	-11.12	8.00	19.12
2462.00	-21.14	0.40	10.00	-10.74	8.00	18.74

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-13.82	0.40	10.00	-3.42	8.00	11.42
2437.00	-16.39	0.40	10.00	-5.99	8.00	13.99
2462.00	-15.56	0.40	10.00	-5.16	8.00	13.16

Sample Calculation:

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

11n-20 MIMO

Freq. [MHz]	Antenna	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Total Result [dBm]	Total Result [mW]	Limit [dBm]	Margin [dB]
2412.00	A	-15.33	0.40	10.00	-4.93	0.32	-2.21	0.60	8.00	10.21
	B	-15.94	0.40	10.00	-5.54	0.28				
2437.00	A	-15.57	0.40	10.00	-5.17	0.30	-2.36	0.58	8.00	10.36
	B	-15.98	0.40	10.00	-5.58	0.28				
2462.00	A	-14.67	0.40	10.00	-4.27	0.37	-1.86	0.65	8.00	9.86
	B	-15.97	0.40	10.00	-5.57	0.28				

11n-40 MIMO

Freq. [MHz]	Antenna	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Total Result [dBm]	Total Result [mW]	Limit [dBm]	Margin [dB]
2422.00	A	-17.42	0.40	10.00	-7.02	0.20	-3.85	0.41	8.00	11.85
	B	-17.10	0.40	10.00	-6.70	0.21				
2437.00	A	-17.16	0.40	10.00	-6.76	0.21	-3.42	0.46	8.00	11.42
	B	-16.52	0.40	10.00	-6.12	0.24				
2452.00	A	-17.13	0.40	10.00	-6.73	0.21	-3.34	0.46	8.00	11.34
	B	-16.41	0.40	10.00	-6.01	0.25				

Sample Calculation:

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

Total Result = 10Log(10^{Antenna A Result}/10)+10^{Antenna B Result}/10))

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Power Density

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 10229481H
Date : 04/02/2014
Temperature/ Humidity : 25deg. C / 29% RH
Engineer : Yutaka Yoshida
Mode : 11a/n-20/n-40 Tx (5GHz Band)

11a

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
5745.00	-13.40	1.20	10.04	-2.16	8.00	10.16
5785.00	-15.84	1.20	10.04	-4.60	8.00	12.60
5825.00	-17.25	1.20	10.04	-6.01	8.00	14.01

11n-20 MIMO

Freq. [MHz]	Antenna	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Total Result [dBm]	Total Result [mW]	Limit [dBm]	Margin [dB]
5745.00	A	-16.17	1.20	10.04	-4.93	0.32	-1.53	0.70	8.00	9.53
	B	-15.42	1.20	10.04	-4.18	0.38				
5785.00	A	-16.32	1.20	10.04	-5.08	0.31	-2.35	0.58	8.00	10.35
	B	-16.89	1.20	10.04	-5.65	0.27				
5825.00	A	-17.64	1.20	10.04	-6.40	0.23	-2.82	0.52	8.00	10.82
	B	-16.56	1.20	10.04	-5.32	0.29				

11n-40 MIMO

Freq. [MHz]	Antenna	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]	Total Result [dBm]	Total Result [mW]	Limit [dBm]	Margin [dB]
5755.00	A	-18.33	1.20	10.04	-7.09	0.20	-3.42	0.45	8.00	11.42
	B	-17.10	1.20	10.04	-5.86	0.26				
5795.00	A	-18.60	1.20	10.04	-7.36	0.18	-4.30	0.37	8.00	12.30
	B	-18.50	1.20	10.04	-7.26	0.19				

Sample Calculation:

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

Total Result = 10Log(10^(Antenna A Result/10)+10^(Antenna B Result/10))

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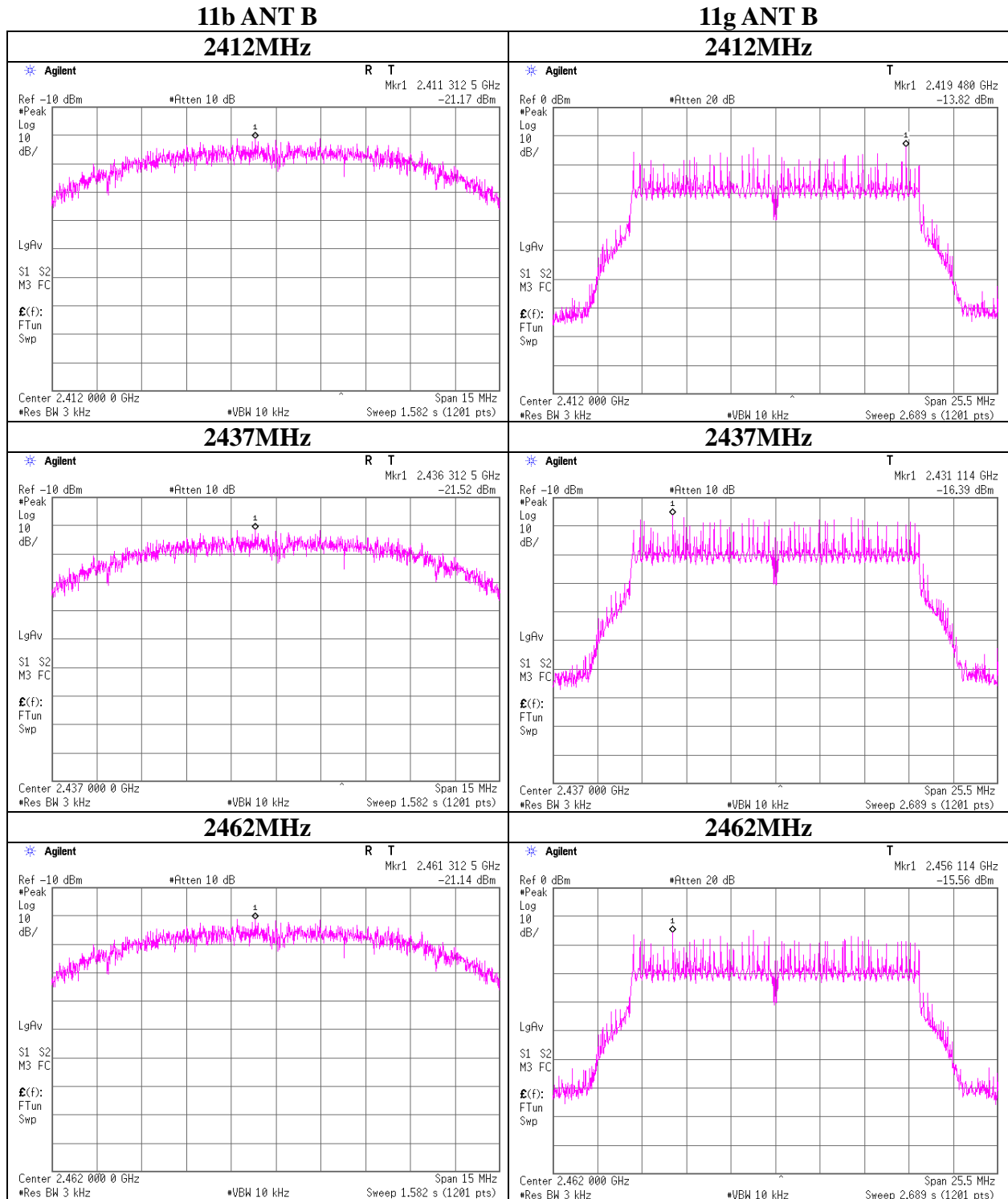
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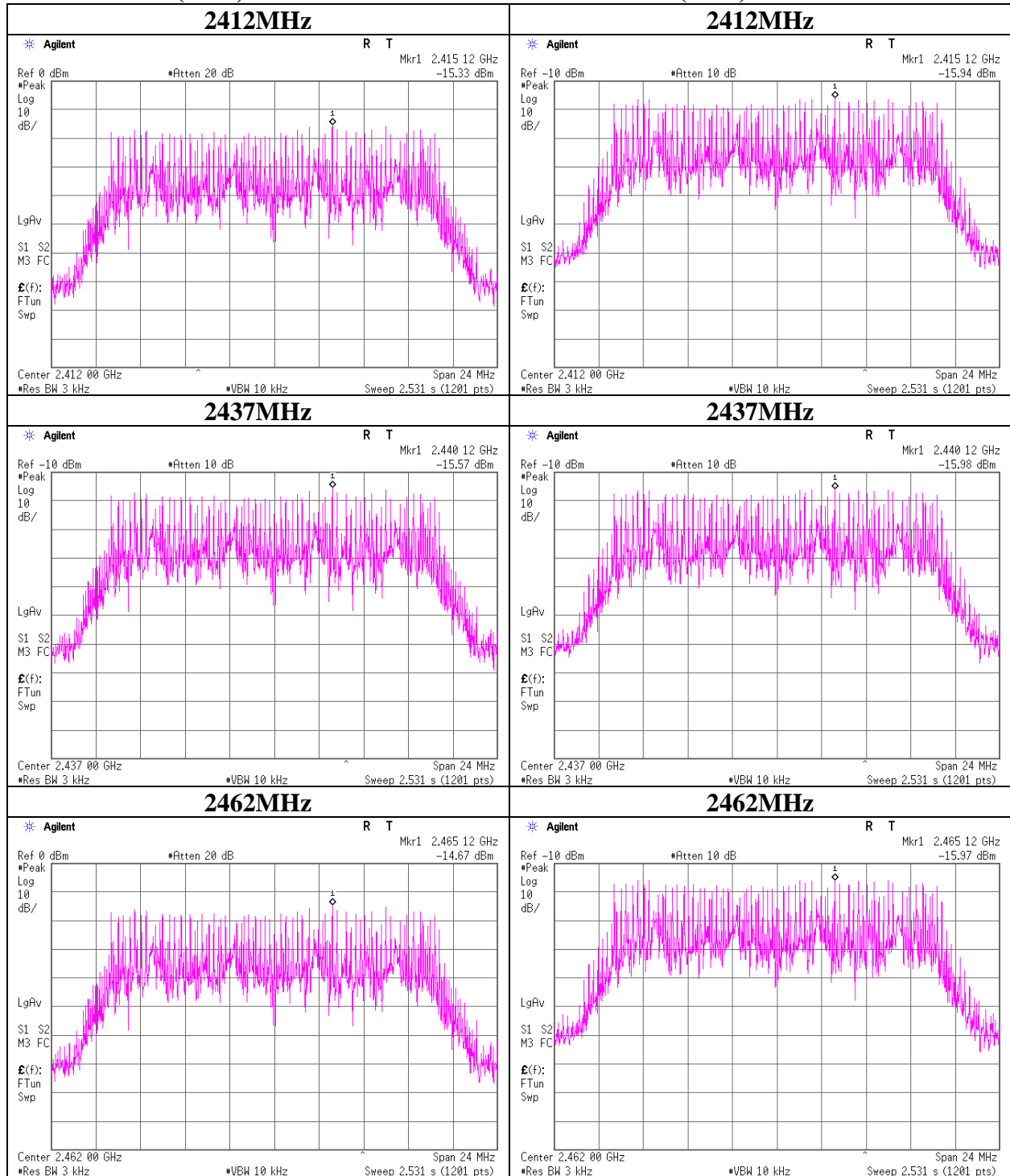
Power Density



Power Density

11n-20(2.4G) MIMO ANT A

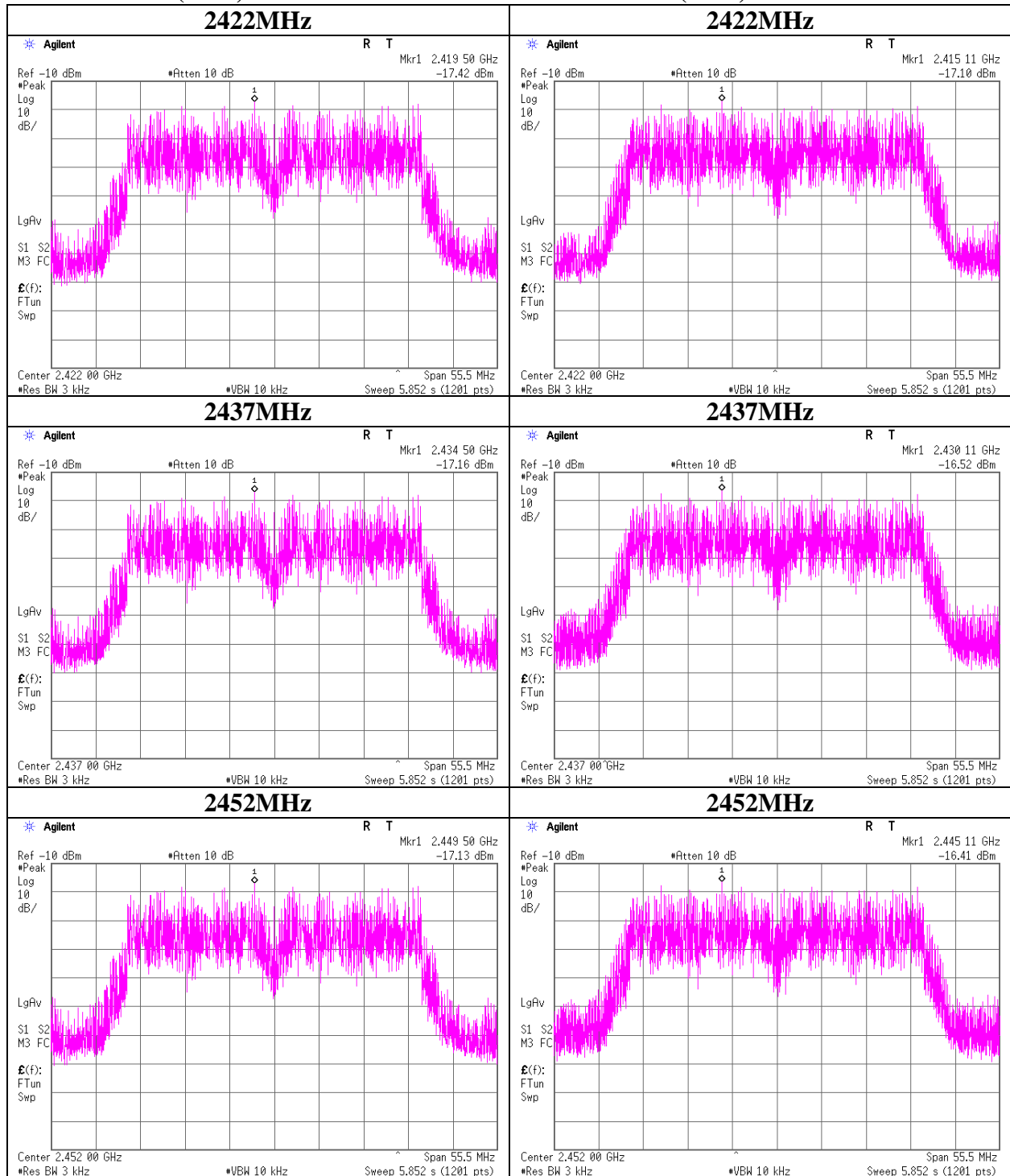
11n-20(2.4G) MIMO ANT B



Power Density

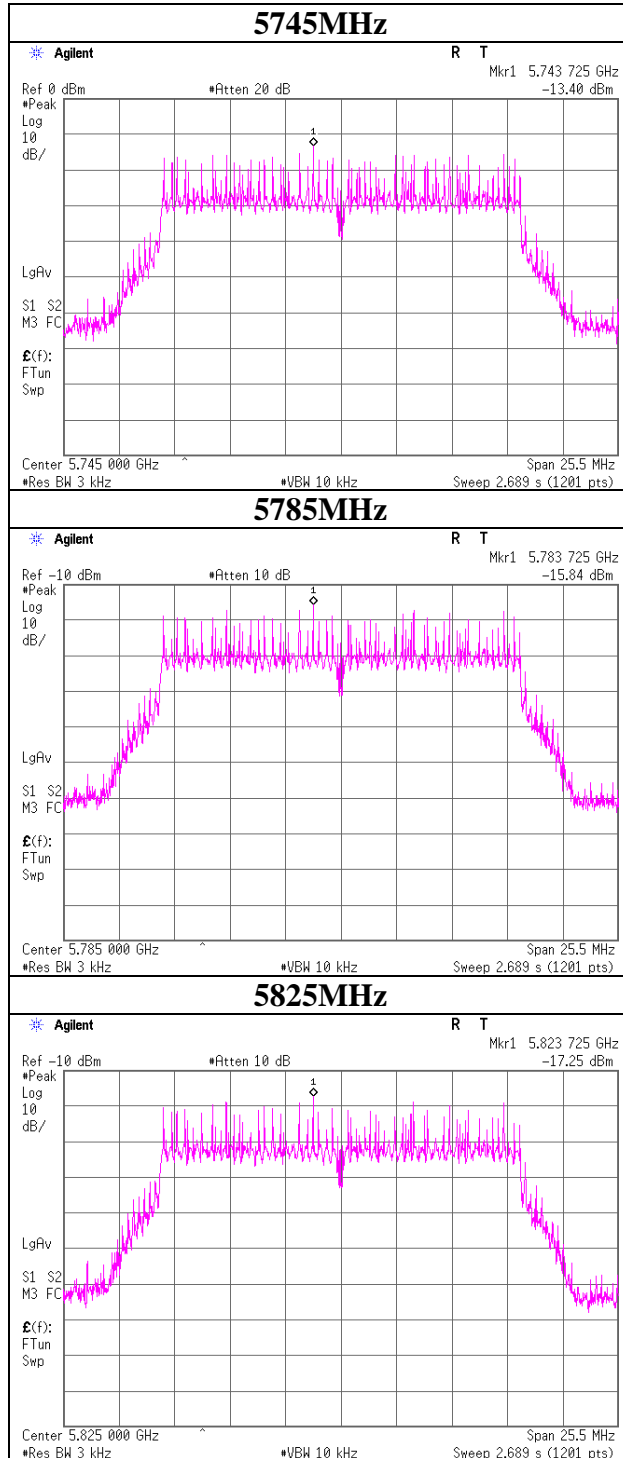
11n-40(2.4G) MIMO ANT A

11n-40(2.4G) MIMO ANT B



Power Density

11a



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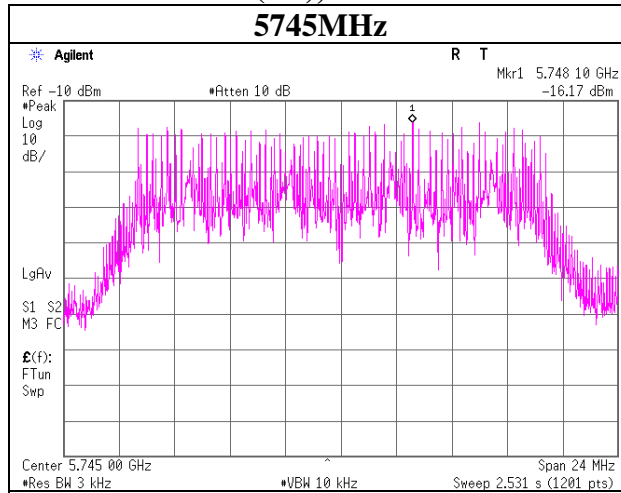
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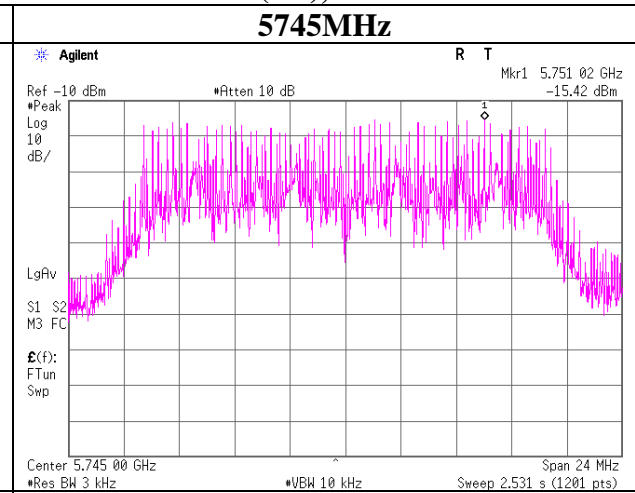
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Power Density

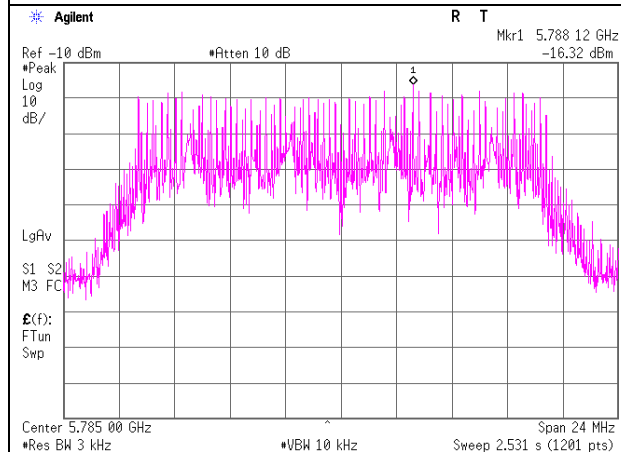
11n-20(5G), Antenna A



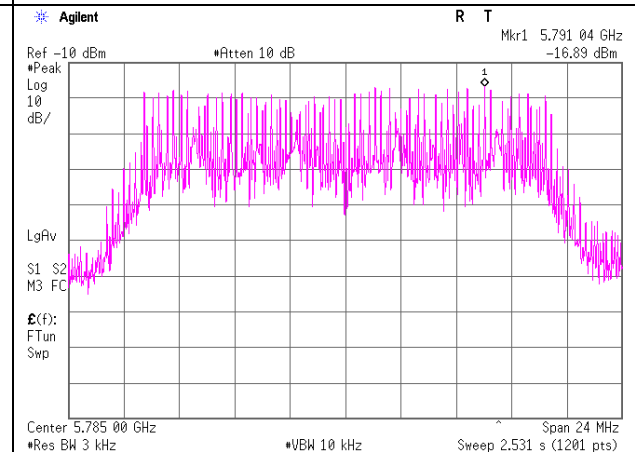
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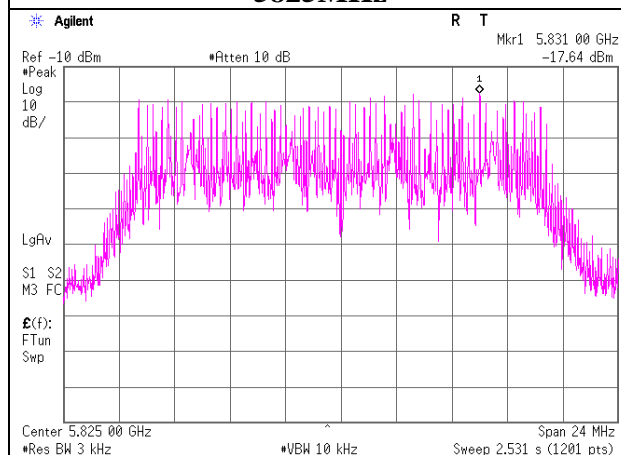
5785MHz



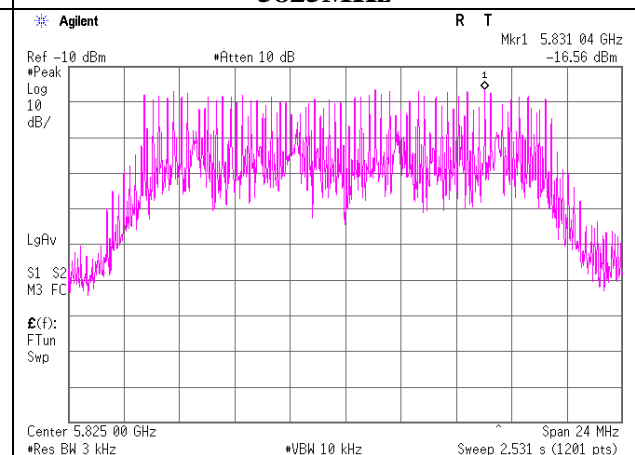
5785MHz



5825MHz



5825MHz



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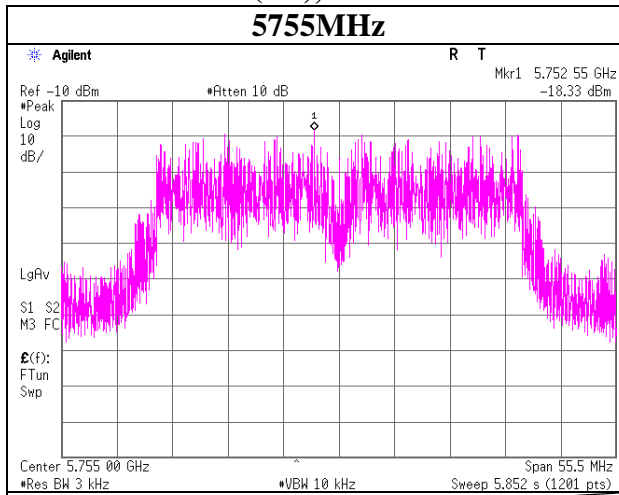
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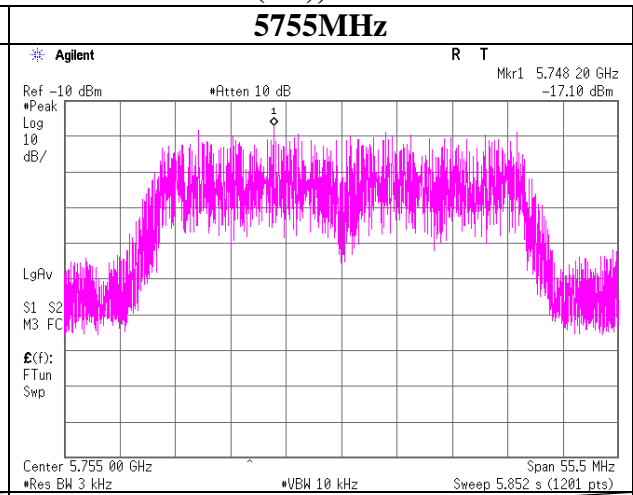
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Power Density

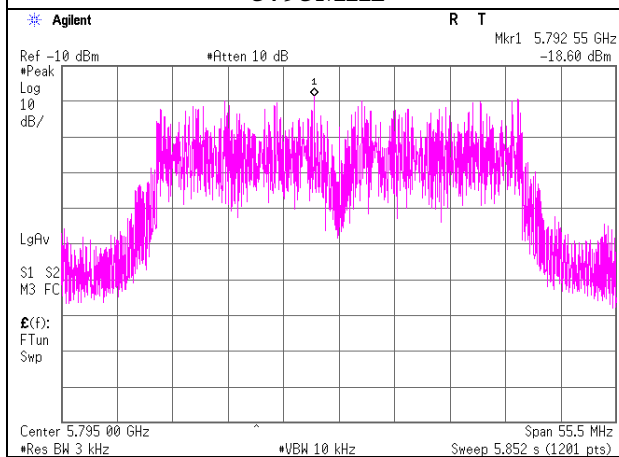
11n-40(5G), Antenna A



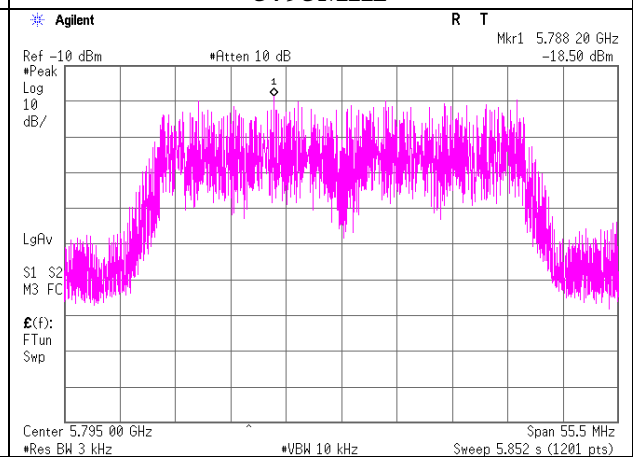
11n-40(5G), Antenna B



5795MHz



5795MHz



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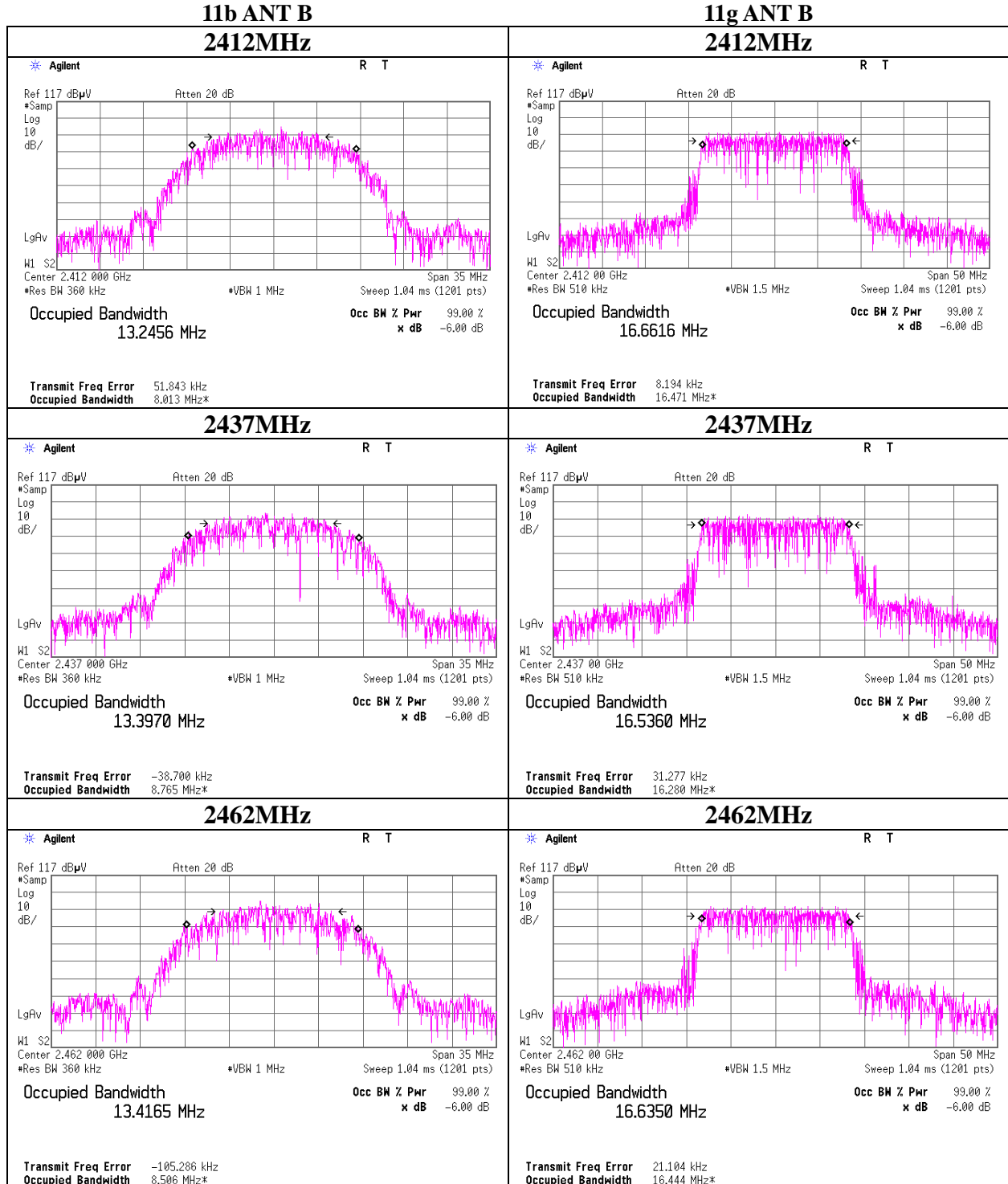
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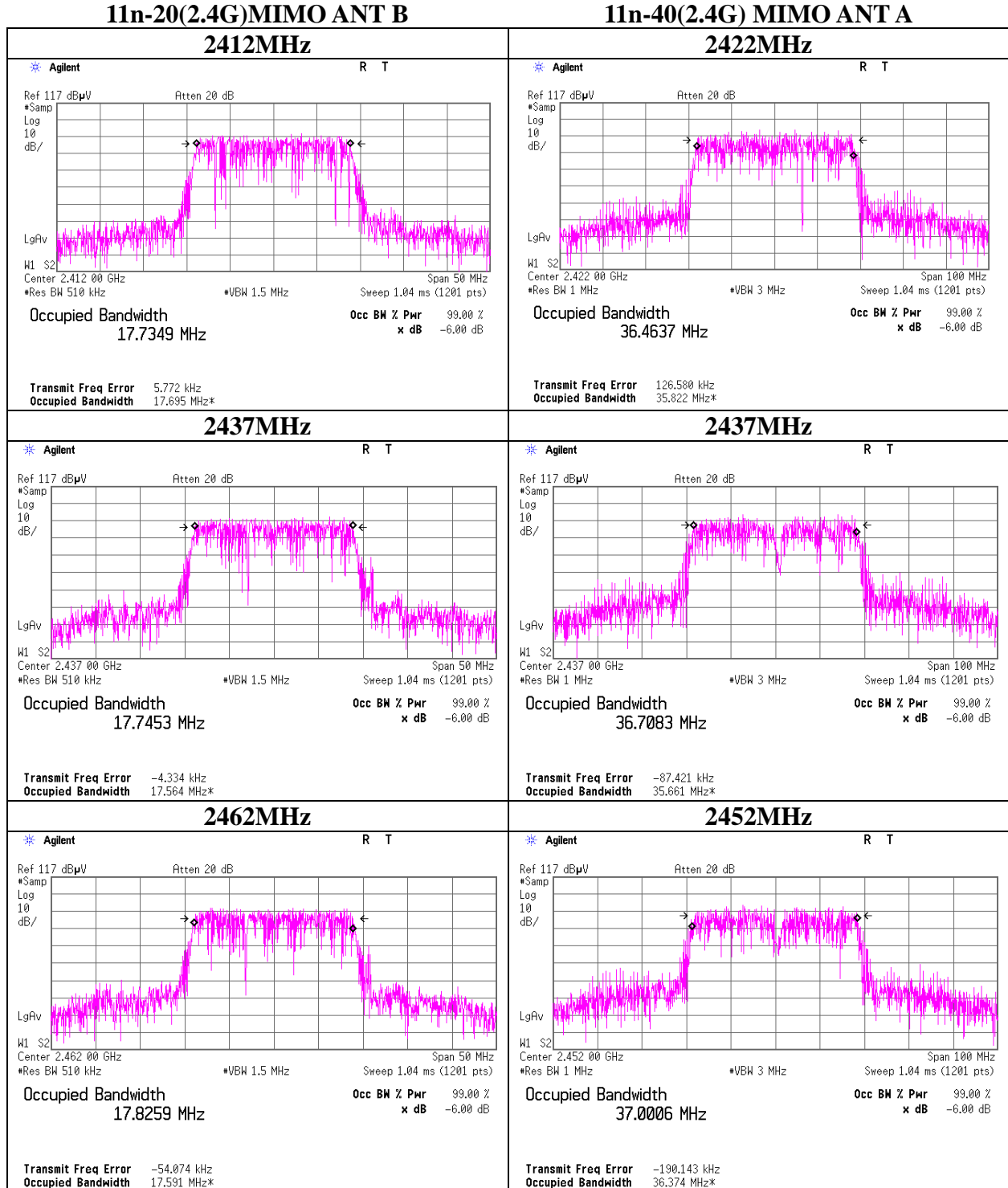
99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10229481H
Date	05/14/2014
Temperature/ Humidity	24deg. C / 42% RH
Engineer	Takumi Shimada
Mode	11b/g Tx



99% Occupied Bandwidth

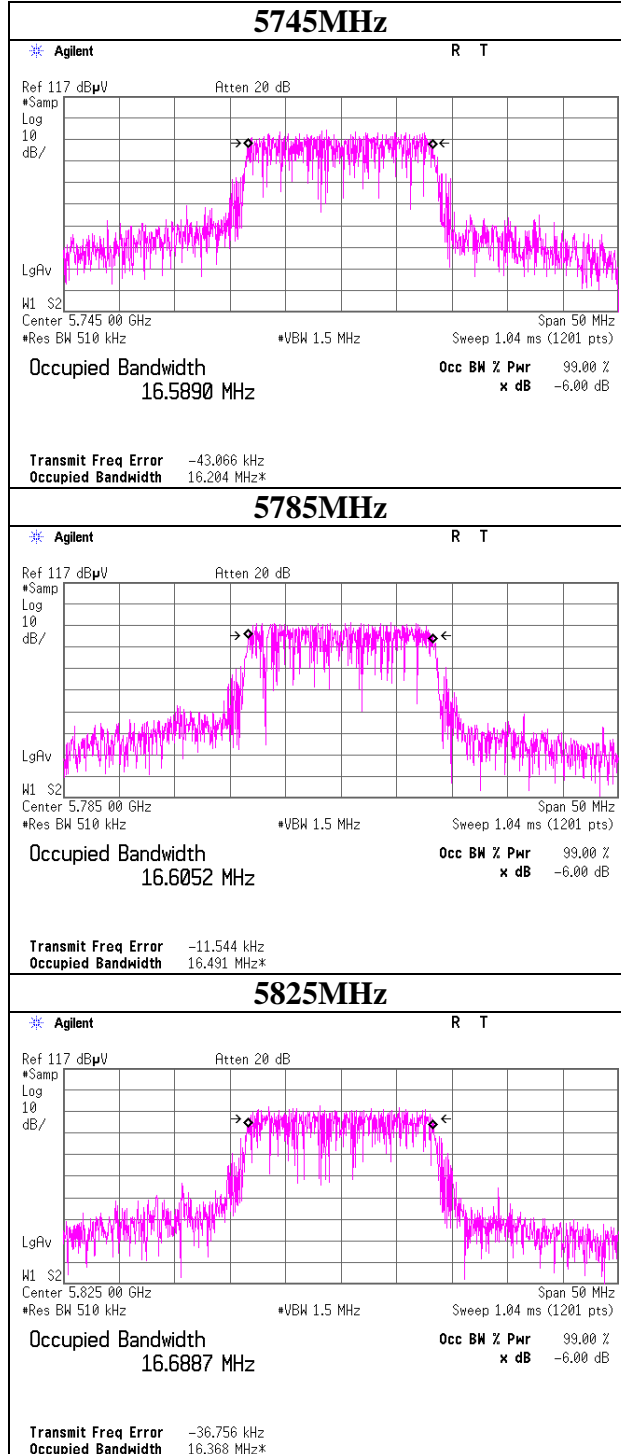
Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10229481H
Date	05/14/2014
Temperature/ Humidity	24deg. C / 42% RH
Engineer	Takumi Shimada
Mode	11n-20/n-40 Tx (2.4GHz Band)



99%Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10229481H
Date	05/14/2014
Temperature/ Humidity	24deg. C / 42% RH
Engineer	Takumi Shimada
Mode	11a Tx

11a

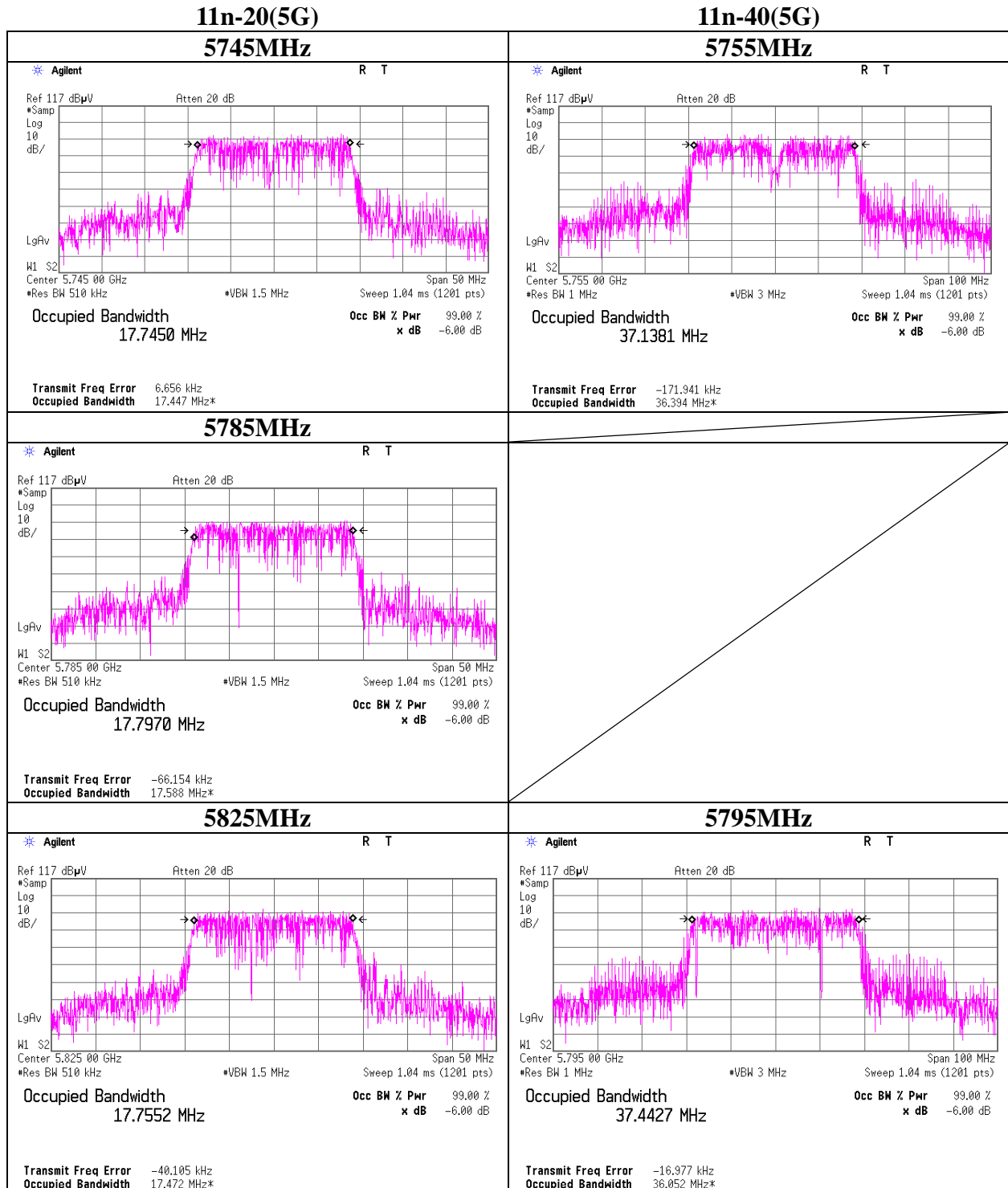


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99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10229481H
Date	05/14/2014
Temperature/ Humidity	24deg. C / 42% RH
Engineer	Takumi Shimada
Mode	11n-20/n-40 Tx (5GHz Band)



APPENDIX 2: Test instruments

EMI test equipment(1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2013/10/15 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2013/10/21 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2013/10/15 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2013/10/21 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MAT-25	Attenuator(10dB)(above 1GHz)	Agilent	8493C	71642	AT	2013/06/20 * 12
MRENT-115	Spectrum Analyzer	Agilent	E4440A	MY4618390	AT	2014/02/28 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2013/06/14 * 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	2013/11/27 * 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	2013/05/30 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2013/12/17 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2014/02/21 * 12
MHA-04	Horn Antenna 26.5-40GHz	EMCO	3160-10	1140	RE	2013/11/25 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2013/06/20 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2014/03/11 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2013/11/15 * 12
MHF-16	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	RE	2013/09/25 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2013/12/24 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2014/02/20 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE/CE	2013/06/11 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2013/10/13 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2013/10/13 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2013/11/26 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 12

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EMI test equipment(2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(EUT)	2014/01/27 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(AE)	2014/01/27 * 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
MTA-31	Terminator	TME	CT-01	-	CE	2014/01/20 * 12
MTA-24	Terminator	Weinschel	M1459A	P6087	AT	Pre Check
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2013/11/25 * 12

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

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

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

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

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