



RADIO TEST REPORT

Test Report No. : 10646854H-A-R2

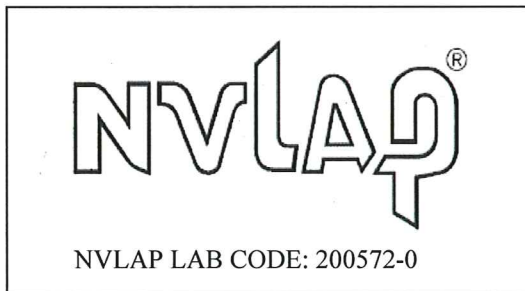
Applicant : Yamaha Corporation
Type of Equipment : Network Module
Model No. : NW-01
FCC ID : A6RNW01A
Test regulation : FCC Part 15 Subpart C: 2015
*WLAN part
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10646854H-A-R1. 10646854H-A-R1 is replaced with this report.

Date of test: January 13 to February 19, 2015

Representative test engineer: *K. Kawamura*
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Takayuki Shimada
Engineer
Consumer Technology Division



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

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SECTION 1: Customer information

Company Name : Yamaha Corporation
Address : 10-1 Nakazawa-cho, Naka-ku, Hamamatsu Shizuoka, 430-8650, Japan
Telephone Number : +81-53-460-2376
Facsimile Number : +81-53-460-2379
Contact Person : Toshihiro Inoue

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

2.1 Identification of E.U.T.

Type of Equipment : Network Module
Model No. : NW-01
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0V
Receipt Date of Sample : January 10, 2015
Country of Mass-production : Malaysia
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

General Specification

Clock frequency(ies) in the system : 32.768kHz, 2.25MHz, 6MHz, 22.5792MHz, 24.576MHz, 25MHz,
26MHz, 50MHz, 400MHz
Operating temperature : 0deg. C to +67deg. C

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Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20MHz & 5MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3V
Antenna Type	Dipole Antenna
Antenna Gain	Antenna with 30mm RF CABLE: 2.7dBi Antenna with 120mm RF CABLE: 2.5dBi Antenna with 160mm RF CABLE: 2.4dBi Antenna with 200mm RF CABLE: 2.3dBi Antenna with 500mm RF CABLE: 1.8dBi

Bluetooth (Ver. 2.1 with EDR function)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	1MHz & 1MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 3.3V
Antenna Type	Dipole Antenna
Antenna Gain	Antenna with 30mm RF CABLE: 2.7dBi Antenna with 120mm RF CABLE: 2.5dBi Antenna with 160mm RF CABLE: 2.4dBi Antenna with 200mm RF CABLE: 2.3dBi Antenna with 500mm RF CABLE: 1.8dBi

*This test report applies for WLAN.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

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

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2009 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	QP 29.3dB, 0.15000MHz, L AV 35.5dB, 12.00513MHz, N	Complied	-
6dB Bandwidth	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: -	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on June 5, 2014)" ----- IC: RSS-Gen 6.13	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 8.9 RSS-Gen 8.10	5.4dB 2390.000MHz, AV, Horizontal	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: 2009 is also referred.

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 3.3V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique antenna connector (U.FL on the Module and Reverse SMA for Antenna itself). Therefore the equipment complies with the requirement of Section 15.203/212.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

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

3.4 Uncertainty

EMI

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

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

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

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

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.5dB	1.7dB	2.8dB	2.8dB	2.9dB	2.6dB

Conducted Emission test

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

Radiated emission test (3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test Location

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

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

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

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	54Mbps, PN9
IEEE 802.11n SISO 20MHz BW (11n-20)	MCS 6, 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: 11dBm, 11g/11n: 6dBm (1ch/11ch), 10dBm (2ch-10ch * ¹) Software: Ver.8.4.1 *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. *1) Band edge compliance was confirmed at pre-check.	

Test Item	Operating Mode	Tested frequency
Conducted Emission Spurious Emission (Conducted)	11n-20 Tx *1)	2437MHz *1)
Spurious Emission (Radiated)	11b Tx 11n-20 Tx *2)	2412MHz 2437MHz 2462MHz
6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412MHz 2437MHz 2462MHz
*1) The test was performed on the representative mode/frequency that had the highest power at antenna terminal test. *2) The test was performed on 11n-20 Tx mode according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009, as the 11n-20 Tx mode had higher power than 11g mode at antenna terminal test.		

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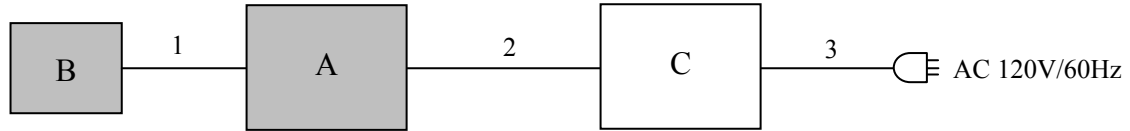
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4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Network Module	NW-01	2 for AT* 3 for other tests	Yamaha Corporation	EUT
B	Antenna	L08RF001-CS-R	-	ADVANCED-CONNECTEK INC.	EUT
C	DC Power Supply	PMC35-2A	13090501	KIKUSUI	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.5 *1)	Unshielded	Unshielded	-
2	DC Cable	2.7	Unshielded	Unshielded	-
3	AC Cable	0.8	Unshielded	Unshielded	-

*1) After pre-check, the test was performed with the worst antenna cable 500mm as a representative.

*AT: Antenna Terminal Conducted test

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

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

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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

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SECTION 6: Radiated Spurious Emission

Test Procedure

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

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

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

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

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

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

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

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

Test Antennas are used as below;

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

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

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

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

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

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

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

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

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

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold*1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
*1) The measurement was performed with Max Hold since the duty cycle was not 100%. *2) Reference data *3) Section 10.2 Method PKPSD (peak PSD) of "558074 D01 DTS Meas Guidance v03r02 (Issued on June 5, 2014)". *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz).							

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

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Conducted Emission

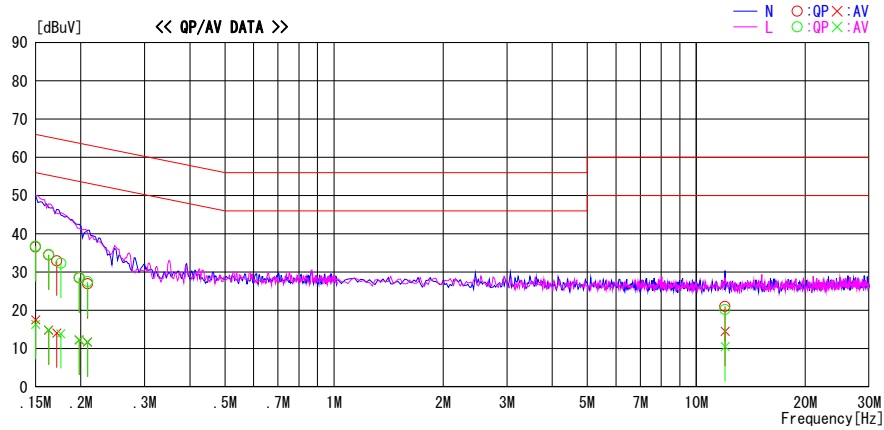
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2015/01/16

Report No. : 10646854H
 Temp./Humi. : 20deg. C / 31% RH
 Engineer : Tsubasa Takayama

Mode / Remarks : WLAN 11n-20 2437MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	23.4	4.3	13.2	36.6	17.5	66.0	56.0	29.4	38.5	N	
0.15000	23.5	3.1	13.2	36.7	16.3	66.0	56.0	29.3	39.7	L	
0.16305	21.3	1.6	13.2	34.5	14.8	65.3	55.3	30.8	40.5	N	
0.16305	21.4	1.7	13.2	34.6	14.9	65.3	55.3	30.7	40.4	L	
0.17175	19.7	0.9	13.2	32.9	14.1	64.9	54.9	32.0	40.8	N	
0.17610	19.1	0.7	13.2	32.3	13.9	64.7	54.7	32.4	40.8	L	
0.19785	15.3	-1.0	13.2	28.5	12.2	63.7	53.7	35.2	41.5	N	
0.19785	15.4	-0.9	13.2	28.6	12.3	63.7	53.7	35.1	41.4	L	
0.20873	13.7	-1.5	13.2	26.9	11.7	63.3	53.3	36.4	41.6	N	
0.20873	14.3	-1.4	13.2	27.5	11.8	63.3	53.3	35.8	41.5	L	
12.00513	6.7	0.2	14.3	21.0	14.5	60.0	50.0	39.0	35.5	N	
12.00513	5.9	-3.8	14.3	20.2	10.5	60.0	50.0	39.8	39.5	L	

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

6dB Bandwidth

Test place Ise EMC Lab. No.11 and No.6 Measurement Room
Report No. 10646854H
Date 01/15/2015 02/19/2015
Temperature/ Humidity 21deg. C / 25% RH 21deg. C / 31% RH
Engineer Tomoki Matsui Keisuke Kawamura
Mode 11b/g/n-20 Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	10.267	>500
2437	10.117	>500
2462	10.265	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.342	>500
2437	15.079	>500
2462	15.112	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	15.133	>500
2437	15.063	>500
2462	15.113	>500

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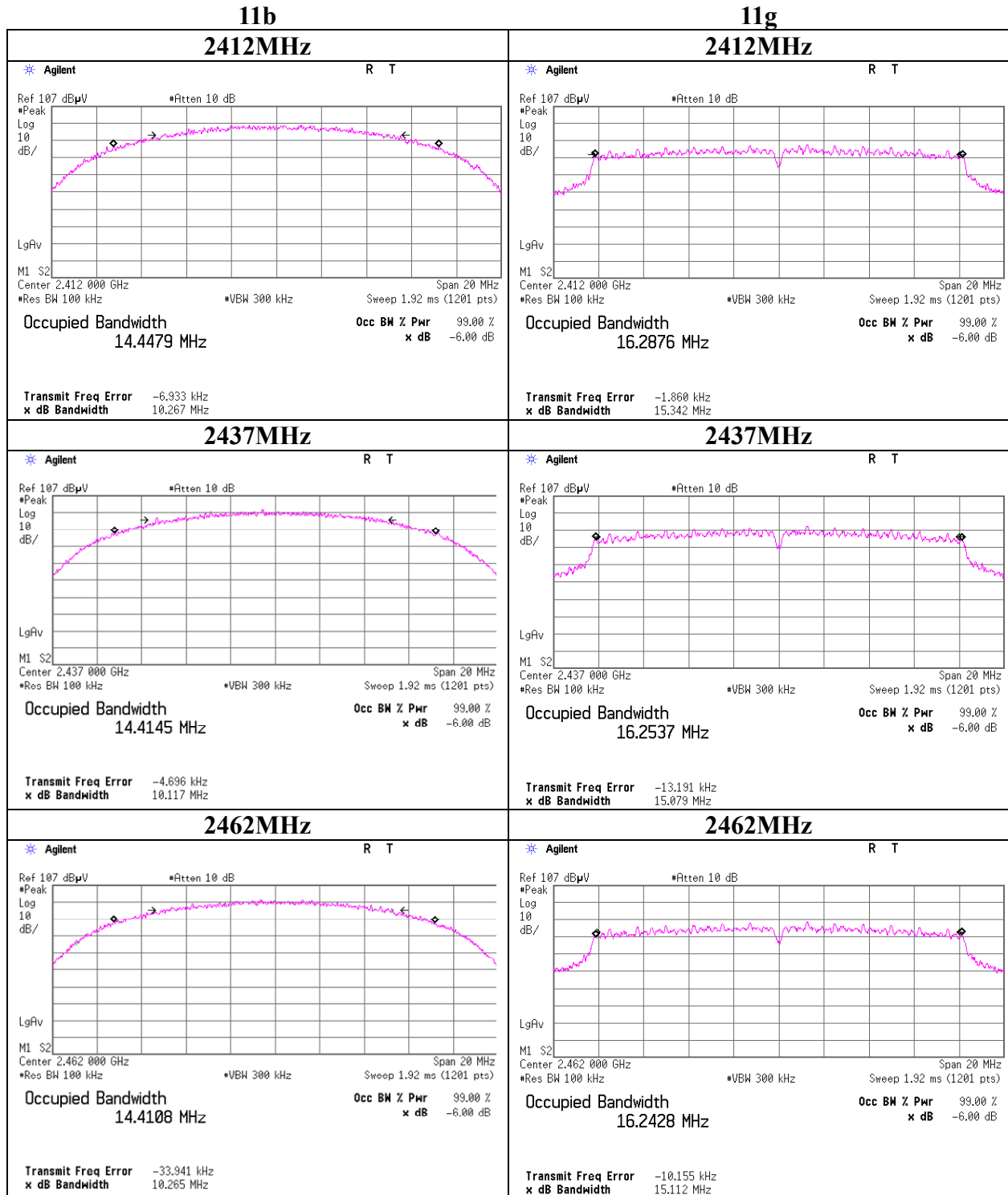
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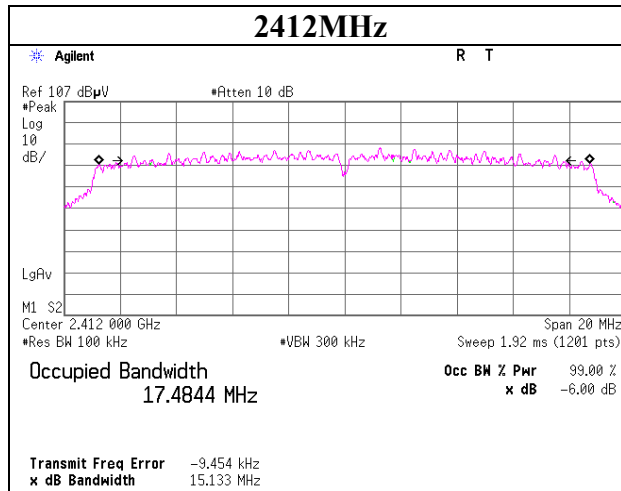
6dB Bandwidth



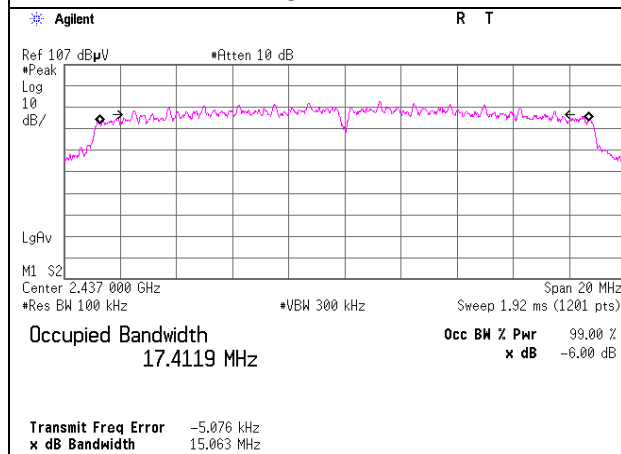
6dB Bandwidth

11n-20

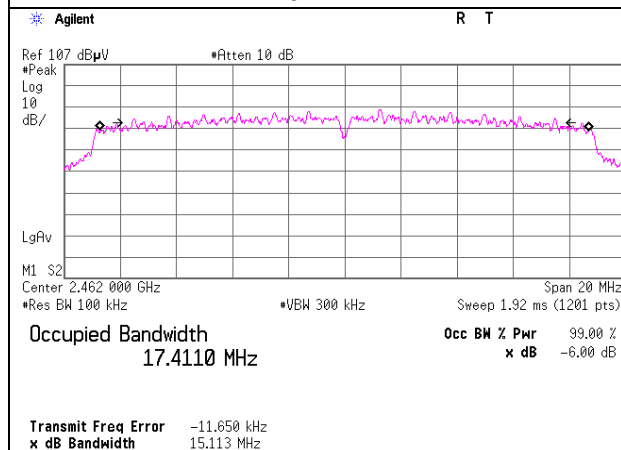
2412MHz



2437MHz



2462MHz



UL Japan, Inc.
Ise EMC Lab.

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Maximum Peak Output Power

Test place Ise EMC Lab. No.11 Measurement Room
 Report No. 10646854H
 Date 01/13/2015 02/18/2015
 Temperature/ Humidity 27deg. C / 20% RH 23deg./ 33% RH
 Engineer Tomoki Matsui Shinichi Miyazono
 Mode 11b Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	0.78	2.05	10.08	12.91	19.54	30.00	1000	17.09
2437	1.01	2.05	10.08	13.14	20.61	30.00	1000	16.86
2462	1.22	2.06	10.08	13.36	21.68	30.00	1000	16.64

Sample Calculation:
 Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	4.75	
2	4.78	
5.5	4.81	
11	4.89	*

*: Worst Rate

All comparizon 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.

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Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	10646854H	
Date	01/13/2015	01/15/2015
Temperature/ Humidity	27deg. C / 20% RH	21deg. C / 25% RH
Engineer	Tomoki Matsui	Tomoki Matsui
Mode	11g Tx	

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	3.13	2.08	10.00	15.21	33.19	30.00	1000	14.79
2437	6.49	2.09	10.00	18.58	72.11	30.00	1000	11.42
2462	3.80	2.10	10.00	15.90	38.90	30.00	1000	14.10

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	6.80	
9	6.80	
12	6.88	
18	6.92	
24	7.02	
36	6.87	
48	6.98	
54	7.17	*

*: 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.

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Maximum Peak Output Power

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	10646854H	
Date	01/13/2015	01/15/2015
Temperature/ Humidity	27deg. C / 20% RH	21deg. C / 25%
Engineer	Tomoki Matsui	Tomoki Matsui
Mode	11n-20 Tx	

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	3.38	2.08	10.00	15.46	35.16	30.00	1000	14.54
2437	6.61	2.09	10.00	18.70	74.13	30.00	1000	11.30
2462	3.66	2.10	10.00	15.76	37.67	30.00	1000	14.24

Sample Calculation:
Result = Reading + Cable Loss + Attenuator

2437MHz

MCS Number	Reading [dBm]	Remark
0	6.84	
1	6.90	
2	6.94	
3	7.05	
4	6.99	
5	7.03	
6	7.15	*
7	7.12	

*: 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.

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Average Output Power

Test place	Ise EMC Lab. No.11 Measurement Room	
Report No.	10646854H	
Date	01/15/2015	02/18/2015
Temperature/ Humidity	21deg. C / 25% RH	23 deg. C / 33% RH
Engineer	Tomoki Matsui	Shinichi Miyazono
Mode	11b/g/n-20 Tx	

[AV]

11b **11Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Duty factor [dB]	Result with Duty factor	
				[dBm]	[mW]		[dBm]	[mW]
2412	-2.59	2.08	10.00	9.49	8.89	0.82	10.31	10.74
2437	-1.92	2.09	10.00	10.17	10.40	0.82	10.99	12.56
2462	-1.62	2.10	10.00	10.48	11.17	0.82	11.30	13.49

11g **54Mbps**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Duty factor [dB]	Result with Duty factor	
				[dBm]	[mW]		[dBm]	[mW]
2412	-9.40	2.08	10.00	2.68	1.85	3.30	5.98	3.96
2437	-5.13	2.09	10.00	6.96	4.97	3.30	10.26	10.62
2462	-8.80	2.10	10.00	3.30	2.14	3.30	6.60	4.57

11n-20 **MCS6**

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Duty factor [dB]	Result with Duty factor	
				[dBm]	[mW]		[dBm]	[mW]
2412	-8.93	2.08	10.00	3.15	2.07	3.25	6.40	4.37
2437	-4.87	2.09	10.00	7.22	5.27	3.25	10.47	11.14
2462	-8.50	2.10	10.00	3.60	2.29	3.25	6.85	4.84

Sample Calculation:

Result with Duty factor = Result + Duty factor

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Radiated Spurious Emission

Report No. 10646854H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date 02/17/2015
Temperature / Humidity 24 deg. C / 29% RH
Engineer Tomoki Matsui
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	2388.640	PK	57.1	27.4	3.2	32.8	-	54.9	73.9	19.0	
Hori	2390.000	PK	58.0	27.4	3.2	32.8	-	55.8	73.9	18.1	
Hori	4824.000	PK	44.0	31.6	5.4	31.9	-	49.1	73.9	24.8	
Hori	7236.000	PK	42.4	36.9	6.5	33.0	-	52.8	73.9	21.1	Floor Noise
Hori	9648.000	PK	41.8	38.8	7.3	33.4	-	54.5	73.9	19.4	Floor Noise
Hori	2388.640	AV	47.9	27.4	3.2	32.8	0.8	46.5	53.9	7.4	*1)
Hori	2390.000	AV	47.7	27.4	3.2	32.8	0.8	46.3	53.9	7.6	*1)
Hori	4824.000	AV	34.8	31.6	5.4	31.9	0.8	40.7	53.9	13.2	
Hori	7236.000	AV	33.5	36.9	6.5	33.0	-	43.9	53.9	10.0	Floor Noise
Hori	9648.000	AV	33.2	38.8	7.3	33.4	-	45.9	53.9	8.0	Floor Noise
Vert	2390.000	PK	53.2	27.4	3.2	32.8	-	51.0	73.9	22.9	
Vert	4824.000	PK	42.8	31.6	5.4	31.9	-	47.9	73.9	26.0	
Vert	7236.000	PK	43.0	36.9	6.5	33.0	-	53.4	73.9	20.5	Floor Noise
Vert	9648.000	PK	42.6	38.8	7.3	33.4	-	55.3	73.9	18.6	Floor Noise
Vert	2390.000	AV	43.2	27.4	3.2	32.8	0.8	41.8	53.9	12.1	*1)
Vert	4824.000	AV	33.5	31.6	5.4	31.9	0.8	39.4	53.9	14.5	
Vert	7236.000	AV	33.7	36.9	6.5	33.0	-	44.1	53.9	9.8	Floor Noise
Vert	9648.000	AV	33.2	38.8	7.3	33.4	-	45.9	53.9	8.0	Floor Noise

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

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

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

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.7	27.4	3.2	32.8	98.5	-	-	Carrier
Hori	2400.000	PK	55.3	27.4	3.2	32.8	53.1	78.5	25.4	
Vert	2412.000	PK	100.3	27.4	3.2	32.8	98.1	-	-	Carrier
Vert	2400.000	PK	54.7	27.4	3.2	32.8	52.5	78.1	25.6	

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

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Radiated Spurious Emission

Report No. 10646854H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date 02/17/2015
Temperature / Humidity 24 deg. C / 29% RH
Engineer Tomoki Matsui
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	2488.671	PK	49.0	27.6	3.3	32.7	-	47.2	73.9	26.7	
Hori	2540.490	PK	48.6	27.7	3.3	32.7	-	46.9	73.9	27.0	
Hori	4874.000	PK	43.2	31.7	5.5	31.9	-	48.5	73.9	25.4	
Hori	7311.000	PK	42.7	37.0	6.5	33.0	-	53.2	73.9	20.7	Floor Noise
Hori	9748.000	PK	41.8	38.9	7.4	33.4	-	54.7	73.9	19.2	Floor Noise
Hori	2488.671	AV	40.3	27.6	3.3	32.7	0.8	39.3	53.9	14.6	*1)
Hori	2540.490	AV	41.0	27.7	3.3	32.7	-	39.3	53.9	14.6	
Hori	4874.000	AV	33.5	31.7	5.5	31.9	0.8	39.6	53.9	14.3	
Hori	7311.000	AV	33.2	37.0	6.5	33.0	-	43.7	53.9	10.2	Floor Noise
Hori	9748.000	AV	33.1	38.9	7.4	33.4	-	46.0	53.9	7.9	Floor Noise
Vert	4874.000	PK	43.2	31.7	5.5	31.9	-	48.5	73.9	25.4	
Vert	7311.000	PK	43.4	37.0	6.5	33.0	-	53.9	73.9	20.0	Floor Noise
Vert	9748.000	PK	41.7	38.9	7.4	33.4	-	54.6	73.9	19.3	Floor Noise
Vert	4874.000	AV	33.5	31.7	5.5	31.9	0.8	39.6	53.9	14.3	
Vert	7311.000	AV	33.2	37.0	6.5	33.0	-	43.7	53.9	10.2	Floor Noise
Vert	9748.000	AV	33.0	38.9	7.4	33.4	-	45.9	53.9	8.0	Floor Noise

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

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

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

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

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Radiated Spurious Emission

Report No. 10646854H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date 02/17/2015
Temperature / Humidity 24 deg. C / 29% RH
Engineer Tomoki Matsui
Mode 11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	52.1	27.6	3.3	32.7	-	50.3	73.9	23.6	
Hori	2511.320	PK	49.2	27.6	3.3	32.7	-	47.4	73.9	26.5	
Hori	2566.600	PK	49.8	27.7	3.3	32.7	-	48.1	73.9	25.8	
Hori	4924.000	PK	43.9	31.9	5.5	31.9	-	49.4	73.9	24.5	
Hori	7386.000	PK	42.3	37.1	6.5	33.1	-	52.8	73.9	21.1	Floor Noise
Hori	9848.000	PK	43.1	38.9	7.4	33.5	-	55.9	73.9	18.0	Floor Noise
Hori	2483.500	AV	42.8	27.6	3.3	32.7	0.8	41.8	53.9	12.1	*1)
Hori	2511.320	AV	41.6	27.6	3.3	32.7	0.8	40.6	53.9	13.3	*1)
Hori	2566.600	AV	42.4	27.7	3.3	32.7	-	40.7	53.9	13.2	
Hori	4924.000	AV	35.3	31.9	5.5	31.9	0.8	41.6	53.9	12.3	
Hori	7386.000	AV	33.7	37.1	6.5	33.1	-	44.2	53.9	9.7	Floor Noise
Hori	9848.000	AV	33.3	38.9	7.4	33.5	-	46.1	53.9	7.8	Floor Noise
Vert	2483.500	PK	53.3	27.6	3.3	32.7	-	51.5	73.9	22.4	
Vert	2566.640	PK	49.7	27.7	3.3	32.7	-	48.0	73.9	25.9	
Vert	4924.000	PK	44.0	31.9	5.5	31.9	-	49.5	73.9	24.4	
Vert	7386.000	PK	42.3	37.1	6.5	33.1	-	52.8	73.9	21.1	Floor Noise
Vert	9848.000	PK	42.3	38.9	7.4	33.5	-	55.1	73.9	18.8	Floor Noise
Vert	2483.500	AV	43.2	27.6	3.3	32.7	0.8	42.2	53.9	11.7	*1)
Vert	2566.640	AV	41.9	27.7	3.3	32.7	-	40.2	53.9	13.7	
Vert	4924.000	AV	34.5	31.9	5.5	31.9	0.8	40.8	53.9	13.1	
Vert	7386.000	AV	33.7	37.1	6.5	33.1	-	44.2	53.9	9.7	Floor Noise
Vert	9848.000	AV	33.3	38.9	7.4	33.5	-	46.1	53.9	7.8	Floor Noise

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

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

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

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

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Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10646854H		
Date	01/14/2015	01/15/2015	
Temperature/ Humidity	20 deg. C / 35% RH	22 deg. C / 36% RH	
Engineer	Kenshi Shimomura	Kenshi Shimomura	
	(1-10GHz)	(10-26.5GHz)	
Mode	11n-20 Tx 2412MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	69.6	27.0	2.8	34.7	-	64.7	73.9	9.2	
Hori	4824.000	PK	43.0	31.9	5.8	33.9	-	46.8	73.9	27.1	Floor Noise
Hori	7236.000	PK	42.2	35.7	7.1	33.8	-	51.2	73.9	22.7	Floor Noise
Hori	9648.000	PK	42.5	38.1	8.1	34.4	-	54.3	73.9	19.6	Floor Noise
Hori	2390.000	AV	50.2	27.0	2.8	34.7	3.3	48.6	53.9	5.4	*1)
Hori	4824.000	AV	34.8	31.9	5.8	33.9	-	38.6	53.9	15.3	Floor Noise
Hori	7236.000	AV	34.3	35.7	7.1	33.8	-	43.3	53.9	10.6	Floor Noise
Hori	9648.000	AV	35.2	38.1	8.1	34.4	-	47.0	53.9	6.9	Floor Noise
Vert	2390.000	PK	66.2	27.0	2.8	34.7	-	61.3	73.9	12.6	
Vert	4824.000	PK	42.7	31.9	5.8	33.9	-	46.5	73.9	27.4	Floor Noise
Vert	7236.000	PK	42.1	35.7	7.1	33.8	-	51.1	73.9	22.8	Floor Noise
Vert	9648.000	PK	43.3	38.1	8.1	34.4	-	55.1	73.9	18.8	Floor Noise
Vert	2390.000	AV	46.8	27.0	2.8	34.7	3.3	45.2	53.9	8.8	*1)
Vert	4824.000	AV	34.8	31.9	5.8	33.9	-	38.6	53.9	15.3	Floor Noise
Vert	7236.000	AV	34.1	35.7	7.1	33.8	-	43.1	53.9	10.8	Floor Noise
Vert	9648.000	AV	35.0	38.1	8.1	34.4	-	46.8	53.9	7.1	Floor Noise

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

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

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

26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	97.2	27.0	3.5	34.7	93.0	-	-	Carrier
Hori	2400.000	PK	66.4	27.0	3.5	34.7	62.2	73.0	10.8	
Vert	2412.000	PK	97.1	27.0	3.5	34.7	92.9	-	-	Carrier
Vert	2400.000	PK	66.5	27.0	3.5	34.7	62.3	72.9	10.6	

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.	10646854H		
Date	01/14/2015	01/15/2015	01/16/2015
Temperature/ Humidity	20 deg. C / 35% RH	22 deg. C / 36% RH	20 deg. C / 32% RH
Engineer	Kenshi Shimomura	Kenshi Shimomura	Tsubasa Takayama
	(1-10GHz)	(10-26.5GHz)	(Below 1GHz)
Mode	11n-20 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	37.600	QP	23.4	15.1	6.8	28.5	-	16.8	40.0	23.2	
Hori	123.289	QP	27.9	13.1	7.6	28.1	-	20.5	43.5	23.0	
Hori	141.653	QP	30.2	14.5	7.7	28.1	-	24.3	43.5	19.2	
Hori	325.042	QP	30.2	15.3	8.8	27.6	-	26.7	46.0	19.3	
Hori	425.000	QP	31.9	17.9	9.2	28.3	-	30.7	46.0	15.3	
Hori	825.010	QP	31.2	22.1	11.0	27.5	-	36.8	46.0	9.2	
Hori	4874.000	PK	43.5	32.0	5.9	33.9	-	47.5	73.9	26.4	Floor Noise
Hori	7311.000	PK	42.2	35.8	7.1	33.8	-	51.3	73.9	22.6	Floor Noise
Hori	9748.000	PK	43.0	38.3	8.1	34.5	-	54.9	73.9	19.0	Floor Noise
Hori	4874.000	AV	34.7	32.0	5.9	33.9	-	38.7	53.9	15.2	Floor Noise
Hori	7311.000	AV	34.2	35.8	7.1	33.8	-	43.3	53.9	10.6	Floor Noise
Hori	9748.000	AV	34.6	38.3	8.1	34.5	-	46.5	53.9	7.4	Floor Noise
Vert	37.506	QP	25.6	15.2	6.8	28.5	-	19.1	40.0	20.9	
Vert	60.240	QP	32.3	7.8	7.1	28.4	-	18.8	40.0	21.2	
Vert	123.417	QP	30.9	13.1	7.6	28.1	-	23.5	43.5	20.0	
Vert	293.540	QP	29.9	19.3	8.7	27.4	-	30.5	46.0	15.5	
Vert	325.042	QP	31.2	15.3	8.8	27.6	-	27.7	46.0	18.3	
Vert	425.000	QP	31.9	17.9	9.2	28.3	-	30.7	46.0	15.3	
Vert	825.010	QP	30.9	22.1	11.0	27.5	-	36.5	46.0	9.5	
Vert	4874.000	PK	43.5	32.0	5.9	33.9	-	47.5	73.9	26.4	Floor Noise
Vert	7311.000	PK	42.5	35.8	7.1	33.8	-	51.6	73.9	22.3	Floor Noise
Vert	9748.000	PK	43.6	38.3	8.1	34.5	-	55.5	73.9	18.4	Floor Noise
Vert	4874.000	AV	35.0	32.0	5.9	33.9	-	39.0	53.9	14.9	Floor Noise
Vert	7311.000	AV	34.4	35.8	7.1	33.8	-	43.5	53.9	10.4	Floor Noise
Vert	9748.000	AV	34.5	38.3	8.1	34.5	-	46.4	53.9	7.5	Floor Noise

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

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.	10646854H	
Date	01/14/2015	01/15/2015
Temperature/ Humidity	20 deg. C / 35% RH	22 deg. C / 36% RH
Engineer	Kenshi Shimomura	Kenshi Shimomura
	(1-10GHz)	(10-26.5GHz)
Mode	11n-20 Tx 2462MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	66.9	26.9	2.8	34.7	-	61.9	73.9	12.0	
Hori	4924.000	PK	42.3	32.1	5.9	33.9	-	46.4	73.9	27.5	Floor Noise
Hori	7386.000	PK	42.4	35.8	7.1	33.8	-	51.5	73.9	22.4	Floor Noise
Hori	9848.000	PK	42.9	38.5	8.1	34.5	-	55.0	73.9	18.9	Floor Noise
Hori	2483.500	AV	49.0	26.9	2.8	34.7	3.3	47.3	53.9	6.7	*1)
Hori	4924.000	AV	34.5	32.1	5.9	33.9	-	38.6	53.9	15.3	Floor Noise
Hori	7386.000	AV	34.4	35.8	7.1	33.8	-	43.5	53.9	10.4	Floor Noise
Hori	9848.000	AV	35.1	38.5	8.1	34.5	-	47.2	53.9	6.7	Floor Noise
Vert	2483.500	PK	65.1	26.9	2.8	34.7	-	60.1	73.9	13.8	
Vert	4924.000	PK	43.4	32.1	5.9	33.9	-	47.5	73.9	26.4	Floor Noise
Vert	7386.000	PK	42.4	35.8	7.1	33.8	-	51.5	73.9	22.4	Floor Noise
Vert	9848.000	PK	43.5	38.5	8.1	34.5	-	55.6	73.9	18.3	Floor Noise
Vert	2483.500	AV	48.0	26.9	2.8	34.7	3.3	46.3	53.9	7.6	*1)
Vert	4924.000	AV	34.2	32.1	5.9	33.9	-	38.3	53.9	15.6	Floor Noise
Vert	7386.000	AV	34.2	35.8	7.1	33.8	-	43.3	53.9	10.6	Floor Noise
Vert	9848.000	AV	35.0	38.5	8.1	34.5	-	47.1	53.9	6.8	Floor Noise

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

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

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

26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

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

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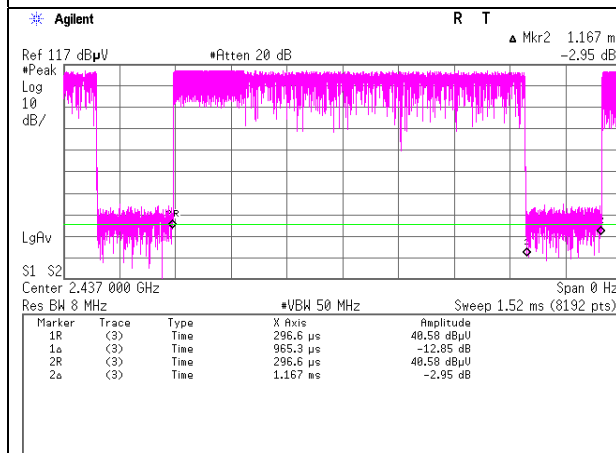
Facsimile : +81 596 24 8124

Burst rate confirmation

Test place : Ise EMC Lab. No.11 Measurement Room
 Report No. : 10646854H
 Date : 01/13/2015
 Temperature/ Humidity : 27deg. C / 20% RH
 Engineer : Tomoki Matsui
 Mode : 11b/g/n-20 Tx

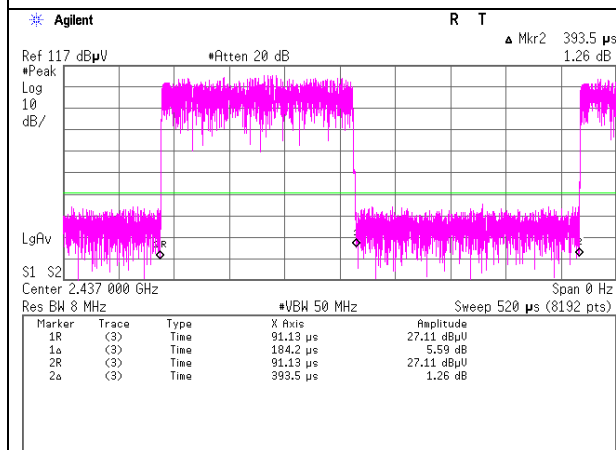
11b 11Mbps

Tx on / (Tx on + Tx off) = 0.827
Tx on / (Tx on + Tx off) * 100 = 82.7 %
Duty factor = 10 * log (1167 / 965.3) = 0.82 dB



11g 54Mbps

Tx on / (Tx on + Tx off) = 0.468
Tx on / (Tx on + Tx off) * 100 = 46.8 %
Duty factor = 10 * log (393.5 / 184.2) = 3.30 dB



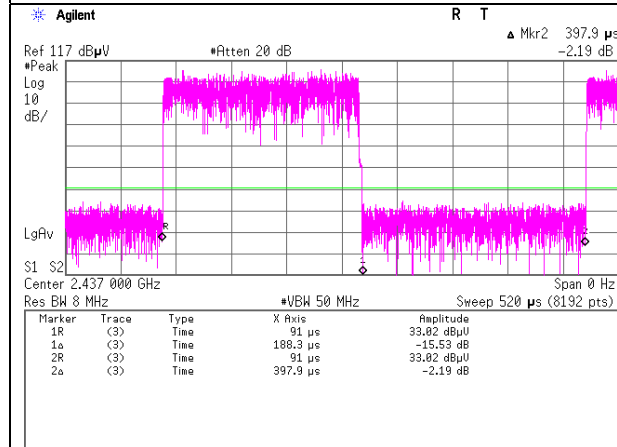
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Burst rate confirmation

11n-20 MCS6

Tx on / (Tx on + Tx off) = 0.473
Tx on / (Tx on + Tx off) * 100 = 47.3 %
Duty factor = 10 * log (397.9 / 188.3) = 3.25 dB



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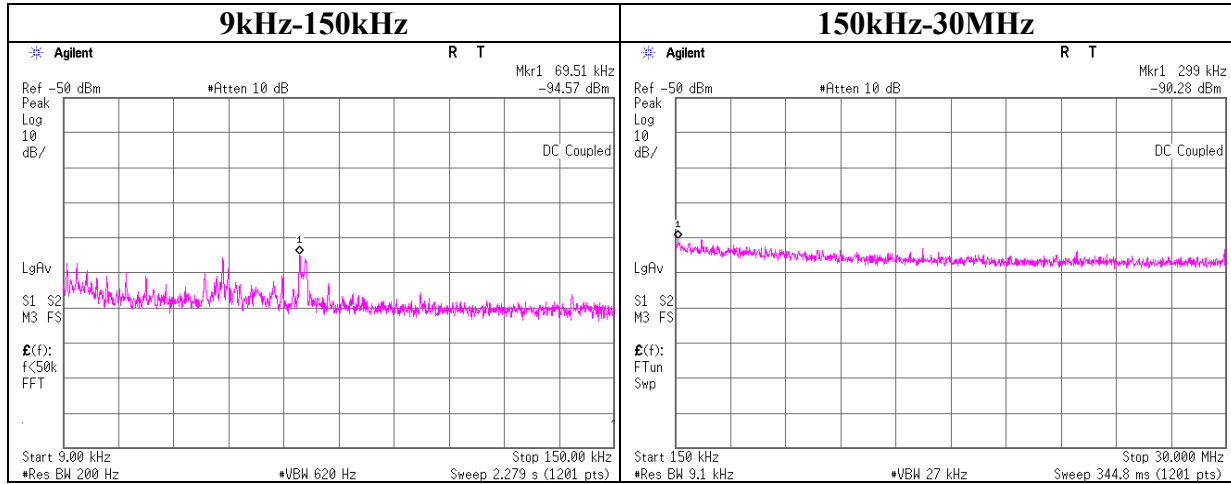
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Conducted Spurious Emission

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10646854H
Date	01/15/2015
Temperature/ Humidity	21deg. C / 25% RH
Engineer	Tomoki Matsui
Mode	11n-20 Tx

11n-20 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]	Margin [dB]	Remark
69.51	-94.6	0.01	10.0	2.0	-82.6	300	6.0	-21.3	30.7	52.0	
299.00	-90.3	0.01	10.0	2.0	-78.3	300	6.0	-17.0	18.0	35.0	

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

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

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Power Density

Test place Ise EMC Lab. No.11 Measurement Room
Report No. 10646854H
Date 01/15/2015 02/18/2015
Temperature/ Humidity 21deg. C / 25% RH 23deg./ 33% RH
Engineer Tomoki Matsui Shinichi Miyazono
Mode 11b/g/n-20 Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-25.56	2.05	10.08	-13.43	8.00	21.43
2437.00	-23.44	2.05	10.08	-11.31	8.00	19.31
2462.00	-24.02	2.06	10.08	-11.88	8.00	19.88

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-37.72	2.08	16.11	-19.53	8.00	27.53
2437.00	-33.57	2.09	16.11	-15.37	8.00	23.37
2462.00	-36.84	2.10	16.11	-18.63	8.00	26.63

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-37.20	2.08	16.11	-19.01	8.00	27.01
2437.00	-32.79	2.09	16.11	-14.59	8.00	22.59
2462.00	-37.08	2.10	16.11	-18.87	8.00	26.87

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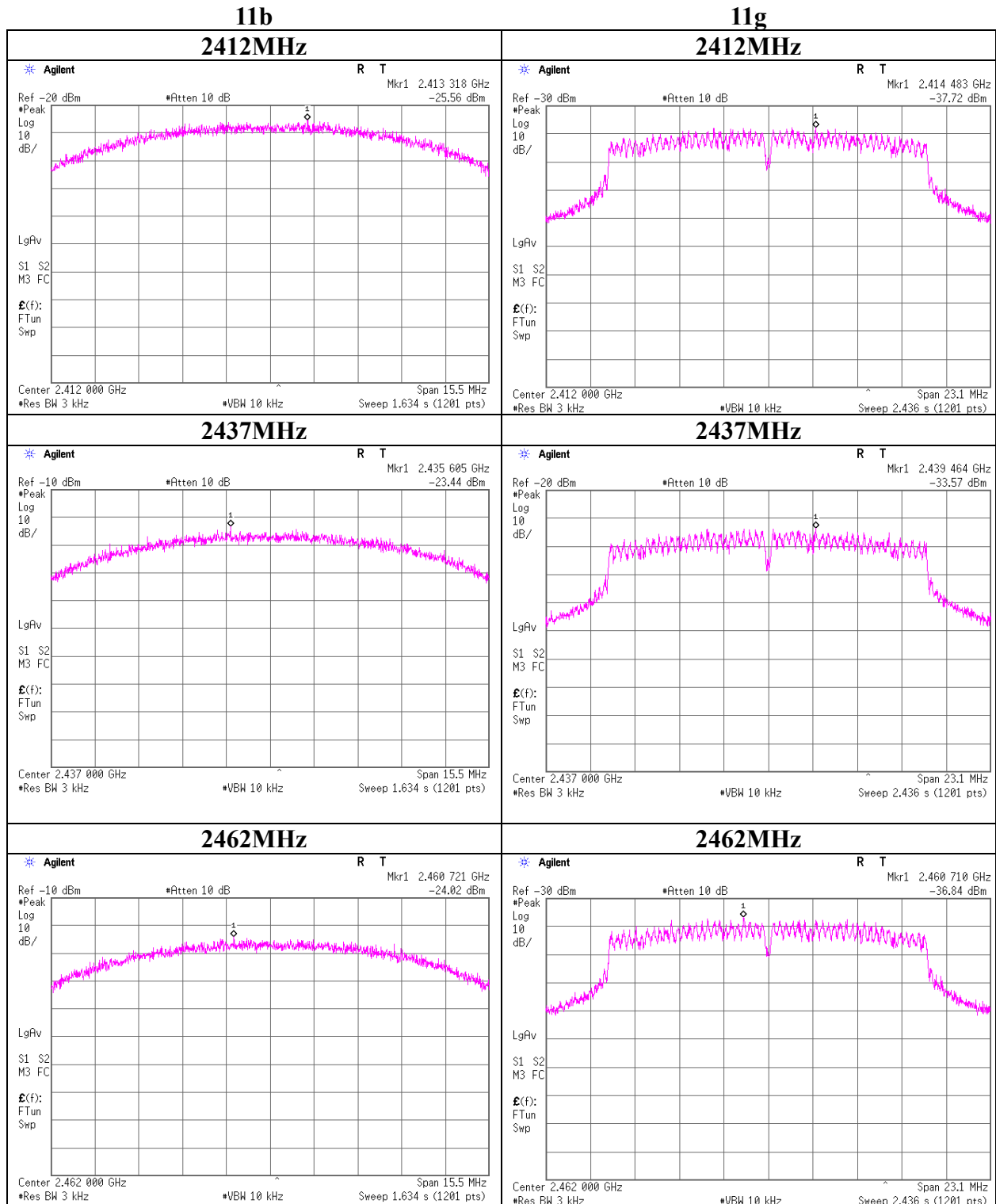
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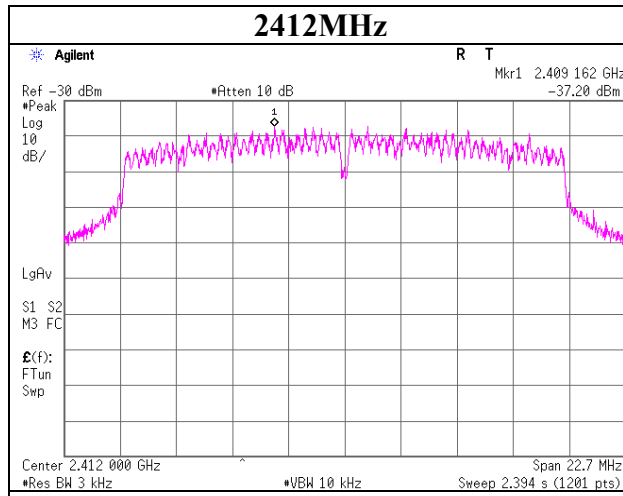
Power Density



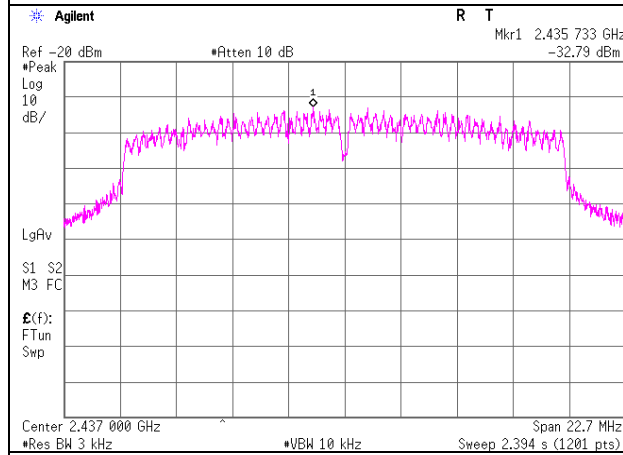
Power Density

11n-20

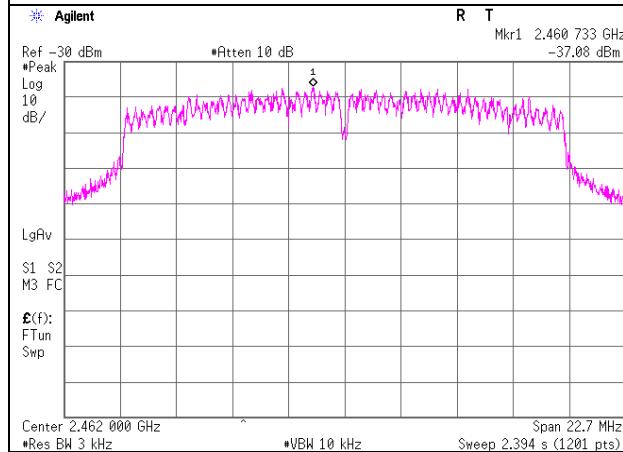
2412MHz



2437MHz



2462MHz



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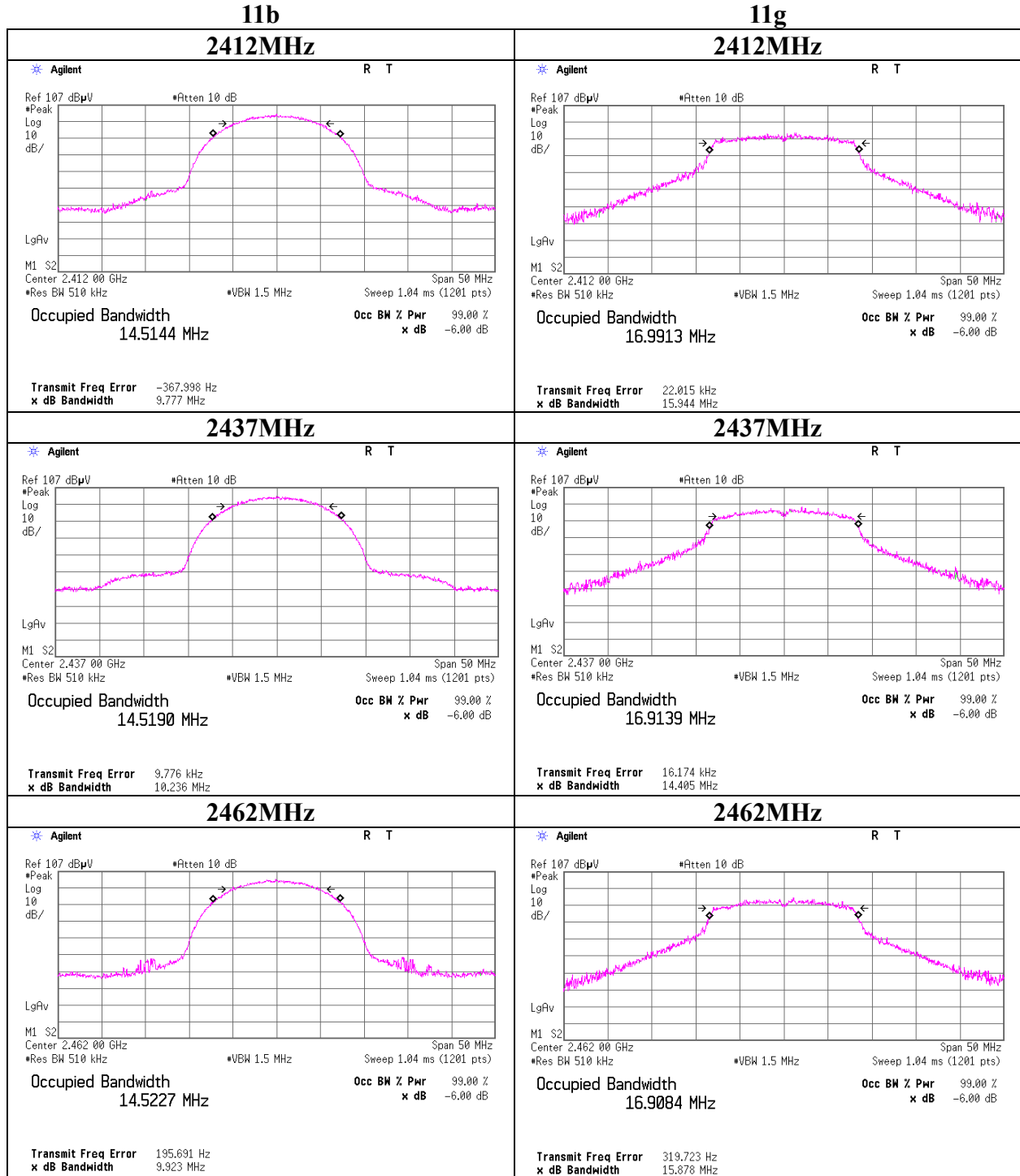
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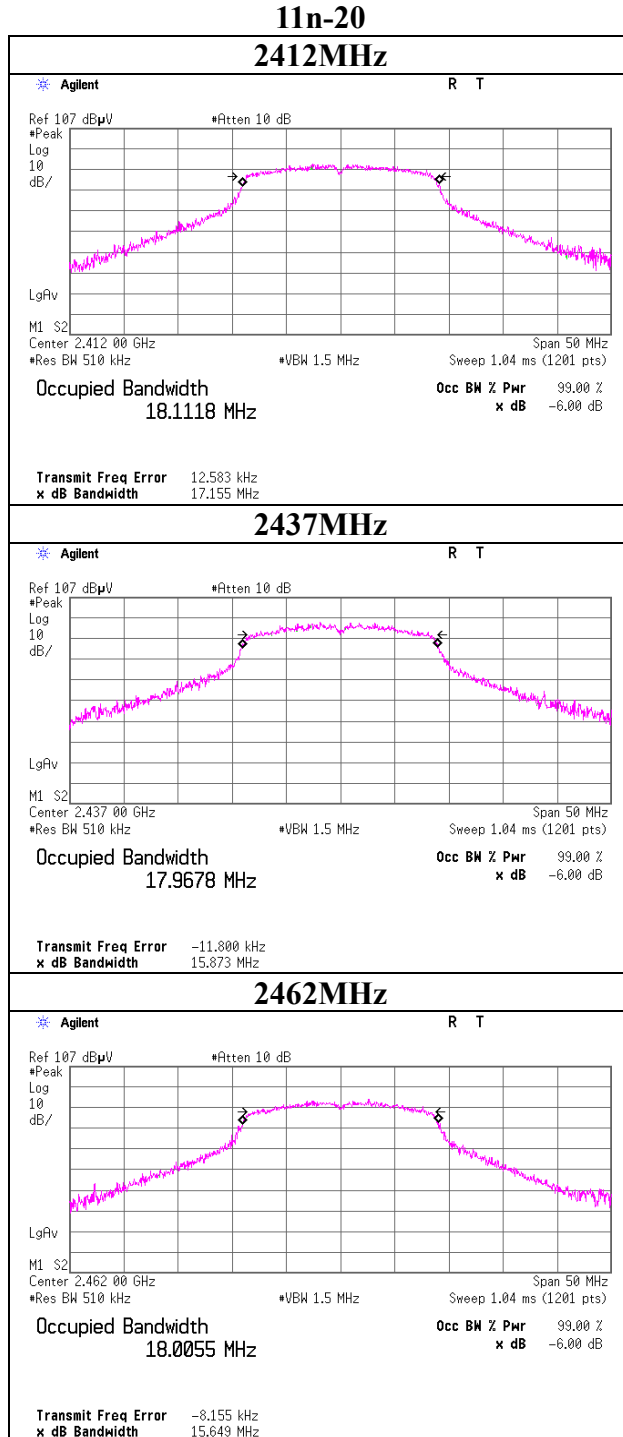
99%Occupied Bandwidth

Test place	Ise EMC Lab. No.11 and No.6 Measurement Room	
Report No.	10646854H	
Date	01/15/2015	02/19/2015
Temperature/ Humidity	21deg. C / 25% RH	21deg. C / 31% RH
Engineer	Tomoki Matsui	Keisuke Kawamura
Mode	Tx 11b /11g	



99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 Measurement Room
Report No.	10646854H
Date	01/15/2015
Temperature/ Humidity	21deg. C / 25% RH
Engineer	Tomoki Matsui
Mode	Tx 11n-20



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APPENDIX 2: Test instruments

EMI test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2014/03/05 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHF-26	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	RE	2014/09/24 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2014/05/21 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2014/02/21 * 12
MOTS-MATM	Antenna Terminal Measurement Software	UL Japan	-	-	AT	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	AT	2014/10/17 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2014/10/06 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2014/10/06 * 12
MCC-67	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28635/2	AT	2014/04/14 * 12
MCC-36	Microwave Cable	Hirose Electric	U.FL-2LP-066-A-(200)	-	AT	2014/09/12 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MAT-19	Attenuator(6dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-106	-	AT	2015/01/07 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2014/12/22 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	CE/RE	2014/11/12 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE/RE	2014/06/03 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2014/07/10 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2014/01/20 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2014/02/20 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2014/11/11 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2014/09/26 * 12

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EMI test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-23	Measure	ASKUL	-	-	RE	-
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2014/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2014/06/11 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2014/03/11 * 12
MOS-23	Thermo-Hygrometer	Custom	CTH-201	0004	AT	2014/12/22 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2014/02/20 * 12
MCC-138	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37953/2	AT	2014/10/02 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2014/03/13 * 12
MCC-35	Microwave Cable	Hirose Electric	U.FL-2LP-066-A-(200)	-	AT	2014/09/12 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2015/01/13 * 12
MTW-02	Torque wrench	HUBER+SUHNER	74 Z-0-0-21	98190	RE/AT	2015/01/16 * 36

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 test

RE: Radiated Emission test

AT: Antenna Terminal Conducted test

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