RADIO TEST REPORT

Test Report No.: 10548959S

Applicant	:	**MITSUMI ELECTRIC CO., LTD.**
Type of Equipment	:	**WLAN 11b/g/n Module**
Model No.	:	**DWM-W077E**
FCC ID	:	**EW4DWMW077E**
Test regulation	:	**FCC Part15 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 limits of the above regulation.
4. The test results in this test 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 any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: November 25 to December 8, 2014

Representative test engineer: S. Takano

Shinichi Takano
Engineer
Consumer Technology Division

Approved by : T. Imamura

Toyokazu Imamura
Leader
Consumer Technology Division

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

REVISION HISTORY

Original Test Report No.: 10548959S

Revision	Test report No.	Date	Page revised	Contents
-(Original)	10548959S	December 16, 2014	-	-
1	10548959S	December 17, 2014	1,4,9,15,16 4	Correction of model name. Correction of description in requirement of FCC 15.31 (e) / 212.
2	10548959S	December 26, 2014	4 9	Correction of description in requirement of FCC 15.31 (e) / 212. Addition of remark.

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SECTION 1: Customer information

Company Name	:	MITSUMI ELECTRIC CO., LTD.
Address	:	1601 Sakai Atsugi-Shi Kanagawa, 243-8533, JAPAN
Telephone Number	:	+81-46-230-3420
Facsimile Number	:	+81-46-230-3500
Contact Person	:	Masashi Tsuchida

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

2.1 Identification of E.U.T.

Type of equipment	:	WLAN 11b/g/n Module
Model No.	:	DWM-W077E
Serial No.	:	Refer to 4.2 in this report.
Rating	:	DC3.3V
Country of Mass-production	:	Philippines, Taiwan
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.
Receipt Date of Sample	:	November 22, 2014

2.2 Product description

Model: DWM-W077E (referred to as the EUT in this report) is WLAN 11b/g/n Module.

Clock frequency(ies) in the system	:	38.4MHz, 32MHz
Equipment type	:	Transceiver
Frequency of operation	:	2412-2462MHz
Bandwidth / channel spacing	:	20MHz / 5MHz
Type of modulation	:	DSSS, OFDM
ITU code	:	D1D, G1D
Antenna type	:	PCB Invert F Antenna(PCB Antenna) / External Invert F Antenna(External Antenna)
Antenna gain	:	-0.97dBi/-0.6dBi
Antenna connector type	:	None / U.FL
Operation temperature range	:	-40 to +85 deg.C

FCC 15.31 (e) / 212
WLAN 11b/g/n Module has its own regulator.
The module is constantly provided voltage (DC3.0V and 1.8V) through the regulator regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC 15.203 / 212
The PCB Invert F Antenna is not removable from the EUT.
The External Invert F Antenna has a U.FL connector.
Therefore the equipment complies with the requirement of 15.203.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2014, final revised on August 15, 2014 and effective October 14, 2014
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures & Results

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A	10.3dB Freq.: 0.18843MHz Detection: Quasi-Peak Phase: N Mode: Tx IEEE802.11g 2437MHz Antenna: External	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	* See data	Complied
Maximum peak output power	ANSI C63.10:2009	FCC 15.247 (b)(3)	Conducted	N/A		Complied
Out of band emission & Restricted band edges	ANSI C63.10:2009	FCC 15.109, 15.247 (d) & 15.209	Conducted / Radiated	N/A	0.2 dB Freq.: 4924.000MHz Polarization: Horizontal Detection: Average Mode: Tx, IEEE802.11b 2462MHz, Antenna: External	Complied
Power density	ANSI C63.10:2009	FCC 15.247 (e)	Conducted	N/A	* See data	Complied
Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422. *1) These tests were also referred to KDB 558074 v03 r02 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".						

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.10:2009, RSS-Gen 4.6.1	-	Conducted	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

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

3.4 Uncertainty

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

Item	Frequency range	No.1 SAC*1/SR*2 (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Conducted emission (AC Mains) LISN	150kHz-30MHz	3.6 dB	3.4 dB	3.4 dB
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.5 dB	3.5 dB
	30MHz-300MHz	4.9 dB	4.9 dB	4.7 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-15GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.7 dB	5.7 dB	5.7 dB
	18GHz-40GHz	4.5 dB	4.3 dB	4.3 dB

*1: SAC=Semi-Anechoic Chamber
*2: SR= Shielded Room is applied besides radiated emission

Conducted emission test

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

Radiated emission test

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

Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 0.68dB
Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.5dB
Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 1.7dB
Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 2.4dB
Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB
Bandwidth Measurement uncertainty for this test was: (±) 0.66%

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number : +81 463 50 6400
Facsimile number : +81 463 50 6401
JAB Accreditation No. : RTL02610

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☐ No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☒ No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☐ No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☒ No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.7 Shielded room	-	2.76 x 3.76 x 2.4	2.76 x 3.76	-
☐ No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	2.55 x 4.1	-

3.6 Test setup, Test data & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

Test item	Mode	Tested frequency	Worst data mode *1)
Conducted emission Radiated emission (below 1GHz)	Transmitting(Tx) IEEE 802.11g *2)	2437MHz *2)	PN9, 18Mbps(Antenna: External) PN9, 54Mbps(Antenna: PCB)
	Transmitting(Tx) IEEE 802.11n HT20	2412MHz	PN9, MCS2 (Antenna: External) PN9, MCS5 (Antenna: PCB)
Radaited emission (Spurious emission) (Above 1GHz)	Transmitting(Tx) IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	PN9, 1Mbps(Antenna: External) PN9, 2Mbps(Antenna: PCB)
	Transmitting(Tx) IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	PN9, 18Mbps(Antenna: External) PN9, 54Mbps(Antenna: PCB)
	Transmitting(Tx) IEEE 802.11n HT20	2412MHz, 2437MHz, 2462MHz	PN9, MCS2 (Antenna: External) PN9, MCS5 (Antenna: PCB)
Maximum peak output power	Transmitting(Tx) IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	PN9, 5.5Mbps(Antenna: External) PN9, 2Mbps(Antenna: PCB)
	Transmitting(Tx) IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	PN9, 18Mbps(Antenna: External) PN9, 24Mbps(Antenna: PCB)
	Transmitting(Tx) IEEE 802.11n HT20	2412MHz, 2437MHz, 2462MHz	PN9, MCS2 (Antenna: External) PN9, MCS5 (Antenna: PCB)
Other items	Transmitting(Tx) IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	PN9, 2Mbps(Antenna: PCB)
	Transmitting(Tx) IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	PN9, 18Mbps(Antenna: External)
	Transmitting(Tx) IEEE 802.11n HT20	2412MHz, 2437MHz, 2462MHz	PN9, MCS2 (Antenna: External)
*1) The worst condition was determined based on the test result of Maximum Peak Output Power. *2) 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.			

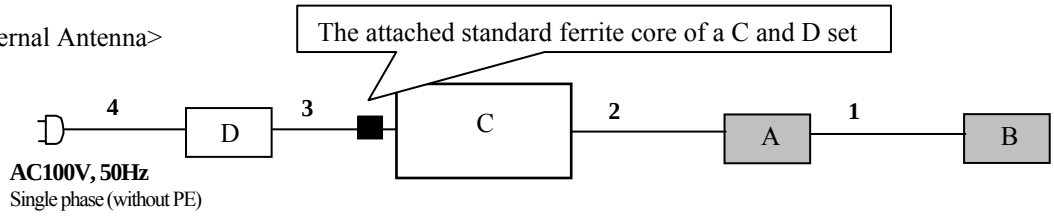
Software : DutApiWifi8801BridgeUart.exe ver.2.0.0.83
Power settings: 11b:14dBm , 11g/n:12dBm

Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

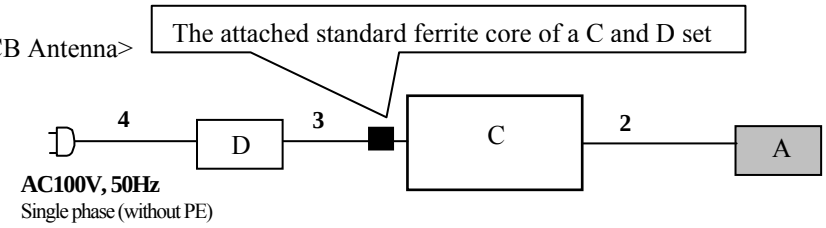
4.2 Configuration and peripherals

■ : Standard ferrite core

<External Antenna>



<PCB Antenna>



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	WLAN 11b/g/n Module	DWM-W077E	*1)	MITSUMI	EUT
B	Invert F Antenna	PIAF02-MITSUMI	1	MITSUMI	EUT
C	Laptop Computer	7666-77J	LV-B8RDC 08/05	Lenovo	-
D	AC Adapter	92P1214	11S92P1213Z1ZDDZ92C B0	Lenovo	-

*1) 01: Radiated emission, 05: Antenna port conducted test. (Antenna port conducted test of PCB Antenna was carried out with an attachment of RF Module cable to RF Module Side(between RF Module and PCB Antenna Pattern).)

List of cables used

No.	Item	Length(m)	Shield		Remarks
			Cable	Connector	
1	Antenna	0.09	Shielded	Shielded	
2	USB	1.4	Shielded	Shielded	-
3	DC	1.8	Unshielded	Unshielded	-
4	AC	1.0	Unshielded	Unshielded	-

* All cables used for the measurement are exclusive use or marketed.

SECTION 5: Conducted emission

5.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 2.0m, raised 0.8m above the conducting ground plane.
The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.
The rear of tabletop was located 40cm to the vertical conducting plane. The rear of peripheral was aligned and was 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 LISN.
Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50ohm connectors of the LISN were resistively terminated in 50ohm when not connected to the measuring equipment.
Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT position : Table top

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT via DC power supply within a Shielded room. The EUT via DC power supply was connected to a Line Impedance Stabilization Network (LISN).
An overview sweep with peak detection has been performed.
The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector.
The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ CISPR Average
IF Bandwidth : 9kHz

5.5 Results

Summary of the test results : Pass
Refer to APPENDIX 1

SECTION 6: 6dB bandwidth & Occupied bandwidth (99%)

Test procedure
The bandwidth was measured with a spectrum analyzer connected to the antenna port.
The test was measured based on Method 8.2 Option 2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 7: Maximum peak output power

Test procedure
The Maximum Output Power was measured with a power meter connected to the antenna port.
The test was measured based on Method 9.1.2 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247" .

Detection type: Peak / Average *1)

Summary of the test results: Pass
Refer to APPENDIX 1

*1) Average detector was used only for Reference data.

SECTION 8: Out of band emissions (Antenna port conducted)

Test procedure
The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.
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.
In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 9: Peak power density

Test procedure
The peak power density was measured with a spectrum analyzer connected to the antenna port.

Instrument used	:	Spectrum Analyzer
RBW / VBW	:	3kHz / 9.1kHz

The test was measured based on Method 10.2 PKPSD of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass
Refer to APPENDIX 1

SECTION 10: Radiated emission

10.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

10.2 Test configuration

EUT was placed on a polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

10.3 Test conditions

Frequency range : 30MHz to 25GHz
EUT position : Table top

10.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.
The radiated emission measurements were made with the following detection.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 3MHz Detector: Linear Voltage Averaging	RBW: 100kHz VBW: 300kHz

*1) Average Power Measurement was measured based on 13.3.2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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

<External Antenna>

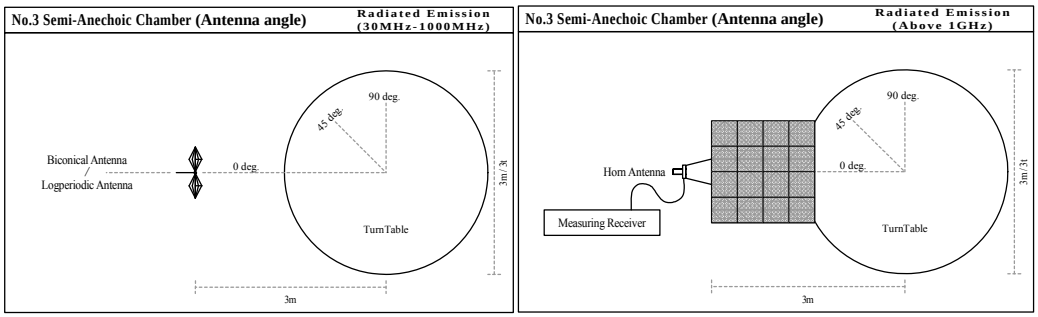
Module/Antenna	Polarization	Carrier	Spurious (Below 1GHz)	Spurious (1-2.8GHz)	Spurious (2.8-25GHz)
Module	Horizontal	Y	Y	Y	Y
	Vertical	Y	Y	Y	Z
Antenna	Horizontal	X	Y	X	X
	Vertical	Z	X	Z	Z

<PCB Antenna>

Polarization	Carrier	Spurious (Below 1GHz)	Spurious (1-2.8GHz)	Spurious (2.8-25GHz)
Horizontal	Z	Y	Z	Y
Vertical	Y	Y	Y	Z

* The definition of each position is shown in a 'Pre-check of the worst position' in APPENDIX 3.

Figure 1. Antenna angle



Band edge level at 2390MHz and 2483.5MHzis below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

10.6 Results

Summary of the test results : Pass
* No noise was detected above the 5th order harmonics.

Refer to APPENDIX 1

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

Conducted emission
6dB bandwidth
Maximum peak output power
Radiated emission
Spurious emission (Antenna port conducted)
Peak power density
Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Conducted emission
Radiated emission
Pre-check of the worst position

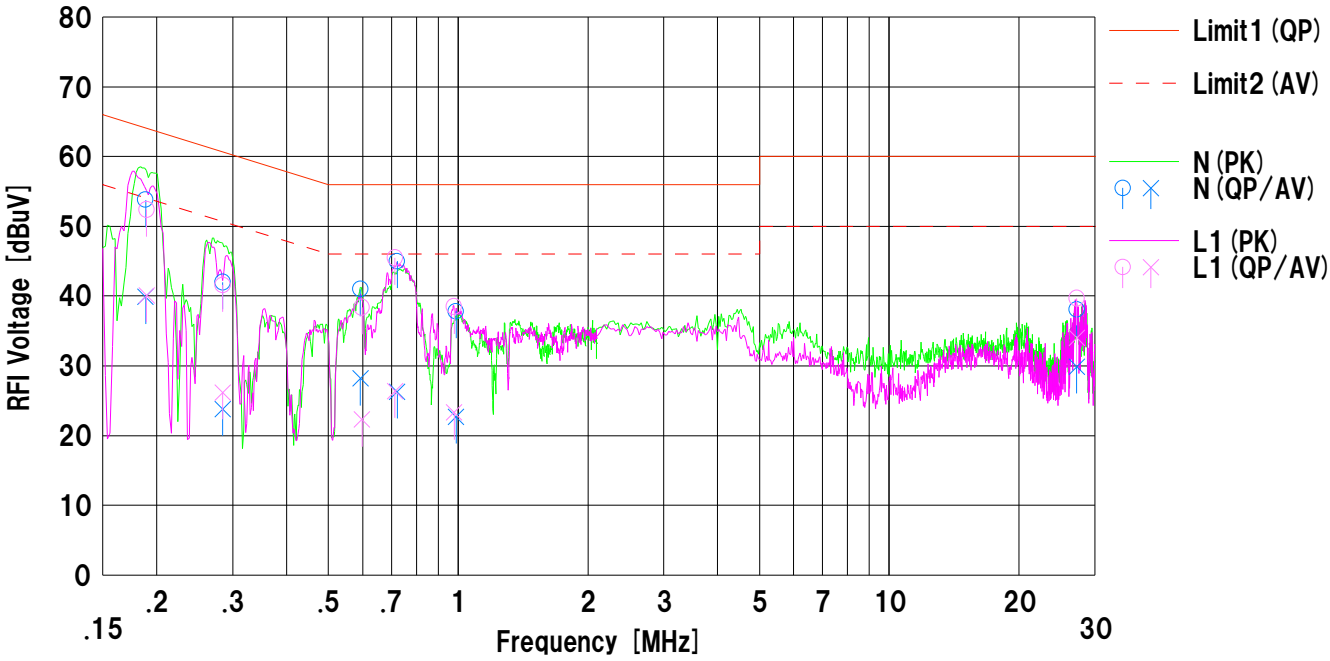
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2014/12/08

Company	: MITSUMI ELECTRIC CO., LTD.	Mode	: Tx 11g 2437MHz
Kind of EUT	: WLAN 11b/g/n Module	Order No.	: 10548959S
Model No.	: DWM-W077E	Power	: DC 5.0V (USB)
Serial No.	: 1	Temp./Humi.	: 21deg.C / 35%RH
Remarks	: External		

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Akio Hayashi



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.18843	41.4	27.5	12.4	53.8	39.9	64.1	54.1	10.3	14.2	N	
2	0.28450	29.5	11.3	12.5	42.0	23.8	60.6	50.6	18.6	26.8	N	
3	0.59370	28.5	15.7	12.5	41.0	28.2	56.0	46.0	15.0	17.8	N	
4	0.72180	32.5	13.8	12.5	45.0	26.3	56.0	46.0	11.0	19.7	N	
5	0.98845	25.4	10.3	12.4	37.8	22.7	56.0	46.0	18.2	23.3	N	
6	27.22900	24.4	16.2	13.7	38.1	29.9	60.0	50.0	21.9	20.1	N	
7	0.18950	40.0	27.7	12.4	52.4	40.1	64.0	54.0	11.6	13.9	L1	
8	0.28464	29.1	13.7	12.5	41.6	26.2	60.6	50.6	19.0	24.4	L1	
9	0.59824	25.9	9.8	12.5	38.4	22.3	56.0	46.0	17.6	23.7	L1	
10	0.71400	33.0	13.9	12.5	45.5	26.4	56.0	46.0	10.5	19.6	L1	
11	0.97885	26.1	10.9	12.4	38.5	23.3	56.0	46.0	17.5	22.7	L1	
12	27.22715	26.0	20.3	13.7	39.7	34.0	60.0	50.0	20.3	16.0	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-05

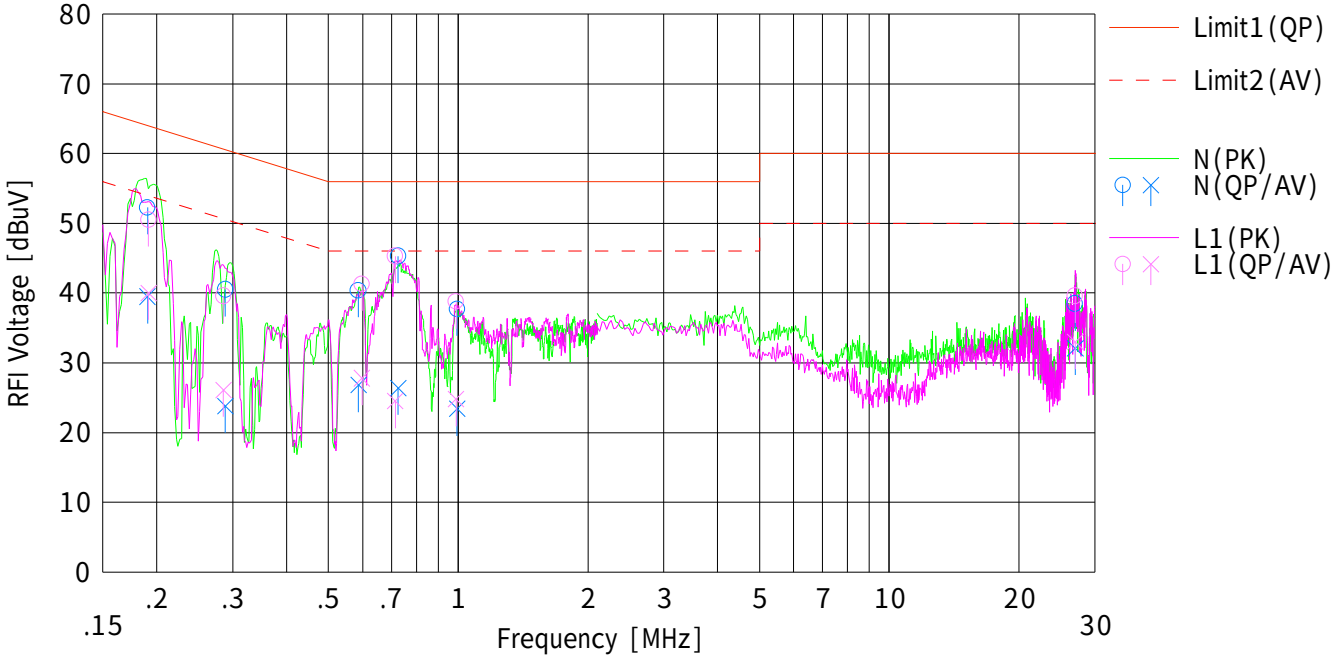
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2014/12/08

Company	: MITSUMI ELECTRIC CO., LTD.	Mode	: Tx 11n HT20 2412MHz
Kind of EUT	: WLAN 11b/g/n Module	Order No.	: 10548959S
Model No.	: **DWM-W077E**	Power	: DC 5.0V(USB)
Serial No.	: 1	Temp./Humi.	: 21deg.C / 35%RH
Remarks	: PCB		

Limit1 : FCC 15C(15.207) QP
Limit2 : FCC 15C(15.207) AV

Engineer : Akio Hayashi



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.19040	39.9	27.1	12.4	52.3	39.5	64.0	54.0	11.7	14.5	N	
2	0.28850	28.0	11.3	12.5	40.5	23.8	60.5	50.5	20.0	26.7	N	
3	0.58720	27.9	14.3	12.5	40.4	26.8	56.0	46.0	15.6	19.2	N	
4	0.72576	32.9	14.0	12.4	45.3	26.4	56.0	46.0	10.7	19.6	N	
5	0.99410	25.2	10.9	12.5	37.7	23.4	56.0	46.0	18.3	22.6	N	
6	27.01890	24.8	18.4	13.7	38.5	32.1	60.0	50.0	21.5	17.9	N	
7	0.19146	38.1	27.6	12.4	50.5	40.0	63.9	53.9	13.4	13.9	L1	
8	0.28520	27.1	13.6	12.5	39.6	26.1	60.6	50.6	21.0	24.5	L1	
9	0.59800	28.8	15.3	12.5	41.3	27.8	56.0	46.0	14.7	18.2	L1	
10	0.71500	32.9	12.1	12.4	45.3	24.5	56.0	46.0	10.7	21.5	L1	
11	0.98982	26.3	12.3	12.5	38.8	24.8	56.0	46.0	17.2	21.2	L1	
12	27.01643	25.9	19.3	13.7	39.6	33.0	60.0	50.0	20.4	17.0	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN+Cable+ATT)[dB]
LISN:SLS-05

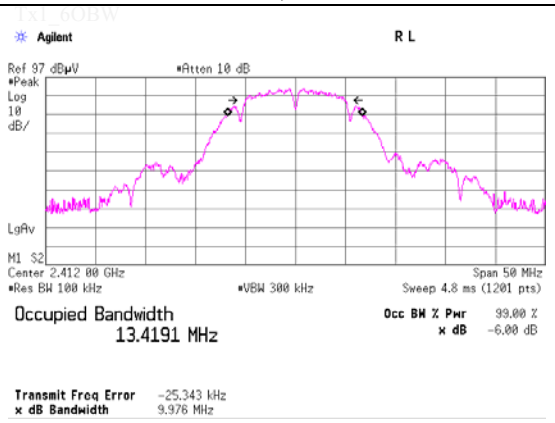
APPENDIX 1: Data of EMI test

-6dB Bandwidth

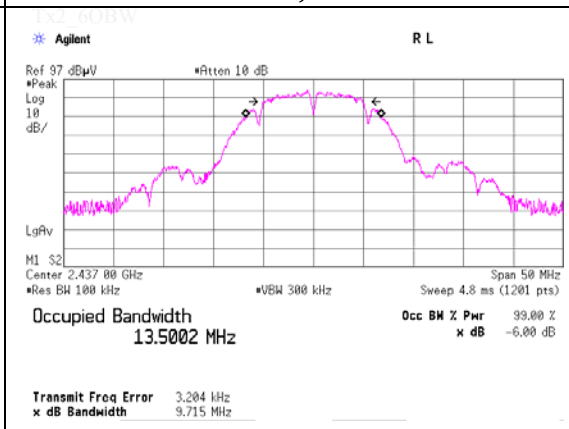
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	9.976	> 0.500
2437.0000	9.715	> 0.500
2462.0000	10.069	> 0.500

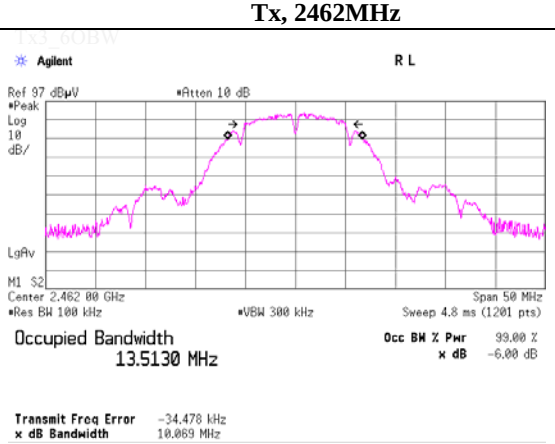
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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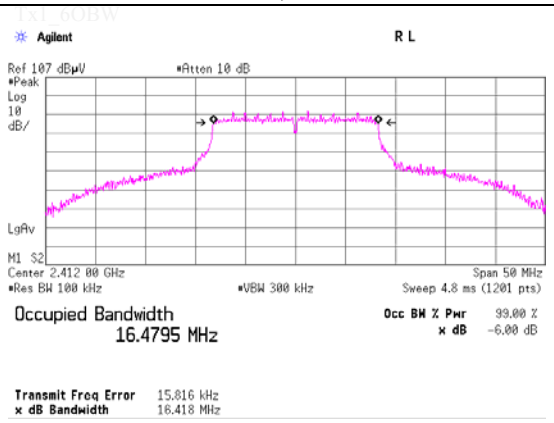
-6dB Bandwidth

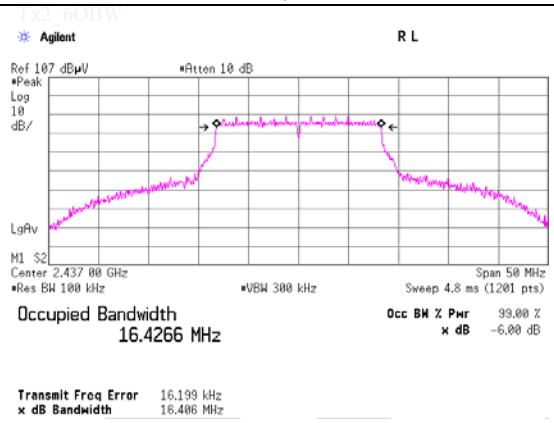
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	16.418	> 0.500
2437.0000	16.406	> 0.500
2462.0000	16.408	> 0.500

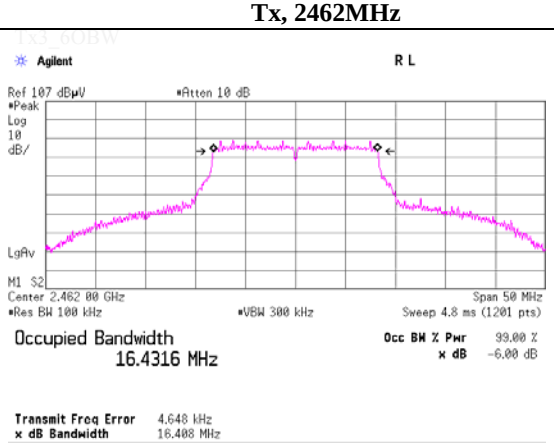
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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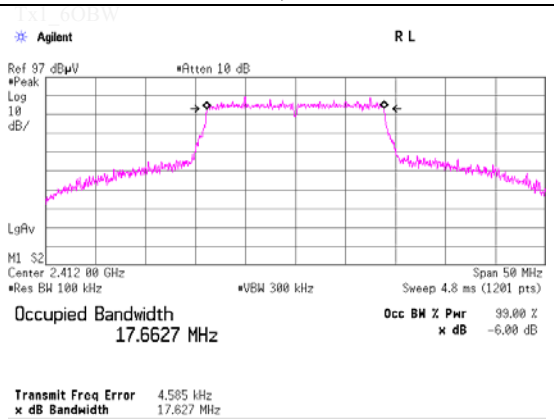
-6dB Bandwidth

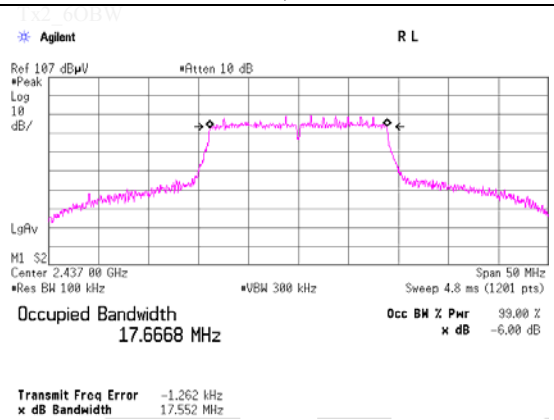
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	17.627	> 0.500
2437.0000	17.552	> 0.500
2462.0000	17.670	> 0.500

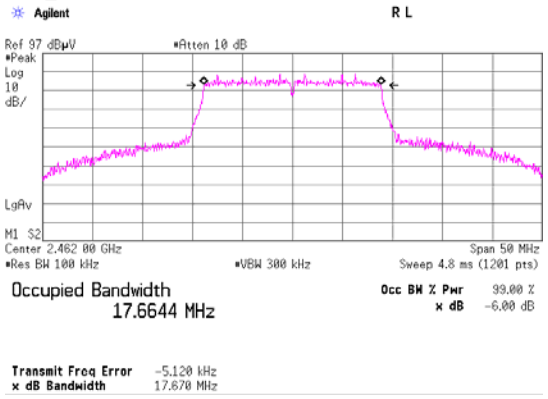
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room	
Date	November 25, 2014		
Temperature / Humidity	23deg.C , 41%RH		
Engineer	Akio Hayashi		
Mode	Tx, IEEE802.11b, PN9,	worst antenna : PCB	worst data mode : 2 Mbps

(* P/M: Power Meter with power sensor)

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
Low	2412.0	6.48	1.88	9.90	18.26	66.99	30.00	1000	11.74
Mid	2437.0	6.16	1.89	9.90	17.95	62.37	30.00	1000	12.05
High	2462.0	5.96	1.90	9.90	17.76	59.70	30.00	1000	12.24

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

[Pre check]
Antenna External

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
External	1	2437.0	5.48	2.09	9.90	17.47	55.85	30.00	1000	12.53
External	2	2437.0	5.45	2.09	9.90	17.44	55.46	30.00	1000	12.56
External	5.5	2437.0	5.10	2.09	9.90	17.09	51.17	30.00	1000	12.91
External	11	2437.0	5.35	2.09	9.90	17.34	54.20	30.00	1000	12.66

Antenna PCB

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]	
PCB	1	2437.0	6.11	1.89	9.90	17.90	61.66	30.00	1000	12.10	
PCB	2	2437.0	6.16	1.89	9.90	**17.95**	62.37	30.00	1000	**12.05**	**Worst**
PCB	5.5	2437.0	6.07	1.89	9.90	17.86	61.09	30.00	1000	12.14	
PCB	11	2437.0	6.11	1.89	9.90	17.90	61.66	30.00	1000	12.10	

Sample Calculation:
Result (External) = Reading + Cable Loss + Atten. Loss
Result (PCB) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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Maximum Conducted Output Power (Reference data)

(AVGPM)

Test place	UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
Date	November 25, 2014
Temperature / Humidity	23deg.C , 41%RH
Engineer	Akio Hayashi
Mode	Tx, IEEE802.11b, PN9, worst antenna : PCB worst data mode : 5.5 Mbps

(* P/M: Power Meter with power sensor, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
Low	2412.0	3.64	1.88	9.90	0.00	15.42	34.83
Mid	2437.0	3.39	1.89	9.90	0.00	15.18	32.96
High	2462.0	2.84	1.90	9.90	0.00	14.64	29.11

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

[Pre check]
Antenna External

	Data rate [Mbps]	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
External	1	2437.0	2.61	2.09	9.90	0.00	14.60	28.84
External	2	2437.0	2.60	2.09	9.90	0.00	14.59	28.77
External	5.5	2437.0	2.23	2.09	9.90	0.00	14.22	26.42
External	11	2437.0	2.29	2.09	9.90	0.00	14.28	26.79

Antenna PCB

	Data rate [Mbps]	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
PCB	1	2437.0	3.33	1.89	9.90	0.00	15.12	32.51
PCB	2	2437.0	3.35	1.89	9.90	0.00	15.14	32.66
PCB	5.5	2437.0	3.39	1.89	9.90	0.00	**15.18**	32.96
PCB	11	2437.0	3.36	1.89	9.90	0.00	15.15	32.73

Sample Calculation: Result (External) = Reading + Cable Loss + Atten. Loss
Result (PCB) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

(*1) Power was measured with using the gate function of power meter.
It was means that the intervals during which the transmitter is off or is transmitting at reduced power level is not included in the average
Therefore, there is no need to add duty cycle correction to the result.

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Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room	
Date	November 25, 2014		
Temperature / Humidity	23deg.C , 41%RH		
Engineer	Akio Hayashi		
Mode	Tx, IEEE802.11g, PN9,	worst antenna : External	worst data mode : 18 Mbps

(* P/M: Power Meter with power sensor)

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
Low	2412.0	10.50	2.09	9.90	22.49	177.42	30.00	1000	7.51
Mid	2437.0	10.53	2.09	9.90	22.52	178.65	30.00	1000	7.48
High	2462.0	10.04	2.10	9.90	22.04	159.96	30.00	1000	7.96

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss

[Pre check]
Antenna External

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]	
External	6	2437.0	10.51	2.09	9.90	22.50	177.83	30.00	1000	7.50	
External	9	2437.0	9.89	2.09	9.90	21.88	154.17	30.00	1000	8.12	
External	12	2437.0	10.35	2.09	9.90	22.34	171.40	30.00	1000	7.66	
External	18	2437.0	10.53	2.09	9.90	**22.52**	178.65	30.00	1000	**7.48**	**Worst**
External	24	2437.0	9.95	2.09	9.90	21.94	156.31	30.00	1000	8.06	
External	36	2437.0	9.73	2.09	9.90	21.72	148.59	30.00	1000	8.28	
External	48	2437.0	10.37	2.09	9.90	22.36	172.19	30.00	1000	7.64	
External	54	2437.0	0.93	2.09	9.90	12.92	19.59	30.00	1000	17.08	

Antenna PCB

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
PCB	6	2437.0	9.18	1.89	9.90	20.97	125.03	30.00	1000	9.03
PCB	9	2437.0	8.71	1.89	9.90	20.50	112.20	30.00	1000	9.50
PCB	12	2437.0	9.04	1.89	9.90	20.83	121.06	30.00	1000	9.17
PCB	18	2437.0	9.19	1.89	9.90	20.98	125.31	30.00	1000	9.02
PCB	24	2437.0	8.96	1.89	9.90	20.75	118.85	30.00	1000	9.25
PCB	36	2437.0	8.97	1.89	9.90	20.76	119.12	30.00	1000	9.24
PCB	48	2437.0	9.70	1.89	9.90	21.49	140.93	30.00	1000	8.51
PCB	54	2437.0	9.71	1.89	9.90	21.50	141.25	30.00	1000	8.50

Sample Calculation:
Result (External) = Reading + Cable Loss + Atten. Loss
Result (PCB) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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Maximum Conducted Output Power (Reference data)

(AVGPM)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room	
Date	November 25, 2014		
Temperature / Humidity	23deg.C , 41%RH		
Engineer	Akio Hayashi		
Mode	Tx, IEEE802.11g, PN9,	worst antenna : PCB	worst data mode : 24 Mbps

(* P/M: Power Meter with power sensor, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
Low	2412.0	1.75	1.88	9.90	0.00	13.53	22.54
Mid	2437.0	1.65	1.89	9.90	0.00	13.44	22.08
High	2462.0	1.03	1.90	9.90	0.00	12.83	19.19

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

[Pre check]
Antenna External

	Data rate [Mbps]	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
External	6	2437.0	1.07	2.09	9.90	0.00	13.06	20.23
External	9	2437.0	1.07	2.09	9.90	0.00	13.06	20.23
External	12	2437.0	1.12	2.09	9.90	0.00	13.11	20.46
External	18	2437.0	1.09	2.09	9.90	0.00	13.08	20.32
External	24	2437.0	0.71	2.09	9.90	0.00	12.70	18.62
External	36	2437.0	0.76	2.09	9.90	0.00	12.75	18.84
External	48	2437.0	0.90	2.09	9.90	0.00	12.89	19.45
External	54	2437.0	0.91	2.09	9.90	0.00	12.90	19.50

Antenna PCB

	Data rate [Mbps]	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
PCB	6	2437.0	1.48	1.89	9.90	0.00	13.27	21.23
PCB	9	2437.0	1.40	1.89	9.90	0.00	13.19	20.84
PCB	12	2437.0	1.48	1.89	9.90	0.00	13.27	21.23
PCB	18	2437.0	1.50	1.89	9.90	0.00	13.29	21.33
PCB	24	2437.0	1.65	1.89	9.90	0.00	**13.44**	22.08
PCB	36	2437.0	1.56	1.89	9.90	0.00	13.35	21.63
PCB	48	2437.0	1.28	1.89	9.90	0.00	13.07	20.28
PCB	54	2437.0	1.37	1.89	9.90	0.00	13.16	20.70

Sample Calculation: Result (External) = Reading + Cable Loss + Atten. Loss
Result (PCB) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

(*1) Power was measured with using the gate function of power meter.
It was means that the intervals during which the transmitter is off or is transmitting at reduced power level is not included in the average
Therefore, there is no need to add duty cycle correction to the result.

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Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room	
Date	November 25, 2014		
Temperature / Humidity	23deg.C , 41%RH		
Engineer	Akio Hayashi		
Mode	Tx, IEEE802.11n HT20, PN9,	worst antenna : External	worst data mode : 2 (MCS)

(* P/M: Power Meter with power sensor)

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
Low	2412.0	10.04	2.09	9.90	22.03	159.59	30.00	1000	7.97
Mid	2437.0	9.80	2.09	9.90	21.79	151.01	30.00	1000	8.21
High	2462.0	9.60	2.10	9.90	21.60	144.54	30.00	1000	8.40

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss

[Pre check]
Antenna External

	Mode (MCS)	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]	
External	0	2437.0	9.41	2.09	9.90	21.40	138.04	30.00	1000	8.60	
External	1	2437.0	9.24	2.09	9.90	21.23	132.74	30.00	1000	8.77	
External	2	2437.0	9.80	2.09	9.90	**21.79**	151.01	30.00	1000	**8.21**	**Worst**
External	3	2437.0	9.63	2.09	9.90	21.62	145.21	30.00	1000	8.38	
External	4	2437.0	8.90	2.09	9.90	20.89	122.74	30.00	1000	9.11	
External	5	2437.0	9.73	2.09	9.90	21.72	148.59	30.00	1000	8.28	
External	6	2437.0	9.15	2.09	9.90	21.14	130.02	30.00	1000	8.86	
External	7	2437.0	9.41	2.09	9.90	21.40	138.04	30.00	1000	8.60	

Antenna PCB

	Mode (MCS)	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
PCB	0	2437.0	9.27	1.89	9.90	21.06	127.64	30.00	1000	8.94
PCB	1	2437.0	9.15	1.89	9.90	20.94	124.17	30.00	1000	9.06
PCB	2	2437.0	8.84	1.89	9.90	20.63	115.61	30.00	1000	9.37
PCB	3	2437.0	9.30	1.89	9.90	21.09	128.53	30.00	1000	8.91
PCB	4	2437.0	9.46	1.89	9.90	21.25	133.35	30.00	1000	8.75
PCB	5	2437.0	9.75	1.89	9.90	21.54	142.56	30.00	1000	8.46
PCB	6	2437.0	9.43	1.89	9.90	21.22	132.43	30.00	1000	8.78
PCB	7	2437.0	9.44	1.89	9.90	21.23	132.74	30.00	1000	8.77

Sample Calculation:
Result (External) = Reading + Cable Loss + Atten. Loss
Result (PCB) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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Maximum Conducted Output Power (Reference data)

(AVGPM)

Test place	UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
Date	November 25, 2014
Temperature / Humidity	23deg.C , 41%RH
Engineer	Akio Hayashi
Mode	Tx, IEEE802.11n HT20, PN9, worst antenna : PCB worst data mode : 5 (MCS)

(* P/M: Power Meter with power sensor, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
Low	2412.0	1.56	1.88	9.90	0.00	13.34	21.58
Mid	2437.0	1.61	1.89	9.90	0.00	13.40	21.88
High	2462.0	0.90	1.90	9.90	0.00	12.70	18.62

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

[Pre check]
Antenna External

	Mode (MCS)	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
External	0	2437.0	1.09	2.09	9.90	0.00	13.08	20.32
External	1	2437.0	1.20	2.09	9.90	0.00	13.19	20.84
External	2	2437.0	0.95	2.09	9.90	0.00	12.94	19.68
External	3	2437.0	0.97	2.09	9.90	0.00	12.96	19.77
External	4	2437.0	0.97	2.09	9.90	0.00	12.96	19.77
External	5	2437.0	1.09	2.09	9.90	0.00	13.08	20.32
External	6	2437.0	1.07	2.09	9.90	0.00	13.06	20.23
External	7	2437.0	1.14	2.09	9.90	0.00	13.13	20.56

Antenna PCB

	Mode (MCS)	Freq. [MHz]	P/M (AV) Reading(*1) [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result [dBm]	Result [mW]
PCB	0	2437.0	1.52	1.89	9.90	0.00	13.31	21.43
PCB	1	2437.0	1.56	1.89	9.90	0.00	13.35	21.63
PCB	2	2437.0	1.27	1.89	9.90	0.00	13.06	20.23
PCB	3	2437.0	1.30	1.89	9.90	0.00	13.09	20.37
PCB	4	2437.0	1.42	1.89	9.90	0.00	13.21	20.94
PCB	5	2437.0	1.61	1.89	9.90	0.00	**13.40**	21.88
PCB	6	2437.0	1.60	1.89	9.90	0.00	13.39	21.83
PCB	7	2437.0	1.18	1.89	9.90	0.00	12.97	19.82

Sample Calculation: Result (External) = Reading + Cable Loss + Atten. Loss
Result (PCB) = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

(*1) Power was measured with using the gate function of power meter.
It was means that the intervals during which the transmitter is off or is transmitting at reduced power level is not included in the average
Therefore, there is no need to add duty cycle correction to the result.

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Maximum Peak Conducted Output Power(Reference)

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room		
Date	November 25, 2014			
Temperature / Humidity	23deg.C , 41%RH			
Engineer	Akio Hayashi			
Mode	Tx, IEEE802.11n HT20, PN9,	worst antenna : PCB	worst data mode :	5 (MCS)

(* P/M: Power Meter with power sensor)

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
Low	2412.0	9.95	2.09	9.90	21.94	156.31	30.00	1000	8.06
Mid	2437.0	9.75	2.09	9.90	21.74	149.28	30.00	1000	8.26
High	2462.0	9.63	2.10	9.90	21.63	145.55	30.00	1000	8.37

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss

This data for determining worst mode of Radiated emission Below 1GHz test for PCB antenna.

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11b	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	57.0	26.4	13.6	41.1	55.9	73.9	18.0	100	354	
Hori.	4824.000	PK	57.7	30.7	5.5	39.8	54.1	73.9	19.8	100	310	
Hori.	7236.000	PK	45.6	36.7	6.9	40.2	49.0	73.9	24.9	100	0	
Hori.	9648.000	PK	45.4	38.5	8.0	40.1	51.8	73.9	22.1	100	0	
Hori.	12060.000	PK	46.5	39.5	8.9	39.6	55.3	73.9	18.6	100	0	
Hori.	2390.000	AV	37.6	26.4	13.6	41.1	36.5	53.9	17.4	100	354	
Hori.	4824.000	AV	55.8	30.7	5.5	39.8	52.2	53.9	**1.7**	100	310	
Hori.	7236.000	AV	36.3	36.7	6.9	40.2	39.7	53.9	14.2	100	0	
Hori.	9648.000	AV	35.6	38.5	8.0	40.1	42.0	53.9	11.9	100	0	
Hori.	12060.000	AV	36.8	39.5	8.9	39.6	45.6	53.9	8.3	100	0	
Vert.	2390.000	PK	57.8	26.4	13.6	41.1	56.7	73.9	17.2	100	122	
Vert.	4824.000	PK	57.0	30.7	5.5	39.8	53.4	73.9	20.5	105	13	
Vert.	7236.000	PK	45.3	36.7	6.9	40.2	48.7	73.9	25.2	100	0	
Vert.	9648.000	PK	46.5	38.5	8.0	40.1	52.9	73.9	21.0	100	0	
Vert.	12060.000	PK	45.9	39.5	8.9	39.6	54.7	73.9	19.2	100	0	
Vert.	2390.000	AV	38.1	26.4	13.6	41.1	37.0	53.9	16.9	100	122	
Vert.	4824.000	AV	54.9	30.7	5.5	39.8	51.3	53.9	2.6	105	13	
Vert.	7236.000	AV	36.8	36.7	6.9	40.2	40.2	53.9	13.7	100	0	
Vert.	9648.000	AV	37.0	38.5	8.0	40.1	43.4	53.9	10.5	100	0	
Vert.	12060.000	AV	37.0	39.5	8.9	39.6	45.8	53.9	8.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	98.4	26.4	13.6	41.1	97.3	-	-	Carrier
Hori.	2397.000	PK	55.3	26.4	13.6	41.1	54.2	77.3	23.1	
Hori.	2400.000	PK	53.0	26.4	13.6	41.1	51.9	77.3	25.4	
Vert.	2412.000	PK	99.9	26.4	13.6	41.1	98.8	-	-	Carrier
Vert.	2397.000	PK	57.9	26.4	13.6	41.1	56.8	78.8	22.0	
Vert.	2400.000	PK	54.8	26.4	13.6	41.1	53.7	78.8	25.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11b	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	58.0	30.9	5.5	39.7	54.7	73.9	19.2	104	0	
Hori.	7311.000	PK	45.5	36.8	6.8	40.3	48.8	73.9	25.1	100	0	
Hori.	9748.000	PK	45.7	38.6	8.0	40.0	52.3	73.9	21.6	100	0	
Hori.	12185.000	PK	46.1	39.4	9.0	39.8	54.7	73.9	19.2	100	0	
Hori.	4874.000	AV	56.2	30.9	5.5	39.7	52.9	53.9	**1.0**	104	0	
Hori.	7311.000	AV	36.3	36.8	6.8	40.3	39.6	53.9	14.3	100	0	
Hori.	9748.000	AV	36.2	38.6	8.0	40.0	42.8	53.9	11.1	100	0	
Hori.	12185.000	AV	36.3	39.4	9.0	39.8	44.9	53.9	9.0	100	0	
Vert.	4874.000	PK	56.1	30.9	5.5	39.7	52.8	73.9	21.1	100	15	
Vert.	7311.000	PK	46.6	36.8	6.8	40.3	49.9	73.9	24.0	100	0	
Vert.	9748.000	PK	45.3	38.6	8.0	40.0	51.9	73.9	22.0	140	37	
Vert.	12185.000	PK	44.9	39.4	9.0	39.8	53.5	73.9	20.4	100	0	
Vert.	4874.000	AV	53.8	30.9	5.5	39.7	50.5	53.9	3.4	100	15	
Vert.	7311.000	AV	36.7	36.8	6.8	40.3	40.0	53.9	13.9	100	0	
Vert.	9748.000	AV	37.0	38.6	8.0	40.0	43.6	53.9	10.3	140	37	
Vert.	12185.000	AV	36.5	39.4	9.0	39.8	45.1	53.9	8.8	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11b	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	56.7	26.6	13.6	41.1	55.8	73.9	18.1	100	146	
Hori.	4924.000	PK	58.4	31.1	5.5	39.6	55.4	73.9	18.5	100	314	
Hori.	7386.000	PK	45.9	36.9	6.8	40.4	49.2	73.9	24.7	100	0	
Hori.	9848.000	PK	46.0	38.6	8.0	39.9	52.7	73.9	21.2	114	41	
Hori.	12310.000	PK	44.0	39.3	9.0	39.9	52.4	73.9	21.5	100	0	
Hori.	2483.500	AV	38.6	26.6	13.6	41.1	37.7	53.9	16.2	100	146	
Hori.	4924.000	AV	56.7	31.1	5.5	39.6	53.7	53.9	**0.2**	100	314	
Hori.	7386.000	AV	36.8	36.9	6.8	40.4	40.1	53.9	13.8	100	0	
Hori.	9848.000	AV	36.7	38.6	8.0	39.9	43.4	53.9	10.5	114	41	
Hori.	12310.000	AV	35.2	39.3	9.0	39.9	43.6	53.9	10.3	100	0	
Vert.	2483.500	PK	56.4	26.6	13.6	41.1	55.5	73.9	18.4	100	125	
Vert.	4924.000	PK	56.2	31.1	5.5	39.6	53.2	73.9	20.7	100	347	
Vert.	7386.000	PK	45.6	36.9	6.8	40.4	48.9	73.9	25.0	100	0	
Vert.	9848.000	PK	45.0	38.6	8.0	39.9	51.7	73.9	22.2	100	0	
Vert.	12310.000	PK	44.3	39.3	9.0	39.9	52.7	73.9	21.2	100	0	
Vert.	2483.500	AV	38.3	26.6	13.6	41.1	37.4	53.9	16.5	100	125	
Vert.	4924.000	AV	54.1	31.1	5.5	39.6	51.1	53.9	2.8	100	347	
Vert.	7386.000	AV	36.6	36.9	6.8	40.4	39.9	53.9	14.0	100	0	
Vert.	9848.000	AV	36.2	38.6	8.0	39.9	42.9	53.9	11.0	100	0	
Vert.	12310.000	AV	35.4	39.3	9.0	39.9	43.8	53.9	10.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11g	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	55.6	26.4	13.6	41.1	54.5	73.9	19.4	100	230	
Hori.	4824.000	PK	53.0	30.7	5.5	39.8	49.4	73.9	24.5	100	311	
Hori.	7236.000	PK	45.4	36.7	6.9	40.2	48.8	73.9	25.1	100	0	
Hori.	9648.000	PK	45.1	38.5	8.0	40.1	51.5	73.9	22.4	100	0	
Hori.	12060.000	PK	47.0	39.5	8.9	39.6	55.8	73.9	18.1	100	0	
Hori.	2390.000	AV	42.2	26.4	13.6	41.1	41.1	53.9	12.8	100	230	*1)
Vert.	2390.000	PK	58.0	26.4	13.6	41.1	56.9	73.9	17.0	100	71	
Vert.	4824.000	PK	52.1	30.7	5.5	39.8	48.5	73.9	25.4	100	0	
Vert.	7236.000	PK	45.6	36.7	6.9	40.2	49.0	73.9	24.9	100	0	
Vert.	9648.000	PK	46.4	38.5	8.0	40.1	52.8	73.9	21.1	160	0	
Vert.	12060.000	PK	46.7	39.5	8.9	39.6	55.5	73.9	18.4	100	0	
Vert.	2390.000	AV	43.5	26.4	13.6	41.1	42.4	53.9	**11.5**	100	71	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4824.000	AV	43.6	30.7	5.5	39.8	1.0	41.0	53.9	12.9	
Hori.	7236.000	AV	36.6	36.7	6.9	40.2	1.0	41.0	53.9	12.9	
Hori.	9648.000	AV	36.7	38.5	8.0	40.1	1.0	44.1	53.9	9.8	
Hori.	12060.000	AV	37.3	39.5	8.9	39.6	1.0	47.1	53.9	**6.8**	
Vert.	4824.000	AV	41.7	30.7	5.5	39.8	1.0	39.1	53.9	14.8	
Vert.	7236.000	AV	36.4	36.7	6.9	40.2	1.0	40.8	53.9	13.1	
Vert.	9648.000	AV	36.4	38.5	8.0	40.1	1.0	43.8	53.9	10.1	
Vert.	12060.000	AV	37.1	39.5	8.9	39.6	1.0	46.9	53.9	7.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.7	26.4	13.6	41.1	92.6	-	-	Carrier
Hori.	2400.000	PK	52.6	26.4	13.6	41.1	51.5	72.6	21.1	
Vert.	2412.000	PK	96.1	26.4	13.6	41.1	95.0	-	-	Carrier
Vert.	2400.000	PK	55.8	26.4	13.6	41.1	54.7	75.0	20.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	December 5, 2014	December 7, 2014	December 8, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH	21 deg.C, 35 %RH
Engineer	Tatsuya Arai	Kenichi Adachi	Akio Hayashi
Mode	Tx, 2437 MHz		
	Tx, IEEE802.11g	Antenna: External	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	199.828	QP	36.4	16.3	7.8	32.1	28.4	43.5	15.1	169	153	
Hori.	4874.000	PK	53.1	30.9	5.5	39.7	49.8	73.9	24.1	100	311	
Hori.	7311.000	PK	45.2	36.8	6.8	40.3	48.5	73.9	25.4	100	0	
Hori.	9748.000	PK	45.1	38.6	8.0	40.0	51.7	73.9	22.2	100	0	
Hori.	12185.000	PK	45.0	39.4	9.0	39.8	53.6	73.9	20.3	100	0	
Vert.	45.548	QP	51.7	12.3	6.7	32.2	38.5	40.0	**1.5**	110	283	
Vert.	71.593	QP	55.0	6.3	6.9	32.2	36.0	40.0	4.0	100	202	
Vert.	92.943	QP	46.7	8.7	7.4	32.1	30.7	43.5	12.8	100	170	
Vert.	199.832	QP	39.0	16.3	7.8	32.1	31.0	43.5	12.5	100	264	
Vert.	4874.000	PK	54.3	30.9	5.5	39.7	51.0	73.9	22.9	100	0	
Vert.	7311.000	PK	45.6	36.8	6.8	40.3	48.9	73.9	25.0	100	0	
Vert.	9748.000	PK	45.8	38.6	8.0	40.0	52.4	73.9	21.5	158	0	
Vert.	12185.000	PK	45.2	39.4	9.0	39.8	53.8	73.9	20.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	43.6	30.9	5.5	39.7	1.0	41.3	53.9	12.6	
Hori.	7311.000	AV	36.7	36.8	6.8	40.3	1.0	41.0	53.9	12.9	
Hori.	9748.000	AV	36.5	38.6	8.0	40.0	1.0	44.1	53.9	9.8	
Hori.	12185.000	AV	36.2	39.4	9.0	39.8	1.0	45.8	53.9	**8.1**	
Vert.	4874.000	AV	44.6	30.9	5.5	39.7	1.0	42.3	53.9	11.6	
Vert.	7311.000	AV	36.5	36.8	6.8	40.3	1.0	40.8	53.9	13.1	
Vert.	9748.000	AV	36.3	38.6	8.0	40.0	1.0	43.9	53.9	10.0	
Vert.	12185.000	AV	36.1	39.4	9.0	39.8	1.0	45.7	53.9	8.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11g	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	62.0	26.6	13.6	41.1	61.1	73.9	12.8	100	150	
Hori.	4924.000	PK	51.6	31.1	5.5	39.6	48.6	73.9	25.3	100	305	
Hori.	7386.000	PK	44.6	36.9	6.8	40.4	47.9	73.9	26.0	100	0	
Hori.	9848.000	PK	44.9	38.6	8.0	39.9	51.6	73.9	22.3	100	0	
Hori.	12310.000	PK	44.0	39.3	9.0	39.9	52.4	73.9	21.5	100	0	
Hori.	2483.500	AV	47.8	26.6	13.6	41.1	46.9	53.9	7.0	100	150	*1)
Vert.	2483.500	PK	63.8	26.6	13.6	41.1	62.9	73.9	11.0	100	127	
Vert.	4924.000	PK	52.9	31.1	5.5	39.6	49.9	73.9	24.0	100	0	
Vert.	7386.000	PK	45.3	36.9	6.8	40.4	48.6	73.9	25.3	100	0	
Vert.	9848.000	PK	45.9	38.6	8.0	39.9	52.6	73.9	21.3	153	0	
Vert.	12310.000	PK	44.6	39.3	9.0	39.9	53.0	73.9	20.9	100	0	
Vert.	2483.500	AV	48.2	26.6	13.6	41.1	47.3	53.9	**6.6**	100	127	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4924.000	AV	43.3	31.1	5.5	39.6	1.0	41.3	53.9	12.6	
Hori.	7386.000	AV	36.2	36.9	6.8	40.4	1.0	40.5	53.9	13.4	
Hori.	9848.000	AV	35.8	38.6	8.0	39.9	1.0	43.5	53.9	10.4	
Hori.	12310.000	AV	35.4	39.3	9.0	39.9	1.0	44.8	53.9	**9.1**	
Vert.	4924.000	AV	43.9	31.1	5.5	39.6	1.0	41.9	53.9	12.0	
Vert.	7386.000	AV	36.5	36.9	6.8	40.4	1.0	40.8	53.9	13.1	
Vert.	9848.000	AV	36.1	38.6	8.0	39.9	1.0	43.8	53.9	10.1	
Vert.	12310.000	AV	35.4	39.3	9.0	39.9	1.0	44.8	53.9	**9.1**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11n HT20	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	56.4	26.4	13.6	41.1	55.3	73.9	18.6	100	356	
Hori.	4824.000	PK	51.3	30.7	5.5	39.8	47.7	73.9	26.2	106	304	
Hori.	7236.000	PK	45.7	36.7	6.9	40.2	49.1	73.9	24.8	100	0	
Hori.	9648.000	PK	45.9	38.5	8.0	40.1	52.3	73.9	21.6	120	339	
Hori.	12060.000	PK	47.0	39.5	8.9	39.6	55.8	73.9	18.1	100	0	
Hori.	2390.000	AV	43.2	26.4	13.6	41.1	42.1	53.9	11.8	100	356	*1)
Vert.	2390.000	PK	59.9	26.4	13.6	41.1	58.8	73.9	15.1	100	33	
Vert.	4824.000	PK	51.5	30.7	5.5	39.8	47.9	73.9	26.0	100	0	
Vert.	7236.000	PK	45.6	36.7	6.9	40.2	49.0	73.9	24.9	100	0	
Vert.	9648.000	PK	46.5	38.5	8.0	40.1	52.9	73.9	21.0	154	0	
Vert.	12060.000	PK	46.6	39.5	8.9	39.6	55.4	73.9	18.5	100	0	
Vert.	2390.000	AV	45.5	26.4	13.6	41.1	44.4	53.9	**9.5**	100	33	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4824.000	AV	43.2	30.7	5.5	39.8	1.0	40.6	53.9	13.3	
Hori.	7236.000	AV	36.5	36.7	6.9	40.2	1.0	40.9	53.9	13.0	
Hori.	9648.000	AV	37.1	38.5	8.0	40.1	1.0	44.5	53.9	9.4	
Hori.	12060.000	AV	37.5	39.5	8.9	39.6	1.0	47.3	53.9	**6.6**	
Vert.	4824.000	AV	42.2	30.7	5.5	39.8	1.0	39.6	53.9	14.3	
Vert.	7236.000	AV	36.5	36.7	6.9	40.2	1.0	40.9	53.9	13.0	
Vert.	9648.000	AV	36.5	38.5	8.0	40.1	1.0	43.9	53.9	10.0	
Vert.	12060.000	AV	37.0	39.5	8.9	39.6	1.0	46.8	53.9	7.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.8	26.4	13.6	41.1	92.7	-	-	Carrier
Hori.	2400.000	PK	54.2	26.4	13.6	41.1	53.1	72.7	19.6	
Vert.	2412.000	PK	96.4	26.4	13.6	41.1	95.3	-	-	Carrier
Vert.	2400.000	PK	56.6	26.4	13.6	41.1	55.5	75.3	19.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11n HT20	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	51.7	30.9	5.5	39.7	48.4	73.9	25.5	100	2	
Hori.	7311.000	PK	45.0	36.8	6.8	40.3	48.3	73.9	25.6	100	0	
Hori.	9748.000	PK	45.5	38.6	8.0	40.0	52.1	73.9	21.8	100	0	
Hori.	12185.000	PK	45.4	39.4	9.0	39.8	54.0	73.9	**19.9**	100	0	
Vert.	4874.000	PK	53.8	30.9	5.5	39.7	50.5	73.9	23.4	100	0	
Vert.	7311.000	PK	45.6	36.8	6.8	40.3	48.9	73.9	25.0	100	0	
Vert.	9748.000	PK	45.7	38.6	8.0	40.0	52.3	73.9	21.6	151	0	
Vert.	12185.000	PK	45.3	39.4	9.0	39.8	53.9	73.9	20.0	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	43.1	30.9	5.5	39.7	1.0	40.8	53.9	13.1	
Hori.	7311.000	AV	36.3	36.8	6.8	40.3	1.0	40.6	53.9	13.3	
Hori.	9748.000	AV	36.3	38.6	8.0	40.0	1.0	43.9	53.9	10.0	
Hori.	12185.000	AV	36.0	39.4	9.0	39.8	1.0	45.6	53.9	8.3	
Vert.	4874.000	AV	44.3	30.9	5.5	39.7	1.0	42.0	53.9	11.9	
Vert.	7311.000	AV	36.4	36.8	6.8	40.3	1.0	40.7	53.9	13.2	
Vert.	9748.000	AV	36.2	38.6	8.0	40.0	1.0	43.8	53.9	10.1	
Vert.	12185.000	AV	36.2	39.4	9.0	39.8	1.0	45.8	53.9	**8.1**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	December 5, 2014	December 7, 2014
Temperature / Humidity	25 deg.C, 33 %RH	23 deg.C, 22 %RH
Engineer	Tatsuya Arai	Kenichi Adachi
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11n HT20	Antenna: External

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	63.4	26.6	13.6	41.1	62.5	73.9	11.4	100	148	
Hori.	4924.000	PK	52.1	31.1	5.5	39.6	49.1	73.9	24.8	100	309	
Hori.	7386.000	PK	45.1	36.9	6.8	40.4	48.4	73.9	25.5	100	0	
Hori.	9848.000	PK	45.3	38.6	8.0	39.9	52.0	73.9	21.9	100	0	
Hori.	12310.000	PK	43.5	39.3	9.0	39.9	51.9	73.9	22.0	100	0	
Hori.	2483.500	AV	49.1	26.6	13.6	41.1	48.2	53.9	5.7	100	148	*1)
Vert.	2483.500	PK	63.5	26.6	13.6	41.1	62.6	73.9	11.3	100	192	
Vert.	4924.000	PK	52.4	31.1	5.5	39.6	49.4	73.9	24.5	100	0	
Vert.	7386.000	PK	45.3	36.9	6.8	40.4	48.6	73.9	25.3	100	0	
Vert.	9848.000	PK	45.8	38.6	8.0	39.9	52.5	73.9	21.4	157	0	
Vert.	12310.000	PK	44.8	39.3	9.0	39.9	53.2	73.9	20.7	100	0	
Vert.	2483.500	AV	50.2	26.6	13.6	41.1	49.3	53.9	**4.6**	100	192	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4924.000	AV	43.3	31.1	5.5	39.6	1.0	41.3	53.9	12.6	
Hori.	7386.000	AV	36.4	36.9	6.8	40.4	1.0	40.7	53.9	13.2	
Hori.	9848.000	AV	36.0	38.6	8.0	39.9	1.0	43.7	53.9	10.2	
Hori.	12310.000	AV	35.4	39.3	9.0	39.9	1.0	44.8	53.9	9.1	
Vert.	4924.000	AV	43.3	31.1	5.5	39.6	1.0	41.3	53.9	12.6	
Vert.	7386.000	AV	36.4	36.9	6.8	40.4	1.0	40.7	53.9	13.2	
Vert.	9848.000	AV	36.1	38.6	8.0	39.9	1.0	43.8	53.9	10.1	
Vert.	12310.000	AV	35.5	39.3	9.0	39.9	1.0	44.9	53.9	**9.0**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11b	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	55.0	26.4	13.6	41.1	53.9	73.9	20.0	100	216	
Hori.	4824.000	PK	58.9	30.7	5.5	39.8	55.3	73.9	18.6	118	302	
Hori.	7236.000	PK	44.4	36.7	6.9	40.2	47.8	73.9	26.1	100	0	
Hori.	9648.000	PK	45.6	38.5	8.0	40.1	52.0	73.9	21.9	100	0	
Hori.	12060.000	PK	44.6	39.5	8.9	39.6	53.4	73.9	20.5	100	0	
Hori.	2390.000	AV	37.6	26.4	13.6	41.1	36.5	53.9	17.4	100	216	
Hori.	4824.000	AV	55.0	30.7	5.5	39.8	51.4	53.9	**2.5**	118	302	
Hori.	7236.000	AV	36.4	36.7	6.9	40.2	39.8	53.9	14.1	100	0	
Hori.	9648.000	AV	35.3	38.5	8.0	40.1	41.7	53.9	12.2	100	0	
Hori.	12060.000	AV	35.6	39.5	8.9	39.6	44.4	53.9	9.5	100	0	
Vert.	2390.000	PK	55.3	26.4	13.6	41.1	54.2	73.9	19.7	118	65	
Vert.	4824.000	PK	57.1	30.7	5.5	39.8	53.5	73.9	20.4	100	344	
Vert.	7236.000	PK	44.5	36.7	6.9	40.2	47.9	73.9	26.0	100	0	
Vert.	9648.000	PK	44.9	38.5	8.0	40.1	51.3	73.9	22.6	100	0	
Vert.	12060.000	PK	44.8	39.5	8.9	39.6	53.6	73.9	20.3	100	0	
Vert.	2390.000	AV	37.4	26.4	13.6	41.1	36.3	53.9	17.6	118	65	
Vert.	4824.000	AV	54.0	30.7	5.5	39.8	50.4	53.9	3.5	100	344	
Vert.	7236.000	AV	36.3	36.7	6.9	40.2	39.7	53.9	14.2	100	0	
Vert.	9648.000	AV	35.2	38.5	8.0	40.1	41.6	53.9	12.3	100	0	
Vert.	12060.000	AV	35.7	39.5	8.9	39.6	44.5	53.9	9.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	96.4	26.4	13.6	41.1	95.3	-	-	Carrier
Hori.	2397.504	PK	54.0	26.4	13.6	41.1	52.9	75.3	22.4	
Hori.	2400.000	PK	52.2	26.4	13.6	41.1	51.1	75.3	24.2	
Vert.	2412.000	PK	96.5	26.4	13.6	41.1	95.4	-	-	Carrier
Vert.	2397.509	PK	53.9	26.4	13.6	41.1	52.8	75.4	22.6	
Vert.	2400.000	PK	51.5	26.4	13.6	41.1	50.4	75.4	25.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11b	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	57.3	30.9	5.5	39.7	54.0	73.9	19.9	100	288	
Hori.	7311.000	PK	47.6	36.8	6.8	40.3	50.9	73.9	23.0	100	0	
Hori.	9748.000	PK	44.8	38.6	8.0	40.0	51.4	73.9	22.5	100	0	
Hori.	12185.000	PK	44.5	39.4	9.0	39.8	53.1	73.9	20.8	100	0	
Hori.	4874.000	AV	54.2	30.9	5.5	39.7	50.9	53.9	**3.0**	100	288	
Hori.	7311.000	AV	36.5	36.8	6.8	40.3	39.8	53.9	14.1	100	0	
Hori.	9748.000	AV	35.1	38.6	8.0	40.0	41.7	53.9	12.2	100	0	
Hori.	12185.000	AV	35.5	39.4	9.0	39.8	44.1	53.9	9.8	100	0	
Vert.	4874.000	PK	56.9	30.9	5.5	39.7	53.6	73.9	20.3	100	354	
Vert.	7311.000	PK	45.3	36.8	6.8	40.3	48.6	73.9	25.3	100	0	
Vert.	9748.000	PK	44.6	38.6	8.0	40.0	51.2	73.9	22.7	100	0	
Vert.	12185.000	PK	45.7	39.4	9.0	39.8	54.3	73.9	19.6	100	0	
Vert.	4874.000	AV	53.6	30.9	5.5	39.7	50.3	53.9	3.6	100	354	
Vert.	7311.000	AV	37.0	36.8	6.8	40.3	40.3	53.9	13.6	100	0	
Vert.	9748.000	AV	35.4	38.6	8.0	40.0	42.0	53.9	11.9	100	0	
Vert.	12185.000	AV	35.3	39.4	9.0	39.8	43.9	53.9	10.0	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11b	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	53.4	26.6	13.6	41.1	52.5	73.9	21.4	100	218	
Hori.	4924.000	PK	59.9	31.1	5.5	39.6	56.9	73.9	17.0	100	299	
Hori.	7386.000	PK	46.2	36.9	6.8	40.4	49.5	73.9	24.4	100	0	
Hori.	9848.000	PK	45.6	38.6	8.0	39.9	52.3	73.9	21.6	143	54	
Hori.	12310.000	PK	45.4	39.3	9.0	39.9	53.8	73.9	20.1	100	0	
Hori.	2483.500	AV	37.5	26.6	13.6	41.1	36.6	53.9	17.3	100	218	
Hori.	4924.000	AV	56.6	31.1	5.5	39.6	53.6	53.9	**0.3**	100	299	
Hori.	7386.000	AV	37.0	36.9	6.8	40.4	40.3	53.9	13.6	100	0	
Hori.	9848.000	AV	36.8	38.6	8.0	39.9	43.5	53.9	10.4	143	54	
Hori.	12310.000	AV	35.8	39.3	9.0	39.9	44.2	53.9	9.7	100	0	
Vert.	2483.500	PK	52.8	26.6	13.6	41.1	51.9	73.9	22.0	116	105	
Vert.	4924.000	PK	58.6	31.1	5.5	39.6	55.6	73.9	18.3	103	353	
Vert.	7386.000	PK	45.8	36.9	6.8	40.4	49.1	73.9	24.8	100	0	
Vert.	9848.000	PK	44.4	38.6	8.0	39.9	51.1	73.9	22.8	100	0	
Vert.	12310.000	PK	46.3	39.3	9.0	39.9	54.7	73.9	19.2	100	0	
Vert.	2483.500	AV	37.6	26.6	13.6	41.1	36.7	53.9	17.2	116	105	
Vert.	4924.000	AV	55.6	31.1	5.5	39.6	52.6	53.9	1.3	103	353	
Vert.	7386.000	AV	36.8	36.9	6.8	40.4	40.1	53.9	13.8	100	0	
Vert.	9848.000	AV	35.6	38.6	8.0	39.9	42.3	53.9	11.6	100	0	
Vert.	12310.000	AV	35.7	39.3	9.0	39.9	44.1	53.9	9.8	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2412 MHz	
	Tx, IEEE802.11g	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	60.7	26.4	13.6	41.1	59.6	73.9	14.3	100	216	
Hori.	4824.000	PK	54.4	30.7	5.5	39.8	50.8	73.9	23.1	120	304	
Hori.	7236.000	PK	45.0	36.7	6.9	40.2	48.4	73.9	25.5	100	0	
Hori.	9648.000	PK	45.5	38.5	8.0	40.1	51.9	73.9	22.0	100	0	
Hori.	12060.000	PK	45.1	39.5	8.9	39.6	53.9	73.9	20.0	100	0	
Hori.	2390.000	AV	44.2	26.4	13.6	41.1	43.1	53.9	10.8	100	216	*1)
Vert.	2390.000	PK	61.7	26.4	13.6	41.1	60.6	73.9	13.3	123	77	
Vert.	4824.000	PK	53.7	30.7	5.5	39.8	50.1	73.9	23.8	100	359	
Vert.	7236.000	PK	46.1	36.7	6.9	40.2	49.5	73.9	24.4	100	0	
Vert.	9648.000	PK	44.4	38.5	8.0	40.1	50.8	73.9	23.1	100	0	
Vert.	12060.000	PK	44.9	39.5	8.9	39.6	53.7	73.9	20.2	100	0	
Vert.	2390.000	AV	45.3	26.4	13.6	41.1	44.2	53.9	**9.7**	123	77	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4824.000	AV	43.4	30.7	5.5	39.8	2.5	42.3	53.9	11.6	
Hori.	7236.000	AV	36.2	36.7	6.9	40.2	2.5	42.1	53.9	11.8	
Hori.	9648.000	AV	34.9	38.5	8.0	40.1	2.5	43.8	53.9	10.1	
Hori.	12060.000	AV	35.6	39.5	8.9	39.6	2.5	46.9	53.9	**7.0**	
Vert.	4824.000	AV	42.1	30.7	5.5	39.8	2.5	41.0	53.9	12.9	
Vert.	7236.000	AV	36.2	36.7	6.9	40.2	2.5	42.1	53.9	11.8	
Vert.	9648.000	AV	35.2	38.5	8.0	40.1	2.5	44.1	53.9	9.8	
Vert.	12060.000	AV	35.6	39.5	8.9	39.6	2.5	46.9	53.9	**7.0**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	92.6	26.4	13.6	41.1	91.5	-	-	Carrier
Hori.	2393.266	PK	55.9	26.4	13.6	41.1	54.8	71.5	16.7	
Hori.	2400.000	PK	53.5	26.4	13.6	41.1	52.4	71.5	19.1	
Vert.	2412.000	PK	93.4	26.4	13.6	41.1	92.3	-	-	Carrier
Vert.	2393.246	PK	56.7	26.4	13.6	41.1	55.6	72.3	16.7	
Vert.	2400.000	PK	54.2	26.4	13.6	41.1	53.1	72.3	19.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11g	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	54.6	30.9	5.5	39.7	51.3	73.9	22.6	100	302	
Hori.	7311.000	PK	46.0	36.8	6.8	40.3	49.3	73.9	24.6	100	0	
Hori.	9748.000	PK	44.7	38.6	8.0	40.0	51.3	73.9	22.6	100	0	
Hori.	12185.000	PK	45.0	39.4	9.0	39.8	53.6	73.9	20.3	100	0	
Vert.	4874.000	PK	53.6	30.9	5.5	39.7	50.3	73.9	23.6	109	359	
Vert.	7311.000	PK	46.8	36.8	6.8	40.3	50.1	73.9	23.8	100	0	
Vert.	9748.000	PK	44.7	38.6	8.0	40.0	51.3	73.9	22.6	100	0	
Vert.	12185.000	PK	45.5	39.4	9.0	39.8	54.1	73.9	**19.8**	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	43.4	30.9	5.5	39.7	2.5	42.6	53.9	11.3	
Hori.	7311.000	AV	36.9	36.8	6.8	40.3	2.5	42.7	53.9	11.2	
Hori.	9748.000	AV	35.3	38.6	8.0	40.0	2.5	44.4	53.9	9.5	
Hori.	12185.000	AV	35.9	39.4	9.0	39.8	2.5	47.0	53.9	**6.9**	
Vert.	4874.000	AV	42.5	30.9	5.5	39.7	2.5	41.7	53.9	12.2	
Vert.	7311.000	AV	37.1	36.8	6.8	40.3	2.5	42.9	53.9	11.0	
Vert.	9748.000	AV	35.3	38.6	8.0	40.0	2.5	44.4	53.9	9.5	
Vert.	12185.000	AV	35.7	39.4	9.0	39.8	2.5	46.8	53.9	7.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11g	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	50.1	26.6	13.6	41.1	49.2	73.9	24.7	100	203	
Hori.	4924.000	PK	56.3	31.1	5.5	39.6	53.3	73.9	20.6	100	297	
Hori.	7386.000	PK	45.3	36.9	6.8	40.4	48.6	73.9	25.3	100	0	
Hori.	9848.000	PK	45.6	38.6	8.0	39.9	52.3	73.9	21.6	100	0	
Hori.	12310.000	PK	44.9	39.3	9.0	39.9	53.3	73.9	20.6	100	0	
Hori.	2483.500	AV	44.4	26.6	13.6	41.1	43.5	53.9	10.4	100	203	*1)
Vert.	2483.500	PK	60.0	26.6	13.6	41.1	59.1	73.9	14.8	100	79	
Vert.	4924.000	PK	55.2	31.1	5.5	39.6	52.2	73.9	21.7	103	359	
Vert.	7386.000	PK	45.5	36.9	6.8	40.4	48.8	73.9	25.1	100	0	
Vert.	9848.000	PK	45.4	38.6	8.0	39.9	52.1	73.9	21.8	100	0	
Vert.	12310.000	PK	44.7	39.3	9.0	39.9	53.1	73.9	20.8	100	0	
Vert.	2483.500	AV	44.5	26.6	13.6	41.1	43.6	53.9	**10.3**	100	79	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4924.000	AV	44.9	31.1	5.5	39.6	2.5	44.4	53.9	9.5	
Hori.	7386.000	AV	36.8	36.9	6.8	40.4	2.5	42.6	53.9	11.3	
Hori.	9848.000	AV	35.7	38.6	8.0	39.9	2.5	44.9	53.9	9.0	
Hori.	12310.000	AV	35.7	39.3	9.0	39.9	2.5	46.6	53.9	**7.3**	
Vert.	4924.000	AV	44.1	31.1	5.5	39.6	2.5	43.6	53.9	10.3	
Vert.	7386.000	AV	36.7	36.9	6.8	40.4	2.5	42.5	53.9	11.4	
Vert.	9848.000	AV	35.6	38.6	8.0	39.9	2.5	44.8	53.9	9.1	
Vert.	12310.000	AV	35.7	39.3	9.0	39.9	2.5	46.6	53.9	**7.3**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	September 28, 2014	September 29, 2014	December 8, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH	21 deg.C, 35 %RH
Engineer	Shinichi Takano	Tatsuya Arai	Akio Hayashi
Mode	Tx, 2412 MHz		
	Tx, IEEE802.11n HT20	Antenna: PCB	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	201.143	QP	34.8	16.3	7.9	32.1	26.9	43.5	16.6	152	155	
Hori.	2390.000	PK	63.1	26.4	13.6	41.1	62.0	73.9	11.9	100	230	
Hori.	4824.000	PK	52.3	30.7	5.5	39.8	48.7	73.9	25.2	100	298	
Hori.	7236.000	PK	44.9	36.7	6.9	40.2	48.3	73.9	25.6	100	0	
Hori.	9648.000	PK	45.2	38.5	8.0	40.1	51.6	73.9	22.3	100	0	
Hori.	12060.000	PK	44.4	39.5	8.9	39.6	53.2	73.9	20.7	100	0	
Hori.	2390.000	AV	45.3	26.4	13.6	41.1	44.2	53.9	9.7	100	230	*1)
Vert.	45.523	QP	51.1	12.3	6.7	32.2	37.9	40.0	**2.1**	100	280	
Vert.	2390.000	PK	63.9	26.4	13.6	41.1	62.8	73.9	11.1	126	77	
Vert.	4824.000	PK	52.0	30.7	5.5	39.8	48.4	73.9	25.5	100	359	
Vert.	7236.000	PK	45.5	36.7	6.9	40.2	48.9	73.9	25.0	100	0	
Vert.	9648.000	PK	44.7	38.5	8.0	40.1	51.1	73.9	22.8	100	0	
Vert.	12060.000	PK	45.1	39.5	8.9	39.6	53.9	73.9	20.0	100	0	
Vert.	2390.000	AV	45.8	26.4	13.6	41.1	44.7	53.9	9.2	126	77	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4824.000	AV	42.6	30.7	5.5	39.8	2.3	41.3	53.9	12.6	
Hori.	7236.000	AV	36.1	36.7	6.9	40.2	2.3	41.8	53.9	12.1	
Hori.	9648.000	AV	35.3	38.5	8.0	40.1	2.3	44.0	53.9	9.9	
Hori.	12060.000	AV	35.6	39.5	8.9	39.6	2.3	46.7	53.9	7.2	
Vert.	4824.000	AV	41.6	30.7	5.5	39.8	2.3	40.3	53.9	13.6	
Vert.	7236.000	AV	36.0	36.7	6.9	40.2	2.3	41.7	53.9	12.2	
Vert.	9648.000	AV	35.3	38.5	8.0	40.1	2.3	44.0	53.9	9.9	
Vert.	12060.000	AV	36.6	39.5	8.9	39.6	2.3	47.7	53.9	**6.2**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	92.5	26.4	13.6	41.1	91.4	-	-	Carrier
Hori.	2400.000	PK	55.7	26.4	13.6	41.1	54.6	71.4	16.8	
Vert.	2412.000	PK	93.2	26.4	13.6	41.1	92.1	-	-	Carrier
Vert.	2400.000	PK	56.1	26.4	13.6	41.1	55.0	72.1	17.1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2437 MHz	
	Tx, IEEE802.11n HT20	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	52.9	30.9	5.5	39.7	49.6	73.9	24.3	100	293	
Hori.	7311.000	PK	45.3	36.8	6.8	40.3	48.6	73.9	25.3	100	0	
Hori.	9748.000	PK	44.3	38.6	8.0	40.0	50.9	73.9	23.0	100	0	
Hori.	12185.000	PK	45.8	39.4	9.0	39.8	54.4	73.9	**19.5**	100	0	
Vert.	4874.000	PK	51.5	30.9	5.5	39.7	48.2	73.9	25.7	110	359	
Vert.	7311.000	PK	46.4	36.8	6.8	40.3	49.7	73.9	24.2	100	0	
Vert.	9748.000	PK	44.4	38.6	8.0	40.0	51.0	73.9	22.9	100	0	
Vert.	12185.000	PK	44.8	39.4	9.0	39.8	53.4	73.9	20.5	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	42.7	30.9	5.5	39.7	2.3	41.7	53.9	12.2	
Hori.	7311.000	AV	36.6	36.8	6.8	40.3	2.3	42.2	53.9	11.7	
Hori.	9748.000	AV	35.3	38.6	8.0	40.0	2.3	44.2	53.9	9.7	
Hori.	12185.000	AV	35.6	39.4	9.0	39.8	2.3	46.5	53.9	**7.4**	
Vert.	4874.000	AV	41.8	30.9	5.5	39.7	2.3	40.8	53.9	13.1	
Vert.	7311.000	AV	36.5	36.8	6.8	40.3	2.3	42.1	53.9	11.8	
Vert.	9748.000	AV	35.1	38.6	8.0	40.0	2.3	44.0	53.9	9.9	
Vert.	12185.000	AV	35.6	39.4	9.0	39.8	2.3	46.5	53.9	**7.4**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	September 28, 2014	September 29, 2014
Temperature / Humidity	26 deg.C, 40 %RH	25 deg.C, 45 %RH
Engineer	Shinichi Takano	Tatsuya Arai
Mode	Tx, 2462 MHz	
	Tx, IEEE802.11n HT20	Antenna: PCB

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	61.6	26.6	13.6	41.1	60.7	73.9	13.2	100	212	
Hori.	4924.000	PK	54.2	31.1	5.5	39.6	51.2	73.9	22.7	100	293	
Hori.	7386.000	PK	45.9	36.9	6.8	40.4	49.2	73.9	24.7	100	0	
Hori.	9848.000	PK	45.5	38.6	8.0	39.9	52.2	73.9	21.7	100	0	
Hori.	12310.000	PK	45.0	39.3	9.0	39.9	53.4	73.9	20.5	100	0	
Hori.	2483.500	AV	45.5	26.6	13.6	41.1	44.6	53.9	**9.3**	100	212	*1)
Vert.	2483.500	PK	60.3	26.6	13.6	41.1	59.4	73.9	14.5	100	84	
Vert.	4924.000	PK	53.7	31.1	5.5	39.6	50.7	73.9	23.2	110	359	
Vert.	7386.000	PK	46.4	36.9	6.8	40.4	49.7	73.9	24.2	100	0	
Vert.	9848.000	PK	44.5	38.6	8.0	39.9	51.2	73.9	22.7	100	0	
Vert.	12310.000	PK	45.1	39.3	9.0	39.9	53.5	73.9	20.4	100	0	
Vert.	2483.500	AV	45.1	26.6	13.6	41.1	44.2	53.9	9.7	100	84	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Out of Band emission (Leakage Power)

Average measurement value with duty factor

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.	4924.000	AV	44.3	31.1	5.5	39.6	2.3	43.6	53.9	10.3	
Hori.	7386.000	AV	36.7	36.9	6.8	40.4	2.3	42.3	53.9	11.6	
Hori.	9848.000	AV	35.6	38.6	8.0	39.9	2.3	44.6	53.9	9.3	
Hori.	12310.000	AV	35.7	39.3	9.0	39.9	2.3	46.4	53.9	**7.5**	
Vert.	4924.000	AV	43.1	31.1	5.5	39.6	2.3	42.4	53.9	11.5	
Vert.	7386.000	AV	36.7	36.9	6.8	40.4	2.3	42.3	53.9	11.6	
Vert.	9848.000	AV	35.6	38.6	8.0	39.9	2.3	44.6	53.9	9.3	
Vert.	12310.000	AV	35.6	39.3	9.0	39.9	2.3	46.3	53.9	7.6	

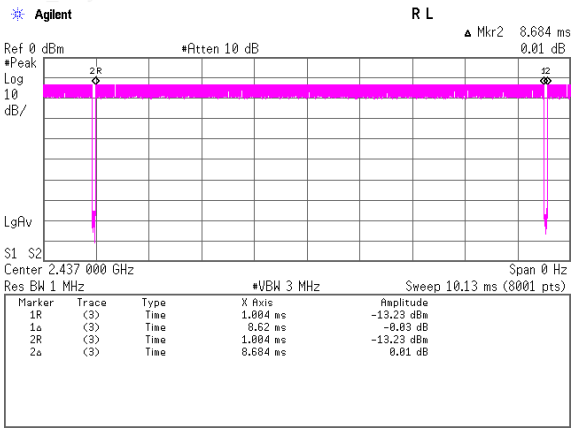
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

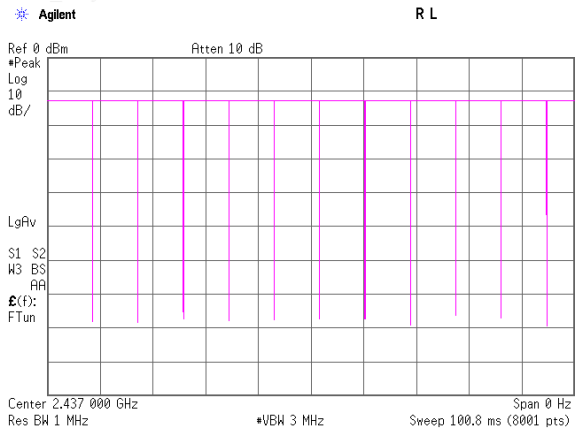
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Burst rate confirmation

Tx, IEEE802.11b, PN9, antenna port External, worst data mode 1Mbps

duty cycle = 0.008620 / 0.008684 = 0.993 (99.3%)





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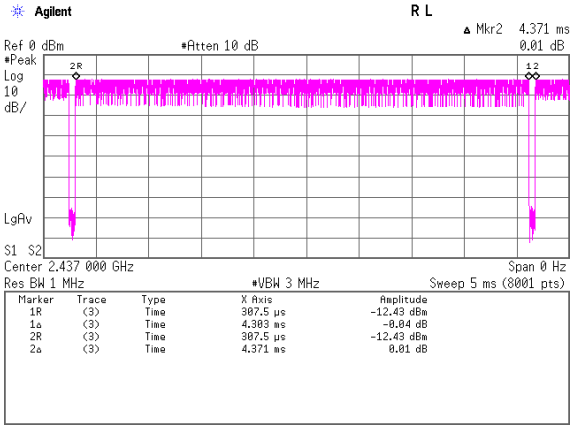
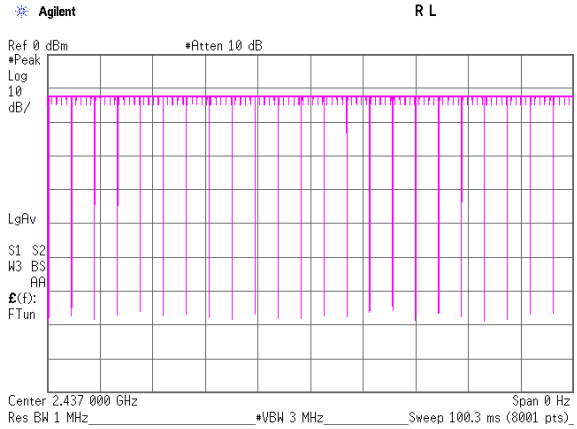
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Burst rate confirmation

Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps

duty cycle = 0.004303 / 0.004371 = 0.984 (98.4%)





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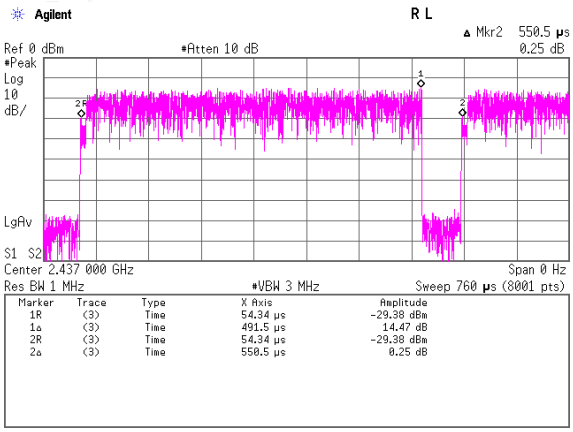
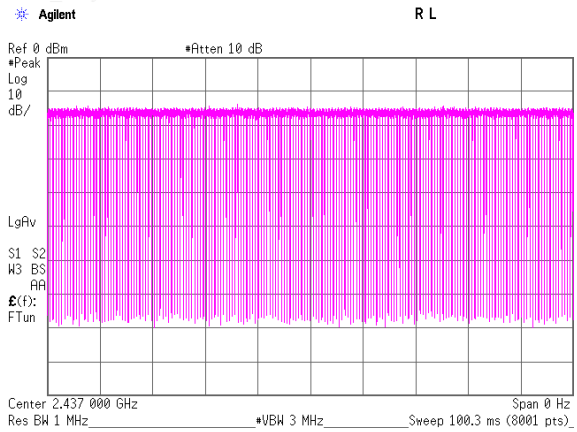
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Duty Factor Calculation chart

Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps

Duty Factor Calculation	
Duty Factor: 20log (1/duty cycle) = 1.0dB	
duty cycle = 0.0004915 / 0.0005505 = 0.893 (89.3%)	
Tx2_duty1 	Tx2_duty2 

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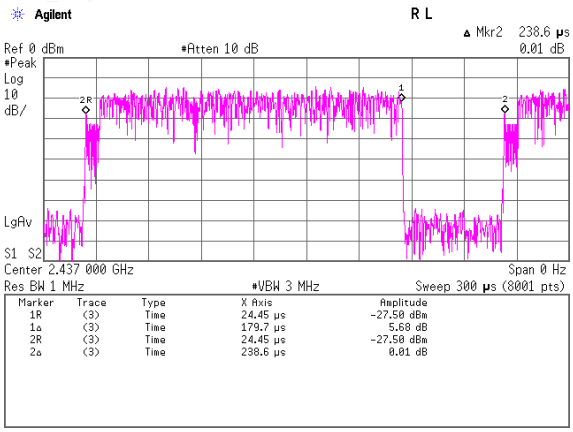
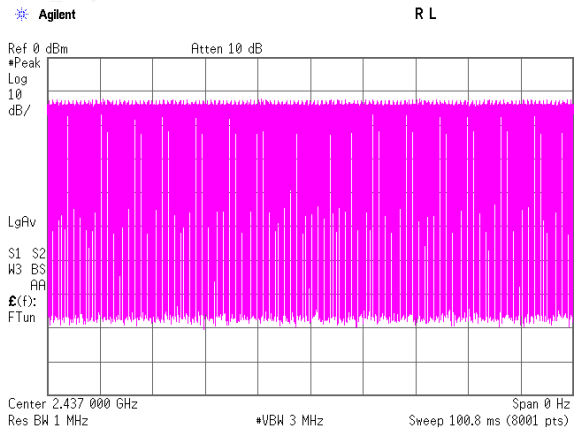
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Duty Factor Calculation chart

Tx, IEEE802.11g, PN9, antenna port PCB, worst data mode 54Mbps

Duty Factor Calculation	
Duty Factor: 20log (1/duty cycle) = 2.5dB	
duty cycle = 0.0001797 / 0.0002386 = 0.753 (75.3%)	
Tx2_duty1 	Tx2_duty2 

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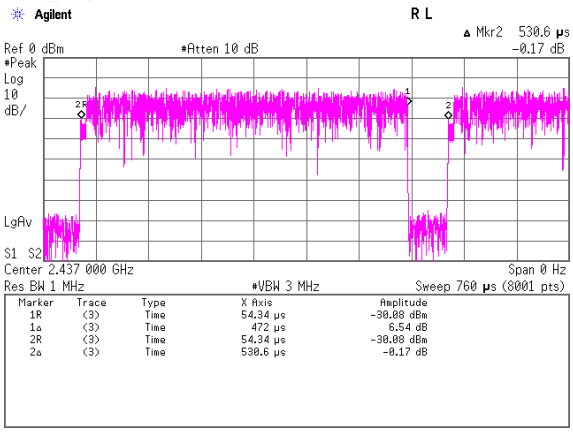
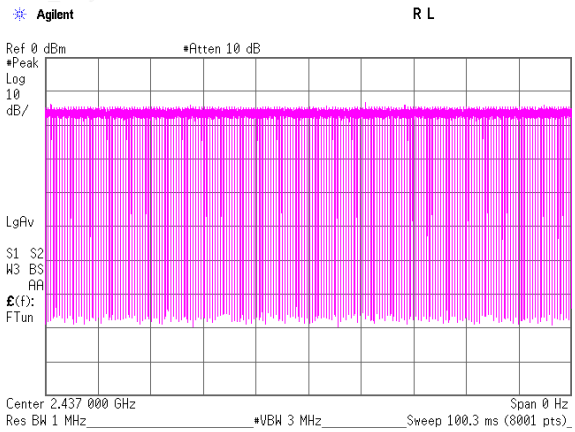
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Duty Factor Calculation chart

Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)

Duty Factor Calculation	
Duty Factor: 20log (1/duty cycle) = 1.0dB	
duty cycle = 0.0004720 / 0.0005306 = 0.890 (89.0%)	
Tx2_duty1 	Tx2_duty2 

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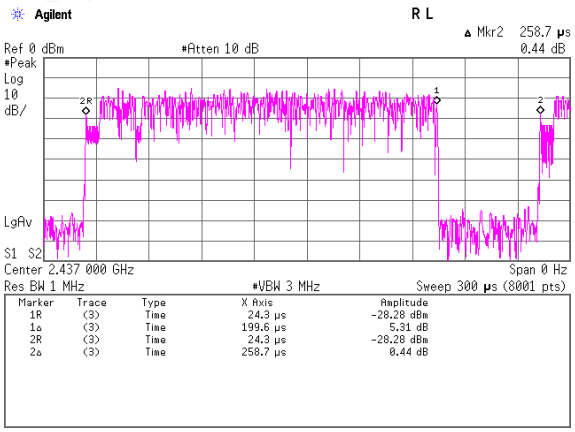
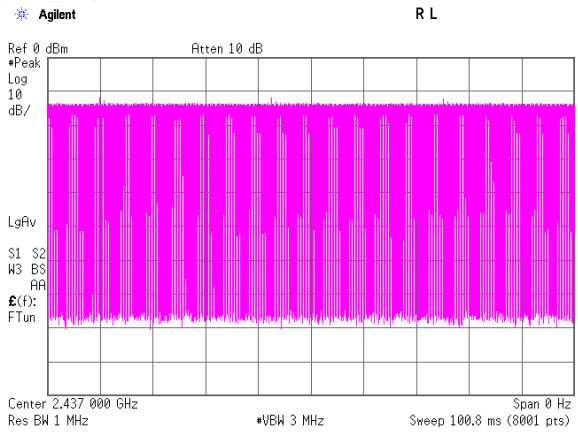
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Duty Factor Calculation chart

Tx, IEEE802.11n HT20, PN9, antenna port PCB, worst data mode 5(MCS)

Duty Factor Calculation	
Duty Factor: 20log (1/duty cycle) = 2.3dB	
duty cycle = 0.0001996 / 0.0002587 = 0.772 (77.2%)	
	

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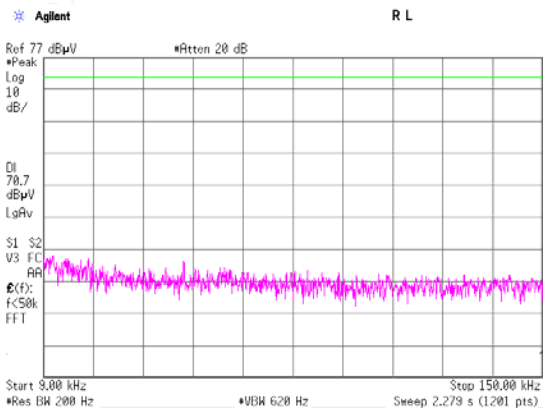
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Spurious emission (Conducted)

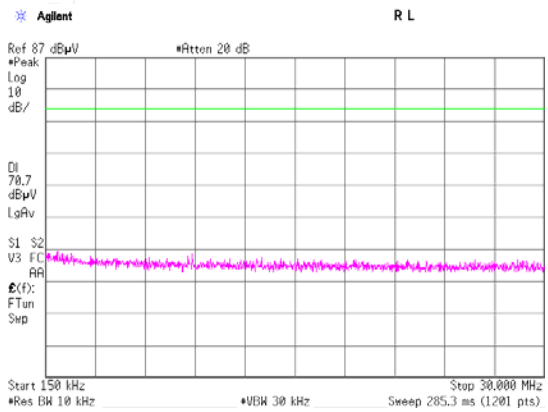
Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps

Tx, 2412MHz (below 30MHz)

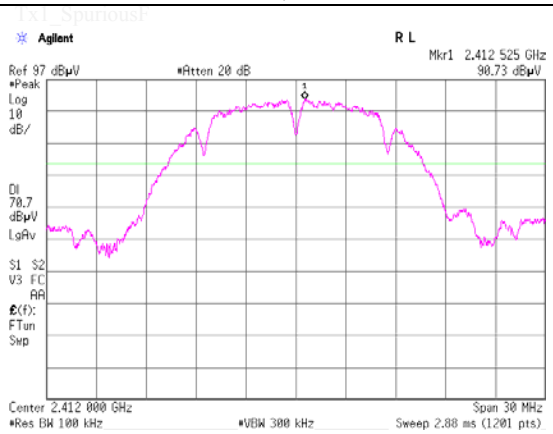
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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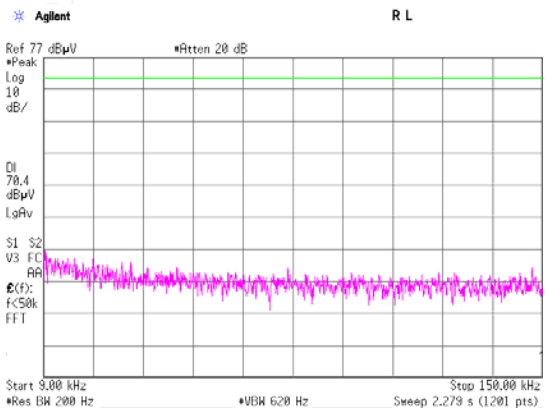
Spurious emission (Conducted)

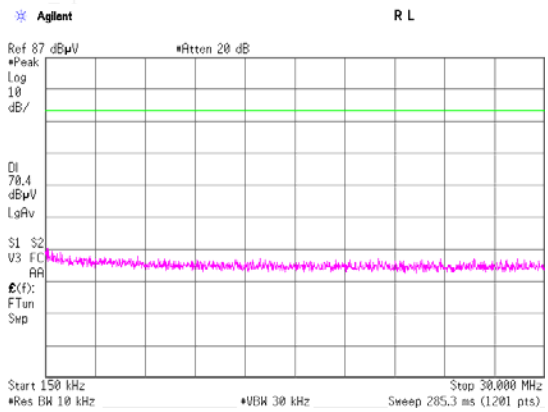
Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps

Tx, 2437MHz (below 30MHz)

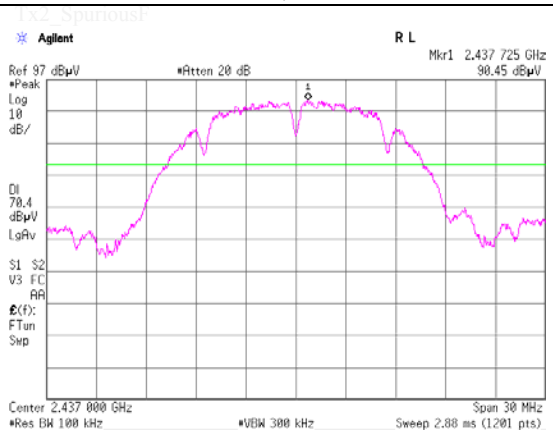
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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Date	November 27, 2014	
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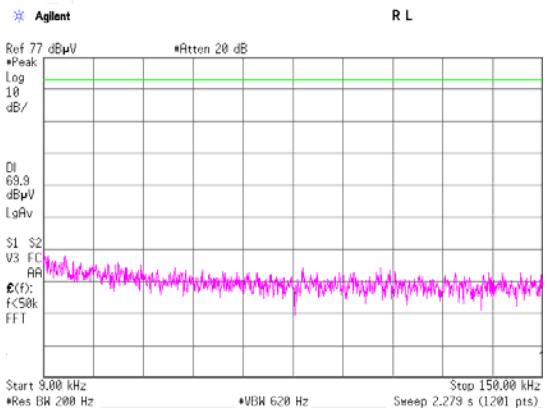
Engineer	Akio Hayashi	

Spurious emission (Conducted)

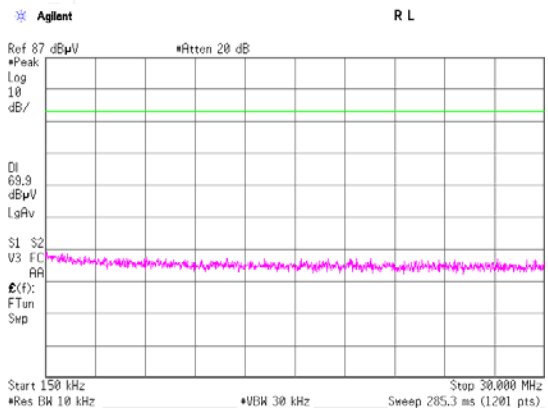
Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps

Tx, 2462MHz (below 30MHz)

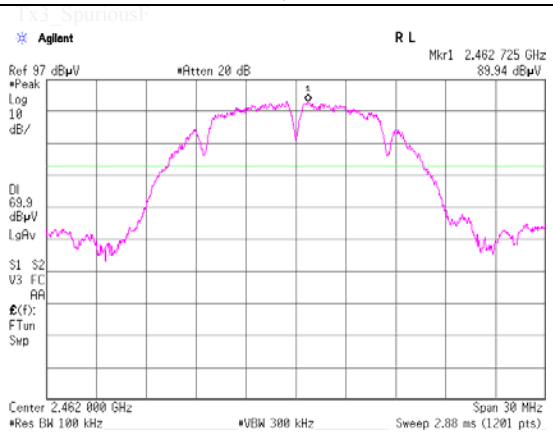
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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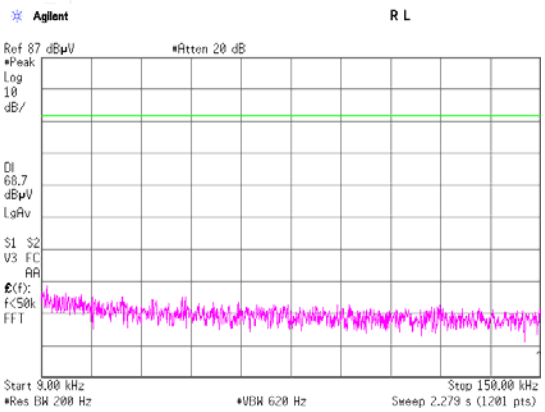
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Spurious emission (Conducted)

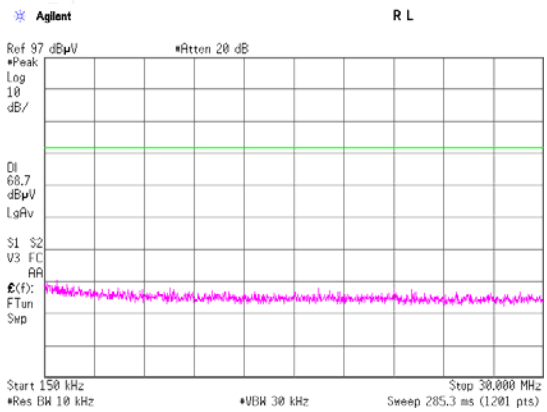
Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps

Tx, 2412MHz (below 30MHz)

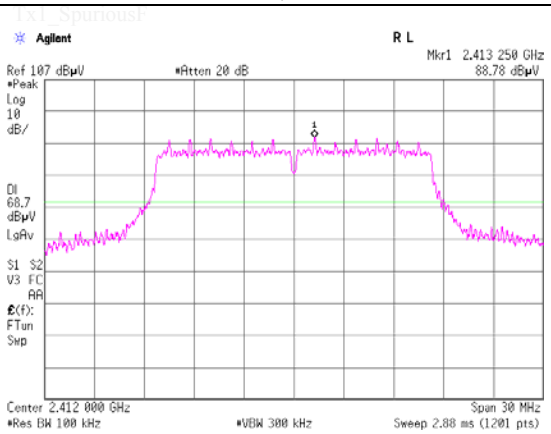
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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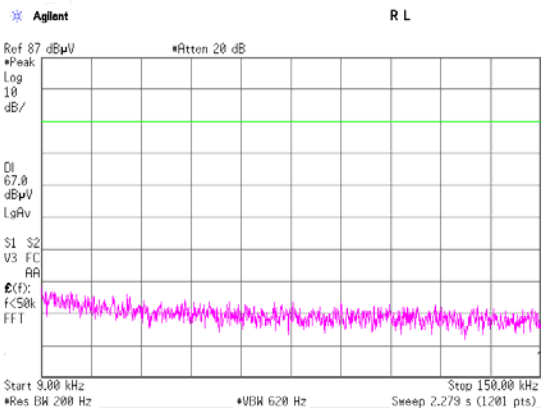
Spurious emission (Conducted)

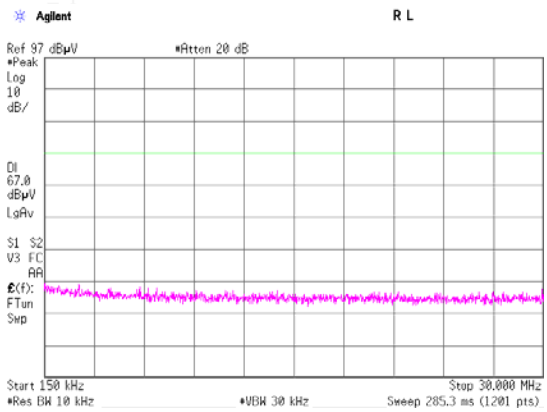
Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps

Tx, 2437MHz (below 30MHz)

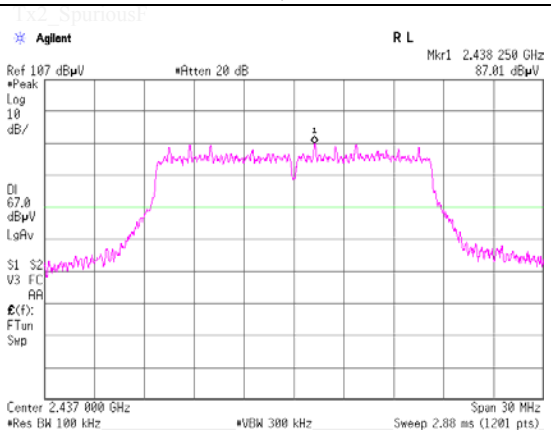
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
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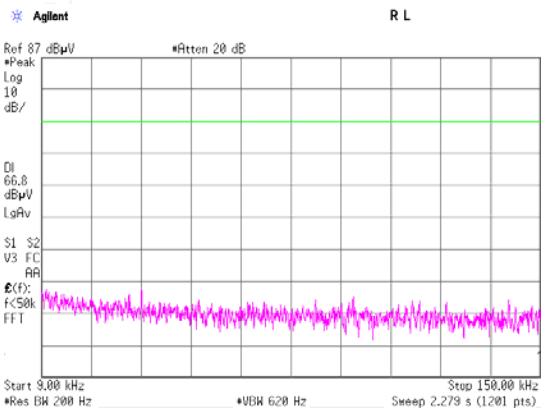
Engineer	Akio Hayashi	

Spurious emission (Conducted)

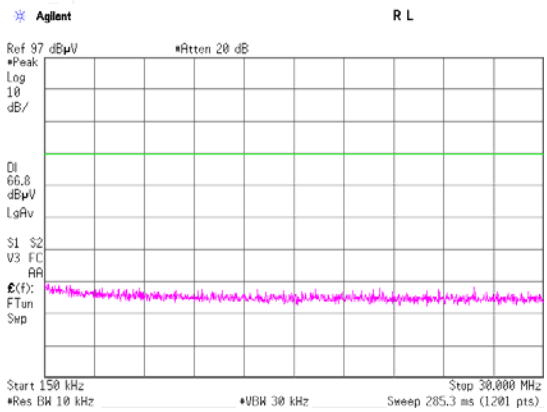
Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps

Tx, 2462MHz (below 30MHz)

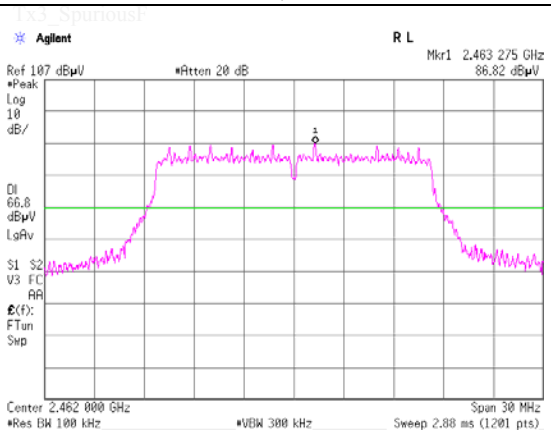
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

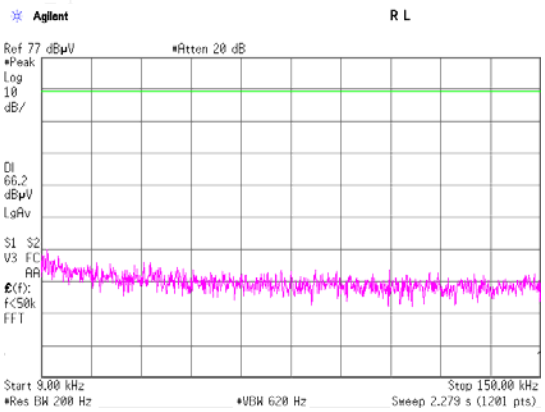
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Spurious emission (Conducted)

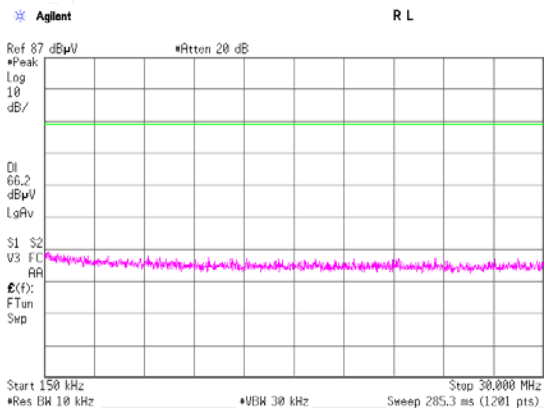
Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)

Tx, 2412MHz (below 30MHz)

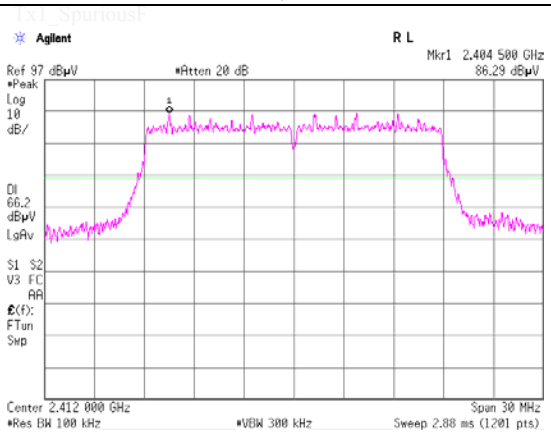
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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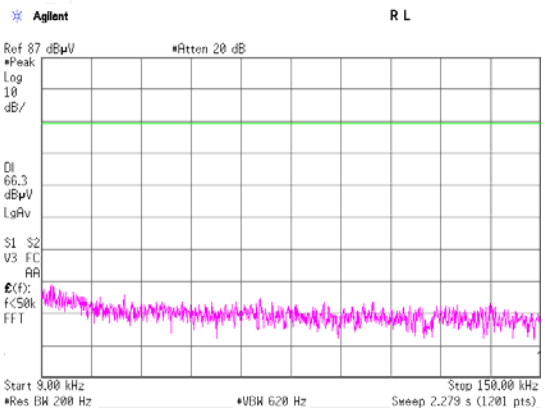
Engineer	Akio Hayashi	

Spurious emission (Conducted)

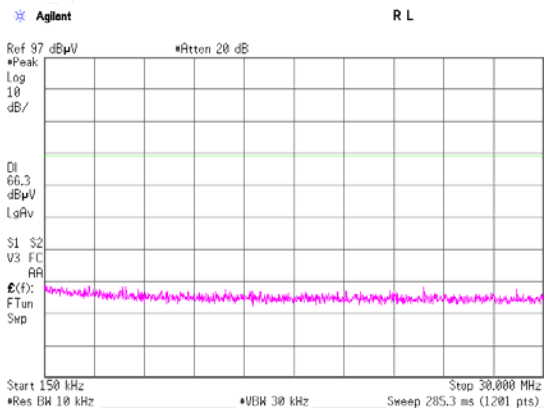
Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)

Tx, 2437MHz (below 30MHz)

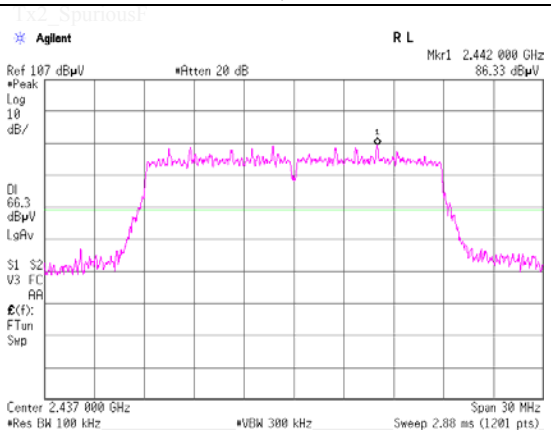
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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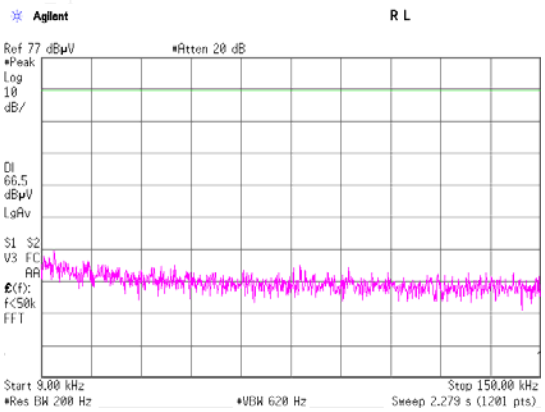
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

Spurious emission (Conducted)

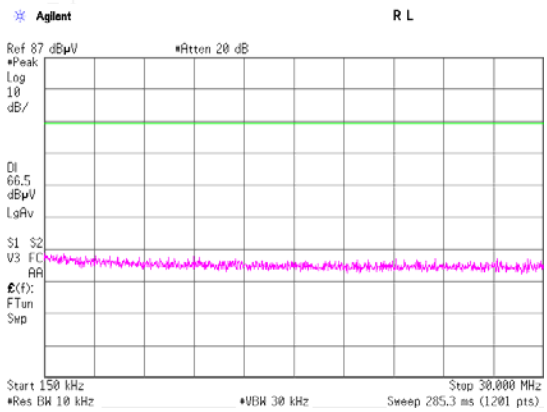
Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)

Tx, 2462MHz (below 30MHz)

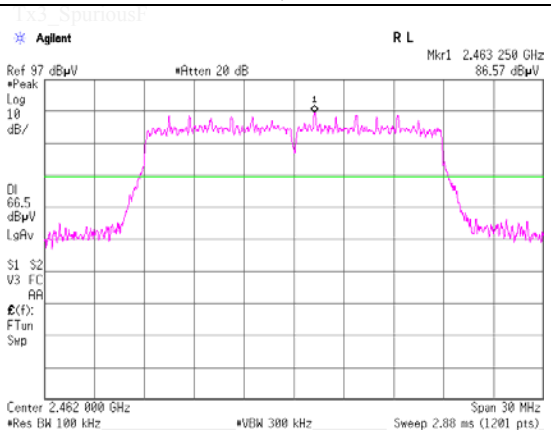
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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Maximum Power Spectral Density

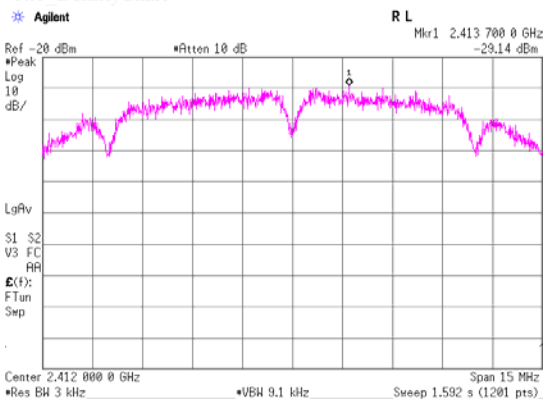
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps	

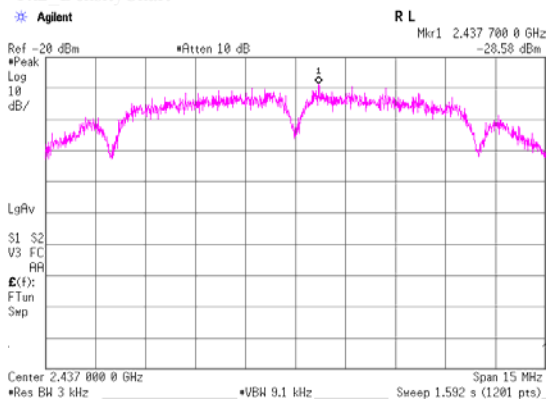
Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2413.70	-29.14	2.09	19.90	-7.15	8.00	15.15
2437.0000	2437.70	-28.58	2.09	19.90	-6.59	8.00	14.59
2462.0000	2463.71	-29.47	2.10	19.90	-7.47	8.00	15.47

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

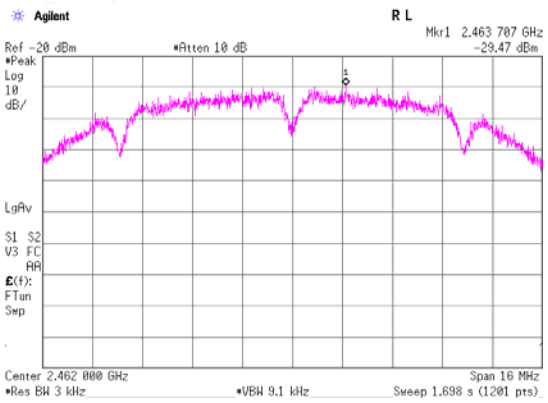
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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Maximum Power Spectral Density

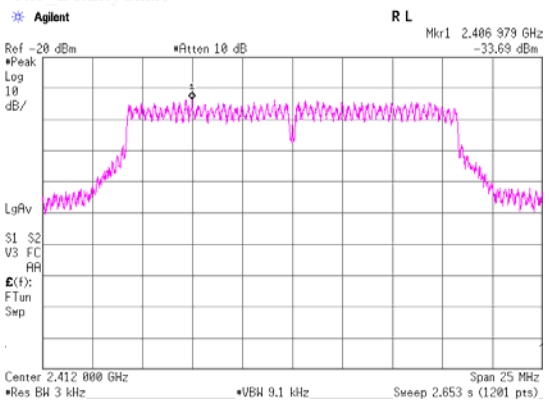
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps	

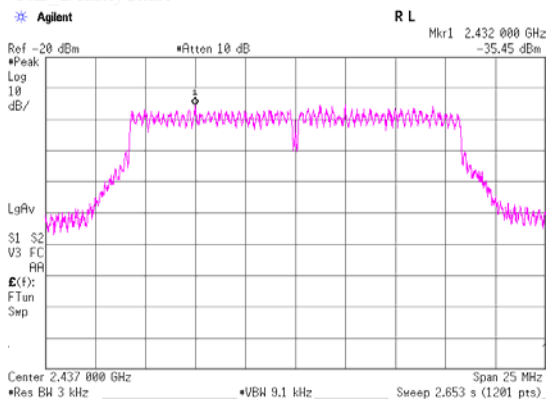
Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2406.98	-33.69	2.09	19.90	-11.70	8.00	19.70
2437.0000	2432.00	-35.45	2.09	19.90	-13.46	8.00	21.46
2462.0000	2461.10	-35.79	2.10	19.90	-13.79	8.00	21.79

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss

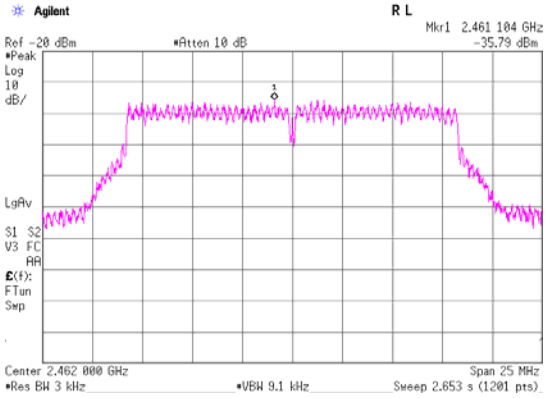
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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Maximum Power Spectral Density

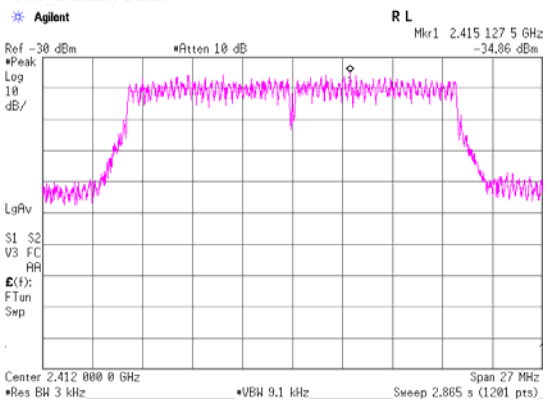
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)	

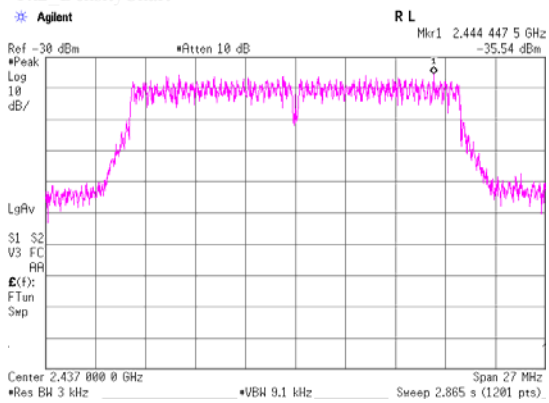
Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2415.13	-34.86	2.09	19.90	-12.87	8.00	20.87
2437.0000	2444.45	-35.54	2.09	19.90	-13.55	8.00	21.55
2462.0000	2465.69	-35.23	2.10	19.90	-13.23	8.00	21.23

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss

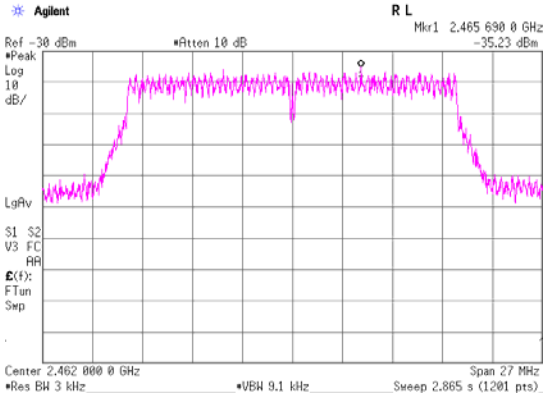
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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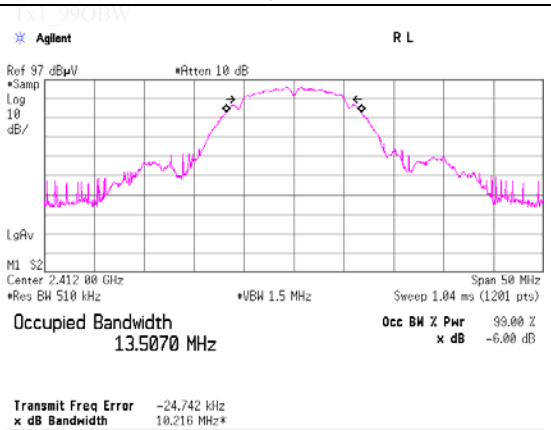
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

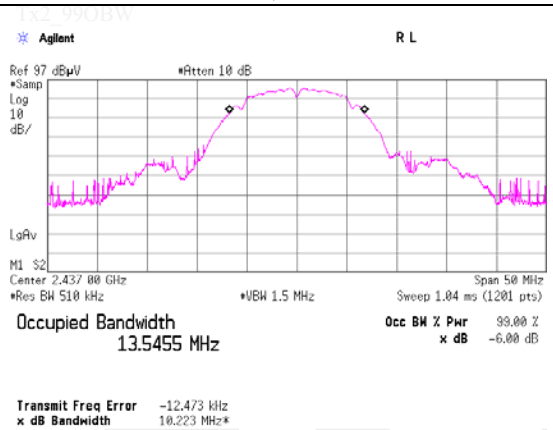
99% Occupied Bandwidth

Tx, IEEE802.11b, PN9, worst antenna port PCB, worst data mode 2Mbps

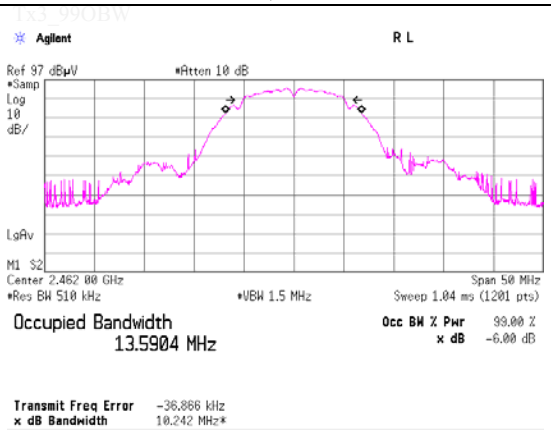
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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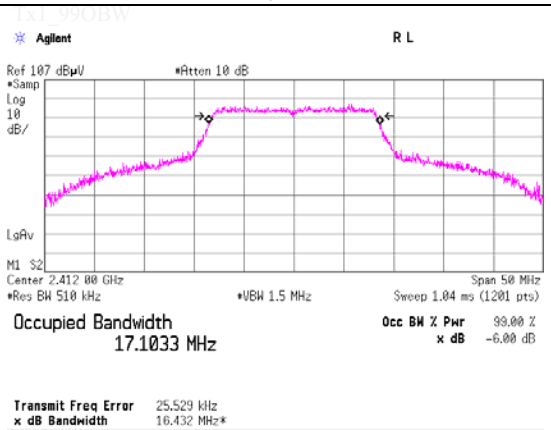
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 27, 2014	
Temperature / Humidity	23deg.C , 44%RH	
Engineer	Akio Hayashi	

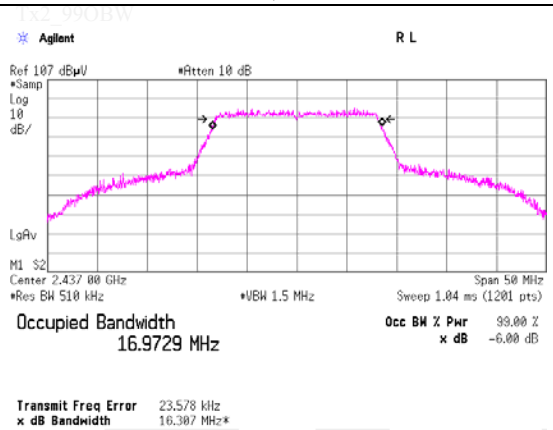
99% Occupied Bandwidth

Tx, IEEE802.11g, PN9, worst antenna port External, worst data mode 18Mbps

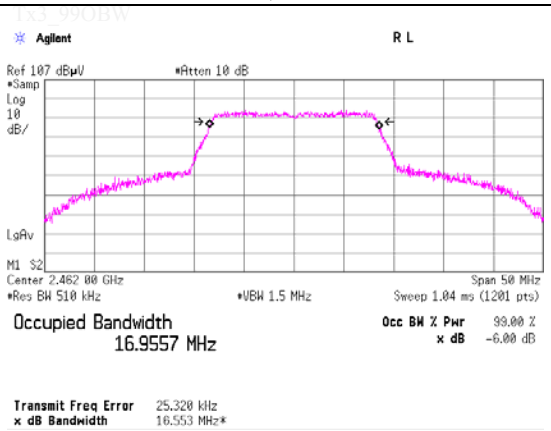
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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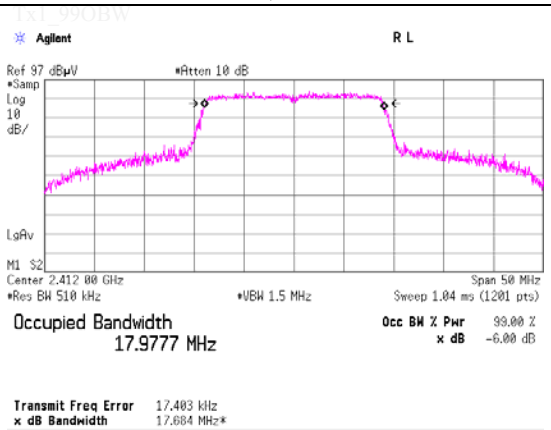
Engineer	Akio Hayashi	

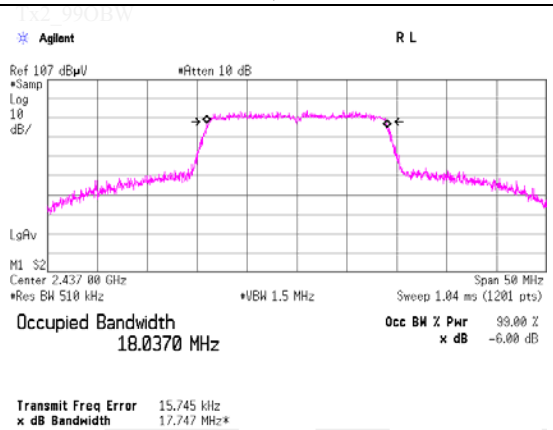
99% Occupied Bandwidth

Tx, IEEE802.11n HT20, PN9, worst antenna port External, worst data mode 2(MCS)

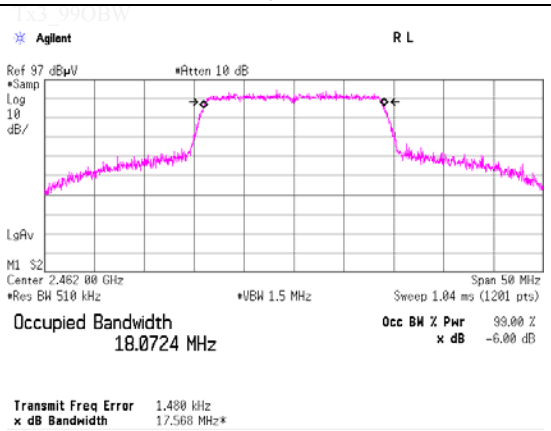
Tx, 2412MHz



Tx, 2437MHz



Tx, 2462MHz



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APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT, RE	2014/03/04 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2014/03/13 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2014/04/22 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2014/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2014/04/04 * 12
SAT20-06	Attenuator	Weinschel Corp.	54A-20	31506	AT	2014/04/22 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2014/07/14 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2014/05/23 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-01 8	RE	2014/06/24 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2014/05/15 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2014/08/12 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2014/10/30 * 12
SJM-15	Measure	ASKUL	-	-	RE,CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE,CE	-
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2014/11/21 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2014/04/22 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2014/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2014/05/15 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2014/03/14 * 12
SCC-C9/C10/ SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/N S4906	-/0901-271(RF Selector)	CE	2014/04/25 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2014/02/26 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2014/09/02 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2014/03/07 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2013/12/26 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE,CE	2014/03/04 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2014/02/14 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2014/10/18 * 12
SCC-C1/C2/C 3/C4/C5/C10/ SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhn er/Suhner/Suhner/Suh ner/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-271(RF Selector)	RE	2014/04/25 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2014/10/18 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .
Test Item :
CE: Conducted emission ,
RE: Radiated emission ,
AT: Antenna terminal conducted tests