FCC CFR47 PART 15 SUBPART C

CLASS II PERMISSIVE CHANGE
TEST REPORT

FOR

Digital Transmission System (DTS)
Wireless Network Adapter Module

MODEL NUMBER: WL14A

FCC ID: ACJ9TGWL14A

REPORT NUMBER: 10573131H-A

ISSUE DATE: December 11, 2014

Prepared for
PANASONIC CORPORATION OF NORTH AMERICA
ONE PANASONIC WAY, 4B-8
SECAUCUS, NEW JERSEY 07094, U.S.A.

Prepared by
UL Japan, Inc.
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
TEL: +81 596 24 8999
FAX: +81 596 24 8124

NVLAP LAB CODE: 200572-0

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

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/11/14	Initial Issue	T.Hatakeda

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

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UL Japan, Inc. Ise EMC Lab.
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	PANASONIC CORPORATION OF NORTH AMERICA ONE PANASONIC WAY, 4B-8 SECAUCUS, NEW JERSEY 07094, U.S.A.
EUT DESCRIPTION:	Digital Transmission System (DTS) Wireless Network Adapter Module
MODEL:	WL14A
SERIAL NUMBER:	4JTSA00148
DATE TESTED:	November 17 to 26, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

UL Japan, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Japan, Inc. By: Tested By:

T. Hatakeda

Takahiro Hatakeda
Leader
Consumer Technology Division

K. Kawamura

Keisuke Kawamura
Engineer
Consumer Technology Division

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0
The full scope of accreditation can be viewed at
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

EMI

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

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

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

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

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The model WL14A, hereafter referred to as EUT, is a PCIe small form factor IEEE802.11a/b/g/n/ac + Bluetooth wireless network adapter module. The module will support MIMO (2x2) for 802.11n/ac modes and MISO (1x2) for 802.11a/b/g modes and utilizes DSSS and OFDM modulation techniques. Bluetooth operates with basic, EDR and BLE modes as SISO (1x1). When Bluetooth is operational WiFi operates as SISO (1x1).

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is adding 2.4GHz external antenna.
External antenna was used for the test as a substitute for Internal Main antenna and supports only SISO mode.

5.3. MAXIMUM AVERAGE OUTPUT POWER

The transmitter has a maximum average conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412-2462	802.11b	14.1	25.70
2412-2462	802.11g	14.3	26.92
2412-2462	802.11n-20	14.1	25.70
2422-2452	802.11n-40	14.4	27.54

5.4. DESCRIPTION OF ADDING ANTENNA

The Whip antenna with 5dBi in 2.4GHz is added.

5.5. SOFTWARE AND FIRMWARE

The test utility software used during testing was DRTU, version. 1.7.4-1041.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. Radiated Emissions below 1 GHz was performed with EUT set to transmit at the channel with highest output power.

Worst-case data rates used per input from the client are as follows:

11b: 1Mbps
11g: 6Mbps
11n HT20: MCS0
11n HT40: MCS0

Worst-case modes were selected for Band edge and Harmonics based on an investigation of the original reports, as shown in the summary table below:

Worst-case Modes to test

2.4GHz		
Low Band edge	High Band edge	Harmonics
11n 40M	11n 40M	11b
Antenna A	Antenna A	Antenna A
Channel 3	Channel 9	Channel 11

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5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Car Mounter	HAVIS	DS-PAN-701-2	PREPR0D SAMPLE3	DoC
AC Adapter	Panasonic	CF-AA6413C M1	6413CM112800108A	DoC
Antenna	SAGA DENSHI KOGYO CO., LTD	24KX2	-	-
Laptop	Panasonic	FZ-G1	4JTSA00148	DoC

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Un-Shielded	180 cm	N/A
2	DC	1	DC	Un-Shielded	90 cm	N/A
3	Antenna	1	Antenna	Shielded	240 cm	N/A

TEST SETUP

The EUT is installed in a Car Mounter during the tests.
A laptop computer was used to configure the EUT to continuously transmit at a specified output power or continuously receive on the channel specified in the test data. For transmit modes the worst case was evaluated.

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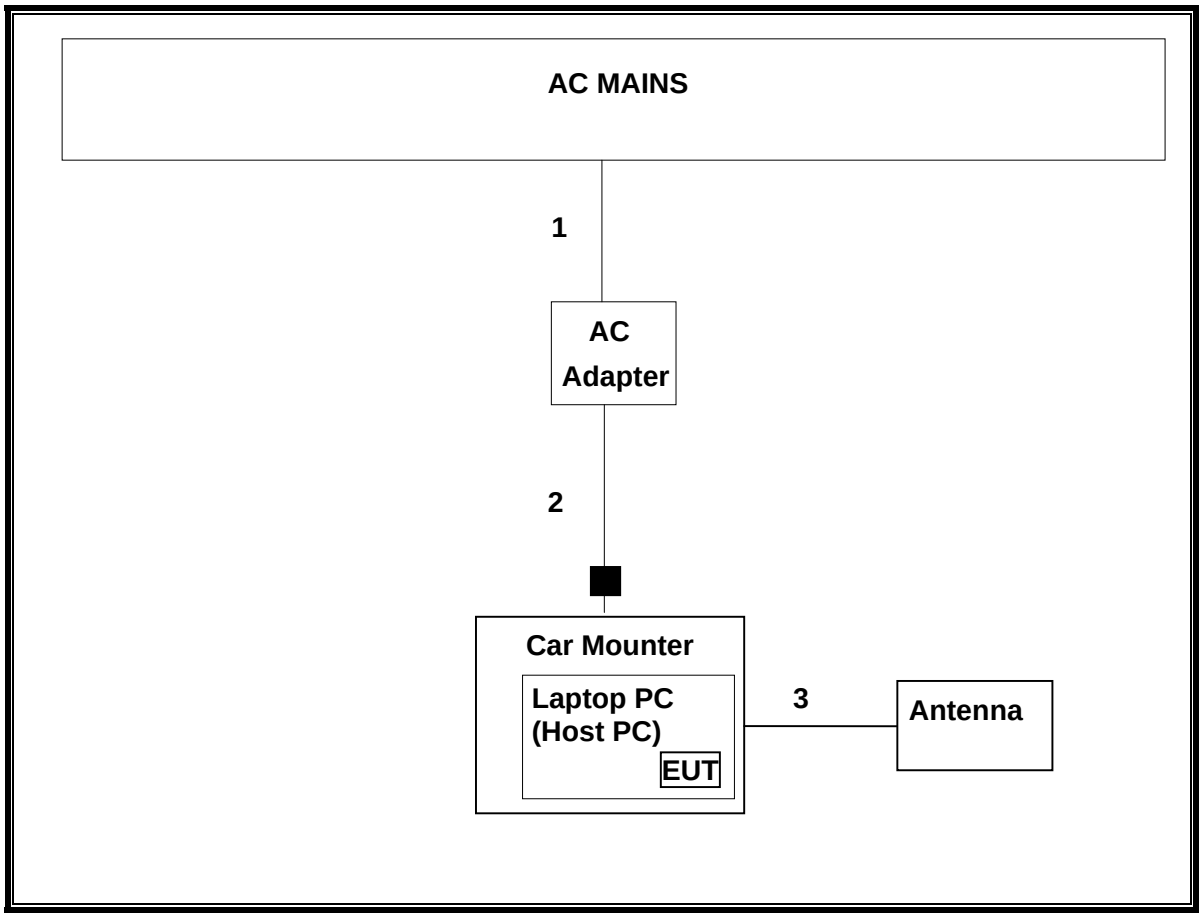
SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2014/02/20 * 12
MAT-20	Attenuator(10dB)(above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2014/01/29 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2014/10/16 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2014/10/15 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	AT	2014/06/06 * 12
MAT-56	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2014/01/15 * 12
MPM-16	Power Meter	Agilent	8990B	MY51000271	AT	2014/04/04 * 12
MPSE-22	Power sensor	Agilent	N1923A	MY54070003	AT	2014/04/04 * 12
MPSE-23	Power sensor	Agilent	N1923A	MY54070004	AT	2014/04/04 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2014/10/06 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2014/10/06 * 12
MPM-13	Power Meter	Anritsu	ML2495A	0824014	AT	2014/11/11 * 12
MPSE-18	Power sensor	Anritsu	MA2411B	0738174	AT	2014/11/11 * 12
MAT-57	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2014/01/15 * 12
MAT-58	Attenuator(10dB)	Suhner	6810.19.A	-	AT	2014/01/15 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/CE	2014/02/20 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2014/02/21 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2014/05/21 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE/CE	2014/06/03 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE	2014/07/10 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2014/02/20 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2014/11/11 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2014/09/26 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and power averaging for average measurements.

The bandedge is investigated with the transmitter set to the lowest and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the high channel in the 2.4GHz 11b band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

7.2. TRANSMITTER ABOVE 1 GHz (worst-case modes)

HARMONICS AND SPURIOUS EMISSIONS

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 50% RH
Engineer	Keisuke Kawamura (1-26.5GHz)
Mode	11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4924.000	PK	42.7	32.1	4.8	33.9	-	45.7	73.9	28.2	
Hori	7386.000	PK	43.8	35.8	5.7	33.8	-	51.5	73.9	22.4	
Hori	9848.000	PK	41.9	38.5	6.9	34.5	-	52.8	73.9	21.1	
Hori	4924.000	AV	34.0	32.1	4.8	33.9	-	37.0	53.9	16.9	
Hori	7386.000	AV	34.9	35.8	5.7	33.8	-	42.6	53.9	11.3	
Hori	9848.000	AV	34.5	38.5	6.9	34.5	-	45.4	53.9	8.5	
Vert	4924.000	PK	41.9	32.1	4.8	33.9	-	44.9	73.9	29.0	
Vert	7386.000	PK	42.6	35.8	5.7	33.8	-	50.3	73.9	23.6	
Vert	9848.000	PK	42.8	38.5	6.9	34.5	-	53.7	73.9	20.2	
Vert	4924.000	AV	33.7	32.1	4.8	33.9	-	36.7	53.9	17.2	
Vert	7386.000	AV	35.1	35.8	5.7	33.8	-	42.8	53.9	11.1	
Vert	9848.000	AV	34.3	38.5	6.9	34.5	-	45.2	53.9	8.7	

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

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

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

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN TEL: +81 596 24 8999 FAX: +81 596 24 8124

BAND EDGE

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11b Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	55.3	27.0	2.8	34.7	-	50.4	73.9	23.5	
Hori	2390.000	AV	48.7	27.0	2.8	34.7	-	43.8	53.9	10.1	
Vert	2390.000	PK	53.4	27.0	2.8	34.7	-	48.5	73.9	25.4	
Vert	2390.000	AV	45.7	27.0	2.8	34.7	-	40.8	53.9	13.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	104.5	27.0	2.8	34.7	99.6	-	-	Carrier
Hori	2396.988	PK	65.2	27.0	2.8	34.7	60.3	79.6	19.3	
Hori	2400.000	PK	52.1	27.0	2.8	34.7	47.2	79.6	32.4	
Vert	2412.000	PK	102.6	27.0	2.8	34.7	97.7	-	-	Carrier
Vert	2396.988	PK	62.9	27.0	2.8	34.7	58.0	77.7	19.7	
Vert	2400.000	PK	50.6	27.0	2.8	34.7	45.7	77.7	32.0	

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

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	55.0	26.9	2.8	34.7	-	50.0	73.9	23.9	
Hori	2483.500	AV	49.7	26.9	2.8	34.7	-	44.7	53.9	9.2	
Vert	2483.500	PK	52.3	26.9	2.8	34.7	-	47.3	73.9	26.6	
Vert	2483.500	AV	46.5	26.9	2.8	34.7	-	41.5	53.9	12.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11g Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	68.3	27.0	2.8	34.7	-	63.4	73.9	10.5	
Hori	2390.000	AV	54.0	27.0	2.8	34.7	-	49.1	53.9	4.8	
Vert	2390.000	PK	64.9	27.0	2.8	34.7	-	60.0	73.9	13.9	
Vert	2390.000	AV	51.4	27.0	2.8	34.7	-	46.5	53.9	7.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	101.3	27.0	2.8	34.7	96.4	-	-	Carrier
Hori	2400.000	PK	73.9	27.0	2.8	34.7	69.0	76.4	7.4	
Vert	2412.000	PK	99.5	27.0	2.8	34.7	94.6	-	-	Carrier
Vert	2400.000	PK	71.4	27.0	2.8	34.7	66.5	74.6	8.1	

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

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11g Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	70.2	26.9	2.8	34.7	-	65.2	73.9	8.7	
Hori	2483.500	AV	55.6	26.9	2.8	34.7	-	50.6	53.9	3.3	
Vert	2483.500	PK	66.8	26.9	2.8	34.7	-	61.8	73.9	12.1	
Vert	2483.500	AV	52.1	26.9	2.8	34.7	-	47.1	53.9	6.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11n-20 Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	69.9	27.0	2.8	34.7	-	65.0	73.9	8.9	
Hori	2390.000	AV	57.8	27.0	2.8	34.7	-	52.9	53.9	1.0	
Vert	2390.000	PK	67.3	27.0	2.8	34.7	-	62.4	73.9	11.5	
Vert	2390.000	AV	55.3	27.0	2.8	34.7	-	50.4	53.9	3.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.4	27.0	2.8	34.7	95.5	-	-	Carrier
Hori	2400.000	PK	72.7	27.0	2.8	34.7	67.8	75.5	7.7	
Vert	2412.000	PK	98.5	27.0	2.8	34.7	93.6	-	-	Carrier
Vert	2400.000	PK	70.3	27.0	2.8	34.7	65.4	73.6	8.2	

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

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11n-20 Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	70.0	26.9	2.8	34.7	-	65.0	73.9	8.9	
Hori	2483.500	AV	58.2	26.9	2.8	34.7	-	53.2	53.9	0.7	
Vert	2483.500	PK	65.8	26.9	2.8	34.7	-	60.8	73.9	13.1	
Vert	2483.500	AV	51.2	26.9	2.8	34.7	-	46.2	53.9	7.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11n-40 Tx 2422MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	69.5	27.0	2.8	34.7	-	64.6	73.9	9.3	
Hori	2390.000	AV	58.4	27.0	2.8	34.7	0.09	53.6	53.9	0.3	*
Vert	2390.000	PK	66.2	27.0	2.8	34.7	-	61.3	73.9	12.6	
Vert	2390.000	AV	55.9	27.0	2.8	34.7	0.09	51.1	53.9	2.8	*

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

*Not Out of Band emission (Leakage Power).

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2422.000	PK	97.1	27.0	2.8	34.7	92.2	-	-	Carrier
Hori	2400.000	PK	68.0	27.0	2.8	34.7	63.1	72.2	9.1	
Vert	2422.000	PK	95.7	27.0	2.8	34.7	90.8	-	-	Carrier
Vert	2400.000	PK	65.7	27.0	2.8	34.7	60.8	70.8	10.0	

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

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Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10573131H
Date	11/26/2014
Temperature/ Humidity	23 deg. C / 54% RH
Engineer	Satofumi Matsuyama (1-26.5GHz)
Mode	11n-40 Tx 2452MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	68.5	26.9	2.8	34.7	-	63.5	73.9	10.4	
Hori	2483.500	AV	58.5	26.9	2.8	34.7	0.09	53.6	53.9	0.3	*
Vert	2483.500	PK	65.3	26.9	2.8	34.7	-	60.3	73.9	13.6	
Vert	2483.500	AV	54.4	26.9	2.8	34.7	0.09	49.5	53.9	4.4	*

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier) + Duty factor (AV)
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

*Not Out of Band emission (Leakage Power).

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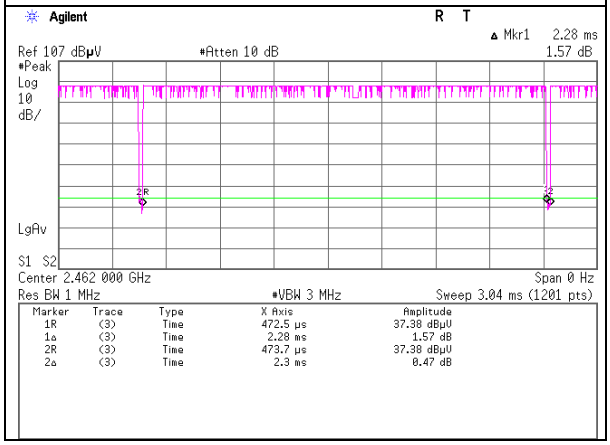
DUTY

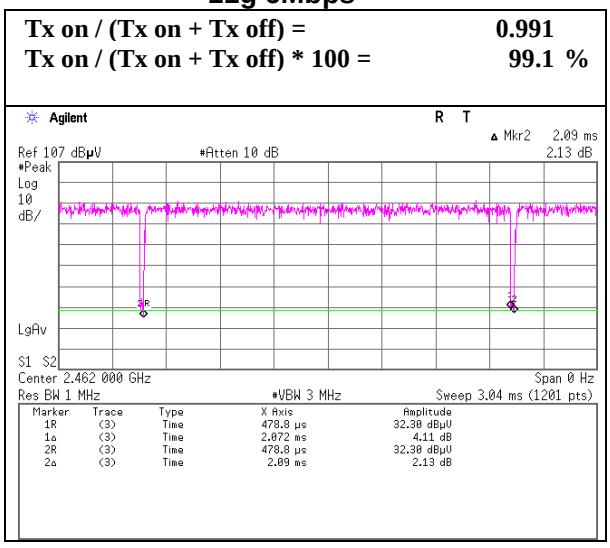
11b 1Mbps

Tx on / (Tx on + Tx off) = 0.991
Tx on / (Tx on + Tx off) * 100 = 99.1 %



11g 6Mbps

Tx on / (Tx on + Tx off) = 0.991
Tx on / (Tx on + Tx off) * 100 = 99.1 %



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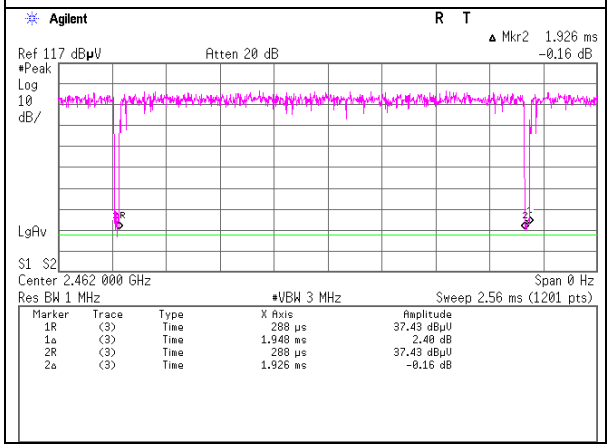
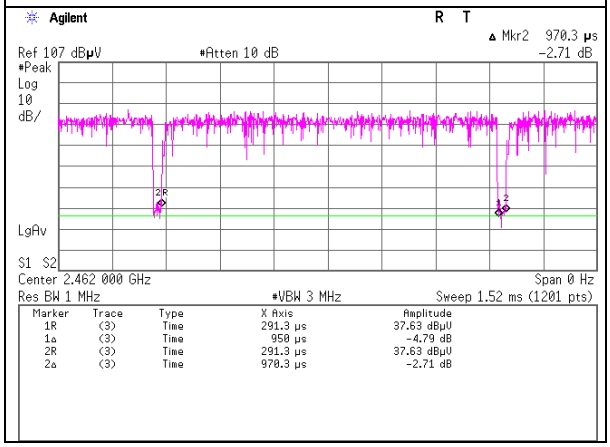
11n-20 MCS0

Tx on / (Tx on + Tx off) =	**0.989**
Tx on / (Tx on + Tx off) * 100 =	**98.9 %**



11n40 MCS0

Tx on / (Tx on + Tx off) =	**0.979**
Tx on / (Tx on + Tx off) * 100 =	**97.9 %**
Duty factor = 10 * log (0.9703 / 0.95) =	**0.09 dB**



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7.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

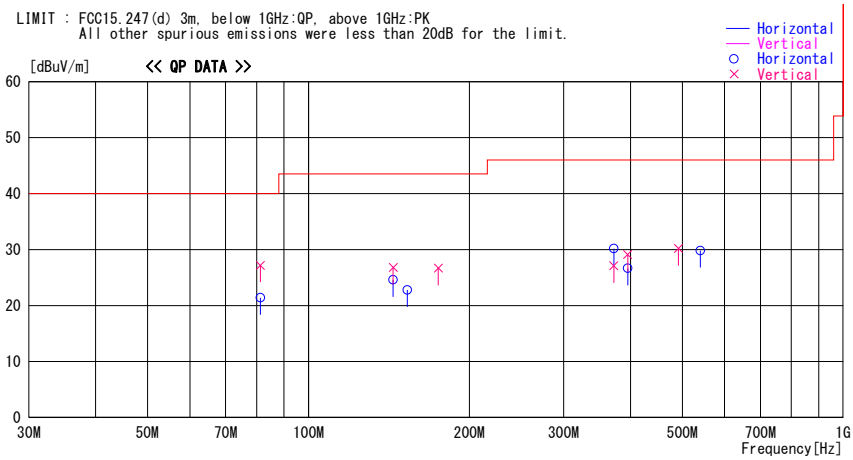
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/11/26

Report No. : 10573131H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 50% RH
Engineer : Keisuke Kawamura

Mode / Remarks : WLAN Tx 11b 1Mbps 2462MHz Worst-Axis(Hori:Hori / Vert:Vert)

LIMIT : FCC15.247(d) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
81.311	41.7	QP	6.6	-21.1	27.2	292	100	Vert.	40.0	12.8	
81.311	35.9	QP	6.6	-21.1	21.4	218	334	Hori.	40.0	18.6	
144.002	30.3	QP	14.6	-20.3	24.6	218	231	Hori.	43.5	18.9	
144.002	32.5	QP	14.6	-20.3	26.8	0	100	Vert.	43.5	16.7	
153.049	28.0	QP	15.0	-20.2	22.8	234	377	Hori.	43.5	20.7	
174.899	30.5	QP	16.2	-20.0	26.7	318	100	Vert.	43.5	16.8	
372.313	29.4	QP	16.8	-19.1	27.1	344	125	Vert.	46.0	18.9	
372.313	32.5	QP	16.8	-19.1	30.2	347	100	Hori.	46.0	15.8	
395.348	28.4	QP	17.4	-19.1	26.7	309	201	Hori.	46.0	19.3	
395.348	30.8	QP	17.4	-19.1	29.1	0	124	Vert.	46.0	16.9	
491.672	30.6	QP	18.6	-19.0	30.2	11	116	Vert.	46.0	15.8	
540.646	29.6	QP	19.1	-18.9	29.8	355	152	Hori.	46.0	16.2	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS((CABLE+ATTEN.) - GAIN(AMP))

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7.4. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

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RESULTS

WORST EMISSIONS

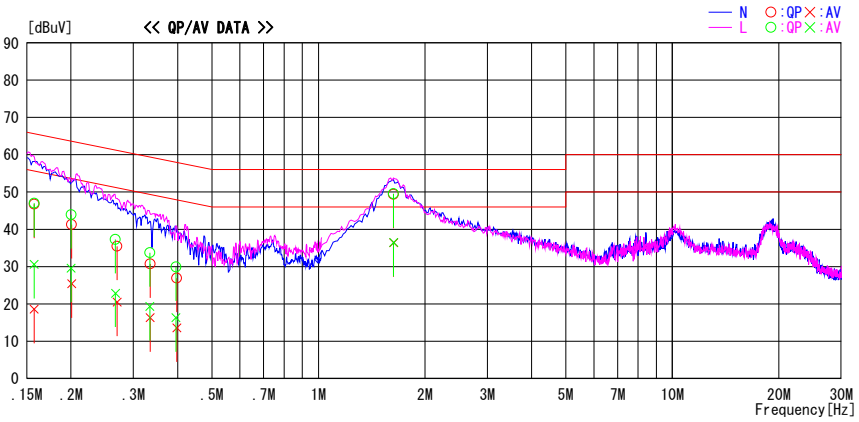
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/11/20

Report No. : 10573131H
Power : AC 120V / 60Hz
Temp./Humi. : 21deg. C / 41% RH
Engineer : Keisuke Kawamura

Mode / Remarks : WLAN Tx 11b 1Mbps 2462MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15725	33.5	5.4	13.2	46.7	18.6	65.6	55.6	18.9	37.0	N	
0.20075	28.1	12.2	13.2	41.3	25.4	63.6	53.6	22.3	28.2	N	
0.26975	22.3	7.3	13.2	35.5	20.5	61.1	51.1	25.6	30.6	N	
0.33455	17.5	3.1	13.2	30.7	16.3	59.3	49.3	28.6	33.0	N	
0.39775	13.7	0.4	13.2	26.9	13.6	57.9	47.9	31.0	34.3	N	
1.63002	36.0	23.0	13.4	49.4	36.4	56.0	46.0	6.6	9.6	N	
0.15725	33.8	17.4	13.2	47.0	30.6	65.6	55.6	18.6	25.0	L	
0.20015	30.7	16.4	13.2	43.9	29.6	63.6	53.6	19.7	24.0	L	
0.26695	24.1	9.7	13.2	37.3	22.9	61.2	51.2	23.9	28.3	L	
0.33375	20.5	6.1	13.2	33.7	19.3	59.4	49.4	25.7	30.1	L	
0.39575	16.7	3.1	13.2	29.9	16.3	57.9	47.9	28.0	31.6	L	
1.63002	36.2	23.1	13.4	49.6	36.5	56.0	46.0	6.4	9.5	L	

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

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8. ANTENNA PORT TEST RESULTS

8.1. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured using a wide bandwidth Peak Power Meter.

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RESULTS

Test place	Ise EMC Lab. No.6 and 2 measurement room	
Report No.	10573131H	
Date	11/17/2014	11/26/2014
Temperature/ Humidity	23 deg. C / 40% RH	23 deg. C / 54% RH
Engineer	Keisuke Kawamura	Satofumi Matsuyama
Mode	Tx Antenna A	

11b 1Mbps

Freq.	Reading PK	Cable Loss	Atten.	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.23	0.96	10.04	16.2	42.01	30.00	1000	13.77
2437	5.85	0.96	10.08	16.9	48.89	30.00	1000	13.11
2462	5.79	0.98	10.04	16.8	48.03	30.00	1000	13.19

11g 6Mbps

Freq.	Reading PK	Cable Loss	Atten.	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.54	0.96	10.04	16.5	45.12	30.00	1000	13.46
2437	7.91	0.96	10.08	19.0	78.57	30.00	1000	11.05
2462	5.01	0.98	10.04	16.0	40.13	30.00	1000	13.97

11n-20 MCS0

Freq.	Reading PK	Cable Loss	Atten.	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	5.19	0.96	10.04	16.2	41.62	30.00	1000	13.81
2437	7.93	0.96	10.08	19.0	78.93	30.00	1000	11.03
2462	4.44	0.98	10.04	15.5	35.20	30.00	1000	14.54

11n-40 MCS0

Freq.	Reading PK	Cable Loss	Atten.	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2422	4.46	0.96	10.04	15.5	35.13	30.00	1000	14.54
2437	7.84	0.96	10.07	18.9	77.14	30.00	1000	11.13
2452	4.39	0.98	10.04	15.4	34.72	30.00	1000	14.59

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

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8.2. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Test place	Ise EMC Lab. No.6 and 2 measurement room	
Report No.	10573131H	
Date	11/17/2014	11/26/2014
Temperature/ Humidity	23 deg. C / 40% RH	23 deg. C / 54% RH
Engineer	Keisuke Kawamura	Satofumi Matsuyama
Mode	Tx Antenna A	

11b 1Mbps

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
2412	2.44	0.96	10.04	13.4
2437	3.05	0.96	10.08	14.1
2462	2.95	0.98	10.04	14.0

11g 6Mbps

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
2412	0.72	0.96	10.04	11.7
2437	3.23	0.96	10.08	14.3
2462	-0.10	0.98	10.04	10.9

11n-20 MCS0

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
2412	0.18	0.96	10.04	11.2
2437	3.10	0.96	10.08	14.1
2462	-0.81	0.98	10.04	10.2

11n-40 MCS0

Freq. [MHz]	Reading AV [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]
2422	-0.48	0.96	10.04	10.5
2437	3.32	0.96	10.08	14.4
2452	-0.67	0.98	10.04	10.3

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

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