



FCC CFR47 PART 15 SUBPART C

**CLASS II PERMISSIVE CHANGE
TEST REPORT**

FOR

1x1 802.11b/g/n PCIe Module with 2.4GHz Whip antenna

MODEL NUMBER: WL12B

FCC ID: ACJ9TGWL12B

REPORT NUMBER: 32JE0121-HO-A

ISSUE DATE: June 15, 2012

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

Prepared by
**UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
TEL: +81 596 24 8116
FAX: +81 596 24 8124**

NVLAP[®]

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

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	06/15/12	Initial Issue	T.Hatakeda

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY	5
4.1. <i>MEASURING INSTRUMENT CALIBRATION.....</i>	<i>5</i>
4.2. <i>SAMPLE CALCULATION.....</i>	<i>5</i>
4.3. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>6</i>
5. EQUIPMENT UNDER TEST.....	7
5.1. <i>DESCRIPTION OF EUT.....</i>	<i>7</i>
5.2. <i>DESCRIPTION OF CLASS II PERMISSIVE CHANGE.....</i>	<i>7</i>
5.3. <i>MAXIMUM OUTPUT POWER.....</i>	<i>7</i>
5.4. <i>DESCRIPTION OF ADDING ANTENNA.....</i>	<i>7</i>
5.5. <i>SOFTWARE AND FIRMWARE.....</i>	<i>7</i>
5.6. <i>WORST-CASE CONFIGURATION AND MODE.....</i>	<i>8</i>
5.7. <i>DESCRIPTION OF TEST SETUP.....</i>	<i>9</i>
6. TEST AND MEASUREMENT EQUIPMENT	11
7. RADIATED TEST RESULTS.....	13
7.1. <i>LIMITS AND PROCEDURE.....</i>	<i>13</i>
7.2. <i>TRANSMITTER ABOVE 1 GHz (worst-case modes).....</i>	<i>14</i>
7.2.1. <i>2.4 GHz BAND (11n HT20).....</i>	<i>14</i>
7.2.2. <i>2.4 GHz BAND (11n HT40).....</i>	<i>18</i>
7.3. <i>WORST-CASE BELOW 1 GHz.....</i>	<i>25</i>
7.4. <i>AC MAINS LINE CONDUCTED EMISSIONS.....</i>	<i>26</i>
8. SETUP PHOTOS.....	28

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: 1x1 802.11b/g/n PCIe Module with 2.4GHz Whip antenna

MODEL: WL12B

SERIAL NUMBER: 2BTSA00113

DATE TESTED: JUNE 2 AND 3, 2012

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. No part of this report may be used to claim product certification, approval, or endorsement by any government agency.

Approved & Released For UL Japan, Inc. By:

Tested By:



Takahiro Hatakeda
Leader of WiSE Japan
UL Verification Services
UL Japan, Inc.



Hironobu Ohnishi
Engineer of WiSE Japan
UL Verification Services
UL Japan, Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, and 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

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	3.1dB
No.2	3.3dB
No.3	3.7dB
No.4	3.2dB

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	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

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

Power meter (±dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (±dB)			Antenna terminal conducted emission (±dB)		Channel power (±dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a 802.11b/g/n PCIe Module that operates in the 2.4GHz.
The module supports 1x1 spacial SISO without beam forming function.

The Radio module is manufactured by Qualcomm Atheros

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is adding 2.4GHz external antenna.

5.3. MAXIMUM OUTPUT POWER

The measured average power values were same as values in original report.
Refer to Qualcomm Atheros Inc. original report No. RF991203E02 R1 issued by Bureau Veritas Consumer Products Services (H.K.) Ltd.

5.4. DESCRIPTION OF ADDING ANTENNA

Whip antenna with 5dBi in 2.4GHz is added.

5.5. SOFTWARE AND FIRMWARE

The test utility software used during testing was Atheros Radio Test 2 (ART2-GUI Version: 2.3).

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 20M	11n 40M	11n 20M	11n 40M	11b
Channel 1	Channel 3	Channel 11	Channel 9	Channel 11
Power AV = 13.1dBm	Power AV = 12.2dBm	Power AV = 12.9dBm	Power AV = 11.5dBm	Power AV = 18.2dBm
Margin = -1.4dB	Margin = -1.5dB	Margin = -1.1dB	Margin = -2.3dB	AV Margin = -8.9dB
				Freq. = 9848MHz

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Panasonic	Toughbook (CF-53)	2BTSA00113	DoC
Laptop Deck	Panasonic	DS-PAN-411-2	BETA25	DoC
AC/DC	Panasonic	CF-AA5713A M1	5713AM112110227A	DoC

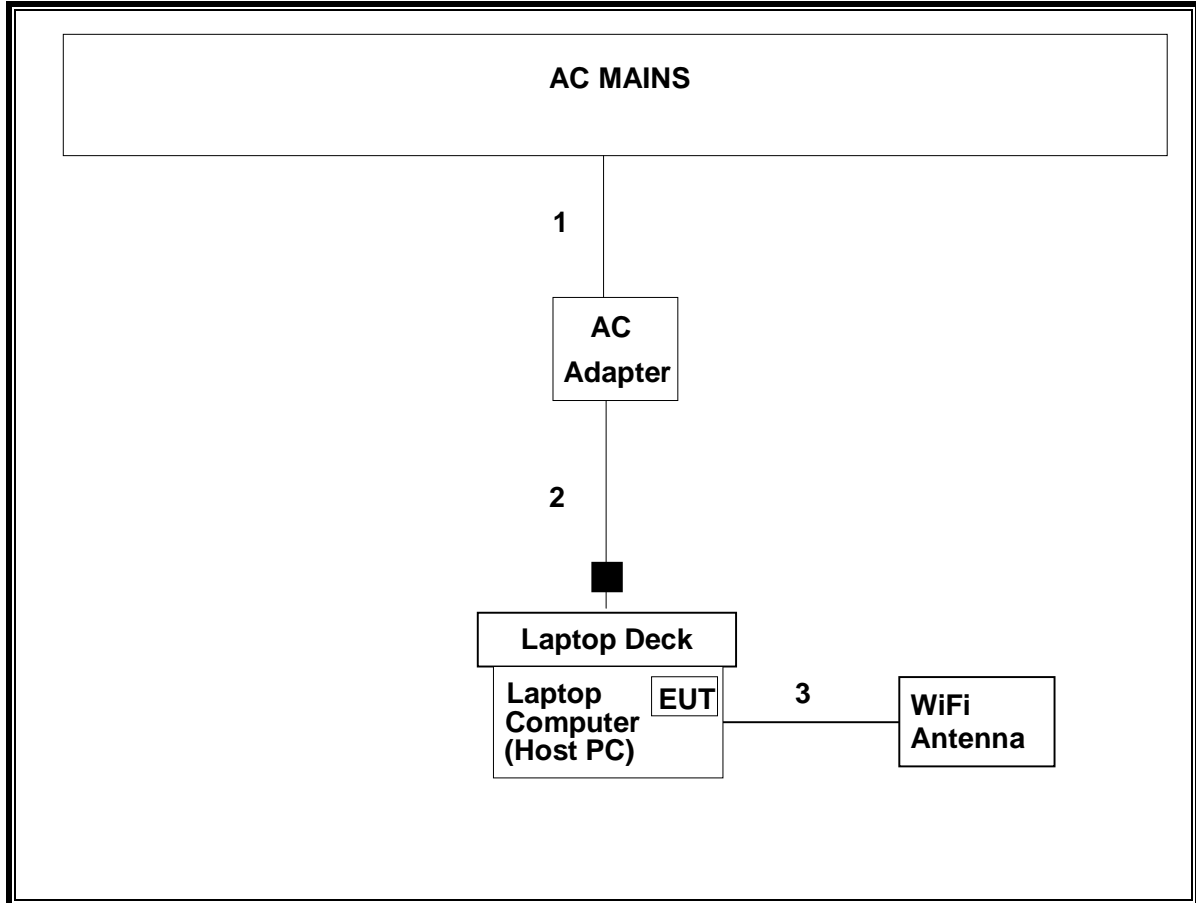
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Un-Shielded	190 cm	N/A
2	DC	1	DC	Un-Shielded	180 cm	N/A
3	Antenna	1	Antenna	Shielded	100 cm	N/A

TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the radio card. 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.

SETUP DIAGRAM FOR TESTS



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)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE/AT	2011/06/30 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2012/02/22 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2012/01/25 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2012/05/30 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2012/04/25 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2012/03/27 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2011/09/13 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2011/09/13 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE/CE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2012/02/03 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE/CE	2012/04/05 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/11/16 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/11/16 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2012/06/01 * 12
AT-38	Attenuator	Anritsu	MP721B	6200961025	RE	2011/12/08 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2012/03/05 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1203S212(1m) / 1204S062(5m)	RE	2012/04/23 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2012/03/28 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2011/06/17 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE	2012/02/09 * 12

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D- 2W(10m)/SFM141 (5m)/421- 010(1m)/sucoform 141-PE(1m)/RFM- E121(Switcher)	-/04178	CE	2011/07/04 * 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

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 1 MHz for peak measurements and 10 Hz for average measurements.

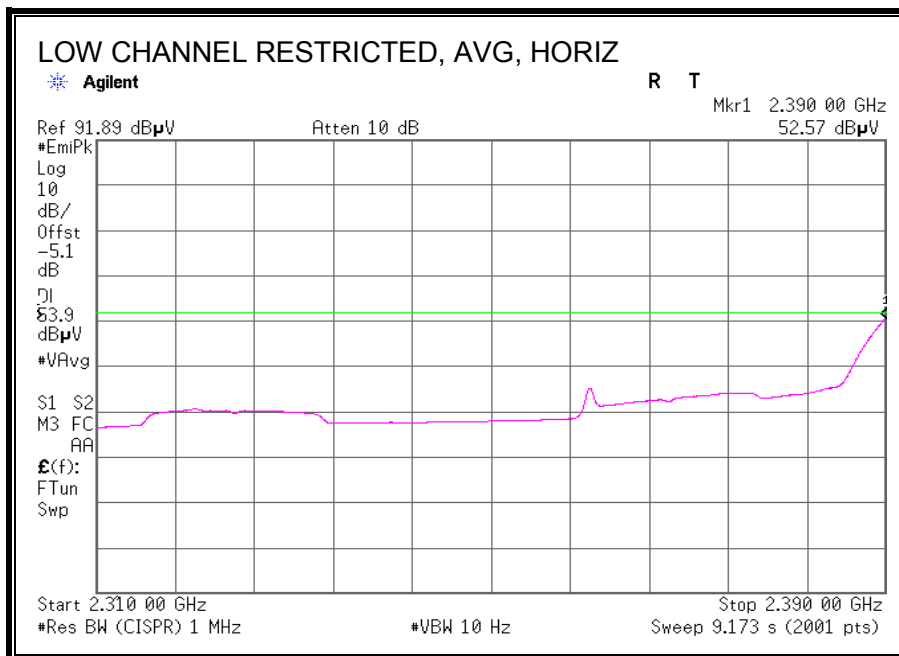
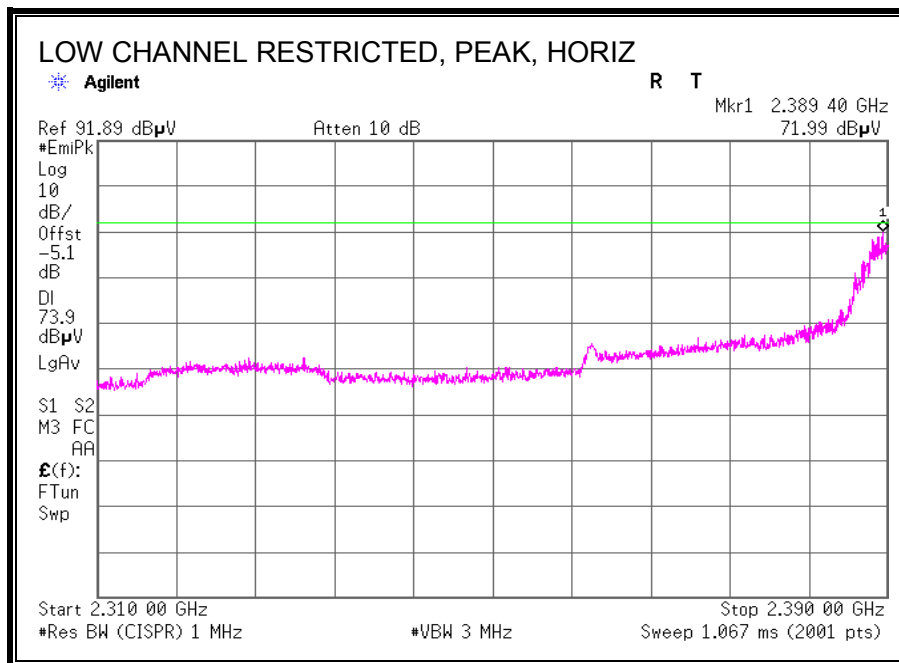
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

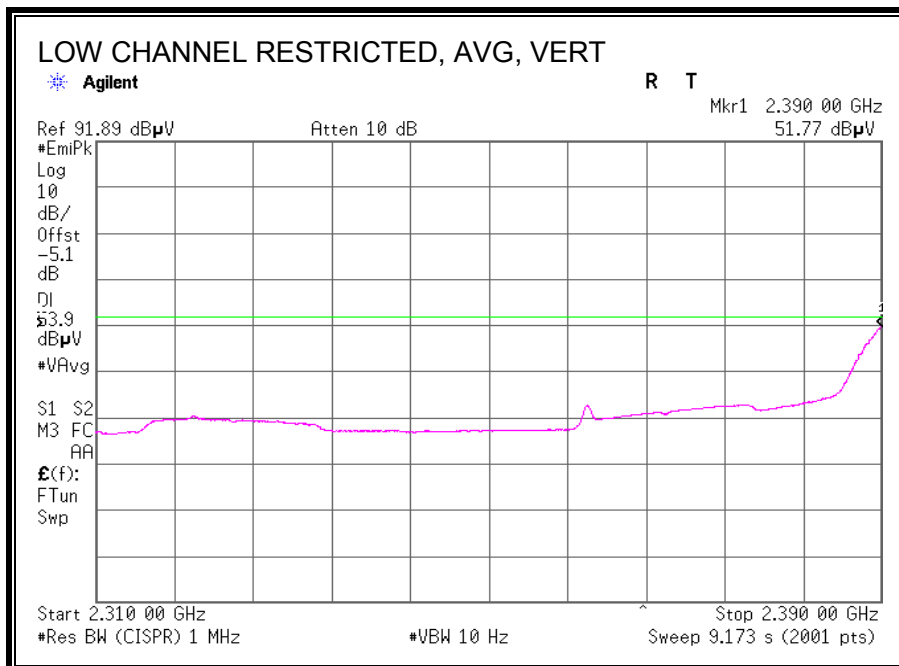
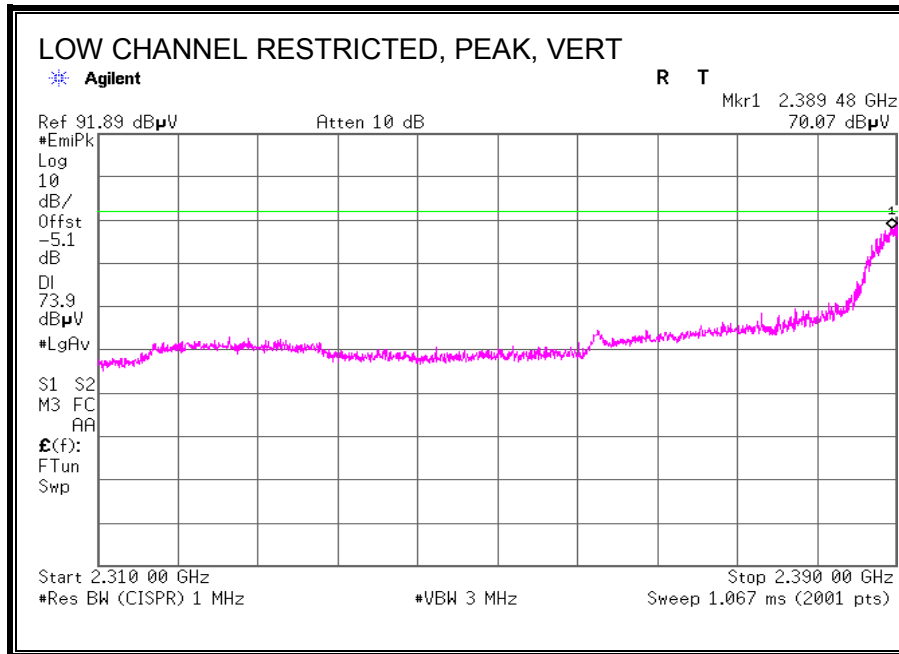
7.2. TRANSMITTER ABOVE 1 GHz (worst-case modes)

7.2.1. 2.4 GHz BAND (11n HT20)

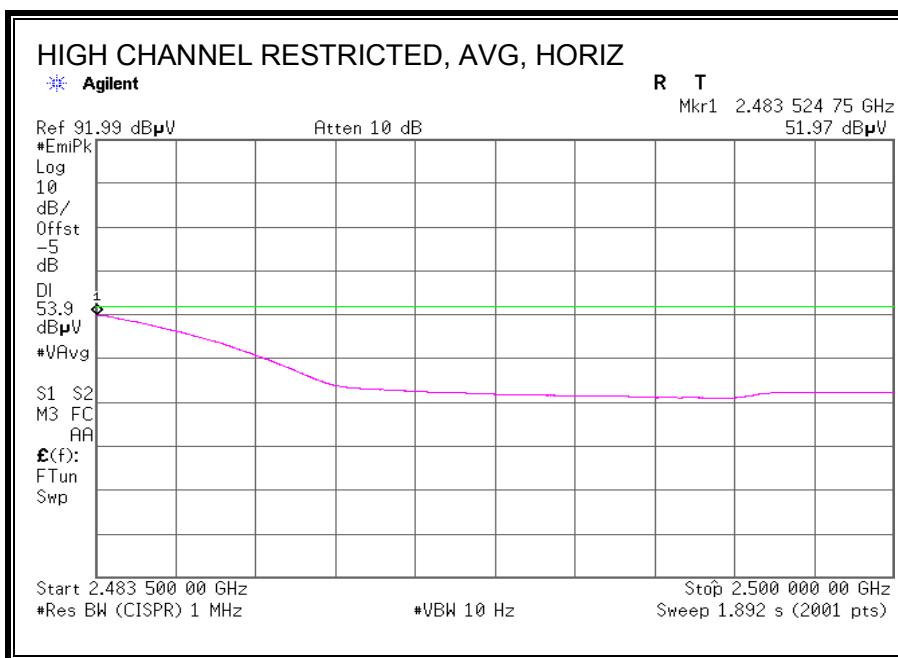
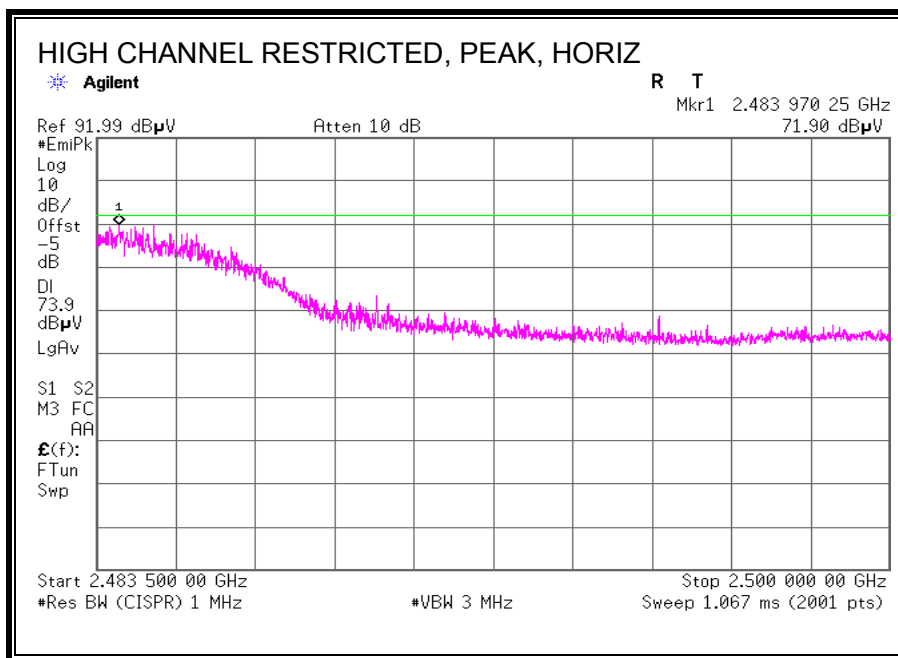
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



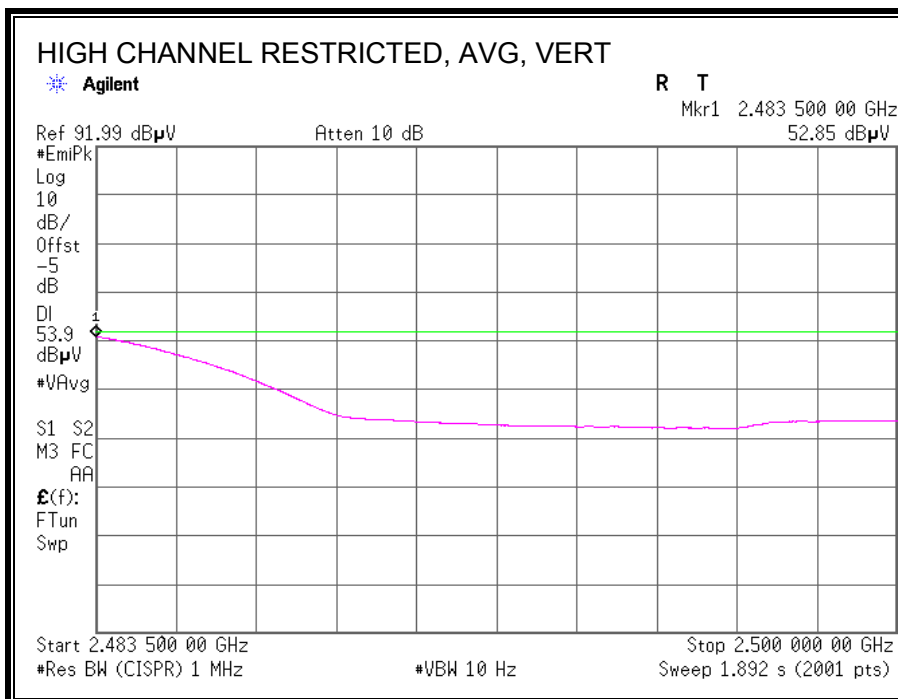
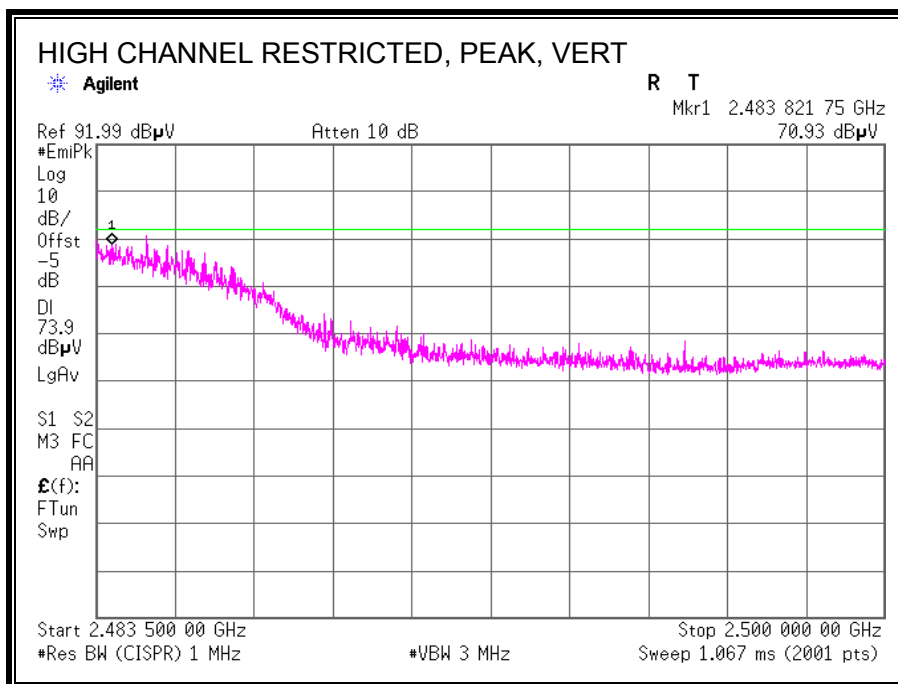
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

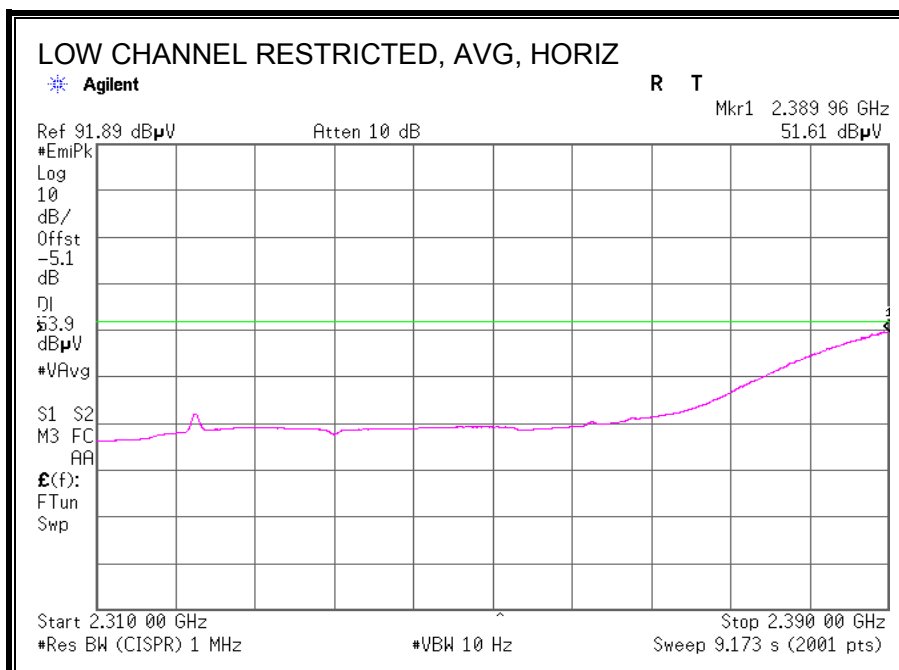
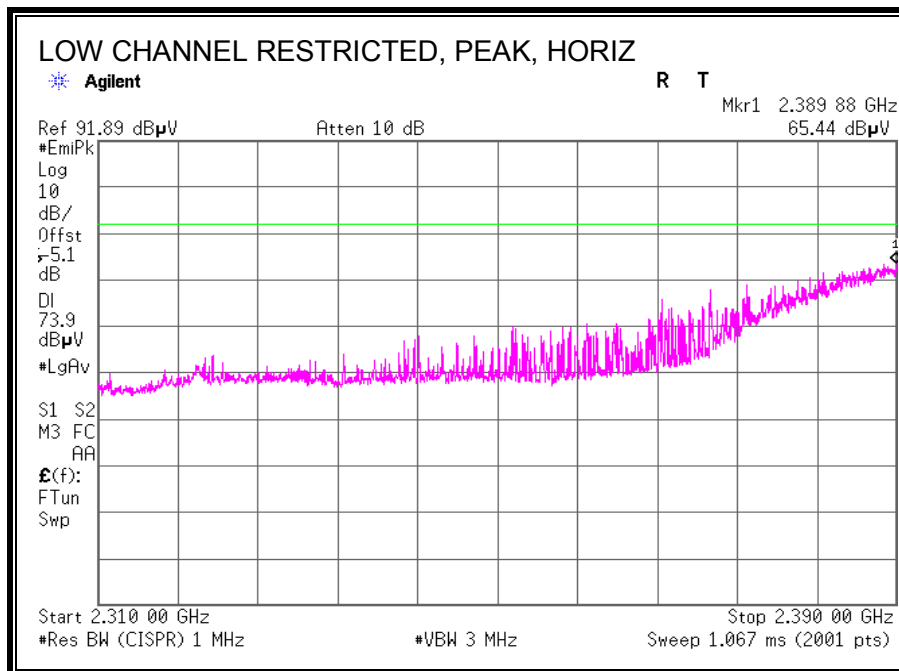


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

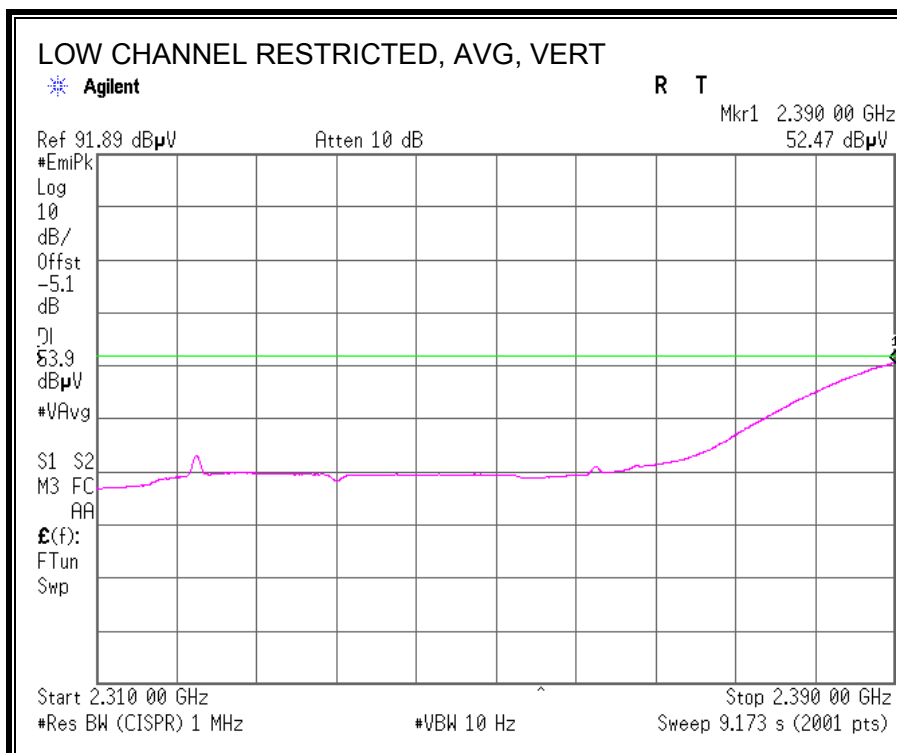
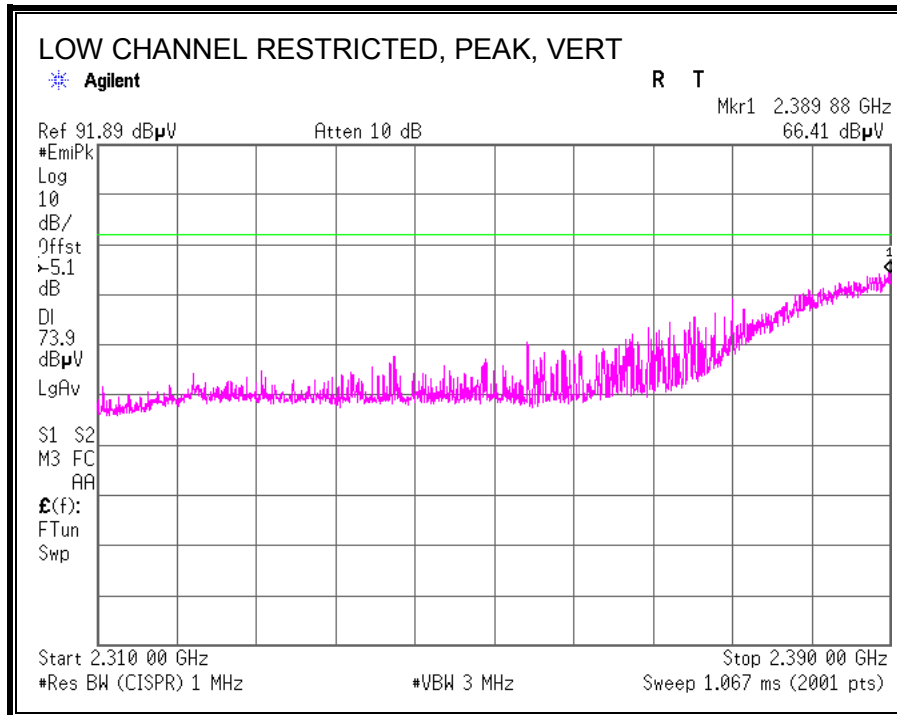


7.2.2 2.4 GHz BAND (11n HT40)

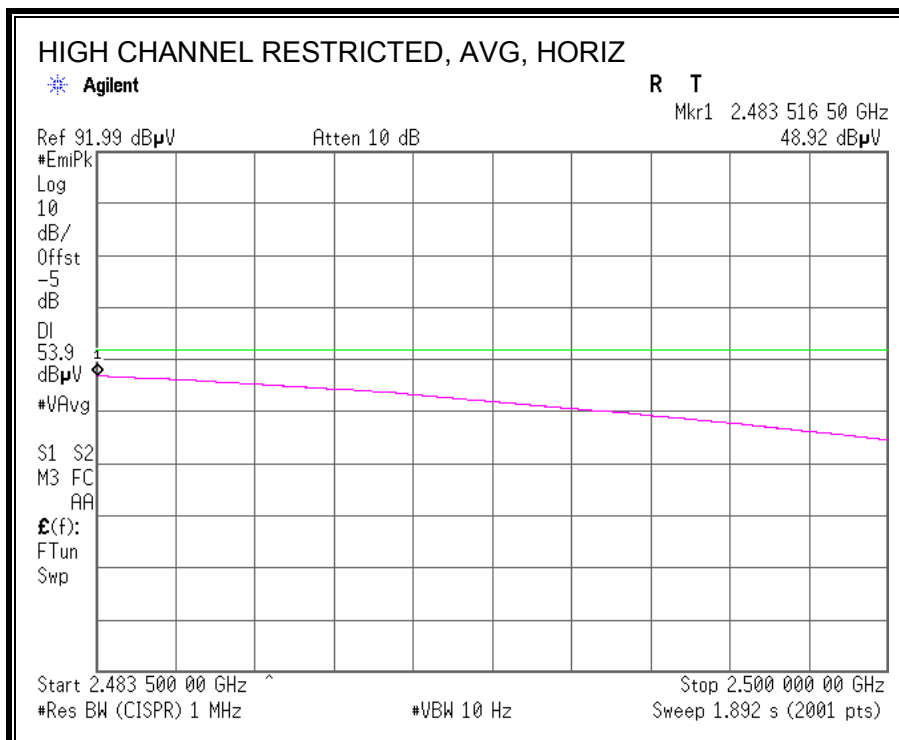
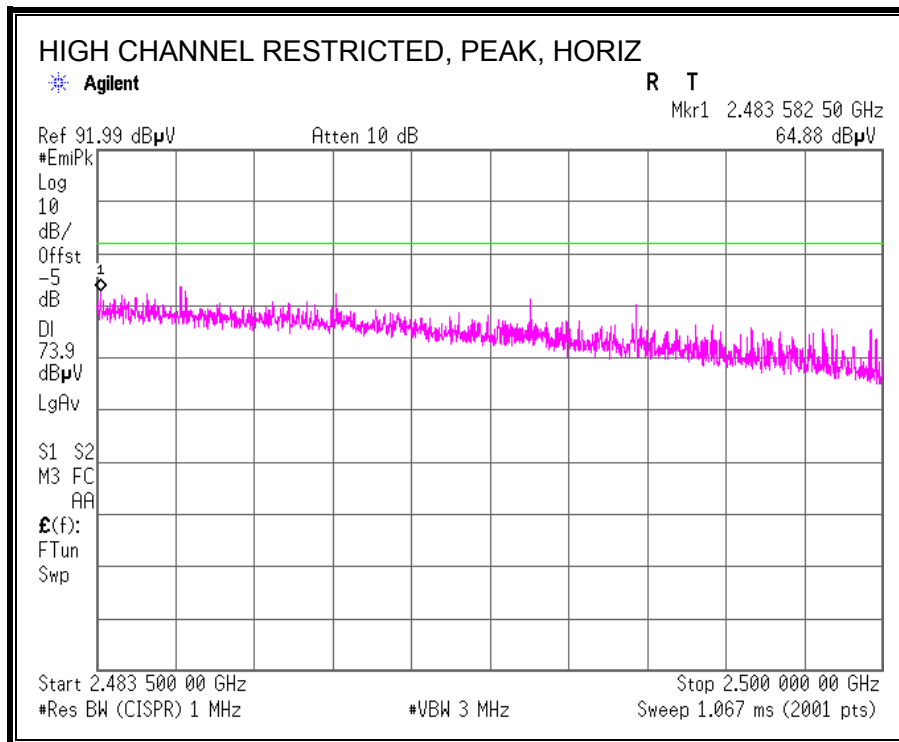
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



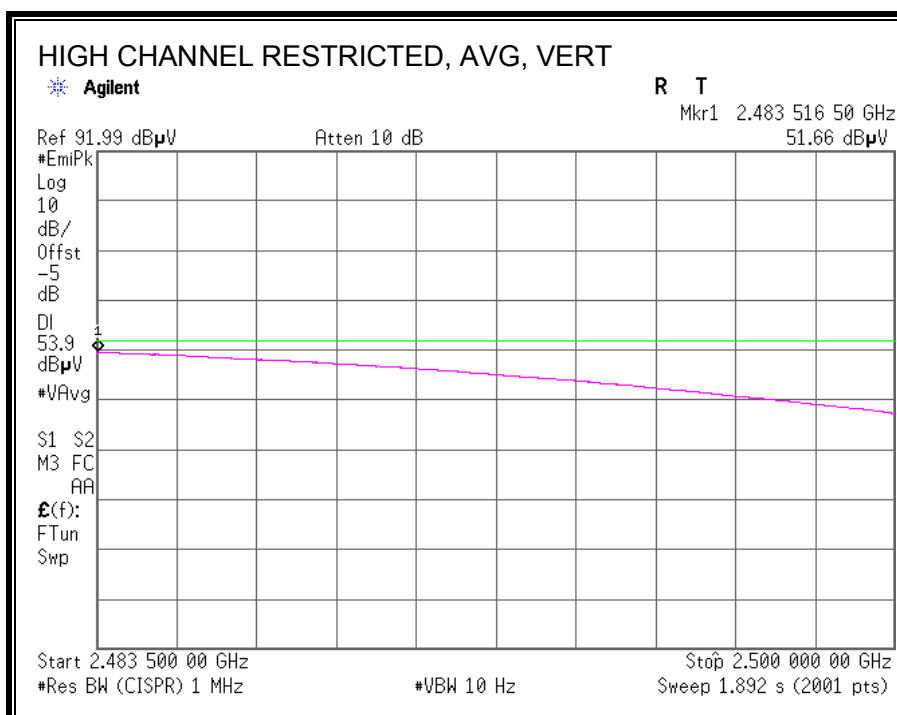
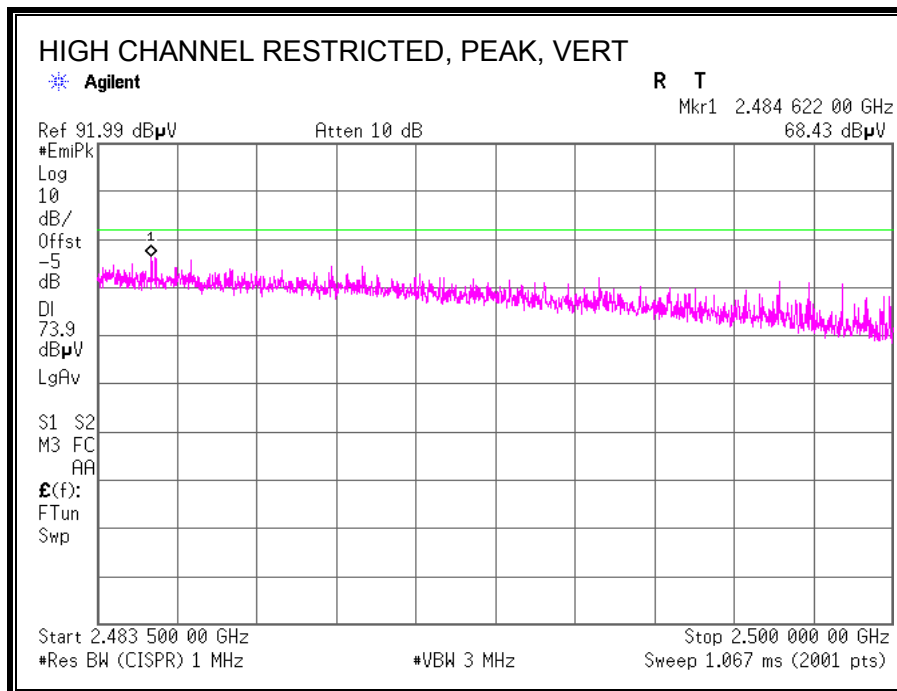
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
 Report No. 32JE0121-HO
 Date 06/02/2012 06/03/2012
 Temperature/ Humidity 24 deg. C / 49% RH 23 deg. C / 54% RH
 Engineer Keisuke Kawamura Satofumi Matsuyama
 (1-10GHz) (Above 10GHz)
 Mode 11b Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4824.000	PK	45.5	31.3	4.0	34.0	46.8	73.9	27.1	
Hori	7236.000	PK	43.2	35.9	4.6	34.2	49.5	73.9	24.4	No Signal
Hori	9648.000	PK	43.3	38.8	5.3	34.7	52.7	73.9	21.2	No Signal
Hori	24120.000	PK	46.1	38.7	-1.1	32.1	51.6	73.9	22.3	No Signal
Hori	4824.000	AV	38.0	31.3	4.0	34.0	39.3	53.9	14.6	
Hori	7236.000	AV	31.4	35.9	4.6	34.2	37.7	53.9	16.2	No Signal
Hori	9648.000	AV	32.2	38.8	5.3	34.7	41.6	53.9	12.3	No Signal
Hori	24120.000	AV	33.8	38.7	-1.1	32.1	39.3	53.9	14.6	No Signal
Vert	4824.000	PK	46.9	31.3	4.0	34.0	48.2	73.9	25.7	
Vert	7236.000	PK	42.8	35.9	4.6	34.2	49.1	73.9	24.8	No Signal
Vert	9648.000	PK	45.2	38.8	5.3	34.7	54.6	73.9	19.4	
Vert	24120.000	PK	45.8	38.7	-1.1	32.1	51.3	73.9	22.6	No Signal
Vert	4824.000	AV	39.2	31.3	4.0	34.0	40.5	53.9	13.5	
Vert	7236.000	AV	31.3	35.9	4.6	34.2	37.6	53.9	16.3	No Signal
Vert	9648.000	AV	33.9	38.8	5.3	34.7	43.3	53.9	10.6	
Vert	24120.000	AV	33.8	38.7	-1.1	32.1	39.3	53.9	14.6	No Signal

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).

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

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

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
 Report No. 32JE0121-HO
 Date 06/02/2012 06/03/2012
 Temperature/ Humidity 24 deg. C / 49% RH 23 deg. C / 54% RH
 Engineer Keisuke Kawamura Satofumi Matsuyama
 (1-10GHz) (Above 10GHz)
 Mode 11b Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	44.5	31.4	3.9	34.0	45.8	73.9	28.1	
Hori	7311.000	PK	43.2	36.0	4.1	34.2	49.1	73.9	24.8	No Signal
Hori	9748.000	PK	43.3	38.9	4.6	34.7	52.1	73.9	21.8	No Signal
Hori	24370.000	PK	45.5	38.6	-1.1	32.1	50.9	73.9	23.0	No Signal
Hori	4874.000	AV	34.9	31.4	3.9	34.0	36.2	53.9	17.7	
Hori	7311.000	AV	31.4	36.0	4.1	34.2	37.3	53.9	16.6	No Signal
Hori	9748.000	AV	32.2	38.9	4.6	34.7	41.0	53.9	12.9	No Signal
Hori	24370.000	AV	33.7	38.6	-1.1	32.1	39.1	53.9	14.8	No Signal
Vert	4874.000	PK	44.9	31.4	3.9	34.0	46.2	73.9	27.7	
Vert	7311.000	PK	42.8	36.0	4.1	34.2	48.7	73.9	25.2	No Signal
Vert	9748.000	PK	44.6	38.9	5.3	34.7	54.1	73.9	19.8	No Signal
Vert	24370.000	PK	45.7	38.6	-1.1	32.1	51.1	73.9	22.8	No Signal
Vert	4874.000	AV	34.5	31.4	3.9	34.0	35.8	53.9	18.1	
Vert	7311.000	AV	31.3	36.0	4.1	34.2	37.2	53.9	16.7	No Signal
Vert	9748.000	AV	32.4	38.9	5.3	34.7	41.9	53.9	12.0	No Signal
Vert	24370.000	AV	33.7	38.6	-1.1	32.1	39.1	53.9	14.8	No Signal

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).

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

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

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
 Report No. 32JE0121-HO
 Date 06/02/2012 06/03/2012
 Temperature/ Humidity 24 deg. C / 49% RH 23 deg. C / 54% RH
 Engineer Keisuke Kawamura Satofumi Matsuyama
 (1-10GHz) (Above 10GHz)
 Mode 11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4924.000	PK	45.6	31.5	4.0	34.0	47.1	73.9	26.8	
Hori	7386.000	PK	43.2	36.1	4.1	34.3	49.1	73.9	24.8	No Signal
Hori	9848.000	PK	46.2	39.1	5.4	34.7	56.0	73.9	17.9	
Hori	24620.000	PK	45.8	38.6	-1.0	32.2	51.2	73.9	22.7	No Signal
Hori	4924.000	AV	38.3	31.5	4.0	34.0	39.8	53.9	14.1	
Hori	7386.000	AV	31.4	36.1	4.1	34.3	37.3	53.9	16.6	No Signal
Hori	9848.000	AV	35.3	39.1	5.4	34.7	45.1	53.9	8.9	
Hori	24620.000	AV	34.0	38.6	-1.0	32.2	39.4	53.9	14.5	No Signal
Vert	4924.000	PK	44.5	31.5	4.0	34.0	46.0	73.9	27.9	
Vert	7386.000	PK	42.8	36.1	4.1	34.3	48.7	73.9	25.2	No Signal
Vert	9848.000	PK	44.5	39.1	5.4	34.7	54.3	73.9	19.6	
Vert	24620.000	PK	45.6	38.6	-1.0	32.2	51.0	73.9	22.9	No Signal
Vert	4924.000	AV	35.2	31.5	4.0	34.0	36.7	53.9	17.2	
Vert	7386.000	AV	31.3	36.1	4.1	34.3	37.2	53.9	16.7	No Signal
Vert	9848.000	AV	34.8	39.1	5.4	34.7	44.6	53.9	9.3	
Vert	24620.000	AV	34.0	38.6	-1.0	32.2	39.4	53.9	14.5	No Signal

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).

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

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

7.3. WORST-CASE BELOW 1 GHz

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

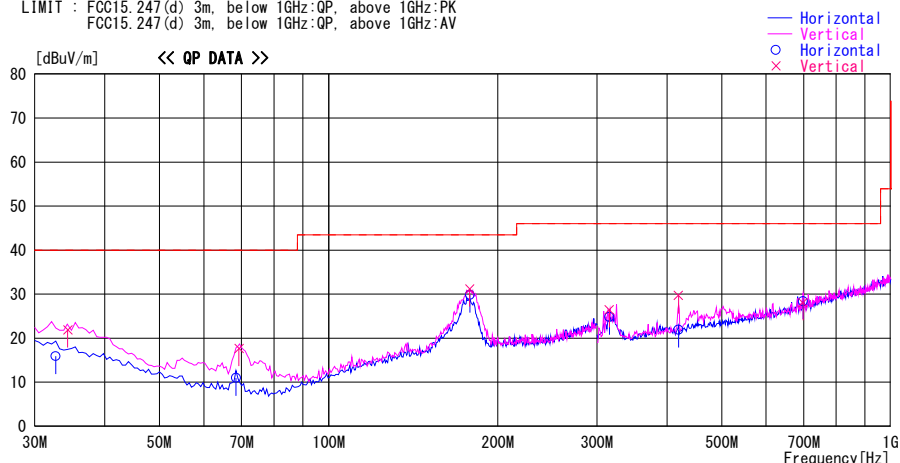
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2012/06/03

Report No. : 32JE0121-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 23 deg. C / 54% RH
 Engineer : Satofumi Matsuyama

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

LIMIT : FCC15.247(d) 3m, below 1GHz:QP, above 1GHz:PK
 FCC15.247(d) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
32.703	23.2	QP	17.6	-24.9	15.9	180	300	Hori.	40.0	24.1	
34.379	29.8	QP	16.9	-24.8	21.9	268	100	Vert.	40.0	18.1	
68.417	28.6	QP	6.8	-24.4	11.0	215	300	Hori.	40.0	29.0	
69.265	35.4	QP	6.7	-24.4	17.7	242	100	Vert.	40.0	22.3	
178.206	38.4	QP	16.0	-23.2	31.2	14	100	Vert.	43.5	12.3	
178.436	37.0	QP	16.0	-23.2	29.8	144	184	Hori.	43.5	13.7	
315.714	32.5	QP	16.3	-22.3	26.5	264	140	Vert.	46.0	19.5	
316.074	30.8	QP	16.3	-22.3	24.8	45	100	Hori.	46.0	21.2	
419.113	33.4	QP	17.9	-21.6	29.7	242	100	Vert.	46.0	16.3	
419.338	25.6	QP	17.9	-21.6	21.9	62	100	Hori.	46.0	24.1	
697.643	26.7	QP	22.0	-20.3	28.4	276	100	Hori.	46.0	17.6	
697.702	26.4	QP	22.0	-20.3	28.1	78	100	Vert.	46.0	17.9	

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)

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 μ H/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 (dB μ V)	
	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.

RESULTS

6 WORST EMISSIONS

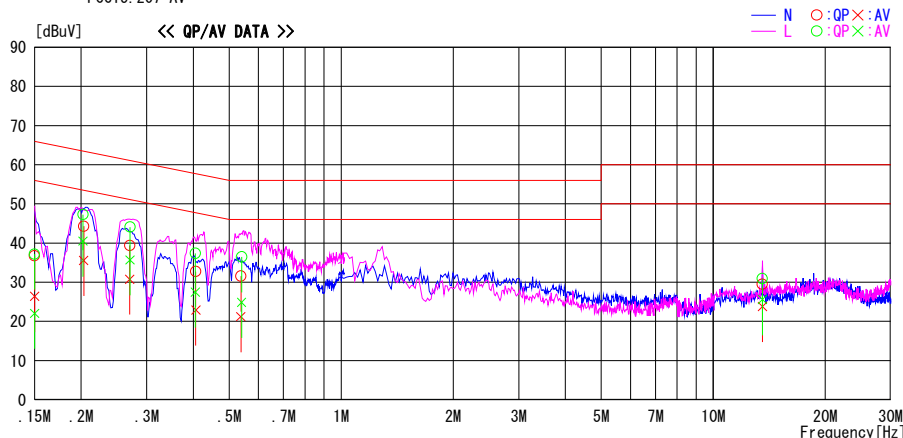
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
 Date : 2012/06/03

Report No. : 32JE0121-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 23deg. C / 54% RH
 Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 11b 1Mbps 2462MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	23.4	13.1	13.3	36.7	26.4	66.0	56.0	29.3	29.6	N	
0.20321	31.0	22.3	13.3	44.3	35.6	63.5	53.5	19.2	17.9	N	
0.27030	26.1	17.5	13.3	39.4	30.8	61.1	51.1	21.7	20.3	N	
0.40692	19.4	9.6	13.3	32.7	22.9	57.7	47.7	25.0	24.8	N	
0.53765	18.3	7.9	13.3	31.6	21.2	56.0	46.0	24.4	24.8	N	
13.55977	15.1	9.4	14.4	29.5	23.8	60.0	50.0	30.5	26.2	N	
0.15000	23.9	8.8	13.3	37.2	22.1	66.0	56.0	28.8	33.9	L	
0.20236	34.0	27.2	13.3	47.3	40.5	63.5	53.5	16.2	13.0	L	
0.27083	30.8	22.4	13.3	44.1	35.7	61.1	51.1	17.0	15.4	L	
0.40562	24.1	14.2	13.3	37.4	27.5	57.7	47.7	20.3	20.2	L	
0.54040	23.2	11.6	13.3	36.5	24.9	56.0	46.0	19.5	21.1	L	
13.55977	16.5	11.2	14.4	30.9	25.6	60.0	50.0	29.1	24.4	L	

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