



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Wireless LAN module

MODEL NUMBER: DWM-W078

FCC ID: EW4DWMW078

REPORT NUMBER: 33EE0032-HO-A

ISSUE DATE: February 4, 2013

Prepared for
Mitsumi Electric Co., Ltd.
1601, Sakai, Atsugi-shi, Kanagawa,
243-8533 JAPAN

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 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>
--	02/04/13	Initial Issue	T. Hatakeda

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY	7
5. EQUIPMENT UNDER TEST	8
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM OUTPUT POWER	8
5.3. AVERAGE OUTPUT POWER	8
5.4. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.5. SOFTWARE AND FIRMWARE	8
5.6. WORST-CASE CONFIGURATION AND MODE	9
5.7. DESCRIPTION OF TEST SETUP	10
6. TEST AND MEASUREMENT EQUIPMENT	13
7. ANTENNA PORT TEST RESULTS	15
7.1. 802.11b MODE IN THE 2.4 GHz BAND	15
7.1.1. 6 dB BANDWIDTH	15
7.1.2. 99% BANDWIDTH	18
7.1.3. OUTPUT POWER	21
7.1.4. AVERAGE POWER	22
7.1.5. POWER SPECTRAL DENSITY	23
7.1.6. CONDUCTED SPURIOUS EMISSIONS	26
7.2. 802.11g MODE IN THE 2.4 GHz BAND	27
7.2.1. 6 dB BANDWIDTH	27
7.2.2. 99% BANDWIDTH	30
7.2.3. OUTPUT POWER	33
7.2.4. AVERAGE POWER	34
7.2.5. POWER SPECTRAL DENSITY	35
7.2.6. CONDUCTED SPURIOUS EMISSIONS	38
7.3. 802.11n-20 MODE IN THE 2.4 GHz BAND	39
7.3.1. 6dB BANDWIDTH	39
7.3.2. 99% BANDWIDTH	42
7.3.3. OUTPUT POWER	45
7.3.4. AVERAGE POWER	46
7.3.5. POWER SPECTRAL DENSITY	47
7.3.6. CONDUCTED SPURIOUS EMISSIONS	50

8. RADIATED TEST RESULTS.....	51
8.1 LIMITS AND PROCEDURE.....	51
8.2 TEST DATA.....	53
8.2.1 802.11b MODE	53
8.2.2 802.11g MODE	56
8.2.3 802.11n-20 MODE.....	60
9 AC POWER LINE CONDUCTED EMISSIONS.....	62
10. MAXIMUM PERMISSIBLE EXPOSURE	64

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Mitsumi Electric Co., Ltd.
1601, Sakai, Atsugi-shi, Kanagawa, 243-8533 JAPAN

EUT DESCRIPTION: Wireless LAN module

MODEL: DWM-W078

SERIAL NUMBER: 1 and 2

DATE TESTED: January 10 to 23, 2013

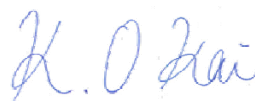
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

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. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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:



TAKAHIRO HATAKEDA
Leader of WiSE Japan
UL Verification Services
UL Japan, Inc.

KATSUNORI OKAI
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 C63.4-2003, 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:

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

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	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	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 Wireless LAN module.

The radio module is manufactured by Mitsumi.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	15.20	33.11
2412 - 2462	802.11g	21.35	136.46
2412 - 2462	802.11n-20	20.87	122.18

5.3. AVERAGE OUTPUT POWER

The transmitter has an average conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	12.62	18.28
2412 - 2462	802.11g	12.09	16.18
2412 - 2462	802.11n-20	12.14	16.37

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Chip antenna, with a maximum gain of -9.2dBi.

5.5. SOFTWARE AND FIRMWARE

The test utility software used during testing was DuTapiSDSD8787/1.0.7.22

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate for each model is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

All final tests in the 802.11b mode were made at 1 Mb/s.

All final tests in the 802.11g mode were made at 24 Mb/s.

All final tests in the 802.11n-20 mode were made at MCS0

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

The EUT was investigated in three orthogonal orientations X, Y, and Z. The outcome showed that Horizontal: Z-orientation and Vertical: X-orientation as the worst case.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	Serial Number
Test Jig	Mitsumi	-	-
PC	Dell	LATITUDE E6400	19728586900
AC/DC Adaptor	Dell	FA90 PE1-00	CN-0CM889-73245-91F-4706-A00
Micro SD	Panasonic	RP-SM01GBJ1K	SR9FB014582

I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-shielded	1.2m	
2	Flat	1	FPC	Un-shielded	0.1m	
3	DC	1	DC	Un-shielded	1.7m	one ferrite at PC end.
4	AC	1	US 115V	Un-shielded	1.8m	

TEST SETUP

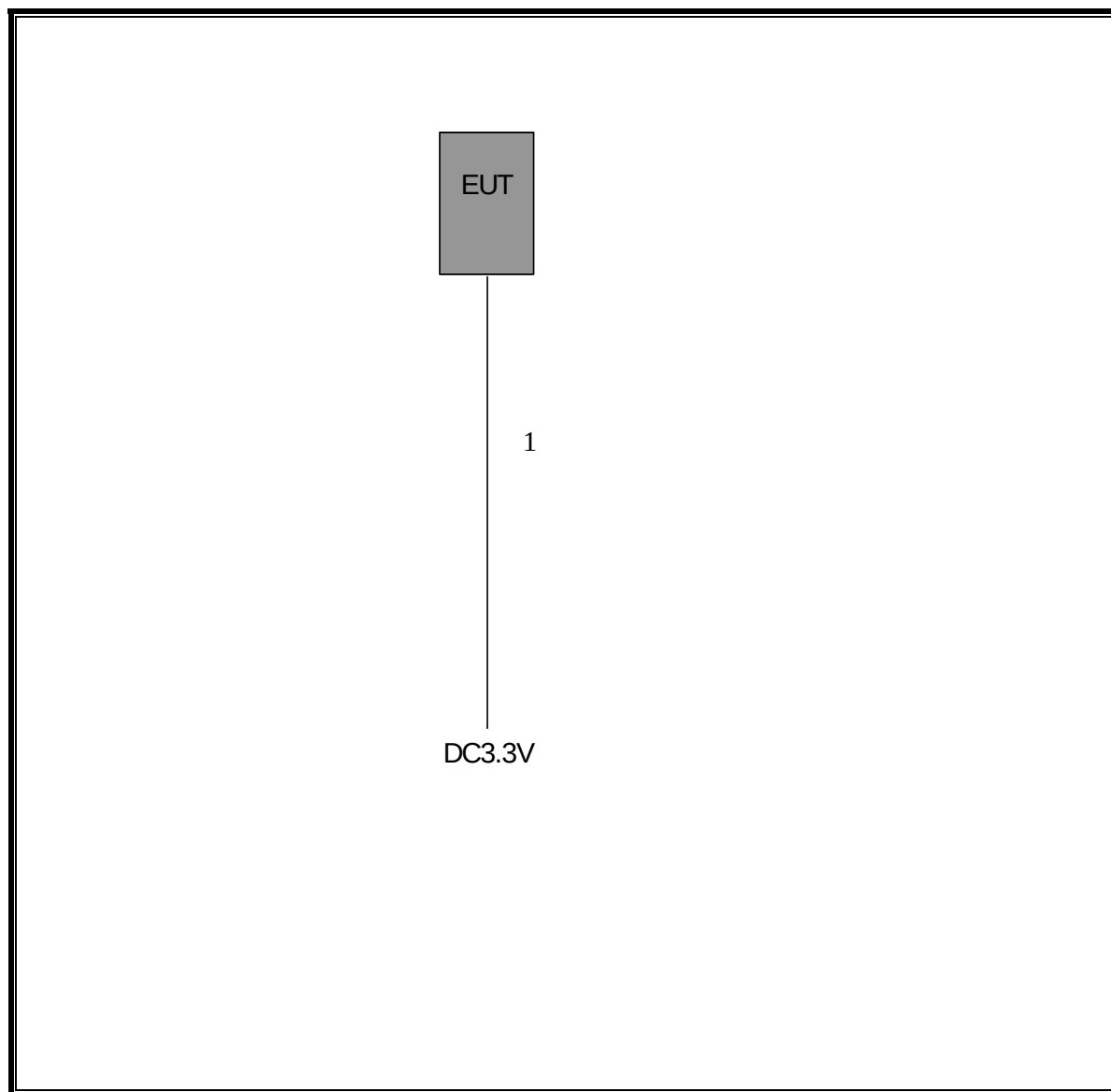
The EUT is connected with Test jig and PC during Conducted Emission, Antenna Terminal Conducted, and Radiated emission (above 1GHz) tests.

The EUT is a stand alone configuration during Radiated emission (below 1GHz) test.

Test software exercised the radio card.

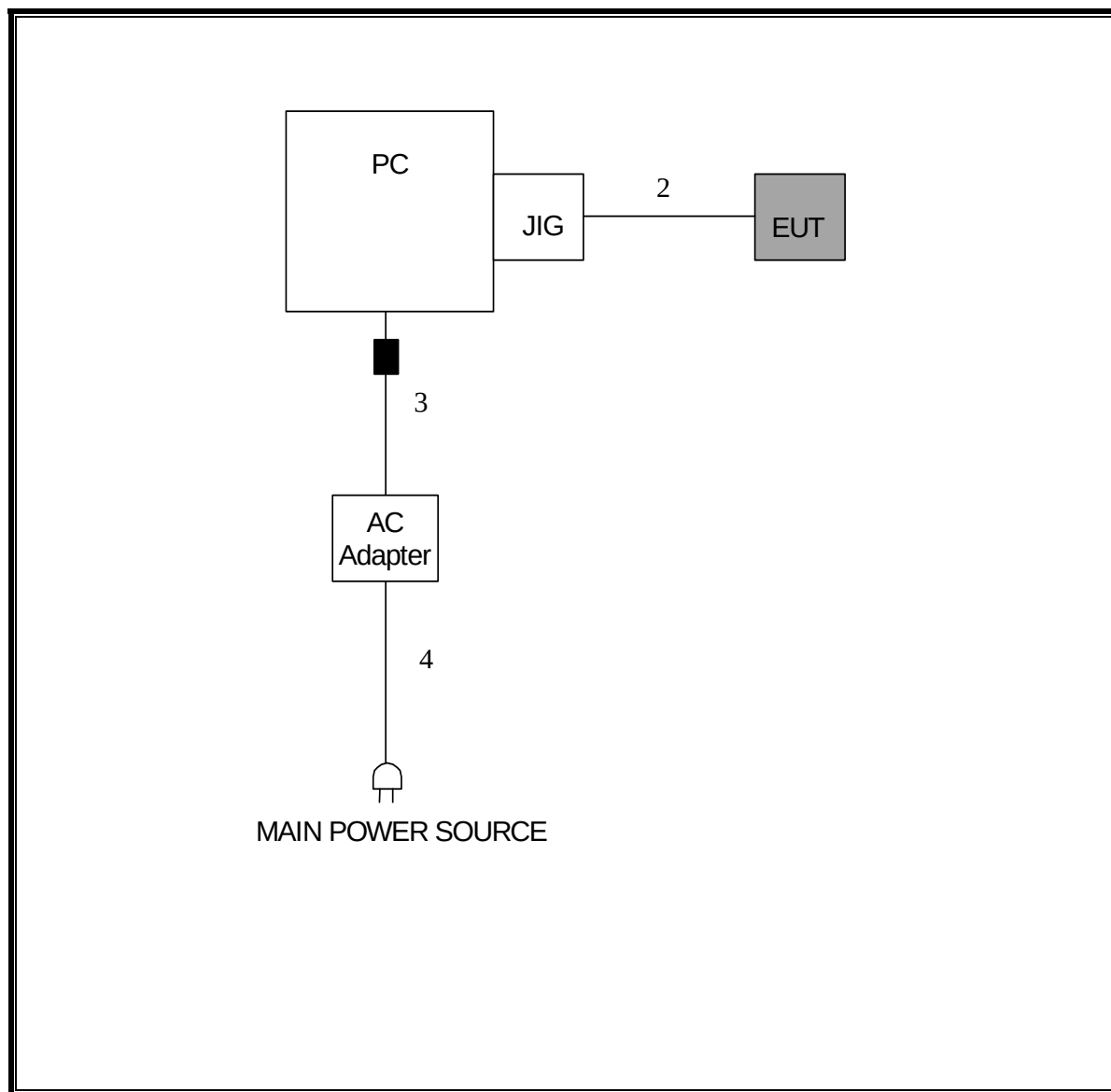
SETUP DIAGRAM FOR TESTS (1/2)

Radiated Emission (below 1GHz)



SETUP DIAGRAM FOR TESTS (2/2)

Conducted Emission, Antenna Terminal Conducted, Radiated emission (above 1GHz) 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)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2012/02/06 * 12
MAT-25	Attenuator(10dB) (above1GHz)	Agilent	8493C	71642	AT	2012/06/27 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2012/10/08 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2012/10/08 * 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	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2012/04/06 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2012/08/17 * 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
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2012/05/30 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE/AT	2012/02/03 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2012/05/25 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2012/09/05 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2012/03/29 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2012/05/21 * 12
MHF-19	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCA	602	RE	2012/09/12 * 12
MCC-76	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278967/4	RE	2012/12/24 * 12

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	CE	2012/04/05 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(EUT)	2013/01/07 * 12
MAT-67	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/09 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ sucoform141- PE(1m)/RFM- E121(Switcher)	-/04178	CE	2012/07/12 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2012/11/06 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2012/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2012/02/08 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2012/06/14 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2012/11/18 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2012/11/18 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2012/11/06 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2012/09/13 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2012/02/20 * 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. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

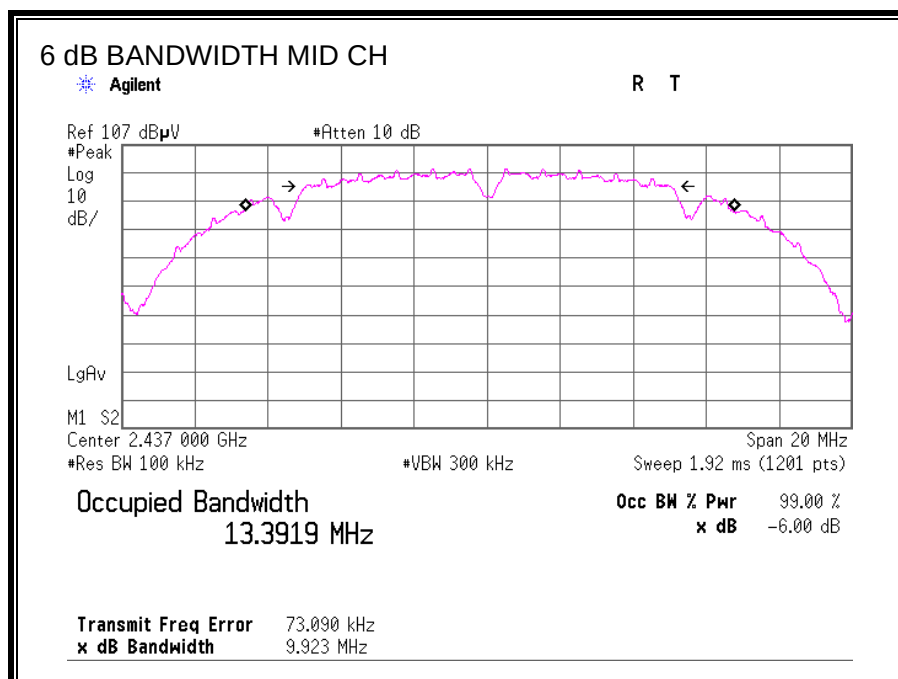
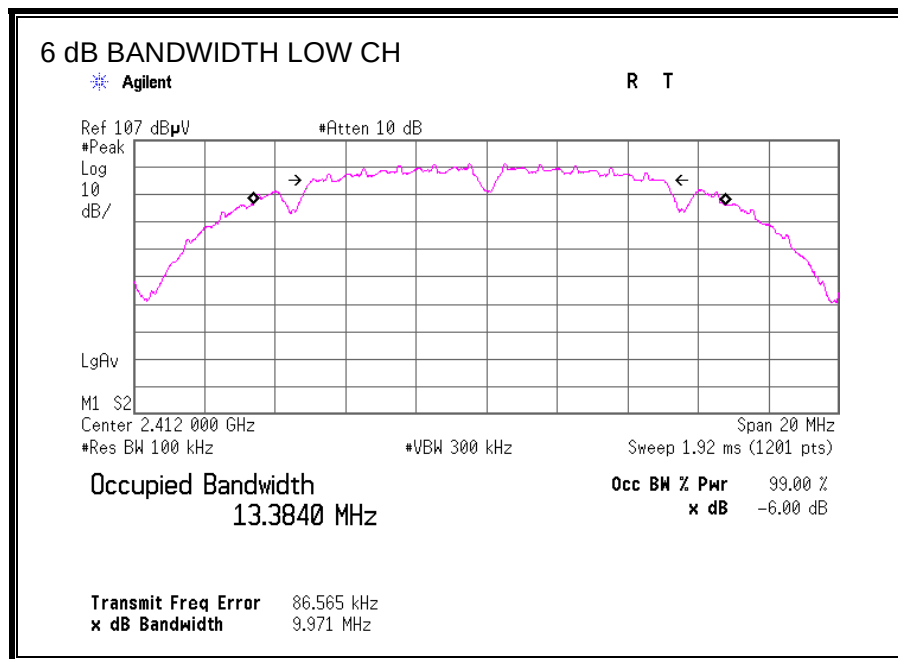
TEST PROCEDURE

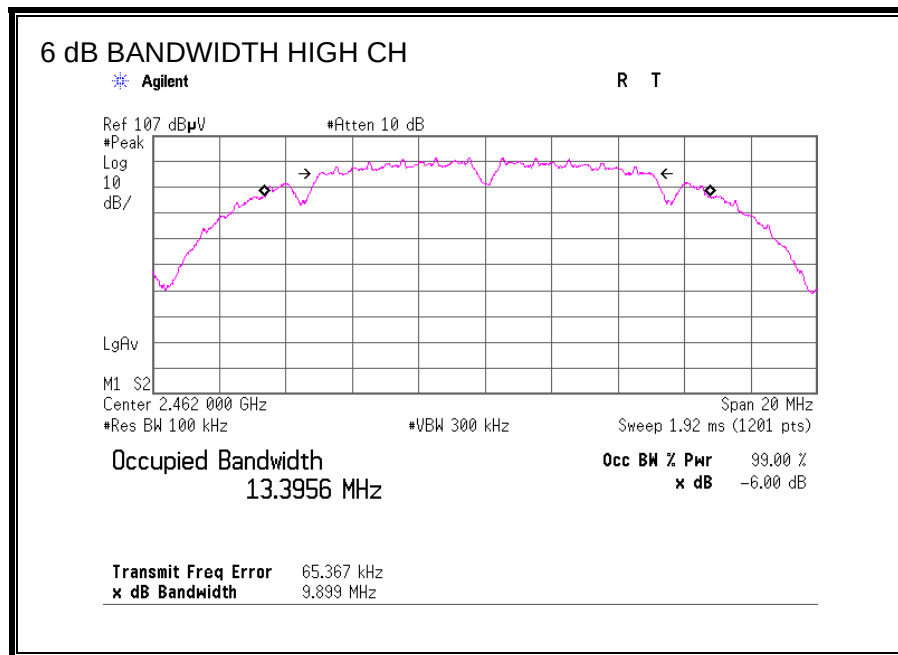
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	9.971	>500
2437	9.923	>500
2462	9.899	>500

6 dB BANDWIDTH



7.1.2. 99% BANDWIDTH**LIMITS**

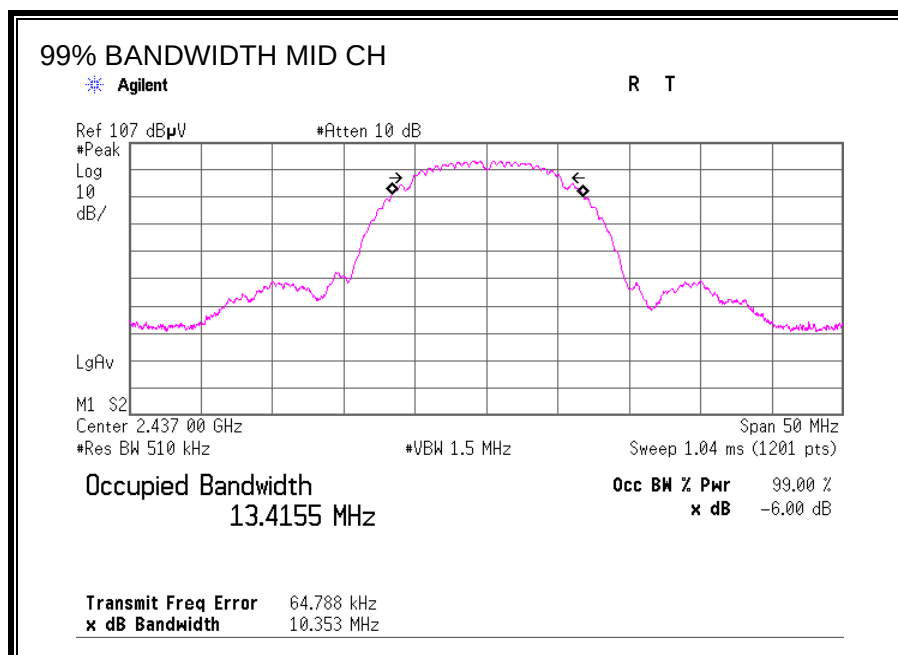
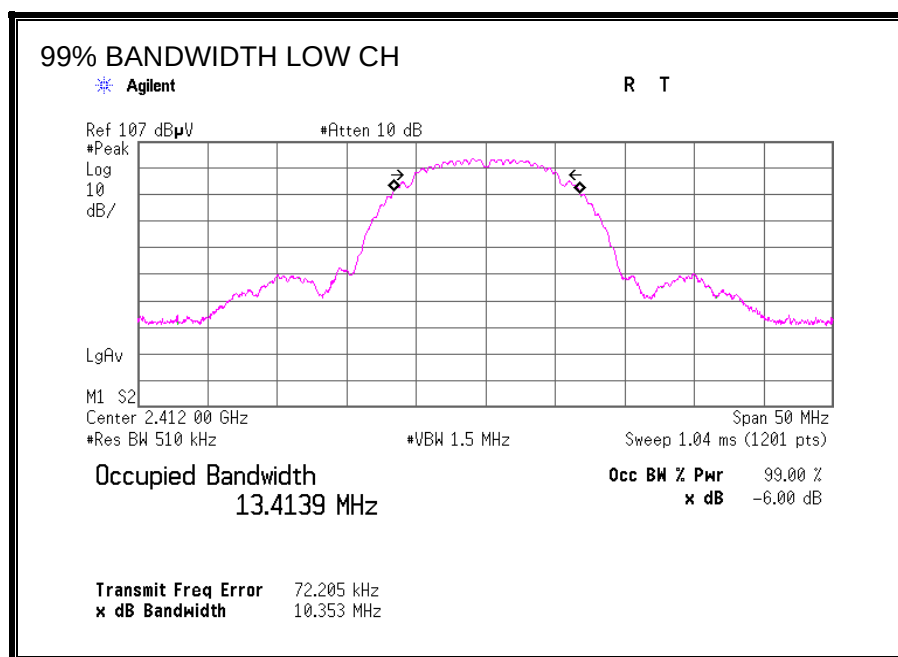
None; for reporting purposes only.

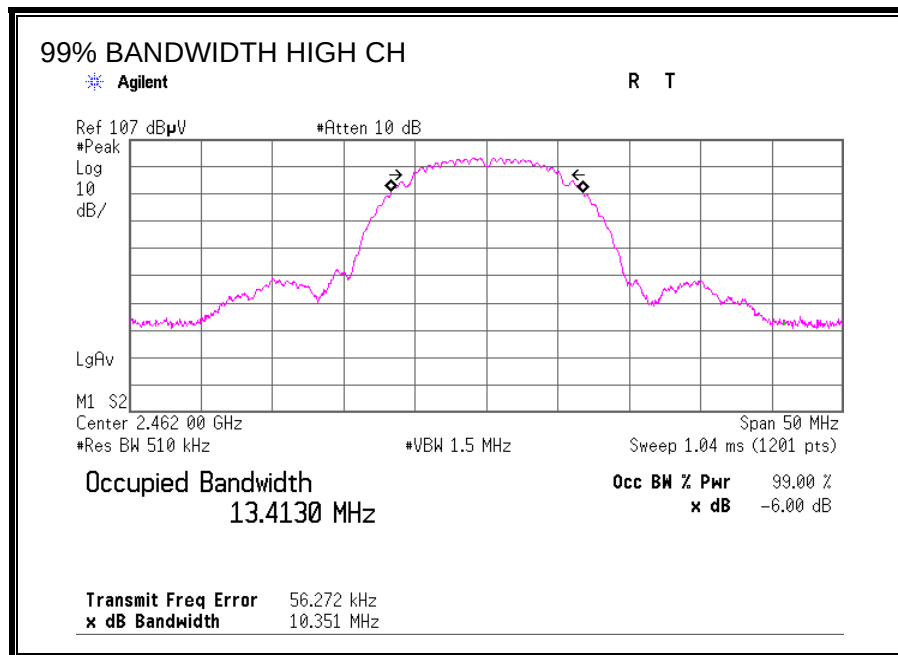
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	13.4139
Middle	2437	13.4155
High	2462	13.4130

99% BANDWIDTH



7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

TEST PROCEDURE

The transmitter output is connected to a power sensor with a power meter.

RESULTS

The cable assembly insertion loss of 10.80 dB (including 10.03 dB pad and 0.77 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	4.40	0.77	10.03	15.20	33.11	30.00	1000	14.80
2437	4.38	0.77	10.03	15.18	32.96	30.00	1000	14.82
2462	4.35	0.77	10.03	15.15	32.73	30.00	1000	14.85

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	4.40	*
2	4.10	
5.5	3.86	
11	3.88	

*: Worst Rate

All comparizon were carried out on same frequency and measurement factors.

7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.80 dB (including 10.03 dB pad and 0.77 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				AVG [dBm]	AVG [mW]
2412	1.82	0.77	10.03	12.62	18.28
2437	1.73	0.77	10.03	12.53	17.91
2462	1.72	0.77	10.03	12.52	17.86

Sample Calculation:

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

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

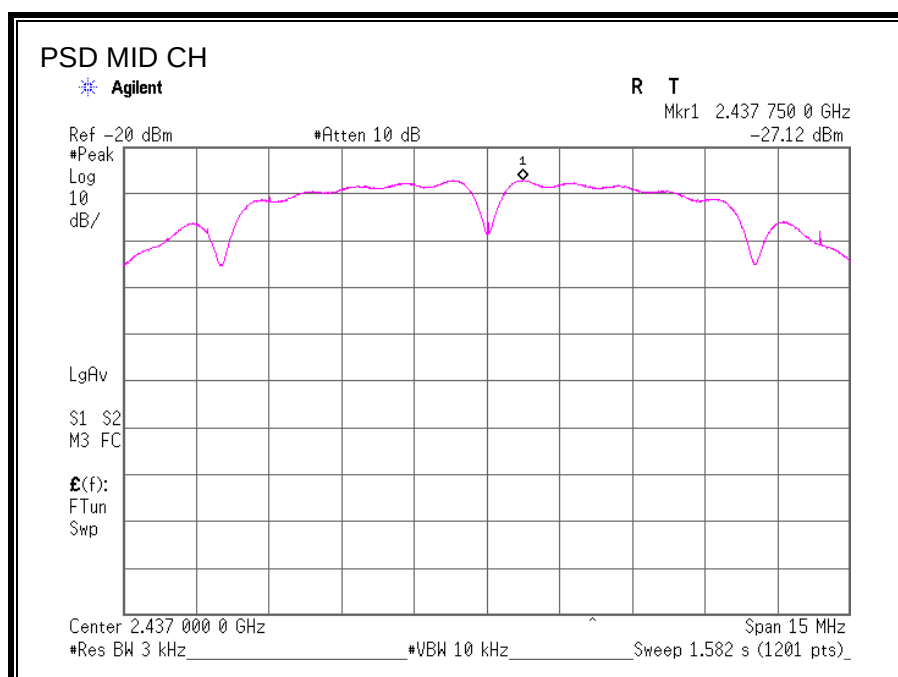
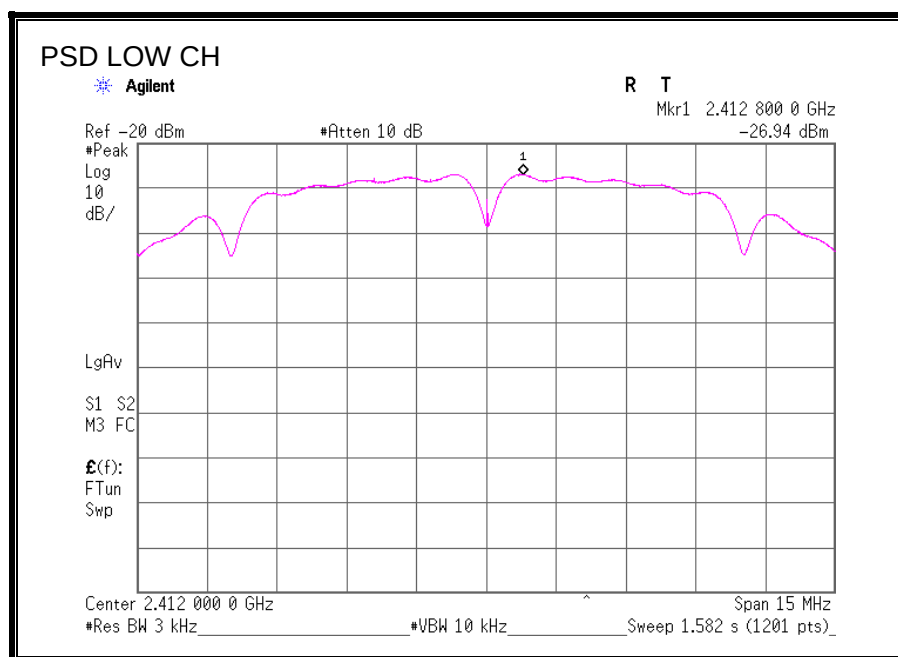
TEST PROCEDURE

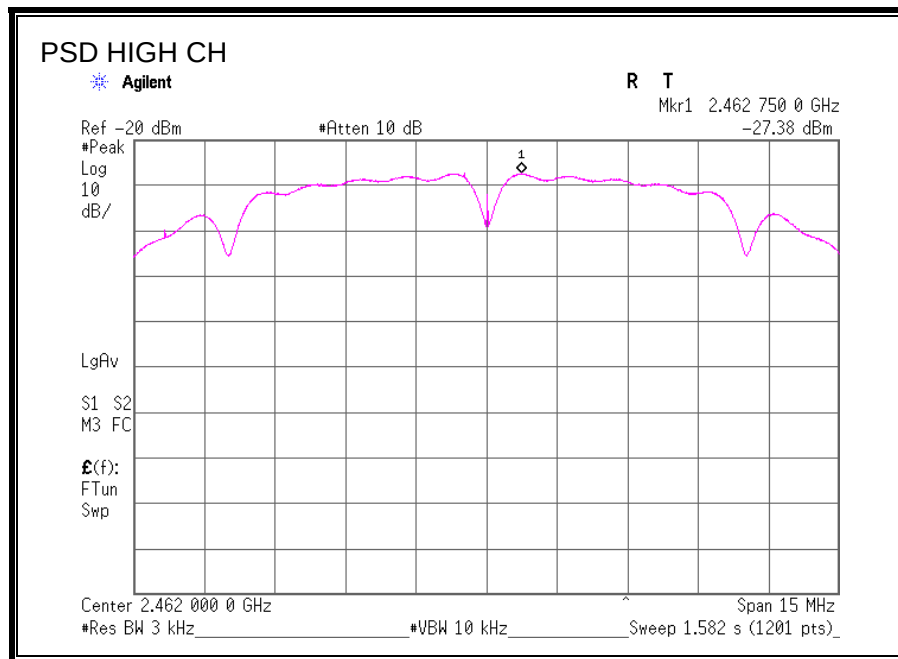
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document KDB558074: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)

RESULTS

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.94	0.77	10.03	-16.14	8.00	24.14
2437.00	-27.12	0.77	10.03	-16.32	8.00	24.32
2462.00	-27.38	0.77	10.03	-16.58	8.00	24.58

POWER SPECTRAL DENSITY



7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 9 kHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

Test was performed only on 802.11g mode in the 2.4 GHz band, at Mid channel, as representative, because it had the highest output power.

7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

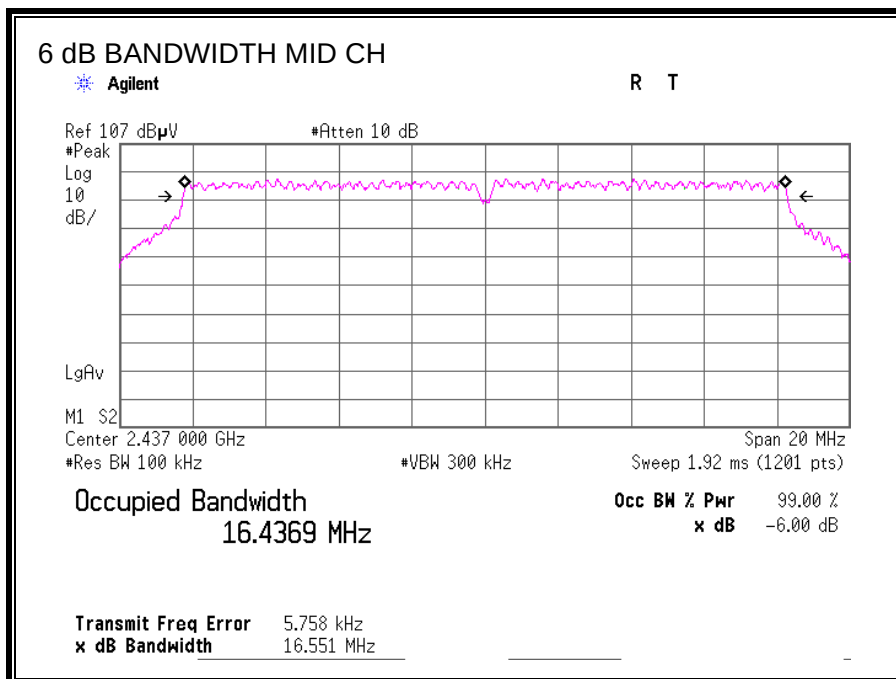
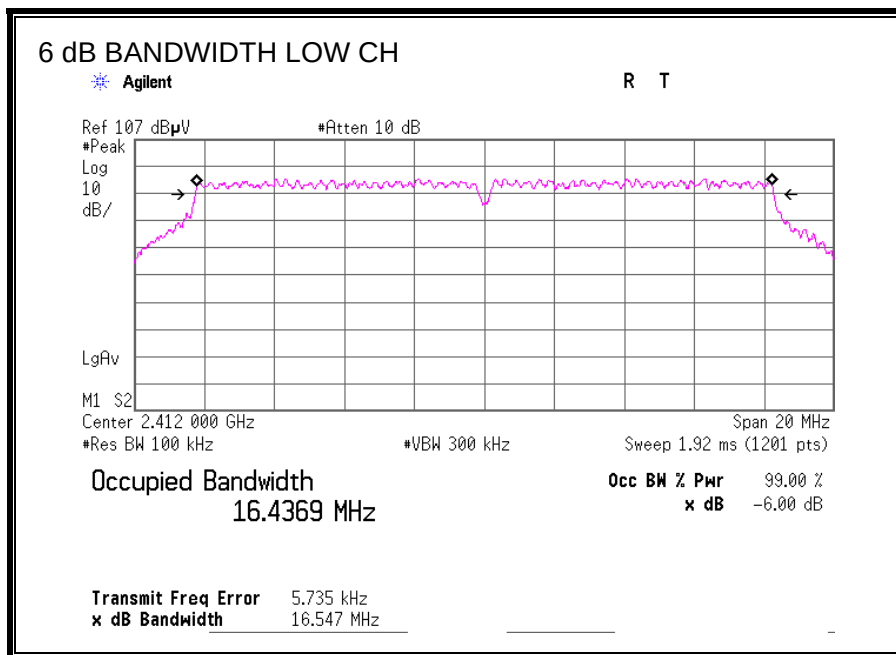
TEST PROCEDURE

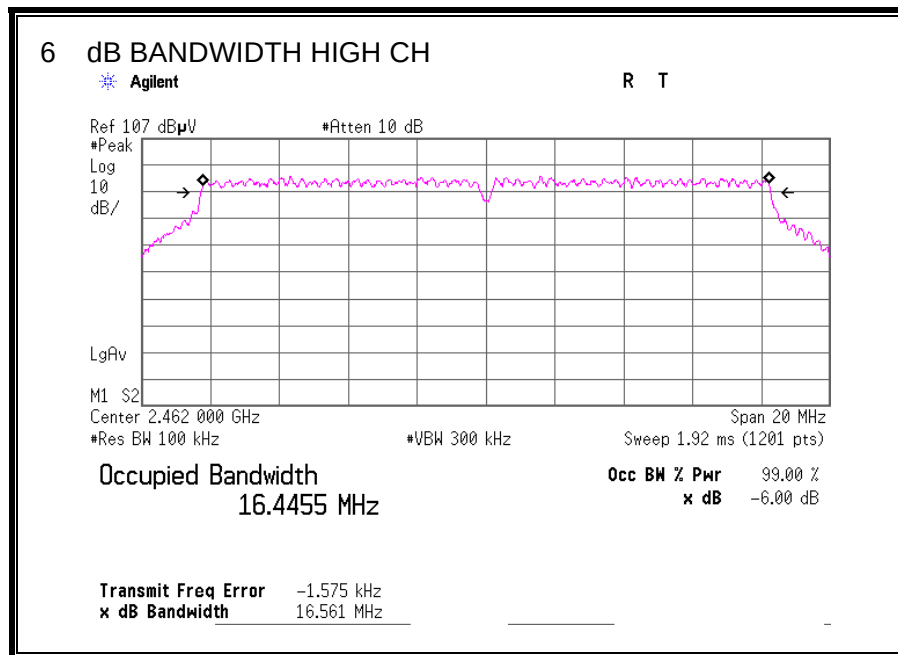
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.547	>500
2437	16.551	>500
2462	16.561	>500

6 dB BANDWIDTH



7.2.2. 99% BANDWIDTH

LIMITS

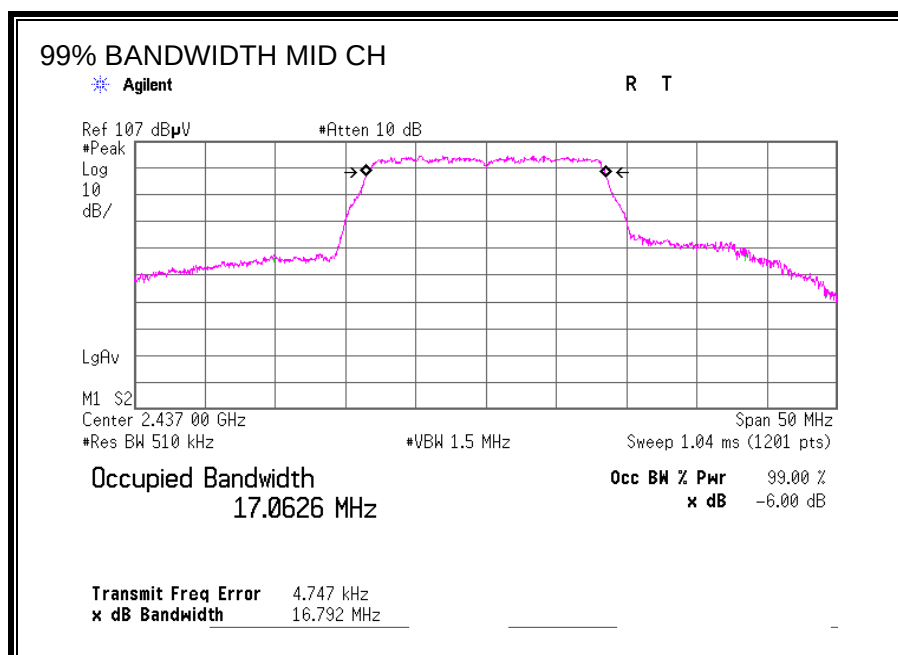
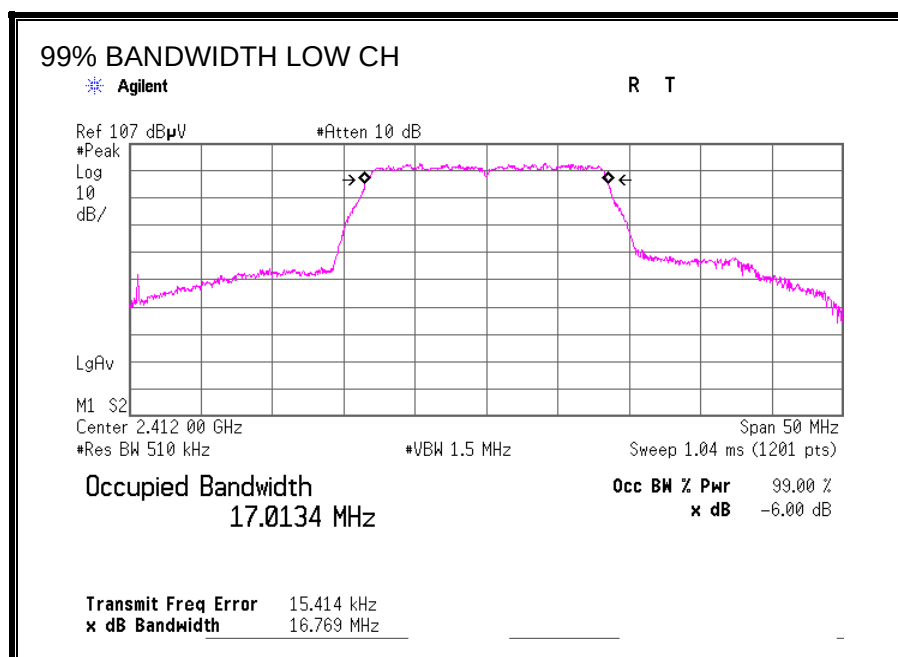
None; for reporting purposes only.

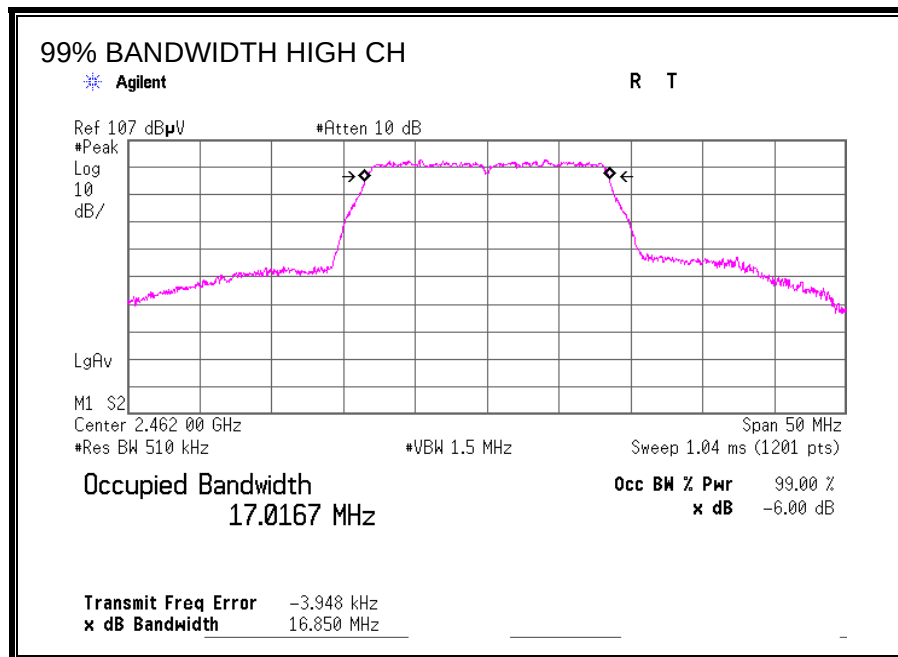
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.0134
Middle	2437	17.0626
High	2462	17.0167

99% BANDWIDTH



7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.80 dB (including 10.03 dB pad and 0.77 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	9.24	0.77	10.03	20.04	100.93	30.00	1000	9.96
2437	10.55	0.77	10.03	21.35	136.46	30.00	1000	8.65
2462	9.15	0.77	10.03	19.95	98.86	30.00	1000	10.05

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
6	10.47	
9	10.22	
12	10.34	
18	10.31	
24	10.55	*
36	10.41	
48	10.26	
54	10.34	

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.80 dB (including 10.03 dB pad and 0.77 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				AVG [dBm]	AVG [mW]
2412	-0.65	0.77	10.03	10.15	10.35
2437	1.29	0.77	10.03	12.09	16.18
2462	-0.99	0.77	10.03	9.81	9.57

Sample Calculation:

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

7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

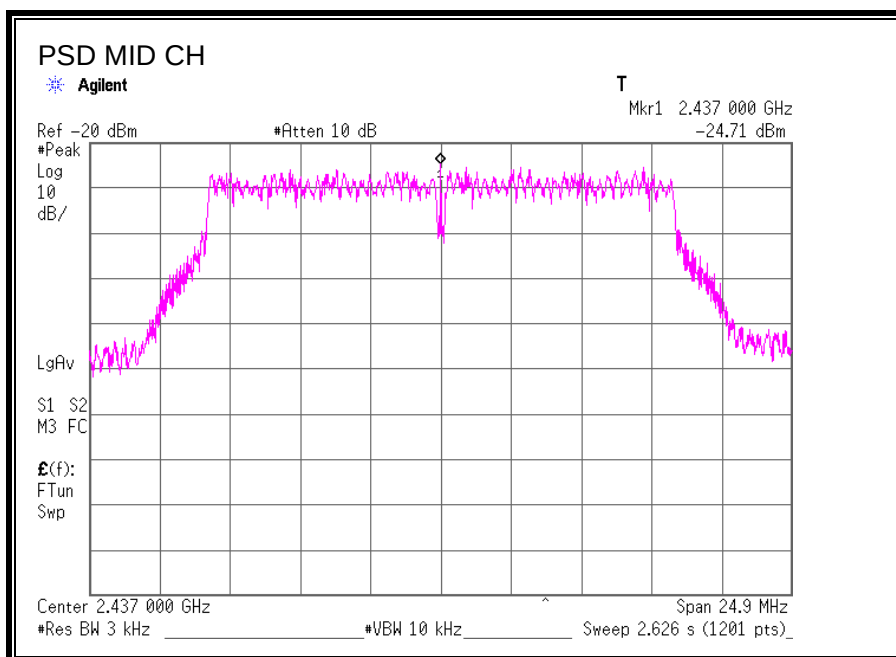
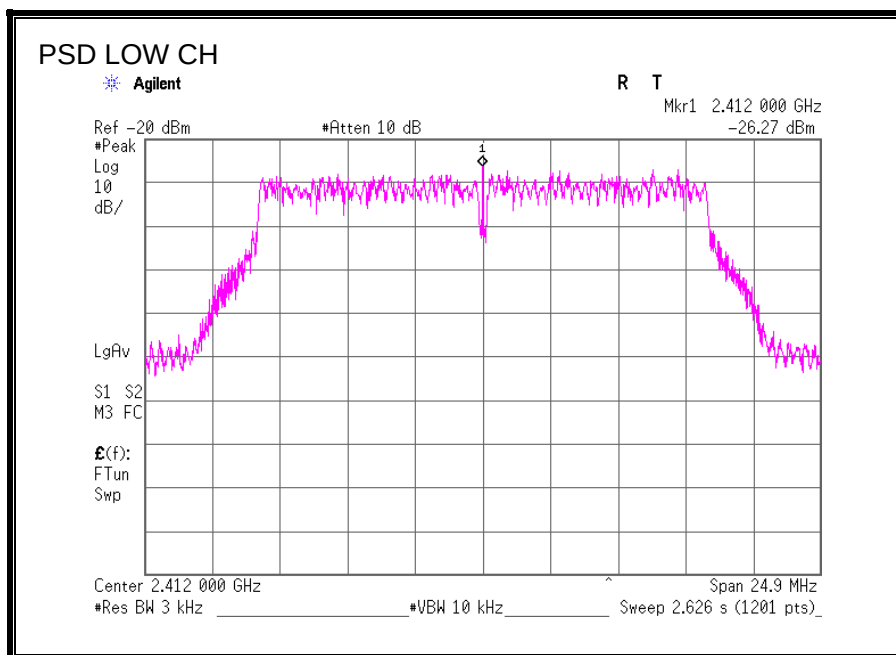
TEST PROCEDURE

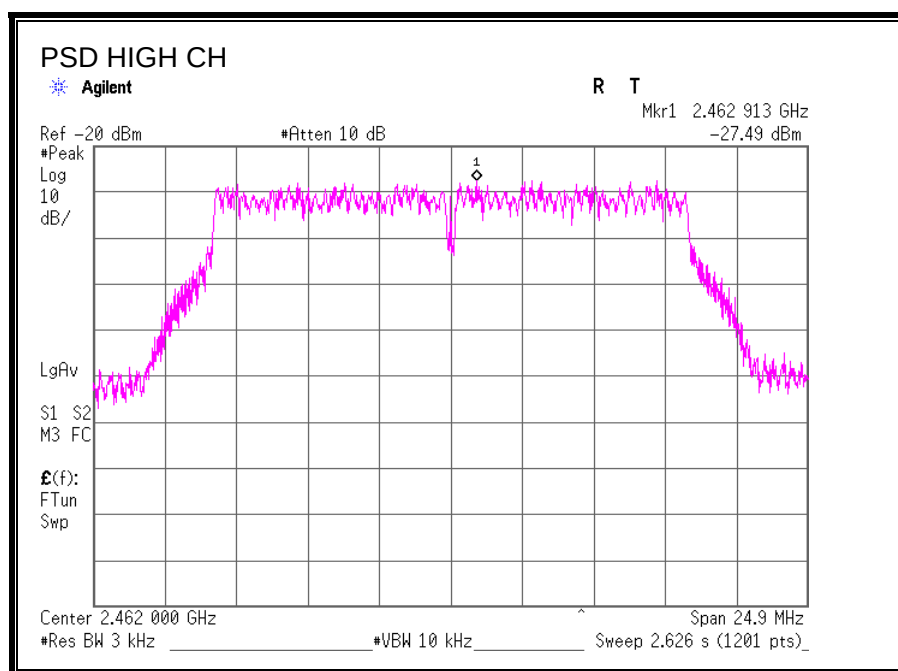
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document KDB558074: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)"

RESULTS

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.27	0.77	10.03	-15.47	8.00	23.47
2437.00	-24.71	0.77	10.03	-13.91	8.00	21.91
2462.00	-27.49	0.77	10.03	-16.69	8.00	24.69

POWER SPECTRAL DENSITY



7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.205 and §15.209

TEST PROCEDURE

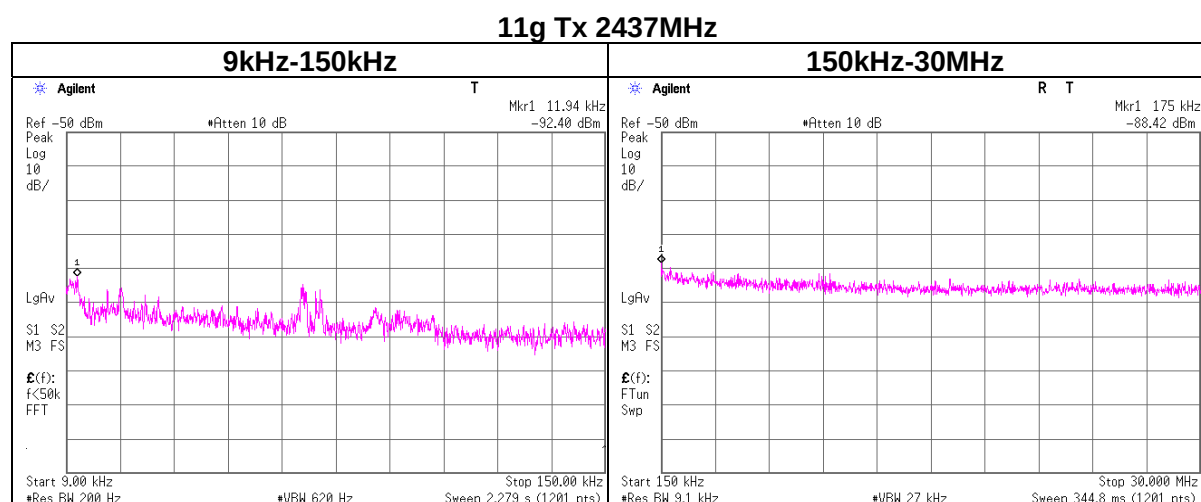
The transmitter output is connected to a spectrum analyzer.

For measurements from 9 kHz to 150 kHz, the resolution bandwidth is set to 200 Hz, then the video bandwidth is set to 620 MHz.

For measurements from 150 kHz to 30 MHz, the resolution bandwidth is set to 200 Hz, then the video bandwidth is set to 620 MHz.

The spectrum from 9 kHz to 30 MHz is investigated with the transmitter set to the middle channel, because it had the highest output power.

RESULTS



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
11.94	-92.4	0.77	9.9	2.0	-79.8	300.0	6.0	-18.5	46.1
175	-88.4	0.77	9.8	2.0	-75.8	300.0	6.0	-14.6	22.7

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

7.3. 802.11n-20 MODE IN THE 2.4 GHz BAND

7.3.1. 6dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

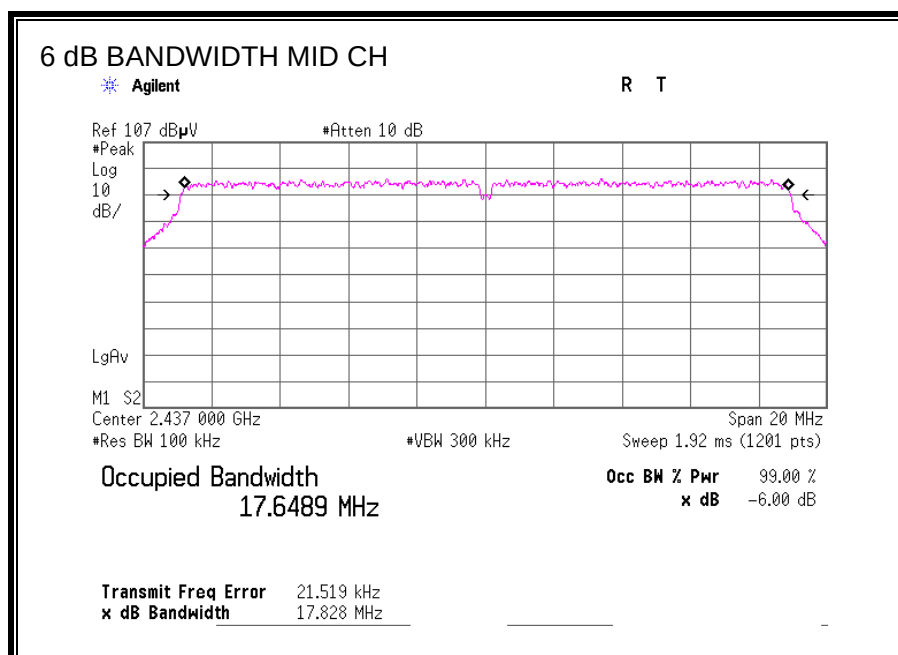
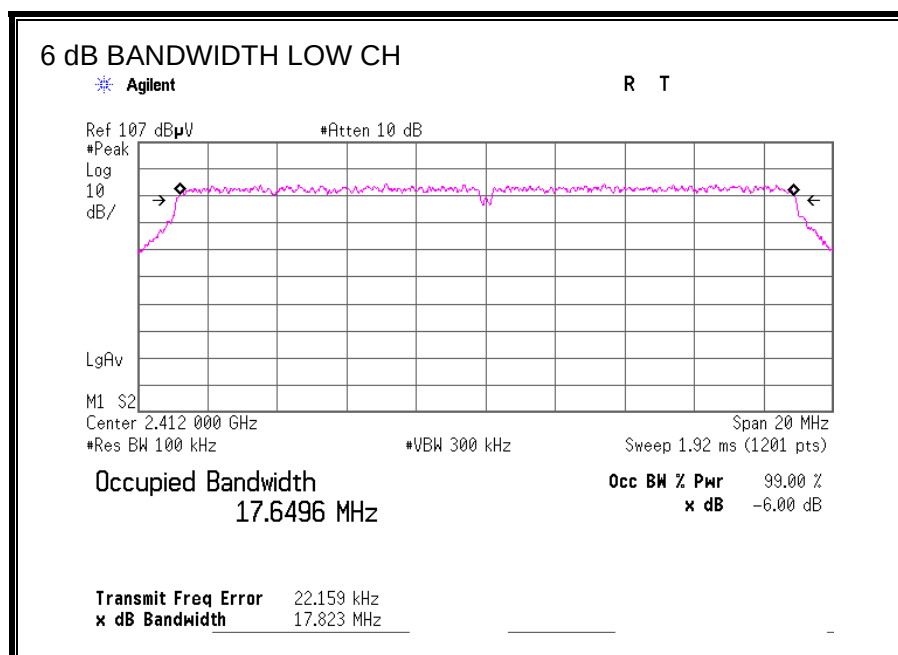
TEST PROCEDURE

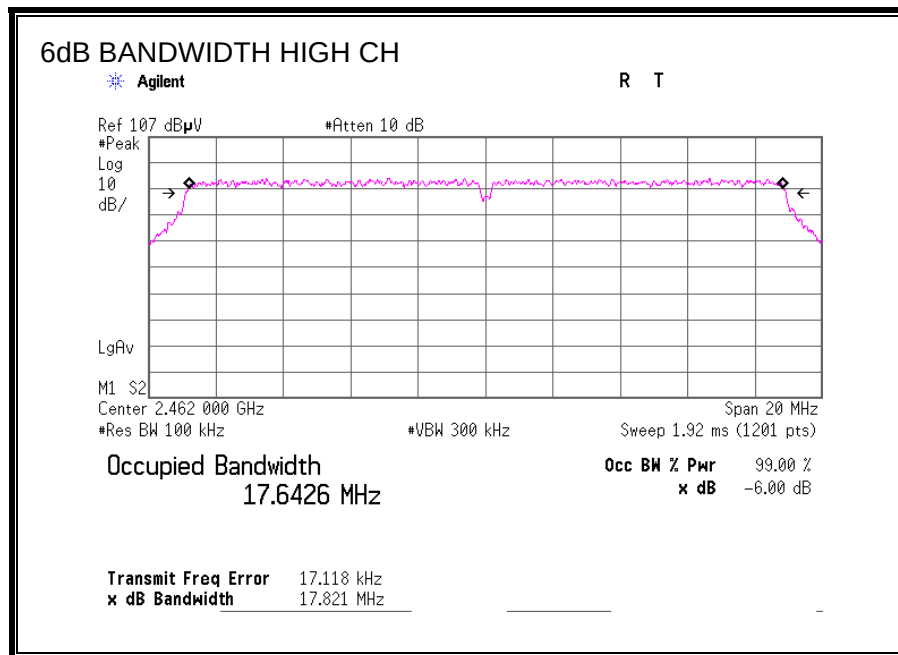
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	17.823	>500
2437	17.828	>500
2462	17.821	>500

6 dB BANDWIDTH



7.3.2. 99% BANDWIDTH

LIMITS

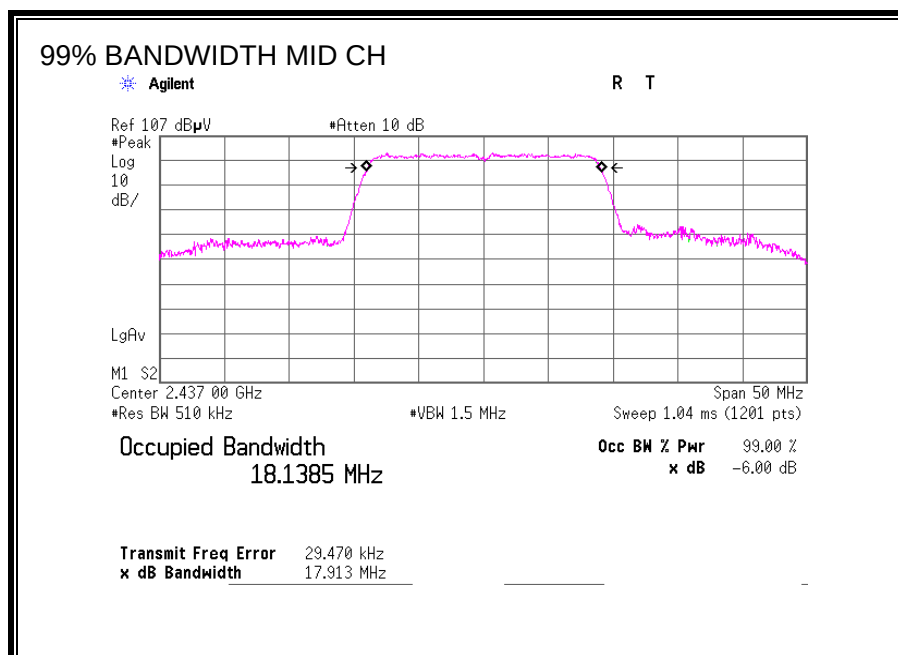
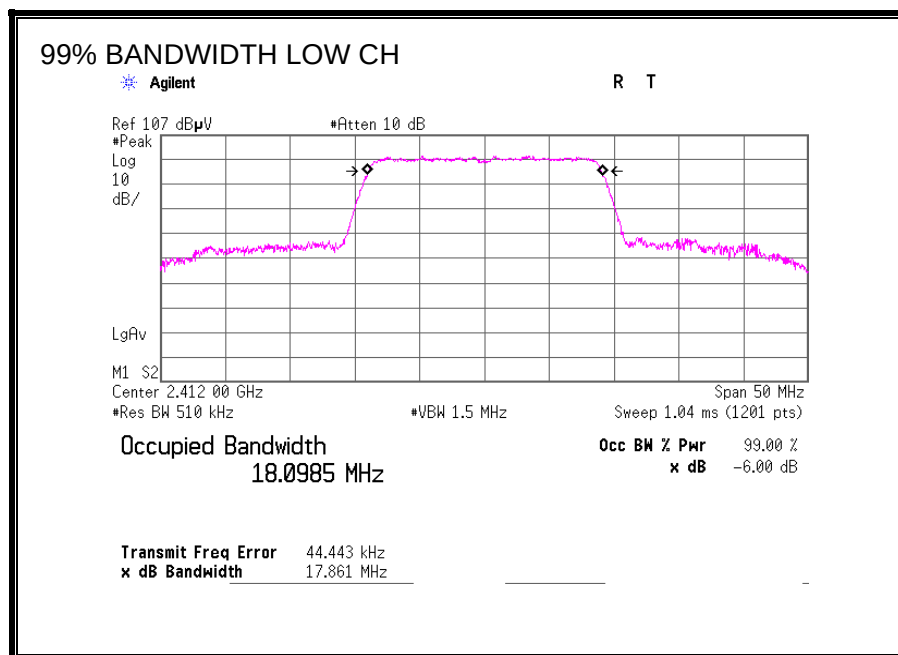
None; for reporting purposes only.

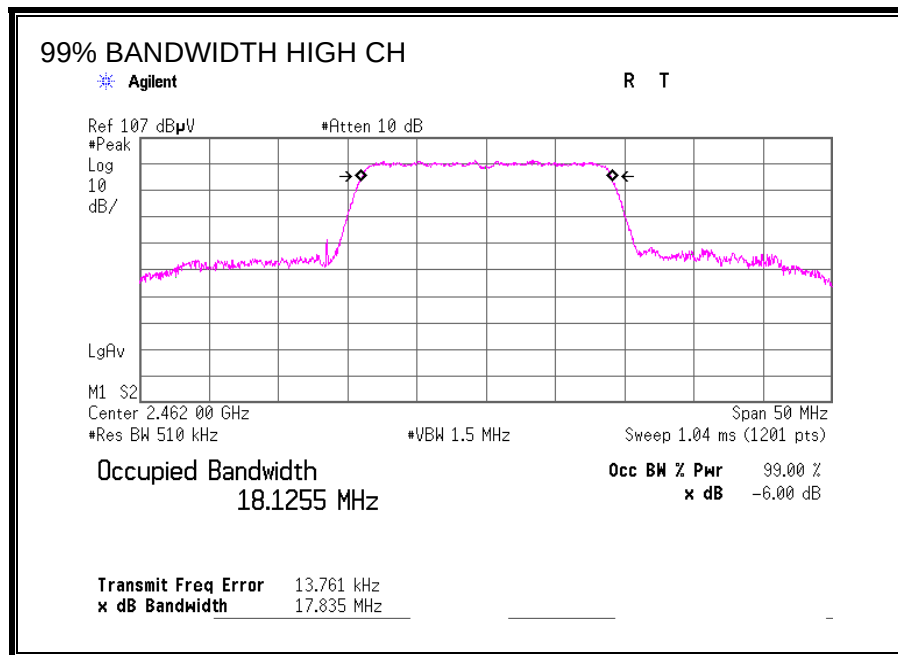
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	18.0985
Middle	2437	18.1385
High	2462	18.1255

99% BANDWIDTH



7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.80 dB (including 10.03 dB pad and 0.77 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	8.51	0.77	10.03	19.31	85.31	30.00	1000	10.69
2437	10.07	0.77	10.03	20.87	122.18	30.00	1000	9.13
2462	8.07	0.77	10.03	18.87	77.09	30.00	1000	11.13

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate	Reading [dBm]	Remark
MCS0	10.07	*
MCS1	10.03	
MCS2	10.03	
MCS3	10.01	
MCS4	9.98	
MCS5	9.89	
MCS6	9.91	
MCS7	9.79	

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.80 dB (including 10.03 dB pad and 0.77 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result	
				AVG [dBm]	AVG [mW]
2412	-0.51	0.77	10.03	10.29	10.69
2437	1.34	0.77	10.03	12.14	16.37
2462	-0.68	0.77	10.03	10.12	10.28

Sample Calculation:

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

7.3.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

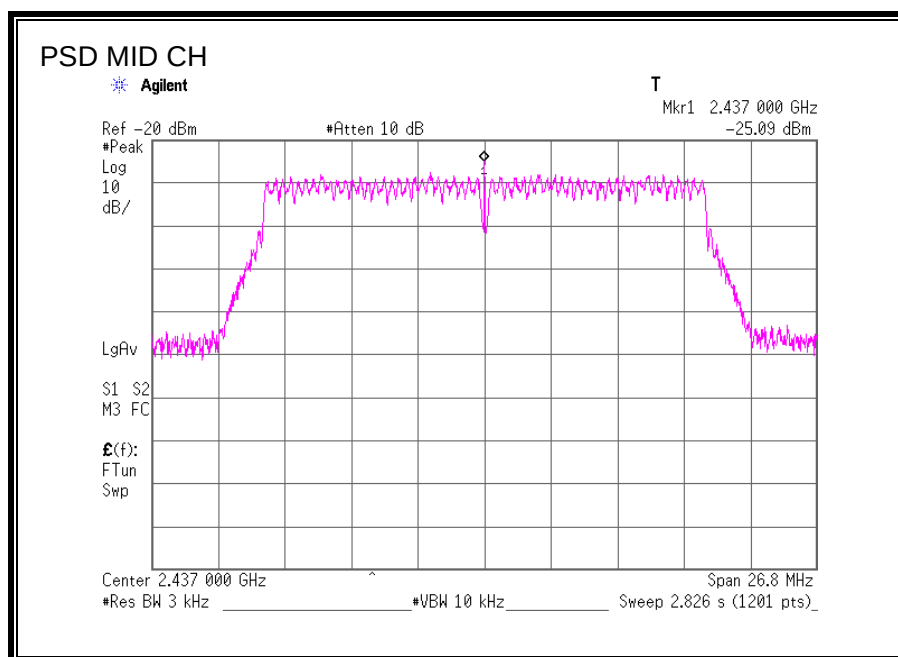
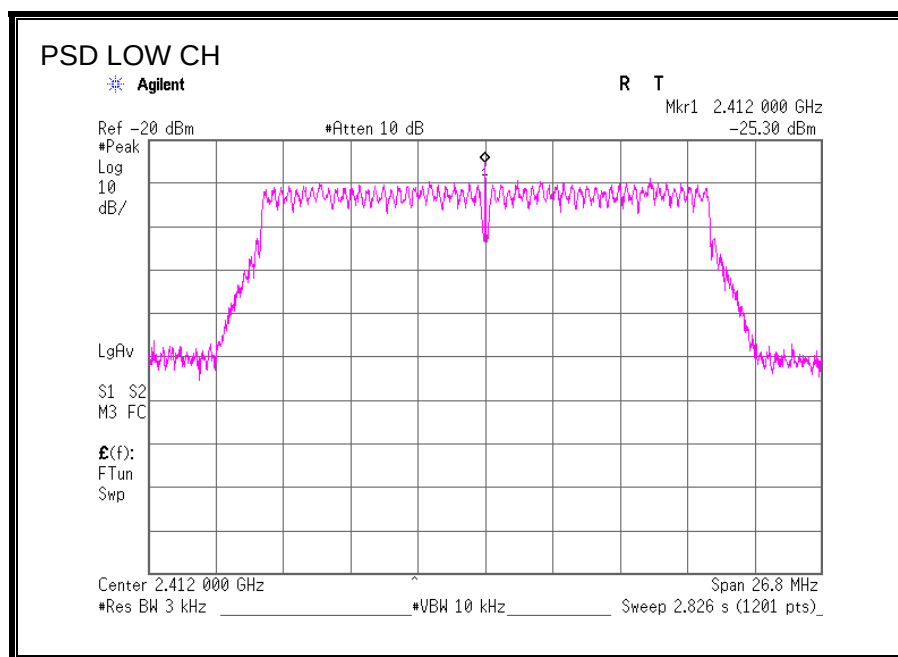
TEST PROCEDURE

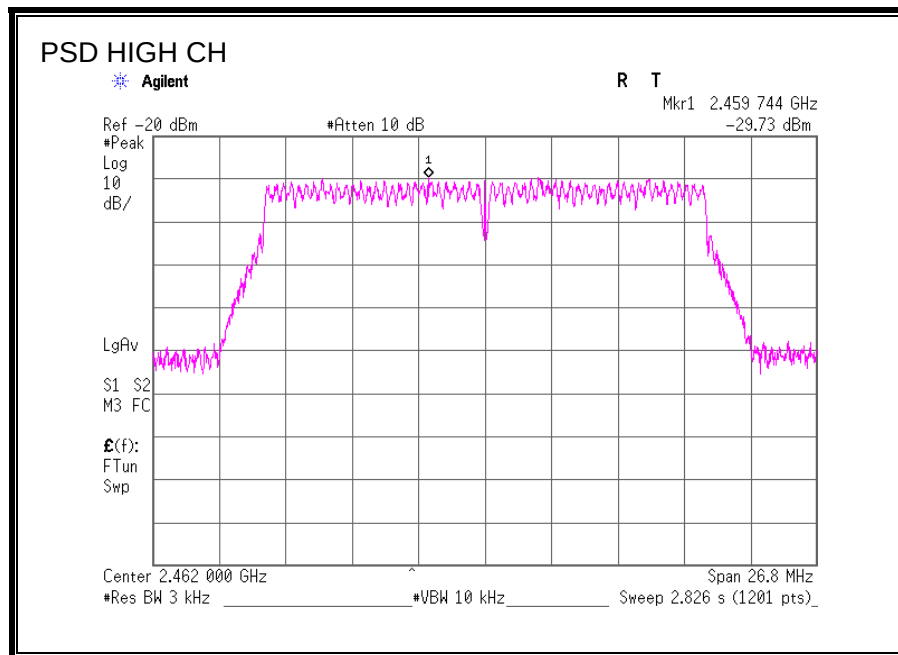
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document KDB558074: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)"

RESULTS

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-25.30	0.77	10.03	-14.50	8.00	22.50
2437.00	-25.09	0.77	10.03	-14.29	8.00	22.29
2462.00	-29.73	0.77	10.03	-18.93	8.00	26.93

POWER SPECTRAL DENSITY



7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 9 kHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

Test was performed only on 802.11g mode in the 2.4 GHz band, at Mid channel, as representative, because it had the highest output power.

8. RADIATED TEST RESULTS

8.1 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.

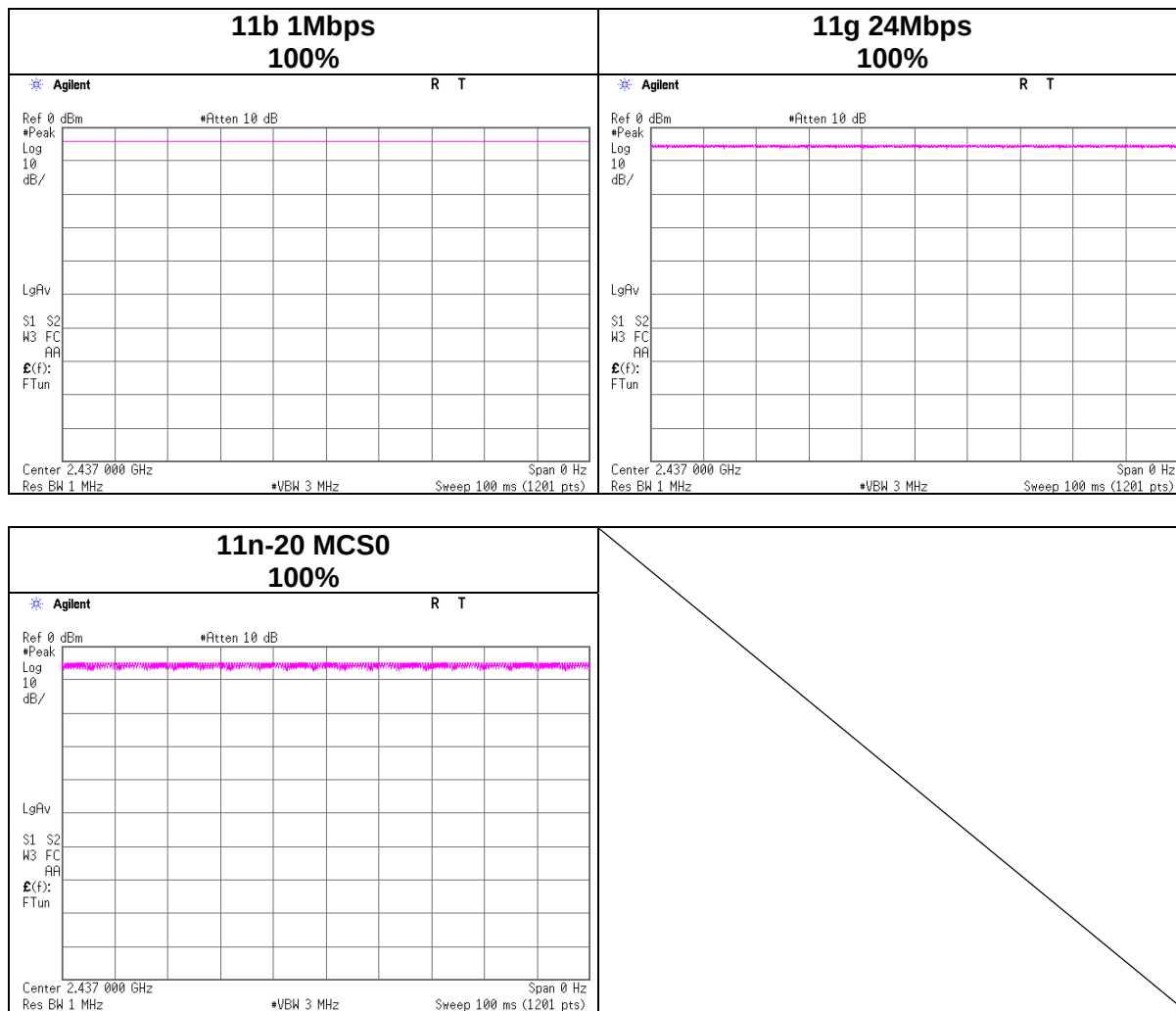
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz.

For the procedure for average measurement, RMS power averaging detector was used. See the burst rate confirmation data on next page.

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.

Burst rate confirmation



8.2 TEST DATA

8.2.1 802.11b MODE

Test place	Head Office EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	33EE0032-HO	
Date	01/17/2013	01/18/2013
Temperature/ Humidity	21 deg. C / 32% RH	24 deg. C / 28% RH
Engineer	Katsunori Okai	Yutaka Yoshida
	(1-10GHz)	(10-26.5GHz)
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	1665.901	PK	60.1	26.2	2.0	33.1	55.2	73.9	18.7	
Hori	2390.000	PK	43.4	27.5	2.4	32.3	41.0	73.9	32.9	
Hori	4824.000	PK	50.3	31.4	4.3	31.5	54.5	73.9	19.4	
Hori	7236.000	PK	42.1	35.8	5.0	32.5	50.4	73.9	23.5	
Hori	9648.000	PK	42.7	38.3	5.8	32.9	53.9	73.9	20.0	
Hori	1665.901	AV	42.3	26.2	2.0	33.1	37.4	53.9	16.5	
Hori	2390.000	AV	34.5	27.5	2.4	32.3	32.1	53.9	21.8	
Hori	4824.000	AV	47.5	31.4	4.3	31.5	51.7	53.9	2.2	
Hori	7236.000	AV	33.3	35.8	5.0	32.5	41.6	53.9	12.3	
Hori	9648.000	AV	34.1	38.3	5.8	32.9	45.3	53.9	8.6	
Vert	1661.071	PK	54.8	26.2	2.0	33.1	49.9	73.9	24.0	
Vert	2390.000	PK	43.4	27.5	2.4	32.3	41.0	73.9	32.9	
Vert	4824.000	PK	46.3	31.4	4.3	31.5	50.5	73.9	23.4	
Vert	7236.000	PK	43.5	35.8	5.0	32.5	51.8	73.9	22.1	
Vert	9648.000	PK	42.0	38.3	5.8	32.9	53.2	73.9	20.7	
Vert	1661.071	AV	37.4	26.2	2.0	33.1	32.5	53.9	21.4	
Vert	2390.000	AV	34.0	27.5	2.4	32.3	31.6	53.9	22.3	
Vert	4824.000	AV	41.4	31.4	4.3	31.5	45.6	53.9	8.3	
Vert	7236.000	AV	33.4	35.8	5.0	32.5	41.7	53.9	12.2	
Vert	9648.000	AV	33.8	38.3	5.8	32.9	45.0	53.9	8.9	

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	97.2	27.5	2.4	32.3	94.8	-	-	Carrier
Hori	2397.550	PK	48.7	27.5	2.4	32.3	46.3	74.8	28.5	
Hori	2400.000	PK	35.6	27.5	2.4	32.3	33.2	74.8	41.6	
Hori	6432.117	PK	45.3	34.8	4.8	31.9	53.0	74.8	21.8	
Vert	2412.000	PK	92.8	27.5	2.4	32.3	90.4	-	-	Carrier
Vert	2397.105	PK	45.7	27.5	2.4	32.3	43.3	70.4	27.1	
Vert	2400.000	PK	35.1	27.5	2.4	32.3	32.7	70.4	37.7	
Vert	6432.166	PK	41.2	34.8	4.8	31.9	48.9	70.4	21.5	

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

Test place	Head Office EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	33EE0032-HO	
Date	01/17/2013	01/18/2013
Temperature/ Humidity	21 deg. C / 32% RH	24 deg. C / 28% RH
Engineer	Katsunori Okai	Yutaka Yoshida
	(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	1662.733	PK	58.8	26.2	2.0	33.1	53.9	73.9	20.0	
Hori	4874.000	PK	51.3	31.5	4.3	31.5	55.6	73.9	18.3	
Hori	7311.000	PK	42.3	35.8	5.0	32.5	50.6	73.9	23.3	
Hori	9748.000	PK	43.1	38.4	5.9	32.9	54.5	73.9	19.4	
Hori	1662.733	AV	39.8	26.2	2.0	33.1	34.9	53.9	19.0	
Hori	4874.000	AV	48.6	31.5	4.3	31.5	52.9	53.9	1.0	
Hori	7311.000	AV	33.2	35.8	5.0	32.5	41.5	53.9	12.4	
Hori	9748.000	AV	33.7	38.4	5.9	32.9	45.1	53.9	8.8	
Vert	1662.704	PK	55.1	26.2	2.0	33.1	50.2	73.9	23.7	
Vert	4874.000	PK	47.5	31.5	4.3	31.5	51.8	73.9	22.1	
Vert	7311.000	PK	42.6	35.8	5.0	32.5	50.9	73.9	23.0	
Vert	9748.000	PK	42.2	38.4	5.9	32.9	53.6	73.9	20.3	
Vert	1662.704	AV	37.6	26.2	2.0	33.1	32.7	53.9	21.2	
Vert	4874.000	AV	43.6	31.5	4.3	31.5	47.9	53.9	6.0	
Vert	7311.000	AV	33.2	35.8	5.0	32.5	41.5	53.9	12.4	
Vert	9748.000	AV	33.4	38.4	5.9	32.9	44.8	53.9	9.1	

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

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

Distance factor: 10GHz-26.5GHz 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	2437.000	PK	97.2	27.5	2.4	32.2	94.9	-	-	Carrier
Hori	6498.817	PK	44.1	35.1	4.8	32.0	52.0	74.9	22.9	
Vert	2437.000	PK	93.5	27.5	2.4	32.2	91.2	-	-	Carrier
Vert	6498.908	PK	40.8	35.1	4.8	32.0	48.7	71.2	22.5	

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

Test place	Head Office EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	33EE0032-HO	
Date	01/17/2013	01/18/2013
Temperature/ Humidity	21 deg. C / 32% RH	24 deg. C / 28% RH
Engineer	Katsunori Okai (1-10GHz)	Yutaka Yoshida (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	1665.901	PK	60.4	26.2	2.0	33.1	55.5	73.9	18.4	
Hori	2483.500	PK	43.6	27.5	2.4	32.2	41.3	73.9	32.6	
Hori	4924.000	PK	51.9	31.7	4.3	31.5	56.4	73.9	17.5	
Hori	7386.000	PK	40.8	35.9	5.1	32.6	49.2	73.9	24.7	
Hori	9848.000	PK	41.1	38.5	5.9	33.0	52.5	73.9	21.4	
Hori	1665.901	AV	42.7	26.2	2.0	33.1	37.8	53.9	16.1	
Hori	2483.500	AV	36.7	27.5	2.4	32.2	34.4	53.9	19.5	
Hori	4924.000	AV	49.2	31.7	4.3	31.5	53.7	53.9	0.2	
Hori	7386.000	AV	33.9	35.9	5.1	32.6	42.3	53.9	11.6	
Hori	9848.000	AV	33.9	38.5	5.9	33.0	45.3	53.9	8.6	
Vert	1661.111	PK	54.7	26.2	2.0	33.1	49.8	73.9	24.1	
Vert	2483.500	PK	44.5	27.5	2.4	32.2	42.2	73.9	31.7	
Vert	4924.000	PK	48.1	31.7	4.3	31.5	52.6	73.9	21.3	
Vert	7386.000	PK	41.1	35.9	5.1	32.6	49.5	73.9	24.4	
Vert	9848.000	PK	40.8	38.5	5.9	33.0	52.2	73.9	21.7	
Vert	1661.111	AV	37.3	26.2	2.0	33.1	32.4	53.9	21.5	
Vert	2483.500	AV	35.3	27.5	2.4	32.2	33.0	53.9	20.9	
Vert	4924.000	AV	44.2	31.7	4.3	31.5	48.7	53.9	5.2	
Vert	7386.000	AV	33.4	35.9	5.1	32.6	41.8	53.9	12.1	
Vert	9848.000	AV	33.8	38.5	5.9	33.0	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 $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **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	2462.000	PK	98.8	27.5	2.4	32.2	96.5	-	-	Carrier
Hori	6565.486	PK	45.5	35.2	4.9	32.0	53.6	76.5	22.9	
Vert	2462.000	PK	94.1	27.5	2.4	32.2	91.8	-	-	Carrier
Vert	6565.526	PK	42.4	35.2	4.9	32.0	50.5	71.8	21.3	

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

8.2.2 802.11g MODE

Test place Head Office EMC Lab.
Semi Anechoic Chamber No.4 No.3
Report No. 33EE0032-HO
Date 01/17/2013 01/18/2013
Temperature/ Humidity 21 deg. C / 32% RH 24 deg. C / 28% RH
Engineer Katsunori Okai Yutaka Yoshida
(1-10GHz) (Above 10GHz)
Mode 11g 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	1660.202	PK	59.8	26.2	2.0	33.1	54.9	73.9	19.0	
Hori	2390.000	PK	52.9	27.5	2.4	32.3	50.5	73.9	23.4	
Hori	4824.000	PK	44.3	31.4	4.3	31.5	48.5	73.9	25.4	
Hori	7236.000	PK	42.2	35.8	5.0	32.5	50.5	73.9	23.4	
Hori	9648.000	PK	42.2	38.3	5.8	32.9	53.4	73.9	20.5	
Hori	1660.202	AV	40.6	26.2	2.0	33.1	35.7	53.9	18.2	
Hori	2390.000	AV	40.7	27.5	2.4	32.3	38.3	53.9	15.6	
Hori	4824.000	AV	35.6	31.4	4.3	31.5	39.8	53.9	14.1	
Hori	7236.000	AV	33.4	35.8	5.0	32.5	41.7	53.9	12.2	
Hori	9648.000	AV	34.0	38.3	5.8	32.9	45.2	53.9	8.7	
Vert	1660.387	PK	54.7	26.2	2.0	33.1	49.8	73.9	24.1	
Vert	2390.000	PK	53.1	27.5	2.4	32.3	50.7	73.9	23.2	
Vert	4824.000	PK	41.3	31.4	4.3	31.5	45.5	73.9	28.4	
Vert	7236.000	PK	42.2	35.8	5.0	32.5	50.5	73.9	23.4	
Vert	9648.000	PK	42.7	38.3	5.8	32.9	53.9	73.9	20.0	
Vert	1660.387	AV	37.3	26.2	2.0	33.1	32.4	53.9	21.5	
Vert	2390.000	AV	40.8	27.5	2.4	32.3	38.4	53.9	15.5	
Vert	4824.000	AV	32.0	31.4	4.3	31.5	36.2	53.9	17.7	
Vert	7236.000	AV	33.3	35.8	5.0	32.5	41.6	53.9	12.3	
Vert	9648.000	AV	33.9	38.3	5.8	32.9	45.1	53.9	8.8	

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

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

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

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	90.8	27.5	2.4	32.3	88.4	-	-	Carrier
Hori	2400.000	PK	50.3	27.5	2.4	32.3	47.9	68.4	20.5	
Hori	6432.147	PK	45.4	34.8	4.8	31.9	53.1	68.4	15.3	
Vert	2412.000	PK	89.1	27.5	2.4	32.3	86.7	-	-	Carrier
Vert	2400.000	PK	51.3	27.5	2.4	32.3	48.9	66.7	17.8	
Vert	6432.261	PK	41.4	34.8	4.8	31.9	49.1	66.7	17.6	

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

Test place	Head Office EMC Lab.		
Semi Anechoic Chamber	No.4	No.3	No.1
Report No.	33EE0032-HO		
Date	01/17/2013	01/18/2013	01/24/2013
Temperature/ Humidity	21 deg. C / 32% RH	24 deg. C / 28% RH	25 deg. C / 35% RH
Engineer	Katsunori Okai (1-10GHz)	Yutaka Yoshida (Above 10GHz)	Keisuke Kawamura (Below 1GHz)
Mode	11g 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	38.400	QP	28.6	15.3	7.4	38.8	12.5	40.0	27.5	
Hori	76.800	QP	28.7	6.8	8.1	38.8	4.8	40.0	35.2	
Hori	115.200	QP	28.5	12.7	8.6	38.9	10.9	43.5	32.6	
Hori	153.600	QP	28.6	15.2	9.1	38.9	14.0	43.5	29.5	
Hori	192.000	QP	28.8	16.9	9.4	38.9	16.2	43.5	27.3	
Hori	384.000	QP	27.9	17.2	11.1	38.4	17.8	46.0	28.2	
Hori	1665.343	PK	60.3	26.2	2.0	33.1	55.4	73.9	18.5	- See 20dBc Data Sheet
Hori	4874.000	PK	49.4	31.5	4.3	31.5	53.7	73.9	20.2	
Hori	6498.853	PK	44.3	35.1	4.8	32.0	52.2	-	-	
Hori	7311.000	PK	42.7	35.8	5.0	32.5	51.0	73.9	22.9	
Hori	9748.000	PK	42.3	38.4	5.9	32.9	53.7	73.9	20.2	
Hori	12185.000	PK	40.7	39.5	-2.4	32.9	44.9	73.9	29.0	
Hori	14622.000	PK	42.6	40.9	-1.6	32.4	49.5	73.9	24.4	
Hori	17059.000	PK	42.0	40.9	-0.6	32.3	50.0	73.9	23.9	
Hori	1665.343	AV	41.7	26.2	2.0	33.1	36.8	53.9	17.1	
Hori	4874.000	AV	40.2	31.5	4.3	31.5	44.5	53.9	9.4	
Hori	7311.000	AV	33.4	35.8	5.0	32.5	41.7	53.9	12.2	
Hori	9748.000	AV	33.6	38.4	5.9	32.9	45.0	53.9	8.9	
Hori	12185.000	AV	33.6	39.5	-2.4	32.9	37.8	53.9	16.1	
Hori	14622.000	AV	35.1	40.9	-1.6	32.4	42.0	53.9	11.9	
Hori	17059.000	AV	34.9	40.9	-0.6	32.3	42.9	53.9	11.0	
Vert	38.400	QP	28.6	15.3	7.4	38.8	12.5	40.0	27.5	
Vert	76.800	QP	28.7	6.8	8.1	38.8	4.8	40.0	35.2	
Vert	115.200	QP	28.5	12.7	8.6	38.9	10.9	43.5	32.6	
Vert	153.600	QP	28.6	15.2	9.1	38.9	14.0	43.5	29.5	
Vert	192.000	QP	28.7	16.9	9.4	38.9	16.1	43.5	27.4	
Vert	384.000	QP	27.9	17.2	11.1	38.4	17.8	46.0	28.2	
Vert	1664.433	PK	54.6	26.2	2.0	33.1	49.7	73.9	24.2	
Vert	4874.000	PK	45.0	31.5	4.3	31.5	49.3	73.9	24.6	
Vert	6498.919	PK	41.0	35.1	4.8	32.0	48.9	-	-	- See 20dBc Data Sheet
Vert	7311.000	PK	42.3	35.8	5.0	32.5	50.6	73.9	23.3	
Vert	9748.000	PK	42.5	38.4	5.9	32.9	53.9	73.9	20.0	
Vert	12185.000	PK	40.8	39.5	-2.4	32.9	45.0	73.9	28.9	
Vert	14622.000	PK	41.9	40.9	-1.6	32.4	48.8	73.9	25.1	
Vert	17059.000	PK	42.6	40.9	-0.6	32.3	50.6	73.9	23.3	
Vert	1664.433	AV	36.6	26.2	2.0	33.1	31.7	53.9	22.2	
Vert	4874.000	AV	35.8	31.5	4.3	31.5	40.1	53.9	13.8	
Vert	7311.000	AV	33.5	35.8	5.0	32.5	41.8	53.9	12.1	
Vert	9748.000	AV	33.6	38.4	5.9	32.9	45.0	53.9	8.9	
Vert	12185.000	AV	33.6	39.5	-2.4	32.9	37.8	53.9	16.1	
Vert	14622.000	AV	35.0	40.9	-1.6	32.4	41.9	53.9	12.0	
Vert	17059.000	AV	34.7	40.9	-0.6	32.3	42.7	53.9	11.2	

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

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

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

Test place Head Office EMC Lab.
Semi Anechoic No.4
Chamber
Report No. 33EE0032-HO
Date 01/17/2013
Temperature/ Humidity 21 deg. C / 32% RH
Engineer Katsunori Okai

Mode 11g Tx 2437MHz

20dBc Data Sheet

Polarity	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori	2437.000	PK	94.6	27.5	2.4	32.2	92.3	-	-	Carrier
Hori	6498.853	AV	44.3	35.1	4.8	32.0	52.2	72.3	20.1	
Vert	2437.000	PK	91.9	27.5	2.4	32.2	89.6	-	-	Carrier
Vert	6498.919	PK	41.0	35.1	4.8	32.0	48.9	69.6	20.7	

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

Test place	Head Office EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	33EE0032-HO	
Date	01/17/2013	01/18/2013
Temperature/ Humidity	21 deg. C / 32% RH	24 deg. C / 28% RH
Engineer	Katsunori Okai (1-10GHz)	Yutaka Yoshida (Above 10GHz)
Mode	11g 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	1662.329	PK	59.8	26.2	2.0	33.1	54.9	73.9	19.0	
Hori	2483.500	PK	60.2	27.5	2.4	32.2	57.9	73.9	16.0	
Hori	4924.000	PK	45.5	31.7	4.3	31.5	50.0	73.9	23.9	
Hori	7386.000	PK	42.4	35.9	5.1	32.6	50.8	73.9	23.1	
Hori	9848.000	PK	42.2	38.5	5.9	33.0	53.6	73.9	20.3	
Hori	1662.329	AV	40.5	26.2	2.0	33.1	35.6	53.9	18.3	
Hori	2483.500	AV	48.5	27.5	2.4	32.2	46.2	53.9	7.7	
Hori	4924.000	AV	36.9	31.7	4.3	31.5	41.4	53.9	12.5	
Hori	7386.000	AV	33.4	35.9	5.1	32.6	41.8	53.9	12.1	
Hori	9848.000	AV	33.7	38.5	5.9	33.0	45.1	53.9	8.8	
Vert	1662.334	PK	55.4	26.2	2.0	33.1	50.5	73.9	23.4	
Vert	2483.500	PK	58.1	27.5	2.4	32.2	55.8	73.9	18.1	
Vert	4924.000	PK	41.4	31.7	4.3	31.5	45.9	73.9	28.0	
Vert	7386.000	PK	41.9	35.9	5.1	32.6	50.3	73.9	23.6	
Vert	9848.000	PK	42.1	38.5	5.9	33.0	53.5	73.9	20.4	
Vert	1662.334	AV	37.8	26.2	2.0	33.1	32.9	53.9	21.0	
Vert	2483.500	AV	45.7	27.5	2.4	32.2	43.4	53.9	10.5	
Vert	4924.000	AV	32.3	31.7	4.3	31.5	36.8	53.9	17.1	
Vert	7386.000	AV	33.5	35.9	5.1	32.6	41.9	53.9	12.0	
Vert	9848.000	AV	33.4	38.5	5.9	33.0	44.8	53.9	9.1	

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

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

Distance factor: 10GHz-26.5GHz $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$ **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	2462.000	PK	92.0	27.5	2.4	32.2	89.7	-	-	Carrier
Hori	6565.505	PK	46.4	35.2	4.9	32.0	54.5	69.7	15.2	
Vert	2462.000	PK	91.6	27.5	2.4	32.2	89.3	-	-	Carrier
Vert	6565.607	PK	42.1	35.2	4.9	32.0	50.2	69.3	19.1	

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

8.2.3 802.11n-20 MODE

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
 Report No. 33EE0032-HO
 Date 01/17/2013
 Temperature/ Humidity 21 deg. C / 32% RH
 Engineer Katsunori Okai

Mode 11n-20 Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	55.6	27.5	2.4	32.3	53.2	73.9	20.7	
Hori	2390.000	AV	42.3	27.5	2.4	32.3	39.9	53.9	14.0	
Vert	2390.000	PK	53.3	27.5	2.4	32.3	50.9	73.9	23.0	
Vert	2390.000	AV	40.9	27.5	2.4	32.3	38.5	53.9	15.4	

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

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

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

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	89.7	27.5	2.4	32.3	87.3	-	-	Carrier
Hori	2400.000	PK	50.0	27.5	2.4	32.3	47.6	67.3	19.7	
Vert	2412.000	PK	87.9	27.5	2.4	32.3	85.5	-	-	Carrier
Vert	2400.000	PK	50.0	27.5	2.4	32.3	47.6	65.5	17.9	

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

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 33EE0032-HO
Date 01/17/2013
Temperature/ Humidity 21 deg. C / 32% RH
Engineer Katsunori Okai

Mode 11n-20 Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	63.5	27.5	2.4	32.2	61.2	73.9	12.7	
Hori	2483.500	AV	51.5	27.5	2.4	32.2	49.2	53.9	4.7	
Vert	2483.500	PK	60.6	27.5	2.4	32.2	58.3	73.9	15.6	
Vert	2483.500	AV	47.5	27.5	2.4	32.2	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 $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

9 AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

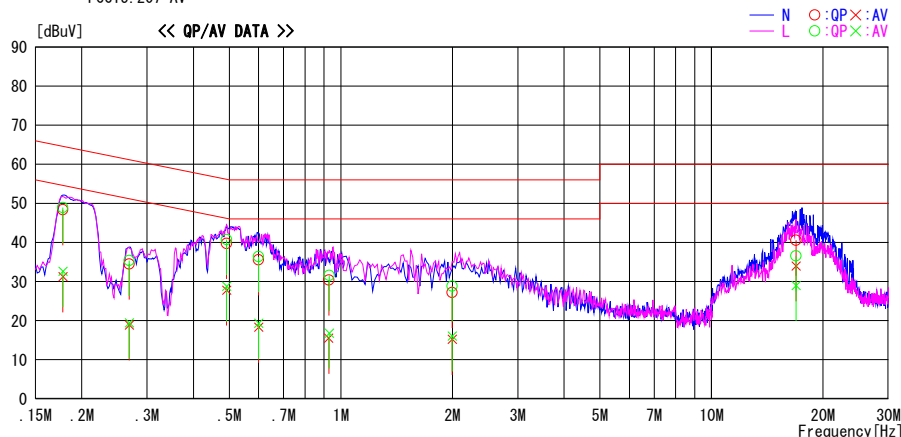
ANSI C63.4

RESULTS**DATA OF CONDUCTED EMISSION TEST**UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
Date : 2013/01/18

Report No. : 33EE0032-H0

Temp./Humi. : 20deg. C / 34% RH
Engineer : Shinya Watanabe

Mode / Remarks : WLAN 11g 24Mbps Tx 2437MHz , OutputLevel = 12dBm

LIMIT : FCC15.207 QP
FCC15.207 AV

Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17790	35.1	17.9	13.3	48.4	31.2	64.6	54.6	16.2	23.4	N	
0.26856	21.2	5.6	13.3	34.5	18.9	61.2	51.2	26.7	32.3	N	
0.49172	26.3	14.4	13.4	39.7	27.8	56.1	46.1	16.4	18.3	N	
0.59982	22.2	4.9	13.4	35.6	18.3	56.0	46.0	20.4	27.7	N	
0.92760	17.0	2.1	13.4	30.4	15.5	56.0	46.0	25.6	30.5	N	
1.99787	13.6	1.6	13.6	27.2	15.2	56.0	46.0	28.8	30.8	N	
16.90118	25.9	19.3	14.7	40.6	34.0	60.0	50.0	19.4	16.0	N	
0.17790	35.6	19.3	13.3	48.9	32.6	64.6	54.6	15.7	22.0	L	
0.26856	22.1	6.1	13.3	35.4	19.4	61.2	51.2	25.8	31.8	L	
0.49172	27.3	15.4	13.4	40.7	28.8	56.1	46.1	15.4	17.3	L	
0.59982	23.0	5.9	13.4	36.4	19.3	56.0	46.0	19.6	26.7	L	
0.93109	18.2	3.4	13.4	31.6	16.8	56.0	46.0	24.4	29.2	L	
1.99787	15.2	2.5	13.6	28.8	16.1	56.0	46.0	27.2	29.9	L	
16.90118	21.9	14.3	14.7	36.6	29.0	60.0	50.0	23.4	21.0	L	

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