FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7

CERTIFICATION TEST REPORT

FOR

802.11bgn WLAN MODULE

MODEL NUMBER: DWM-W042

FCC ID: EW4DWMW042
IC: 4250A-DWMW042

REPORT NUMBER: 10J13370-1

ISSUE DATE: AUGUST 24, 2010

Prepared for

MITSUMI ELECTRIC CO., LTD.
1601, SAKAI, ATSUGI-SHI,
KANAGAWA, 243-8533, JAPAN

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/24/10	Initial Issue	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MITSUMI ELECTRIC CO., LTD.
1601, SAKAI, ATSUGI-SHI,
KANAGAWA, 243-8533, JAPAN

EUT DESCRIPTION: 802.11bgn WLAN MODULE

MODEL: DWM-W042

SERIAL NUMBER: 0166 AND 0162

DATE TESTED: AUGUST 19 to 24, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (CCS) 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS 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 CCS By:

THU CHAN
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

MENGISTU MEKURIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11b/g/n WLAN module that is manufactured by Ralink.

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	18.71	74.30
2412 - 2462	802.11g	24.16	260.62
2412 - 2462	HT20	24.19	262.42

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes PCB-Type antennas with maximum gain of 1.43dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was RT3x7x_ATE_Utility_v1.3.3.14.

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module connected to a host Laptop PC via USB cable.

The worst-case data rates used during the tests are as follows:

802.11b Mode (20 MHz BW operation): 1 Mbps, CCK.
802.11g Mode (20 MHz BW operation): 6 Mbps, OFDM.
802.11n HT20 Mode (20 MHz BW operation): MCS0, OFDM.

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 also investigated at X, Y, and Z antenna orientations to figure out the worst-case. After the investigations the Y orientation was turned out as worst-case.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop	Dell	D620	28071776413
AC/DC Adapter	Dell	LA65NS0-00	CN-0DF263-71615-72M-2925

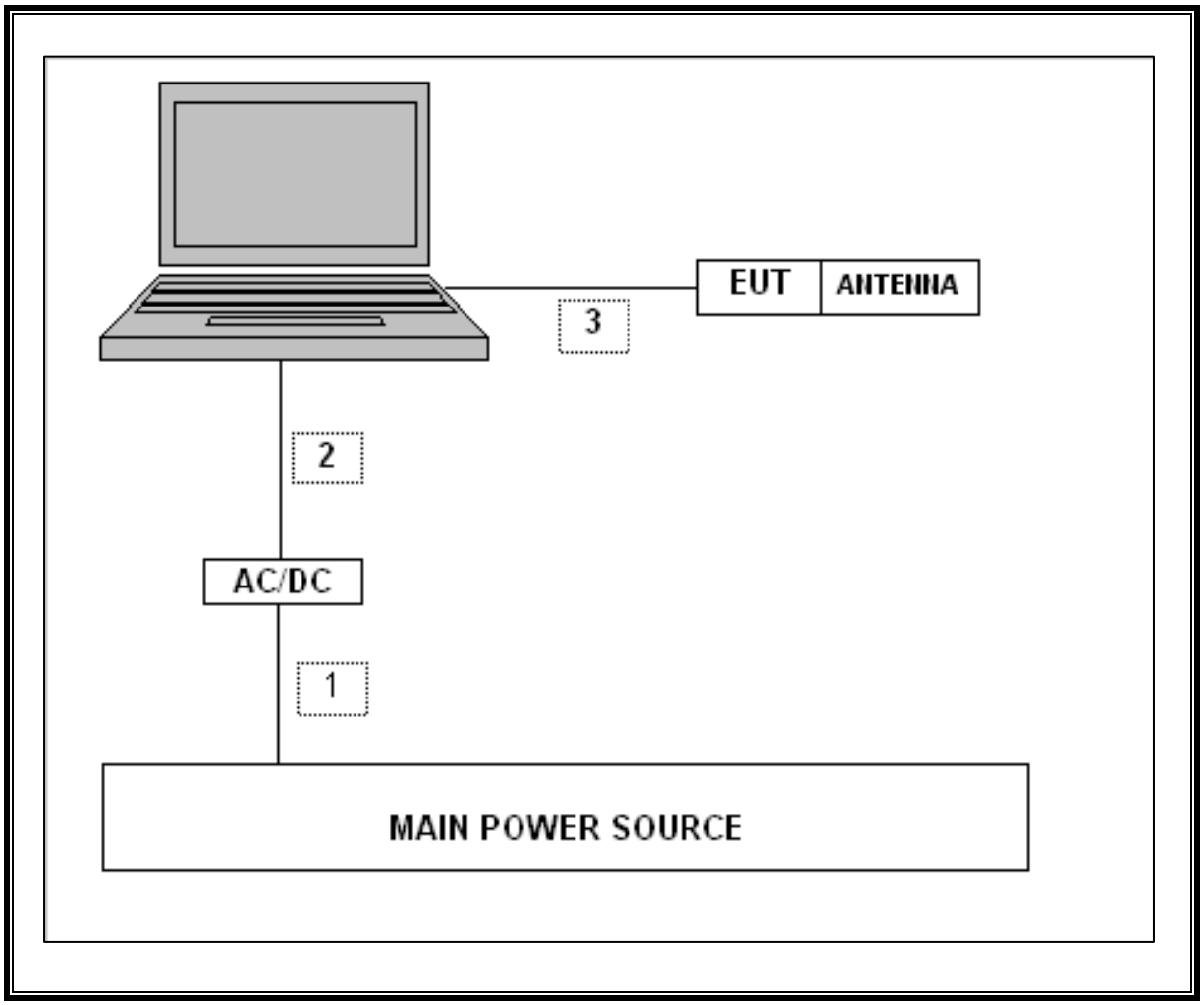
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US115V	Unshielded	1m	N/A
2	DC	1	DC Plug in	Unshielded	1.5m	N/A
3	USB	1	USB	Shielded	.3 m	To remote Laptop

TEST SETUP

The EUT was connected to the laptop via USB cable during the test. Test software exercised the radio card.

SETUP DIAGRAM FOR LINE CONDUCTION TEST



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/18/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/31/10
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11
EMI Receiver, 2.9 GHz	Agilent / HP	8542E	C00957	03/24/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/14/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/14/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/29/11
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/10
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/10
Peak Power Meter	Boonton	4541	N/A	01/15/11
Peak / Average Power Sensor	Boonton	57318	N/A	02/02/11

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

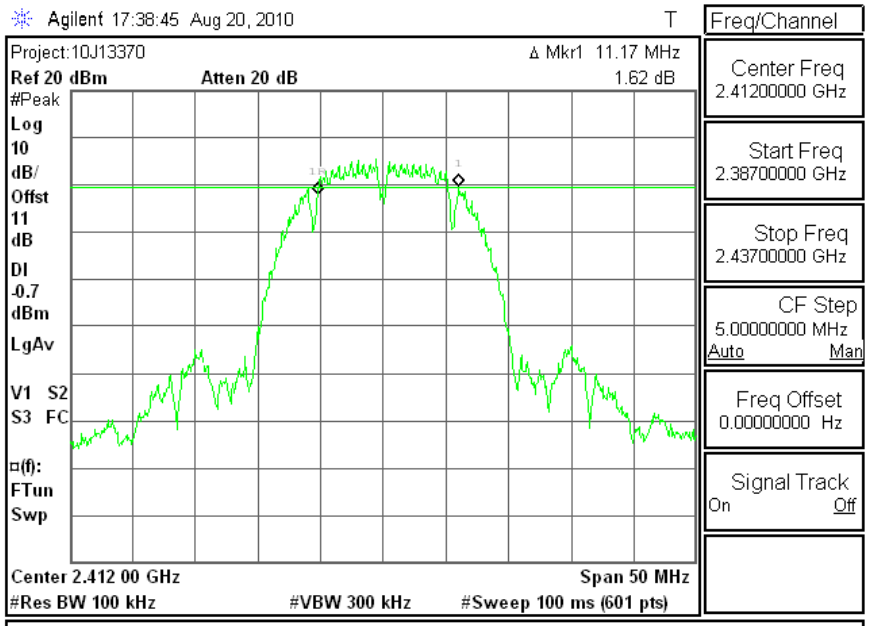
TEST PROCEDURE

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.

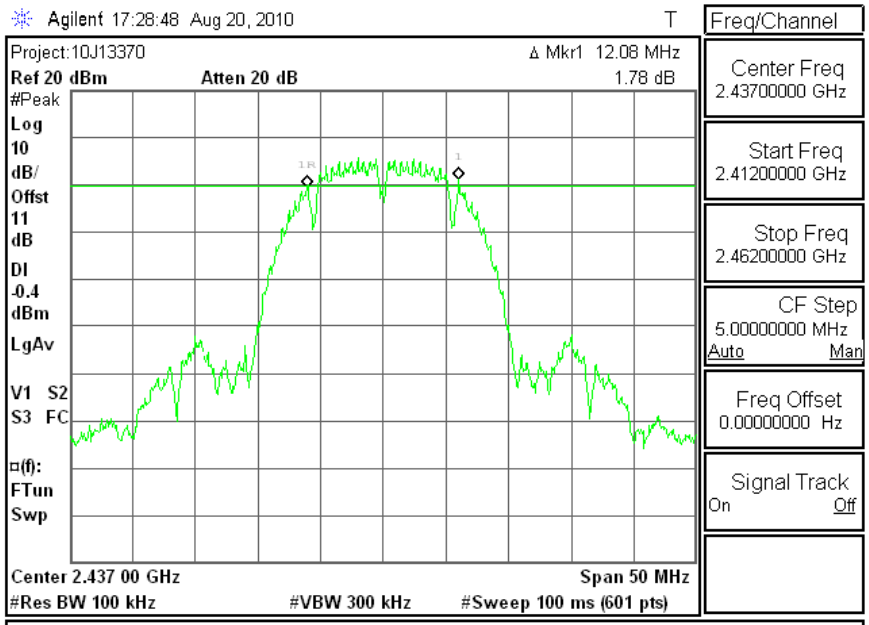
RESULTS

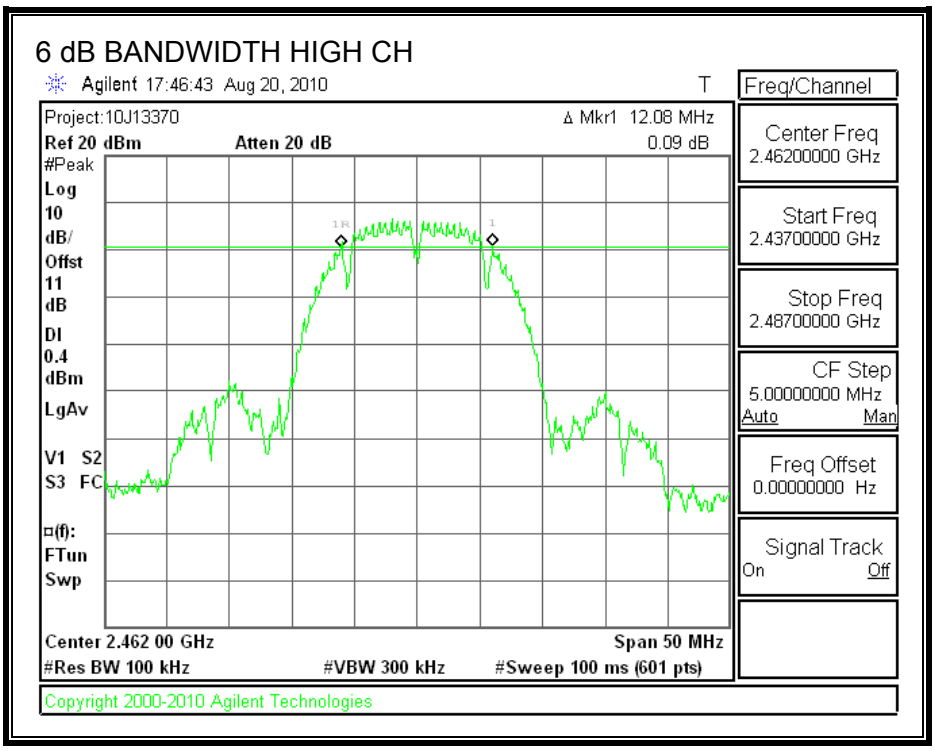
Channel	Frequency (MHz)	6 dB BW (MHz)	Minimum Limit (MHz)
Low	2412	11.17	0.5
Middle	2437	12.08	0.5
High	2462	12.08	0.5

6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH





7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

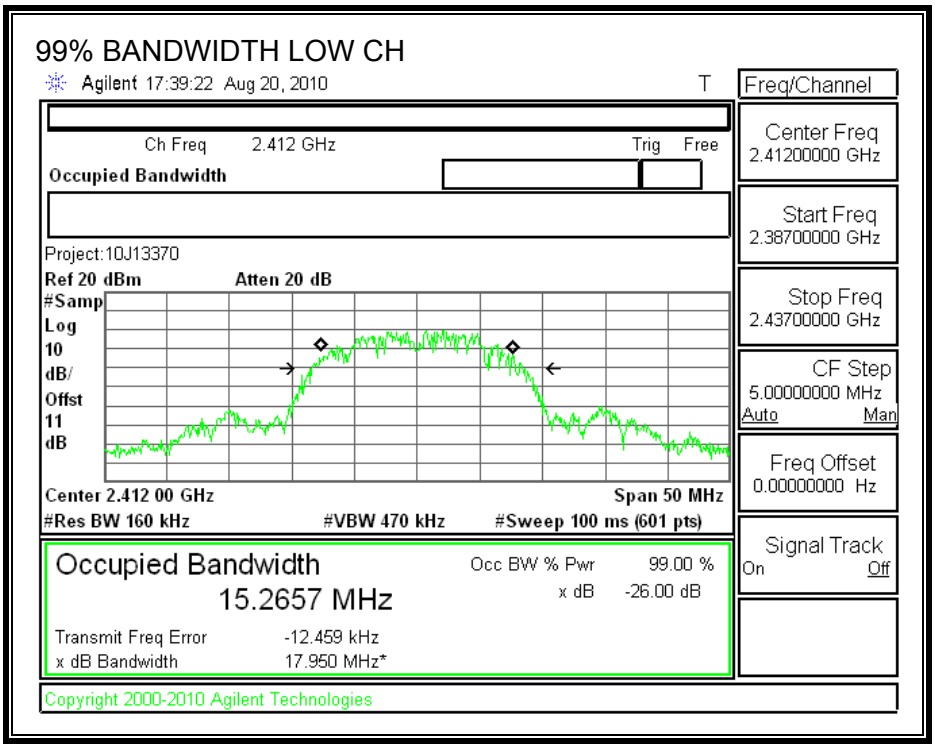
TEST PROCEDURE

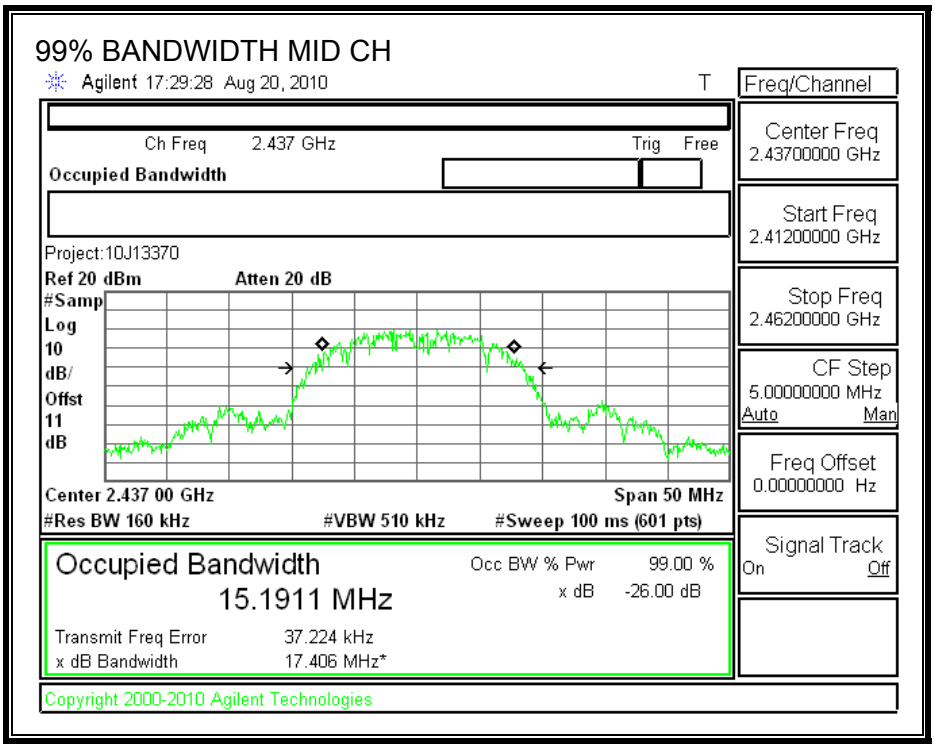
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

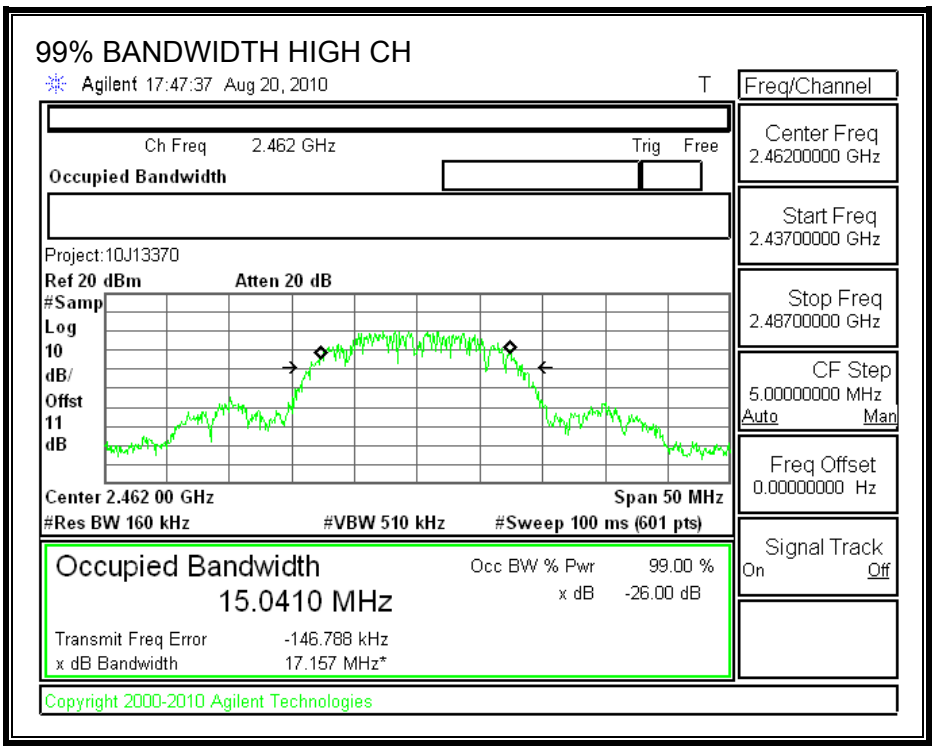
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.2657
Middle	2437	15.1911
High	2462	15.0410

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 meter.

RESULTS

Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	7.490	11.0	18.49	30	-11.51
Middle	2437	7.643	11.0	18.64	30	-11.36
High	2462	7.709	11.0	18.71	30	-11.29

7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)
Low	2412	4.40	11.00	15.40
Middle	2437	4.64	11.00	15.64
High	2462	4.75	11.00	15.75

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

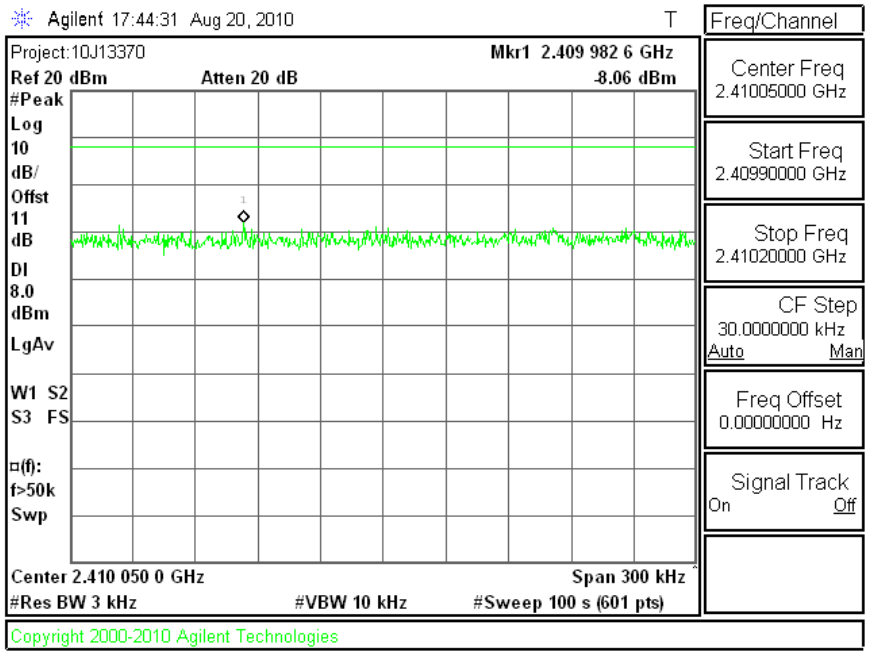
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

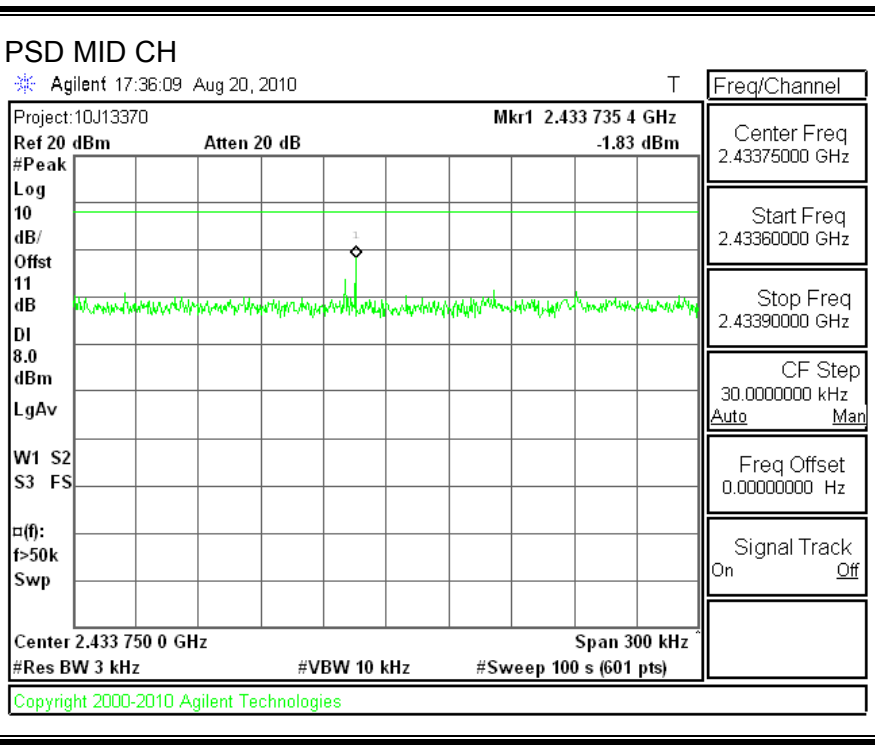
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.06	8	-16.06
Middle	2437	-1.83	8	-9.83
High	2462	-7.40	8	-15.40

POWER SPECTRAL DENSITY

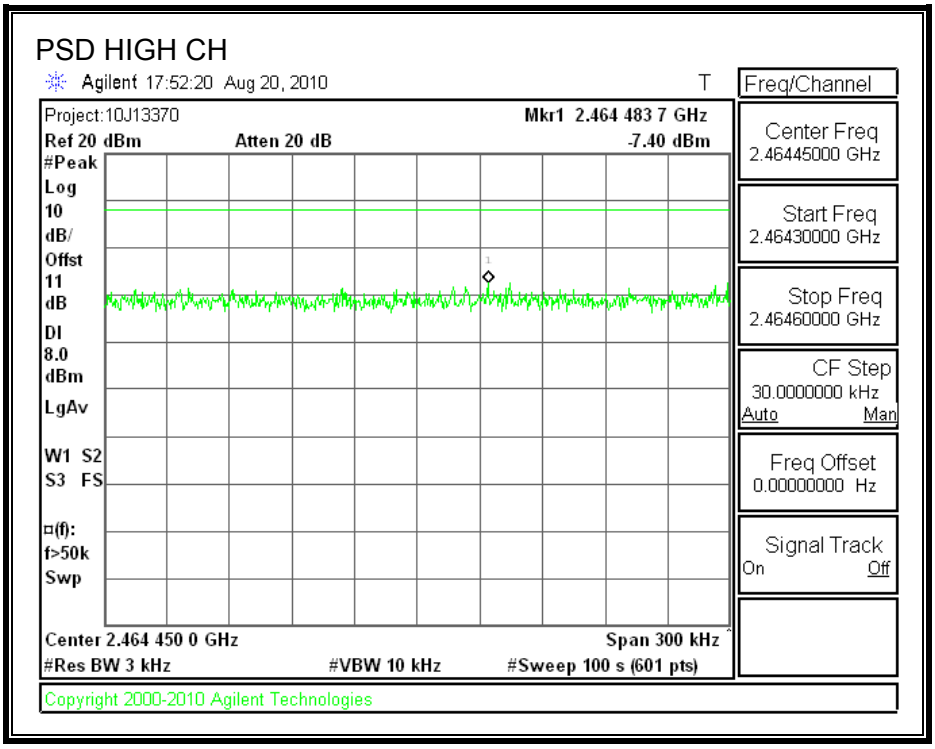
PSD LOW CH



PSD MID CH



PSD HIGH CH



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

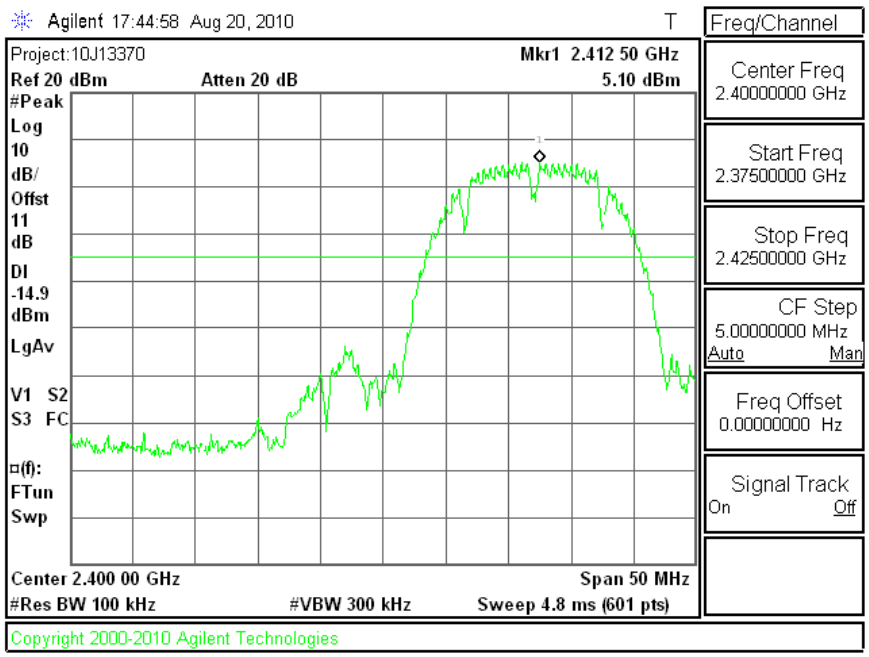
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

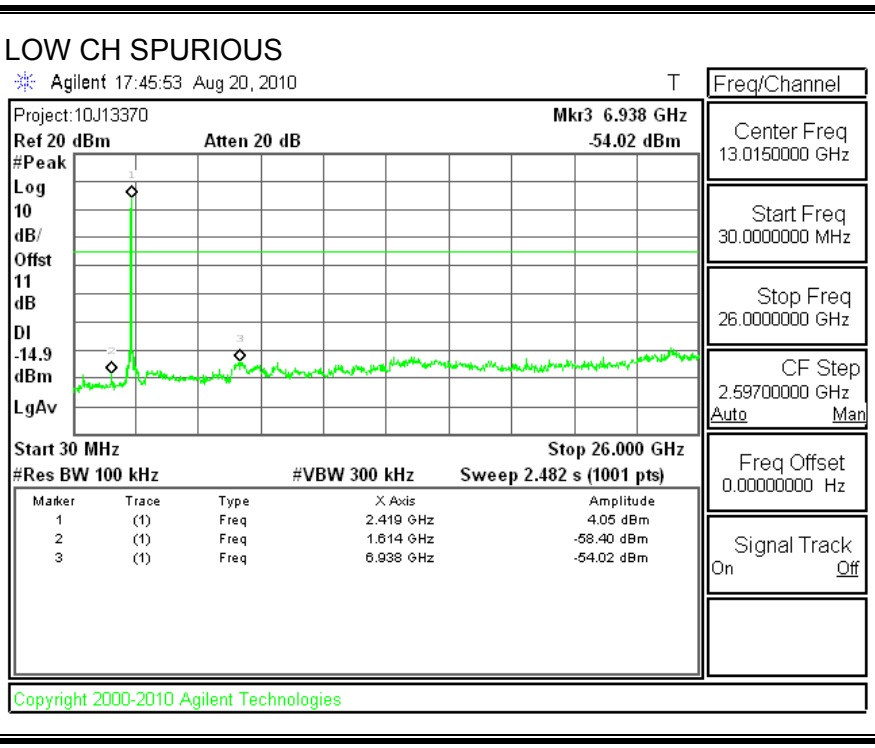
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

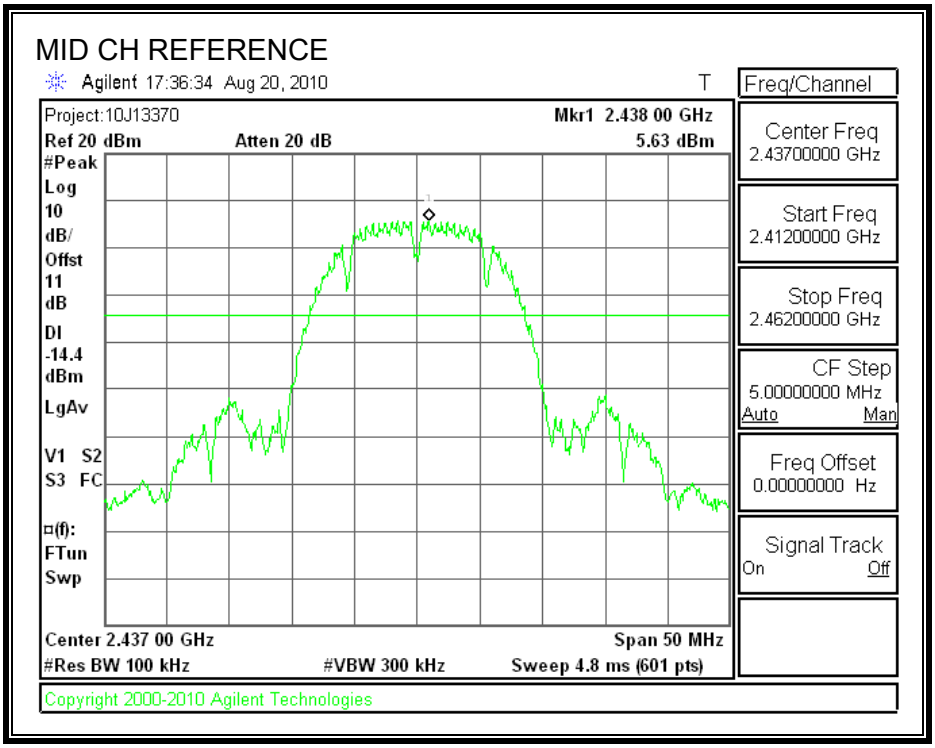
LOW CH BANDEDGE

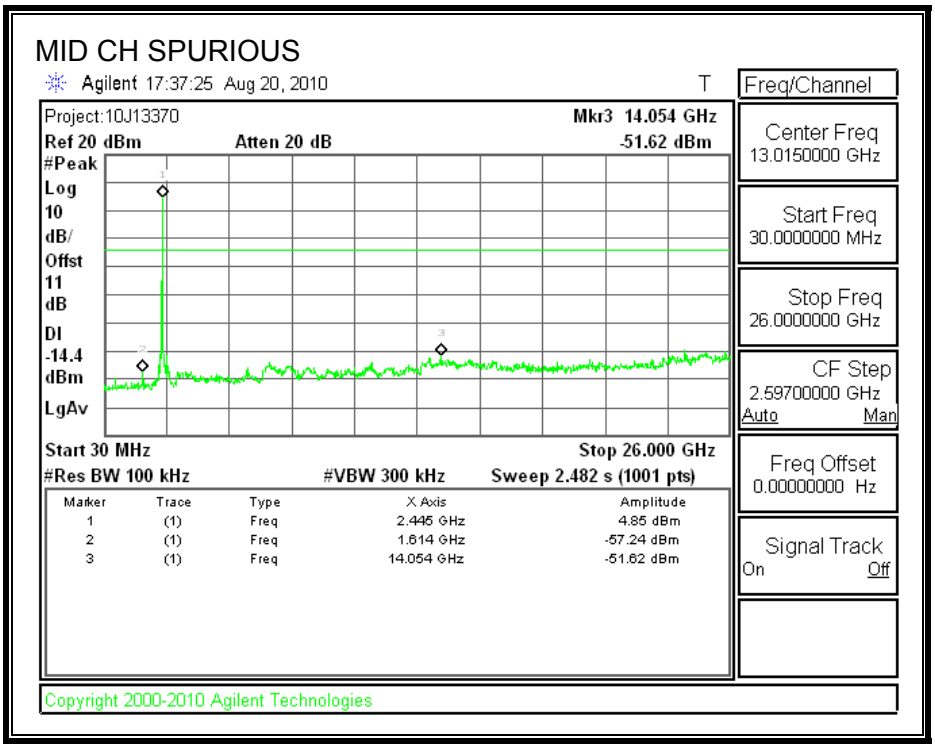


LOW CH SPURIOUS

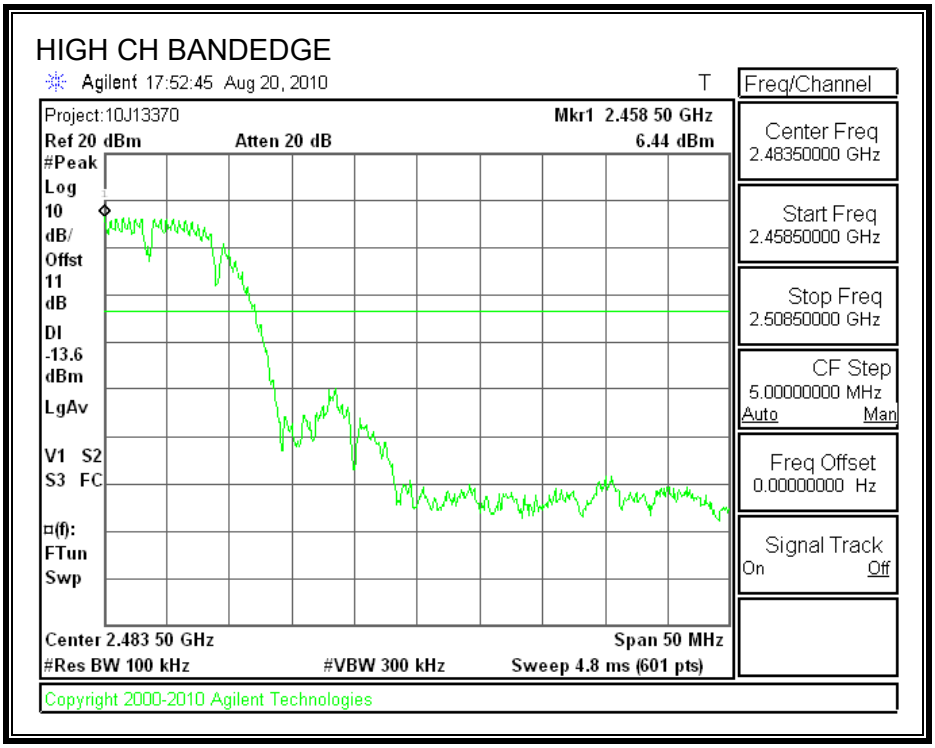


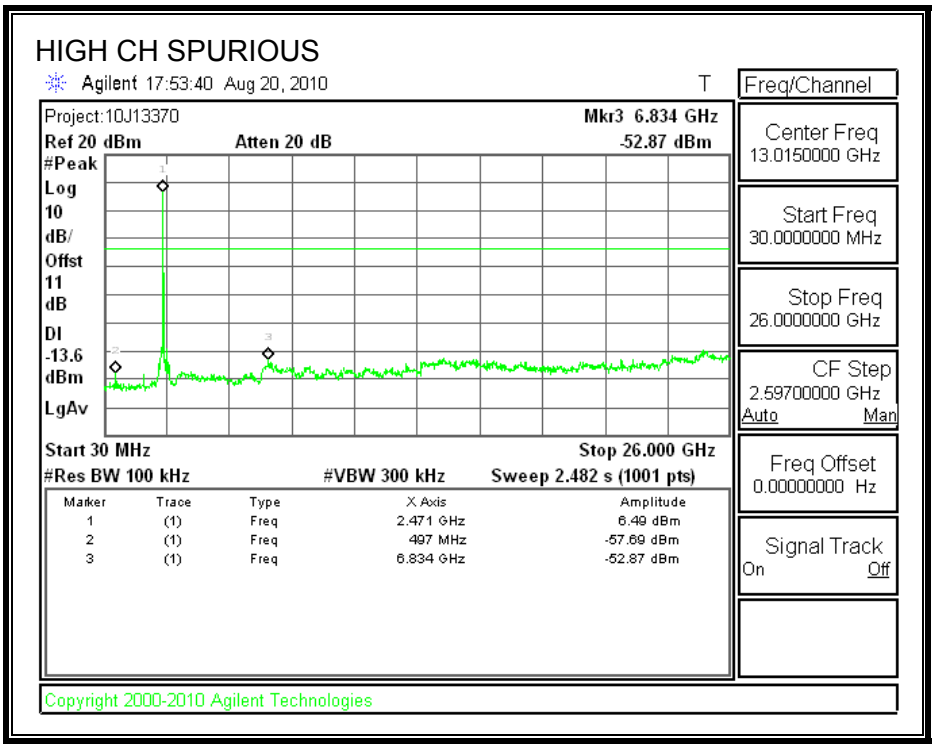
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.2. 802.11 g 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.

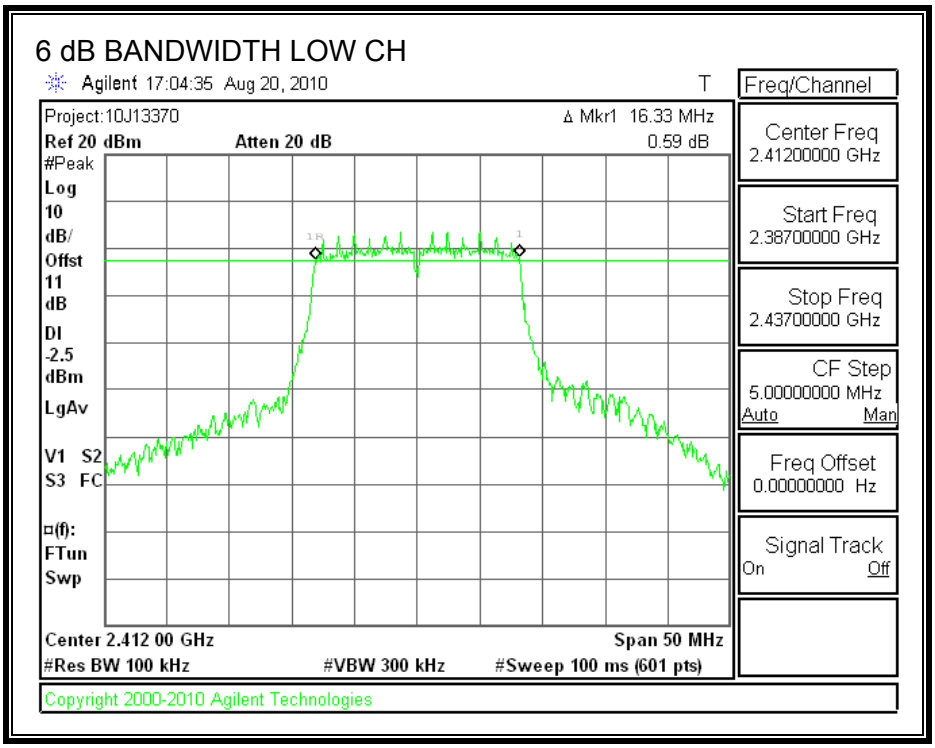
TEST PROCEDURE

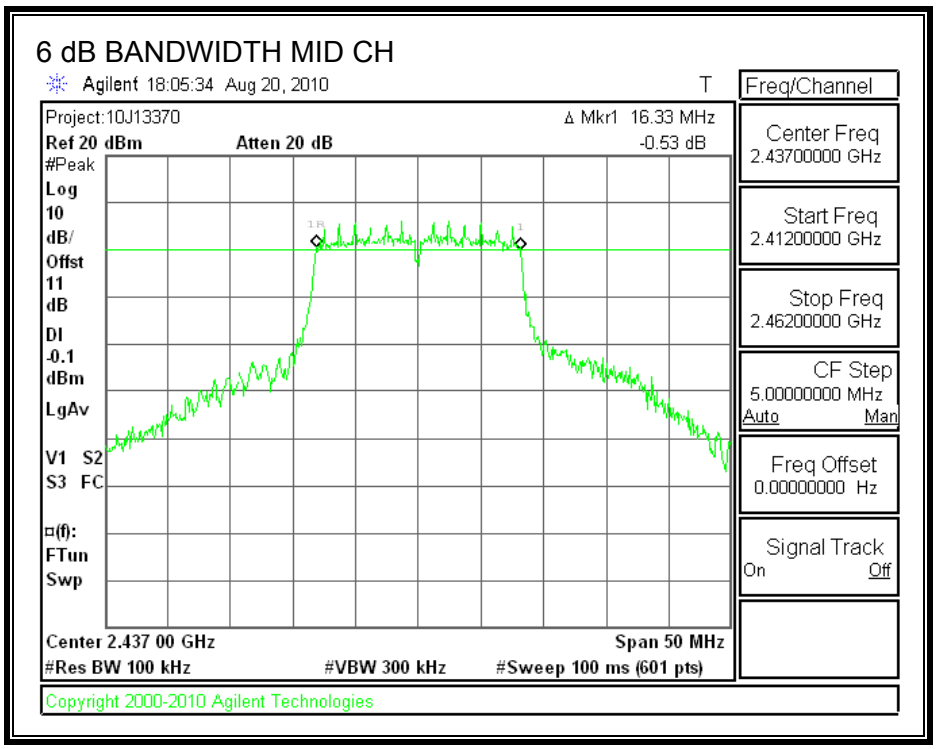
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

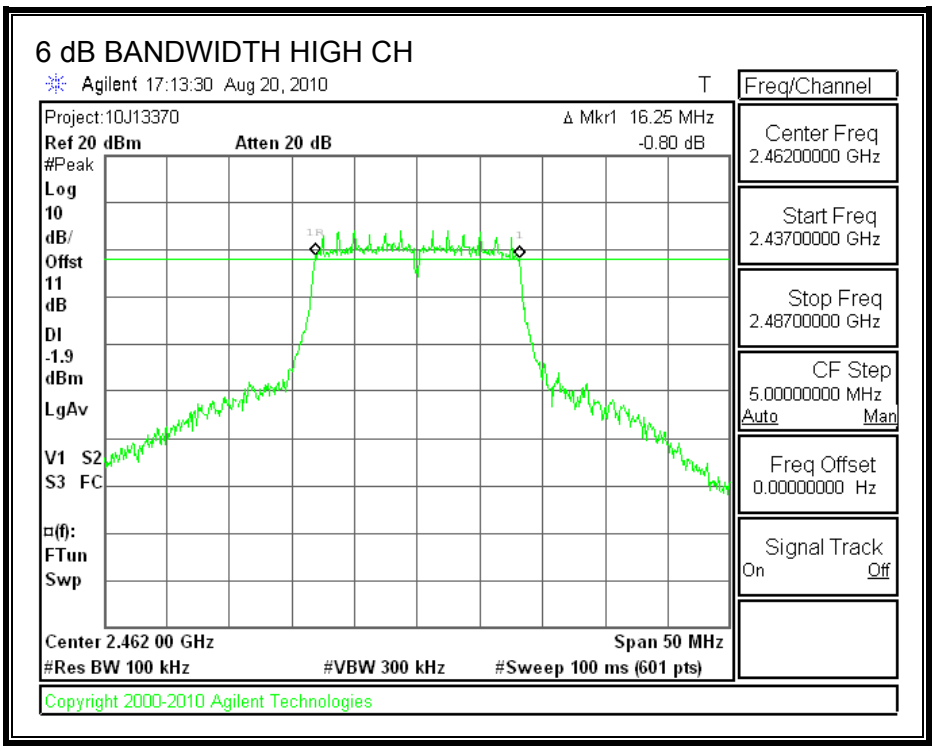
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.33	0.5
Middle	2437	16.33	0.5
High	2462	16.25	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

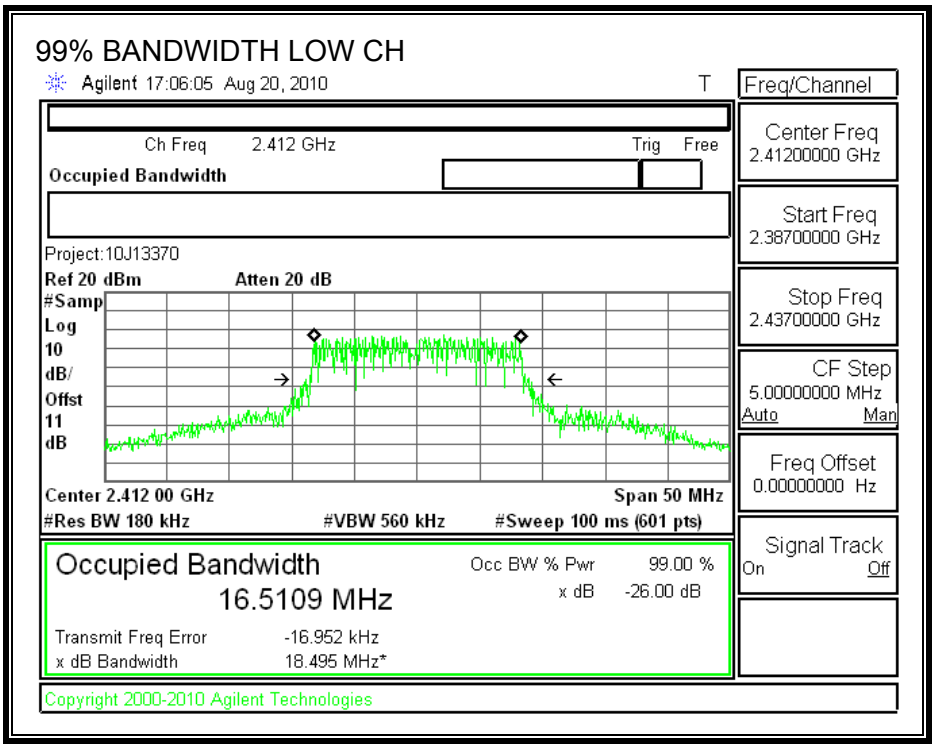
TEST PROCEDURE

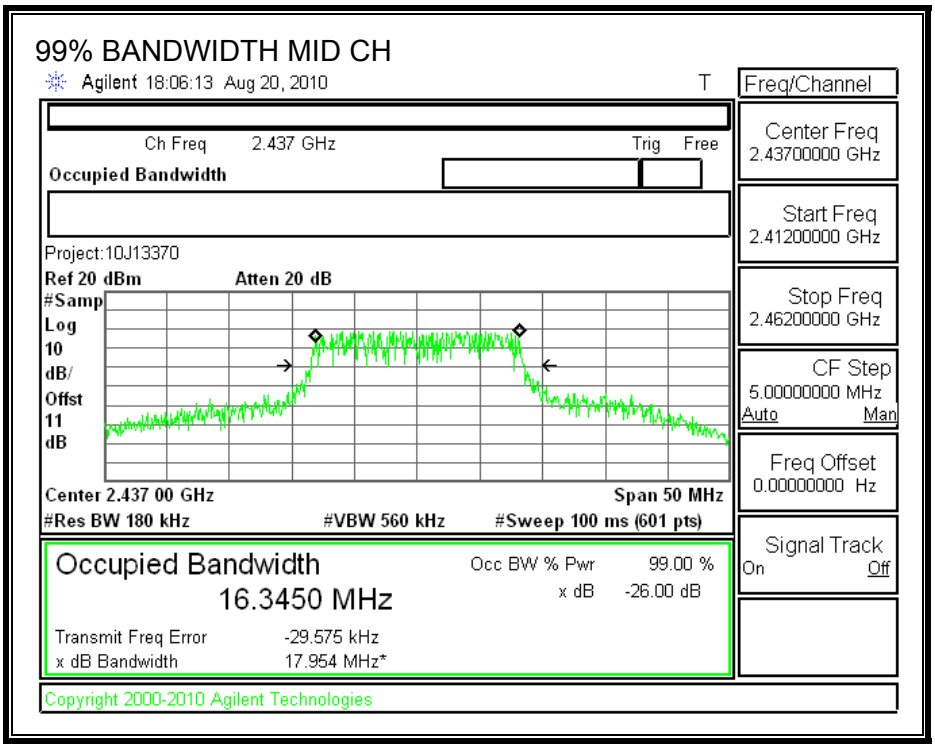
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

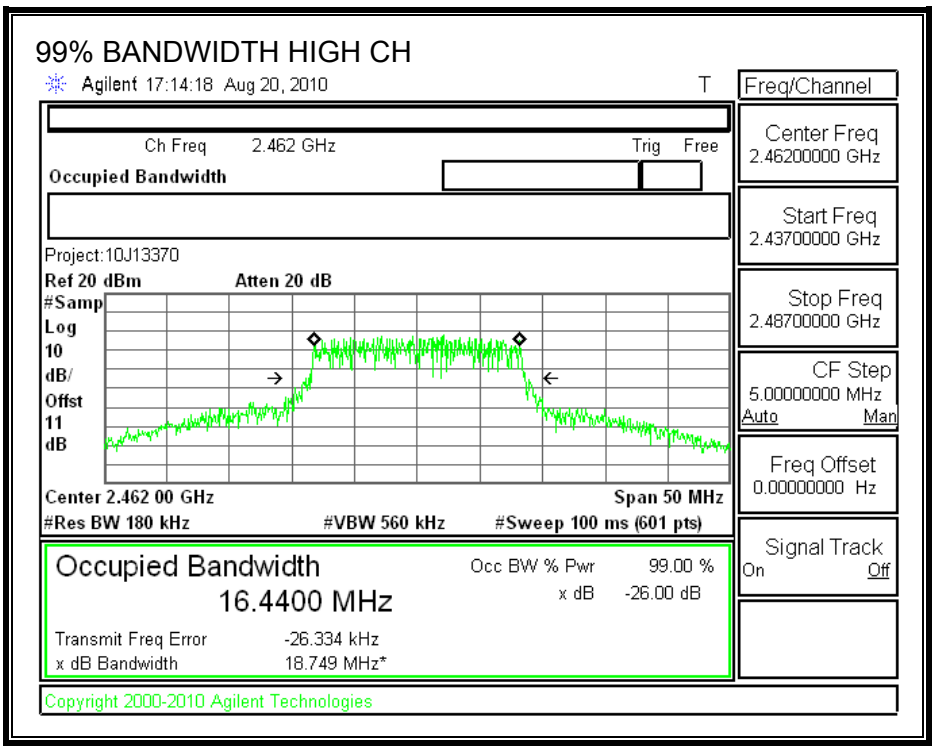
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5109
Middle	2437	16.3450
High	2462	16.4400

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

Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.462	11.0	23.46	30	-6.54
Middle	2437	13.162	11.0	24.16	30	-5.84
High	2462	12.808	11.0	23.81	30	-6.19

7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)
Low	2412	2.822	11.0	13.82
Middle	2437	4.566	11.0	15.57
High	2462	3.477	11.0	14.48

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

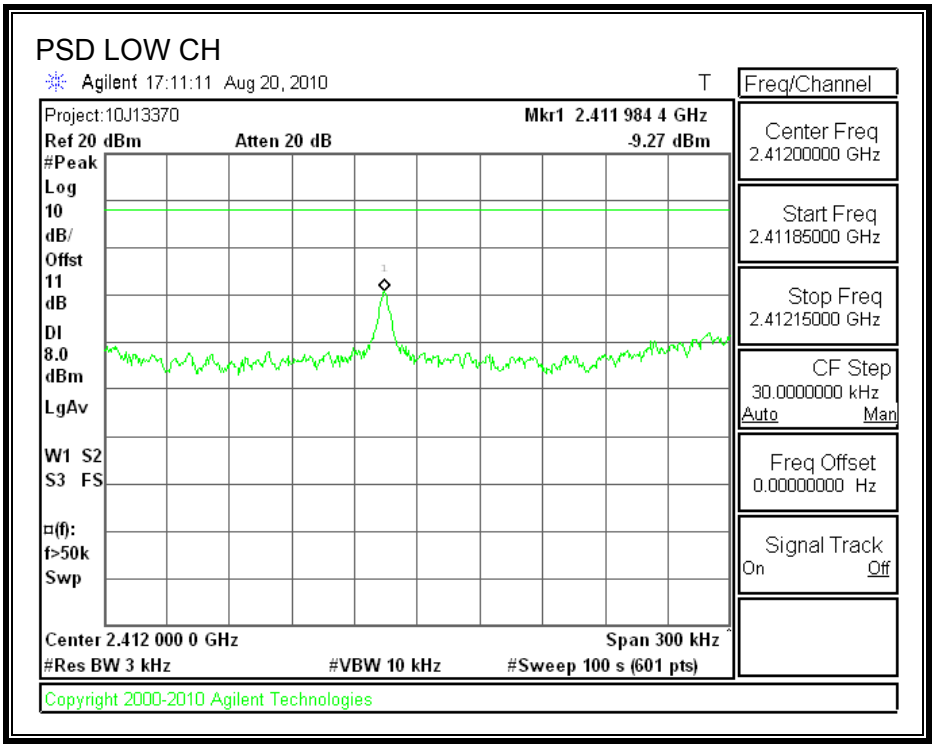
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

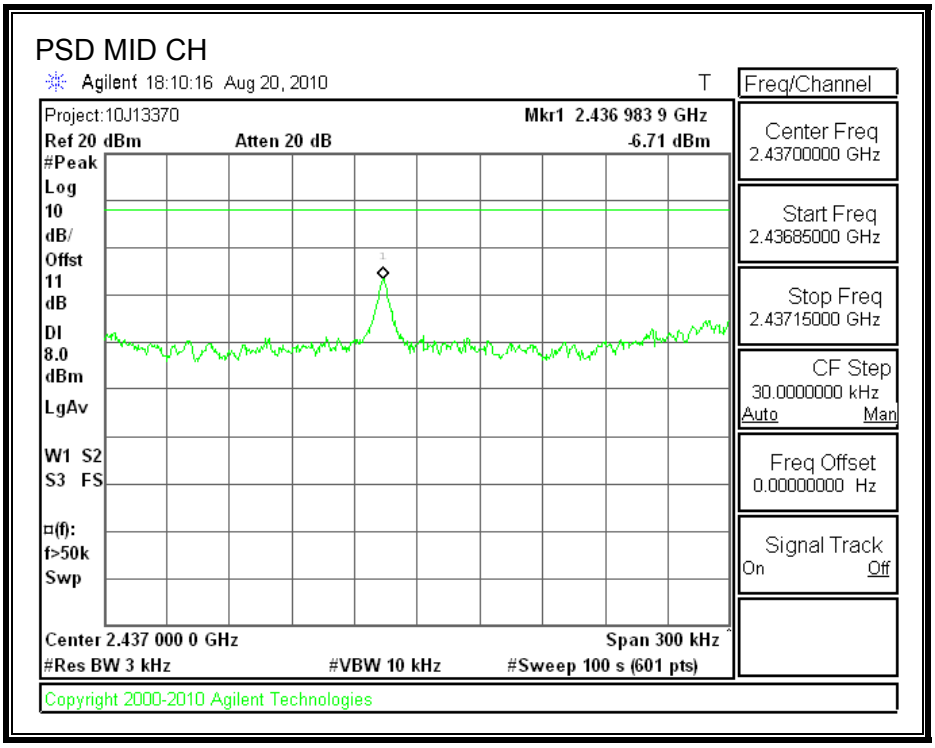
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.27	8	-17.27
Middle	2437	-6.71	8	-14.71
High	2462	-9.62	8	-17.62

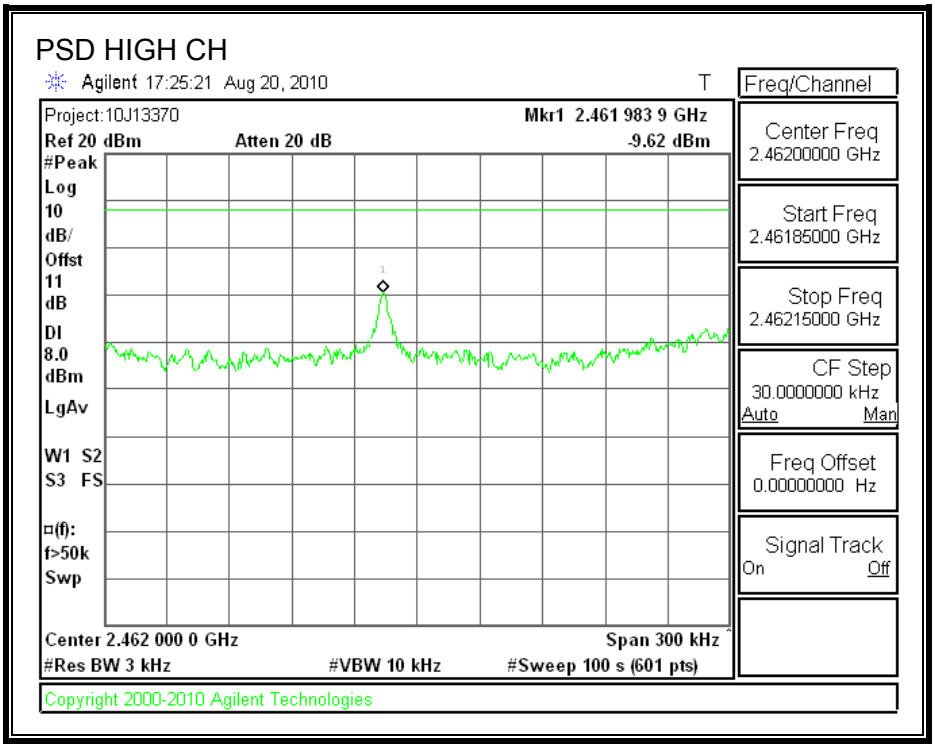
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH





7.2.6. 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.

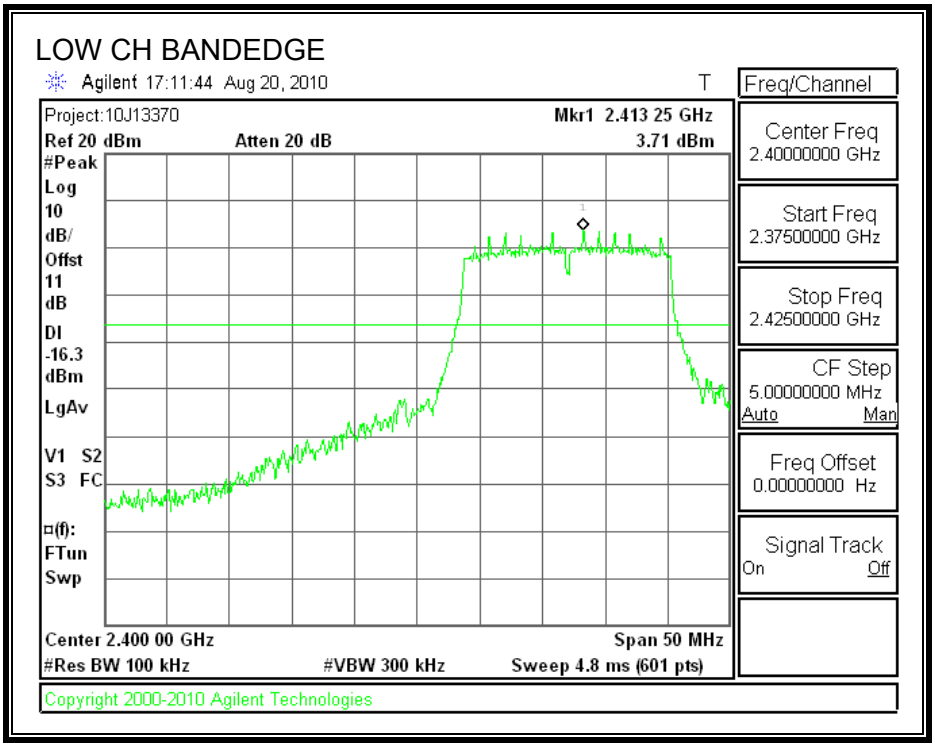
TEST PROCEDURE

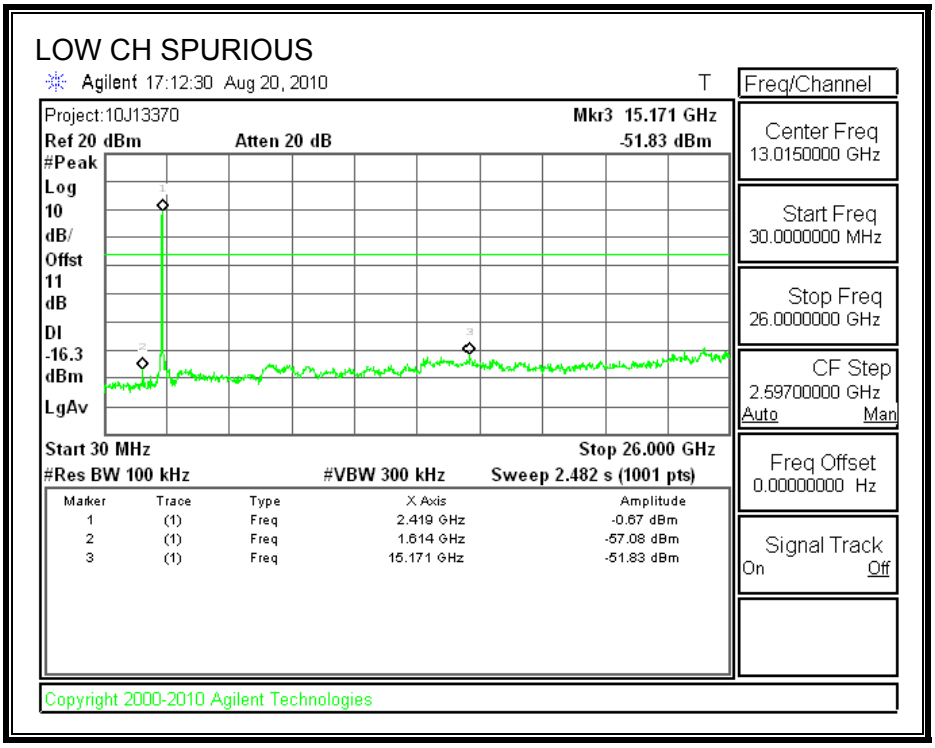
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

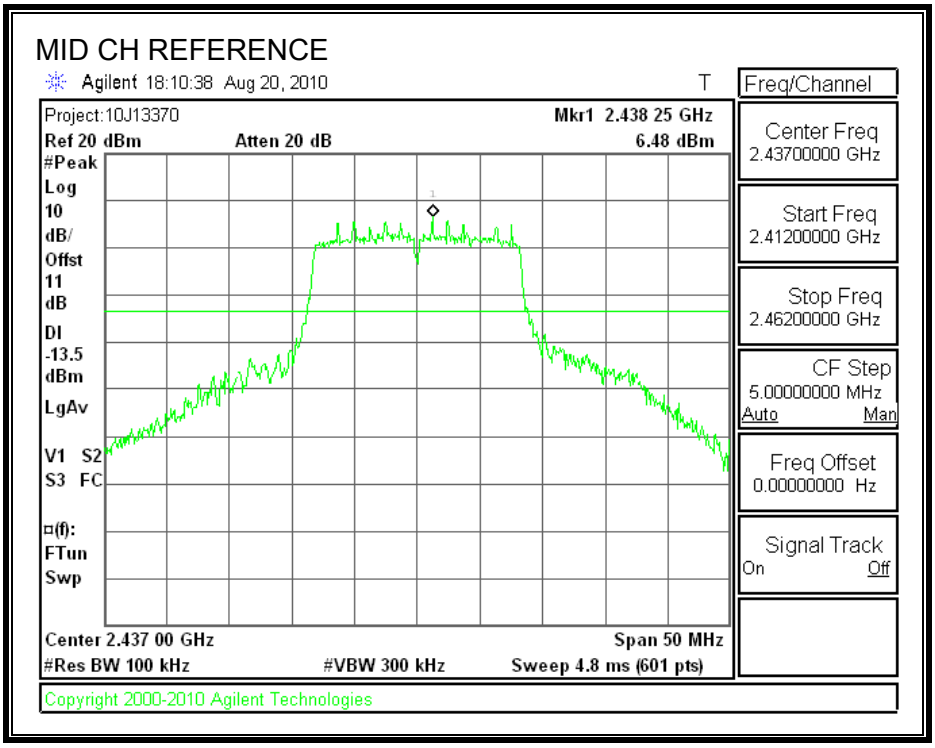
RESULTS

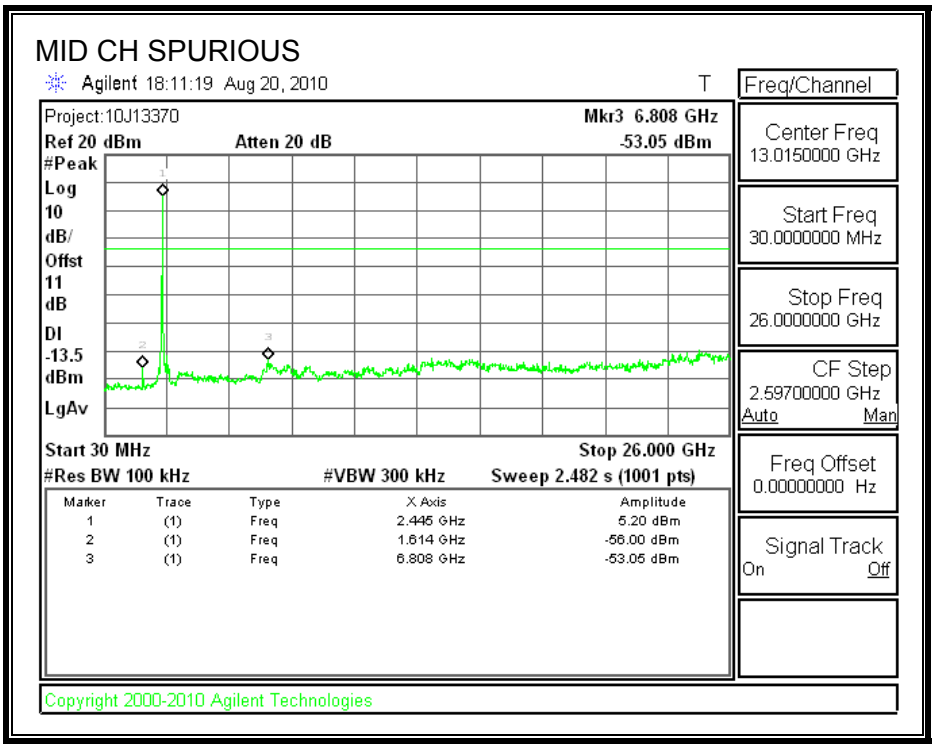
SPURIOUS EMISSIONS, LOW CHANNEL



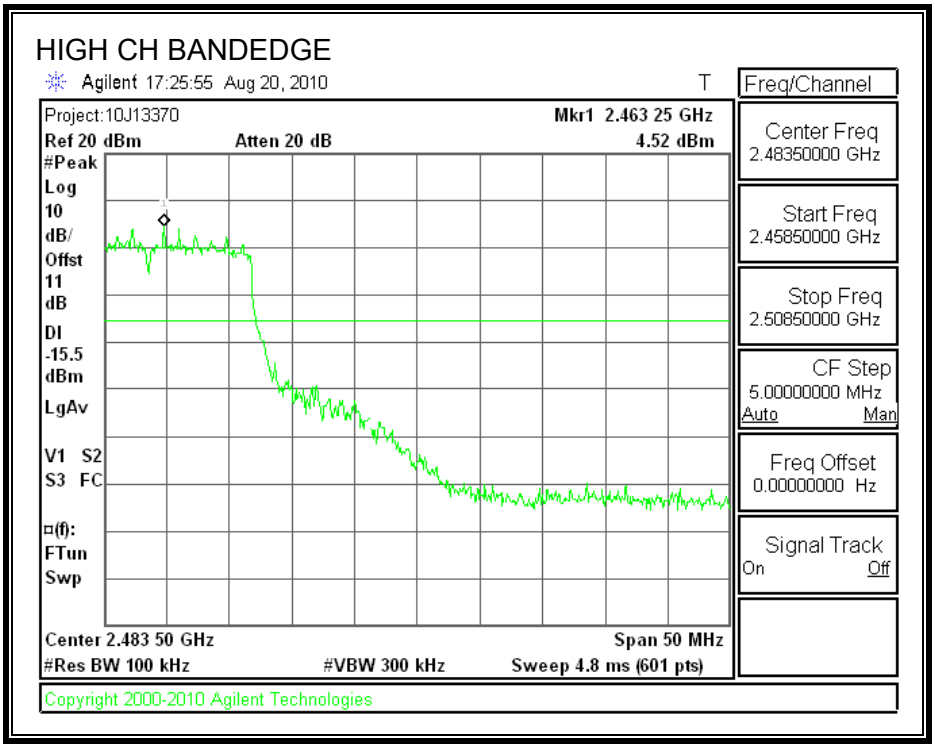


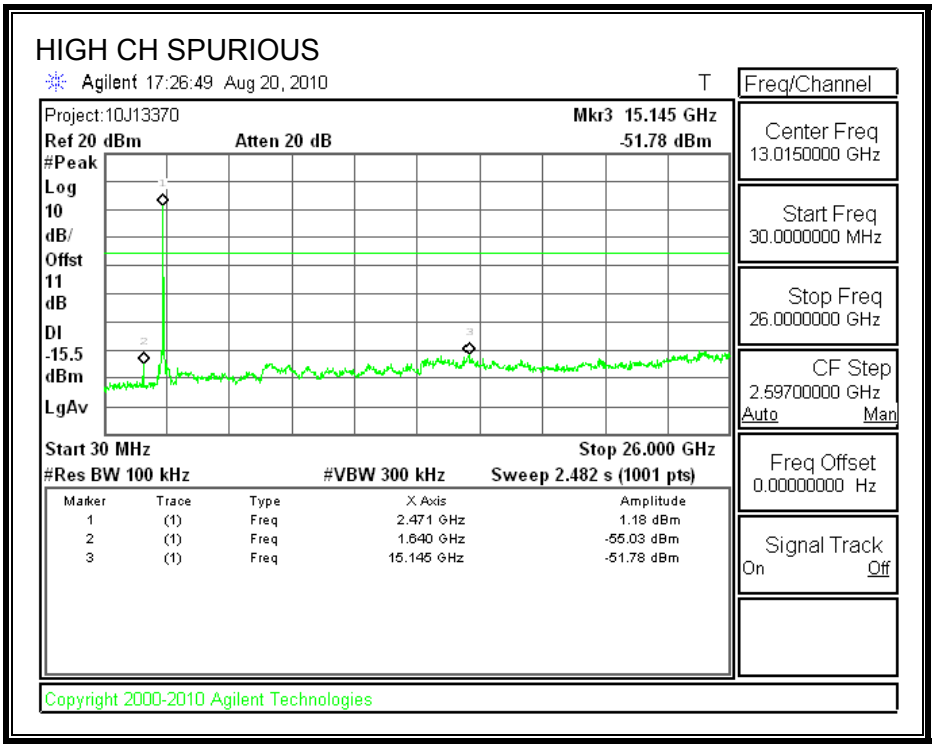
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.3. 802.11HT 20 MODE IN THE 2.4 GHz BAND

7.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

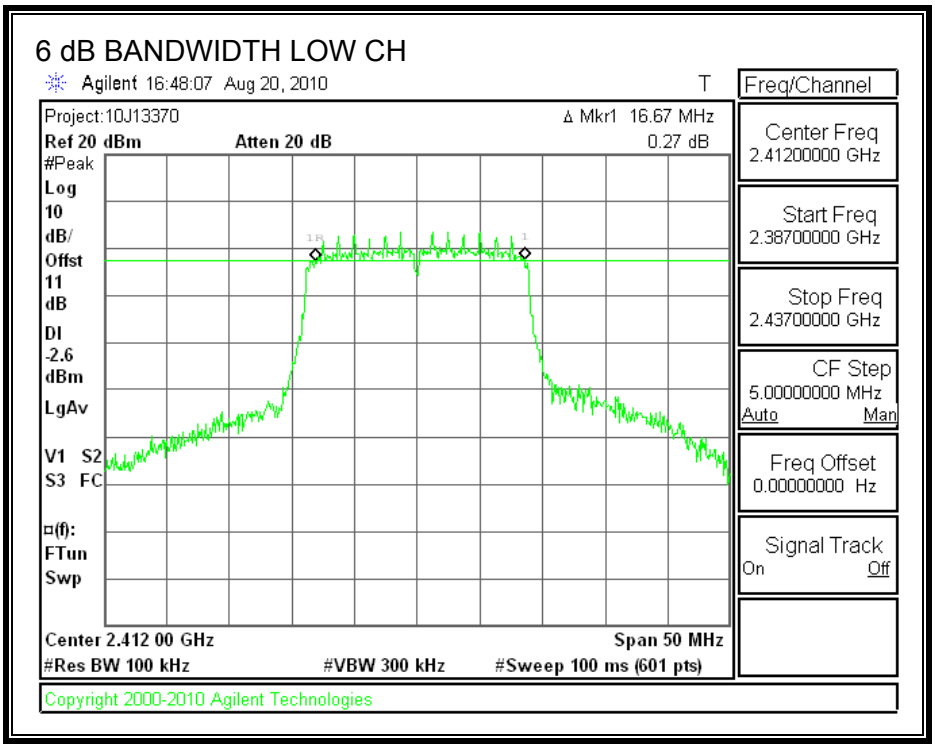
TEST PROCEDURE

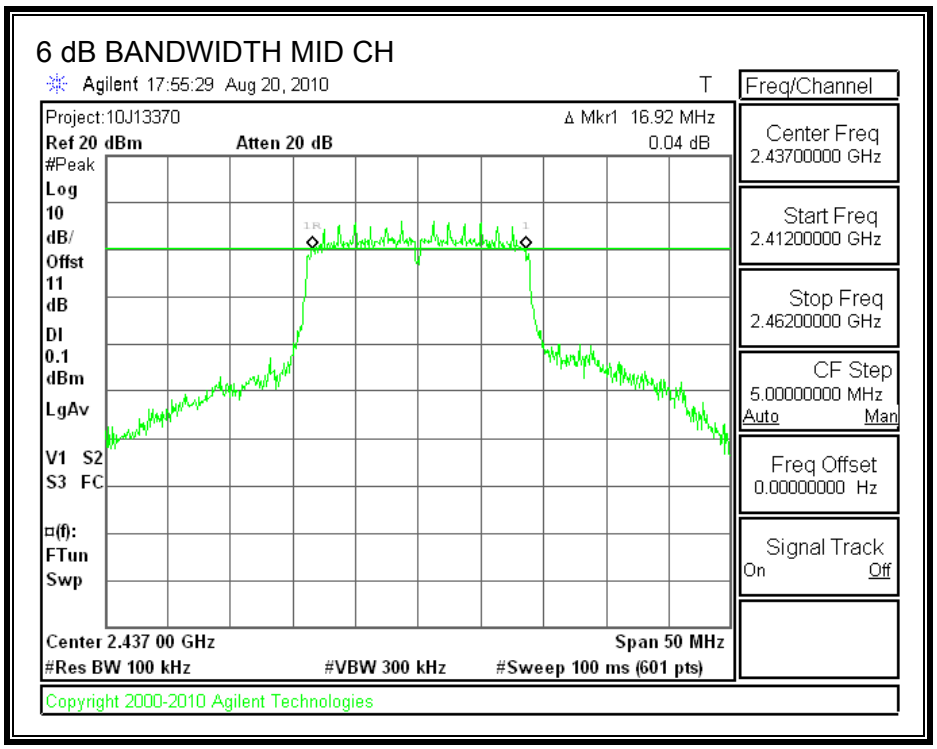
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

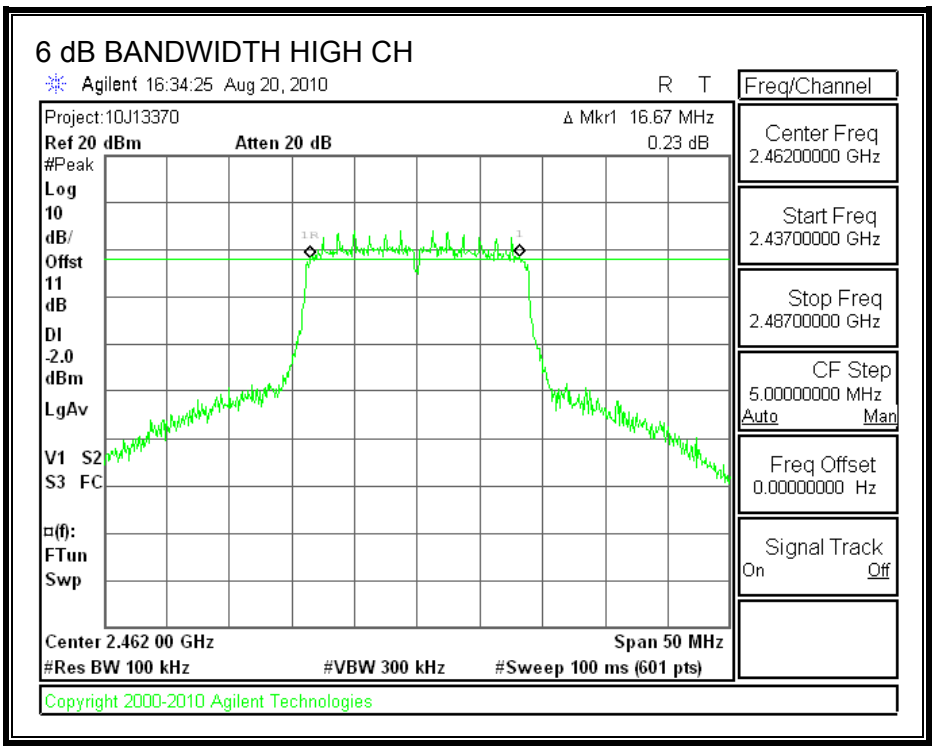
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.67	0.5
Middle	2437	16.92	0.5
High	2462	16.67	0.5

6 dB BANDWIDTH







7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

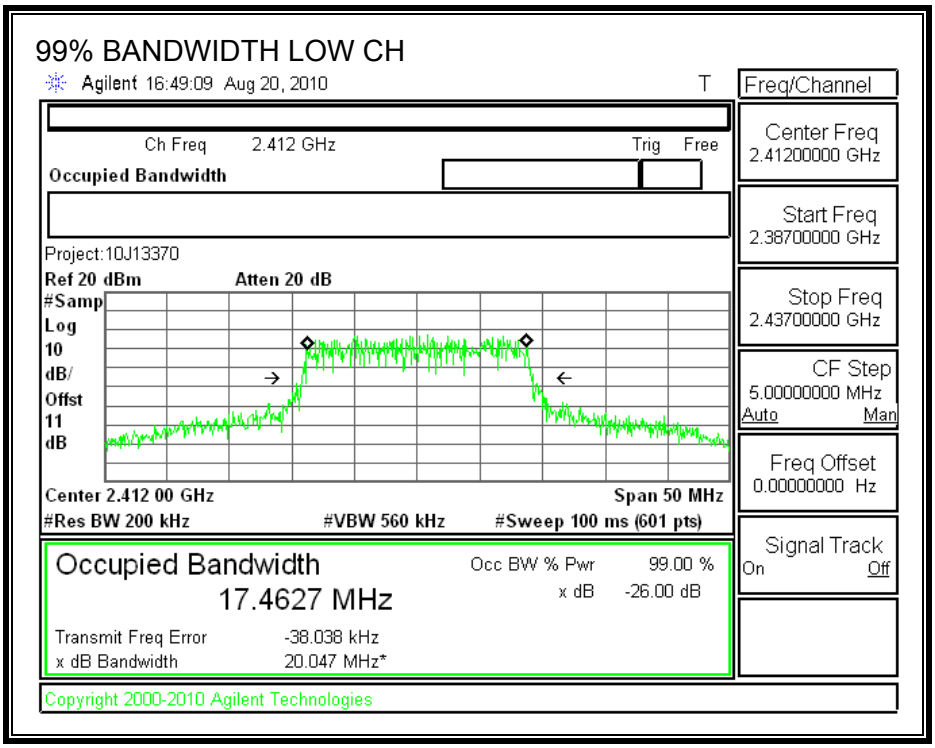
TEST PROCEDURE

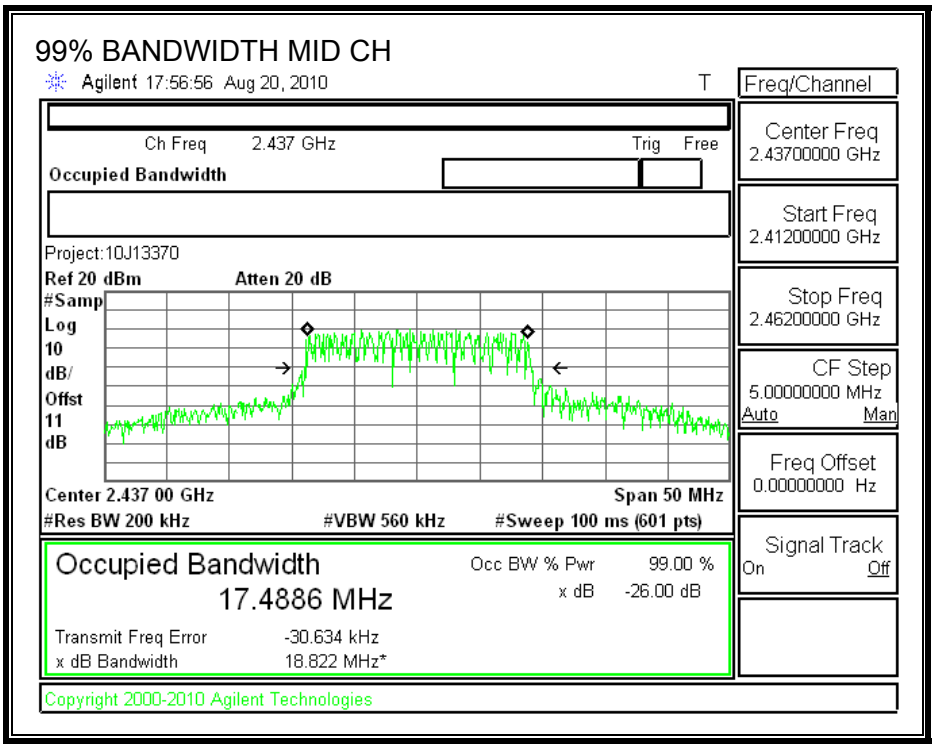
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

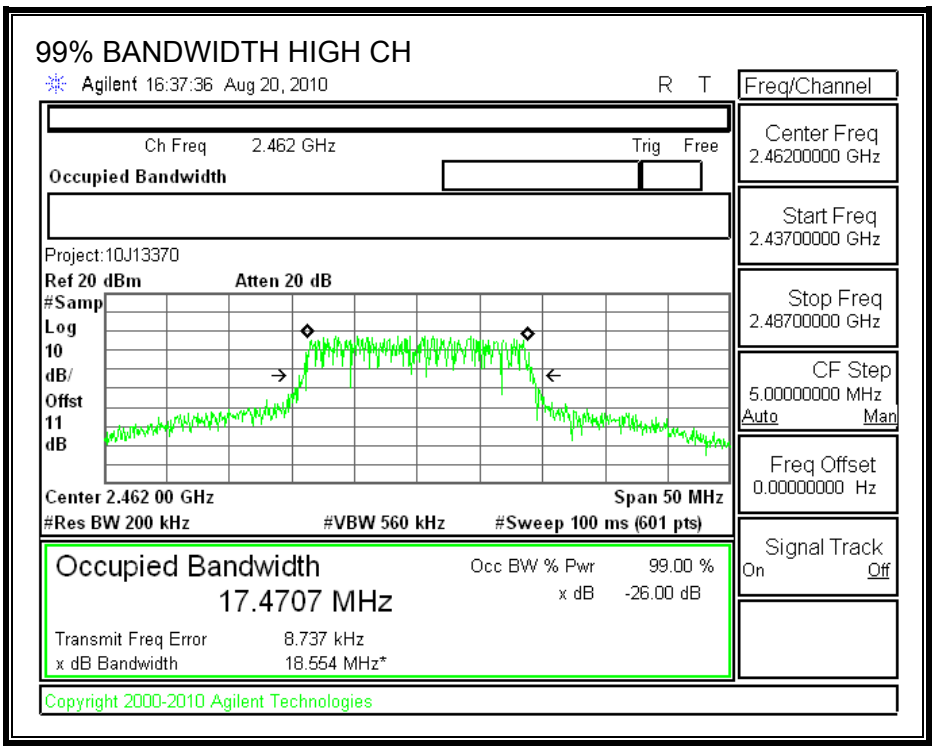
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.4627
Middle	2437	17.4886
High	2462	17.4707

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

Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.430	11.0	23.43	30	-6.57
Middle	2437	13.190	11.0	24.19	30	-5.81
High	2462	12.665	11.0	23.67	30	-6.34

7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)
Low	2412	2.774	11.0	13.77
Middle	2437	4.575	11.0	15.58
High	2462	3.347	11.0	14.35

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

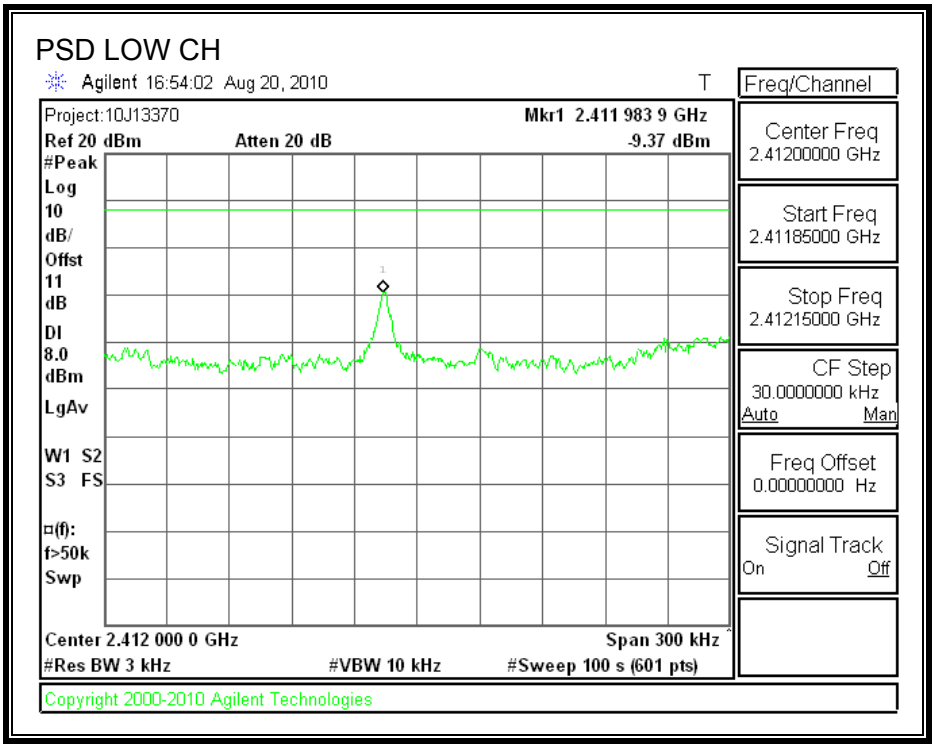
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

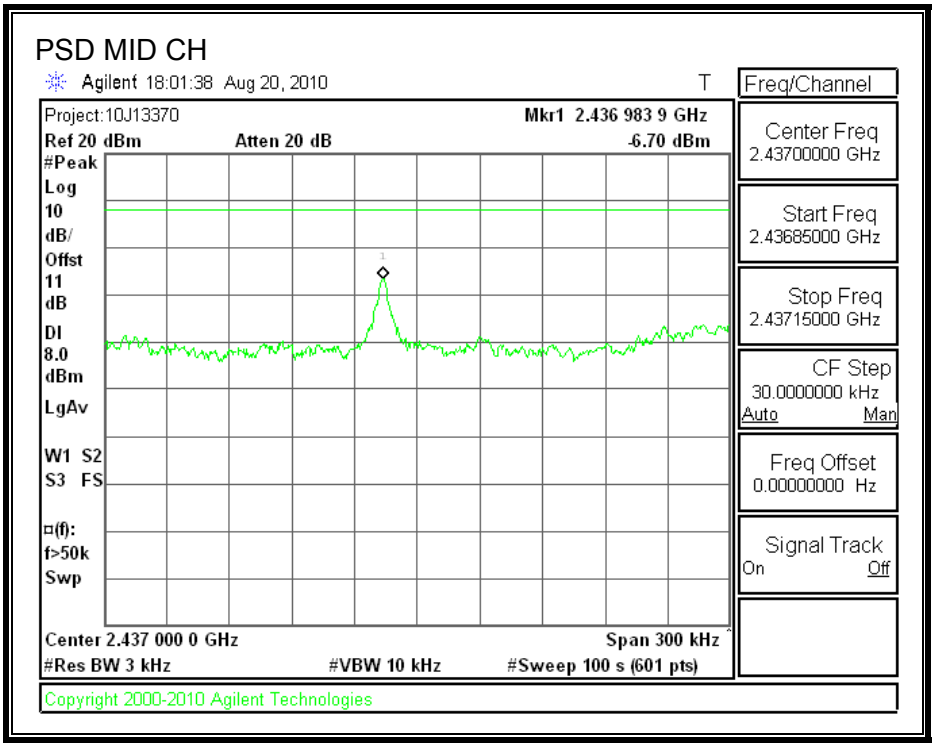
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.37	8	-17.37
Middle	2437	-6.70	8	-14.70
High	2462	-9.63	8	-17.63

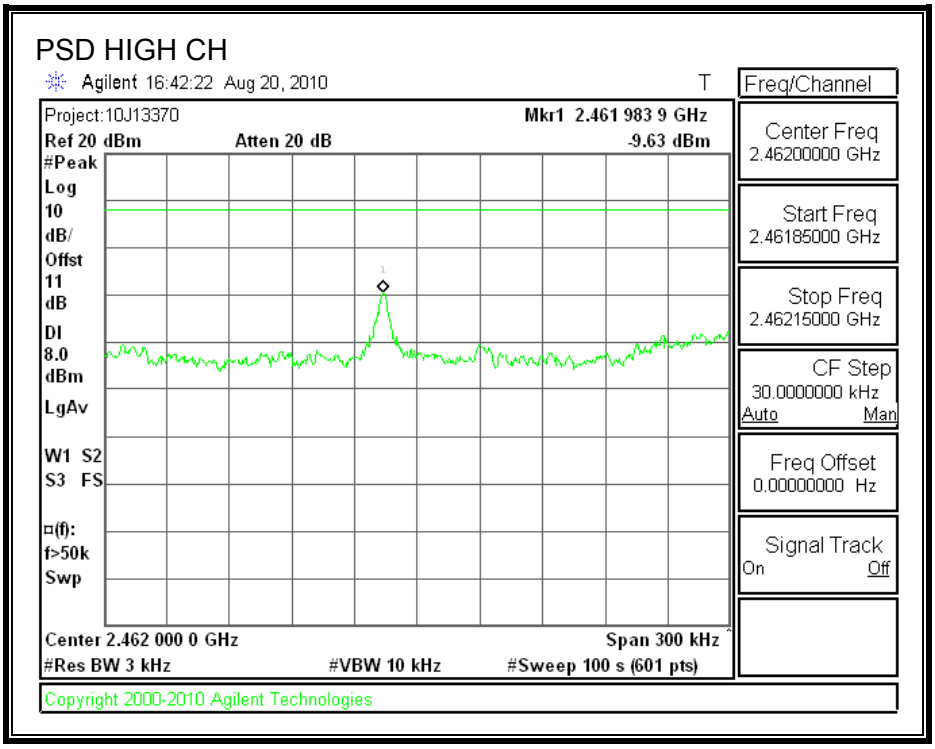
POWER SPECTRAL DENSITY

PSD LOW CH



PSD MID CH





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.

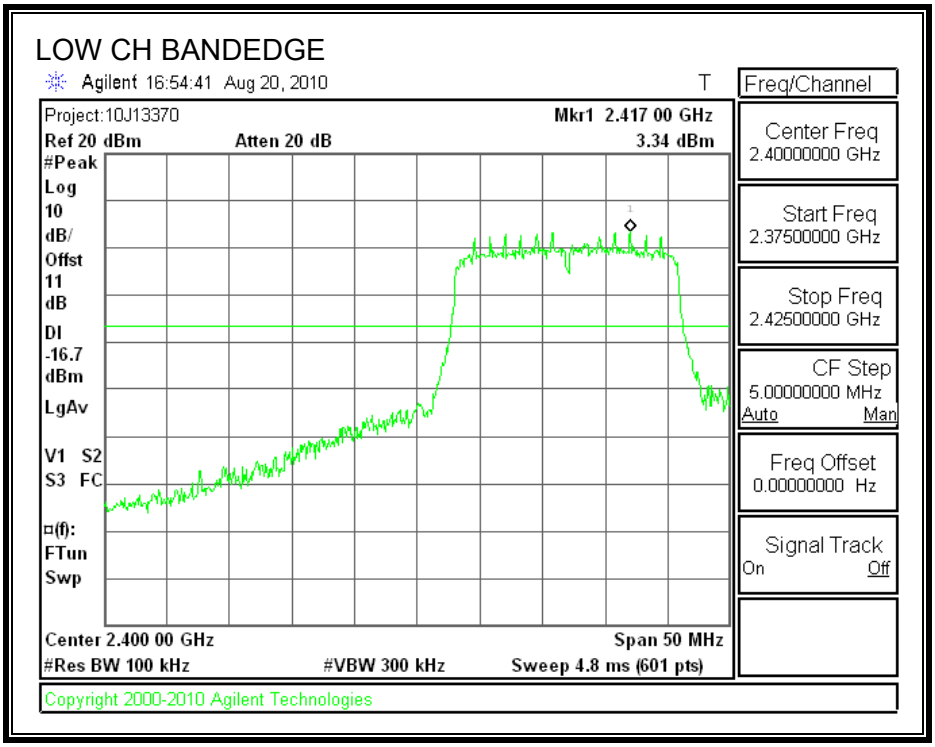
TEST PROCEDURE

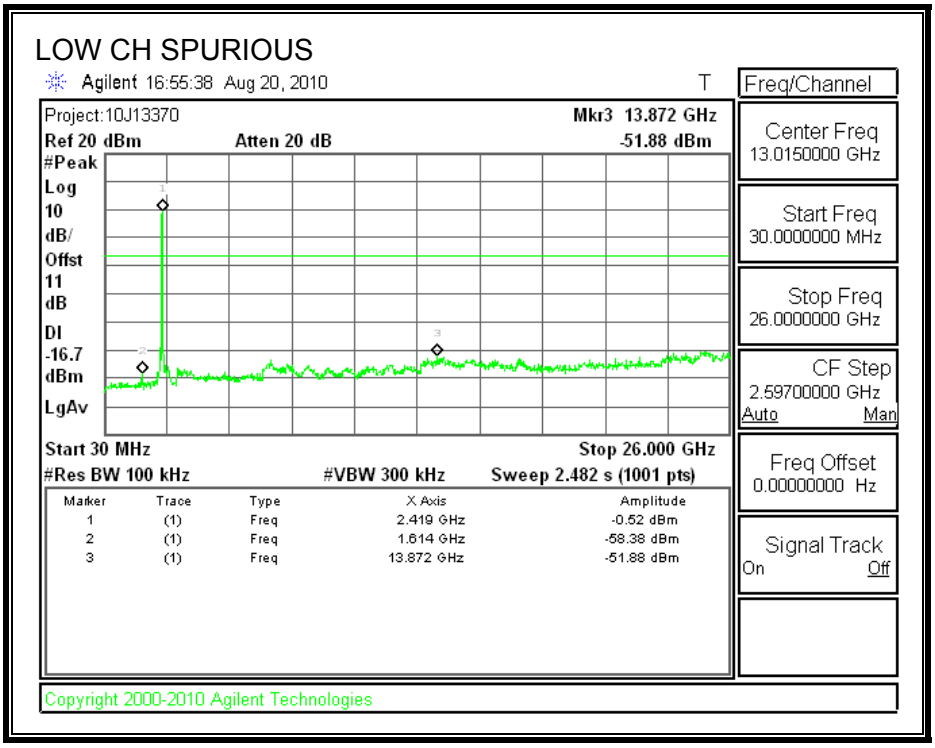
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

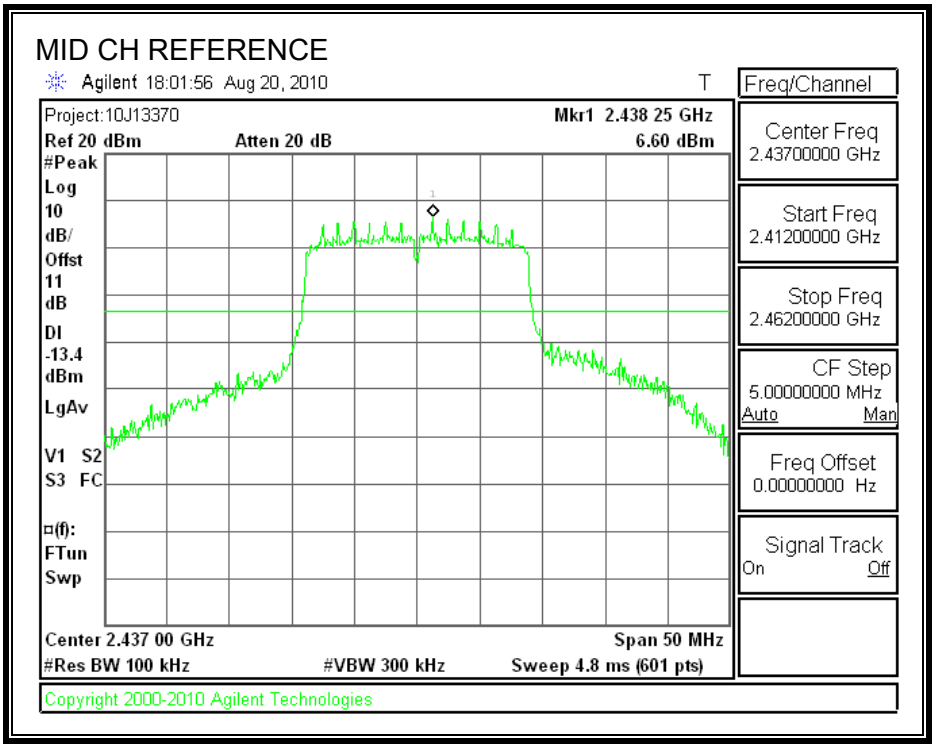
RESULTS

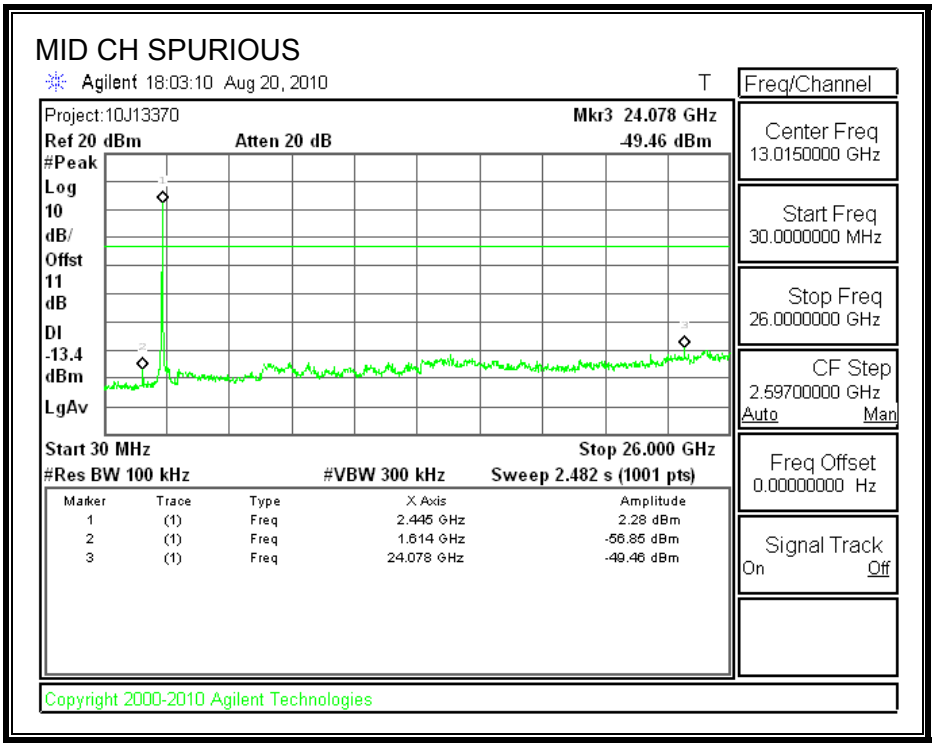
SPURIOUS EMISSIONS, LOW CHANNEL



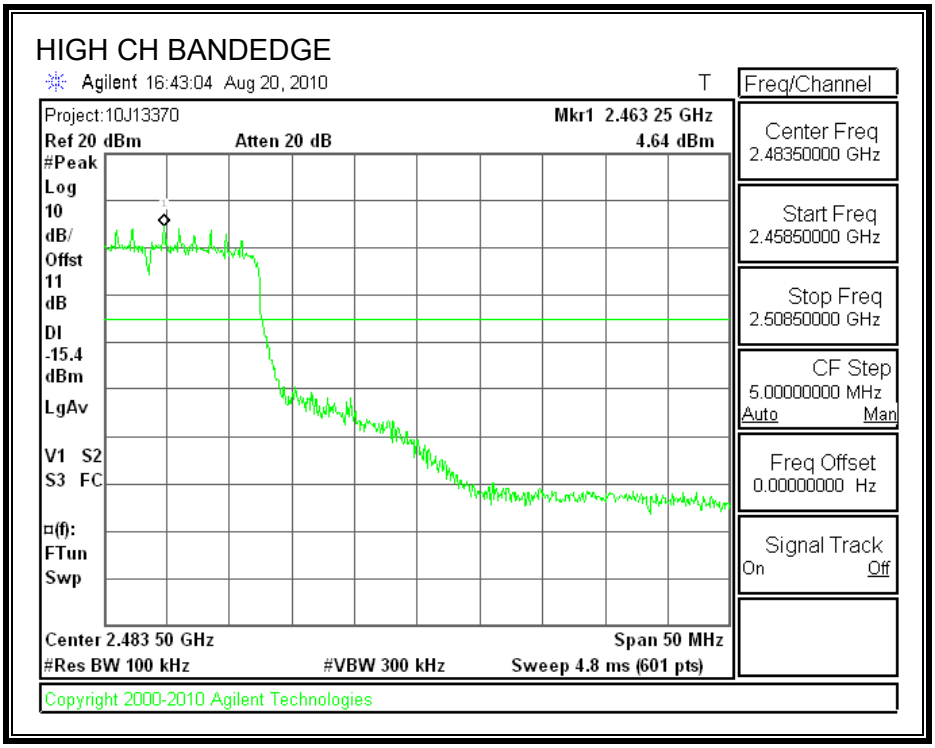


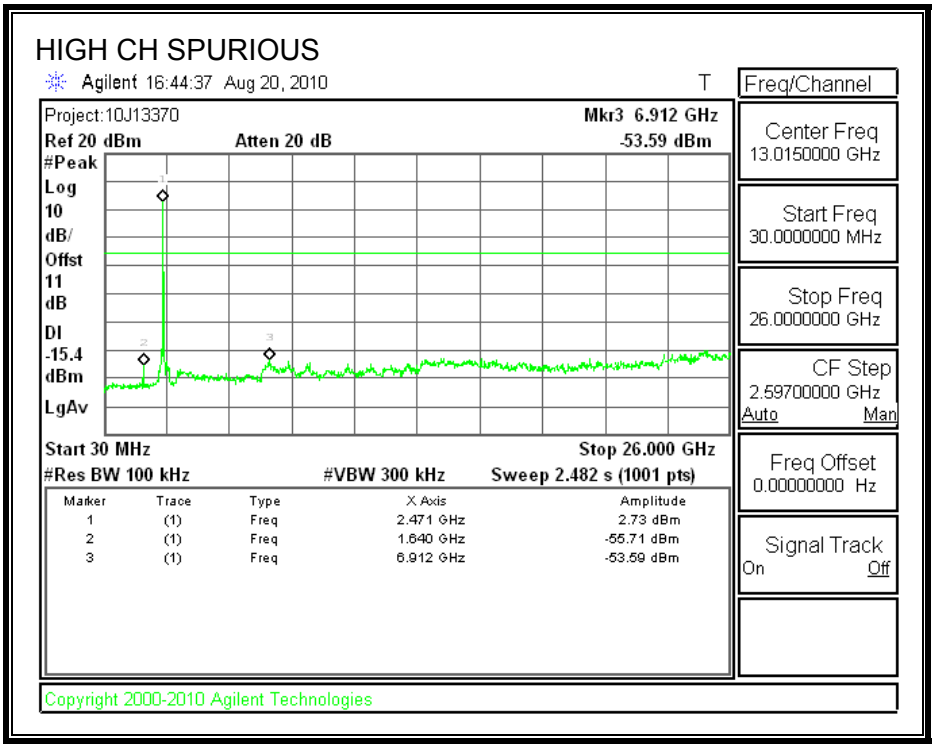
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





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

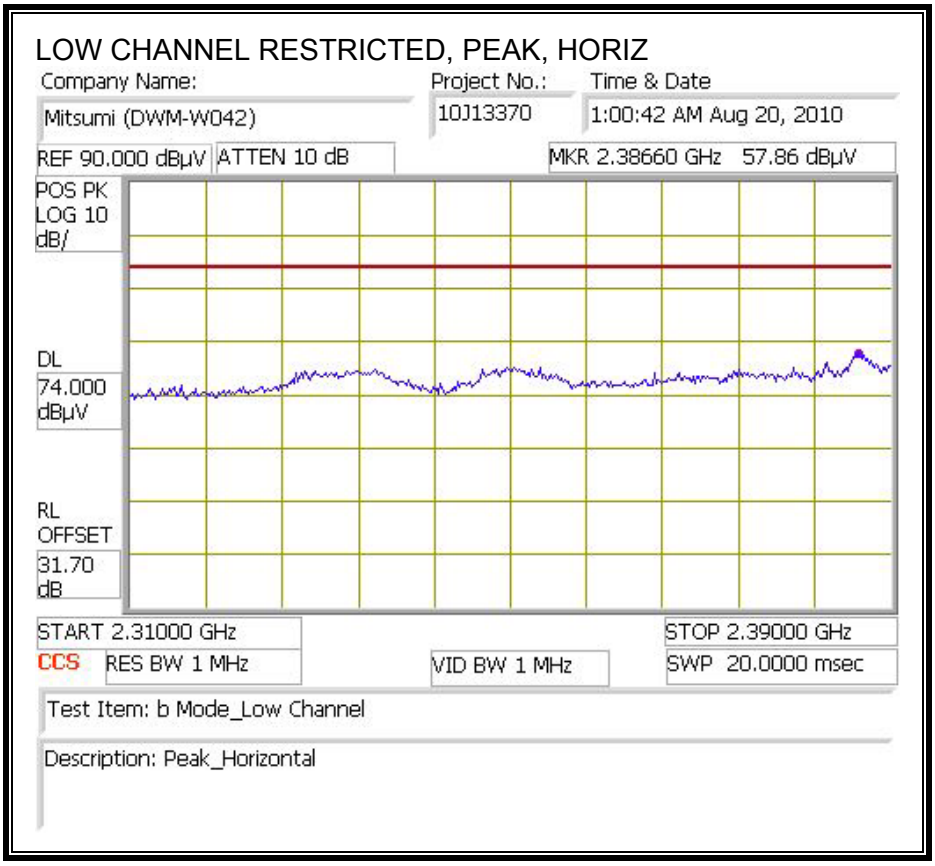
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

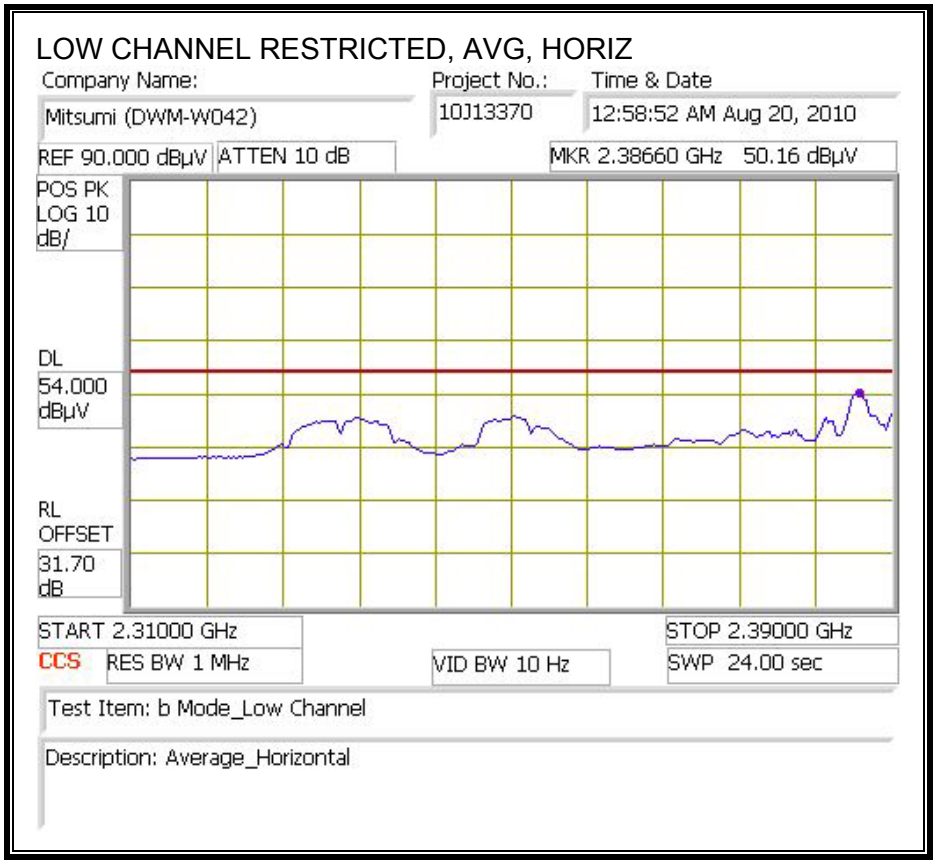
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each appplicable band.

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.

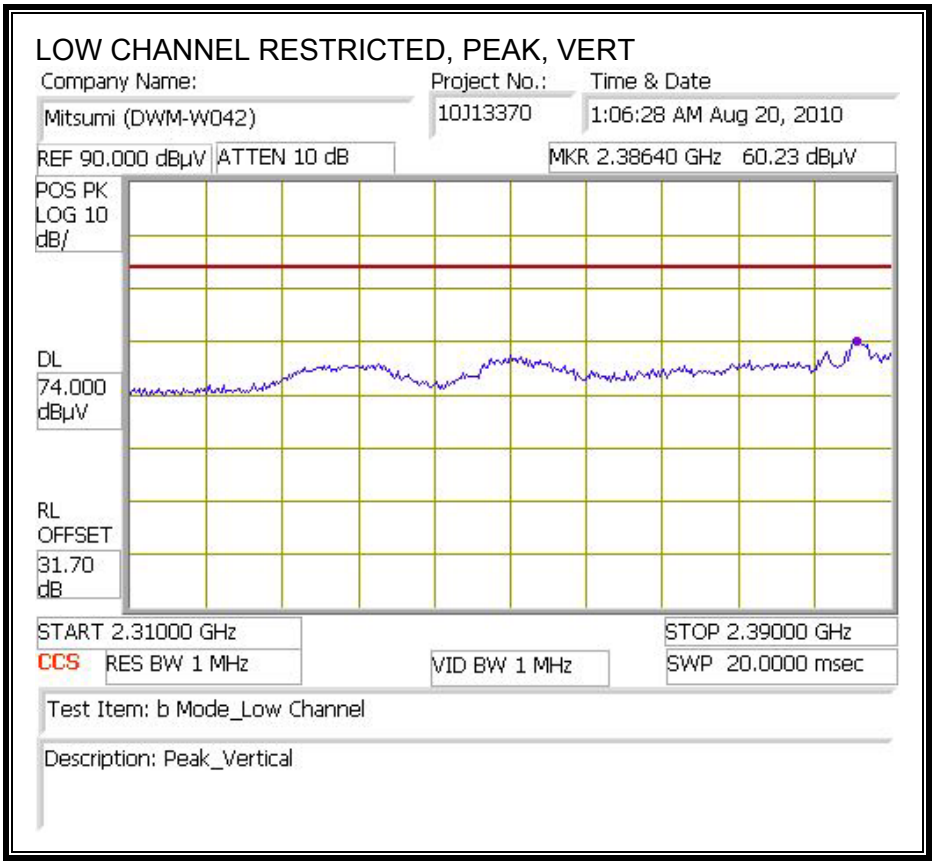
8.2. TRANSMITTER ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

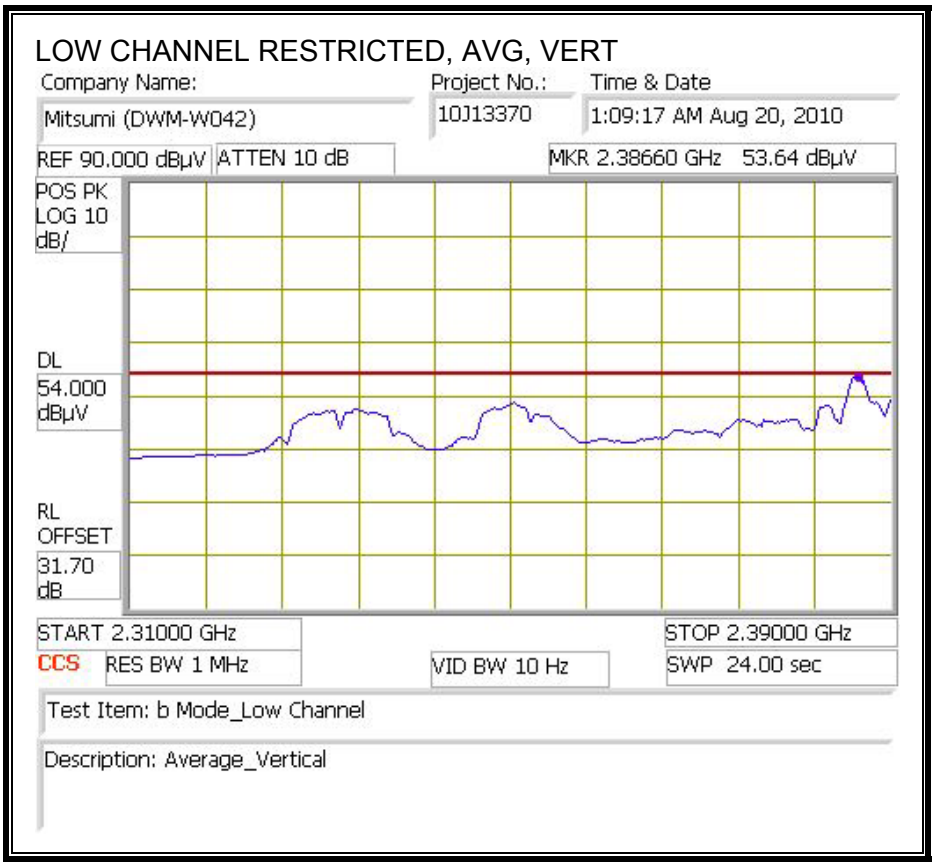
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



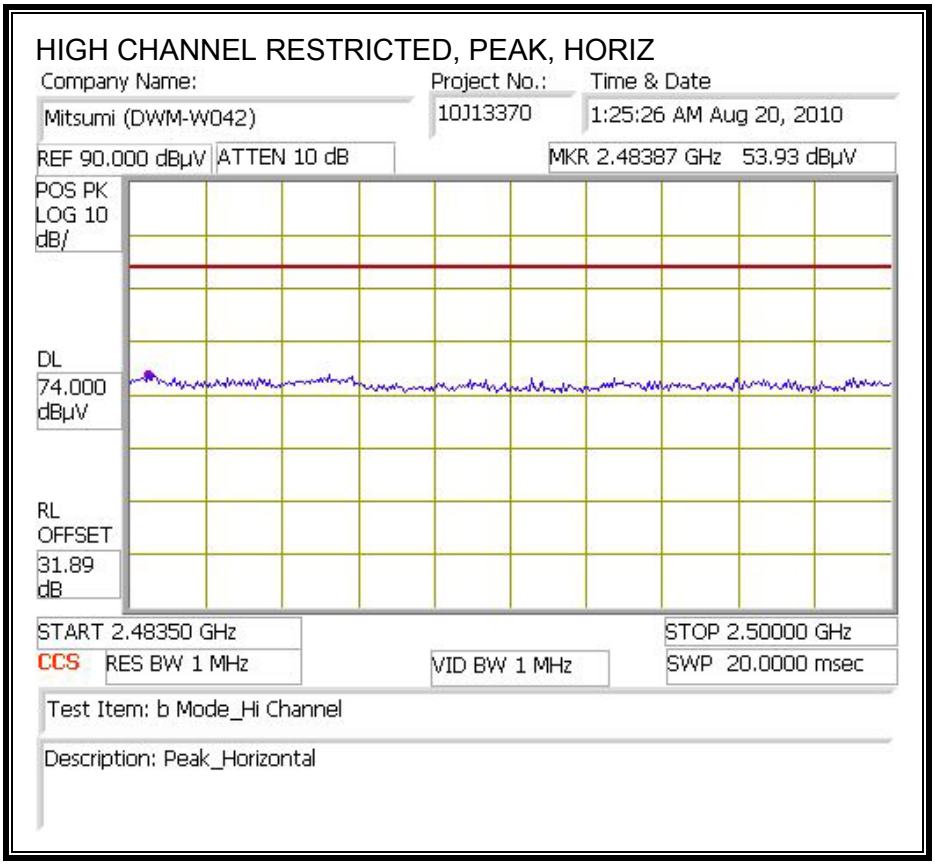


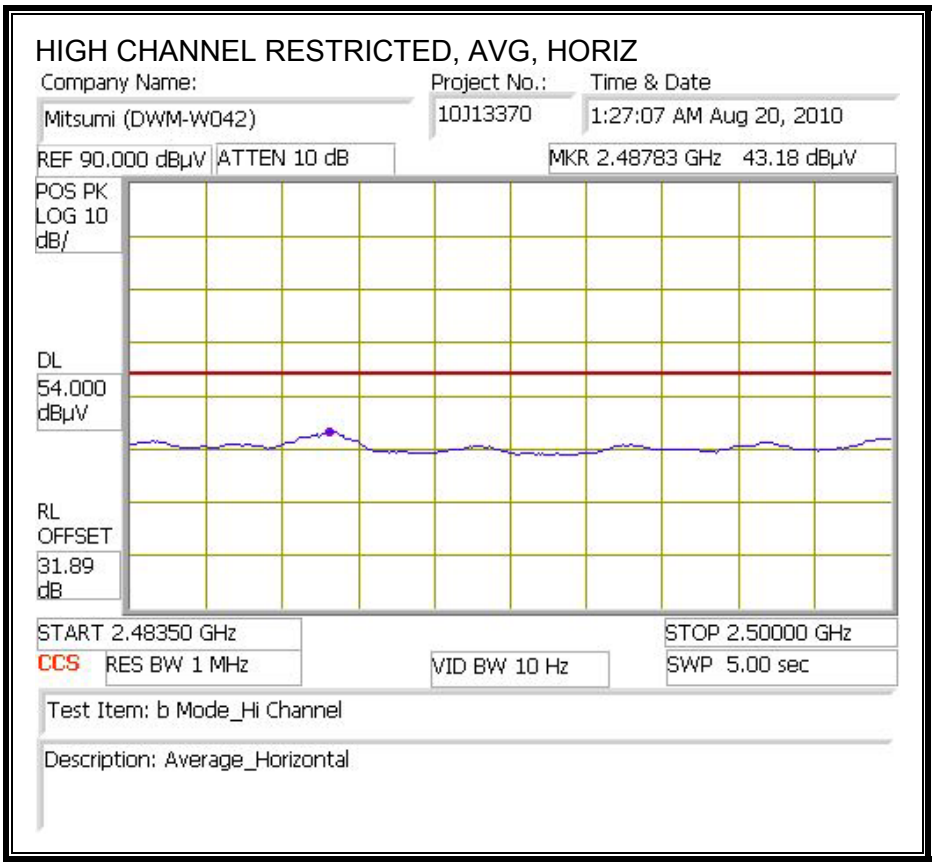
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



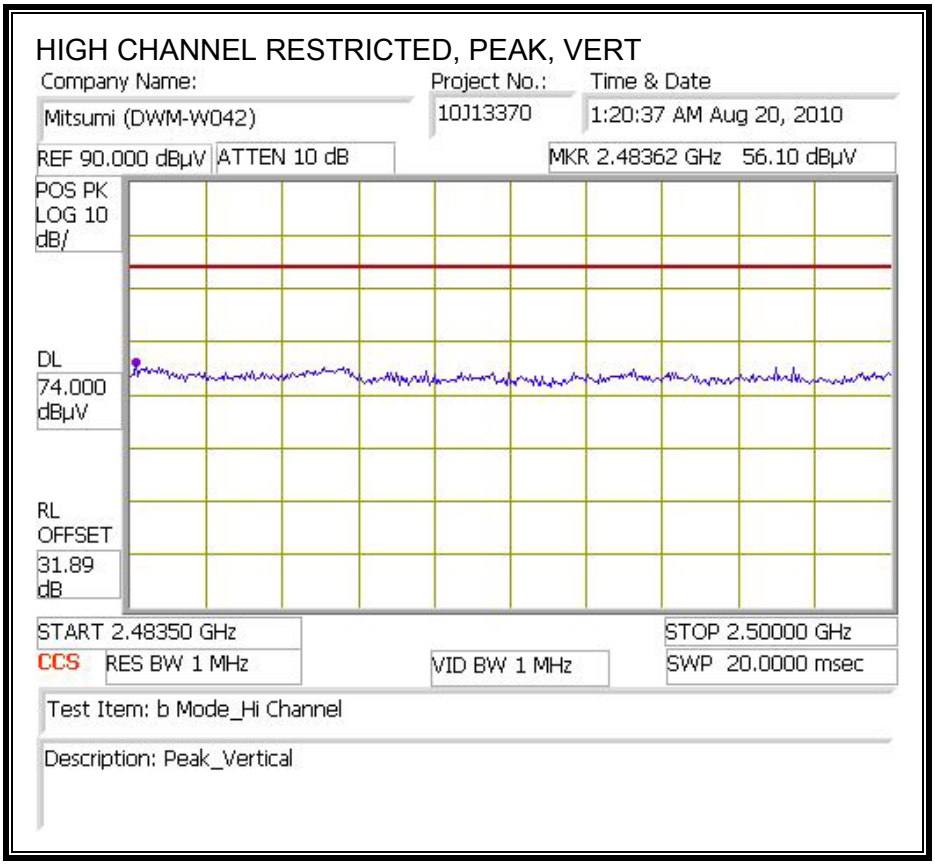


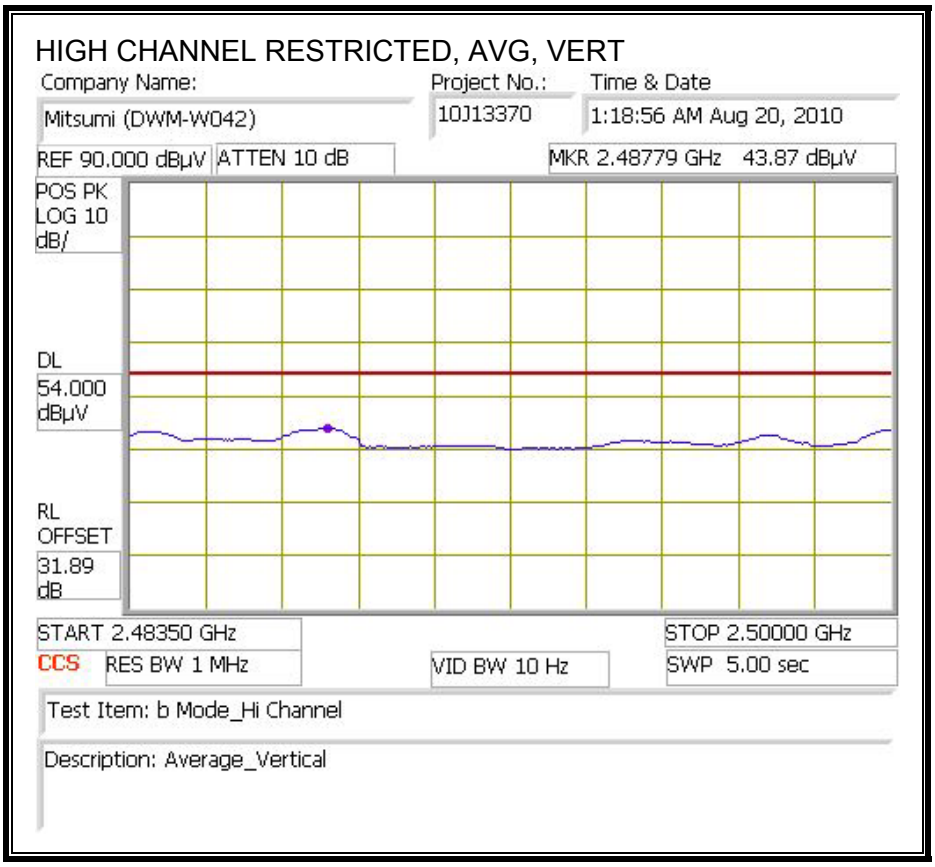
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Mitsumi Electric, Ltd.
Project #: 10J13370
Date: 8/21/2010
Test Engineer: Mengistu Mekuria
Configuration: EUT Alone
Mode: Tx, b Mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_001

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

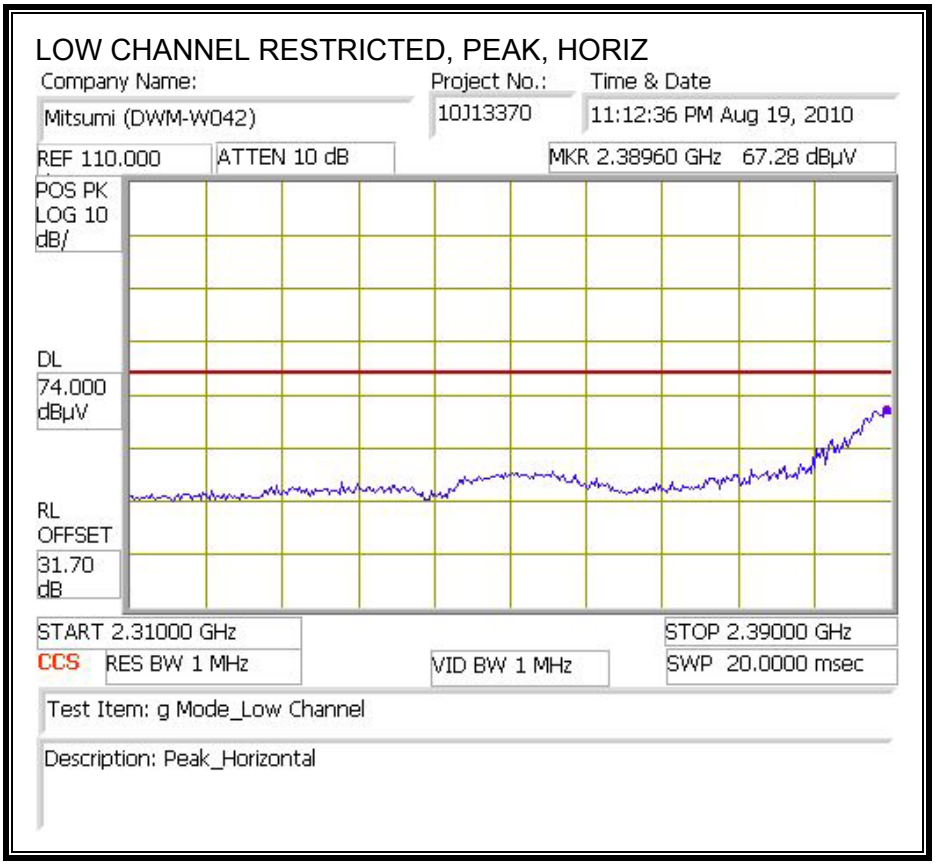
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (2412.0 MHz)															
4.824	3.0	47.8	44.4	33.0	5.8	-36.5	0.0	0.0	50.1	46.7	74	54	-23.9	-7.3	H
4.824	3.0	52.1	49.6	33.0	5.8	-36.5	0.0	0.0	54.5	51.9	74	54	-19.5	-2.1	V
Mid Channel (2437.0 MHz)															
4.874	3.0	47.4	44.0	33.1	5.8	-36.5	0.0	0.0	49.9	46.5	74	54	-24.1	-7.5	H
7.311	3.0	40.6	30.6	35.3	7.3	-36.2	0.0	0.0	47.0	36.9	74	54	-27.0	-17.1	H
4.874	3.0	51.4	49.1	33.1	5.8	-36.5	0.0	0.0	53.9	51.6	74	54	-20.1	-2.4	V
7.311	3.0	39.7	30.5	35.3	7.3	-36.2	0.0	0.0	46.1	36.8	74	54	-27.9	-17.2	V
Hi Channel (2462.0 MHz)															
4.924	3.0	45.7	41.5	33.1	5.9	-36.5	0.0	0.0	48.3	44.1	74	54	-25.7	-9.9	H
7.386	3.0	40.5	30.4	35.4	7.3	-36.2	0.0	0.0	47.0	36.9	74	54	-27.0	-17.1	H
4.924	3.0	49.3	46.2	33.1	5.9	-36.5	0.0	0.0	51.8	48.8	74	54	-22.2	-5.2	V
7.386	3.0	40.0	29.6	35.4	7.3	-36.2	0.0	0.0	46.5	36.1	74	54	-27.5	-17.9	V

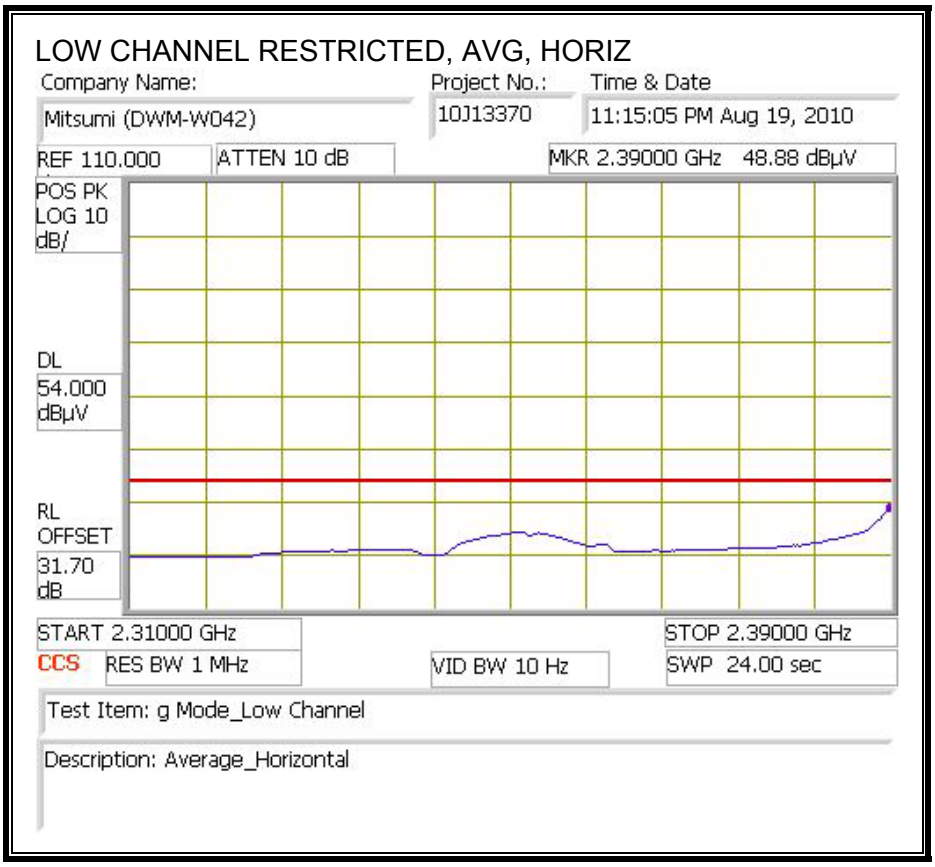
Rev. 07.22.09

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

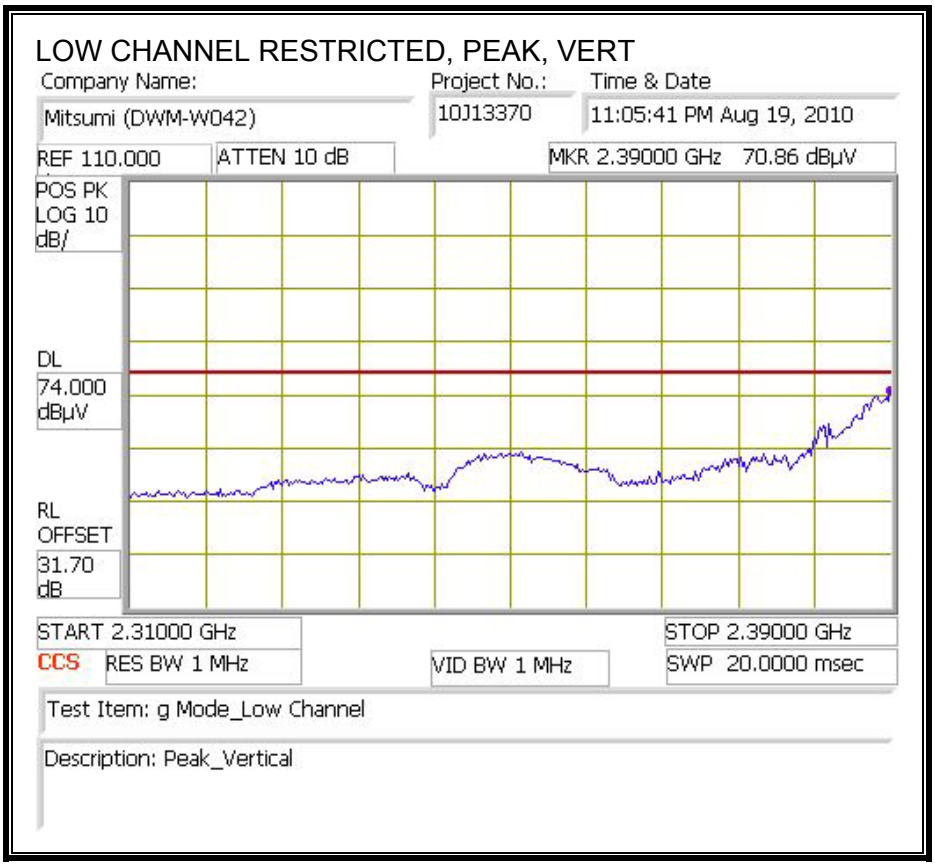
8.3. TRANSMITTER ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

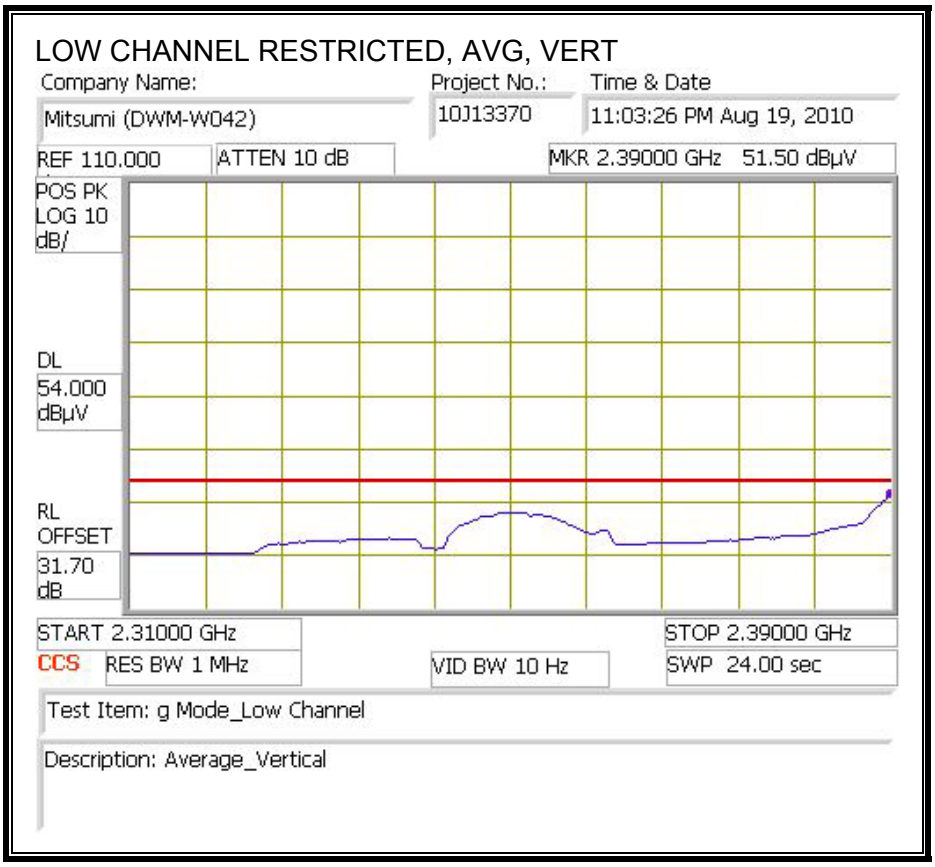
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



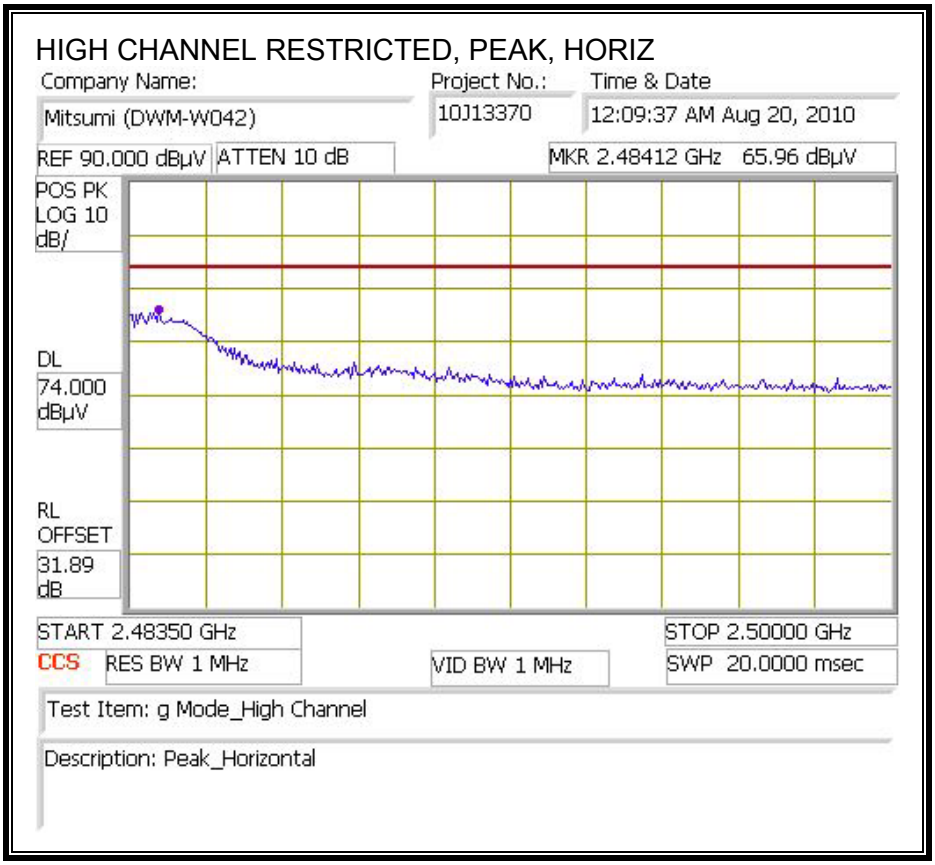


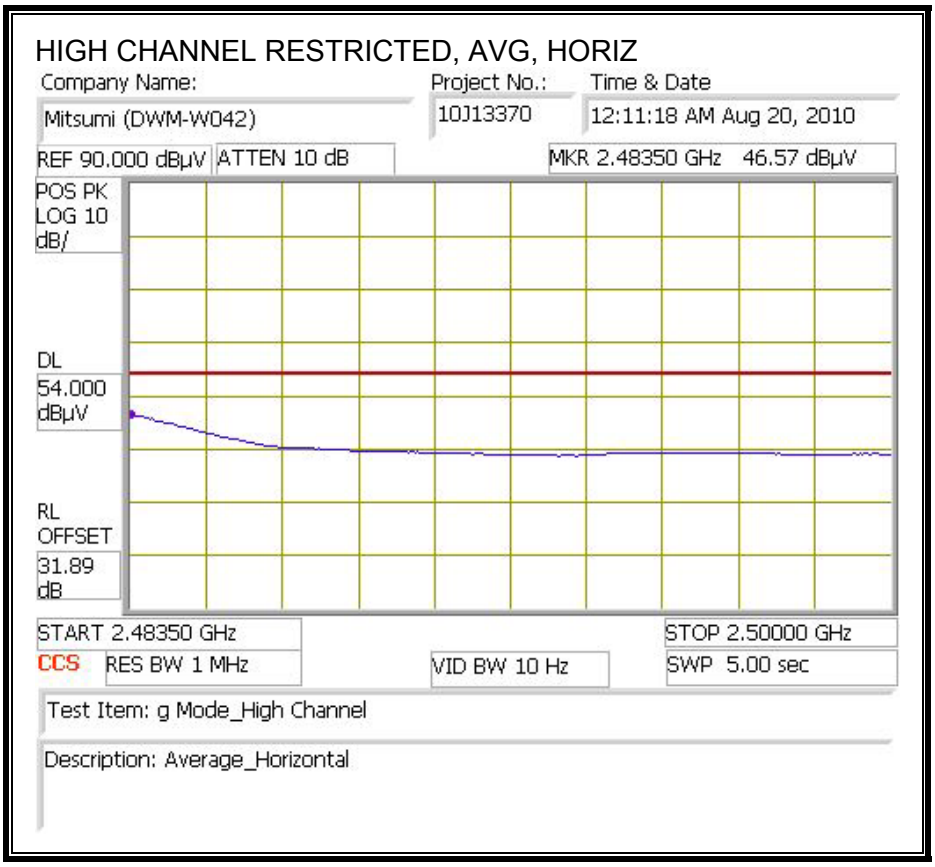
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



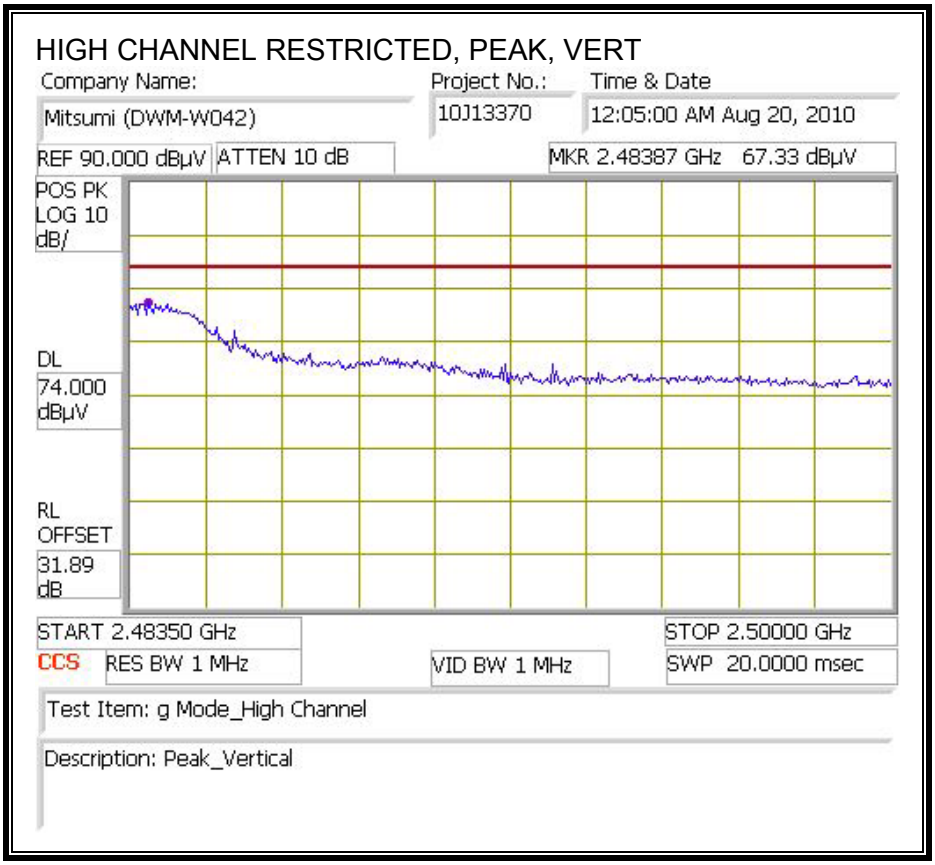


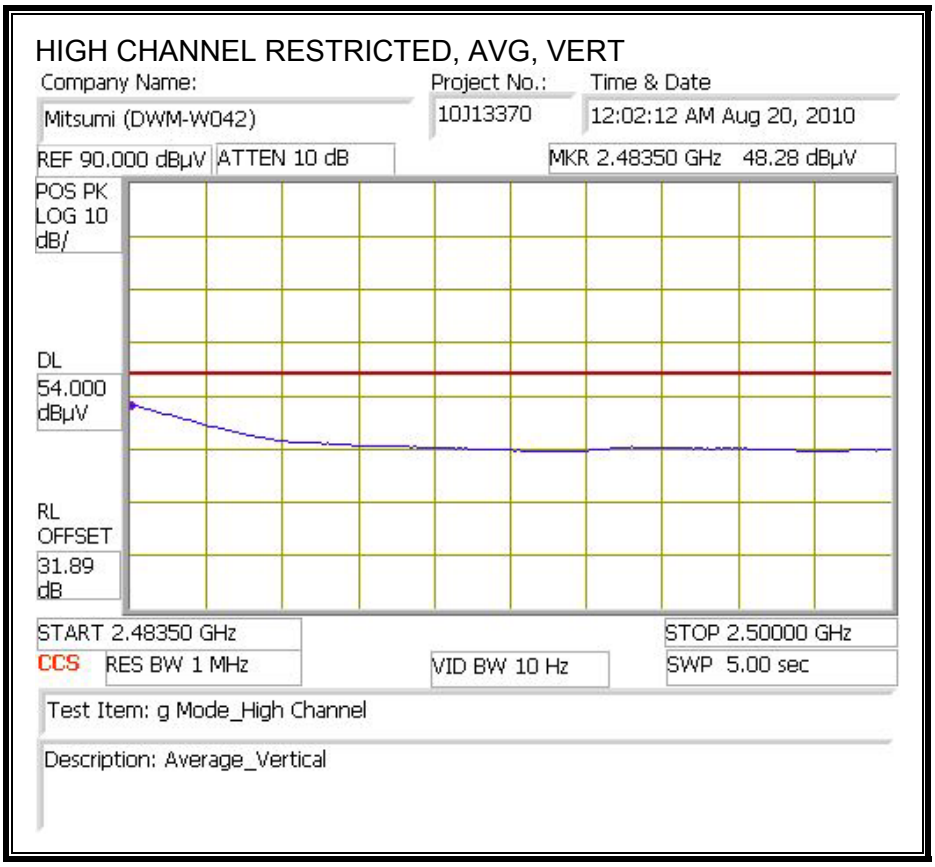
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Mitsumi Electric, Ltd.
Project #: 10J13370
Date: 8/21/2010
Test Engineer: Mengistu Mekuria
Configuration: EUT Alone
Mode: Tx, g Mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_001

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (2412.0 MHz)															
4.824	3.0	47.3	32.9	33.0	5.8	-36.5	0.0	0.0	49.7	35.3	74	54	-24.3	-18.7	H
4.824	3.0	53.2	38.7	33.0	5.8	-36.5	0.0	0.0	55.5	41.1	74	54	-18.5	-12.9	V
Mid Channel (2437.0 MHz)															
4.874	3.0	46.2	32.1	33.1	5.8	-36.5	0.0	0.0	48.6	34.6	74	54	-25.4	-19.4	H
7.311	3.0	44.9	29.5	35.3	7.3	-36.2	0.0	0.0	51.3	35.8	74	54	-22.7	-18.2	H
4.874	3.0	53.4	38.8	33.1	5.8	-36.5	0.0	0.0	55.8	41.2	74	54	-18.2	-12.8	V
7.311	3.0	44.5	29.3	35.3	7.3	-36.2	0.0	0.0	50.8	35.6	74	54	-23.2	-18.4	V
Hi Channel (2462.0 MHz)															
4.924	3.0	44.2	30.0	33.1	5.9	-36.5	0.0	0.0	46.7	32.5	74	54	-27.3	-21.5	H
7.386	3.0	41.4	28.0	35.4	7.3	-36.2	0.0	0.0	47.9	34.5	74	54	-26.1	-19.5	H
4.924	3.0	49.5	35.0	33.1	5.9	-36.5	0.0	0.0	52.1	37.6	74	54	-21.9	-16.4	V
7.386	3.0	43.0	28.4	35.4	7.3	-36.2	0.0	0.0	49.5	34.9	74	54	-24.5	-19.1	V

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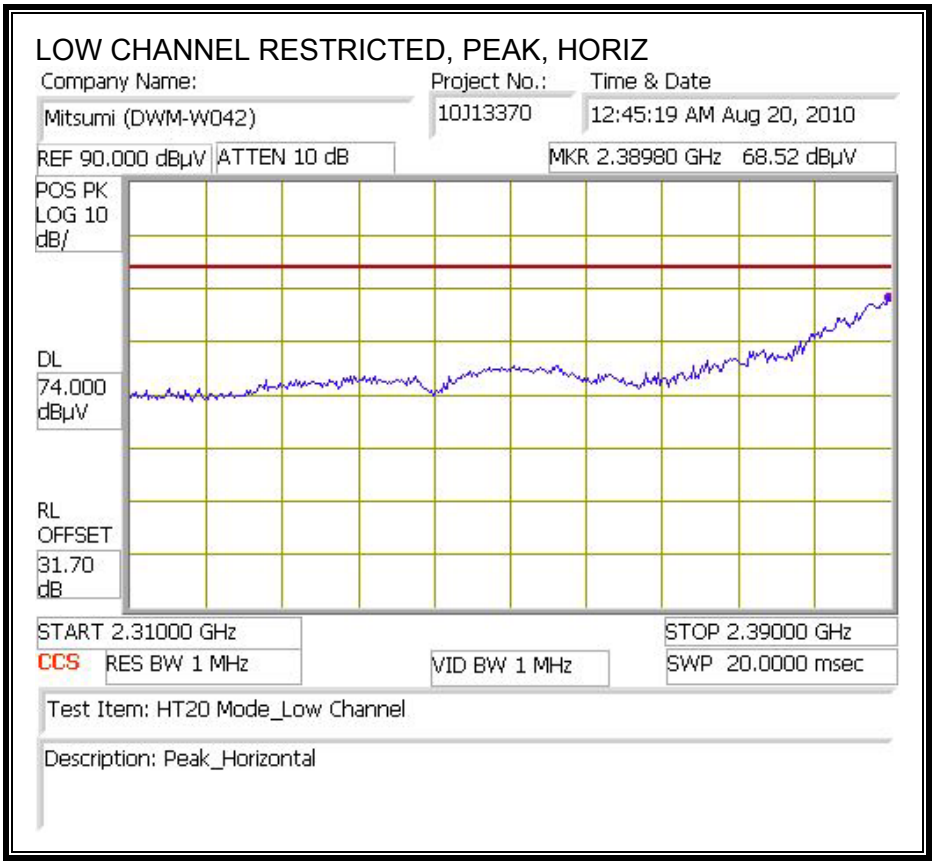
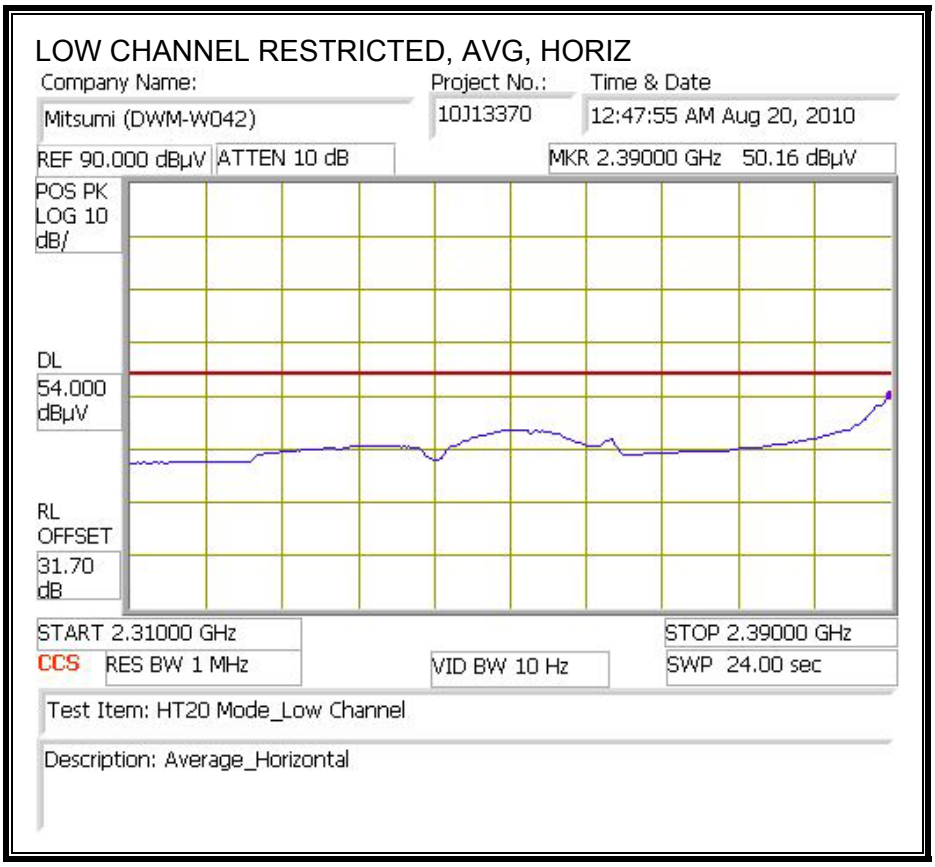
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

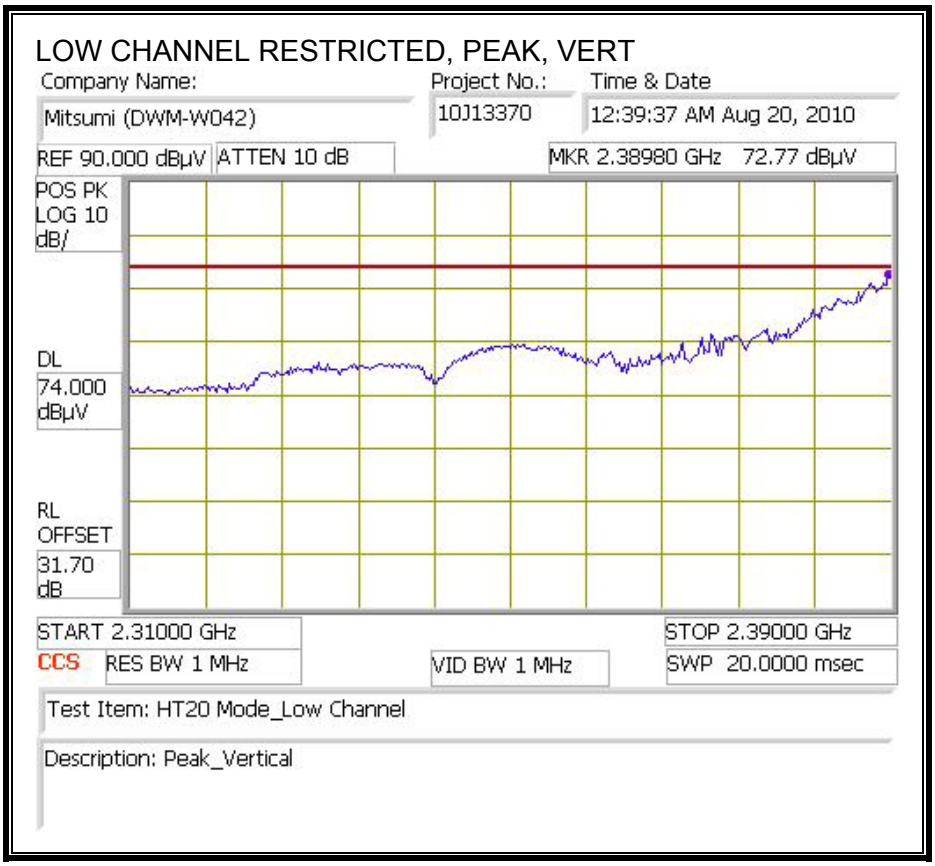
8.4. TRANSMITTER ABOVE 1 GHz FOR HT 20 MODE IN THE 2.4 GHz BAND

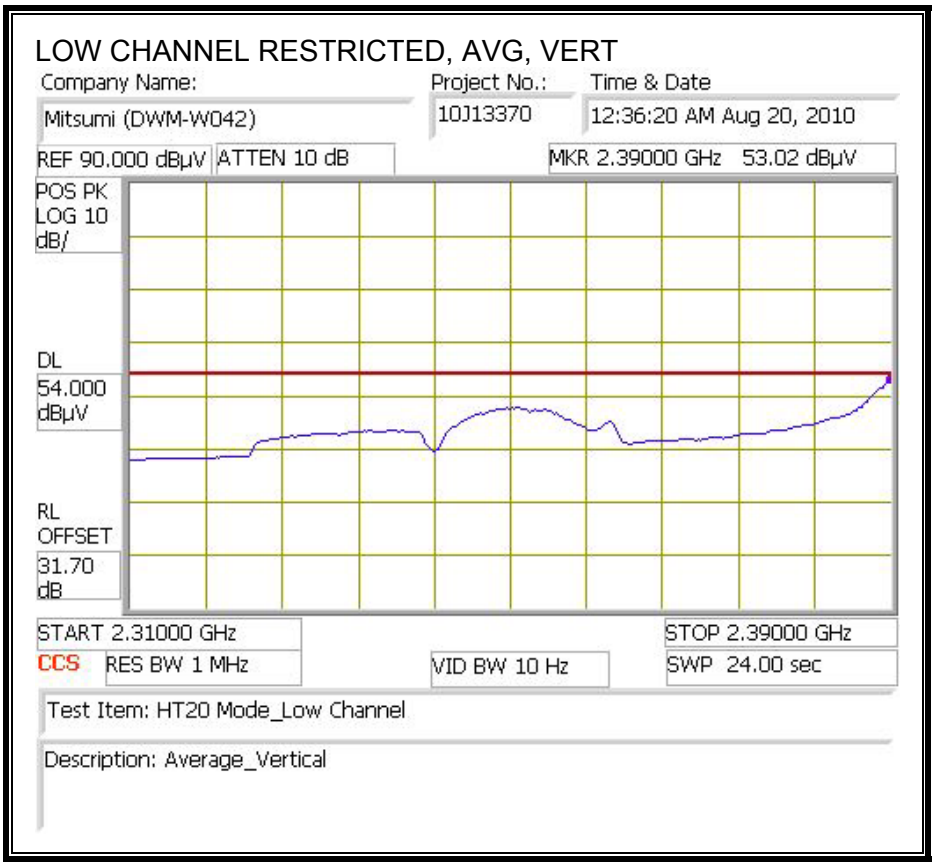
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



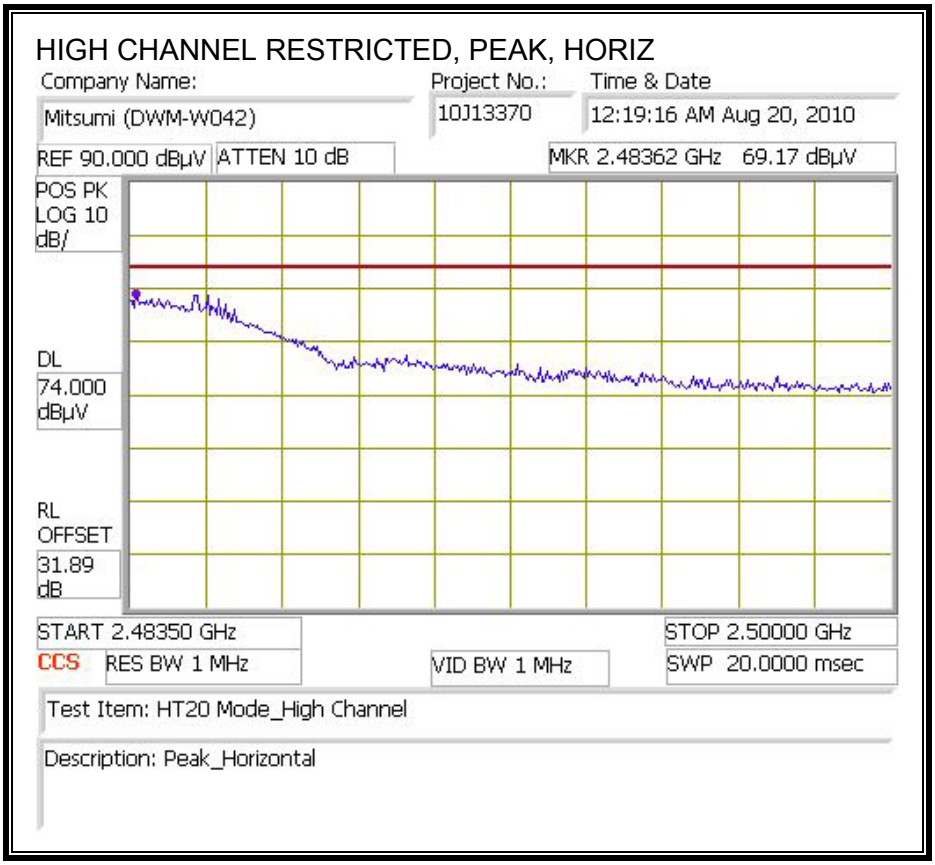


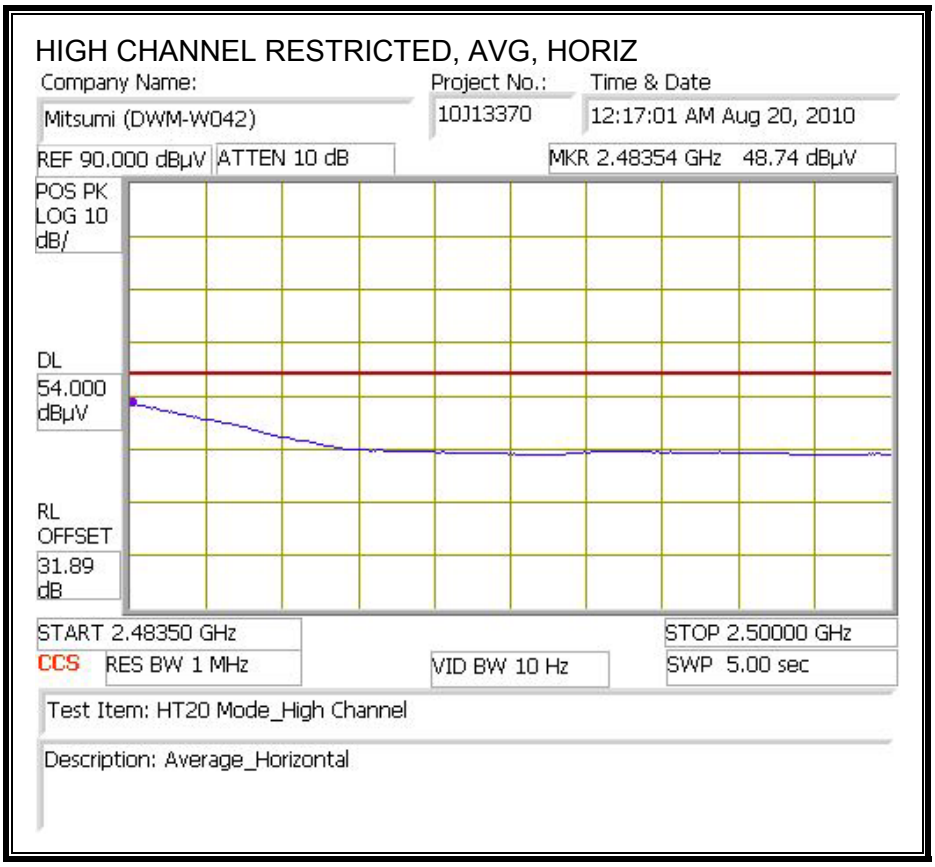
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



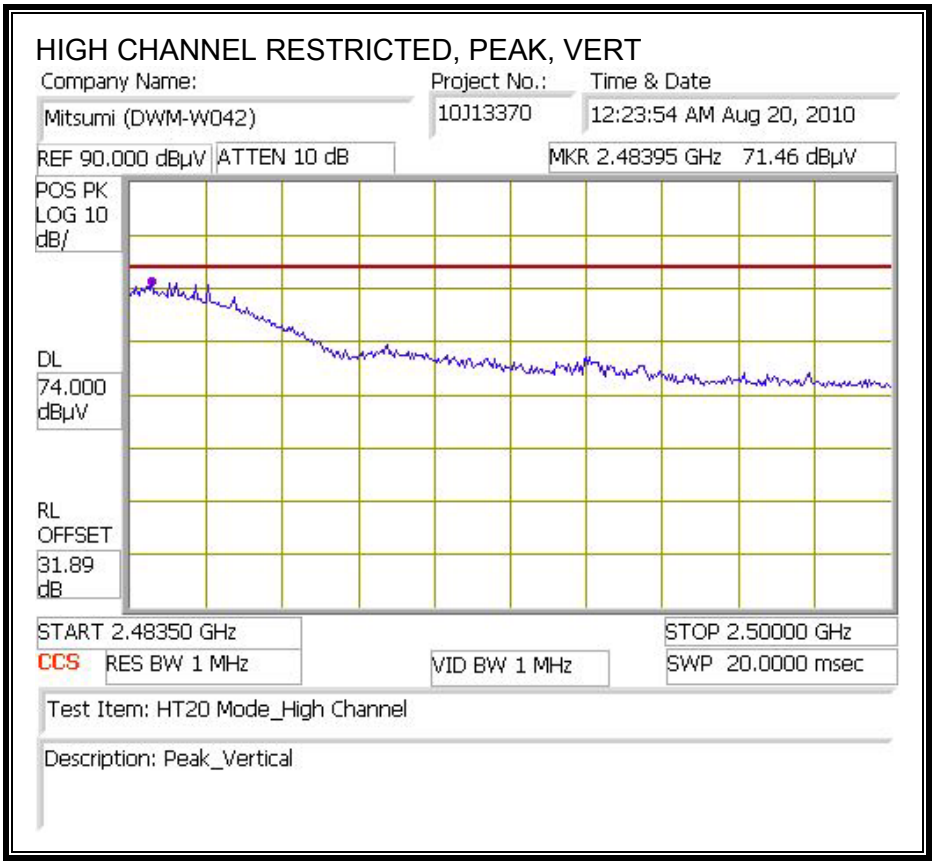


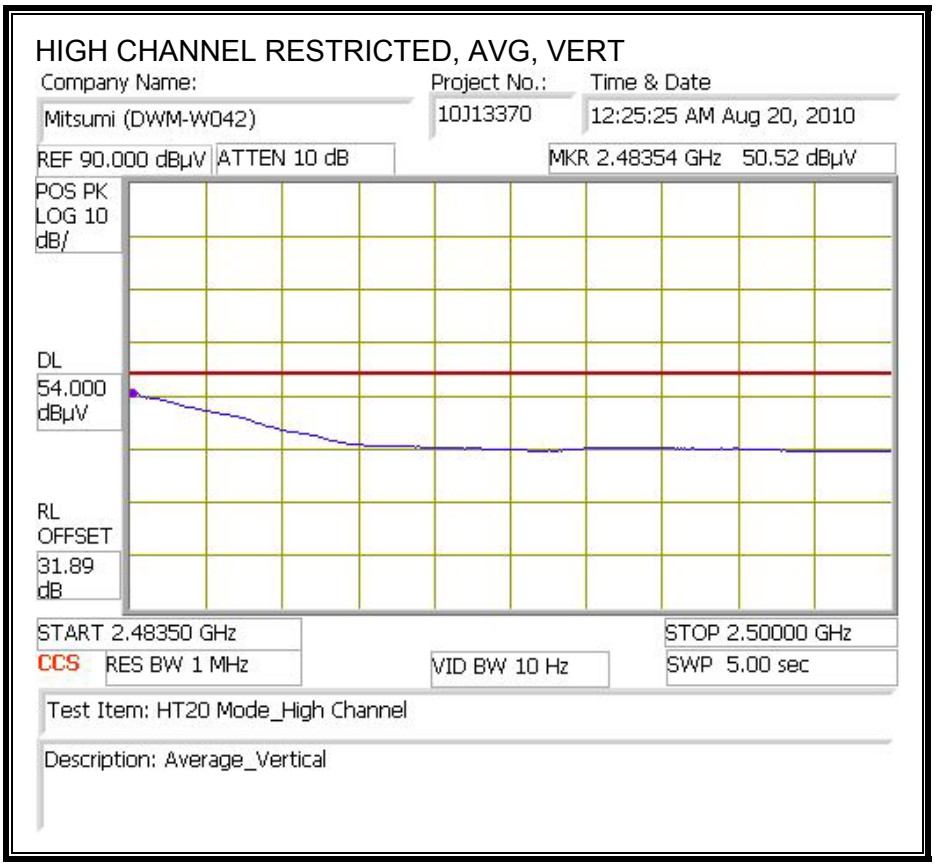
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Mitsumi Electric, Ltd.
Project #: 10J13370
Date: 8/21/2010
Test Engineer: Mengistu Mekuria
Configuration: EUT Alone
Mode: Tx, HT20 Mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A005(			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		R_001

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel (2412.0 MHz)															
4.824	3.0	48.0	32.6	32.8	5.8	-34.8	0.0	0.0	51.7	36.3	74	54	-22.3	-17.7	H
4.824	3.0	54.0	38.4	32.8	5.8	-34.8	0.0	0.0	57.8	42.1	74	54	-16.2	-11.9	V
Mid Channel (2437.0 MHz)															
4.874	3.0	47.8	31.6	32.8	5.8	-34.9	0.0	0.0	51.6	35.4	74	54	-22.4	-18.6	H
7.311	3.0	45.6	29.2	35.2	7.3	-34.7	0.0	0.0	53.4	37.0	74	54	-20.6	-17.0	H
4.874	3.0	54.6	38.4	32.8	5.8	-34.9	0.0	0.0	58.4	42.2	74	54	-15.6	-11.8	V
7.311	3.0	45.6	29.2	35.2	7.3	-34.7	0.0	0.0	53.4	37.0	74	54	-20.6	-17.0	V
Hi Channel (2462.0 MHz)															
4.924	3.0	45.1	29.7	32.8	5.9	-34.9	0.0	0.0	48.9	33.6	74	54	-25.1	-20.4	H
7.386	3.0	42.8	27.8	35.3	7.3	-34.6	0.0	0.0	50.8	35.8	74	54	-23.2	-18.2	H
4.924	3.0	50.6	34.7	32.8	5.9	-34.9	0.0	0.0	54.5	38.6	74	54	-19.5	-15.4	V
7.386	3.0	43.5	28.2	35.3	7.3	-34.6	0.0	0.0	51.4	36.1	74	54	-22.6	-17.9	V

Rev. 07.22.09

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.5. RECEIVER ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Mitsumi Electric, Ltd.
Project #: 10J13370
Date: 8/23/2010
Test Engineer: Mengistu Mekuria
Configuration: EUT Alone
Mode: Rx, Mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel															
1.332	3.0	60.1	38.2	25.0	2.8	-39.0	0.0	0.0	48.8	26.9	74	54	-25.2	-27.1	V
1.666	3.0	67.4	38.8	26.1	3.1	-38.5	0.0	0.0	58.1	29.5	74	54	-15.9	-24.5	V
1.992	3.0	50.3	30.3	27.2	3.5	-38.1	0.0	0.0	42.9	22.8	74	54	-31.1	-31.2	V
2.492	3.0	49.9	31.3	28.5	3.9	-37.5	0.0	0.0	44.9	26.2	74	54	-29.1	-27.8	V
1.000	3.0	62.9	40.7	23.9	2.4	-39.5	0.0	0.0	49.6	27.4	74	54	-24.4	-26.6	H
1.200	3.0	56.5	38.1	24.5	2.6	-39.2	0.0	0.0	44.4	26.0	74	54	-29.6	-28.0	H
1.664	3.0	58.0	33.7	26.1	3.1	-38.5	0.0	0.0	48.7	24.3	74	54	-25.3	-29.7	H

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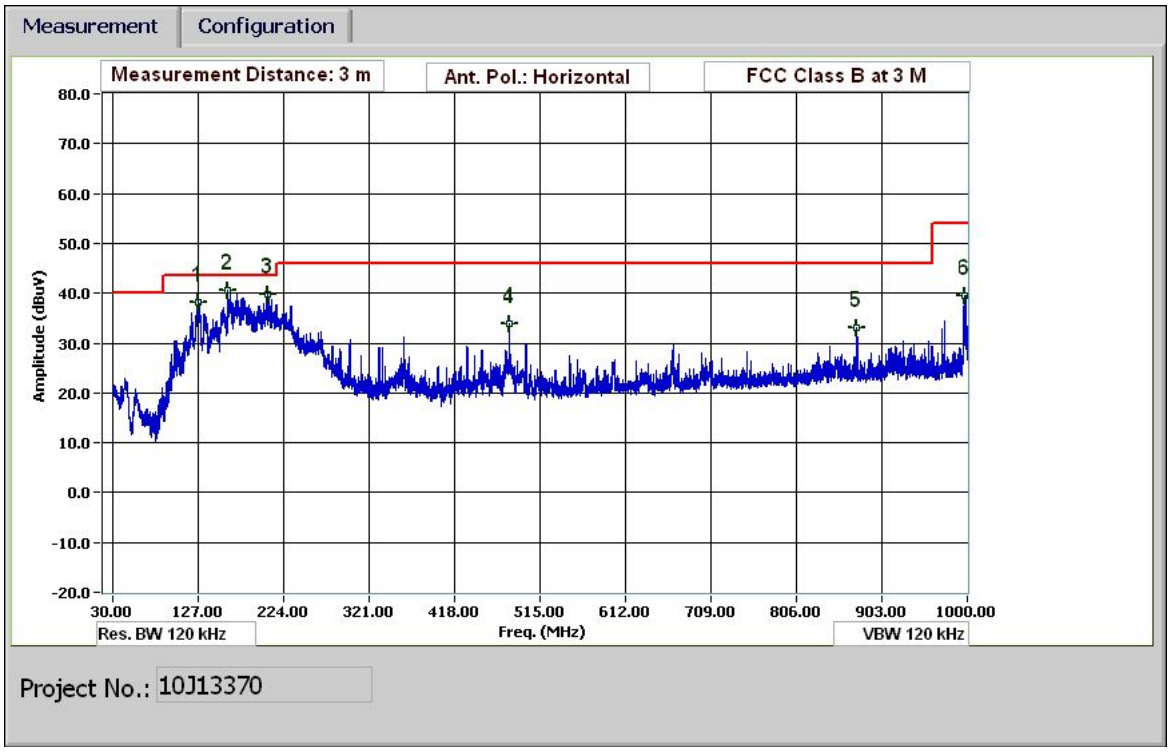
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

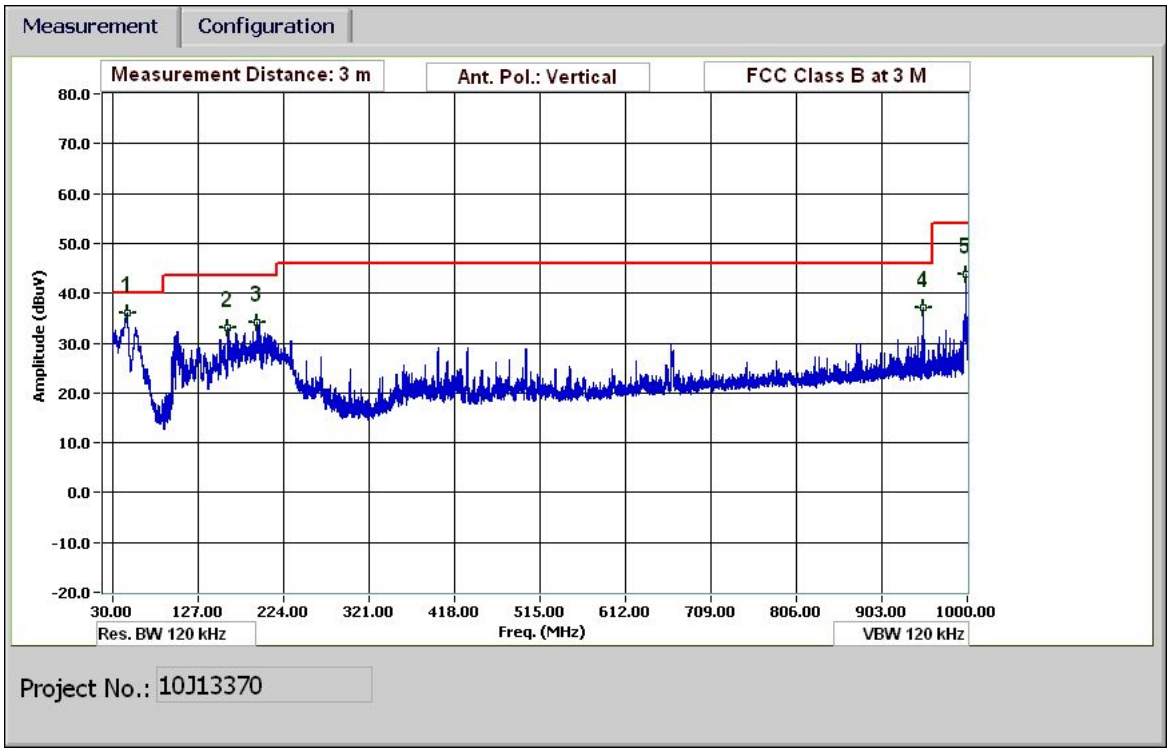
8.6. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Mengistu Mekuria
Date: 08/23/10
Project #: 10J13370
Company: Mitsumi Electric, Inc.
EUT Description: 802.11B/G/N WLAN Module
EUT M/N: DWM-W046
Test Target: FCC Class B
Mode Oper: RX Mode

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
126.724	3.0	51.9	13.6	1.1	28.3	0.0	0.0	38.3	43.5	-5.2	H	P	
160.085	3.0	55.9	11.7	1.1	28.3	0.0	0.0	40.5	43.5	-3.0	H	P	
160.002	3.0	55.6	11.7	1.1	28.3	0.0	0.0	40.1	43.5	-3.4	H	QP	
206.527	3.0	54.6	12.0	1.3	28.2	0.0	0.0	39.7	43.5	-3.8	H	P	
480.019	3.0	43.5	16.4	2.0	27.9	0.0	0.0	33.9	46.0	-12.1	H	P	
874.955	3.0	36.3	21.6	2.8	27.7	0.0	0.0	33.1	46.0	-12.9	H	P	
997.000	3.0	42.0	22.4	3.0	27.9	0.0	0.0	39.5	54.0	-14.5	H	P	
46.321	3.0	53.7	10.2	0.6	28.4	0.0	0.0	36.0	40.0	-4.0	V	P	
159.965	3.0	48.4	11.7	1.1	28.3	0.0	0.0	33.0	43.5	-10.5	V	P	
194.407	3.0	49.5	11.6	1.2	28.2	0.0	0.0	34.1	43.5	-9.4	V	P	
950.678	3.0	39.8	22.2	2.9	27.9	0.0	0.0	37.0	46.0	-9.0	V	P	
999.160	3.0	46.4	22.5	3.0	27.9	0.0	0.0	43.9	54.0	-10.1	V	P	

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Note: No other emissions were detected above the system noise floor.

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

6 WORST EMISSIONS

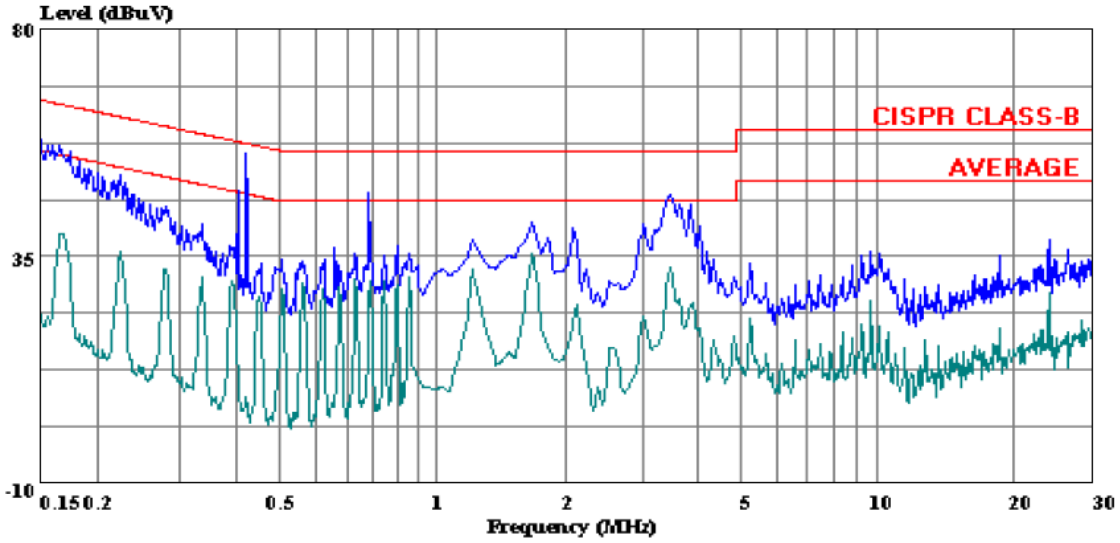
CONDUCTED EMISSIONS DATA (115VAC 60Hz)

Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.42	55.49	--	30.25	0.00	57.43	47.43	-1.94	-17.18	L1
0.78	47.72	--	30.18	0.00	56.00	46.00	-8.28	-15.82	L1
3.58	47.20	--	32.84	0.00	56.00	46.00	-8.80	-13.16	L1
0.18	57.85	--	39.78	0.00	64.49	54.49	-6.64	-14.71	L2
0.40	44.59	--	26.54	0.00	57.90	47.90	-13.31	-21.36	L2
3.94	45.59	--	32.18	0.00	56.00	46.00	-10.41	-13.82	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 28 File#: 10J13370_LC.EMI Date: 08-23-2010 Time: 21:48:48



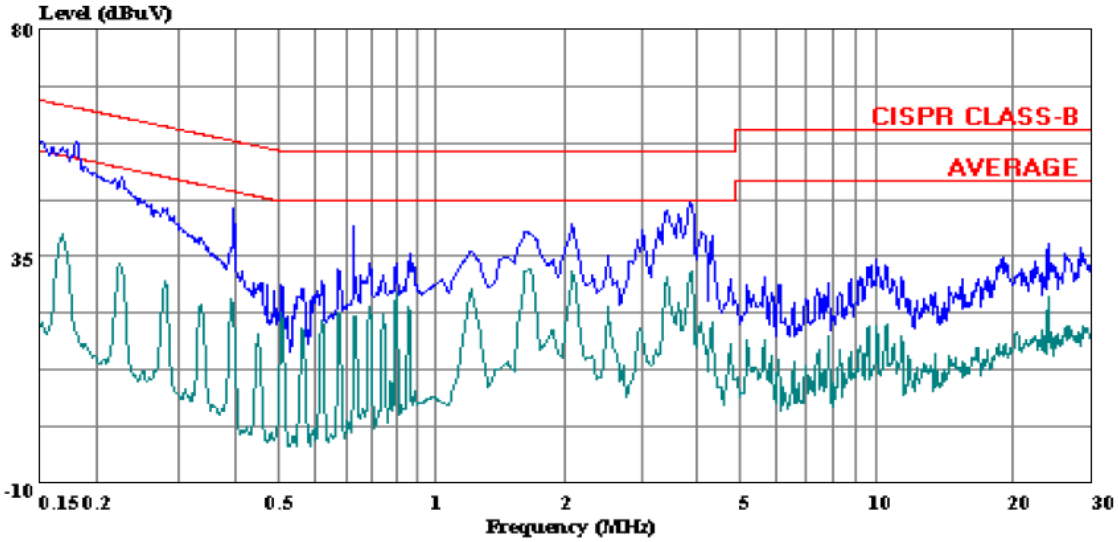
Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 10U13370
Company: : Mitsumi Electric. Ltd.
Configuration:: EUT with Laptop PC
Mode : : TX Mode (Worst-Case)
Target: : FCC Class B
Voltage: : 115 VAC / 60Hz
: L1: Peak (Blue) ; Average (Green)

LINE 2 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 21 File#: 10J13370_LC.EMI Date: 08-23-2010 Time: 21:40:42



Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 10U13370
Company: : Mitsumi Electric. Ltd.
Configuration:: EUT with Laptop PC
Mode : : TX Mode (Worst-Case)
Target: : FCC Class B
Voltage: : 115 VAC / 60Hz
: L2: Peak (Blue) ; Average (Green)

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
2.4 GHz	b mode	0.20	18.71	1.43	0.21	0.021
2.4 GHz	g mode	0.20	24.16	1.43	0.72	0.072
2.4 GHz	HT20	0.20	24.19	1.43	0.73	0.073