FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

802.11b/g RADIO CARD- 4 TYPES OF ANTENNAS (INTEGRAL, DIPOLE, PCBA, AND PIFA)

FCC ID: W7OMRF24WG0MAMB
FCC MODEL NUMBER: MRF24WG0MAMB

IC NUMBER: 7693A-24W0MAMB
IC MODEL: MRF24WG0MA, MRF24WG0MB

REPORT NUMBER: 12U14434-1, Revision D

ISSUE DATE: AUGUST 29, 2012

Prepared for
MICROCHIP TECHNOLOGY, INC.
2355 West Chandler Blvd
Chandler, AZ 85224-6199, USA

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/19/12	Initial Issue	T. LEE
A	07/23/12	Updated FCC ID	A. Zaffar
B	07/31/12	Revised model numbers	A. Zaffar
C	08/03/12	Added 26.5 GHz Horn and PreAmp in Equipment List Added Duty Cycle Correction Factor Updated Test Method	T. LEE
D	08/29/12	Deleted Duty Cycle Correction Factor	T. LEE

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROCHIP TECHNOLOGY, INC.
2355 West Chandler Blvd
Chandler, AZ 85224-6199, USA

EUT DESCRIPTION: 802.11b/g RADIO CARD- 4 TYPES OF ANTENNAS (INTEGRAL, DIPOLE, PCBA, AND PIFA)

FCC MODELS: MRF24WG0MAMB
IC MODELS: MRF24WG0MA, MRF24WG0MB

SERIAL NUMBER: INT. ANT. #3 (INTEGRAL ANTENNA) AND EXT. ANT. #2 (ALL OTHER ANTENNAS AND ANTENNA PORT)

DATE TESTED: JUNE 06 to 14, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

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

TIM LEE
STAFF ENGINEER
UL CCS

Tested By:

DOUG ANDERSON
EMC ENGINEER
UL CCS

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 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

UL 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 transceiver module.

The radio module is manufactured by Microchip Technology, Inc..

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	18.17	65.61
2412 - 2462	802.11g	25.94	392.64

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes four antenna types:

Antenna Information			
Type	**Manufacturer**	**Model Number**	**Peak Gain (dBi)**
Integral	Microchip Technology, Inc	N/A	0
Dipole	Aristotle Enterprises, Inc	RFA-02-C2M2-D034	2
PCBA	Aristotle Enterprises, Inc	RFA-02-P05-D034	2
PIFA	Aristotle Enterprises, Inc	RFA-02-G03-D034	0

5.4. SOFTWARE AND FIRMWARE

The EUT firmware and test utility software used during testing was A2Debugger(0428).bin.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

For three of the four antenna types the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that the following orientations were the worst-case orientations and all subsequent final radiated testing was performed with the EUT in these orientations:

Integral Antenna	Z-Orientation
Dipole Antenna	Y-Orientation
PCBA Antenna	Z-Orientation
PIFA Antenna	Y-Orientation

The worst-case orientation for the dipole was assumed to be the Y-orientation, so it was the one antenna type not investigated.

Based on the manufacturer's attestation that the nominal output power is reduced as the data rate increases, the data rates tested represent the highest power and worst-case with respect to EMC performance.

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter 1 (EUT/LC)	Touch Electronics	SA06N05-V	R00043400345	DoC
Test Fixture	Microchip Technology, Inc.	EN-MRF24GOMA/MB-	N/A	N/A
Notebook PC	Lenovo	Type 7658-RUU	L3-K1332 08/04	DoC
AC Adapter 2 (PC)	Lenovo	92P1109	11S92P1109Z1ZB TZ6A782D	DoC
USB to RS-232 Adapter	National Instruments	USB-232	T0X001A0	N/A
USB to SPI Adapter	Total Phase	Aardvark I2C/SPI	2237-445909	N/A
Fast Ethernet Switch	Netgear	FS605 V2	01055	DoC
AC Adapter 3 (Switch)	Netgear	DV-07580S-B25	01057	DoC

I/O CABLES

Antenna Port and WLAN Radiated Emissions:

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC Power (PC)	1	3-Prong	Un-Shielded	95 cm	
2	DC Power (EUT)	1	Barrel	Un-Shielded	1.1 m	
3	DC Power (PC)	1	Barrel	Un-Shielded	1.75 m	
4	RS-232	1	DB-9	Shielded	3.8 m	
5	SPI	1	10 Pin DIP	Un-Shielded	1.9 m	
6	RF In/Out	1	U.FL	Shielded	30 cm	PCBA and PIFA / Not Used for Integral Antenna
6	RF In/Out	1	SMA	Shielded	1.0 m	Dipole / Not Used for Integral Antenna

30-1000 MHz Worst-Case Radiated Emissions:

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Barrel	Un-Shielded	1.1 m	
2	RF In/Out	1	U.FL	Shielded	30 cm	PCBA and PIFA / Not Used for Integral Antenna
2	RF In/Out	1	SMA	Shielded	1.0 m	Dipole / Not Used for Integral Antenna

AC Line Conducted Emissions (EUT with an External AC Adapter):

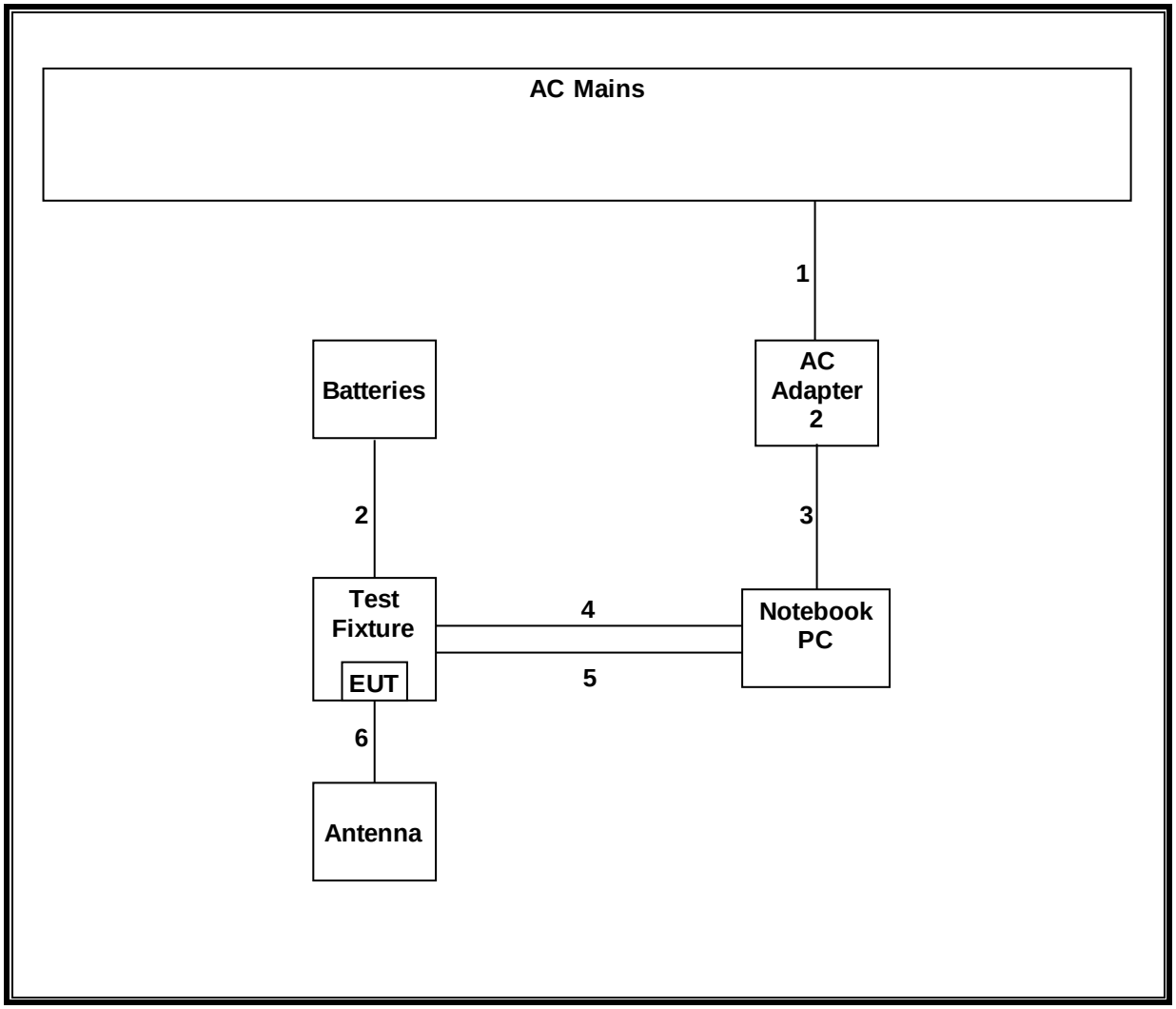
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC Power	1	3-Prong	Un-Shielded	1.5 m	
2	DC Power	1	Barrel	Un-Shielded	1.0 m	

TEST SETUP

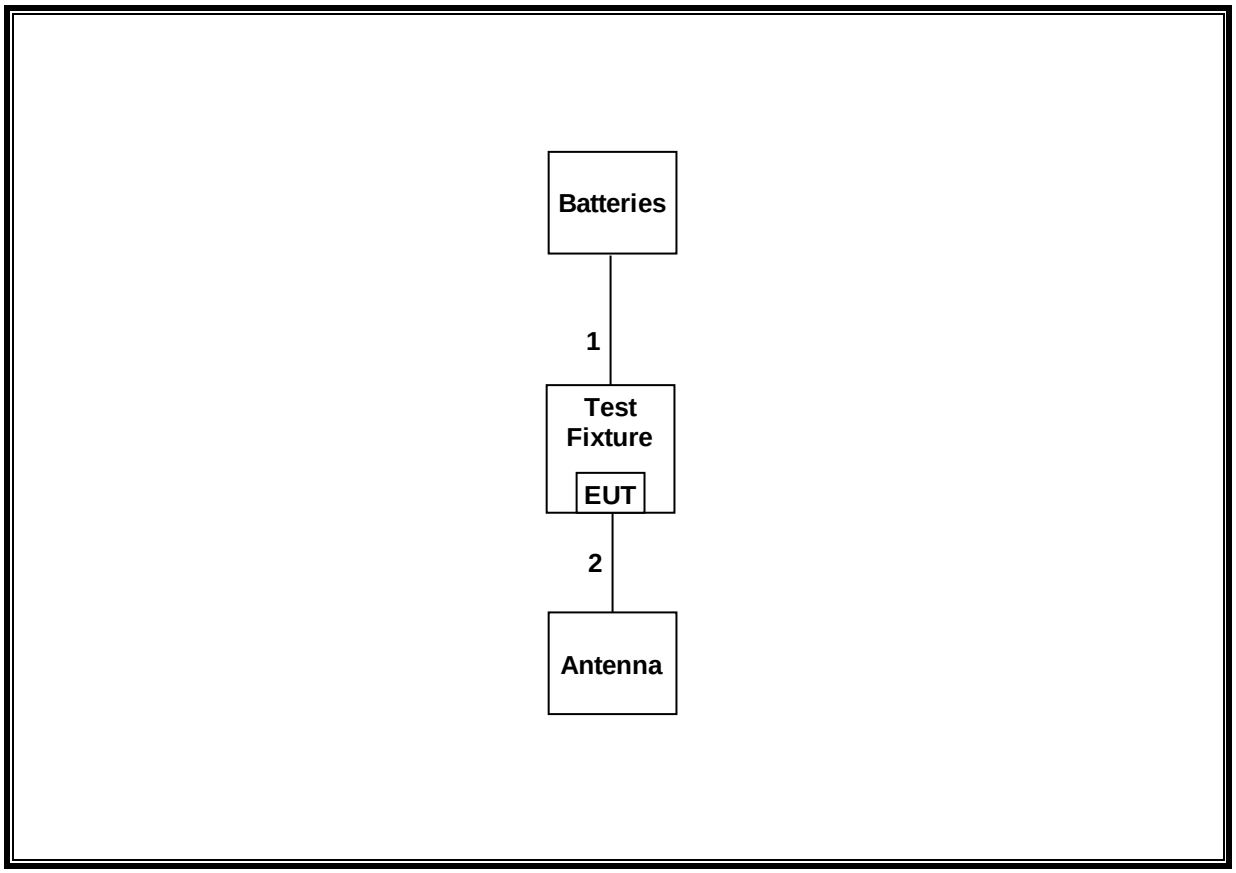
The EUT is installed in a test fixture controlled by a host laptop computer during the tests. The host laptop is removed during portions of the testing that was performed. Test software exercised the radio card.

SETUP DIAGRAMS FOR TESTS

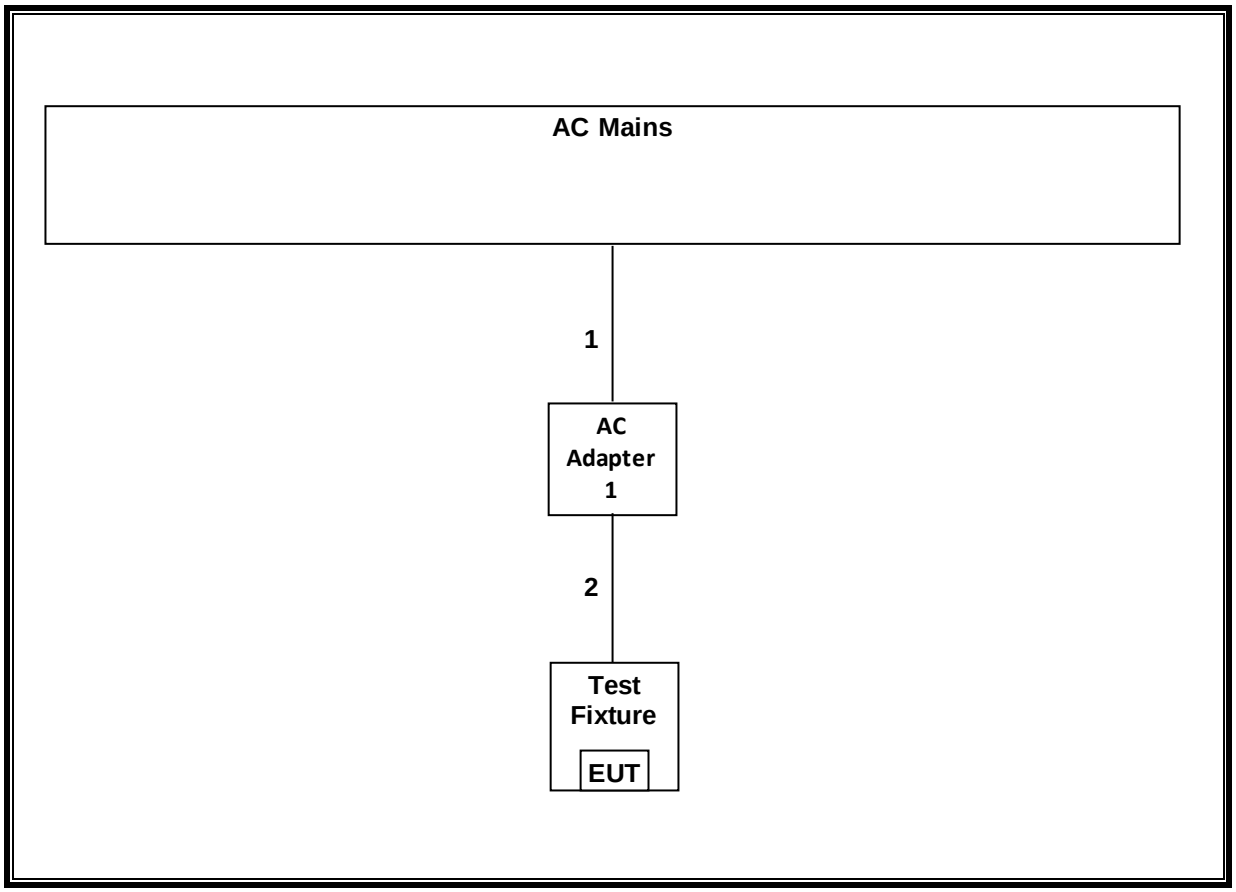
Antenna Port and WLAN Radiated Emissions:



30-1000 MHz Worst-Case Radiated Emissions:



AC Line Conducted Emissions (EUT with an External AC Adapter):



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 Date**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	03/22/12	03/22/13
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	09/02/11	09/02/12
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	N/A	02/07/12	02/07/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	11/11/11	11/11/12
Antenna, Horn, 18 GHz	EMCO	3115	C00945	10/06/11	10/06/12
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	07/28/11	07/28/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/12/11	07/12/12
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR	CNR
Power Meter	Agilent / HP	437B	N02778	08/11/10	08/11/12
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/19/11	08/19/13
LISN, 30 MHz	FCC	50/250-25-2	C00626	12/13/11	12/13/12
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	03/07/12	03/07/13

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)

IC RSS-210 A8.2 (a)

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

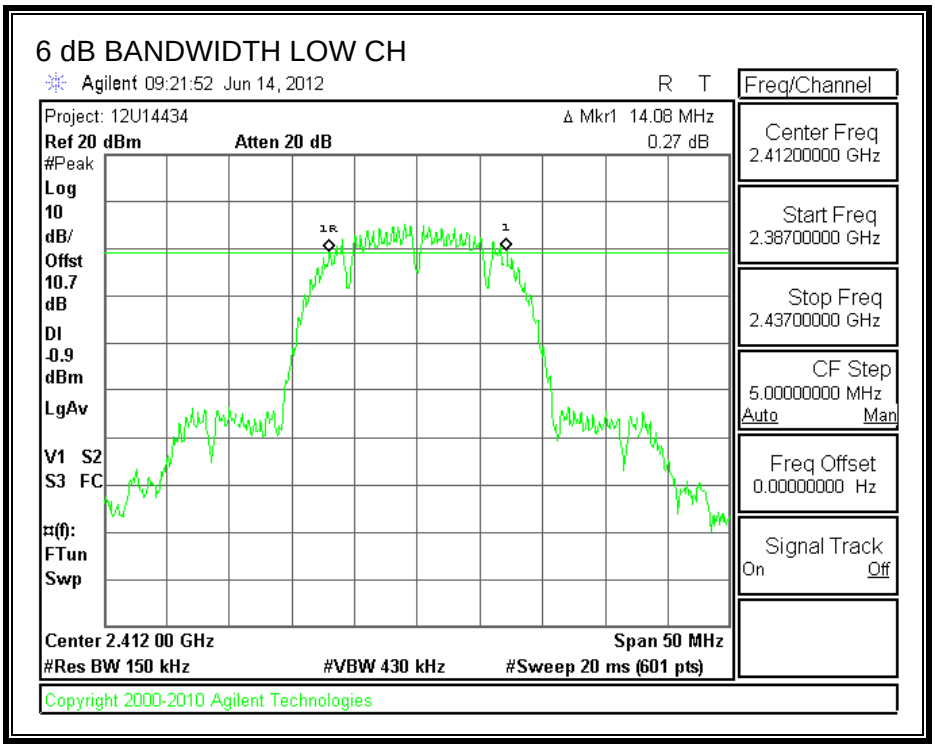
TEST PROCEDURE

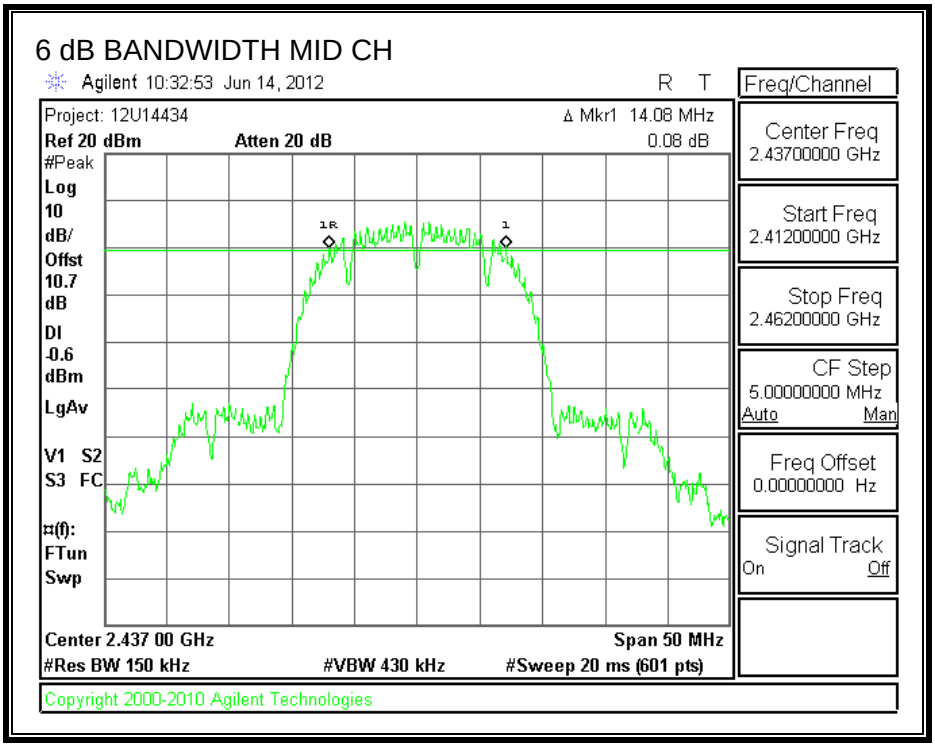
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:
"Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247."

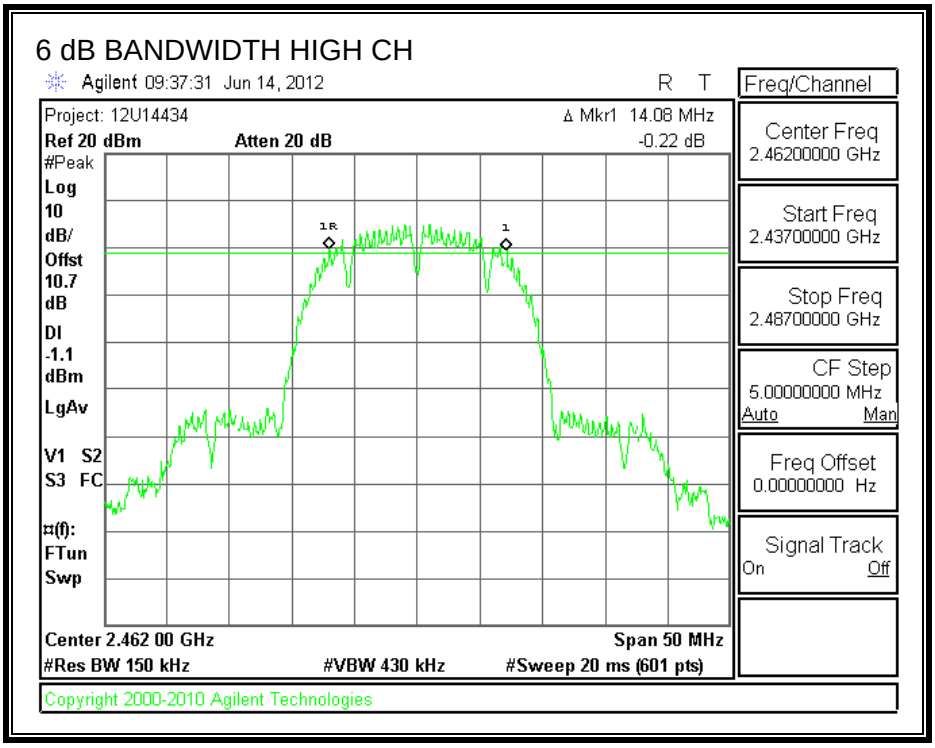
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	14.0830	0.5
Middle	2437	14.0830	0.5
High	2462	14.0830	0.5

6 dB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

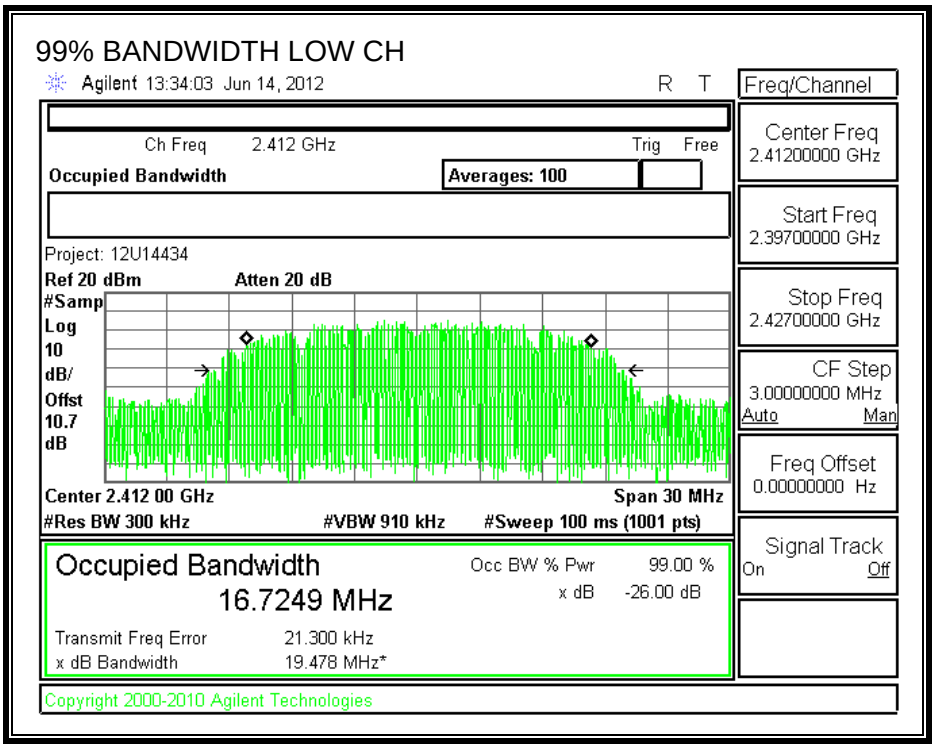
TEST PROCEDURE

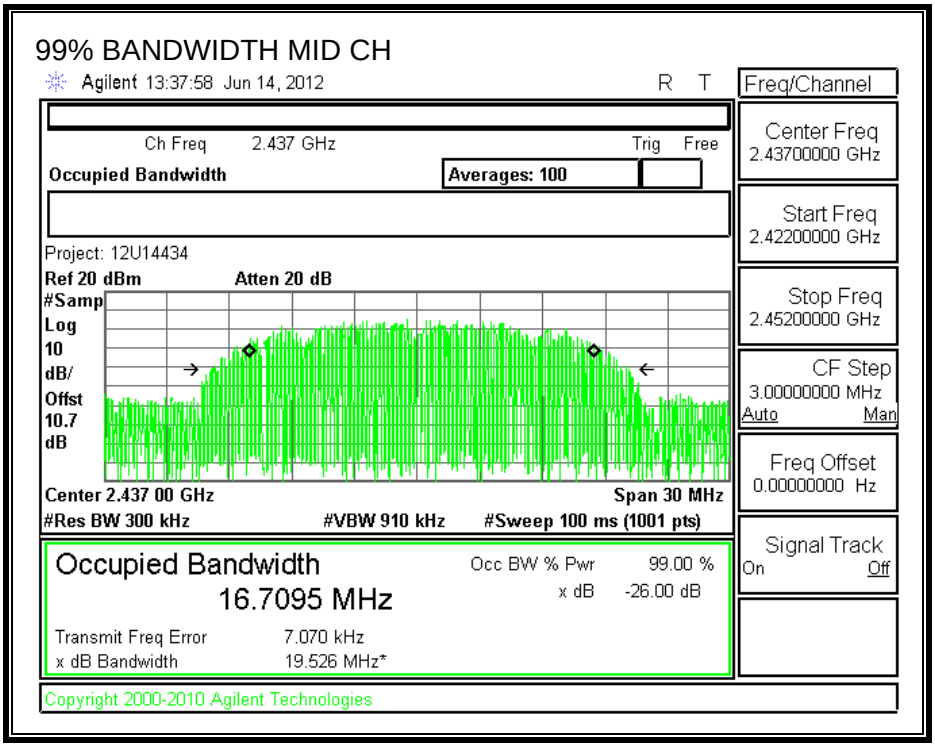
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

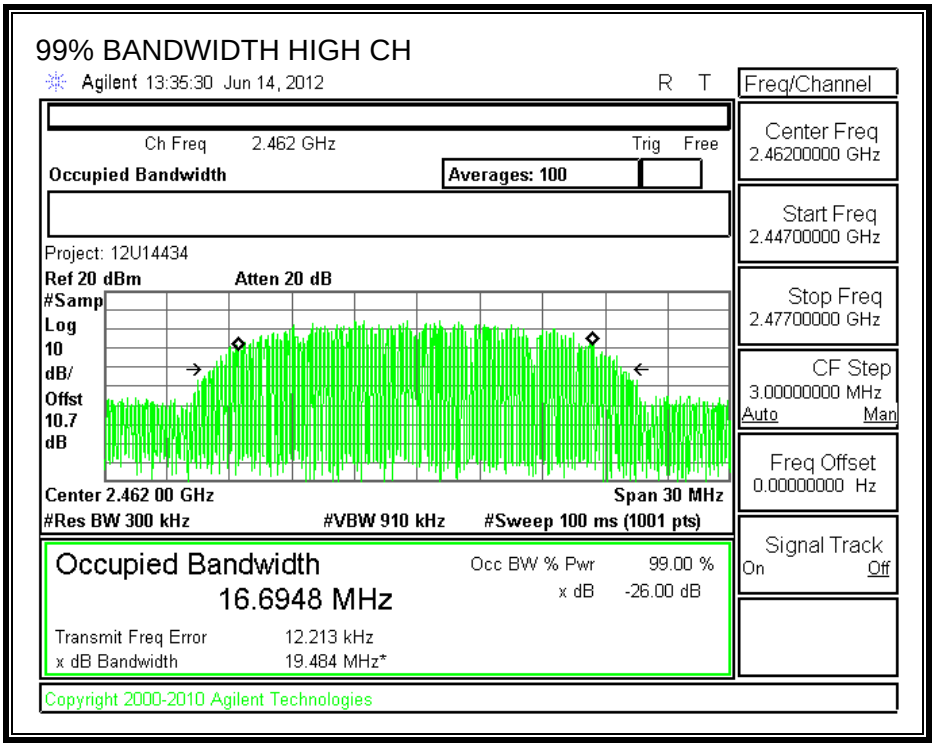
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.7249
Middle	2437	16.7095
High	2462	16.6948

99% BANDWIDTH







7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

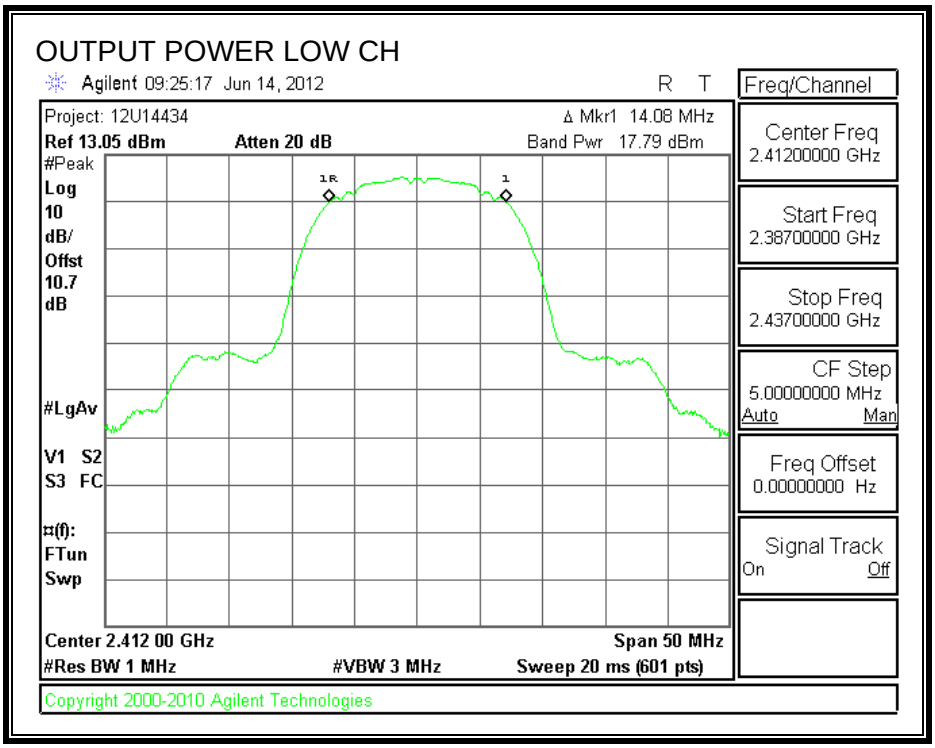
TEST PROCEDURE

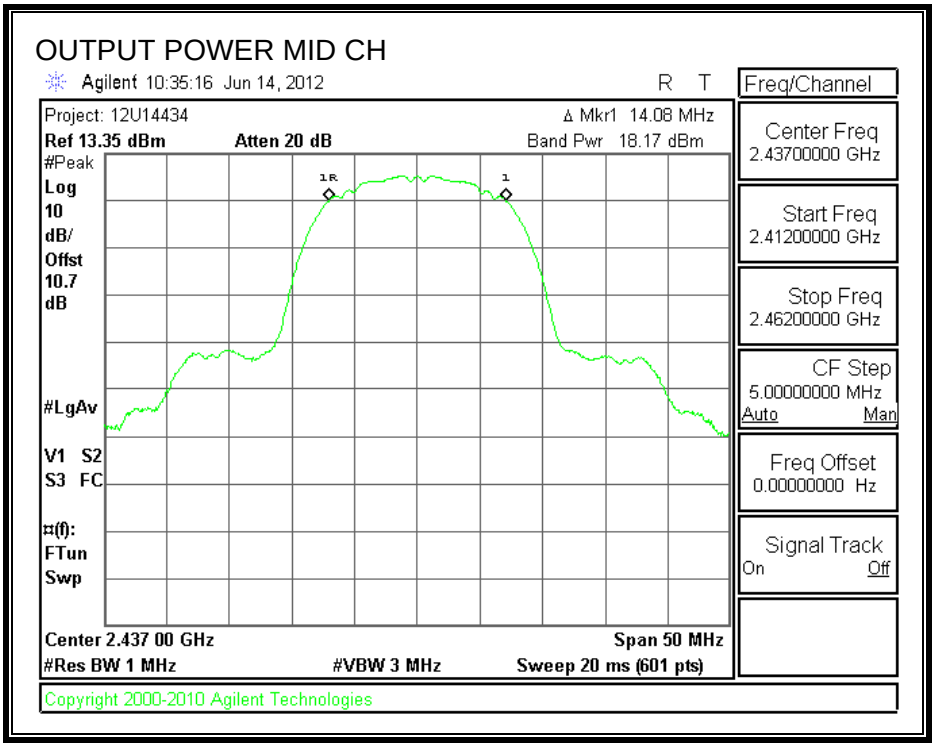
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

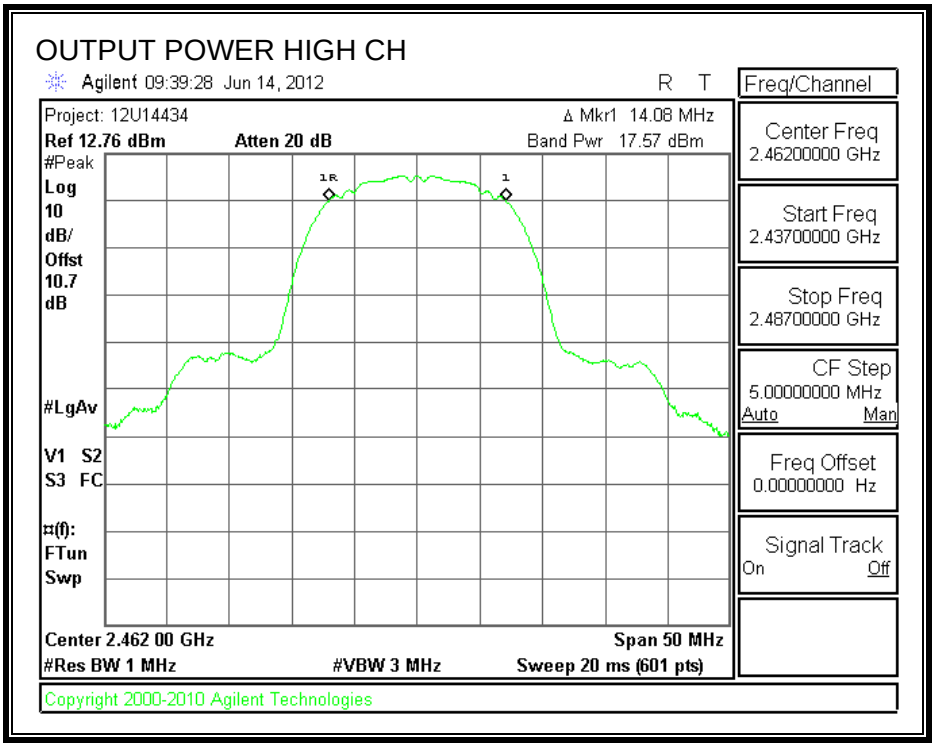
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	17.790	30	-12.210
Middle	2437	18.170	30	-11.830
High	2462	17.570	30	-12.430

OUTPUT POWER







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 10.73 dB (including 9.676 dB pad and 1.05 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	12.55
Middle	2437	18.25
High	2462	12.26

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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.

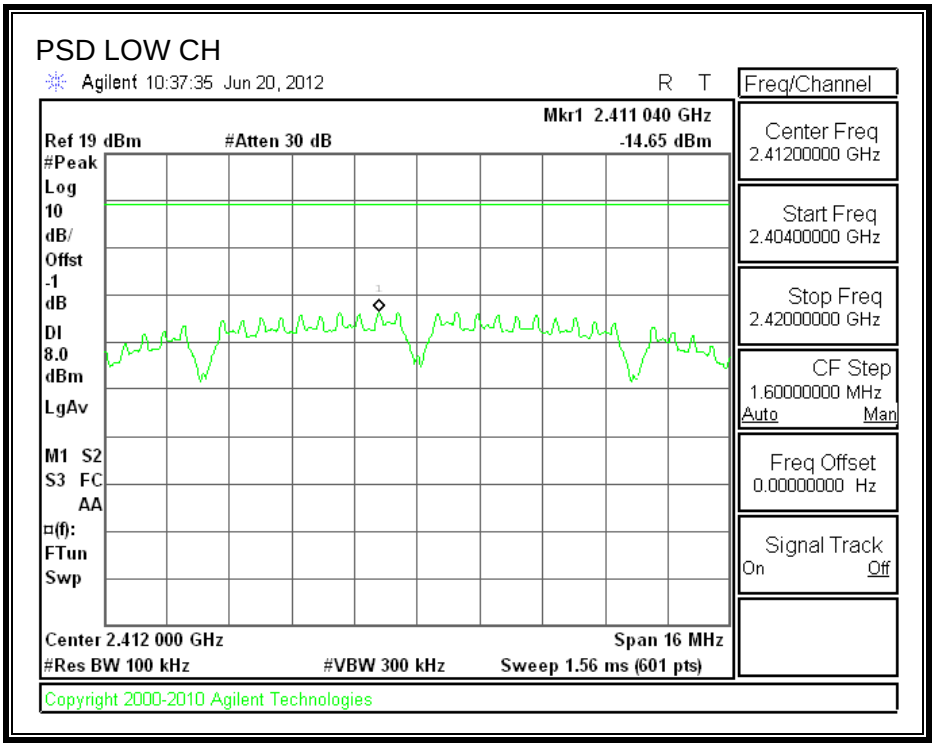
TEST PROCEDURE

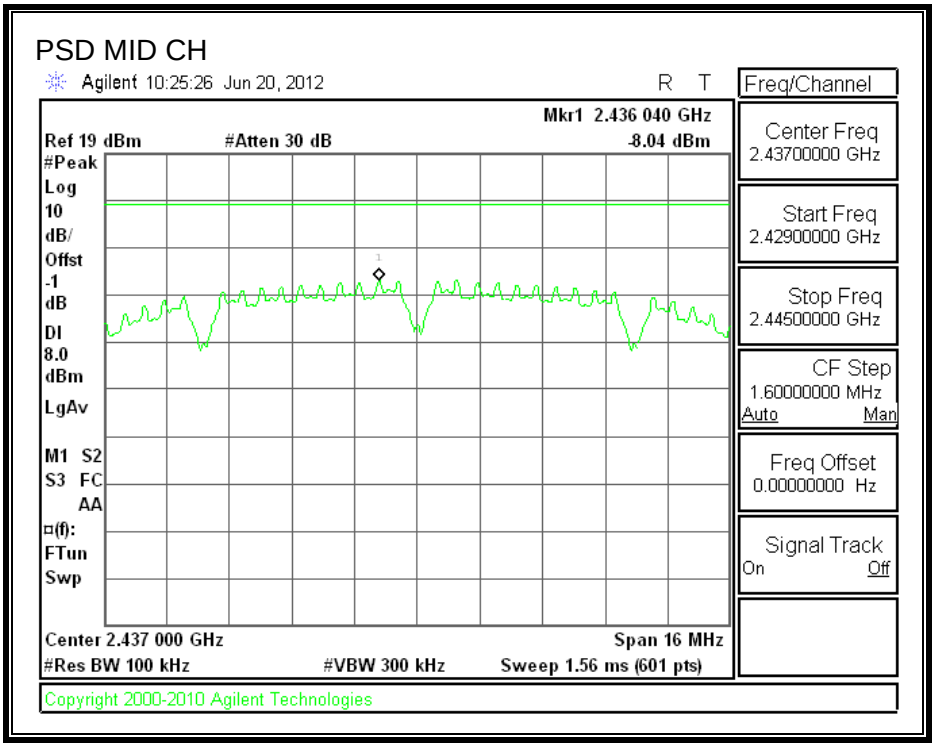
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

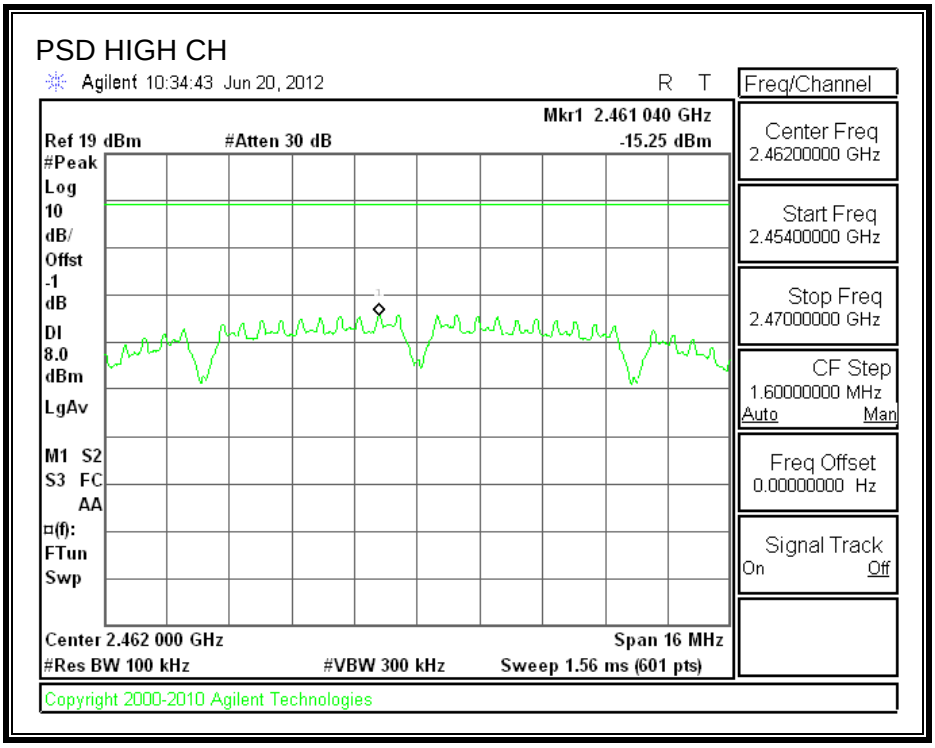
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-14.65	8	-22.65
Middle	2437	-8.04	8	-16.04
High	2462	-15.25	8	-23.25

POWER SPECTRAL DENSITY







7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

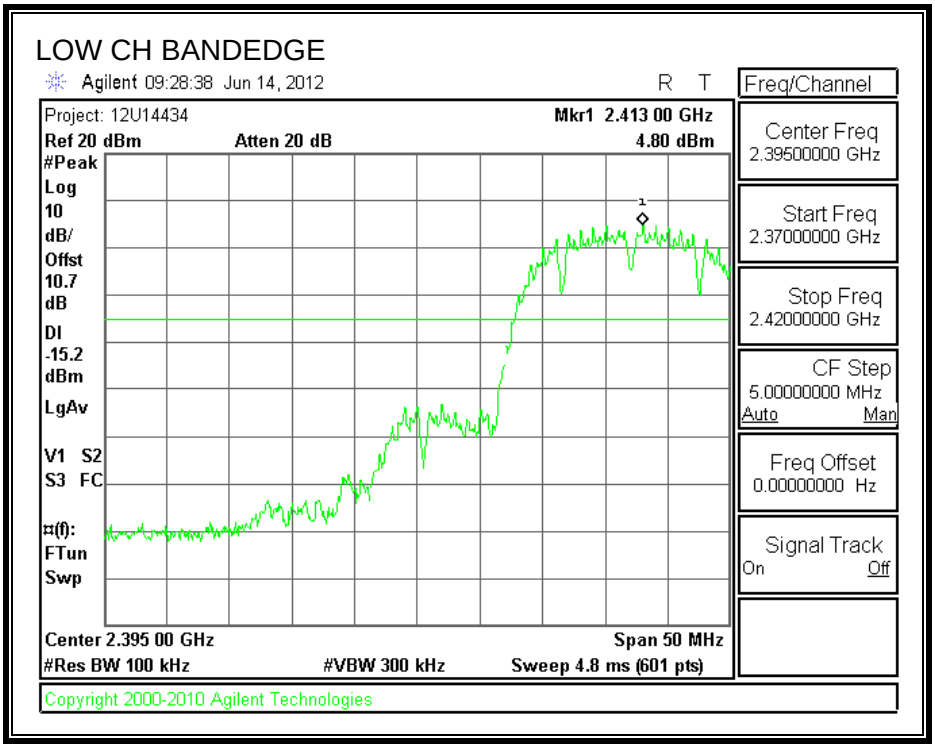
TEST PROCEDURE

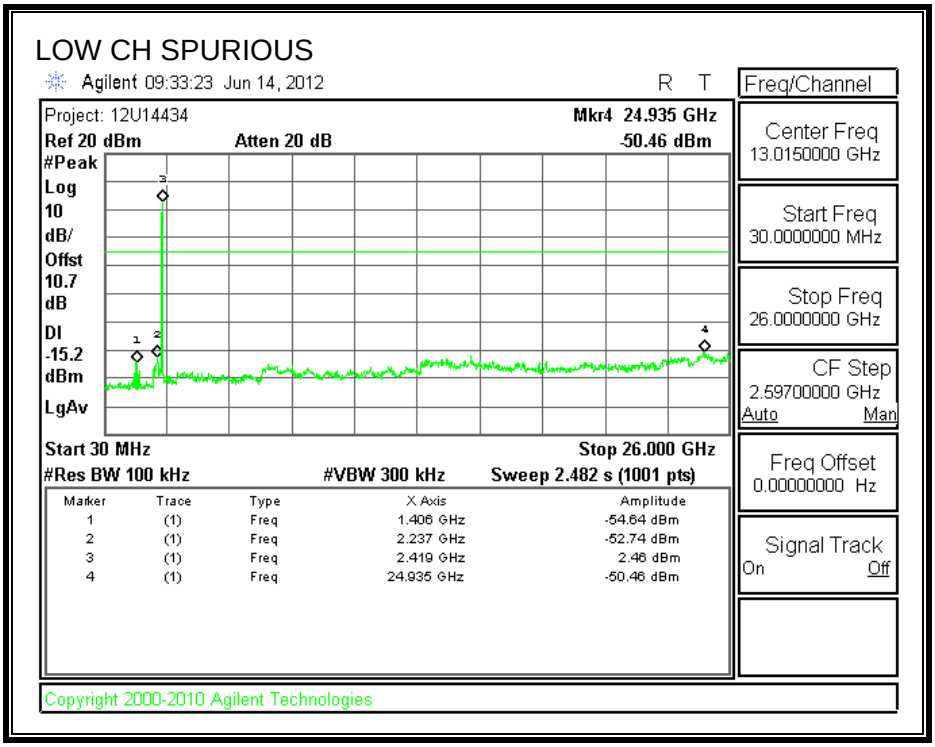
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

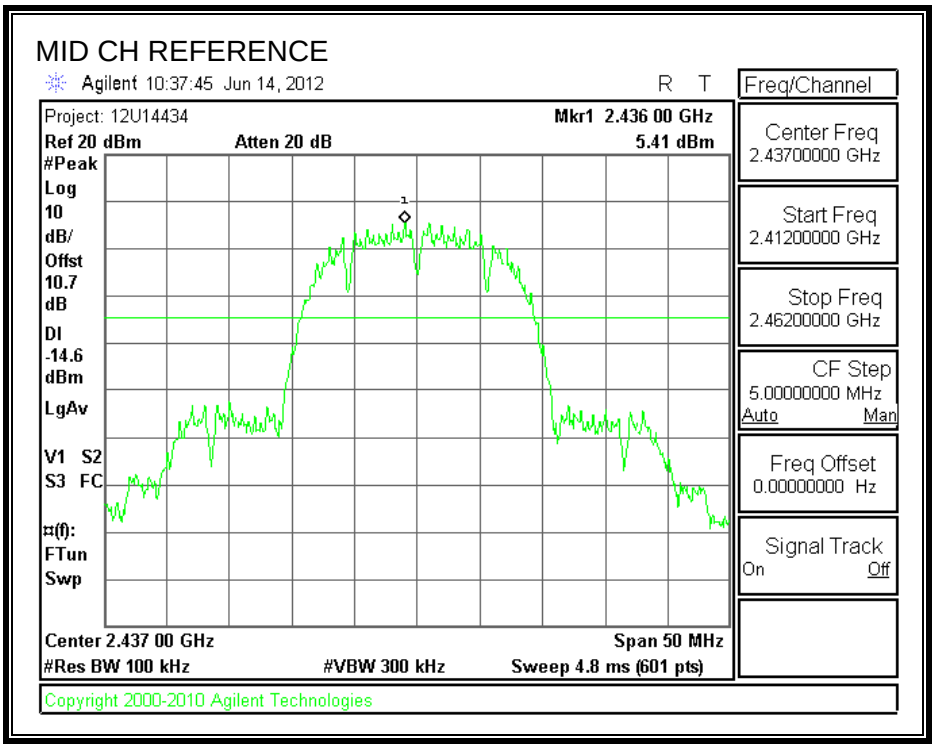
RESULTS

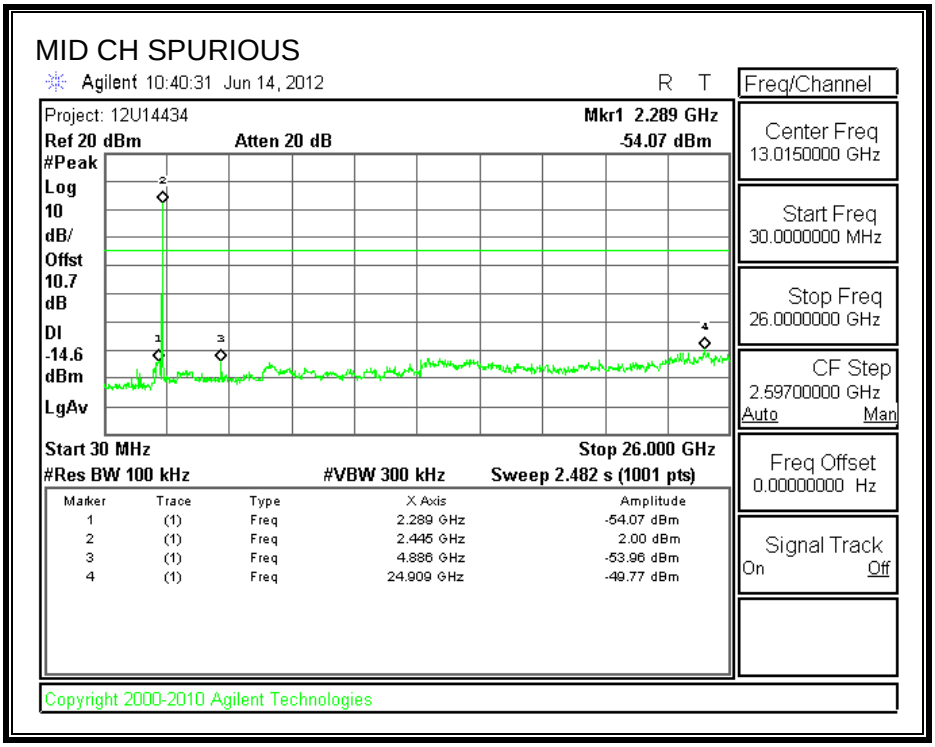
SPURIOUS EMISSIONS, LOW CHANNEL



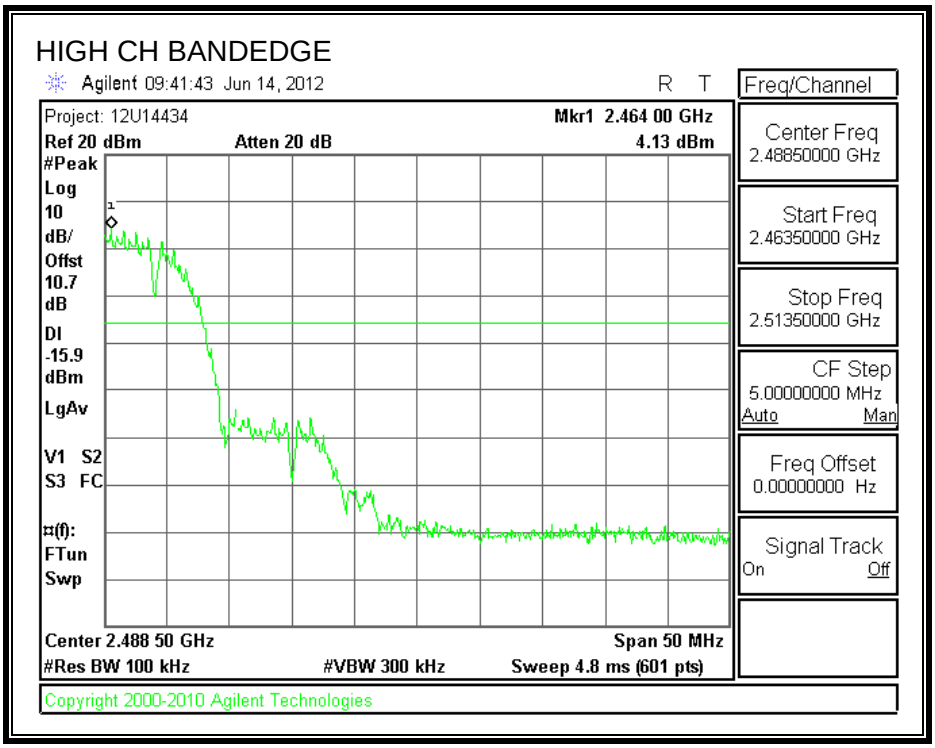


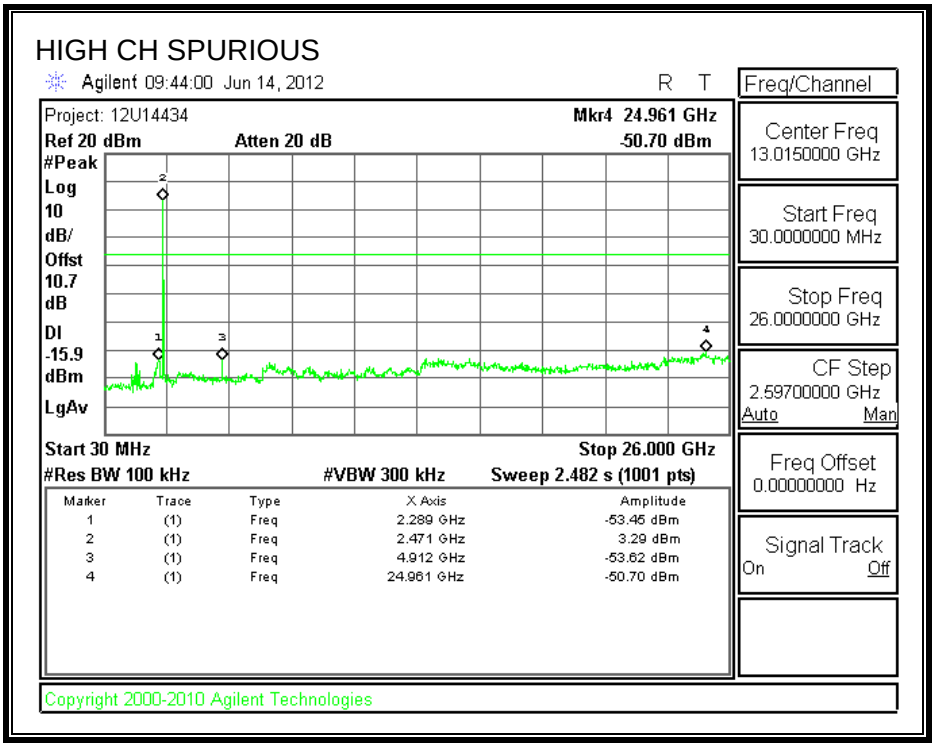
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

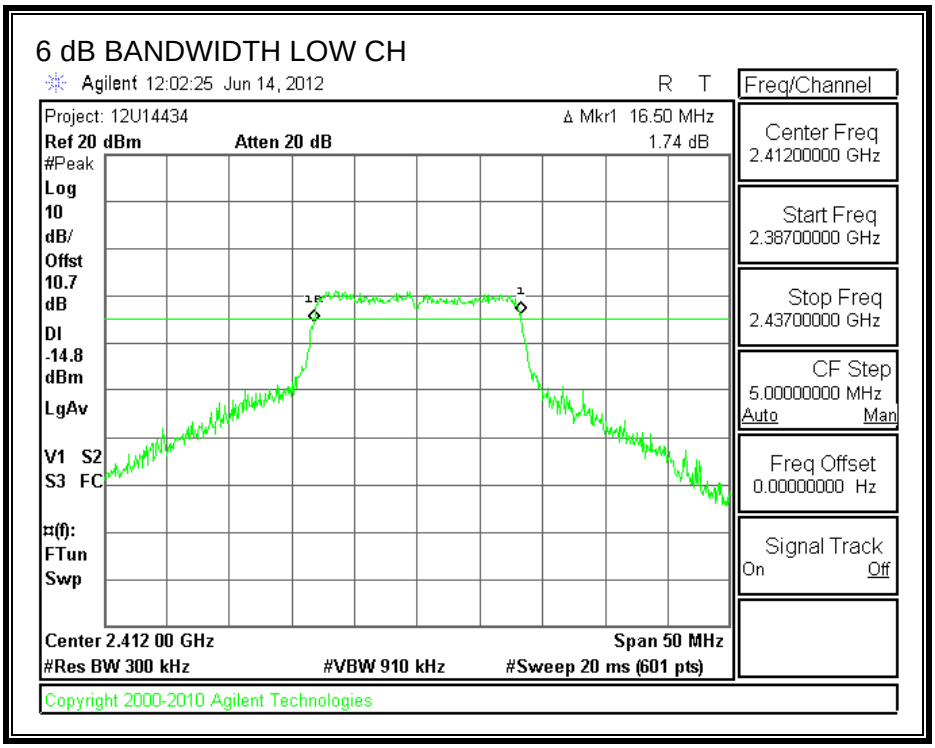
TEST PROCEDURE

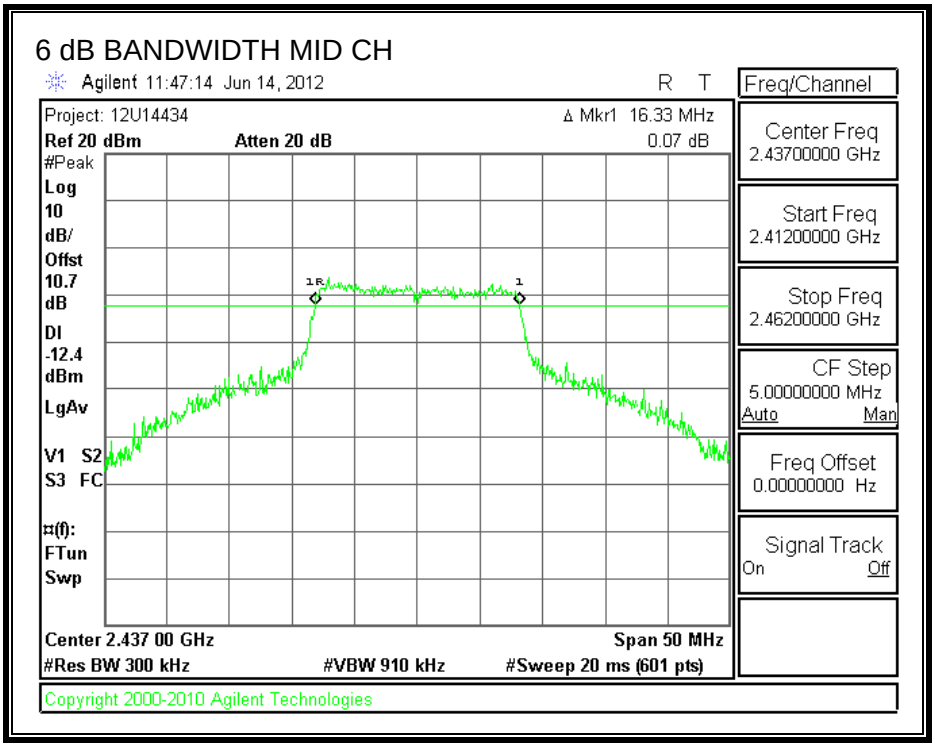
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:
"Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247."

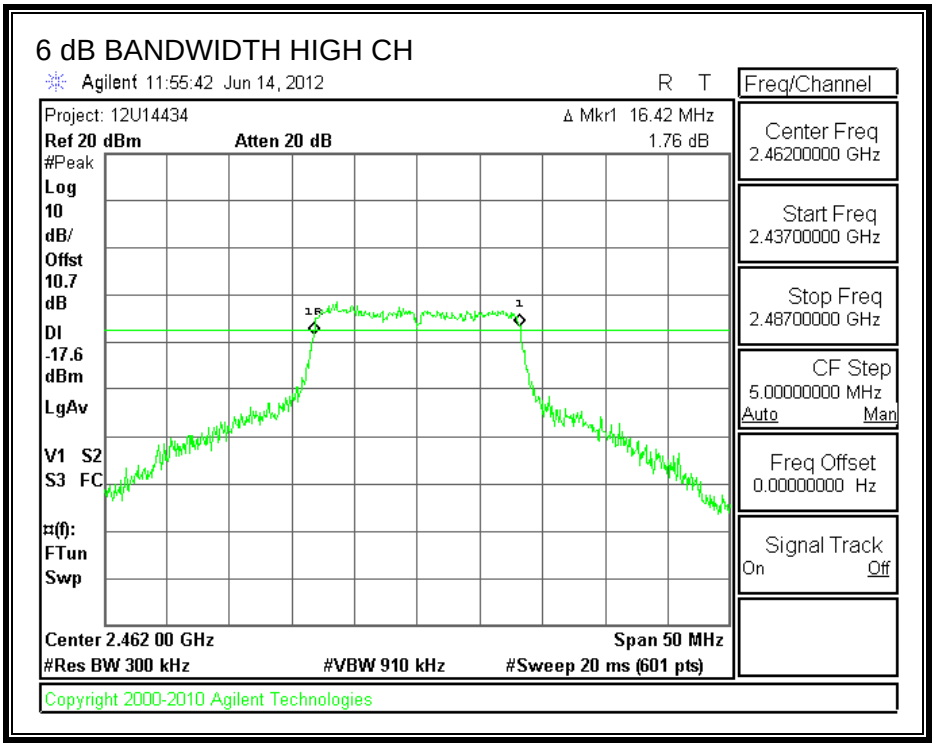
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.5000	0.5
Middle	2437	16.3330	0.5
High	2462	16.4170	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

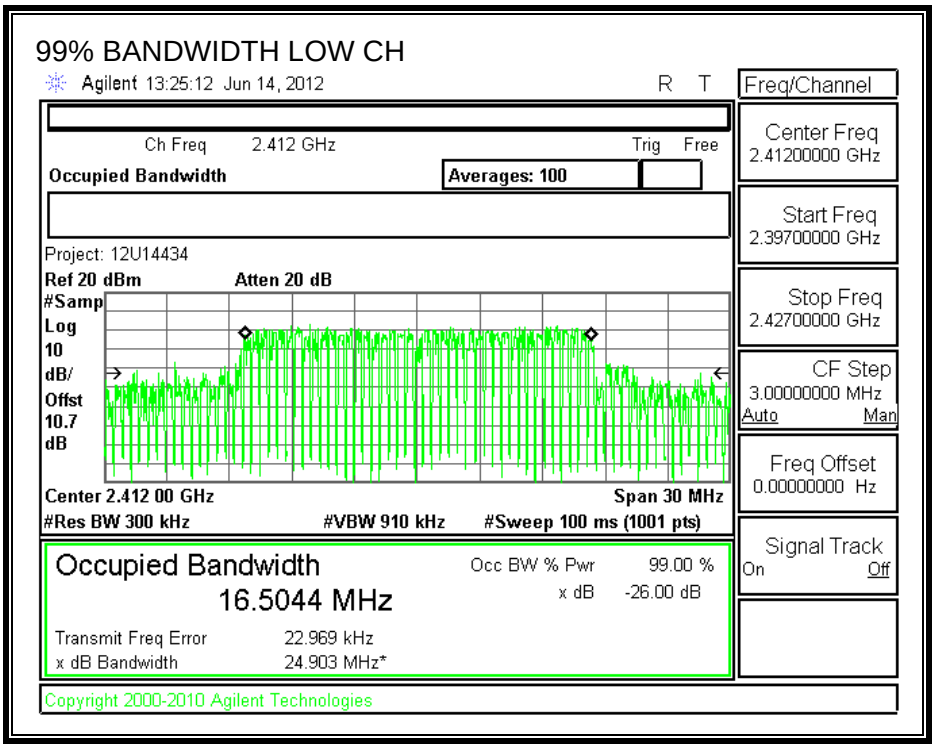
TEST PROCEDURE

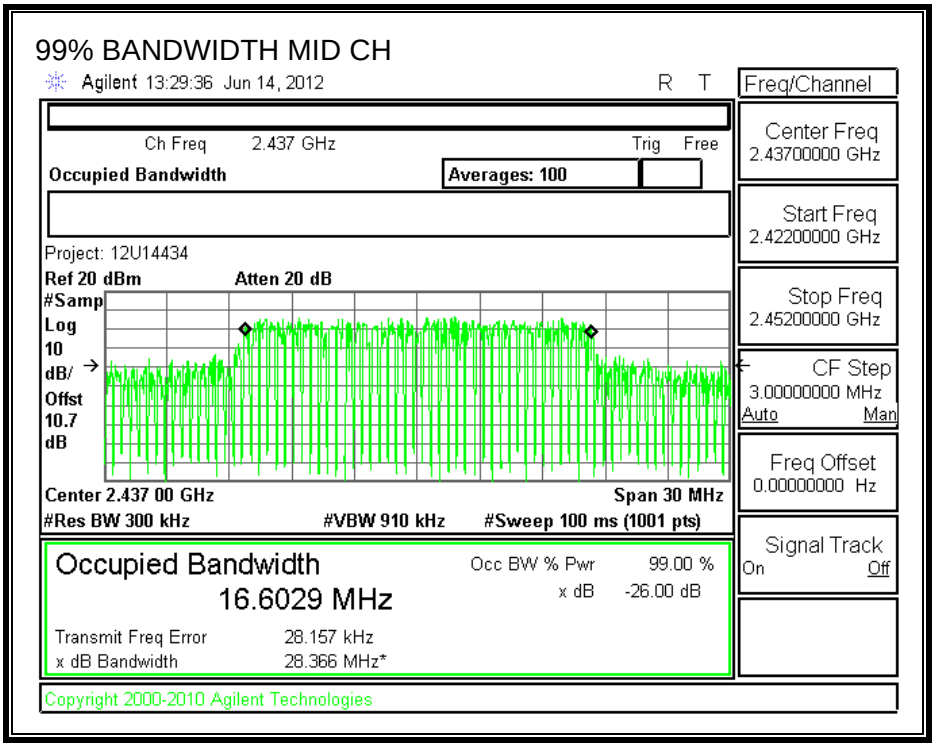
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

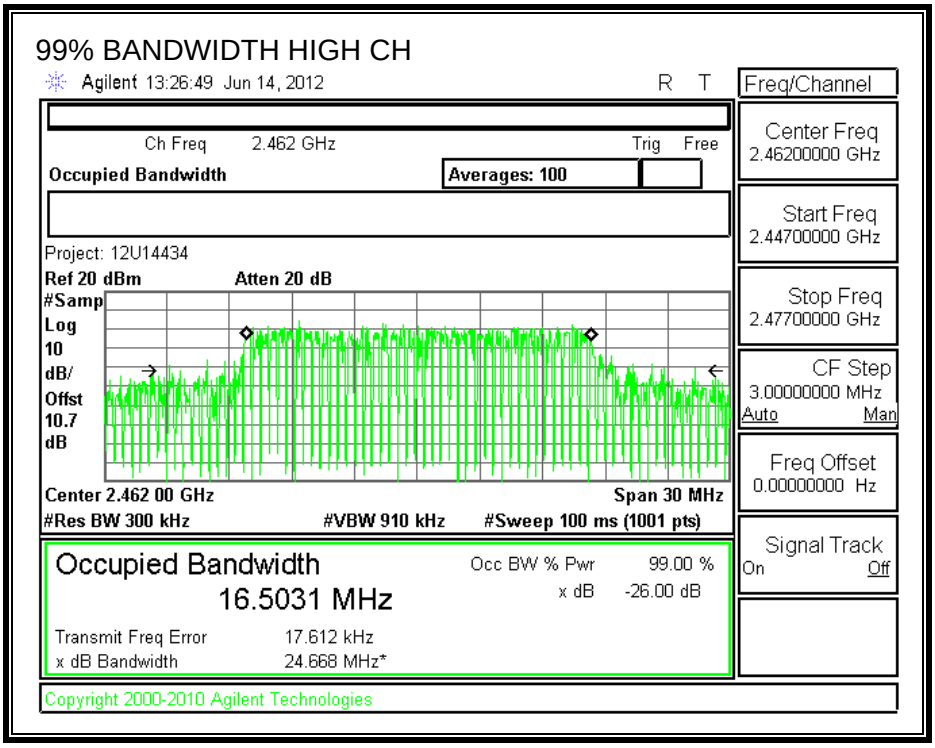
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5044
Middle	2437	16.6029
High	2462	16.5031

99% BANDWIDTH







7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

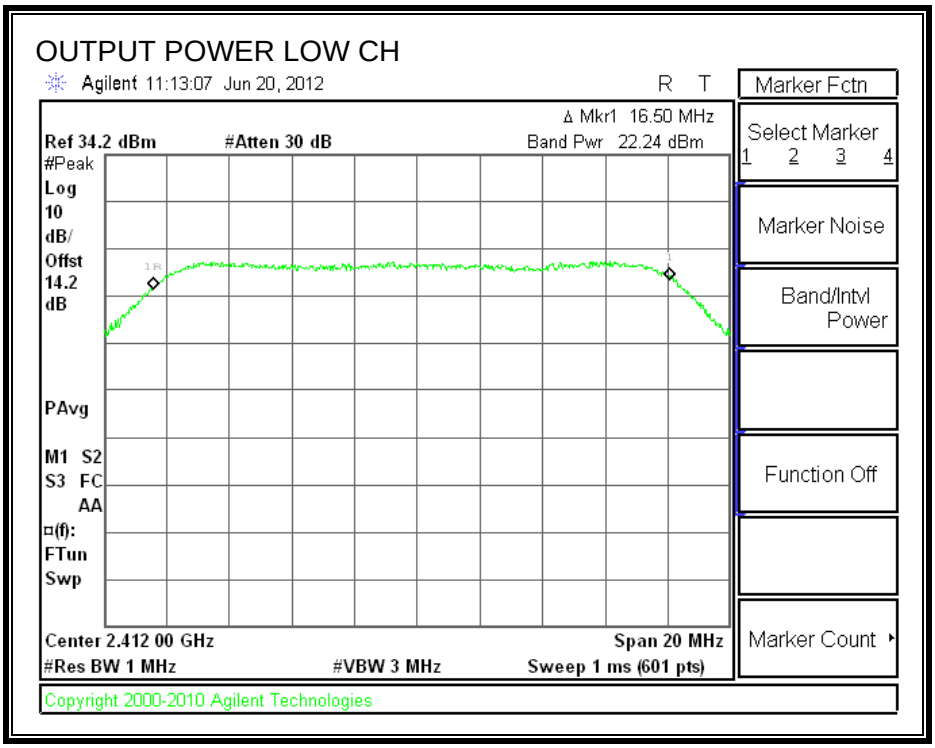
TEST PROCEDURE

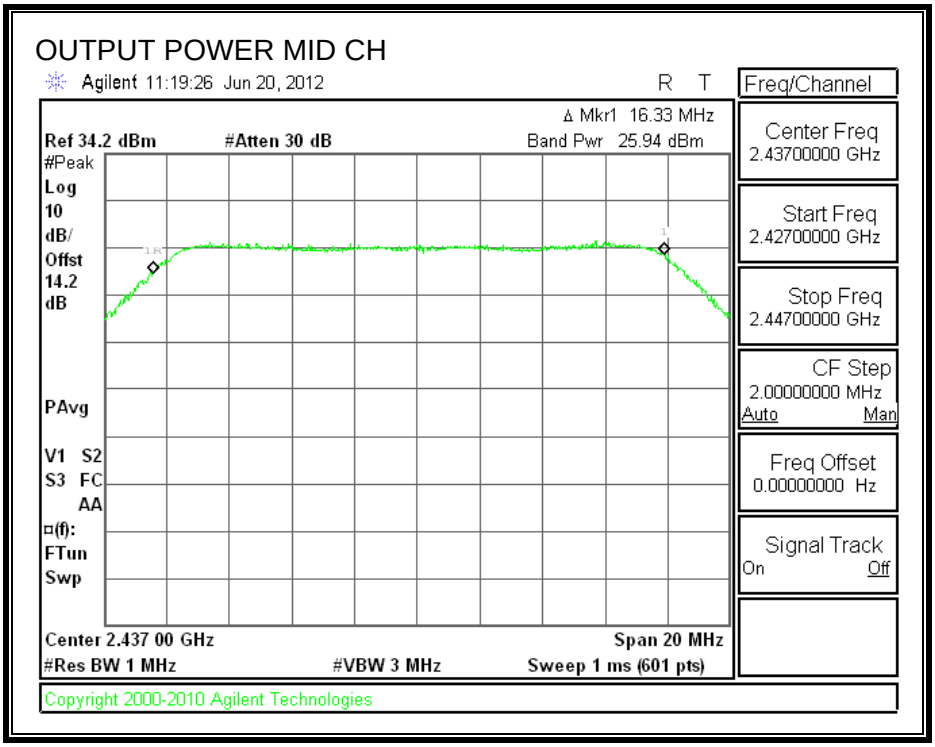
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

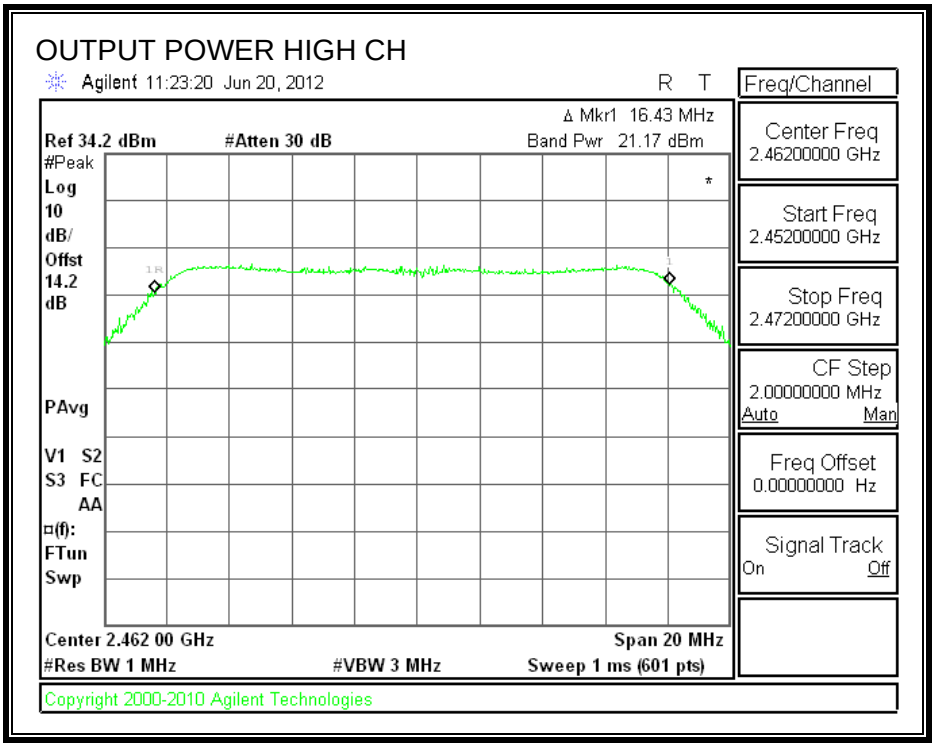
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2412	22.240	30	-7.760
Middle	2437	25.940	30	-4.060
High	2462	21.170	30	-8.830

OUTPUT POWER







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 10.73 dB (including 9.676 dB pad and 1.05 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	12.55
Middle	2437	18.25
High	2462	12.26

7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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.

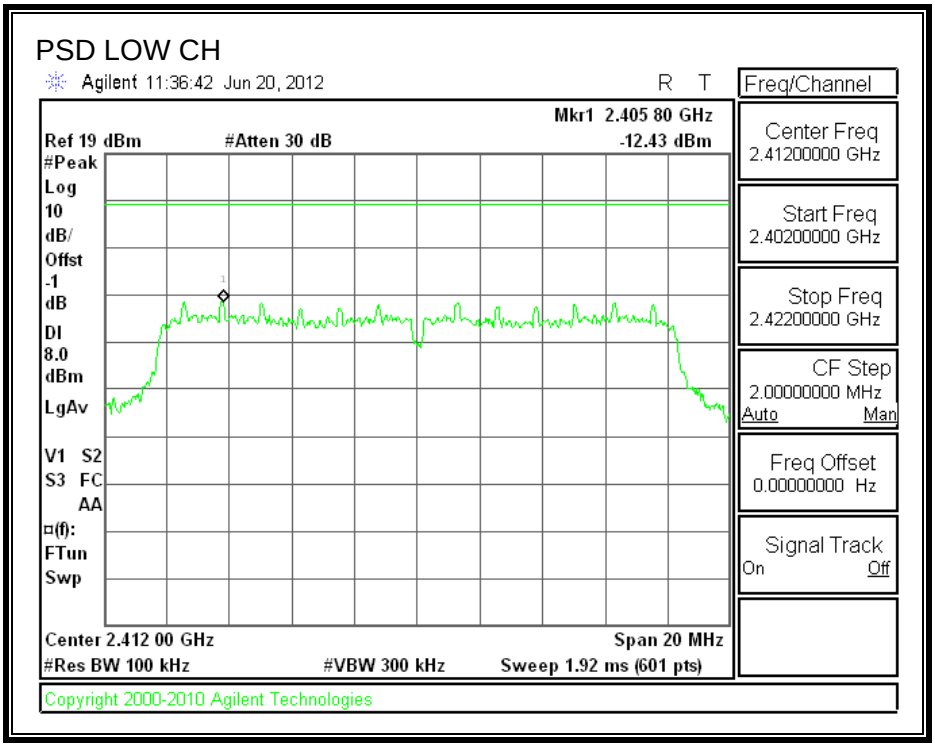
TEST PROCEDURE

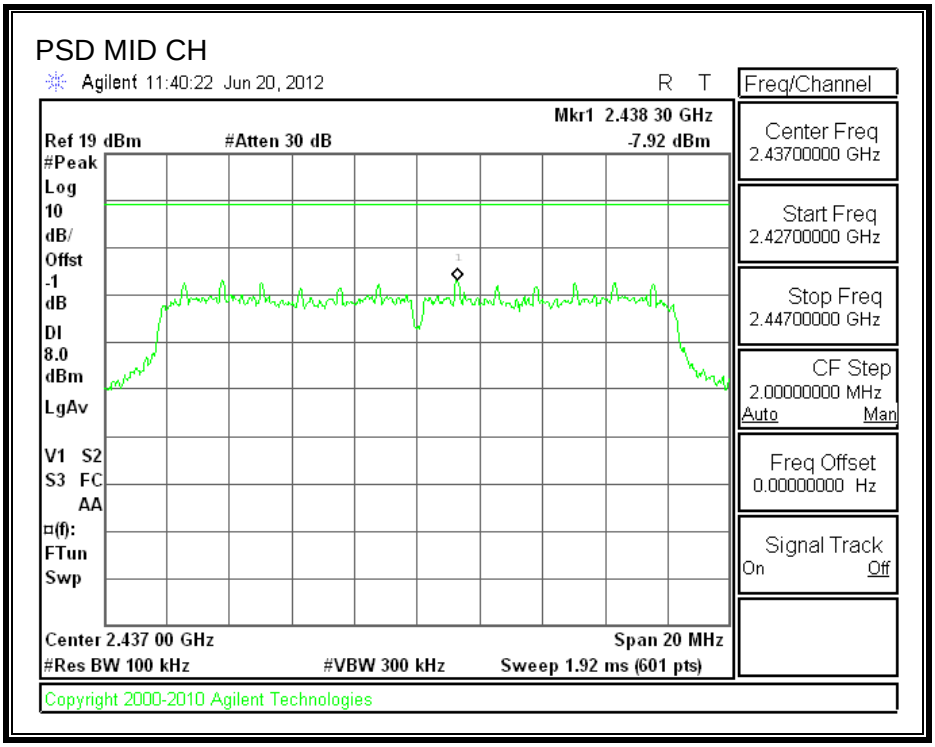
KDB 558074 D01 v01 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247”.

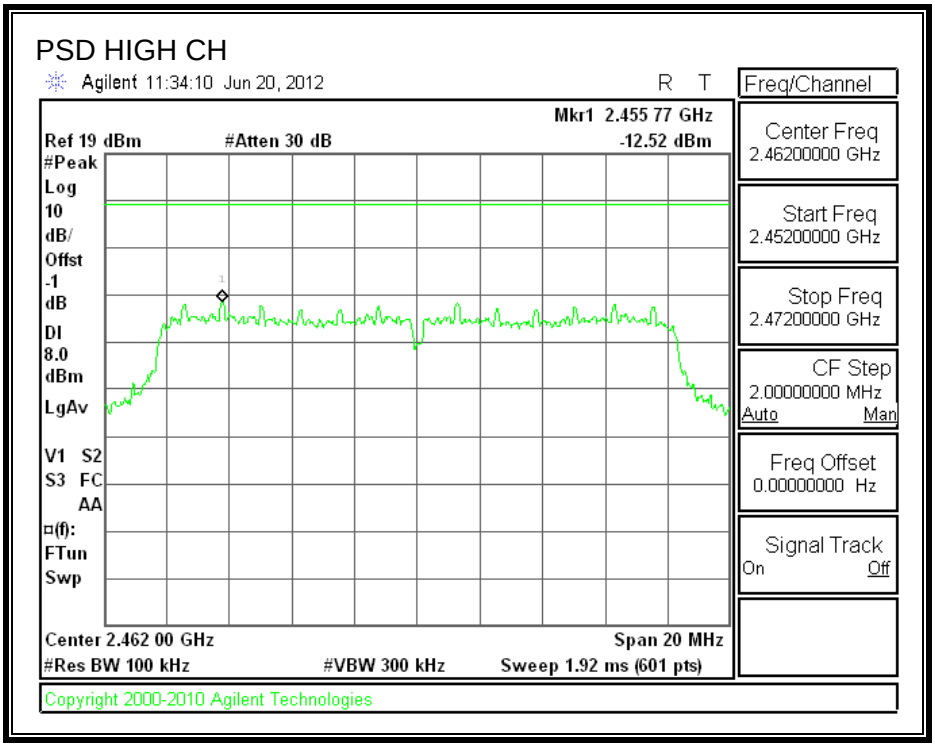
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-12.43	8	-20.43
Middle	2437	-7.92	8	-15.92
High	2462	-12.52	8	-20.52

POWER SPECTRAL DENSITY







7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

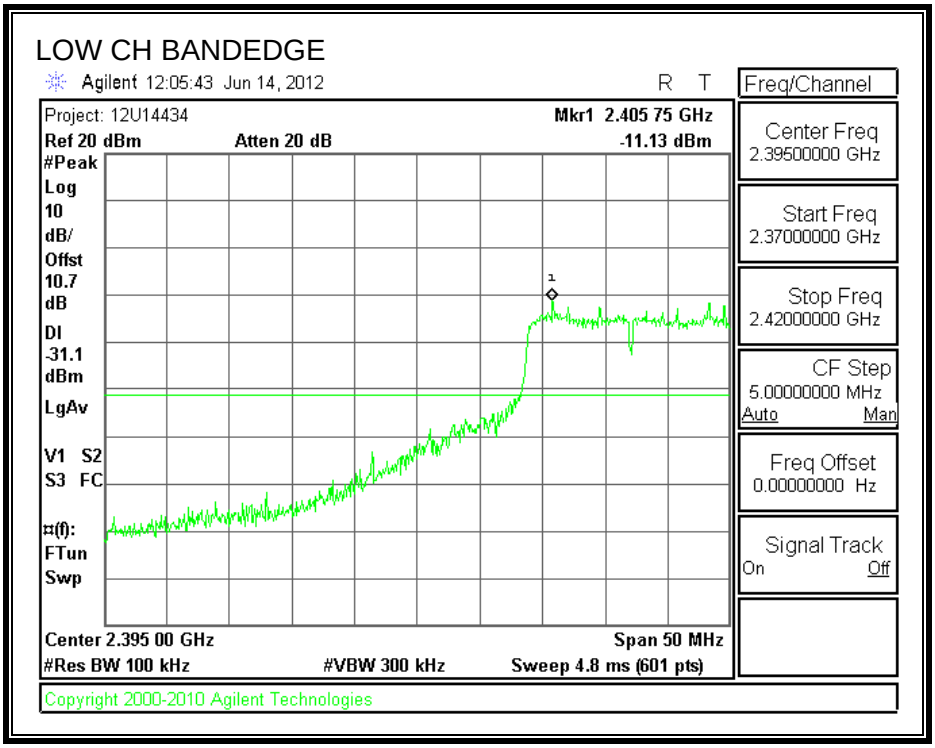
TEST PROCEDURE

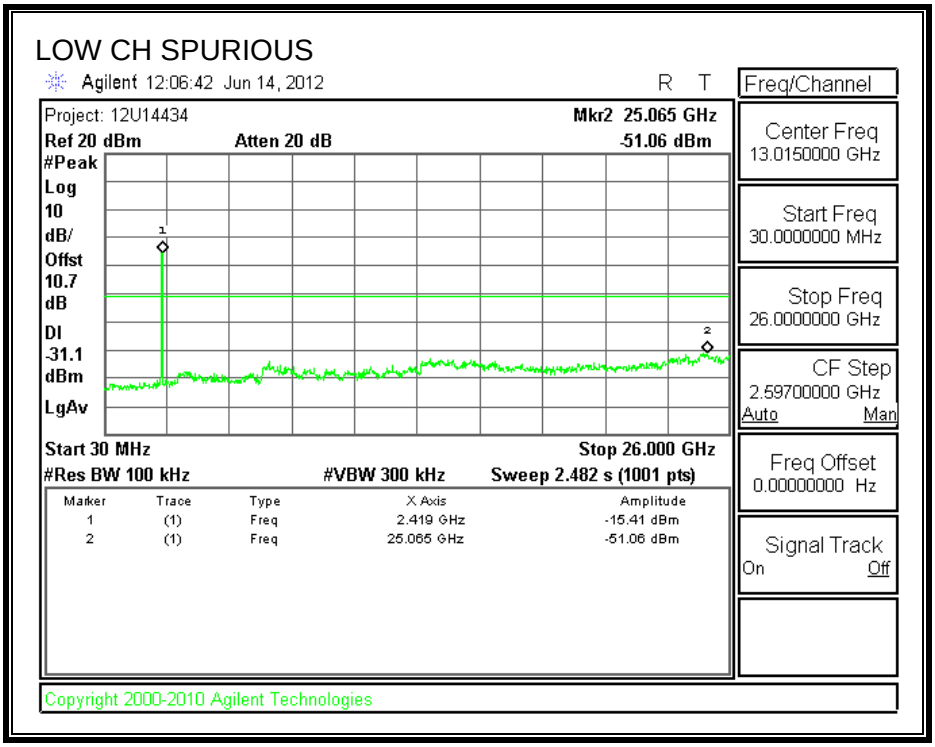
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

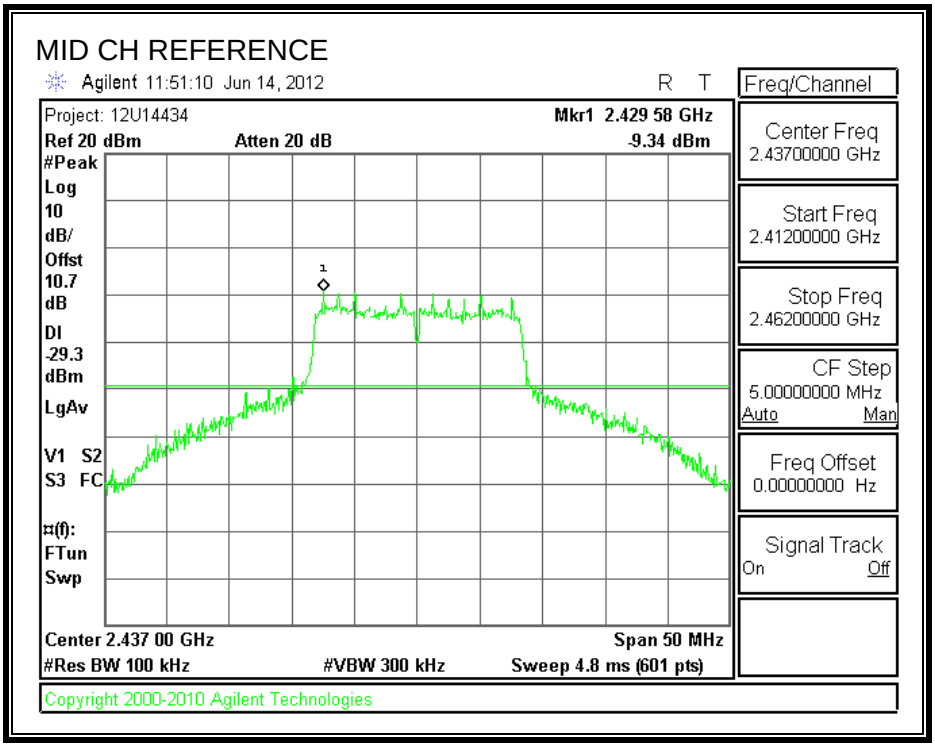
RESULTS

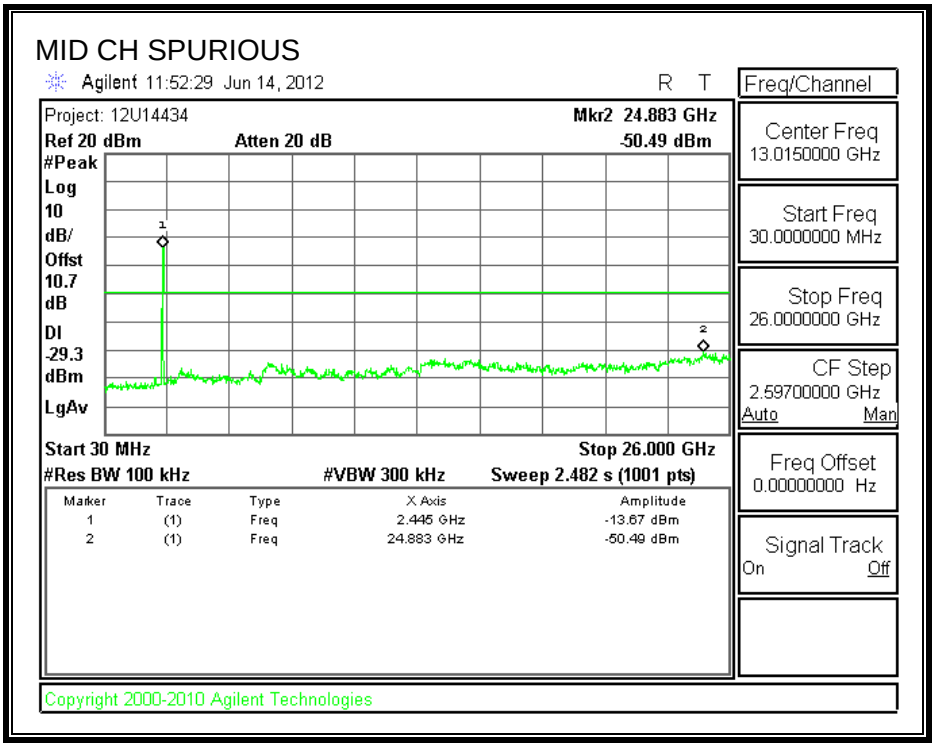
SPURIOUS EMISSIONS, LOW CHANNEL



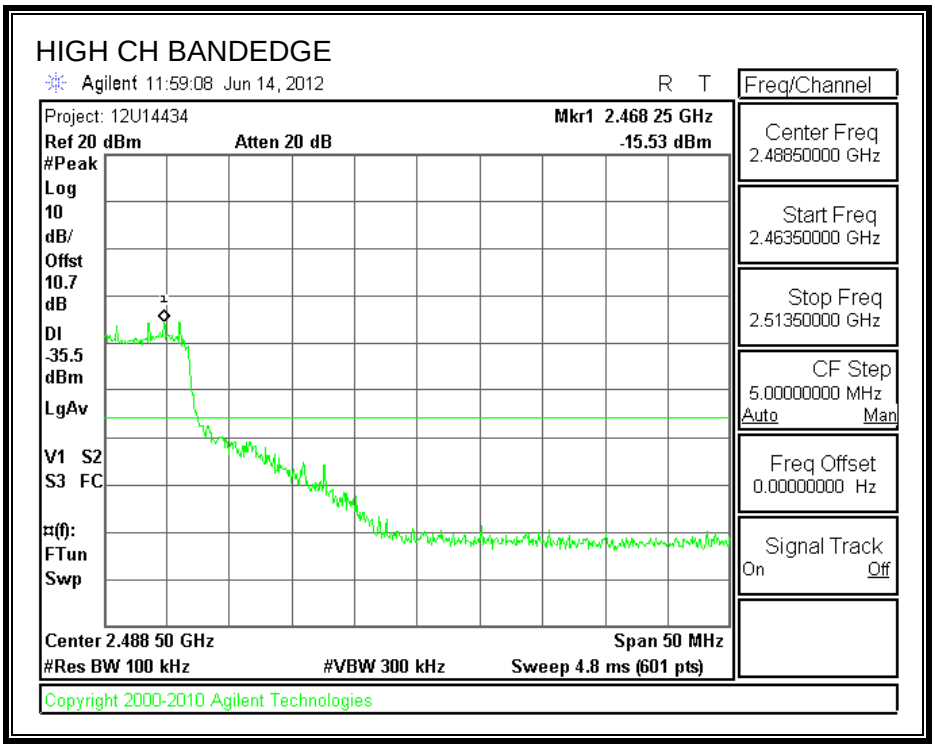


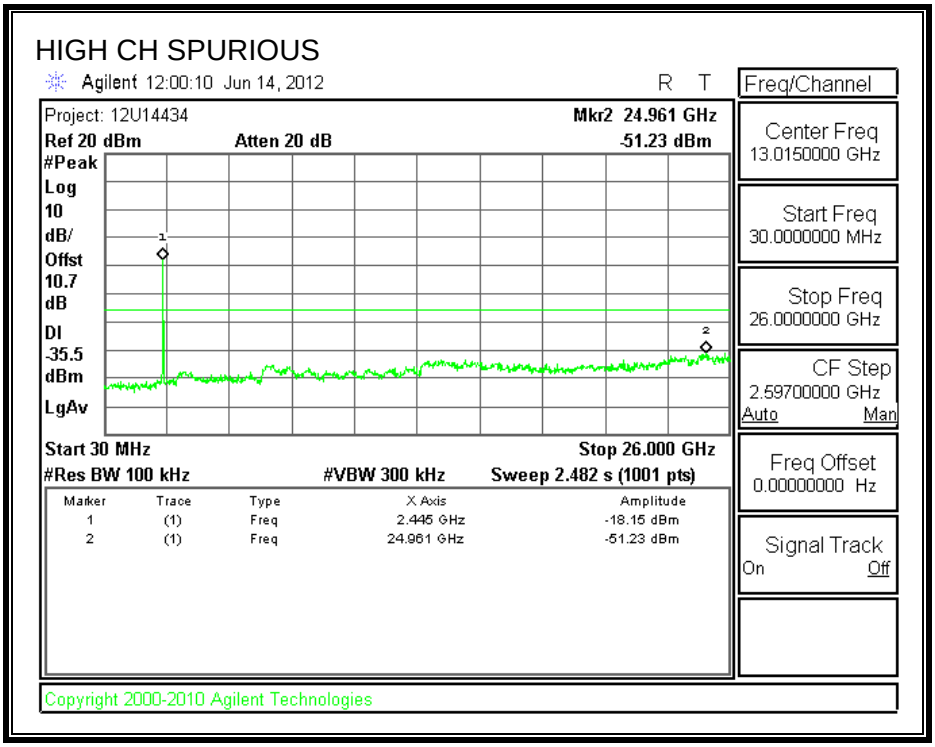
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





RADIATED TEST RESULTS

7.3. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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.

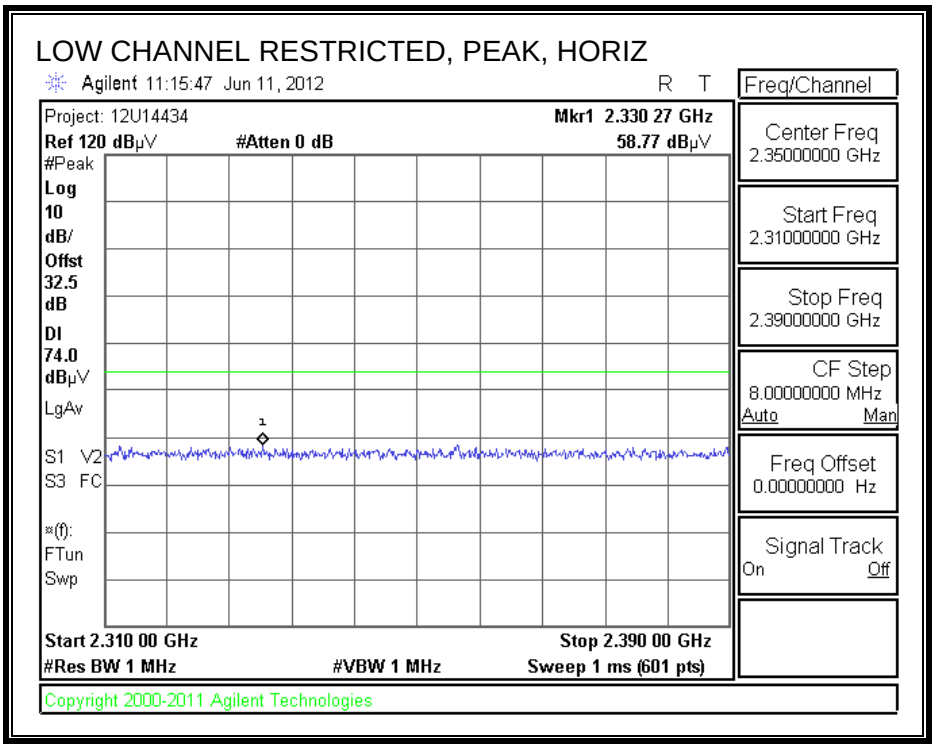
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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

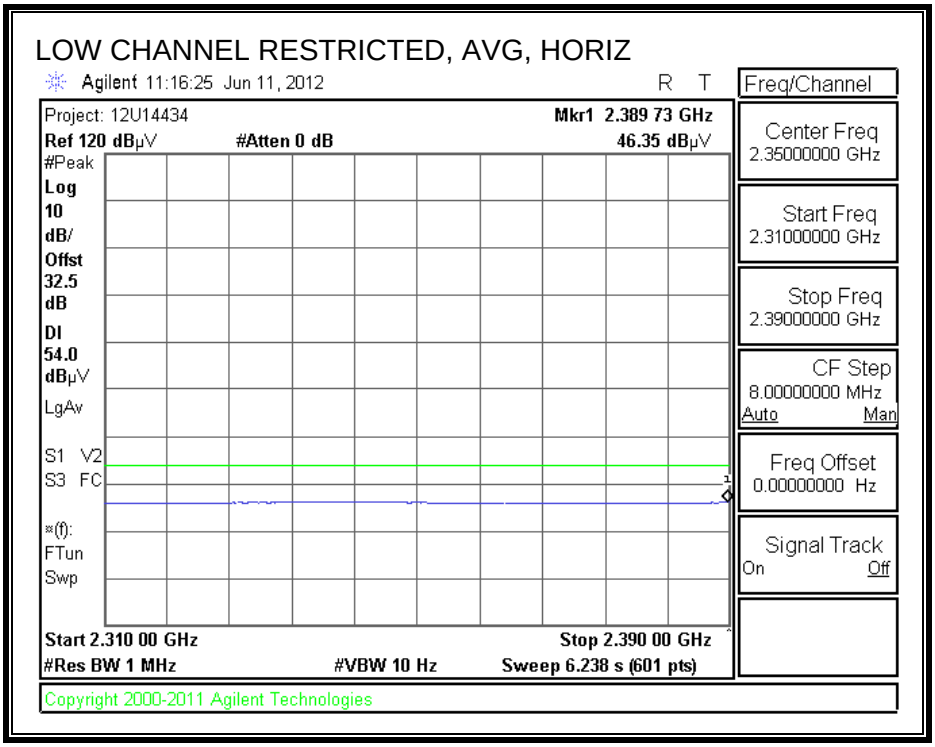
7.4. TRANSMITTER ABOVE 1 GHz: TX MODE IN THE IN THE 2.4 GHz BAND

7.4.1. TX ABOVE 1 GHz FOR 802.11b MODE (INTEGRAL ANTENNA)

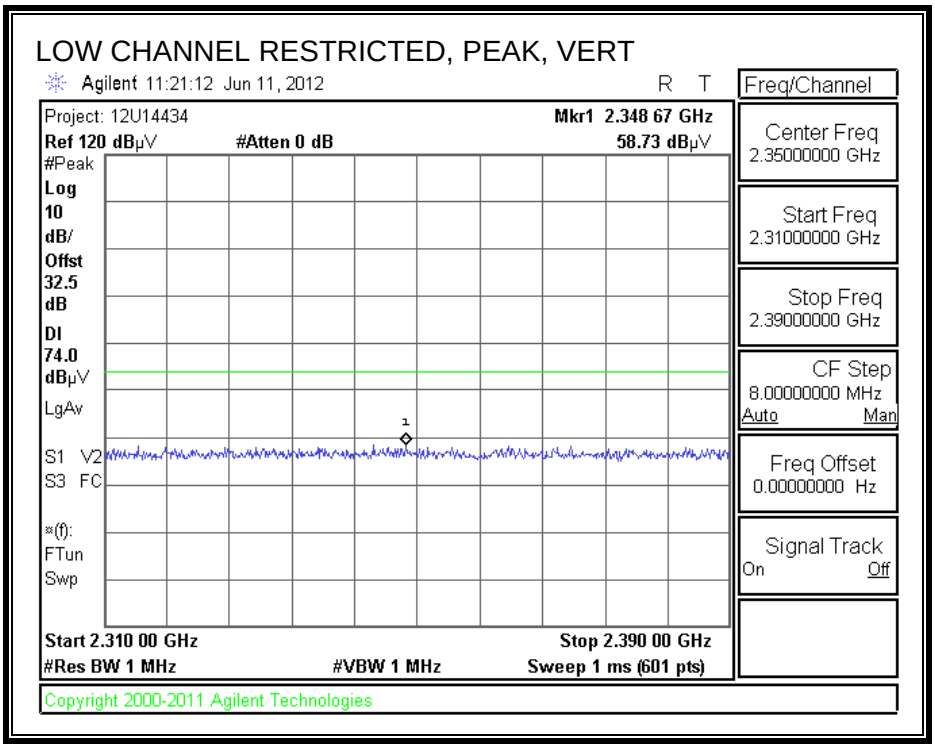
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

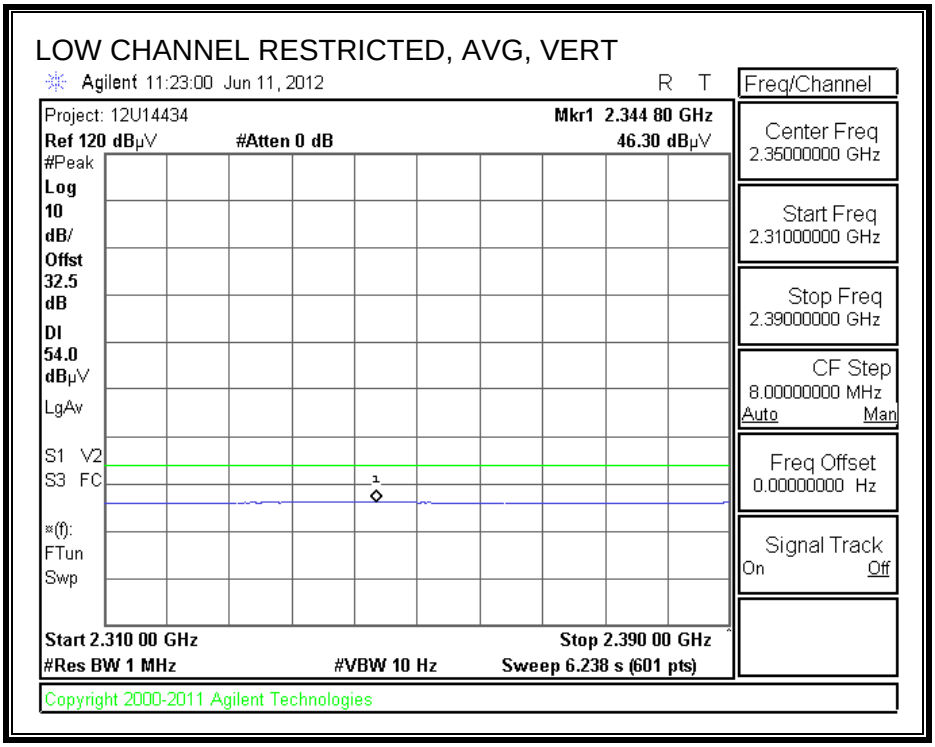


LOW CHANNEL RESTRICTED, AVG, HORIZ

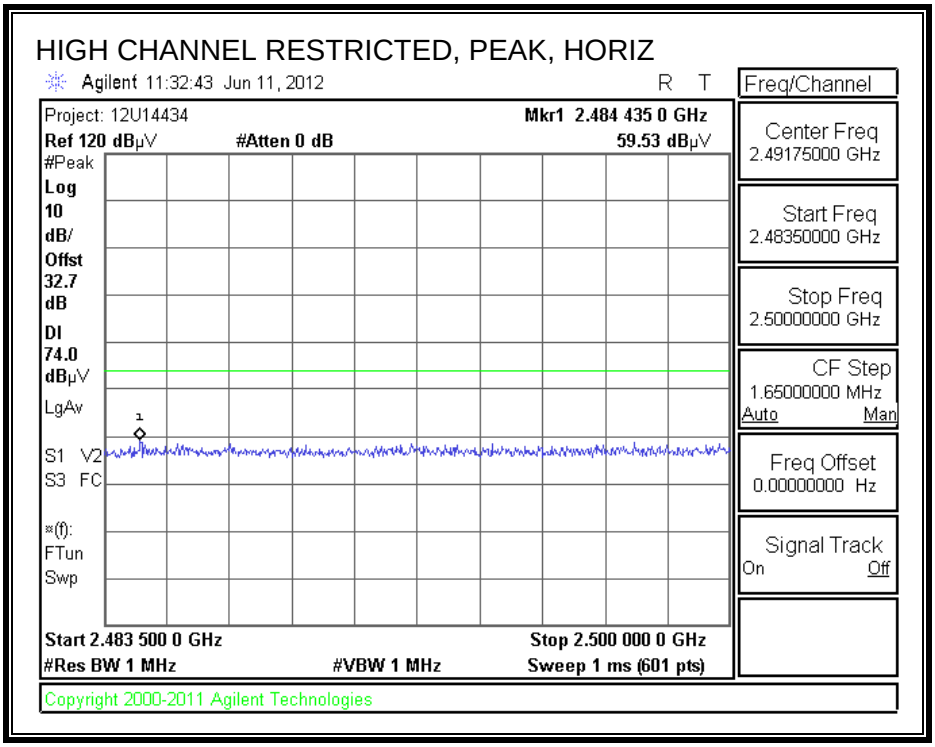


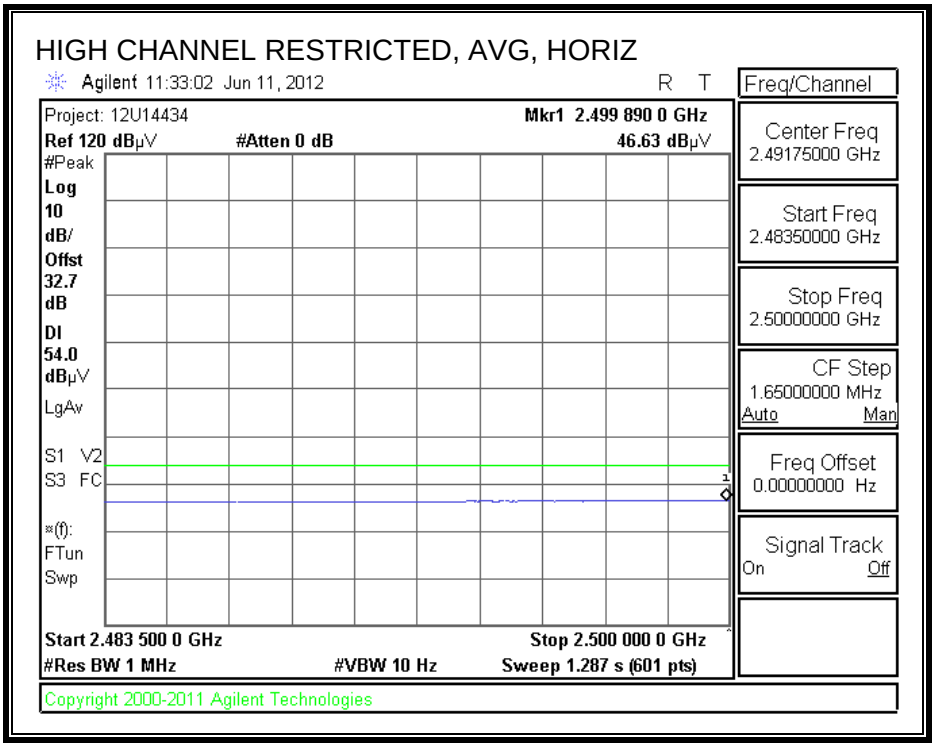
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



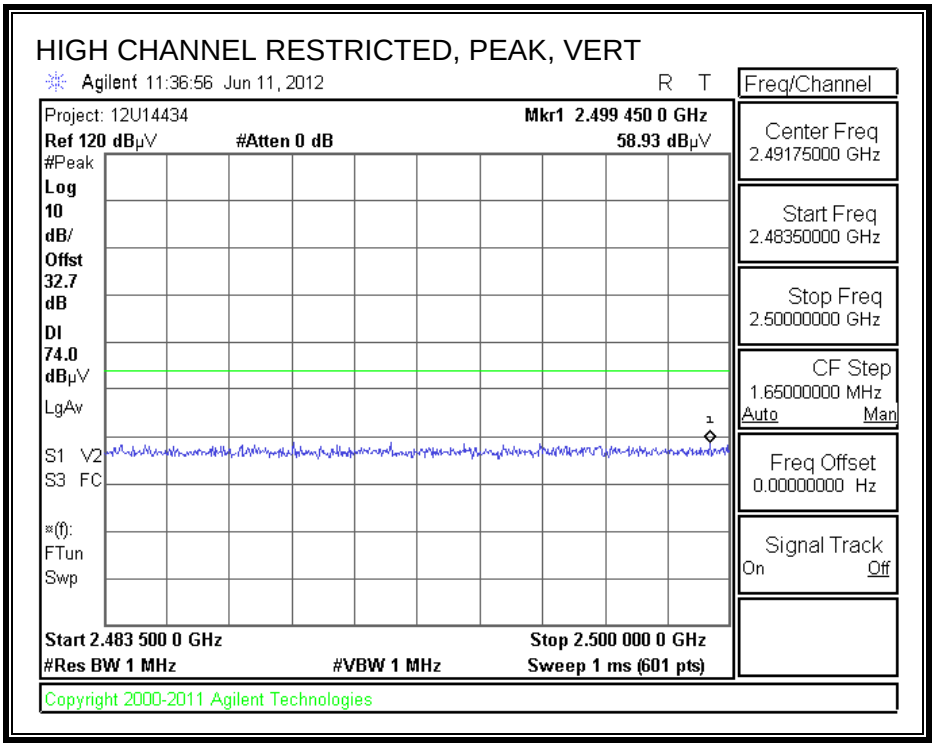


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

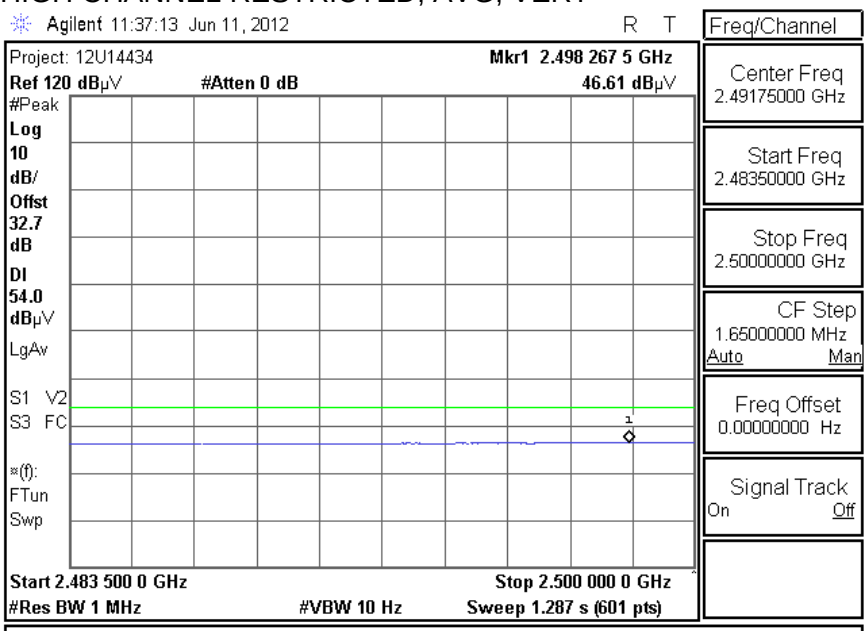




RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/11/12
Test Engineer: Doug Anderson
Configuration: EUT w/Integral Antenna and Support Equipment
Mode: Continuous Tx / 11b

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

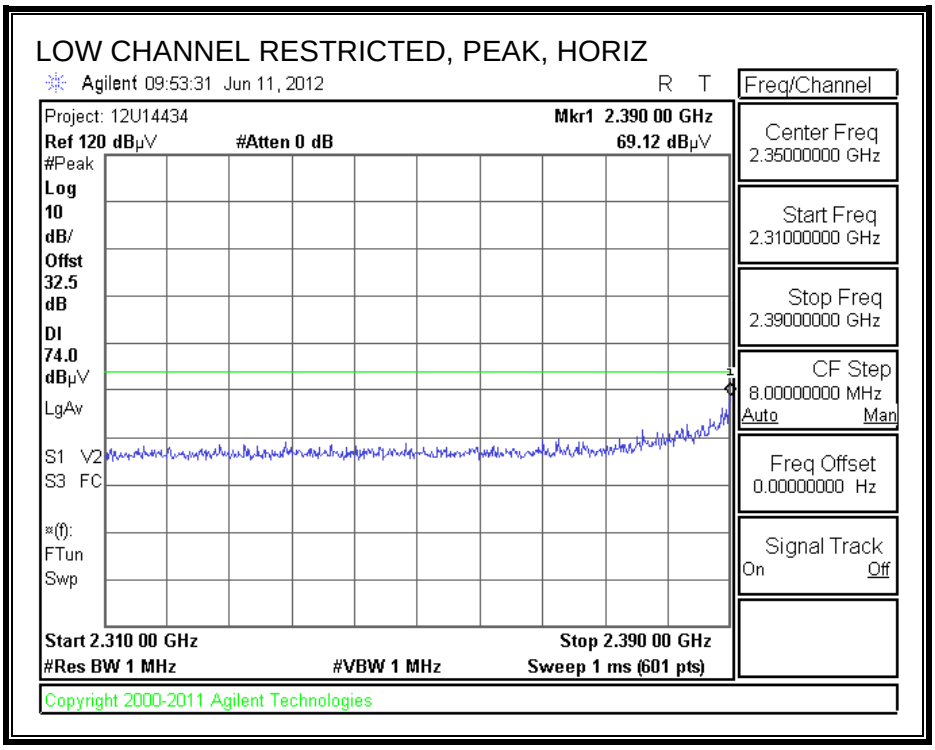
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: Horizontal															
4.824	3.0	50.7	45.9	33.4	6.2	-35.5	0.0	0.0	54.8	50.0	74	54	-19.2	-4.0	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	45.8	41.9	33.4	6.2	-35.5	0.0	0.0	49.9	46.1	74	54	-24.1	-7.9	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	59.8	47.4	33.5	6.2	-35.5	0.0	0.0	64.0	51.6	74	54	-10.0	-2.4	Pwr Setting= 37
7.311	3.0	56.8	40.3	35.7	8.4	-35.4	0.0	0.0	65.5	48.9	74	54	-8.5	-5.1	Pwr Setting= 37
Mid Channel: Vertical															
4.874	3.0	53.4	45.7	33.5	6.2	-35.5	0.0	0.0	57.6	49.9	74	54	-16.4	-4.1	Pwr Setting= 37
7.311	3.0	49.5	35.0	35.7	8.4	-35.4	0.0	0.0	58.2	43.6	74	54	-15.8	-10.4	Pwr Setting= 37
High Channel: Horizontal															
4.924	3.0	52.5	47.8	33.5	6.3	-35.5	0.0	0.0	56.8	52.1	74	54	-17.2	-1.9	Pwr Setting= 28
7.386	3.0	42.9	29.6	35.8	8.4	-35.5	0.0	0.0	51.7	38.4	74	54	-22.3	-15.6	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	50.1	45.5	33.5	6.3	-35.5	0.0	0.0	54.4	49.8	74	54	-19.6	-4.2	Pwr Setting= 28
7.386	3.0	41.36	28.3	35.8	8.4	-35.5	0.0	0.0	50.1	37.0	74	54	-23.9	-17.0	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

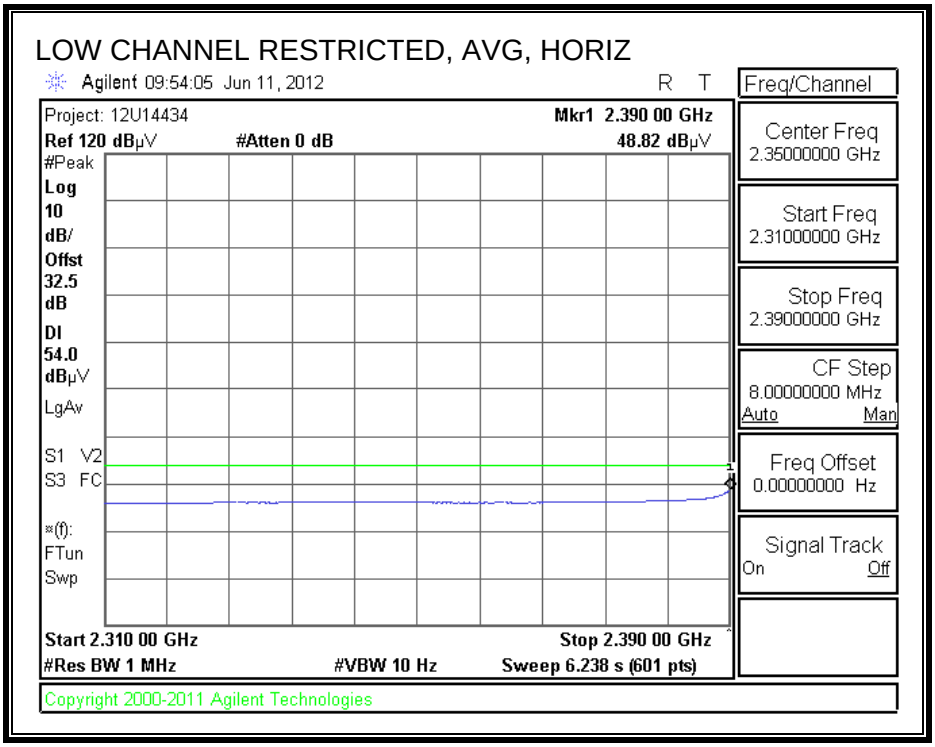
Rev. 11.10.11

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		

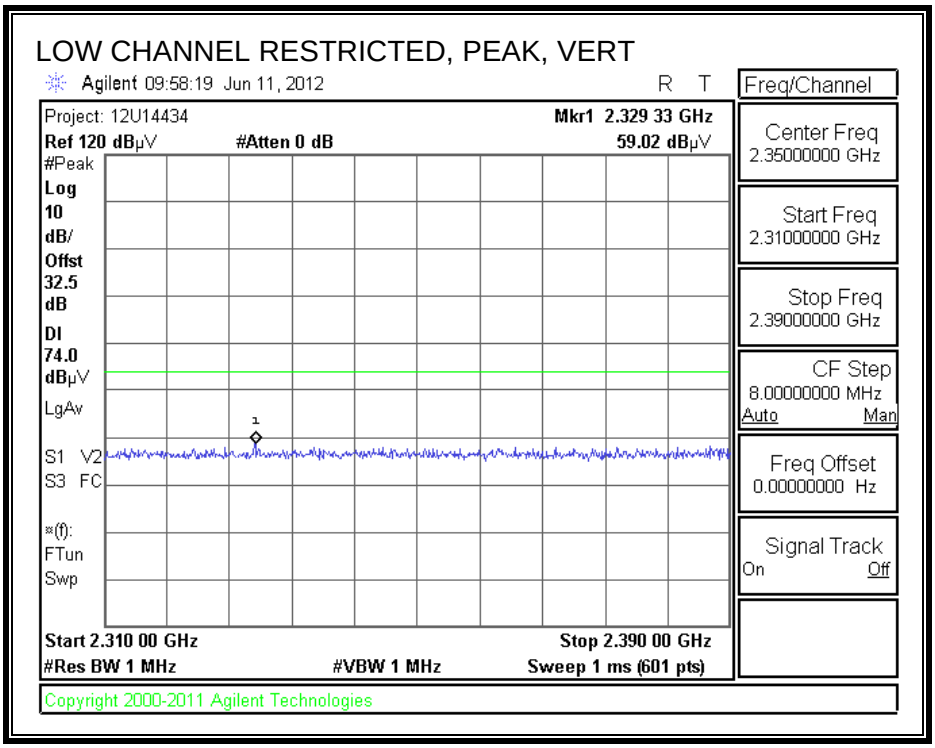
7.4.2. TX ABOVE 1 GHz FOR 802.11g MODE (INTEGRAL ANTENNA)

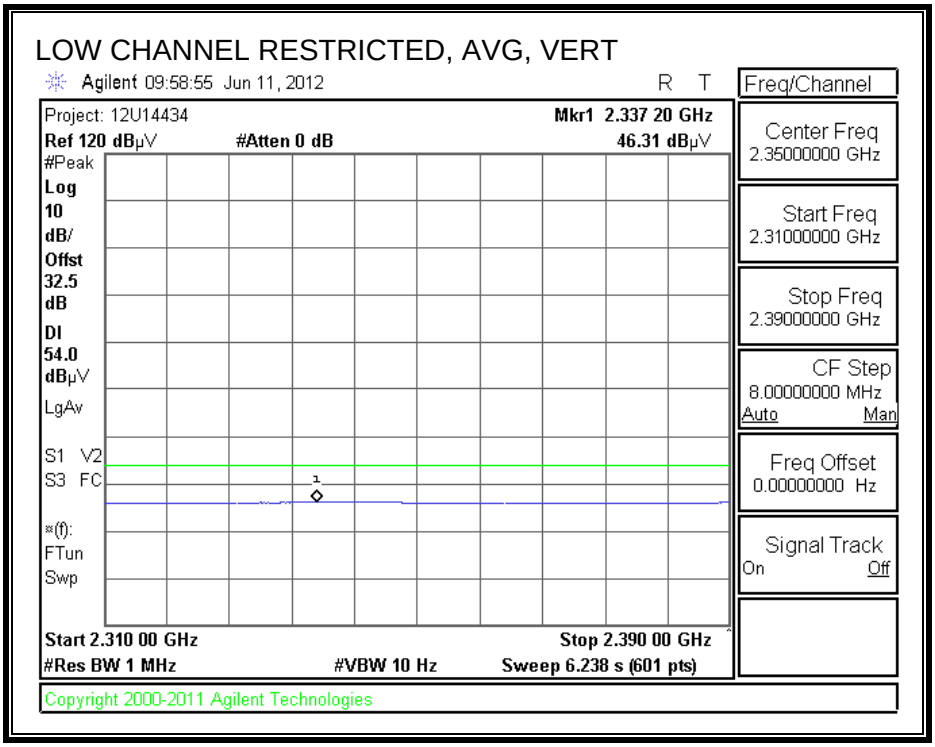
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



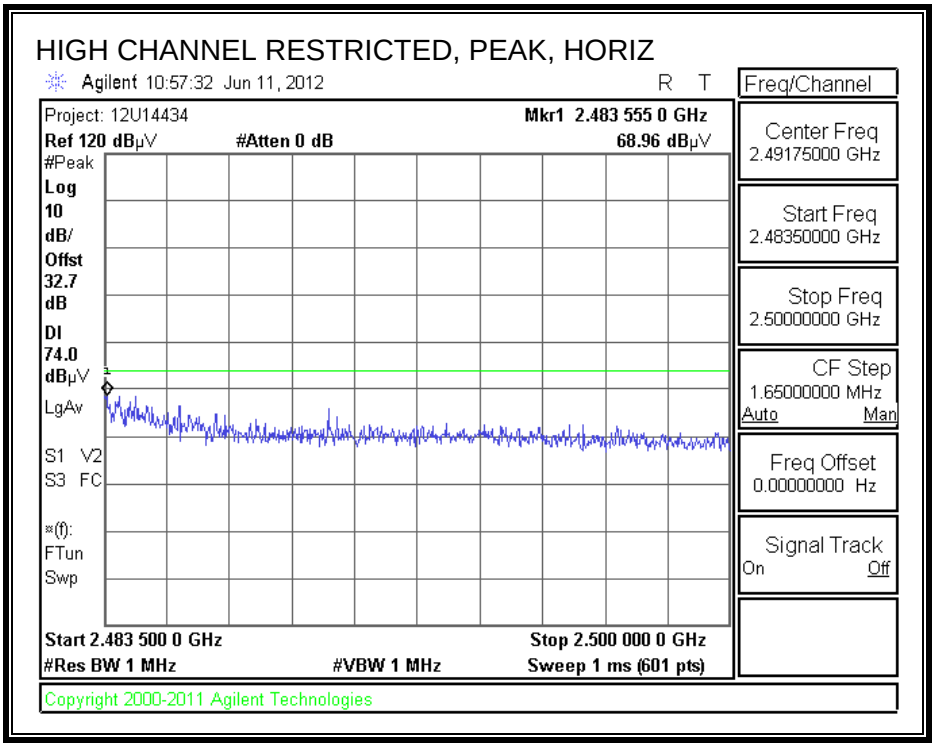


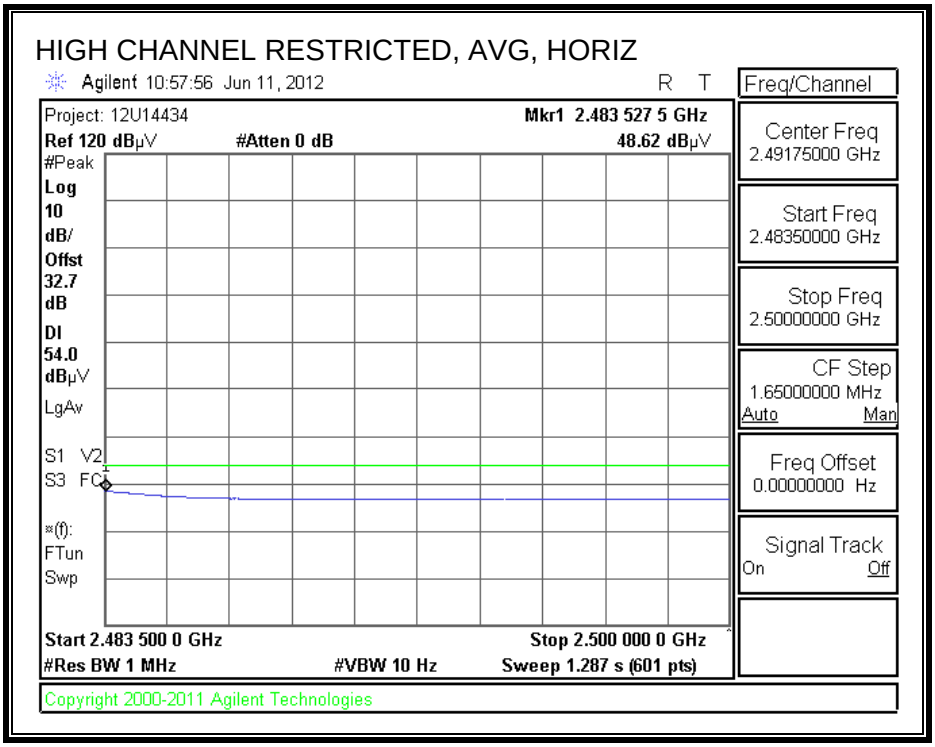
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



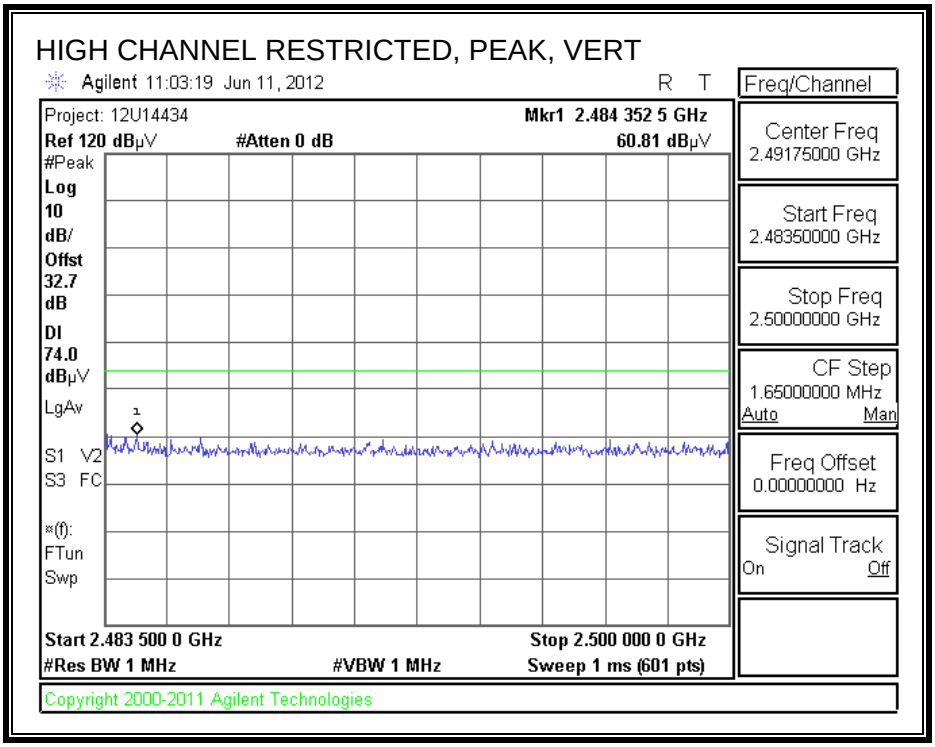


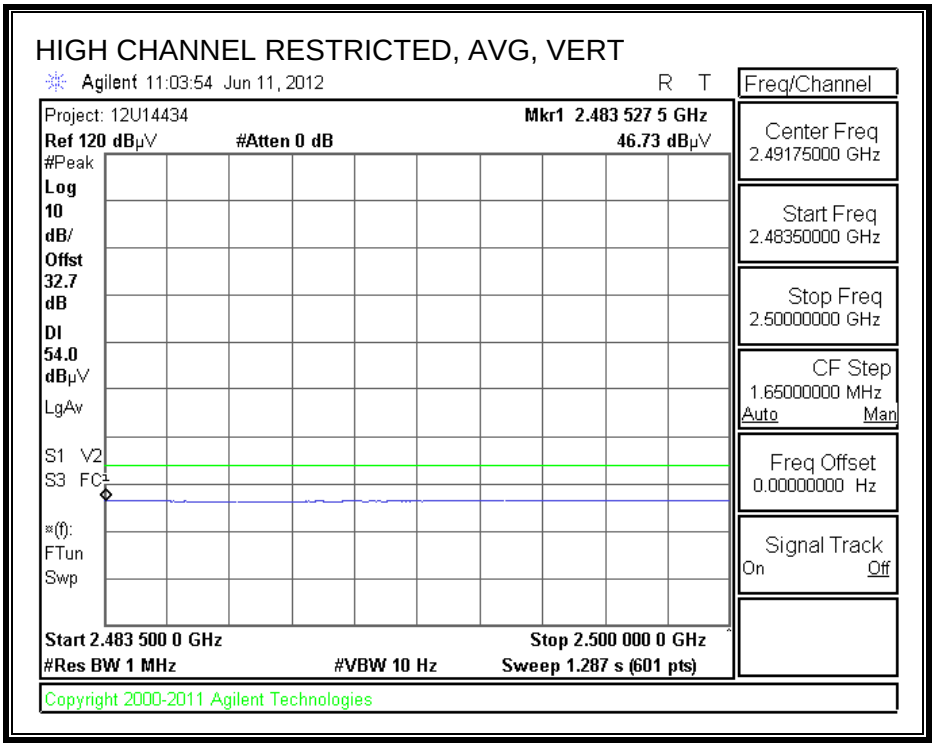
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/12/12
Test Engineer: Doug Anderson
Configuration: EUT w/Integral Antenna and Support Equipment
Mode: Continuous Tx / 11g

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

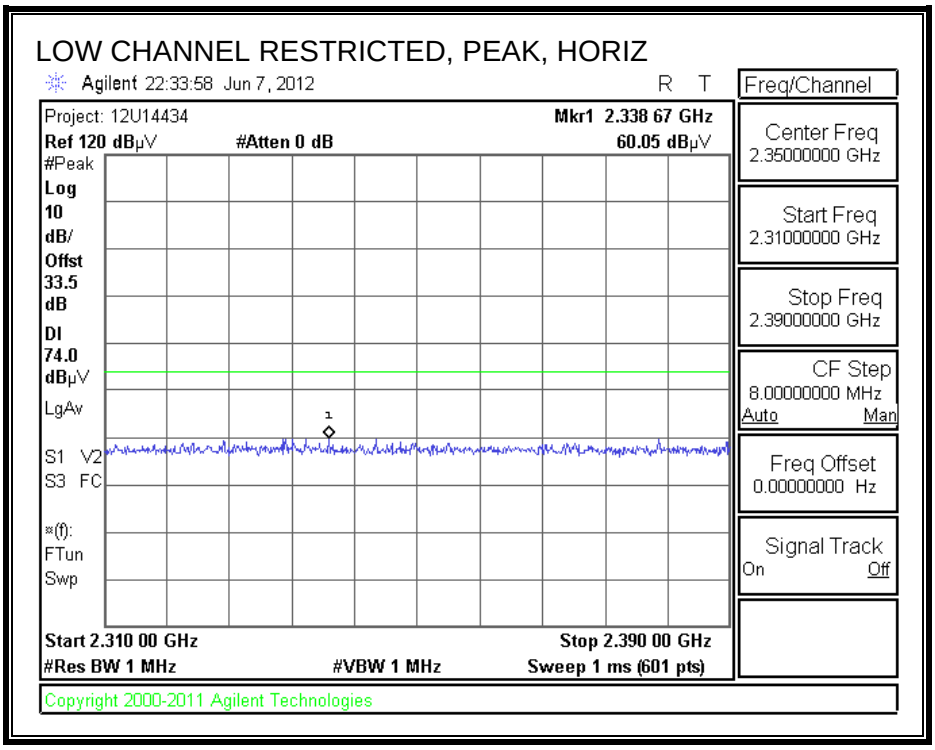
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: Horizontal															
4.824	3.0	48.3	41.6	33.4	6.2	-35.5	0.0	0.0	52.5	45.7	74	54	-21.5	-8.3	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	48.9	41.3	33.4	6.2	-35.5	0.0	0.0	53.1	45.4	74	54	-20.9	-8.6	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	52.0	42.8	33.5	6.2	-35.5	0.0	0.0	56.2	47.0	74	54	-17.8	-7.0	Pwr Setting= 32
7.311	3.0	57.3	37.9	35.7	8.4	-35.4	0.0	0.0	66.0	46.6	74	54	-8.0	-7.4	
Mid Channel: Vertical															
4.874	3.0	52.5	41.3	33.5	6.2	-35.5	0.0	0.0	56.7	45.5	74	54	-17.3	-8.5	Pwr Setting= 32
7.311	3.0	55.6	36.5	35.7	8.4	-35.4	0.0	0.0	64.2	45.1	74	54	-9.8	-8.9	
High Channel: Horizontal															
4.924	3.0	50.6	42.6	33.5	6.3	-35.5	0.0	0.0	54.9	46.9	74	54	-19.1	-7.1	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	46.1	39.7	33.5	6.3	-35.5	0.0	0.0	50.4	44.1	74	54	-23.6	-9.9	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

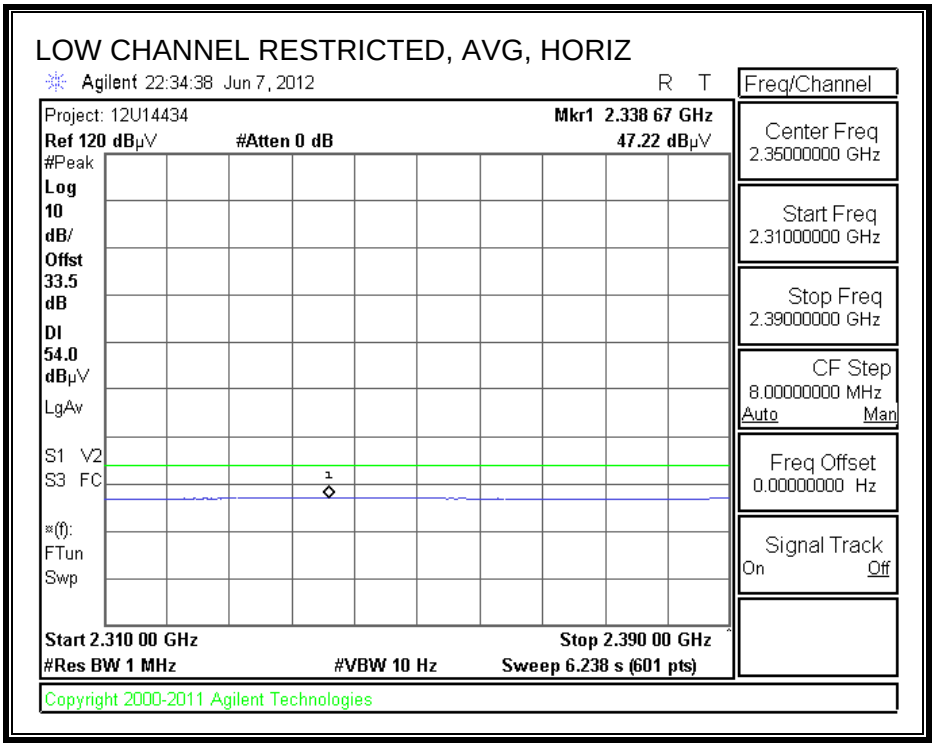
Rev. 11.10.11

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		

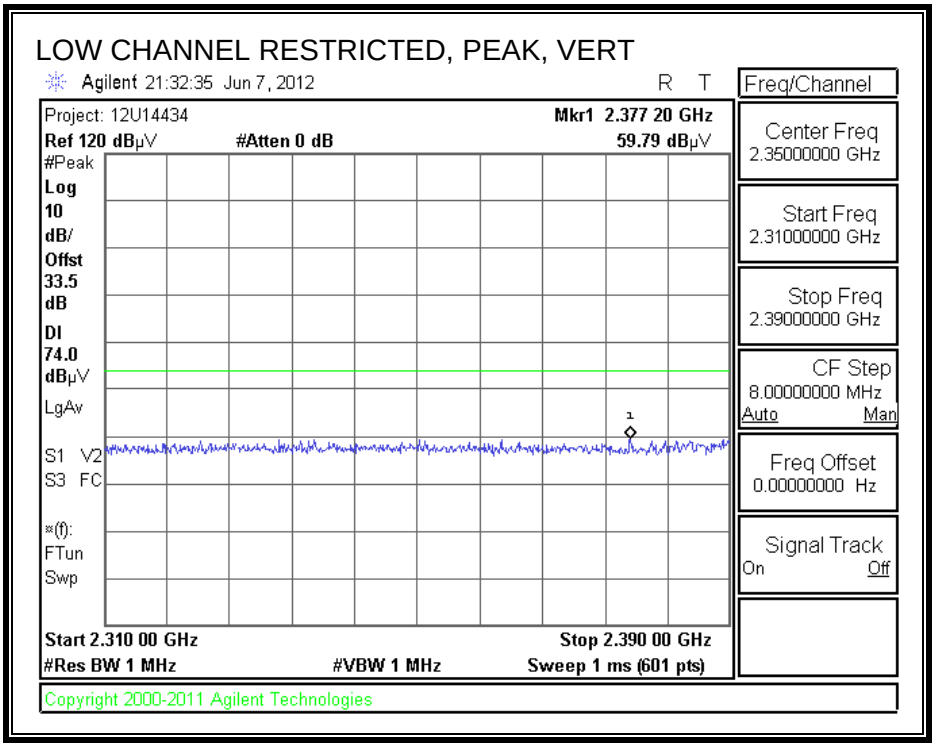
TX ABOVE 1 GHz FOR 802.11b MODE (DIPOLE ANTENNA)

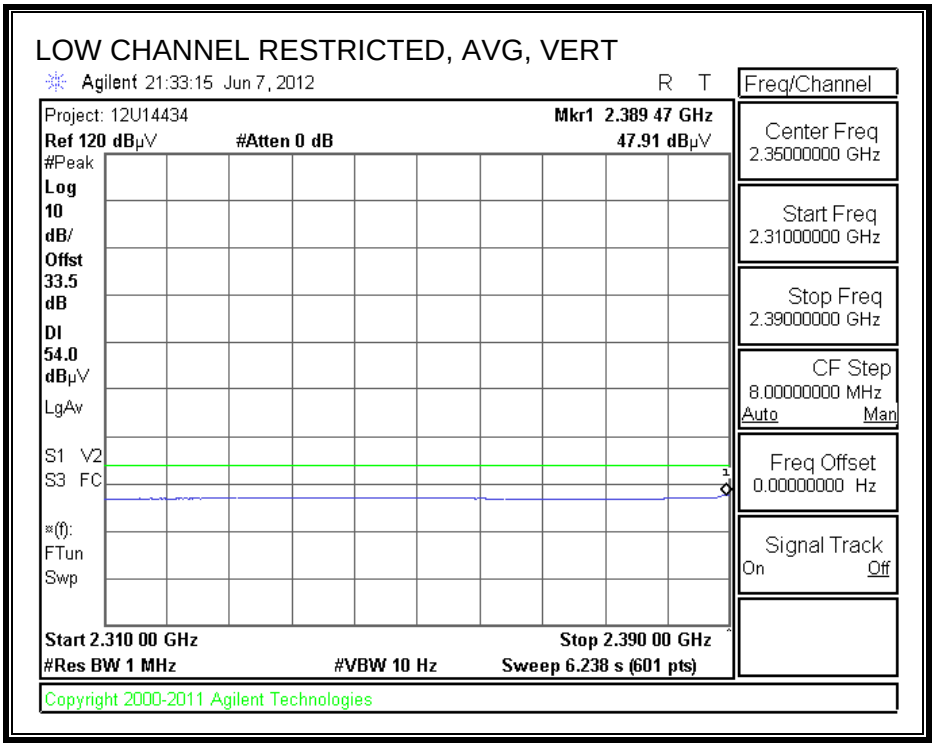
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



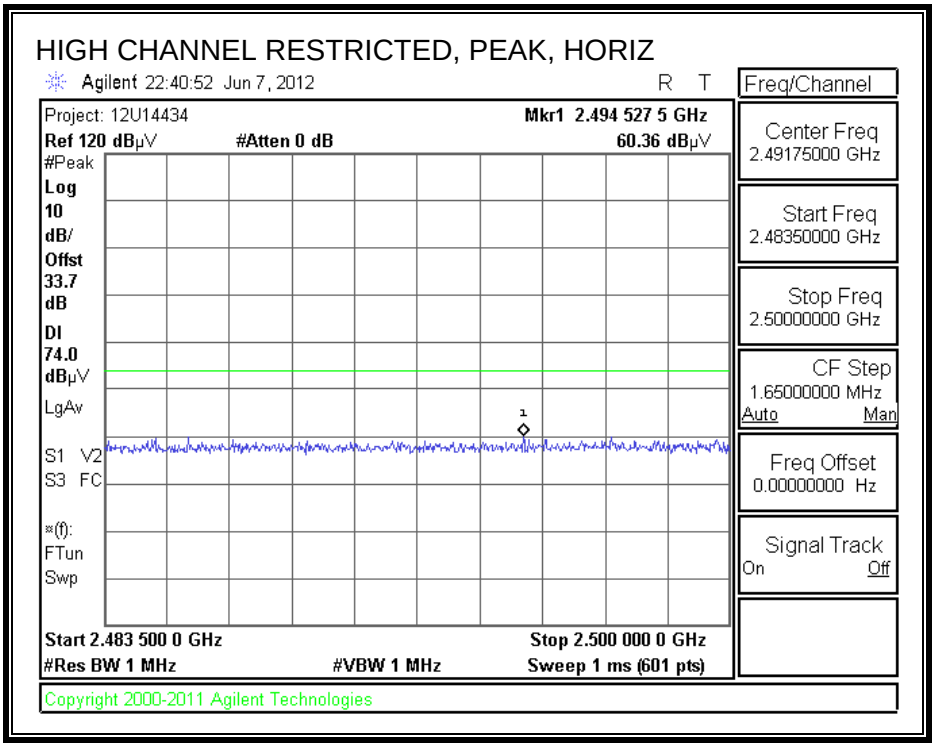


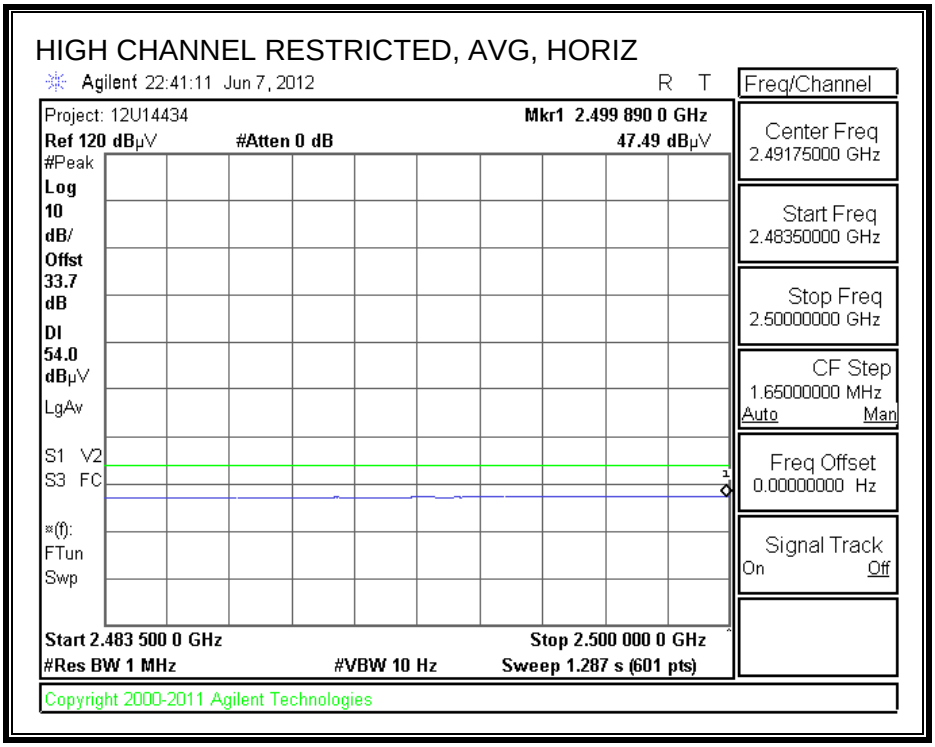
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



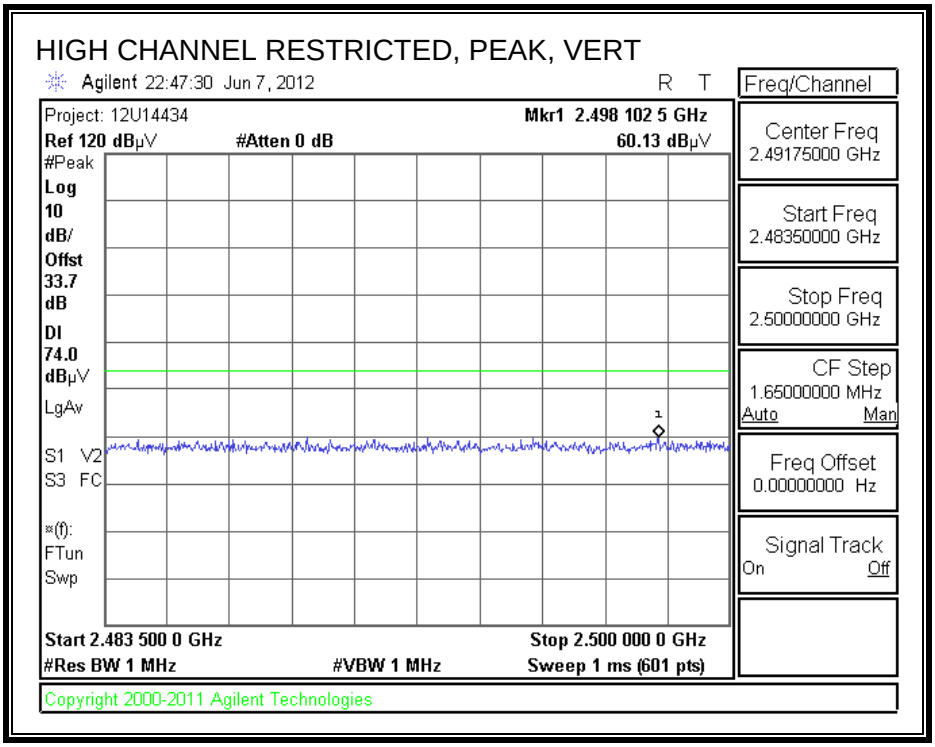


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

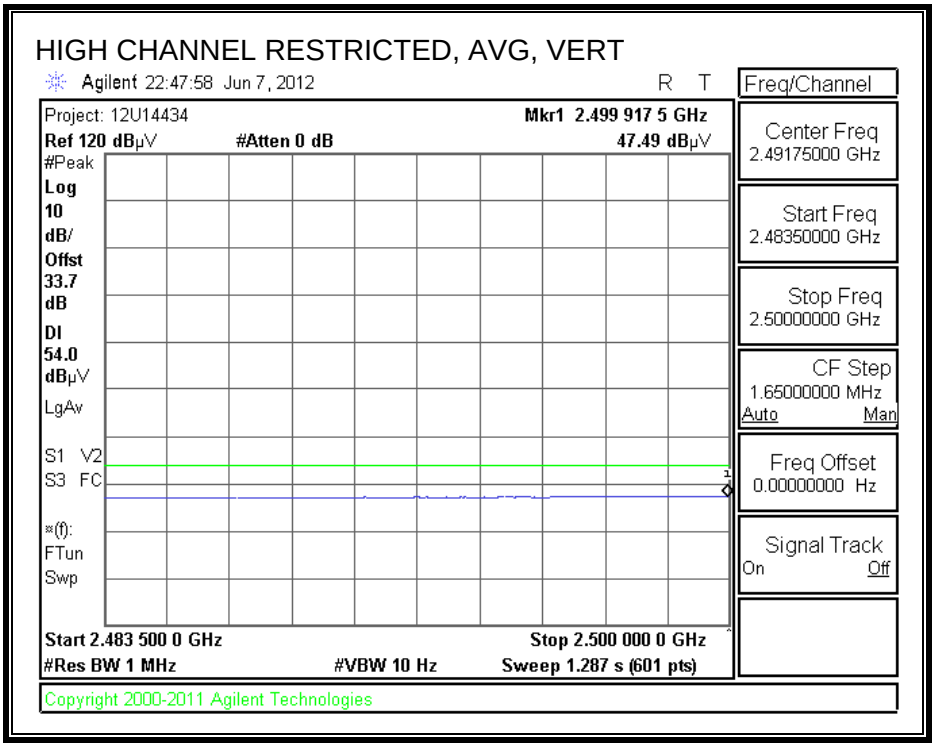




RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/07/12
Test Engineer: Doug Anderson
Configuration: EUT w/C2M2 Dipole Antenna and Support Equipment
Mode: Continuous Tx / 11b

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

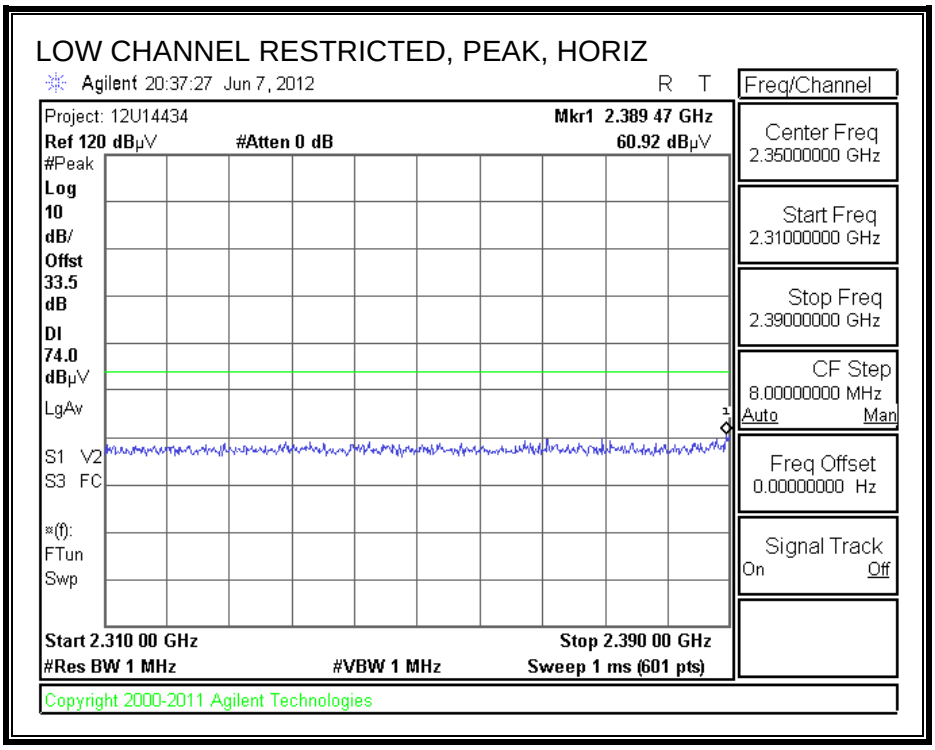
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: Horizontal															
4.824	3.0	44.4	38.0	33.4	6.2	-35.5	0.0	0.0	48.5	42.1	74	54	-25.5	-11.9	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	47.6	44.4	33.4	6.2	-35.5	0.0	0.0	51.7	48.5	74	54	-22.3	-5.5	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	45.7	37.9	33.5	6.2	-35.5	0.0	0.0	49.9	42.1	74	54	-24.1	-11.9	Pwr Setting= 37
7.311	3.0	46.9	32.9	35.7	8.4	-35.4	0.0	0.0	55.5	41.5	74	54	-18.5	-12.5	Pwr Setting= 37
Mid Channel: Vertical															
4.874	3.0	50.6	43.5	33.5	6.2	-35.5	0.0	0.0	54.8	47.8	74	54	-19.2	-6.2	Pwr Setting= 37
7.311	3.0	54.5	38.0	35.7	8.4	-35.4	0.0	0.0	63.1	46.6	74	54	-10.9	-7.4	Pwr Setting= 37
High Channel: Horizontal															
4.924	3.0	43.9	38.5	33.5	6.3	-35.5	0.0	0.0	48.2	42.8	74	54	-25.8	-11.2	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	48.0	43.7	33.5	6.3	-35.5	0.0	0.0	52.4	48.0	74	54	-21.6	-6.0	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

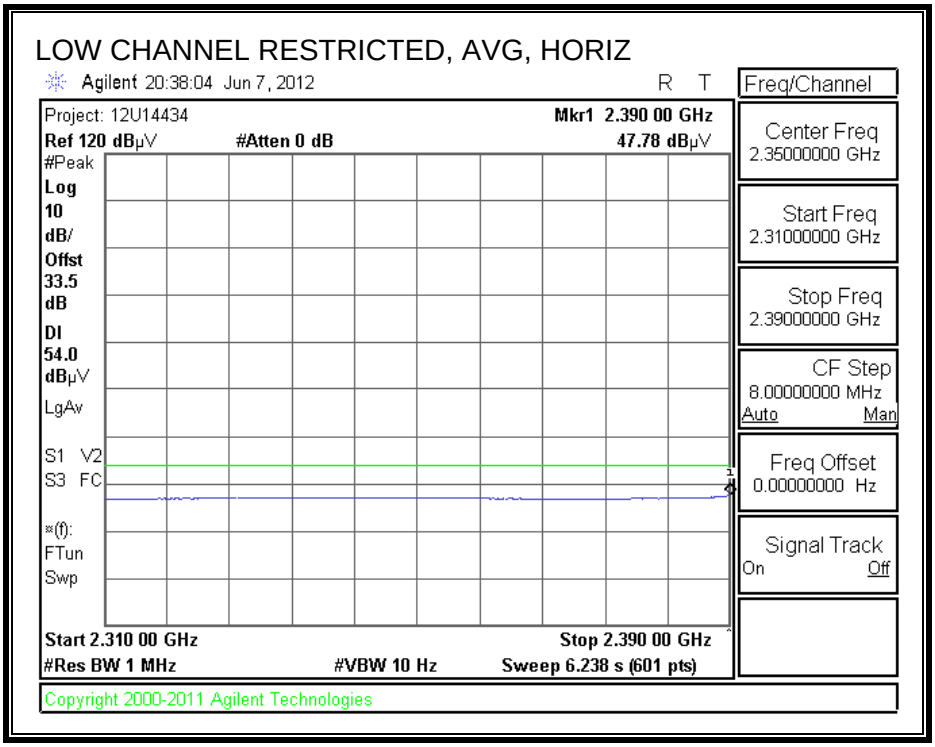
Rev. 11.10.11

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		

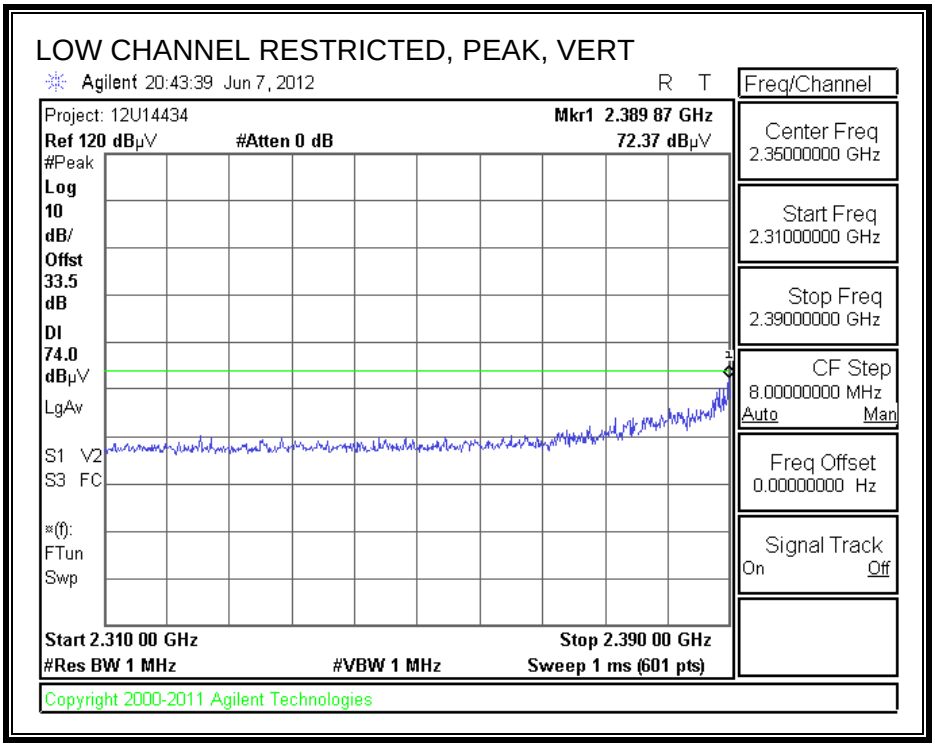
7.4.3. TX ABOVE 1 GHz FOR 802.11g MODE (DIPOLE ANTENNA)

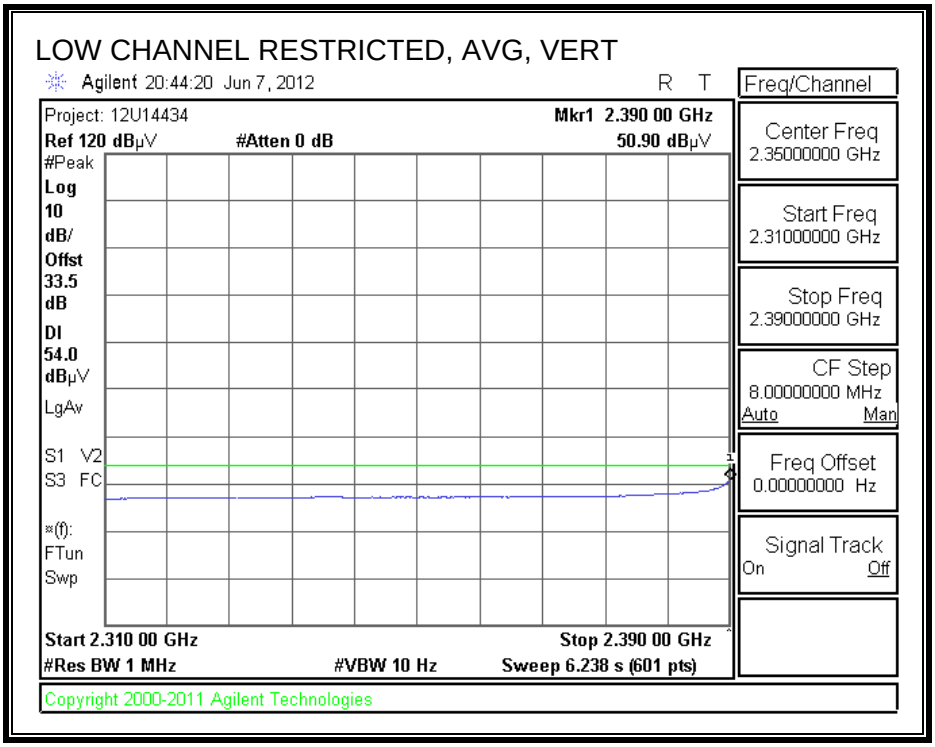
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



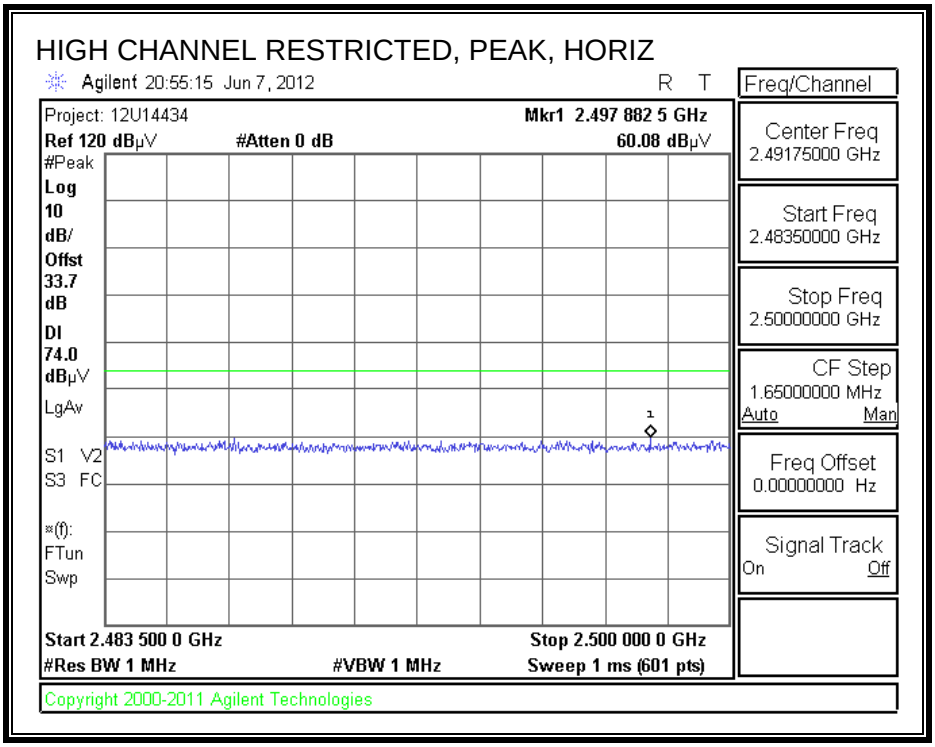


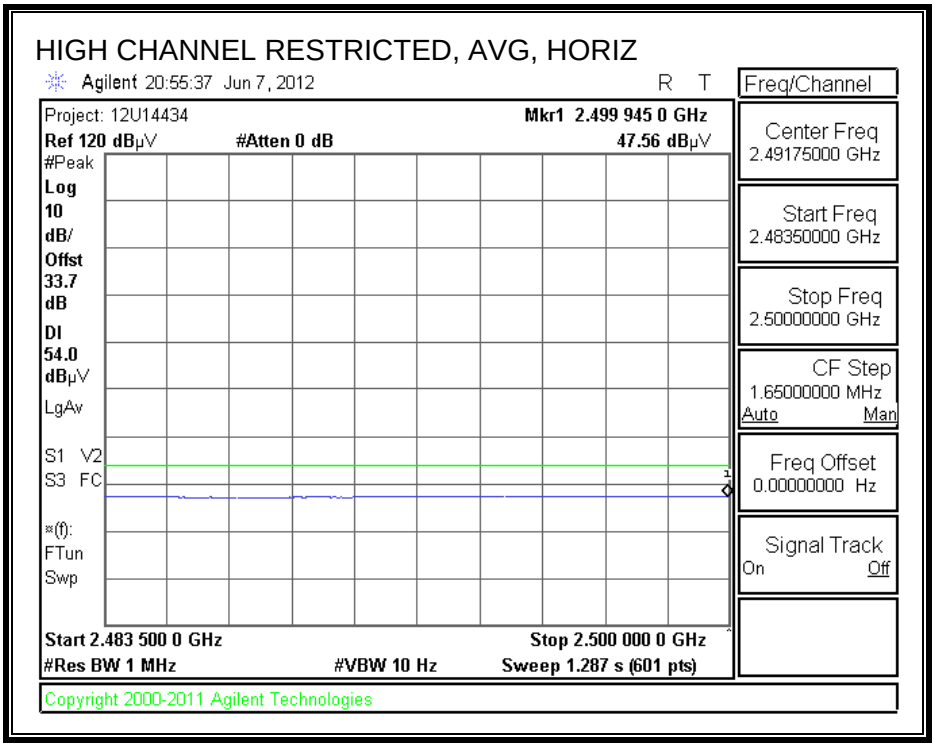
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



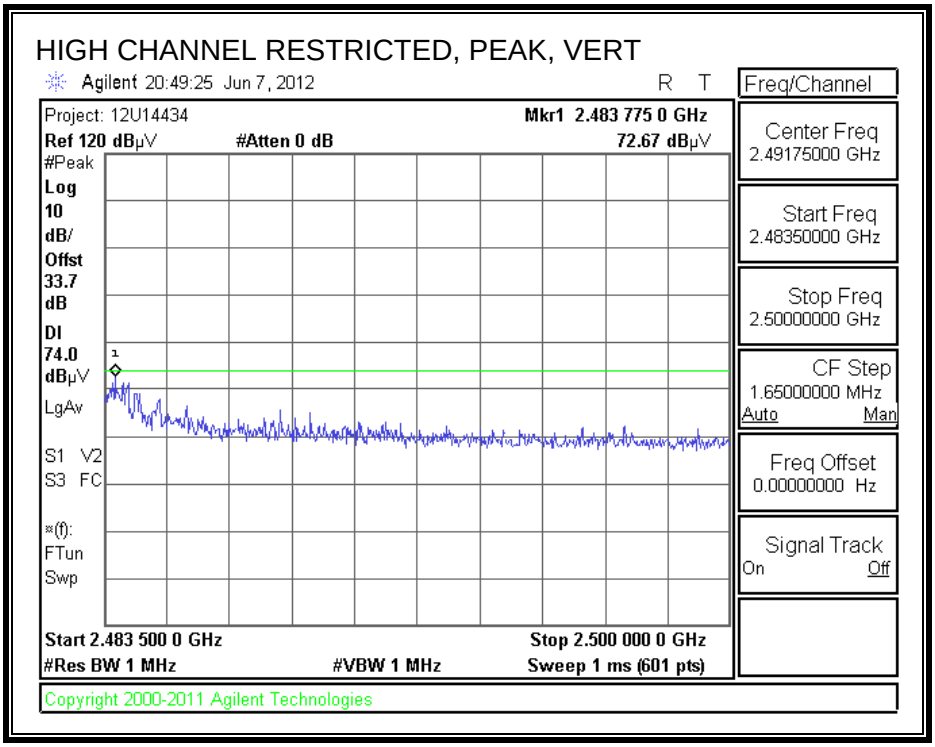


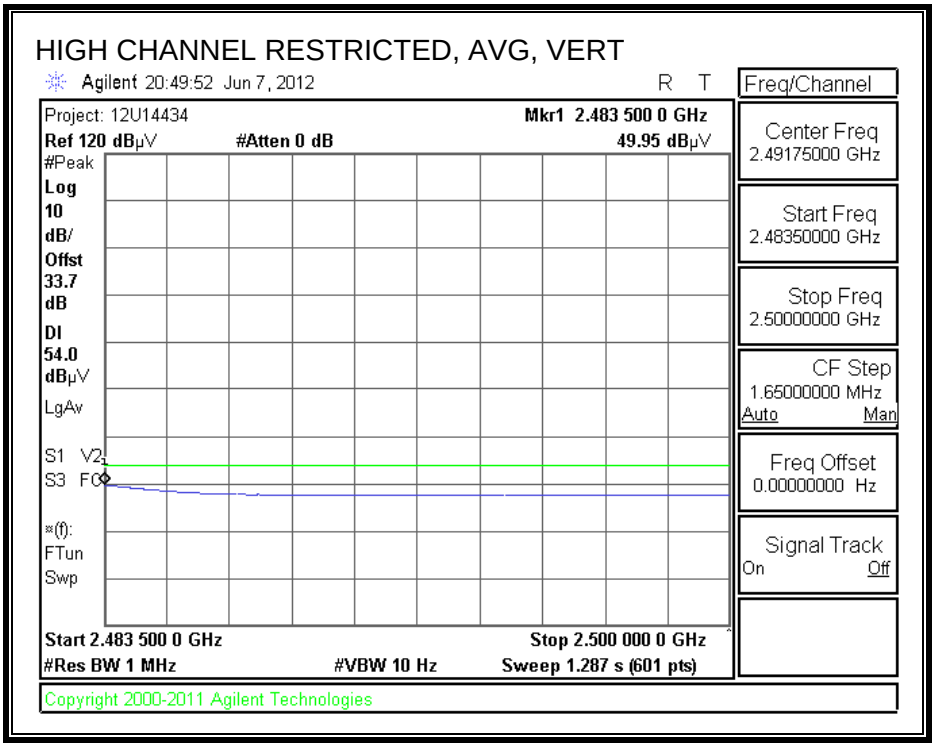
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/07/12
Test Engineer: Doug Anderson
Configuration: EUT w/C2M2 Dipole Antenna and Support Equipment
Mode: Continuous Tx / 11g

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: Horizontal															
4.824	3.0	42.3	35.9	33.4	6.2	-35.5	0.0	0.0	46.5	40.1	74	54	-27.5	-13.9	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	47.4	42.0	33.4	6.2	-35.5	0.0	0.0	51.5	46.1	74	54	-22.5	-7.9	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	42.4	35.2	33.5	6.2	-35.5	0.0	0.0	46.6	39.4	74	54	-27.4	-14.6	Pwr Setting= 32
7.311	3.0	49.7	30.4	35.7	8.4	-35.4	0.0	0.0	58.4	39.1	74	54	-15.6	-14.9	Pwr Setting= 32
Mid Channel: Vertical															
4.874	3.0	48.7	42.7	33.5	6.2	-35.5	0.0	0.0	52.9	46.9	74	54	-21.1	-7.1	Pwr Setting= 32
7.311	3.0	55.4	35.9	35.7	8.4	-35.4	0.0	0.0	64.0	44.5	74	54	-10.0	-9.5	Pwr Setting= 32
High Channel: Horizontal															
4.924	3.0	43.0	37.5	33.5	6.3	-35.5	0.0	0.0	47.4	41.8	74	54	-26.6	-12.2	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	47.1	43.6	33.5	6.3	-35.5	0.0	0.0	51.5	47.9	74	54	-22.5	-6.1	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

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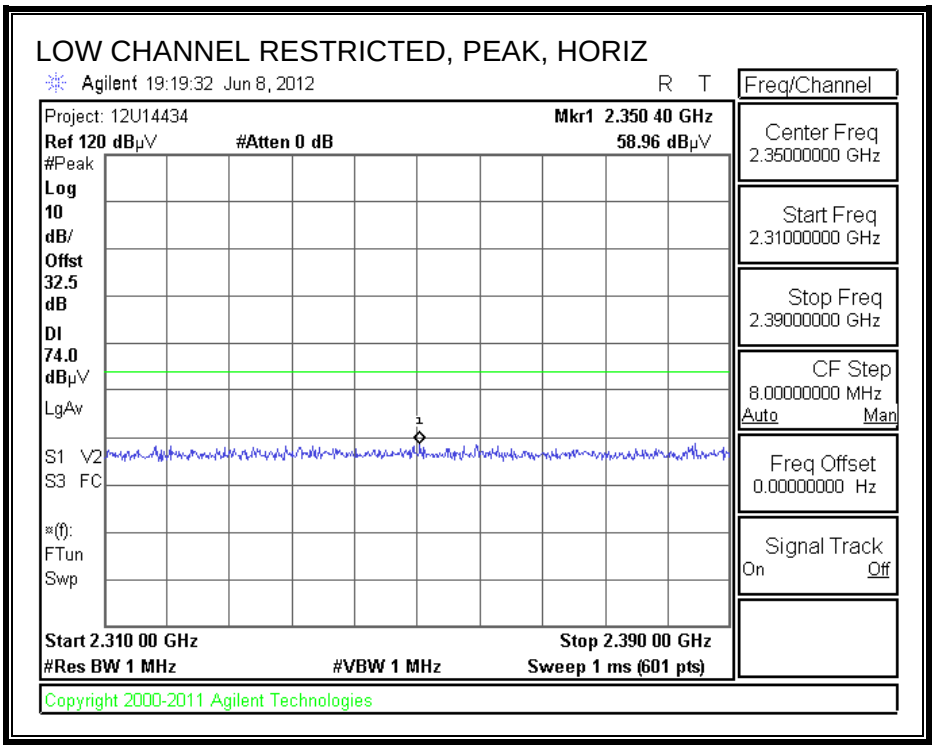
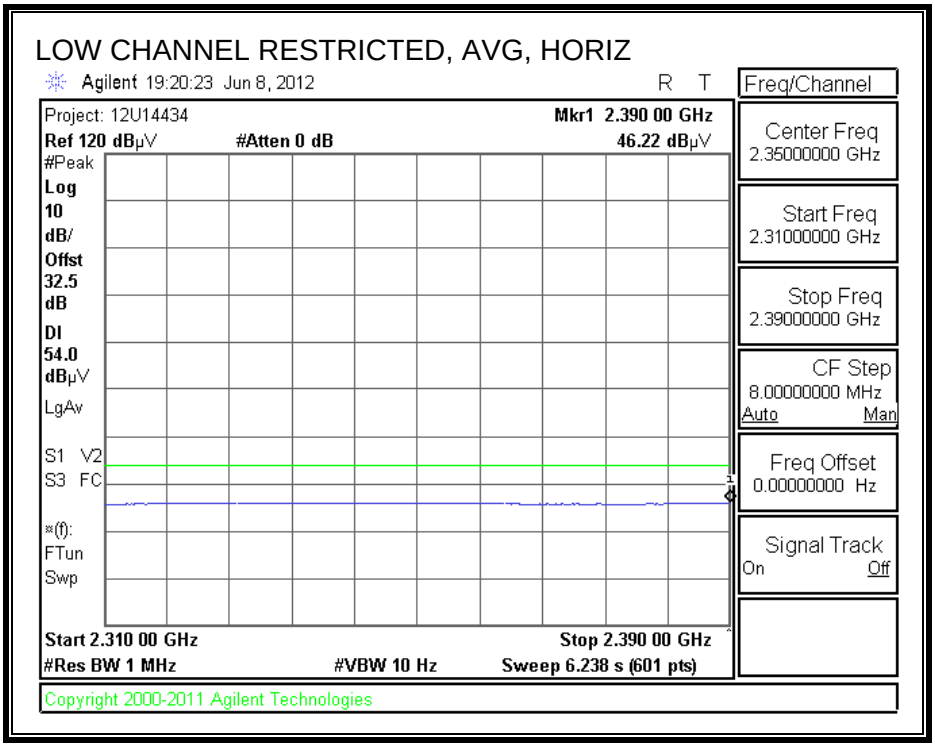
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

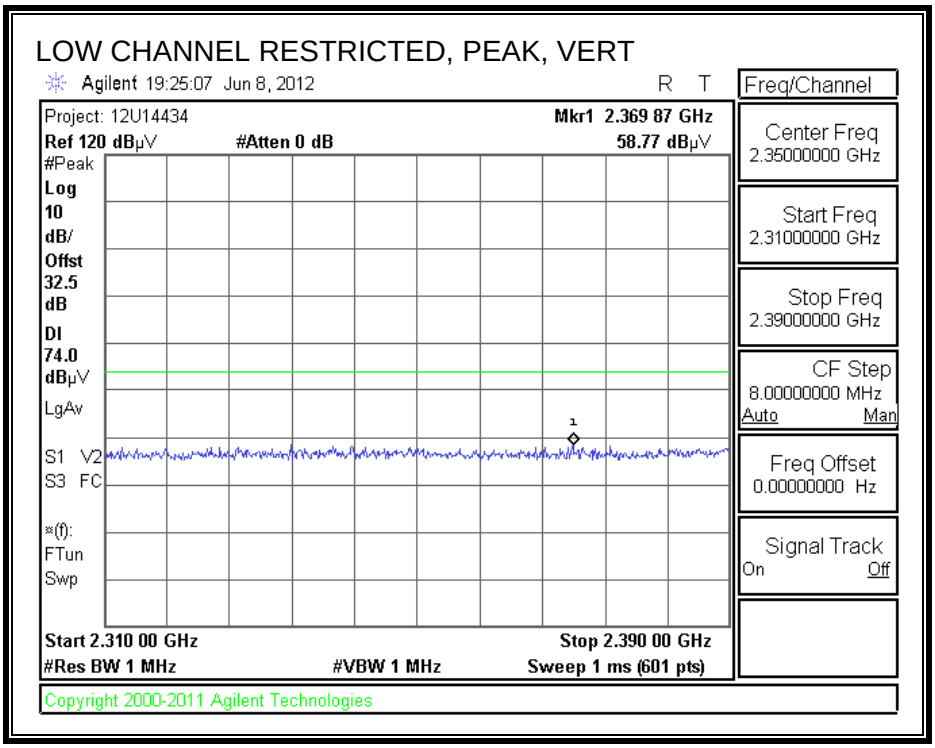
7.4.4. TX ABOVE 1 GHz FOR 802.11b MODE (PCBA ANTENNA)

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

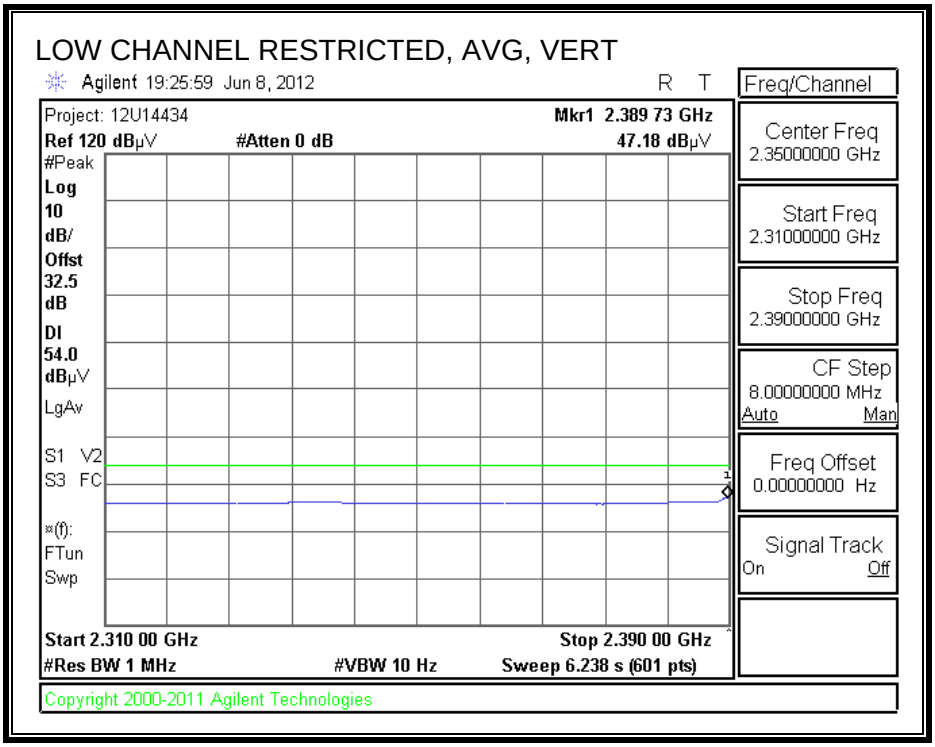




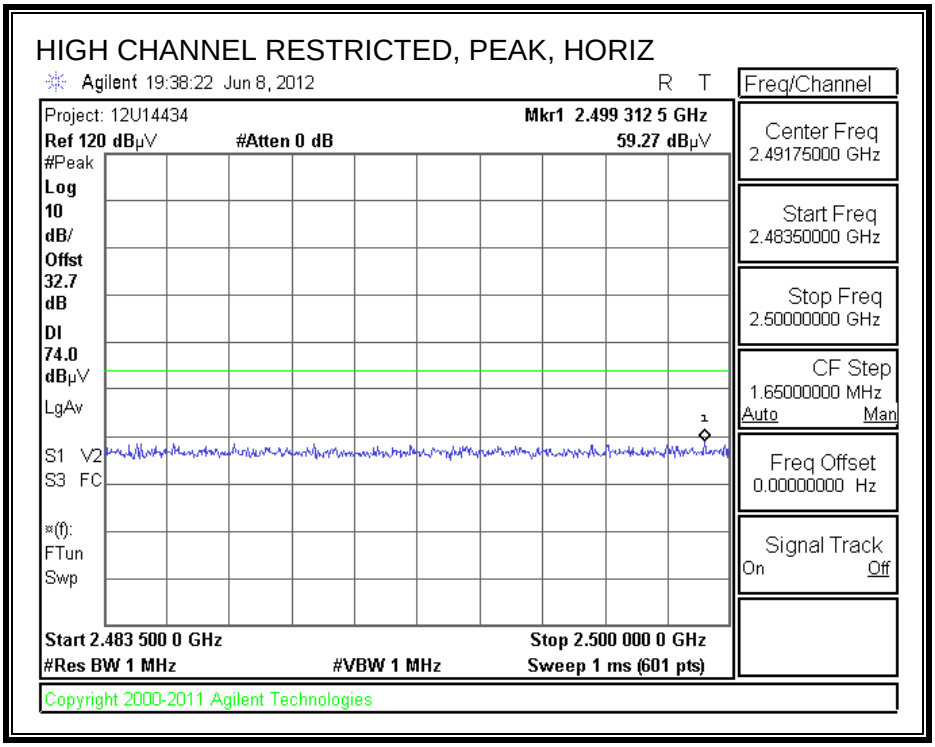
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

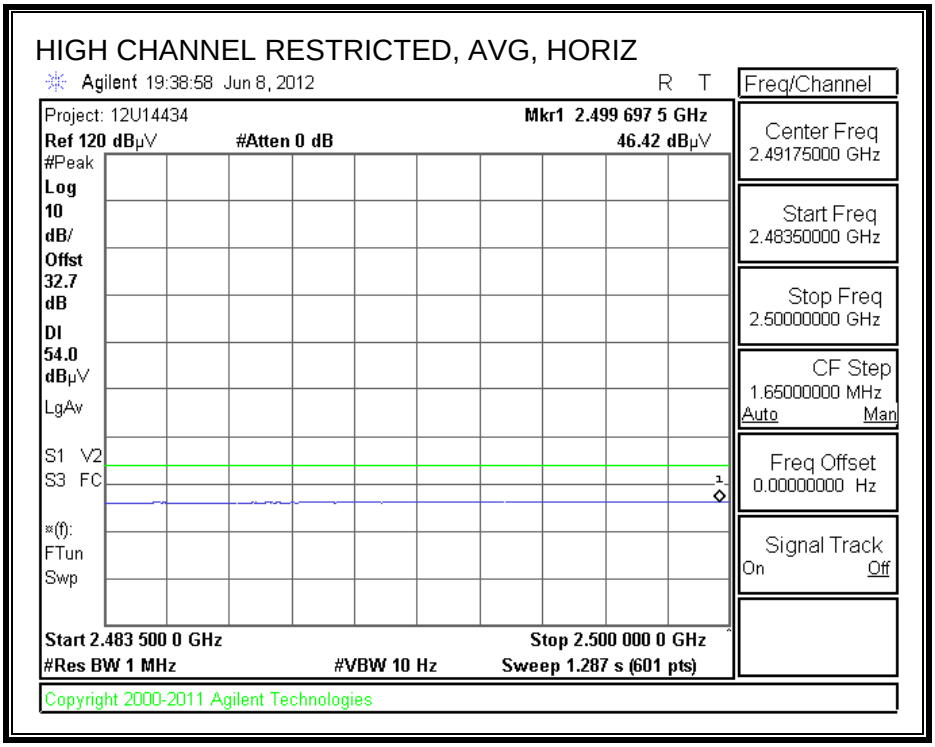


LOW CHANNEL RESTRICTED, AVG, VERT

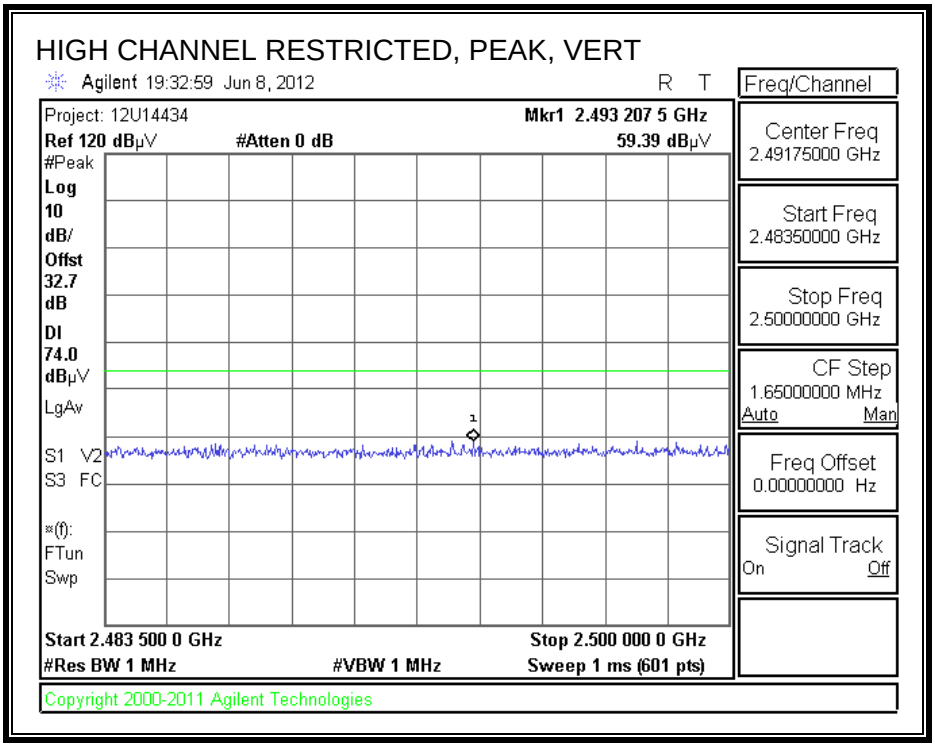


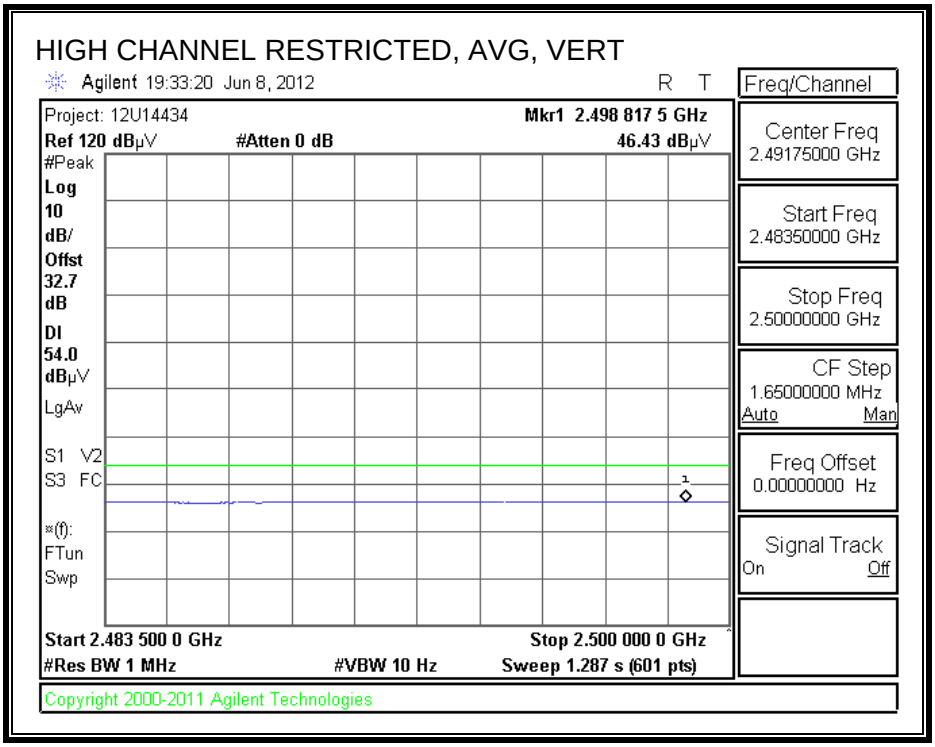
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/08/12
Test Engineer: Doug Anderson
Configuration: EUT w/P05 PCBA Antenna and Support Equipment
Mode: Continuous Tx / 11b

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

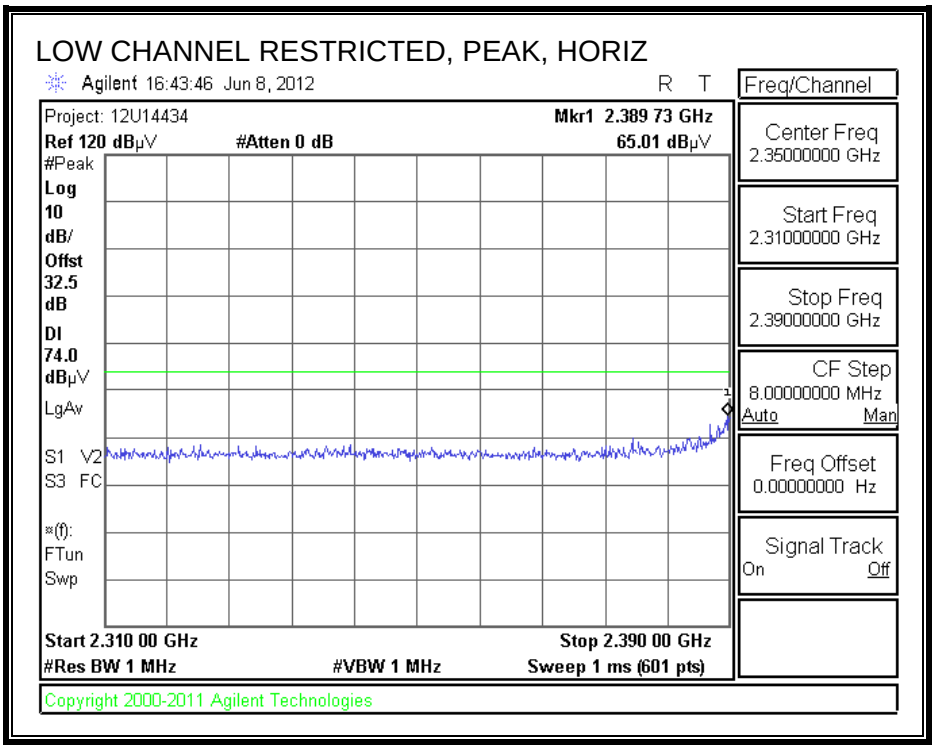
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: Horizontal															
4.824	3.0	44.1	36.8	33.4	6.2	-35.5	0.0	0.0	48.3	41.0	74	54	-25.7	-13.0	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	48.5	44.2	33.4	6.2	-35.5	0.0	0.0	52.7	48.3	74	54	-21.3	-5.7	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	46.1	43.7	33.5	6.2	-35.5	0.0	0.0	50.4	47.9	74	54	-23.6	-6.1	Pwr Setting= 37
7.311	3.0	45.4	31.9	35.7	8.4	-35.4	0.0	0.0	54.0	40.6	74	54	-20.0	-13.4	Pwr Setting= 37
Mid Channel: Vertical															
4.874	3.0	50.2	47.0	33.5	6.2	-35.5	0.0	0.0	54.4	51.3	74	54	-19.6	-2.7	Pwr Setting= 37
7.311	3.0	52.1	36.6	35.7	8.4	-35.4	0.0	0.0	60.8	45.2	74	54	-13.2	-8.8	Pwr Setting= 37
High Channel: Horizontal															
4.924	3.0	44.2	37.9	33.5	6.3	-35.5	0.0	0.0	48.5	42.2	74	54	-25.5	-11.8	Pwr Setting= 28
7.386	3.0	42.3	35.4	35.8	8.4	-35.5	0.0	0.0	51.1	44.2	74	54	-22.9	-9.8	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	48.4	45.6	33.5	6.3	-35.5	0.0	0.0	52.7	49.9	74	54	-21.3	-4.1	Pwr Setting= 28
7.386	3.0	41.0	27.1	35.8	8.4	-35.5	0.0	0.0	49.8	35.9	74	54	-24.2	-18.1	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

Rev. 11.10.11

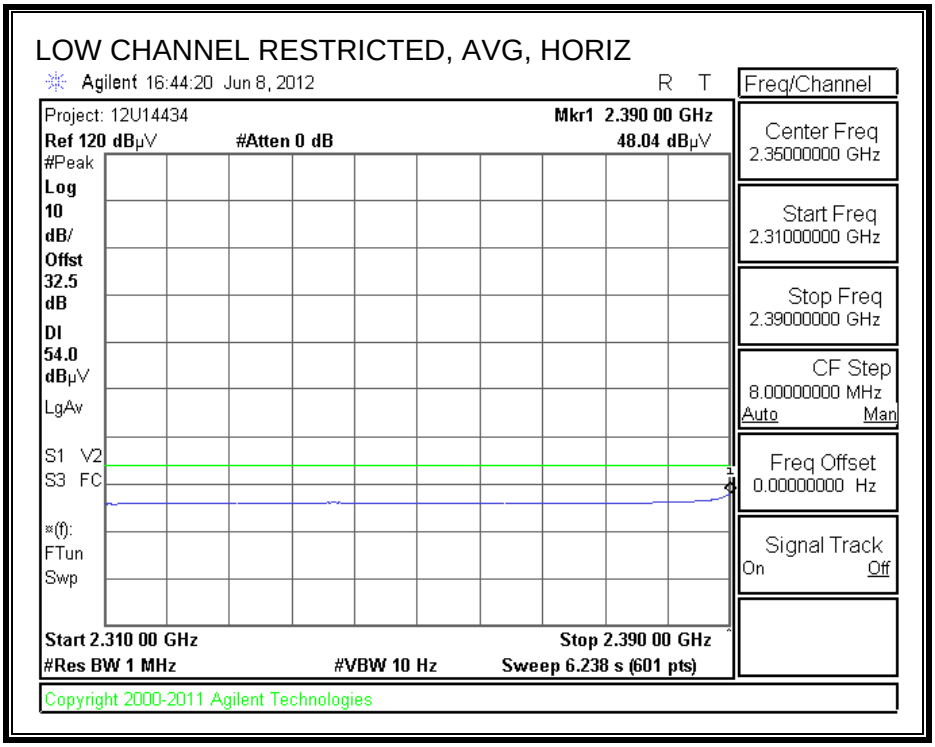
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

7.4.5. TX ABOVE 1 GHz FOR 802.11g MODE (PCBA ANTENNA)

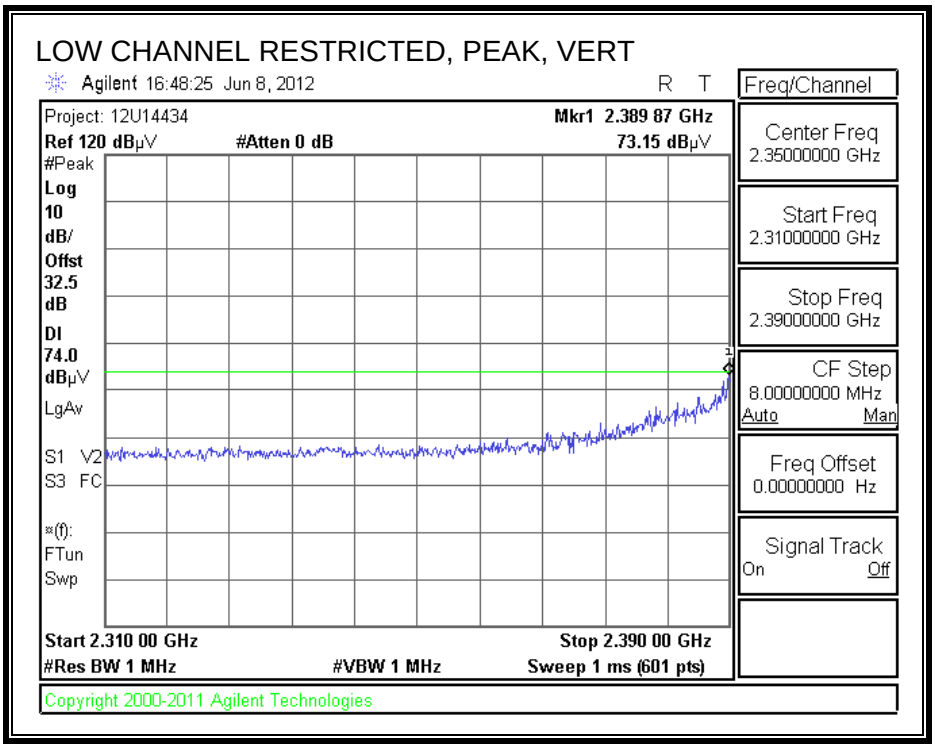
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

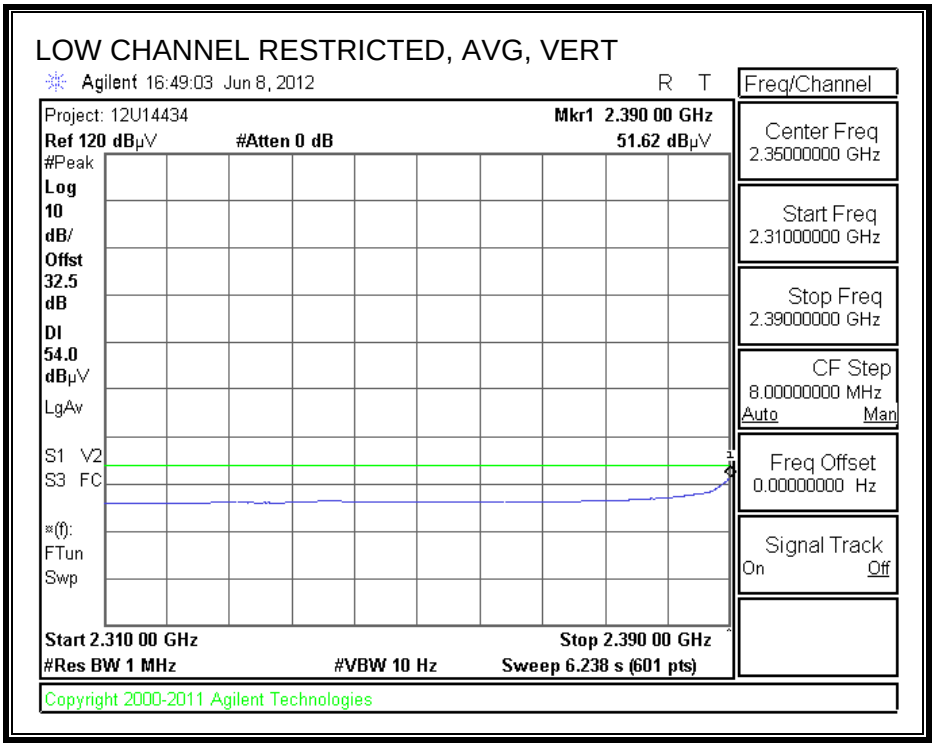


LOW CHANNEL RESTRICTED, AVG, HORIZ

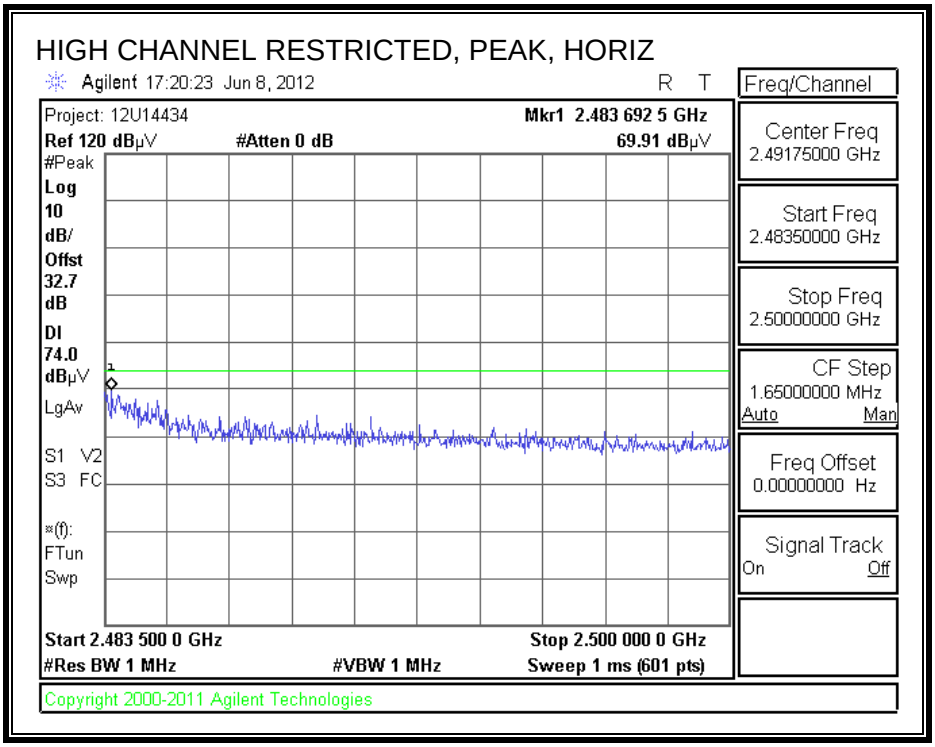


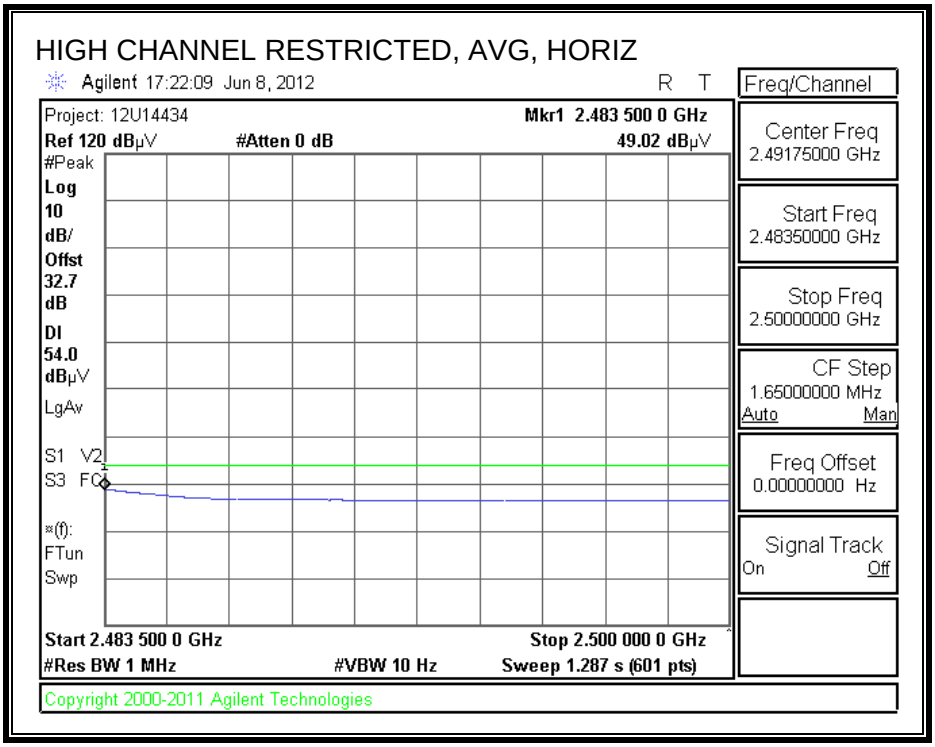
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



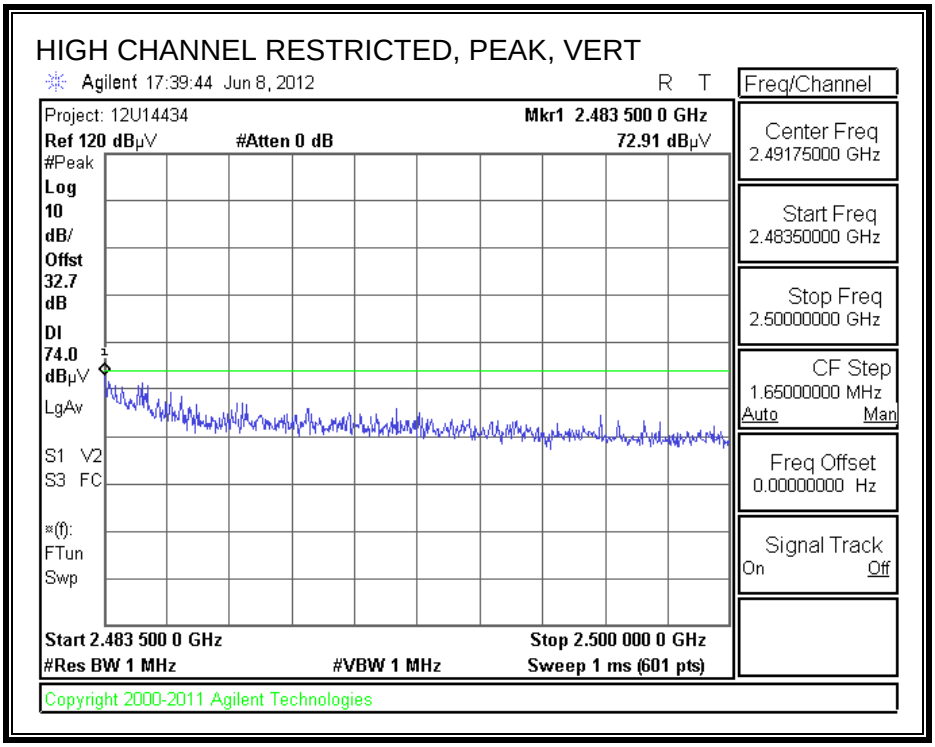


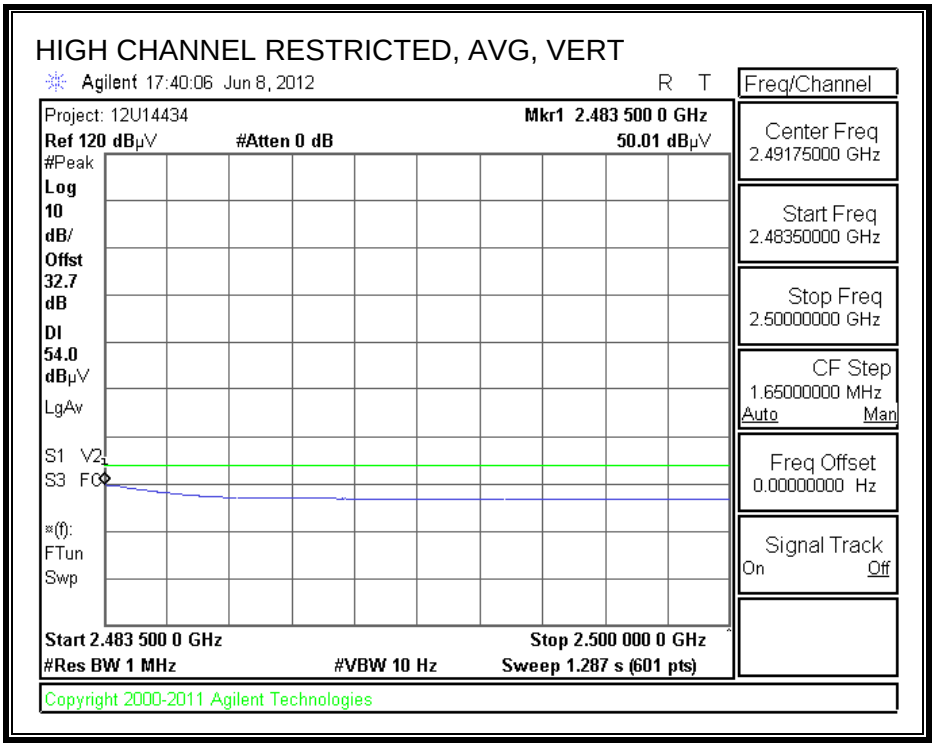
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/11/12
Test Engineer: Doug Anderson
Configuration: EUT w/P05 PCBA Antenna and Support Equipment
Mode: Continuous Tx / 11g

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

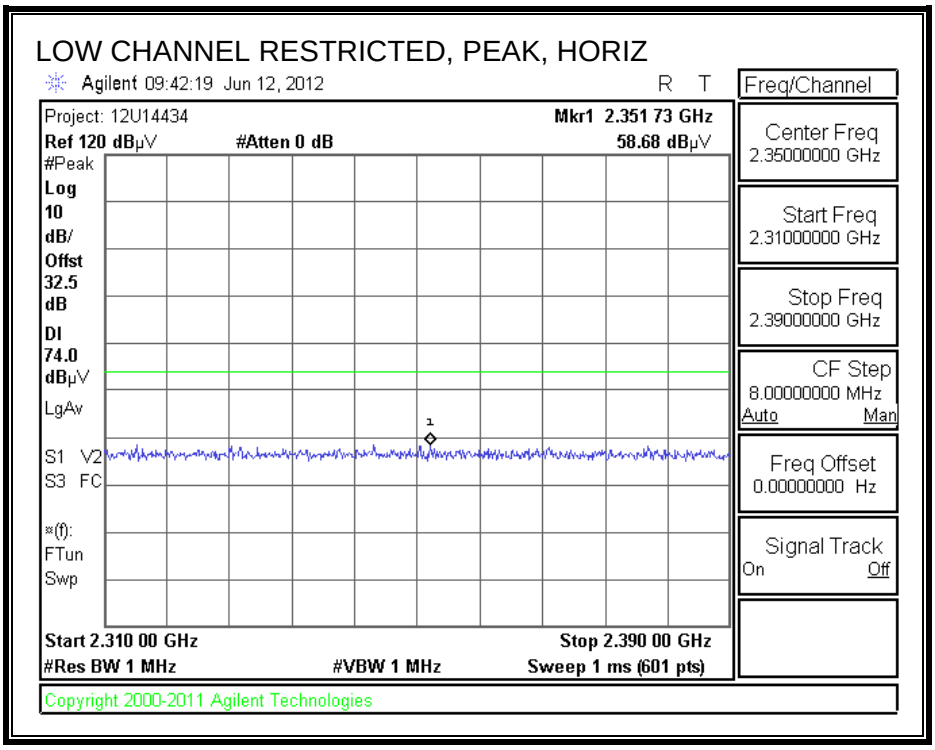
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: Horizontal															
4.824	3.0	45.2	38.4	33.4	6.2	-35.5	0.0	0.0	49.4	42.5	74	54	-24.6	-11.5	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	49.4	41.6	33.4	6.2	-35.5	0.0	0.0	53.5	45.8	74	54	-20.5	-8.2	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	50.7	42.1	33.5	6.2	-35.5	0.0	0.0	54.9	46.3	74	54	-19.1	-7.7	Pwr Setting= 32
7.311	3.0	58.0	39.5	35.7	8.4	-35.4	0.0	0.0	66.6	48.1	74	54	-7.4	-5.9	
Mid Channel: Vertical															
4.874	3.0	46.0	38.4	33.5	6.2	-35.5	0.0	0.0	50.3	42.6	74	54	-23.7	-11.4	Pwr Setting= 32
7.311	3.0	51.7	34.6	35.7	8.4	-35.4	0.0	0.0	60.4	43.2	74	54	-13.6	-10.8	
High Channel: Horizontal															
4.924	3.0	44.7	37.8	33.5	6.3	-35.5	0.0	0.0	49.1	42.1	74	54	-24.9	-11.9	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	47.9	43.3	33.5	6.3	-35.5	0.0	0.0	52.3	47.6	74	54	-21.7	-6.4	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

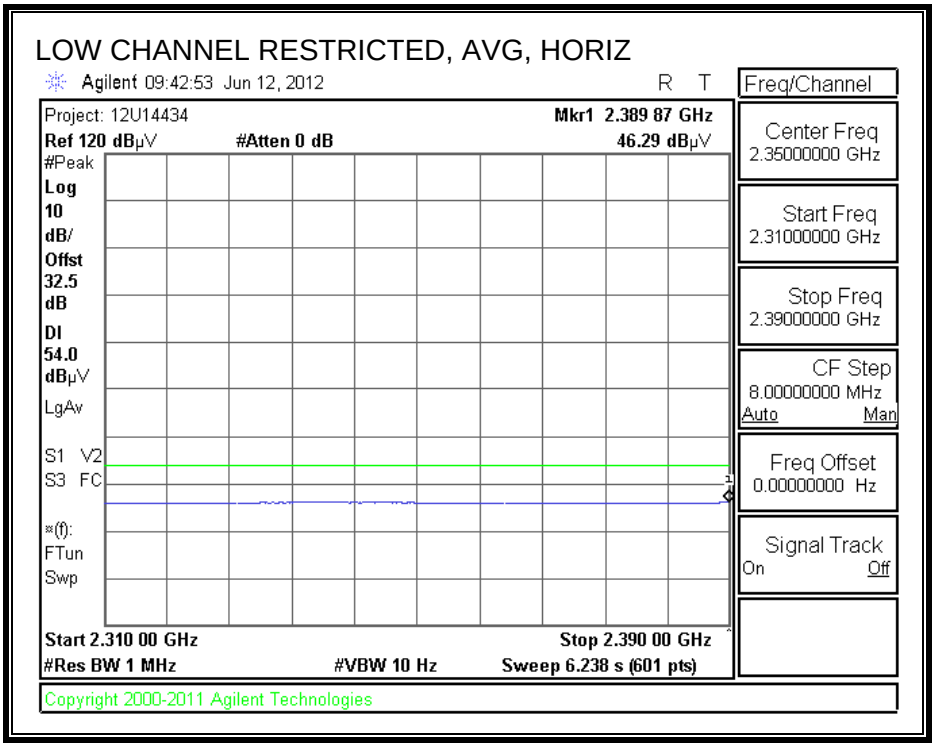
Rev. 11.10.11

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		

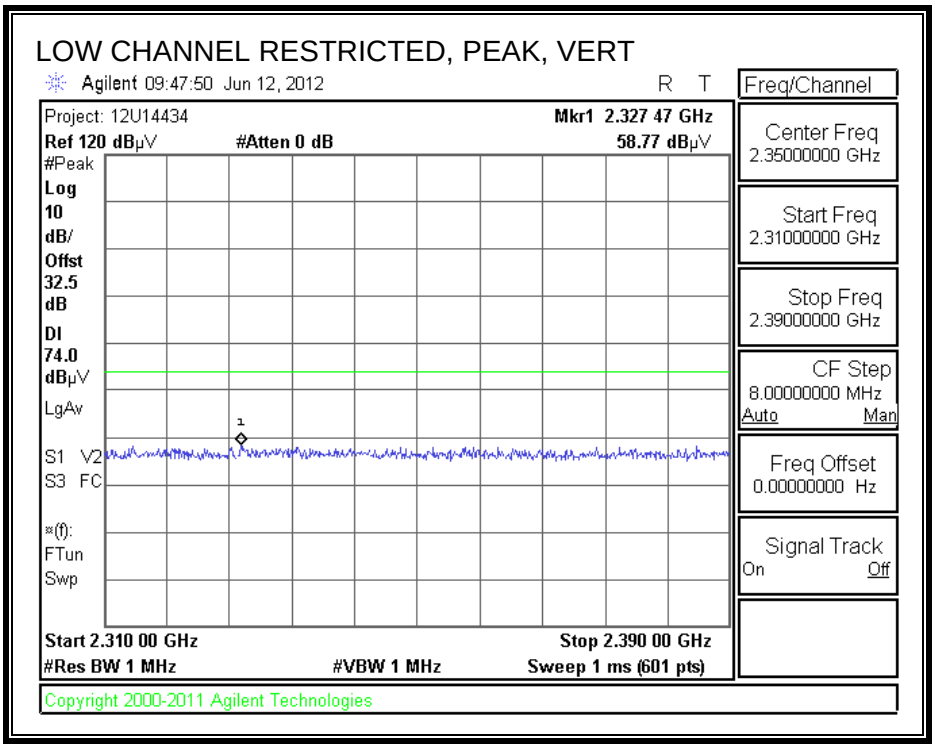
7.4.6. TX ABOVE 1 GHz FOR 802.11b MODE (PIFA ANTENNA)

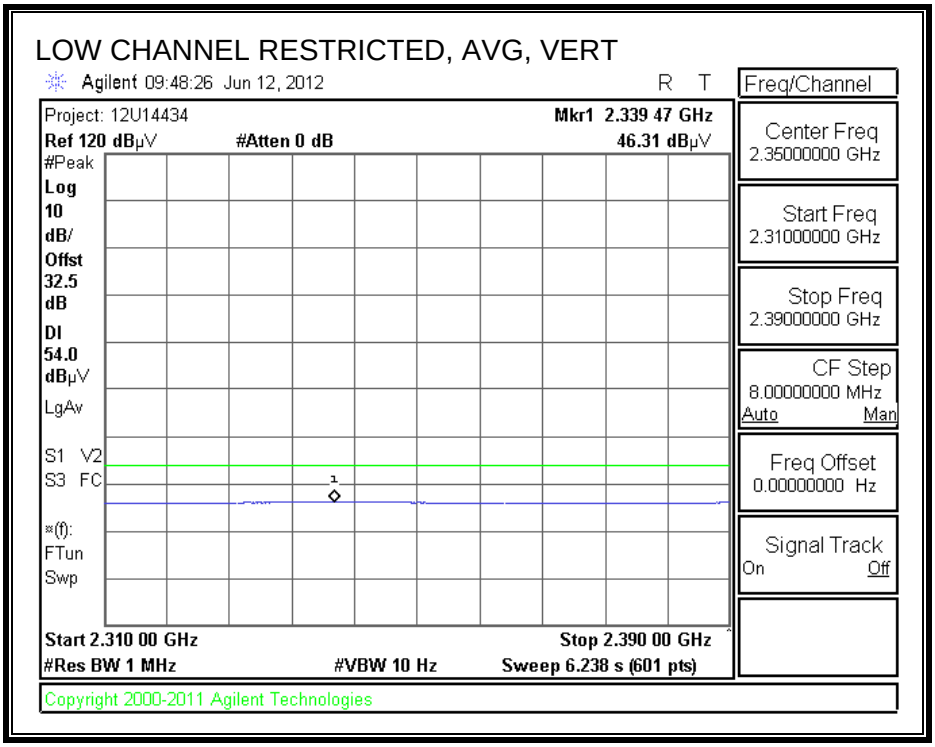
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



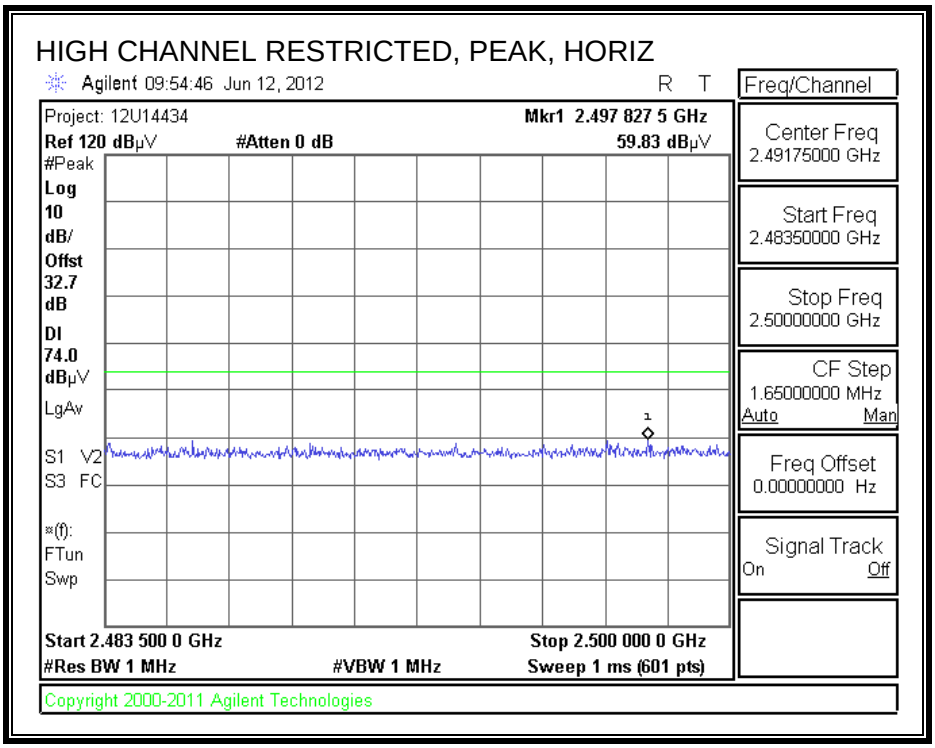


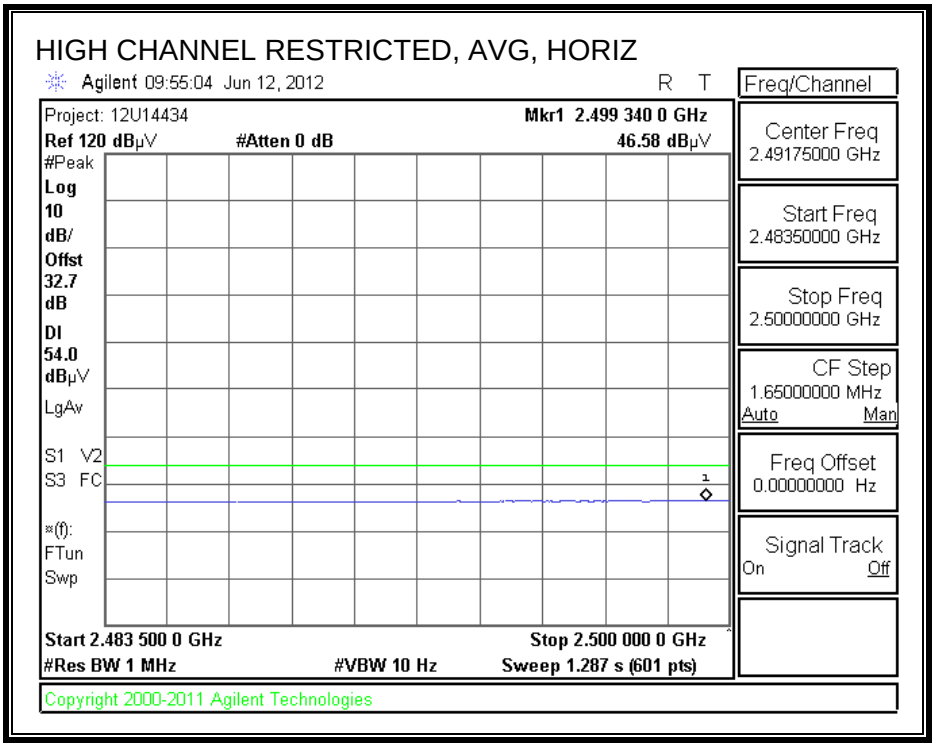
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



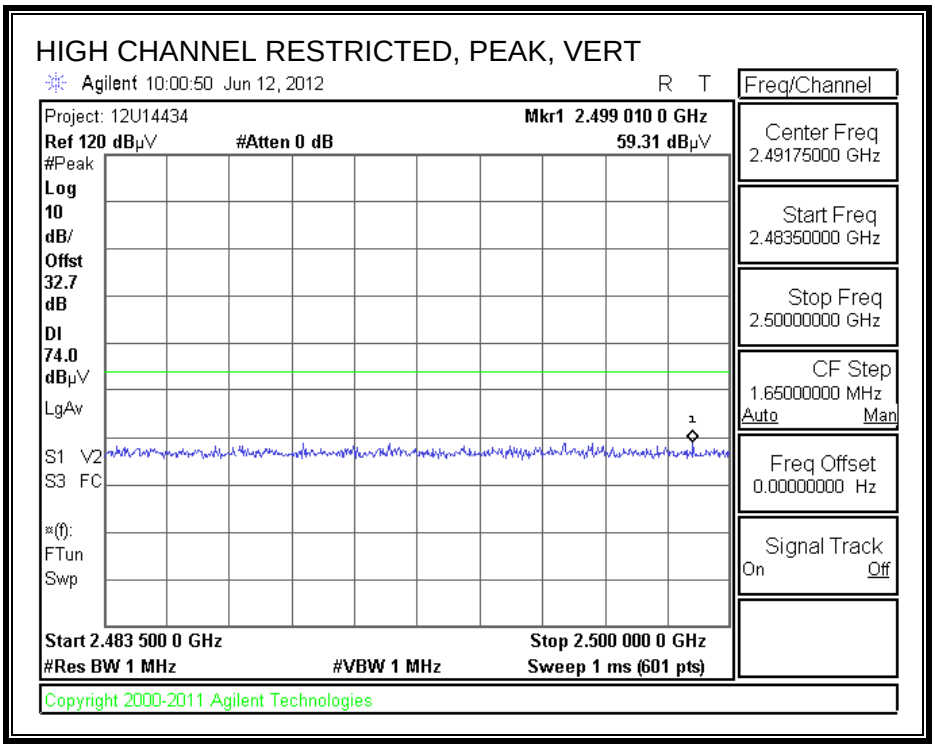


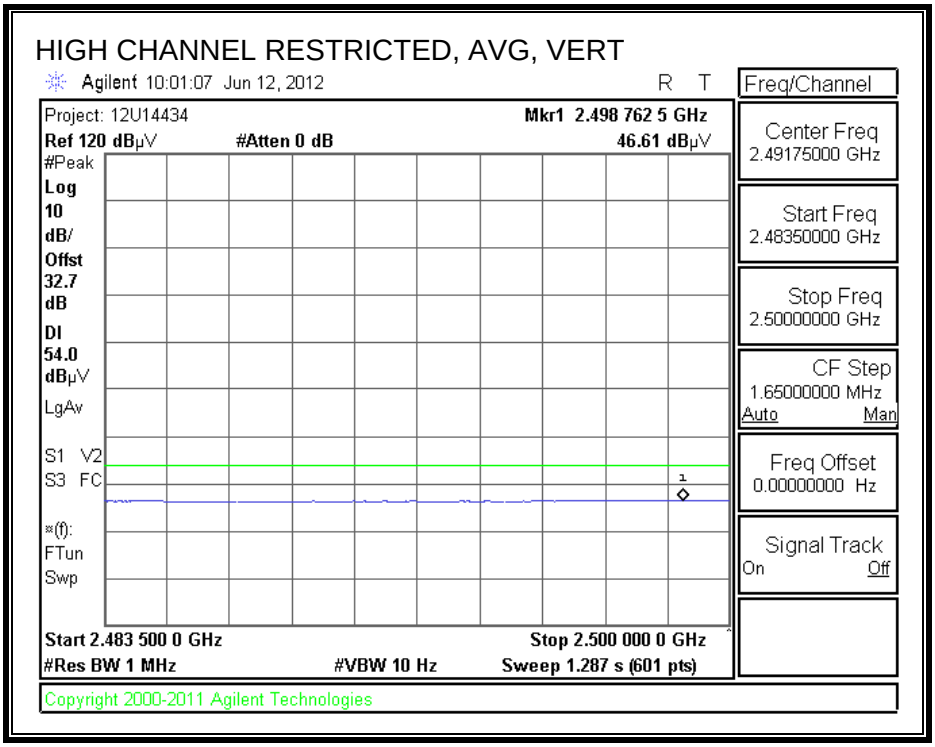
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/12/12
Test Engineer: Doug Anderson
Configuration: EUT w/G03 PIFA Antenna and Support Equipment
Mode: Continuous Tx / 11b

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

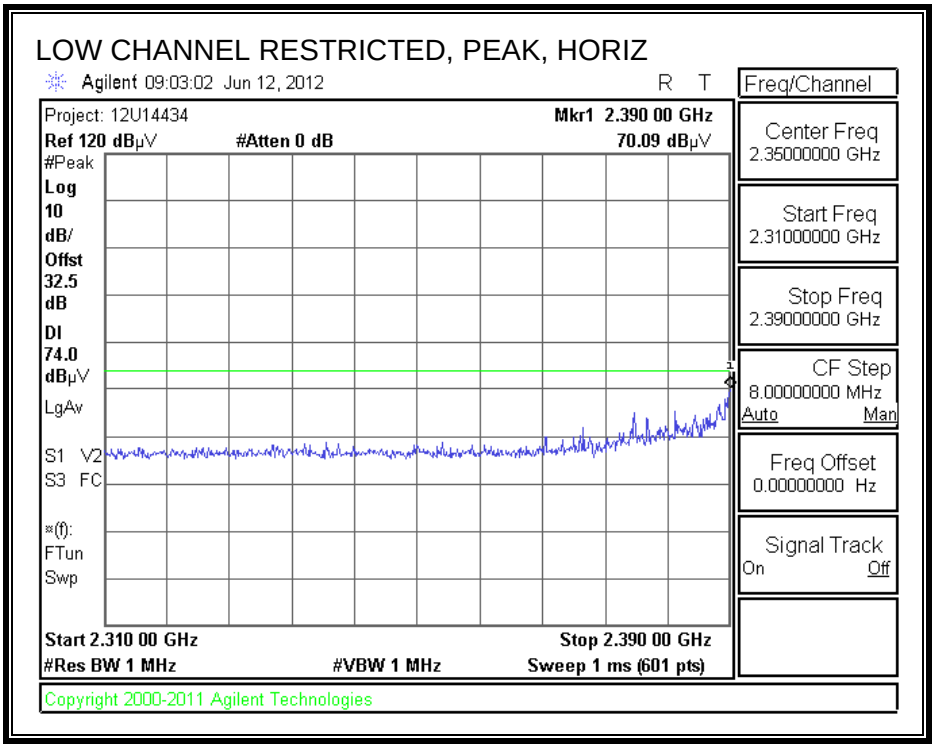
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: Horizontal															
4.824	3.0	46.2	40.0	33.4	6.2	-35.5	0.0	0.0	50.3	44.1	74	54	-23.7	-9.9	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	49.5	45.2	33.4	6.2	-35.5	0.0	0.0	53.6	49.4	74	54	-20.4	-4.6	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	49.4	41.0	33.5	6.2	-35.5	0.0	0.0	53.6	45.3	74	54	-20.4	-8.7	Pwr Setting= 37
7.311	3.0	43.9	30.8	35.7	8.4	-35.4	0.0	0.0	52.5	39.5	74	54	-21.5	-14.5	Pwr Setting= 37
Mid Channel: Vertical															
4.874	3.0	54.8	49.5	33.5	6.2	-35.5	0.0	0.0	59.1	53.7	74	54	-14.9	-0.3	Pwr Setting= 35
7.311	3.0	48.4	35.1	35.7	8.4	-35.4	0.0	0.0	57.0	43.7	74	54	-17.0	-10.3	Pwr Setting= 37
High Channel: Horizontal															
4.924	3.0	45.7	39.6	33.5	6.3	-35.5	0.0	0.0	50.0	43.9	74	54	-24.0	-10.1	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	49.9	45.8	33.5	6.3	-35.5	0.0	0.0	54.3	50.1	74	54	-19.7	-3.9	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

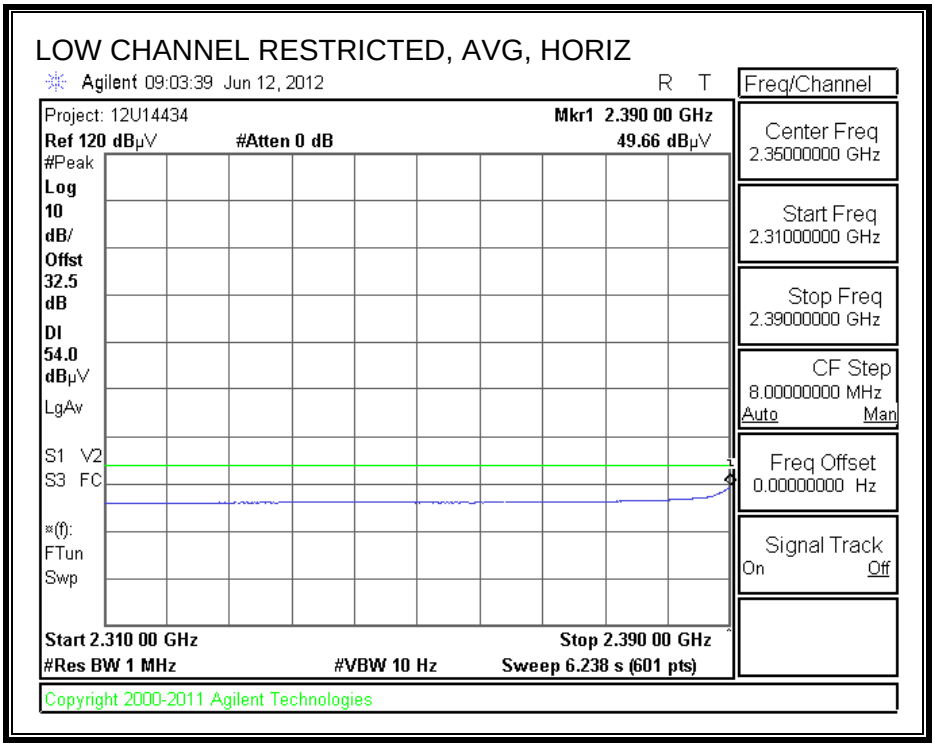
Rev. 11.10.11

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		

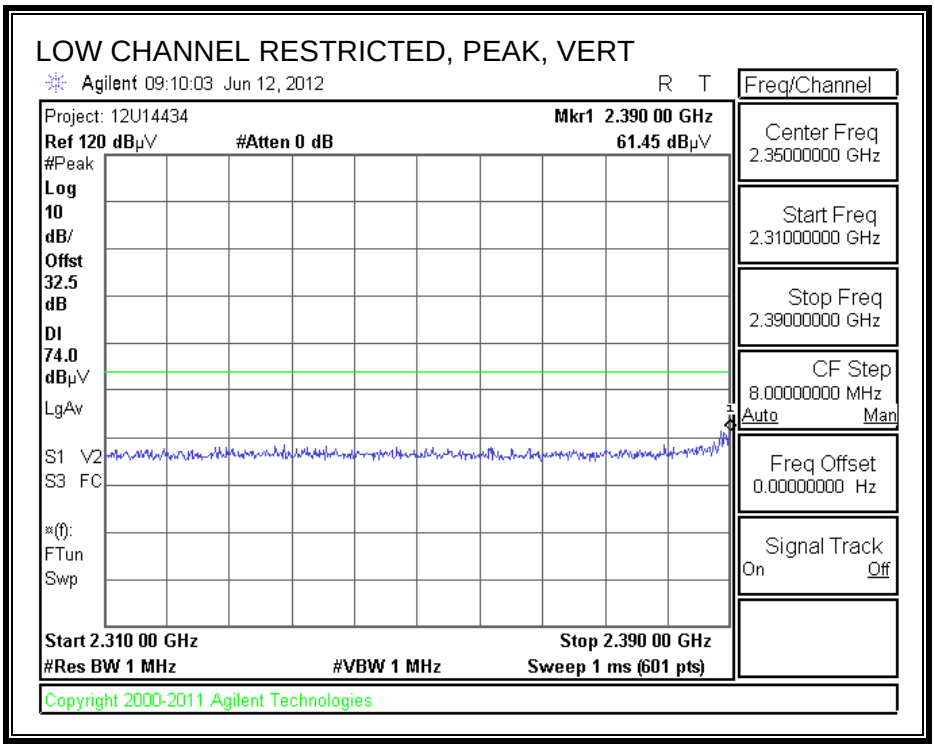
TX ABOVE 1 GHz FOR 802.11g MODE (PIFA ANTENNA)

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

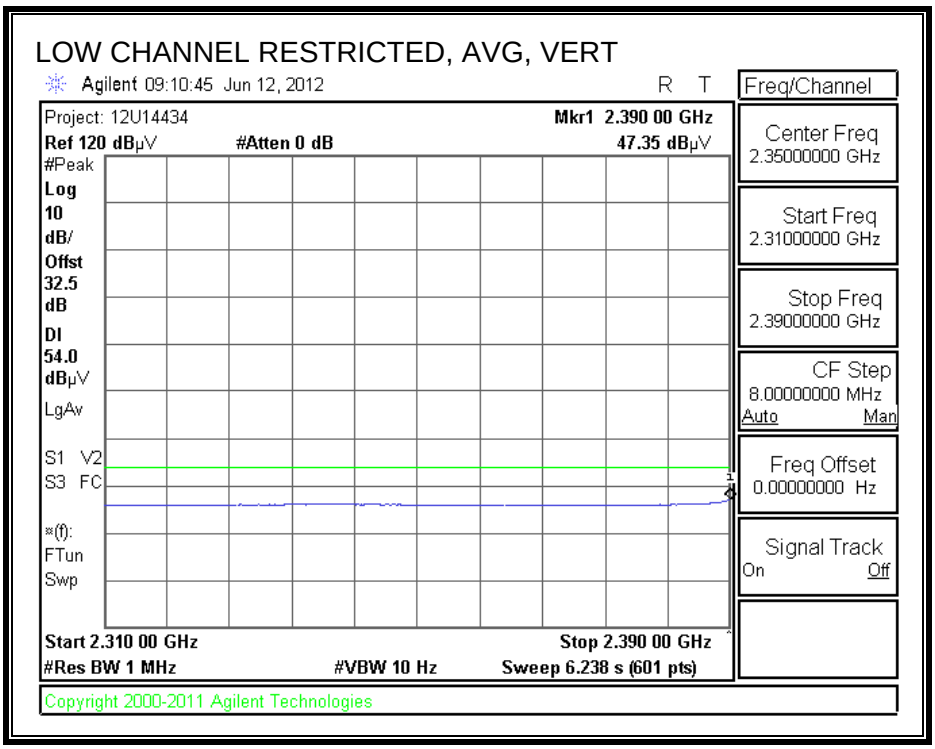




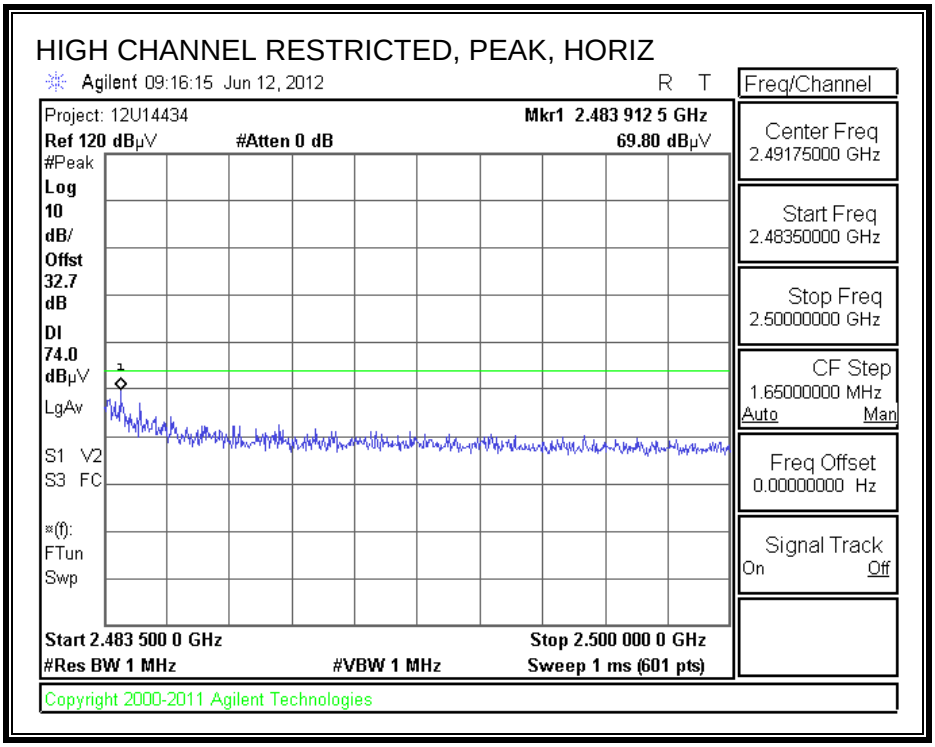
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

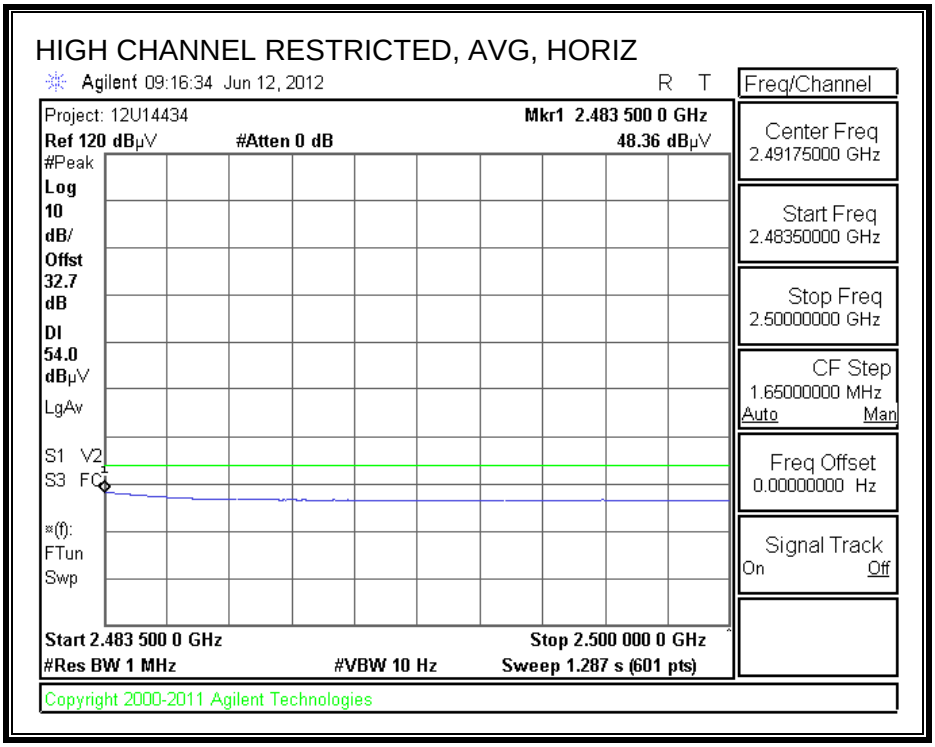


LOW CHANNEL RESTRICTED, AVG, VERT

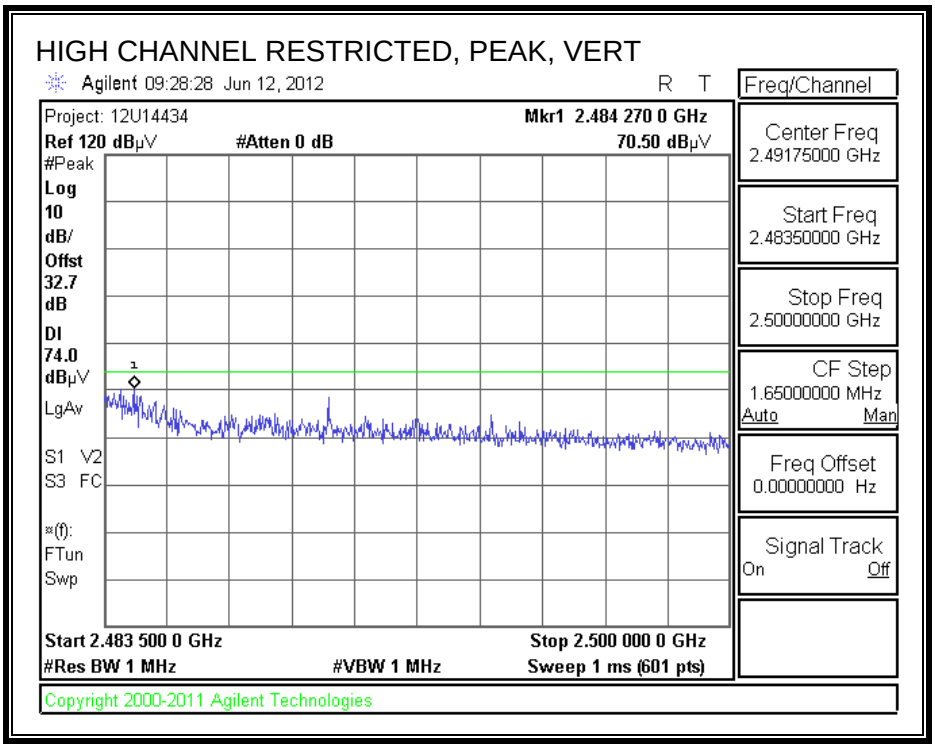


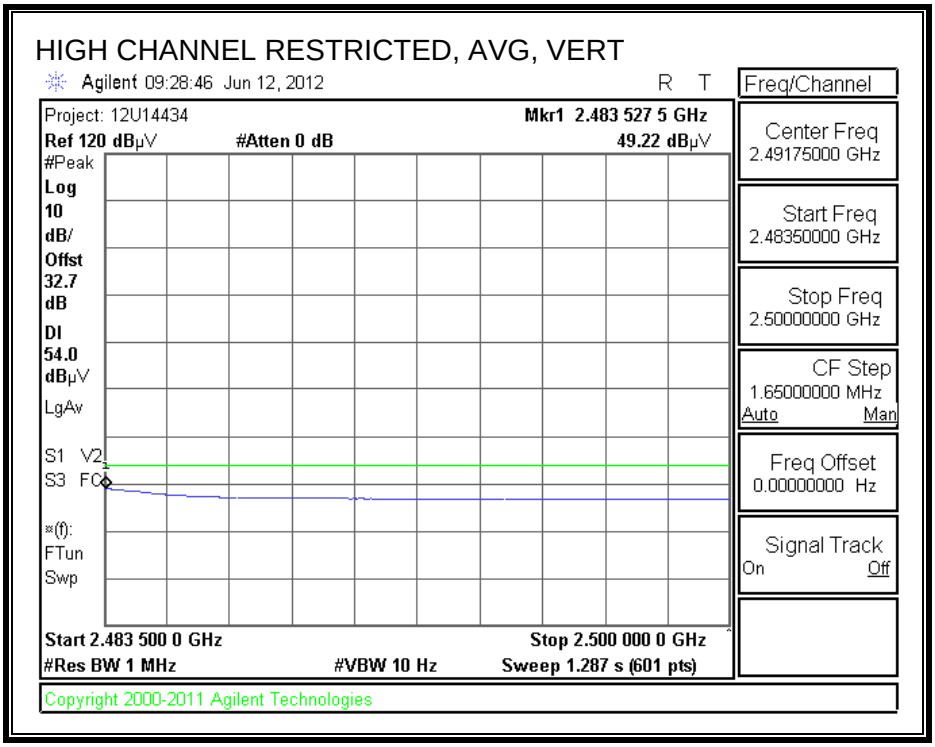
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber-A

Company: Microchip
Project #: 12U14434
Date: 06/12/12
Test Engineer: Doug Anderson
Configuration: EUT w/G03 PIFA Antenna and Support Equipment
Mode: Continuous Tx / 11g

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: Horizontal															
4.824	3.0	45.6	39.1	33.4	6.2	-35.5	0.0	0.0	49.8	43.2	74	54	-24.2	-10.8	Pwr Setting= 28
Low Channel: Vertical															
4.824	3.0	49.8	45.9	33.4	6.2	-35.5	0.0	0.0	53.9	50.1	74	54	-20.1	-3.9	Pwr Setting= 28
Mid Channel: Horizontal															
4.874	3.0	47.5	40.0	33.5	6.2	-35.5	0.0	0.0	51.7	44.2	74	54	-22.3	-9.8	Pwr Setting= 32
7.311	3.0	46.4	30.9	35.7	8.4	-35.4	0.0	0.0	55.0	39.5	74	54	-19.0	-14.5	
Mid Channel: Vertical															
4.874	3.0	53.2	44.8	33.5	6.2	-35.5	0.0	0.0	57.4	49.1	74	54	-16.6	-4.9	Pwr Setting= 32
7.311	3.0	56.0	37.7	35.7	8.4	-35.4	0.0	0.0	64.6	46.3	74	54	-9.4	-7.7	
High Channel: Horizontal															
4.924	3.0	46.0	39.0	33.5	6.3	-35.5	0.0	0.0	50.4	43.4	74	54	-23.6	-10.6	Pwr Setting= 28
High Channel: Vertical															
4.924	3.0	49.6	43.7	33.5	6.3	-35.5	0.0	0.0	53.9	48.0	74	54	-20.1	-6.0	Pwr Setting= 28
No Other Signigficant Emissions Within 20 dB of the Limit Found															

Rev. 11.10.11

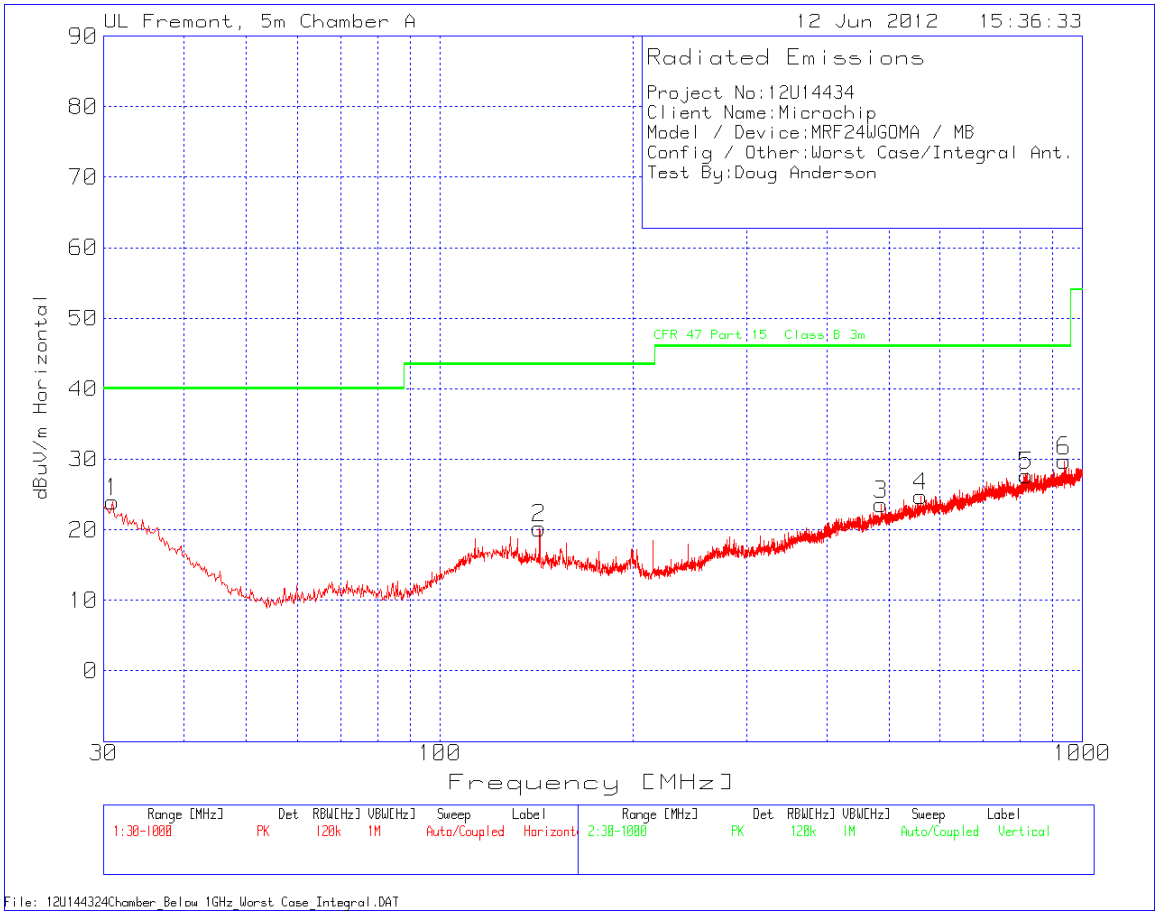
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

WORST-CASE BELOW 1 GHz

7.4.7. INTEGRAL ANTENNA

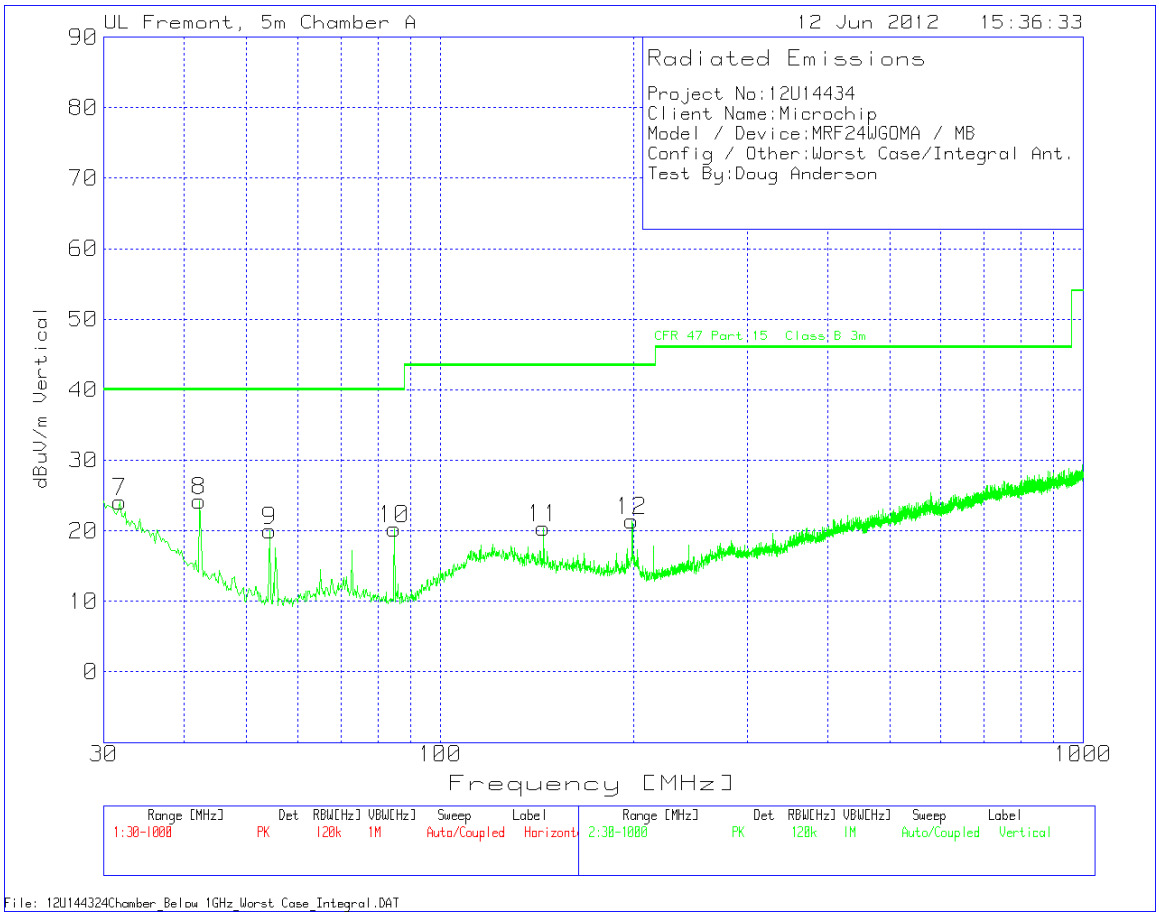
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:12U14434
Client Name:Microchip
Model / Device:MRF24WGOMA / MB
Config / Other:Worst Case/Integral Ant.
Test By:Doug Anderson

Range 1 30 - 1000MHz

Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
30.9692	31.12	PK	-27.5	20.4	24.02	40	-15.98	200	Horz
143.0116	34.22	PK	-26.6	12.6	20.22	43.5	-23.28	200	Horz
486.8925	31.01	PK	-24.9	17.5	23.61	46	-22.39	300	Horz
560.5536	30.65	PK	-24.3	18.4	24.75	46	-21.25	200	Horz
819.5304	29.44	PK	-23.1	21.4	27.74	46	-18.26	200	Horz
936.4189	30.7	PK	-23.2	22.3	29.8	46	-16.2	200	Horz

Range 2 30 - 1000MHz

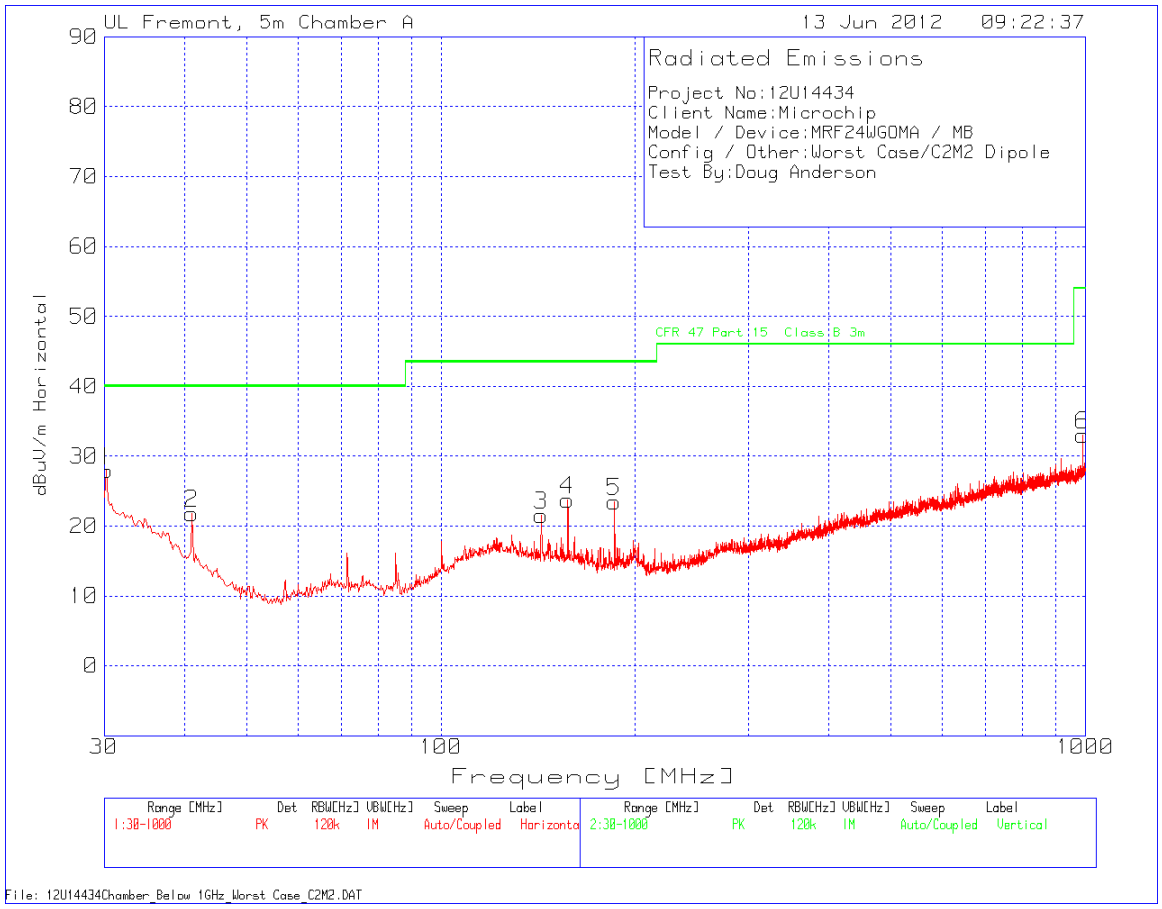
Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
31.7446	31.57	PK	-27.5	20	24.07	40	-15.93	100	Vert
42.2122	39.29	PK	-27.4	12.3	24.19	40	-15.81	300	Vert
54.2306	39.99	PK	-27.3	7.3	19.99	40	-20.01	100	Vert
84.8581	40.04	PK	-27.1	7.3	20.24	40	-19.76	100	Vert
144.7562	34.65	PK	-26.6	12.3	20.35	43.5	-23.15	100	Vert
198.8389	35.48	PK	-26.2	12.2	21.48	43.5	-22.02	200	Vert

PK - Peak detector
QP - Quasi-Peak detector

7.4.8. DIPOLE ANTENNA

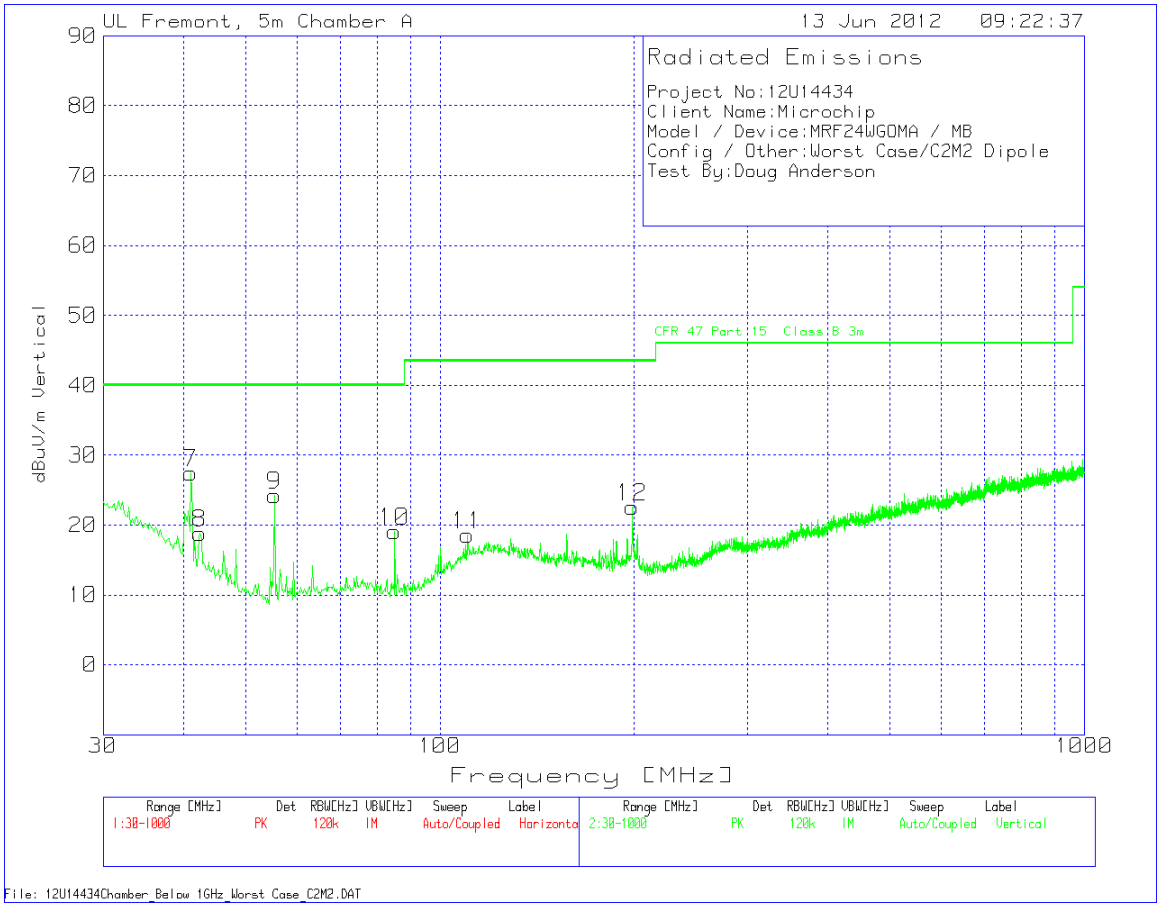
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:12U14434
Client Name:Microchip
Model / Device:MRF24WGOMA / MB
Config / Other:Worst Case/C2M2 Dipole Ant.
Test By:Doug Anderson

Range 1 30 - 1000MHz

Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
30.1938	34.32	PK	-27.5	21.1	27.92	40	-12.08	300	Horz
41.0492	35.85	PK	-27.4	13.3	21.75	40	-18.25	300	Horz
143.0116	35.52	PK	-26.6	12.6	21.52	43.5	-21.98	200	Horz
157.3561	38.23	PK	-26.5	12	23.73	43.5	-19.77	200	Horz
186.0452	38.72	PK	-26.4	11.2	23.52	43.5	-19.98	100	Horz
990.3078	33.36	PK	-23	22.7	33.06	54	-20.94	400	Horz

Range 2 30 - 1000MHz

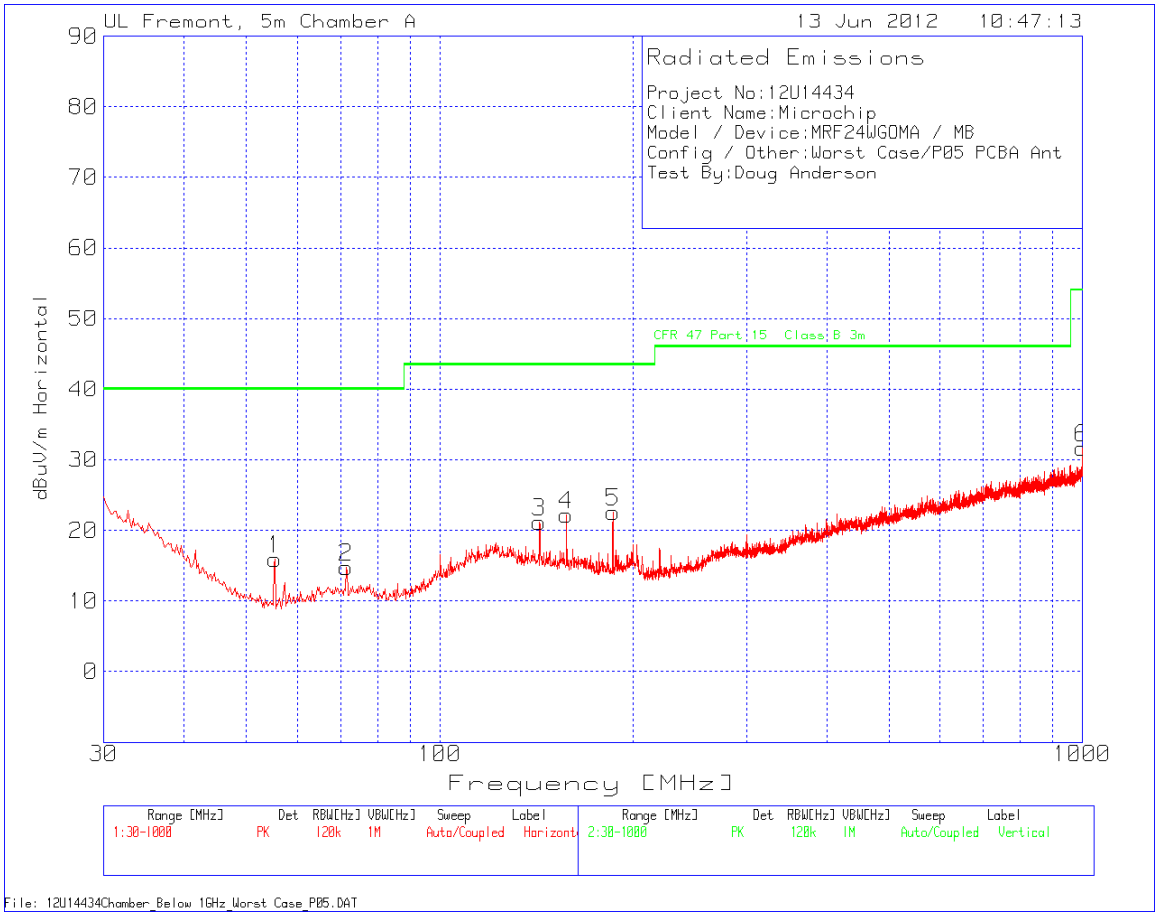
Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
41.0492	41.57	PK	-27.4	13.3	27.47	40	-12.53	100	Vert
42.4061	34.01	PK	-27.4	12.2	18.81	40	-21.19	100	Vert
55.3937	44.5	PK	-27.3	7.1	24.3	40	-15.7	100	Vert
85.052	38.92	PK	-27.1	7.3	19.12	40	-20.88	100	Vert
110.4456	32.51	PK	-26.7	12.8	18.61	43.5	-24.89	100	Vert
199.0328	36.56	PK	-26.2	12.2	22.56	43.5	-20.94	100	Vert

PK - Peak detector
QP - Quasi-Peak detector

7.4.9. PCBA ANTENNA

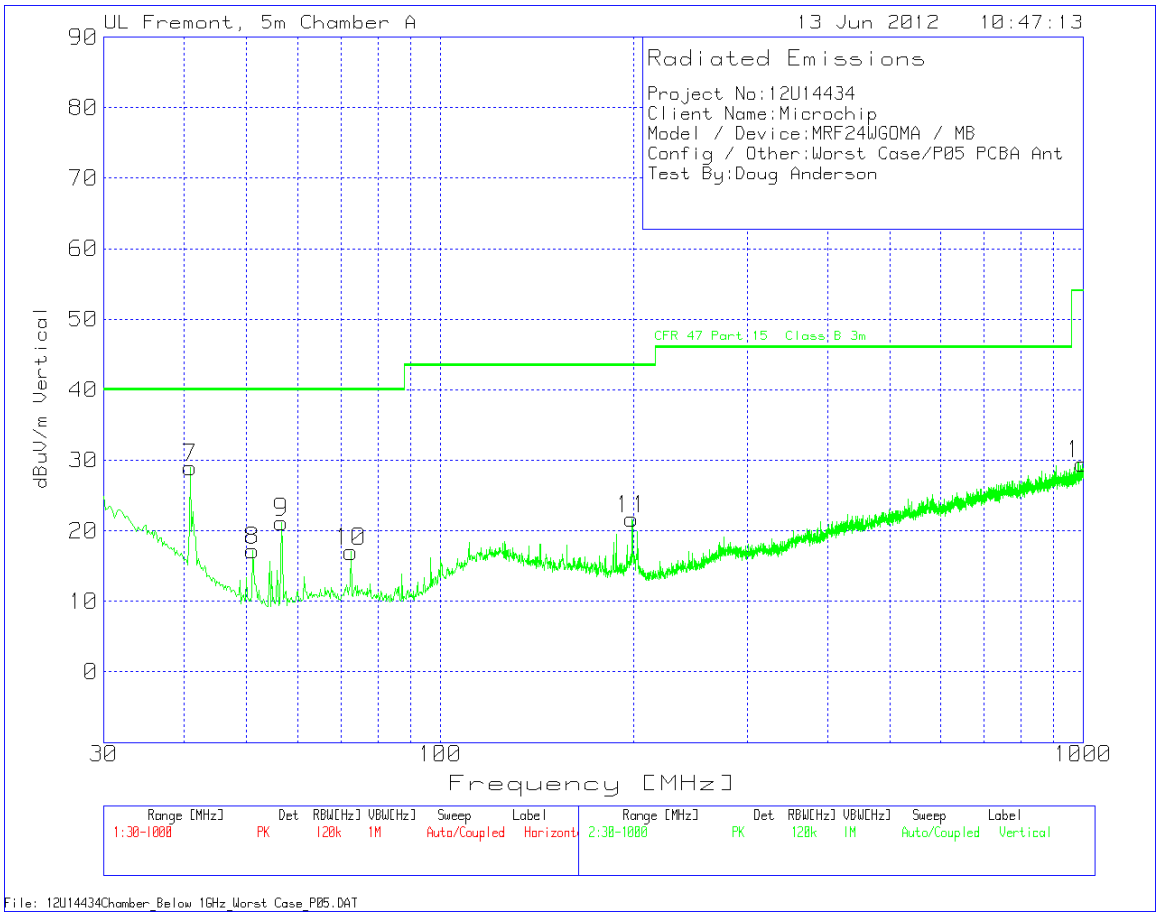
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:12U14434
Client Name:Microchip
Model / Device:MRF24WGOMA / MB
Config / Other:Worst Case/P05 PCBA Ant.
Test By:Doug Anderson

Range 1 30 - 1000MHz

Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
55.3937	36.15	PK	-27.3	7.1	15.95	40	-24.05	400	Horz
71.4828	33.8	PK	-27.1	8.1	14.8	40	-25.2	400	Horz
143.0116	35.17	PK	-26.6	12.6	21.17	43.5	-22.33	100	Horz
157.3561	36.68	PK	-26.5	12	22.18	43.5	-21.32	200	Horz
186.0452	37.8	PK	-26.4	11.2	22.6	43.5	-20.9	100	Horz
1000	31.74	PK	-23.1	23	31.64	54	-22.36	100	Horz

Range 2 30 - 1000MHz

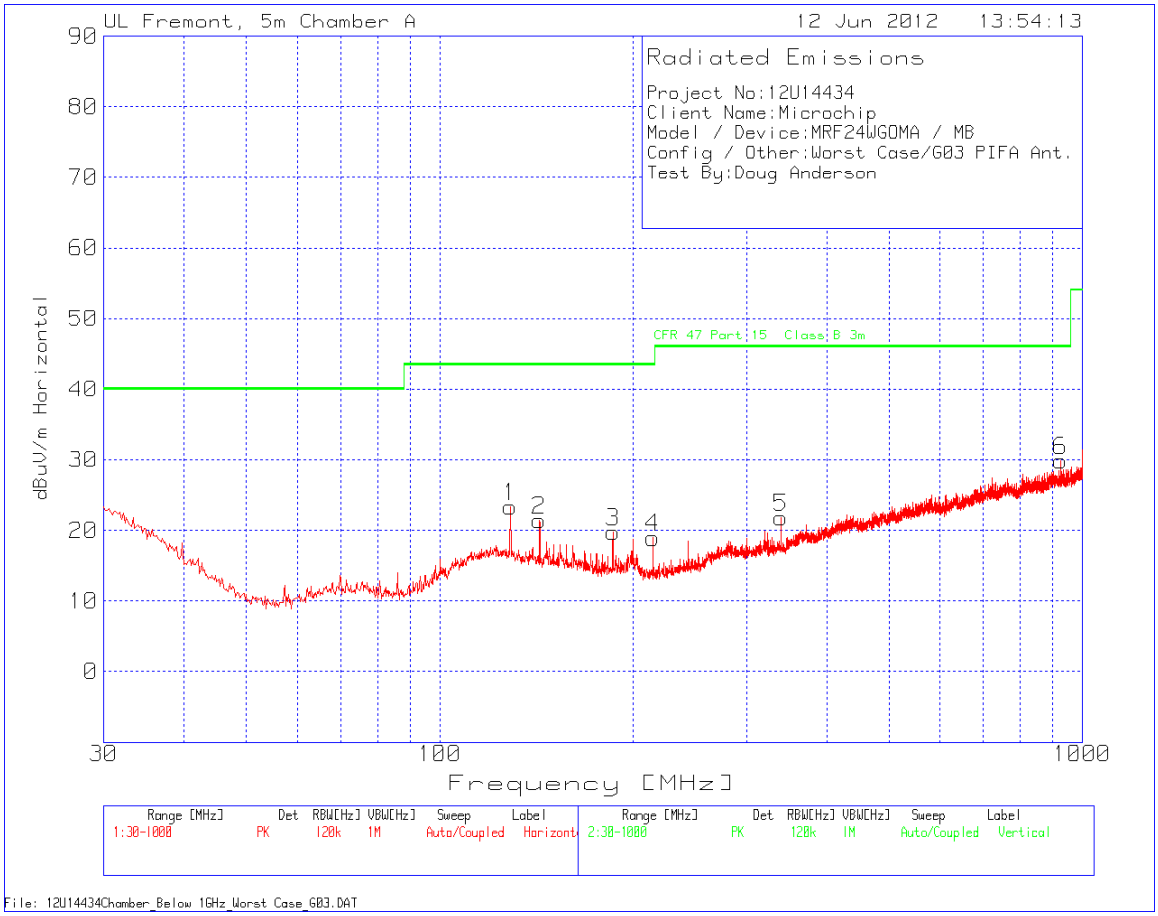
Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
40.8553	42.94	PK	-27.4	13.4	28.94	40	-11.06	100	Vert
51.1291	36.74	PK	-27.2	7.7	17.24	40	-22.76	100	Vert
56.5568	41.43	PK	-27.3	7.1	21.23	40	-18.77	100	Vert
72.6459	36.02	PK	-27.1	8.1	17.02	40	-22.98	100	Vert
198.8389	35.68	PK	-26.2	12.2	21.68	43.5	-21.82	100	Vert
998.2554	29.64	PK	-23.1	23	29.54	54	-24.46	400	Vert

PK - Peak detector
QP - Quasi-Peak detector

7.4.10. PIFA ANTENNA

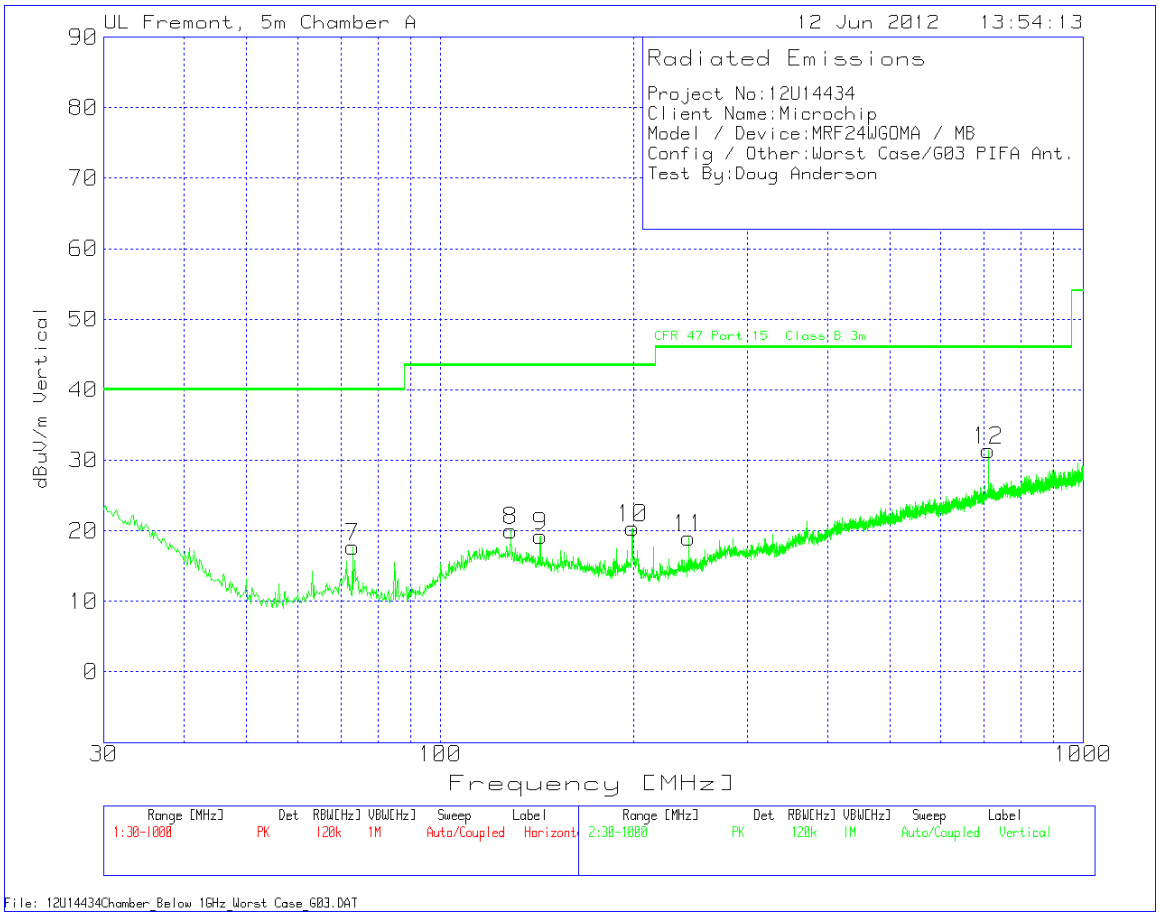
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Project No:12U14434
Client Name:Microchip
Model / Device:MRF24WGOMA / MB
Config / Other:Worst Case/G03 PIFA Ant.
Test By:Doug Anderson

Range 1 30 - 1000MHz

Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
128.8609	36.31	PK	-26.7	13.7	23.31	43.5	-20.19	200	Horz
143.0116	35.39	PK	-26.6	12.6	21.39	43.5	-22.11	200	Horz
186.0452	35.01	PK	-26.4	11.2	19.81	43.5	-23.69	100	Horz
214.5404	34.64	PK	-26.2	10.5	18.94	43.5	-24.56	100	Horz
339.958	33.66	PK	-25.6	13.7	21.76	46	-24.24	100	Horz
925.1759	30.94	PK	-23.3	22.2	29.84	46	-16.16	300	Horz

Range 2 30 - 1000MHz

Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Chamber A Pre-Amp Gain [dB] + Cable Loss dB	Chamber A Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B 3m Limit dB(µV/m)	Margin dB	Height cm	Polarity V/H
73.0336	36.74	PK	-27.1	8.1	17.74	40	-22.26	100	Vert
128.8609	32.97	PK	-26.7	13.7	19.97	43.5	-23.53	300	Vert
143.2054	33.21	PK	-26.6	12.6	19.21	43.5	-24.29	300	Vert
199.0328	34.37	PK	-26.2	12.2	20.37	43.5	-23.13	200	Vert
243.4233	33.46	PK	-26	11.5	18.96	46	-27.04	300	Vert
713.1095	34.64	PK	-23.3	20.1	31.44	46	-14.56	400	Vert

PK - Peak detector
QP - Quasi-Peak detector

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

Note: **An EUT populated with an integral antenna was chosen for this test to be representative of all four of the antenna configurations.**

RESULTS

6 WORST EMISSIONS

Manufacturer: Microchip
Project: 12U14434
Model: MRF24WGOMA / MB
120VAC / 60Hz
Tested By: Doug Anderson

Line-L1 .15 - 30MHz

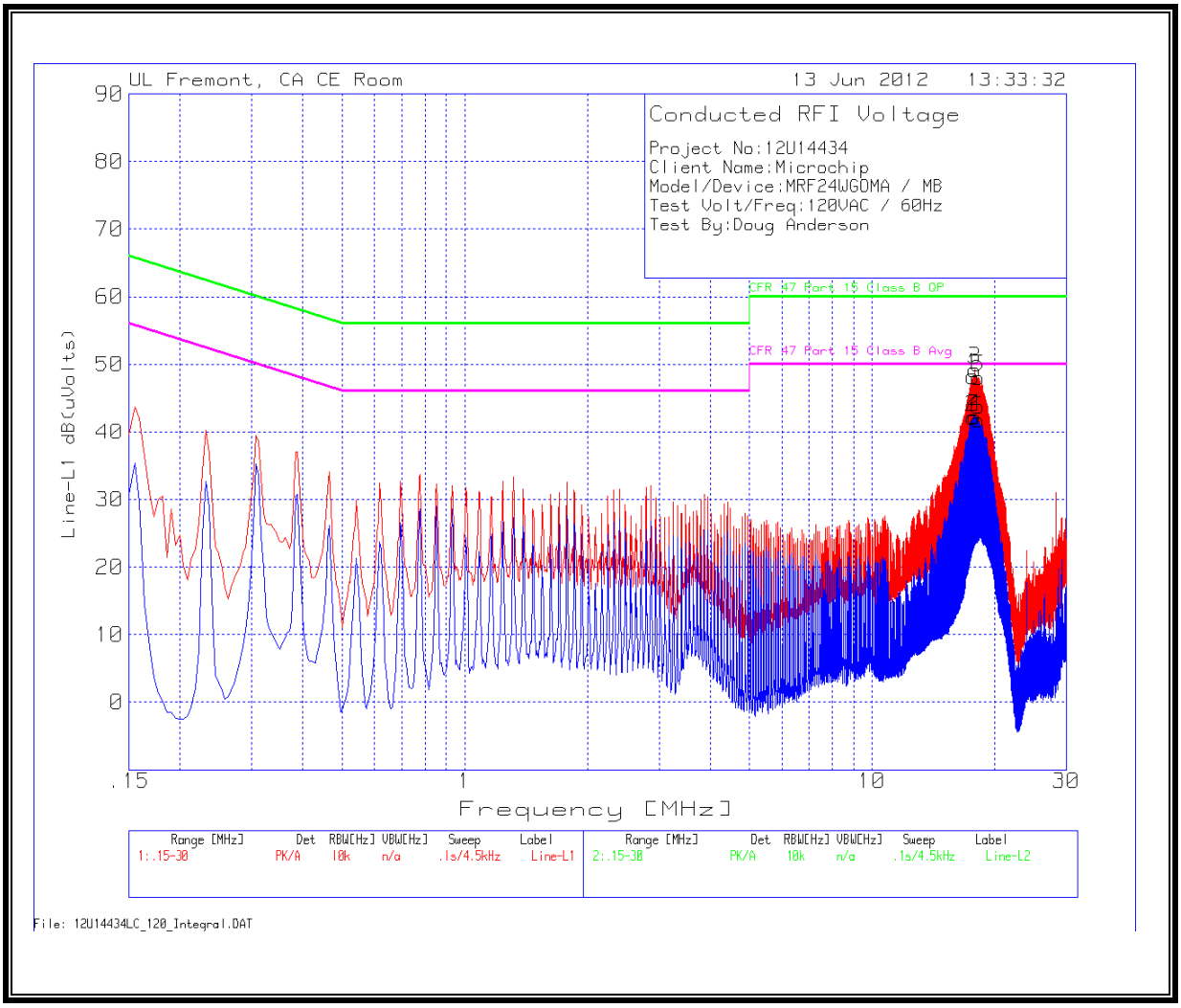
Test Freq. MHz	Meter Reading dB(µV)	Detector Type	LISN Factor dB	Path Loss (dB)	Corrected Reading dB(µV)	Class B Quasi-Peak Limit dB(µV)	Quasi-Peak Margin dB	Class B Average Limit dB(µV)	Average Margin dB
17.7135	47.84	PK	0.2	0.2	48.24	60	-11.76	-	-
17.7135	41.74	Av	0.2	0.2	42.14	-	-	50	-7.86
17.8665	48.78	PK	0.2	0.2	49.18	60	-10.82	-	-
17.8665	41.9	Av	0.2	0.2	42.3	-	-	50	-7.7
18.2535	47.69	PK	0.2	0.2	48.09	60	-11.91	-	-
18.2535	41.43	Av	0.2	0.2	41.83	-	-	50	-8.17

Line-L2 .15 - 30MHz

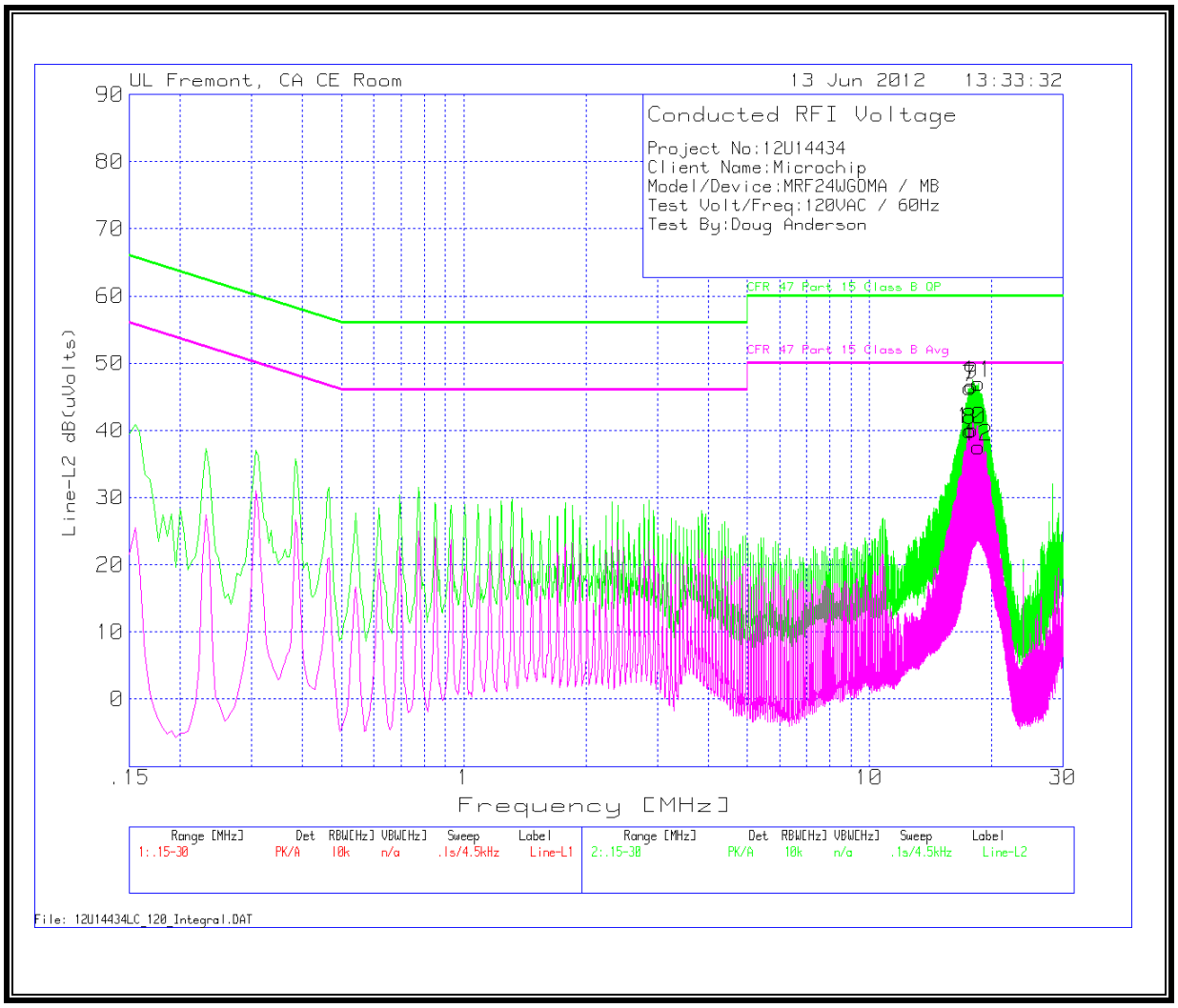
Test Freq. MHz	Meter Reading dB(µV)	Detector Type	LISN Factor dB	Path Loss (dB)	Corrected Reading dB(µV)	Class B Quasi-Peak Limit dB(µV)	Quasi-Peak Margin dB	Class B Average Limit dB(µV)	Average Margin dB
17.6955	45.95	PK	0.2	0.2	46.35	60	-13.65	-	-
17.6955	39.56	Av	0.2	0.2	39.96	-	-	50	-10.04
17.853	46.3	PK	0.2	0.2	46.7	60	-13.3	-	-
17.853	39.76	Av	0.2	0.2	40.16	-	-	50	-9.84
18.5505	46.52	PK	0.3	0.2	47.02	60	-12.98	-	-
18.5505	37.09	Av	0.3	0.2	37.59	-	-	50	-12.41

PK - Peak detector
QP - Quasi-Peak detector
Av - Average detector

LINE 1 RESULTS



LINE 2 RESULTS



9. 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.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

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.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))
where
D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

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

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

RESULTS

Band	Mode	Separation Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Source Based EIRP (mW)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
2.4 GHz	WLAN	20	12.9	2.0	100	30.7	0.01	0.061