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

CERTIFICATION TEST REPORT

FOR

AVIONICS CABIN WIRELESS ACCESS POINT

MODEL NUMBER: MCWAP- 0122

FCC ID: WPX-MCWAP
IC: 8014A- MCWAP

REPORT NUMBER: 10U13240-1

ISSUE DATE: JUNE 11, 2010

Prepared for
AIRCELL LLC
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/11/10	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: AIRCELL LLC
1250 N.ARLINGTON HEIGHTS Rd.
ITASCA, ILLINOIS 60143, U.S.A.

EUT DESCRIPTION: Avionics Cabin Wireless Access Point

MODEL: MCWAP-0122

SERIAL NUMBER: Proto 0001

DATE TESTED: May 28 to June 08, 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:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

TOM CHEN
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 Avionics Cabin Wireless Access Point, 802.11a/b/g transceiver MCWAP.

The radio module is manufactured by Aircell LLC.

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	23.84	242.10
2412 - 2462	802.11g	23.30	213.80
5745-5825	802.11a	23.35	216.27

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Monopole antenna, with a maximum gain of 2.7dBi in the 2.4 GHz band and 6.7dBi in the 5 GHz band.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was ART, rev. 4.6 #6 and PuTTY ver 0.06, Tftpd32 ver 3.35.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. Radiated emission 30-1000 MHz was performed with the EUT set to the worst-case channel.

The following worst-case data rates were used based on input from the client:

For 11b: 11Mbps
For 11g: 54 Mbps

X and Y orientations were investigated and orientation Y was found to be worst-case.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Notebook PC	Dell	PP18L	7330873681.00	DoC
AC Adapter (PC)	Hi Pro Electronics	HA65NS1-00	CN-OHN662-47890-84R-C14R	DoC
Patch Antenna 1 (2400-5875 MHz)	Huber + Suhner	SWA 2459/360/4/45/V	716655	N/A
Patch Antenna 2 (2400-5935 MHz)	Huber + Suhner	SWA 2459/360/7/20/V_1	717255	N/A

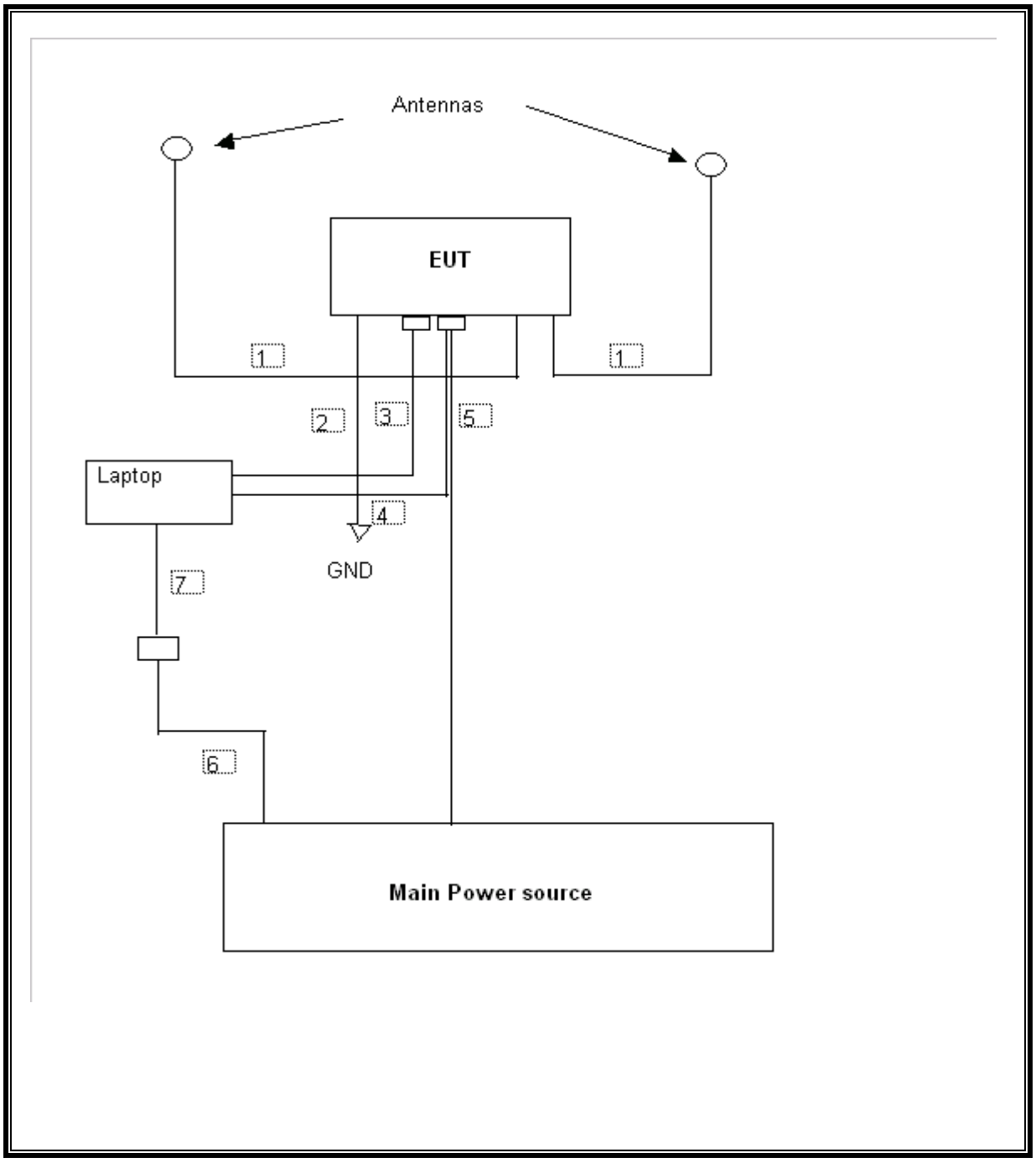
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	Antenna	2	TNC	Shielded	1meter	N/A
2	GND	1	Screw	Braid	2 meters	N/A
3	LAN	1	RJ45	Unshielded	2 meters	N/A
4	Serial	1	DB9	Unshielded	2meters	N/A
5	AC	1	US115V	Unshielded	2 meters	N/A
6	AC	1	US115V	Unshielded	2 meters	N/A
7	DC	1	DC	Unshielded	1.5 meter	N/A

TEST SETUP

The EUT is an Avionics Cabin Wireless Access Point.

SETUP DIAGRAM FOR TESTS



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**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	01/14/09	07/14/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/06/10	07/06/10
Horn Antenna 18GHz	EMCO	3115	C00783	01/29/09	07/29/10
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	02/04/09	08/04/10
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	02/05/10	05/05/11
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	01/07/10	12/04/11
Peak Power Meter	Agilent / HP	E4416A	C00963	12/04/09	12/04/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/09	05/06/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/06/09	11/06/10
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	11/05/09	11/05/10

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.

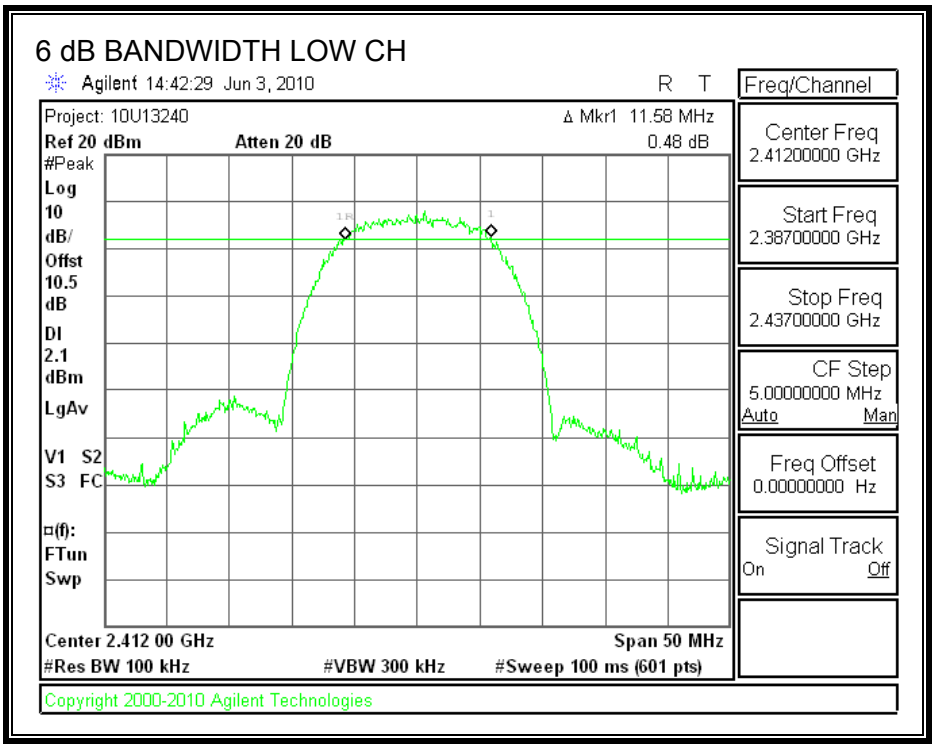
TEST PROCEDURE

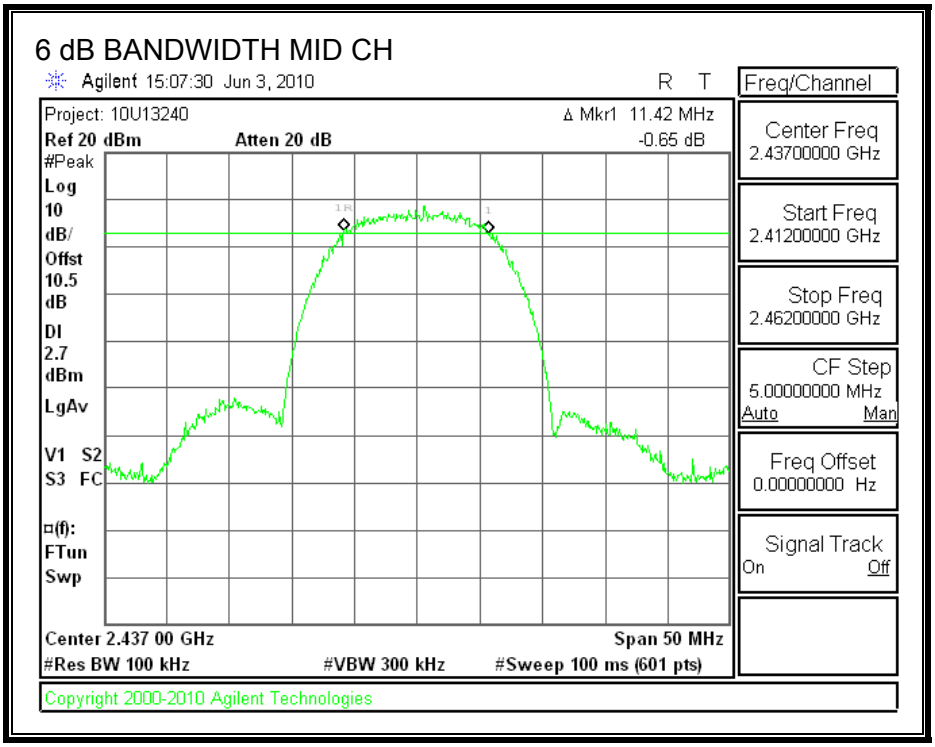
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

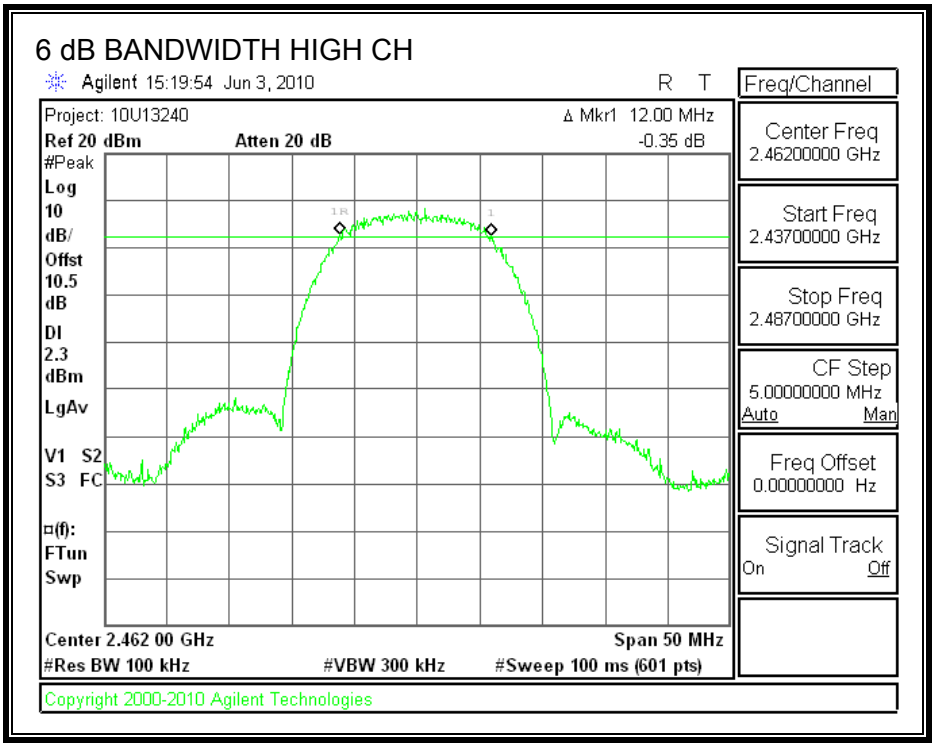
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	11.58	0.5
Middle	2437	11.42	0.5
High	2462	12.00	0.5

6 dB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

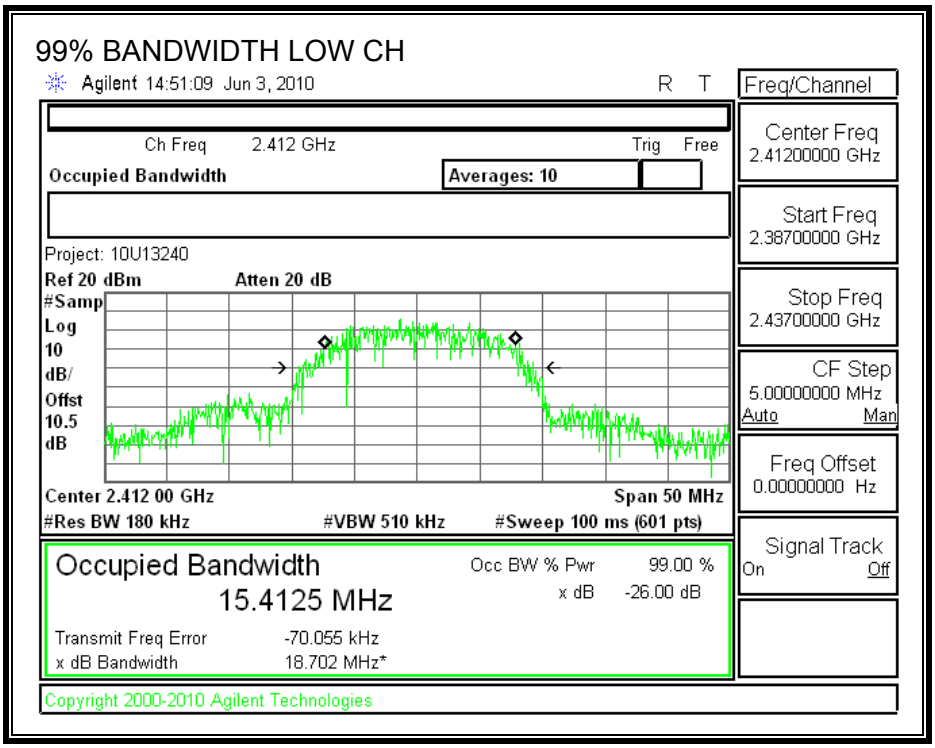
TEST PROCEDURE

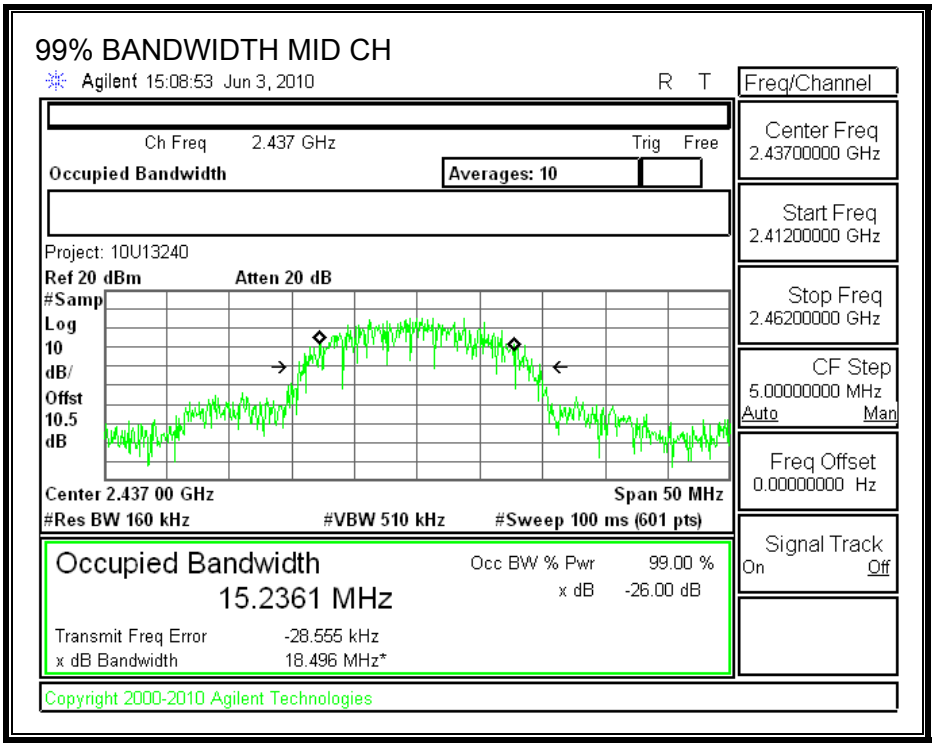
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

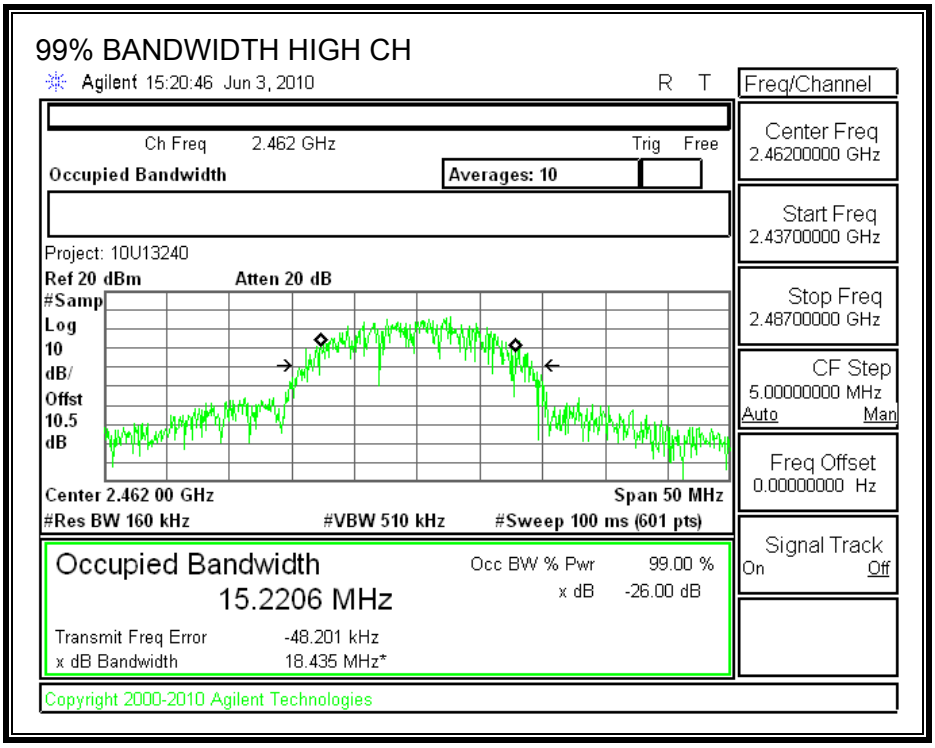
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.4125
Middle	2437	15.2361
High	2462	15.2206

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.

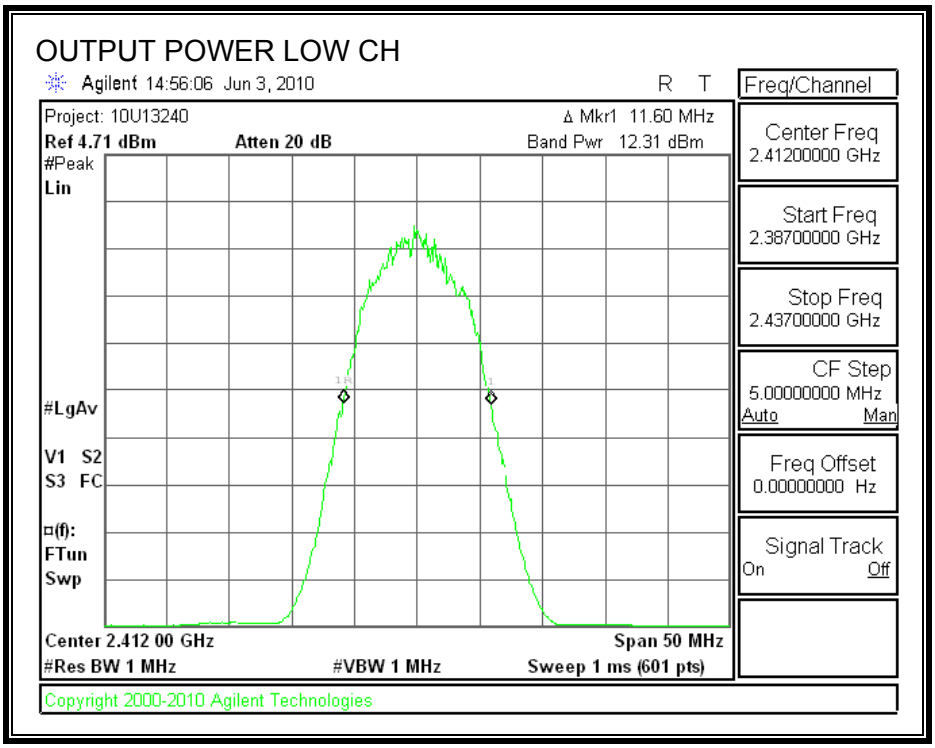
TEST PROCEDURE

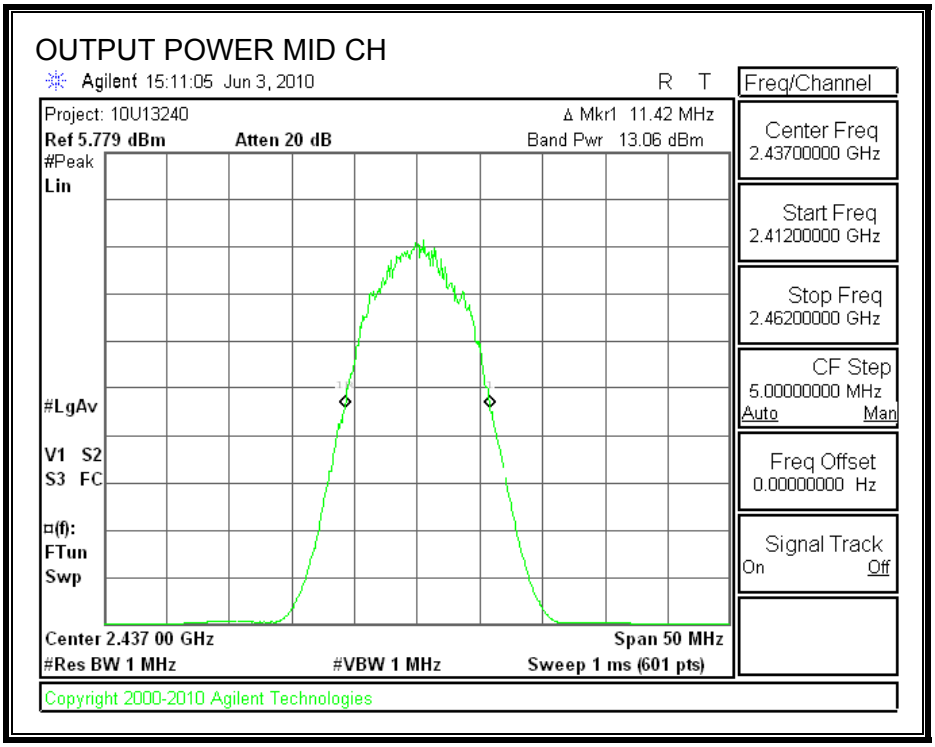
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

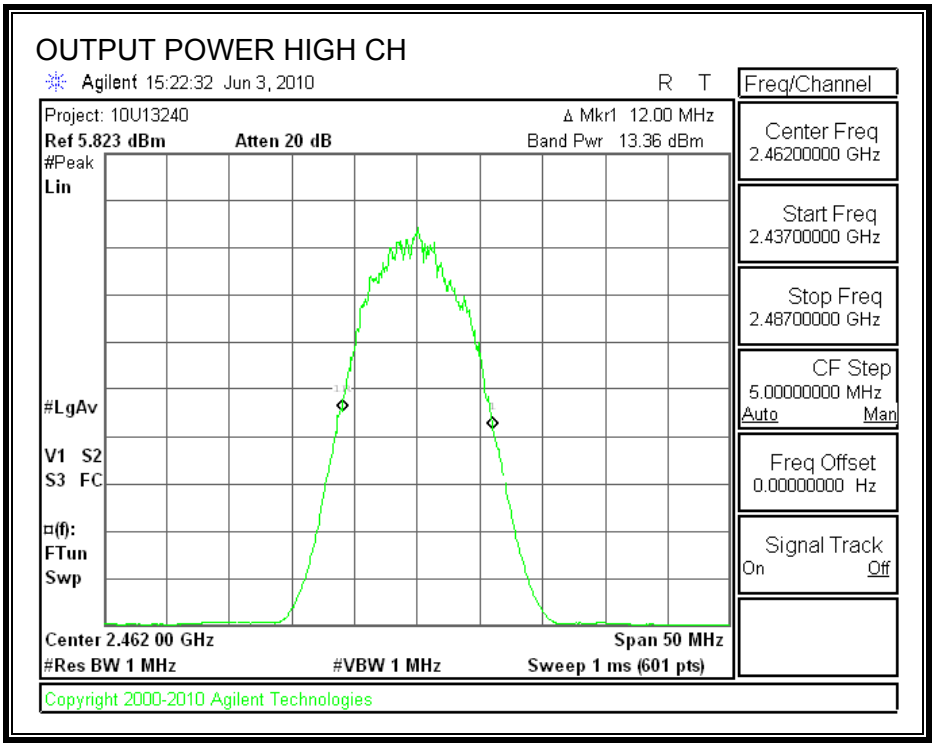
RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.31	10.48	22.79	30	-7.21
Middle	2437	13.06	10.48	23.54	30	-6.46
High	2462	13.36	10.48	23.84	30	-6.16

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 10.5 dB (including 10 dB pad and 0.5 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	17.10
Middle	2437	18.05
High	2462	17.90

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.

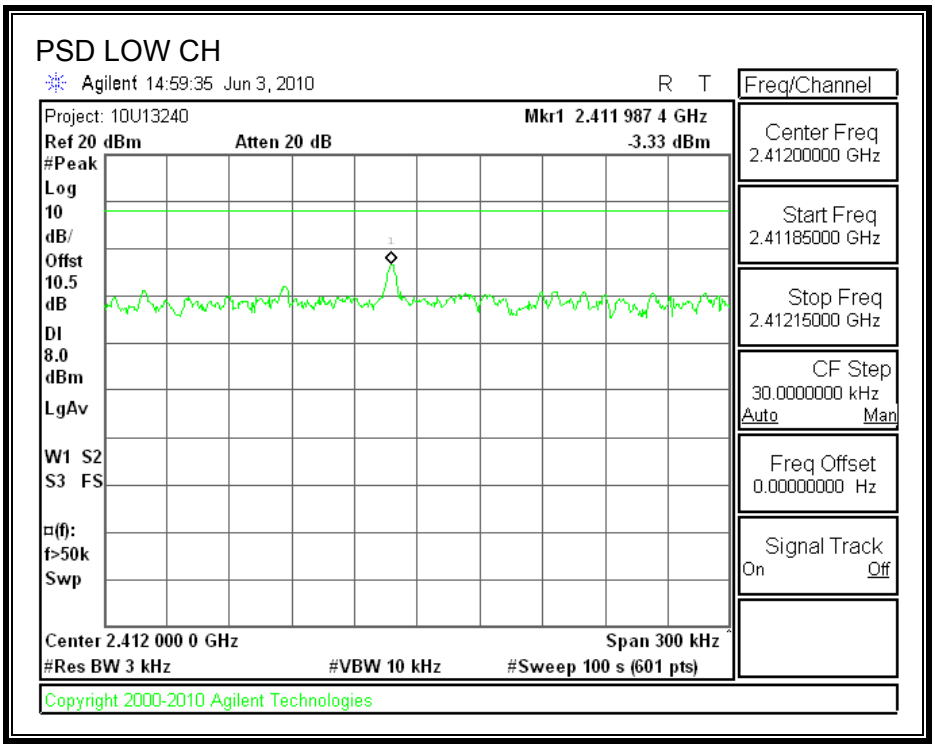
TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document “Measurement of Digital Transmission Systems Operating under Section 15.247”, March 23, 2005.

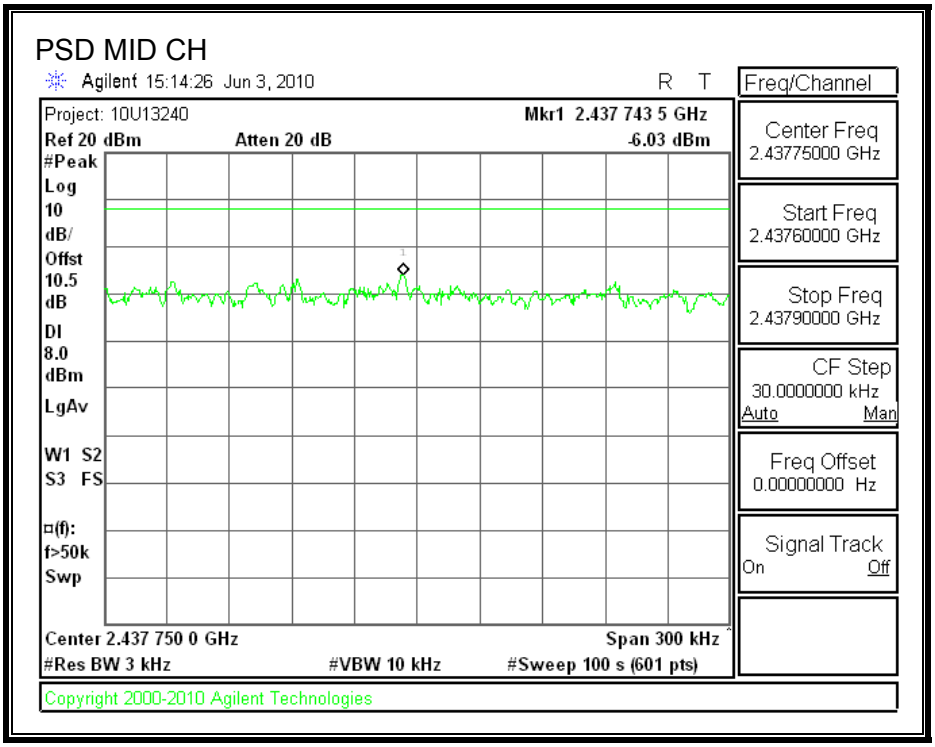
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.33	8	-11.33
Middle	2437	-6.03	8	-14.03
High	2462	-2.36	8	-10.36

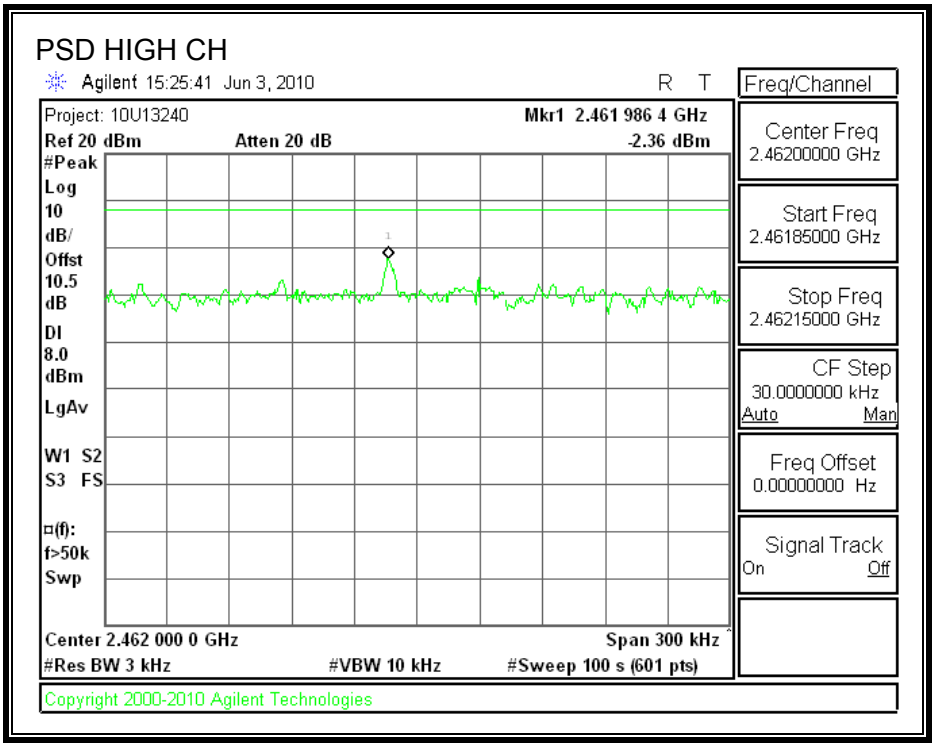
POWER SPECTRAL DENSITY



PSD MID CH



PSD HIGH CH



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.

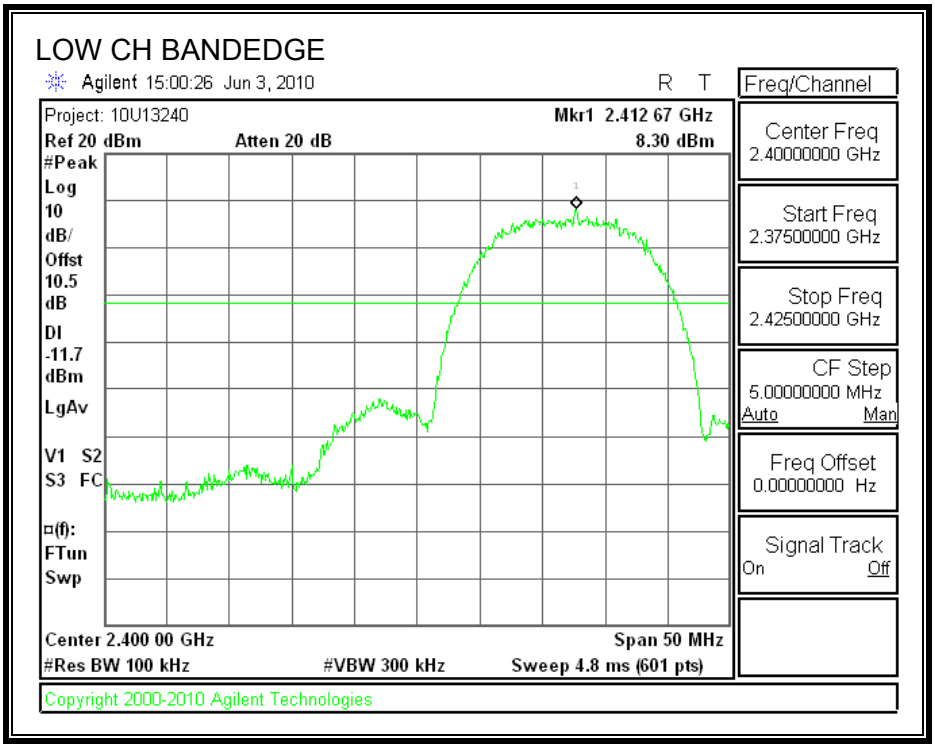
TEST PROCEDURE

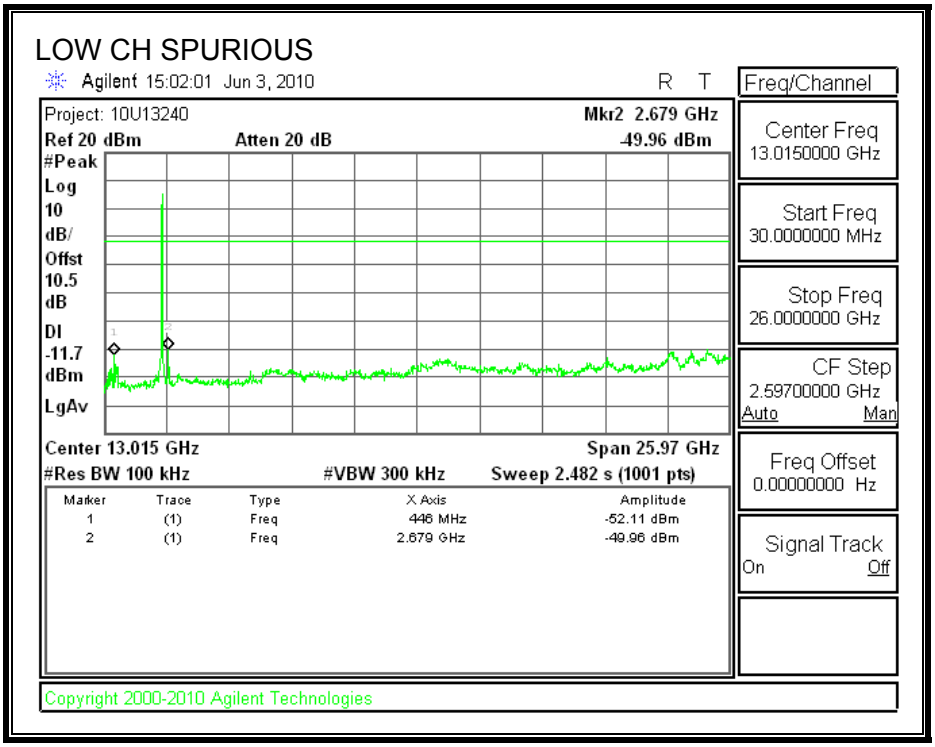
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

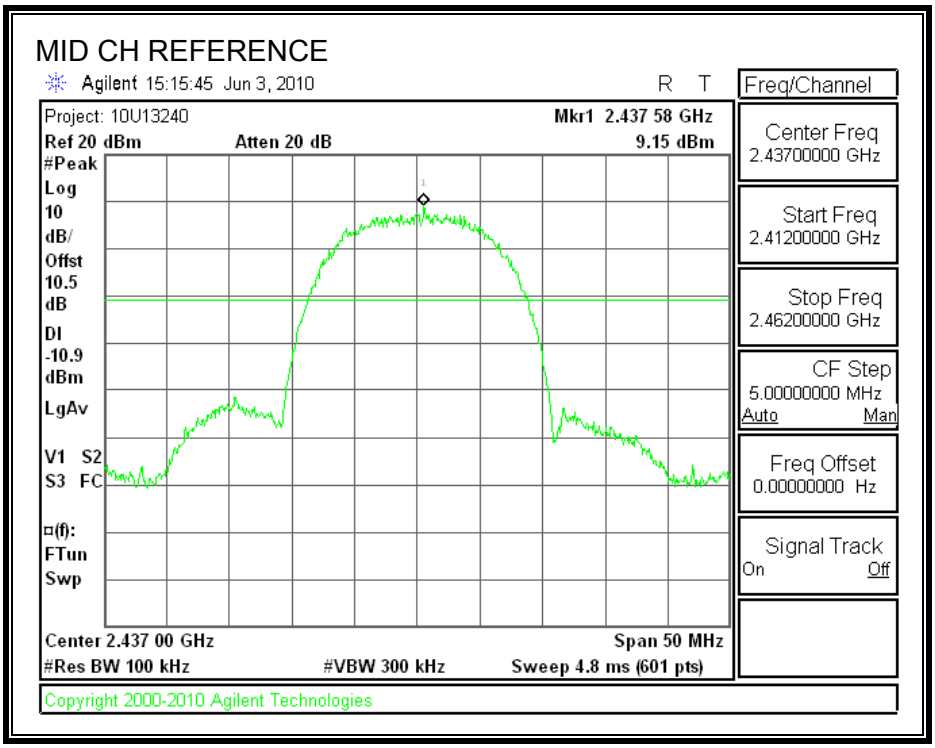
RESULTS

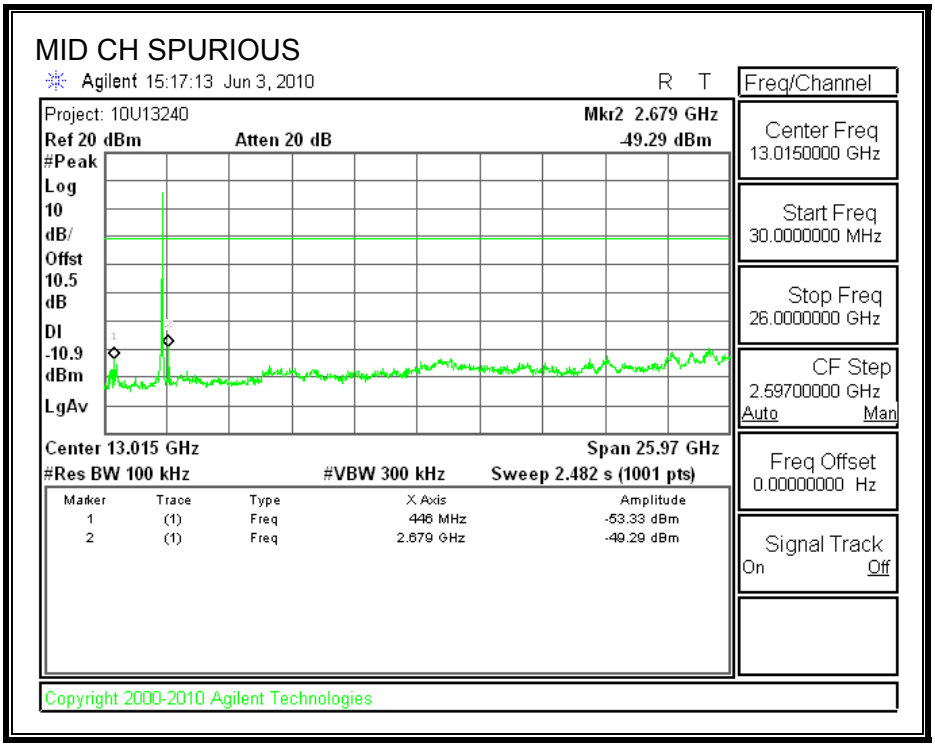
SPURIOUS EMISSIONS, LOW CHANNEL



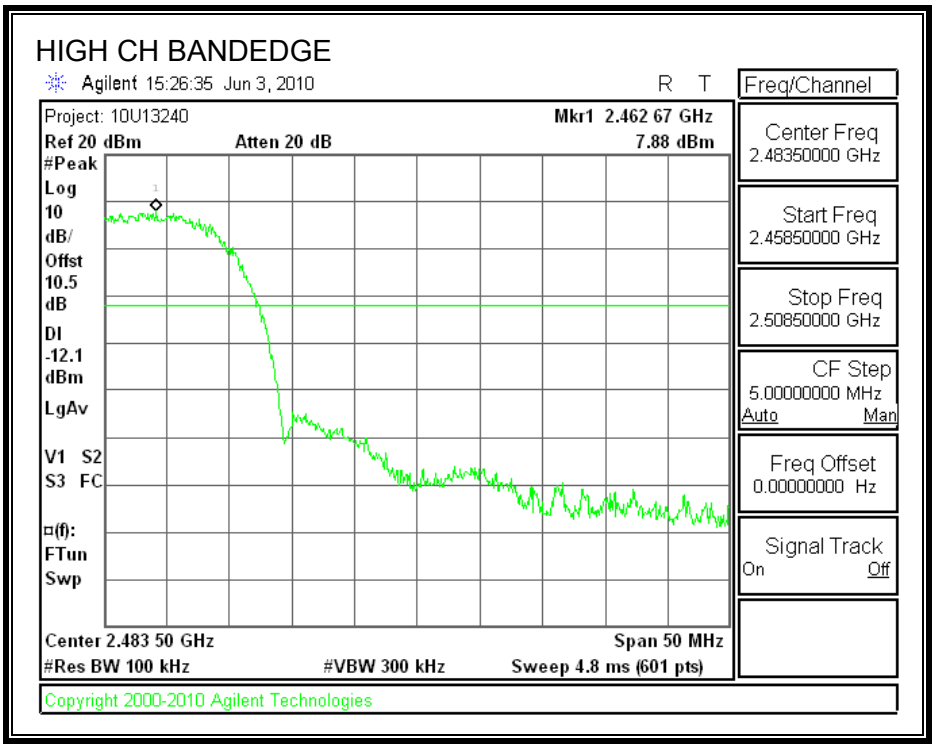


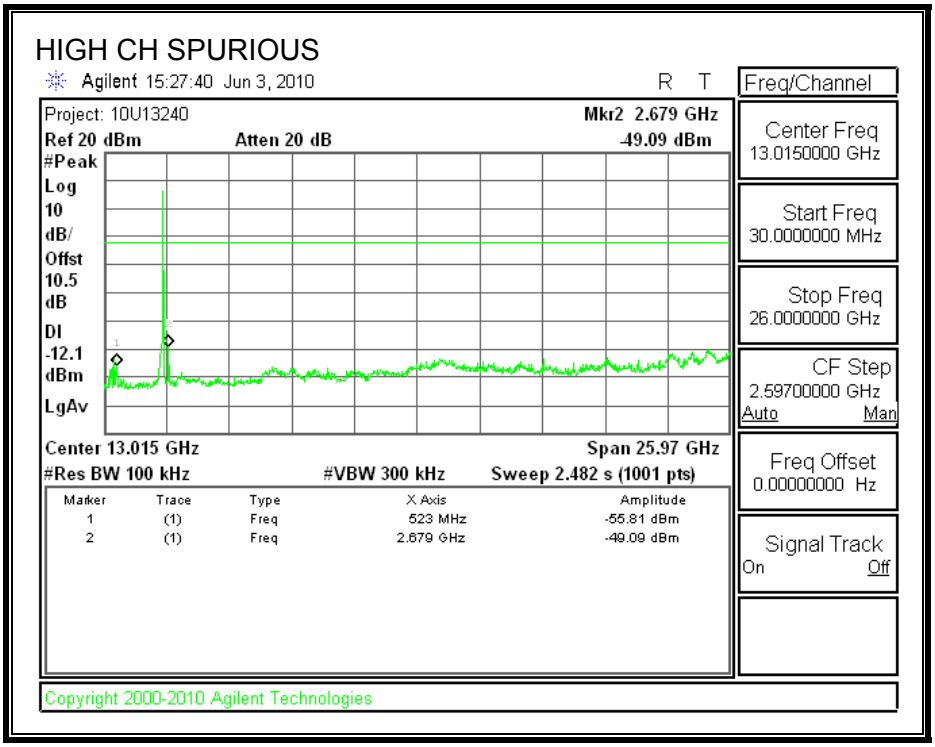
SPURIOUS EMISSIONS, MID CHANNEL





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.

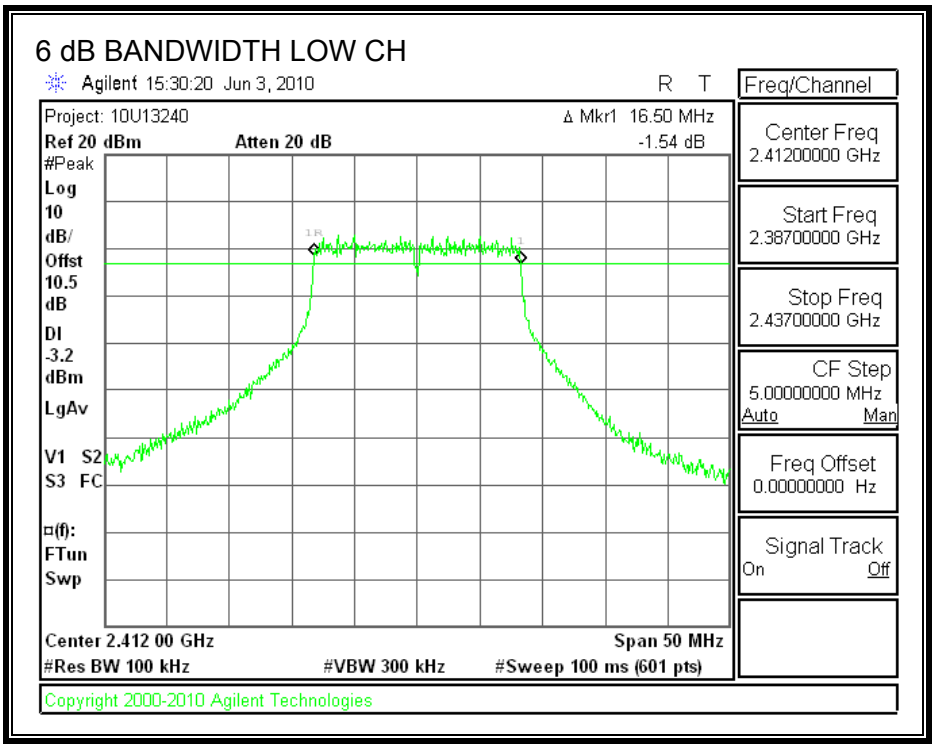
TEST PROCEDURE

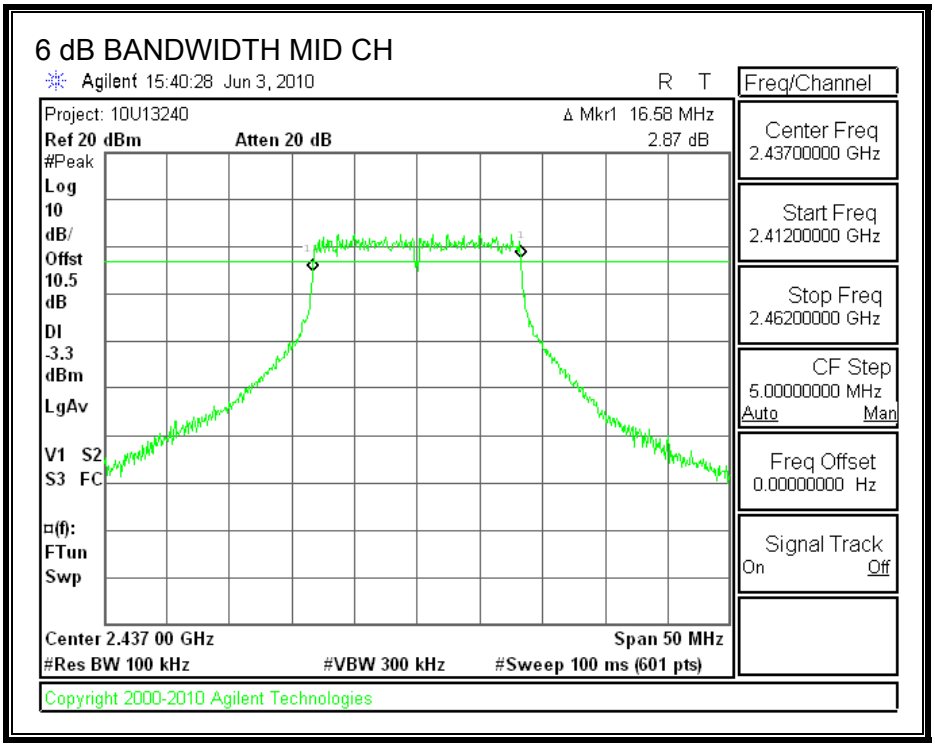
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

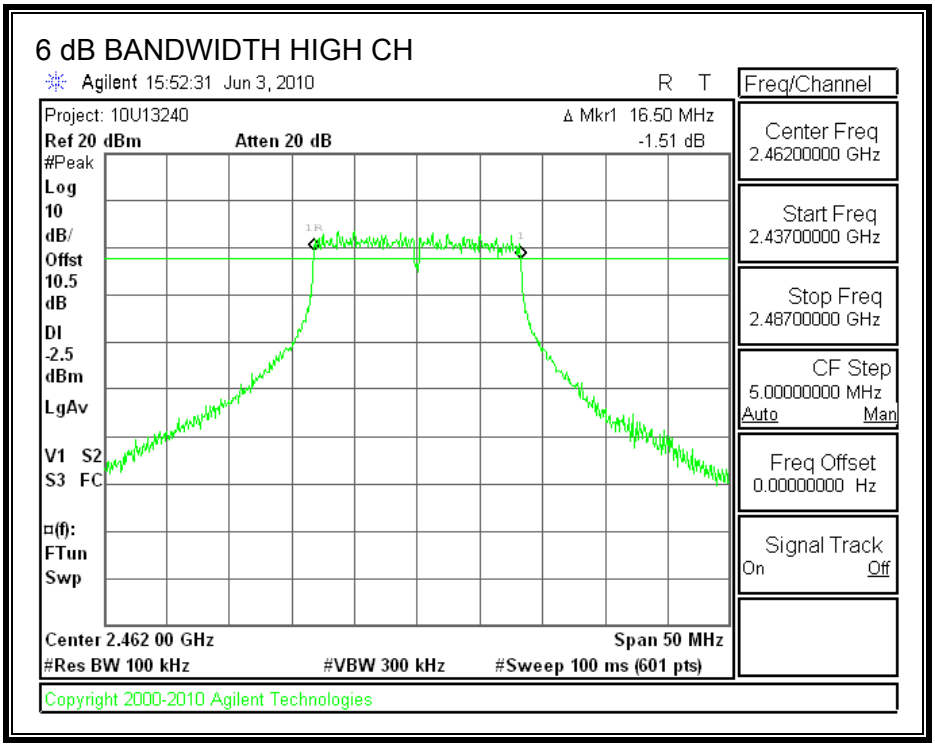
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.50	0.5
Middle	2437	16.58	0.5
High	2462	16.50	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

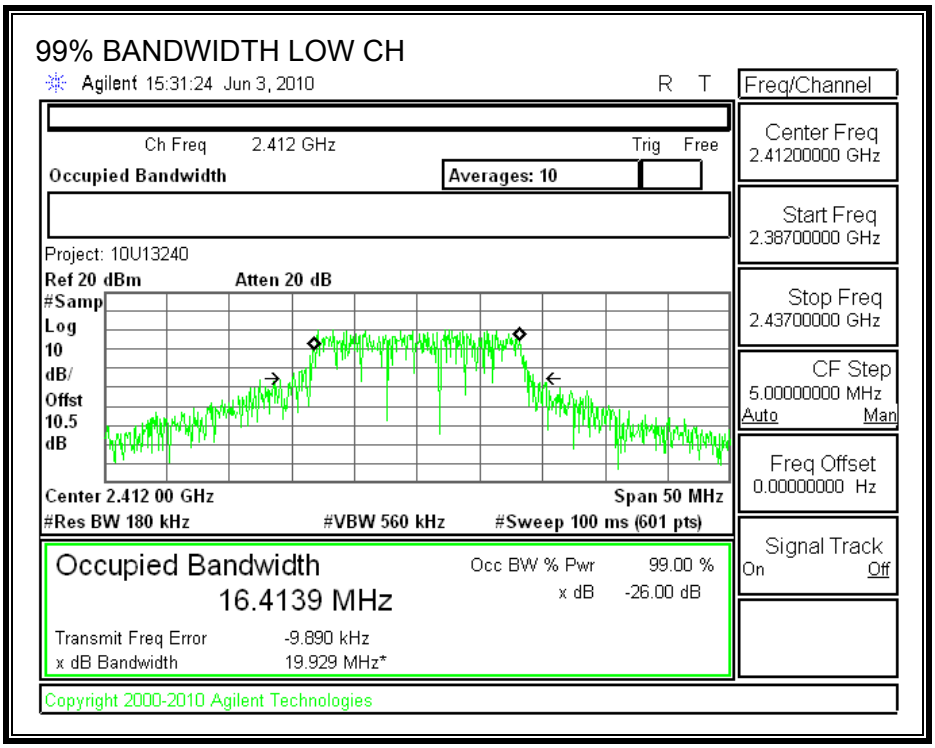
TEST PROCEDURE

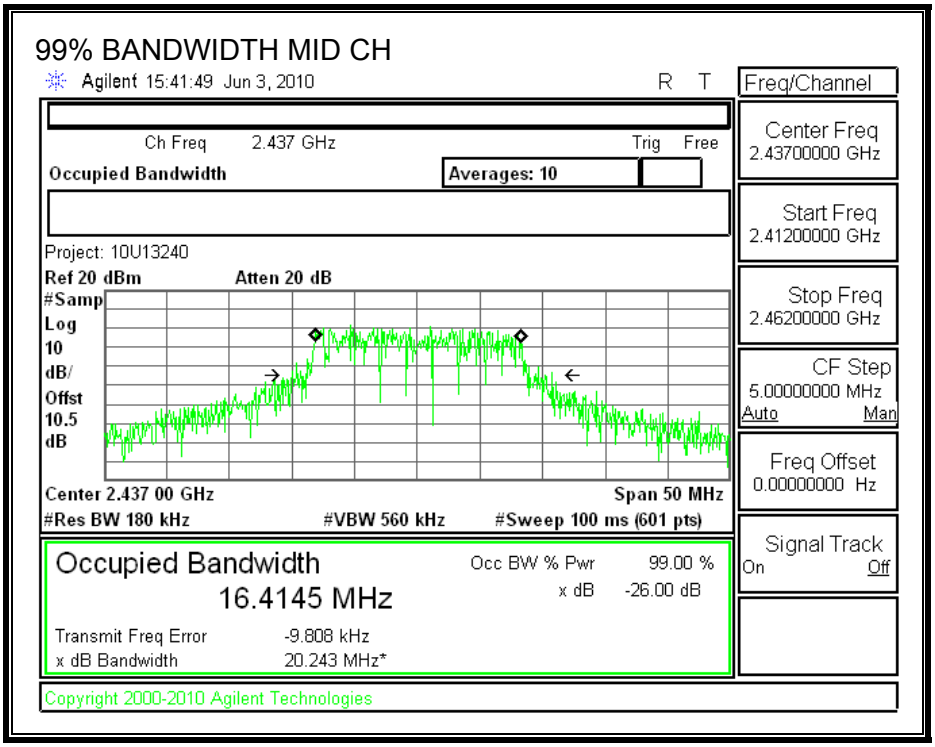
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

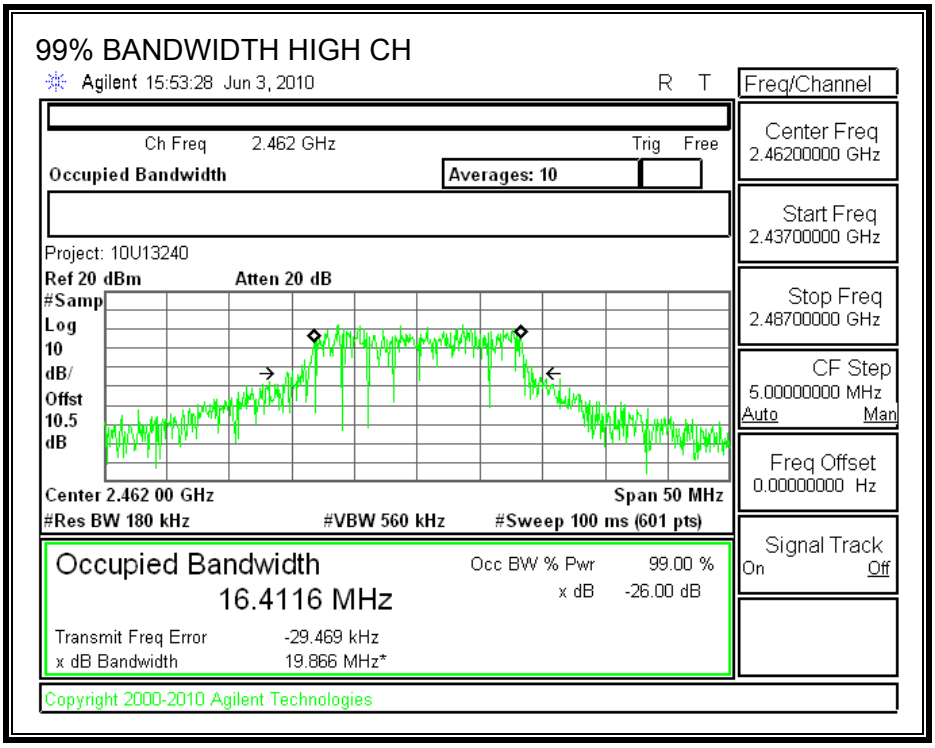
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4139
Middle	2437	16.4145
High	2462	16.4116

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.

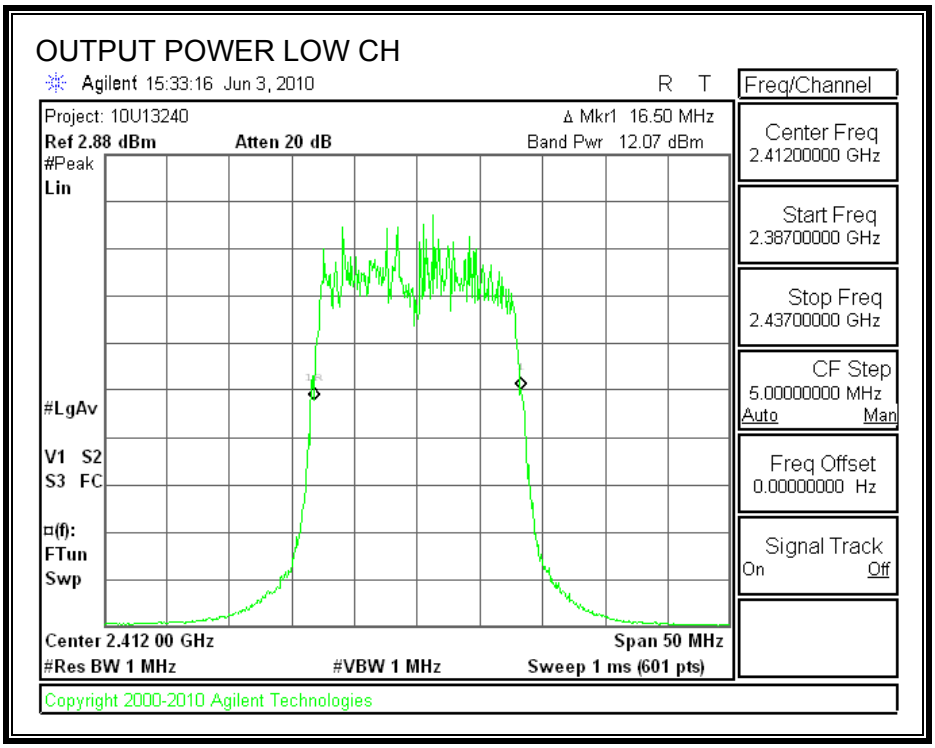
TEST PROCEDURE

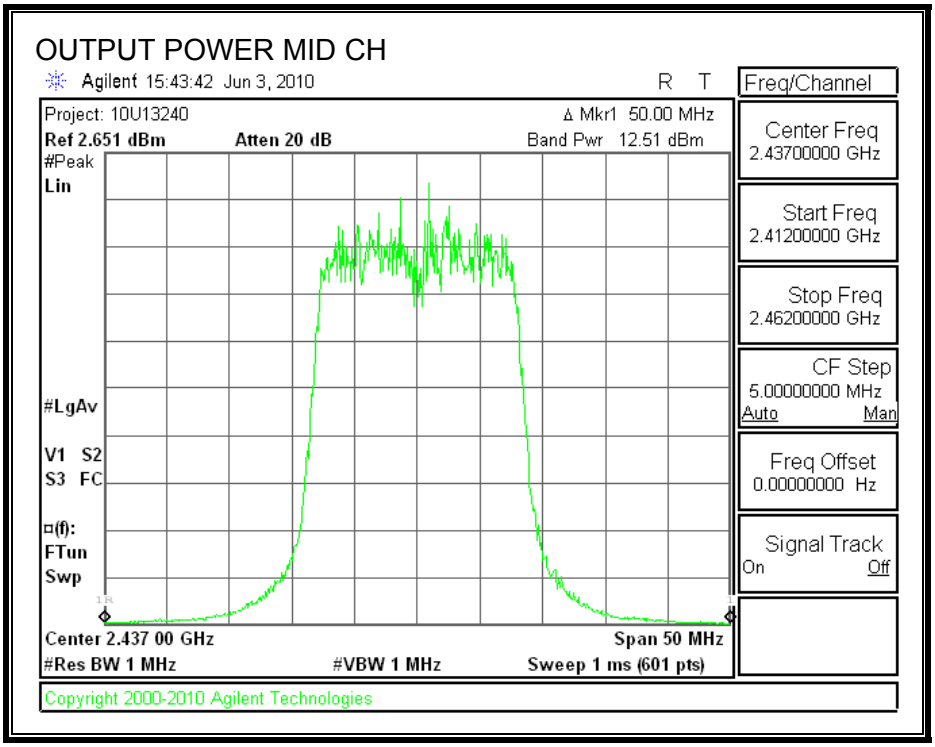
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

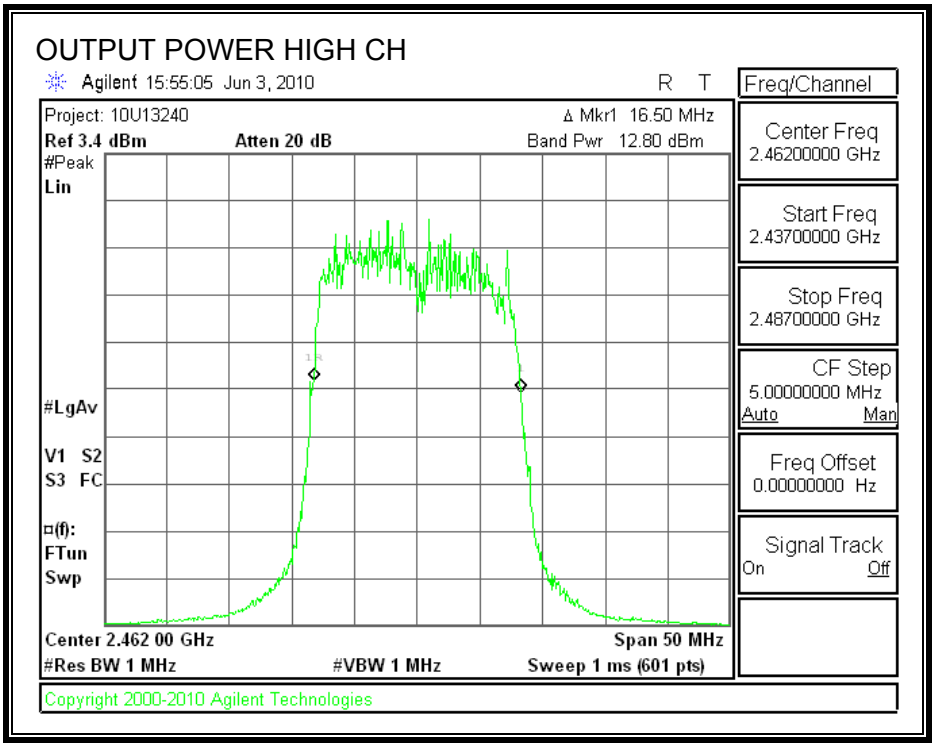
RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.07	10.5	22.57	30	-7.43
Middle	2437	12.51	10.5	23.01	30	-6.99
High	2462	12.80	10.5	23.30	30	-6.70

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 10.5 dB (including 10 dB pad and 0.5 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	14.20
Middle	2437	14.51
High	2462	14.54

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.

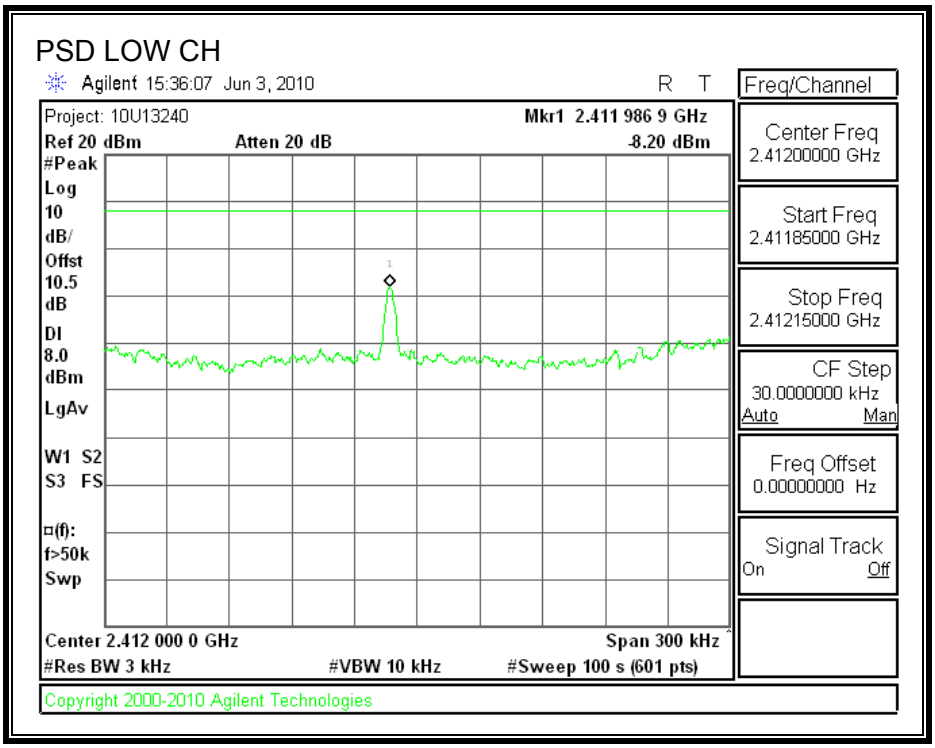
TEST PROCEDURE

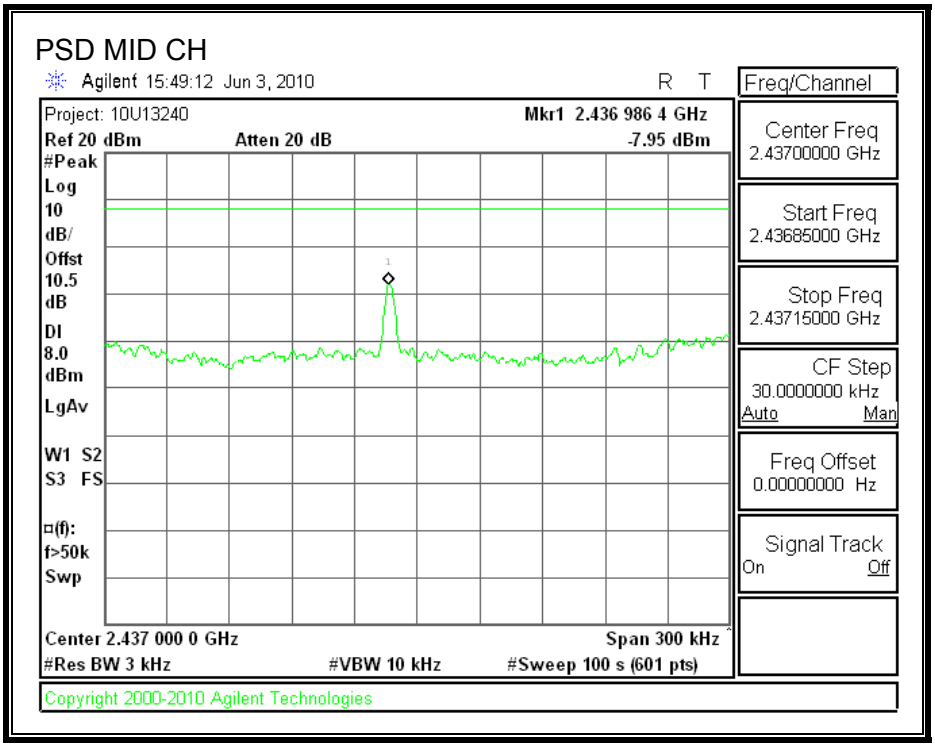
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document “Measurement of Digital Transmission Systems Operating under Section 15.247”, March 23, 2005.

RESULTS

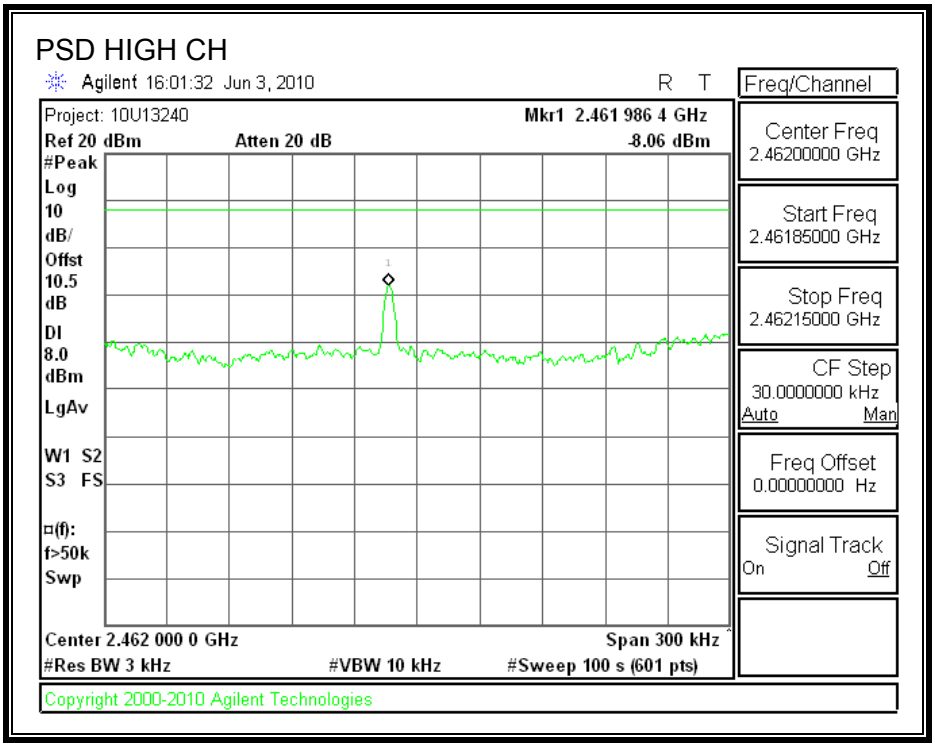
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.20	8	-16.20
Middle	2437	-7.95	8	-15.95
High	2462	-8.06	8	-16.06

POWER SPECTRAL DENSITY





PSD HIGH CH



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.

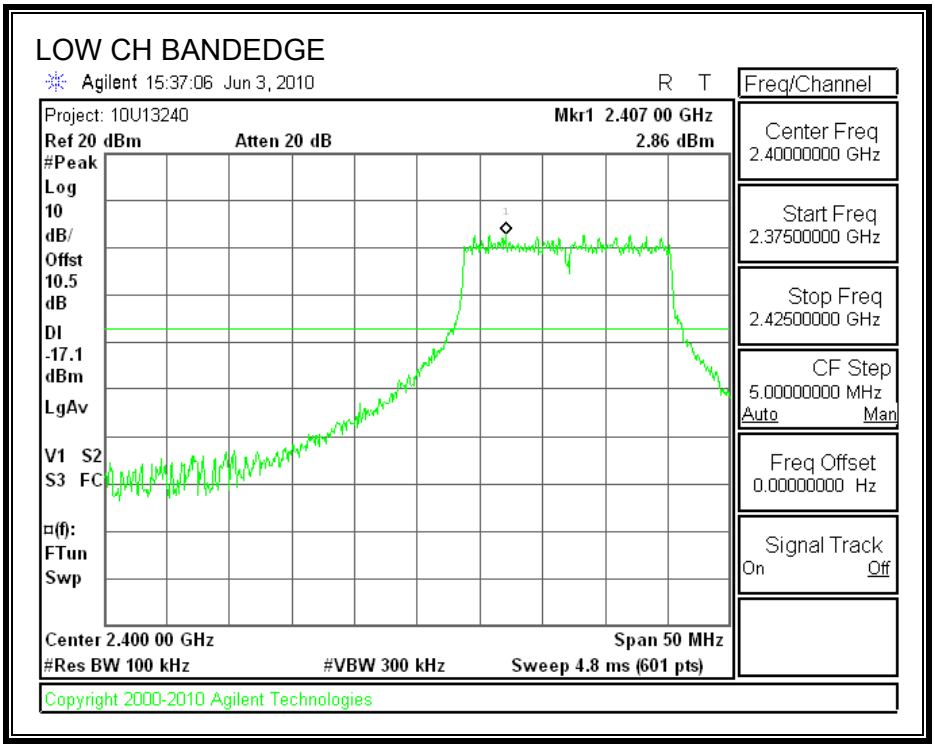
TEST PROCEDURE

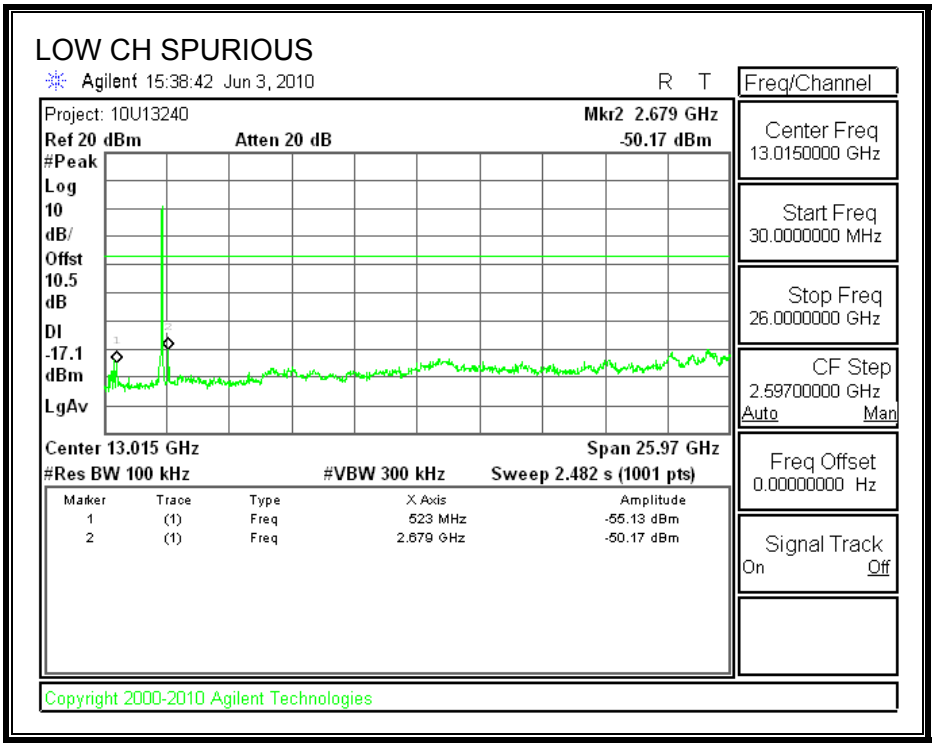
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

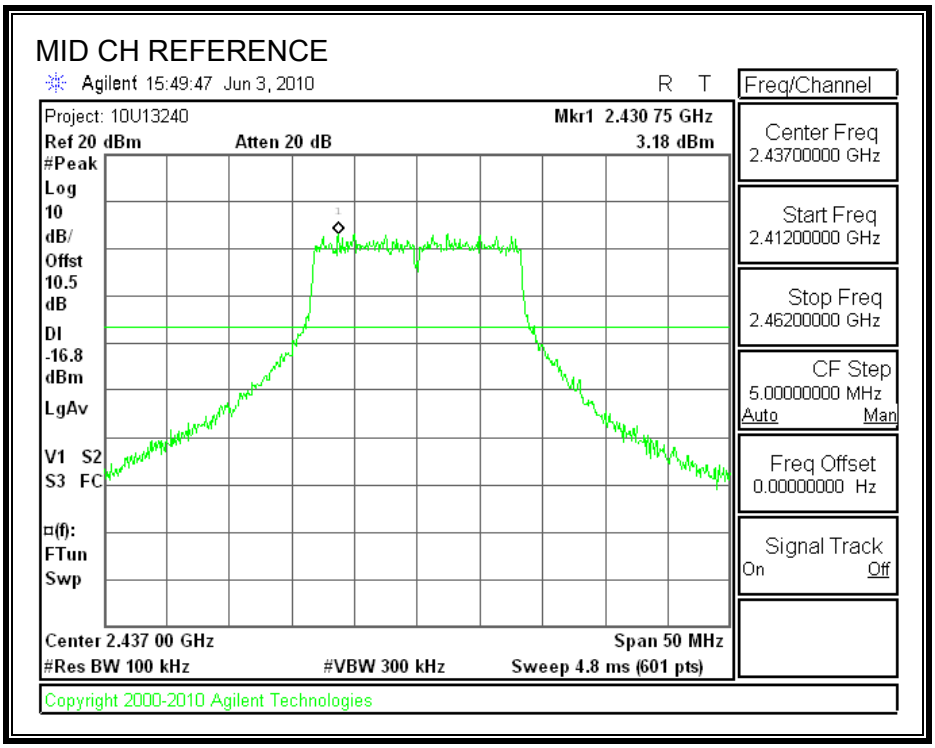
RESULTS

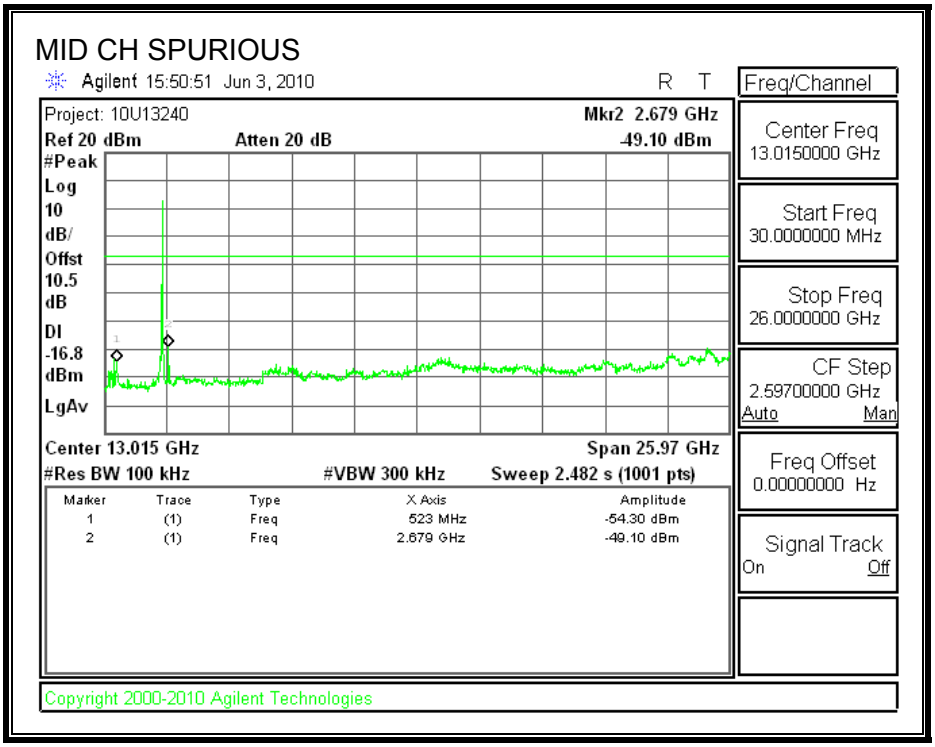
SPURIOUS EMISSIONS, LOW CHANNEL



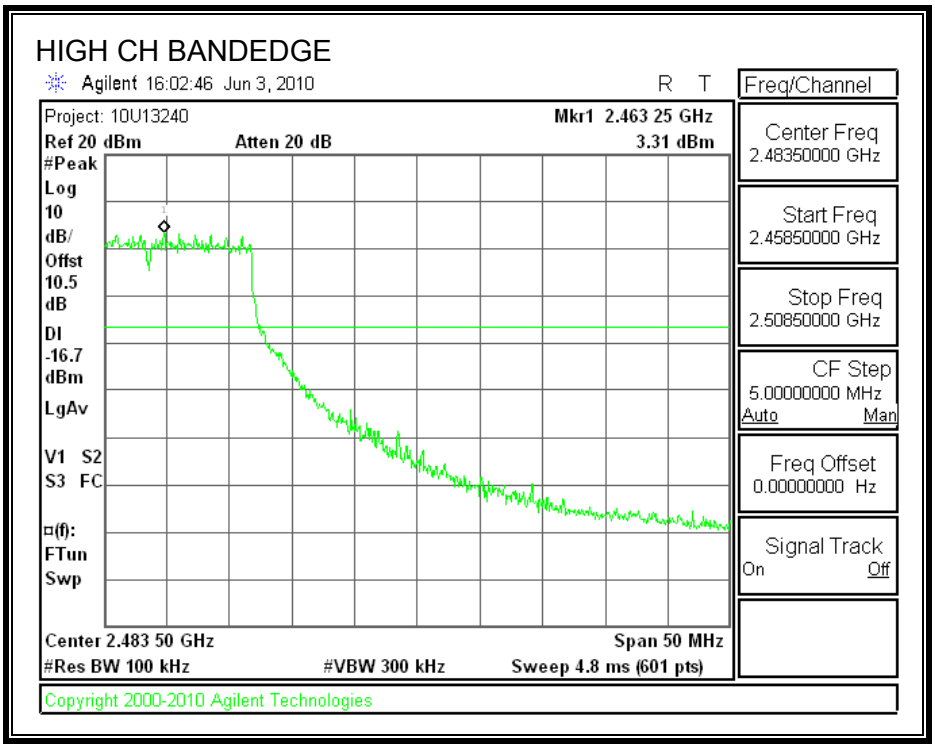


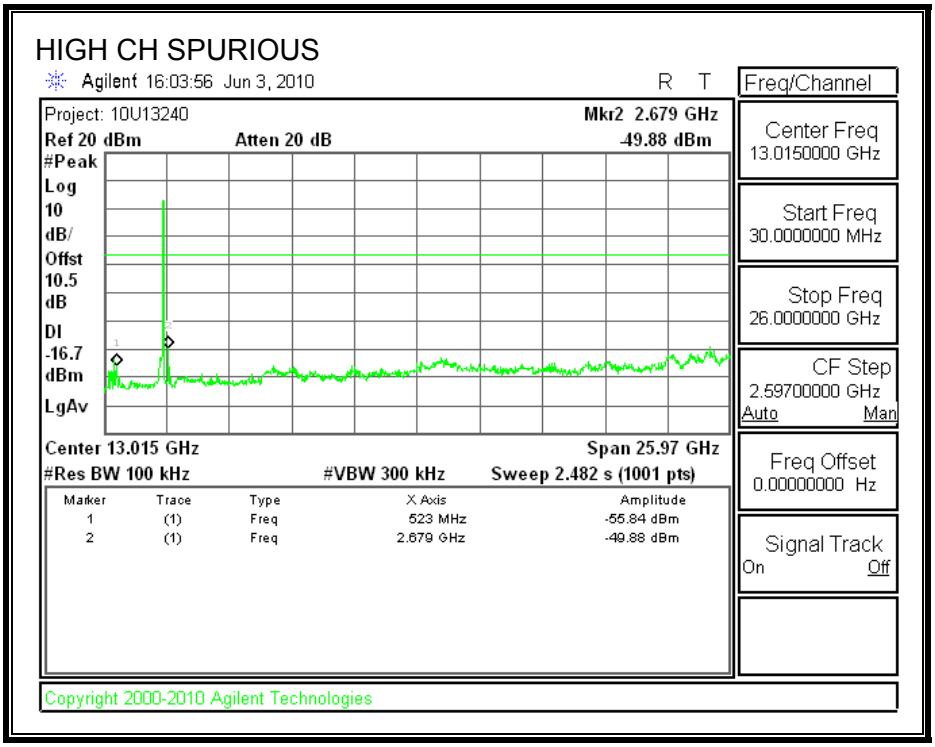
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.3. 802.11a MODE IN THE 5.8 GHz BAND

7.3.1. 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.

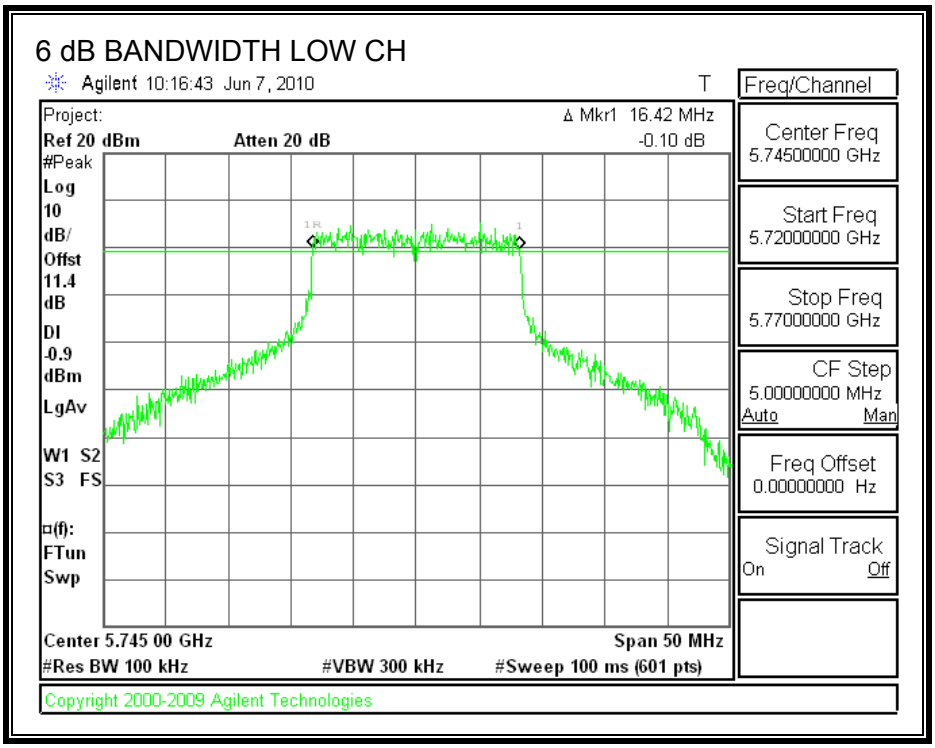
TEST PROCEDURE

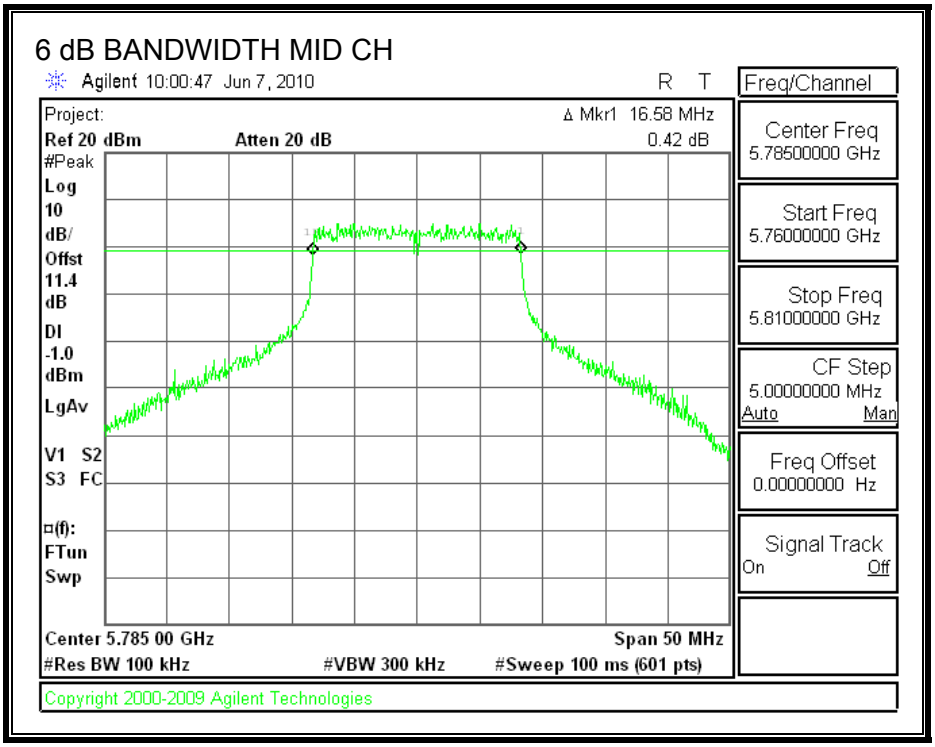
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

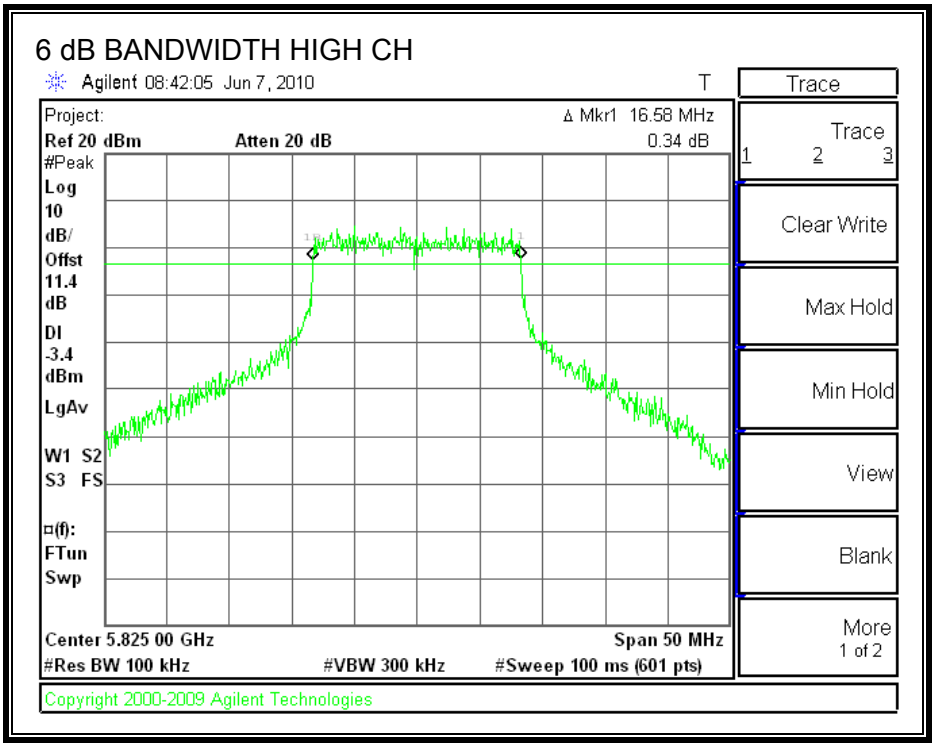
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.42	0.5
Middle	5785	16.58	0.5
High	5825	16.58	0.5

6 dB BANDWIDTH







7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

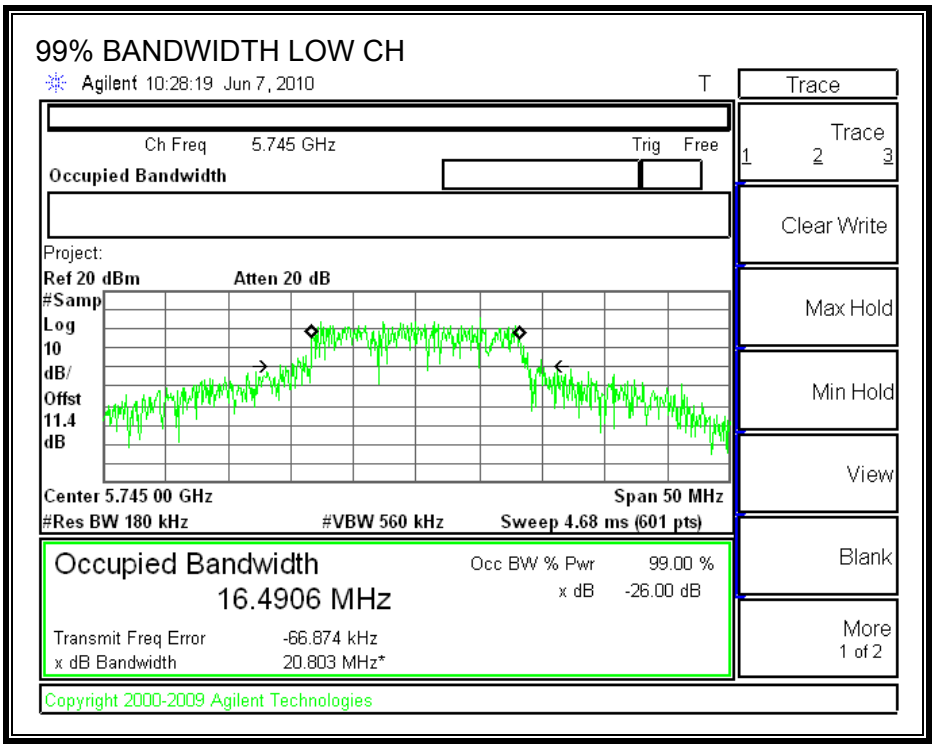
TEST PROCEDURE

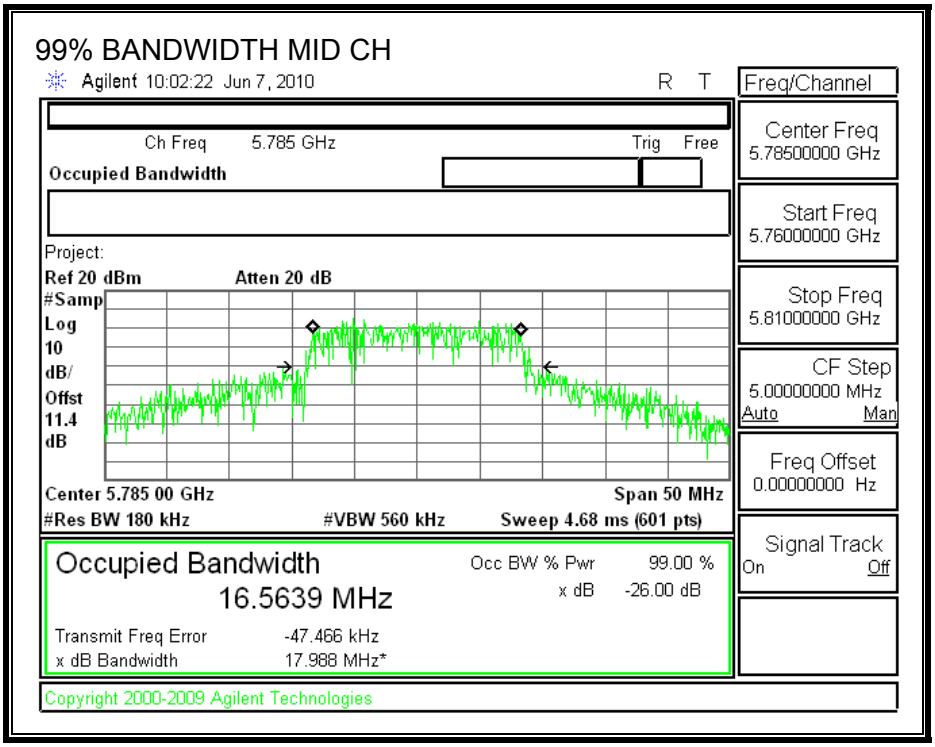
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

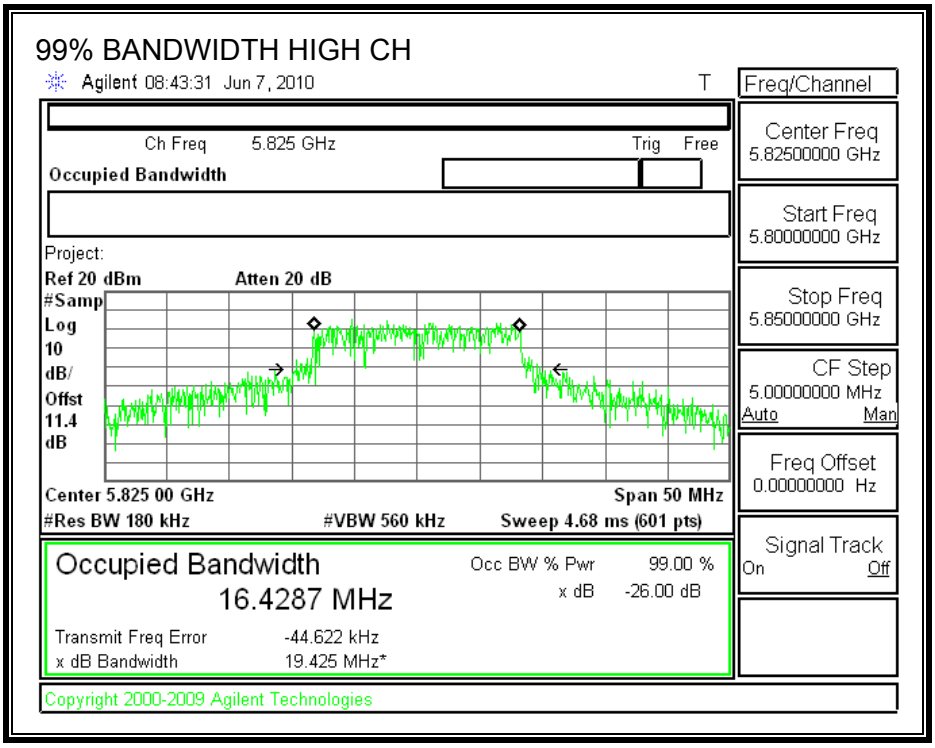
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.4906
Middle	5785	16.5639
High	5825	16.4287

99% BANDWIDTH







7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is 6.7 dBi for other than fixed, point-to-point operations, therefore the limit is 29.3 dBm.

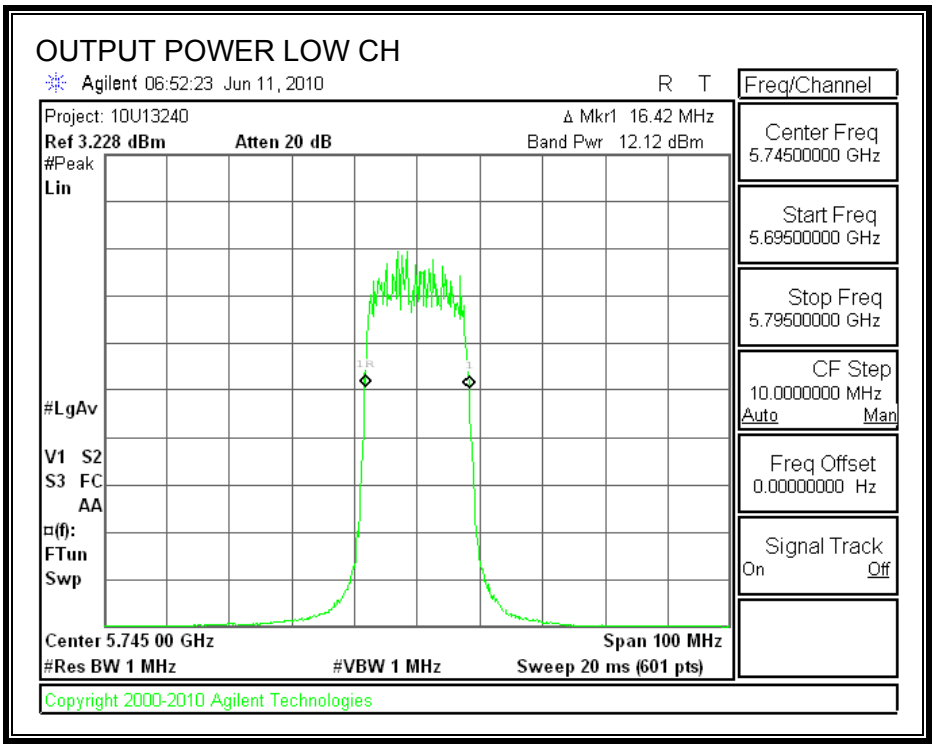
TEST PROCEDURE

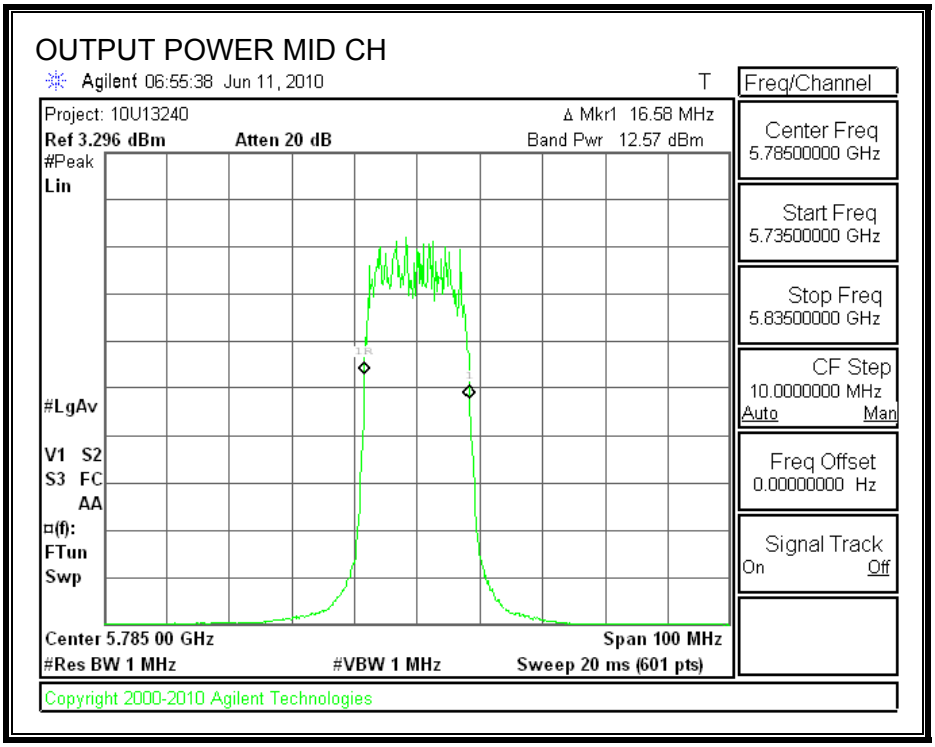
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

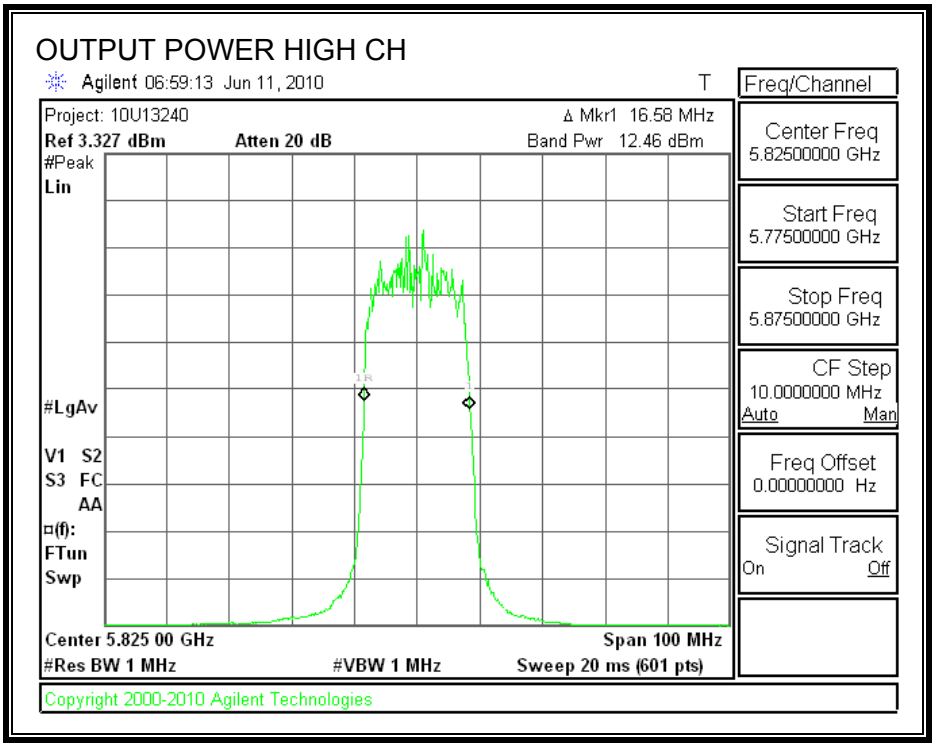
RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	12.12	10.78	22.90	29.3	-6.40
Middle	5785	12.57	10.78	23.35	29.3	-5.95
High	5825	12.46	10.78	23.24	29.3	-6.06

OUTPUT POWER







7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.4 dB (including 10 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	16.62
Middle	5785	16.03
High	5825	16.18

7.3.5. 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.

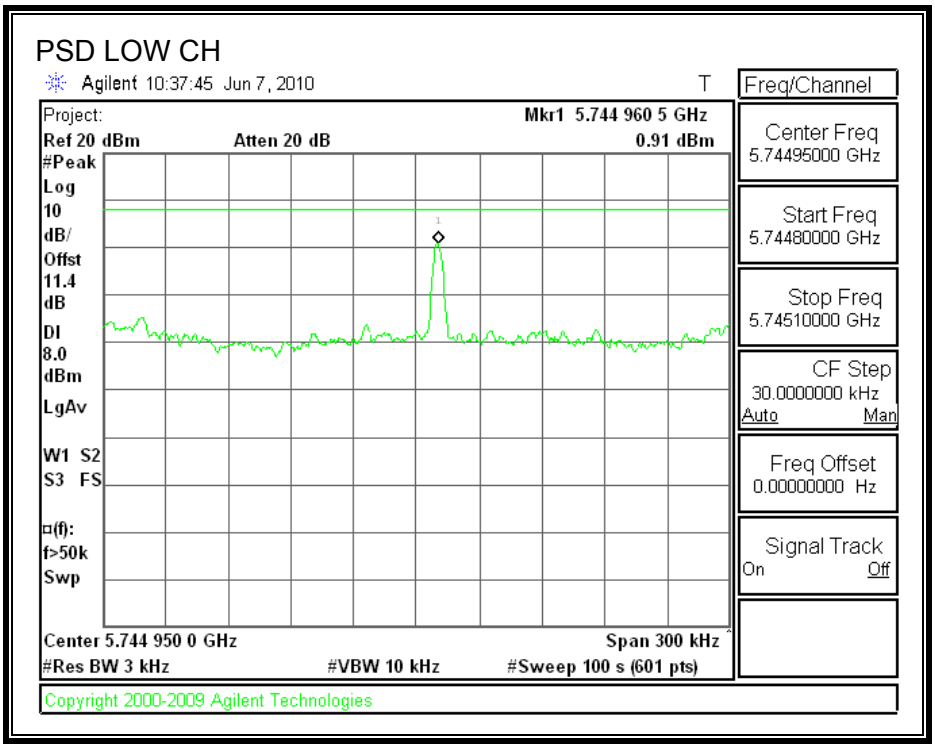
TEST PROCEDURE

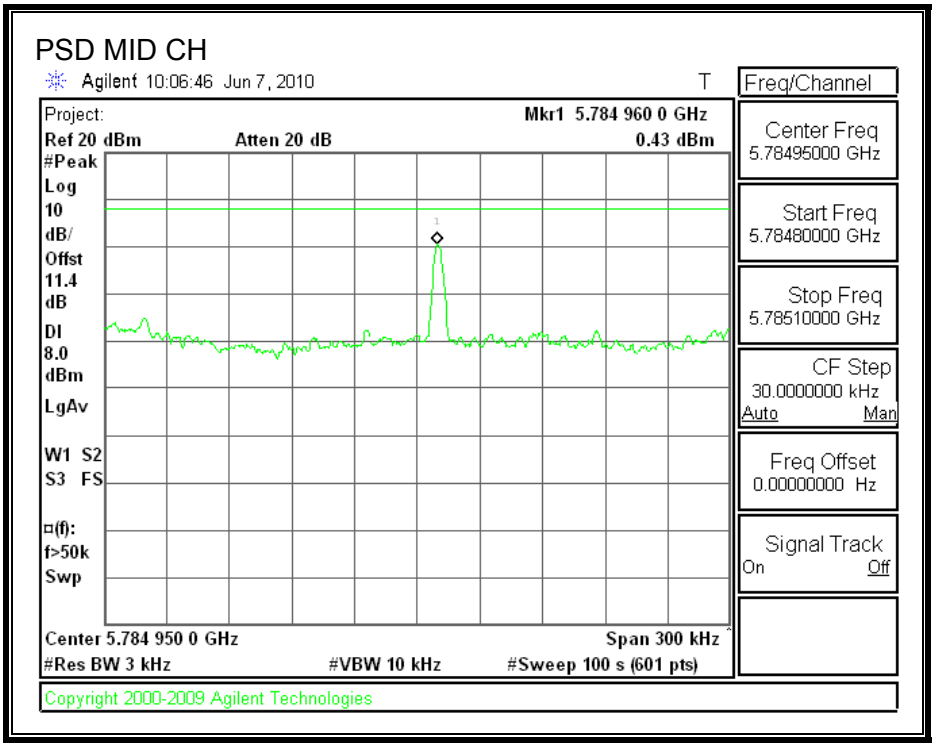
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

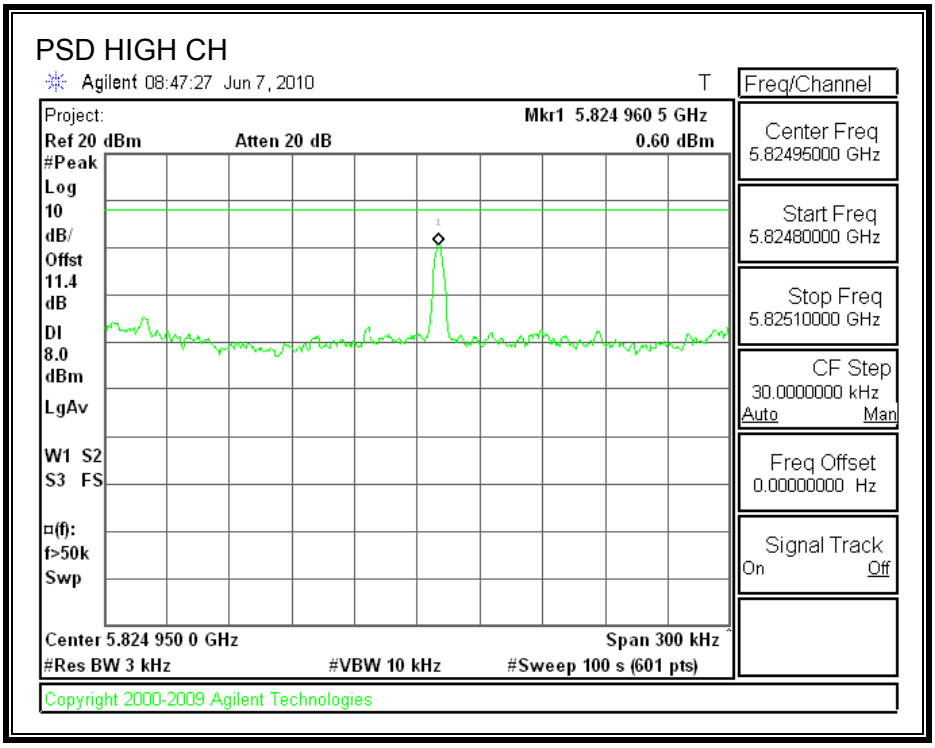
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	0.91	8	-7.09
Middle	5785	0.43	8	-7.57
High	5825	0.60	8	-7.40

POWER SPECTRAL DENSITY





PSD HIGH CH



7.3.6. 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.

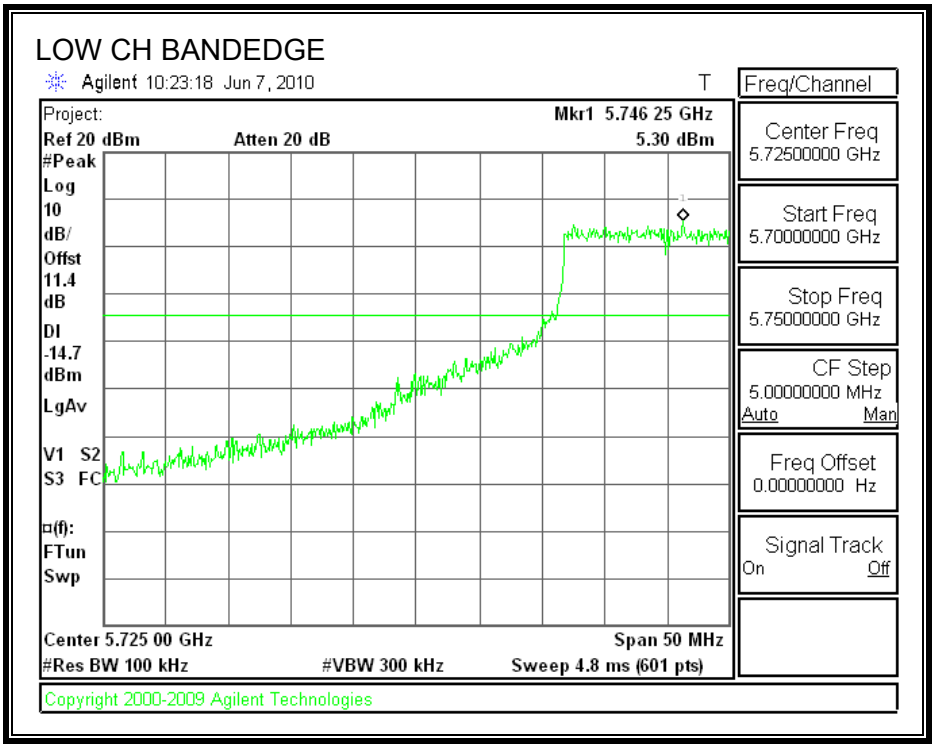
TEST PROCEDURE

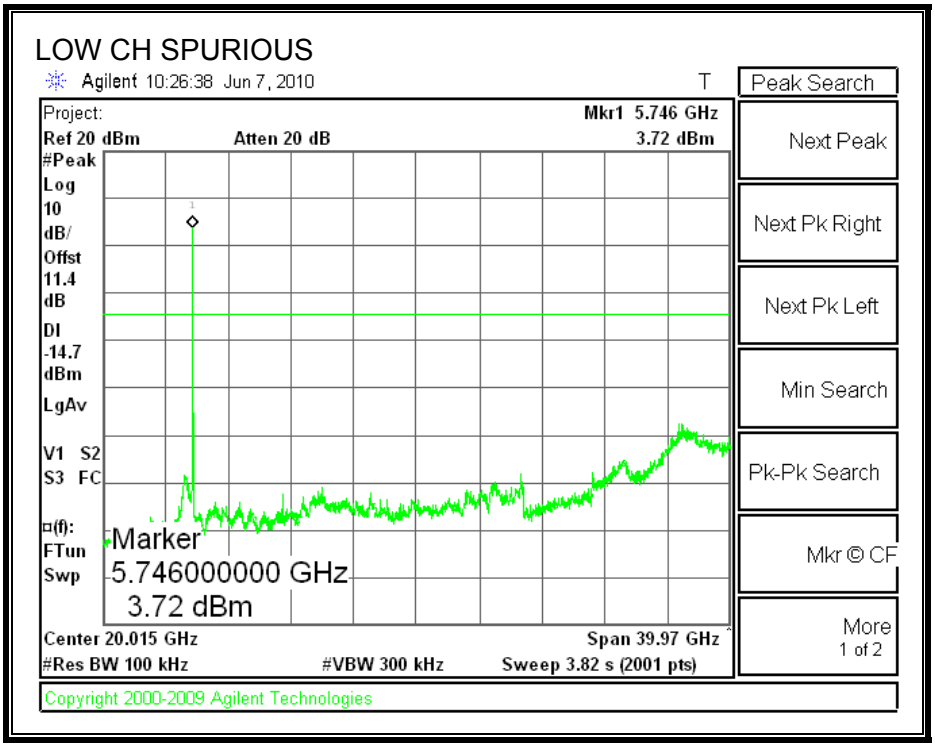
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

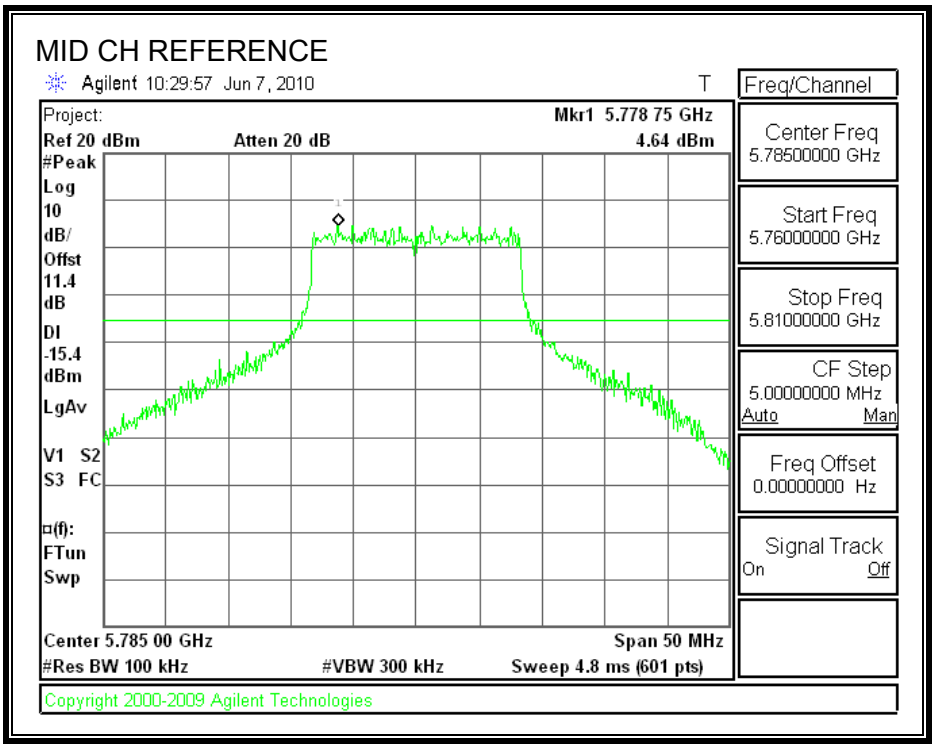
RESULTS

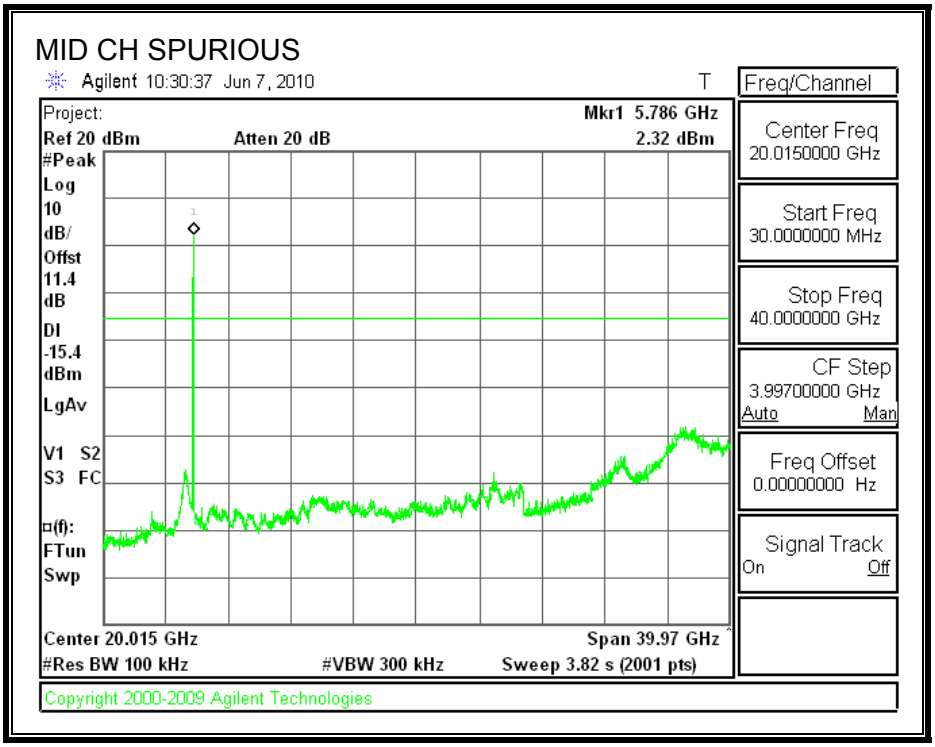
SPURIOUS EMISSIONS, LOW CHANNEL



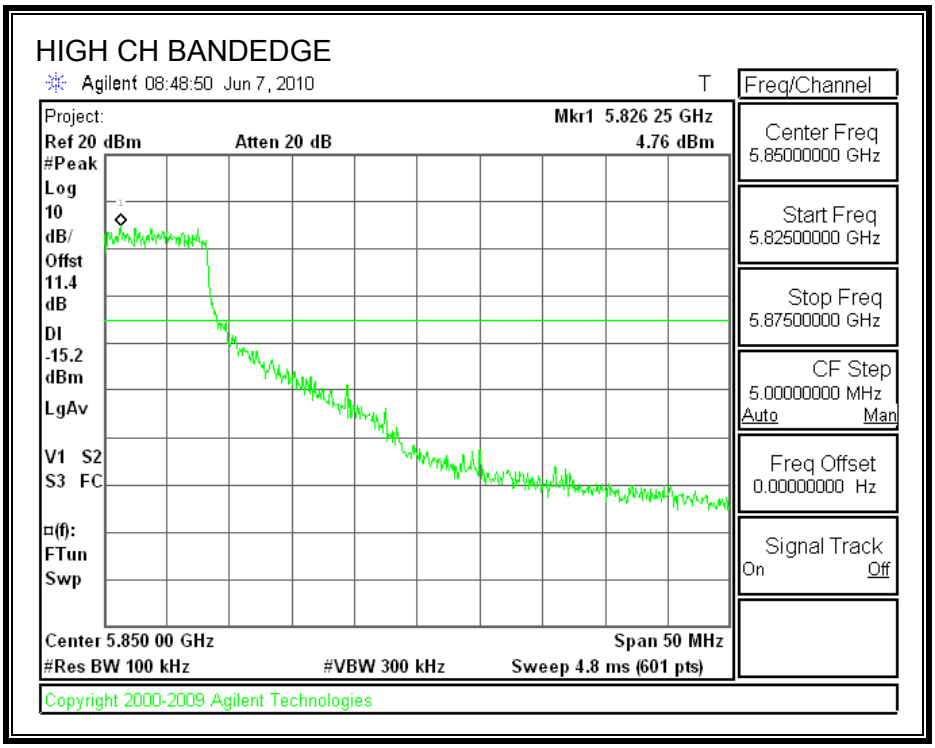


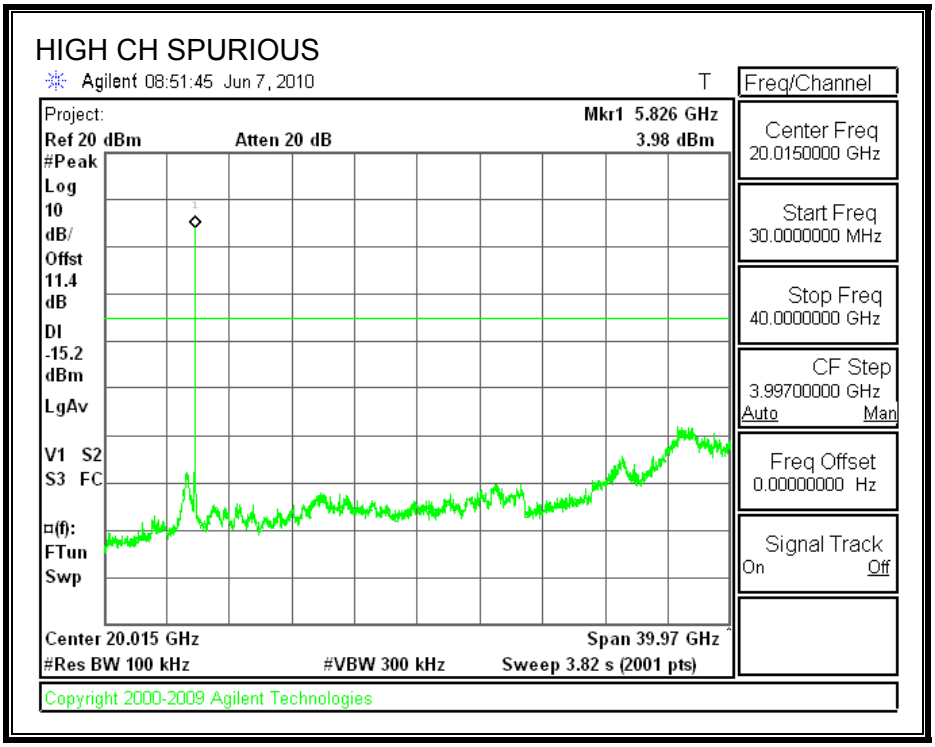
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.4. RECEIVER CONDUCTED SPURIOUS EMISSIONS

LIMITS

IC RSS-GEN 7.2.3.1

Antenna Conducted Measurement: Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, or 5 nanowatts (-53 dBm) above 1 GHz.

TEST PROCEDURE

IC RSS-GEN 4.10, Conducted Method

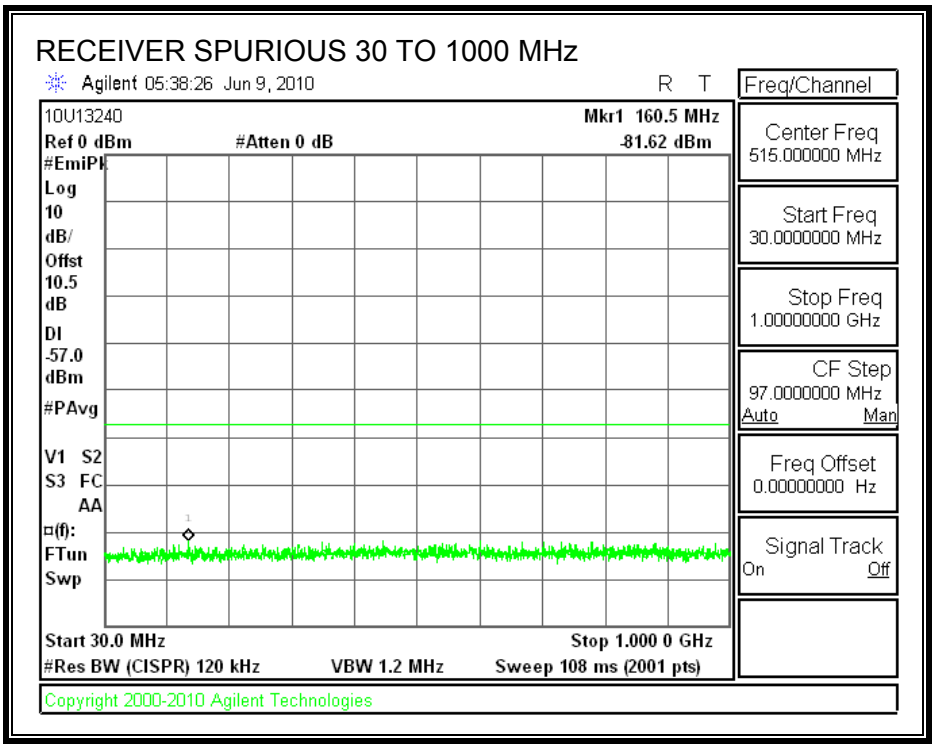
The receiver antenna port is connected to a spectrum analyzer.

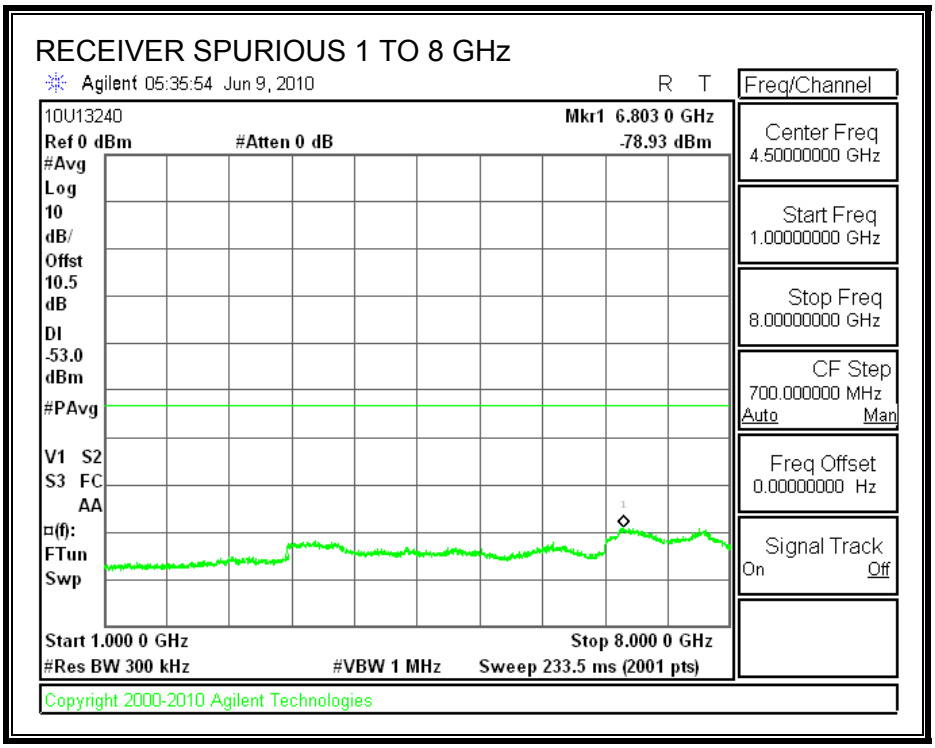
The spectrum from 30 MHz to 8 GHz is investigated with the receiver set to the middle channel of the 2.4 GHz band.

The spectrum from 30 MHz to 18 GHz is investigated with the receiver set to the middle channel of each 5 GHz band.

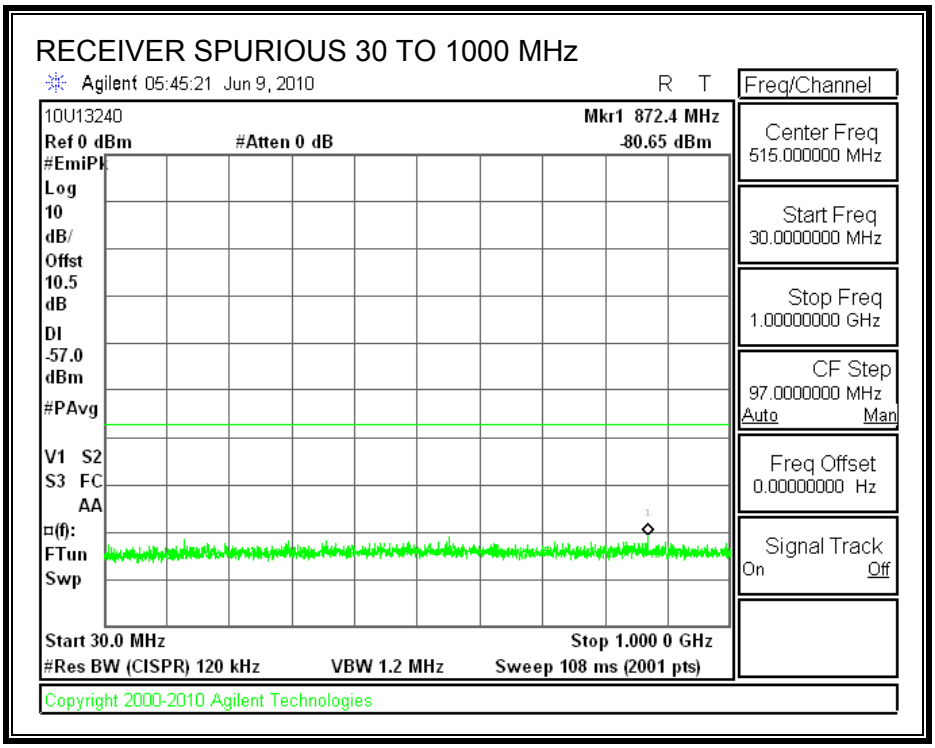
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

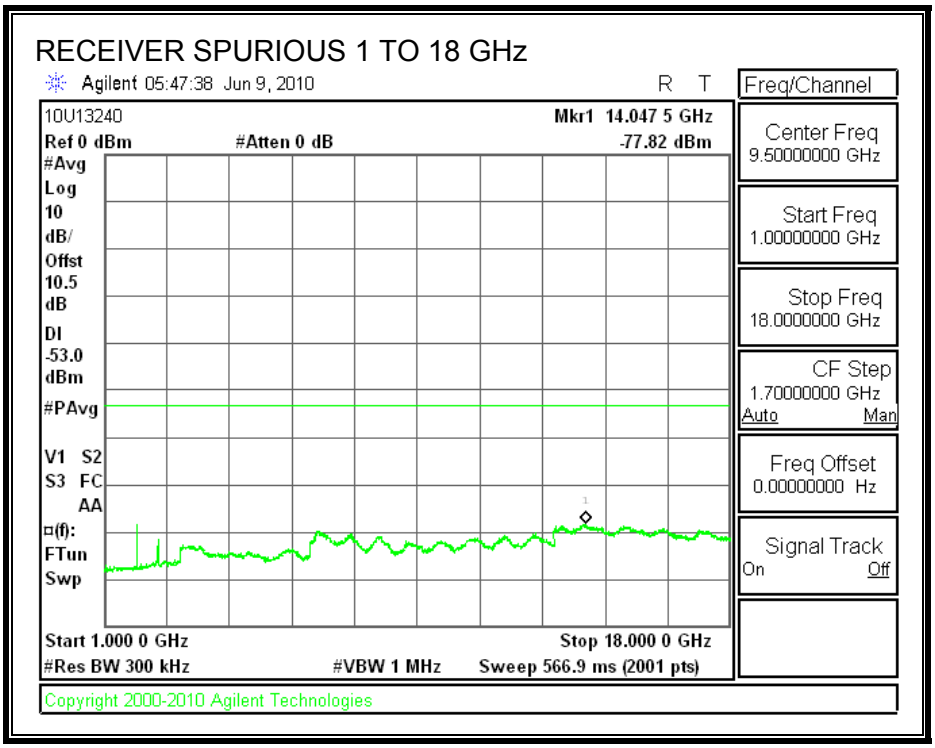
RECEIVER SPURIOUS EMISSIONS IN THE 2.4 GHz BAND





RECEIVER SPURIOUS EMISSIONS IN THE 5.8 GHz BAND





8. RADIATED TEST RESULTS

8.1. 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.

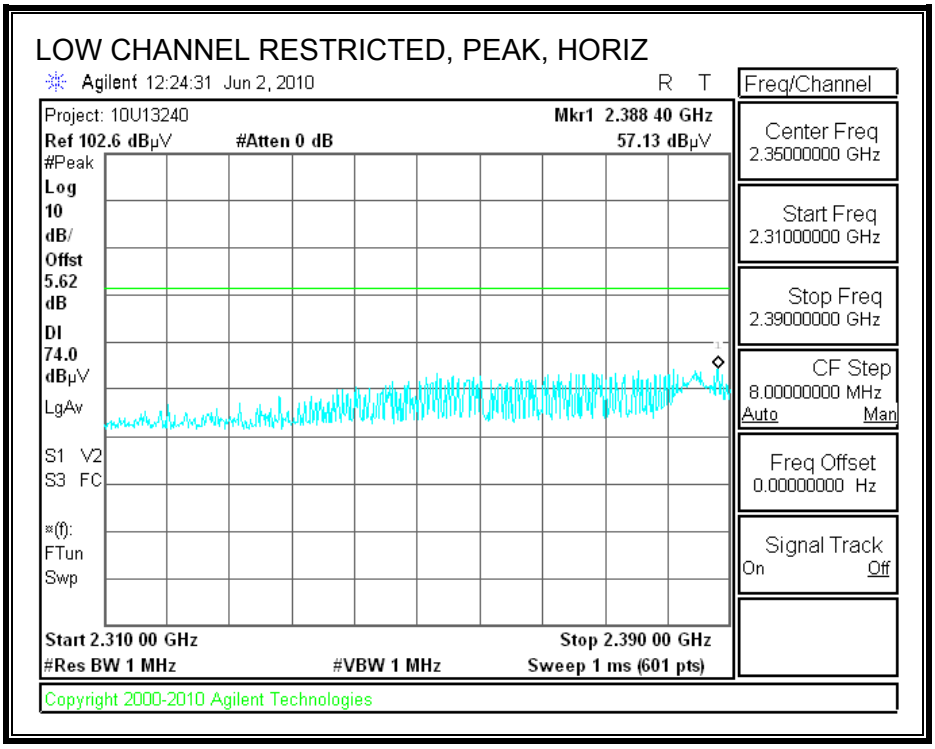
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

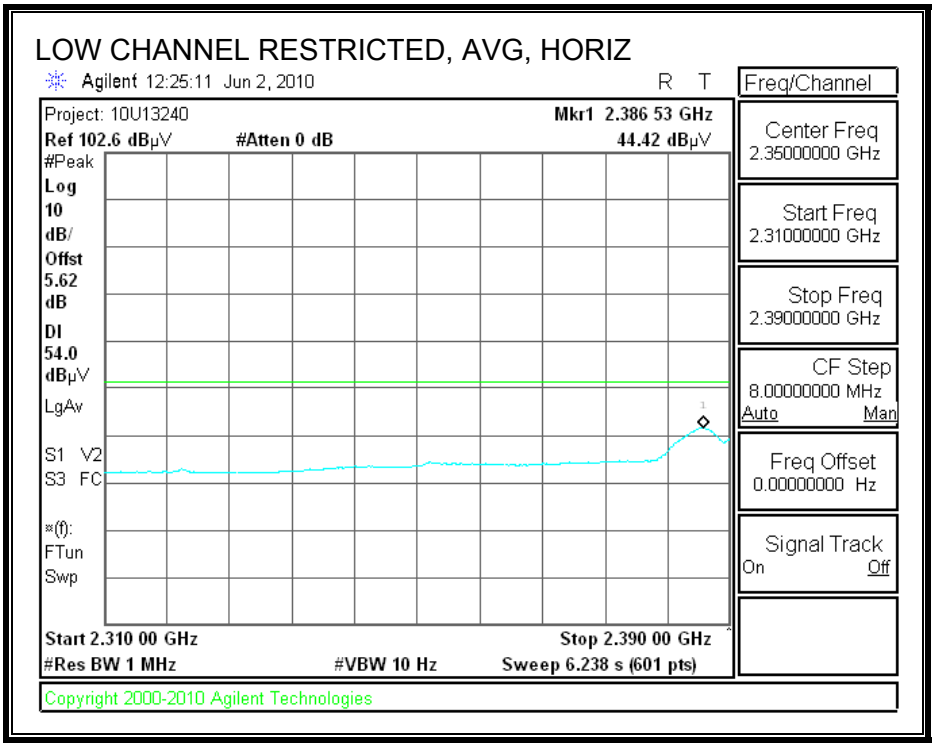
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

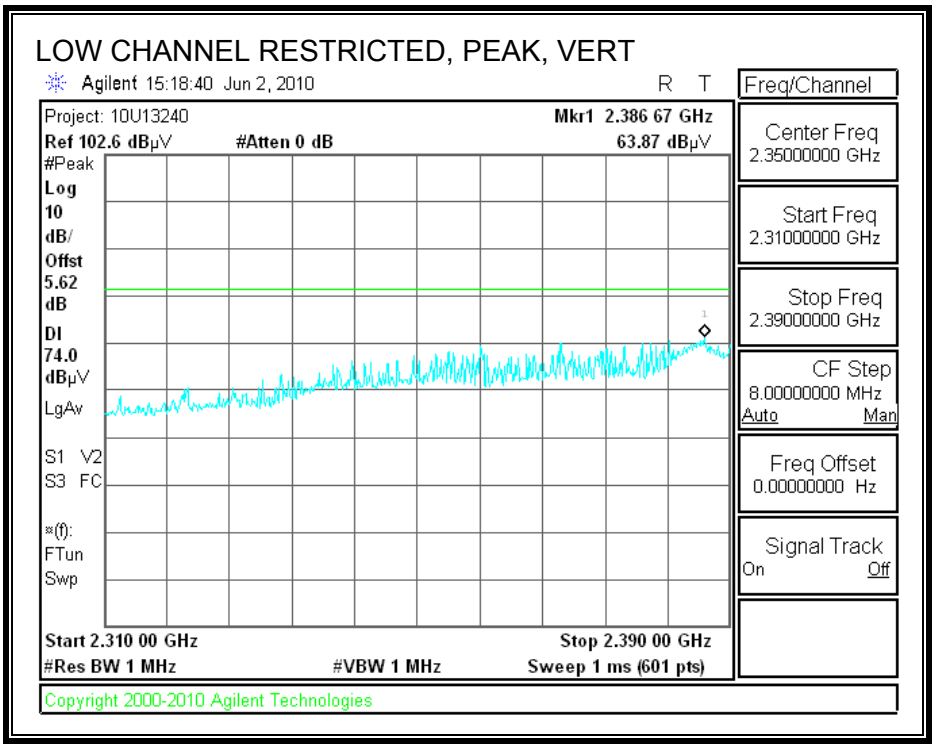
8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

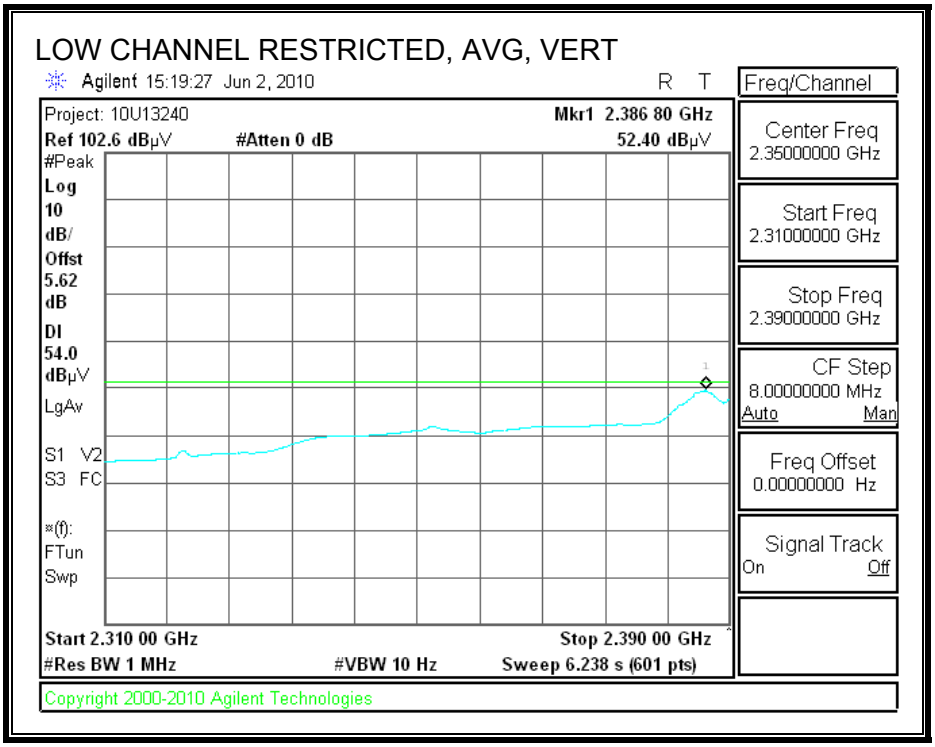
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



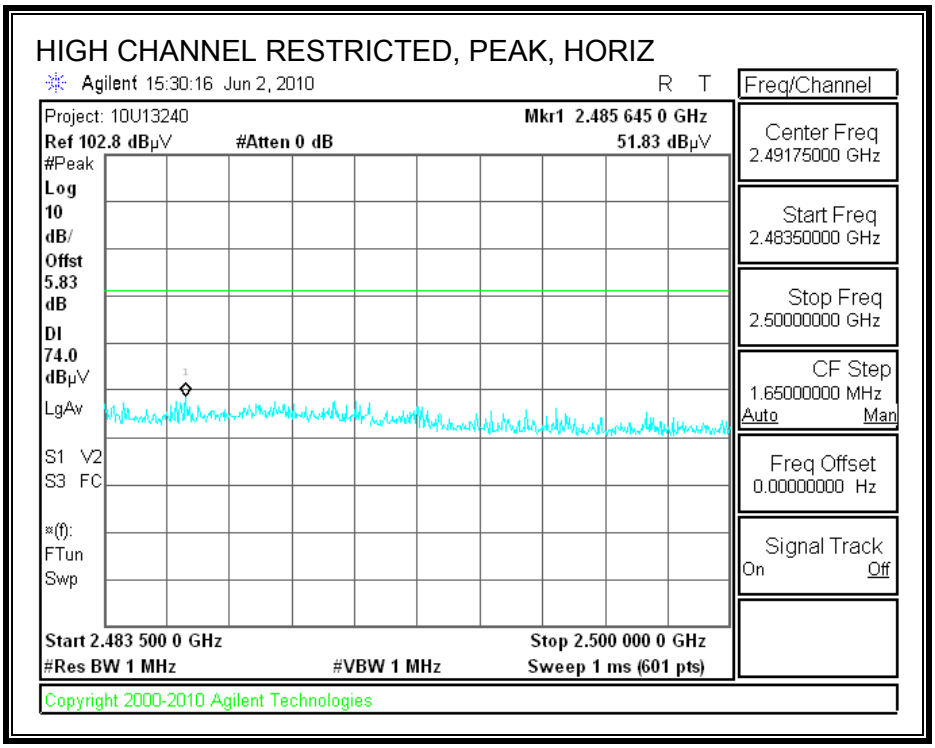


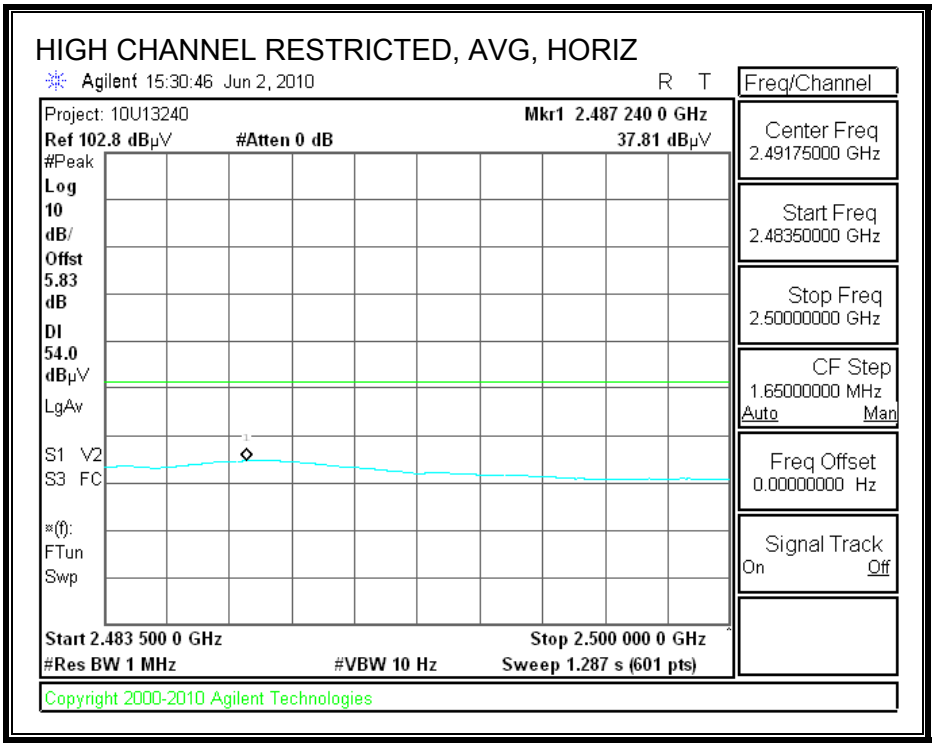
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



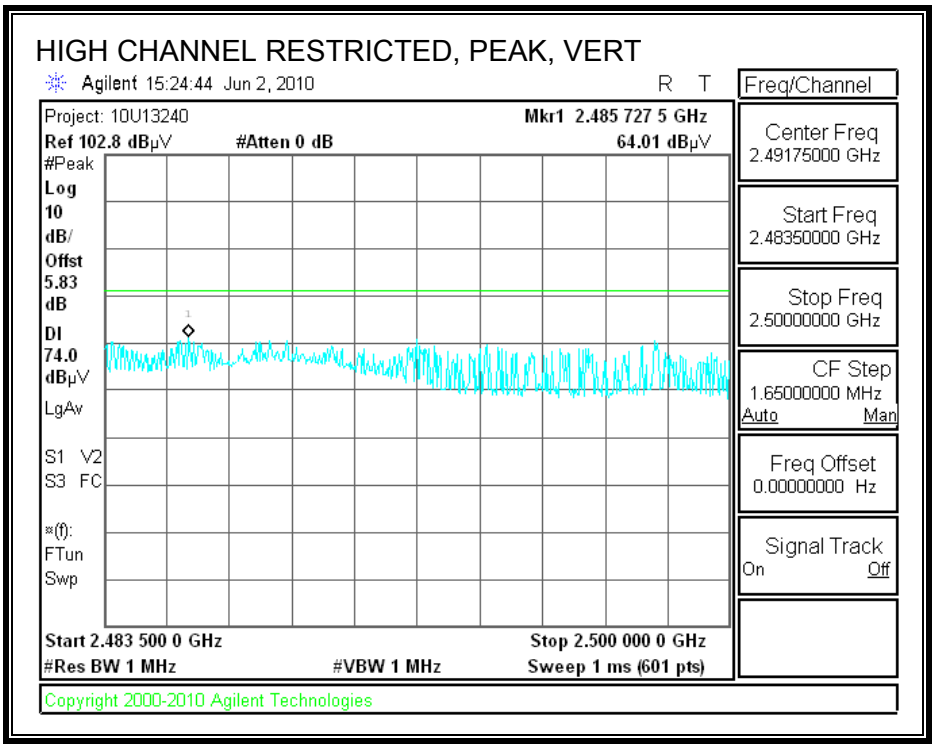


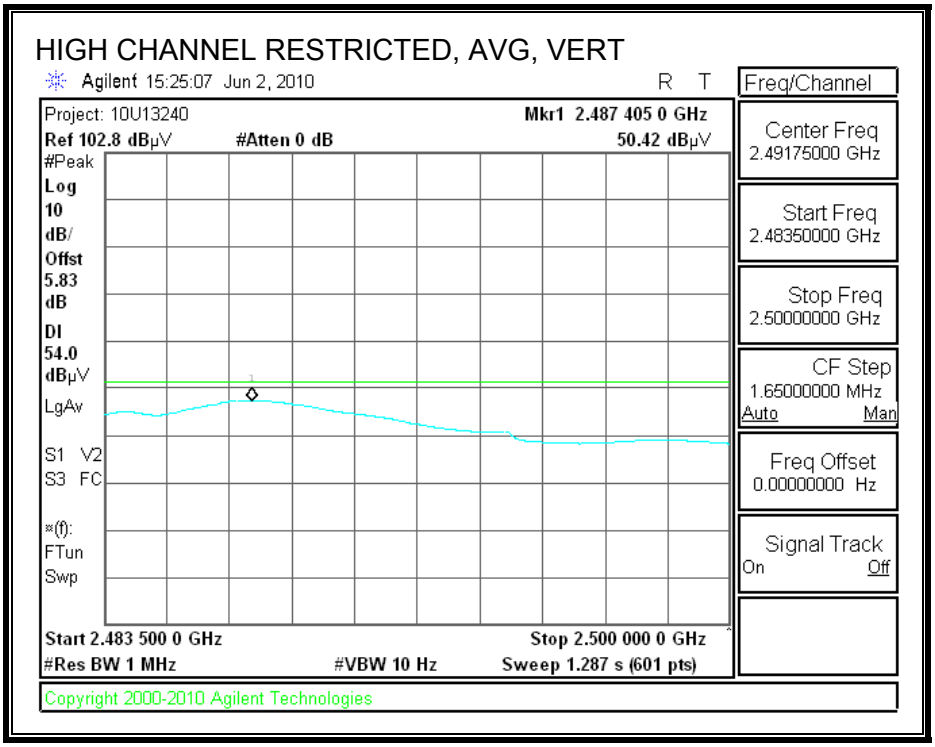
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 06/02/10
Project #: 10U13240
Company: Aircell
EUT Description: Cabin Wireless Acess Point
EUT M/N: EUT with support laptop PC
Test Target: FCC Class B
Mode Oper: Continously TX

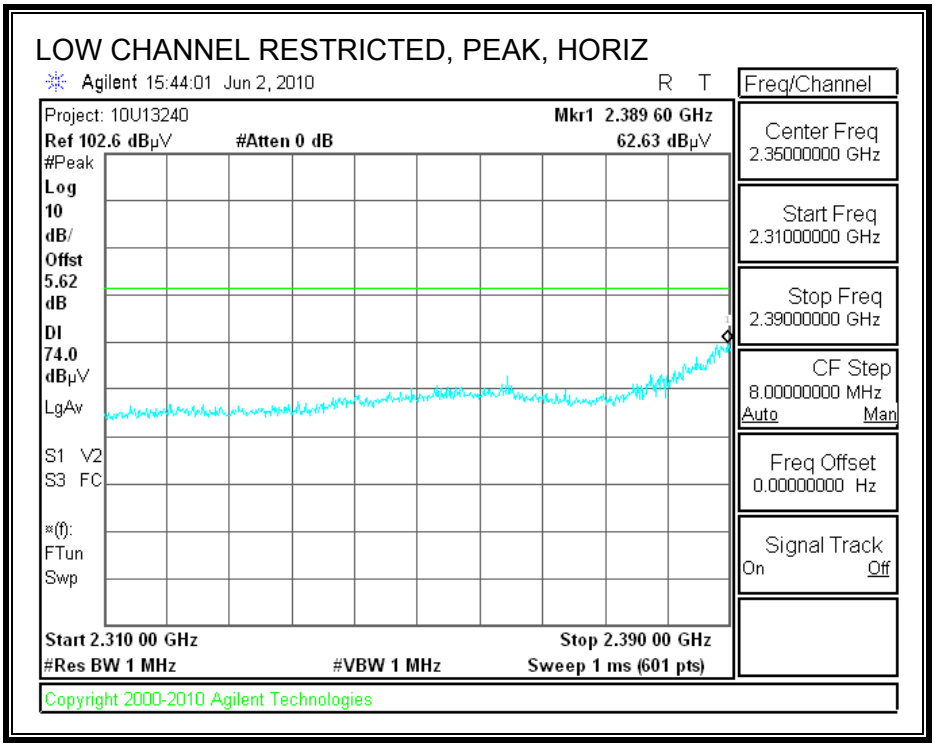
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs.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

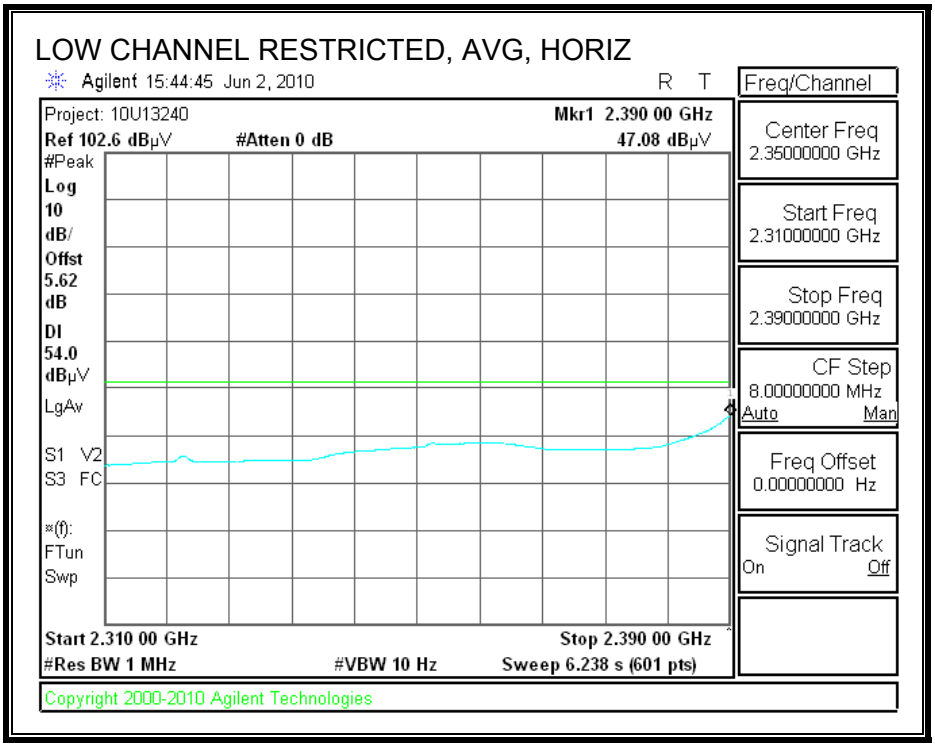
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz Low CH													
4.824	3.0	36.0	32.7	5.8	-34.8	0.0	0.0	39.6	74.0	-34.4	H	P	Hori
4.824	3.0	23.0	32.7	5.8	-34.8	0.0	0.0	26.6	54.0	-27.4	H	A	Hori
7.236	3.0	34.5	35.4	7.2	-34.1	0.0	0.0	43.0	74.0	-31.0	H	P	Hori
7.236	3.0	22.1	35.4	7.2	-34.1	0.0	0.0	30.6	54.0	-23.4	H	A	Hori
4.824	3.0	35.3	32.7	5.8	-34.8	0.0	0.0	38.9	74.0	-35.1	V	P	Vert
4.824	3.0	23.0	32.7	5.8	-34.8	0.0	0.0	26.7	54.0	-27.3	V	A	Vert
7.236	3.0	34.2	35.4	7.2	-34.1	0.0	0.0	42.7	74.0	-31.3	V	P	Vert
7.236	3.0	22.0	35.4	7.2	-34.1	0.0	0.0	30.5	54.0	-23.5	V	A	Vert
2437MHz Mid CH													
4.874	3.0	35.9	32.7	5.8	-34.8	0.0	0.0	39.6	74.0	-34.4	H	P	Hori
4.874	3.0	22.6	32.7	5.8	-34.8	0.0	0.0	26.3	54.0	-27.7	H	A	Hori
7.311	3.0	34.7	35.5	7.3	-34.1	0.0	0.0	43.3	74.0	-30.7	H	P	Hori
7.311	3.0	22.5	35.5	7.3	-34.1	0.0	0.0	31.1	54.0	-22.9	H	A	Hori
4.874	3.0	35.8	32.7	5.8	-34.8	0.0	0.0	39.5	74.0	-34.5	V	P	Vert
4.874	3.0	22.7	32.7	5.8	-34.8	0.0	0.0	26.4	54.0	-27.6	V	A	Vert
7.311	3.0	34.8	35.5	7.3	-34.1	0.0	0.0	43.4	74.0	-30.6	V	P	Vert
7.311	3.0	22.6	35.5	7.3	-34.1	0.0	0.0	31.2	54.0	-22.8	V	A	Vert
2462MHz High CH													
4.924	3.0	35.6	32.7	5.9	-34.8	0.0	0.0	39.4	74.0	-34.6	H	P	Hori
4.924	3.0	22.9	32.7	5.9	-34.8	0.0	0.0	26.7	54.0	-27.3	H	A	Hori
7.386	3.0	34.7	35.6	7.3	-34.1	0.0	0.0	43.5	74.0	-30.5	H	P	Hori
7.386	3.0	22.8	35.6	7.3	-34.1	0.0	0.0	31.5	54.0	-22.5	H	A	Hori
4.924	3.0	35.8	32.7	5.9	-34.8	0.0	0.0	39.6	74.0	-34.4	V	P	Vert
4.924	3.0	23.0	32.7	5.9	-34.8	0.0	0.0	26.8	54.0	-27.2	V	A	Vert
7.386	3.0	35.9	35.6	7.3	-34.1	0.0	0.0	44.6	74.0	-29.4	V	P	Vert
7.386	3.0	22.7	35.6	7.3	-34.1	0.0	0.0	31.5	54.0	-22.5	V	A	Vert

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

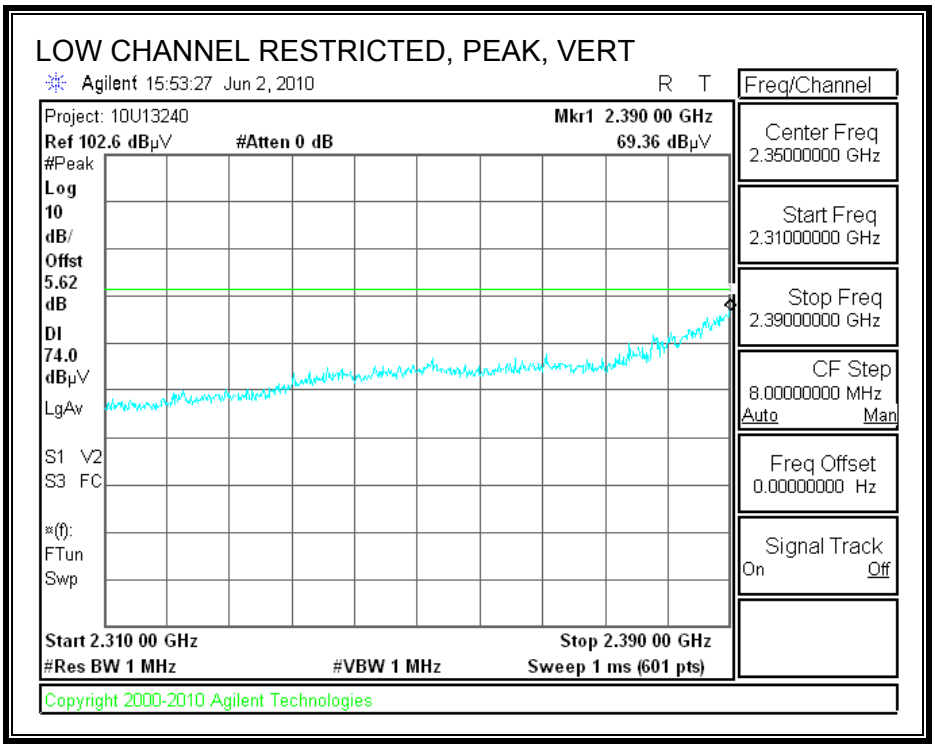
8.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

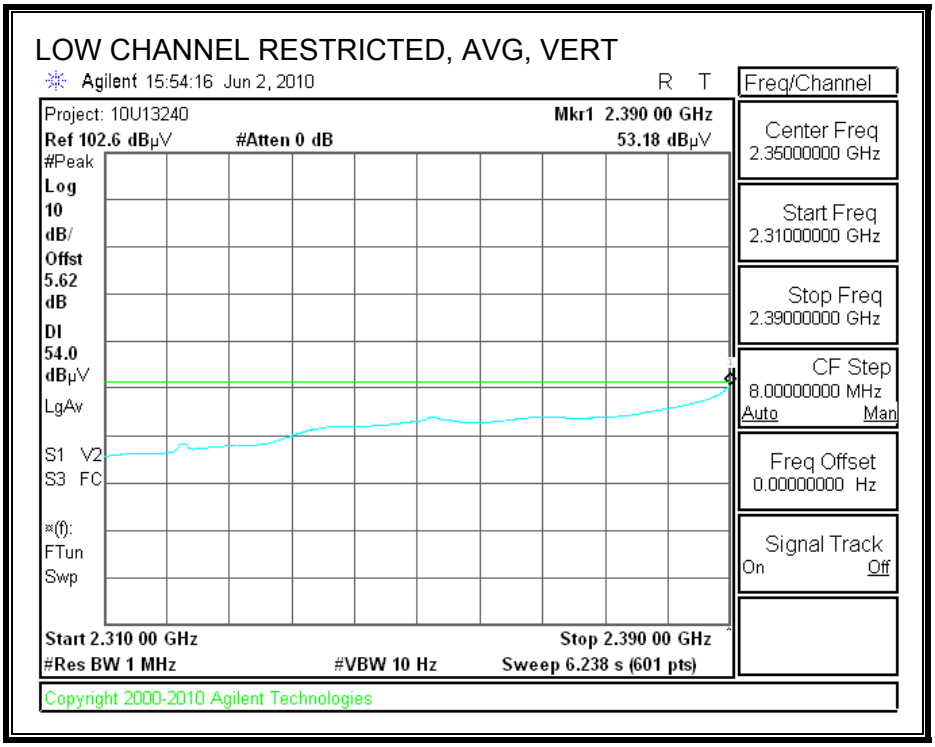
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



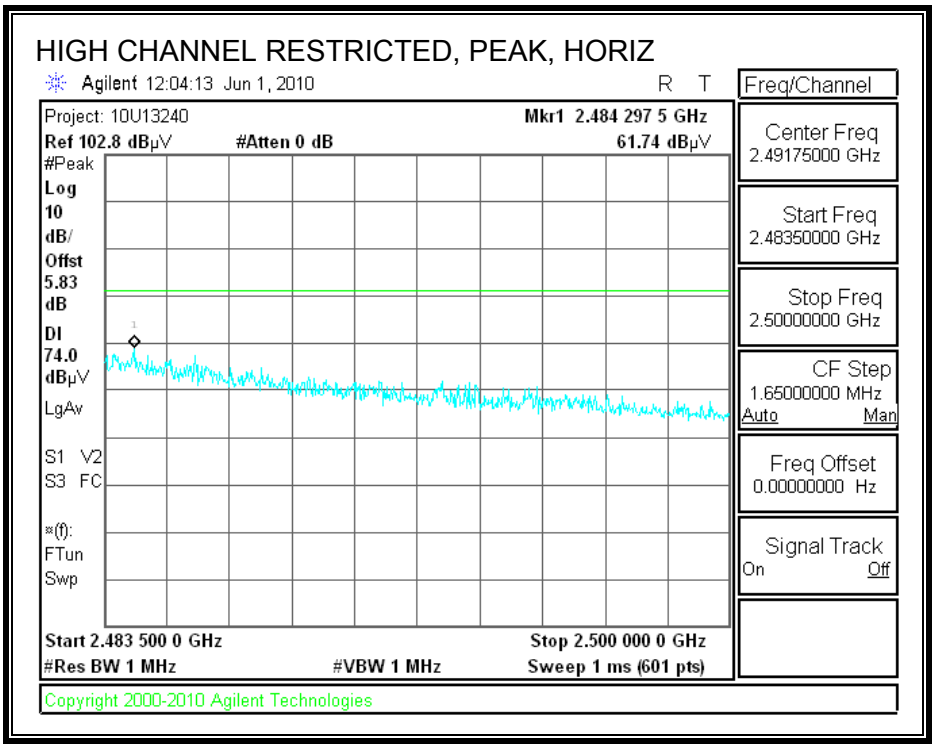


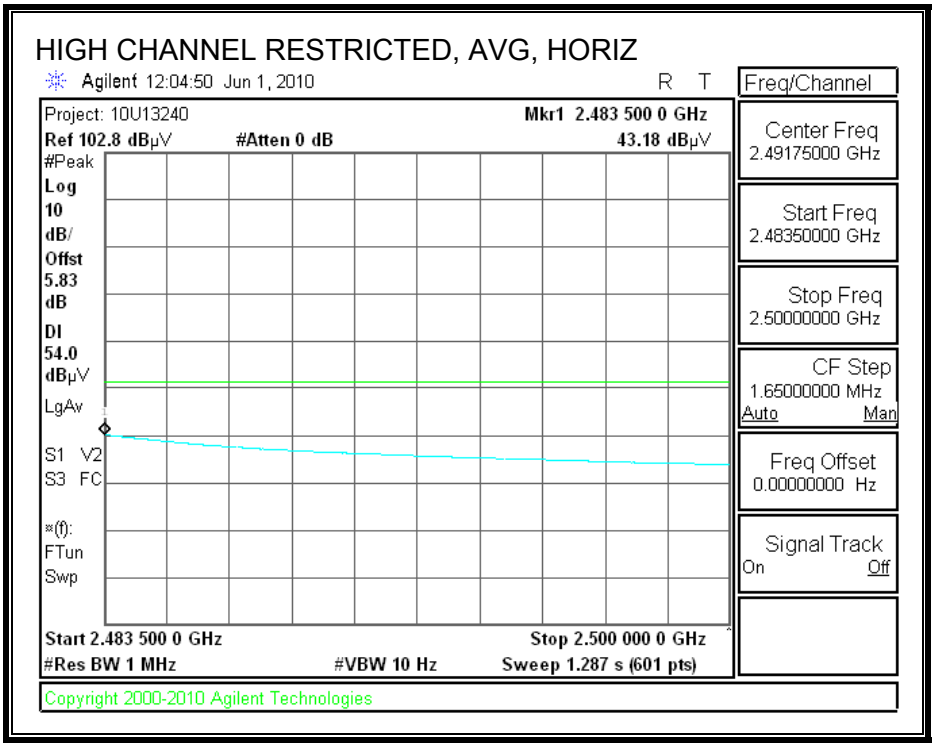
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



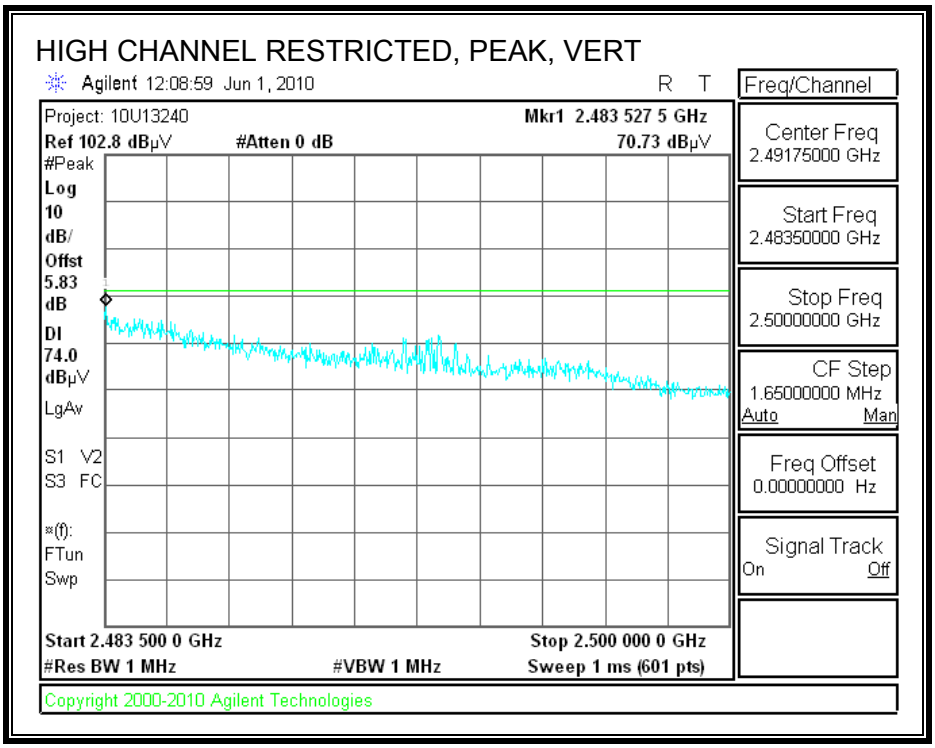


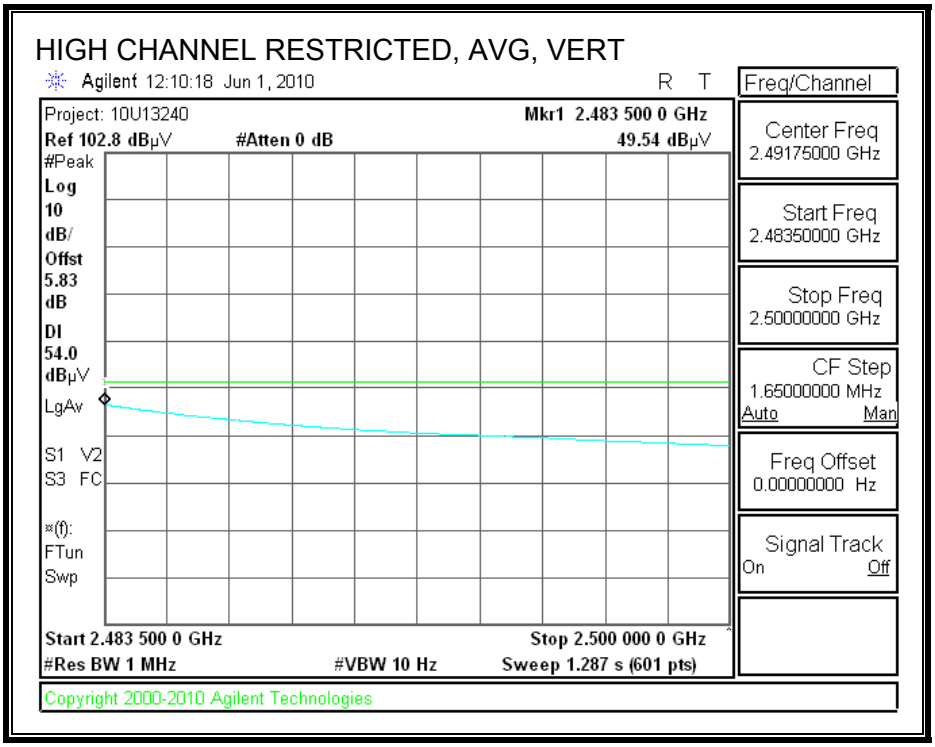
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 06/02/10
Project #: 10U13240
Company: Aircell
EUT Description: Cabin Wireless Acess Point
EUT M/N: EUT with support laptop PC
Test Target: FCC Calss B
Mode Oper: Continously TX

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2412MHz Low CH													
4.824	3.0	36.4	32.7	5.8	-34.8	0.0	0.0	40.1	74.0	-33.9	H	P	Hori
4.824	3.0	23.5	32.7	5.8	-34.8	0.0	0.0	27.2	54.0	-26.8	H	A	Hori
7.236	3.0	34.2	35.4	7.2	-34.1	0.0	0.0	42.7	74.0	-31.3	H	P	Hori
7.236	3.0	21.9	35.4	7.2	-34.1	0.0	0.0	30.4	54.0	-23.6	H	A	Hori
4.824	3.0	35.4	32.7	5.8	-34.8	0.0	0.0	39.0	74.0	-35.0	V	P	Vert
4.824	3.0	23.4	32.7	5.8	-34.8	0.0	0.0	27.1	54.0	-26.9	V	A	Vert
7.236	3.0	34.5	35.4	7.2	-34.1	0.0	0.0	43.0	74.0	-31.0	V	P	Vert
7.236	3.0	21.9	35.4	7.2	-34.1	0.0	0.0	30.4	54.0	-23.6	V	A	Vert
2437MHz Mid CH													
4.874	3.0	35.4	32.7	5.8	-34.8	0.0	0.0	39.1	74.0	-34.9	H	P	Hori
4.874	3.0	23.1	32.7	5.8	-34.8	0.0	0.0	26.8	54.0	-27.2	H	A	Hori
7.311	3.0	34.5	35.5	7.3	-34.1	0.0	0.0	43.1	74.0	-30.9	H	P	Hori
7.311	3.0	22.4	35.5	7.3	-34.1	0.0	0.0	31.1	54.0	-22.9	H	A	Hori
4.874	3.0	35.4	32.7	5.8	-34.8	0.0	0.0	39.1	74.0	-34.9	V	P	Vert
4.874	3.0	23.1	32.7	5.8	-34.8	0.0	0.0	26.8	54.0	-27.2	V	A	Vert
7.311	3.0	34.6	35.5	7.3	-34.1	0.0	0.0	43.2	74.0	-30.8	V	P	Vert
7.311	3.0	22.5	35.5	7.3	-34.1	0.0	0.0	31.1	54.0	-22.9	V	A	Vert
2462MHz High CH													
4.924	3.0	36.3	32.7	5.9	-34.8	0.0	0.0	40.1	74.0	-33.9	H	P	Hori
4.924	3.0	23.4	32.7	5.9	-34.8	0.0	0.0	27.2	54.0	-26.8	H	A	Hori
7.386	3.0	35.4	35.6	7.3	-34.1	0.0	0.0	44.2	74.0	-29.8	H	P	Hori
7.386	3.0	22.7	35.6	7.3	-34.1	0.0	0.0	31.4	54.0	-22.6	H	A	Hori
4.924	3.0	35.5	32.7	5.9	-34.8	0.0	0.0	39.4	74.0	-34.7	V	P	Vert
4.924	3.0	23.4	32.7	5.9	-34.8	0.0	0.0	27.2	54.0	-26.8	V	A	Vert
7.386	3.0	35.4	35.6	7.3	-34.1	0.0	0.0	44.2	74.0	-29.8	V	P	Vert
7.386	3.0	22.7	35.6	7.3	-34.1	0.0	0.0	31.5	54.0	-22.5	V	A	Vert

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.2.3. TX ABOVE 1 GHz FOR 802.11a MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 06/02/10
Project #: 10U13240
Company: Aircell
EUT Description: Cabin Wireless Acess Point
EUT M/N: EUT with support laptop PC
Test Target: FCC Calss B
Mode Oper: Continously TX

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

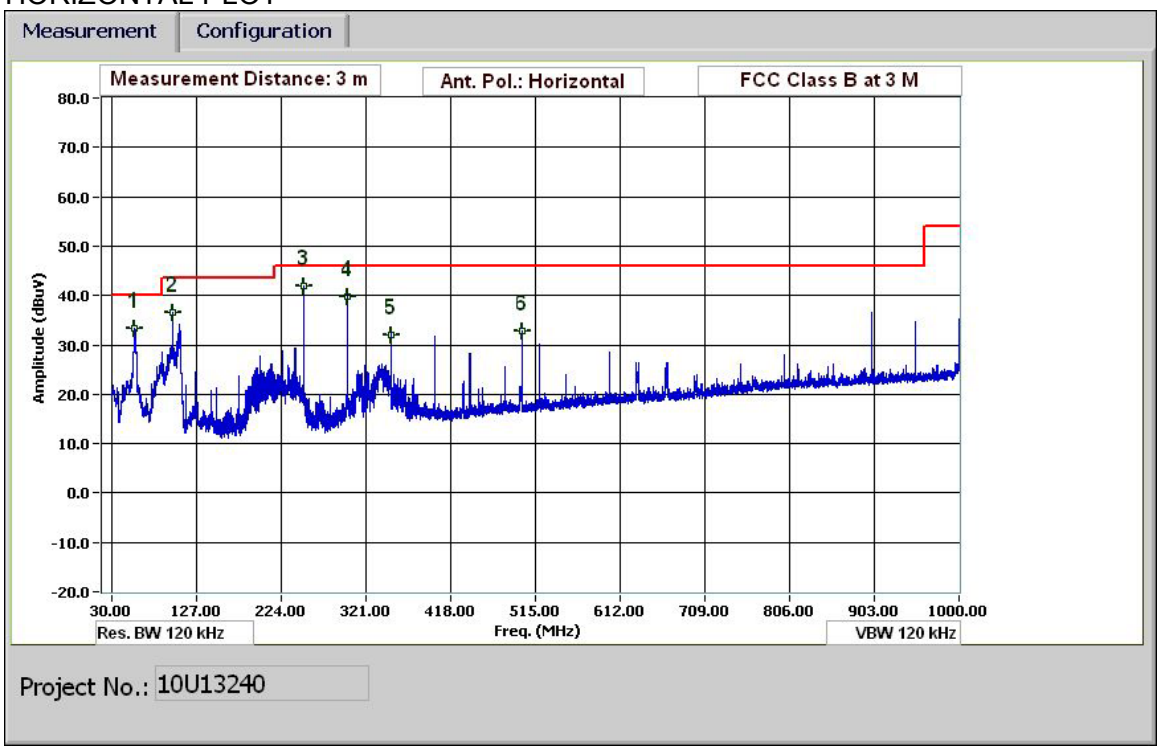
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5745MHz Low CH													
11.490	3.0	36.6	38.0	9.5	-32.5	0.0	0.7	52.3	74.0	-21.7	V	P	Vert
11.490	3.0	24.3	38.0	9.5	-32.5	0.0	0.7	40.0	54.0	-14.0	V	A	Vert
17.235	3.0	31.8	41.8	12.2	-32.0	0.0	0.6	54.4	74.0	-19.6	V	P	Vert
17.235	3.0	19.6	41.8	12.2	-32.0	0.0	0.6	42.2	54.0	-11.8	V	A	Vert
11.490	3.0	32.7	38.0	9.5	-32.5	0.0	0.7	48.4	74.0	-25.6	H	P	Hori
11.490	3.0	21.2	38.0	9.5	-32.5	0.0	0.7	36.9	54.0	-17.1	H	A	Hori
17.235	3.0	31.7	41.8	12.2	-32.0	0.0	0.6	54.3	74.0	-19.7	H	P	Hori
17.235	3.0	19.5	41.8	12.2	-32.0	0.0	0.6	42.1	54.0	-11.9	H	A	Hori
5785MHz Mid CH													
11.570	3.0	33.5	38.1	9.5	-32.5	0.0	0.7	49.3	74.0	-24.7	H	P	Hori
11.570	3.0	20.8	38.1	9.5	-32.5	0.0	0.7	36.6	54.0	-17.4	H	A	Hori
17.355	3.0	32.7	42.4	12.2	-32.1	0.0	0.6	55.8	74.0	-18.2	H	P	Hori
17.355	3.0	19.4	42.4	12.2	-32.1	0.0	0.6	42.5	54.0	-11.5	H	A	Hori
11.570	3.0	35.0	38.1	9.5	-32.5	0.0	0.7	50.8	74.0	-23.2	V	P	Vert
11.570	3.0	23.5	38.1	9.5	-32.5	0.0	0.7	39.3	54.0	-14.7	V	A	Vert
17.355	3.0	31.7	42.4	12.2	-32.1	0.0	0.6	54.9	74.0	-19.1	V	P	Vert
17.355	3.0	19.4	42.4	12.2	-32.1	0.0	0.6	42.6	54.0	-11.4	V	A	Vert
5825MHz Mid CH													
11.650	3.0	34.0	38.2	9.6	-32.5	0.0	0.7	49.9	74.0	-24.1	V	P	Vert
11.650	3.0	21.8	38.2	9.6	-32.5	0.0	0.7	37.7	54.0	-16.3	V	A	Vert
17.475	3.0	31.5	42.9	12.3	-32.1	0.0	0.6	55.2	74.0	-18.8	V	P	Vert
17.475	3.0	19.5	42.9	12.3	-32.1	0.0	0.6	43.2	54.0	-10.8	V	A	Vert
11.650	3.0	33.8	38.2	9.6	-32.5	0.0	0.7	49.7	74.0	-24.3	H	P	Hori
11.650	3.0	20.9	38.2	9.6	-32.5	0.0	0.7	36.8	54.0	-17.2	H	A	Hori
17.475	3.0	31.8	42.9	12.3	-32.1	0.0	0.6	55.5	74.0	-18.5	H	P	Hori
17.475	3.0	19.5	42.9	12.3	-32.1	0.0	0.6	43.2	54.0	-10.8	H	A	Hori

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.3. WORST-CASE BELOW 1 GHz

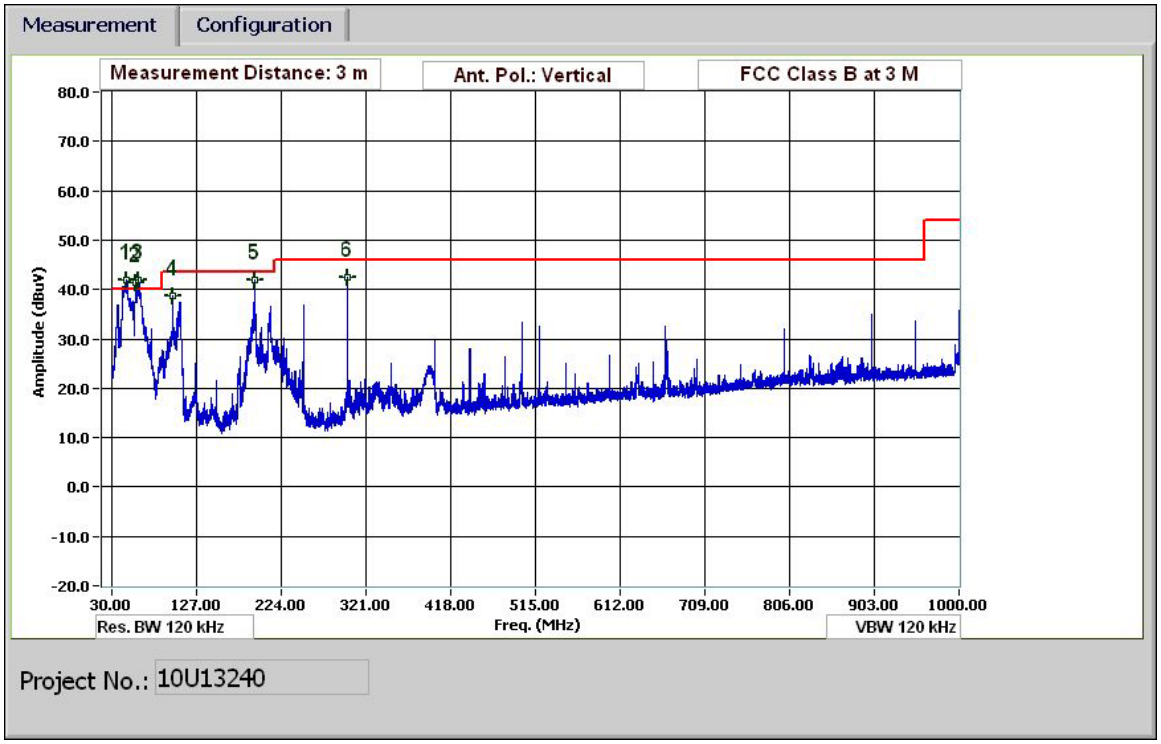
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



Note: The signals 1, 2, and 3 shown in this plot which are 46.081 MHz, 57.361 MHz and 60.721 MHz do not lie in the restricted bands specified in FCC 15.205.

HORIZONTAL AND VERTICAL DATA

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

Test Engr: Tom Chen
Date: 06/04/10
Project #: 10U13240
Company: Aircell
Test Target: FCC-B
Mode Oper: TX ON

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
Horizontal													
56.041	3.0	54.5	7.9	0.6	29.6	0.0	0.0	33.4	40.0	-6.6	H	P	
99.963	3.0	55.3	10.1	0.9	29.5	0.0	0.0	36.7	43.5	-6.8	H	P	
249.969	3.0	57.6	11.8	1.4	28.8	0.0	0.0	42.0	46.0	-4.0	H	P	
300.011	3.0	53.6	13.3	1.6	28.8	0.0	0.0	39.7	46.0	-6.3	H	P	
349.933	3.0	45.2	14.2	1.8	29.0	0.0	0.0	32.1	46.0	-13.9	H	P	
499.939	3.0	43.5	16.8	2.1	29.7	0.0	0.0	32.7	46.0	-13.3	H	P	
Vertical													
99.963	3.0	57.3	10.1	0.9	29.5	0.0	0.0	38.7	43.5	-4.8	V	P	
193.087	3.0	58.1	11.4	1.2	29.0	0.0	0.0	41.9	43.5	-1.6	V	P	
300.011	3.0	56.3	13.3	1.6	28.8	0.0	0.0	42.4	46.0	-3.6	V	P	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

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

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

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

(MPE distance equals 20 cm)

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	WLAN	0.20	23.84	2.70	0.90	0.090
5 GHz	WLAN	0.20	23.35	6.70	2.01	0.201