



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

CERTIFICATION TEST REPORT

FOR

**WIRELESS ACCESSORY RADIO
MODEL NUMBER: 1525**

**FCC ID: C3K1525
IC: 3048A-1525**

REPORT NUMBER: 13U14860-1, Revision B

ISSUE DATE: JUNE 13, 2013

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	4/10/13	Initial Issue	T. LEE
A	6/12/13	Revise EUT name	S.KUWATANI
B	6/13/13	Added a note to explain limits in radiated harmonics data above 1 GHz.	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Microsoft Corporation
One Microsoft Way
Redmond, WA 98052, U.S.A.

EUT DESCRIPTION: WIRELESS ACCESSORY RADIO

MODEL: 1525

SERIAL NUMBER: 0050432165B0 and 0050432165BA

DATE TESTED: February 14 to April 3, 2013

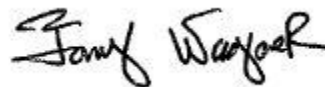
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

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:

Tested By:



Tim Lee
WISE PROJECT LEADER
UL CCS

Tony Wagoner
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2003, 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:

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

4.3. MEASUREMENT UNCERTAINTY

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

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 a WIRELESS ACCESSORY RADIO.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	11.54	14.26
2412 - 2462	802.11g	16.77	47.53
2412 - 2462	802.11n HT20	17.24	52.97
5745 - 5825	802.11a	17.18	52.24
5745 - 5825	802.11n HT20	17.25	53.09

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an external patch antenna, with a maximum gain of 2.2 dBi for the 2.4 Ghz band and 3.14 dBi for the 5 GHz band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 14.1.23.9.

The EUT driver software installed during testing was 1.0.7.49.

The test utility software used during testing was DutApiBRIDGEETH8782.exe.

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.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11a mode: 6 Mbps
802.11n HT20mode: MCS0

Radiated emissions for EUT with antenna was performed and passed; therefore, antenna port spurious was not performed.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

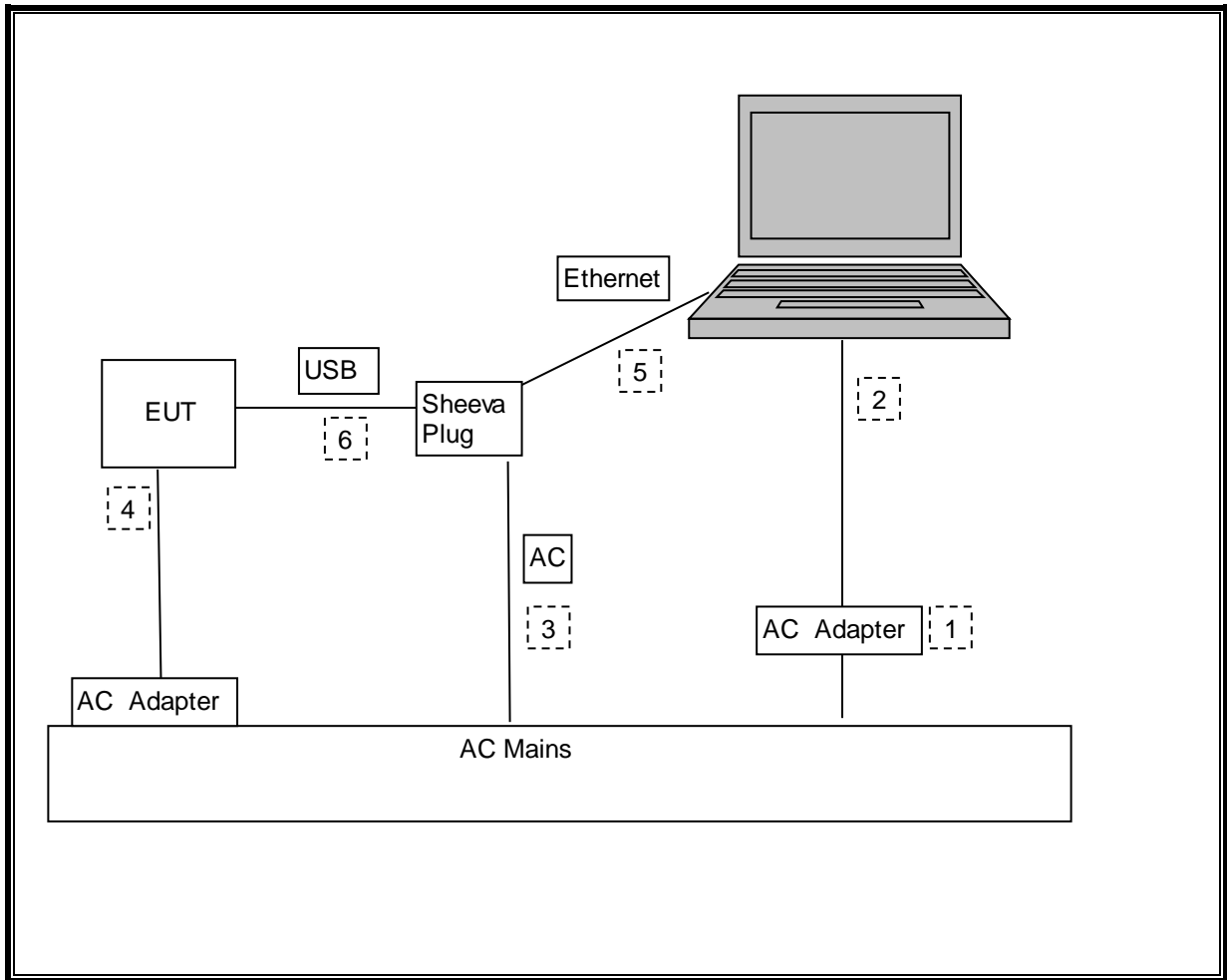
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop PC	DELL	Vostro 1000	DVT	DoC
AC-DC Adapter	DELL	LA65NS0-00	CN-ODF263-71615-6C4	DoC
Sheeva Plug	Globalscale	003-SP1001	1043-002835	N/A

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	USA 3P	Unshielded	1.8	None
2	DC	1	DC	Unshielded	1.8	None
3	AC	1	USA 2P	Unshielded	1.5	None
4	DC	1	DC	Unshielded	1.3	None
5	Ethernet	1	Ethernet	Unshielded	1	None
6	USB	1	USB	Unshielded	1.2	None

TEST SETUP

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



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
PSA (Conducted)	Agilent	E4446A	C01069	12/20/12	12/20/14
PSA (Radiated)	Agilent	E4446A	C00986	04/01/13	04/01/14
Antenna, Horn, 18 GHz	ETS	3117	C01022	02/21/13	02/21/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/13	02/13/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/12	10/22/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/13	01/16/14
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02679	CNR	CNR
Reject Filter, 5.725-5.825 GHz	Micro-Tronics	BRC13192	N02677	CNR	CNR
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/12	08/08/13
P-Series single channel Power Meter	Agilent / HP	N1911A	T227	10/12/12	10/12/13
Peak / Average Power Sensor	Agilent / HP	E9323A	T228	10/11/12	10/11/13

7. MEASUREMENT METHODS

KDB 558074 Measurement Procedure PK2 is used for power and PKPSD is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

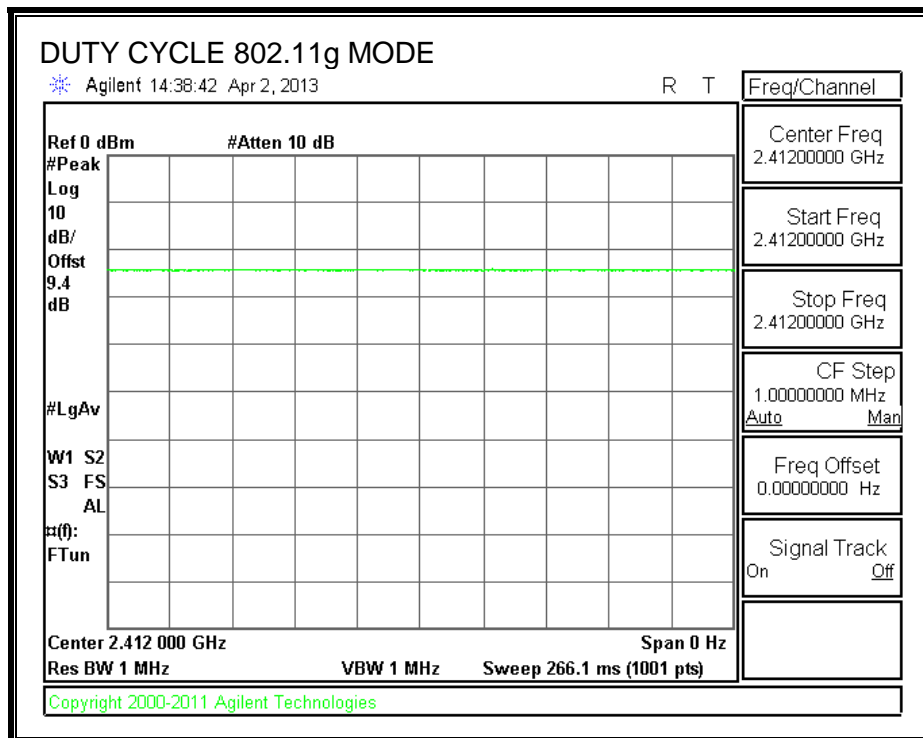
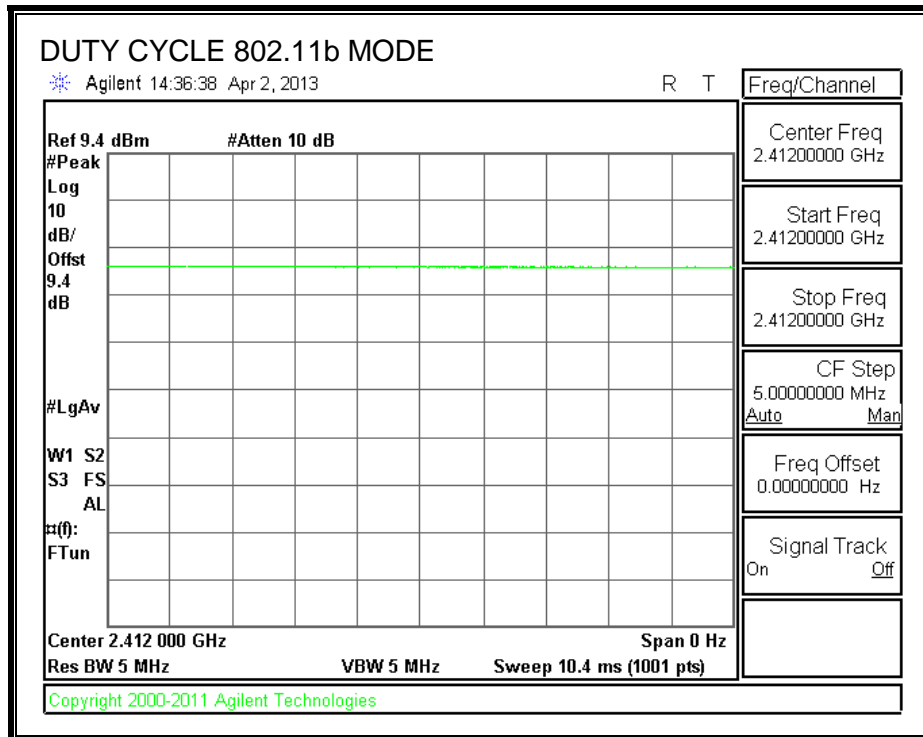
None; for reporting purposes only.

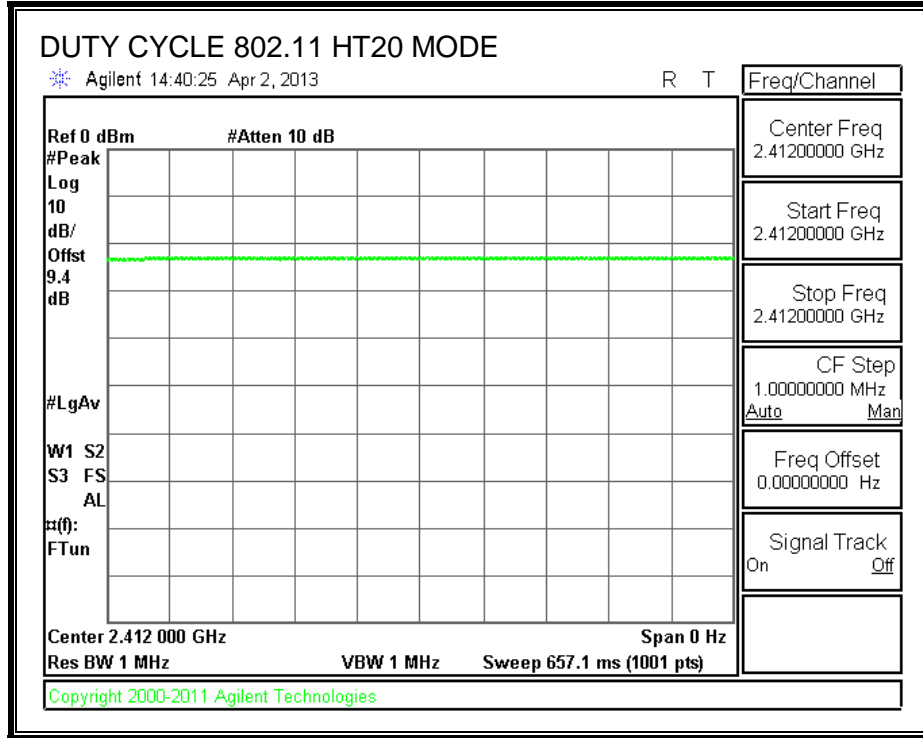
PROCEDURE

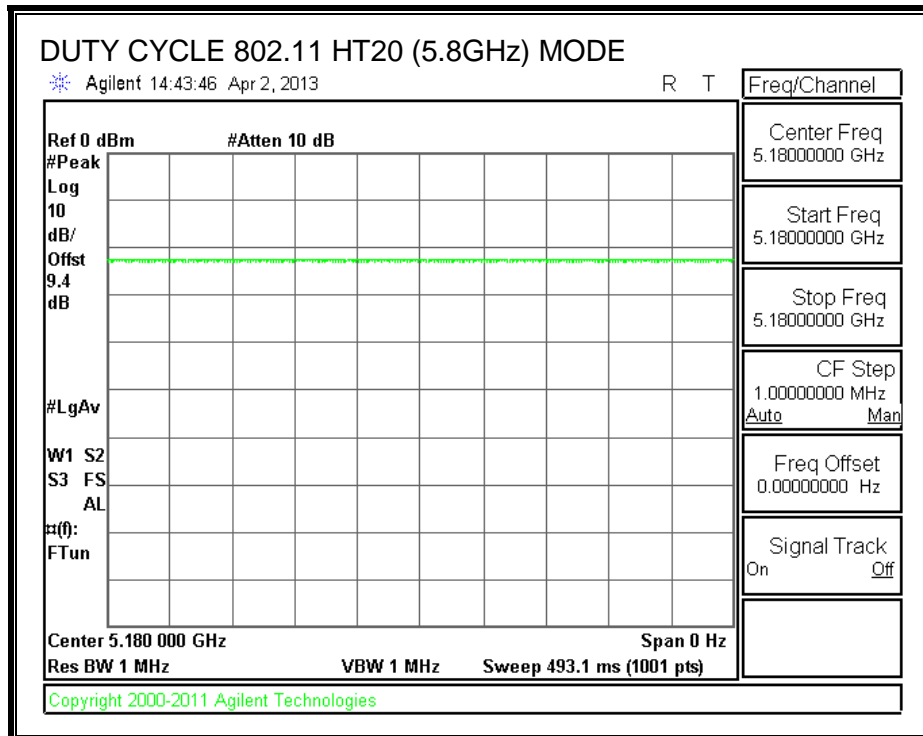
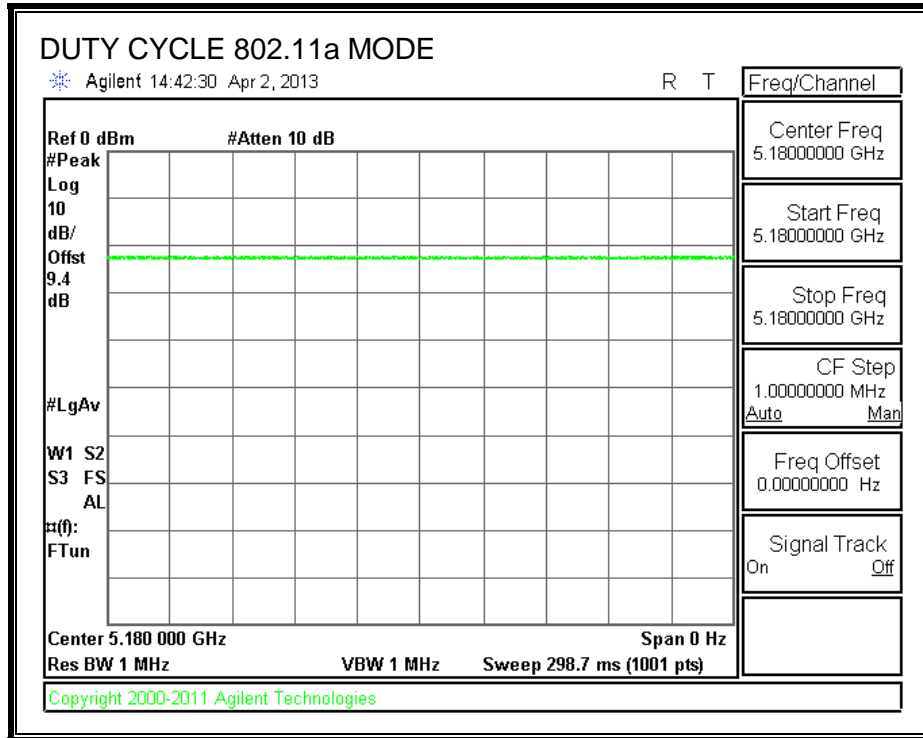
KDB 789033 Zero-Span Spectrum Analyzer Method.

8.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	100.00	100	1.000	100.0%	0.00
802.11g	100.00	100	1.000	100.0%	0.00
802.11n HT20	100.00	100	1.000	100.0%	0.00
802.11a	100.00	100	1.000	100.0%	0.00
802.11n HT20 (5.8GHz)	100.00	100	1.000	100.0%	0.00







8.1.1. MEASUREMENT METHOD FOR POWER AND PPSD

The Duty Cycle is greater than or equal to 98% therefore KDB 789033 Method SA-1 is used.

8.1.2. MEASUREMENT METHOD FOR AVERAGE SPURIOUS EMISSIONS ABOVE 1 GHz

The Duty Cycle is greater than or equal to 98%, KDB 789033 Method AD with Power RMS Averaging is used.

9. ANTENNA PORT TEST RESULTS

9.1. 802.11b MODE IN THE 2.4 GHz BAND

9.1.1. 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.

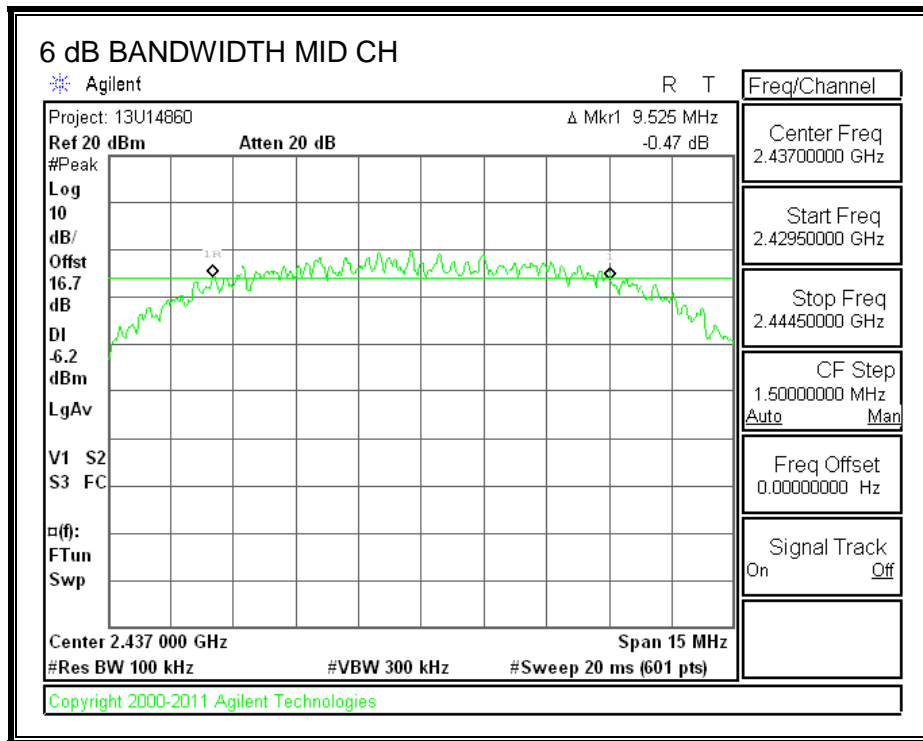
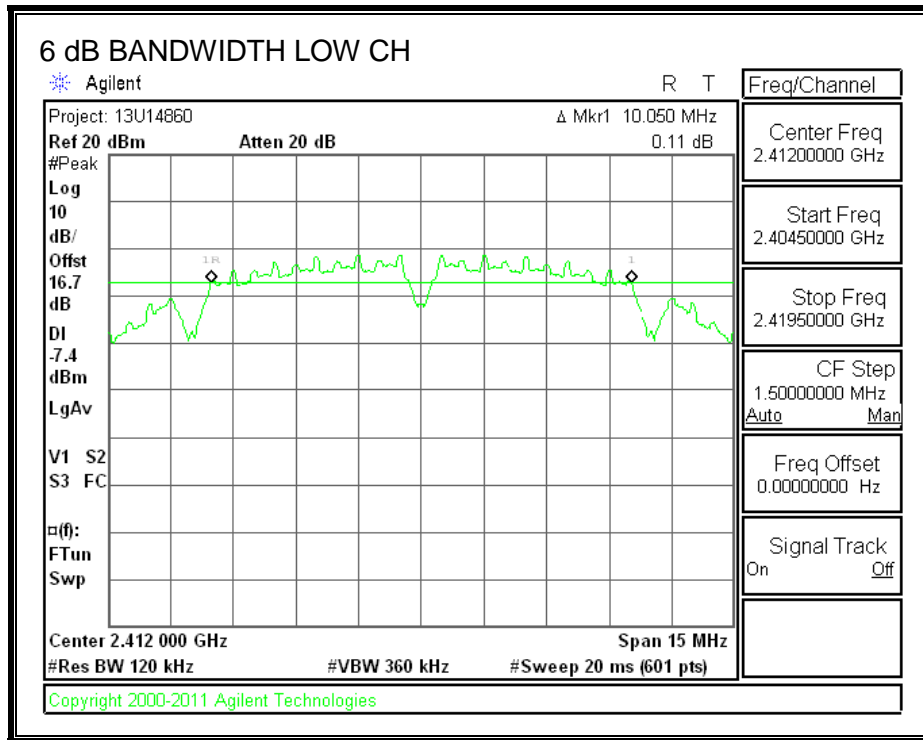
TEST PROCEDURE

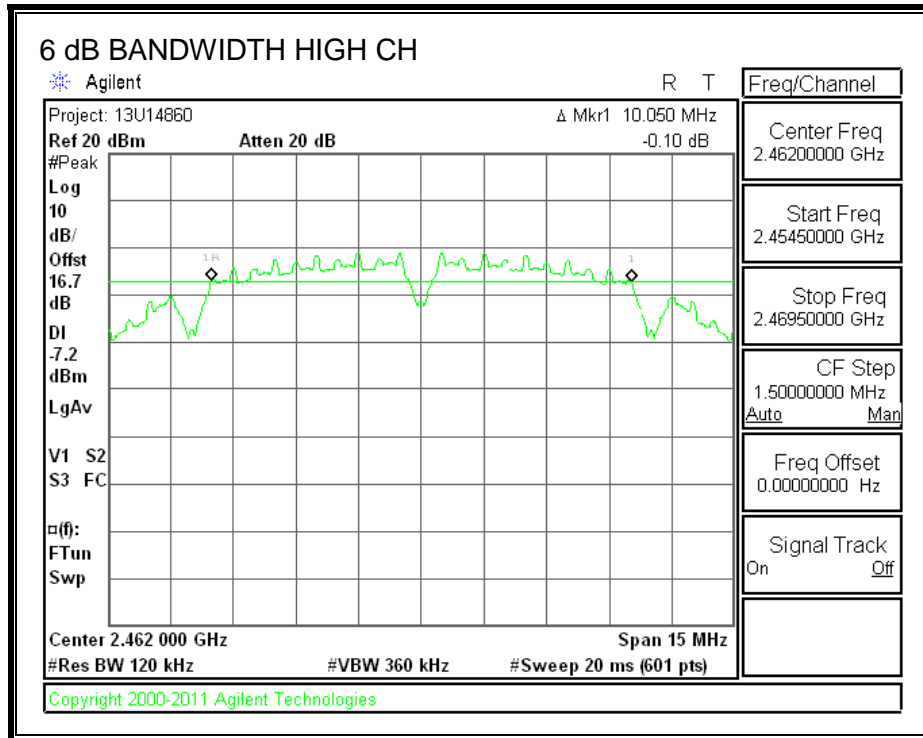
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	10.050	0.5
Mid	2437	9.525	0.5
High	2462	10.050	0.5

6 dB BANDWIDTH





9.1.2. 99% BANDWIDTH

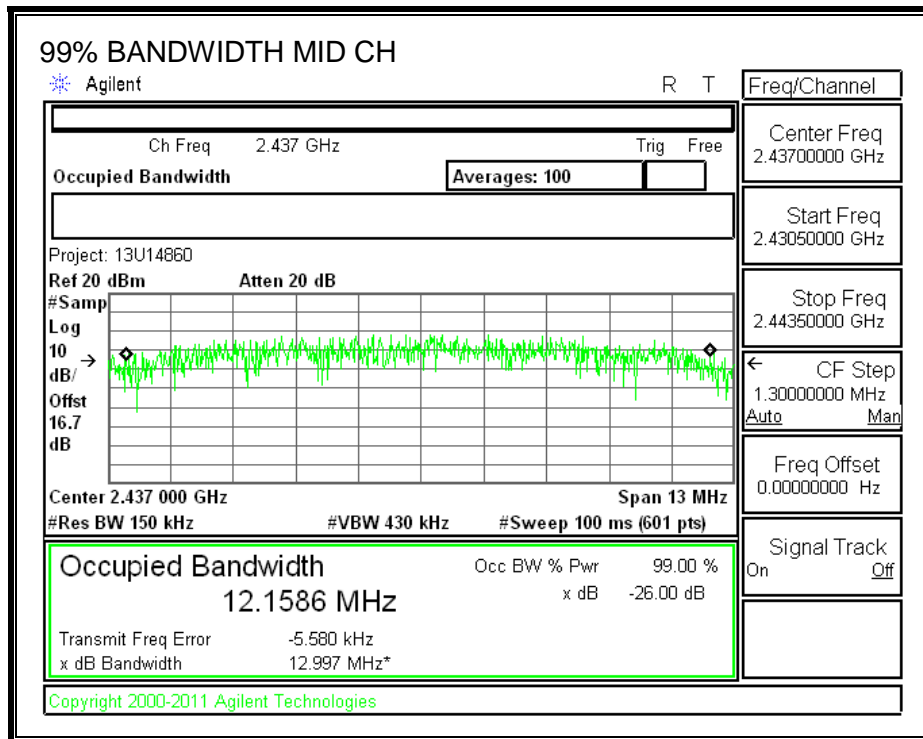
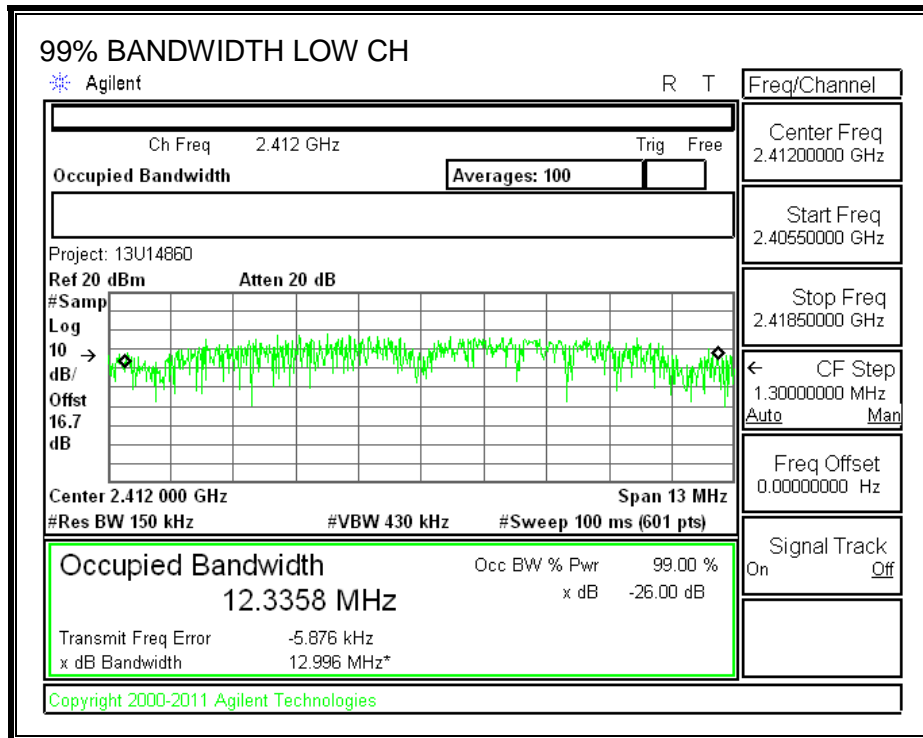
LIMITS

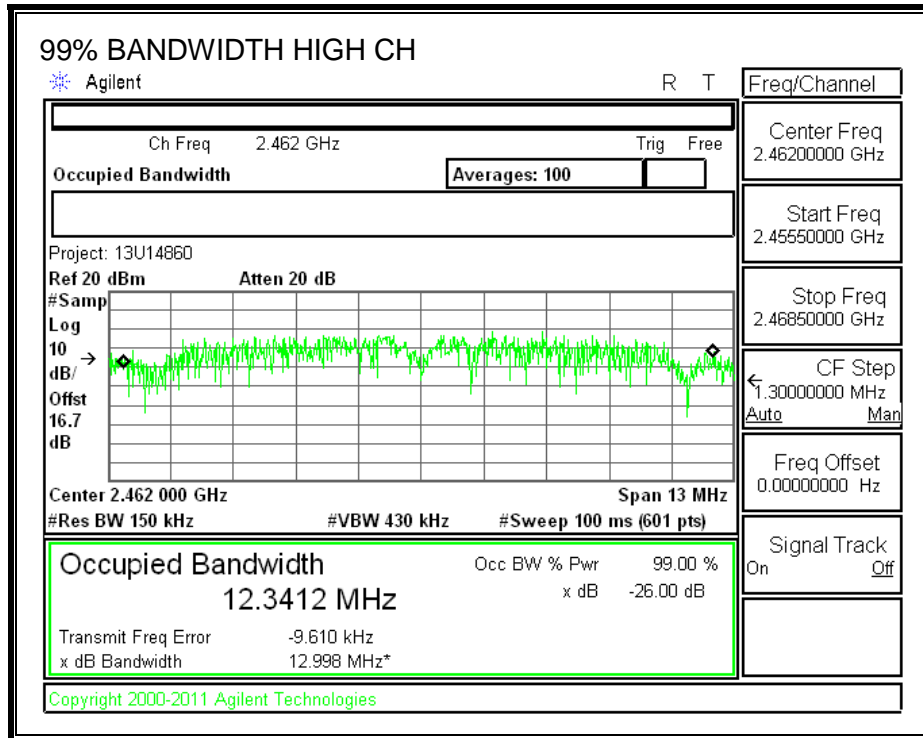
None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.3358
Mid	2437	12.1586
High	2462	12.3412

99% BANDWIDTH





9.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	9.11
Mid	2437	9.11
High	2462	8.80

9.1.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

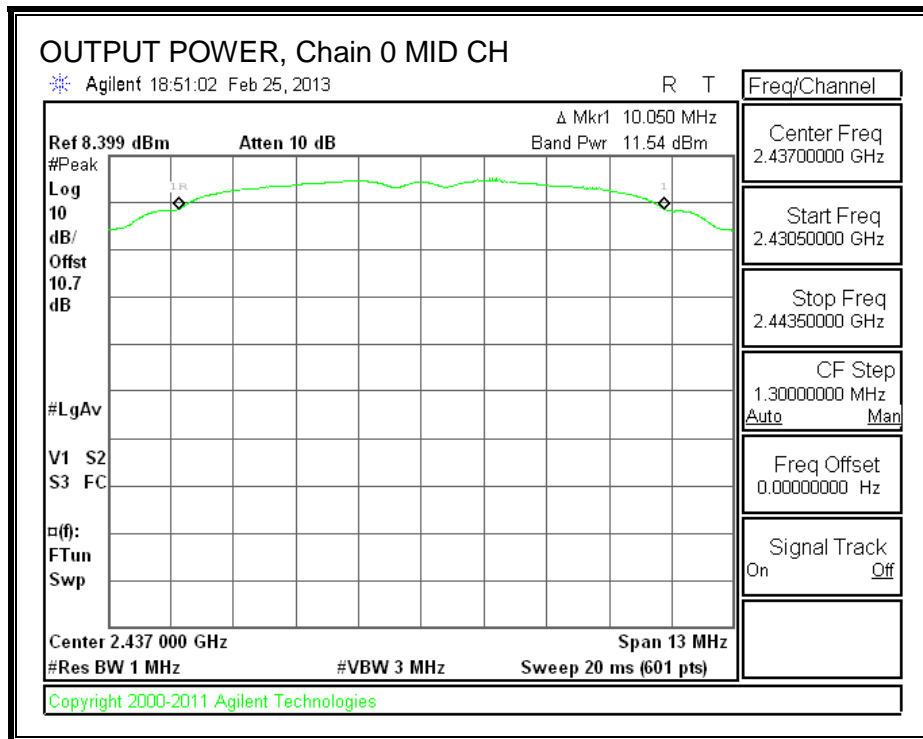
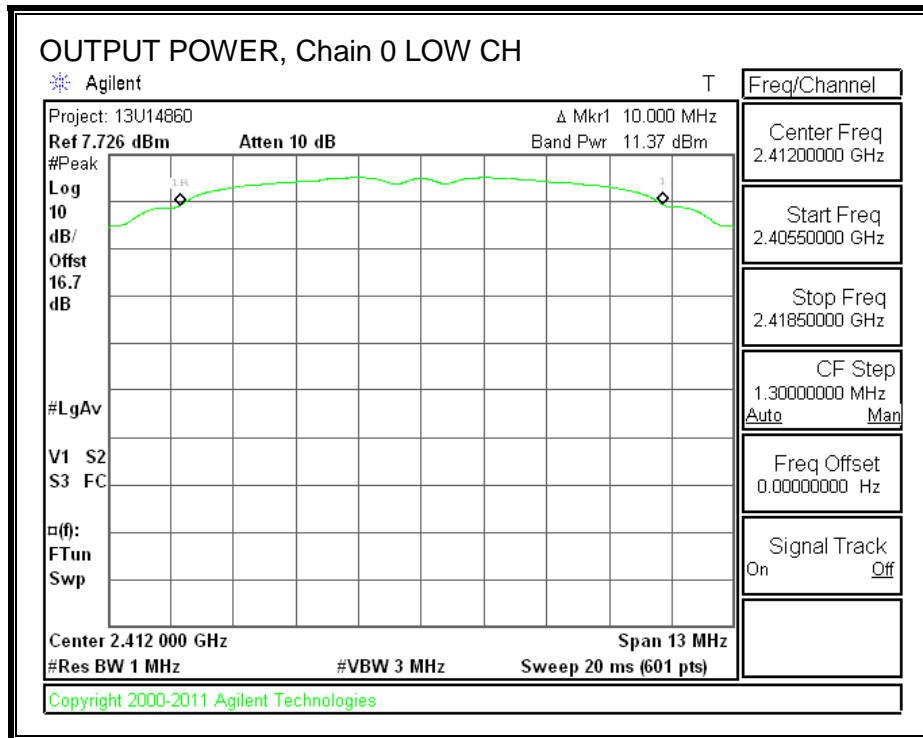
Limits

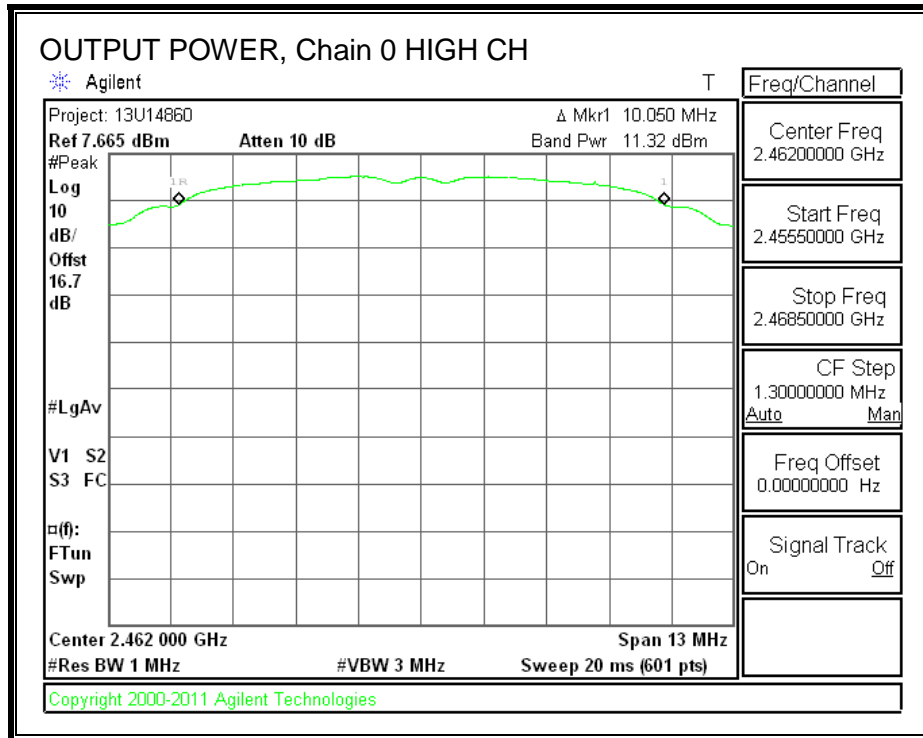
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	2.20	30.00	30	36	30.00
Mid	2437	2.20	30.00	30	36	30.00
High	2462	2.20	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	11.37	11.37	30.00	-18.63
Mid	2437	11.54	11.54	30.00	-18.46
High	2462	11.32	11.32	30.00	-18.68

OUTPUT POWER, Chain 0





9.1.5. PSD

LIMITS

FCC §15.247

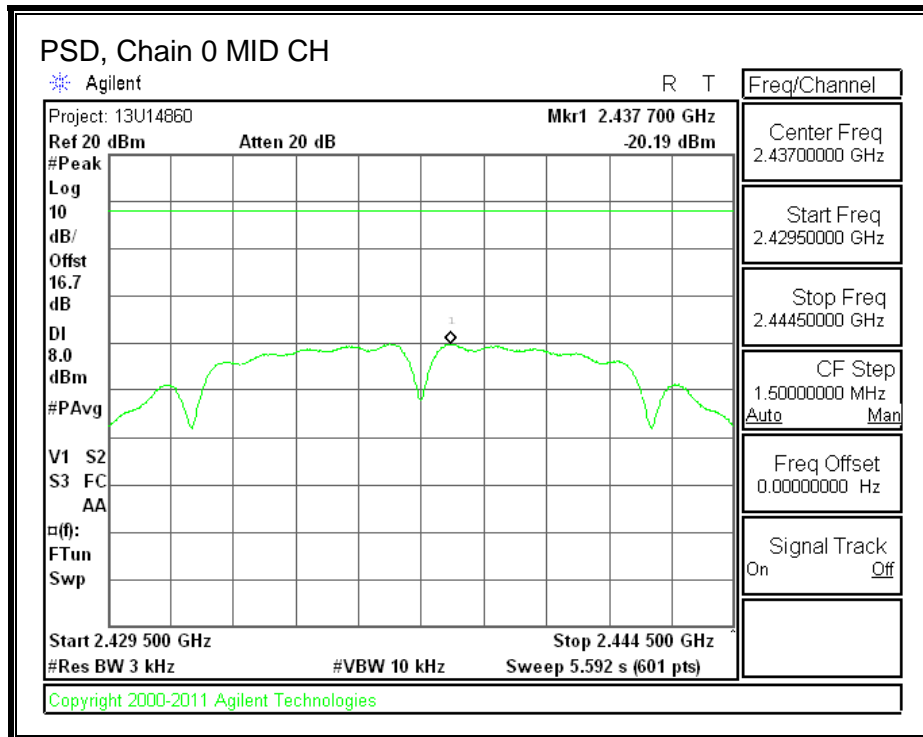
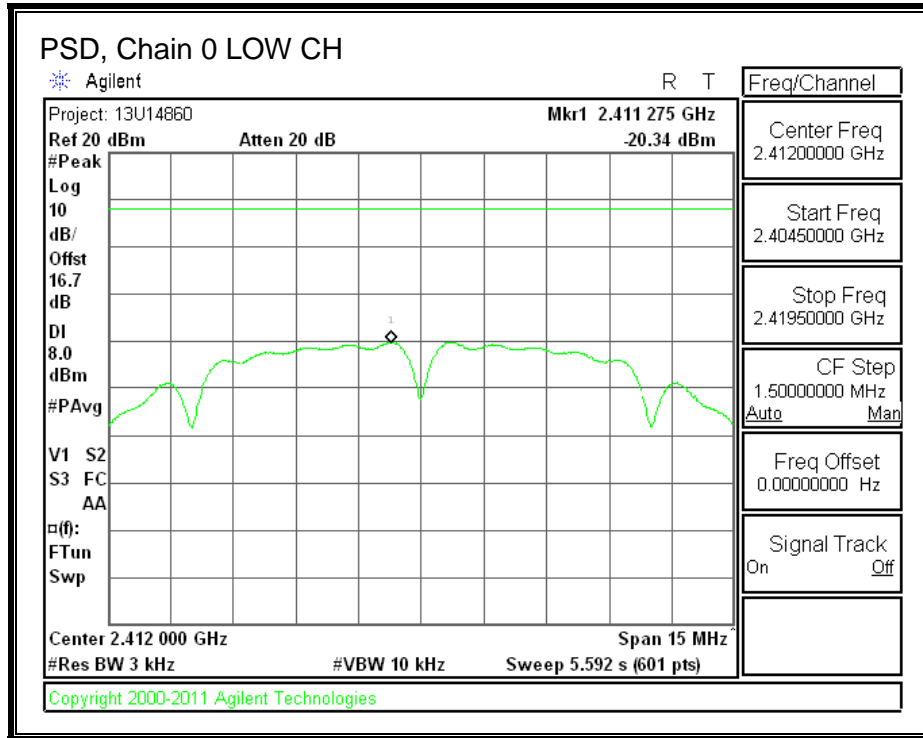
IC RSS-210 A8.2

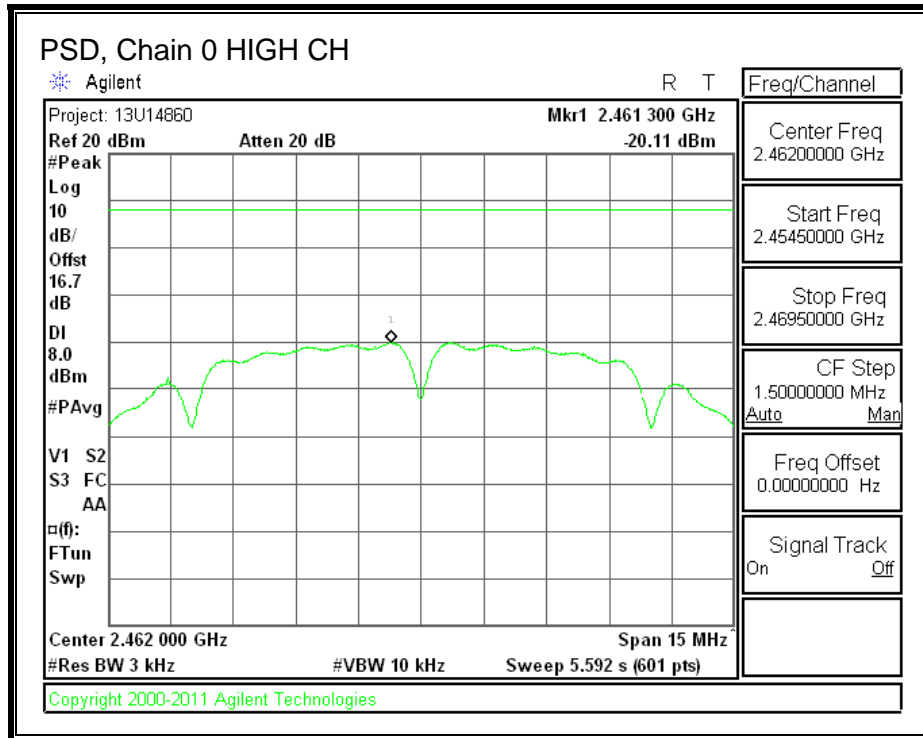
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-20.34	8.0	-28.3
Mid	2437	-20.19	8.0	-28.2
High	2462	-20.11	8.0	-28.1

PSD, Chain 0





9.1.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

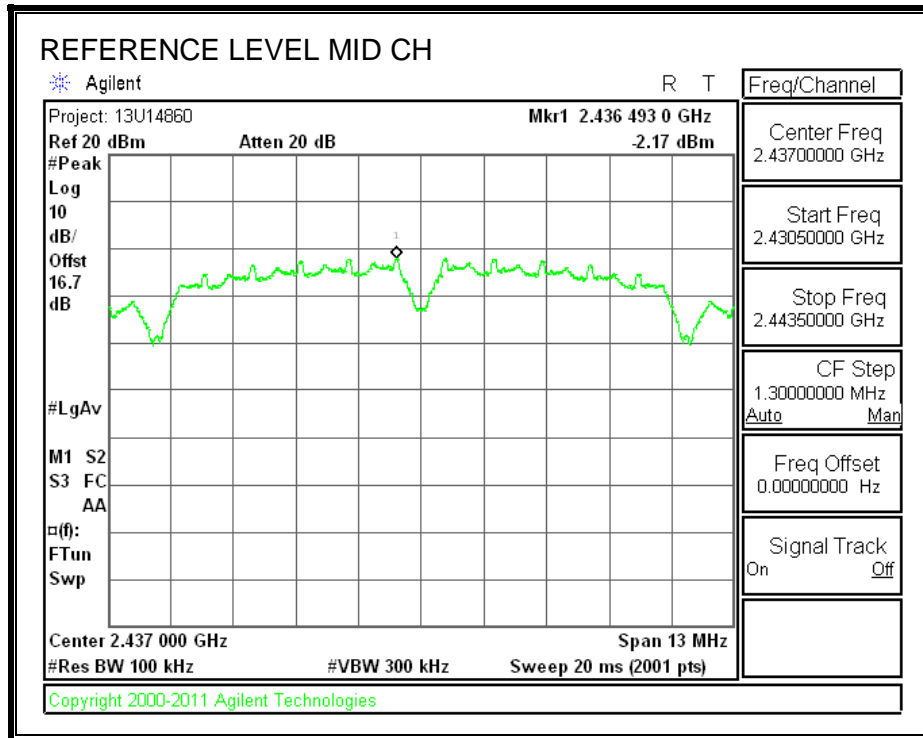
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

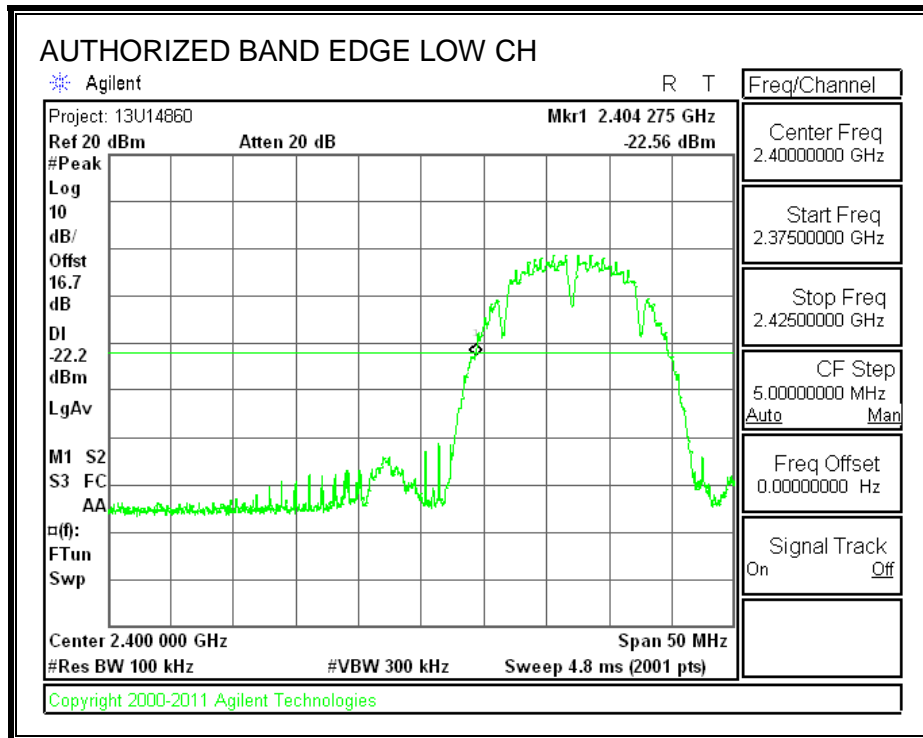
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

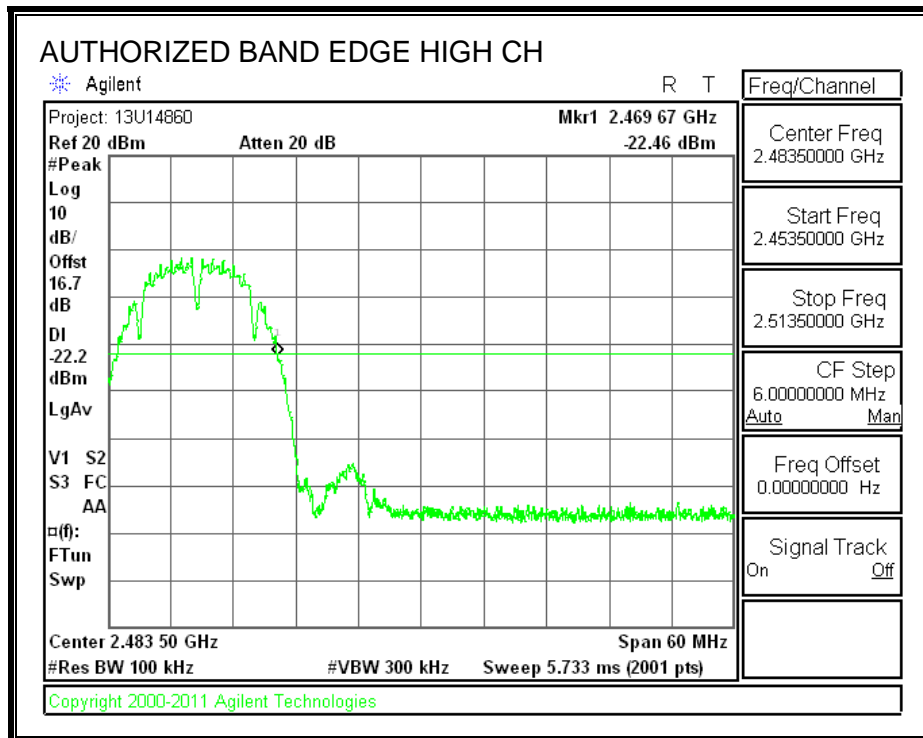
IN-BAND REFERENCE LEVEL



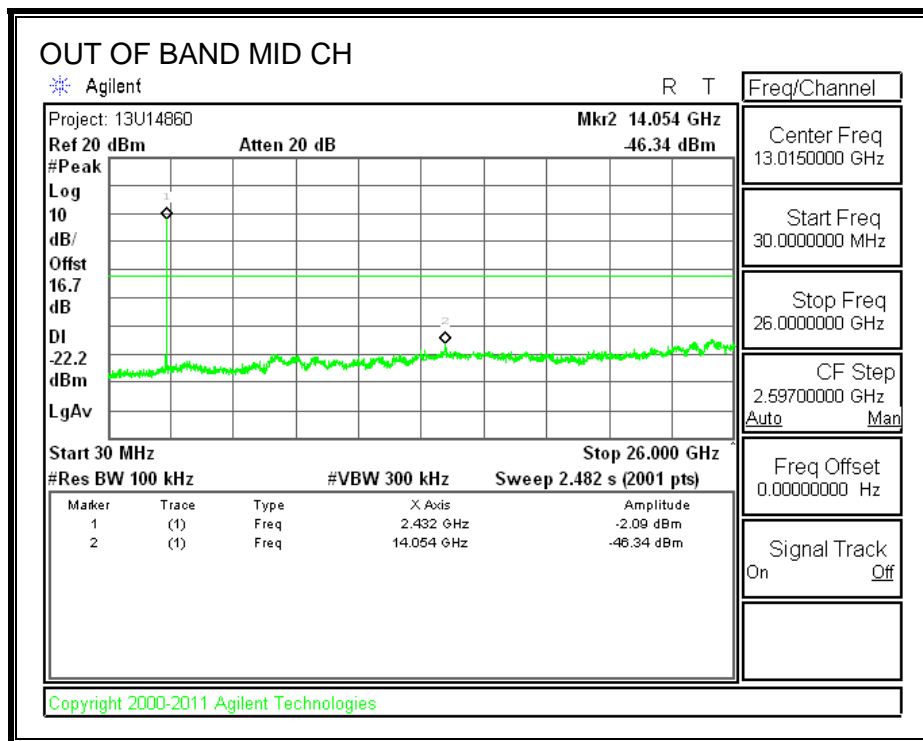
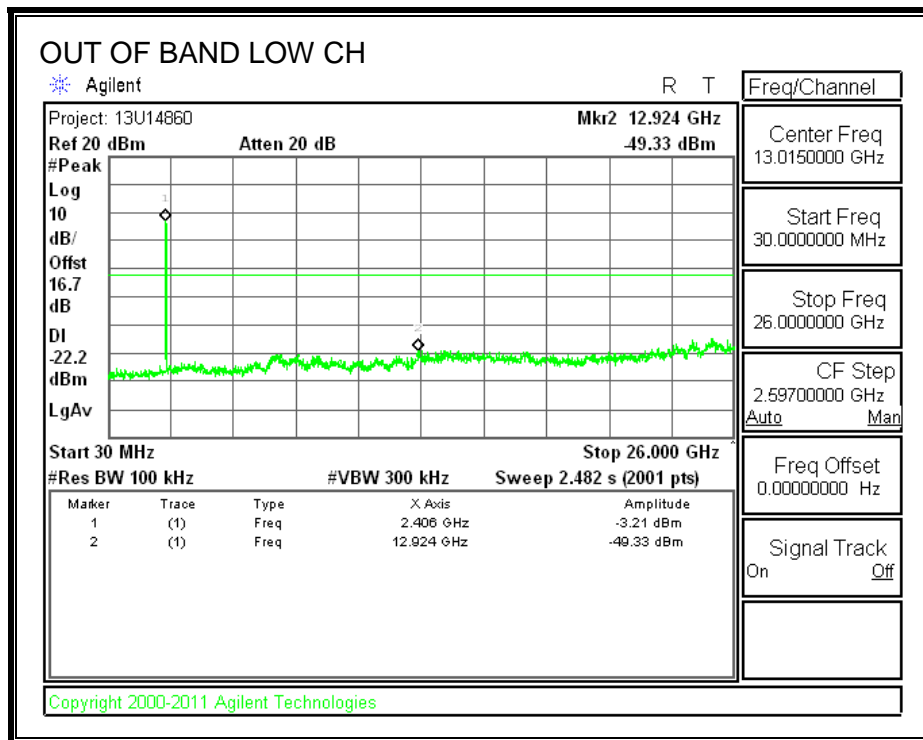
LOW CHANNEL BANDEDGE

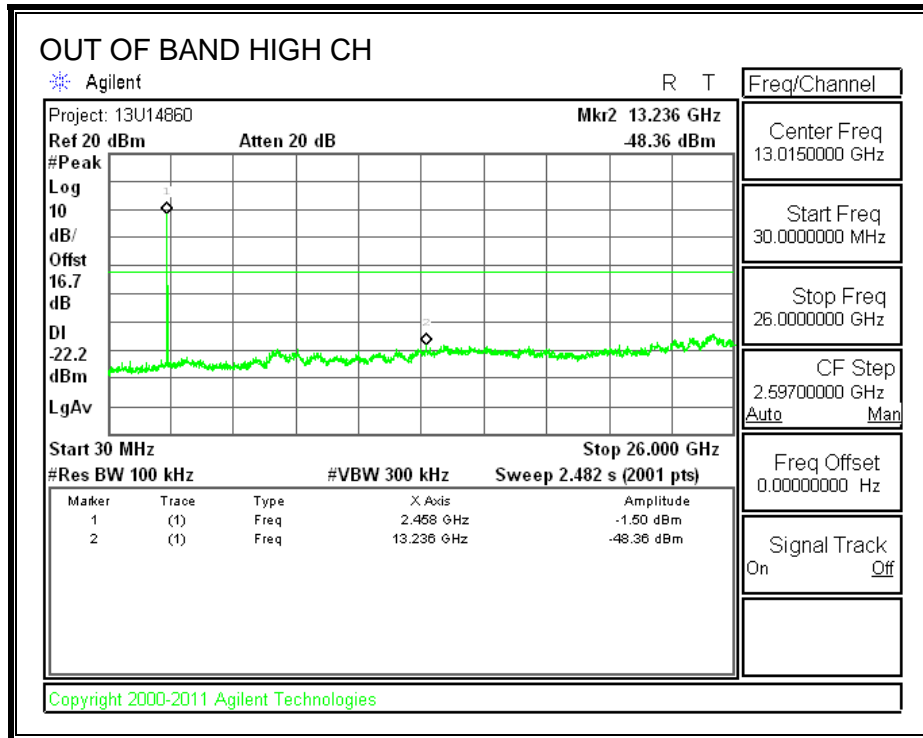


HIGH CHANNEL BANDEDGE



OUT-OF-BAND EMISSIONS





9.2. 802.11g MODE IN THE 2.4 GHz BAND

9.2.1. 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.

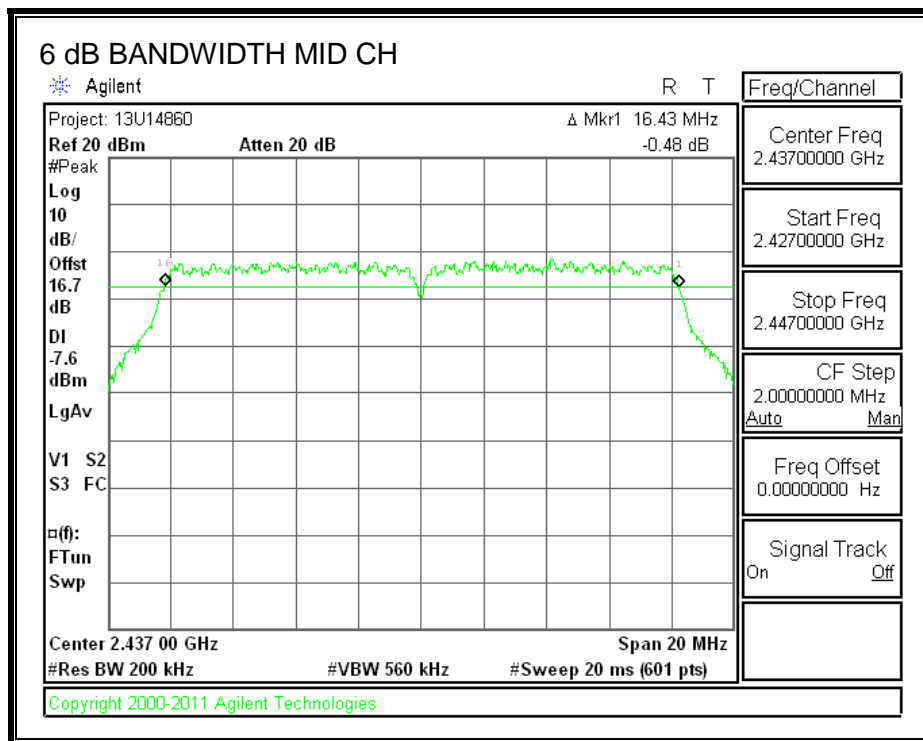
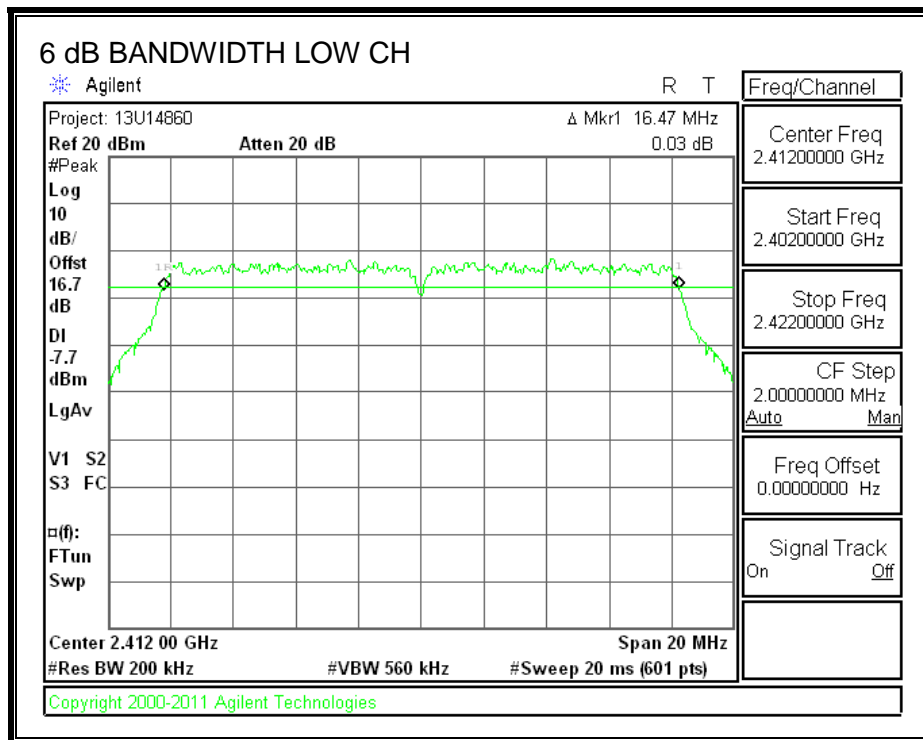
TEST PROCEDURE

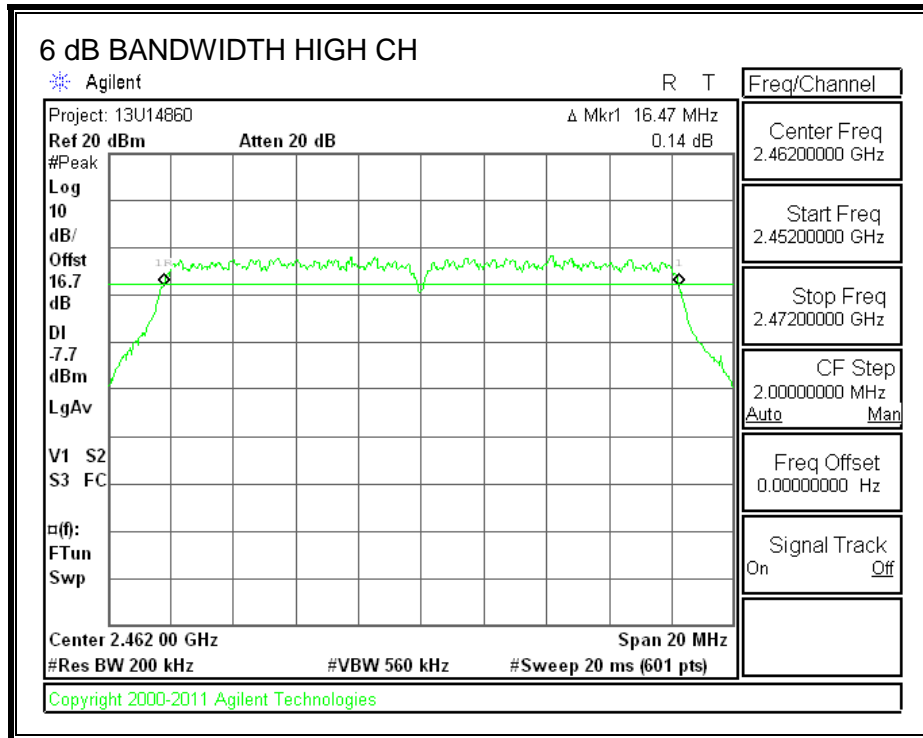
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.470	0.5
Mid	2437	16.430	0.5
High	2462	16.470	0.5

6 dB BANDWIDTH





9.2.1. 99% BANDWIDTH

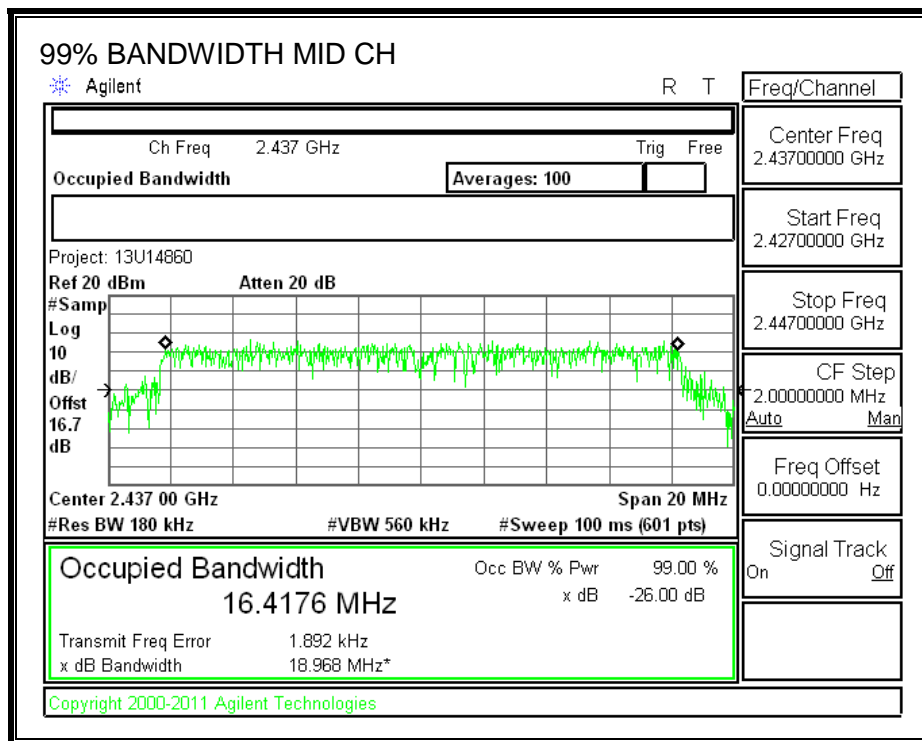
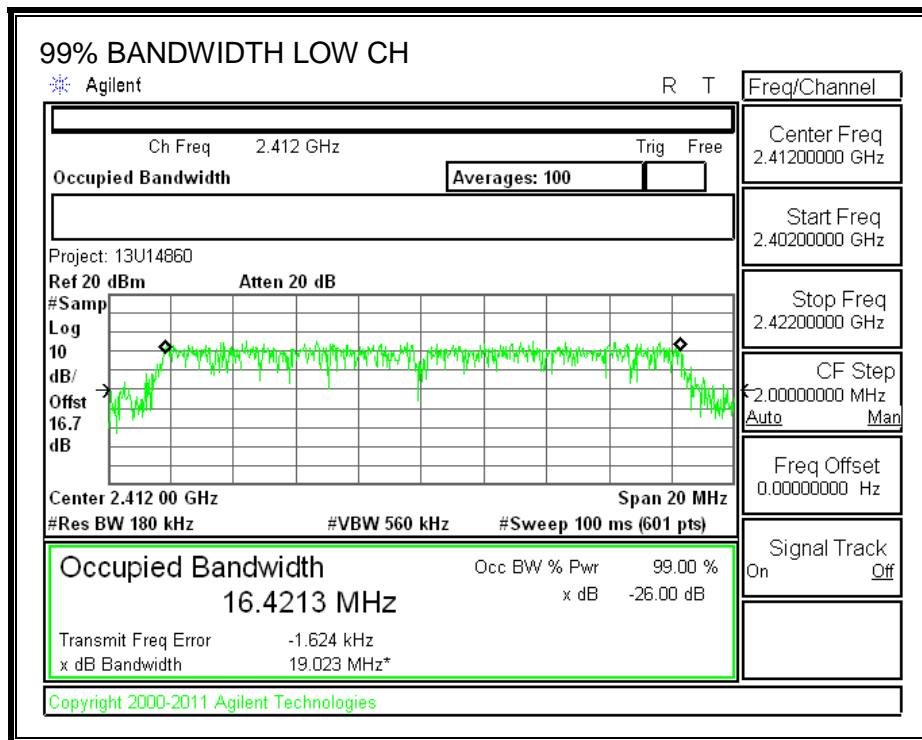
LIMITS

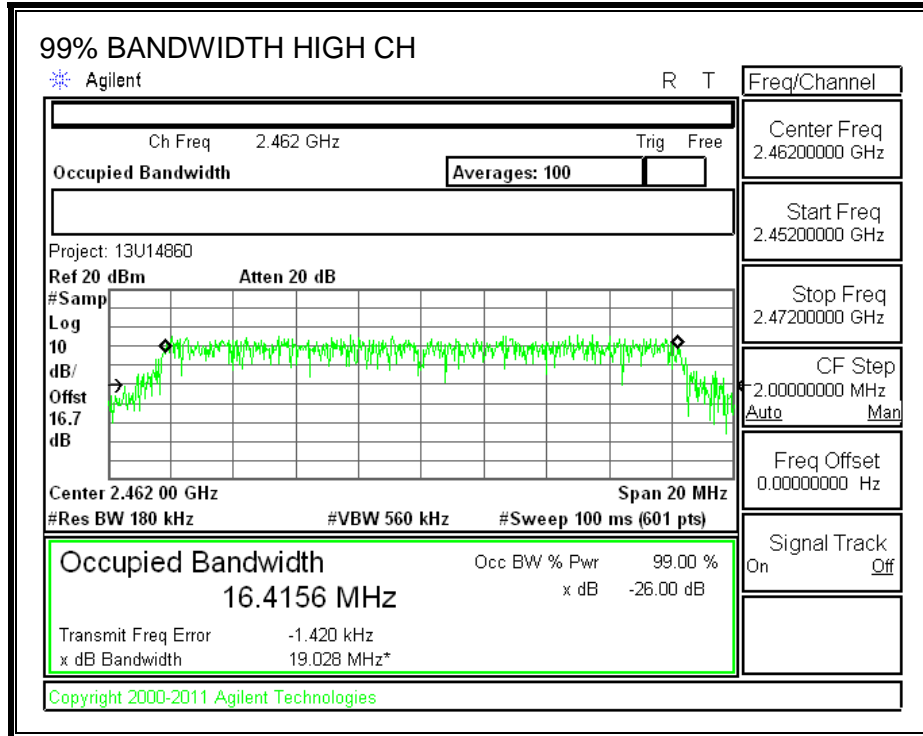
None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4213
Mid	2437	16.4176
High	2462	16.4156

99% BANDWIDTH





9.2.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	8.93
Mid	2437	9.24
High	2462	9.11

9.2.1. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

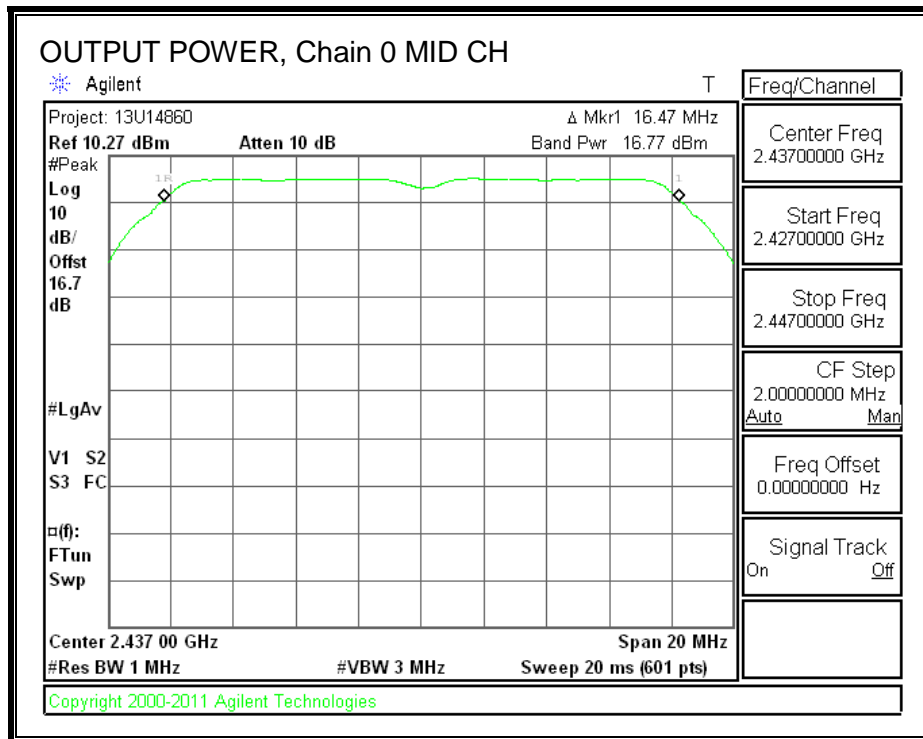
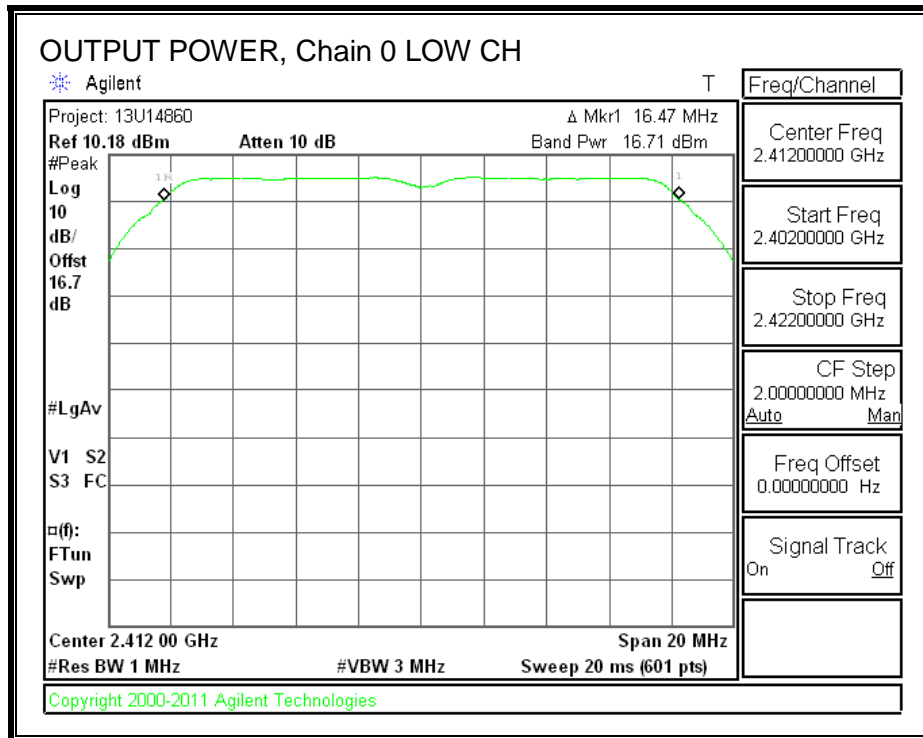
RESULTS

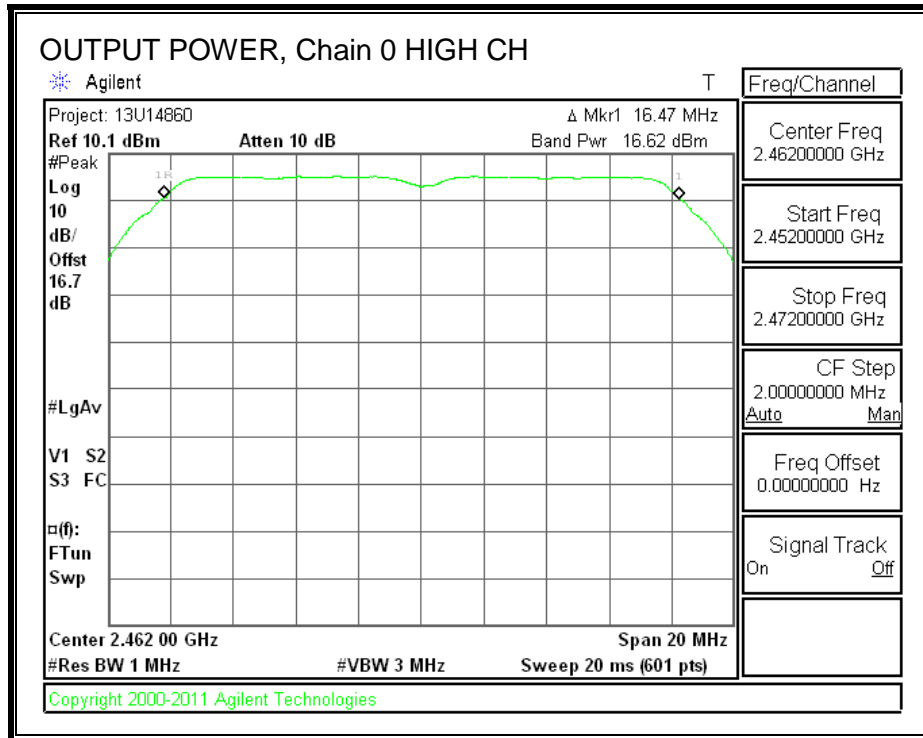
	(MHz)	(dBi)	Limit (dBm)	Limit (dBm)	Limit (dBm)	(dBm)
Low	2412	2.20	30.00	30	36	30.00
Mid	2437	2.20	30.00	30	36	30.00
High	2462	2.20	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	16.71	16.71	30.00	-13.29
Mid	2437	16.77	16.77	30.00	-13.23
High	2462	16.62	16.62	30.00	-13.38

OUTPUT POWER, Chain 0





9.2.1. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

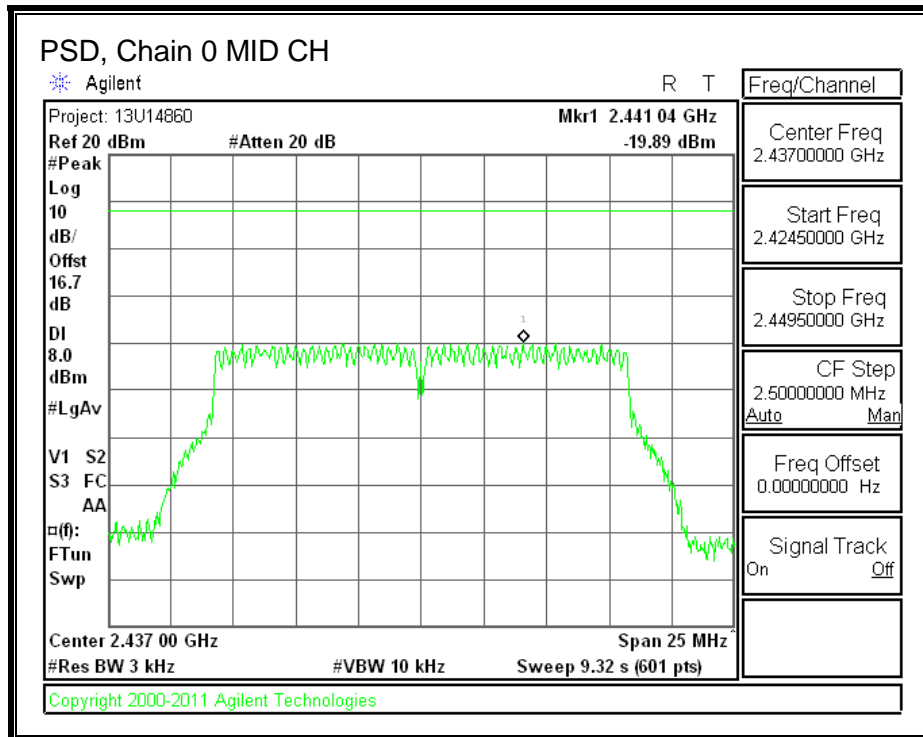
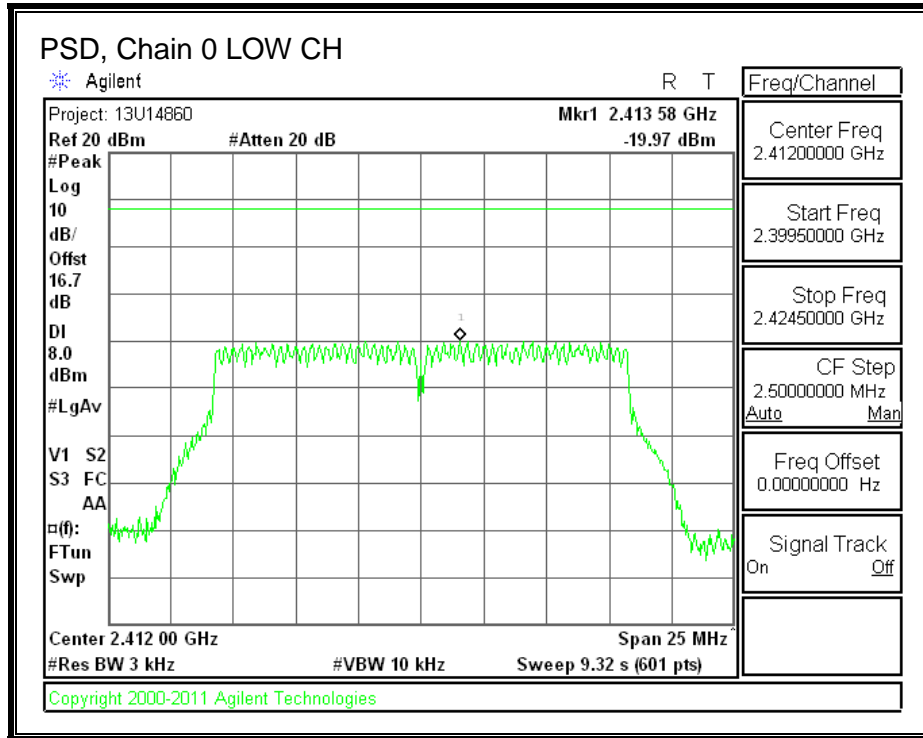
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

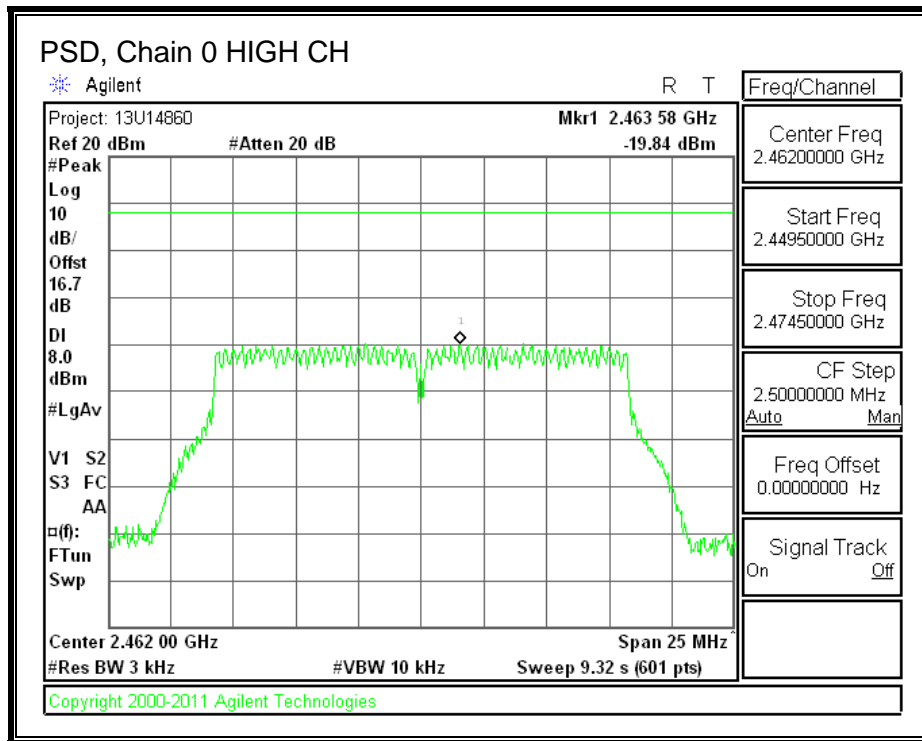
RESULTS

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-19.97	8.0	-28.0
Mid	2437	-19.89	8.0	-27.9
High	2462	-19.84	8.0	-27.8

PSD, Chain 0





9.2.1. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

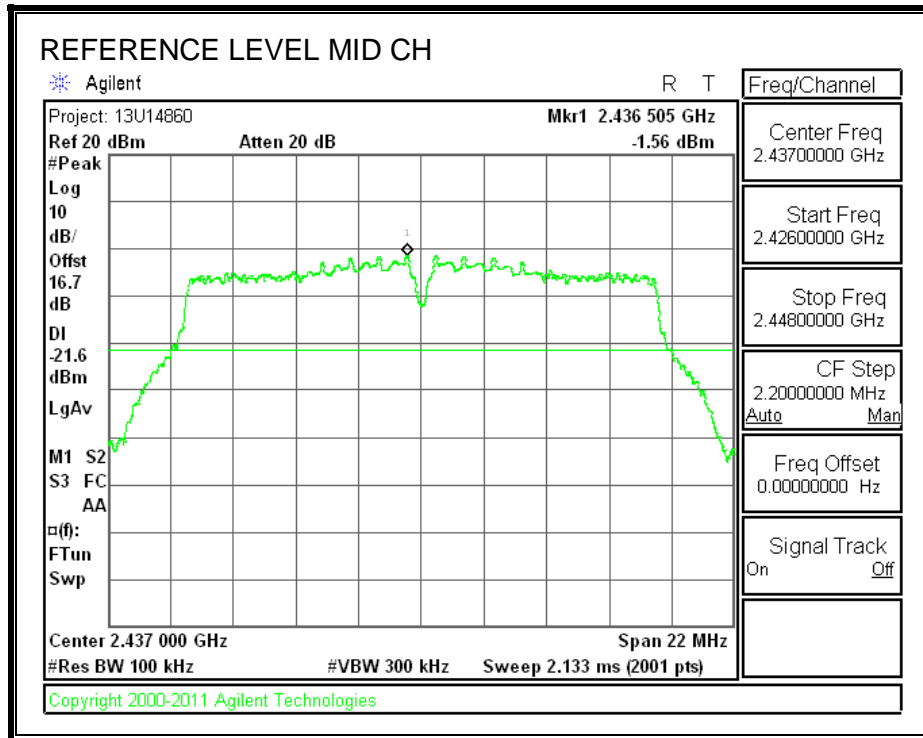
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

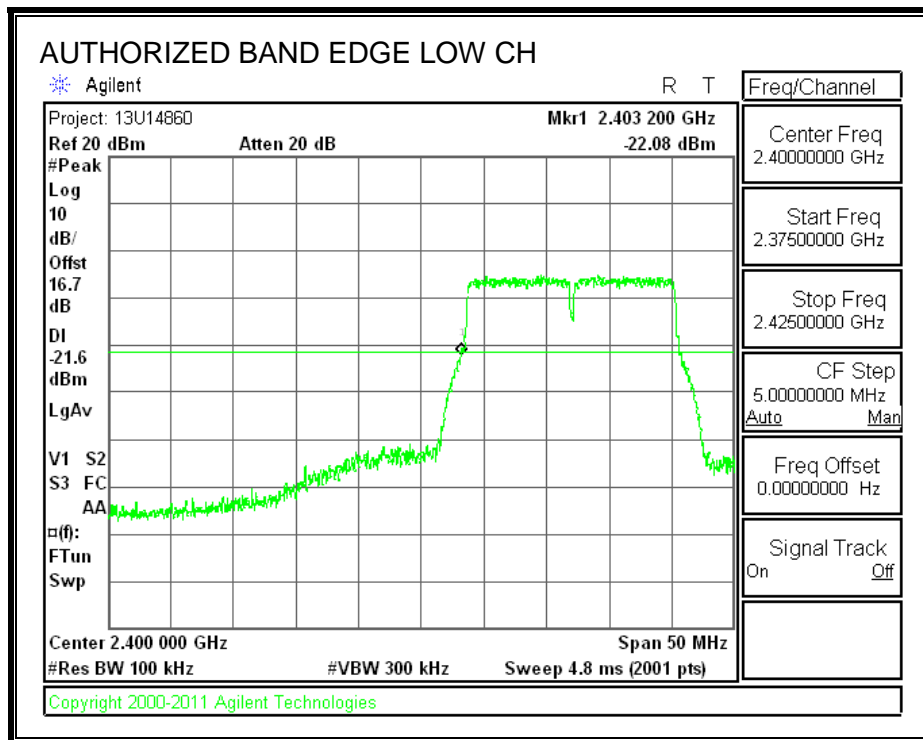
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

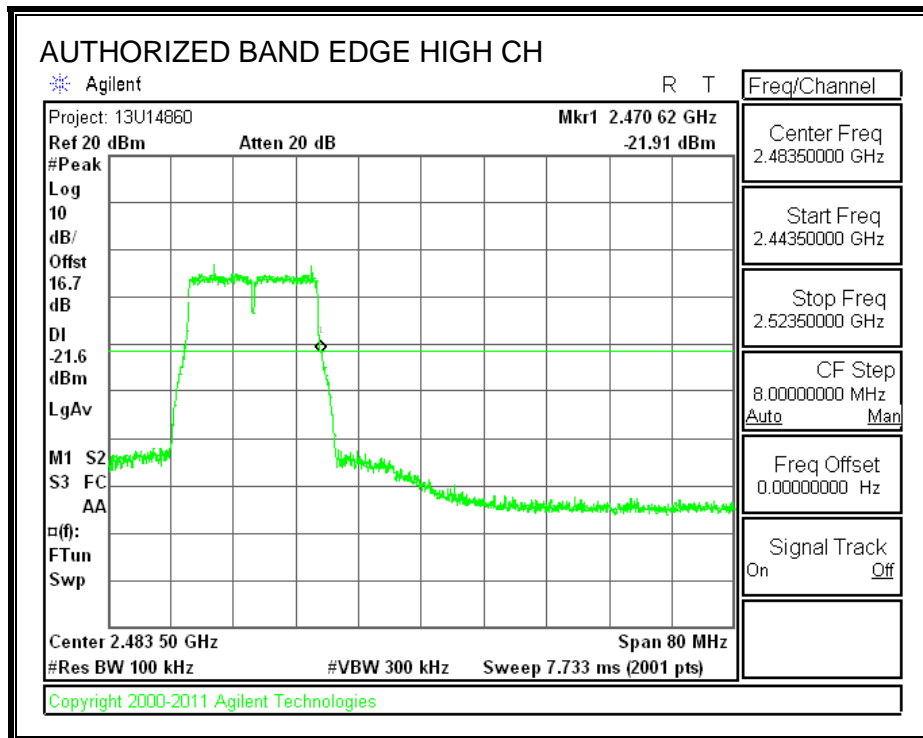
IN-BAND REFERENCE LEVEL



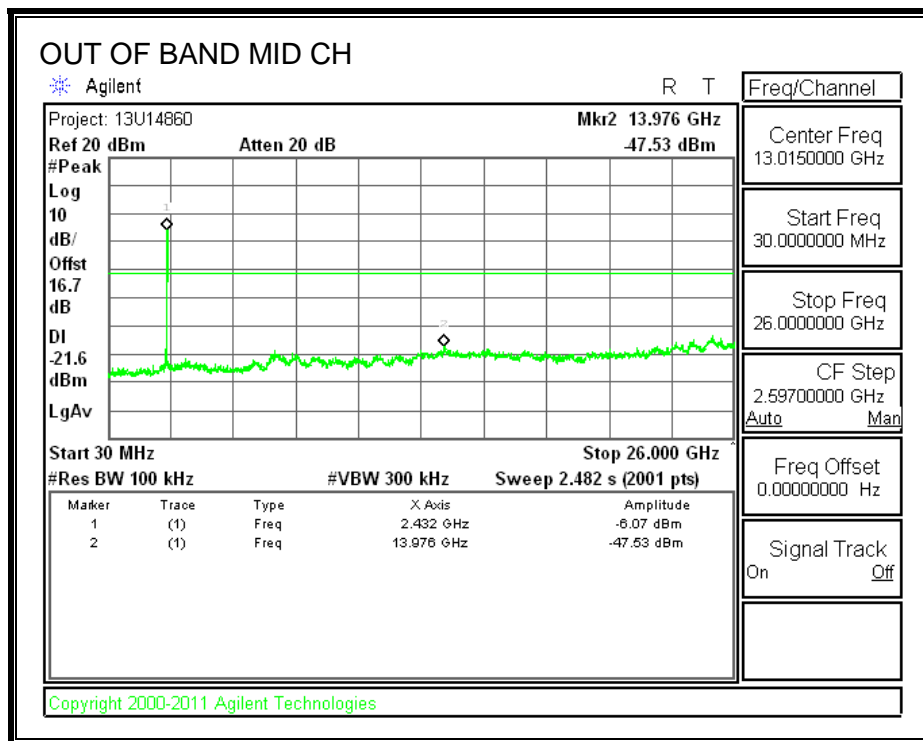
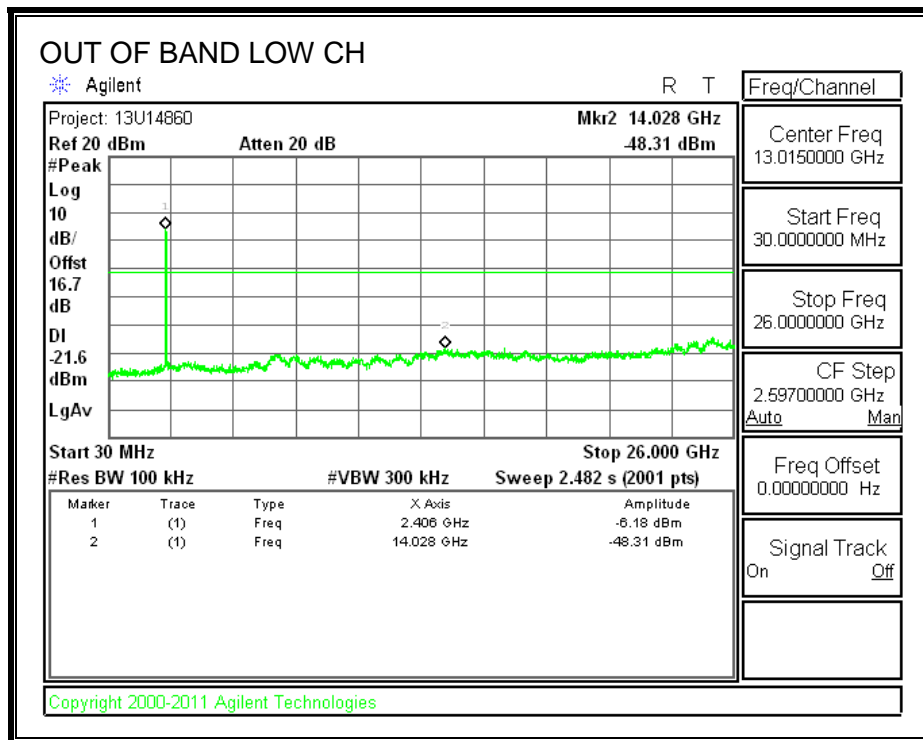
LOW CHANNEL BANDEDGE

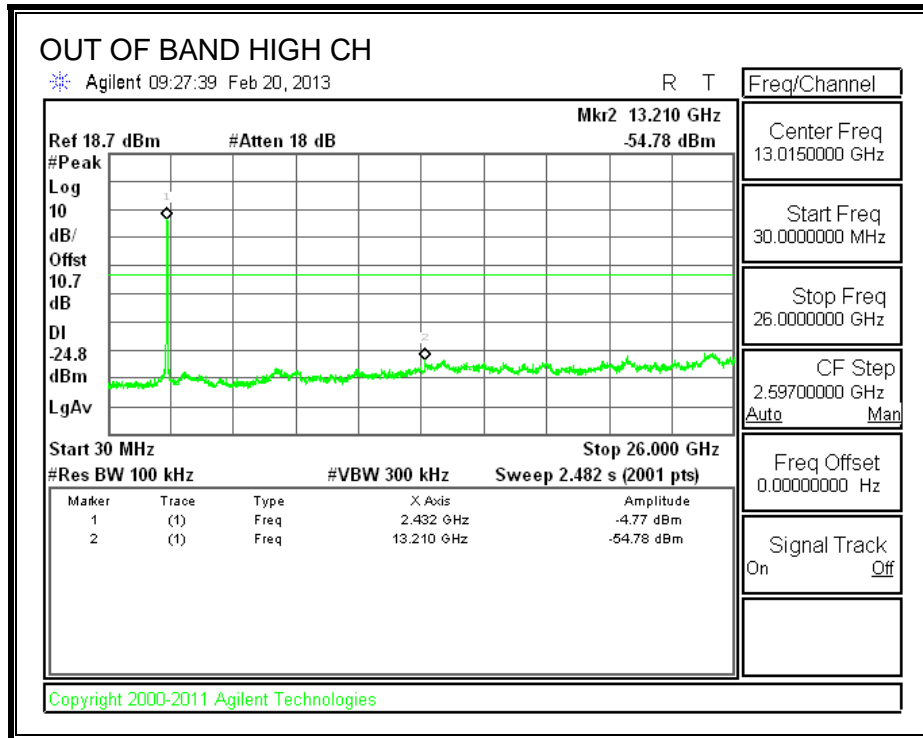


HIGH CHANNEL BANDEDGE



OUT-OF-BAND EMISSIONS





9.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

9.3.1. 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.

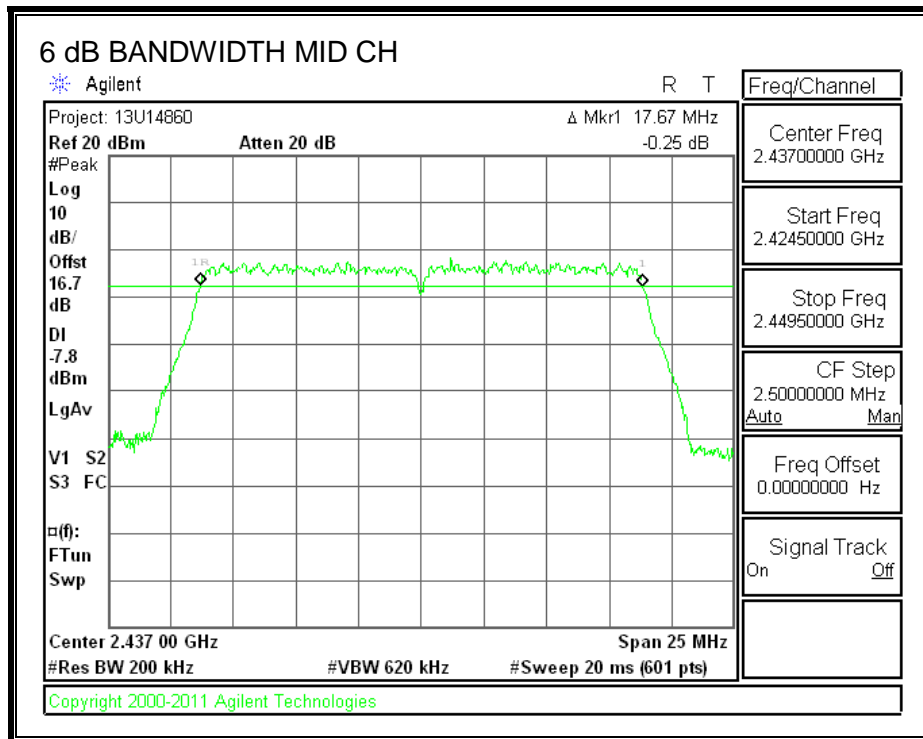
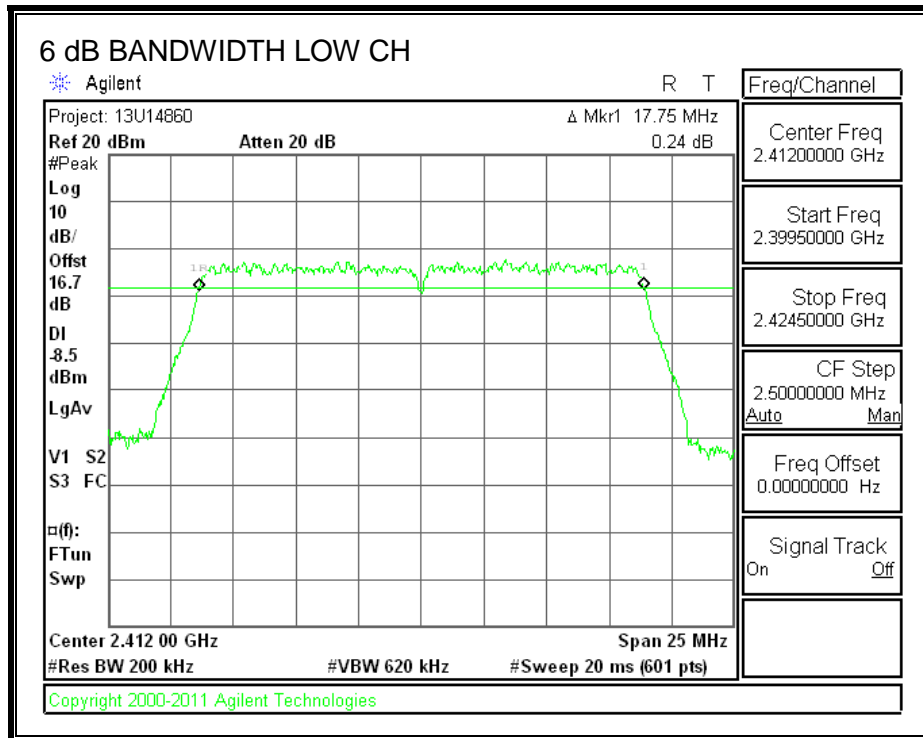
TEST PROCEDURE

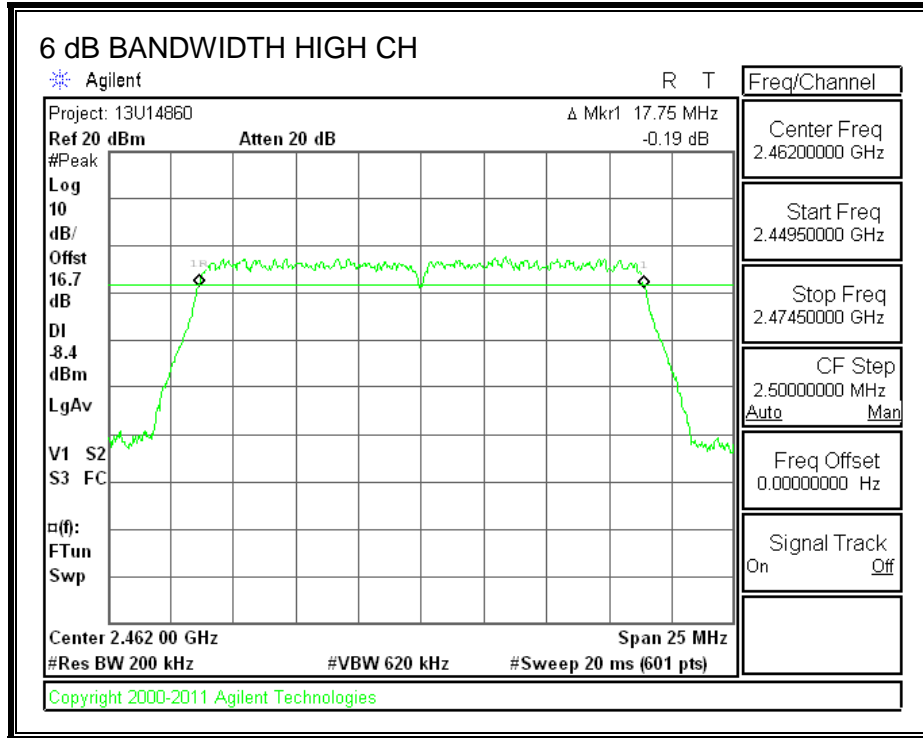
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.750	0.5
Mid	2437	17.670	0.5
High	2462	17.750	0.5

6 dB BANDWIDTH





9.3.2. 99% BANDWIDTH

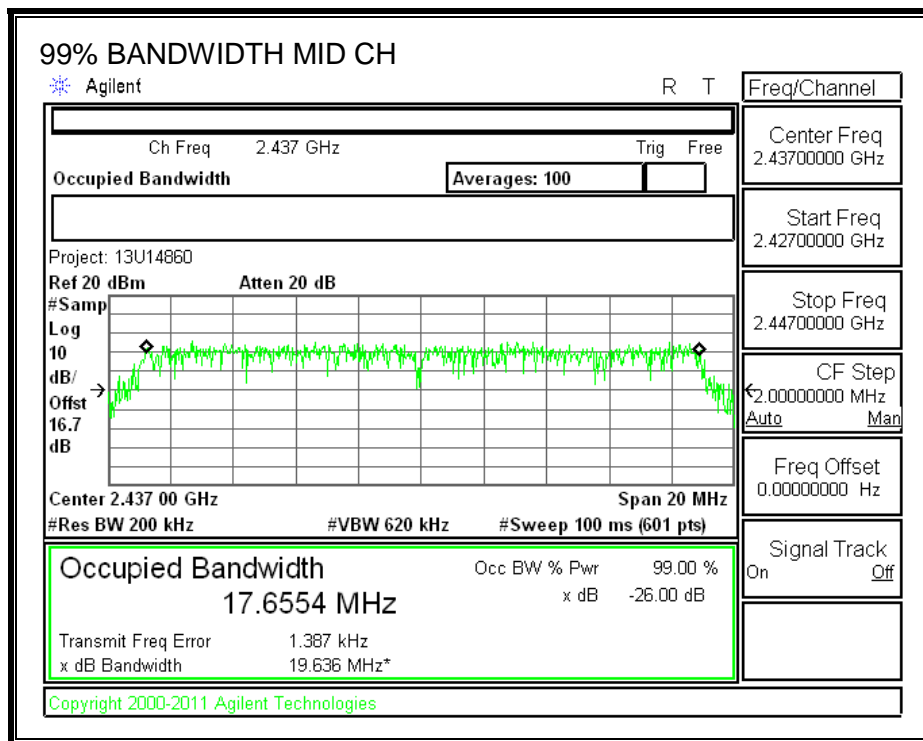
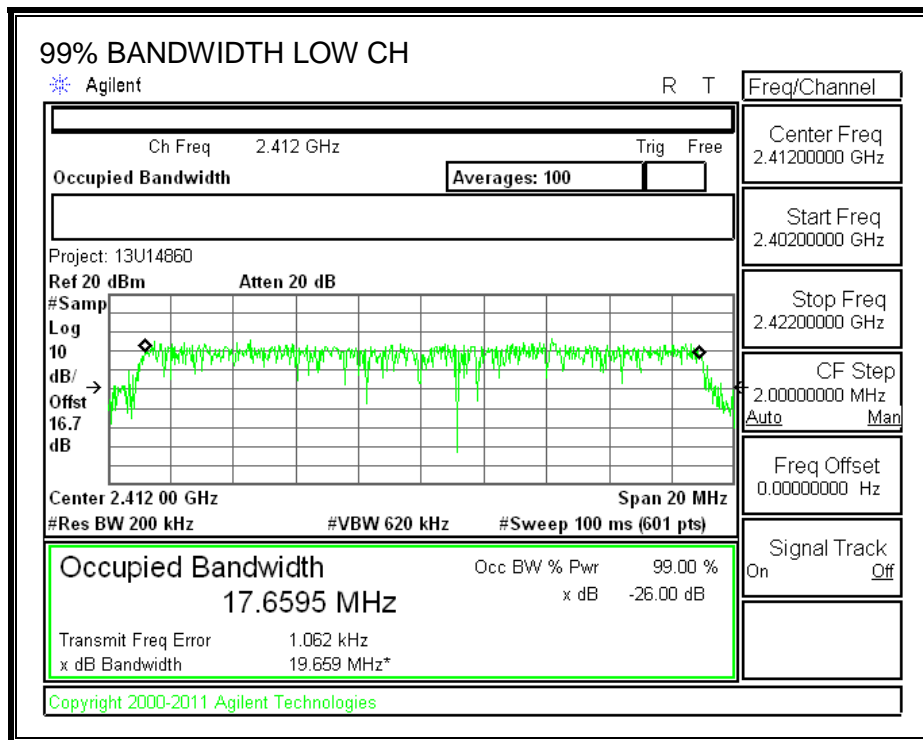
LIMITS

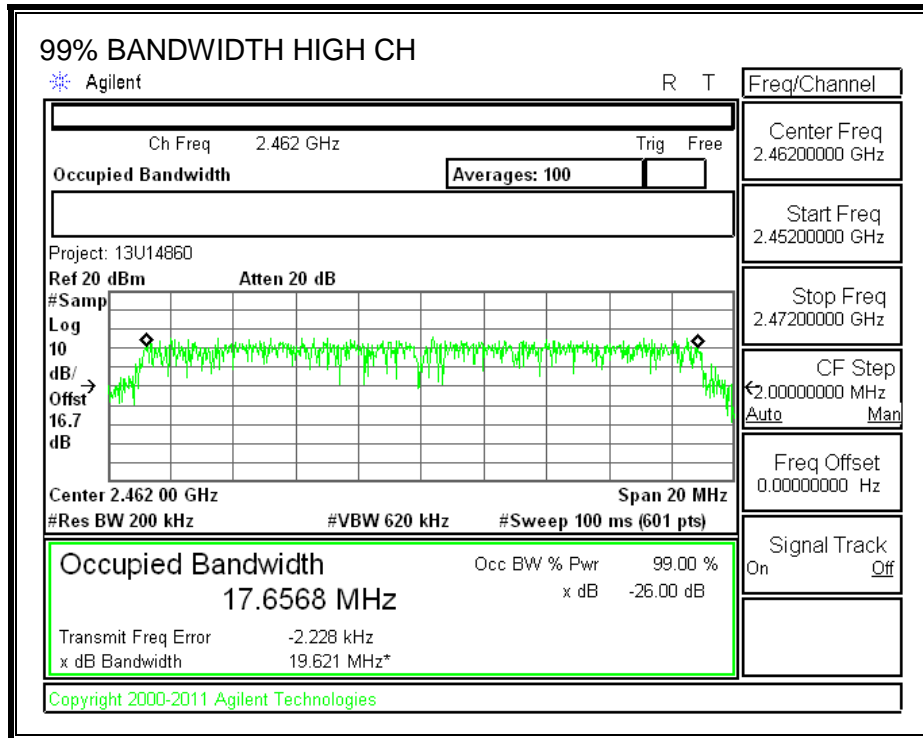
None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.6595
Mid	2437	17.6554
High	2462	17.6568

99% BANDWIDTH





9.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	9.04
Mid	2437	9.28
High	2462	9.07

9.3.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

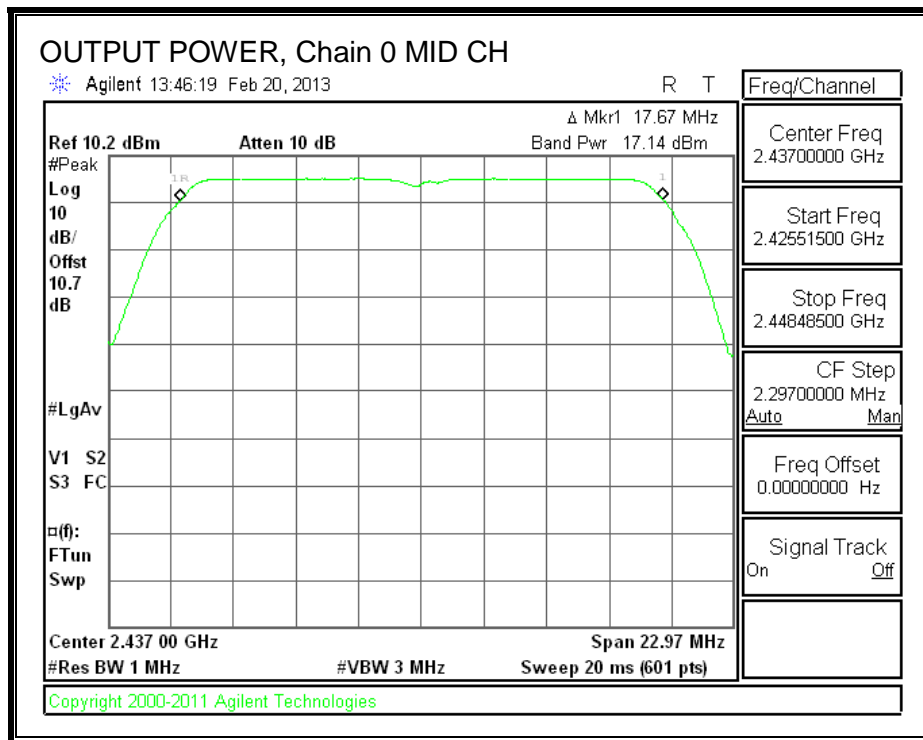
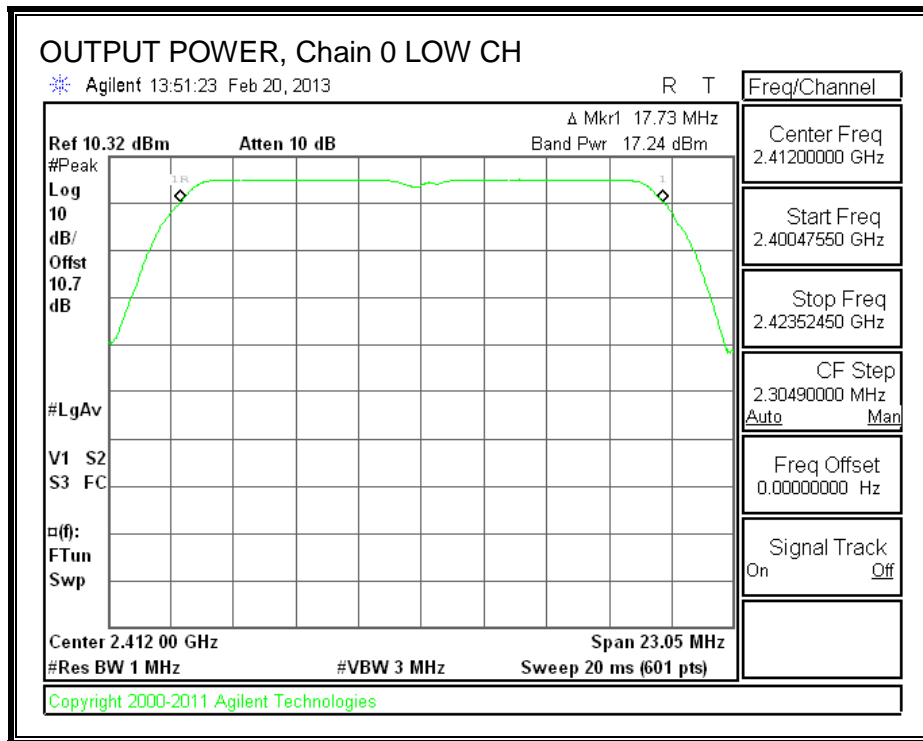
Limits

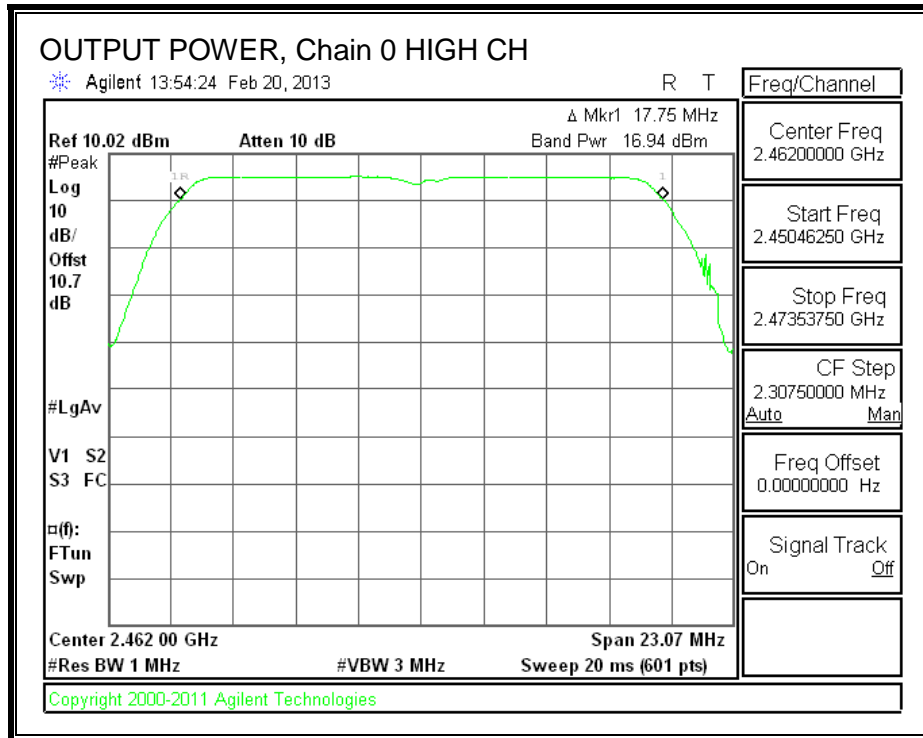
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	2.20	30.00	30	36	30.00
Mid	2437	2.20	30.00	30	36	30.00
High	2462	2.20	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	17.24	17.24	30.00	-12.76
Mid	2437	17.14	17.14	30.00	-12.86
High	2462	16.94	16.94	30.00	-13.06

OUTPUT POWER, Chain 0





9.3.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

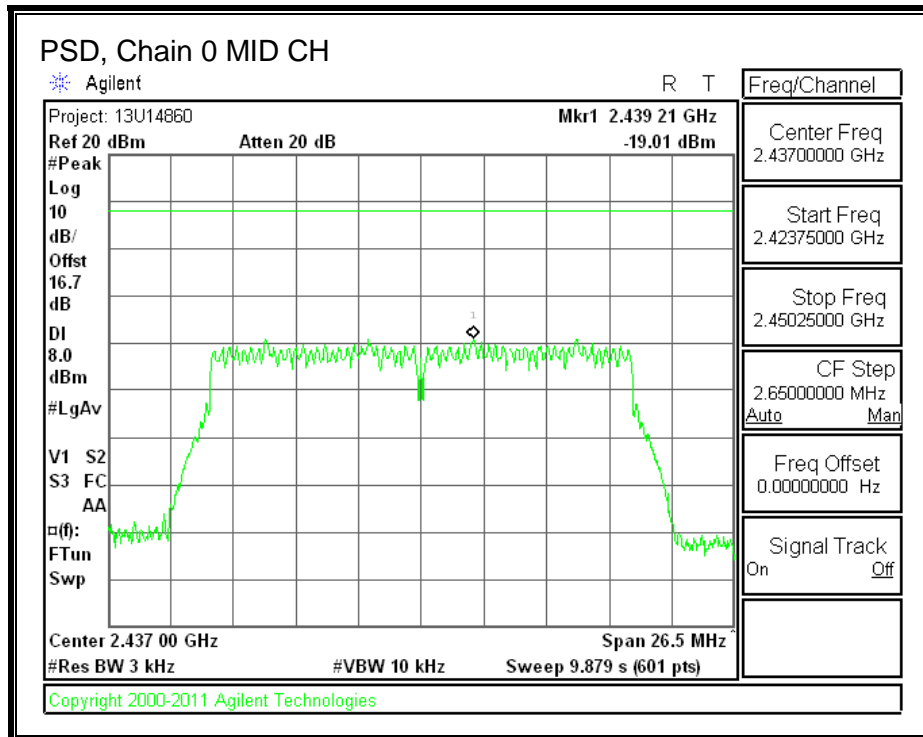
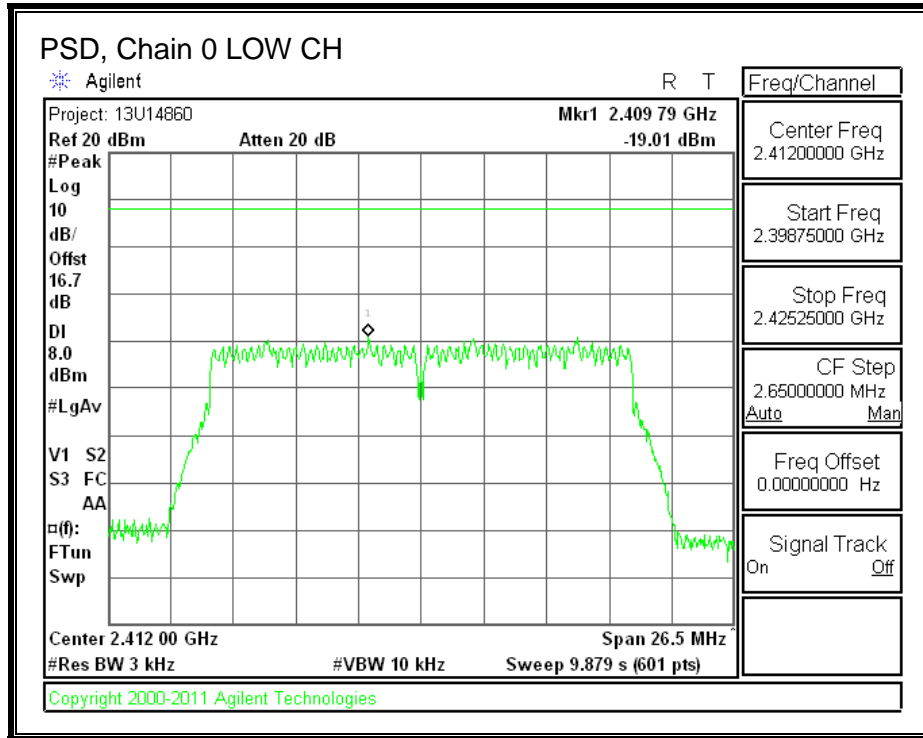
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

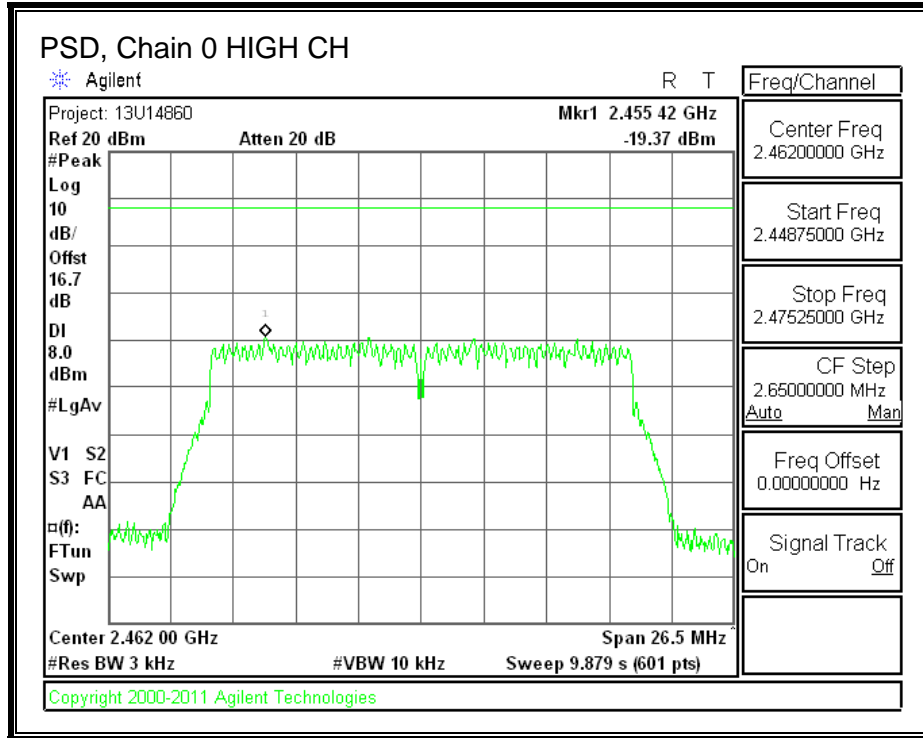
RESULTS

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-19.01	8.0	-27.0
Mid	2437	-19.01	8.0	-27.0
High	2462	-19.37	8.0	-27.4

PSD, Chain 0





9.3.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

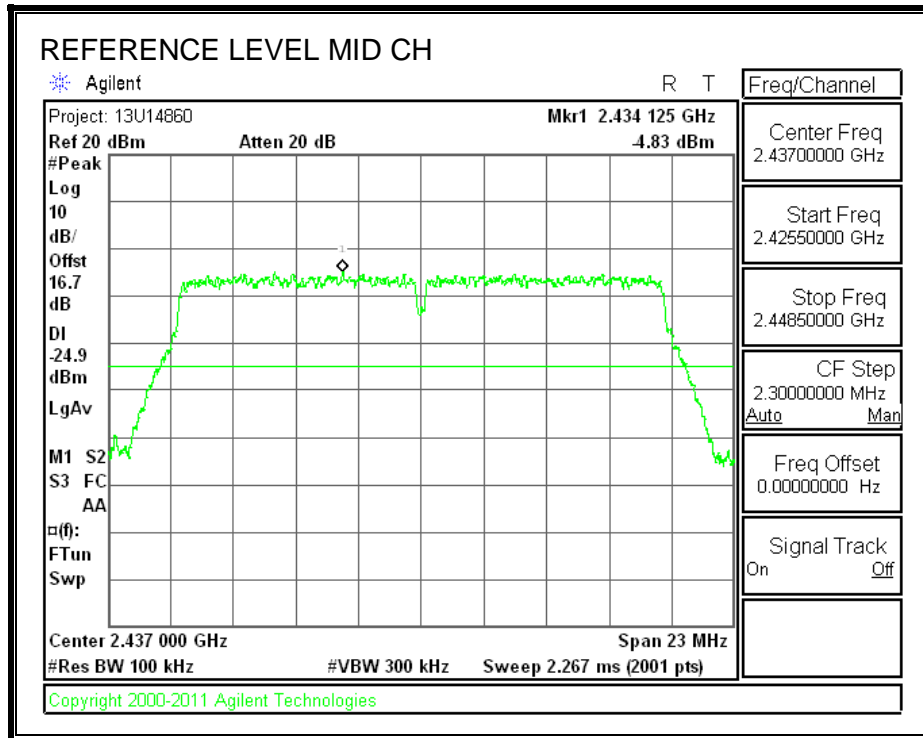
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

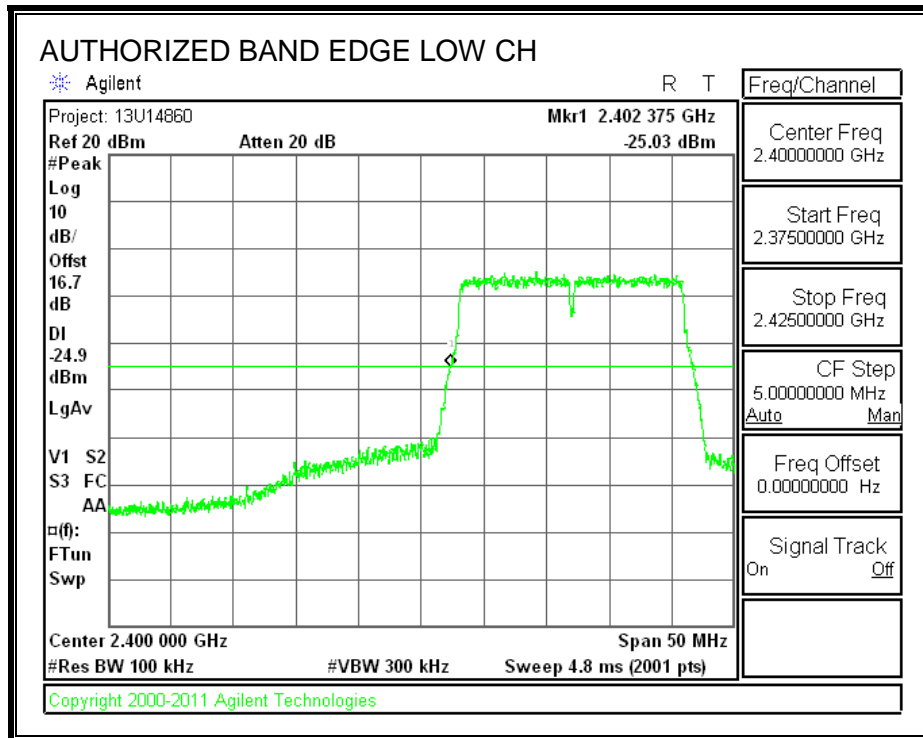
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

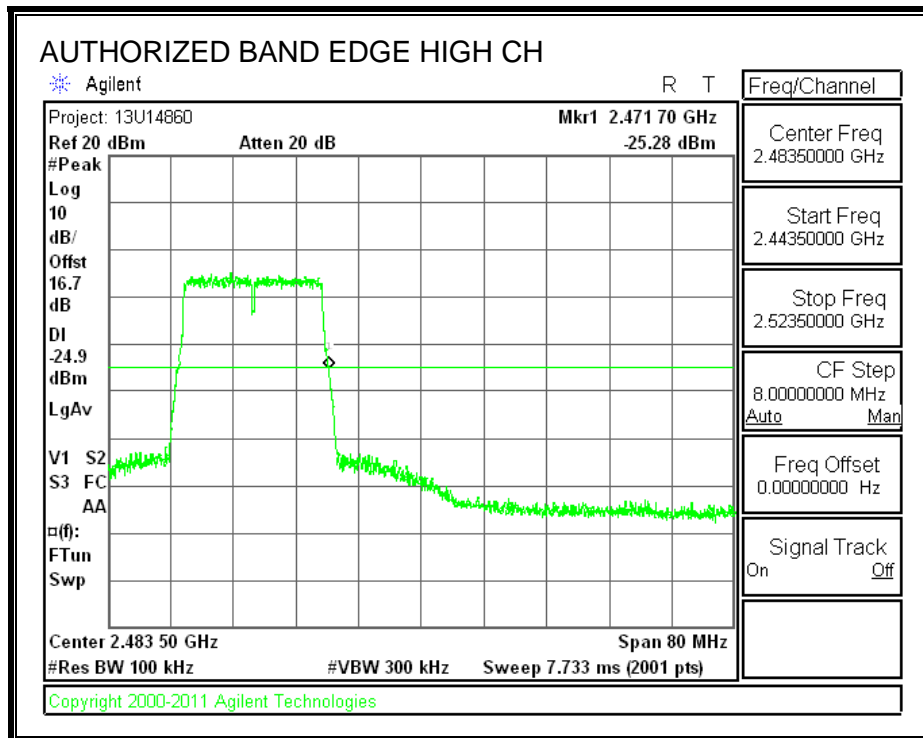
IN-BAND REFERENCE LEVEL



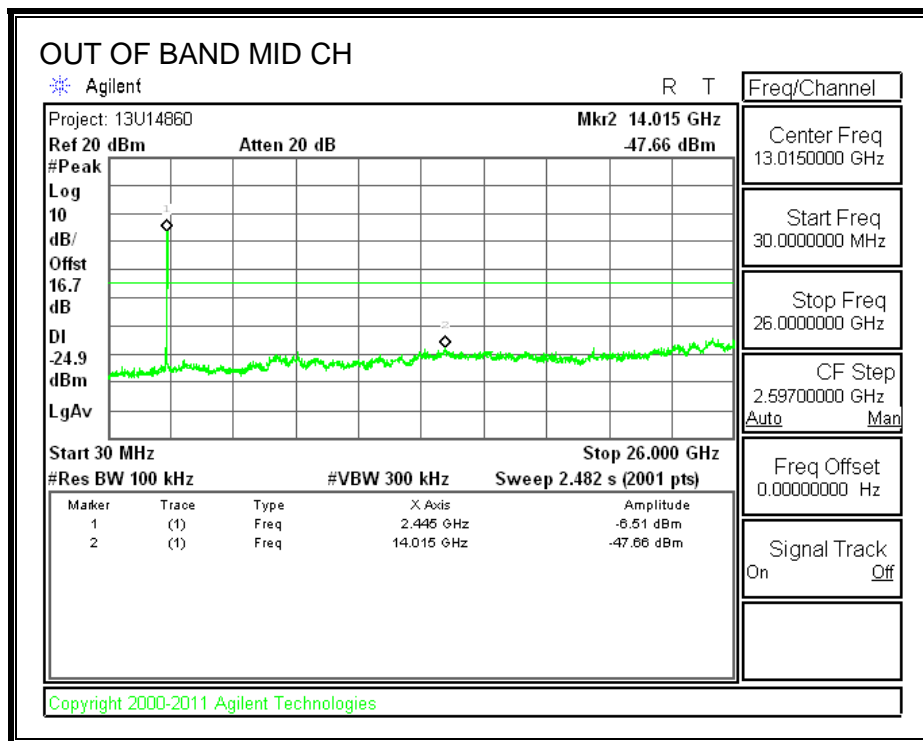
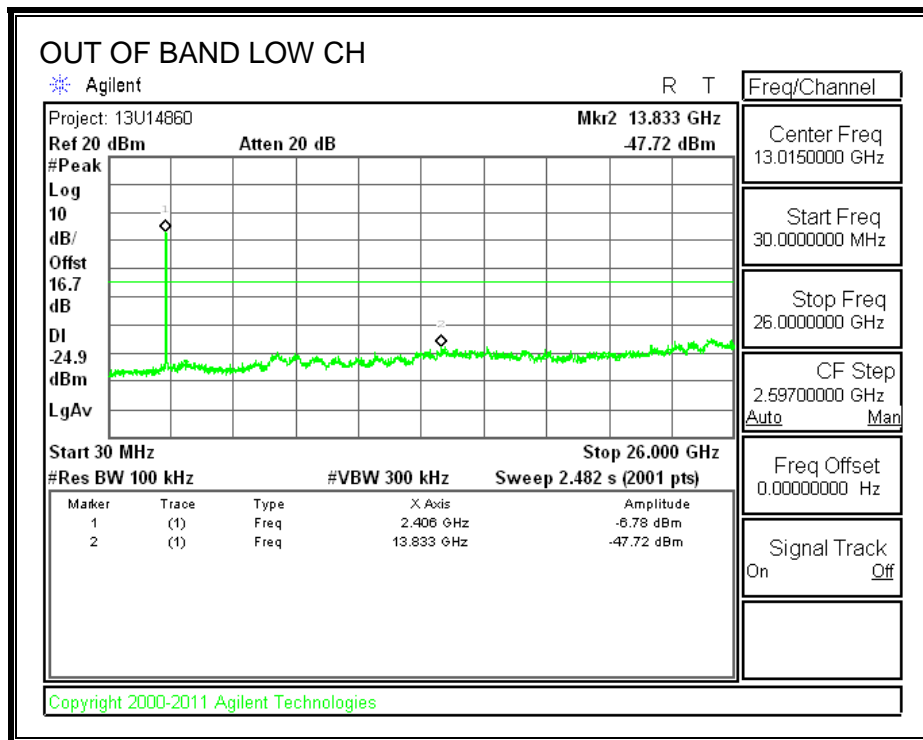
LOW CHANNEL BANDEGE

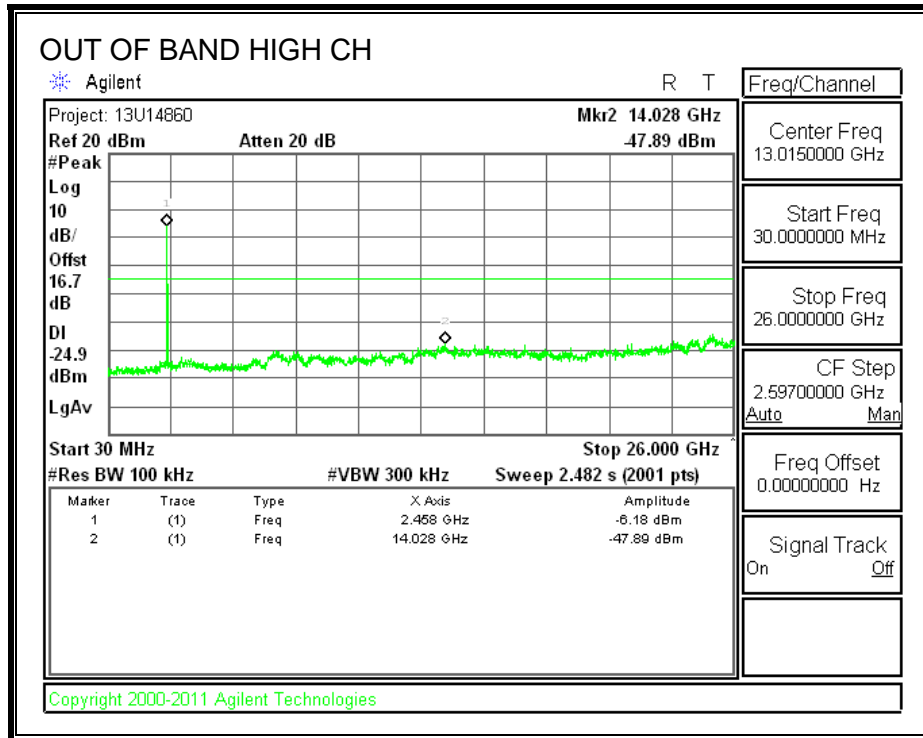


HIGH CHANNEL BANDEGE



OUT-OF-BAND EMISSIONS





9.4. 802.11a MODE IN THE 5.8 GHz BAND

9.4.1. 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.

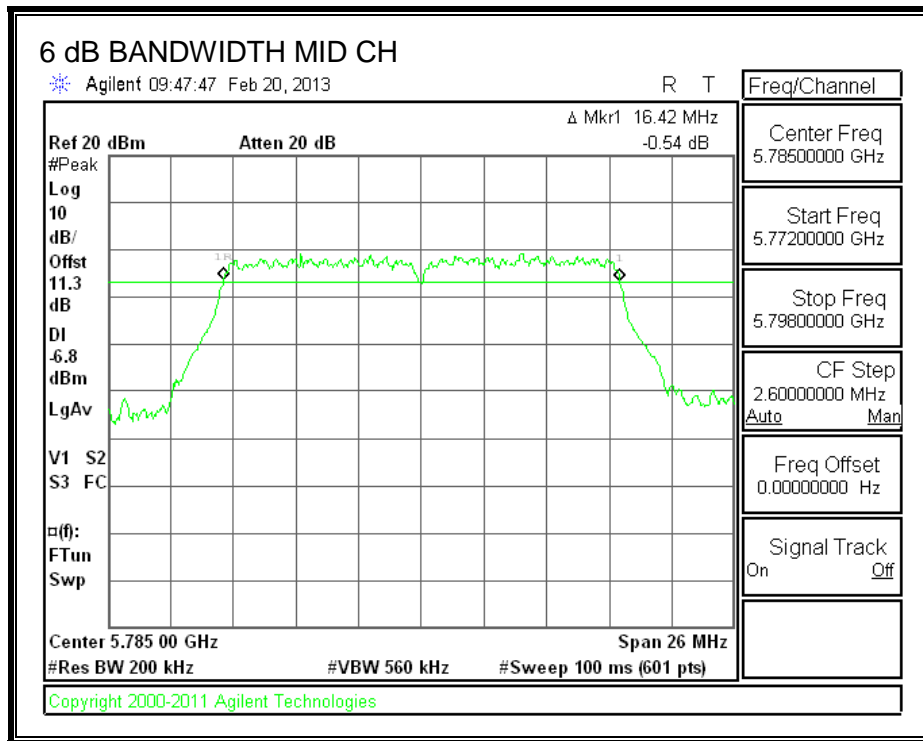
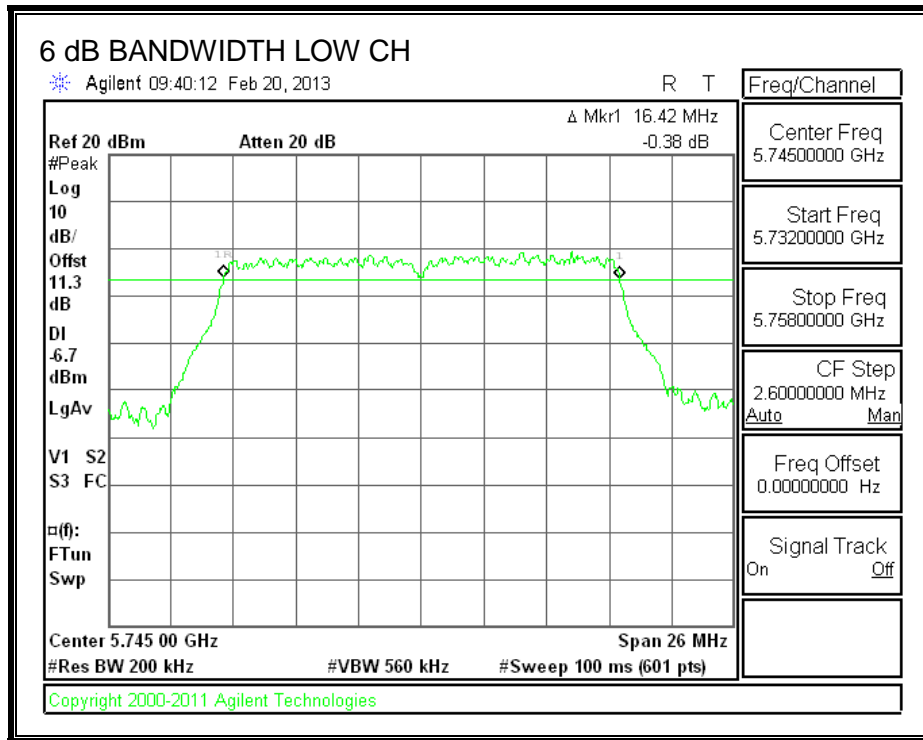
TEST PROCEDURE

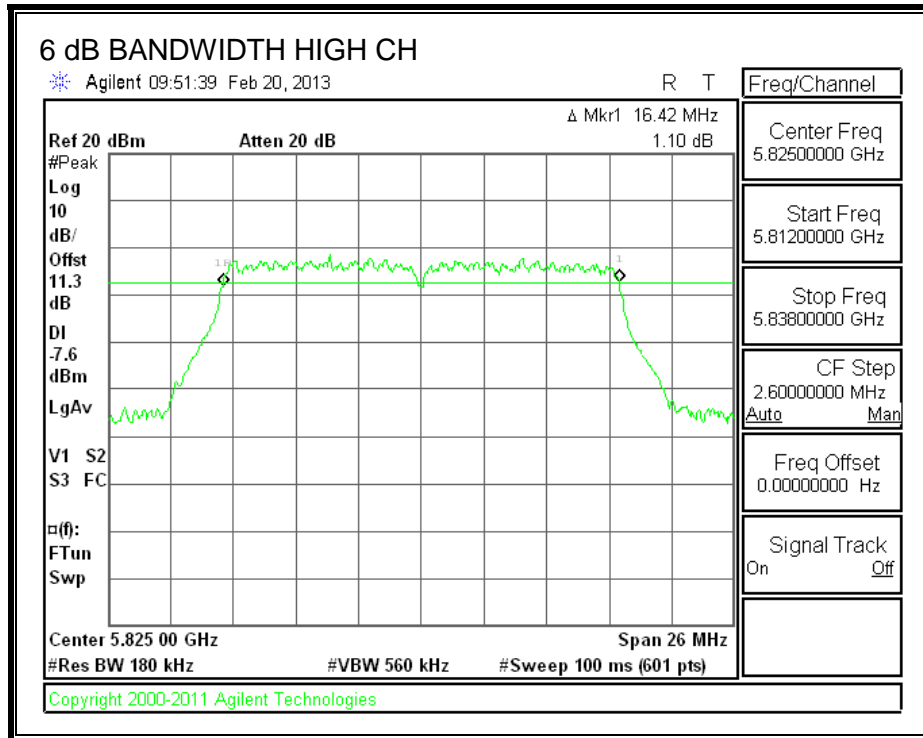
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.420	0.5
Mid	5785	16.420	0.5
High	5825	16.420	0.5

6 dB BANDWIDTH





9.4.2. 99% BANDWIDTH

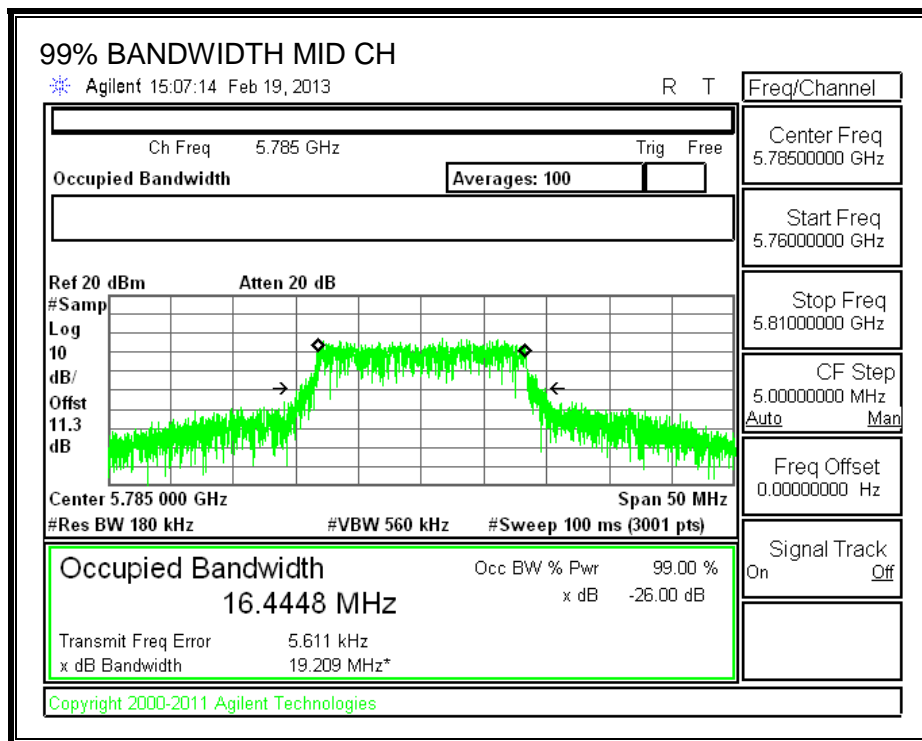
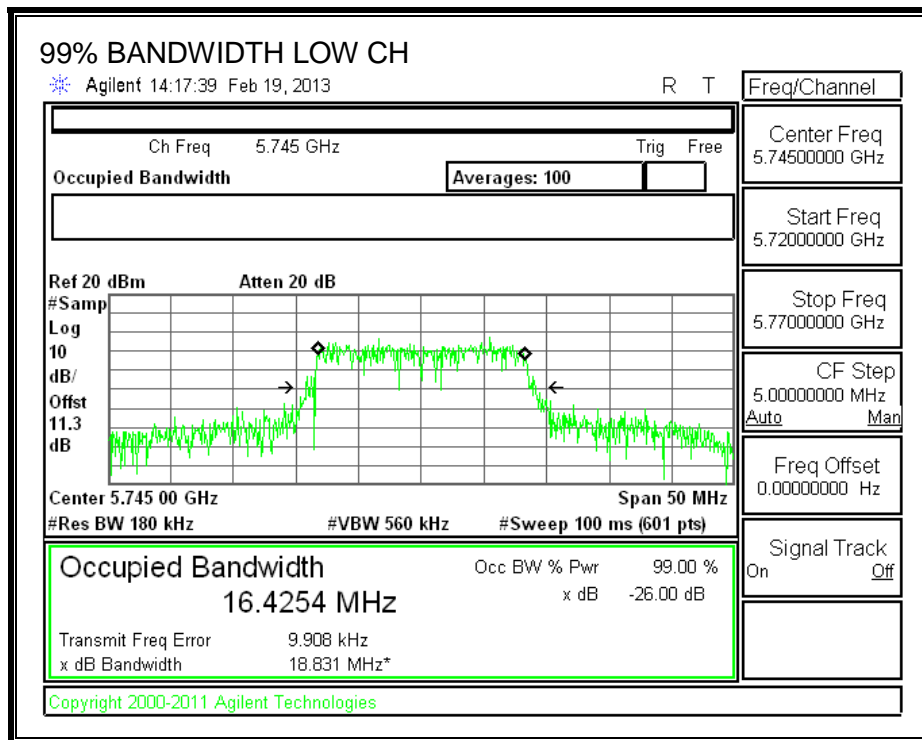
LIMITS

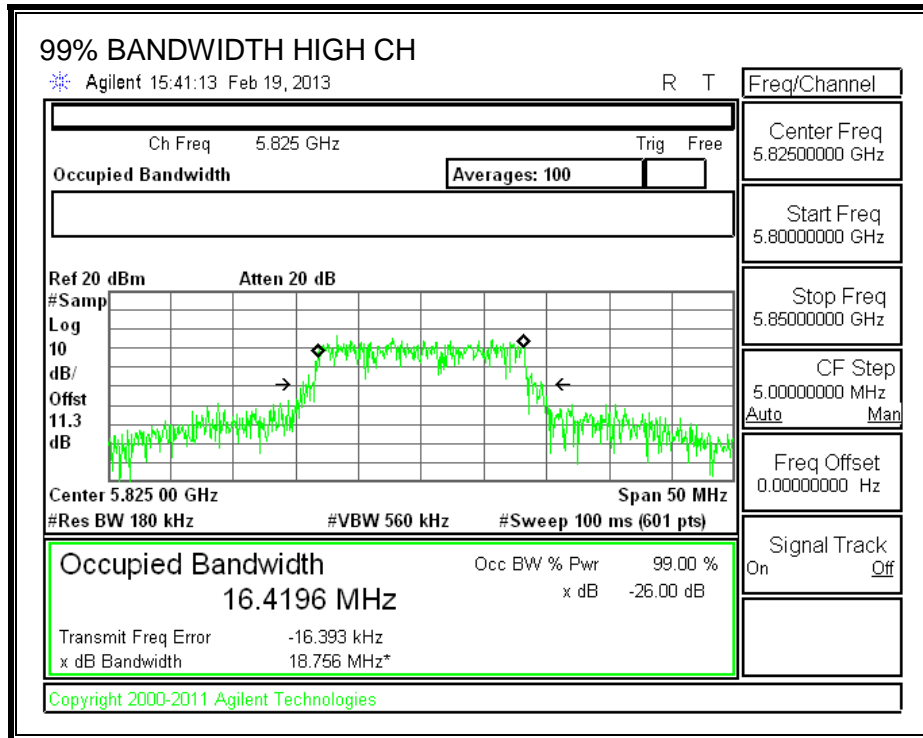
None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.4254
Mid	5785	16.4448
High	5825	16.4196

99% BANDWIDTH





9.4.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5745	9.66
Mid	5785	9.73
High	5825	9.53

9.4.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

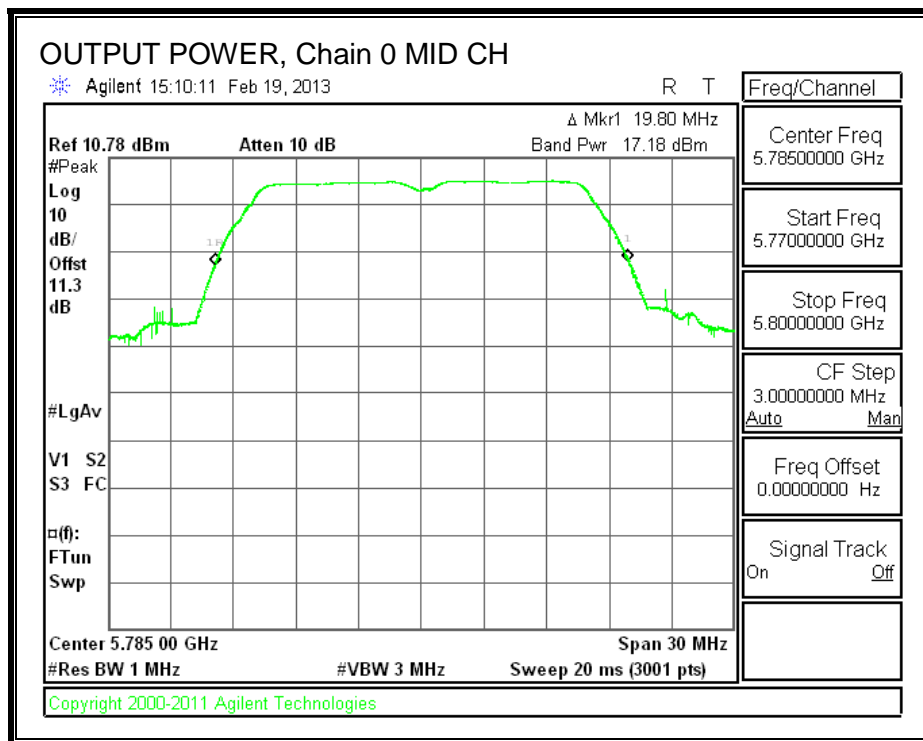
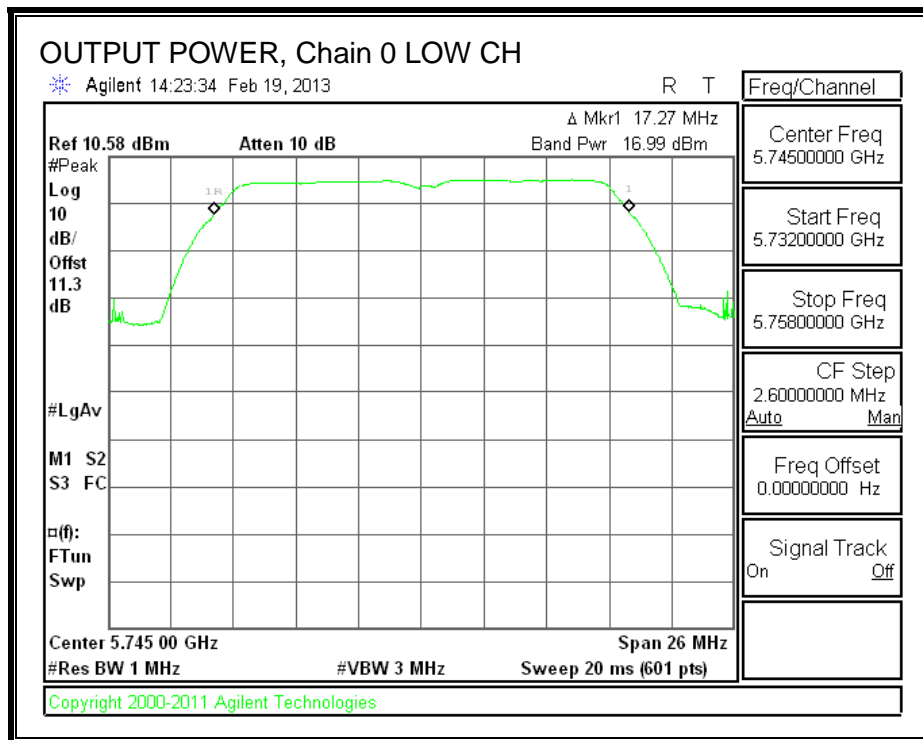
Limits

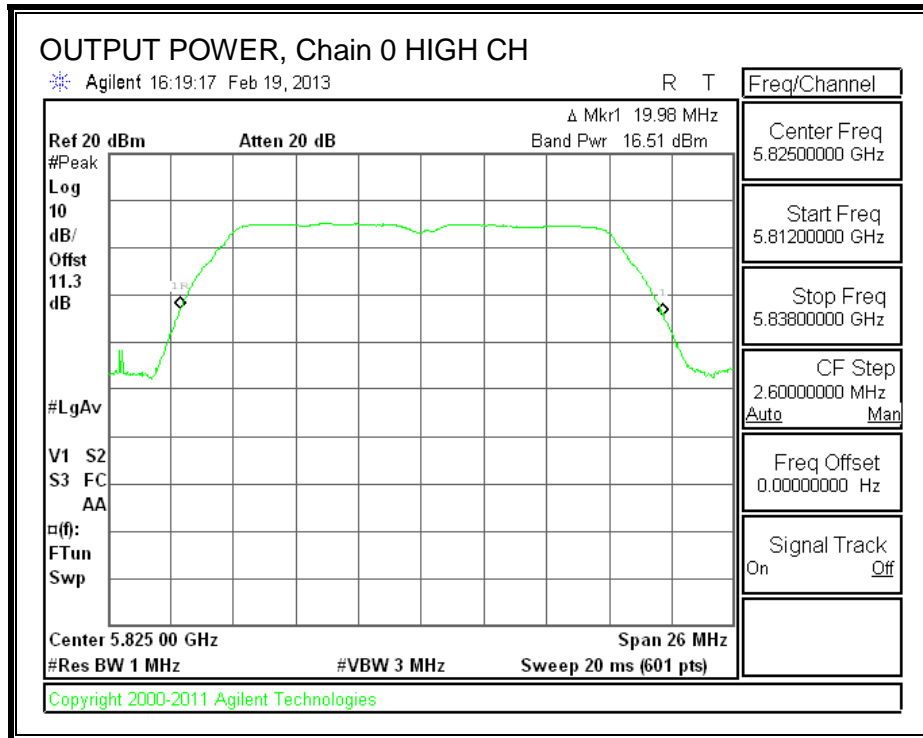
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	3.14	30.00	30	36	30.00
Mid	5785	3.14	30.00	30	36	30.00
High	5825	3.14	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5745	16.99	16.99	30.00	-13.01
Mid	5785	17.18	17.18	30.00	-12.82
High	5825	16.51	16.51	30.00	-13.49

OUTPUT POWER, Chain 0





9.4.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

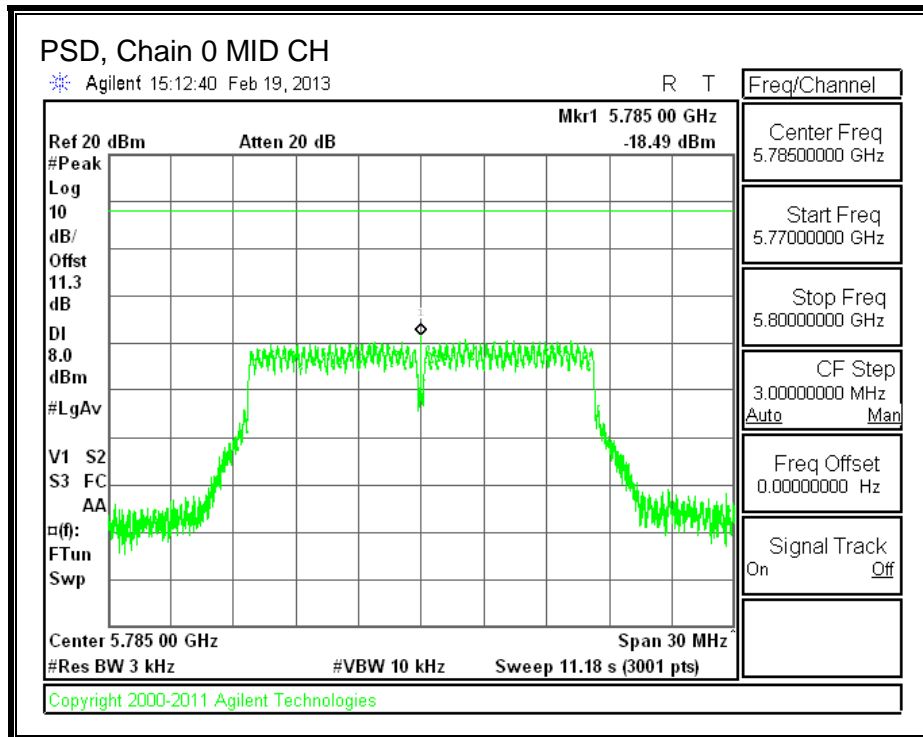
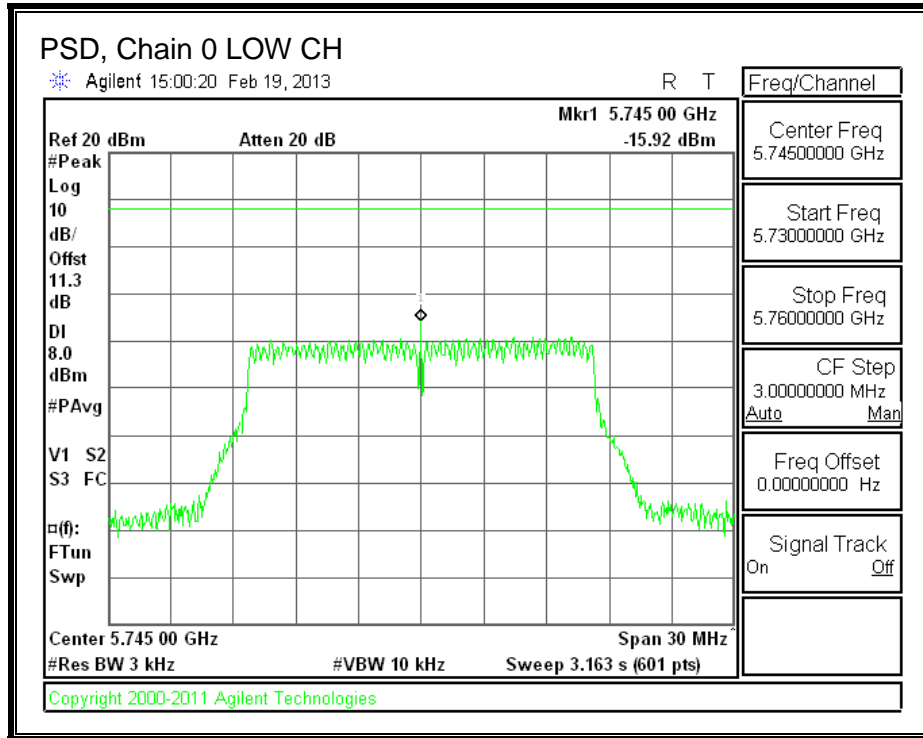
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

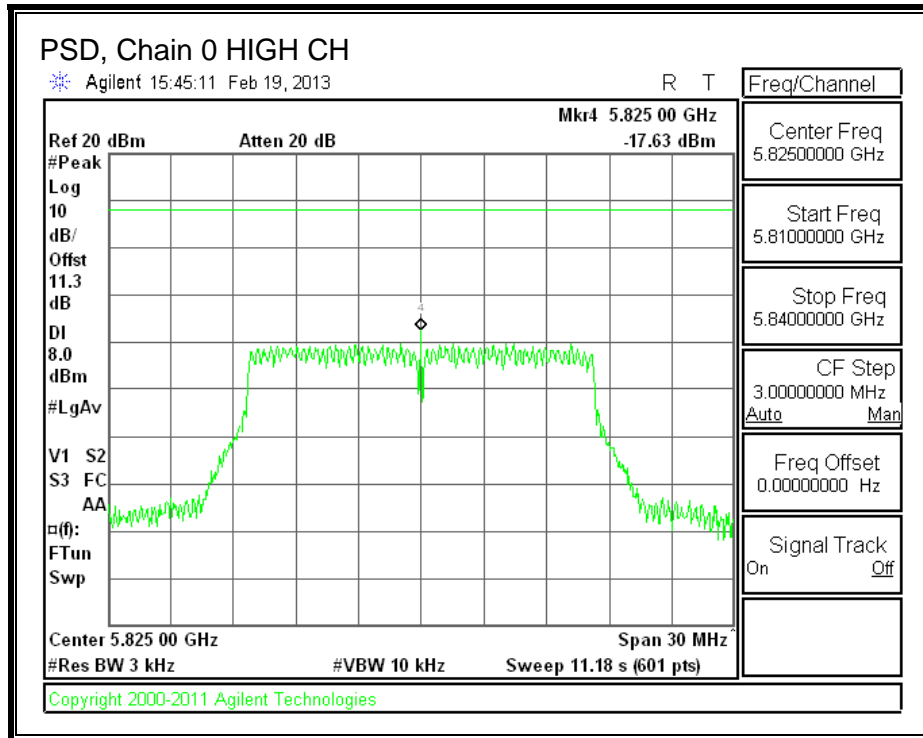
RESULTS

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-15.92	8.0	-23.9
Mid	5785	-18.49	8.0	-26.5
High	5825	-17.63	8.0	-25.6

PSD, Chain 0





9.4.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

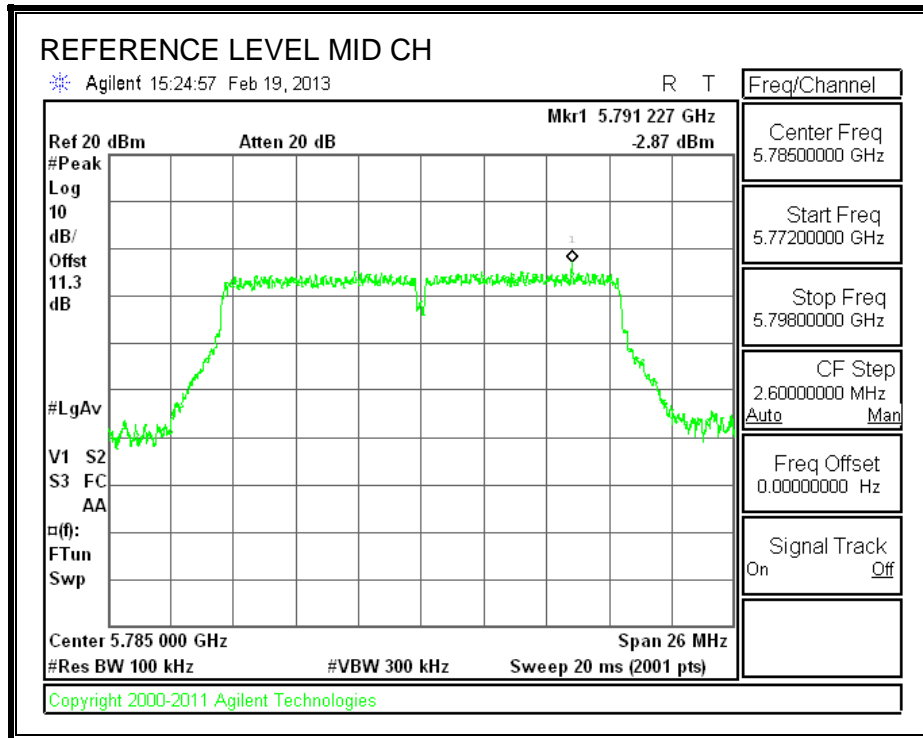
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

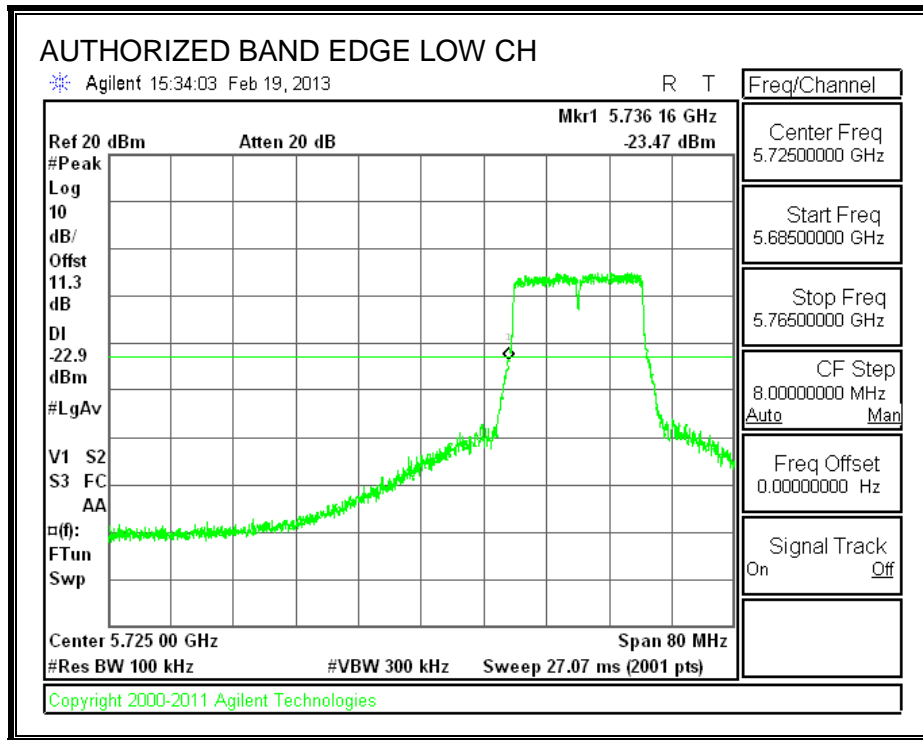
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

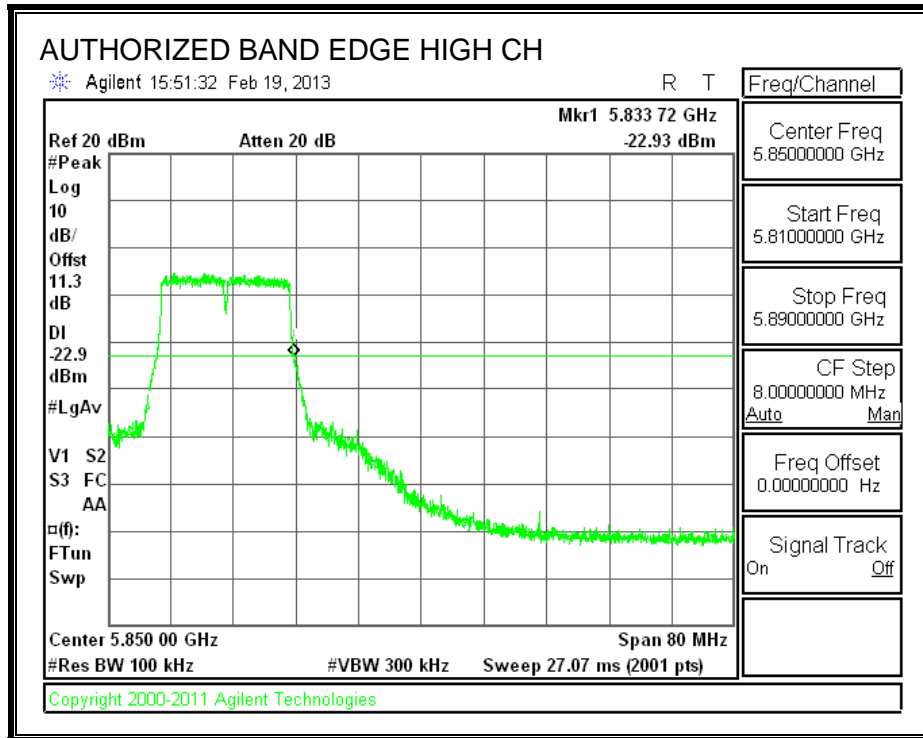
IN-BAND REFERENCE LEVEL



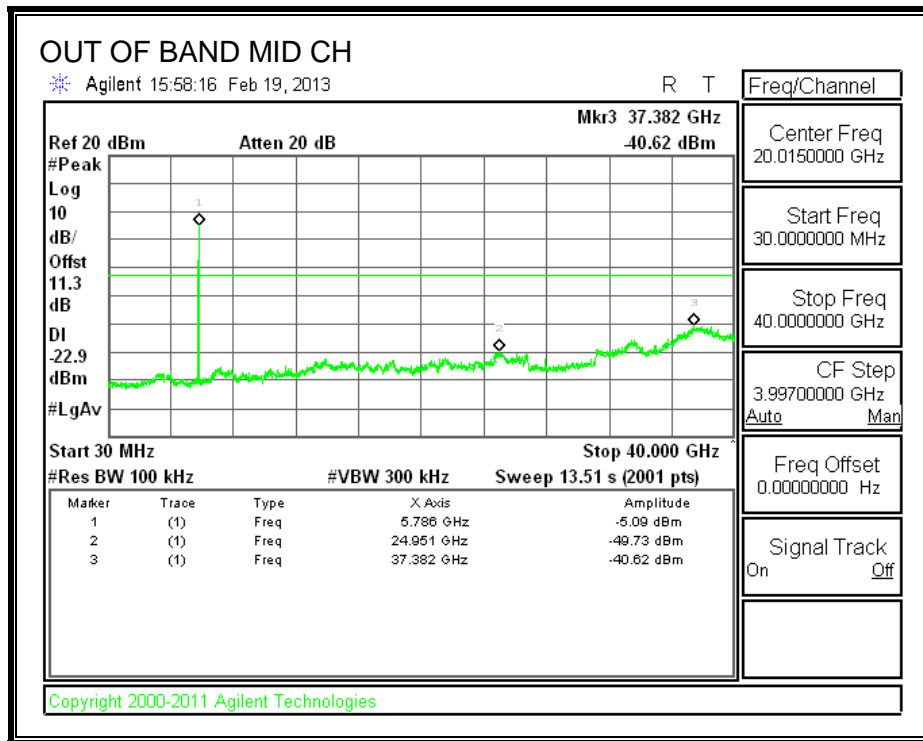
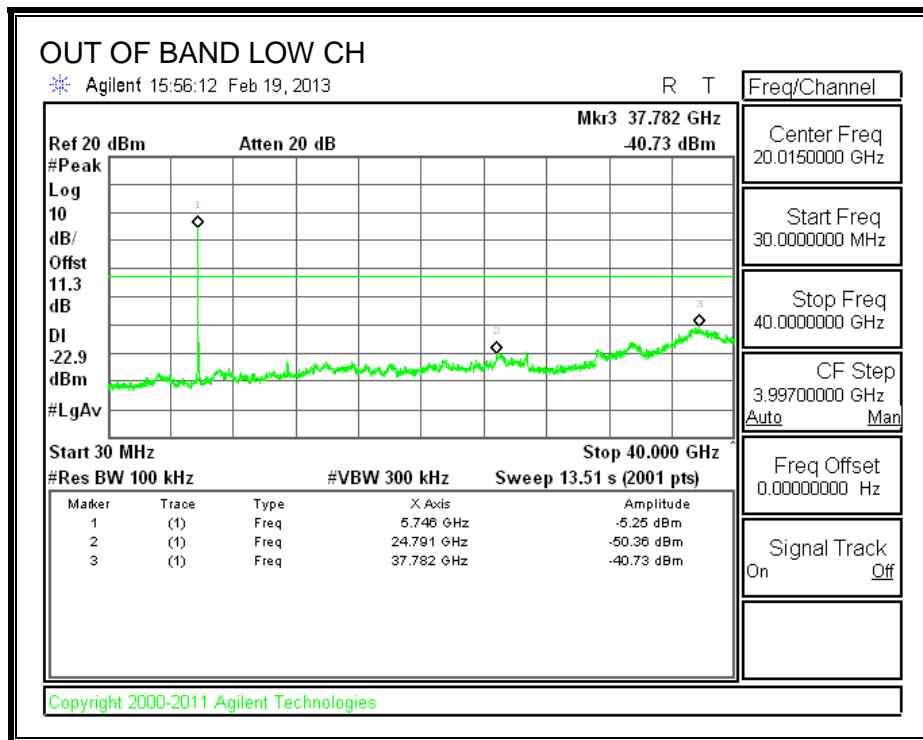
LOW CHANNEL BANDEDGE

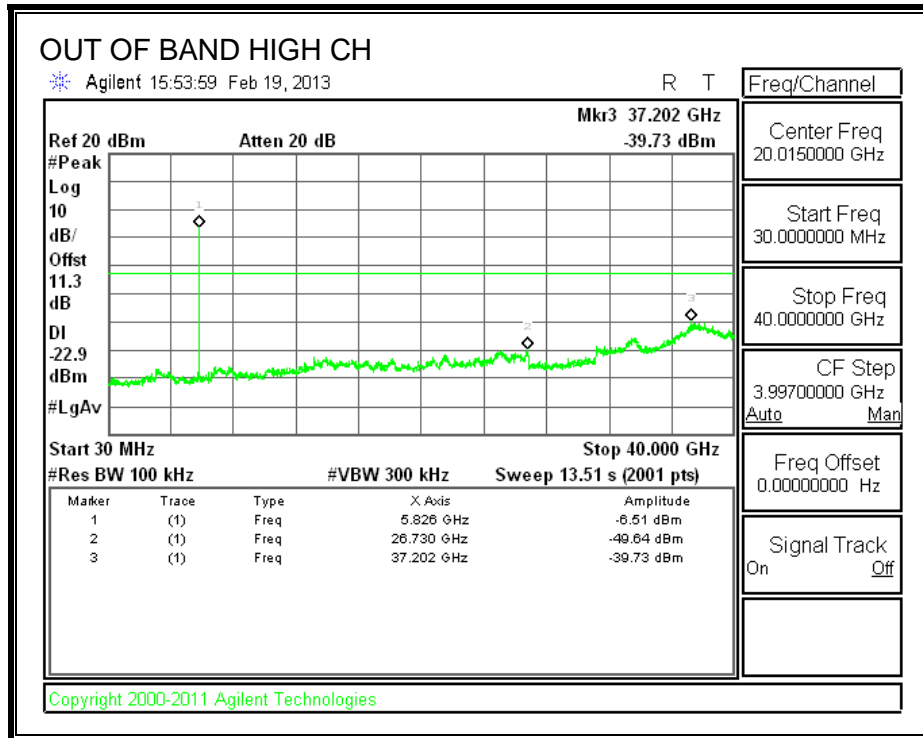


HIGH CHANNEL BANDEDGE



OUT-OF-BAND EMISSIONS





9.5. 802.11n HT20 MODE IN THE 5.8 GHz BAND

9.5.1. 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.

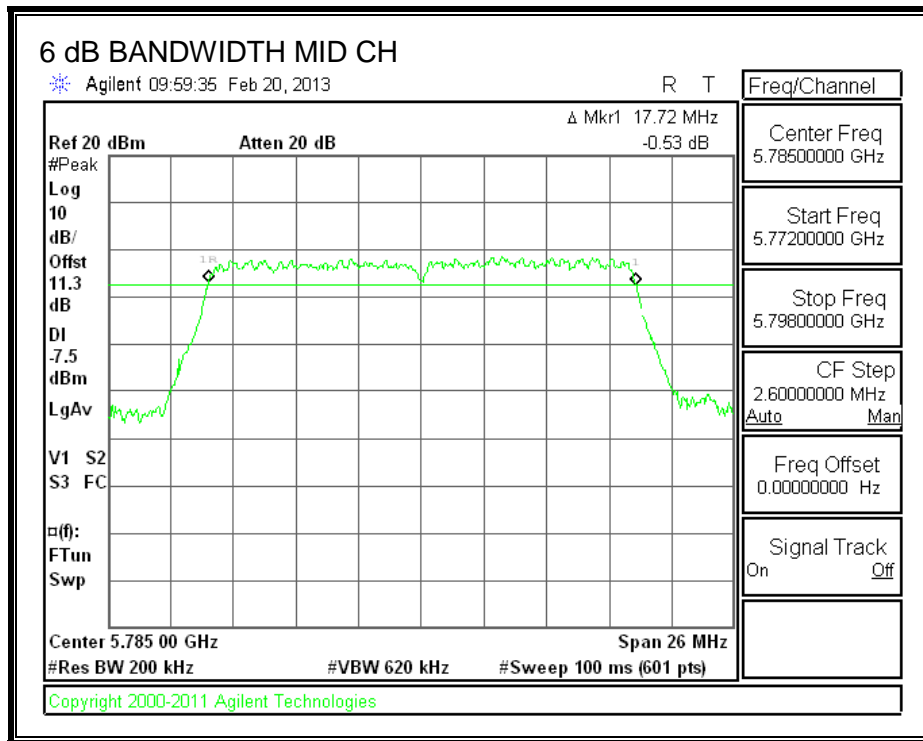
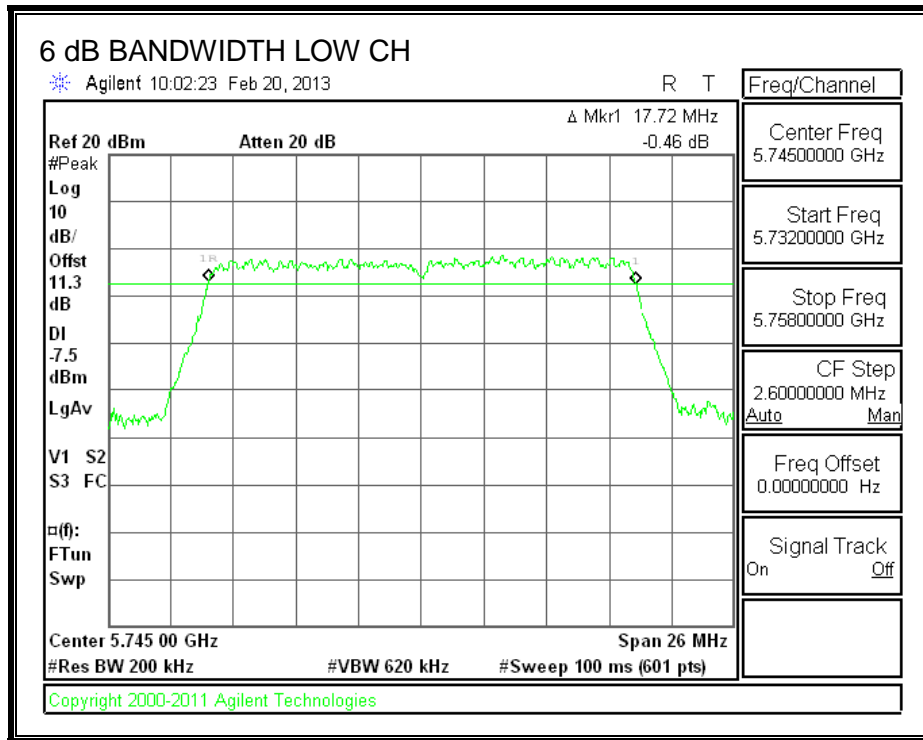
TEST PROCEDURE

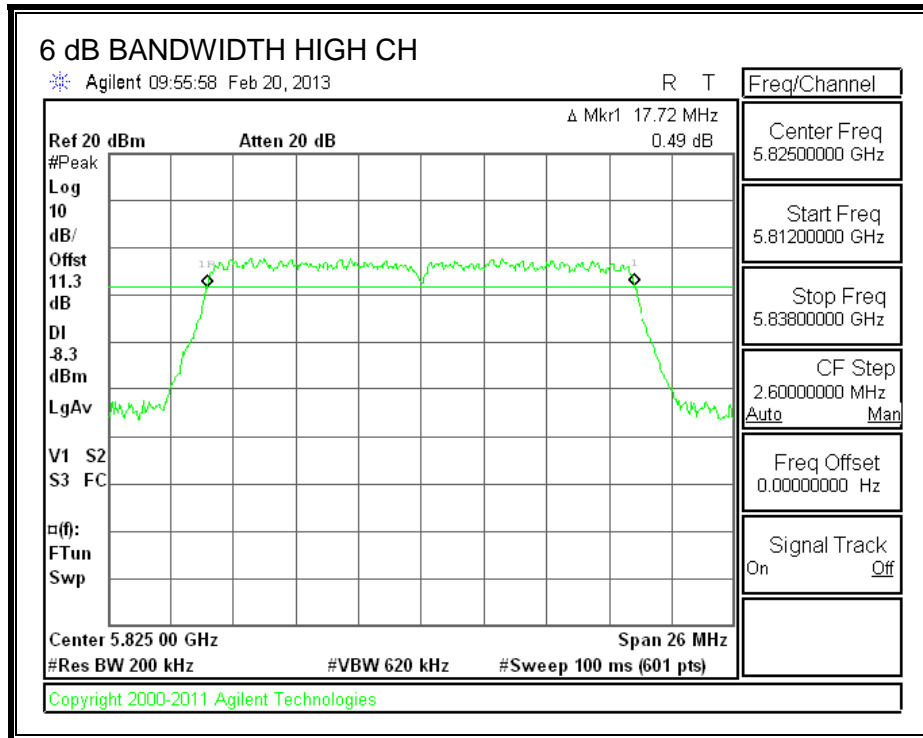
The transmitter output is connected to a spectrum analyzer with the RBW set between 1% and 5% of the EBW, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	17.720	0.5
Mid	5785	17.720	0.5
High	5825	17.720	0.5

6 dB BANDWIDTH





9.5.2. 99% BANDWIDTH

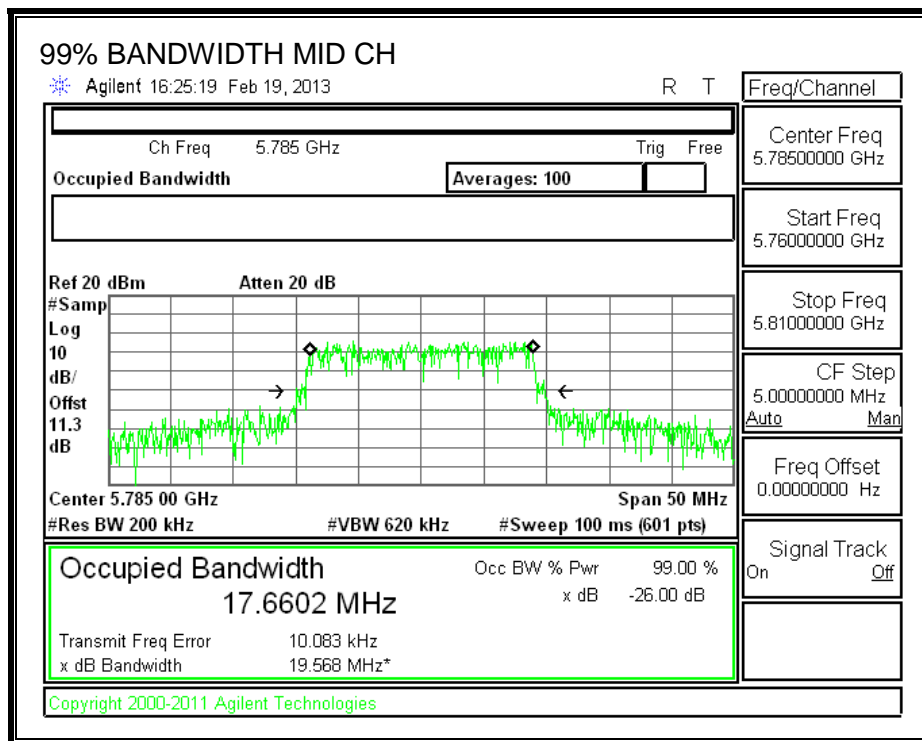
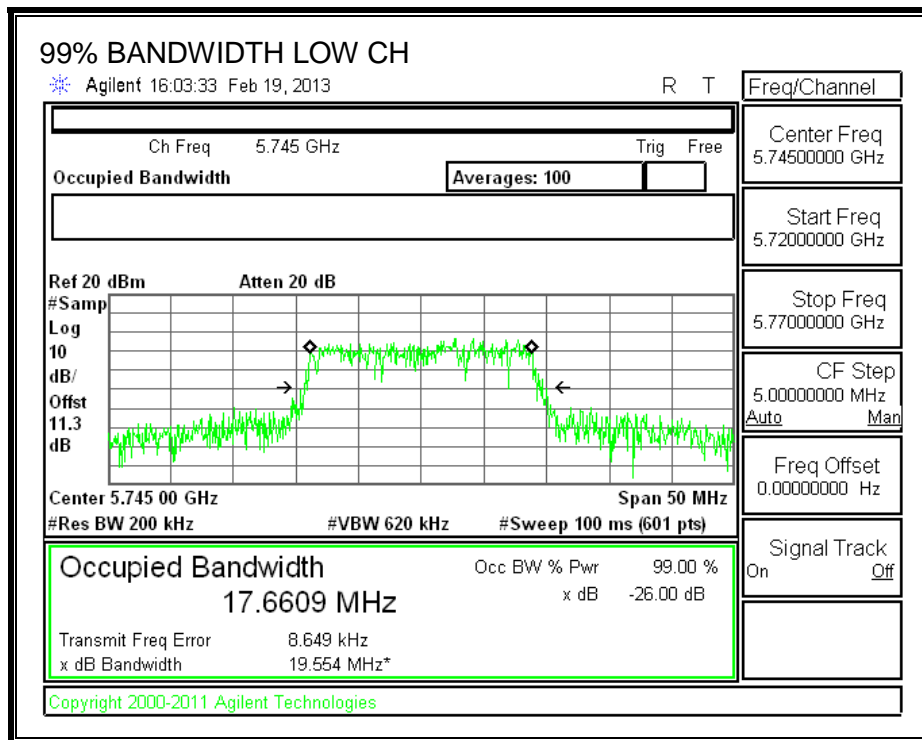
LIMITS

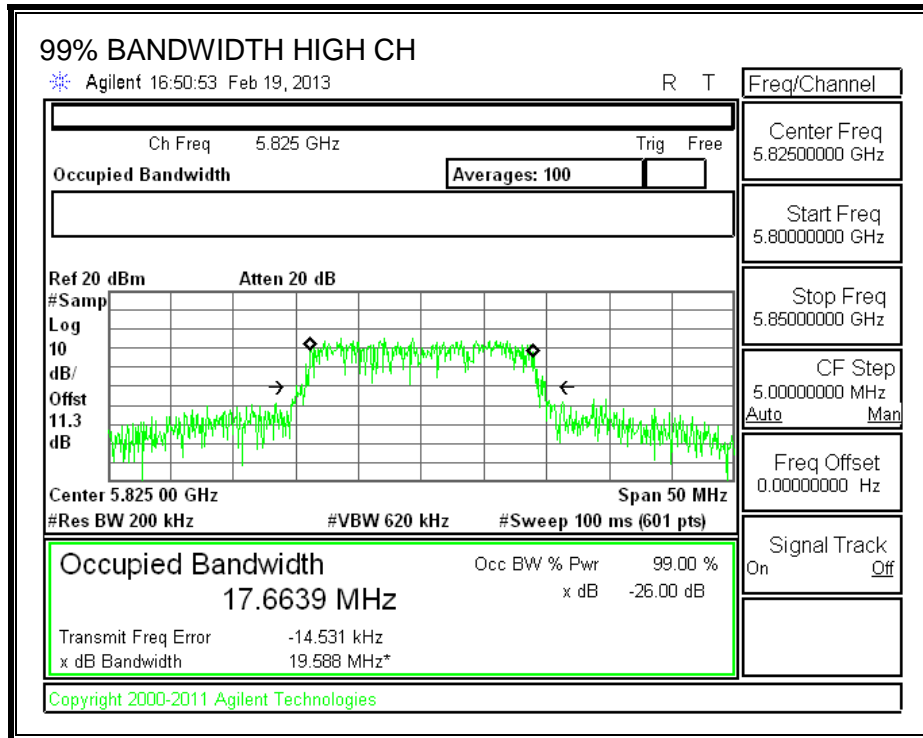
None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	17.6609
Mid	5785	17.6602
High	5825	17.6639

99% BANDWIDTH





9.5.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	5745	9.41
Mid	5785	9.77
High	5825	9.27

9.5.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS

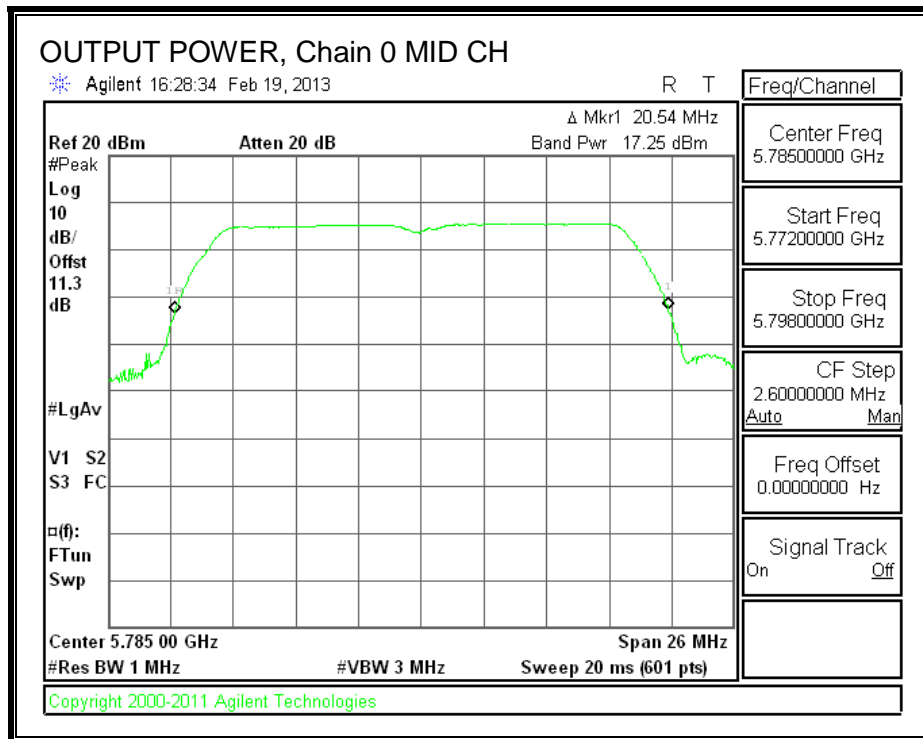
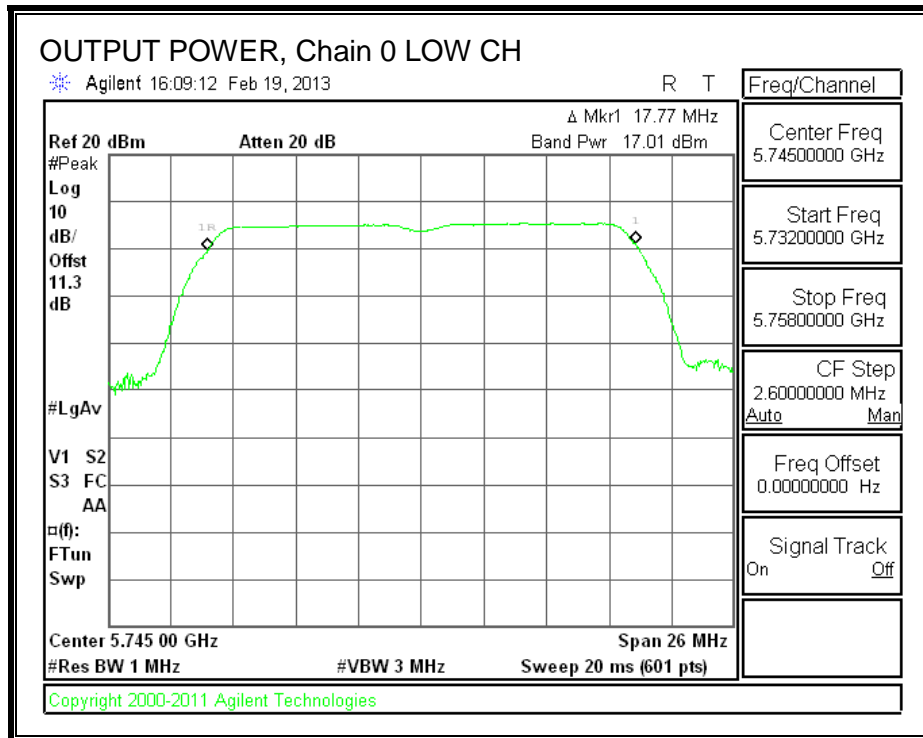
Limits

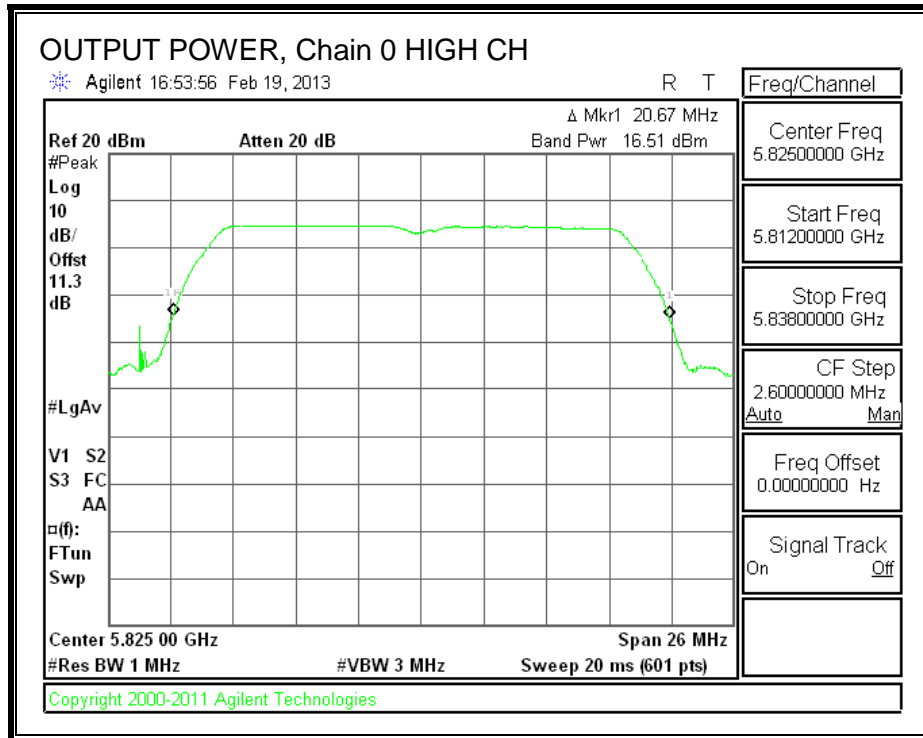
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	5745	3.14	30.00	30	36	30.00
Mid	5785	3.14	30.00	30	36	30.00
High	5825	3.14	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	5745	17.01	17.01	30.00	-12.99
Mid	5785	17.25	17.25	30.00	-12.75
High	5825	16.51	16.51	30.00	-13.49

OUTPUT POWER, Chain 0





9.5.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

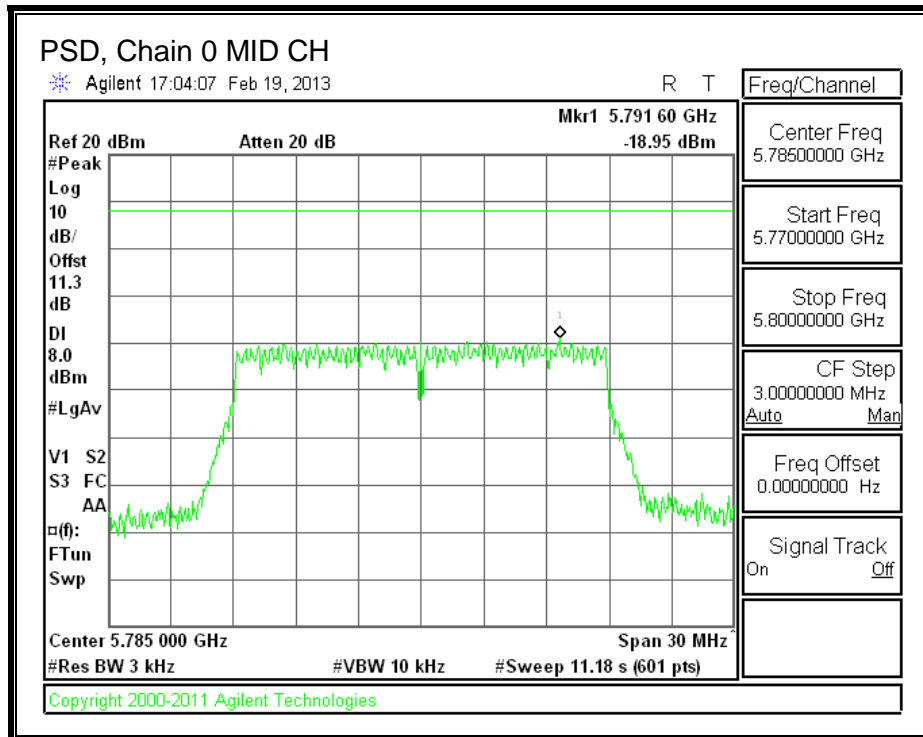
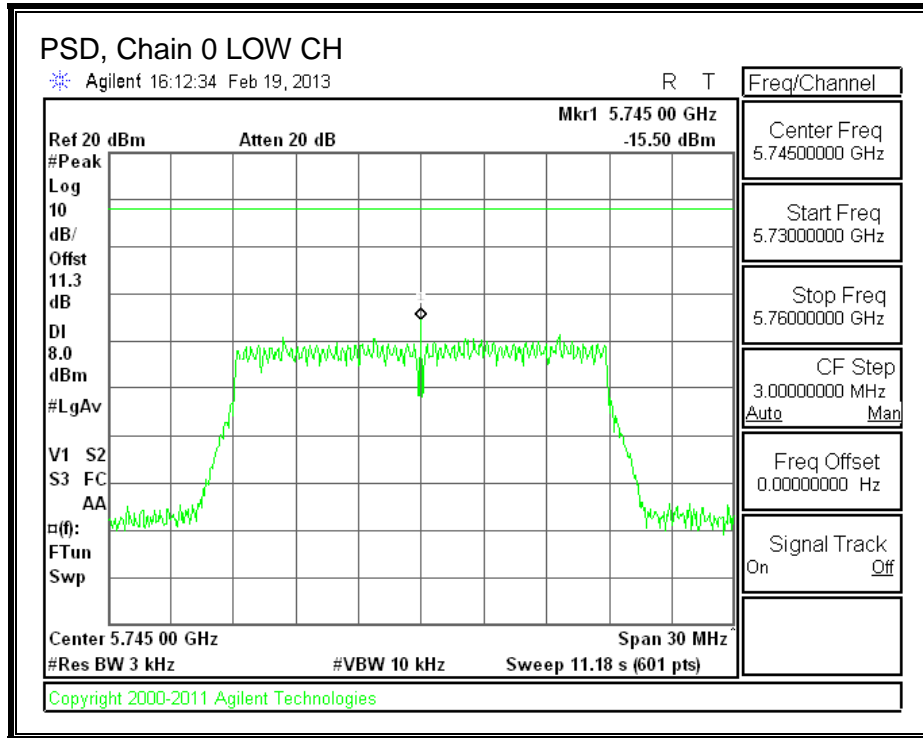
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

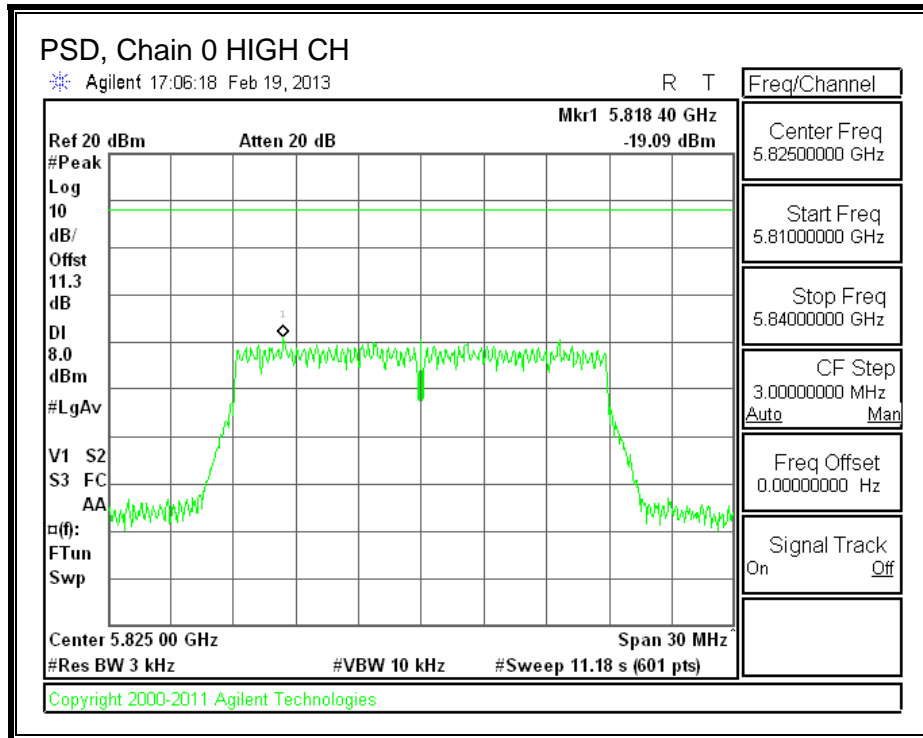
RESULTS

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-15.50	8.0	-23.5
Mid	5785	-18.95	8.0	-27.0
High	5825	-19.09	8.0	-27.1

PSD, Chain 0





9.5.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

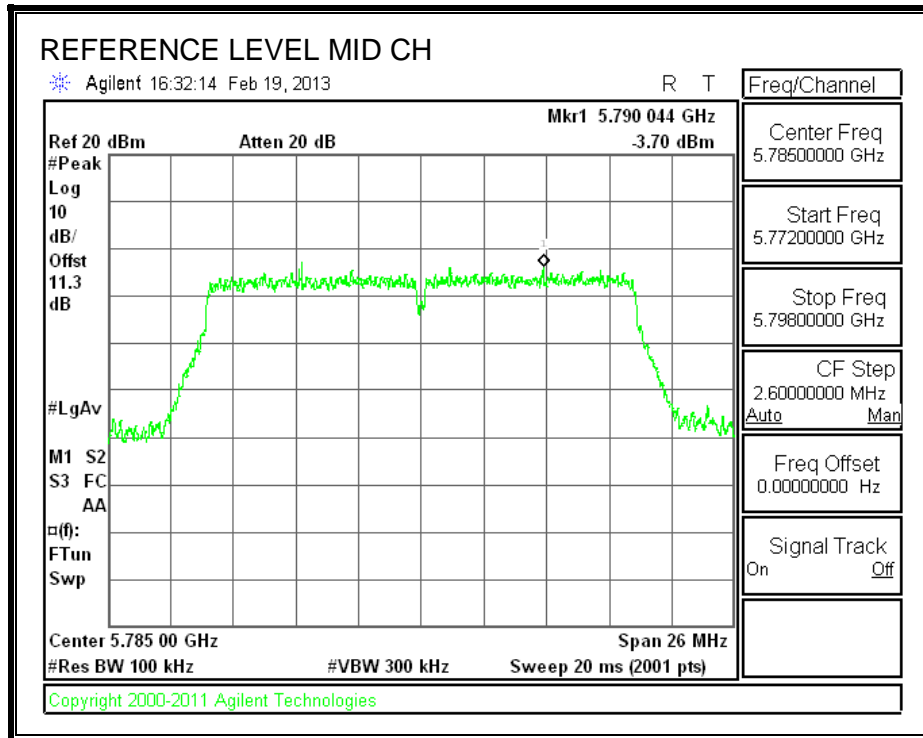
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

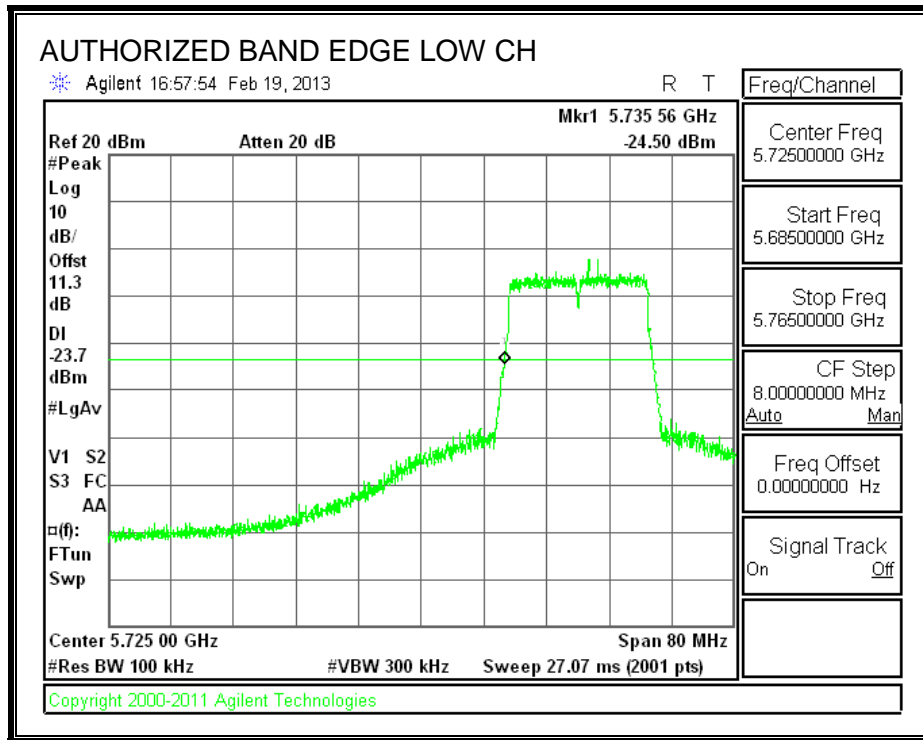
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

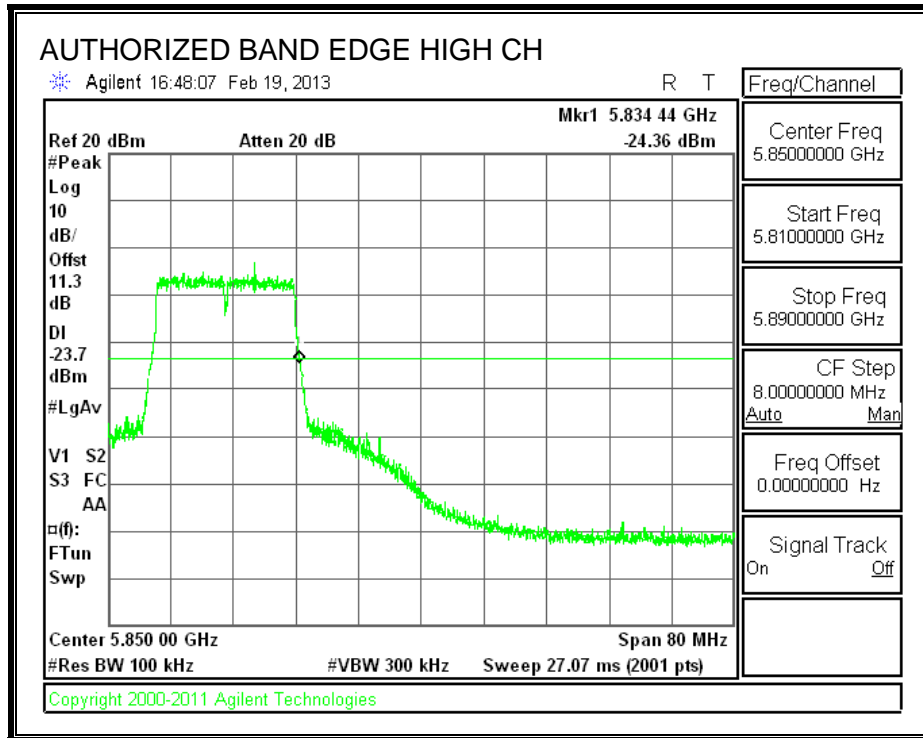
IN-BAND REFERENCE LEVEL



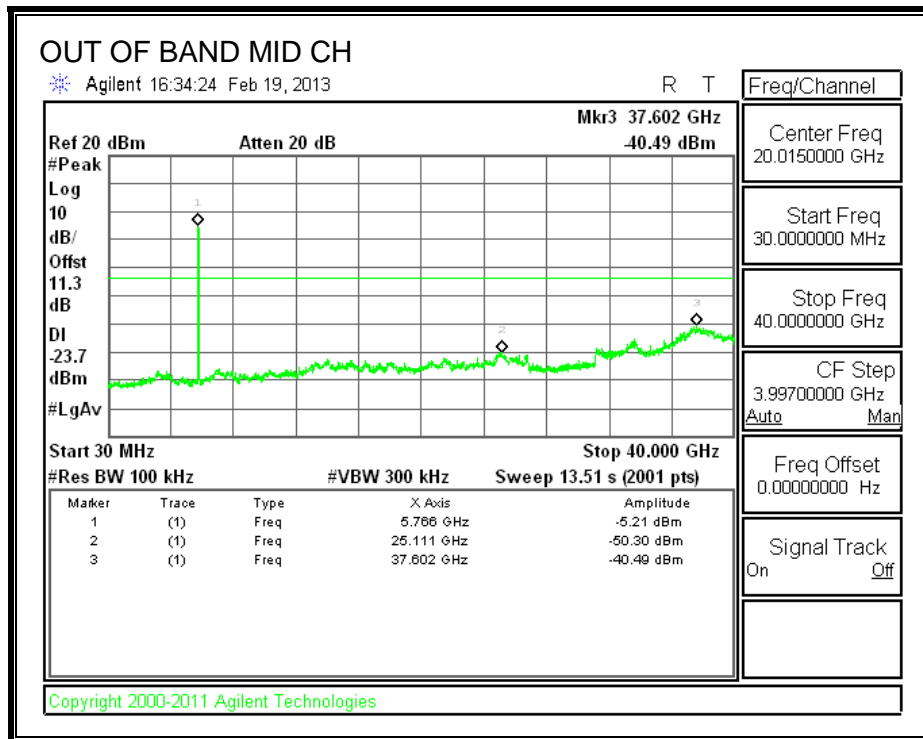
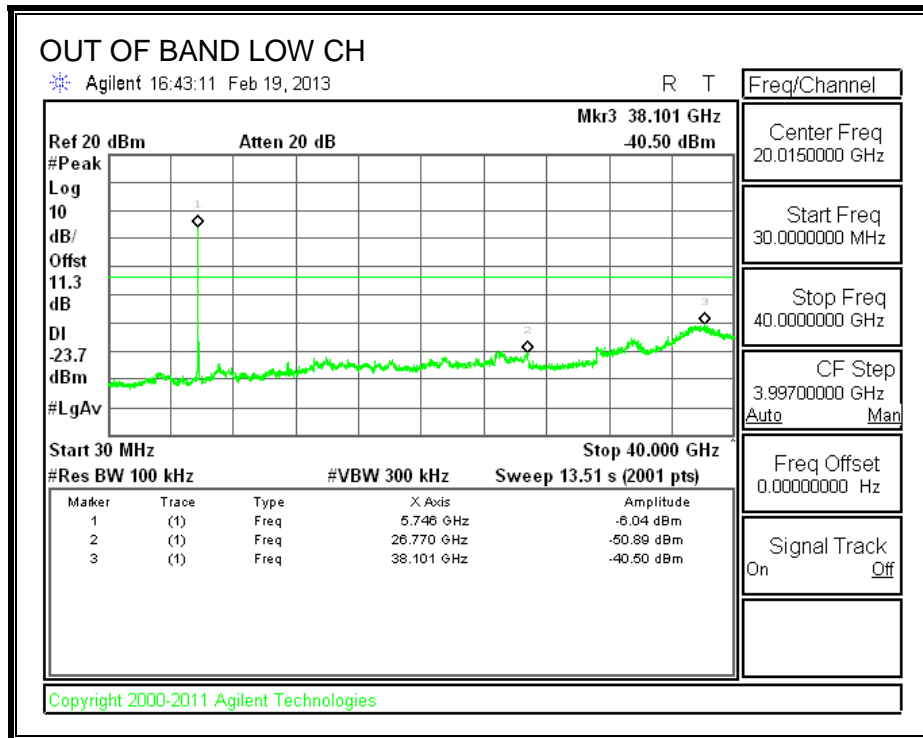
LOW CHANNEL BANDEDGE

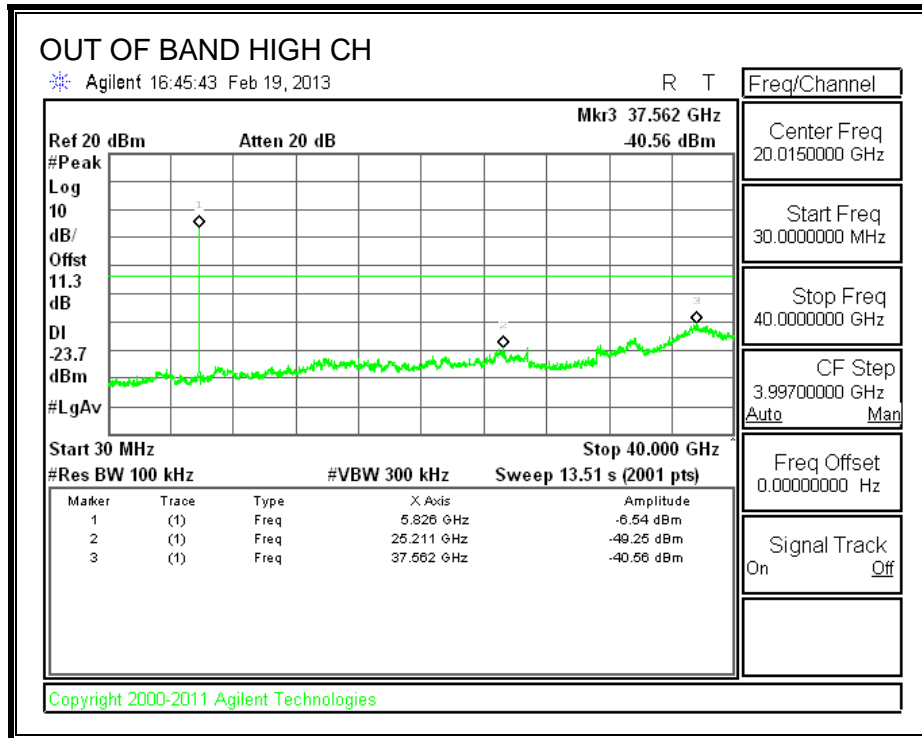


HIGH CHANNEL BANDEDGE



OUT-OF-BAND EMISSIONS





10. RADIATED TEST RESULTS

10.1. 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.

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; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

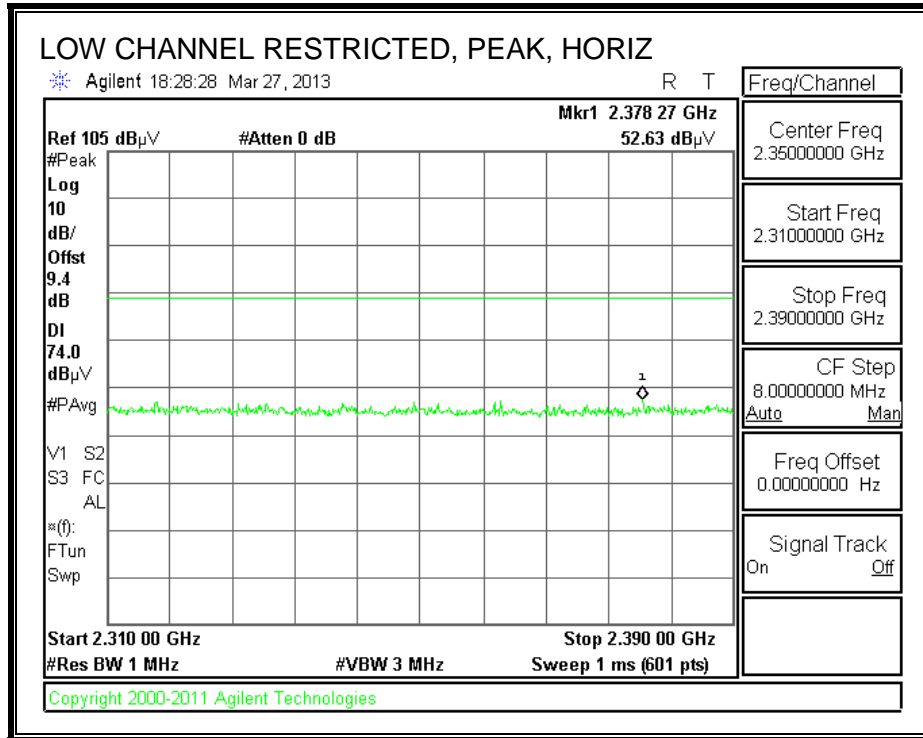
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

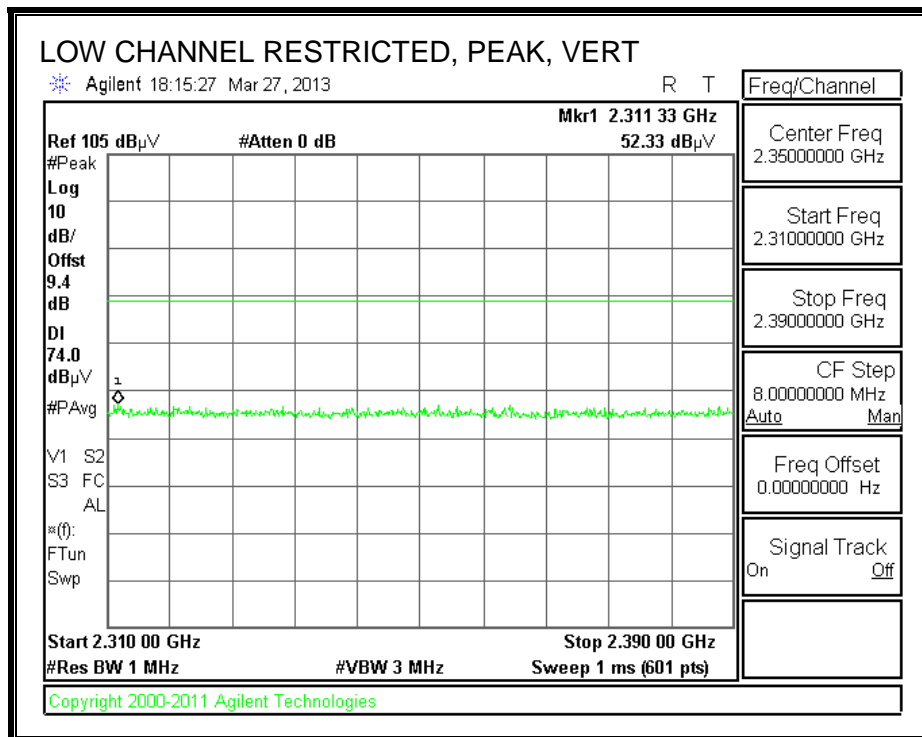
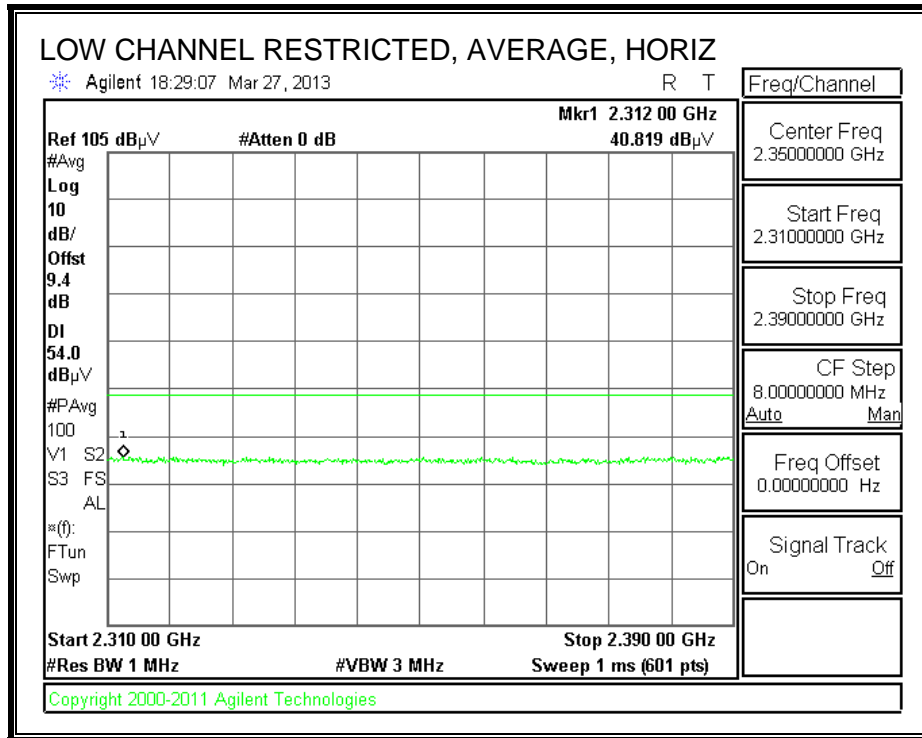
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

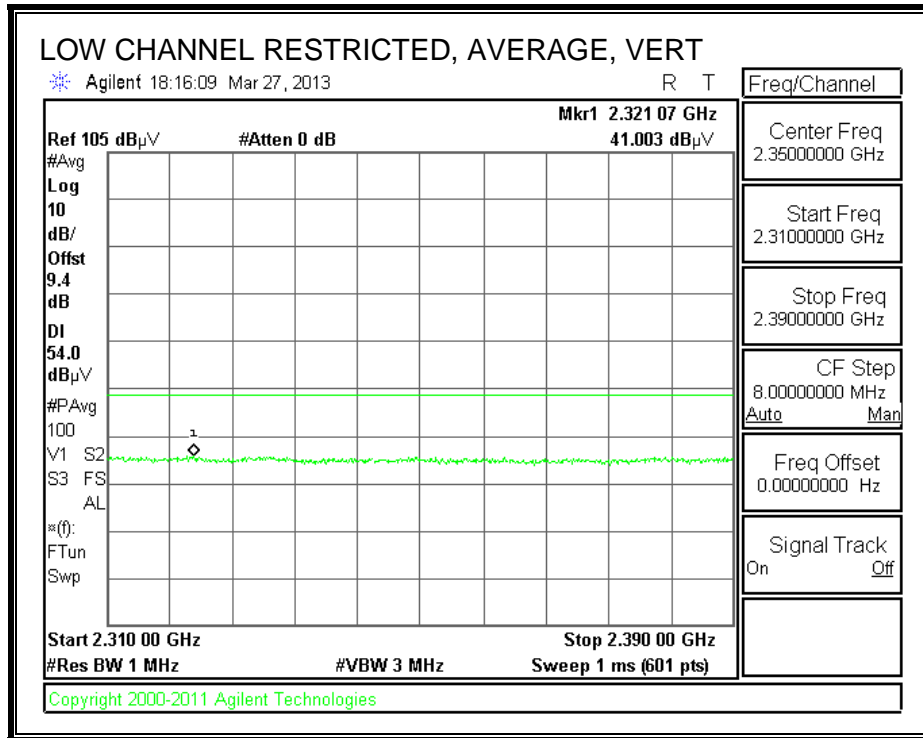
10.2. TRANSMITTER ABOVE 1 GHz

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

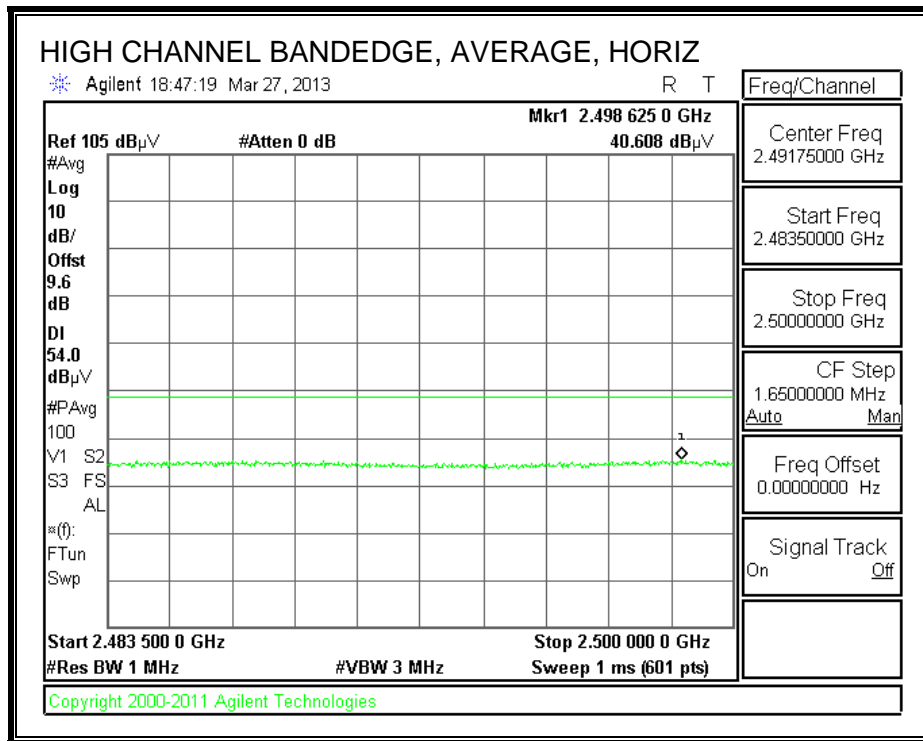
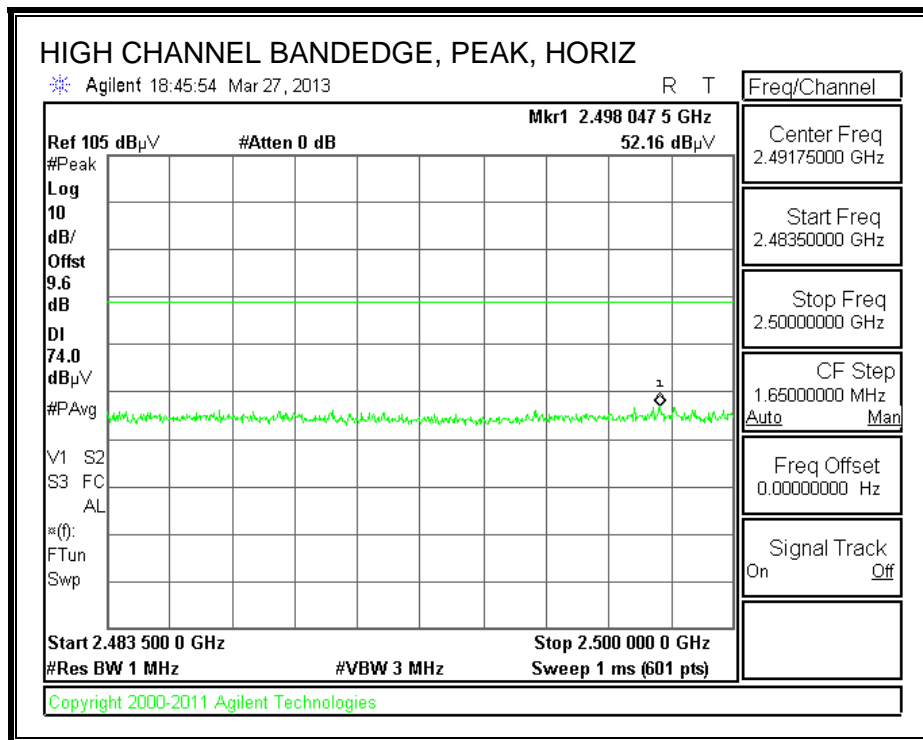
Low RESTRICTED BANDEDGE (LOW CHANNEL)

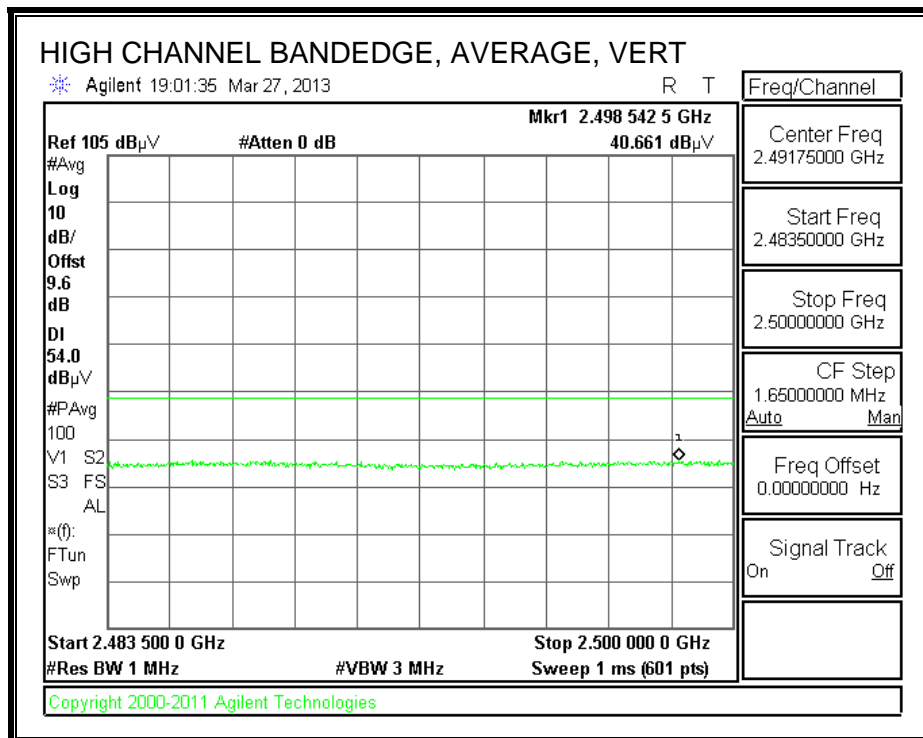
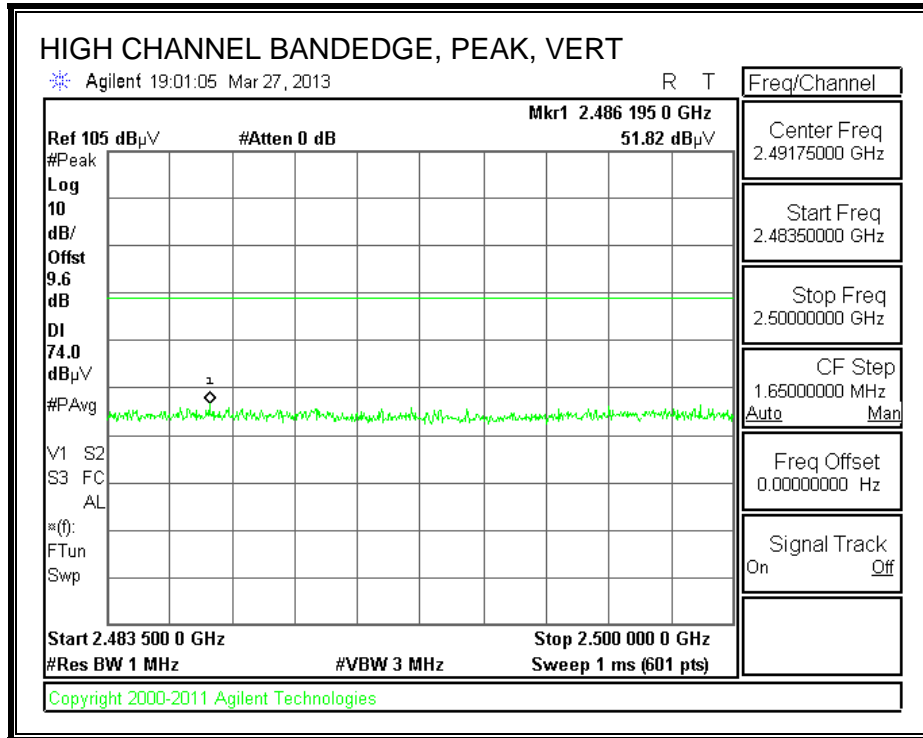




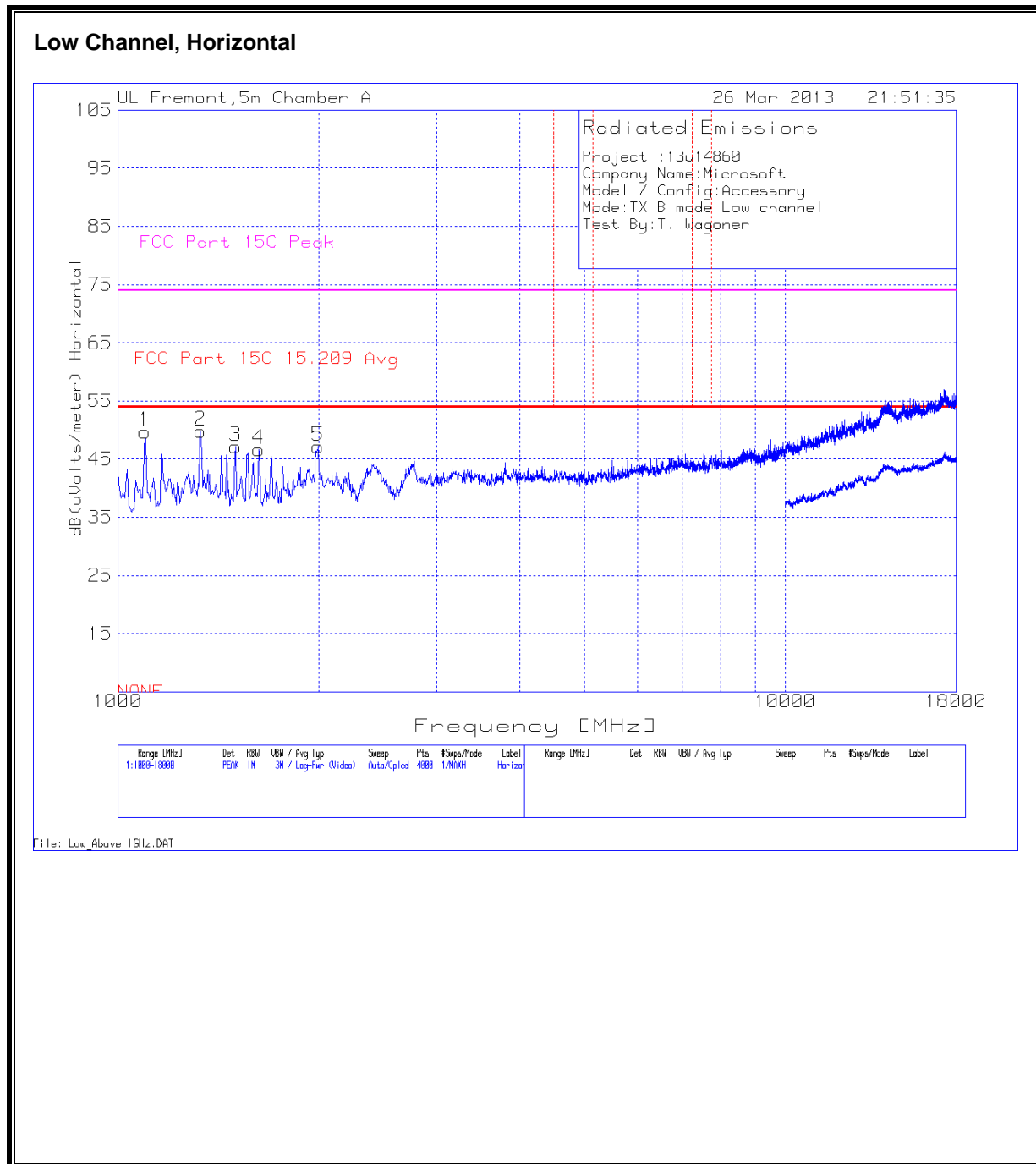


AUTHORIZED BANDEDGE (HIGH CHANNEL)

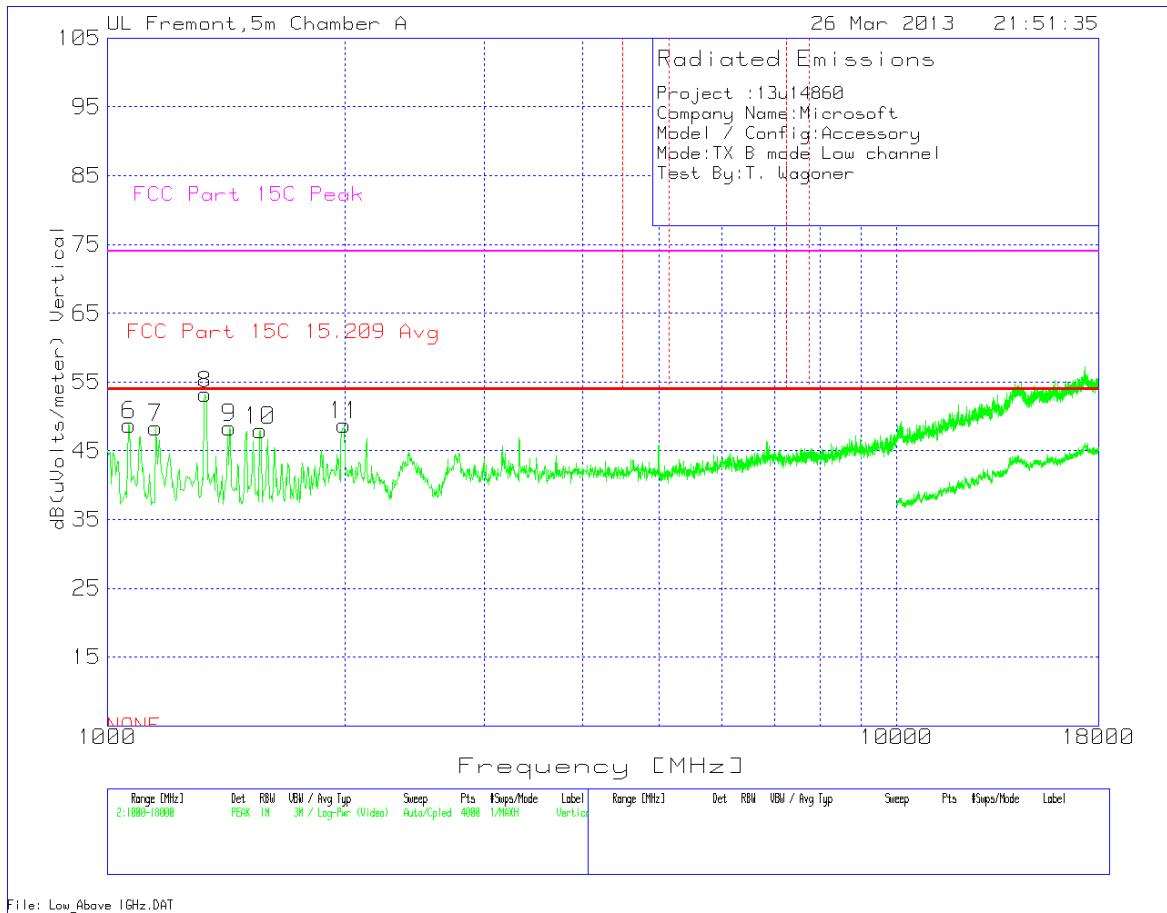




HARMONICS AND SPURIOUS EMISSIONS



Low Channel, Vertical



Low Channel, Data

Project :	13u14860															
Company Name:	Microsoft															
Model / Config:	Accessory															
Mode:	TX B mode Low channel															
Test By:	T. Wagoner															

Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	57.12	PK	27.9	-38.7	3.1	0.3	49.72	53.97	-4.25	74	-24.28	0	49.72	100	Horz
2	1331.252	54.06	PK	30.1	-38.1	3.3	0.4	49.76	53.97	-4.21	74	-24.24	0	49.76	200	Horz
3	1501.124	51.96	PK	28.9	-37.7	3.5	0.5	47.16	53.97	-6.81	74	-26.84	0	47.16	100	Horz
4	1628.529	51.45	PK	28.6	-37.6	3.6	0.6	46.65	53.97	-7.32	74	-27.35	0	46.65	100	Horz
5	1998.001	47.51	PK	31.9	-37.1	4	0.9	47.21	53.97	-6.76	74	-26.79	0	47.21	200	Horz
6	1067.949	56.11	PK	28	-38.7	3.1	0.3	48.81	53.97	-5.16	74	-25.19	0	48.81	200	Vert
7	1152.885	54.7	PK	28.7	-38.5	3.2	0.3	48.4	53.97	-5.57	74	-25.6	0	48.4	100	Vert
8	1331.252	57.49	PK	30.1	-38.1	3.3	0.4	53.19	53.97	-0.78	74	-20.81	0	53.19	100	Vert
9	1428.928	52.93	PK	29.5	-37.9	3.4	0.4	48.33	53.97	-5.64	74	-25.67	0	48.33	200	Vert
10	1564.826	52.92	PK	28.5	-37.7	3.6	0.6	47.92	53.97	-6.05	74	-26.08	0	47.92	100	Vert
11	1998.001	49.05	PK	31.9	-37.1	4	0.9	48.75	53.97	-5.22	74	-25.25	0	48.75	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1098.76	51.09	MAv1	27.9	-38.7	3.1	0.3	43.69	53.97	-10.28	74	-30.31	0	43.69	207	122	Horz
1331.87	51	MAv1	30.1	-38.1	3.3	0.4	46.7	53.97	-7.27	74	-27.3	0	46.7	266	171	Horz
1331.63	49.71	MAv1	30.1	-38.1	3.3	0.4	45.41	53.97	-8.56	74	-28.59	0	45.41	85	179	Vert

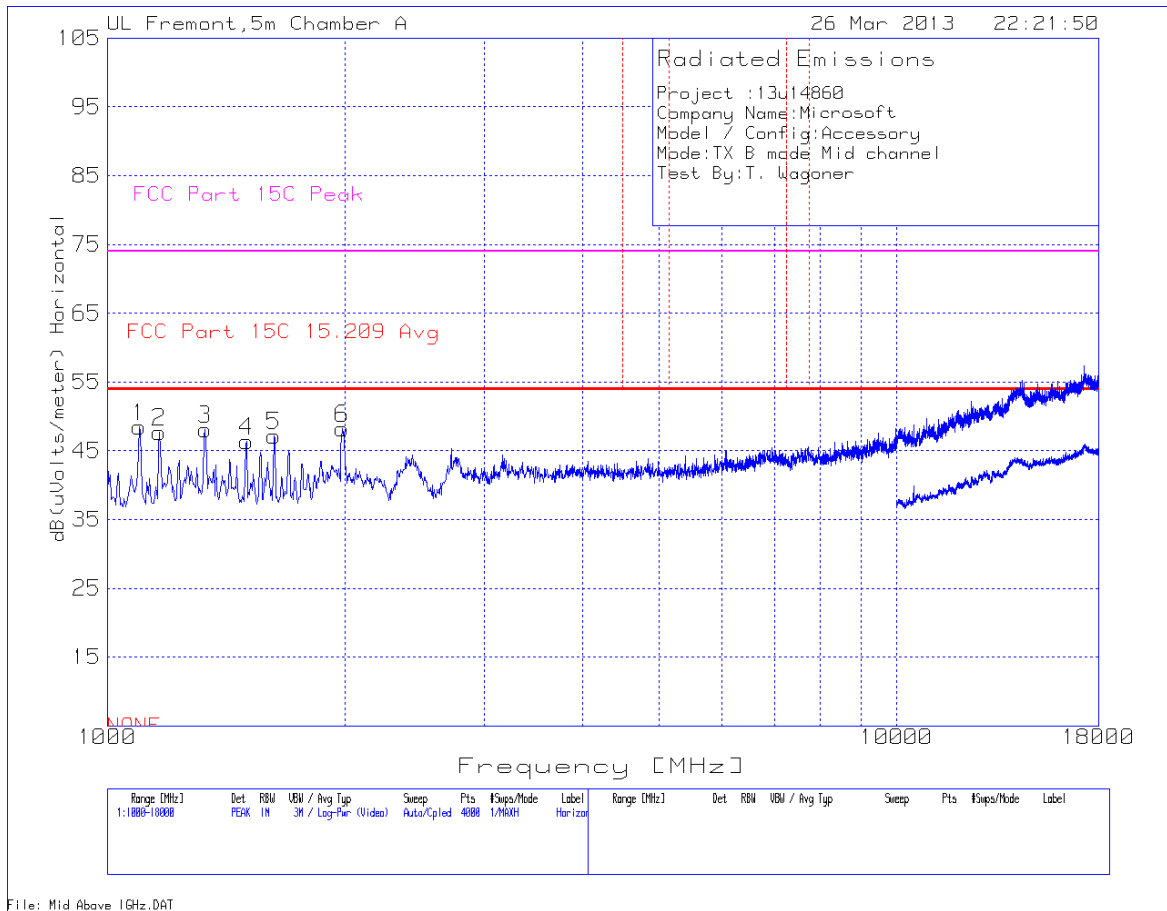
PK - Peak detector

MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

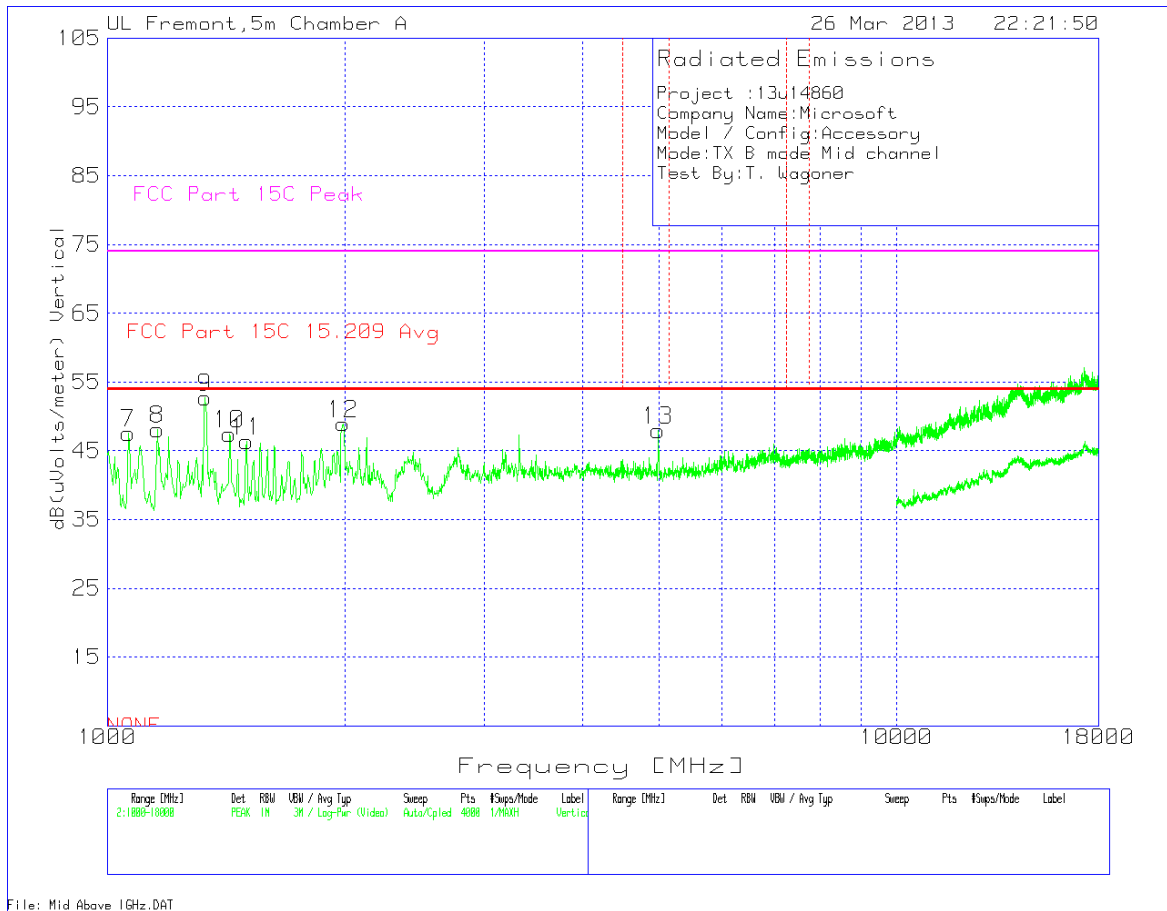
Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	TX B mode Mid channel																
Test By:	T. Wagoner																

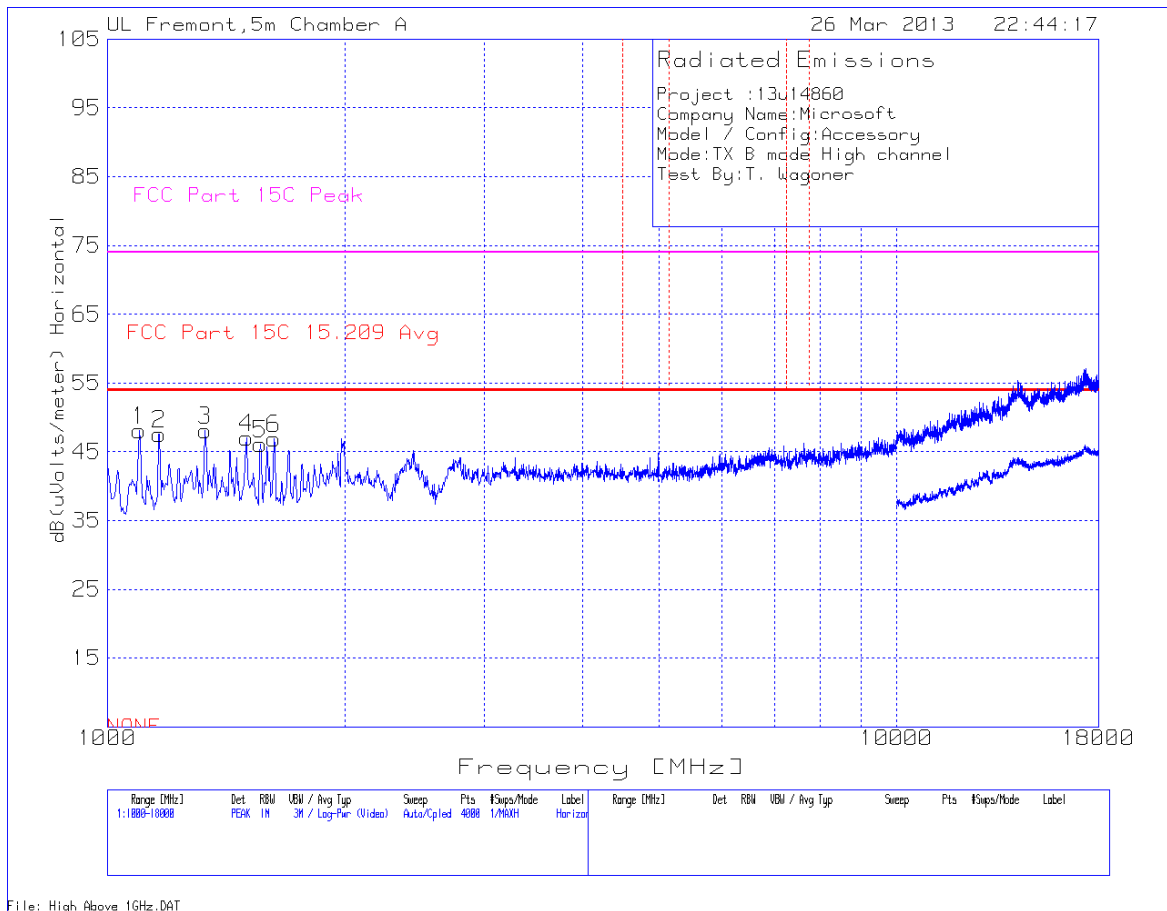
Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	55.83	PK	27.9	-38.7	3.1	0.3	48.43	53.97	-5.54	74	-25.57	0	48.43	100	Horz
2	1165.626	53.68	PK	29	-38.5	3.2	0.3	47.68	53.97	-6.29	74	-26.32	0	47.68	100	Horz
3	1331.252	52.35	PK	30.1	-38.1	3.3	0.4	48.05	53.97	-5.92	74	-25.95	0	48.05	100	Horz
4	1501.124	51.15	PK	28.9	-37.7	3.5	0.5	46.35	53.97	-7.62	74	-27.65	0	46.35	100	Horz
5	1628.529	51.96	PK	28.6	-37.6	3.6	0.6	47.16	53.97	-6.81	74	-26.84	0	47.16	100	Horz
6	1985.261	48.49	PK	31.9	-37.1	4	0.9	48.19	53.97	-5.78	74	-25.81	0	48.19	100	Horz
7	1063.702	54.92	PK	28	-38.7	3.1	0.3	47.62	53.97	-6.35	74	-26.38	0	47.62	200	Vert
8	1157.132	54.24	PK	28.8	-38.5	3.2	0.3	48.04	53.97	-5.93	74	-25.96	0	48.04	200	Vert
9	1331.252	56.97	PK	30.1	-38.1	3.3	0.4	52.67	53.97	-1.3	74	-21.33	0	52.67	100	Vert
10	1428.928	52.06	PK	29.5	-37.9	3.4	0.4	47.46	53.97	-6.51	74	-26.54	0	47.46	100	Vert
11	1501.124	51.16	PK	28.9	-37.7	3.5	0.5	46.36	53.97	-7.61	74	-27.64	0	46.36	100	Vert
12	1989.508	49.25	PK	31.9	-37.1	4	0.9	48.95	53.97	-5.02	74	-25.05	0	48.95	200	Vert
13	4983.512	42.58	PK	33.9	-35.6	6.9	0.2	47.98	53.97	-5.99	74	-26.02	n/a	n/a	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.63	49.71	MAV1	30.1	-38.1	3.3	0.4	45.41	53.97	-8.56	74	-28.59	0	45.41	85	179	Vert

PK - Peak detector
 MAV1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

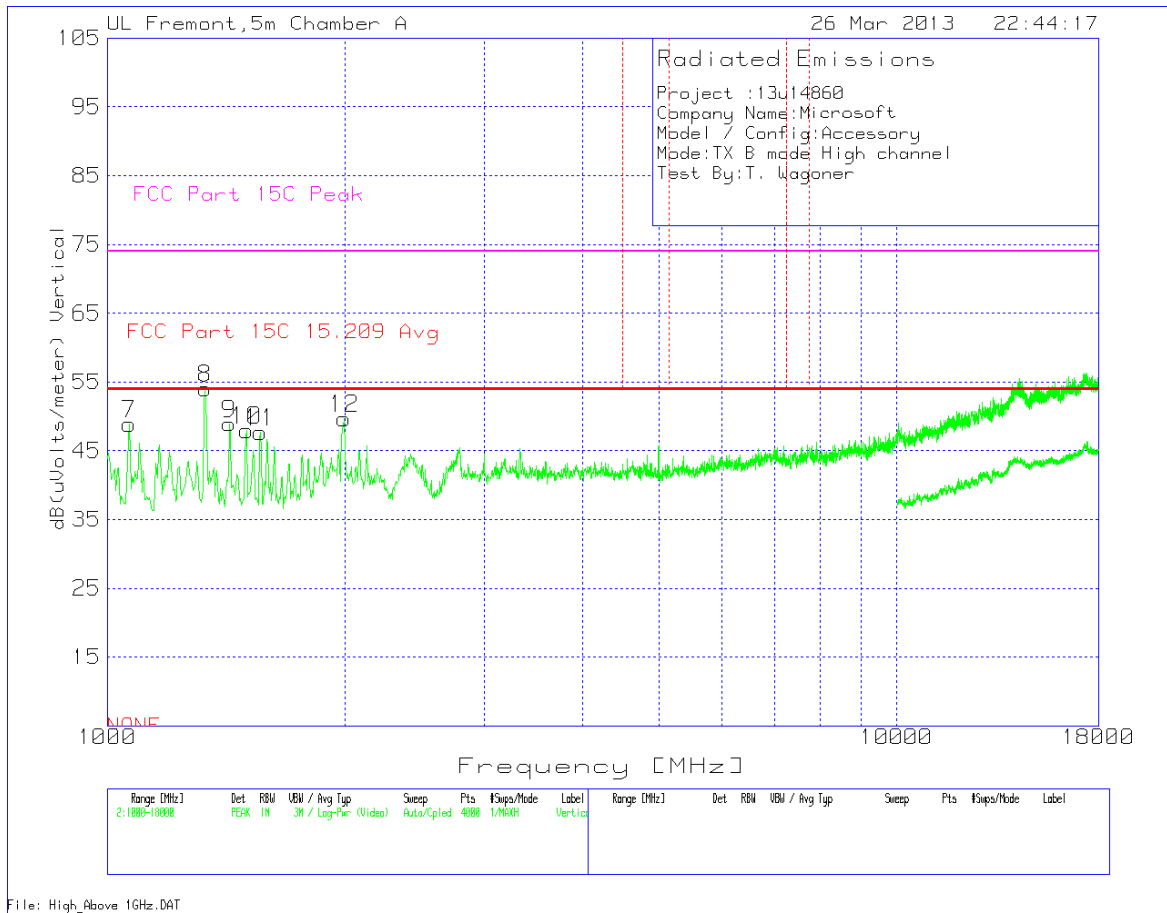
Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	TX B mode High channel																
Test By:	T. Wagoner																

Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts/meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	55.48	PK	27.9	-38.7	3.1	0.3	48.08	53.97	-5.89	74	-25.92	0	48.08	100	Horz
2	1163.502	53.71	PK	28.9	-38.5	3.2	0.3	47.61	53.97	-6.36	74	-26.39	0	47.61	100	Horz
3	1331.252	52.45	PK	30.1	-38.1	3.3	0.4	48.15	53.97	-5.82	74	-25.85	0	48.15	200	Horz
4	1501.124	51.82	PK	28.9	-37.7	3.5	0.5	47.02	53.97	-6.95	74	-26.98	0	47.02	100	Horz
5	1564.826	51.12	PK	28.5	-37.7	3.6	0.6	46.12	53.97	-7.85	74	-27.88	0	46.12	200	Horz
6	1628.529	51.72	PK	28.6	-37.6	3.6	0.6	46.92	53.97	-7.05	74	-27.08	0	46.92	100	Horz
7	1067.949	56.19	PK	28	-38.7	3.1	0.3	48.89	53.97	-5.08	74	-25.11	0	48.89	200	Vert
8	1331.252	58.3	PK	30.1	-38.1	3.3	0.4	54	53.97	0.03	74	-20	0	54	100	Vert
9	1428.928	53.55	PK	29.5	-37.9	3.4	0.4	48.95	53.97	-5.02	74	-25.05	0	48.95	100	Vert
10	1501.124	52.76	PK	28.9	-37.7	3.5	0.5	47.96	53.97	-6.01	74	-26.04	0	47.96	100	Vert
11	1564.826	52.75	PK	28.5	-37.7	3.6	0.6	47.75	53.97	-6.22	74	-26.25	0	47.75	200	Vert
12	1998.001	49.99	PK	31.9	-37.1	4	0.9	49.69	53.97	-4.28	74	-24.31	0	49.69	200	Vert

Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts/meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.31	44.36	MAv1	30.1	-38.1	3.3	0.4	40.06	53.97	-13.91	74	-33.94	0	40.06	360	183	Vert
1997.08	34.95	MAv1	31.9	-37.1	4	0.9	34.65	53.97	-19.32	74	-39.35	0	34.65	122	197	Vert

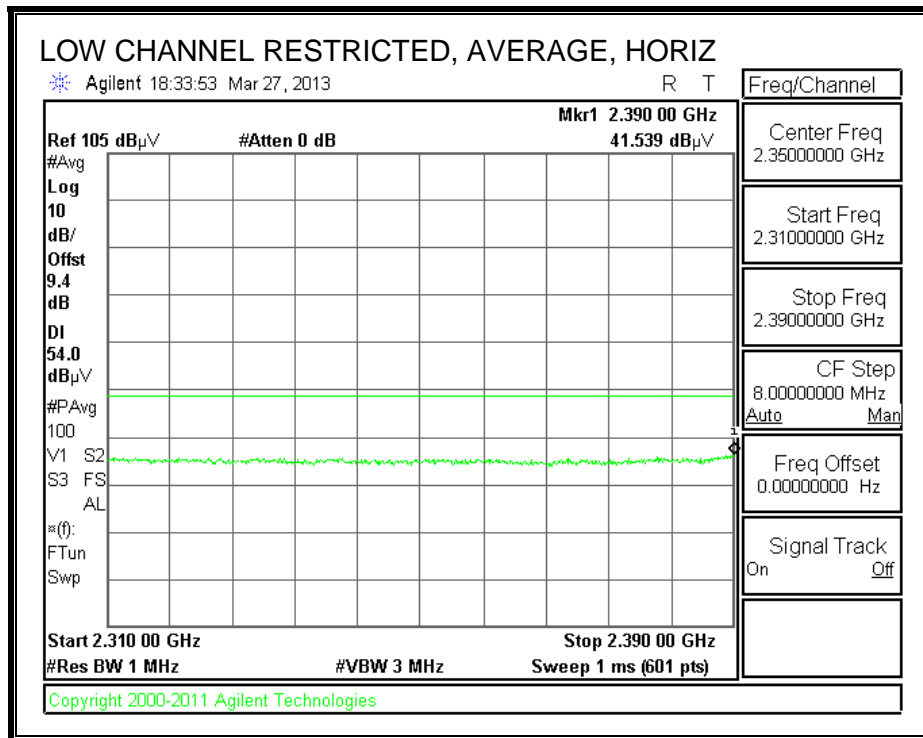
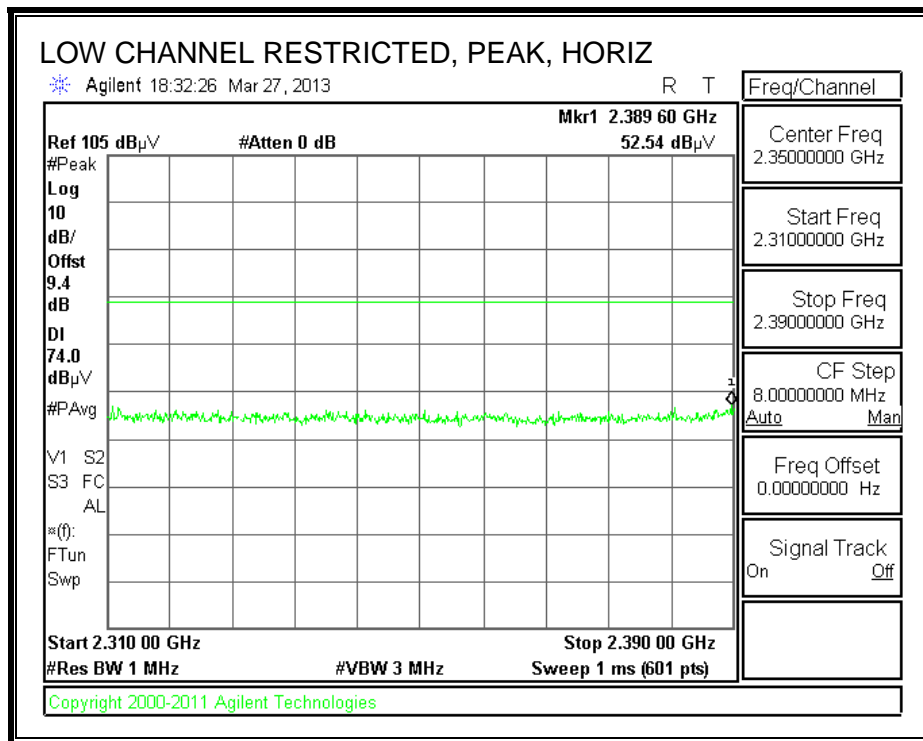
PK - Peak detector
 MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

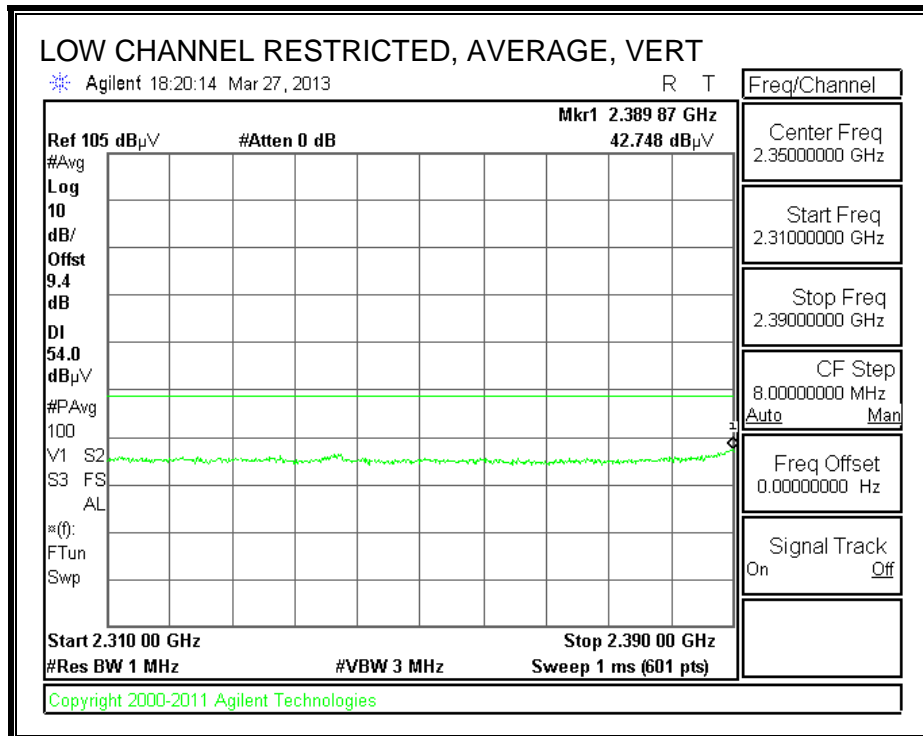
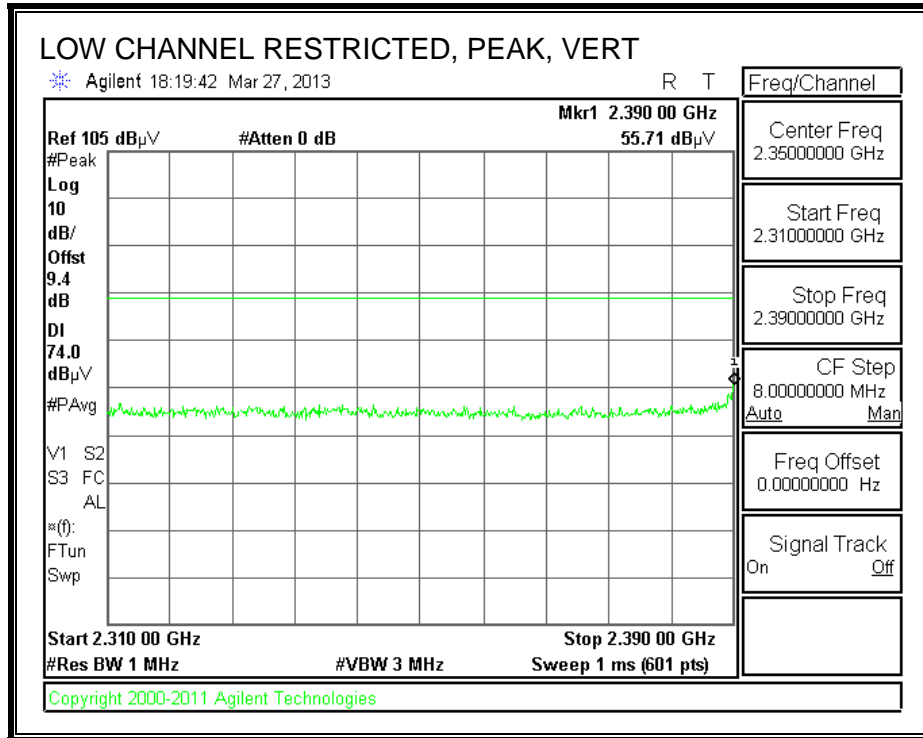
Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.

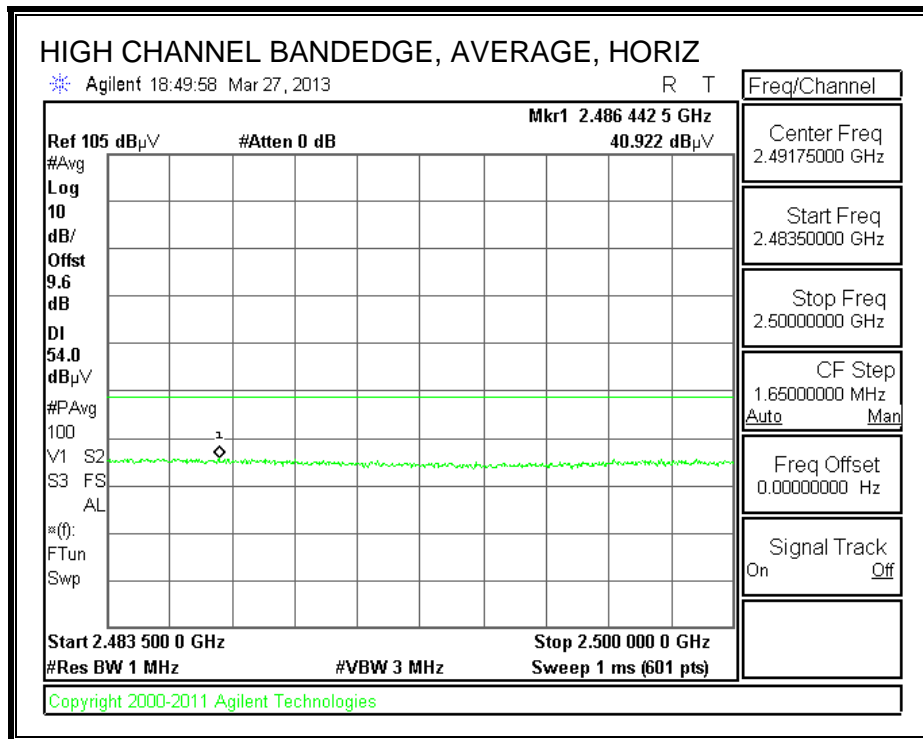
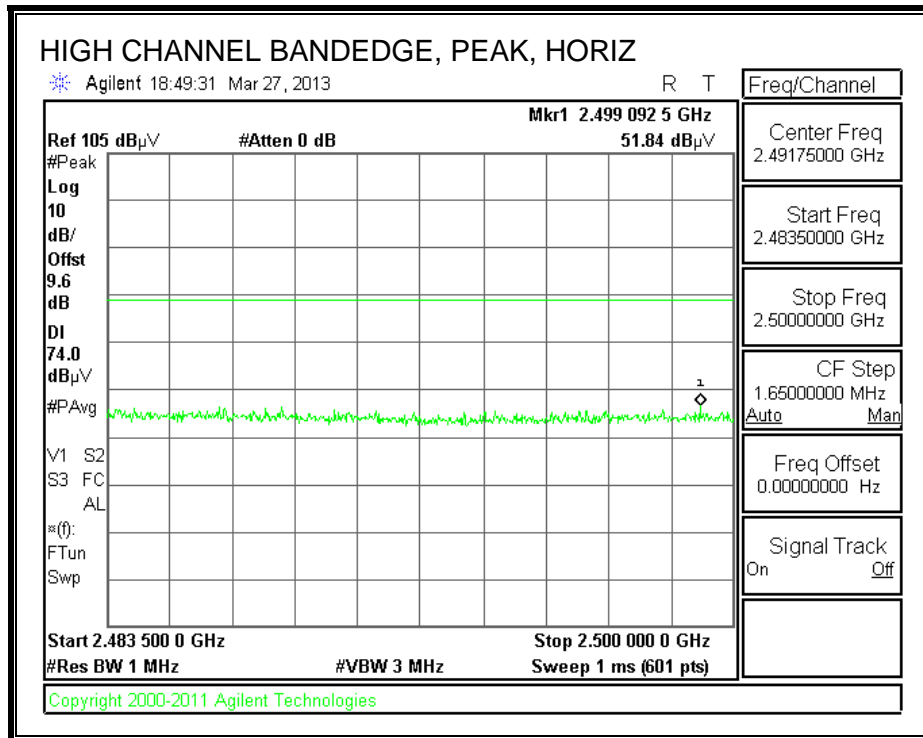
10.3. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

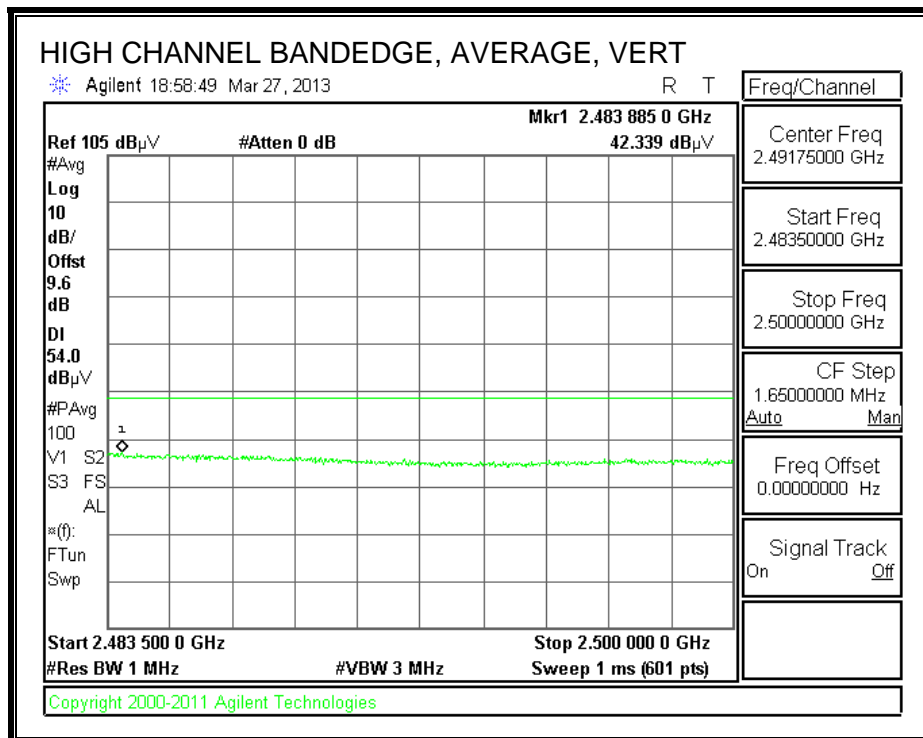
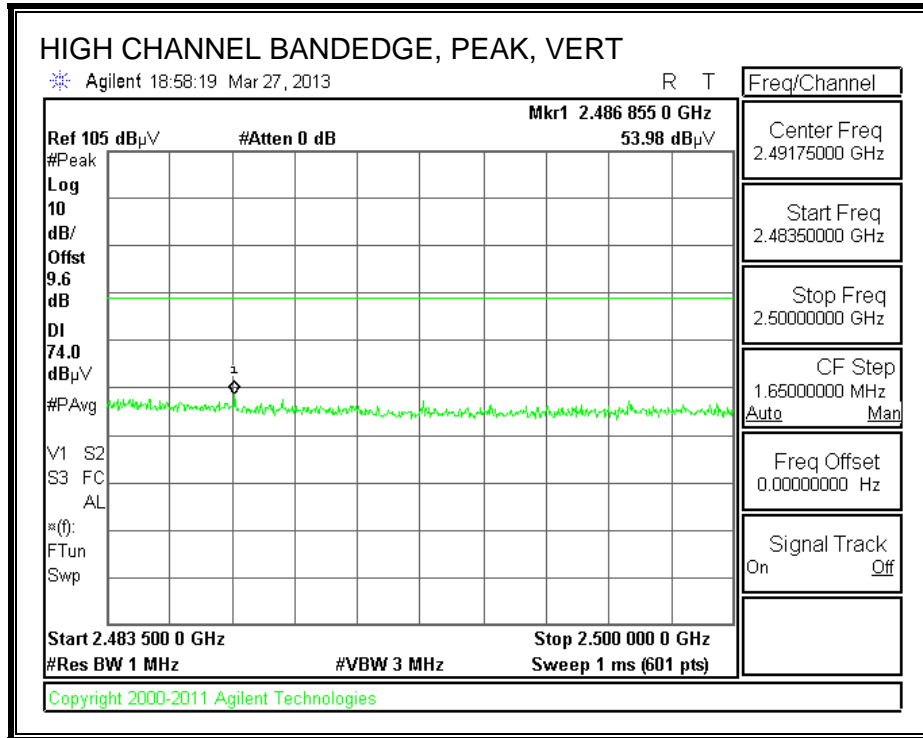
RESTRICTED BANDEDGE (LOW CHANNEL)



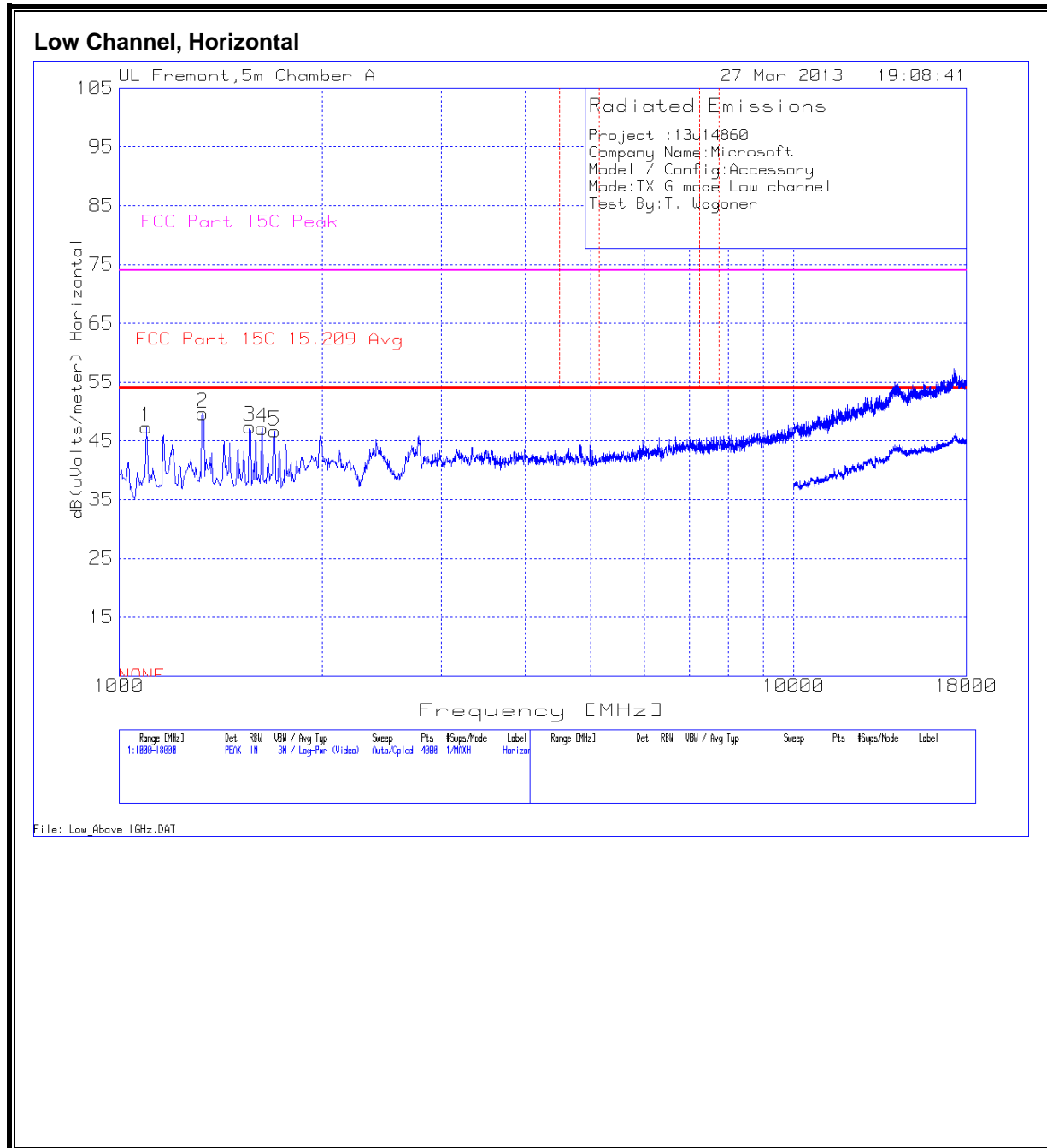


AUTHORIZED BANDEDGE (HIGH CHANNEL)

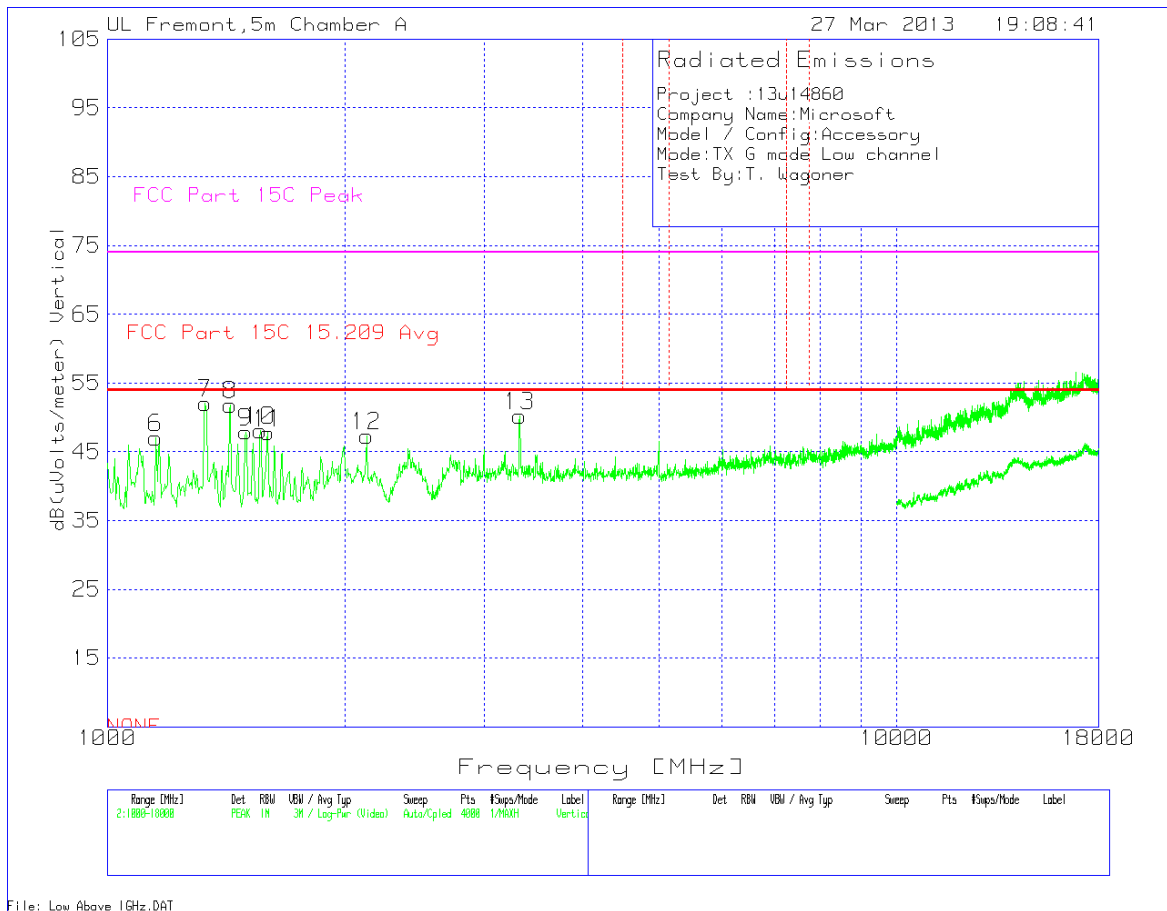




HARMONICS AND SPURIOUS EMISSIONS



Low Channel, Vertical



Low Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	TX B mode low channel																
Test By:	T. Wagoner																

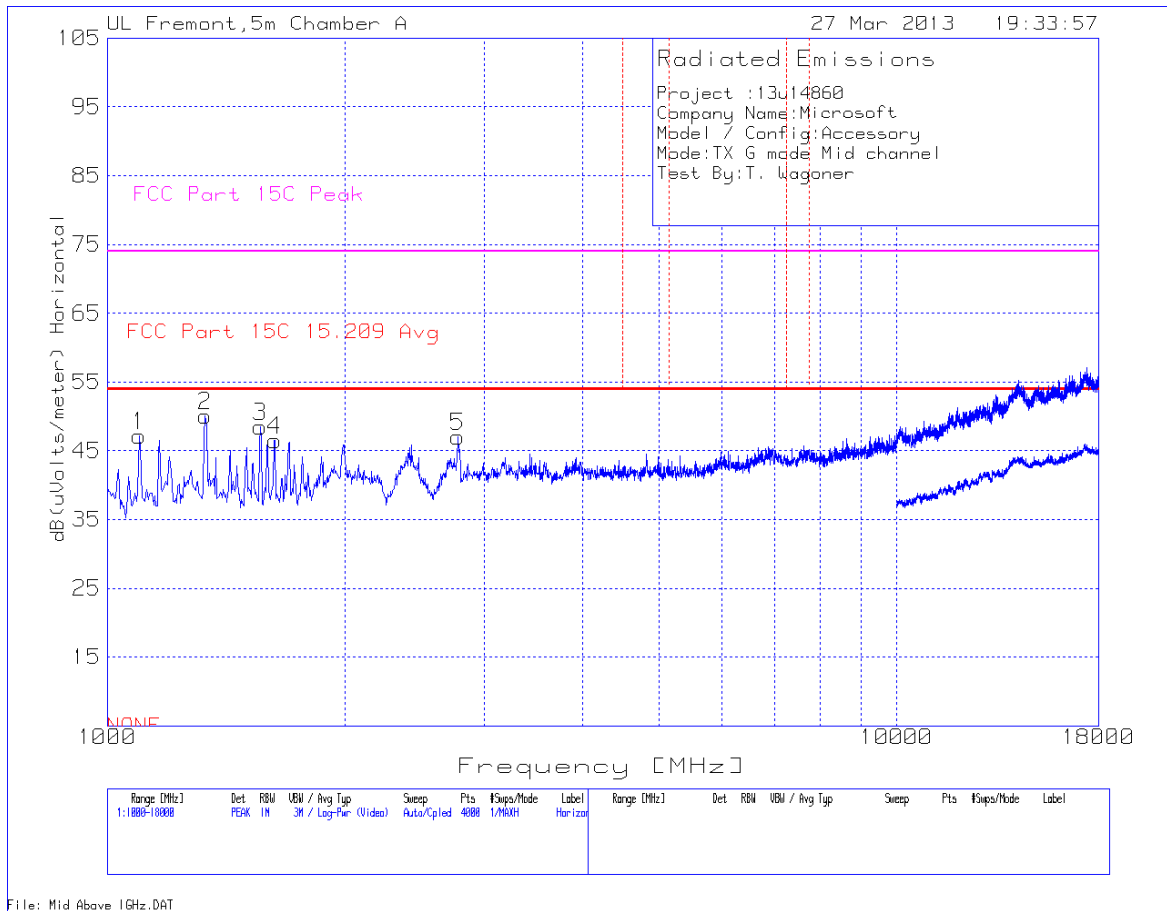
Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRf	dB(uV/s/meter)	FCC Part 15C 15.209	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	54.76	PK	27.9	-38.7	3.1	0.3	47.36	53.97	-6.61	74	-26.64	0	47.36	100	Horz
2	1331.252	54.04	PK	30.1	-38.1	3.3	0.4	49.74	53.97	-4.23	74	-24.26	0	49.74	200	Horz
3	1564.826	52.48	PK	28.5	-37.7	3.6	0.6	47.48	53.97	-6.49	74	-26.52	0	47.48	100	Horz
4	1632.775	51.81	PK	28.7	-37.6	3.6	0.6	47.11	53.97	-6.86	74	-26.89	0	47.11	100	Horz
5	1700.724	50.5	PK	29.4	-37.5	3.7	0.6	46.7	53.97	-7.27	74	-27.3	0	46.7	100	Horz
6	1152.885	53.28	PK	28.7	-38.5	3.2	0.3	46.98	53.97	-6.99	74	-27.02	0	46.98	200	Vert
7	1331.252	56.41	PK	30.1	-38.1	3.3	0.4	52.11	53.97	-1.86	74	-21.89	0	52.11	100	Vert
8	1433.175	56.4	PK	29.5	-37.9	3.4	0.4	51.8	53.97	-2.17	74	-22.2	0	51.8	100	Vert
9	1496.877	52.79	PK	28.9	-37.8	3.5	0.5	47.89	53.97	-6.08	74	-26.11	0	47.89	100	Vert
10	1564.826	53.12	PK	28.5	-37.7	3.6	0.6	48.12	53.97	-5.85	74	-25.88	0	48.12	100	Vert
11	1598.801	52.86	PK	28.3	-37.6	3.6	0.6	47.76	53.97	-6.21	74	-26.24	0	47.76	100	Vert
12	2129.653	47.57	PK	31.6	-37	4.2	0.9	47.27	53.97	-6.7	74	-26.73	0	47.27	100	Vert
13	3327.255	47.86	PK	32.9	-36.5	5.4	0.5	50.16	53.97	-3.81	74	-23.84	0	50.16	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRf	dB(uV/s/meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1332.39	44.11	MAv1	30.1	-38.1	3.3	0.4	39.81	53.97	-14.16	74	-34.19	0	39.81	272	196	Horz
1332.19	44.19	MAv1	30.1	-38.1	3.3	0.4	39.89	53.97	-14.08	74	-34.11	0	39.89	335	197	Vert
1431.3	44.49	MAv1	29.5	-37.9	3.4	0.4	39.89	53.97	-14.08	74	-34.11	0	39.89	29	168	Vert
3327.52	30.57	MAv1	32.9	-36.5	5.4	0.5	32.87	53.97	-21.1	74	-41.13	0	32.87	322	229	Vert

PK - Peak detector
 MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

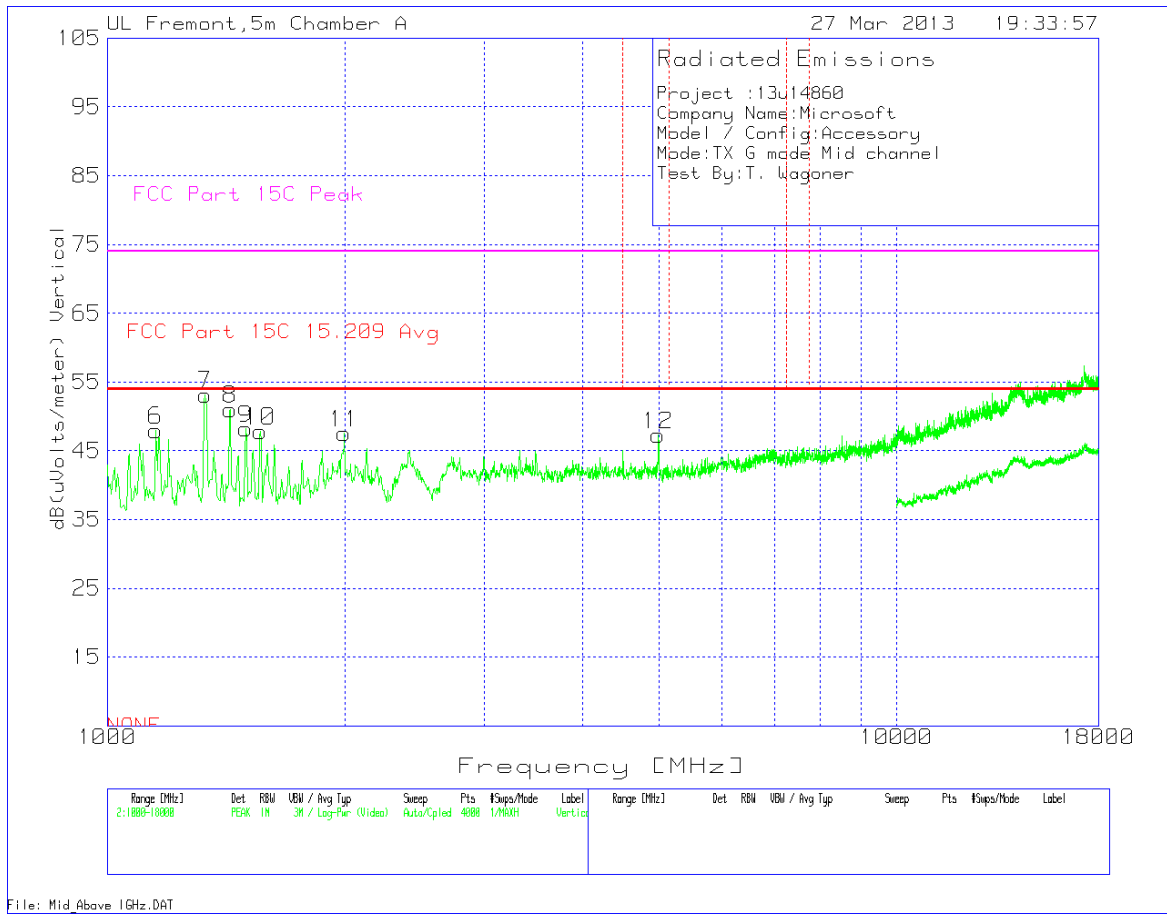
Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

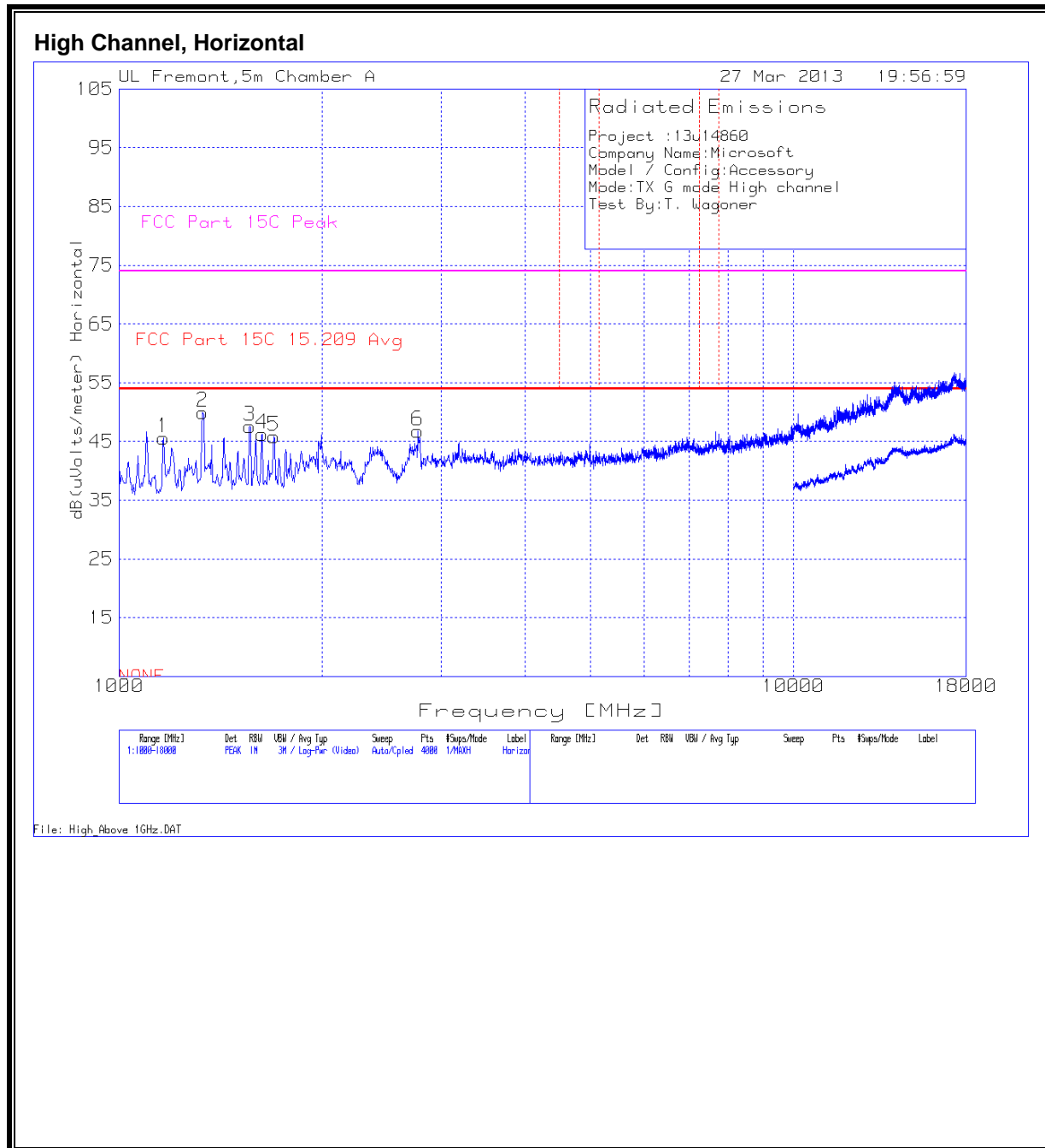
Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	TX G mode Mid channel																
Test By:	T. Wagoner																

Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts/meter)	FCC Part 15C Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	54.58	PK	27.9	-38.7	3.1	0.3	47.18	53.97	-6.79	74	-26.82	0	47.18	100	Horz
2	1331.252	54.34	PK	30.1	-38.1	3.3	0.4	50.04	53.97	-3.93	74	-23.96	0	50.04	200	Horz
3	1564.826	53.47	PK	28.5	-37.7	3.6	0.6	48.47	53.97	-5.5	74	-25.53	0	48.47	100	Horz
4	1632.775	51.23	PK	28.7	-37.6	3.6	0.6	46.53	53.97	-7.44	74	-27.47	0	46.53	100	Horz
5	2783.662	45.44	PK	32.6	-36.7	4.8	0.9	47.04	53.97	-6.93	74	-26.96	0	47.04	200	Horz
6	1152.885	54.21	PK	28.7	-38.5	3.2	0.3	47.91	53.97	-6.06	74	-26.09	0	47.91	200	Vert
7	1331.252	57.43	PK	30.1	-38.1	3.3	0.4	53.13	53.97	-0.84	74	-20.87	0	53.13	100	Vert
8	1433.175	55.64	PK	29.5	-37.9	3.4	0.4	51.04	53.97	-2.93	74	-22.96	0	51.04	100	Vert
9	1496.877	53.06	PK	28.9	-37.8	3.5	0.5	48.16	53.97	-5.81	74	-25.84	0	48.16	100	Vert
10	1564.826	52.77	PK	28.5	-37.7	3.6	0.6	47.77	53.97	-6.2	74	-26.23	0	47.77	100	Vert
11	1998.001	47.8	PK	31.9	-37.1	4	0.9	47.5	53.97	-6.47	74	-26.5	0	47.5	100	Vert
12	4987.759	41.84	PK	33.9	-35.6	6.9	0.2	47.24	53.97	-6.73	74	-26.76	n/a	n/a	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts/meter)	FCC Part 15C Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1332.09	44.51	MAv1	30.1	-38.1	3.3	0.4	40.21	53.97	-13.76	74	-33.79	0	40.21	272	169	Horz
1331.59	47.63	MAv1	30.1	-38.1	3.3	0.4	43.33	53.97	-10.64	74	-30.67	0	43.33	354	173	Vert
1431.36	36.87	MAv1	29.5	-37.9	3.4	0.4	32.27	53.97	-21.7	74	-41.73	0	32.27	354	173	Vert

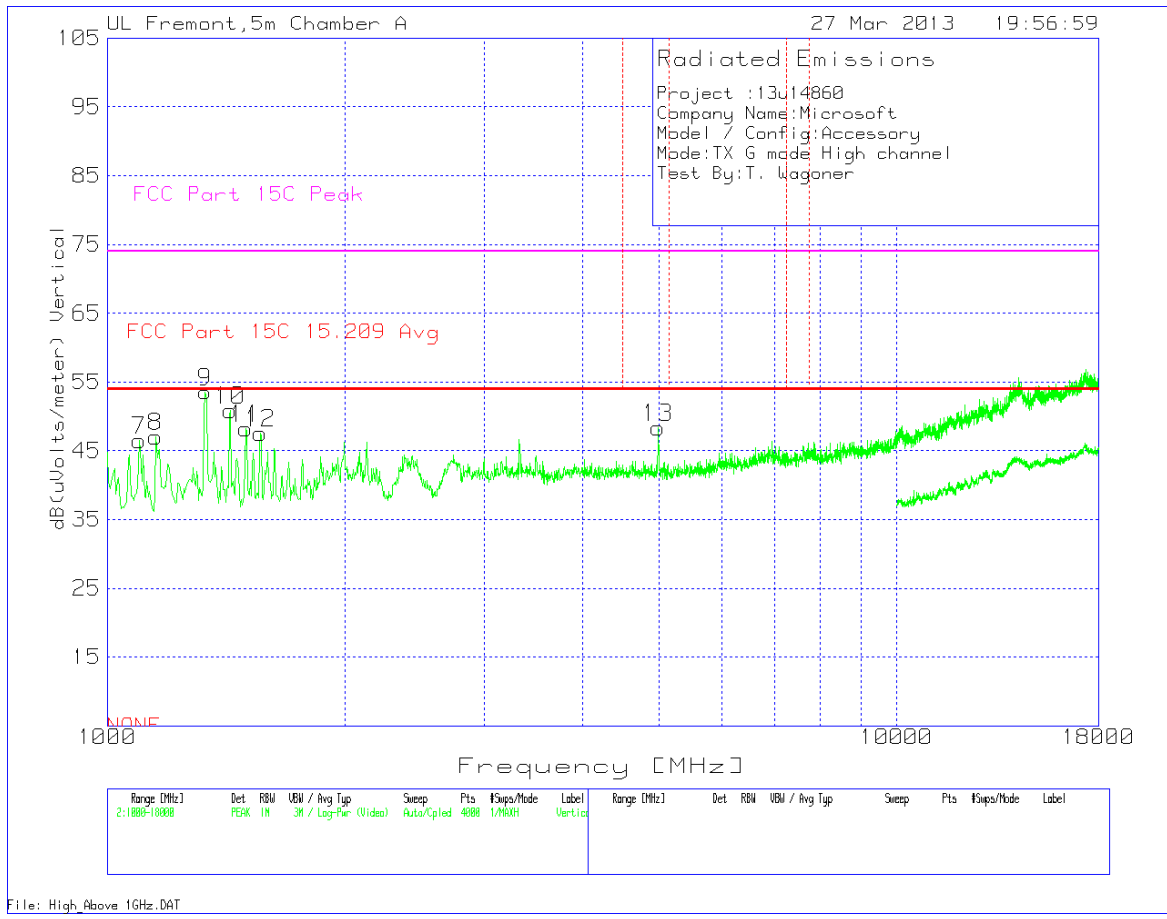
PK - Peak detector
 MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.



High Channel, Vertical



High Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	TX G mode High channel																
Test By:	T. Wagoner																

Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1165.626	51.53	PK	29	-38.5	3.2	0.3	45.53	53.97	-8.44	74	-28.47	0	45.53	100	Horz
2	1331.252	54.2	PK	30.1	-38.1	3.3	0.4	49.9	53.97	-4.07	74	-24.1	0	49.9	100	Horz
3	1564.826	52.62	PK	28.5	-37.7	3.6	0.6	47.62	53.97	-6.35	74	-26.38	0	47.62	100	Horz
4	1632.775	51	PK	28.7	-37.6	3.6	0.6	46.3	53.97	-7.67	74	-27.7	0	46.3	100	Horz
5	1696.478	49.54	PK	29.4	-37.5	3.7	0.7	45.84	53.97	-8.13	74	-28.16	0	45.84	100	Horz
6	2775.169	45.15	PK	32.6	-36.7	4.8	0.9	46.75	53.97	-7.22	74	-27.25	0	46.75	200	Horz
7	1097.677	53.91	PK	27.9	-38.7	3.1	0.3	46.51	53.97	-7.46	74	-27.49	0	46.51	100	Vert
8	1152.885	53.37	PK	28.7	-38.5	3.2	0.3	47.07	53.97	-6.9	74	-26.93	0	47.07	200	Vert
9	1331.252	57.88	PK	30.1	-38.1	3.3	0.4	53.58	53.97	-0.39	74	-20.42	0	53.58	100	Vert
10	1433.175	55.46	PK	29.5	-37.9	3.4	0.4	50.86	53.97	-3.11	74	-23.14	0	50.86	100	Vert
11	1496.877	53.08	PK	28.9	-37.8	3.5	0.5	48.18	53.97	-5.79	74	-25.82	0	48.18	100	Vert
12	1564.826	52.53	PK	28.5	-37.7	3.6	0.6	47.53	53.97	-6.44	74	-26.47	0	47.53	100	Vert
13	4983.512	43.01	PK	33.9	-35.6	6.9	0.2	48.41	53.97	-5.56	74	-25.59	n/a	n/a	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.77	44.3	MAv1	30.1	-38.1	3.3	0.4	40	53.97	-13.97	74	-34	0	40	274	171	Horz
1331.95	44.15	MAv1	30.1	-38.1	3.3	0.4	39.85	53.97	-14.12	74	-34.15	0	39.85	340	178	Vert
1431.56	44.24	MAv1	29.5	-37.9	3.4	0.4	39.64	53.97	-14.33	74	-34.36	0	39.64	211	190	Vert

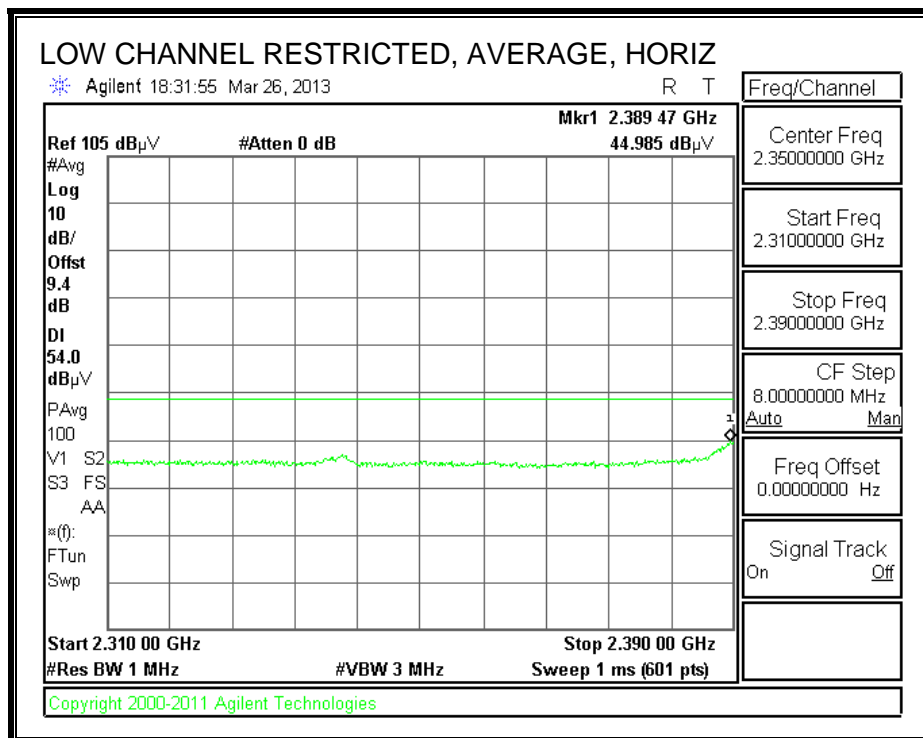
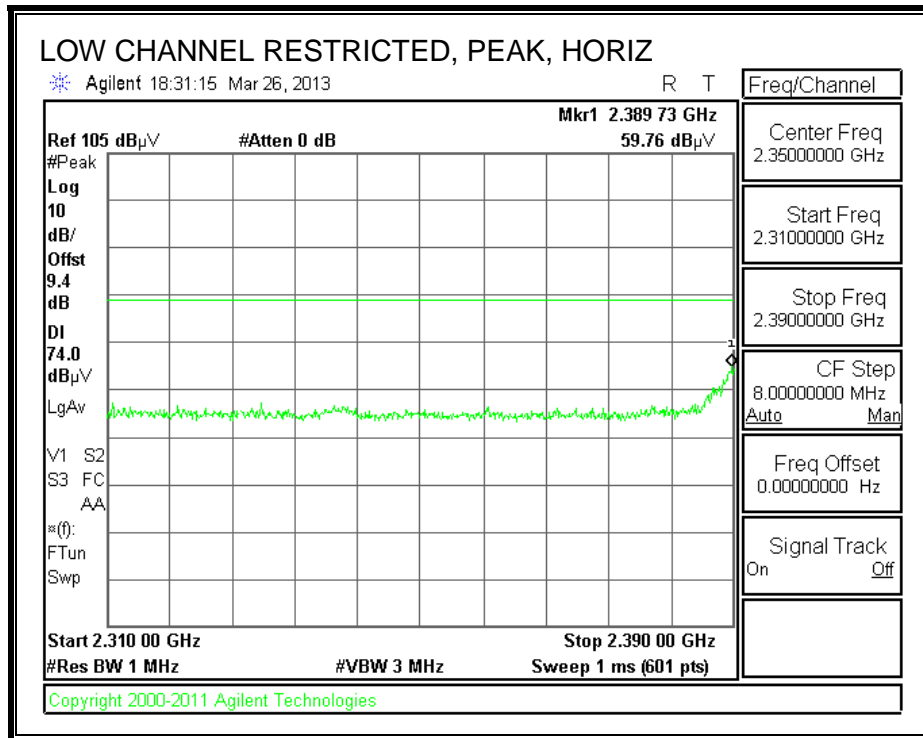
PK - Peak detector
 MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

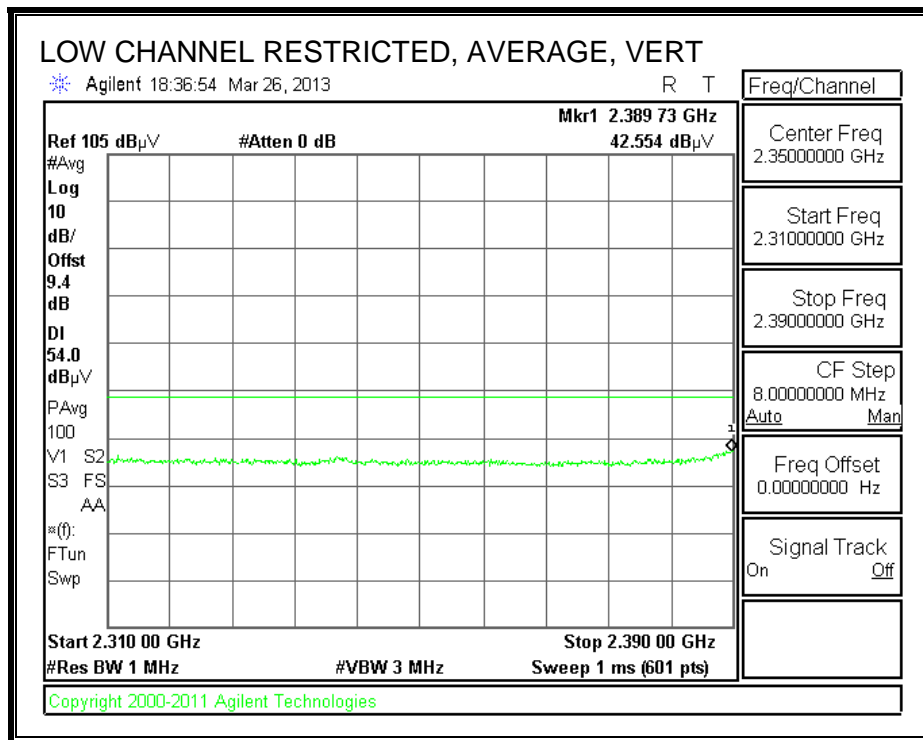
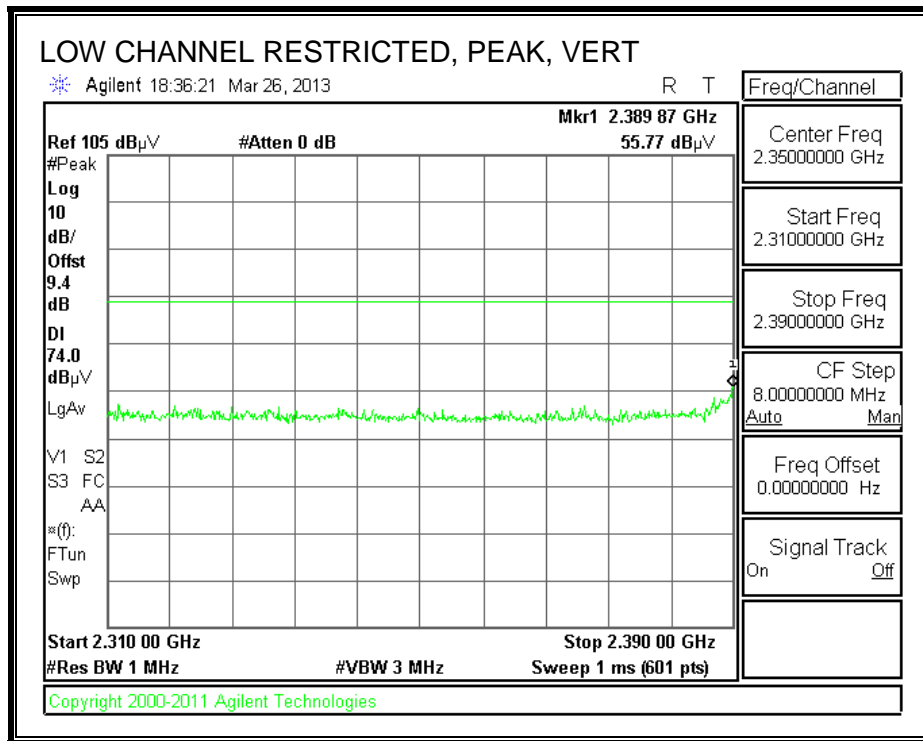
Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.

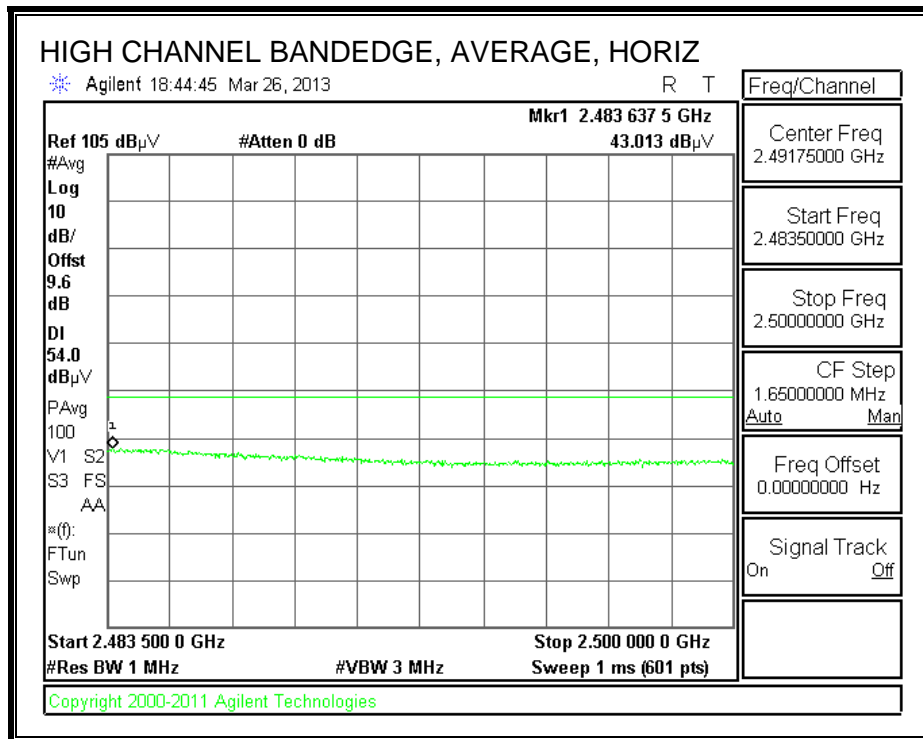
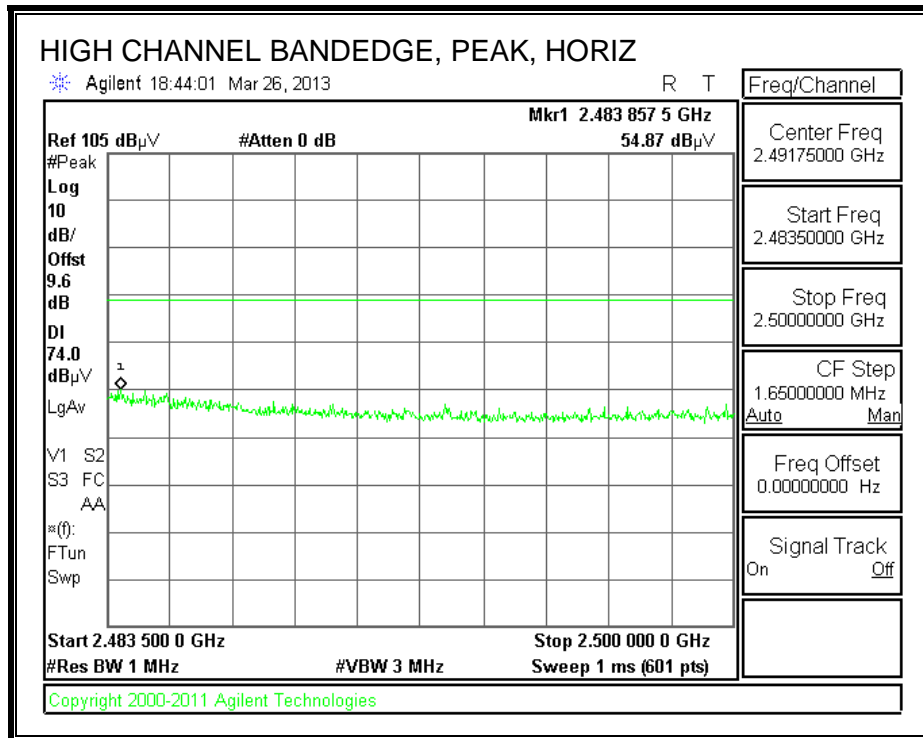
10.4. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND

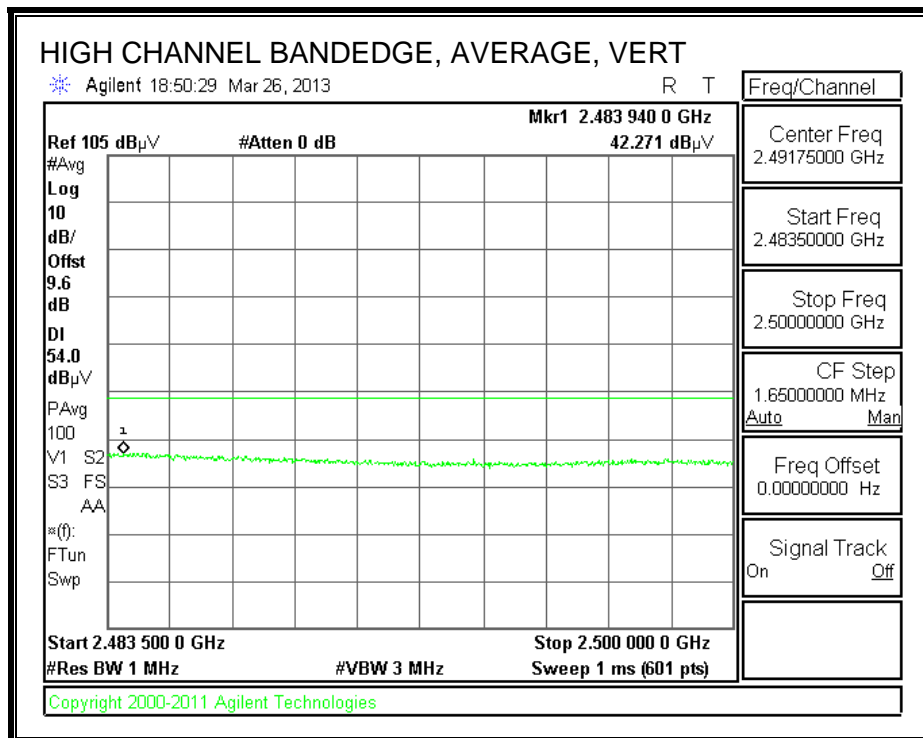
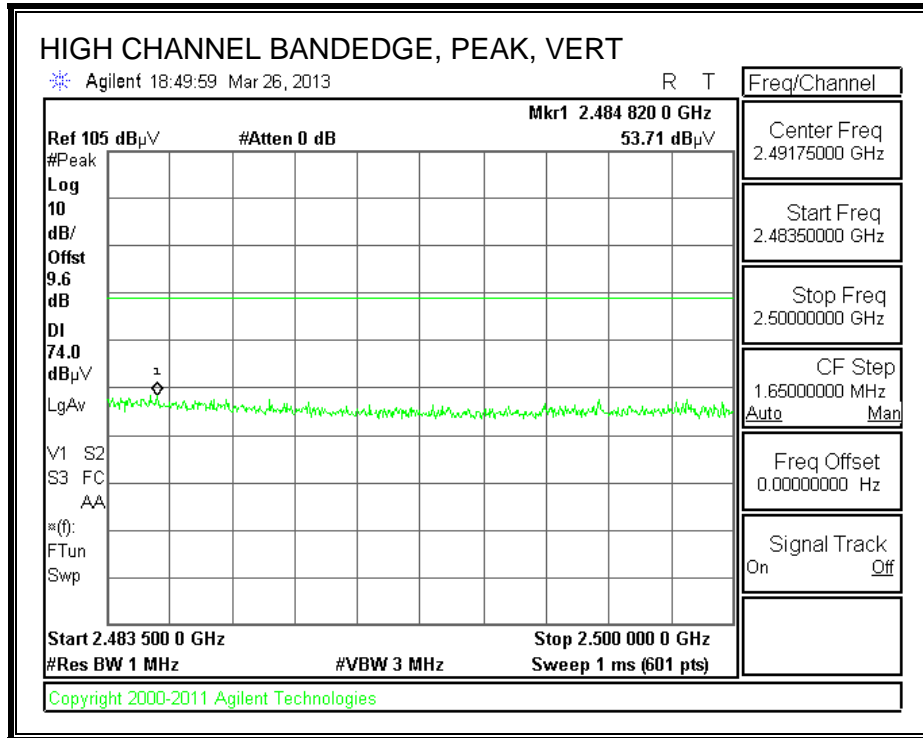
RESTRICTED BANDEDGE (LOW CHANNEL)



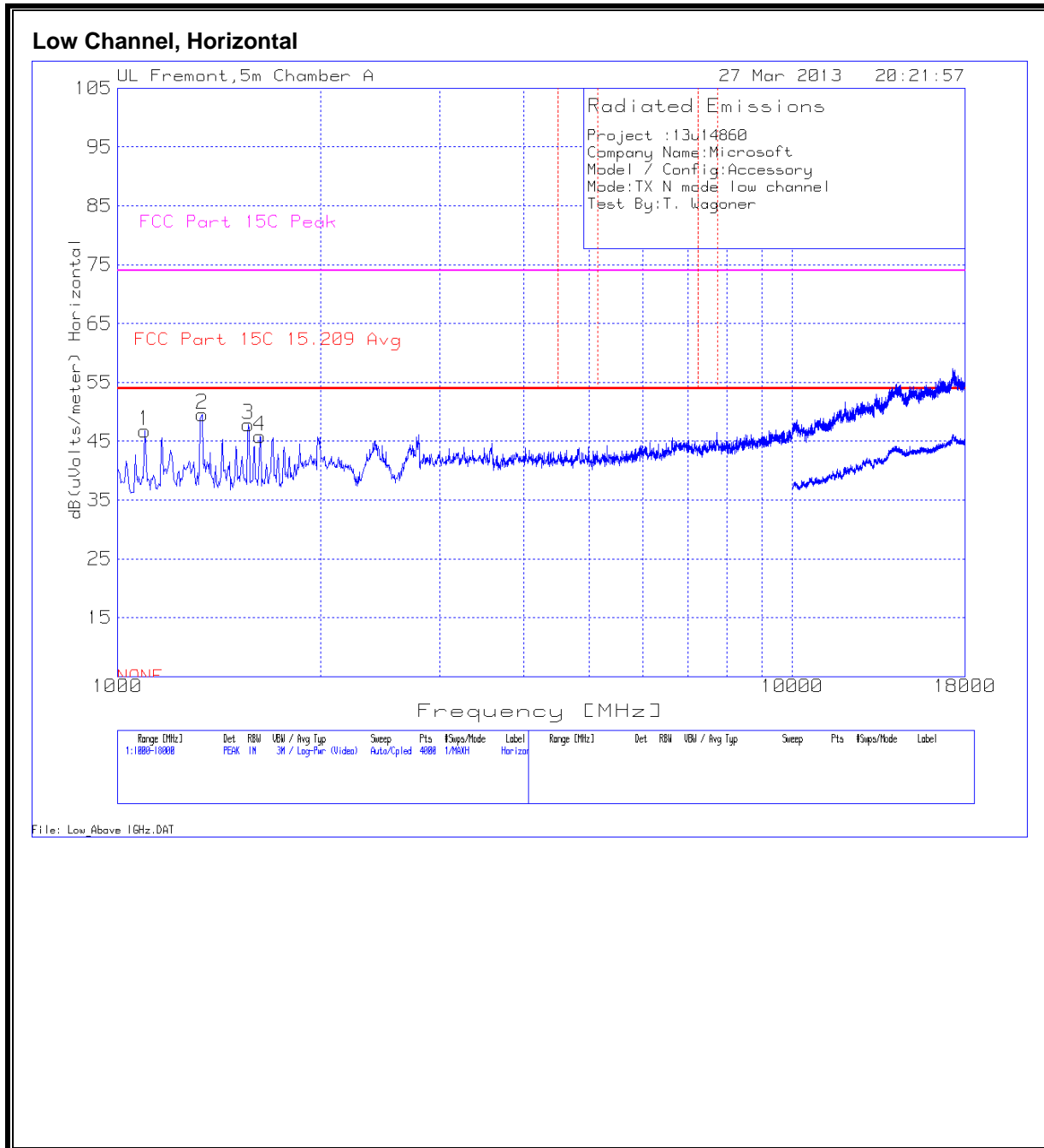


AUTHORIZED BANDEDGE (HIGH CHANNEL)

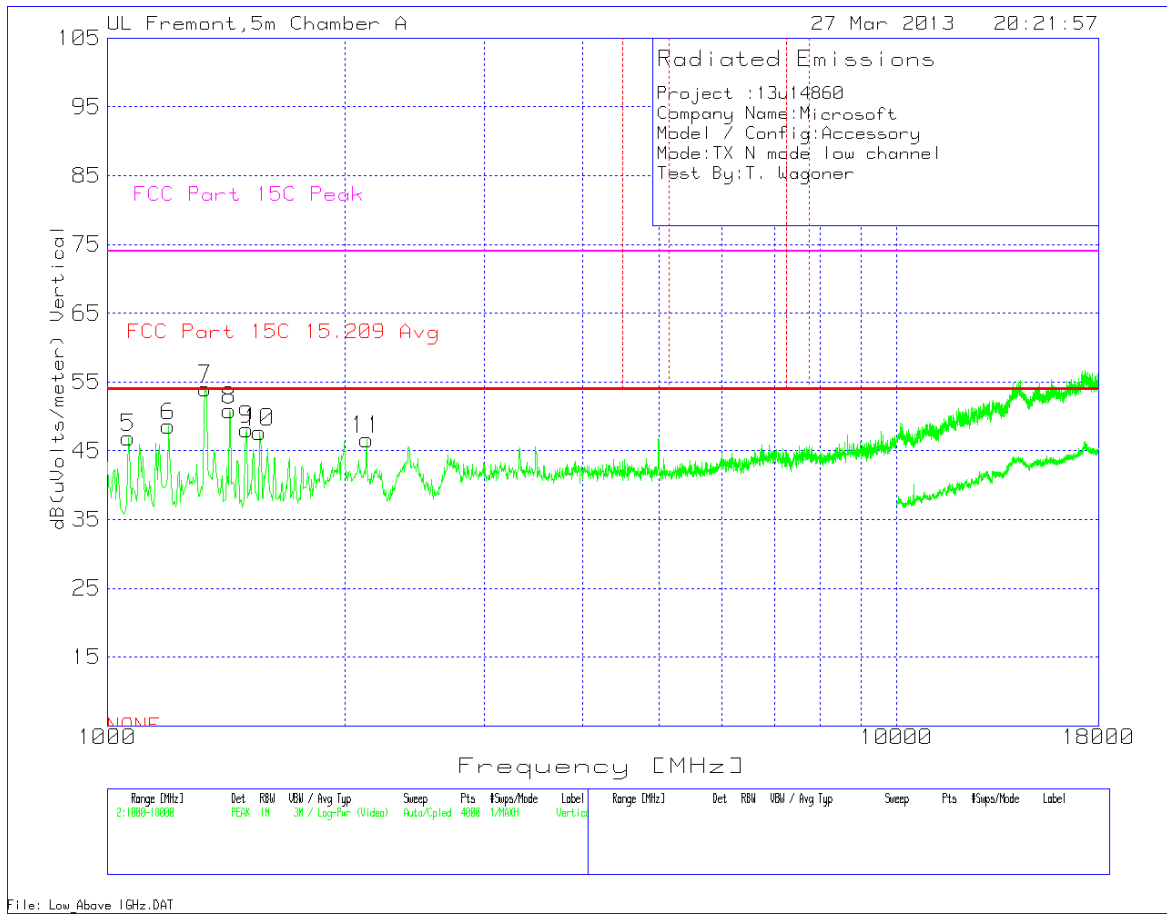




HARMONICS AND SPURIOUS EMISSIONS



Low Channel, Vertical



Low Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	TX N mode low channel																
Test By:	T. Wagoner																

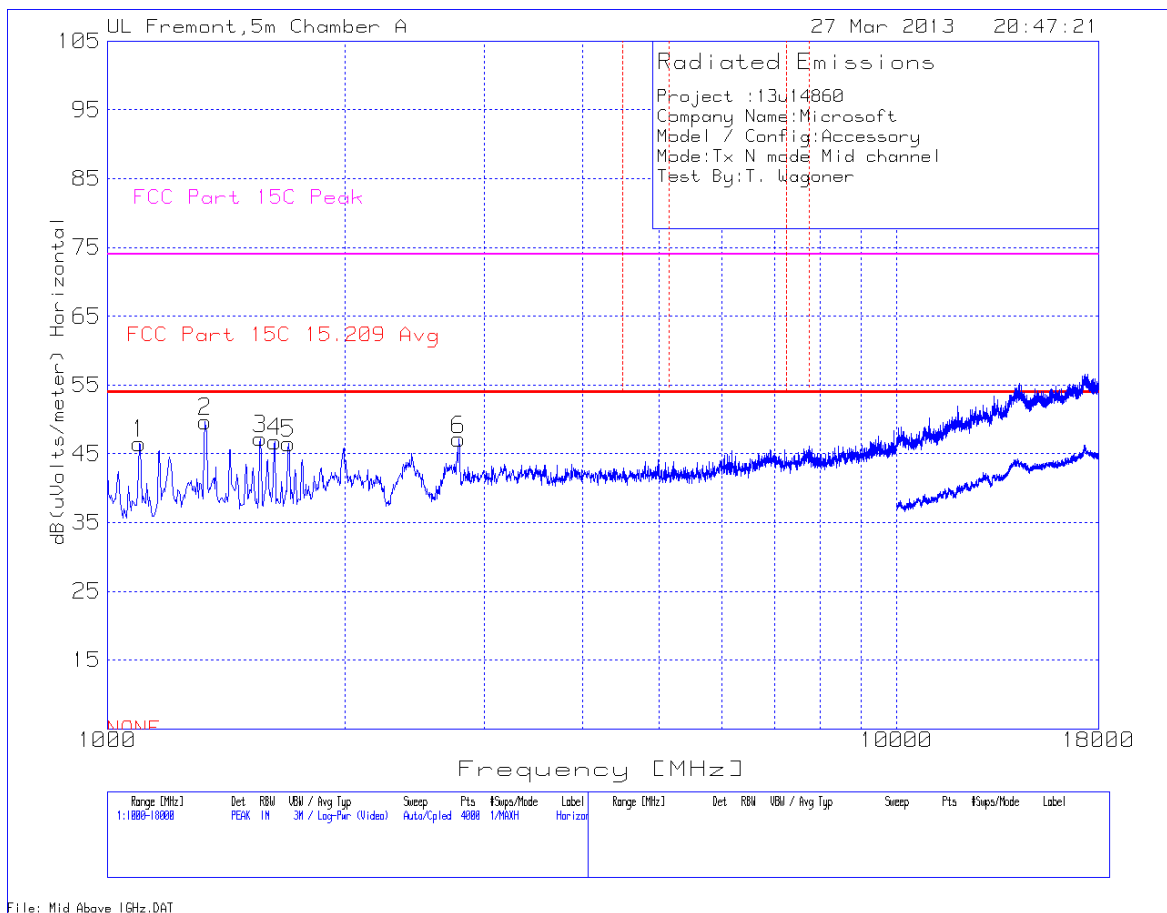
Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	54.19	PK	27.9	-38.7	3.1	0.3	46.79	53.97	-7.18	74	-27.21	0	46.79	100	Horz
2	1335.498	53.85	PK	30.1	-38.1	3.3	0.4	49.55	53.97	-4.42	74	-24.45	0	49.55	200	Horz
3	1564.826	52.77	PK	28.5	-37.7	3.6	0.6	47.77	53.97	-6.2	74	-26.23	0	47.77	100	Horz
4	1628.529	50.7	PK	28.6	-37.6	3.6	0.6	45.9	53.97	-8.07	74	-28.1	0	45.9	100	Horz
5	1063.702	54.2	PK	28	-38.7	3.1	0.3	46.9	53.97	-7.07	74	-27.1	0	46.9	200	Vert
6	1195.353	54.06	PK	29.4	-38.4	3.2	0.3	48.56	53.97	-5.41	74	-25.44	0	48.56	200	Vert
7	1331.252	58.37	PK	30.1	-38.1	3.3	0.4	54.07	53.97	0.1	74	-19.93	0	54.07	100	Vert
8	1428.928	55.46	PK	29.5	-37.9	3.4	0.4	50.86	53.97	-3.11	74	-23.14	0	50.86	100	Vert
9	1501.124	52.9	PK	28.9	-37.7	3.5	0.5	48.1	53.97	-5.87	74	-25.9	0	48.1	100	Vert
10	1560.58	52.66	PK	28.5	-37.7	3.6	0.6	47.66	53.97	-6.31	74	-26.34	0	47.66	100	Vert
11	2129.653	46.96	PK	31.6	-37	4.2	0.9	46.66	53.97	-7.31	74	-27.34	0	46.66	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts/ meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.8	41.86	MAv1	30.1	-38.1	3.3	0.4	37.56	53.97	-16.41	74	-36.44	0	37.56	16	108	Horz
1331.47	51.03	MAv1	30.1	-38.1	3.3	0.4	46.73	53.97	-7.24	74	-27.27	0	46.73	249	125	Vert
1431.51	49	MAv1	29.5	-37.9	3.4	0.4	44.4	53.97	-9.57	74	-29.6	0	44.4	220	110	Vert

PK - Peak detector
 MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

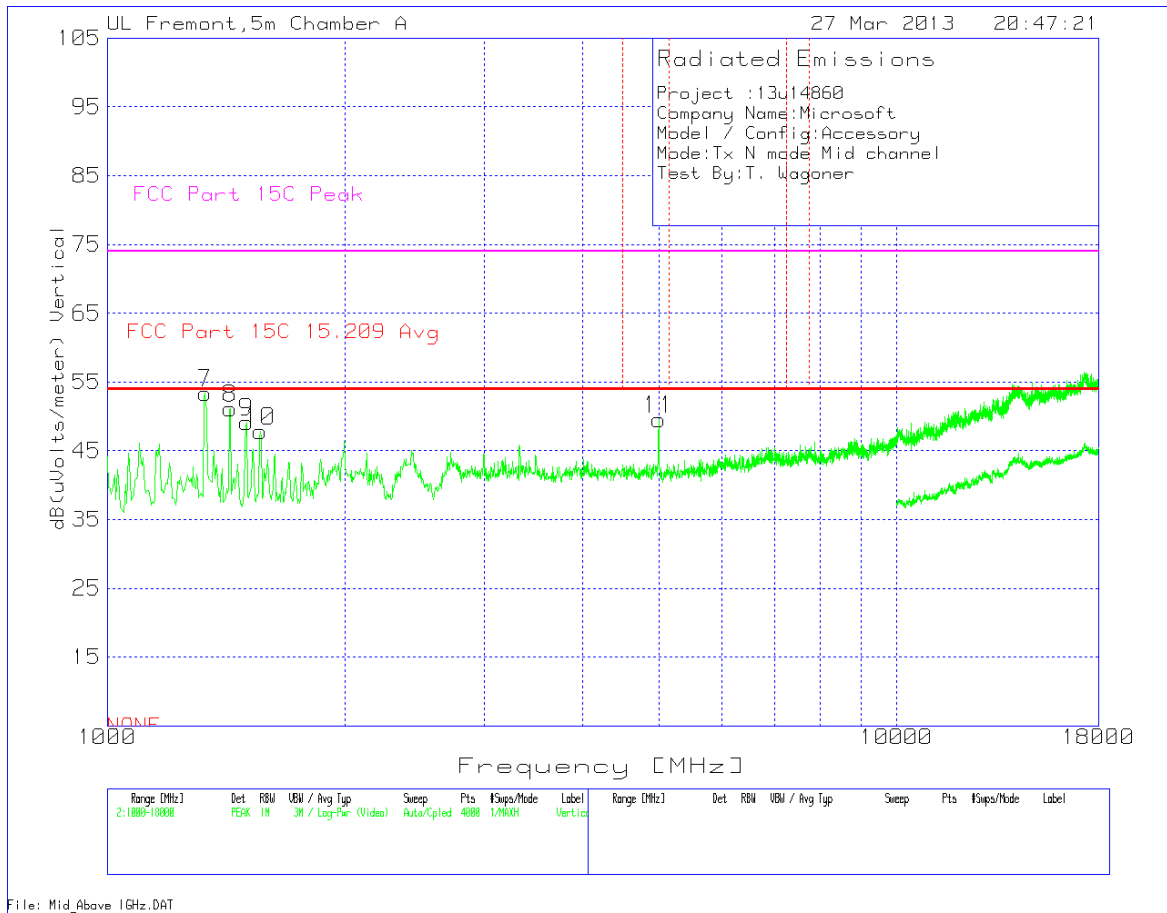
Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	Tx N mode Mid channel																
Test By:	T. Wagoner																

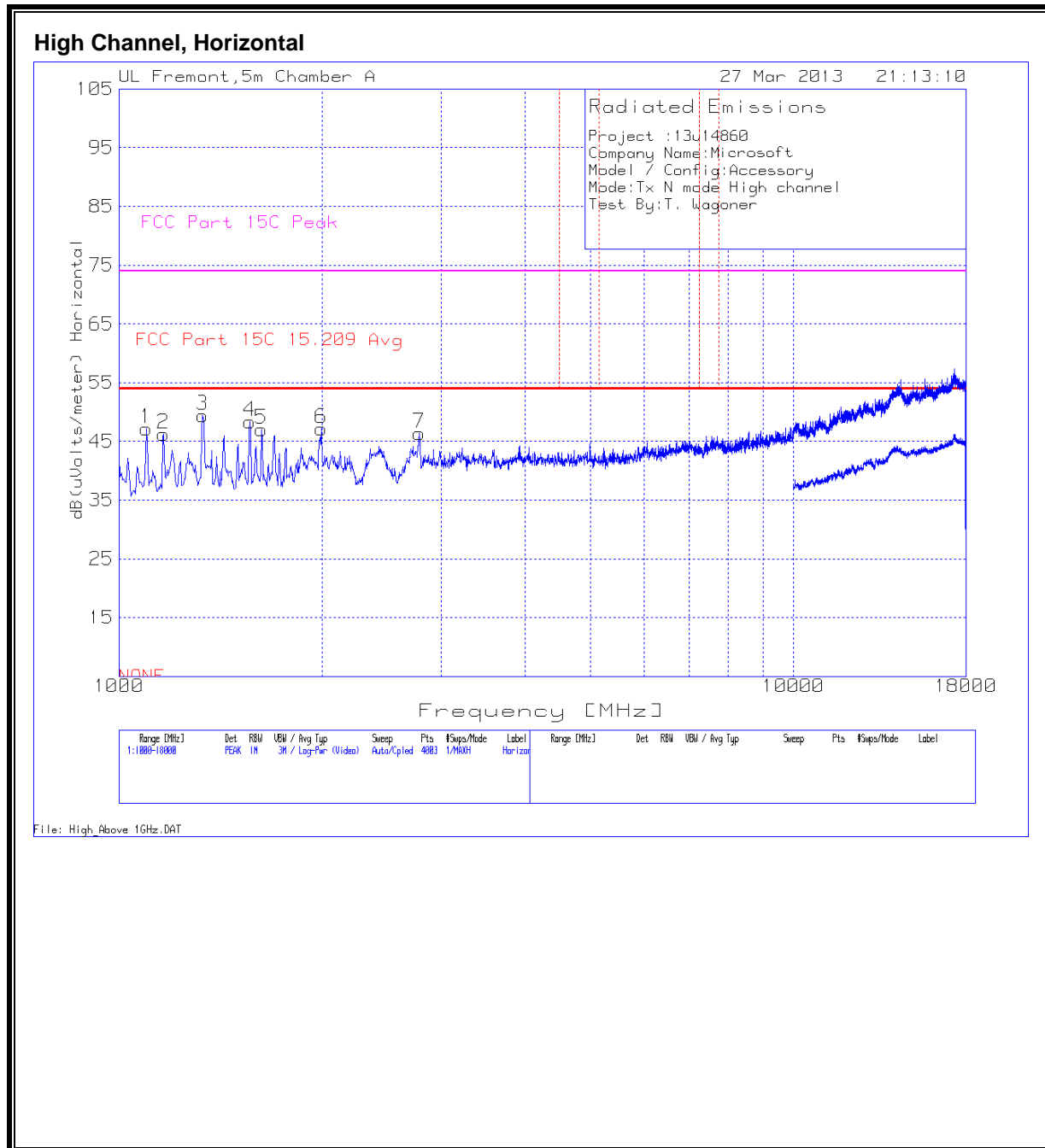
Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	53.94	PK	27.9	-38.7	3.1	0.3	46.54	53.97	-7.43	74	-27.46	0	46.54	100	Horz
2	1331.252	53.95	PK	30.1	-38.1	3.3	0.4	49.65	53.97	-4.32	74	-24.35	0	49.65	200	Horz
3	1564.826	52.23	PK	28.5	-37.7	3.6	0.6	47.23	53.97	-6.74	74	-26.77	0	47.23	100	Horz
4	1632.775	51.43	PK	28.7	-37.6	3.6	0.6	46.73	53.97	-7.24	74	-27.27	0	46.73	100	Horz
5	1696.478	50.19	PK	29.4	-37.5	3.7	0.7	46.49	53.97	-7.48	74	-27.51	0	46.49	100	Horz
6	2787.909	45.5	PK	32.6	-36.7	4.8	0.9	47.1	53.97	-6.87	74	-26.9	0	47.1	200	Horz
7	1331.252	57.67	PK	30.1	-38.1	3.3	0.4	53.37	53.97	-0.6	74	-20.63	0	53.37	100	Vert
8	1433.175	55.75	PK	29.5	-37.9	3.4	0.4	51.15	53.97	-2.82	74	-22.85	0	51.15	100	Vert
9	1501.124	53.92	PK	28.9	-37.7	3.5	0.5	49.12	53.97	-4.85	74	-24.88	0	49.12	100	Vert
10	1564.826	52.82	PK	28.5	-37.7	3.6	0.6	47.82	53.97	-6.15	74	-26.18	0	47.82	100	Vert
11	4996.253	44.16	PK	33.9	-35.6	6.9	0.2	49.56	53.97	-4.41	74	-24.44	n/a	n/a	100	Vert

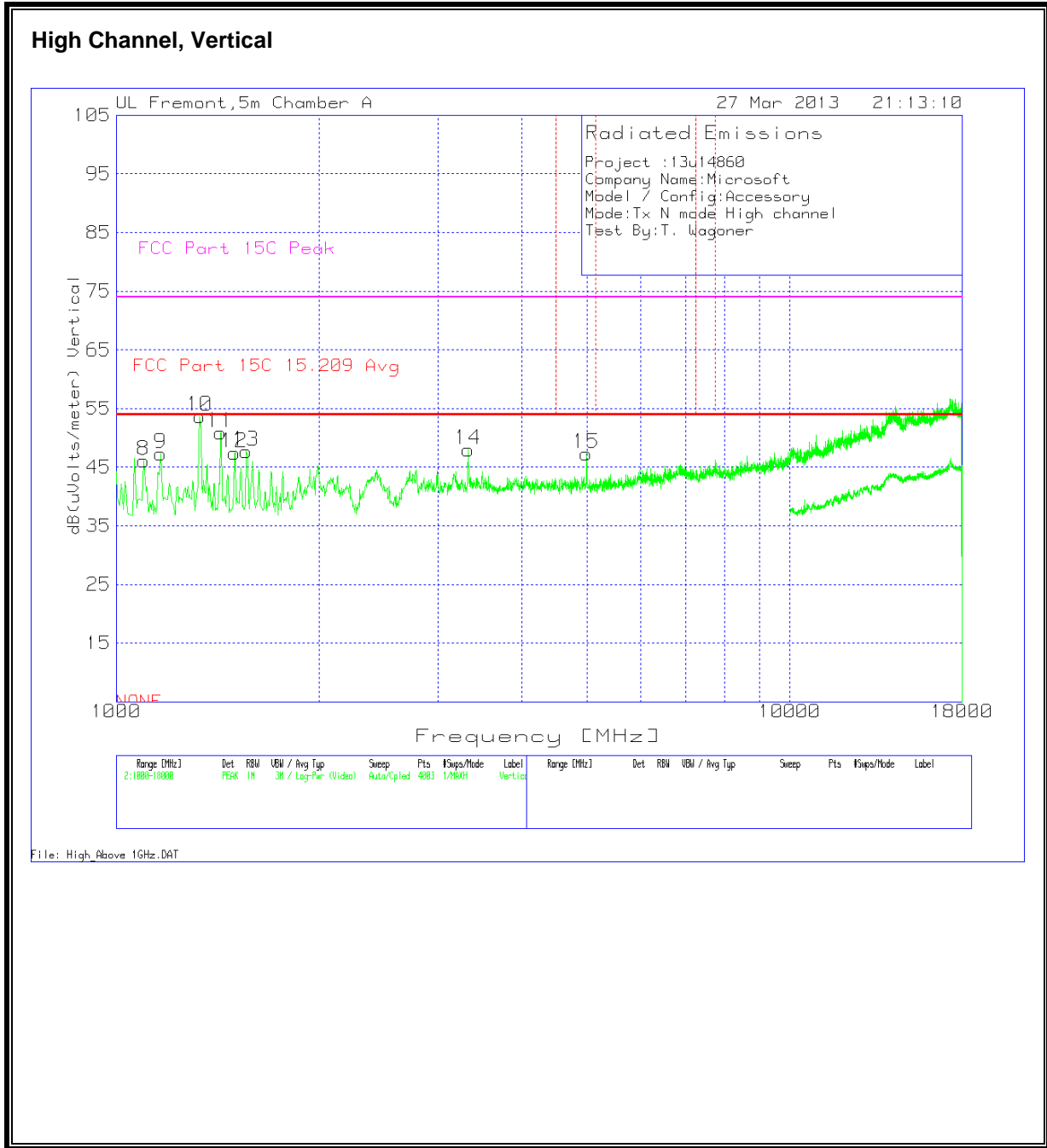
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uVolts /meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.61	44.6	MAv1	30.1	-38.1	3.3	0.4	40.3	53.97	-13.67	74	-33.7	0	40.3	274	209	Horz
1331.51	49.52	MAv1	30.1	-38.1	3.3	0.4	45.22	53.97	-8.75	74	-28.78	0	45.22	331	163	Vert
1432.02	37.82	MAv1	29.5	-37.9	3.4	0.4	33.22	53.97	-20.75	74	-40.78	0	33.22	281	177	Vert
1499.88	46.87	MAv1	28.9	-37.8	3.5	0.5	41.97	53.97	-12	74	-32.03	0	41.97	200	127	Vert
4990.41	26.98	MAv1	33.9	-35.6	6.9	0.2	32.38	53.97	-21.59	74	-41.62	0	n/a	72	383	Vert

PK - Peak detector
 MAv1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

Notes:

There was no signal from EUT above the system noise floor up to 26 GHz.





High Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	Tx N mode High channel																
Test By:	T. Wagoner																

Marker No.	Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uV/s/meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Height [cm]	Polarity
1	1097.677	54.57	PK	27.9	-38.7	3.1	0.3	47.17	53.97	-6.8	74	-26.83	0	47.17	100	Horz
2	1165.626	52.27	PK	29	-38.5	3.2	0.3	46.27	53.97	-7.7	74	-27.73	0	46.27	200	Horz
3	1331.252	53.68	PK	30.1	-38.1	3.3	0.4	49.38	53.97	-4.59	74	-24.62	0	49.38	200	Horz
4	1564.826	53.41	PK	28.5	-37.7	3.6	0.6	48.41	53.97	-5.56	74	-25.59	0	48.41	100	Horz
5	1628.529	51.89	PK	28.6	-37.6	3.6	0.6	47.09	53.97	-6.88	74	-26.91	0	47.09	100	Horz
6	1993.755	47.48	PK	31.9	-37.1	4	0.9	47.18	53.97	-6.79	74	-26.82	0	47.18	200	Horz
7	2787.909	44.8	PK	32.6	-36.7	4.8	0.9	46.4	53.97	-7.57	74	-27.6	0	46.4	200	Horz
8	1097.677	53.53	PK	27.9	-38.7	3.1	0.3	46.13	53.97	-7.84	74	-27.87	0	46.13	100	Vert
9	1165.626	53.32	PK	29	-38.5	3.2	0.3	47.32	53.97	-6.65	74	-26.68	0	47.32	200	Vert
10	1331.252	57.99	PK	30.1	-38.1	3.3	0.4	53.69	53.97	-0.28	74	-20.31	0	53.69	100	Vert
11	1428.928	55.43	PK	29.5	-37.9	3.4	0.4	50.83	53.97	-3.14	74	-23.17	0	50.83	100	Vert
12	1496.877	52.39	PK	28.9	-37.8	3.5	0.5	47.49	53.97	-6.48	74	-26.51	0	47.49	100	Vert
13	1560.58	52.73	PK	28.5	-37.7	3.6	0.6	47.73	53.97	-6.24	74	-26.27	0	47.73	100	Vert
14	3331.501	45.7	PK	32.9	-36.5	5.4	0.5	48	53.97	-5.97	74	-26	0	48	200	Vert
15	4987.759	41.86	PK	33.9	-35.6	6.9	0.2	47.26	53.97	-6.71	74	-26.74	n/a	n/a	100	Vert
Test Frequency	Meter Reading	Detector	T136 ETS 3117	T144 HP8449B	Cable Factor	T160 BRF	dB(uV/s/meter)	FCC Part 15C 15.209 Avg	Margin (dB)	FCC Part 15C Peak	Margin (dB)	NONE	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1325.13	36.49	MAV1	30.2	-38.1	3.3	0.4	32.29	53.97	-21.68	74	-41.71	0	32.29	92	167	Horz
1332.61	43.18	MAV1	30.1	-38.1	3.3	0.4	38.88	53.97	-15.09	74	-35.12	0	38.88	340	175	Vert
1431.19	48.85	MAV1	29.5	-37.9	3.4	0.4	44.25	53.97	-9.72	74	-29.75	0	44.25	221	124	Vert

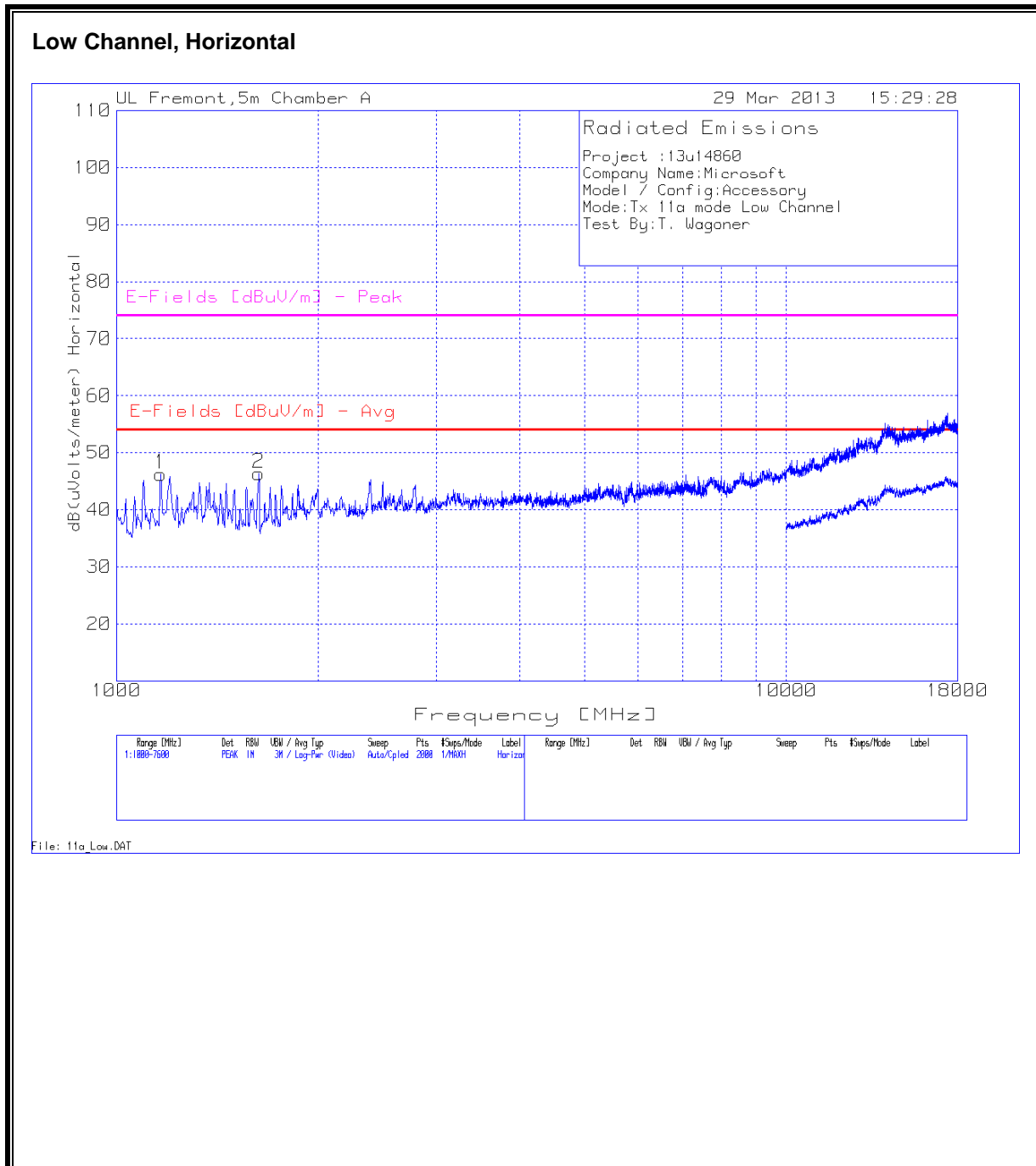
PK - Peak detector
 MAV1 - KDB558074 v02 10.2.3.2/8.2.1 Option 1 Maximum RMS Average

Notes:

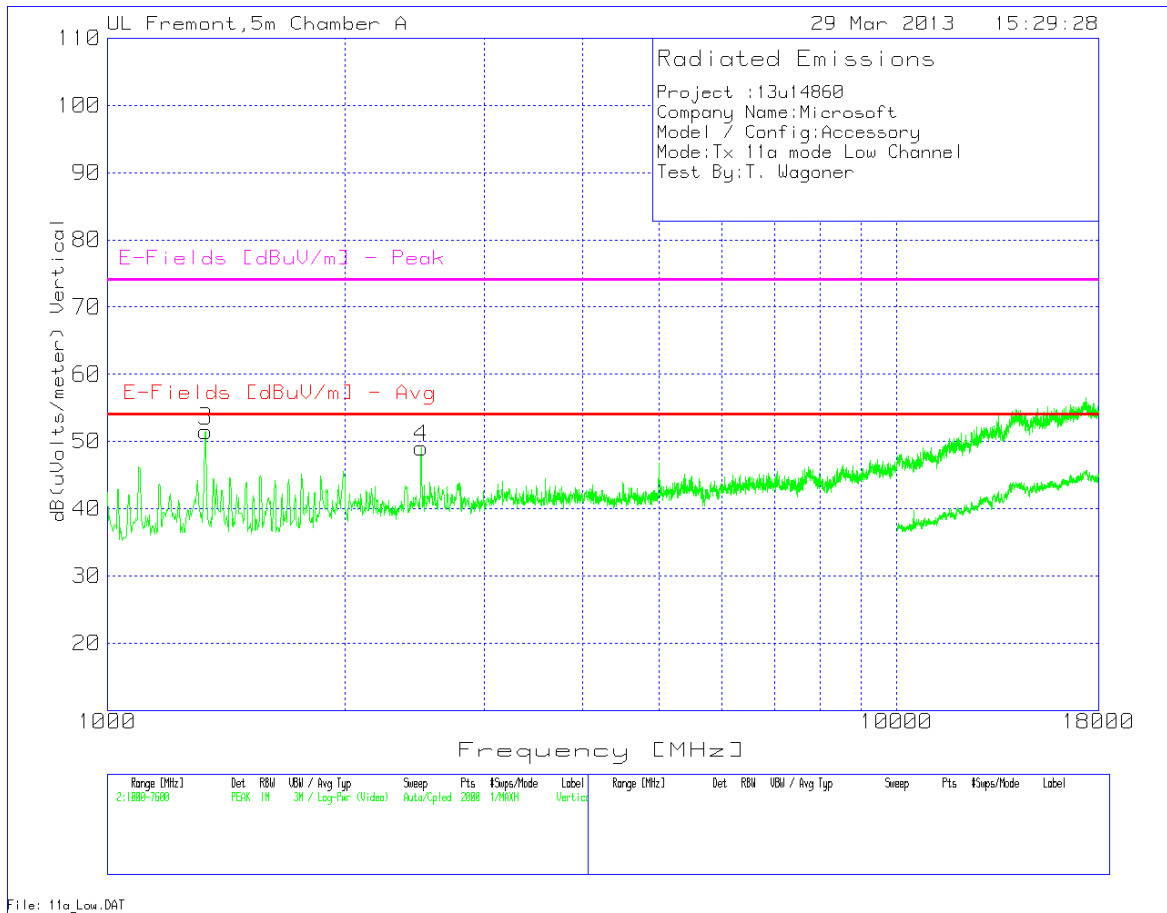
There was no signal from EUT above the system noise floor up to 26 GHz.

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

HARMONICS AND SPURIOUS EMISSIONS



Low Channel, Vertical



Low Channel, Data

Project :	13u14860																
Company Name:	Microsoft																
Model / Config:	Accessory																
Mode:	Tx 11a mode Low Channel																
Test By:	T. Wagoner																

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uV/s/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	52.66	PK	28.9	-38.5	3.2	0	46.26	53.97	-7.71	74	-27.74	100	Horz
2	1629.985	51.74	PK	28.6	-37.6	3.6	0	46.34	53.97	-7.63	74	-27.66	200	Horz
3	1333.133	56.17	PK	30.1	-38.1	3.3	0	51.47	53.97	-2.5	74	-22.53	100	Vert
4	2497.451	48.62	PK	32.6	-36.8	4.5	0.1	49.02	53.97	-4.95	74	-24.98	100	Vert
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uV/s/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.55	49.9	AD1	30.1	-38.1	3.3	0	45.2	53.97	-8.77	74	-28.8	247	101	Vert
2498.09	33.79	AD1	32.6	-36.8	4.5	0.1	34.19	53.97	-19.78	74	-39.81	237	106	Vert

PK - Peak detector

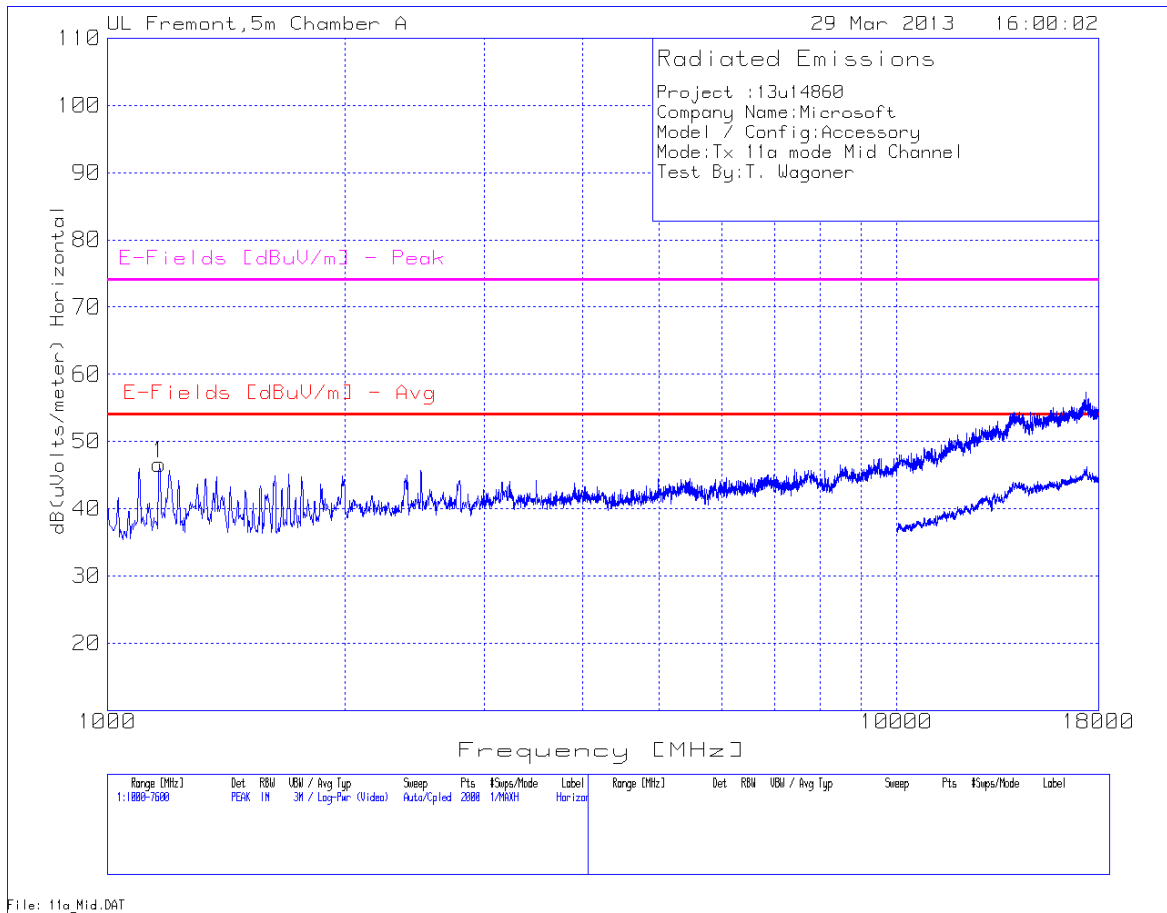
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

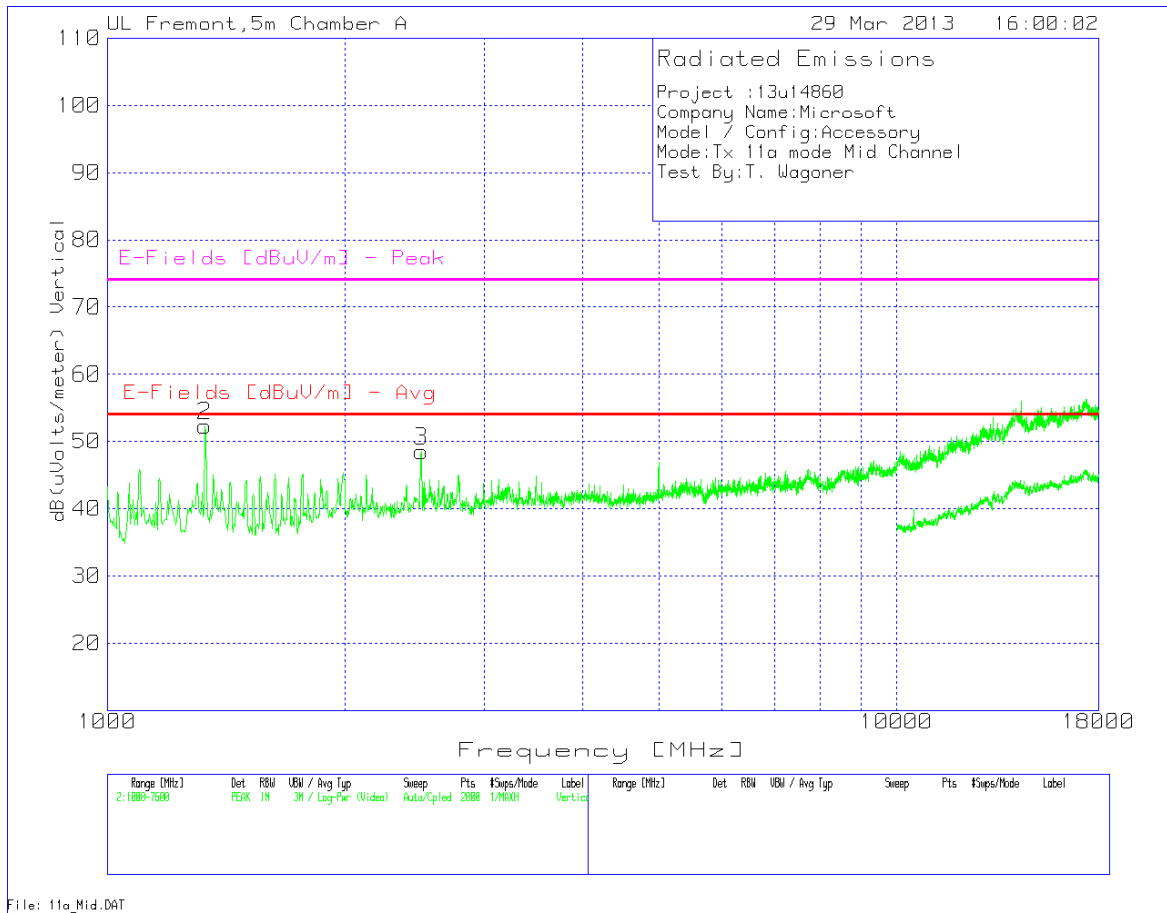
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860													
Company Name:	Microsoft													
Model / Config:	Accessory													
Mode:	Tx 11a mode Mid Channel													
Test By:	T. Wagoner													

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	52.98	PK	28.9	-38.5	3.2	0	46.58	53.97	-7.39	74	-27.42	100	Horz
2	1329.835	56.93	PK	30.2	-38.1	3.3	0	52.33	53.97	-1.64	74	-21.67	100	Vert
3	2500.75	48.21	PK	32.6	-36.8	4.5	0	48.51	53.97	-5.46	74	-25.49	100	Vert

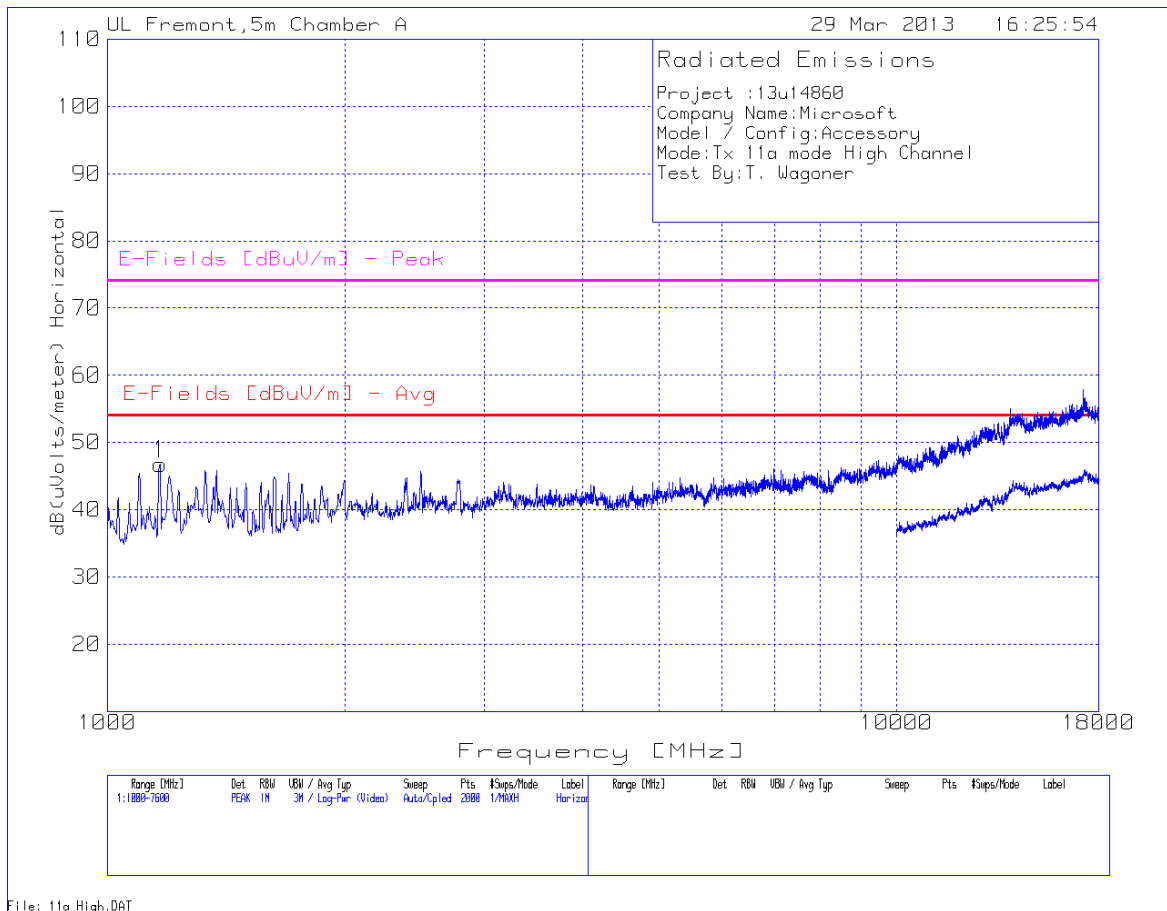
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1330.92	44.71	AD1	30.1	-38.1	3.3	0	40.01	53.97	-13.96	74	-33.99	252	102	Vert

PK - Peak detector
 AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

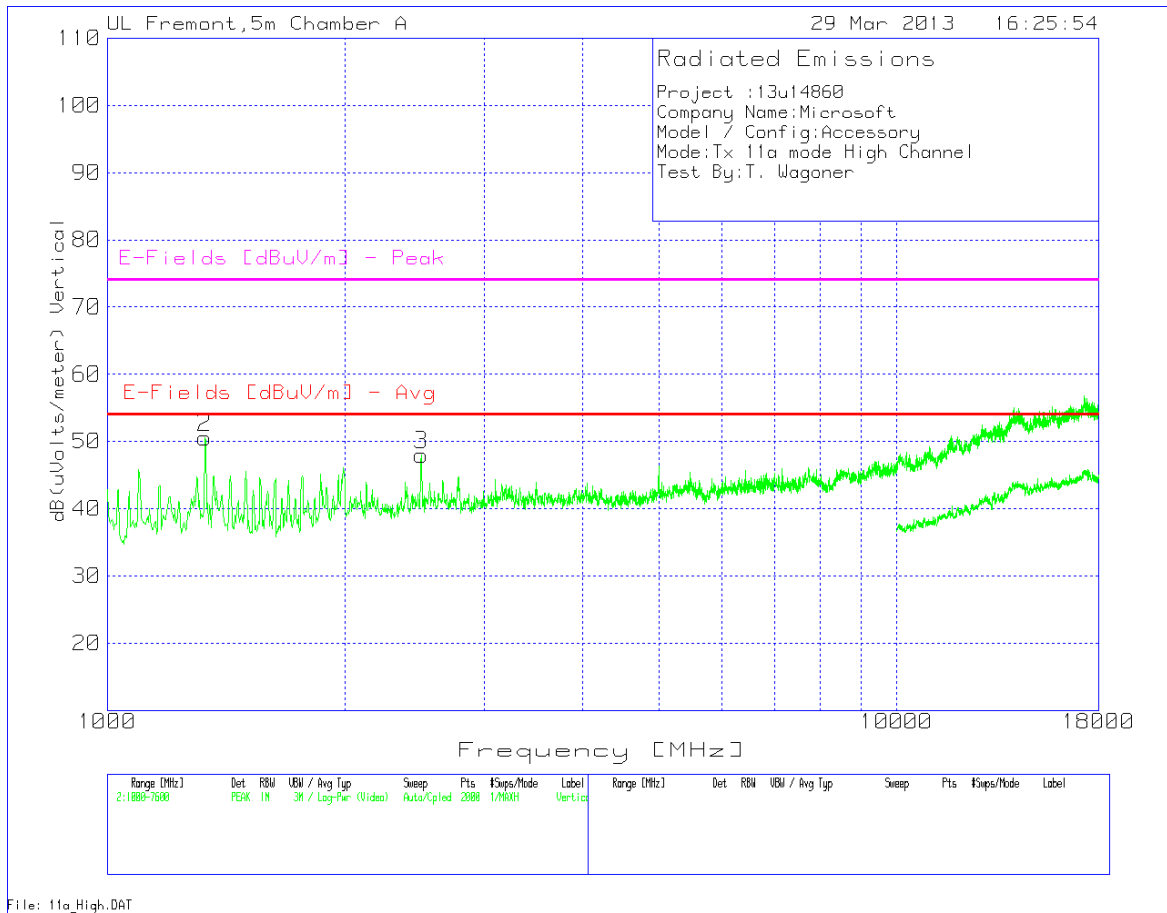
Notes:

- 1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.
- 2) There was no signal from EUT above the system noise floor up to 40 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860														
Company Name:	Microsoft														
Model / Config:	Accessory														
Mode:	Tx 11a mode High Channel														
Test By:	T. Wagoner														

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRf [dB]	dB(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1168.216	53.05	PK	29	-38.5	3.2	0	46.75	53.97	-7.22	74	-27.25	100	Horz
2	1329.835	55.23	PK	30.2	-38.1	3.3	0	50.63	53.97	-3.34	74	-23.37	100	Vert
3	2500.75	47.64	PK	32.6	-36.8	4.5	0	47.94	53.97	-6.03	74	-26.06	100	Vert
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRf [dB]	dB(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.78	38.29	AD1	30.1	-38.1	3.3	0	33.59	53.97	-20.38	74	-40.41	223	179	Vert

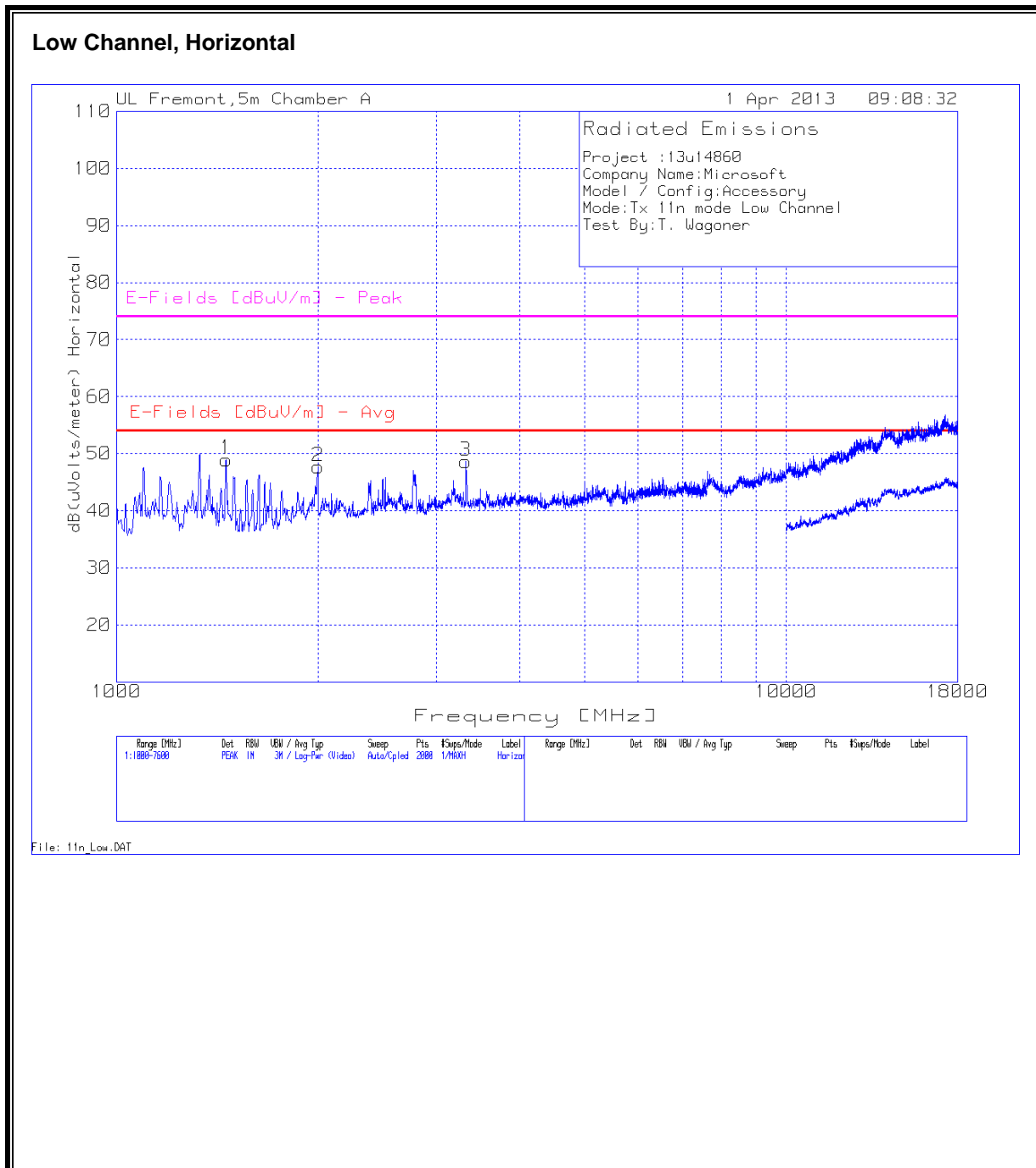
PK - Peak detector
 AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

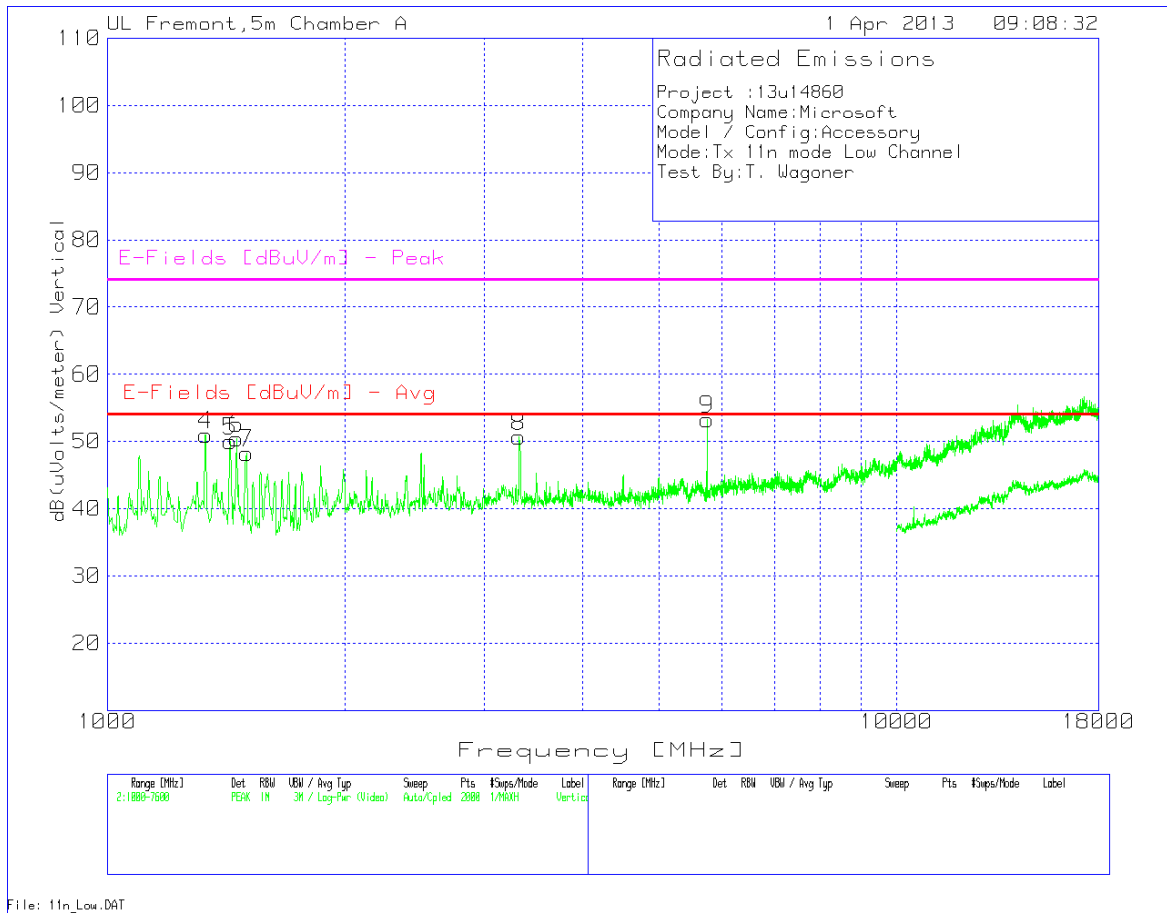
- 1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.
- 2) There was no signal from EUT above the system noise floor up to 40 GHz.

10.6. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS



Low Channel, Vertical



Low Channel, Data

Project :	13u14860
Company Name:	Microsoft
Model / Config:	Accessory
Mode:	Tx 11n mode Low Channel
Test By:	T. Wagoner

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uV/s/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1458.471	53.98	PK	29.3	-37.8	3.5	0	48.98	53.97	-4.99	74	-25.02	100	Horz
2	1999.4	48.86	PK	31.9	-37.1	4	0	47.66	53.97	-6.31	74	-26.34	200	Horz
3	3325.337	46.81	PK	32.9	-36.5	5.4	0	48.61	53.97	-5.36	74	-25.39	100	Horz
4	1333.133	55.71	PK	30.1	-38.1	3.3	0	51.01	53.97	-2.96	74	-22.99	100	Vert
5	1432.084	55.03	PK	29.5	-37.9	3.4	0	50.03	53.97	-3.94	74	-23.97	100	Vert
6	1458.471	55.4	PK	29.3	-37.8	3.5	0	50.4	53.97	-3.57	74	-23.6	100	Vert
7	1501.349	53.54	PK	28.9	-37.7	3.5	0	48.24	53.97	-5.73	74	-25.76	100	Vert
8	3325.337	48.84	PK	32.9	-36.5	5.4	0	50.64	53.97	-3.33	74	-23.36	100	Vert
9	5752.924	46.44	PK	34.7	-35.5	7.5	0.1	53.24	53.97	-0.73	74	-20.76	200	Vert
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uV/s/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1465.53	34.5	AD1	29.2	-37.8	3.5	0	29.4	53.97	-24.57	74	-44.6	131	381	Horz
1331.13	42.74	AD1	30.1	-38.1	3.3	0	38.04	53.97	-15.93	74	-35.96	345	199	Vert
1431.54	41.71	AD1	29.5	-37.9	3.4	0	36.71	53.97	-17.26	74	-37.29	185	177	Vert
1463.73	36.96	AD1	29.2	-37.8	3.5	0	31.86	53.97	-22.11	74	-42.14	130	129	Vert
3326.06	32.36	AD1	32.9	-36.5	5.4	0	34.16	53.97	-19.81	74	-39.84	218	227	Vert
5758.02	26.17	AD1	34.7	-35.5	7.5	0.1	32.97	53.97	-21	74	-41.03	45	146	Vert

PK - Peak detector

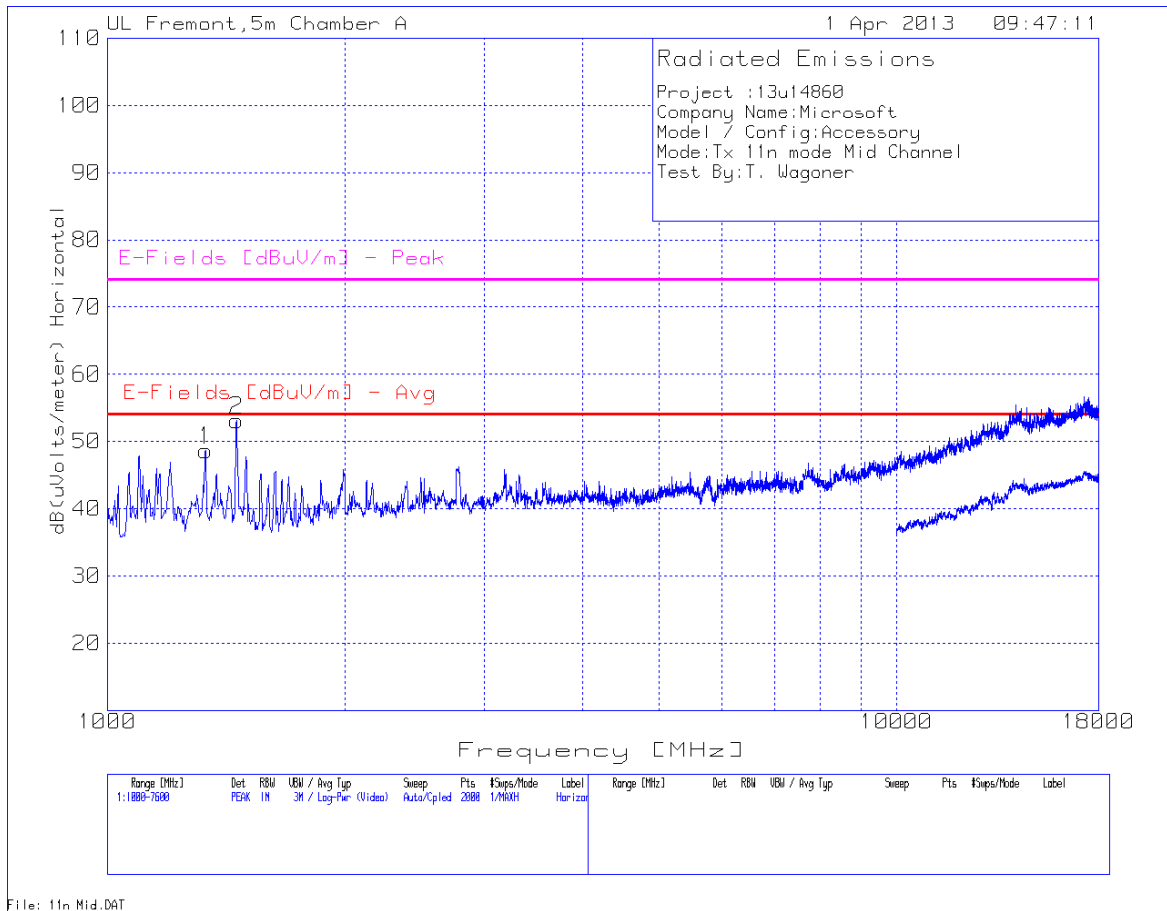
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

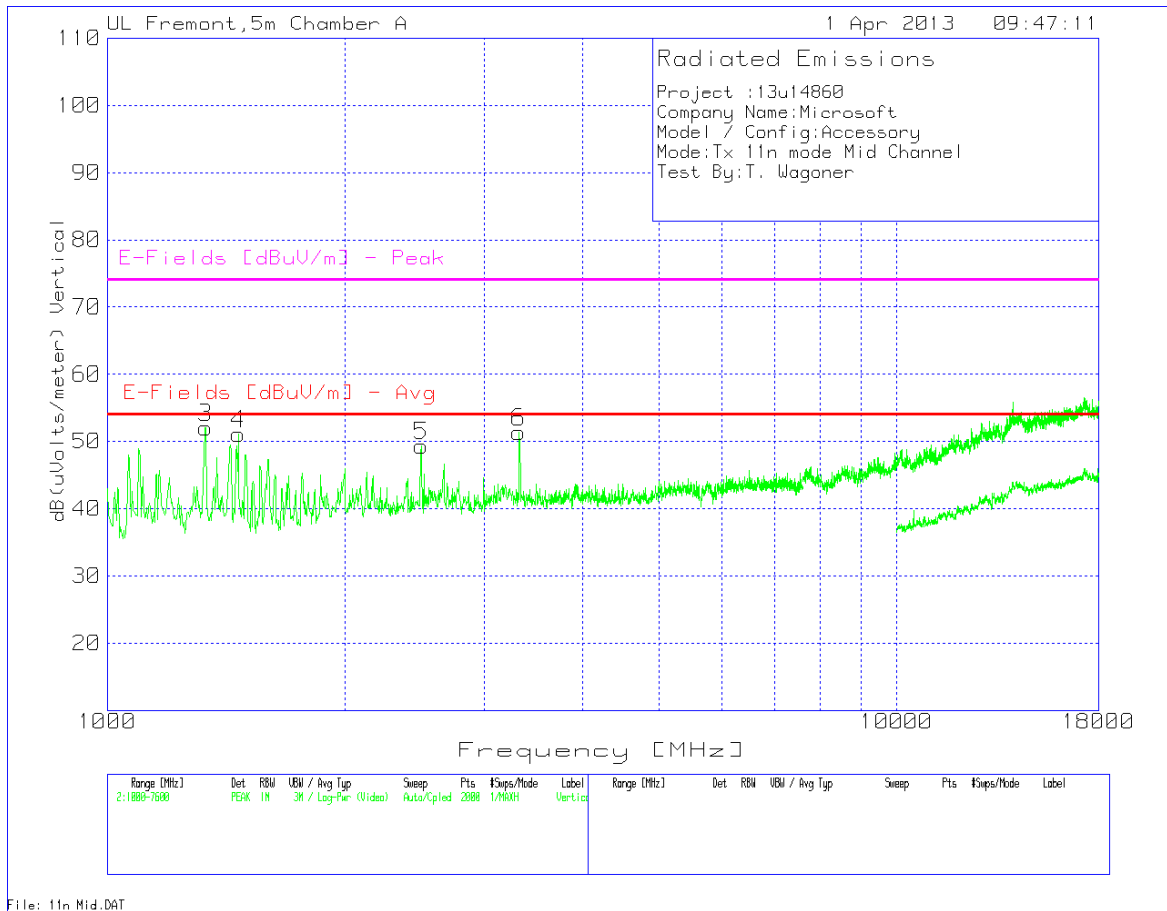
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.

2) There was no signal from EUT above the system noise floor up to 40 GHz.

Mid Channel, Horizontal



Mid Channel, Vertical



Mid Channel, Data

Project :	13u14860														
Company Name:	Microsoft														
Model / Config:	Accessory														
Mode:	Tx 11n mode Mid Channel														
Test By:	T. Wagoner														

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uV/s/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1333.133	53.33	PK	30.1	-38.1	3.3	0	48.63	53.97	-5.34	74	-25.37	200	Horz
2	1458.471	58.16	PK	29.3	-37.8	3.5	0	53.16	53.97	-0.81	74	-20.84	200	Horz
3	1333.133	56.79	PK	30.1	-38.1	3.3	0	52.09	53.97	-1.88	74	-21.91	100	Vert
4	1465.067	56.16	PK	29.2	-37.8	3.5	0	51.06	53.97	-2.91	74	-22.94	100	Vert
5	2497.451	49.01	PK	32.6	-36.8	4.5	0.1	49.41	53.97	-4.56	74	-24.59	100	Vert
6	3325.337	49.63	PK	32.9	-36.5	5.4	0	51.43	53.97	-2.54	74	-22.57	200	Vert

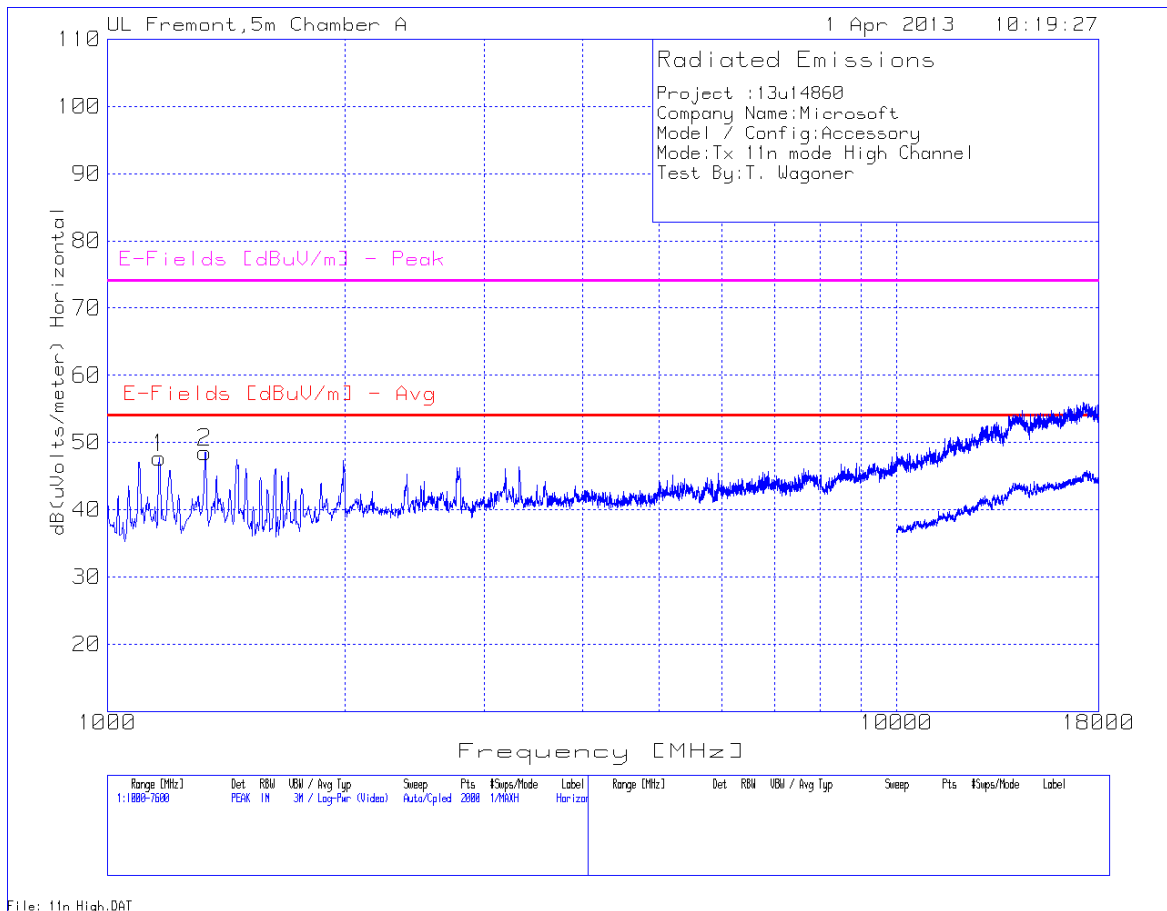
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uV/s/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1464.91	36.49	AD1	29.2	-37.8	3.5	0	31.39	53.97	-22.58	74	-42.61	272	135	Horz
1331.85	42.69	AD1	30.1	-38.1	3.3	0	37.99	53.97	-15.98	74	-36.01	253	151	Vert
1464.41	40.31	AD1	29.2	-37.8	3.5	0	35.21	53.97	-18.76	74	-38.79	191	146	Vert
2496.75	32.77	AD1	32.6	-36.8	4.5	0.1	33.17	53.97	-20.8	74	-40.83	260	142	Vert
3327.9	31.81	AD1	32.9	-36.5	5.4	0	33.61	53.97	-20.36	74	-40.39	13	272	Vert

PK - Peak detector
 AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

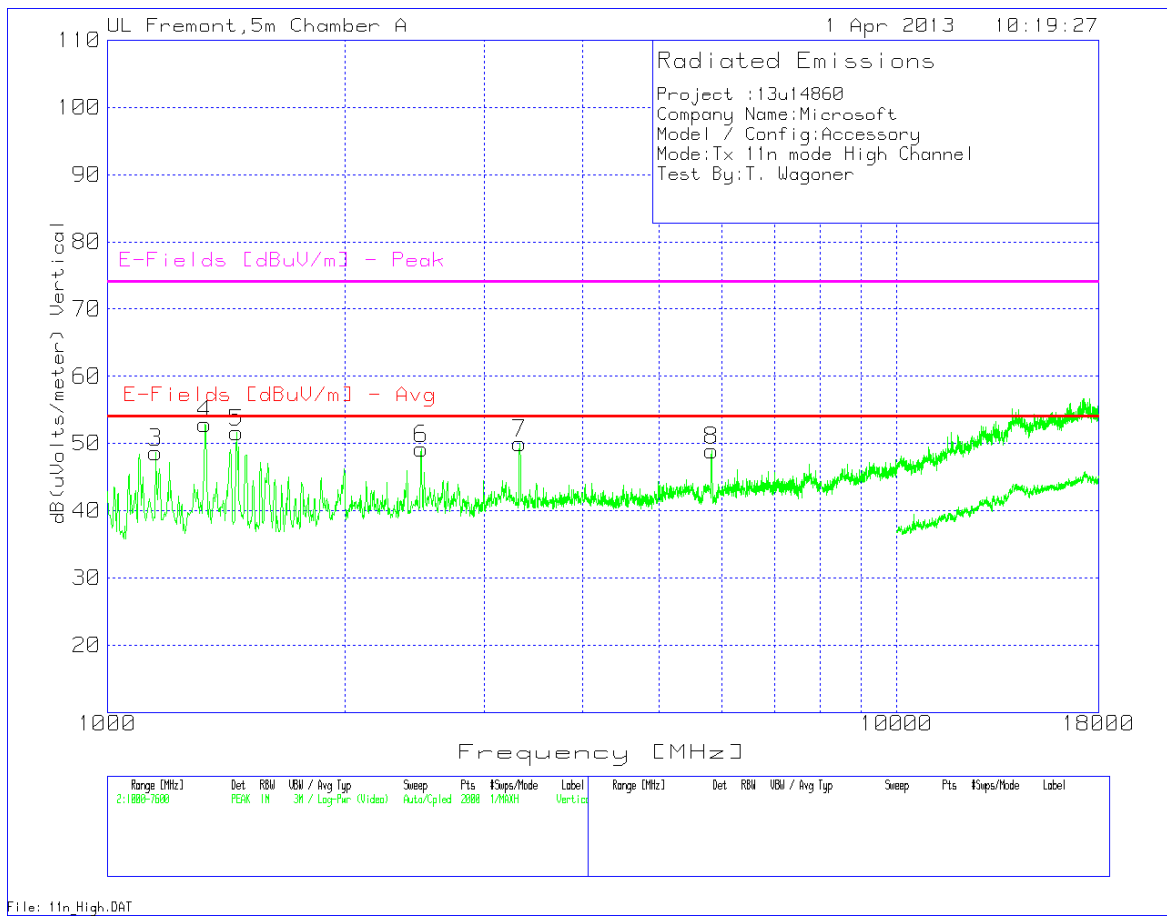
Notes:

- 1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.
- 2) There was no signal from EUT above the system noise floor up to 40 GHz.

High Channel, Horizontal



High Channel, Vertical



High Channel, Data

Project :	13u14860														
Company Name:	Microsoft														
Model / Config:	Accessory														
Mode:	Tx 11n mode High Channel														
Test By:	T. Wagoner														

Marker No.	Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1164.918	54.18	PK	28.9	-38.5	3.2	0	47.78	53.97	-6.19	74	-26.22	100	Horz
2	1329.835	53.18	PK	30.2	-38.1	3.3	0	48.58	53.97	-5.39	74	-25.42	200	Horz
3	1151.724	55.3	PK	28.7	-38.5	3.2	0	48.7	53.97	-5.27	74	-25.3	100	Vert
4	1329.835	57.48	PK	30.2	-38.1	3.3	0	52.88	53.97	-1.09	74	-21.12	100	Vert
5	1458.471	56.59	PK	29.3	-37.8	3.5	0	51.59	53.97	-2.38	74	-22.41	100	Vert
6	2497.451	48.78	PK	32.6	-36.8	4.5	0.1	49.18	53.97	-4.79	74	-24.82	100	Vert
7	3331.934	48.17	PK	32.9	-36.5	5.4	0	49.97	53.97	-4	74	-24.03	200	Vert
8	5828.786	41.85	PK	34.9	-35.5	7.6	0.1	48.95	53.97	-5.02	74	-25.05	200	Vert
Test Frequency	Meter Reading	Detector	T136 Ant Factor [dB/m]	T144 Preamp Gain [dB]	Cable Factor [dB]	T159 BRF [dB]	dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1331.82	47.54	AD1	30.1	-38.1	3.3	0	42.84	53.97	-11.13	74	-31.16	252	122	Vert
1464.77	40.27	AD1	29.2	-37.8	3.5	0	35.17	53.97	-18.8	74	-38.83	249	109	Vert
2496.53	33.49	AD1	32.6	-36.8	4.5	0.1	33.89	53.97	-20.08	74	-40.11	166	135	Vert
3333.67	44.38	AD1	32.9	-36.5	5.4	0	46.18	53.97	-7.79	74	-27.82	166	135	Vert

PK - Peak detector

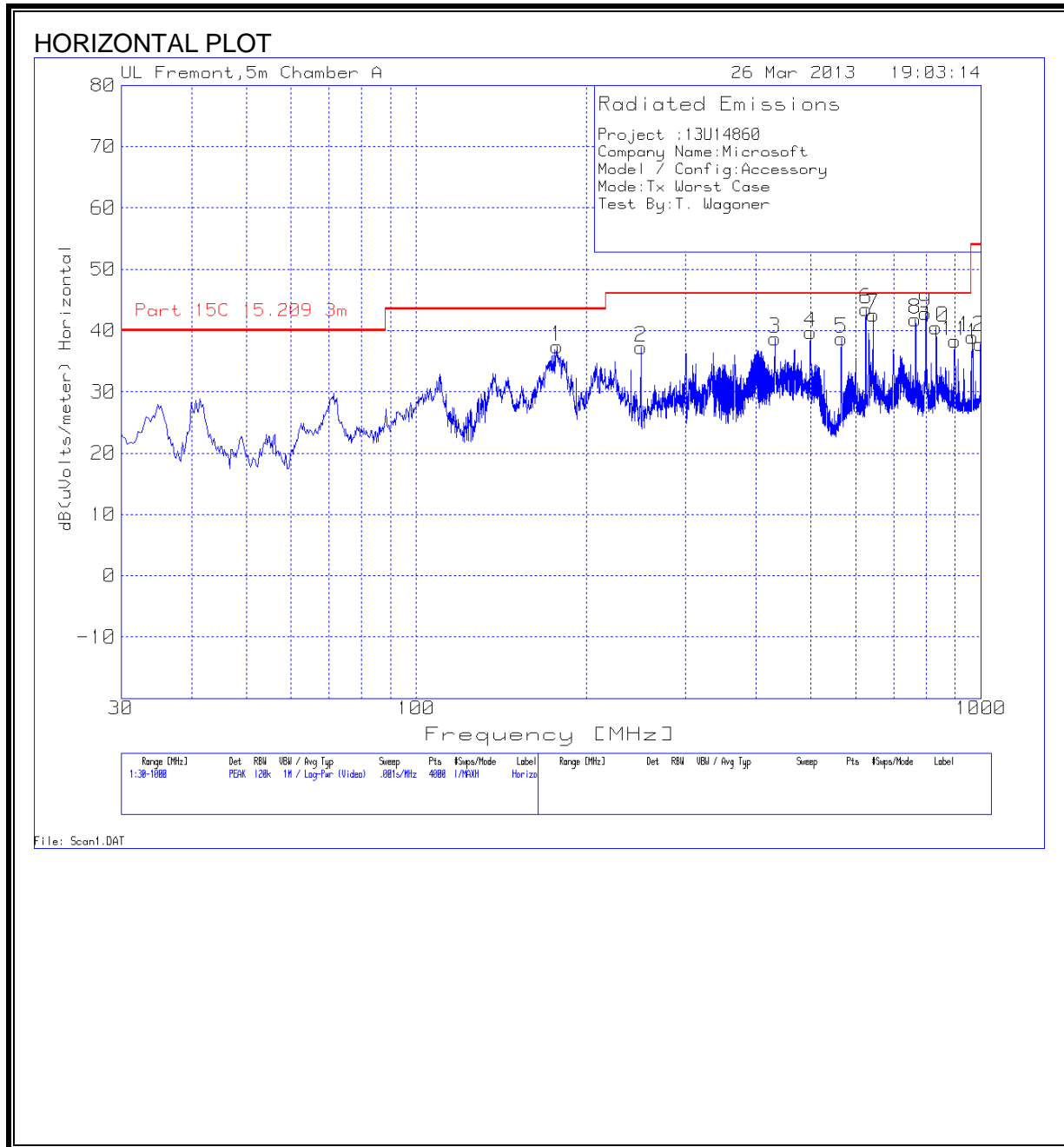
AD1 - KDB 789033 v01r02 G)j Method: AD Primary Power Average

Notes:

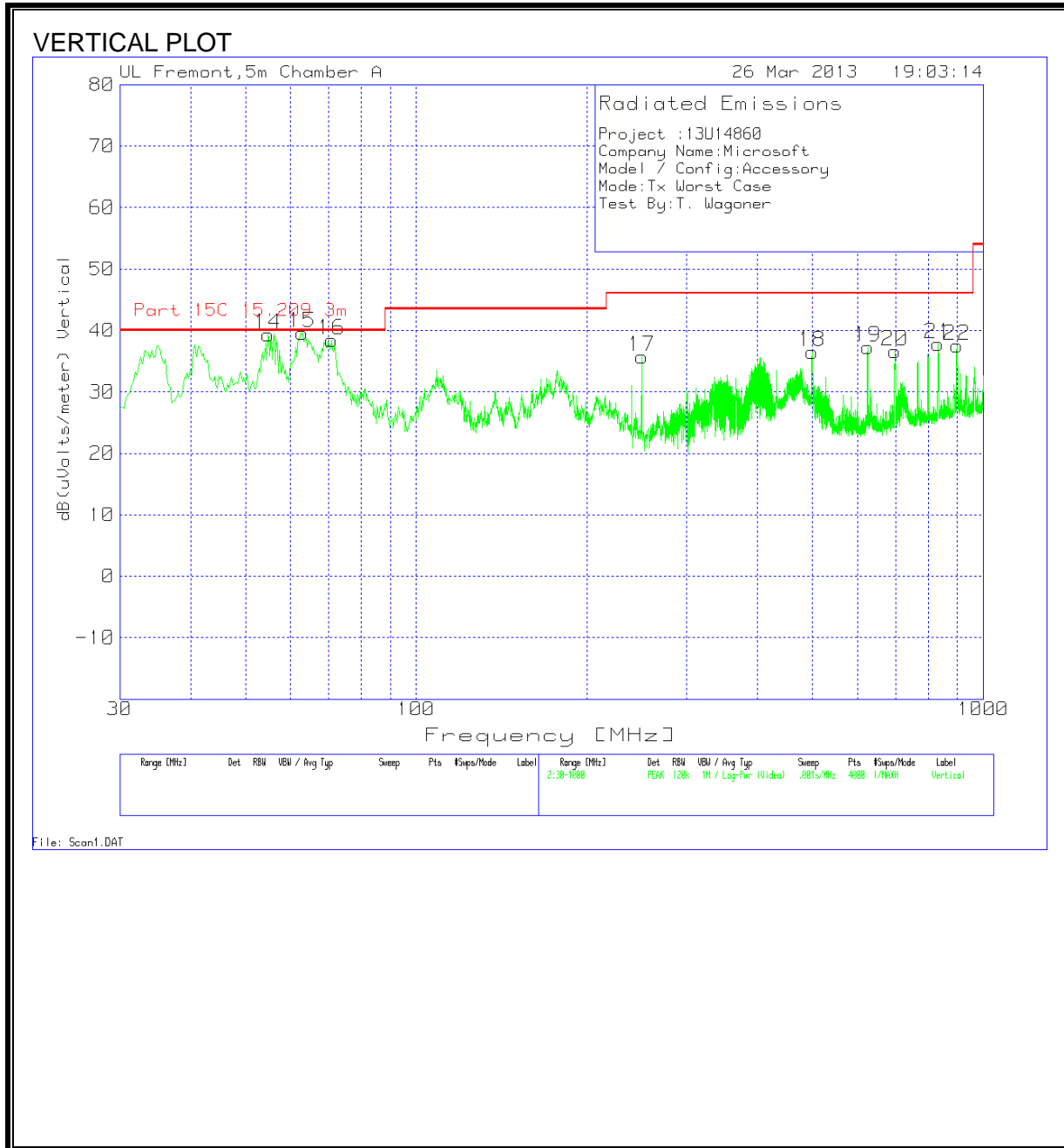
- 1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but are below 68dBuV/m.
- 2) There was no signal from EUT above the system noise floor up to 40 GHz.

10.1. WORST-CASE BELOW 1 GHz

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



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



DATA

Project :	13U14860									
Company Name:	Microsoft									
Model / Config:	Accessory									
Mode:	Tx Worst Case									
Test By:	T. Wagoner									

Marker No.	Test Frequency	Meter Reading	Detector	T185 Antenna Factor	T64 preamp/cable loss loop	dB(uVolts /meter)	Part 15C 15.209 3m	Margin	Height [cm]	Polarity
1	177.3295	52.84	PK	11	-26.4	37.44	43.5	-6.06	200	Horz
2	249.7827	51.93	PK	11.5	-26.1	37.33	46	-8.67	100	Horz
3	432.006	47.35	PK	16.5	-25.2	38.65	46	-7.35	100	Horz
4	499.1282	46.28	PK	17.9	-24.5	39.68	46	-6.32	100	Horz
5	566.2503	44.26	PK	18.5	-24	38.76	46	-7.24	100	Horz
6	625.1337	47.36	PK	19.3	-23.2	43.46	46	-2.54	100	Horz
7	643.5498	45.97	PK	19.8	-23.2	42.57	46	-3.43	100	Horz
8	765.9206	44.17	PK	20.8	-23.2	41.77	46	-4.23	100	Horz
9	798.8758	44.69	PK	21	-22.9	42.79	46	-3.21	100	Horz
10	832.5581	41.75	PK	21.7	-22.9	40.55	46	-5.45	100	Horz
11	898.9533	39.06	PK	22.1	-22.9	38.26	46	-7.74	100	Horz
12	965.5908	39.04	PK	22.8	-22.9	38.94	54	-15.06	100	Horz
13	998.3038	37.47	PK	23.2	-22.9	37.77	54	-16.23	100	Horz
14	54.7165	59.8	PK	6.9	-27.4	39.3	40	-0.7	200	Vert
15	62.9553	59.48	PK	7.4	-27.3	39.58	40	-0.42	200	Vert
16	70.9518	57.53	PK	8.1	-27.2	38.43	40	-1.57	200	Vert
17	249.7827	50.35	PK	11.5	-26.1	35.75	46	-10.25	200	Vert
18	499.1282	43.14	PK	17.9	-24.5	36.54	46	-9.46	200	Vert
19	625.1337	41.21	PK	19.3	-23.2	37.31	46	-8.69	200	Vert
20	699.0407	39.59	PK	20.1	-23.1	36.59	46	-9.41	200	Vert
21	832.8004	39.05	PK	21.7	-22.9	37.85	46	-8.15	200	Vert
22	898.4686	38.28	PK	22.1	-22.8	37.58	46	-8.42	200	Vert
57.423	56.84	QP	6.9	-27.4	36.34	40	-3.66	141	101	Vert
61.968	57.73	QP	7.4	-27.3	37.83	40	-2.17	128	104	Vert
70.972	54.61	QP	8.1	-27.2	35.51	40	-4.49	138	102	Vert

PK - Peak detector

QP - Quasi-Peak detector

Av - Average detector

11. 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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

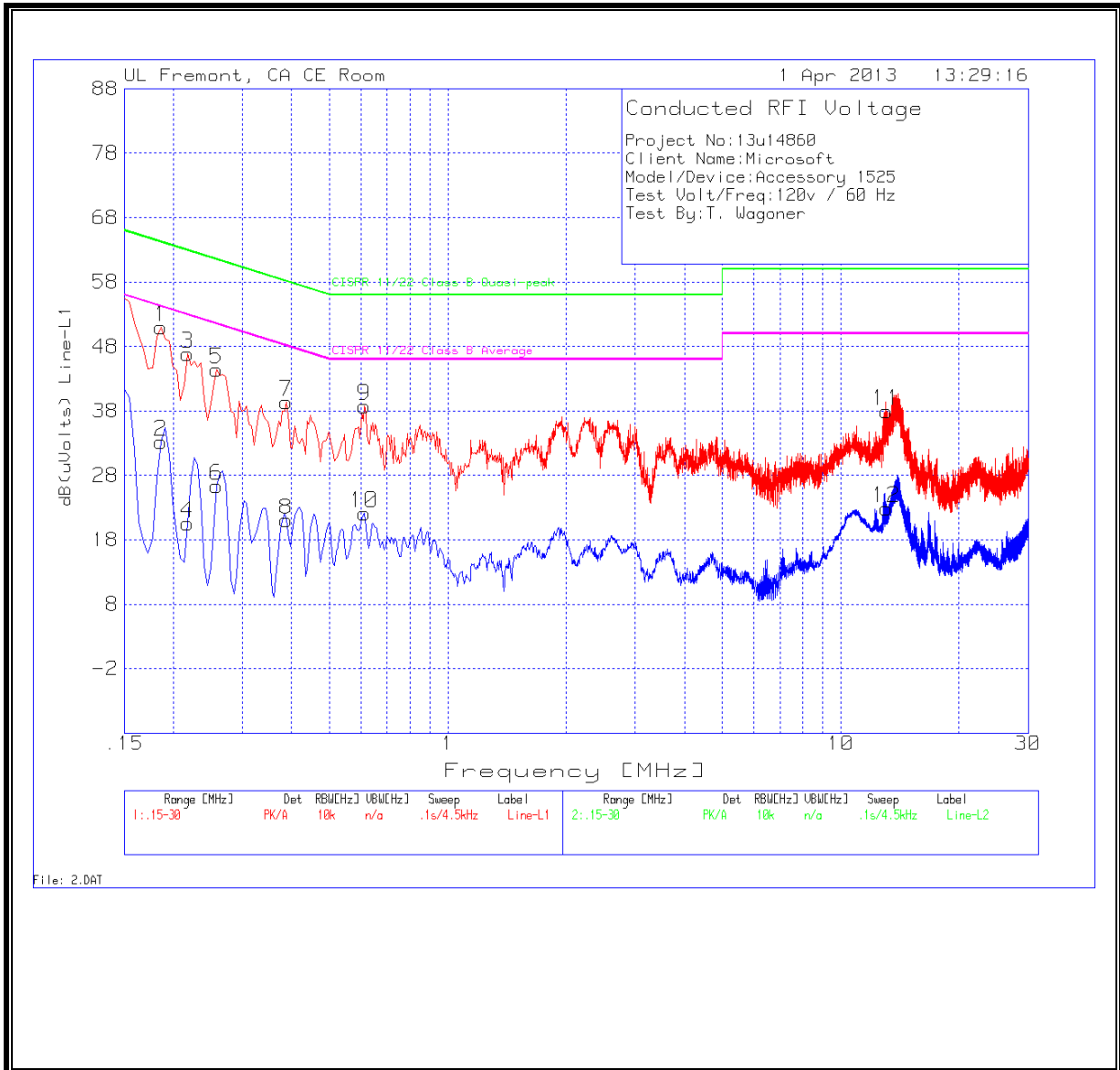
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

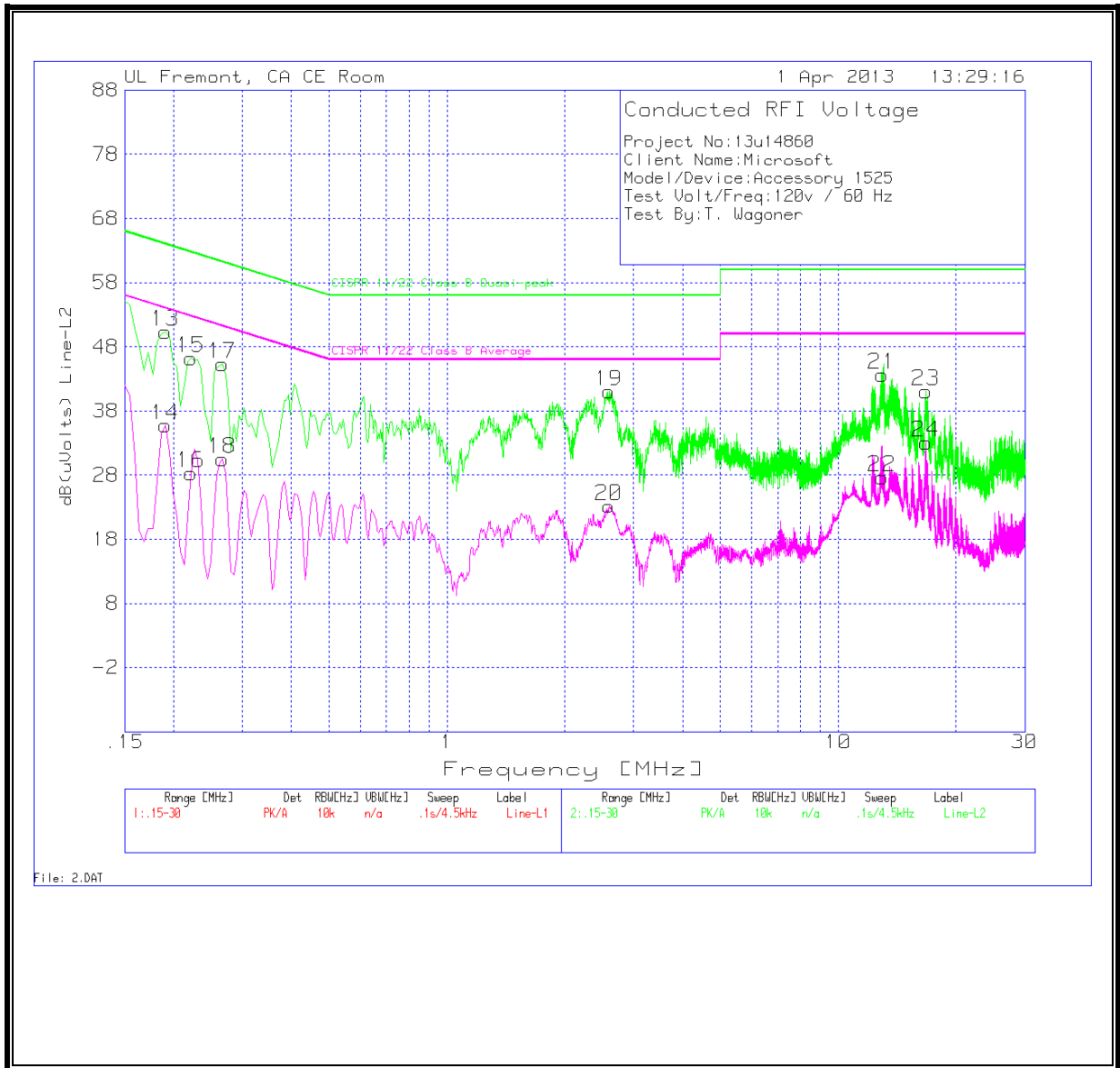
RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



LINE 2 RESULTS



DATA

Project No:		13u14860								
Client Name:		Microsoft								
Model/Device:		Accessory 1525								
Test Volt/Freq:		120v / 60 Hz								
Test By:		T. Wagoner								
Line-L1 .15 - 30MHz										
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin	
0.186	50.85	PK	0.1	0	50.95	64.2	-13.25	-	-	
0.186	33.06	Av	0.1	0	33.16	-	-	54.2	-21.04	
0.2175	46.75	PK	0.1	0	46.85	62.9	-16.05	-	-	
0.2175	20.48	Av	0.1	0	20.58	-	-	52.9	-32.32	
0.258	44.34	PK	0.1	0	44.44	61.5	-17.06	-	-	
0.258	26.29	Av	0.1	0	26.39	-	-	51.5	-25.11	
0.3885	39.32	PK	0.1	0	39.42	58.1	-18.68	-	-	
0.3885	20.93	Av	0.1	0	21.03	-	-	48.1	-27.07	
0.6135	38.63	PK	0.1	0	38.73	56	-17.27	-	-	
0.6135	22.03	Av	0.1	0	22.13	-	-	46	-23.87	
13.0515	37.59	PK	0.2	0.2	37.99	60	-22.01	-	-	
13.0515	22.49	Av	0.2	0.2	22.89	-	-	50	-27.11	
Line-L2 .15 - 30MHz										
Test Frequency	Meter Reading	Detector	T24 IL L2.TXT (dB)	LC Cables 2&3.TXT (dB)	dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin	CISPR 11/22 Class B Average	Margin	
0.1905	50.24	PK	0.1	0	50.34	64	-13.66	-	-	
0.1905	35.62	Av	0.1	0	35.72	-	-	54	-18.28	
0.222	46.17	PK	0.1	0	46.27	62.7	-16.43	-	-	
0.222	28.21	Av	0.1	0	28.31	-	-	52.7	-24.39	
0.267	45.25	PK	0.1	0	45.35	61.2	-15.85	-	-	
0.267	30.44	Av	0.1	0	30.54	-	-	51.2	-20.66	
2.5935	40.81	PK	0.1	0.1	41.01	56	-14.99	-	-	
2.5935	23.01	Av	0.1	0.1	23.21	-	-	46	-22.79	
12.9435	43.23	PK	0.2	0.2	43.63	60	-16.37	-	-	
12.9435	27.21	Av	0.2	0.2	27.61	-	-	50	-22.39	
16.7595	40.63	PK	0.2	0.2	41.03	60	-18.97	-	-	
16.7595	32.67	Av	0.2	0.2	33.07	-	-	50	-16.93	
PK - Peak detector										
Av - Average detector										

12. MAXIMUM PERMISSIBLE RF EXPOSURE

12.1. 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.

12.2. 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/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{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/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

12.3. EQUATIONS

POWER DENSITY

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * \text{D}^2)$$

Where

S = Power density in mW/cm²
EIRP = Equivalent Isotropic Radiated Power in mW
D = Separation distance in cm

Power density in units of mW/cm² is converted to units of W/m² by multiplying by 10.

DISTANCE

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

Where

D = Separation distance in cm
EIRP = Equivalent Isotropic Radiated Power in mW
S = Power density in mW/cm²

SOURCE-BASED DUTY CYCLE

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

Where

DC = Duty Cycle in %, as applicable
EIRP = Equivalent Isotropic Radiated Power in W

MIMO AND COLOCATED TRANSMITTERS (IDENTICAL LIMIT FOR ALL TRANSMITTERS)

For multiple chain devices, and 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 EIRP (in linear units) of each transmitter.

$$\text{Total EIRP} = (\text{EIRP1}) + (\text{EIRP2}) + \dots + (\text{EIRPn})$$

where

EIRPx = Source-based time-averaged EIRP of chain x or transmitter x

The total EIRP is then used to calculate the Power Density or the Distance as applicable.

MIMO AND COLOCATED TRANSMITTERS

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply:

The Power Density at the specified separation distance is calculated for each transmitter chain or transmitter.

The fraction of the exposure limit is calculated for each chain or transmitter as (Power Density of chain or transmitter) / (Limit applicable to that chain or transmitter).

The fractions are summed.

Compliance is established if the sum of the fractions is less than or equal to one.

12.4. LIMITS AND IC EXEMPTION

VARIABLE LIMITS

For mobile radio equipment operating in the cellular phone band, the lowest power density limit is calculated using the lowest frequency:

$$824 \text{ MHz} / 1500 = 0.55 \text{ mW/cm}^2 \text{ (FCC)}$$

$$824 \text{ MHz} / 150 = 5.5 \text{ W/m}^2 \text{ (IC).}$$

FIXED LIMITS

For operation in the PCS band, the 2.4 GHz band and the 5 GHz bands:

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

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

INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

12.5. RF EXPOSURE RESULTS

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.

Calculation for the Accessory Radio

Single Chain and non-colocated transmitters								
Band	Mode	Separatio Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (mW)	FCC Power Density (mW/cm ²)	IC Density (W/m ²)
2.4 GHz	WLAN	20	11.50	2.20	100.0	23.4	0.005	0.05
5 GHz	WLAN	20	11.50	3.14	100.0	29.1	0.006	0.06

Worst Case calculation of both Radios

Multiple chain or colocated transmitters									
Band	Mode	Chain for MIMO	Separatio Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (mW)	FCC Power Density (mW/cm ²)	IC Density (W/m ²)
5 GHz	Accessory WLAN	1		11.50	3.14	100.0	29.1		
2.4 GHz	Network WLAN	2		17.50	3.38	100.0	122.5		
2.4 GHz	Network WLAN	3		17.50	4.61	100.0	162.6		
Combined			20				331.2	0.066	0.66

Note: antenna gains in the tables above are worst-case gains for individual chains

The device operates above 1.5 GHz with a maximum EIRP less than or equal to 5 Watts as a mobile device with a minimum separation distance of 20 cm, therefore it is exempt from routine RF Exposure Evaluation under RSS-102.