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: 13U14860-5, Revision B

ISSUE DATE: JUNE 13, 2013

Prepared for
MICROSOFT CORPORATION
ONE MICROSOFT WAY
REDMOND WA 98052, U.S.A.

Prepared by
UL CCS
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	05/17/13	Initial Issue	T. LEE
A	06/12/13	Revise EUT name	S.KUWATANI
B	06/13/13	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 (RF);
01950291000065330548 (DFS)

DATE TESTED: February 14 to April 3, 2013 (RF) and May 16 to 17, 2013 (DFS)

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:

TIM LEE
WiSE PROGRAM MANAGER
UL CCS

Tested By:

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is 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)
5180 - 5240	802.11a	9.42	8.75
5180 - 5240	802.11n HT20	9.41	8.73

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an external patch antenna, with a maximum gain of 3.14 dBi at 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:

802.11a mode: 6 Mbps
802.11n HT20mode: MCS0

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

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

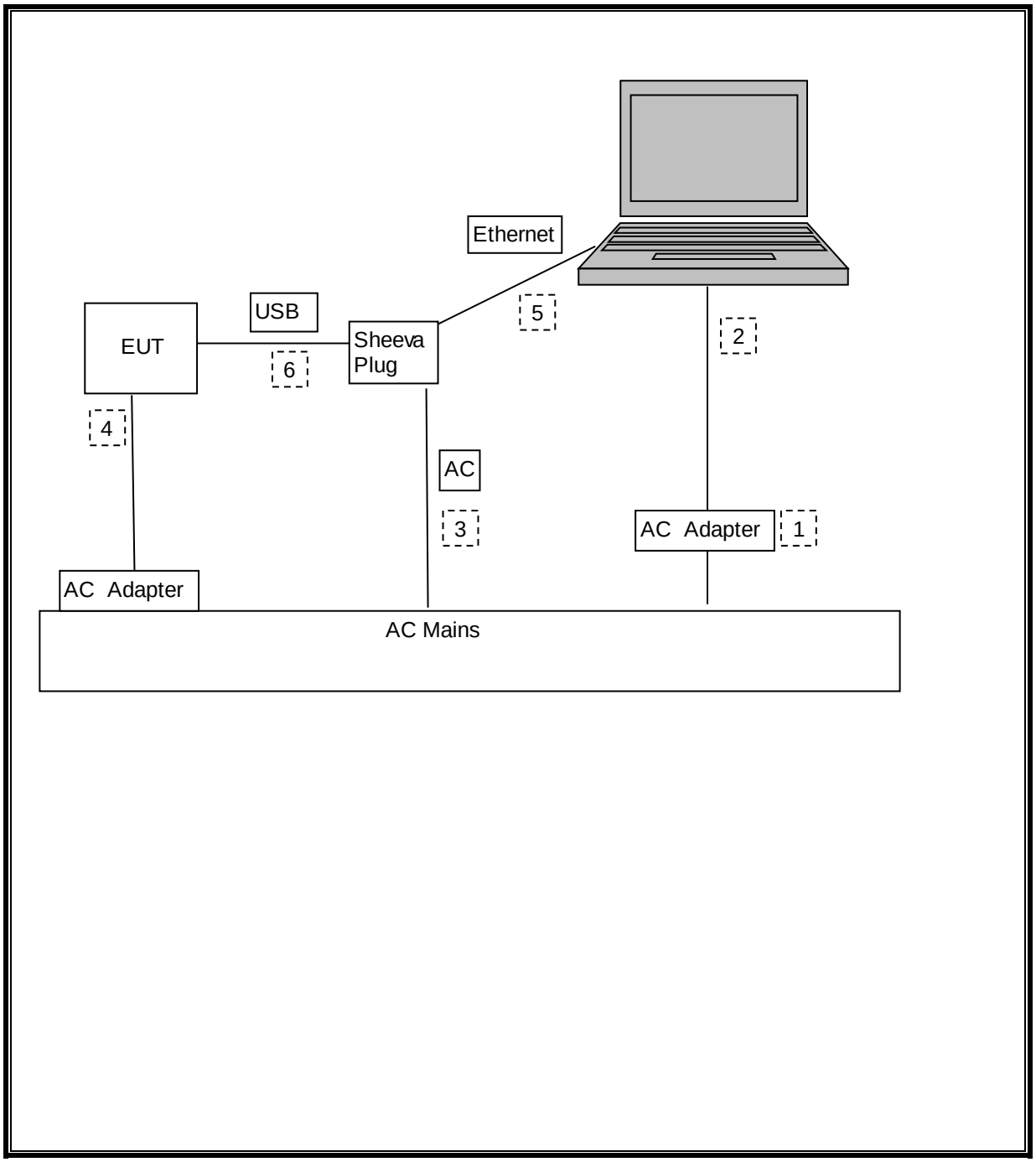
I/O CABLES

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.

SETUP DIAGRAM FOR TESTS



7. 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

8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

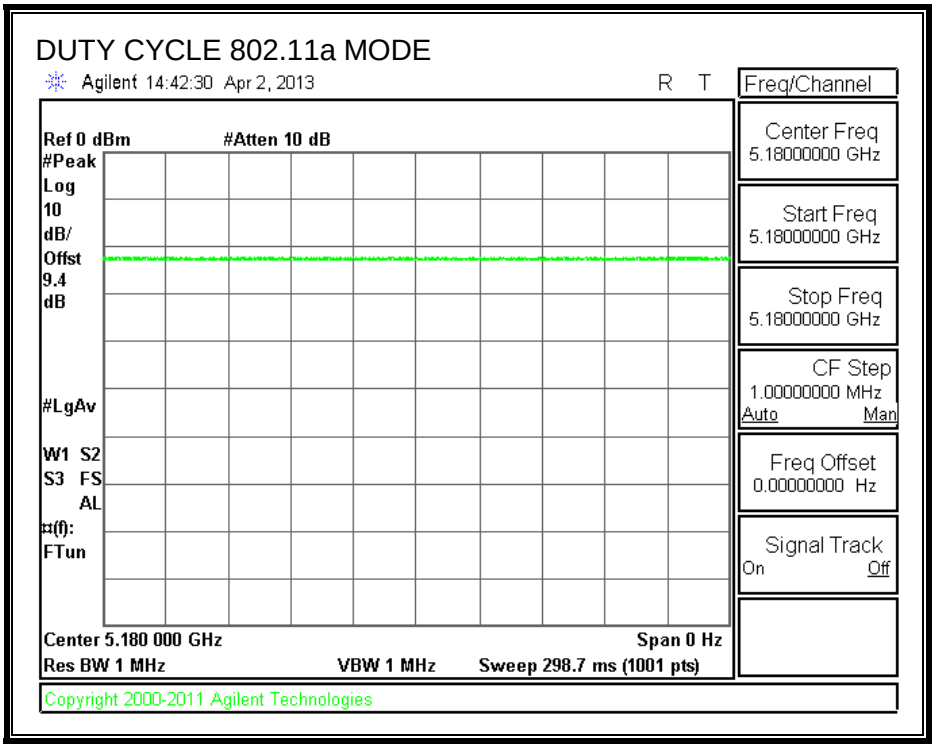
PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

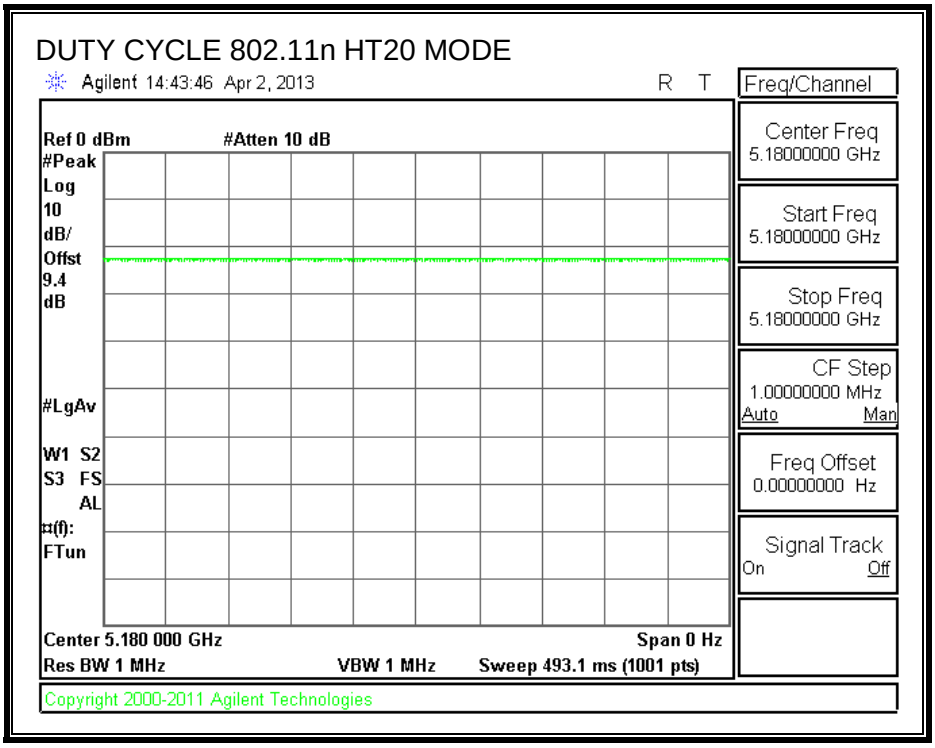
8.1.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11a 20 MHz	100.00	100	1.000	100.0%	0.00	0.010
802.11n HT20	100.00	100	1.000	100.0%	0.00	0.010

8.1.2. DUTY CYCLE PLOTS



DUTY CYCLE 802.11n HT20 MODE



8.1.3. MEASUREMENT METHOD FOR POWER AND PPSD

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

8.1.4. 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. 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.

10. ANTENNA PORT TEST RESULTS

10.1. 802.11a MODE IN THE 5.2 GHz BAND

10.1.1. 26 dB BANDWIDTH

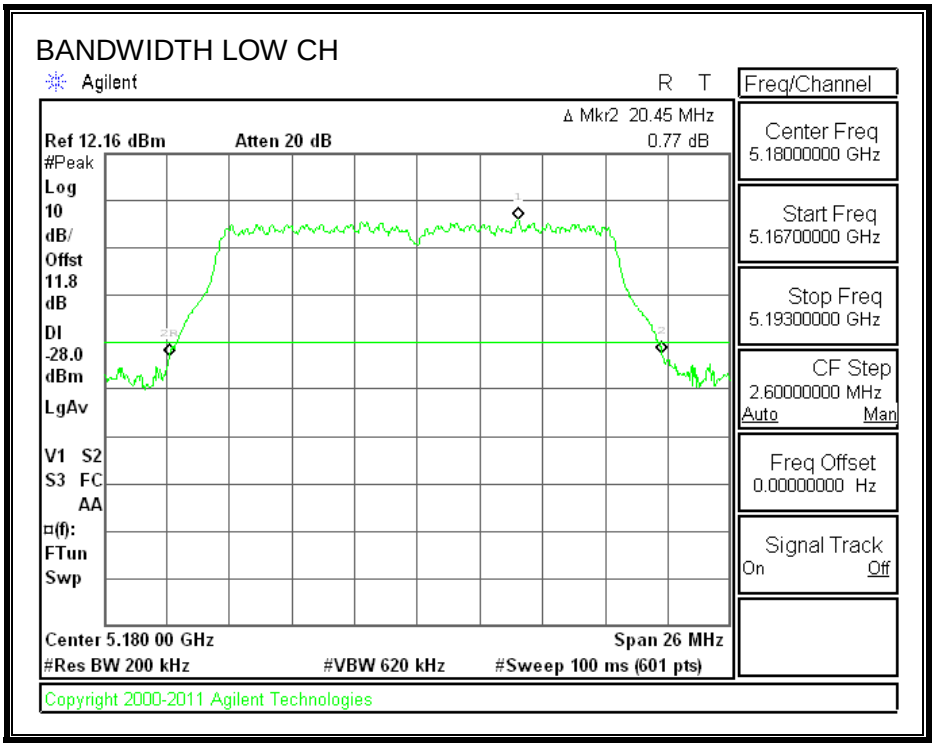
LIMITS

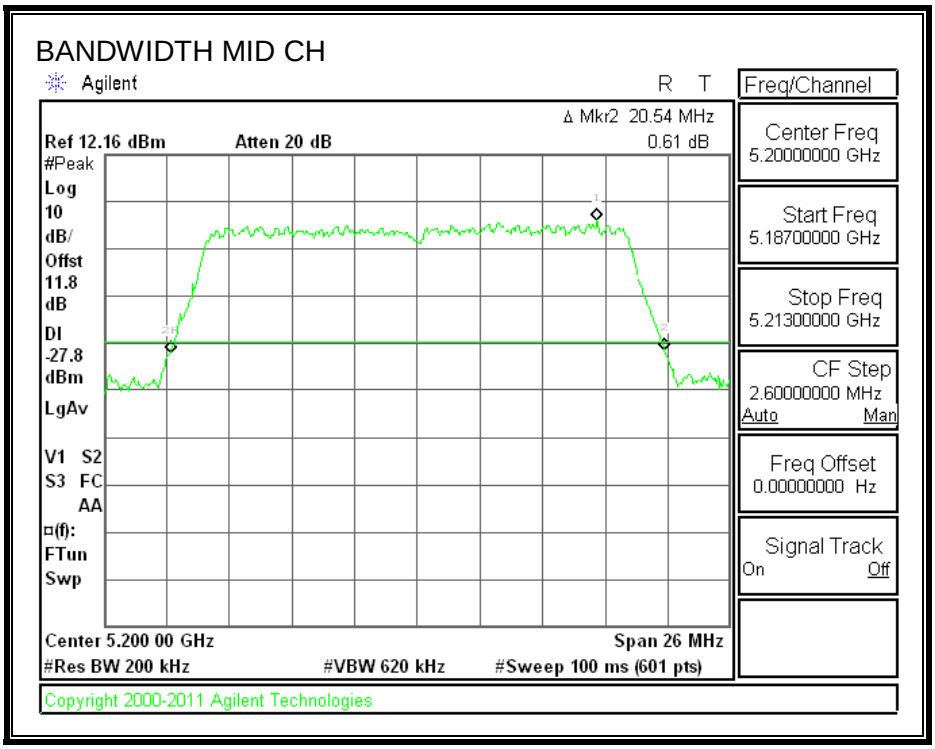
None; for reporting purposes only.

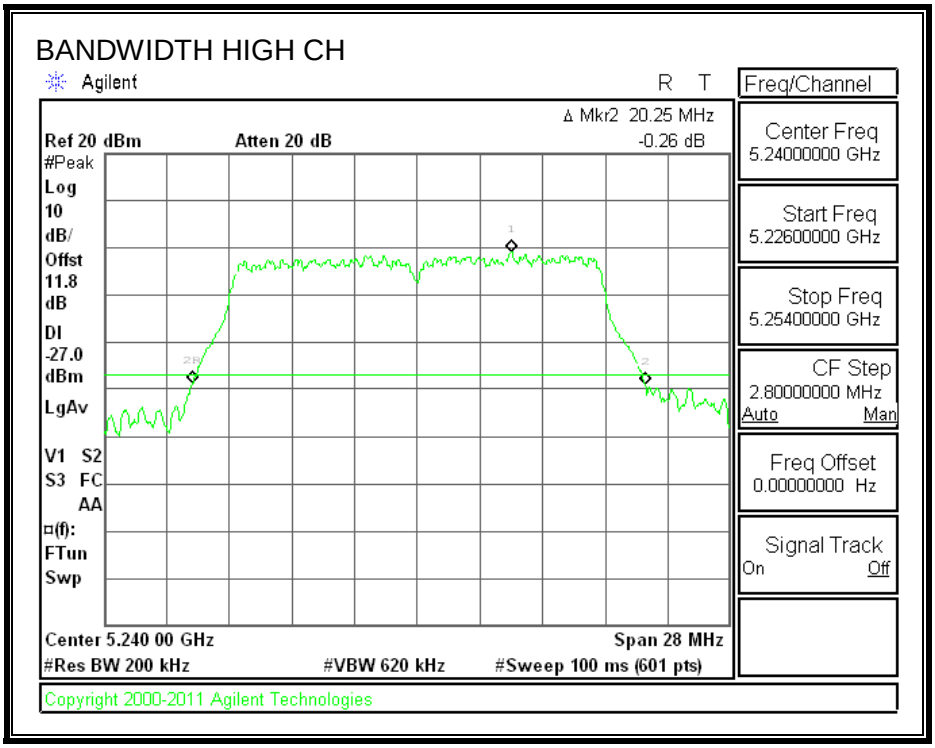
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	20.5
Mid	5200	20.5
High	5240	20.3

26 dB BANDWIDTH







10.1.2. 99% BANDWIDTH

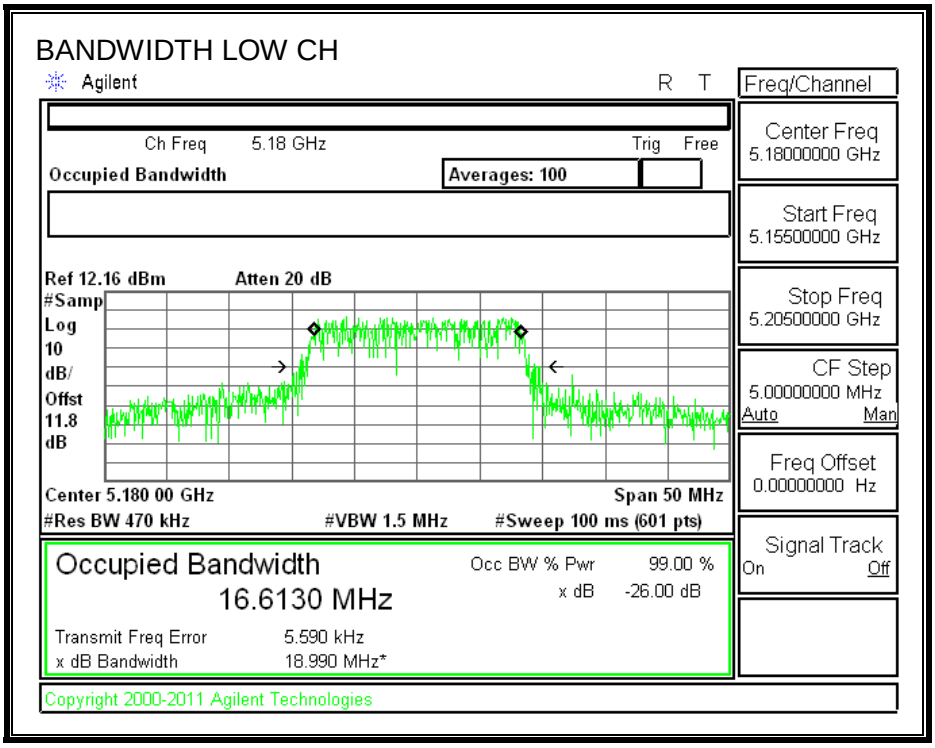
LIMITS

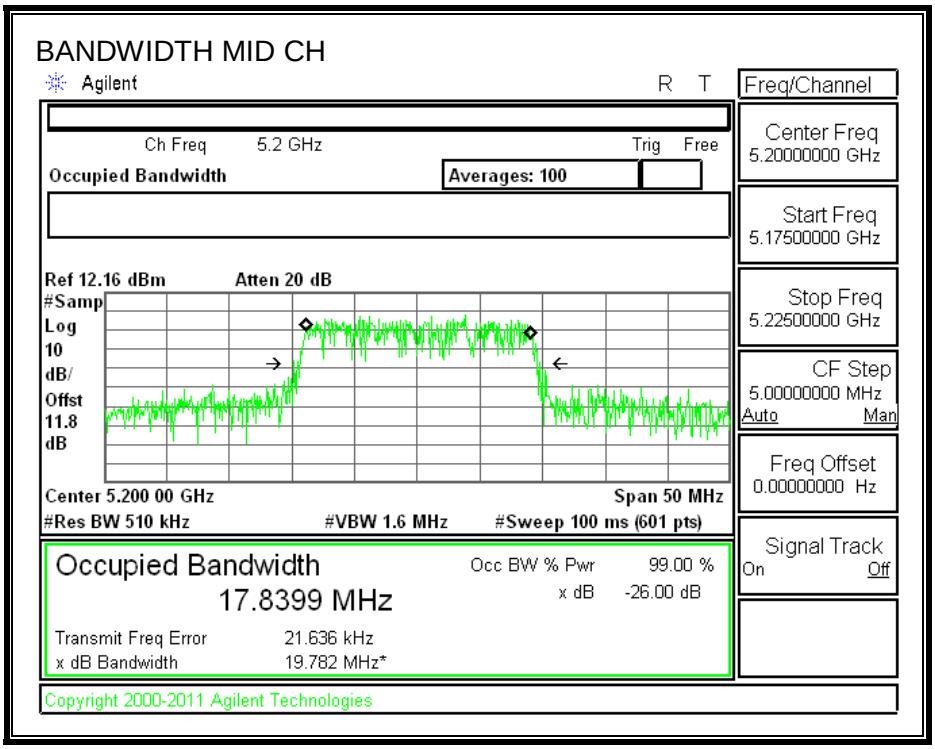
None; for reporting purposes only.

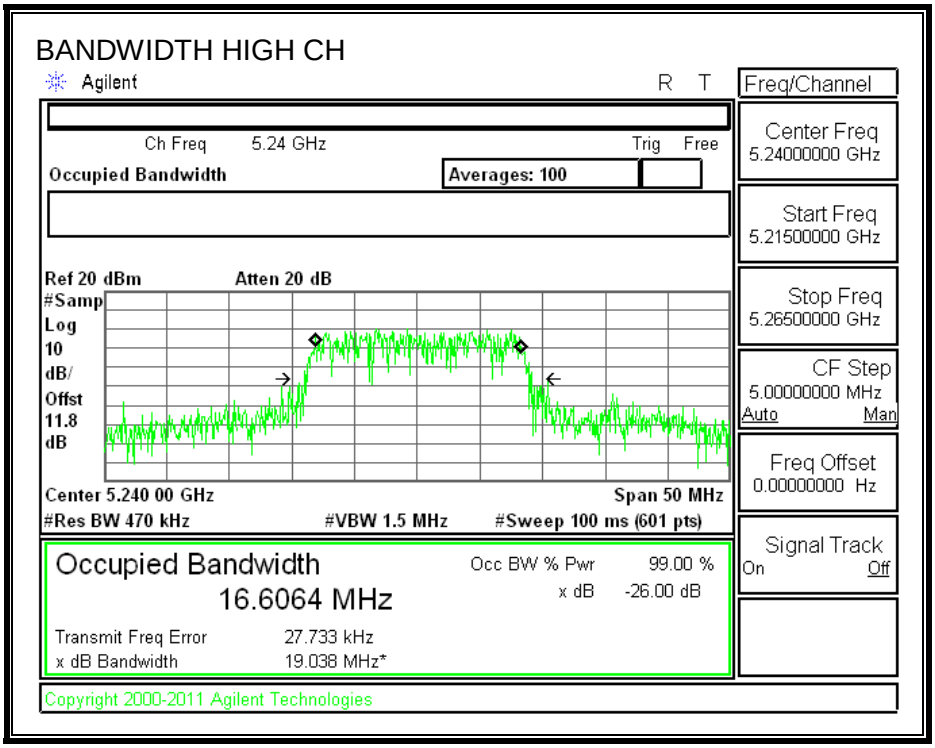
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5180	16.6
Mid	5200	17.8
High	5240	16.6

99% BANDWIDTH







10.1.3. 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	5180	9.12
Mid	5200	9.33
High	5240	9.90

10.1.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5180	20.5	16.6	3.14
Mid	5200	20.5	17.8	3.14
High	5240	20.3	16.6	3.14

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	17.00	22.20	19.06	17.00	4.00	10.00	4.00
Mid	5200	17.00	22.51	19.37	17.00	4.00	10.00	4.00
High	5240	17.00	22.20	19.06	17.00	4.00	10.00	4.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

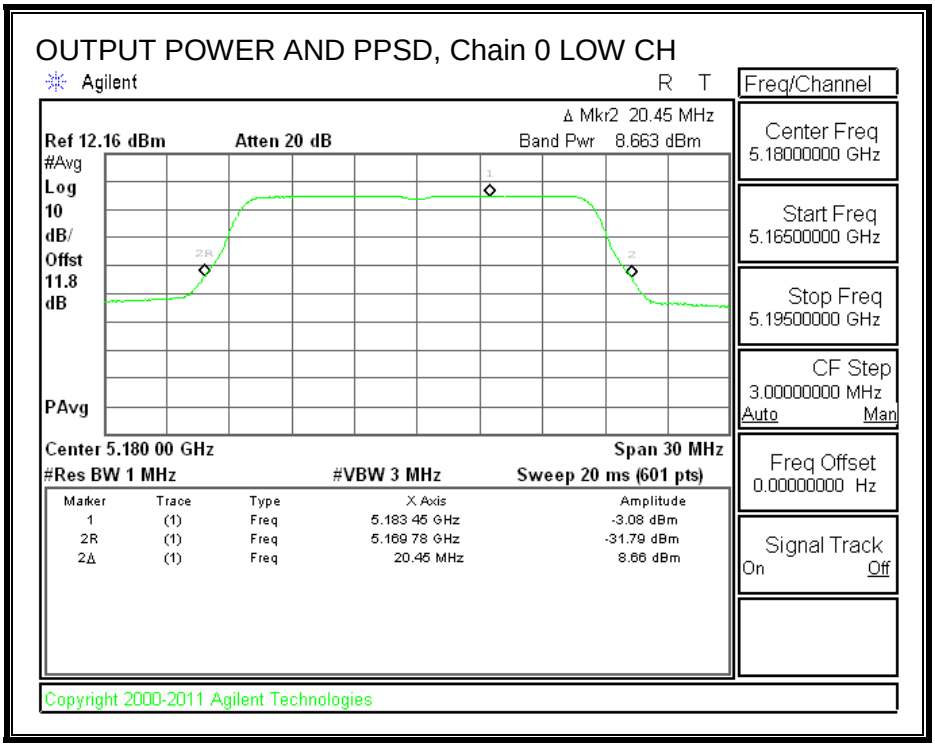
Output Power Results

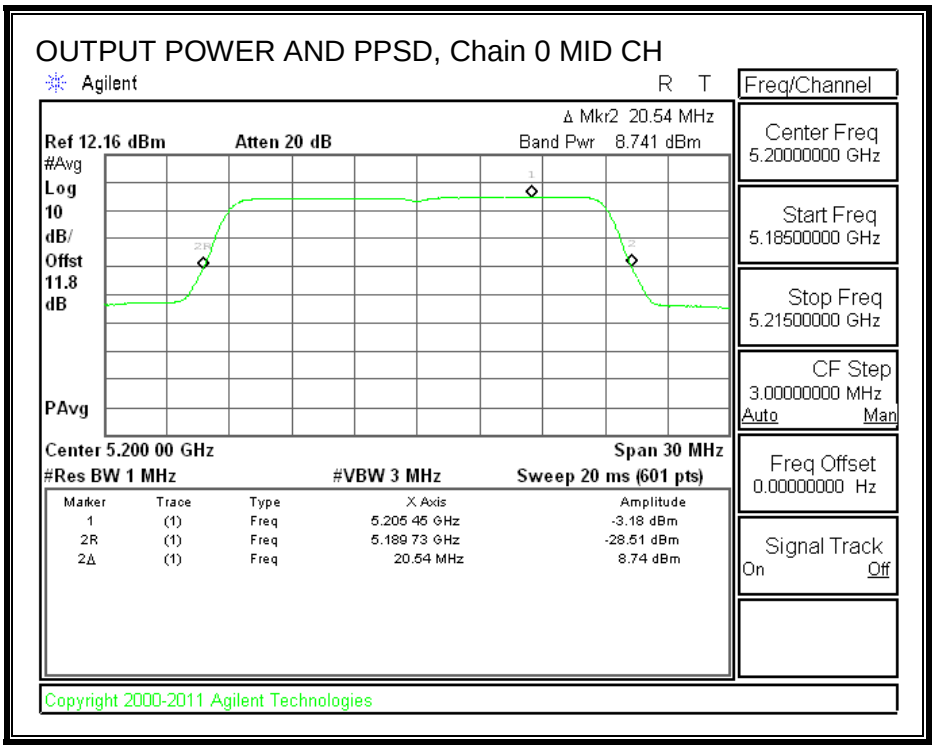
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	8.66	8.66	17.00	-8.34
Mid	5200	8.74	8.74	17.00	-8.26
High	5240	9.42	9.42	17.00	-7.59

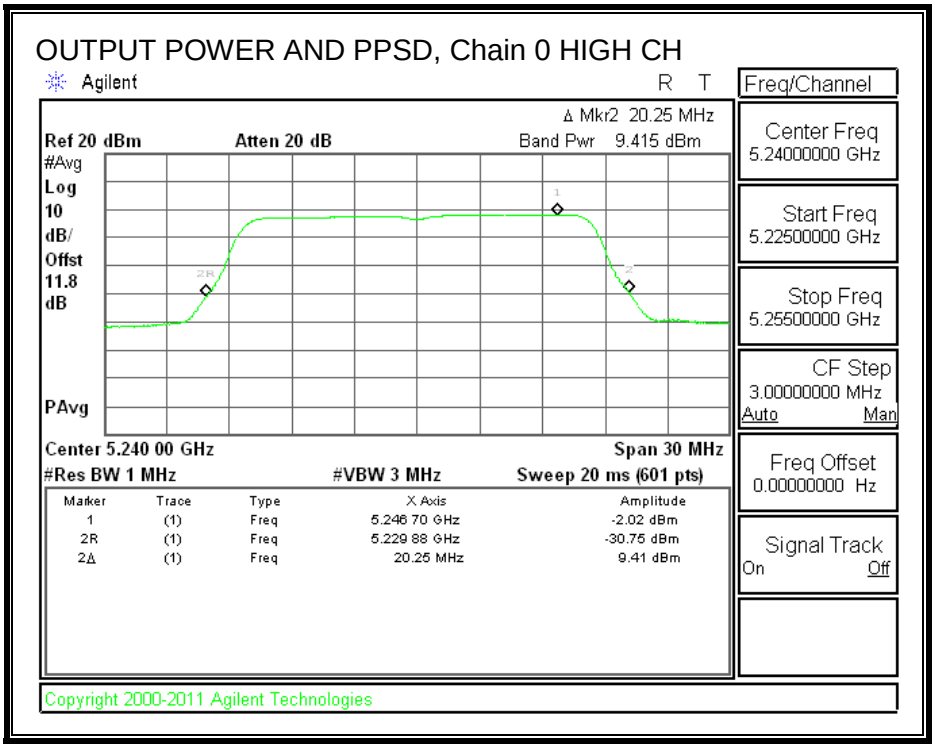
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-3.08	-3.08	4.00	-7.08
Mid	5200	-3.18	-3.18	4.00	-7.18
High	5240	-2.02	-2.02	4.00	-6.02

OUTPUT POWER AND PPSD, Chain 0







10.1.5. PEAK EXCURSION

LIMITS

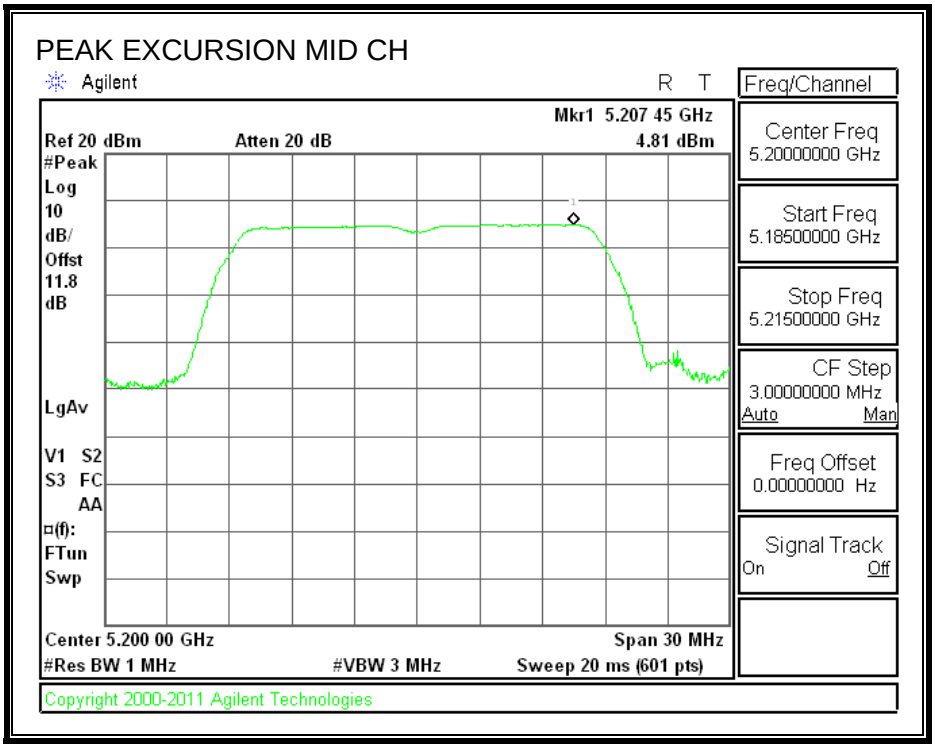
FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

RESULTS

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	4.81	-3.18	0.00	7.99	13	-5.01

PEAK EXCURSION



10.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

10.2.1. 26 dB BANDWIDTH

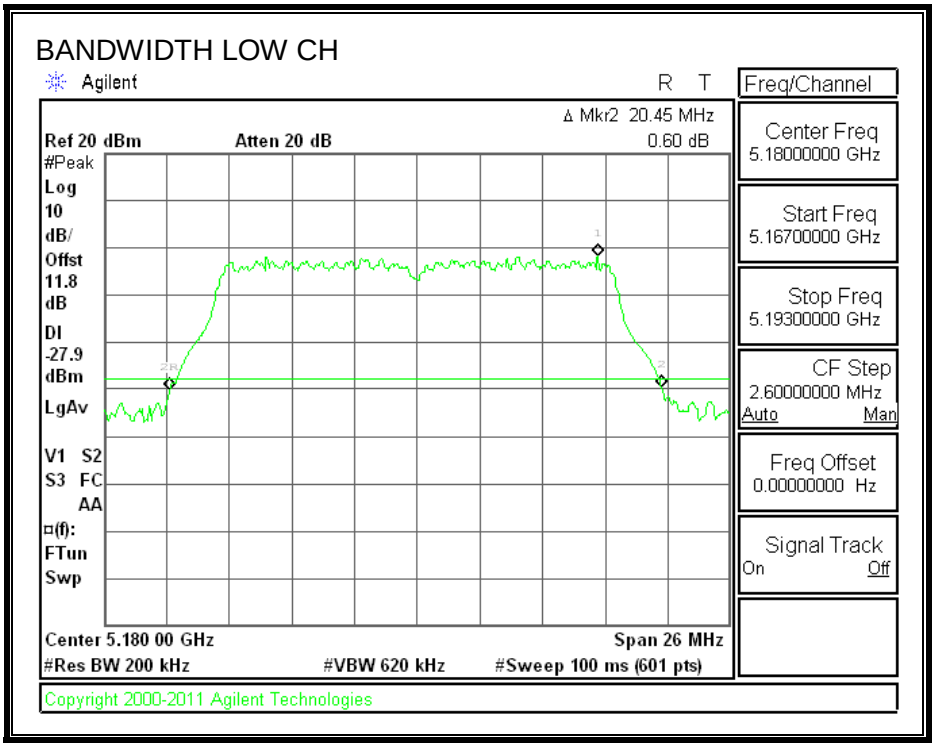
LIMITS

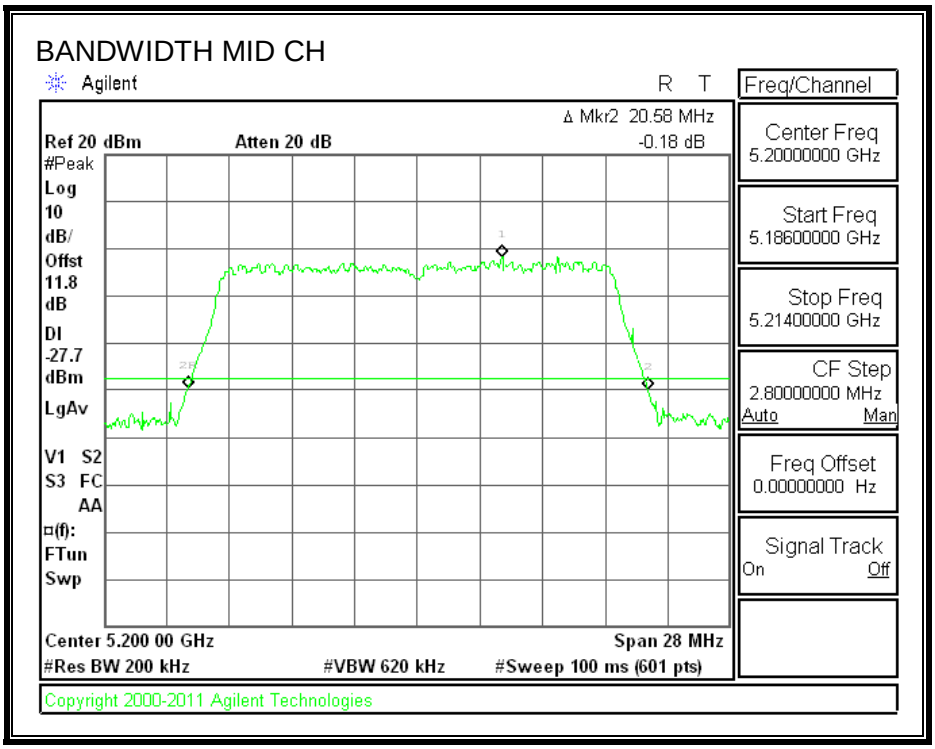
None; for reporting purposes only.

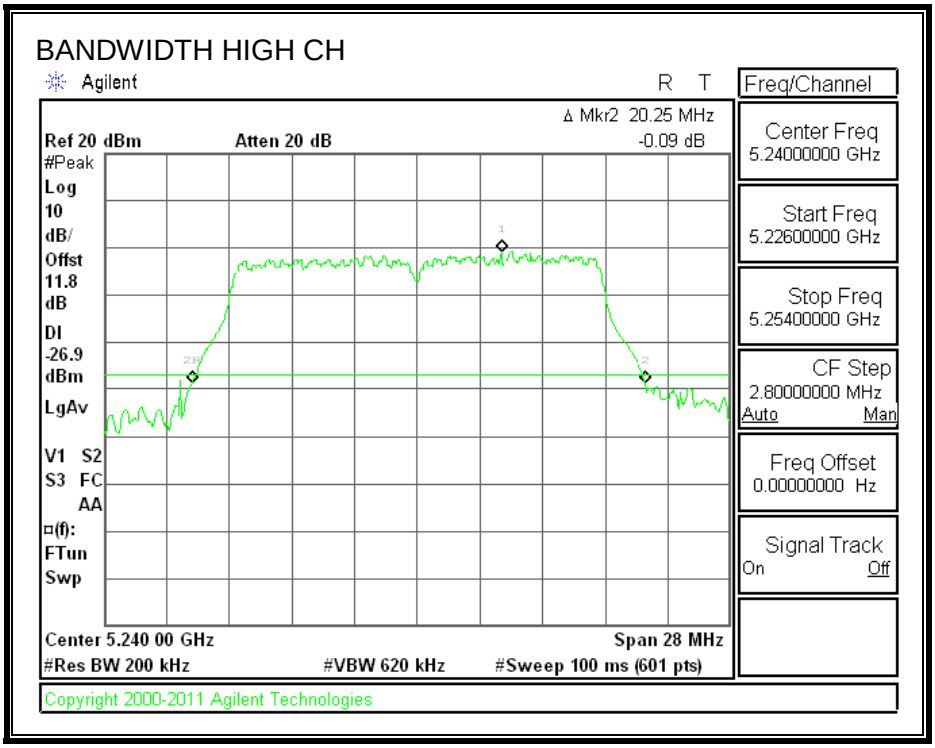
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	20.5
Mid	5200	20.6
High	5240	20.3

26 dB BANDWIDTH







10.2.2. 99% BANDWIDTH

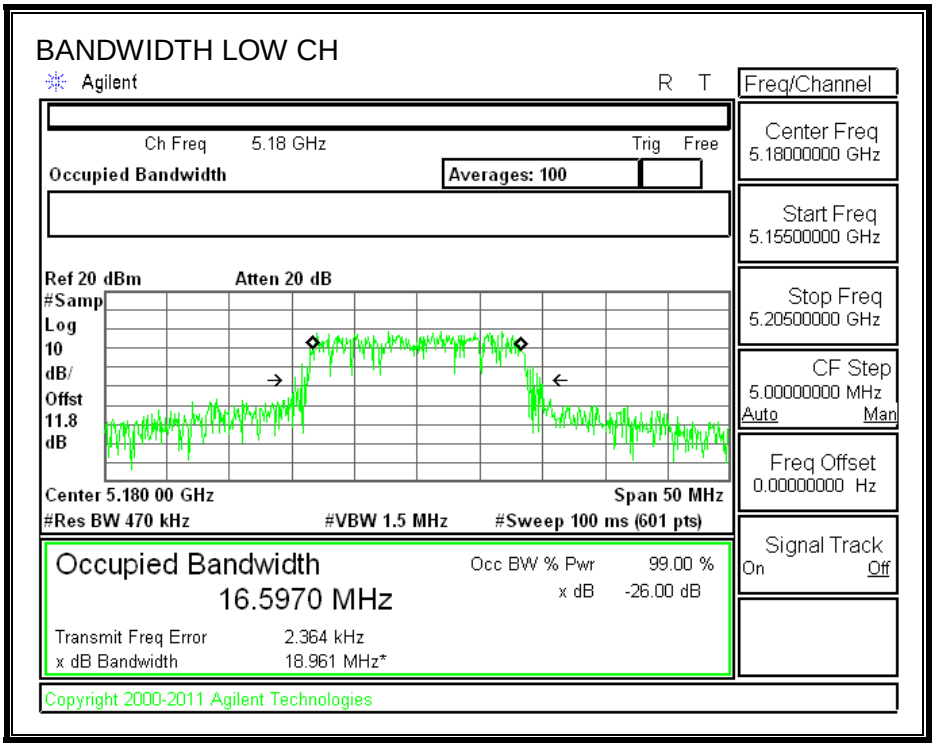
LIMITS

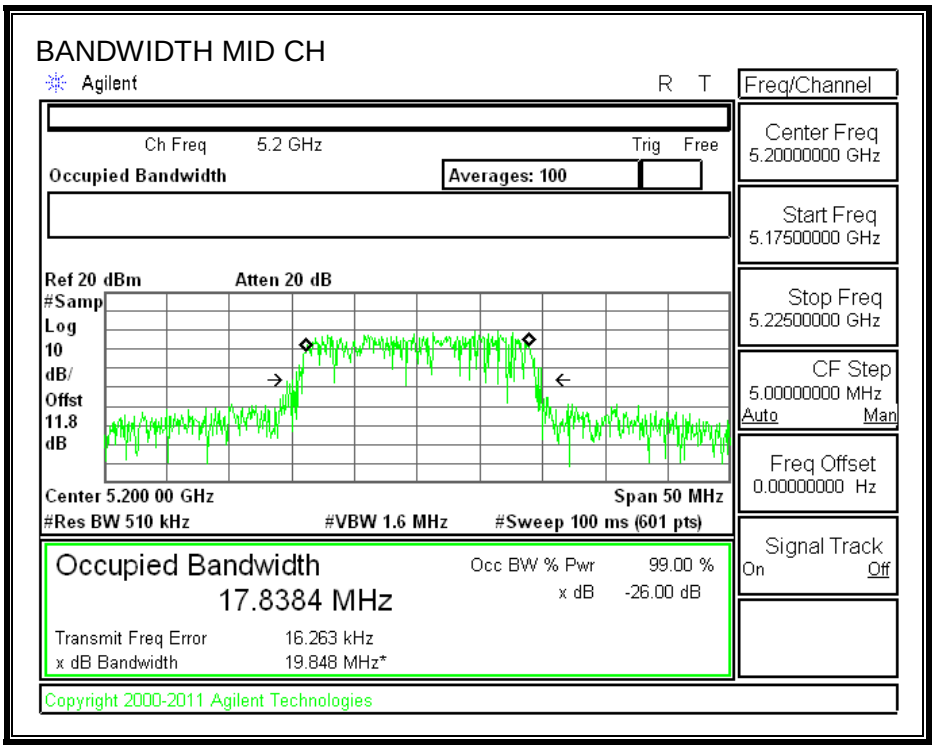
None; for reporting purposes only.

RESULTS

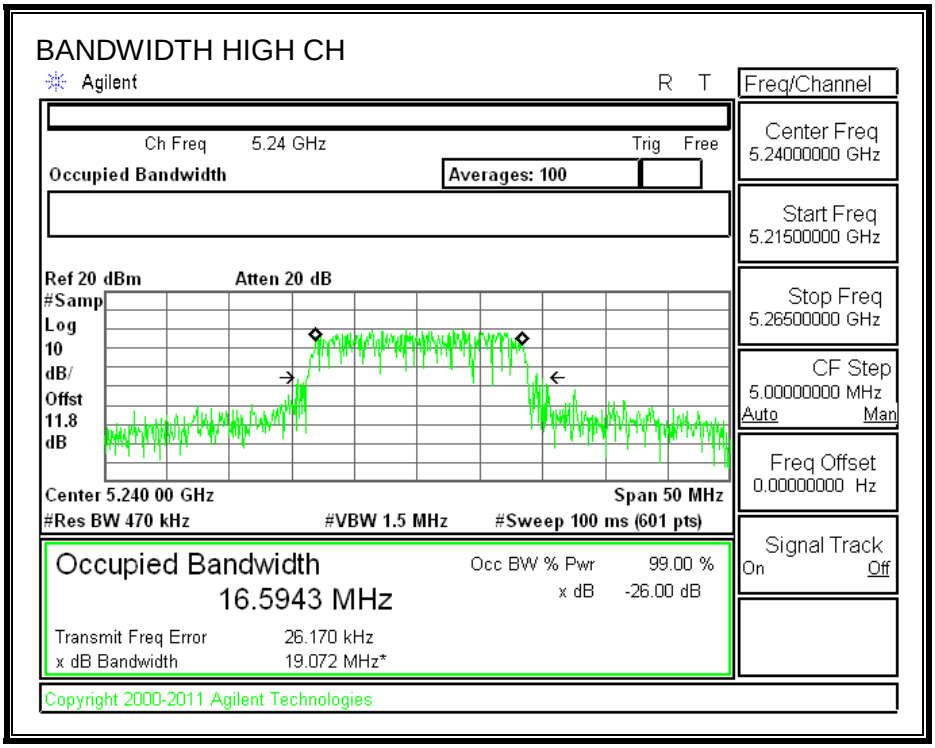
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5180	16.6
Mid	5200	17.8
High	5240	16.6

99% BANDWIDTH





BANDWIDTH HIGH CH



10.2.3. 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	5180	9.01
Mid	5200	9.10
High	5240	9.63

10.2.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

IC RSS-210 A9.2 (1)

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Bandwidth and Antenna Gain

Channel	Frequency (MHz)	Min 26 dB BW (MHz)	Min 99% BW (MHz)	Directional Gain (dBi)
Low	5180	20.5	16.6	3.14
Mid	5200	20.6	17.8	3.14
High	5240	20.3	16.6	3.14

Limits

Channel	Frequency (MHz)	FCC Power Limit (dBm)	IC EIRP Limit (dBm)	Max IC Power (dBm)	Power Limit (dBm)	FCC PPSD Limit (dBm)	IC eirp PSD Limit (dBm)	PPSD Limit (dBm)
Low	5180	17.00	22.20	19.06	17.00	4.00	10.00	4.00
Mid	5200	17.00	22.51	19.37	17.00	4.00	10.00	4.00
High	5240	17.00	22.20	19.06	17.00	4.00	10.00	4.00

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

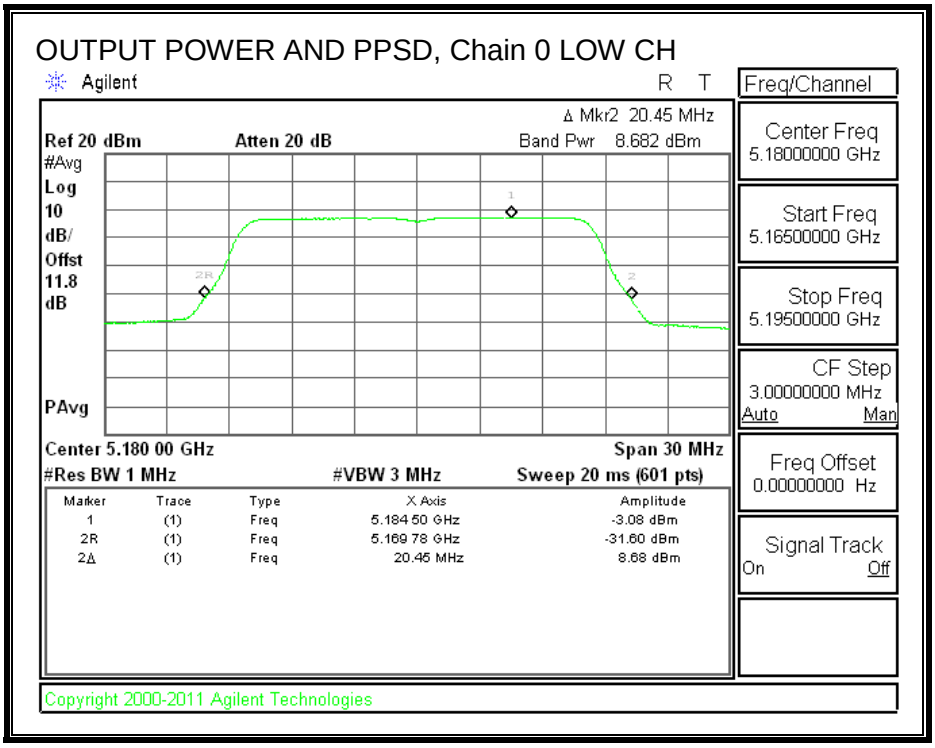
Output Power Results

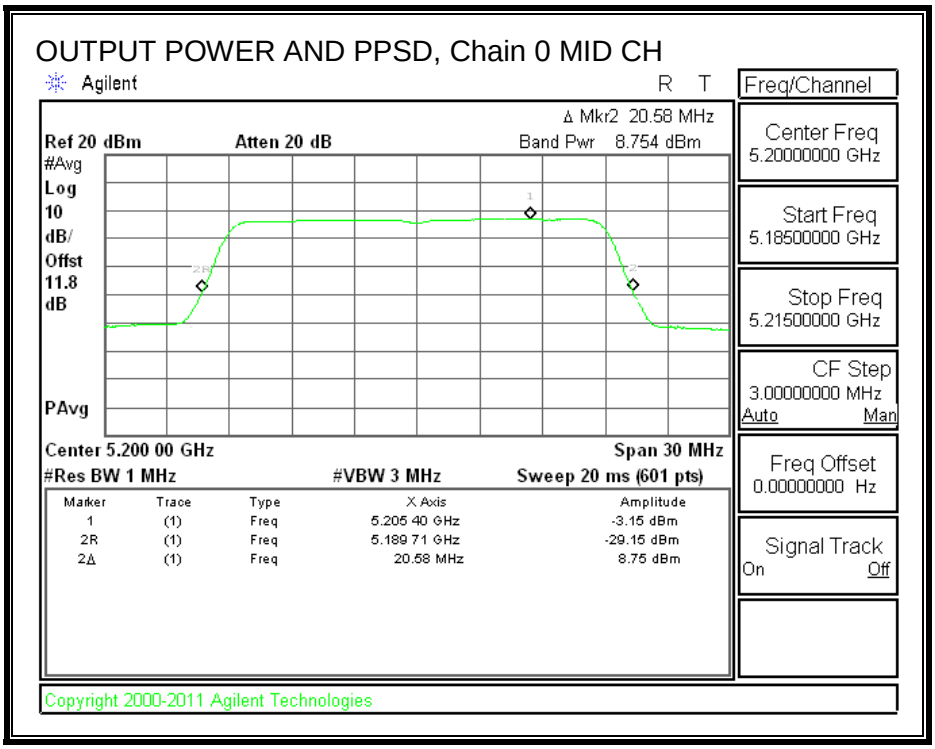
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	8.68	8.68	17.00	-8.32
Mid	5200	8.75	8.75	17.00	-8.25
High	5240	9.41	9.41	17.00	-7.59

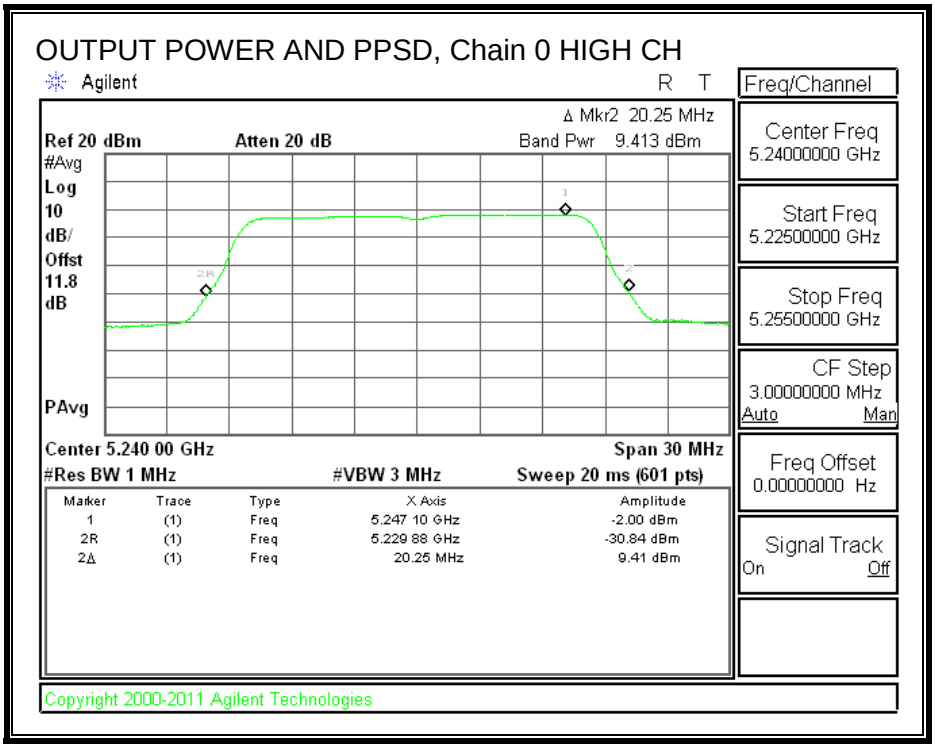
PPSD Results

Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5180	-3.08	-3.08	4.00	-7.08
Mid	5200	-3.15	-3.15	4.00	-7.15
High	5240	-2.00	-2.00	4.00	-6.00

OUTPUT POWER AND PPSD, Chain 0







10.2.5. PEAK EXCURSION

LIMITS

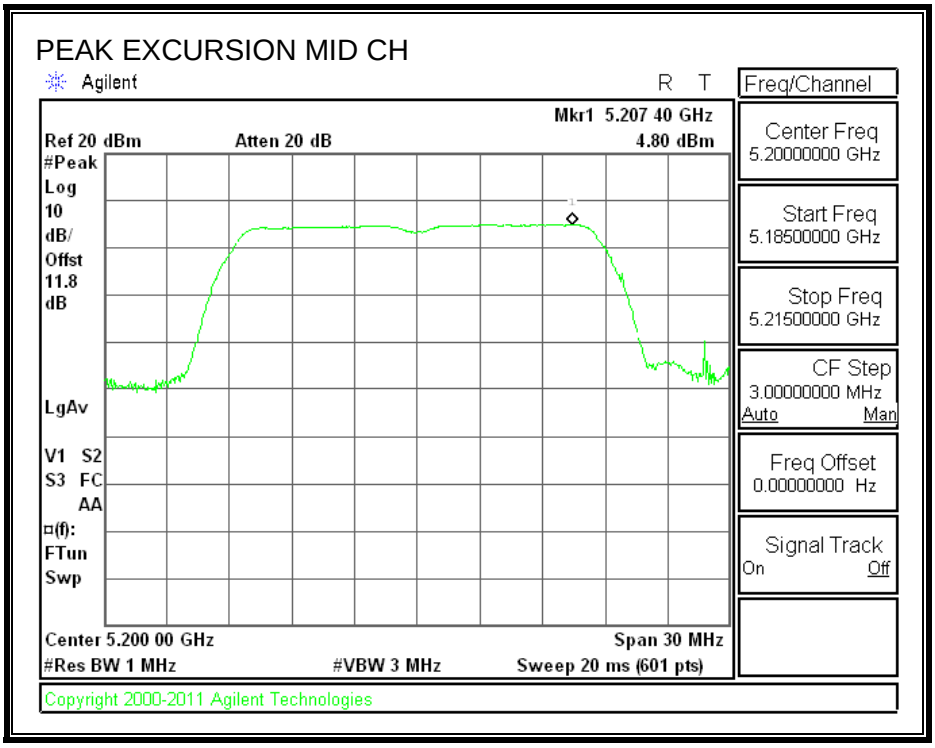
FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

RESULTS

Channel	Frequency (MHz)	PK Level (dBm)	PSD (dBm)	DCCF (dB)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Mid	5200	4.80	-3.15	0.00	7.95	13	-5.05

PEAK EXCURSION



11. RADIATED TEST RESULTS

11.1. 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.

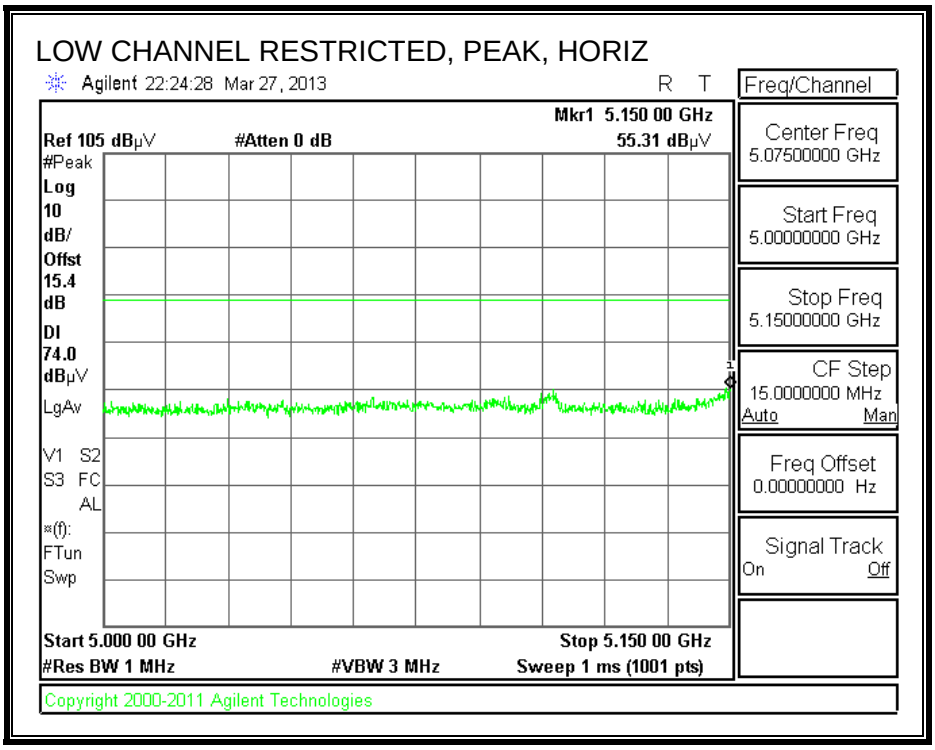
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

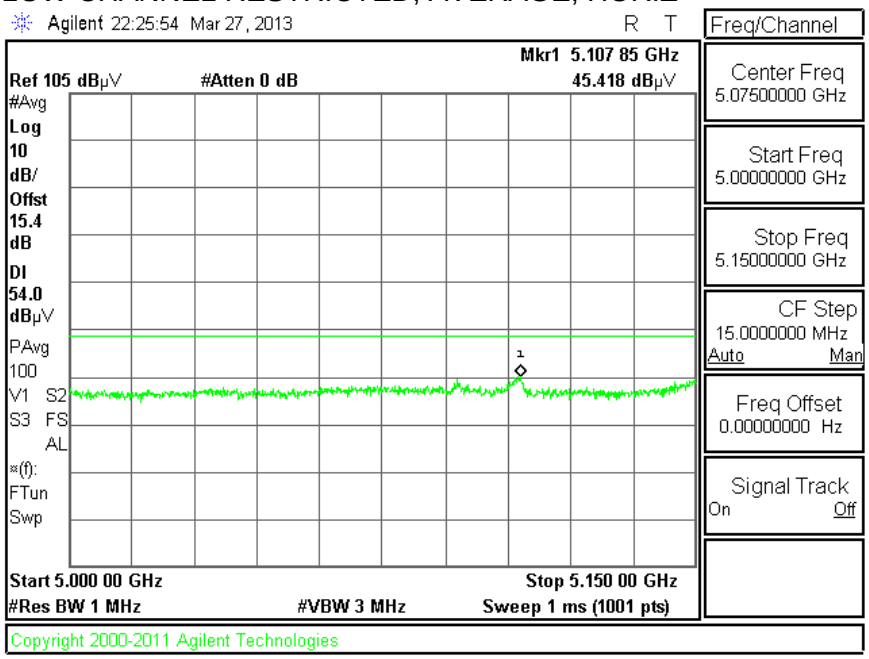
11.2. TRANSMITTER ABOVE 1 GHz

11.2.1. TX ABOVE 1 GHz 802.11a MODE IN THE 5.2 GHz BAND

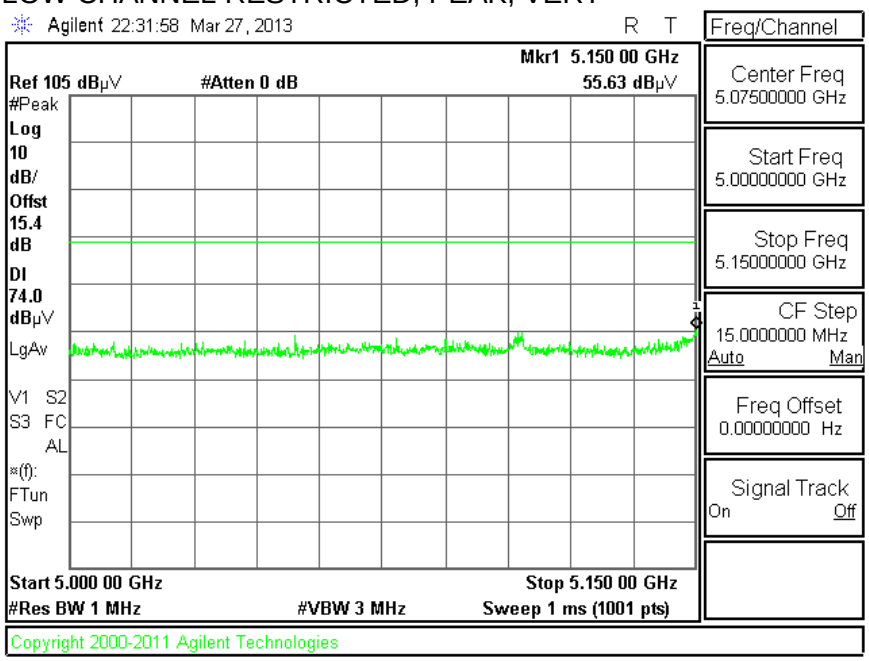
RESTRICTED BANDEDGE (LOW CHANNEL)

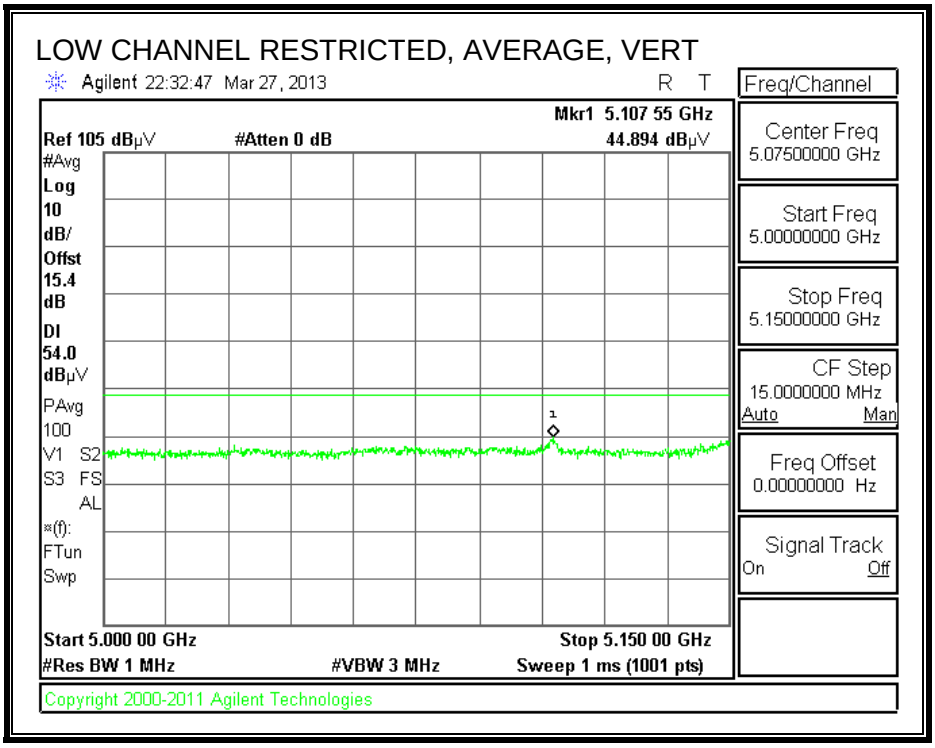


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



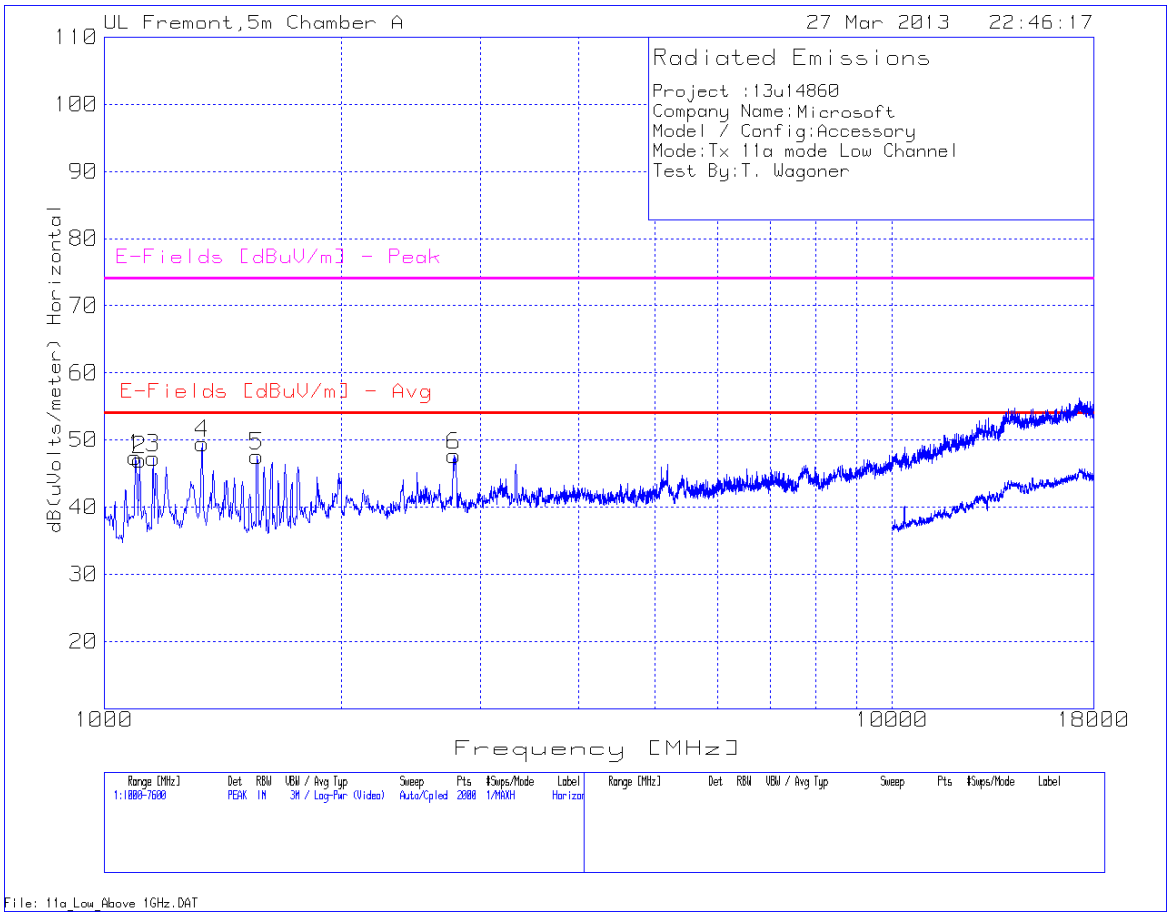
LOW CHANNEL RESTRICTED, PEAK, VERT



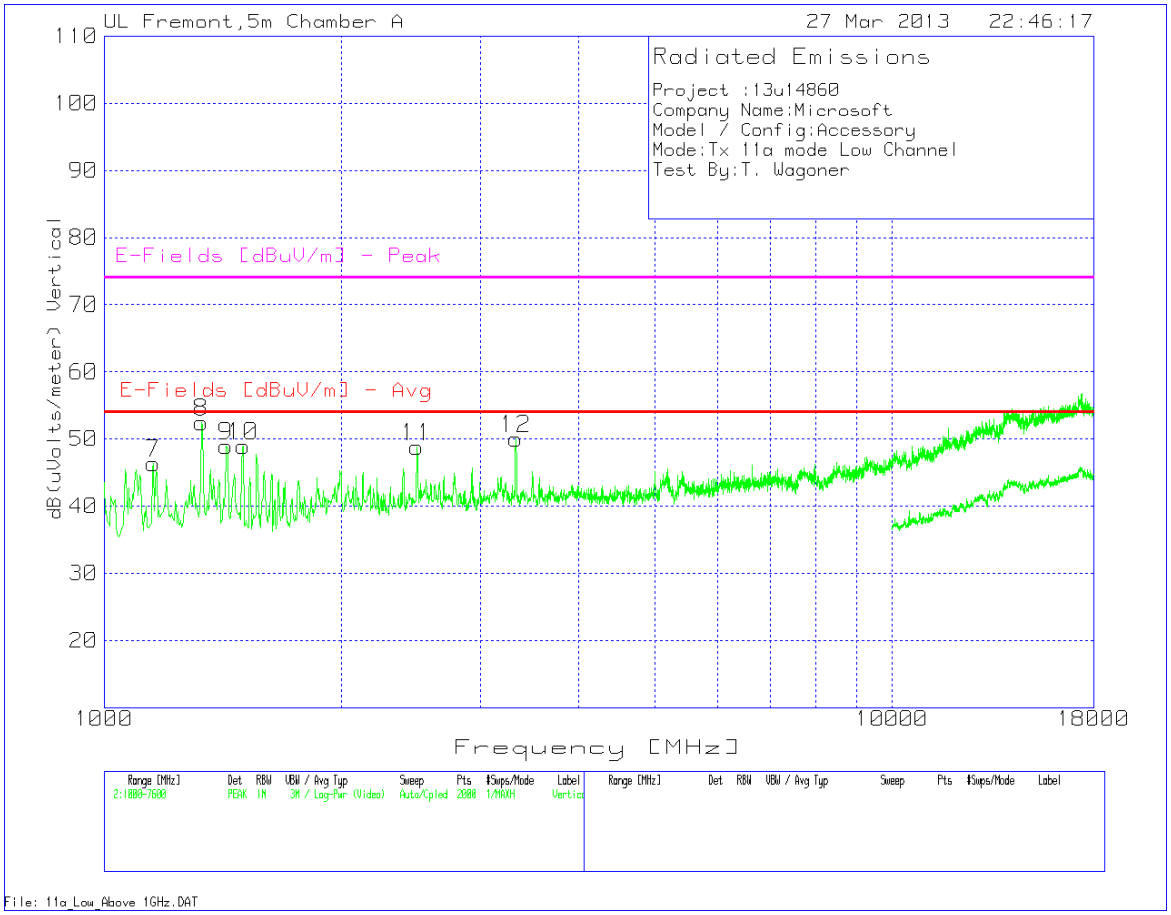


HARMONICS AND SPURIOUS EMISSIONS

Low Channel, Horizontal



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(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1095.652	55.09	PK	27.9	-38.7	3.1	0	47.39	53.97	-6.58	74	-26.61	100	Horz
2	1108.846	54.59	PK	28	-38.6	3.1	0	47.09	53.97	-6.88	74	-26.91	100	Horz
3	1155.022	53.8	PK	28.8	-38.5	3.2	0	47.3	53.97	-6.67	74	-26.7	100	Horz
4	1333.133	54.21	PK	30.1	-38.1	3.3	0	49.51	53.97	-4.46	74	-24.49	200	Horz
5	1564.018	53.18	PK	28.5	-37.7	3.6	0	47.58	53.97	-6.39	74	-26.42	100	Horz
6	2781.109	46.96	PK	32.6	-36.7	4.8	0	47.66	53.97	-6.31	74	-26.34	200	Horz
7	1155.022	52.88	PK	28.8	-38.5	3.2	0	46.38	53.97	-7.59	74	-27.62	100	Vert
8	1329.835	57.1	PK	30.2	-38.1	3.3	0	52.5	53.97	-1.47	74	-21.5	100	Vert
9	1428.786	53.92	PK	29.5	-37.9	3.4	0	48.92	53.97	-5.05	74	-25.08	100	Vert
10	1501.349	54.19	PK	28.9	-37.7	3.5	0	48.89	53.97	-5.08	74	-25.11	100	Vert
11	2490.855	48.37	PK	32.6	-36.8	4.5	0.1	48.77	53.97	-5.2	74	-25.23	100	Vert
12	3331.934	48.19	PK	32.9	-36.5	5.4	0	49.99	53.97	-3.98	74	-24.01	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
1331.48	50.53	AD1	30.1	-38.1	3.3	0	45.83	53.97	-8.14	74	-28.17	249	133	Vert
1499.88	46.87	AD1	28.9	-37.8	3.5	0	41.47	53.97	-12.5	74	-32.53	200	127	Vert
3331.81	34.56	AD1	32.9	-36.5	5.4	0	36.36	53.97	-17.61	74	-37.64	230	123	Vert

PK - Peak detector

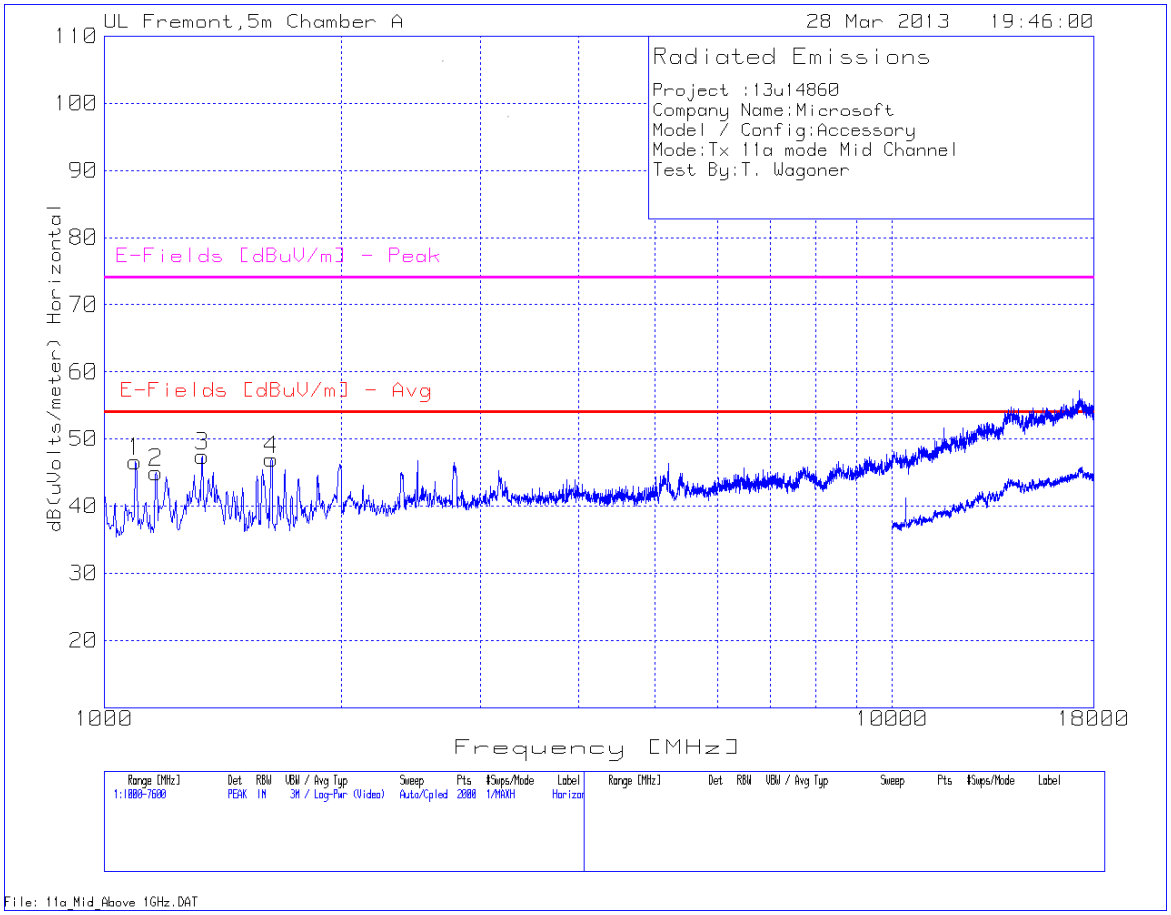
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

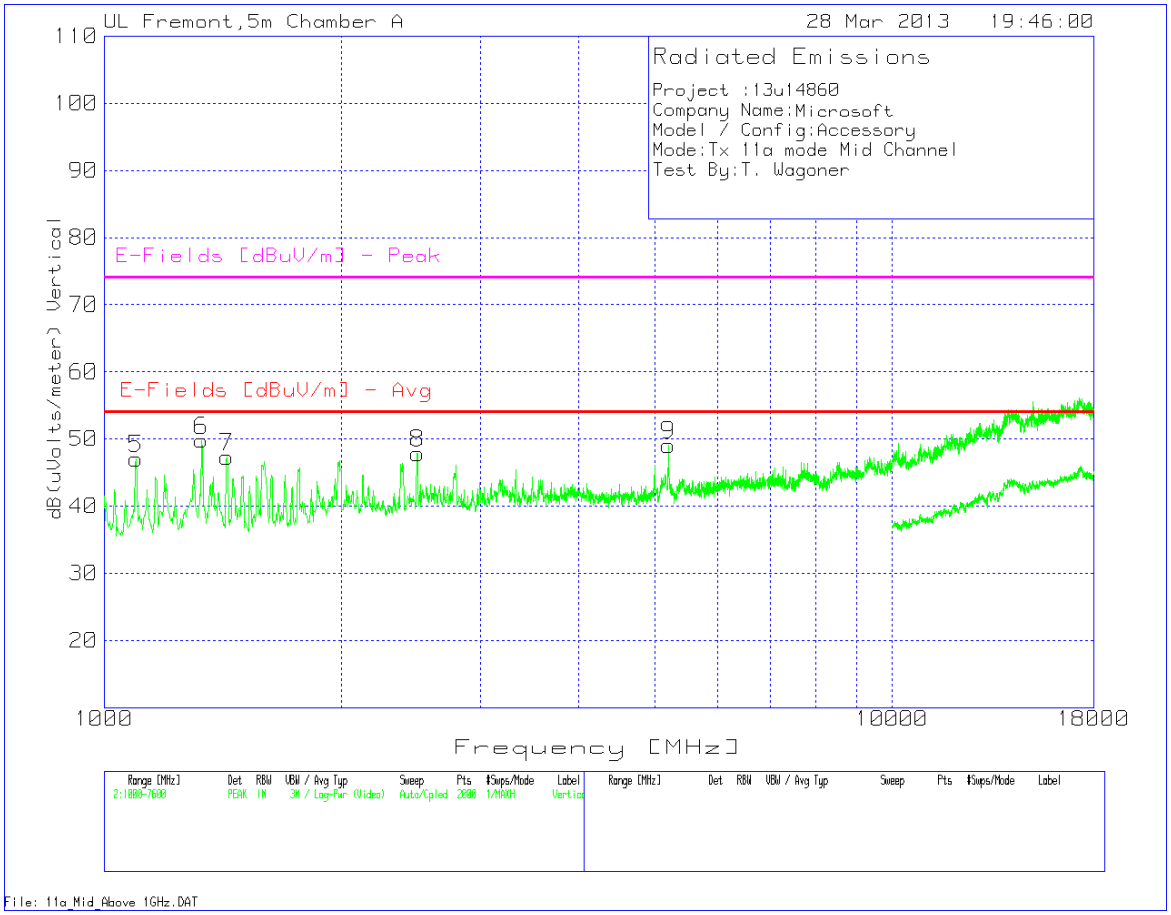
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but 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	1095.652	54.35	PK	27.9	-38.7	3.1	0	46.65	53.97	-7.32	74	-27.35	200	Horz
2	1164.918	51.41	PK	28.9	-38.5	3.2	0	45.01	53.97	-8.96	74	-28.99	100	Horz
3	1333.133	52.21	PK	30.1	-38.1	3.3	0	47.51	53.97	-6.46	74	-26.49	200	Horz
4	1629.985	52.38	PK	28.6	-37.6	3.6	0	46.98	53.97	-6.99	74	-27.02	100	Horz
5	1098.951	54.75	PK	27.9	-38.7	3.1	0	47.05	53.97	-6.92	74	-26.95	200	Vert
6	1329.835	54.42	PK	30.2	-38.1	3.3	0	49.82	53.97	-4.15	74	-24.18	100	Vert
7	1432.084	52.37	PK	29.5	-37.9	3.4	0	47.37	53.97	-6.6	74	-26.63	100	Vert
8	2497.451	47.51	PK	32.6	-36.8	4.5	0.1	47.91	53.97	-6.06	74	-26.09	100	Vert
9	5205.397	42.43	PK	34.2	-35.5	7.1	0.9	49.13	53.97	-4.84	74	-24.87	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
1331.78	43.59	AD1	30.1	-38.1	3.3	0	38.89	53.97	-15.08	74	-35.11	268	195	Horz
5197.02	18.25	AD1	34.2	-35.5	7	0.9	24.85	53.97	-29.12	74	-49.15	338	184	Horz

PK - Peak detector

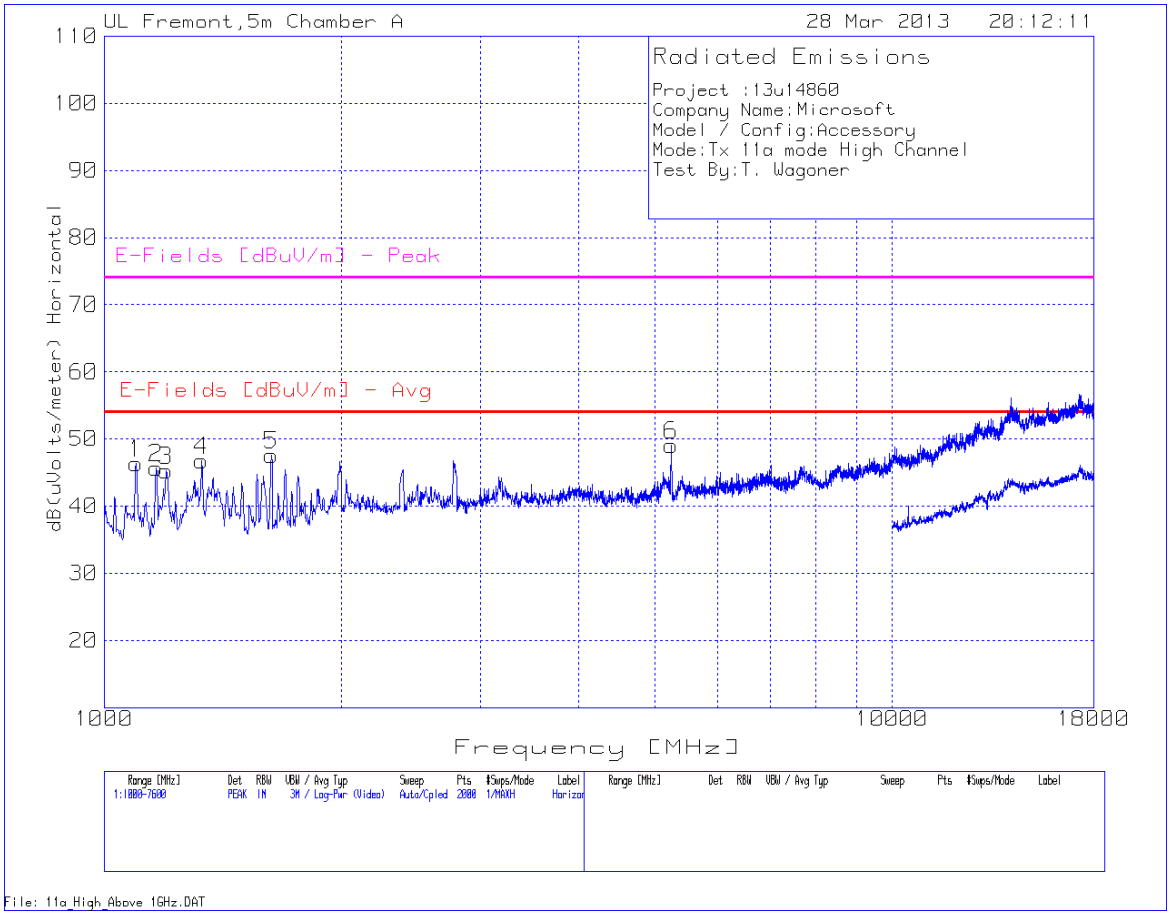
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

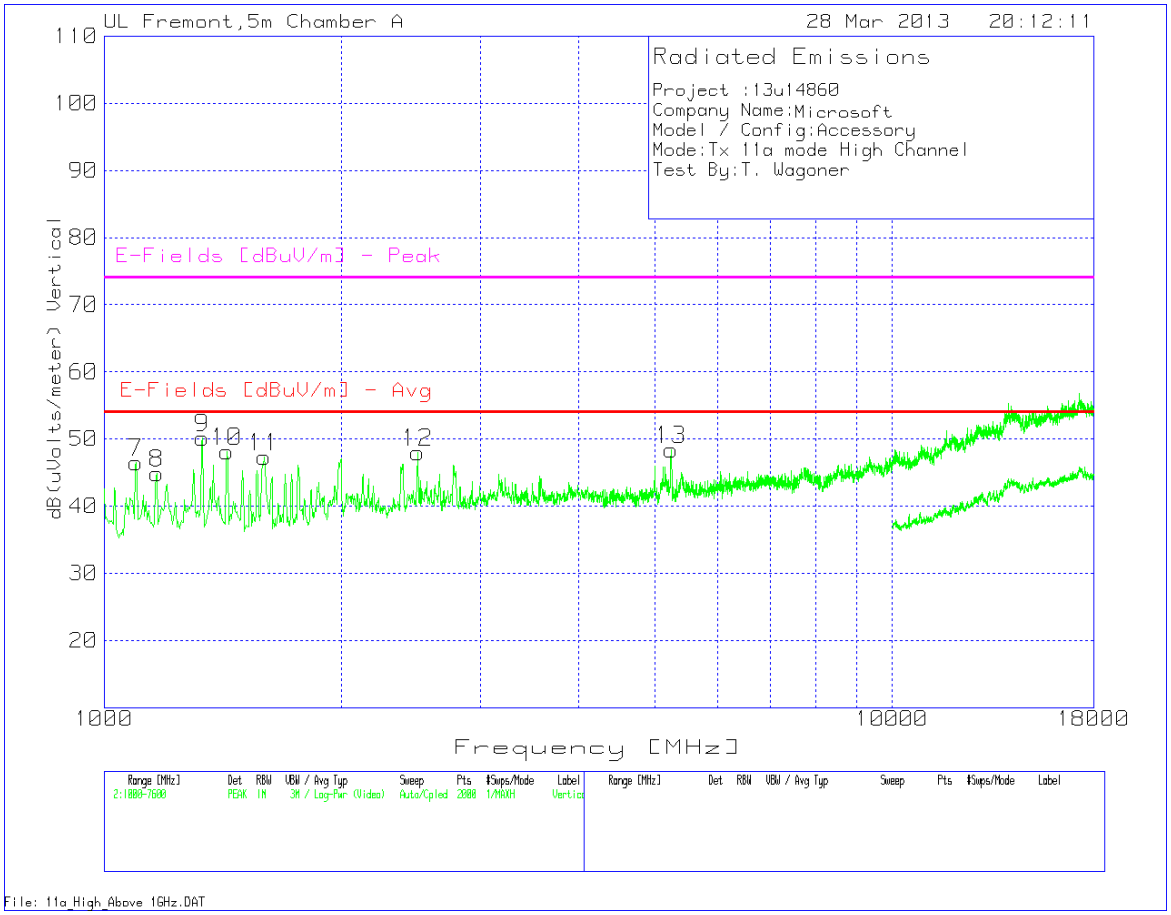
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but 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	1098.951	54.04	PK	27.9	-38.7	3.1	0	46.34	53.97	-7.63	74	-27.66	200	Horz
2	1164.918	52.08	PK	28.9	-38.5	3.2	0	45.68	53.97	-8.29	74	-28.32	100	Horz
3	1197.901	50.97	PK	29.5	-38.4	3.2	0	45.27	53.97	-8.7	74	-28.73	200	Horz
4	1329.835	51.36	PK	30.2	-38.1	3.3	0	46.76	53.97	-7.21	74	-27.24	200	Horz
5	1629.985	52.96	PK	28.6	-37.6	3.6	0	47.56	53.97	-6.41	74	-26.44	100	Horz
6	5248.276	42.37	PK	34.2	-35.5	7.1	0.9	49.07	53.97	-4.9	74	-24.93	200	Horz
7	1098.951	54.25	PK	27.9	-38.7	3.1	0	46.55	53.97	-7.42	74	-27.45	200	Vert
8	1168.216	51.14	PK	29	-38.5	3.2	0	44.84	53.97	-9.13	74	-29.16	200	Vert
9	1333.133	54.87	PK	30.1	-38.1	3.3	0	50.17	53.97	-3.8	74	-23.83	100	Vert
10	1432.084	53.14	PK	29.5	-37.9	3.4	0	48.14	53.97	-5.83	74	-25.86	100	Vert
11	1597.001	52.97	PK	28.3	-37.6	3.6	0	47.27	53.97	-6.7	74	-26.73	100	Vert
12	2500.75	47.75	PK	32.6	-36.8	4.5	0	48.05	53.97	-5.92	74	-25.95	100	Vert
13	5248.276	41.69	PK	34.2	-35.5	7.1	0.9	48.39	53.97	-5.58	74	-25.61	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
5246.82	34.2	AD1	34.2	-35.5	7.1	0.9	40.9	53.97	-13.07	74	-33.1	336	200	Horz
1331.55	43.3	AD1	30.1	-38.1	3.3	0	38.6	53.97	-15.37	74	-35.4	330	237	Vert

PK - Peak detector

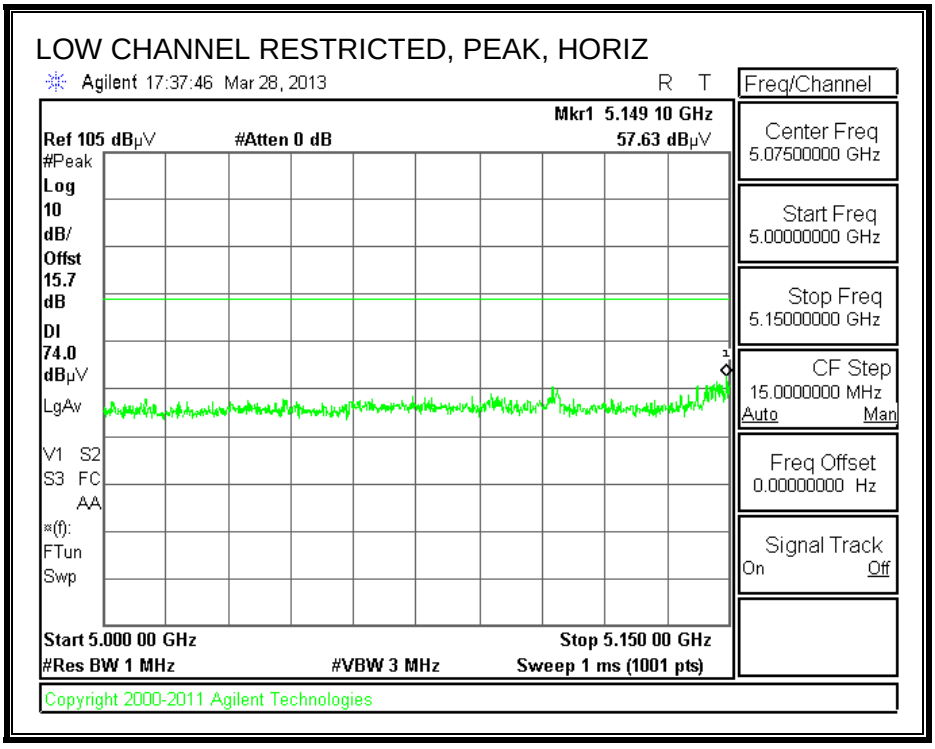
Notes:

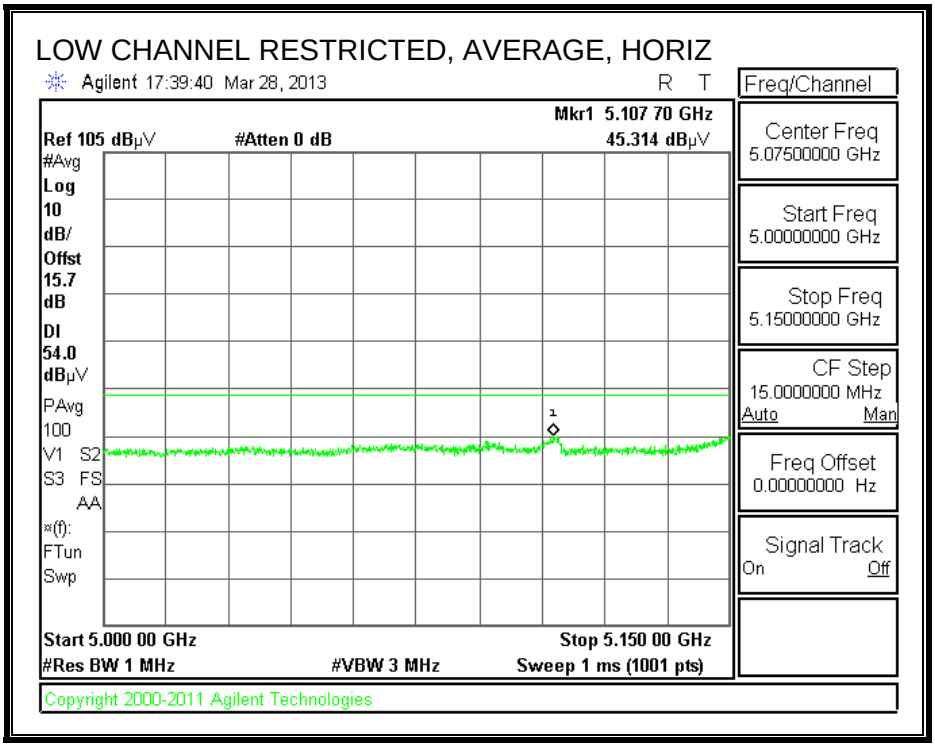
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but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

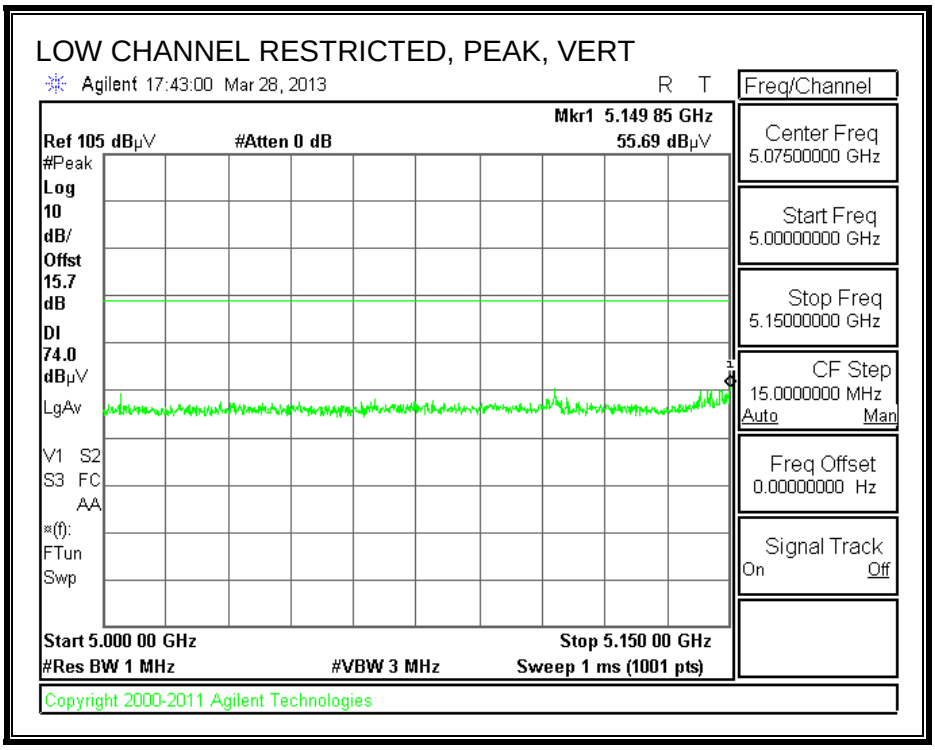
2) There was no signal from EUT above the system noise floor up to 40 GHz.

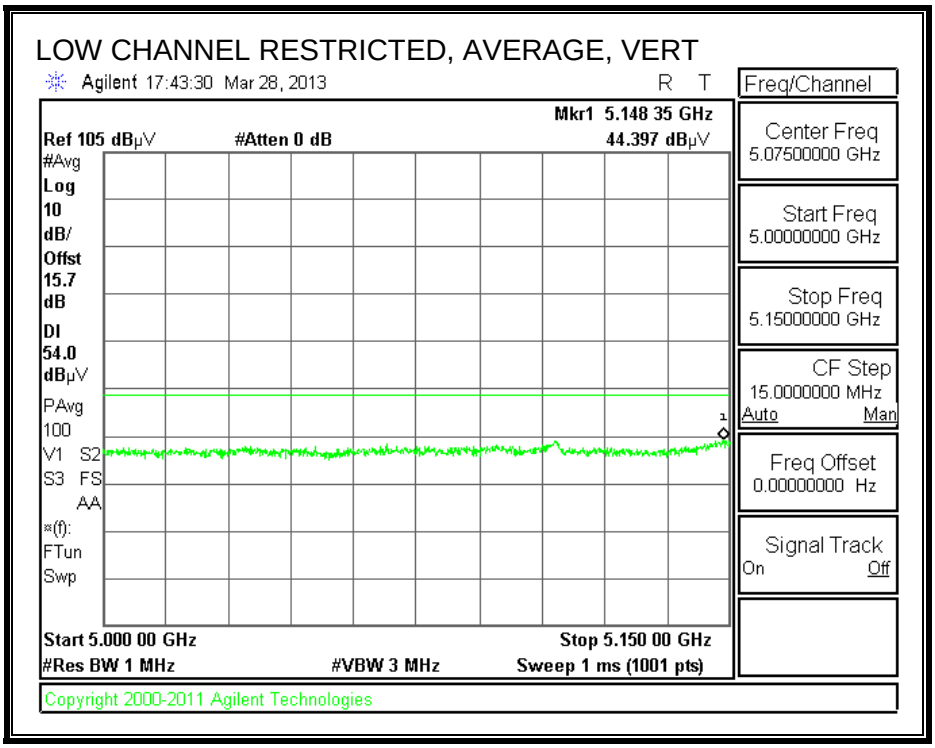
11.2.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)



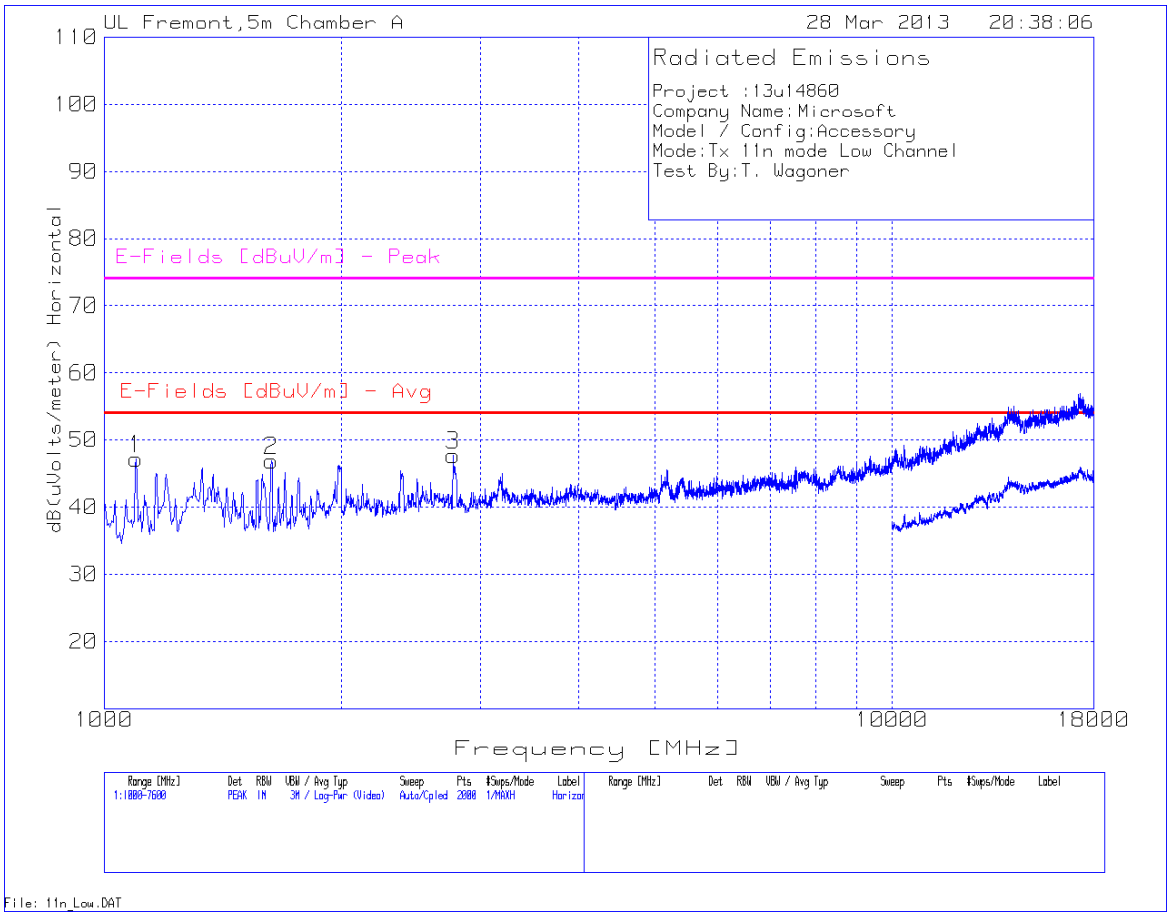




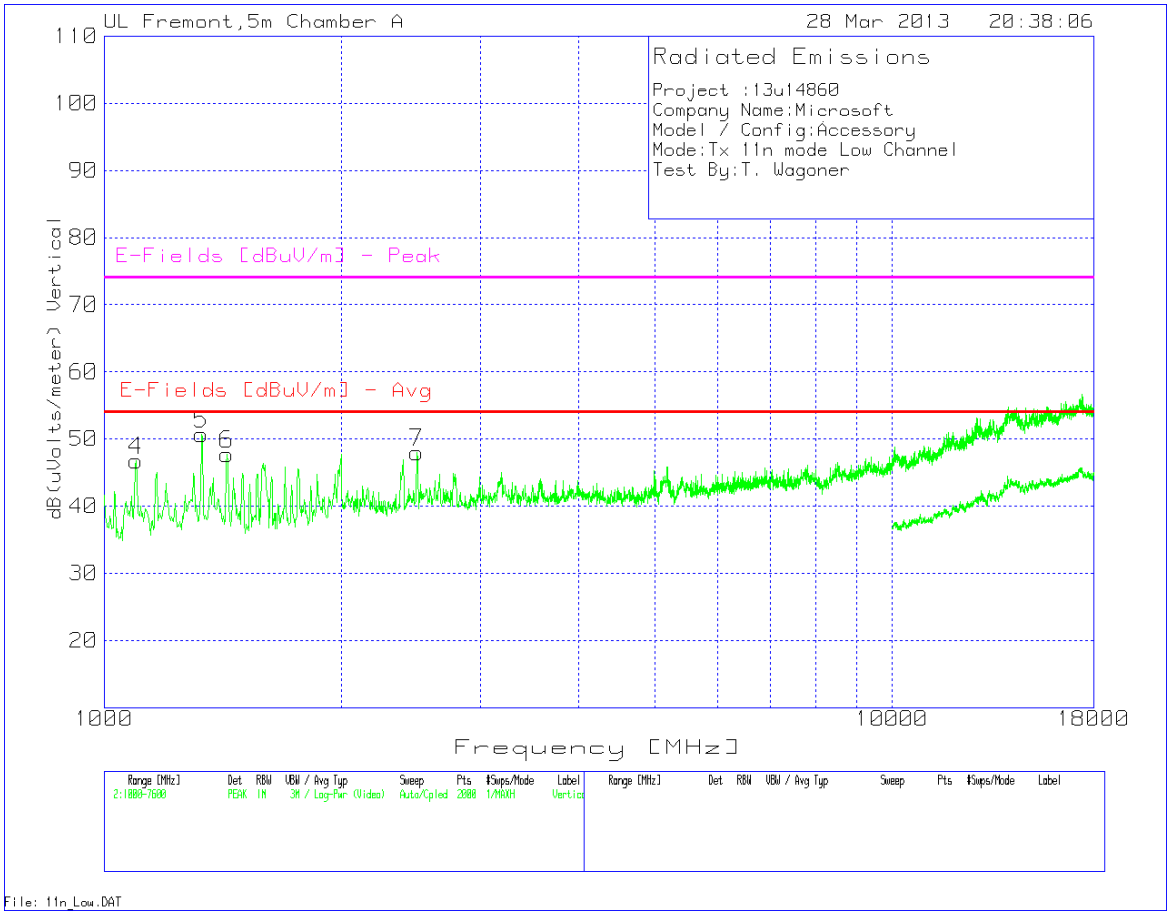


HARMONICS AND SPURIOUS EMISSIONS

Low Channel, Horizontal



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(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1098.951	54.93	PK	27.9	-38.7	3.1	0	47.23	53.97	-6.74	74	-26.77	200	Horz
2	1629.985	52.26	PK	28.6	-37.6	3.6	0	46.86	53.97	-7.11	74	-27.14	100	Horz
3	2771.214	47.08	PK	32.6	-36.8	4.8	0	47.68	53.97	-6.29	74	-26.32	200	Horz
4	1098.951	54.42	PK	27.9	-38.7	3.1	0	46.72	53.97	-7.25	74	-27.28	200	Vert
5	1329.835	55.26	PK	30.2	-38.1	3.3	0	50.66	53.97	-3.31	74	-23.34	100	Vert
6	1432.084	52.72	PK	29.5	-37.9	3.4	0	47.72	53.97	-6.25	74	-26.28	100	Vert
7	2490.855	47.59	PK	32.6	-36.8	4.5	0.1	47.99	53.97	-5.98	74	-26.01	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
1331.55	43.3	AD1	30.1	-38.1	3.3	0	38.6	53.97	-15.37	74	-35.4	330	237	Vert

PK - Peak detector

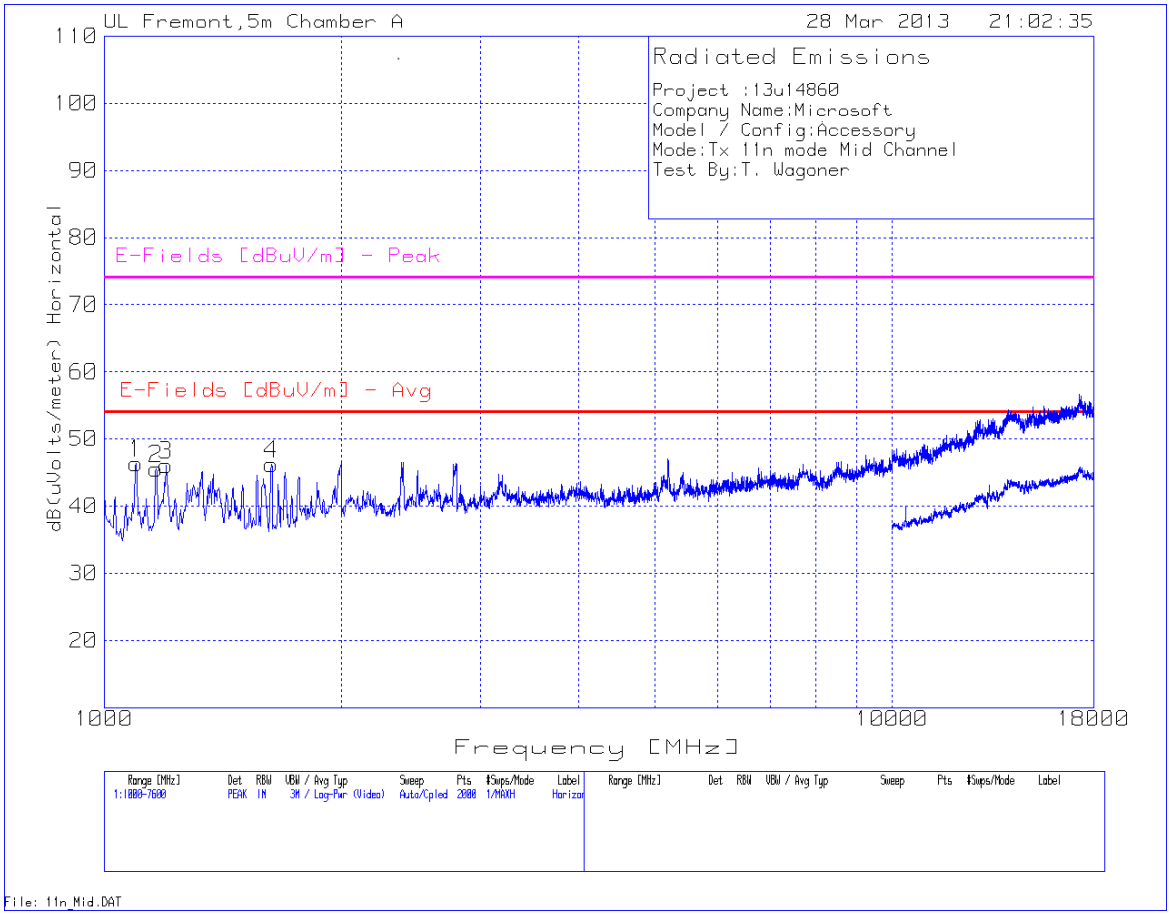
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

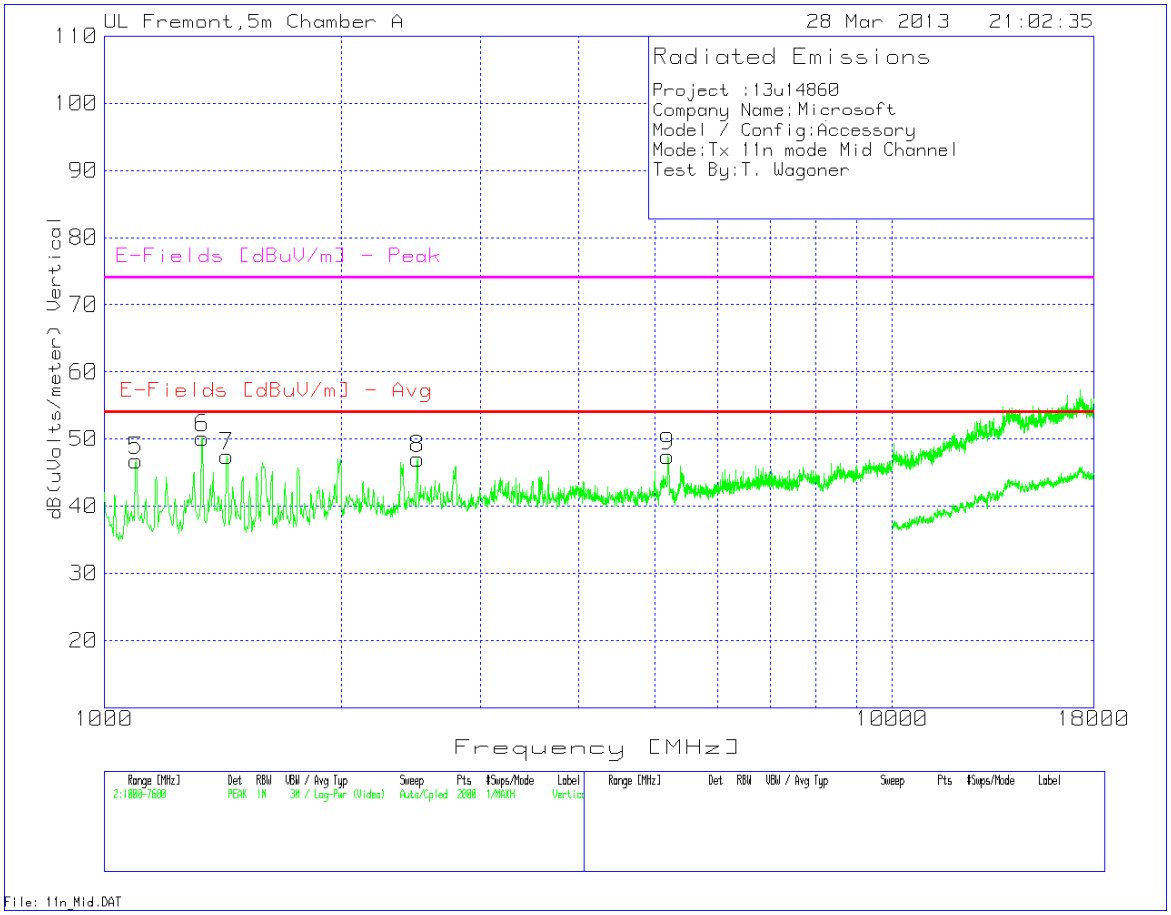
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but 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(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height [cm]	Polarity
1	1098.951	54.11	PK	27.9	-38.7	3.1	0	46.41	53.97	-7.56	74	-27.59	100	Horz
2	1164.918	52.01	PK	28.9	-38.5	3.2	0	45.61	53.97	-8.36	74	-28.39	100	Horz
3	1197.901	51.84	PK	29.5	-38.4	3.2	0	46.14	53.97	-7.83	74	-27.86	200	Horz
4	1629.985	51.59	PK	28.6	-37.6	3.6	0	46.19	53.97	-7.78	74	-27.81	100	Horz
5	1098.951	54.49	PK	27.9	-38.7	3.1	0	46.79	53.97	-7.18	74	-27.21	200	Vert
6	1333.133	54.88	PK	30.1	-38.1	3.3	0	50.18	53.97	-3.79	74	-23.82	100	Vert
7	1432.084	52.5	PK	29.5	-37.9	3.4	0	47.5	53.97	-6.47	74	-26.5	100	Vert
8	2497.451	46.68	PK	32.6	-36.8	4.5	0.1	47.08	53.97	-6.89	74	-26.92	100	Vert
9	5192.204	40.81	PK	34.2	-35.5	7	0.9	47.41	53.97	-6.56	74	-26.59	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
1331.15	44.63	AD1	30.1	-38.1	3.3	0	39.93	53.97	-14.04	74	-34.07	271	198	Horz

PK - Peak detector

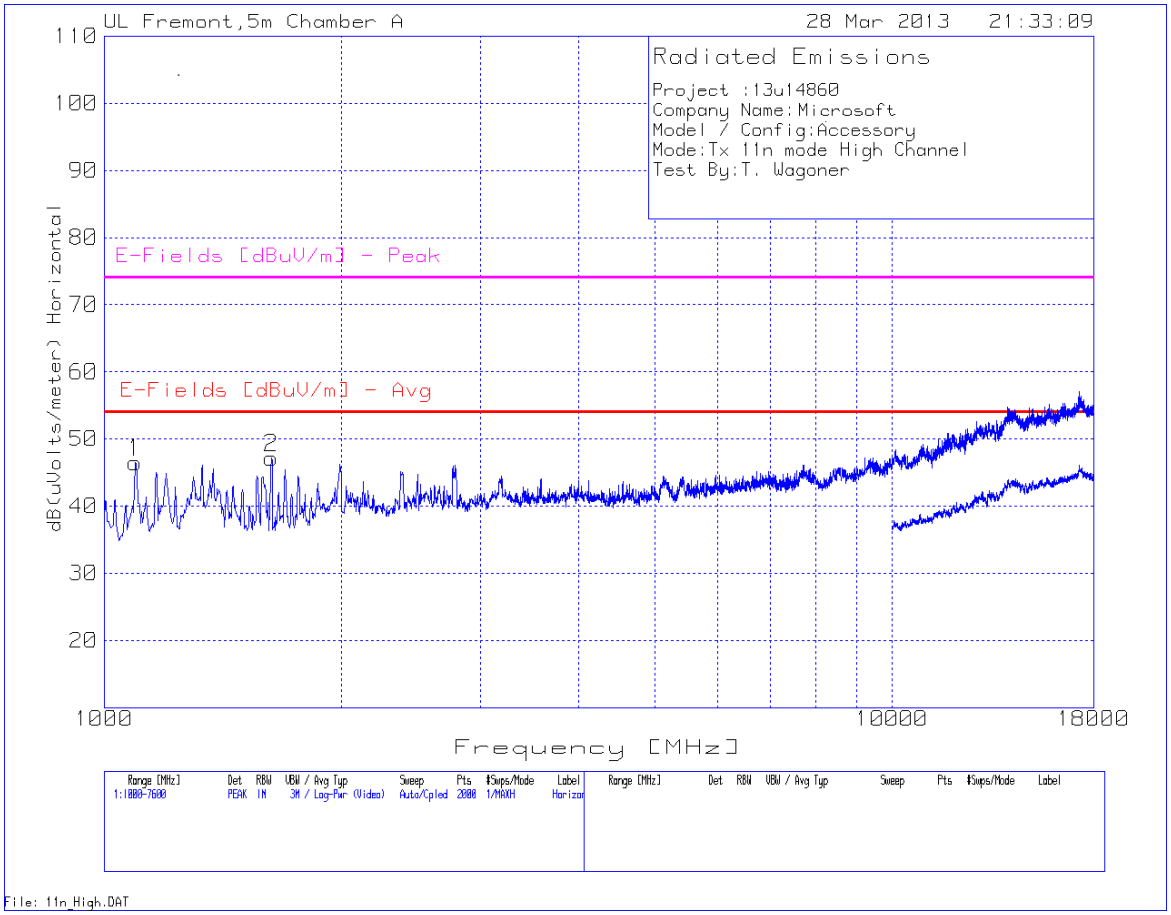
AD1 - KDB 789033 v01r02 G)6) Method: AD Primary Power Average

Notes:

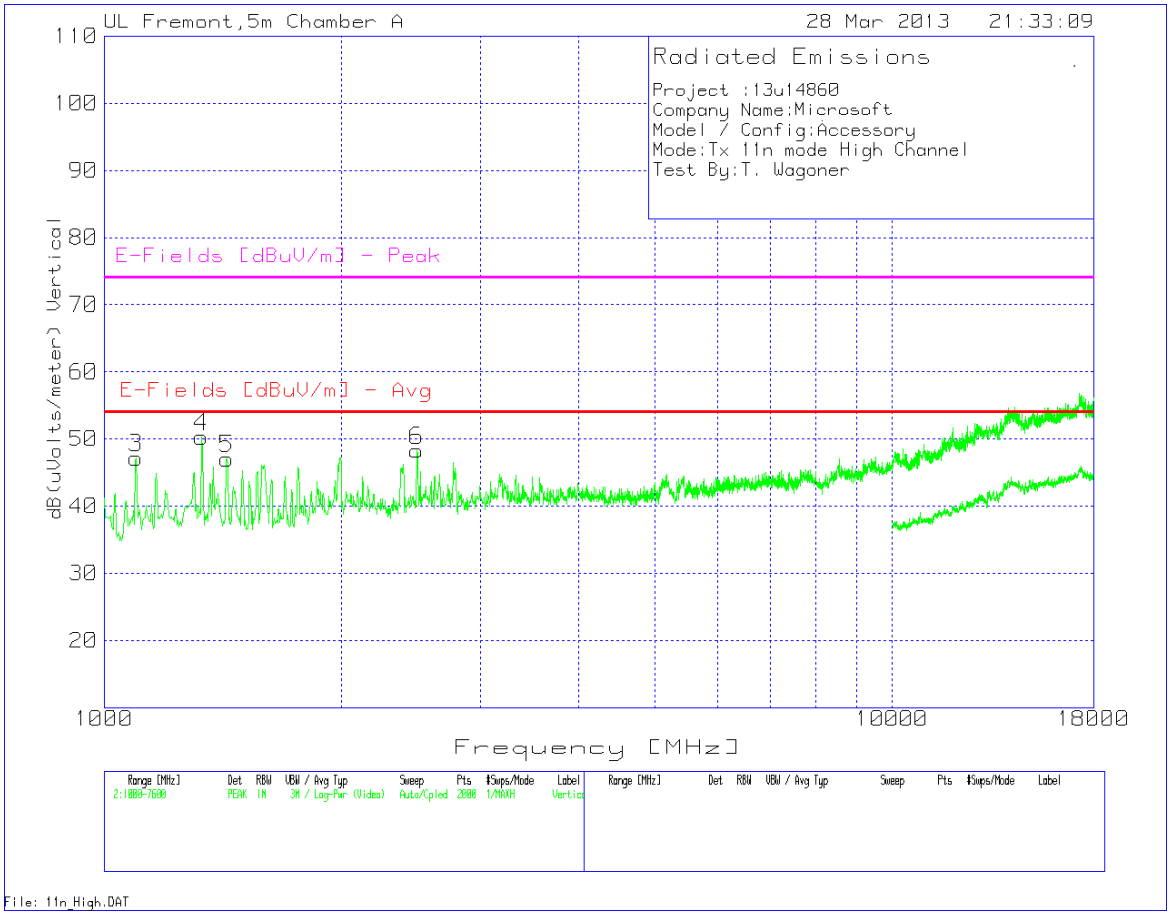
1) The PK limit of 74 dBuV/m and the AVG limit of 54 dBuV/m only apply in restricted bands, outside restricted bands the limit is 68.3dBuV/m (-27dBm/MHz eirp). The plots and discrete measurements all show peak emissions are below 54dBuV/m from 1- 10 GHz, above 10 GHz emissions exceed the 54dBuV/m but 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	1095.652	54.27	PK	27.9	-38.7	3.1	0	46.57	53.97	-7.4	74	-27.43	200	Horz
2	1629.985	52.56	PK	28.6	-37.6	3.6	0	47.16	53.97	-6.81	74	-26.84	100	Horz
3	1098.951	54.83	PK	27.9	-38.7	3.1	0	47.13	53.97	-6.84	74	-26.87	200	Vert
4	1329.835	54.92	PK	30.2	-38.1	3.3	0	50.32	53.97	-3.65	74	-23.68	100	Vert
5	1432.084	52.06	PK	29.5	-37.9	3.4	0	47.06	53.97	-6.91	74	-26.94	100	Vert
6	2490.855	47.93	PK	32.6	-36.8	4.5	0.1	48.33	53.97	-5.64	74	-25.67	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
1331.55	43.3	AD1	30.1	-38.1	3.3	0	38.6	53.97	-15.37	74	-35.4	330	237	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.

12. 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.

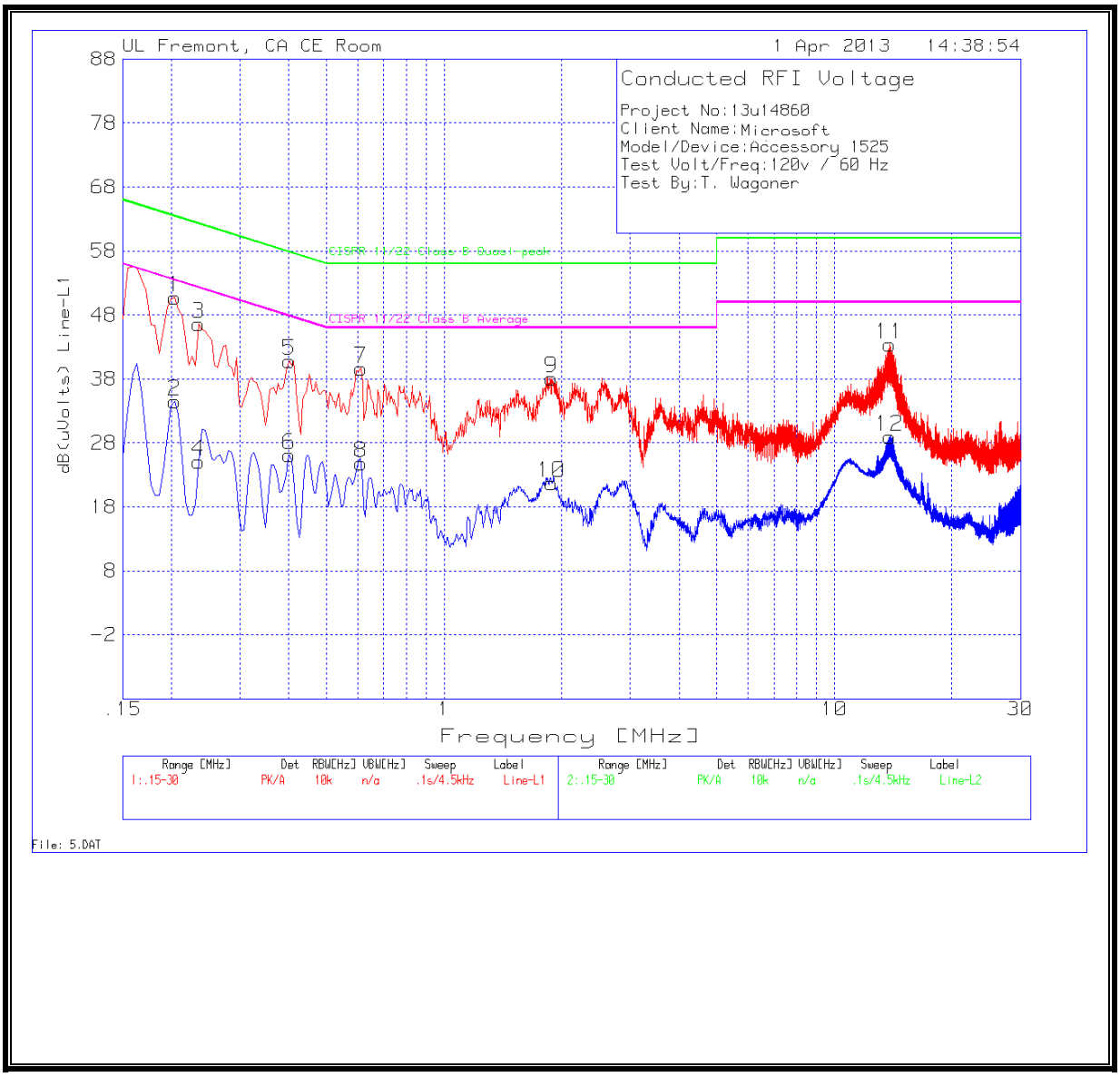
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

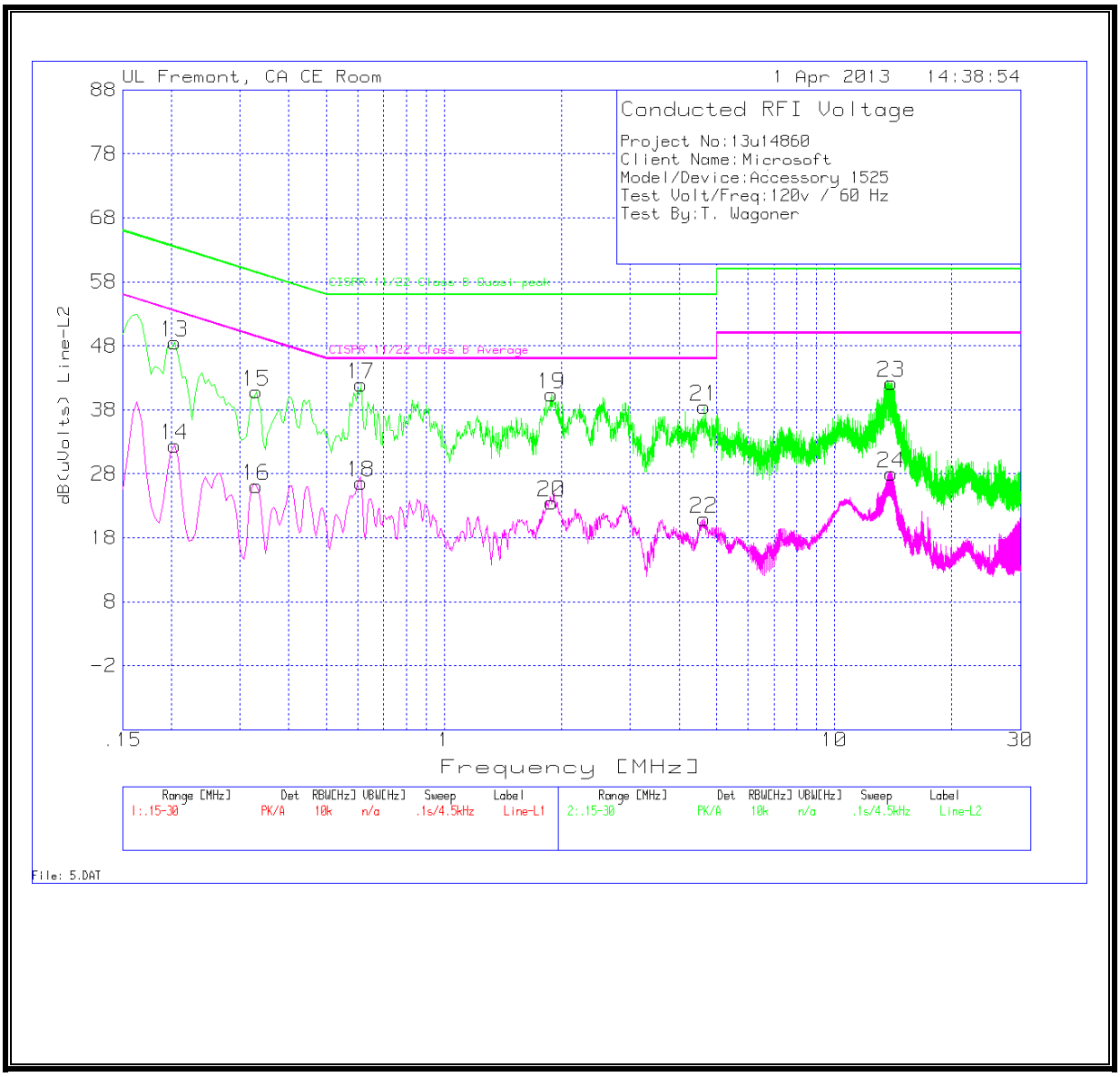
RESULTS

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
0.204	50.62	PK	0.1	0	50.72	63.4	-12.68	-	-
0.204	34.35	Av	0.1	0	34.45	-	-	53.4	-18.95
0.2355	46.46	PK	0.1	0	46.56	62.3	-15.74	-	-
0.2355	25.04	Av	0.1	0	25.14	-	-	52.3	-27.16
0.402	40.75	PK	0.1	0	40.85	57.8	-16.95	-	-
0.402	26.04	Av	0.1	0	26.14	-	-	47.8	-21.66
0.6135	39.57	PK	0.1	0	39.67	56	-16.33	-	-
0.6135	24.78	Av	0.1	0	24.88	-	-	46	-21.12
1.887	37.96	PK	0.1	0.1	38.16	56	-17.84	-	-
1.887	21.48	Av	0.1	0.1	21.68	-	-	46	-24.32
13.839	43.04	PK	0.2	0.2	43.44	60	-16.56	-	-
13.839	28.56	Av	0.2	0.2	28.96	-	-	50	-21.04

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
0.204	48.42	PK	0.1	0	48.52	63.4	-14.88	-	-
0.204	32.36	Av	0.1	0	32.46	-	-	53.4	-20.94
0.33	40.77	PK	0.1	0	40.87	59.5	-18.63	-	-
0.33	26.03	Av	0.1	0	26.13	-	-	49.5	-23.37
0.6135	41.82	PK	0.1	0	41.92	56	-14.08	-	-
0.6135	26.56	Av	0.1	0	26.66	-	-	46	-19.34
1.887	40.18	PK	0.1	0.1	40.38	56	-15.62	-	-
1.887	23.35	Av	0.1	0.1	23.55	-	-	46	-22.45
4.6365	38.28	PK	0.1	0.1	38.48	56	-17.52	-	-
4.6365	20.74	Av	0.1	0.1	20.94	-	-	46	-25.06
13.965	41.8	PK	0.2	0.2	42.2	60	-17.8	-	-
13.965	27.64	Av	0.2	0.2	28.04	-	-	50	-21.96

PK - Peak detector

Av - Average detector

13. MAXIMUM PERMISSIBLE RF EXPOSURE

13.1. 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.

13.2. 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	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

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

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

13.3. EQUATIONS

POWER DENSITY

Power density is given by:

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

Where

S = Power density in mW/cm^2
EIRP = Equivalent Isotropic Radiated Power in mW
D = Separation distance in cm

Power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by 10.

DISTANCE

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

Where

D = Separation distance in cm
EIRP = Equivalent Isotropic Radiated Power in mW
S = Power density in mW/cm^2

SOURCE-BASED DUTY CYCLE

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

Source-based time-averaged EIRP = (DC / 100) * 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.

Total EIRP = (EIRP1) + (EIRP2) + ... + (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.

13.4. 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 MHz / 1500 = 0.55 mW/cm^2 (FCC)
824 MHz / 150 = 5.5 W/m^2 (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 mW/cm^2
From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 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.

13.5. 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)**
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.