FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

HANDELD COMPUTING DEVICE

MODEL NUMBER: 1572

FCC ID: C3K1572
IC: 3048A-1572

REPORT NUMBER: 13U16702-3A

ISSUE DATE: FEBRUARY 12, 2014

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

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	1/30/14	Initial Issue	T. LEE
--	2/12/14	Equipment list updated	J. VANG

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROSOFT CORPORATION
ONE MICROSOFT WAY
REDMOND, WA 98052, U.S.A.

EUT DESCRIPTION: HANDHELD COMPUTING DEVICE WITH 802.11 A/B/G/N WLAN AND BLUETOOTH RADIOS

MODEL: 1572

SERIAL NUMBER: 008079434852

DATE TESTED: JANUARY 8, 2014 to JANUARY 30, 2014

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 Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 Verification Services Inc. By:

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WiSE Program Manager
UL Verification Services Inc.

Tested By:

JOE VANG
EMC ENGINEER
UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☒ Chamber A	☐ Chamber D
☐ Chamber B	☒ Chamber E
☐ Chamber C	☐ Chamber F

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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

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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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a hand held computing device with 802.11 a/b/g/n WLAN and Bluetooth radios.

The unit supports AFH mode. The manufacturer attested the following.

- It is in compliance with Bluetooth Specification 1.2 or later specification.
- The number of hopping channels in AFH mode is 20 channels
- The output power does not transmit over 125 mW
- The channel separation is based upon 2/3 of 20 dB channel bandwidth

5.2. MAXIMUM OUTPUT POWER

The measured average power values were within ± 0.5 dB of the original values. Refer to original report number “13U15414-3A” for exact output power values and for all antenna port results.

5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The change filed under this application has the following changes.

- The reference oscillator type change from TXCO to simple Crystal, with the reference frequency stays the same and the new part pin for pin compatible with original.
- New PCB Layout with Different PCB stack up

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

T The radio utilizes a PIFA antenna, with a maximum gain of 3.1 dBi.

5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Window RT 8.1 Preview Build 943

The test utility software used during testing was Laptool 189.1.0.9.0\ WIFI Tool.exe

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5.6. 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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

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5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
USB Ethernet Adaptor	CISCO	USB 300M	CU90MC02233	DoC
Laptop	Lenovo	L420	7854CT0	DoC
AC Adaptor (laptop)	Lenovo	92P1156	111S92P1156ZDXN272091	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	AC	Unshielded	1.8	AC adapter
2	USB	1	USB	Unshielded	0.1	USB to Ethernet adapter
3	DC	1	DC	Unshielded	1.8	
4	Ethernet	1	RJ 45	Unshielded	0.6	Connects to USB adapter

TEST SETUP

The EUT is a standalone wireless handheld computing device. Test software exercised the wireless module installed within the device under test.

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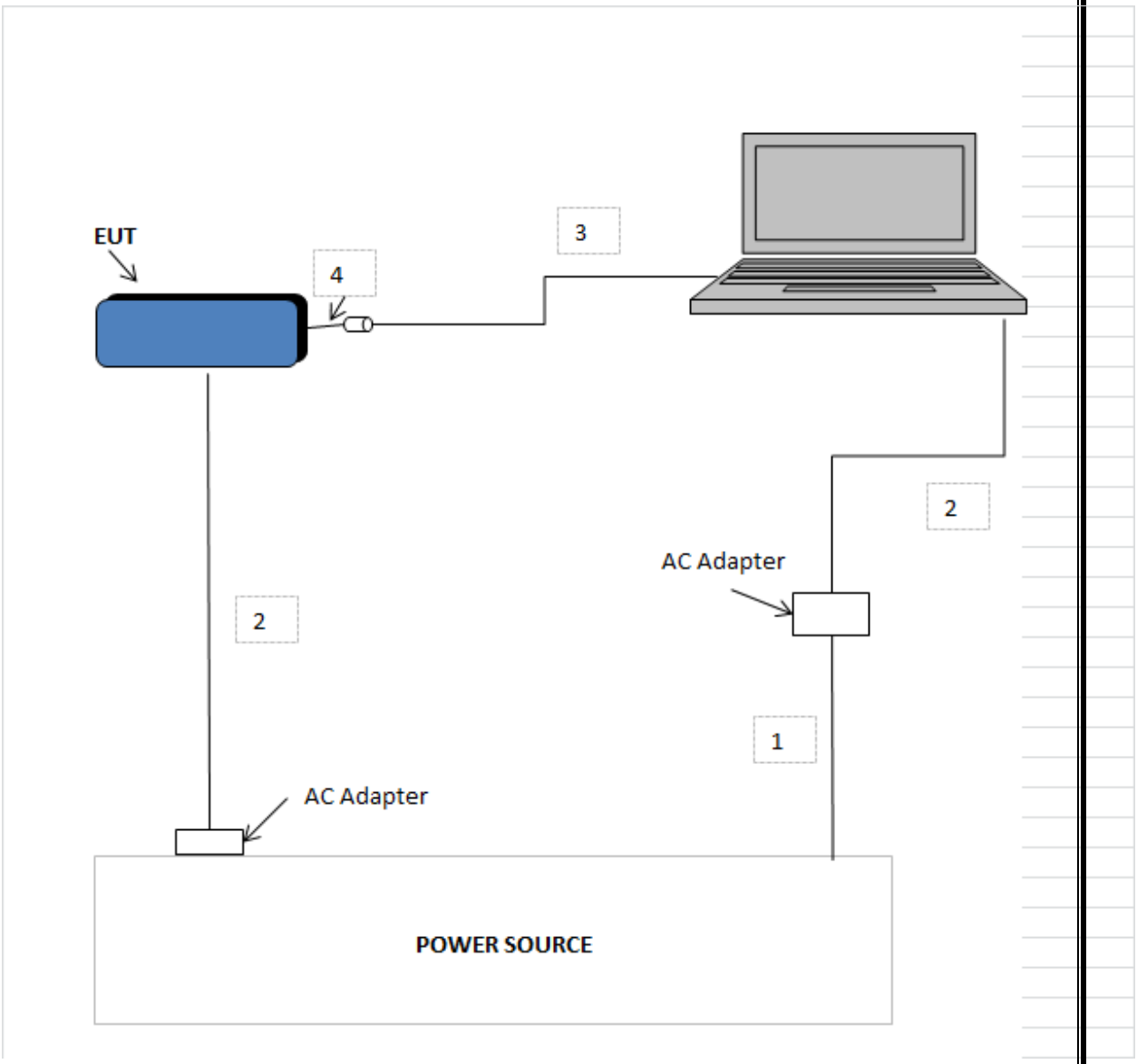
SETUP DIAGRAM FOR TESTS



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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**
Single Channel PK Power Meter	Agilent	N1911A	F00022	4/3/2013
Wideband Power Sensor, 30MHz video bandwidth	Agilent	N1921A	F00358	10/1/2013
Spectrum Analyzer, 44 GHz	Agilent	E4446A	C00986	4/1/2013
Antenna, Horn, 18 GHz	ETS Lindgren	3117	C01022	2/21/2013
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	8/22/2013
High Pass Filter	Micro-Tronics	HPM17543	F00224	6/26/2013
Low Pass Filter	Micro-Tronics	LPS17541	F00219	6/26/2013
High Pass Filter	Micro-Tronics	HPS17542	F00222	6/26/2013
RF PreAmplifier, 1-18GHz	Miteq	TBD	F00350	6/26/2013
Preamplifier, 1300 MHz	Agilent	8447D	C00885	6/26/2013
Spectrum Analyzer, 40 GHz	Agilent	8564E	C00951	7/29/2013
PreAmplifier, 1-26.5GHz	Agilent	8449B	F00167	3/23/2013
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	6/28/2013
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/26/2013
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	8/20/2013

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7. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

7.1. 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/B Minimum VBW (kHz)
Bluetooth GFSK	2.880	3.750	0.768	76.80%	1.15	0.347
Bluetooth 8PSK	2.875	3.745	0.768	76.77%	1.15	0.348

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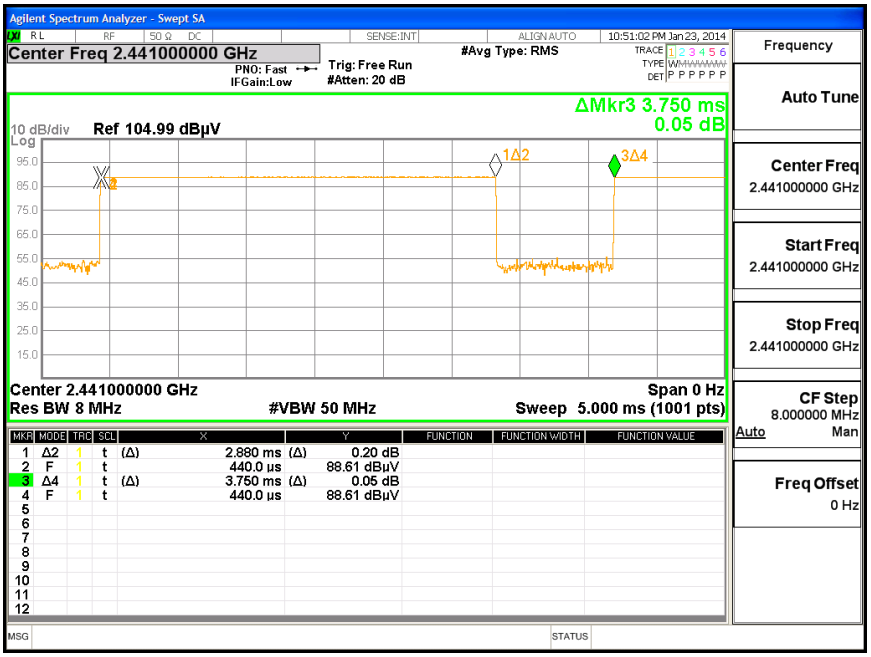
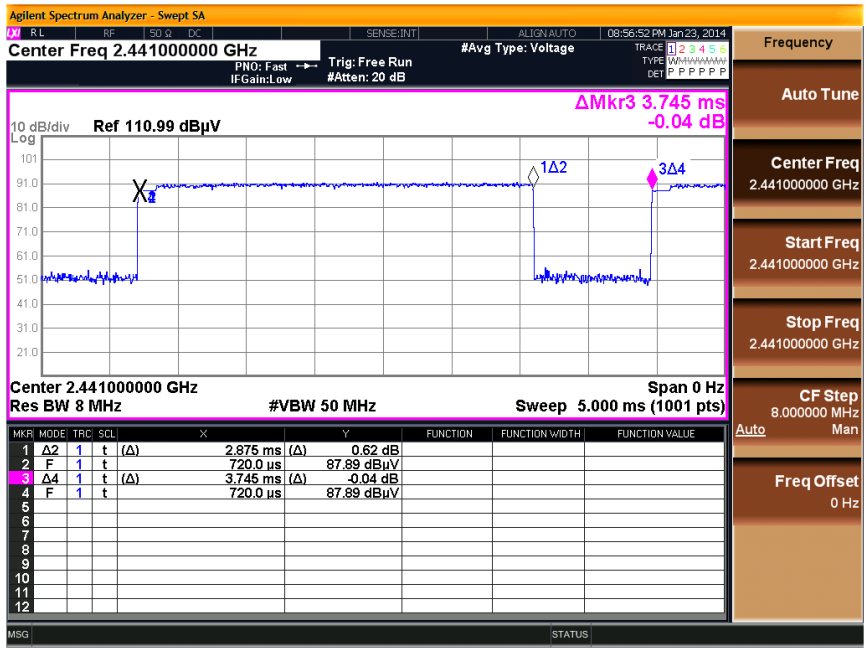
7.2. DUTY CYCLE PLOTS

DUTY CYCLE GFSK MODE



DUTY CYCLE 8PSK MODE



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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

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

The 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.

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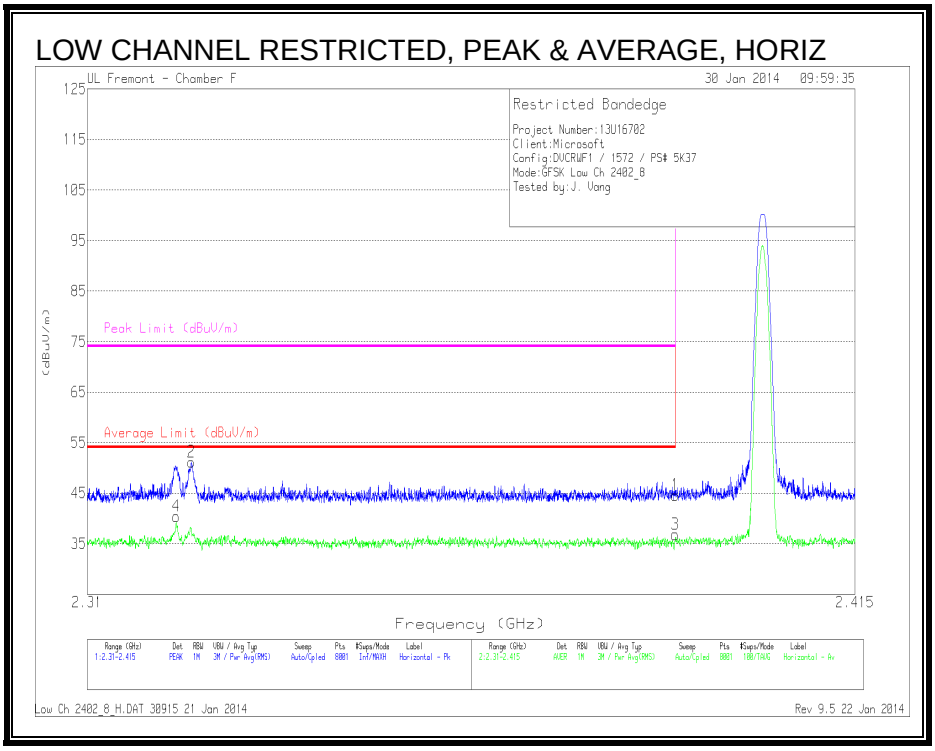
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	36.3	PK	32.1	-23.8	44.6	-	-	74	-29.4	260	109	H
2	2.324	42.64	PK	32	-23.5	51.14	-	-	74	-22.86	260	109	H
3	2.39	27.32	RMS	32.1	-23.8	35.62	54	-18.38	-	-	260	109	H
4	2.322	30.72	RMS	32	-23.5	39.22	54	-14.78	-	-	260	109	H

PK - Peak detector

RMS - RMS detection

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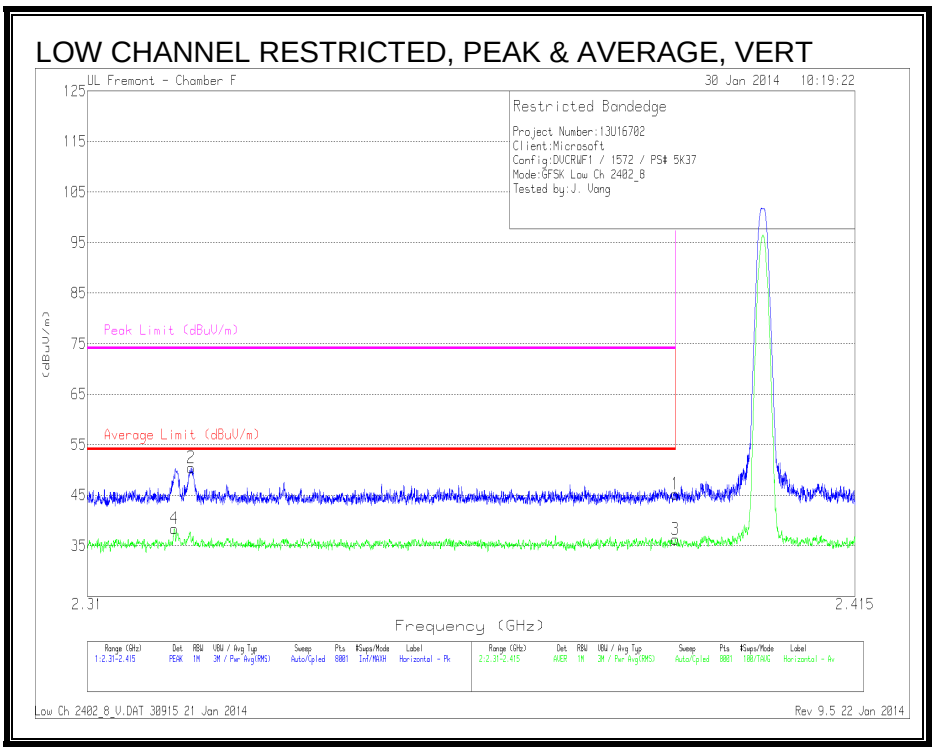
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	36.91	PK	32.1	-23.8	45.21	-	-	74	-28.79	314	179	V
2	2.324	41.9	PK	32	-23.5	50.4	-	-	74	-23.6	314	179	V
3	2.39	27.96	RMS	32.1	-23.8	36.26	54	-17.74	-	-	314	179	V
4	2.322	29.89	RMS	32	-23.5	38.39	54	-15.61	-	-	314	179	V

PK - Peak detector

RMS - RMS detection

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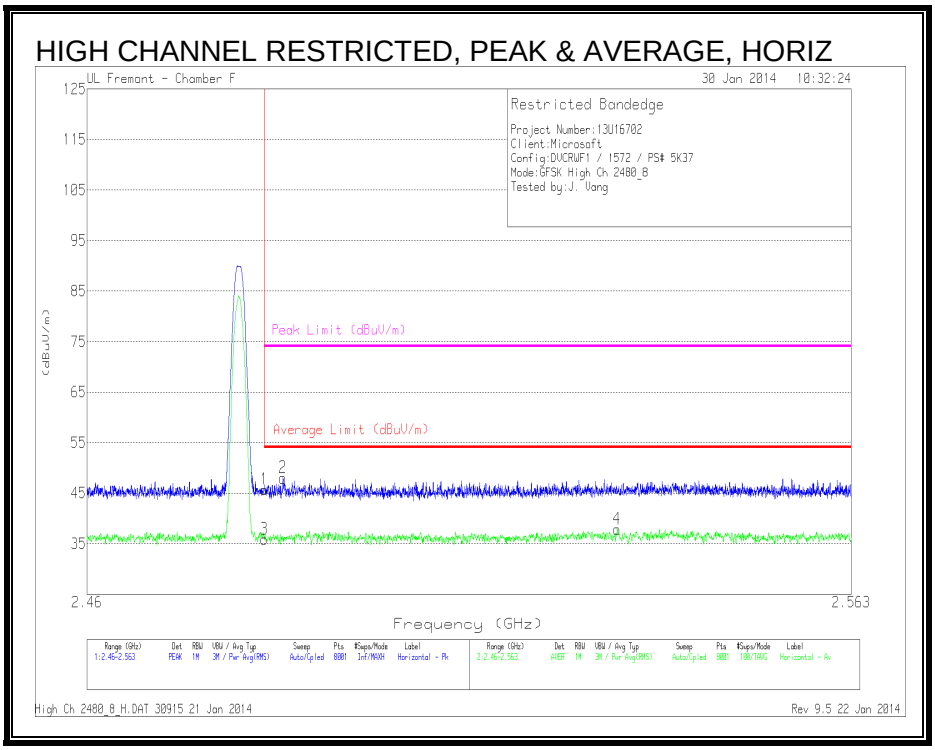
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	36.35	PK	32.4	-23	45.75	-	-	74	-28.25	305	108	H
2	2.486	38.53	PK	32.4	-22.9	48.03	-	-	74	-25.97	305	108	H
3	2.484	26.5	RMS	32.4	-23	35.9	54	-18.1	-	-	305	108	H
4	2.531	28.19	RMS	32.5	-22.8	37.89	54	-16.11	-	-	305	108	H

PK - Peak detector

RMS - RMS detection

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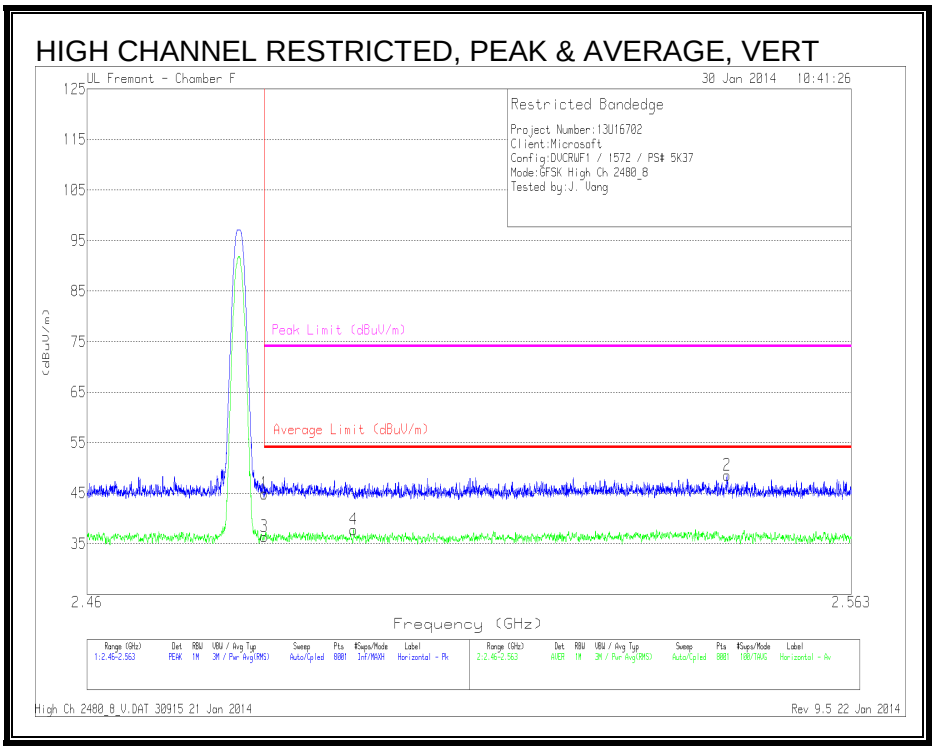
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	35.53	PK	32.4	-23	44.93	-	-	74	-29.07	248	263	V
2	2.546	38.94	PK	32.6	-23	48.54	-	-	74	-25.46	248	263	V
3	2.484	26.97	RMS	32.4	-23	36.37	54	-17.63	-	-	248	263	V
4	2.495	28.3	RMS	32.5	-23	37.8	54	-16.2	-	-	248	263	V

PK - Peak detector

RMS - RMS detection

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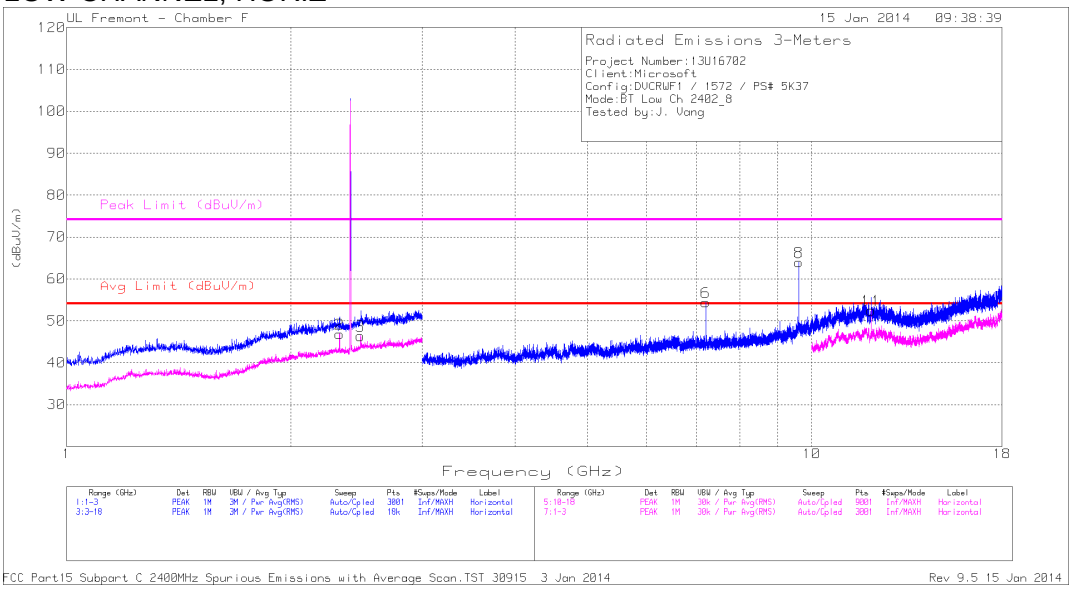
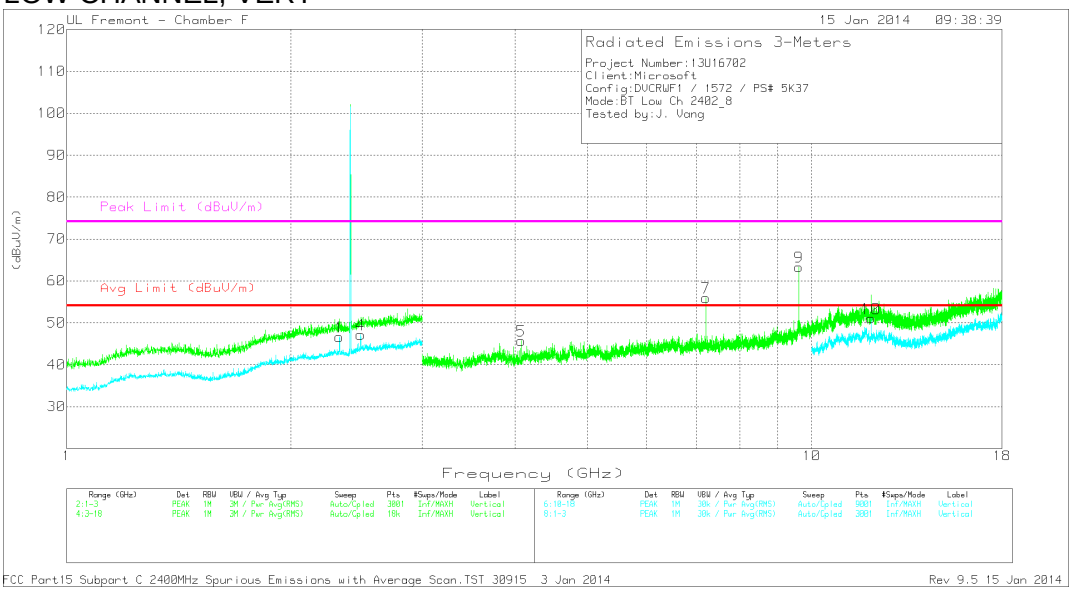
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL

LOW CHANNEL, HORIZ



LOW CHANNEL, VERT



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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/ Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 4.075	41.52	PK	33.4	-29.2	0	45.72	54	-8.28	74	-28.28	0-360	201	V
11	* 12.01	33.68	Avg	39.3	-20.5	5.2	57.68	-	-	74	-16.32	0-360	201	H
10	* 12.009	32.27	Avg	39.3	-20.5	5.2	56.27	-	-	74	-17.73	0-360	199	V
2	* 2.324	38.37	Avg	32	-23.5	5.2	52.07	54	-1.93	74	-21.93	0-360	101	H
1	* 2.321	38.14	Avg	32	-23.5	5.2	51.84	54	-2.16	74	-22.16	0-360	199	V
3	** 2.479	37.19	Avg	32.4	-23.2	5.2	51.59	-	-	74	-22.41	0-360	201	H
4	** 2.48	37.96	Avg	32.4	-23.2	5.2	52.36	-	-	74	-21.64	0-360	199	V
6	** 7.206	45.43	PK	35.7	-26.7	0	54.43	-	-	74	-19.57	0-360	200	H
7	** 7.207	46.85	PK	35.7	-26.6	0	55.95	-	-	74	-18.05	0-360	101	V
8	** 9.609	47.78	PK	37.3	-21.1	0	63.98	-	-	74	-10.02	0-360	200	H
9	** 9.609	47.15	PK	37.3	-21.1	0	63.35	-	-	74	-10.65	0-360	201	V

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Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.322	45.58	PK3	32	-23.5	0	54.08	-	-	74	-19.92	277	399	H
* 2.322	33.64	VB1T	32	-23.5	1.2	43.34	54	-10.66	-	-	277	399	H
* 2.324	47.15	PK3	32	-23.5	0	55.65	-	-	74	-18.35	337	215	V
* 2.322	34.87	VB1T	32	-23.5	1.2	44.57	54	-9.43	-	-	337	215	V
* 12.009	41.23	PK3	39.3	-20.5	0	60.03	-	-	74	-13.97	353	214	H
* 12.009	32.6	VB1T	39.3	-20.5	1.2	52.6	54	-1.4	-	-	353	214	H
* 12.011	41.54	PK3	39.3	-20.5	0	60.34	-	-	74	-13.66	18	217	V
* 12.009	32.67	VB1T	39.3	-20.5	1.2	52.67	54	-1.33	-	-	18	217	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - Denotes a frequency in a non-restricted band. Compliance is shown in conducted Out Of Band Emissions testing (-20dBc) for Peak and (-30dBc) for Average.

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK3 - FHSS Method: Maximum Peak

VB 1/T - FHSS Method: Reduced Video Bandwidth

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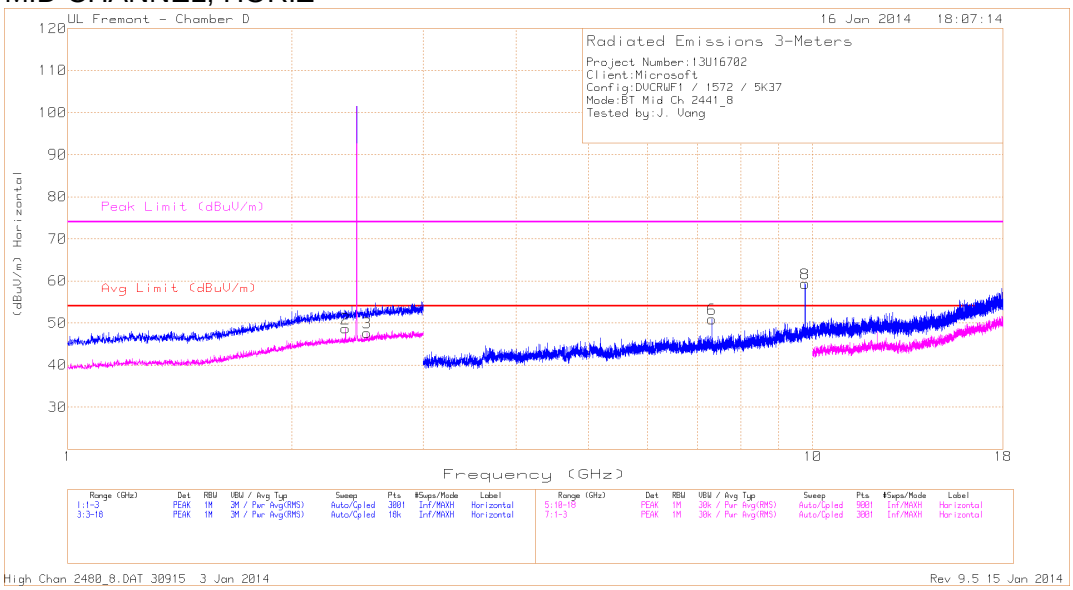
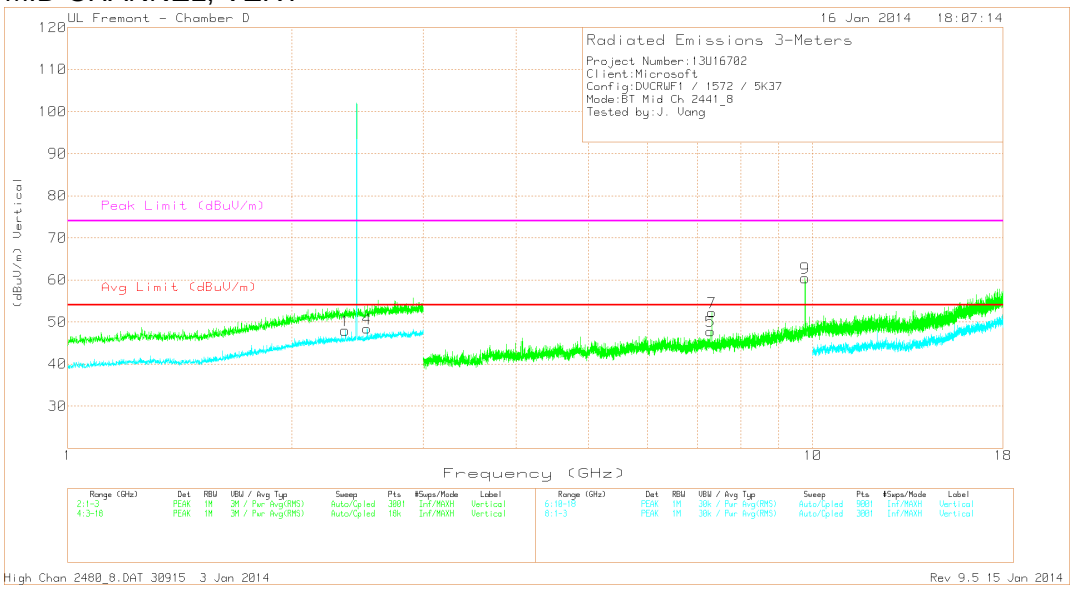
MID CHANNEL

MID CHANNEL, HORIZ



MID CHANNEL, VERT



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MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 7.324	40	PK	35.9	-25	50.9	54	-3.1	74	-23.1	0-360	201	H
5	* 7.291	36.73	PK	35.9	-24.8	47.83	54	-6.17	74	-26.17	0-360	100	V
7	* 7.324	41.39	PK	35.9	-25	52.29	54	-1.71	74	-21.71	0-360	100	V
2	* 2.359	37.09	Avg	32.4	-20.8	48.69	54	-5.31	-	-	0-360	100	H
1	* 2.357	36.38	Avg	32.4	-20.8	47.98	54	-6.02	-	-	0-360	201	V
3	** 2.522	35.78	Avg	32.4	-20.5	47.68	-	-	74	-26.32	0-360	100	H
4	** 2.523	36.55	Avg	32.4	-20.5	48.45	-	-	74	-25.55	0-360	201	V
8	** 9.765	43.46	PK	37.4	-21.5	59.36	-	-	74	-14.64	0-360	100	H
9	** 9.765	44.54	PK	37.4	-21.5	60.44	-	-	74	-13.56	0-360	201	V

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Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.357	47.35	PK3	32.4	-20.8	0	58.95	-	-	74	-15.05	295	130	H
* 2.357	34.74	VB1T	32.4	-20.8	1.2	47.54	54	-6.46	-	-	295	130	H
* 7.323	46.06	PK3	35.9	-25	0	56.96	-	-	74	-17.04	26	299	H
* 7.323	40.46	VB1T	35.9	-25	1.2	52.56	54	-1.44	-	-	26	299	H
* 7.323	45.35	PK3	35.9	-25	0	56.25	-	-	74	-17.75	34	341	V
* 7.323	40.84	VB1T	35.9	-25	1.2	52.94	54	-1.06	-	-	34	341	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - Denotes a frequency in a non-restricted band. Compliance is shown in conducted Out Of Band Emissions testing (-20dBc) for Peak and (-30dBc) for Average.

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK3 - FHSS Method: Maximum Peak

VB 1/T - FHSS Method: Reduced Video Bandwidth

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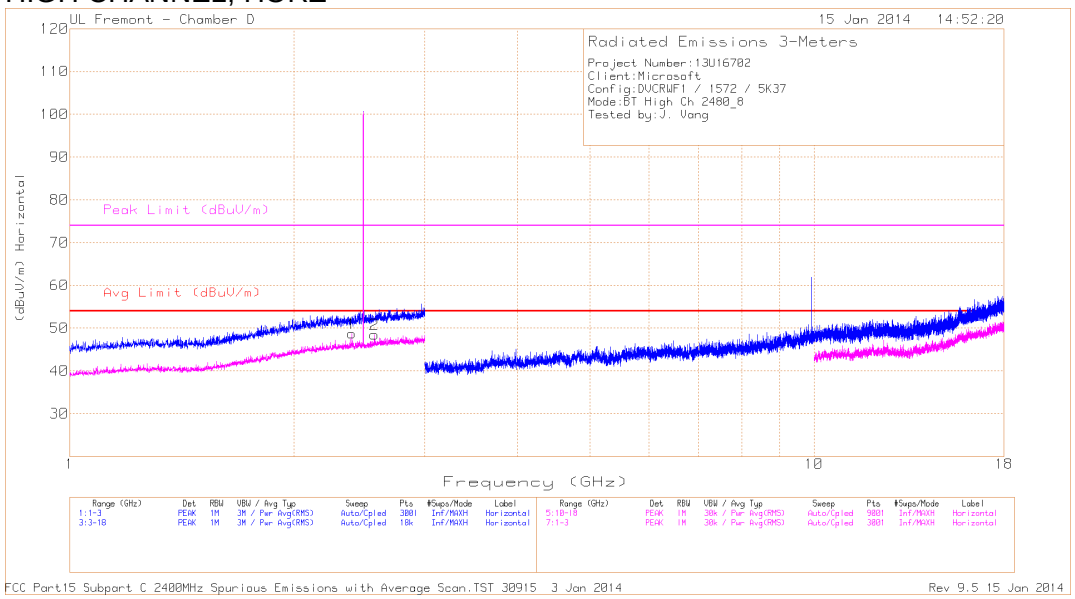
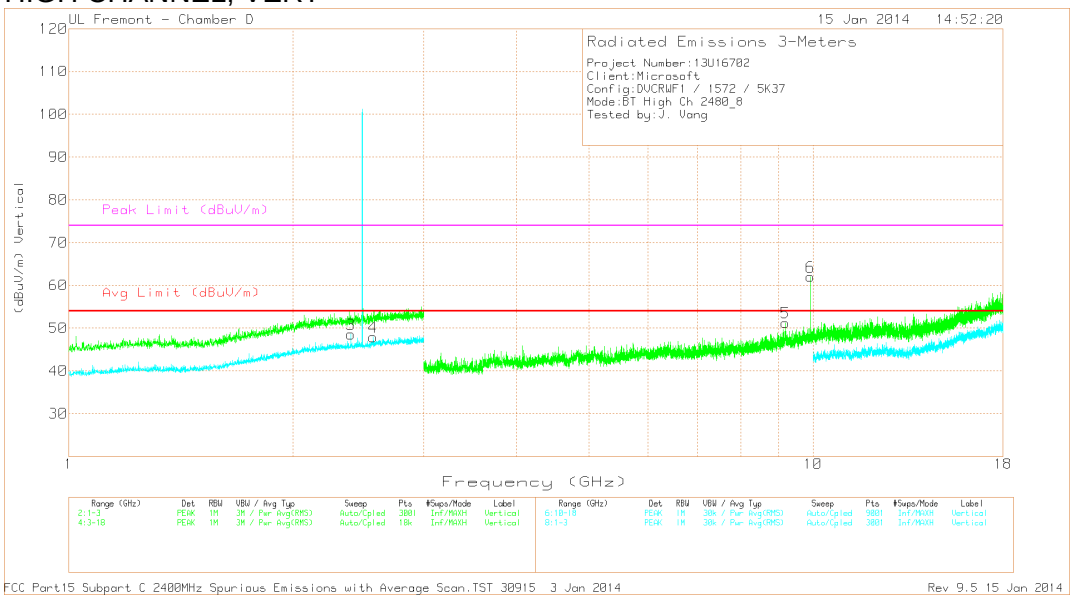
HIGH CHANNEL

HIGH CHANNEL, HORZ



HIGH CHANNEL, VERT



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HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 9.184	35.64	PK	36.8	-21.2	0	51.24	54	-2.76	74	-22.76	0-360	100	V
1	** 2.394	36.88	Avg	32.4	-20.5	5.2	53.98	-	-	74	-20.02	0-360	100	H
3	** 2.395	36.67	Avg	32.4	-20.5	5.2	53.77	-	-	74	-20.23	0-360	201	V
4	** 2.565	35.93	Avg	32.5	-20.5	5.2	53.13	-	-	74	-20.87	0-360	201	V
2	** 2.567	36.53	Avg	32.5	-20.5	5.2	53.73	-	-	74	-20.27	0-360	100	H
6	** 9.92	46.02	PK	37.7	-21.7	0	62.02	-	-	74	-11.98	0-360	100	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 9.178	37.6	PK3	36.8	-21.3	0	53.1	-	-	74	-20.9	264	360	V
* 9.159	25.31	VB1T	36.8	-22	1.2	41.31	54	-12.69	-	-	264	360	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - Denotes a frequency in a non-restricted band. Compliance is shown in conducted Out Of Band Emissions testing (-20dBc) for Peak and (-30dBc) for Average.

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

PK3 - FHSS Method: Maximum Peak

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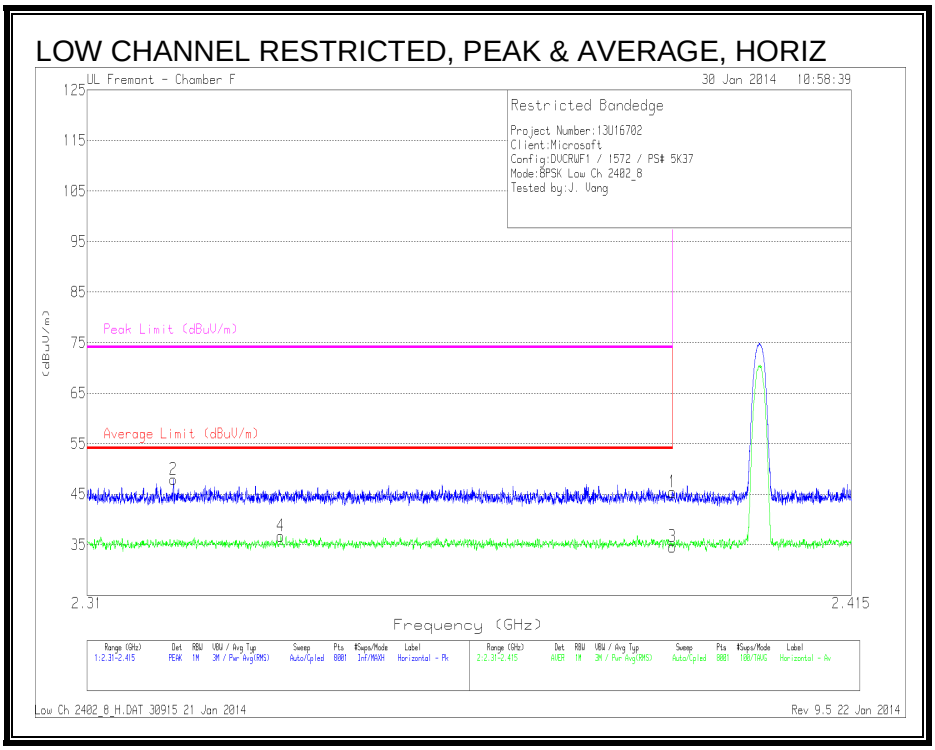
8.2.2. BASIC DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	37.11	PK	32.1	-23.8	45.41	-	-	74	-28.59	306	279	H
2	2.322	39.43	PK	32	-23.5	47.93	-	-	74	-26.07	306	279	H
3	2.39	26.3	RMS	32.1	-23.8	34.6	54	-19.4	-	-	306	279	H
4	2.336	28.22	RMS	32	-23.5	36.72	54	-17.28	-	-	306	279	H

PK - Peak detector

RMS - RMS detection

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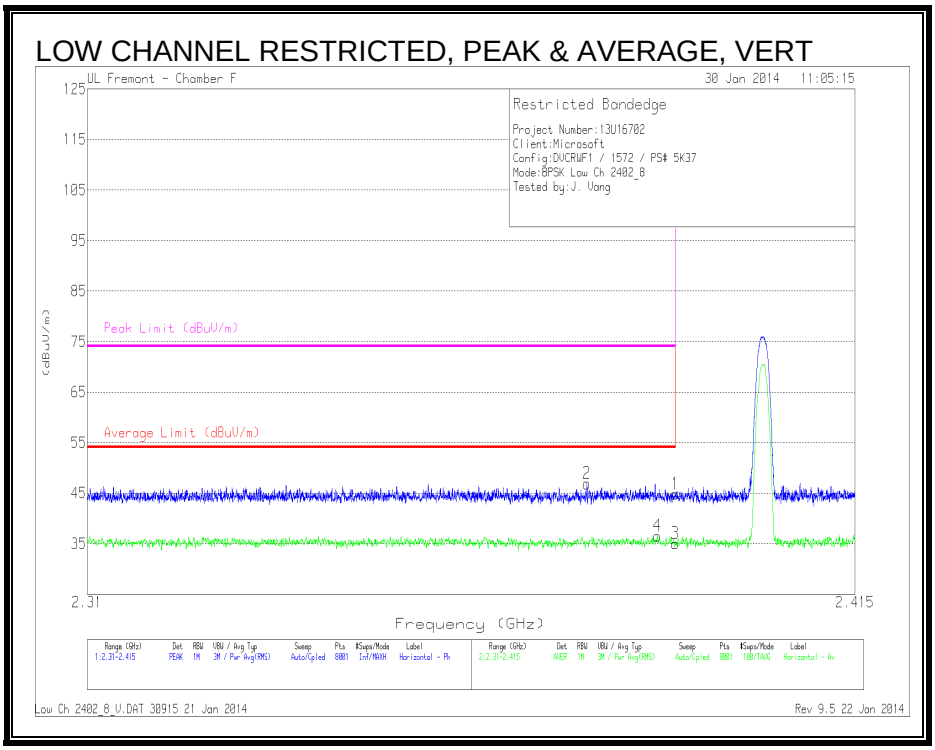
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	36.52	PK	32.1	-23.8	44.82	-	-	74	-29.18	159	101	V
2	2.378	38.7	PK	32.1	-23.9	46.9	-	-	74	-27.1	159	101	V
3	2.39	26.71	RMS	32.1	-23.8	35.01	54	-18.99	-	-	159	101	V
4	2.388	28.22	RMS	32.1	-23.8	36.52	54	-17.48	-	-	159	101	V

PK - Peak detector

RMS - RMS detection

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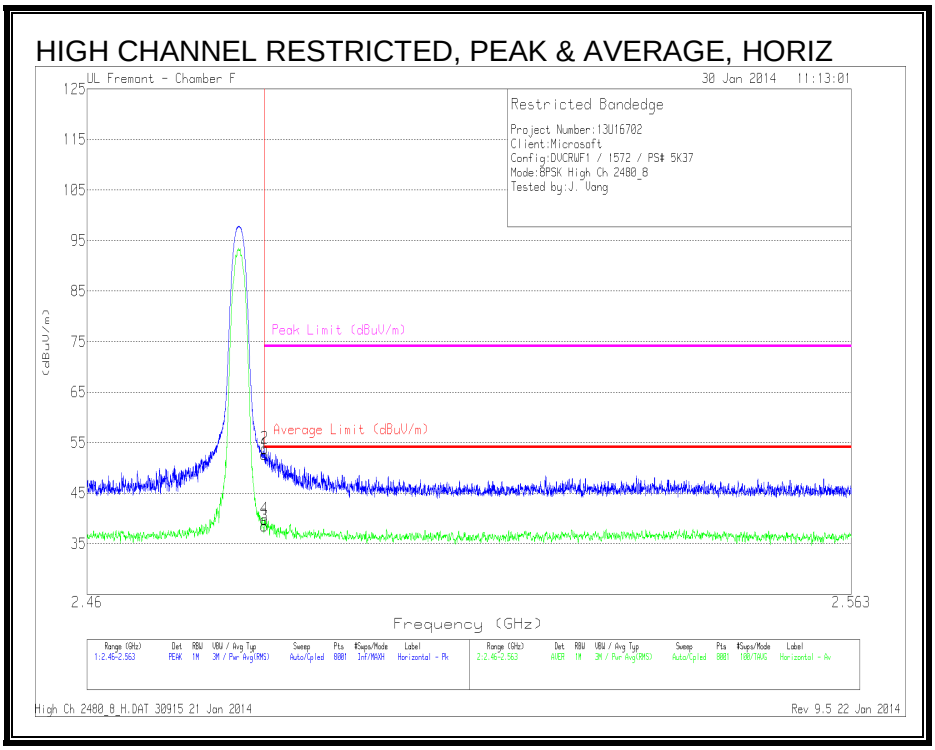
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	43.3	PK	32.4	-23	52.7	-	-	74	-21.3	262	281	H
2	2.484	44.46	PK	32.4	-23	53.86	-	-	74	-20.14	262	281	H
3	2.484	29.13	RMS	32.4	-23	38.53	54	-15.47	-	-	262	281	H
4	2.484	30.45	RMS	32.4	-23	39.85	54	-14.15	-	-	262	281	H

PK - Peak detector

RMS - RMS detection

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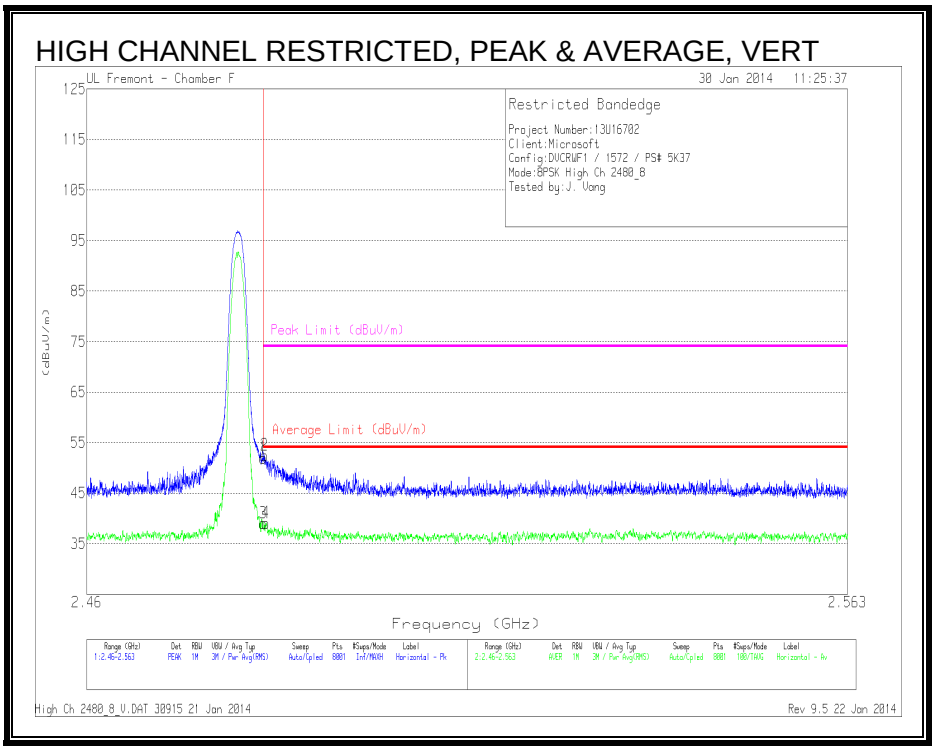
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	42.58	PK	32.4	-23	51.98	-	-	74	-22.02	287	117	V
2	2.484	43.08	PK	32.4	-23	52.48	-	-	74	-21.52	287	117	V
3	2.484	29.65	RMS	32.4	-23	39.05	54	-14.95	-	-	287	117	V
4	2.484	29.69	RMS	32.4	-23	39.09	54	-14.91	-	-	287	117	V

PK - Peak detector

RMS - RMS detection

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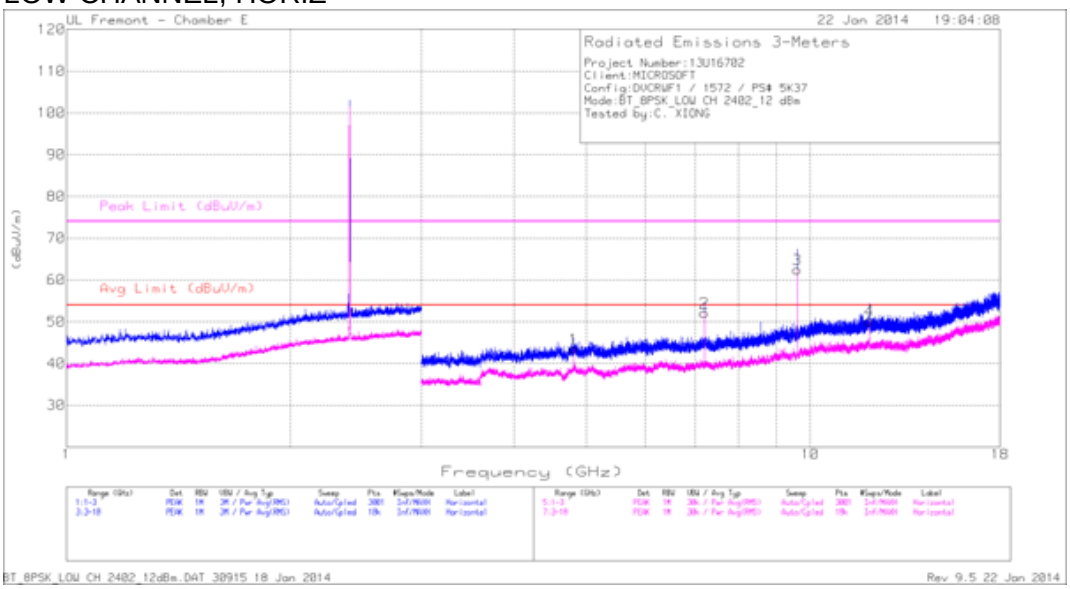
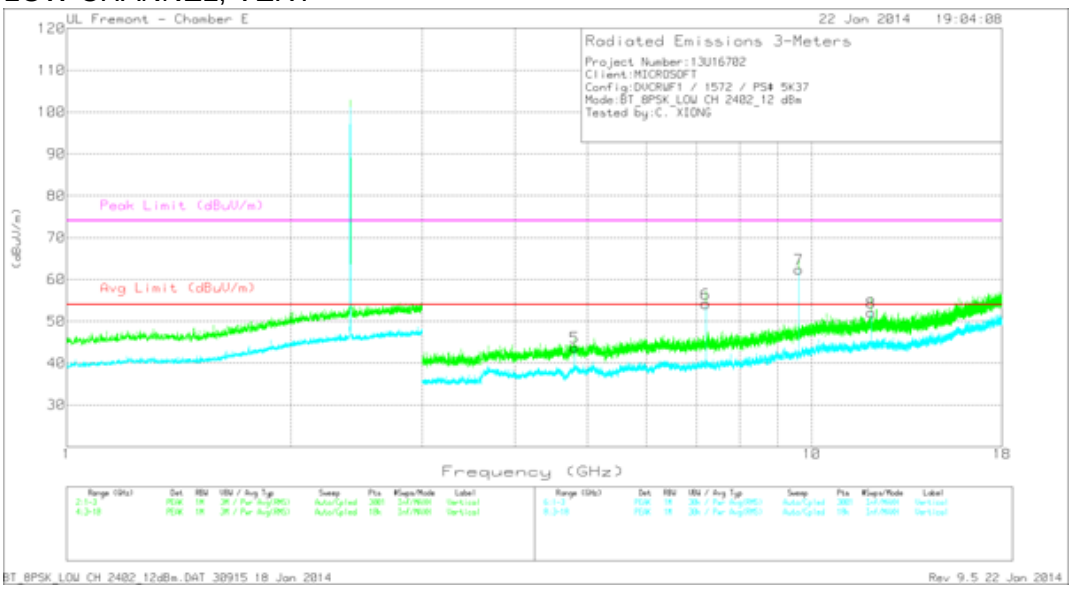
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL

LOW CHANNEL, HORIZ



LOW CHANNEL, VERT



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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.805	36.22	Avg	34.4	-27.1	0	43.52	53.97	-10.45	-	-	0-360	100	H
4	* 12.009	31.94	Avg	39.2	-20.9	0	50.24	53.97	-3.73	-	-	0-360	201	H
5	* 4.804	36.45	Avg	34.4	-27.1	0	43.75	53.97	-10.22	-	-	0-360	100	V
8	* 12.01	33.77	Avg	39.2	-20.9	0	52.07	53.97	-1.9	-	-	0-360	100	V
2	**7.206	41.31	Avg	35.9	-25.1	0	52.11	-	-	-	-	0-360	201	H
6	**7.206	43.4	Avg	35.9	-25.1	0	54.2	-	-	-	-	0-360	100	V
3	**9.607	47.74	Avg	37.3	-22.5	0	62.54	-	-	-	-	0-360	100	H
7	**9.607	47.55	Avg	37.3	-22.5	0	62.35	-	-	-	-	0-360	201	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - indicates frequency in a non-restricted band. Compliance is shown in conducted Out Of Band Emissions testing (-20dBc) for Peak and (-30dBc) for Average.

Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 12.009	41.81	PK3	39.2	-20.9	0	60.11	-	-	74	-13.89	360	197	H
* 12.01	33.28	VB1T	39.2	-20.9	1.2	52.78	53.97	-1.19	-	-	360	197	H
* 12.01	41.87	PK3	39.2	-20.9	0	60.17	-	-	74	-13.83	354	145	V
* 12.01	33.17	VB1T	39.2	-20.9	1.2	52.67	53.97	-1.3	-	-	354	145	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB 1/T - FHSS Method: Reduced Video Bandwidth

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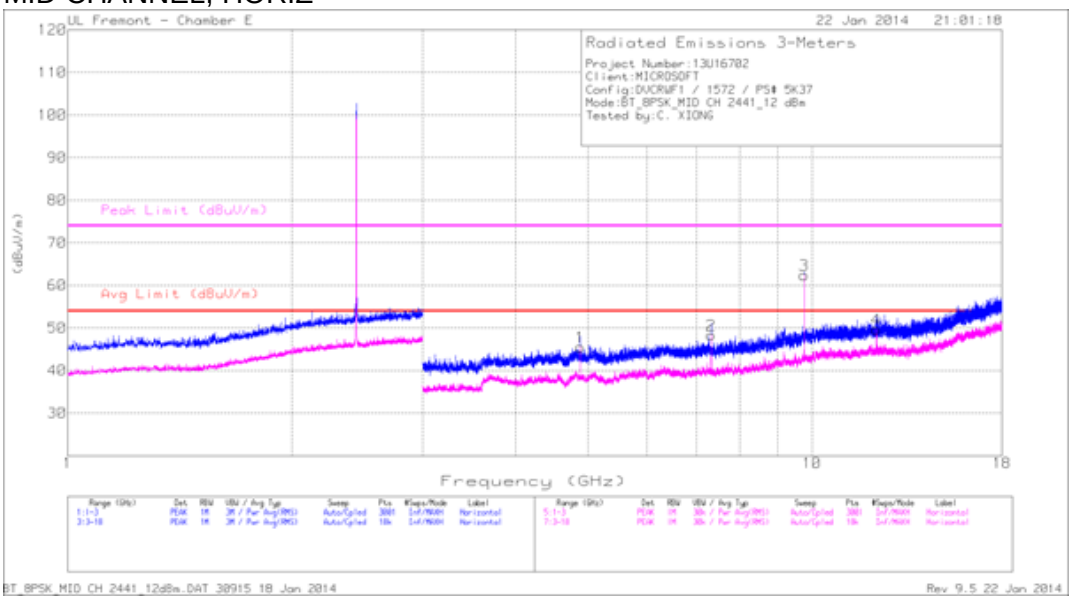
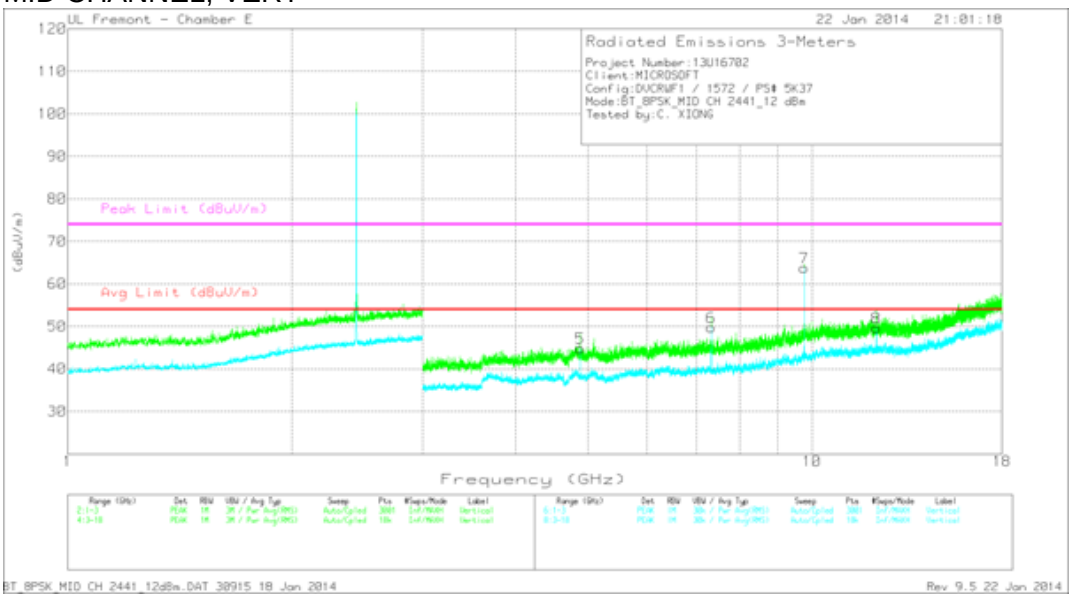
MID CHANNEL

MID CHANNEL, HORIZ



MID CHANNEL, VERT



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MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.882	38.36	Avg	34.3	-27.1	0	45.56	53.97	-8.41	-	-	0-360	100	H
2	* 7.323	37.42	Avg	35.9	-25	0	48.32	53.97	-5.65	-	-	0-360	201	H
4	* 12.204	31.9	Avg	39.2	-21.4	0	49.7	53.97	-4.27	-	-	0-360	201	H
5	* 4.882	37.56	Avg	34.3	-27	0	44.86	53.97	-9.11	-	-	0-360	100	V
6	* 7.322	38.88	Avg	35.9	-25	0	49.78	53.97	-4.19	-	-	0-360	201	V
8	* 12.206	31.86	Avg	39.2	-21.4	0	49.66	53.97	-4.31	-	-	0-360	100	V
3	**9.764	46.54	Avg	37.4	-21.5	0	62.44	-	-	-	-	0-360	201	H
7	**9.765	47.87	Avg	37.4	-21.5	0	63.77	-	-	-	-	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - indicates frequency in a non-restricted band. Compliance is shown in conducted Out Of Band Emissions testing (-20dBc) for Peak and (-30dBc) for Average.

Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.323	46.37	PK3	35.9	-25	0	57.27	-	-	74	-16.73	24	361	H
* 7.323	39.52	VB1T	35.9	-25	1.2	51.62	53.97	-2.35	-	-	24	361	H
* 12.206	40.24	PK3	39.2	-21.4	0	58.04	-	-	74	-15.96	265	106	H
* 12.205	31.08	VB1T	39.2	-21.4	1.2	50.08	53.97	-3.89	-	-	265	106	H
* 7.323	48.05	PK3	35.9	-25	0	58.95	-	-	74	-15.05	38	365	V
* 7.323	41.41	VB1T	35.9	-25	1.2	53.51	53.97	-.46	-	-	38	365	V
* 12.204	40.35	PK3	39.2	-21.4	0	58.15	-	-	74	-15.85	287	102	V
* 12.205	31.22	VB1T	39.2	-21.4	1.2	50.22	53.97	-3.75	-	-	287	102	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB 1/T - FHSS Method: Reduced Video Bandwidth

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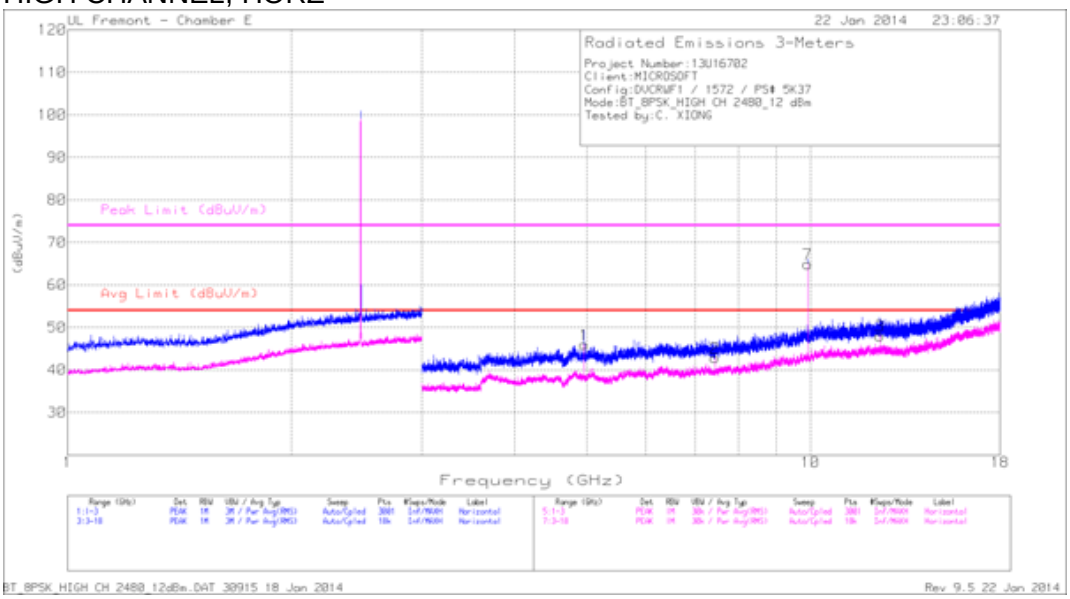
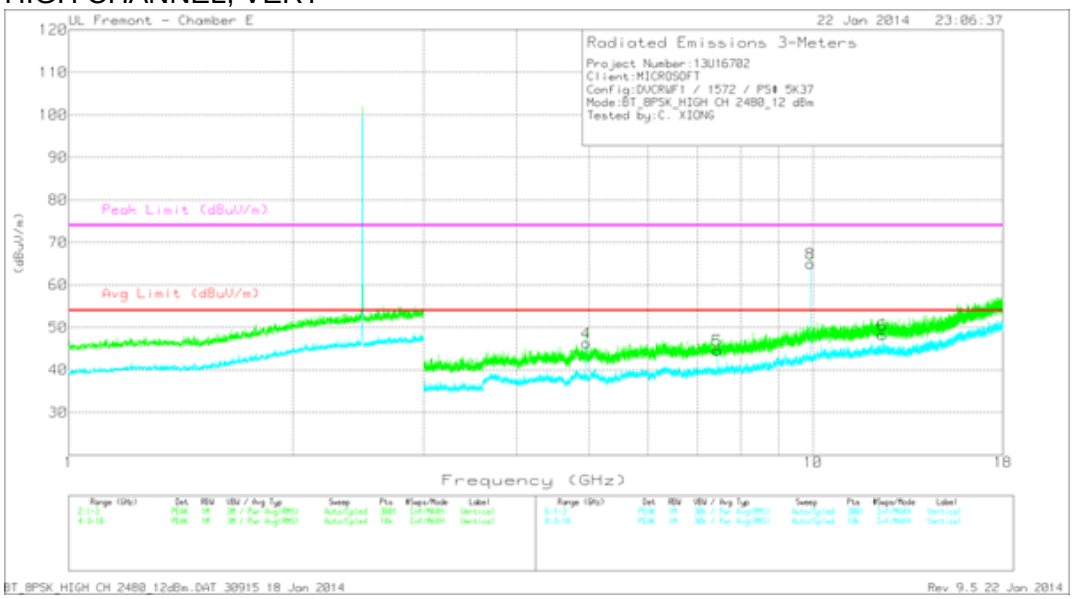
HIGH CHANNEL

HIGH CHANNEL, HORZ



HIGH CHANNEL, VERT



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HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.96	39.77	Avg	34.3	-28.1	0	45.97	53.97	-8	-	-	0-360	100	H
2	* 7.44	31.74	Avg	35.9	-24.8	0	42.84	53.97	-11.13	-	-	0-360	201	H
3	* 12.4	30.23	Avg	39.2	-21.4	0	48.03	53.97	-5.94	-	-	0-360	201	H
4	* 4.96	40.13	Avg	34.3	-28.1	0	46.33	53.97	-7.64	-	-	0-360	201	V
5	* 7.44	33.49	Avg	35.9	-24.8	0	44.59	53.97	-9.38	-	-	0-360	100	V
6	* 12.399	30.51	Avg	39.2	-21.5	0	48.21	53.97	-5.76	-	-	0-360	100	V
7	**9.919	48.92	Avg	37.7	-21.7	0	64.92	-	-	-	-	0-360	201	H
8	**9.92	49.01	Avg	37.7	-21.7	0	65.01	-	-	-	-	0-360	201	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

** - indicates frequency in a non-restricted band. Compliance is shown in conducted Out Of Band Emissions testing (-20dBc) for Peak and (-30dBc) for Average.

Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (db/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 12.399	37.89	PK3	39.2	-21.5	0	55.59	-	-	74	-18.41	259	105	H
* 12.4	27.76	VB1T	39.2	-21.4	1.2	46.76	53.97	-7.21	-	-	259	105	H
* 12.401	38.14	PK3	39.2	-21.4	0	55.94	-	-	74	-18.06	262	109	V
* 12.4	27.91	VB1T	39.2	-21.4	1.2	46.91	53.97	-7.06	-	-	262	109	V
* 7.323	48.05	PK3	35.9	-25	0	58.95	-	-	74	-15.05	38	365	V
* 7.323	41.41	VB1T	35.9	-25	1.2	53.51	53.97	-.46	-	-	38	365	V
* 12.204	40.35	PK3	39.2	-21.4	0	58.15	-	-	74	-15.85	287	102	V
* 12.205	31.22	VB1T	39.2	-21.4	1.2	50.22	53.97	-3.75	-	-	287	102	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

VB 1/T - FHSS Method: Reduced Video Bandwidth

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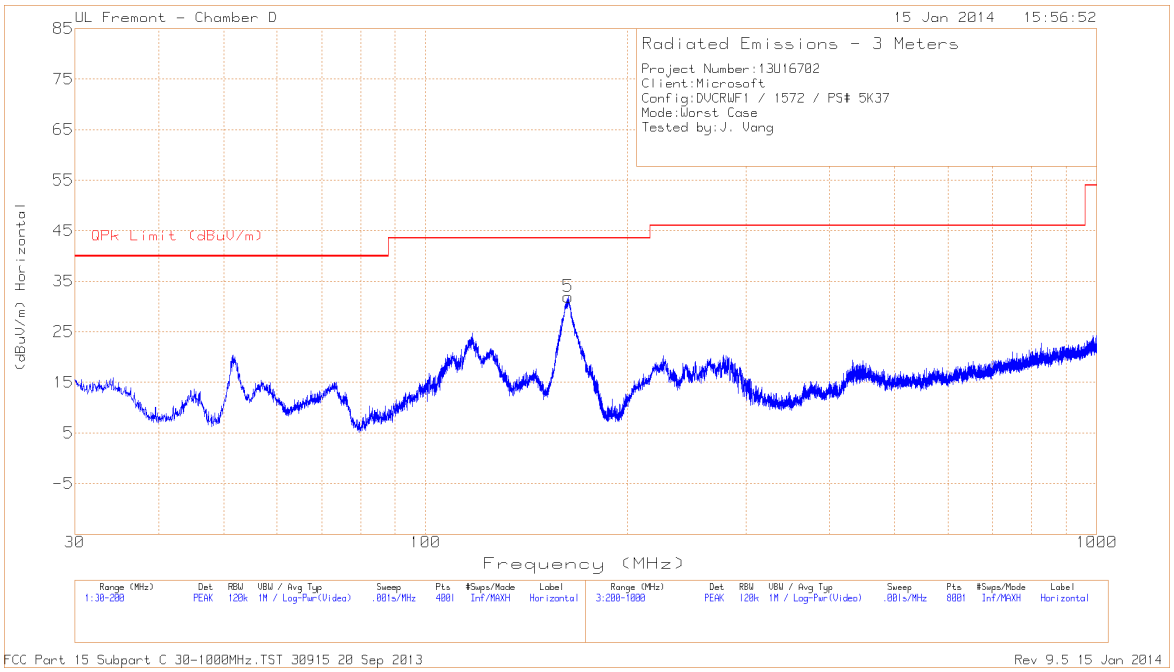
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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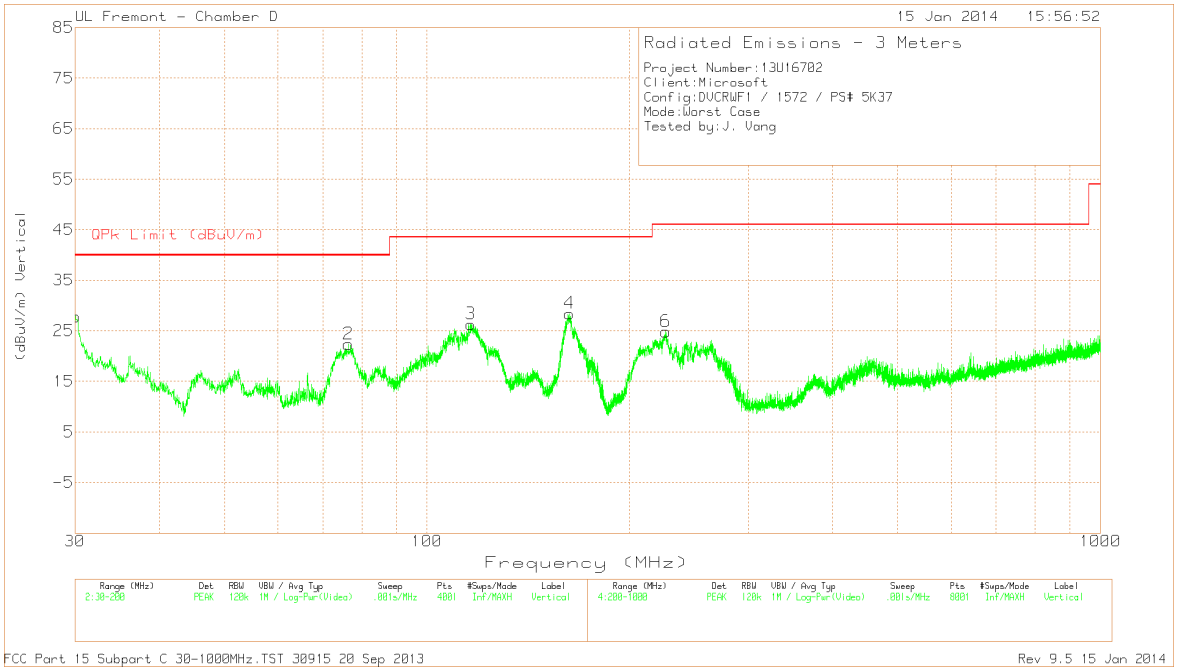
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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BELOW 1G DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 dB/m	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.0425	38.63	PK	21.3	-32.1	27.83	40	-12.17	0-360	100	V
2	76.4525	45.95	PK	8.1	-31.7	22.35	40	-17.65	0-360	100	V
3	116.105	44.49	PK	13.4	-31.6	26.29	43.52	-17.23	0-360	100	V
4	162.8125	47.6	PK	12.1	-31.3	28.4	43.52	-15.12	0-360	100	V
5	163.1525	51.04	PK	12.1	-31.2	31.94	43.52	-11.58	0-360	200	H
6	226.2	44.93	PK	10.9	-31	24.83	46.02	-21.19	0-360	100	V

PK - Peak detector

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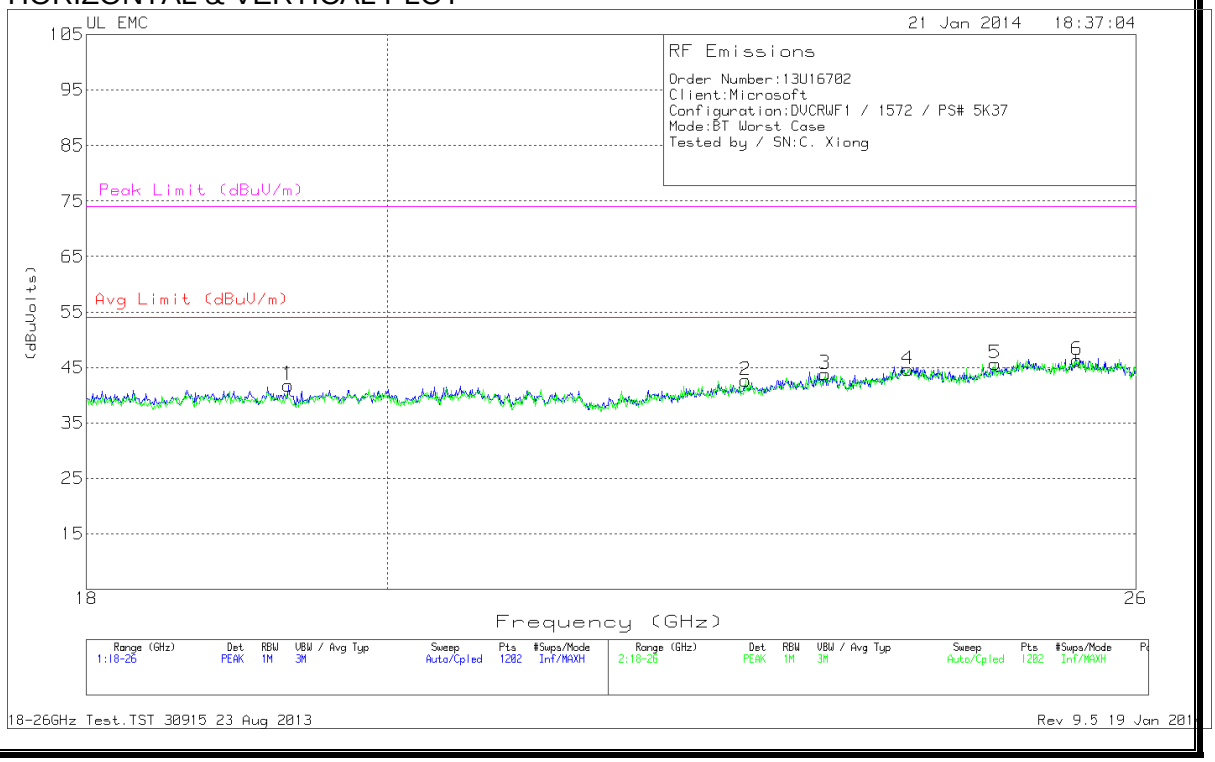
8.4. WORST-CASE 18 to 26GHz

SPURIOUS EMISSIONS 18000 26000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

HORIZONTAL & VERTICAL PLOT



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18 TO 26G DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T89 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.319	42.63	PK	32.5	-23.8	-9.5	41.83	54	-12.16	74	-32.16
2	22.676	42.37	PK	33.4	-23.6	-9.5	42.66	54	-11.33	74	-31.33
3	23.316	43.03	PK	33.4	-23.1	-9.5	43.83	54	-10.16	74	-30.16
4	24.002	43.27	PK	33.6	-22.7	-9.5	44.66	54	-9.33	74	-29.33
5	24.748	43.87	PK	34	-22.7	-9.5	45.66	54	-8.33	74	-28.33
6	25.467	44.33	PK	34.1	-22.6	-9.5	46.33	54	-7.66	74	-27.66

PK - Peak detector

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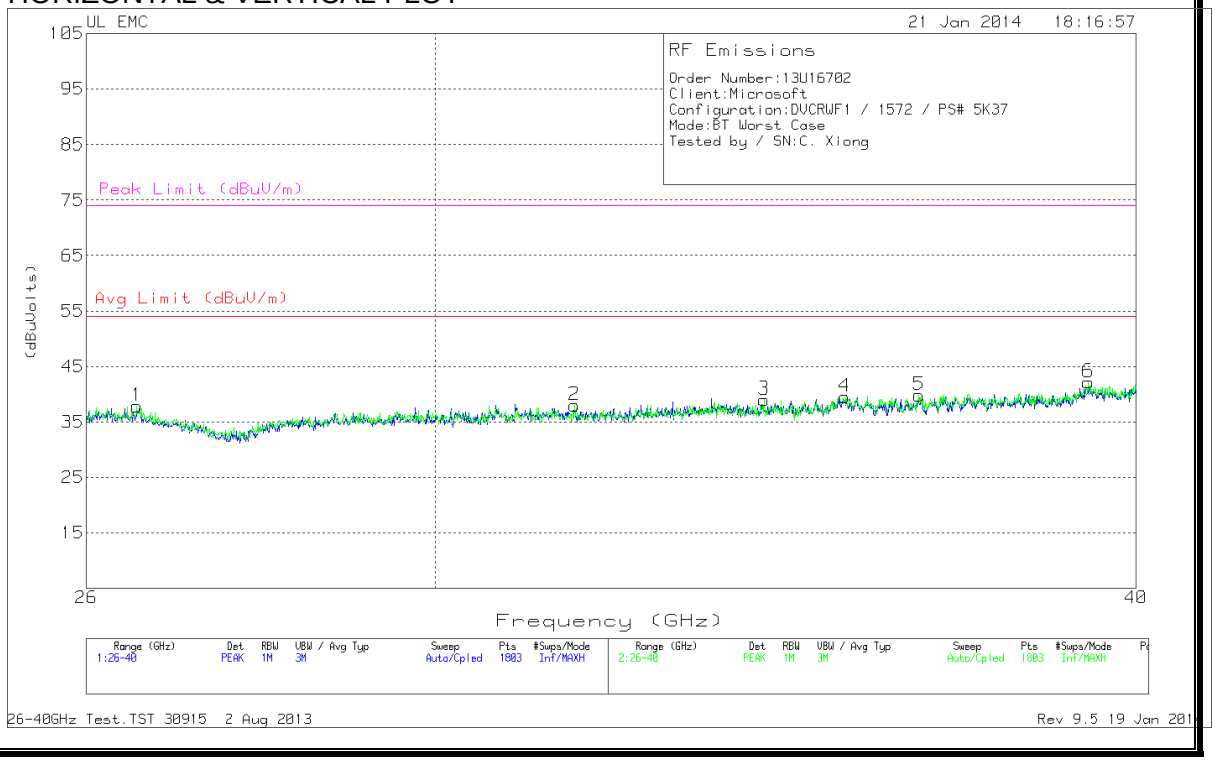
8.5. WORST-CASE 26 to 40GHz

SPURIOUS EMISSIONS 2600 40000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)

HORIZONTAL & VERTICAL PLOT



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26 TO 40G DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T90 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	26.544	45.43	PK	35.5	-33.6	-9.5	37.83	54	-16.16	74	-36.16
2	31.765	46.7	PK	36.3	-35.5	-9.5	38	54	-16	74	-36
3	34.336	48	PK	37.1	-36.6	-9.5	39	54	-15	74	-35
4	35.49	48.3	PK	37.9	-37.2	-9.5	39.5	54	-14.5	74	-34.5
5	36.589	50.13	PK	37.1	-37.9	-9.5	39.83	54	-14.16	74	-34.16
6	39.223	49.17	PK	38.5	-36	-9.5	42.16	54	-11.83	74	-31.83

PK - Peak detector

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9. 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.

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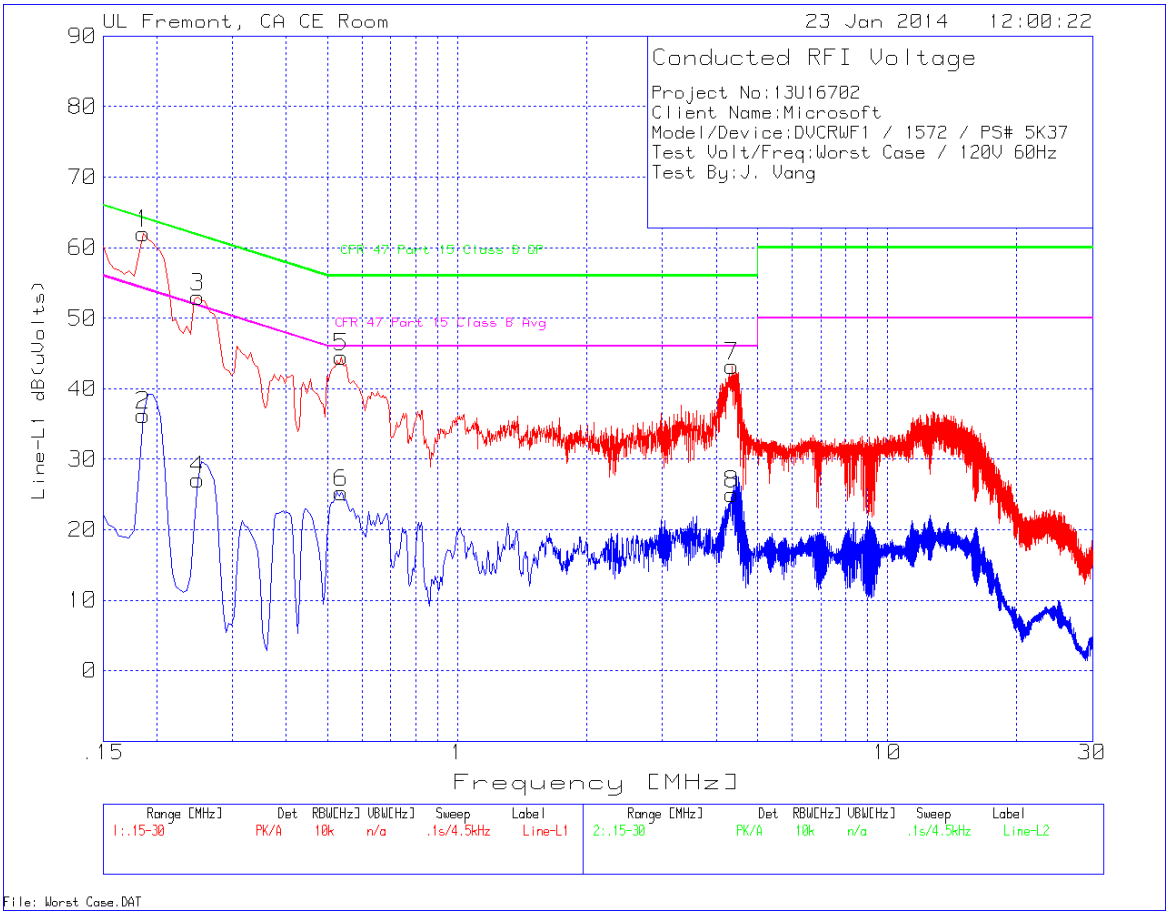
LINE 1 RESULTS



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LINE 1 DATA RESULTS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dB(uVolts)	CFR 47 Part 15 Class B QP	Margin to Limit (dB)	CFR 47 Part 15 Class B Avg	Margin to Limit (dB)
1	.186	61.04	PK	1	0	62.04	64.2	-2.16	-	-
2	.186	35.2	Av	1	0	36.2	-	-	54.2	-18
3	.249	52.31	PK	.7	0	53.01	61.8	-8.79	-	-
4	.249	26.38	Av	.7	0	27.08	-	-	51.8	-24.72
5	.537	44.13	PK	.3	0	44.43	56	-11.57	-	-
6	.537	24.92	Av	.3	0	25.22	-	-	46	-20.78
7	4.362	42.86	PK	.2	.1	43.16	56	-12.84	-	-
8	4.362	24.75	Av	.2	.1	25.05	-	-	46	-20.95

PK - Peak detector

Av - average detection

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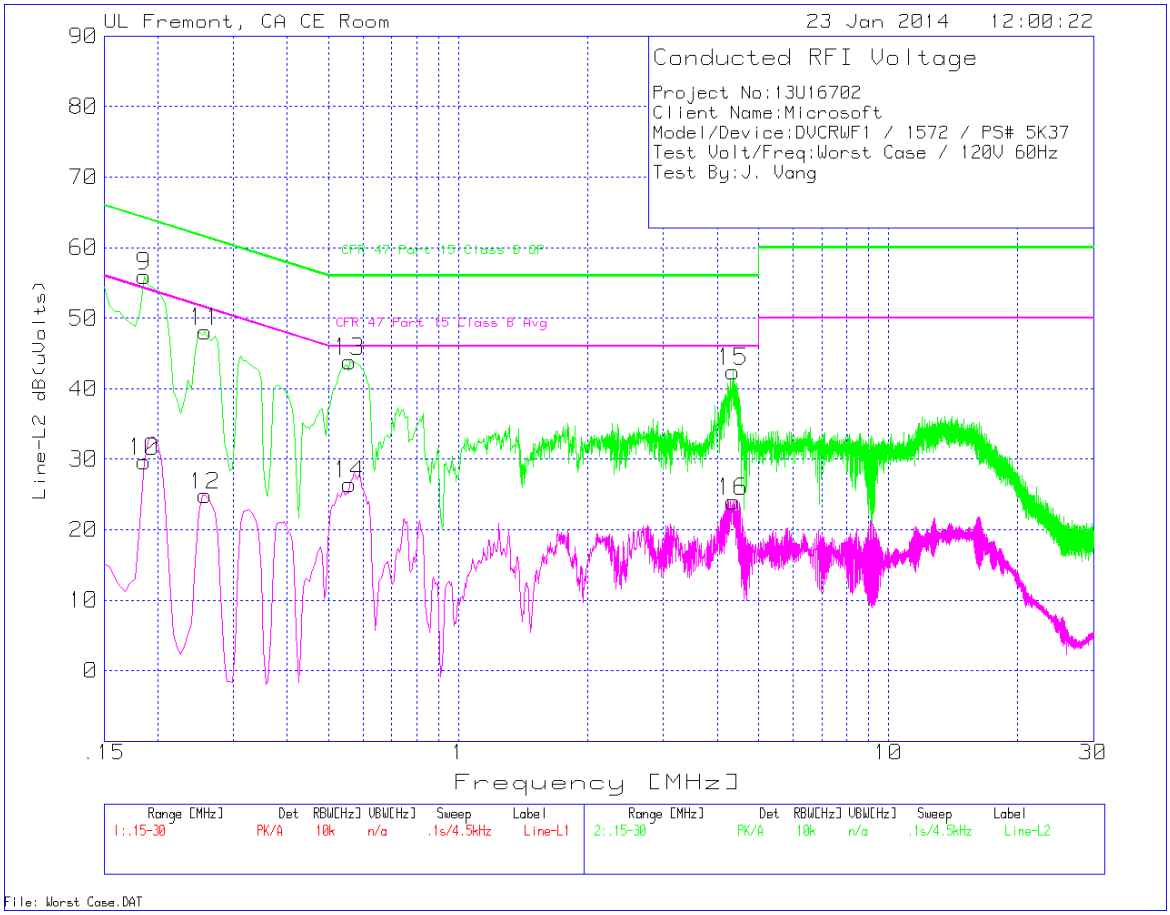
LINE 2 RESULTS



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LINE 2 DATA RESULTS

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dB(uVolts)	CFR 47 Part 15 Class B QP	Margin to Limit (dB)	CFR 47 Part 15 Class B Avg	Margin to Limit (dB)
9	.186	54.87	PK	1.1	0	55.97	64.2	-8.23	-	-
10	.186	28.57	Av	1.1	0	29.67	-	-	54.2	-24.53
11	.258	47.41	PK	.7	0	48.11	61.5	-13.39	-	-
12	.258	24.13	Av	.7	0	24.83	-	-	51.5	-26.67
13	.5595	43.59	PK	.3	0	43.89	56	-12.11	-	-
14	.5595	26.18	Av	.3	0	26.48	-	-	46	-19.52
15	4.362	42.07	PK	.2	.1	42.37	56	-13.63	-	-
16	4.362	23.72	Av	.2	.1	24.02	-	-	46	-21.98

PK - Peak detector

Av - average detection

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