



CERTIFICATION TEST REPORT

Report Number. : 16U23300-E7V2

Applicant : Insight Energy Ventures, LLC DBA Powerley
333 W. Seventh St. #200
Royal Oak, MI 48067, U.S.A.

Model : EB2.0

FCC ID : 2AHFD-N1O9A911

IC ID : 21573-482A2

EUT Description : Wireless Sensor Bridge for Home Energy Control

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1
INDUSTRY CANADA RSS-GEN Issue 4

Date of Issue:
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NVLAP[®]

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	06/14/16	Initial Issue	D. Corona
V2	06/22/16	Updated Section 5.3 & 8.6.1	J. WU

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Insight Energy Ventures, LLC DBA Powerley

EUT DESCRIPTION: Wireless Sensor Bridge for home energy control.

MODEL: EB2.0

SERIAL NUMBER: AMJ001532-006 (for conducted), AMJ001532-0010 (for radiated)

DATE TESTED: 5/24/2016 – 6/21/2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	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
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UL Verification Services Inc.

Tested By:



KIYA KEDIDA
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UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-247 Issue 1.

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
<input checked="" type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input checked="" type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input type="checkbox"/> Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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:

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

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
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 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 sensor bridge for home energy control.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405 - 2480	ZigBee	16.87	48.64

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB trace antenna, with a maximum gain of 4.7 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 7.45.41.24 <r608913 WLTEST>

The EUT driver software installed during testing was 1.107 RC 5.0 W10: Apr 6, 2016.

The test utility software used during testing was Tera Term, Version 4.90(SVN# 6338).

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T430	PBB4M4Y	N/A
Laptop AC Adapter	Lenovo	ADLS90NLT2A	11S36200297ZZ30036RDM2	N/A
AC Adapter	ITE	YMC1801UW	N/A	N/A
TTL Converter	B&B electronics	232LPTTL33	N/A	N/A

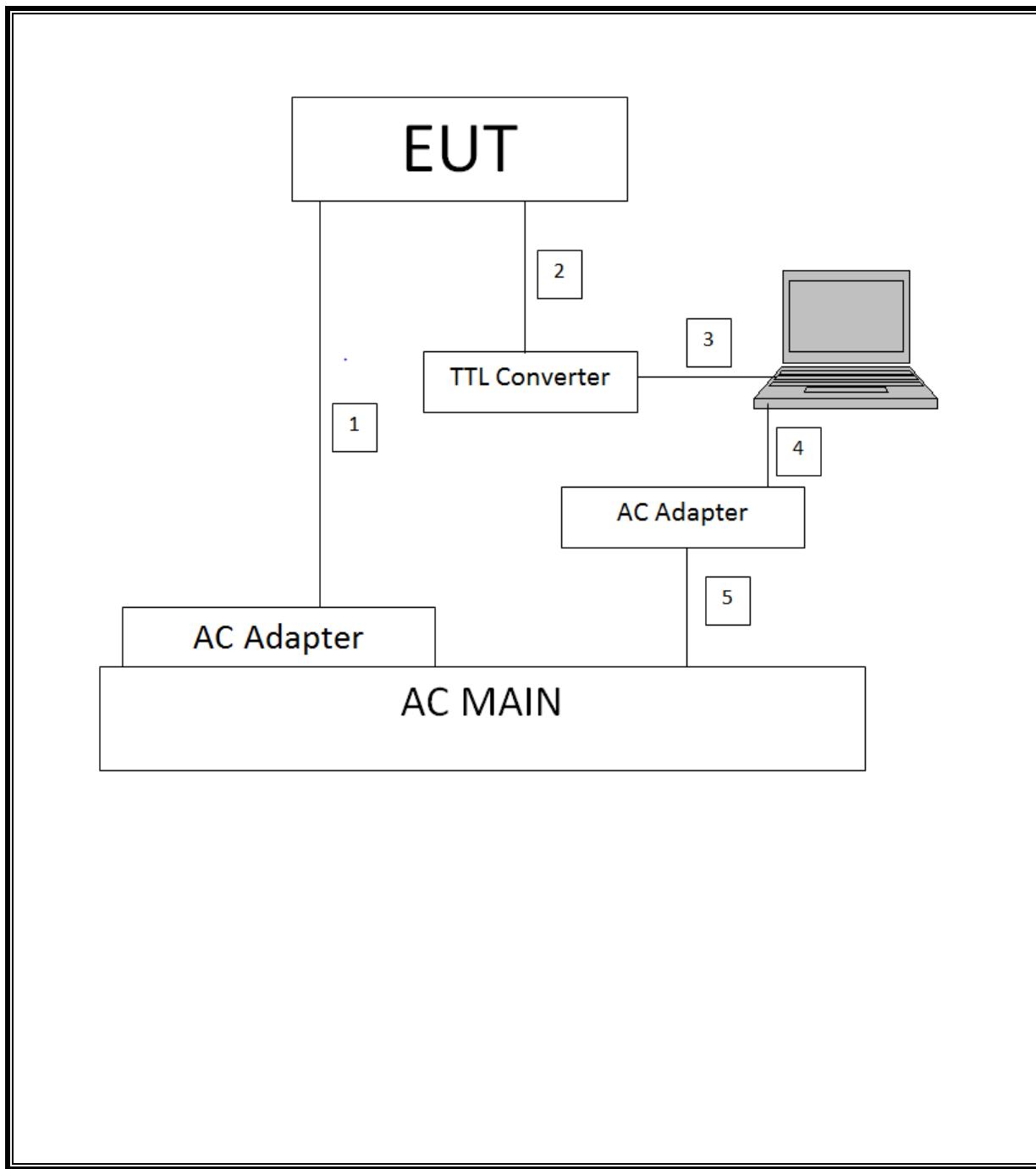
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	Micro-USB	Shielded	1.6	
2	Comm	1	Serial 9 Pins/3 Pins	Unshielded	0.8	
3	Comm	1	USB/Serial 9 Pins	Unshielded	0.4	
4	DC	1	20V DC	Unshielded	1.5	
5	AC	1	US115V	Unshielded	1	

TEST SETUP

The EUT is a standalone unit, and the radio is exercised by Tera Term test software, via a USB/Serial cable.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	T Number	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	130	09/01/16
Antenna, Horn, 18GHz	ETS Lindgren	3117	345	03/07/17
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/31/16
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	88	04/07/17
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16
RF Preamplifier, 30MHz - 1GHz	HP	8447D	10	02/01/17
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	123	10/22/16
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	908	04/13/17
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	907	01/06/17
EMI Test Receiver, 9 KHz to 7 GHz	Rohde & Schwarz	ECS17	284	09/10/16
Peak Power Meter	Agilent / HP	N1911A	229	07/29/16
Peak / Average Power Sensor	Keysight	E9327A	117	02/28/17
LISN, 30 MHz	FCC	50/250-25-2	24	02/09/17
Low Pass Filter 5GHz	Microtronics	LPS17541	482	03/09/17
High Pass Filter 6GHz	Microtronics	HPS17542	483	03/09/17
High Pass Filter 3GHz	Microtronics	HPM17543	485	03/09/17

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Apr 12, 2016
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015
Conducted Port Software	UL	UL RF	Ver 4.7, Apr 28, 2016

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v03r05, Section 6.0.

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

99% BW: ANSI C63.10-2013, Section 6.9.3.

Output Power: KDB 558074 D01 v03r05, Section 9.1.1

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

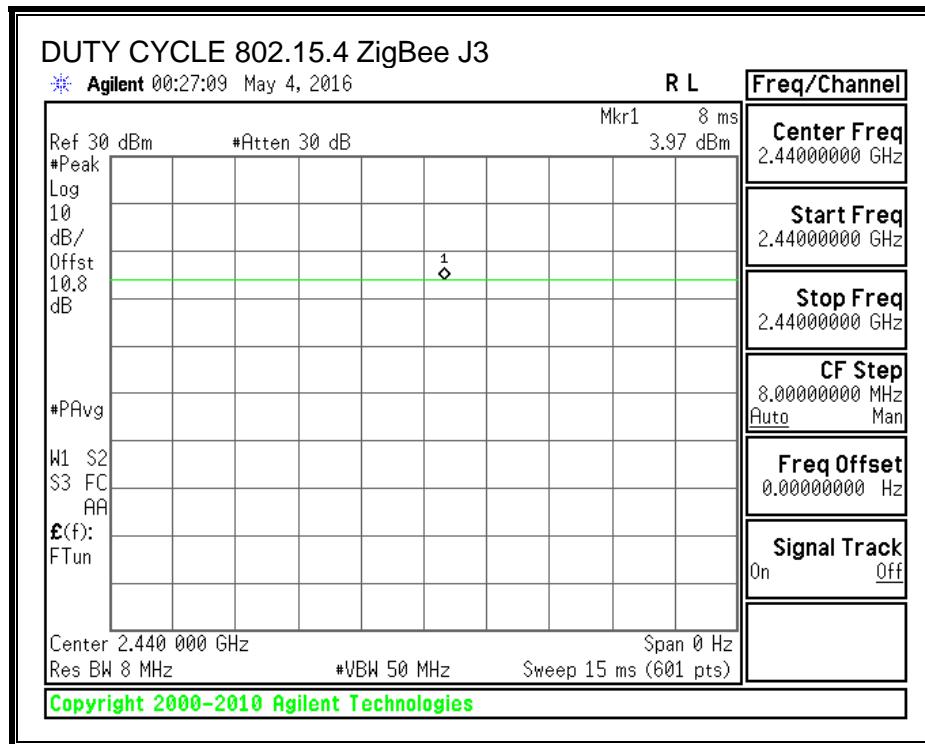
LIMITS

None; for reporting purposes only.

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)
2.4GHz Band						
802.15.4 Zigbee	10.000	10.000	1.000	100.00%	0.00	0.010

8.1.1. DUTY CYCLE PLOT



8.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 Clause 5.2.1

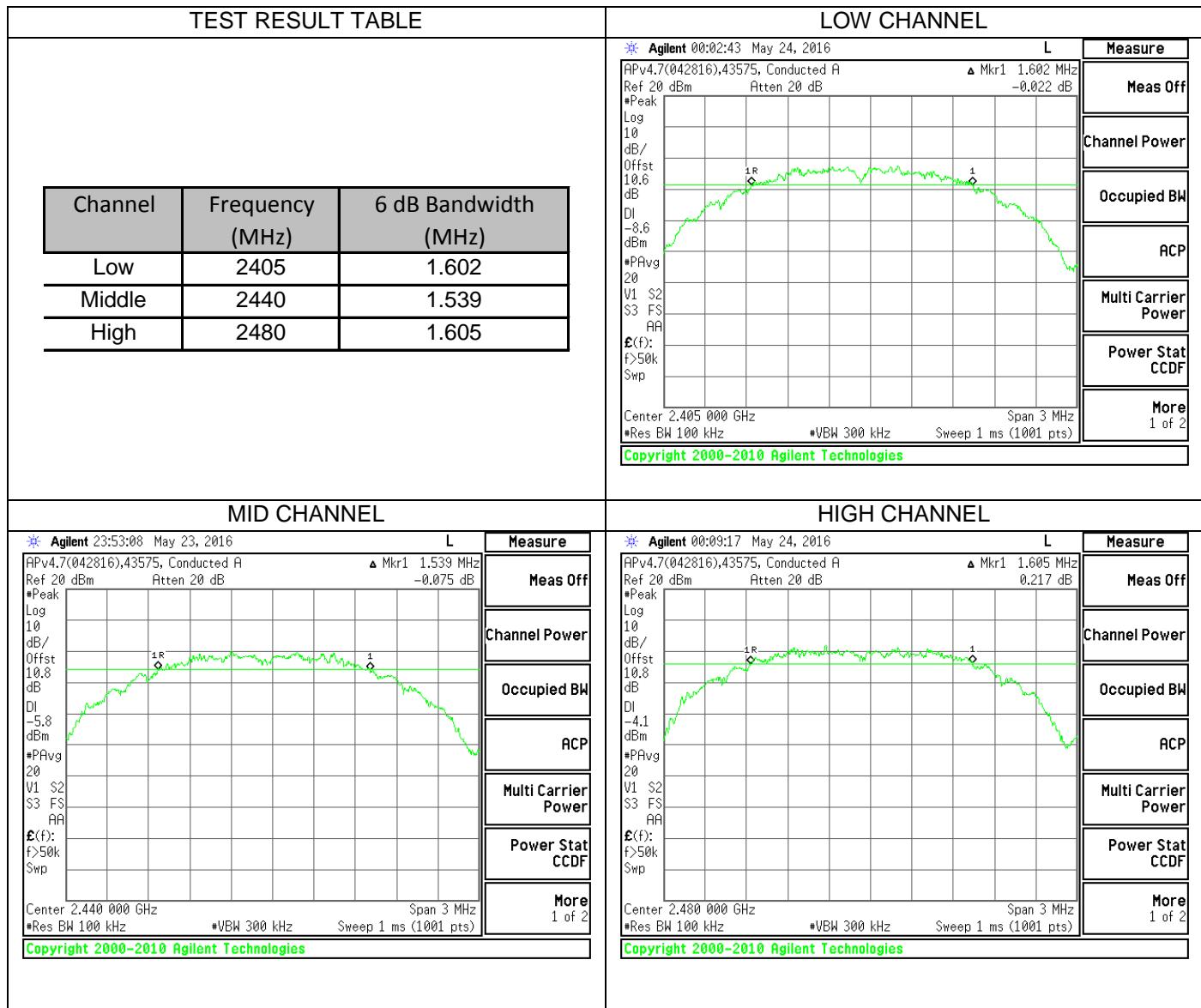
The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

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

RESULTS

8.2.1. 6 dB BANDWIDTH PLOTS AND TABLE



8.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

8.3.1. 99% BANDWIDTH PLOTS AND TABLE

TEST RESULT TABLE			LOW CHANNEL		MID CHANNEL		HIGH CHANNEL	
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Ch Freq 2.405 GHz	Trig Free	Ch Freq 2.44 GHz	Trig Free	Ch Freq 2.48 GHz	Trig Free
Low	2405	2.3340	Occupied Bandwidth	Averages: 20	Occupied Bandwidth	Averages: 20	Occupied Bandwidth	Averages: 20
Middle	2440	2.3392	APv4.7(042816),43575, Conducted A Ref 20 dBm #Atten 20 dB	#Samp 10 Log 10 dB/ Offst 10.6 dB	APv4.7(042816),43575, Conducted A Ref 20 dBm #Atten 20 dB	#Samp 10 Log 10 dB/ Offst 10.6 dB	APv4.7(042816),43575, Conducted A Ref 20.8 dBm #Atten 20 dB	#Samp 10 Log 10 dB/ Offst 10.8 dB
High	2480	2.3983	Center 2.405 000 GHz Span 5 MHz #Res BW 39 kHz #VBW 110 kHz #Sweep 100 ms (1001 pts)	Copyright 2000-2010 Agilent Technologies	Center 2.440 000 GHz Span 5 MHz #Res BW 39 kHz #VBW 110 kHz #Sweep 100 ms (1001 pts)	Copyright 2000-2010 Agilent Technologies	Center 2.480 000 GHz Span 5 MHz #Res BW 39 kHz #VBW 110 kHz Sweep 10 ms (1001 pts)	Copyright 2000-2010 Agilent Technologies
TEST RESULT TABLE			Measure	Measure	Measure	Measure	Measure	Measure
			Meas Off	Meas Off	Meas Off	Meas Off	Meas Off	Meas Off
			Channel Power	Channel Power	Channel Power	Channel Power	Channel Power	Channel Power
			Occupied BW	Occupied BW	Occupied BW	Occupied BW	Occupied BW	Occupied BW
			ACP	ACP	ACP	ACP	ACP	ACP
			Multi Carrier Power	Multi Carrier Power	Multi Carrier Power	Multi Carrier Power	Multi Carrier Power	Multi Carrier Power
			Power Stat CCDF	Power Stat CCDF	Power Stat CCDF	Power Stat CCDF	Power Stat CCDF	Power Stat CCDF
			More 1 of 2	More 1 of 2	More 1 of 2	More 1 of 2	More 1 of 2	More 1 of 2

8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 5.4.4

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

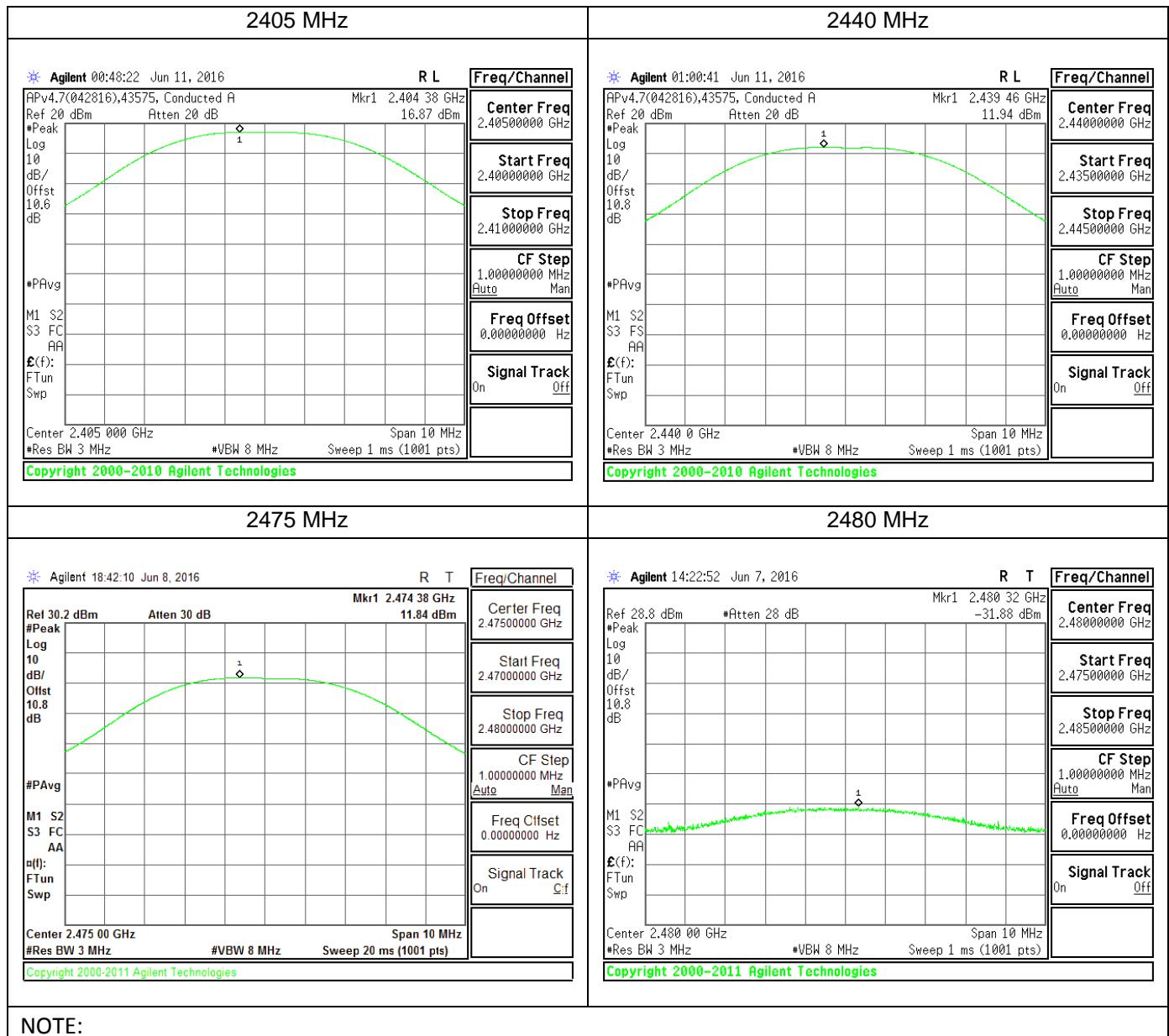
TEST PROCEDURE

Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r04 spectrum analyzer.

RESULTS

8.4.1. OUTPUT POWER PLOTS

Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
2405	16.87	30	-13.130
2440	11.94	30	-18.060
2475	11.84	30	-18.160
2480	-31.88	30	-61.880



8.5. POWER SPECTRAL DENSITY

FCC §15.247 (e)

IC RSS-247 Clause 5.2.2

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.

TEST PROCEDURE

Power Spectral Density was performed utilizing the "Method PKPSD (Peak PSD)" under KDB558074 D01 DTS Meas Guidance v03r05.

RESULTS

8.5.1. POWER SPECTRAL DENSITY PLOTS AND TABLE

TEST RESULT TABLE					LOW CHANNEL	
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	R L	Freq/Channel
Low	2405	1.32	8	-6.68		Center Freq 2.4050000 GHz Start Freq 2.4025000 GHz Stop Freq 2.4075000 GHz CF Step 500.000000 kHz Freq Offset 0.0000000 Hz Signal Track On
Middle	2440	-3.69	8	-11.69		
High	2480	-51.37	8	-59.37		

MID CHANNEL					HIGH CHANNEL	
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	R L	Freq/Channel
Low	2440	-3.69	8	-11.69		Center Freq 2.4400000 GHz Start Freq 2.4375000 GHz Stop Freq 2.4425000 GHz CF Step 500.000000 kHz Freq Offset 0.0000000 Hz Signal Track On
Middle	2480	-51.37	8	-59.37		
High	2480	-51.37	8	-59.37		Center Freq 2.4800000 GHz Start Freq 2.4775000 GHz Stop Freq 2.4825000 GHz CF Step 500.000000 kHz Freq Offset 0.0000000 Hz Signal Track On

NOTE:

8.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

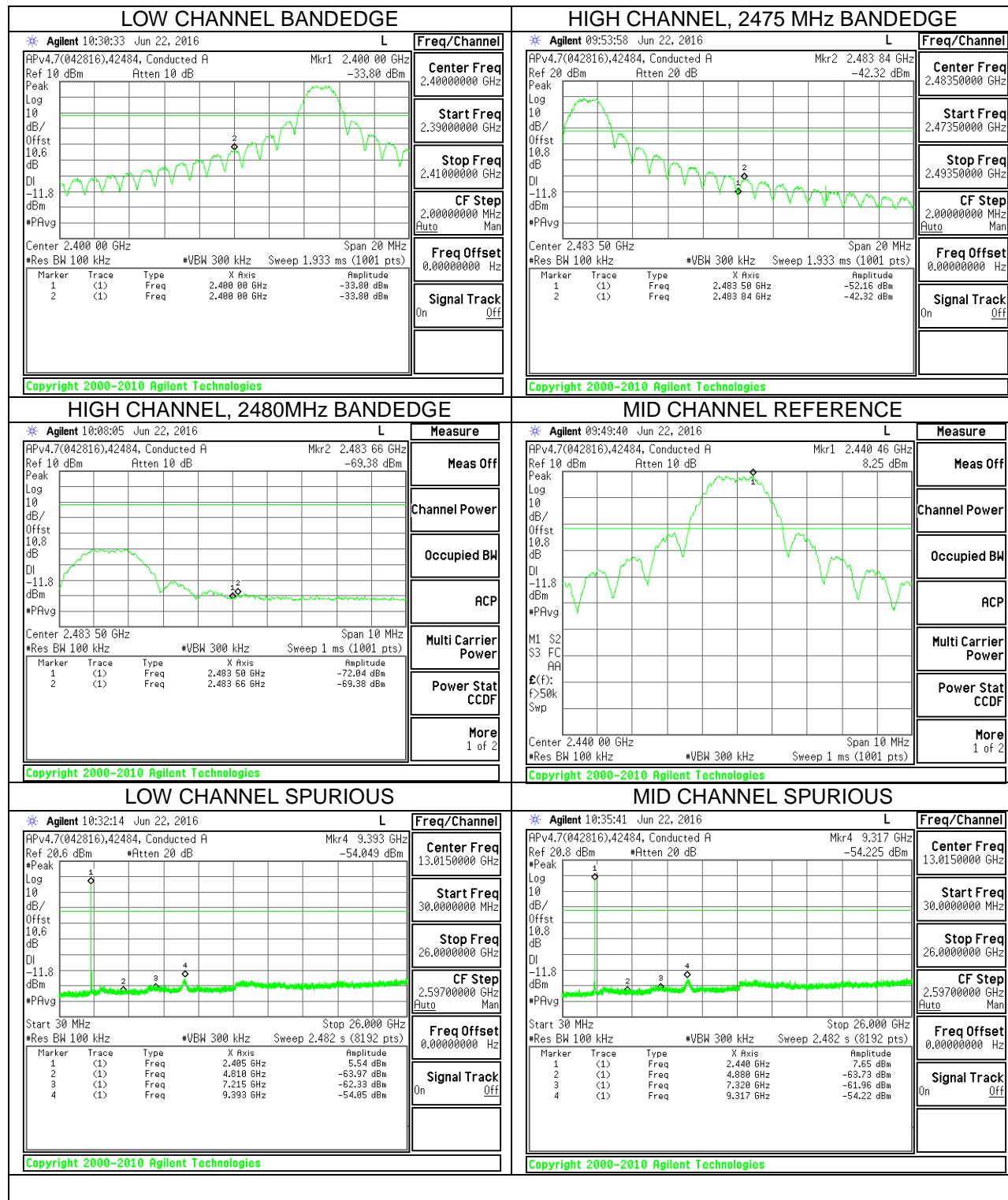
FCC §15.247 (d)

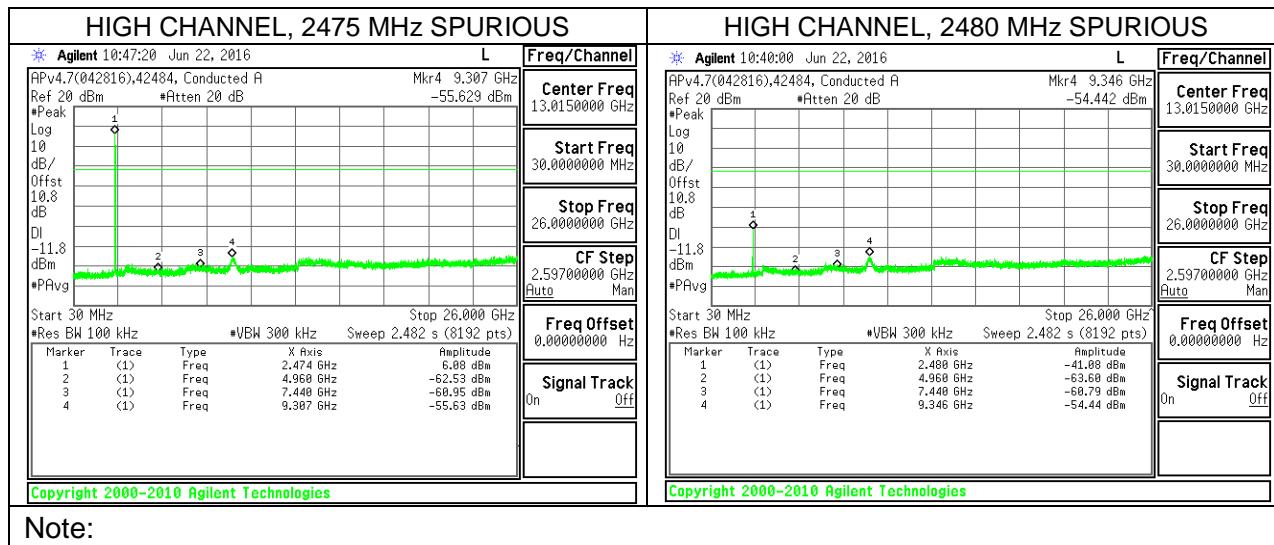
IC RSS-247 Clause 5.5

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.

RESULTS

8.6.1. BANDEDGE AND SPURIOUS EMISSIONS PLOTS





Note:

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

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 for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. 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 3 MHz for peak measurements and add duty cycle factor for average measurements. Please refer to test report section 8.1 for duty cycle factor information.

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.

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

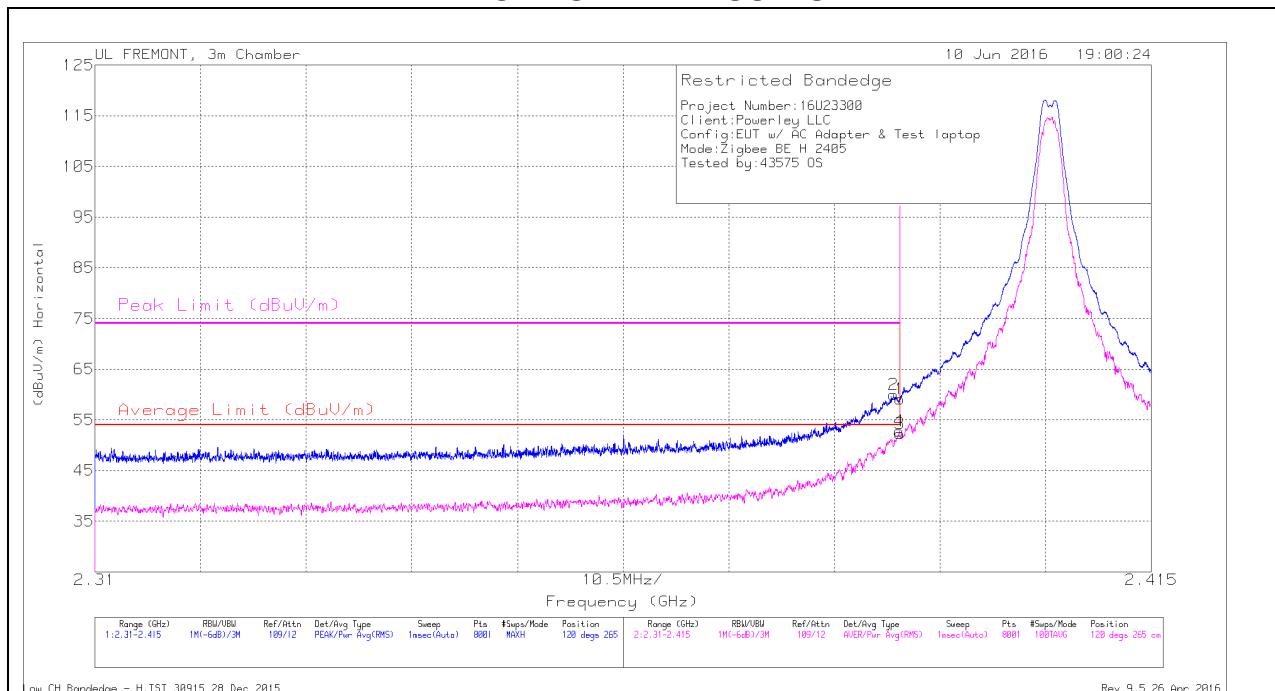
RESULTS

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. TX ABOVE 1 GHz FOR MODE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL 2405 MHz)

HORIZONTAL RESULTS



Trace Markers

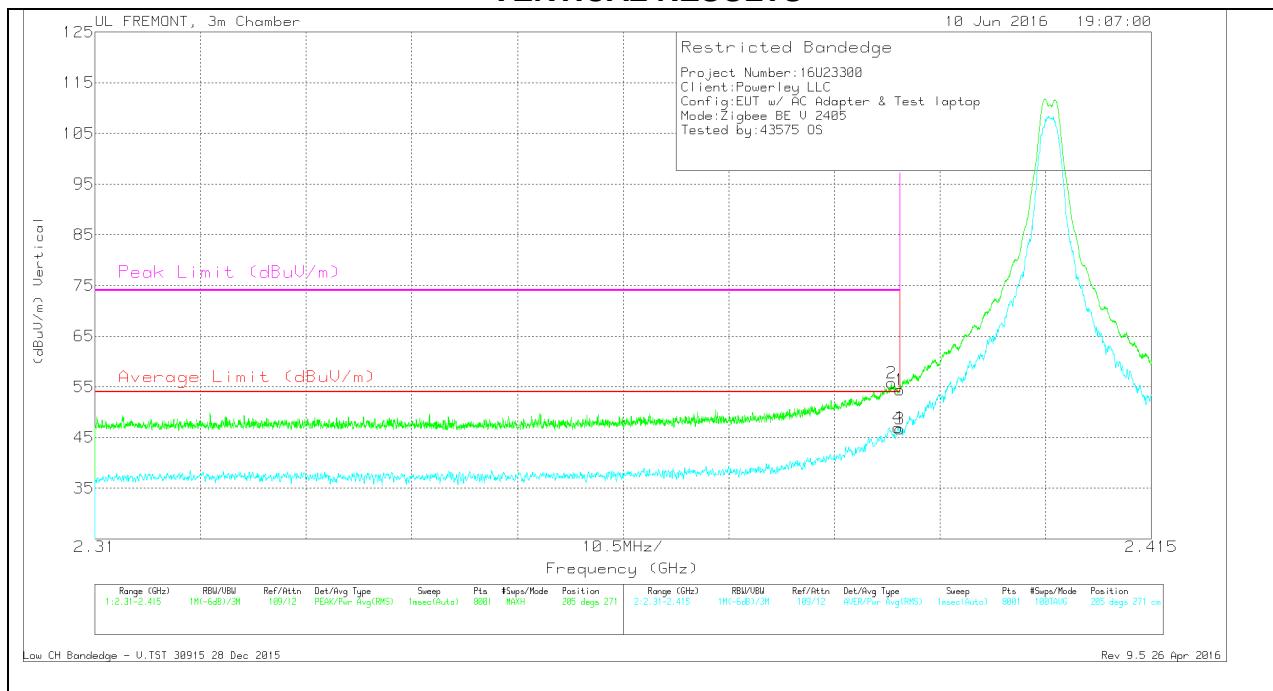
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.389	48.96	Pk	32.1	-21.1	59.96	-	-	74	-14.04	120	265	H
1	2.39	48.26	Pk	32.1	-21.2	59.16	-	-	74	-14.84	120	265	H
3	2.39	41.36	RMS	32.1	-21.2	52.26	54	-1.74	-	-	120	265	H
4	2.39	41.86	RMS	32.1	-21.2	52.76	54	-1.24	-	-	120	265	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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
2	2.389	44.72	Pk	32.1	-21.1	55.72	-	-	74	-18.28	205	271	V
1	2.39	43.54	Pk	32.1	-21.2	54.44	-	-	74	-19.56	205	271	V
3	2.39	35.79	RMS	32.1	-21.2	46.69	54	-7.31	-	-	205	271	V
4	2.39	36	RMS	32.1	-21.2	46.9	54	-7.1	-	-	205	271	V

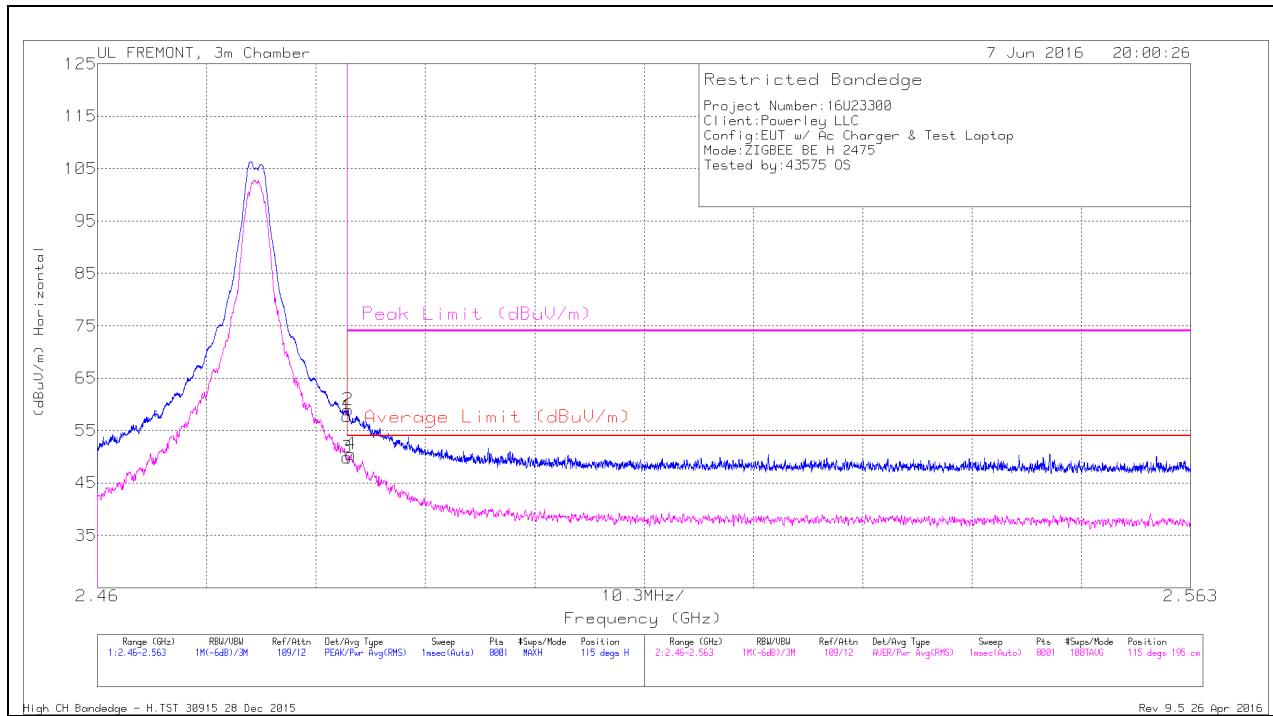
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (2475 MHz)

HORIZONTAL RESULTS



Trace Markers

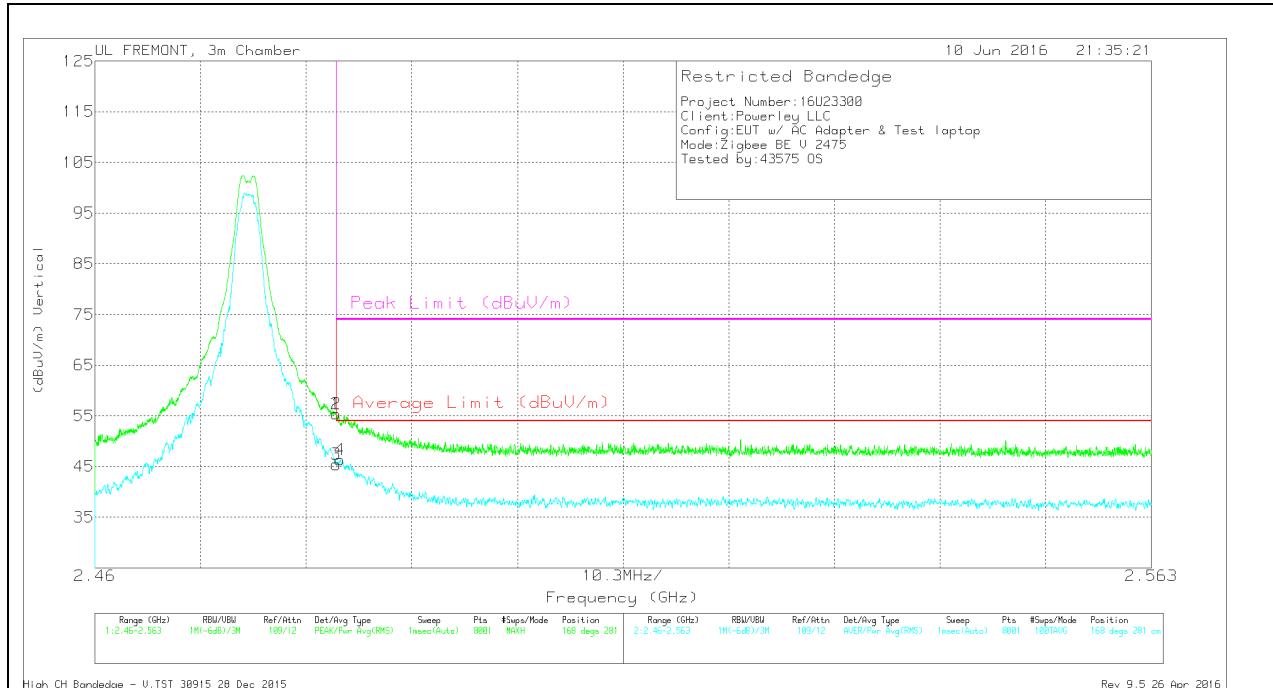
Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBm)	Average Limit (dBm)	Margin (dB)	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	46.58	Pk	32.4	-21.2	57.78	-	-	74	-16.22	115	195	H
2	2.484	47.74	Pk	32.4	-21.2	58.94	-	-	74	-15.06	115	195	H
3	2.484	38.66	RMS	32.4	-21.2	49.86	54	-4.14	-	-	115	195	H
4	2.484	39.28	RMS	32.4	-21.2	50.48	54	-3.52	-	-	115	195	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (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	44.16	Pk	32.4	-21.2	55.36	-	-	74	-18.64	168	281	V
2	2.484	44.19	Pk	32.4	-21.2	55.39	-	-	74	-18.61	168	281	V
3	2.484	34.19	RMS	32.4	-21.2	45.39	54	-8.61	-	-	168	281	V
4	2.484	35.11	RMS	32.4	-21.2	46.31	54	-7.69	-	-	168	281	V

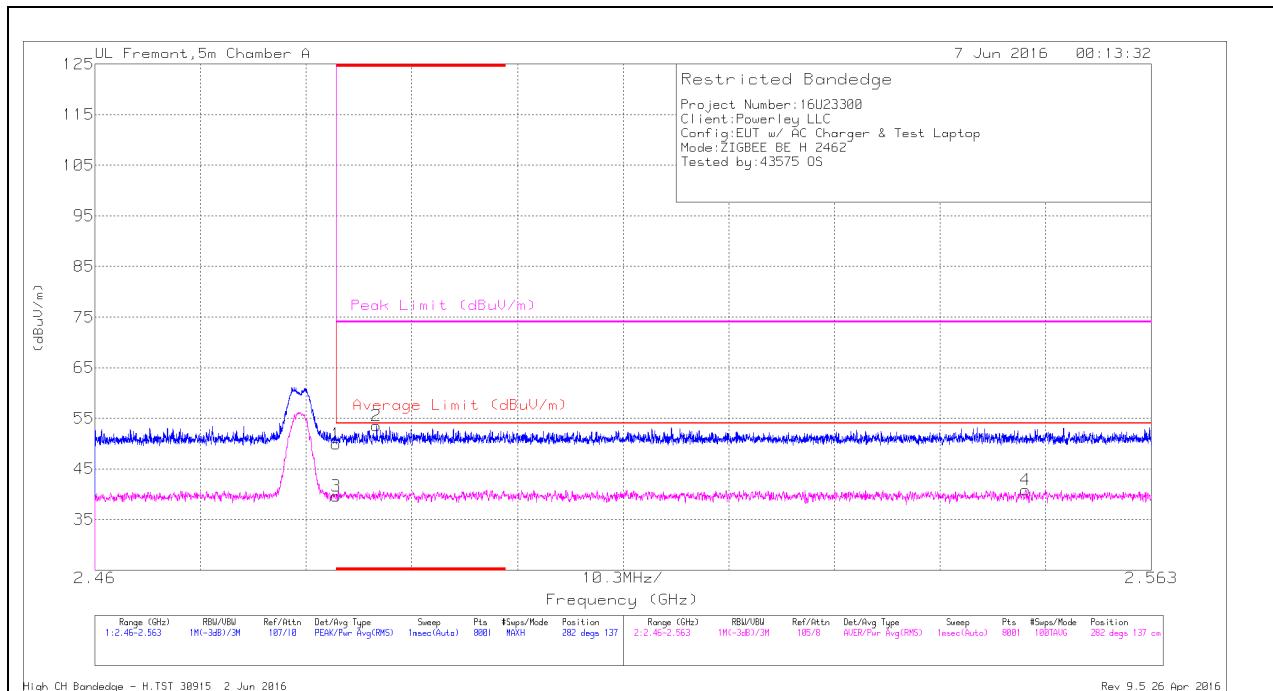
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL 2480 MHz)

HORIZONTAL RESULTS



Trace Markers

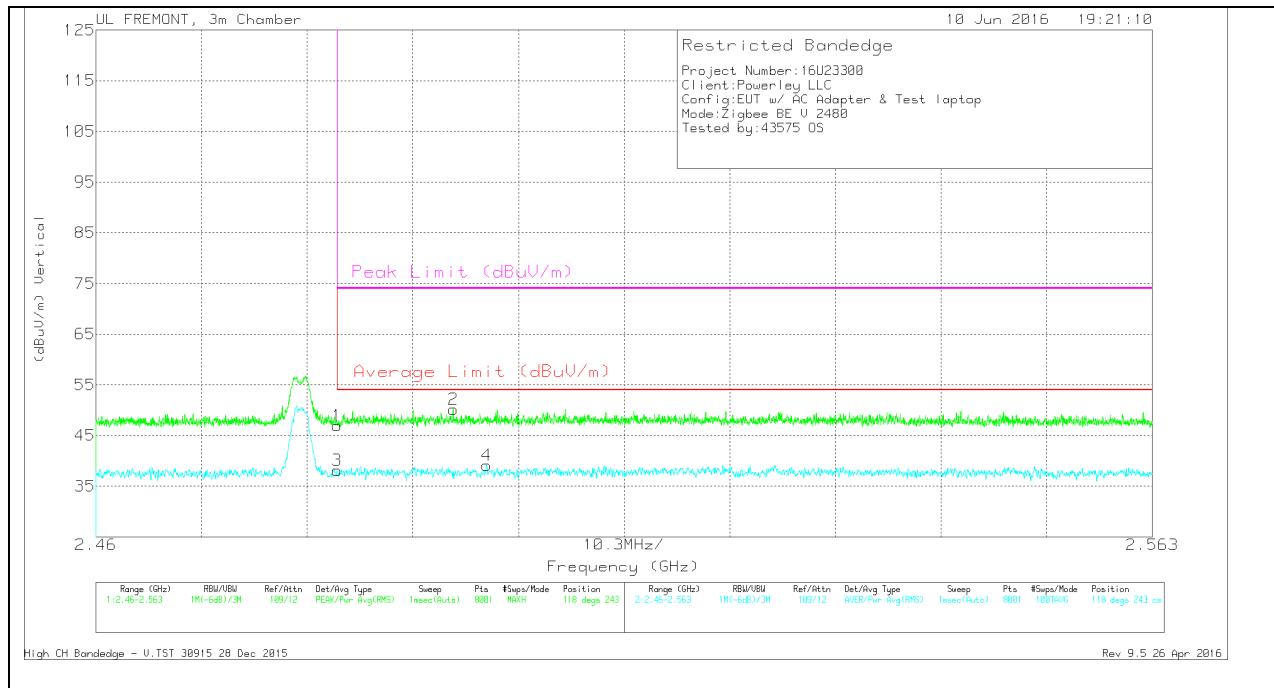
Marker	Frequency (GHz)	Meter Reading (dBmU)	Det	AF T346 (dB/m)	Amp/Cbf/Fitr (dB)	Corrected Reading (dBmU/m)	Average Limit (dBmU/m)	Margin (dB)	Peak Limit (dBmU/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	35.46	Pk	32.4	-17.9	49.96	-	-	74	-24.04	282	137	H
2	* 2.487	38.9	Pk	32.5	-17.9	53.5	-	-	74	-20.5	282	137	H
3	* 2.484	25.08	RMS	32.4	-17.9	39.58	54	-14.42	-	-	282	137	H
4	2.551	26.21	RMS	32.4	-17.8	40.81	54	-13.19	-	-	282	137	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	35.79	Pk	32.4	-21.2	46.99	-	-	74	-27.01	118	243	V
3	2.484	26.93	RMS	32.4	-21.2	38.13	54	-15.87	-	-	118	243	V
2	2.495	39	Pk	32.4	-21.2	50.2	-	-	74	-23.8	118	243	V
4	2.498	27.71	RMS	32.4	-21	39.11	54	-14.89	-	-	118	243	V

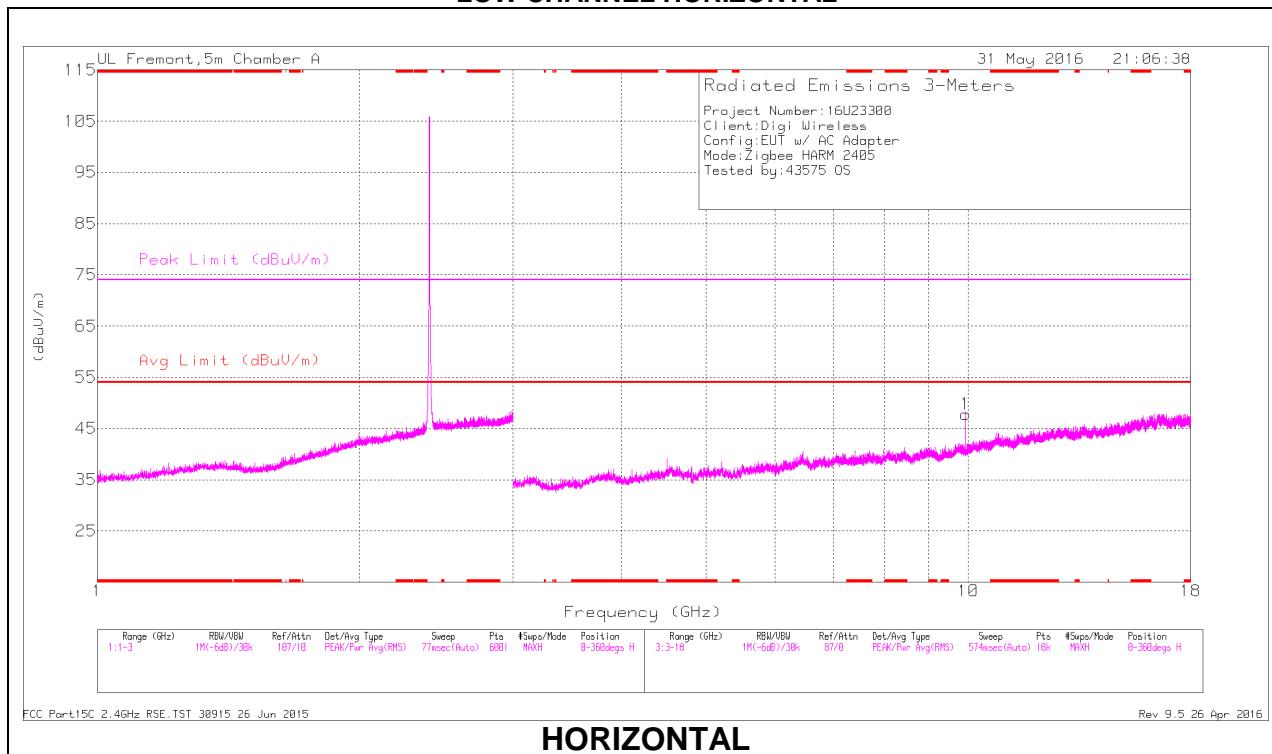
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

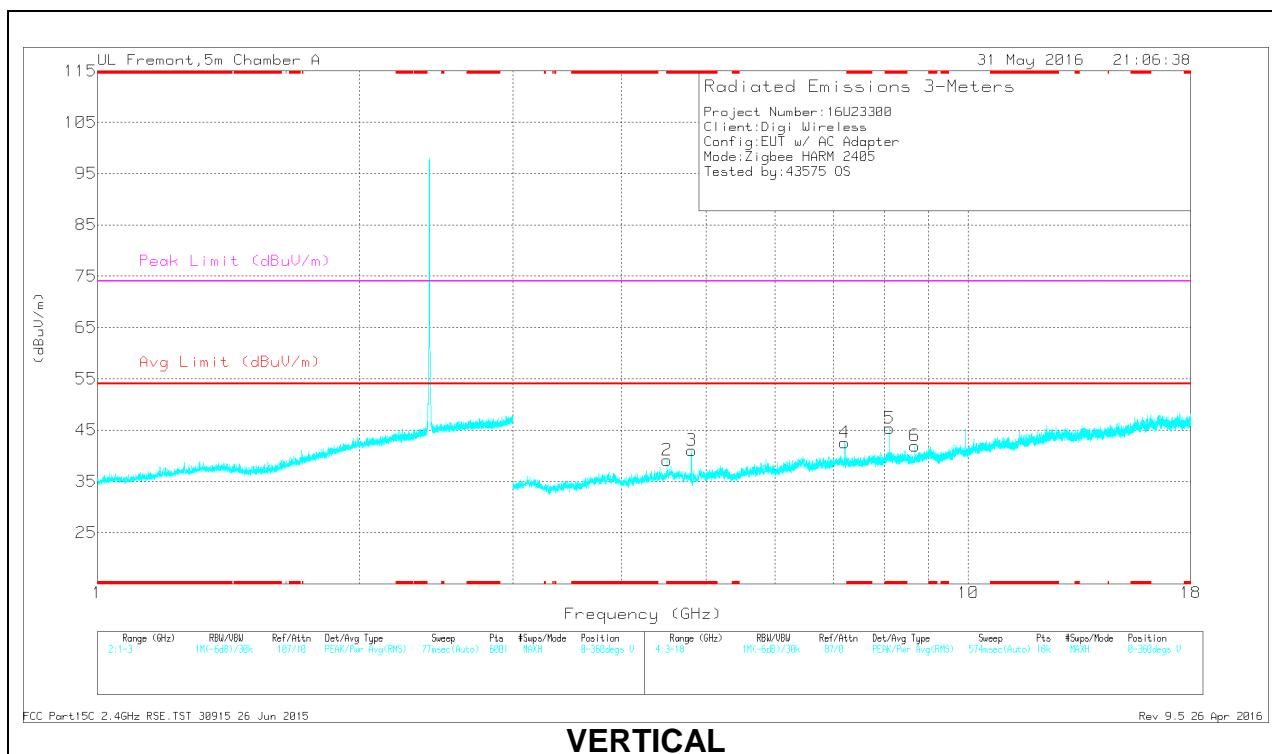
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



HORIZONTAL



VERTICAL

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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
2	* 4.51	34.25	Pk	34.3	-29.4	0	39.15	-	-	74	-34.85	0-360	199	V
3	* 4.811	35.58	Pk	34.3	-28.8	0	41.08	-	-	74	-32.92	0-360	199	V
5	* 8.118	32.6	Pk	35.9	-23.2	0	45.3	-	-	74	-28.7	0-360	199	V
4	7.213	31.56	Pk	35.7	-24.7	0	42.56	-	-	-	-	0-360	199	V
6	8.681	29.05	Pk	36	-23.1	0	41.95	-	-	-	-	0-360	199	V
1	9.922	33.19	Pk	36.9	-22.3	0	47.79	-	-	-	-	0-360	101	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

Radiated Emissions

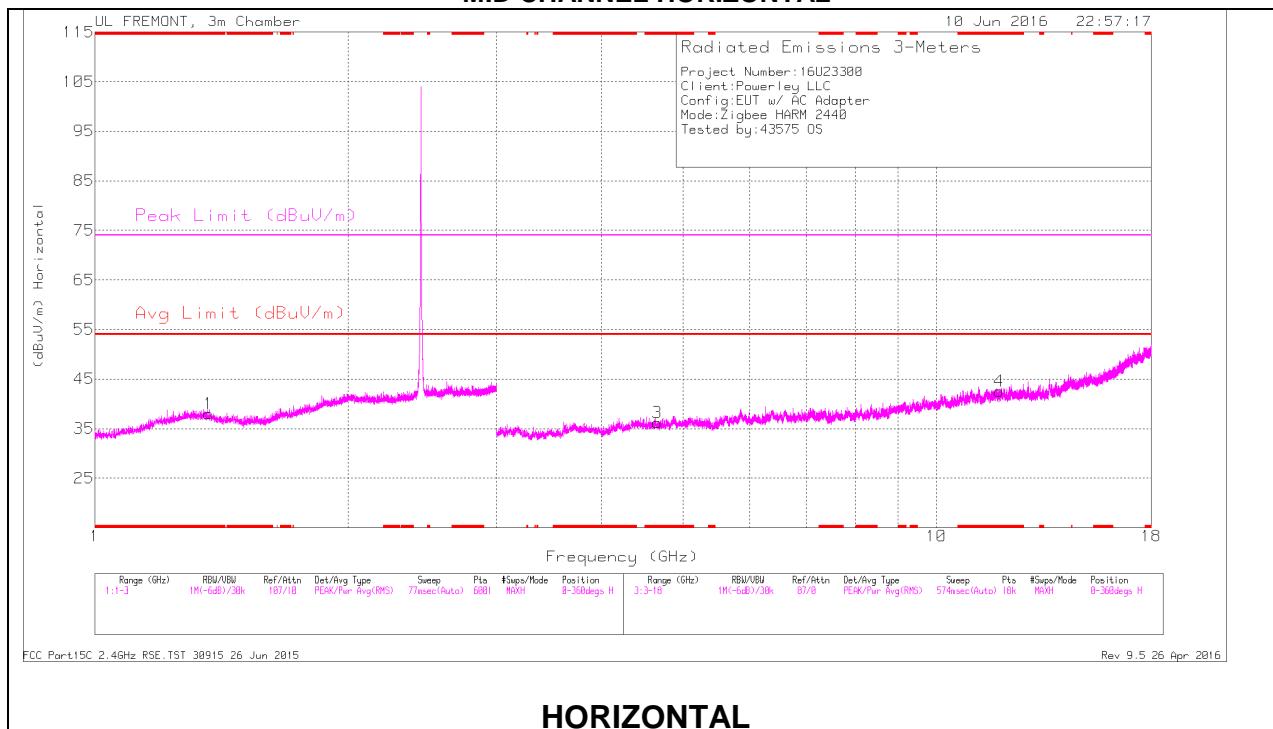
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.51	40.09	PK2	34.3	-29.4	0	44.99	-	-	74	-29.01	343	229	V
* 4.51	32.75	MAv1	34.3	-29.4	0	37.65	54	-16.35	-	-	343	229	V
* 4.811	42.43	PK2	34.3	-28.8	0	47.93	-	-	74	-26.07	211	372	V
* 4.811	35.64	MAv1	34.3	-28.8	0	41.14	54	-12.86	-	-	211	372	V
* 8.118	37.06	PK2	35.9	-23.2	0	49.76	-	-	74	-24.24	234	244	V
* 8.118	31.25	MAv1	35.9	-23.2	0	43.95	54	-10.05	-	-	234	244	V
7.213	37.79	PK2	35.7	-24.7	0	48.79	-	-	-	-	309	210	V
7.213	29.01	MAv1	35.7	-24.7	0	40.01	-	-	-	-	309	210	V
8.68	22.52	MAv1	36	-23.1	0	35.42	-	-	-	-	348	387	V
8.681	32.49	PK2	36	-23.1	0	45.39	-	-	-	-	348	387	V
9.922	37.49	PK2	36.9	-22.3	0	52.09	-	-	-	-	87	103	H
9.922	31.74	MAv1	36.9	-22.3	0	46.34	-	-	-	-	87	103	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

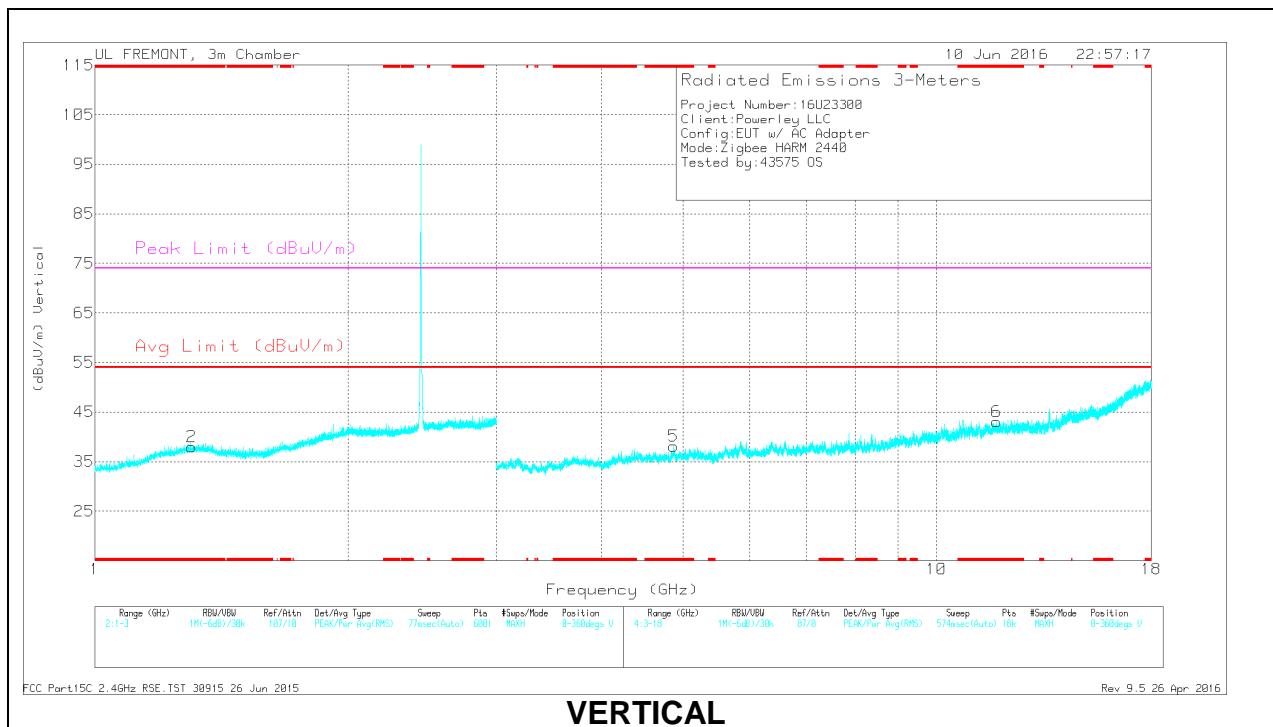
Pk - Peak detector

RMS - RMS detection

MID CHANNEL HORIZONTAL



HORIZONTAL



VERTICAL

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.364	29.1	Pk	29.2	-20.3	38	-	-	74	-36	0-360	100	H
2	* 1.303	28.55	Pk	29.9	-20.5	37.95	-	-	74	-36.05	0-360	200	V
3	* 4.66	29.72	Pk	34.4	-27.9	36.22	-	-	74	-37.78	0-360	200	H
4	* 11.871	24.76	Pk	39	-21.2	42.56	-	-	74	-31.44	0-360	200	H
5	* 4.873	30.55	Pk	34.2	-26.6	38.15	-	-	74	-35.85	0-360	100	V
6	* 11.783	24.79	Pk	38.9	-20.6	43.09	-	-	74	-30.91	0-360	200	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

Radiated Emissions

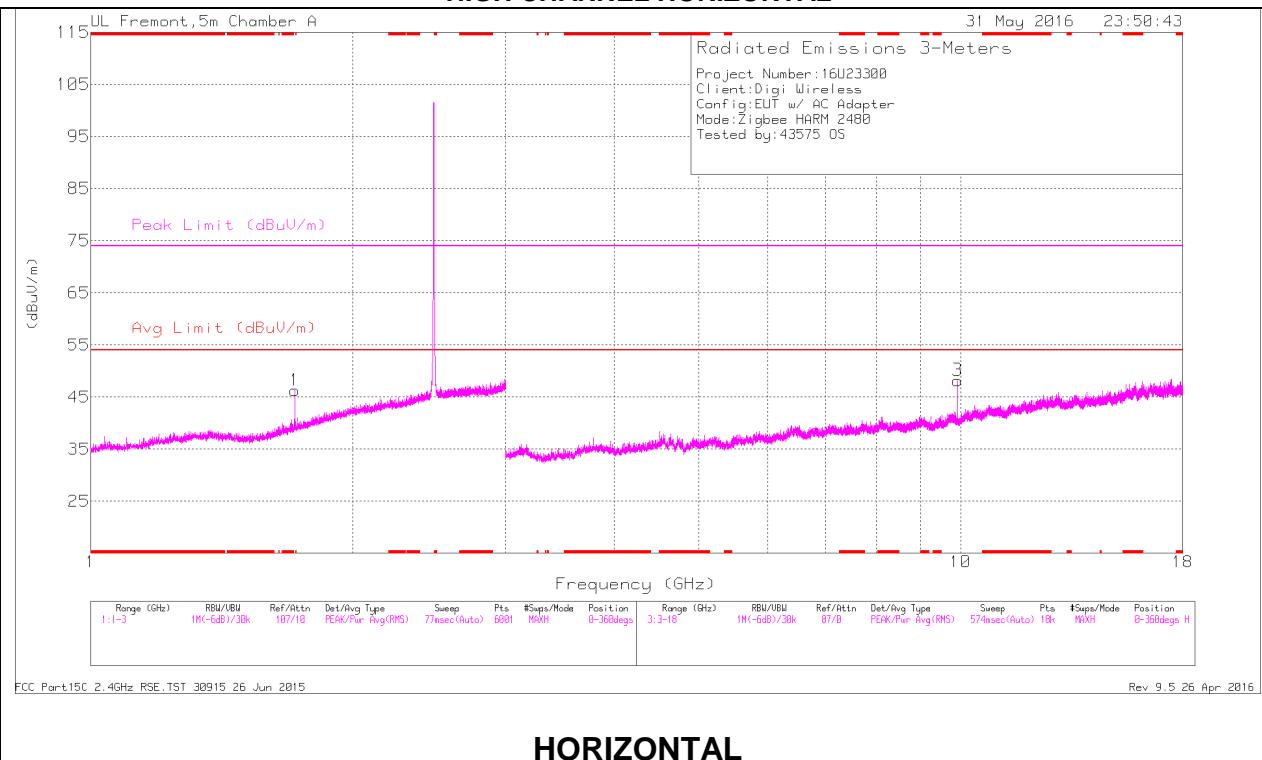
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.365	35.57	PK2	29.2	-20.2	44.57	-	-	74	-29.43	240	292	H
* 1.366	23.93	MAv1	29.2	-20.2	32.93	54	-21.07	-	-	240	292	H
* 1.304	34.87	PK2	29.9	-20.4	44.37	-	-	74	-29.63	221	357	V
* 1.301	23.69	MAv1	29.9	-20.6	32.99	54	-21.01	-	-	221	357	V
* 4.661	36.75	PK2	34.4	-27.9	43.25	-	-	74	-30.75	152	353	H
* 4.659	26.03	MAv1	34.4	-27.9	32.53	54	-21.47	-	-	152	353	H
* 11.872	32.68	PK2	39	-21.2	50.48	-	-	74	-23.52	179	349	H
* 11.87	22.33	MAv1	39	-21.2	40.13	54	-13.87	-	-	179	349	H
* 4.874	36.21	PK2	34.2	-26.6	43.81	-	-	74	-30.19	7	341	V
* 4.874	25.62	MAv1	34.2	-26.6	33.22	54	-20.78	-	-	7	341	V
* 11.781	31.47	PK2	38.9	-20.6	49.77	-	-	74	-24.23	145	323	V
* 11.782	21.49	MAv1	38.9	-20.6	39.79	54	-14.21	-	-	145	323	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

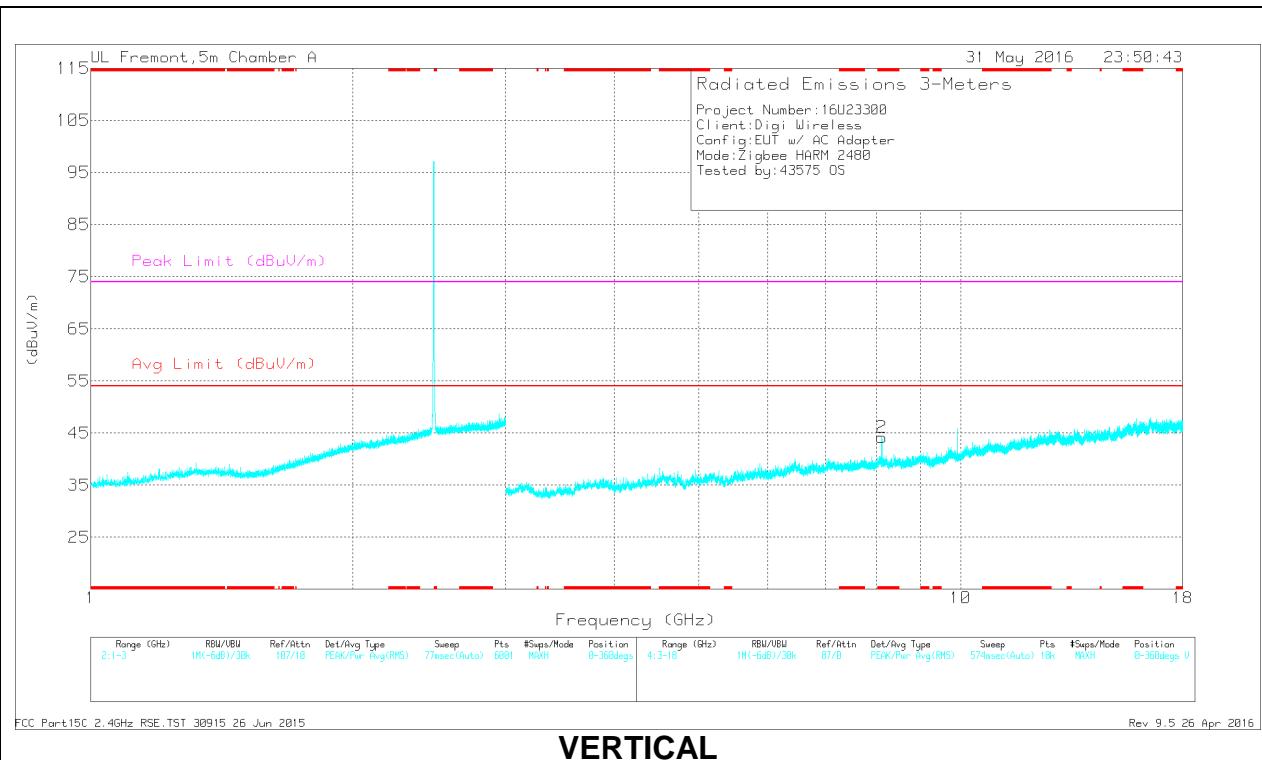
Pk - Peak detector

RMS - RMS detection

HIGH CHANNEL HORIZONTAL



HORIZONTAL



VERTICAL

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr (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	1.717	36.45	Pk	29.4	-19.6	0	46.25	-	-	-	-	0-360	101	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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
2	* 8.117	31.44	Pk	35.9	-23.2	0	44.14	-	-	74	-29.86	0-360	199	V
3	9.921	33.58	Pk	36.9	-22.3	0	48.18	-	-	-	-	0-360	101	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr	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
* 1.721	35.93	PK2	29.4	-19.6	0	45.73	-	-	74	-28.27	150	369	H
* 1.721	24.75	MAv1	29.4	-19.6	0	34.55	54	-19.45	-	-	150	369	H
* 8.118	36.88	PK2	35.9	-23.2	0	49.58	-	-	74	-24.42	244	247	V
* 8.118	31.23	MAv1	35.9	-23.2	0	43.93	54	-10.07	-	-	244	247	V
9.922	37.47	PK2	36.9	-22.3	0	52.07	-	-	-	-	97	101	H
9.922	32.25	MAv1	36.9	-22.3	0	46.85	-	-	-	-	97	101	H

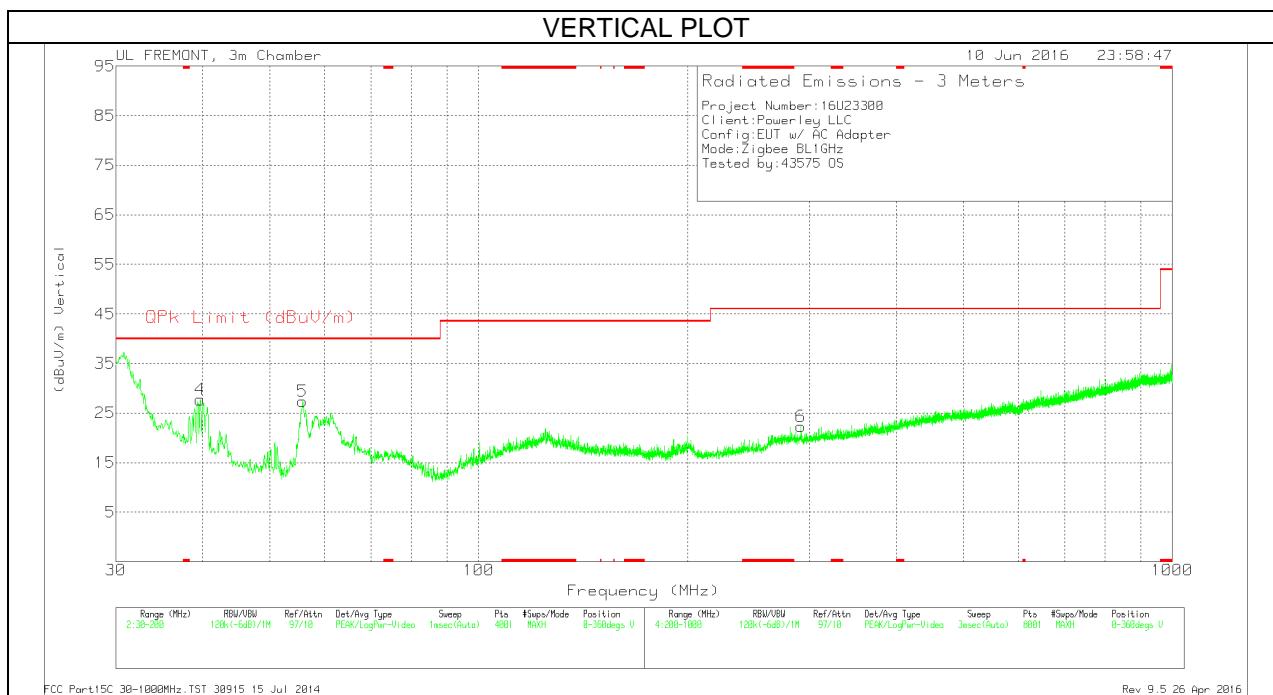
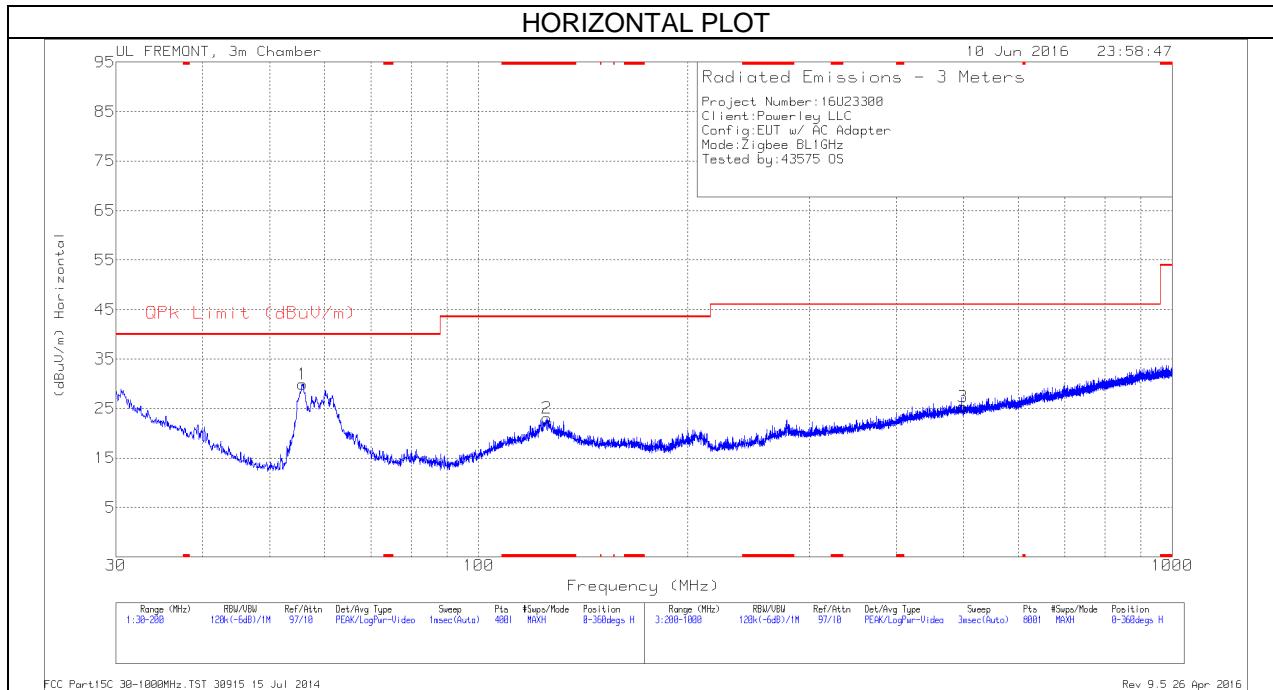
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

9.1. WORST-CASE BELOW 1 GHz

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



BELOW 1 GHz TABLE

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T122 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 125.4975	31.06	Pk	18	-26	23.06	43.52	-20.46	0-360	400	H
4	39.69	36.8	Pk	18	-27.1	27.7	40	-12.3	0-360	100	V
1	55.7125	45.67	Pk	11.1	-26.9	29.87	40	-10.13	0-360	400	H
5	55.755	43.14	Pk	11.1	-26.9	27.34	40	-12.66	0-360	100	V
6	291.4	29.35	Pk	17.3	-24.4	22.25	46.02	-23.77	0-360	200	V
3	499.3	28.79	Pk	21.6	-25	25.39	46.02	-20.63	0-360	400	H

indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

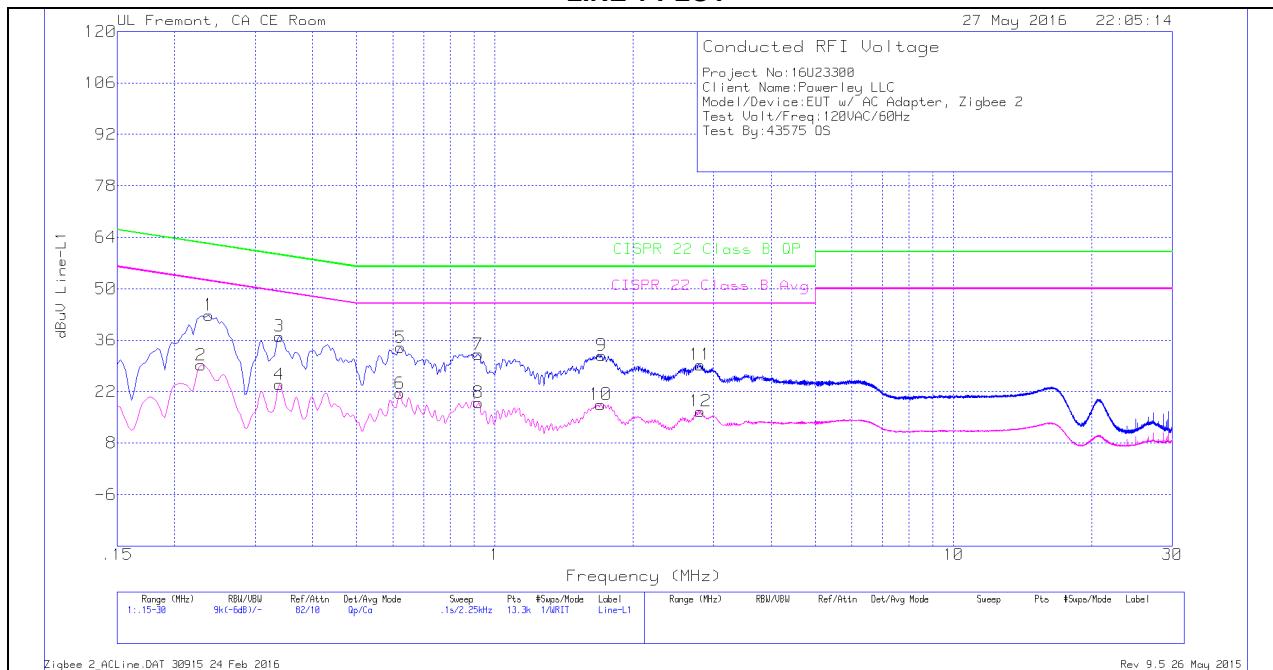
TEST PROCEDURE

ANSI C63.4

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULT

Trace Markers

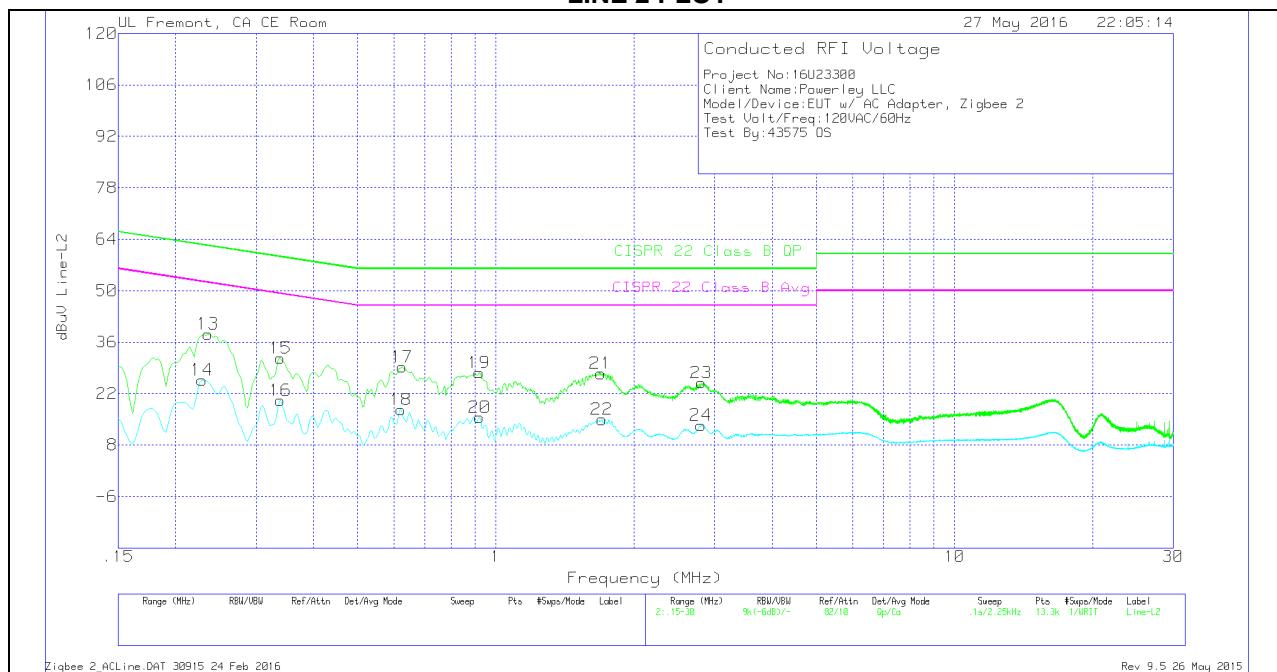
Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Limiter (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.23775	32.02	Qp	.7	0	10.1	42.82	62.17	-19.35	-	-
2	.22875	18.35	Ca	.8	0	10.1	29.25	-	-	52.49	-23.24
3	.339	26.43	Qp	.5	0	10.1	37.03	59.23	-22.2	-	-
4	.339	13.32	Ca	.5	0	10.1	23.92	-	-	49.23	-25.31
5	.6225	23.61	Qp	.3	0	10.1	34.01	56	-21.99	-	-
6	.62025	11.1	Ca	.3	0	10.1	21.5	-	-	46	-24.5
7	.9195	21.64	Qp	.3	.1	10.1	32.14	56	-23.86	-	-
8	.92175	8.53	Ca	.3	.1	10.1	19.03	-	-	46	-26.97
9	1.70925	21.46	Qp	.2	.1	10.1	31.86	56	-24.14	-	-
10	1.70138	8.11	Ca	.2	.1	10.1	18.51	-	-	46	-27.49
11	2.805	18.93	Qp	.2	.1	10.1	29.33	56	-26.67	-	-
12	2.80725	6.26	Ca	.2	.1	10.1	16.66	-	-	46	-29.34

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 PLOT



LINE 2 RESULT

Trace Markers

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Limiter (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
13	.2355	27.31	Qp	.8	0	10.1	38.21	62.25	-24.04	-	-
14	.22875	14.78	Ca	.8	0	10.1	25.68	-	-	52.49	-26.81
15	.339	21.02	Qp	.5	0	10.1	31.62	59.23	-27.61	-	-
16	.339	9.55	Ca	.5	0	10.1	20.15	-	-	49.23	-29.08
17	.62475	18.79	Qp	.3	0	10.1	29.19	56	-26.81	-	-
18	.62025	7.19	Ca	.3	0	10.1	17.59	-	-	46	-28.41
19	.9195	17.15	Qp	.3	.1	10.1	27.65	56	-28.35	-	-
20	.92175	5.05	Ca	.3	.1	10.1	15.55	-	-	46	-30.45
21	1.69125	17.06	Qp	.2	.1	10.1	27.46	56	-28.54	-	-
22	1.7025	4.57	Ca	.2	.1	10.1	14.97	-	-	46	-31.03
23	2.805	14.54	Qp	.2	.1	10.1	24.94	56	-31.06	-	-
24	2.8005	2.96	Ca	.2	.1	10.1	13.36	-	-	46	-32.64

Qp - Quasi-Peak detector

Ca - CISPR average detection