



CERTIFICATION TEST REPORT

Report Number. : 16U23300-E5V2

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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Prepared by:

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	6/14/2016	Initial Issue	D. Corona
V2	6/21/2016	Updated Section 5.3, 9.2.5 and 10.2.1	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: Conducted: AMJ001532-002, AMJ001532-0007
Radiated: AMJ001532-0008, AMJ001532-0010

DATE TESTED: MAY 23 – JUNE 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.

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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 type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input checked="" type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input 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, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance, 1000 to 6000 MHz	3.86 dB
Radiated Disturbance, 6000 to 18000 MHz	4.23 dB
Radiated Disturbance, 18000 to 26000 MHz	5.30 dB
Radiated Disturbance, 26000 to 40000 MHz	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	802.15.4 ZigBee	17.92	61.94

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB trace antenna, with a maximum gain of 4 dBi for the main and 5 dBi for the diversity.

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.

Base on power investigation, all testing were only performed on J3 port as worst case.

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

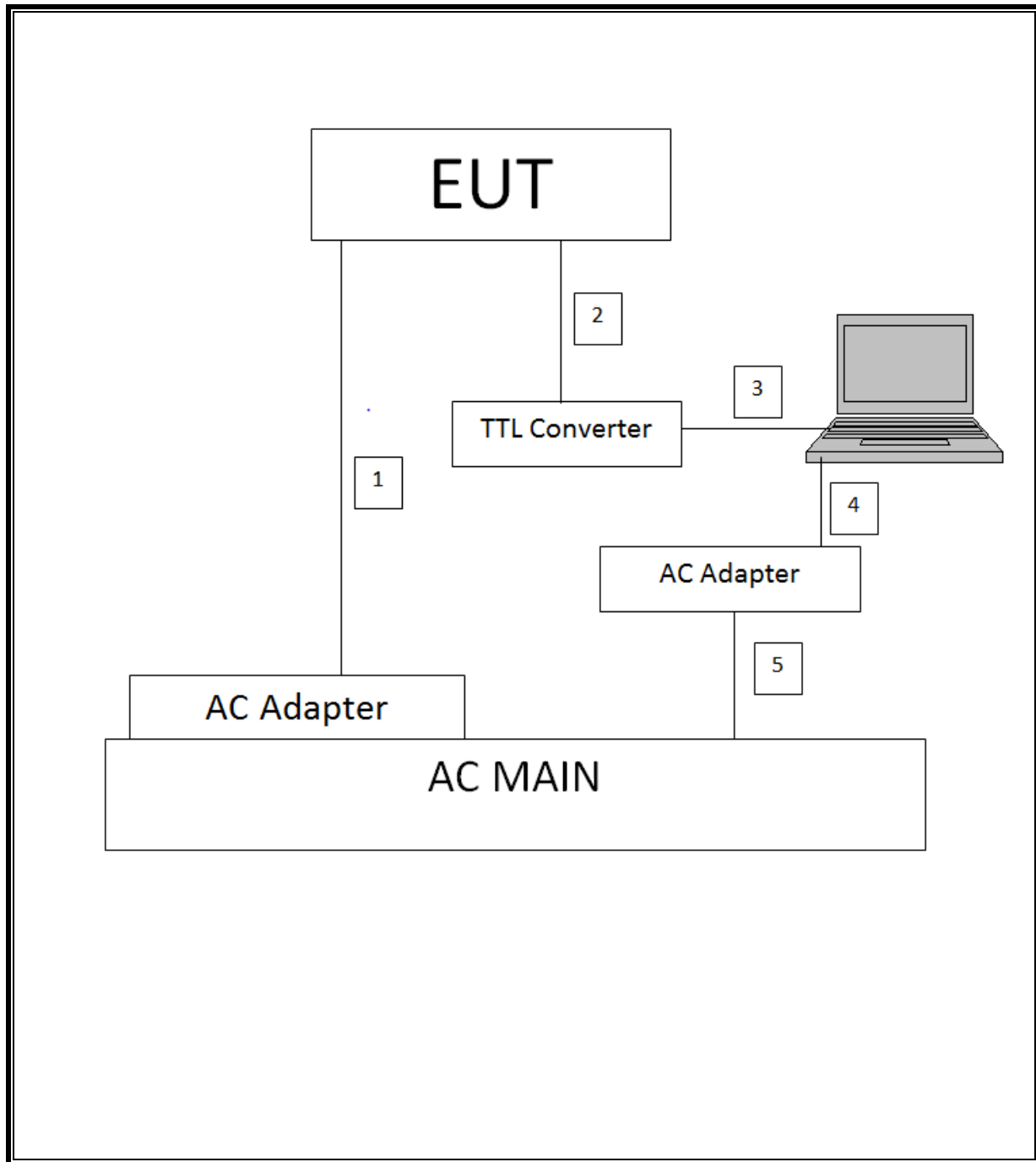
I/O CABLES

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
Spectrum Analyzer, 40 GHz	Agilent / HP	8564E	106	08/14/16
Spectrum Analyzer, 44 GHz	Keysight	N9030A	907	01/06/17
ESR7 EMI Test Receiver 7GHz	Rohde & Schwarz	ESR	1436	12/19/16
LISN, 30 MHz	FCC	FCC-LISN-50/250-25-2	24	02/09/17
Amplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	493	03/09/17
Amplifier, 1-8GHz, 35 dB	Miteq	AMF-4D-01000800-30-29P	1156	03/09/17
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	130	09/01/16
Antenna, Horn, 18GHz	ETS Lindgren	3117	345	02/22/17
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/26/17
High Pass Filter 3GHz	Micro-Tronics	HPS17543	485	03/09/17
High Pass Filter 6GHz	Micro-Tronics	HPS17542	483	03/09/17
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	482	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. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2.1	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247	RSS-247 5.4.4	TX conducted output power	<30dBm		Pass
15.247	RSS-247 5.2.2	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10		Pass
15.205, 15.209, 15.247 (d)	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass

9. ANTENNA PORT TEST RESULTS

9.1.1. ON TIME AND DUTY CYCLE

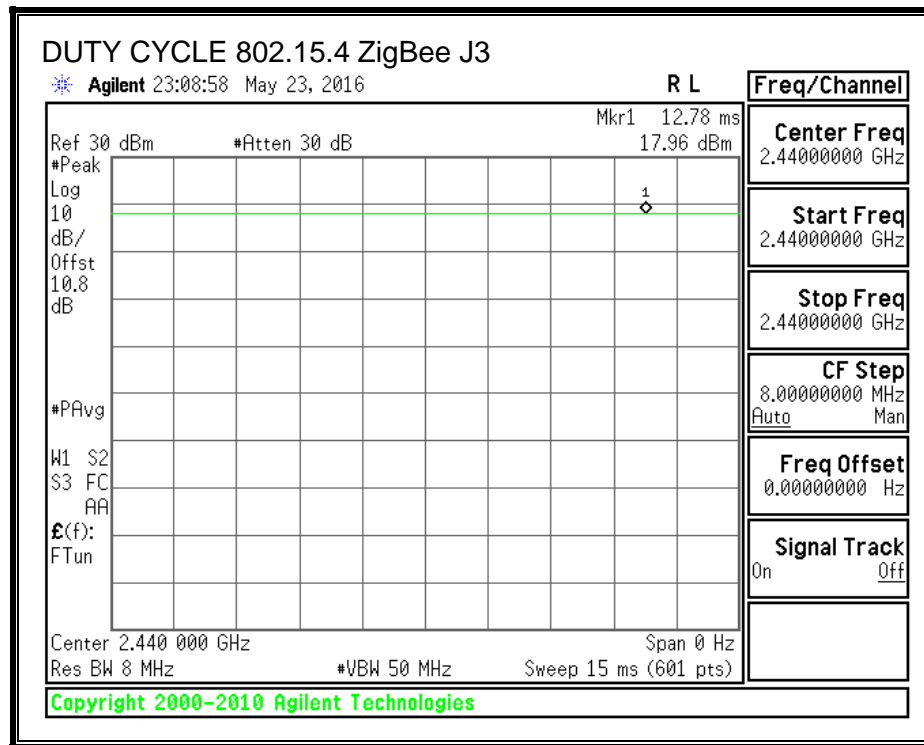
LIMITS

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 J3	10.000	10.000	1.000	100.00%	0.00	0.010

9.1.2. DUTY CYCLE PLOT



9.2. 802.15.4 MODE IN THE 2.4 GHz BAND

9.2.1. 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.

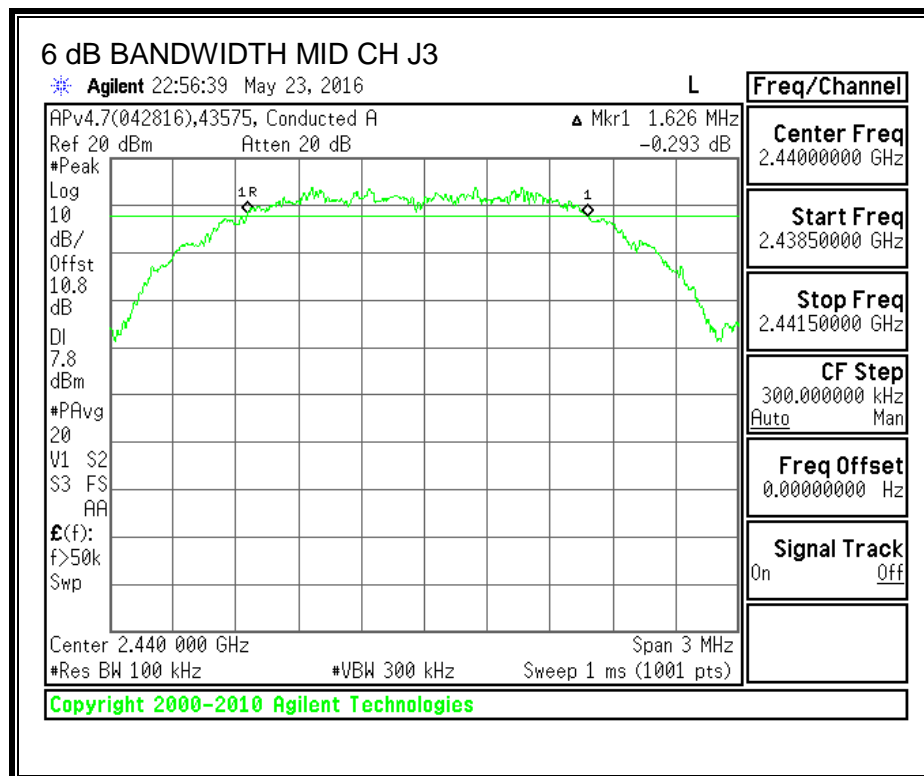
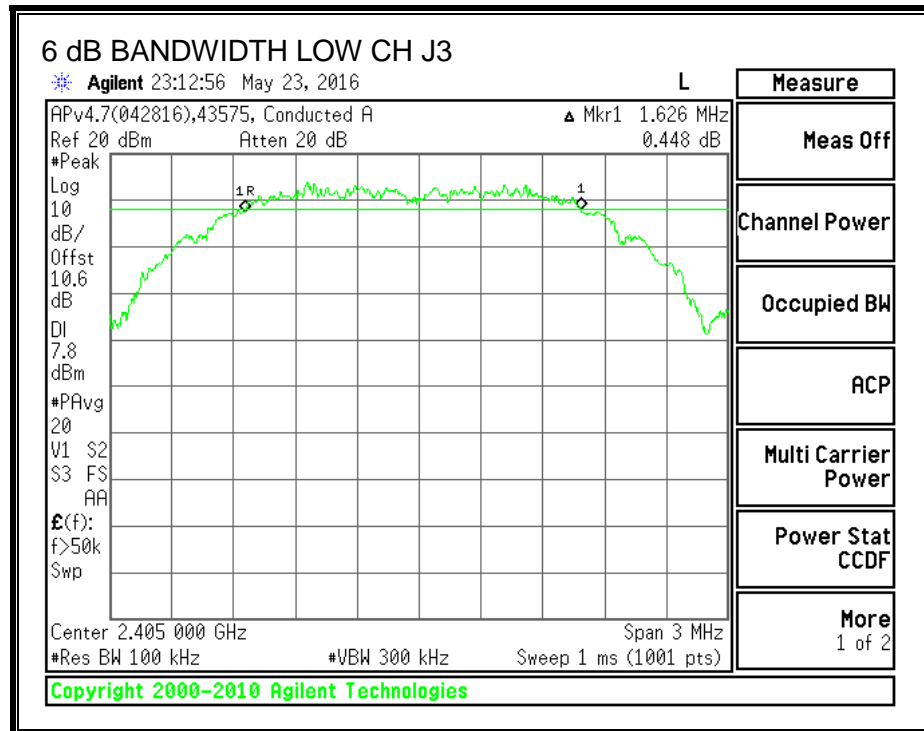
TEST PROCEDURE

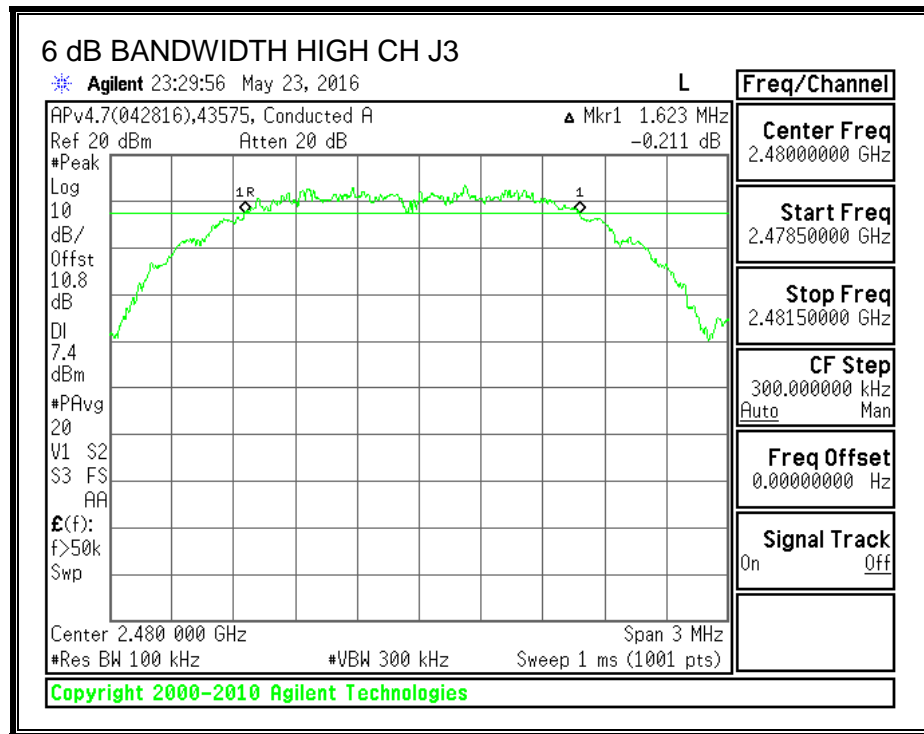
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS – J3

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.626	0.5
Middle	2440	1.626	0.5
High	2480	1.623	0.5

6 dB BANDWIDTH J3





9.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

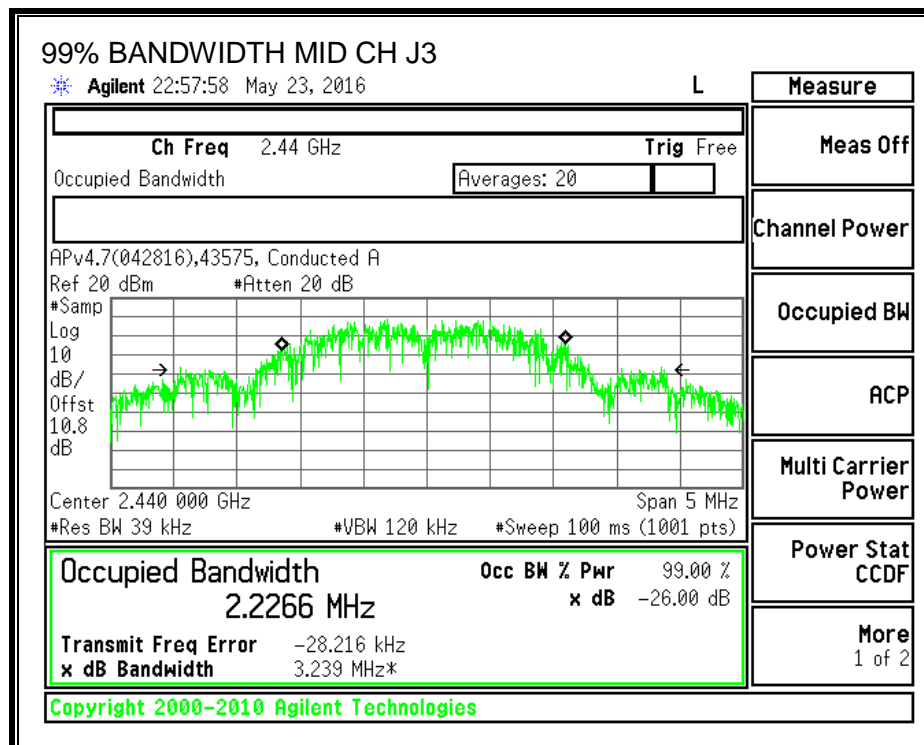
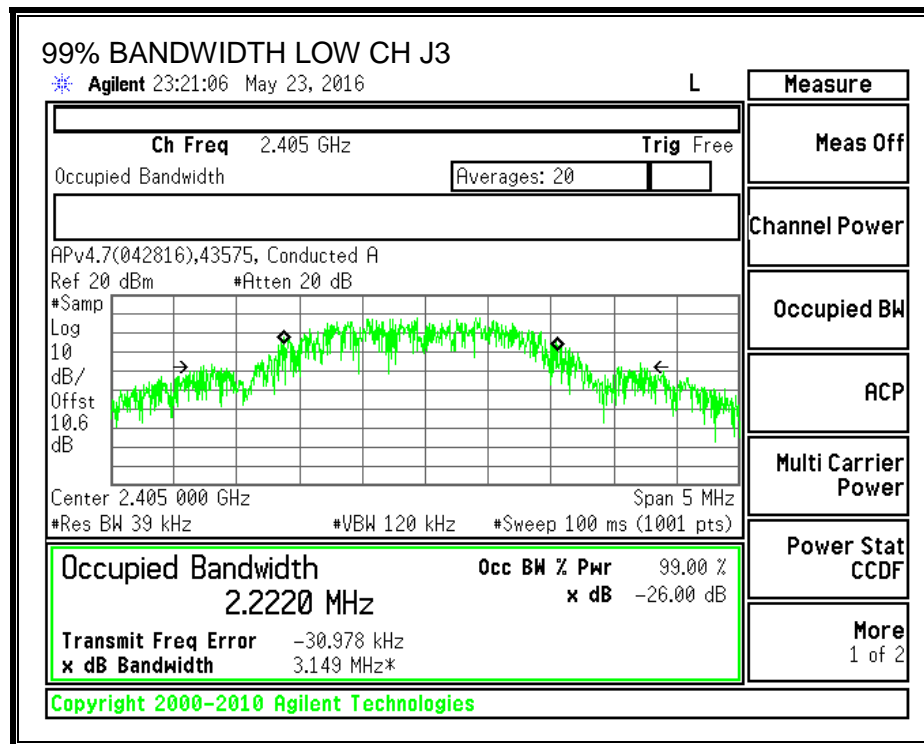
TEST PROCEDURE

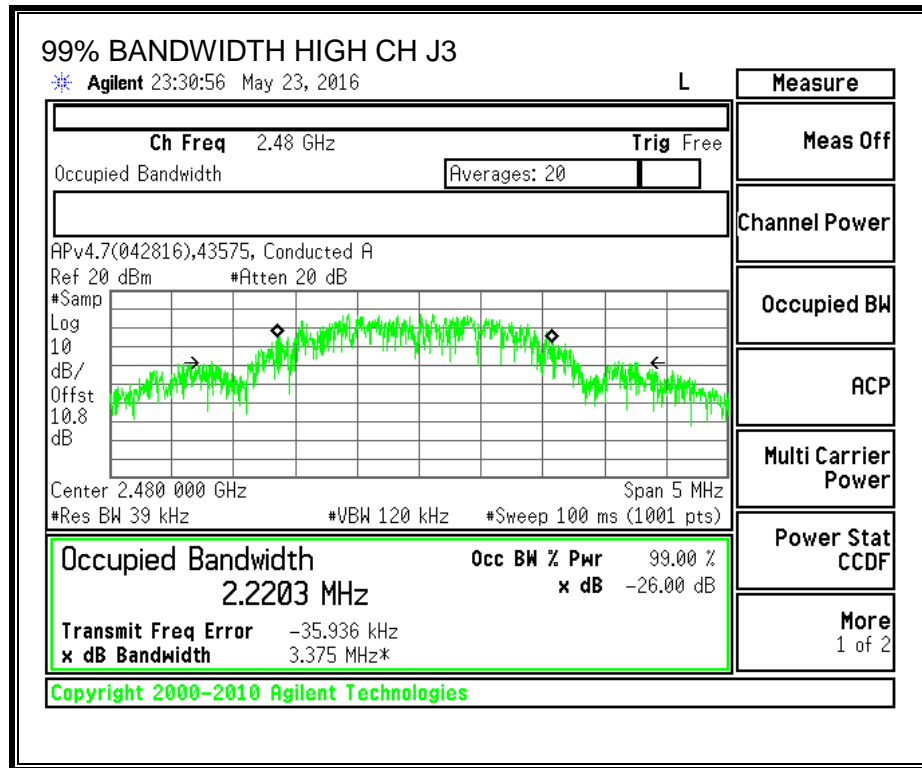
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS J3

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.2220
Middle	2440	2.2266
High	2480	2.2203

99% BANDWIDTH J3





9.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

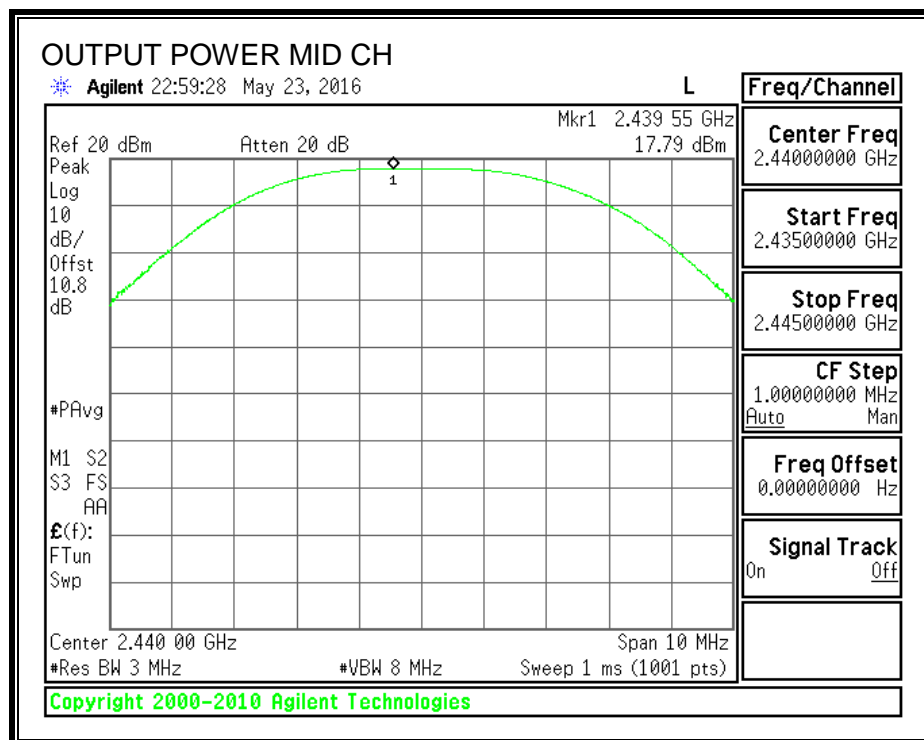
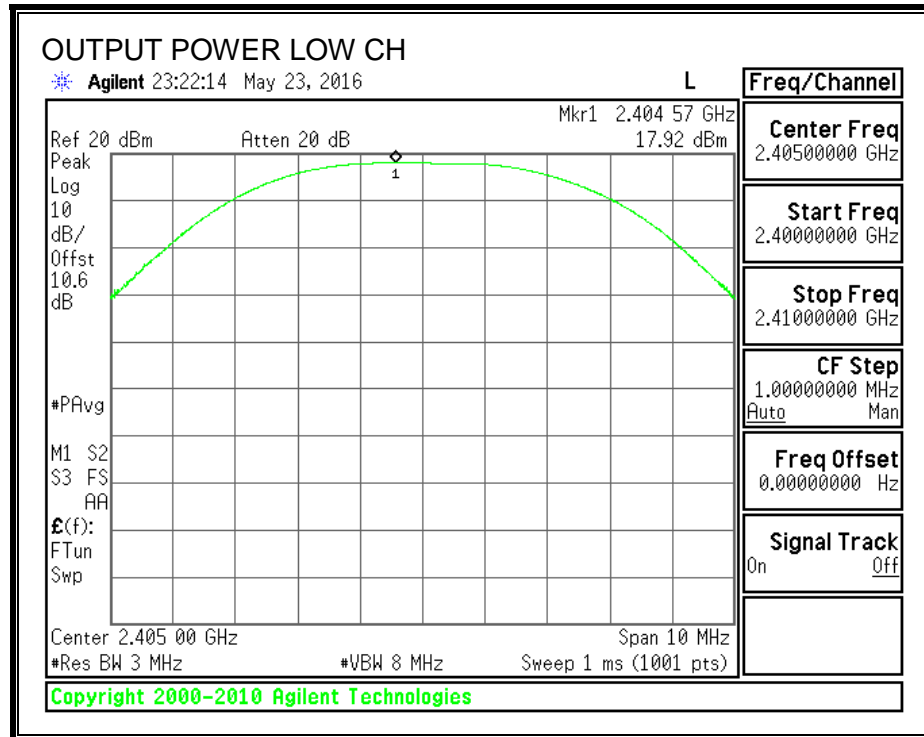
IC RSS-247 5.4 (4)

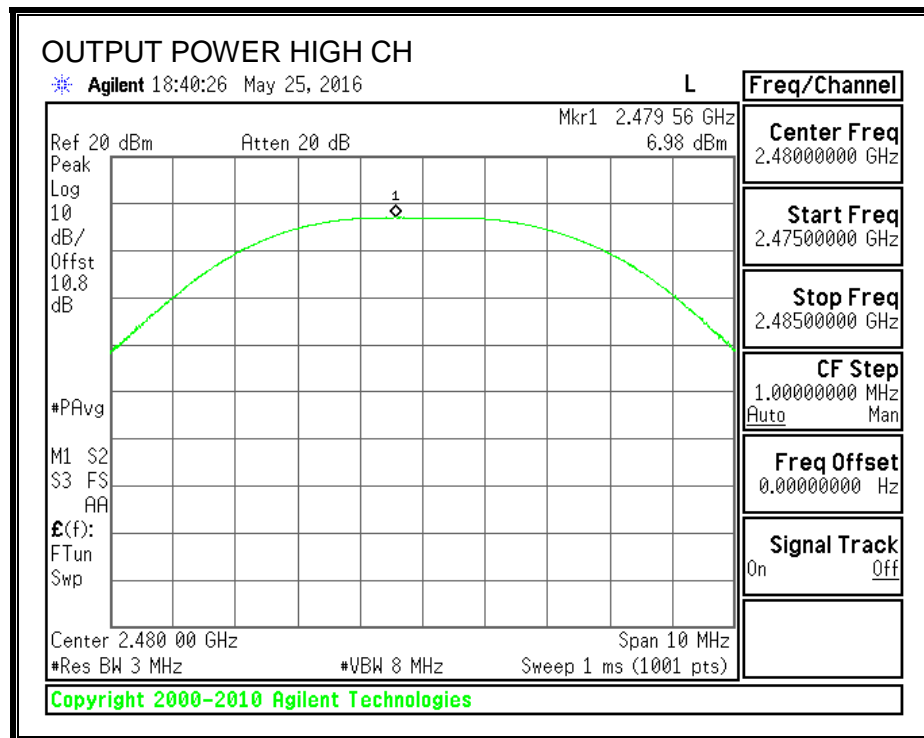
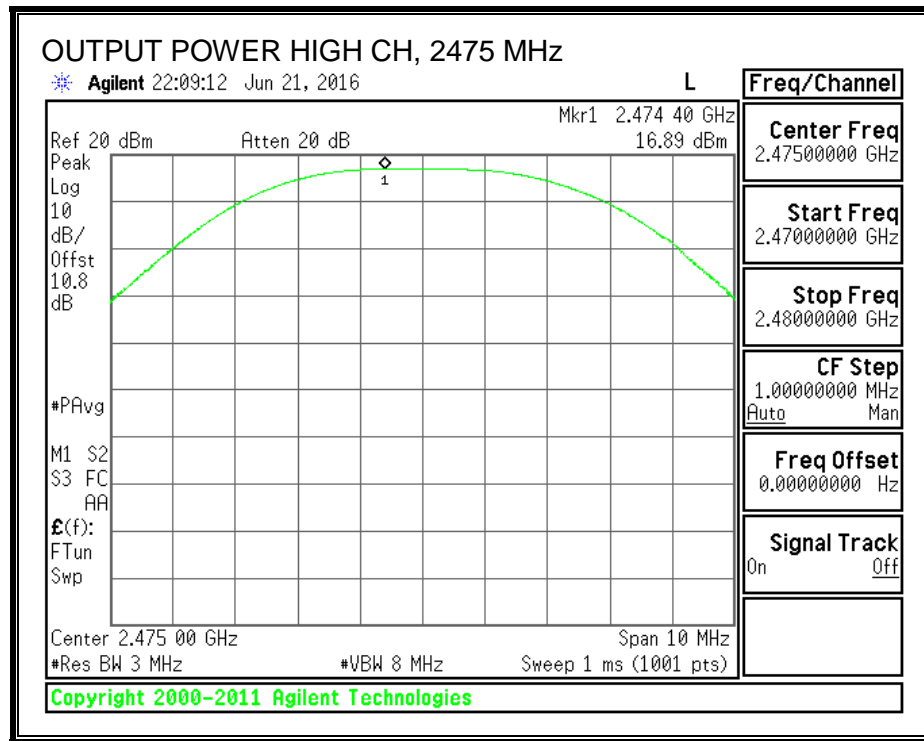
For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional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

RESULTS J3

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2405	17.92	30	-12.080
Middle	2440	17.79	30	-12.210
High	2475	16.89	30	-13.110
High	2480	6.98	30	-23.020

OUTPUT POWER J3





9.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

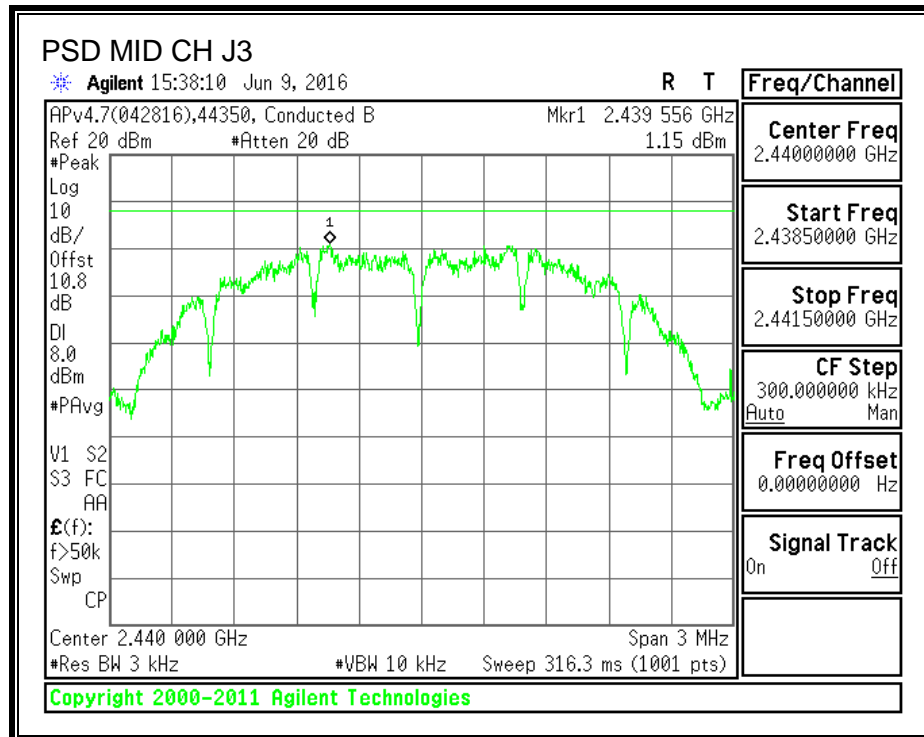
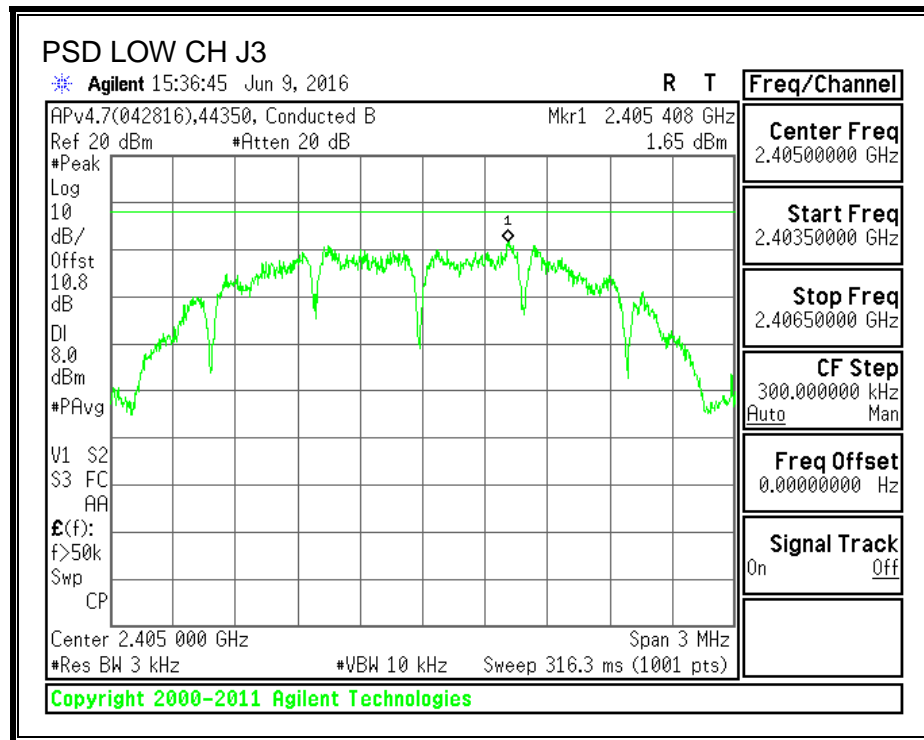
IC RSS-247 Clause 5.2.2

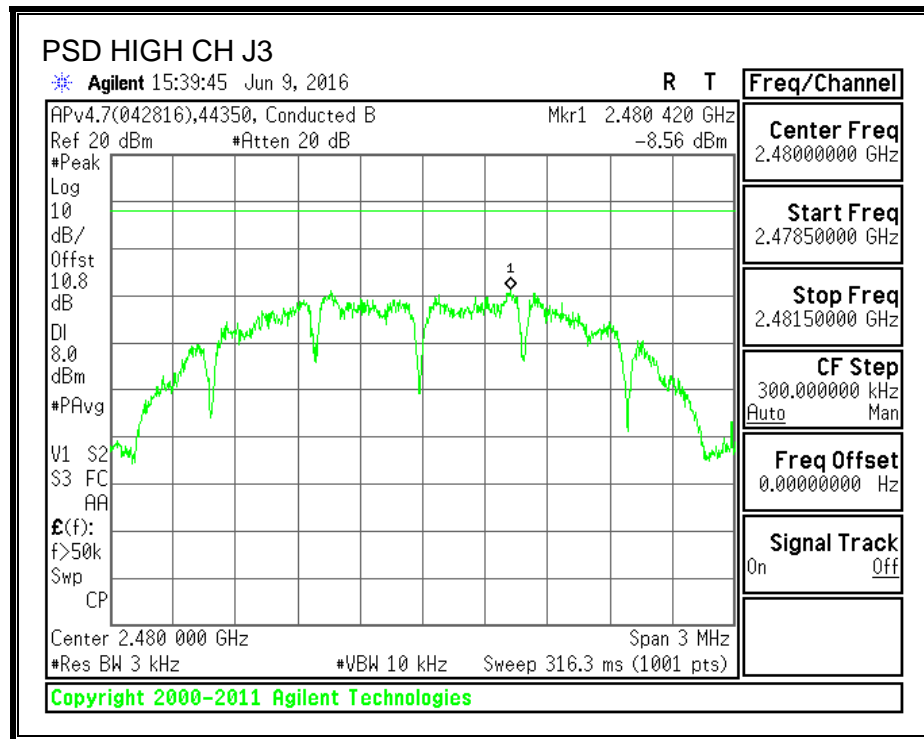
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS J3

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2405	1.65	8	-6.35
Middle	2440	1.15	8	-6.85
High	2480	-8.56	8	-16.56

POWER SPECTRAL DENSITY J3





9.2.5. CONDUCTED SPURIOUS EMISSIONS

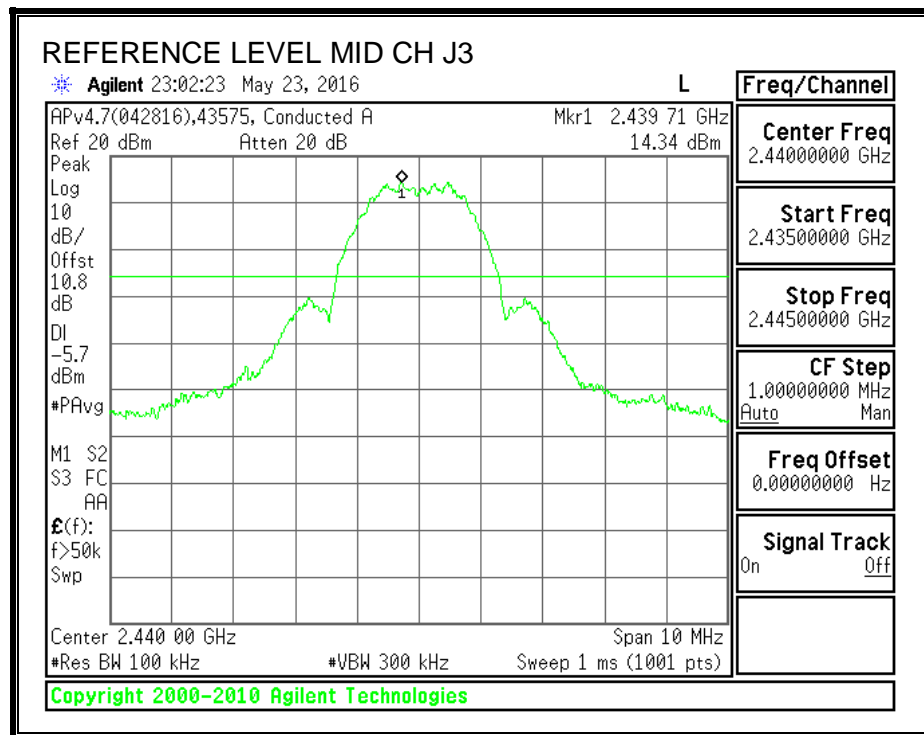
LIMITS

FCC §15.247 (d)

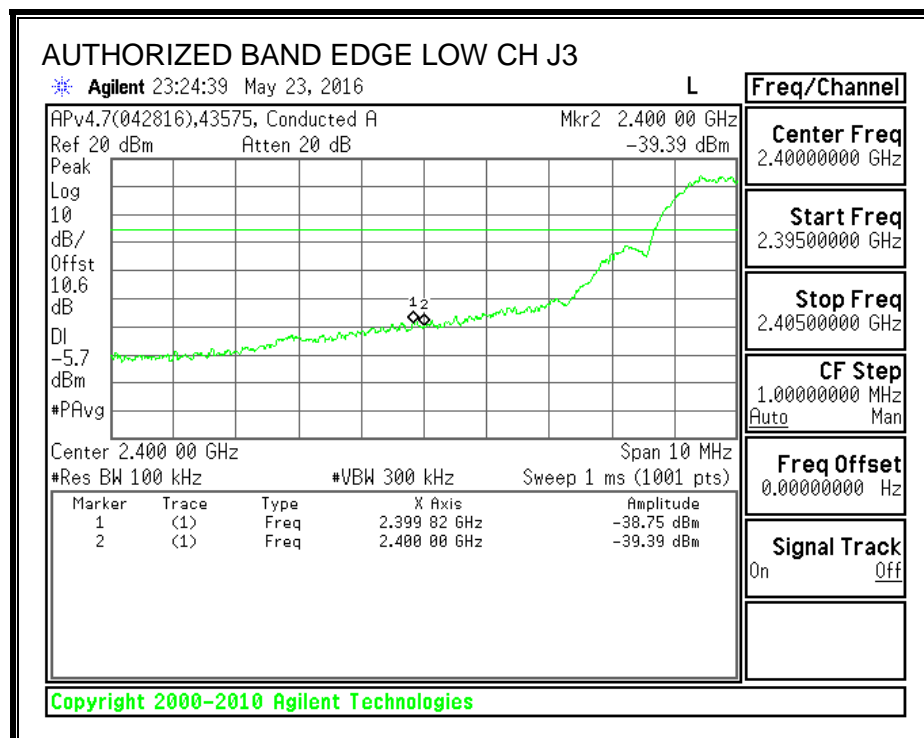
IC RSS-247 Clause 5.5

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.

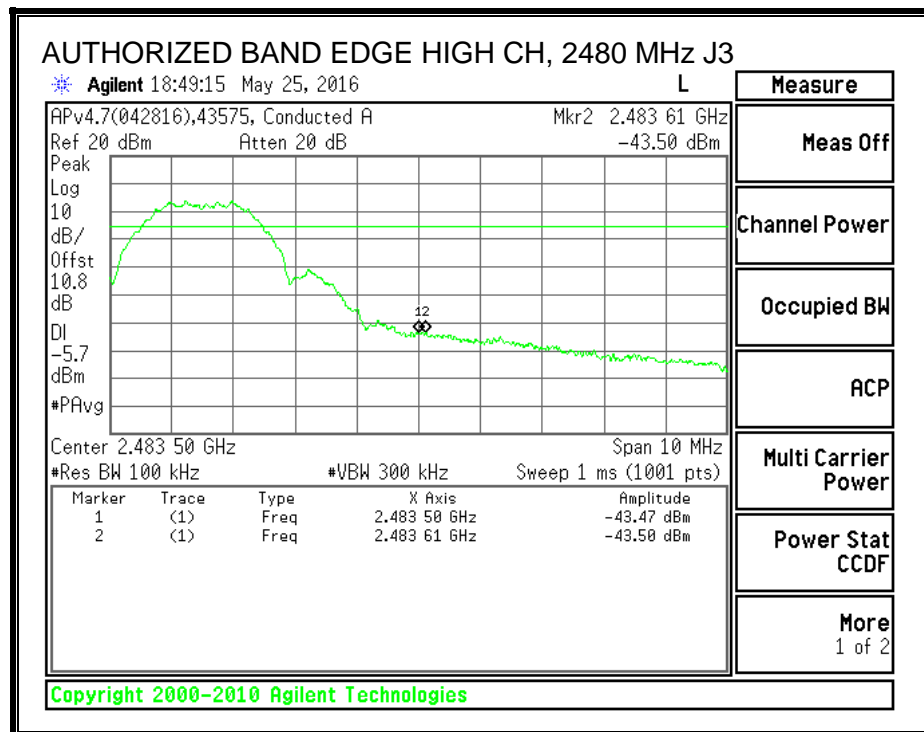
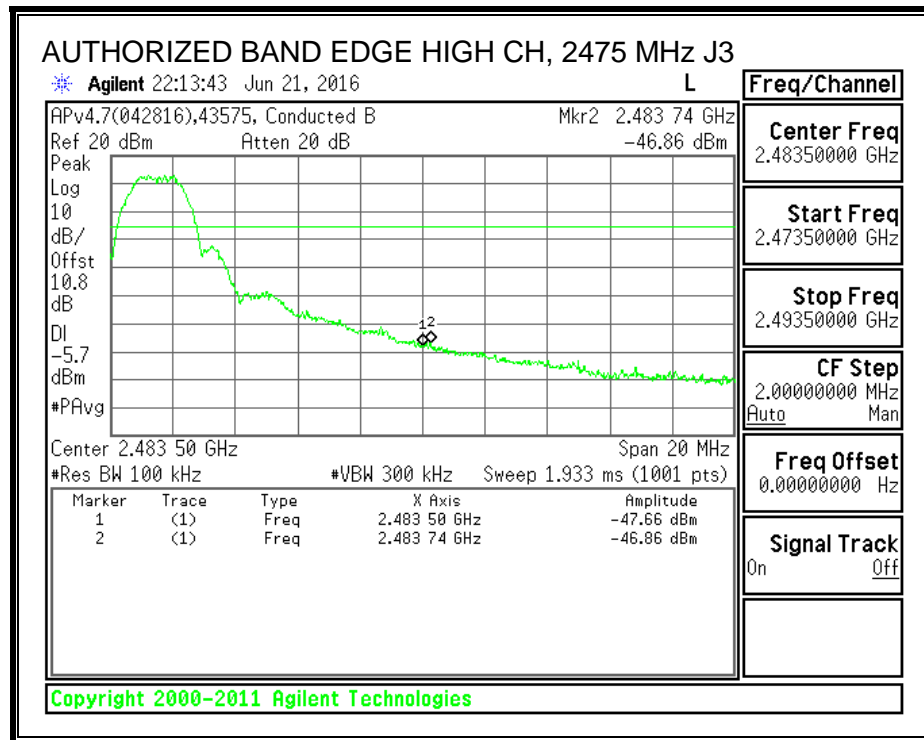
IN-BAND REFERENCE LEVEL J3



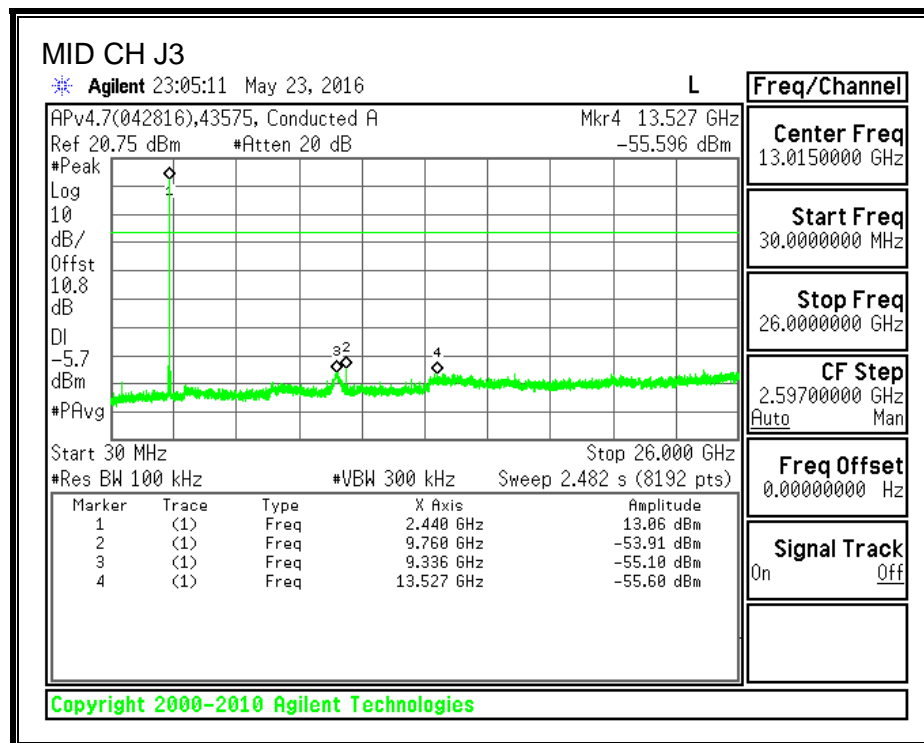
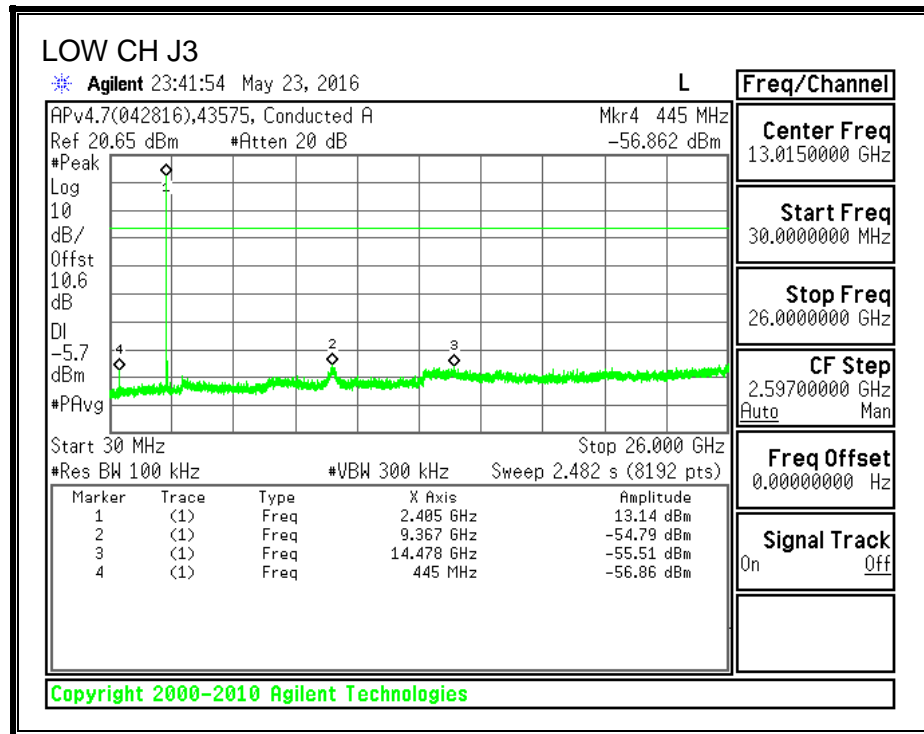
LOW CHANNEL BANDEDGE J3

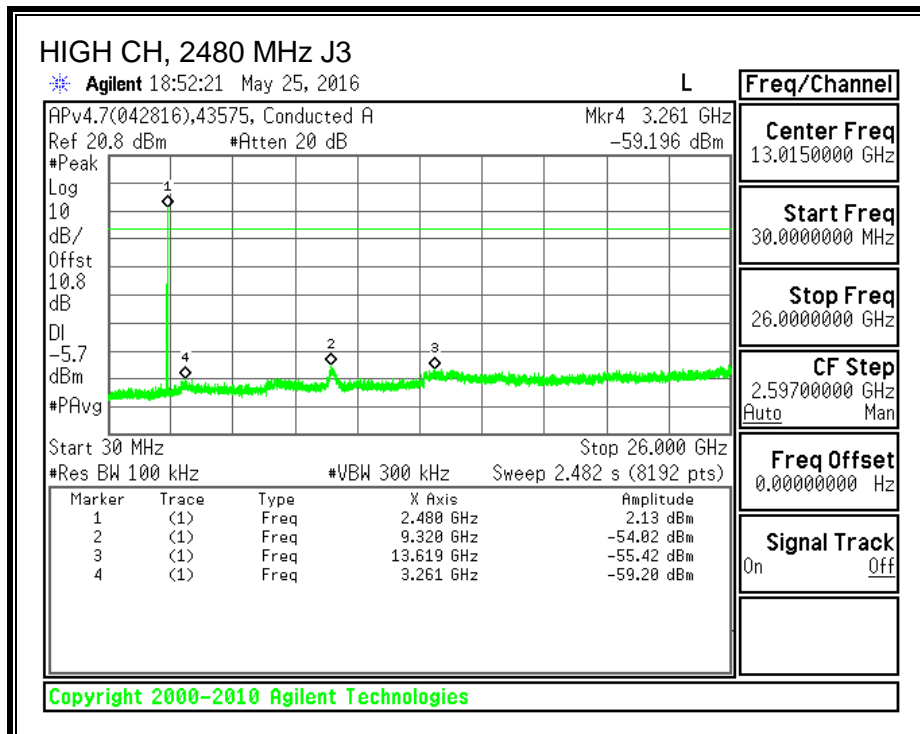
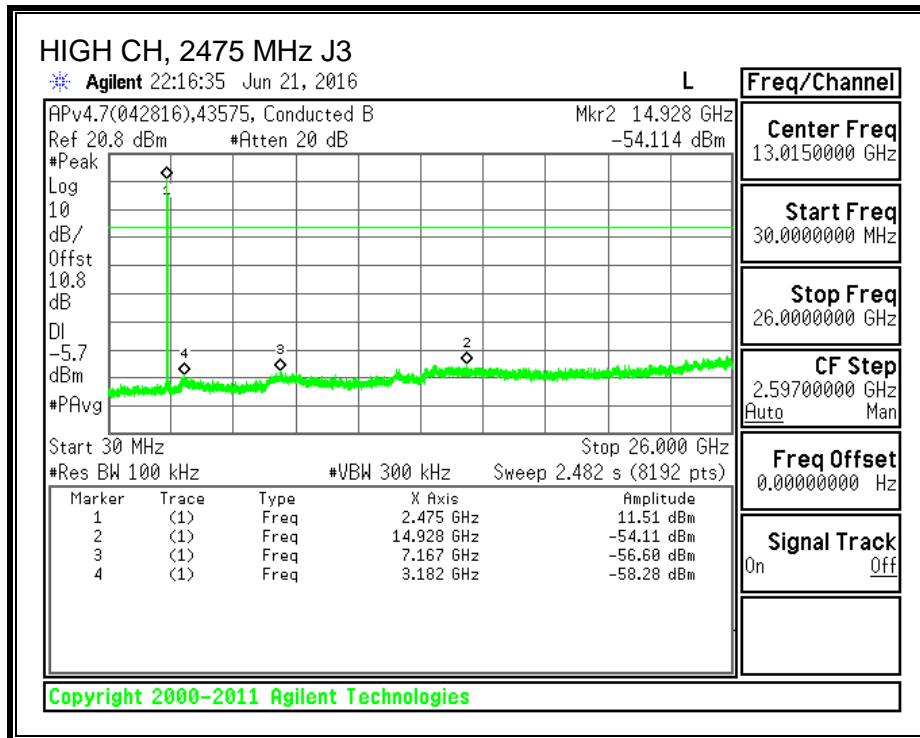


HIGH CHANNEL BANDEDGE J3



CONDUCTED SPURIOUS EMISSIONS J3





Note:

Each channel was verified, and it appears that middle channel is worst and was selected as the reference limit for all channels.

10. RADIATED TEST RESULTS

10.1. 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 9.1.1 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.

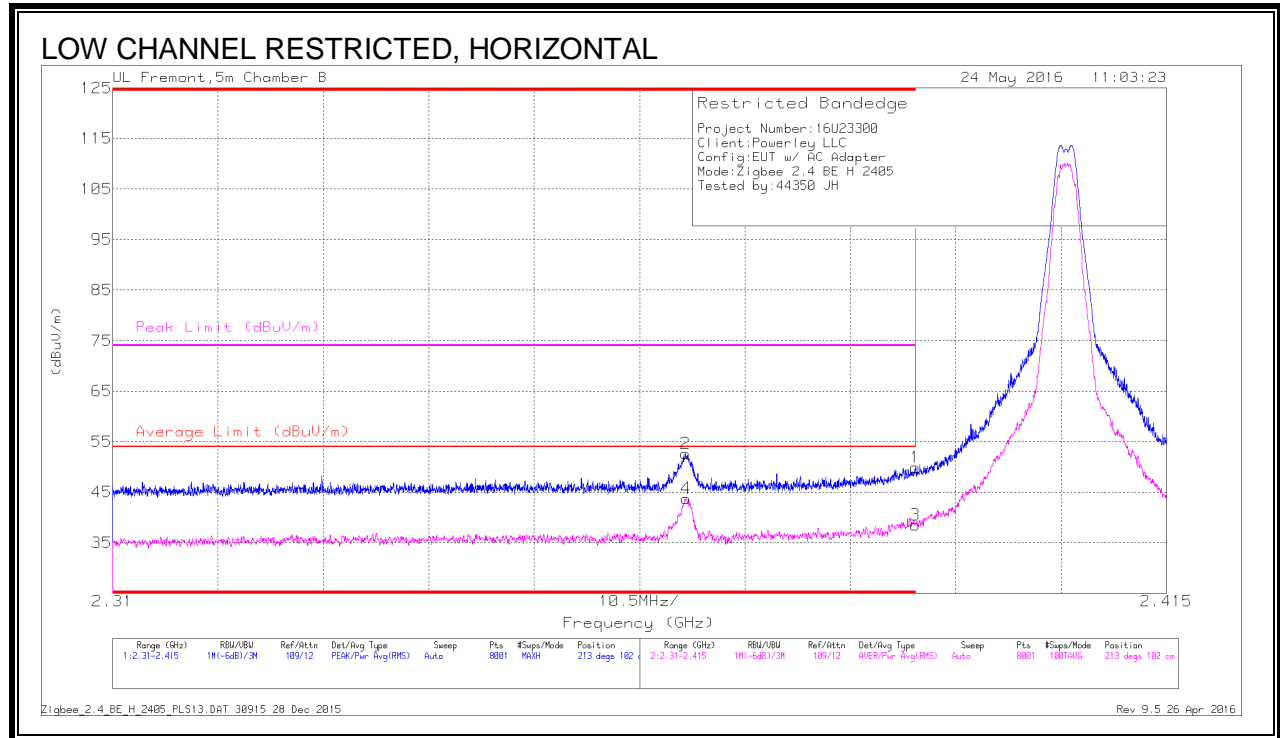
Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

RESULTS

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. TX ABOVE 1 GHz FOR 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Trace Markers

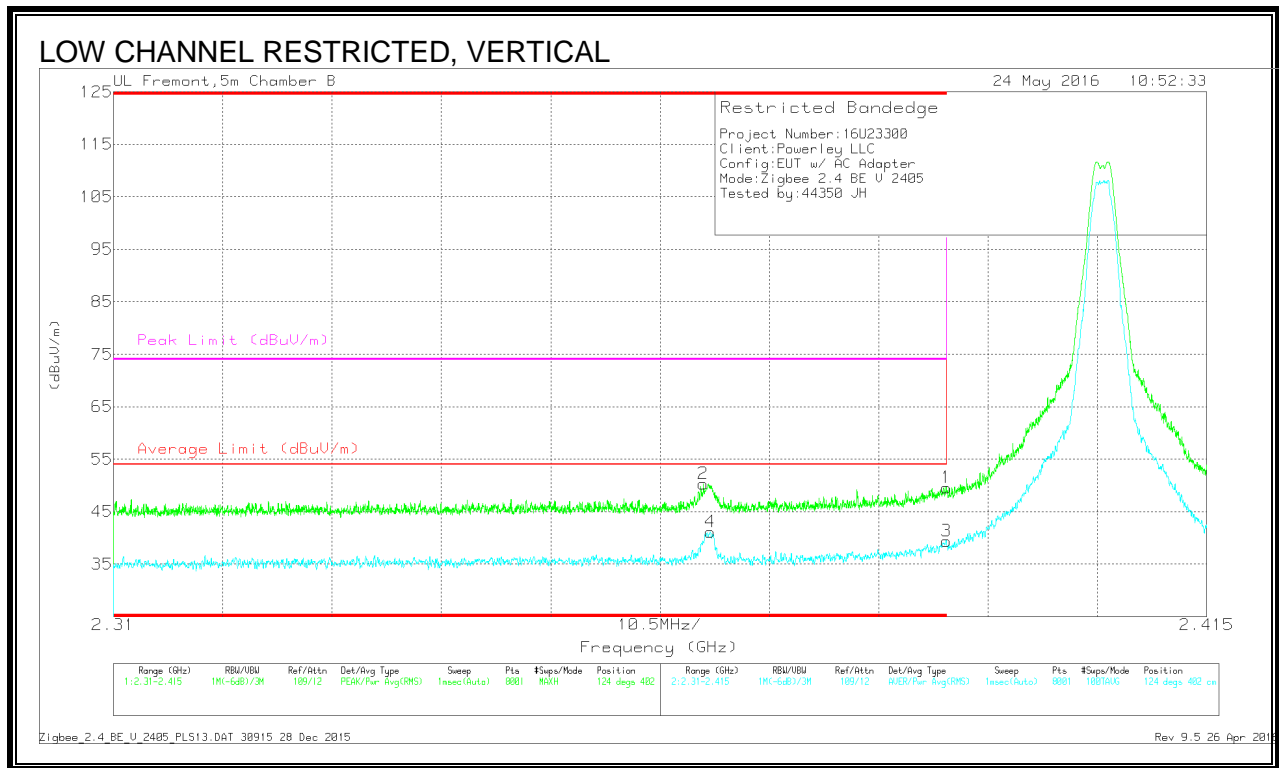
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Ch/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	40.08	Pk	32.1	-22.3	0	49.88	-	-	74	-24.12	213	102	H
2	* 2.367	42.96	Pk	32	-22.3	0	52.66	-	-	74	-21.34	213	102	H
3	* 2.39	28.64	RMS	32.1	-22.3	0	38.44	54	-15.56	-	-	213	102	H
4	* 2.367	34.07	RMS	32	-22.3	0	43.77	54	-10.23	-	-	213	102	H

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Trace Markers

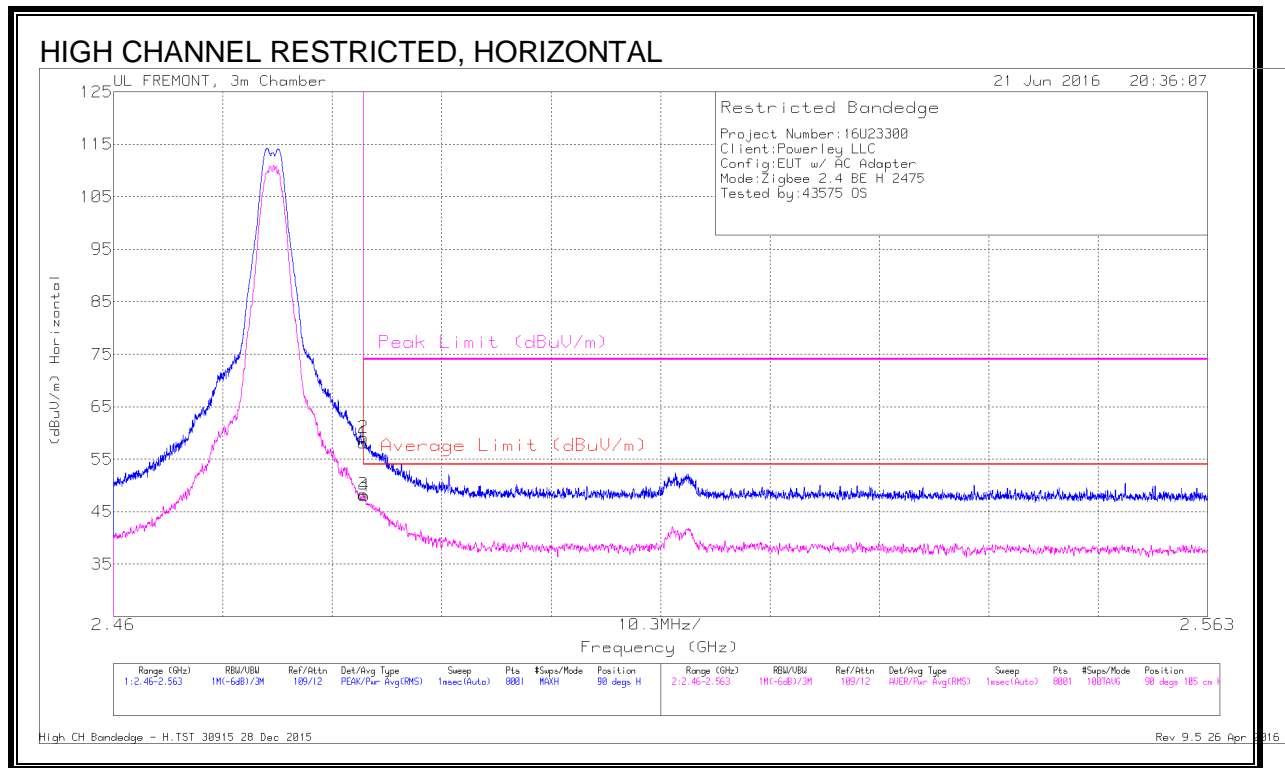
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Ch/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.78	Pk	32.1	-22.3	0	49.58	-	-	74	-24.42	124	402	V
2	* 2.367	40.58	Pk	32	-22.3	0	50.28	-	-	74	-23.72	124	402	V
3	* 2.39	29.6	RMS	32.1	-22.3	0	39.4	54	-14.6	-	-	124	402	V
4	* 2.367	31.35	RMS	32	-22.3	0	41.05	54	-12.95	-	-	124	402	V

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, 2475 MHz, HORIZONTAL)



Trace Markers

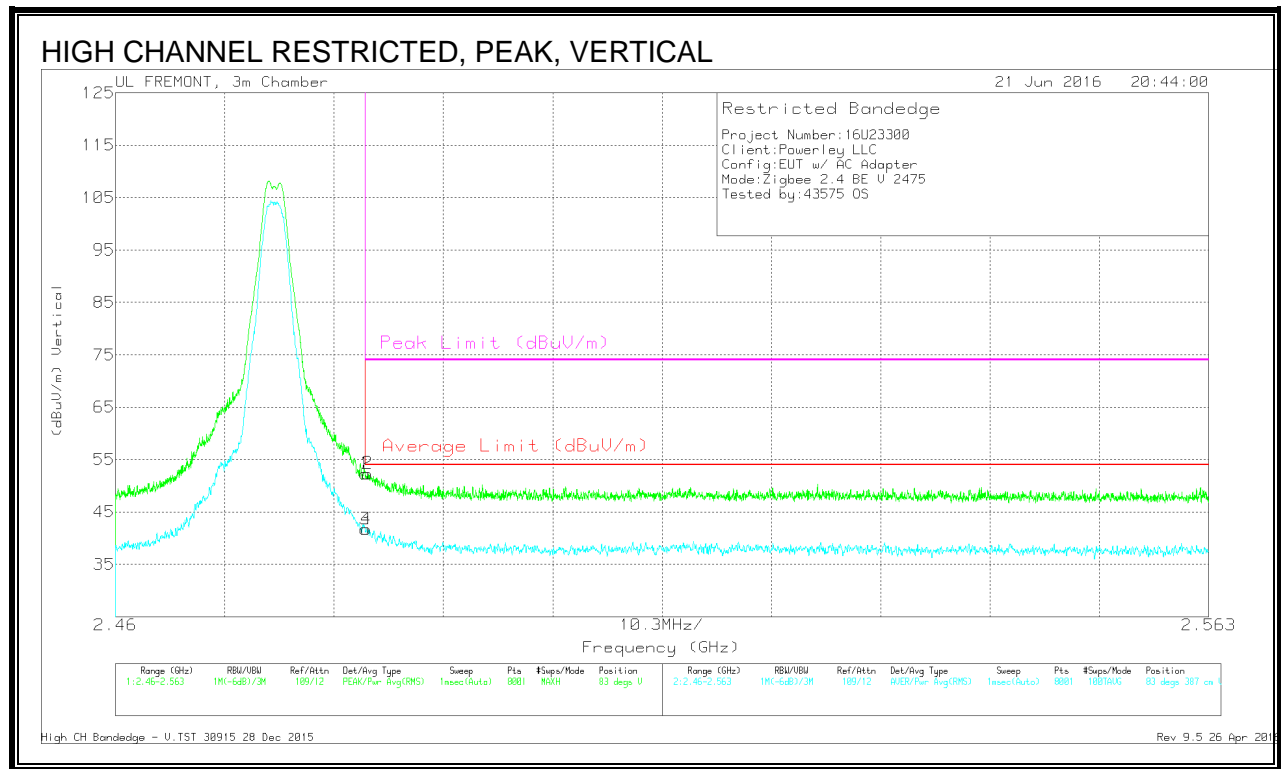
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Ch/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	46.94	Pk	32.4	-21.2	0	58.14	-	-	74	-15.86	90	105	H
2	2.484	47.95	Pk	32.4	-21.2	0	59.15	-	-	74	-14.85	90	105	H
3	2.484	37.11	RMS	32.4	-21.2	0	48.31	54	-5.69	-	-	90	105	H
4	2.484	36.87	RMS	32.4	-21.2	0	48.07	54	-5.93	-	-	90	105	H

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL 2475 MHz, VERTICAL)



Trace Markers

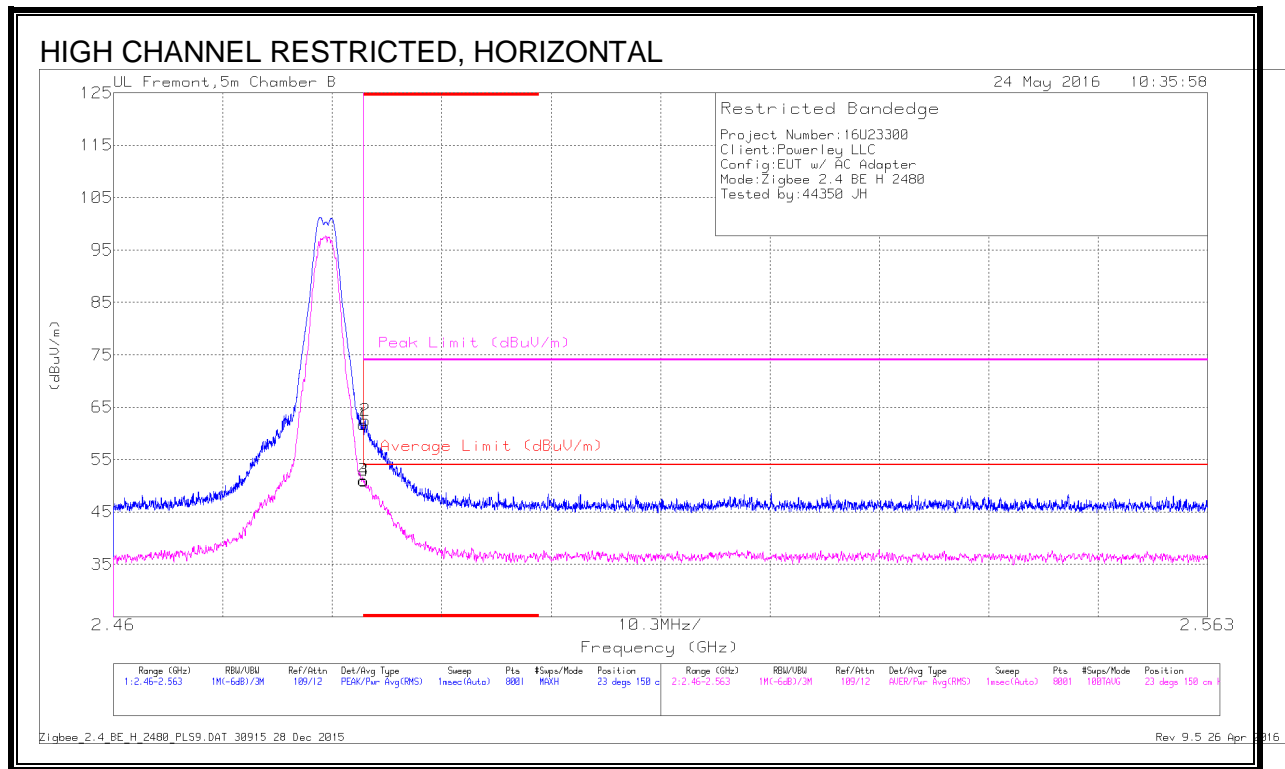
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	41.07	Pk	32.4	-21.2	0	52.27	-	-	74	-21.73	83	387	V
2	2.484	41.14	Pk	32.4	-21.2	0	52.34	-	-	74	-21.66	83	387	V
3	2.484	30.58	RMS	32.4	-21.2	0	41.78	54	-12.22	-	-	83	387	V
4	2.484	30.54	RMS	32.4	-21.2	0	41.74	54	-12.26	-	-	83	387	V

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

Pk - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, 2480 MHz, HORIZONTAL)



Trace Markers

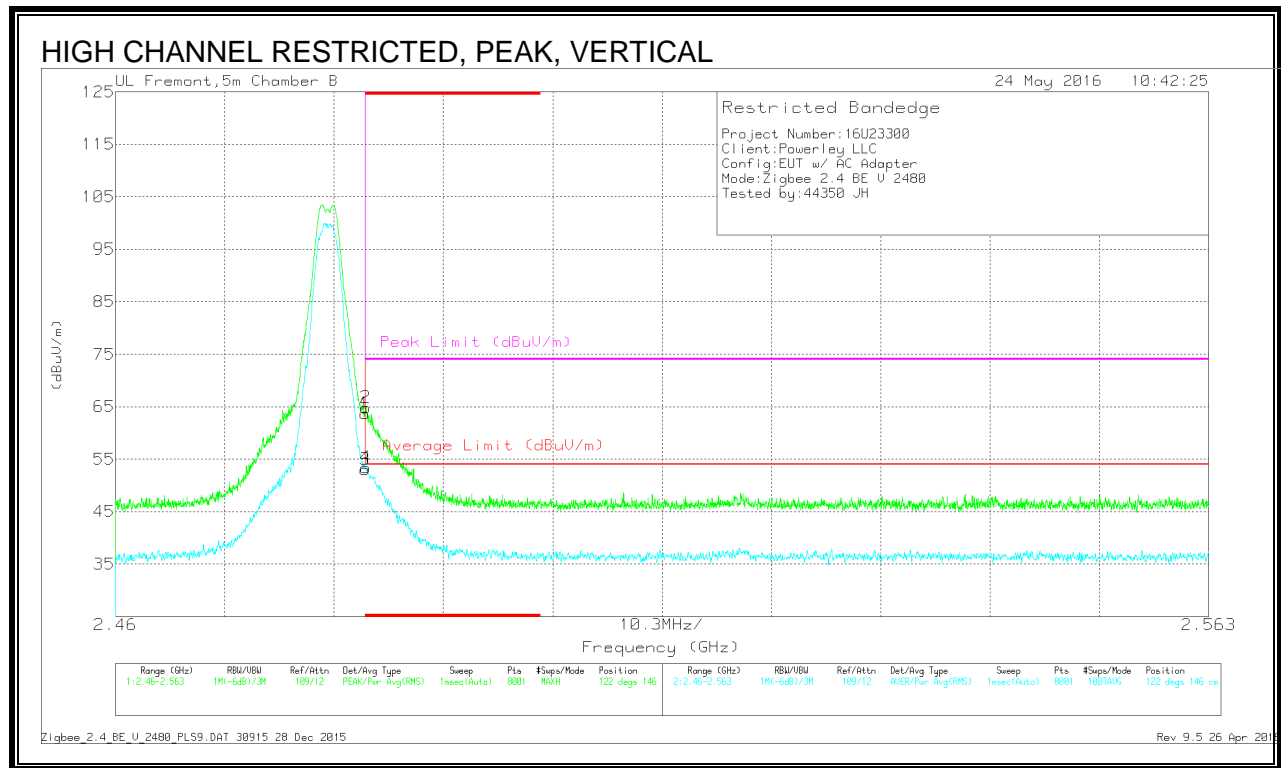
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Ch/Flt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	51.76	PK	32.3	-22.3	0	61.76	-	-	74	-12.24	23	150	H
2	* 2.484	52.51	PK	32.3	-22.3	0	62.51	-	-	74	-11.49	23	150	H
3	* 2.484	41.07	RMS	32.3	-22.3	0	51.07	54	-2.93	-	-	23	150	H
4	* 2.484	40.91	RMS	32.3	-22.3	0	50.91	54	-3.09	-	-	23	150	H

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL 2480 MHz, VERTICAL)



Trace Markers

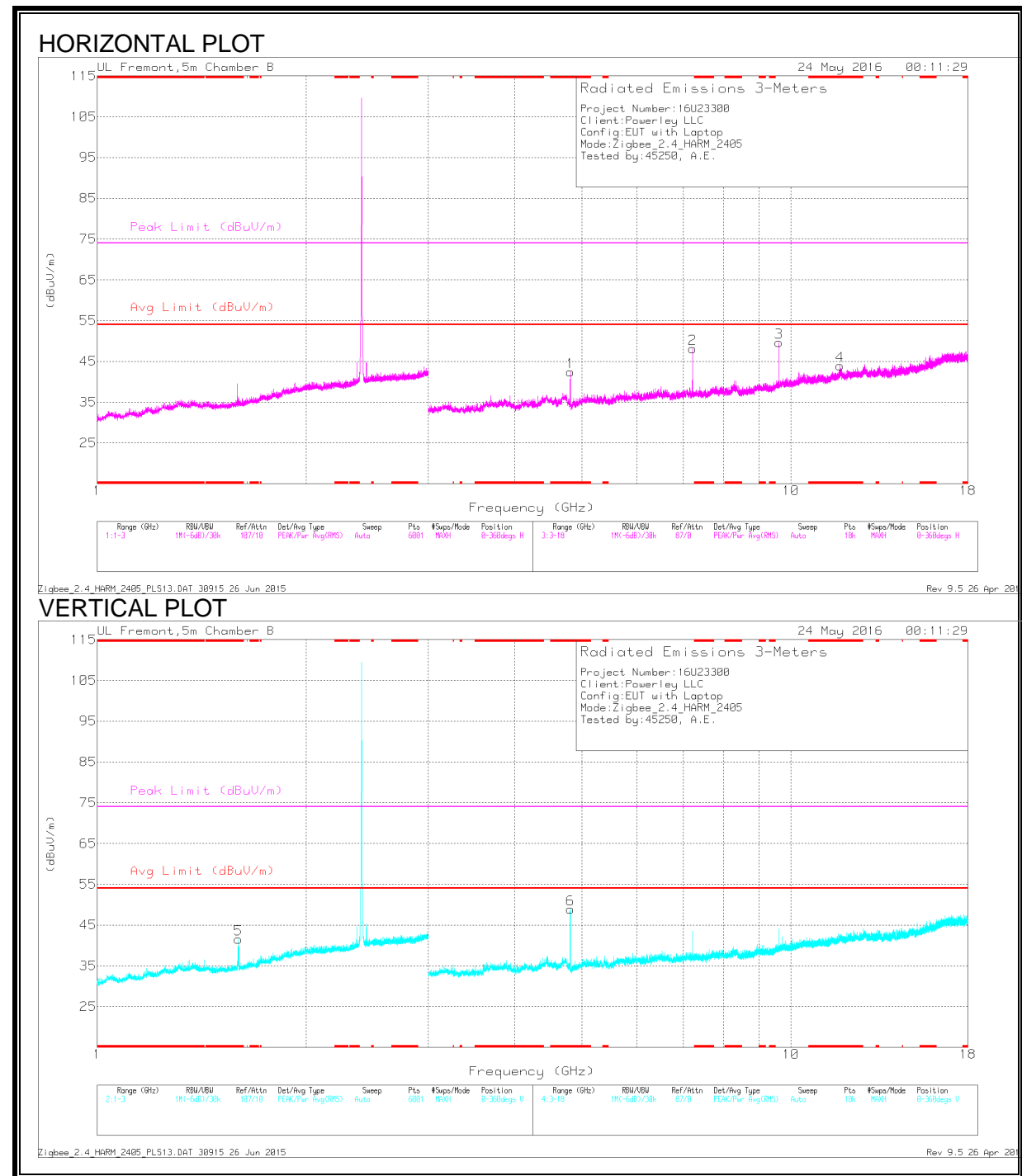
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Ch/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	53.75	Pk	32.3	-22.3	0	63.75	-	-	74	-10.25	122	146	V
2	* 2.484	54.8	Pk	32.3	-22.3	0	64.8	-	-	74	-9.2	122	146	V
3	* 2.484	43.03	RMS	32.3	-22.3	0	53.03	54	-97	-	-	122	146	V
4	* 2.484	43.35	RMS	32.3	-22.3	0	53.35	54	-65	-	-	122	146	V

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

PK - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/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
5	* 1.597	35.73	Pk	28.1	-22.3	0	41.53	-	-	74	-32.47	0-360	101	V
1	* 4.811	40.08	Pk	33.8	-31.4	0	42.48	-	-	74	-31.52	0-360	199	H
4	* 11.776	29.92	Pk	38.7	-24.7	0	43.92	-	-	74	-30.08	0-360	101	H
6	* 4.811	46.54	Pk	33.8	-31.4	0	48.94	-	-	74	-25.06	0-360	101	V
2	7.213	42.58	Pk	35.6	-30	0	48.18	-	-	-	-	0-360	199	H
3	9.621	39.76	Pk	36.7	-26.8	0	49.66	-	-	-	-	0-360	199	H

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/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
* 1.597	45.11	PK2	28.1	-22.4	0	50.81	-	-	74	-23.19	148	110	V
* 1.599	26.65	MAV1	28.1	-22.3	0	32.45	54	-21.55	-	-	148	110	V
* 4.811	47.25	PK2	33.8	-31.4	0	49.65	-	-	74	-24.35	250	329	H
* 4.811	40.56	MAV1	33.8	-31.4	0	42.96	54	-11.04	-	-	250	329	H
* 11.777	34.12	PK2	38.7	-24.7	0	48.12	-	-	74	-25.88	222	186	H
* 11.775	23.83	MAV1	38.7	-24.6	0	37.93	54	-16.07	-	-	222	186	H
* 4.811	50.79	PK2	33.8	-31.4	0	53.19	-	-	74	-20.81	205	109	V
* 4.811	45.53	MAV1	33.8	-31.4	0	47.93	54	-6.07	-	-	205	109	V
7.213	49.13	PK2	35.6	-30	0	54.73	-	-	74	-19.27	177	267	H
9.622	45.91	PK2	36.7	-26.8	0	55.81	-	-	74	-18.19	164	229	H

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

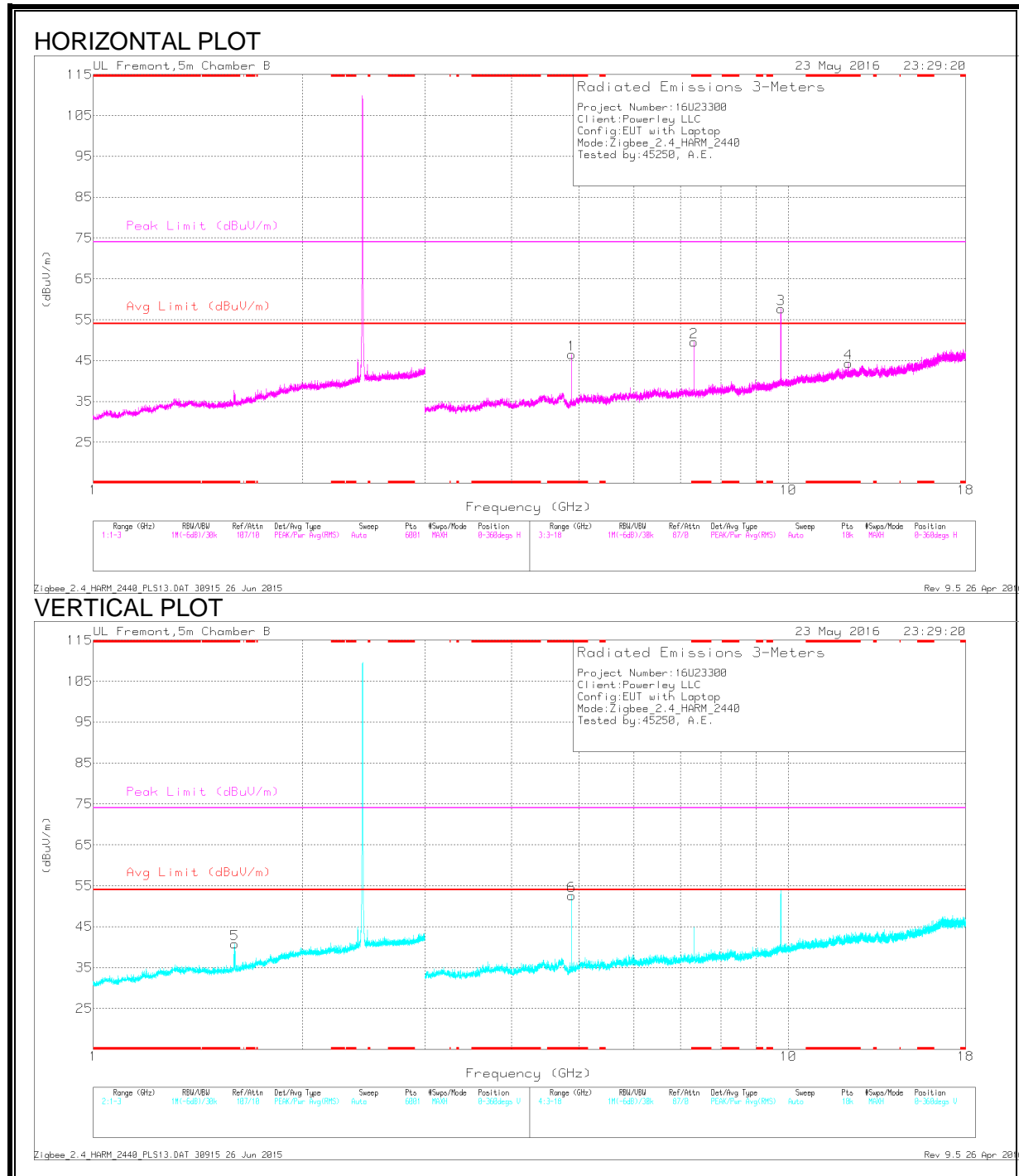
-Compliance for emissions in non-restricted bands is shown in conducted out of band testing

PK - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/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
5	* 1.597	34.92	Pk	28.1	-22.3	0	40.72	-	-	74	-33.28	0-360	200	V
1	* 4.879	45.49	Pk	33.8	-32.8	0	46.49	-	-	74	-27.51	0-360	101	H
2	* 7.318	44.34	Pk	35.6	-30.4	0	49.54	-	-	74	-24.46	0-360	101	H
4	* 12.203	30.5	Pk	39.1	-25.3	0	44.3	-	-	74	-29.7	0-360	199	H
6	* 4.881	51.64	Pk	33.8	-32.8	0	52.64	-	-	74	-21.36	0-360	101	V
3	9.762	47.02	Pk	36.9	-26.3	0	57.62	-	-	-	-	0-360	199	H

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

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/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
* 1.598	42.26	PK2	28.1	-22.3	0	48.06	-	-	74	-25.94	9	118	V
* 1.597	24.94	MAV1	28.1	-22.3	0	30.74	54	-23.26	-	-	9	118	V
* 4.881	50	PK2	33.8	-32.8	0	51	-	-	74	-23	177	259	H
* 4.881	43.74	MAV1	33.8	-32.8	0	44.74	54	-9.26	-	-	177	259	H
* 7.318	48.83	PK2	35.6	-30.4	0	54.03	-	-	74	-19.97	184	289	H
* 7.318	42.36	MAV1	35.6	-30.4	0	47.56	54	-6.44	-	-	184	289	H
* 12.203	37.26	PK2	39.1	-25.3	0	51.06	-	-	74	-22.94	164	215	H
* 12.203	28.8	MAV1	39.1	-25.3	0	42.6	54	-11.4	-	-	164	215	H
* 4.881	54.85	PK2	33.8	-32.8	0	55.85	-	-	74	-18.15	224	119	V
* 4.881	49.63	MAV1	33.8	-32.8	0	50.63	54	-3.37	-	-	224	119	V
9.762	51.67	PK2	36.9	-26.3	0	62.27	-	-	74	-11.73	155	237	H

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

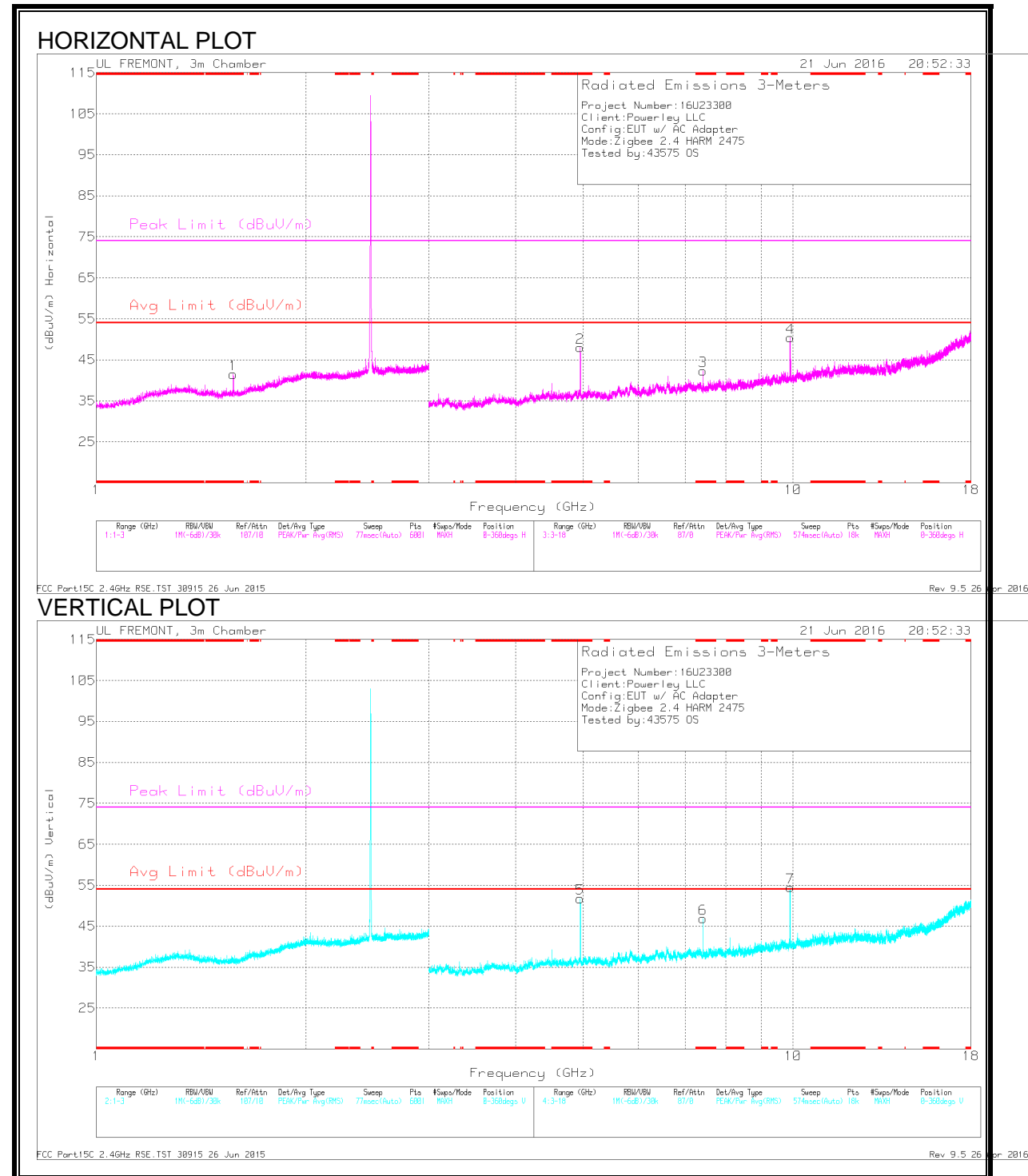
-Compliance for emissions in non-restricted bands is shown in conducted out of band testing

PK - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/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	* 1.572	33.58	Pk	27.9	-20	0	41.48	-	-	74	-32.52	0-360	287	H
2	* 4.949	41.03	Pk	34.2	-27.2	0	48.03	-	-	74	-25.97	0-360	100	H
3	* 7.426	31.96	Pk	35.8	-25.4	0	42.36	-	-	74	-31.64	0-360	100	H
5	* 4.951	44.86	Pk	34.2	-27.3	0	51.76	-	-	74	-22.24	0-360	200	V
6	* 7.426	36.48	Pk	35.8	-25.4	0	46.88	-	-	74	-27.12	0-360	200	V
4	9.901	35.02	Pk	37	-21.6	0	50.42	-	-	-	-	0-360	100	H
7	9.901	39.06	Pk	37	-21.6	0	54.46	-	-	-	-	0-360	100	V

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

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/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
* 1.572	40.48	PK2	27.9	-20	0	48.38	-	-	74	-25.62	354	171	H
* 1.573	32.59	MAV1	27.9	-19.9	0	40.59	54	-13.41	-	-	354	171	H
* 4.951	46.84	PK2	34.2	-27.3	0	53.74	-	-	74	-20.26	215	324	H
* 4.949	40.99	MAV1	34.2	-27.2	0	47.99	54	-6.01	-	-	215	324	H
* 7.426	38.06	PK2	35.8	-25.4	0	48.46	-	-	74	-25.54	181	301	H
* 7.427	30.14	MAV1	35.8	-25.4	0	40.54	54	-13.46	-	-	181	301	H
* 7.427	44.72	PK2	35.8	-25.4	0	55.12	-	-	74	-18.88	262	321	V
* 7.427	38.71	MAV1	35.8	-25.4	0	49.11	54	-4.89	-	-	262	321	V
* 4.951	50.74	PK2	34.2	-27.3	0	57.64	-	-	74	-16.36	320	304	V
* 4.951	45.9	MAV1	34.2	-27.3	0	52.8	54	-1.2	-	-	320	304	V
9.902	38.22	PK2	37	-21.6	0	53.62	-	-	74	-20.38	347	104	H
9.902	45.51	PK2	37	-21.6	0	60.91	-	-	74	-13.09	352	328	V

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

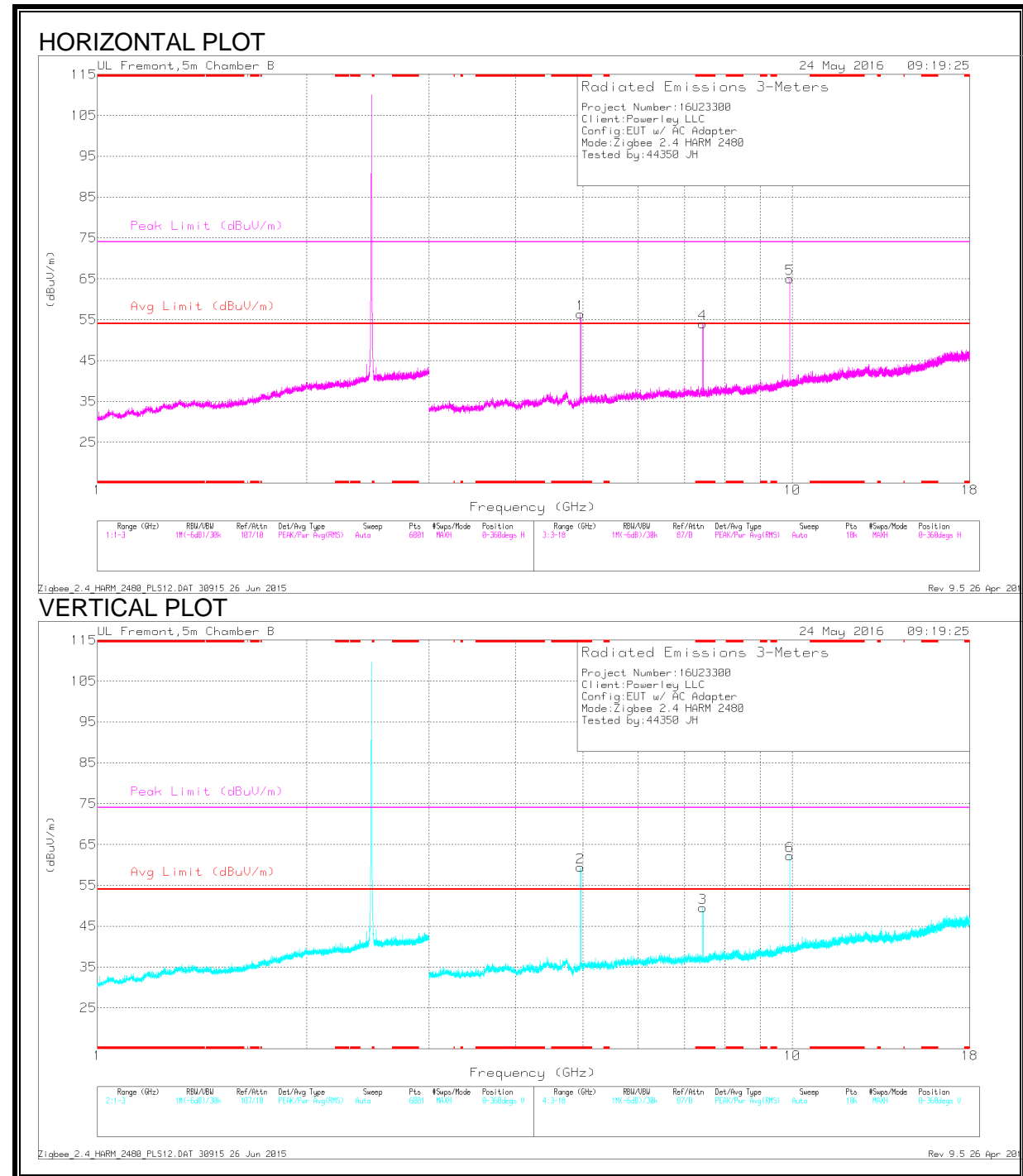
-Compliance for emissions in non-restricted bands is shown in conducted out of band testing

PK - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/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	* 4.959	54.59	Pk	34	-32.2	0	56.39	-	-	74	-17.61	0-360	101	H
4	* 7.438	48	Pk	35.6	-29.6	0	54	-	-	74	-20	0-360	101	H
2	* 4.959	57.58	Pk	34	-32.2	0	59.38	-	-	74	-14.62	0-360	101	V
3	* 7.438	43.51	Pk	35.6	-29.6	0	49.51	-	-	74	-24.49	0-360	101	V
5	9.917	54.49	Pk	37.2	-26.7	0	64.99	-	-	-	-	0-360	101	H
6	9.921	51.64	Pk	37.3	-26.7	0	62.24	-	-	-	-	0-360	199	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/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
* 4.959	50.54	PK2	34	-32.2	0	52.34	-	-	74	-21.66	13	103	H
* 4.959	44.81	MAv1	34	-32.2	0	46.61	54	-7.39	-	-	13	103	H
* 7.441	48.1	PK2	35.6	-29.5	0	54.2	-	-	74	-19.8	337	105	H
* 7.441	41.7	MAv1	35.6	-29.5	0	47.8	54	-6.2	-	-	337	105	H
* 4.961	54.46	PK2	34	-32.2	0	56.26	-	-	74	-17.74	3	117	V
* 4.959	49.34	MAv1	34	-32.2	0	51.14	54	-2.86	-	-	3	117	V
* 7.441	42.87	PK2	35.6	-29.6	0	48.87	-	-	74	-25.13	341	102	V
* 7.438	36.48	MAv1	35.6	-29.6	0	42.48	54	-11.52	-	-	341	102	V
9.918	50.77	PK2	37.2	-26.7	0	61.27	-	-	74	-12.73	334	117	H
9.918	49.23	PK2	37.2	-26.7	0	59.73	-	-	74	-14.27	28	249	V

* - indicates frequency in CFR Pt 15 / IC-Restricted Band

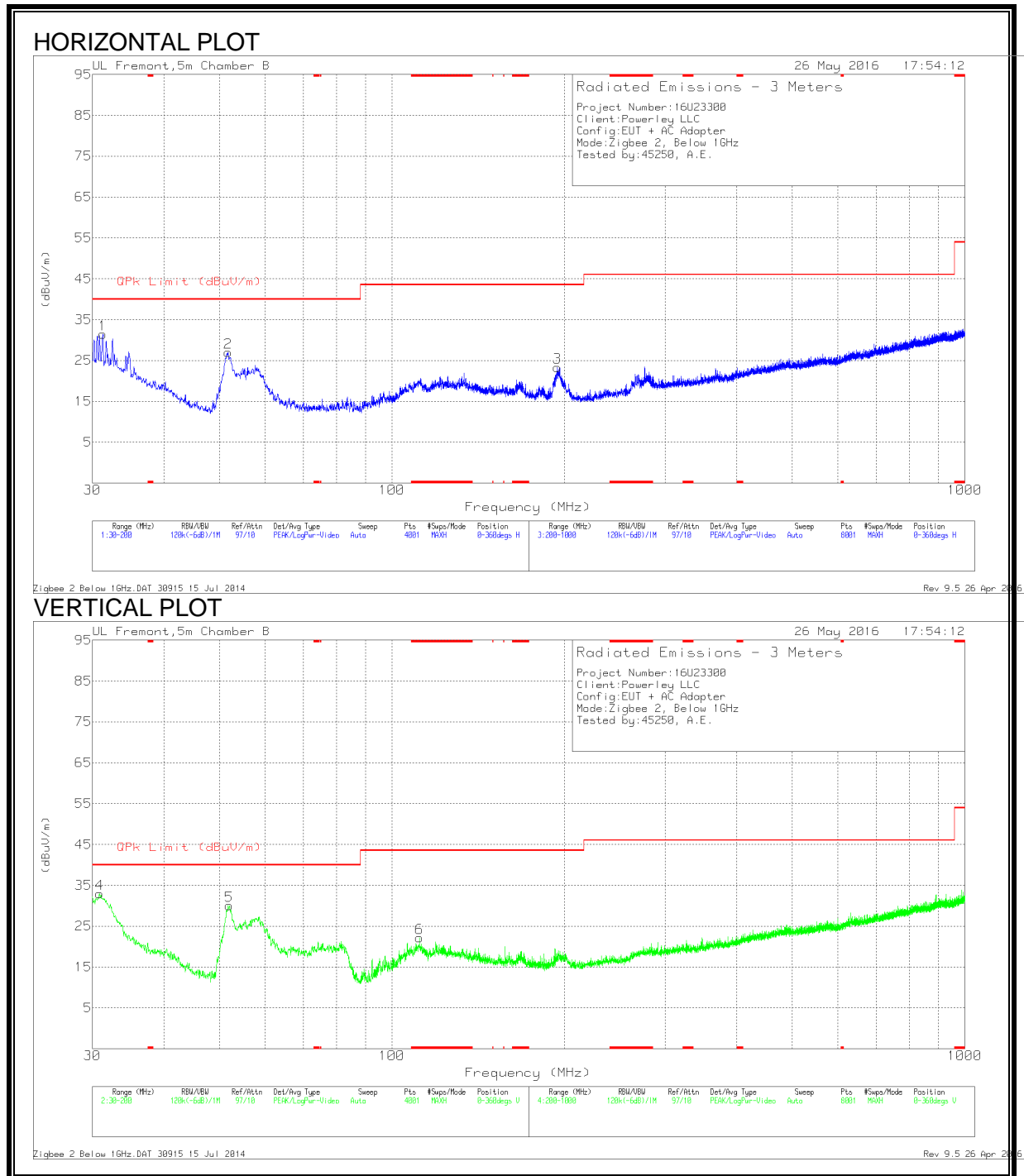
-Compliance for emissions in non-restricted bands is shown in conducted out of band testing

PK - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 111.685	33.32	Pk	16.8	-28	22.12	43.52	-21.4	0-360	100	V
4	30.85	37.34	Pk	24.5	-28.9	32.94	40	-7.06	0-360	100	V
1	31.275	36.13	Pk	24.2	-28.9	31.43	40	-8.57	0-360	100	H
2	51.76	44.45	Pk	11.1	-28.6	26.95	40	-13.05	0-360	400	H
5	52.015	47.55	Pk	11.1	-28.6	30.05	40	-9.95	0-360	100	V
3	194.39	34.78	Pk	15.7	-27.1	23.38	43.52	-20.14	0-360	100	H

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

Pk - Peak detector

11. 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.

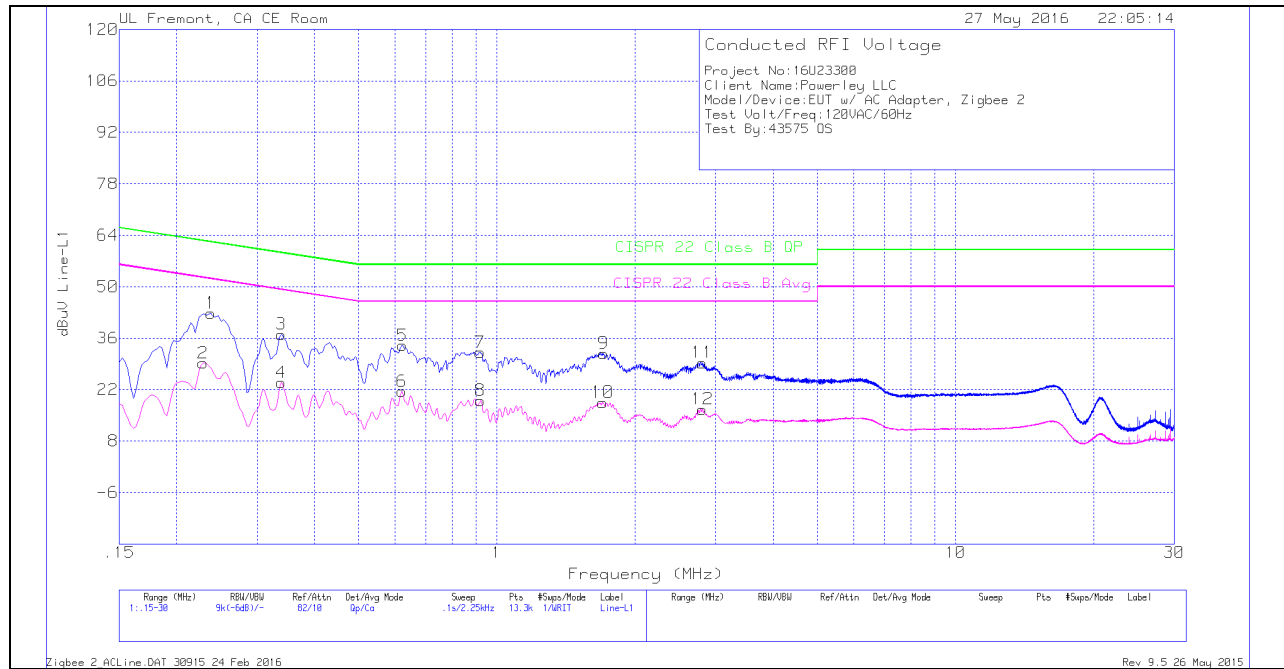
TEST PROCEDURE

ANSI C63.4

RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 1 RESULT

Trace Markers

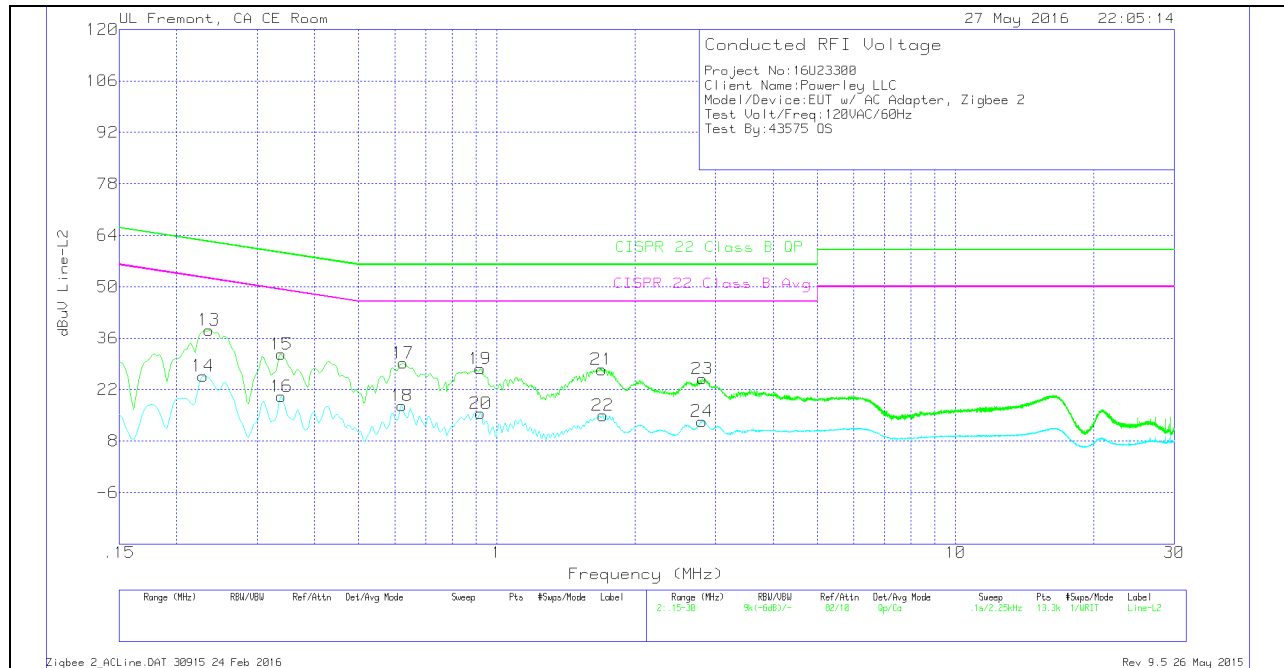
Range 1: Line-L1 15 - 30MHz

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