



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION TEST REPORT**

FOR

RF4CE ZIGBEE RADIO

MODEL NUMBER: ID:072

FCC ID: DKNWWT

REPORT NUMBER: 16U22887-E1V1

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NVLAP LAB CODE 200065-0

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Echostar Technologies LLC
EUT DESCRIPTION: RF4CE ZIGBEE RADIO
MODEL: ID:072
SERIAL NUMBER: E4EXGB3493M (Conducted), E4EXGB34930M (Radiated)
DATE TESTED: Feburary 23- 26, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	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 revision 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, and FCC CFR 47 Part 15.

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.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a RF4CE Zigbee Radio.

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)
2402-2480	ZIGBEE	4.76	2.99

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 5dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit on the channel with higher output power as worst-case scenario.

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Liteon	PB-1250-8ES1	ETC1343000297	N/A
Support Host	Echostar	HOPPER 3	R5EXPB00013H	N/A
IR remote	N/A	N/A	N/A	N/A

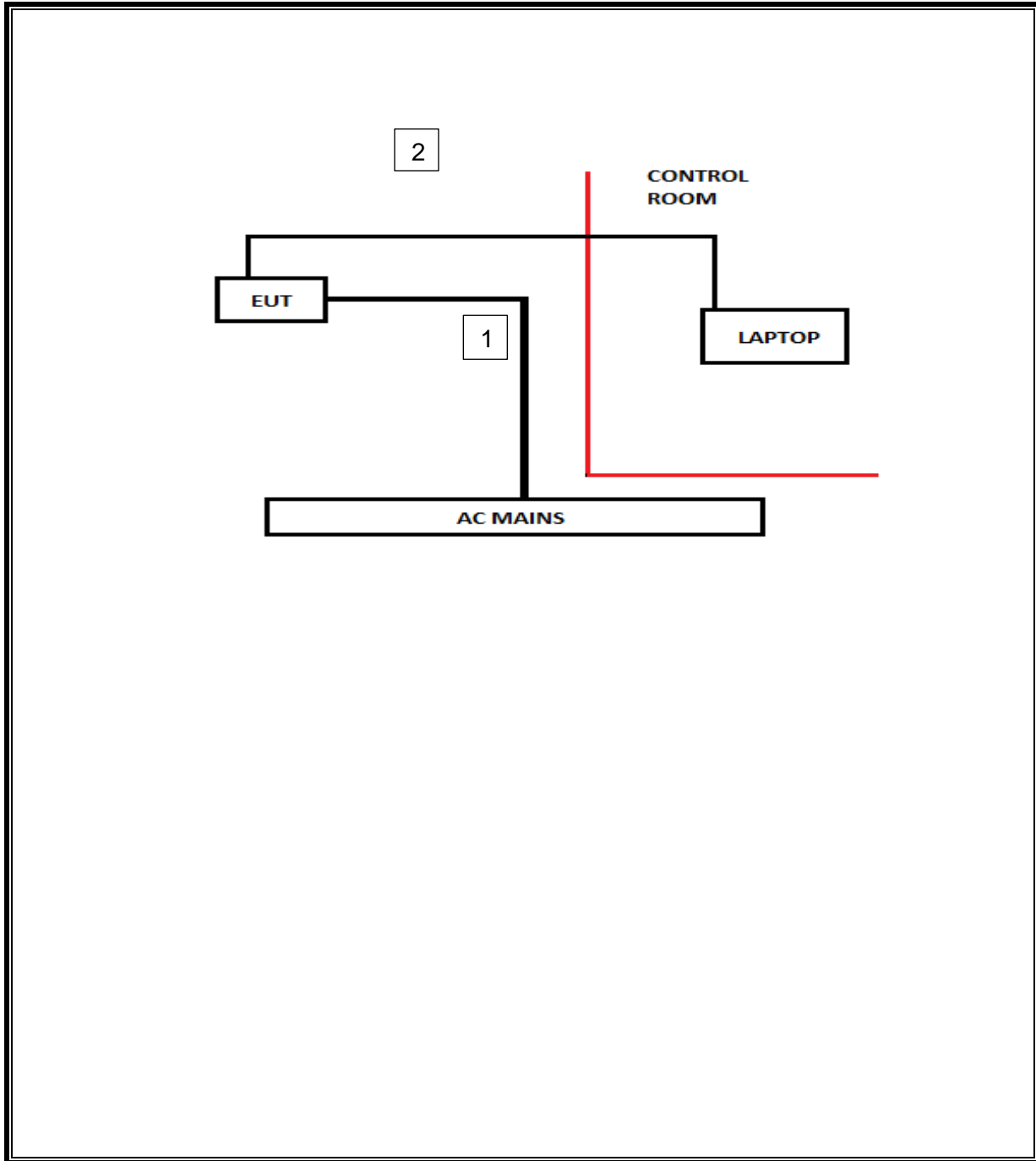
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	3-Prong	N/A	1.2	N/A
2	Ethernet	1	RJ-45	Unshielded	4	N/A

TEST SETUP

EUT was controlled with IR remote to enable ZEBBEE communications.

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	863	04/10/16
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/12/16
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	88	04/07/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	123	10/22/16
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	906	03/03/16
EMI Test Receiver, 9 KHz to 7 GHz	Rohde & Schwarz	ECS17	284	09/10/16
Peak Power Meter	Agilent / HP	N1914A	254	06/08/16
Peak / Average Power Sensor	Keysight	E9327A	117	03/09/16
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	160	CNR
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	417	05/04/16
High Pass Filter 6GHz	Micro-Tronics	HPS17542	893	04/25/16
High Pass Filter 3GHz	Micro-Tronics	HPS17543	898	04/25/16

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015
Antenna Port Software	UL	UL RF	Ver 3.9.1, Dec 28, 2015

7. 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 Bandwidth (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	Radiated	Pass
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME, DUTY CYCLE

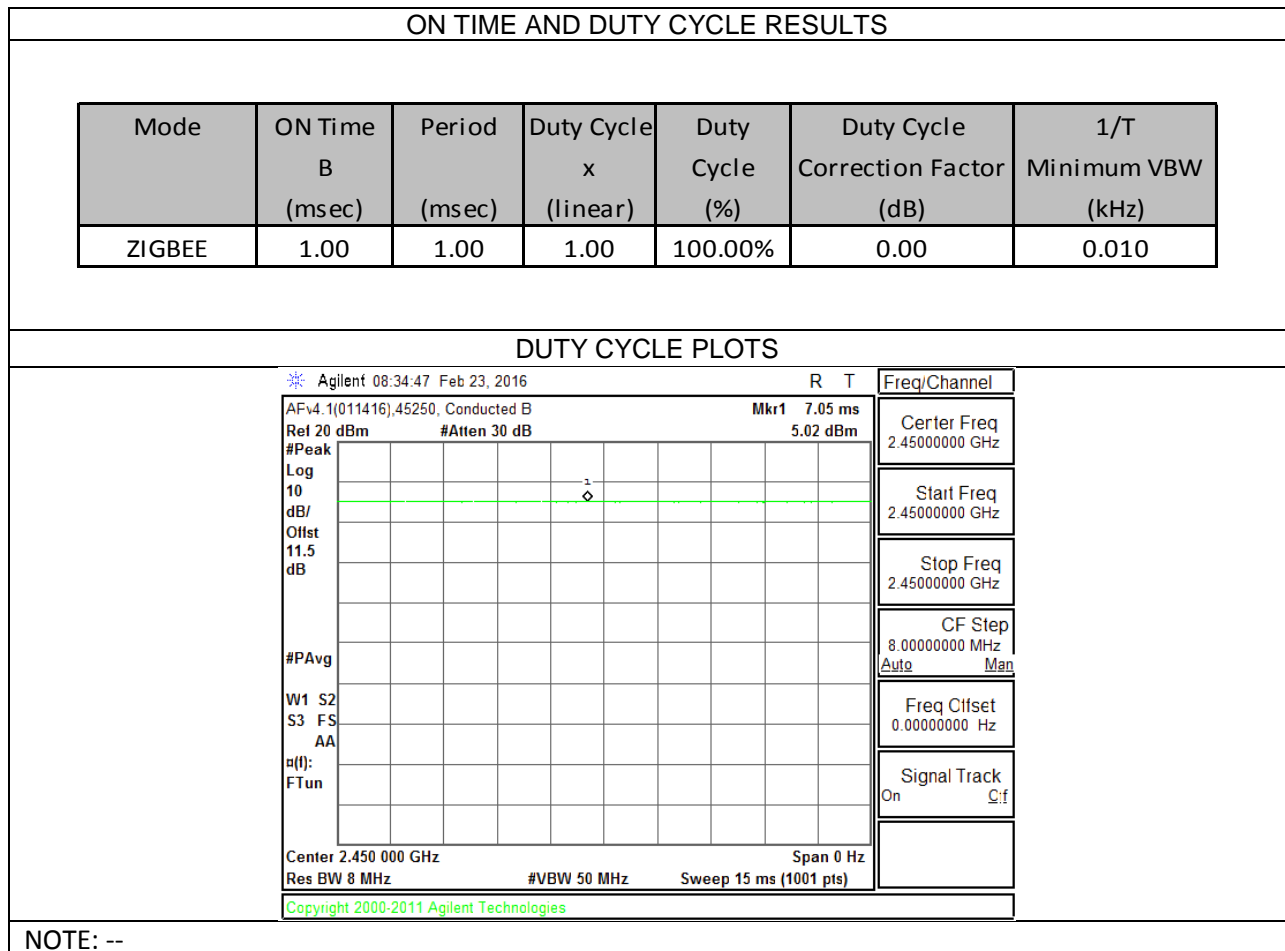
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

RESULTS



8.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

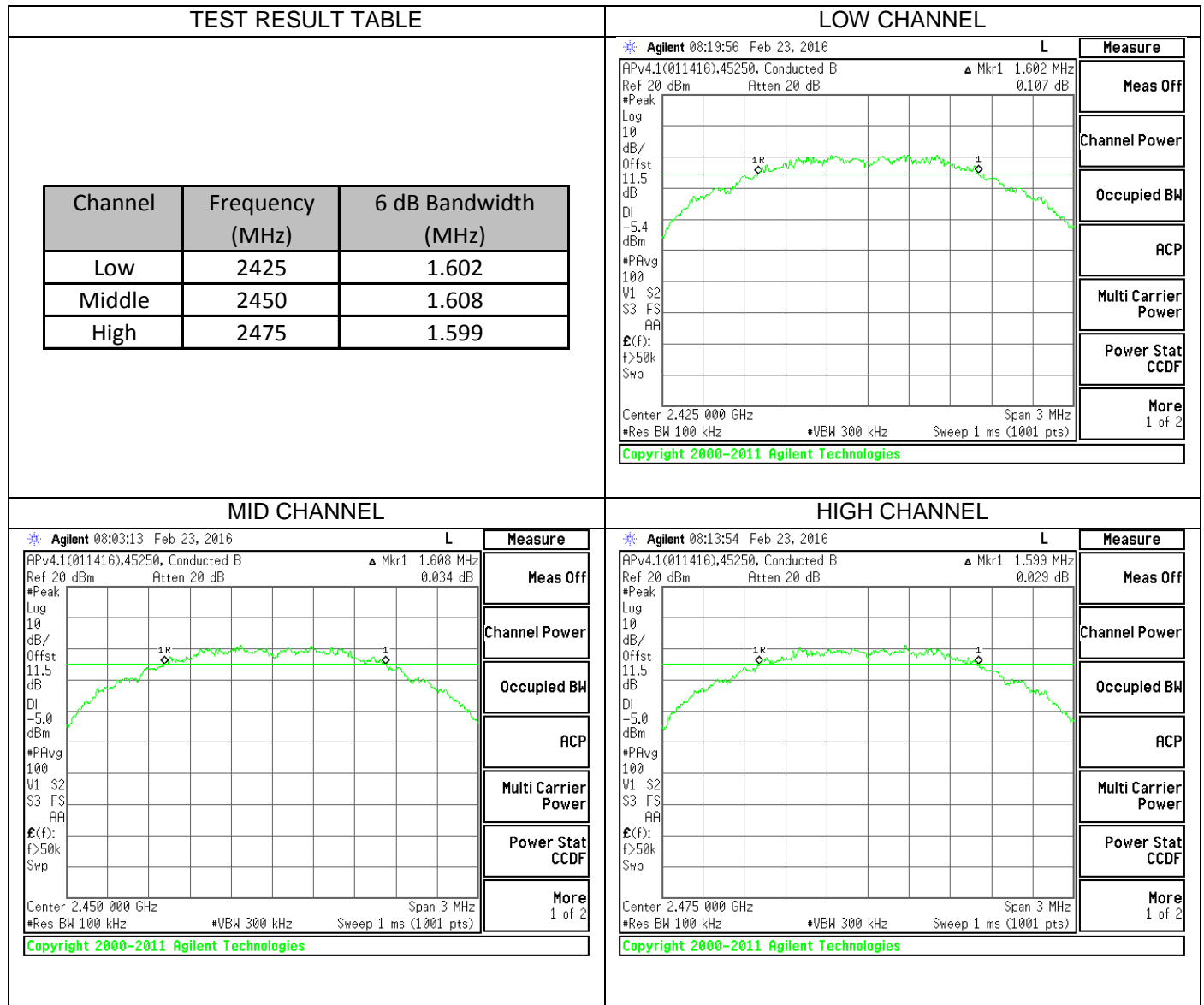
The minimum 6 dB bandwidth shall be at least 500 kHz.

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

Refer to KDB558074 D01 DTS Meas Guidance v03r04: The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. 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																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Channel</th> <th style="width: 30%;">Frequency (MHz)</th> <th style="width: 50%;">99% Bandwidth (MHz)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Low</td> <td style="text-align: center;">2425</td> <td style="text-align: center;">2.588</td> </tr> <tr> <td style="text-align: center;">Middle</td> <td style="text-align: center;">2450</td> <td style="text-align: center;">2.586</td> </tr> <tr> <td style="text-align: center;">High</td> <td style="text-align: center;">2475</td> <td style="text-align: center;">2.585</td> </tr> </tbody> </table>	Channel	Frequency (MHz)	99% Bandwidth (MHz)	Low	2425	2.588	Middle	2450	2.586	High	2475	2.585	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: small;">* Agilent 08:22:33 Feb 23, 2016 L Measure</p> <p style="text-align: center;">Ch Freq 2.425 GHz Trig Free</p> <p>Occupied Bandwidth Averages: 100</p> <hr/> <p style="font-size: x-small;">APV4.1(011416),45250, Conducted B Ref 20 dBm *Atten 30 dB</p> <p style="font-size: x-small;">Center 2.425 000 GHz Span 5 MHz *Res BW 39 kHz *VBW 110 kHz Sweep 10 ms (1001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td style="text-align: center;">Occupied Bandwidth</td> <td style="text-align: center;">Occ BW % Pwr</td> </tr> <tr> <td style="text-align: center;">2.5882 MHz</td> <td style="text-align: center;">99.00 %</td> </tr> <tr> <td style="text-align: center;">x dB Bandwidth</td> <td style="text-align: center;">x dB</td> </tr> <tr> <td style="text-align: center;">4.747 MHz*</td> <td style="text-align: center;">-26.00 dB</td> </tr> </table> <p style="font-size: x-small;">Transmit Freq Error 13.753 kHz x dB Bandwidth 4.747 MHz*</p> <p style="font-size: x-small;">Copyright 2000-2011 Agilent Technologies</p> </div>	Occupied Bandwidth	Occ BW % Pwr	2.5882 MHz	99.00 %	x dB Bandwidth	x dB	4.747 MHz*	-26.00 dB
Channel	Frequency (MHz)	99% Bandwidth (MHz)																			
Low	2425	2.588																			
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<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: small;">* Agilent 08:05:34 Feb 23, 2016 L Measure</p> <p style="text-align: center;">Ch Freq 2.45 GHz Trig Free</p> <p>Occupied Bandwidth Averages: 100</p> <hr/> <p style="font-size: x-small;">APV4.1(011416),45250, Conducted B Ref 20 dBm *Atten 30 dB</p> <p style="font-size: x-small;">Center 2.450 000 GHz Span 5 MHz *Res BW 39 kHz *VBW 110 kHz Sweep 10 ms (1001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td style="text-align: center;">Occupied Bandwidth</td> <td style="text-align: center;">Occ BW % Pwr</td> </tr> <tr> <td style="text-align: center;">2.5858 MHz</td> <td style="text-align: center;">99.00 %</td> </tr> <tr> <td style="text-align: center;">x dB Bandwidth</td> <td style="text-align: center;">x dB</td> </tr> <tr> <td style="text-align: center;">4.738 MHz*</td> <td style="text-align: center;">-26.00 dB</td> </tr> </table> <p style="font-size: x-small;">Transmit Freq Error 12.193 kHz x dB Bandwidth 4.738 MHz*</p> <p style="font-size: x-small;">Copyright 2000-2011 Agilent Technologies</p> </div>	Occupied Bandwidth	Occ BW % Pwr	2.5858 MHz	99.00 %	x dB Bandwidth	x dB	4.738 MHz*	-26.00 dB	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: small;">* Agilent 08:15:10 Feb 23, 2016 L Measure</p> <p style="text-align: center;">Ch Freq 2.475 GHz Trig Free</p> <p>Occupied Bandwidth Averages: 100</p> <hr/> <p style="font-size: x-small;">APV4.1(011416),45250, Conducted B Ref 20 dBm *Atten 30 dB</p> <p style="font-size: x-small;">Center 2.475 000 GHz Span 5 MHz *Res BW 39 kHz *VBW 120 kHz Sweep 9.933 ms (1001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td style="text-align: center;">Occupied Bandwidth</td> <td style="text-align: center;">Occ BW % Pwr</td> </tr> <tr> <td style="text-align: center;">2.5846 MHz</td> <td style="text-align: center;">99.00 %</td> </tr> <tr> <td style="text-align: center;">x dB Bandwidth</td> <td style="text-align: center;">x dB</td> </tr> <tr> <td style="text-align: center;">4.732 MHz*</td> <td style="text-align: center;">-26.00 dB</td> </tr> </table> <p style="font-size: x-small;">Transmit Freq Error 10.630 kHz x dB Bandwidth 4.732 MHz*</p> <p style="font-size: x-small;">Copyright 2000-2011 Agilent Technologies</p> </div>	Occupied Bandwidth	Occ BW % Pwr	2.5846 MHz	99.00 %	x dB Bandwidth	x dB	4.732 MHz*	-26.00 dB				
Occupied Bandwidth	Occ BW % Pwr																				
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x dB Bandwidth	x dB																				
4.732 MHz*	-26.00 dB																				

8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b)

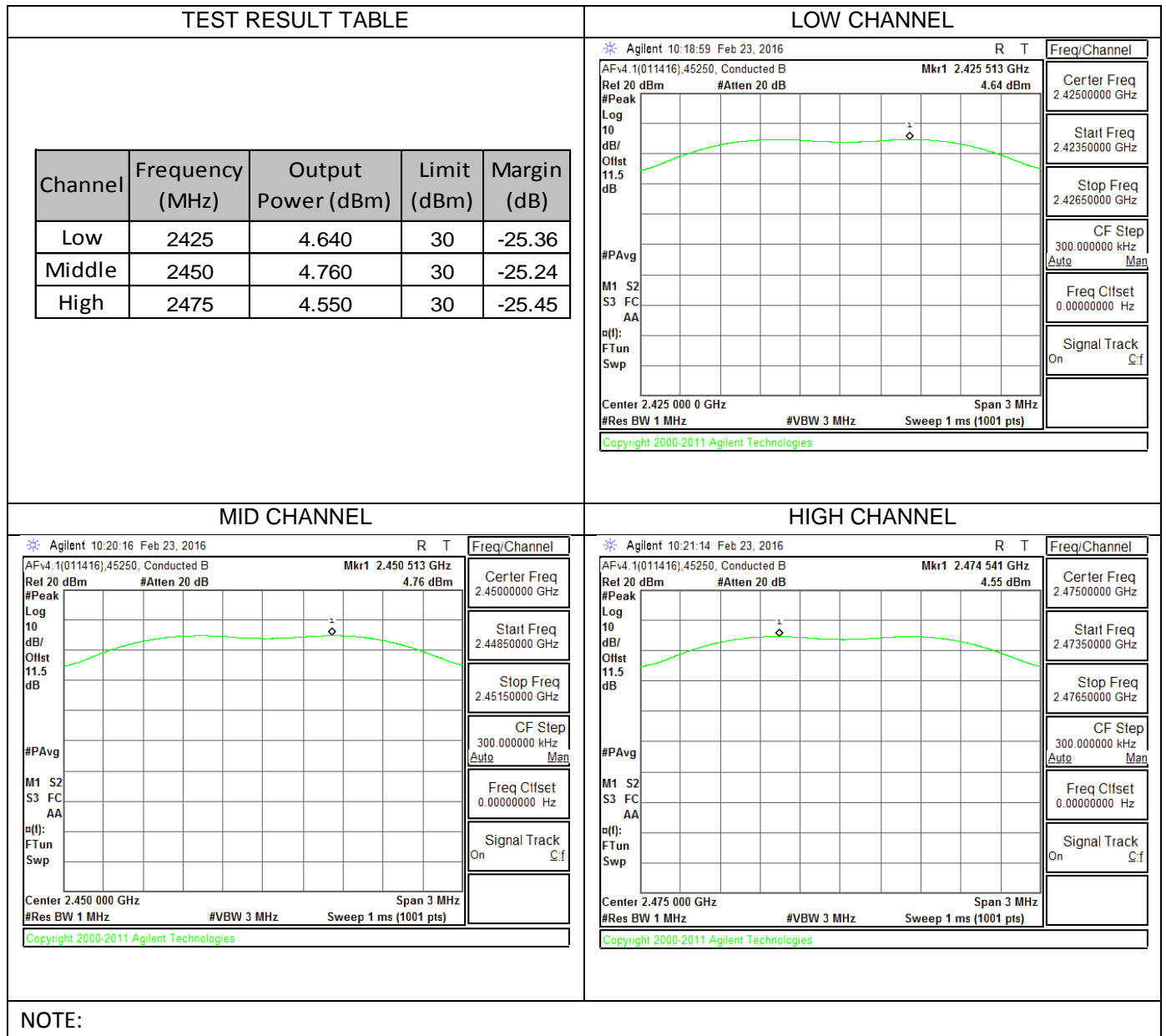
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

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

RESULTS

8.4.1. OUTPUT POWER PLOTS



8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.6 dB (including 10 dB pad and 0.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2425	4.300
Middle	2450	4.260
High	2475	4.070

NOTE: --

8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

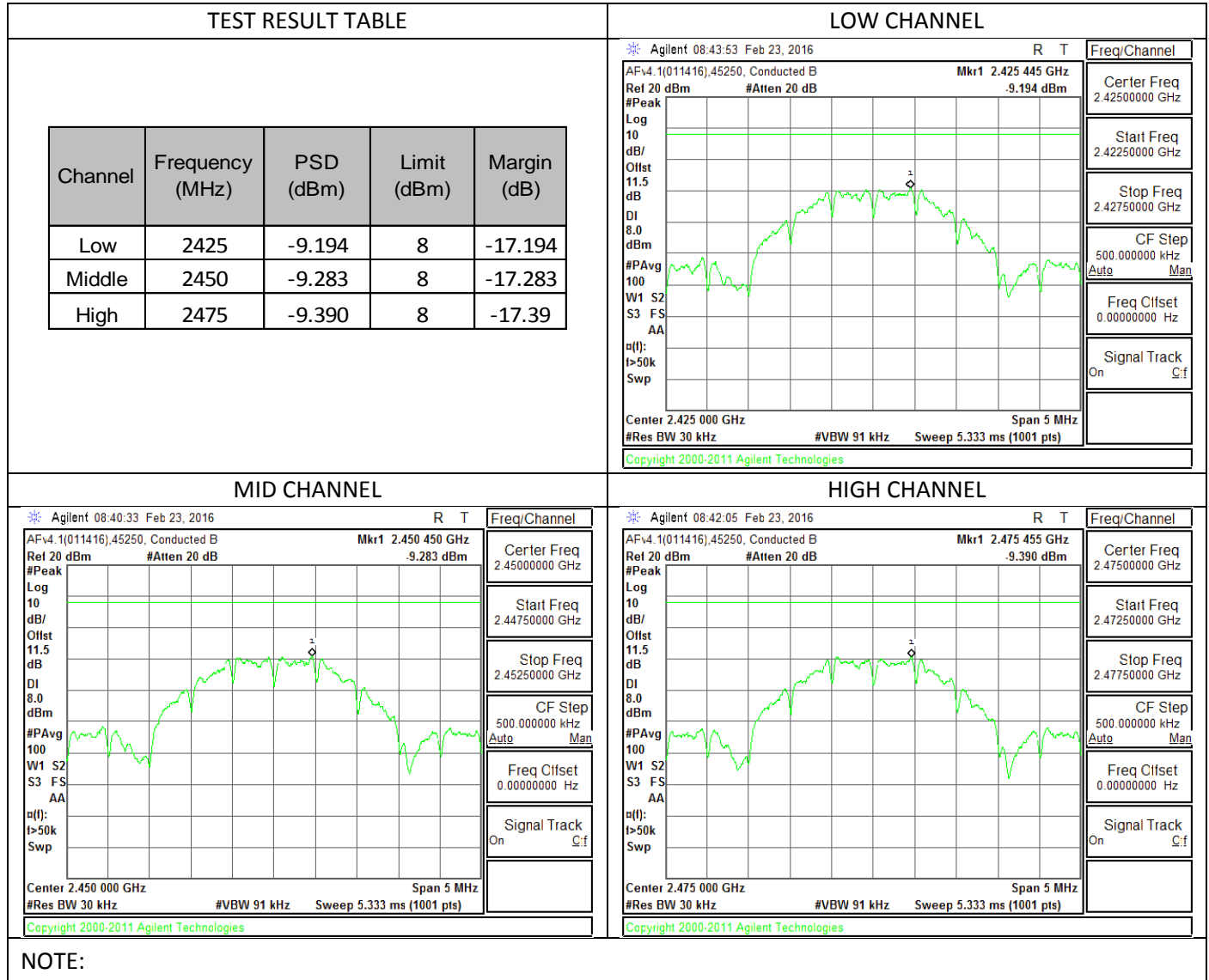
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

Power Spectral Density was performed utilizing the “Method PKPSD (Peak PSD)” under KDB558074 D01 DTS Meas Guidance v03r04.

RESULTS

8.6.1. POWER SPECTRAL DENSITY PLOTS AND TABLE



8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

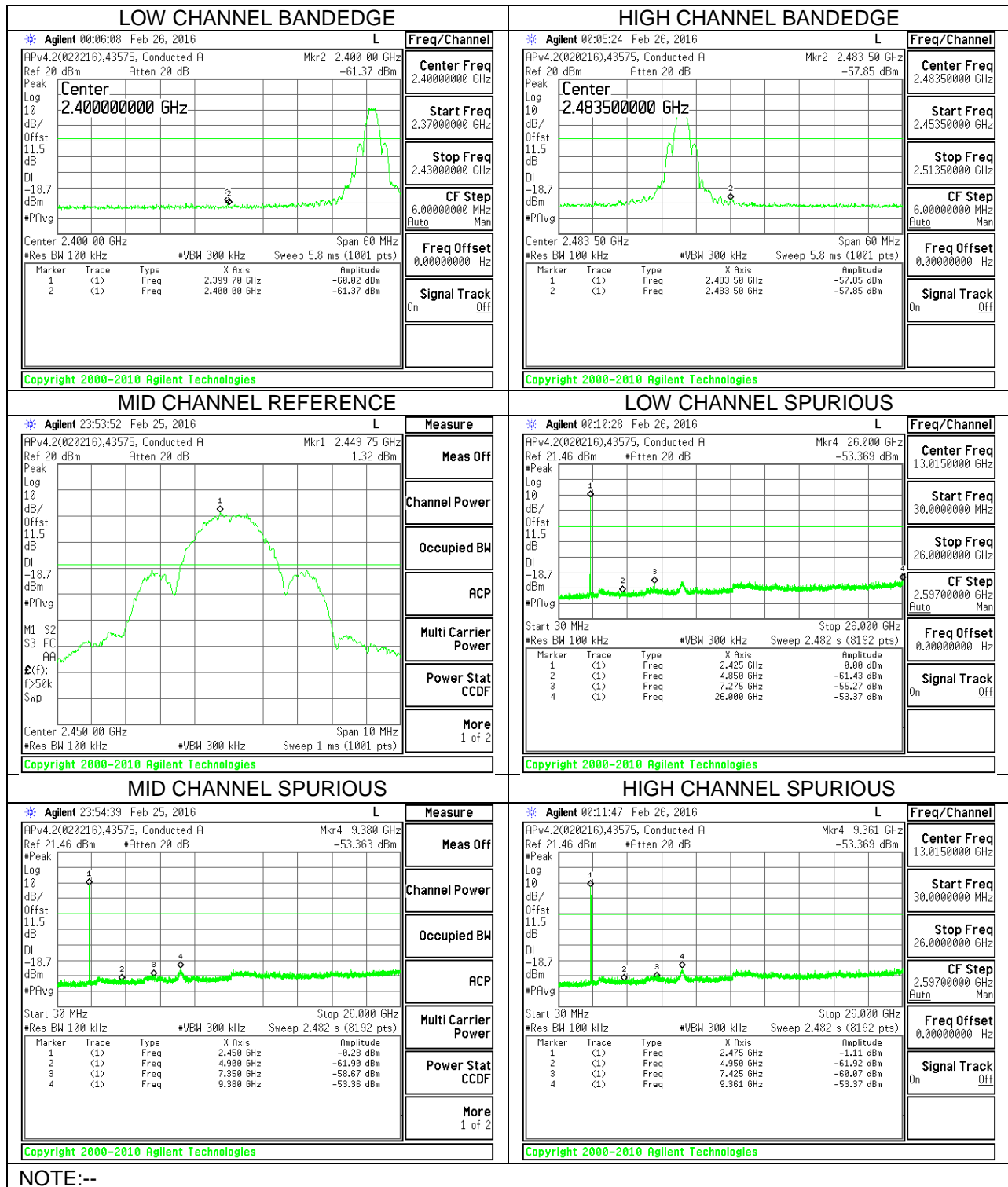
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

RESULTS

8.7.1. BANDEDGE AND SPURIOUS EMISSIONS PLOTS



9. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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.

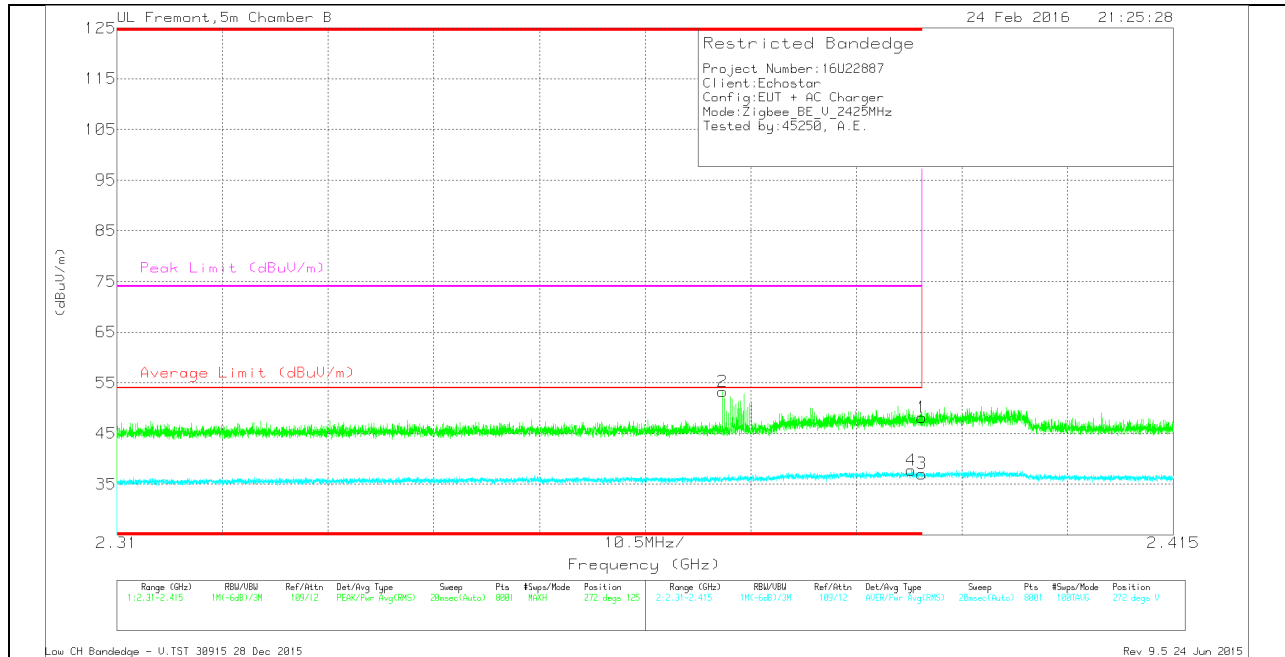
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak and average measurements.

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.

RESULTS

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Fitter/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
2	* 2.37	43.27	Pk	31.9	-21.9	0	53.27	-	-	74	-20.73	272	125	V
4	* 2.389	27.6	RMS	32	-21.9	0	37.7	54	-16.3	-	-	272	125	V
1	* 2.39	38.04	Pk	32	-21.9	0	48.14	-	-	74	-25.86	272	125	V
3	* 2.39	26.97	RMS	32	-21.9	0	37.07	54	-16.93	-	-	272	125	V

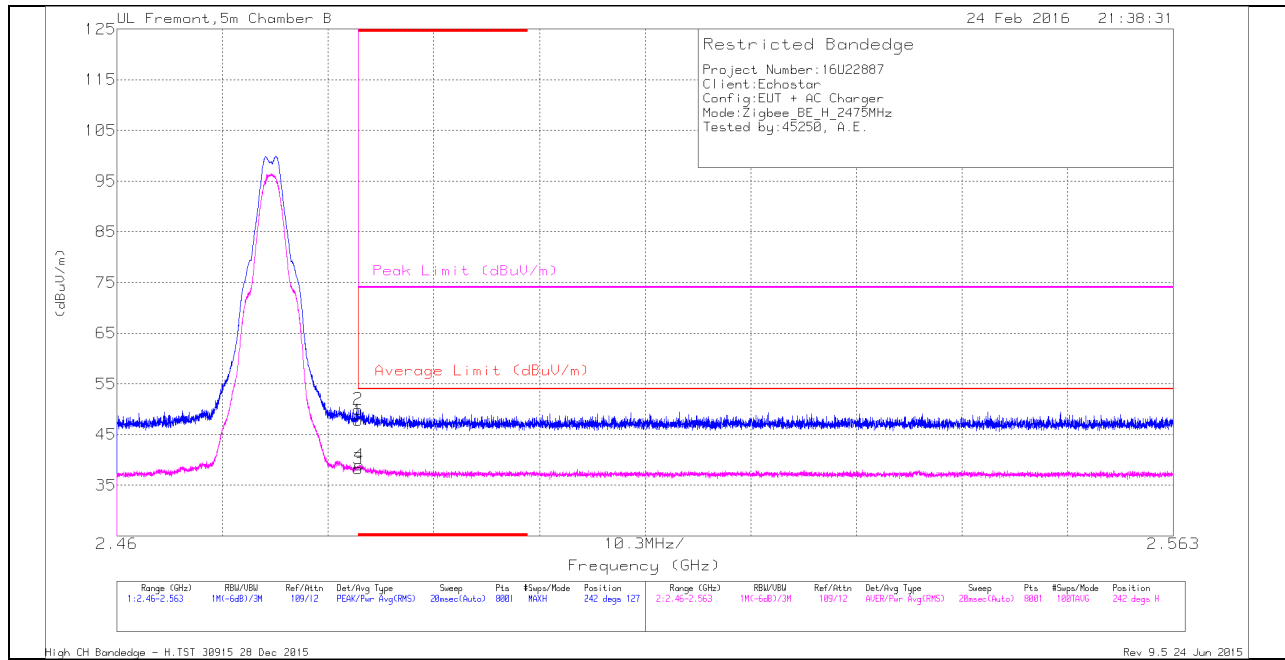
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

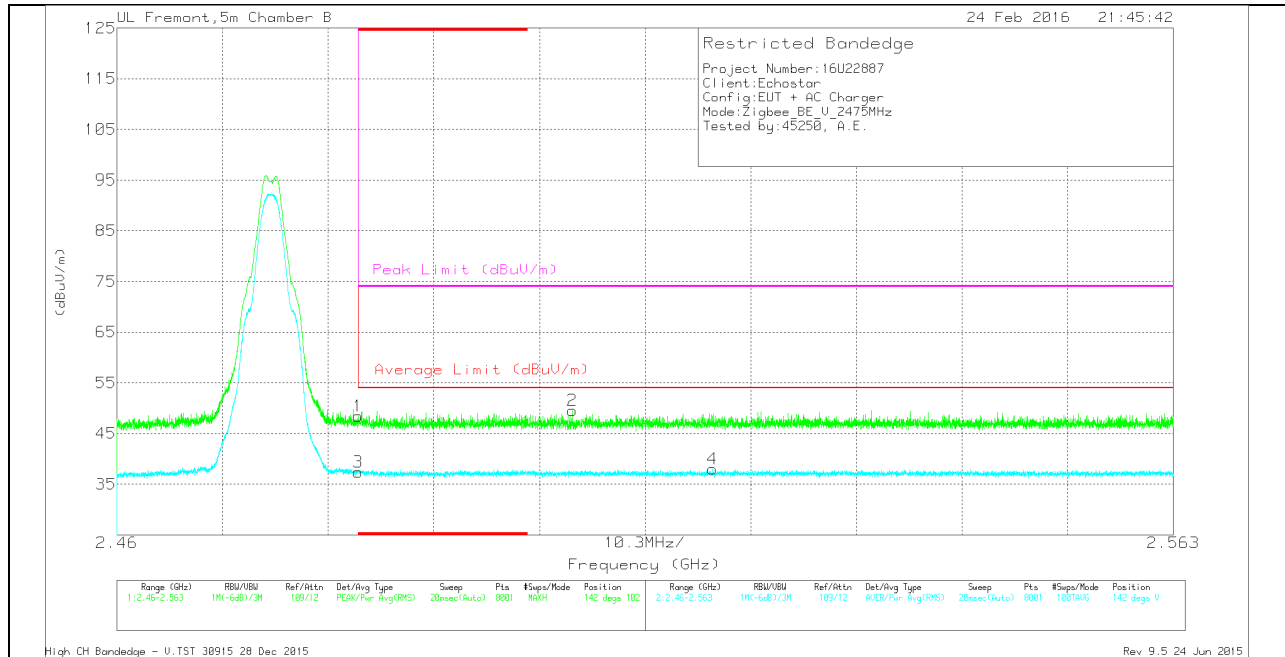
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Filter/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	37.09	Pk	32.5	-21.8	0	47.79	-	-	74	-26.21	242	127	H
2	* 2.484	39.28	Pk	32.5	-21.8	0	49.98	-	-	74	-24.02	242	127	H
3	* 2.484	27.52	RMS	32.5	-21.8	0	38.22	54	-15.78	-	-	242	127	H
4	* 2.484	28.27	RMS	32.5	-21.8	0	38.97	54	-15.03	-	-	242	127	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/r/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	37.72	Pk	32.5	-21.8	0	48.42	-	-	74	-25.58	142	102	V
3	* 2.484	26.63	RMS	32.5	-21.8	0	37.33	54	-16.67	-	-	142	102	V
2	2.504	38.86	Pk	32.5	-21.8	0	49.56	-	-	74	-24.44	142	102	V
4	2.518	27.3	RMS	32.6	-21.9	0	38	54	-16	-	-	142	102	V

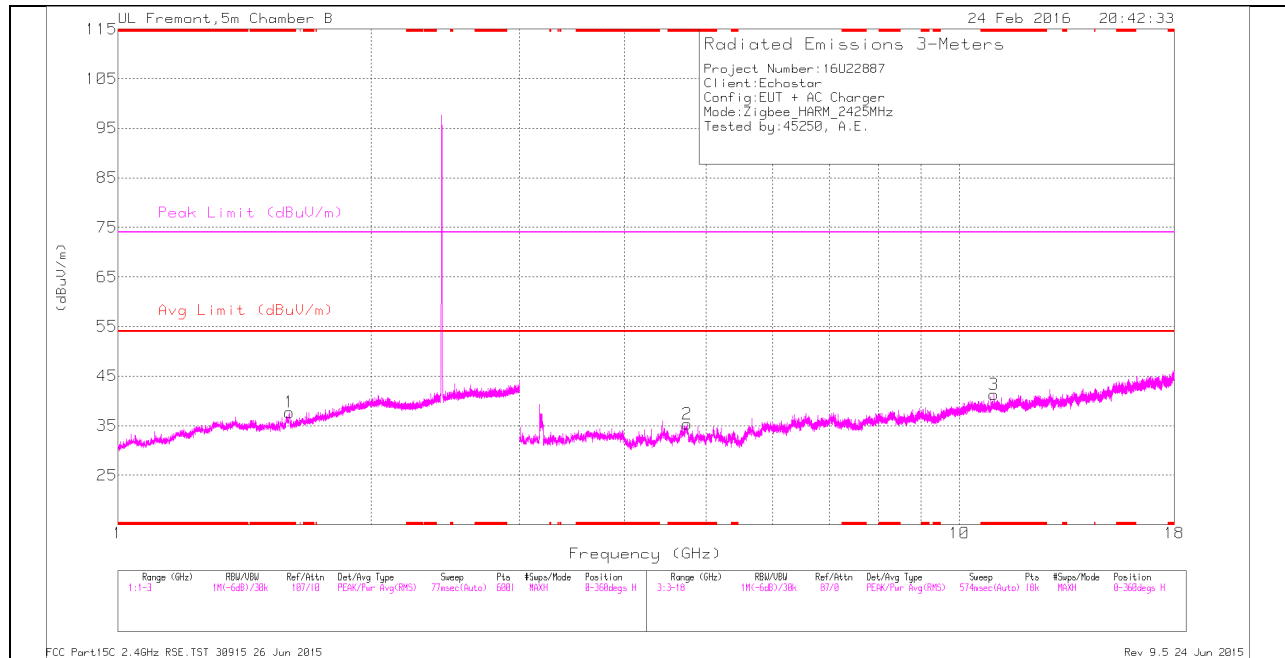
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

RMS - RMS detection

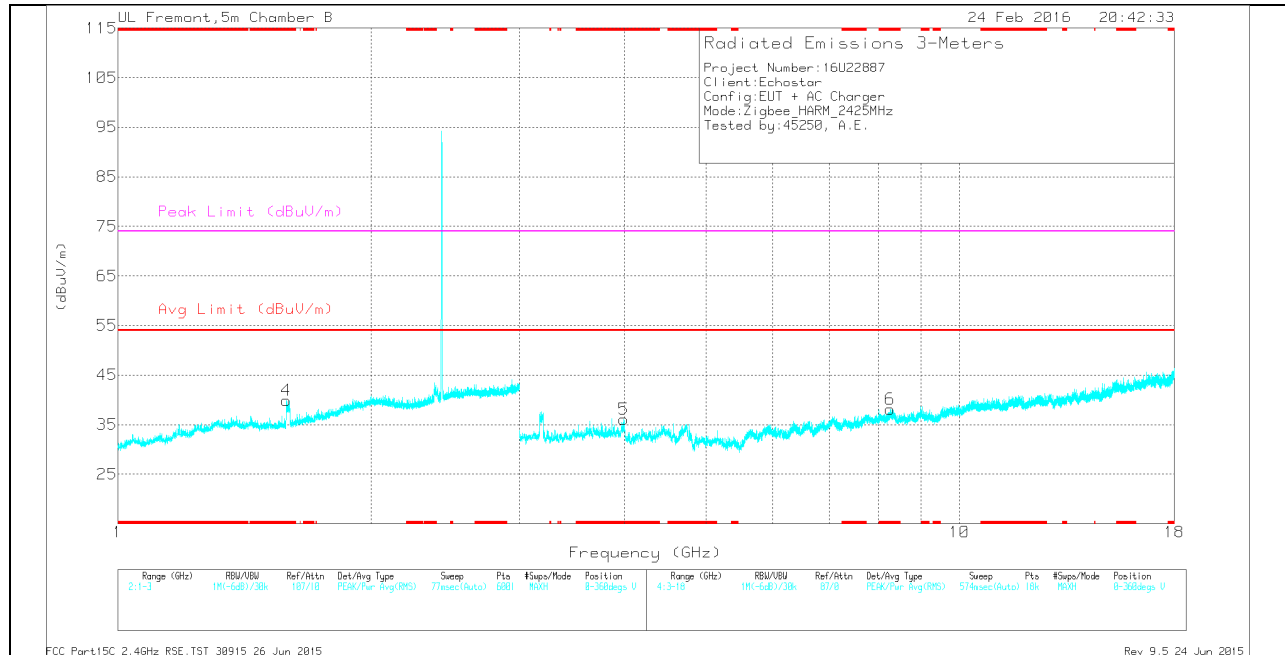
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

LOW CHANNEL VERTICAL



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

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Ftr /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	* 1.599	30.77	Pk	28.8	-21.9	0	37.67	-	-	74	-36.33	0-360	101	H
4	* 1.585	33.03	Pk	28.8	-21.9	0	39.93	-	-	74	-34.07	0-360	101	V
2	* 4.745	31.69	Pk	34.3	-30.7	0	35.29	-	-	74	-38.71	0-360	101	H
3	* 10.98	28.32	Pk	37.7	-24.7	0	41.32	-	-	74	-32.68	0-360	101	H
5	* 3.987	35.38	Pk	33.3	-32.6	0	36.08	-	-	74	-37.92	0-360	199	V
6	* 8.276	30.16	Pk	35.7	-27.8	0	38.06	-	-	74	-35.94	0-360	101	V

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

Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

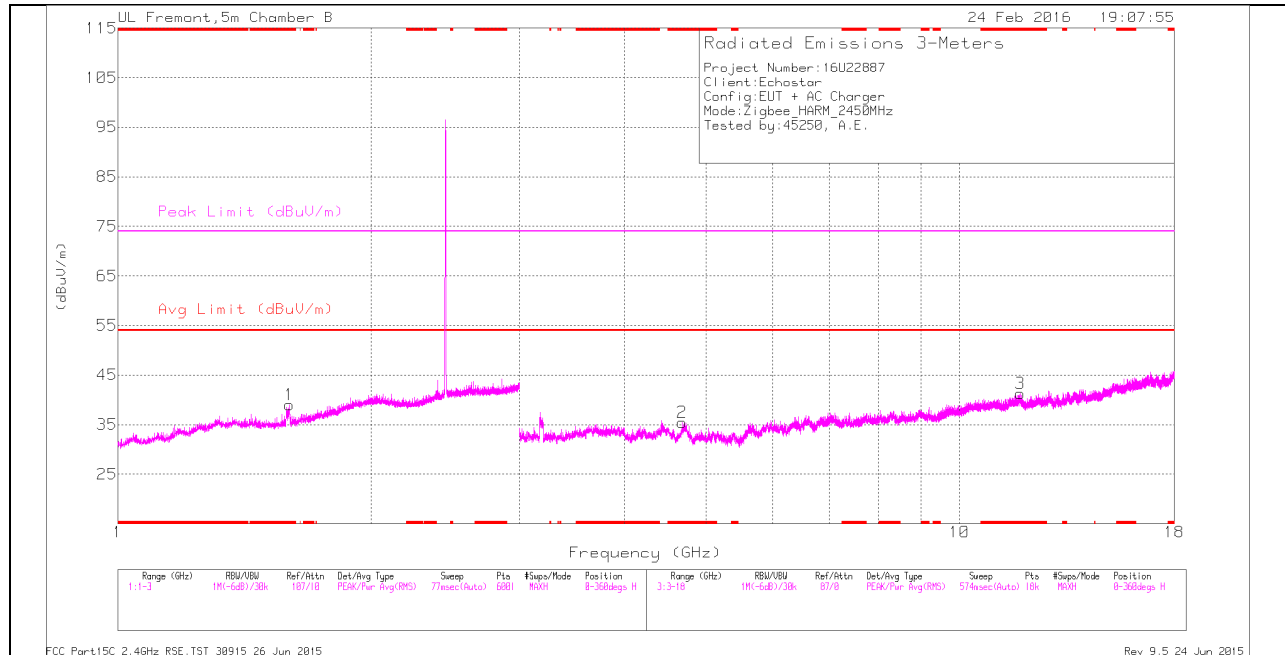
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.6	41.79	PK2	28.8	-21.9	0	48.69	-	-	74	-25.31	66	385	H
* 1.597	28.67	MAV1	28.8	-21.9	0	35.57	54	-18.43	-	-	66	385	H
* 1.586	41.11	PK2	28.8	-21.9	0	48.01	-	-	74	-25.99	150	351	V
* 1.587	27.97	MAV1	28.8	-21.9	0	34.87	54	-19.13	-	-	150	351	V
* 4.744	37.72	PK2	34.3	-30.7	0	41.32	-	-	74	-32.68	112	242	H
* 4.744	26.63	MAV1	34.3	-30.7	0	30.23	54	-23.77	-	-	112	242	H
* 10.978	35.45	PK2	37.7	-24.7	0	48.45	-	-	74	-25.55	291	187	H
* 10.98	24.15	MAV1	37.7	-24.7	0	37.15	54	-16.85	-	-	291	187	H
* 3.987	43.93	PK2	33.3	-32.6	0	44.63	-	-	74	-29.37	186	225	V
* 3.986	30.11	MAV1	33.3	-32.6	0	30.81	54	-23.19	-	-	186	225	V
* 8.275	38.76	PK2	35.7	-27.8	0	46.66	-	-	74	-27.34	34	129	V
* 8.276	26.88	MAV1	35.7	-27.8	0	34.78	54	-19.22	-	-	34	129	V

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

PK2 - KDB558074 Method: Maximum Peak

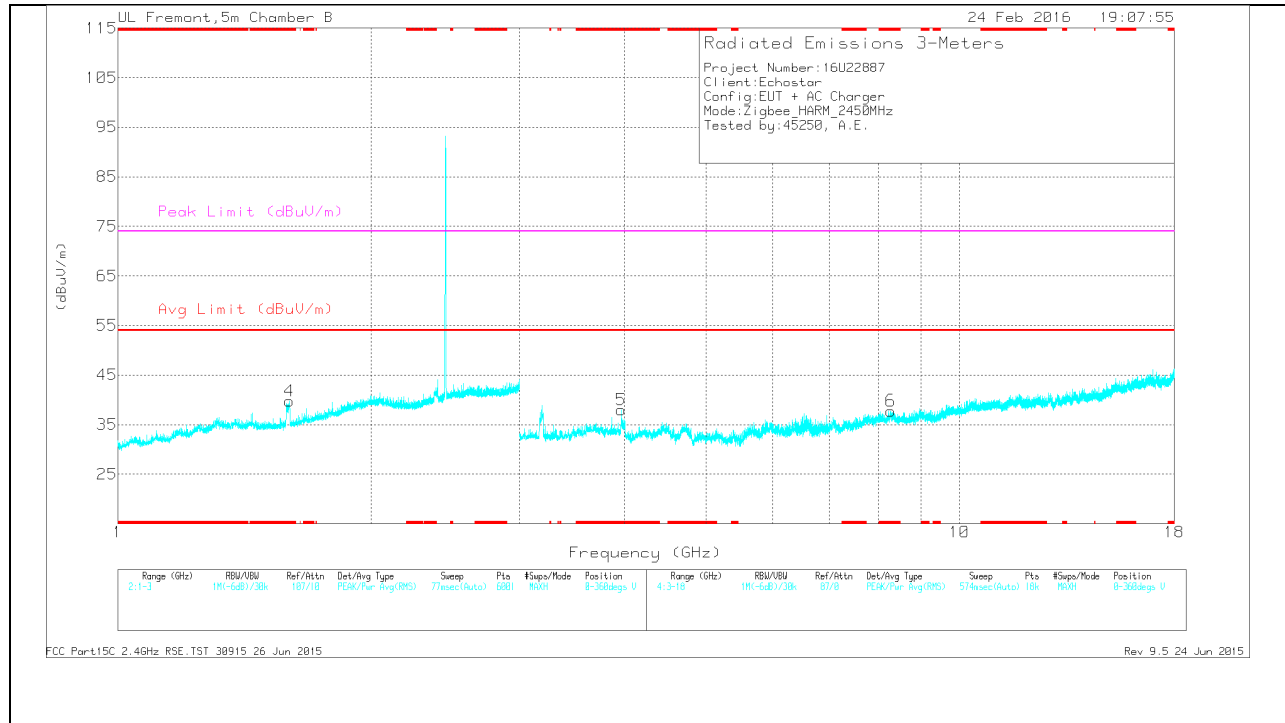
MAV1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



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

MID CHANNEL VERTICAL



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

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Ftr /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	* 1.6	32.05	Pk	28.8	-21.9	0	38.95	-	-	74	-35.05	0-360	199	H
4	* 1.6	32.84	Pk	28.8	-21.9	0	39.74	-	-	74	-34.26	0-360	101	V
2	* 4.686	33.05	Pk	34.2	-31.8	0	35.45	-	-	74	-38.55	0-360	200	H
3	* 11.8	26.96	Pk	38.6	-24.3	0	41.26	-	-	74	-32.74	0-360	101	H
5	* 3.961	36.9	Pk	33.4	-32.3	0	38	-	-	74	-36	0-360	200	V
6	* 8.287	29.59	Pk	35.7	-27.5	0	37.79	-	-	74	-36.21	0-360	200	V

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

Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

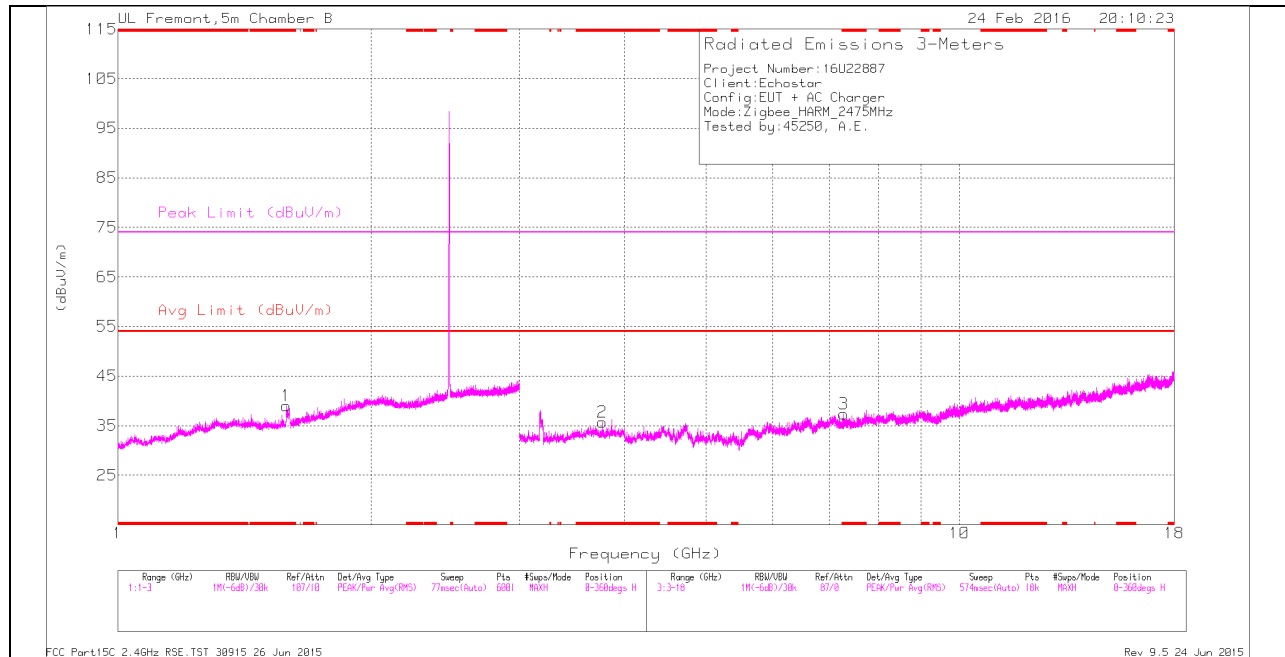
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.598	42.83	PK2	28.8	-21.9	0	49.73	-	-	74	-24.27	69	386	H
* 1.598	27.89	MAv1	28.8	-21.9	0	34.79	54	-19.21	-	-	69	386	H
* 1.598	42.93	PK2	28.8	-21.9	0	49.83	-	-	74	-24.17	147	354	V
* 1.599	29.05	MAv1	28.8	-21.9	0	35.95	54	-18.05	-	-	147	354	V
* 4.686	38.71	PK2	34.2	-31.8	0	41.11	-	-	74	-32.89	126	206	H
* 4.685	27.88	MAv1	34.2	-31.8	0	30.28	54	-23.72	-	-	126	206	H
* 11.8	34.46	PK2	38.6	-24.3	0	48.76	-	-	74	-25.24	11	165	H
* 11.802	23.58	MAv1	38.6	-24.2	0	37.98	54	-16.02	-	-	11	165	H
* 3.963	49.83	PK2	33.4	-32.3	0	50.93	-	-	74	-23.07	191	207	V
* 3.962	28.37	MAv1	33.4	-32.3	0	29.47	54	-24.53	-	-	191	207	V
* 8.287	38.11	PK2	35.7	-27.5	0	46.31	-	-	74	-27.69	298	248	V
* 8.287	27.21	MAv1	35.7	-27.5	0	35.41	54	-18.59	-	-	298	248	V

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

PK2 - KDB558074 Method: Maximum Peak

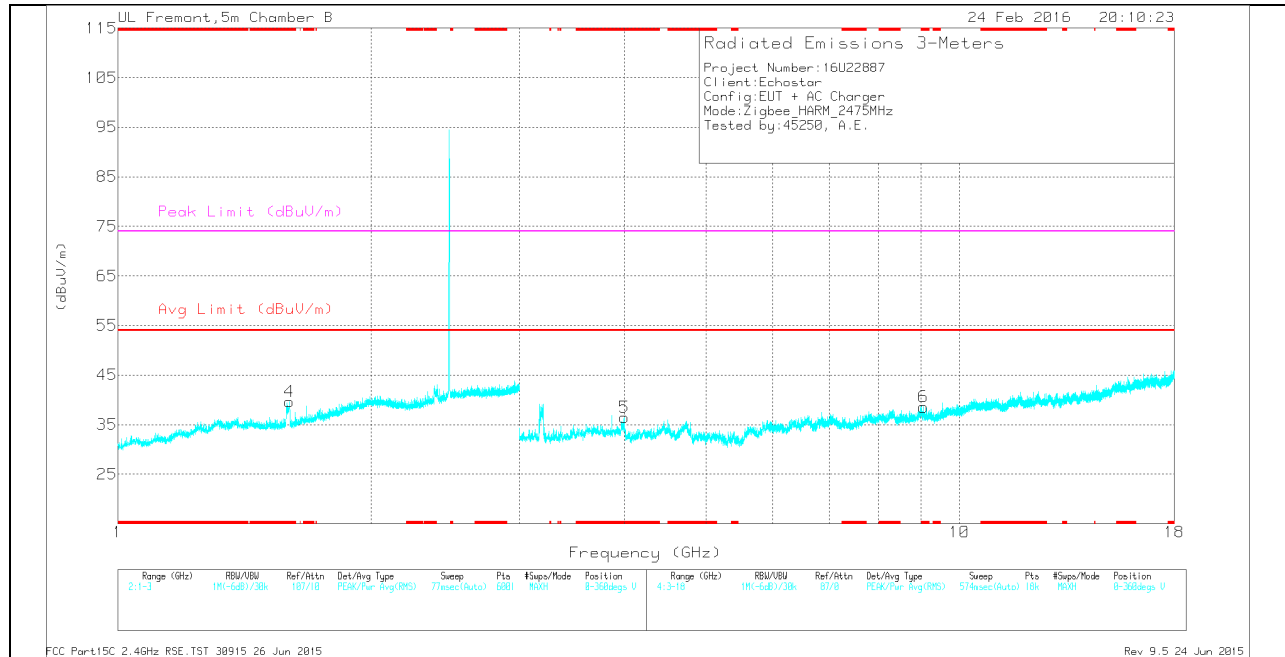
MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



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

HIGH CHANNEL VERTICAL



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

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fitr /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	* 1.585	32.09	Pk	28.8	-21.9	0	38.99	-	-	74	-35.01	0-360	200	H
4	* 1.599	32.78	Pk	28.8	-21.9	0	39.68	-	-	74	-34.32	0-360	101	V
2	* 3.762	35.13	Pk	33.4	-32.8	0	35.73	-	-	74	-38.27	0-360	199	H
3	* 7.29	32.35	Pk	35.3	-30.3	0	37.35	-	-	74	-36.65	0-360	101	H
5	* 3.999	35.9	Pk	33.3	-32.7	0	36.5	-	-	74	-37.5	0-360	199	V
6	* 9.062	29.66	Pk	36.1	-27.2	0	38.56	-	-	74	-35.44	0-360	199	V

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

Avg - Video bandwidth < Resolution bandwidth

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fitr /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
* 1.586	40.94	PK2	28.8	-21.9	0	47.84	-	-	74	-26.16	70	389	H
* 1.587	27.72	MAV1	28.8	-21.9	0	34.62	54	-19.38	-	-	70	389	H
* 1.599	43.11	PK2	28.8	-21.9	0	50.01	-	-	74	-23.99	145	356	V
* 1.598	29.34	MAV1	28.8	-21.9	0	36.24	54	-17.76	-	-	145	356	V
* 3.762	40.02	PK2	33.4	-32.8	0	40.62	-	-	74	-33.38	96	246	H
* 3.762	28.98	MAV1	33.4	-32.8	0	29.58	54	-24.42	-	-	96	246	H
* 7.289	39.32	PK2	35.3	-30.3	0	44.32	-	-	74	-29.68	19	131	H
* 7.29	27.78	MAV1	35.3	-30.3	0	32.78	54	-21.22	-	-	19	131	H
* 3.999	49.17	PK2	33.3	-32.7	0	49.77	-	-	74	-24.23	195	208	V
* 3.999	29.16	MAV1	33.3	-32.7	0	29.76	54	-24.24	-	-	195	208	V
* 9.06	36.62	PK2	36.1	-27.2	0	45.52	-	-	74	-28.48	284	201	V
* 9.061	25.97	MAV1	36.1	-27.2	0	34.87	54	-19.13	-	-	284	201	V

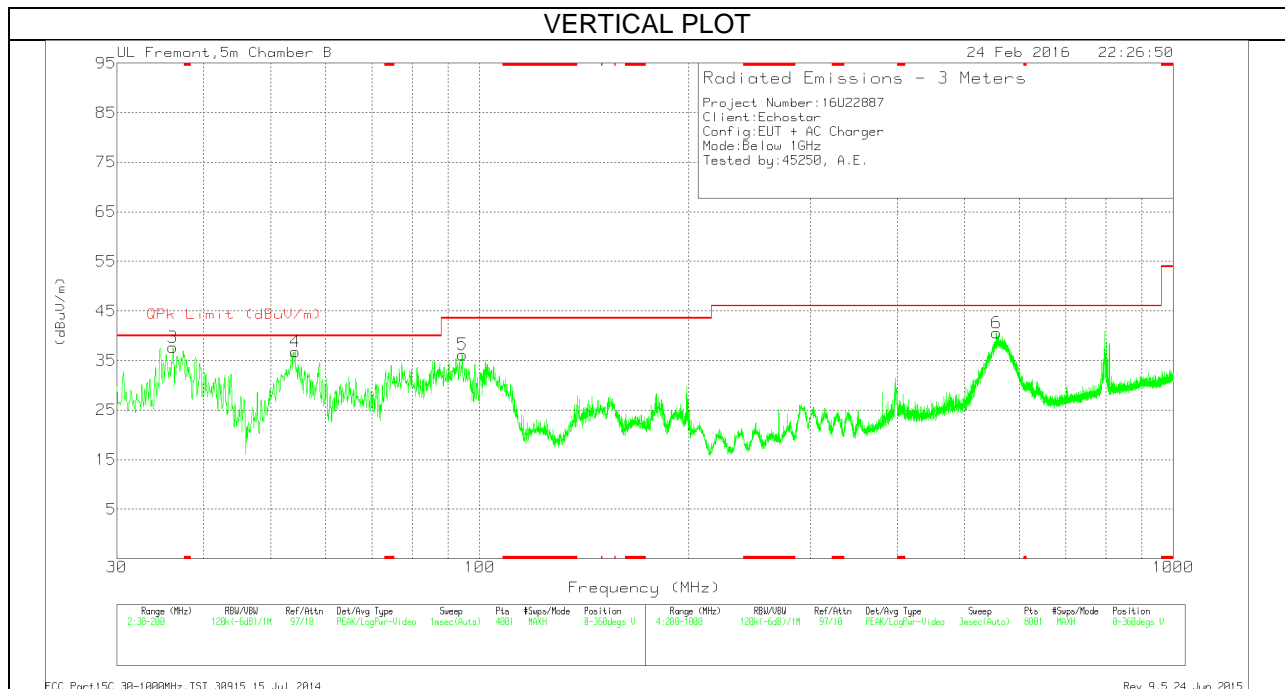
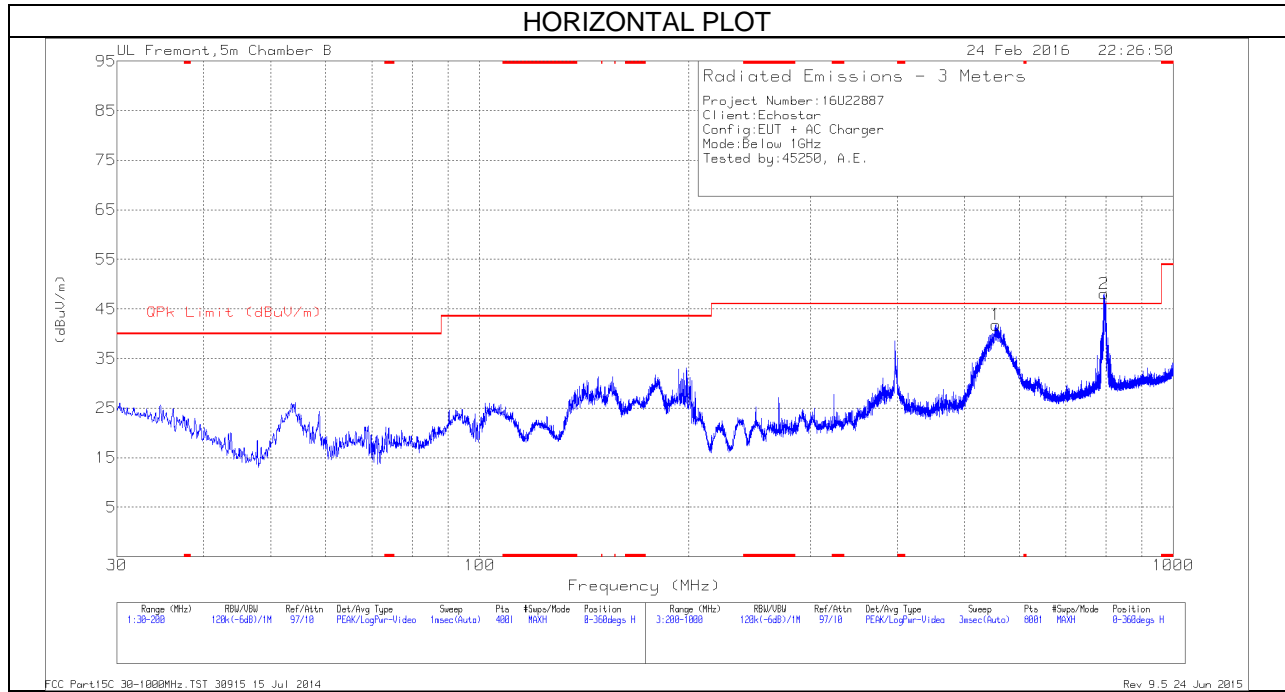
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

9.2. 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 T130 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	36.12	45.54	Pk	20.9	-28.8	37.64	40	-2.36	0-360	101	V
4	54.1825	54.25	Pk	11	-28.5	36.75	40	-3.25	0-360	101	V
5	94.3875	51.7	Pk	12.7	-28.2	36.2	43.52	-7.32	0-360	101	V
1	554.6	45.49	Pk	22.4	-26.1	41.79	46.02	-4.23	0-360	199	H
6	555.8	44.31	Pk	22.4	-26.1	40.61	46.02	-5.41	0-360	101	V
2	795	47.63	Pk	25.1	-24.7	48.03	46.02	2.01	0-360	101	H

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

Pk - Peak detector

Radiated Emissions

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
36.1409	43.29	Qp	20.9	-28.8	35.39	40	-4.61	322	103	V
54.1791	49.96	Qp	11	-28.5	32.46	40	-7.54	38	102	V
94.3928	47.55	Qp	12.7	-28.2	32.05	43.52	-11.47	2	115	V
554.4704	44.38	Qp	22.4	-26.1	40.68	46.02	-5.34	93	171	H
555.5437	39.82	Qp	22.4	-26.1	36.12	46.02	-9.9	105	104	V
794.8651	31.5	Qp	25.1	-24.7	31.9	46.02	-14.12	266	103	H

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

Qp - Quasi-Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

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 C63.10.

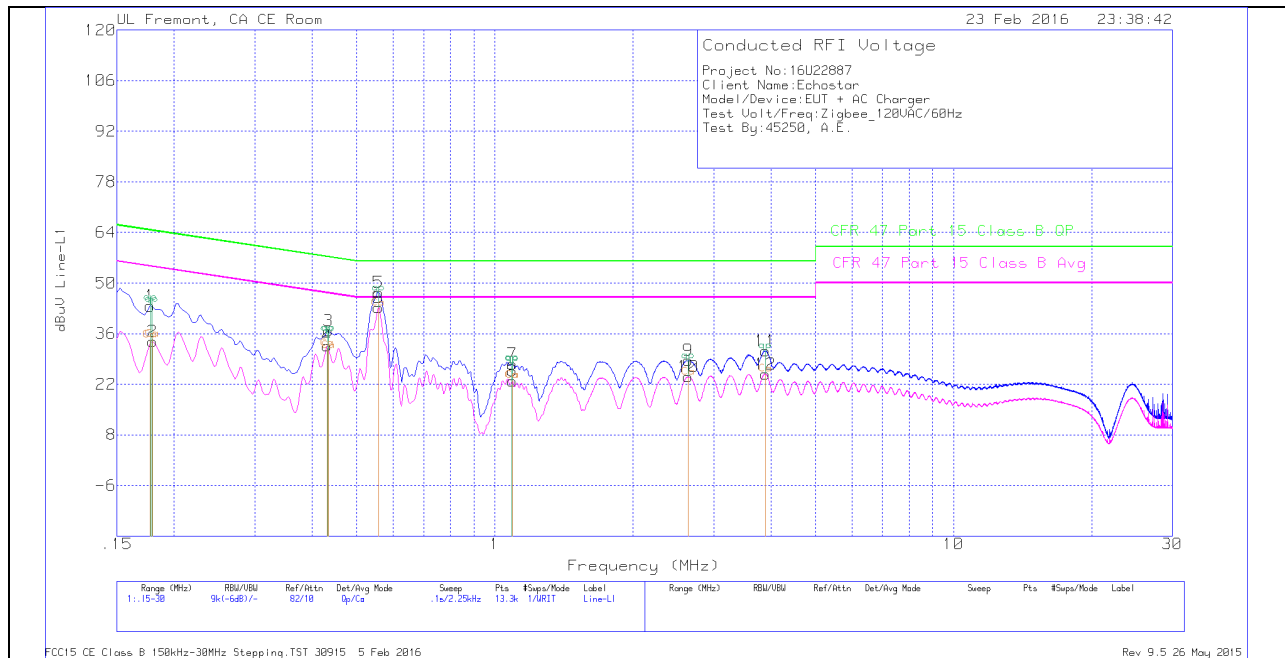
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

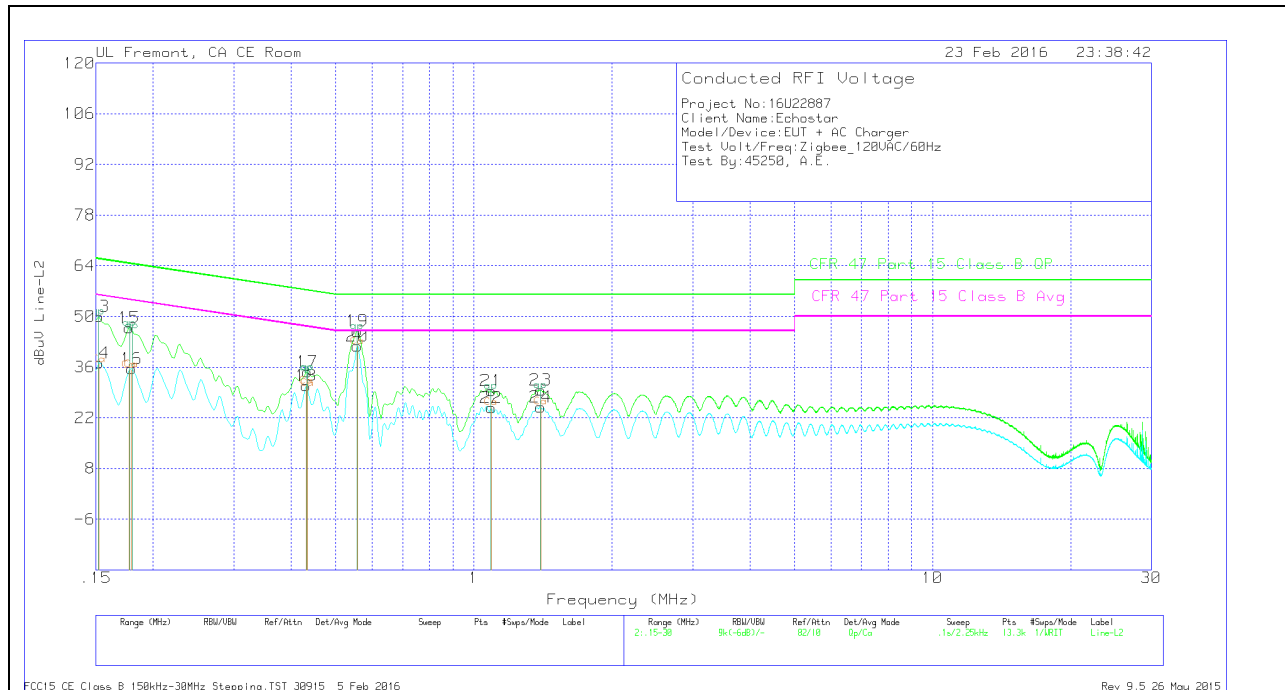
RESULTS

6 WORST EMISSIONS

LINE 1 PLOT



LINE 2 PLOT



LINE 1 and 2 RESULT

Trace Markers

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T1310 IL L1	LC Cables 1&3	10dB Pad	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.177	33.66	Qp	0	0	10	43.66	64.63	-20.97	-	-
2	.17925	23.9	Ca	0	0	10	33.9	-	-	54.52	-20.62
3	.4335	26.82	Qp	0	0	10	36.82	57.19	-20.37	-	-
4	.43125	22.68	Ca	0	0	10	32.68	-	-	47.23	-14.55
5	.55725	37.45	Qp	0	0	10	47.45	56	-8.55	-	-
6	.55725	33.22	Ca	0	0	10	43.22	-	-	46	-2.78
7	1.09275	17.58	Qp	0	0	10	27.58	56	-28.42	-	-
8	1.0905	12.93	Ca	0	0	10	22.93	-	-	46	-23.07
9	2.64188	18.51	Qp	0	.1	10	28.61	56	-27.39	-	-
10	2.64188	14.01	Ca	0	.1	10	24.11	-	-	46	-21.89
11	3.89513	21.1	Qp	0	.1	10	31.2	56	-24.8	-	-
12	3.89513	14.75	Ca	0	.1	10	24.85	-	-	46	-21.15

Qp - Quasi-Peak detector

Ca - CISPR average detection

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T1310 IL L2	LC Cables 2&3	10dB Pad	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.15225	39.96	Qp	0	0	10	49.96	65.88	-15.92	-	-
14	.15225	27.07	Ca	0	0	10	37.07	-	-	55.88	-18.81
15	.177	36.93	Qp	0	0	10	46.93	64.63	-17.7	-	-
16	.17925	25.62	Ca	0	0	10	35.62	-	-	54.52	-18.9
17	.4335	24.68	Qp	0	0	10	34.68	57.19	-22.51	-	-
18	.43125	20.83	Ca	0	0	10	30.83	-	-	47.23	-16.4
19	.55725	35.92	Qp	0	0	10	45.92	56	-10.08	-	-
20	.55725	31.76	Ca	0	0	10	41.76	-	-	46	-4.24
21	1.0905	19.56	Qp	0	0	10	29.56	56	-26.44	-	-
22	1.0905	14.8	Ca	0	0	10	24.8	-	-	46	-21.2
23	1.39875	19.54	Qp	0	.1	10	29.64	56	-26.36	-	-
24	1.39875	14.86	Ca	0	.1	10	24.96	-	-	46	-21.04

Qp - Quasi-Peak detector

Ca - CISPR average detection