FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

ZIGBEE DEVICE

MODEL NUMBER: ID:089

FCC ID: DKNMJK462

REPORT NUMBER: 15U21019-E1, Revision A

ISSUE DATE: SEP 3, 2015

Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/20/15	Initial Issue	P. ZHANG
A	9/3/15	Updated page 7	P. ZHANG

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Echostar Technologies LLC

EUT DESCRIPTION: ZIGBEE Sattellite setup box

MODEL: ID: 089

SERIAL NUMBER: 1507088215 (Radiated), 1507088224 (Conducted)

DATE TESTED: AUGUST 14 – AUGUST 20, 2015

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 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 C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

Deviation – EUT tested at 1.5m height instead of 0.8m for above 1GHz.

3. FACILITIES AND ACCREDITATION

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

47173 Benicia Street	47266 Benicia Street
☒ Chamber A(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☒ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☐ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 18000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a ZIGBEE Sattellite setup box.

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)
2425 - 2475	ZIGBEE	4.48	2.81

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 0 dBi.

5.4. 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 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**
Laptop	HP	N/A	N/A	N/A
Router	Netgear	N/A	N/A	N/A

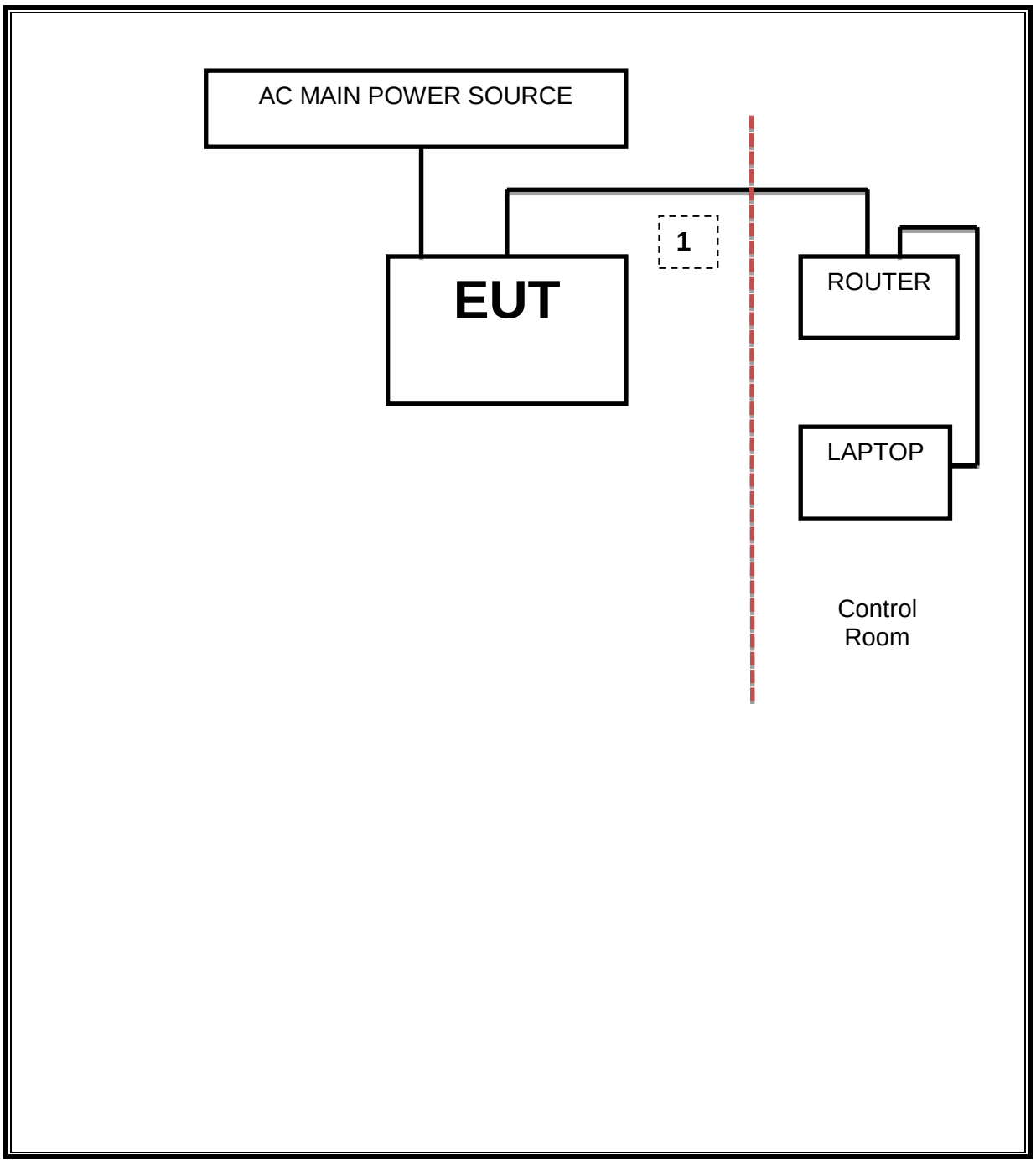
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	ethernet	1	RJ-45	un-shielded	5	N/A
2						N/A

TEST SETUP

EUT was set in the Hidden menu mode to enable ZIGBEE 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**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
Spectrum Analyzer,9KHz-40GHz	HP	8564E	C00986	04/01/16
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/13/16
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/18/16
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
Antenna, Horn, 1-18 GHz	ETS	3117	C01022	02/21/16
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/15
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/16
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/16
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	T404	06/29/16
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 40GHz	Miteq	NSP4000-SP2	C00990	08/20/15
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	F00219	05/23/16
High Pass Filter 6GHz	Micro-Tronics	HPS17542	F00222	05/22/16
High Pass Filter 3GHz	Micro-Tronics	HPM17543	F00224	05/22/16

7. SUMMARY

8.

RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
RSS-210 A8.2(a)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	1.59 MHz
RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-58.89 dBm
RSS-210 A8.4	TX conducted output power	<30dBm		Pass	4.48 dBm
RSS-210 A8.2	PSD	<8dBm		Pass	-10.23 dBm
RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	54.6 dBuV
RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	38.96 dBuV/m

ANTENNA PORT TEST RESULTS

8.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

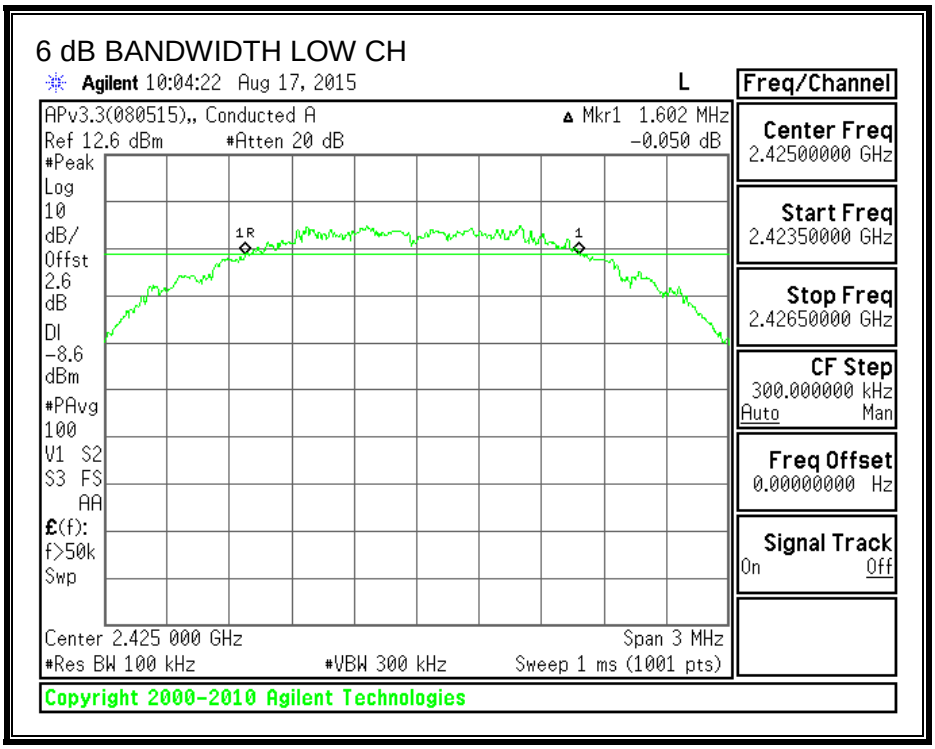
TEST PROCEDURE

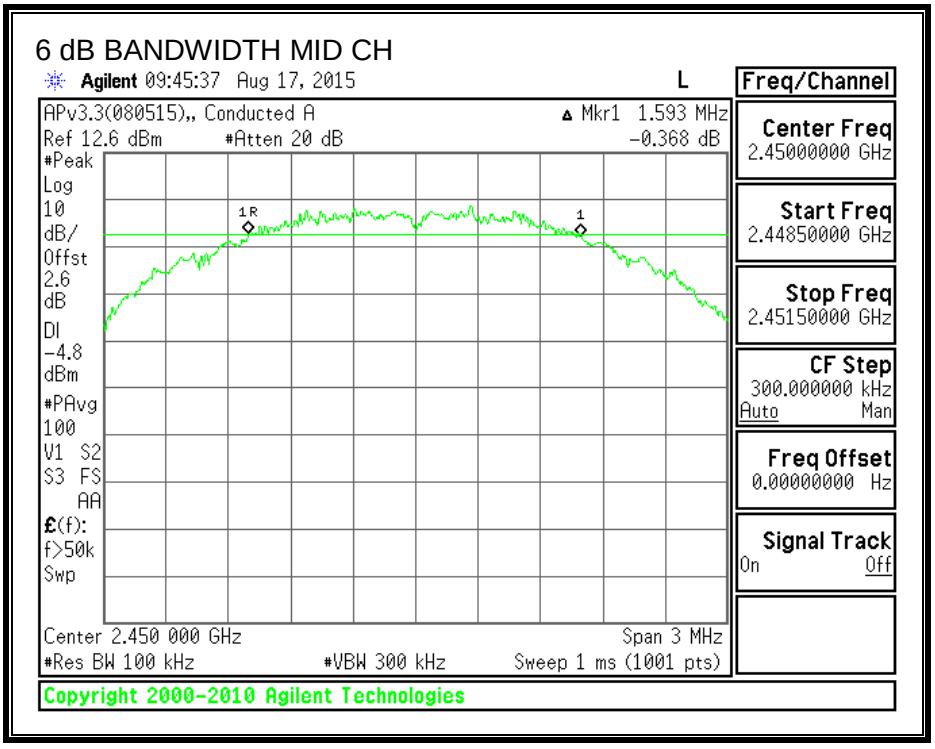
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

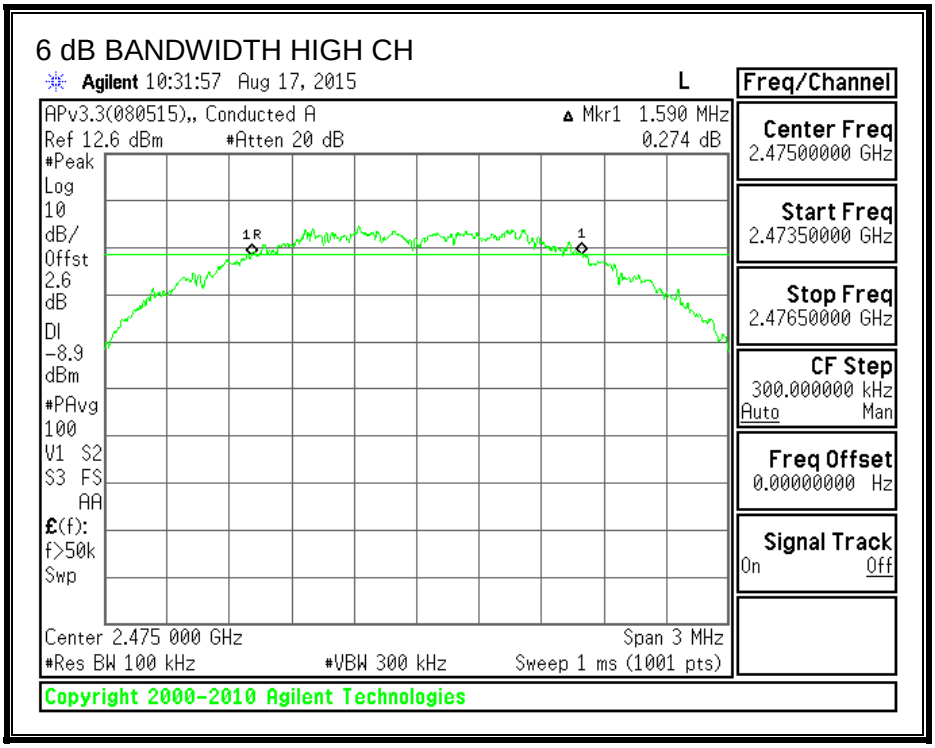
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2425	1.6020	0.5
Middle	2450	1.5930	0.5
High	2475	1.5900	0.5

6 dB BANDWIDTH







8.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

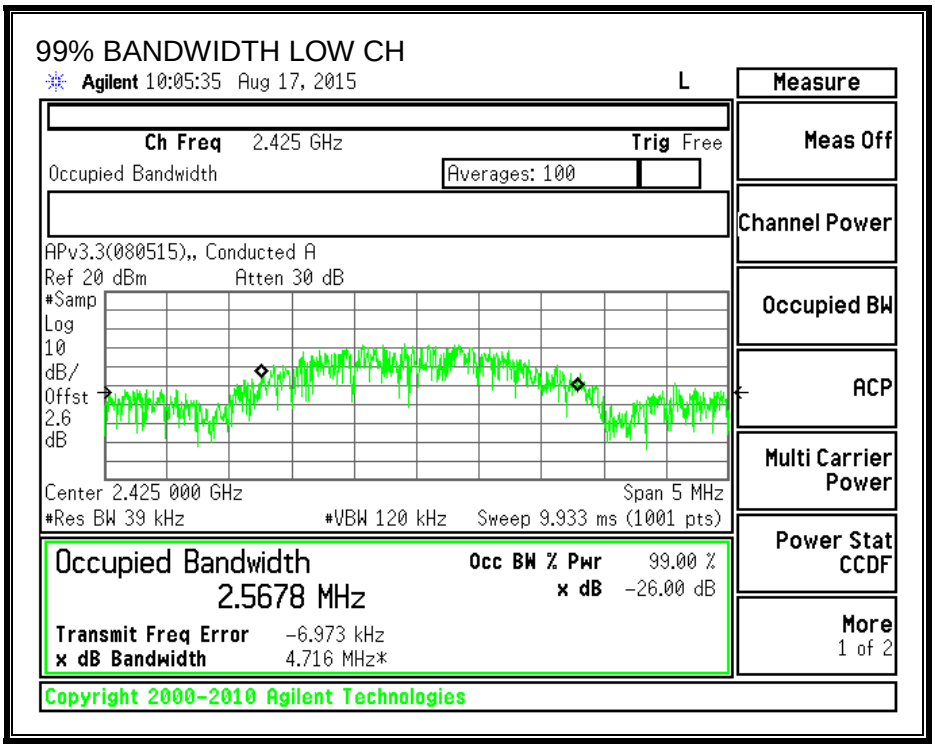
TEST PROCEDURE

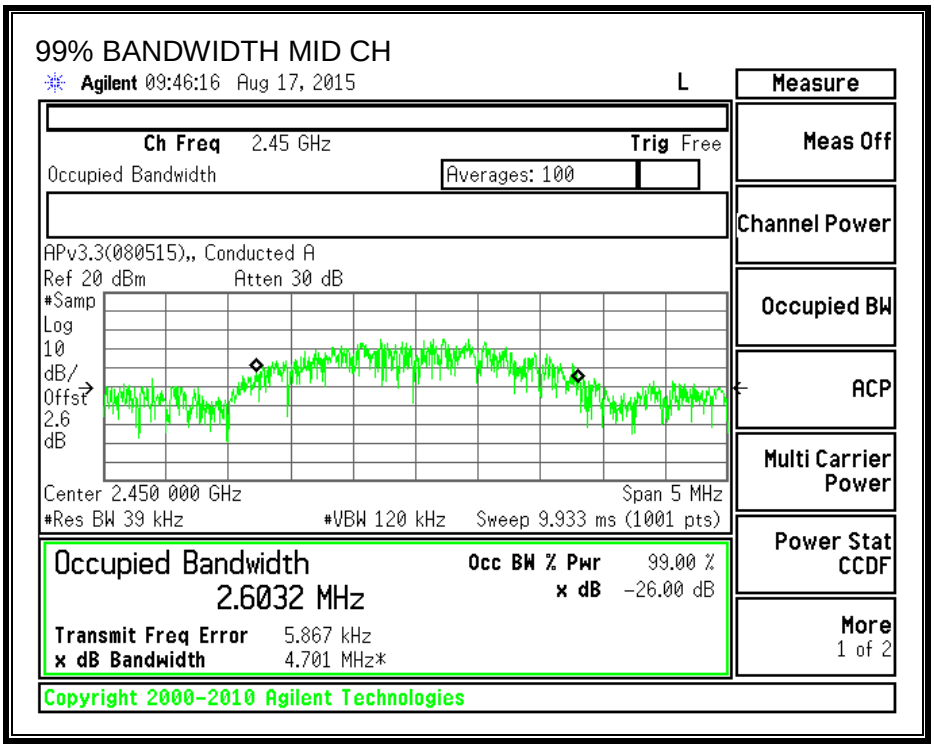
Reference to KDB558074 D01 DTS Meas Guidance v03r03: The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

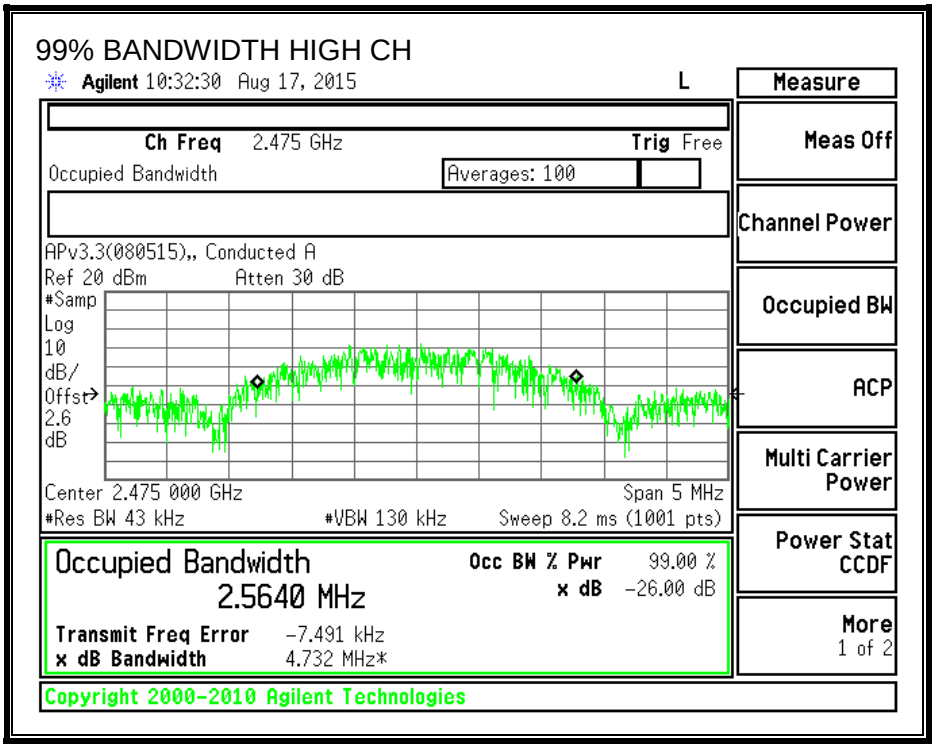
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2425	2.5678
Middle	2450	2.6032
High	2475	2.5640

99% BANDWIDTH







8.3. 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.

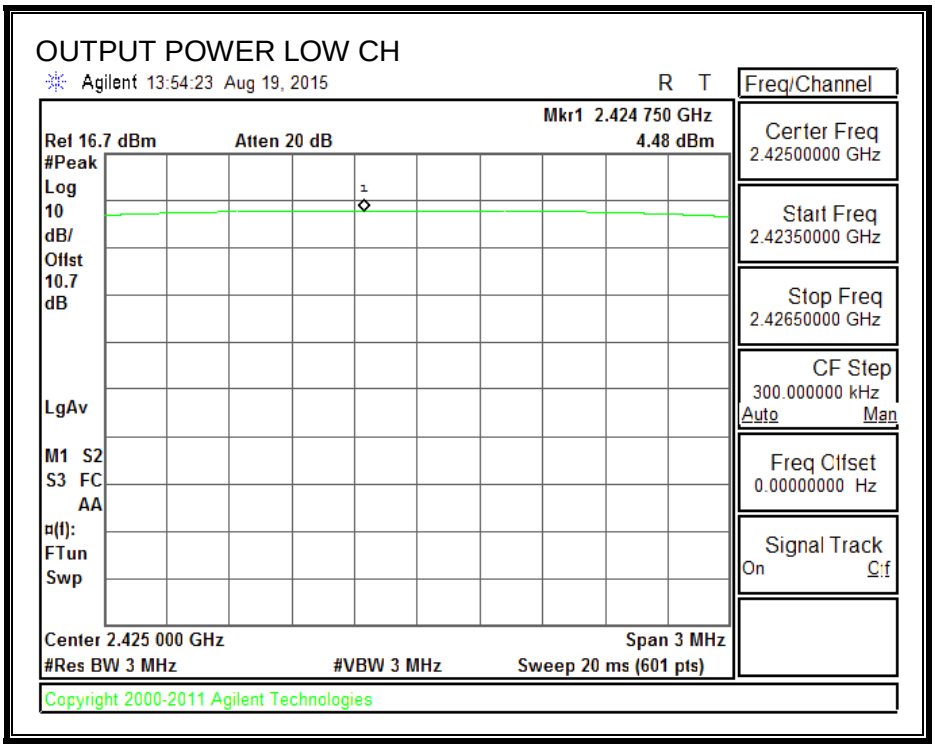
TEST PROCEDURE

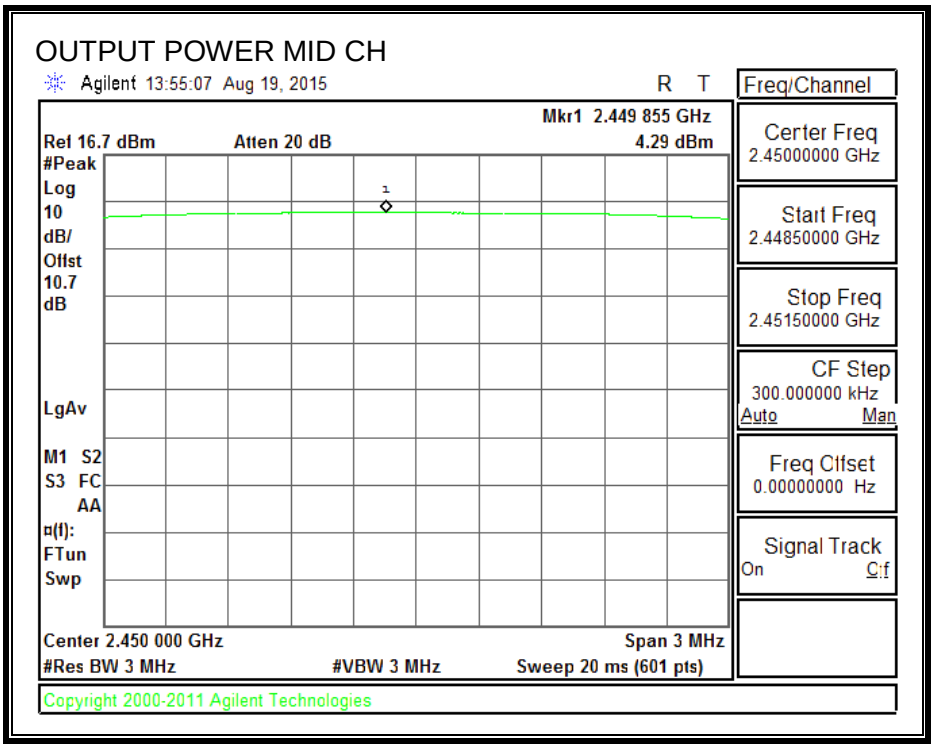
Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r03 utilizing spectrum analyzer.

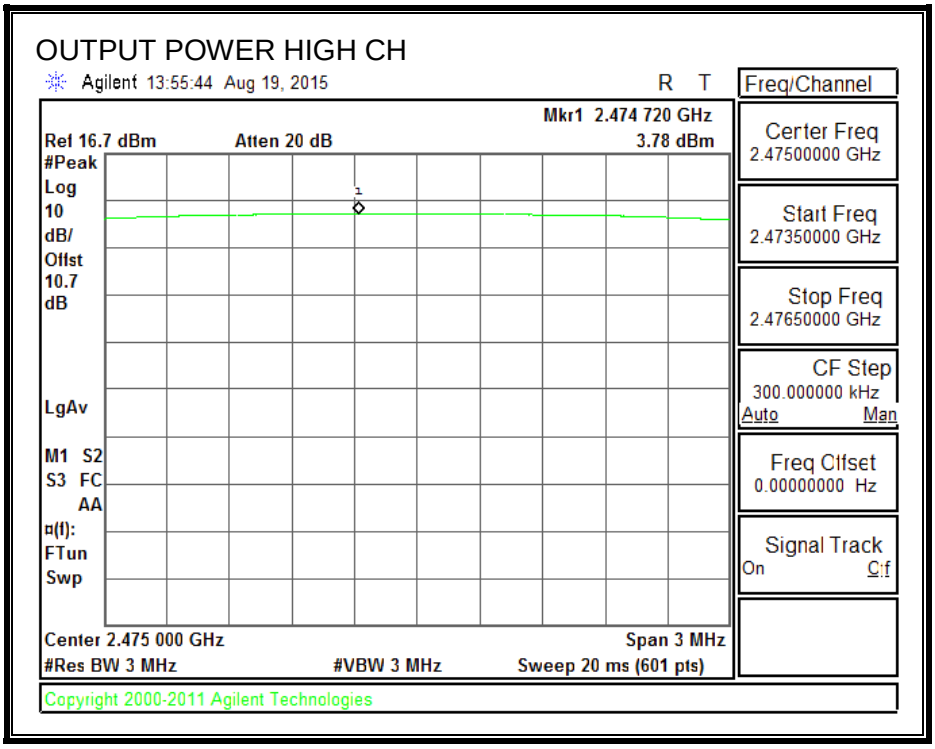
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2425	4.480	30	-25.520
Middle	2450	4.290	30	-25.710
High	2475	3.780	30	-26.220

OUTPUT POWER







8.4. 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 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	AV power (dBm)
Low	2425	3.24
Middle	2450	3.25
High	2475	2.82

8.5. 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.

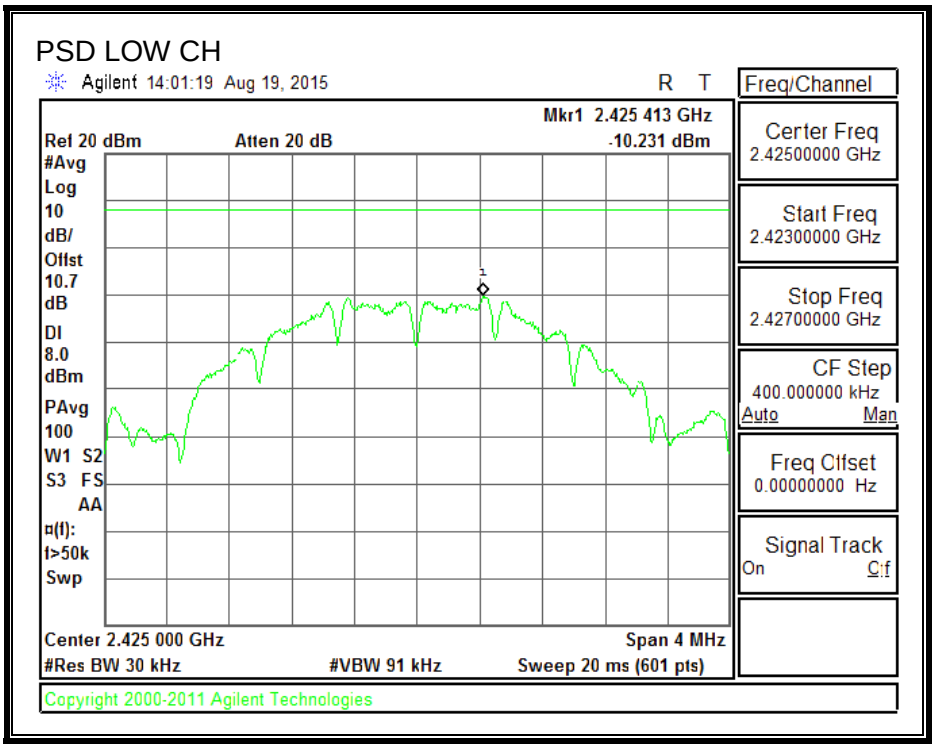
TEST PROCEDURE

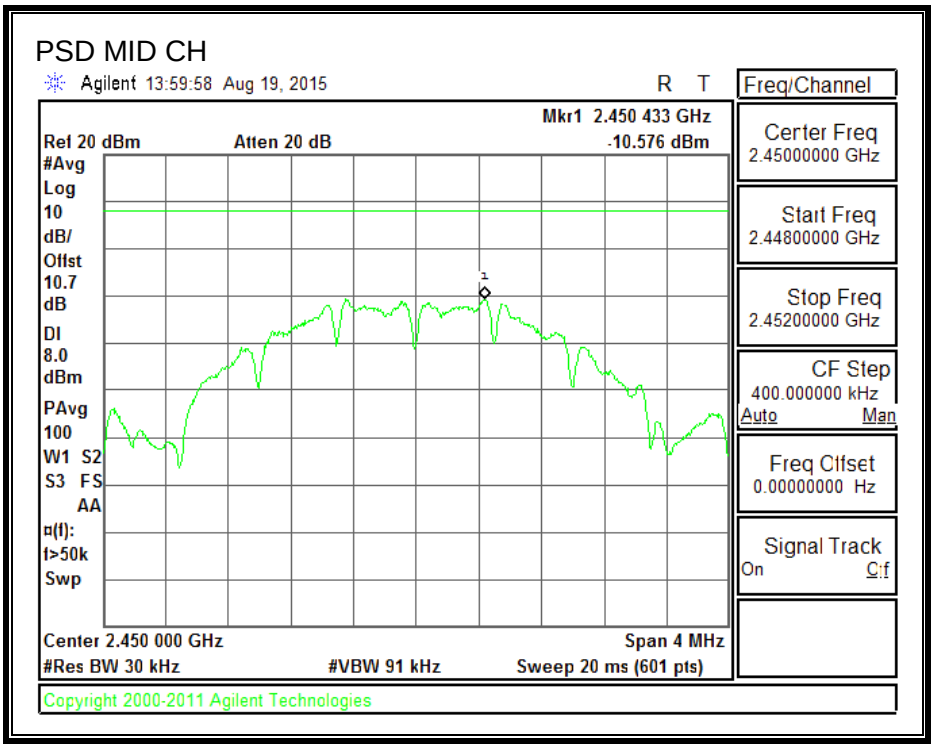
Power Spectral Density was performed utilizing the “Method PKPSD (Peak PSD)” under KDB558074 D01 DTS Meas Guidance v03r03.

RESULTS

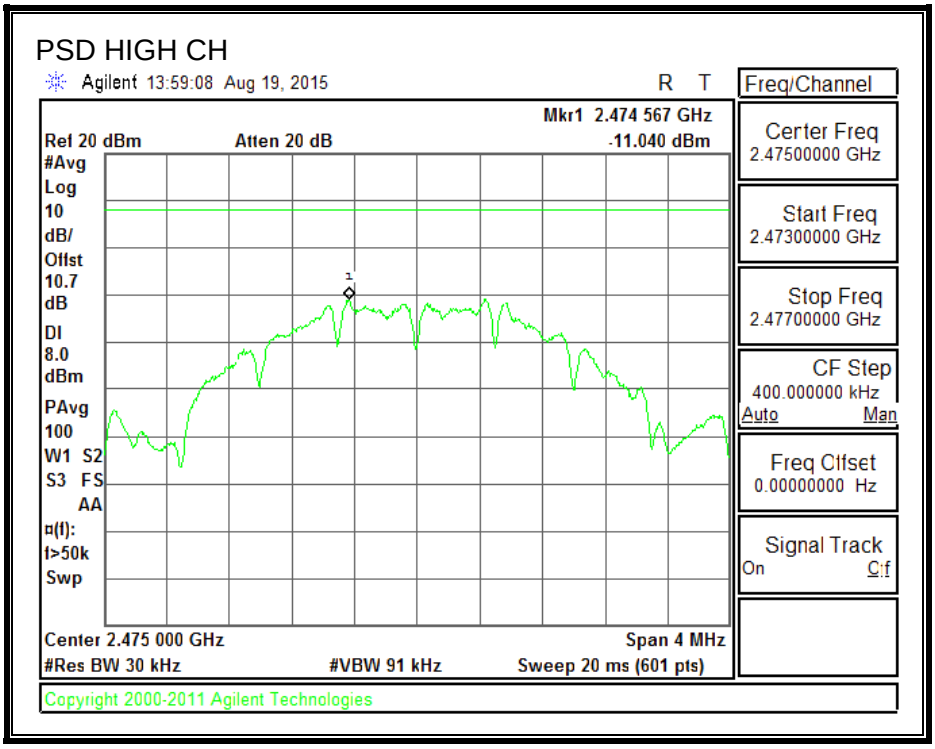
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2425	-10.23	8	-18.23
Middle	2450	-10.58	8	-18.58
High	2475	-11.04	8	-19.04

POWER SPECTRAL DENSITY





PSD HIGH CH



8.6. 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.

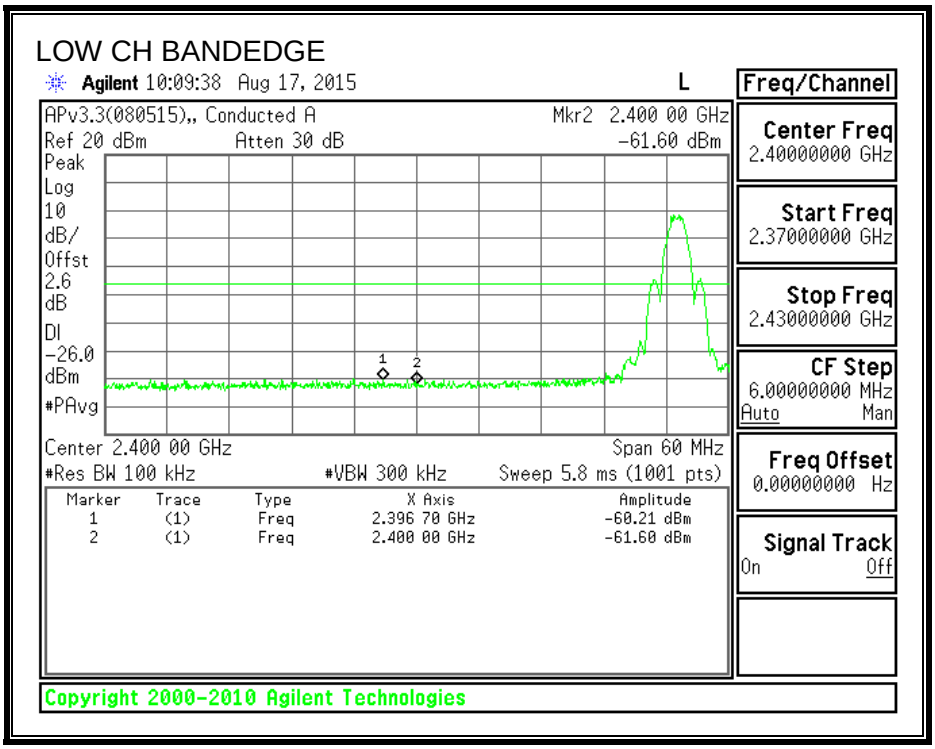
TEST PROCEDURE

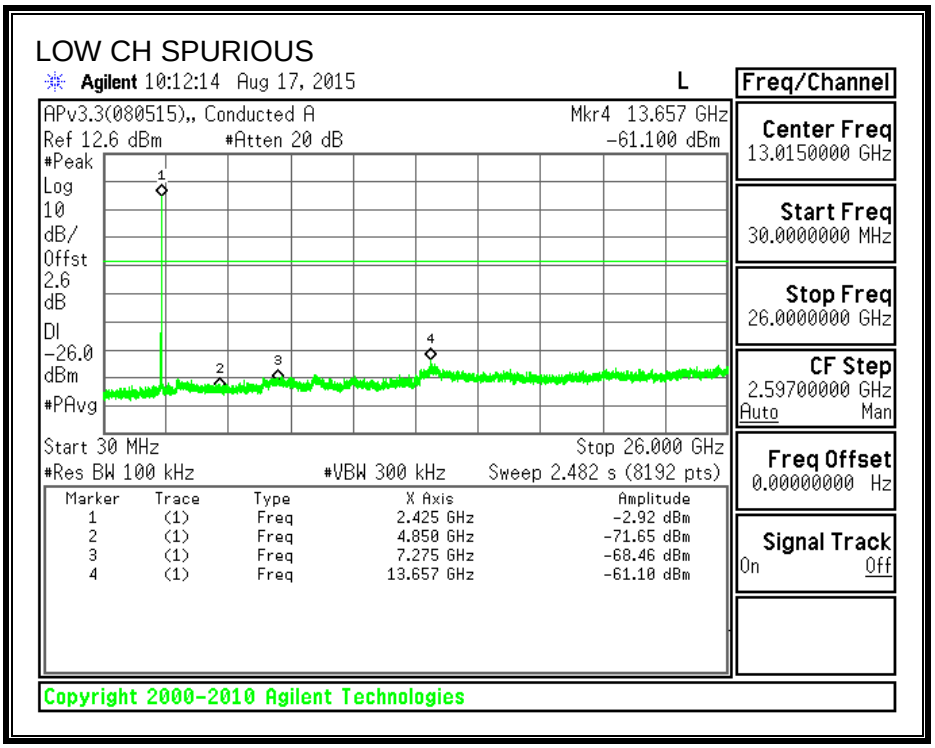
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

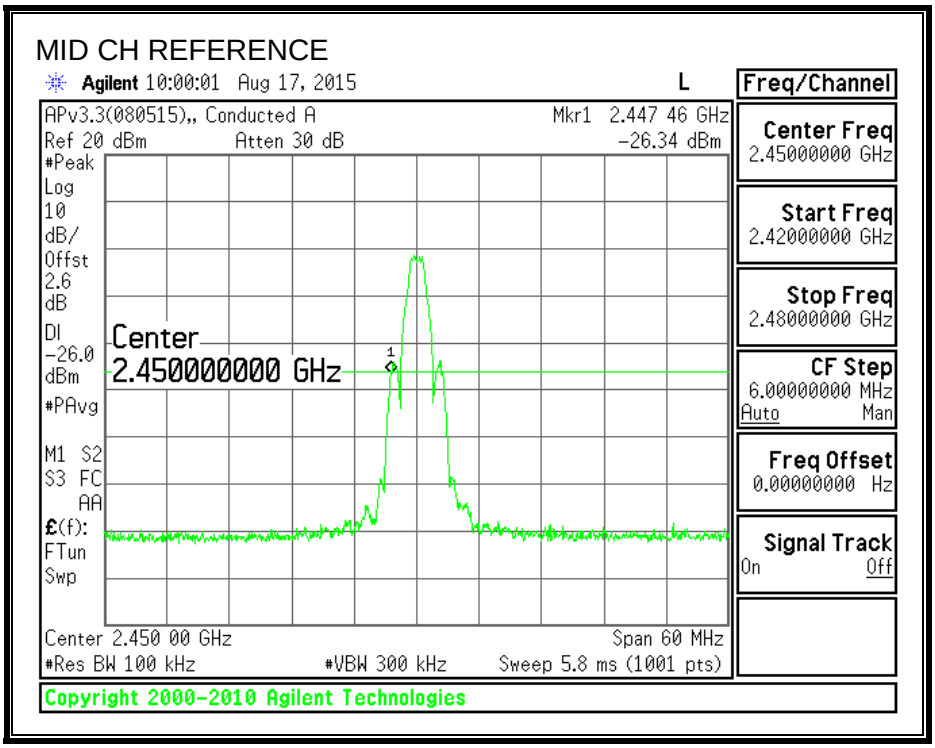
RESULTS

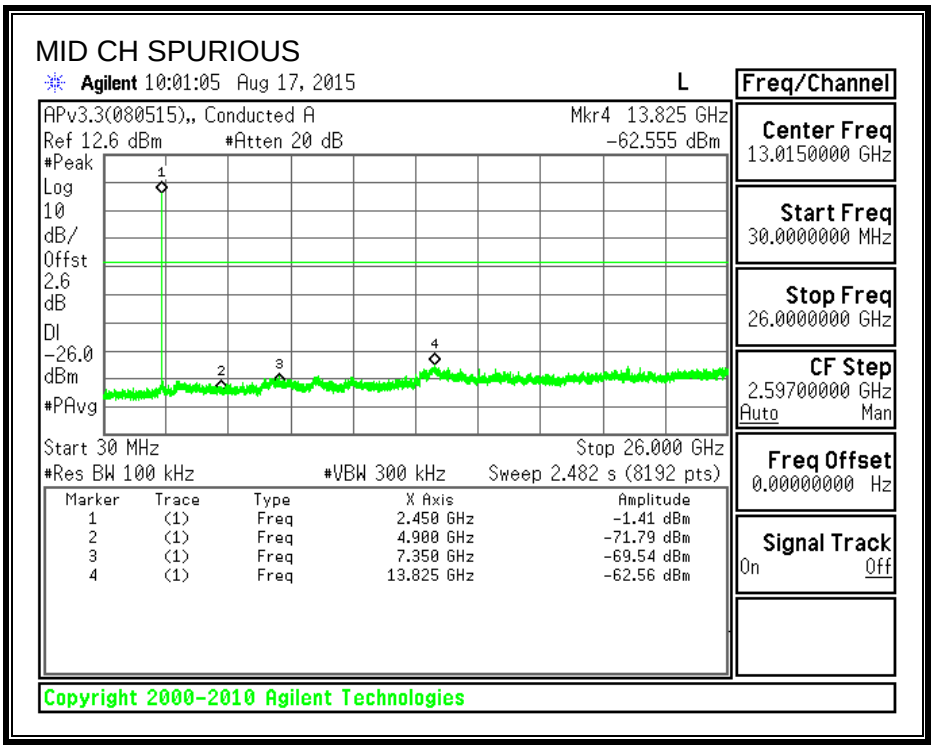
SPURIOUS EMISSIONS, LOW CHANNEL



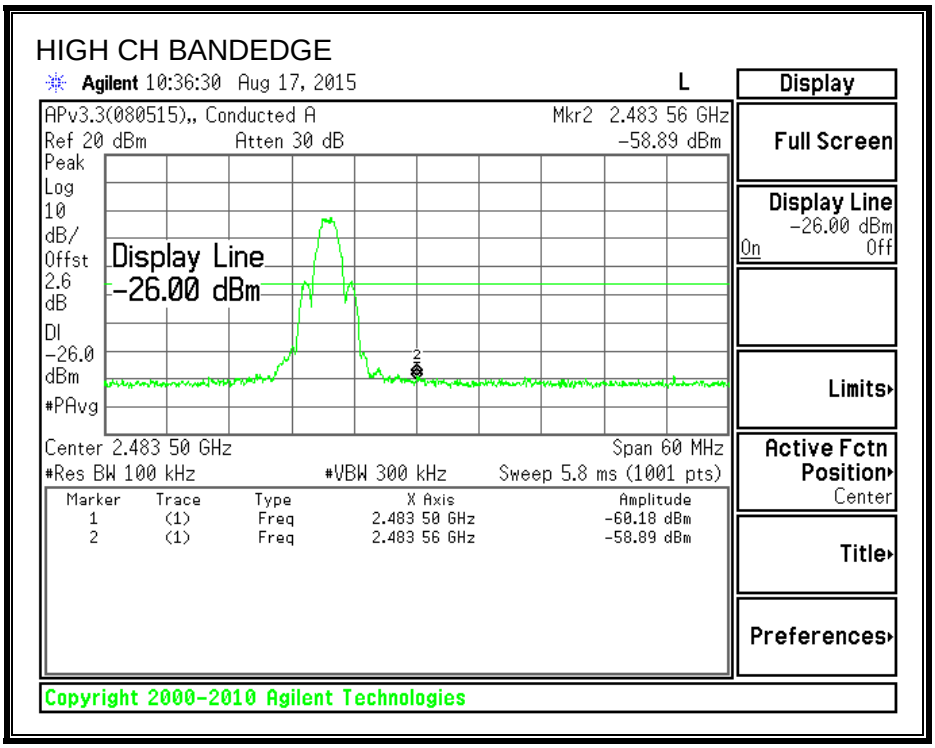


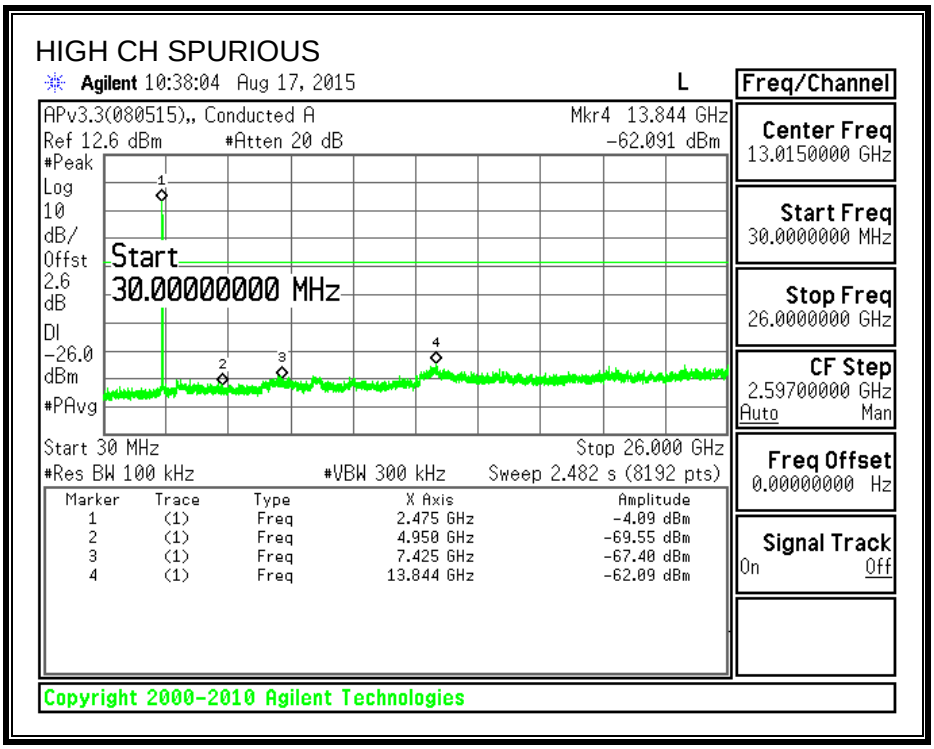
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

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. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10 - 2009. The EUT is set to transmit in a continuous mode.

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

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor = 10 log (1/x) = 0dB.

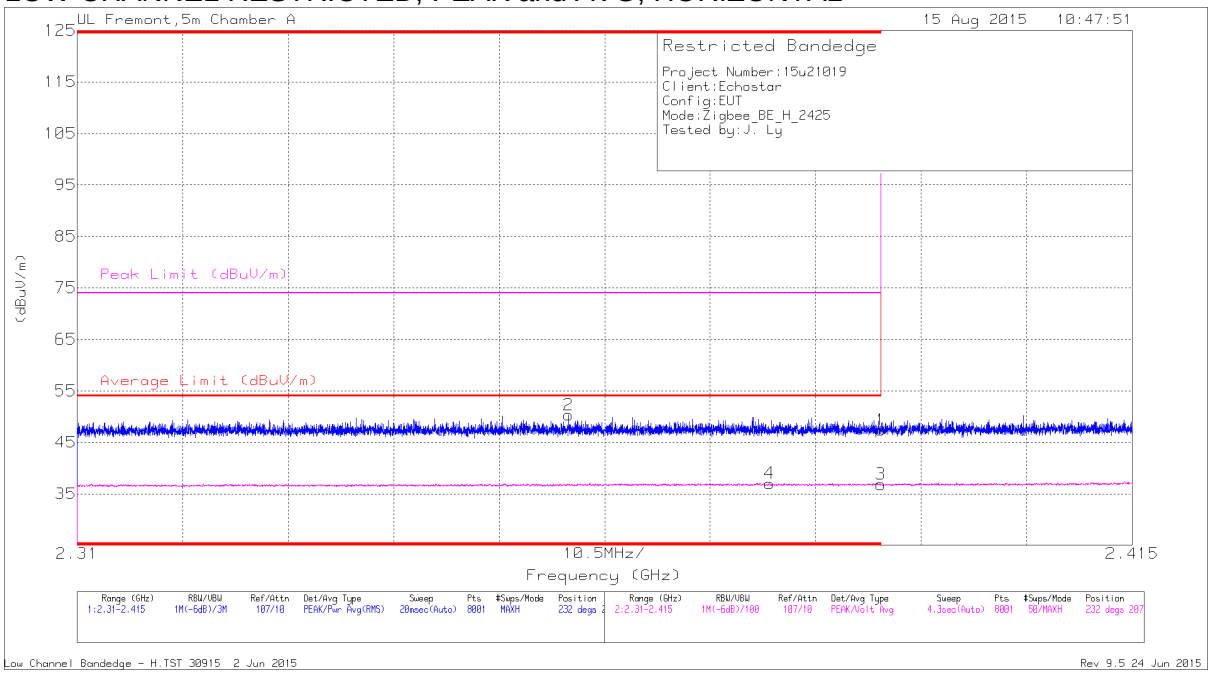
The spectrum from 1GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

9.2. TRANSMITTER ABOVE 1 GHz

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, PEAK and AVG, HORIZONTAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.96	Pk	32	-24.6	47.36	-	-	74	-26.64	232	207	H
2	* 2.359	43.11	Pk	31.9	-24.7	50.31	-	-	74	-23.69	232	207	H
3	* 2.39	29.44	RMS	32	-24.6	36.84	54	-17.16	-	-	232	207	H
4	* 2.379	29.73	RMS	31.9	-24.6	37.03	54	-16.97	-	-	232	207	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
Pk - Peak detector
RMS - RMS detection

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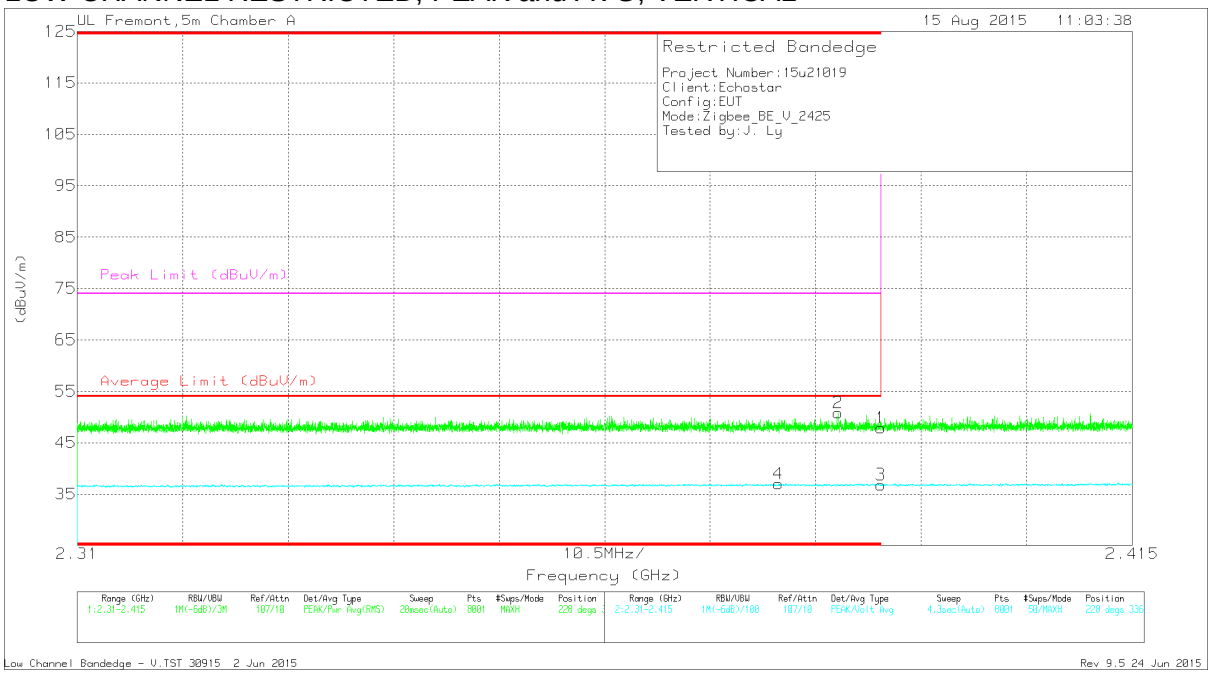
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK and AVG, VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (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
4	* 2.38	29.72	RMS	31.9	-24.6	37.02	54	-16.98	-	-	228	336	V
2	* 2.386	43.42	Pk	32	-24.6	50.82	-	-	74	-23.18	228	336	V
1	* 2.39	40.47	Pk	32	-24.6	47.87	-	-	74	-26.13	228	336	V
3	* 2.39	29.4	RMS	32	-24.6	36.8	54	-17.2	-	-	228	336	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
Pk - Peak detector
RMS - RMS detection

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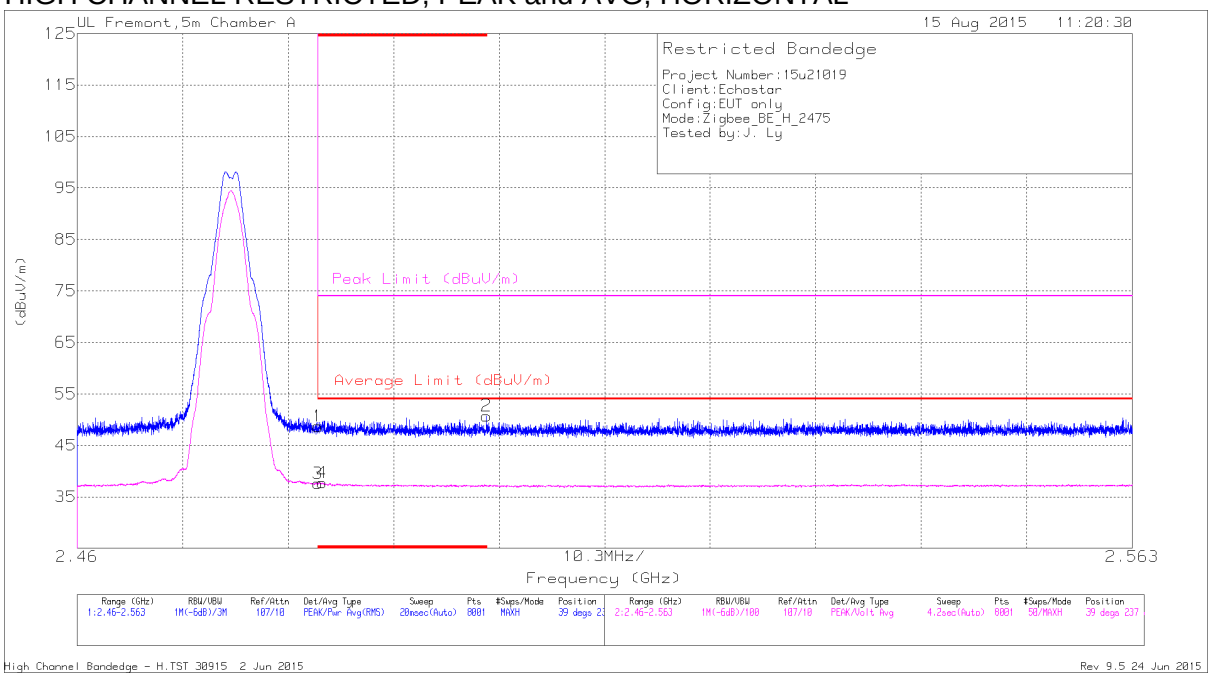
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK and AVG, HORIZONTAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (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	41.09	Pk	32.1	-24.5	48.69	-	-	74	-25.31	39	237	H
3	* 2.484	30	RMS	32.1	-24.5	37.6	54	-16.4	-	-	39	237	H
4	* 2.484	30.14	RMS	32.1	-24.5	37.74	54	-16.26	-	-	39	237	H
2	* 2.5	43.12	Pk	32.1	-24.5	50.72	-	-	74	-23.28	39	237	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
Pk - Peak detector
RMS - RMS detection

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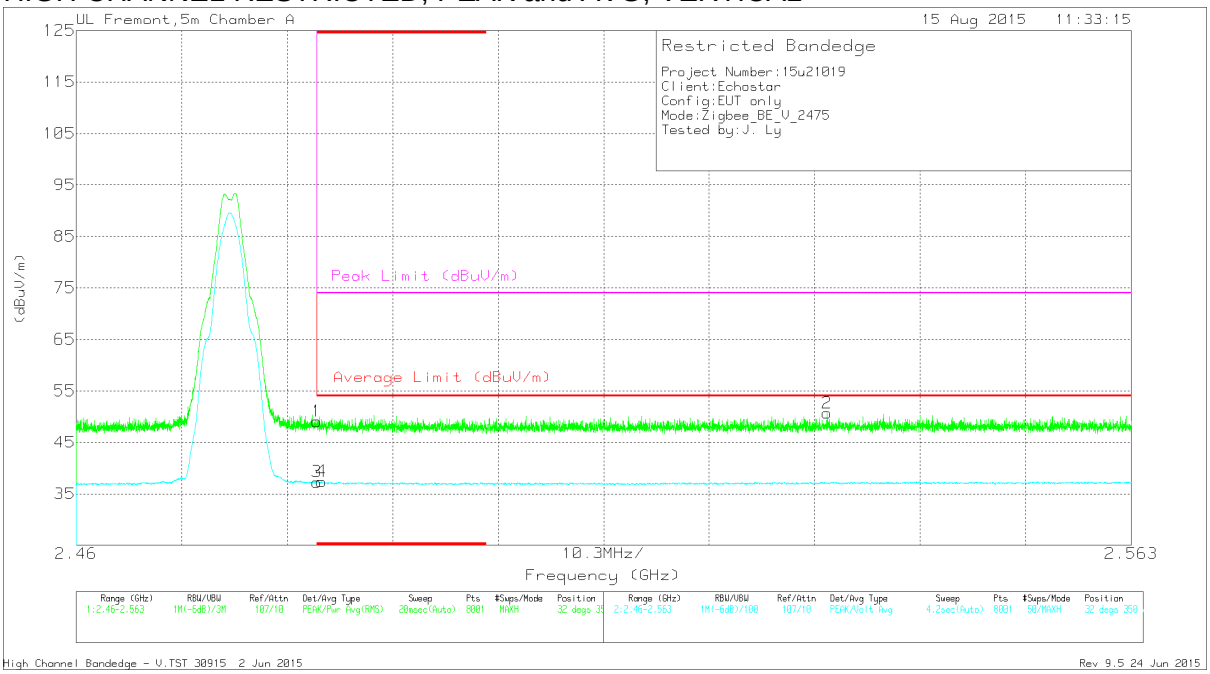
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK and AVG, VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (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	41.47	Pk	32.1	-24.5	49.07	-	-	74	-24.93	32	350	V
3	* 2.484	29.71	RMS	32.1	-24.5	37.31	54	-16.69	-	-	32	350	V
4	* 2.484	29.81	RMS	32.1	-24.5	37.41	54	-16.59	-	-	32	350	V
2	2.533	42.98	Pk	32.1	-24.4	50.68	-	-	74	-23.32	32	350	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
Pk - Peak detector
RMS - RMS detection

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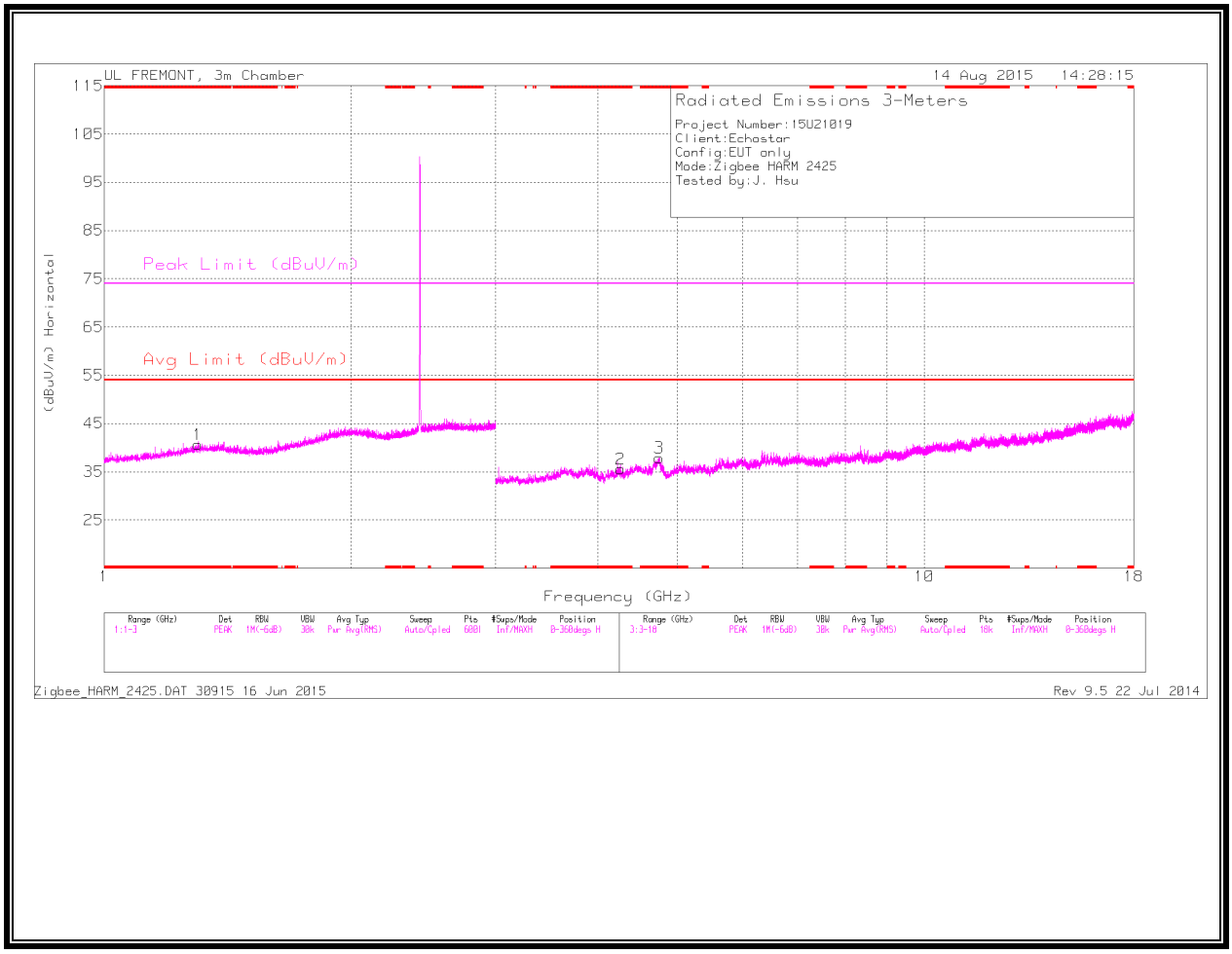
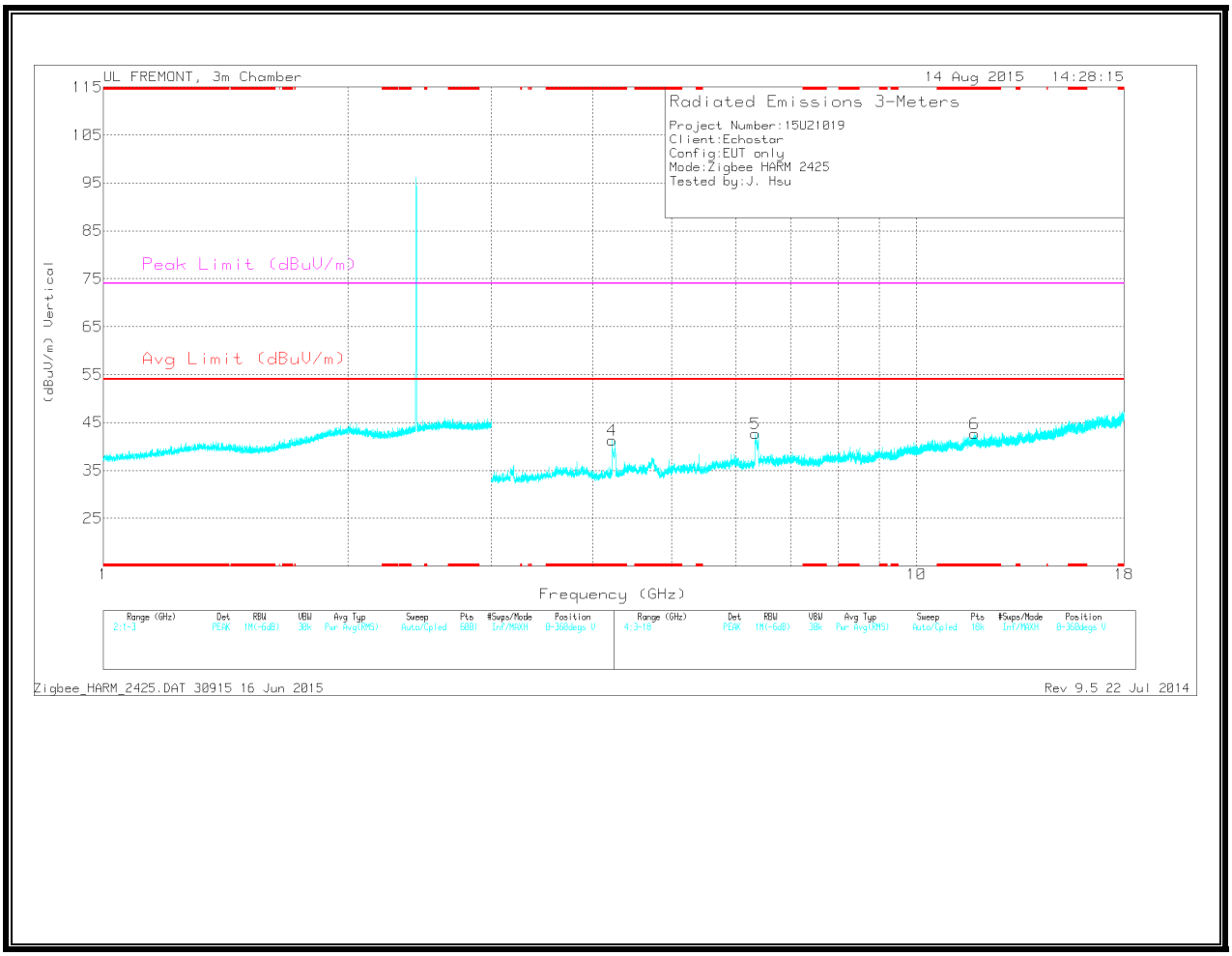
HARMONICS AND SPURIOUS EMISSIONS

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.

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/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	* 1.3	36.62	Pk	29.4	-25.4	40.62	-	-	74	-33.38	0-360	199	H
2	* 4.263	34.6	Pk	33.5	-32.5	35.6	-	-	74	-38.4	0-360	101	H
3	* 4.751	34.32	Pk	34.3	-30.7	37.92	-	-	74	-36.08	0-360	199	H
4	* 4.222	39.86	Pk	33.4	-32	41.26	-	-	74	-32.74	0-360	101	V
6	* 11.788	28.53	Pk	38.6	-24.4	42.73	-	-	74	-31.27	0-360	199	V
5	6.341	38.42	Pk	35.6	-31.3	42.72	-	-	-	-	0-360	101	V

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

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 1.298	44.67	PK2	29.4	-25.4	48.67	-	-	74	-25.33	1	101	H
* 1.298	32.84	MAv1	29.4	-25.4	36.84	54	-17.16	-	-	1	101	H
* 4.263	43.36	PK2	33.5	-32.5	44.36	-	-	74	-29.64	1	101	H
* 4.263	31.49	MAv1	33.5	-32.5	32.49	54	-21.51	-	-	1	101	H
* 4.753	41.92	PK2	34.3	-30.7	45.52	-	-	74	-28.48	1	101	H
* 4.751	30.81	MAv1	34.3	-30.7	34.41	54	-19.59	-	-	1	101	H
* 4.222	49.36	PK2	33.4	-32	50.76	-	-	74	-23.24	65	105	V
* 4.223	33.96	MAv1	33.4	-32	35.36	54	-18.64	-	-	65	105	V
* 11.79	35.51	PK2	38.6	-24.4	49.71	-	-	74	-24.29	65	105	V
* 11.786	24.66	MAv1	38.6	-24.3	38.96	54	-15.04	-	-	65	105	V
6.339	30.96	MAv1	35.6	-31.3	35.26	-	-	-	-	65	105	V
6.34	44.77	PK2	35.6	-31.3	49.07	-	-	-	-	65	105	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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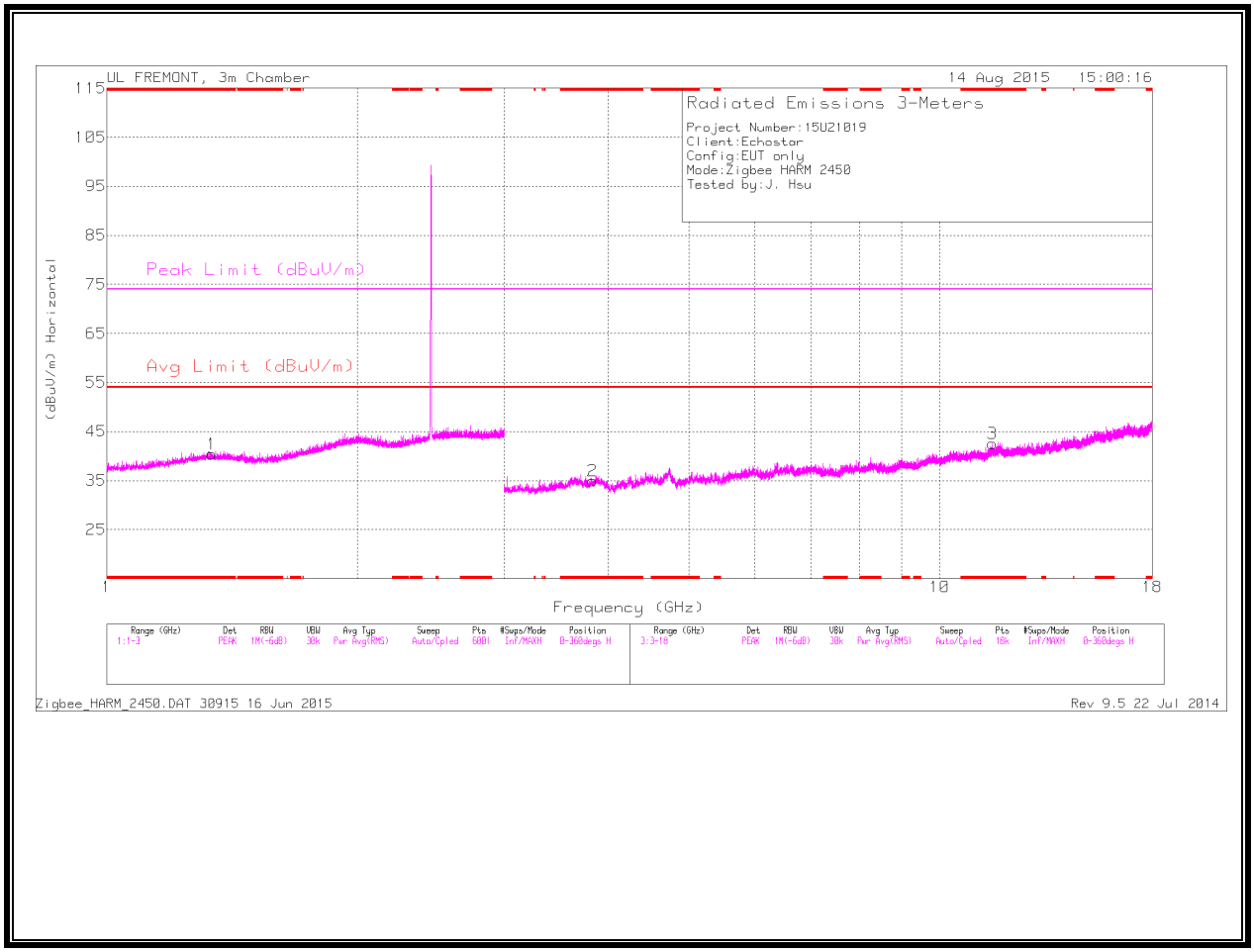
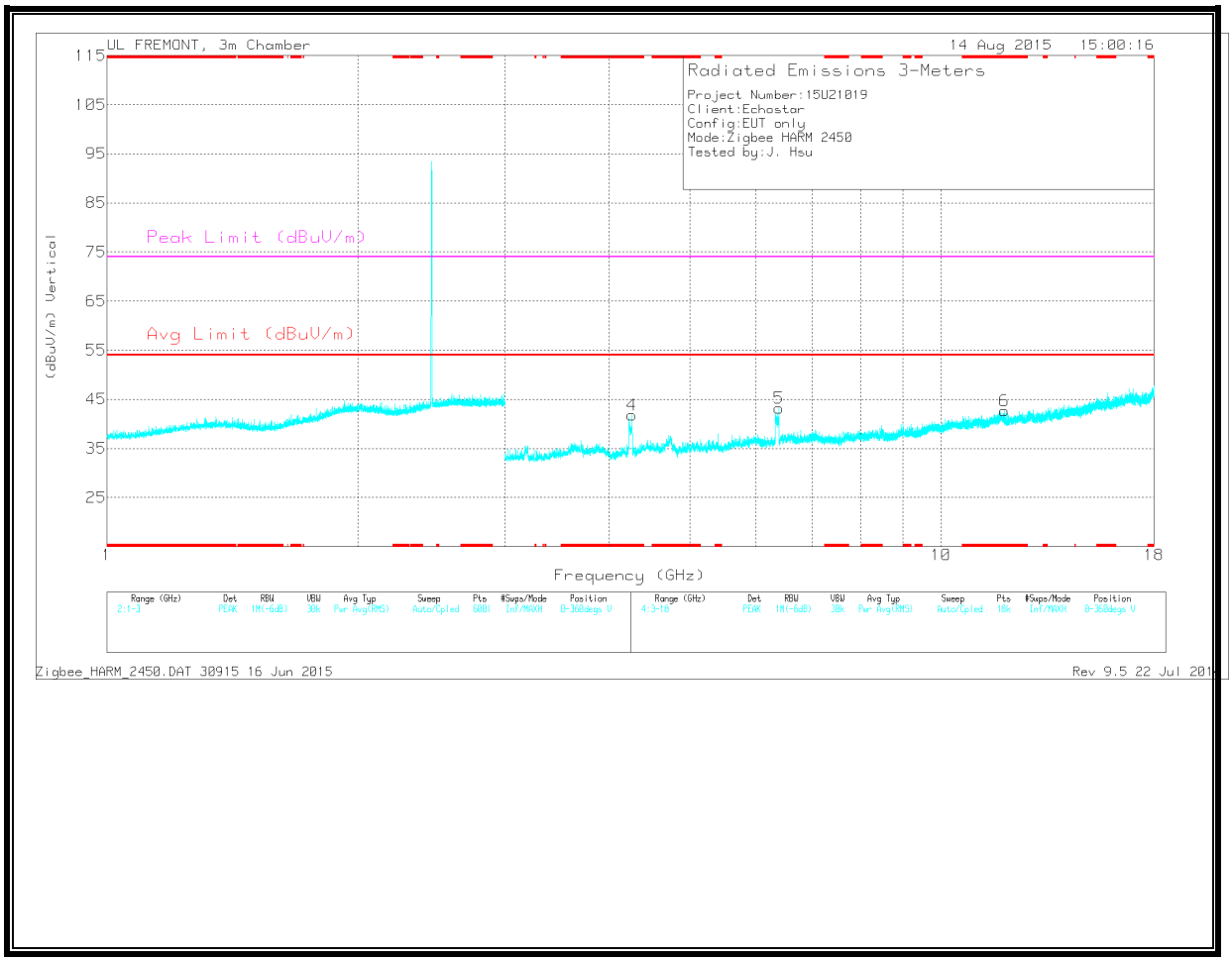
MID CHANNEL

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.

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/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	* 1.338	36.45	Pk	29.4	-25.4	40.45	-	-	74	-33.55	0-360	199	H
2	* 3.828	33.73	Pk	33.4	-32.2	34.93	-	-	74	-39.07	0-360	199	H
3	* 11.572	28.69	Pk	38.4	-24.5	42.59	-	-	74	-31.41	0-360	199	H
4	* 4.262	40.79	Pk	33.5	-32.5	41.79	-	-	74	-32.21	0-360	101	V
6	* 11.915	29.22	Pk	38.6	-25.1	42.72	-	-	74	-31.28	0-360	101	V
5	6.395	38.94	Pk	35.7	-31.5	43.14	-	-	-	-	0-360	101	V

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

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 1.337	44.54	PK2	29.4	-25.4	48.54	-	-	74	-25.46	1	101	H
* 1.338	32.86	MAv1	29.4	-25.4	36.86	54	-17.14	-	-	1	101	H
* 3.828	42.48	PK2	33.4	-32.2	43.68	-	-	74	-30.32	1	101	H
* 3.828	30.96	MAv1	33.4	-32.2	32.16	54	-21.84	-	-	1	101	H
* 11.573	36.34	PK2	38.4	-24.5	50.24	-	-	74	-23.76	1	101	H
* 11.572	24.7	MAv1	38.4	-24.5	38.6	54	-15.4	-	-	1	101	H
* 11.914	36.08	PK2	38.6	-25.1	49.58	-	-	74	-24.42	329	312	V
* 11.917	24.91	MAv1	38.6	-25.1	38.41	54	-15.59	-	-	329	312	V
* 4.263	43.23	PK2	33.5	-32.5	44.23	-	-	74	-29.77	329	312	V
* 4.263	31.21	MAv1	33.5	-32.5	32.21	54	-21.79	-	-	329	312	V
6.394	30.2	MAv1	35.7	-31.5	34.4	-	-	-	-	329	312	V
6.396	41.16	PK2	35.7	-31.4	45.46	-	-	-	-	329	312	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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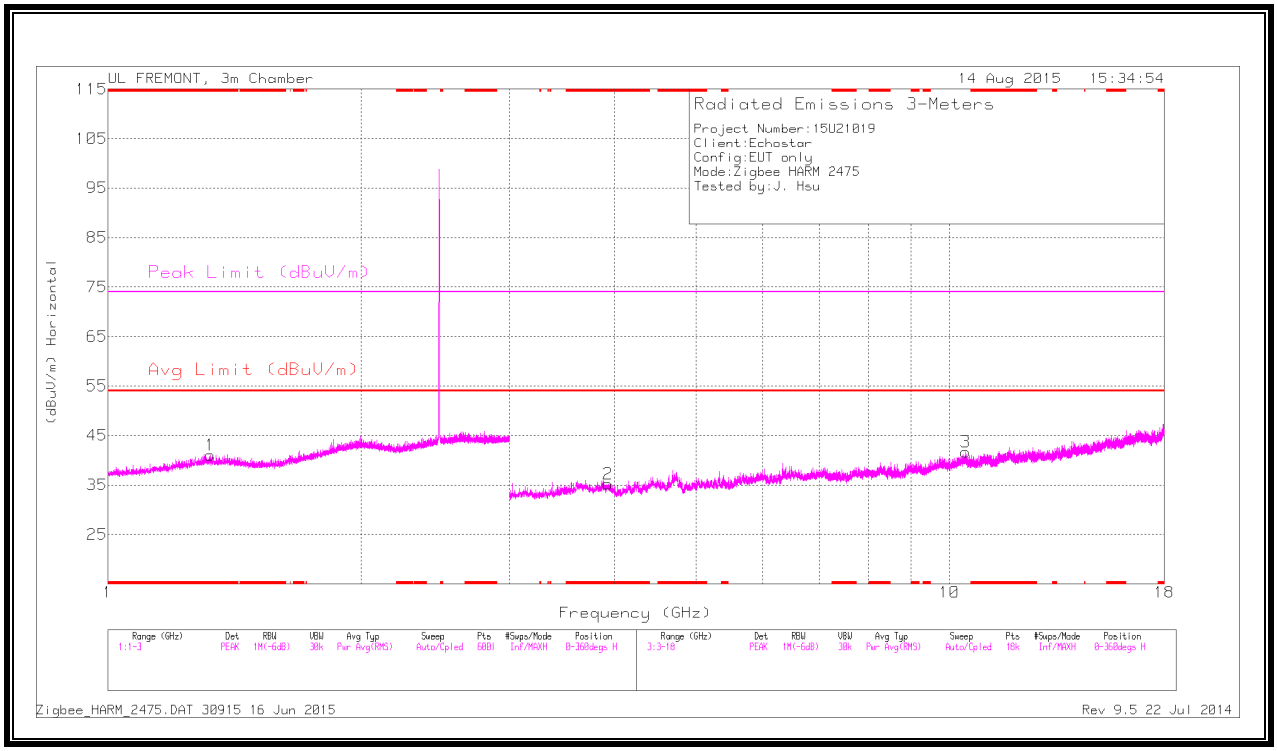
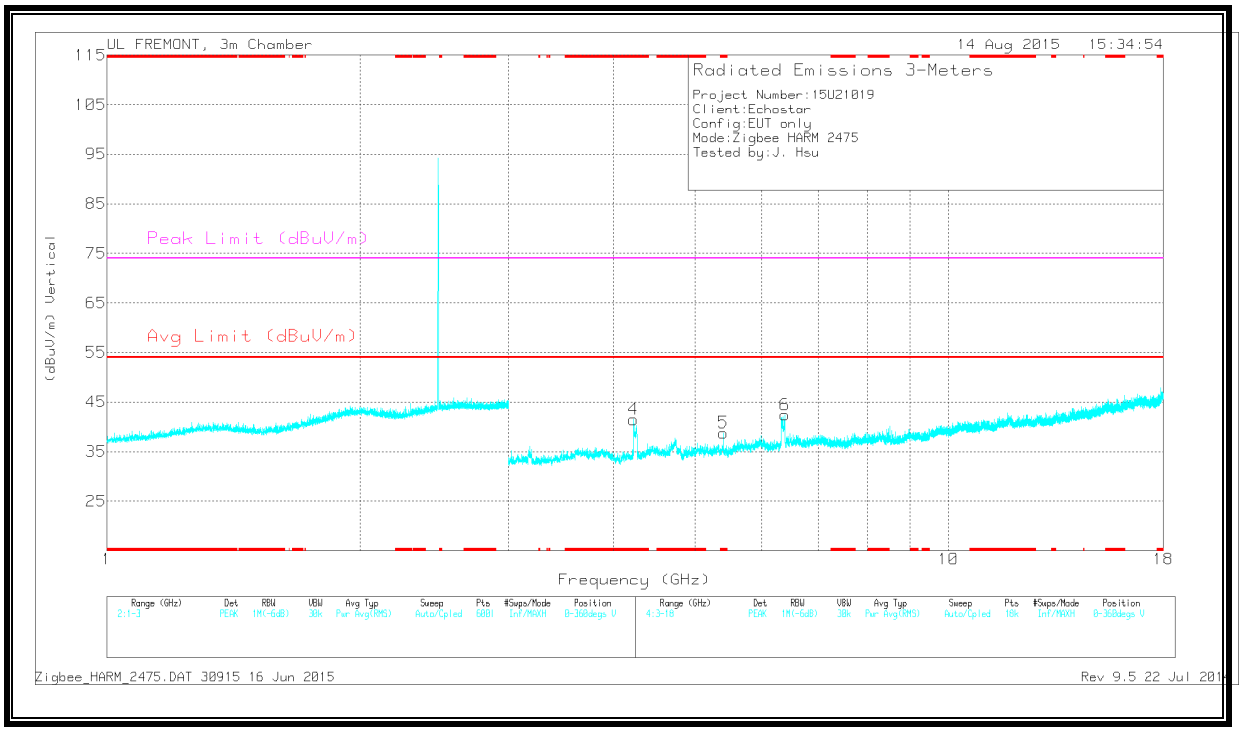
HIGH CHANNEL
HORIZONTAL



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

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/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	* 1.323	36.96	Pk	29.4	-25.3	41.06	-	-	74	-32.94	0-360	101	H
2	* 3.927	33.73	Pk	33.5	-32	35.23	-	-	74	-38.77	0-360	101	H
4	* 4.222	40.08	Pk	33.4	-32	41.48	-	-	74	-32.52	0-360	101	V
5	* 5.4	35.11	Pk	34.5	-30.8	38.81	-	-	74	-35.19	0-360	101	V
6	6.391	38.26	Pk	35.7	-31.5	42.46	-	-	-	-	0-360	101	V
3	10.456	29.56	Pk	37.4	-25.3	41.66	-	-	-	-	0-360	101	H

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

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
* 1.325	44.57	PK2	29.4	-25.3	48.67	-	-	74	-25.33	1	101	H
* 1.322	32.96	MAv1	29.4	-25.4	36.96	54	-17.04	-	-	1	101	H
* 3.926	42.57	PK2	33.5	-32	44.07	-	-	74	-29.93	1	101	H
* 3.928	31.22	MAv1	33.5	-32	32.72	54	-21.28	-	-	1	101	H
* 4.221	49.94	PK2	33.4	-32	51.34	-	-	74	-22.66	58	102	V
* 4.222	34.59	MAv1	33.4	-32	35.99	54	-18.01	-	-	58	102	V
* 5.4	41.22	PK2	34.5	-30.8	44.92	-	-	74	-29.08	58	102	V
* 5.399	29.54	MAv1	34.5	-30.8	33.24	54	-20.76	-	-	58	102	V
6.391	45.06	PK2	35.7	-31.5	49.26	-	-	-	-	58	102	V
6.393	32.06	MAv1	35.7	-31.5	36.26	-	-	-	-	58	102	V
10.456	25.36	MAv1	37.4	-25.3	37.46	-	-	-	-	1	101	H
10.457	35.99	PK2	37.4	-25.3	48.09	-	-	-	-	1	101	H

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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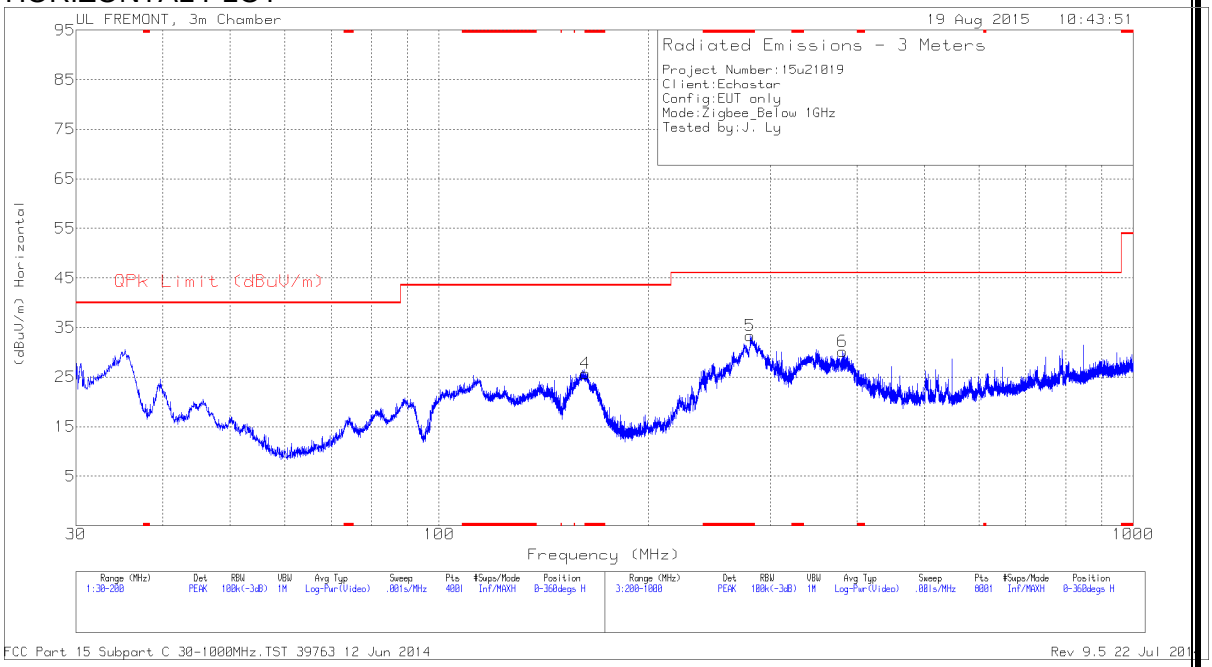
9.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 162.345	39.29	PK	12	-25.6	25.69	43.52	-17.83	0-360	200	H
5	* 280.9	44.4	PK	13.4	-24.5	33.3	46.02	-12.72	0-360	100	H
1	35.27	51.29	PK	17.8	-27.1	41.99	40	1.99	0-360	100	V
2	40.115	49.01	PK	14.2	-27	36.21	40	-3.79	0-360	100	V
3	44.4925	47.22	PK	11.1	-27	31.32	40	-8.68	0-360	100	V
6	381.6	39.84	PK	15	-24.7	30.14	46.02	-15.88	0-360	100	H

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

PK - Peak detector

Radiated Emissions

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 162.2879	35.13	QP	12	-25.6	21.53	43.52	-21.99	117	161	H
* 280.8214	39.6	QP	13.4	-24.5	28.5	46.02	-17.52	143	114	H
35.3362	48.81	QP	17.7	-27.1	39.41	40	-.59	42	100	V

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

* Decreases with the logarithm of the frequency.

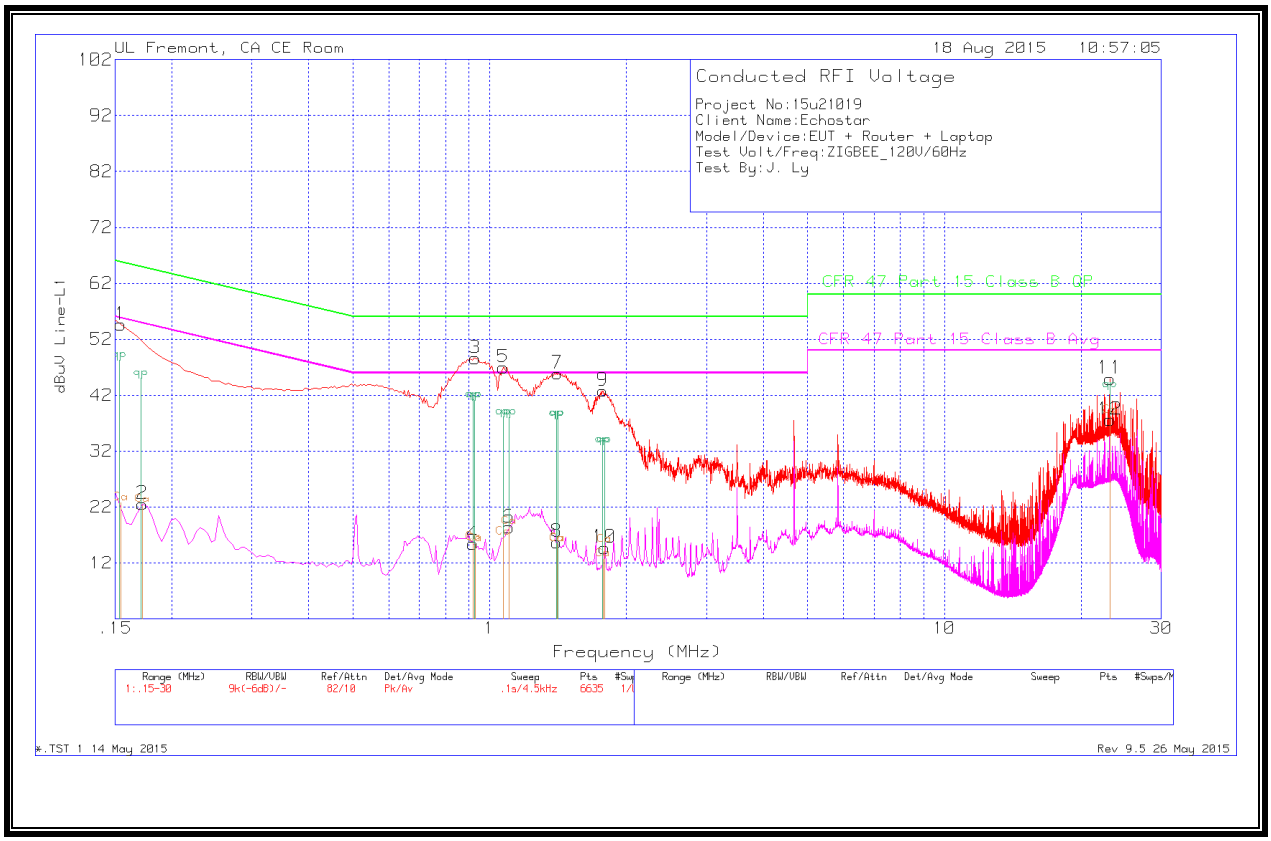
TEST PROCEDURE

ANSI C63.10 - 2009

RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



Trace Markers

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
1	.1545	53.3	Pk	1.3	0	54.6	65.75	-11.15	-	-
2	.1725	21.45	Av	1.1	0	22.55	-	-	54.84	-32.29
3	.9285	48.3	Pk	.3	0	48.6	56	-7.4	-	-
4	.9195	15.01	Av	.3	.1	15.41	-	-	46	-30.59
5	1.0725	46.76	Pk	.2	0	46.96	56	-9.04	-	-
6	1.104	18.16	Av	.2	0	18.36	-	-	46	-27.64
7	1.41	45.57	Pk	.2	.1	45.87	56	-10.13	-	-
8	1.4055	15.55	Av	.2	0	15.75	-	-	46	-30.25
9	1.7745	42.49	Pk	.2	.1	42.79	56	-13.21	-	-
10	1.788	14.42	Av	.2	.1	14.72	-	-	46	-31.28
11	23.127	44.45	Pk	.3	.2	44.95	60	-15.05	-	-
12	23.127	37.11	Av	.3	.2	37.61	-	-	50	-12.39

Pk - Peak detector
Av - Average detection

Peak/Average/RMS Emissions

Range 1: Line-L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
.15338	21.32	Ca	1.4	0	22.72	-	-	55.81	-33.09
.17138	21.26	Ca	1.1	0	22.36	-	-	54.89	-32.53
.92738	15.03	Ca	.3	0	15.33	-	-	46	-30.67
.92063	15.24	Ca	.3	.1	15.64	-	-	46	-30.36
1.07228	16.38	Ca	.2	0	16.58	-	-	46	-29.42
1.10468	18.21	Ca	.2	0	18.41	-	-	46	-27.59
1.41068	15.03	Ca	.2	.1	15.33	-	-	46	-30.67
1.40528	15.2	Ca	.2	0	15.4	-	-	46	-30.6
1.77338	12.36	Ca	.2	.1	12.66	-	-	46	-33.34
1.78778	14.91	Ca	.2	.1	15.21	-	-	46	-30.79
23.1268	37.82	Ca	.3	.2	38.32	-	-	50	-11.68

Ca - CISPR average detection

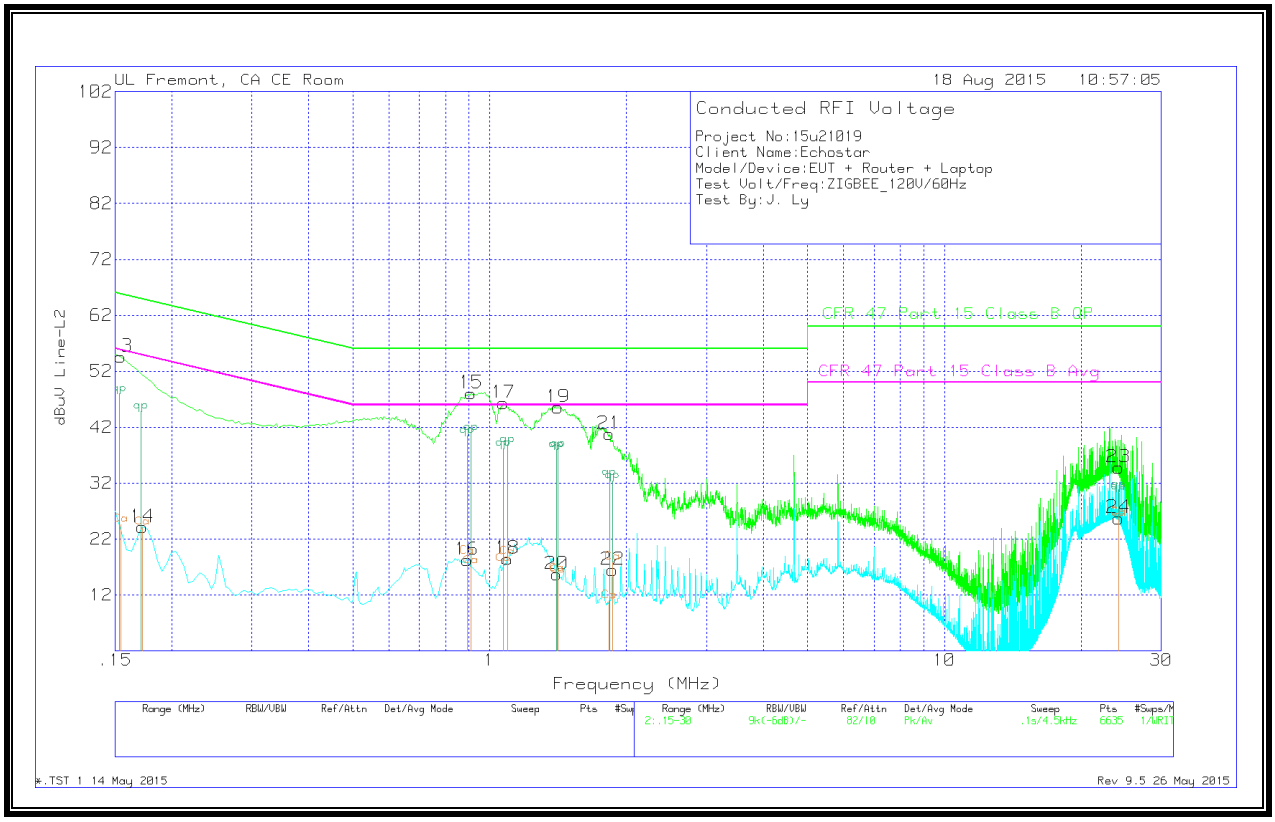
Quasi-Peak Emissions

Range 1: Line-L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
.15338	46.84	Qp	1.4	0	48.24	65.81	-17.57	-	-
.17138	43.93	Qp	1.1	0	45.03	64.89	-19.86	-	-
.92738	40.8	Qp	.3	0	41.1	56	-14.9	-	-
.92063	40.77	Qp	.3	.1	41.17	56	-14.83	-	-
1.07228	37.88	Qp	.2	0	38.08	56	-17.92	-	-
1.10468	37.86	Qp	.2	0	38.06	56	-17.94	-	-
1.41068	37.55	Qp	.2	.1	37.85	56	-18.15	-	-
1.40528	37.57	Qp	.2	0	37.77	56	-18.23	-	-
1.77338	32.79	Qp	.2	.1	33.09	56	-22.91	-	-
1.78778	32.77	Qp	.2	.1	33.07	56	-22.93	-	-
23.1268	42.46	Qp	.3	.2	42.96	60	-17.04	-	-

Qp - Quasi-Peak detector

LINE 2 RESULTS



Trace Markers

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
13	.1545	53.18	Pk	1.4	0	54.58	65.75	-11.17	-	-
14	.1725	22.93	Av	1.2	0	24.13	-	-	54.84	-30.71
15	.9105	47.74	Pk	.3	0	48.04	56	-7.96	-	-
16	.8925	17.97	Av	.3	0	18.27	-	-	46	-27.73
17	1.0725	45.92	Pk	.3	.1	46.32	56	-9.68	-	-
18	1.095	18.15	Av	.3	0	18.45	-	-	46	-27.55
19	1.4145	45.23	Pk	.2	.1	45.53	56	-10.47	-	-
20	1.4055	15.5	Av	.2	0	15.7	-	-	46	-30.3
21	1.833	40.47	Pk	.2	.1	40.77	56	-15.23	-	-
22	1.8645	16.18	Av	.2	.1	16.48	-	-	46	-29.52
23	24.1665	34.21	Pk	.3	.3	34.81	60	-25.19	-	-
24	24.162	25.24	Av	.3	.2	25.74	-	-	50	-24.26

Pk - Peak detector
Av - Average detection

Peak/Average/RMS Emissions

Range 2: Line-L2 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
.15338	23.05	Ca	1.5	0	24.55	-	-	55.81	-31.26
.17138	22.87	Ca	1.2	0	24.07	-	-	54.89	-30.82
.91118	16.85	Ca	.3	0	17.15	-	-	46	-28.85
.89318	18.55	Ca	.3	0	18.85	-	-	46	-27.15
1.07228	17.1	Ca	.3	.1	17.5	-	-	46	-28.5
1.09568	18.48	Ca	.3	0	18.78	-	-	46	-27.22
1.41518	15.15	Ca	.2	.1	15.45	-	-	46	-30.55
1.40438	15.53	Ca	.2	0	15.73	-	-	46	-30.27
1.83368	10.59	Ca	.2	.1	10.89	-	-	46	-35.11
1.86338	17.52	Ca	.2	.1	17.82	-	-	46	-28.18
24.1663	25.28	Ca	.3	.3	25.88	-	-	50	-24.12
24.1631	25.17	Ca	.3	.2	25.67	-	-	50	-24.33

Ca - CISPR average detection

Quasi-Peak Emissions

Range 2: Line-L2 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	Margin (dB)	CFR 47 Part 15 Class B Avg	Margin (dB)
.15338	46.45	Qp	1.5	0	47.95	65.81	-17.86	-	-
.17138	43.61	Qp	1.2	0	44.81	64.89	-20.08	-	-
.91118	40.72	Qp	.3	0	41.02	56	-14.98	-	-
.89318	40.17	Qp	.3	0	40.47	56	-15.53	-	-
1.07228	37.79	Qp	.3	.1	38.19	56	-17.81	-	-
1.09568	38.56	Qp	.3	0	38.86	56	-17.14	-	-
1.41518	37.8	Qp	.2	.1	38.1	56	-17.9	-	-
1.40438	37.74	Qp	.2	0	37.94	56	-18.06	-	-
1.83368	32.64	Qp	.2	.1	32.94	56	-23.06	-	-
1.86338	32.06	Qp	.2	.1	32.36	56	-23.64	-	-
24.1663	30.2	Qp	.3	.3	30.8	60	-29.2	-	-
24.1631	29.91	Qp	.3	.2	30.41	60	-29.59	-	-

Qp - Quasi-Peak detector