FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1

BLUETOOTH LOW ENERGY
CERTIFICATION TEST REPORT

FOR

PORTABLE COMPUTER

MODEL NUMBER: A1708

FCC ID: BCGA1708
IC: 579C-A1708

REPORT NUMBER: 16U23796-E2V2

ISSUE DATE: OCTOBER 17, 2016

Prepared for
APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	09/22/2016	Initial Issue	Mengistu Mekuria
V2	10/17/2016	Re-measured power	Eric Yu

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: PORTABLE COMPUTER

MODEL: A1708

SERIAL NUMBER: C02RT00FH4RK

DATE TESTED: JULY 29 – OCTOBER 17, 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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SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

JINGANG LI
EMC ENGINEER
UL VERIFICATION SERVICES INC.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v03r05, ANSI C63.10-2013, 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
☐ Chamber A	☐ Chamber D
☐ Chamber B	☒ Chamber E
☐ Chamber C	☒ Chamber F
	☐ Chamber G
	☐ 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:

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, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance,1000 to 18000 MHz	4.32 dB
Radiated Disturbance,18000 to 26000 MHz	4.45 dB
Radiated Disturbance,26000 to 40000 MHz	5.24 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a laptop device with Bluetooth and WLAN Radios (AC 80 MHZ Beam-Forming).

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	BLE	4.81	3.03

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain Chain 0 (dBi)
2.4	4.2

5.4. SOFTWARE AND FIRMWARE

The firmware version installed in the EUT during testing was v91 c5459

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 output power for PSD and spurious tests was set higher than maximum for the purposes of testing only.

Worst-case data rates as provided by the client were:
Based on the baseline scan, the worst-case data rates were:

BLE: 1 Mbps.

The EUT was investigated with and without AC Charger. And the worst was determined to be EUT with AC Charger. Therefore, all final radiated testing was performed with AC Charger.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC/ DC Adapter	Apple Inc.	A1718	N/A	N/A
Earphone	Apple Inc.	N/A	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	2	SMA	Un-Shielded	0.2	To Spectrum Analyzer
2	DC	1	Lightning	Un-Shielded	2	N/A

I/O CABLES (ABOVE 1G RADIATED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	Lightning	Un-Shielded	2	N/A

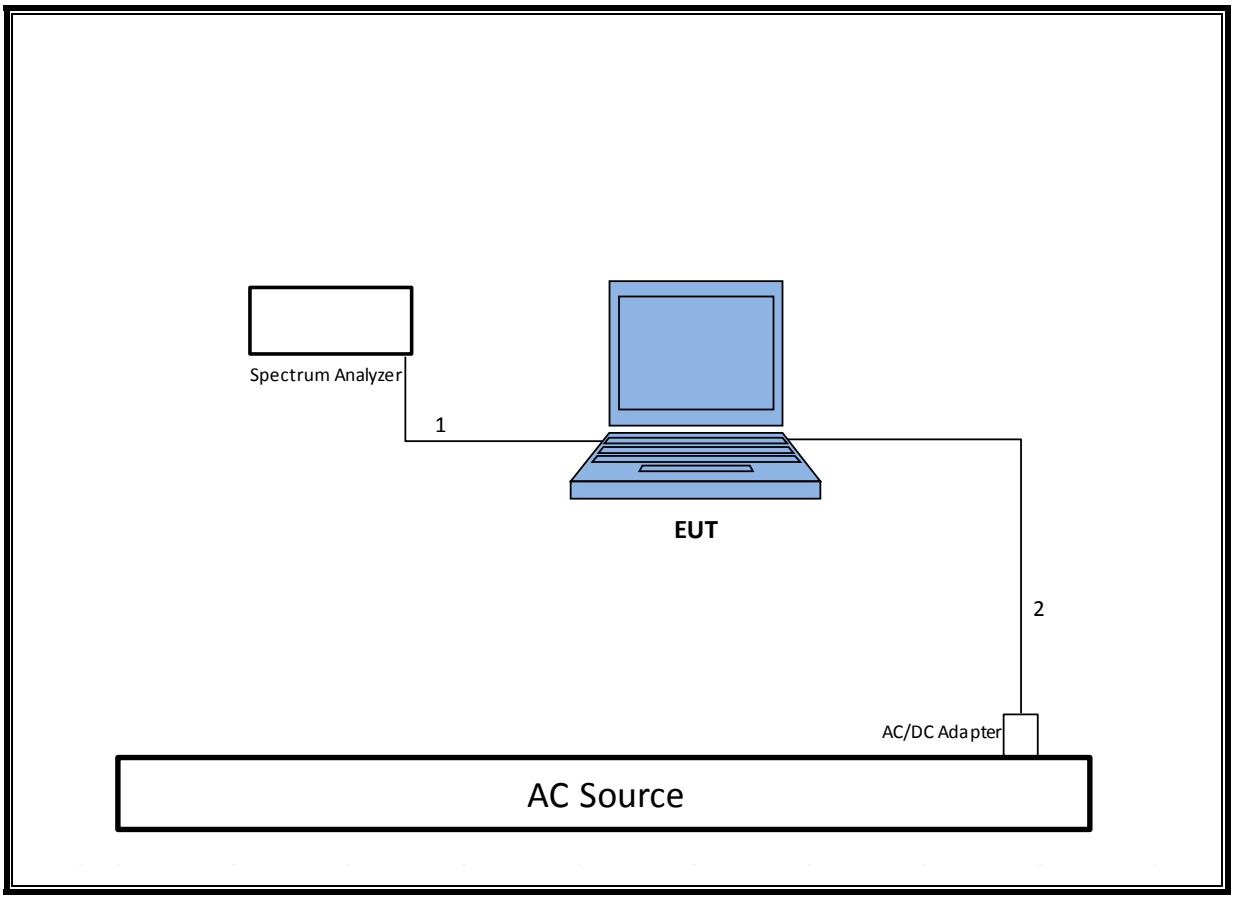
I/O CABLES (BELOW 1G RADIATED AND AC POWER CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	Lightning	Un-Shielded	2	NA
2	Audio	1	Jack	Un-Shielded	0.5	NA

TEST SETUP- CONDUCTED PORT

The EUT was tested connected to spectrum analyzer via antenna port. Test software exercised the EUT.

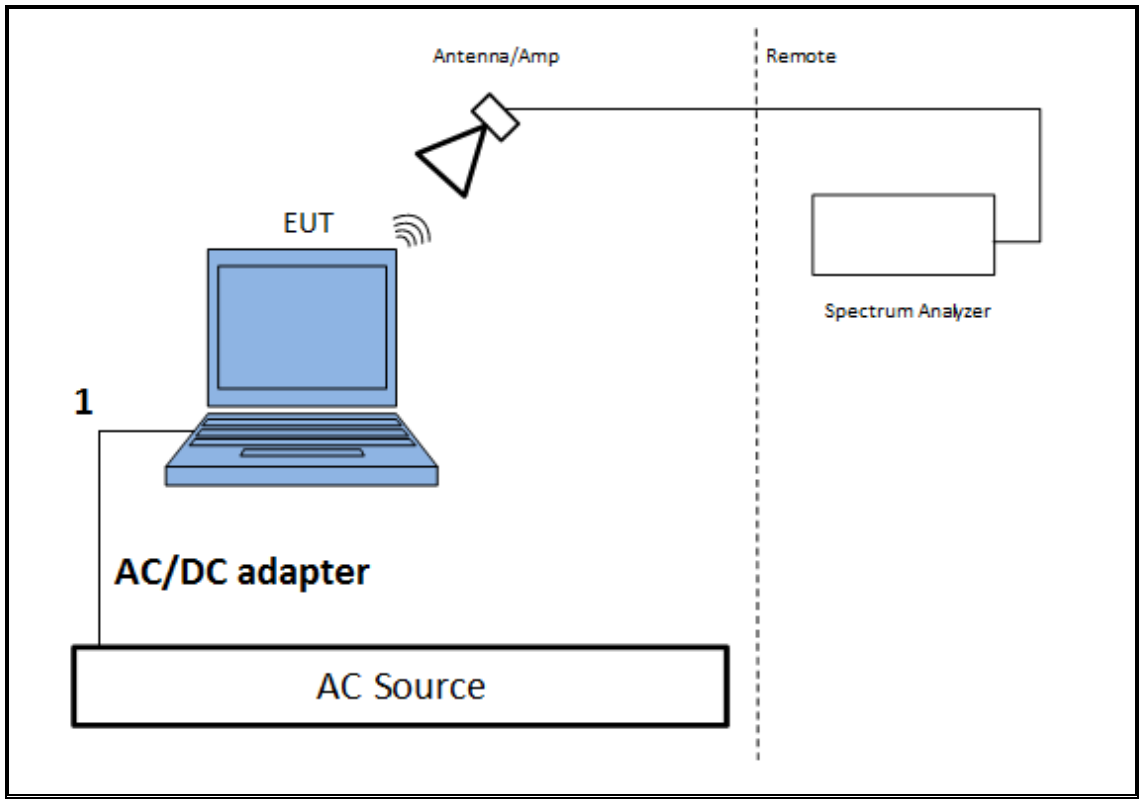
SETUP DIAGRAM



TEST SETUP- RADIATED- ABOVE 1 GHz

The EUT was powered by AC/DC adapter. Test software exercised the EUT.

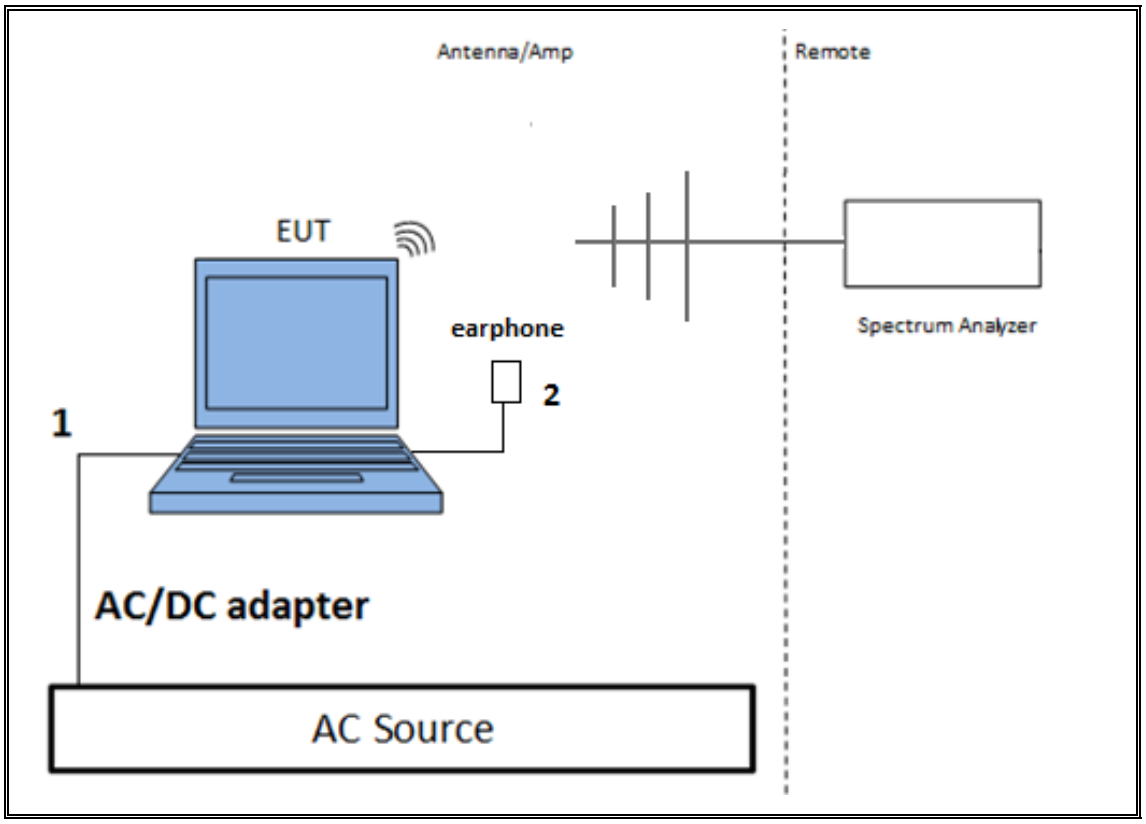
SETUP DIAGRAM



TEST SETUP- RADIATED- BELOW 1 GHz

The EUT was powered by AC/DC adapter and with earphone plugged in. Test software exercised the EUT.

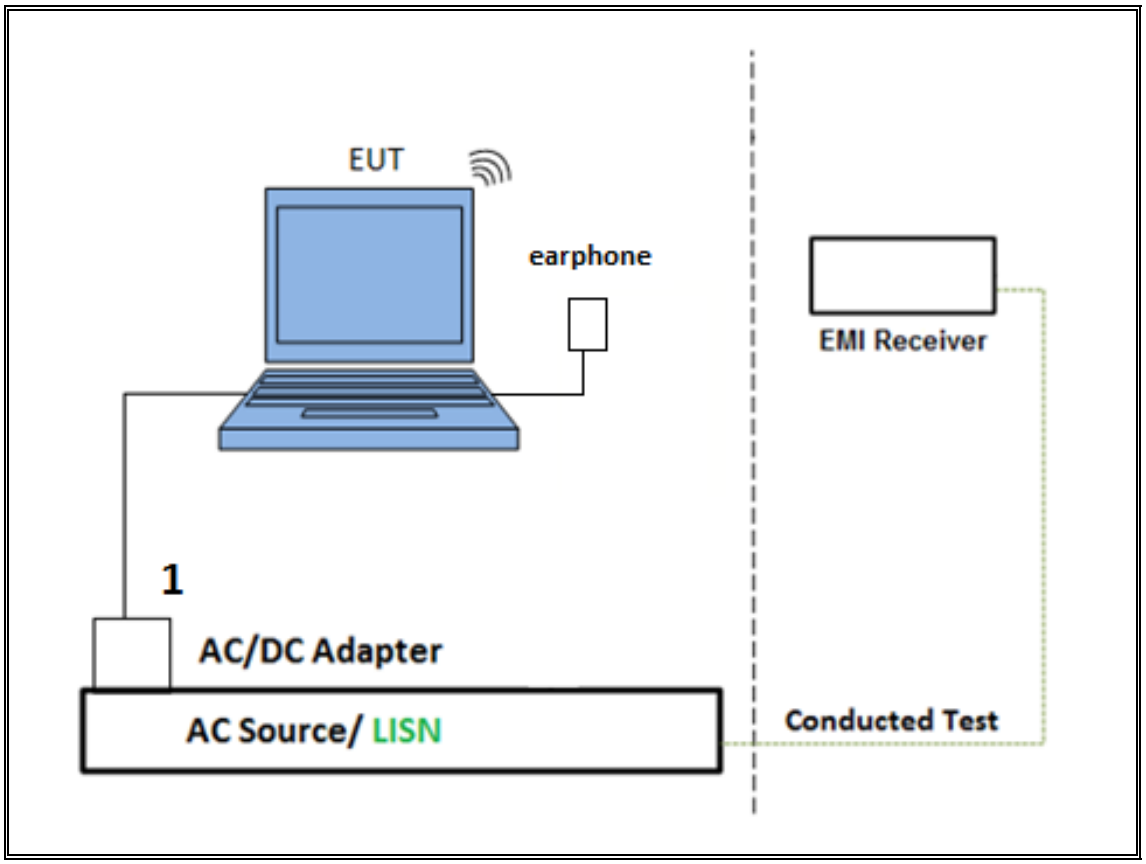
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED TESTS

The EUT was powered by AC/DC adapter and with earphone plugged in. Test software exercised the EUT.

SETUP DIAGRAM



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**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	00154522	1/12/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A022813-1	10/28/2016
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	1782158	1/25/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	323562	5/4/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	MY52350675	11/15/2016
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	MY51380911	10/15/2017
Power Meter, P-series single channel	Agilent	N1911A	GB45100212	9/25/2017
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	MY53260010	7/8/2017
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	209336	5/26/2017
Spectrum Analyzer, 40 GHz	Agilent	8564E	3943A01643	8/14/2017
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	3008A04710	7/5/2017
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	100935	9/10/2017
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2	161124	9/16/2017
Power Cable, Line Conducted Emissions	U L	PG1	N/A	7/28/2017
UL SOFTWARE				
* Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015	
* Conducted Software	UL	UL EMC	Ver 5.0, June 22, 2016	
* AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

Note: * indicates automation software version used in the compliance certification testing

7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

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

Output Power: KDB 558074 D01 v03r05, Section 9.1.2.

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.

Band-edge: KDB 558074 D01 v03r05, Section 12.1.

ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

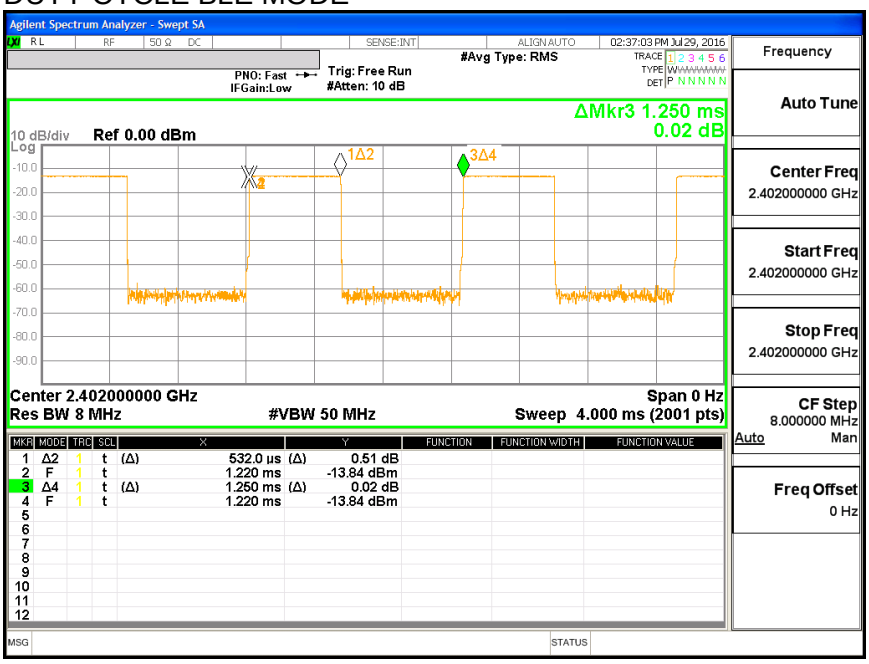
KDB 558074 Zero-Span Spectrum Analyzer Method.

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)
BLE	0.532	1.250	0.426	42.56%	3.71	1.880

DUTY CYCLE PLOTS

DUTY CYCLE BLE MODE



7.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

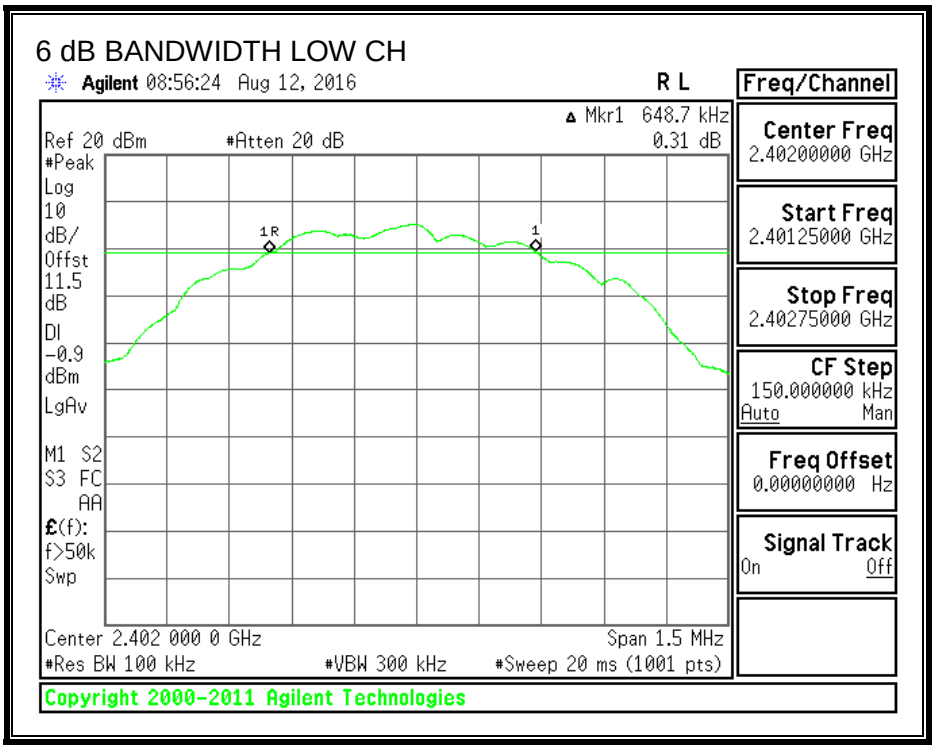
IC RSS-247 (5.2) (1)

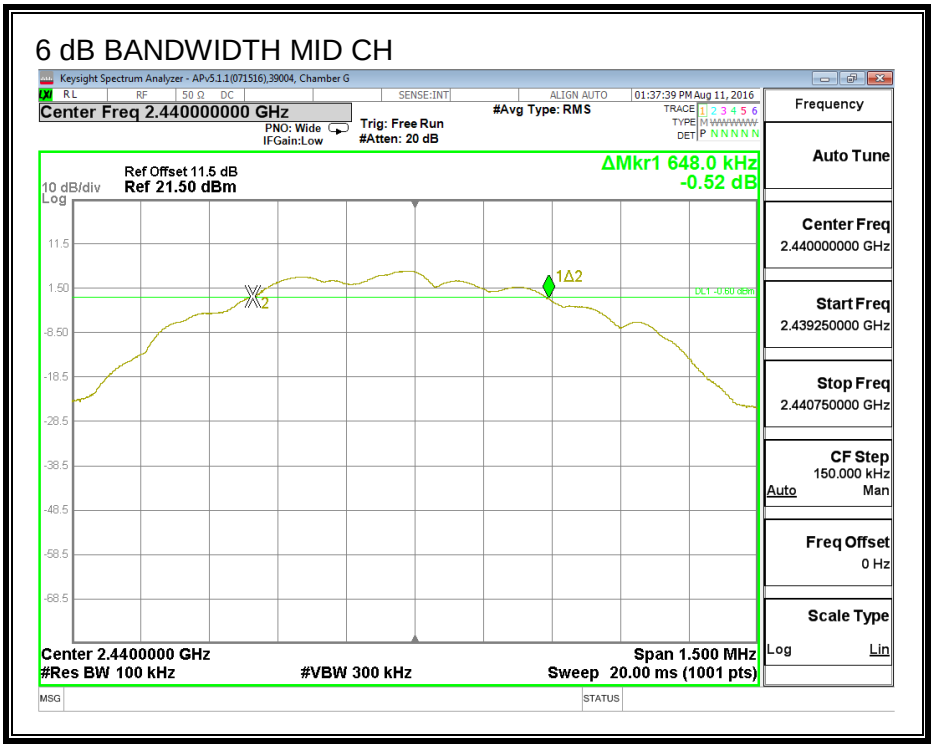
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

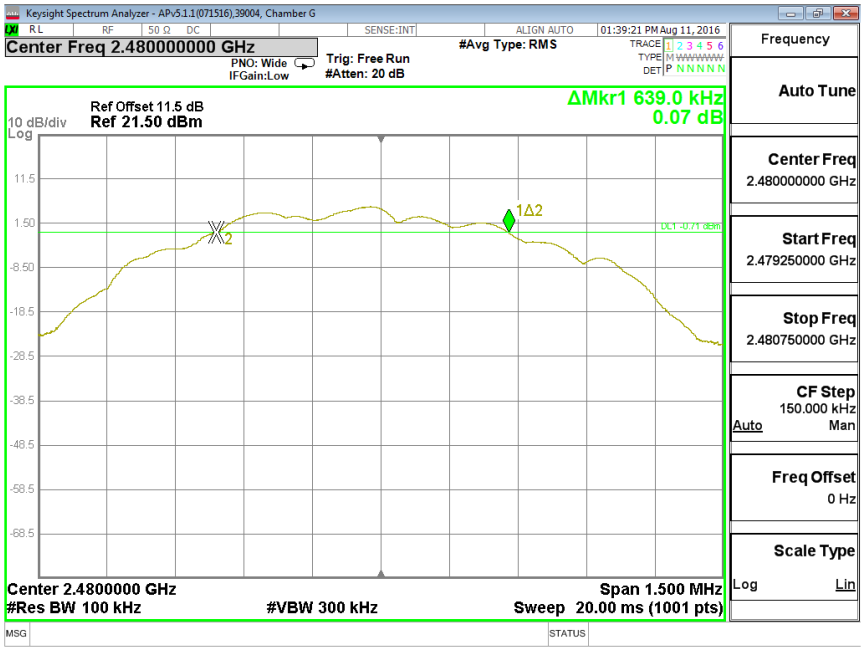
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.649	0.5
Middle	2440	0.648	0.5
High	2480	0.639	0.5

6 dB BANDWIDTH





6 dB BANDWIDTH HIGH CH



7.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

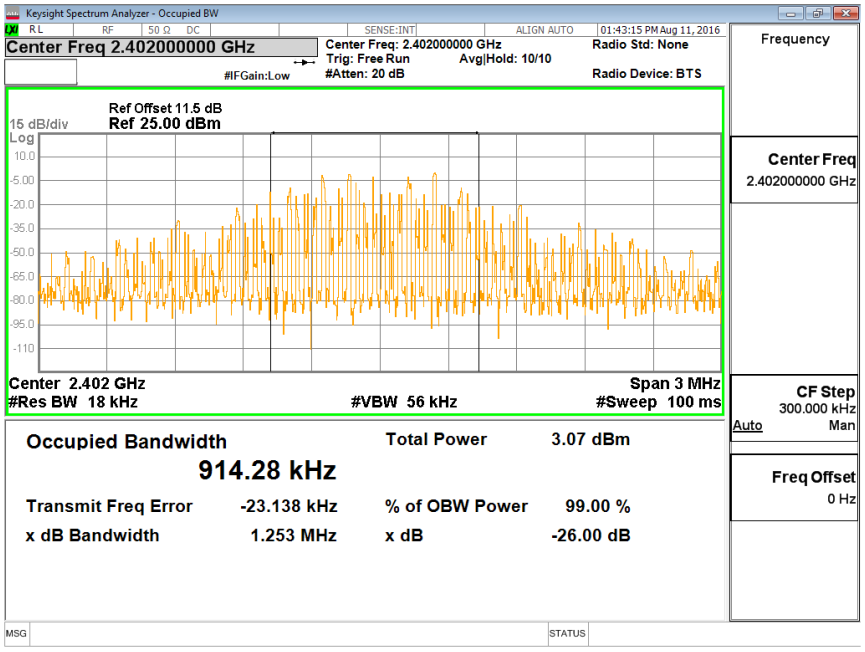
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth or to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

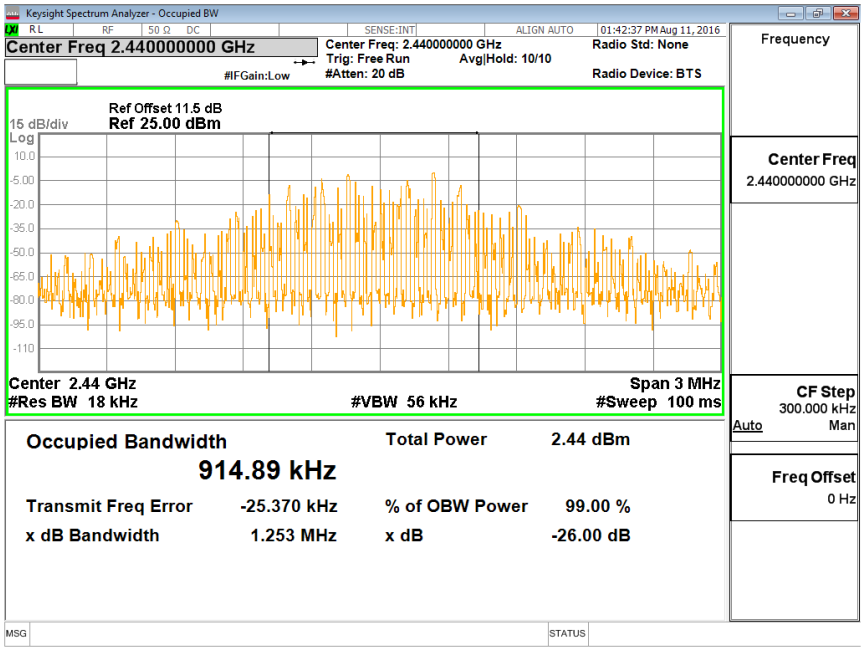
Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	2402	914.28
Middle	2440	914.89
High	2480	898.02

99% BANDWIDTH

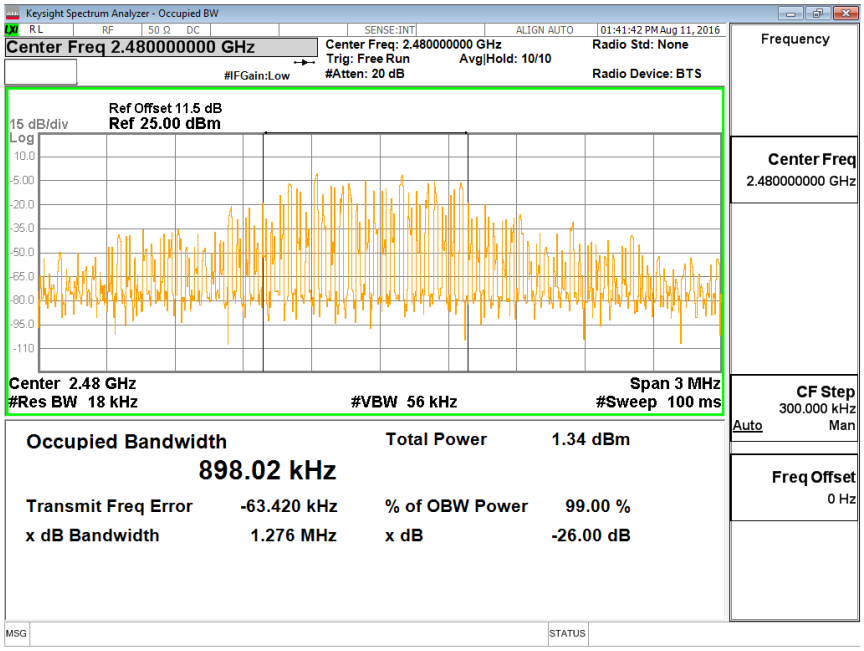
99% BANDWIDTH LOW CH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

ID:	43573	Date:	10/17/16

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.52
Middle	2440	4.58
High	2480	4.67

7.5. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-247 (5.4) (4)

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

RESULTS

ID:	43573	Date:	10/17/16

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.66	30	-25.340
Middle	2440	4.73	30	-25.270
High	2480	4.81	30	-25.190

7.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 (5.2) (2)

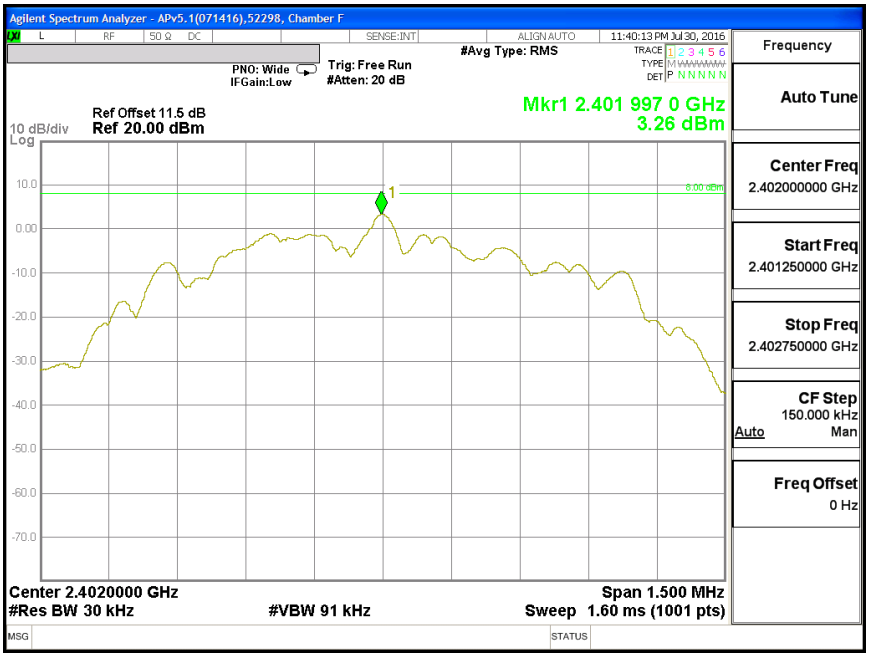
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

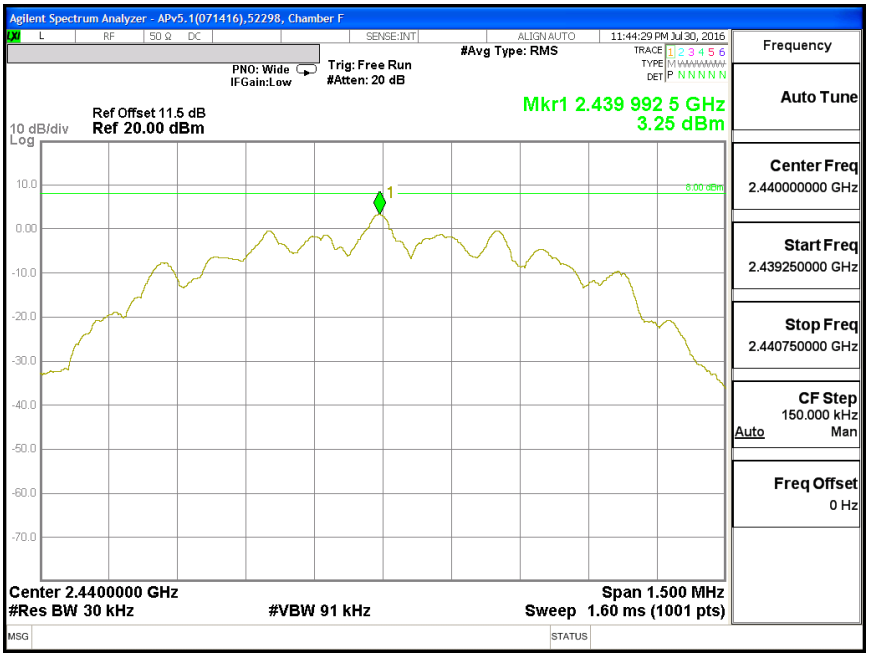
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.26	8	-4.74
Middle	2440	3.25	8	-4.75
High	2480	3.36	8	-4.64

POWER SPECTRAL DENSITY

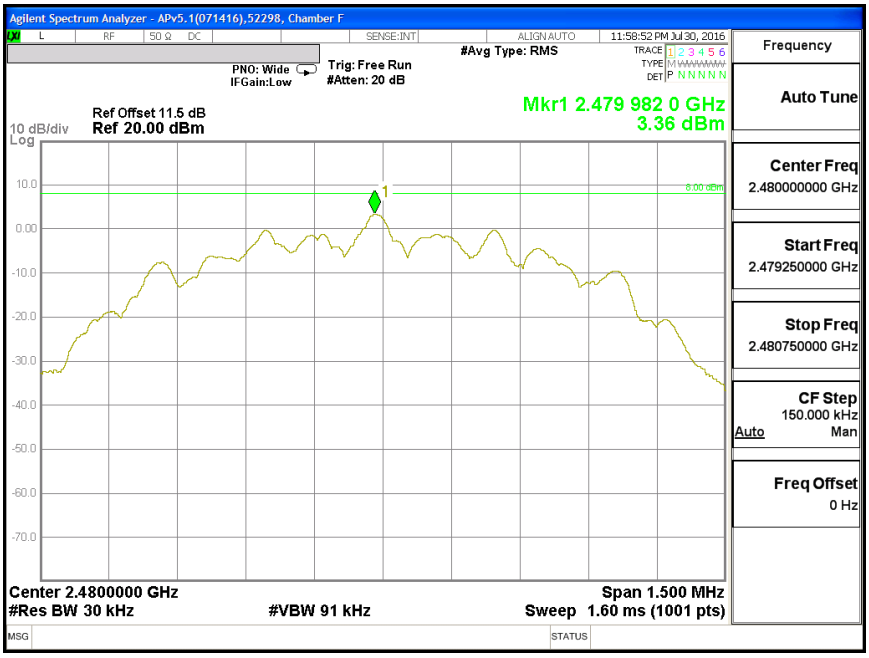
PSD LOW CH



PSD MID CH



PSD HIGH CH



7.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

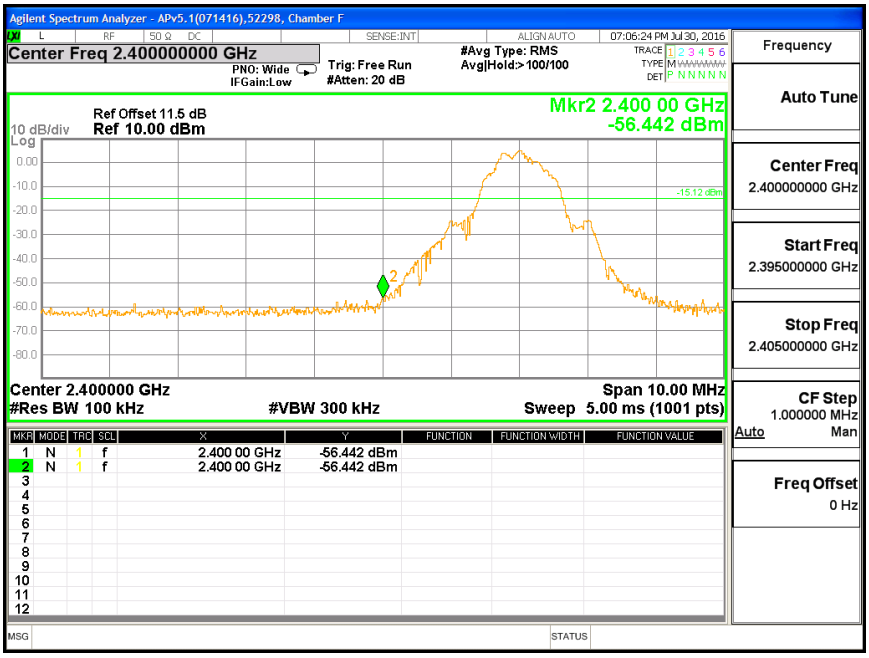
IC RSS-247 (5.5)

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

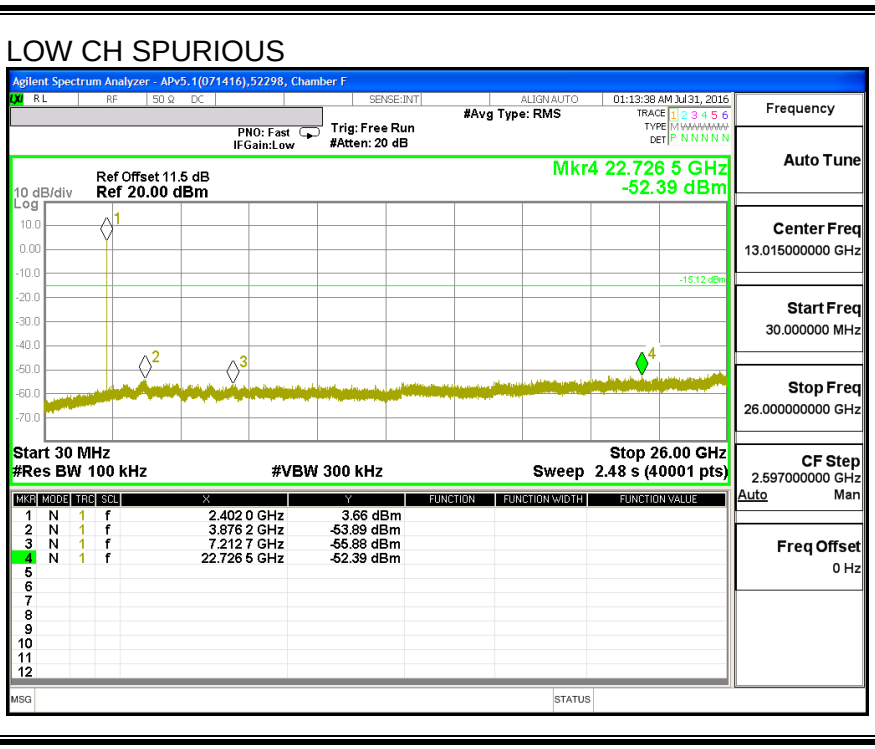
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE

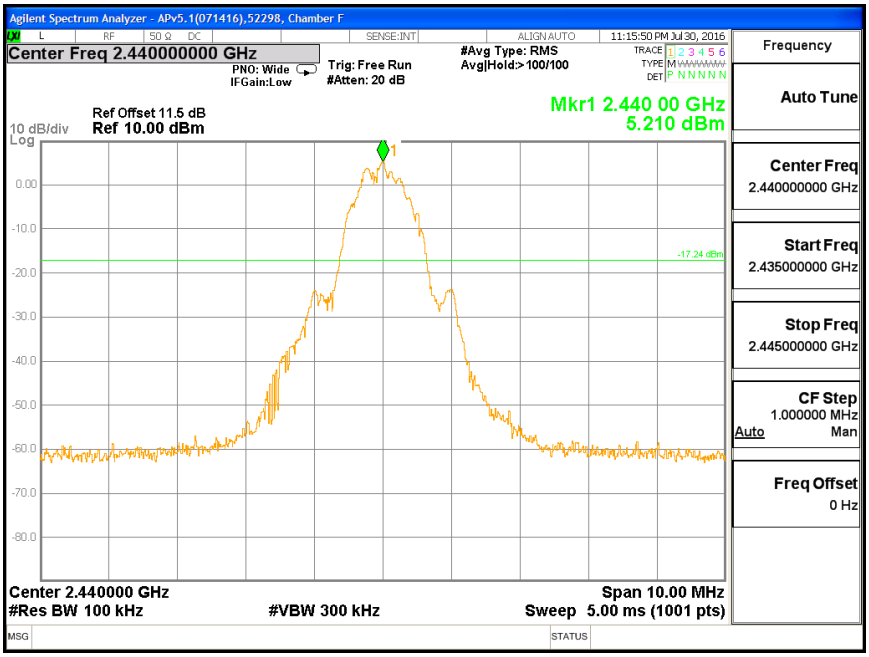


LOW CH SPURIOUS

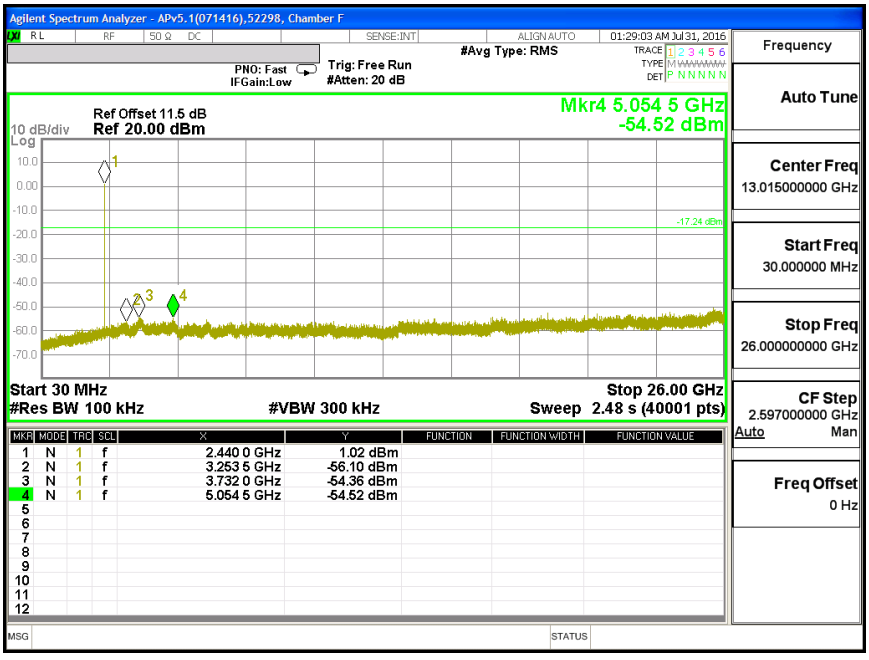


SPURIOUS EMISSIONS, MID CHANNEL

MID CH REFERENCE

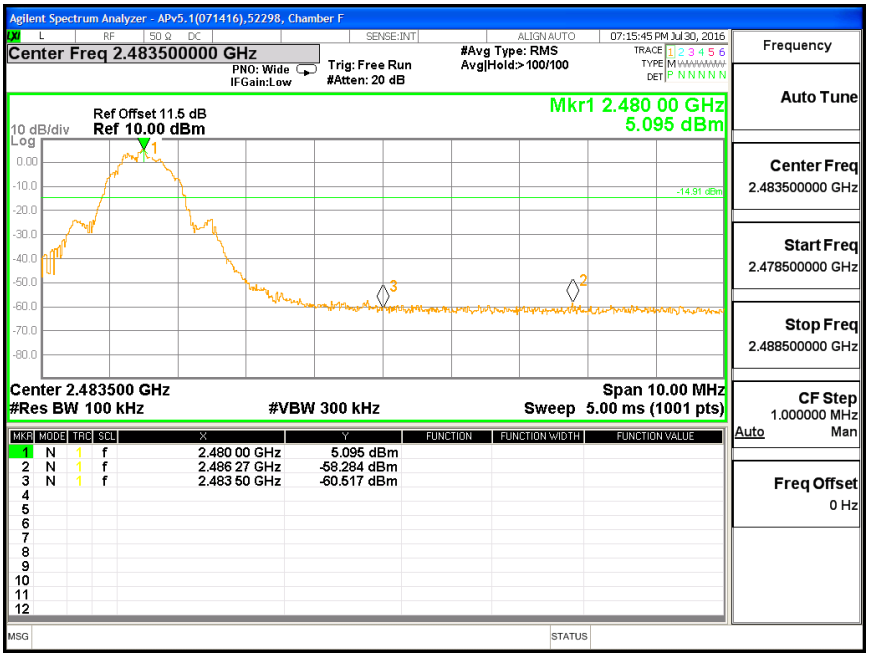


MID CH SPURIOUS

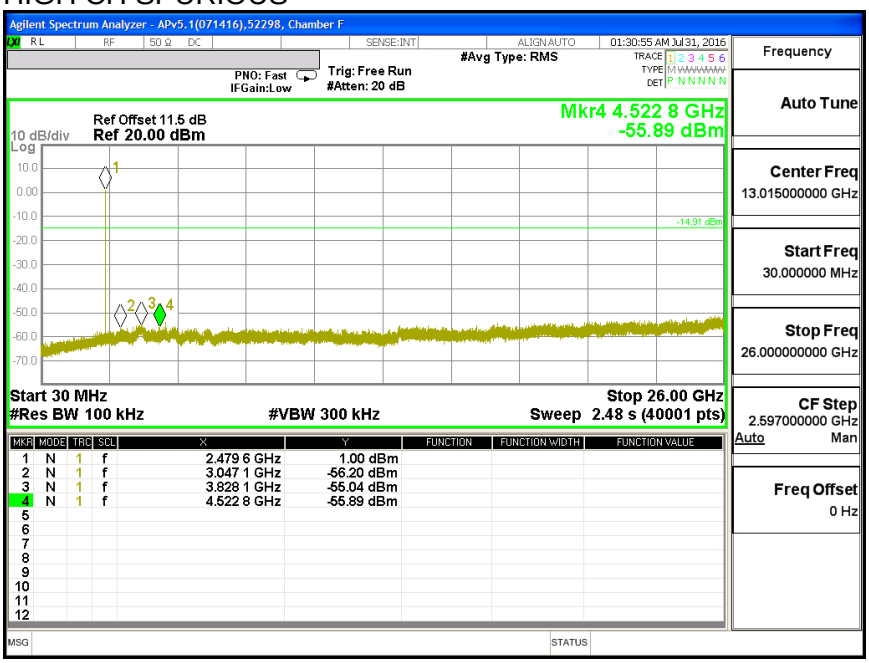


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CH BANDEDGE



HIGH CH SPURIOUS



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

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 measurement below 1GHz; 1.5 m above the ground plane for measurement 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 pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

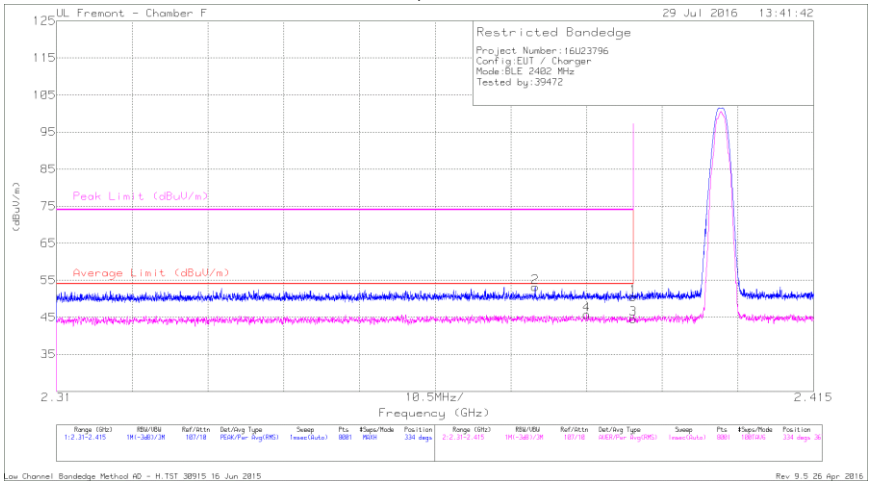
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

8.2. ABOVE 1 GHz

8.2.1. RESTRICTED BANDEDGE

LOW CHANNEL RESTRICTED, HORIZONTAL

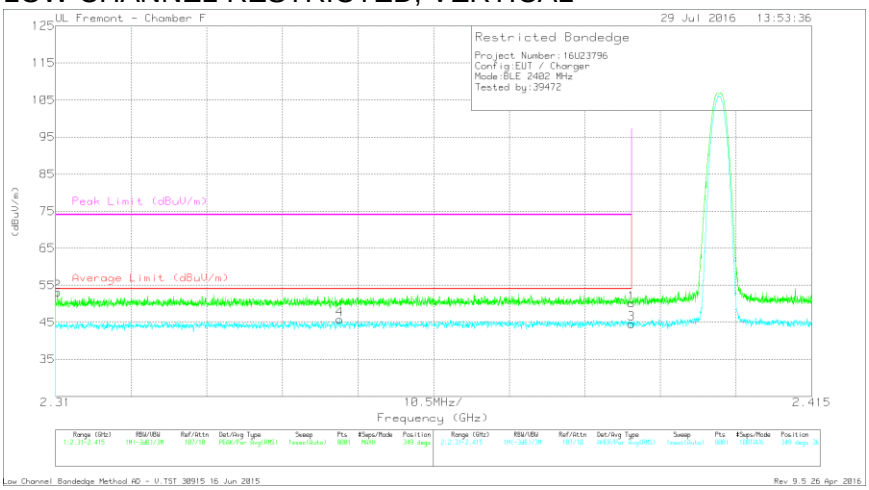


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl/ 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	39.32	Pk	32.1	-20.9	0	50.52	-	-	74	-23.48	334	367	H
2	* 2.376	42	Pk	32.1	-20.9	0	53.2	-	-	74	-20.8	334	367	H
3	* 2.39	29.69	RMS	32.1	-20.9	3.71	44.6	54	-9.4	-	-	334	367	H
4	* 2.384	30.83	RMS	32.1	-20.9	3.71	45.74	54	-8.26	-	-	334	367	H

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

LOW CHANNEL RESTRICTED, VERTICAL

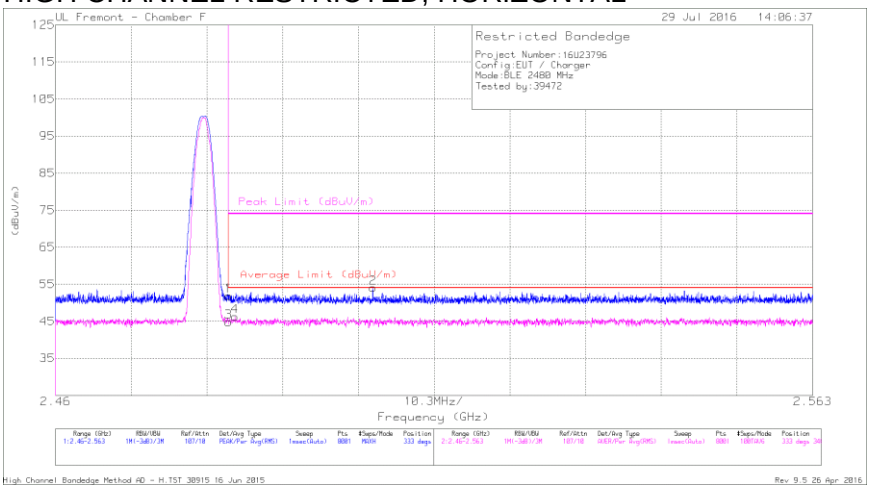


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /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	38.93	Pk	32.1	-20.9	0	50.13	-	-	74	-23.87	349	361	V
2	* 2.31	42.35	Pk	31.7	-20.9	0	53.15	-	-	74	-20.85	349	361	V
3	* 2.39	29.7	RMS	32.1	-20.9	3.71	44.61	54	-9.39	-	-	349	361	V
4	* 2.349	31.1	RMS	31.9	-20.9	3.71	45.81	54	-8.19	-	-	349	361	V

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

HIGH CHANNEL RESTRICTED, HORIZONTAL



DATA

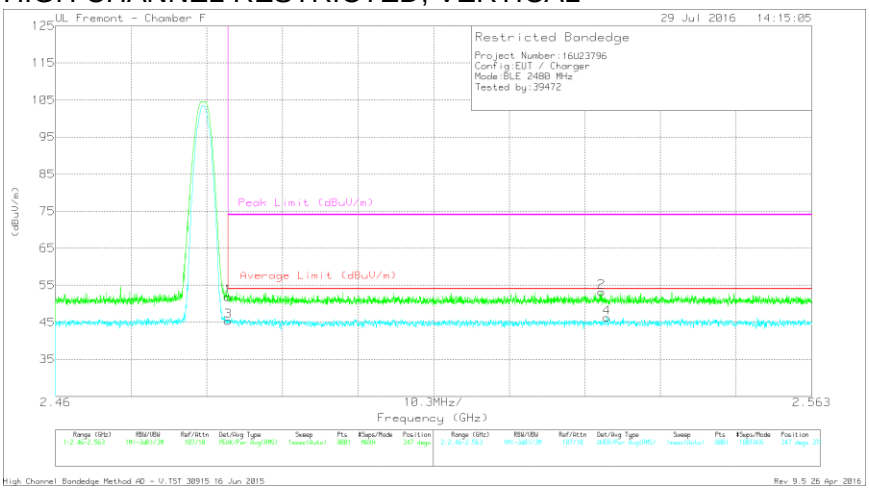
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.56	Pk	32.3	-21	0	51.86	-	-	74	-22.14	333	340	H
2	2.503	42.63	Pk	32.3	-20.9	0	54.03	-	-	74	-19.97	333	340	H
3	* 2.484	29.86	RMS	32.3	-21	3.71	44.87	54	-9.13	-	-	333	340	H
4	* 2.484	31.3	RMS	32.3	-21	3.71	46.31	54	-7.69	-	-	333	340	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

RMS - RMS detection

HIGH CHANNEL RESTRICTED, VERTICAL



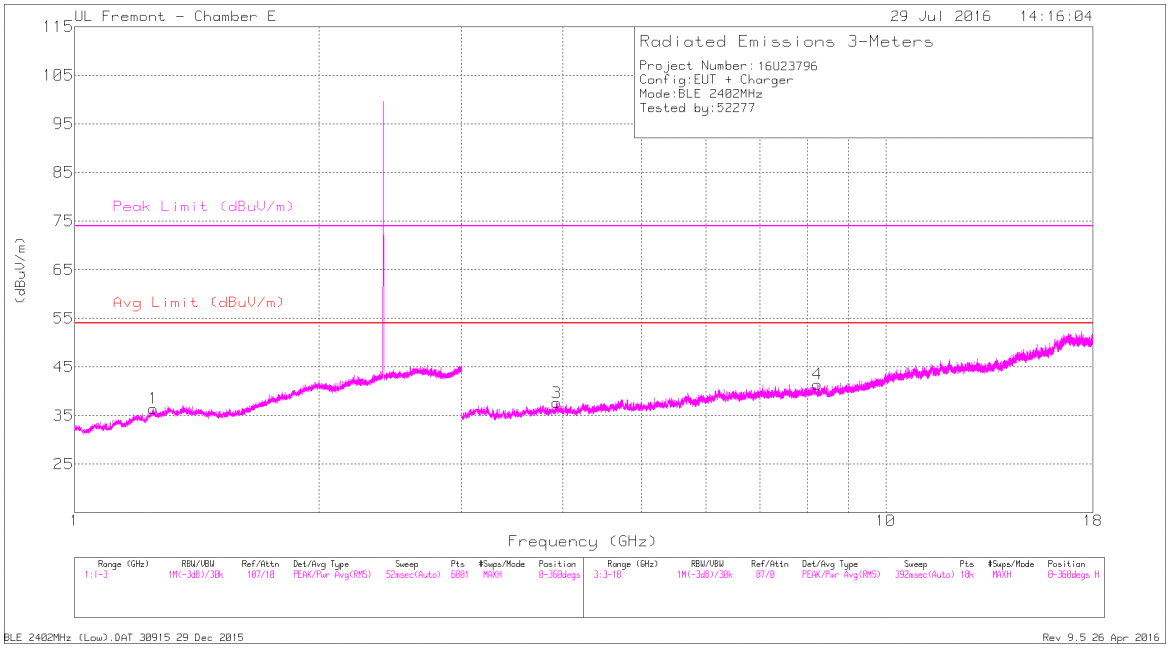
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /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	40.61	Pk	32.3	-21	0	51.91	-	-	74	-22.09	347	378	V
2	2.534	41.84	Pk	32.2	-20.8	0	53.24	-	-	74	-20.76	347	378	V
3	* 2.484	30.39	RMS	32.3	-21	3.71	45.4	54	-8.6	-	-	347	378	V
4	2.535	31.14	RMS	32.2	-20.8	3.71	46.25	54	-7.75	-	-	347	378	V

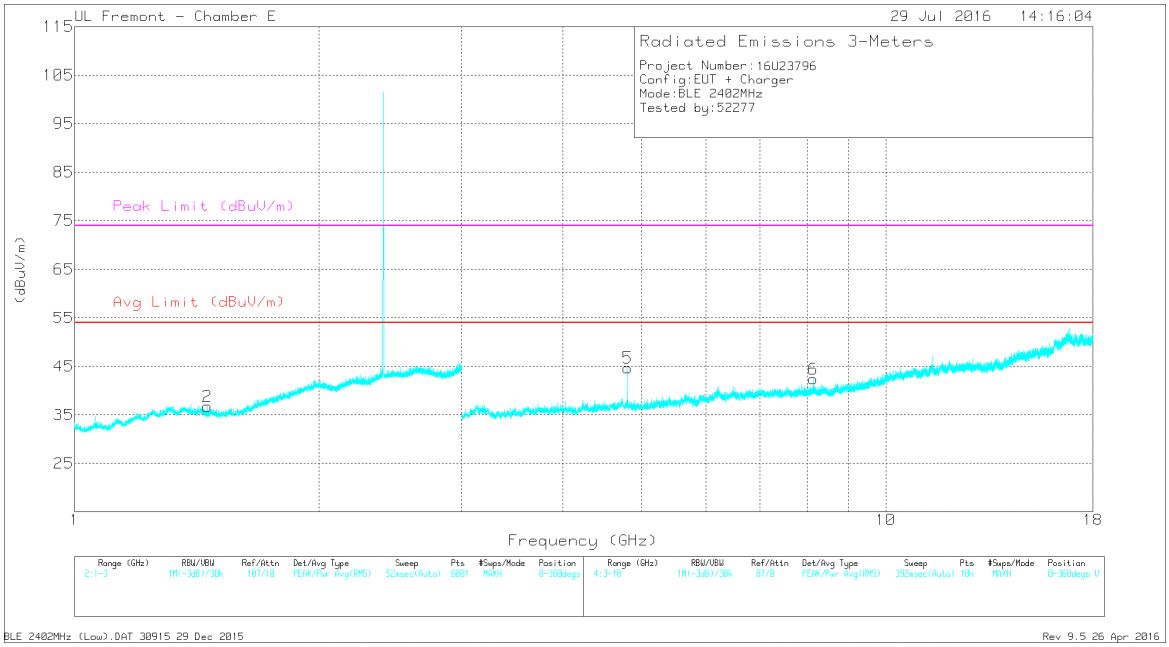
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

8.2.2. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



DATA

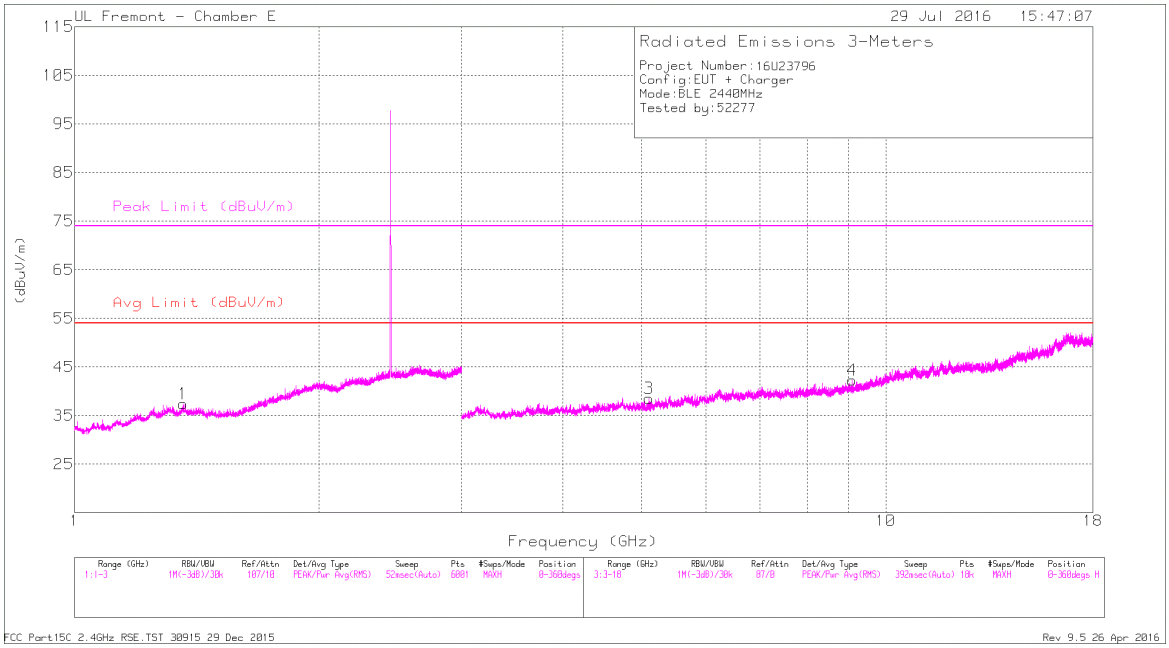
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.251	36.67	PK2	29	-22.6	0	43.07	-	-	74	-30.93	228	173	H
	* 1.25	25.19	MAv1	28.9	-22.6	3.71	35.2	54	-18.8	-	-	228	173	H
2	* 1.458	35.58	PK2	28.3	-21.8	0	42.08	-	-	74	-31.92	53	385	V
	* 1.456	24.69	MAv1	28.3	-21.9	3.71	34.8	54	-19.2	-	-	53	385	V
3	* 3.934	39.9	PK2	33.3	-29.6	0	43.6	-	-	74	-30.4	128	339	H
	* 3.932	29.02	MAv1	33.3	-29.6	3.71	36.43	54	-17.57	-	-	128	339	H
4	* 8.241	38.27	PK2	35.8	-27	0	47.07	-	-	74	-26.93	236	328	H
	* 8.241	27.57	MAv1	35.8	-27	3.71	40.08	54	-13.92	-	-	236	328	H
5	* 4.805	45.97	PK2	34	-29.8	0	50.17	-	-	74	-23.83	154	276	V
	* 4.804	36.63	MAv1	34	-29.8	3.71	44.54	54	-9.46	-	-	154	276	V
6	* 8.133	37.25	PK2	35.7	-25.5	0	47.45	-	-	74	-26.55	158	201	V
	* 8.134	26.27	MAv1	35.7	-25.5	3.71	40.18	54	-13.82	-	-	158	201	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

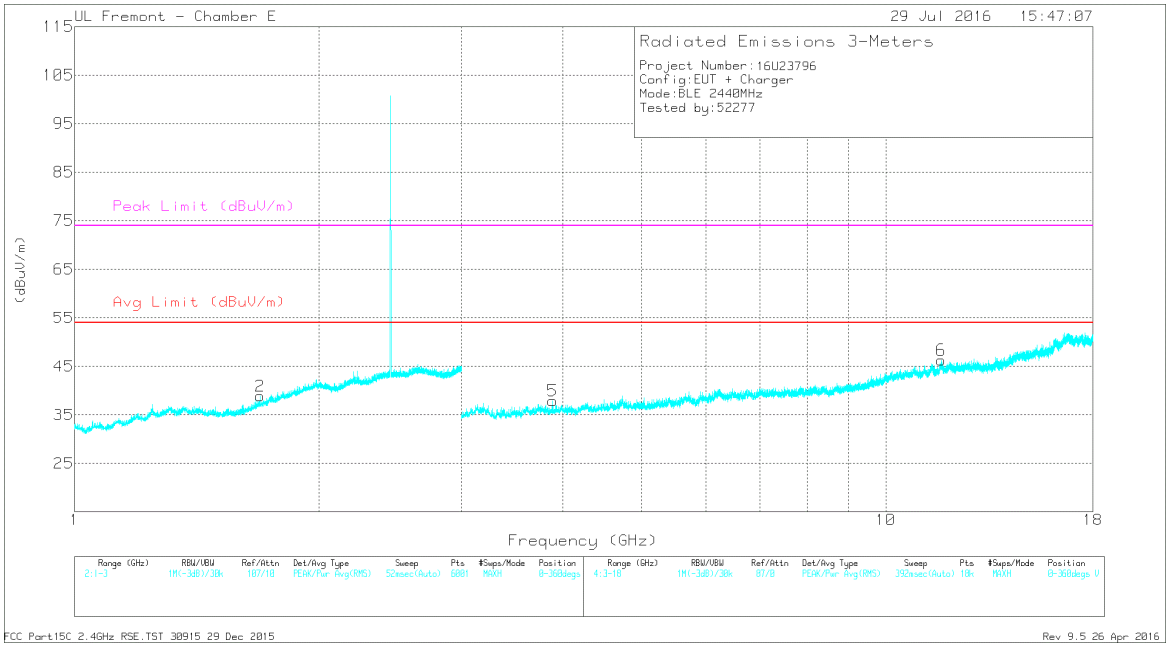
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



DATA

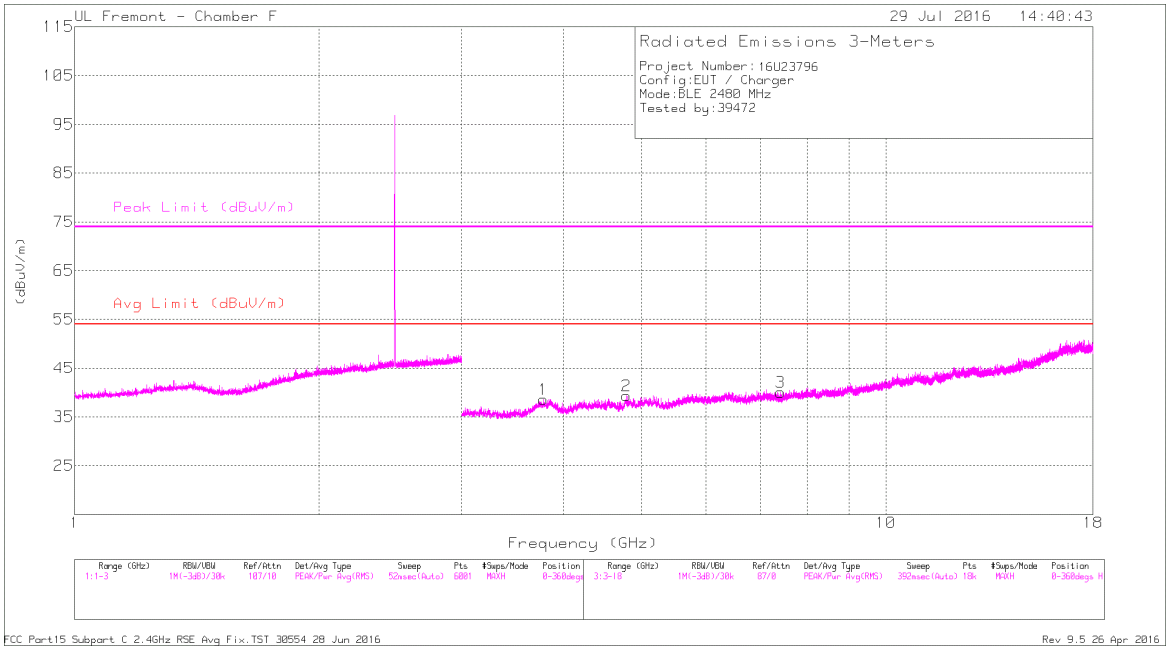
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.362	36.48	PK2	29.2	-22.1	0	43.58	-	-	74	-30.42	207	290	H
	* 1.36	25.24	MAv1	29.2	-22.1	3.71	36.05	54	-17.95	-	-	207	290	H
2	* 1.692	36.37	PK2	29	-21.1	0	44.27	-	-	74	-29.73	263	261	V
	* 1.693	25.05	MAv1	29	-21.1	3.71	36.66	54	-17.34	-	-	263	261	V
3	* 5.107	40.77	PK2	34	-29.9	0	44.87	-	-	74	-29.13	99	339	H
	* 5.103	29.2	MAv1	34	-29.8	3.71	37.11	54	-16.89	-	-	99	339	H
4	* 9.094	37.38	PK2	36.1	-26.2	0	47.28	-	-	74	-26.72	281	263	H
	* 9.091	26.88	MAv1	36.1	-26.2	3.71	40.49	54	-13.51	-	-	281	263	H
5	* 3.885	40.22	PK2	33.3	-30.6	0	42.92	-	-	74	-31.08	261	334	V
	* 3.886	29.72	MAv1	33.3	-30.5	3.71	36.23	54	-17.77	-	-	261	334	V
6	* 11.71	35.79	PK2	38.6	-22.5	0	51.89	-	-	74	-22.11	239	162	V
	* 11.712	25.33	MAv1	38.6	-22.5	3.71	45.14	54	-8.86	-	-	239	162	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

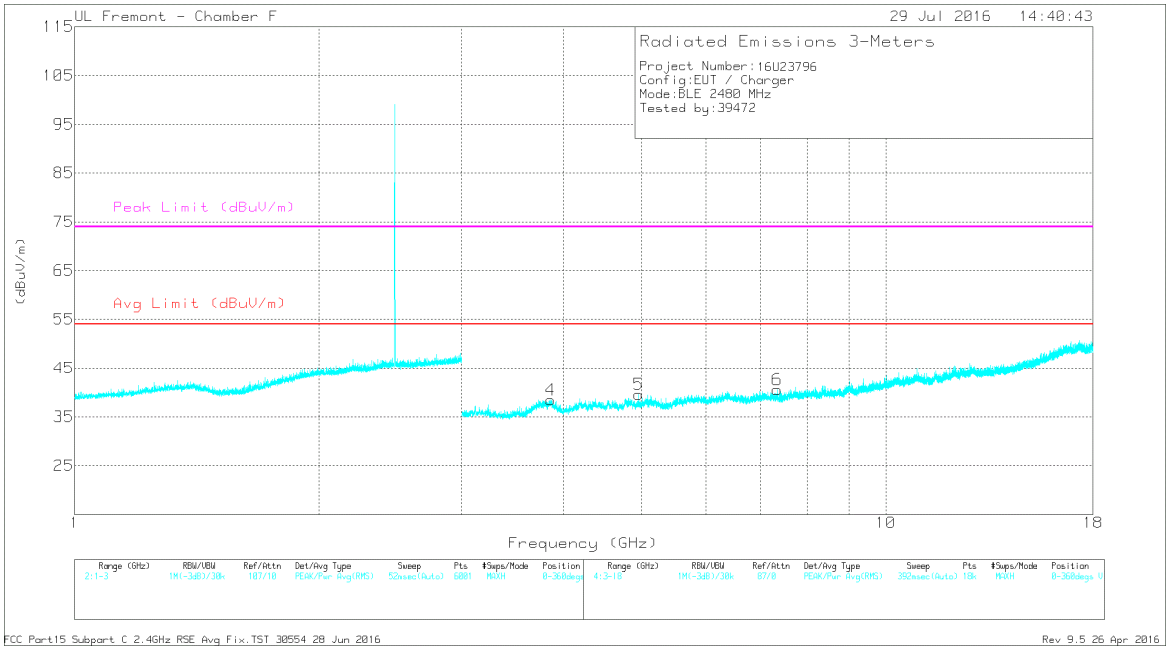
PK3 - FHSS Method: Maximum Peak

VB10Hz - FHSS Method: 10Hz Video Bandwidth

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.781	38	PK2	33.4	-28.9	0	42.5	-	-	74	-31.5	37	225	H
	* 3.782	27.89	MAv1	33.4	-28.9	3.71	36.1	54	-17.9	-	-	37	225	H
2	* 4.961	40.22	PK2	34.2	-28.5	0	45.92	-	-	74	-28.08	324	360	H
	* 4.961	27.81	MAv1	34.2	-28.5	3.71	37.22	54	-16.78	-	-	324	360	H
3	* 7.438	35.93	PK2	35.6	-25.8	0	45.73	-	-	74	-28.27	125	244	H
	* 7.441	25.25	MAv1	35.6	-25.9	3.71	38.66	54	-15.34	-	-	125	244	H
4	* 3.862	39.6	PK2	33.4	-28.2	0	44.8	-	-	74	-29.2	357	321	V
	* 3.862	27.79	MAv1	33.4	-28.2	3.71	36.7	54	-17.3	-	-	357	321	V
5	* 4.96	38.97	PK2	34.2	-28.5	0	44.67	-	-	74	-29.33	17	271	V
	* 4.96	28.46	MAv1	34.2	-28.5	3.71	37.87	54	-16.13	-	-	17	271	V
6	* 7.442	35.54	PK2	35.6	-25.9	0	45.24	-	-	74	-28.76	348	133	V
	* 7.441	25.23	MAv1	35.6	-25.9	3.71	38.64	54	-15.36	-	-	348	133	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

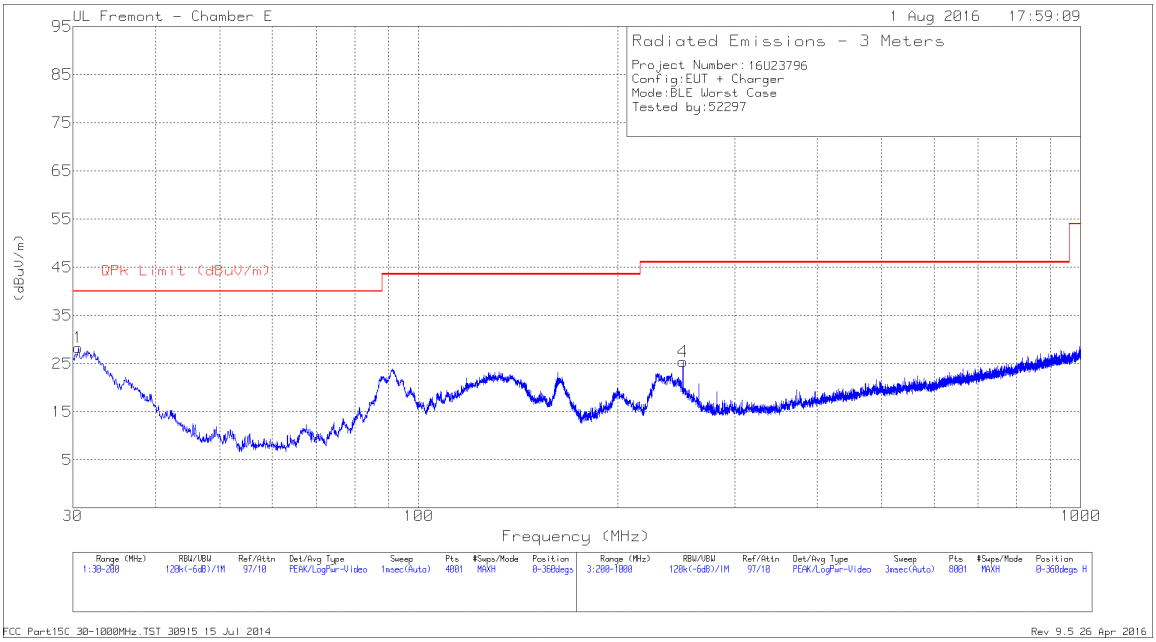
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

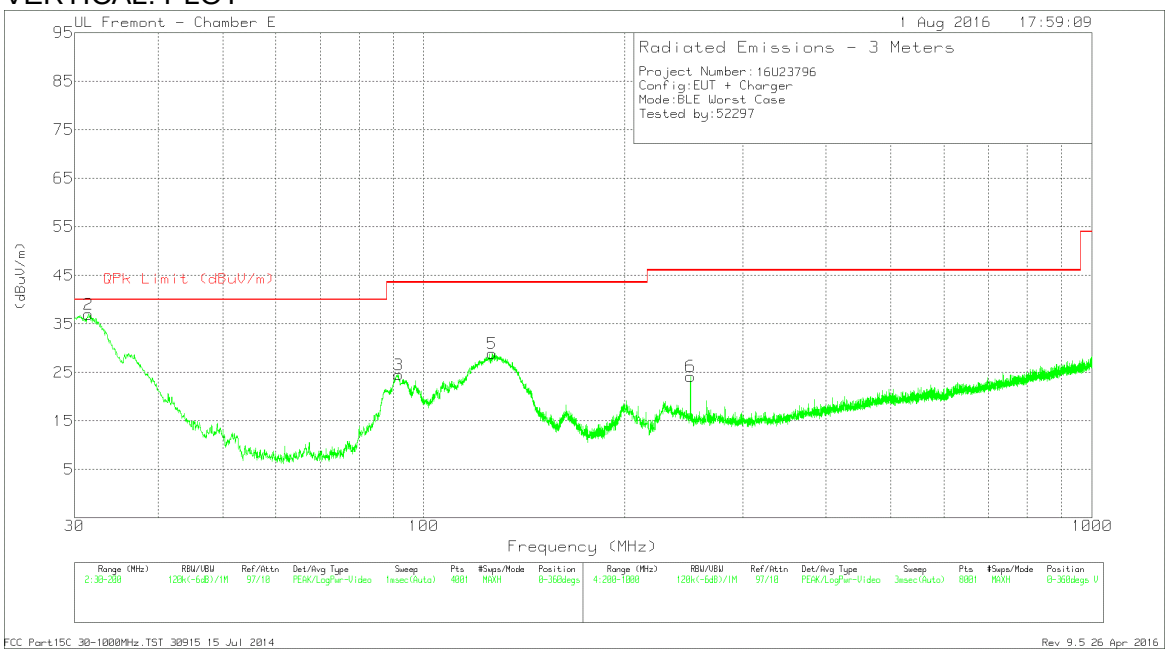
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL: PLOT



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.595	35.44	Pk	24.7	-31.8	28.34	40	-11.66	0-360	299	H
2	31.4875	44.77	Pk	24	-31.8	36.97	40	-3.03	0-360	100	V
	31.490	41.3	Qp	23.9	-31.8	33.4	40	-6.6	40	101	V
3	91.6675	44.01	Pk	11.9	-31.4	24.51	43.52	-19.01	0-360	100	V
4	* 250.7	40.64	Pk	15.4	-30.6	25.44	46.02	-20.58	0-360	100	H
5	* 126.5175	42.08	Pk	18	-31.2	28.88	43.52	-14.64	0-360	100	V
6	* 250.7	39.4	Pk	15.4	-30.6	24.2	46.02	-21.82	0-360	200	V

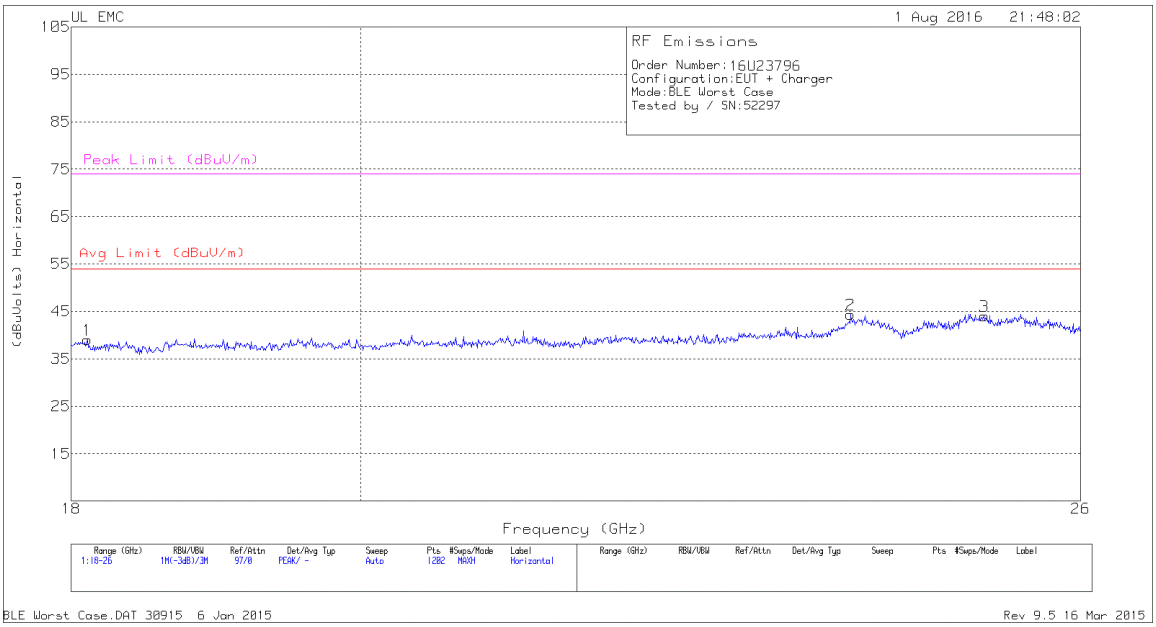
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

Qp - Quasi-Peak detector

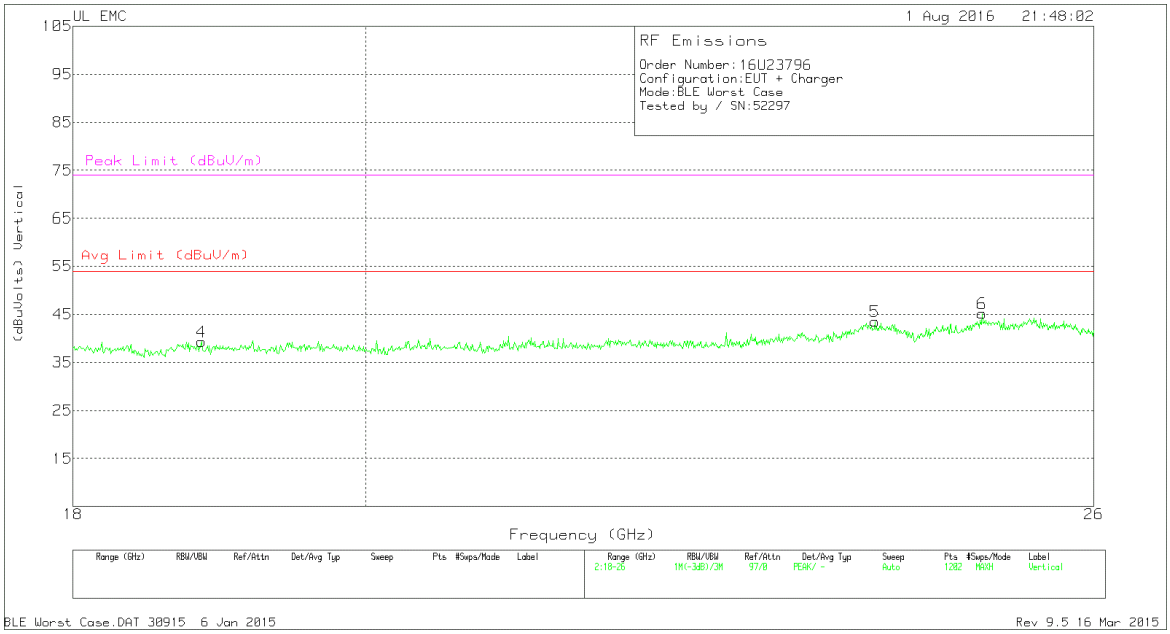
8.4. WORST-CASE 18 to 26 GHz

SPURIOUS EMISSIONS 18 to 26 GHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL: PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T449 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.107	41.5	Pk	32.5	-25.5	-9.5	39	54	-15	74	-35
2	23.908	43.73	Pk	34	-23.9	-9.5	44.33	54	-9.67	74	-29.67
3	25.101	43.6	Pk	34.3	-24.4	-9.5	44	54	-10	74	-30
4	18.853	41.43	Pk	32.5	-25.1	-9.5	39.33	54	-14.67	74	-34.67
5	24.028	43.1	Pk	34	-24.1	-9.5	43.5	54	-10.5	74	-30.5
6	24.974	44.67	Pk	34.2	-24.2	-9.5	45.17	54	-8.83	74	-28.83

PK - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

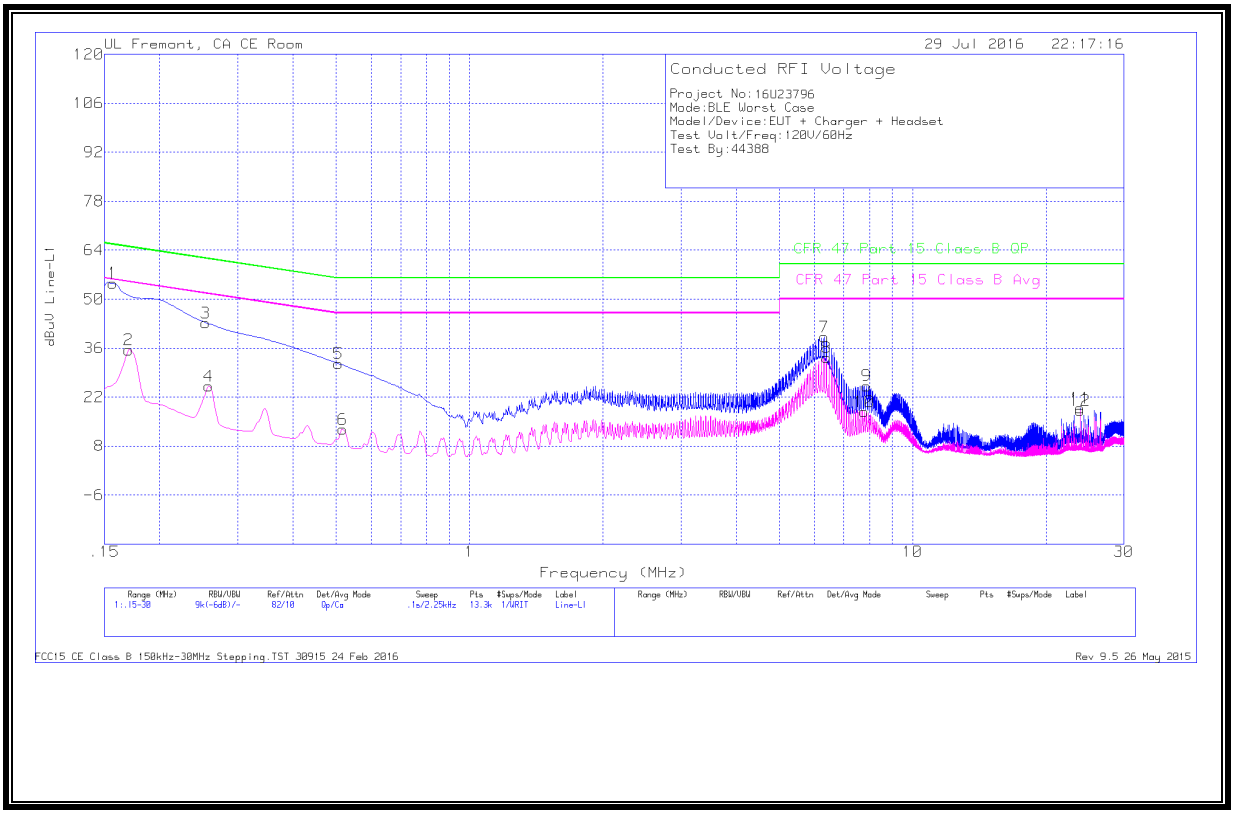
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

EUT POWERED BY AC/DC ADAPTER VIA USB CABLE

LINE 1 RESULTS

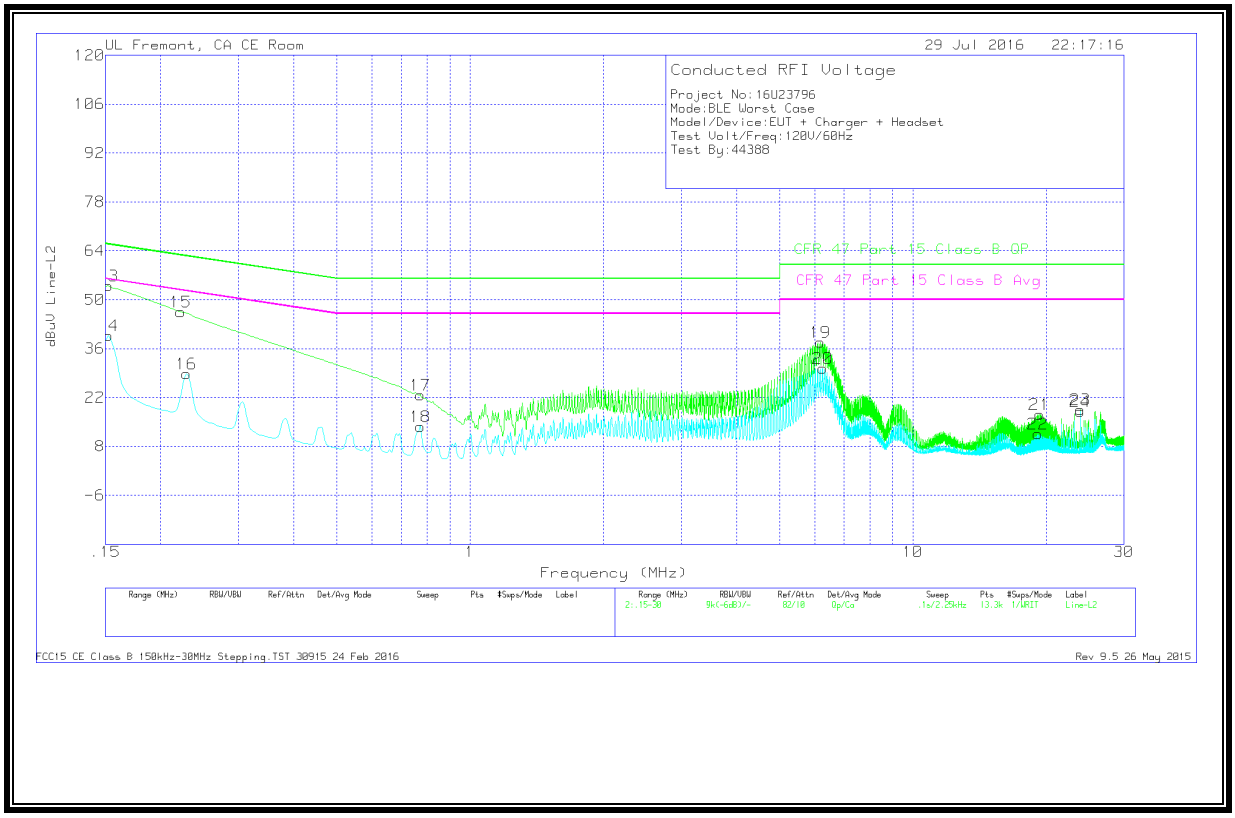


WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables 1&3	Limiter (dB)	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	.15675	44.5	Qp	0	0	10.1	54.6	65.63	-11.03	-	-
2	.17025	25.39	Ca	0	0	10.1	35.49	-	-	54.95	-19.46
3	.2535	33.17	Qp	0	0	10.1	43.27	61.64	-18.37	-	-
4	.258	15.04	Ca	0	0	10.1	25.14	-	-	51.5	-26.36
5	.5055	21.4	Qp	0	0	10.1	31.5	56	-24.5	-	-
6	.51675	2.78	Ca	0	0	10.1	12.88	-	-	46	-33.12
7	6.3105	28.86	Qp	0	.1	10.2	39.16	60	-20.84	-	-
8	6.396	22.96	Ca	0	.1	10.2	33.26	-	-	50	-16.74
9	7.87875	14.93	Qp	0	.1	10.2	25.23	60	-34.77	-	-
10	7.782	7.49	Ca	0	.1	10.2	17.79	-	-	50	-32.21
11	23.919	8.25	Qp	.1	.2	10.4	18.95	60	-41.05	-	-
12	23.919	7.44	Ca	.1	.2	10.4	18.14	-	-	50	-31.86

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables 2&3	Limiter (dB)	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	43.93	Qp	0	0	10.1	54.03	65.88	-11.85	-	-
14	.15225	29.6	Ca	0	0	10.1	39.7	-	-	55.88	-16.18
15	.222	36.4	Qp	0	0	10.1	46.5	62.74	-16.24	-	-
16	.22875	18.66	Ca	0	0	10.1	28.76	-	-	52.49	-23.73
17	.77325	12.56	Qp	0	0	10.1	22.66	56	-33.34	-	-
18	.77325	3.64	Ca	0	0	10.1	13.74	-	-	46	-32.26
19	6.1755	27.51	Qp	0	.1	10.2	37.81	60	-22.19	-	-
20	6.252	20.02	Ca	0	.1	10.2	30.32	-	-	50	-19.68
21	19.32	6.58	Qp	0	.2	10.3	17.08	60	-42.92	-	-
22	19.16925	1.09	Ca	0	.2	10.3	11.59	-	-	50	-38.41
23	23.919	7.8	Qp	.1	.2	10.4	18.5	60	-41.5	-	-
24	23.919	7.24	Ca	.1	.2	10.4	17.94	-	-	50	-32.06

Qp - Quasi-Peak detector
Ca - CISPR average detection