



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

CERTIFICATION TEST REPORT

FOR

APPLE WATCH

MODEL NUMBER: A1553

**FCC ID: BCG-E2870
IC: 579C-E2870**

REPORT NUMBER: 14U19383-E2, REVISION C

ISSUE DATE: MARCH 03, 2015

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

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	02/20/15	Initial Issue	C. Pang
A	02/25/15	Change EUT name	M. Mekuria
B	02/27/15	Revised report to address TCB's questions	T. Chu
C	03/03/15	Revised report to address TCB's questions	T. Chu

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: APPLE WATCH

MODEL: A1553

SERIAL NUMBER: 227LGA-SiP (CONDUCTED), FH7P3054G9HN (ANTENNA 1 RADIATED), FH7P20CSG9HM (ANTENNA 2 RADIATED)

DATE TESTED: DECEMBER 02, 2014 – FEBRUARY 04, 2015

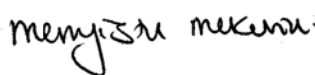
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

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 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 and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

Tested By:



MENGISTU MEKURIA
SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

ROY ZHENG
LAB TECHNICIAN
UL VERIFICATION SERVICES INC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 8.

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an Apple Watch with WLAN, Bluetooth and NFC support.

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	12.12	16.29

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Planar Inverted-F Antenna (PIFA) with a maximum gain as below table:

Frequency Band (GHz)	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)
2.4	-12.1	-12.1

The EUT has one WiFi/BT antenna port. The antenna used in any given unit can be either antenna 1 or antenna 2

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 12.3.1051.1701

The software used in the EUT during Bluetooth FHSS testing was version 12.3.748.1192.

5.5. WORST-CASE CONFIGURATION AND MODE

EUT has 3 types of enclosures and various kinds of metallic and non-metallic wristbands. There are 2 types of metallic bands; Metal Links, and Metal Mesh. Worst case configuration was investigated; and it was found that the stainless steel enclosure and metal mesh wristband was the worst case. All testing are performed on the worst case.

The following configurations were investigated and EUT powered by AC/DC adapter was the worst-case scenario. AC power line and below 1G radiated tests were conducted on configuration 1.

Configuration	Descriptions
1	EUT powered by AC/DC adapter via USB cable with wireless charger
2	EUT powered by host PC via USB cable with wireless charger

Radiated emission, 30-1000MHz and 18-26GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

All testing was performed with the EUT in three orthogonal orientations X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait). It was found that Y-orientation (landscape) was the worst-case.

The EUT has one WiFi/BT antenna port. The antenna used in any given unit can be either antenna 1 or antenna 2. Therefore, all radiated tests were performed on both antennas.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Lenovo	92P1160	11S92P1160Z1ZBGH798B12	N/A
Laptop	Lenovo	7659	L3-AL664 08/03	N/A
Wireless Charger	Apple	A1570	DLC451508N5FTPG3K	BCGA1570
AC/DC adapter	Apple	A1265	1X3276SZZ08QZ	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	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB to mini USB	Shielded	1	To laptop and fixture

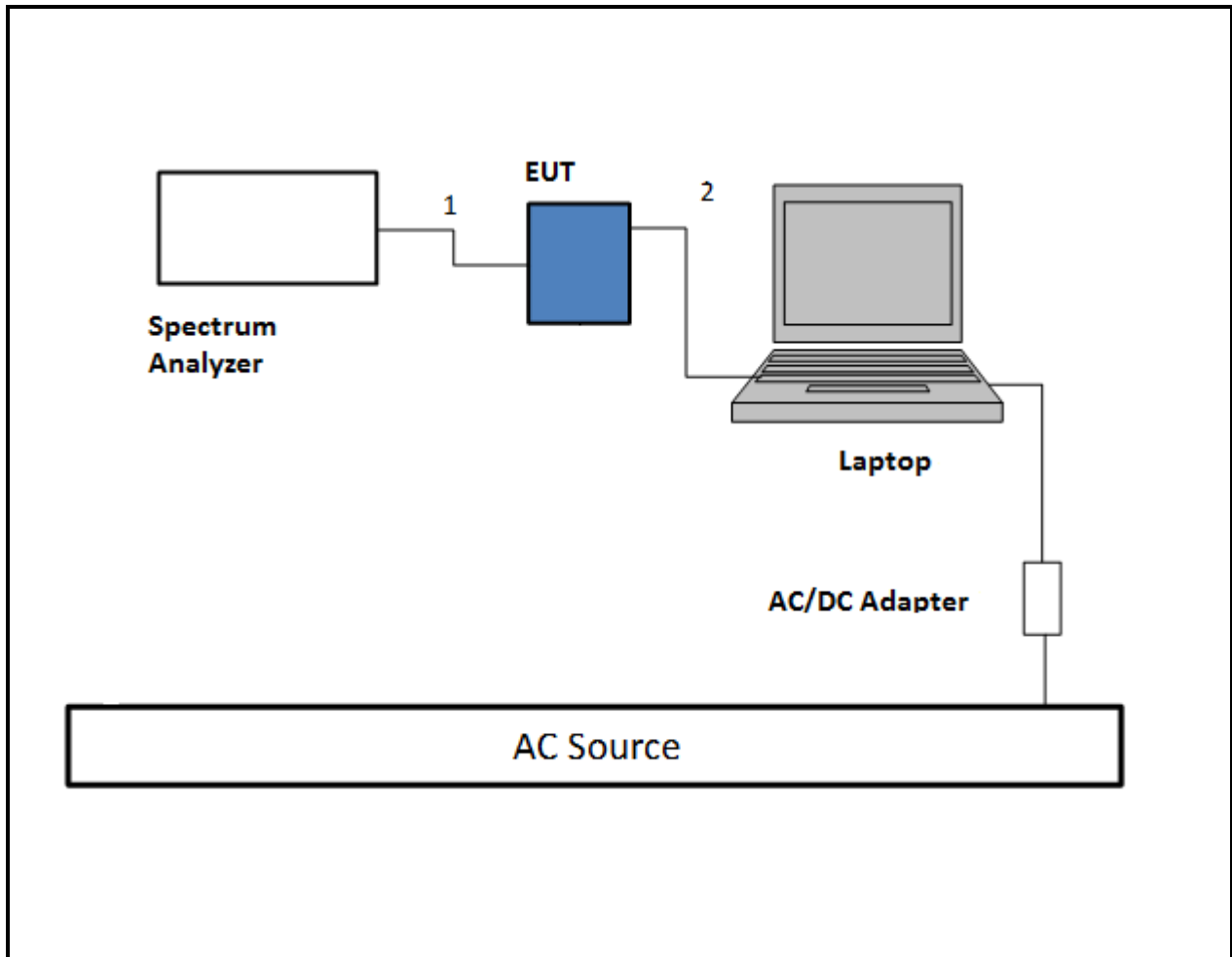
I/O CABLES (BELOW 1G RADIATED AND AC POWERLINE CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	Un-Shielded	2	To AC/DC adapter

TEST SETUP- CONDUCTED PORT

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

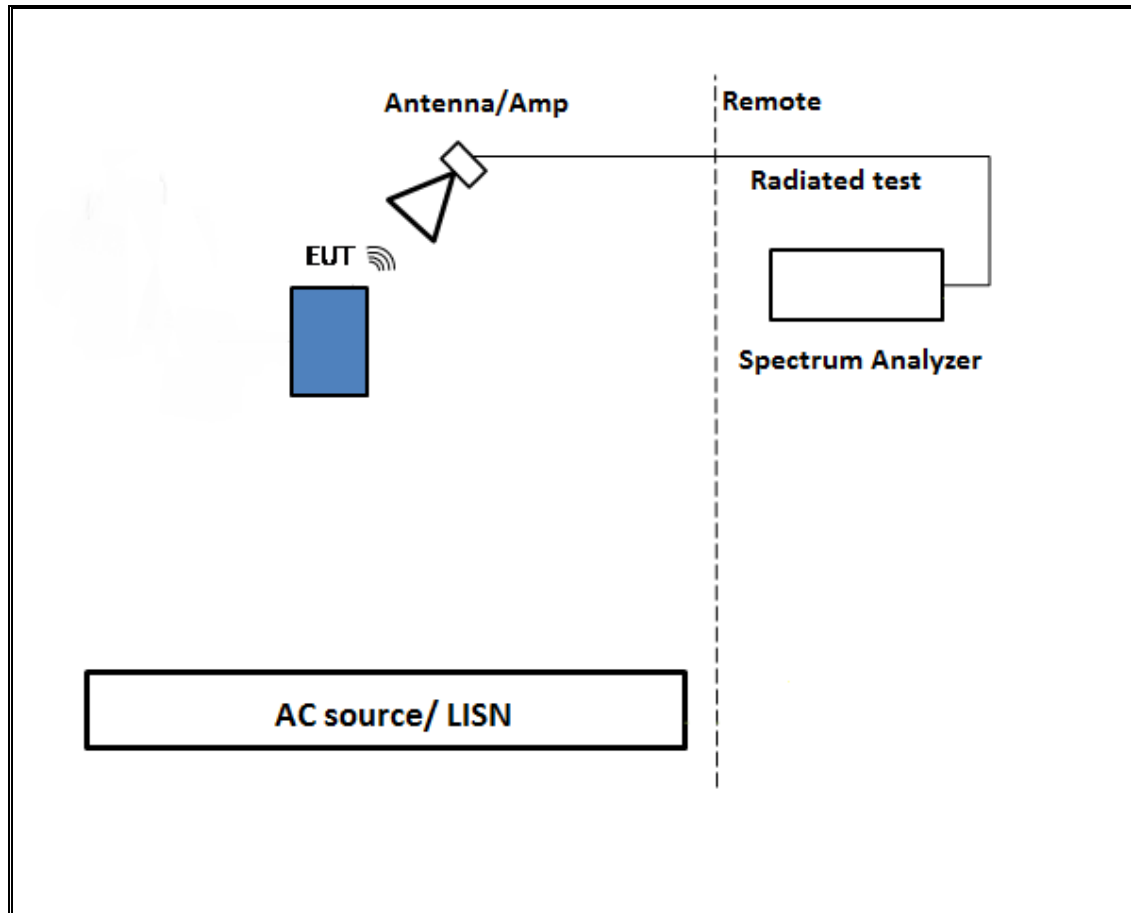
SETUP DIAGRAM



TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was tested battery powered. Test software exercised the EUT.

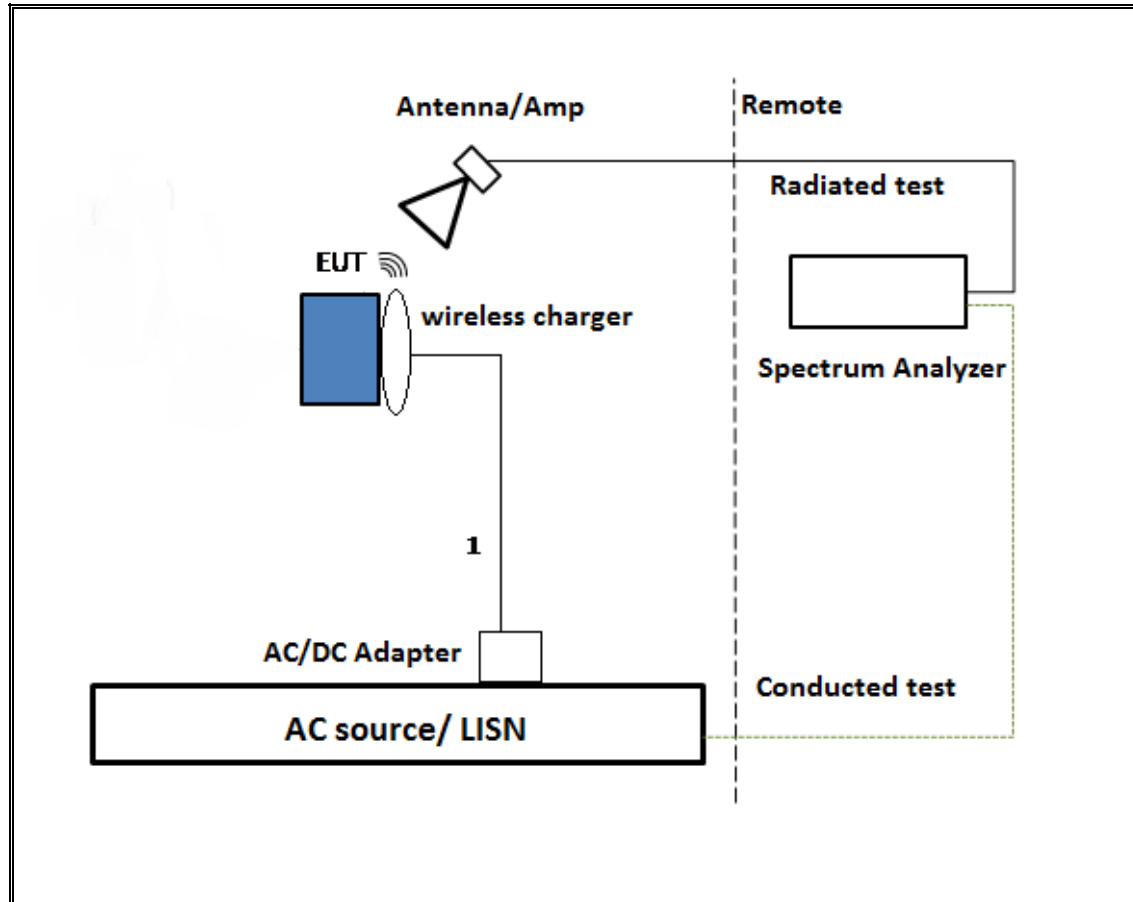
SETUP DIAGRAM



TEST SETUP- BELOW 1GHZ & AC LINE CONDUCTED TESTS

The EUT was powered by wireless charger. 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	T Number	Cal Due
PXA Signal Analyzer	Agilent	N9030A	T342	06/25/15
Power Meter	Agilent	N1911A	T382	04/09/15
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	01/15/16
Antenna, Hybrid 30MHz to 2GHz	Sunol Sciences	JB3	T407	05/05/15
PXA Signal Analyzer 3Hz to 44GHz	Agilent	N9030A	T340	03/11/15
Amplifier, 10KHz to 1GHz	Sonoma	310N	T286	04/23/15
Amplifier, 1 to 18GHz	Miteq	AFS42-00101	T740	01/26/16
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	T284	09/16/15
LISN, 30 MHz	FCC	LISN-50/ 250-25-2	T24	01/16/16
Amplifier, 1 to 26.5 Ghz	Agilent	8449B	T404	03/25/15
Antenna, Horn 18 to 26.5GHz	ARA	SWH-28	T125	05/09/15
Spectrum Analyzer	Agilent	8564E	T106	08/06/15

7. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r02

Output Power: KDB 558074 D01 v03r02.

Power Spectral Density: KDB 558074 D01 v03r02.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r02.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r02

8. DUTY CYCLE

LIMITS

None; for reporting purposes only.

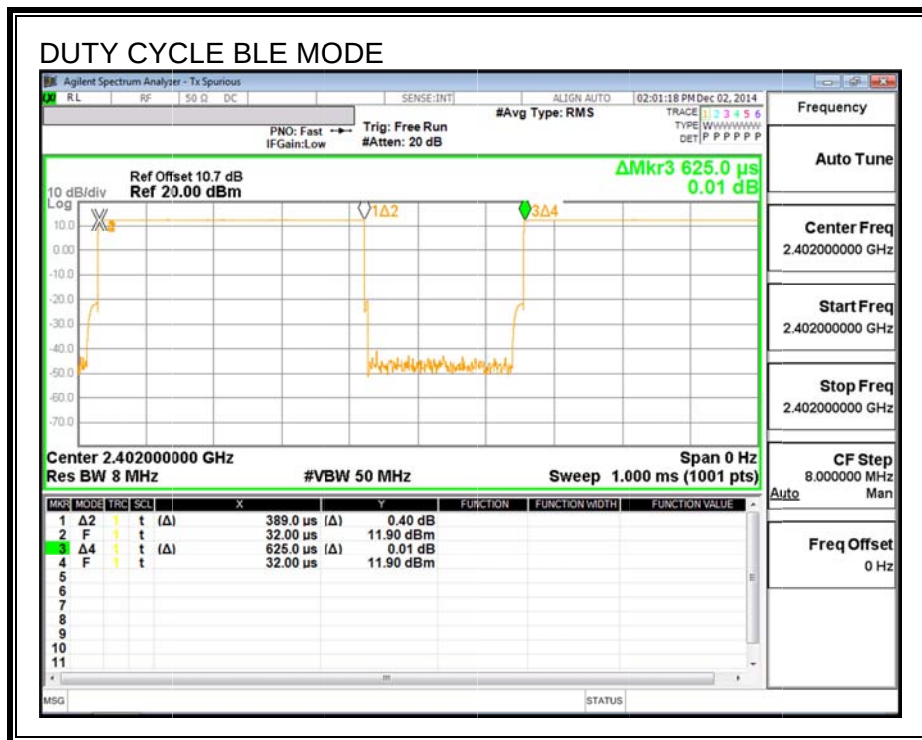
PROCEDURE

KDB 789033 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	0.389	0.625	0.622	62.2%	2.059	2.571

DUTY CYCLE PLOTS



9. ANTENNA PORT TEST RESULTS

9.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

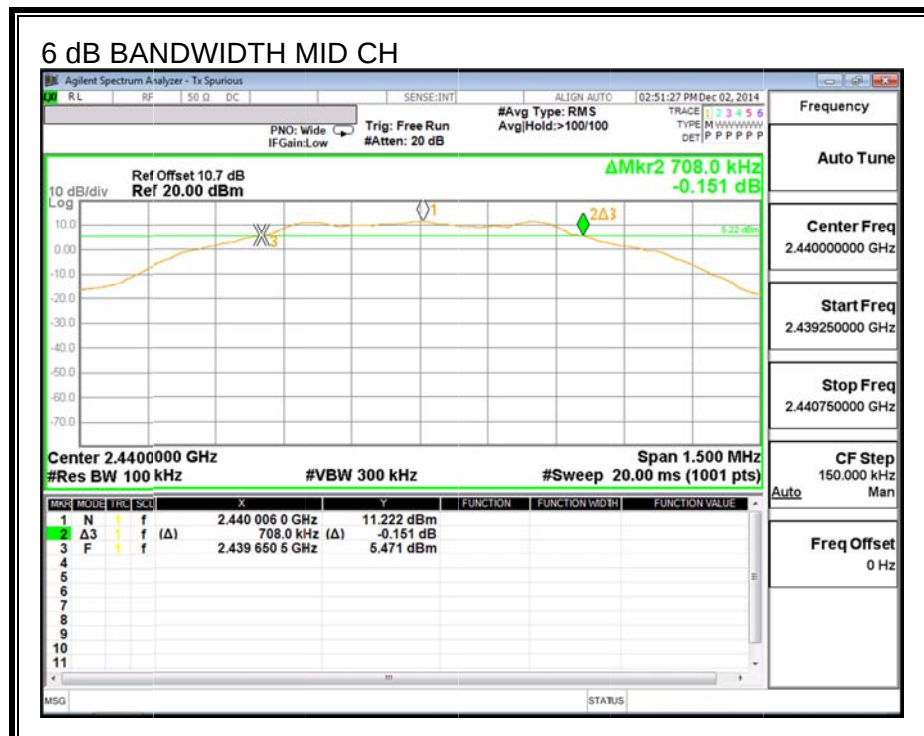
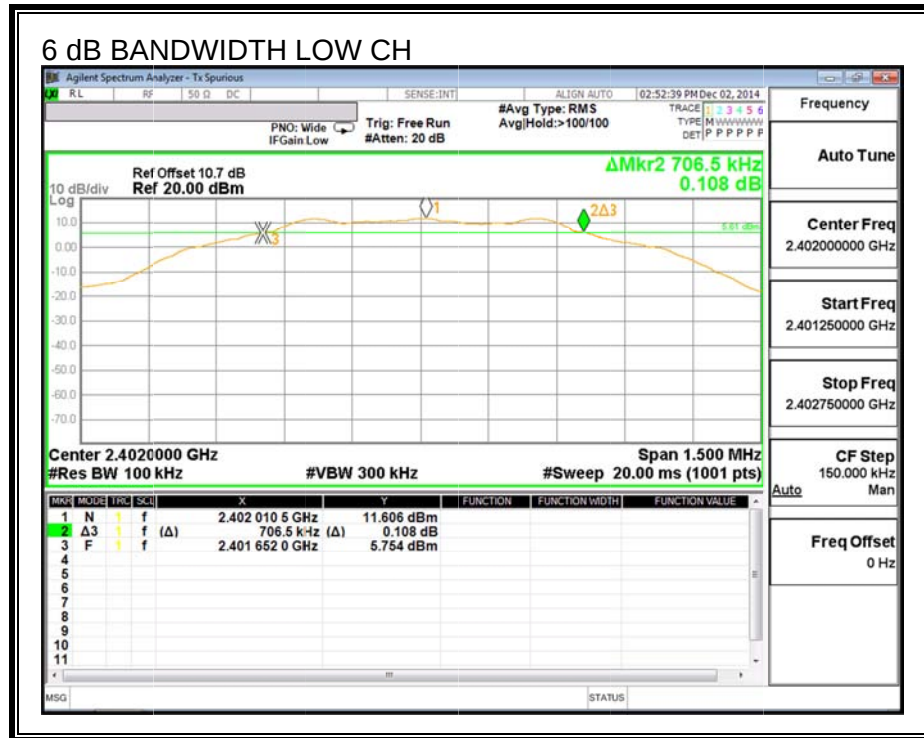
TEST PROCEDURE

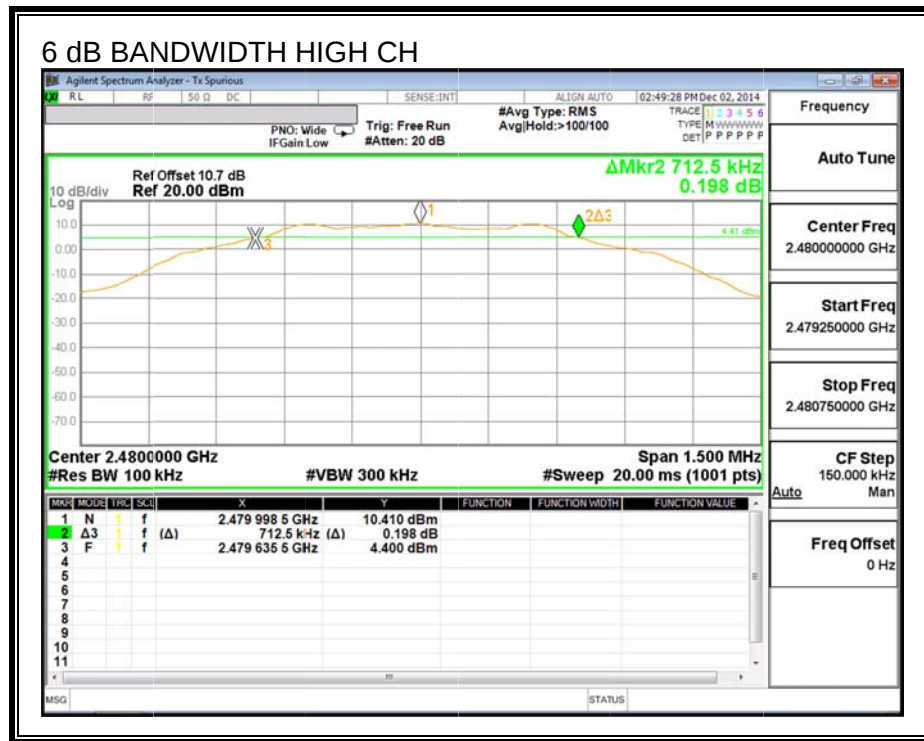
KDB 558074 D01 v03r02 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (KHz)	Minimum Limit (KHz)
Low	2402	706.5	500.0
Middle	2440	708.0	500.0
High	2480	712.5	500.0

6 dB BANDWIDTH





9.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

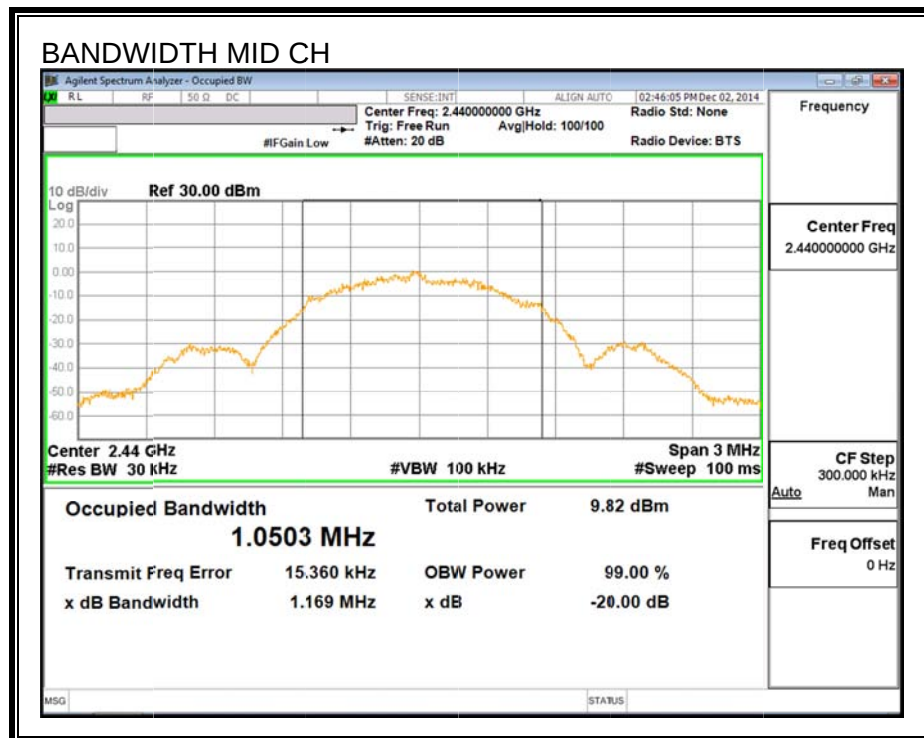
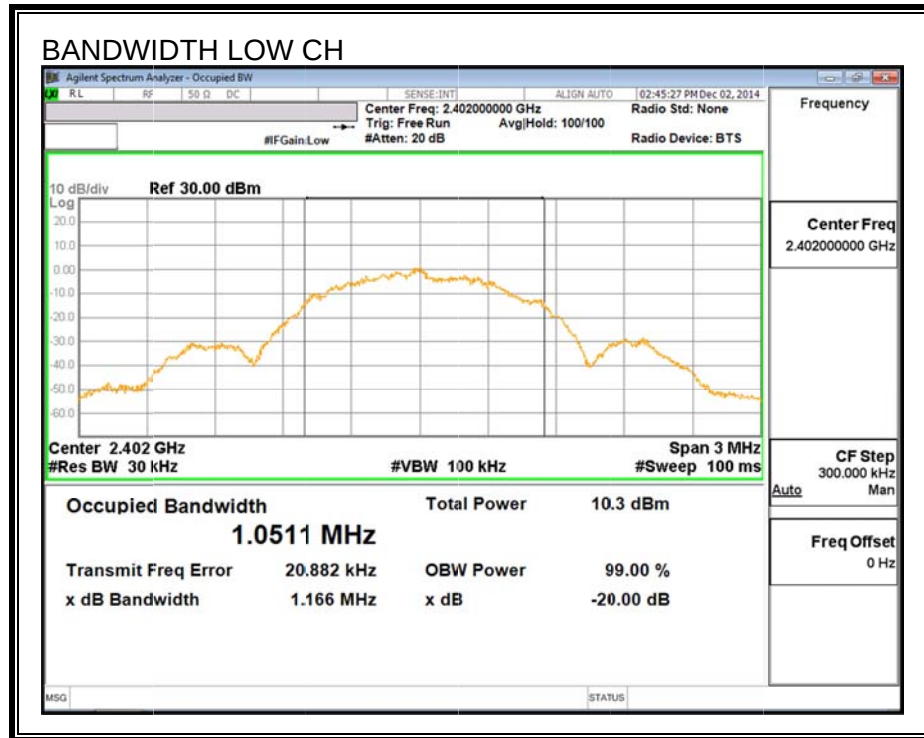
TEST PROCEDURE

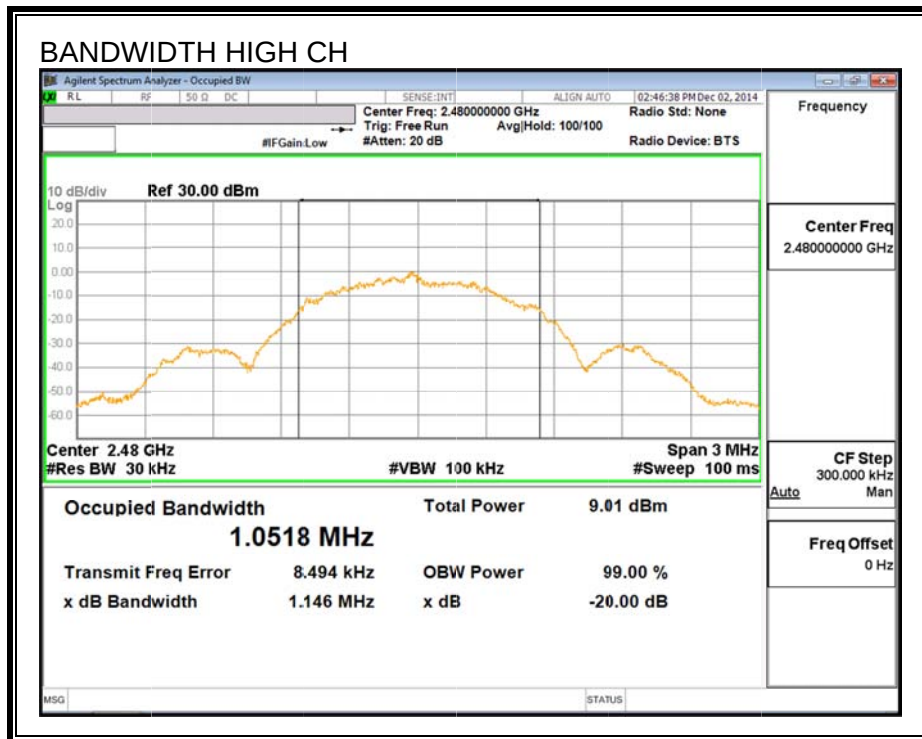
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Frequency (MHz)	99% Bandwidth (MHz)
2402	1.0511
2440	1.0503
2480	1.0518

99% BANDWIDTH





9.3. OUTPUT POWER

LIMIT

§15.247 (b) (1)

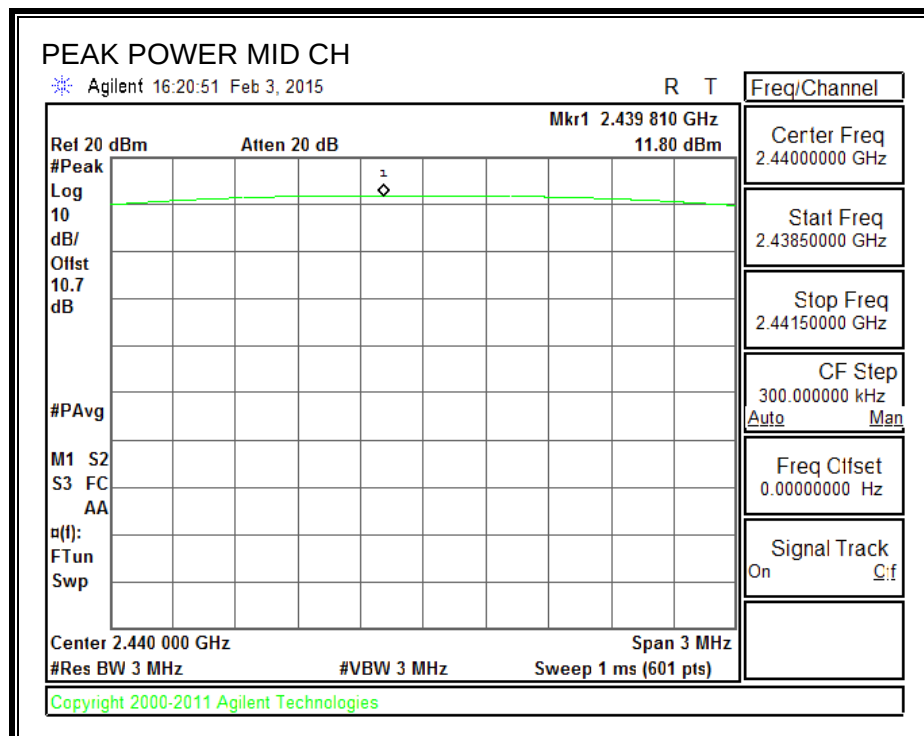
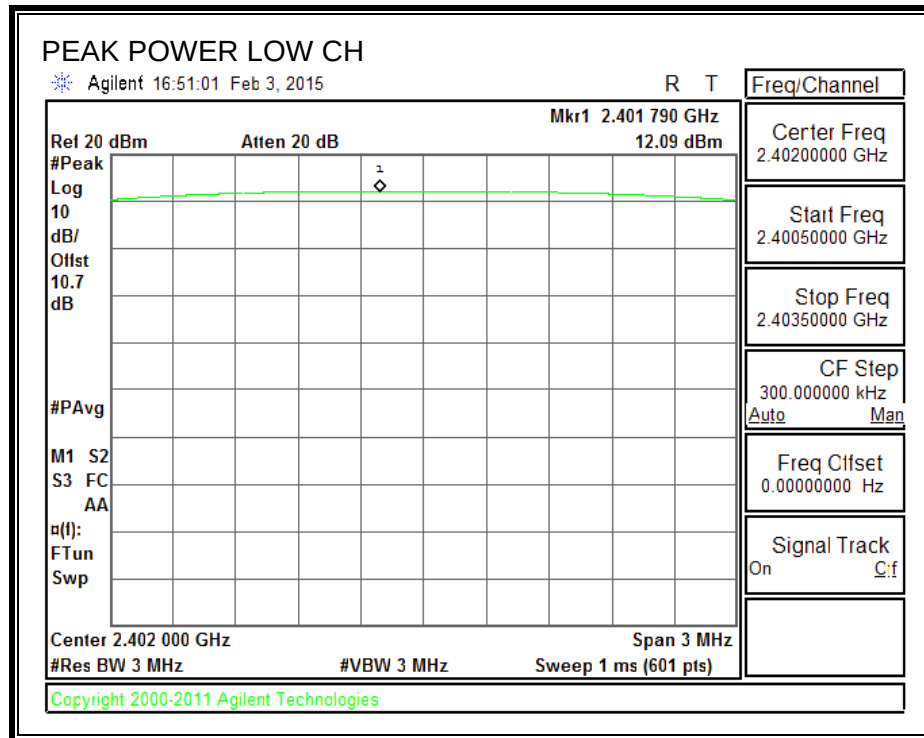
The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

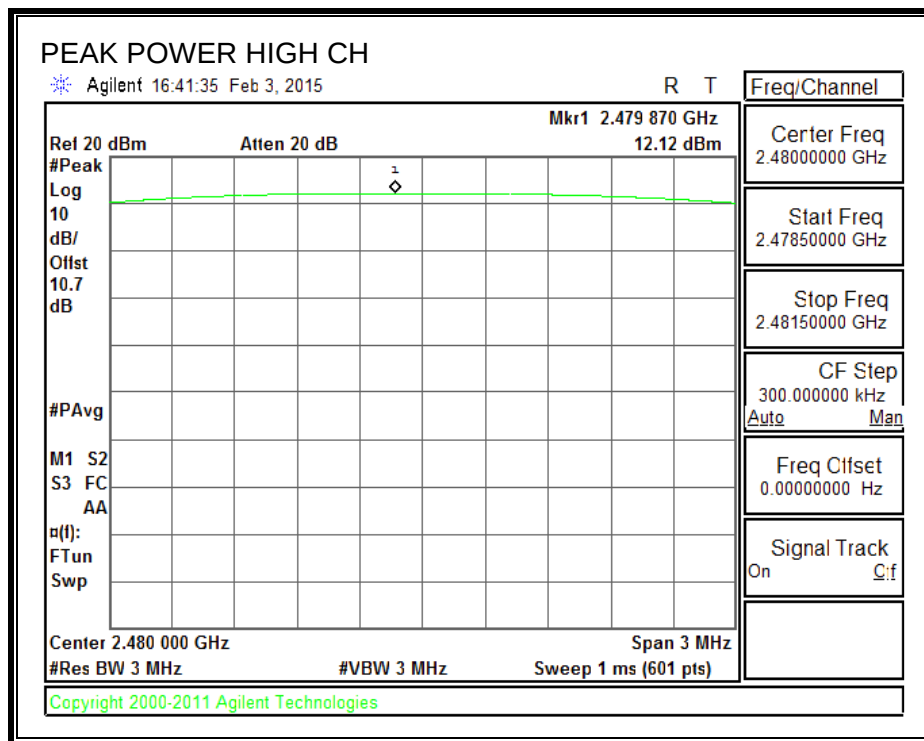
TEST PROCEDURE

KDB 558074 D01 v03r02 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.09	30	-17.91
Middle	2440	11.80	30	-18.20
High	2480	12.12	30	-17.88





9.4. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 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	2402	11.97
Middle	2440	11.65
High	2480	11.92

9.5. 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.

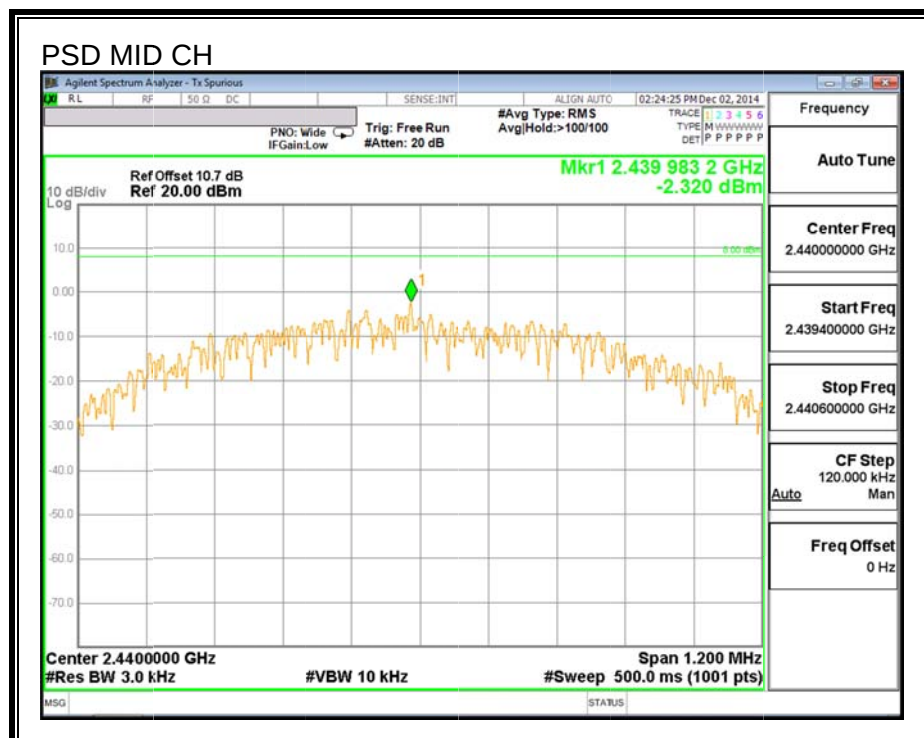
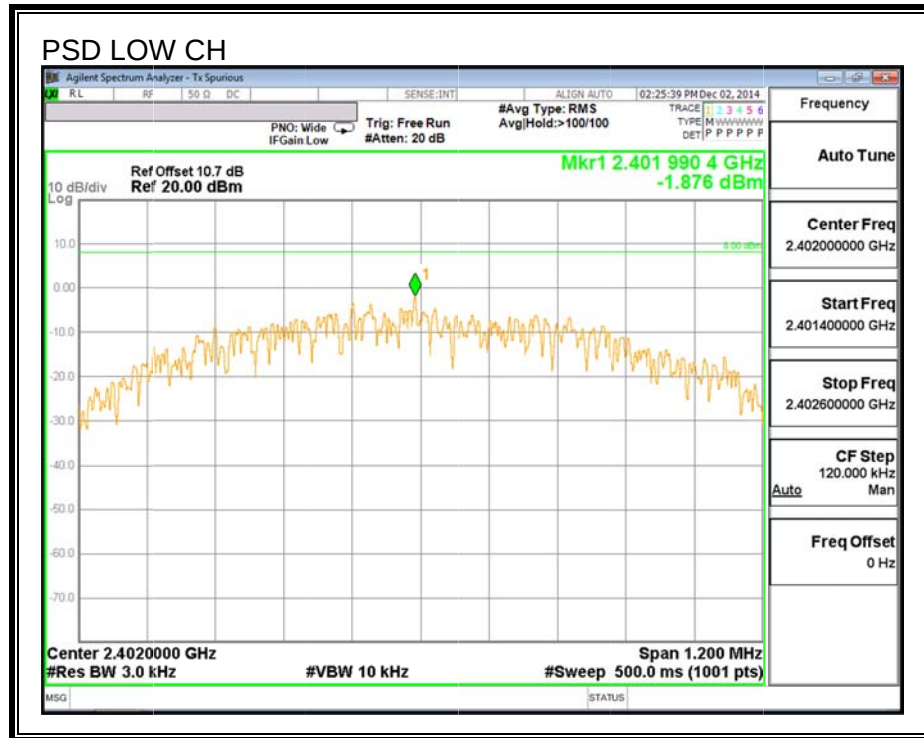
TEST PROCEDURE

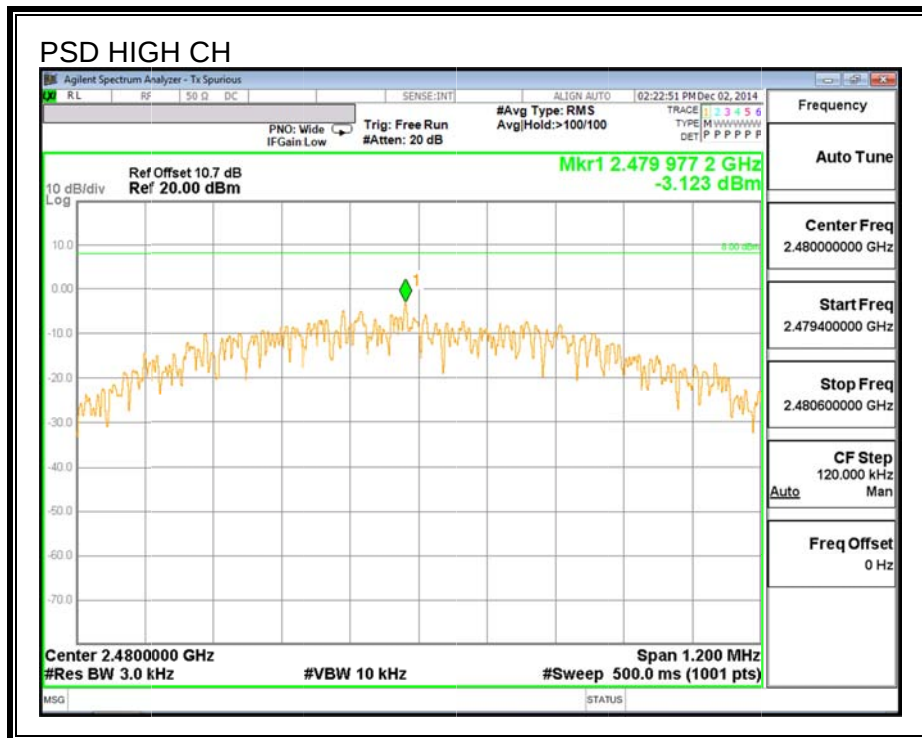
KDB 558074 D01 v03r02 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-1.88	8	-9.88
Middle	2440	-2.32	8	-10.32
High	2480	-3.12	8	-11.12

POWER SPECTRAL DENSITY





9.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

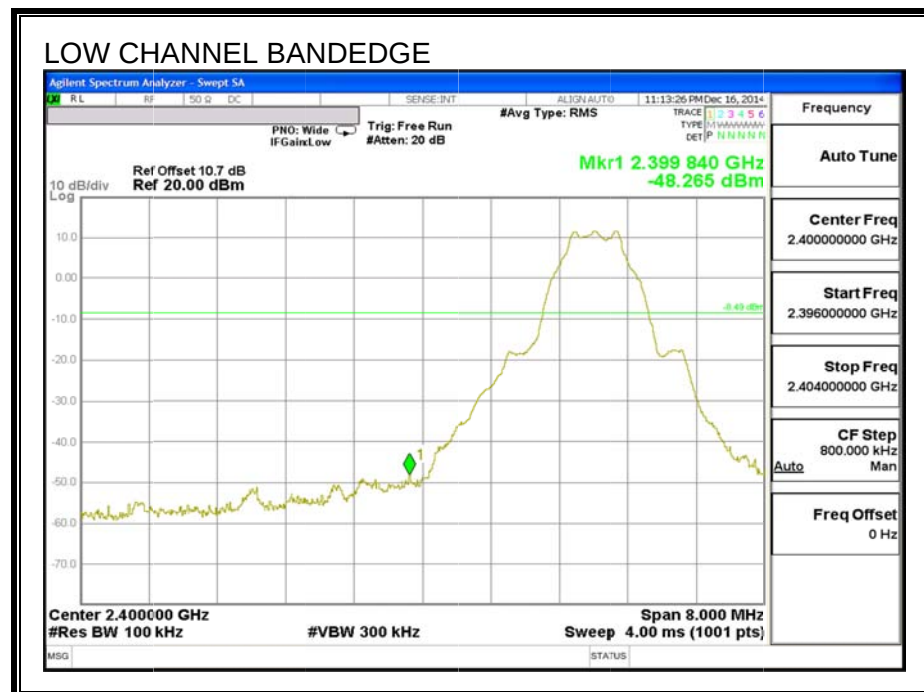
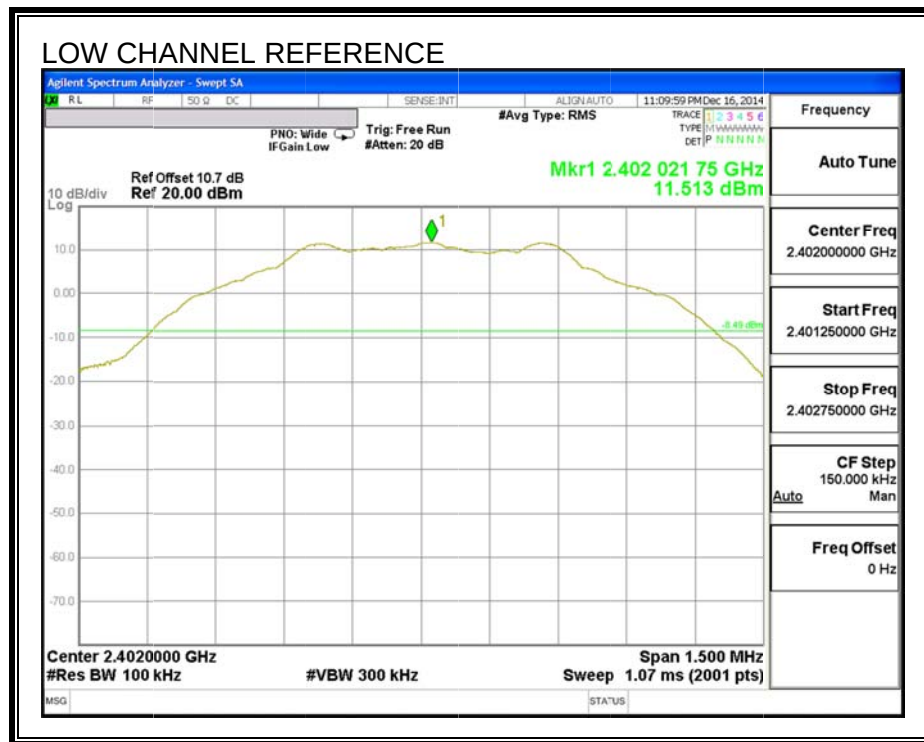
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

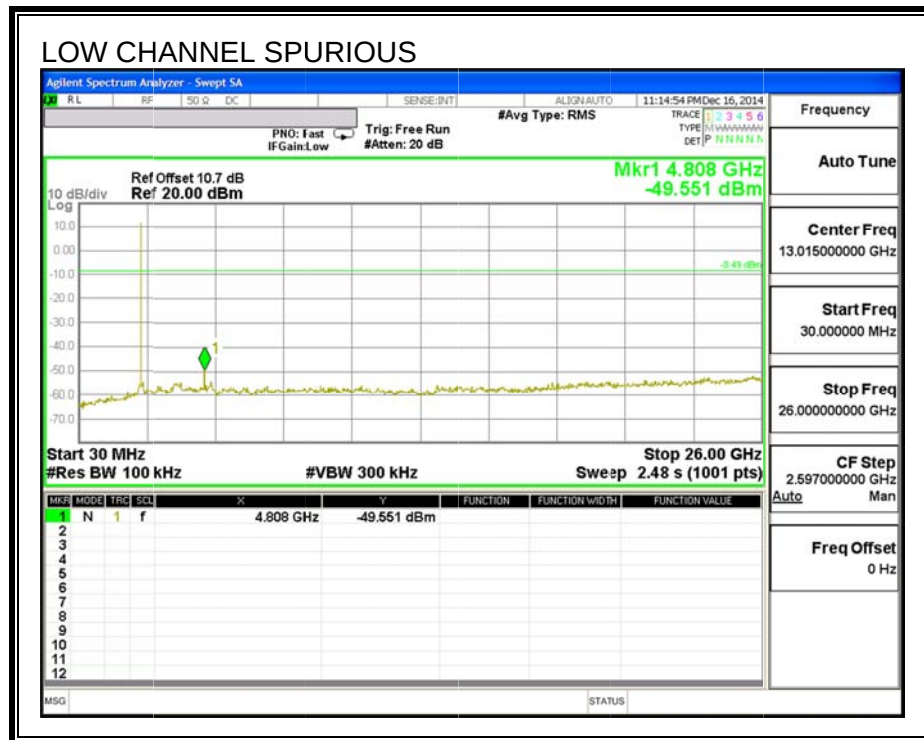
TEST PROCEDURE

KDB 558074 D01 v03r02 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

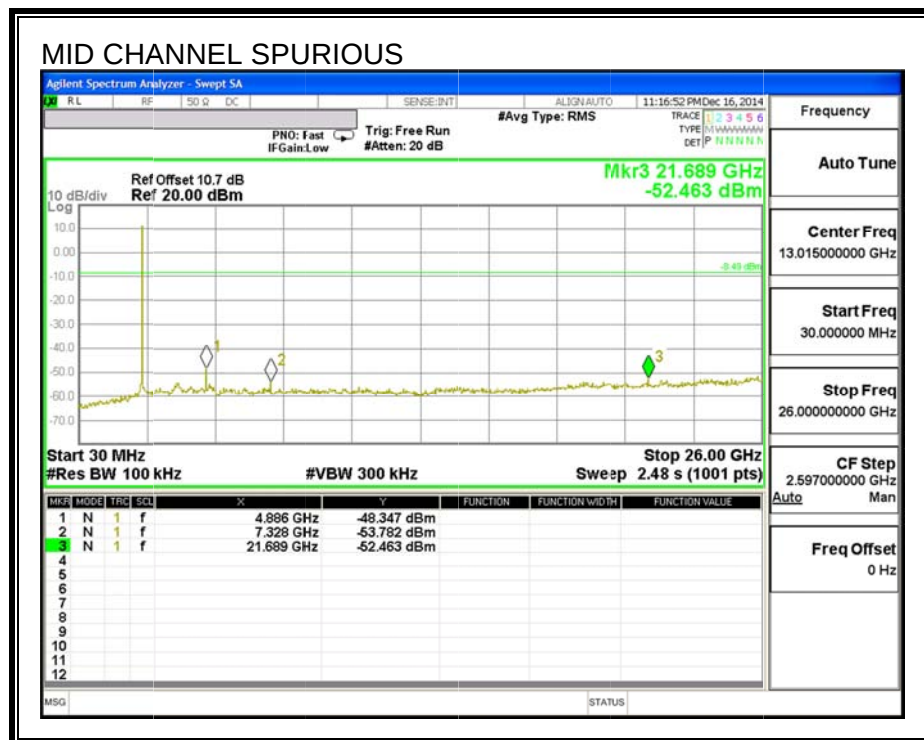
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

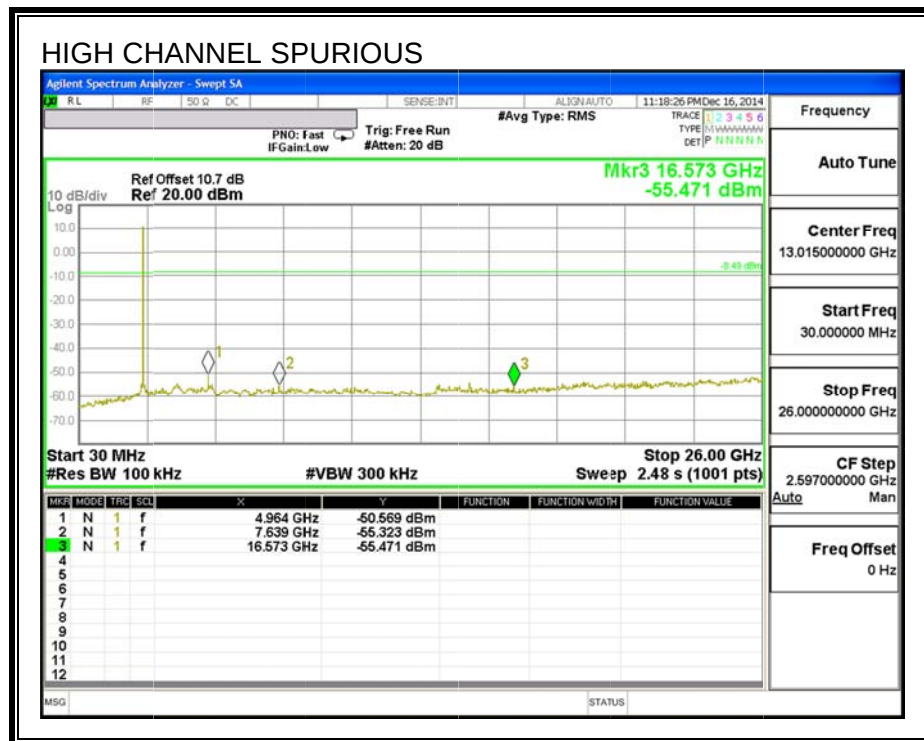
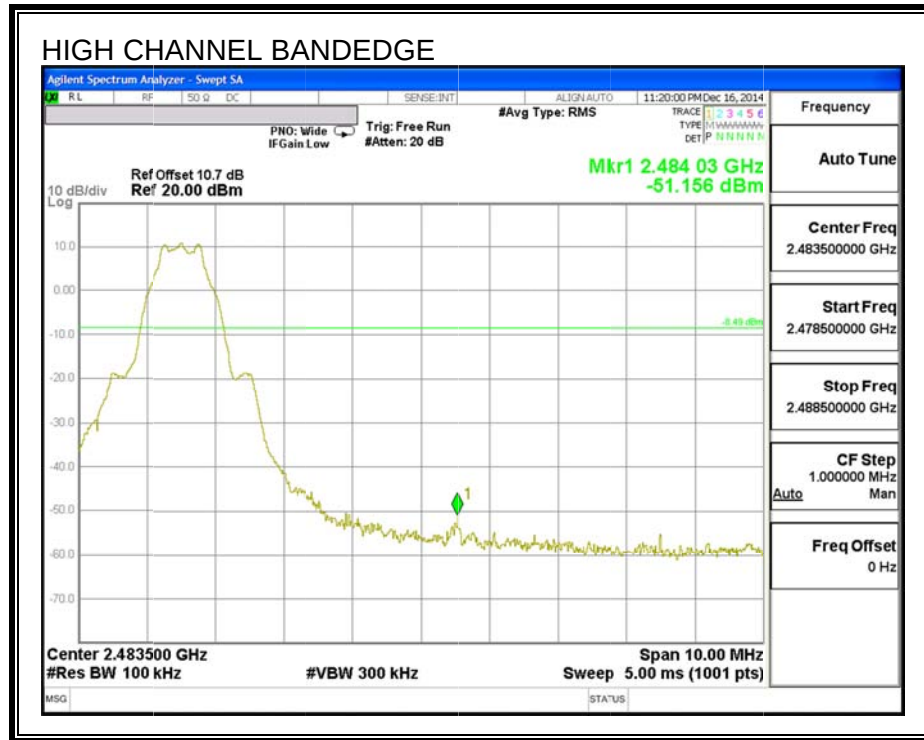




SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

IC RSS-GEN, Section 7 (Receiver)

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 C63.4. The EUT is set to transmit in a continuous mode.

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

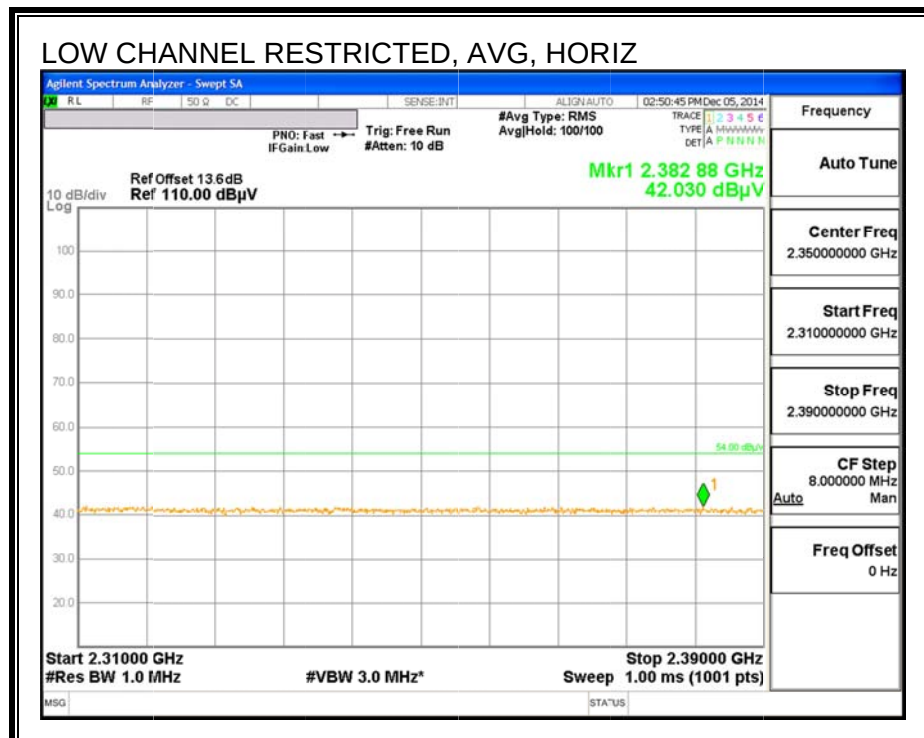
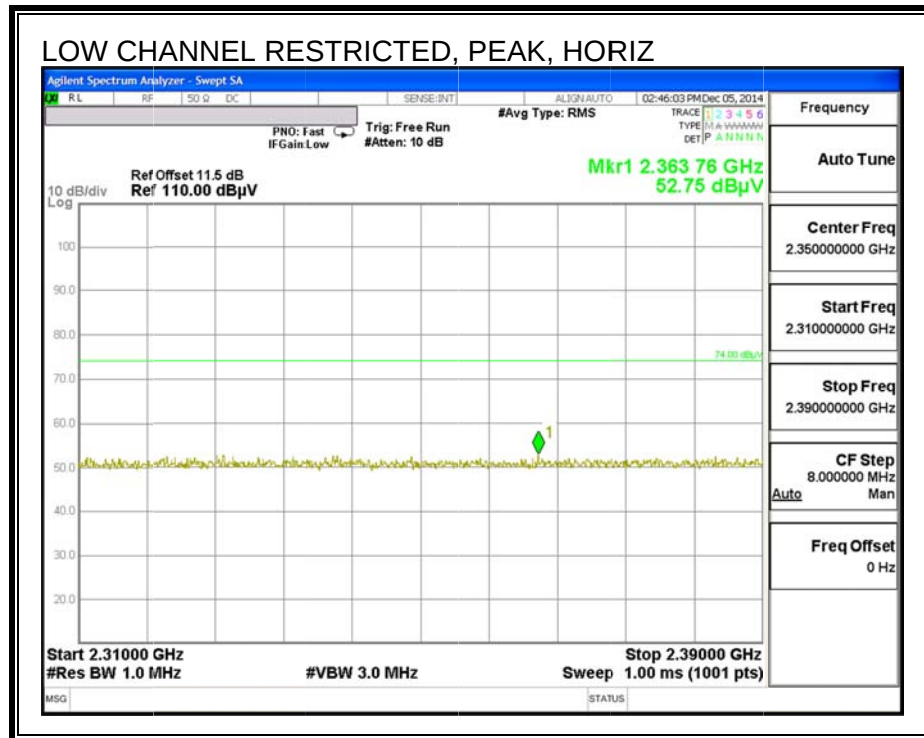
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

For 2.4 GHz band, 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.

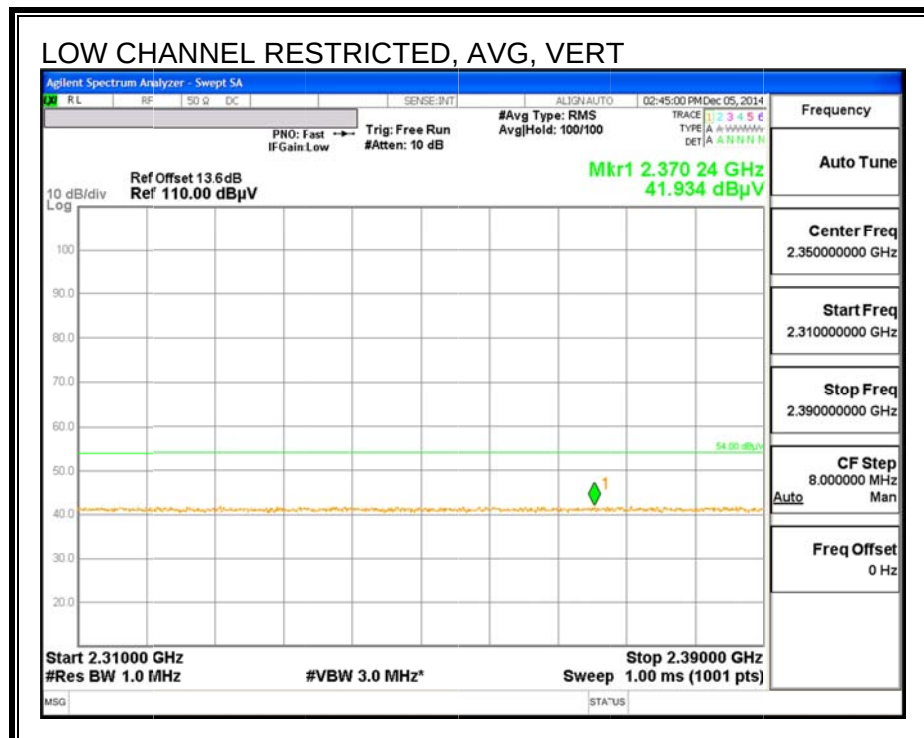
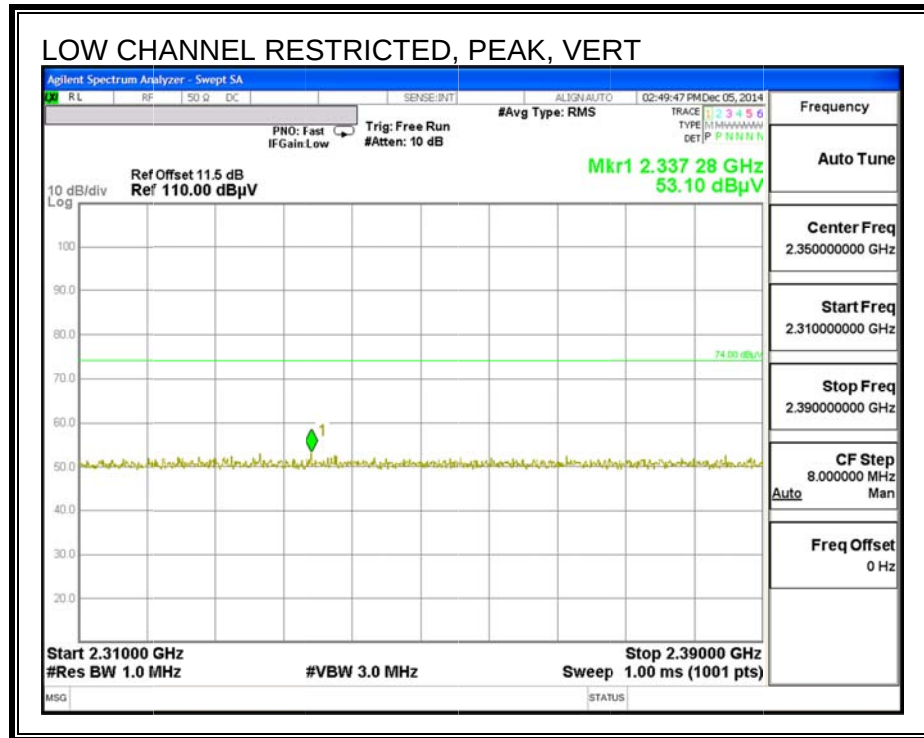
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

10.2. TRANSMITTER ABOVE 1 GHz ANTENNA 1

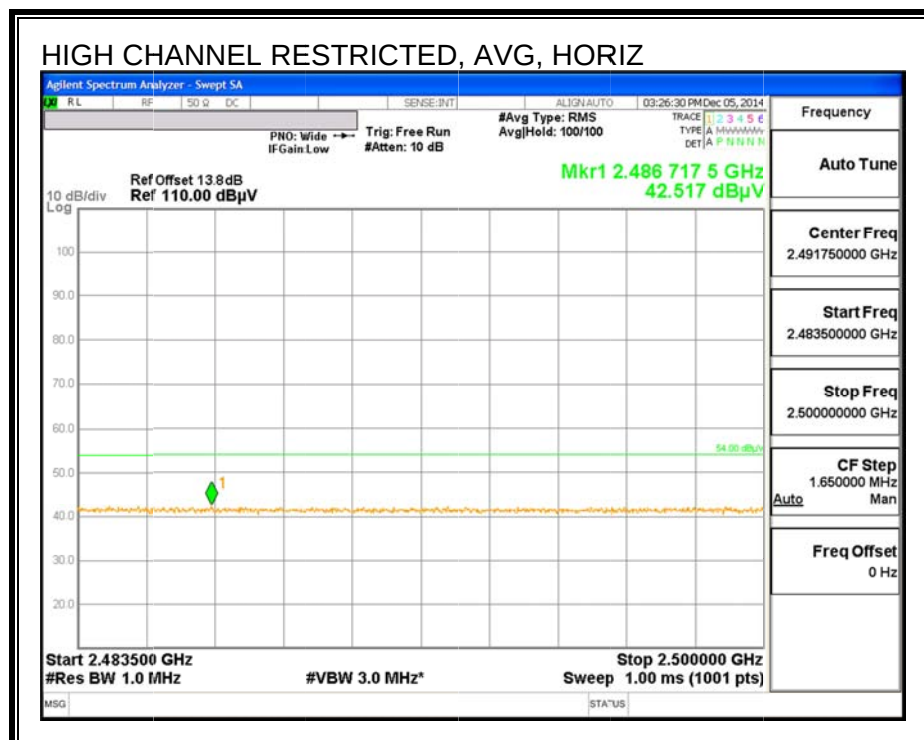
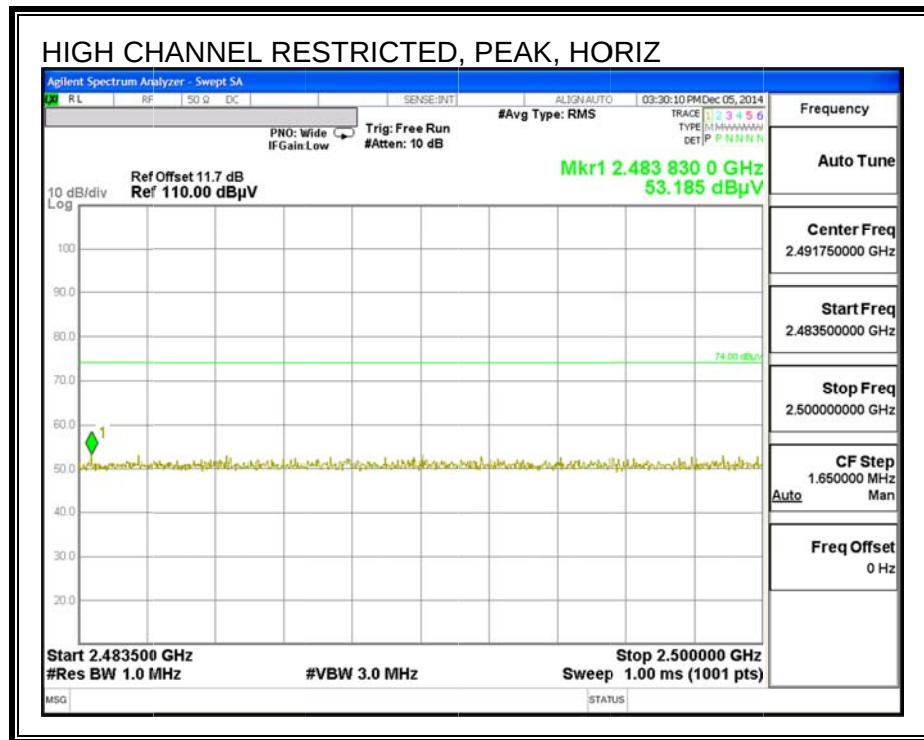
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



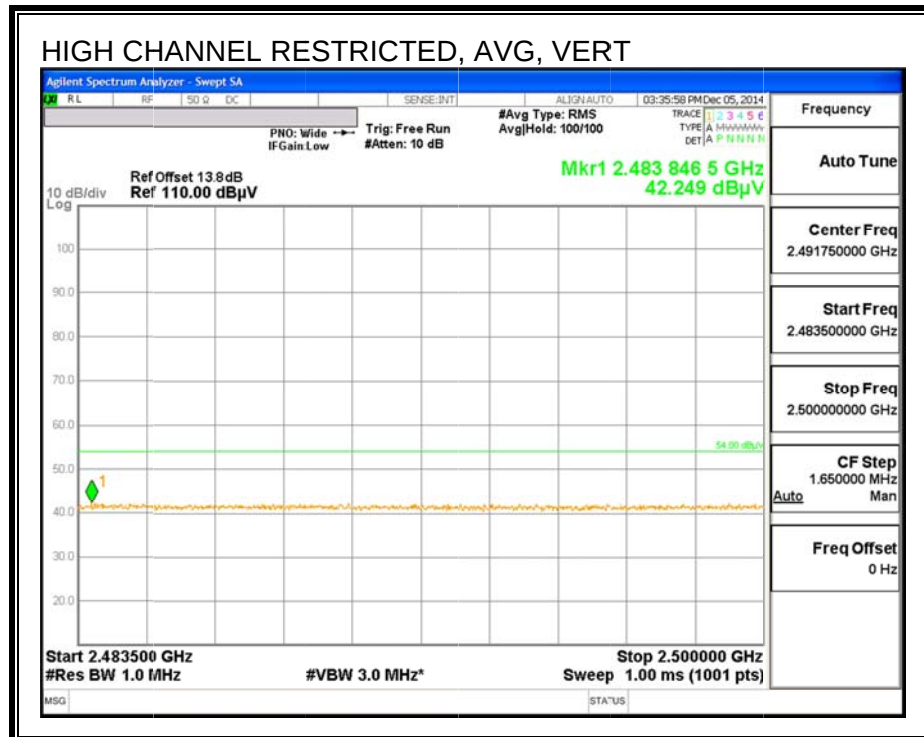
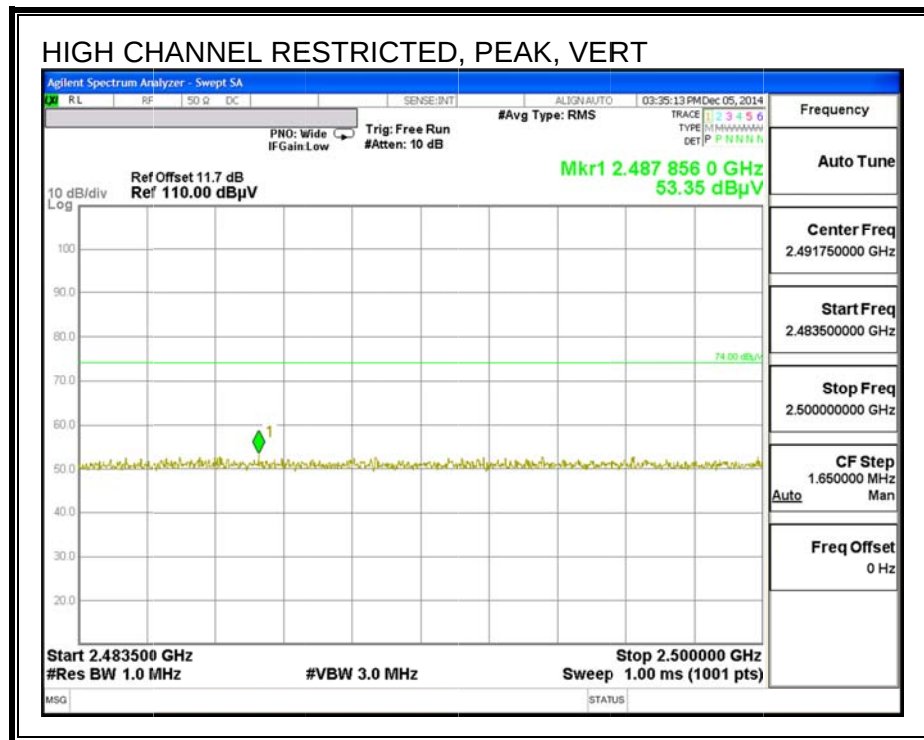
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



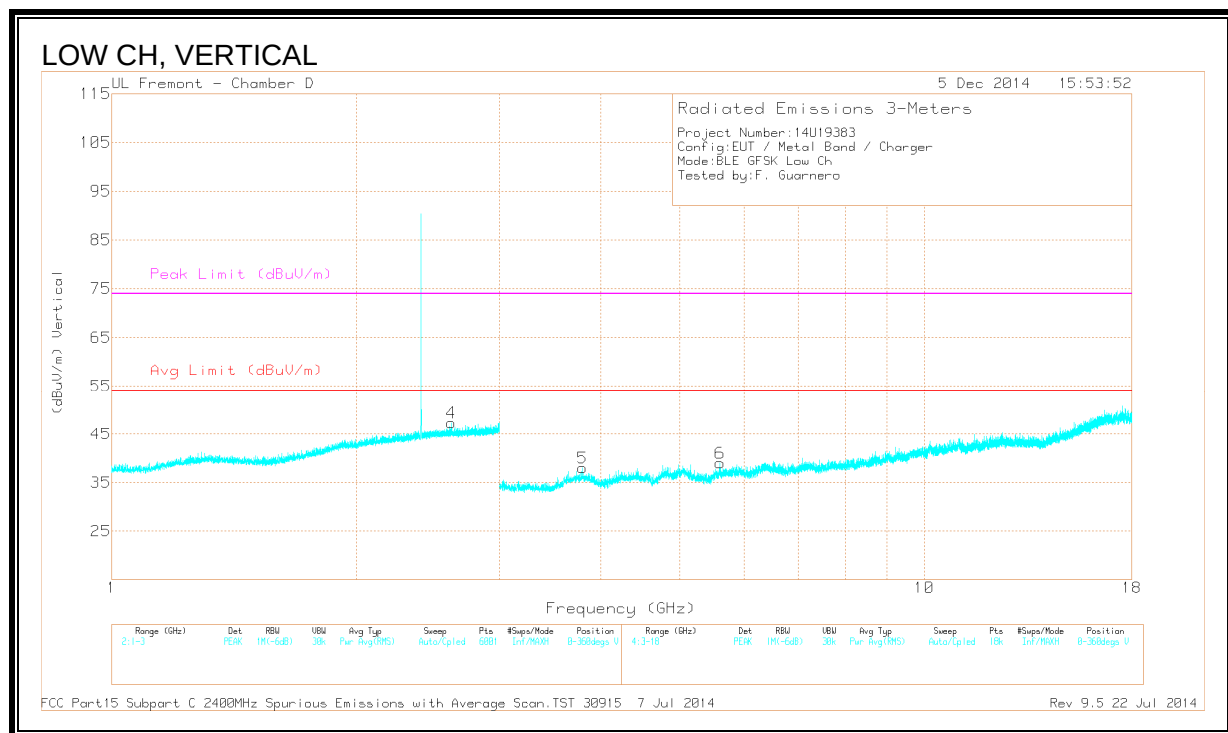
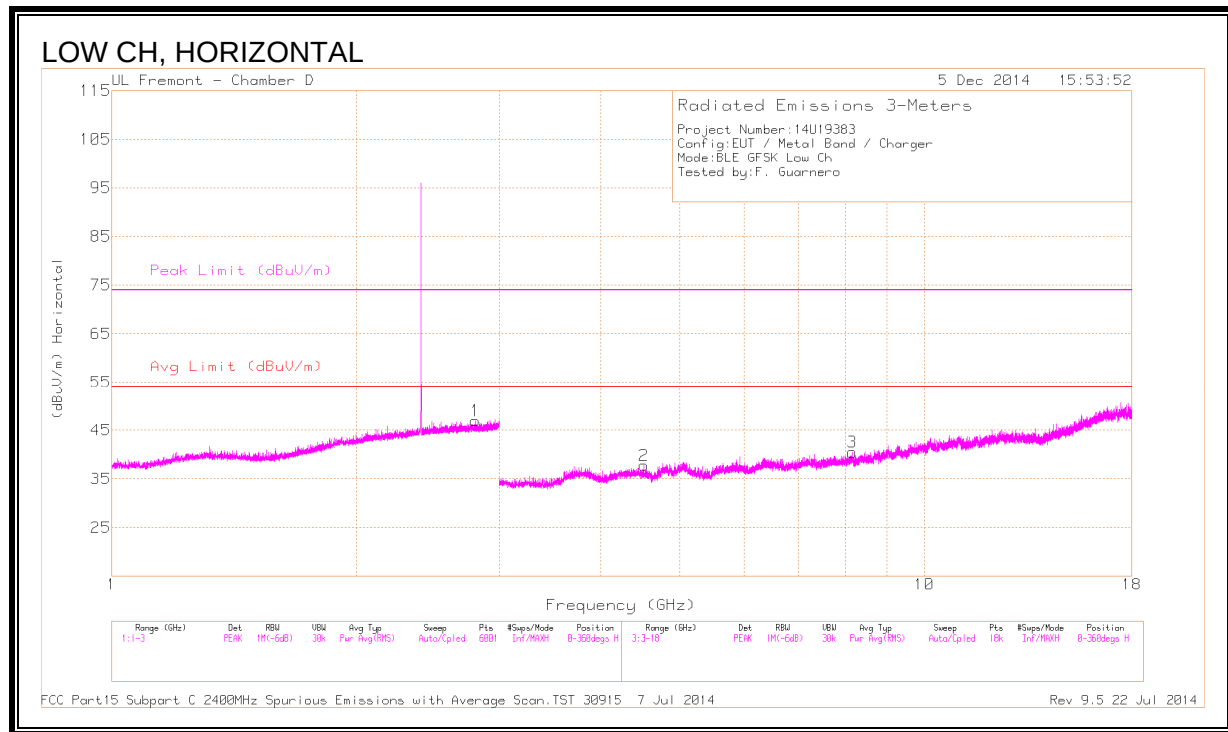
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS



DATA

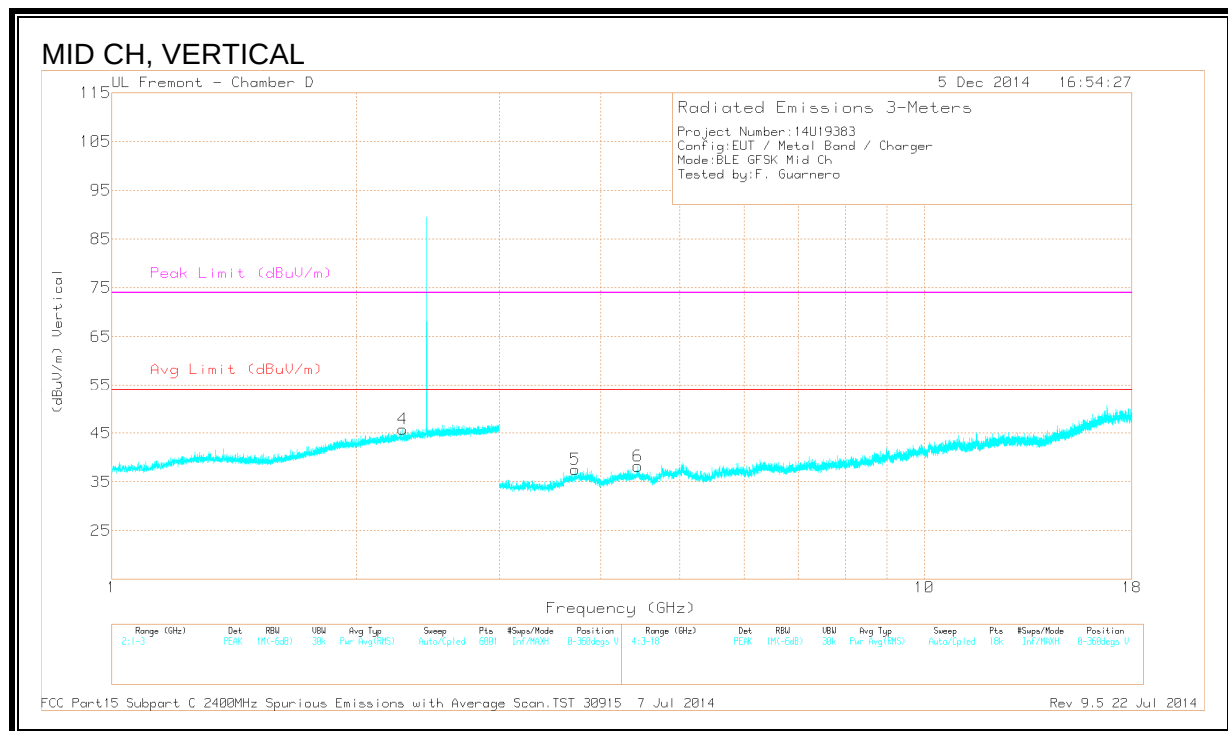
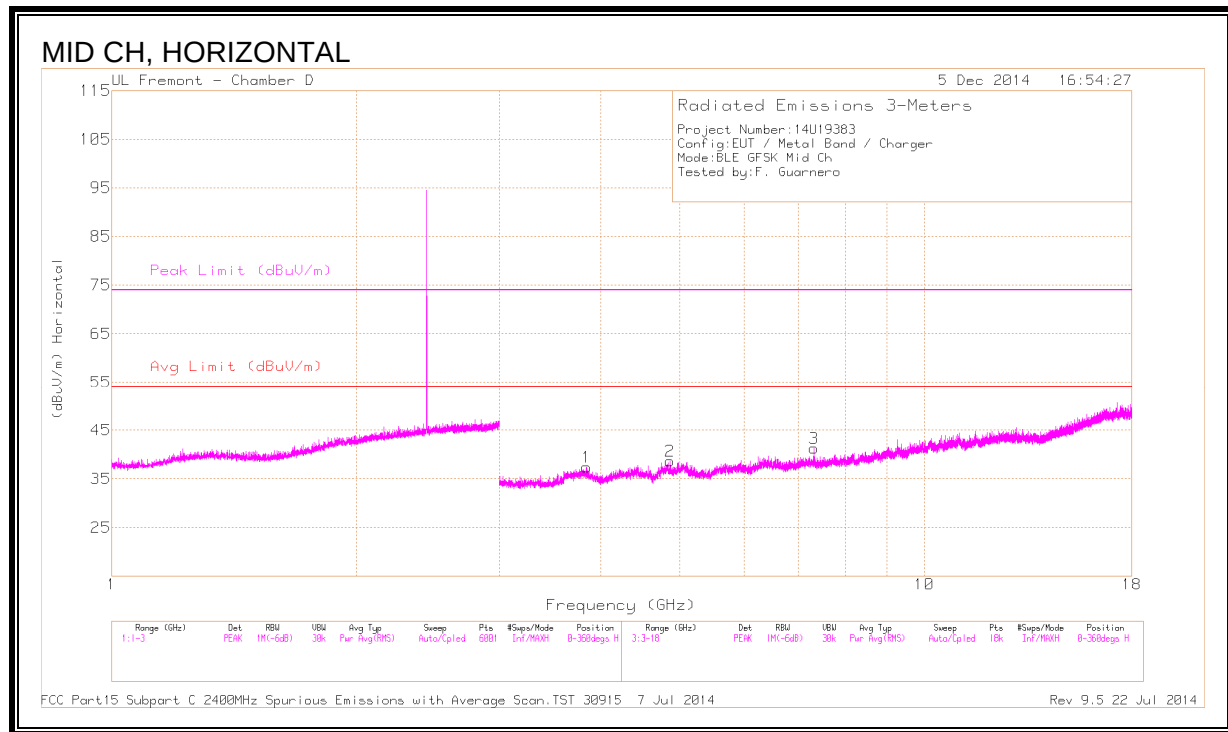
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.803	41.83	PK2	32.5	-20.1	0	54.23	-	-	74	-19.77	204	227	H
	* 2.802	30.11	MAv1	32.5	-20.1	2.06	44.57	54	-9.43	-	-	204	227	H
2	* 4.519	38.61	PK2	34.0	-27.5	0	45.11	-	-	74	-28.89	197	238	H
	* 4.521	26.63	MAv1	34.0	-27.5	2.06	35.19	54	-18.81	-	-	197	238	H
3	* 8.153	34.42	PK2	35.8	-23.4	0	46.82	-	-	74	-27.18	248	226	H
	* 8.150	24.28	MAv1	35.8	-23.4	2.06	38.74	54	-15.26	-	-	248	226	H
4	2.618	42.24	PK2	32.3	-20.3	0	54.24	-	-	-	-	298	247	V
5	* 3.793	38.62	PK2	33.4	-28.2	0	43.82	-	-	74	-30.18	306	340	V
	* 3.793	27.40	MAv1	33.4	-28.2	2.06	34.66	54	-19.34	-	-	306	340	V
6	5.607	37.04	PK2	34.5	-26.7	0	44.84	-	-	-	-	303	324	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HARMONICS AND SPURIOUS EMISSIONS



DATA

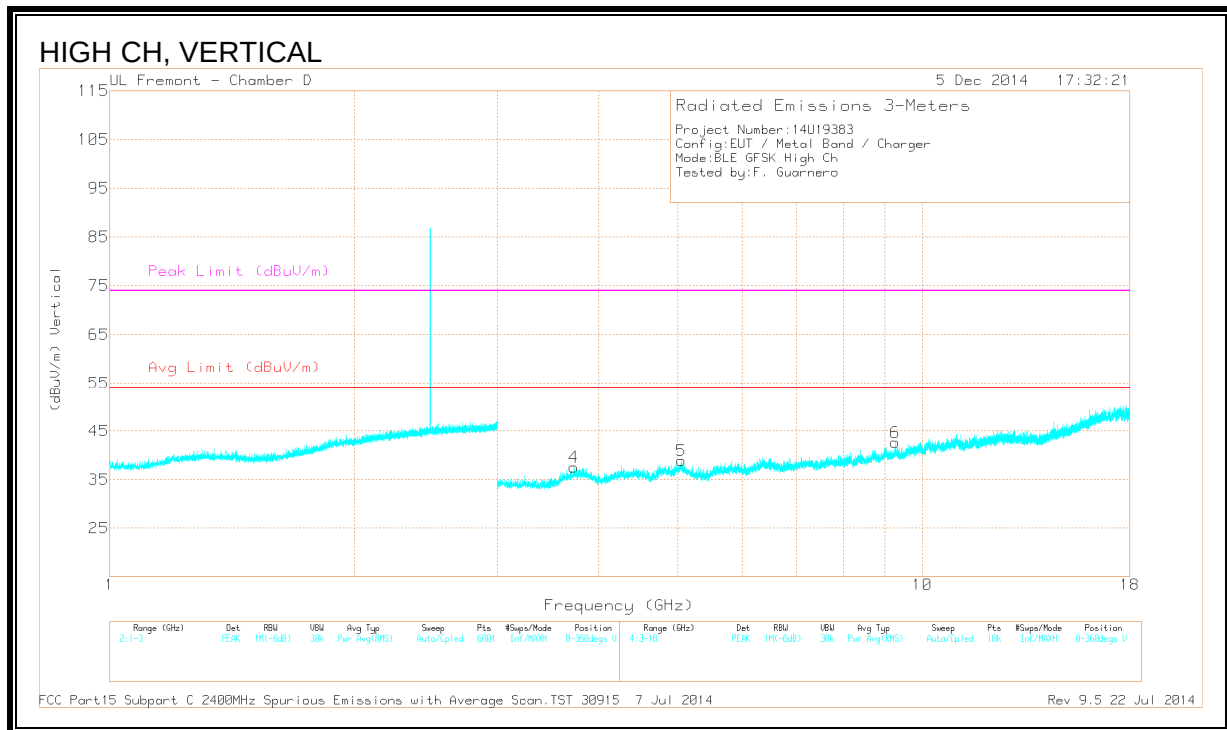
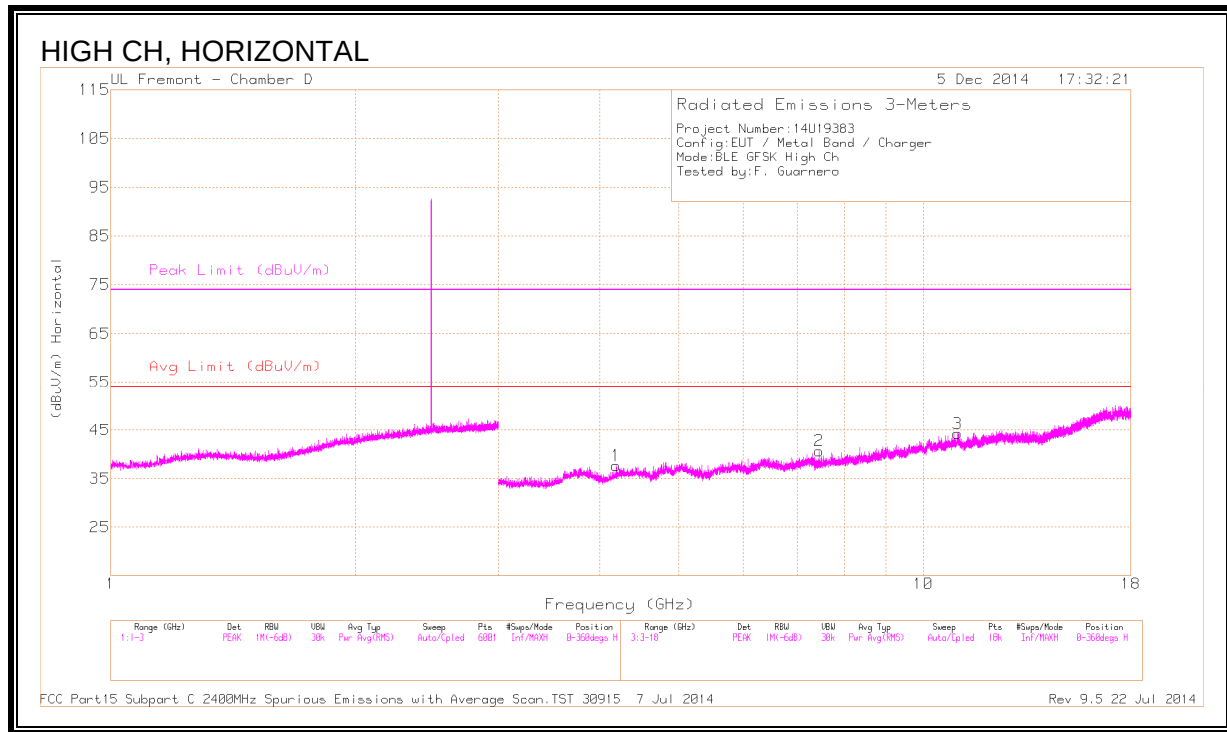
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.839	39.41	PK2	33.4	-28.3	0	44.51	-	-	74	-29.49	335	252	H
	* 3.841	27.39	MAv1	33.4	-28.3	2.06	34.55	54	-19.45	-	-	335	252	H
2	* 4.868	37.57	PK2	34.2	-27.7	0	44.07	-	-	74	-29.93	326	261	H
	* 4.866	26.05	MAv1	34.2	-27.7	2.06	34.61	54	-19.39	-	-	326	261	H
3	* 7.320	37.70	PK2	35.7	-24.9	0	48.50	-	-	74	-25.50	331	253	H
	* 7.319	26.60	MAv1	35.7	-24.8	2.06	39.56	54	-14.44	-	-	331	253	H
4	* 2.282	41.34	PK2	31.8	-20.8	0	52.34	-	-	74	-21.66	351	277	V
	* 2.282	30.16	MAv1	31.8	-20.8	2.06	43.22	54	-10.78	-	-	351	277	V
5	* 3.721	38.38	PK2	33.2	-28.7	0	42.88	-	-	74	-31.12	351	275	V
	* 3.723	27.83	MAv1	33.2	-28.7	2.06	34.39	54	-19.61	-	-	351	275	V
6	4.444	37.94	PK2	33.9	-27.6	0	44.24	-	-	-	-	334	268	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T344 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.186	37.39	PK2	33.5	-27.3	0	43.59	-	-	74	-30.41	260	368	H
	* 4.185	25.93	MAv1	33.5	-27.3	2.06	34.19	54	-19.81	-	-	260	368	H
2	* 7.441	36.63	PK2	35.6	-24.8	0	47.43	-	-	74	-26.57	280	153	H
	* 7.439	25.80	MAv1	35.6	-24.8	2.06	38.66	54	-15.34	-	-	280	153	H
3	* 11.025	33.68	PK2	38.1	-20.3	0	51.48	-	-	74	-22.52	268	300	H
	* 11.027	22.44	MAv1	38.1	-20.3	2.06	42.30	54	-11.70	-	-	268	300	H
4	* 3.722	38.39	PK2	33.2	-28.7	0	42.89	-	-	74	-31.11	254	142	V
	* 3.725	27.13	MAv1	33.2	-28.7	2.06	33.69	54	-20.31	-	-	254	142	V
5	* 5.051	37.19	PK2	34.3	-26.4	0	45.09	-	-	74	-28.91	280	219	V
	* 5.052	25.80	MAv1	34.3	-26.4	2.06	35.76	54	-18.24	-	-	280	219	V
6	9.259	34.32	PK2	36.4	-20.8	0	49.92	-	-	-	-	123	141	V

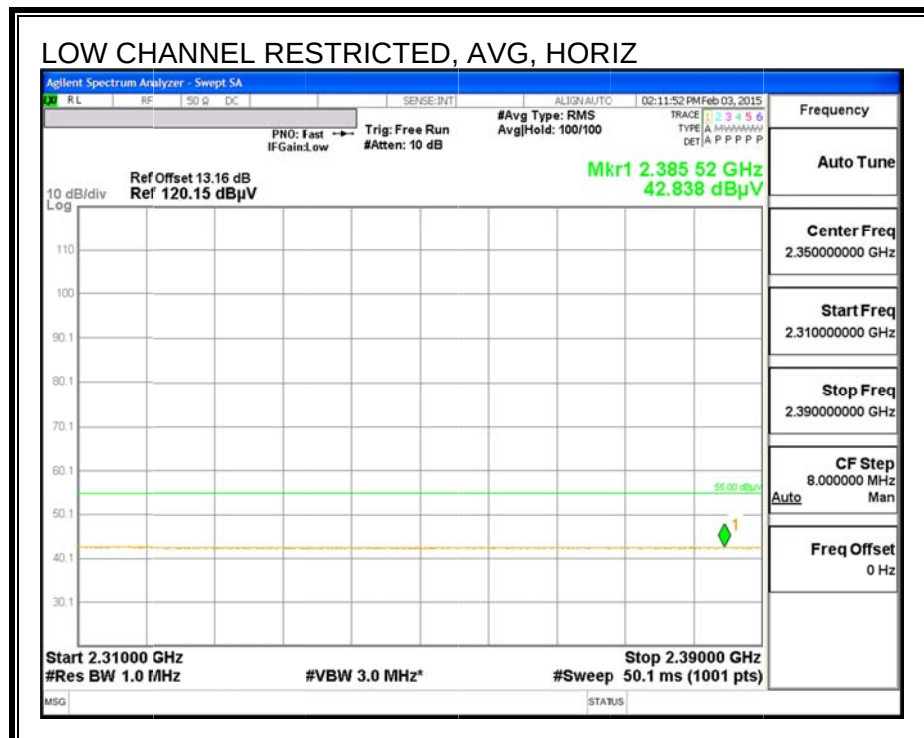
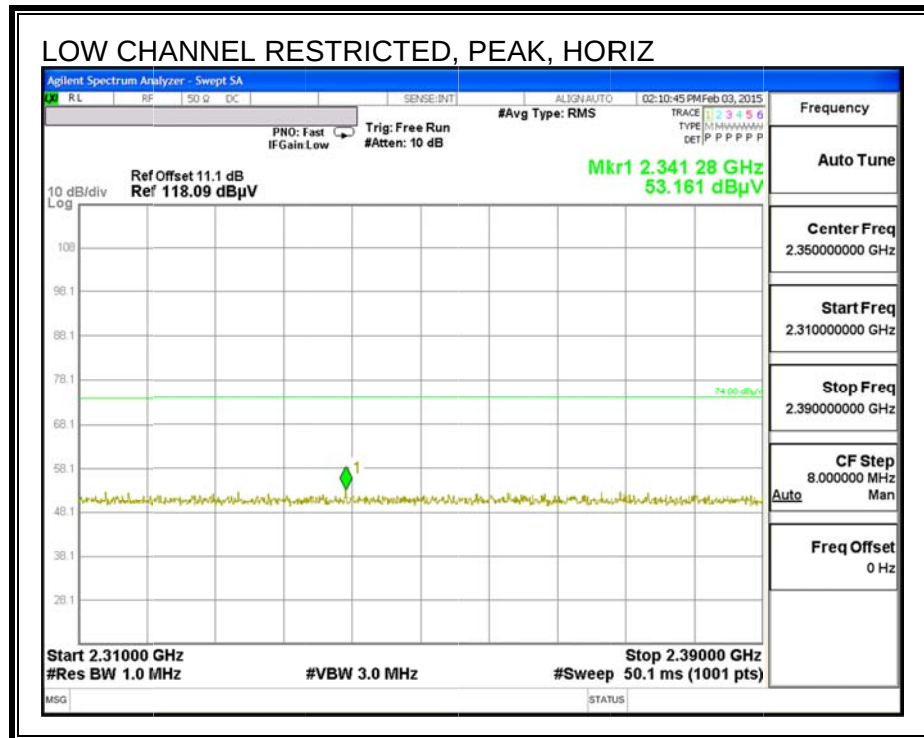
* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

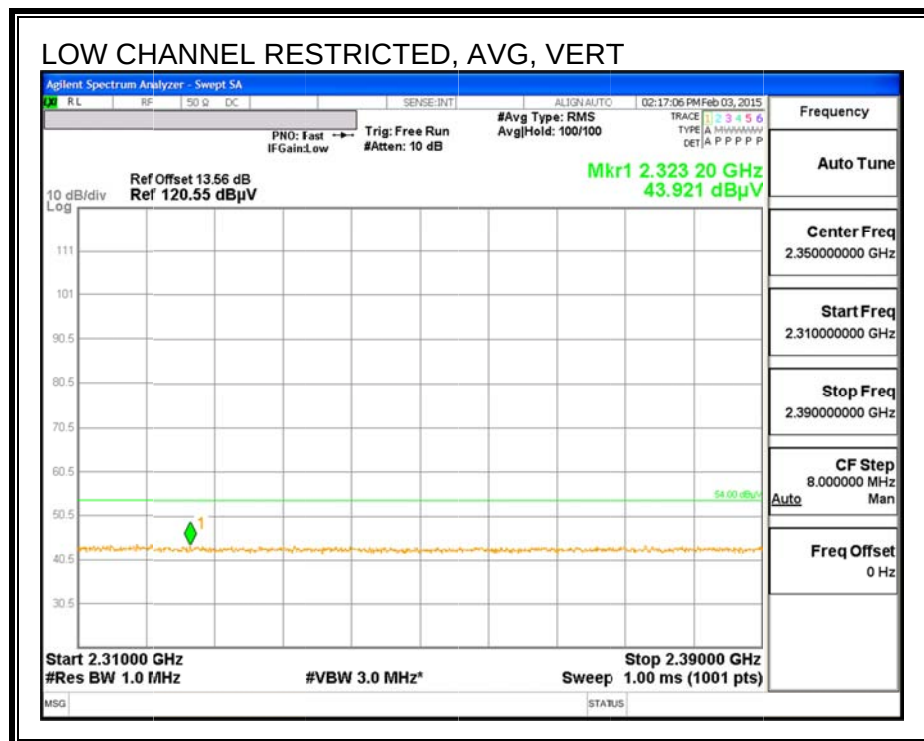
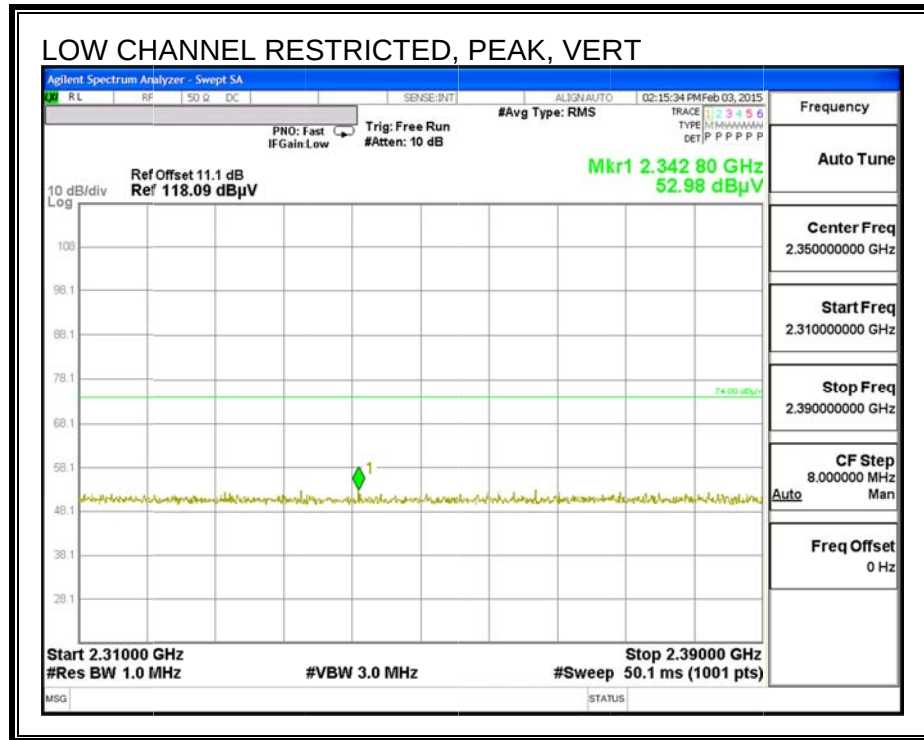
MAv1 - KDB558074 Option 1 Maximum RMS Average

10.3. TRANSMITTER ABOVE 1 GHz ANTENNA 2

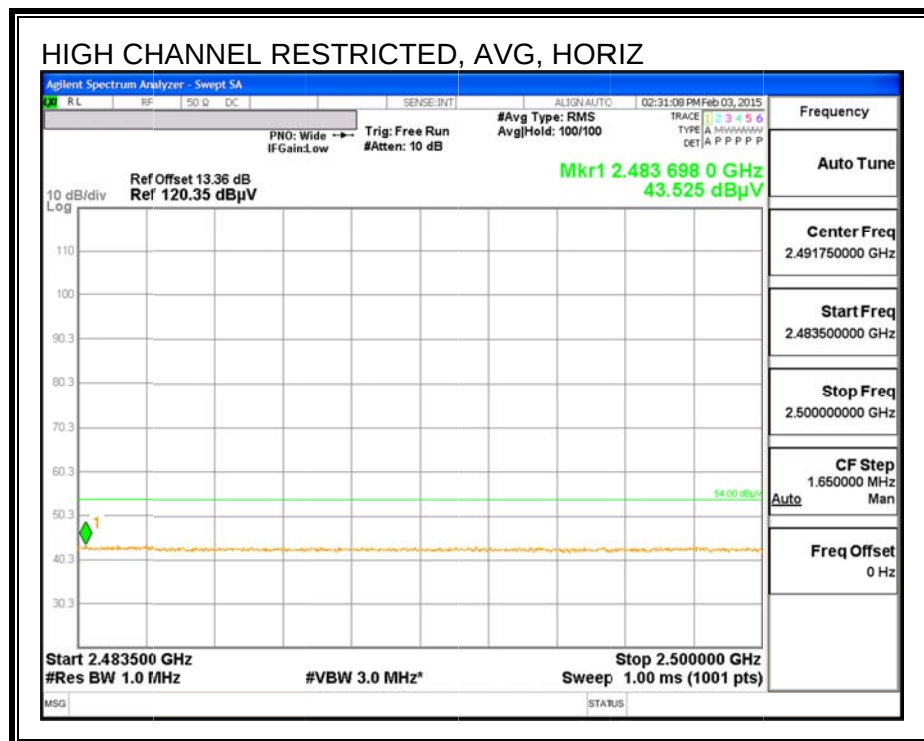
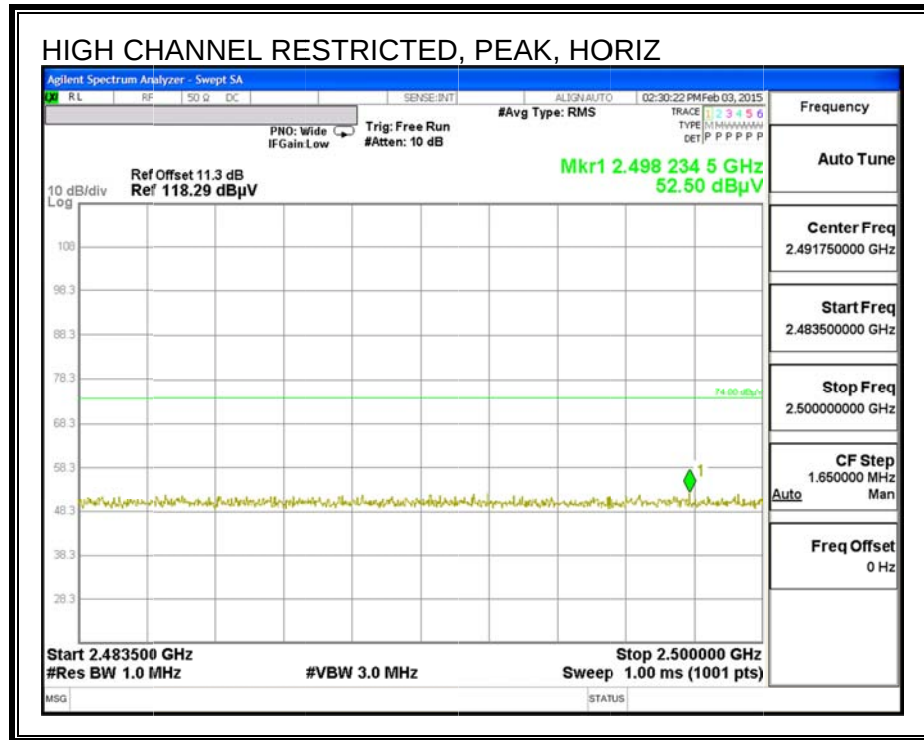
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



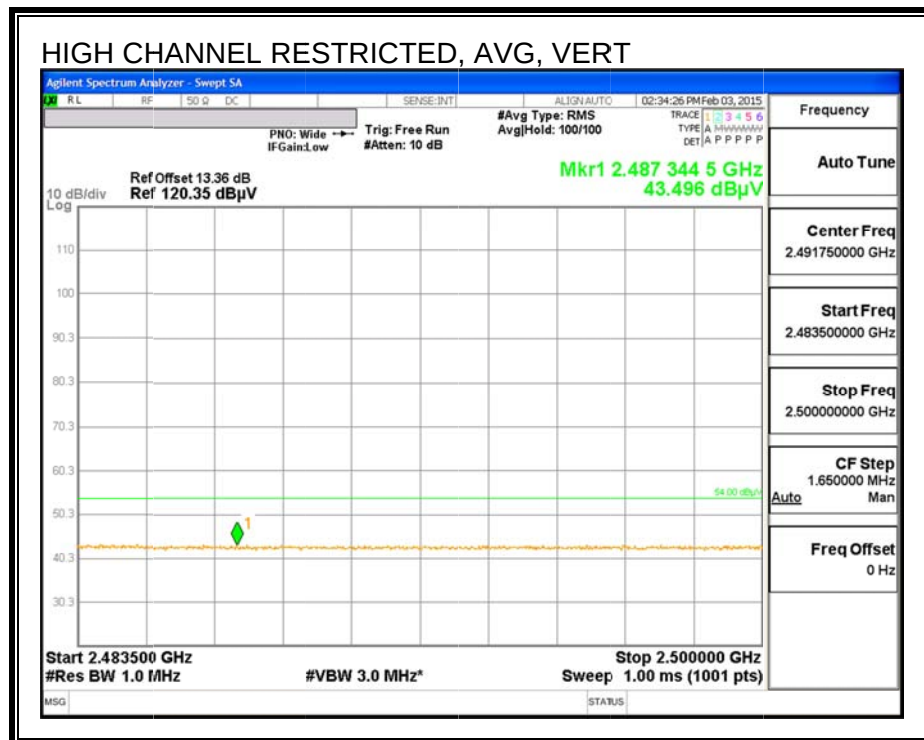
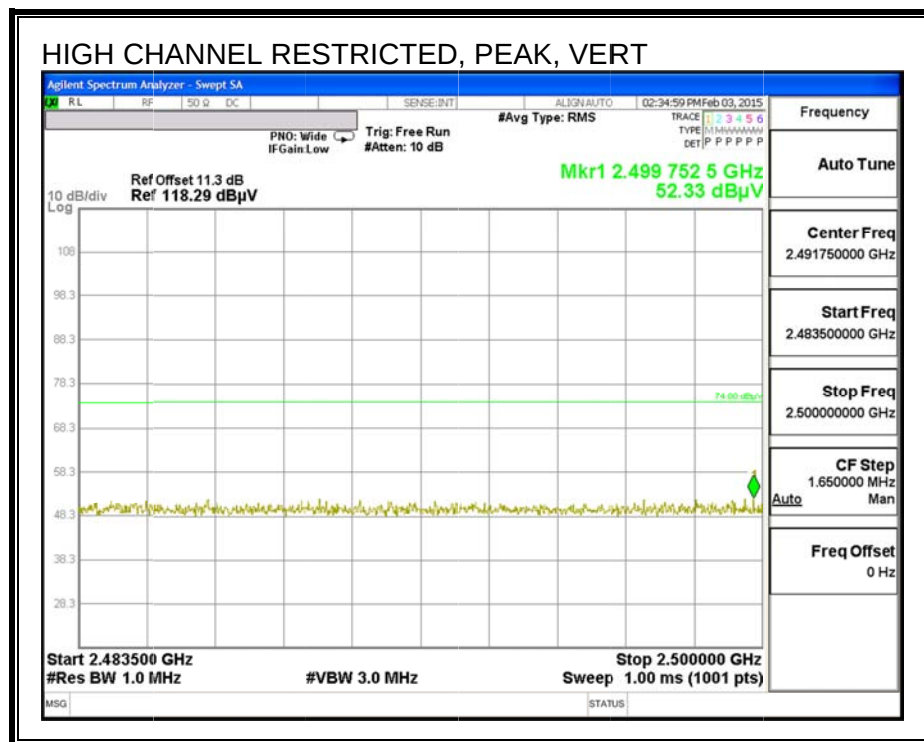
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



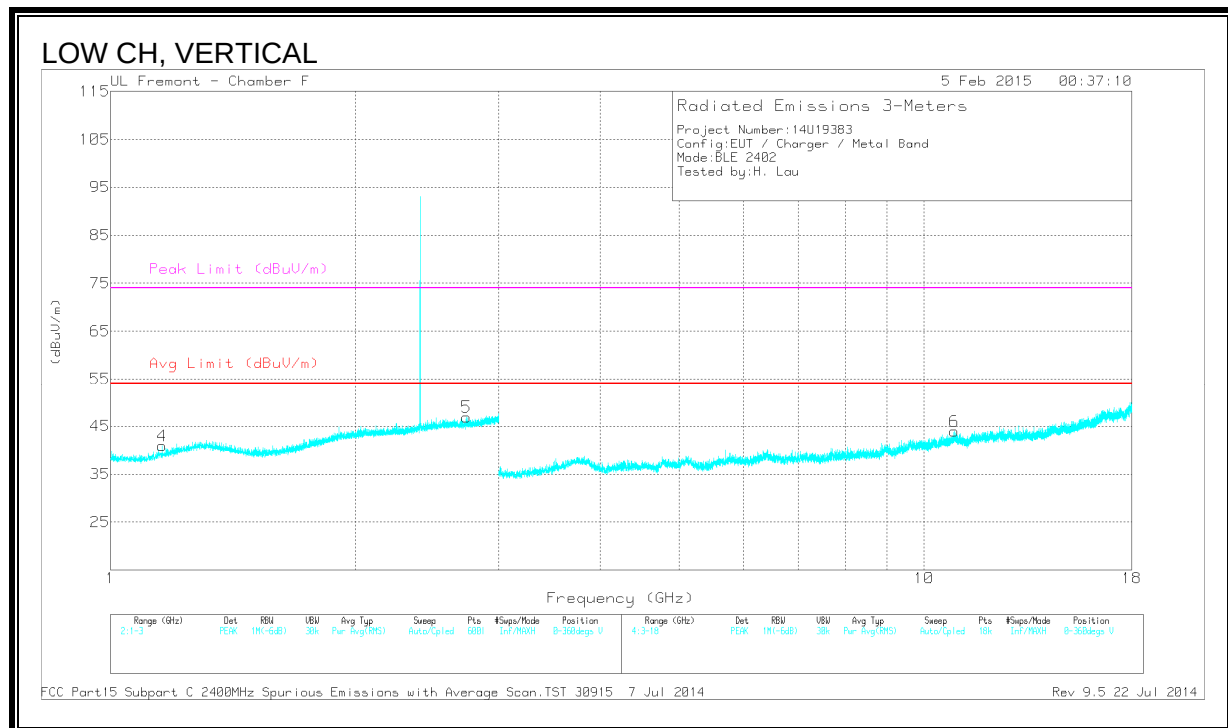
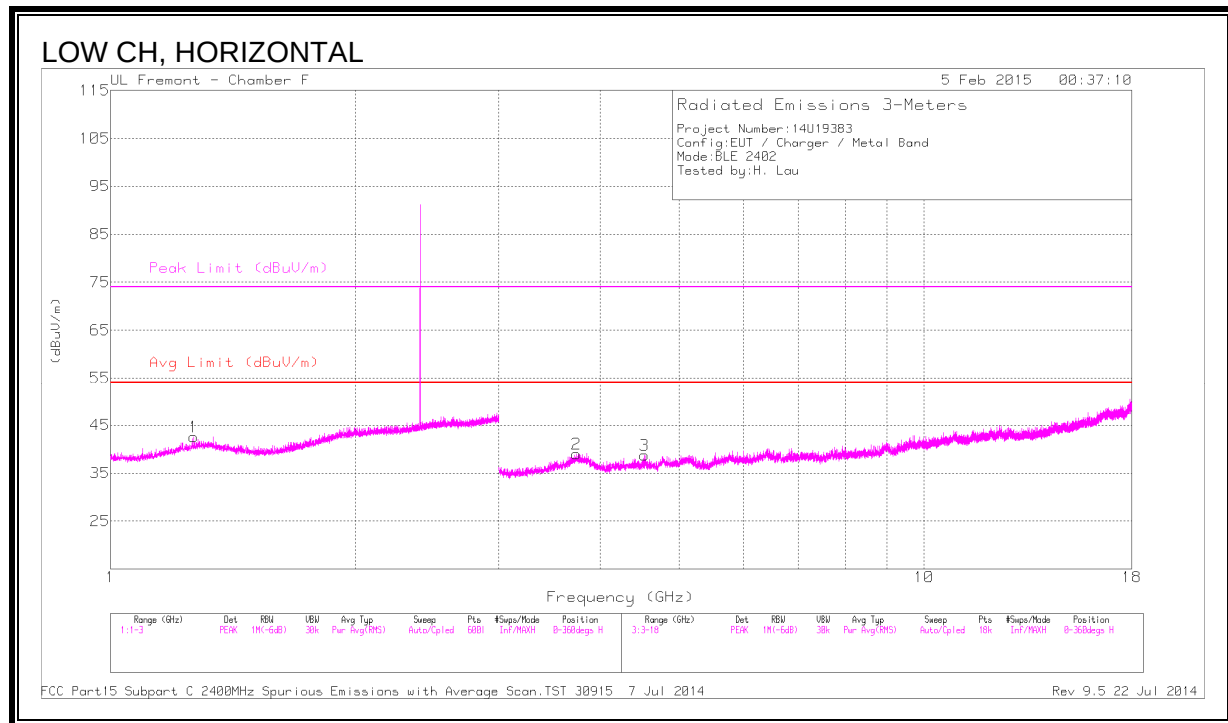
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



LOW CHANNEL HARMONICS AND SPURIOUS EMISSIONS



DATA

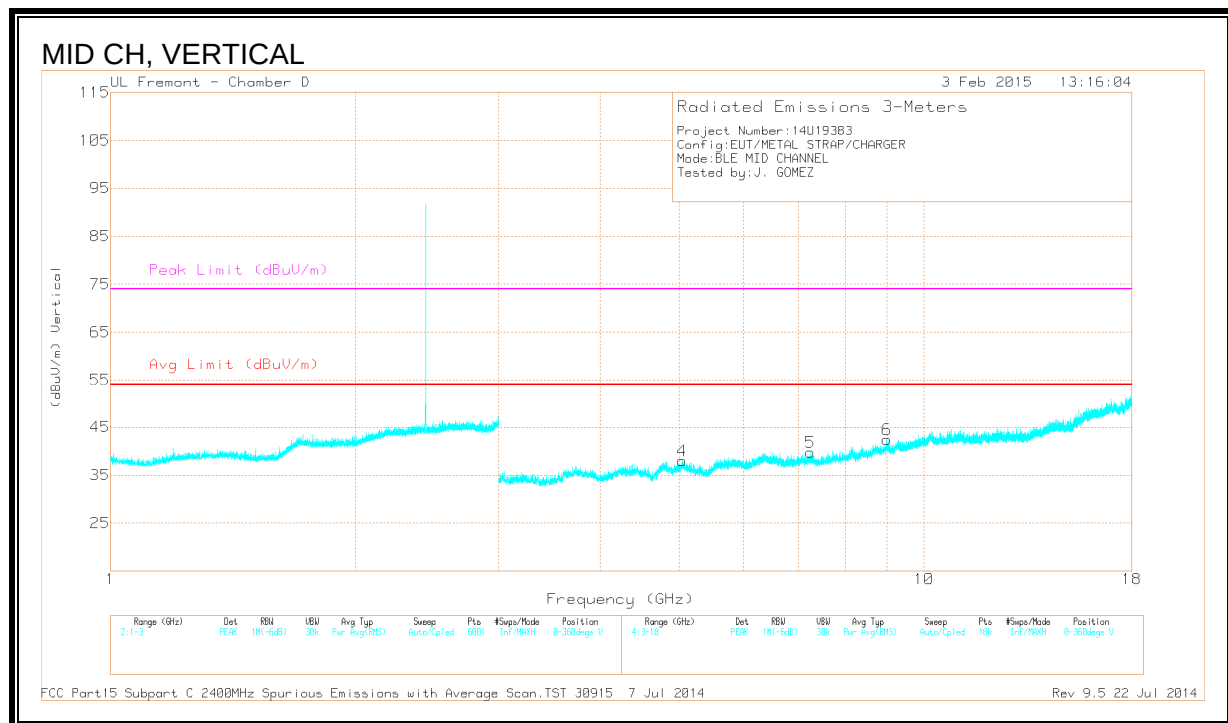
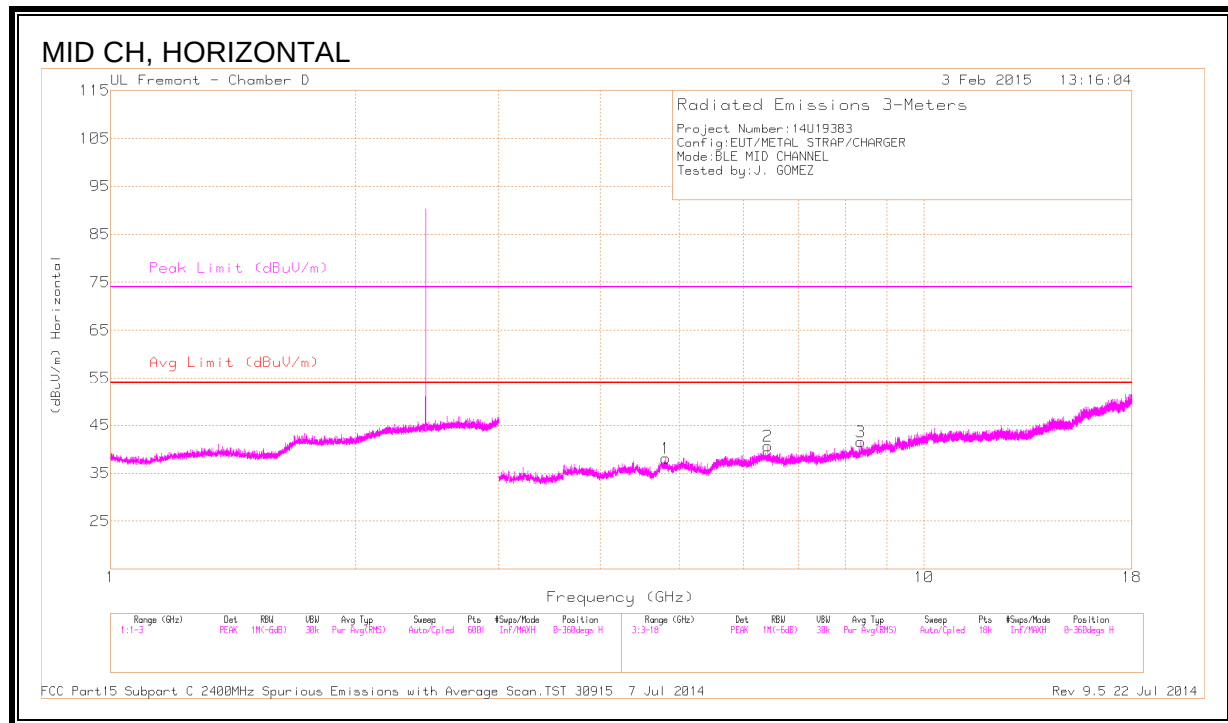
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.268	41.59	PK2	29.7	-22.3	0	48.99	-	-	74	-25.01	15	175	H
	* 1.268	30.68	MAv1	29.7	-22.3	2.06	40.14	54	-13.86	-	-	15	175	H
2	* 3.738	39.55	PK2	34.7	-29.2	0	45.05	-	-	74	-28.95	169	178	H
	* 3.738	28.28	MAv1	34.7	-29.2	2.06	35.88	54	-18.12	-	-	169	178	H
3	* 4.533	38.14	PK2	34.0	-27.9	0	44.24	-	-	74	-29.76	132	158	H
	* 4.531	26.96	MAv1	34.0	-27.8	2.06	35.26	54	-18.74	-	-	132	158	H
4	* 1.157	42.52	PK2	28.3	-22.5	0	48.32	-	-	74	-25.68	65	121	V
	* 1.156	30.61	MAv1	28.3	-22.5	2.06	38.51	54	-15.49	-	-	65	121	V
5	* 2.737	41.63	PK2	32.8	-20.6	0	53.83	-	-	74	-20.17	119	149	V
	* 2.735	30.33	MAv1	32.8	-20.6	2.06	44.63	54	-9.37	-	-	119	149	V
6	* 10.899	34.79	PK2	38.1	-21.5	0	51.39	-	-	74	-22.61	202	191	V
	* 10.899	23.06	MAv1	38.1	-21.5	2.06	41.76	54	-12.24	-	-	202	191	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HARMONICS AND SPURIOUS EMISSIONS



DATA

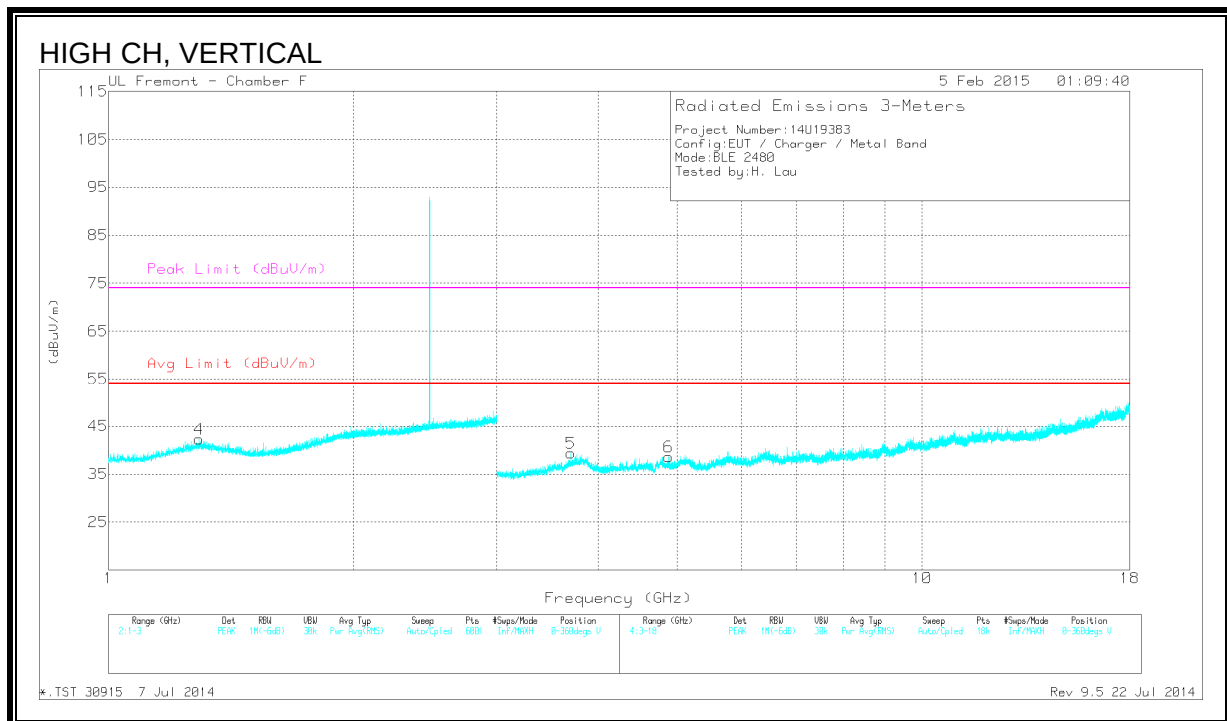
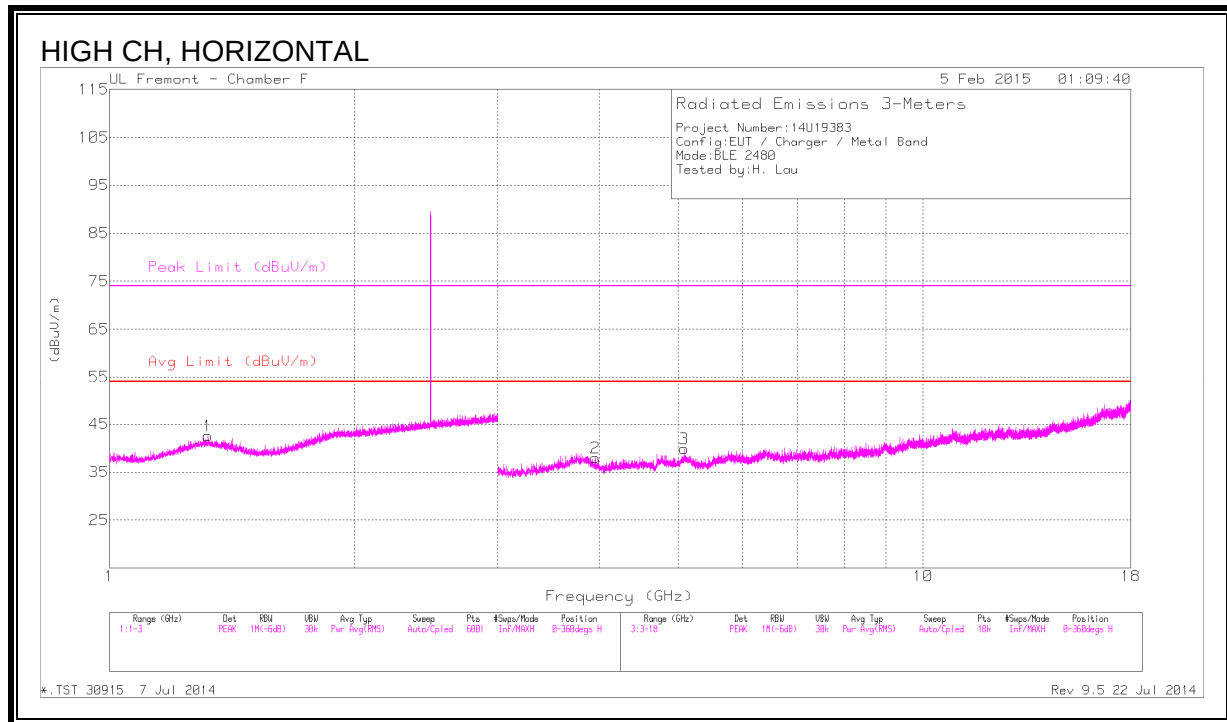
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/ Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.812	37.08	PK2	34.0	-27.2	0	43.88	-	-	74	-30.12	177	270	H
	* 4.809	26.36	MAv1	34.0	-27.1	2.06	35.36	54	-18.64	-	-	177	270	H
2	6.425	36.91	PK2	36.0	-26.5	0	46.41	-	-	-	-	336	248	H
3	* 8.360	35.02	PK2	36.1	-23.4	0	47.72	-	-	74	-26.28	109	164	H
	* 8.358	23.68	MAv1	36.1	-23.5	2.06	38.38	54	-15.62	-	-	109	164	H
4	* 5.046	38.33	PK2	34.0	-26.7	0	45.63	-	-	74	-28.37	167	216	V
	* 5.045	26.04	MAv1	34.0	-26.7	2.06	35.44	54	-18.56	-	-	167	216	V
5	7.246	36.79	PK2	35.6	-24.9	0	47.49	-	-	-	-	100	198	V
6	8.992	35.16	PK2	36.6	-21.9	0	49.86	-	-	-	-	243	148	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HARMONICS AND SPURIOUS EMISSIONS



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.318	41.72	PK2	29.9	-22.2	0	49.42	-	-	74	-24.58	333	190	H
	* 1.318	30.48	MAv1	29.9	-22.2	2.06	40.28	54	-13.72	-	-	333	190	H
2	* 3.954	38.69	PK2	33.9	-29.1	0	43.49	-	-	74	-30.51	237	168	H
	* 3.958	27.88	MAv1	33.8	-29.1	2.06	34.68	54	-19.32	-	-	237	168	H
3	* 5.085	37.96	PK2	34.3	-27.1	0	45.16	-	-	74	-28.84	271	191	H
	* 5.085	26.62	MAv1	34.3	-27.2	2.06	35.82	54	-18.18	-	-	271	191	H
4	* 1.293	42.33	PK2	30.0	-22.2	0	50.13	-	-	74	-23.87	282	220	V
	* 1.293	30.46	MAv1	30.0	-22.2	2.06	40.36	54	-13.64	-	-	282	220	V
5	* 3.701	39.19	PK2	34.8	-29.3	0	44.69	-	-	74	-29.31	202	147	V
	* 3.702	28.19	MAv1	34.8	-29.3	2.06	35.79	54	-18.21	-	-	202	147	V
6	* 4.882	37.87	PK2	34.2	-27.9	0	44.17	-	-	74	-29.83	151	118	V
	* 4.883	26.62	MAv1	34.2	-27.9	2.06	34.98	54	-19.02	-	-	151	118	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

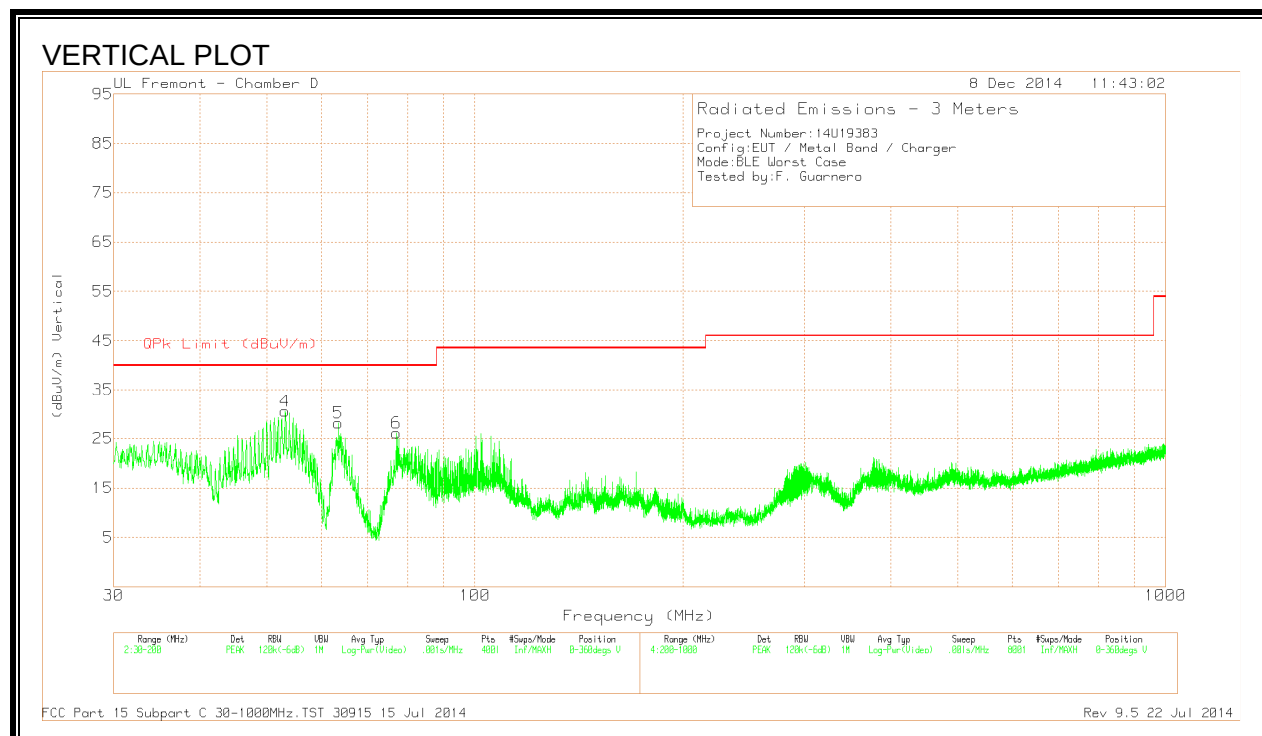
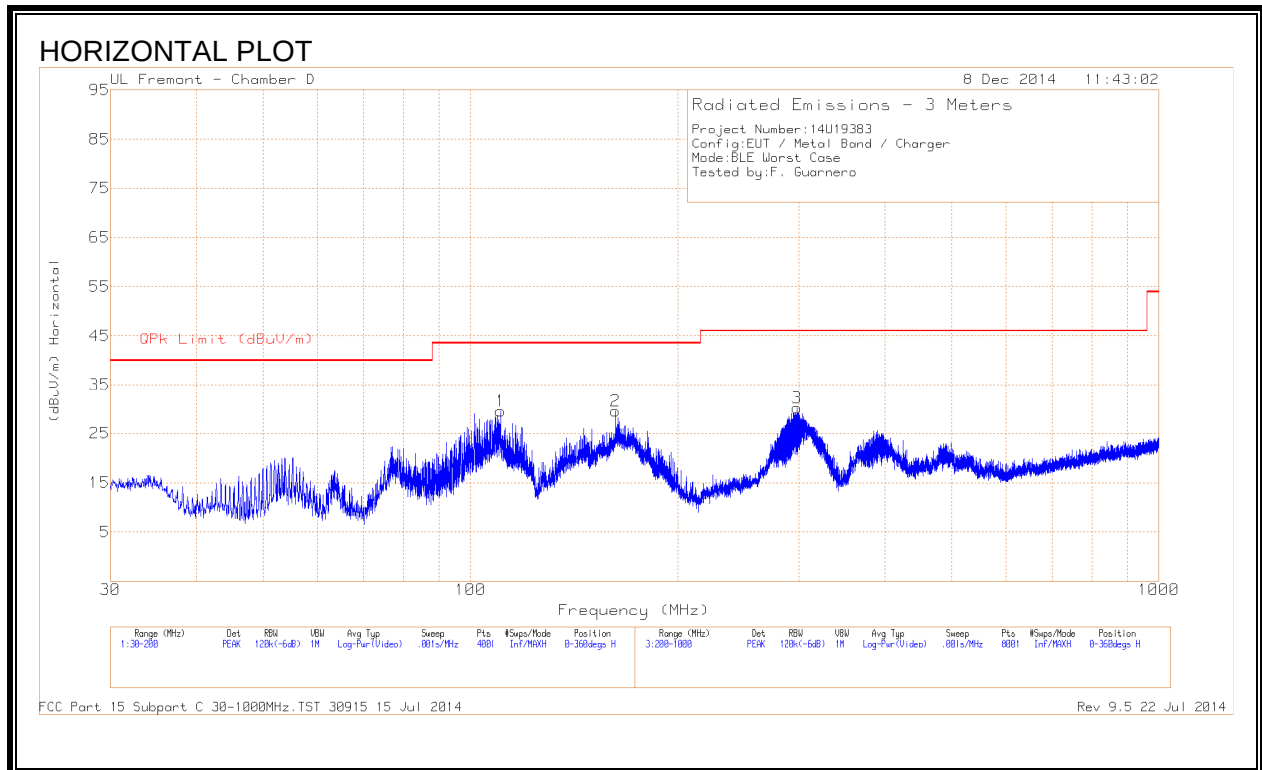
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

10.4. WORST-CASE BELOW 1 GHz

ANTENNA 1

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



DATA

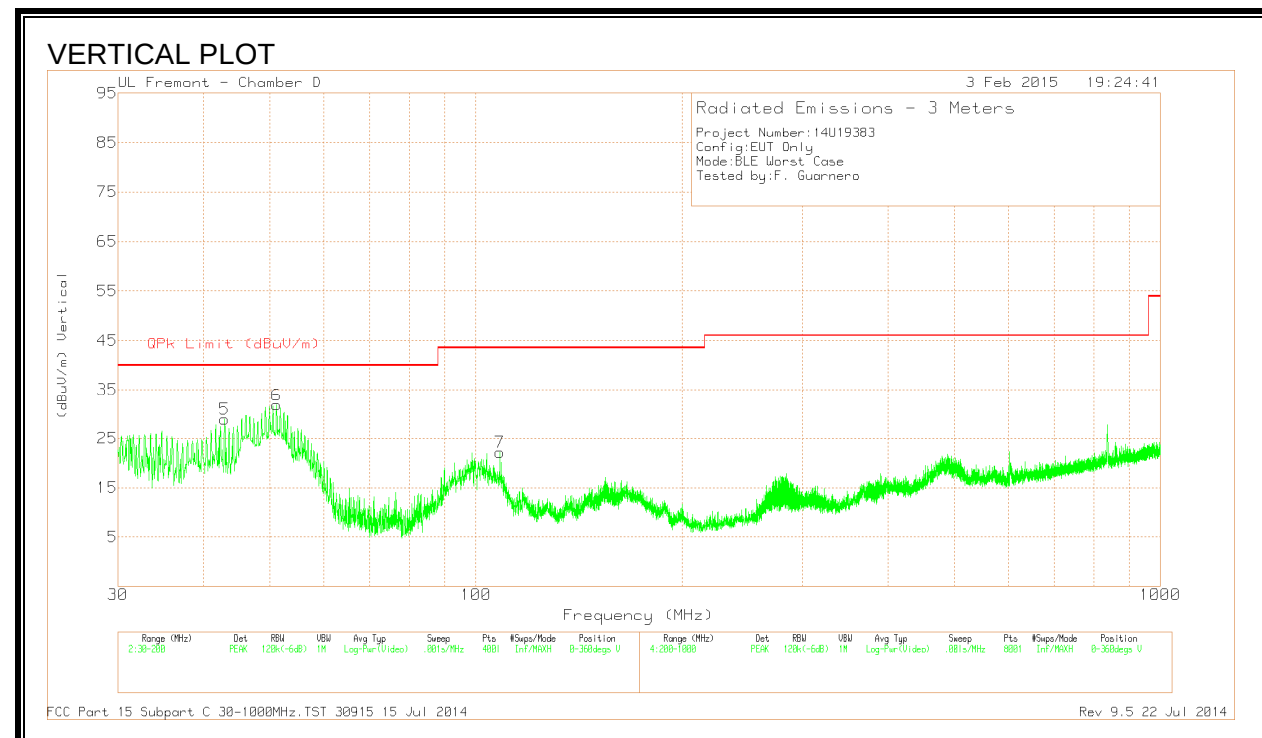
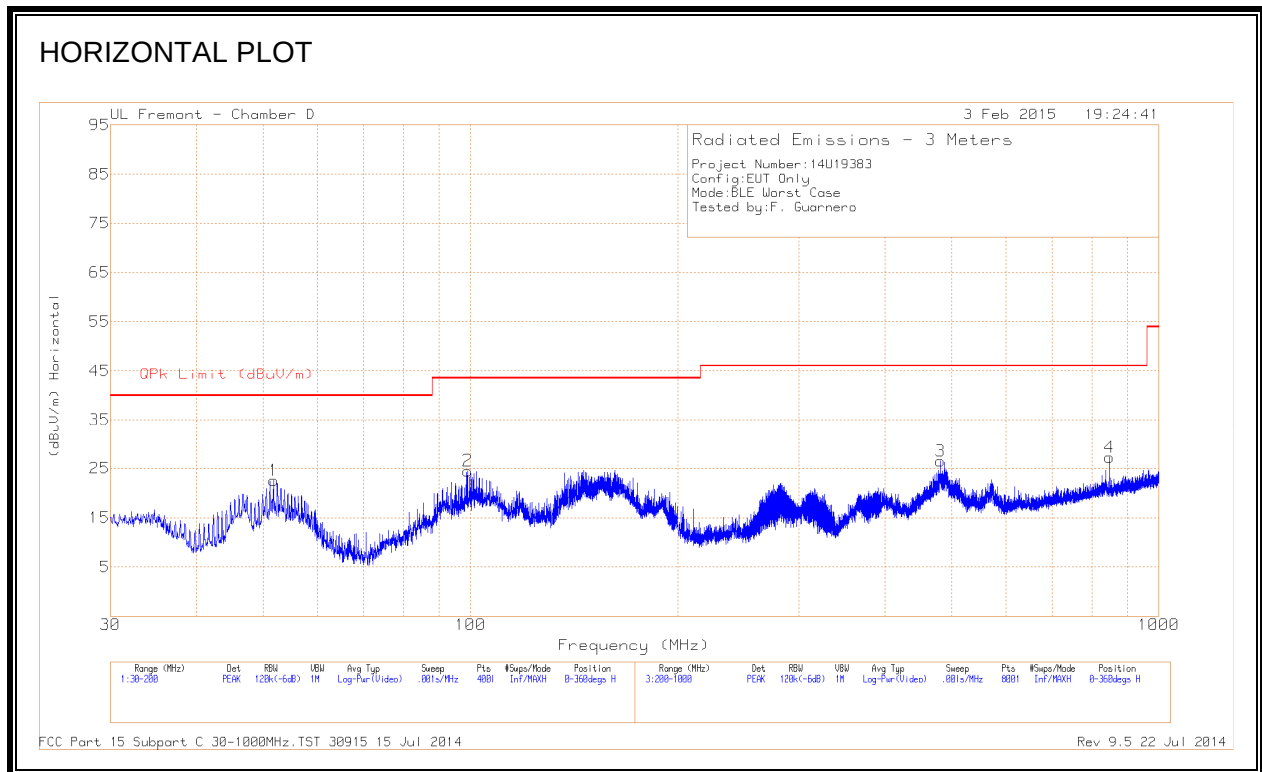
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 110.580	48.00	PK	12.8	-31.3	29.50	43.52	-14.02	0-360	301	H
2	* 162.6425	48.40	PK	12.1	-31.0	29.50	43.52	-14.02	0-360	301	H
3	298.100	47.16	PK	13.4	-30.4	30.16	46.02	-15.86	0-360	100	H
4	53.1625	54.96	PK	7.3	-31.7	30.56	40.00	-9.44	0-360	100	V
5	63.405	51.80	PK	7.9	-31.6	28.10	40.00	-11.90	0-360	100	V
6	77.005	49.72	PK	7.9	-31.5	26.12	40.00	-13.88	0-360	100	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK - Peak detector

ANTENNA 2

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



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	51.8025	46.62	PK	7.5	-31.6	22.52	40.00	-17.48	0-360	401	H
2	99.020	45.82	PK	10.0	-31.3	24.52	43.52	-19.00	0-360	301	H
3	481.500	38.60	PK	17.7	-29.8	26.5	46.02	-19.52	0-360	201	H
4	848.000	34.11	PK	21.8	-28.7	27.21	46.02	-18.81	0-360	201	H
5	42.9625	48.90	PK	11.8	-31.8	28.9	40.00	-11.10	0-360	100	V
6	51.165	55.90	PK	7.6	-31.7	31.8	40.00	-8.20	0-360	100	V
7	* 108.370	41.03	PK	12.4	-31.3	22.13	43.52	-21.39	0-360	100	V

* - indicates frequency in CFR15.205/IC8.10 Restricted Band

PK - Peak detector

10.5. WORST-CASE ABOVE 18 GHz

ANTENNA 1

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)



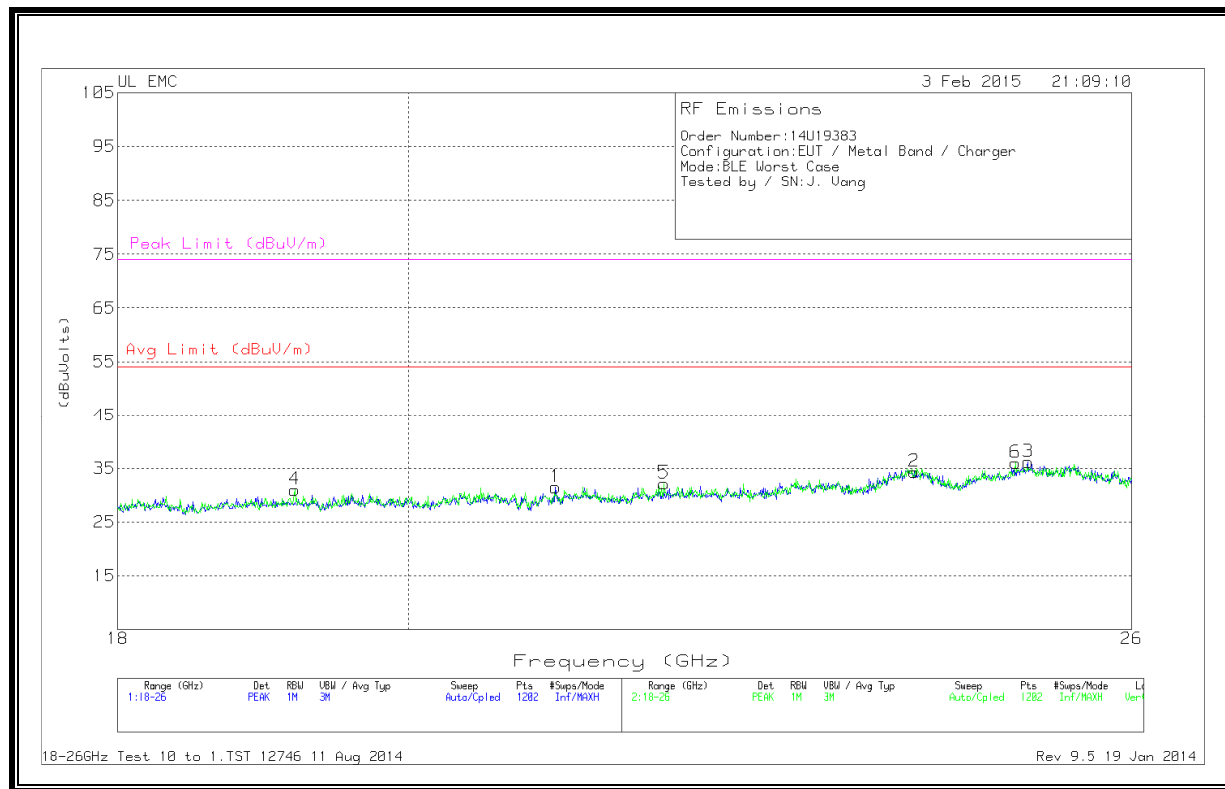
HORIZONTAL & VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T125 (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	24.015	42.57	PK	33.9	-22.8	-9.5	44.17	54	-9.83	74	-29.83
2	24.055	42.97	PK	33.9	-22.7	-9.5	44.67	54	-9.33	74	-29.33

PK - Peak detector

ANTENNA 2

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)



HORIZONTAL & VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (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	21.097	41.80	PK	33.3	-23.6	-20	31.50	54	-22.50	74	-42.50
2	24.028	43.03	PK	34.2	-22.9	-20	34.33	54	-19.66	74	-39.66
3	25.041	44.27	PK	34.5	-22.6	-20	36.16	54	-17.83	74	-37.83
4	19.192	41.60	PK	32.9	-23.5	-20	31.00	54	-23.00	74	-43.00
5	21.943	42.37	PK	33.7	-23.9	-20	32.16	54	-21.83	74	-41.83
6	24.928	44.20	PK	34.5	-22.7	-20	36.00	54	-18.00	74	-38.00

PK - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

* Decreases with the logarithm of the frequency.

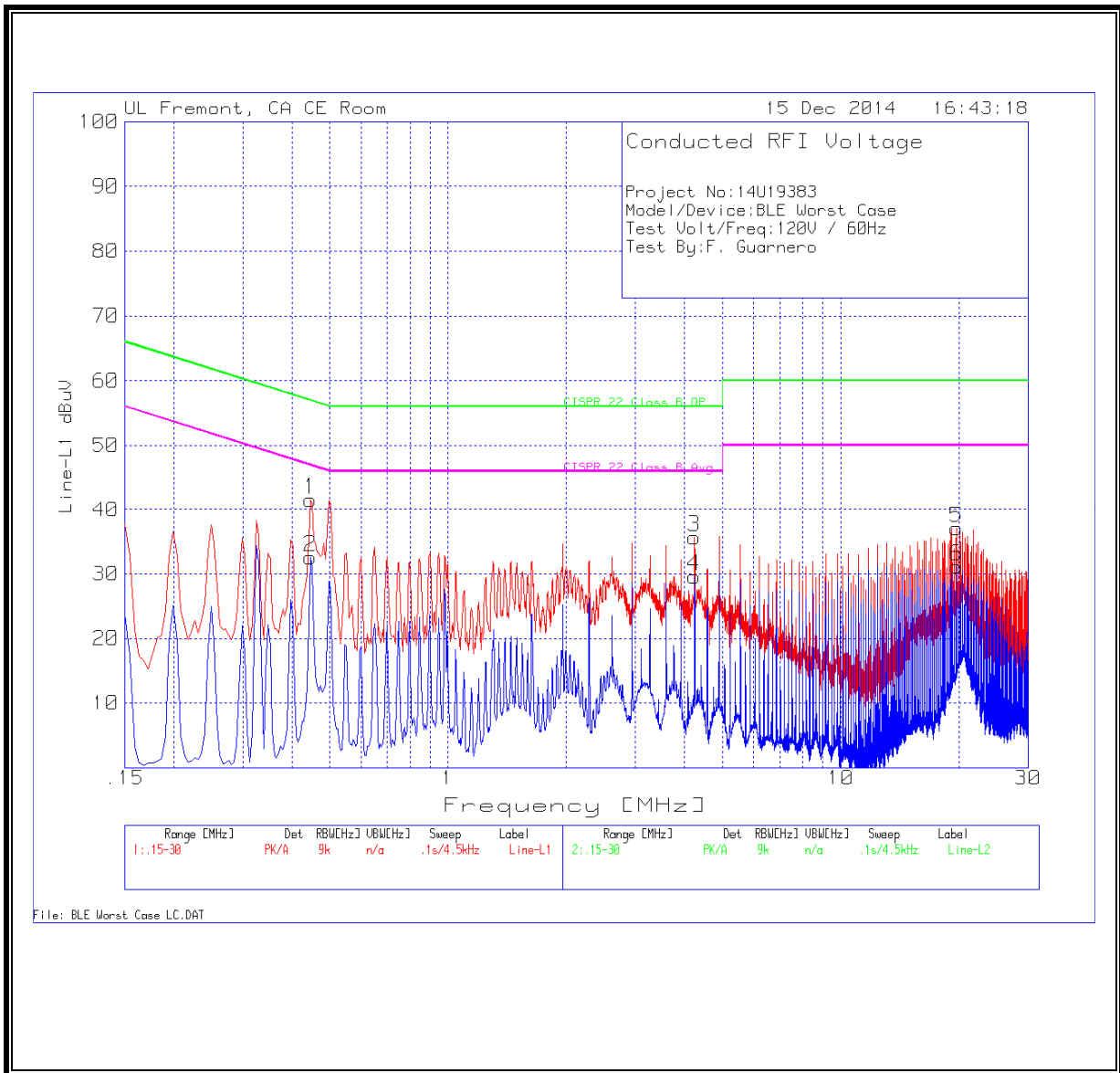
TEST PROCEDURE

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 C63.4.-2009.

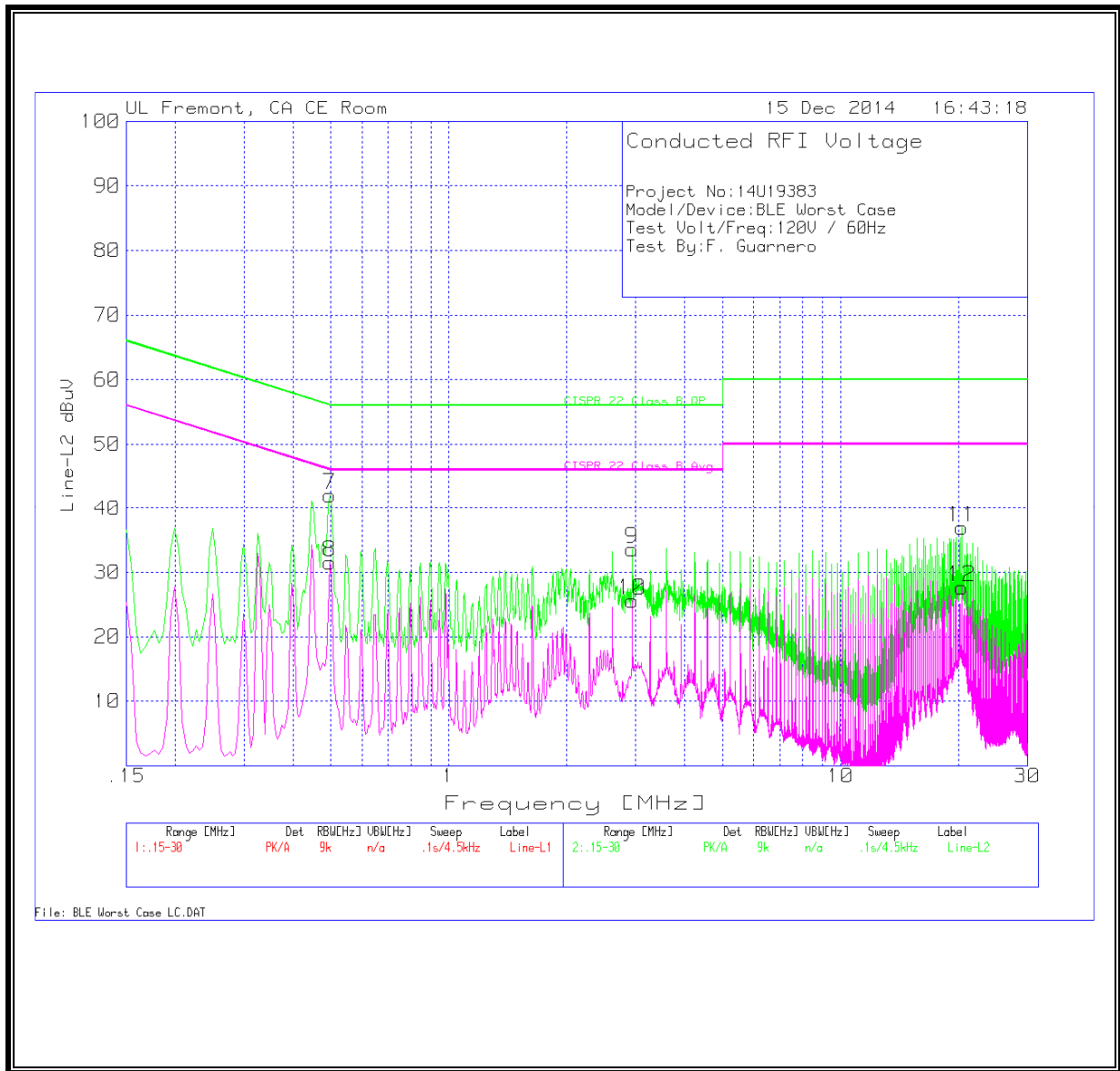
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

LINE 1 PLOT



LINE 2 PLOT



WORST EMISSIONS DATA

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.4470	41.19	PK	.4	0	41.59	56.9	-15.31	-	-
2	.4470	32.16	Av	.4	0	32.56	-	-	46.9	-14.34
3	4.2450	35.32	PK	.2	.1	35.62	56	-20.38	-	-
4	4.2450	29.36	Av	.2	.1	29.66	-	-	46.0	-16.34
5	19.7565	36.58	PK	.3	.2	37.08	60	-22.92	-	-
6	19.7565	30.71	Av	.3	.2	31.21	-	-	50.0	-18.79

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
7	.4965	41.68	PK	.4	0	42.08	56.1	-14.02	-	-
8	.4965	31.19	Av	.4	0	31.59	-	-	46.1	-14.51
9	2.9400	33.35	PK	.2	.1	33.65	56	-22.35	-	-
10	2.9400	25.37	Av	.2	.1	25.67	-	-	46.0	-20.33
11	20.409	36.41	PK	.3	.2	36.91	60	-23.09	-	-
12	20.409	27.13	Av	.3	.2	27.63	-	-	50.0	-22.37

PK - Peak detector

Av - average detection