CERTIFICATION TEST REPORT

Report Number. : 11888671-E8V1

Applicant	:	VALVE CORPORATION 10400 NE 4th ST. SUITE 1400 BELLEVUE, WA 98004, U.S.A.
Model	:	1004
FCC ID	:	2AES41004
IC	:	20207-1004
EUT Description	:	SteamVR Tracking 2.0 Base Station
Test Standard(s)	:	LP0002: 2016

Date Of Issue:
November 14, 2017

Prepared by:
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	11/14/2017	Initial Issue	--

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 7

3. FACILITIES AND ACCREDITATION 7

4. CALIBRATION AND UNCERTAINTY 8

4.1. MEASURING INSTRUMENT CALIBRATION 8

4.2. SAMPLE CALCULATION 8

4.3. MEASUREMENT UNCERTAINTY 8

5. EQUIPMENT UNDER TEST 9

5.1. DESCRIPTION OF EUT 9

5.2. MAXIMUM OUTPUT POWER 9

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 9

5.4. SOFTWARE AND FIRMWARE 9

5.5. WORST-CASE CONFIGURATION AND MODE 10

5.6. DESCRIPTION OF TEST SETUP 11

6. TEST AND MEASUREMENT EQUIPMENT 14

7. ANTENNA PORT TEST RESULTS 15

7.1. MEASUREMENT METHODS 15

7.2.1. ON TIME, DUTY CYCLE 16
7.2.2. 6 dB BANDWIDTH 18
7.2.3. 99% BANDWIDTH 21
7.2.4. AVERAGE POWER 24
7.2.5. OUTPUT POWER 25
7.2.6. POWER SPECTRAL DENSITY 28
7.2.7. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS 31

8. RADIATED TEST RESULTS 35

8.1. LIMITS AND PROCEDURE 35

8.2. TRANSMITTER ABOVE 1GHZ 36

8.2.1. RESTRICTED BANDEDGE (LOW CHANNEL) 36
8.2.2. AUTHORIZED BANDEDGE (HIGH CHANNEL) 38
8.2.3. HARMONICS AND SPURIOUS EMISSIONS 40

8.3. TRANSMITTER WORST-CASE BELOW 1 GHz 46

8.4. TRANSMITTER WORST-CASE ABOVE 18 GHz 48

8.5. RECEIVER WORST-CASE BELOW 1GHZ 50

8.6. RECEIVER WORST-CASE ABOVE 1GHZ 52

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9. AC POWER LINE CONDUCTED EMISSIONS 54

10. SETUP PHOTOS 57

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: VALVE CORPORATION
10400 NE 4th ST. SUITE 1400
BELLEVUE, WA 98004, U.S.A.

EUT DESCRIPTION: SteamVR Tracking 2.0 Base Station

MODEL: 1004

SERIAL NUMBER: AB73700187 (Conducted), AB739000CF (Radiated)

DATE TESTED: OCTOBER 13, 2017 – NOVEMBER 06, 2017

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
LP0002: 2016	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 U.S. government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with NCC: LP0002: 2016, FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v04, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

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:22541-1)
☐ Chamber B (IC:2324B-2)	☒ Chamber E (IC:22541-2)
☒ Chamber C (IC:2324B-3)	☒ Chamber F (IC:22541-3)
	☐ Chamber G (IC:22541-4)
	☐ Chamber H (IC:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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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
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB
Occupied Channel Bandwidth	±0.39 %

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The equipment under test is a laser scanning base station for position tracking.

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	0.94	1.24

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Peak Gain (dBi)
2.4	6.80

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Teraterm. Firmware version 4.96 and Software tool version was 2.3

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5.5. WORST-CASE CONFIGURATION AND MODE

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

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

Worst-case data rate as provided by the client was:

BLE: 1 Mbps.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Laptop	Lenovo	T420	PBFBKHK
AC Adapter	Chicony	A16-010N1A	F187551702000383

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	2-Prong	Un-Shielded	1	
2	USB	1	Micro USB	Un-Shielded	0.5	

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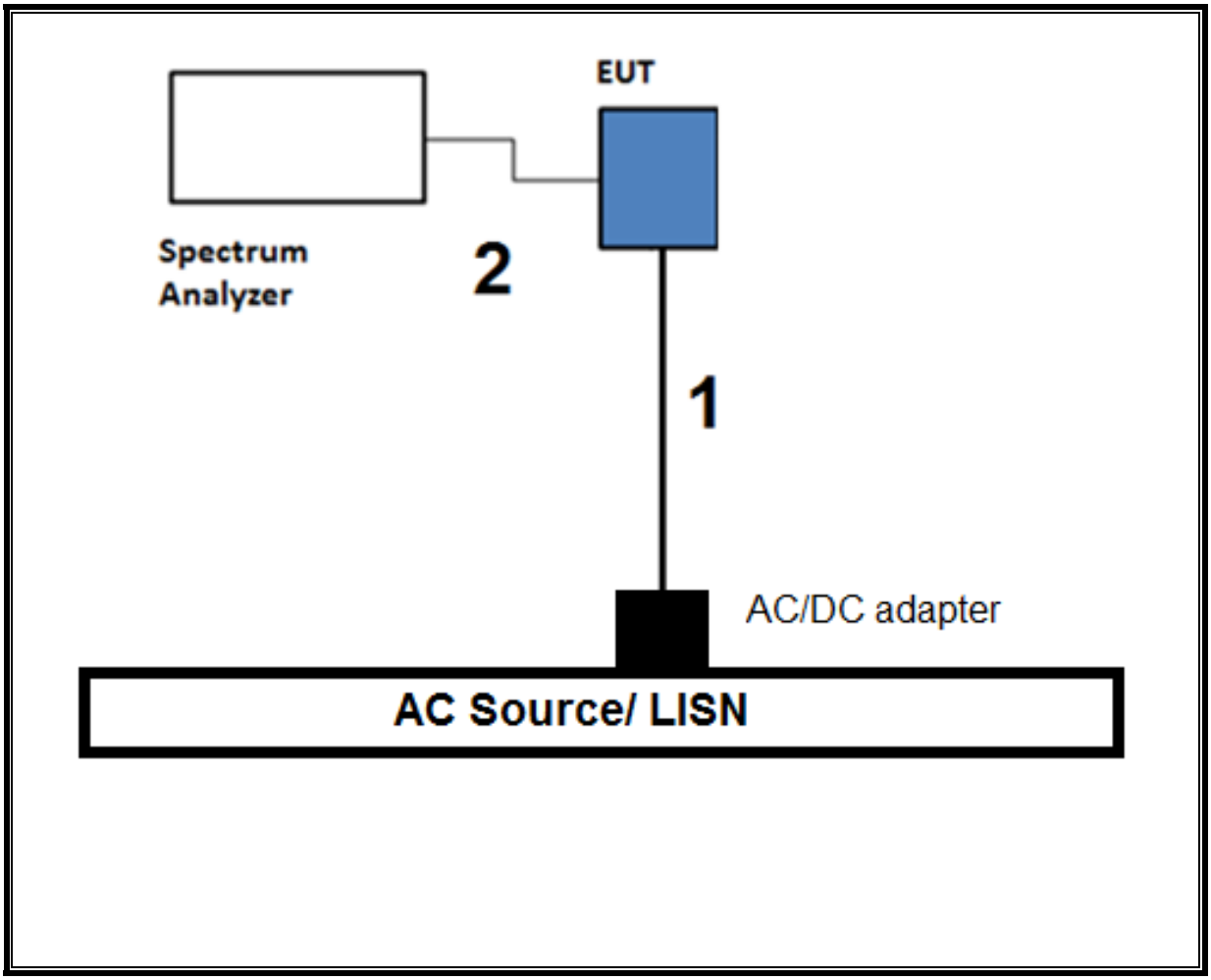
TEST SETUP – CONDUCTED TEST SETUP

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

SETUP DIAGRAM



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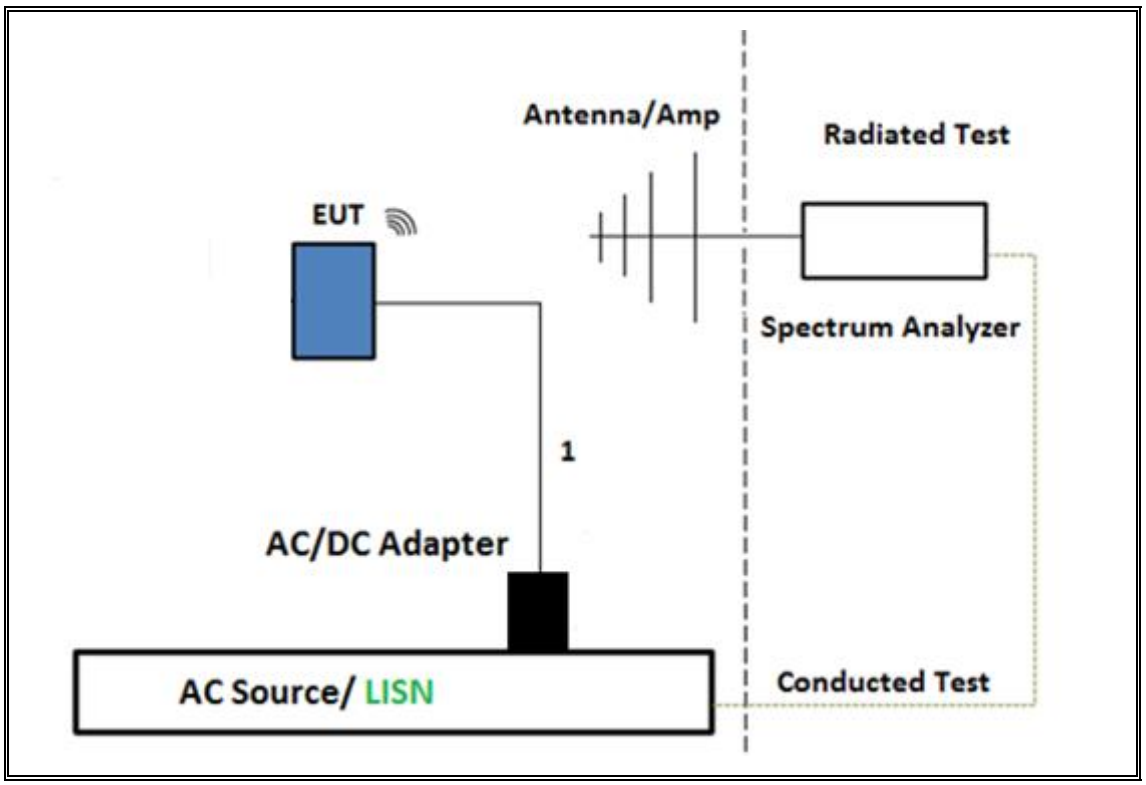
TEST SETUP- RADIATED AND AC LINE CONDUCTED TESTS

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

SETUP DIAGRAM



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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, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB1	T122	1/31/2018
Amplifier, 10KHz to 1GHz, 32dB	Sonoma Instrument	310	T173	6/24/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A-544	T1113	12/20/2017
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T346	3/28/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T742	1/25/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T907	1/23/2018
Power Meter, P-series single channel	Keysight	N1911A	T1264	7/08/2018
Power Sensor, P – series, 50MHz to 18GHz, Wideband	Keysight	N1921A	T413	6/20/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T408	11/10/2017
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T712	1/30/2018
Amplifier, 10KHz to 1GHz, 32dB	Sonoma Instrument	310N	T300	11/10/2017
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T931	9/22/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T905	1/11/2018
Amplifier, 1-26.5GHz	Keysight	8449B	T404	7/05/2018
Antenna, Horn 18 to 26.5GHz	A.R.A.	MWH-1826	T89	1/4/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T459	6/22/2018
AC Line Conducted				
EMI Test Receiver, 9KHz to 7GHz	Rohde & Schwarz	ESR	1436	1/6/2018
LISN	FISCHER	FCC-LISN-50/250-25-2-01	T1310	1/17/2018
LISN	Solar Electronics	8012-50-R-24-BNC	T24	6/2/2018
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016	
Conducted Software	UL	UL RF	Ver 7.3, September 28, 2017	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v04, Section 8.1.

Output Power: KDB 558074 D01 v04, Section 9.1.3.

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1.

Band-edge: KDB 558074 D01 v04, Section 12.1.

Conducted line emissions: C63.10, Clause 6.2

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7.2.1. 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	0.395	0.625	0.633	63.29%	1.99	2.530

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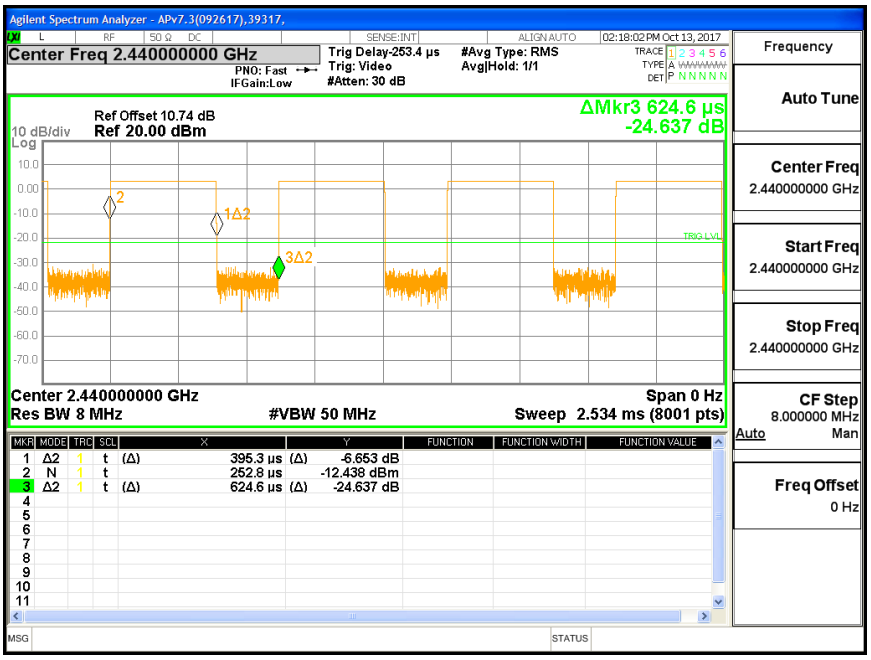
DUTY CYCLE PLOTS

DUTY CYCLE BLE



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7.2.2. 6 dB BANDWIDTH

LIMITS

NCC LP0002 3.10.1 §6.2

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.726	0.5
Middle	2440	0.664	0.5
High	2480	0.708	0.5

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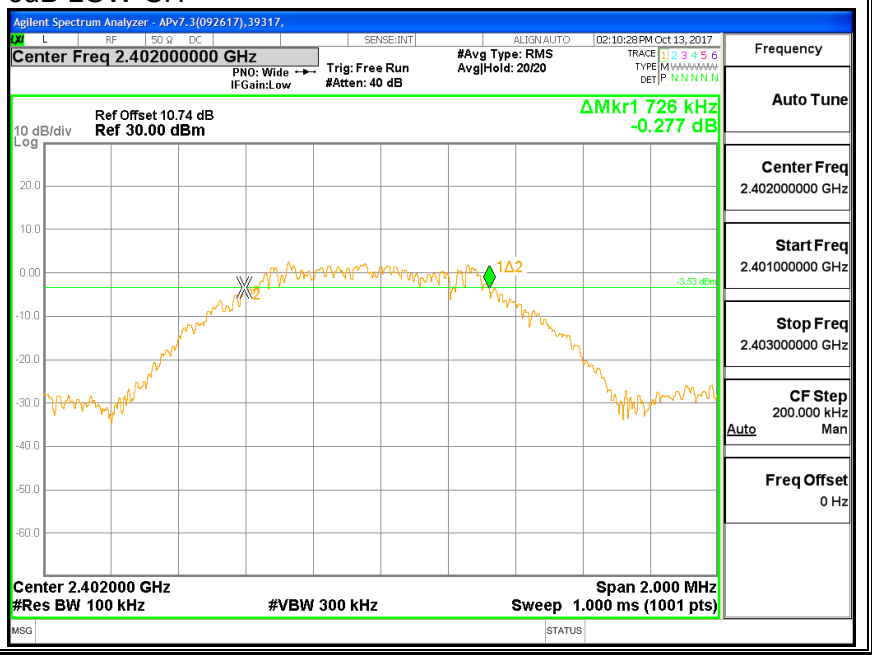
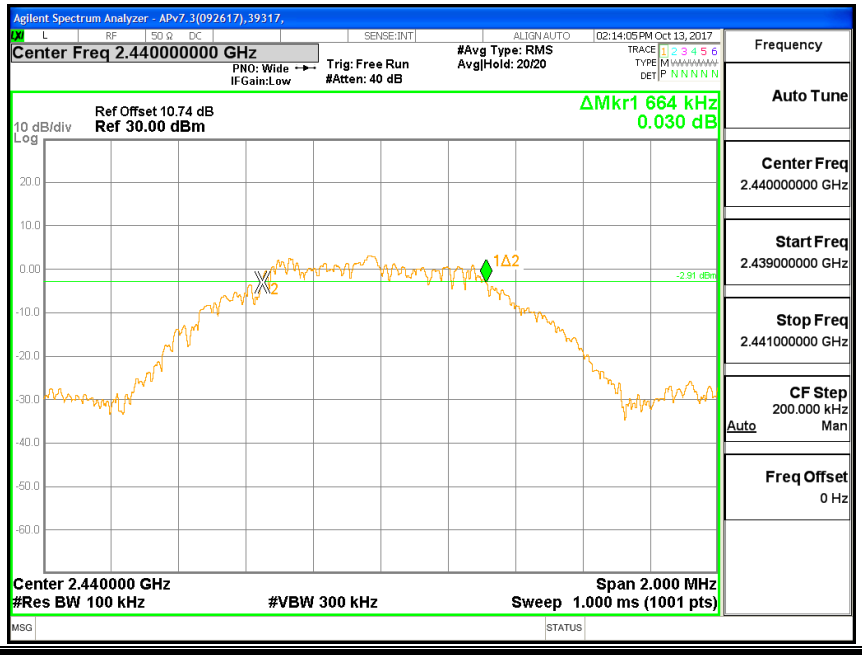
6dB LOW CH



6dB MID CH



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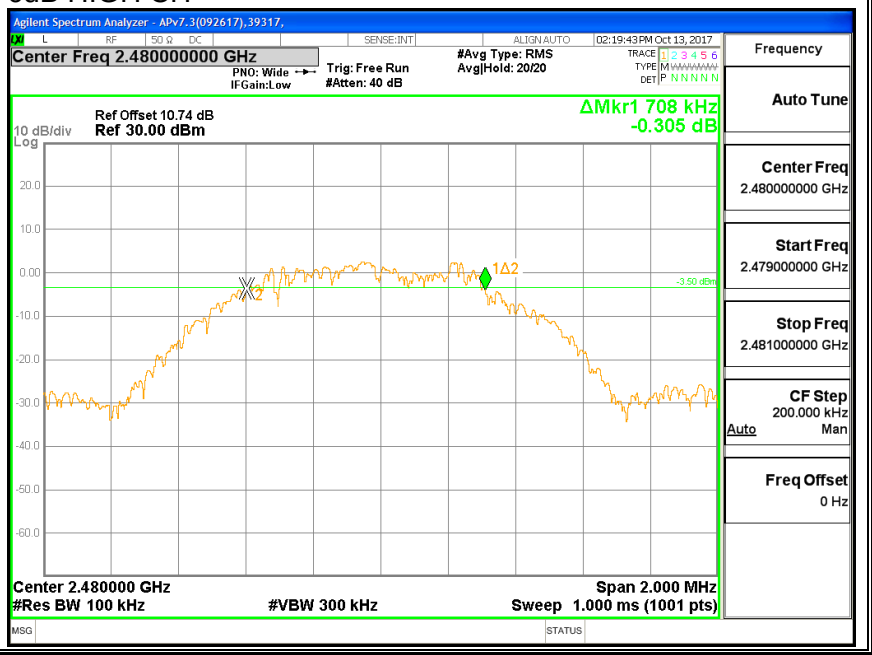
6dB HIGH CH



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7.2.3. 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 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	2402	1.0430
Middle	2440	1.0495
High	2480	1.0500

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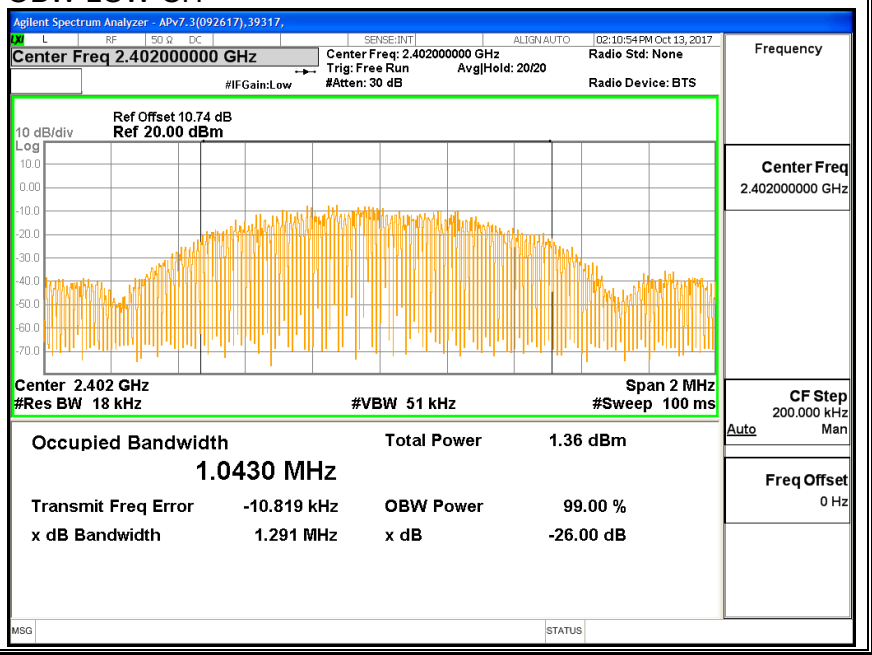
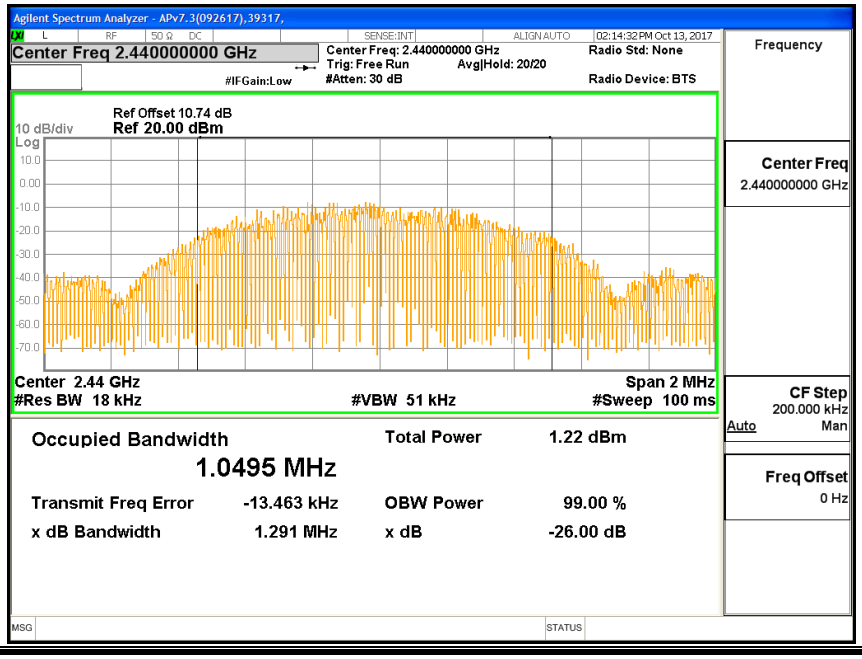
OBW LOW CH



OBW MID CH



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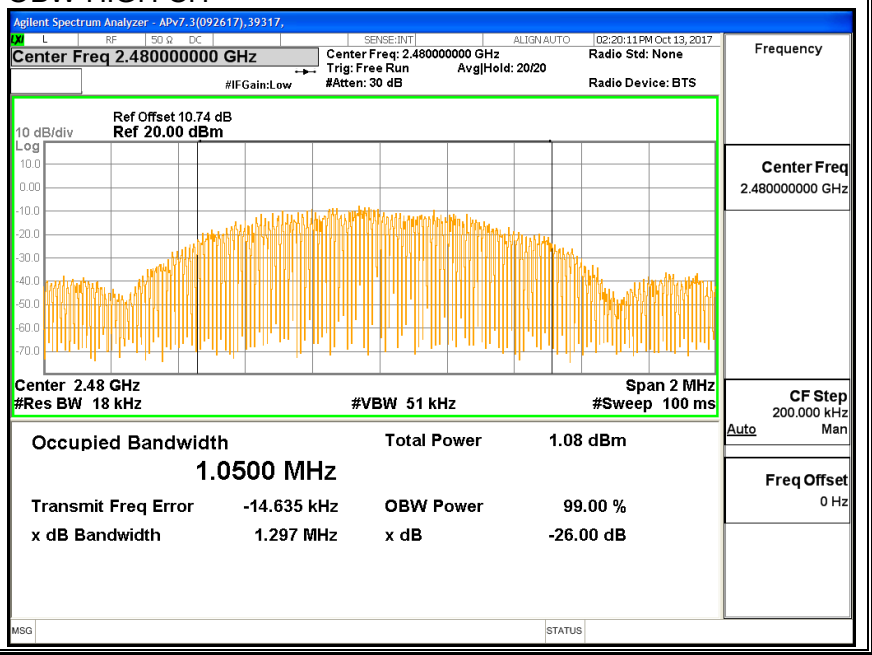
OBW HIGH CH



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7.2.4. AVERAGE POWER

ID:	39317	Date:	10/13/17

LIMITS

None; for reporting purposes only.

The cable assembly insertion loss of 10.74 dB (including 10 dB pad and 0.74 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	0.36
Middle	2440	0.36
High	2480	0.33

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7.2.5. OUTPUT POWER

ID:	39317	Date:	10/16/17

LIMITS

NCC LP0002 3.10.1 §2.3

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

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.94	29.2	-28.26
Middle	2440	0.78	29.2	-28.42
High	2480	0.76	29.2	-28.44

* Peak antenna gain is 6.8dBi for this point-to-multipoint system, limit is 29.2dBm.

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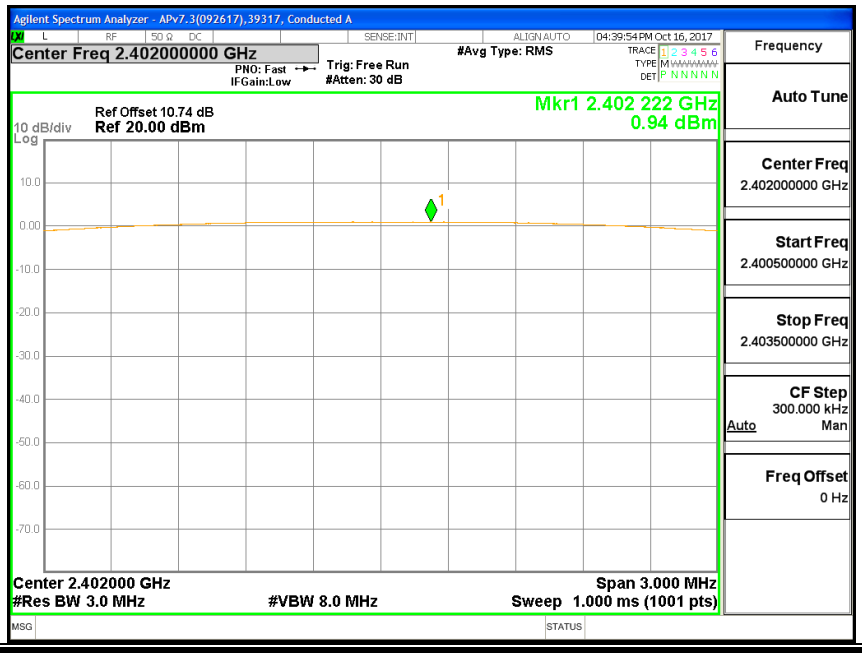
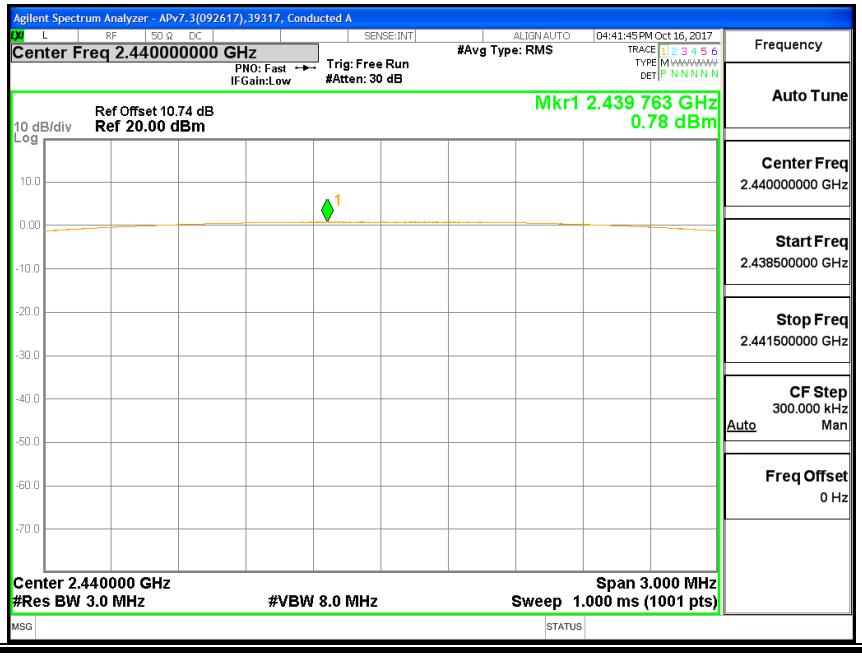
LOW CH



MID CH



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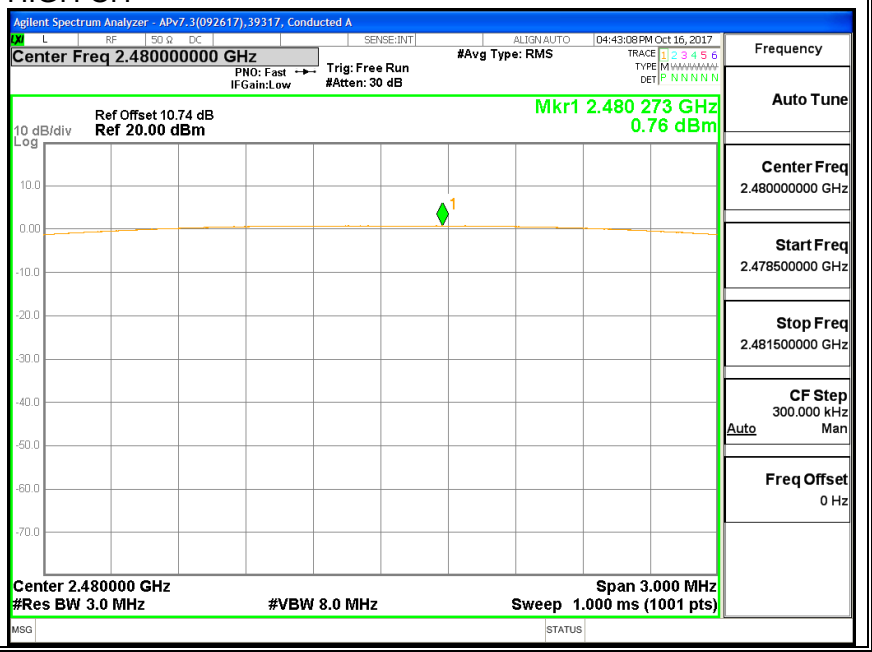
HIGH CH



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7.2.6. POWER SPECTRAL DENSITY

LIMITS

NCC LP0002 3.10.1 §6.2.2

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	-15.34	8	-23.34
Middle	2440	-17.24	8	-25.24
High	2480	-16.00	8	-24.00

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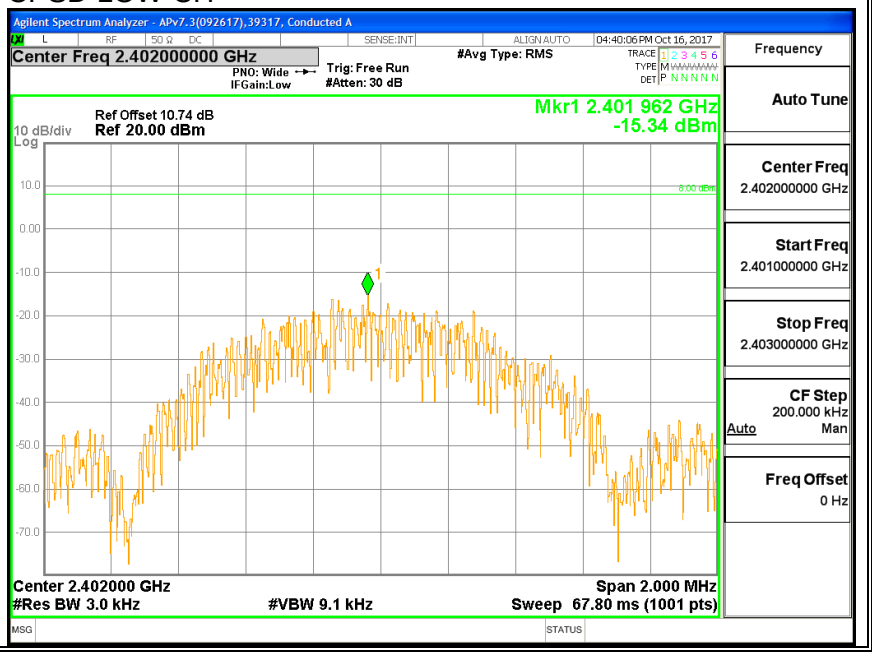
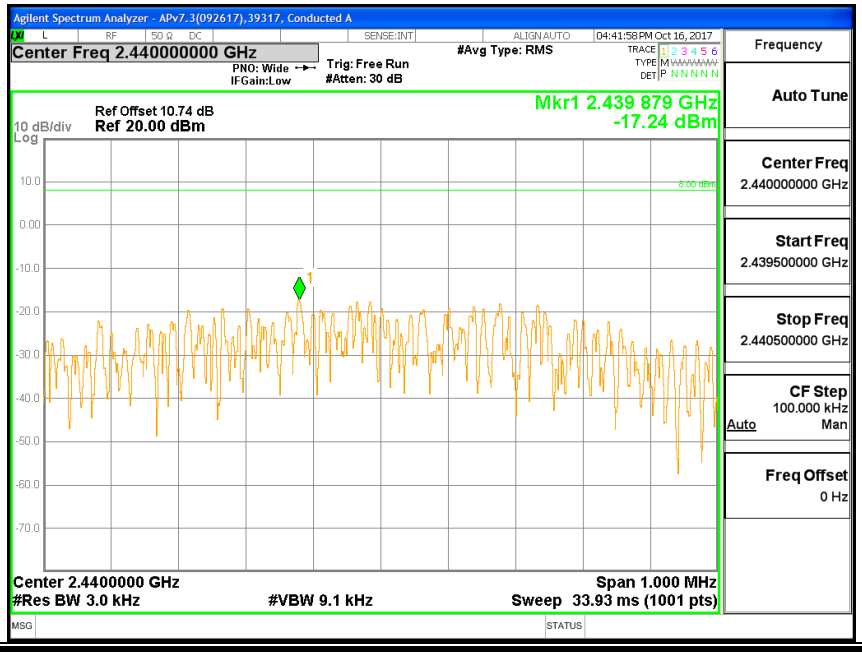
CPSD LOW CH



CPSD MID CH



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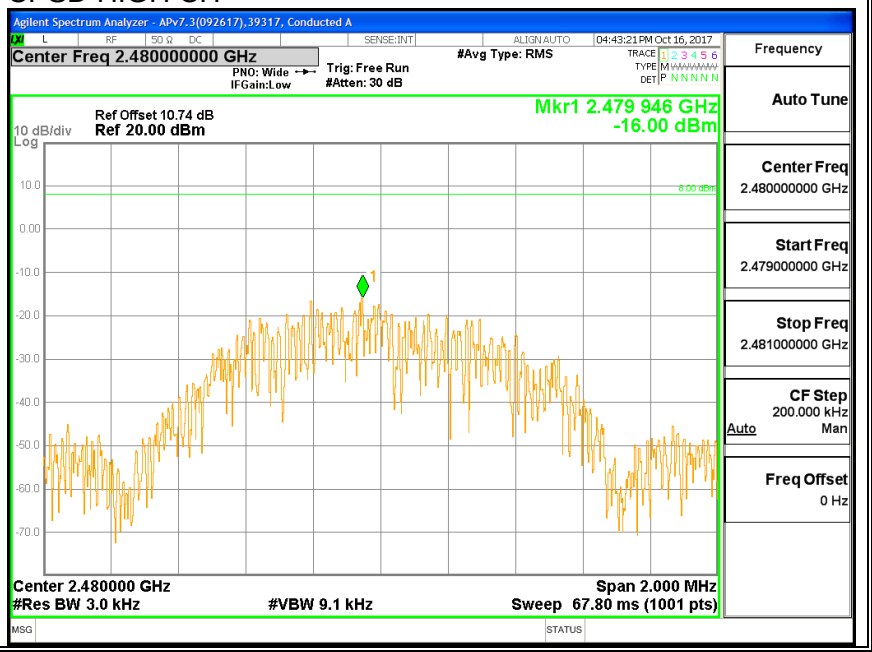
CPSD HIGH CH



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7.2.7. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

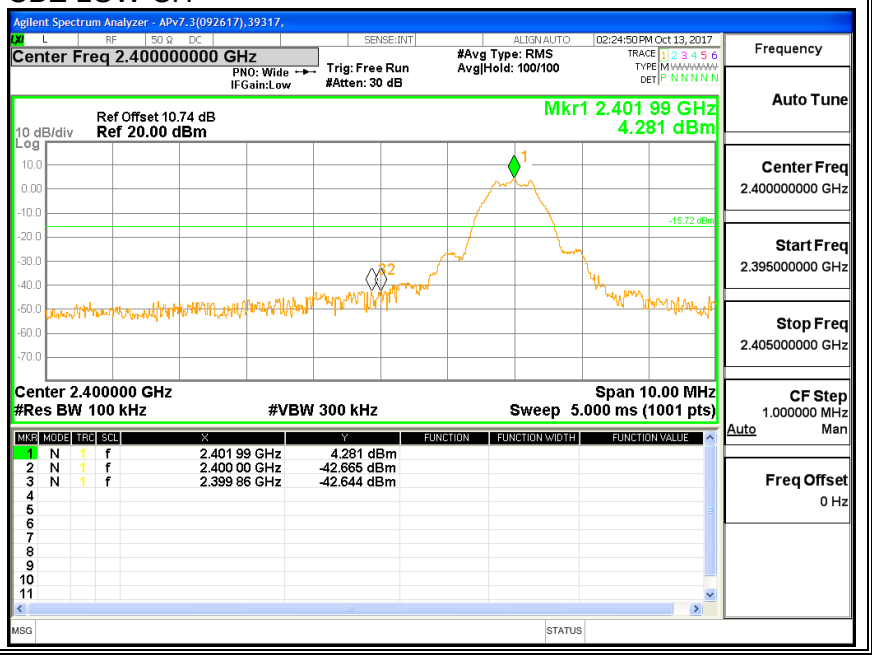
LIMITS

NCC LP0002 3.10.1 §5.1

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

RESULTS

CBE LOW CH



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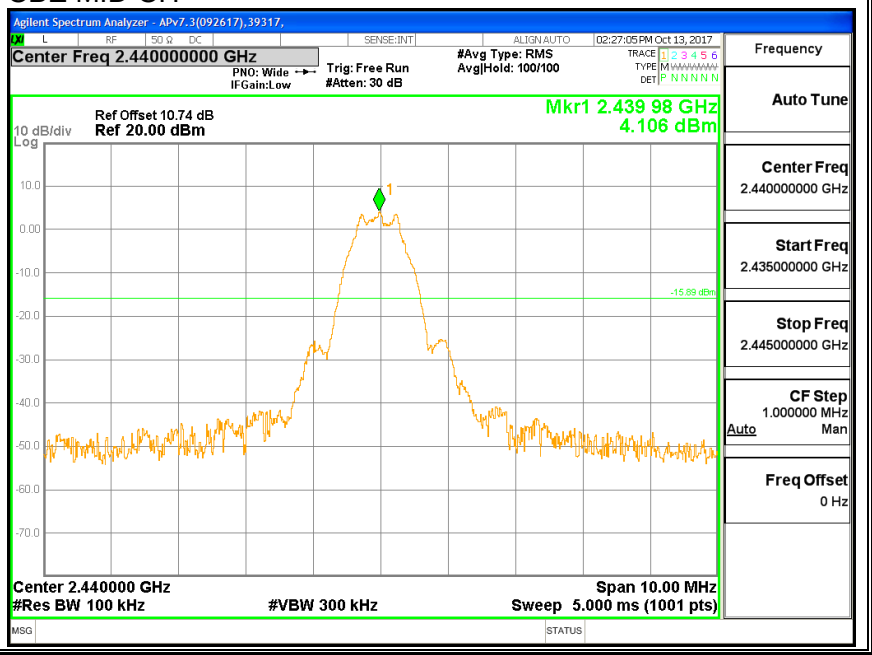
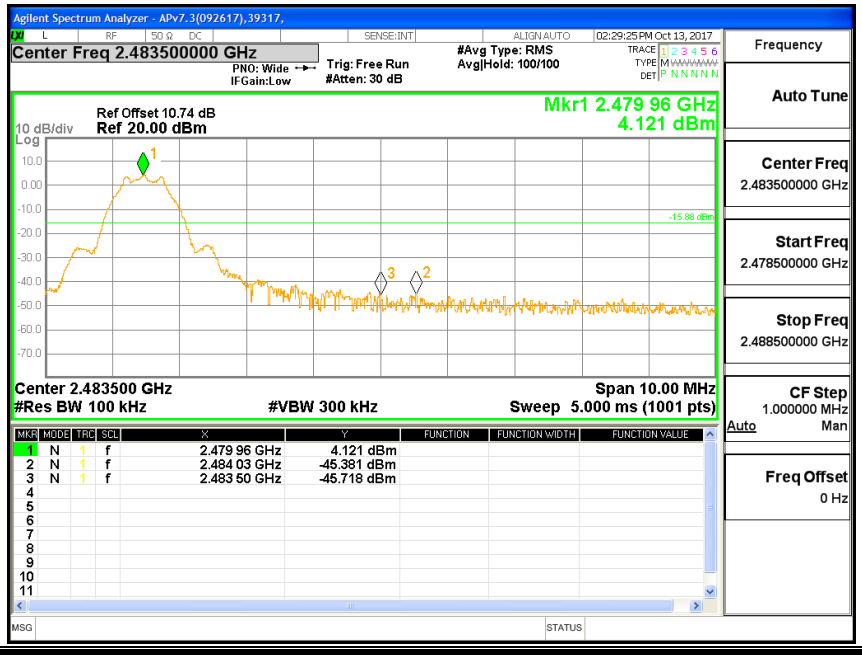
CBE MID CH



CBE HIGH CH



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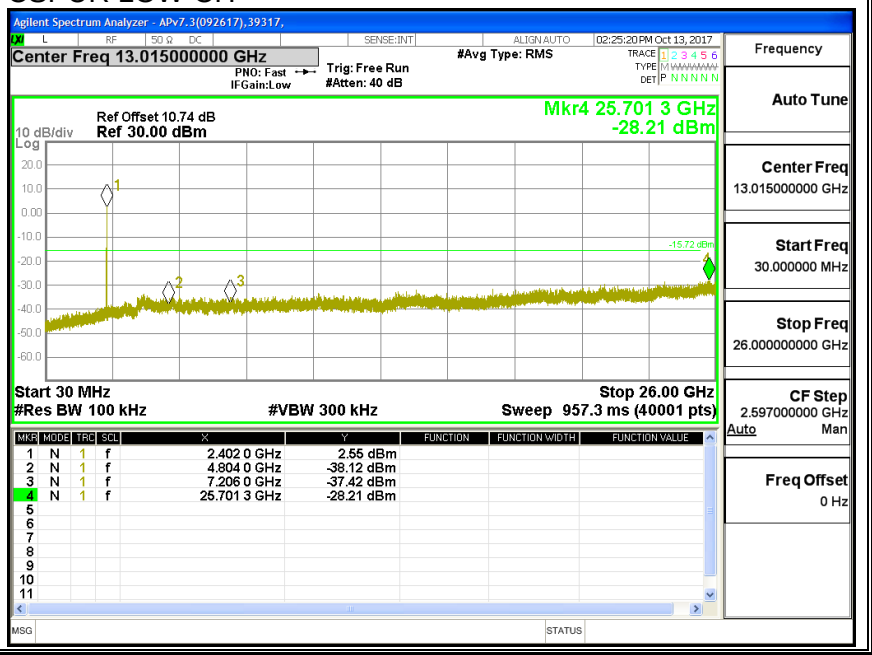
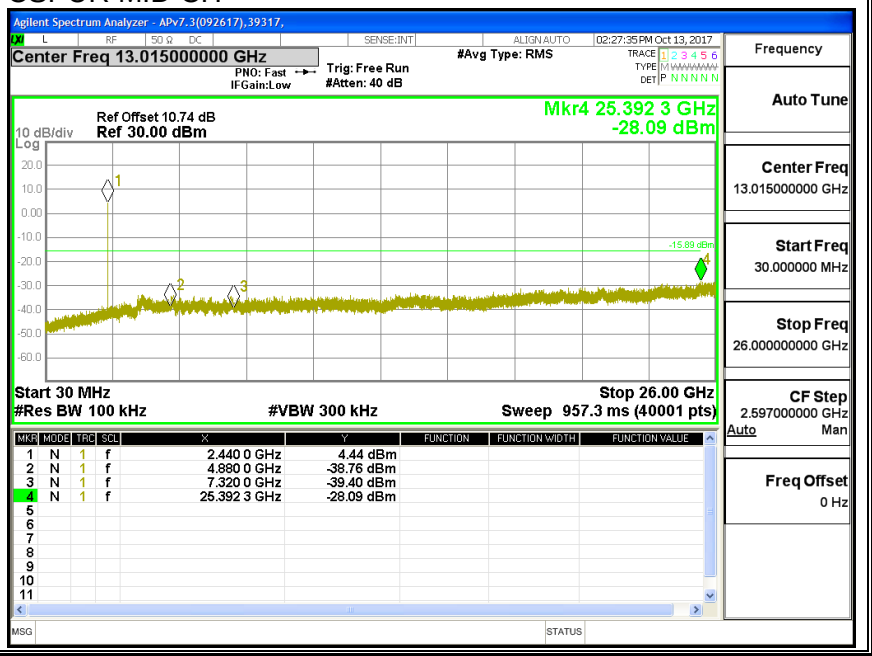
CSPUR LOW CH



CSPUR MID CH



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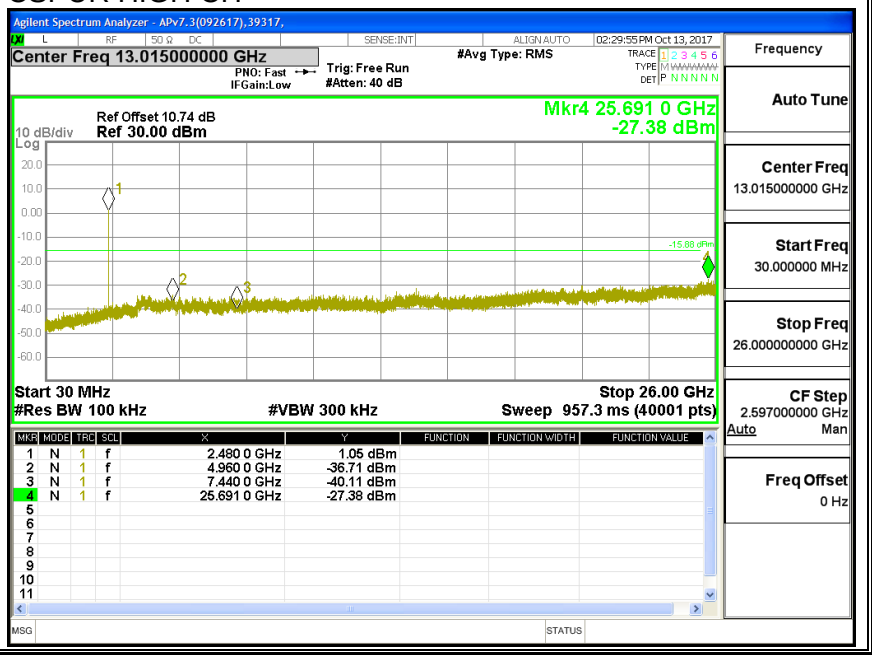
CSPUR HIGH CH



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8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

NCC LP0002 §2.7 and §2.8

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 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.

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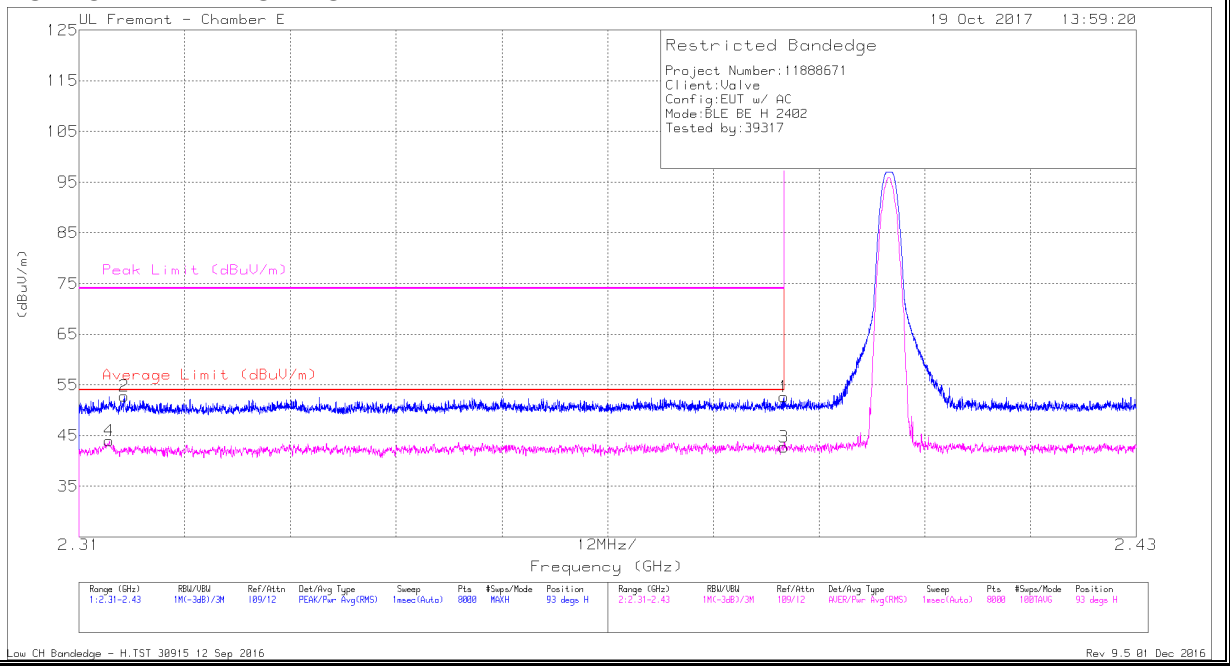
8.2. TRANSMITTER ABOVE 1GHZ

8.2.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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	39.86	Pk	32	-19.2	0	52.66	-	-	74	-21.34	93	242	H
2	* 2.315	40.66	Pk	31.7	-19.6	0	52.76	-	-	74	-21.24	93	242	H
3	* 2.39	27.89	RMS	32	-19.2	1.99	42.68	54	-11.32	-	-	93	242	H
4	* 2.313	29.83	RMS	31.7	-19.6	1.99	43.92	54	-10.08	-	-	93	242	H

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

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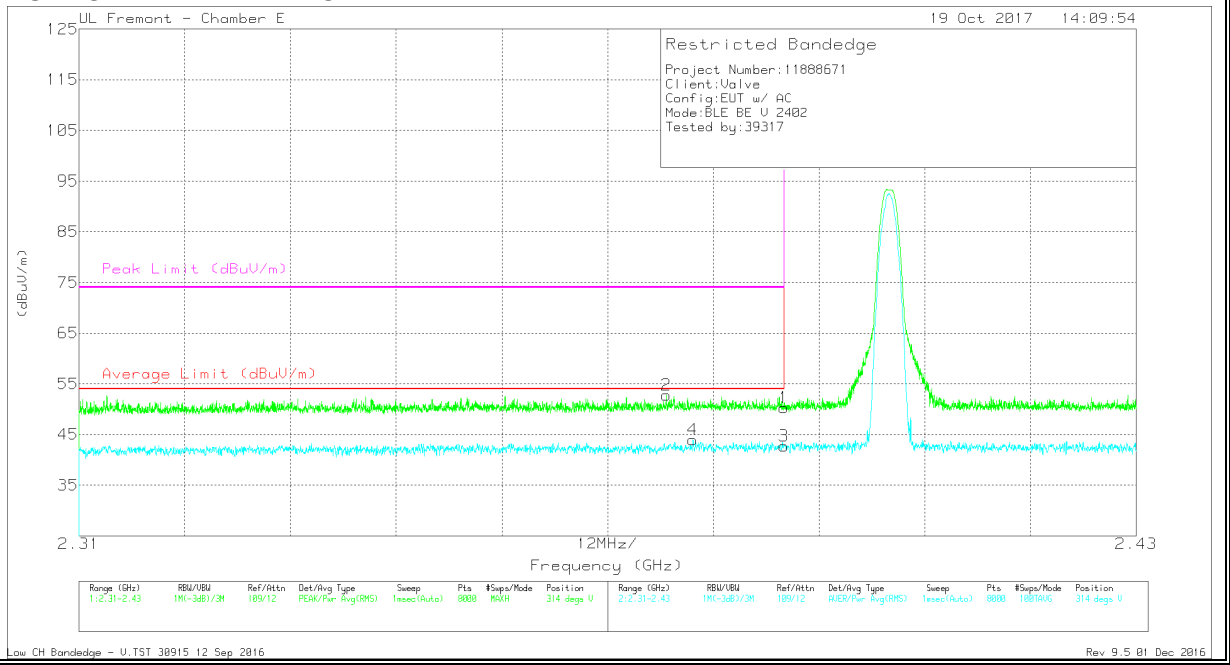
LOW CHANNEL VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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	37.5	Pk	32	-19.2	0	50.3	-	-	74	-23.7	314	172	V
2	* 2.377	40.16	Pk	31.9	-19.3	0	52.76	-	-	74	-21.24	314	172	V
3	* 2.39	27.9	RMS	32	-19.2	1.99	42.69	54	-11.31	-	-	314	172	V
4	* 2.38	29.36	RMS	31.9	-19.3	1.99	43.95	54	-10.05	-	-	314	172	V

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

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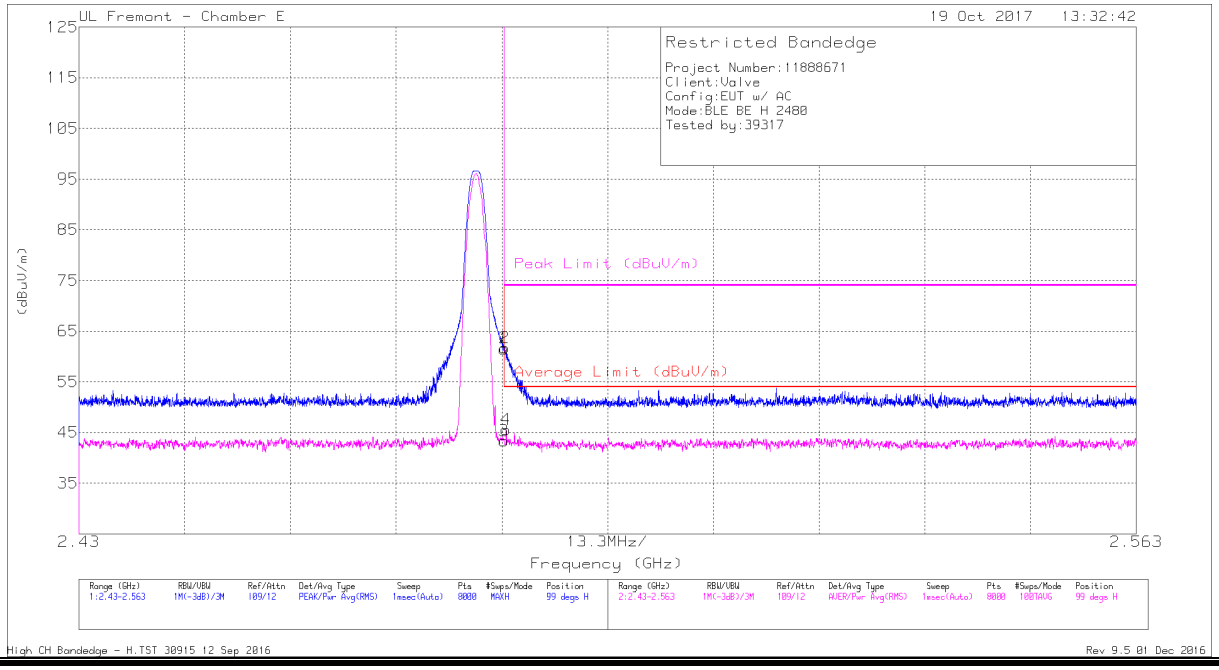
8.2.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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	48.83	Pk	32.1	-19.4	0	61.53	-	-	74	-12.47	99	202	H
2	* 2.484	48.97	Pk	32.1	-19.4	0	61.67	-	-	74	-12.33	99	202	H
3	* 2.484	28.6	RMS	32.1	-19.4	1.99	43.29	54	-10.71	-	-	99	202	H
4	* 2.484	30.83	RMS	32.1	-19.4	1.99	45.52	54	-8.48	-	-	99	202	H

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

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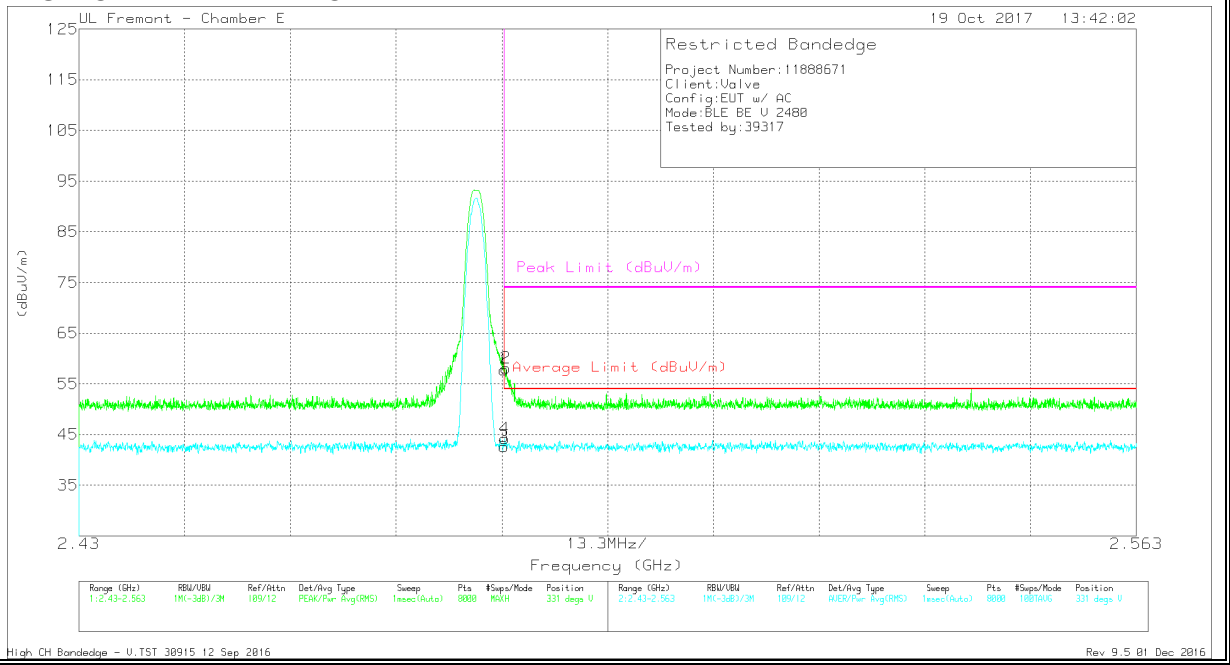
HIGH CHANNEL VERTICAL



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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	45.04	Pk	32.1	-19.4	0	57.74	-	-	74	-16.26	331	125	V
2	* 2.484	45.39	Pk	32.1	-19.4	0	58.09	-	-	74	-15.91	331	125	V
3	* 2.484	27.9	RMS	32.1	-19.4	1.99	42.59	54	-11.41	-	-	331	125	V
4	* 2.484	29.53	RMS	32.1	-19.4	1.99	44.22	54	-9.78	-	-	331	125	V

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

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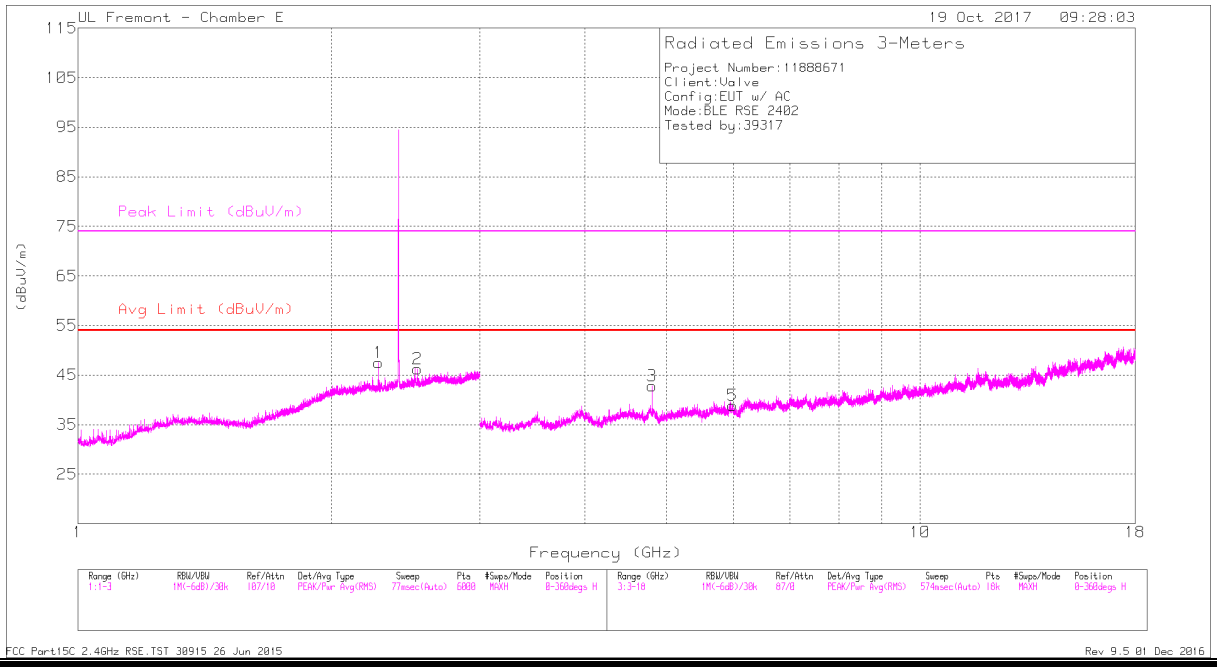
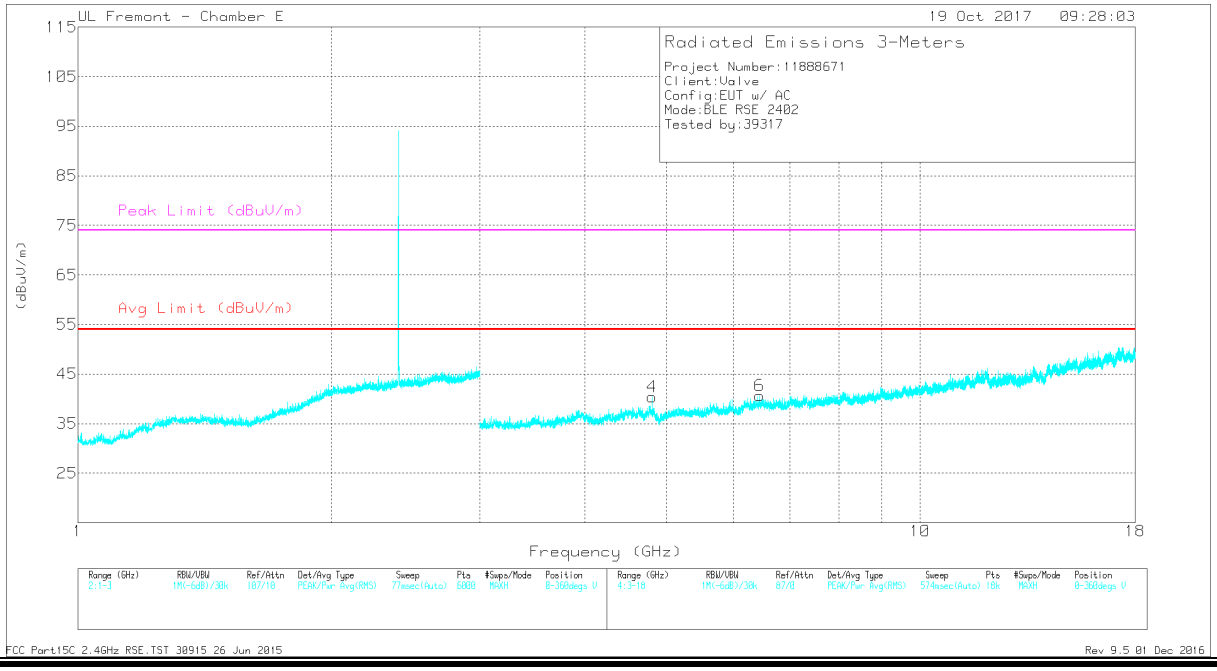
8.2.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



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DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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
* 2.274	37.4	PK2	31.8	-19.4	0	49.8	-	-	74	-24.2	0	199	H
* 2.274	26.36	MAv1	31.8	-19.4	1.99	40.75	54	-13.25	-	-	0	199	H
* 4.804	45.75	PK2	34.4	-29.1	0	51.05	-	-	74	-22.95	33	200	H
* 4.804	33.94	MAv1	34.4	-29.1	1.99	41.23	54	-12.77	-	-	33	200	H
* 4.804	43.28	PK2	34.4	-29.1	0	48.58	-	-	74	-25.42	134	215	V
* 4.804	31.72	MAv1	34.4	-29.1	1.99	39.01	54	-14.99	-	-	134	215	V
2.53	37	PK2	32.1	-19.6	0	49.5	-	-	-	-	0	102	H
2.53	25.75	MAv1	32.1	-19.6	1.99	40.24	-	-	-	-	0	102	H
5.985	38.63	PK2	35.4	-28.6	0	45.43	-	-	-	-	33	200	H
5.985	27.67	MAv1	35.4	-28.7	1.99	36.36	-	-	-	-	33	200	H
6.445	37.89	PK2	36.2	-27.6	0	46.49	-	-	-	-	134	201	V
6.446	27.3	MAv1	36.2	-27.6	1.99	37.89	-	-	-	-	134	201	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

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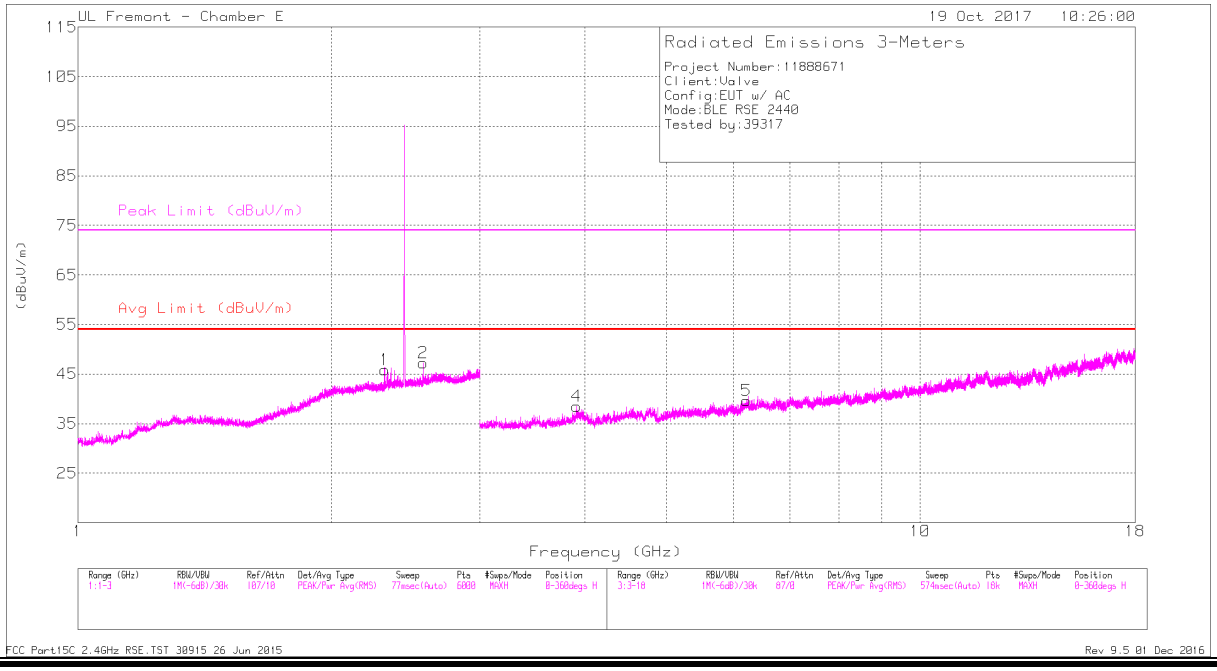
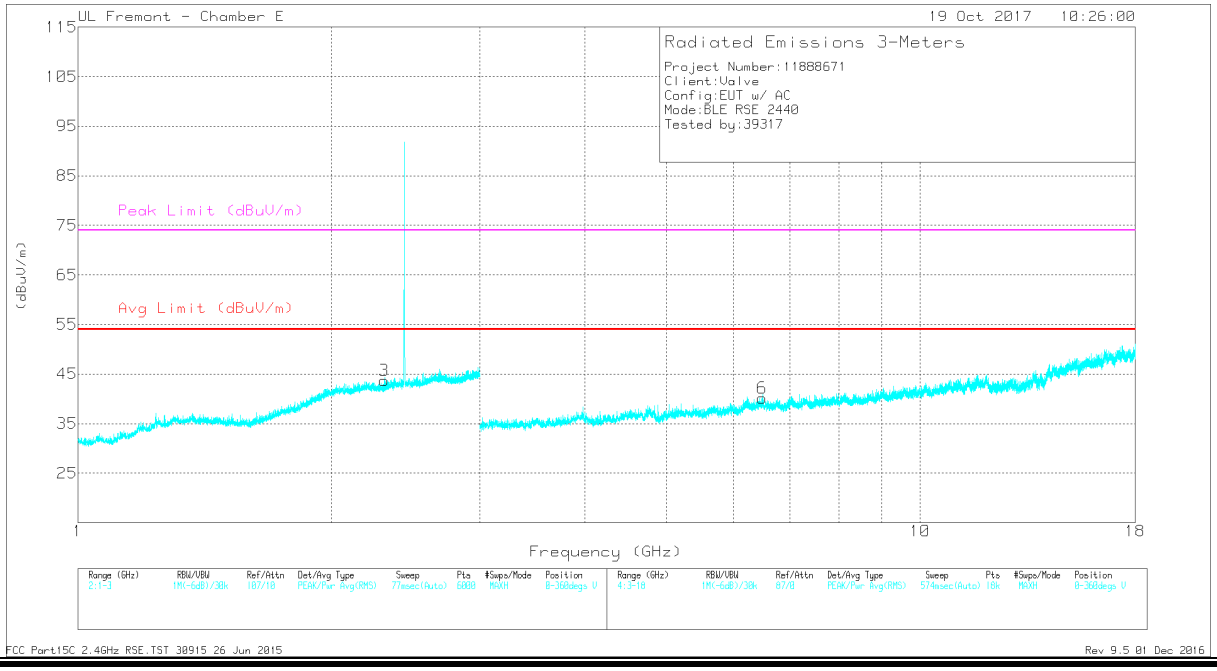
MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



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DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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
* 2.312	42.23	PK2	31.7	-19.6	0	54.33	-	-	74	-19.67	119	293	H
* 2.312	30	MAv1	31.7	-19.6	1.99	44.09	54	-9.91	-	-	119	293	H
* 2.312	37.57	PK2	31.7	-19.6	0	49.67	-	-	74	-24.33	354	187	V
* 2.312	26.66	MAv1	31.7	-19.6	1.99	40.75	54	-13.25	-	-	354	187	V
* 3.909	39.62	PK2	33.7	-29.1	0	44.22	-	-	74	-29.78	8	102	H
* 3.911	27.94	MAv1	33.7	-29	1.99	34.63	54	-19.37	-	-	8	102	H
2.568	39.62	PK2	32.1	-19.5	0	52.22	-	-	-	-	119	100	H
2.568	28.07	MAv1	32.1	-19.5	1.99	42.66	-	-	-	-	119	100	H
6.221	25.14	MAv1	35.9	-26.7	1.99	36.33	-	-	-	-	174	355	H
6.223	36.98	PK2	35.9	-26.7	0	46.18	-	-	-	-	174	355	H
6.493	26.48	MAv1	36.1	-27	1.99	37.57	-	-	-	-	174	101	V
6.494	37.82	PK2	36.1	-27	0	46.92	-	-	-	-	174	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

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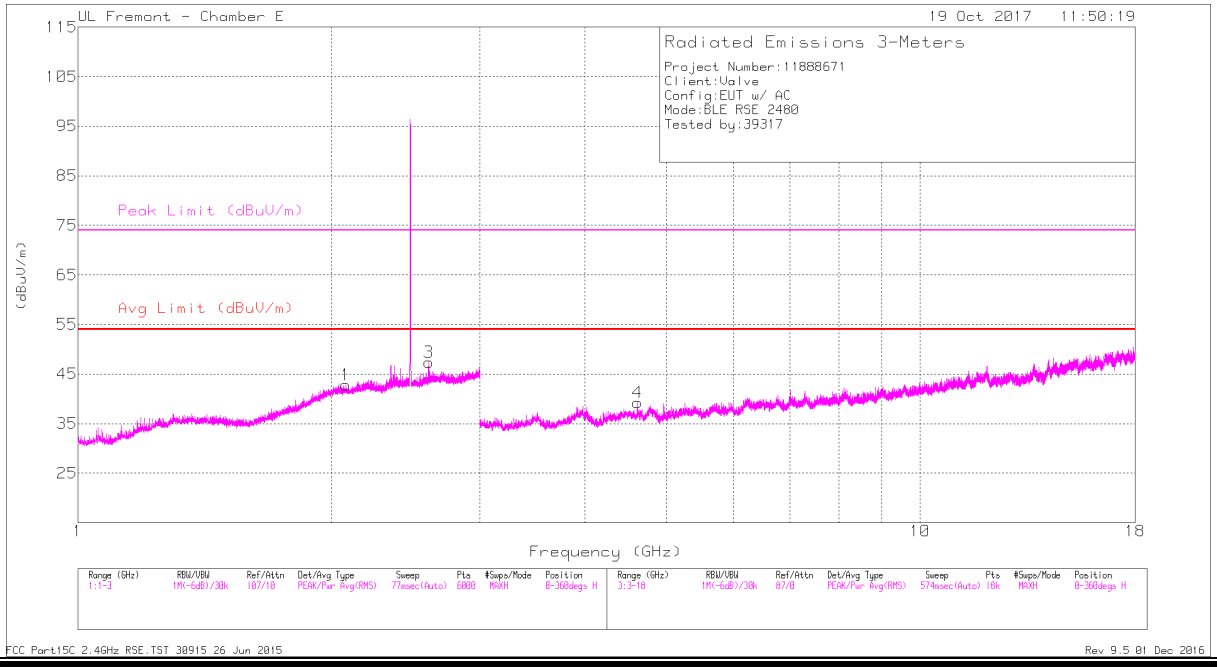
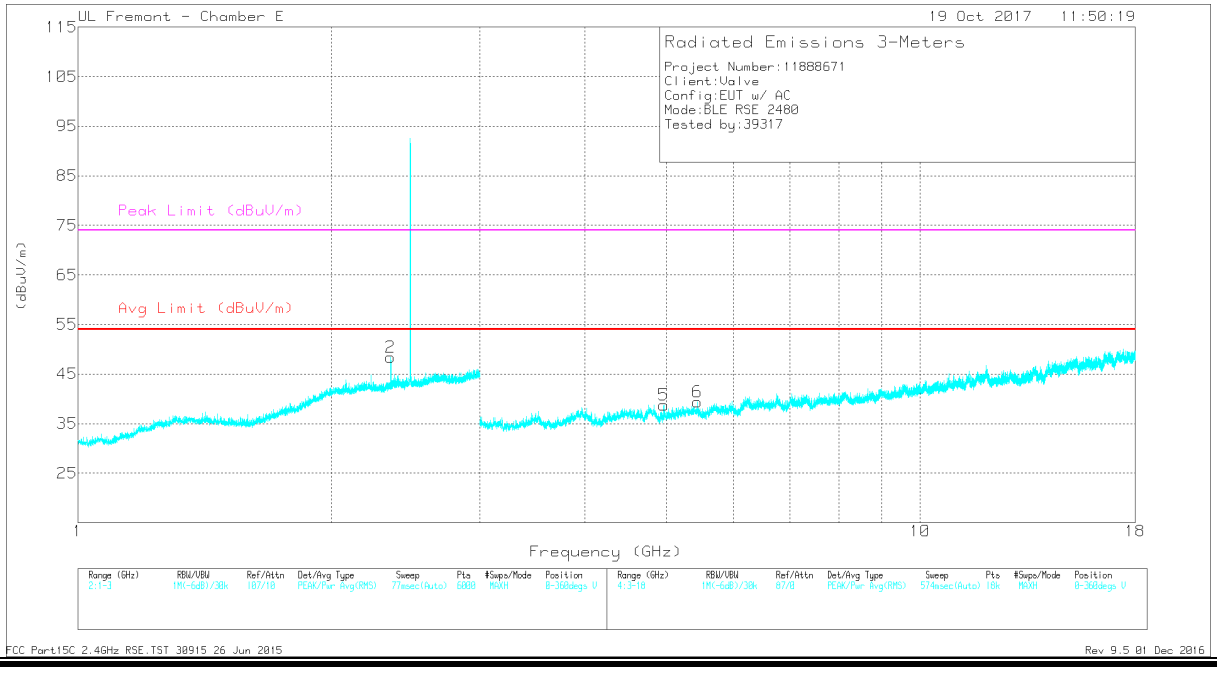
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



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DATA

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (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
* 2.352	40.24	PK2	31.8	-19.4	0	52.64	-	-	74	-21.36	332	159	V
* 2.352	29.21	MAv1	31.8	-19.4	1.99	43.6	54	-10.4	-	-	332	159	V
* 4.621	40.01	PK2	34.4	-30	0	44.41	-	-	74	-29.59	332	102	H
* 4.623	29.05	MAv1	34.4	-30	1.99	35.44	54	-18.56	-	-	332	102	H
* 4.96	40.11	PK2	34.5	-29.8	0	44.81	-	-	74	-29.19	96	102	V
* 4.96	29.69	MAv1	34.5	-29.8	1.99	36.38	54	-17.62	-	-	96	102	V
* 5.435	38.59	PK2	35.1	-28.9	0	44.79	-	-	74	-29.21	348	348	V
* 5.437	26.87	MAv1	35.1	-29	1.99	34.96	54	-19.04	-	-	348	348	V
2.077	24.25	MAv1	32.1	-20	1.99	38.34	-	-	-	-	338	338	H
2.08	36.04	PK2	32.1	-20	0	48.14	-	-	-	-	338	338	H
2.608	41.22	PK2	32.2	-19.3	0	54.12	-	-	-	-	97	185	H
2.608	29.57	MAv1	32.2	-19.3	1.99	44.46	-	-	-	-	97	185	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

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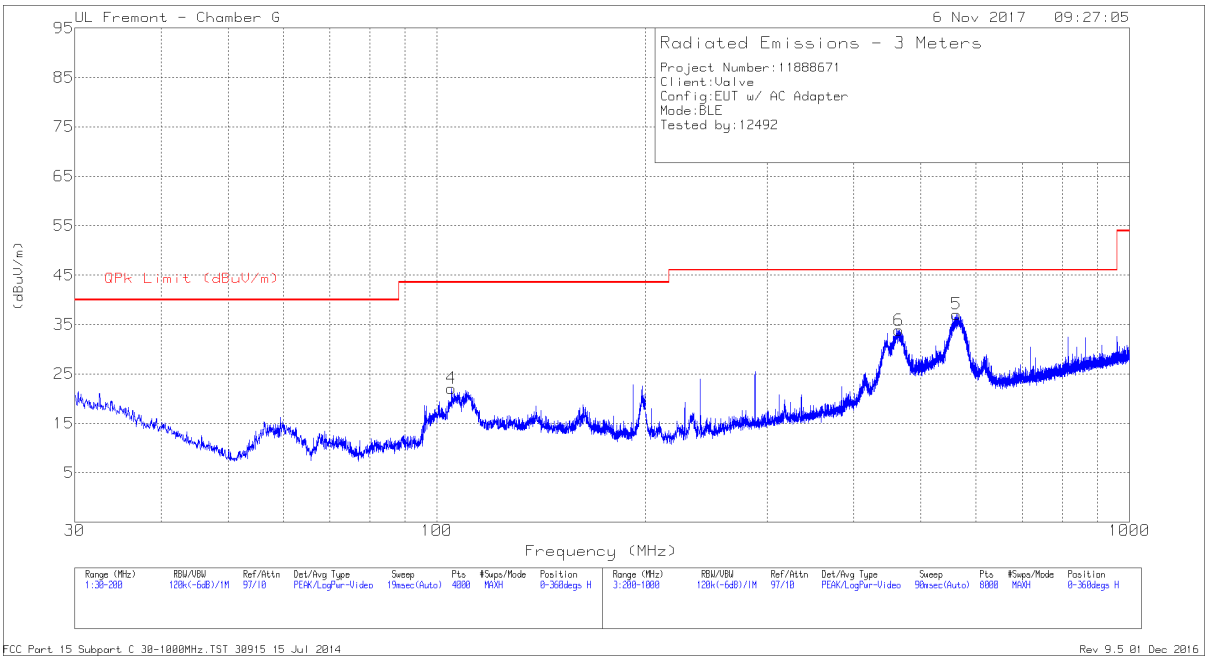
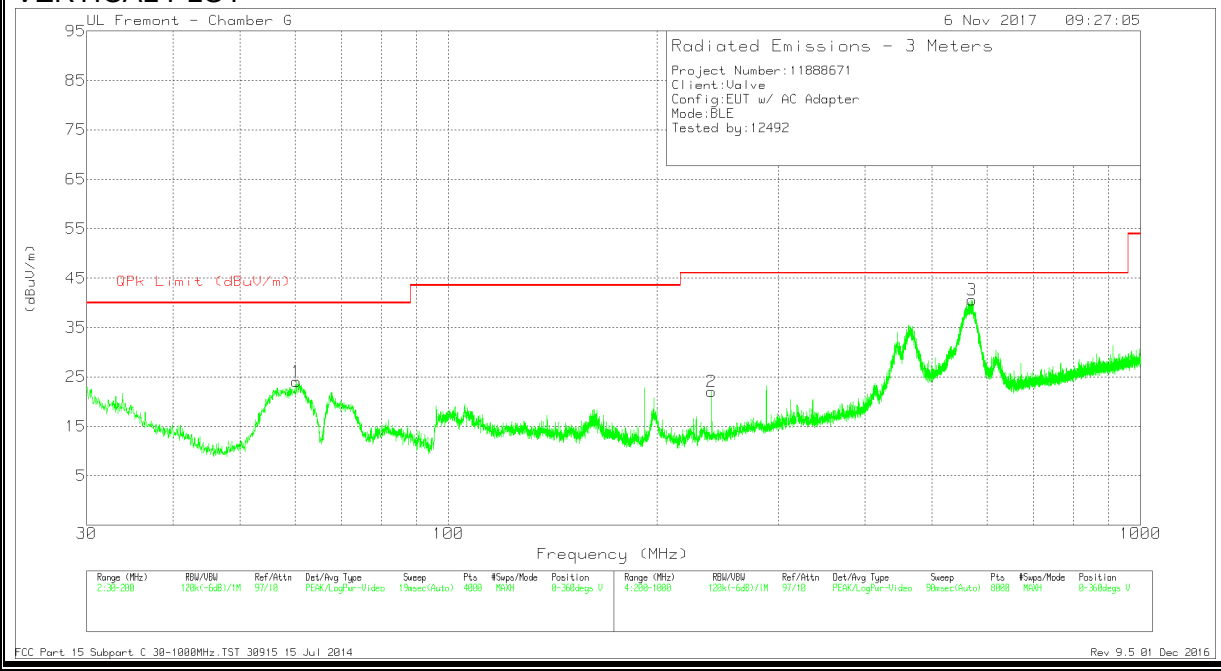
8.3. TRANSMITTER WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 240.0052	35.79	Pk	15.5	-29.3	21.99	46.02	-24.03	0-360	100	V
1	60.3103	43.44	Pk	11.5	-30.9	24.04	40	-15.96	0-360	100	V
4	104.9044	37.11	Pk	15.4	-30.4	22.11	43.52	-21.41	0-360	300	H
6	464.7344	40.71	Pk	21.2	-28	33.91	46.02	-12.11	0-360	200	H
5	562.8472	42.29	Pk	22.4	-27.6	37.09	46.02	-8.93	0-360	200	H
3	570.8482	45.84	Pk	22.4	-27.7	40.54	46.02	-5.48	0-360	200	V
	571.0109	44.28	Qp	22.4	-27.7	38.98	46.02	-7.04	109	176	V

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

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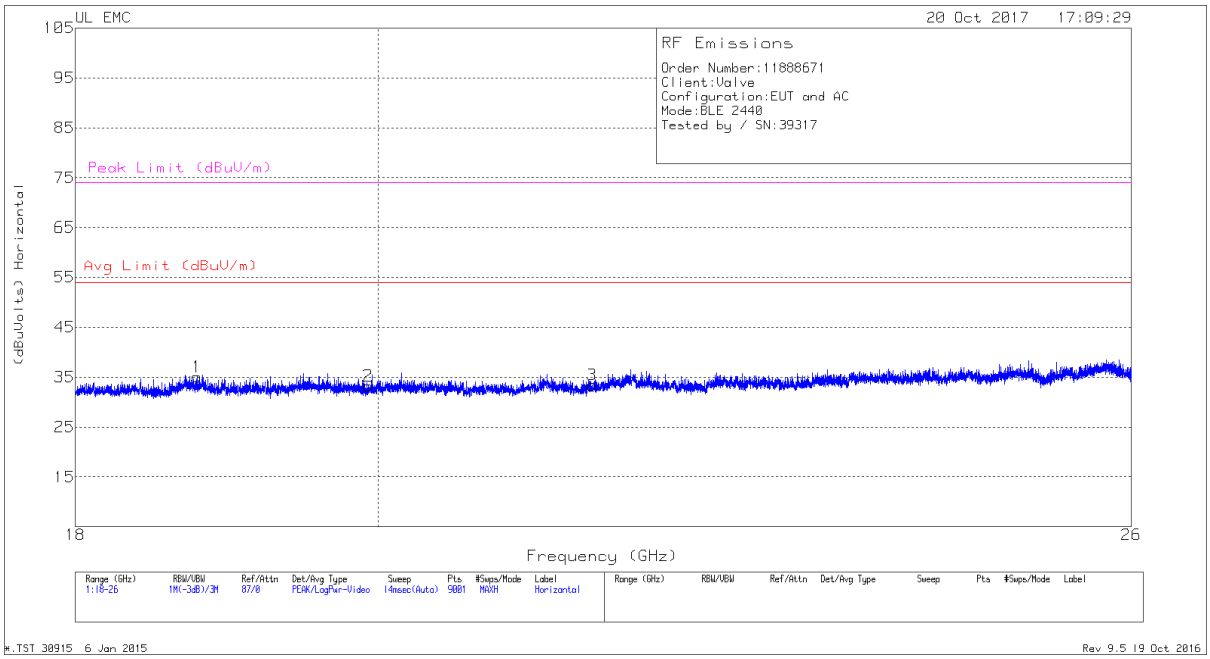
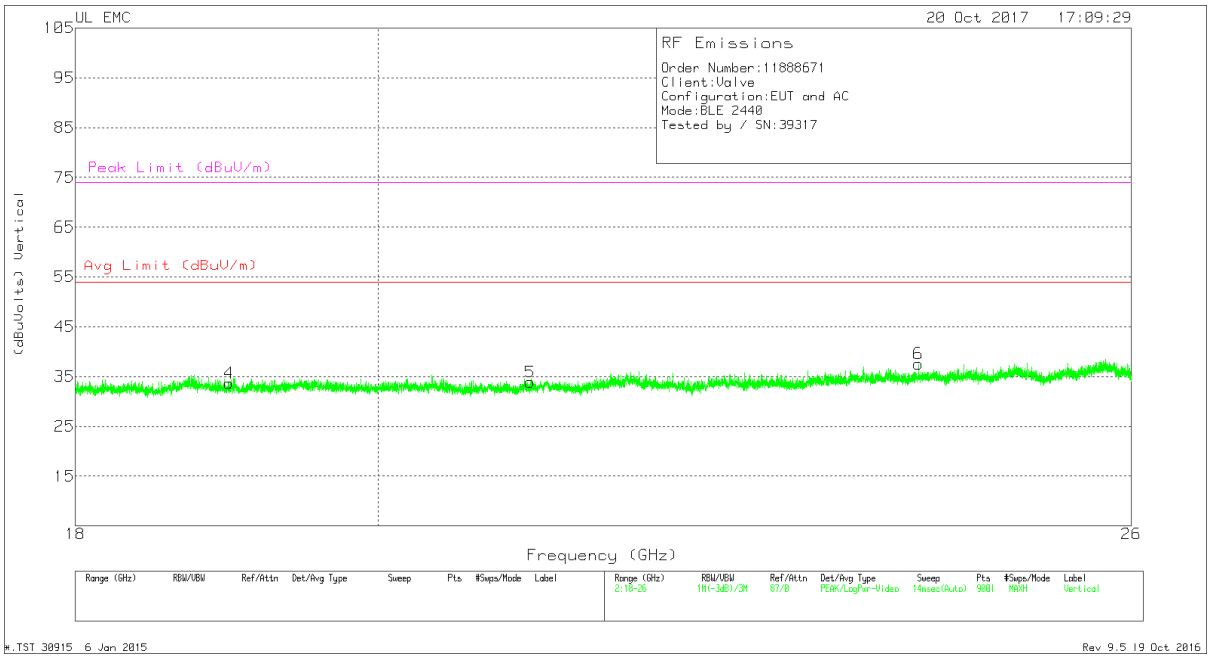
8.4. TRANSMITTER WORST-CASE ABOVE 18 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



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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	18.779	37.14	Pk	32.5	-25.1	-9.5	35.04	54	-18.96	74	-38.96
2	19.932	35.06	Pk	32.9	-25.2	-9.5	33.26	54	-20.74	74	-40.74
3	21.548	35.13	Pk	33.1	-25.3	-9.5	33.43	54	-20.57	74	-40.57
4	18.989	36.02	Pk	32.2	-25	-9.5	33.72	54	-20.28	74	-40.28
5	21.088	35.88	Pk	32.7	-25.2	-9.5	33.88	54	-20.12	74	-40.12
6	24.141	37.96	Pk	33.4	-24.3	-9.5	37.56	54	-16.44	74	-36.44

Pk - Peak detector

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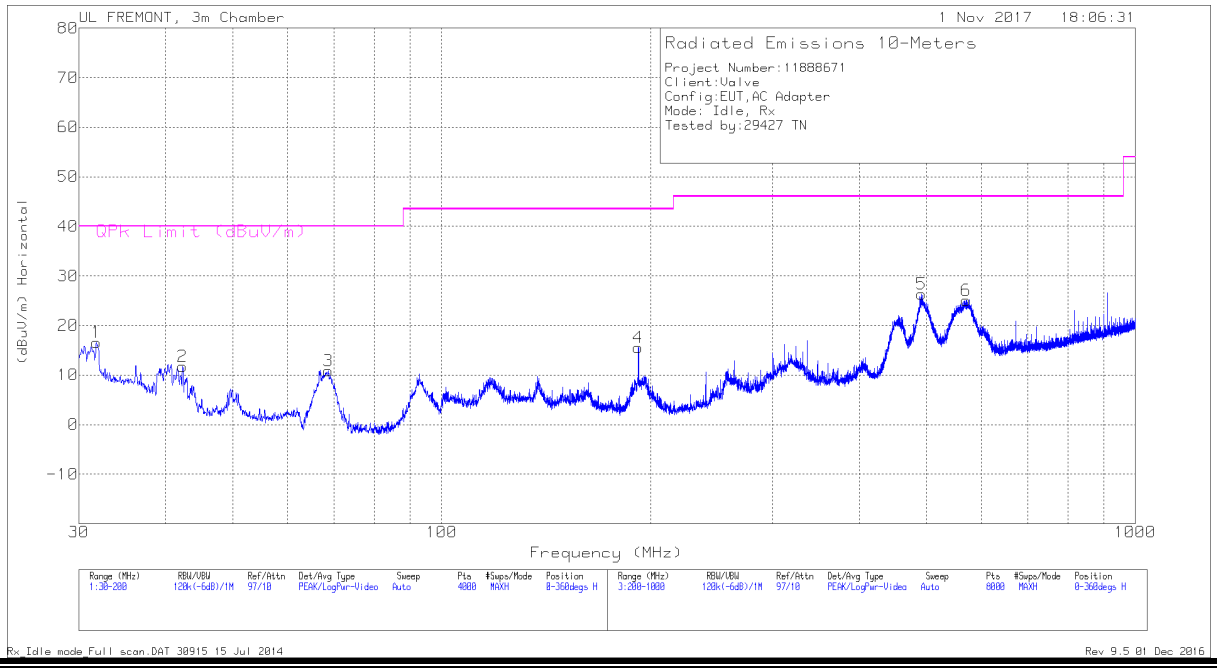
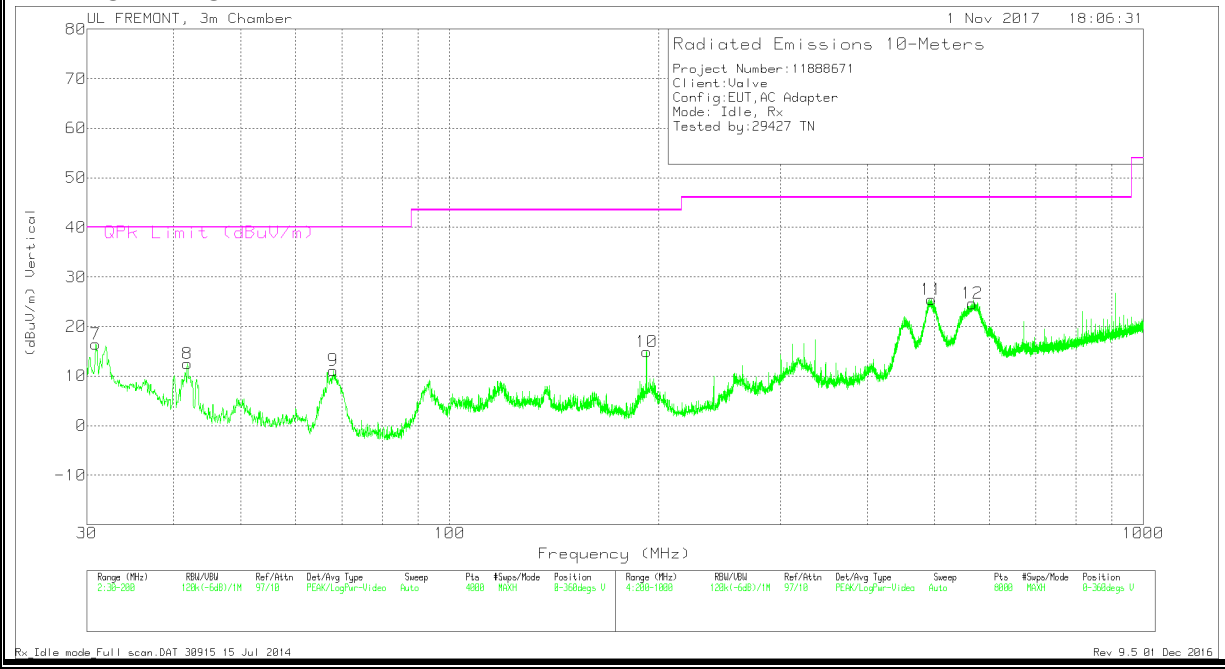
8.5. RECEIVER WORST-CASE BELOW 1GHZ

3 m RADIATED EMISSIONS 30 TO 1000 MHz

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB/m)	Dist Corr (dB) 20Log	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	30.8927	33.49	Pk	24.6	-31.1	-10.5	16.49	40	-23.51	0-360
1	31.7855	34.23	Pk	24	-31.1	-10.5	16.63	40	-23.37	0-360
8	41.8818	37.46	Pk	16.5	-30.9	-10.5	12.56	40	-27.44	0-360
2	42.3282	36.92	Pk	16.2	-30.9	-10.5	11.72	40	-28.28	0-360
9	67.9623	40.27	Pk	12	-30.6	-10.5	11.17	40	-28.83	0-360
3	68.6425	39.87	Pk	12.1	-30.6	-10.5	10.87	40	-29.13	0-360
4	192.1795	39.99	Pk	15.6	-29.5	-10.5	15.59	43.52	-27.93	0-360
10	192.222	39.35	Pk	15.6	-29.5	-10.5	14.95	43.52	-28.57	0-360
5	492.338	42.9	Pk	21.6	-27.7	-10.5	26.3	46.02	-19.72	0-360
11	495.2384	42.1	Pk	21.6	-27.8	-10.5	25.4	46.02	-20.62	0-360
12	567.1477	40.23	Pk	22.4	-27.5	-10.5	24.63	46.02	-21.39	0-360
6	570.2481	40.6	Pk	22.5	-27.5	-10.5	25.1	46.02	-20.92	0-360

Pk - Peak detector
CISPR 30-1000MHz Class B.TST 30915 15 Jul 2014
Rev 9.5 01 Dec 2016

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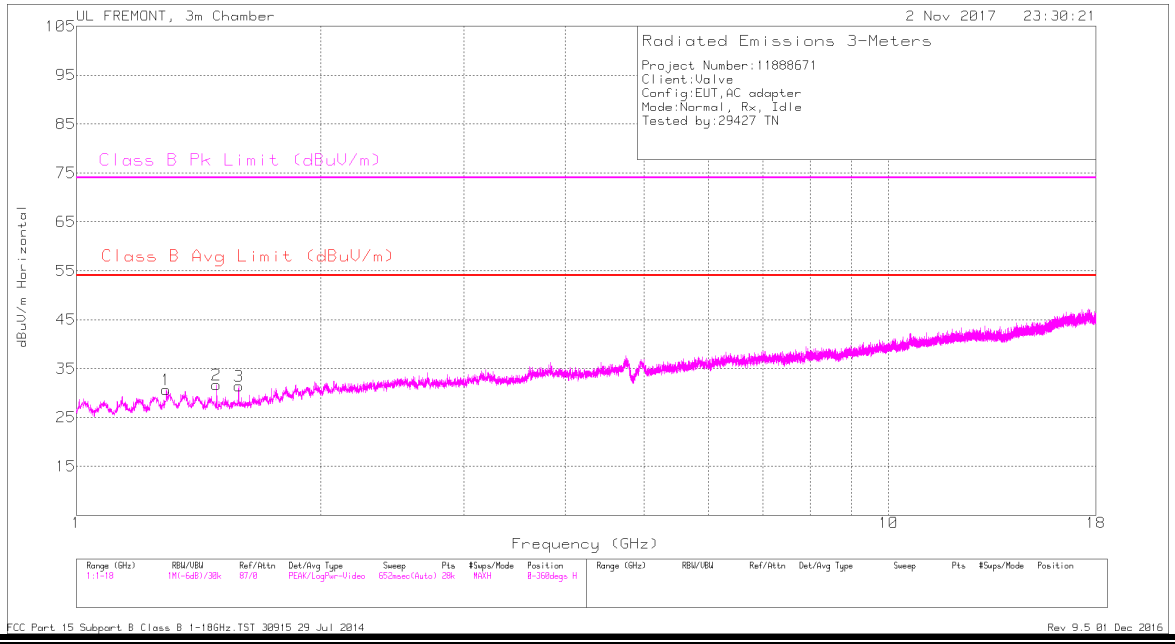
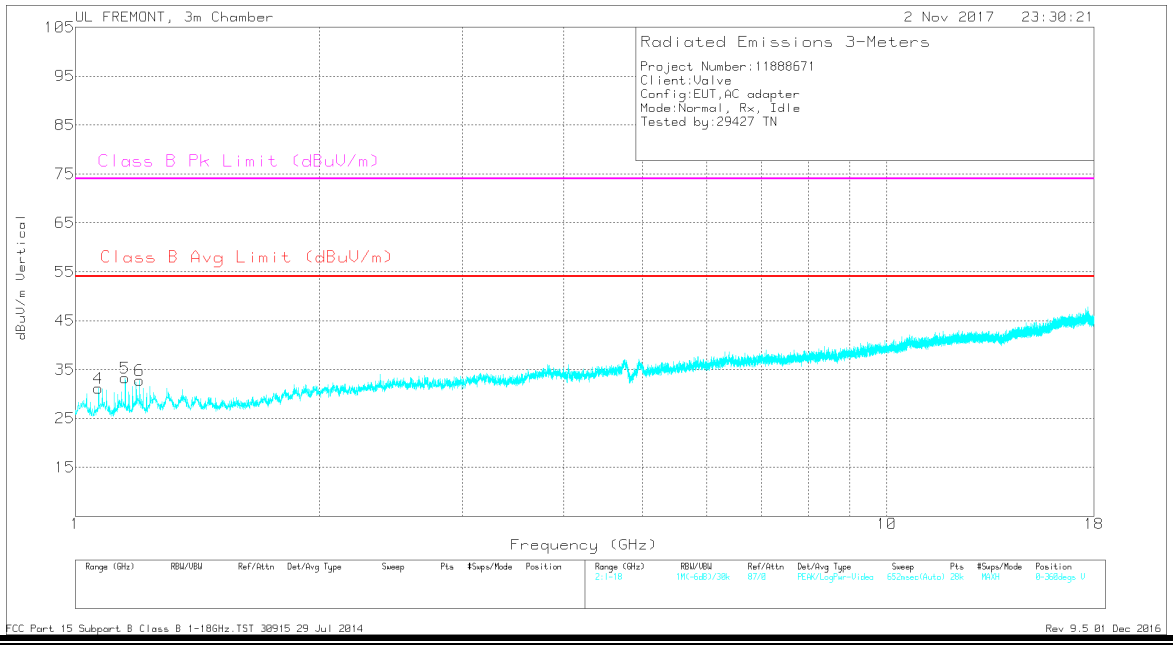
8.6. RECEIVER WORST-CASE ABOVE 1GHZ

3 m RADIATED EMISSIONS 1000 TO 18,000 MHz

HORIZONTAL PLOT



VERTICAL PLOT



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DATA

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.068	43.91	Pk	27.4	-32.6	38.71	-	-	74	-35.29	8	100	V
1.068	33.3	Av	27.4	-32.6	28.1	54	-25.9	-	-	8	100	V
1.152	42.14	Pk	27.8	-32.5	37.44	-	-	74	-36.56	250	100	V
1.152	33.11	Av	27.8	-32.5	28.41	54	-25.59	-	-	250	100	V
1.2	44.12	Pk	28.1	-32.5	39.72	-	-	74	-34.28	289	336	V
1.2	34.27	Av	28.1	-32.5	29.87	54	-24.13	-	-	289	336	V
1.288	41.27	Pk	29	-32.3	37.97	-	-	74	-36.03	100	100	H
1.288	27.54	Av	29	-32.3	24.24	54	-29.76	-	-	100	100	H
1.488	42.37	Pk	28.2	-32	38.57	-	-	74	-35.43	147	100	H
1.488	33.89	Av	28.2	-32	30.09	54	-23.91	-	-	147	100	H
1.584	42.04	Pk	28.2	-32.1	38.14	-	-	74	-35.86	150	100	H
1.584	32.04	Av	28.2	-32.1	28.14	54	-25.86	-	-	150	100	H

Pk - Peak detector

Av - Average detection

FCC Part 15 Subpart B Class B 1-18GHz.TST 30915 29 Jul 2014
Rev 9.5 01 Dec 2016

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9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

NCC LP0002 §2.3

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

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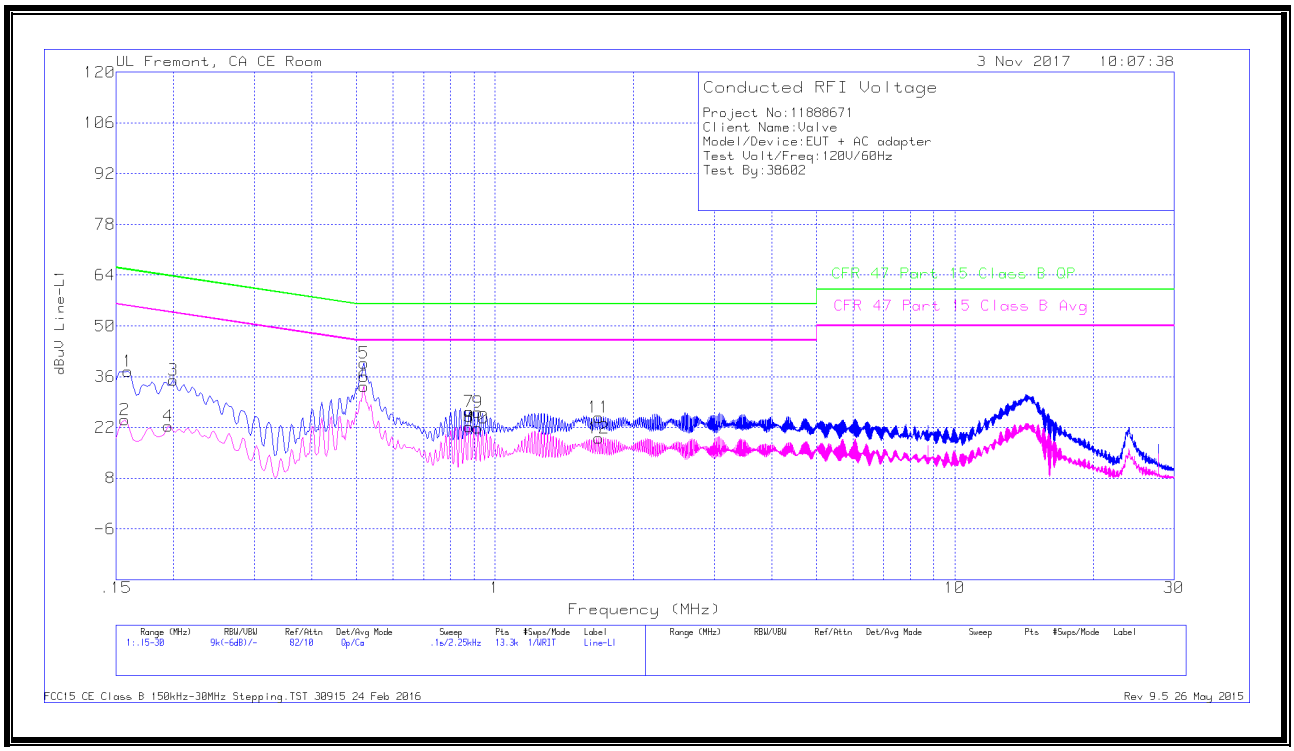
LINE 1 RESULTS



WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	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	.159	27.27	Qp	.1	0	10.1	37.47	65.52	-28.05	-	-
2	.15675	13.84	Ca	.1	0	10.1	24.04	-	-	55.63	-31.59
3	.1995	24.89	Qp	0	0	10.1	34.99	63.63	-28.64	-	-
4	.195	12.26	Ca	0	0	10.1	22.36	-	-	53.82	-31.46
5	.519	29.68	Qp	0	0	10.1	39.78	56	-16.22	-	-
6	.519	23.15	Ca	0	0	10.1	33.25	-	-	46	-12.75
7	.879	16.28	Qp	0	0	10.1	26.38	56	-29.62	-	-
8	.879	12.07	Ca	0	0	10.1	22.17	-	-	46	-23.83
9	.9195	16.15	Qp	0	0	10.1	26.25	56	-29.75	-	-
10	.9195	11.73	Ca	0	0	10.1	21.83	-	-	46	-24.17
11	1.68225	14.59	Qp	0	.1	10.1	24.79	56	-31.21	-	-
12	1.68225	8.91	Ca	0	.1	10.1	19.11	-	-	46	-26.89

Qp - Quasi-Peak detector
Ca - CISPR average detection

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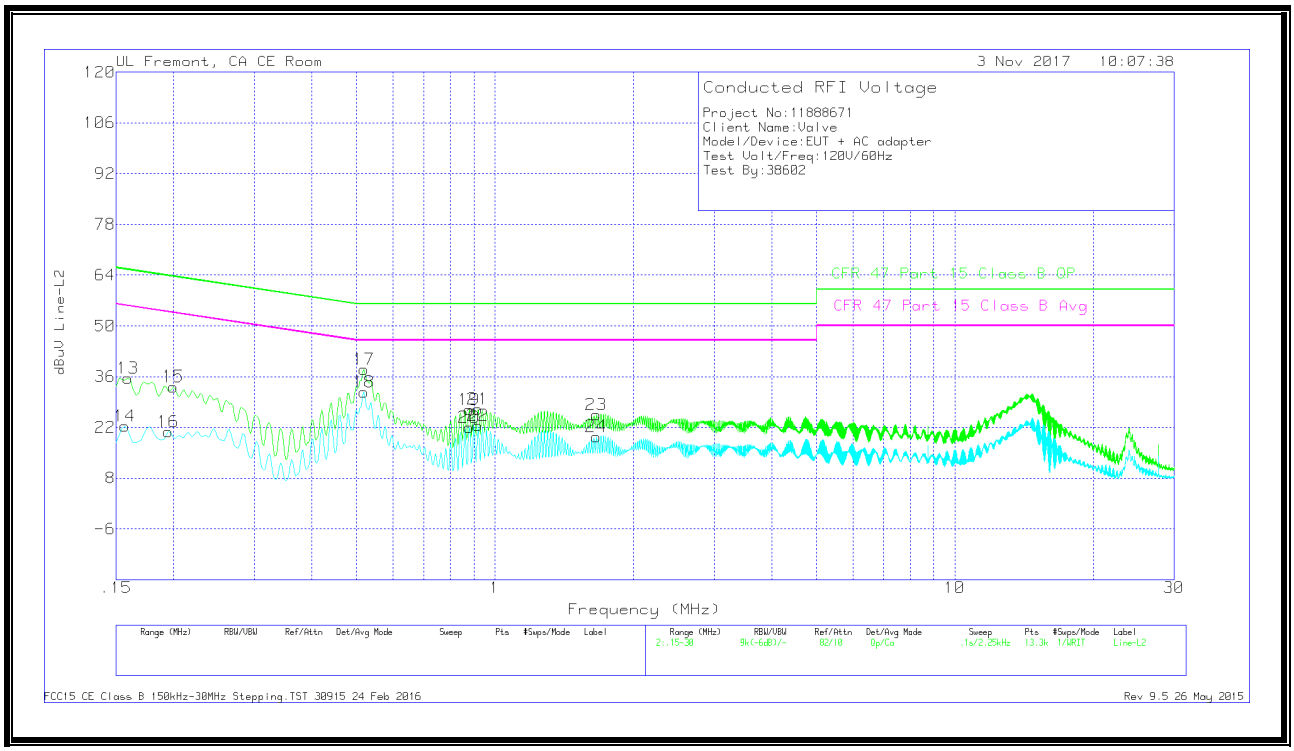
LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	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	.159	25.48	Qp	0	0	10.1	35.58	65.52	-29.94	-	-
14	.15675	12.22	Ca	0	0	10.1	22.32	-	-	55.63	-33.31
15	.1995	23.12	Qp	0	0	10.1	33.22	63.63	-30.41	-	-
16	.195	10.74	Ca	0	0	10.1	20.84	-	-	53.82	-32.98
17	.519	27.9	Qp	0	0	10.1	38	56	-18	-	-
18	.519	21.71	Ca	0	0	10.1	31.81	-	-	46	-14.19
19	.879	16.8	Qp	0	0	10.1	26.9	56	-29.1	-	-
20	.879	11.9	Ca	0	0	10.1	22	-	-	46	-24
21	.9195	16.9	Qp	0	.1	10.1	27.1	56	-28.9	-	-
22	.9195	12.28	Ca	0	.1	10.1	22.48	-	-	46	-23.52
23	1.662	15.3	Qp	0	.1	10.1	25.5	56	-30.5	-	-
24	1.662	9.29	Ca	0	.1	10.1	19.49	-	-	46	-26.51

Qp - Quasi-Peak detector
Ca - CISPR average detection

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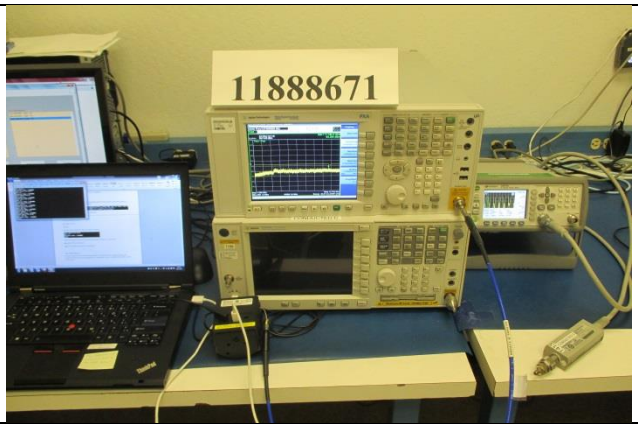
10. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

FRONT PHOTO

AC MAINS LINE CONDUCTED EMISSIONS	
FRONT PHOTO	BACK PHOTO

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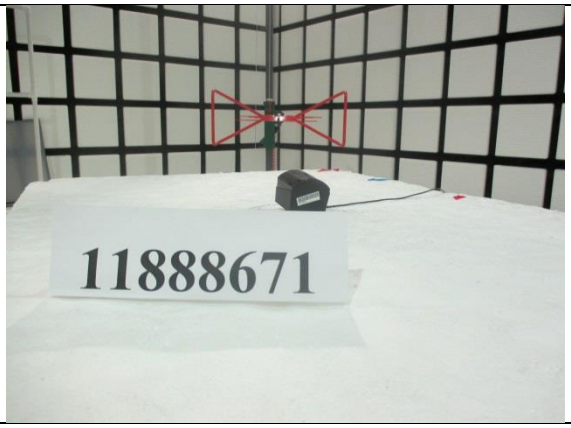
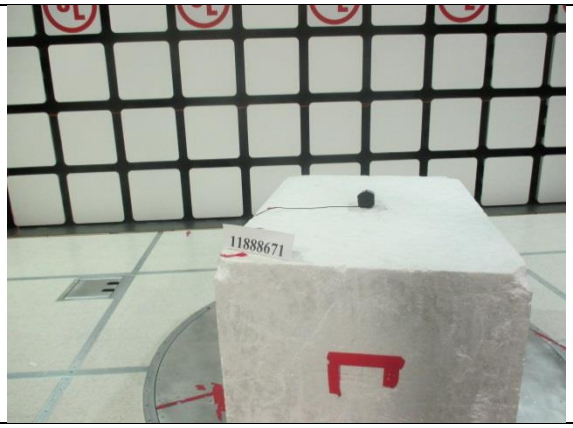
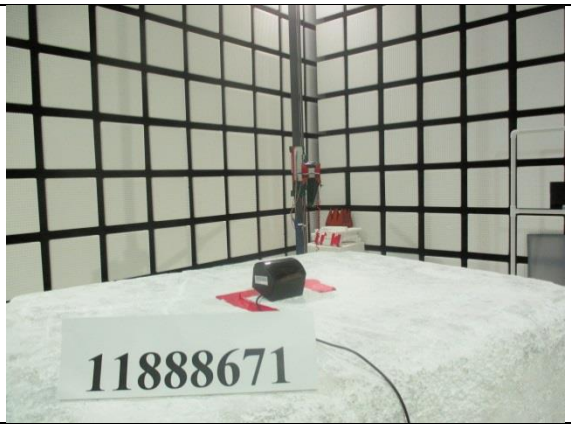
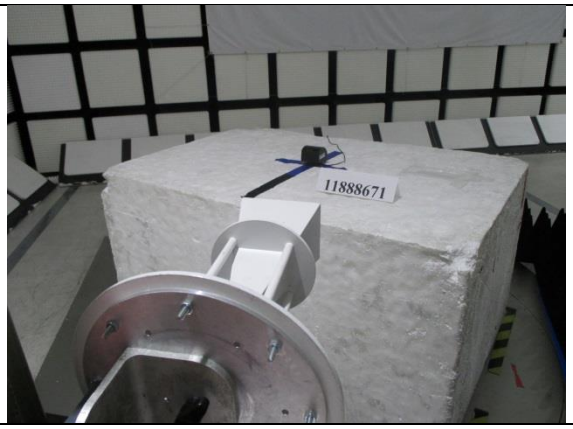
3 METER RADIATED SPURIOUS EMISSIONS 30MHZ TO 1GHZ	
	
FRONT PHOTO	BACK PHOTO
3 METER RADIATED SPURIOUS EMISSIONS 1GHZ TO 18GHZ	
	
FRONT PHOTO	BACK PHOTO
3 METER RADIATED SPURIOUS EMISSIONS 18GHZ TO 26GHZ	
	
FRONT PHOTO	BACK PHOTO

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RADIATED RF MEASUREMENT FOR PORTABLE CONFIGURATION	
X-AXIS FRONT PHOTO	Y-AXIS FRONT PHOTO
Z-AXIS FRONT PHOTO	

END OF REPORT

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