



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Steam Controller

MODEL NUMBER: 1001

FCC ID: 2AES41001

REPORT NUMBER: 10723151A

ISSUE DATE: July 8, 2015

Prepared for
Valve Corporation
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Suite 500
Bellevue, WA 98004

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NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/08/15	Initial Issue	M.Ferrer

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Valve Corporation
10900 NE 4th St.
Suite 500
Bellevue, WA 98004

EUT DESCRIPTION: Steam Controller

MODEL: 1001

SERIAL NUMBER: Prototype

DATE TESTED: March 24, 2015 – July 8, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 LLC By:



Bart Mucha
Staff Engineer
UL LLC

Tested By:



MICHAEL FERRER
Program Manager
UL LLC

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.

Testing Deviation - EUT was tested 1.5m height for above 1GHz Radiated Emissions in accordance TCB Conference call Dec 2014.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062 USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/Standards/scopes/1004140.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

Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)

Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)

Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.3. MEASUREMENT UNCERTAINTY

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

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	9k-30MHz	E-Field Loop	2.14dB
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	30-200MHz	Bicon 3m Horz	3.30dB
Radiated Emissions	30-130MHz	Bicon 3m Vert	4.84dB
Radiated Emissions	130-200MHz	Bicon 3m Vert	4.94dB
Radiated Emissions	200-1000MHz	LogP 3m Horz	3.46dB
Radiated Emissions	200-1000MHz	LogP 3m Vert	4.98dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a wireless controller. The device is battery powered. There is a USB port, but it is only used as an alternative connection to the PC. When USB connection is made, the wireless portion is disabled. The USB does not charge the device.

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output E-field as follows:

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)	Output AV E-field Strength (dBuV/m)
2402-2480	TX	100.18	87.84

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 3.43 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

The worst-case axis is Y-axis.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List		
Description	Manufacturer	Model
EUT	Valve	1001
Laptop	Lenovo	T420

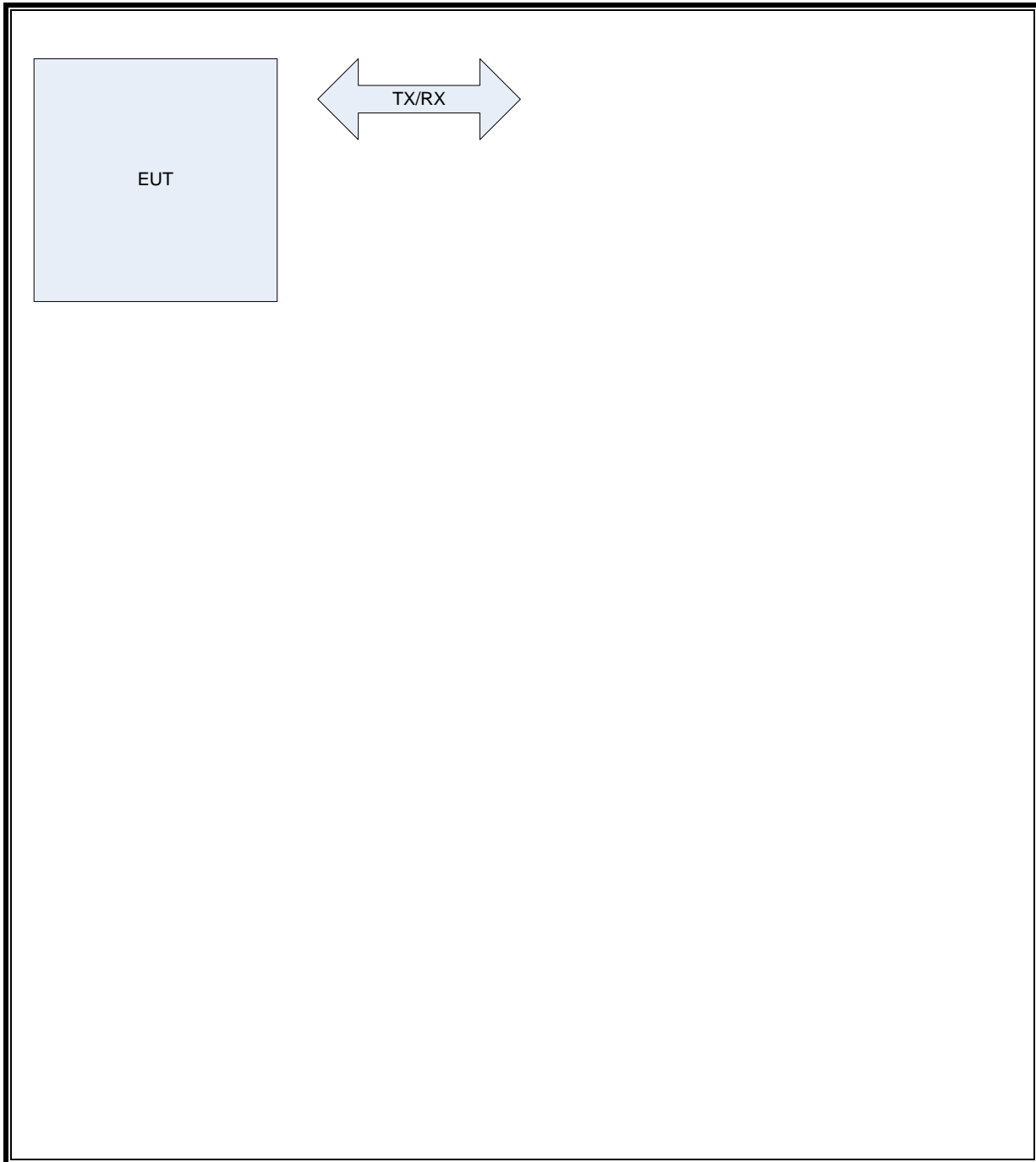
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	IO	>3m	Only used to program

TEST SETUP

The EUT is a standalone device that is battery powered. The USB port is only used for programming and then removed during testing.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List					
Description	Manufacturer	Model	T No.	Cal Date	Cal Due
Radiated Software	UL	UL EMC	Ver 9.5, May 20, 2015		
Conducted Software	UL	UL EMC	Ver 9.5, Oct 24 2014		
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20141230	20151231
Bicon Antenna	Chase	VBA6106A	EMC4078	20140401	20150401
Log-P Antenna	Chase	UPA6109	EMC4313	24141119	20151130
Spectrum Analyzer	Rohde & Schwarz	ESU	EMC4323	20141216	20151231
Antenna Array	UL	BOMS	EMC4276	20141201	20151231
EMI Test Receiver	Agilent	N9030A	EMC4360	20141219	20151219
Loop Antenna	EMCO	6502/1	EMC4026	20150420	20160430

Radiated Emissions 30-1000MHz was performed March 25, 2015

7. TEST RESULTS

7.1.1. OCCUPIED BANDWIDTH

LIMITS

None; for reporting purposes only.

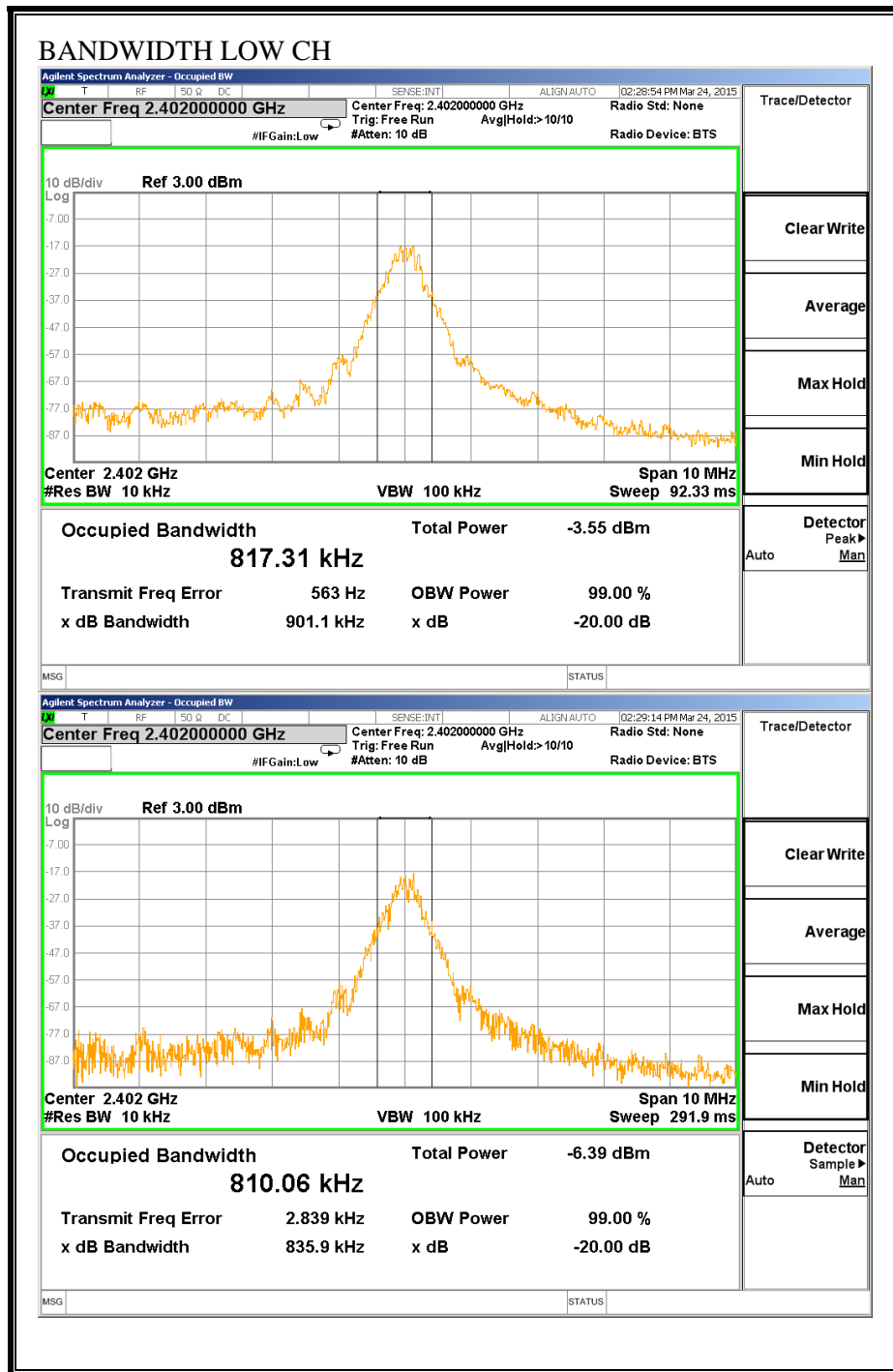
TEST PROCEDURE

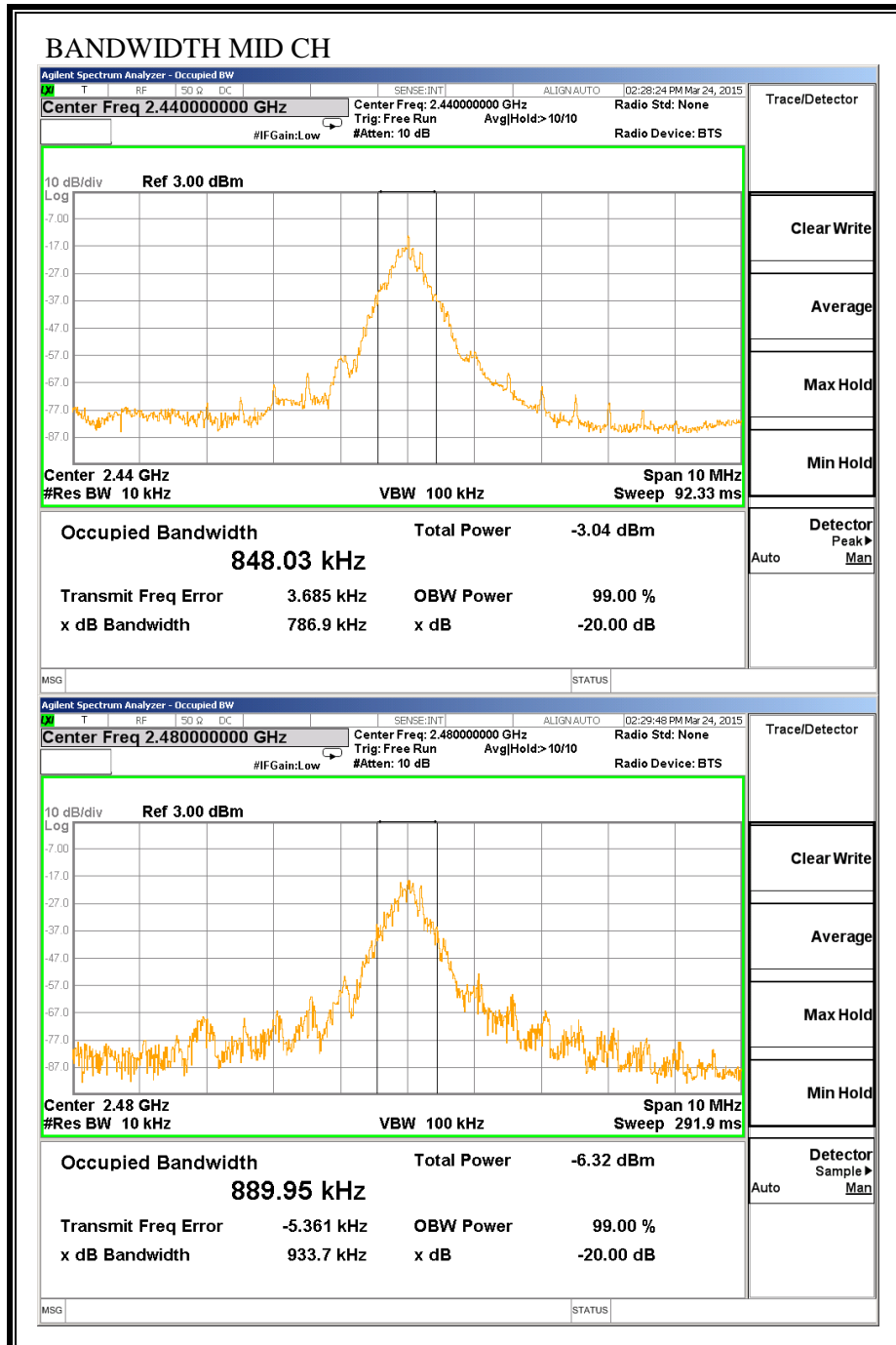
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

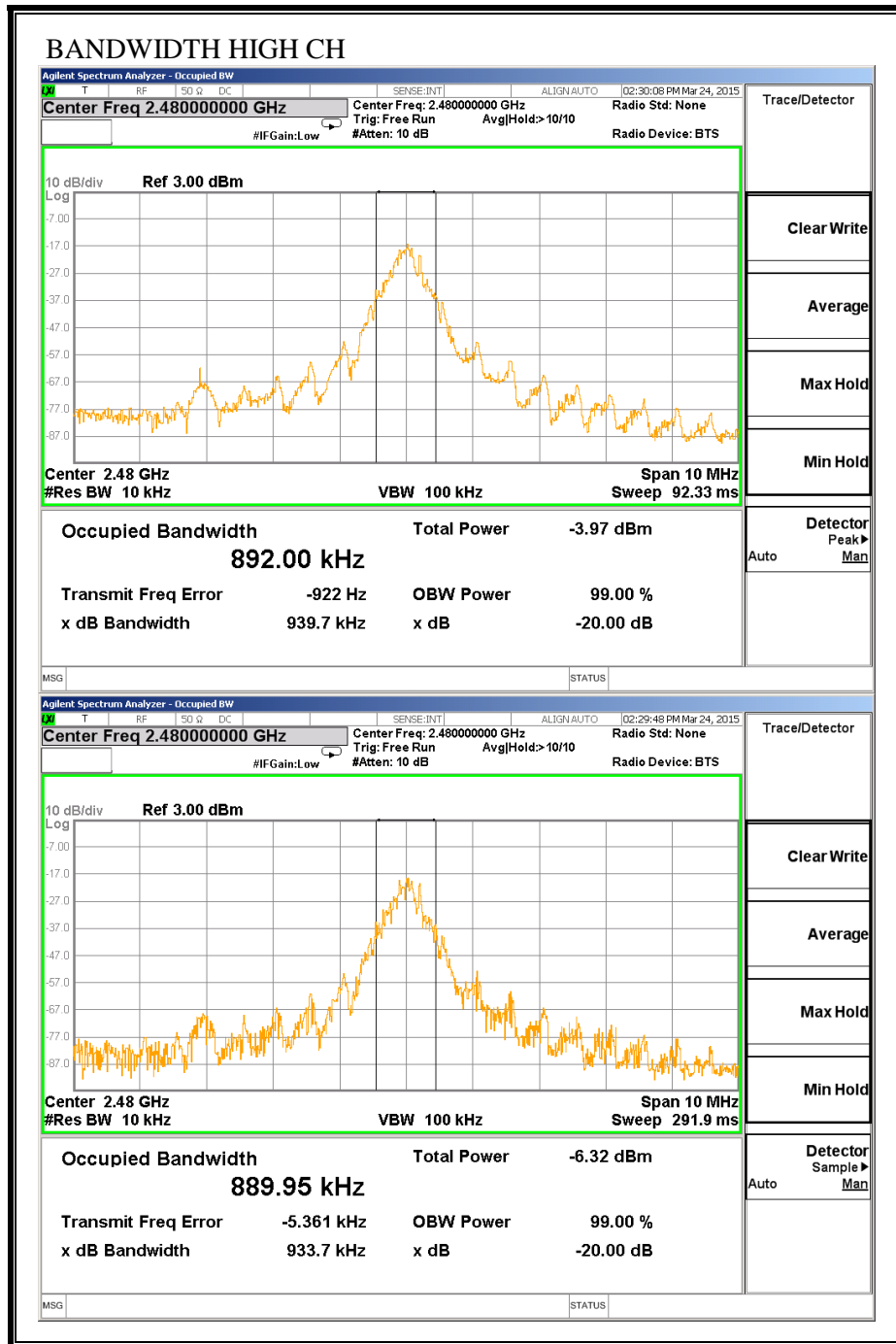
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (kHz)	20dB Bandwidth (kHz)
Low	2402	810.06	901.1
Middle	2440	889.95	786.9
High	2480	889.95	939.7

99% BANDWIDTH







7.2. RADIATED EMISSIONS

LIMIT

IC RSS-210, A2.9
 FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

RESULTS

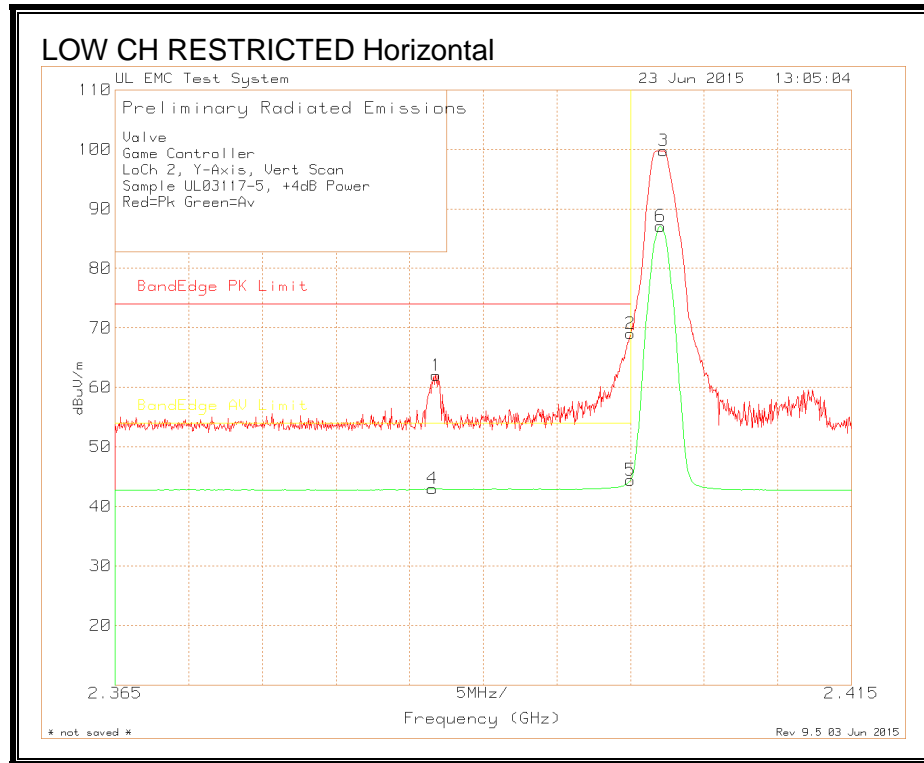
7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

Valve
 Game Controller
 Fundamentals, Y-Axis
 Sample UL03117-5, 4dB Power
 Red=Pk Green=Av

Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Gain dB/m	Corrected Gain/Loss (dB)	Corrected Reading dBuV/m	47 CFR		47 CFR		Azimuth [Degs]	Height [cm]	Polarity
					Part 15 PK (dB)	Margin (dB)	Part 15 AV	Margin (dB)			
2.402	73.05 Pk	21.8	4.58	99.43	114	-14.57	-	-	321	100	H
2.402	60.73 Av	21.8	4.58	87.11	114	-26.89	94	-6.89	321	100	H
2.402	72.14 Pk	21.8	4.58	98.52	114	-15.48	-	-	135	106	V
2.402	59.8 Av	21.8	4.58	86.18	114	-27.82	94	-7.82	135	106	V
2.44	73.7 Pk	21.9	4.58	100.18	114	-13.82	-	-	321	100	H
2.44	61.36 Av	21.9	4.58	87.84	114	-26.16	94	-6.16	321	100	H
2.44	72.43 Pk	21.9	4.58	98.91	114	-15.09	-	-	145	100	V
2.44	60.08 Av	21.9	4.58	86.56	114	-27.44	94	-7.44	145	100	V
2.4797	73.24 Pk	22	4.36	99.6	114	-14.4	-	-	320	100	H
2.48	60.9 Av	22	4.36	87.26	114	-26.74	94	-6.74	320	100	H
2.48	71.57 Pk	22	4.36	97.93	114	-16.07	-	-	138	100	V
2.48	59.18 Av	22	4.36	85.54	114	-28.46	94	-8.46	138	100	V

7.2.2. TRANSMITTER RESTRICTED BAND EDGES

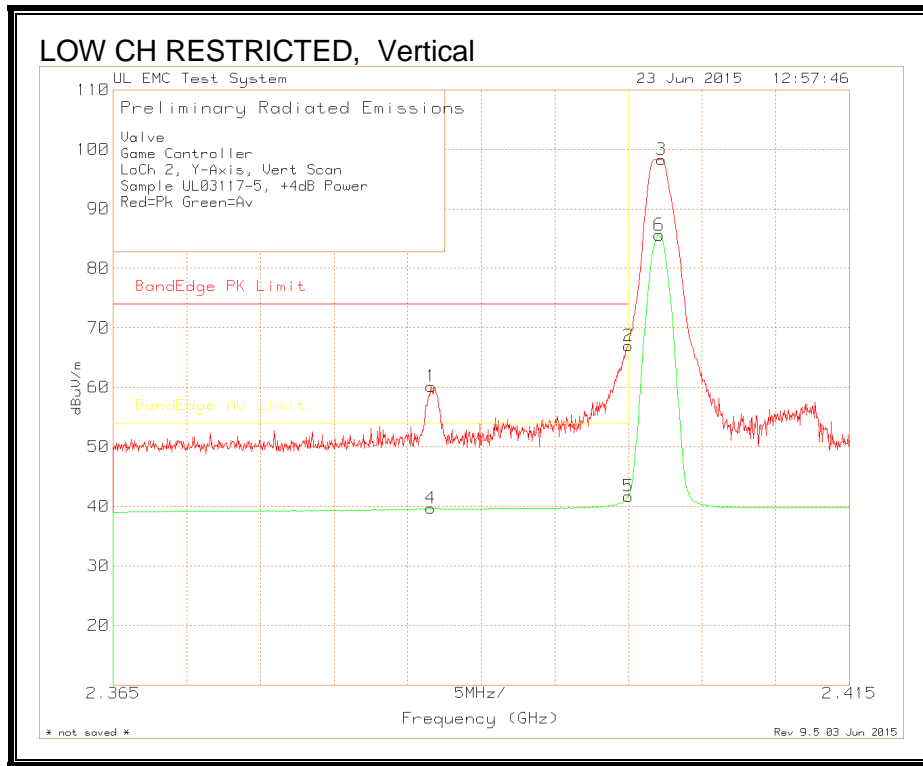
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Valve
 Game Controller
 LoCh 2, Y-Axis, Vert Scan
 Sample UL03117-5, +4dB Power
 Red=Pk Green=Av

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB/m)	Corrected Gain/Loss (dB)	Corrected Reading (dBuV/m)	BandEdge PK Limit (dB)	BandEdge Margin (dB)	BandEdge AV Limit (dB)	BandEdge Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.3868	35.52 Pk	21.8	4.69	62.01	74	-11.99	54	8.01	116	100	H
2	2.4	42.65 Pk	21.8	4.61	69.06	74	-4.94	54	15.06	116	100	H
3	2.4023	73.38 Pk	21.8	4.58	99.76	-	-	-	-	116	100	H
4	2.3866	16.48 AV	21.8	4.69	42.97	74	-31.03	54	-11.03	116	100	H
5	2.4	17.98 AV	21.8	4.61	44.39	74	-29.61	54	-9.61	116	100	H
6	2.4021	60.68 AV	21.8	4.58	87.06	-	-	-	-	116	100	H

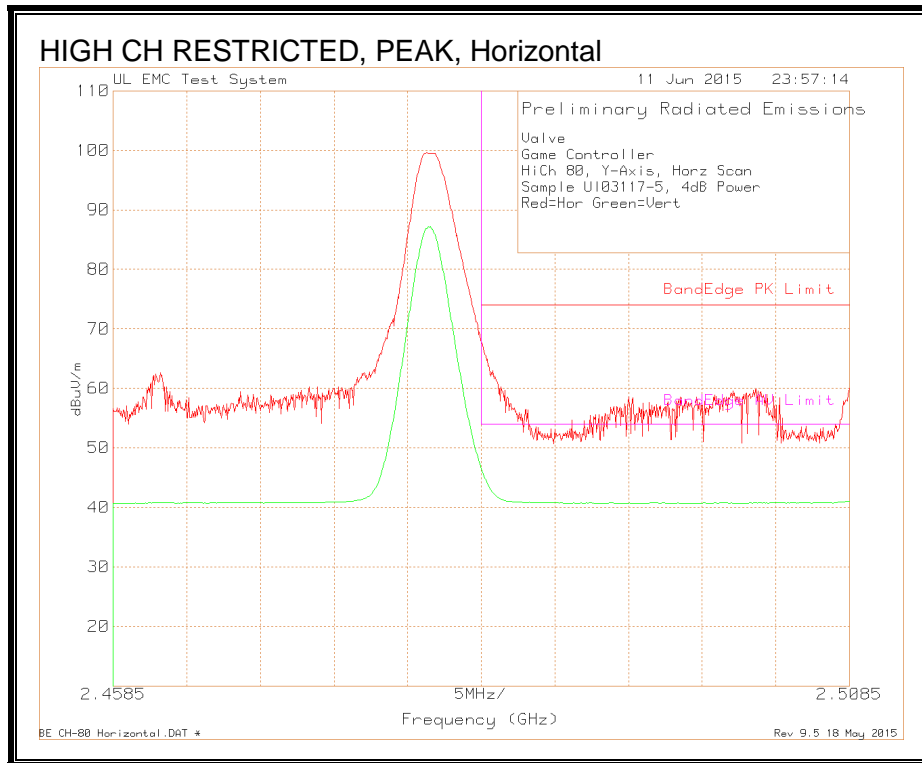
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Valve
 Game Controller
 LoCh 2, Y-Axis, Vert Scan
 Sample UL03117-5, +4dB Power
 Red=Pk Green=Av

Marker No.	Test Frequency (GHz)	Meter Reading(d BuV) Detector	Antenna Gain dB/m	Corrected Gain/Loss (dB)	Corrected Reading dBuV/m	BandEdge Margin		Azimuth [Degs]	Height [cm]	Polarity	
						PK Limit (dB)	AV Limit (dB)				
1	2.3866	33.69 Pk	21.8	4.69	60.18	74	-13.82	54	6.18	294	100 V
2	2.4	40.58 Pk	21.8	4.61	66.99	74	-7.01	54	12.99	294	100 V
3	2.4023	71.92 Pk	21.8	4.58	98.3	-	-	-	-	294	100 V
4	2.3866	13.2 AV	21.8	4.69	39.69	74	-34.31	54	-14.31	294	100 V
5	2.4	15.27 AV	21.8	4.61	41.68	74	-32.32	54	-12.32	294	100 V
6	2.4021	59.2 AV	21.8	4.58	85.58	-	-	-	-	294	100 V

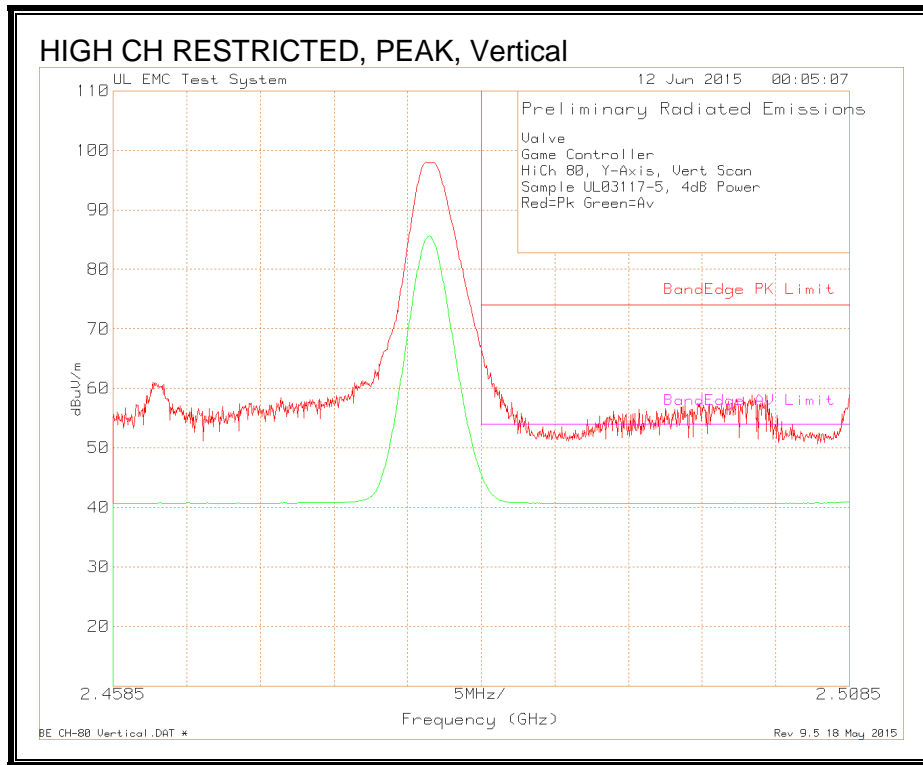
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Valve
 Game Controller
 HiCh 80, Y-Axis, Horz Scan
 Sample UI03117-5, 4dB Power
 Red=Hor Green=Vert

Marker No.	Test Frequnc y (GHz)	Meter Reading(d BuV) Detector	Antenna		Corrected		BandEdge PK Limit (dB)	Margin (dB)	BandEdge AV Limit (dB)	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
			Gain dB/m	Gain/Loss (dB)	Reading dBuV/m	Gain/Loss (dB)							
1	2.4798	73.21 Pk	22	4.36	99.57	-	-	-	-	-	320	100	H
2	2.4835	41.6 Pk	22.1	4.37	68.07	-	-	-	-	-	320	100	H
3	2.4835	41.23 Pk	22.1	4.37	67.7	74	-6.3	54	13.7	13.7	320	100	H
4	2.4836	41.19 Pk	22.1	4.37	67.66	74	-6.34	54	13.66	13.66	320	100	H
5	2.4799	60.85 Pk	22	4.36	87.21	-	-	-	-	-	320	100	H
6	2.4835	20.45 Pk	22.1	4.37	46.92	-	-	-	-	-	320	100	H
7	2.4835	20.06 Pk	22.1	4.37	46.53	74	-27.47	54	-7.47	-7.47	320	100	H
8	2.4836	19.68 Pk	22.1	4.37	46.15	74	-27.85	54	-7.85	-7.85	320	100	H

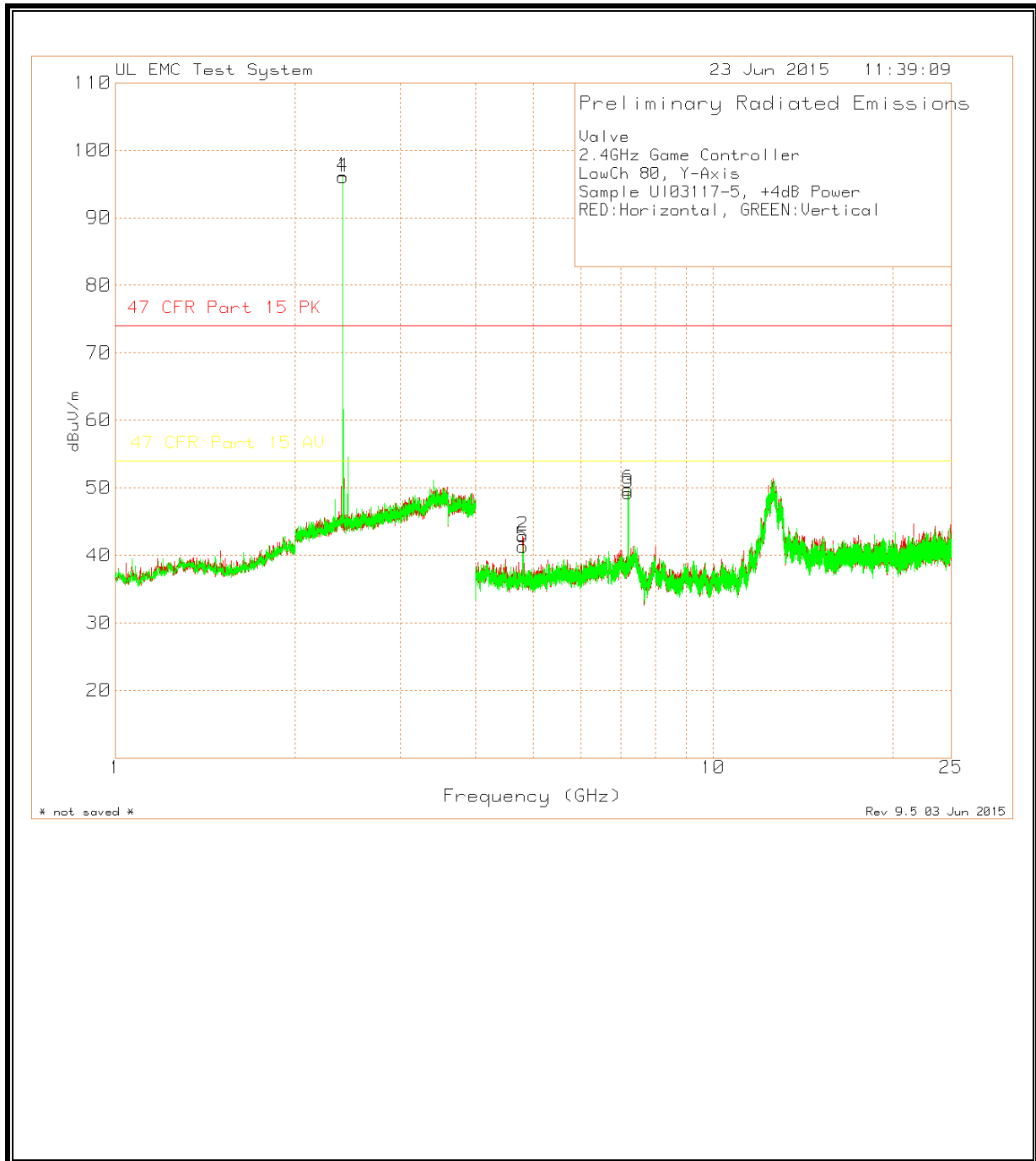
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Valve
 Game Controller
 HiCh 80, Y-Axis, Vert Scan
 Sample UL03117-5, 4dB Power
 Red=Pk Green=Av

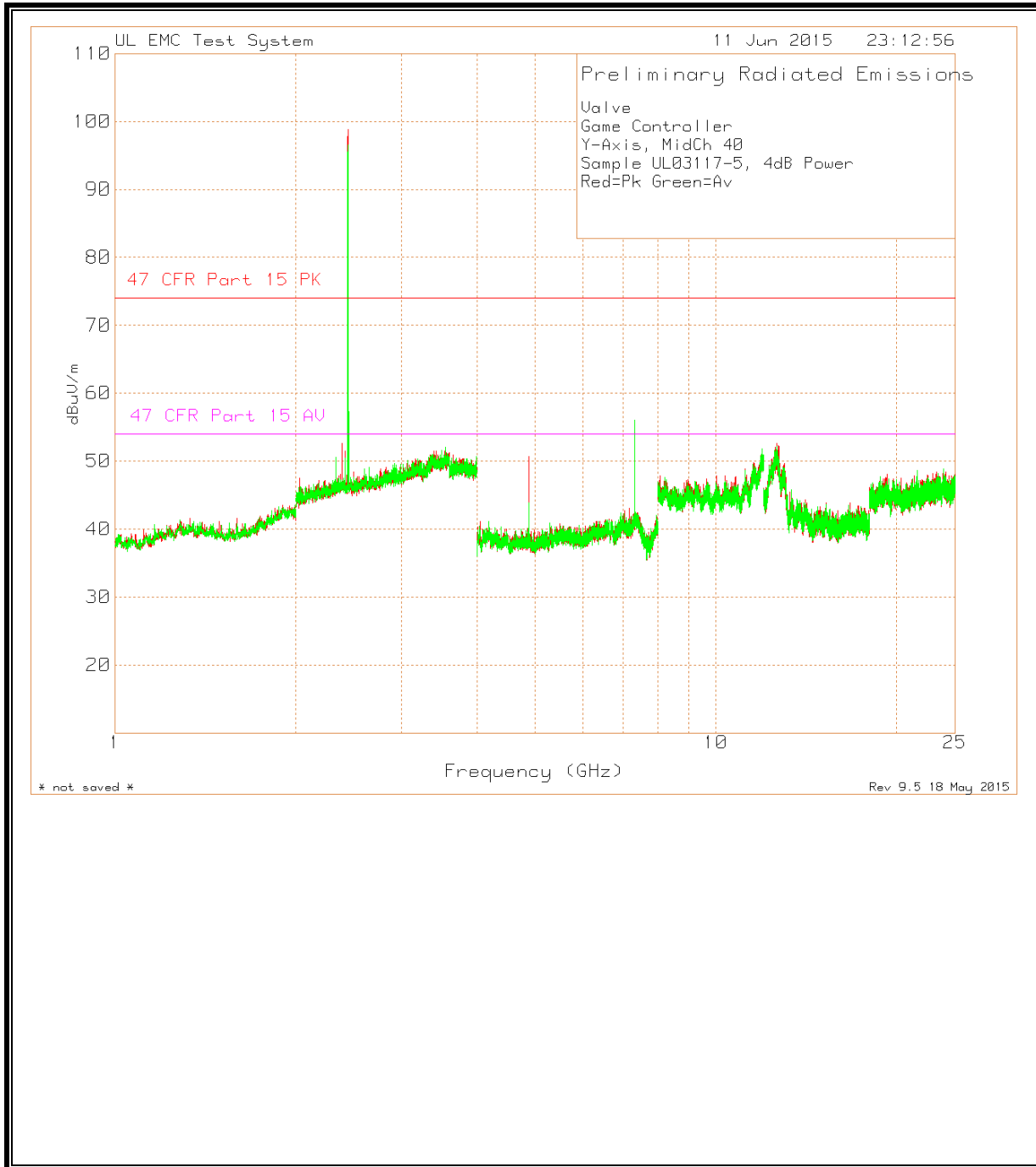
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Gain (dB/m)	Corrected		BandEdge PK Limit (dB)	BandEdge Margin (dB)	BandEdge AV Limit (dB)	BandEdge Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
				Gain/Loss (dB)	Reading (dBuV/m)							
1	2.4798	71.61 Pk	22	4.36	97.97	-	-	-	-	138	100	V
2	2.4834	40.63 Pk	22.1	4.37	67.1	-	-	-	-	138	100	V
3	2.4835	40.2 Pk	22.1	4.37	66.67	74	-7.33	54	12.67	138	100	V
4	2.4836	39.22 Pk	22.1	4.37	65.69	74	-8.31	54	11.69	138	100	V
5	2.48	59.26 AV	22	4.36	85.62	-	-	-	-	138	100	V
6	2.4834	19.71 AV	22.1	4.37	46.18	-	-	-	-	138	100	V
7	2.4835	19.06 AV	22.1	4.37	45.53	74	-28.47	54	-8.47	138	100	V
8	2.4836	18.46 AV	22.1	4.37	44.93	74	-29.07	54	-9.07	138	100	V

7.2.3. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



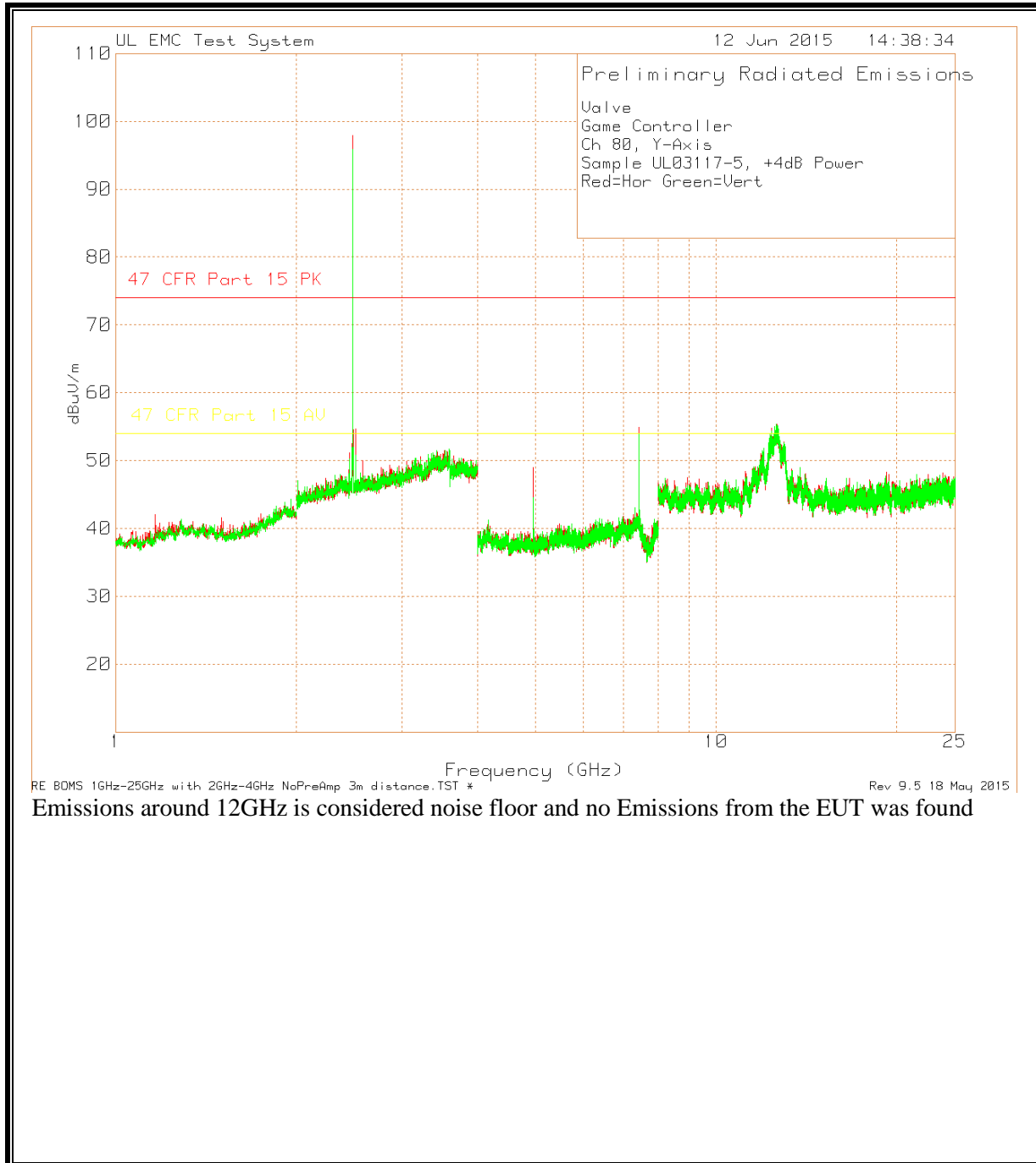
Valve
 2.4GHz Game Controller
 LowCh 80, Y-Axis
 Sample UI03117-5, +4dB Power
 RED:Horizontal, GREEN:Vertical

Test	Meter	Antenna	Corrected			47 CFR		Part 15	Margin	Azimuth	Height	Polarity
			Gain	Gain/Loss	Reading	47 CFR	Margin					
Frequenc	Reading	Gain	Gain/Loss	Reading	47 CFR	Margin	Part 15	Margin	Azimuth	Height	Polarity	
y (GHz)	(dBuV) Detector	dB/m	(dB)	dBuV/m	Part 15 PK (dB)	AV	(dB)	[Degs]	[cm]			
4.8035	74.6 Pk	27.7	-50.66	51.64	74	-22.36	-	-	346	124	H	
4.804	55.11 Av	27.7	-50.65	32.16	74	-41.84	54	-21.84	346	124	H	
7.2066	67.79 Pk	29.7	-46.65	50.84	74	-23.16	-	-	236	100	H	
7.2062	53.68 Av	29.7	-46.65	36.73	74	-37.27	54	-17.27	236	100	H	
4.8038	71.01 Pk	27.7	-50.65	48.06	74	-25.94	-	-	21	120	V	
4.8041	52.26 Av	27.7	-50.65	29.31	74	-44.69	54	-24.69	21	120	V	
7.2052	69.98 Pk	29.7	-46.66	53.02	74	-20.98	-	-	330	186	V	
7.2062	55.5 Av	29.7	-46.65	38.55	74	-35.45	54	-15.45	330	186	V	



Valve
 Game Controller
 Y-Axis, MidCh 40
 Sample UL03117-5, 4dB Power
 Red=Pk Green=Av

Test	Meter		Corrected		47 CFR		47 CFR		Azimuth	Height	
Frequency	Reading	Antenna	Gain/Loss	Reading	47 CFR	Margin	Part 15	Margin	[Degs]	[cm]	Polarity
(GHz)	(dBuV)	Detector	Gains	(dB)	dBuV/m	Part 15 PK (dB)	AV	(dB)			
4.8794	75.31 Pk		27.7	-50.35	52.66	74	-21.34	-		184	146 H
4.88	58.56 Av		27.7	-50.35	35.91	74	-38.09	54	-18.09	184	146 H
4.8794	71.37 Pk		27.7	-50.35	48.72	74	-25.28	-		220	157 V
4.88	54.48 Av		27.7	-50.35	31.83	74	-42.17	54	-22.17	220	157 V
7.3193	70.98 Pk		30.6	-45.88	55.7	74	-18.3	-		154	127 H
7.3201	56.37 Av		30.6	-45.89	41.08	74	-32.92	54	-12.92	154	127 H
7.3206	72.23 Pk		30.6	-45.9	56.93	74	-17.07	-		168	150 V
7.3201	57.52 Av		30.6	-45.89	42.23	74	-31.77	54	-11.77	168	150 V

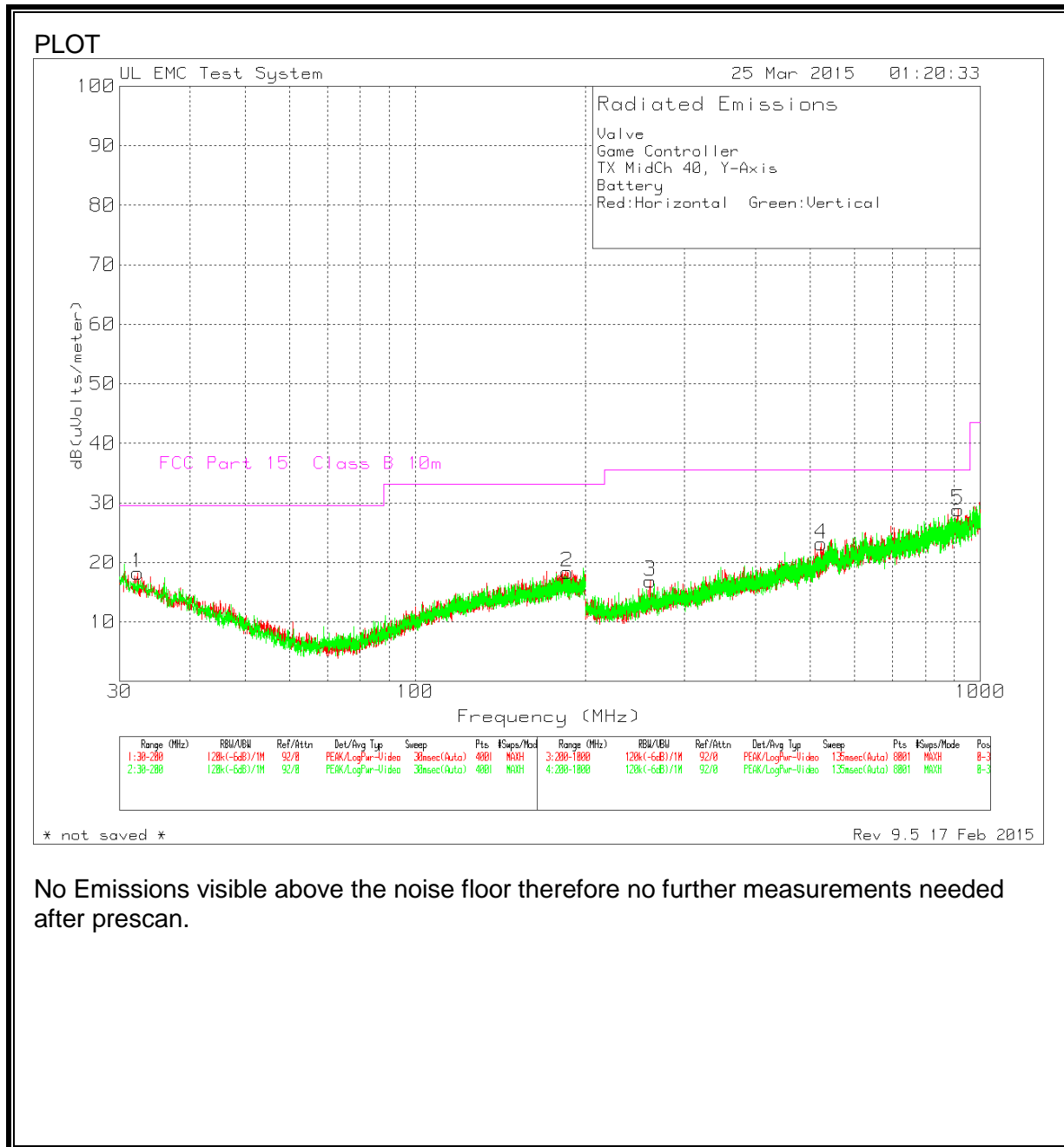


Valve
 Game Controller
 Ch 80, Y-Axis
 Sample UL03117-5, +4dB Power
 Red=Hor Green=Vert

Test Frequency (GHz)	Meter Reading (dBuV)	Antenna Detector	Antenna Gain (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	47 CFR		47 CFR		Azimuth [Degs]	Height [cm]	Polarity
						47 CFR Part 15 PK (dB)	Margin (dB)	47 CFR Part 15 AV	Margin (dB)			
4.9593	73.04	Pk	27.8	-50.74	50.1	74	-23.9	-	-	13	145	H
4.96	59.67	Av	27.8	-50.74	36.73	74	-37.27	54	-17.27	13	145	H
7.4392	72.83	Pk	30.6	-46.79	56.64	74	-17.36	-	-	345	135	H
7.44	58.16	Av	30.6	-46.82	41.94	74	-32.06	54	-12.06	345	135	H
7.4392	71.63	Pk	30.6	-46.79	55.44	74	-18.56	-	-	342	150	V
7.44	56.94	Av	30.6	-46.82	40.72	74	-33.28	54	-13.28	342	150	V
4.9596	70.77	Pk	27.8	-50.74	47.83	74	-26.17	-	-	51	164	V
4.96	57.07	Av	27.8	-50.74	34.13	74	-39.87	54	-19.87	51	164	V

7.2.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz



SPURIOUS EMISSIONS 9k TO 30 MHz

