



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

CERTIFICATION TEST REPORT

FOR

BT + BLE + NORDIC and WLAN DTS/UNII a/b/g/n/ac

**MODEL NUMBER: 1003
FCC ID: 2AES41003
IC ID: 20207-1003**

REPORT NUMBER: 15U21133-E5

ISSUE DATE: JULY 23, 2015

***Prepared for*
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NVLAP LAB CODE 200065-0

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: VALVE
EUT DESCRIPTION: BT+BLE+NORDIC and WLAN DTS/UNII a/b/g/n/ac
MODEL: 1003
SERIAL NUMBER: FL524000A0 (Conducted); FL524000E3 (Radiated)
DATE TESTED: JULY 10-16, 2015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 2	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009 for FCC and ANSI C63.10-2013 for IC, 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(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☐ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☒ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

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 18000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a BT+BLE+NORDIC and WLAN DTS/UNII a/b/g/n/ac.

5.2. MAXIMUM OUTPUT FUNDAMENTAL FIELD STRENGTH

The ANT+ mode has maximum output fundamental field strength as follows:

Frequency Range (MHz)	Mode	Peak E-field Strength (dBuV/m)	Avg E-field Strength (dBuV/m)	Distance (m)
2402 - 2480	ANT +	98.24	85.92	3.00

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 1.2 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

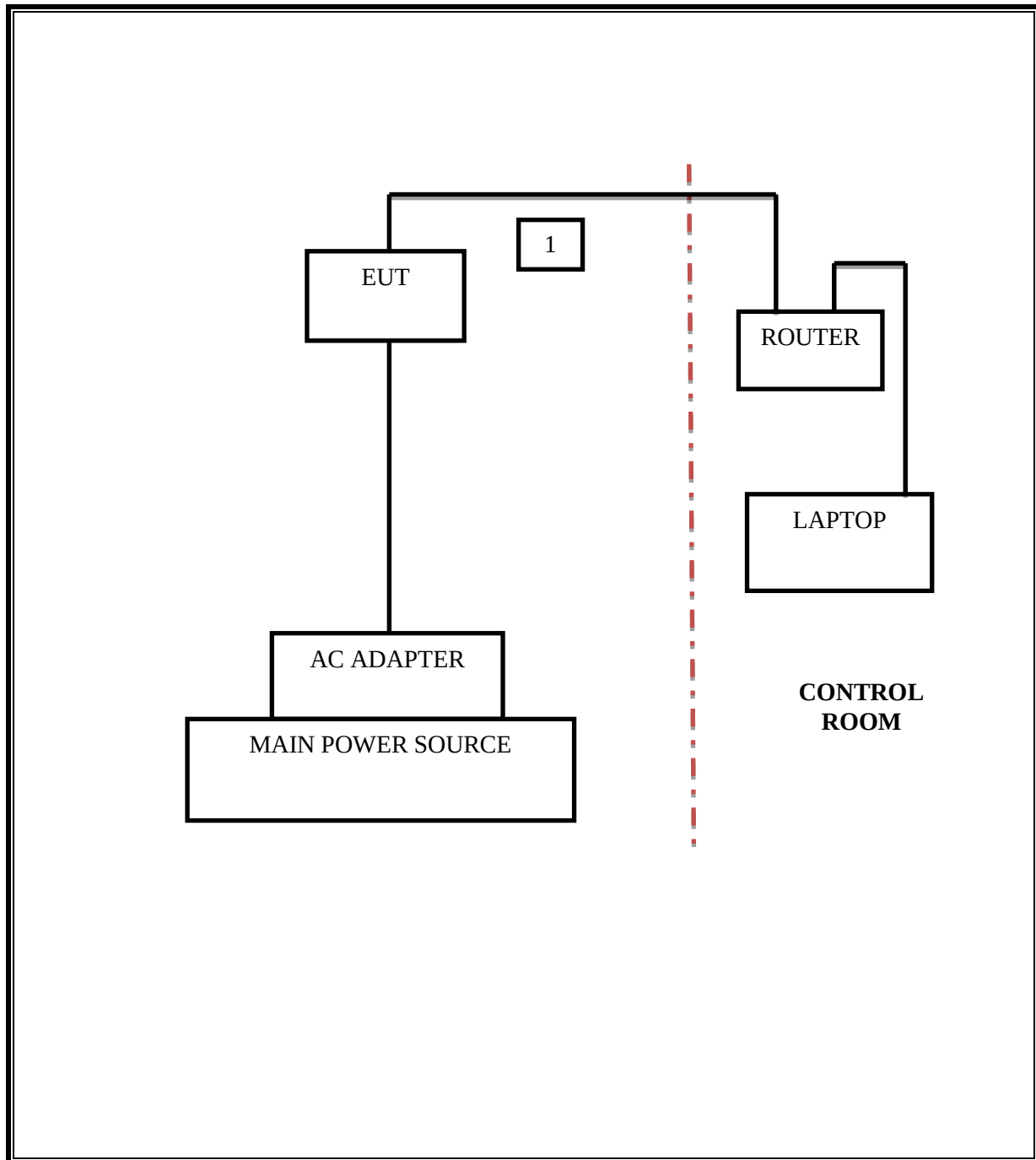
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC ADAPTER	CHICONY	A15-012N1A	N/A	N/A
LAPTOP	DELL	N/A	N/A	N/A
LAPTOP	DELL	N/A	N/A	N/A
ROUTER	NETGEAR	N600	N/A	N/A
ROUTER	D-LINK	DIR-655B1	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Ethernet	1	RJ-45	Unshielded	5m	N/A

TEST SETUP

The EUT is set to continuously transmit in test mode.



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	Asset	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15
Spectrum Analyzer, 9KHz-40GHz	HP	8564E	C00986	04/01/16
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/13/15
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/18/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15
Antenna, Horn, 1-18 GHz	ETS	3117	C01022	02/21/16
Antenna, Horn, 18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/15
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/16
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/16
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/16
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/16
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 40GHz	Miteq	NSP4000-SP2	C00990	08/20/15
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	F00219	05/23/16
High Pass Filter 6GHz	Micro-Tronics	HPS17542	F00222	05/22/16
High Pass Filter 3GHz	Micro-Tronics	HPM17543	F00224	05/22/16

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Version 9.5, 07/22/14
Conducted Software	UL	UL EMC	Version 9.5, 05/17/14
CLT Software	UL	UL RF	Version 1.0, 02/02/15
Antenna Port Software	UL	UL RF	Version 2.1.1.1, 1/20/15

7. LIMITS AND RESULTS

7.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

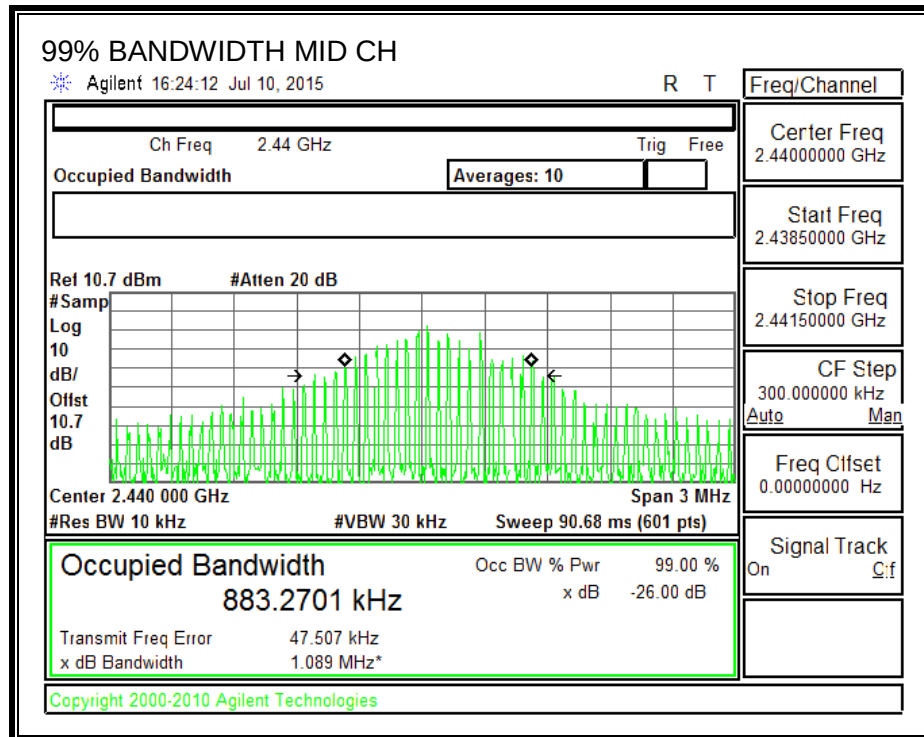
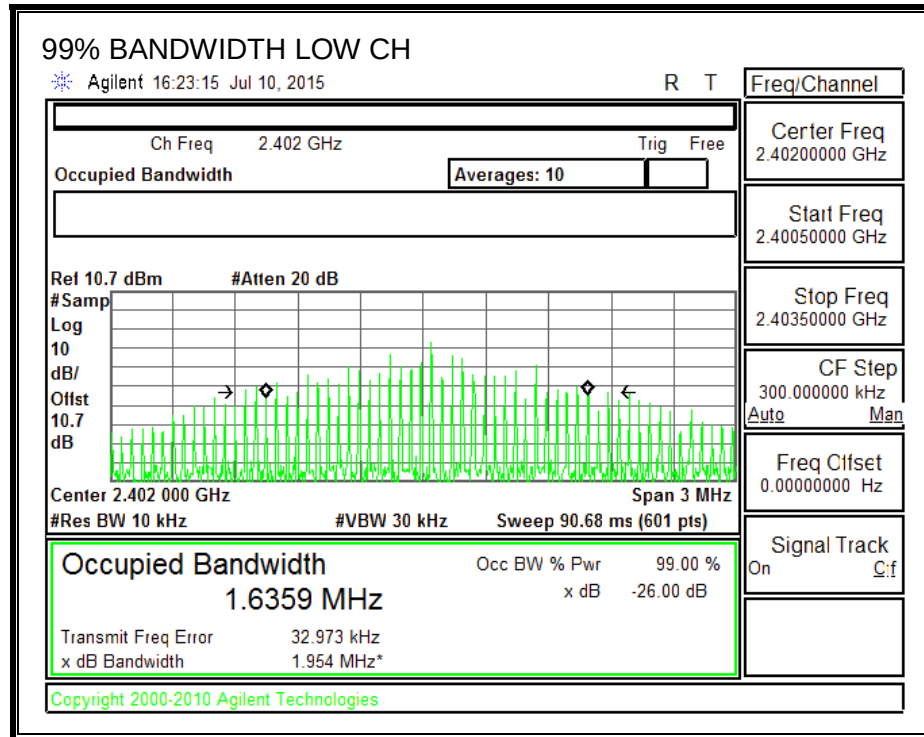
TEST PROCEDURE

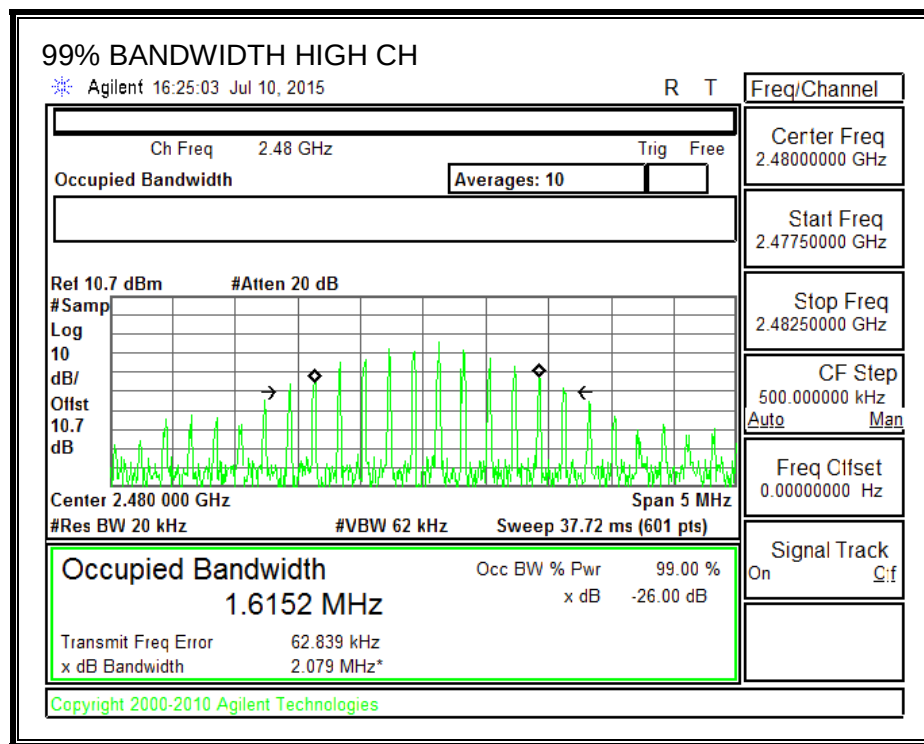
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.6359
Middle	2442	0.8832
High	2480	1.6152

99% BANDWIDTH





7.2. TRANSMITTER RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.10

LIMIT

FCC 15.249
IC RSS-210, A2.9

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.

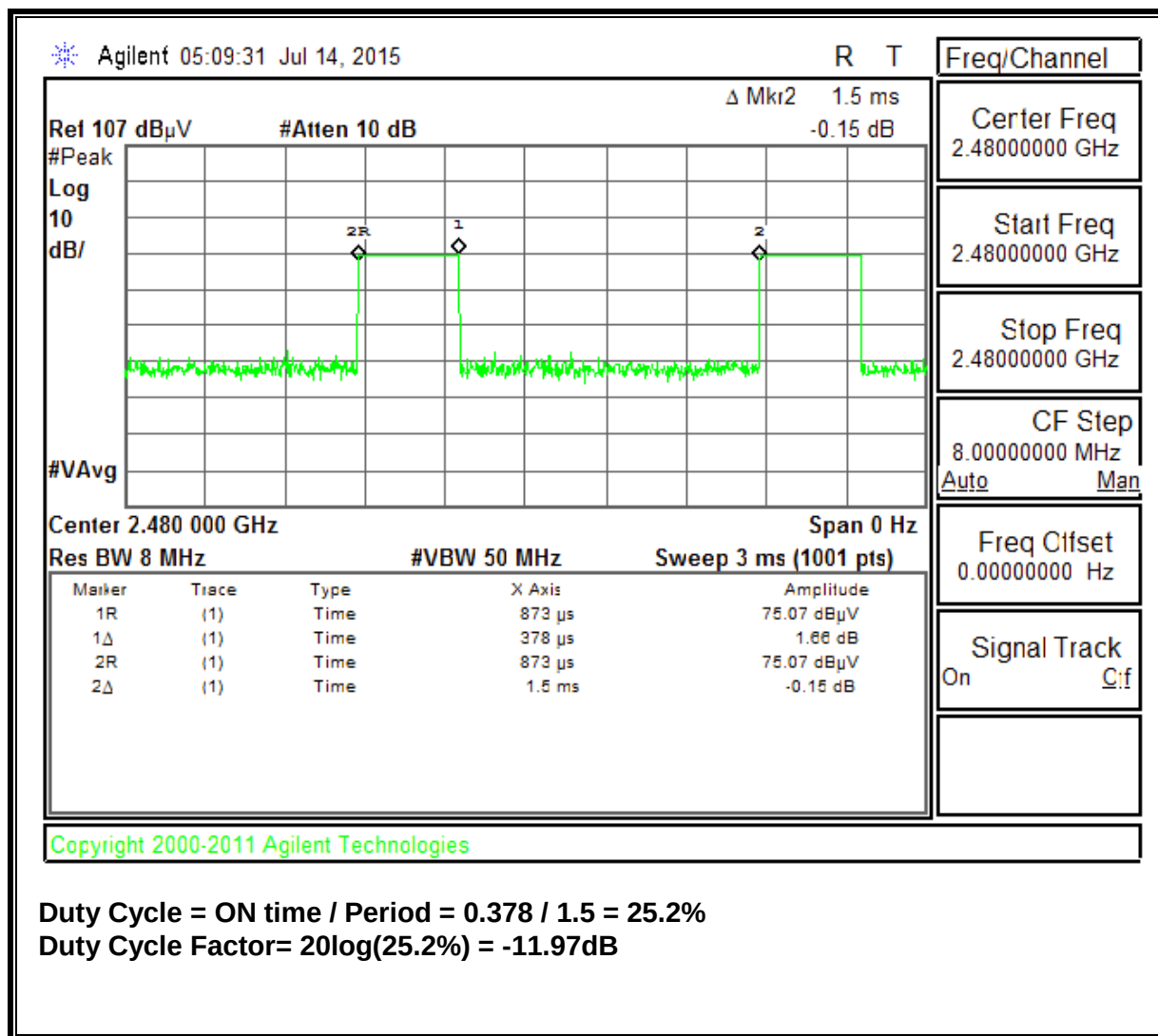
(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Frequency (MHz)	Field strength (microvolts/meter)	Measure- ment dis- tance (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. DUTY CYCLE



7.2.2. FUNDAMENTAL FREQUENCY RADIATED EMISSION

 FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP 47173 BENICIA STREET, FREMONT, CA 94538, USA	Project #: 15U21133 Report #: 15U21133 Date & Time: 07/15/15 Test Engr: J. Hsu	
	Company: Valve	
	EUT Description:	
	Test Configuration: X POSITION	
Type of Test: FCC		
Mode of Operation: Transmitting : Nordic Radio		

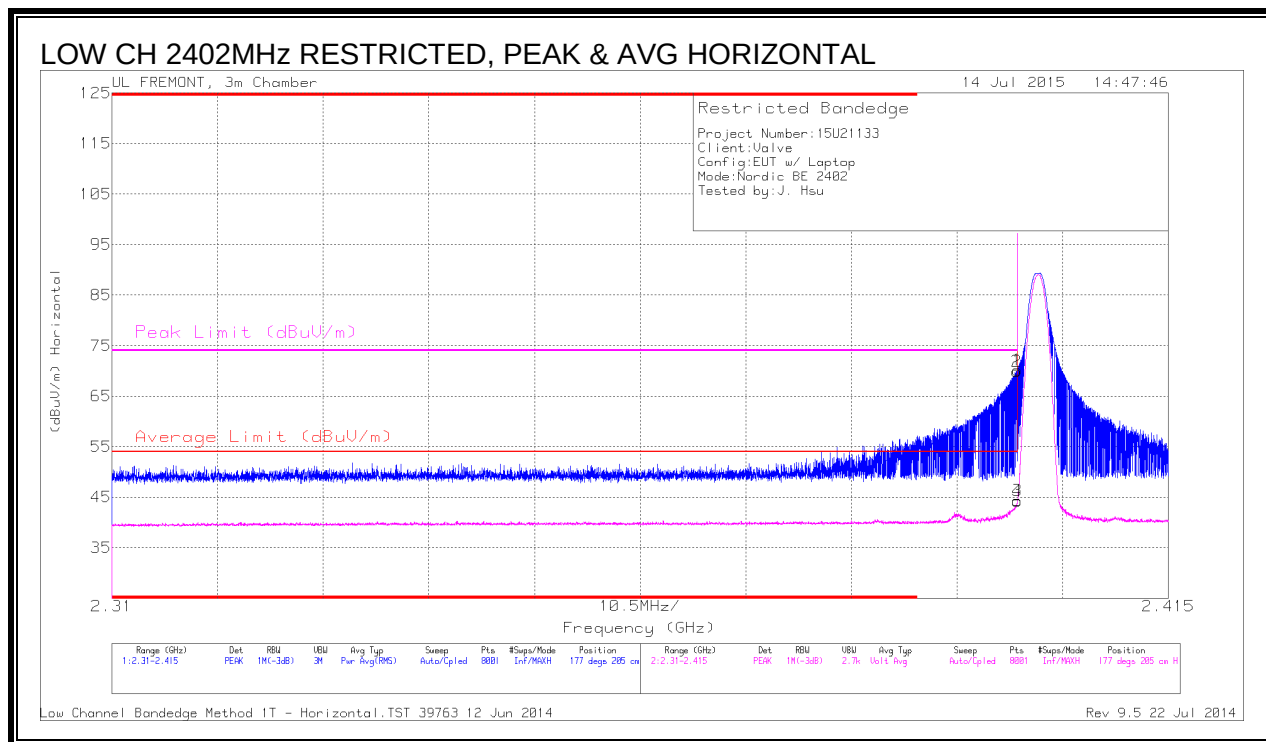
$M\% = ((t1+t2+t3+...)/T) * 66.83\% = 25.20\%$

Av Reading = Pk Reading + 20*log(M%)
20 * log (M%) = -11.97

Freq. (MHz)	Pk Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Pk Level (dBuV/m)	Av Level (dBuV/m)	Pk Limit FCC_B	Av Limit FCC_B	Pk Margin (dB)	Avg Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)
Low channel													
2402.00	83.56	32.05	-32.40	0.00	83.21	71.24	114.00	94.00	-30.79	-22.76	3mV	0.00	1.00
2402.00	90.40	32.05	-32.40	0.00	90.05	78.08	114.00	94.00	-23.95	-15.92	3mH	0.00	2.00
Mid channel													
2442.00	93.1	32.05	-32.40	0.00	92.75	80.78	114.00	94.00	-21.25	-13.22	3mV	0.00	1.00
2442.00	98.59	32.05	-32.40	0.00	98.24	86.27	114.00	94.00	-15.76	-7.73	3mH	0.00	2.00
High channel													
2480.00	85.52	32.05	-32.40	0.00	85.17	73.20	114.00	94.00	-28.83	-20.80	3mV	0.00	1.00
2480.00	92.62	32.05	-32.40	0.00	92.27	80.30	114.00	94.00	-21.73	-13.70	3mH	0.00	2.00

7.2.3. TRANSMITTER RESTRICTED BAND EDGES

RESTRICTED BANDEDGE (LOW CHANNEL 2402, HORIZONTAL)

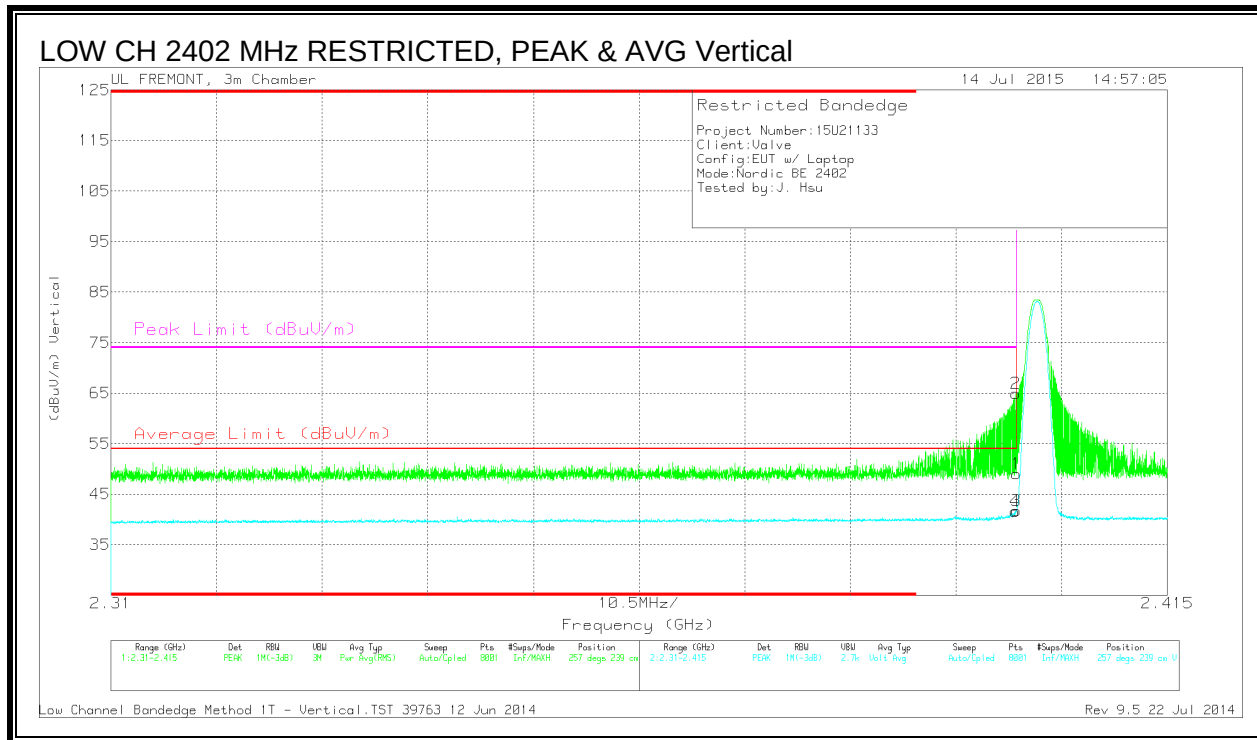


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.4	60.56	PK	32	-22.4	70.16	-	-	74	-3.84	177	205	H
2	2.4	60.34	PK	32	-22.4	69.94	-	-	74	-4.06	177	205	H
3	2.4	34.75	VB1T	32	-22.4	44.35	54	-9.65	-	-	177	205	H
4	2.4	34.63	VB1T	32	-22.4	44.23	54	-9.77	-	-	177	205	H

PK - Peak detector

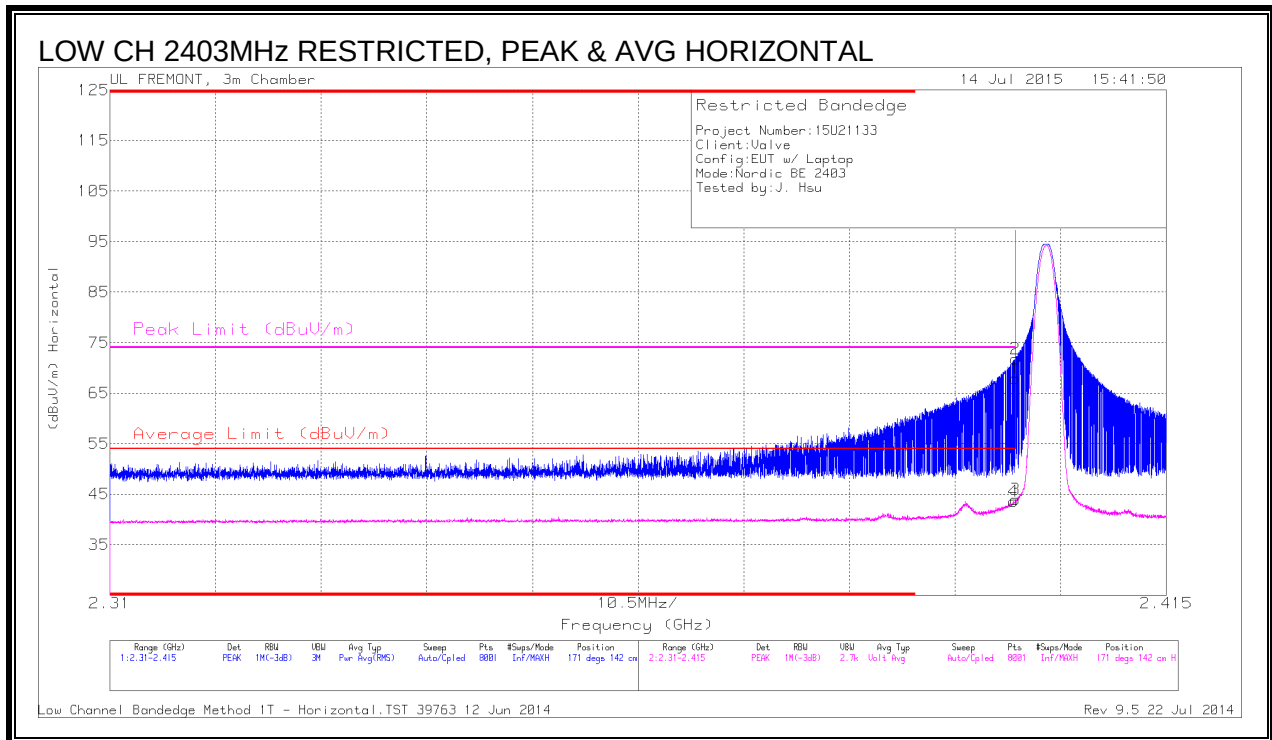
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (LOW CHANNEL 2402, VERTICAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Ampl/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.4	39.46	PK	32	-22.4	49.06	-	-	74	-24.94	257	239	V
2	2.4	55.39	PK	32	-22.4	64.99	-	-	74	-9.01	257	239	V
3	2.4	32.08	VB1T	32	-22.4	41.68	54	-12.32	-	-	257	239	V
4	2.4	32.04	VB1T	32	-22.4	41.64	54	-12.36	-	-	257	239	V

PK - Peak detector

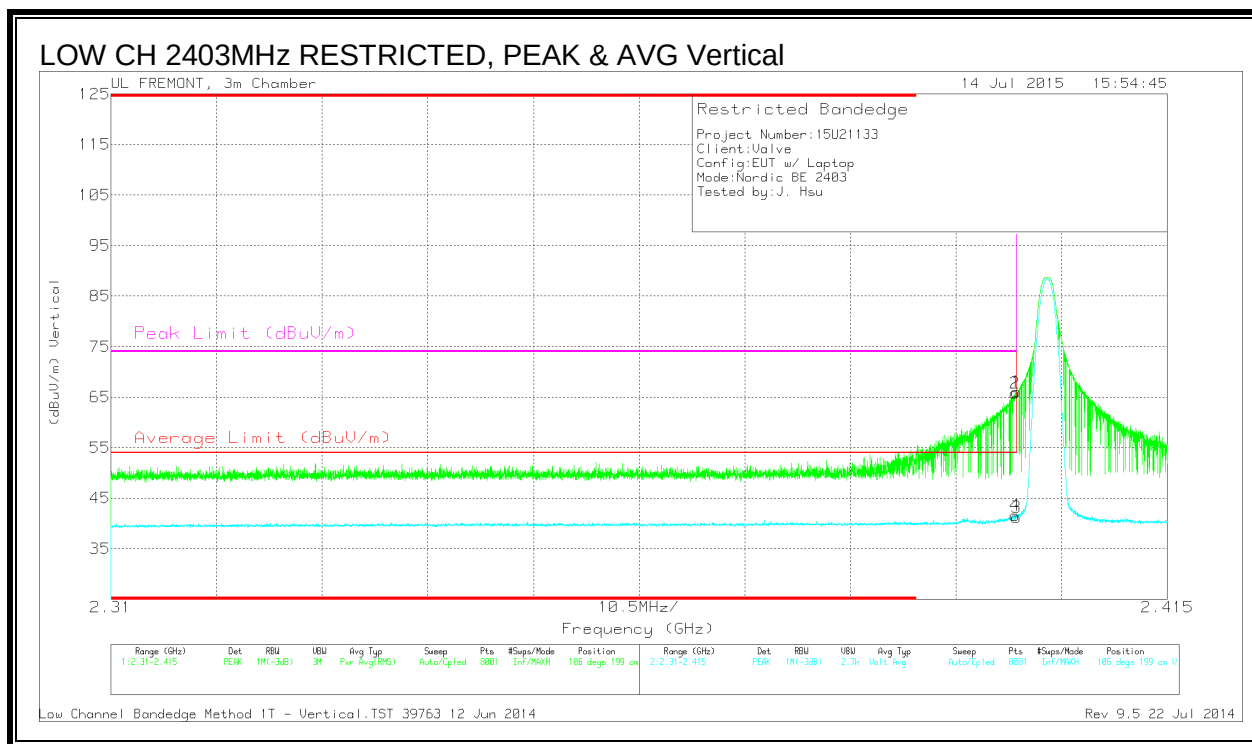
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (2403 CHANNEL, HORIZONTAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.4	58.27	PK	32	-22.4	67.87	-	-	74	-6.13	171	142	H
2	2.4	62.14	PK	32	-22.4	71.74	-	-	74	-2.26	171	142	H
3	2.4	34.33	VB1T	32	-22.4	43.93	54	-10.07	-	-	171	142	H
4	2.4	33.98	VB1T	32	-22.4	43.58	54	-10.42	-	-	171	142	H

PK - Peak detector

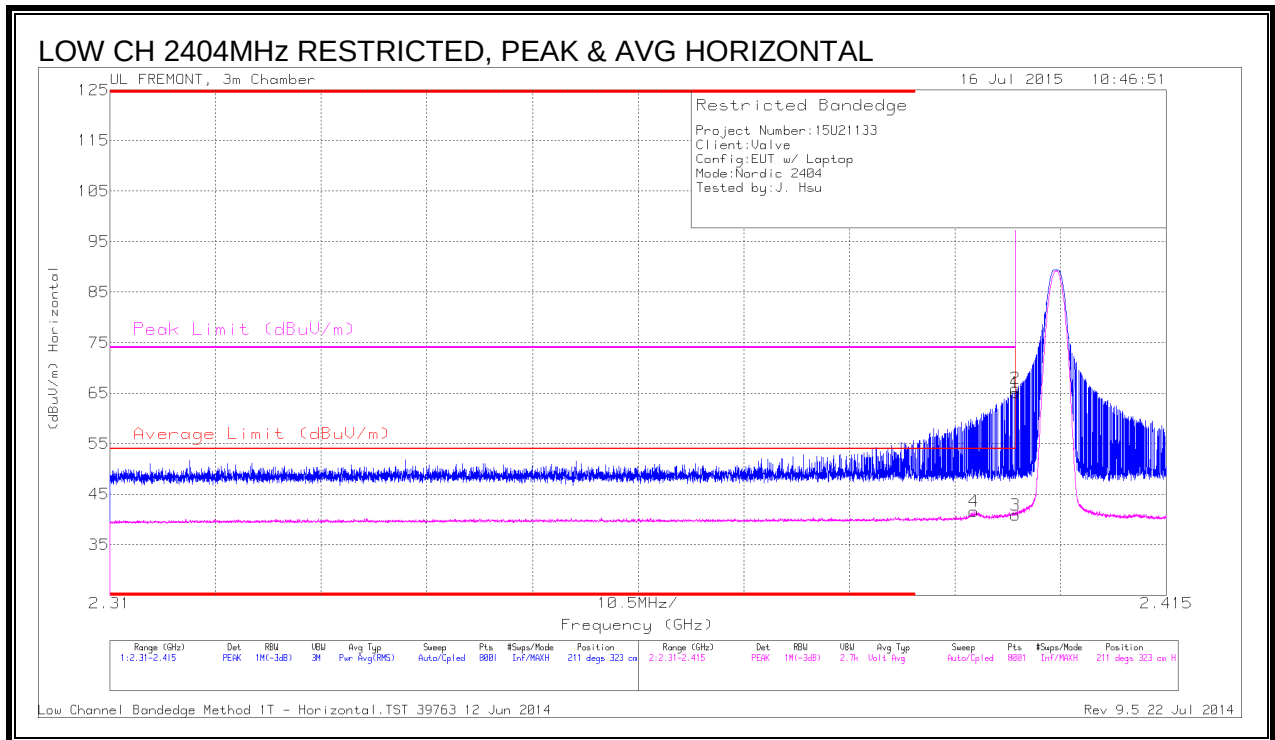
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (2403 CHANNEL, VERTICAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Ampl/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.4	56.41	PK	32	-22.4	66.01	-	-	74	-7.99	106	199	V
2	2.4	56.24	PK	32	-22.4	65.84	-	-	74	-8.16	106	199	V
3	2.4	31.66	VB1T	32	-22.4	41.26	54	-12.74	-	-	106	199	V
4	2.4	32.04	VB1T	32	-22.4	41.64	54	-12.36	-	-	106	199	V

PK - Peak detector

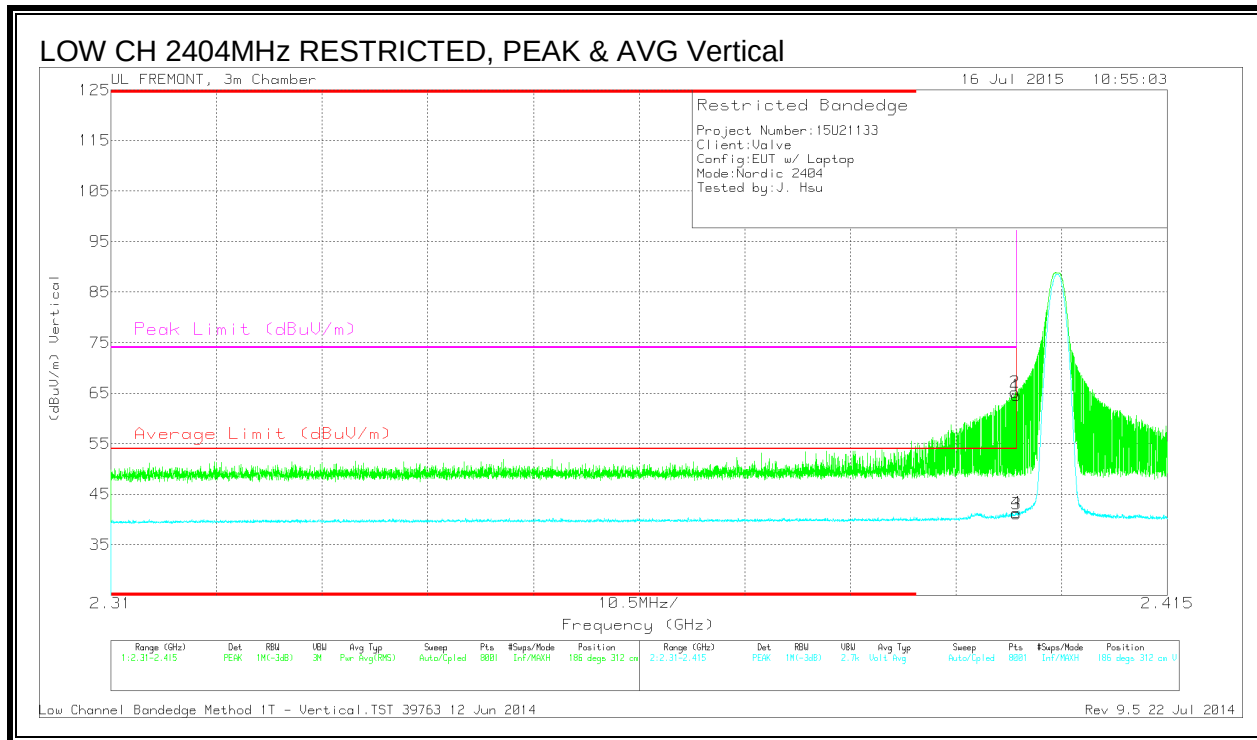
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (2404 CHANNEL, HORIZONTAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Correct d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	2.396	32.04	VB1T	32	-22.4	41.64	54	-12.36	-	-	211	323	H
1	2.4	55.49	PK	32	-22.4	65.09	-	-	74	-8.91	211	323	H
2	2.4	56.29	PK	32	-22.4	65.89	-	-	74	-8.11	211	323	H
3	2.4	31.27	VB1T	32	-22.4	40.87	54	-13.13	-	-	211	323	H

PK - Peak detector

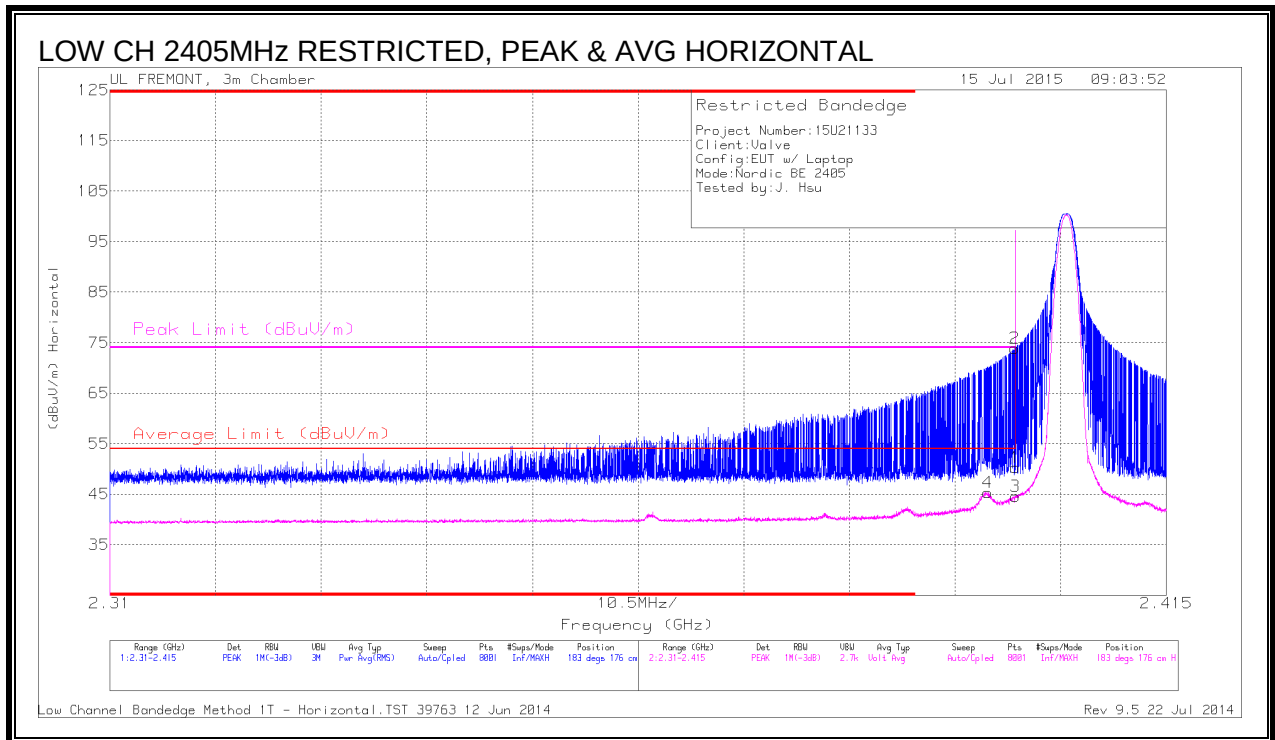
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (2404 CHANNEL, VERTICAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Ampl/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.4	54.92	PK	32	-22.4	64.52	-	-	74	-9.48	186	312	V
2	2.4	55.55	PK	32	-22.4	65.15	-	-	74	-8.85	186	312	V
3	2.4	31.51	VB1T	32	-22.4	41.11	54	-12.89	-	-	186	312	V
4	2.4	31.77	VB1T	32	-22.4	41.37	54	-12.63	-	-	186	312	V

PK - Peak detector

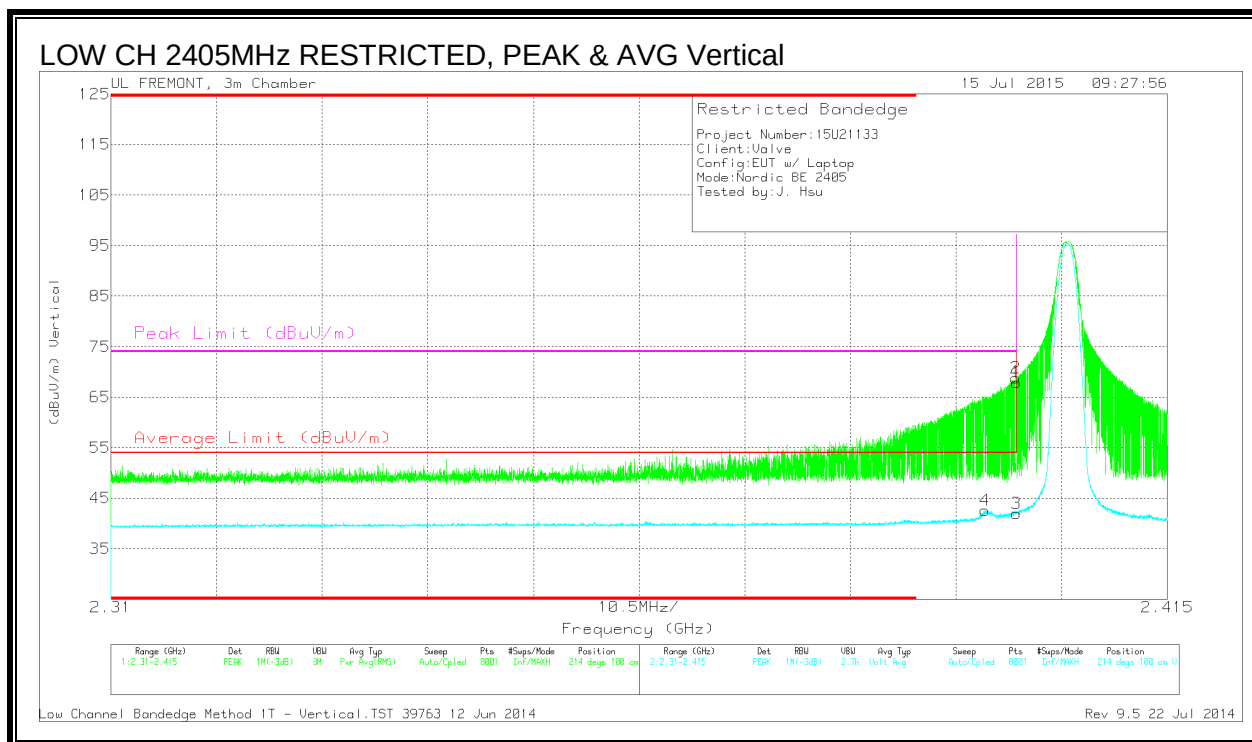
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (2405 CHANNEL, HORIZONTAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	2.397	35.78	VB1T	32	-22.4	45.38	54	-8.62	-	-	183	176	H
1	2.4	40.66	PK	32	-22.4	50.26	-	-	74	-23.74	183	176	H
2	2.4	64.27	PK	32	-22.4	73.87	-	-	74	-13	183	176	H
3	2.4	34.95	VB1T	32	-22.4	44.55	54	-9.45	-	-	183	176	H

PK - Peak detector

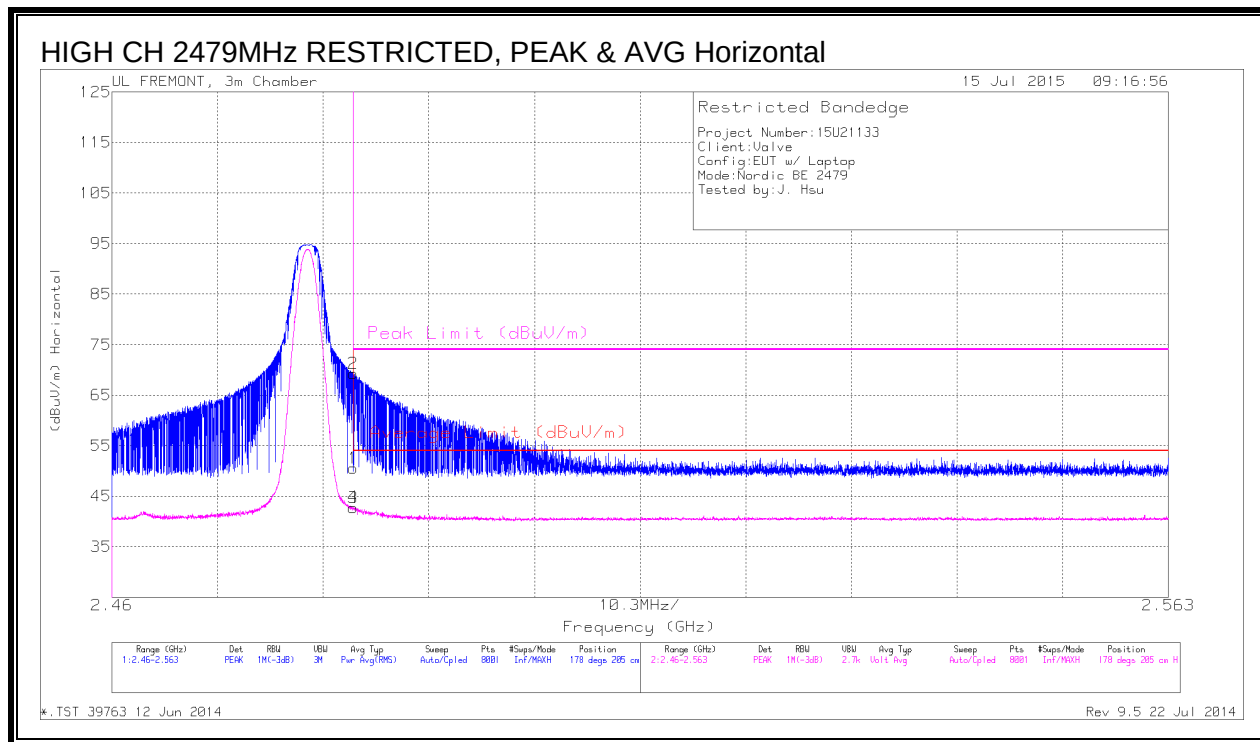
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEDGE (2405 CHANNEL, VERTICAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Ampl/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	2.397	33.04	VB1T	32	-22.4	42.64	54	-11.36	-	-	214	100	V
1	2.4	58.38	PK	32	-22.4	67.98	-	-	74	-6.02	214	100	V
2	2.4	59.14	PK	32	-22.4	68.74	-	-	74	-5.26	214	100	V
3	2.4	32.4	VB1T	32	-22.4	42	54	-12	-	-	214	100	V

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

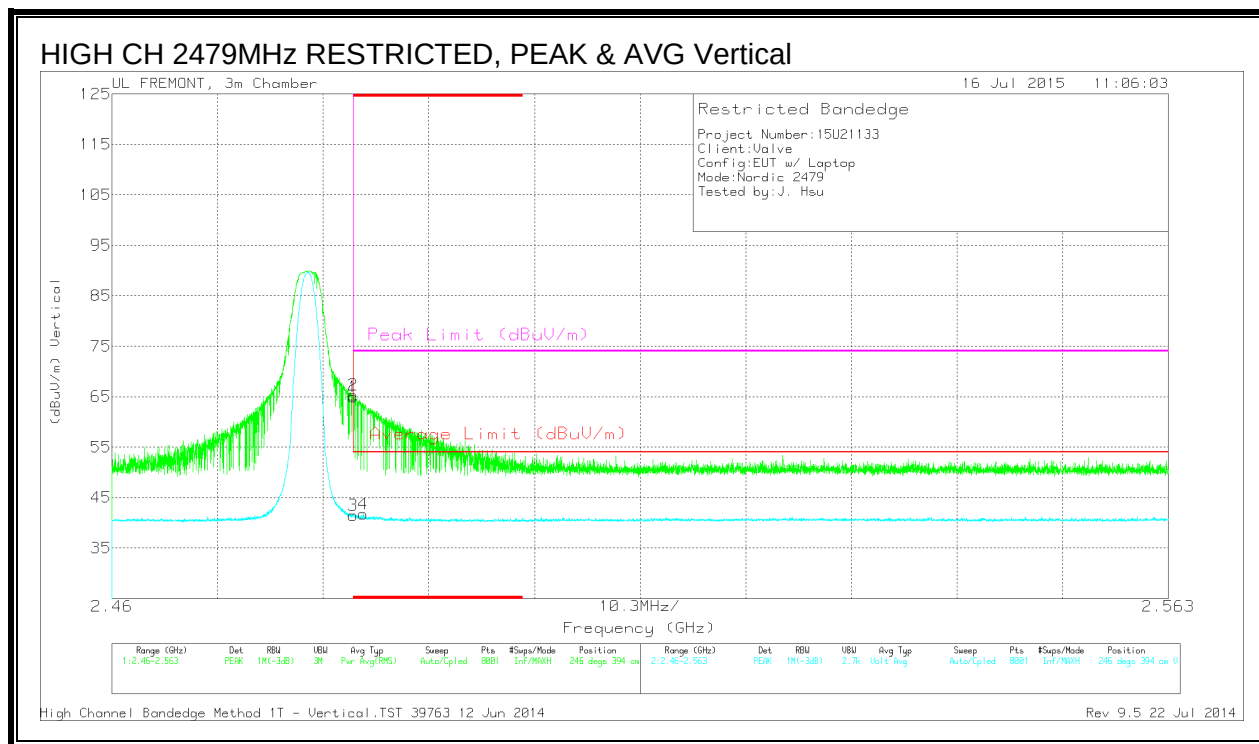
RESTRICTED BANDEDGE (2479 CHANNEL, HORIZONTAL)**Trace Markers**

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	40.31	PK	32.3	-22.1	50.51	-	-	74	-23.49	178	205	H
2	2.484	59.1	PK	32.3	-22.1	69.3	-	-	74	-4.7	178	205	H
3	2.484	32.52	VB1T	32.3	-22.1	42.72	54	-11.28	-	-	178	205	H
4	2.484	32.58	VB1T	32.3	-22.1	42.78	54	-11.22	-	-	178	205	H

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEGE (2479 CHANNEL, VERTICAL)



Trace Markers

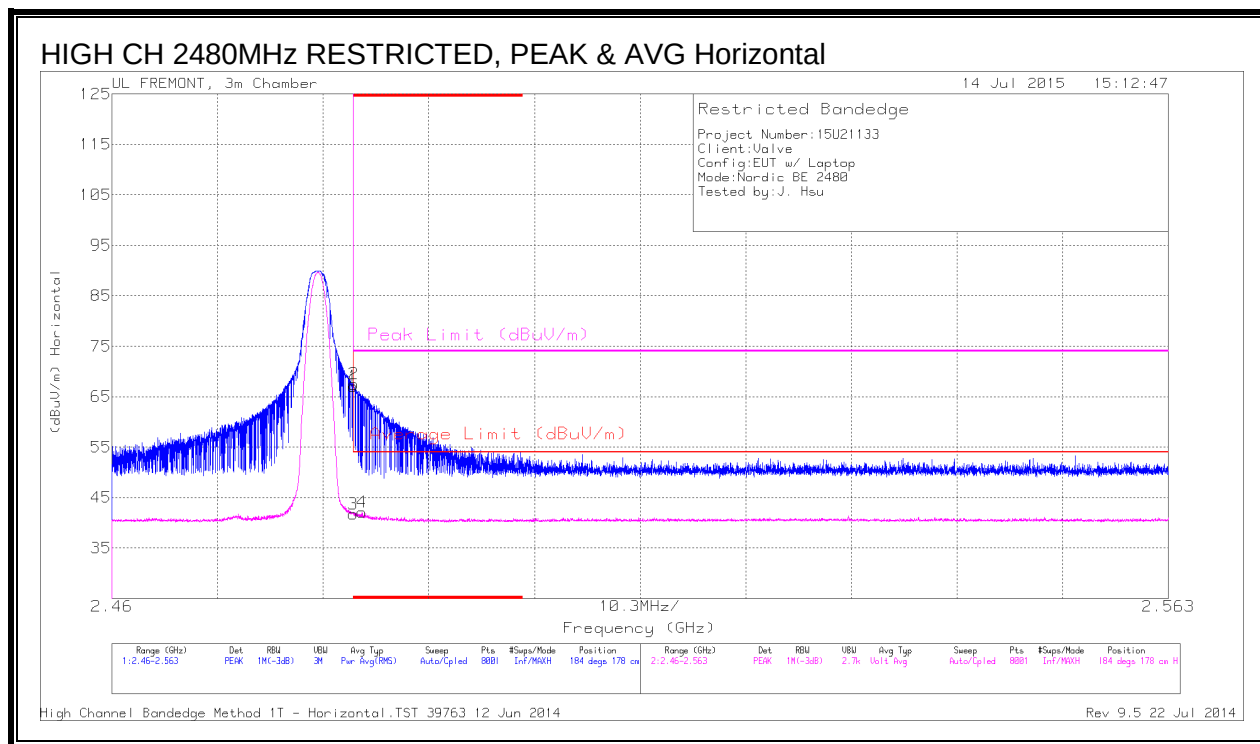
Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	54.76	PK	32.3	-22.1	64.96	-	-	74	-9.04	246	394	V
2	* 2.484	55.07	PK	32.3	-22.1	65.27	-	-	74	-8.73	246	394	V
3	* 2.484	31.27	VB1T	32.3	-22.1	41.47	54	-12.53	-	-	246	394	V
4	* 2.484	31.57	VB1T	32.3	-22.1	41.77	54	-12.23	-	-	246	394	V

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

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEGE (HIGH CHANNEL, HORIZONTAL)



Trace Markers

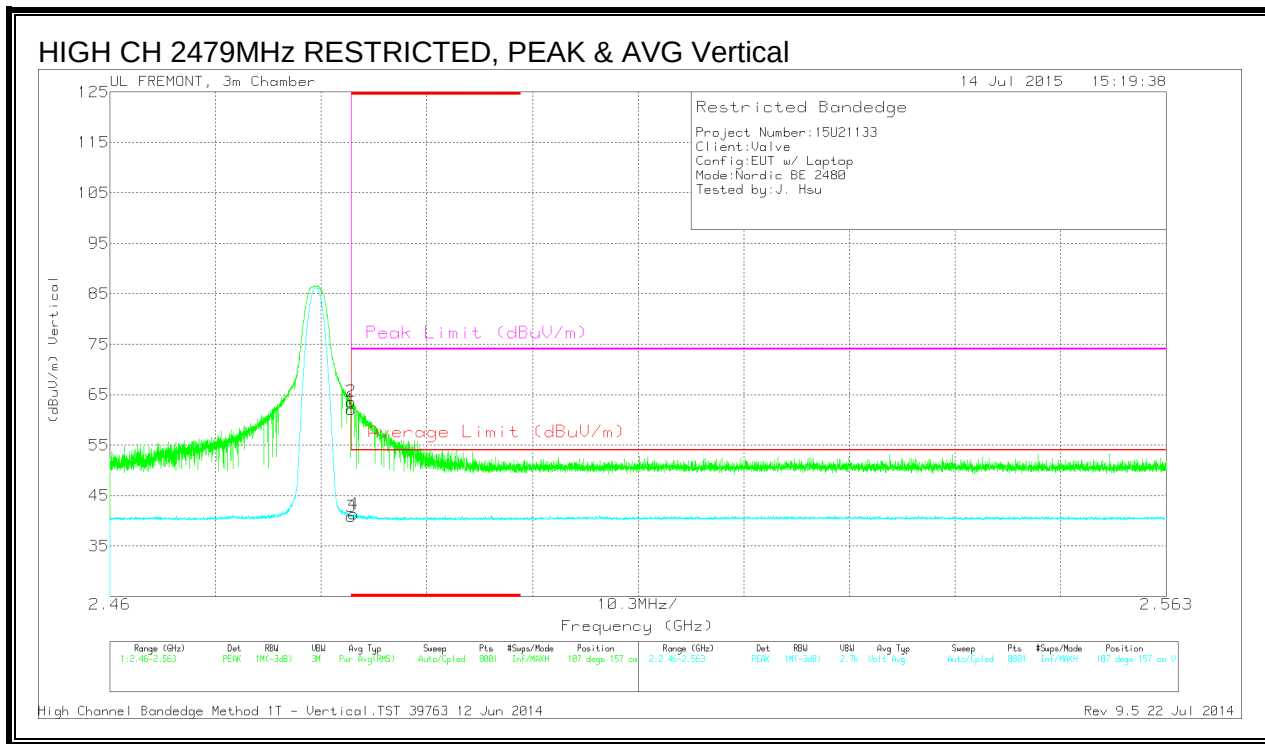
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/ Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	56.87	PK	32.3	-22.1	67.07	-	-	74	-6.93	184	178	H
2	* 2.484	57.29	PK	32.3	-22.1	67.49	-	-	74	-6.51	184	178	H
3	* 2.484	31.54	VB1T	32.3	-22.1	41.74	54	-12.26	-	-	184	178	H
4	* 2.484	31.9	VB1T	32.3	-22.1	42.1	54	-11.9	-	-	184	178	H

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

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

RESTRICTED BANDEGE (HIGH CHANNEL, VERTICAL)



Trace Markers

Marker	Frequen cy (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/ Filtr/Pad (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	51.91	PK	32.3	-22.1	62.11	-	-	74	-11.89	107	157	V
2	* 2.484	53.44	PK	32.3	-22.1	63.64	-	-	74	-10.36	107	157	V
3	* 2.484	30.7	VB1T	32.3	-22.1	40.9	54	-13.1	-	-	107	157	V
4	* 2.484	31.18	VB1T	32.3	-22.1	41.38	54	-12.62	-	-	107	157	V

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

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz**HARMONICS**

FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

47173 BENICIA STREET, FREMONT, CA 94538, USA

Project #: 15U21133
Report #: 15U21133
Date & Time: 07/15/15
Test Engr: J. Hsu

Company: Valve
EUT Description:
Test Configuration: X POSITION
Type of Test: FCC
Mode of Operation: Transmitting : Nordic Radio

M% = ((t1+t2+t3+...)/T) * 66.83% = 25.20%

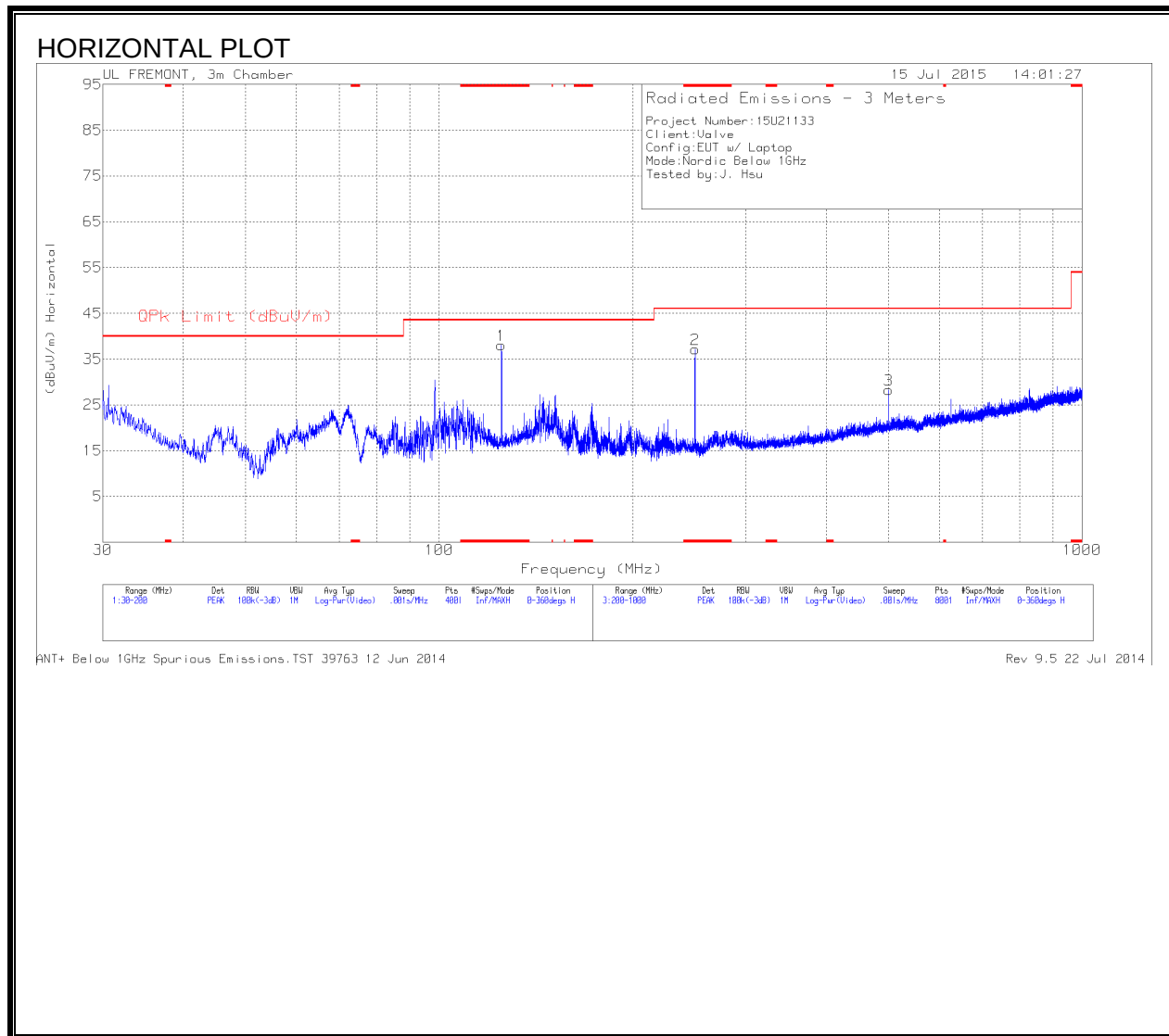
Av Reading = Pk Reading + 20*log(M%)
20 * log (M%) = -11.97

Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Pk Level (dBuV/m)	Av Level (dBuV/m)	Pk Limit FCC B	Av Limit FCC B	Pk Margin (dB)	Avg Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)
Low channel														
4806.00	42.21	31.47	34.00	-31.00	0.00	45.21	34.47	74.00	54.00	-28.79	-19.53	3mV	0.00	1.00
4806.00	48.35	43.76	34.00	-31.00	0.00	51.35	46.76	74.00	54.00	-22.65	-7.24	3mH	0.00	2.00
Mid channel														
4884.00	56.64	50.09	34.00	-31.00	0.00	59.64	53.09	74.00	54.00	-14.36	-0.91	3mV	0.00	1.00
4884.00	55.66	48.07	34.00	-31.00	0.00	58.66	51.07	74.00	54.00	-15.34	-2.93	3mH	0.00	2.00
High channel														
4960.00	46.81	41.83	34.00	-31.00	0.00	49.81	44.83	74.00	54.00	-24.19	-9.17	3mV	0.00	1.00
4960.00	51.77	49.00	34.00	-31.00	0.00	54.77	52.00	74.00	54.00	-19.23	-2.00	3mH	0.00	2.00

Note: Average reading get from max hold with reduce VBW method.

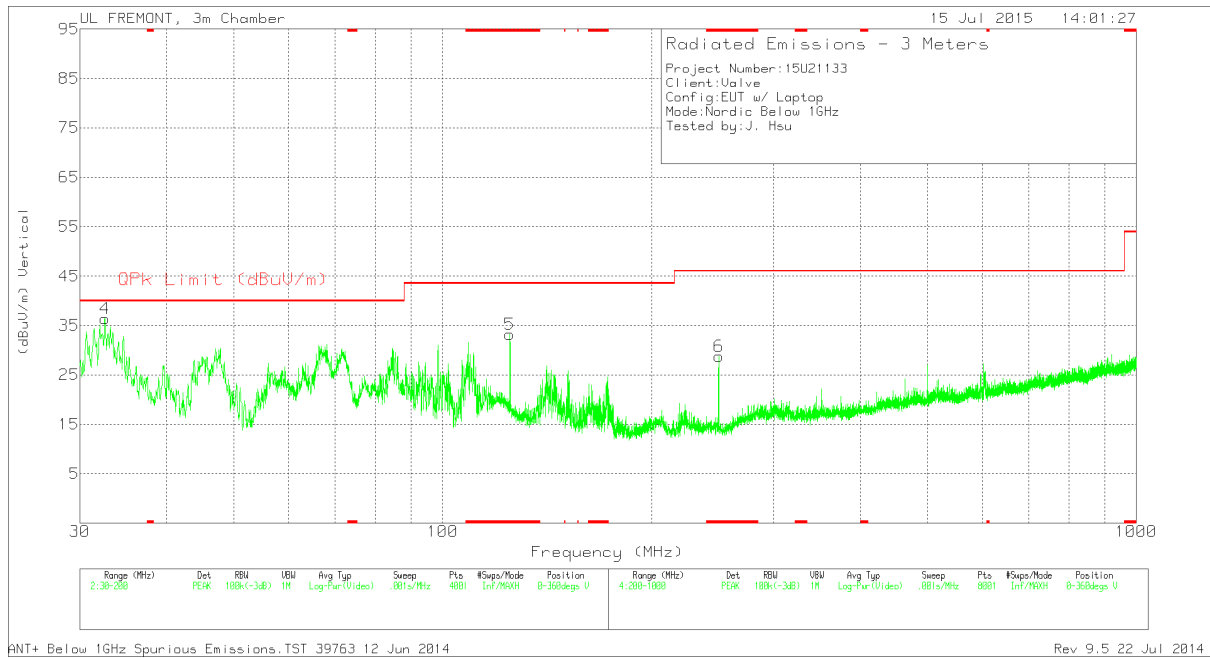
7.2.4. SPURIOUS BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)



SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)

VERTICAL PLOT



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 124.9875	50.05	PK	14	-26	38.05	43.52	-5.47	0-360	100	H
5	* 124.9875	45.2	PK	14	-26	33.2	43.52	-10.32	0-360	100	V
2	* 250	50.36	PK	11.5	-24.7	37.16	46.02	-8.86	0-360	100	H
6	* 250	42.02	PK	11.5	-24.7	28.82	46.02	-17.2	0-360	200	V
4	32.5925	43.6	PK	19.9	-27.1	36.4	40	-3.6	0-360	100	V
3	500	35.53	PK	17.7	-25	28.23	46.02	-17.79	0-360	200	H

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

PK - Peak detector

Radiated Emissions

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 125.0068	52.1	QP	14	-26	40.1	43.52	-3.42	284	125	H
* 250.0133	50.94	QP	11.5	-24.7	37.74	46.02	-8.28	305	219	H

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

QP - Quasi-Peak detector

8. 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.

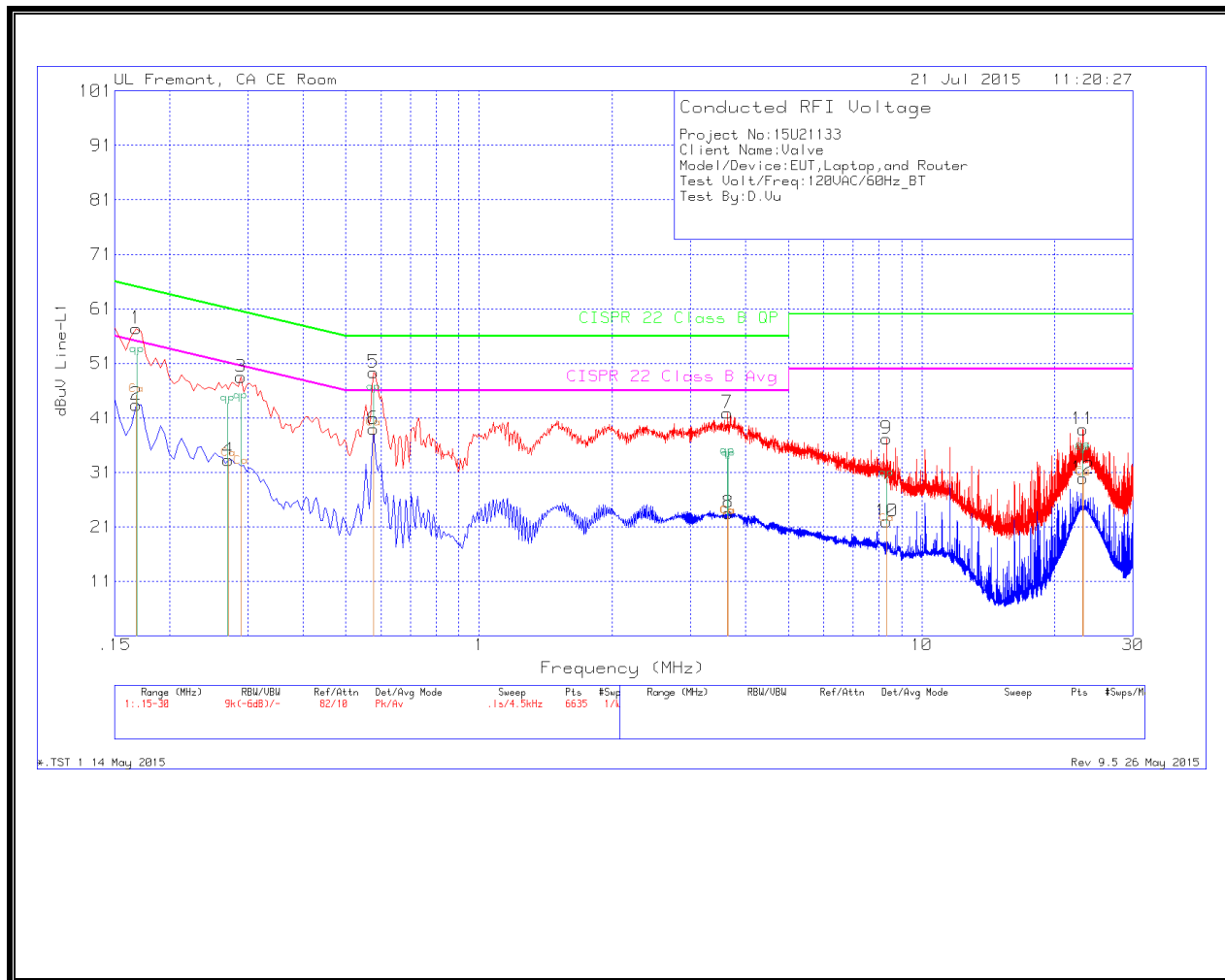
TEST PROCEDURE

ANSI C63.10

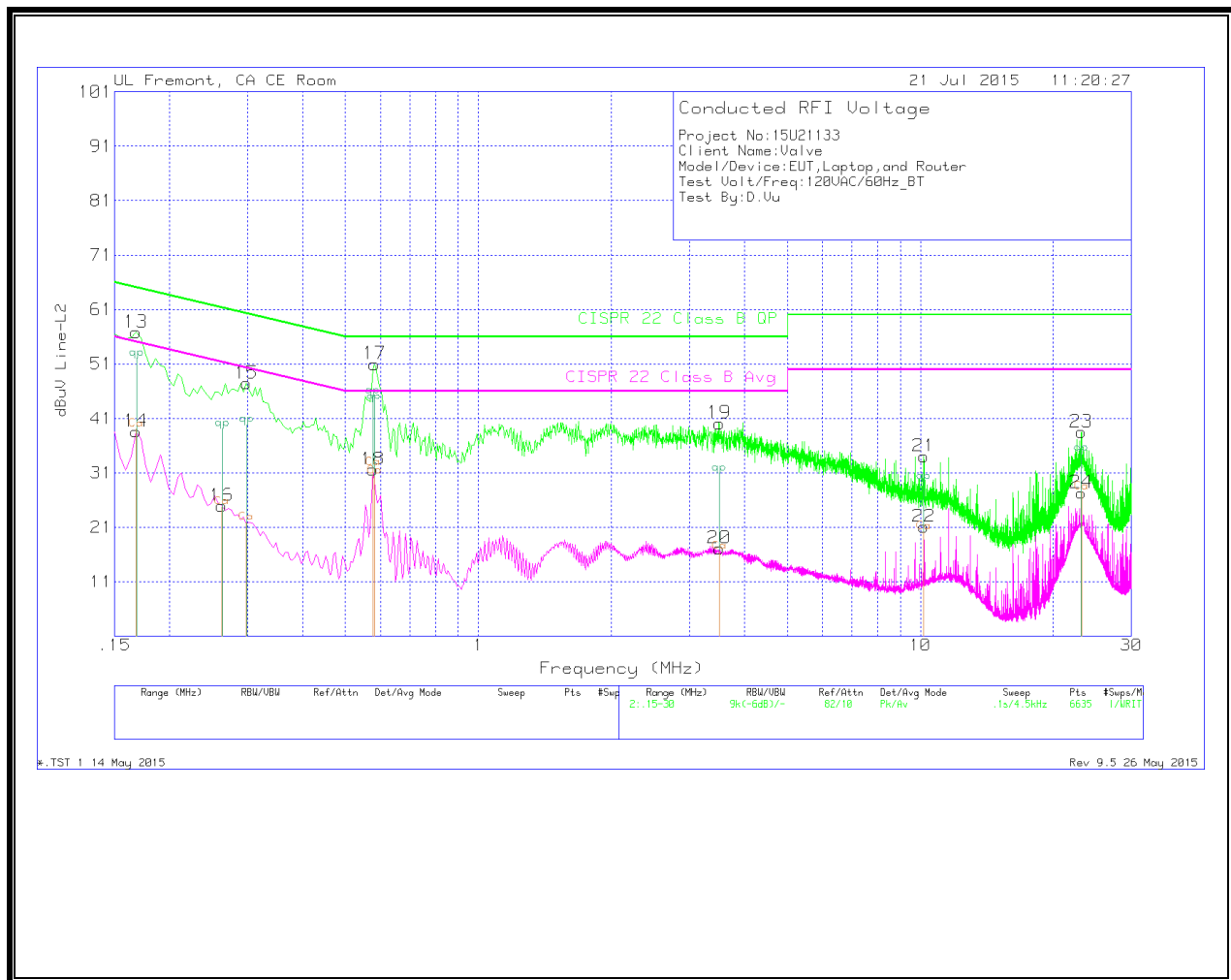
RESULTS

6 WORST EMISSIONS

LINE 1 RESULTS



LINE 2 RESULTS



Trace Markers

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
1	.168	56.22	Pk	1.2	0	57.42	65.06	-7.64		
2	.168	42.24	Av	1.2	0	43.44	-	-	55.06	-11.62
3	.2895	47.92	Pk	.6	0	48.52	60.54	-12.02		
4	.2715	32.71	Av	.6	0	33.31	-	-	51.07	-17.76
5	.5775	49.05	Pk	.3	0	49.35	56	-6.65		
6	.5775	38.68	Av	.3	0	38.98	-	-	46	-7.02
7	3.6375	41.61	Pk	.2	.1	41.91	56	-14.09		
8	3.6555	23.28	Av	.2	.1	23.58	-	-	46	-22.42
9	8.331	36.88	Pk	.2	.1	37.18	60	-22.82		
10	8.331	21.7	Av	.2	.1	22	-	-	50	-28
11	23.127	38.42	Pk	.3	.2	38.92	60	-21.08		
12	23.1315	29.41	Av	.3	.2	29.91	-	-	50	-20.09

Pk - Peak detector

Av - Average detection

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
13	.168	55.5	Pk	1.3	0	56.8	65.06	-8.26		
14	.168	37.29	Av	1.3	0	38.59	-	-	55.06	-16.47
15	.2985	46.86	Pk	.6	0	47.46	60.28	-12.82		
16	.2625	24.26	Av	.7	0	24.96	-	-	51.35	-26.39
17	.582	50.69	Pk	.3	0	50.99	56	-5.01		
18	.5775	31.33	Av	.3	0	31.63	-	-	46	-14.37
19	3.507	39.8	Pk	.2	.1	40.1	56	-15.9		
20	3.507	16.84	Av	.2	.1	17.14	-	-	46	-28.86
21	10.1805	33.64	Pk	.2	.2	34.04	60	-25.96		
22	10.1805	20.7	Av	.2	.2	21.1	-	-	50	-28.9
23	23.1315	37.99	Pk	.3	.2	38.49	60	-21.51		
24	23.1315	26.83	Av	.3	.2	27.33	-	-	50	-22.67

Pk - Peak detector

Av - Average detection

Peak/Average/RMS Emissions

Peak/Average/RMS Emissions

Range 1: Line-L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
.16868	44.05	Ca	1.2	0	45.25	-	-	55.03	-9.78
.28928	31.48	Ca	.6	0	32.08	-	-	50.55	-18.47
.27038	32.9	Ca	.6	0	33.5	-	-	51.11	-17.61
.57818	38.78	Ca	.3	0	39.08	-	-	46	-6.92
3.63863	22.64	Ca	.2	.1	22.94	-	-	46	-23.06
3.65618	22.58	Ca	.2	.1	22.88	-	-	46	-23.12
8.33168	21.2	Ca	.2	.1	21.5	-	-	50	-28.5
23.1281	29.65	Ca	.3	.2	30.15	-	-	50	-19.85
23.1304	29.32	Ca	.3	.2	29.82	-	-	50	-20.18

Ca - CISPR average detection

Range 2: Line-L2 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
.16868	37.71	Ca	1.3	0	39.01	-	-	55.03	-16.02
.29918	21.27	Ca	.6	0	21.87	-	-	50.27	-28.4
.26363	24	Ca	.7	0	24.7	-	-	51.32	-26.62
.58088	30.09	Ca	.3	0	30.39	-	-	46	-15.61
.57728	31.62	Ca	.3	0	31.92	-	-	46	-14.08
3.50768	16.21	Ca	.2	.1	16.51	-	-	46	-29.49
10.1812	19.76	Ca	.2	.2	20.16	-	-	50	-29.84
23.1304	27	Ca	.3	.2	27.5	-	-	50	-22.5

Ca - CISPR average detection

Quasi-Peak Emissions

Range 1: Line-L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
.16868	51.39	Qp	1.2	0	52.59	65.03	-12.44	-	-
.28928	43.46	Qp	.6	0	44.06	60.55	-16.49	-	-
.27038	43.05	Qp	.6	0	43.65	61.11	-17.46	-	-
.57818	45.35	Qp	.3	0	45.65	56	-10.35	-	-
3.63863	33.65	Qp	.2	.1	33.95	56	-22.05	-	-
3.65618	33.22	Qp	.2	.1	33.52	56	-22.48	-	-
8.33168	29.54	Qp	.2	.1	29.84	60	-30.16	-	-
23.1281	34.53	Qp	.3	.2	35.03	60	-24.97	-	-
23.1304	34.13	Qp	.3	.2	34.63	60	-25.37	-	-

Qp - Quasi-Peak detector

Range 2: Line-L2 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
.16868	50.78	Qp	1.3	0	52.08	65.03	-12.95	-	-
.29918	39.26	Qp	.6	0	39.86	60.27	-20.41	-	-
.26363	38.44	Qp	.7	0	39.14	61.32	-22.18	-	-
.58088	43.72	Qp	.3	0	44.02	56	-11.98	-	-
.57728	44.8	Qp	.3	0	45.1	56	-10.9	-	-
3.50768	30.64	Qp	.2	.1	30.94	56	-25.06	-	-
10.1812	28.99	Qp	.2	.2	29.39	60	-30.61	-	-
23.1304	34.09	Qp	.3	.2	34.59	60	-25.41	-	-

Qp - Quasi-Peak detector