



**FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 5**

TEST REPORT

FOR

eTap System, Firmware Update USB

MODEL NUMBER: 12701

**FCC ID: C90-LINKED
IC: 10161A-LINKED**

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Prepared for

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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SRAM LLC
EUT DESCRIPTION: eTap System, Firmware Update USB
MODEL: 12701
SERIAL NUMBER: 4025500238
DATE TESTED: SEPTEMBER 29-30, 2015

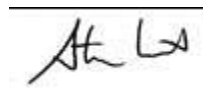
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART B, Class B	Pass
ICES – 003 ISSUE 5, Class B	Pass

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.

Approved & Released For
UL Verification Services Inc. By:

Tested By:



STEVE LEITNER
PROGRAM MANAGER
UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009 and CAN/CSA-CEI/IEC CISPR 22-10 as referenced by ICES-003 Issue 5.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

The test site and facility is covered under FCC Test Firm Registration # 208313. Chamber A is covered under Industry Canada company address code 2324A with site number 2324B -2.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a USB dongle with 802.15.4 SRAMLink ZigBee technology. The device is intended for updating firmware on SRAM bicycle components.

GENERAL INFORMATION

Power Requirements	5 VDC from USB port
List of frequencies generated or used by the EUT	37.768 kHz, 8 MHz, 16 MHz

5.2. TEST CONFIGURATION

The following configuration was investigated.

EUT Configuration	Description
Typical	EUT mounted to laptop + rear derailleur. The laptop was connected in minimum configuration with a USB mouse and an Ethernet switch.

5.3. WORST CASE MODE OF OPERATION

Mode	Description
Normal	EUT linked to rear derailleur by means of Bootloader program provided by manufacturer.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 1.0.0.

The test utility software used during testing was Bootloader, Rev. 0.7.0.0; Bootstick, Rev. 0.7.0.0

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT & PERIPHERALS

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Laptop	ACER	P1EV6	LUSFT02292260C8E83400
AC adapter	ACER	W10-040N1A	F13061332048621
USB mouse	Lenovo	MSU1175	2J003C3352B
Switch	Netgear	EN106	ENT6A99003602
AC adapter	Netgear	LPS421-480508	N/A

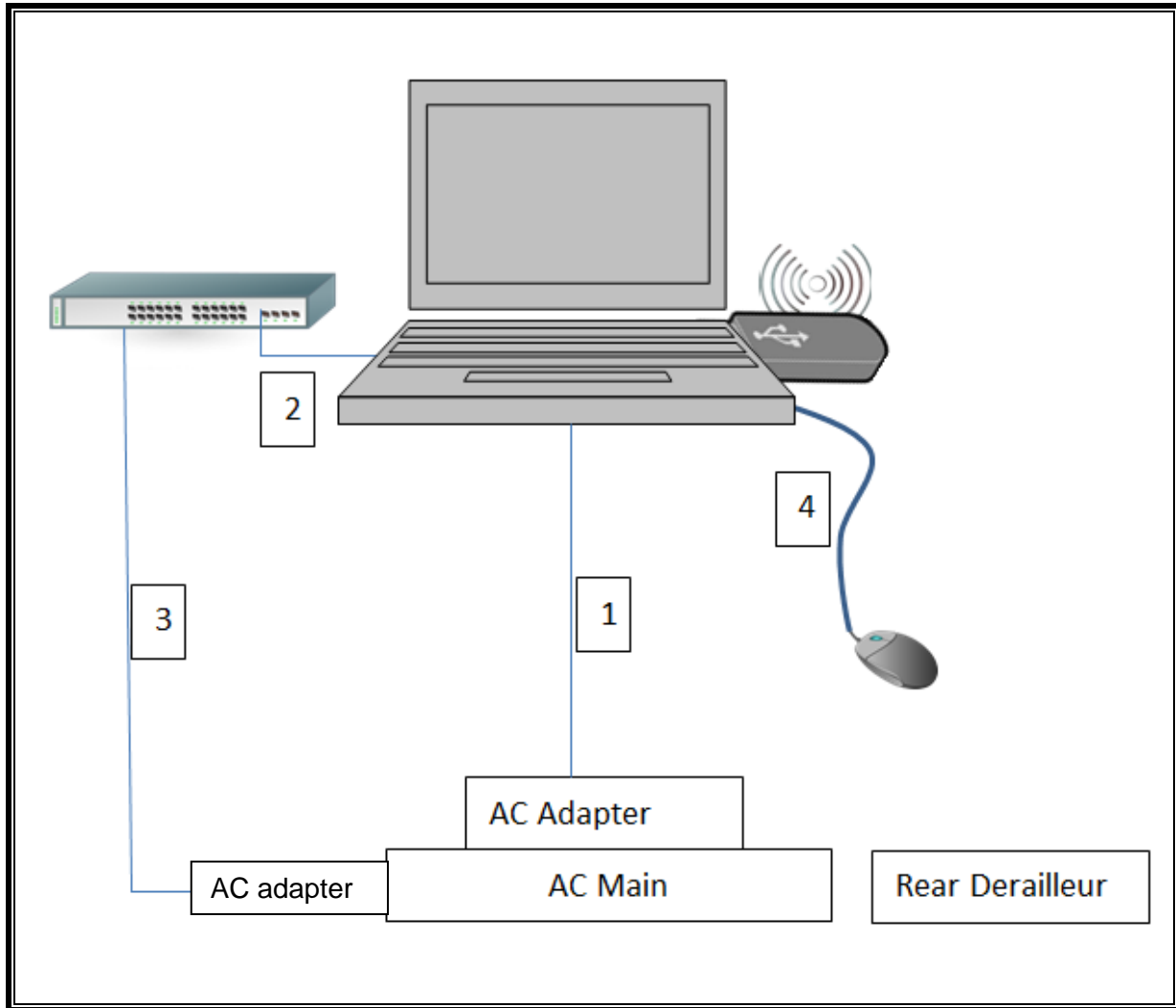
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	No. of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	Barrel	Unshielded	1.5	Laptop AC adapter
2	Ethernet	1	RJ45	Unshielded	1	To switch
3	DC	1	Barrel	Unshielded	1	Switch AC adapter
4	USB	1	USB	Unshielded	1.5	Mouse

TEST SETUP

The EUT is installed in a typical configuration. Test software exercised the EUT.

TEST 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 No.	Cal Date	Cal Due
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015		
Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015		
Spectrum Analyzer, 3 Hz-44GHz	Agilent	N9030A	908	05/26/15	05/26/16
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	447	06/10/15	06/10/16
Preamplifier, 10KHz-1000MHz	Sonoma	310	300	11/01/14	11/01/15
EMI Test Receiver, 9KHz to 7GHz	Rohde & Schwarz	ESCI 7	284	09/16/15	09/16/16
LISN	FCC	50/250-25-2	24	01/16/15	01/16/16

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS

LIMITS

FCC 15B Class B using CISPR limits
ICES-005

Limits for radiated disturbance of Class B ITE at measuring distance of 10 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 230	30
230 to 1000	37

Note: The lower limit shall apply at the transition frequency.

TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated or used in the EUT is 16 MHz, therefore the frequency range was investigated from 30 MHz to 1000 MHz based on the following table.

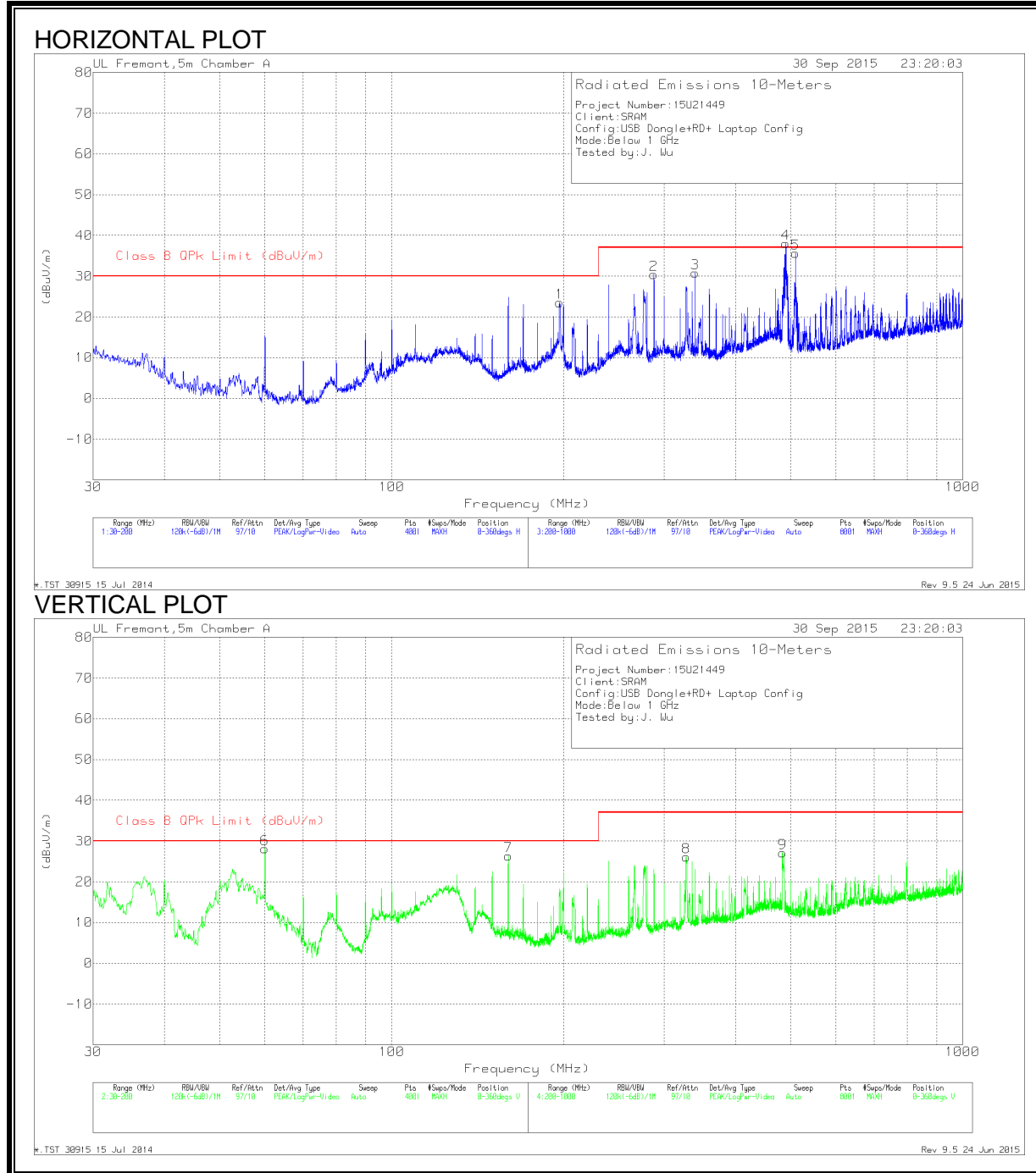
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40,000 MHz, whichever is lower

Measurements were made at a 3 m test distance. Results were extrapolated for 10 m limits using a 10.5 dB distance correction factor.

RESULTS

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

Test location: Chamber A B C D
 E F G H



Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB/m)	Dist Cor (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
60.0031	58.19	Qp	11.3	-30.9	-10.5	28.09	30	-1.91	197	105	V
159.9993	50.51	Qp	16.3	-30.2	-10.5	26.11	30	-3.89	108	115	V
196.8275	45.84	Qp	16.1	-30	-10.5	21.44	30	-8.56	219	147	H
288.0053	52.77	Qp	17.3	-29.4	-10.5	30.17	37	-6.83	131	101	H
328.182	45.28	Qp	17.9	-29.3	-10.5	23.38	37	-13.62	73	179	V
340.0115	51.6	Qp	18	-29.3	-10.5	29.8	37	-7.2	314	112	H
483.2033	38.85	Qp	21.7	-28.7	-10.5	21.35	37	-15.65	300	118	V
489.999	41.48	Qp	21.7	-28.7	-10.5	23.98	37	-13.02	321	306	H
510.2261	27.93	Qp	21.7	-28.7	-10.5	10.43	37	-26.57	151	141	H

Qp - Quasi-Peak detector

7.2. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMITS

FCC 15B Class B

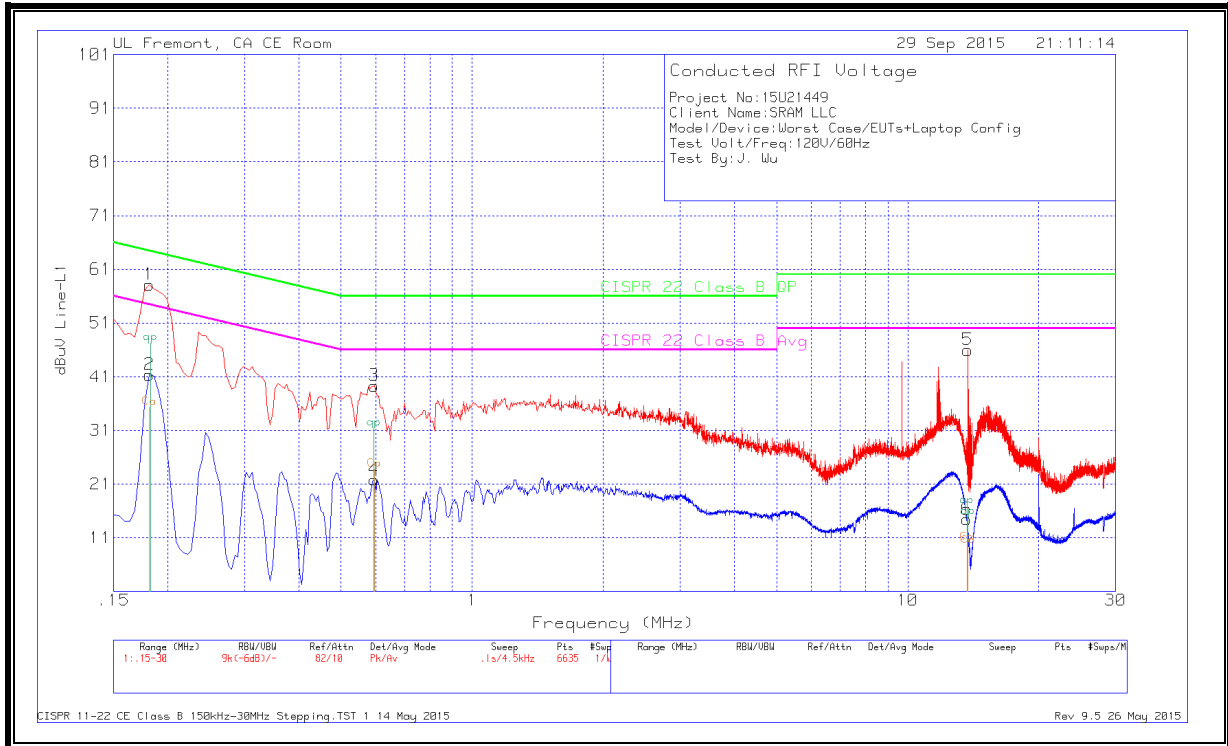
ICES-003 Class B

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

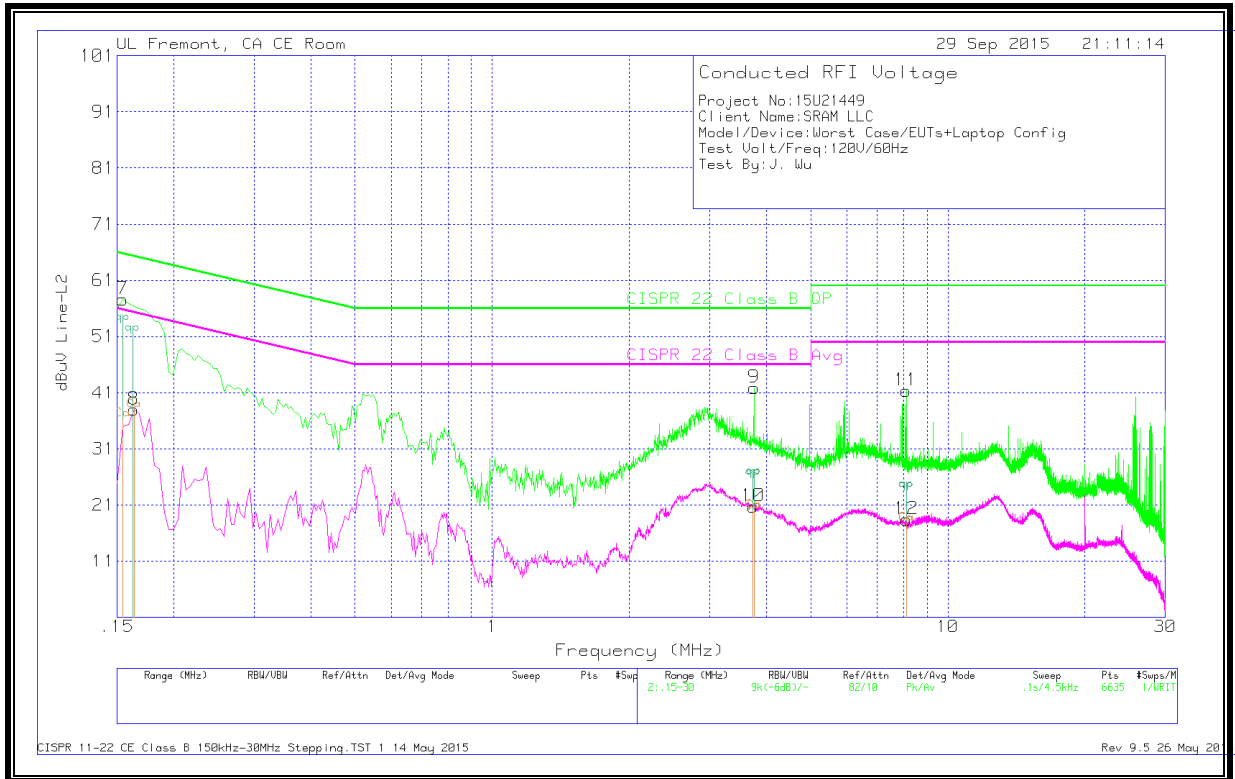
Notes:
1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

RESULTS

LINE 1



LINE 2



DATA

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	.18263	46.21	Qp	1.1	0	47.31	64.37	-17.06	-	-
2	.18263	34.2	Ca	1.1	0	35.3	-	-	54.37	-19.07
3	.5955	39.03	Pk	.3	0	39.33	56	-16.67	46	-6.67
4	.5955	21.51	Av	.3	0	21.81	-	-	46	-24.19
5	13.749	45.55	Pk	.2	.2	45.95	60	-14.05	50	-4.05
6	13.668	14.02	Av	.2	.2	14.42	-	-	50	-35.58

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)
7	.15428	52.01	Qp	1.4	0	53.41	65.77	-12.36	-	-
8	.15428	34.87	Ca	1.4	0	36.27	-	-	55.77	-19.5
9	3.7545	41.57	Pk	.2	.1	41.87	56	-14.13	46	-4.13
10	3.7365	20.46	Av	.2	.1	20.76	-	-	46	-25.24
11	8.1015	41.04	Pk	.2	.1	41.34	60	-18.66	50	-8.66
12	8.115	18.15	Av	.2	.1	18.45	-	-	50	-31.55

Pk - Peak detector

Av - Average detection

Qp - Quasi-Peak detector

Ca - CISPR average detection