



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 9**

**CERTIFICATION TEST REPORT**

**FOR**

**SMARTPHONE**

**MODEL NUMBER: A1898**

**FCC ID: BCG-E3173A  
IC: 579C-E3173A**

**REPORT NUMBER: 11724033-E6V7**

**ISSUE DATE: JULY 28, 2017**

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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	7/13/2017	Initial Issue	Mengistu Mekuria
V2	7/18/2017	Address TCB's Questions	Chin Pang
V3	7/19/2017	Address TCB's Questions	Chin Pang
V4	7/19/2017	Added additional worst case config info	Francisco Guarnero
V5	7/20/2017	Address TCB's Question	Chin Pang
V6	7/27/2017	Updated Worst Case Configuration	Eric Ting
V7	7/28/2017	Updated Section 8	Joe Vang

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## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** SMARTPHONE

**MODEL:** A1898

**SERIAL NUMBER:** C39TQ005J6LP

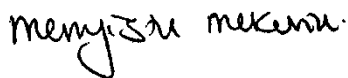
**DATE TESTED:** MARCH 15, 2017 – JUNE 19, 2017

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Pass
INDUSTRY CANADA RSS-210 Issue 9, Annex B.6.	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.

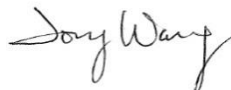
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. 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.

Approved & Released For  
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Prepared By:



TONY WANG  
EMC ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 9.

## 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
<input type="checkbox"/> Chamber A (IC:2324B-1)	<input type="checkbox"/> Chamber D (IC:22541-1)
<input type="checkbox"/> Chamber B (IC:2324B-2)	<input checked="" type="checkbox"/> Chamber E (IC:22541-2)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input type="checkbox"/> Chamber F (IC:22541-3)
	<input type="checkbox"/> Chamber G (IC:22541-4)
	<input checked="" type="checkbox"/> Chamber H (IC:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively

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, 9KHz to 0.15 MHz	$\pm 3.84$ dB
Conducted Disturbance, 0.15 to 30 MHz	$\pm 3.65$ dB
Radiated Disturbance, 9KHz to 30 MHz	$\pm 3.15$ dB
Radiated Disturbance, 30 to 1000 MHz	$\pm 5.36$ dB
Radiated Disturbance, 1000 to 18000 MHz	$\pm 4.32$ dB
Radiated Disturbance, 18000 to 26000 MHz	$\pm 4.45$ dB
Radiated Disturbance, 26000 to 40000 MHz	$\pm 5.24$ dB
Temperature	$\pm 0.9$ °C
Supply voltages	$\pm 0.45$ %
Time	$\pm 0.02$ %

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The equipment under test is a mobile phone with GSM, GPRS, EGPRS, UMTS, LTE and TD-SCDMA technologies. It also supports IEEE 802.11a/b/g/n/ac, Bluetooth, GPS and NFC. The device has a built-in inductive charging receiver which is not user accessible. The rechargeable battery is not user accessible.

\* CE mode is NFC Card Emulation Mode

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak radiated magnetic field strength as follows:

Frequency Range (MHz)	Mode	Type	E Field at 30m distance (dBuV/m)
13.56	*CE Mode	B	28.10
	Reader	B	28.67

### 5.3. SOFTWARE AND FIRMWARE

The test utility software used during testing was Firmware version 1.8 rev 55147 and Software tool version was NCI\_UART\_RTM4\_B1\_V1.07

### 5.4. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated under three orthogonal orientations X (Flatbed), Y (Landscape), and Z (Portrait); It was determined that The Y (Landscape) was worst-case orientation.

The worst case position of the EUT was investigated under two configurations: EUT with power supply, EUT with earphones. The EUT with power supply configuration was determined to be worst-case configurations; therefore, all final tests were performed on the EUT with power supply.

In addition, Type A, B, F and ISO15693 with CE mode and Reader mode data rate were investigated to determine the worst case based on the highest power and spurious emissions. Type B was determined to be the worst case and therefore Type B was selected for all final tests.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

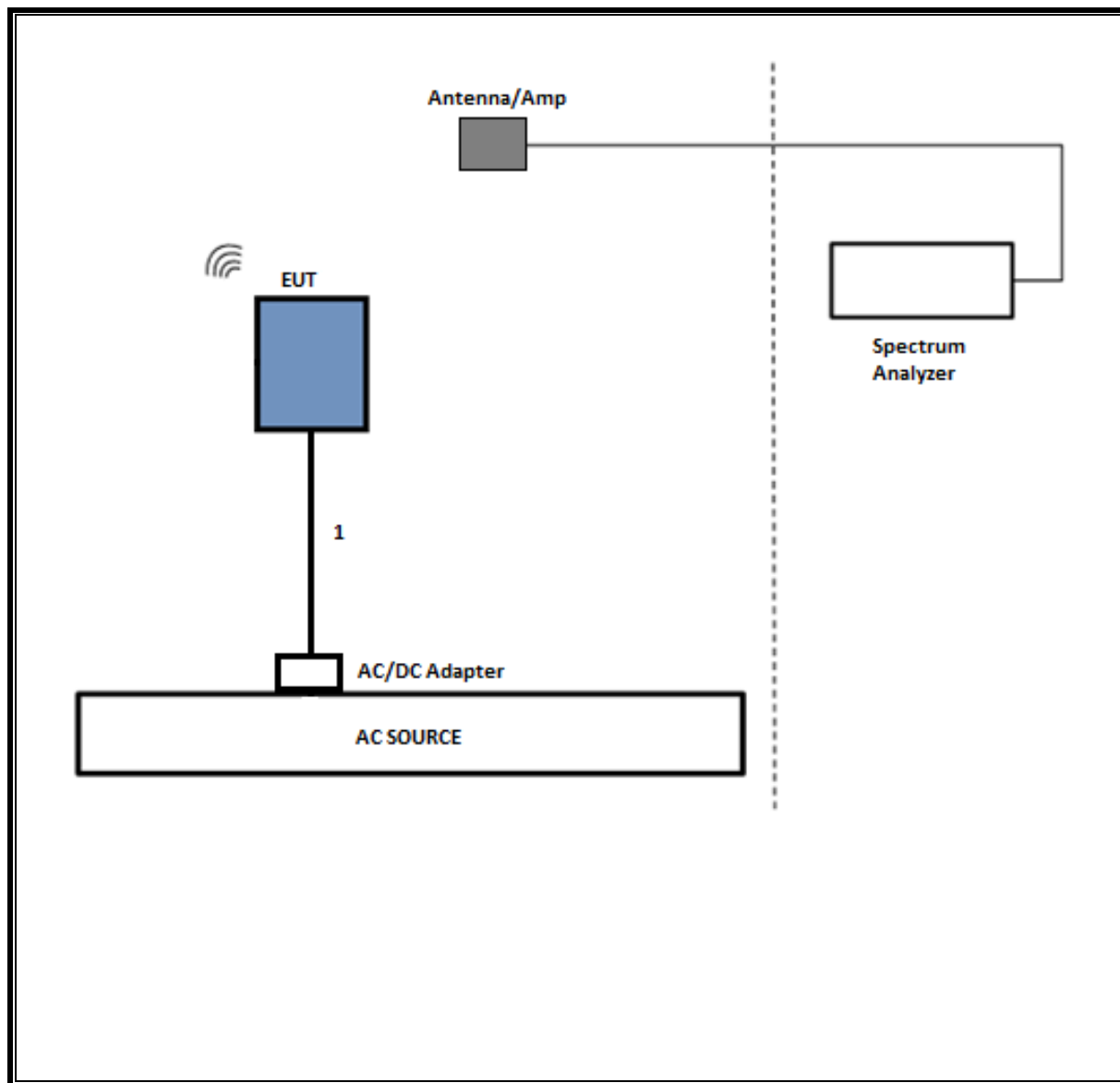
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	Mac Book Pro	D292365COYADHLHC3	n/a
Laptop AC/DC Adapter	Apple	A1436	N/A	n/a
EUT AC/DC Adapter	Apple	A1385	D292365B2FQDHLHC7	n/a

### I/O CABLES

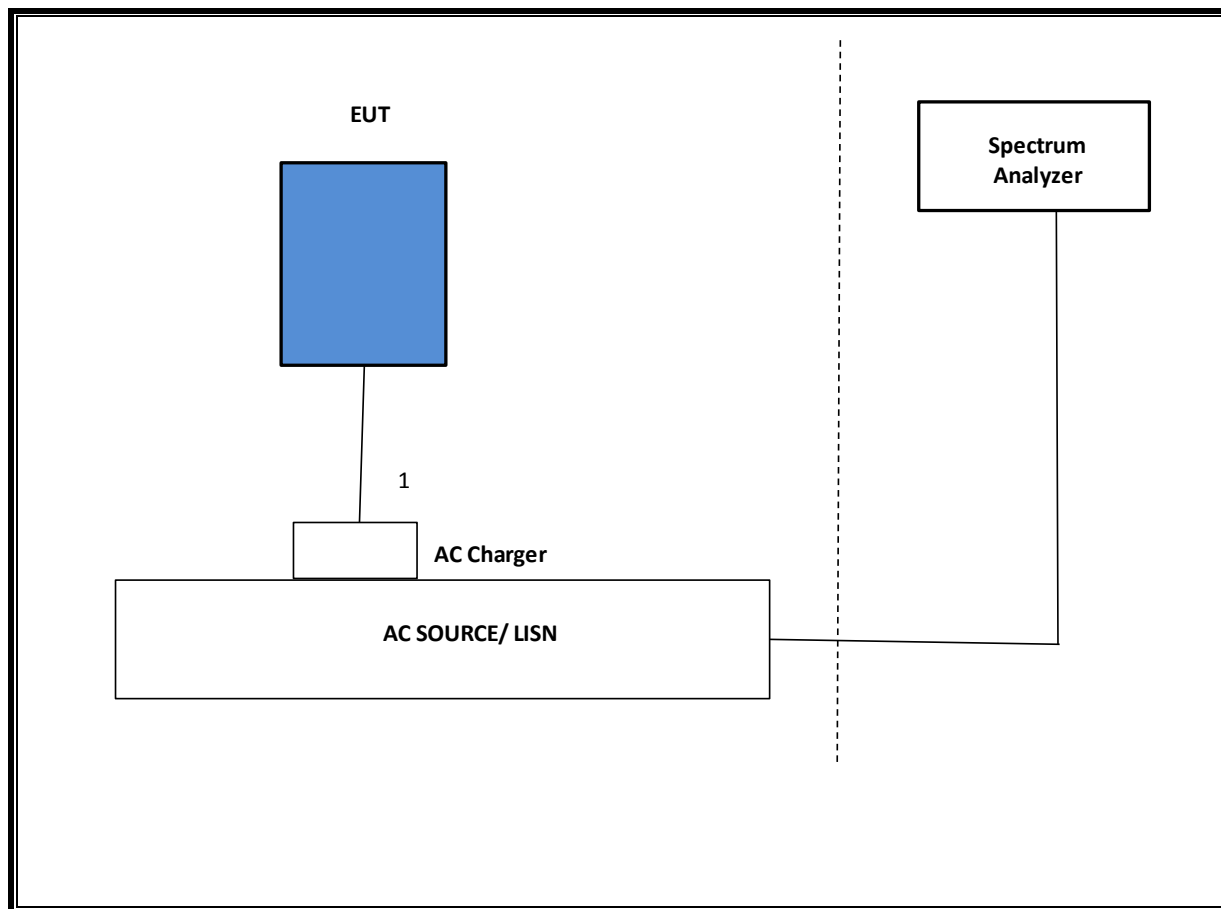
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	Un-shielded	1	n/a



**SETUP DIAGRAM FOR RADIATED TESTS**



**SETUP DIAGRAM FOR LINE CONDUCTED 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	Asset	Cal Due
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T426	9/23/2017
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T285	6/20/2017
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1113	12/20/2017
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	5/3/2017
Amplifier, 1 to 18GHz, 35dB	Amplical	AMP1G18-35	T1569	9/15/2017
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T835	6/18/2017
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1613	12/2/2017
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	09/10/2017
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T757	12/22/2017
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T459	06/13/2017
EMI Test Receiver 9KHz-7GHz	Rohde & Schwarz	ESC17	T1436	1/06/2018
*LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/08/2017
Power Cable, Line Conducted Emissions	UL	PG1	T861	9/1/2017
UL AUTOMATION SOFTWARE				
**Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016	
**Conducted Software	UL	UL EMC	Ver 5.4, October 13, 2016	
**AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

Note: \*Testing is completed before equipment expiration date.

\*\* indicates automation software version used in the compliance certification testing

## 7. OCCUPIED BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 10kHz. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

Note: Because the measured signal is CW/CW-like adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW

### RESULTS

<b>ID:</b>	38602	<b>Date:</b>	3/16/17
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#### 99% and 20dB BW

#### CE Mode

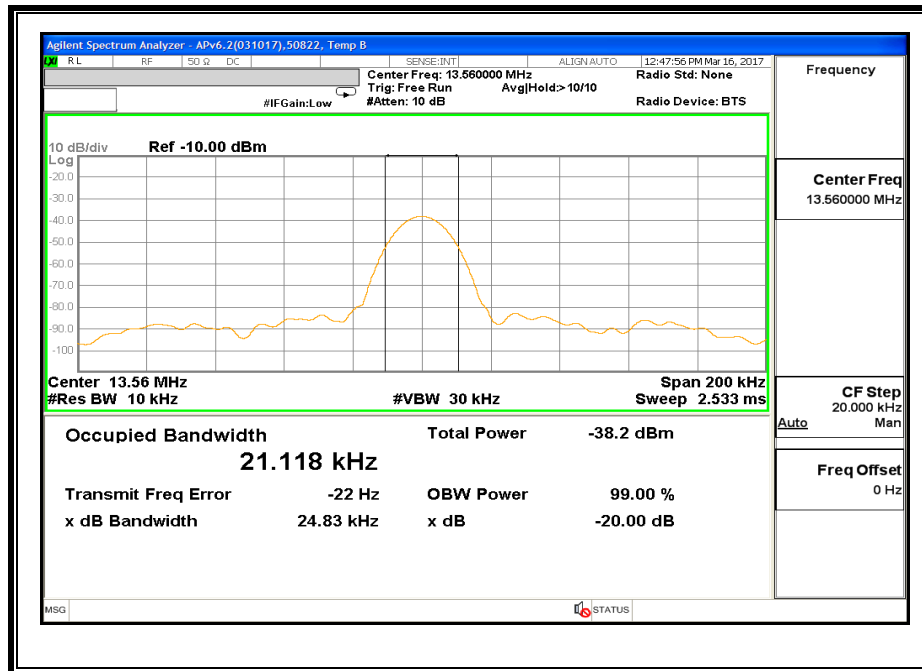
Moduation	Frequency	Data Rate	99% Bandwidth	20dB Bandwidth
	(MHz)	(Kbps)	(KHz)	(KHz)
Type B	13.56	848	21.118	24.83

#### READER

Moduation	Frequency	Data Rate	99% Bandwidth	20dB Bandwidth
	(MHz)	(Kbps)	(KHz)	(KHz)
Type B	13.56	848	22.181	25.43

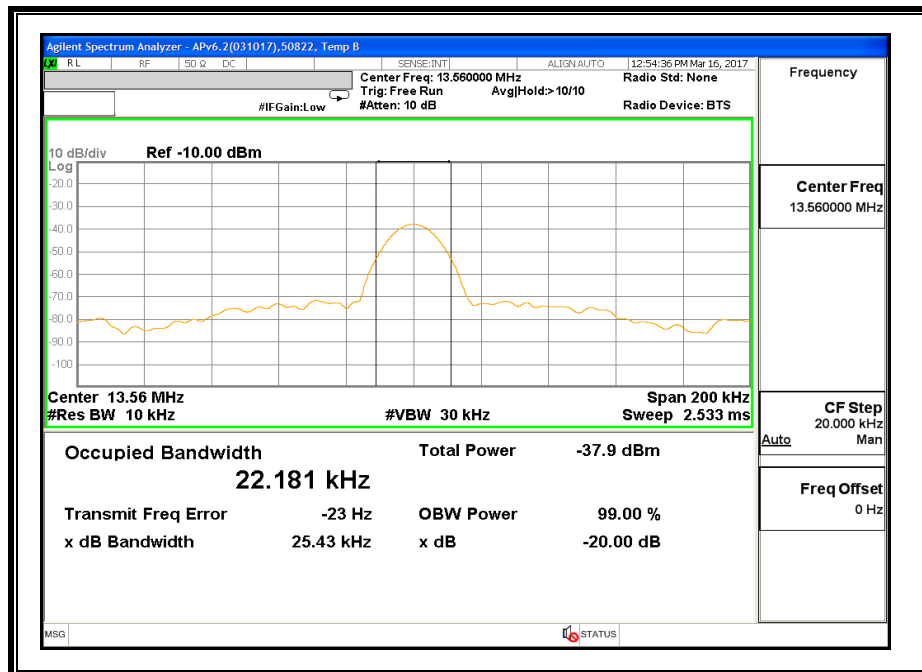
## 7.1. CE MODE

### Type B, 848Kbps



## 7.2. READER MODE

### Type B, 848Kbps



## 8. RADIATED EMISSION TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMIT

§15.225

IC RSS-210, Issue 9 Annex B.6.

IC RSS-GEN, Section 8.9 (Transmitter)

IC RSS-GEN, Section 7.1.2 (Receiver)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
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 470-806MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§15.231 and 15.241.

§15.209 (b) in the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) the emission limits shown the above tables are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

#### **TEST PROCEDURE**

ANSI C63.10, 2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

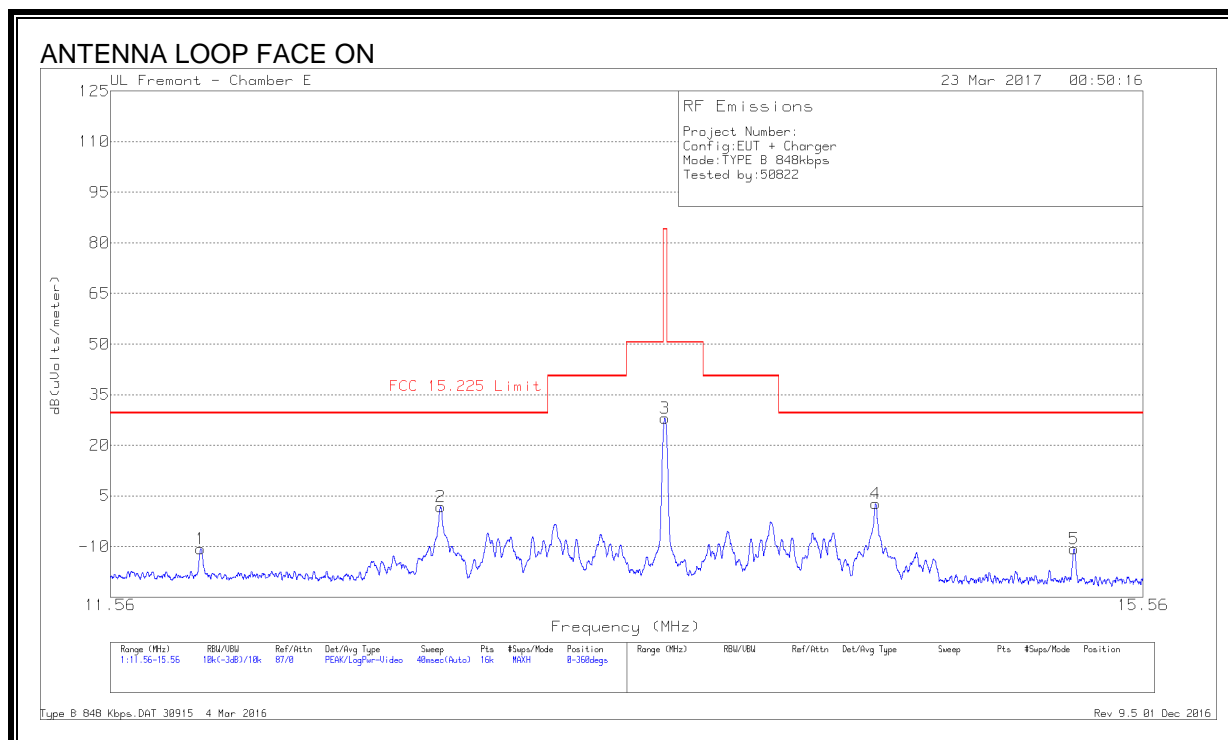
#### **RESULTS**

## 8.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

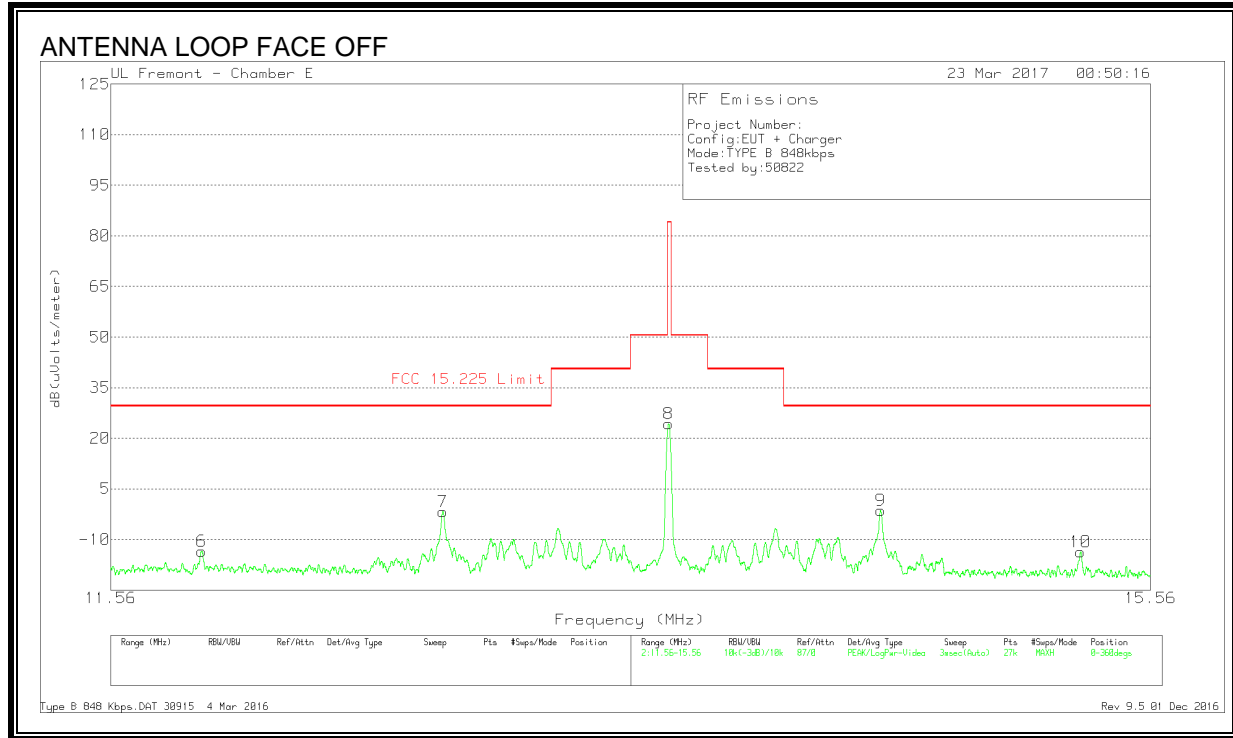
### 8.2.1. CE MODE

#### TYPE B

#### 848Kbps FUNDAMENTAL





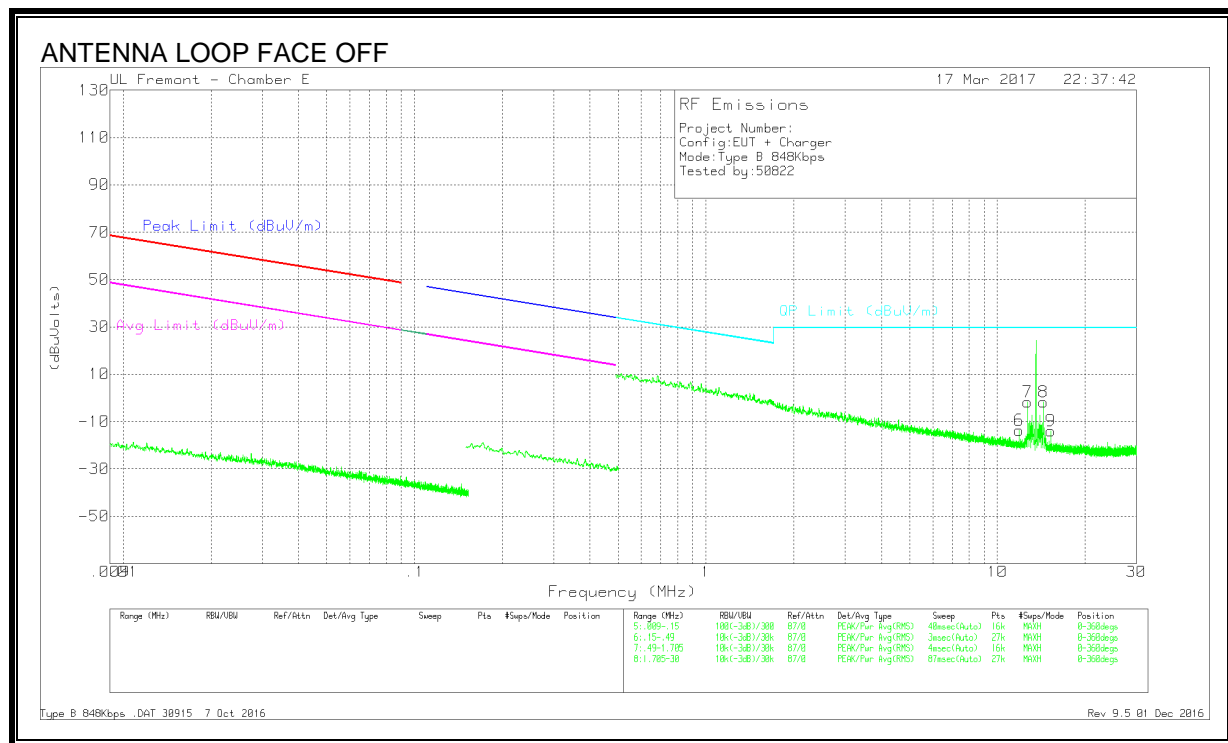
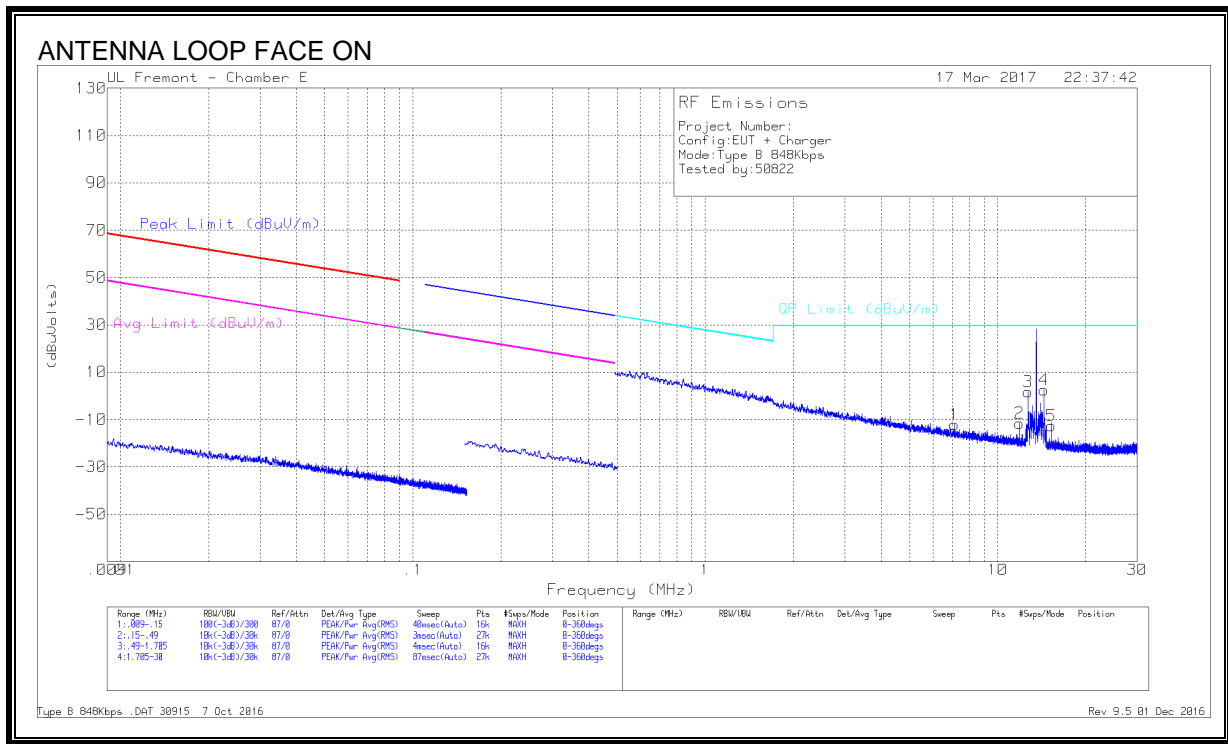


## DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	11.86425	18.07	Pk	10.8	.4	-40	-10.73	29.54	-40.27	0-360
6	11.86451	15.37	Pk	10.8	.4	-40	-13.43	29.54	-42.97	0-360
7	12.71092	27.19	Pk	10.7	.4	-40	-1.71	29.54	-31.25	0-360
2	12.71238	30.65	Pk	10.7	.4	-40	1.75	29.54	-27.79	0-360
8	13.55807	53.23	Pk	10.6	.4	-40	24.23	84	-59.77	0-360
3	13.55988	57.1	Pk	10.6	.4	-40	28.1	84	-55.9	0-360
9	14.40449	27.63	Pk	10.6	.4	-40	-1.37	29.54	-30.91	0-360
4	14.40763	31.61	Pk	10.6	.4	-40	2.61	29.54	-26.93	0-360
10	15.25245	15.38	Pk	10.5	.4	-40	-13.72	29.54	-43.26	0-360
5	15.25463	18.38	Pk	10.5	.4	-40	-10.72	29.54	-40.26	0-360

Pk - Peak detector

## SPURIOUS EMISSION



# DATA

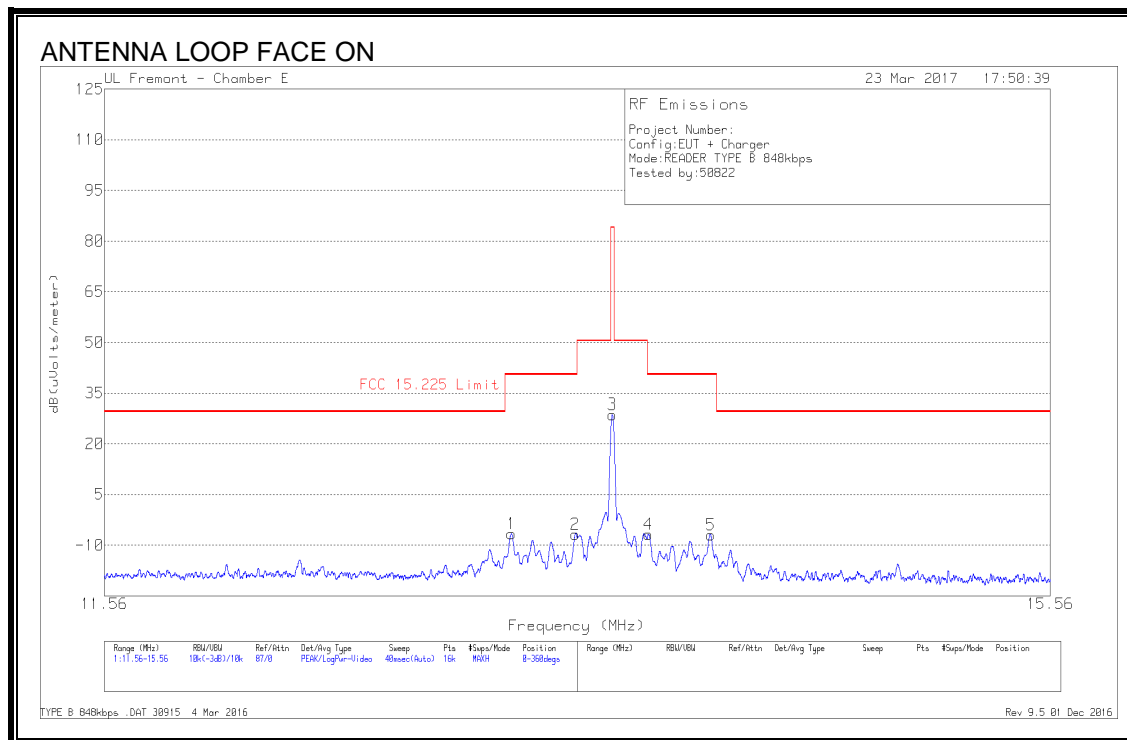
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	7.12788	16.2	Pk	11.3	.3	-40	-12.2	29.5	-41.7	0-360
2	11.86641	17.22	Pk	10.8	.4	-40	-11.58	29.5	-41.08	0-360
6	11.8685	15.01	Pk	10.8	.4	-40	-13.79	29.5	-43.29	0-360
3	12.71372	30.54	Pk	10.7	.4	-40	1.64	29.5	-27.86	0-360
7	12.71424	27.05	Pk	10.7	.4	-40	-1.85	29.5	-31.35	0-360
8	14.40833	27.23	Pk	10.6	.4	-40	-1.77	29.5	-31.27	0-360
4	14.40886	31.48	Pk	10.6	.4	-40	2.48	29.5	-27.02	0-360
9	15.25669	15.11	Pk	10.5	.4	-40	-13.99	29.5	-43.49	0-360
5	15.26088	16.44	Pk	10.5	.4	-40	-12.66	29.5	-42.16	0-360

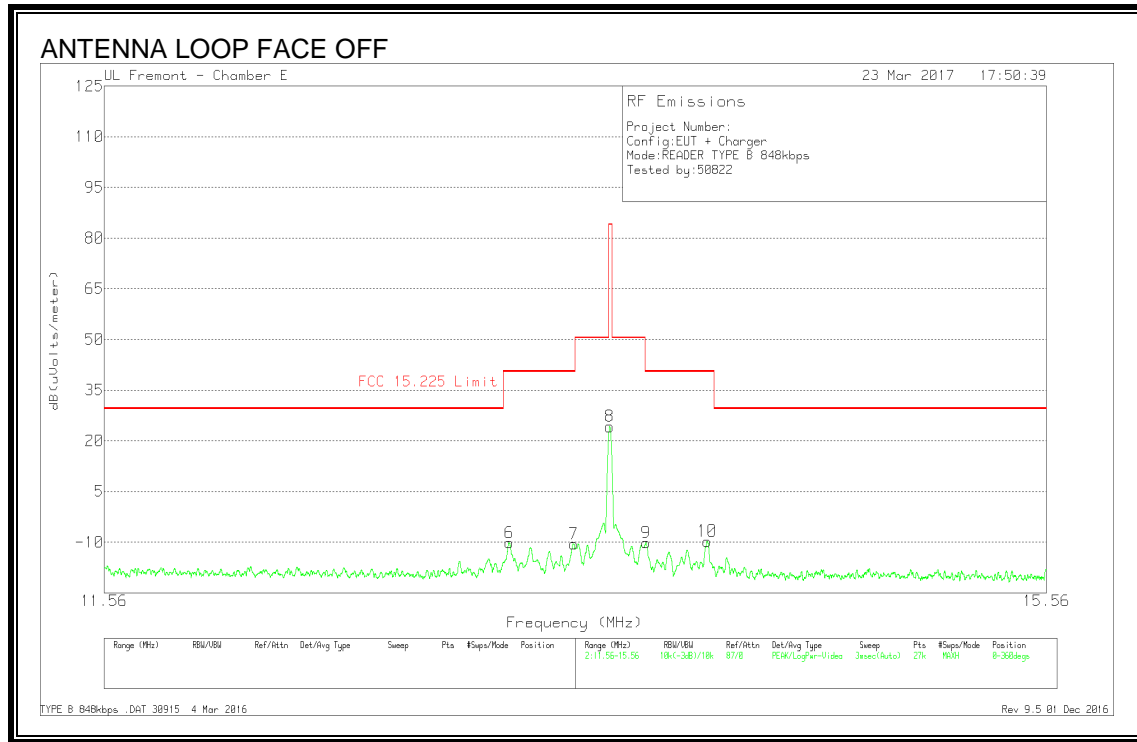
Pk - Peak detector

## 8.2.2. READER MODE

### TYPE B

### 848Kbps FUNDAMENTAL





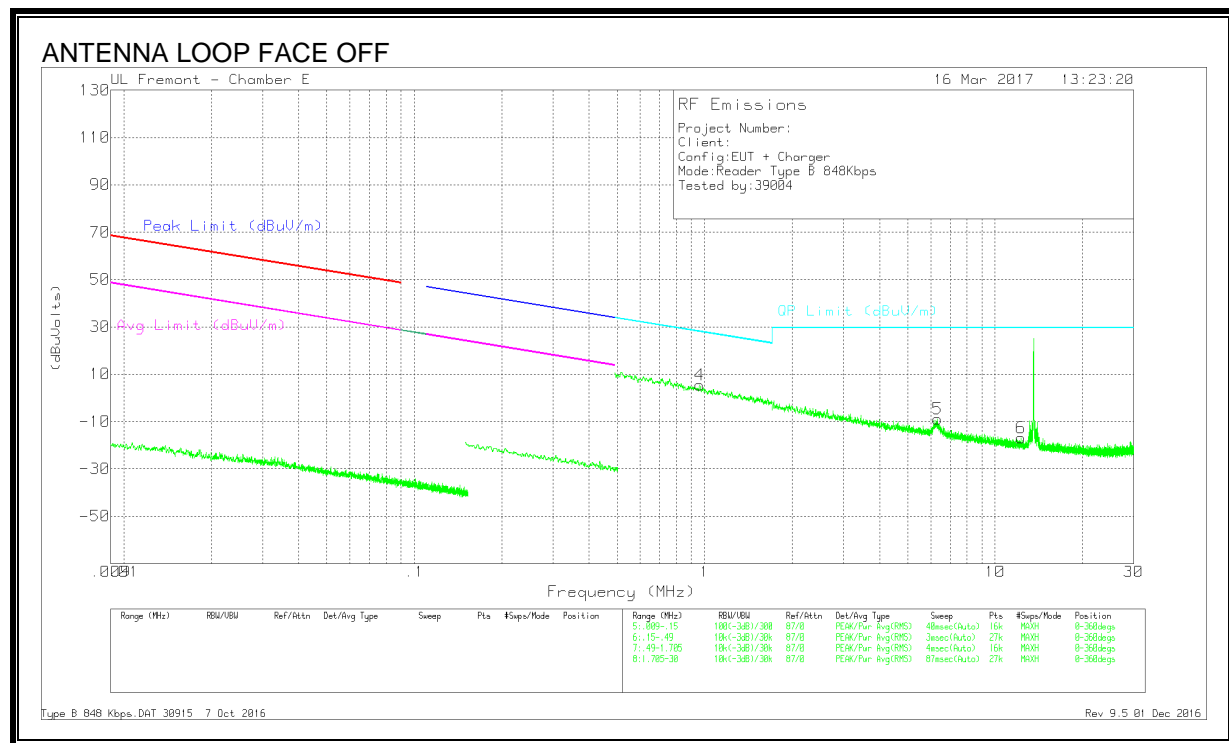
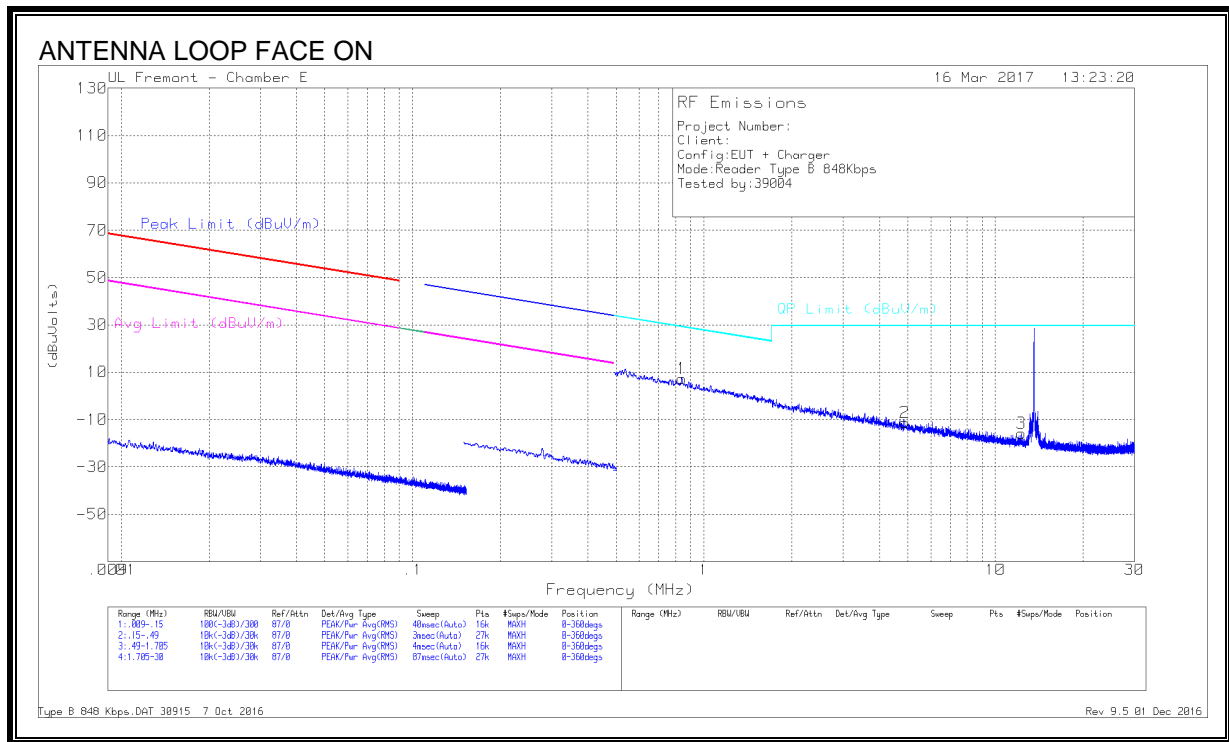
## DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
6	13.13494	18.74	Pk	10.7	.4	-40	-10.16	40.51	-50.67	0-360
1	13.13688	22.22	Pk	10.7	.4	-40	-6.68	40.51	-47.19	0-360
2	13.40225	22.11	Pk	10.7	.4	-40	-6.79	40.51	-47.3	0-360
7	13.40489	18.43	Pk	10.7	.4	-40	-10.47	40.51	-50.98	0-360
8	13.55793	53.21	Pk	10.6	.4	-40	24.21	84	-59.79	0-360
3	13.55988	57.67	Pk	10.6	.4	-40	28.67	84	-55.33	0-360
9	13.71421	18.77	Pk	10.6	.4	-40	-10.23	40.51	-50.74	0-360
4	13.71538	22.28	Pk	10.6	.4	-40	-6.72	40.51	-47.23	0-360
10	13.9818	19.31	Pk	10.6	.4	-40	-9.69	40.51	-50.2	0-360
5	13.98625	22	Pk	10.6	.4	-40	-7	40.51	-47.51	0-360

Pk - Peak detector

FCC 15.225 13.56MHz Fundamental Mask.TST 30915 4 Mar 2016  
Rev 9.5 26 Apr 2016

## SPURIOUS EMISSION

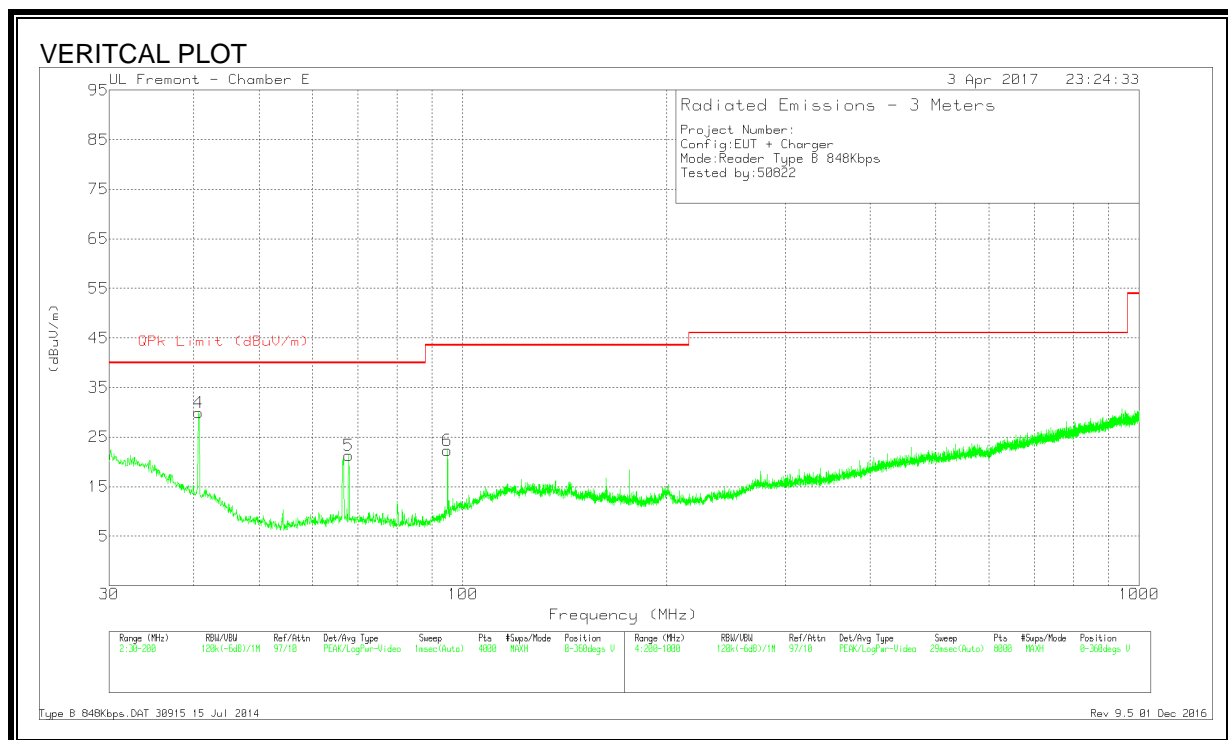
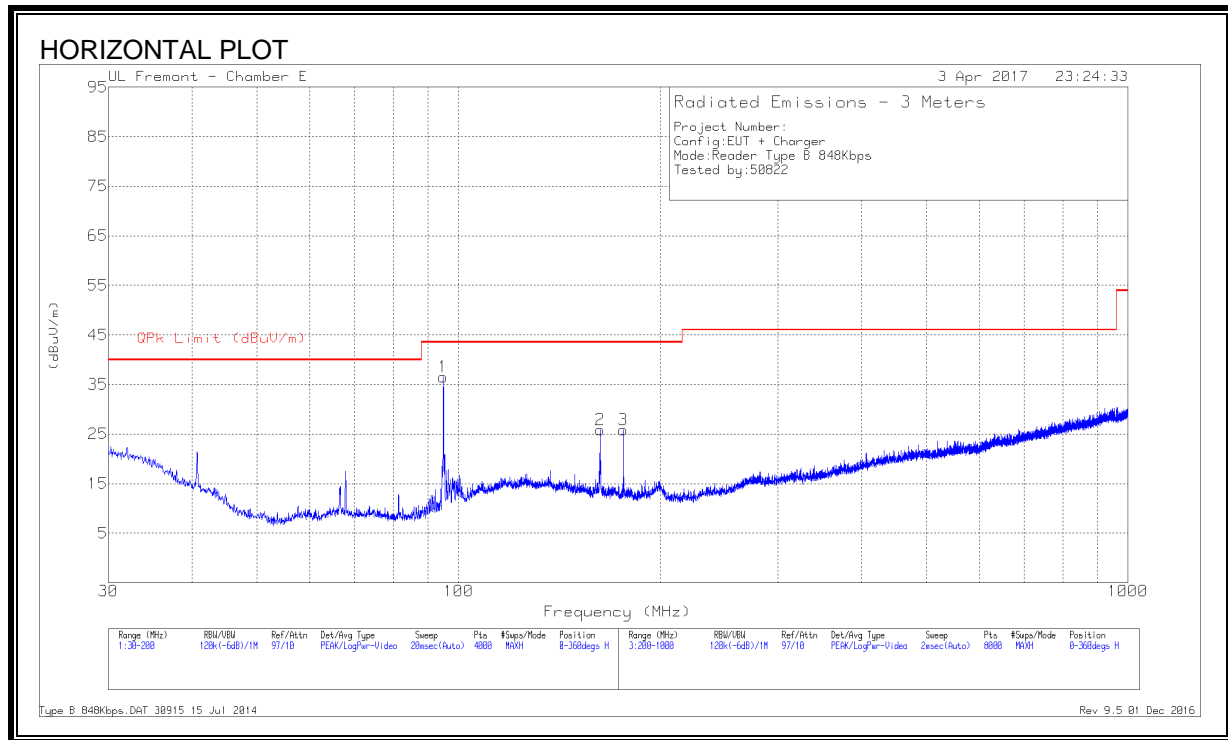


## DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.84021	35.44	Pk	11.8	.1	-40	7.34	29.13	-21.79	0-360
4	.96086	33.43	Pk	11.8	.1	-40	5.33	27.97	-22.64	0-360
2	4.88463	17.07	Pk	11.5	.2	-40	-11.23	29.5	-40.73	0-360
5	6.33926	19.42	Pk	11.4	.3	-40	-8.88	29.5	-38.38	0-360
3	12.28404	13.05	Pk	10.8	.4	-40	-15.75	29.5	-45.25	0-360
6	12.29294	11.89	Pk	10.8	.4	-40	-16.91	29.5	-46.41	0-360

Pk - Peak detector

### 8.3. TX SPURIOUS EMISSION 30 TO 1000 MHz (Worst Case)





# Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T899 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 162.7275	40.25	Pk	15.8	-30.2	25.85	43.52	-17.67	0-360	199	H
4	40.6675	43.69	Pk	17.7	-31.5	29.89	40	-10.11	0-360	100	V
5	67.7825	40.34	Pk	12.1	-31.2	21.24	40	-18.76	0-360	100	V
1	94.8975	54.64	Pk	12.8	-30.9	36.54	43.52	-6.98	0-360	300	H
6	94.8975	40.44	Pk	12.8	-30.9	22.34	43.52	-21.18	0-360	100	V
3	176.285	40.7	Pk	15.3	-30.2	25.8	43.52	-17.72	0-360	199	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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## 9. FREQUENCY STABILITY

### LIMIT

RSS-210 Issue 9

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### TEST PROCEDURE

ANSI C63.10, 2013 Clause 6.8.1 and 6.8.2

### RESULTS

No non-compliance noted.

<b>ID:</b>	38602	<b>Date:</b>	3/27/2017
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## CE MODE

### TYPE B 848Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20°C										
Limit: $\pm 100$ ppm = 1.356 kHz										
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
(VAC)	(°C)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5597167	2.391	13.5597104	2.854	13.5597072	3.087	13.5597078	3.044	$\pm 100$
3.80	40	13.5597069	3.113	13.5597065	3.144	13.5597064	3.151	13.5597069	3.115	$\pm 100$
3.80	30	13.5597114	2.783	13.5597137	2.608	13.5597163	2.418	13.5597185	2.255	$\pm 100$
<b>3.80</b>	<b>20</b>	<b>13.5597491</b>	<b>0.000</b>	<b>13.5597478</b>	<b>0.099</b>	<b>13.5597468</b>	<b>0.171</b>	<b>13.5597461</b>	<b>0.224</b>	<b><math>\pm 100</math></b>
3.80	10	13.5597603	-0.828	13.5597653	-1.193	13.5597697	-1.520	13.5597731	-1.771	$\pm 100$
3.80	0	13.5597900	-3.019	13.5597949	-3.377	13.5597989	-3.670	13.5598018	-3.883	$\pm 100$
3.80	-10	13.5598153	-4.885	13.5598184	-5.112	13.5598208	-5.285	13.5598224	-5.406	$\pm 100$
3.80	-20	13.5598270	-5.745	13.5598268	-5.730	13.5598264	-5.698	13.5598258	-5.659	$\pm 100$
3.23	20	13.5597315	1.301	13.5597359	0.977	13.5597397	0.691	13.5597431	0.442	$\pm 100$
4.37	20	13.5597433	0.425	13.5597440	0.377	13.5597447	0.325	13.5597453	0.279	$\pm 100$

## Reader Mode

### TYPE B 848Kbps

Limit: $\pm 100$ ppm = 1.356 kHz										
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
(VAC)	(°C)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5597351	1.326	13.5597227	2.235	13.5597127	2.975	13.5597070	3.398	$\pm 100$
3.80	40	13.5597067	3.416	13.5597067	3.417	13.5597069	3.406	13.5597066	3.426	$\pm 100$
3.80	30	13.5597106	3.128	13.5597120	3.029	13.5597135	2.918	13.5597146	2.835	$\pm 100$
<b>3.80</b>	<b>20</b>	<b>13.5597530</b>	<b>0.000</b>	<b>13.5597507</b>	<b>0.173</b>	<b>13.5597492</b>	<b>0.282</b>	<b>13.5597478</b>	<b>0.390</b>	<b><math>\pm 100</math></b>
3.80	10	13.5597604	-0.542	13.5597643	-0.827	13.5597677	-1.081	13.5597702	-1.265	$\pm 100$
3.80	0	13.5597851	-2.364	13.5597892	-2.669	13.5597930	-2.949	13.5597963	-3.186	$\pm 100$
3.80	-10	13.5598089	-4.115	13.5598125	-4.383	13.5598157	-4.617	13.5598182	-4.802	$\pm 100$
3.80	-20	13.5598256	-5.350	13.5598265	-5.419	13.5598271	-5.459	13.5598272	-5.472	$\pm 100$
3.23	20	13.5597249	2.079	13.5597274	1.888	13.5597298	1.714	13.5597313	1.607	$\pm 100$
4.37	20	13.5597295	1.740	13.5597311	1.617	13.5597325	1.512	13.5597332	1.465	$\pm 100$

## 10. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207  
IC RSS-GEN, Section 8.8

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB $\mu$ 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.		

### TEST PROCEDURE

ANSI C63.10

### RESULTS

No non-compliance noted:

## 10.1. CE MODE TYPE B

### 10.1.1. NORMAL OPERATION, 848 KBPS

#### 6 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	.33675	35.69	Qp	0	.1	10.1	45.89	59.28	-13.39	-	-
2	.33675	29.4	Ca	0	.1	10.1	39.6	-	-	49.28	-9.68
3	.672	35.97	Qp	0	.1	10.1	46.17	56	-9.83	-	-
4	.672	29.12	Ca	0	.1	10.1	39.32	-	-	46	-6.68
5	1.00725	34.95	Qp	0	.1	10.1	45.15	56	-10.85	-	-
6	1.00725	29.62	Ca	0	.1	10.1	39.82	-	-	46	-6.18
7	1.3425	29.55	Qp	0	.1	10.1	39.75	56	-16.25	-	-
8	1.3425	24.9	Ca	0	.1	10.1	35.1	-	-	46	-10.9
9	2.3505	28.92	Qp	0	.1	10.1	39.12	56	-16.88	-	-
10	2.3505	23.6	Ca	0	.1	10.1	33.8	-	-	46	-12.2
11	13.56	60.61	Qp	.1	.2	10.2	71.11	60	11.11	-	-
12	13.56	55.63	Ca	.1	.2	10.2	66.13	-	-	50	16.13

Range 2: Line-L2 .15 - 30MHz

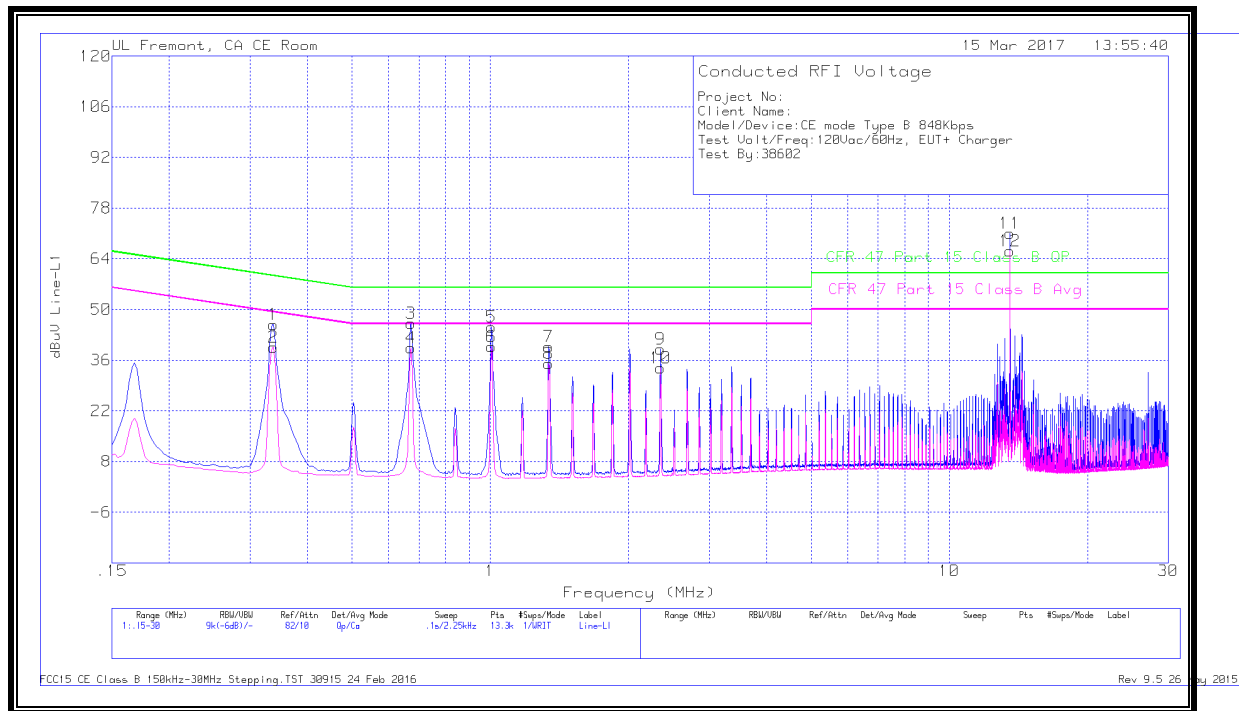
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.33675	37.45	Qp	0	.1	10.1	47.65	59.28	-11.63	-	-
14	.33675	31.44	Ca	0	.1	10.1	41.64	-	-	49.28	-7.64
15	.672	36.76	Qp	0	.1	10.1	46.96	56	-9.04	-	-
16	.672	31.82	Ca	0	.1	10.1	42.02	-	-	46	-3.98
17	1.00725	35.59	Qp	0	.1	10.1	45.79	56	-10.21	-	-
18	1.00725	31.66	Ca	0	.1	10.1	41.86	-	-	46	-4.14
19	1.3425	29.85	Qp	0	.1	10.1	40.05	56	-15.95	-	-
20	1.3425	26.3	Ca	0	.1	10.1	36.5	-	-	46	-9.5
21	2.3505	29.02	Qp	0	.1	10.1	39.22	56	-16.78	-	-
22	2.3505	24.81	Ca	0	.1	10.1	35.01	-	-	46	-10.99
23	13.56	58.33	Qp	.1	.2	10.2	68.83	60	8.83	-	-
24	13.56	52.16	Ca	.1	.2	10.2	62.66	-	-	50	12.66

Qp - Quasi-Peak detector

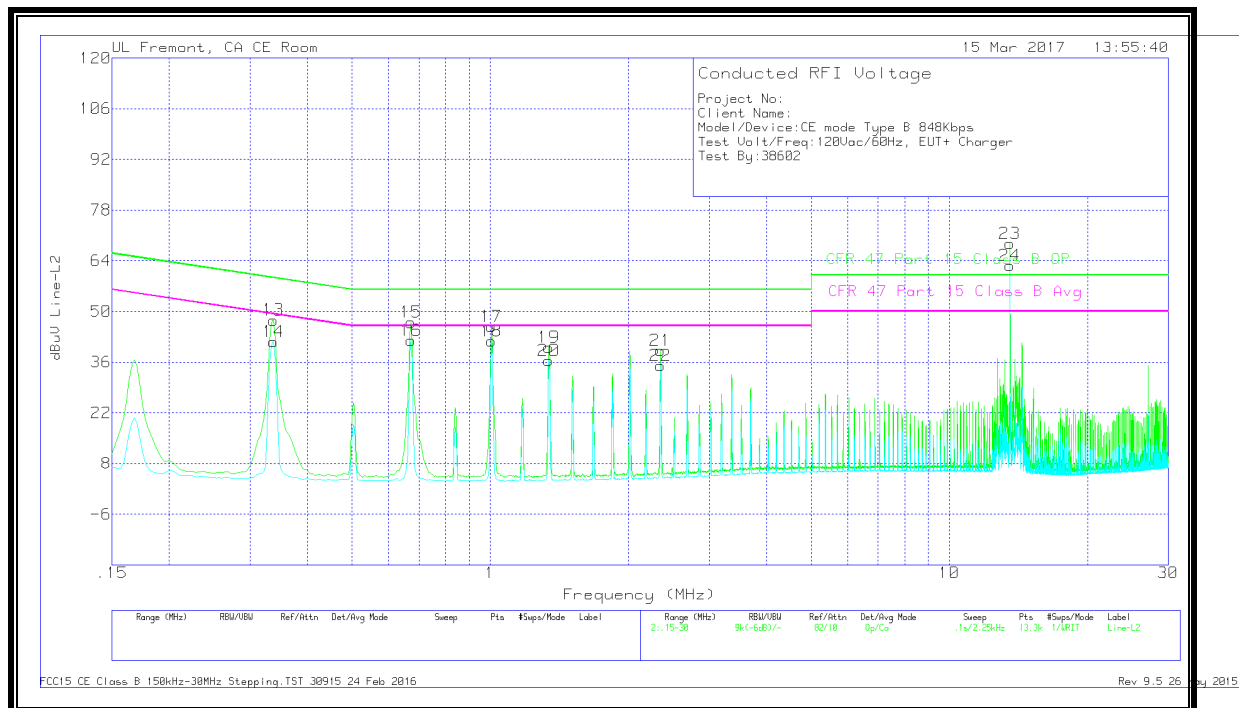
Ca - CISPR average detection

Note: 13.56MHz is a fundamental frequency of the EUT. Data under the following section indicate that when the antenna terminal is terminated the fundamental amplitude is lowering below the limit line.

## LINE 1 RESULTS



## LINE 2 RESULTS



## 10.1.2. WITH ANTENNA PORT TERMINATED, 848 KBPS

### WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL 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	.16125	27.67	Qp	1.2	.1	10.1	39.07	65.4	-26.33	-	-
2	.16125	5.58	Ca	1.2	.1	10.1	16.98	-	-	55.4	-38.42
3	.25125	22.62	Qp	.6	.1	10.1	33.42	61.72	-28.3	-	-
4	.25125	3.01	Ca	.6	.1	10.1	13.81	-	-	51.72	-37.91
5	.3435	17.29	Qp	.4	.1	10.1	27.89	59.12	-31.23	-	-
6	.34575	1.37	Ca	.4	.1	10.1	11.97	-	-	49.06	-37.09
7	.78	18.77	Qp	.2	.1	10.1	29.17	56	-26.83	-	-
8	.78112	8.49	Ca	.2	.1	10.1	18.89	-	-	46	-27.11
9	4.58475	10.57	Qp	.2	.1	10.1	20.97	56	-35.03	-	-
10	4.58475	.93	Ca	.2	.1	10.1	11.33	-	-	46	-34.67
11	18.582	12.02	Qp	.2	.3	10.3	22.82	60	-37.18	-	-
12	18.5696	1.33	Ca	.2	.3	10.3	12.13	-	-	50	-37.87

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL 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	.17025	27.75	Qp	1.2	.1	10.1	39.15	64.95	-25.8	-	-
14	.177	4.09	Ca	1.2	.1	10.1	15.49	-	-	54.63	-39.14
15	.25575	23.23	Qp	.7	.1	10.1	34.13	61.57	-27.44	-	-
16	.25463	1.06	Ca	.7	.1	10.1	11.96	-	-	51.6	-39.64
17	.34125	17	Qp	.5	.1	10.1	27.7	59.17	-31.47	-	-
18	.3435	-1.94	Ca	.5	.1	10.1	8.76	-	-	49.12	-40.36
19	.78112	16.07	Qp	.3	.1	10.1	26.57	56	-29.43	-	-
20	.78	3.46	Ca	.3	.1	10.1	13.96	-	-	46	-32.04
21	4.49475	9.91	Qp	.2	.1	10.1	20.31	56	-35.69	-	-
22	4.48575	.79	Ca	.2	.1	10.1	11.19	-	-	46	-34.81
23	24.1328	8.08	Qp	.3	.3	10.5	19.18	60	-40.82	-	-
24	24.1125	-.62	Ca	.3	.3	10.5	10.48	-	-	50	-39.52

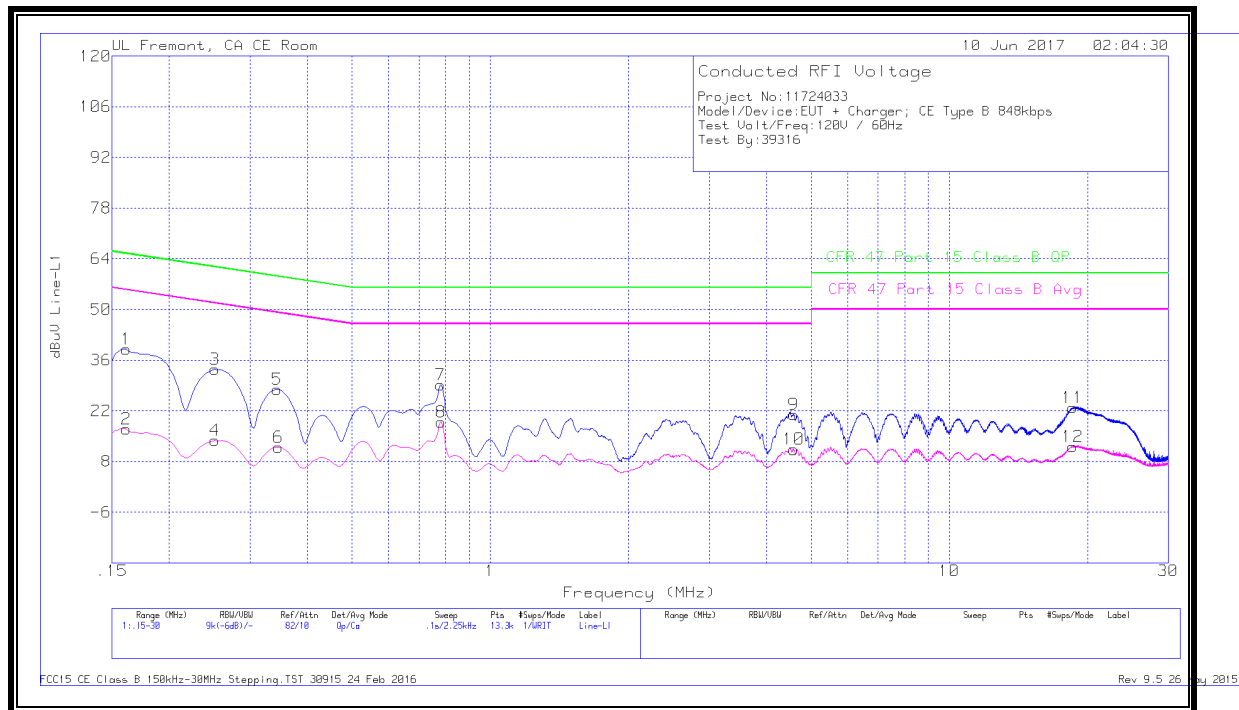
Qp - Quasi-Peak detector

Ca - CISPR average detection

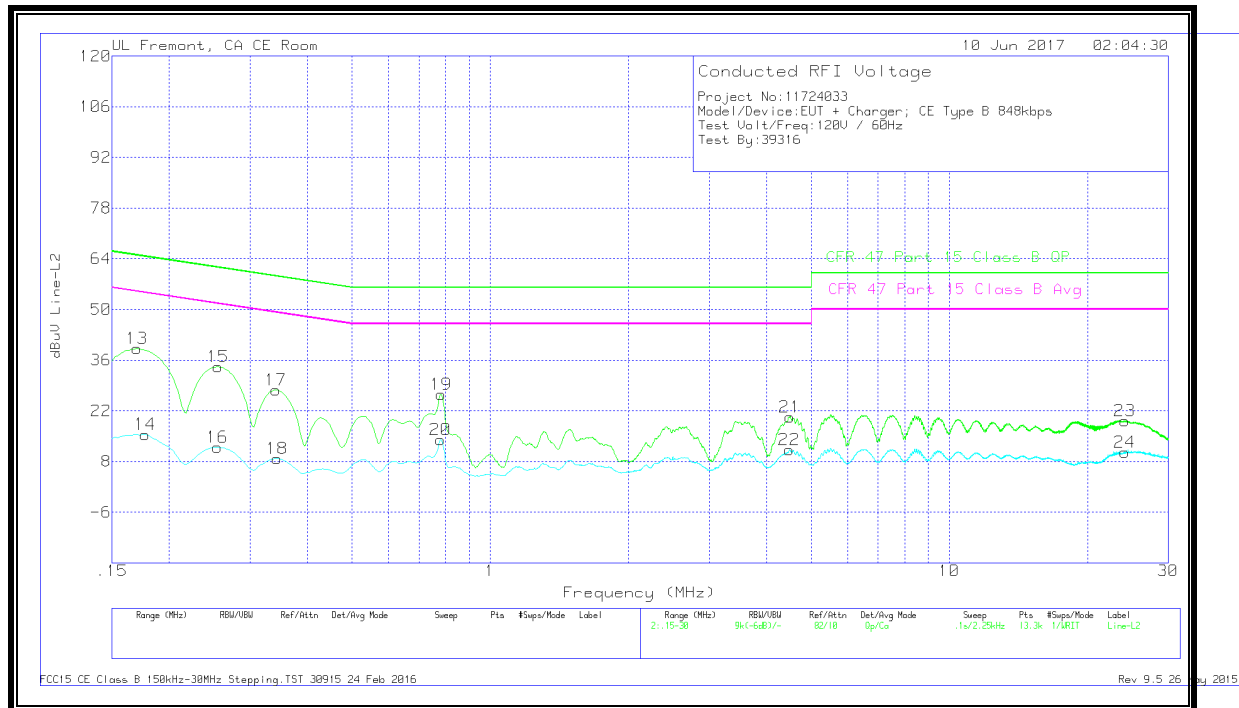
FCC15 CE Class B 150kHz-30MHz Stepping.TST 30915 24 Feb 2016

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## LINE 1 RESULTS



## LINE 2 RESULTS





## 10.2. READER MODE TYPE B

### 10.2.1. NORMAL OPERATION, 848 KBPS

#### 6 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	.33675	36.32	Qp	0	.1	10.1	46.52	59.28	-12.76	-	-
2	.33675	30.2	Ca	0	.1	10.1	40.4	-	-	49.28	-8.88
3	.672	36.61	Qp	0	.1	10.1	46.81	56	-9.19	-	-
4	.672	29.94	Ca	0	.1	10.1	40.14	-	-	46	-5.86
5	1.00725	35.5	Qp	0	.1	10.1	45.7	56	-10.3	-	-
6	1.00725	30.25	Ca	0	.1	10.1	40.45	-	-	46	-5.55
7	1.3425	29.93	Qp	0	.1	10.1	40.13	56	-15.87	-	-
8	1.3425	25.38	Ca	0	.1	10.1	35.58	-	-	46	-10.42
9	13.8953	34.1	Qp	.1	.2	10.2	44.6	60	-15.4	-	-
10	13.8953	19.42	Ca	.1	.2	10.2	29.92	-	-	50	-20.08
11	13.56	62.42	Qp	.1	.2	10.2	72.92	60	12.92	-	-
12	13.56	57.31	Ca	.1	.2	10.2	67.81	-	-	50	17.81

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	.33675	37.83	Qp	0	.1	10.1	48.03	59.28	-11.25	-	-
14	.33675	31.95	Ca	0	.1	10.1	42.15	-	-	49.28	-7.13
15	.672	37.29	Qp	0	.1	10.1	47.49	56	-8.51	-	-
16	.672	32.31	Ca	0	.1	10.1	42.51	-	-	46	-3.49
17	1.00725	36.09	Qp	0	.1	10.1	46.29	56	-9.71	-	-
18	1.00725	32.13	Ca	0	.1	10.1	42.33	-	-	46	-3.67
19	1.3425	30.25	Qp	0	.1	10.1	40.45	56	-15.55	-	-
20	1.3425	26.7	Ca	0	.1	10.1	36.9	-	-	46	-9.1
21	27.1185	28.67	Qp	.1	.3	10.5	39.57	60	-20.43	-	-
22	27.1185	14.39	Ca	.1	.3	10.5	25.29	-	-	50	-24.71
23	13.56	60.64	Qp	.1	.2	10.2	71.14	60	11.14	-	-
24	13.56	54.58	Ca	.1	.2	10.2	65.08	-	-	50	15.08

Qp - Quasi-Peak detector

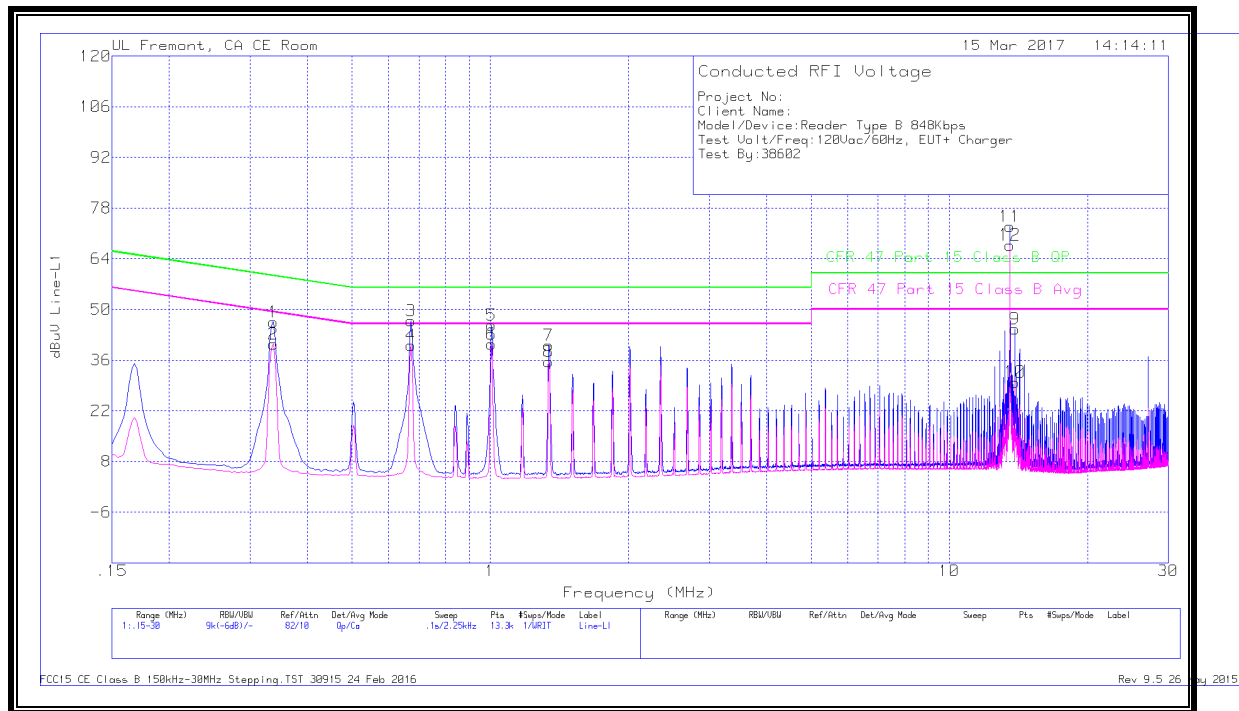
Ca - CISPR average detection

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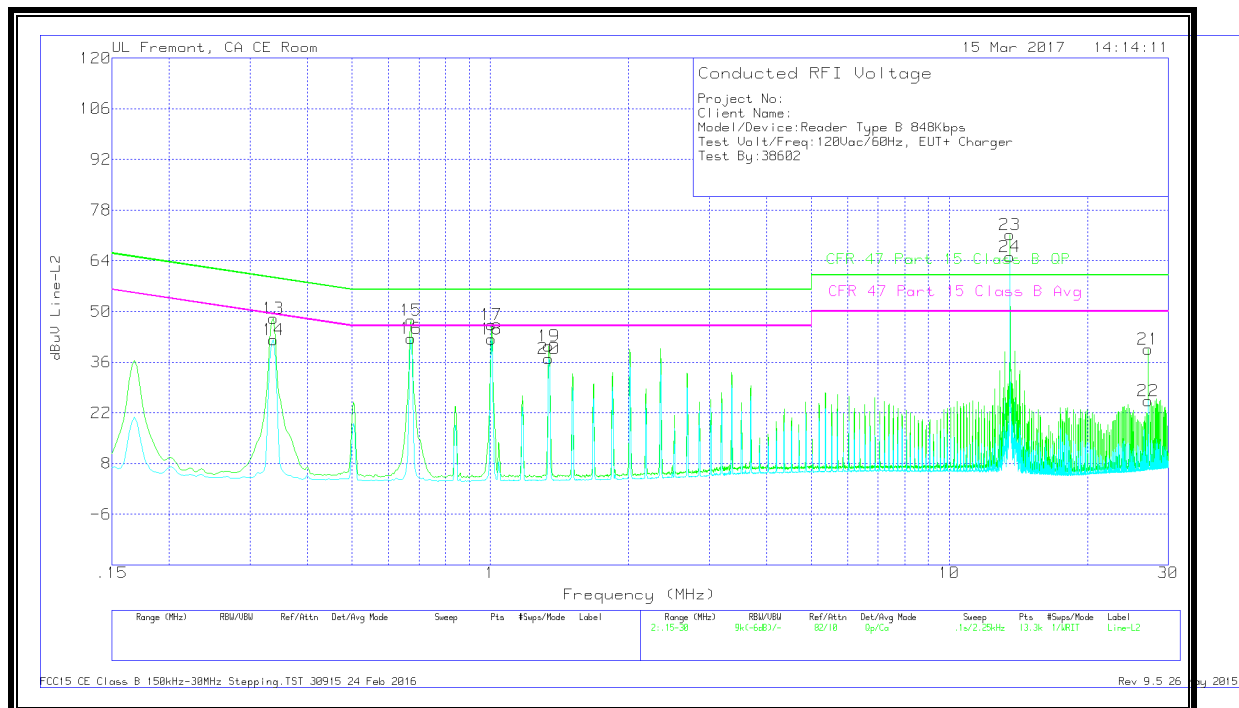
Rev 9.5 26 May 2015

Note: 13.56MHz is a fundamental frequency of the EUT. Data under the following section indicate that when the antenna terminal is terminated the fundamental amplitude is lowering below the limit line.

## LINE 1 RESULTS



## LINE 2 RESULTS



## 10.2.2. WITH ANTENNA PORT TERMINATED, 848 KBPS

### WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL 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	.1635	25.48	Qp	1.2	.1	10.1	36.88	65.28	-28.4	-	-
2	.1635	2.09	Ca	1.2	.1	10.1	13.49	-	-	55.28	-41.79
3	.25575	21.02	Qp	.6	.1	10.1	31.82	61.57	-29.75	-	-
4	.25125	-.43	Ca	.6	.1	10.1	10.37	-	-	51.72	-41.35
5	.3435	15.9	Qp	.4	.1	10.1	26.5	59.12	-32.62	-	-
6	.34125	-2.37	Ca	.4	.1	10.1	8.23	-	-	49.17	-40.94
7	.78225	13.59	Qp	.2	.1	10.1	23.99	56	-32.01	-	-
8	.78	2.99	Ca	.2	.1	10.1	13.39	-	-	46	-32.61
9	13.5105	6.87	Qp	.2	.2	10.2	17.47	60	-42.53	-	-
10	13.5116	-1.23	Ca	.2	.2	10.2	9.37	-	-	50	-40.63
11	21.5948	7.51	Qp	.3	.3	10.4	18.51	60	-41.49	-	-
12	21.5925	-.9	Ca	.3	.3	10.4	10.1	-	-	50	-39.9

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL 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	.17025	25.89	Qp	1.2	.1	10.1	37.29	64.95	-27.66	-	-
14	.177	2.02	Ca	1.2	.1	10.1	13.42	-	-	54.63	-41.21
15	.258	21.15	Qp	.7	.1	10.1	32.05	61.5	-29.45	-	-
16	.25575	.11	Ca	.7	.1	10.1	11.01	-	-	51.57	-40.56
17	.34125	14.69	Qp	.5	.1	10.1	25.39	59.17	-33.78	-	-
18	.3435	-1.42	Ca	.5	.1	10.1	9.28	-	-	49.12	-39.84
19	.78225	16.11	Qp	.3	.1	10.1	26.61	56	-29.39	-	-
20	.78225	6.47	Ca	.3	.1	10.1	16.97	-	-	46	-29.03
21	13.5398	4.67	Qp	.3	.2	10.2	15.37	60	-44.63	-	-
22	13.5398	-2.24	Ca	.3	.2	10.2	8.46	-	-	50	-41.54
23	21.48	8.81	Qp	.3	.3	10.4	19.81	60	-40.19	-	-
24	21.48	.64	Ca	.3	.3	10.4	11.64	-	-	50	-38.36

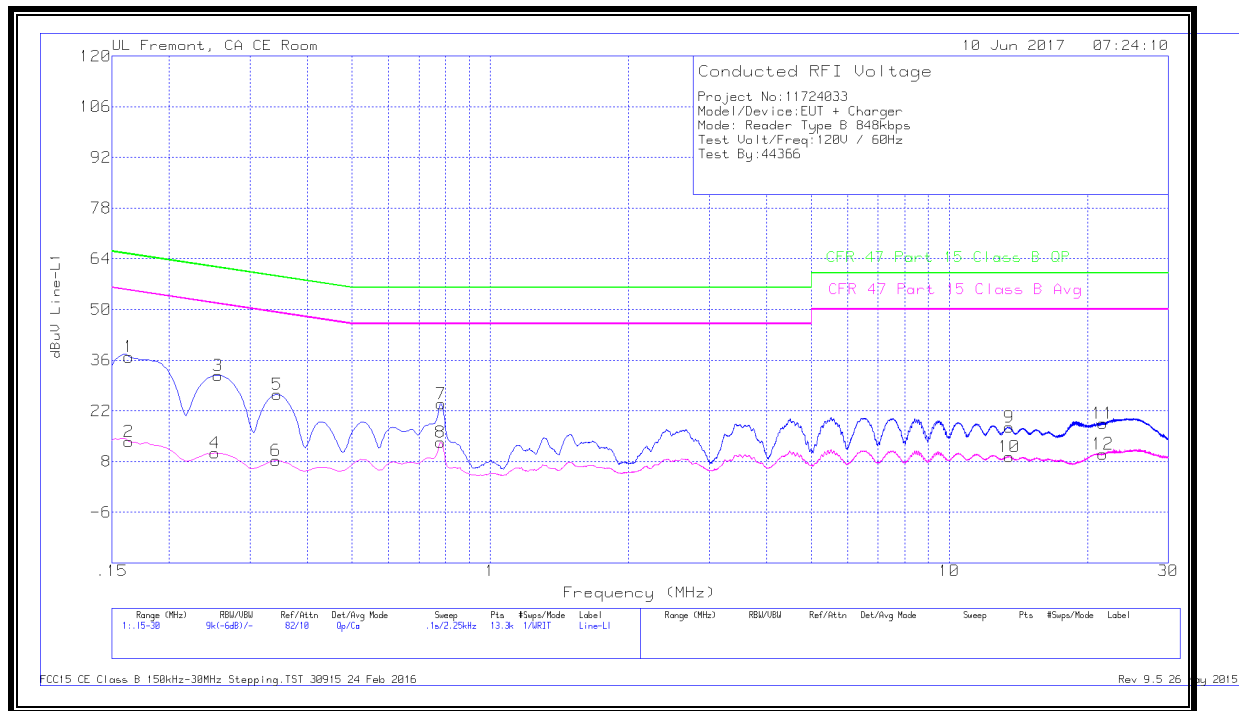
Qp - Quasi-Peak detector

Ca - CISPR average detection

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## LINE 1 RESULTS



## LINE 2 RESULTS

