



# **CERTIFICATION TEST REPORT**

**Report Number. : 12607353-E11V2**

**Applicant :** APPLE, INC.  
1 APPLE PARK WAY  
CUPERTINO, CA. 95014, U.S.A.

**Model :** A2215

**FCC ID :** BCG-E3307A

**IC :** 579C-E3307A

**EUT Description :** SMARTPHONE

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 9

**Date Of Issue:**  
8/8/2019

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	8/1/2019	Initial Issue	Chin Pang
V2	8/8/2019	Addressed TCB question	Joe Vang

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S.A.

**EUT DESCRIPTION:** SMARTPHONE

**MODEL:** A2215

**SERIAL NUMBER:** C39YV06LN2RW

**DATE TESTED:** MAY 1, 2019 – July 26, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Complies
ISED RSS-210 Issue 9, Annex B	Complies
ISED RSS-GEN Issue 5	Complies

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:

Prepared By:

*Mengistu Mekuria*

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Mengistu Mekuria  
Senior Test Engineer  
UL VERIFICATION SERVICES INC.

*Tony Wang*

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Tony Wang  
LAB 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 5, 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 (ISED:2324B-1)	<input type="checkbox"/> Chamber D (ISED:22541-1)
<input type="checkbox"/> Chamber B (ISED:2324B-2)	<input type="checkbox"/> Chamber E (ISED:22541-2)
<input type="checkbox"/> Chamber C (ISED:2324B-3)	<input checked="" type="checkbox"/> Chamber F (ISED:22541-3)
	<input type="checkbox"/> Chamber G (ISED:22541-4)
	<input type="checkbox"/> Chamber H (ISED:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under ISED Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

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 [NVLAP Lab Search](#).

## 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
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

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

EUT is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wide band, GPS and NFC. All models support at least one UICC based SIM. The second SIM, if present, is either UICC based pSIM (physical SIM) or e-SIM (electronic SIM). The device has a built-in inductive charging receiver. The rechargeable battery is also not user accessible

### 5.2. DIFFERENCE IN MODEL NUMBER

### 5.3. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode		Kbps	E Field at 30m distance (dBuV/m)
13.56	Type B	CE	848	17.71
		Reader	848	20.81

### 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). The Y (Landscape orientation) was determined to be the 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 and F with CE mode and Reader mode data rates and ISO 15693 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	Macbook Pro	C02P41RZG086	FCC DoC
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123	NA
EUT AC Adapter	Apple	A1385	D292365CDYADHLHC3	NA

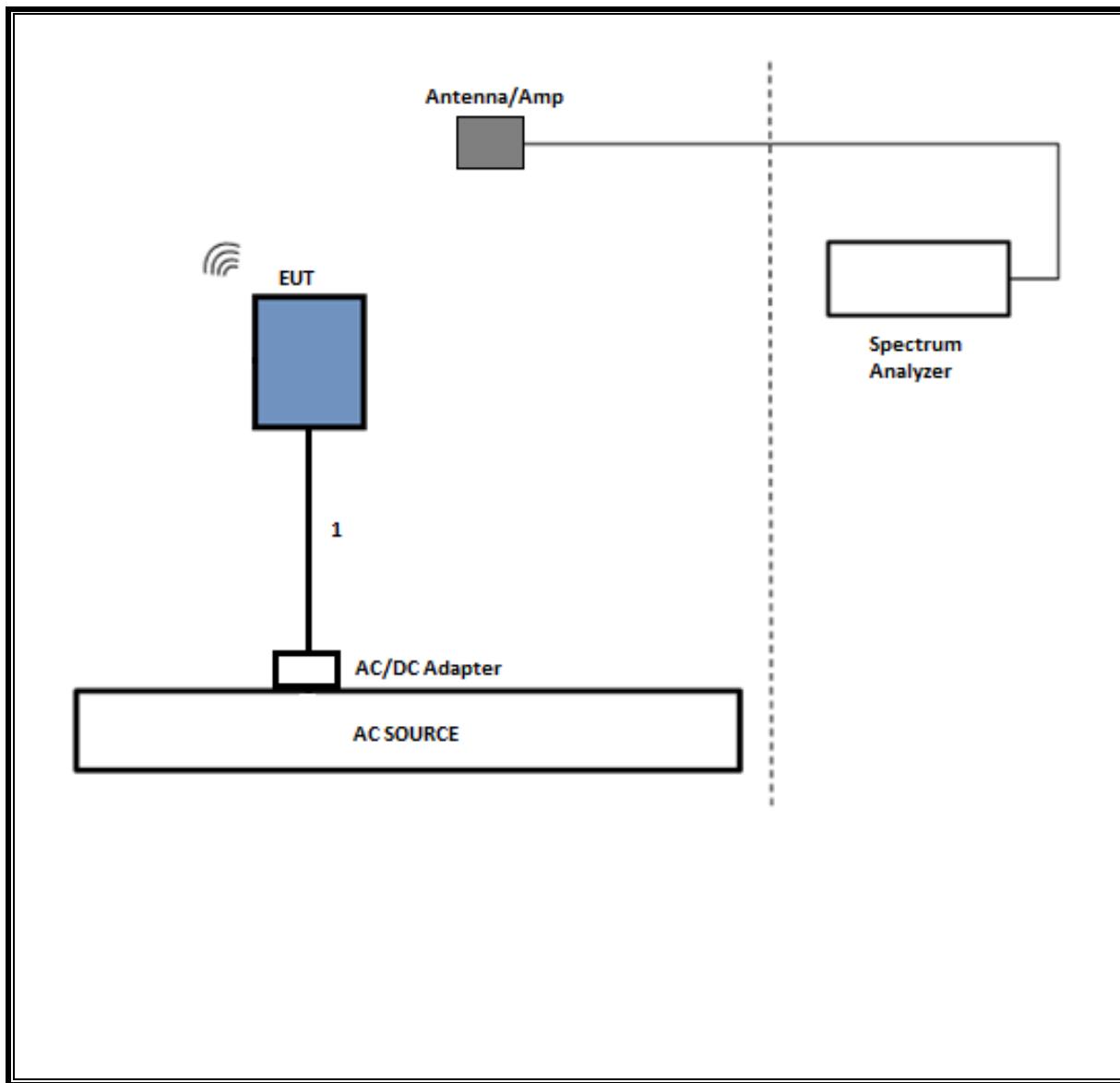
### I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-Shielded	1	N/A

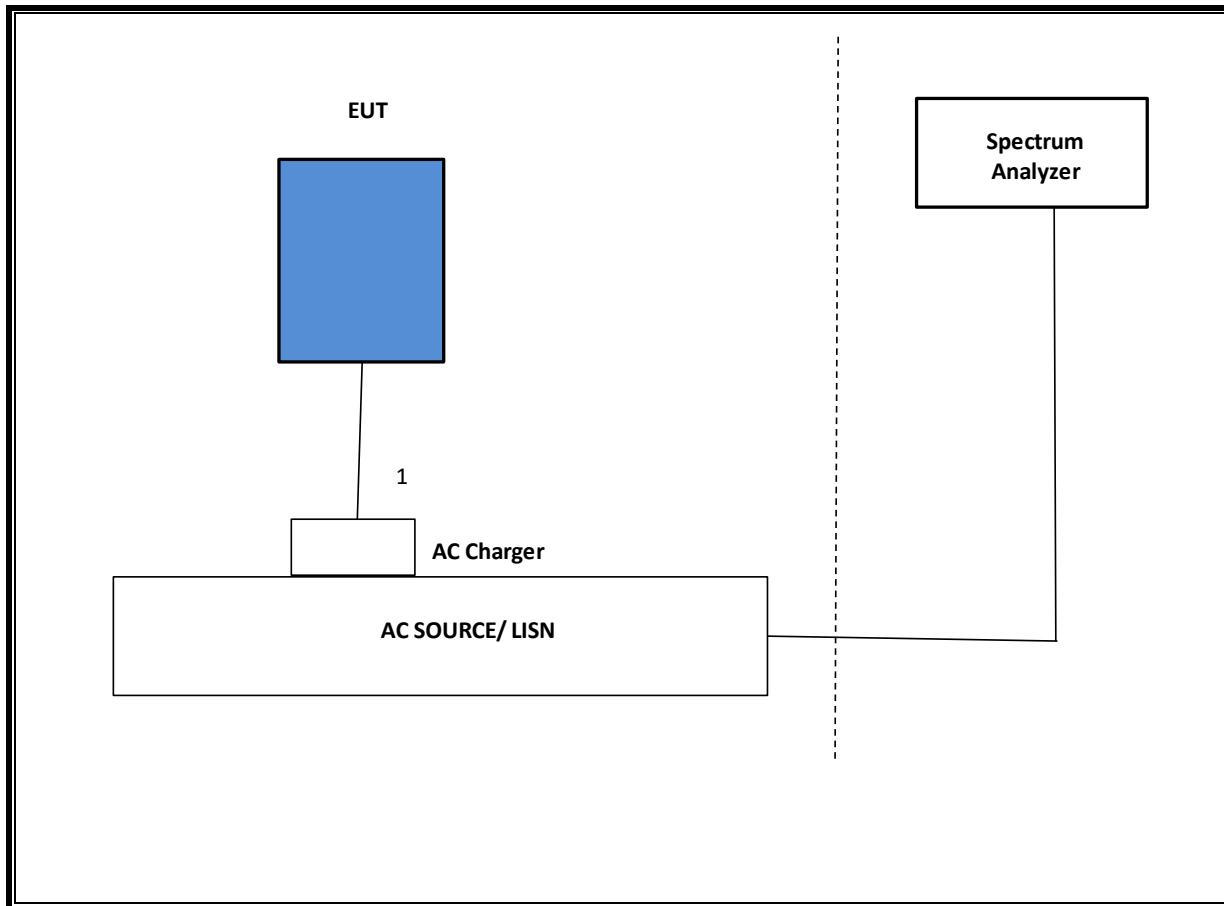
### TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the EUT.

**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:

Description	Manufacturer	Model	ID Num	Cal Due
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T900	06/18/2019
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T173	07/06/2019
*Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent (Keysight) Technologies	E4446A	T99	06/27/2019
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	08/15/2019
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	06/06/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2020
<b>AC Line Conducted</b>				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	02/14/2020
Power Cable, Line Conducted Emissions	UL	PG1	T861	02/14/2020
*LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	08/31/2019
<b>UL AUTOMATION SOFTWARE</b>				
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	

\*Testing is completed before equipment expiration date.

## 7. OCCUPIED BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

Type A with highest data rate. 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 or 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

#### 99% and 20dB BW

##### **CE MODE**

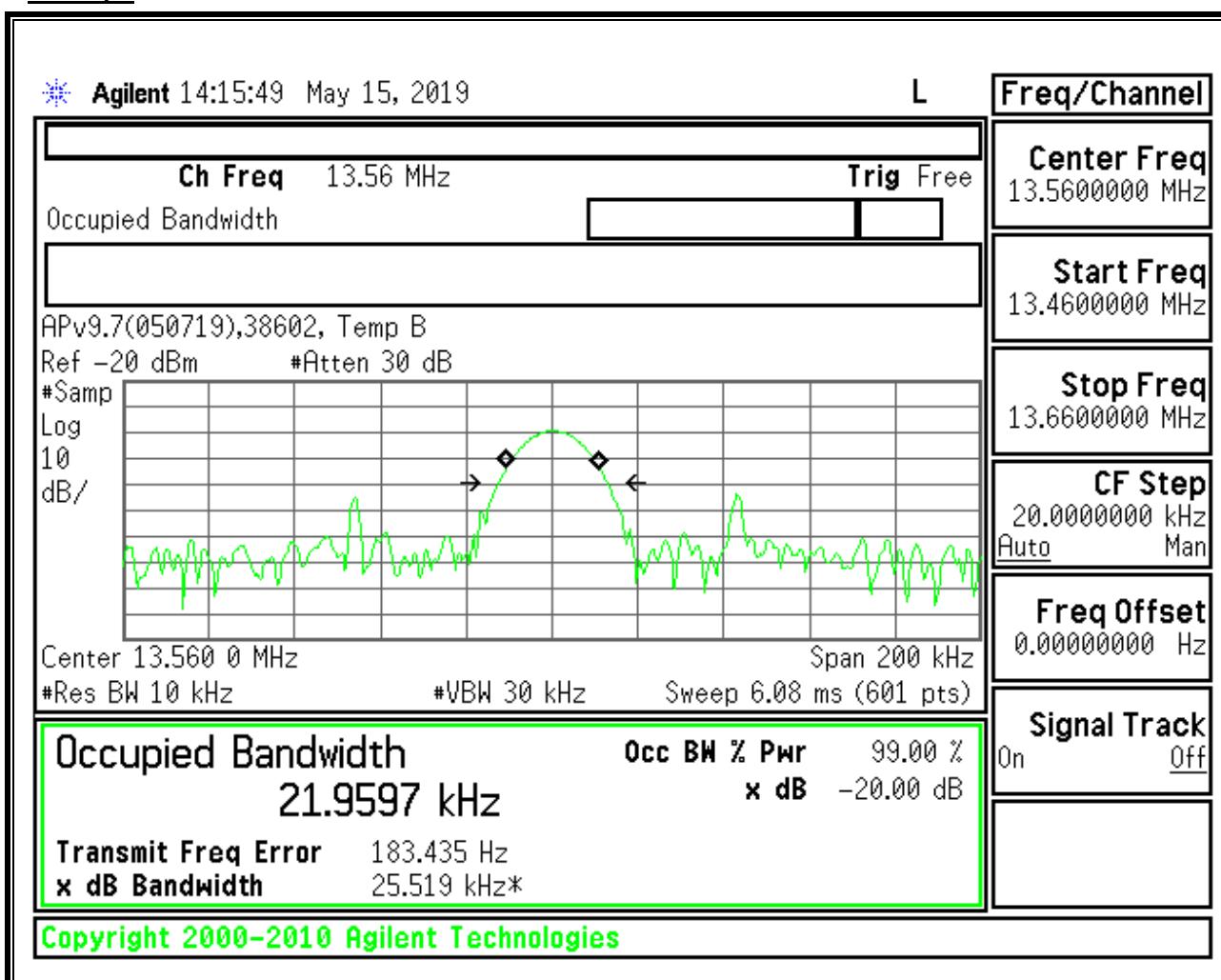
Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	21.9597	25.519

##### **READER MODE**

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	21.8364	25.154

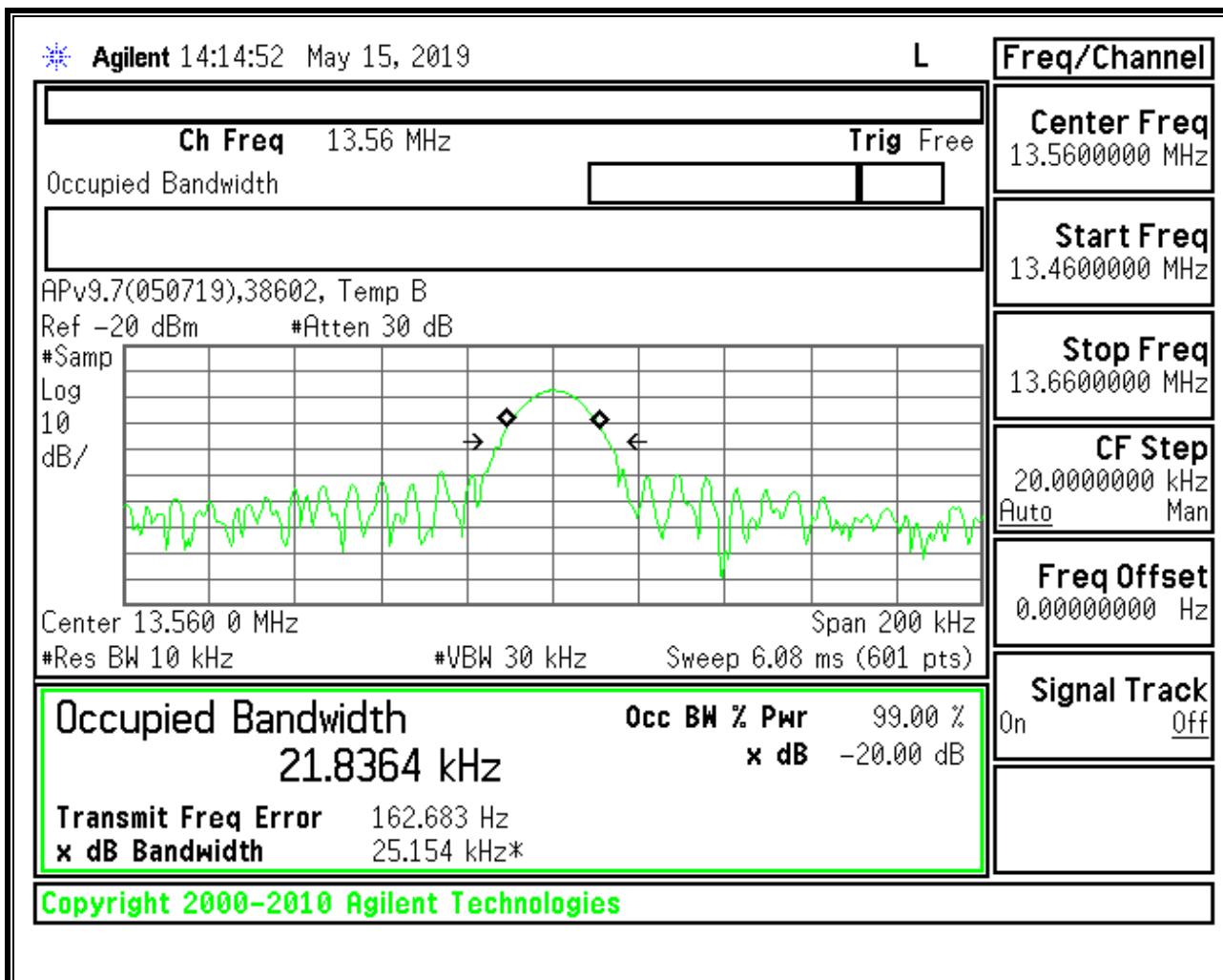
## 7.1. CE MODE

848Kbps



## 7.2. READER MODE

848Kbps



## 8. RADIATED EMISSION TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMIT

§15.225

IC RSS-210, Annex B.6

IC RSS-GEN, Section 8.9 (Transmitter)

(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 ( $\mu$ V/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 470-806 MHz. 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 field 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 table 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

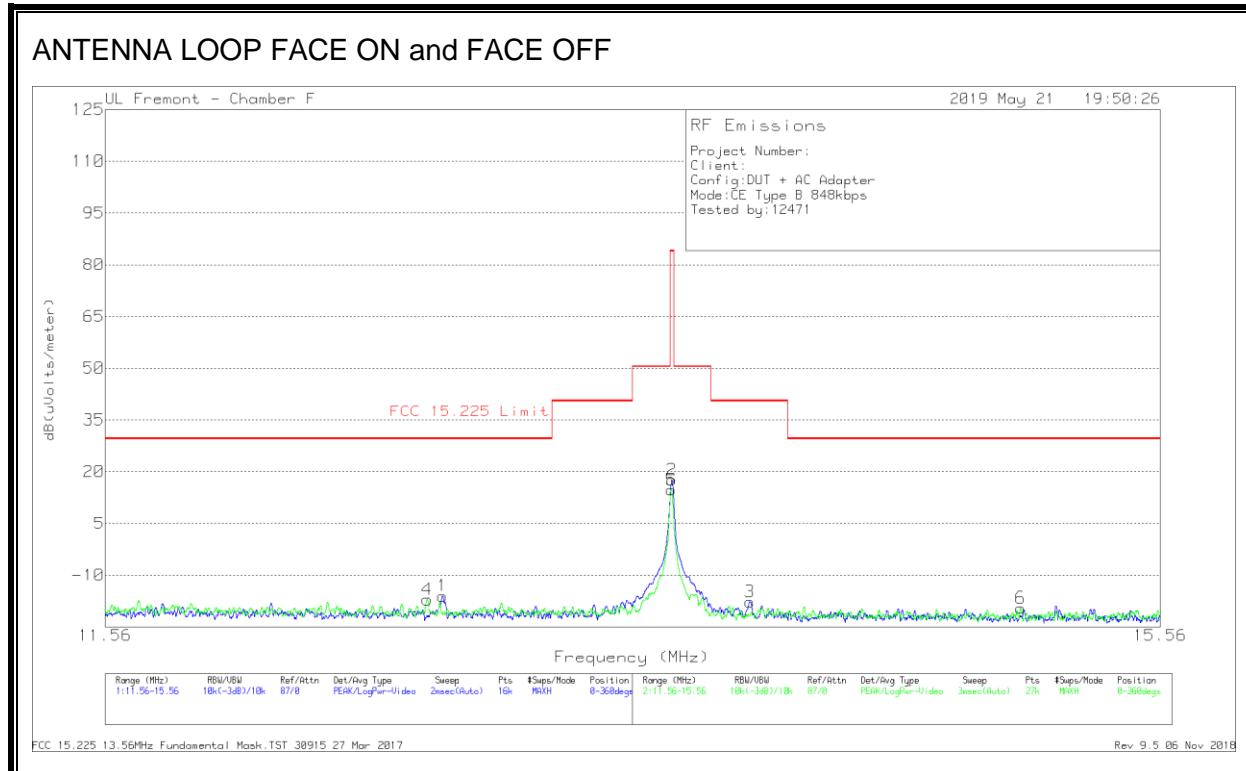
The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency, or 1000 MHz, whichever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

#### **RESULTS**

## 8.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 - 30 MHz), EUT WITH AC/DC ADAPTER

### 8.2.1. CE MODE

#### FUNDAMENTAL 848Kbps

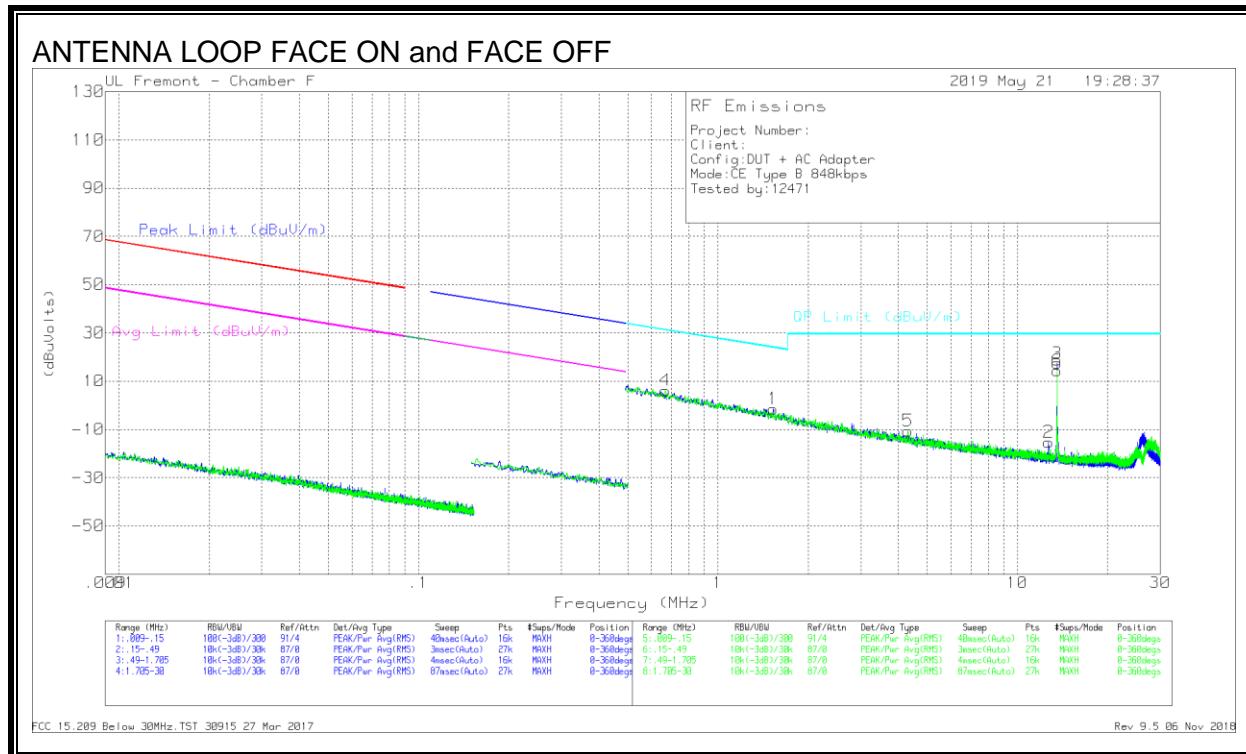


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	12.71213	13.38	Pk	10.2	.4	-40	-16.02	29.54	-45.56	0-360
2	13.56	47.21	Pk	10.1	.4	-40	17.71	84	-66.29	0-360
3	13.86213	11.88	Pk	10	.4	-40	-17.72	40.51	-58.23	0-360
4	12.65735	12.33	Pk	10.2	.4	-40	-17.07	29.54	-46.61	0-360
5	13.55822	44.22	Pk	10.1	.4	-40	14.72	84	-69.28	0-360
6	14.95986	10.13	Pk	9.9	.4	-40	-19.57	29.54	-49.11	0-360

Pk - Peak detector

FCC 15.225 13.56MHz Fundamental Mask.TST 30915 27 Mar 2017  
Rev 9.5 06 Nov 2018

**SPURIOUS EMISSION 848Kbps**



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	1.52949	27.68	Pk	10.7	.1	-40	-40	-1.52	23.94	-25.46	0-360
2	12.71214	14.07	Pk	10.2	.4	-40	-40	-15.33	29.5	-44.83	0-360
4	.66742	35.44	Pk	10.6	.1	-40	-40	6.14	31.12	-24.98	0-360
5	4.31085	18.47	Pk	10.7	.2	-40	-40	-10.63	29.5	-40.13	0-360

Pk - Peak detector

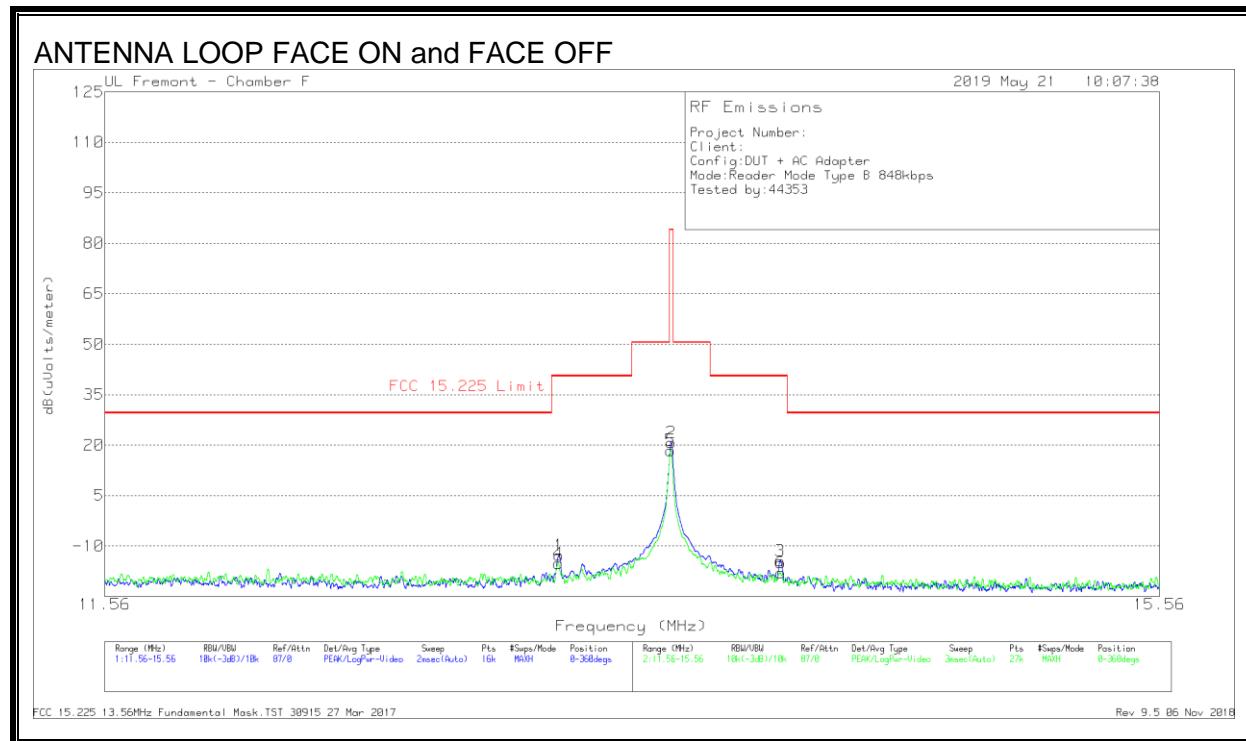
FCC 15.209 Below 30MHz. TST 30915 27 Mar 2017

Rev 9.5 06 Nov 2018

Note: Marker 3 and 6 are the fundamental signal.

## 8.2.2. READER MODE

### FUNDAMENTAL 848Kbps



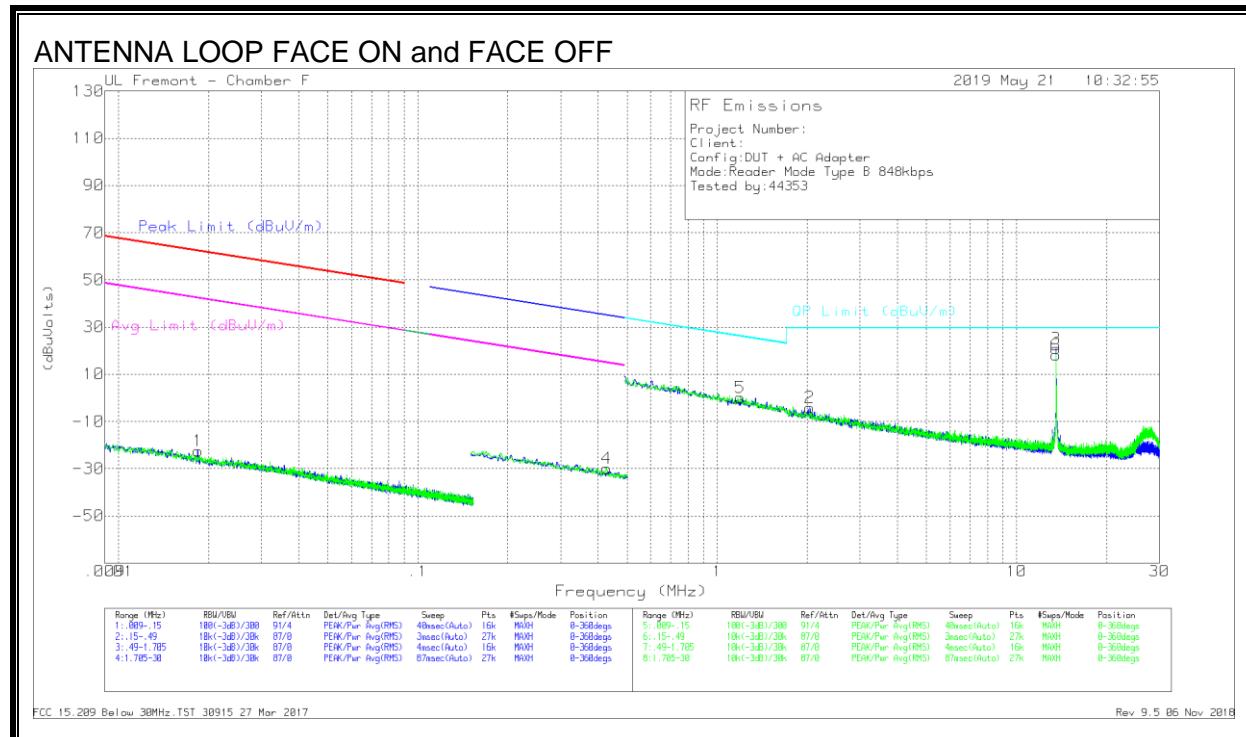
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	13.13838	16.68	Pk	10.1	.4	-40	-12.82	40.51	-53.33	0-360
2	13.55925	50.31	Pk	10.1	.4	-40	20.81	84	-63.19	0-360
3	13.98225	15.14	Pk	10	.4	-40	-14.46	40.51	-54.97	0-360
4	13.13539	14.29	Pk	10.1	.4	-40	-15.21	40.51	-55.72	0-360
5	13.55822	47.93	Pk	10.1	.4	-40	18.43	84	-65.57	0-360
6	13.98513	11.57	Pk	10	.4	-40	-18.03	40.51	-58.54	0-360

Pk - Peak detector

FCC 15.225 13.56MHz Fundamental Mask.TST 30915 27 Mar 2017

Rev 9.5 06 Nov 2018

## **SPURIOUS EMISSION 848Kbps**



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV offits)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01841	42.23	Pk	15.2	0	-80	-22.57	62.29	-84.86	42.29	-64.86	-	-	-	-	0-360
4	.42729	39.41	Pk	10.6	.1	-80	-29.89	-	-	-	-	34.99	-64.88	14.99	-44.88	0-360

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)
2	2.04141	24.86	Pk	10.7	.2	-40	-4.24	29.5	-33.74	0-360
5	1.19338	29.51	Pk	10.6	.1	-40	.21	26.09	-25.88	0-360

Pk - Peak detector

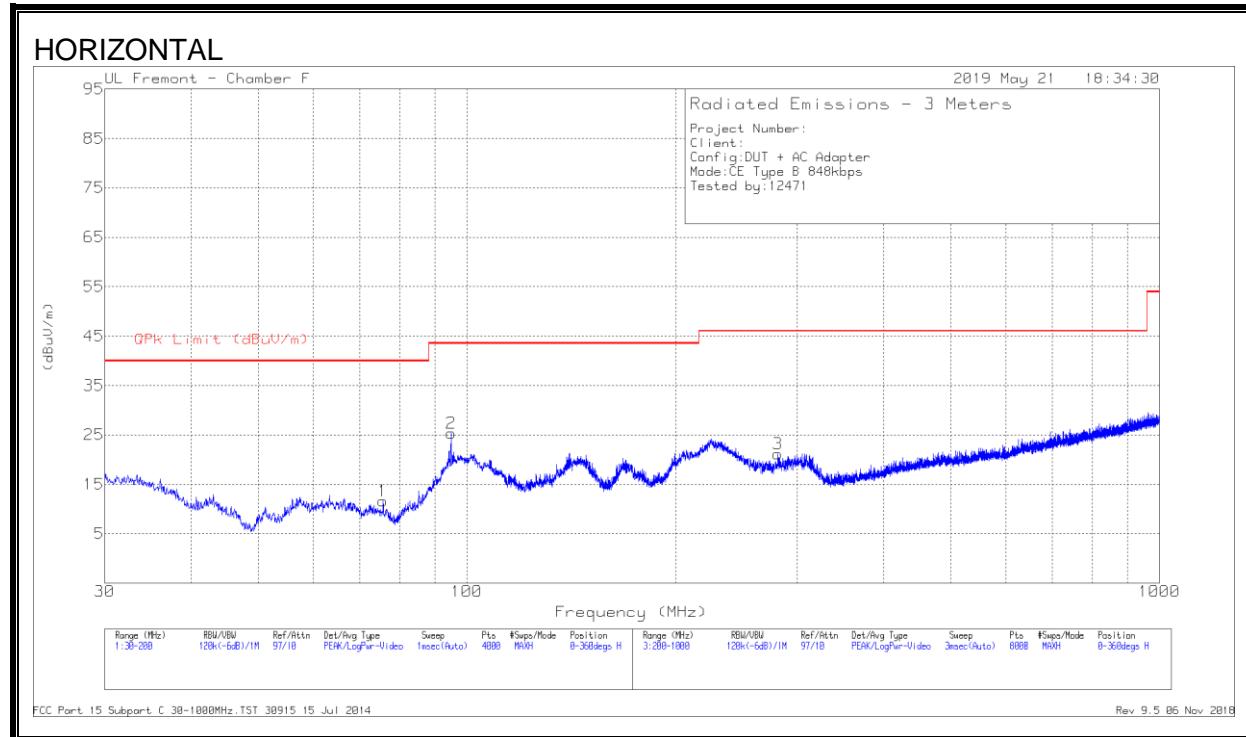
FCC 15.209 Below 30MHz.TST 30915 27 Mar 2017  
Rev 9.5 06 Nov 2018

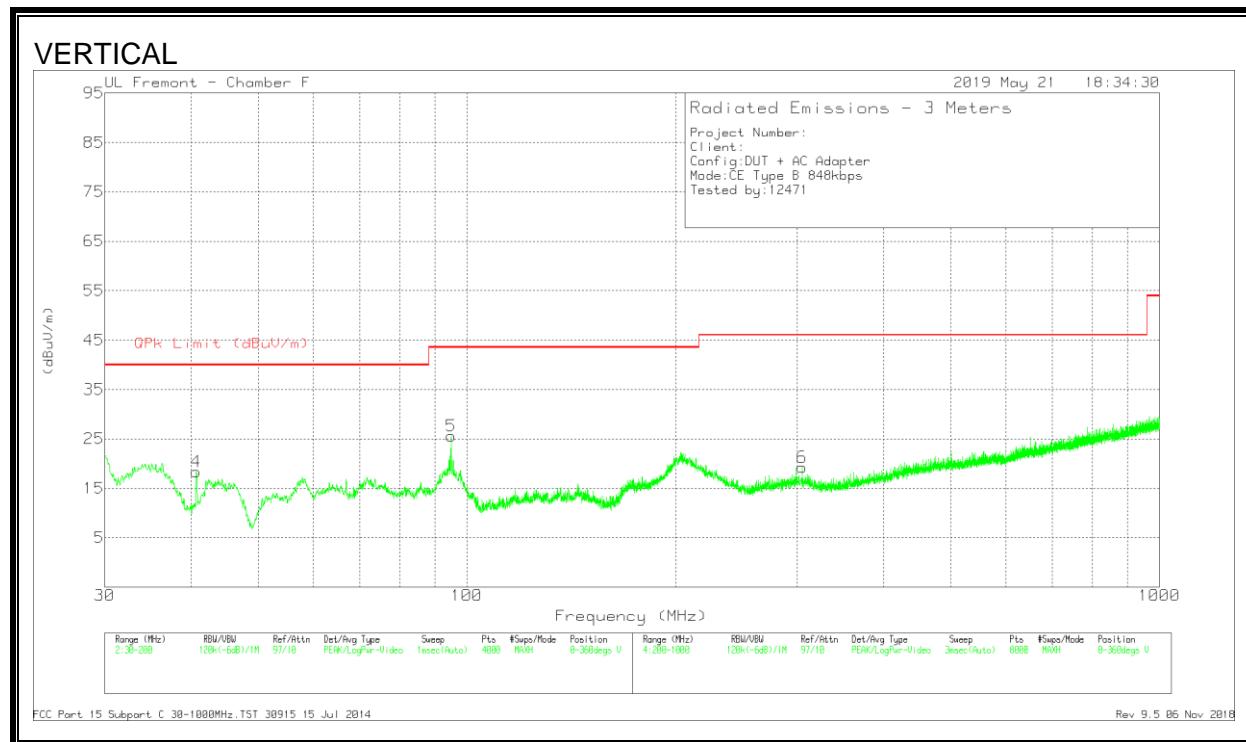
Note: Marker 3 and 6 are the fundamental signal.

### 8.3. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

#### 8.3.1. CE MODE

##### SPURIOUS EMISSION 848Kbps





Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	75.825	25.37	Qp	11.8	-31.4	5.77	40	-34.23	122	240	H
2	94.9124	42.55	Qp	12.7	-31.2	24.05	43.52	-19.47	347	296	H
4	40.6737	30.8	Qp	17.8	-31.8	16.8	40	-23.2	18	108	V
5	94.9196	42.56	Qp	12.7	-31.2	24.06	43.52	-19.46	94	108	V
3	* 281.0279	28.09	Qp	17.3	-29.9	15.49	46.02	-30.53	106	126	H
6	304.9369	25.61	Qp	17.5	-29.9	13.21	46.02	-32.81	100	123	V

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

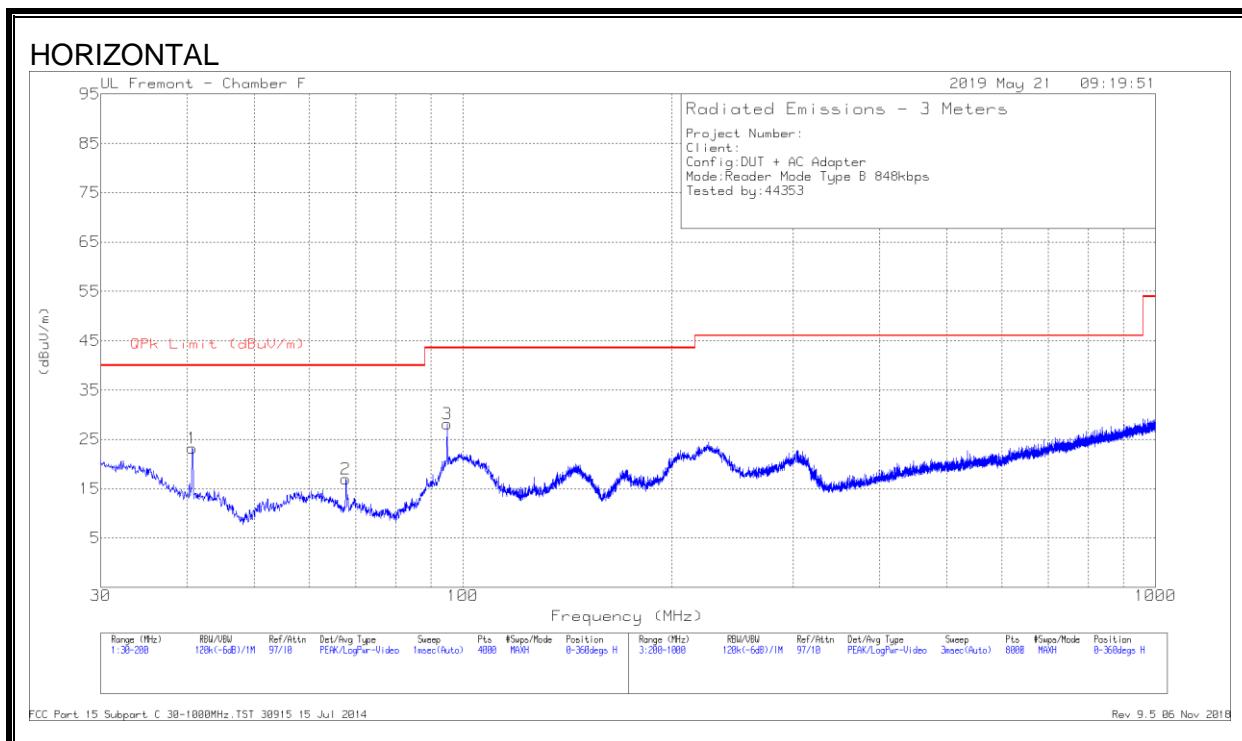
Qp - Quasi-Peak detector

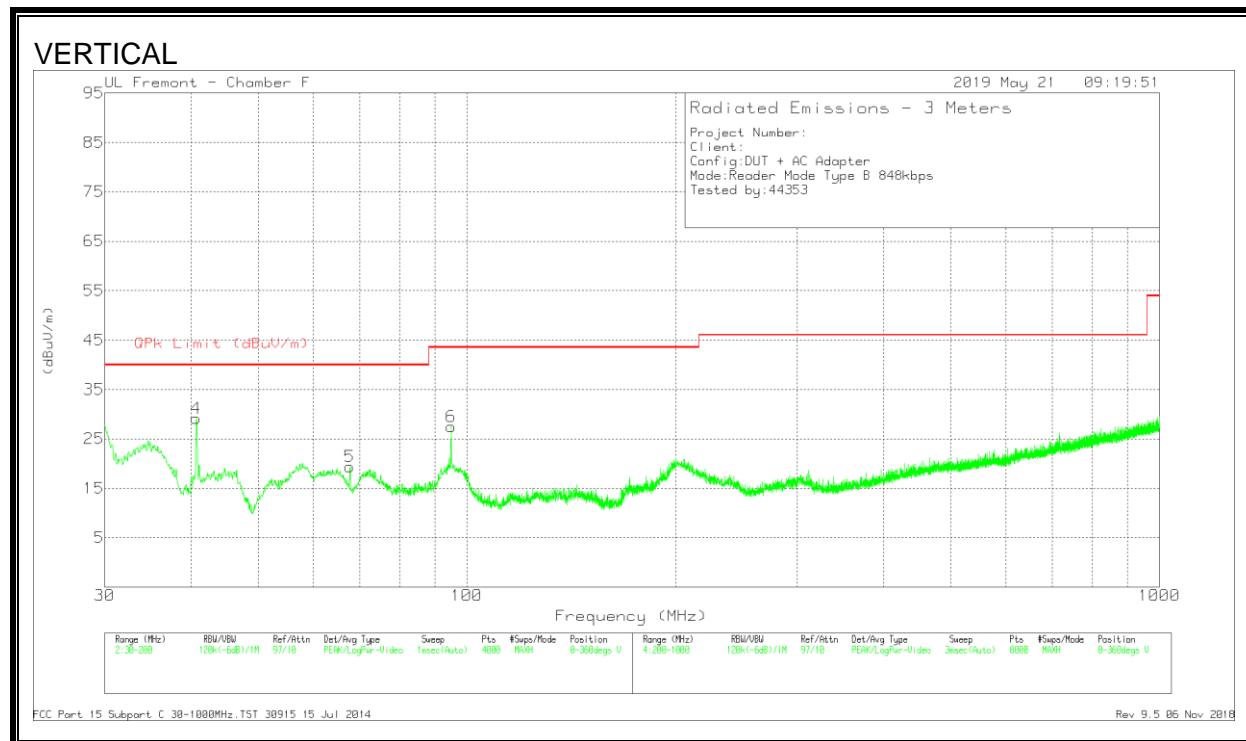
FCC Part 15 Subpart C 30-1000MHz.TST 30915 15 Jul 2014

Rev 9.5 06 Nov 2018

### 8.3.2. READER MODE

#### SPURIOUS EMISSION 848Kbps





## DATA

### Radiated Emissions

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
40.6708	36.43	Qp	17.8	-31.8	22.43	40	-17.57	122	381	H
67.799	35.81	Qp	12.2	-31.5	16.51	40	-23.49	116	232	H
94.921	45.22	Qp	12.7	-31.2	26.72	43.52	-16.8	351	172	H
40.6833	42.42	Qp	17.8	-31.8	28.42	40	-11.58	191	104	V
67.7947	37.71	Qp	12.2	-31.5	18.41	40	-21.59	293	125	V
94.921	44.86	Qp	12.7	-31.2	26.36	43.52	-17.16	99	100	V

Qp - Quasi-Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 15 Jul 2014

Rev 9.5 06 Nov 2018

## 9. FREQUENCY STABILITY

### LIMIT

§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.

IC RSS-210, Annex B.6

Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

### TEST PROCEDURE

ANSI C63.10-2013 Clause 6.8

### RESULTS

No non-compliance noted.

ID:	38602	Date:	5/15/19
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## 9.1. CE MODE

### 848Kbps

#### CE MODE TYPE A 848 Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20°C										
		Limit: ± 100 ppm = 1.35600 KHz								
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
		Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5600471	9.735	13.5600455	9.621	13.5600443	9.532	13.5600431	9.443	± 100
	40	13.5600438	9.495	13.5598955	-1.441	13.5598972	-1.315	13.5598986	-1.212	± 100
	30	13.5600545	10.281	13.5600570	10.466	13.5600598	10.672	13.5600629	10.906	± 100
	20	<b>13.5600531</b>	<b>10.182</b>	<b>13.5600558</b>	<b>10.381</b>	<b>13.5600588</b>	<b>10.603</b>	<b>13.5600620</b>	<b>10.836</b>	<b>± 100</b>
	10	13.5602632	25.675	13.5601131	14.605	13.5601118	14.512	13.5601104	14.408	± 100
	0	13.5601161	14.829	13.5601758	19.229	13.5601906	20.319	13.5601601	18.072	± 100
	-10	13.5601064	14.110	13.5599592	3.256	13.5599707	4.108	13.5599617	3.438	± 100
	-20	13.5599634	3.568	13.5601588	17.974	13.5601848	19.896	13.5602150	22.117	± 100
3.23	20	13.5600885	-2.611	13.5600954	-3.116	13.5600961	-3.169	13.5601012	-3.546	± 100
4.37	20	13.5601908	-10.151	13.5600642	-0.818	13.5600654	-0.903	13.5600668	-1.012	± 100

## 9.2. READER MODE

### 848Kbps

#### READER MODE TYPE A 848Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20°C										
		Limit: ± 100 ppm = 1.35600 KHz								
Power Supply	Envir. Temp	Frequency Deviation Measured with Time Elapse								
		Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
3.80	50	13.5600384	2.816	13.5600380	2.846	13.5600380	2.843	13.5600389	2.774	± 100
	40	13.5600379	2.853	13.5600377	2.869	13.5600376	2.872	13.5600377	2.867	± 100
	30	13.5598315	18.071	13.5600240	3.878	13.5600011	5.566	13.5600105	4.873	± 100
	20	<b>13.5600766</b>	<b>0.000</b>	<b>13.5600752</b>	<b>0.100</b>	<b>13.5600738</b>	<b>0.201</b>	<b>13.5600725</b>	<b>0.296</b>	<b>± 100</b>
	10	13.5600355	3.029	13.5600354	3.036	13.5600789	-0.170	13.5600207	4.123	± 100
	0	13.5600960	-1.433	13.5600984	-1.609	13.5601007	-1.783	13.5601029	-1.943	± 100
	-10	13.5600545	1.630	13.5600617	1.096	13.5600536	1.697	13.5600345	3.099	± 100
	-20	13.5601118	-2.596	13.5601112	-2.553	13.5601104	-2.493	13.5601093	-2.417	± 100
3.23	20	13.5600940	-1.286	13.5600904	-1.022	13.5600893	-0.939	13.5600888	-0.904	± 100
4.37	20	13.5600643	0.905	13.5600590	1.297	13.5600564	1.490	13.5600542	1.648	± 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 C63.10:2013

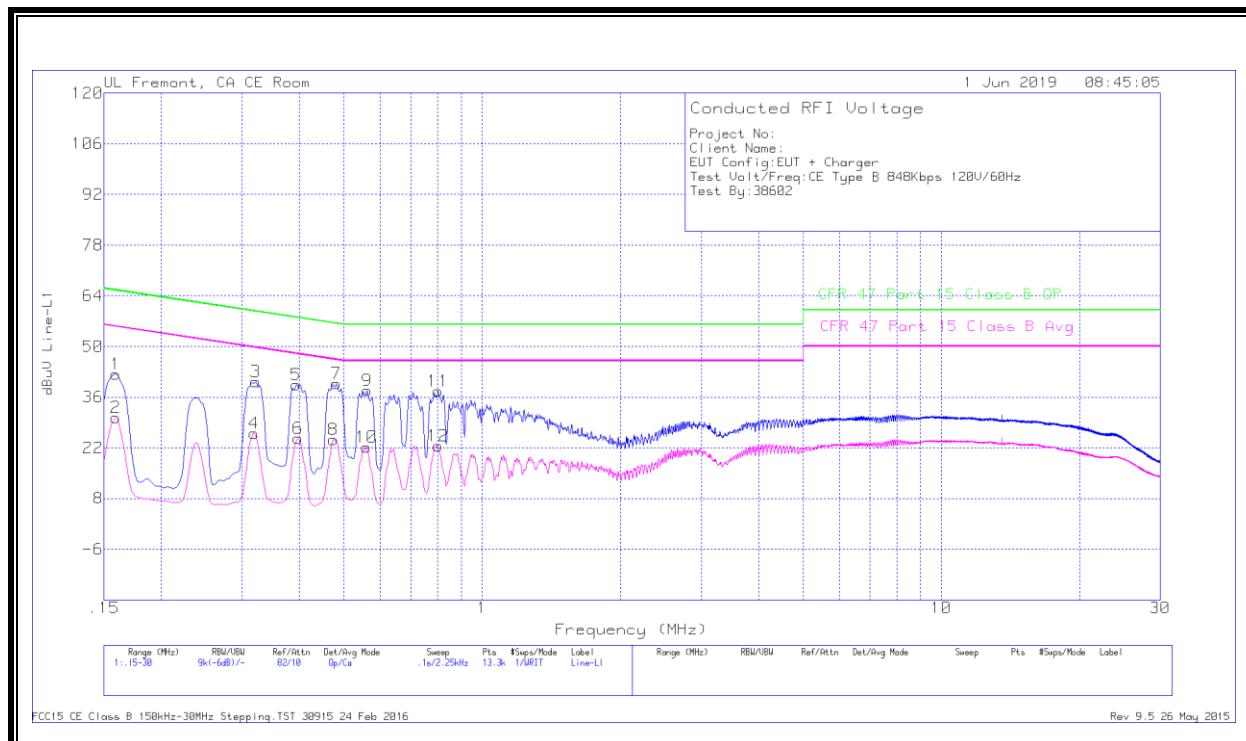
### RESULTS

No non-compliance noted:

## 10.1. CE MODE

### 10.1.1. NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

#### LINE 1 RESULTS



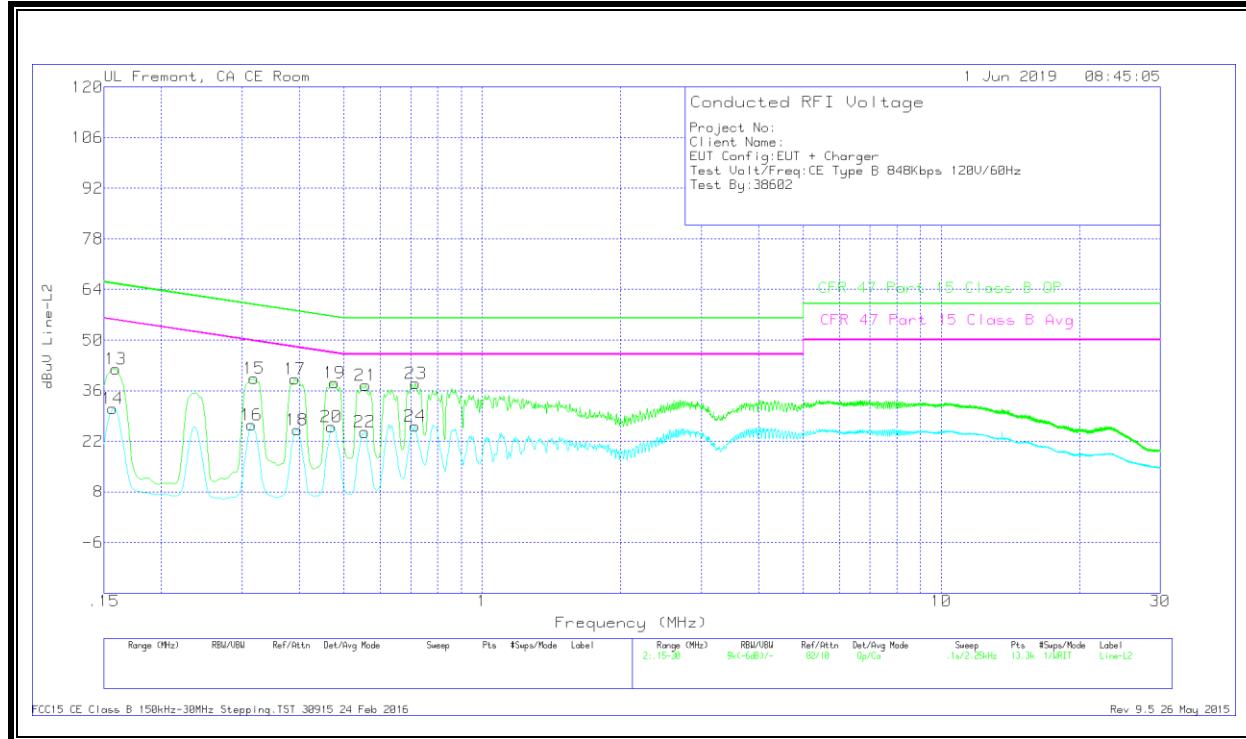
#### WORST EMISSIONS

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	32.09	Qp	.1	0	10.1	42.29	65.52	-23.23	-	-
2	.159	20.19	Ca	.1	0	10.1	30.39	-	-	55.52	-25.13
3	.321	30.17	Qp	0	0	10.1	40.27	59.68	-19.41	-	-
4	.31875	15.99	Ca	0	0	10.1	26.09	-	-	49.74	-23.65
5	.393	29.35	Qp	0	0	10.1	39.45	58	-18.55	-	-
6	.3975	14.56	Ca	0	0	10.1	24.66	-	-	47.91	-23.25
7	.48075	29.66	Qp	0	0	10.1	39.76	56.33	-16.57	-	-
8	.474	14.23	Ca	0	0	10.1	24.33	-	-	46.44	-22.11
9	.56175	27.7	Qp	0	0	10.1	37.8	56	-18.2	-	-
10	.5595	12.06	Ca	0	0	10.1	22.16	-	-	46	-23.84
11	.8025	27.49	Qp	0	0	10.1	37.59	56	-18.41	-	-
12	.8025	12.46	Ca	0	0	10.1	22.56	-	-	46	-23.44

Qp - Quasi-Peak detector

Ca - CISPR average detection

## LINE 2 RESULTS



## WORST EMISSIONS

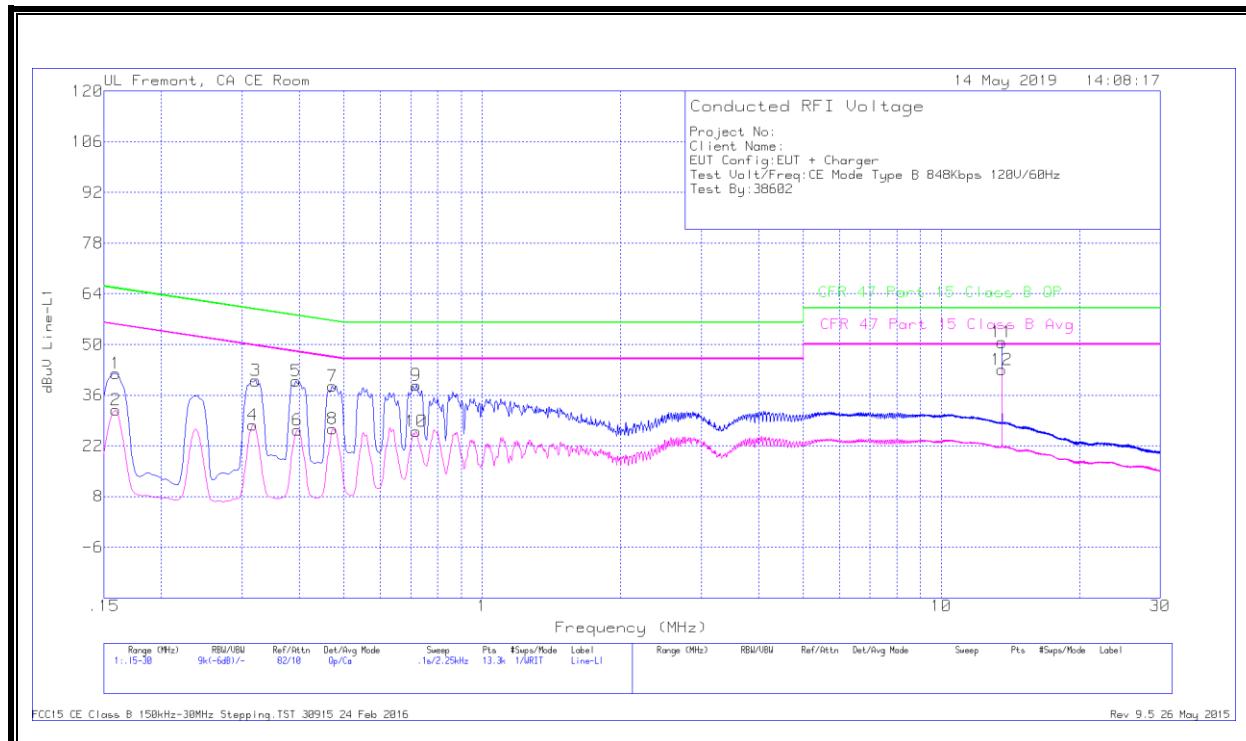
Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR )Margin (dB)
13	.159	30.99	Qp	.1	0	10.1	41.19	65.52	-24.33	-	-
14	.159	19.73	Ca	.1	0	10.1	29.93	-	-	55.52	-25.59
15	.31875	30.15	Qp	0	0	10.1	40.25	59.74	-19.49	-	-
16	.3165	16.83	Ca	0	0	10.1	26.93	-	-	49.8	-22.87
17	.39075	28.63	Qp	0	0	10.1	38.73	58.05	-19.32	-	-
18	.39525	14.63	Ca	0	0	10.1	24.73	-	-	47.95	-23.22
19	.4785	29.46	Qp	0	0	10.1	39.56	56.37	-16.81	-	-
20	.47175	14.6	Ca	0	0	10.1	24.7	-	-	46.48	-21.78
21	.798	28.5	Qp	0	0	10.1	38.6	56	-17.4	-	-
22	.79575	14.23	Ca	0	0	10.1	24.33	-	-	46	-21.67
23	13.56	42.6	Qp	.1	.2	10.2	53.1	60	-6.9	-	-
24	13.56	33.73	Ca	.1	.2	10.2	44.23	-	-	50	-5.77

Qp - Quasi-Peak detector

Ca - CISPR average detection

### 10.1.2. NORMAL OPERATION WITHOUT ANTENNA PORT TERMINATED, 848Kbps

#### LINE 1 RESULTS



#### WORST EMISSIONS

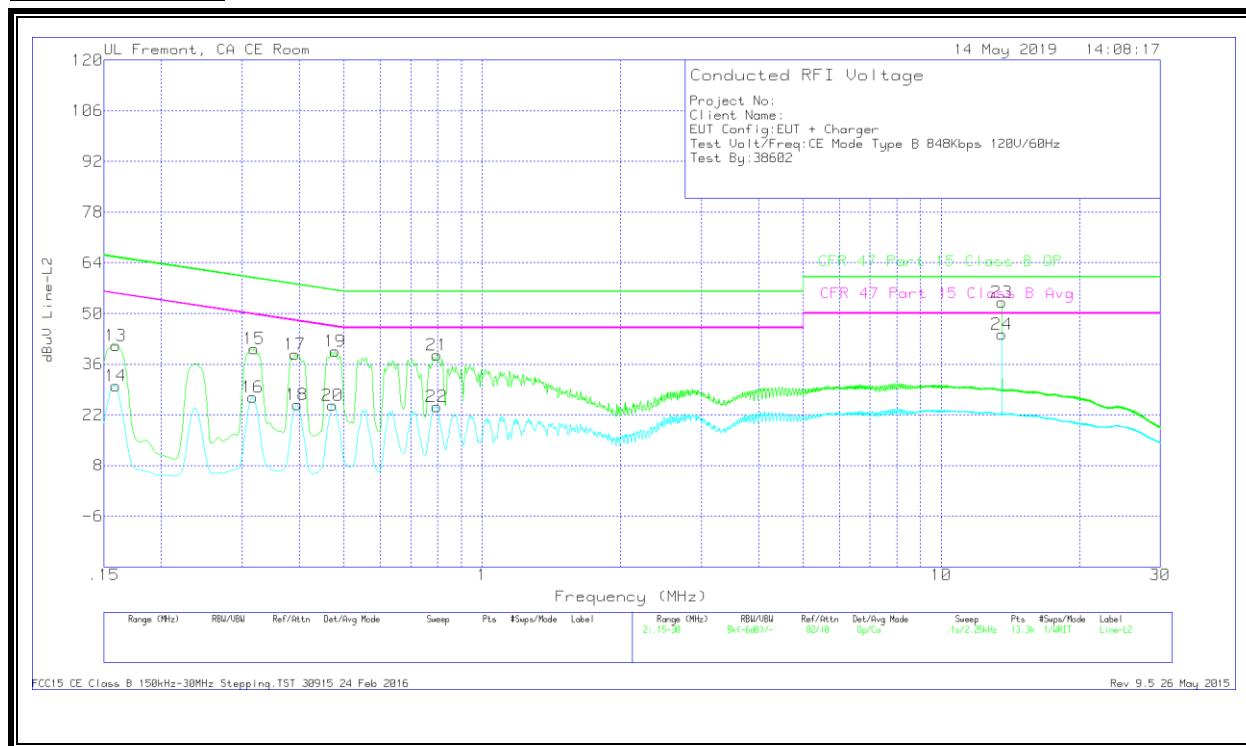
Range 1: Line-L1 .15 - 30MHz												
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR )Margin (dB)	
1	.159	31.81	Qp	.1	0	10.1	42.01	65.52	-23.51	-	-	
2	.159	21.67	Ca	.1	0	10.1	31.87	-	-	55.52	-23.65	
3	.321	29.91	Qp	0	0	10.1	40.01	59.68	-19.67	-	-	
4	.3165	17.68	Ca	0	0	10.1	27.78	-	-	49.8	-22.02	
5	.393	29.77	Qp	0	0	10.1	39.87	58	-18.13	-	-	
6	.39525	16.2	Ca	0	0	10.1	26.3	-	-	47.95	-21.65	
7	.47175	28.5	Qp	0	0	10.1	38.6	56.48	-17.88	-	-	
8	.47175	16.6	Ca	0	0	10.1	26.7	-	-	46.48	-19.78	
9	.71925	28.68	Qp	0	0	10.1	38.78	56	-17.22	-	-	
10	.71925	15.94	Ca	0	0	10.1	26.04	-	-	46	-19.96	
11	13.56	40.11	Qp	.1	.2	10.2	50.61	60	-9.39	-	-	
12	13.56	32.47	Ca	.1	.2	10.2	42.97	-	-	50	-7.03	

Qp - Quasi-Peak detector

Ca - CISPR average detection

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

## 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	30.99	Qp	.1	0	10.1	41.19	65.52	-24.33	-	-
14	.159	19.73	Ca	.1	0	10.1	29.93	-	-	55.52	-25.59
15	.31875	30.15	Qp	0	0	10.1	40.25	59.74	-19.49	-	-
16	.3165	16.83	Ca	0	0	10.1	26.93	-	-	49.8	-22.87
17	.39075	28.63	Qp	0	0	10.1	38.73	58.05	-19.32	-	-
18	.39525	14.63	Ca	0	0	10.1	24.73	-	-	47.95	-23.22
19	.4785	29.46	Qp	0	0	10.1	39.56	56.37	-16.81	-	-
20	.47175	14.6	Ca	0	0	10.1	24.7	-	-	46.48	-21.78
21	.798	28.5	Qp	0	0	10.1	38.6	56	-17.4	-	-
22	.79575	14.23	Ca	0	0	10.1	24.33	-	-	46	-21.67
23	13.56	42.6	Qp	.1	.2	10.2	53.1	60	-6.9	-	-
24	13.56	33.73	Ca	.1	.2	10.2	44.23	-	-	50	-5.77

Qp - Quasi-Peak detector

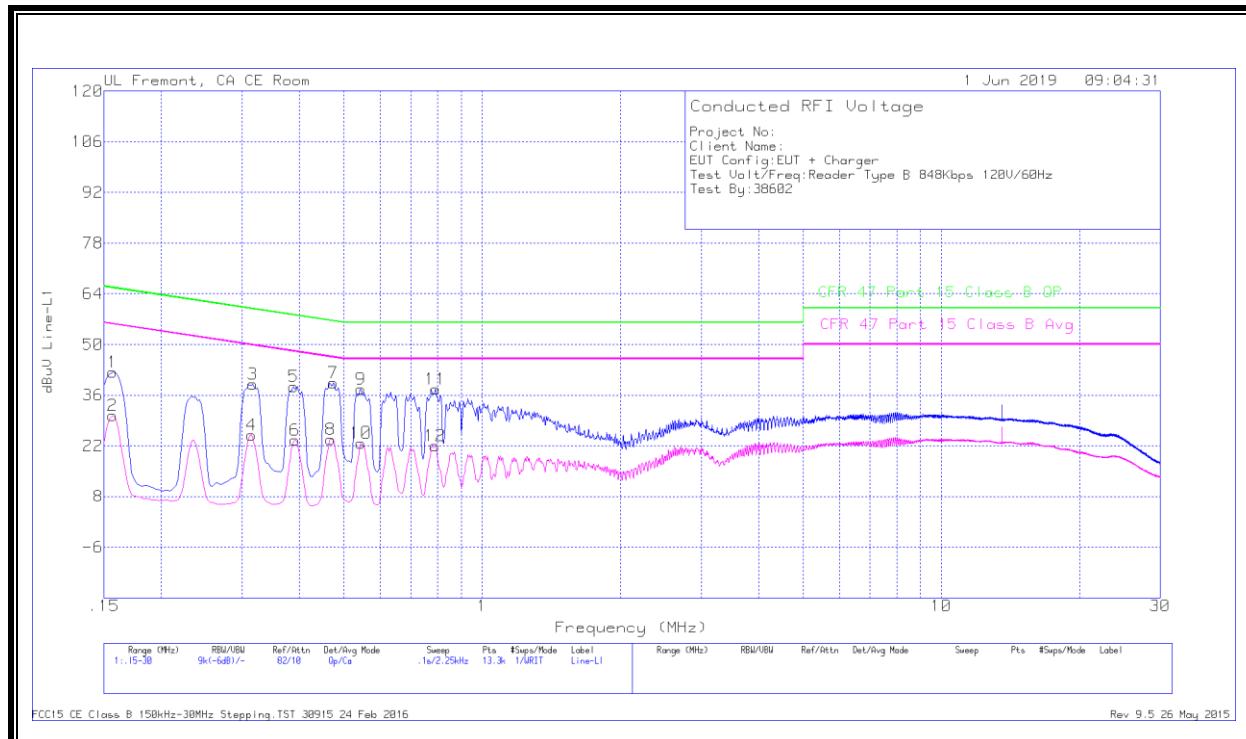
Ca - CISPR average detection

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

## 10.2. READER MODE

### 10.2.1. NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

#### LINE 1 RESULTS



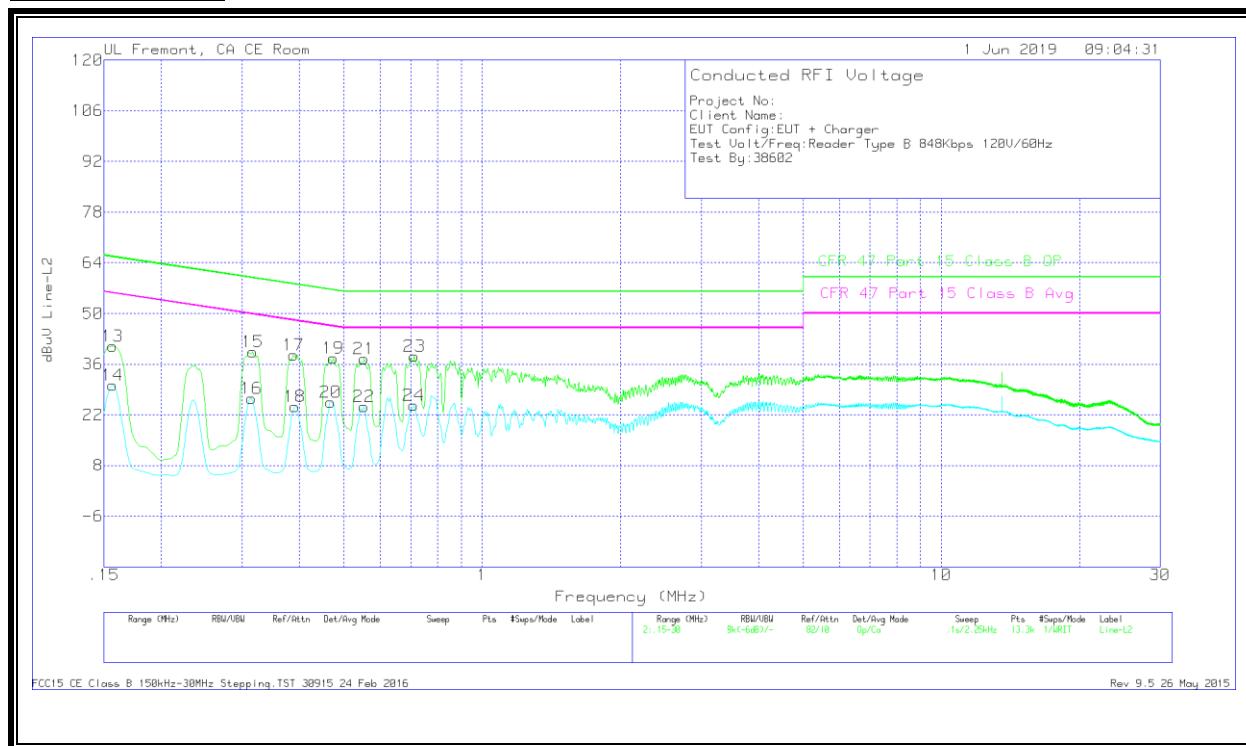
#### WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBm)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBm	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.15675	32.16	Qp	.1	0	10.1	42.36	65.63	-23.27	-	-
2	.15675	20.2	Ca	.1	0	10.1	30.4	-	-	55.63	-25.23
3	.3165	28.97	Qp	0	0	10.1	39.07	59.8	-20.73	-	-
4	.31425	14.83	Ca	0	0	10.1	24.93	-	-	49.86	-24.93
5	.3885	28.3	Qp	0	0	10.1	38.4	58.1	-19.7	-	-
6	.39075	13.47	Ca	0	0	10.1	23.57	-	-	48.05	-24.48
7	.474	29.35	Qp	0	0	10.1	39.45	56.44	-16.99	-	-
8	.46725	13.72	Ca	0	0	10.1	23.82	-	-	46.56	-22.74
9	.54375	27.62	Qp	0	0	10.1	37.72	56	-18.28	-	-
10	.54375	12.69	Ca	0	0	10.1	22.79	-	-	46	-23.21
11	.79125	27.56	Qp	0	0	10.1	37.66	56	-18.34	-	-
12	.789	11.93	Ca	0	0	10.1	22.03	-	-	46	-23.97

Qp - Quasi-Peak detector

Ca - CISPR average detection

## LINE 2 RESULTS



## WORST EMISSIONS

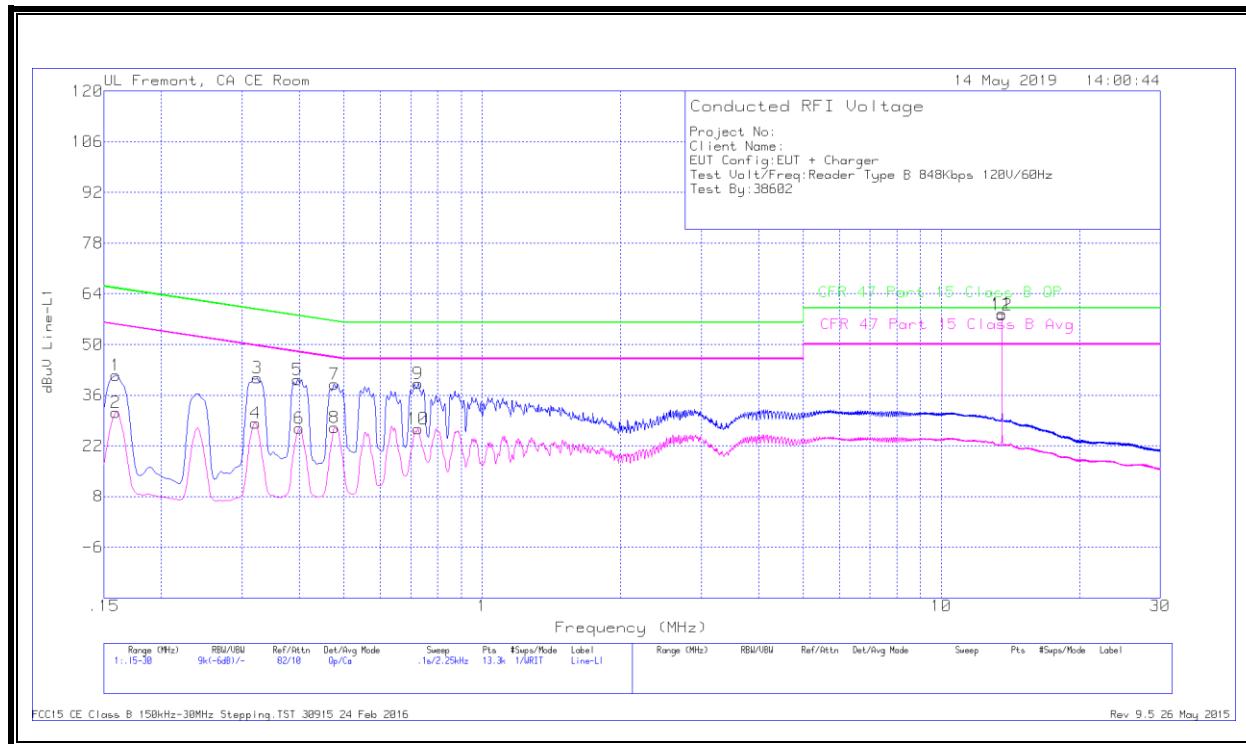
Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR )Margin (dB)
13	.15675	30.73	Qp	.1	0	10.1	40.93	65.63	-24.7	-	-
14	.15675	20.01	Ca	.1	0	10.1	30.21	-	-	55.63	-25.42
15	.3165	29.29	Qp	0	0	10.1	39.39	59.8	-20.41	-	-
16	.31425	16.36	Ca	0	0	10.1	26.46	-	-	49.86	-23.4
17	.3885	28.39	Qp	0	0	10.1	38.49	58.1	-19.61	-	-
18	.39075	14.18	Ca	0	0	10.1	24.28	-	-	48.05	-23.77
19	.474	27.48	Qp	0	0	10.1	37.58	56.44	-18.86	-	-
20	.46725	15.32	Ca	0	0	10.1	25.42	-	-	46.56	-21.14
21	.55275	27.42	Qp	0	0	10.1	37.52	56	-18.48	-	-
22	.55275	14.14	Ca	0	0	10.1	24.24	-	-	46	-21.76
23	.7125	28.05	Qp	0	0	10.1	38.15	56	-17.85	-	-
24	.71025	14.57	Ca	0	0	10.1	24.67	-	-	46	-21.33

Qp - Quasi-Peak detector

Ca - CISPR average detection

## 10.2.2. NORMAL OPERATION WITHOUT ANTENNA PORT TERMINATED, 848Kbps

### LINE 1 RESULTS



### WORST EMISSIONS

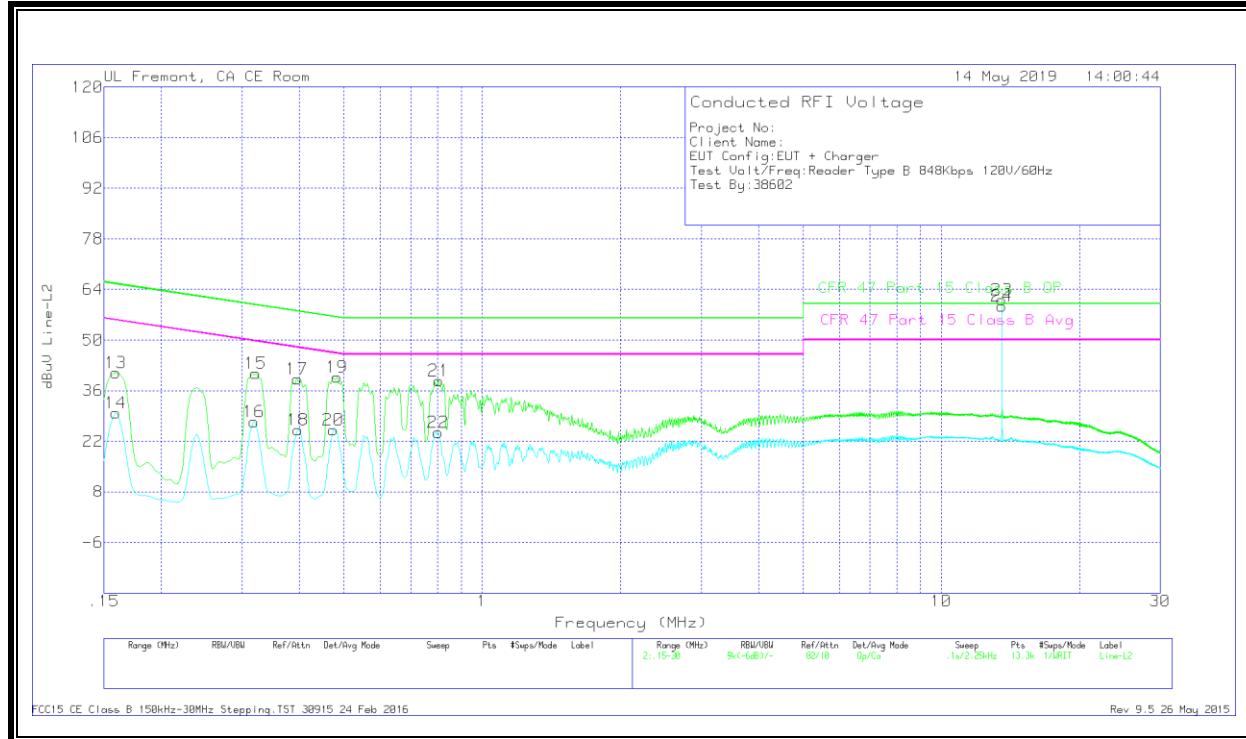
Range 1: Line-L1 .15 - 30MHz												
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR )Margin (dB)	
1	.159	31.29	Qp	.1	0	10.1	41.49	65.52	-24.03	-	-	
2	.159	21.08	Ca	.1	0	10.1	31.28	-	-	55.52	-24.24	
3	.32325	30.75	Qp	0	0	10.1	40.85	59.62	-18.77	-	-	
4	.321	18.17	Ca	0	0	10.1	28.27	-	-	49.68	-21.41	
5	.39525	30.17	Qp	0	0	10.1	40.27	57.95	-17.68	-	-	
6	.39975	16.71	Ca	0	0	10.1	26.81	-	-	47.86	-21.05	
7	.47625	28.92	Qp	0	0	10.1	39.02	56.4	-17.38	-	-	
8	.47625	16.97	Ca	0	0	10.1	27.07	-	-	46.4	-19.33	
9	.726	29.17	Qp	0	0	10.1	39.27	56	-16.73	-	-	
10	.726	16.58	Ca	0	0	10.1	26.68	-	-	46	-19.32	
11	13.56	48.06	Qp	.1	.2	10.2	58.56	60	-1.44	-	-	
12	13.56	47.65	Ca	.1	.2	10.2	58.15	-	-	50	8.15	

Qp - Quasi-Peak detector

Ca - CISPR average detection

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

## 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	30.76	Qp	.1	0	10.1	40.96	65.52	-24.56	-	-
14	.159	19.61	Ca	.1	0	10.1	29.81	-	-	55.52	-25.71
15	.321	30.71	Qp	0	0	10.1	40.81	59.68	-18.87	-	-
16	.31875	17.34	Ca	0	0	10.1	27.44	-	-	49.74	-22.3
17	.39525	29.06	Qp	0	0	10.1	39.16	57.95	-18.79	-	-
18	.3975	15.07	Ca	0	0	10.1	25.17	-	-	47.91	-22.74
19	.483	29.62	Qp	0	0	10.1	39.72	56.29	-16.57	-	-
20	.474	15.03	Ca	0	0	10.1	25.13	-	-	46.44	-21.31
21	.80362	28.68	Qp	0	0	10.1	38.78	56	-17.22	-	-
22	.8025	14.36	Ca	0	0	10.1	24.46	-	-	46	-21.54
23	13.56	50.67	Qp	.1	.2	10.2	61.17	60	1.17	-	-
24	13.56	48.89	Ca	.1	.2	10.2	59.39	-	-	50	9.39

Qp - Quasi-Peak detector

Ca - CISPR average detection

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

## END OF REPORT

## 11. SETUP PHOTOS

Please refer to 12607353-EP1V1 for setup photos