



CERTIFICATION TEST REPORT

Report Number. : 12607346-E11V2

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

Model : A2160, A2216, AND A2217

FCC ID : BCG-E3305A

IC : 579C-E3305A

EUT Description : SMARTPHONE

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

Date Of Issue:
August 05, 2019

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	7/29/2019	Initial Issue	Chin Pang
V2	8/5/2019	Address TCB Questions	Chris Xiong

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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: A2160, A2216 AND A2217

SERIAL NUMBER: C39YV073N2R5 (Conducted), C39YJ033MKLX (Radiated)

DATE TESTED: MAY 14, 2019 – JUNE 06, 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
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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 checked="" 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

The Apple iPhone, 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, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM is either UICC based, electronic SIM (e-SIM), or second SIM is not present. The device has a built-in inductive charging receiver which is not user accessible. The rechargeable battery is not user accessible.

5.2. DIFFERENCE IN MODEL NUMBER

Model A2160, A2216 and A2217 is electrically identical to Model A2160. Three model numbers are allocated for marketing and logistic purposes only. A2160 was used to perform all final tests.

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	21.22
		Reader	848	19.09

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

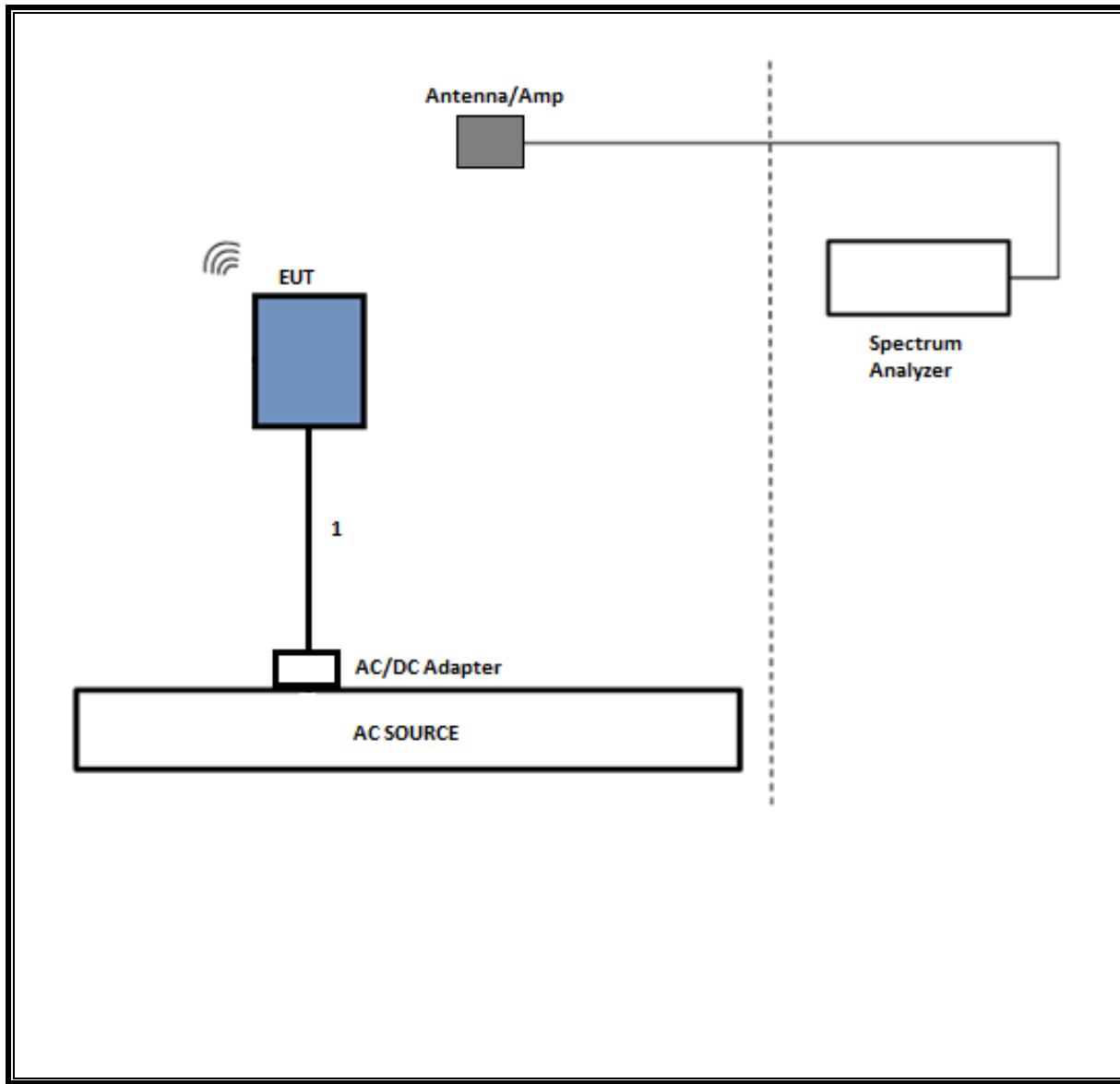
I/O CABLES

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

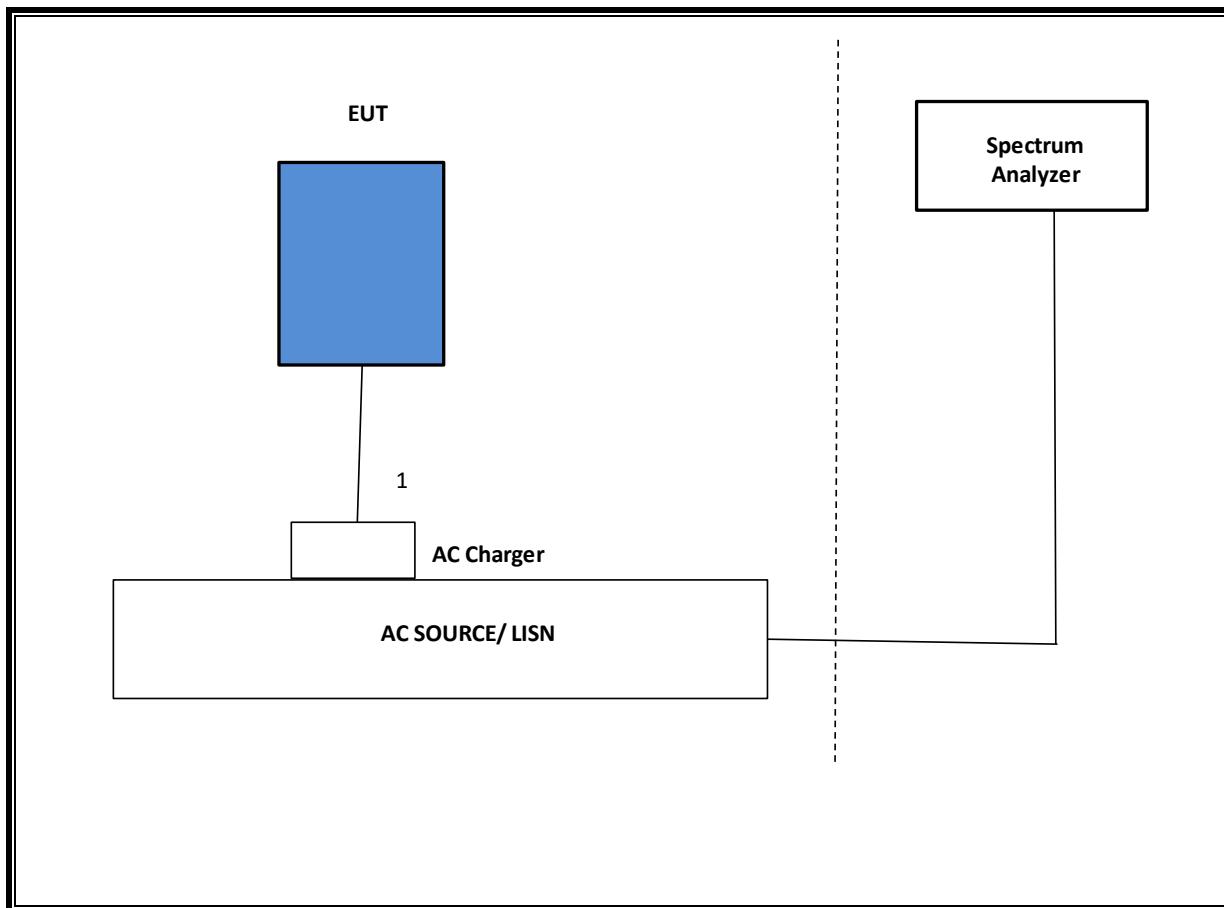
TEST SETUP

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	JB1	T407	06/11/2019
Amplifier, 9KHz to 1GHz, 32dB	Sonoma	310N	PRE0180176	05/03/2020
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1454	01/23/2020
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	08/15/2019
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T757	09/25/2019
*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	T189	06/12/2019
Spectrum Analyzer, PXA, 3Hz to 50GHz w/Ext. Mixer	Agilent (Keysight) Technologies	N9030A	T342	01/23/2020
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	02/14/2020
Power Cable, Line Conducted Emissions	UL	PG1	T861	08/31/2019
*LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/19/2019
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	

*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

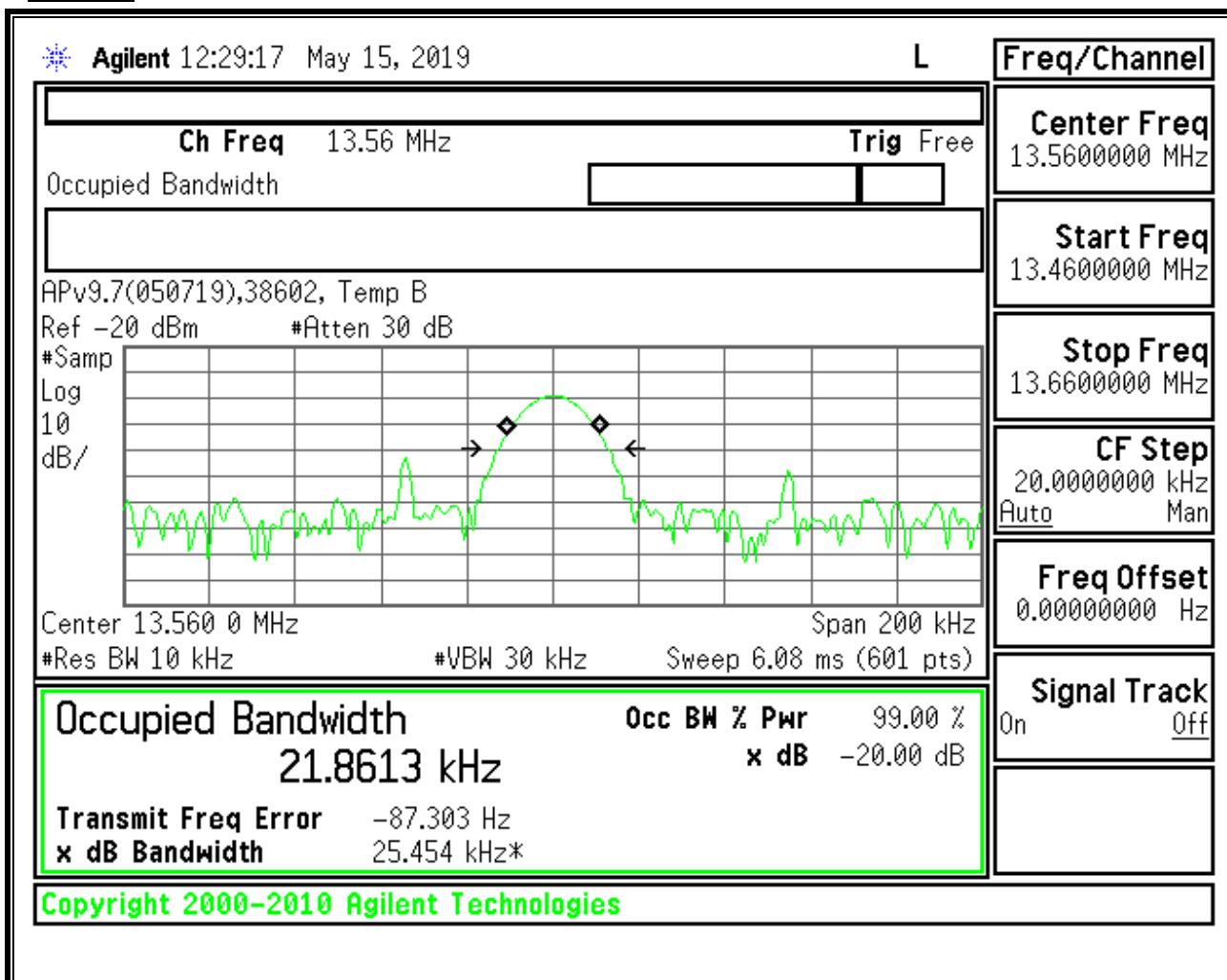
Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	21.8613	25.454

READER MODE

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	21.8731	25.602

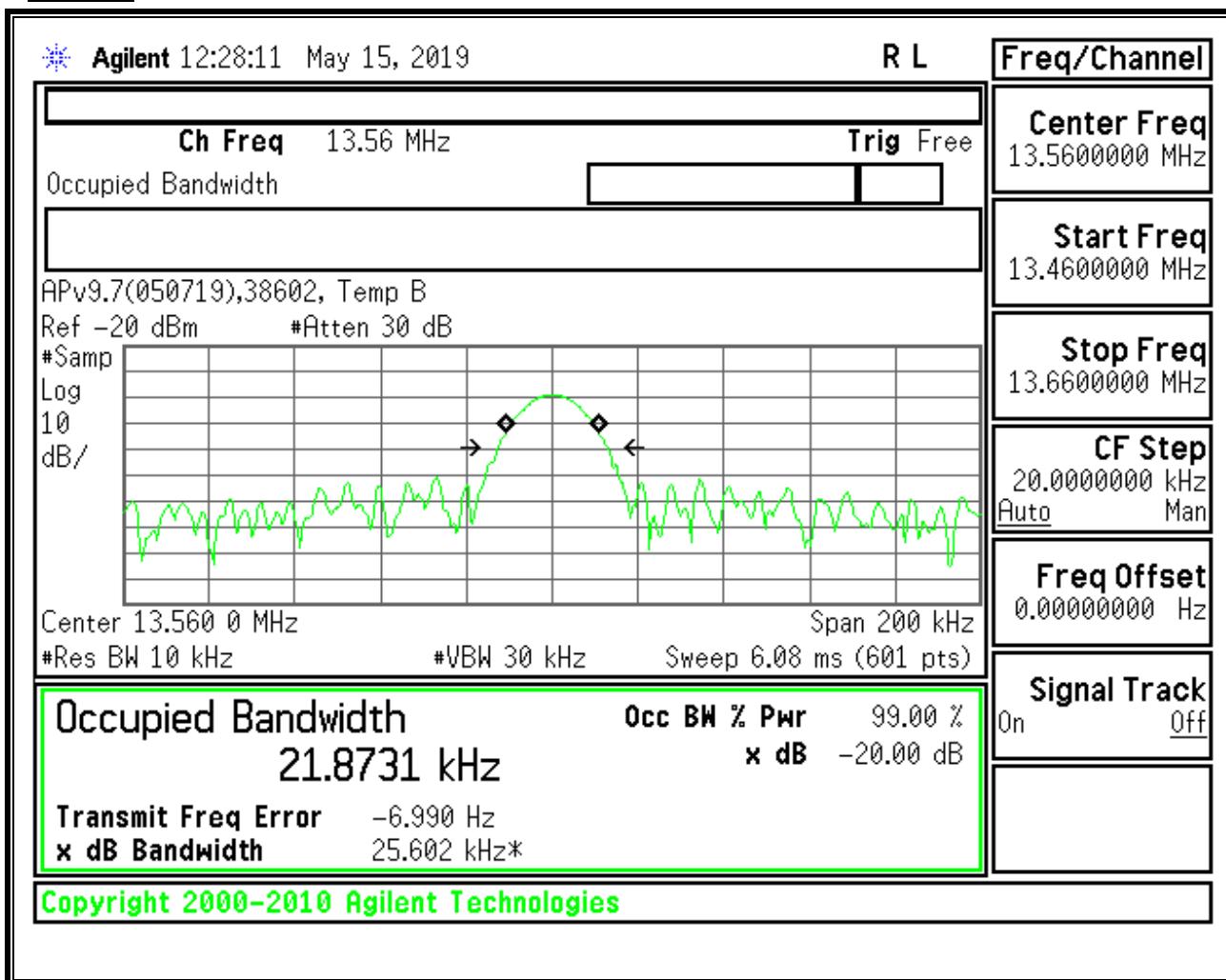
7.1. CE MODE

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 (μ 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 μ V/m to dB μ V/m is:

Limit (dB μ V/m) = 20 log limit (μ V/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

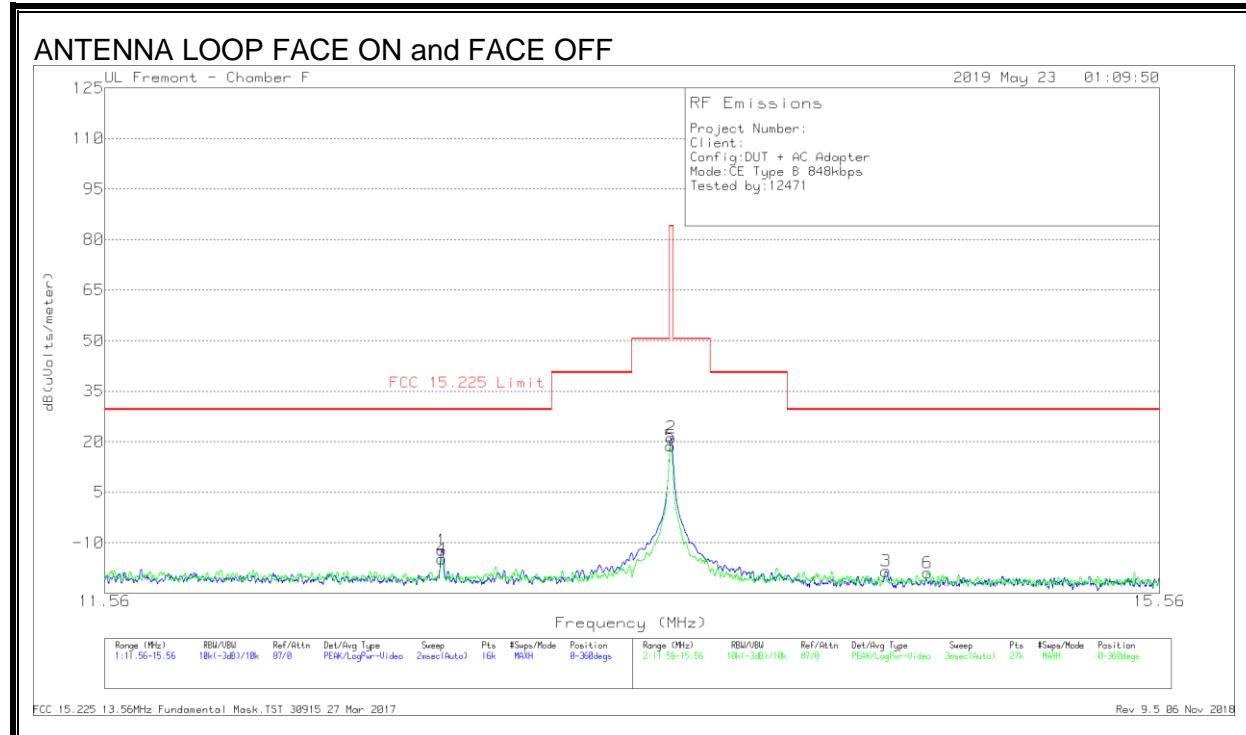
The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

RESULTS

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

8.2.1. CE MODE

FUNDAMENTAL 848Kbps



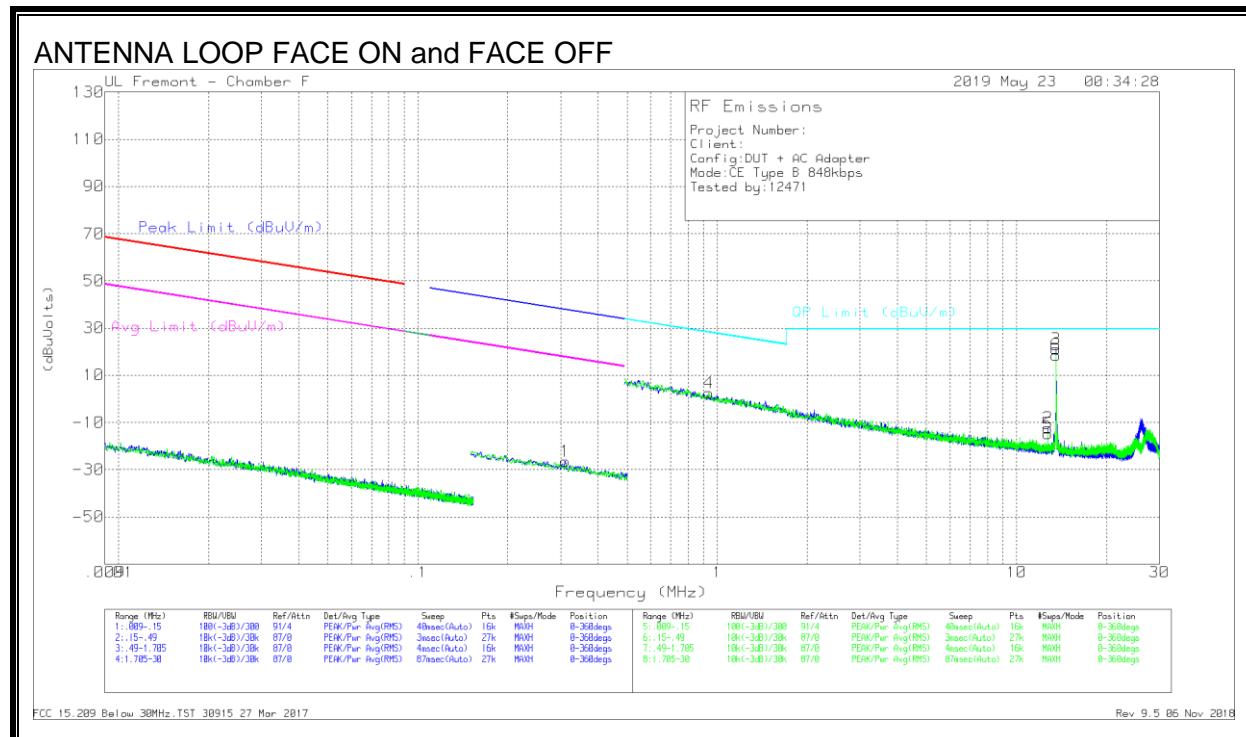
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	12.71138	17.11	Pk	10.2	.4	-40	-12.29	29.54	-41.83	0-360
2	13.55975	50.72	Pk	10.1	.4	-40	21.22	84	-62.78	0-360
3	14.40575	11.16	Pk	10	.4	-40	-18.44	29.54	-47.98	0-360
4	12.71122	14.61	Pk	10.2	.4	-40	-14.79	29.54	-44.33	0-360
5	13.55793	48.14	Pk	10.1	.4	-40	18.64	84	-65.36	0-360
6	14.57676	10.76	Pk	10	.4	-40	-18.84	29.54	-48.38	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 (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.31047	42.73	Pk	10.7	.1	-80	-26.47	37.77	-64.24	17.77	-44.24	0-360

Pk - Peak detector

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	12.71319	17.13	Pk	10.2	.4	-40	-12.27	29.5	-41.77	0-360
4	.93593	31.73	Pk	10.6	.1	-40	2.43	28.19	-25.76	0-360
5	12.71476	14.59	Pk	10.2	.4	-40	-14.81	29.5	-44.31	0-360

Pk - Peak detector

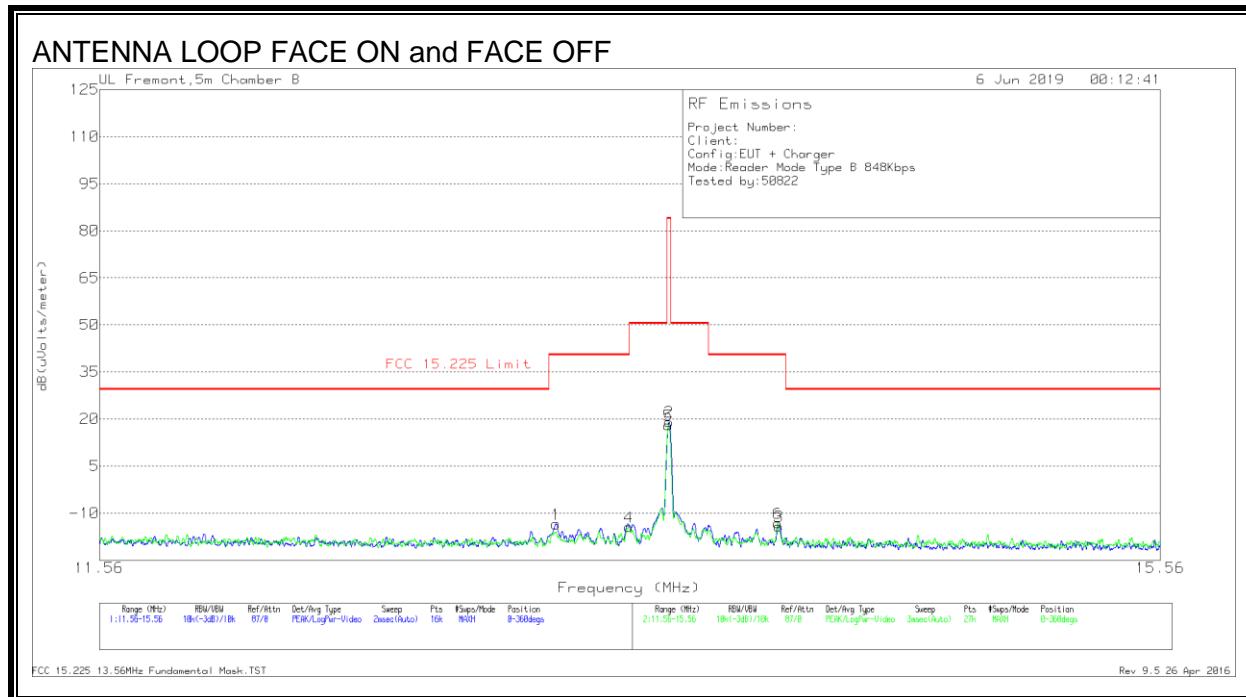
FCC 15.209 Below 30MHz.TST 30915 27 Mar 2017

Rev 9.5 06 Nov 2018

Note: Marker 3 and 6 are the fundamental signal.

8.2.2. READER MODE

FUNDAMENTAL 848Kbps



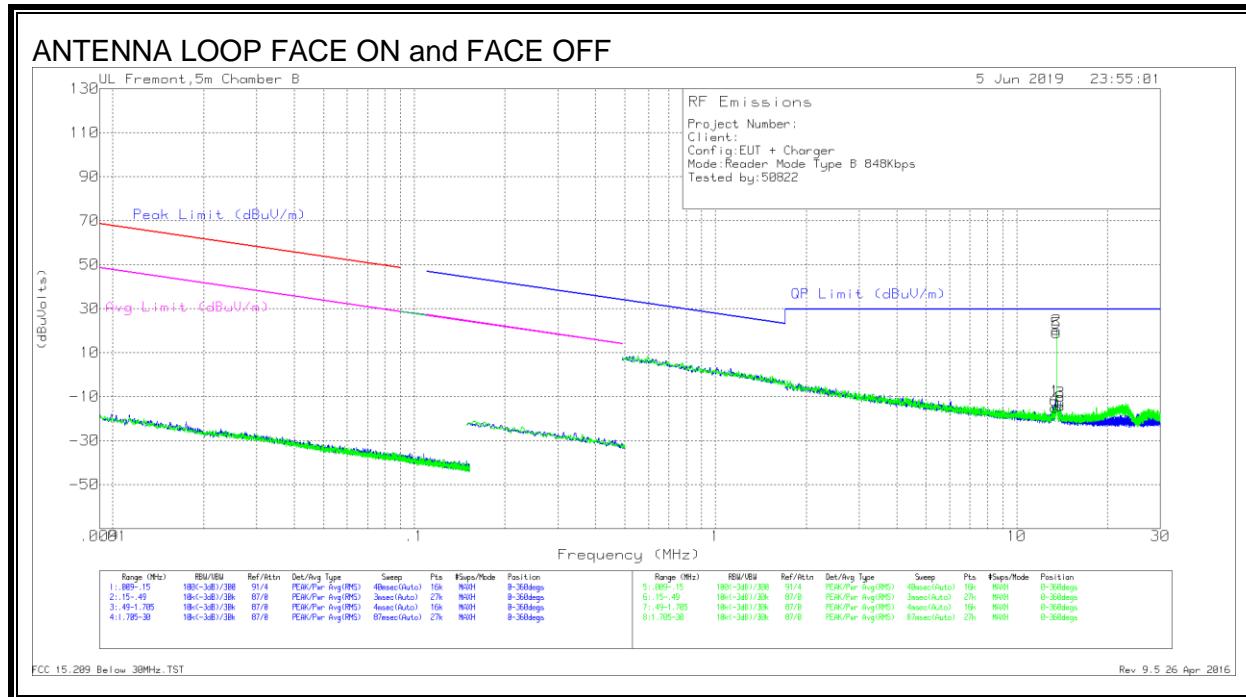
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	13.13788	15.34	Pk	10.7	.5	-40	-13.46	40.51	-53.97	0-360
4	13.40785	14.42	Pk	10.7	.5	-40	-14.38	40.51	-54.89	0-360
5	13.55807	46.95	Pk	10.6	.5	-40	18.05	84	-65.95	0-360
2	13.56013	47.99	Pk	10.6	.5	-40	19.09	84	-64.91	0-360
6	13.97943	15.72	Pk	10.6	.5	-40	-13.18	40.51	-53.69	0-360
3	13.98313	14.73	Pk	10.6	.5	-40	-14.17	40.51	-54.68	0-360

Pk - Peak detector

FCC 15.225 13.56MHz Fundamental Mask.TST

Rev 9.5 26 Apr 2016

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)
4	13.40697	13.33	Pk	11	.5	-40	-15.17	29.5	-44.67	0-360
1	13.42583	16.54	Pk	11	.5	-40	-11.96	29.5	-41.46	0-360
3	13.98284	15.84	Pk	11	.5	-40	-12.66	29.5	-42.16	0-360
6	13.98756	14.13	Pk	11	.5	-40	-14.37	29.5	-43.87	0-360

Pk - Peak detector

FCC 15.209 Below 30MHz.TST

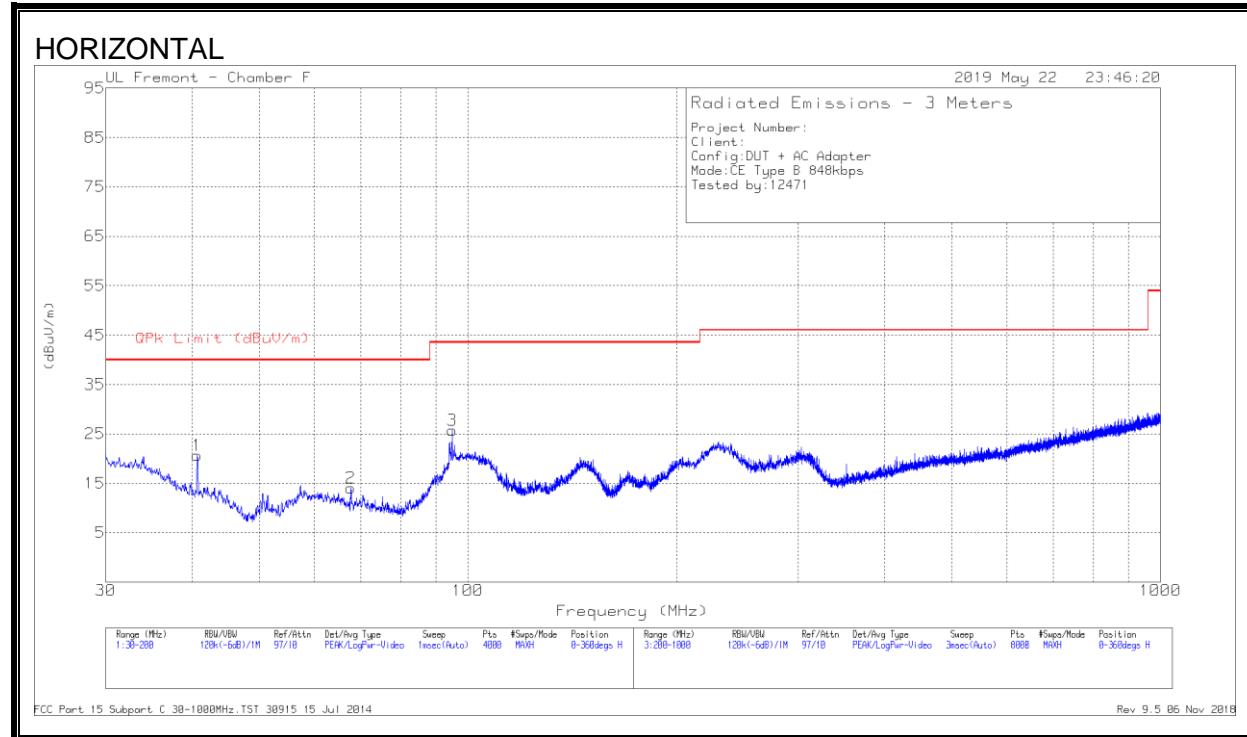
Rev 9.5 26 Apr 2016

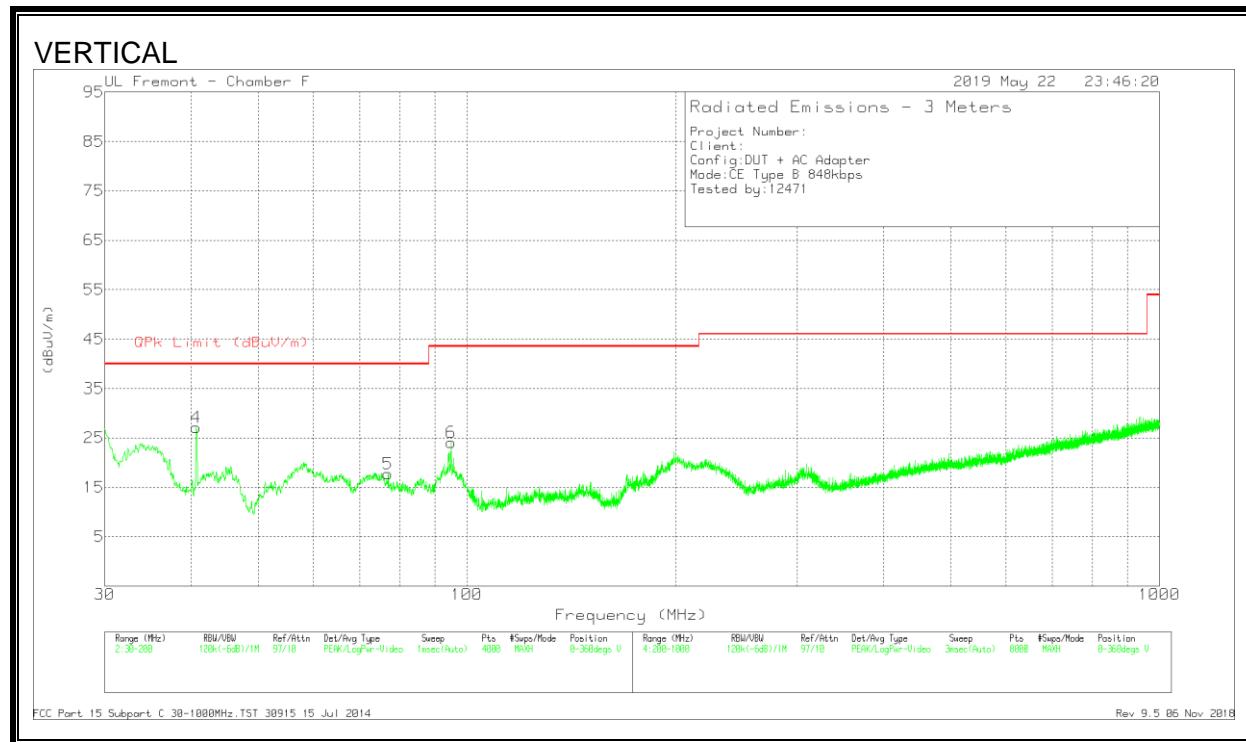
Note: Marker 2 and 5 are the fundamental signal.

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

8.3.1. CE MODE

SPURIOUS EMISSION 848Kbps





DATA

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	40.6794	34.28	Qp	17.8	-31.8	20.28	40	-19.72	127	338	H
2	67.7985	30.25	Qp	12.2	-31.5	10.95	40	-29.05	326	210	H
3	94.9205	42.01	Qp	12.7	-31.2	23.51	43.52	-20.01	130	321	H
4	40.6866	40.48	Qp	17.8	-31.8	26.48	40	-13.52	202	114	V
5	76.7769	31.59	Qp	11.7	-31.4	11.89	40	-28.11	21	114	V
6	94.9249	40.88	Qp	12.7	-31.2	22.38	43.52	-21.14	113	111	V

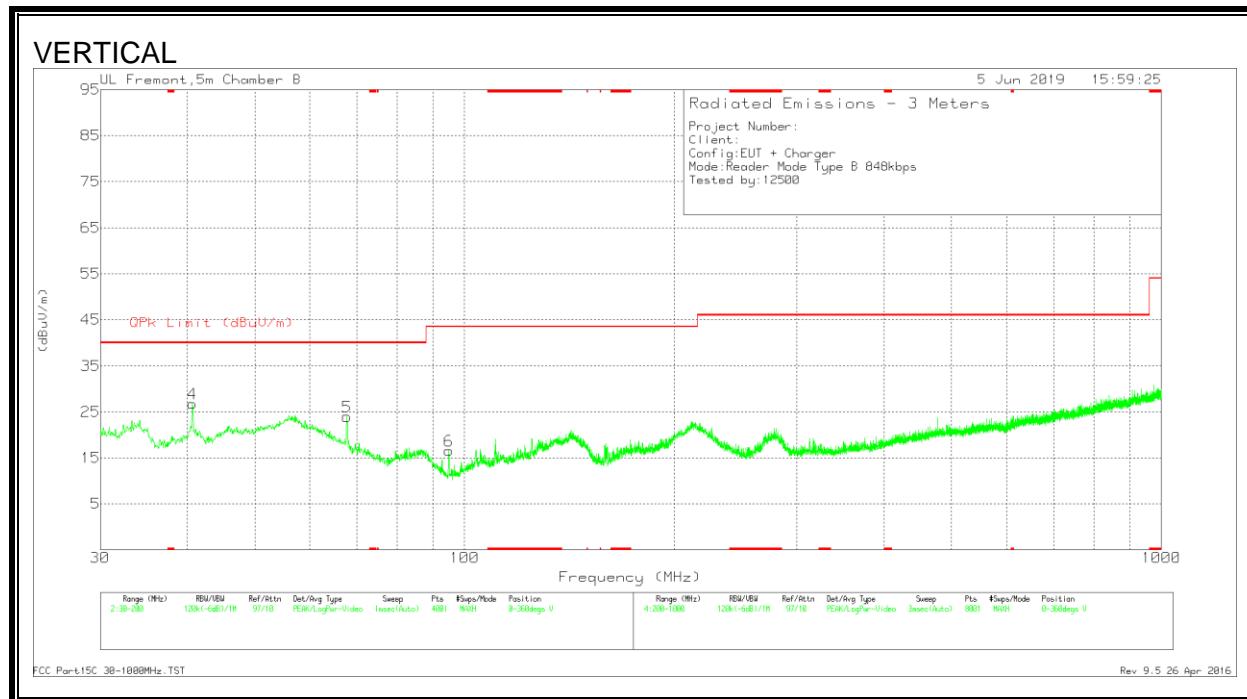
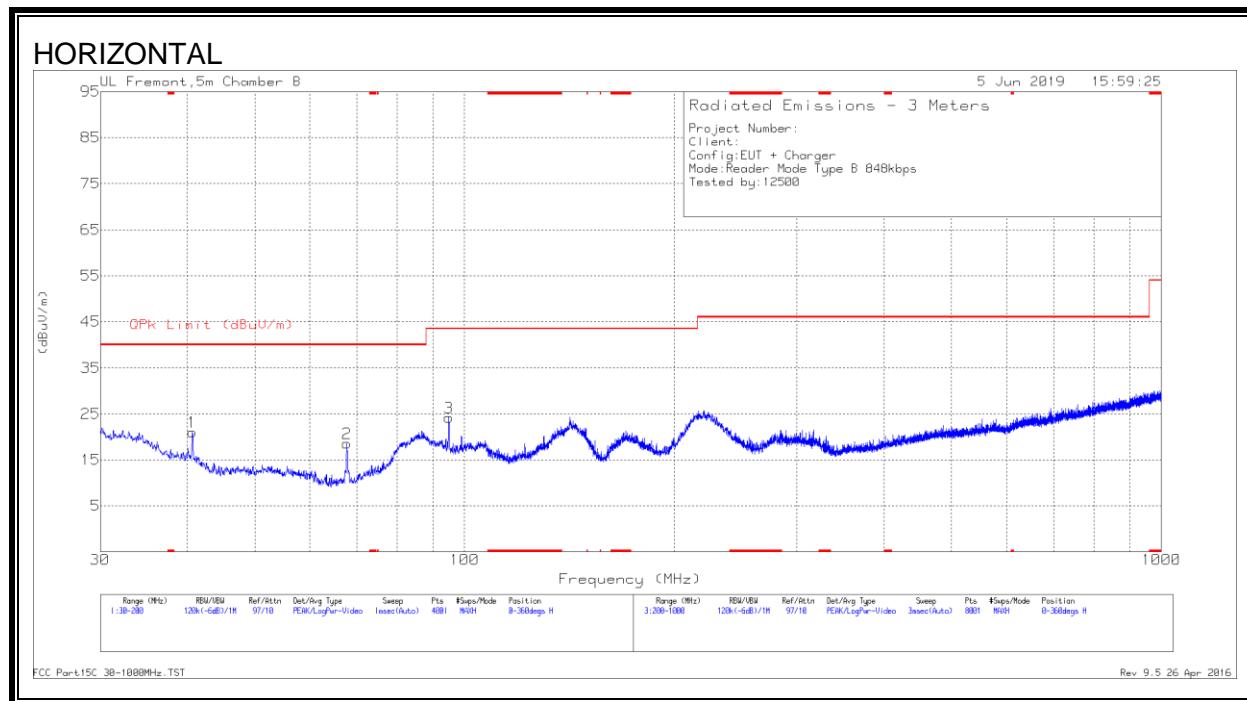
Qp - Quasi-Peak detector

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

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	40.6675	34.86	Pk	17.5	-31.3	21.06	40	-18.94	0-360	399	H
4	40.6675	40.57	Pk	17.5	-31.3	26.77	40	-13.23	0-360	101	V
2	67.7825	37.5	Pk	12.1	-31	18.6	40	-21.4	0-360	299	H
5	67.7825	42.86	Pk	12.1	-31	23.96	40	-16.04	0-360	101	V
3	94.8975	42.01	Pk	12.9	-30.7	24.21	43.52	-19.31	0-360	199	H
6	94.9188	34.36	Pk	12.9	-30.7	16.56	43.52	-26.96	0-360	101	V

Pk - Peak detector

FCC Part15C 30-1000MHz.TST

Rev 9.5 26 Apr 2016

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 $\pm 0.01\%$ (± 100 ppm).

TEST PROCEDURE

ANSI C63.10-2013 Clause 6.8

RESULTS

No non-compliance noted.

ID:	38602	Date:	5/14/19
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9.1. CE MODE

848Kbps

CE MODE TYPE B 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								
(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	13.5598572	4.269	13.5597846	9.620	13.5598027	8.283	13.5598195	7.044	± 100
	40	13.5596966	16.110	13.5596620	18.662	13.5596987	15.958	13.5596846	16.996	± 100
	30	13.5598315	6.159	13.5600240	-8.034	13.5600011	-6.345	13.5600105	-7.038	± 100
	20	13.5599150	0.000	13.5598511	4.719	13.5598381	5.674	13.5598116	7.628	± 100
	10	13.5596851	16.961	13.5600354	-8.875	13.5600789	-12.081	13.5600207	-7.789	± 100
	0	13.5598171	7.223	13.5601304	-15.880	13.5601450	-16.955	13.5601394	-16.542	± 100
	-10	13.5600545	10.281	13.5600617	-10.815	13.5600536	-10.215	13.5600345	-8.812	± 100
	-20	13.5600545	-10.281	13.5600617	-10.815	13.5600536	-10.215	13.5600345	-8.812	± 100
3.23	20	13.5601029	-13.851	13.5599596	-3.288	13.5599659	-3.747	13.5599718	-4.187	± 100
4.37	20	13.5598003	8.463	13.5598017	8.356	13.5598257	6.586	13.5598328	6.068	± 100

9.2. READER MODE

848Kbps

READER MODE TYPE B 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								
(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	13.5598466	5.457	13.5598446	5.599	13.5598426	5.752	13.5598406	5.897	± 100
	40	13.5598716	3.614	13.5598683	3.855	13.5598647	4.123	13.5598611	4.383	± 100
	30	13.5599048	1.159	13.5599015	1.408	13.5598978	1.681	13.5598938	1.970	± 100
	20	13.5599206	0.000	13.5599216	-0.075	13.5599228	-0.162	13.5599241	-0.258	± 100
	10	13.5599080	0.924	13.5599189	0.119	13.5599307	-0.745	13.5599429	-1.646	± 100
	0	13.5599664	-3.380	13.5599724	-3.820	13.5599784	-4.268	13.5599846	-4.725	± 100
	-10	13.5600008	-5.916	13.5600037	-6.133	13.5600065	-6.336	13.5600087	-6.503	± 100
	-20	13.5600146	-6.934	13.5600149	-6.957	13.5600149	-6.960	13.5600147	-6.940	± 100
3.23	20	13.5599539	-2.458	13.5599493	-2.117	13.5599438	-1.715	13.5599375	-1.250	± 100
4.37	20	13.5599090	0.854	13.5599124	0.600	13.5599162	0.324	13.5599201	0.033	± 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 μ 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 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.

TEST PROCEDURE

ANSI C63.10:2013

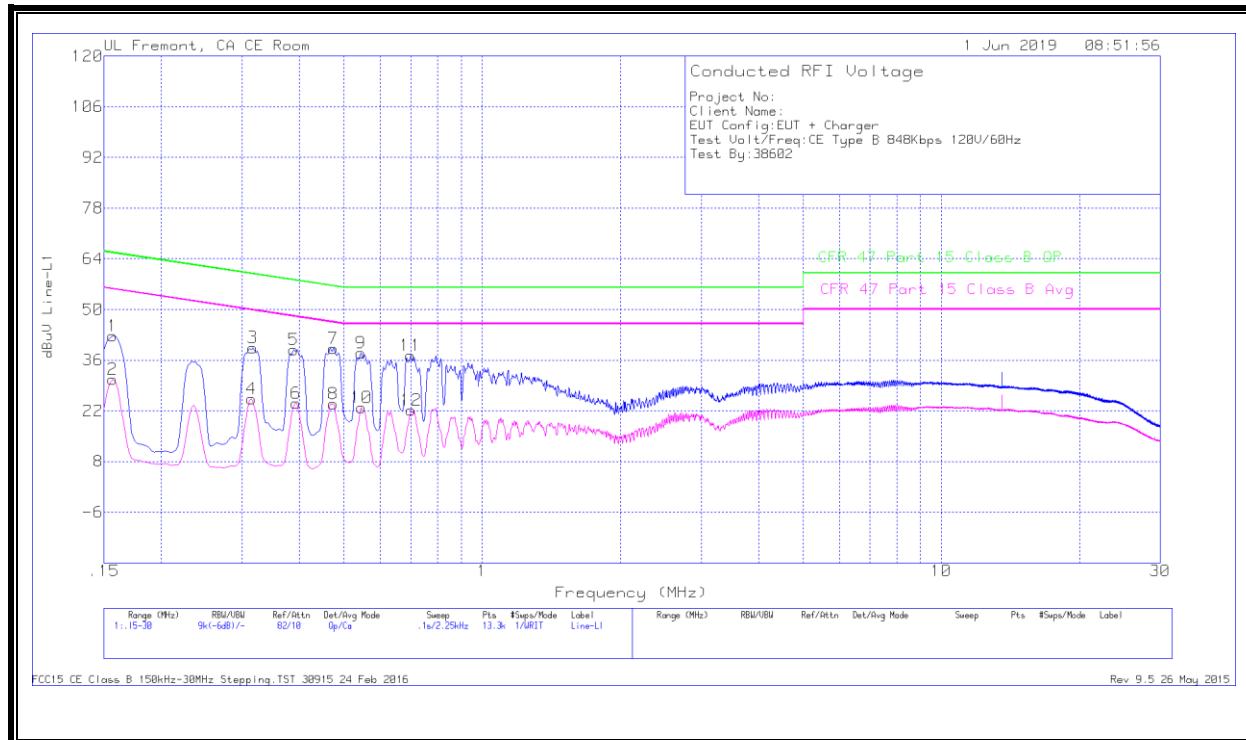
RESULTS

No non-compliance noted:

10.1. CE MODE

10.1.1. NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



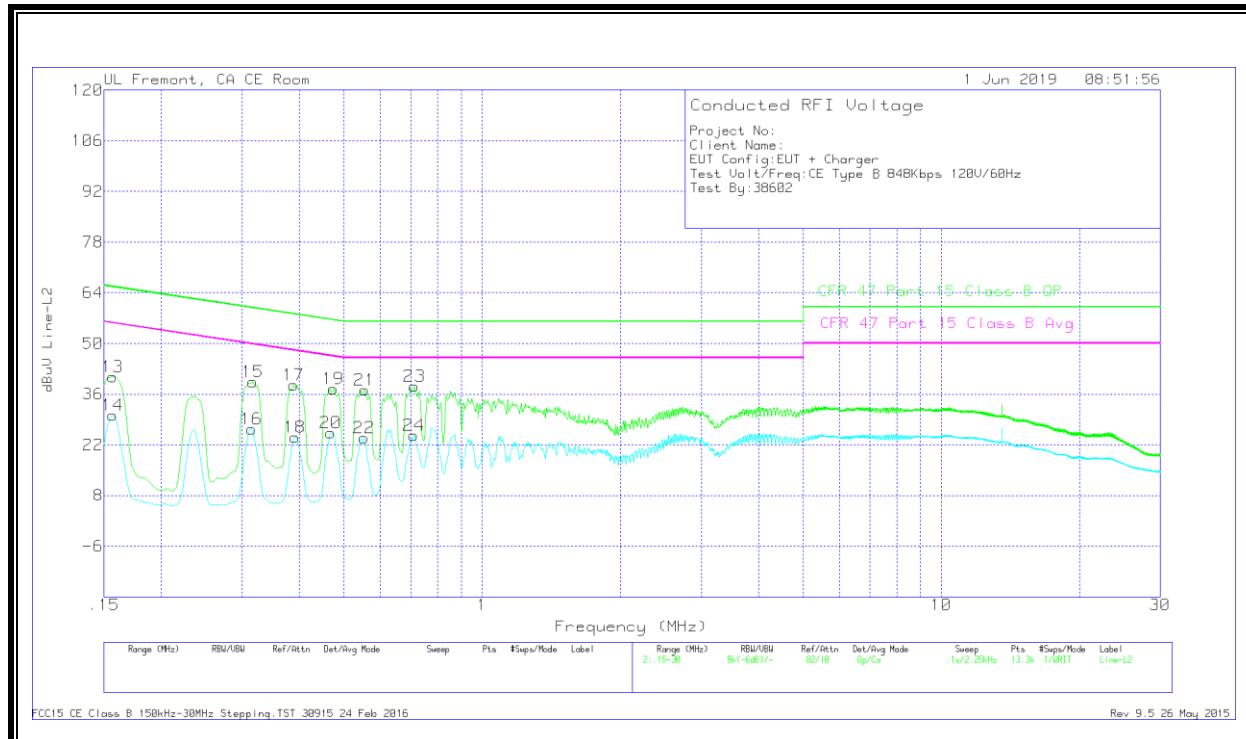
WORST EMISSIONS

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	.15675	32.49	Qp	.1	0	10.1	42.69	65.63	-22.94	-	-
2	.15675	20.44	Ca	.1	0	10.1	30.64	-	-	55.63	-24.99
3	.3165	29.38	Qp	0	0	10.1	39.48	59.8	-20.32	-	-
4	.31425	15.28	Ca	0	0	10.1	25.38	-	-	49.86	-24.48
5	.3885	28.84	Qp	0	0	10.1	38.94	58.1	-19.16	-	-
6	.393	13.92	Ca	0	0	10.1	24.02	-	-	48	-23.98
7	.474	29.16	Qp	0	0	10.1	39.26	56.44	-17.18	-	-
8	.474	13.76	Ca	0	0	10.1	23.86	-	-	46.44	-22.58
9	.54375	27.97	Qp	0	0	10.1	38.07	56	-17.93	-	-
10	.546	12.82	Ca	0	0	10.1	22.92	-	-	46	-23.08
11	.699	27.25	Qp	0	0	10.1	37.35	56	-18.65	-	-
12	.70125	12.11	Ca	0	0	10.1	22.21	-	-	46	-23.79

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

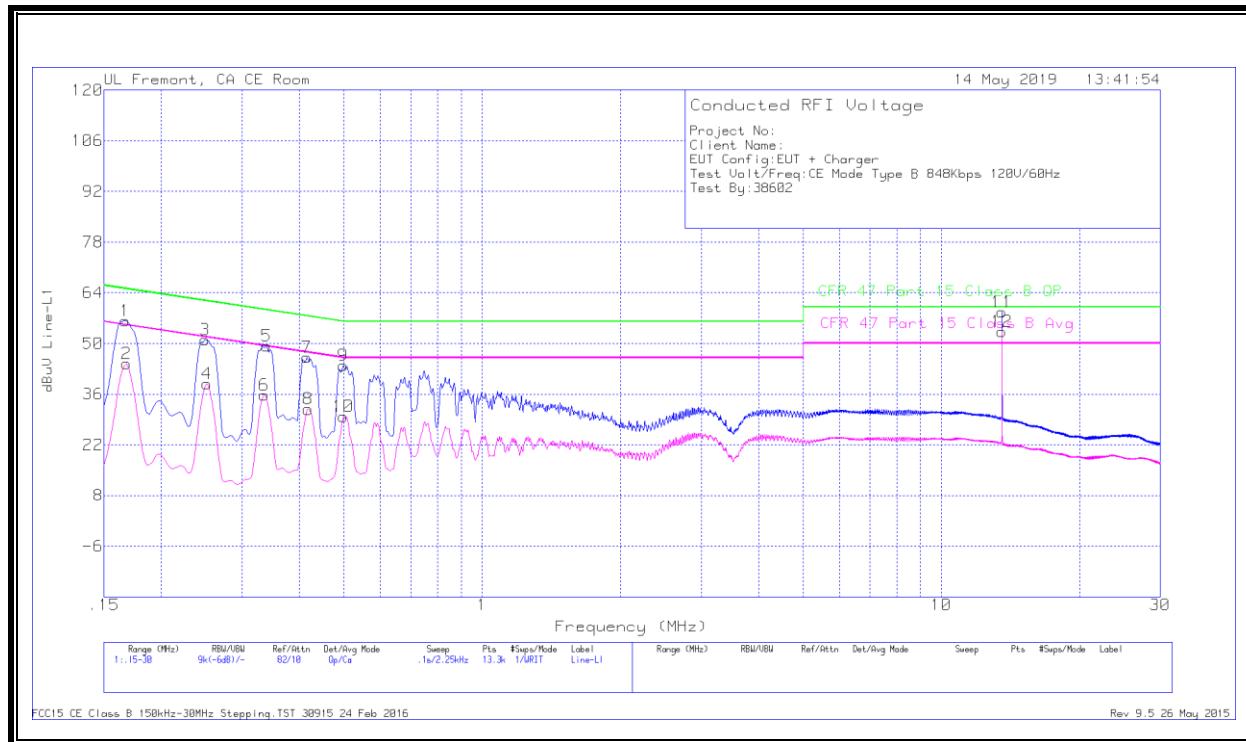
Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.15675	30.66	Qp	.1	0	10.1	40.86	65.63	-24.77	-	-
14	.15675	19.96	Ca	.1	0	10.1	30.16	-	-	55.63	-25.47
15	.3165	29.3	Qp	0	0	10.1	39.4	59.8	-20.4	-	-
16	.31425	16.32	Ca	0	0	10.1	26.42	-	-	49.86	-23.44
17	.3885	28.43	Qp	0	0	10.1	38.53	58.1	-19.57	-	-
18	.39075	14.05	Ca	0	0	10.1	24.15	-	-	48.05	-23.9
19	.474	27.4	Qp	0	0	10.1	37.5	56.44	-18.94	-	-
20	.46725	15.18	Ca	0	0	10.1	25.28	-	-	46.56	-21.28
21	.555	27	Qp	0	0	10.1	37.1	56	-18.9	-	-
22	.55275	13.86	Ca	0	0	10.1	23.96	-	-	46	-22.04
23	.7125	28.1	Qp	0	0	10.1	38.2	56	-17.8	-	-
24	.71025	14.5	Ca	0	0	10.1	24.6	-	-	46	-21.4

Qp - Quasi-Peak detector

Ca - CISPR average detection

10.1.2. NORMAL OPERATION WITHOUT ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



WORST EMISSIONS

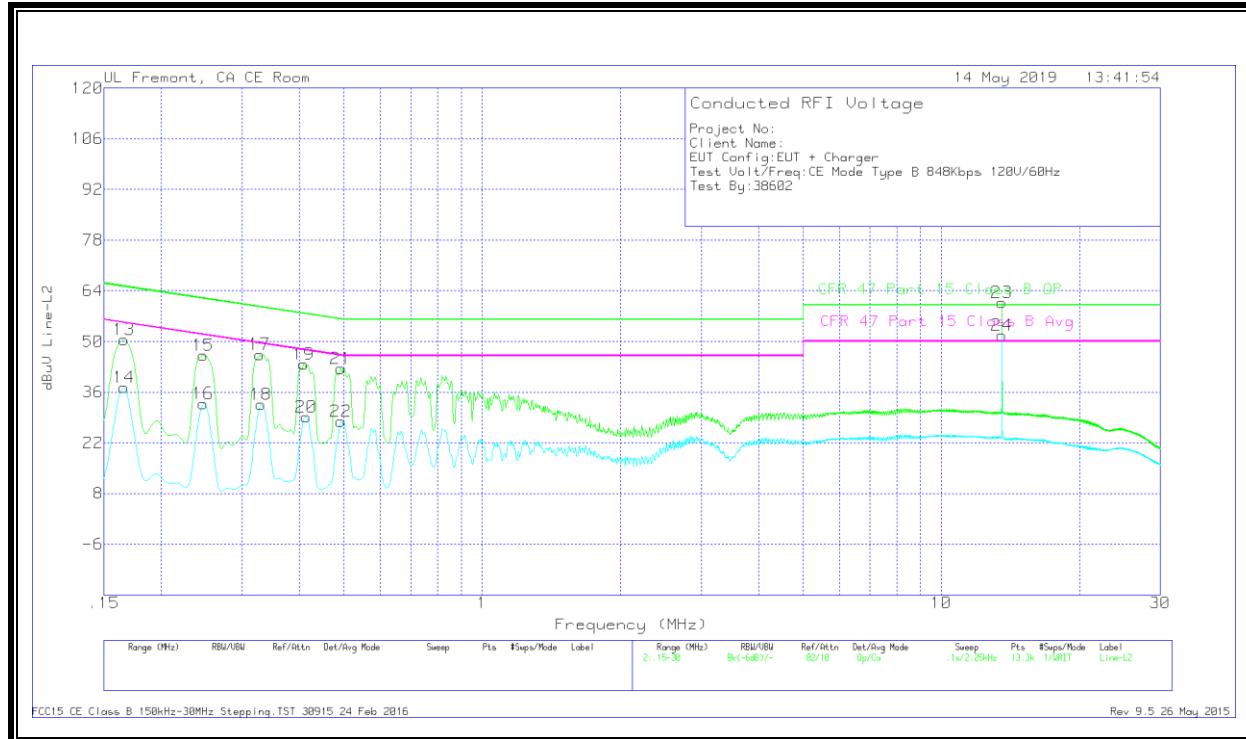
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.16688	46.04	Qp	.1	0	10.1	56.24	65.11	-8.87	-	-
2	.168	34.17	Ca	.1	0	10.1	44.37	-	-	55.06	-10.69
3	.249	40.98	Qp	0	0	10.1	51.08	61.79	-10.71	-	-
4	.25125	28.79	Ca	0	0	10.1	38.89	-	-	51.72	-12.83
5	.339	39.16	Qp	0	0	10.1	49.26	59.23	-9.97	-	-
6	.3345	25.64	Ca	0	0	10.1	35.74	-	-	49.34	-13.6
7	.4155	36.14	Qp	0	0	10.1	46.24	57.54	-11.3	-	-
8	.41775	21.74	Ca	0	0	10.1	31.84	-	-	47.49	-15.65
9	.49875	33.83	Qp	0	0	10.1	43.93	56.02	-12.09	-	-
10	.49875	19.77	Ca	0	0	10.1	29.87	-	-	46.02	-16.15
11	13.56	48.13	Qp	.1	.2	10.2	58.63	60	-1.37	-	-
12	13.56	42.75	Ca	.1	.2	10.2	53.25	-	-	50	3.25

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	.16575	40.24	Qp	.1	0	10.1	50.44	65.17	-14.73	-	-
14	.16575	27.09	Ca	.1	0	10.1	37.29	-	-	55.17	-17.88
15	.24675	36.11	Qp	0	0	10.1	46.21	61.87	-15.66	-	-
16	.24675	22.77	Ca	0	0	10.1	32.87	-	-	51.87	-19
17	.32775	36.33	Qp	0	0	10.1	46.43	59.51	-13.08	-	-
18	.33	22.56	Ca	0	0	10.1	32.66	-	-	49.45	-16.79
19	.40875	33.66	Qp	0	0	10.1	43.76	57.67	-13.91	-	-
20	.41325	18.99	Ca	0	0	10.1	29.09	-	-	47.58	-18.49
21	.492	32.43	Qp	0	0	10.1	42.53	56.13	-13.6	-	-
22	.492	17.78	Ca	0	0	10.1	27.88	-	-	46.13	-18.25
23	13.56	50.33	Qp	.1	.2	10.2	60.83	60	.83	-	-
24	13.56	41.23	Ca	.1	.2	10.2	51.73	-	-	50	1.73

Qp - Quasi-Peak detector

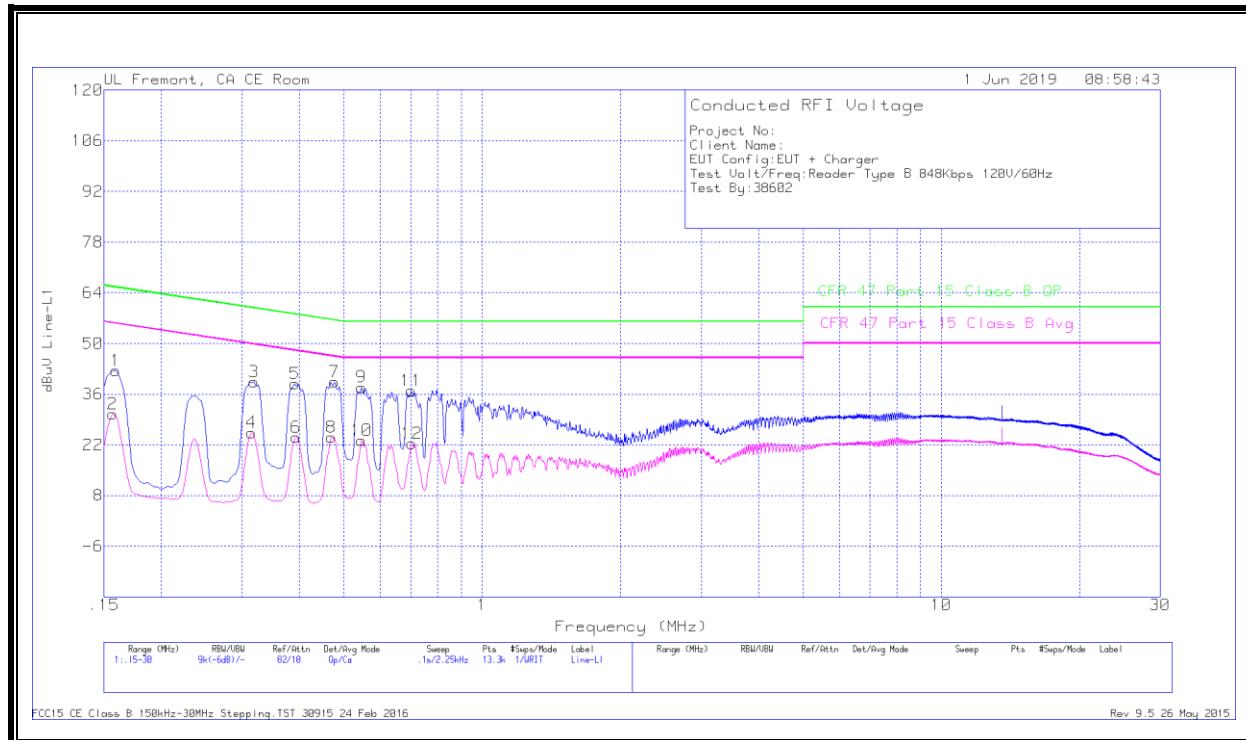
Ca - CISPR average detection

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



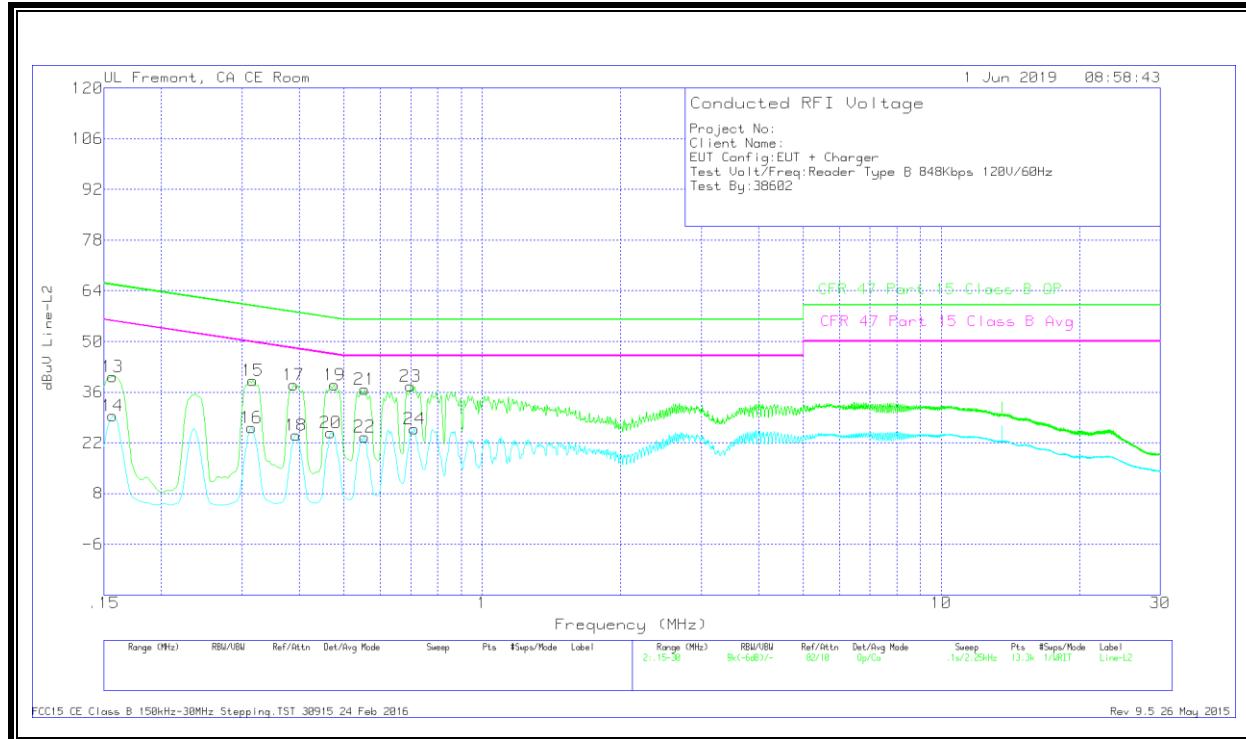
WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (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	32.34	Qp	.1	0	10.1	42.54	65.52	-22.98	-	-
2	.15675	20.29	Ca	.1	0	10.1	30.49	-	-	55.63	-25.14
3	.31875	29.35	Qp	0	0	10.1	39.45	59.74	-20.29	-	-
4	.31425	15.3	Ca	0	0	10.1	25.4	-	-	49.86	-24.46
5	.39075	28.8	Qp	0	0	10.1	38.9	58.05	-19.15	-	-
6	.393	13.95	Ca	0	0	10.1	24.05	-	-	48	-23.95
7	.47625	29.24	Qp	0	0	10.1	39.34	56.4	-17.06	-	-
8	.4695	13.94	Ca	0	0	10.1	24.04	-	-	46.52	-22.48
9	.546	27.82	Qp	0	0	10.1	37.92	56	-18.08	-	-
10	.546	13.09	Ca	0	0	10.1	23.19	-	-	46	-22.81
11	.70125	26.88	Qp	0	0	10.1	36.98	56	-19.02	-	-
12	.7035	12.28	Ca	0	0	10.1	22.38	-	-	46	-23.62

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

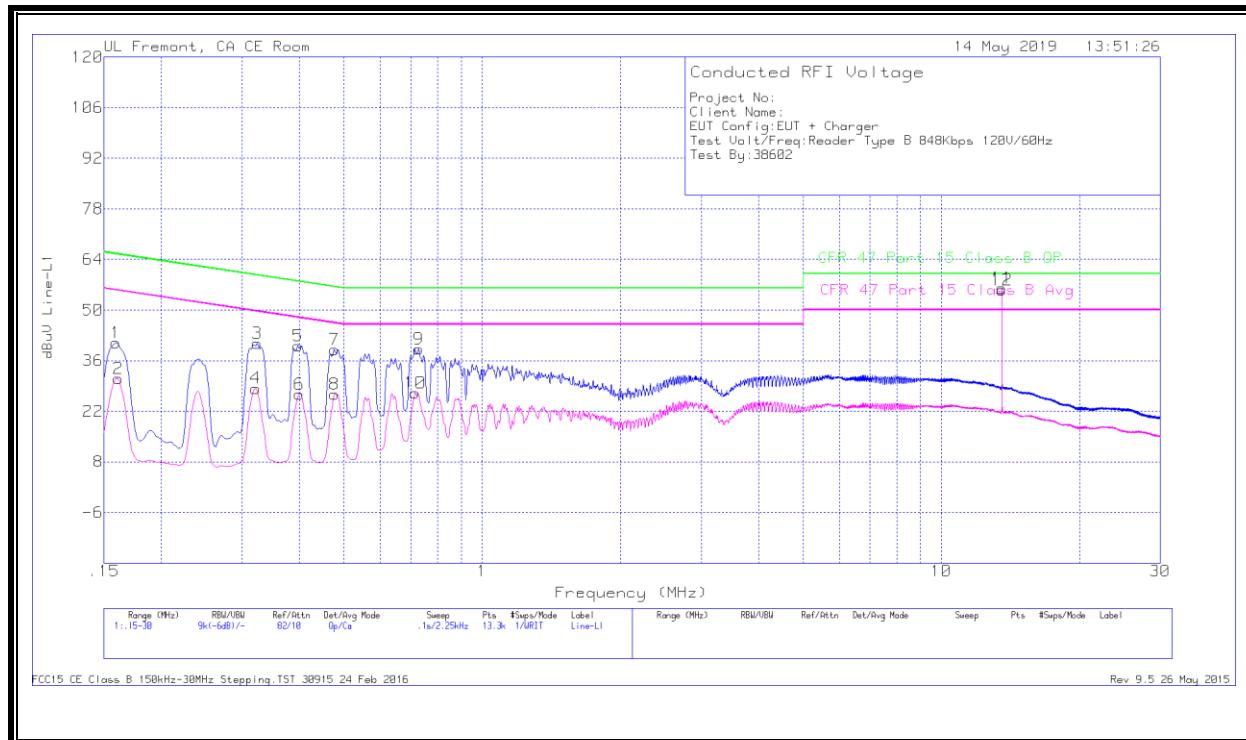
Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.15675	30.14	Qp	.1	0	10.1	40.34	65.63	-25.29	-	-
14	.15675	19.35	Ca	.1	0	10.1	29.55	-	-	55.63	-26.08
15	.3165	29.06	Qp	0	0	10.1	39.16	59.8	-20.64	-	-
16	.31425	16.1	Ca	0	0	10.1	26.2	-	-	49.86	-23.66
17	.3885	27.89	Qp	0	0	10.1	37.99	58.1	-20.11	-	-
18	.393	14.01	Ca	0	0	10.1	24.11	-	-	48	-23.89
19	.47625	27.84	Qp	0	0	10.1	37.94	56.4	-18.46	-	-
20	.46725	14.67	Ca	0	0	10.1	24.77	-	-	46.56	-21.79
21	.555	26.71	Qp	0	0	10.1	36.81	56	-19.19	-	-
22	.555	13.56	Ca	0	0	10.1	23.66	-	-	46	-22.34
23	.699	27.49	Qp	0	0	10.1	37.59	56	-18.41	-	-
24	.7125	15.69	Ca	0	0	10.1	25.79	-	-	46	-20.21

Qp - Quasi-Peak detector

Ca - CISPR average detection

10.2.2. NORMAL OPERATION WITHOUT ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



WORST EMISSIONS

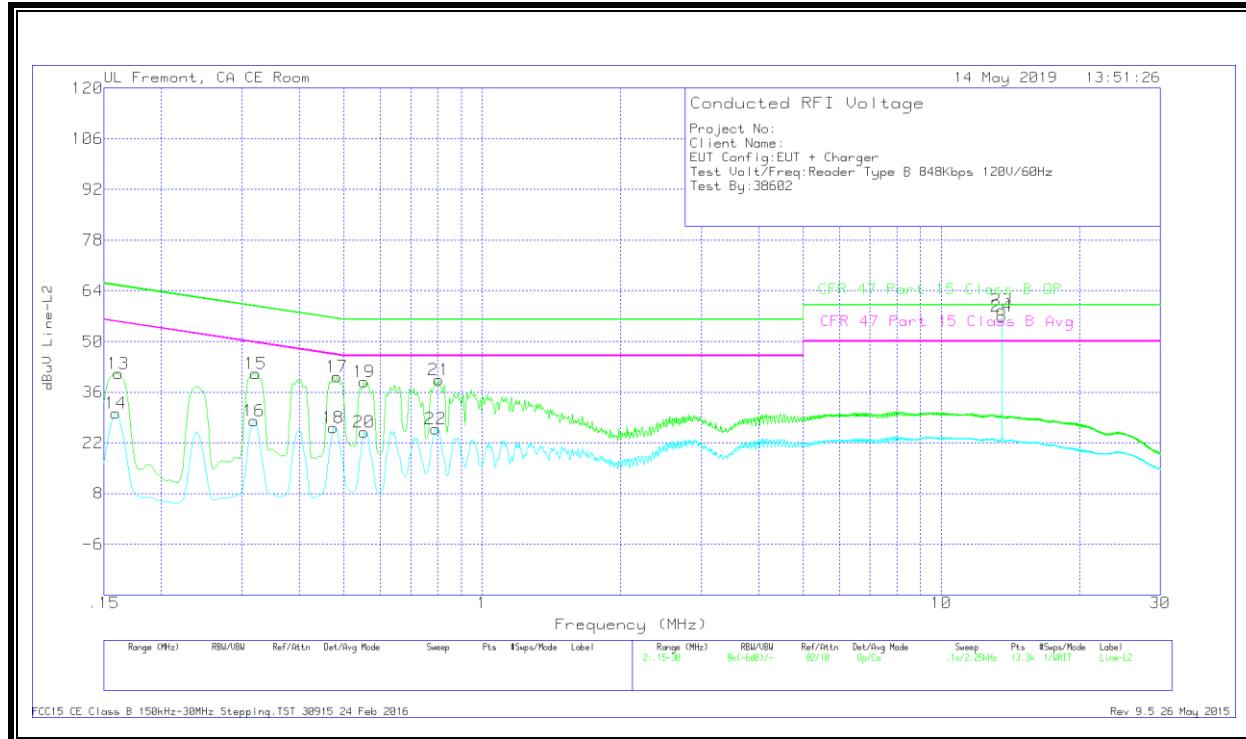
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.159	30.74	Qp	.1	0	10.1	40.94	65.52	-24.58	-	-
2	.16125	20.92	Ca	.1	0	10.1	31.12	-	-	55.4	-24.28
3	.32325	30.64	Qp	0	0	10.1	40.74	59.62	-18.88	-	-
4	.321	18.26	Ca	0	0	10.1	28.36	-	-	49.68	-21.32
5	.3975	30.04	Qp	0	0	10.1	40.14	57.91	-17.77	-	-
6	.39975	16.68	Ca	0	0	10.1	26.78	-	-	47.86	-21.08
7	.47625	29	Qp	0	0	10.1	39.1	56.4	-17.3	-	-
8	.47625	16.62	Ca	0	0	10.1	26.72	-	-	46.4	-19.68
9	.72825	29.16	Qp	0	0	10.1	39.26	56	-16.74	-	-
10	.71475	17.03	Ca	0	0	10.1	27.13	-	-	46	-18.87
11	13.56	45.61	Qp	.1	.2	10.2	56.11	60	-3.89	-	-
12	13.56	45.13	Ca	.1	.2	10.2	55.63	-	-	50	5.63

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	.16125	30.98	Qp	.1	0	10.1	41.18	65.4	-24.22	-	-
14	.159	19.93	Ca	.1	0	10.1	30.13	-	-	55.52	-25.39
15	.321	31.04	Qp	0	0	10.1	41.14	59.68	-18.54	-	-
16	.31875	17.93	Ca	0	0	10.1	28.03	-	-	49.74	-21.71
17	.483	30.14	Qp	0	0	10.1	40.24	56.29	-16.05	-	-
18	.474	16.07	Ca	0	0	10.1	26.17	-	-	46.44	-20.27
19	.55275	28.75	Qp	0	0	10.1	38.85	56	-17.15	-	-
20	.55275	14.79	Ca	0	0	10.1	24.89	-	-	46	-21.11
21	.80475	29.23	Qp	0	0	10.1	39.33	56	-16.67	-	-
22	.79125	15.81	Ca	0	0	10.1	25.91	-	-	46	-20.09
23	13.56	48.24	Qp	.1	.2	10.2	58.74	60	-1.26	-	-
24	13.56	46.43	Ca	.1	.2	10.2	56.93	-	-	50	6.93

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 12607346-EP1V1 for setup photos