TEST REPORT

Report Number: 13190901-E12V1

Applicant	:	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2398
FCC ID	:	BCG-E3540A
IC	:	579C-E3540A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 10

Date of Issue:
September 21, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP TESTING

NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	9/21/2020	Initial issue	Chin Pang

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: SMARTPHONE

MODEL: A2398

Serial Number: Original: C7CCT02VQ90P
Spot Check**:** C7CCT008Q908

DATE TESTED: SEPTEMBER 01 – SEPTEMBER 08, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies
ISED RSS-210 Issue 10, 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. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

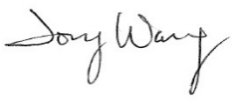
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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 the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

Chin Pang
Senior Engineer
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



Tony Wang
Test Engineer
Consumer Technology Division
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 5, and RSS-210 Issue 10.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, 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	47658 Kato Rd.
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC:22541-1)	☐ Chamber I (IC: 2324A-5)
☐ Chamber B (IC:2324B-2)	☐ Chamber E (IC:22541-2)	☐ Chamber J (IC: 2324A-6)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)	☐ Chamber K (IC: 2324A-1)
	☒ Chamber G (IC:22541-4)	☐ Chamber L (IC: 2324A-3)
	☒ Chamber H (IC:22541-5)	☐ Chamber M (IC: 2324A-2)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

5. INTRODUCTION OF TEST DATA REUSE

5.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

5.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: BCG-E3539A, IC: 579C-3539A to cover variant BCG-E3540A, 579C-3540A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

5.3. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2398, FCC ID: BCG-E3540A, IC: 579C-E3540A for radiated spurious and radiated band-edge in accordance with the Test Plan that was approved via KDB inquiry.

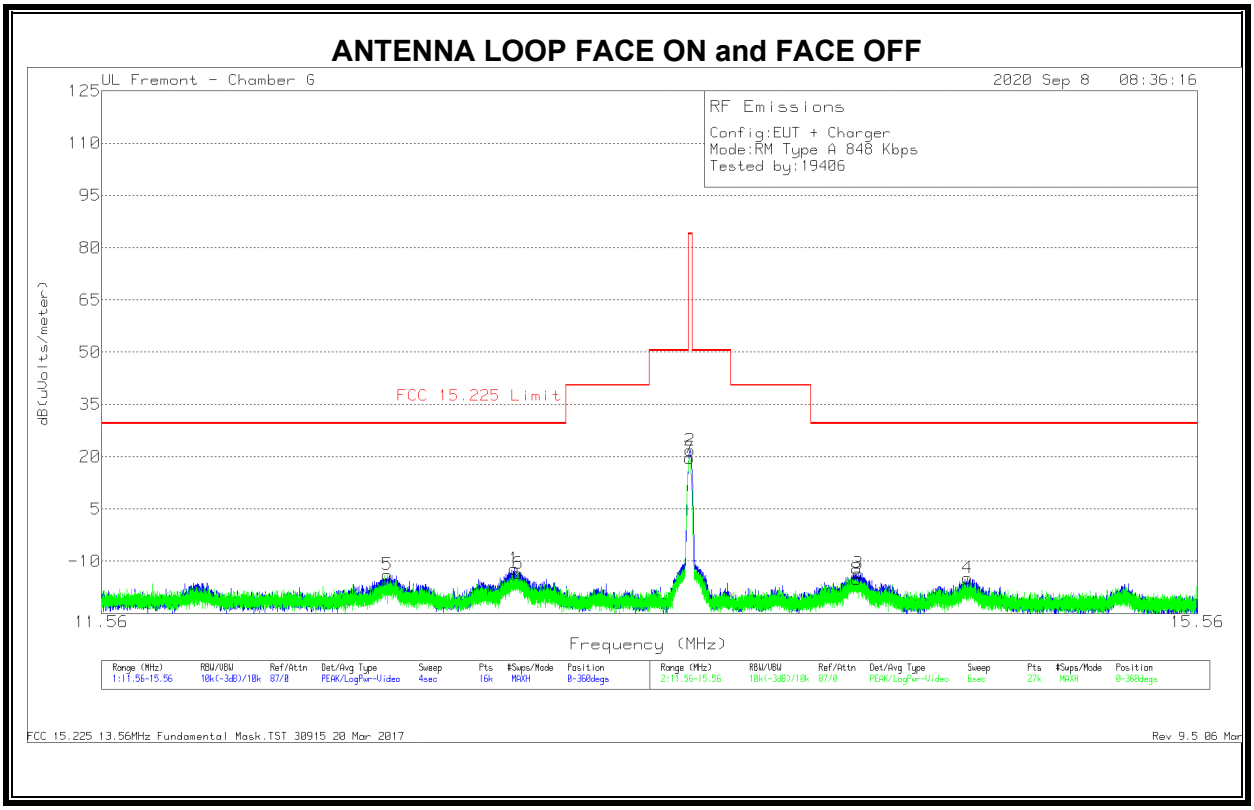
Technology	Mode	Test Item	Measured	Original model		Spot check model		Delta (dB)
				A2176		A2398		
				BCG-E3539A 579C-E3539A		BCG-E3540A 579C-E3540A		
			Frequency (MHz)	E Field at 30m (dBuV/m)	E Field at 3 m (dBuV/m)	E Field at 30m (dBuV/m)	E Field at 3 m (dBuV/m)	Peak
NFC	Reader	Fundamental	13.56	23.19		21.88		-1.31
	Reader	RSE	40.67		34.1		33.77	-.33

Comparison of the models, upper deviation is within 3dB range and all tests are under FCC Technical Limits. The test report for FCC ID: BCG-E3539A, IC: 579C-E3539A is therefore being used to support the application for certification for FCC ID: BCG-E3540A, IC: 579C-E3540A.

SPOT CHECK DATA

5.3.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL



DATA

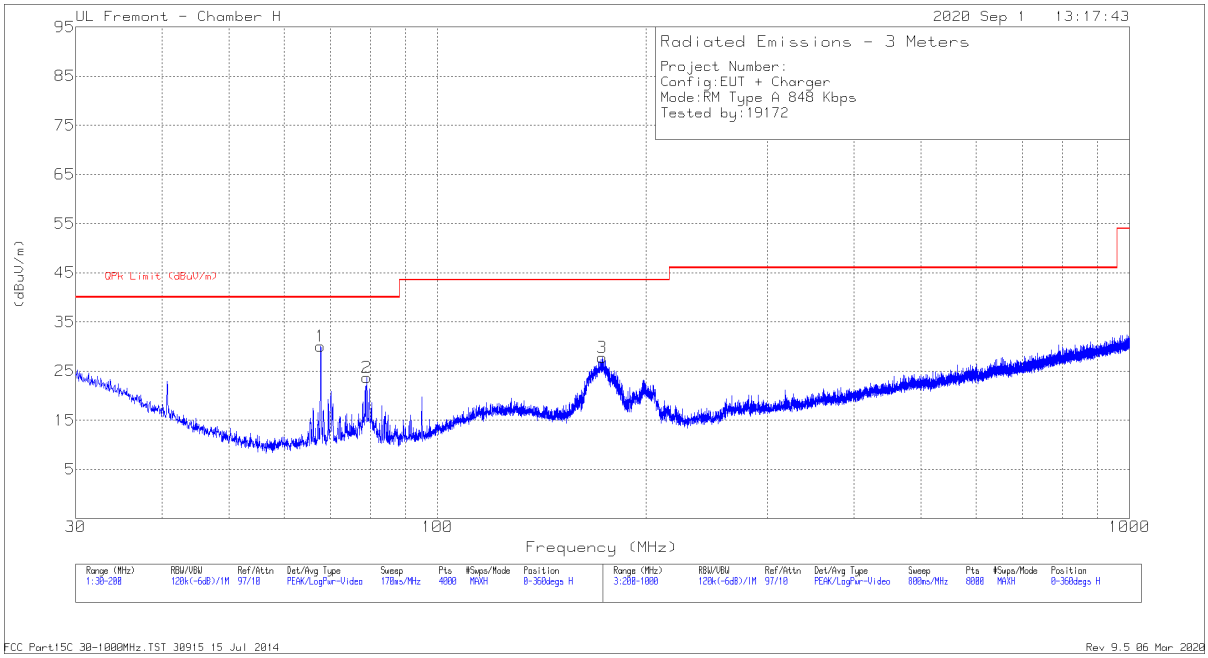
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 30m	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
5	12.4921	14.88	Pk	10.7	.5	-40	-13.92	29.54	-43.46	0-360
1	12.928	16.79	Pk	10.6	.5	-40	-12.11	29.54	-41.65	0-360
6	12.94262	15.37	Pk	10.6	.5	-40	-13.53	29.54	-43.07	0-360
7	13.55756	48.38	Pk	10.6	.6	-40	19.58	84	-64.42	0-360
2	13.56013	50.68	Pk	10.6	.6	-40	21.88	84	-62.12	0-360
8	14.18759	13.58	Pk	10.6	.6	-40	-15.22	29.54	-44.76	0-360
3	14.19125	15.25	Pk	10.6	.6	-40	-13.55	29.54	-43.09	0-360
4	14.61875	14	Pk	10.6	.6	-40	-14.8	29.54	-44.34	0-360

Pk - Peak detector

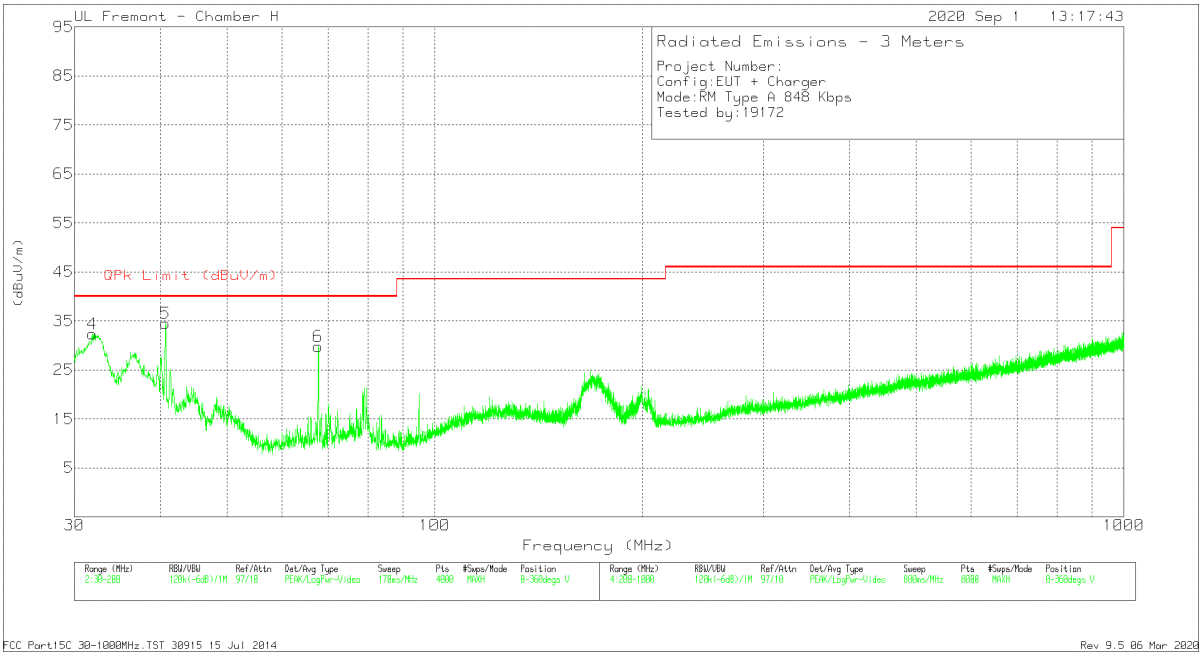
5.3.2. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode), Spurious Emissions 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 173.0495	40.08	Pk	17.6	-29.9	27.78	43.52	-15.74	0-360	200	H
4	31.8705	36.93	Pk	26.7	-31.3	32.33	40	-7.67	0-360	100	V
5	40.6703	45.67	Pk	19.9	-31.1	34.47	40	-5.53	0-360	100	V
	40.6813	44.97	Qp	19.9	-31.1	33.77	40	-6.23	208	108	V
1	67.7923	46.6	Pk	14.2	-30.8	30	40	-10	0-360	300	H
6	67.7923	46.37	Pk	14.2	-30.8	29.77	40	-10.23	0-360	100	V
2	78.9727	40.35	Pk	14	-30.7	23.65	40	-16.35	0-360	200	H

PK-Peak detector
Qp - Quasi-Peak detector

5.4. REFERENCE DETAIL

Reference application that contains the reused reference data which is attached to this report in Appendix A.

Equipment Class	Reference FCC ID & IC	Reference Report Number	Report Title/Section
DXX	BCG-E3539A 579C-E3539A	13179110-E12	FCC_IC Report NFC / All sections

5.5. WORST-CASE CONFIGURATION AND MODE

EUT was performed based on the worst case model A2176.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all radiated emissions.

5.6. 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

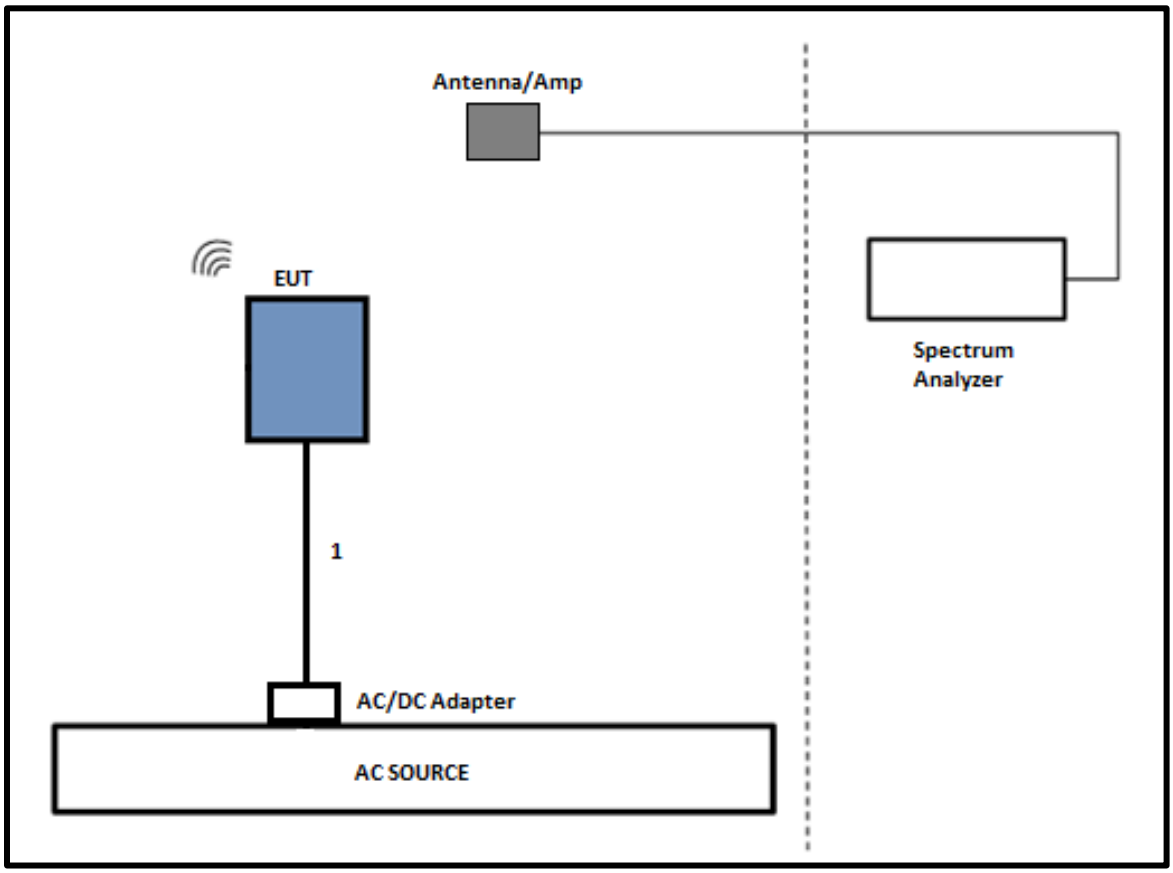
I/O CABLES

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 radio card.

SETUP DIAGRAM FOR RADIATED 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**	**ID Num**	**Cal Due**	**Last Cal**
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A	T917	01/21/2021	01/21/2020
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T1683	04/28/2021	04/28/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A-544	T1210	01/21/2021	01/21/2020
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB1	T185	06/26/2021	06/26/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	T835	01/23/2021	01/23/2020

UL AUTOMATION SOFTWARE			
Radiated Software	UL	UL EMC	Ver 9.5, Mar 6, 2020

7. SETUP PHOTOS

Please refer to 13179110-EP1 for setup photos.

END OF TEST REPORT

Appendix A – Reference Test Report

Attached is the test report (13179110-E12) containing the reference data from the parent model as detailed in section 5.4.

TEST REPORT

Report Number. : 13179110-E12V2

Applicant	:	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2176
FCC ID	:	BCG-E3539A
IC	:	579C-E3539A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 10

Date Of Issue:
September 30, 2020

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/21/2020	Initial Issue	Vien Tran
V2	9/30/2020	Address TCB Questions	Francisco Guarnero

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: SMARTPHONE

MODEL: A2176

SERIAL NUMBER: C7CCT02VQ90P

DATE TESTED: MAY 17, 2020 – SEPTEMBER 10, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies
ISED RSS-210 Issue 10, 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. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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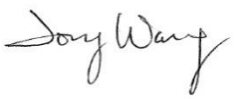
Approved & Released For
UL Verification Services Inc. By:

Chin Pang
Senior Engineer
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



Tony Wang
Test Engineer
Consumer Technology Division
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, KDB 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 5, and RSS-210 Issue 10.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, 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	47658 Kato Rd.
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC:22541-1)	☒ Chamber I (IC: 2324A-5)
☐ Chamber B (IC:2324B-2)	☐ Chamber E (IC:22541-2)	☐ Chamber J (IC: 2324A-6)
☐ Chamber C (IC:2324B-3)	☐ Chamber F (IC:22541-3)	☐ Chamber K (IC: 2324A-1)
	☐ Chamber G (IC:22541-4)	☐ Chamber L (IC: 2324A-3)
	☒ Chamber H (IC:22541-5)	☐ Chamber M (IC: 2324A-2)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 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, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

5.2. MAXIMUM E-FIELD STRENGTH

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

Antenna	Frequency Range (MHz)	Mode		Kbps	E Field at 30m distance (dBuV/m)
Primary	13.56	Type A	Reader	848	23.19
			CE	848	22.27
Secondary	13.56	Type A	Reader	848	1.93

5.3. 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 EUT has primary and secondary antennas and worst case was investigated on the primary antenna since it has the highest power.

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, Tag and Reader, Tag and CE mode mode were investigated with Type A, B and F with data rates, such as 106Kbp/s, 212Kbp/s, 424Kbp/s and 848Kbp/s and ISO 15693 configuration to determine the worst case based on the highest power and spurious emissions. Type A 848Kbp/s Reader mode was determined to be the worst case and therefore Type A was selected for all final tests

For below 30MHz testing, investigation was done on three antenna orientations: RX antenna Face-on, Face-off and horizontal (parallel to ground). The worst-case configurations were determined on RX antenna Face-on and Face-off; therefore, all final tests were performed using these two orientations.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 meter open area 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.

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

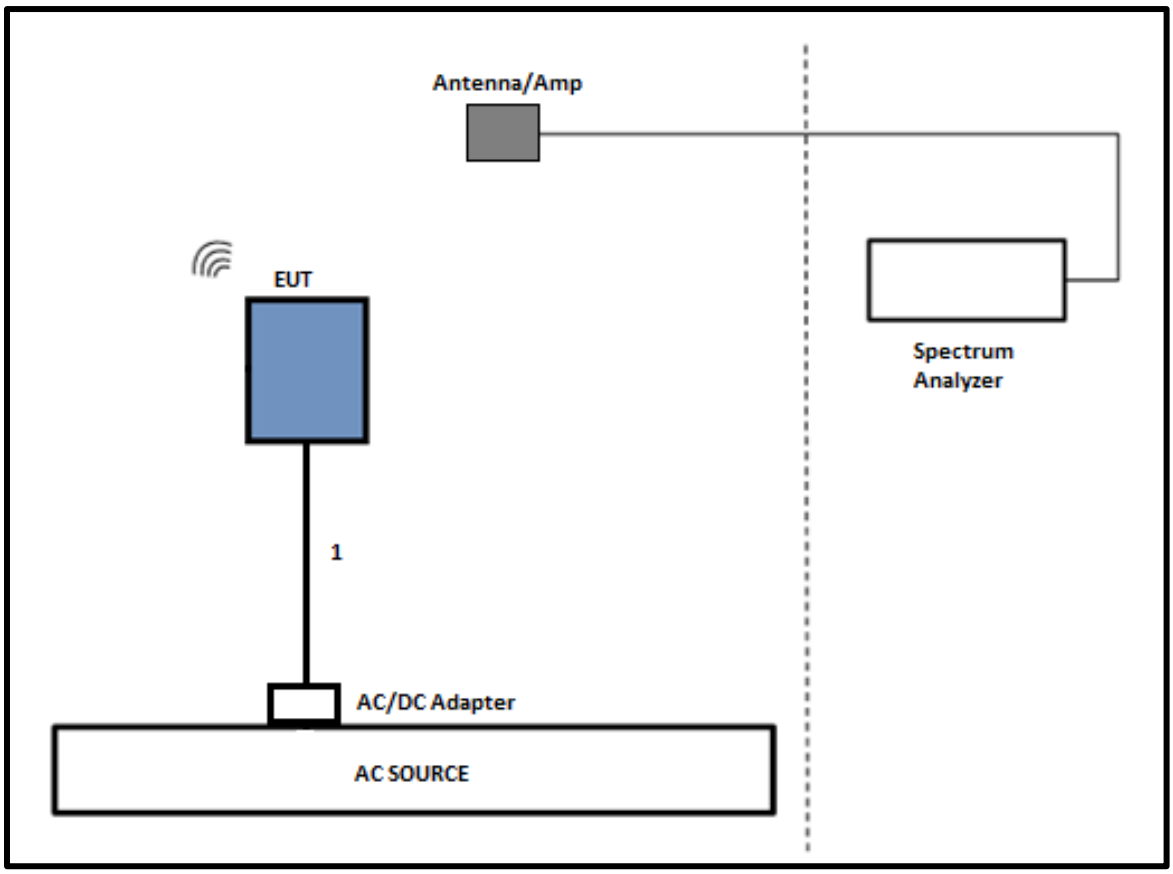
I/O CABLES

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 radio card.

SETUP DIAGRAM FOR RADIATED 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**	**ID Num**	**Cal Due**	**Last Cal**
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T900	08/09/2020	08/09/2019
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T835	01/23/2021	01/23/2020
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T757	10/01/2020	10/01/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	01/22/2021	01/22/2020
Antenna, Broadband Hybrid, 30MHz to 3GHz	SunAR rf motion	JB3	PRE0184052	11/12/2020	11/12/2019
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0186650	01/23/2021	01/23/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	Pre0179522	02/20/2021	02/20/2020

AC Line Conducted					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
*EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESR	T1436	02/20/2021	02/20/2020
Power Cable, Line Conducted Emissions	UL	PR1	T861	10/27/2020	10/27/2019
LISN for Conducted Emissions CISPR-16	FISCHER CUSTOM COMMUNICATIONS	FCC-LISN-50/250-25-2-01	PRE0186446	01/23/2021	01/23/2020
UL AUTOMATION SOFTWARE					
Radiated Software	UL	UL EMC	Ver 9.5, Mar 6, 2020		
Conducted Software	UL	UL EMC	2020.2.26		
AC Line Conducted Software	UL	UL EMC	Ver 9.5, February 21, 2020		

Note: * 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 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

Primary Antenna

Type A (Reader Mode)

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.7108	29.003

Type A (CE Mode)

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.2005	28.594

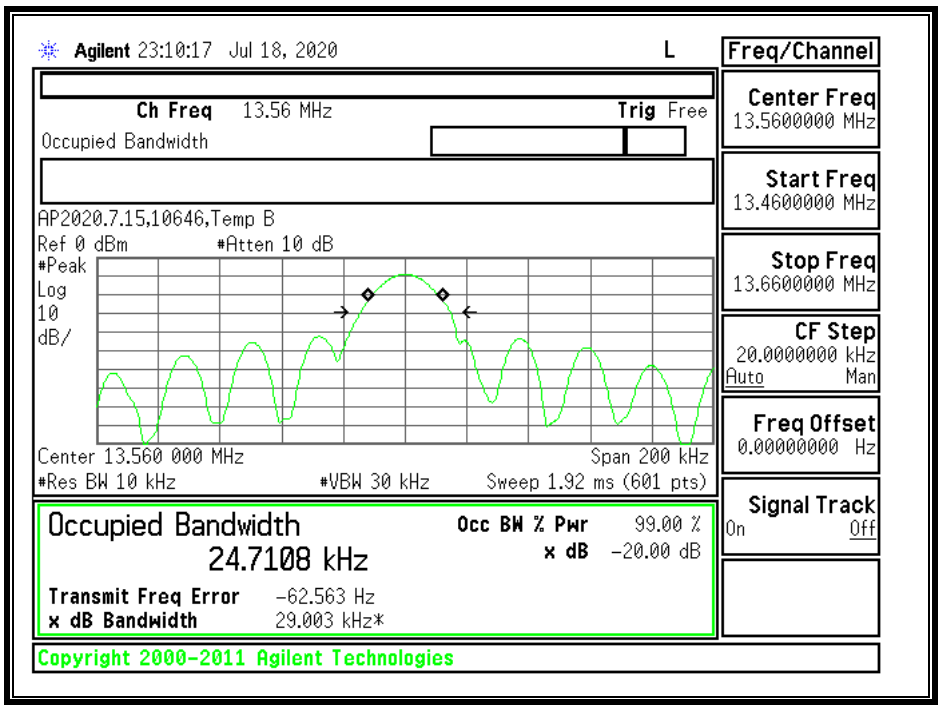
Secondary Antenna

Type A (Reader Mode)

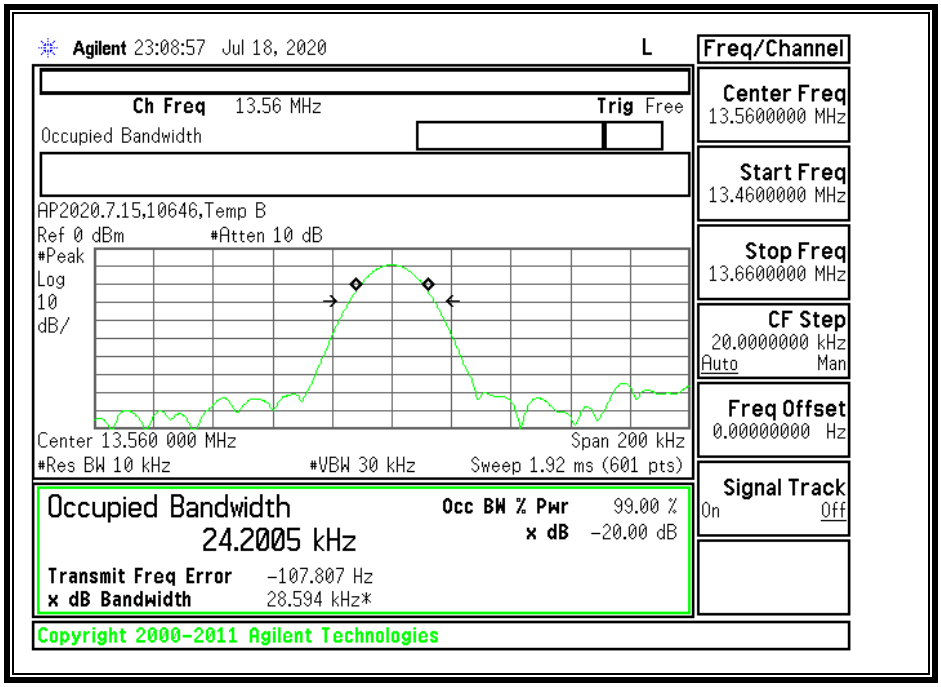
Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	23.424	25.14

7.1. PRIMARY ANTENNA

Type A (Reader Mode), 848Kbps

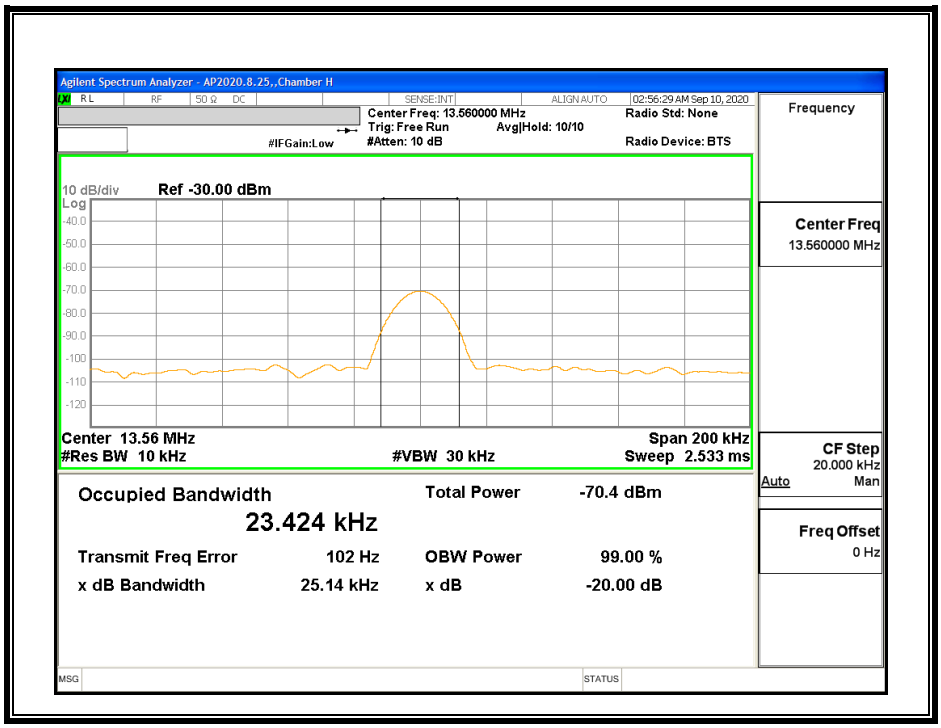


Type A (CE Mode), 848Kbps



7.2. SECONDARY ANTENNA

Type A (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 (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 470-806 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 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 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

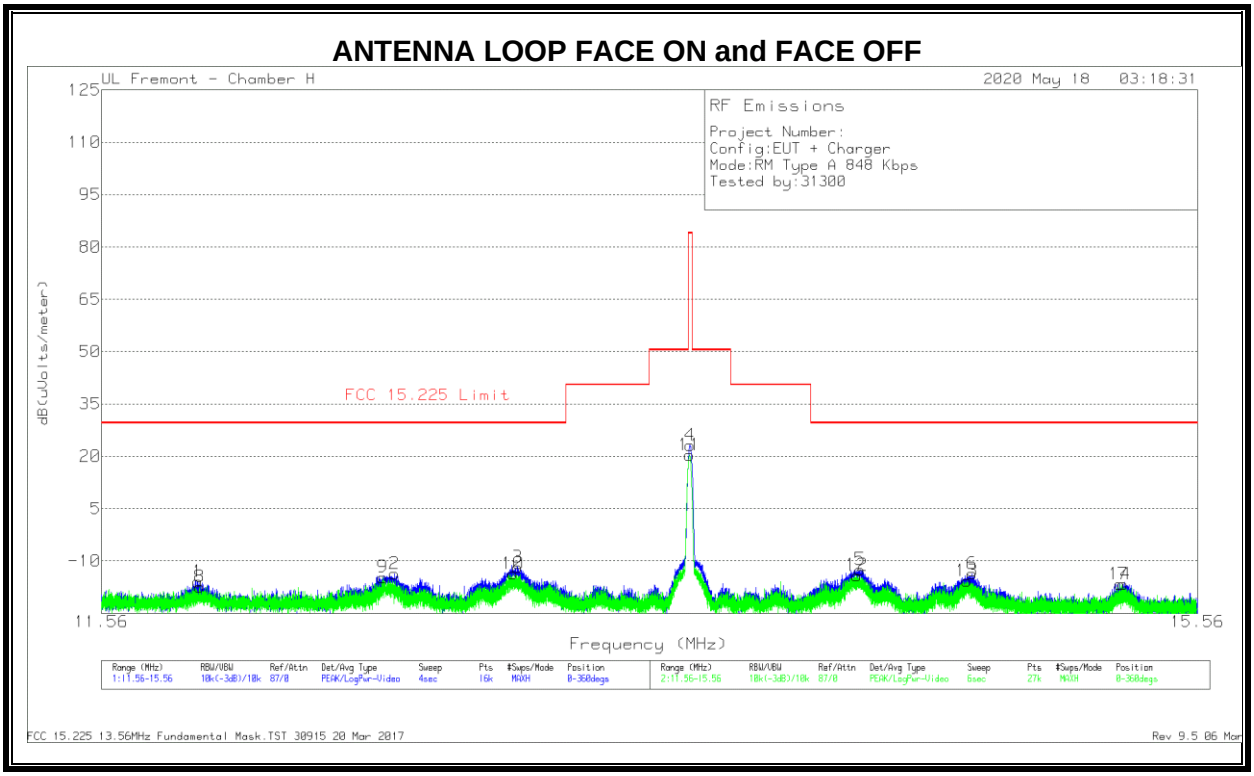
The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

RESULTS

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

8.2.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL



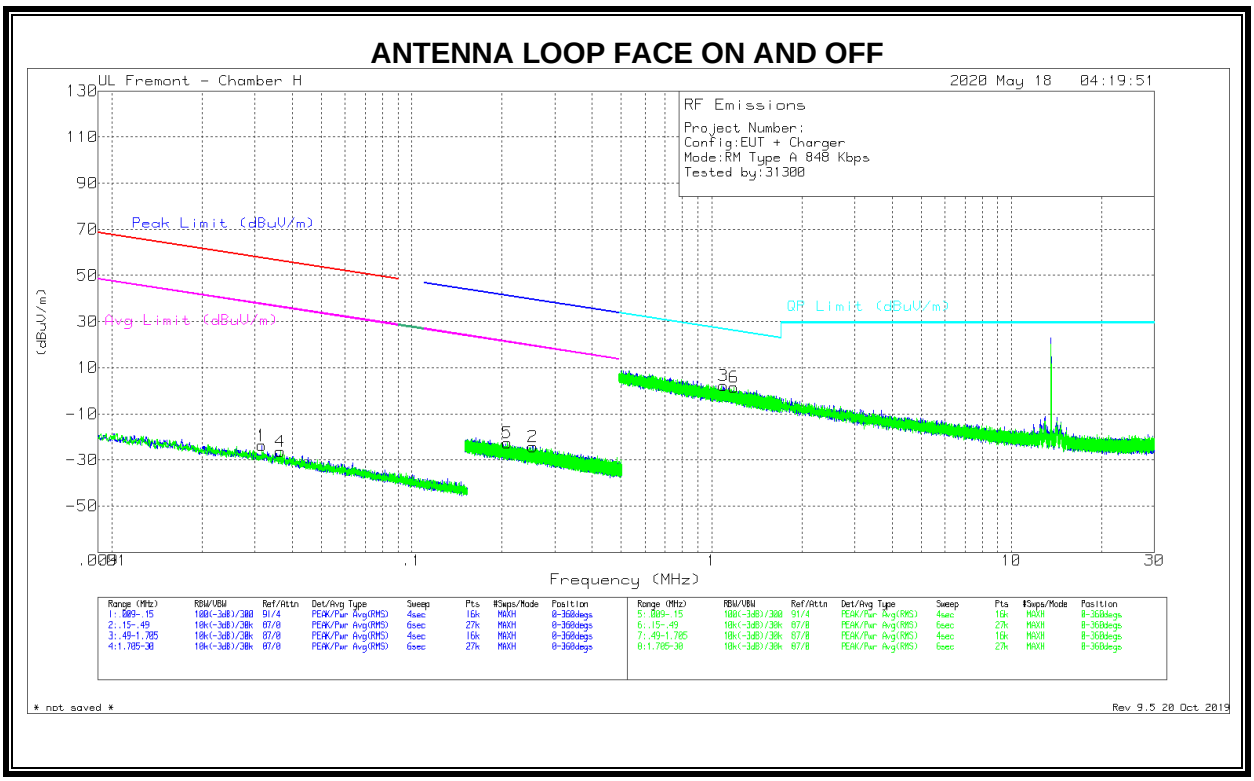
DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	11.86525	12.97	Pk	10.7	.4	-40	-15.93	29.54	-45.47	0-360
8	11.87228	11.48	Pk	10.7	.4	-40	-17.42	29.54	-46.96	0-360
9	12.47671	14.21	Pk	10.7	.4	-40	-14.69	29.54	-44.23	0-360
2	12.5165	15.41	Pk	10.6	.4	-40	-13.59	29.54	-43.13	0-360
10	12.92545	15.42	Pk	10.6	.4	-40	-13.58	29.54	-43.12	0-360
3	12.9405	17.14	Pk	10.6	.4	-40	-11.86	29.54	-41.4	0-360
11	13.55807	49.3	Pk	10.6	.4	-40	20.3	84	-63.7	0-360
4	13.56013	52.19	Pk	10.6	.4	-40	23.19	84	-60.81	0-360
12	14.18656	14.87	Pk	10.6	.4	-40	-14.13	29.54	-43.67	0-360
5	14.199	16.55	Pk	10.6	.4	-40	-12.45	29.54	-41.99	0-360
13	14.6159	13.29	Pk	10.6	.4	-40	-15.71	29.54	-45.25	0-360
6	14.63675	15.33	Pk	10.6	.4	-40	-13.67	29.54	-43.21	0-360
14	15.23721	12.37	Pk	10.6	.4	-40	-16.63	29.54	-46.17	0-360
7	15.251	12.38	Pk	10.6	.4	-40	-16.62	29.54	-46.16	0-360

Pk - Peak detector

FCC 15.225 13.56MHz Fundamental Mask.TST 30915 20 Mar 2017
Rev 9.5 06 Mar 2020

SPURIOUS EMISSION



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.03161	41.89	Pk	14.3	0	-80	-23.81	57.59	-81.4	37.59	-61.4	-	-	-	-	0-360
4	.03648	39.88	Pk	13.8	0	-80	-26.32	56.34	-82.66	36.34	-62.66	-	-	-	-	0-360
5	.20851	46.36	Pk	11	.1	-80	-22.54	-	-	-	-	41.24	-63.78	21.24	-43.78	0-360
2	.2533	44.78	Pk	10.9	.1	-80	-24.22	-	-	-	-	39.54	-63.76	19.54	-43.76	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.09412	30.97	Pk	11.2	.1	-40	2.27	26.84	-24.57	0-360
6	1.18692	30.19	Pk	11.2	.1	-40	1.49	26.14	-24.65	0-360

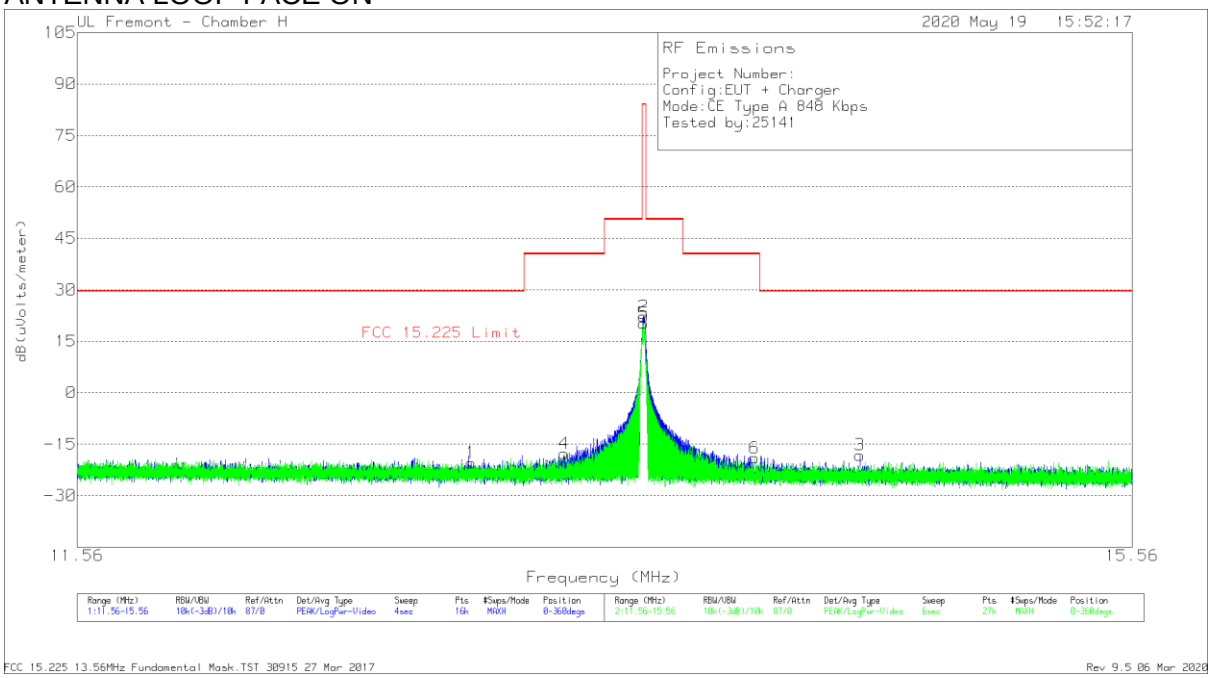
Pk - Peak detector

FCC 15.209 Below 30MHz.TST 30915 28 Apr 2017
Rev 9.5 06 Mar 2020

8.2.2. CE MODE, TYPE A 848Kbps

FUNDAMENTAL 848Kbps

ANTENNA LOOP FACE ON



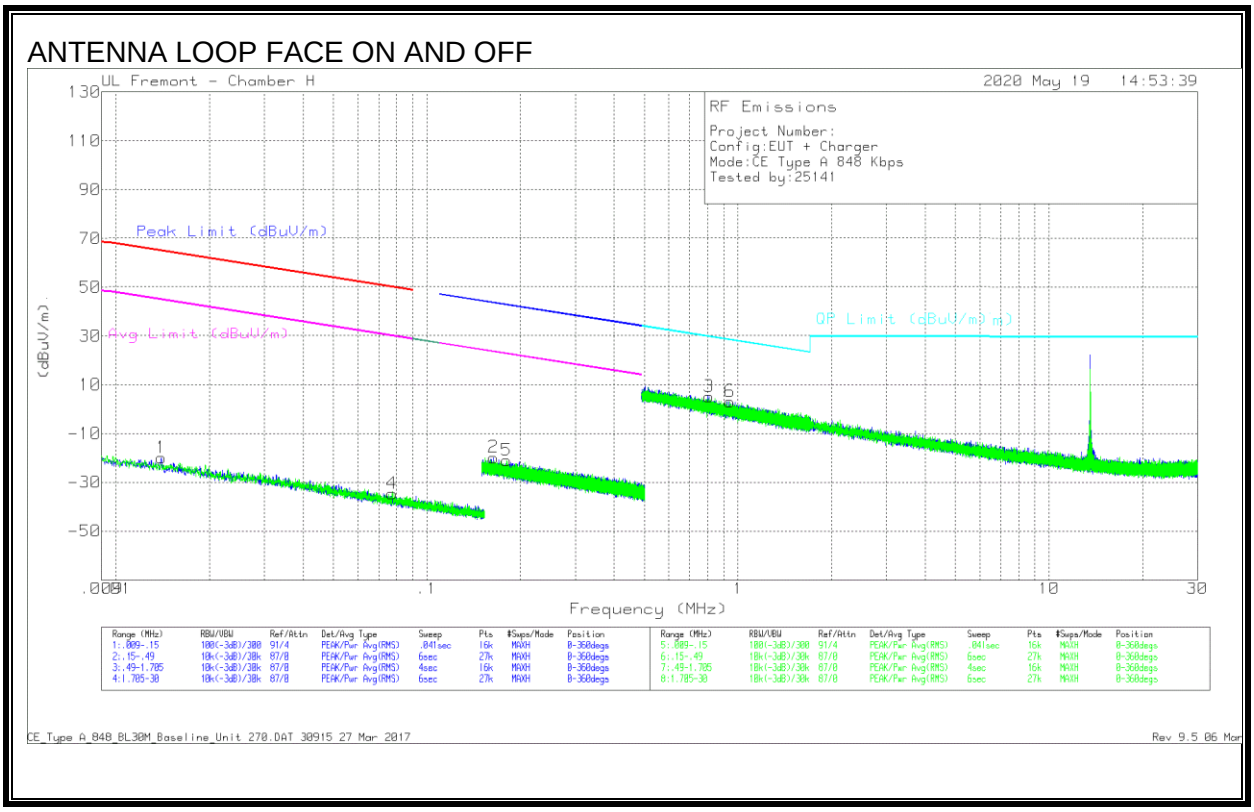
DATA

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	12.9165	8.89	Pk	10.3	.4	-40	-20.41	29.54	-49.95	0-360
4	13.25889	11.55	Pk	10.3	.4	-40	-17.75	40.51	-58.26	0-360
5	13.55933	49.63	Pk	10.2	.4	-40	20.23	84	-63.77	0-360
2	13.5595	51.67	Pk	10.2	.4	-40	22.27	84	-61.73	0-360
6	13.98957	10.36	Pk	10.2	.4	-40	-19.04	40.51	-59.55	0-360
3	14.41075	11.22	Pk	10.2	.4	-40	-18.18	29.54	-47.72	0-360

Pk - Peak detector

FCC 15.225 13.56MHz Fundamental Mask.TST 30915 27 Mar 2017
Rev 9.5 06 Mar 2020

SPURIOUS EMISSION 848Kbps



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	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	.014	42.6	Pk	17.4	0	-80	-20	64.66	-84.66	44.66	-64.66	-	-	-	-	0-360
4	.07738	33.1	Pk	12.3	0	-80	-34.6	49.81	-84.41	29.81	-64.41	-	-	-	-	0-360
2	.16378	48.54	Pk	11.6	.1	-80	-19.76	-	-	-	-	43.34	-63.1	23.34	-43.1	0-360
5	.18015	47.47	Pk	11.5	.1	-80	-20.93	-	-	-	-	42.51	-63.44	22.51	-43.44	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.8057	34.33	Pk	10.8	.1	-40	5.23	29.49	-24.26	0-360
6	.94167	32.28	Pk	10.8	.1	-40	3.18	28.14	-24.96	0-360

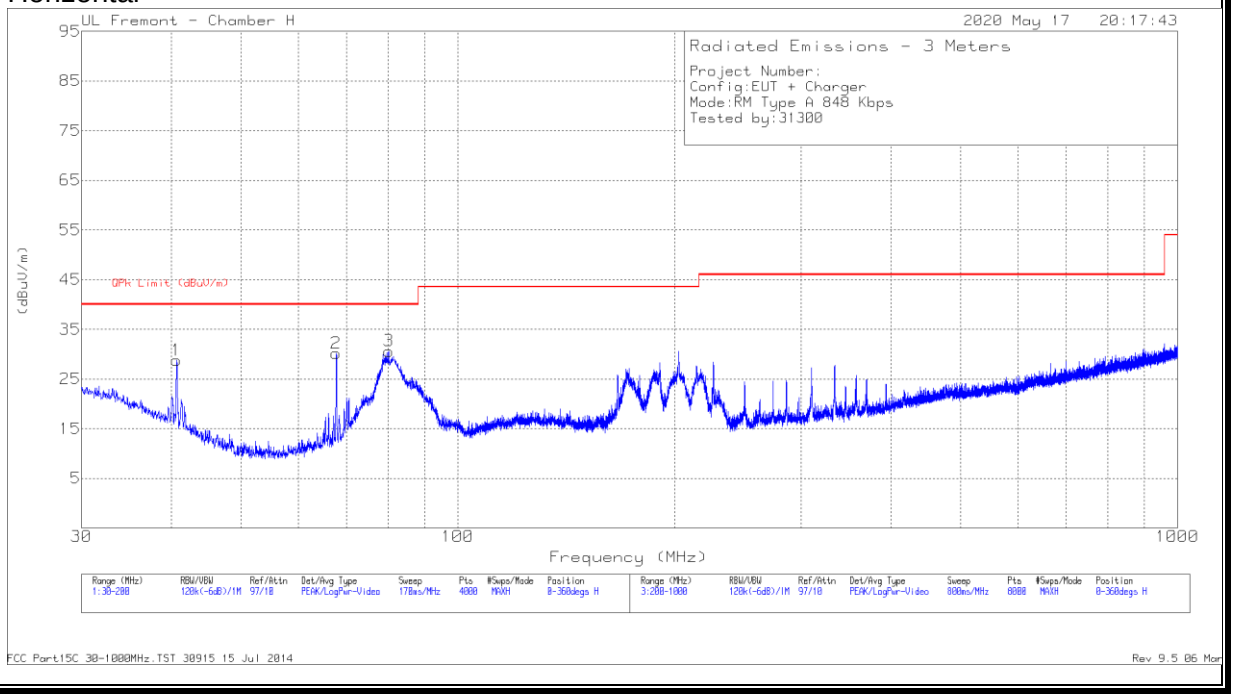
PK - Peak detector
FCC 15.209 Below 30MHz.TST 30915 27 Mar 2017
Rev 9.5 06 Mar 2020

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

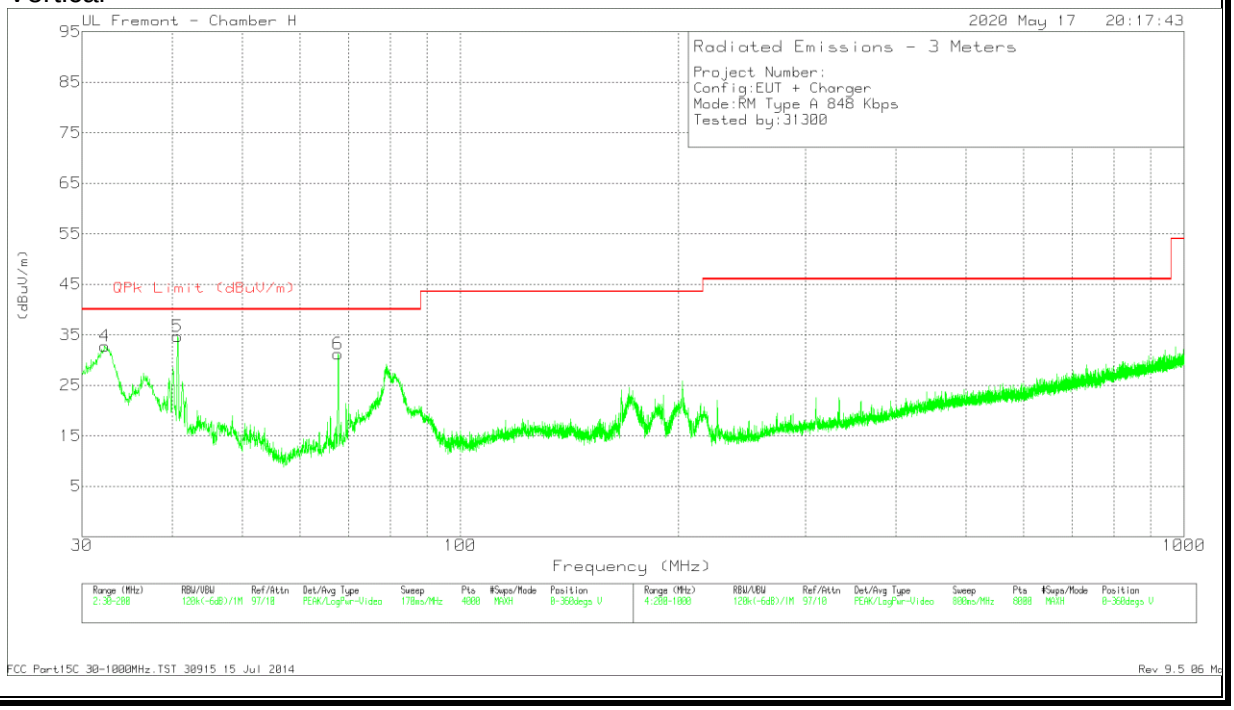
Type A (Reader Mode)

SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

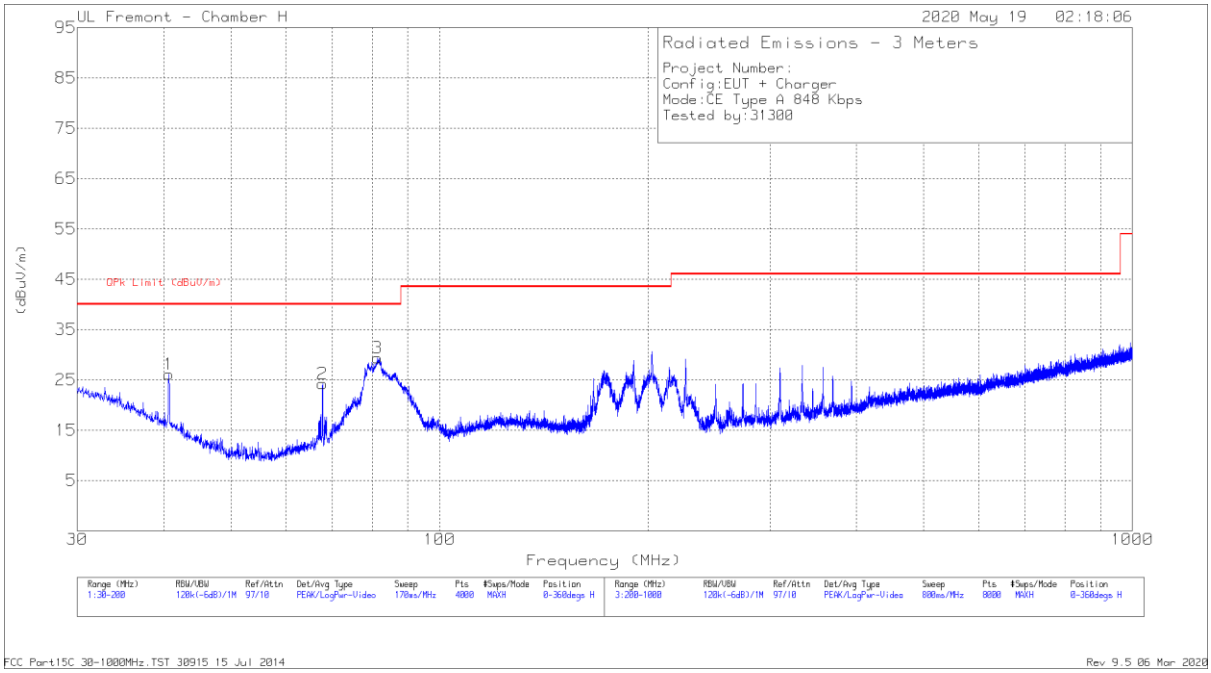
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	32.2531	38.44	Pk	25.5	-31.2	32.74	40	-7.26	0-360	100	V
1	40.6703	40.06	Pk	19.8	-31.1	28.76	40	-11.24	0-360	400	H
5	40.6703	45.89	Pk	19.8	-31.1	34.59	40	-5.41	0-360	100	V
	40.6669	45.4	Qp	19.8	-31.1	34.1	40	-5.9	304	106	V
2	67.7923	46.94	Pk	14	-30.8	30.14	40	-9.86	0-360	300	H
6	67.7923	47.94	Pk	14	-30.8	31.14	40	-8.86	0-360	100	V
3	80.1205	48.02	Pk	13.3	-30.7	30.62	40	-9.38	0-360	300	H

PK - Peak detector
Qp - Quasi-Peak detector

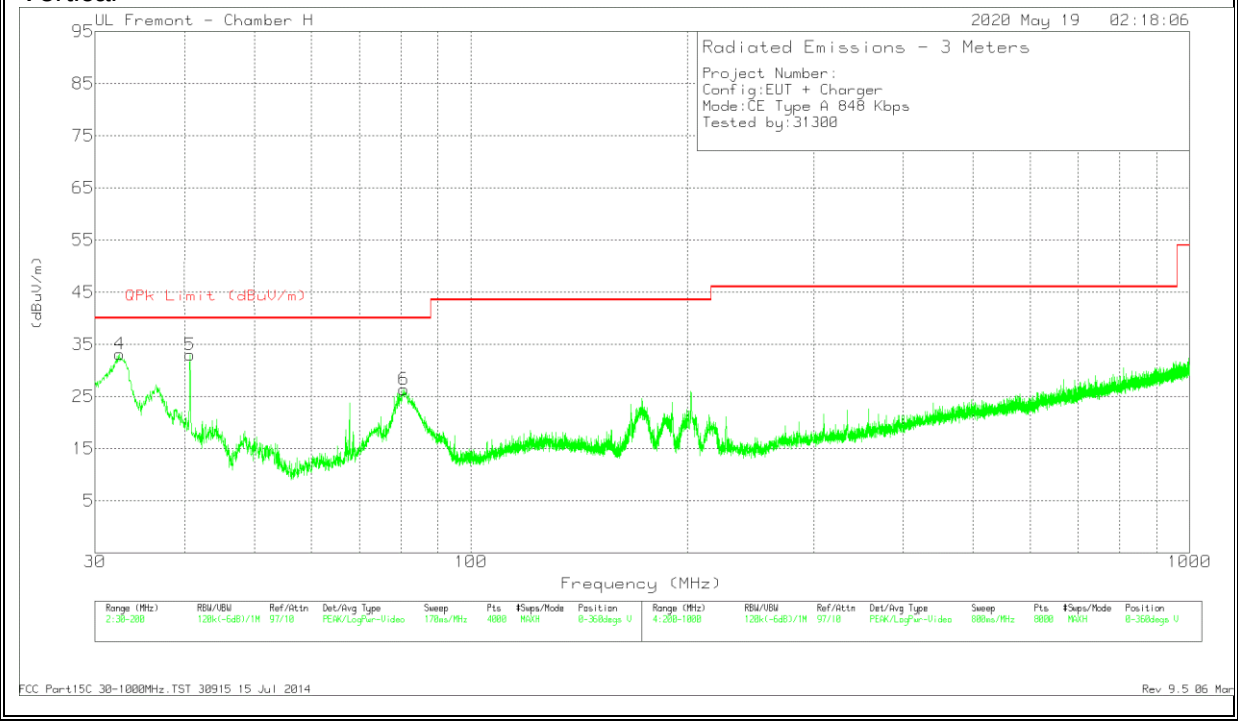
FCC Part15C 30-1000MHz.TST 30915 15 Jul 2014
Rev 9.5 06 Mar 2020

Type A (CE Mode), SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



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
4	32.4656	38.9	Pk	25.4	-31.2	33.1	40	-6.9	0-360	100	V
1	40.6703	37.39	Pk	19.8	-31.1	26.09	40	-13.91	0-360	400	H
5	40.6703	44.26	Pk	19.8	-31.1	32.96	40	-7.04	0-360	100	V
2	67.7923	41.03	Pk	14	-30.8	24.23	40	-15.77	0-360	400	H
6	80.7156	43.63	Pk	13.3	-30.6	26.33	40	-13.67	0-360	100	V
3	81.3958	46.63	Pk	13.3	-30.6	29.33	40	-10.67	0-360	400	H

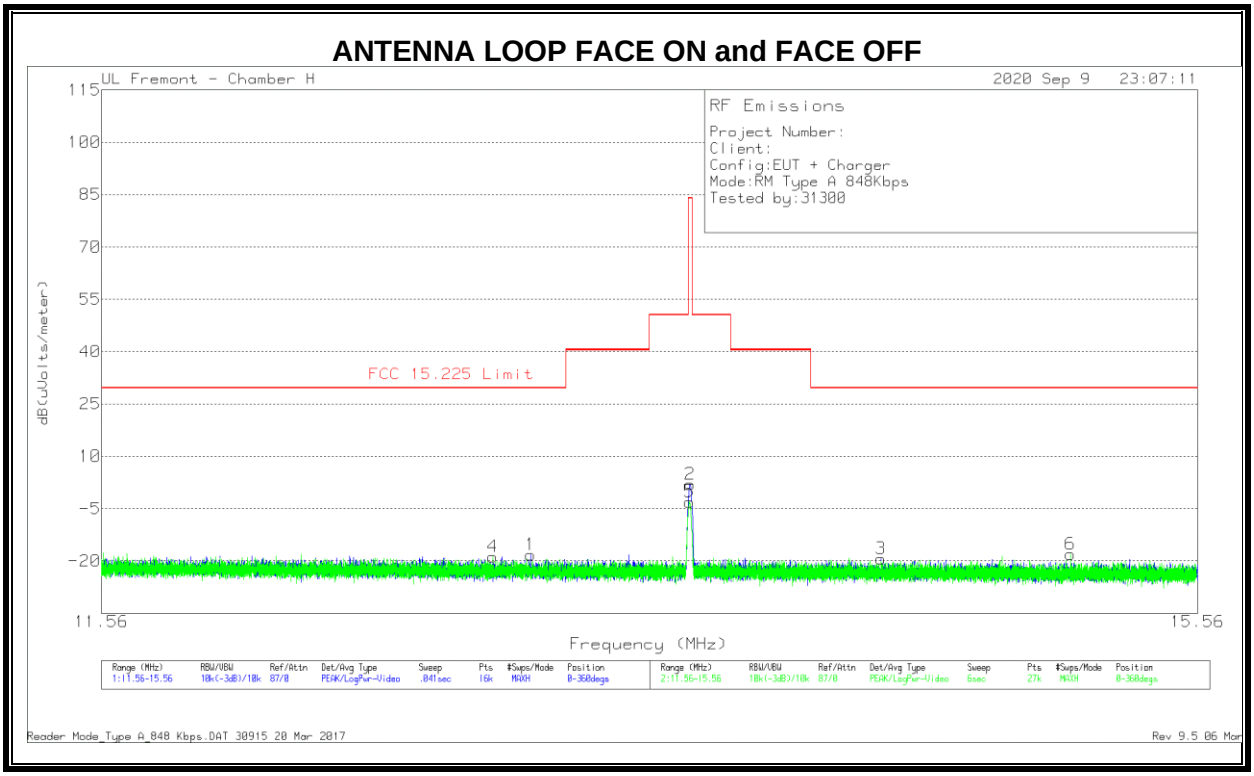
Pk - Peak detector

FCC Part15C 30-1000MHz.TST 30915 15 Jul 2014
Rev 9.5 06 Mar 2020

8.3. SECONDARY ANTENNA FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 - 30 MHz), EUT WITH AC/DC ADAPTER (re-mark)

8.3.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL

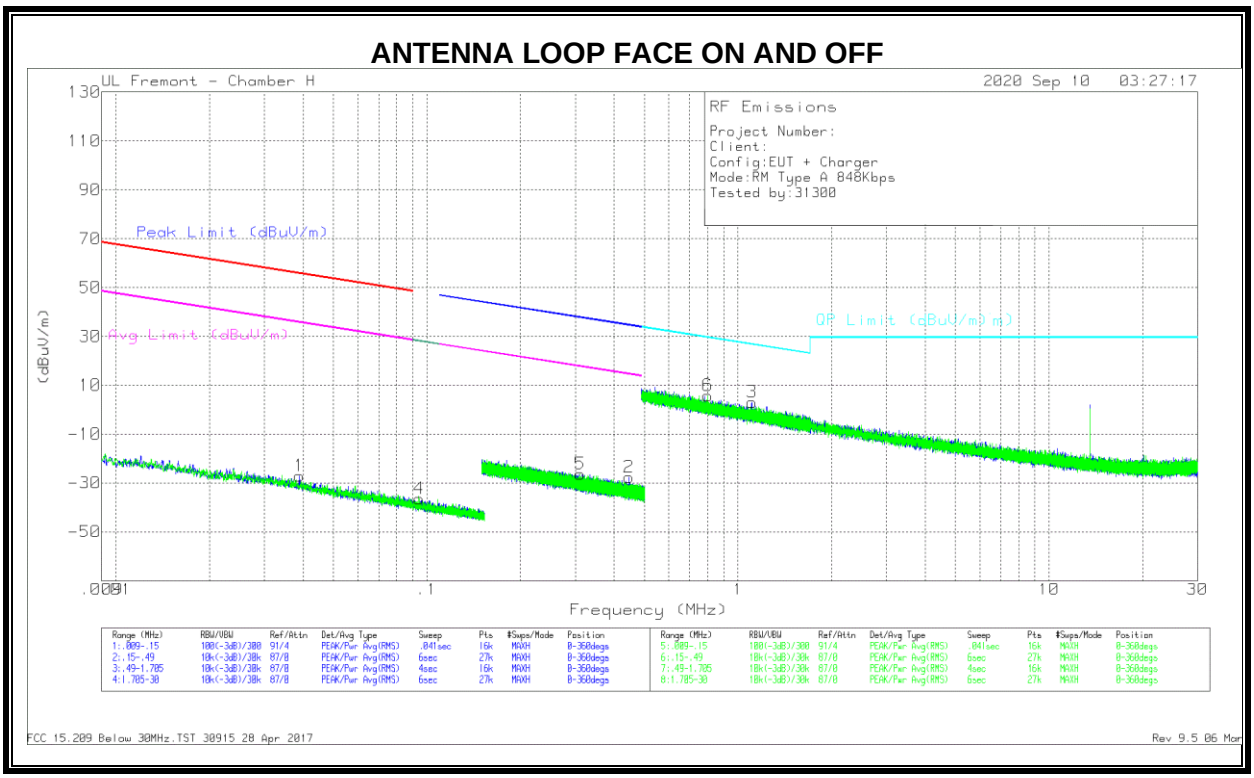


DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
4	12.85367	10.24	Pk	10.6	.4	-40	-18.76	29.54	-48.3	0-360
1	12.987	10.78	Pk	10.6	.4	-40	-18.22	29.54	-47.76	0-360
5	13.55696	25.99	Pk	10.6	.4	-40	-3.01	84	-87.01	0-360
2	13.55975	30.93	Pk	10.6	.4	-40	1.93	84	-82.07	0-360
3	14.27975	9.64	Pk	10.6	.4	-40	-19.36	29.54	-48.9	0-360
6	15.034	10.96	Pk	10.6	.4	-40	-18.04	29.54	-47.58	0-360

Pk - Peak detector

SPURIOUS EMISSION



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.03899	39.46	Pk	13.5	0	-80	-27.04	55.77	-82.81	35.77	-62.81	-	-	-	-	-	-	0-360
4	.09431	32.04	Pk	11.6	0	-80	-36.36	-	-	-	-	28.1	-64.46	-	-	-	-	0-360
5	.31055	42.73	Pk	10.9	.1	-80	-26.27	-	-	-	-	-	-	37.77	-64.04	17.77	-44.04	0-360
2	.44726	41.3	Pk	10.9	.1	-80	-27.7	-	-	-	-	-	-	34.59	-62.29	14.59	-42.29	0-360

Pk - Peak detector

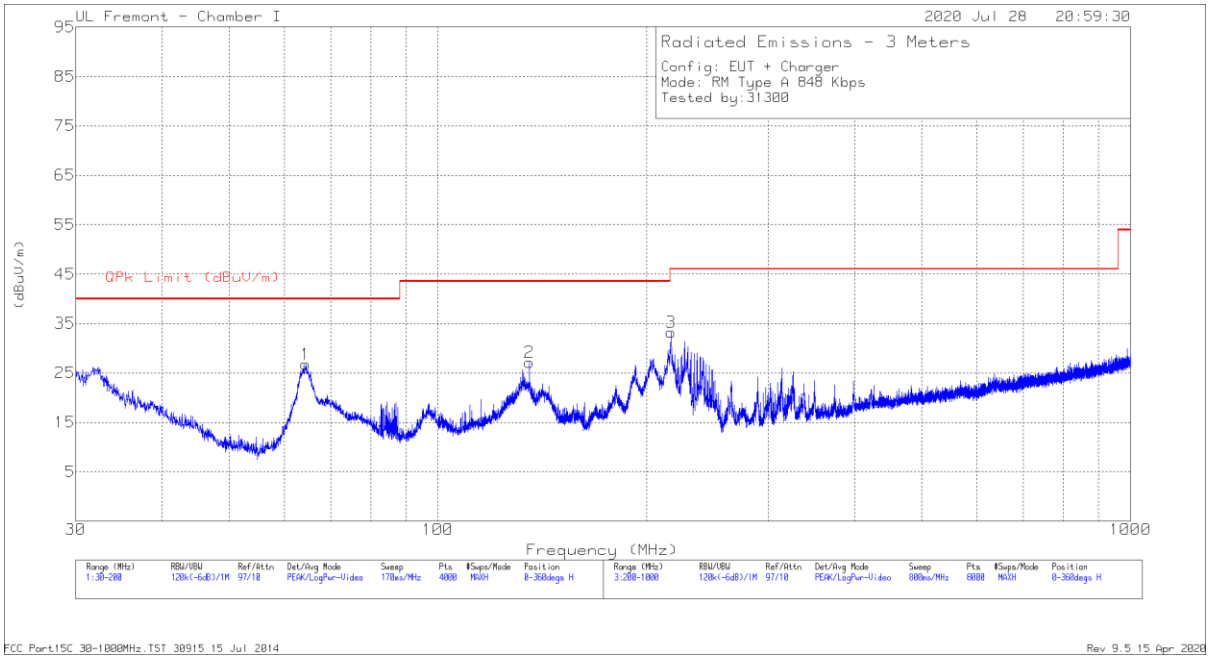
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
6	.79864	34.75	Pk	11	.1	-40	5.85	-	29.57	-23.72	0-360
3	1.10902	31.87	Pk	11.2	.1	-40	3.17	-	26.73	-23.56	0-360

Pk - Peak detector

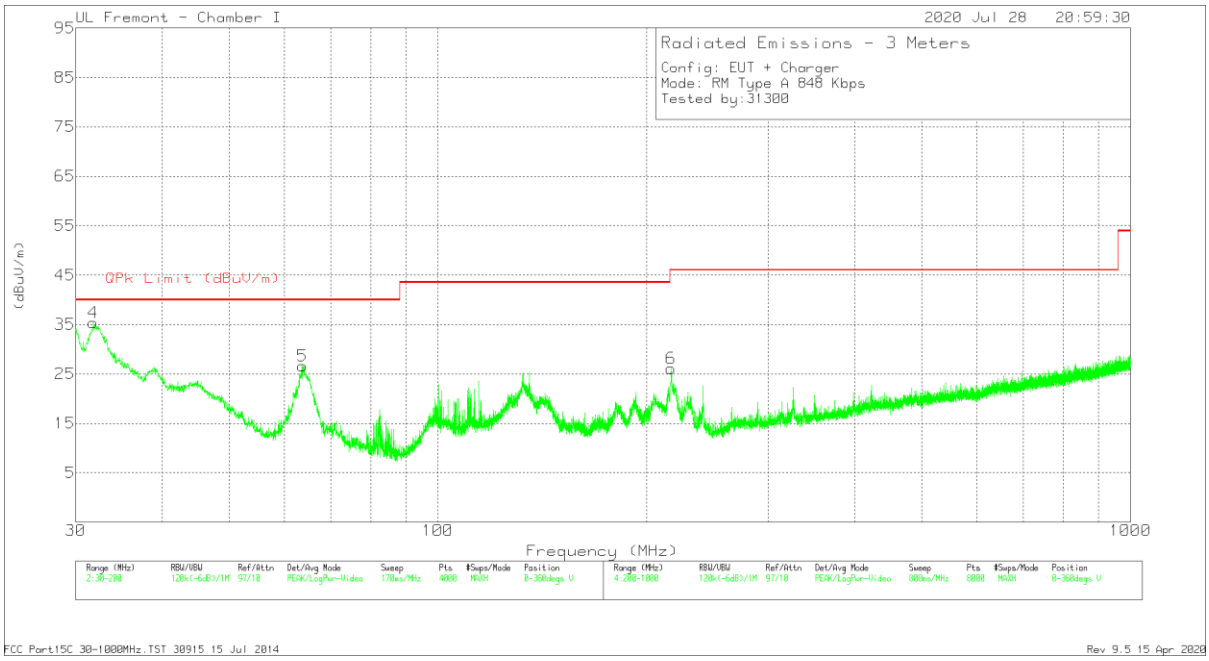
8.3.2. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode),SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184052 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	64.3914	44.09	Pk	13.6	-31	26.69	40	-13.31	0-360	299	H
2	* 135.5973	38.78	Pk	19	-30.6	27.18	43.52	-16.34	0-360	199	H
4	31.7855	41.18	Pk	25.7	-31.5	35.38	40	-4.62	0-360	100	V
	32.0013	37.42	Qp	25.5	-31.5	31.42	40	-8.58	235	103	V
5	63.7112	43.96	Pk	13.6	-31	26.56	40	-13.44	0-360	100	V
3	217.0022	47.06	Pk	16.4	-30.3	33.16	46.02	-12.86	0-360	99	H
6	217.3022	40.04	Pk	16.4	-30.3	26.14	46.02	-19.88	0-360	199	V

Pk - Peak detector
Qp - Quasi-Peak detector

9. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±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 ±0.01% (±100 ppm).

TEST PROCEDURE

ANSI C63.10-2013 Clause 6.8

RESULTS

No non-compliance noted.

ID:	38602	**Date:**	07/06/2020 & 9/10/2020

9.1. PRIMARY ANTENNA

READER MODE, TYPE A 848Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC										
Limit: ± 100 ppm = 1.35600 KHz										
Power Supply	Envir. Temp	Frequency Deviation Measureed with Time Elapse								
(VAC)	(ºC)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
	50	13.5597461	4.715	13.5597462	4.715	13.5597465	4.687	13.5597474	4.624	± 100
	40	13.5597618	3.557	13.5597590	3.769	13.5597560	3.990	13.5597532	4.196	± 100
	30	13.5598092	0.069	13.5597969	0.975	13.5597879	1.635	13.5597809	2.153	± 100
3.80	***20***	***13.5598101***	***0.000***	***13.5598102***	***-0.006***	***13.5598101***	***-0.004***	***13.5598101***	***-0.001***	***± 100***
	10	13.5597823	2.048	13.5597966	0.994	13.5598134	-0.243	13.5598310	-1.540	± 100
	0	13.5598627	-3.882	13.5598692	-4.361	13.5598760	-4.860	13.5598826	-5.348	± 100
	-10	13.5599033	-6.877	13.5599077	-7.196	13.5599119	-7.508	13.5599155	-7.776	± 100
	-20	13.5599075	-7.182	13.5599185	-7.999	13.5599268	-8.605	13.5599319	-8.986	± 100
3.23	20	13.5598288	-1.380	13.5598688	-4.330	13.5598549	-3.304	13.5598910	-5.970	± 100
4.37	20	13.5599166	-7.857	13.5598852	-5.543	13.5598856	-5.566	13.5599185	-7.997	± 100

CE MODE, TYPE A 848Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC										
Limit: ± 100 ppm = 1.35600 KHz										
Power Supply	Envir. Temp	Frequency Deviation Measureed with Time Elapse								
(VAC)	(ºC)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
	50	13.5597475	5.618	13.5597462	5.712	13.5597455	5.759	13.5597454	5.767	± 100
	40	13.5597672	4.163	13.5597644	4.366	13.5597612	4.602	13.5597582	4.826	± 100
	30	13.5598005	1.708	13.5597967	1.985	13.5597922	2.316	13.5597884	2.602	± 100
3.80	***20***	***13.5598236***	***0.000***	***13.5598238***	***-0.013***	***13.5598239***	***-0.020***	***13.5598240***	***-0.030***	***± 100***
	10	13.5598063	1.277	13.5598207	0.213	13.5598340	-0.768	13.5598478	-1.780	± 100
	0	13.5598759	-3.854	13.5598821	-4.310	13.5598889	-4.814	13.5598948	-5.251	± 100
	-10	13.5599141	-6.668	13.5599173	-6.904	13.5599208	-7.165	13.5599246	-7.447	± 100
	-20	13.5599347	-8.187	13.5599352	-8.231	13.5599358	-8.271	13.5599361	-8.296	± 100
3.23	20	13.5597576	4.871	13.5597552	5.048	13.5597544	5.107	13.5597443	5.852	± 100
4.37	20	13.5598551	-2.317	13.5598421	-1.364	13.5598563	-2.412	13.5598557	-2.367	± 100

9.2. SECONDARY ANTENNA

READER MODE, TYPE A 848Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC										
Limit: ± 100 ppm = 1.35600 KHz										
Power Supply	Envir. Temp	Frequency Deviation Measureed with Time Elapse								
(VAC)	(ºC)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
	50	13.5599121	-8.997	13.5597499	2.965	13.5598800	-6.630	13.5597888	0.096	± 100
	40	13.5599464	-11.527	13.5598776	-6.453	13.5598773	-6.431	13.5598027	-0.929	± 100
	30	13.5597678	1.647	13.5597977	-0.560	13.5597968	-0.492	13.5596374	11.261	± 100
3.80	***20***	***13.5597901***	***0.000***	***13.5597901***	***0.000***	***13.5597860***	***0.302***	***13.5597818***	***0.612***	***± 100***
	10	13.5597818	0.612	13.5597818	0.612	13.5597818	0.612	13.5597818	0.612	± 100
	0	13.5597818	0.612	13.5597818	0.612	13.5597818	0.612	13.5597818	0.612	± 100
	-10	13.5598456	-4.091	13.5598507	-4.466	13.5598209	-2.269	13.5598612	-5.241	± 100
	-20	13.5597818	0.612	13.5599185	-9.473	13.5597855	0.339	13.5599319	-10.460	± 100
3.23	20	*13.5597867*	0.251	*13.5597865*	0.265	*13.5597340*	4.137	*13.5597782*	0.878	± 100
4.37	20	*13.5597932*	-0.229	*13.5597903*	-0.015	*13.5598890*	-7.294	*13.5597832*	0.509	± 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 50µH/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 (dBµV)	
	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

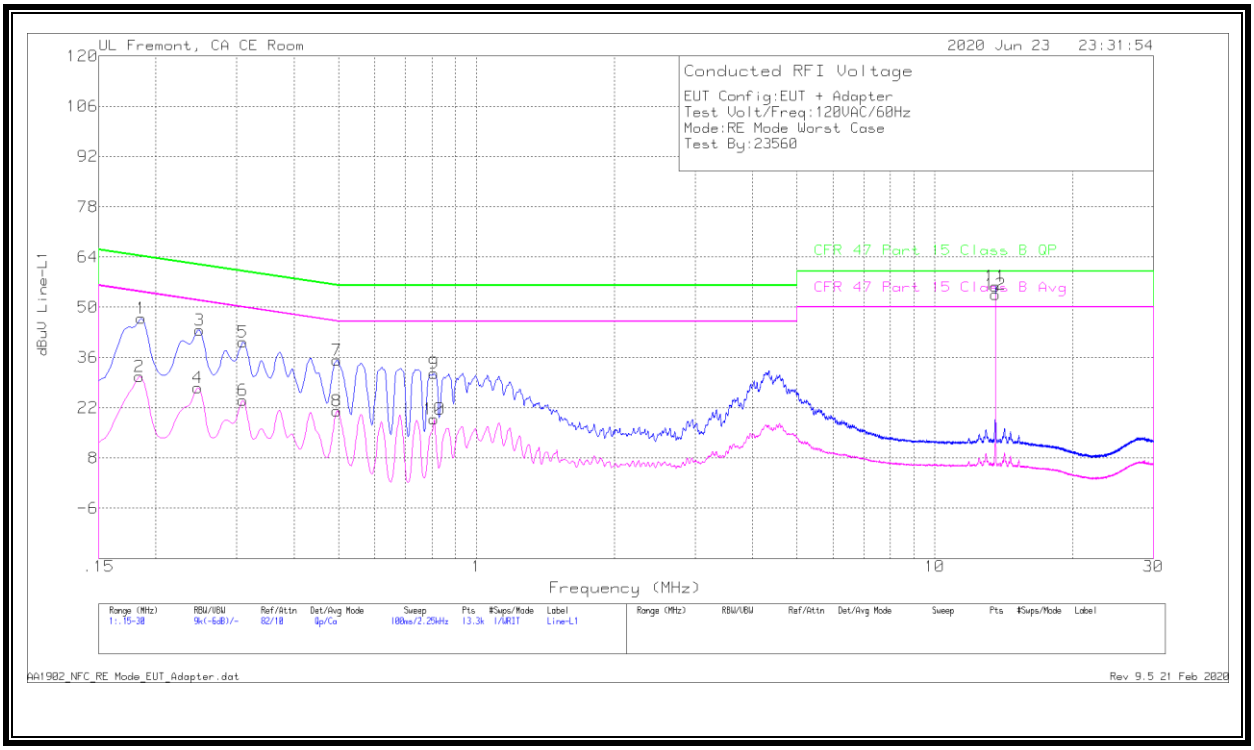
RESULTS

No non-compliance noted:

10.1. PRIMARY ANTENNA

10.1.1. READER MODE, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

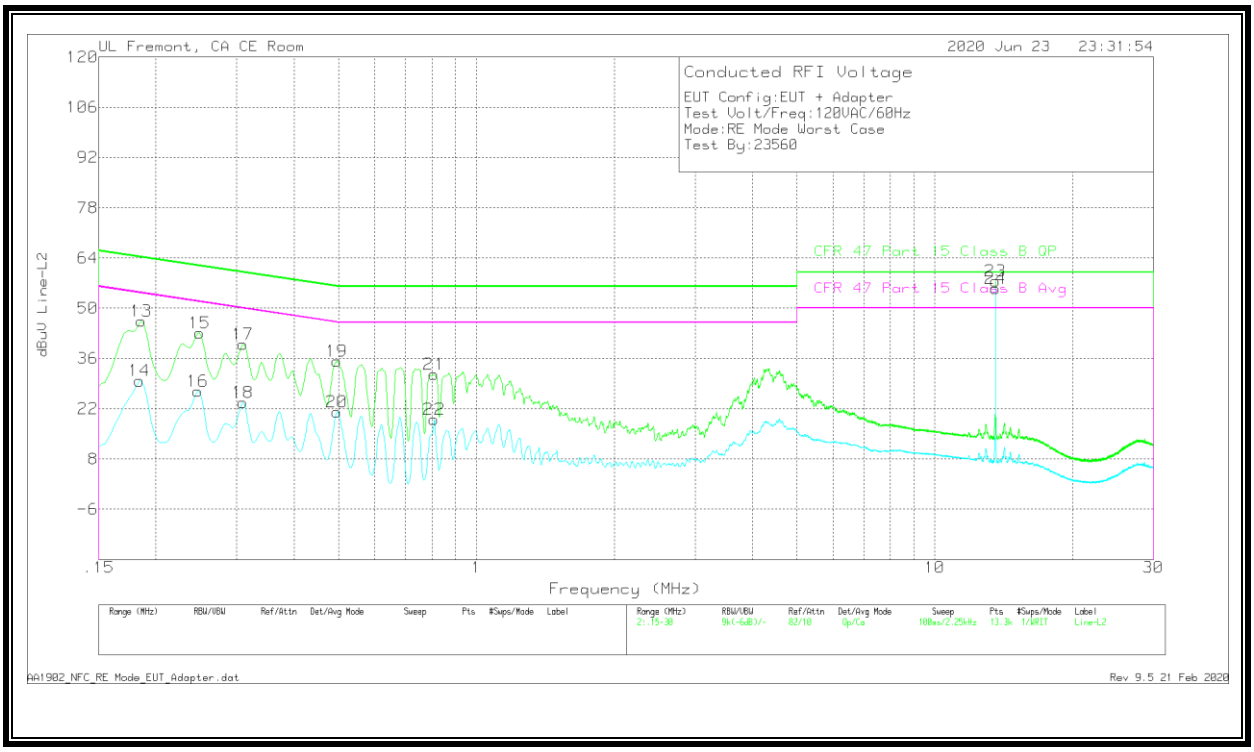
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.186	37.01	Qp	0	0	10	47.01	64.21	-17.2	-	-
2	.18375	20.72	Ca	0	0	10	30.72	-	-	54.31	-23.59
3	.249	33.68	Qp	0	0	10	43.68	61.79	-18.11	-	-
4	.24675	17.6	Ca	0	0	10	27.6	-	-	51.87	-24.27
5	.30975	30.25	Qp	0	0	10	40.25	59.98	-19.73	-	-
6	.30975	14.11	Ca	0	0	10	24.11	-	-	49.98	-25.87
7	.4965	25.24	Qp	0	0	10	35.24	56.06	-20.82	-	-
8	.4965	11.13	Ca	0	0	10	21.13	-	-	46.06	-24.93
9	.80925	21.65	Qp	0	0	10	31.65	56	-24.35	-	-
10	.80925	8.86	Ca	0	0	10	18.86	-	-	46	-27.14
11	*13.56	45.37	Qp	.1	.2	10.1	55.77	60	-4.23	-	-
12	*13.56	43.11	Ca	.1	.2	10.1	53.51	-	-	**50**	**3.51**

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1902_NFC_RE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 2020

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 2 RESULTS



Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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	.186	36.42	Qp	0	0	10	46.42	64.21	-17.79	-	-
14	.18375	19.76	Ca	0	0	10	29.76	-	-	54.31	-24.55
15	.249	33.15	Qp	0	0	10	43.15	61.79	-18.64	-	-
16	.24675	16.94	Ca	0	0	10	26.94	-	-	51.87	-24.93
17	.30975	29.91	Qp	0	0	10	39.91	59.98	-20.07	-	-
18	.30975	13.73	Ca	0	0	10	23.73	-	-	49.98	-26.25
19	.4965	25.29	Qp	0	0	10	35.29	56.06	-20.77	-	-
20	.4965	11.06	Ca	0	0	10	21.06	-	-	46.06	-25
21	.80925	21.66	Qp	0	0	10	31.66	56	-24.34	-	-
22	.80925	9.07	Ca	0	0	10	19.07	-	-	46	-26.93
23	*13.56	47.12	Qp	.1	.2	10.1	57.52	60	-2.48	-	-
24	*13.56	45.04	Ca	.1	.2	10.1	55.44	-	-	**50**	**5.44**

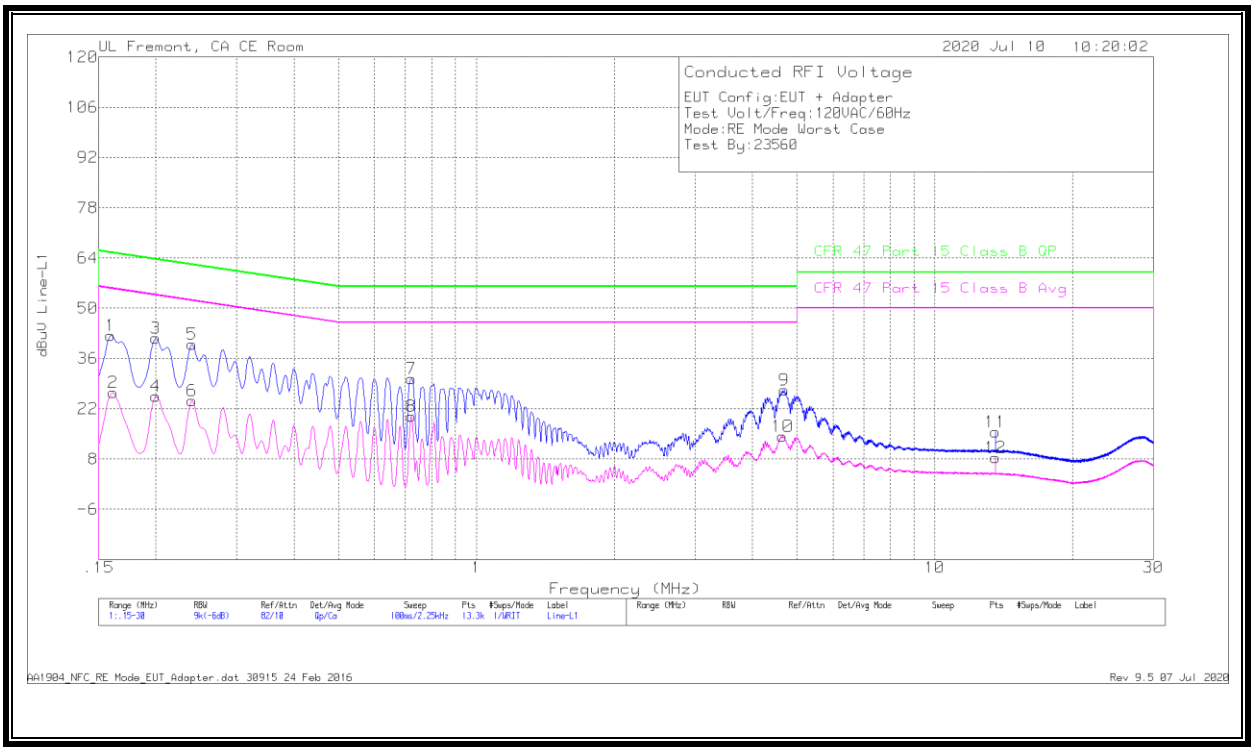
Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1902_NFC_RE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 2020

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

NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



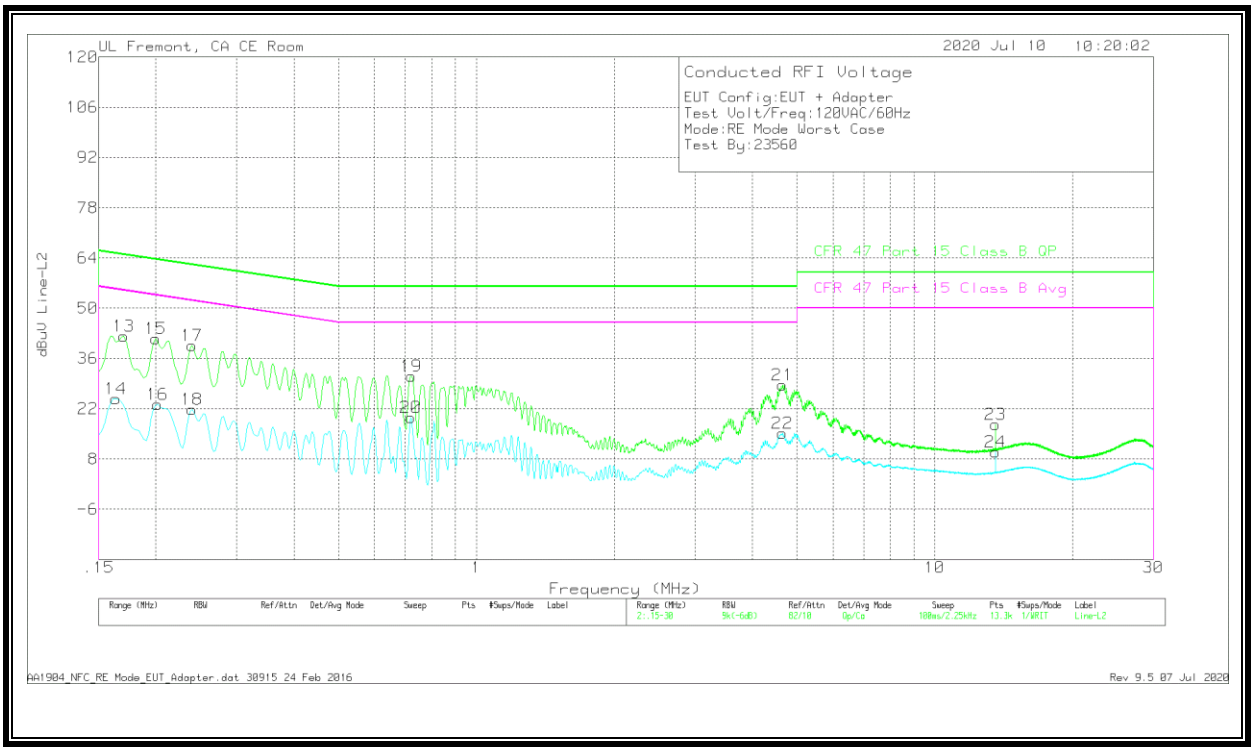
Worst Emission

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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	32.27	Qp	.1	0	10	42.37	65.52	-23.15	-	-
2	.16125	16.52	Ca	0	0	10	26.52	-	-	55.4	-28.88
3	.1995	31.74	Qp	0	0	10	41.74	63.63	-21.89	-	-
4	.1995	15.52	Ca	0	0	10	25.52	-	-	53.63	-28.11
5	.24	29.92	Qp	0	0	10	39.92	62.1	-22.18	-	-
6	.24	14.22	Ca	0	0	10	24.22	-	-	52.1	-27.88
7	.7215	20.42	Qp	0	0	10	30.42	56	-25.58	-	-
8	.7215	9.86	Ca	0	0	10	19.86	-	-	46	-26.14
9	4.695	16.98	Qp	0	.1	10.1	27.18	56	-28.82	-	-
10	4.659	4.15	Ca	0	.1	10.1	14.35	-	-	46	-31.65
11	13.56	5.2	Qp	.1	.2	10.1	15.6	60	-44.4	-	-
12	13.56	-2.09	Ca	.1	.2	10.1	8.31	-	-	50	-41.69

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1904_NFC_RE Mode_EUT_Adapter.dat 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

LINE 2 RESULTS



Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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)M argin (dB)
13	.17025	32.15	Qp	0	0	10	42.15	64.95	-22.8	-	-
14	.1635	14.81	Ca	0	0	10	24.81	-	-	55.28	-30.47
15	.1995	31.48	Qp	0	0	10	41.48	63.63	-22.15	-	-
16	.20175	13.17	Ca	0	0	10	23.17	-	-	53.54	-30.37
17	.24	29.6	Qp	0	0	10	39.6	62.1	-22.5	-	-
18	.24	11.8	Ca	0	0	10	21.8	-	-	52.1	-30.3
19	.7215	21.03	Qp	0	0	10	31.03	56	-24.97	-	-
20	.71925	9.47	Ca	0	0	10	19.47	-	-	46	-26.53
21	4.659	18.38	Qp	0	.1	10.1	28.58	56	-27.42	-	-
22	4.65788	4.95	Ca	0	.1	10.1	15.15	-	-	46	-30.85
23	13.56	7.25	Qp	.1	.2	10.1	17.65	60	-42.35	-	-
24	13.56	-.46	Ca	.1	.2	10.1	9.94	-	-	50	-40.06

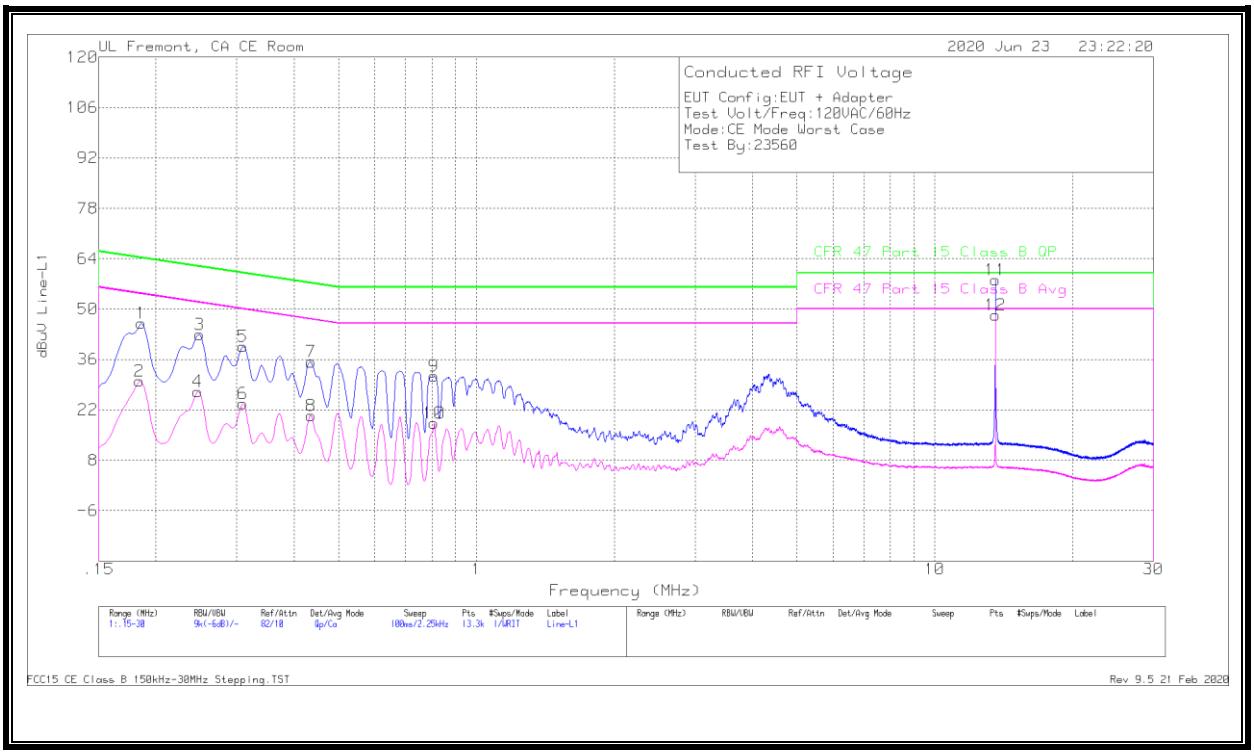
Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1904_NFC_RE Mode_EUT_Adapter.dat 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

10.1.2. CE MODE, TYPE A 848Kbps

NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

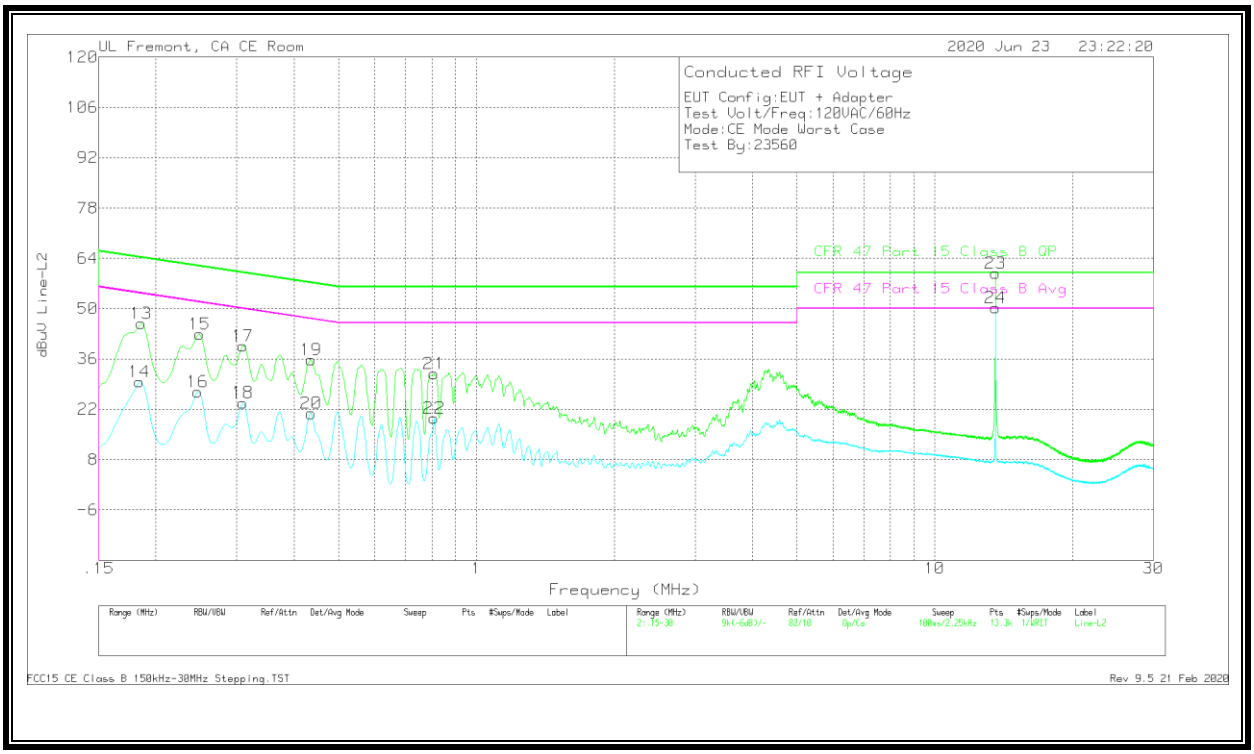
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.186	36.01	Qp	0	0	10	46.01	64.21	-18.2	-	-
2	.18375	19.94	Ca	0	0	10	29.94	-	-	54.31	-24.37
3	.249	32.89	Qp	0	0	10	42.89	61.79	-18.9	-	-
4	.24675	17.13	Ca	0	0	10	27.13	-	-	51.87	-24.74
5	.30975	29.61	Qp	0	0	10	39.61	59.98	-20.37	-	-
6	.30975	13.8	Ca	0	0	10	23.8	-	-	49.98	-26.18
7	.43575	25.34	Qp	0	0	10	35.34	57.14	-21.8	-	-
8	.43575	10.49	Ca	0	0	10	20.49	-	-	47.14	-26.65
9	.80925	21.46	Qp	0	0	10	31.46	56	-24.54	-	-
10	.80925	8.4	Ca	0	0	10	18.4	-	-	46	-27.6
11	13.56	47.7	Qp	.1	.2	10.1	58.1	60	-1.9	-	-
12	13.56	37.89	Ca	.1	.2	10.1	48.29	-	-	50	-1.71

Qp - Quasi-Peak detector
Ca - CISPR average detection

FCC15 CE Class B 150kHz-30MHz Stepping.TST
Rev 9.5 21 Feb 2020

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

LINE 2 RESULTS



Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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	.186	35.95	Qp	0	0	10	45.95	64.21	-18.26	-	-
14	.18375	19.69	Ca	0	0	10	29.69	-	-	54.31	-24.62
15	.249	32.85	Qp	0	0	10	42.85	61.79	-18.94	-	-
16	.24675	16.94	Ca	0	0	10	26.94	-	-	51.87	-24.93
17	.30975	29.6	Qp	0	0	10	39.6	59.98	-20.38	-	-
18	.30975	13.82	Ca	0	0	10	23.82	-	-	49.98	-26.16
19	.43575	25.77	Qp	0	0	10	35.77	57.14	-21.37	-	-
20	.43575	10.86	Ca	0	0	10	20.86	-	-	47.14	-26.28
21	.80925	21.91	Qp	0	0	10	31.91	56	-24.09	-	-
22	.80925	9.54	Ca	0	0	10	19.54	-	-	46	-26.46
23	13.56	49.5	Qp	.1	.2	10.1	59.9	60	-.1	-	-
24	13.56	39.82	Ca	.1	.2	10.1	50.22	-	-	**50**	**.22**

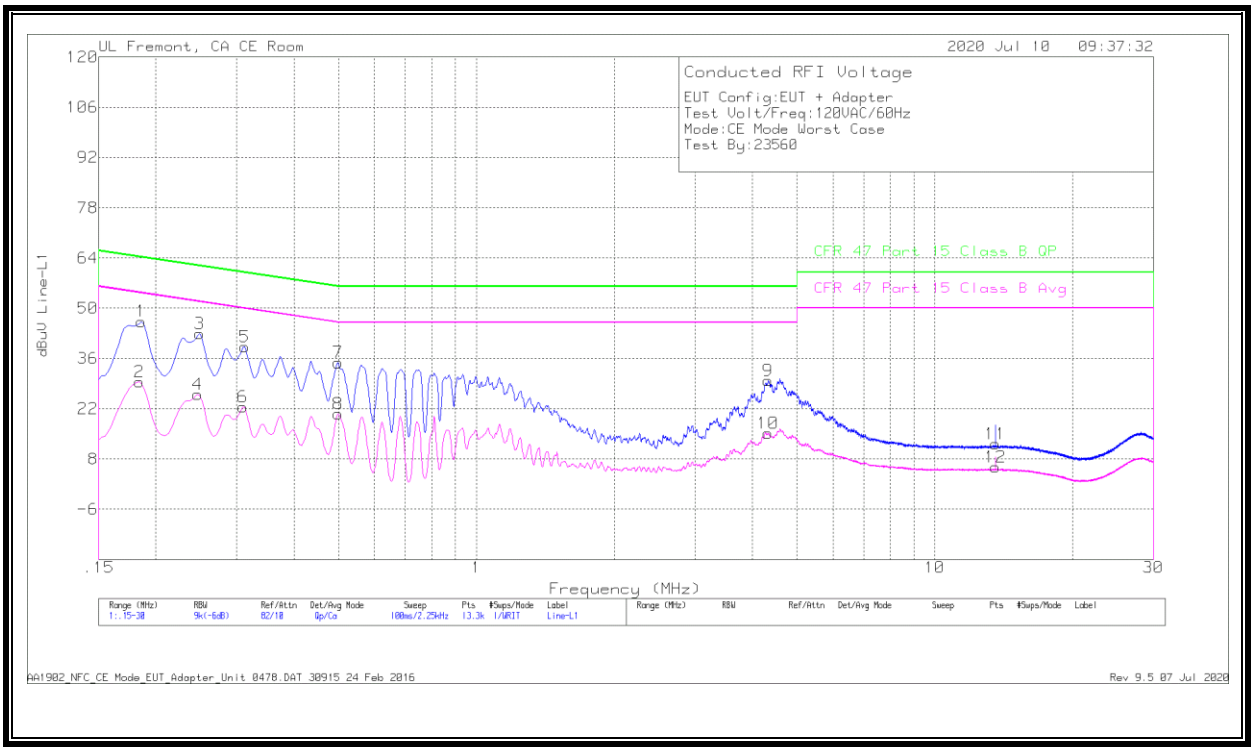
Qp - Quasi-Peak detector
Ca - CISPR average detection

FCC15 CE Class B 150kHz-30MHz Stepping.TST
Rev 9.5 21 Feb 2020

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

NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



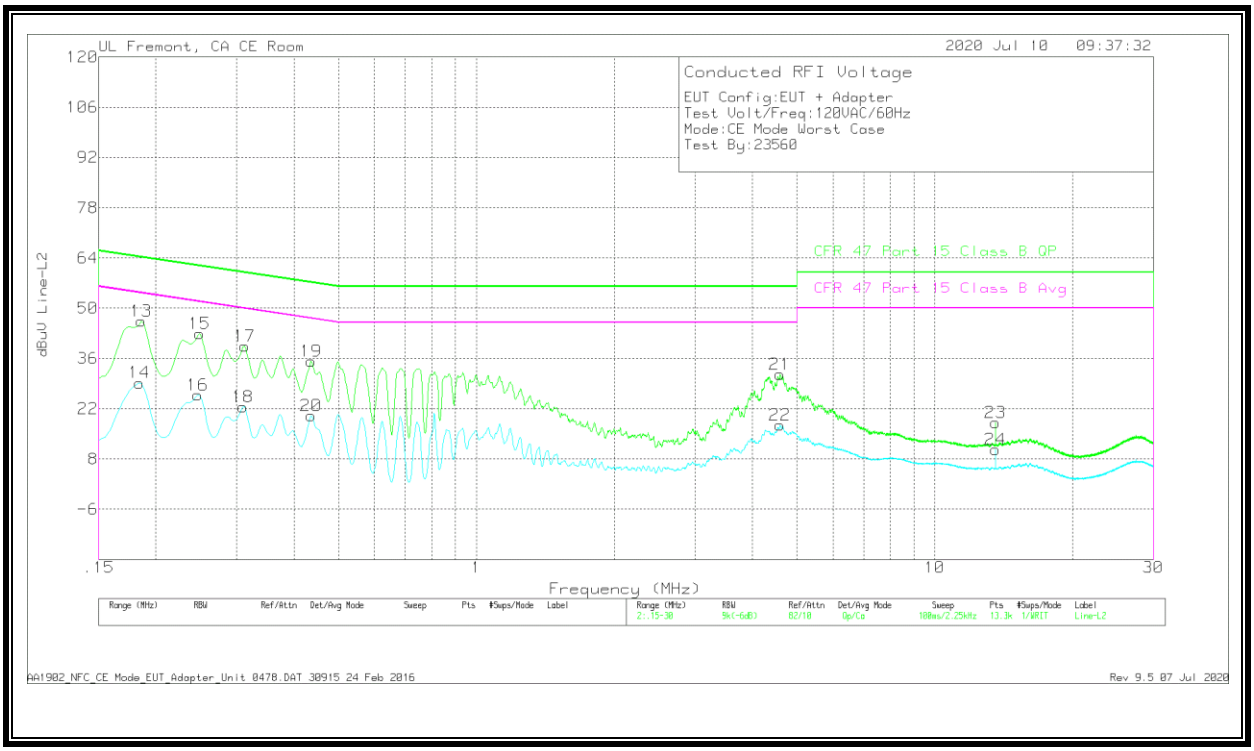
Worst Emission

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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	.186	36.33	Qp	0	0	10	46.33	64.21	-17.88	-	-
2	.18375	19.55	Ca	0	0	10	29.55	-	-	54.31	-24.76
3	.249	32.98	Qp	0	0	10	42.98	61.79	-18.81	-	-
4	.24675	15.99	Ca	0	0	10	25.99	-	-	51.87	-25.88
5	.312	29.34	Qp	0	0	10	39.34	59.92	-20.58	-	-
6	.30975	12.47	Ca	0	0	10	22.47	-	-	49.98	-27.51
7	.49875	24.82	Qp	0	0	10	34.82	56.02	-21.2	-	-
8	.49875	10.58	Ca	0	0	10	20.58	-	-	46.02	-25.44
9	4.33275	19.63	Qp	0	.1	10.1	29.83	56	-26.17	-	-
10	4.3305	4.94	Ca	0	.1	10.1	15.14	-	-	46	-30.86
11	13.56675	1.85	Qp	.1	.2	10.1	12.25	60	-47.75	-	-
12	13.56675	-4.71	Ca	.1	.2	10.1	5.69	-	-	50	-44.31

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1902_NFC_CE Mode_EUT_Adapter_Unit 0478.DAT 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

LINE 2 RESULTS



Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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)M argin (dB)
13	.186	36.34	Qp	0	0	10	46.34	64.21	-17.87	-	-
14	.18375	19.23	Ca	0	0	10	29.23	-	-	54.31	-25.08
15	.249	32.99	Qp	0	0	10	42.99	61.79	-18.8	-	-
16	.24675	15.85	Ca	0	0	10	25.85	-	-	51.87	-26.02
17	.312	29.5	Qp	0	0	10	39.5	59.92	-20.42	-	-
18	.30975	12.59	Ca	0	0	10	22.59	-	-	49.98	-27.39
19	.43575	25.3	Qp	0	0	10	35.3	57.14	-21.84	-	-
20	.43575	10.05	Ca	0	0	10	20.05	-	-	47.14	-27.09
21	4.596	21.38	Qp	0	.1	10.1	31.58	56	-24.42	-	-
22	4.59825	7.25	Ca	0	.1	10.1	17.45	-	-	46	-28.55
23	13.56	7.68	Qp	.1	.2	10.1	18.08	60	-41.92	-	-
24	13.56	.3	Ca	.1	.2	10.1	10.7	-	-	50	-39.3

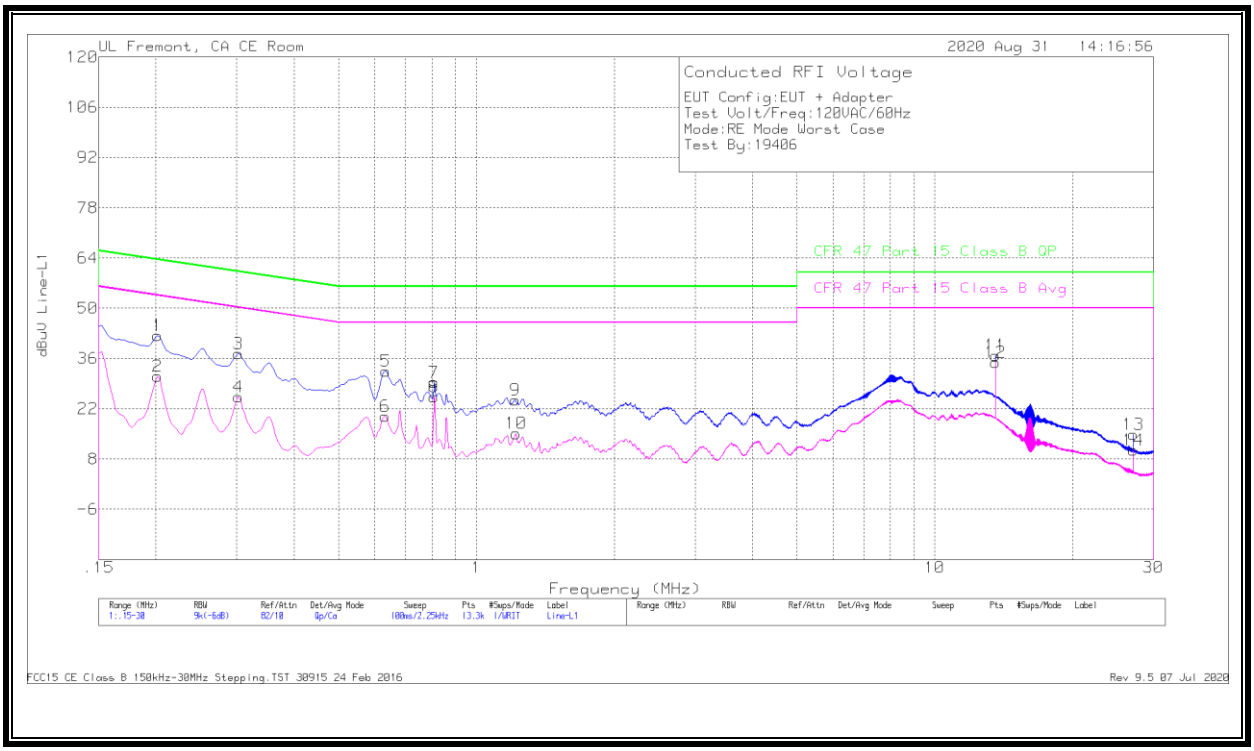
Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1902_NFC_CE Mode_EUT_Adapter_Unit 0478.DAT 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

10.2. SECONDARY ANTENNA

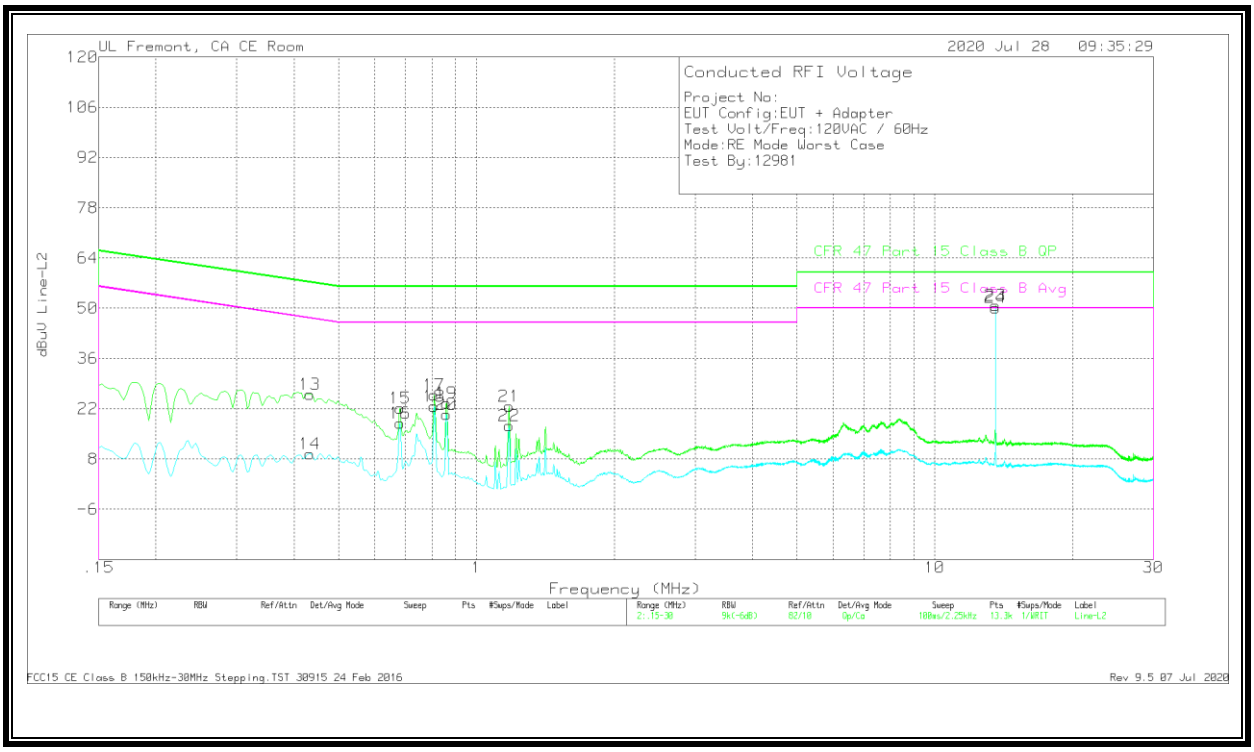
10.2.1. READER MODE, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

LINE 2 RESULTS



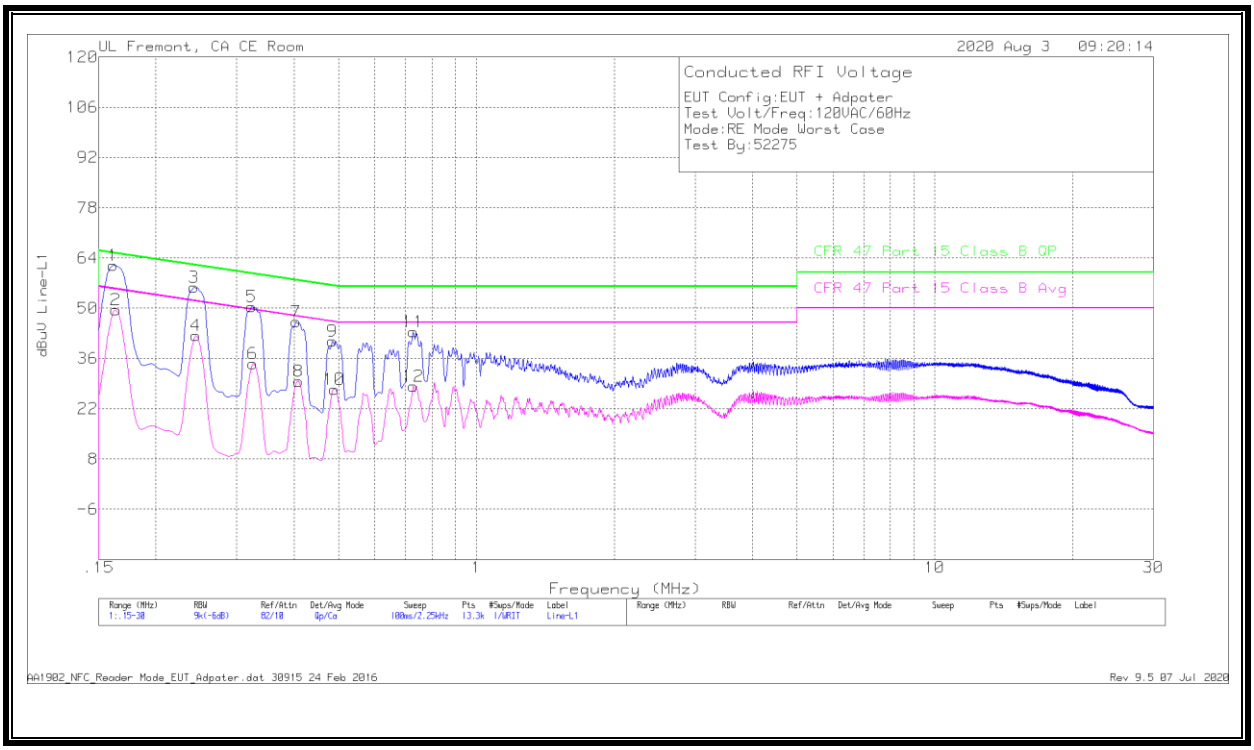
Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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	.4335	16.05	Qp	0	0	10	26.05	57.19	-31.14	-	-
14	.4335	-.54	Ca	0	0	10	9.46	-	-	47.19	-37.73
15	.681	12.19	Qp	0	0	10	22.19	56	-33.81	-	-
16	.681	8.05	Ca	0	0	10	18.05	-	-	46	-27.95
17	.80925	15.79	Qp	0	0	10	25.79	56	-30.21	-	-
18	.80925	12.65	Ca	0	0	10	22.65	-	-	46	-23.35
19	.861	13.52	Qp	0	0	10	23.52	56	-32.48	-	-
20	.861	10.48	Ca	0	0	10	20.48	-	-	46	-25.52
21	1.17825	12.54	Qp	0	.1	10	22.64	56	-33.36	-	-
22	1.17825	7.23	Ca	0	.1	10	17.33	-	-	46	-28.67
23	13.56	40.44	Qp	.1	.2	10.1	50.84	60	-9.16	-	-
24	13.56	39.77	Ca	.1	.2	10.1	50.17	-	-	**50**	**.17**

Qp - Quasi-Peak detector
Ca - CISPR average detection

NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



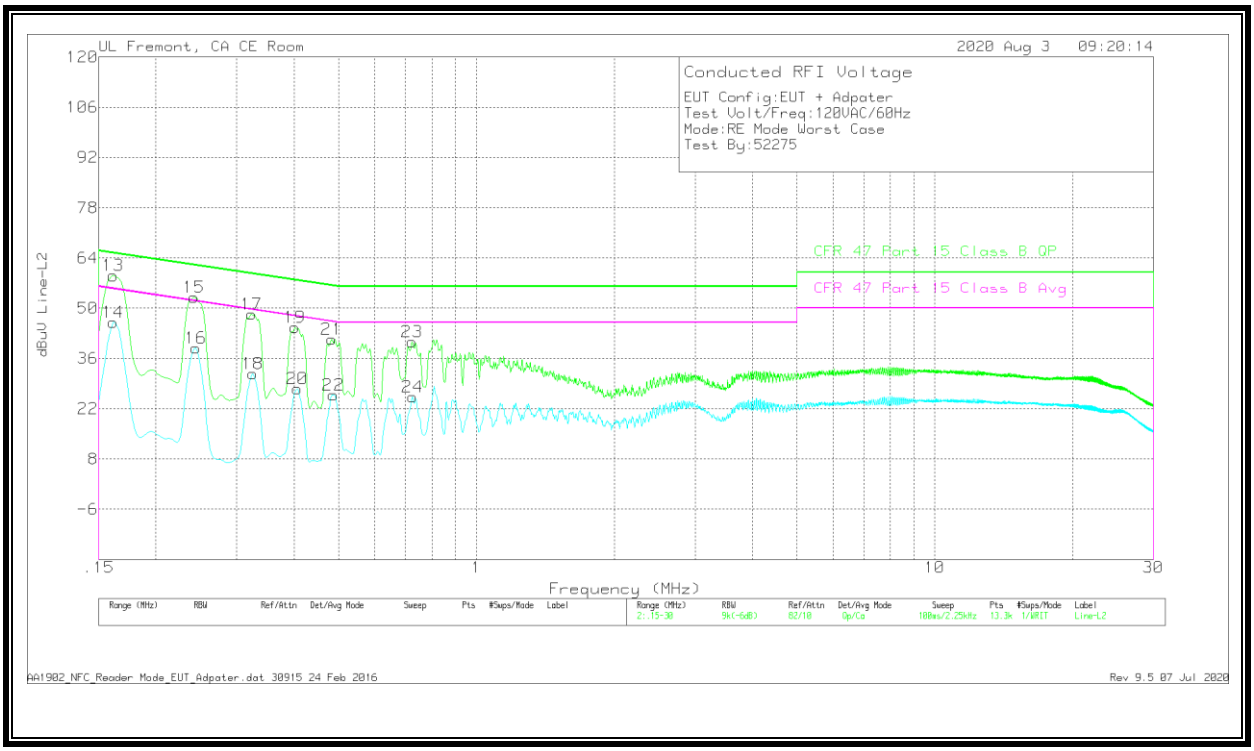
Worst Emission

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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	.16125	51.99	Qp	0	0	10	61.99	65.4	-3.41	-	-
2	.1635	39.59	Ca	0	0	10	49.59	-	-	55.28	-5.69
3	.24225	45.76	Qp	0	0	10	55.76	62.02	-6.26	-	-
4	.2445	32.34	Ca	0	0	10	42.34	-	-	51.94	-9.6
5	.32325	40.37	Qp	0	0	10	50.37	59.62	-9.25	-	-
6	.3255	24.63	Ca	0	0	10	34.63	-	-	49.57	-14.94
7	.40425	36.28	Qp	0	0	10	46.28	57.77	-11.49	-	-
8	.40875	19.74	Ca	0	0	10	29.74	-	-	47.67	-17.93
9	.48525	30.83	Qp	0	0	10	40.83	56.25	-15.42	-	-
10	.48975	17.4	Ca	0	0	10	27.4	-	-	46.17	-18.77
11	.72825	33.4	Qp	0	0	10	43.4	56	-12.6	-	-
12	.72825	18.26	Ca	0	0	10	28.26	-	-	46	-17.74

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1902_NFC_Reader Mode_EUT_Adpater.dat 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

LINE 2 RESULTS



Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 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)M argin (dB)
13	.16125	49.07	Qp	0	0	10	59.07	65.4	-6.33	-	-
14	.16125	36.08	Ca	0	0	10	46.08	-	-	55.4	-9.32
15	.24225	42.98	Qp	0	0	10	52.98	62.02	-9.04	-	-
16	.2445	28.89	Ca	0	0	10	38.89	-	-	51.94	-13.05
17	.32325	38.28	Qp	0	0	10	48.28	59.62	-11.34	-	-
18	.3255	21.77	Ca	0	0	10	31.77	-	-	49.57	-17.8
19	.402	34.6	Qp	0	0	10	44.6	57.81	-13.21	-	-
20	.4065	17.54	Ca	0	0	10	27.54	-	-	47.72	-20.18
21	.483	31.32	Qp	0	0	10	41.32	56.29	-14.97	-	-
22	.4875	15.9	Ca	0	0	10	25.9	-	-	46.21	-20.31
23	.72375	30.69	Qp	0	0	10	40.69	56	-15.31	-	-
24	.726	15.24	Ca	0	0	10	25.24	-	-	46	-20.76

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1902_NFC_Reader Mode_EUT_Adpater.dat 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

11. SETUP PHOTOS

Please refer to 13179110-EP1V1 for setup photos.

END OF TEST REPORT