



TEST REPORT

Report Number. : 13389132-E12V1

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

Model : A2411, A2412, A2413

FCC ID : BCG-E3550A

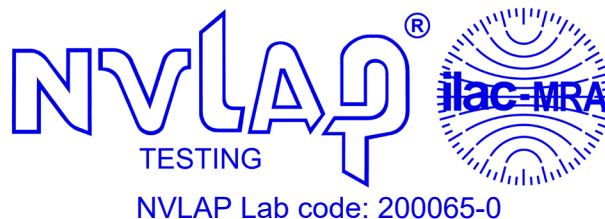
IC : 579C-E3550A

EUT Description : SMARTPHONE

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS-210 ISSUE 10
ISED RSS-GEN ISSUE 5

Date of Issue:
September 21, 2020

Prepared by:
UL Verification Services Inc.
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Revision History

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

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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: A2411, A2412 A2413

Serial Number: (Original): G6TCQ01TQ897
(Spot Check): G6TD401R06R1

DATE TESTED: September 01, 2020 – September 06, 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.

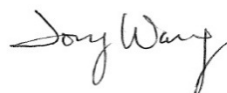
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Approved & Released For
UL Verification Services Inc. By:



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, 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-E3548A, IC: 579C-E3548A to cover variant model BCG-E3550A, 579C-E3550A. 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. DIFFERENCE IN MODEL NUMBER

Models A2411, A2412, and A2413 are electrically identical and the model numbers are allocated for marketing and logistic purposes only. Model A2411 was used for the spot check testing described in this report.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2411, FCC ID: BCG-E3550A, IC: BCG-E3550A for radiated spurious and Fundamental in accordance with the Test Plan that was approved via KDB inquiry.

Technology	Mode	Test Item	Measured	Original model		Spot check model		Delta (dB)
				A2342		A2411, A2412, A2413		
				BCG-E3548A 579C-E3548A		BCG-E3550A 579C-E3550A		
			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	Fund	13.56	27.71		27.16		-.55
NFC	Reader	RSE	40.68		35.17		35.85	0.68

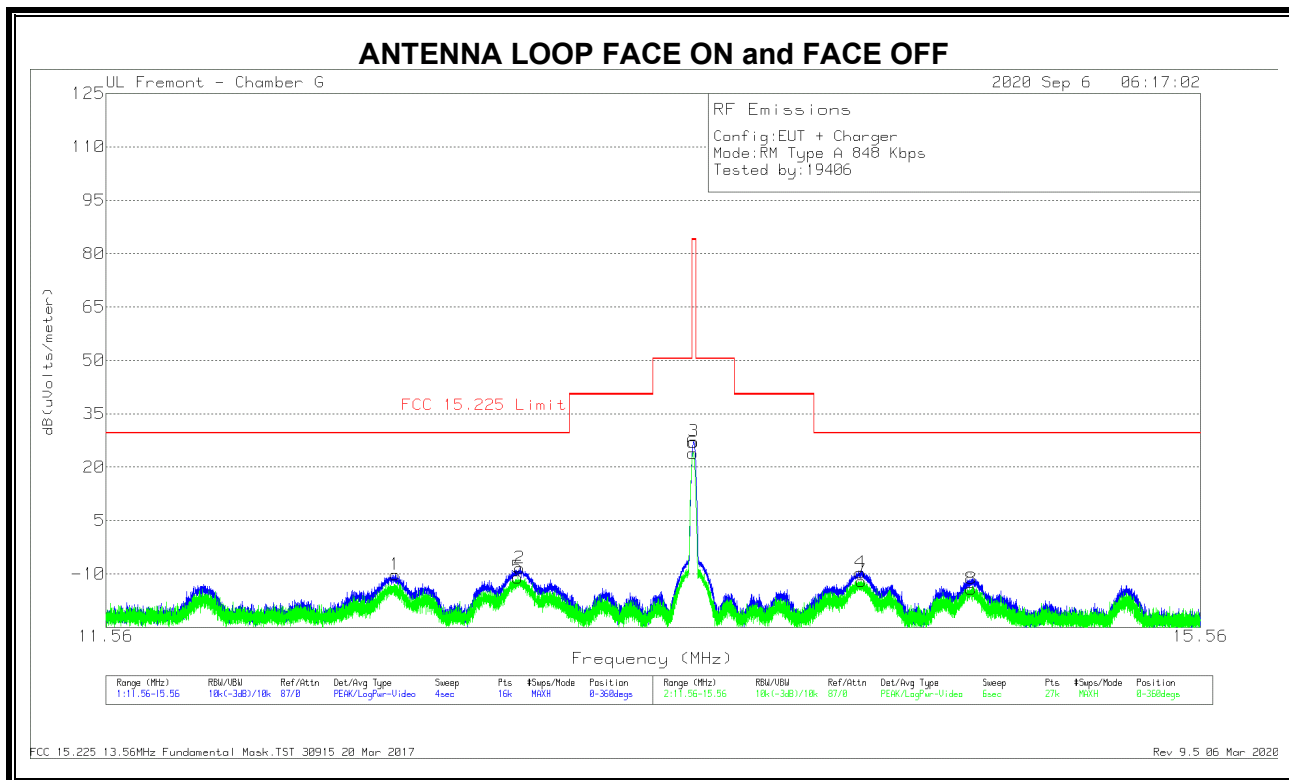
Comparison of the models, upper deviation is within 3dB range and all tests are under FCC Technical Limits. The test report for FCC ID BCG-E3548A, IC: 579C-E3548A is therefore being used to support the application for certification for FCC ID: BCG-E3550A, IC: 579C-E3550A.

NF: Noise Floor

SPOT CHECK DATA

5.4.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL



DATA

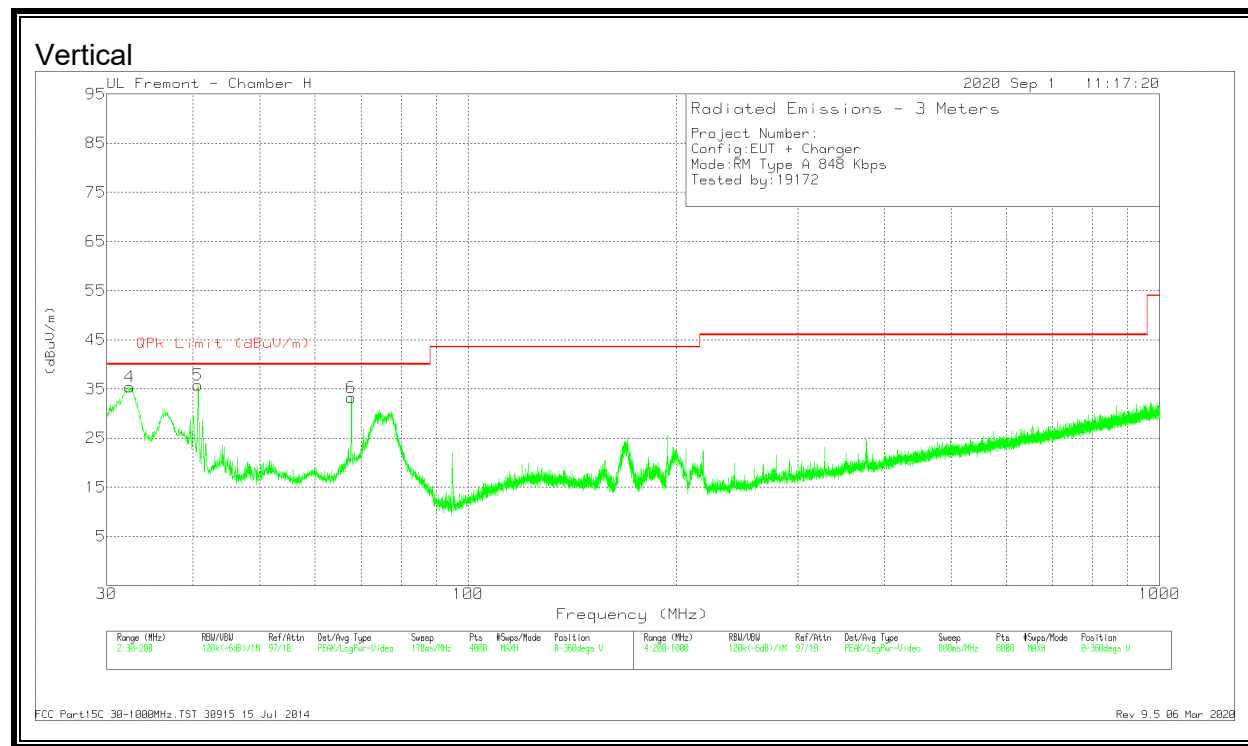
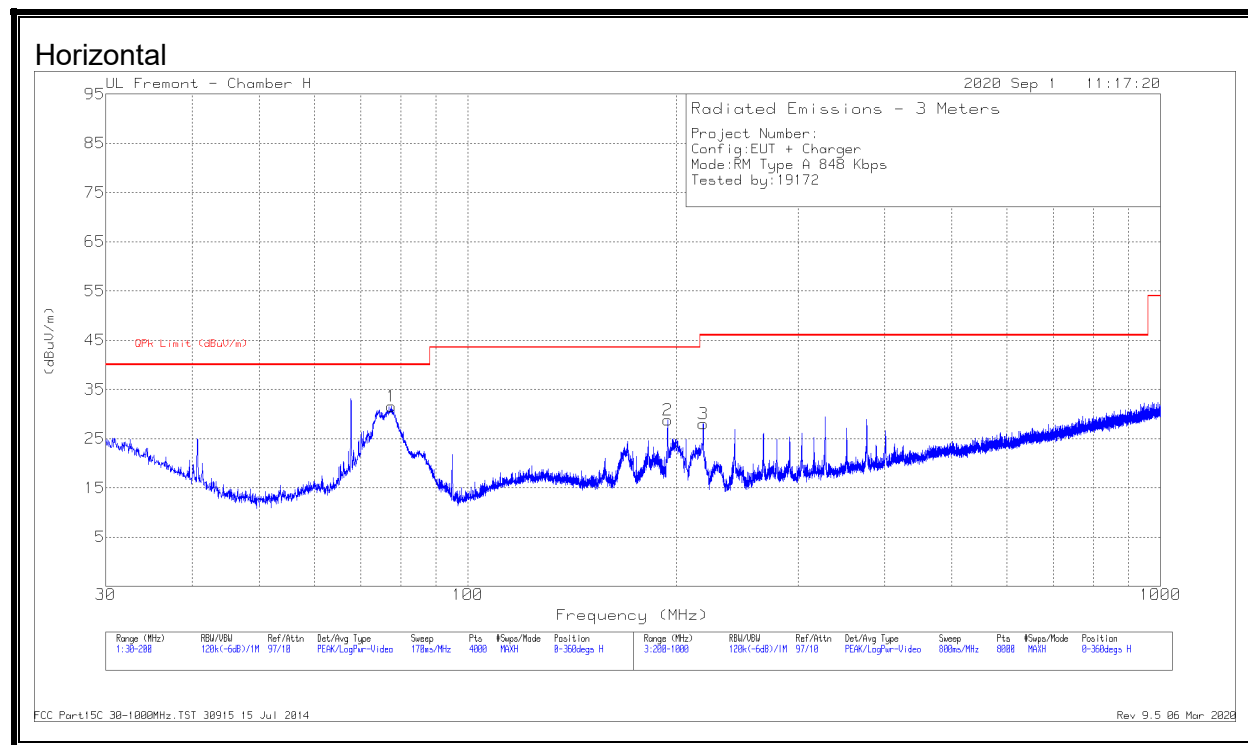
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr 30m	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	12.504	18.69	Pk	10.6	.5	-40	-10.21	29.54	-39.75	0-360
5	12.92796	17.91	Pk	10.6	.5	-40	-10.99	29.54	-40.53	0-360
2	12.935	20.5	Pk	10.6	.5	-40	-8.4	29.54	-37.94	0-360
6	13.55696	52.82	Pk	10.6	.6	-40	24.02	84	-59.98	0-360
3	13.56013	55.96	Pk	10.6	.6	-40	27.16	84	-56.84	0-360
4	14.188	19.17	Pk	10.6	.6	-40	-9.63	29.54	-39.17	0-360
7	14.1907	16.87	Pk	10.6	.6	-40	-11.93	29.54	-41.47	0-360
8	14.62123	14.55	Pk	10.6	.6	-40	-14.25	29.54	-43.79	0-360

Pk - Peak detector

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

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

Type A (Reader Mode), Spurious Emissions 848Kbps



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
4	32.4231	40.26	Pk	26.3	-31.2	35.36	40	-4.64	0-360	100	V
	32.4071	37.59	Qp	26.3	-31.2	32.69	40	-7.31	310	100	V
5	40.6703	46.99	Pk	19.9	-31.1	35.79	40	-4.21	0-360	100	V
	40.6794	47.05	Qp	19.9	-31.1	35.85	40	-4.15	209	100	V
6	67.7923	49.8	Pk	14.2	-30.8	33.2	40	-6.8	0-360	100	V
1	77.6123	48.13	Pk	14.1	-30.7	31.53	40	-8.47	0-360	300	H
2	194.3475	40.22	Pk	18.1	-29.6	28.72	43.52	-14.8	0-360	200	H
3	218.7024	40.22	Pk	17.3	-29.5	28.02	46.02	-18	0-360	99	H

5.5. REFERENCE DETAIL

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

Equipment Class	Reference FCC ID & IC	Reference Report	Report Title/Section
DXX	BCG-E3548A 579C-E3548A	13335182-E12	FCC IC_NFC Report / All sections

5.6. WORST-CASE CONFIGURATION AND MODE

The fundamental and spurious of the EUT was performed based on the worst case on model A2342.

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.

5.7. 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

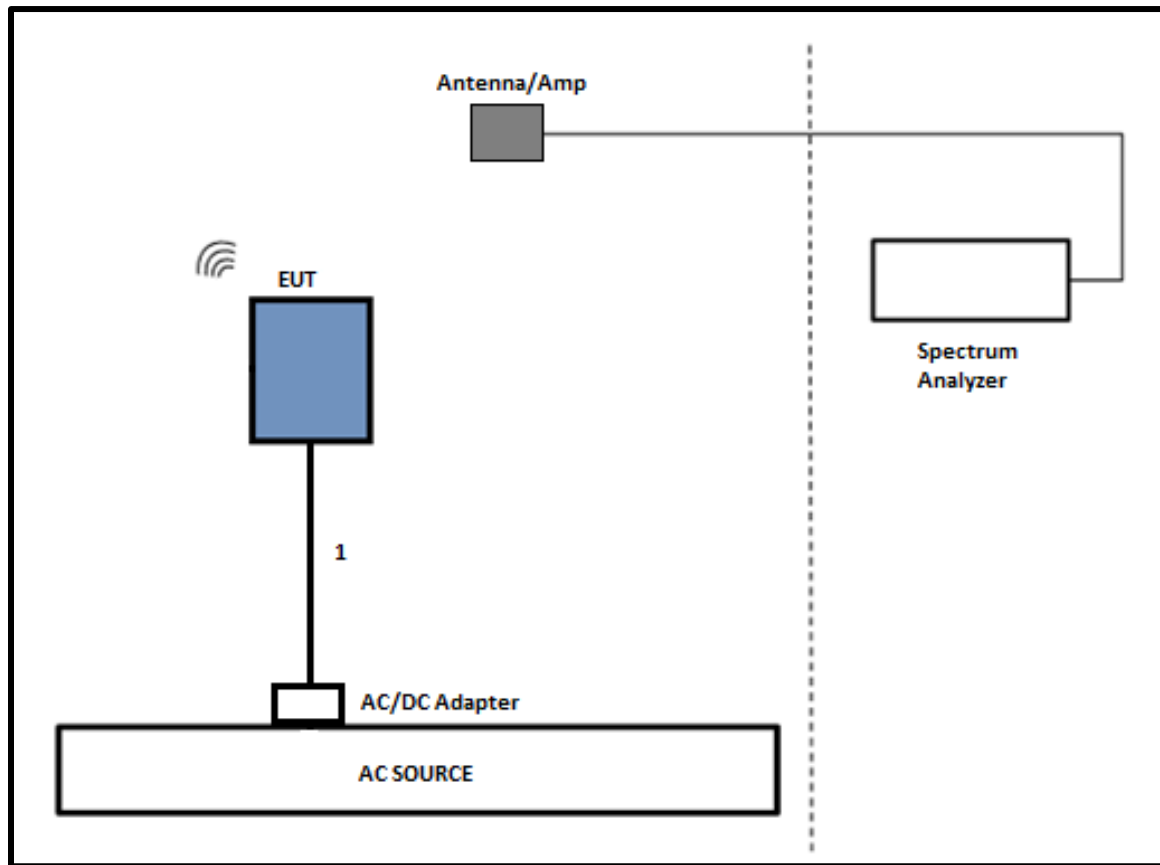
I/O CABLES

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 13335182-EP1V1 for setup photos.

END OF TEST REPORT

Appendix A – Reference Test Report

Attached is the test report (13335182-E12) containing the reference data from the parent model as detailed in section 5.5.



TEST REPORT

Report Number. : 13335182-E12V3

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

Model : A2342

FCC ID : BCG-E3548A

IC : 579C-E3548A

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.
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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/21/2020	Initial Issue	Chin Pang
V2	9/25/2020	Address TCB's Questions	Chin Pang
V3	9/30/2020	Address TCB's Questions	Vien Tran

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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: A2342

Serial Number: G6TCQ01TQ897

DATE TESTED: MAY 15, 2020 – AUGUST 09, 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.

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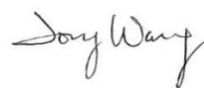
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Approved & Released For
UL Verification Services Inc. By:



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, Annex B.

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.
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☐ 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}
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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	27.71
			CE	848	26.58
Secondary	13.56	Type A	Reader	848	-9.46

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.

5.4. 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	D292365CDYADHLC3	NA

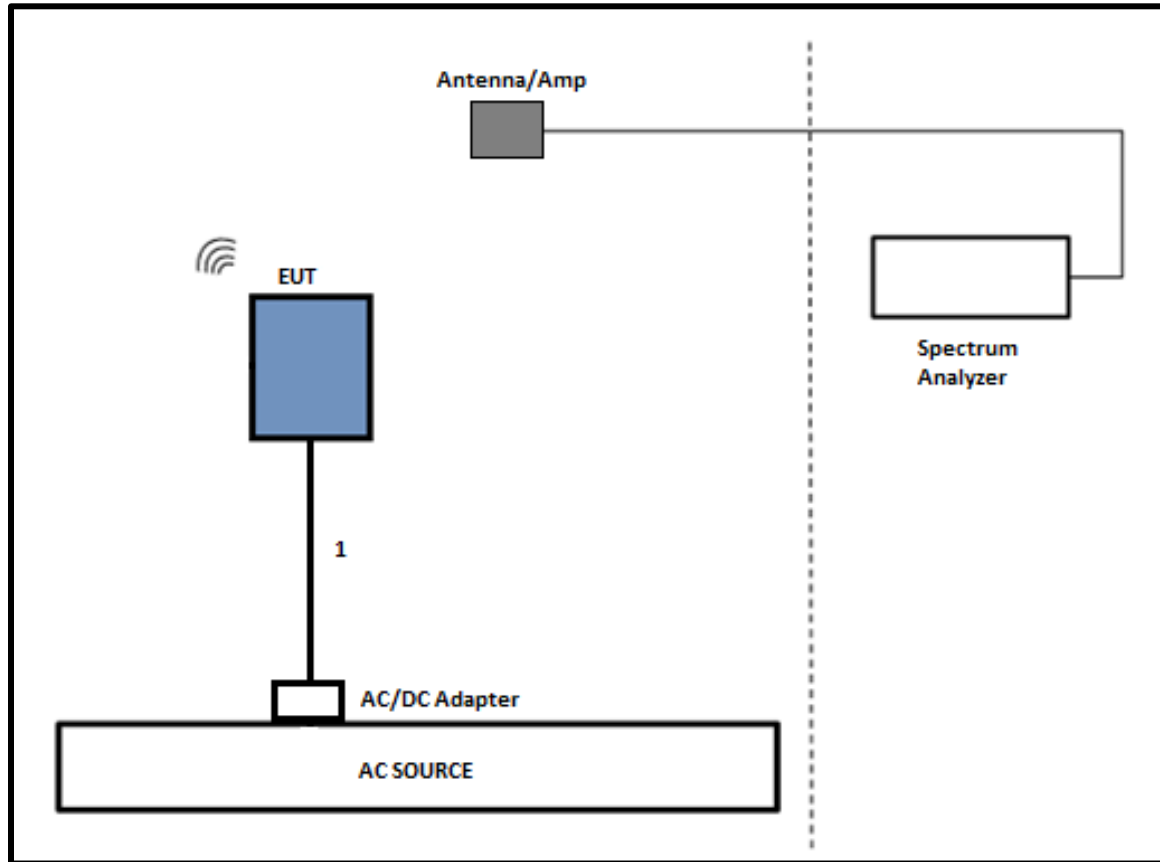
I/O CABLES

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

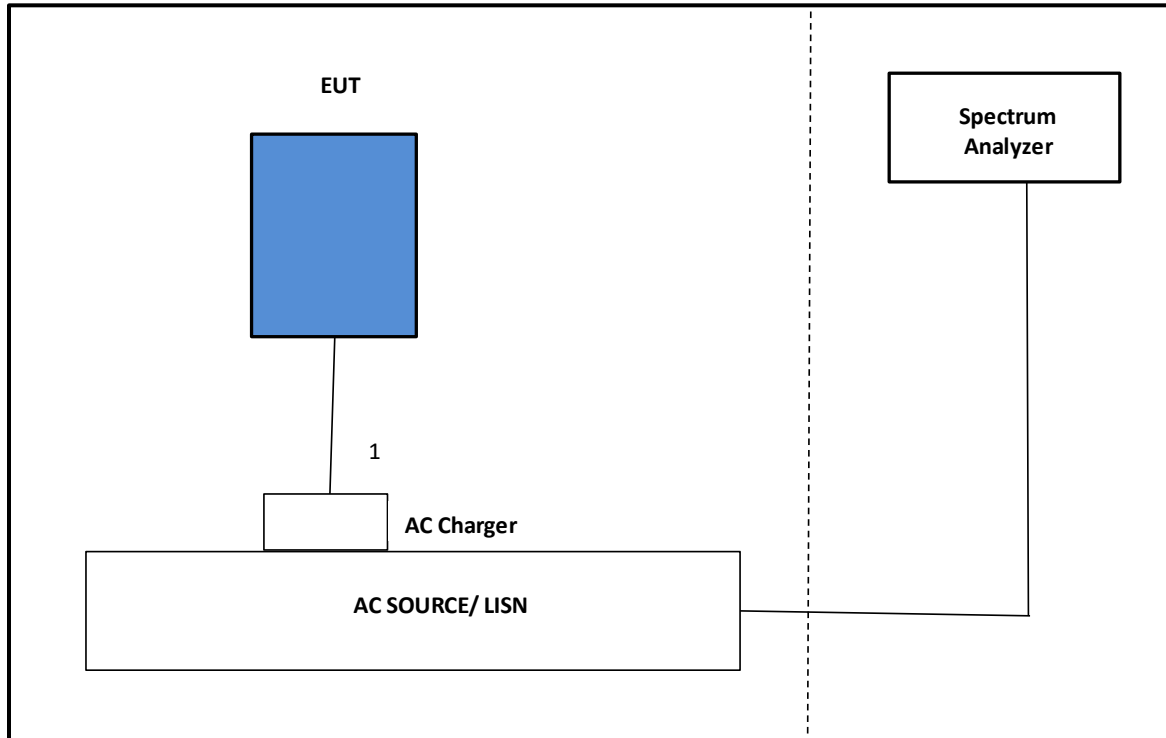
TEST SETUP

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

SETUP DIAGRAM FOR RADIATED TESTS



SETUP DIAGRAM FOR LINE CONDUCTED TESTS



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

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	EMCO	6502	T35	06/06/2020	06/06/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	01/22/2021	01/22/2020
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	12/22/2020	12/22/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A-544	T1210	01/22/2021	01/22/2020

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		

*Testing is completed before equipment expiration date.

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	24.6153	28.629

Type A (CE Mode)

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.2095	28.611

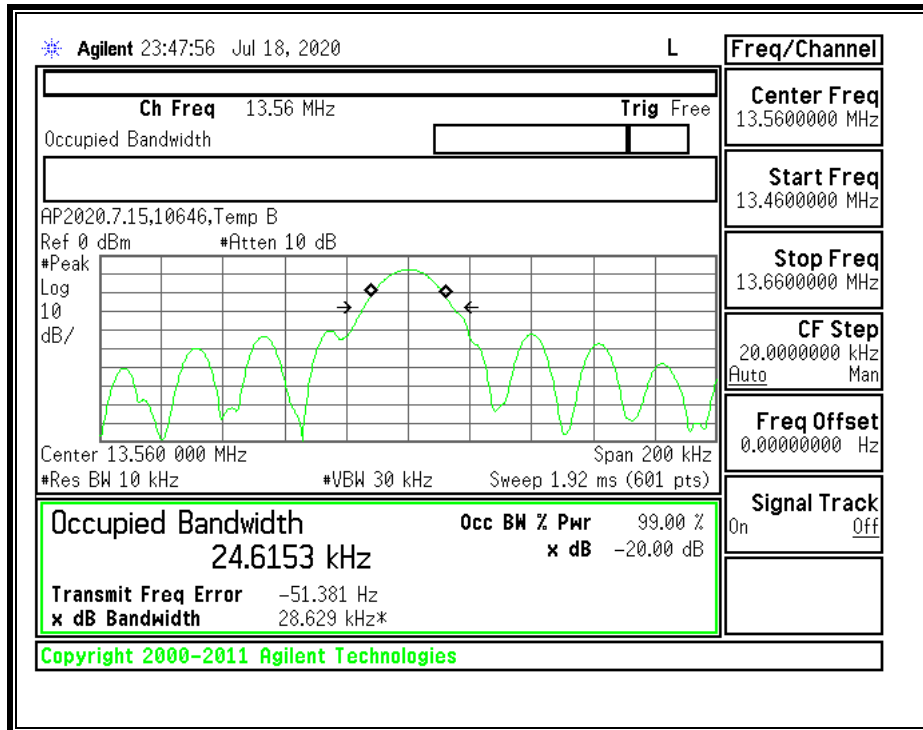
Secondary Antenna

Type A (Reader Mode)

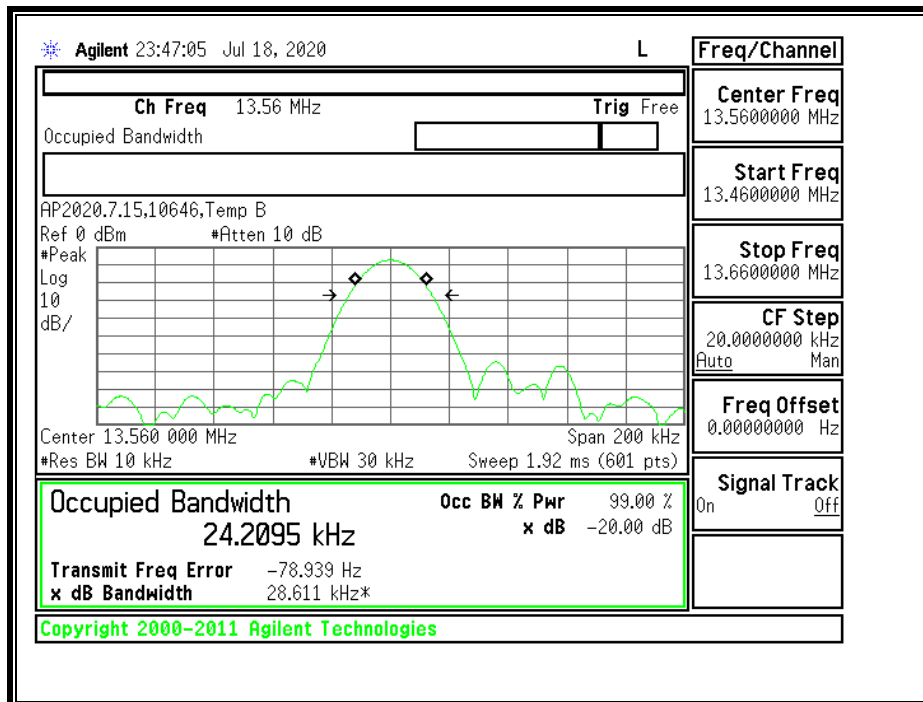
Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	25.8563	32.864

7.1. PRIMARY ANTENNA

Type A (Reader Mode), 848Kbps

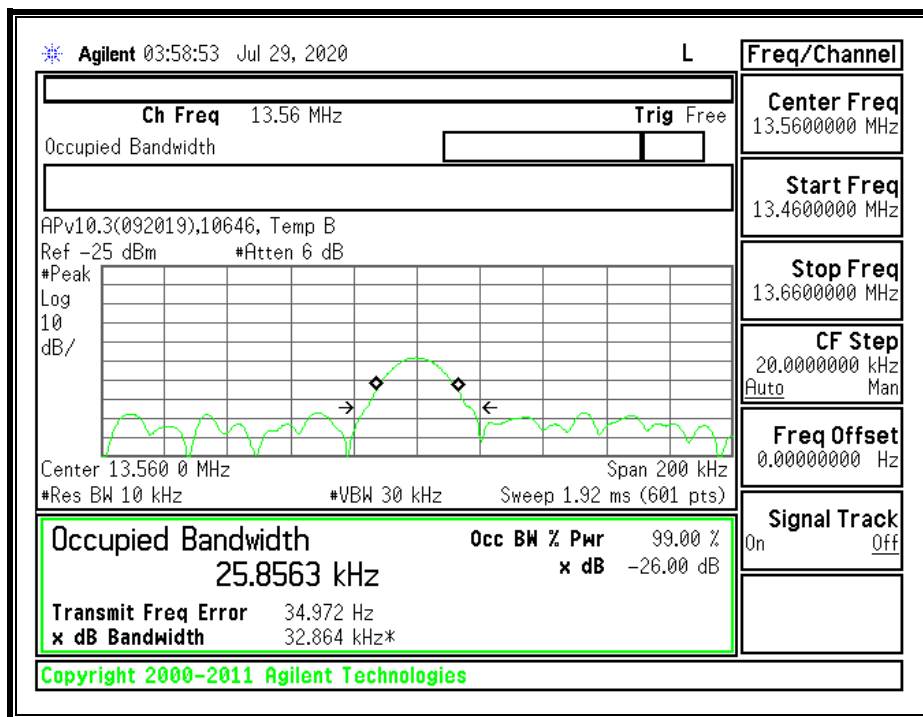


Type A (CE Mode), 848Kbps



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 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

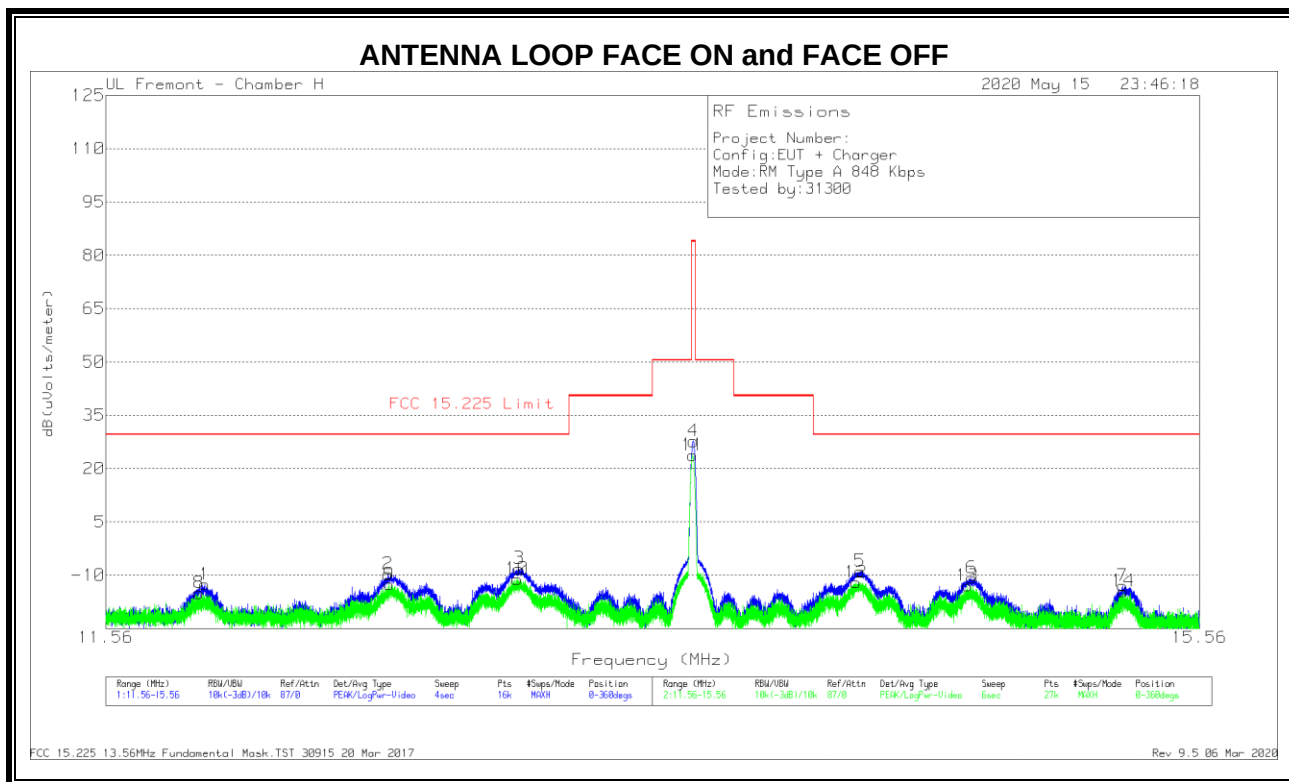
The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

RESULTS

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

8.2.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL

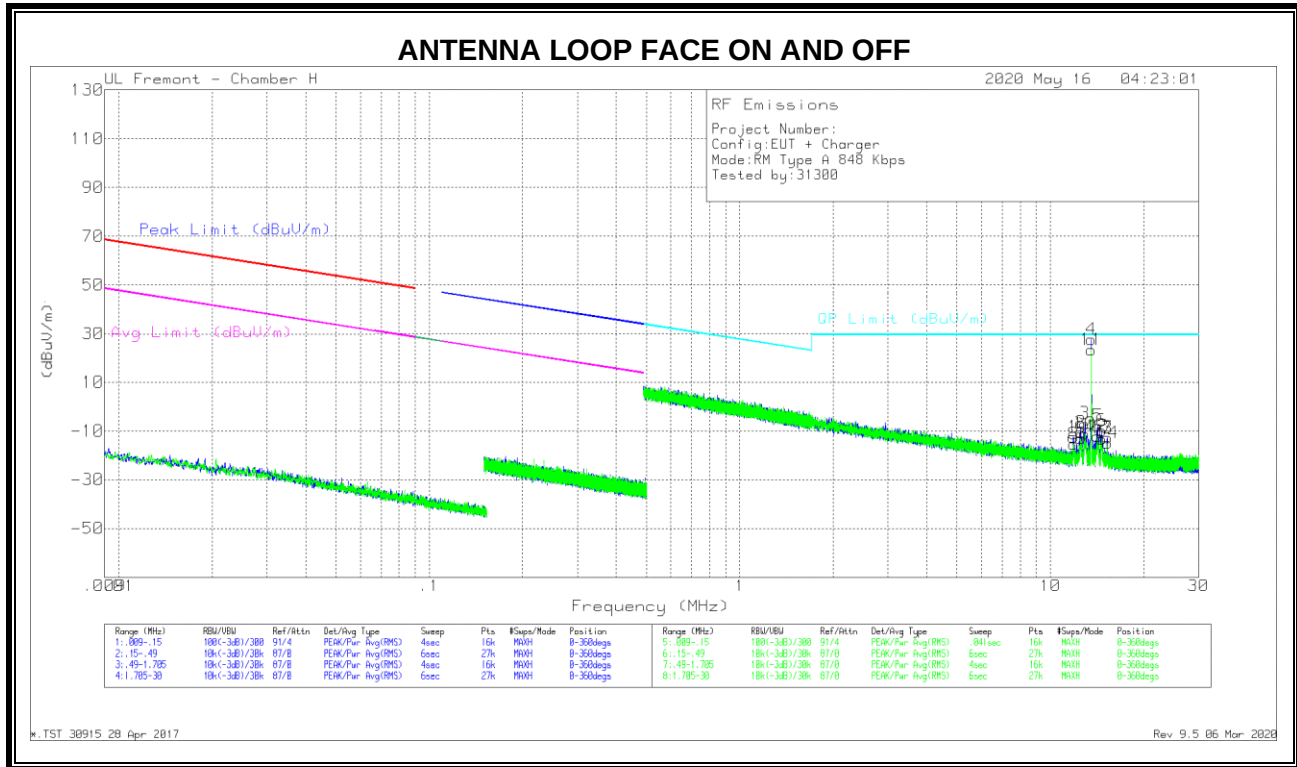


DATA

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)
8	11.85526	13.88	Pk	10.7	.4	-40	-15.02	29.54	-44.56	0-360
1	11.87525	16.29	Pk	10.7	.4	-40	-12.61	29.54	-42.15	0-360
2	12.48	19.2	Pk	10.7	.4	-40	-9.7	29.54	-39.24	0-360
9	12.48485	16.33	Pk	10.7	.4	-40	-12.57	29.54	-42.11	0-360
10	12.92678	17.92	Pk	10.6	.4	-40	-11.08	29.54	-40.62	0-360
3	12.93325	20.9	Pk	10.6	.4	-40	-8.1	29.54	-37.64	0-360
11	13.55785	52.76	Pk	10.6	.4	-40	23.76	84	-60.24	0-360
4	13.56	56.71	Pk	10.6	.4	-40	27.71	84	-56.29	0-360
12	14.17353	16.96	Pk	10.6	.4	-40	-12.04	29.54	-41.58	0-360
5	14.1895	20.12	Pk	10.6	.4	-40	-8.88	29.54	-38.42	0-360
13	14.6091	16.02	Pk	10.6	.4	-40	-12.98	29.54	-42.52	0-360
6	14.62625	18.24	Pk	10.6	.4	-40	-10.76	29.54	-40.3	0-360
7	15.23725	16.03	Pk	10.6	.4	-40	-12.97	29.54	-42.51	0-360
14	15.24165	14.48	Pk	10.6	.4	-40	-14.52	29.54	-44.06	0-360

Pk - Peak detector

SPURIOUS EMISSION



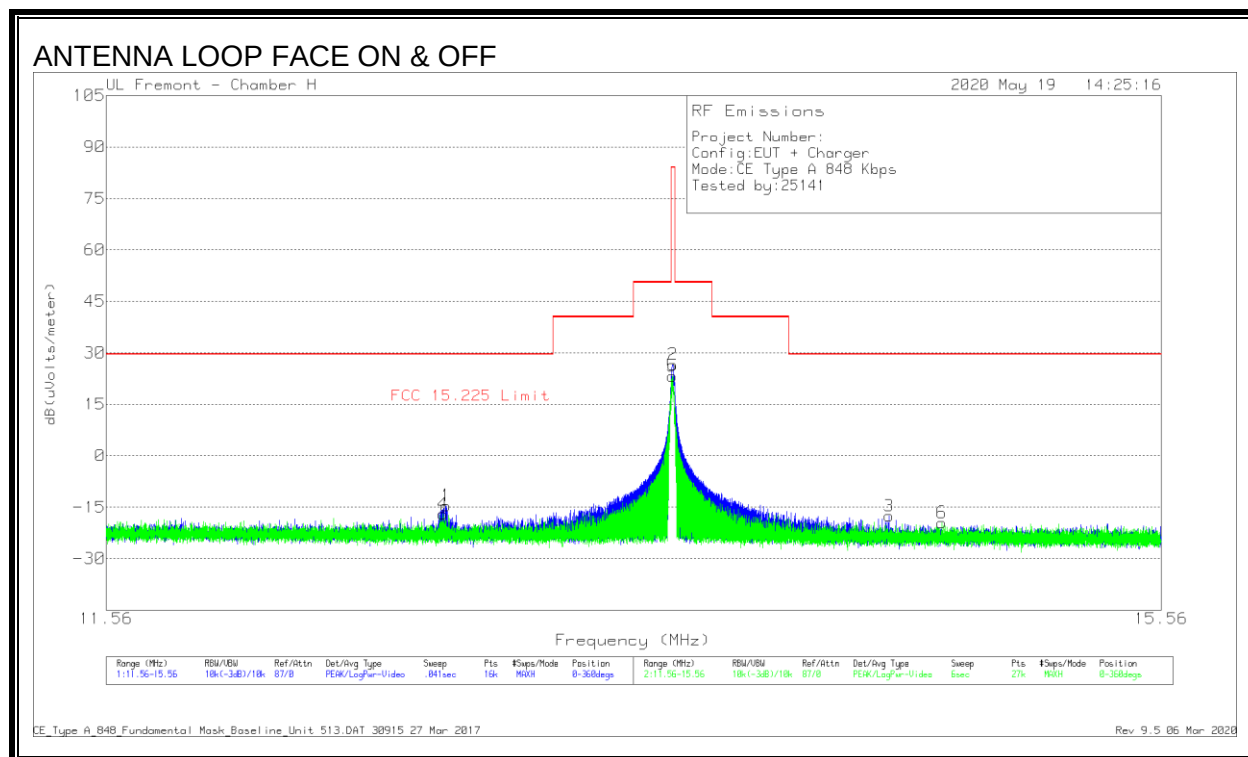
DATA

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)
1	11.85907	16.53	Pk	10.7	.4	-40	-12.37	29.5	-41.87	0-360
8	11.86955	13.48	Pk	10.7	.4	-40	-15.42	29.5	-44.92	0-360
9	12.50988	16.01	Pk	10.6	.4	-40	-12.99	29.5	-42.49	0-360
2	12.5277	18.34	Pk	10.6	.4	-40	-10.66	29.5	-40.16	0-360
10	12.93118	17.93	Pk	10.6	.4	-40	-11.07	29.5	-40.57	0-360
3	12.93222	22.04	Pk	10.6	.4	-40	-6.96	29.5	-36.46	0-360
4	13.55893	56.51	Pk	10.6	.4	-40	27.51	29.5	-1.99	0-360
11	13.55998	52.35	Pk	10.6	.4	-40	23.35	29.5	-6.15	0-360
12	14.1762	16.95	Pk	10.6	.4	-40	-12.05	29.5	-41.55	0-360
5	14.18354	21.15	Pk	10.6	.4	-40	-7.85	29.5	-37.35	0-360
6	14.63208	19.26	Pk	10.6	.4	-40	-9.74	29.5	-39.24	0-360
13	14.63418	15.91	Pk	10.6	.4	-40	-13.09	29.5	-42.59	0-360
14	15.23992	14.06	Pk	10.6	.4	-40	-14.94	29.5	-44.44	0-360
7	15.25354	16.39	Pk	10.6	.4	-40	-12.61	29.5	-42.11	0-360

Pk - Peak detector

8.2.2. CE MODE, TYPE A 848Kbps

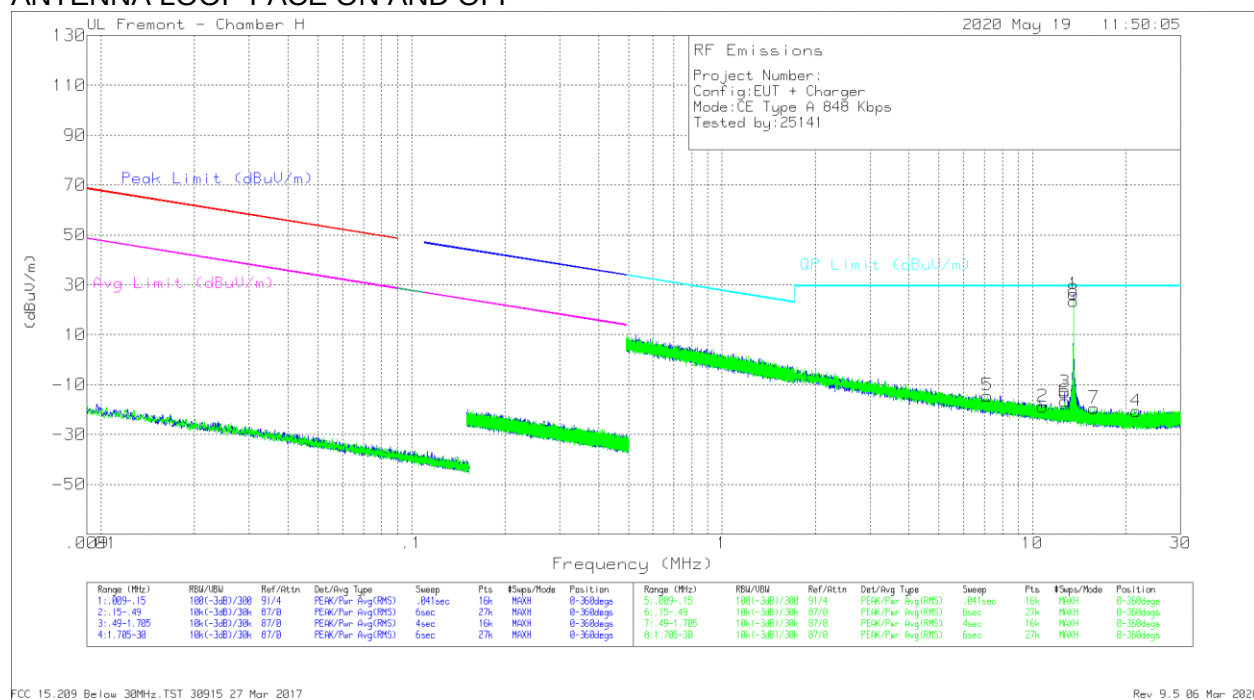
FUNDAMENTAL 848Kbps



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)
4	12.71055	12.32	Pk	10.3	.4	-40	-16.98	29.54	-46.52	0-360
1	12.722	14.78	Pk	10.3	.4	-40	-14.52	29.54	-44.06	0-360
5	13.5583	52.61	Pk	10.2	.4	-40	23.21	84	-60.79	0-360
2	13.56	55.98	Pk	10.2	.4	-40	26.58	84	-57.42	0-360
3	14.4115	11.83	Pk	10.2	.4	-40	-17.57	29.54	-47.11	0-360
6	14.62745	9.99	Pk	10.1	.4	-40	-19.51	29.54	-49.05	0-360

Pk - Peak detector

SPURIOUS EMISSION 848Kbps**ANTENNA LOOP FACE ON AND OFF****DATA**

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)
5	7.15833	7.17	Qp	10.7	.3	-40	-21.83	29.5	-51.33	272
2	10.7846	4.69	Qp	10.5	.4	-40	-24.41	29.5	-53.91	59
3	12.7058	7.7	Qp	10.3	.4	-40	-21.6	29.5	-51.1	23
6	12.7217	5.82	Qp	10.3	.4	-40	-23.48	29.5	-52.98	113
7	15.8077	2.77	Qp	10	.4	-40	-26.83	29.5	-56.33	143
4	21.586	2.25	Qp	9.3	.5	-40	-27.95	29.5	-57.45	190
1	13.55945	55.71	PK	10.2	.4	-40	26.31	29.5	-3.19	0-360
8	13.55945	52.93	PK	10.2	.4	-40	23.53	29.5	-5.97	0-360

PK - Peak detector

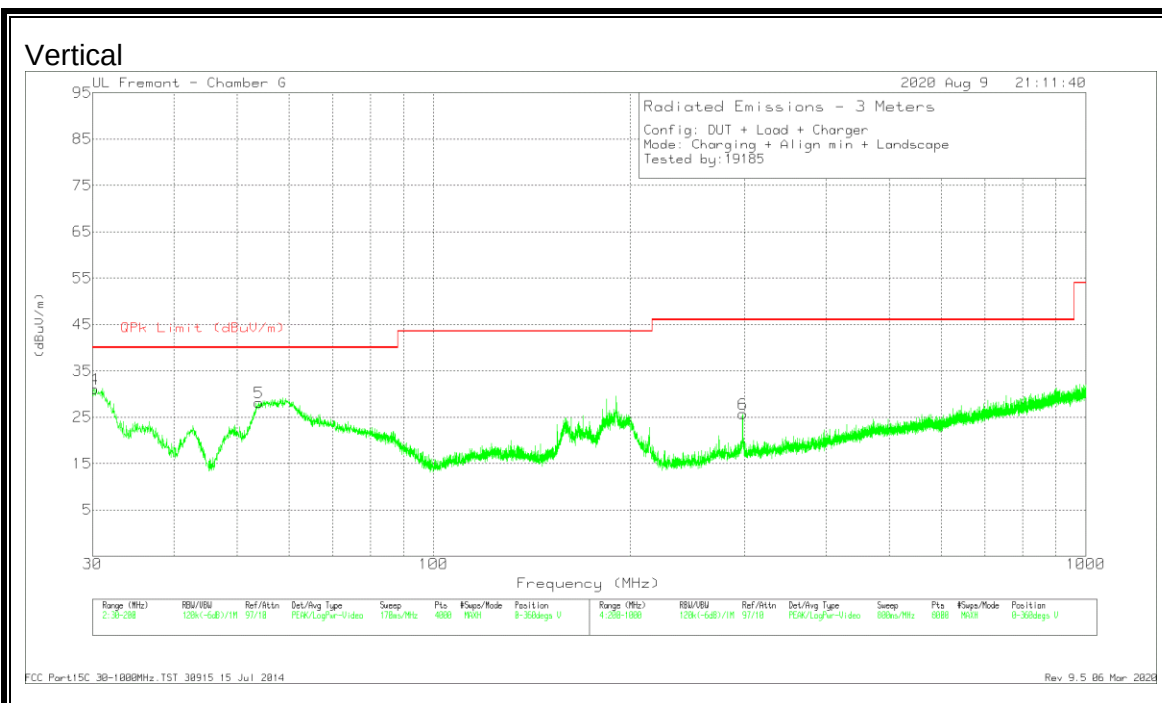
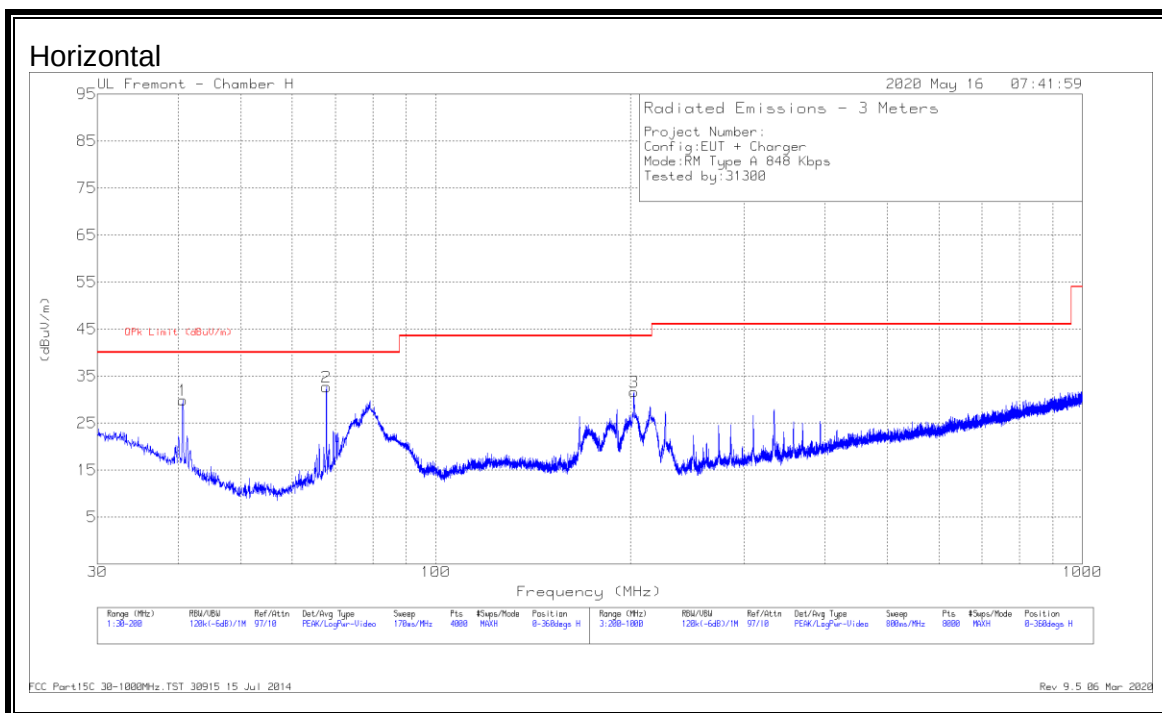
Qp - Quasi-Peak detector

Note: Marker 1 and 8 are the fundamental signal

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

8.3.1. Type A (Reader Mode)

SPURIOUS EMISSION 848Kbps



DATA

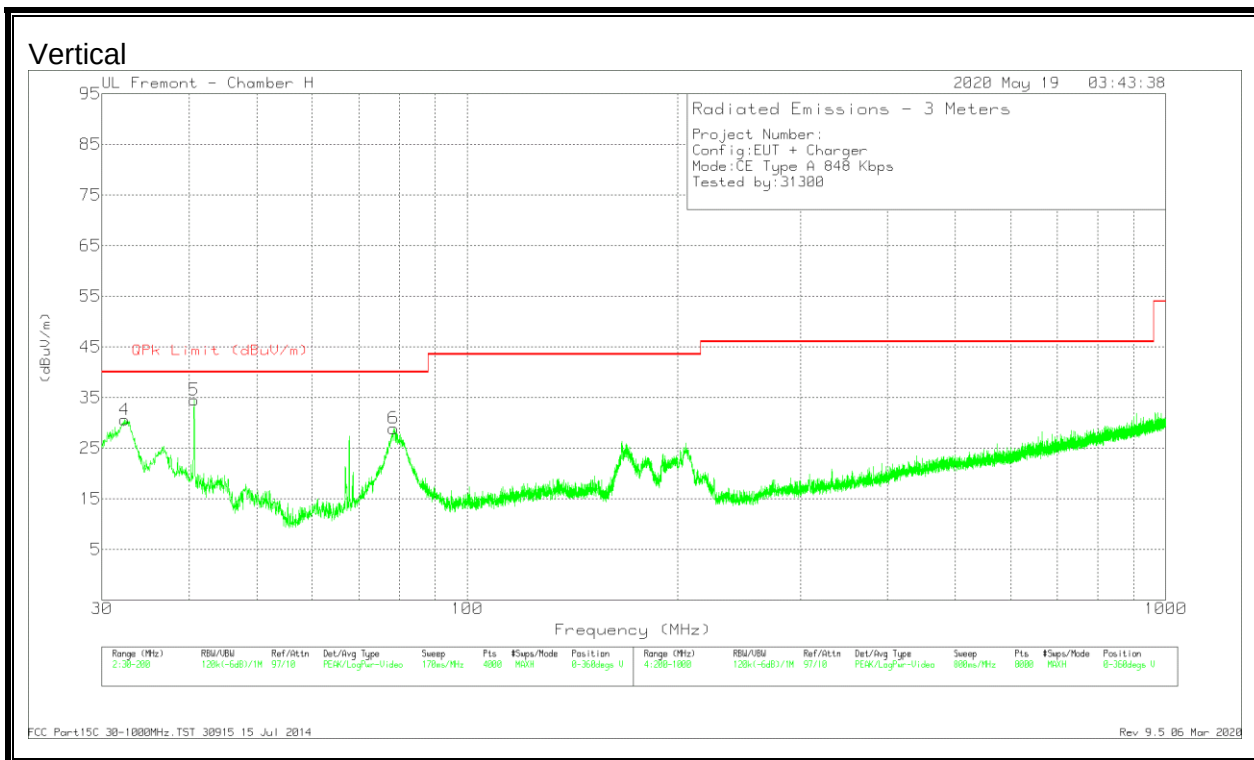
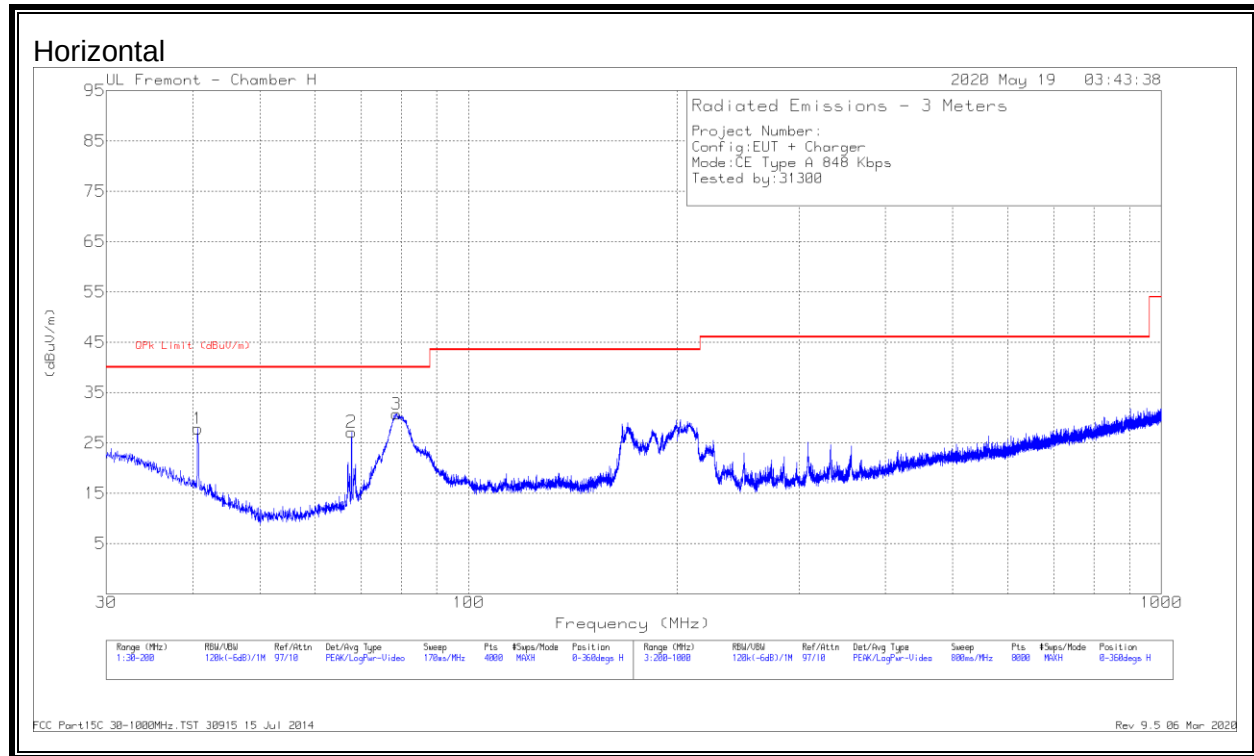
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	AmplCbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	32.3806	39.38	Pk	25.4	-31.2	33.58	40	-6.42	0-360	100	V
1	40.6703	41.17	Pk	19.8	-31.1	29.87	40	-10.13	0-360	400	H
5	40.6703	46	Pk	19.8	-31.1	34.7	40	-5.3	0-360	100	V
	40.6852	46.47	Qp	19.8	-31.1	35.17	40	-4.83	294	100	V
2	67.7923	49.48	Pk	14	-30.8	32.68	40	-7.32	0-360	300	H
6	67.7923	49.24	Pk	14	-30.8	32.44	40	-7.56	0-360	100	V
3	202.7004	43.32	Pk	17.9	-29.6	31.62	43.52	-11.9	0-360	200	H

Pk - Peak detector

Qp - Quasi-Peak detector

8.3.2. Type A (CE Mode)

SPURIOUS EMISSION 848Kbps



DATA

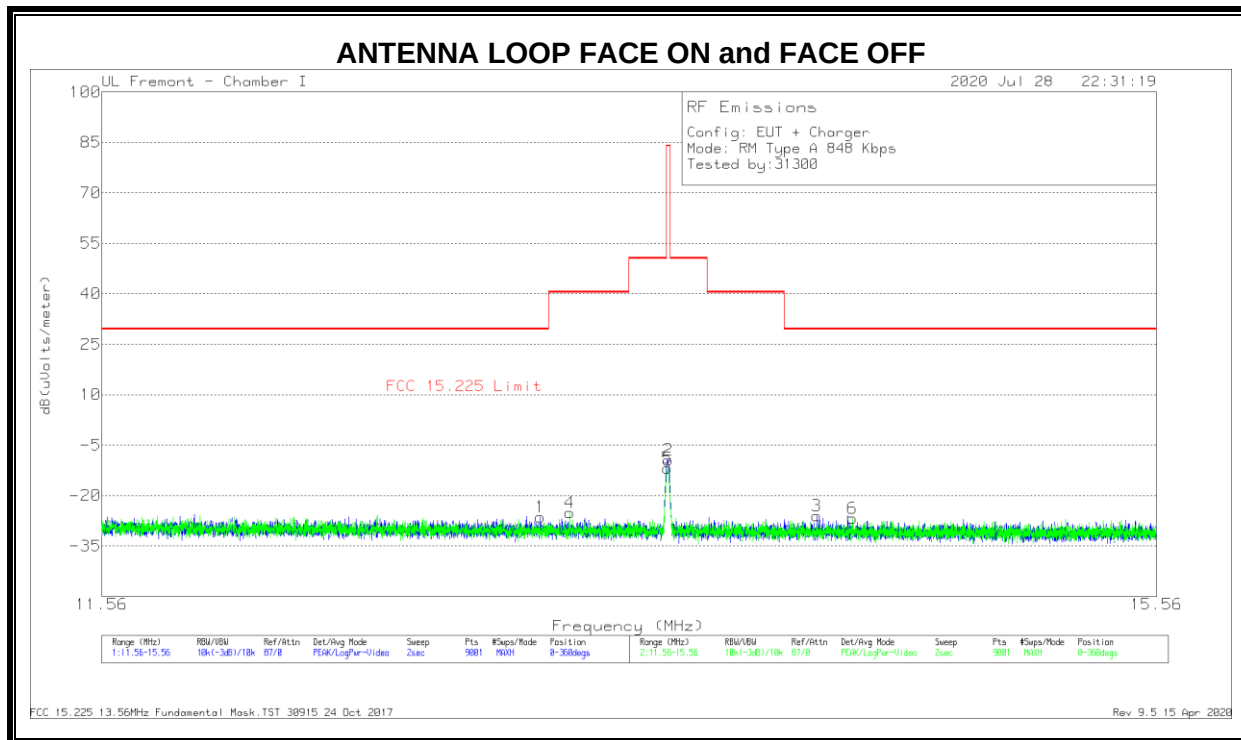
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	32.3381	36.28	Pk	25.5	-31.2	30.58	40	-9.42	0-360	100	V
1	40.6703	39.12	Pk	19.8	-31.1	27.82	40	-12.18	0-360	300	H
5	40.6703	45.79	Pk	19.8	-31.1	34.49	40	-5.51	0-360	100	V
	40.6693	44.35	Qp	19.8	-31.1	33.05	40	-6.95	319	106	V
2	67.7923	43.92	Pk	14	-30.8	27.12	40	-12.88	0-360	200	H
6	78.4625	46.11	Pk	13.5	-30.7	28.91	40	-11.09	0-360	100	V
3	78.6751	48.01	Pk	13.4	-30.7	30.71	40	-9.29	0-360	300	H

Pk - Peak detector
Qp - Quasi-Peak detector

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

8.4.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL

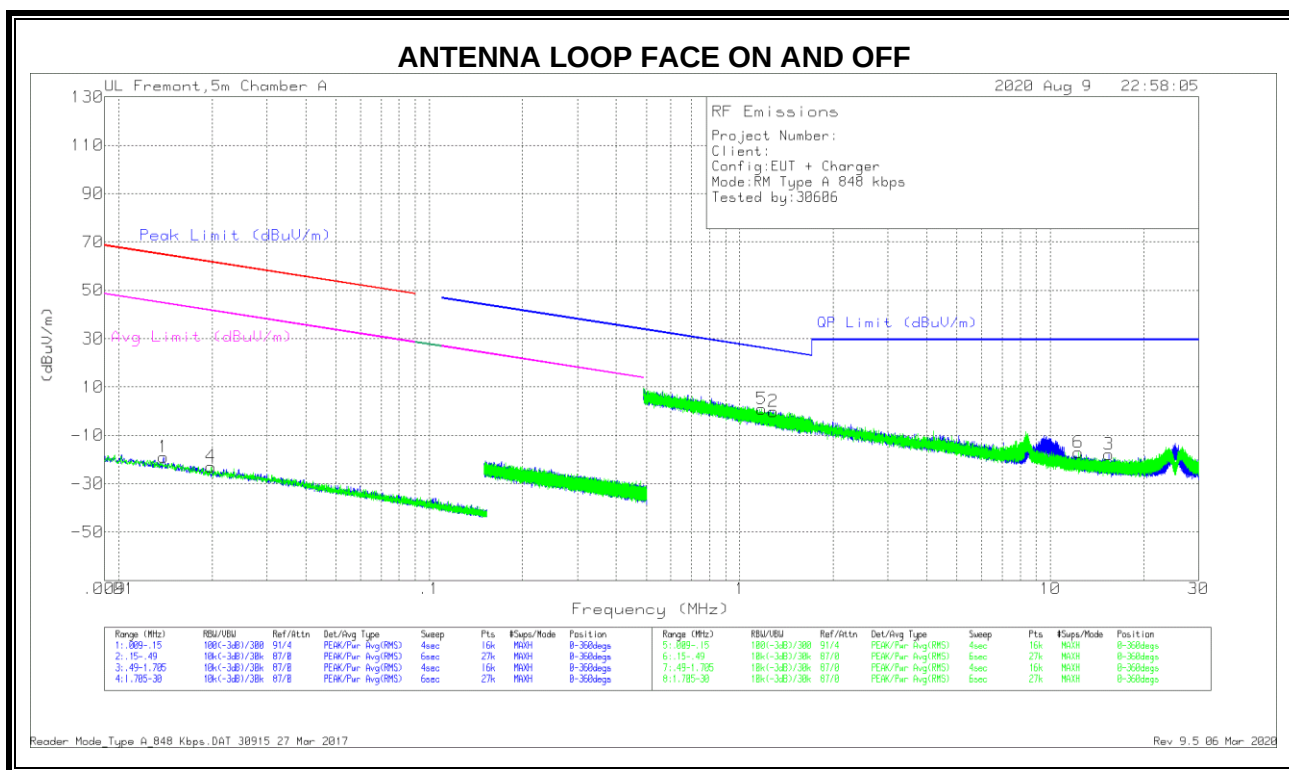


DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0180175 (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	13.08114	10.92	Pk	34.2	-31.5	-40	-26.38	29.54	-55.92	0-360
2	13.55933	27.94	Pk	34.1	-31.5	-40	-9.46	84	-93.46	0-360
3	14.13964	11.27	Pk	34.1	-31.4	-40	-26.03	29.54	-55.57	0-360
4	13.18904	12.16	Pk	34.2	-31.5	-40	-25.14	40.51	-65.65	0-360
5	13.55756	25.54	Pk	34.1	-31.5	-40	-11.86	84	-95.86	0-360
6	14.28394	10.53	Pk	34.1	-31.4	-40	-26.77	29.54	-56.31	0-360

Pk - Peak detector

SPURIOUS EMISSION



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)	Azimuth (Degs)
1	.01395	43.45	Pk	17.5	0	-80	-19.05	64.69	-83.74	44.69	-63.74	0-360
4	.01985	41.91	Pk	15.2	0	-80	-22.89	61.63	-84.52	41.63	-64.52	0-360

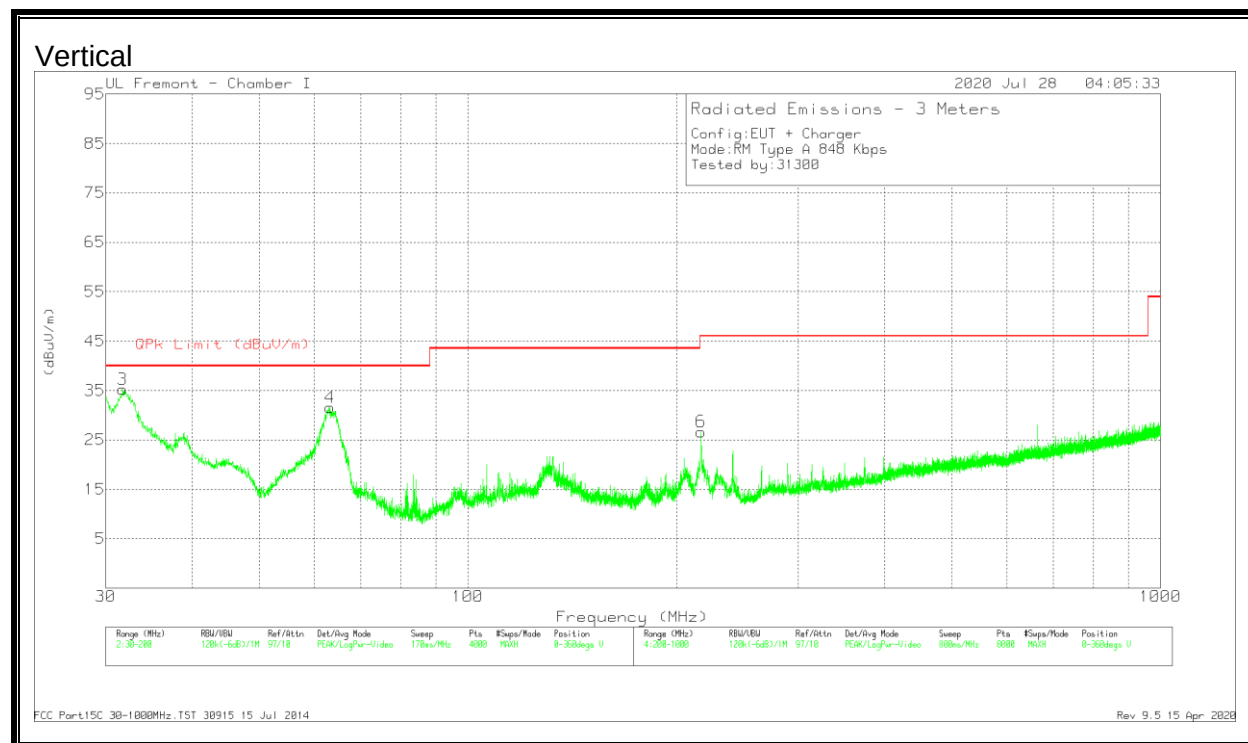
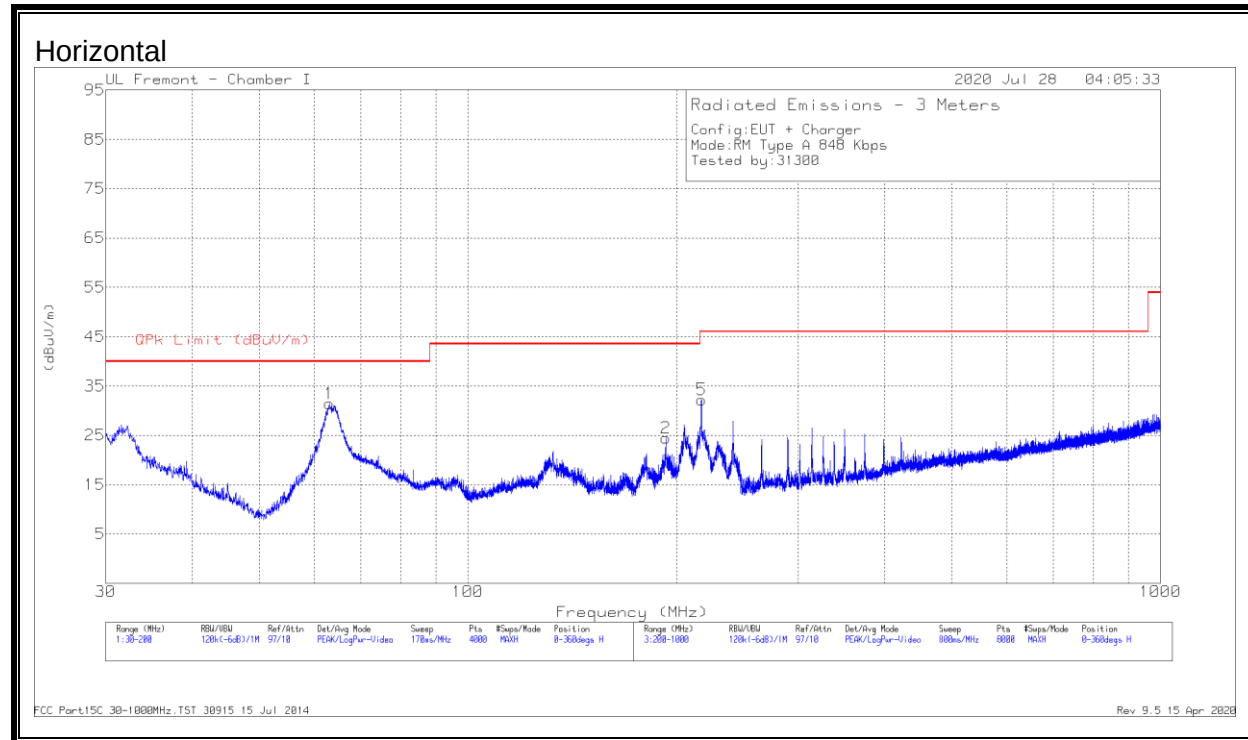
Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	1.17461	30.02	Pk	10.8	.2	-40	1.02	26.23	-25.21	0-360
2	1.28192	28.78	Pk	10.8	.2	-40	-.22	25.47	-25.69	0-360
6	12.31076	12.07	Pk	10.4	.5	-40	-17.03	29.5	-46.53	0-360
3	15.39293	11.56	Pk	10.1	.5	-40	-17.84	29.5	-47.34	0-360

Pk - Peak detector

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

Type A (Reader Mode), SPURIOUS EMISSION 848Kbps



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	63.0736	48.89	Pk	13.5	-31	31.39	40	-8.61	0-360	399	H
2	193.0722	37.8	Pk	17	-30.3	24.5	43.52	-19.02	0-360	99	H
3	31.743	41.03	Pk	25.7	-31.5	35.23	40	-4.77	0-360	100	V
	31.9578	38.05	Qp	25.5	-31.5	32.05	40	-7.95	258	105	V
4	63.2436	49.04	Pk	13.5	-31	31.54	40	-8.46	0-360	100	V
5	217.4023	46.16	Pk	16.4	-30.3	32.26	46.02	-13.76	0-360	99	H
6	217.2022	40.58	Pk	16.4	-30.3	26.68	46.02	-19.34	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 $\pm 0.01\%$ 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:	7/02/2020 & 08/01/2020
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9.1. PRIMARY ANTENNA

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								
(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	13.5597621	5.115	13.5597649	4.907	13.5597687	4.629	13.5597732	4.294	± 100
	40	13.5597588	5.357	13.5597575	5.452	13.5597565	5.525	13.5597560	5.563	± 100
	30	13.5597829	3.576	13.5597791	3.857	13.5597753	4.138	13.5597719	4.392	± 100
	20	13.5598314	0.000	13.5598243	0.527	13.5598170	1.067	13.5598102	1.562	± 100
	10	13.5597890	3.128	13.5598006	2.274	13.5598142	1.269	13.5598281	0.248	± 100
	0	13.5606029	-56.889	13.5606279	-58.735	13.5605784	-55.089	13.5606177	-57.983	± 100
	-10	13.5605856	-55.619	13.5607039	-64.339	13.5606787	-62.485	13.5606978	-63.891	± 100
	-20	13.5610769	-91.849	13.5609121	-79.697	13.5608861	-77.776	13.5609388	-81.668	± 100
3.23	20	13.5598329	-0.108	13.5598555	-1.774	13.5598804	-3.613	13.5599136	-6.062	± 100
4.37	20	13.5597635	5.008	13.5597744	4.204	13.5597785	3.900	13.5597755	4.122	± 100

CE 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								
(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	13.5600078	24.671	13.5599919	25.843	13.5599284	30.528	13.5600606	20.778	± 100
	40	13.5599474	29.130	13.5598462	36.590	13.5599171	31.364	13.5598622	35.409	± 100
	30	13.5598396	37.077	13.5602634	5.824	13.5601366	15.177	13.5601703	12.686	± 100
	20	13.5603424	0.000	13.5605757	-17.207	13.5604017	-4.376	13.5604457	-7.622	± 100
	10	13.5603623	-1.471	13.5603242	1.342	13.5603586	-1.196	13.5603382	0.309	± 100
	0	13.5602844	4.273	13.5601716	12.595	13.5602561	6.361	13.5601148	16.784	± 100
	-10	13.5601556	13.775	13.5601303	15.640	13.5601440	14.630	13.5601176	16.578	± 100
	-20	13.5602584	6.189	13.5604886	-10.786	13.5605942	-18.570	13.5605003	-11.645	± 100
3.23	20	13.5602352	7.906	13.5603147	2.039	13.5602763	4.875	13.5602574	6.267	± 100
4.37	20	13.5599534	28.685	13.5599445	29.341	13.5599244	30.823	13.5599012	32.534	± 100

9.2. SECONDARY ANTENNA

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								
(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	13.5599215	3.495	13.5599220	3.453	13.5599230	3.384	13.5599242	3.296	± 100
	40	13.5599201	3.594	13.5599203	3.581	13.5599209	3.539	13.5599215	3.490	± 100
	30	13.5599307	2.814	13.5599335	2.609	13.5599365	2.383	13.5599393	2.181	± 100
	20	13.5599688	0.000	13.5599703	-0.109	13.5599721	-0.240	13.5599740	-0.379	± 100
	10	13.5599957	-1.981	13.5600009	-2.361	13.5600060	-2.739	13.5600099	-3.030	± 100
	0	13.5600360	-4.949	13.5600397	-5.225	13.5600430	-5.469	13.5600456	-5.658	± 100
	-10	13.5600664	-7.191	13.5600686	-7.355	13.5600704	-7.488	13.5600715	-7.569	± 100
	-20	13.5600820	-8.348	13.5600829	-8.409	13.5600834	-8.451	13.5600839	-8.482	± 100
3.23	20	13.5599685	0.023	13.5599702	-0.103	13.5599720	-0.235	13.5599739	-0.371	± 100
4.37	20	13.5599689	0.000	13.5599704	-0.111	13.5599721	-0.242	13.5599740	-0.380	± 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

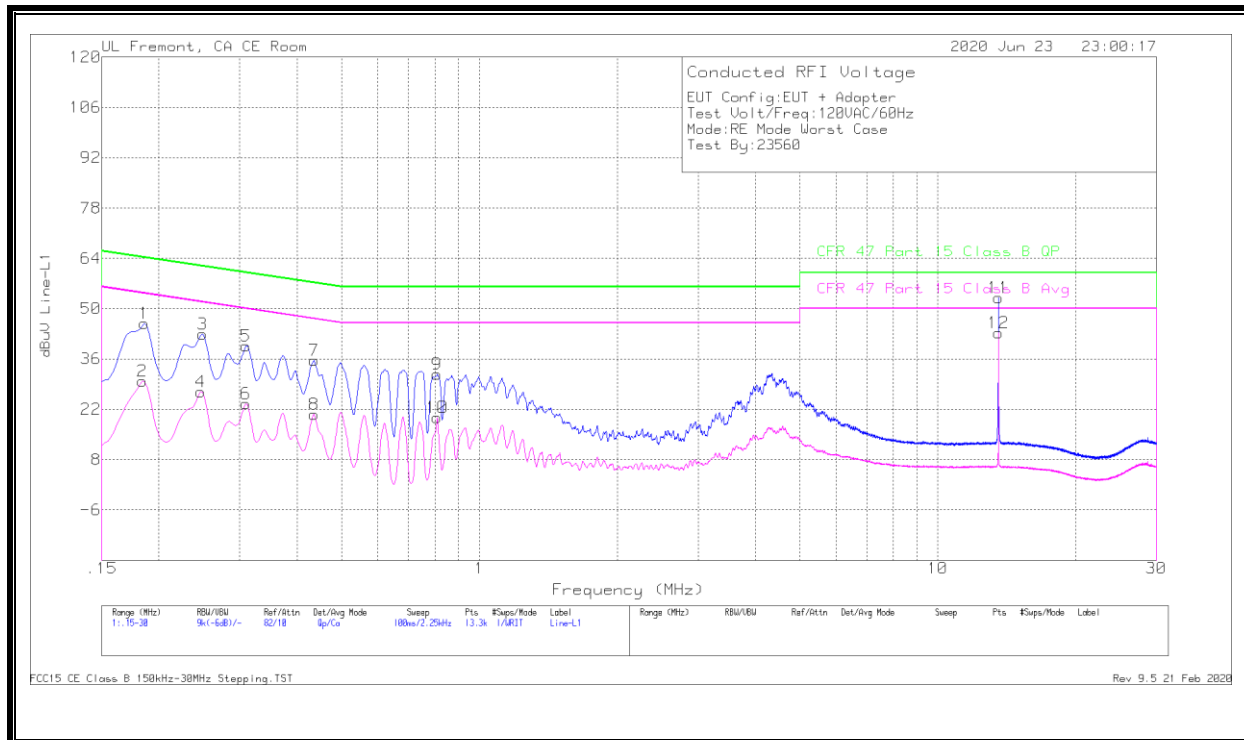
RESULTS

No non-compliance noted:

10.1. READER MODE, TYPE A 848Kbps

10.1.1. NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

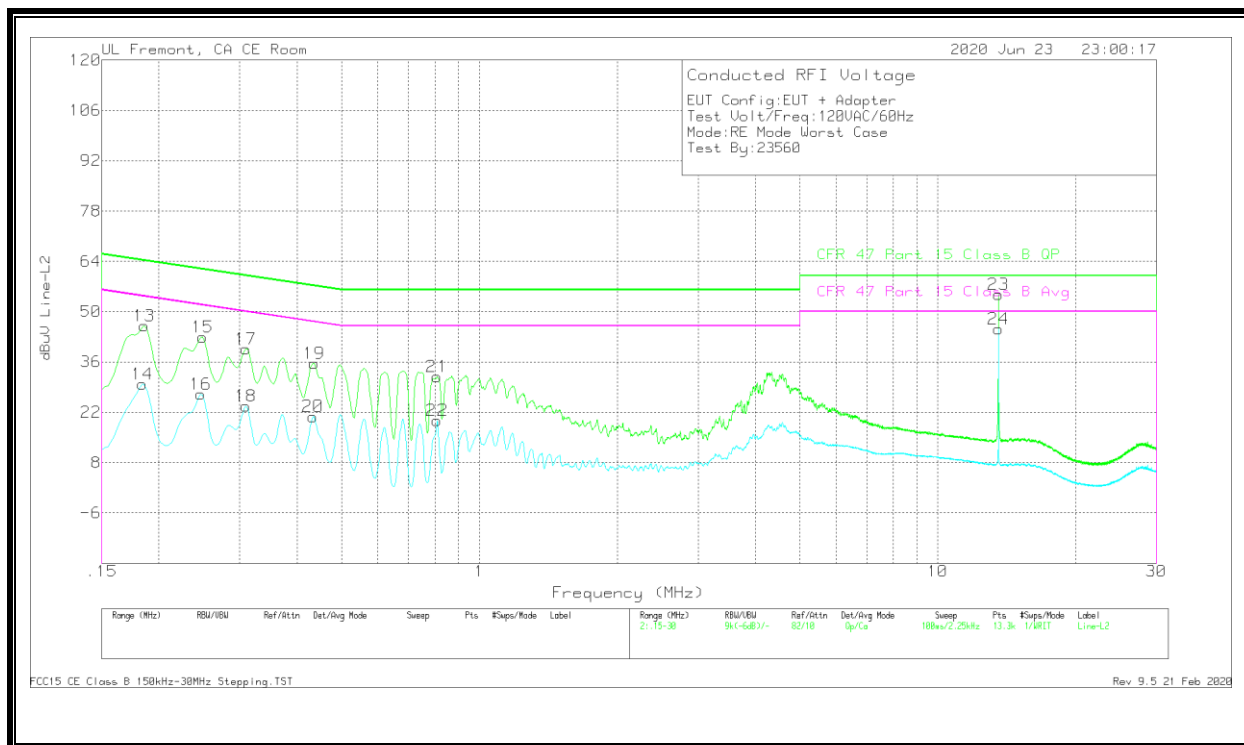
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)M argin (dB)
1	.186	35.95	Qp	0	0	10	45.95	64.21	-18.26	-	-
2	.18375	19.78	Ca	0	0	10	29.78	-	-	54.31	-24.53
3	.249	32.97	Qp	0	0	10	42.97	61.79	-18.82	-	-
4	.24675	16.93	Ca	0	0	10	26.93	-	-	51.87	-24.94
5	.30975	29.57	Qp	0	0	10	39.57	59.98	-20.41	-	-
6	.30975	13.59	Ca	0	0	10	23.59	-	-	49.98	-26.39
7	.43575	25.55	Qp	0	0	10	35.55	57.14	-21.59	-	-
8	.43575	10.57	Ca	0	0	10	20.57	-	-	47.14	-26.57
9	.80925	21.78	Qp	0	0	10	31.78	56	-24.22	-	-
10	.80925	9.65	Ca	0	0	10	19.65	-	-	46	-26.35
11	13.56	42.66	Qp	.1	.2	10.1	53.06	60	-6.94	-	-
12	13.56	32.85	Ca	.1	.2	10.1	43.25	-	-	50	-6.75

Qp - Quasi-Peak detector

Ca - CISPR average detection

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

LINE 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	36.07	Qp	0	0	10	46.07	64.21	-18.14	-	-
14	.18375	19.88	Ca	0	0	10	29.88	-	-	54.31	-24.43
15	.249	32.85	Qp	0	0	10	42.85	61.79	-18.94	-	-
16	.24675	17.01	Ca	0	0	10	27.01	-	-	51.87	-24.86
17	.30975	29.59	Qp	0	0	10	39.59	59.98	-20.39	-	-
18	.30975	13.8	Ca	0	0	10	23.8	-	-	49.98	-26.18
19	.43575	25.67	Qp	0	0	10	35.67	57.14	-21.47	-	-
20	.4335	10.85	Ca	0	0	10	20.85	-	-	47.19	-26.34
21	.80925	21.99	Qp	0	0	10	31.99	56	-24.01	-	-
22	.80925	9.74	Ca	0	0	10	19.74	-	-	46	-26.26
23	13.56	44.41	Qp	.1	.2	10.1	54.81	60	-5.19	-	-
24	13.56	34.78	Ca	.1	.2	10.1	45.18	-	-	50	-4.82

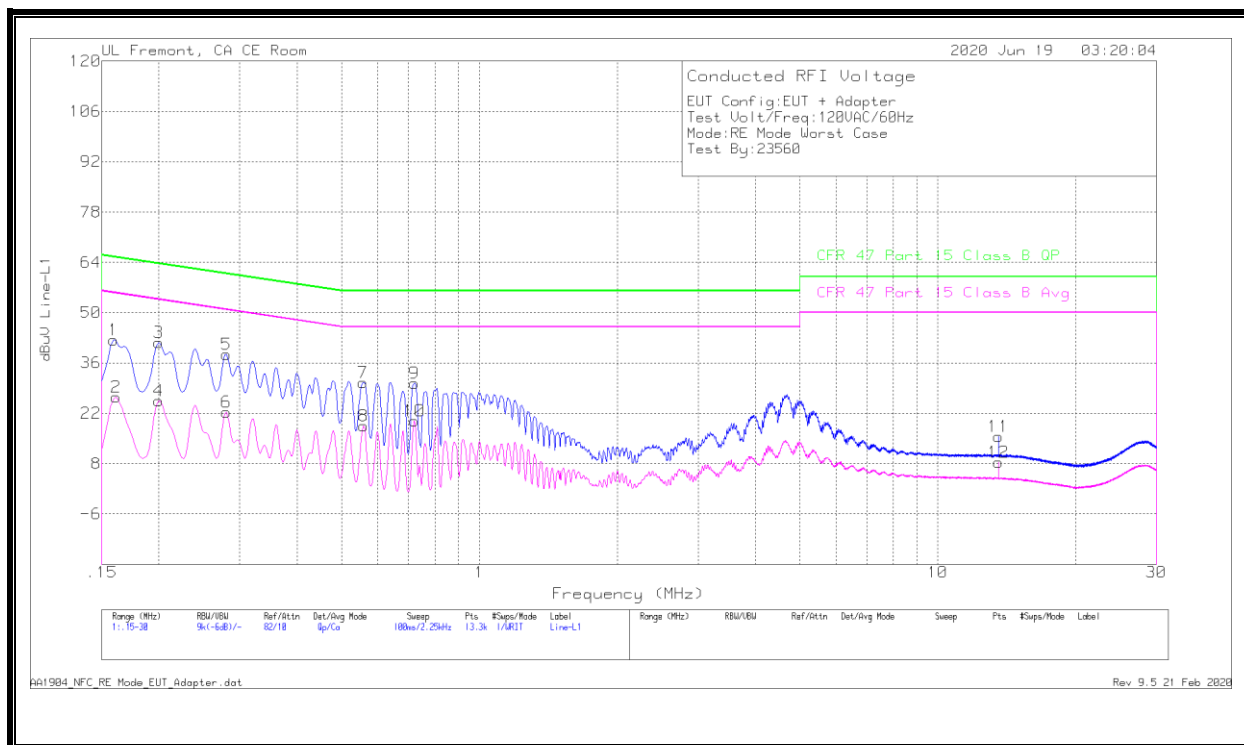
Qp - Quasi-Peak detector
Ca - CISPR average detection

FCC15 CE Class B 150kHz-30MHz Stepping.TST
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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.

10.1.2. NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS

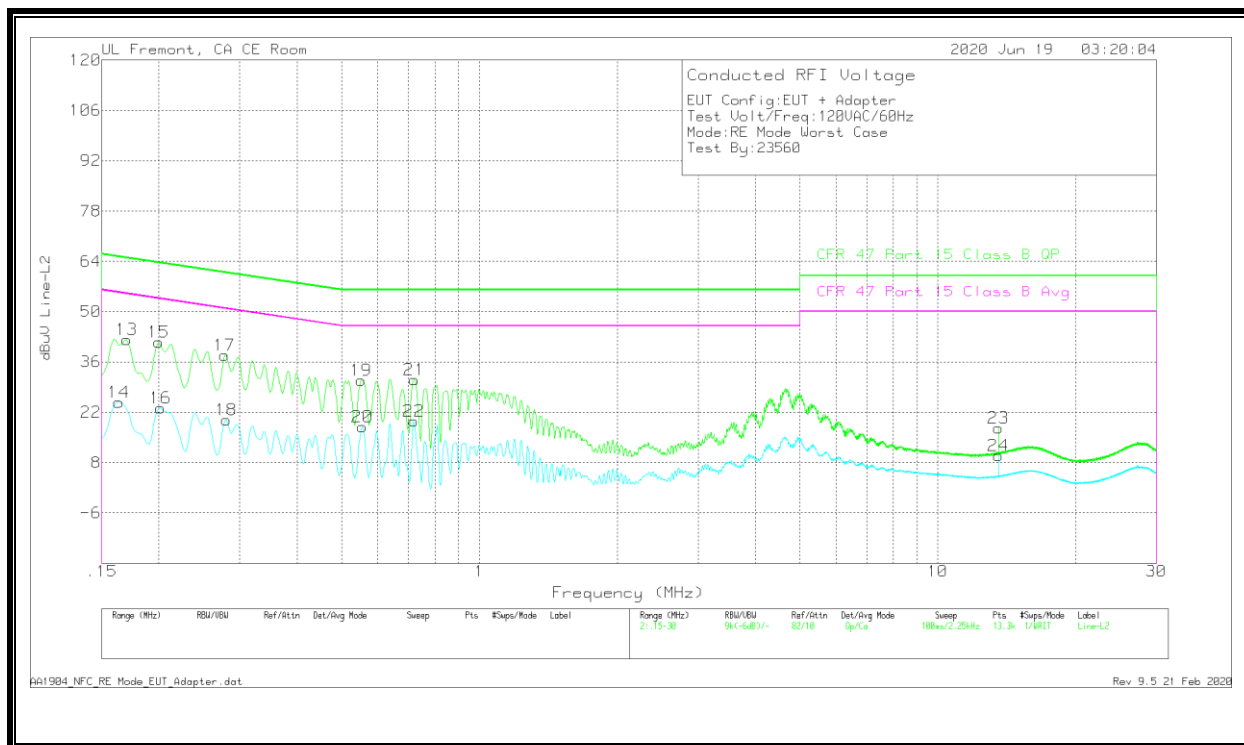


Worst Emission

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)M argin (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	.2805	28.32	Qp	0	0	10	38.32	60.8	-22.48	-	-
6	.2805	12.28	Ca	0	0	10	22.28	-	-	50.8	-28.52
7	.55725	20.61	Qp	0	0	10	30.61	56	-25.39	-	-
8	.5595	8.55	Ca	0	0	10	18.55	-	-	46	-27.45
9	.7215	20.42	Qp	0	0	10	30.42	56	-25.58	-	-
10	.7215	9.86	Ca	0	0	10	19.86	-	-	46	-26.14
*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

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	.27825	27.94	Qp	0	0	10	37.94	60.87	-22.93	-	-
18	.2805	9.83	Ca	0	0	10	19.83	-	-	50.8	-30.97
19	.55275	20.89	Qp	0	0	10	30.89	56	-25.11	-	-
20	.555	8	Ca	0	0	10	18	-	-	46	-28
21	.7215	21.03	Qp	0	0	10	31.03	56	-24.97	-	-
22	.71925	9.47	Ca	0	0	10	19.47	-	-	46	-26.53
*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

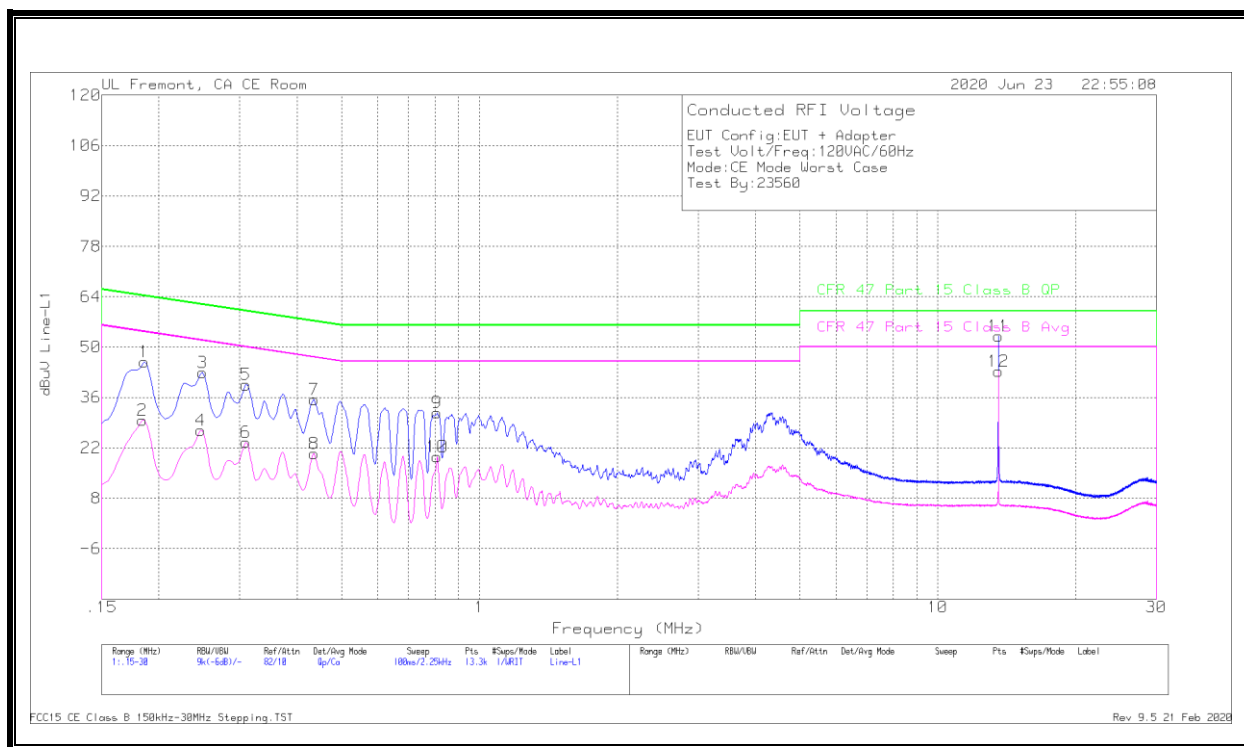
Ca - CISPR average detection

AA1904_NFC_RE_Mode_EUT_Adapter.dat
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10.2. CE MODE, TYPE A 848Kbps

10.2.1. NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

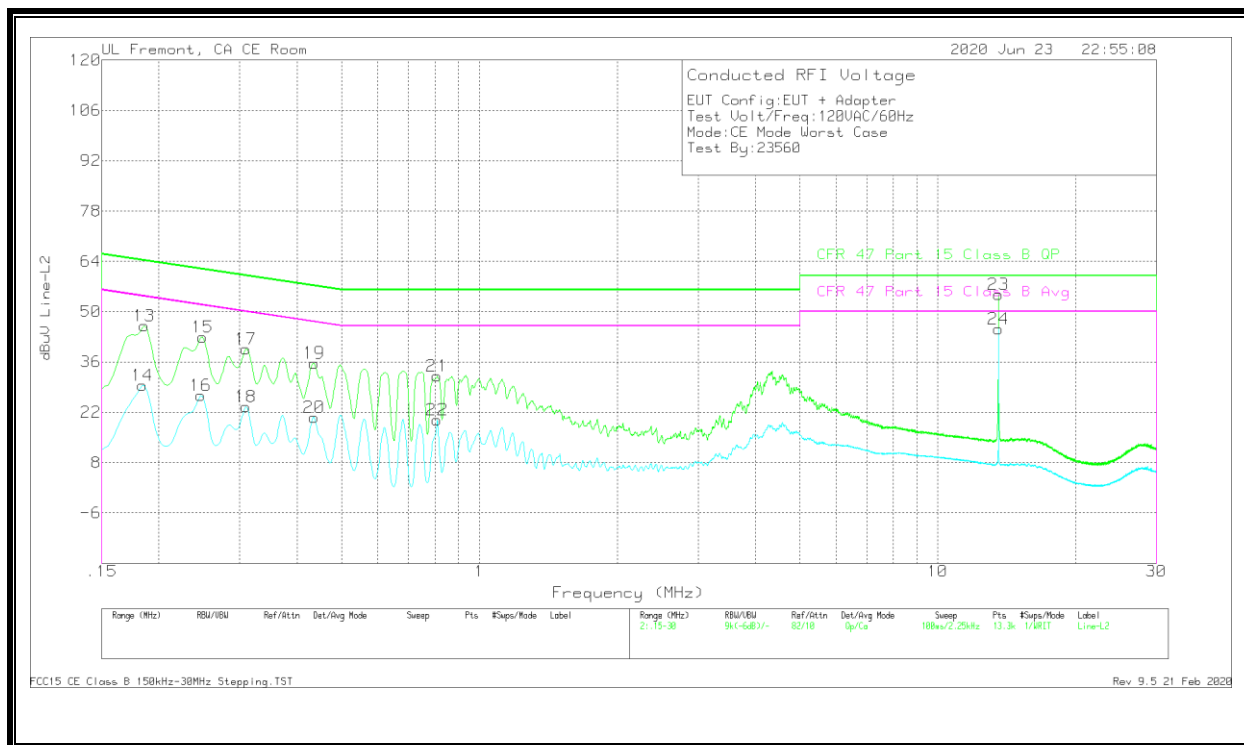
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)M argin (dB)
1	.186	35.91	Qp	0	0	10	45.91	64.21	-18.3	-	-
2	.18375	19.69	Ca	0	0	10	29.69	-	-	54.31	-24.62
3	.249	32.89	Qp	0	0	10	42.89	61.79	-18.9	-	-
4	.24675	16.9	Ca	0	0	10	26.9	-	-	51.87	-24.97
5	.30975	29.53	Qp	0	0	10	39.53	59.98	-20.45	-	-
6	.30975	13.62	Ca	0	0	10	23.62	-	-	49.98	-26.36
7	.43575	25.44	Qp	0	0	10	35.44	57.14	-21.7	-	-
8	.43575	10.42	Ca	0	0	10	20.42	-	-	47.14	-26.72
9	.80925	21.74	Qp	0	0	10	31.74	56	-24.26	-	-
10	.80925	9.61	Ca	0	0	10	19.61	-	-	46	-26.39
11	13.56	42.65	Qp	.1	.2	10.1	53.05	60	-6.95	-	-
12	13.56	32.83	Ca	.1	.2	10.1	43.23	-	-	50	-6.77

Qp - Quasi-Peak detector

Ca - CISPR average detection

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

LINE 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	36.11	Qp	0	0	10	46.11	64.21	-18.1	-	-
14	.18375	19.48	Ca	0	0	10	29.48	-	-	54.31	-24.83
15	.249	32.9	Qp	0	0	10	42.9	61.79	-18.89	-	-
16	.24675	16.68	Ca	0	0	10	26.68	-	-	51.87	-25.19
17	.30975	29.65	Qp	0	0	10	39.65	59.98	-20.33	-	-
18	.30975	13.55	Ca	0	0	10	23.55	-	-	49.98	-26.43
19	.43575	25.68	Qp	0	0	10	35.68	57.14	-21.46	-	-
20	.43575	10.67	Ca	0	0	10	20.67	-	-	47.14	-26.47
21	.80925	22.06	Qp	0	0	10	32.06	56	-23.94	-	-
22	.80925	9.9	Ca	0	0	10	19.9	-	-	46	-26.1
23	13.56	44.39	Qp	.1	.2	10.1	54.79	60	-5.21	-	-
24	13.56	34.74	Ca	.1	.2	10.1	45.14	-	-	50	-4.86

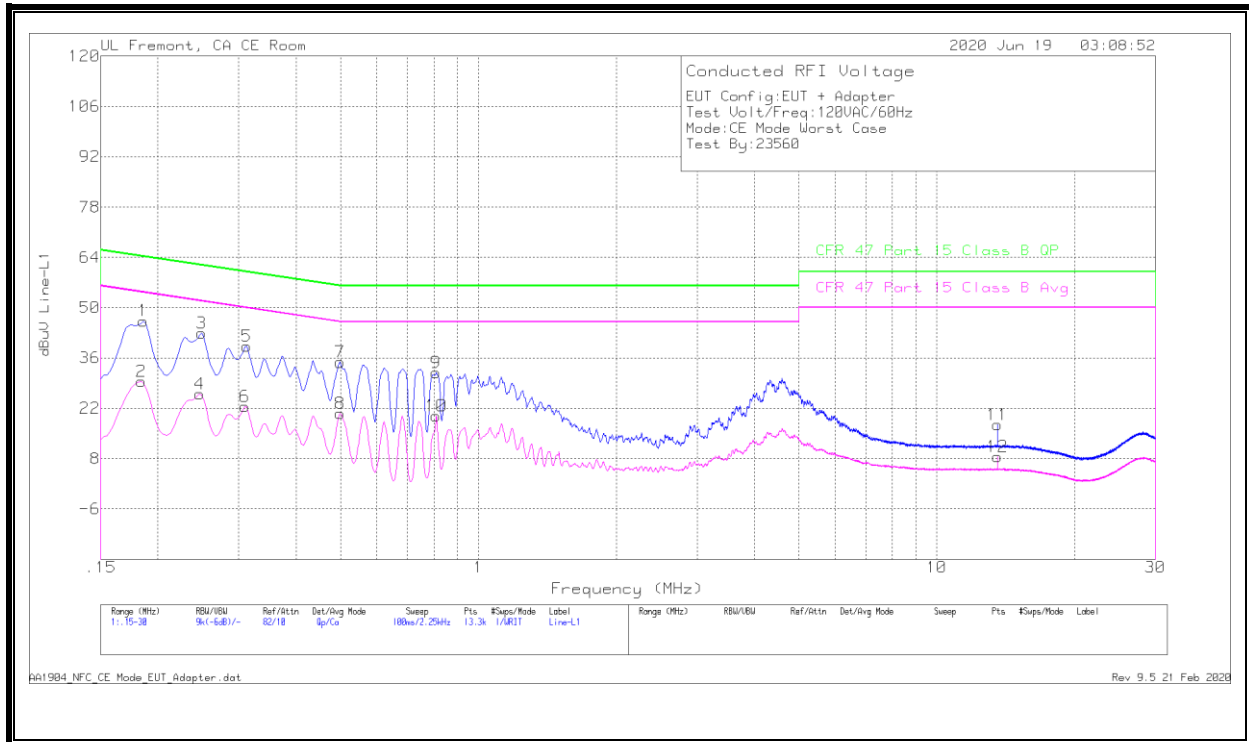
Qp - Quasi-Peak detector
Ca - CISPR average detection

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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.

10.2.2. NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS

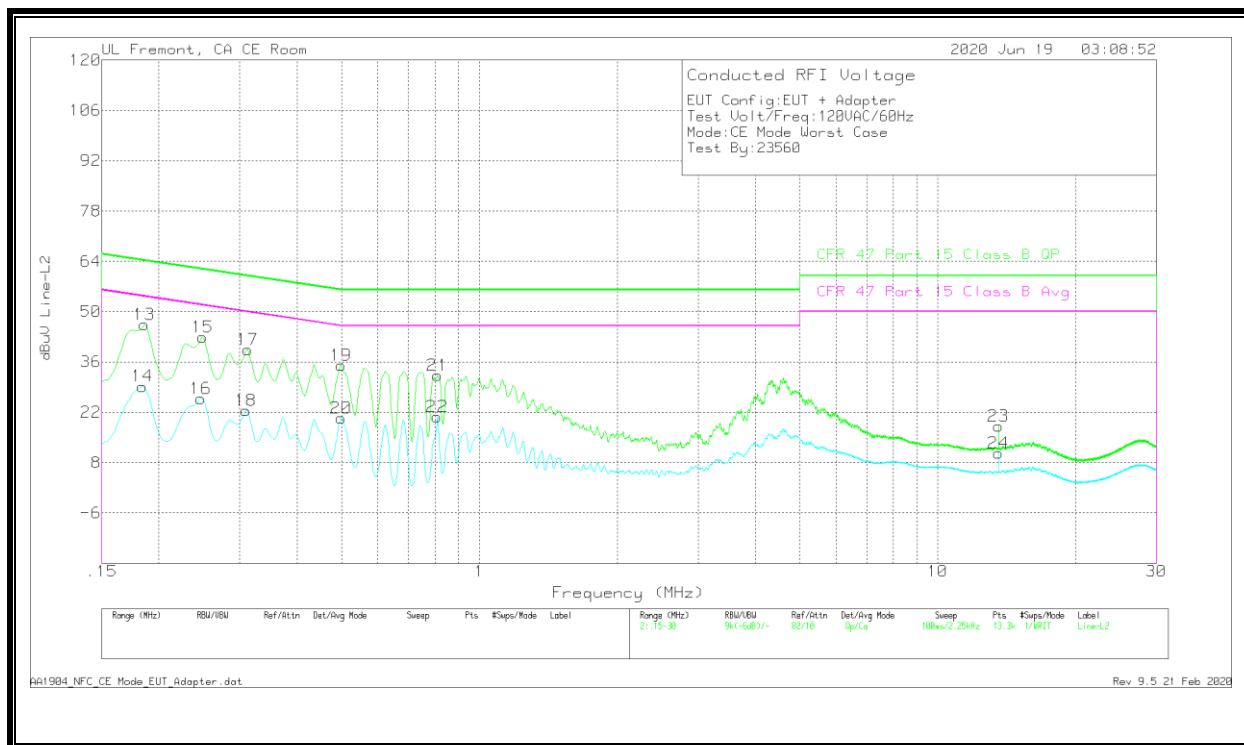


Worst Emission

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)M argin (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	.80925	21.88	Qp	0	0	10	31.88	56	-24.12	-	-
10	.80925	9.93	Ca	0	0	10	19.93	-	-	46	-26.07
*11	13.56	6.99	Qp	.1	.2	10.1	17.39	60	-42.61	-	-
*12	13.56	-1.92	Ca	.1	.2	10.1	8.48	-	-	50	-41.52

Qp - Quasi-Peak detector
Ca - CISPR average detection

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	.49875	25.07	Qp	0	0	10	35.07	56.02	-20.95	-	-
20	.49875	10.42	Ca	0	0	10	20.42	-	-	46.02	-25.6
21	.8115	22.24	Qp	0	0	10	32.24	56	-23.76	-	-
22	.80925	10.72	Ca	0	0	10	20.72	-	-	46	-25.28
*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

*Indicates UL RFID signal. Not from device.

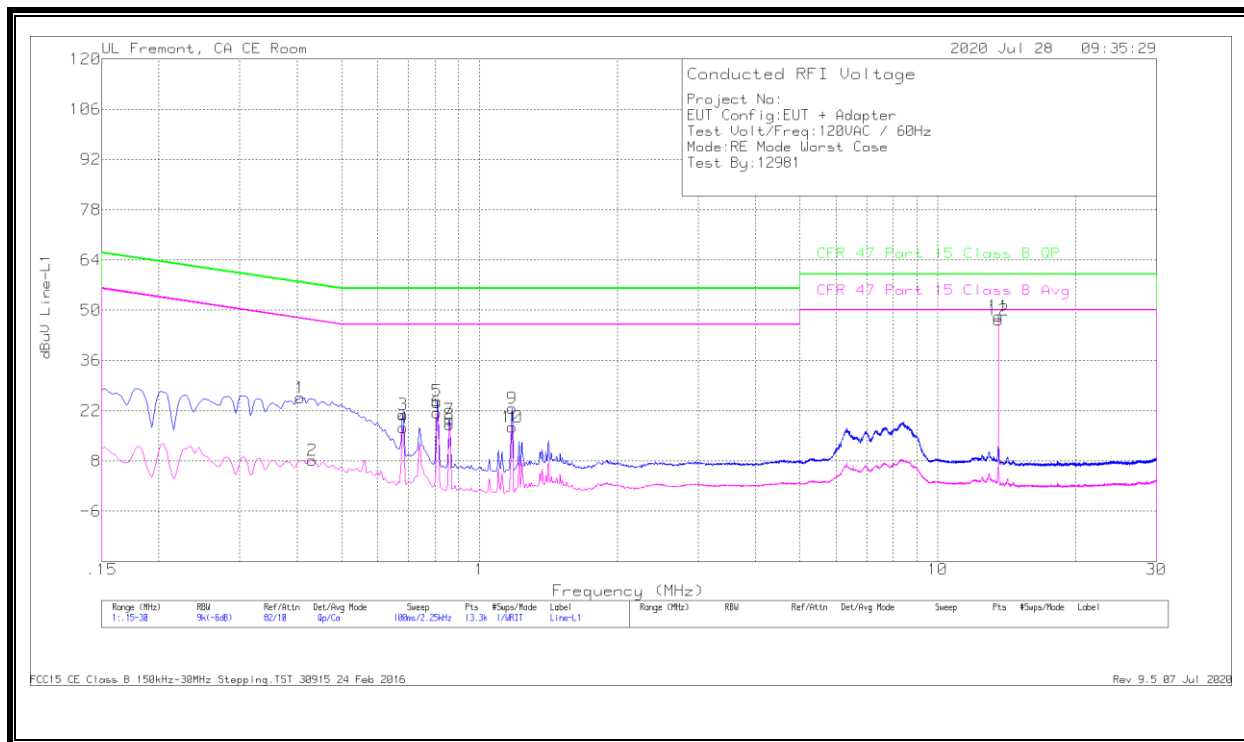
AA1904_NFC_CE Mode_EUT_Adapter.dat

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10.3. SECONDARY ANTENNA

10.3.1. READER MODE, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

Range 1: Line-L1 .15 - 30MHz

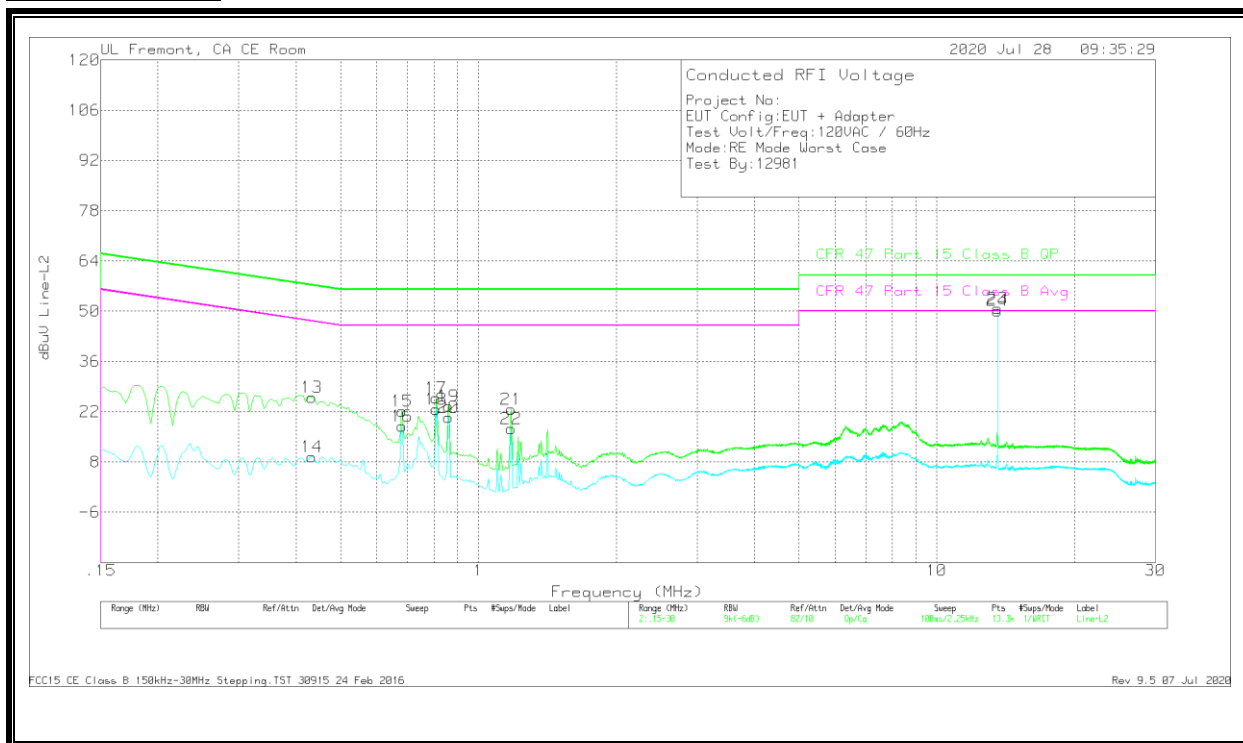
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)M argin (dB)
1	.4065	15.6	Qp	0	0	10	25.6	57.72	-32.12	-	-
2	.43125	-1.74	Ca	0	0	10	8.26	-	-	47.23	-38.97
3	.681	11.02	Qp	0	0	10	21.02	56	-34.98	-	-
4	.681	7.35	Ca	0	0	10	17.35	-	-	46	-28.65
5	.80925	14.8	Qp	0	0	10	24.8	56	-31.2	-	-
6	.80925	11.55	Ca	0	0	10	21.55	-	-	46	-24.45
7	.861	9.53	Qp	0	0	10	19.53	56	-36.47	-	-
8	.861	8.16	Ca	0	0	10	18.16	-	-	46	-27.84
9	1.17825	12.58	Qp	0	.1	10	22.68	56	-33.32	-	-
10	1.17825	7.34	Ca	0	.1	10	17.44	-	-	46	-28.56
11	13.56	37.92	Qp	.1	.2	10.1	48.32	60	-11.68	-	-
12	13.56	36.94	Ca	.1	.2	10.1	47.34	-	-	50	-2.66

Qp - Quasi-Peak detector

Ca - CISPR average detection

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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

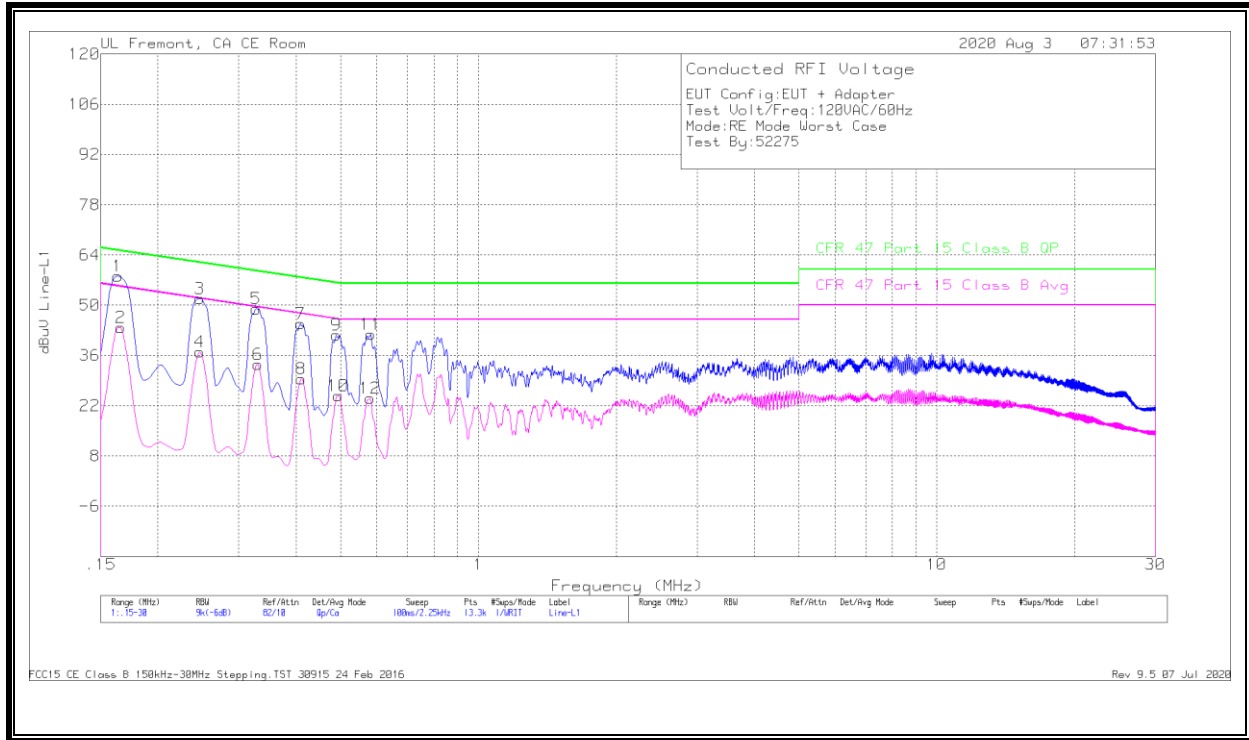
Ca - CISPR average detection

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10.3.2. NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



Worst Emission

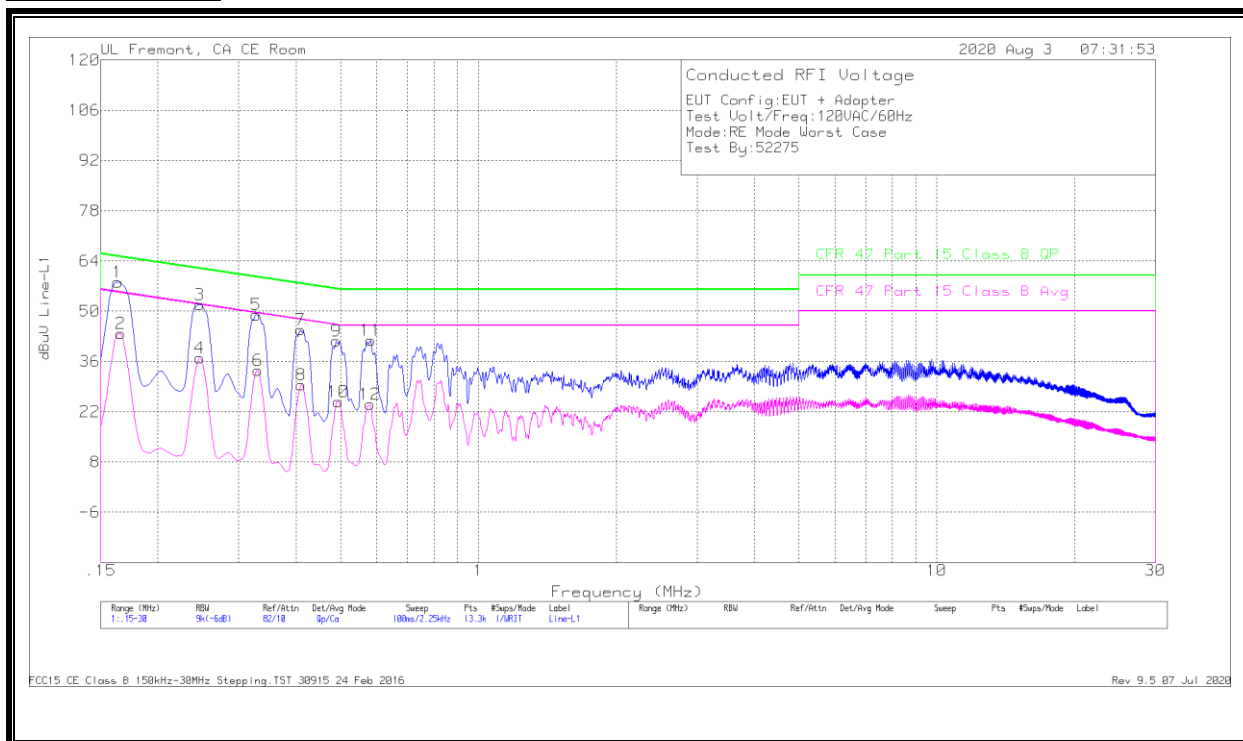
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)M argin (dB)
1	.1635	48.07	Qp	0	0	10	58.07	65.28	-7.21	-	-
2	.16575	33.82	Ca	0	0	10	43.82	-	-	55.17	-11.35
3	.24675	41.9	Qp	0	0	10	51.9	61.87	-9.97	-	-
4	.24675	27.07	Ca	0	0	10	37.07	-	-	51.87	-14.8
5	.32775	38.95	Qp	0	0	10	48.95	59.51	-10.56	-	-
6	.33	23.58	Ca	0	0	10	33.58	-	-	49.45	-15.87
7	.40875	34.78	Qp	0	0	10	44.78	57.67	-12.89	-	-
8	.411	19.57	Ca	0	0	10	29.57	-	-	47.63	-18.06
9	.48975	31.69	Qp	0	0	10	41.69	56.17	-14.48	-	-
10	.49425	14.86	Ca	0	0	10	24.86	-	-	46.1	-21.24
11	.582	31.85	Qp	0	0	10	41.85	56	-14.15	-	-
12	.57975	14.06	Ca	0	0	10	24.06	-	-	46	-21.94

Qp - Quasi-Peak detector

Ca - CISPR average detection

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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	.1635	46.44	Qp	0	0	10	56.44	65.28	-8.84	-	-
14	.1635	32.03	Ca	0	0	10	42.03	-	-	55.28	-13.25
15	.24675	40.35	Qp	0	0	10	50.35	61.87	-11.52	-	-
16	.24675	24.97	Ca	0	0	10	34.97	-	-	51.87	-16.9
17	.3255	36.98	Qp	0	0	10	46.98	59.57	-12.59	-	-
18	.32775	21.43	Ca	0	0	10	31.43	-	-	49.51	-18.08
19	.4065	32.47	Qp	0	0	10	42.47	57.72	-15.25	-	-
20	.411	17.24	Ca	0	0	10	27.24	-	-	47.63	-20.39
21	.4965	30.74	Qp	0	0	10	40.74	56.06	-15.32	-	-
22	.49425	12.32	Ca	0	0	10	22.32	-	-	46.1	-23.78
23	.57075	30.13	Qp	0	0	10	40.13	56	-15.87	-	-
24	.57075	12.5	Ca	0	0	10	22.5	-	-	46	-23.5

Qp - Quasi-Peak detector

Ca - CISPR average detection

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11. SETUP PHOTOS

Please refer to 13335182-EP1 for setup photos.

END OF TEST REPORT