TEST REPORT

Report Number. : 13336566-E12V1

Applicant	:	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2406
FCC ID	:	BCG-E3546A
IC	:	579C-E3546A
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

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: A2406

Serial Number: (Original): G6TCM020Q5T6
(Spot Check): G6TC501YPT9F

DATE TESTED: AUGIST21, 2020 – AUGUST 23, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies
ISED RSS-210 Issue 10	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.

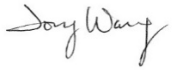
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. 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, 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: 2324A.

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-E3545A, IC: 579C-E3545A to cover variant model BCG-E3546A, 579C-E3546A. 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 A2406, FCC ID: BCG-E3546A, IC: 579C-E3546A for Reader mode Fundamental The data from the application has been verified through appropriate spot D01 as shown in the summary below.

Technology	Mode	Test Item	Measured	Original model		Spot check model		Delta (dB)
				A2341		A2406		
				BCG-E3545A 579C-E3545A		BCG-E3546A 579C-E3546A		
			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	23.5		15.47		-8.03
	Reader	RSE	40.6765		36.2		33.88	-2.32

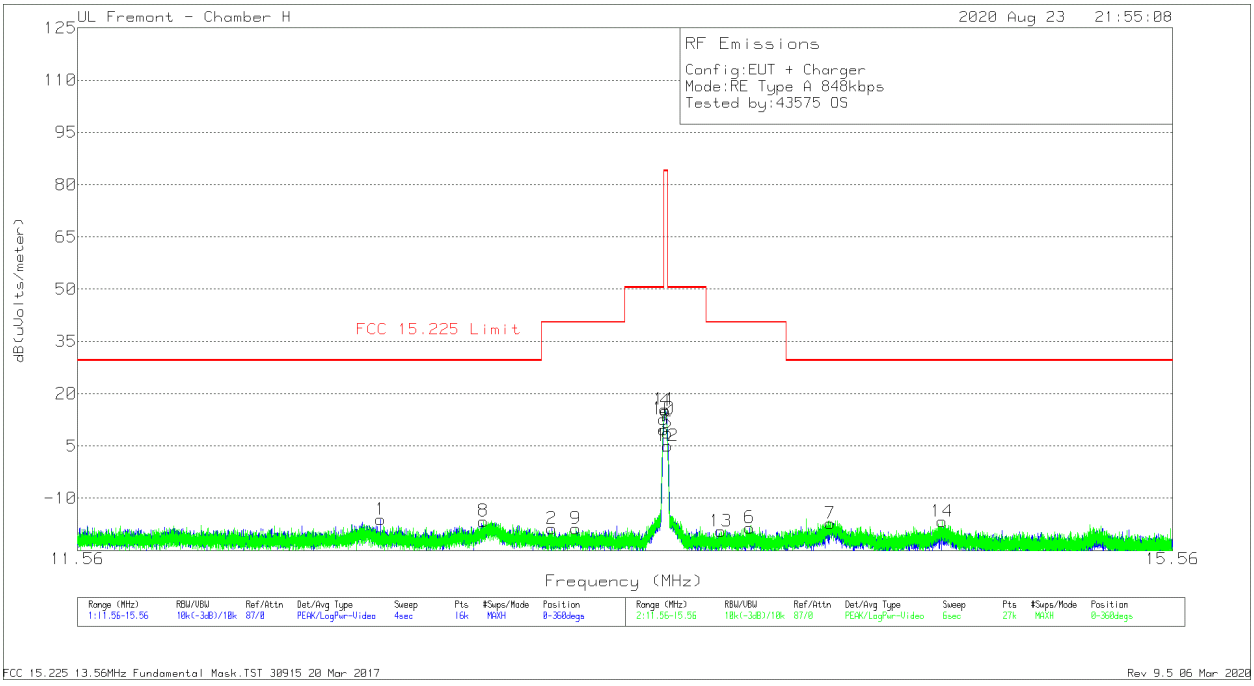
Comparison of the models, upper deviation is within 3dB range and all tests are under FCC Technical Limits. The test report for FCC ID BCG-E3545A, IC: 579C-E3546A is therefore being used to support the application for certification for FCC ID: BCG-E3546A & IC: 579C-E3546A

SPOT CHECK DATA

5.3.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL

ANTENNA LOOP FACE ON and FACE OFF



DATA

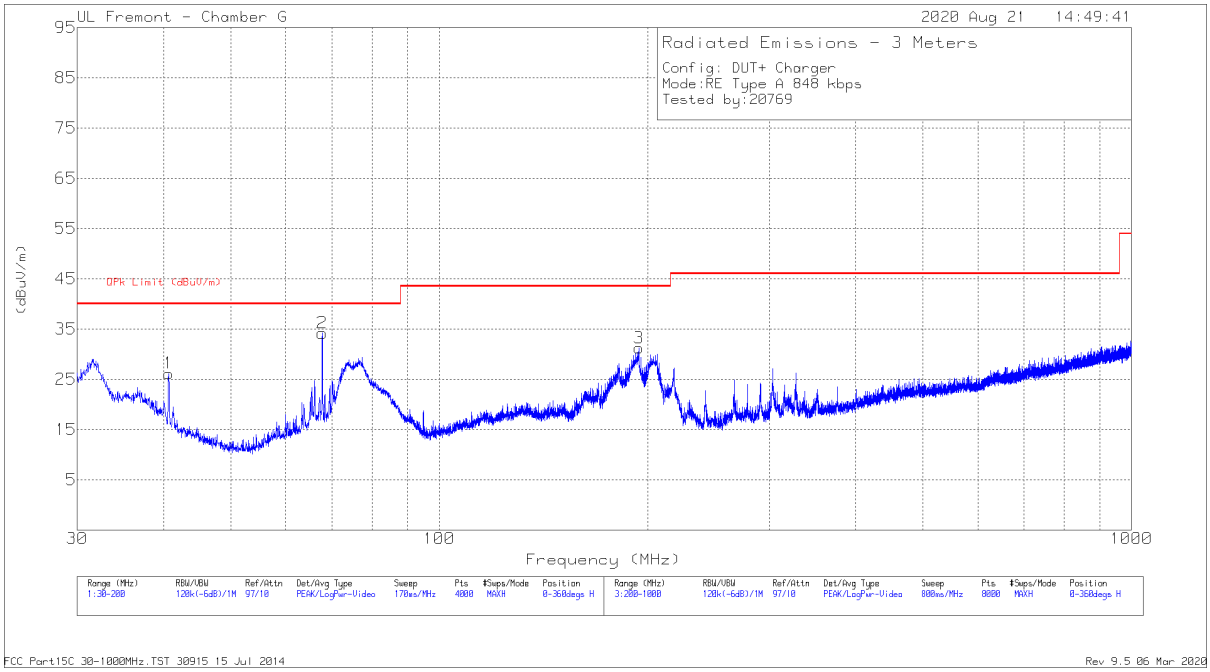
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	12.5505	12.88	Pk	10.6	.4	-40	-16.12	29.54	-45.66	0-360
8	12.90591	12.44	Pk	10.6	.4	-40	-16.56	29.54	-46.1	0-360
2	13.14713	10.37	Pk	10.6	.4	-40	-18.63	40.51	-59.14	0-360
9	13.23299	10.31	Pk	10.6	.4	-40	-18.69	40.51	-59.2	0-360
3	13.55275	38.62	Pk	10.6	.4	-40	9.62	50.5	-40.88	0-360
10	13.55297	41.79	Pk	10.6	.4	-40	12.79	50.5	-37.71	0-360
11	13.55785	44.47	Pk	10.6	.4	-40	15.47	84	-68.53	0-360
4	13.56038	44.11	Pk	10.6	.4	-40	15.11	84	-68.89	0-360
12	13.56703	33.96	Pk	10.6	.4	-40	4.96	50.5	-45.54	0-360
5	13.56725	37.77	Pk	10.6	.4	-40	8.77	50.5	-41.73	0-360
13	13.76564	9.55	Pk	10.6	.4	-40	-19.45	40.51	-59.96	0-360
6	13.87275	10.57	Pk	10.6	.4	-40	-18.43	40.51	-58.94	0-360
7	14.17875	11.8	Pk	10.6	.4	-40	-17.2	29.54	-46.74	0-360
14	14.6159	12.31	Pk	10.6	.4	-40	-16.69	29.54	-46.23	0-360

Pk - Peak detector

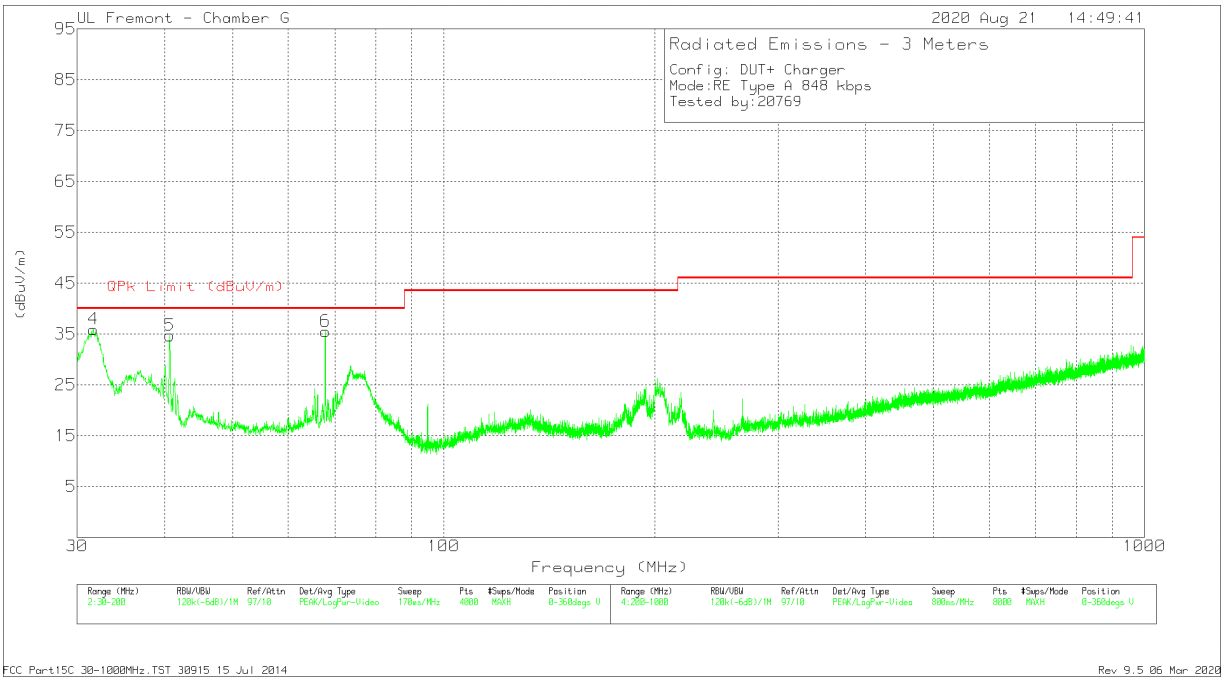
5.3.2. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode), SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	194.305	43.11	Pk	17.6	-29.5	31.21	43.52	-12.31	0-360	101	H
1	40.6703	37.66	Pk	19.4	-30.9	26.16	40	-13.84	0-360	301	H
4	31.775	36.88	Qp	26.1	-31	31.98	40	-8.02	298	112	V
5	40.6756	45.38	Qp	19.4	-30.9	33.88	40	-6.12	202	100	V
2	67.799	51.01	Qp	14.1	-30.6	34.51	40	-5.49	328	239	H
6	67.7993	51.49	Qp	14.1	-30.6	34.99	40	-5.01	114	104	V

Pk - Peak detector
Qp - Quasi-Peak detector

5.4. 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-E3545A 579C-E3545A	13259315-E12	FCC IC_NFC Report / All sections

5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental and spurious of the EUT was performed based on the worst case on model A2341.

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.

5.6. 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

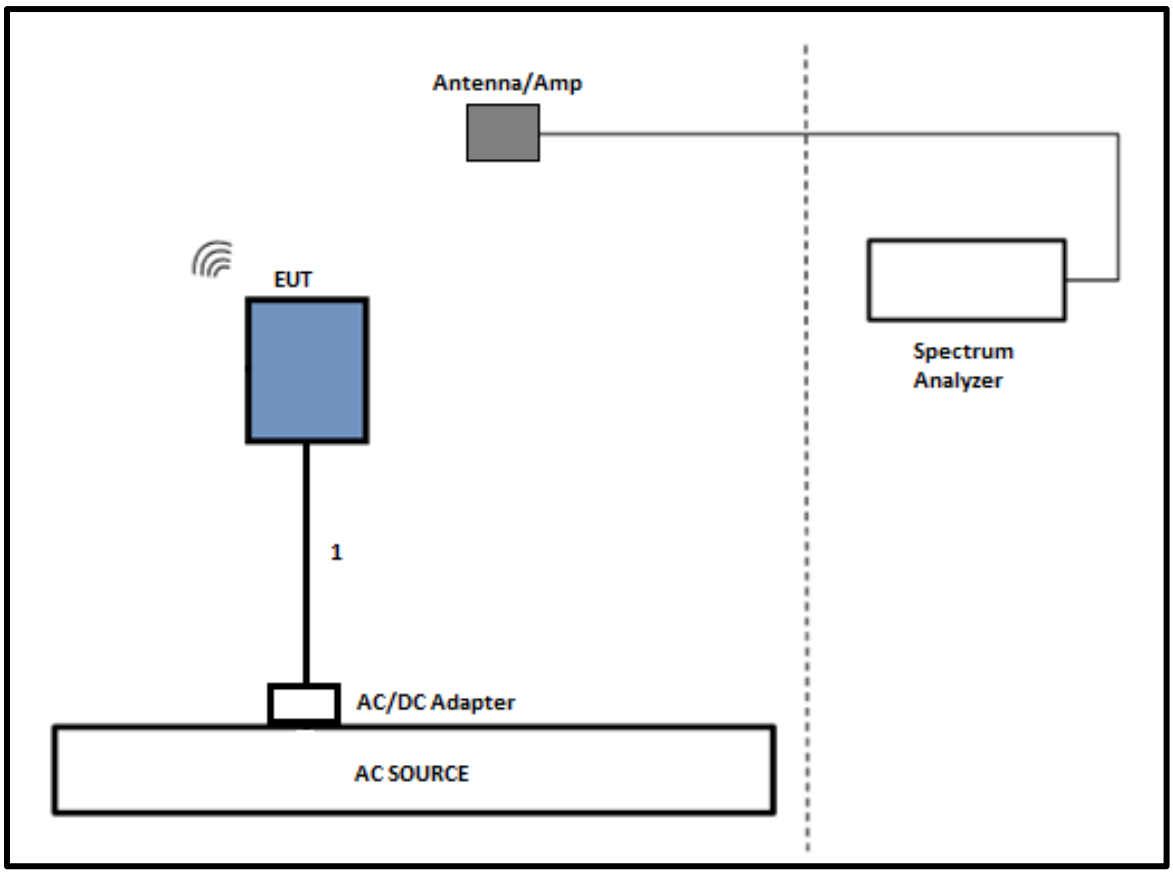
I/O CABLES

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**
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	JB3	T477	09/04/2020	09/04/2019
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T835	01/23/2021	01/23/2020
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T917	01/21/2021	01/21/2020

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

*Testing is completed before equipment expiration date.

7. SETUP PHOTOS

Please refer to 13259315-EP1 for setup photos.

END OF TEST REPORT

Appendix A – Reference Test Report

Attached is the test report (13259315-E12) containing the reference data from the parent model as detailed in section 5.4.

TEST REPORT

Report Number. : 13259315-E12V2

Applicant	:	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2341
FCC ID	:	BCG-E3545A
IC	:	579C-E3545A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 10

Date Of Issue:
September 18, 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

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	8/26/2020	Initial Issue	Chin Pang
V2	9/18/2020	Address TCB's Questions	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: A2341

SERIAL NUMBER: G6TCM020Q5T6

DATE TESTED: MAY 18, 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.

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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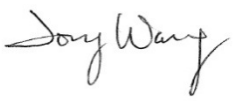
Approved & Released For
UL Verification Services Inc. By:

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	22.80
			CE	848	21.69
Secondary	13.56	Type A	Reader	848	-7.58

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	D292365CDYADHLHC3	NA

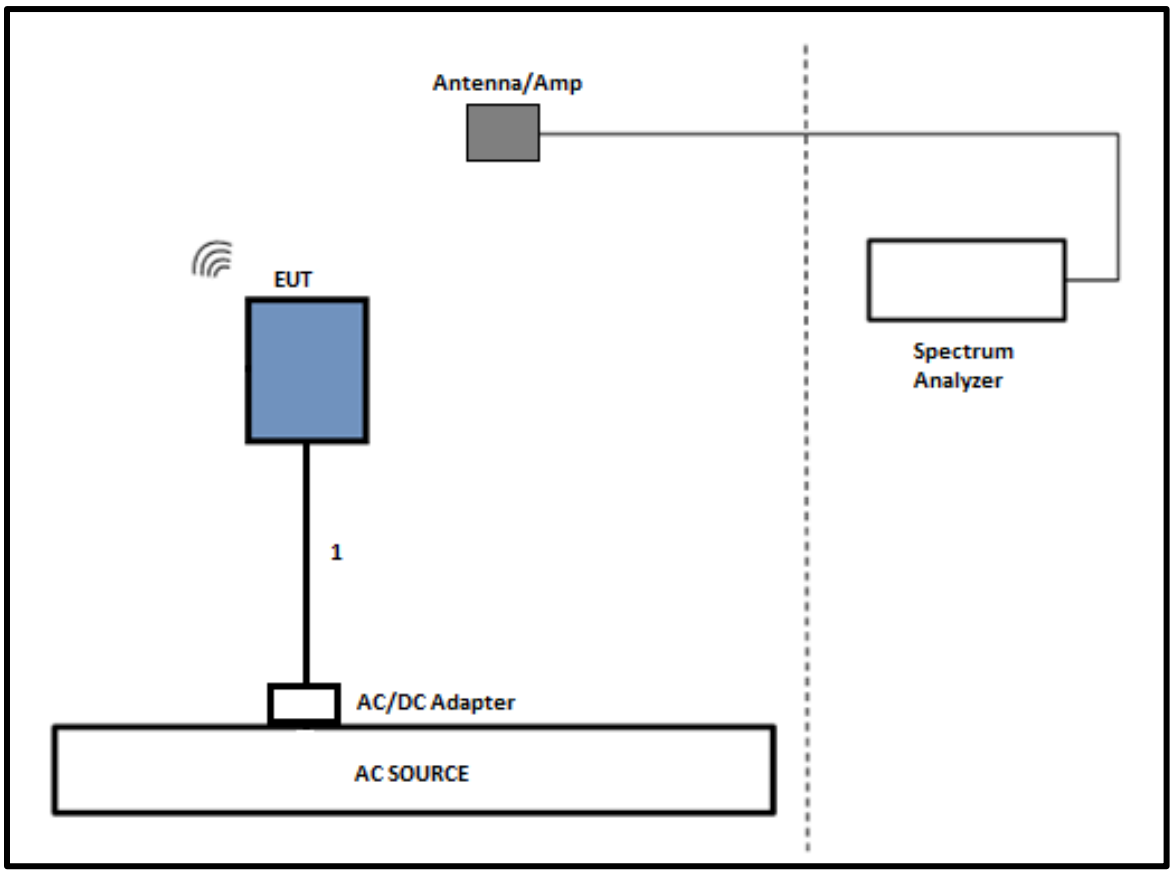
I/O CABLES

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

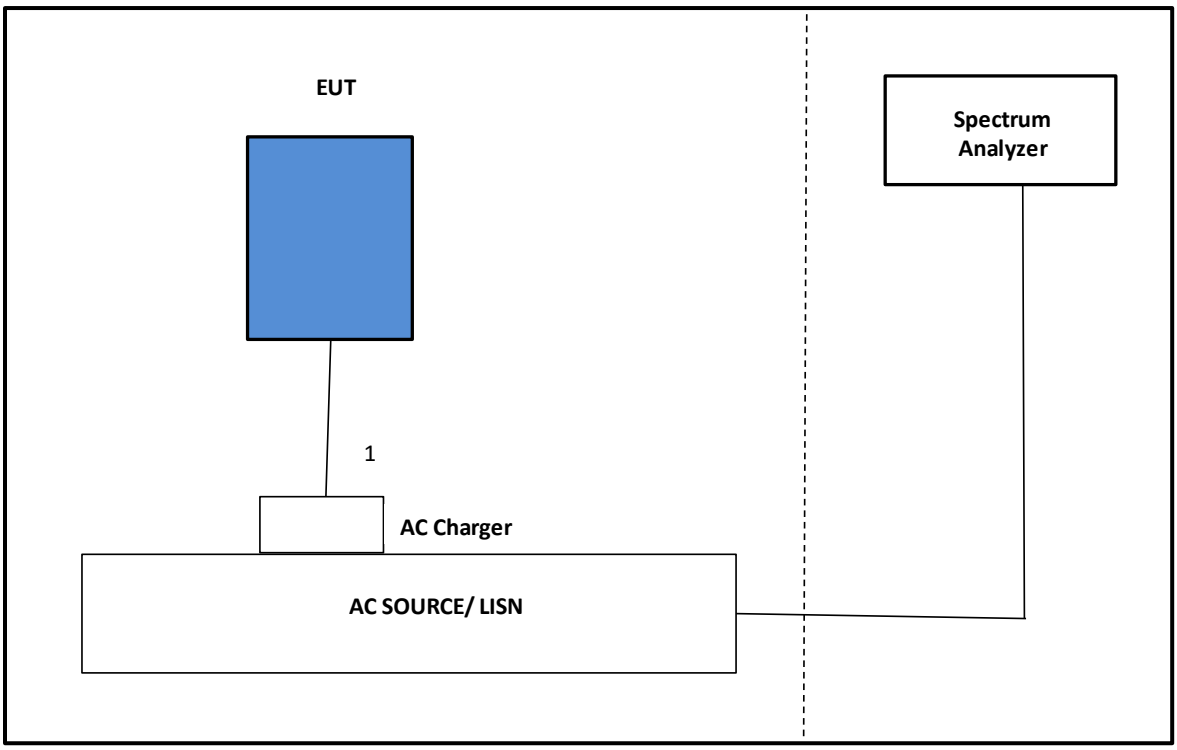
TEST SETUP

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

SETUP DIAGRAM FOR RADIATED TESTS



SETUP DIAGRAM FOR LINE CONDUCTED TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**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	T1683	04/28/2021	04/28/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	01/22/2021	01/22/2020
Antenna, Active Loop 9KHz to 30MHz	ETS-Lindgren	6502	T757	10/01/2020	10/01/2019
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
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	12/22/2020	12/22/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2021	01/23/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1210	01/21/2021	01/21/2020

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	24.5325	28.770

Type A (CE Mode)

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.2153	28.609

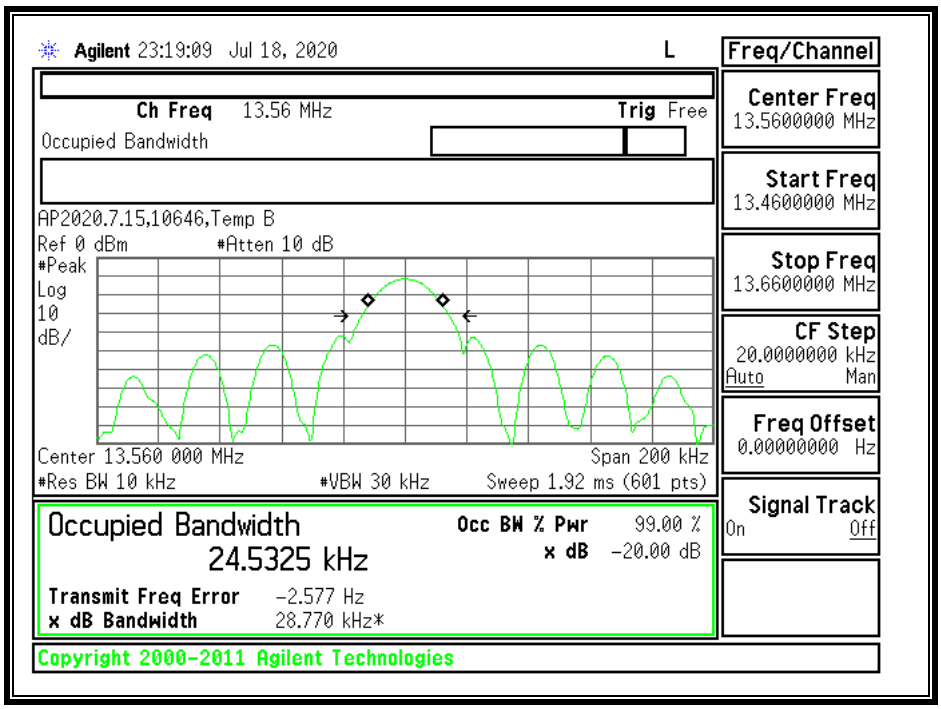
Secondary Antenna

Type A (Reader Mode)

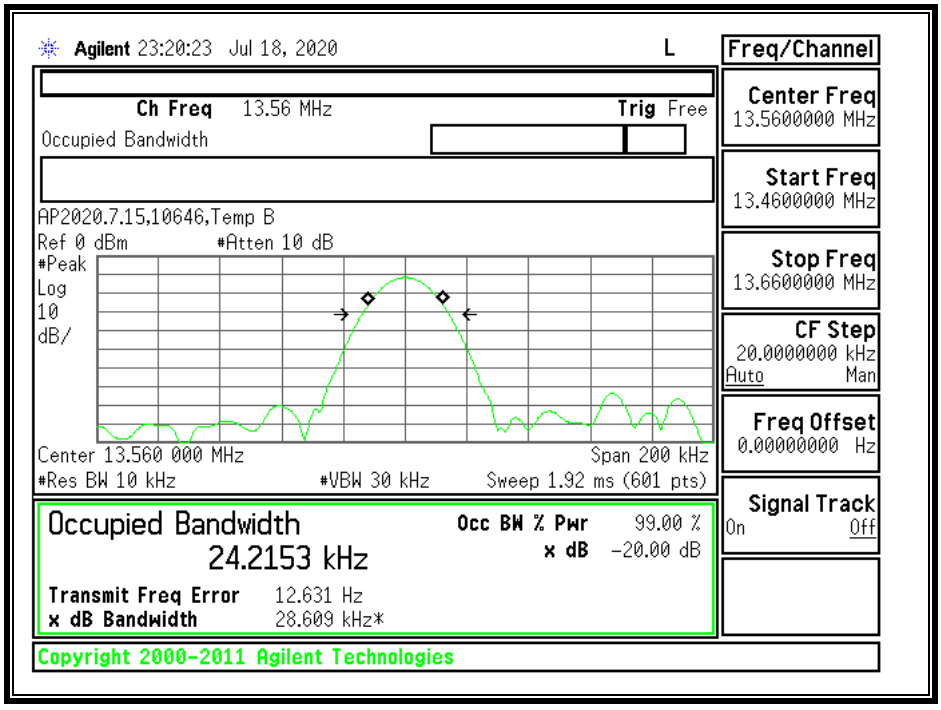
Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.363	28.30

7.1. PRIMARY ANTENNA

Type A (Reader Mode), 848Kbps

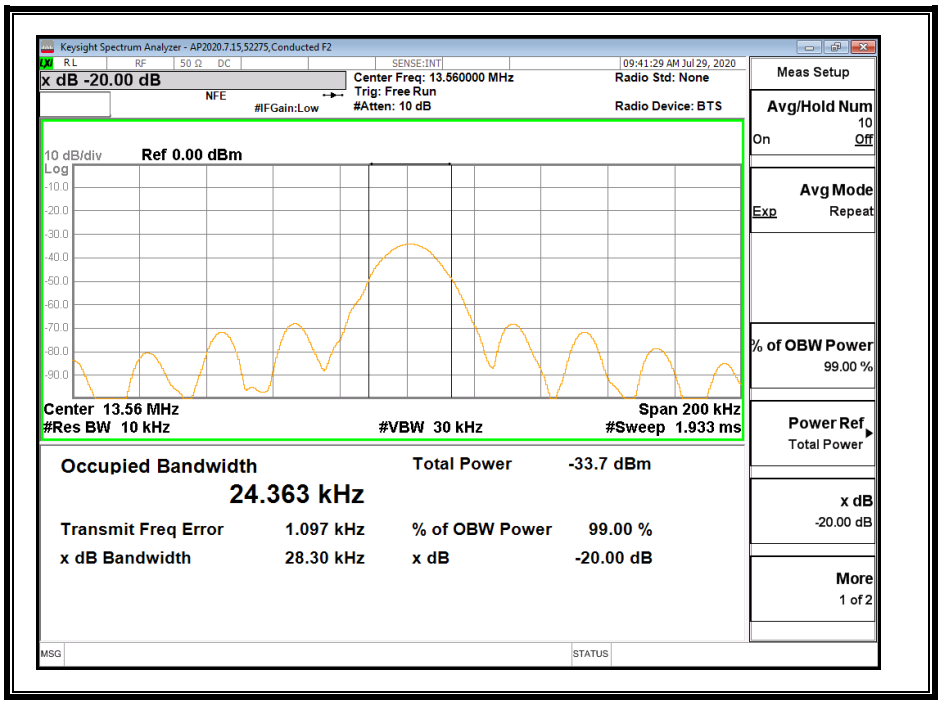


Type A (CE Mode), 848Kbps



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.

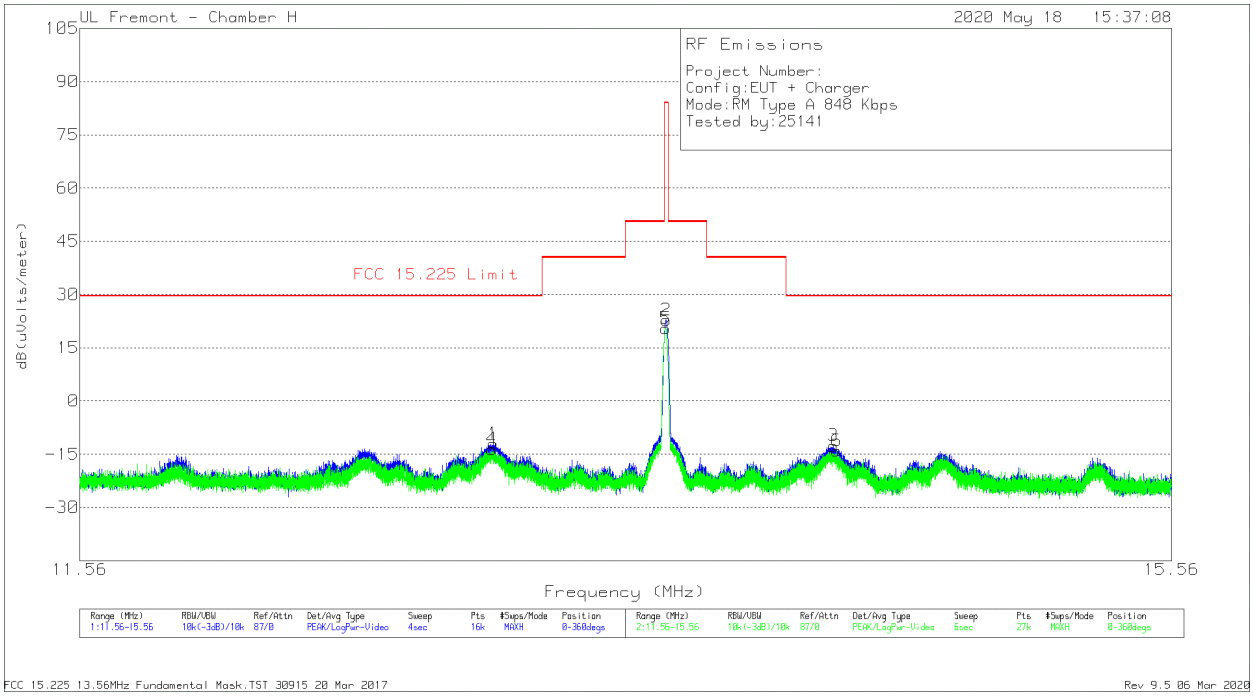
RESULTS

Note: The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as report in the table) using free space impedance of 377 Ohms. For example, the measurement at frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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



ANTENNA LOOP FACE ON and FACE OFF

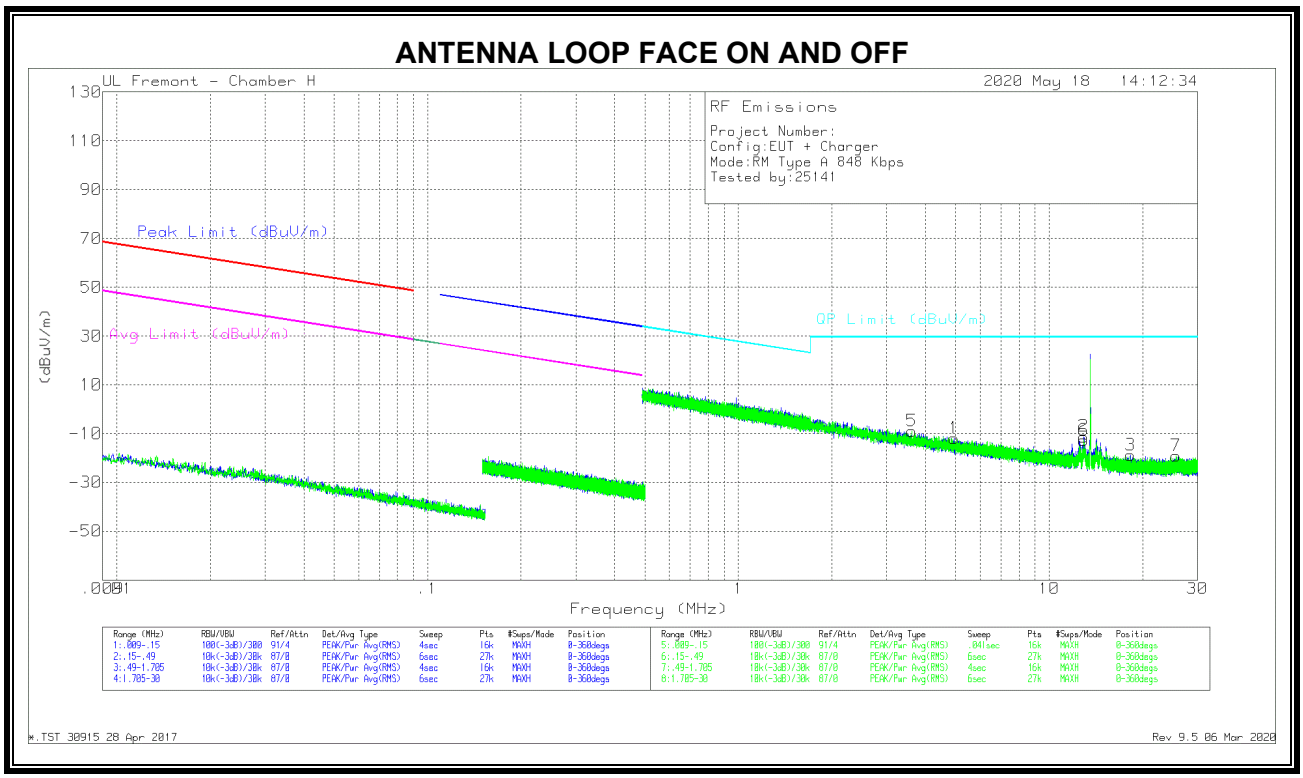
DATA

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	12.9324	15.43	Pk	10.6	.4	-40	-13.57	29.54	-43.11	0-360
1	12.93725	16.93	Pk	10.6	.4	-40	-12.07	29.54	-41.61	0-360
5	13.55852	49.42	Pk	10.6	.4	-40	20.42	84	-63.58	0-360
2	13.55988	51.8	Pk	10.6	.4	-40	22.8	84	-61.2	0-360
3	14.19225	16.34	Pk	10.6	.4	-40	-12.66	29.54	-42.2	0-360
6	14.20506	14.96	Pk	10.6	.4	-40	-14.04	29.54	-43.58	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



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)
5	3.6197	19.45	Pk	11.4	.2	-40	-8.95	29.5	-38.45	0-360
1	4.94122	16.66	Pk	11.2	.2	-40	-11.94	29.5	-41.44	0-360
6	12.91546	16.3	Pk	10.6	.4	-40	-12.7	29.5	-42.2	0-360
2	12.92384	17.78	Pk	10.6	.4	-40	-11.22	29.5	-40.72	0-360
3	18.29903	10.45	Pk	10.3	.5	-40	-18.75	29.5	-48.25	0-360
7	25.61302	11.06	Pk	9.2	.6	-40	-19.14	29.5	-48.64	0-360

Radiated Emissions

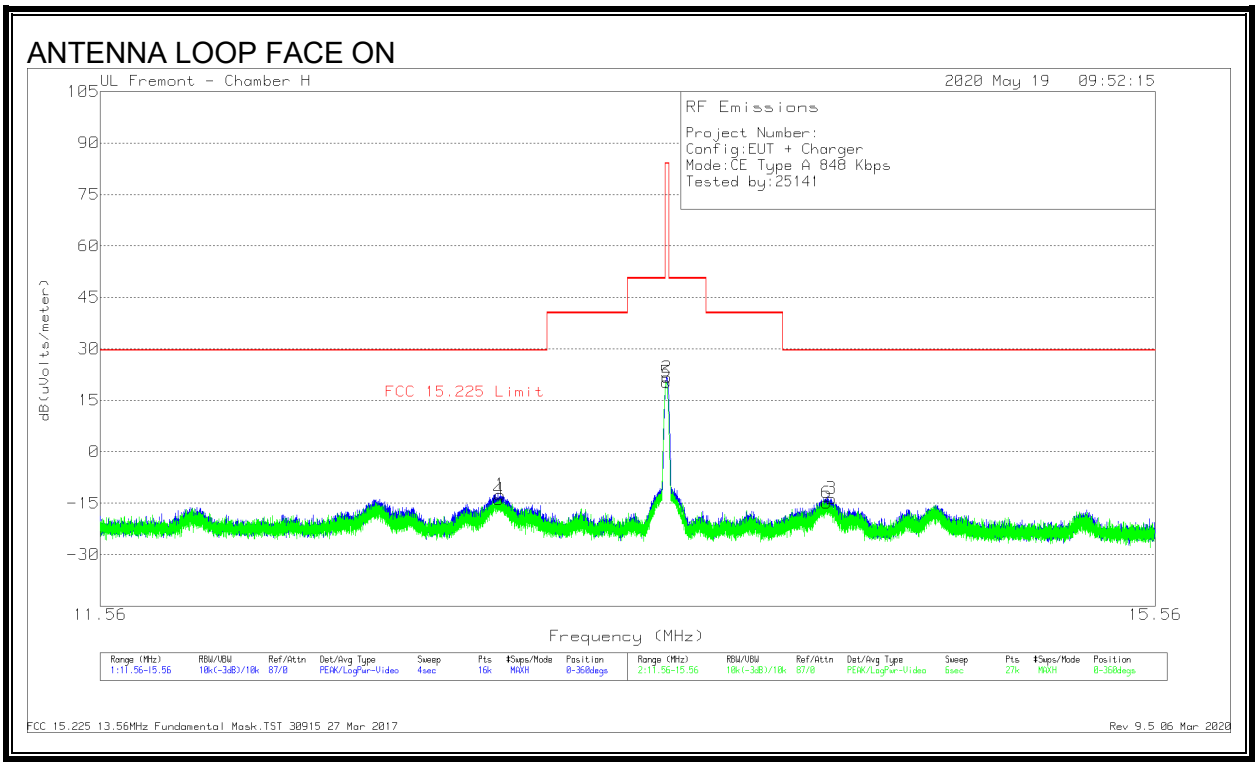
Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3.62082	12.13	Qp	11.4	.2	-40	-16.27	29.5	-45.77	118
4.94263	9.88	Qp	11.2	.2	-40	-18.72	29.5	-48.22	117
12.917	12.36	Qp	10.6	.4	-40	-16.64	29.5	-46.14	195
12.9196	10.51	Qp	10.6	.4	-40	-18.49	29.5	-47.99	91
18.2967	2.11	Qp	10.3	.5	-40	-27.09	29.5	-56.59	108
25.6085	2.53	Qp	9.2	.6	-40	-27.67	29.5	-57.17	356

PK – Peak detector
Qp - Quasi-Peak detector

*.TST 30915 28 Apr 2017
Rev 9.5 06 Mar 2020

8.2.2. CE MODE, TYPE A 848Kbps

FUNDAMENTAL 848Kbps



DATA

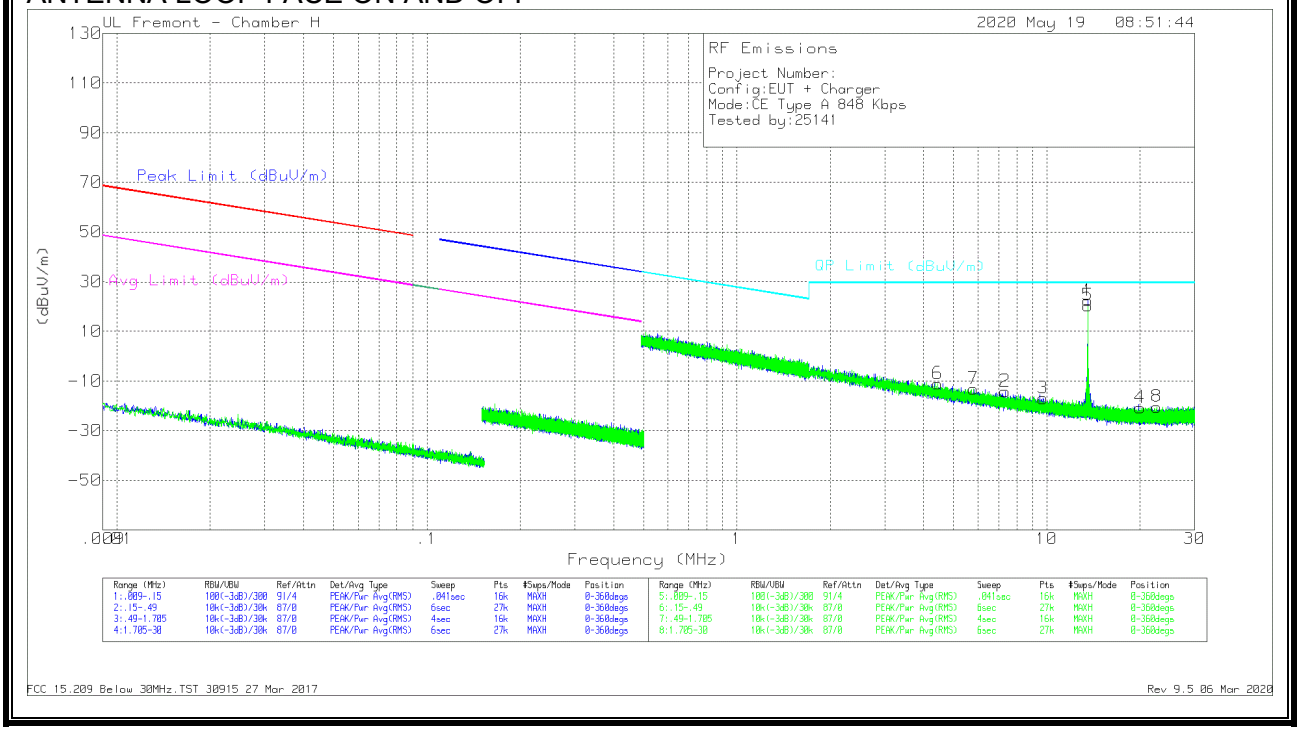
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
4	12.93359	15.48	Pk	10.3	.4	-40	-13.82	29.54	-43.36	0-360
1	12.93825	16.8	Pk	10.3	.4	-40	-12.5	29.54	-42.04	0-360
5	13.55763	49.72	Pk	10.2	.4	-40	20.32	84	-63.68	0-360
2	13.56	51.09	Pk	10.2	.4	-40	21.69	84	-62.31	0-360
6	14.18478	14.56	Pk	10.2	.4	-40	-14.84	29.54	-44.38	0-360
3	14.20275	15.79	Pk	10.2	.4	-40	-13.61	29.54	-43.15	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

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)
6	4.44342	17.9	Pk	10.8	.2	-40	-11.1	29.5	-40.6	0-360
7	5.80163	15.7	Pk	10.8	.3	-40	-13.2	29.5	-42.7	0-360
2	7.33381	14.78	Pk	10.7	.3	-40	-14.22	29.5	-43.72	0-360
3	9.72639	12.02	Pk	10.6	.4	-40	-16.98	29.5	-46.48	0-360
1	13.55893	51.72	Pk	10.2	.4	-40	22.32	29.5	-7.18	0-360
5	13.55893	49.82	Pk	10.2	.4	-40	20.42	29.5	-9.08	0-360
4	20.0209	9.22	Pk	9.5	.5	-40	-20.78	29.5	-50.28	0-360
8	22.63042	9.98	Pk	9.1	.5	-40	-20.42	29.5	-49.92	0-360

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)
4.45149	11.07	Qp	10.8	.2	-40	-17.93	29.5	-47.43	180
5.80393	8.96	Qp	10.8	.3	-40	-19.94	29.5	-49.44	352
7.34345	6.98	Qp	10.7	.3	-40	-22.02	29.5	-51.52	304
9.74176	5.36	Qp	10.6	.4	-40	-23.64	29.5	-53.14	206
20.0116	2.32	Qp	9.5	.5	-40	-27.68	29.5	-57.18	72
22.6334	2.89	Qp	9.1	.5	-40	-27.51	29.5	-57.01	11

PK – Peak detector
Qp - Quasi-Peak detector

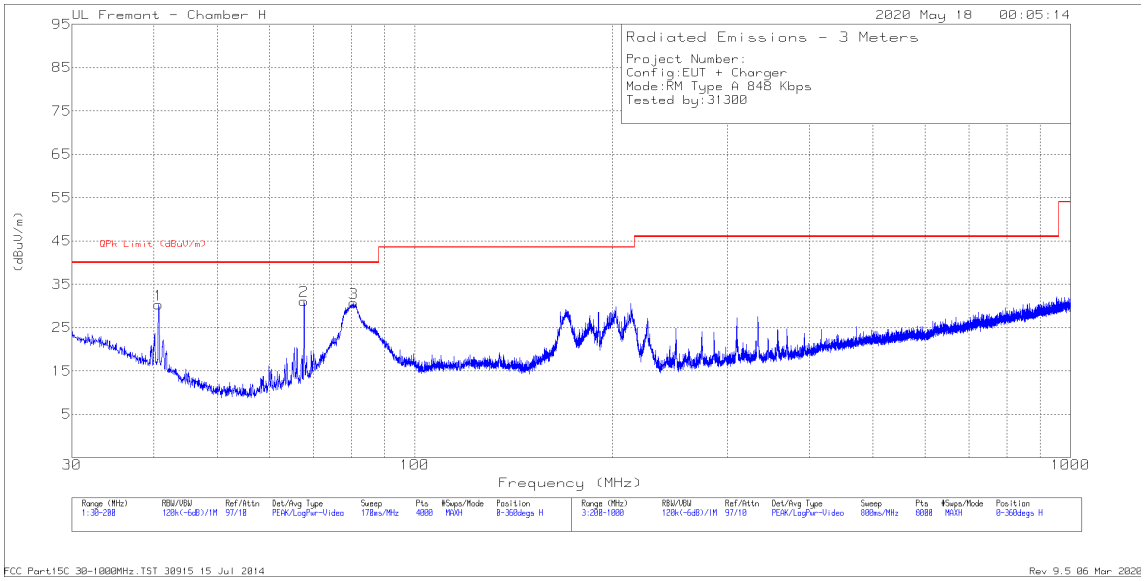
FCC 15.209 Below 30MHz.TST 30915 27 Mar 2017
Rev 9.5 06 Mar 2020

Note: Marker 1 and 5 are the fundamental signal

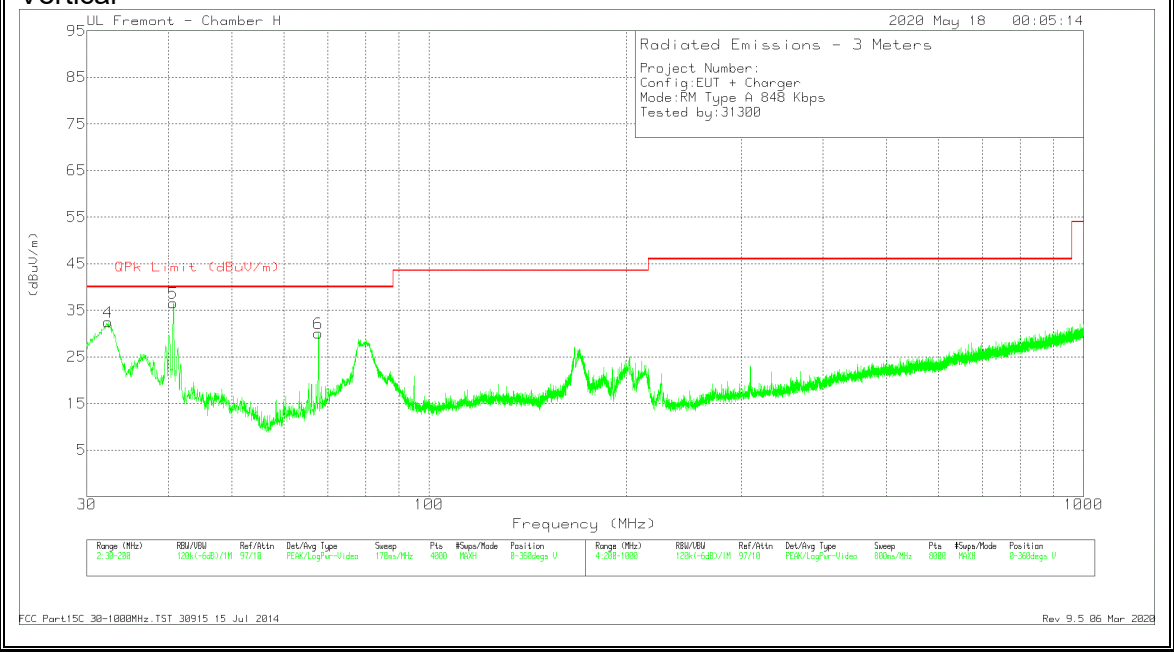
8.2.3. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode), SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

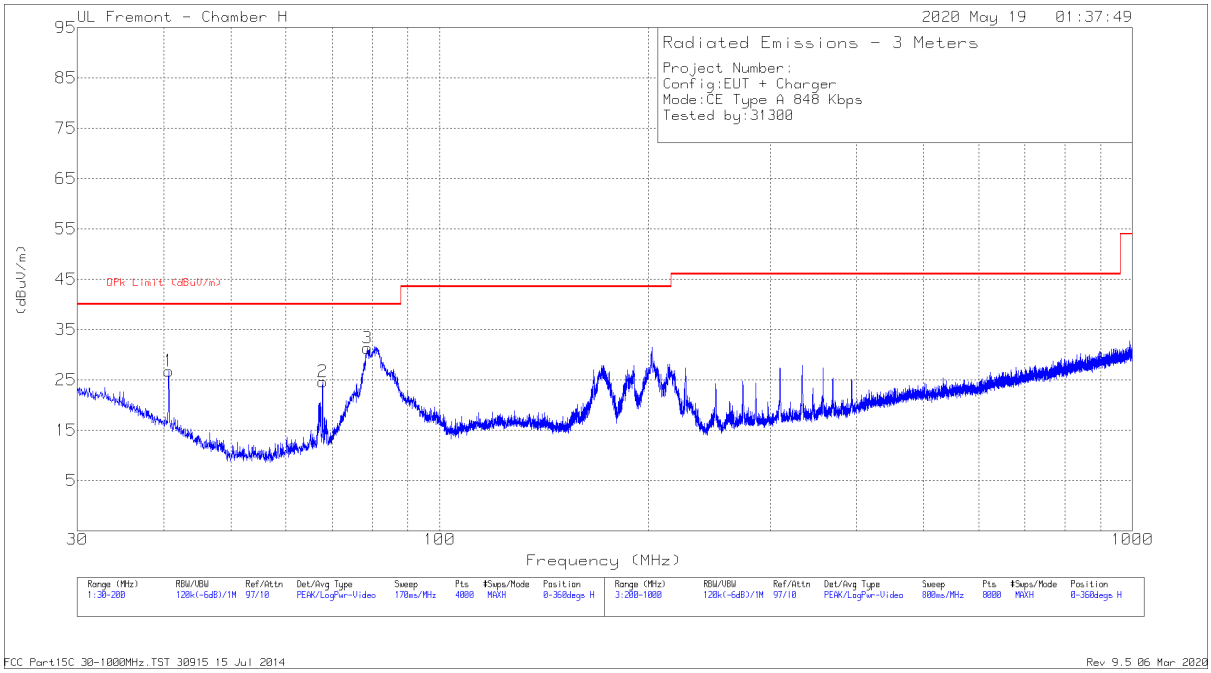
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	32.3381	38.12	Pk	25.5	-31.2	32.42	40	-7.58	0-360	100	V
1	40.6703	41.55	Pk	19.8	-31.1	30.25	40	-9.75	0-360	400	H
5	40.6703	47.87	Pk	19.8	-31.1	36.57	40	-3.43	0-360	100	V
	40.6765	47.5	Qp	19.8	-31.1	36.2	40	-3.8	322	106	V
2	67.7923	47.93	Pk	14	-30.8	31.13	40	-8.87	0-360	300	H
6	67.7923	46.89	Pk	14	-30.8	30.09	40	-9.91	0-360	100	V
3	80.7156	47.95	Pk	13.3	-30.6	30.65	40	-9.35	0-360	400	H

Pk - Peak detector
Qp - Quasi-Peak detector

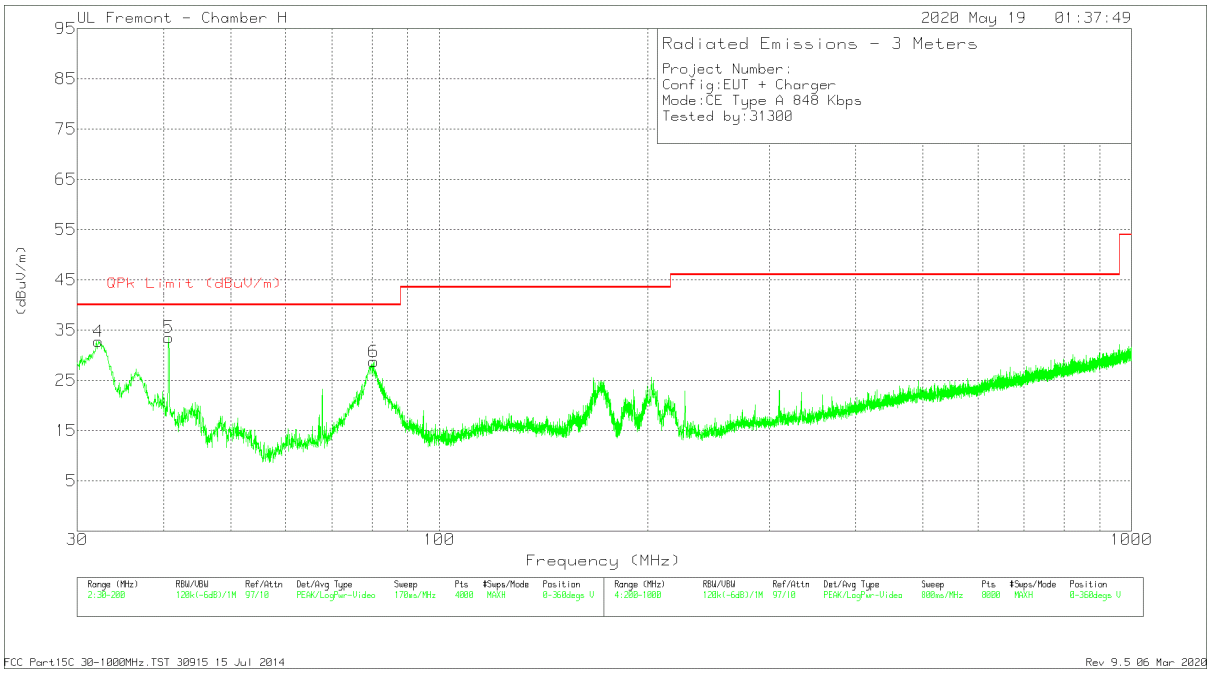
FCC Part15C 30-1000MHz.TST 30915 15 Jul 2014
Rev 9.5 06 Mar 2020

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	32.2106	38.43	Pk	25.5	-31.2	32.73	40	-7.27	0-360	100	V
1	40.6703	38.08	Pk	19.8	-31.1	26.78	40	-13.22	0-360	400	H
5	40.7128	44.91	Pk	19.7	-31.1	33.51	40	-6.49	0-360	100	V
2	67.8348	41.45	Pk	14	-30.8	24.65	40	-15.35	0-360	200	H
3	78.7601	48.61	Pk	13.4	-30.7	31.31	40	-8.69	0-360	400	H
6	80.4606	46.11	Pk	13.3	-30.7	28.71	40	-11.29	0-360	100	V

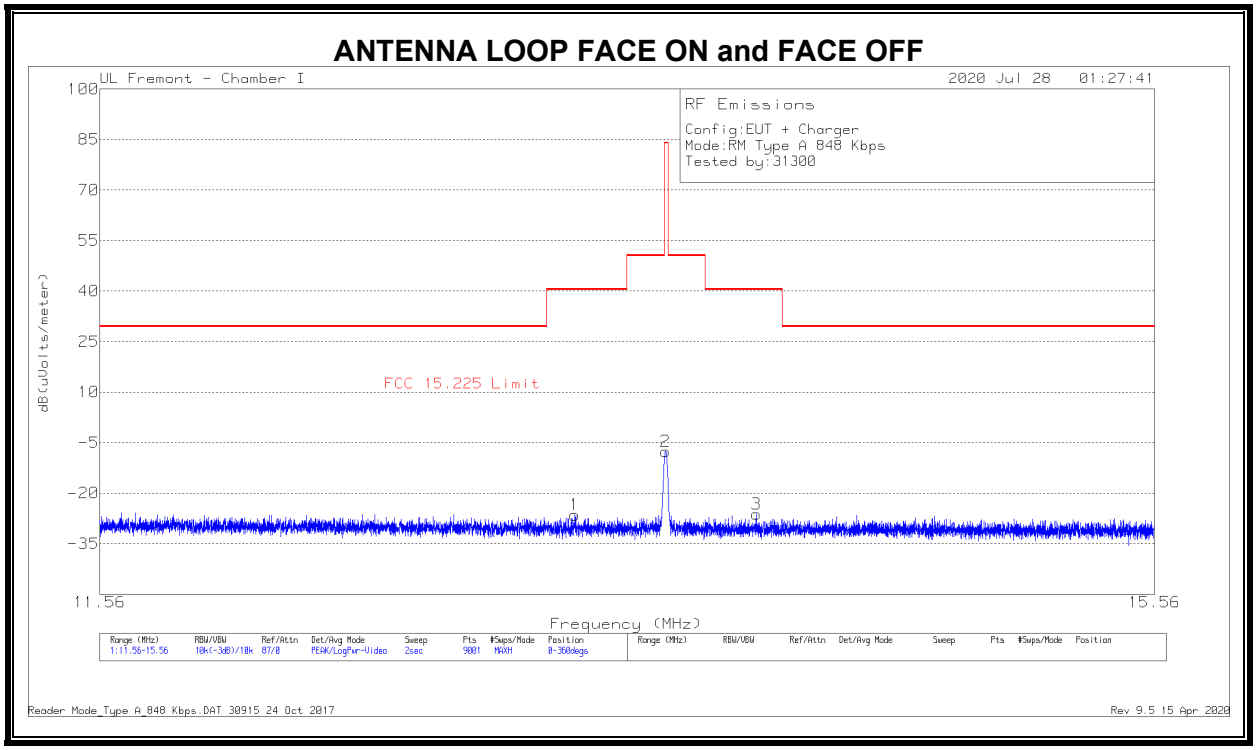
Pk - Peak detector

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

8.3.1. READER MODE, TYPE A 848Kbps

FUNDAMENTAL



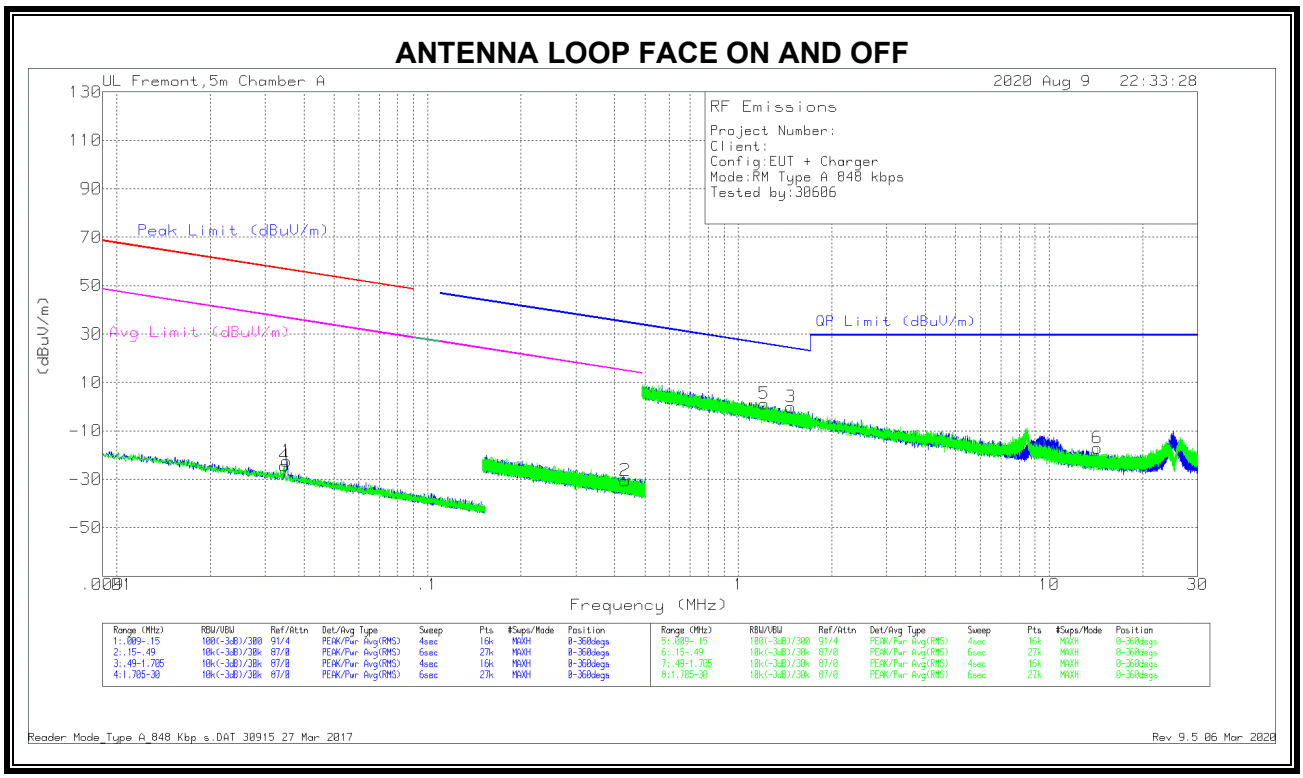
DATA

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	13.21568	10.81	Pk	34.2	-31.5	-40	-26.49	40.51	-67	0-360
2	13.55756	29.82	Pk	34.1	-31.5	-40	-7.58	84	-91.58	0-360
3	13.91054	11.06	Pk	34.1	-31.4	-40	-26.24	40.51	-66.75	0-360
4	13.20102	10.43	Pk	34.2	-31.5	-40	-26.87	40.51	-67.38	0-360
5	13.55933	25.87	Pk	34.1	-31.5	-40	-11.53	84	-95.53	0-360
6	13.91364	9.99	Pk	34.1	-31.4	-40	-27.31	40.51	-67.82	0-360

Pk - Peak detector

Reader Mode_Type A_848 Kbps.DAT 30915 24 Oct 2017
Rev 9.5 15 Apr 2020

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)
4	.03469	41.8	Pk	13.9	0	-80	-24.3	56.78	-81.08	36.78	-61.08	0-360
1	.03527	43.74	Pk	13.9	0	-80	-22.36	56.64	-79	36.64	-59	0-360
2	.43249	38.42	Pk	11	.1	-80	-30.48	34.89	-65.37	14.89	-45.37	0-360

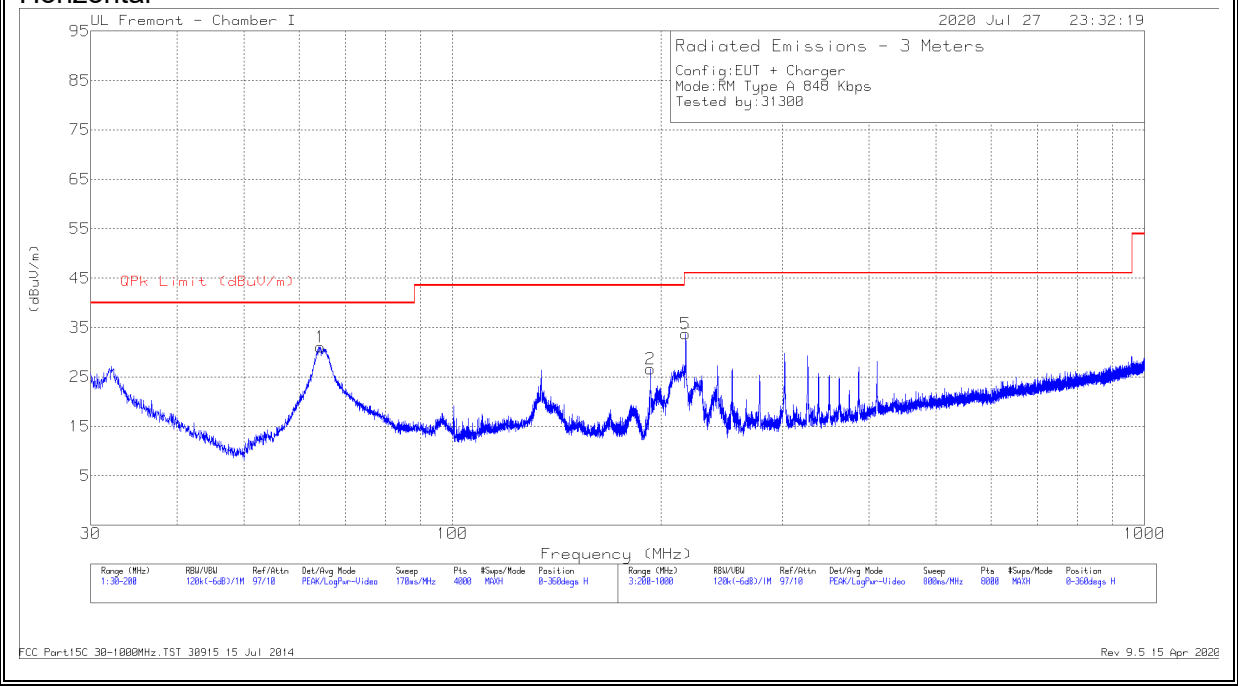
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	1.2123	30.27	Pk	10.8	.2	-40	1.27	25.95	-24.68	0-360
3	1.47519	28.78	Pk	10.8	.2	-40	-.22	24.25	-24.47	0-360
6	14.281	12.12	Pk	10.2	.5	-40	-17.18	29.5	-46.68	0-360

Pk - Peak detector

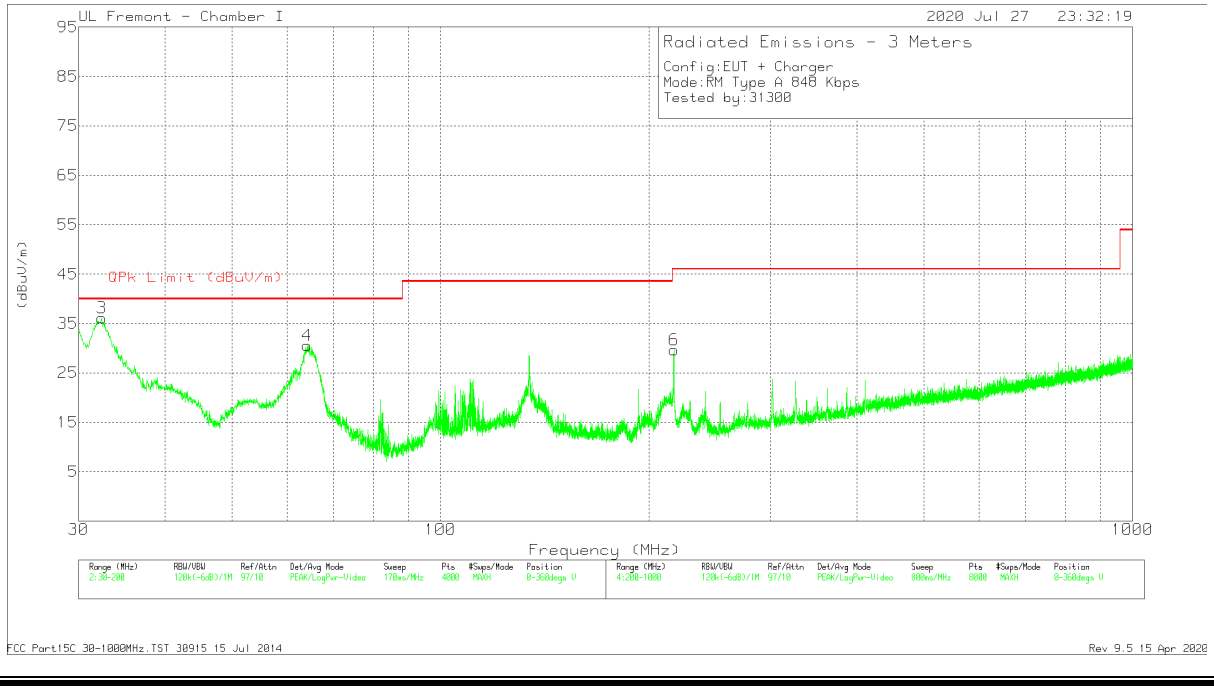
8.3.2. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode), SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE018 4052 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	64.4339	48.51	Pk	13.6	-31	31.11	40	-8.89	0-360	299	H
2	193.199	39.93	Pk	17	-30.3	26.63	43.52	-16.89	0-360	101	H
3	32.4231	42.37	Pk	25.2	-31.4	36.17	40	-3.83	0-360	100	V
	32.3869	39.04	Qp	25.3	-31.4	32.94	40	-7.06	271	100	V
4	64.2214	47.95	Pk	13.6	-31	30.55	40	-9.45	0-360	100	V
5	217.302	47.57	Pk	16.4	-30.3	33.67	46.02	-12.35	0-360	99	H
6	217.402	43.61	Pk	16.4	-30.3	29.71	46.02	-16.31	0-360	200	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:**	7/02/2020 & 08/01/2020

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	13.5598439	2.399	13.5598452	2.305	13.5598469	2.183	13.5598492	2.014	± 100
	40	13.5598344	3.103	13.5598335	3.171	13.5598325	3.243	13.5598320	3.283	± 100
	30	13.5598521	1.797	13.5598521	1.797	13.5598521	1.797	13.5598521	1.797	± 100
3.80	***20***	***13.5598765***	***0.000***	***13.5598757***	***0.058***	***13.5598749***	***0.119***	***13.5598741***	***0.176***	***± 100***
	10	13.5598539	1.667	13.5598626	1.026	13.5598736	0.212	13.5598876	-0.822	± 100
	0	13.5599274	-3.753	13.5599350	-4.315	13.5599438	-4.969	13.5599537	-5.694	± 100
	-10	13.5599886	-8.267	13.5599954	-8.771	13.5600030	-9.328	13.5600101	-9.854	± 100
	-20	13.5600436	-12.324	13.5600477	-12.626	13.5600525	-12.982	13.5600577	-13.362	± 100
3.23	20	13.5599435	-4.941	13.5599446	-5.022	13.5599454	-5.080	13.5599552	-5.809	± 100
4.37	20	13.5598445	2.355	13.5598464	2.220	13.5598350	3.055	13.5598352	3.046	± 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	13.5598387	6.541	13.5598373	6.639	13.5598359	6.748	13.5598342	6.872	± 100
	40	13.5598619	4.830	13.5598586	5.073	13.5598547	5.356	13.5598506	5.662	± 100
	30	13.5599062	1.560	13.5599013	1.922	13.5598952	2.370	13.5598881	2.895	± 100
3.80	***20***	***13.5599274***	***0.000***	***13.5599350***	***-0.562***	***13.5599438***	***-1.216***	***13.5599537***	***-1.941***	***± 100***
	10	13.5599428	-1.136	13.5599501	-1.674	13.5599585	-2.299	13.5599682	-3.009	± 100
	0	13.5600041	-5.661	13.5600113	-6.193	13.5600199	-6.824	13.5600287	-7.472	± 100
	-10	13.5600650	-10.151	13.5600702	-10.537	13.5600758	-10.945	13.5600832	-11.492	± 100
	-20	13.5601130	-13.689	13.5601161	-13.916	13.5601186	-14.104	13.5601209	-14.270	± 100
3.23	20	13.5599554	-2.070	13.5599556	-2.083	13.5599590	-2.332	13.5599690	-3.068	± 100
4.37	20	13.5598853	3.103	13.5598739	3.942	13.5598847	3.147	13.5598604	4.942	± 100

9.2. SECONDARY ANTENNA

READER MODE, TYPE A 848Kbps

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	13.5599117	2.316	13.5599151	2.062	13.5599192	1.761	13.5599235	1.444	± 100
	40	13.5599070	2.663	13.5599052	2.797	13.5599038	2.895	13.5599031	2.947	± 100
	30	13.5599042	2.870	13.5599055	2.771	13.5599072	2.645	13.5599088	2.530	± 100
3.80	***20***	***13.5599431***	***0.000***	***13.5599410***	***0.158***	***13.5599391***	***0.293***	***13.5599372***	***0.434***	***± 100***
	10	13.5599546	-0.848	13.5599586	-1.145	13.5599624	-1.422	13.5599652	-1.630	± 100
	0	13.5599733	-2.225	13.5599917	-3.584	13.5599957	-3.877	13.5599986	-4.091	± 100
	-10	13.5600207	-5.720	13.5600235	-5.927	13.5600256	-6.084	13.5600270	-6.184	± 100
	-20	13.5600421	-7.298	13.5600437	-7.416	13.5600449	-7.504	13.5600457	-7.565	± 100
3.23	20	13.5599635	-1.501	13.5599822	-2.887	13.5599744	-2.306	13.5599751	-2.363	± 100
4.37	20	13.5599137	2.167	13.5599224	1.525	13.5599305	0.926	13.5599357	0.543	± 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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

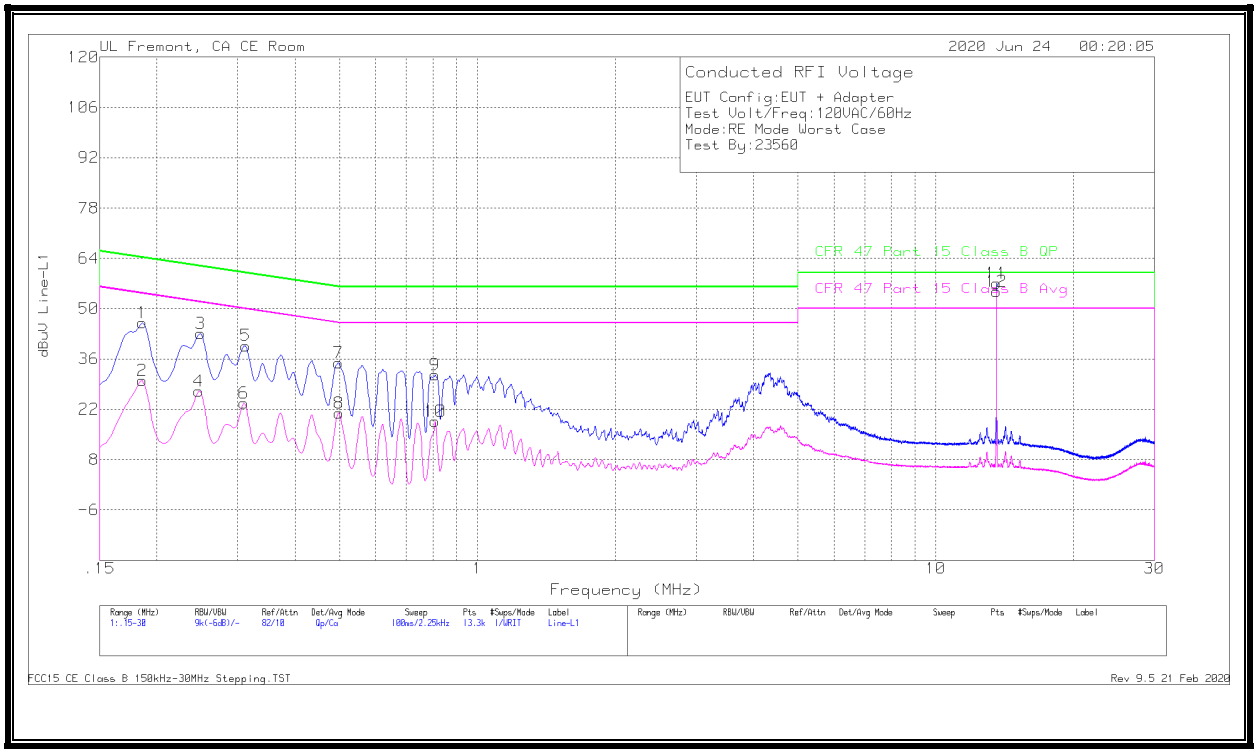
RESULTS

No non-compliance noted:

10.1. PRIMARY ANTENNA

READER MODE, TYPE A 848Kbps, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

Range 1: Line-L1 .15 - 30MHz

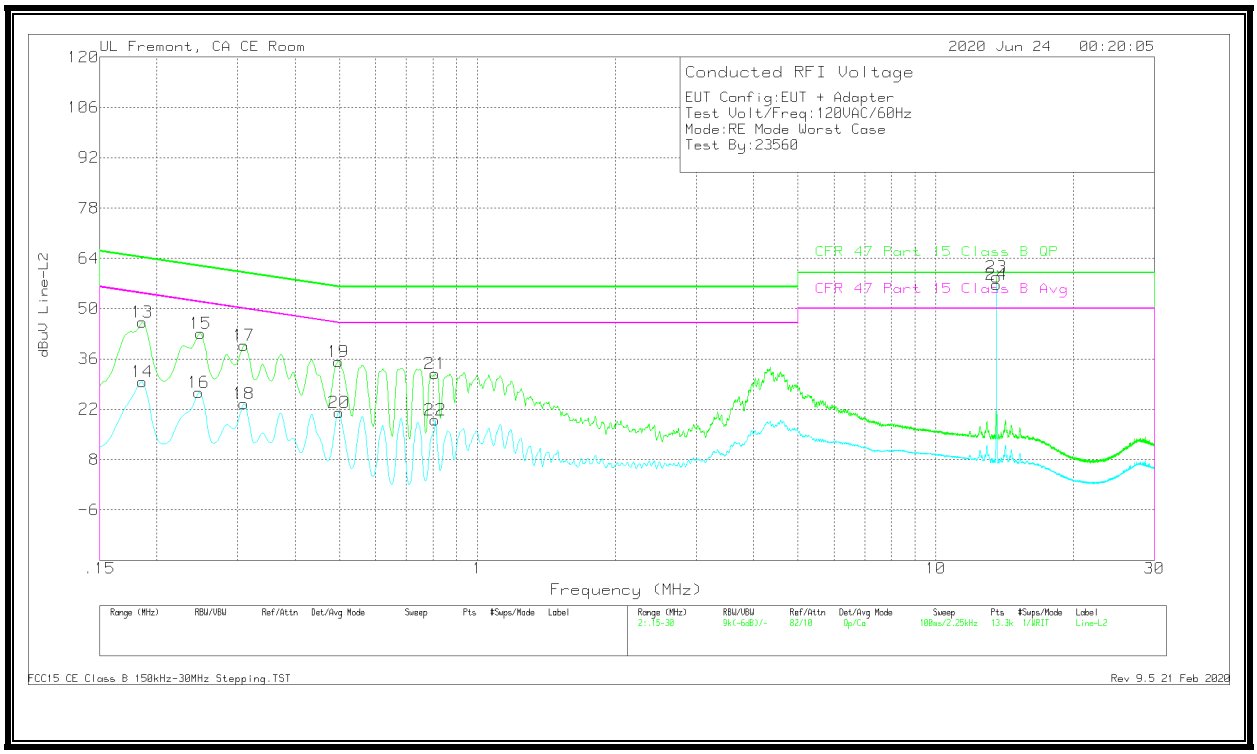
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.186	36.13	Qp	0	0	10	46.13	64.21	-18.08	-	-
2	.186	19.98	Ca	0	0	10	29.98	-	-	54.21	-24.23
3	.249	33.1	Qp	0	0	10	43.1	61.79	-18.69	-	-
4	.24675	17.1	Ca	0	0	10	27.1	-	-	51.87	-24.77
5	.312	29.7	Qp	0	0	10	39.7	59.92	-20.22	-	-
6	.30975	13.77	Ca	0	0	10	23.77	-	-	49.98	-26.21
7	.49763	24.95	Qp	0	0	10	34.95	56.04	-21.09	-	-
8	.49875	10.89	Ca	0	0	10	20.89	-	-	46.02	-25.13
9	.80925	21.55	Qp	0	0	10	31.55	56	-24.45	-	-
10	.80925	8.71	Ca	0	0	10	18.71	-	-	46	-27.29
11	13.56	46.73	Qp	.1	.2	10.1	57.13	60	-2.87	-	-
12	13.56	44.43	Ca	.1	.2	10.1	54.83	-	-	**50**	**4.83**

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 10.1.2 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	36.29	Qp	0	0	10	46.29	64.21	-17.92	-	-
14	.186	19.6	Ca	0	0	10	29.6	-	-	54.21	-24.61
15	.249	33.08	Qp	0	0	10	43.08	61.79	-18.71	-	-
16	.24675	16.75	Ca	0	0	10	26.75	-	-	51.87	-25.12
17	.30975	29.76	Qp	0	0	10	39.76	59.98	-20.22	-	-
18	.30975	13.58	Ca	0	0	10	23.58	-	-	49.98	-26.4
19	.49763	25.24	Qp	0	0	10	35.24	56.04	-20.8	-	-
20	.49875	11.13	Ca	0	0	10	21.13	-	-	46.02	-24.89
21	.80925	21.87	Qp	0	0	10	31.87	56	-24.13	-	-
22	.80925	8.97	Ca	0	0	10	18.97	-	-	46	-27.03
23	13.56	48.42	Qp	.1	.2	10.1	58.82	60	-1.18	-	-
24	13.56	46.33	Ca	.1	.2	10.1	56.73	-	-	**50**	**6.73**

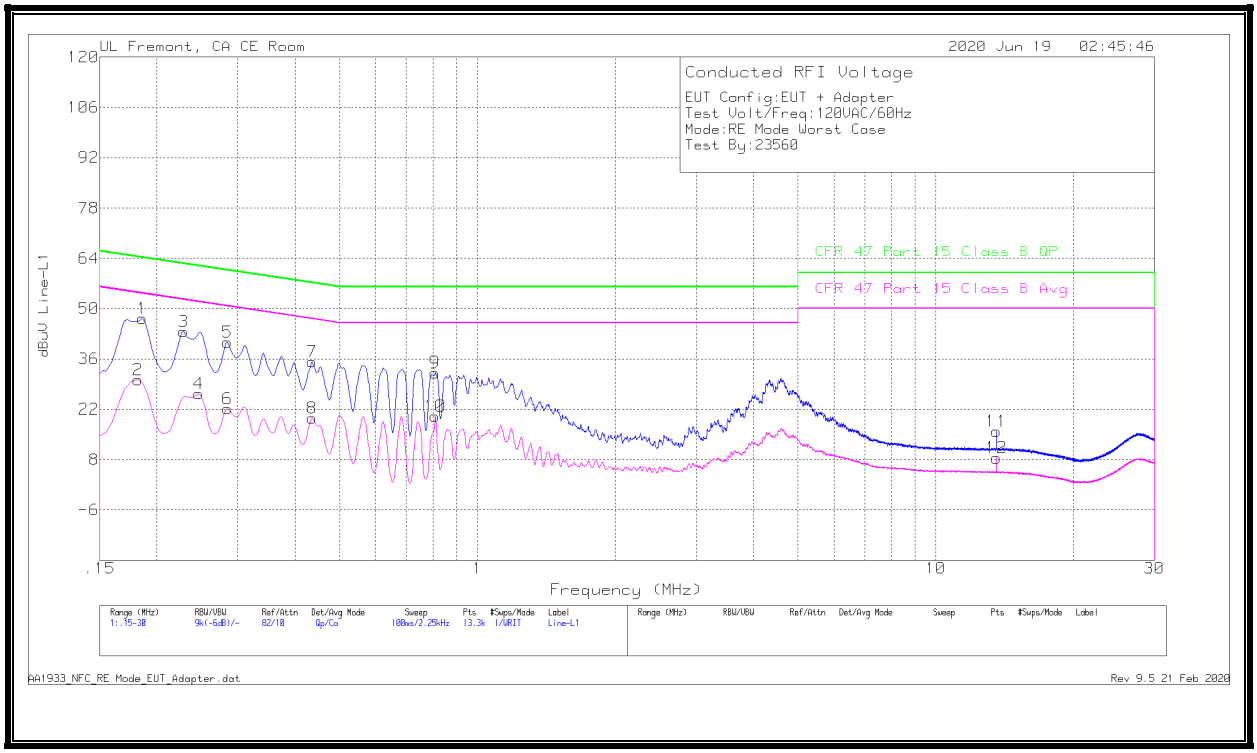
Qp - Quasi-Peak detector
Ca - CISPR average detection

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 10.1.2 indicate 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



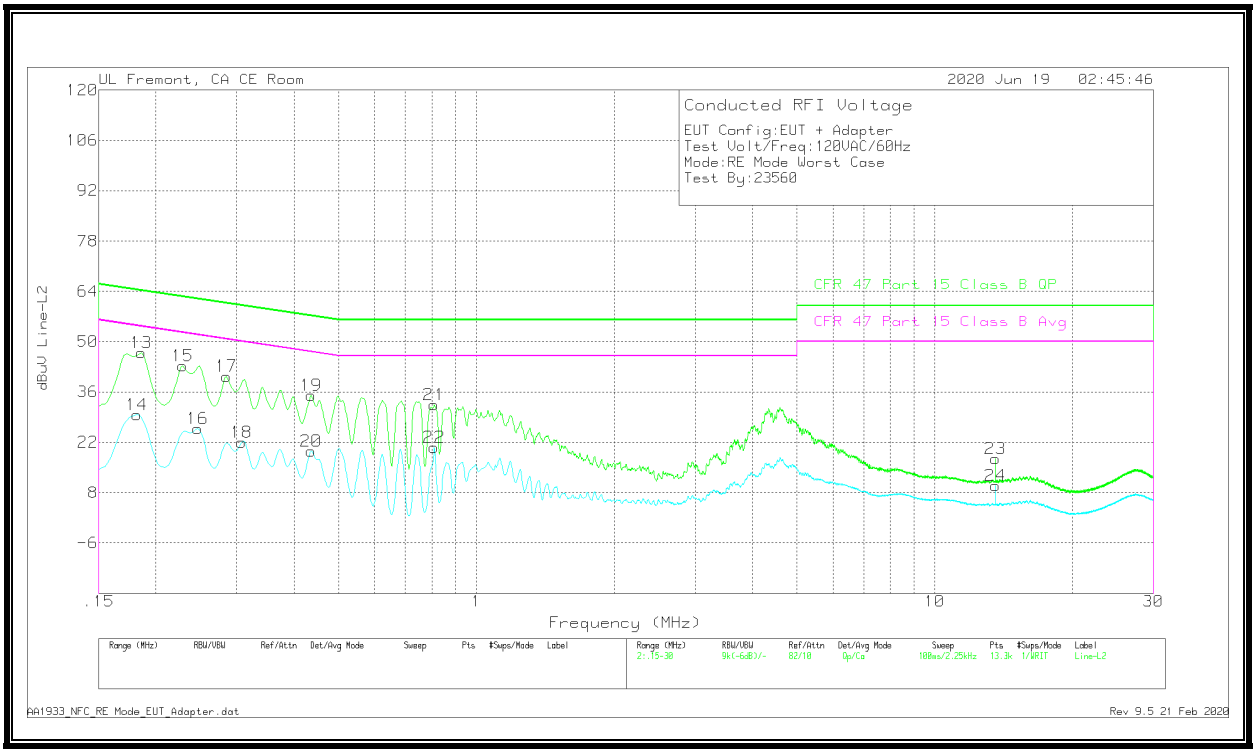
Worst Emission

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)M argin (dB)
1	.186	37.3	Qp	0	0	10	47.3	64.21	-16.91	-	-
2	.1815	20.2	Ca	0	0	10	30.2	-	-	54.42	-24.22
3	.22875	33.7	Qp	0	0	10	43.7	62.49	-18.79	-	-
4	.24675	16.29	Ca	0	0	10	26.29	-	-	51.87	-25.58
5	.285	30.73	Qp	0	0	10	40.73	60.67	-19.94	-	-
6	.285	12.22	Ca	0	0	10	22.22	-	-	50.67	-28.45
7	.43575	25.18	Qp	0	0	10	35.18	57.14	-21.96	-	-
8	.43575	9.61	Ca	0	0	10	19.61	-	-	47.14	-27.53
9	.80925	22.19	Qp	0	0	10	32.19	56	-23.81	-	-
10	.80925	10.03	Ca	0	0	10	20.03	-	-	46	-25.97
11	13.56	5.54	Qp	.1	.2	10.1	15.94	60	-44.06	-	-
12	13.56	-1.93	Ca	.1	.2	10.1	8.47	-	-	50	-41.53

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1933_NFC_RE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 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)Margin (dB)
13	.186	36.97	Qp	0	0	10	46.97	64.21	-17.24	-	-
14	.1815	19.66	Ca	0	0	10	29.66	-	-	54.42	-24.76
15	.22875	33.28	Qp	0	0	10	43.28	62.49	-19.21	-	-
16	.24675	15.87	Ca	0	0	10	25.87	-	-	51.87	-26
17	.285	30.39	Qp	0	0	10	40.39	60.67	-20.28	-	-
18	.3075	12.04	Ca	0	0	10	22.04	-	-	50.04	-28
19	.43575	25.1	Qp	0	0	10	35.1	57.14	-22.04	-	-
20	.43575	9.59	Ca	0	0	10	19.59	-	-	47.14	-27.55
21	.80925	22.41	Qp	0	0	10	32.41	56	-23.59	-	-
22	.80925	10.66	Ca	0	0	10	20.66	-	-	46	-25.34
23	13.56	7.13	Qp	.1	.2	10.1	17.53	60	-42.47	-	-
24	13.56	-.4	Ca	.1	.2	10.1	10	-	-	50	-40

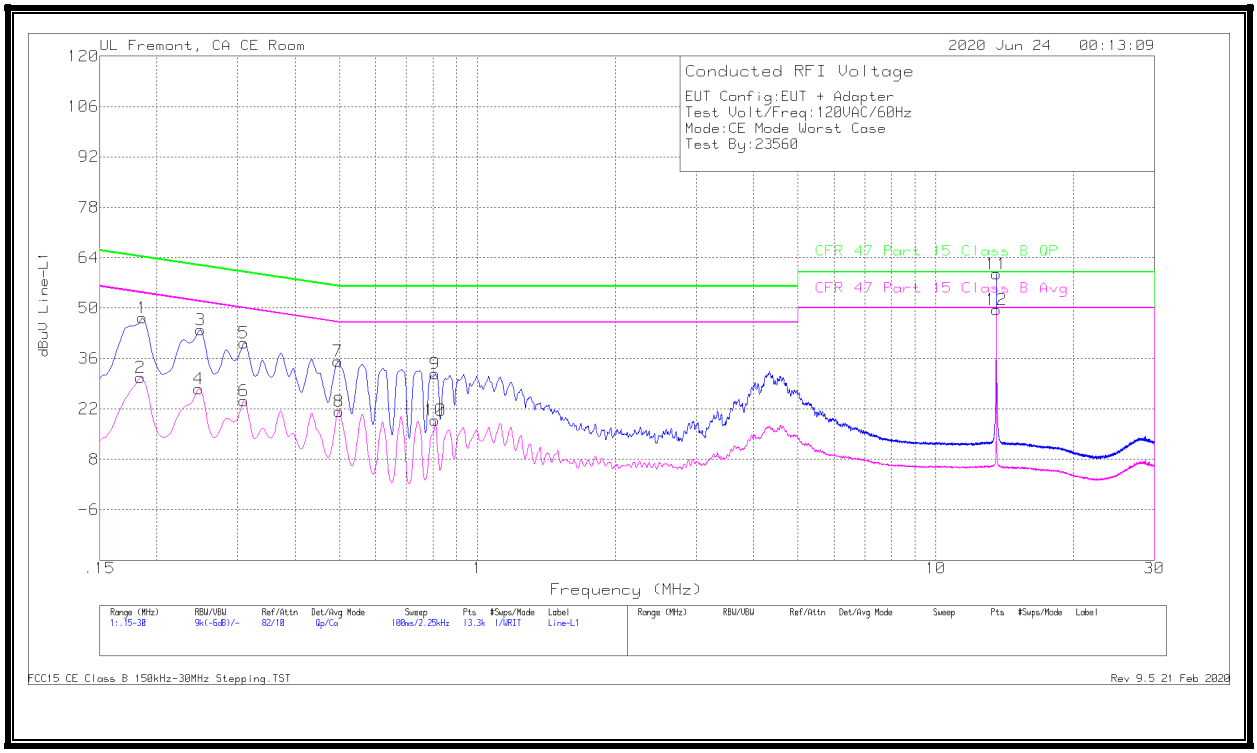
Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1933_NFC_RE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 2020

CE MODE, TYPE A 848Kbps

NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

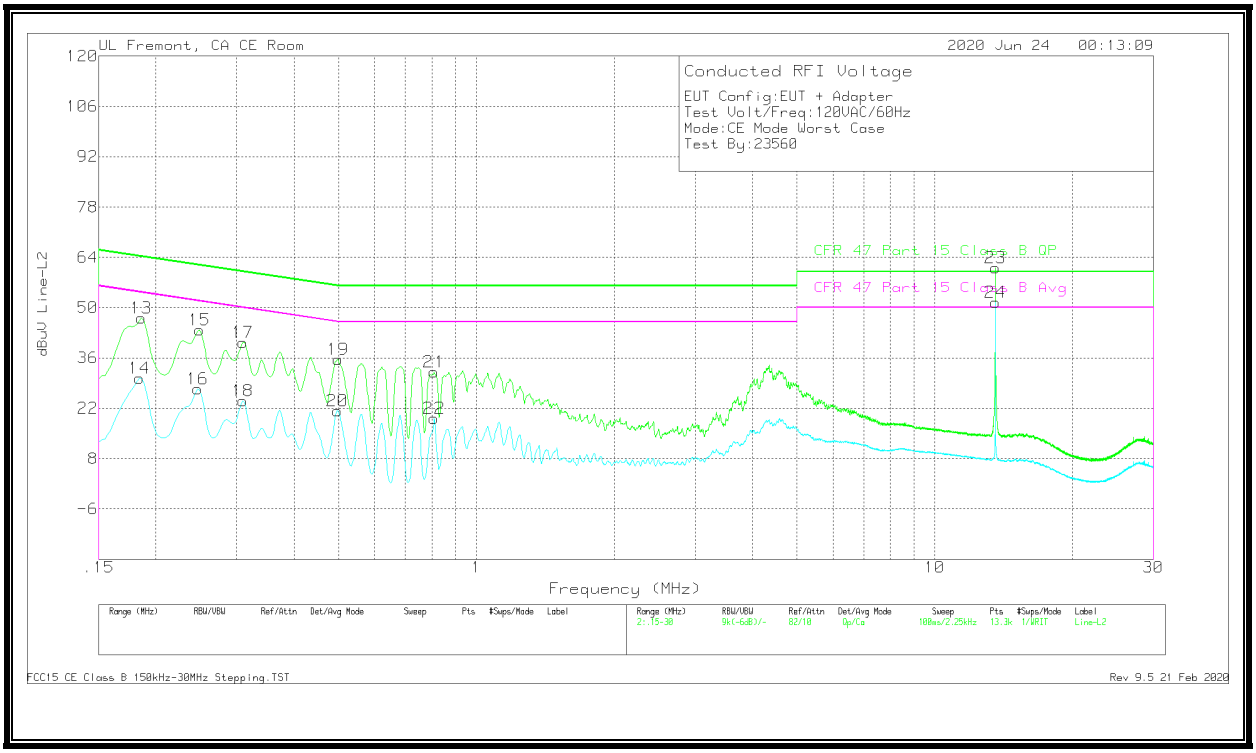
Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.186	37.27	Qp	0	0	10	47.27	64.21	-16.94	-	-
2	.18375	20.79	Ca	0	0	10	30.79	-	-	54.31	-23.52
3	.249	33.93	Qp	0	0	10	43.93	61.79	-17.86	-	-
4	.24675	17.55	Ca	0	0	10	27.55	-	-	51.87	-24.32
5	.30975	30.32	Qp	0	0	10	40.32	59.98	-19.66	-	-
6	.30975	14.25	Ca	0	0	10	24.25	-	-	49.98	-25.73
7	.4965	25.27	Qp	0	0	10	35.27	56.06	-20.79	-	-
8	.49875	11.25	Ca	0	0	10	21.25	-	-	46.02	-24.77
9	.80925	21.7	Qp	0	0	10	31.7	56	-24.3	-	-
10	.80925	8.87	Ca	0	0	10	18.87	-	-	46	-27.13
11	13.56	49.03	Qp	.1	.2	10.1	59.43	60	-.57	-	-
12	13.56	39.15	Ca	.1	.2	10.1	49.55	-	-	50	-.45

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 10.2.2 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	37.13	Qp	0	0	10	47.13	64.21	-17.08	-	-
14	.18375	20.42	Ca	0	0	10	30.42	-	-	54.31	-23.89
15	.249	33.78	Qp	0	0	10	43.78	61.79	-18.01	-	-
16	.24675	17.35	Ca	0	0	10	27.35	-	-	51.87	-24.52
17	.30975	30.28	Qp	0	0	10	40.28	59.98	-19.7	-	-
18	.30975	14.04	Ca	0	0	10	24.04	-	-	49.98	-25.94
19	.49875	25.52	Qp	0	0	10	35.52	56.02	-20.5	-	-
20	.49763	11.29	Ca	0	0	10	21.29	-	-	46.04	-24.75
21	.80925	22.08	Qp	0	0	10	32.08	56	-23.92	-	-
22	.80925	9.24	Ca	0	0	10	19.24	-	-	46	-26.76
23	13.56	50.75	Qp	.1	.2	10.1	61.15	**60**	**1.15**	-	-
24	13.56	41.01	Ca	.1	.2	10.1	51.41	-	-	**50**	**1.41**

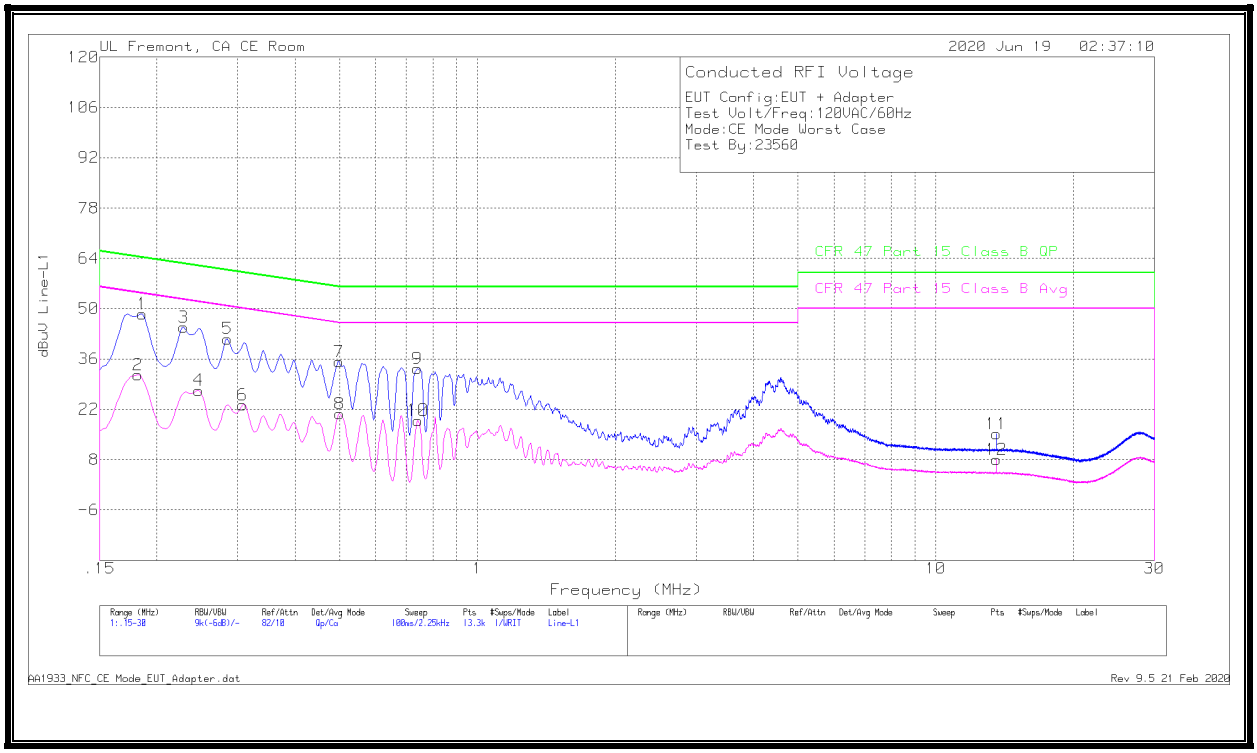
Qp - Quasi-Peak detector
Ca - CISPR average detection

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 10.2.2 indicate 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



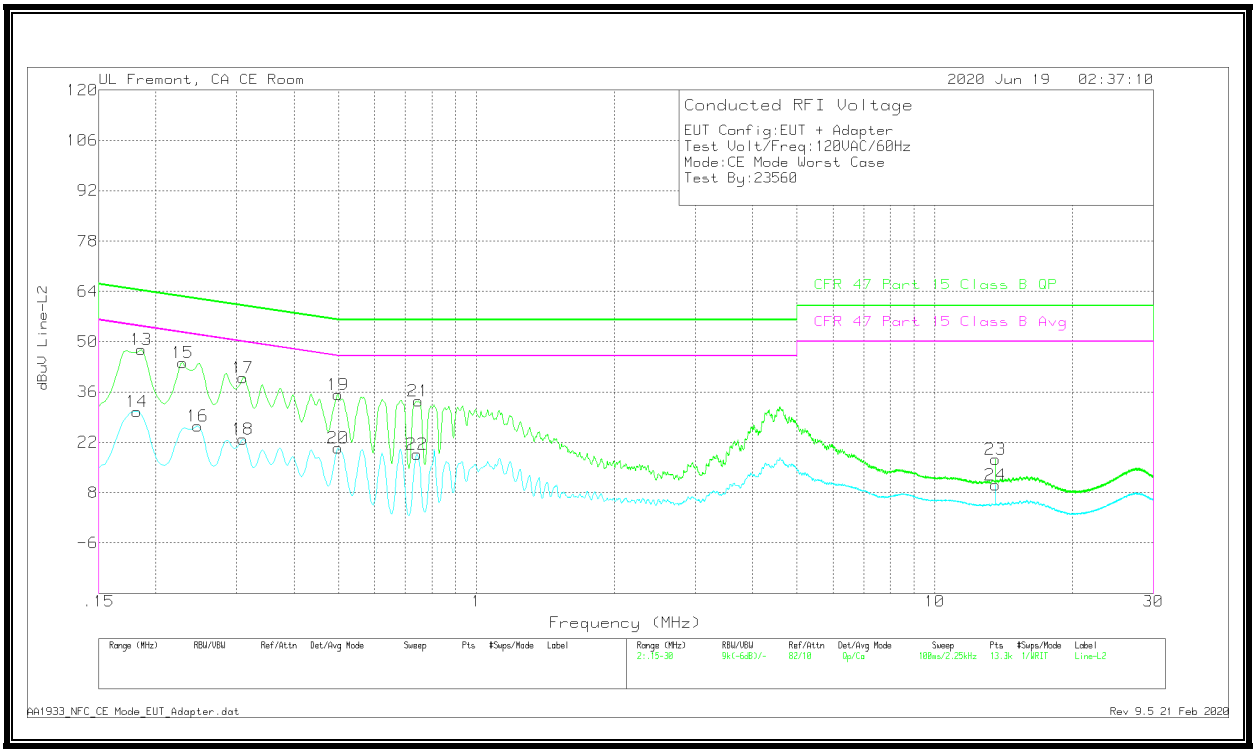
Worst Emission

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	38.59	Qp	0	0	10	48.59	64.21	-15.62	-	-
2	.1815	21.63	Ca	0	0	10	31.63	-	-	54.42	-22.79
3	.22875	34.89	Qp	0	0	10	44.89	62.49	-17.6	-	-
4	.24675	17.31	Ca	0	0	10	27.31	-	-	51.87	-24.56
5	.285	31.62	Qp	0	0	10	41.62	60.67	-19.05	-	-
6	.3075	13.28	Ca	0	0	10	23.28	-	-	50.04	-26.76
7	.49875	25.22	Qp	0	0	10	35.22	56.02	-20.8	-	-
8	.501	10.73	Ca	0	0	10	20.73	-	-	46	-25.27
9	.7395	23.31	Qp	0	0	10	33.31	56	-22.69	-	-
10	.74175	8.93	Ca	0	0	10	18.93	-	-	46	-27.07
11	13.56	4.85	Qp	.1	.2	10.1	15.25	60	-44.75	-	-
12	13.56	-2.39	Ca	.1	.2	10.1	8.01	-	-	50	-41.99

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1933_NFC_CE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 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)Margin (dB)
13	.186	37.84	Qp	0	0	10	47.84	64.21	-16.37	-	-
14	.1815	20.57	Ca	0	0	10	30.57	-	-	54.42	-23.85
15	.22875	34.13	Qp	0	0	10	44.13	62.49	-18.36	-	-
16	.24675	16.49	Ca	0	0	10	26.49	-	-	51.87	-25.38
17	.30975	30.03	Qp	0	0	10	40.03	59.98	-19.95	-	-
18	.30975	12.9	Ca	0	0	10	22.9	-	-	49.98	-27.08
19	.49875	25.23	Qp	0	0	10	35.23	56.02	-20.79	-	-
20	.49875	10.34	Ca	0	0	10	20.34	-	-	46.02	-25.68
21	.74625	23.52	Qp	0	0	10	33.52	56	-22.48	-	-
22	.74175	8.63	Ca	0	0	10	18.63	-	-	46	-27.37
23	13.56	6.95	Qp	.1	.2	10.1	17.35	60	-42.65	-	-
24	13.56	-.21	Ca	.1	.2	10.1	10.19	-	-	50	-39.81

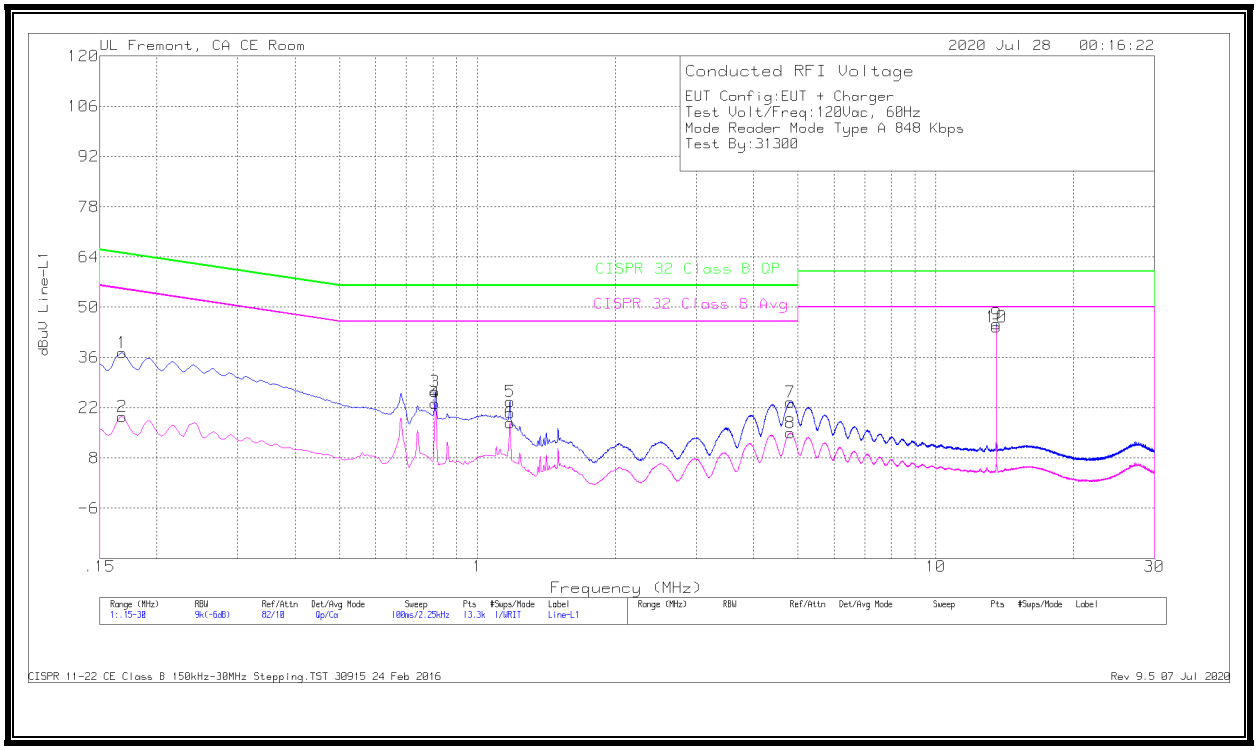
Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1933_NFC_CE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 2020

10.2. SECONDARY ANTENNA

READER MODE, TYPE A 848Kbps, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

Range 1: Line-L1 .15 - 30MHz

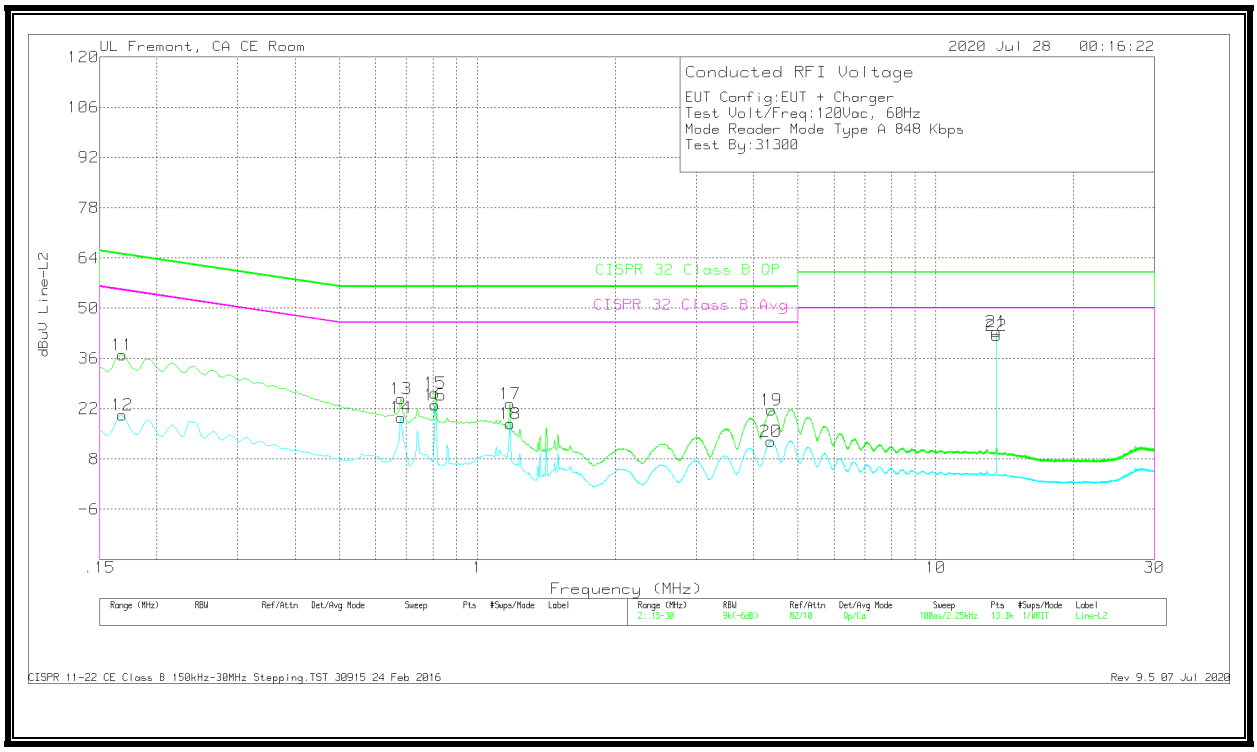
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CISPR 32 Class B QP	Margin (dB)	CISPR 32 Class B Avg	Margin (dB)
1	.168	27.29	Qp	0	0	10	37.29	65.06	-27.77	-	-
2	.168	9.58	Ca	0	0	10	19.58	-	-	55.06	-35.48
3	.80925	16.56	Qp	0	0	10	26.56	56	-29.44	-	-
4	.80925	13.29	Ca	0	0	10	23.29	-	-	46	-22.71
5	1.17825	13.65	Qp	0	.1	10	23.75	56	-32.25	-	-
6	1.17825	7.78	Ca	0	.1	10	17.88	-	-	46	-28.12
7	4.81875	13.42	Qp	0	.1	10.1	23.62	56	-32.38	-	-
8	4.8165	4.8	Ca	0	.1	10.1	15	-	-	46	-31
9	13.56	35.03	Qp	.1	.2	10.1	45.43	60	-14.57	-	-
10	13.56	34.14	Ca	.1	.2	10.1	44.54	-	-	50	-5.46

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 10.1.2 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	PRE0186446 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CISPR 32 Class B QP	Margin (dB)	CISPR 32 Class B Avg	Margin (dB)
11	.168	27.04	Qp	0	0	10	37.04	65.06	-28.02	-	-
12	.168	10.2	Ca	0	0	10	20.2	-	-	55.06	-34.86
13	.681	14.73	Qp	0	0	10	24.73	56	-31.27	-	-
14	.681	9.53	Ca	0	0	10	19.53	-	-	46	-26.47
15	.80925	16.33	Qp	0	0	10	26.33	56	-29.67	-	-
16	.80925	13.05	Ca	0	0	10	23.05	-	-	46	-22.95
17	1.17825	13.32	Qp	0	.1	10	23.42	56	-32.58	-	-
18	1.17825	7.67	Ca	0	.1	10	17.77	-	-	46	-28.23
19	4.38225	11.38	Qp	0	.1	10.1	21.58	56	-34.42	-	-
20	4.3665	2.74	Ca	0	.1	10.1	12.94	-	-	46	-33.06
21	13.56	33.11	Qp	.1	.2	10.1	43.51	60	-16.49	-	-
22	13.56	31.97	Ca	.1	.2	10.1	42.37	-	-	50	-7.63

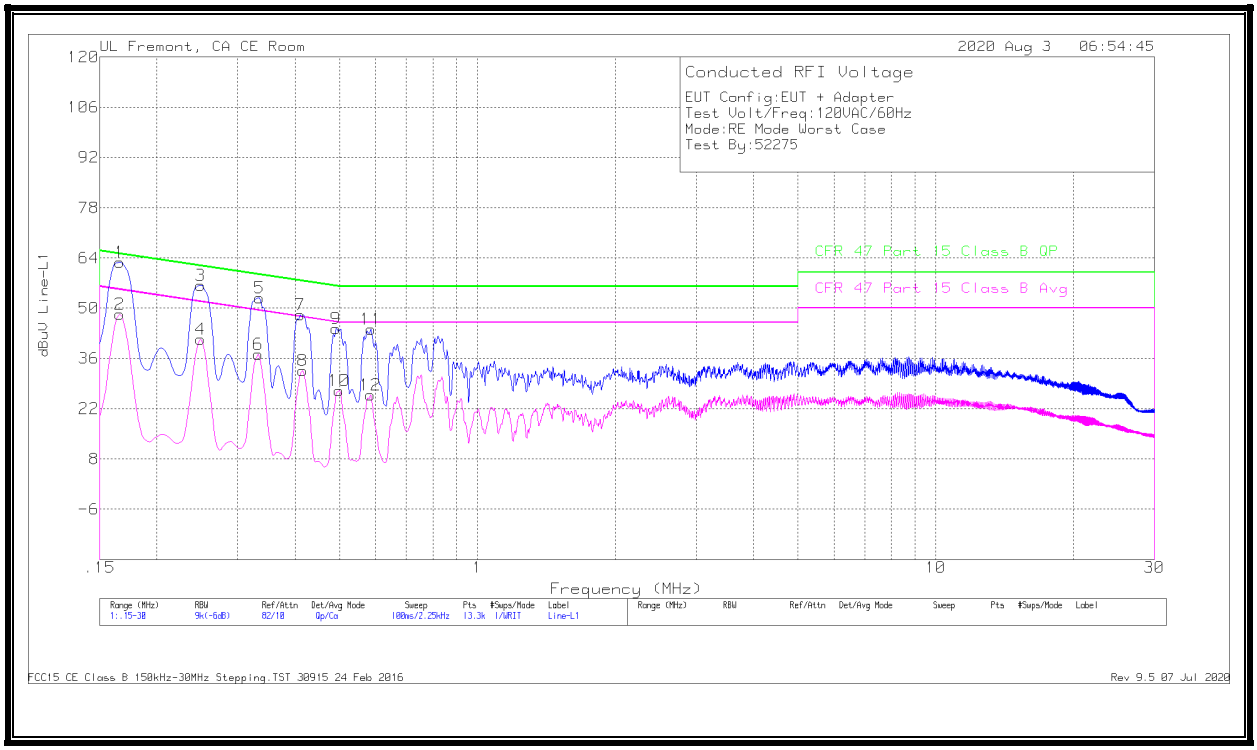
Qp - Quasi-Peak detector
Ca - CISPR average detection

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 10.1.2 indicate 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

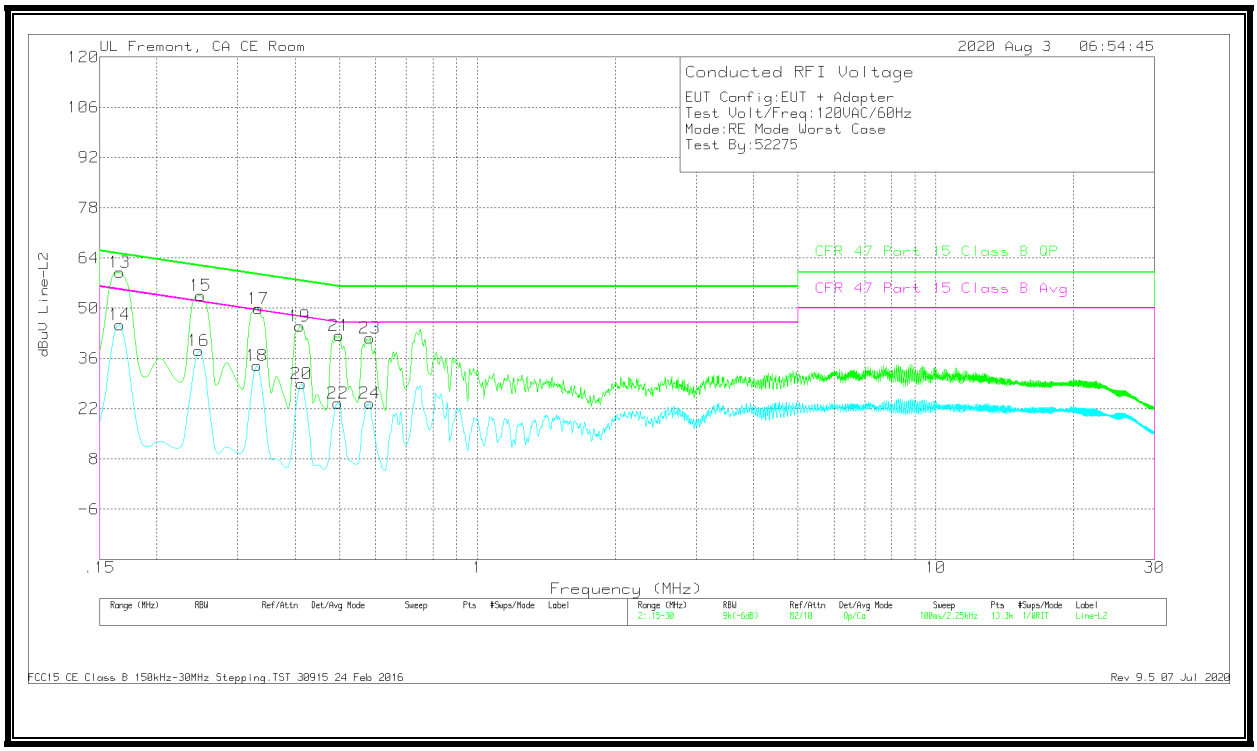
Range 1: Line-L1 .15 - 30MHz

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	.16575	52.86	Qp	0	0	10	62.86	65.17	-2.31	-	-
2	.16575	38.4	Ca	0	0	10	48.4	-	-	55.17	-6.77
3	.249	46.42	Qp	0	0	10	56.42	61.79	-5.37	-	-
4	.249	31.31	Ca	0	0	10	41.31	-	-	51.79	-10.48
5	.3345	42.89	Qp	0	0	10	52.89	59.34	-6.45	-	-
6	.33225	27.23	Ca	0	0	10	37.23	-	-	49.39	-12.16
7	.411	38.15	Qp	0	0	10	48.15	57.63	-9.48	-	-
8	.4155	22.58	Ca	0	0	10	32.58	-	-	47.54	-14.96
9	.492	34.3	Qp	0	0	10	44.3	56.13	-11.83	-	-
10	.49875	17	Ca	0	0	10	27	-	-	46.02	-19.02
11	.5865	34.09	Qp	0	0	10	44.09	56	-11.91	-	-
12	.58425	15.76	Ca	0	0	10	25.76	-	-	46	-20.24

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1933_NFC_RE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 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)Margin (dB)
13	.16575	50.04	Qp	0	0	10	60.04	65.17	-5.13	-	-
14	.16575	35.45	Ca	0	0	10	45.45	-	-	55.17	-9.72
15	.249	43.61	Qp	0	0	10	53.61	61.79	-8.18	-	-
16	.24675	28.14	Ca	0	0	10	38.14	-	-	51.87	-13.73
17	.33225	39.9	Qp	0	0	10	49.9	59.39	-9.49	-	-
18	.33	23.98	Ca	0	0	10	33.98	-	-	49.45	-15.47
19	.40875	35.05	Qp	0	0	10	45.05	57.67	-12.62	-	-
20	.41325	18.89	Ca	0	0	10	28.89	-	-	47.58	-18.69
21	.49875	32.43	Qp	0	0	10	42.43	56.02	-13.59	-	-
22	.4965	13.5	Ca	0	0	10	23.5	-	-	46.06	-22.56
23	.582	31.68	Qp	0	0	10	41.68	56	-14.32	-	-
24	.582	13.61	Ca	0	0	10	23.61	-	-	46	-22.39

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1933_NFC_RE Mode_EUT_Adapter.dat
Rev 9.5 21 Feb 2020

11. SETUP PHOTOS

Please refer to 13259315-EP1 for setup photos.

END OF TEST REPORT