TEST REPORT

Report Number. : 13131736-E12V2

Applicant	:	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2402
FCC ID	:	BCG-E3543A
IC	:	579C-E3543A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 10

Date of Issue:
September 15, 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	8/27/2020	Initial issue	Chin Pang
V2	9/15/2020	Updated per TCB's comments	Vien Tran

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

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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: A2402

Serial Number: Original: G6TCQ010Q5DD
Spot Check**:** G6TC400CPT8W

DATE TESTED: JUNE 06, 2020 – AUGUST 08, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies
ISED RSS-210 Issue 10, Annex B	Complies
ISED RSS-GEN Issue 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

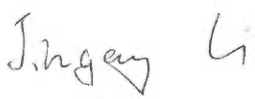
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components.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

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

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

Prepared By:



Jingang Li
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-E3542A and IC: 579C-E3542A to cover variant model BCG-E3543A and 579C-E3543A. 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 A2402, FCC ID: BCG-E3543A and IC: 579C-E3543A for radiated fundamental and spurious in accordance with the Test Plan that was approved via KDB inquiry.

Technology	Mode	Test Item	Measured	Original model		Spot check model		Delta (dB)
				A2172		A2402		
				BCG-E3542A, 579C-E3542A		BCG-E3543A 579C-E3543A		
			Frequency (MHz)	E Field at 30m (dBuV/m)	E Field at 3 m (dBuV/m)	E Field at 30m (dBuV/m)	E Field at 3 m (dBuV/m)	Peak
NFC	Reader	Fundamental	13.56	23.5		23.46		-0.04
	Reader	RSE	40.6765		35.69		NF	NA

Comparison of the models, upper deviation is within 3dB range and all tests are under FCC/IC Technical Limits. The test report for FCC ID: BCG-E3542A and IC: 579C-E3542A is therefore being used to support the application for certification for FCC ID: BCG-E3543A and IC: 579C-E3543A.

Note: The output powers were verified on model A2402 to match with model A2172 before radiated emissions spot check was performed

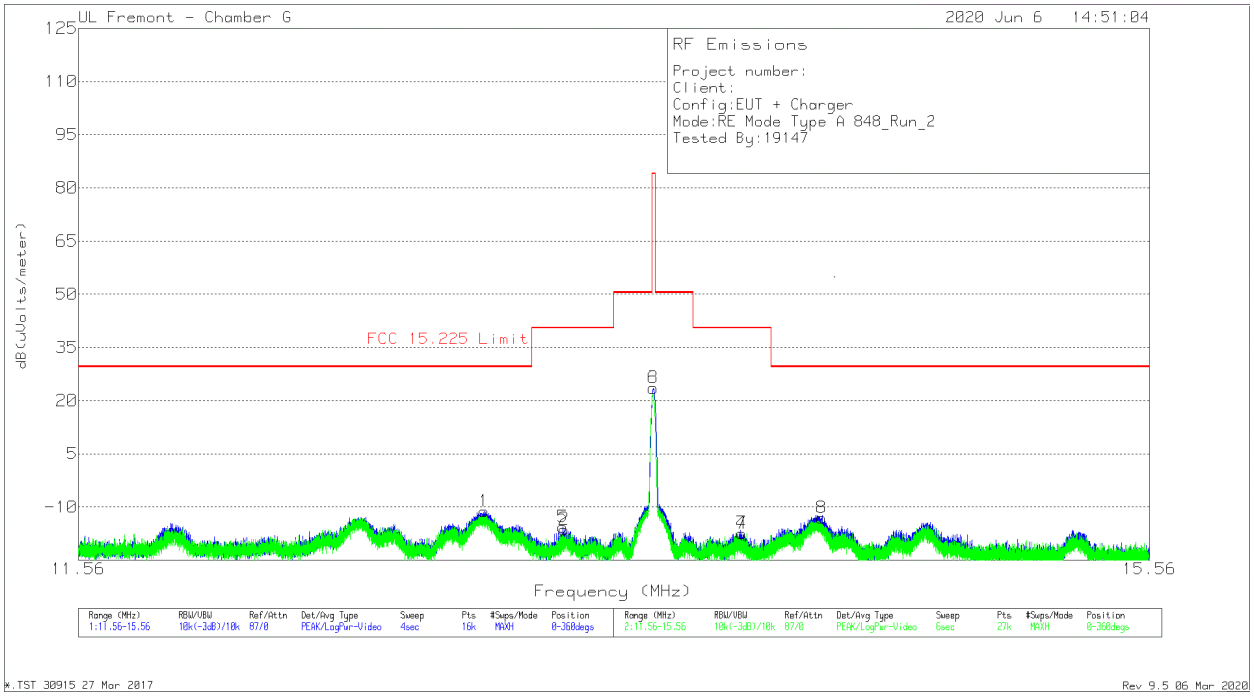
Note: NF: noise floor

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 (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	12.9365	18.02	Pk	10.3	.4	-40	-11.28	29.54	-40.82	0-360
5	13.22325	13.63	Pk	10.3	.4	-40	-15.67	40.51	-56.18	0-360
2	13.22675	12.97	Pk	10.3	.4	-40	-16.33	40.51	-56.84	0-360
3	13.5595	52.86	Pk	10.2	.4	-40	23.46	84	-60.44	0-360
6	13.5595	52.86	Pk	10.2	.4	-40	23.46	84	-60.44	0-360
4	13.89575	11.97	Pk	10.2	.4	-40	-17.43	40.51	-57.94	0-360
7	13.89575	11.97	Pk	10.2	.4	-40	-17.43	40.51	-57.94	0-360
8	14.20625	16.33	Pk	10.2	.4	-40	-13.07	29.54	-42.61	0-360

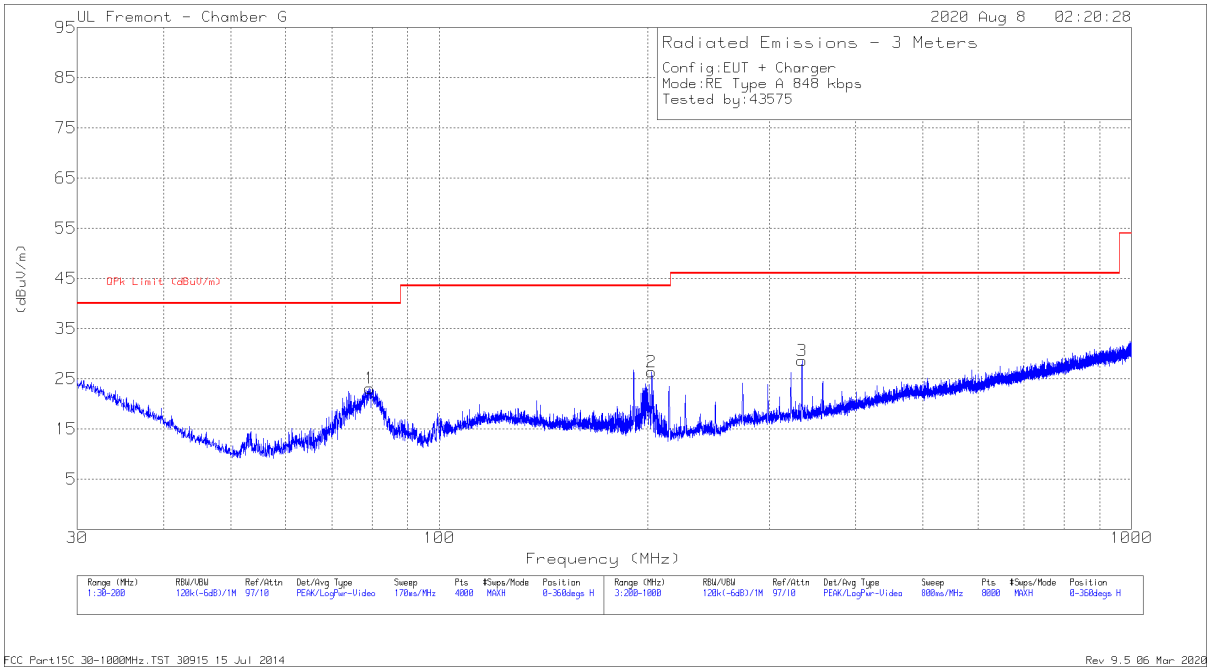
Pk - Peak detector

*.TST 30915 27 Mar 2017
Rev 9.5 06 Mar 2020

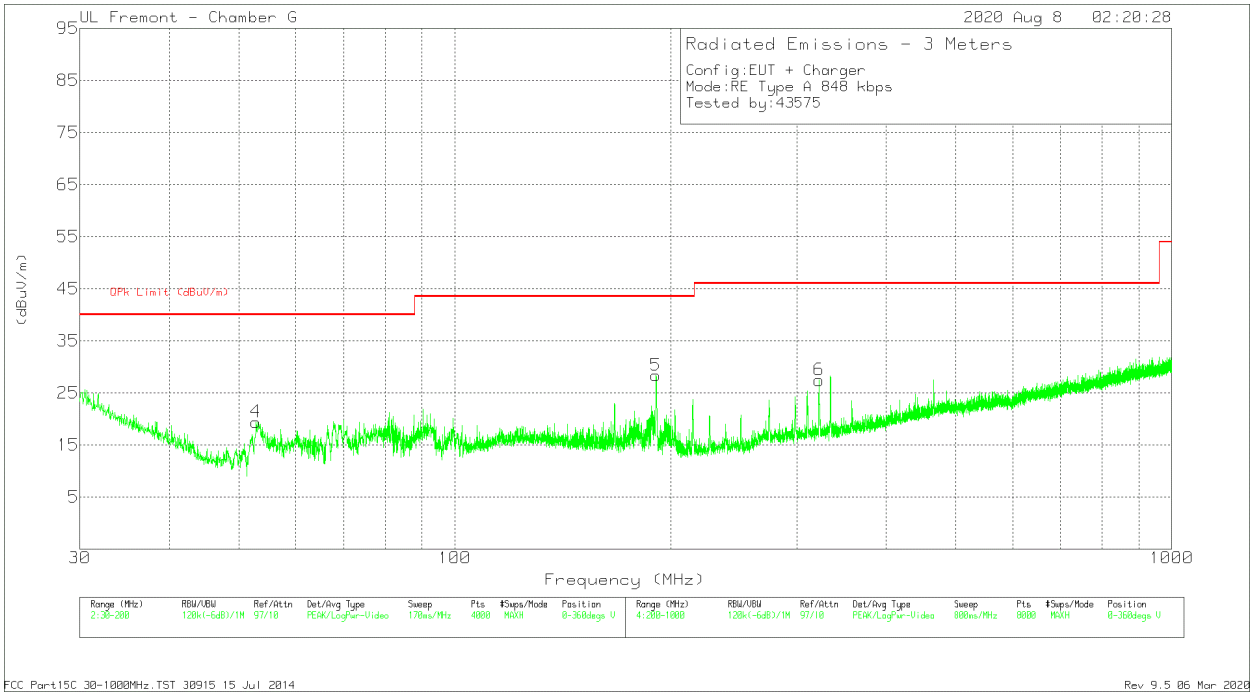
5.3.2. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode), Spurious Emissions 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 334.3175	37.29	Pk	20	-28.7	28.59	46.02	-17.43	0-360	99	H
6	* 322.2159	36.34	Pk	19.9	-28.8	27.44	46.02	-18.58	0-360	97	V
4	52.8284	36.9	Pk	13.3	-30.8	19.4	40	-20.6	0-360	100	V
1	79.3978	39.91	Pk	13.7	-30.5	23.11	40	-16.89	0-360	301	H
5	190.9466	40.45	Pk	17.4	-29.5	28.35	43.52	-15.17	0-360	100	V
	190.9053	39.17	Qp	17.4	-29.5	27.07	43.52	-16.45	185	110	V
2	202.8004	37.83	Pk	18	-29.5	26.33	43.52	-17.19	0-360	99	H

Qp - Quasi-Peak detector
Pk - Peak detector

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

5.1. REFERENCE DETAIL

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

Equipment Class	Reference FCC ID & IC	Reference Report Number	Report Title/Section
DXX	BCG-E3542A 579C-E3542A	13179116-E12	FCC IC_NFC Report / All sections

5.2. WORST-CASE CONFIGURATION AND MODE

EUT was performed based on the worst case model A2172.

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

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

5.3. 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

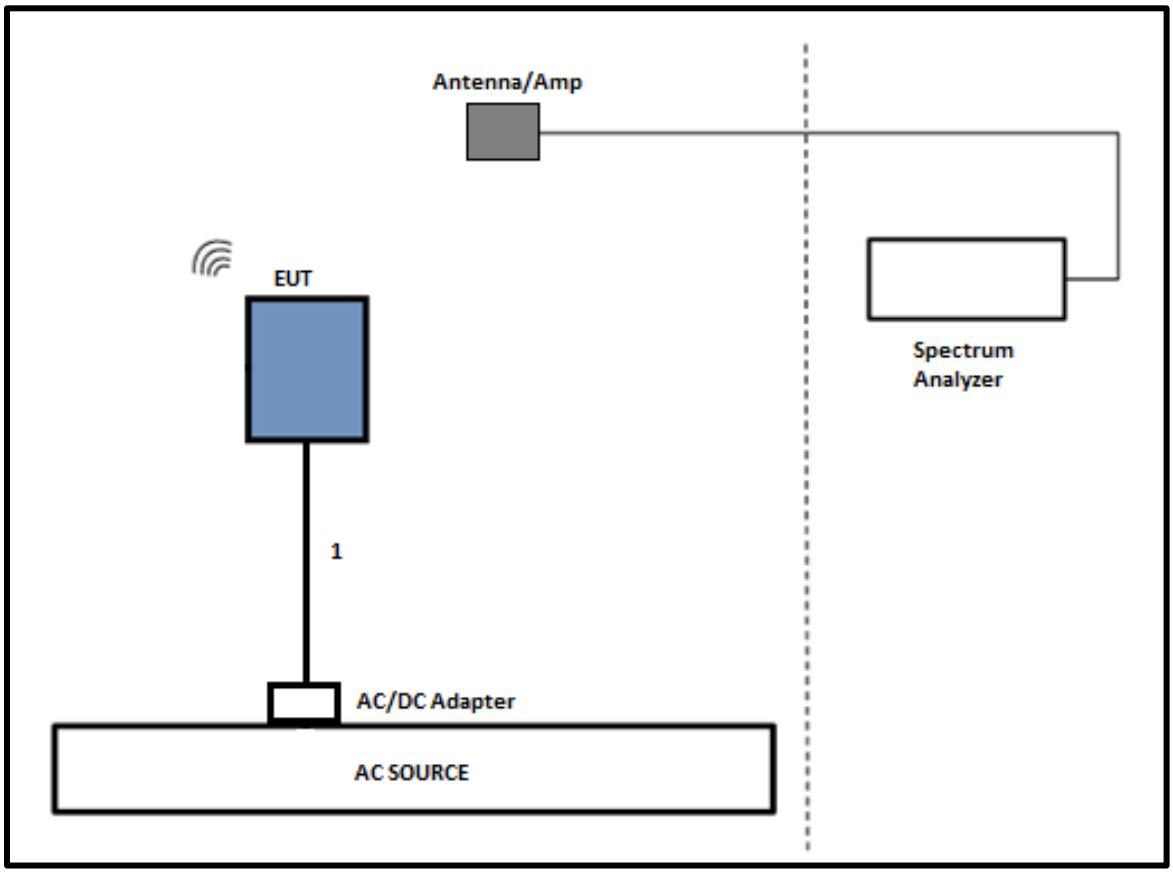
I/O CABLES

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:

7 TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**ID Num**	**Cal Due**	**Last Cal**
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	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

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

7. SETUP PHOTOS

Please refer to 13179116-EP1 for setup photos

Appendix A - Reference Test Report

Attached is the test report (13179116-E12) containing the reference data form the parent model as detailed in section 5.1.

TEST REPORT

Report Number. : 13179116-E12V2

Applicant	:	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	:	A2172
FCC ID	:	BCG-E3542A
IC	:	579C-E3542A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 10

Date Of Issue:
September 09, 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	9/9/2020	Address TCB's Questions	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: A2172

SERIAL NUMBER: G6TCN00YQ5HL

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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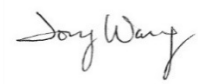
Approved & Released For
UL Verification Services Inc. By:

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.

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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}
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%.

4.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

5.2. MAXIMUM E-FIELD STRENGTH

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

Antenna	Frequency Range (MHz)	Mode		Kbps	E Field at 30m distance (dBuV/m)
Primary	13.56	Type A	Reader	848	23.50
			CE	848	22.65
Secondary	13.56	Type A	Reader	848	-7.75

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 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 with 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

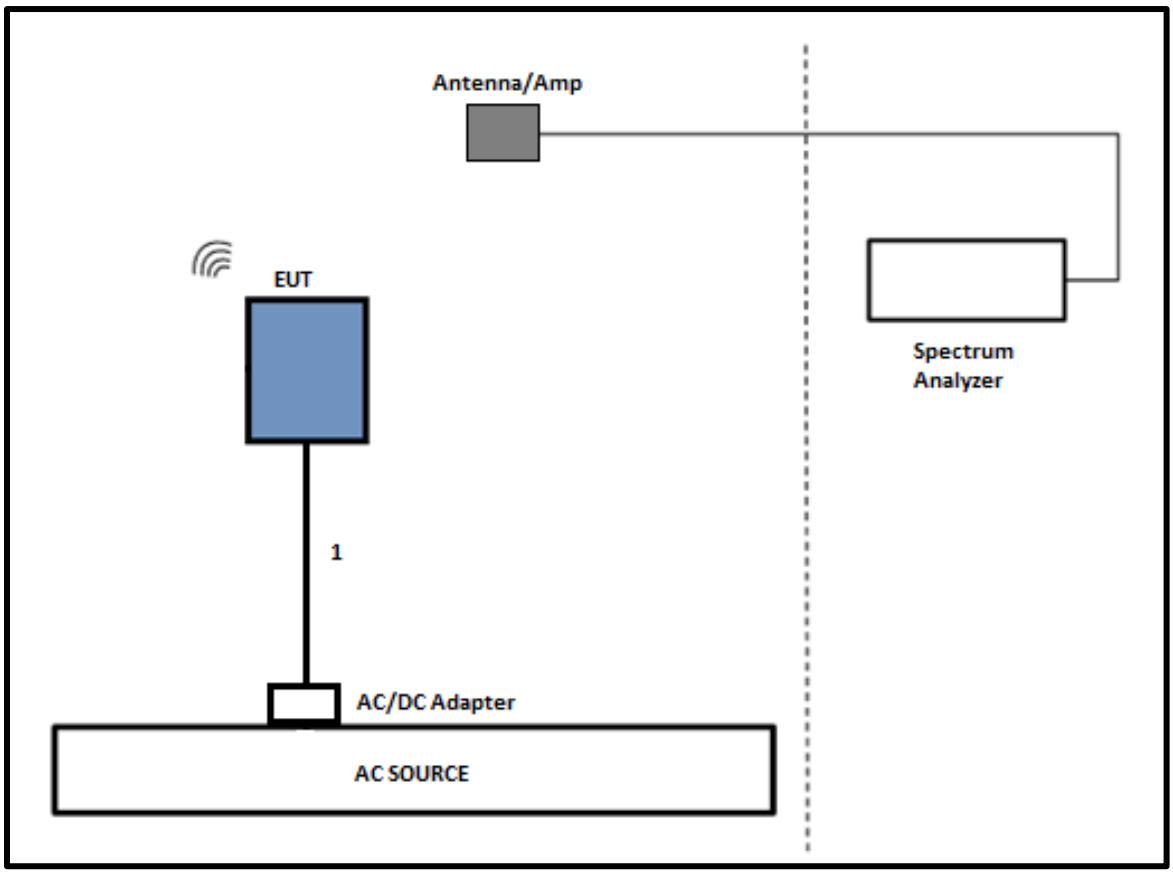
I/O CABLES

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

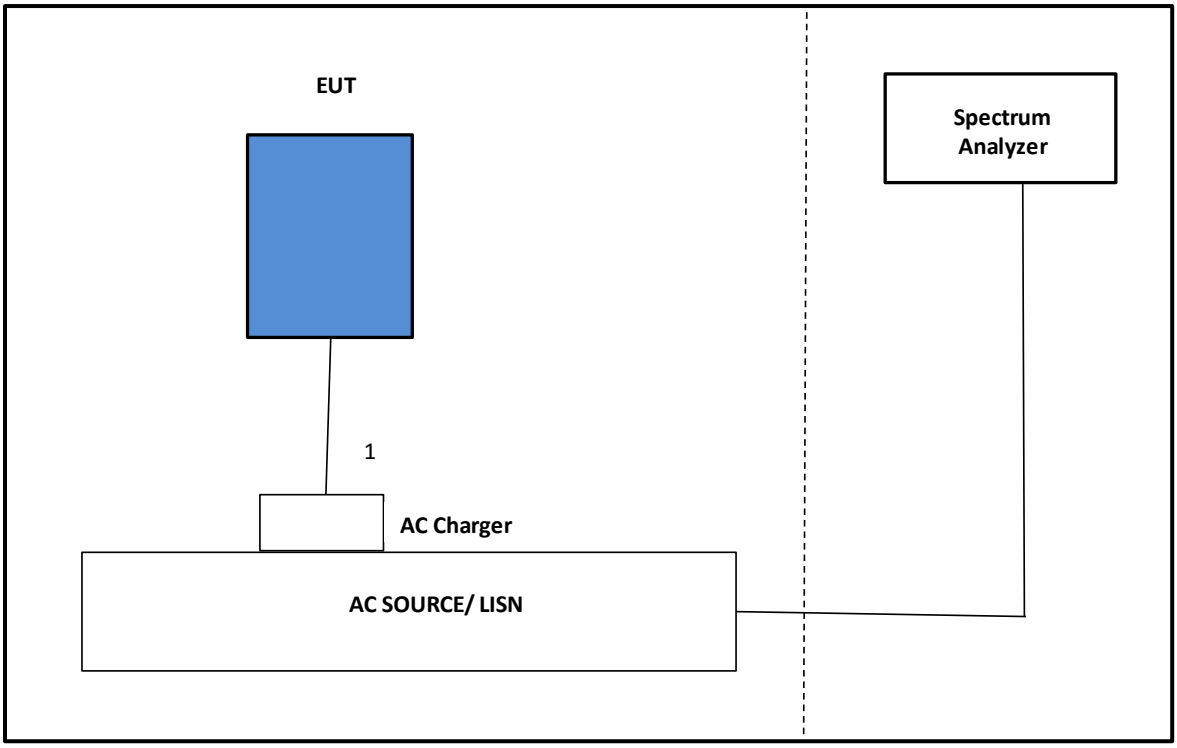
TEST SETUP

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	T35	06/06/2020	06/06/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	01/22/2021	1/22/2020
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
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	12/22/2020	12/22/2019
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0186650	01/23/2021	01/23/2020
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	24.2572	28.221

Type A (CE Mode)

Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.1890	28.577

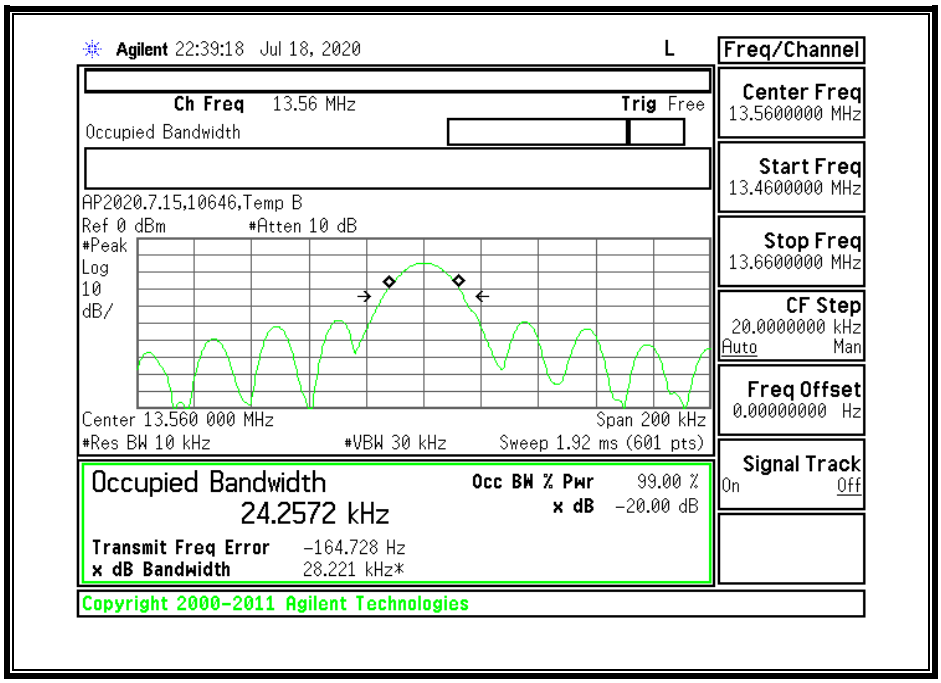
Secondary Antenna

Type A (Reader Mode)

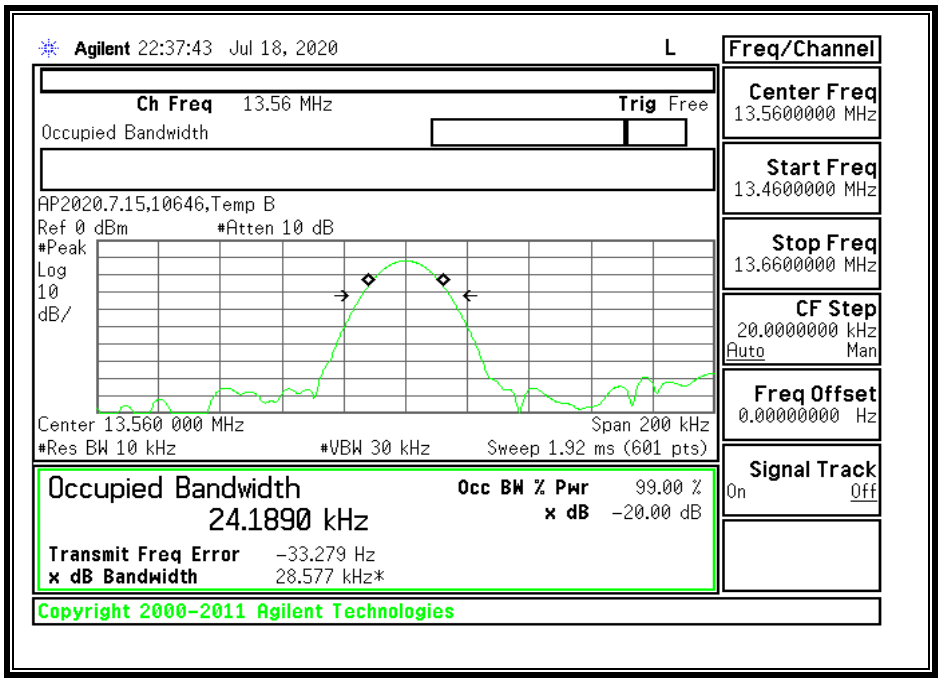
Mode Kbps	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
848	13.56	24.9234	29.232

7.1. PRIMARY ANTENNA

Type A (Reader Mode),848Kbps

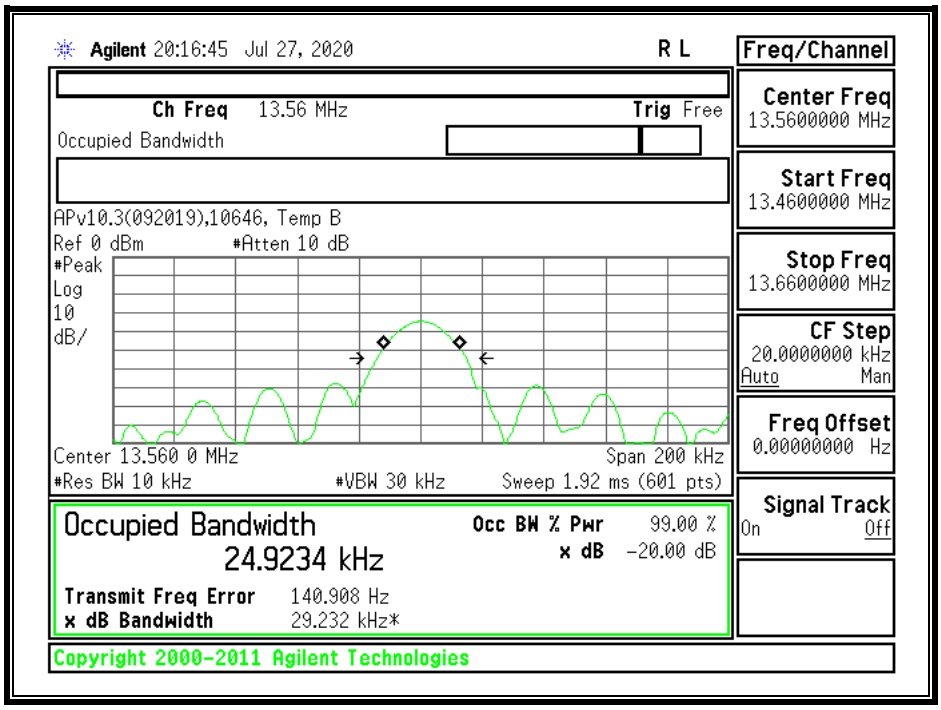


Type A (CE Mode),848Kbps



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.

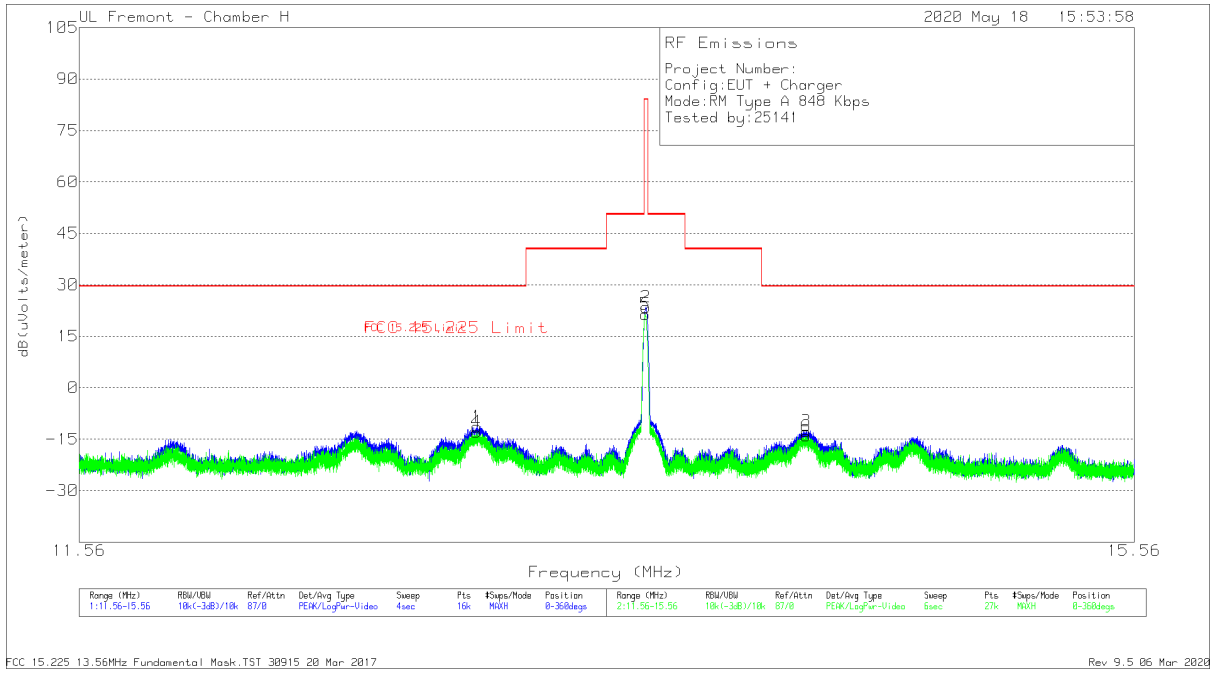
RESULTS

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

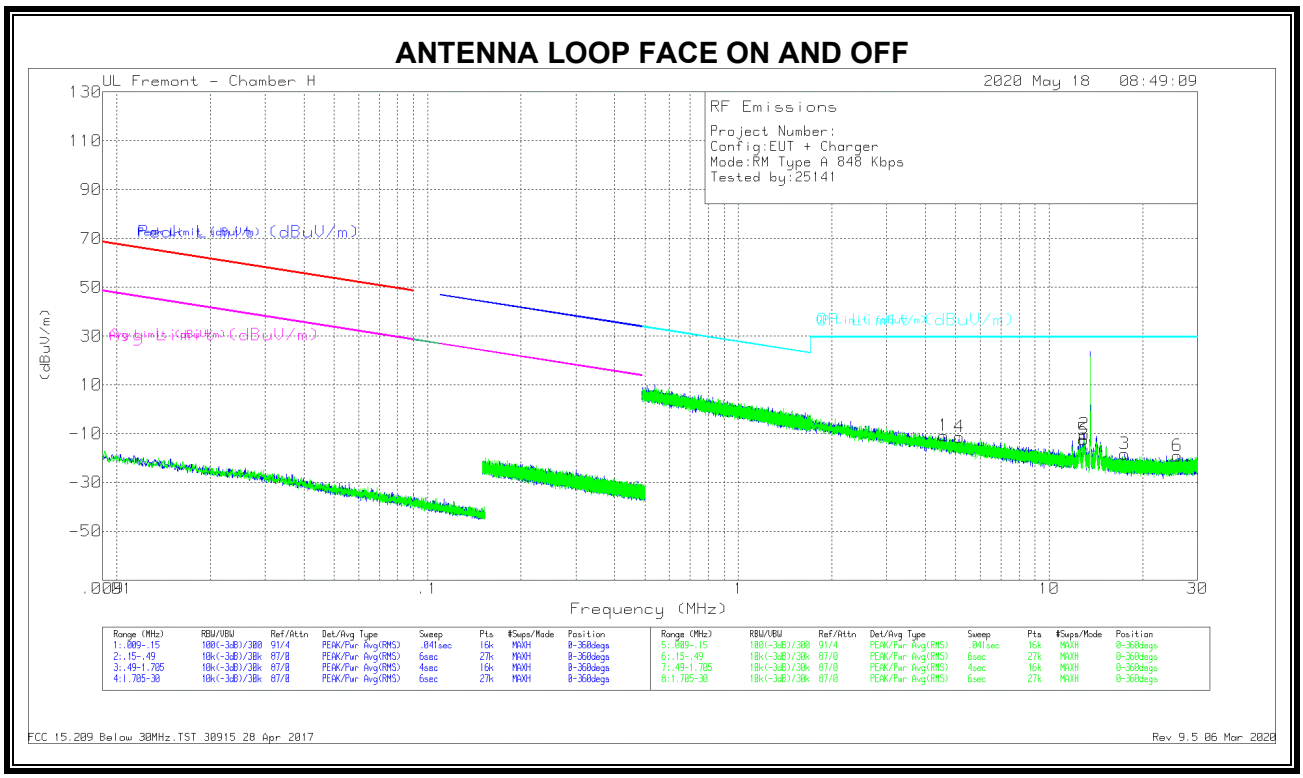
DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
4	12.9287	16.14	Pk	10.6	.4	-40	-12.86	29.54	-42.4	0-360
1	12.93075	17.63	Pk	10.6	.4	-40	-11.37	29.54	-40.91	0-360
5	13.55756	50.39	Pk	10.6	.4	-40	21.39	84	-62.61	0-360
2	13.56025	52.5	Pk	10.6	.4	-40	23.5	84	-60.5	0-360
3	14.18625	16.33	Pk	10.6	.4	-40	-12.67	29.54	-42.21	0-360
6	14.18641	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



DATA

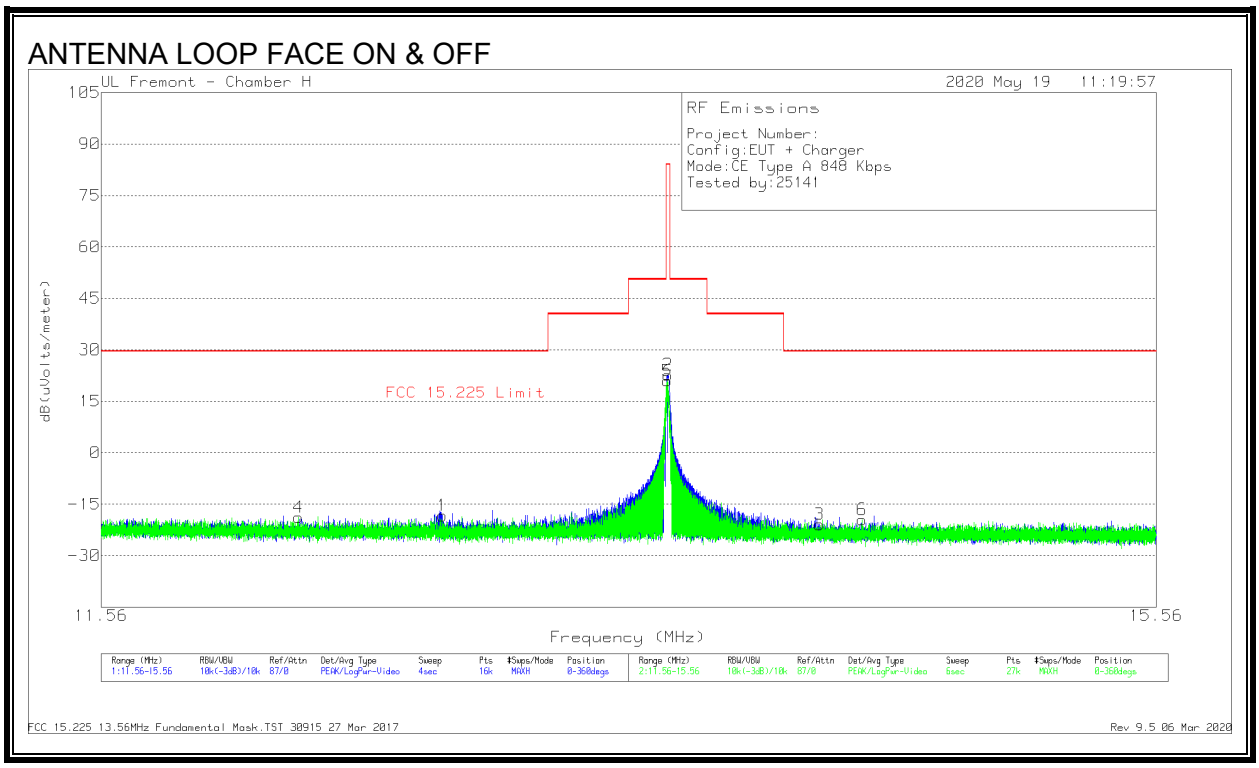
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	4.56746	10.78	Qp	11.3	.2	-40	-17.72	29.5	-47.22	52
2	12.9389	13.83	Qp	10.6	.4	-40	-15.17	29.5	-44.67	199
3	17.5037	2.57	Qp	10.3	.5	-40	-26.63	29.5	-56.13	66
4	5.12614	9.86	Qp	11.2	.2	-40	-18.74	29.5	-48.24	76
5	12.9317	11.83	Qp	10.6	.4	-40	-17.17	29.5	-46.67	98
6	25.8761	3.42	Qp	9.1	.6	-40	-26.88	29.5	-56.38	97

PK- Peak detector
Qp - Quasi-Peak detector

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

8.2.2. CE MODE, TYPE A 848Kbps

FUNDAMENTAL 848Kbps



DATA

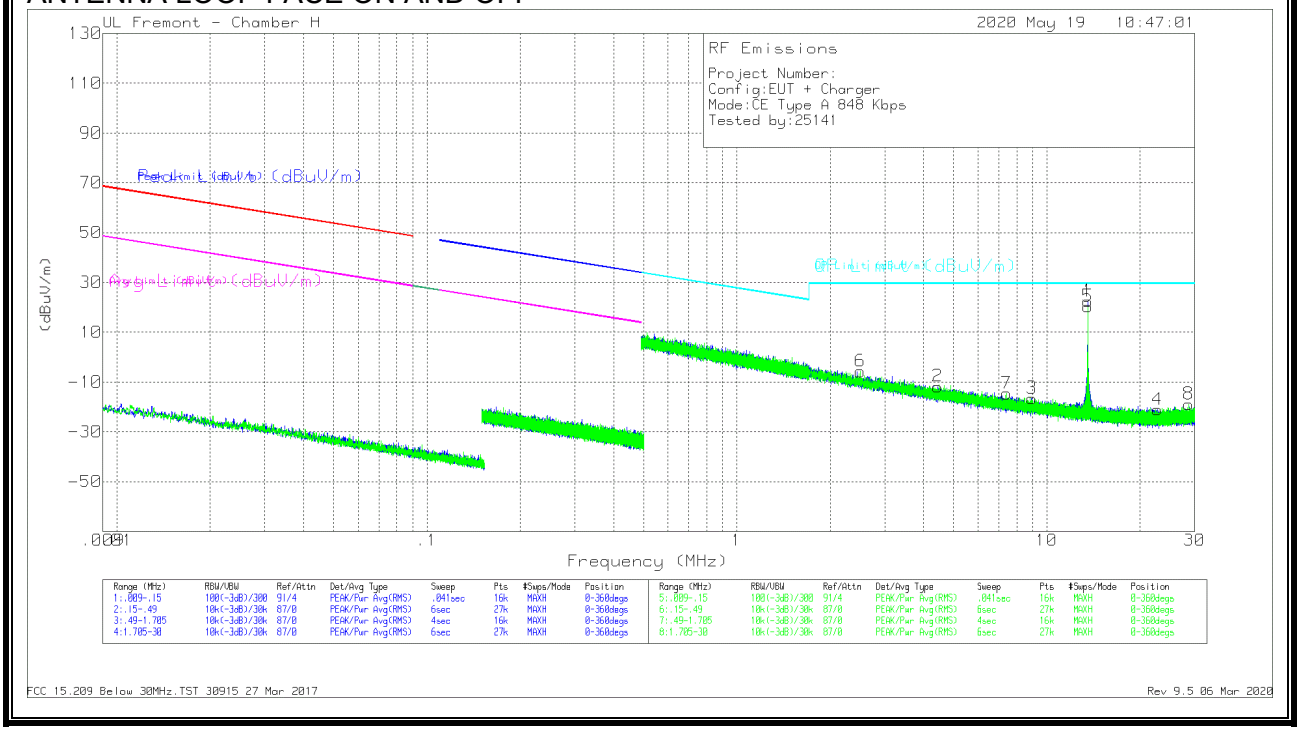
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
4	12.22082	10.36	Pk	10.4	.4	-40	-18.84	29.54	-48.38	0-360
1	12.72525	10.99	Pk	10.3	.4	-40	-18.31	29.54	-47.85	0-360
5	13.55874	50.36	Pk	10.2	.4	-40	20.96	84	-63.04	0-360
2	13.561	52.05	Pk	10.2	.4	-40	22.65	84	-61.35	0-360
3	14.15225	8.51	Pk	10.2	.4	-40	-20.89	29.54	-50.43	0-360
6	14.32212	9.88	Pk	10.2	.4	-40	-19.52	29.54	-49.06	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	2.49279	16.05	Qp	10.8	.2	-40	-12.95	29.5	-42.45	315
2	4.44328	11.05	Qp	10.8	.2	-40	-17.95	29.5	-47.45	285
7	7.40885	6.86	Qp	10.7	.3	-40	-22.14	29.5	-51.64	267
3	8.96717	5.7	Qp	10.6	.3	-40	-23.4	29.5	-52.9	223
4	22.7742	2.37	Qp	9.1	.5	-40	-28.03	29.5	-57.53	297
8	28.7338	4.18	Qp	8.1	.6	-40	-27.12	29.5	-56.62	323

Qp - Quasi-Peak detector

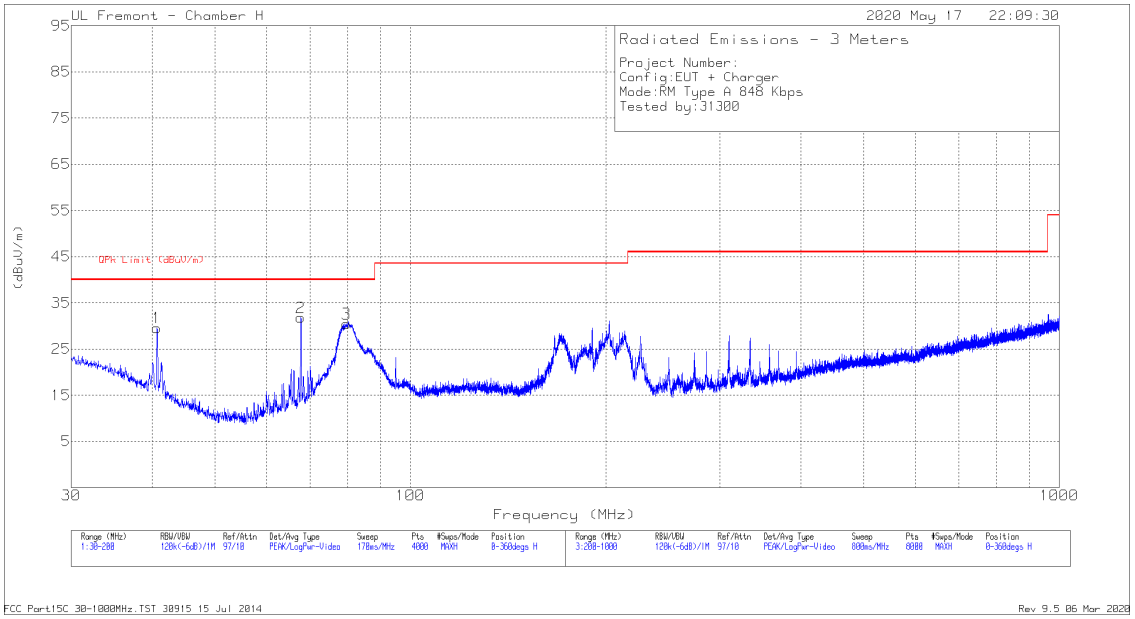
FCC 15.209 Below 30MHz.TST 30915 27 Mar 2017
Rev 9.5 06 Mar 2020

Note: Marker 1 and 5 are the fundamental signal

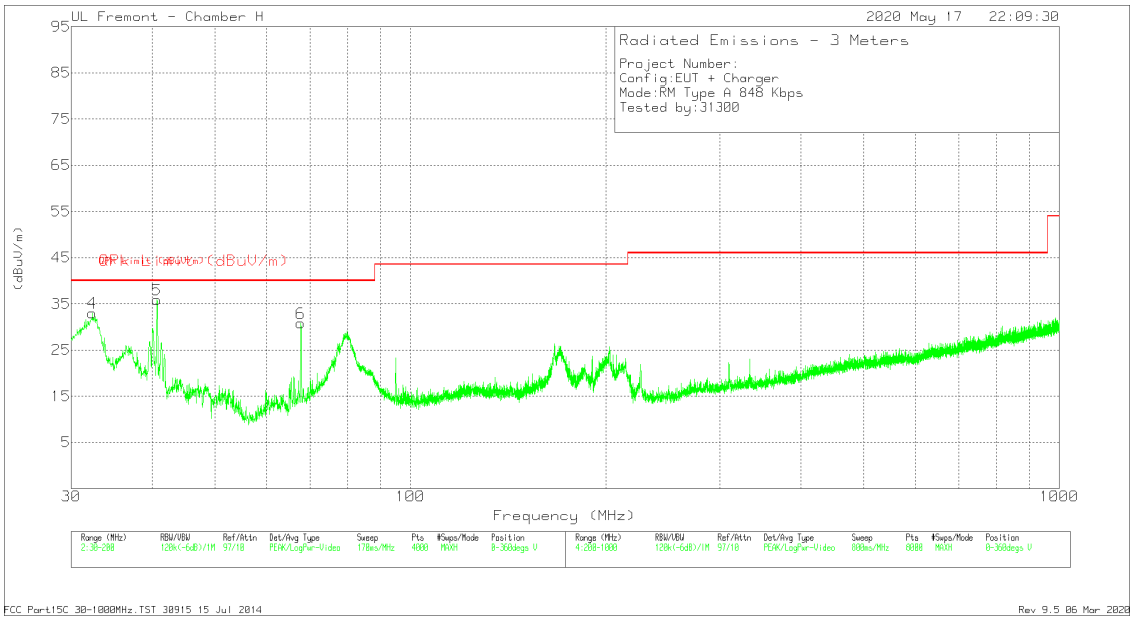
8.2.3. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode), SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

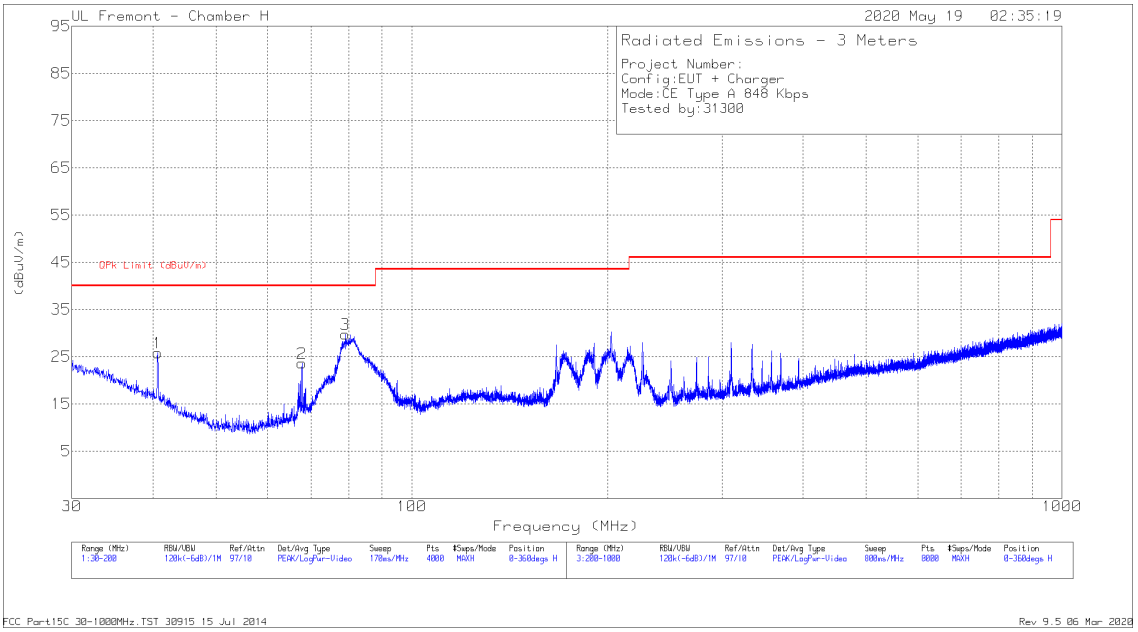
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	32.3381	38.74	Pk	25.5	-31.2	33.04	40	-6.96	0-360	100	V
1	40.6703	40.9	Pk	19.8	-31.1	29.6	40	-10.4	0-360	400	H
5	40.6703	47.2	Pk	19.8	-31.1	35.9	40	-4.1	0-360	100	V
	40.6765	46.99	Qp	19.8	-31.1	35.69	40	-4.31	149	100	V
2	67.7923	48.62	Pk	14	-30.8	31.82	40	-8.18	0-360	300	H
6	67.7923	47.62	Pk	14	-30.8	30.82	40	-9.18	0-360	100	V
3	79.6528	47.89	Pk	13.3	-30.7	30.49	40	-9.51	0-360	300	H

Pk - Peak detector
Qp - Quasi-Peak detector

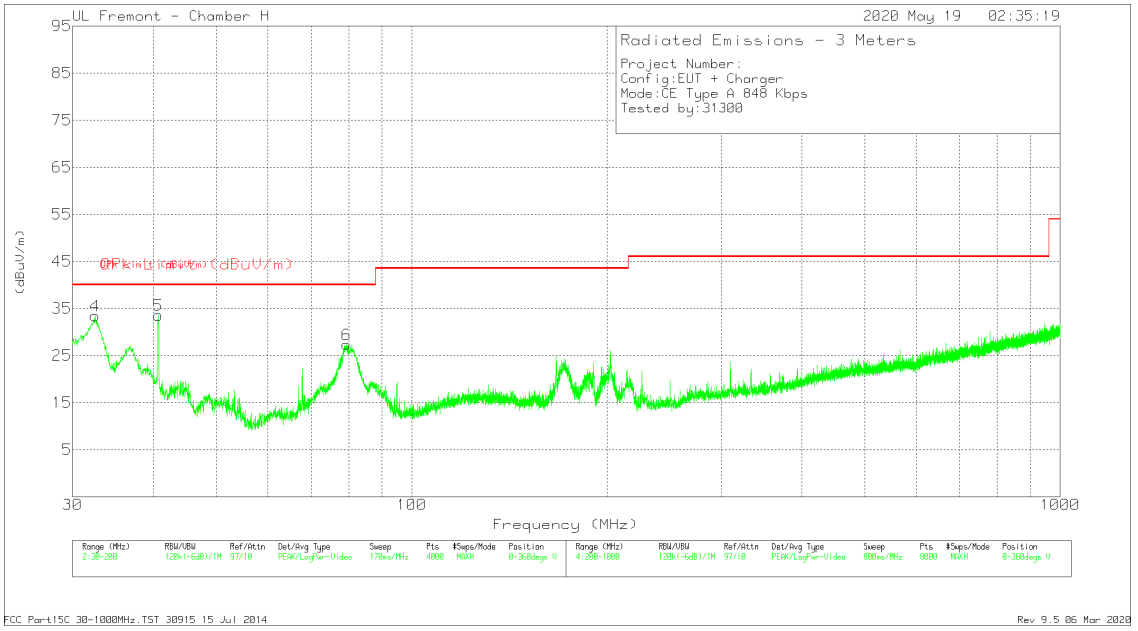
FCC Part15C 30-1000MHz.TST 30915 15 Jul 2014
Rev 9.5 06 Mar 2020

Type A (CE Mode),SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	32.5081	39.25	Pk	25.4	-31.2	33.45	40	-6.55	0-360	100	V
1	40.6703	37.12	Pk	19.8	-31.1	25.82	40	-14.18	0-360	400	H
5	40.6703	44.86	Pk	19.8	-31.1	33.56	40	-6.44	0-360	100	V
2	67.7923	40.4	Pk	14	-30.8	23.6	40	-16.4	0-360	400	H
3	79.1002	47.05	Pk	13.4	-30.7	29.75	40	-10.25	0-360	300	H
6	79.3978	44.64	Pk	13.4	-30.7	27.34	40	-12.66	0-360	100	V

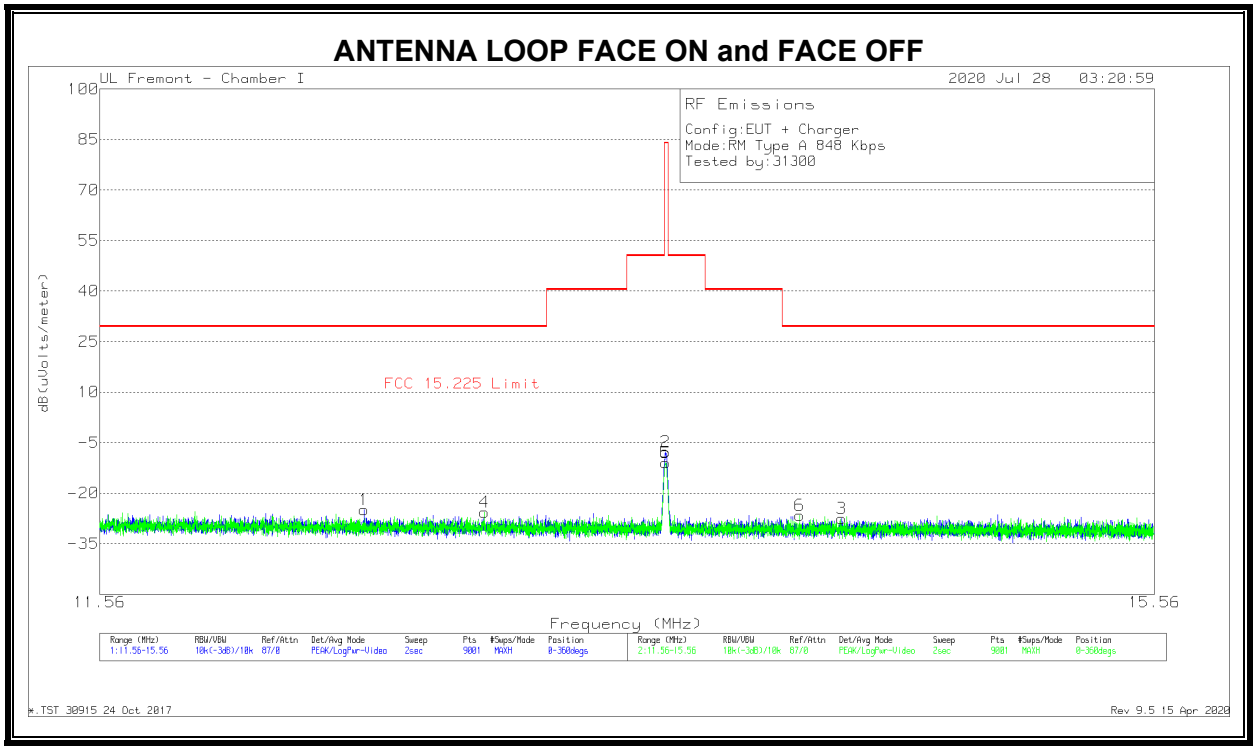
Pk - Peak detector

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

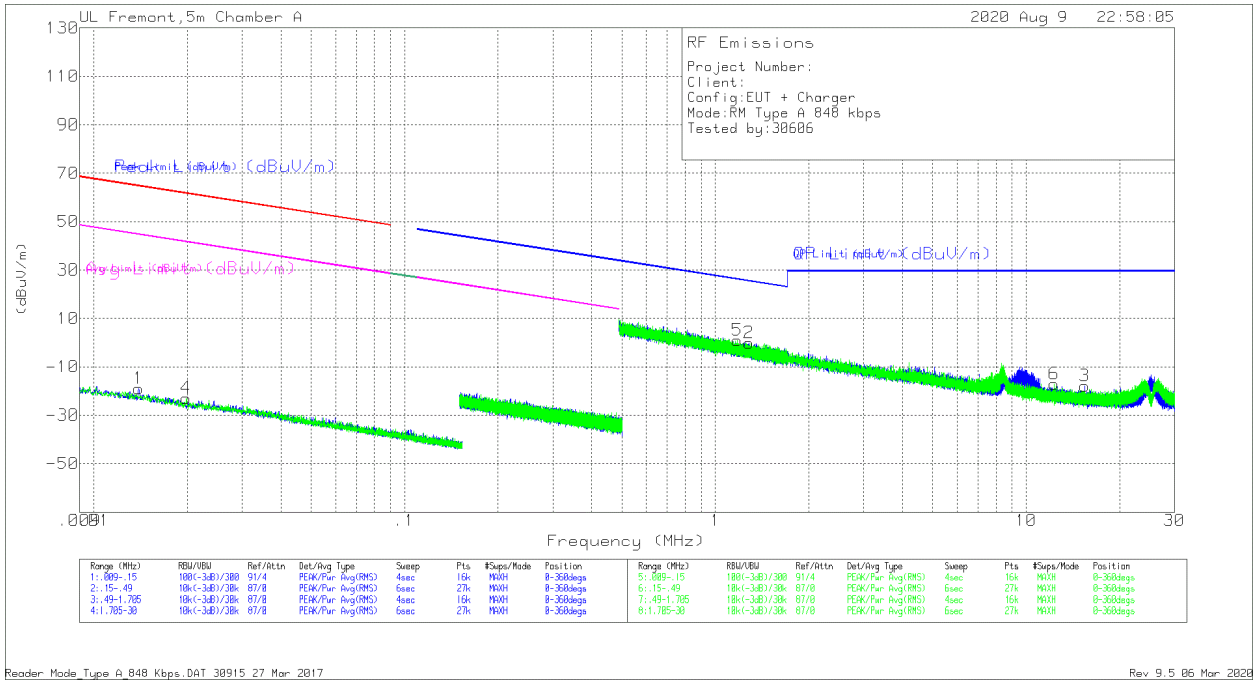
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE01866 50 (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading dB(uVolts/ meter)	FCC 15.225 Limit	PK Margin (dB)	Azimuth (Degs)
1	12.45333	12.31	Pk	34.3	-31.5	-40	-24.89	29.54	-54.43	0-360
2	13.55756	29.65	Pk	34.1	-31.5	-40	-7.75	84	-91.75	0-360
3	14.24798	9.76	Pk	34.1	-31.4	-40	-27.54	29.54	-57.08	0-360
4	12.88312	11.64	Pk	34.2	-31.5	-40	-25.66	29.54	-55.2	0-360
5	13.55889	26.51	Pk	34.1	-31.5	-40	-10.89	84	-94.89	0-360
6	14.08059	10.64	Pk	34.1	-31.4	-40	-26.66	29.54	-56.2	0-360

Pk - Peak detector

*.TST 30915 24 Oct 2017
Rev 9.5 15 Apr 2020

SPURIOUS EMISSION

ANTENNA LOOP FACE ON AND OFF



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

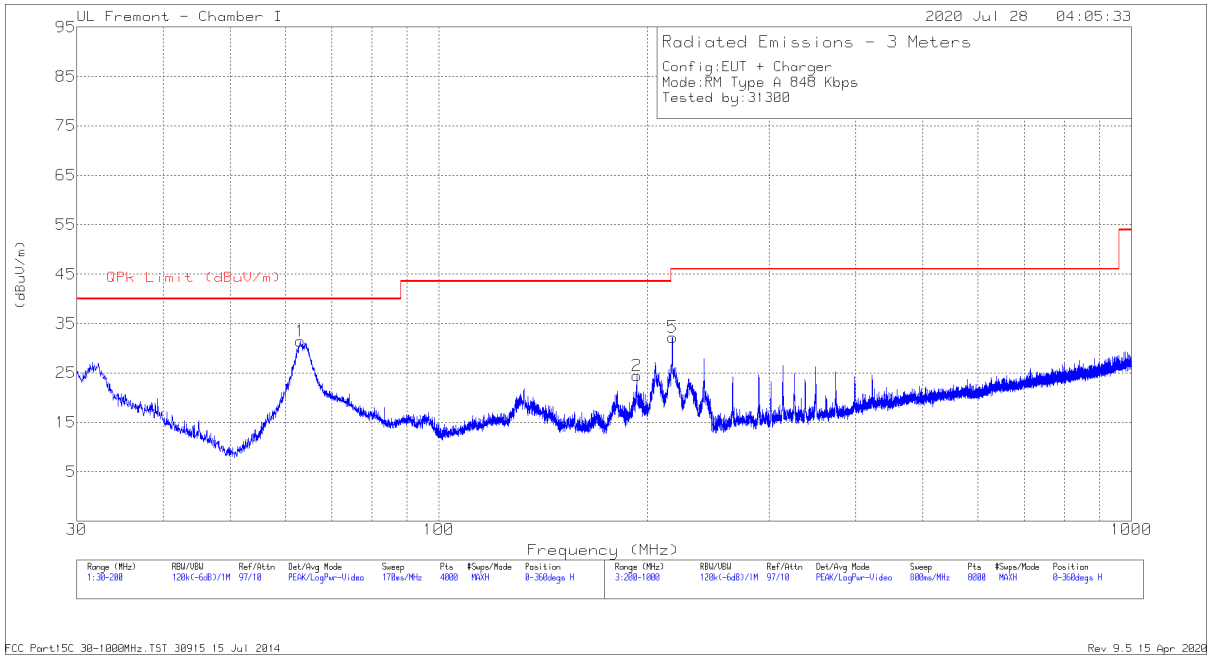
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	1.17461	30.02	Pk	10.8	.2	-40	1.02	26.23	-25.21	0-360
2	1.28192	28.78	Pk	10.8	.2	-40	-.22	25.47	-25.69	0-360
6	12.31076	12.07	Pk	10.4	.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
Reader Mode_Type A_848 Kbps.DAT 30915 27 Mar 2017
Rev 9.5 06 Mar 2020

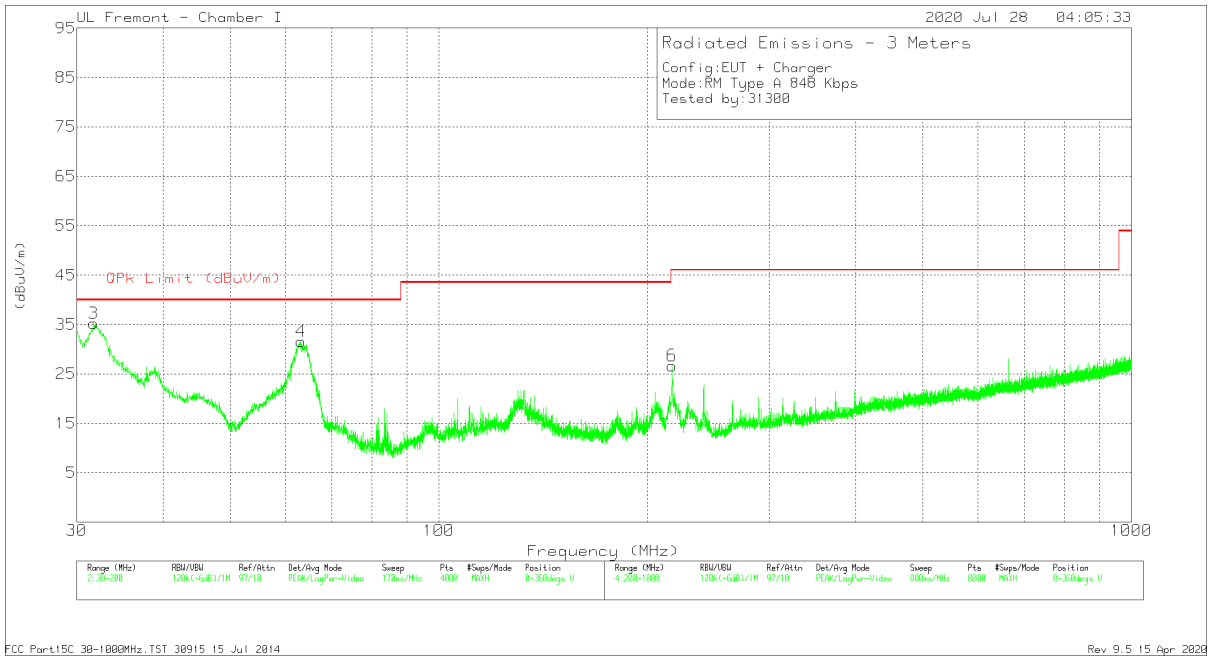
8.3.2. TX SPURIOUS EMISSION 30 TO 1000 MHz, EUT WITH AC/DC ADAPTER

Type A (Reader Mode),SPURIOUS EMISSION 848Kbps

Horizontal



Vertical



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184052 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	63.0736	48.89	Pk	13.5	-31	31.39	40	-8.61	0-360	399	H
2	193.072	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	217.402	46.16	Pk	16.4	-30.3	32.26	46.02	-13.76	0-360	99	H
6	217.202	40.58	Pk	16.4	-30.3	26.68	46.02	-19.34	0-360	199	V

Pk - Peak detector

Qp - Quasi-Peak detector

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

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	13.5597729	2.125	13.5597756	1.923	13.5597790	1.674	13.5597832	1.366	± 100
	40	13.5597675	2.523	13.5597669	2.568	13.5597663	2.610	13.5597661	2.622	± 100
	30	13.5597857	1.181	13.5597831	1.373	13.5597804	1.567	13.5597784	1.719	± 100
3.80	***20***	***13.5598017***	***0.000***	***13.5598026***	***-0.070***	***13.5598039***	***-0.166***	***13.5598048***	***-0.232***	***± 100***
	10	13.5597972	0.334	13.5598071	-0.401	13.5598185	-1.238	13.5598299	-2.080	± 100
	0	13.5598574	-4.106	13.5598615	-4.410	13.5598685	-4.928	13.5598751	-5.413	± 100
	-10	13.5599027	-7.446	13.5599090	-7.916	13.5599155	-8.391	13.5599208	-8.784	± 100
	-20	13.5599424	-10.373	13.5598911	-6.595	13.5599027	-7.449	13.5599356	-9.876	± 100
3.23	20	13.5598828	-5.978	13.5598545	-3.891	13.5598554	-3.963	13.5598625	-4.483	± 100
4.37	20	13.5597574	3.263	13.5597564	3.337	13.5597502	3.796	13.5597224	5.850	± 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	13.5599594	29.363	13.5599521	29.900	13.5599086	33.103	13.5599211	32.188	± 100
	40	13.5599464	30.319	13.5598776	35.389	13.5598773	35.412	13.5598027	40.916	± 100
	30	13.5598995	33.780	13.5596814	49.861	13.5596744	50.376	13.5597272	46.484	± 100
3.80	***20***	***13.5603575***	***0.000***	***13.5602701***	***6.446***	***13.5601425***	***15.860***	***13.5602482***	***8.060***	***± 100***
	10	13.5601671	14.045	13.5599820	27.692	13.5599595	29.354	13.5599462	30.331	± 100
	0	13.5599907	27.049	13.5599564	29.584	13.5600865	19.984	13.5599791	27.908	± 100
	-10	13.5599997	26.388	13.5600729	20.989	13.5598960	34.037	13.5600760	20.759	± 100
	-20	13.5599697	28.597	13.5600456	23.005	13.5599705	28.544	13.5600712	21.113	± 100
3.23	20	13.5601671	14.045	13.5601671	14.045	13.5601671	14.045	13.5601671	14.045	± 100
4.37	20	13.5599594	29.363	13.5599594	29.363	13.5599594	29.363	13.5599594	29.363	± 100

9.2. SECONDARY ANTENNA

READER MODE, TYPE A 848Kbps

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC										
Limit: ± 100 ppm = 1.35600 KHz										
Power Supply	Envir. Temp	Frequency Deviation Measureed with Time Elapse								
(VAC)	(ºC)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)
	50	13.55996006	0.492	13.55996228	0.328	13.55996441	0.171	13.55996643	0.022	± 100
	40	13.55994947	1.273	13.55994941	1.277	13.55994945	1.274	13.55994939	1.279	± 100
	30	13.55995976	0.514	13.55995838	0.616	13.55995725	0.699	13.55995628	0.771	± 100
3.80	***20***	13.55996673	***0.000***	13.55997152	***-0.353***	13.5599715	***-0.352***	13.55997977	***-0.962***	***± 100***
	10	13.56000092	-2.522	13.56000577	-2.879	13.56000574	-2.877	13.56001325	-3.430	± 100
	0	13.56003918	-5.343	13.56004359	-5.668	13.56004746	-5.953	13.56005004	-6.144	± 100
	-10	13.56007753	-8.171	13.56008043	-8.385	13.56008363	-8.621	13.56008563	-8.768	± 100
	-20	13.56007522	-8.001	13.56007771	-8.185	13.56007943	-8.312	13.56008054	-8.393	± 100
3.23	20	13.55996672	0.001	13.55996671	0.001	13.55996671	0.001	13.55996671	0.002	± 100
4.37	20	13.55995975	0.515	13.55995974	0.515	13.55995975	0.515	13.55995975	0.515	± 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.

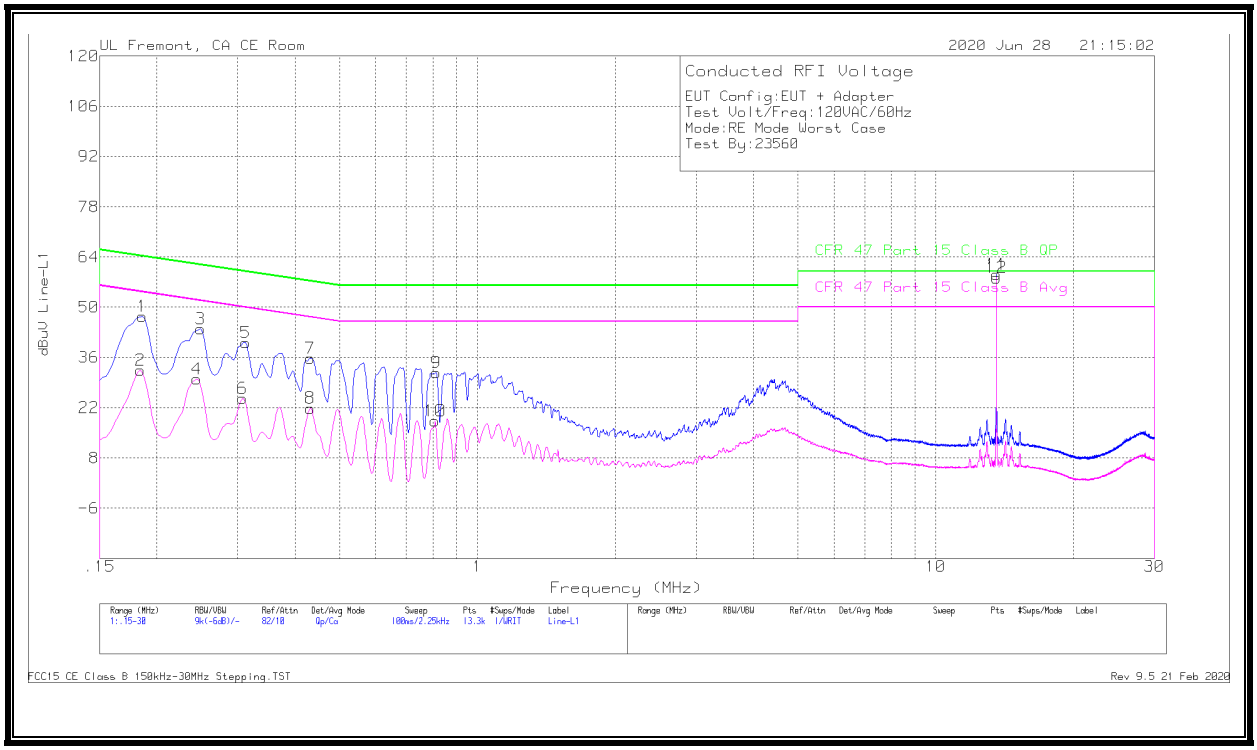
RESULTS

No non-compliance noted:

10.1. PRIMARY ANTENNA

10.1.1. READER MODE, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

Range 1: Line-L1 .15 - 30MHz

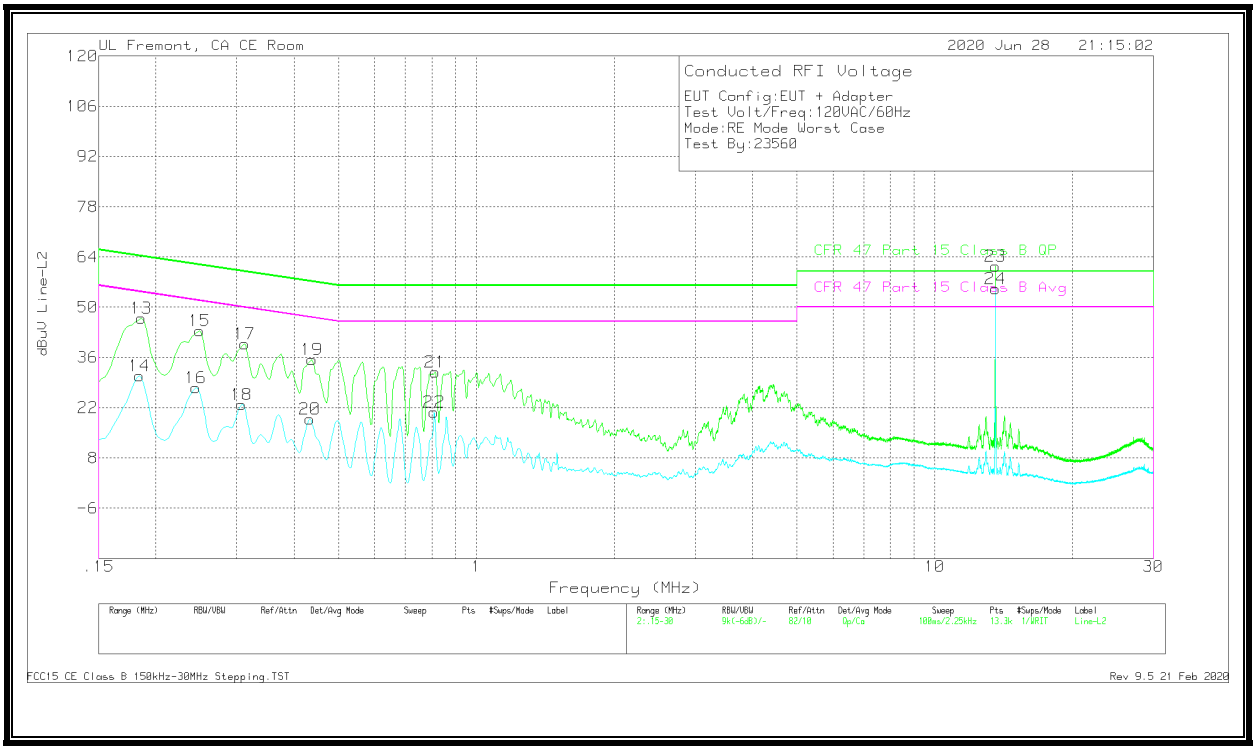
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.186	37.53	Qp	0	0	10	47.53	64.21	-16.68	-	-
2	.18375	22.43	Ca	0	0	10	32.43	-	-	54.31	-21.88
3	.249	33.92	Qp	0	0	10	43.92	61.79	-17.87	-	-
4	.2445	19.96	Ca	0	0	10	29.96	-	-	51.94	-21.98
5	.312	30.2	Qp	0	0	10	40.2	59.92	-19.72	-	-
6	.3075	14.68	Ca	0	0	10	24.68	-	-	50.04	-25.36
7	.43125	25.79	Qp	0	0	10	35.79	57.23	-21.44	-	-
8	.43125	11.9	Ca	0	0	10	21.9	-	-	47.23	-25.33
9	.81375	21.76	Qp	0	0	10	31.76	56	-24.24	-	-
10	.80925	8.38	Ca	0	0	10	18.38	-	-	46	-27.62
11	13.56	48.78	Qp	.1	.2	10.1	59.18	60	-.82	-	-
12	13.56	47.8	Ca	.1	.2	10.1	58.2	-	-	**50**	**8.2**

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	36.97	Qp	0	0	10	46.97	64.21	-17.24	-	-
14	.18375	20.89	Ca	0	0	10	30.89	-	-	54.31	-23.42
15	.249	33.4	Qp	0	0	10	43.4	61.79	-18.39	-	-
16	.2445	17.6	Ca	0	0	10	27.6	-	-	51.94	-24.34
17	.312	29.84	Qp	0	0	10	39.84	59.92	-20.08	-	-
18	.3075	12.94	Ca	0	0	10	22.94	-	-	50.04	-27.1
19	.438	25.35	Qp	0	0	10	35.35	57.1	-21.75	-	-
20	.4335	8.78	Ca	0	0	10	18.78	-	-	47.19	-28.41
21	.81375	22	Qp	0	0	10	32	56	-24	-	-
22	.80925	10.77	Ca	0	0	10	20.77	-	-	46	-25.23
23	13.56	51.03	Qp	.1	.2	10.1	61.43	**60**	**1.43**	-	-
24	13.56	44.72	Ca	.1	.2	10.1	55.12	-	-	**50**	**5.12**

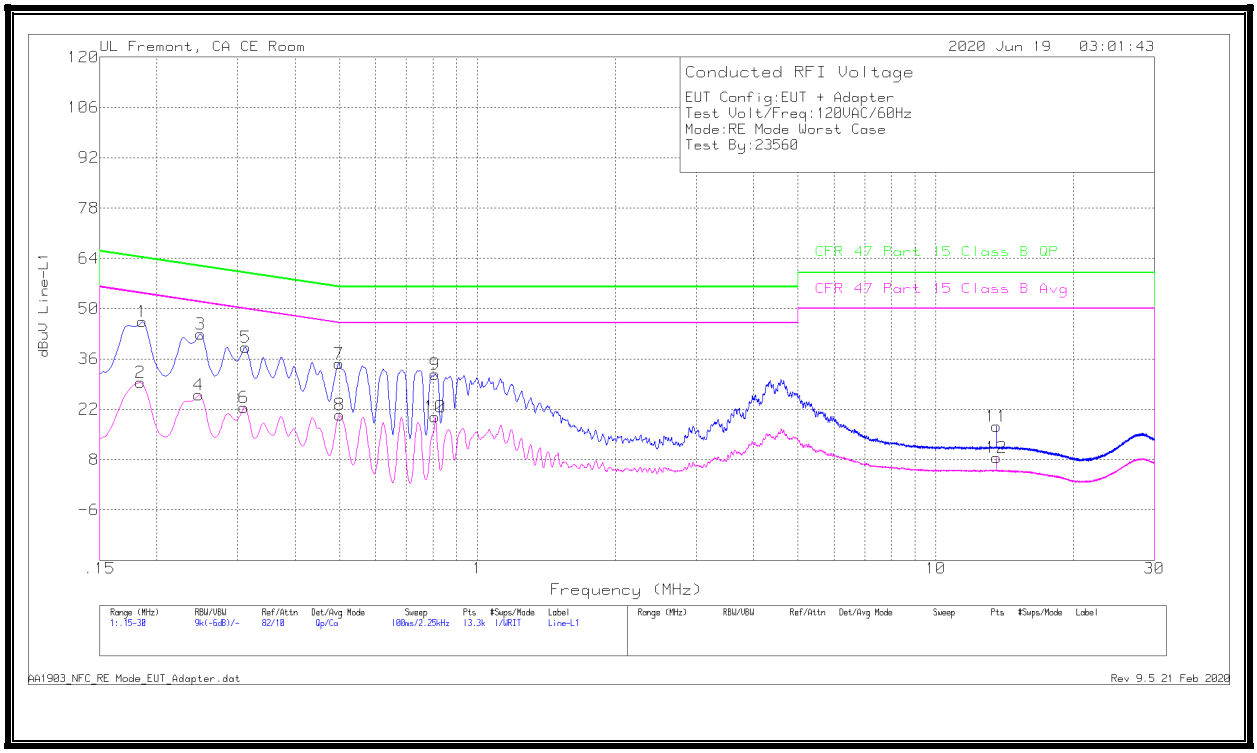
Qp - Quasi-Peak detector
Ca - CISPR average detection

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 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	36.44	Qp	0	0	10	46.44	64.21	-17.77	-	-
2	.18375	19.56	Ca	0	0	10	29.56	-	-	54.31	-24.75
3	.249	33	Qp	0	0	10	43	61.79	-18.79	-	-
4	.24675	16.01	Ca	0	0	10	26.01	-	-	51.87	-25.86
5	.312	29.32	Qp	0	0	10	39.32	59.92	-20.6	-	-
6	.30975	12.54	Ca	0	0	10	22.54	-	-	49.98	-27.44
7	.49875	24.75	Qp	0	0	10	34.75	56.02	-21.27	-	-
8	.501	10.5	Ca	0	0	10	20.5	-	-	46	-25.5
9	.80925	21.77	Qp	0	0	10	31.77	56	-24.23	-	-
10	.80925	9.85	Ca	0	0	10	19.85	-	-	46	-26.15
11	13.56	6.83	Qp	.1	.2	10.1	17.23	60	-42.77	-	-
12	13.56	-1.84	Ca	.1	.2	10.1	8.56	-	-	50	-41.44

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1903_NFC_RE Mode_EUT_Adapter.dat
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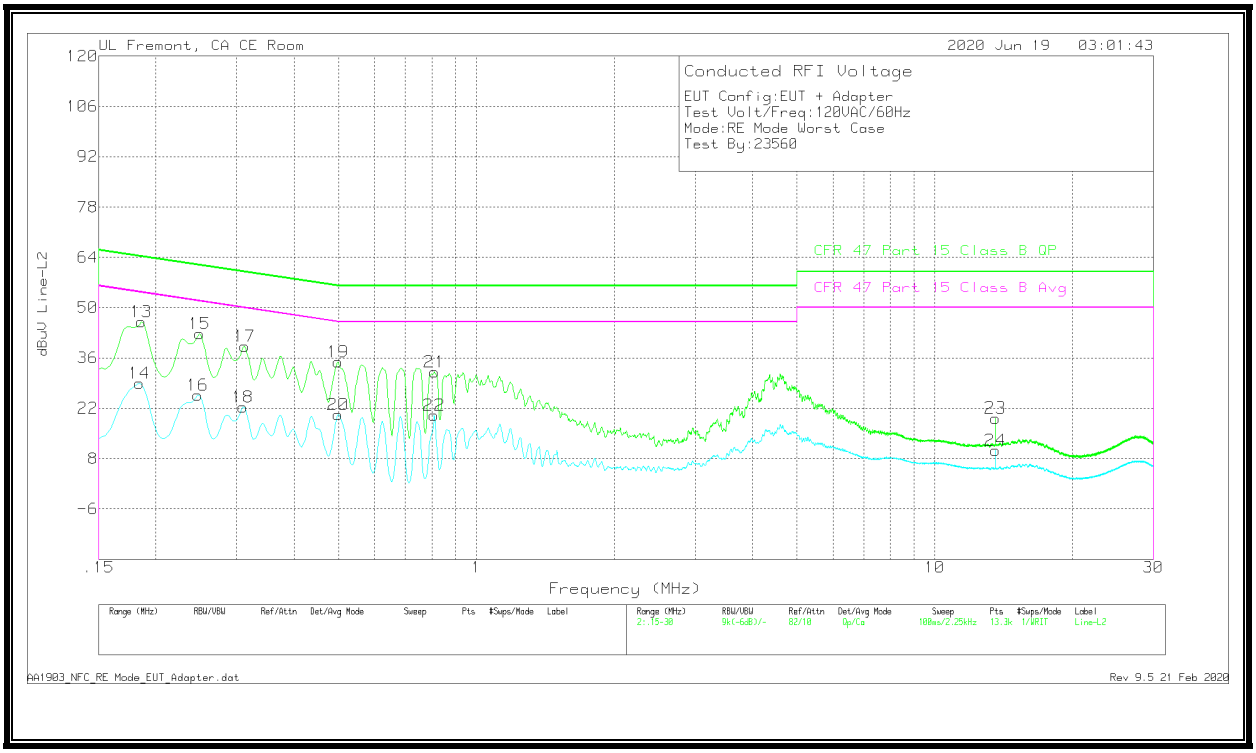
LINE 2 RESULTS



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	.186	36.12	Qp	0	0	10	46.12	64.21	-18.09	-	-
14	.18375	18.98	Ca	0	0	10	28.98	-	-	54.31	-25.33
15	.249	32.81	Qp	0	0	10	42.81	61.79	-18.98	-	-
16	.24675	15.62	Ca	0	0	10	25.62	-	-	51.87	-26.25
17	.312	29.34	Qp	0	0	10	39.34	59.92	-20.58	-	-
18	.30975	12.39	Ca	0	0	10	22.39	-	-	49.98	-27.59
19	.49875	24.87	Qp	0	0	10	34.87	56.02	-21.15	-	-
20	.49875	10.2	Ca	0	0	10	20.2	-	-	46.02	-25.82
21	.8115	22.12	Qp	0	0	10	32.12	56	-23.88	-	-
22	.80925	10.1	Ca	0	0	10	20.1	-	-	46	-25.9
23	13.56	8.88	Qp	.1	.2	10.1	19.28	60	-40.72	-	-
24	13.56	-.03	Ca	.1	.2	10.1	10.37	-	-	50	-39.63

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1903_NFC_RE Mode_EUT_Adapter.dat
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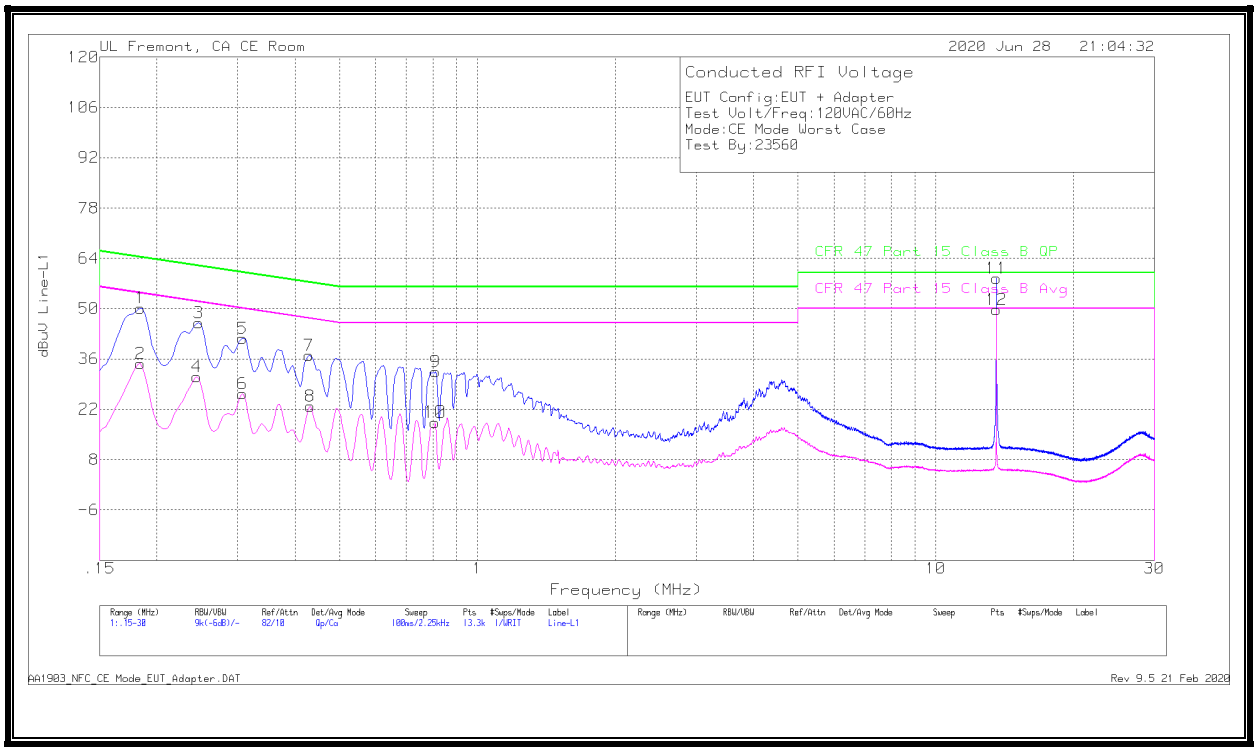
10.1.2. CE MODE, TYPE A 848Kbps

NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.18375	40.17	Qp	0	0	10	50.17	64.31	-14.14	-	-
2	.18375	24.67	Ca	0	0	10	34.67	-	-	54.31	-19.64
3	.24675	36.02	Qp	0	0	10	46.02	61.87	-15.85	-	-
4	.2445	21.04	Ca	0	0	10	31.04	-	-	51.94	-20.9
5	.3075	31.78	Qp	0	0	10	41.78	60.04	-18.26	-	-
6	.3075	16.3	Ca	0	0	10	26.3	-	-	50.04	-23.74
7	.429	26.98	Qp	0	0	10	36.98	57.27	-20.29	-	-
8	.43125	12.93	Ca	0	0	10	22.93	-	-	47.23	-24.3
9	.8115	22.48	Qp	0	0	10	32.48	56	-23.52	-	-
10	.80925	8.41	Ca	0	0	10	18.41	-	-	46	-27.59
11	13.56	48.02	Qp	.1	.2	10.1	58.42	60	-1.58	-	-
12	13.56	39.39	Ca	.1	.2	10.1	49.79	-	-	50	-.21

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1903_NFC_CE Mode_EUT_Adapter.DAT
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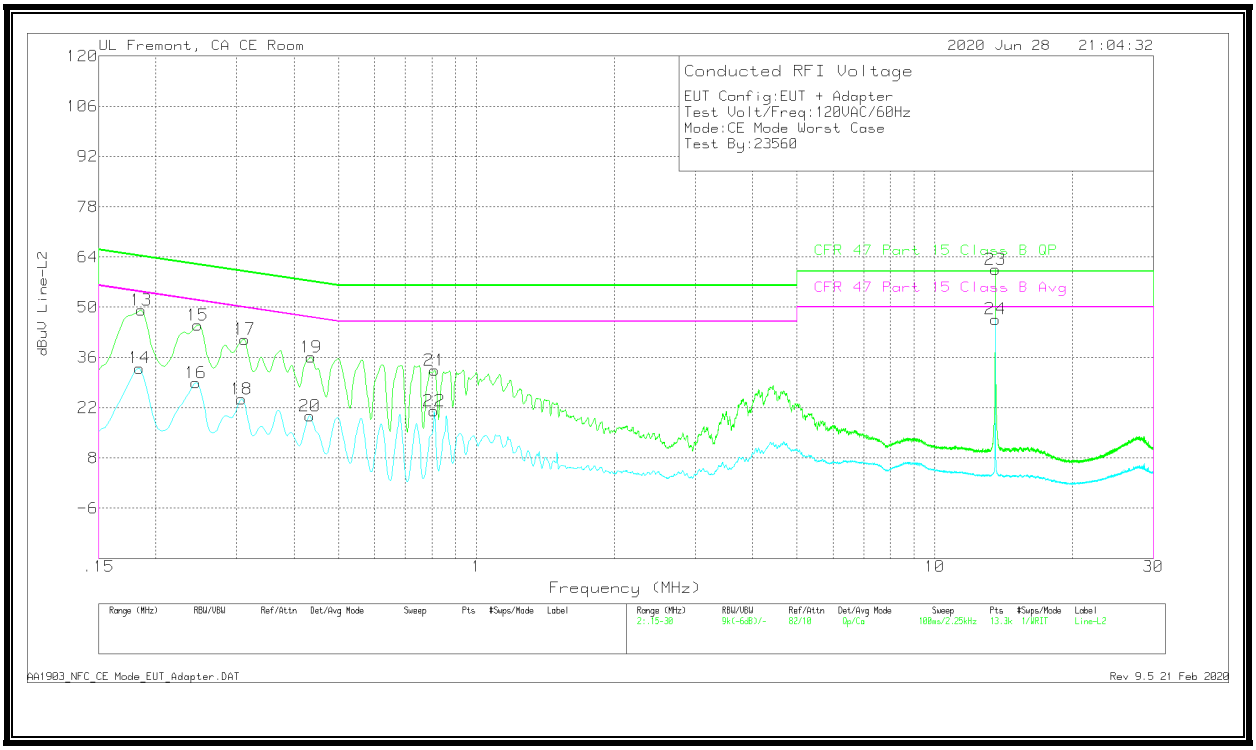
Note: 13.56MHz is a fundamental frequency of the EUT. Data under the following section 10.2.2 indicate that when the antenna terminal is terminated the fundamental amplitude is lowering below the limit line.

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	39.21	Qp	0	0	10	49.21	64.21	-15	-	-
14	.18375	23.07	Ca	0	0	10	33.07	-	-	54.31	-21.24
15	.24675	35.07	Qp	0	0	10	45.07	61.87	-16.8	-	-
16	.2445	19.04	Ca	0	0	10	29.04	-	-	51.94	-22.9
17	.312	31.09	Qp	0	0	10	41.09	59.92	-18.83	-	-
18	.3075	14.46	Ca	0	0	10	24.46	-	-	50.04	-25.58
19	.43575	26.09	Qp	0	0	10	36.09	57.14	-21.05	-	-
20	.4335	9.66	Ca	0	0	10	19.66	-	-	47.19	-27.53
21	.8115	22.52	Qp	0	0	10	32.52	56	-23.48	-	-
22	.80925	11.05	Ca	0	0	10	21.05	-	-	46	-24.95
23	13.56	50.08	Qp	.1	.2	10.1	60.48	**60**	**.48**	-	-
24	13.56	36.28	Ca	.1	.2	10.1	46.68	-	-	50	-3.32

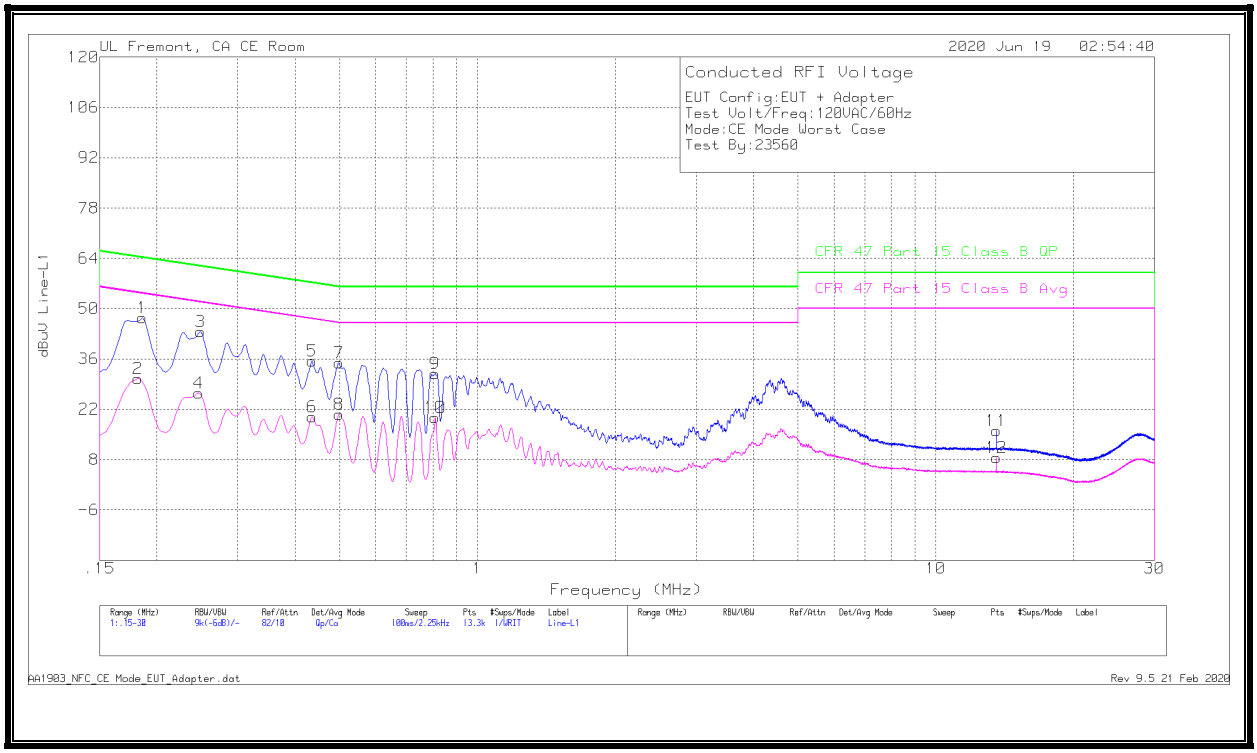
Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1903_NFC_CE Mode_EUT_Adapter.DAT
Rev 9.5 21 Feb 2020

Note: 13.56MHz is a fundamental frequency of the EUT. Data under the following section 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	37.42	Qp	0	0	10	47.42	64.21	-16.79	-	-
2	.1815	20.51	Ca	0	0	10	30.51	-	-	54.42	-23.91
3	.249	33.69	Qp	0	0	10	43.69	61.79	-18.1	-	-
4	.24675	16.53	Ca	0	0	10	26.53	-	-	51.87	-25.34
5	.43575	25.4	Qp	0	0	10	35.4	57.14	-21.74	-	-
6	.43575	9.9	Ca	0	0	10	19.9	-	-	47.14	-27.24
7	.49875	24.91	Qp	0	0	10	34.91	56.02	-21.11	-	-
8	.49988	10.55	Ca	0	0	10	20.55	-	-	46	-25.45
9	.80925	21.99	Qp	0	0	10	31.99	56	-24.01	-	-
10	.80925	9.8	Ca	0	0	10	19.8	-	-	46	-26.2
11	13.56	5.71	Qp	.1	.2	10.1	16.11	60	-43.89	-	-
12	13.56	-1.8	Ca	.1	.2	10.1	8.6	-	-	50	-41.4

Qp - Quasi-Peak detector
Ca - CISPR average detection

AA1903_NFC_CE Mode_EUT_Adapter.dat
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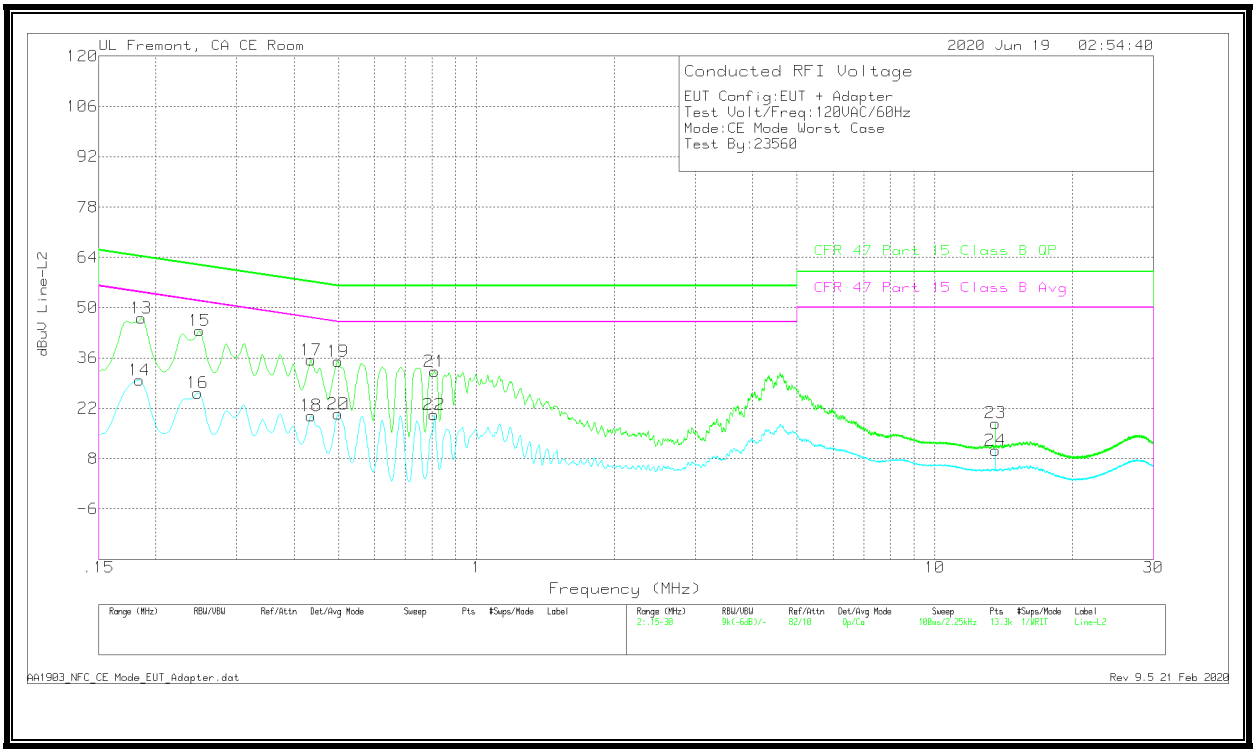
LINE 2 RESULTS



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	.186	37.17	Qp	0	0	10	47.17	64.21	-17.04	-	-
14	.18375	19.85	Ca	0	0	10	29.85	-	-	54.31	-24.46
15	.249	33.61	Qp	0	0	10	43.61	61.79	-18.18	-	-
16	.24675	16.27	Ca	0	0	10	26.27	-	-	51.87	-25.6
17	.43575	25.46	Qp	0	0	10	35.46	57.14	-21.68	-	-
18	.43575	9.98	Ca	0	0	10	19.98	-	-	47.14	-27.16
19	.49875	25.11	Qp	0	0	10	35.11	56.02	-20.91	-	-
20	.49988	10.46	Ca	0	0	10	20.46	-	-	46	-25.54
21	.8115	22.24	Qp	0	0	10	32.24	56	-23.76	-	-
22	.80925	10.27	Ca	0	0	10	20.27	-	-	46	-25.73
23	13.56	7.49	Qp	.1	.2	10.1	17.89	60	-42.11	-	-
24	13.56	-.18	Ca	.1	.2	10.1	10.22	-	-	50	-39.78

Qp - Quasi-Peak detector
Ca - CISPR average detection

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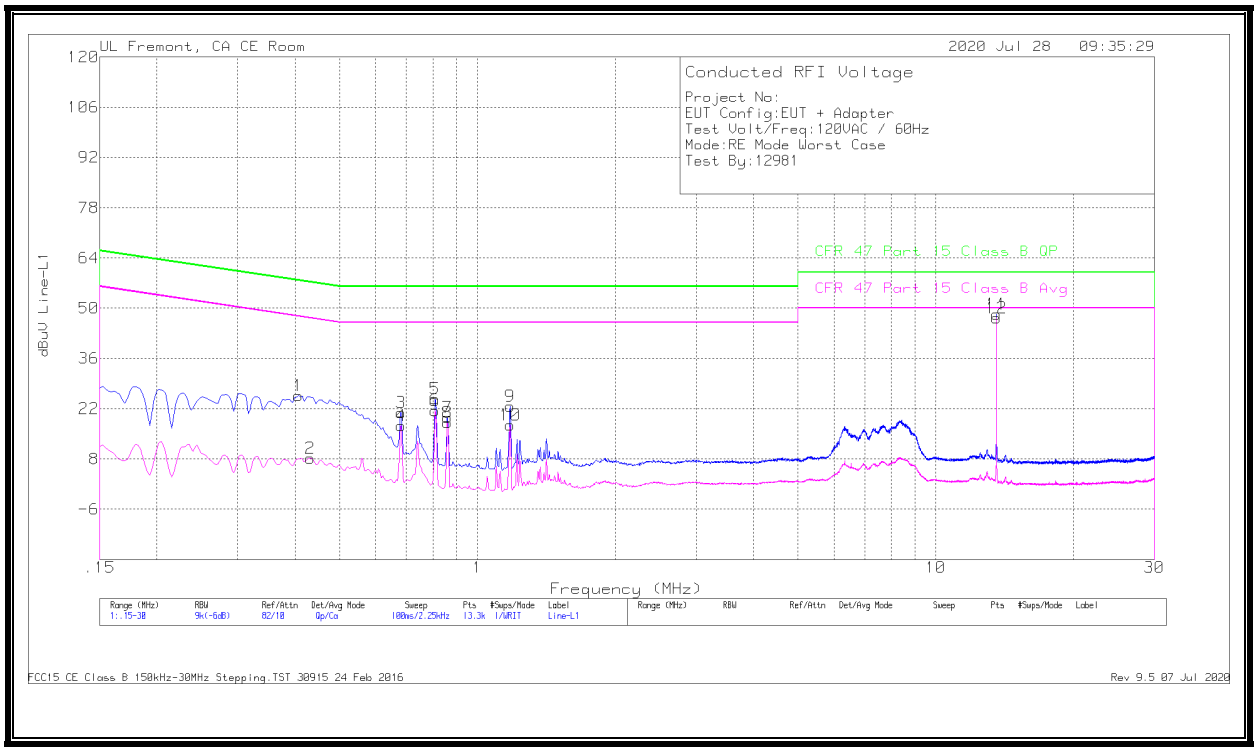
10.2. SECONDARY ANTENNA

10.2.1. READER MODE, NORMAL OPERATION

LINE 1 RESULTS



Worst Emission

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.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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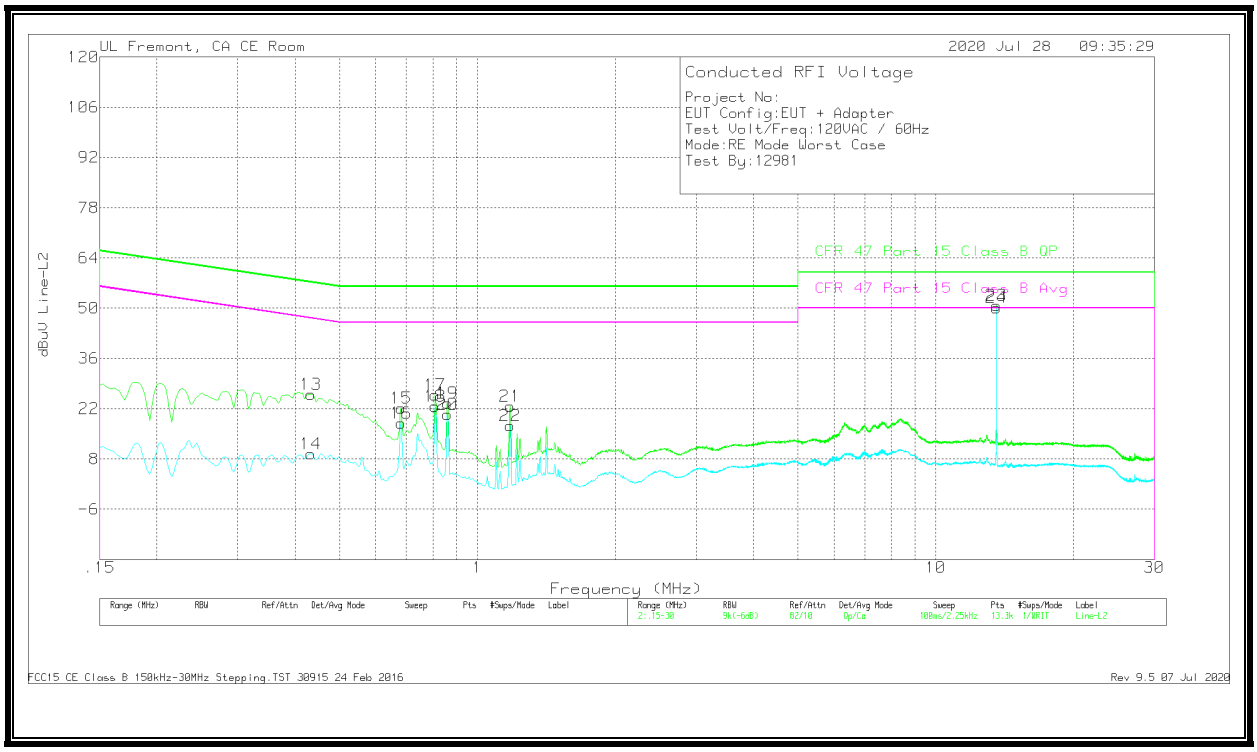
LINE 2 RESULTS



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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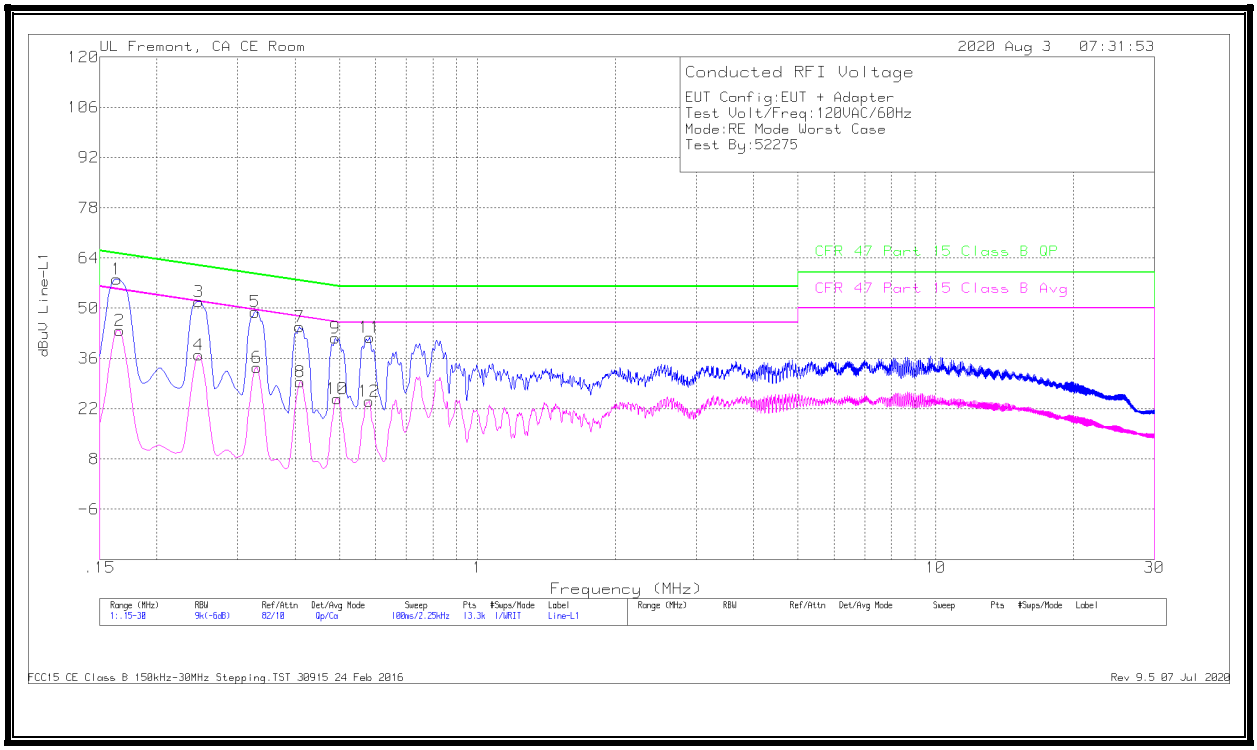
NORMAL OPERATION WITH ANTENNA PORT TERMINATED, 848Kbps

LINE 1 RESULTS



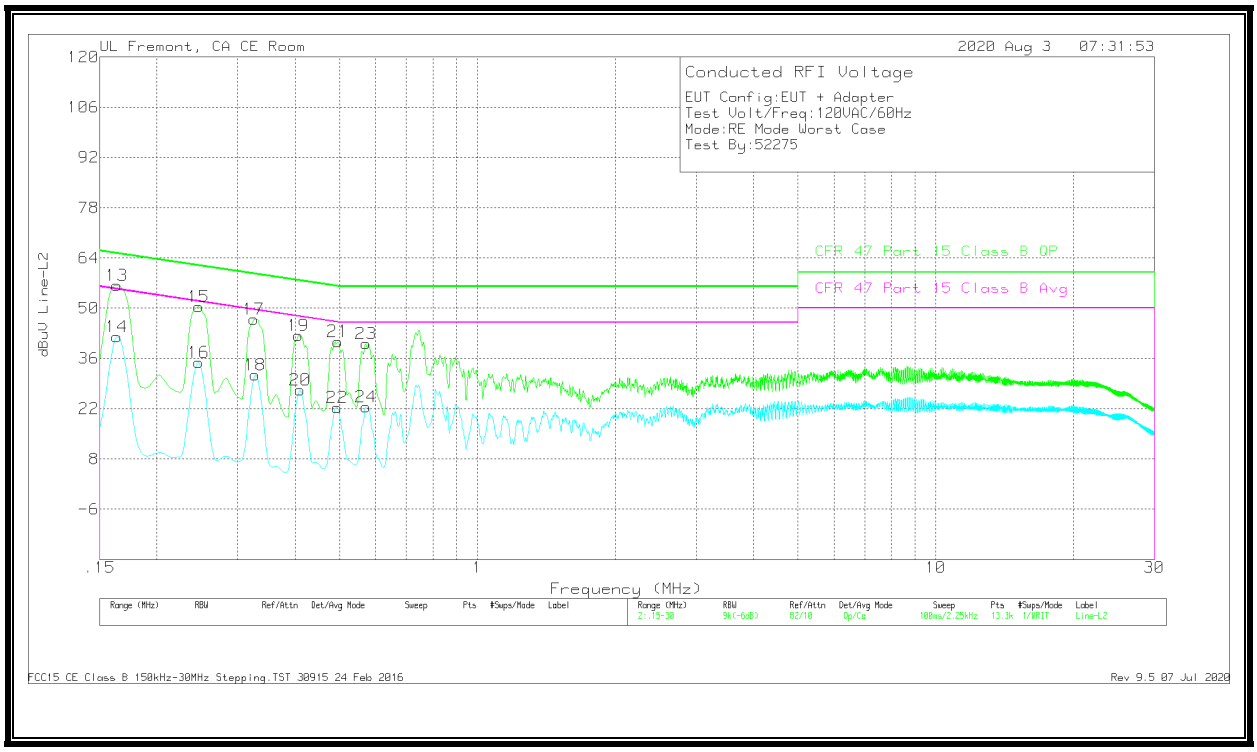
Worst Emission

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	.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

FCC15 CE Class B 150kHz-30MHz Stepping.TST 30915 24 Feb 2016
Rev 9.5 07 Jul 2020

LINE 2 RESULTS



Worst Emission

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)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

FCC15 CE Class B 150kHz-30MHz Stepping.TST 30915 24 Feb 2016
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11. SETUP PHOTOS

Please refer to 13179116-EP1V1 for setup photos.

END OF TEST REPORT

END OF TEST REPORT

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701I
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888