



# **CERTIFICATION TEST REPORT**

**Report Number. : 13146732-E13V1**

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

**Model :** A2399, A2400, A2401

**FCC ID :** BCG-E3541A

**IC :** 579C-E3541A

**EUT Description :** SMARTPHONE

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C  
ISED RSS-216 ISSUE 2  
ISED RSS-GEN ISSUE 5

**Date of Issue:**  
September 21, 2020

**Prepared by:**  
UL Verification Services Inc.  
47173 Benicia Street  
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## REPORT REVISION HISTORY

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

## TABLE OF CONTENTS

<b>REPORT REVISION HISTORY .....</b>	<b>2</b>
<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>4</b>
<b>2. TEST METHODOLOGY .....</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>5</b>
<b>4. DECISION RULES AND MEASUREMENT UNCERTAINTY .....</b>	<b>6</b>
4.1. <i>METROLOGICAL TRACEABILITY</i> .....	6
4.2. <i>DECISION RULES</i> .....	6
4.3. <i>MEASUREMENT UNCERTAINTY</i> .....	6
<b>5. INTRODUCTION OF TEST DATA REUSE.....</b>	<b>7</b>
5.1. <i>EUT DESCRIPTION</i> .....	7
5.2. <i>INTRODUCTION</i> .....	7
5.3. <i>DIFFERENCE IN MODEL NUMBER</i> .....	7
5.4. <i>SPOT CHECK VERIFICATION RESULTS SUMMARY</i> .....	7
5.4.1. FCC TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz .....	8
5.4.2. IC / CISPR 11 TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz .....	9
5.4.3. FCC TX SPURIOUS EMISSION 30 TO 1000 MHz .....	10
5.4.4. IC / CISPR 11 TX SPURIOUS EMISSION 30 TO 1000 MHz .....	12
5.5. <i>REFERENCE DETAIL</i> .....	14
5.6. <i>WORST-CASE CONFIGURATION AND MODE</i> .....	14
5.7. <i>DESCRIPTION OF TEST SETUP</i> .....	15
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>16</b>
<b>7. SETUP PHOTOS.....</b>	<b>16</b>
<b>Appendix A – Reference Test Report .....</b>	<b>17</b>

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
ONE APPLE PARK WAY  
CUPERTINO, CA 95014,

**EUT DESCRIPTION:** Smartphone

**MODEL:** A2399, A2400, A2401

**SERIAL NUMBER:** (Original): C7CCW023Q91T  
(Spot Check): C7CCT01RQ920

**DATE TESTED:** AUGUST 14-15, 2020

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Complies
ISED RSS-216 Issue 2	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:



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

Prepared By:



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Joe Vang  
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, and FCC CFR 47 Part 15, RSS-GEN Issue 5 and RSS-216 Issue 2 January 2016.

## 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 ISED Site Code:	47266 Benicia Street ISED Site Code:	47658 Kato Rd ISED Site Code:
<input type="checkbox"/> Chamber A (IC:2324B-1)	<input type="checkbox"/> Chamber D (IC:22541-1)	<input type="checkbox"/> Chamber I (IC: 2324A-5)
<input type="checkbox"/> Chamber B (IC:2324B-2)	<input type="checkbox"/> Chamber E (IC:22541-2)	<input type="checkbox"/> Chamber J (IC: 2324A-6)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input type="checkbox"/> Chamber F (IC:22541-3)	<input type="checkbox"/> Chamber K (IC: 2324A-1)
	<input checked="" type="checkbox"/> Chamber G (IC:22541-4)	<input type="checkbox"/> Chamber L (IC: 2324A-3)
	<input type="checkbox"/> Chamber H (IC:22541-5)	

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	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	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

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

### 5.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: BCG-E3539A, IC: 579C-E3539A to cover variant model BCG-E3541A, 579C-E3541A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

### 5.3. DIFFERENCE IN MODEL NUMBER

Models A2399, A2400, and A2401 are electrically identical and the model numbers are allocated for marketing and logistic purposes only. Model A2399 was used for the spot check testing described in this report.

### 5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2399, FCC ID: BCG-E3541A, IC: 579C-E3541A for radiated spurious and fundamental in accordance with the Test Plan that was approved via KDB inquiry..

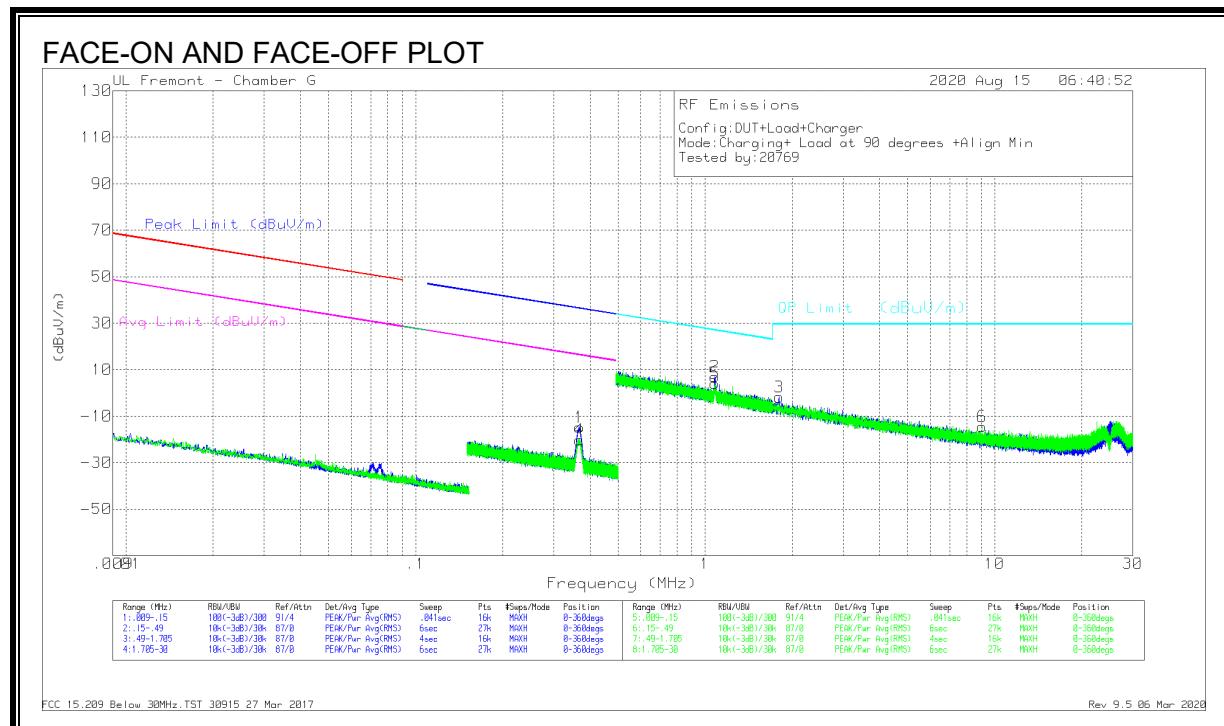
Item		Original model		Spot check model		Delta (dB)			
		A2176		A2399, A2400, A2401					
		BCG-E3539A, 579C-E3539A		BCG-E3541A, 579C-E3541A					
Frequency		FCC	IC	FCC	IC	FCC	IC		
Fundamental	360kHz	-12.95 dBuV/m	13.87 dBuA/m	-14.77 dBuV/m	9.19 dBuA/m	-1.82	-4.68		
RSE	30.4286 MHz (FCC) 59.52 MHz (IC)	32.22 dBuV/m	31.15 dBuV/m	27.99 dBuV/m	31.16dBuV/m	-4.23	0.01		

Comparison of the models, upper deviation is within 3dB range and all tests are under FCC Technical Limits. The test report for FCC ID: BCG-E3539A. IC: 579C-E3539A is therefore being used to support the application for certification for FCC ID: BCG-E3541A & IC: 579C-E3541A

**SPOT CHECK DATA**

**5.4.1. FCC TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz**

**OPERATING WITH LOAD**



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	.36746	48.65	Pk	11.1	.1	-80	-20.15	36.3	-56.45	16.3	-36.45	305
1	.3683	54.03	Pk	11.1	.1	-80	-14.77	36.28	-51.05	16.28	-31.05	33

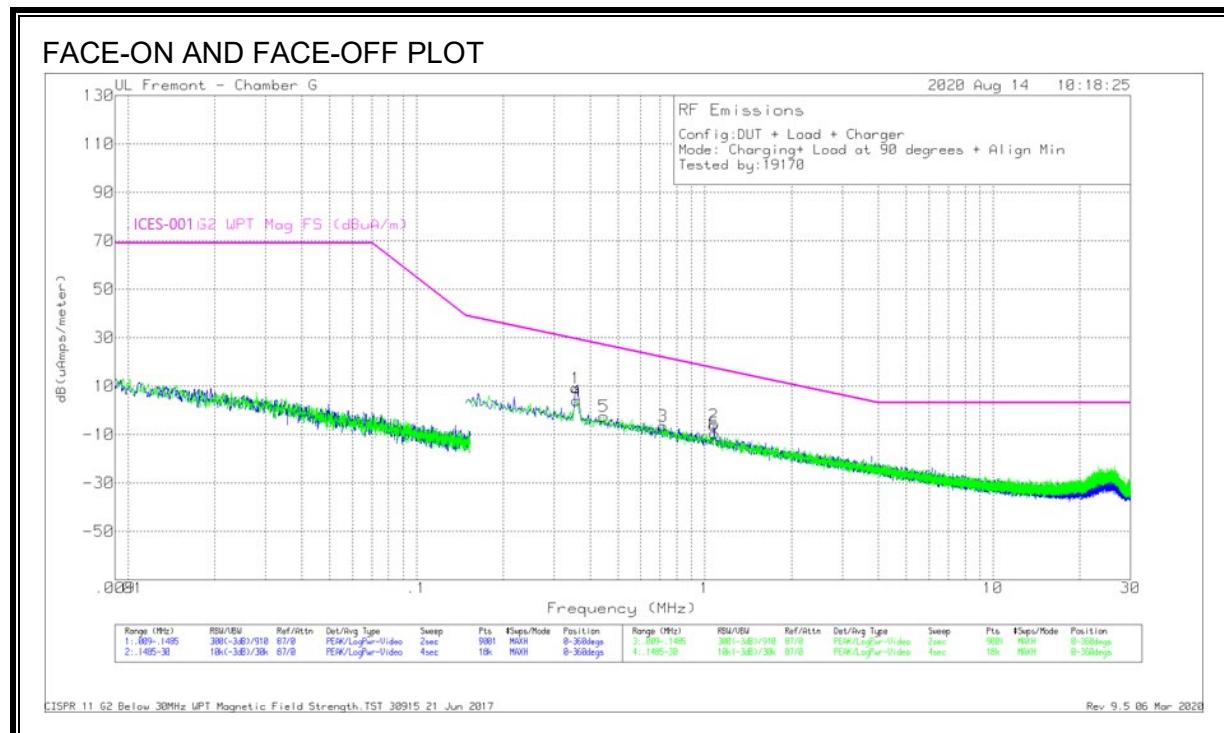
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
2	1.07991	36.13	Pk	10.8	.1	-40	7.03	26.96	-19.93	224
5	1.08158	33.24	Pk	10.8	.1	-40	4.14	26.94	-22.8	301
3	1.80037	27.21	Pk	10.8	.2	-40	-1.79	29.5	-31.29	279
6	9.05829	14.39	Pk	10.6	.5	-40	-14.51	29.5	-44.01	42

Pk - Peak detector

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

## 5.4.2. IC / CISPR 11 TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz

### OPERATING WITH LOAD



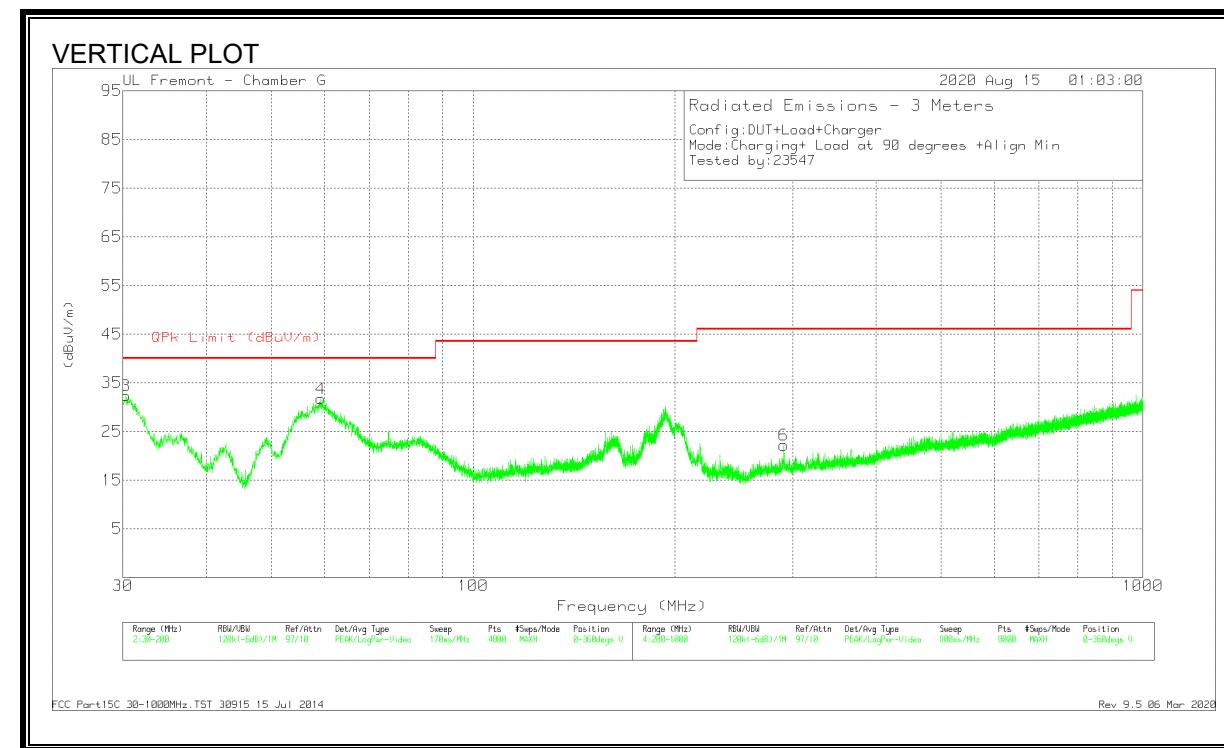
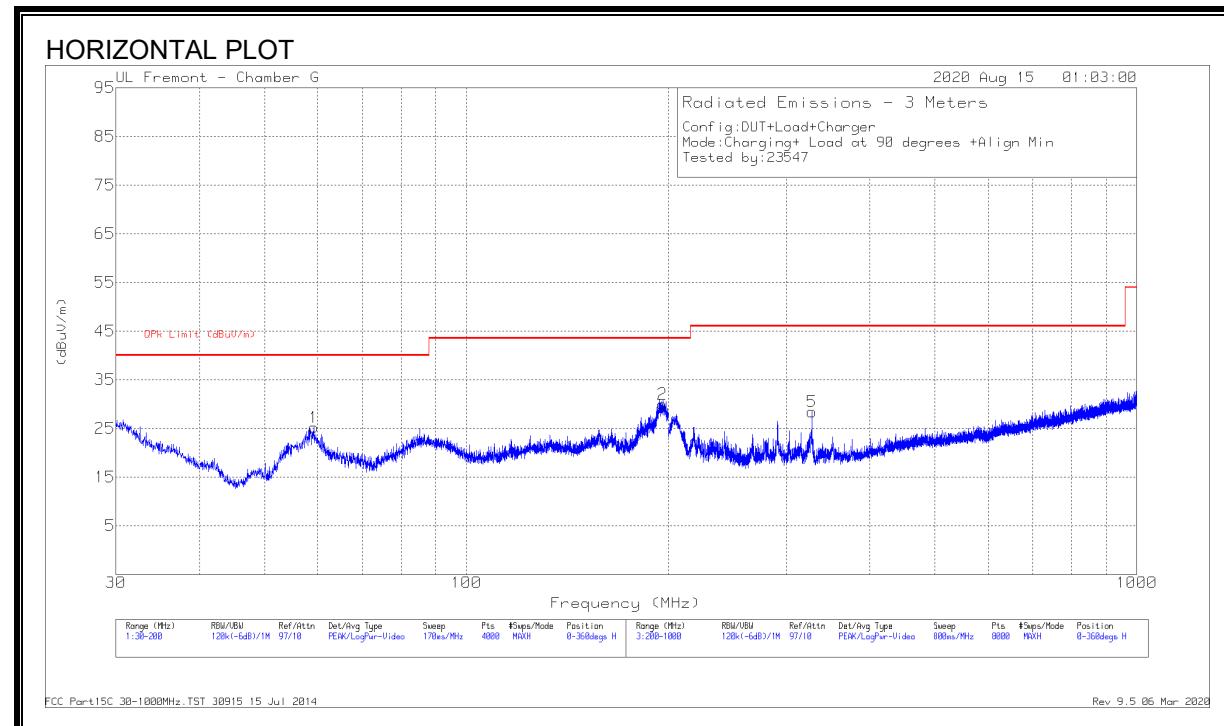
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Corrected Reading dB(uAmps/meter)	CISPR11 G2 WPT Mag FS (dBuA/m)	Margin (dB)	Azimuth (Degs)
1	.35741	49.69	Pk	-40.6	.1	9.19	29.4	-20.21	215
4	.35907	44.42	Pk	-40.6	.1	3.92	29.35	-25.43	293
5	.44694	37.94	Pk	-40.5	.1	-2.46	26.96	-29.42	300
3	.71719	33.89	Pk	-40.5	.1	-6.51	21.79	-28.3	335
2	1.07366	33.88	Pk	-40.2	.1	-6.22	17.38	-23.6	353
6	1.08195	30.59	Pk	-40.2	.1	-9.51	17.29	-26.8	294

Pk - Peak detector

CISPR 11 G2 Below 30MHz WPT Magnetic Field Strength.TST 30915 21 Jun 2017  
Rev 9.5 06 Mar 2020

### 5.4.3. FCC TX SPURIOUS EMISSION 30 TO 1000 MHz

#### OPERATING WITH LOAD



**DATA**

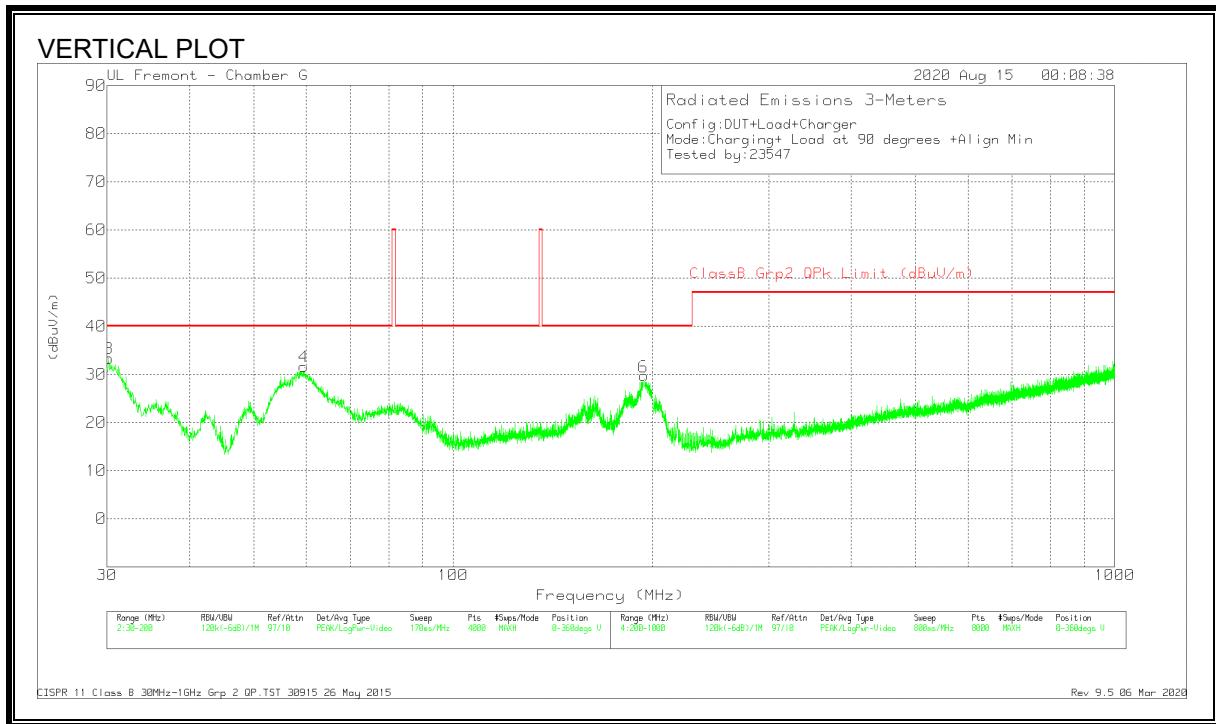
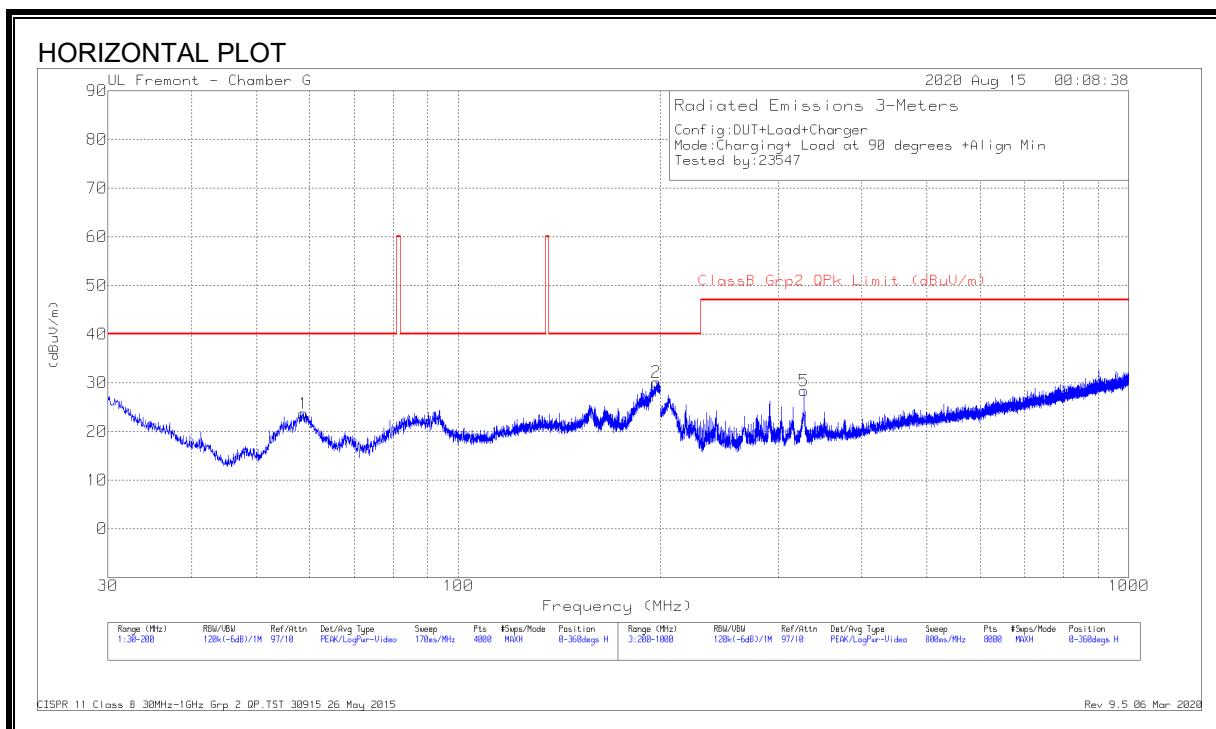
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 327.6435	35.8	Qp	20	-28.6	27.2	46.02	-18.82	194	101	H
3	30.4286	31.99	Qp	27	-31	27.99	40	-12.01	256	100	V
1	59.0695	37.29	Qp	13.4	-30.7	19.99	40	-20.01	196	225	H
4	59.4137	44.28	Qp	13.4	-30.7	26.98	40	-13.02	167	102	V
2	196.3053	36.06	Qp	17.9	-29.5	24.46	43.52	-19.06	146	103	H
6	291.234	28.38	Qp	19.4	-28.9	18.88	46.02	-27.14	31	244	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Qp - Quasi-Peak detector

#### 5.4.4. IC / CISPR 11 TX SPURIOUS EMISSION 30 TO 1000 MHz

##### OPERATING WITH LOAD



**DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	ClassB Grp2 QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	30.17	37.11	Pk	27.2	-31	33.31	40	-6.69	111	100	V
1	58.7374	41.01	Pk	13.4	-30.7	23.71	40	-16.29	233	201	H
4	59.5243	48.46	Pk	13.4	-30.7	31.16	40	-8.84	105	100	V
2	197.1533	41.64	Pk	18	-29.5	30.14	40	-9.86	114	99	H
6	193.6352	41.25	Pk	18	-29.5	29.75	47	-17.25	100	99	V
5	327.8166	36.99	Pk	20	-28.6	28.39	47	-18.61	109	99	H

Pk - Peak detector

CISPR 11 Class B 30MHz-1GHz Grp 2 QP.TST 30915 26 May 2015  
Rev 9.5 06 Mar 2020

## 5.5. 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	Report Title/Section
DCD	BCG-E3539A 579C-E3539A	13179110-E13	FCC IC_WPT Report / All sections

## 5.6. WORST-CASE CONFIGURATION AND MODE

The EUT is a smartphone which connected to the AC/DC adapter via USB-C cable, and the inductive charging coil to charge WPT accessories. For the entire radiated emissions test, the EUT was performed based on the worst case on model A2176.

Mode	Descriptions
Operating	EUT and Load powered by AC/DC adapter

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 300 m 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 D01.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT & PERIPHERALS

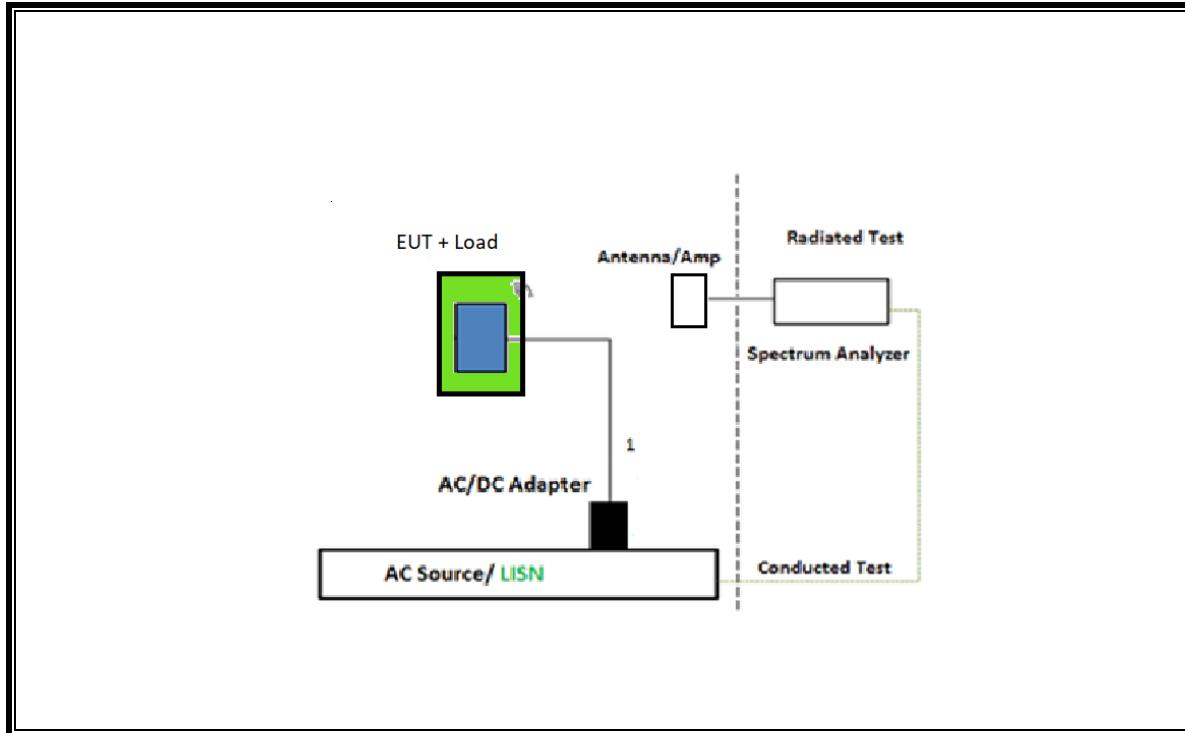
SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC/DC adapter	Apple	A2305	N/A	N/A
Phone	Apple	A2095	D92YT005MWC4	BCG-A2095
WPT Accessory	Apple	N/A	N/A	N/A

### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	USBC	Un-shielded	2	5W Power Supply

### TEST SETUP

#### OPERATING MODE PHONE WITH LOAD



## 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	T1616	10/28/2020	10/28/2019
*Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB	Sunol Sciences Crop.	JB3	T477	09/04/2020	09/04/2019
Amplifier, 10kHz to 1GHz, 32dB	Sonoma Instrument	310N	T834	07/14/2021	07/14/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A-544	T1113	03/02/2021	03/02/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2021	01/23/2020

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 13179110-EP1 for setup photos

## Appendix A – Reference Test Report

Attached is the test report (13179110-E13) containing the reference data from the parent model as detailed in section 5.5.

## END OF TEST REPORT



# **CERTIFICATION TEST REPORT**

**Report Number. : 13179110-E13V2**

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

**Model :** A2176

**FCC ID :** BCG-E3539A

**IC :** 579C-E3539A

**EUT Description :** Smartphone

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C  
ISED RSS-216 ISSUE 2

**Date Of Issue:**  
October 01, 2020

**Prepared by:**  
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Fremont, CA 94538 U.S.A.  
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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/21/2020	Initial Issue	Chin Pang
V2	10/01/2020	Addressed TCB Questions	Francisco Guarnero

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>4</b>
<b>2. TEST METHODOLOGY .....</b>	<b>5</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>5</b>
<b>4. DECISION RULES AND MEASUREMENT UNCERTAINTY .....</b>	<b>6</b>
4.1. <i>METROLOGICAL TRACEABILITY</i> .....	6
4.2. <i>DECISION RULES</i> .....	6
4.3. <i>MEASUREMENT UNCERTAINTY</i> .....	6
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>7</b>
5.1. <i>DESCRIPTION OF EUT</i> .....	7
5.2. <i>MAXIMUM E-FIELD and H-FIELD</i> .....	7
5.3. <i>WORST-CASE CONFIGURATION AND MODE</i> .....	7
5.4. <i>DESCRIPTION OF TEST SETUP</i> .....	8
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>9</b>
<b>7. OCCUPIED BANDWIDTH .....</b>	<b>10</b>
<b>8. RADIATED EMISSION TEST RESULTS.....</b>	<b>11</b>
8.1. <i>LIMITS AND PROCEDURE</i> .....	11
8.2. <i>EUT With Load</i> .....	12
8.2.1. FCC TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz .....	12
8.2.2. IC / CISPR 11 TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz .....	13
8.2.3. FCC TX SPURIOUS EMISSION 30 TO 1000 MHz .....	14
8.2.4. IC / CISPR 11 TX SPURIOUS EMISSION 30 TO 1000 MHz .....	16
<b>9. AC POWER LINE CONDUCTED EMISSIONS .....</b>	<b>18</b>
9.1. <i>EUT With Load</i> .....	19
9.1.1. OPERATING MODE WITH LOAD POWERED BY AC/DC ADAPTER .....	19
9.1.2. OPERATING MODE WITH LOAD POWERED BY HOST LAPTOP VIA USB CABLE .....	21
<b>10. SETUP PHOTOS .....</b>	<b>23</b>

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE, INC.  
ONE APPLE PARK WAY  
CUPERTINO, CA 95014,

**EUT DESCRIPTION:** Smartphone

**MODEL:** A2176

**SERIAL NUMBER:** C7CD601F08HL

**DATE TESTED:** AUGUST 13, 2020 – SEPTEMBER 10, 2020

APPLICABLE STANDARDS	
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Approved & Released For  
UL Verification Services Inc. By:



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

Prepared By:



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Joe Vang  
Test Engineer  
Consumer Technology Division  
UL Verification Services Inc.

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## 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	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	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 and H-FIELD

The transmitter has maximum peak radiated electric and magnetic field strength as follows:

Fundamental Frequency (KHz)	Mode	E field (300m distance) FCC (dBuV/m)	H field (3m distance) IC (dBuA/m)
360	Operating	-12.95	13.87

### 5.3. WORST-CASE CONFIGURATION AND MODE

The EUT is a smartphone which connected to the AC/DC adapter via USB-C cable, and the inductive charging coil to charge WPT accessories. For the entire radiated emissions test, the EUT was investigated on the following configuration during the test: 1. At its natural orientation with EUT set at center location, 2. EUT offset 2mm left and right, 3. EUT with 2mm spacer to find out the worst case location. And the worst case was at 2mm offset to the right and 3mm spacer.

Mode	Descriptions
Operating	EUT and Load powered by AC/DC adapter

For below 30MHz & 1GHz tests EUT was connected to AC power adapter as the worst case, For AC line conducted emission, test was investigated with AC power adapter.

The EUT was tested as operation modes. During operational mode, EUT was tested with Phone and load.

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 300 m 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 D01.

## 5.4. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT & PERIPHERALS

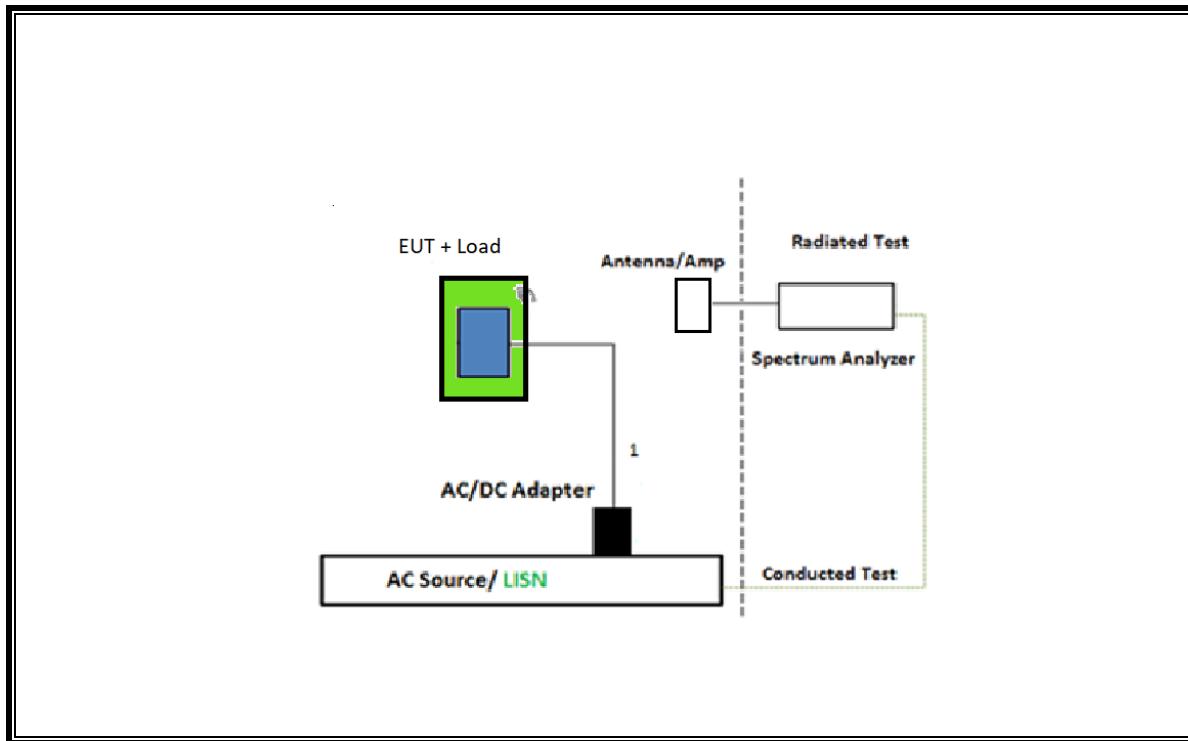
SUPPORT EQUIPMENT & PERIPHERALS LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC/DC adapter	Apple	A2305	N/A	N/A
WPT Accessory	Apple	N/A	N/A	N/A

### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	USBC	Un-shielded	2	5W Power Supply

### TEST SETUP

#### OPERATING MODE PHONE WITH LOAD



## 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	T1616	10/28/2020	10/28/2019
*Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB	Sunol Sciences Crop.	JB3	T477	09/04/2020	09/04/2019
Amplifier, 10kHz to 1GHz, 32dB	Sonoma Instrument	310N	T834	07/14/2021	07/14/2020
Sniffer Probes	Electro Metrics	EM-6992	N/A	NA	NA
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A-544	T1113	03/02/2021	03/02/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2021	01/23/2020

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		

## 7. OCCUPIED BANDWIDTH

### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 300Hz. 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-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



## 8. RADIATED EMISSION TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.209 (a)

ICES-001 Section 3.3.4, IC RSS-216 6.2.2, and IC RSS-GEN Sections 8.9 and 8.10.

Frequency (MHz)	Field Strength (microvolts/meter)	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 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3

Note: The lower limit shall apply at the transition frequency.

ICES-001 Issue 5 Table 2 & Table 4:

**Table 2: Magnetic field strength radiated emission limits for induction cooking appliances**

Frequency range (MHz)	Quasi-peak, at 3 m distance (dB $\mu$ A/m)
0.009 – 0.07	69
0.07 – 0.15	69 to 39 *
0.15 – 30	39 to 7 *
*	The limit level in dB $\mu$ A/m decreases linearly with the logarithm of frequency.

**Table 4: Electric field strength radiated emission limits for induction cooking appliances**

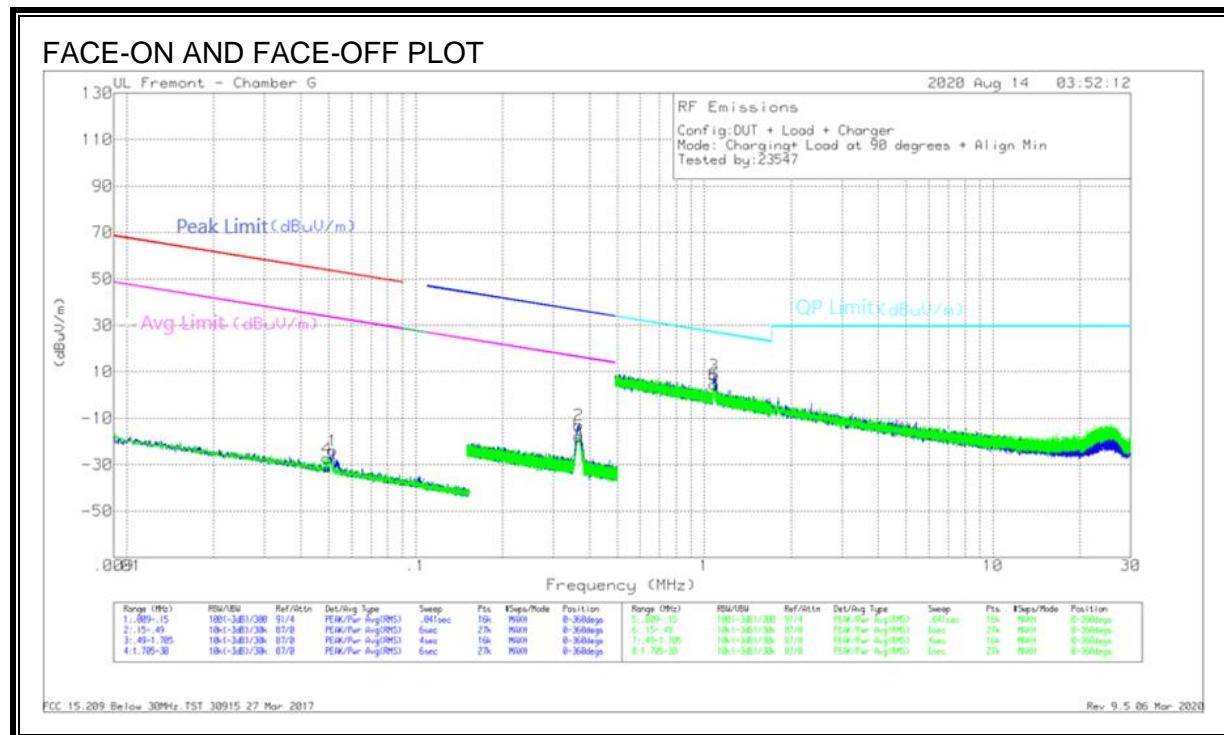
Frequency range (MHz)	OATS or SAC *	OATS or SAC *	FAR *
	10 m measurement distance Quasi-peak (dB $\mu$ V/m)	3 m measurement distance Quasi-peak (dB $\mu$ V/m)	3 m measurement distance Quasi-peak (dB $\mu$ V/m)
30 – 230	30	40	42 to 35**
230 – 1000	37	47	42
<b>Note:</b> The more stringent limit applies at the transition frequency.			
* OATS = open-area test site, SAC = semi-anechoic chamber, FAR = fully-anechoic room (see CSA CISPR 11:19).			
** The limit level in dB $\mu$ V/m decreases linearly with the logarithm of frequency.			

#### RESULTS

## 8.2. EUT With Load

### 8.2.1. FCC TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz

#### OPERATING WITH LOAD



#### 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	.04939	39.85	Pk	12.7	.1	-80	-27.35	53.71	-81.06	33.71	-61.06	100
1	.05175	43.25	Pk	12.7	.1	-80	-23.95	53.31	-77.26	33.31	-57.26	100
5	.36765	51.04	Pk	11.1	.1	-80	-17.76	36.3	-54.06	16.3	-34.06	124
2	.36767	55.85	Pk	11.1	.1	-80	-12.95	36.3	-49.25	16.3	-29.25	336

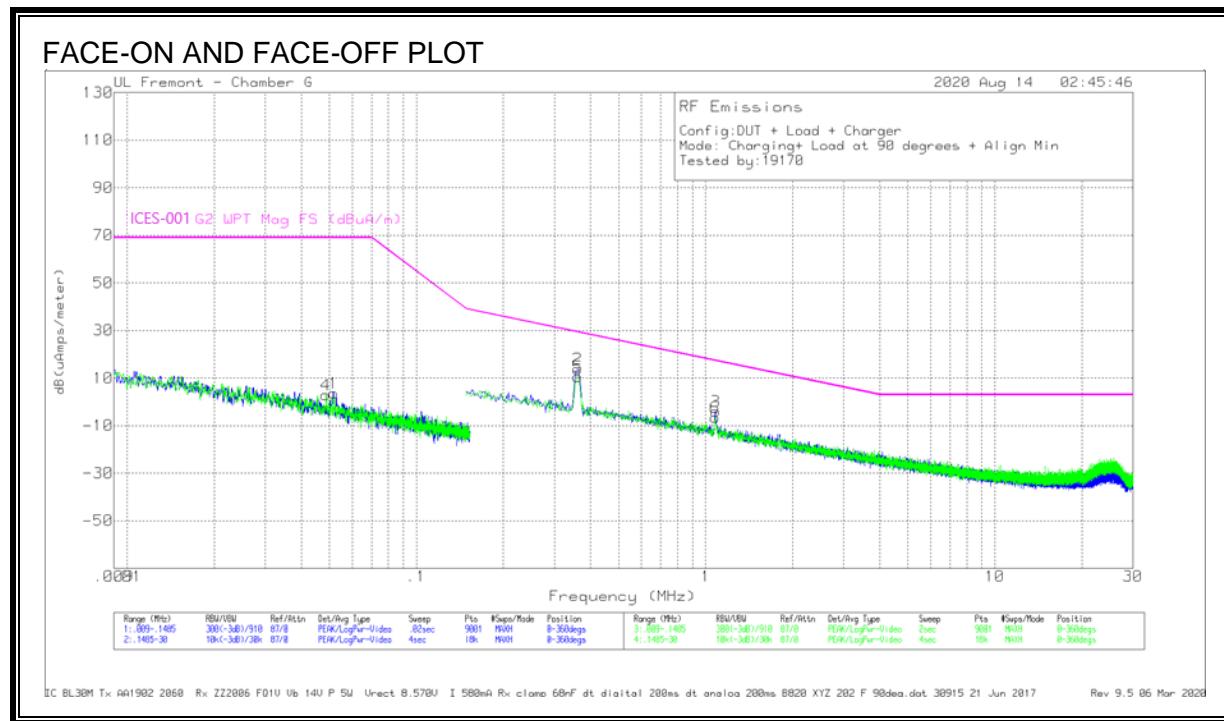
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 30m	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.08029	37.58	Pk	10.8	.1	-40	8.48	26.95	-18.47	174
6	1.08196	33.81	Pk	10.8	.1	-40	4.71	26.94	-22.23	69

Pk - Peak detector

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

## 8.2.2. IC / CISPR 11 TX FUNDAMENTAL AND SPURIOUS EMISSIONS FROM 9 kHz TO 30 MHz

### OPERATING WITH LOAD



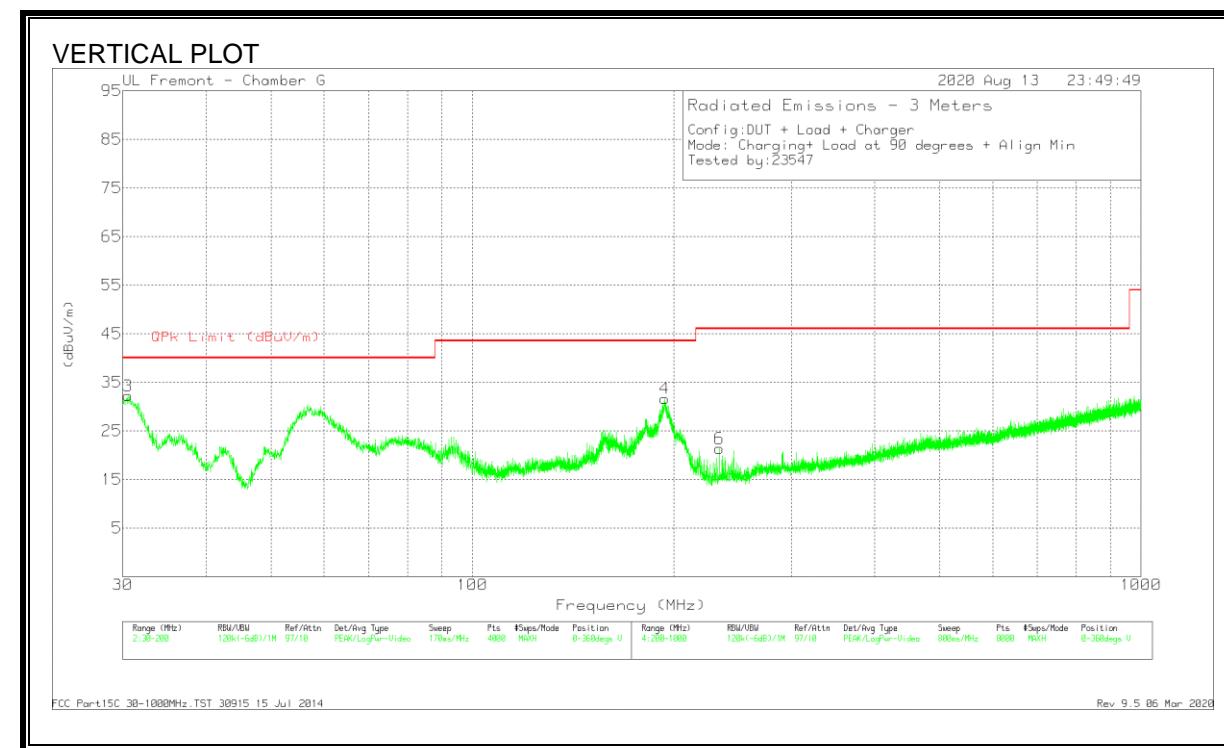
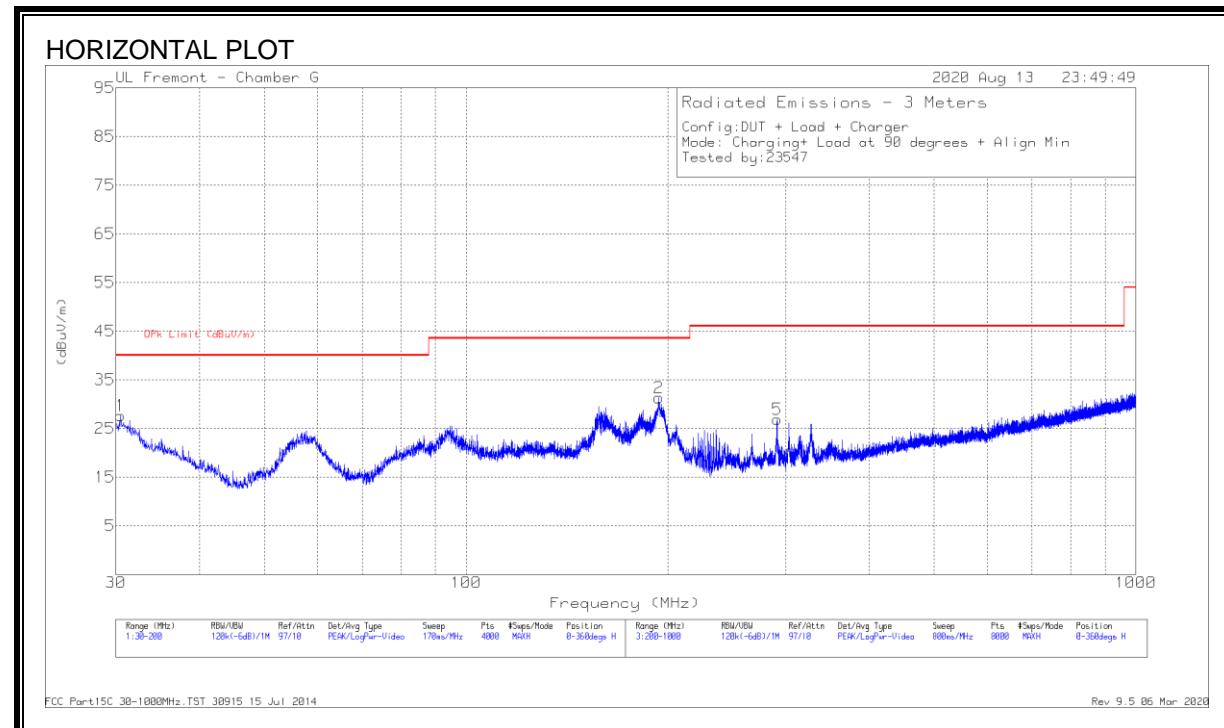
### DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Corrected Reading dB(uAmps/meter)	CISPR11 G2 WPT Mag FS (dBuA/m)	Margin (dB)	Azimuth (Degs)
4	.04871	41.73	Pk	-38.9	.1	2.93	69	-66.07	217
1	.05169	42.52	Pk	-39	.1	3.62	69	-65.38	342
2	.36072	54.37	Pk	-40.6	.1	13.87	29.3	-15.43	35
5	.36072	51.06	Pk	-40.6	.1	10.56	29.3	-18.74	306
6	1.07864	33.54	Pk	-40.2	.1	-6.56	17.33	-23.89	298
3	1.08195	36.13	Pk	-40.2	.1	-3.97	17.29	-21.26	37

Pk - Peak detector

### 8.2.3. FCC TX SPURIOUS EMISSION 30 TO 1000 MHz

#### OPERATING WITH LOAD



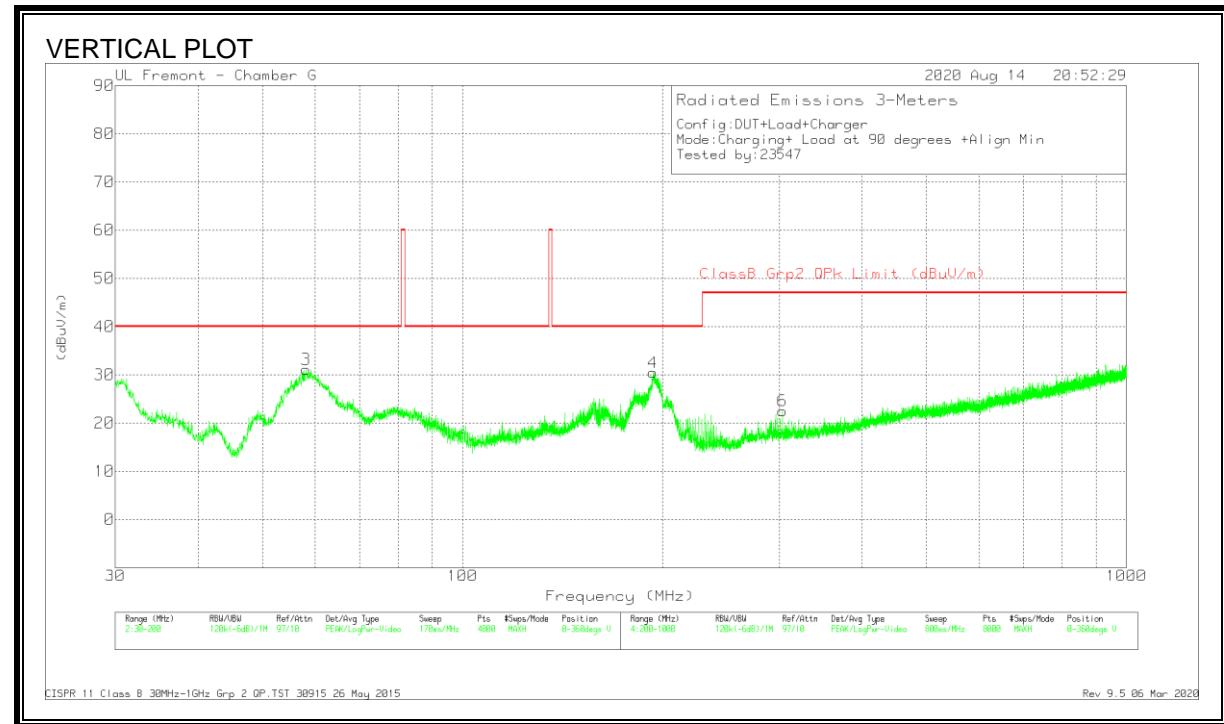
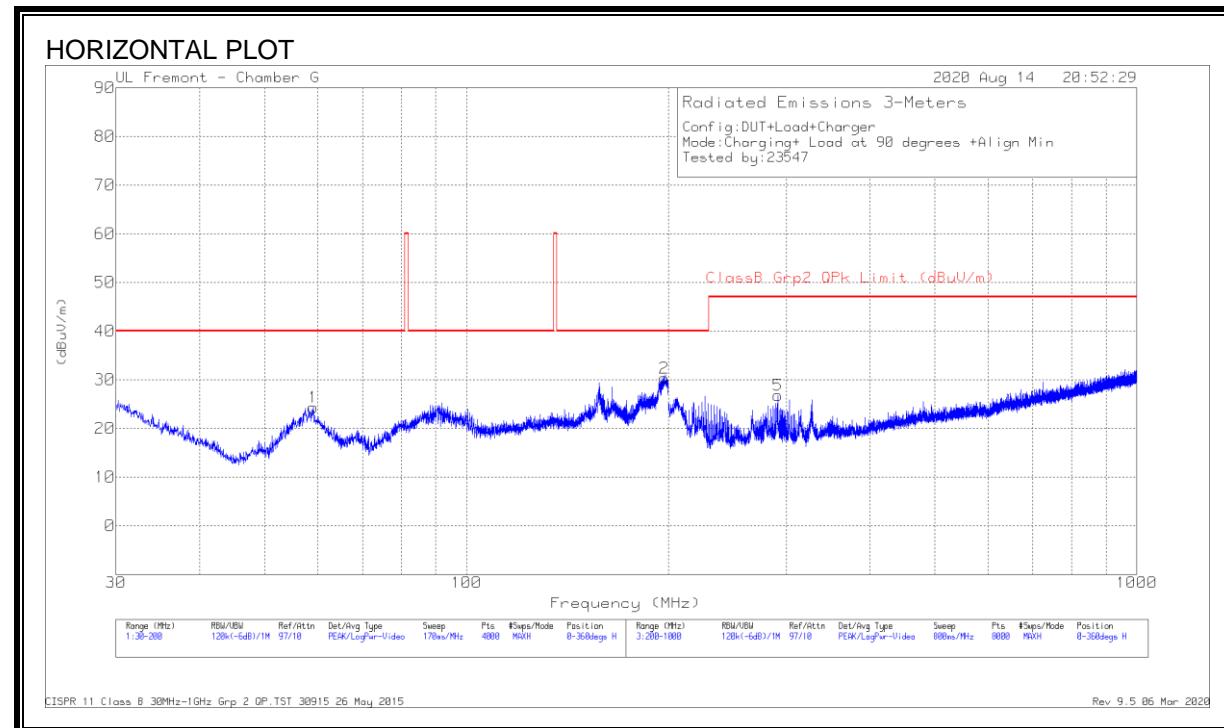
**DATA**

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
1	30.5101	31.64	Pk	27	-31	27.64	40	-12.36	0-360	99	H
3	30.5526	36.22	Pk	27	-31	32.22	40	-7.78	0-360	100	V
2	194.0074	43.21	Pk	17.6	-29.5	31.31	43.52	-12.21	0-360	99	H
4	194.0074	43.57	Pk	17.6	-29.5	31.67	43.52	-11.85	0-360	100	V
6	234.0044	33.3	Pk	17.4	-29.3	21.4	46.02	-24.62	0-360	301	V
5	291.4119	36.38	Pk	19.4	-28.9	26.88	46.02	-19.14	0-360	99	H

Pk - Peak detector

## 8.2.4. IC / CISPR 11 TX SPURIOUS EMISSION 30 TO 1000 MHz

### OPERATING WITH LOAD



**DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	ClassB Grp2 QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	58.1423	48.45	Pk	13.4	-30.7	31.15	40	-8.85	0-360	100	V
1	59.0775	41.61	Pk	13.4	-30.7	24.31	40	-15.69	0-360	201	H
4	193.6248	42.37	Pk	17.6	-29.5	30.47	40	-9.53	0-360	100	V
2	197.4083	41.75	Pk	18.1	-29.5	30.35	40	-9.65	0-360	99	H
5	291.4119	36.3	Pk	19.4	-28.9	26.8	47	-20.2	0-360	100	H
6	303.3134	31.84	Pk	19.5	-28.8	22.54	47	-24.46	0-360	100	V

Pk - Peak detector

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

ICES-001 Issue 5 Table 1:

**Table 1: Conducted emission limits for induction cooking appliances (AC mains terminals)**

Frequency range (MHz)	Appliances rated 100 V, without an earth connection	Appliances rated 100 V, without an earth connection	All other appliances	All other appliances
	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)
0.009 – 0.05	122	—	110	—
0.05 – 0.15	102 to 92 *	—	90 to 80 *	—
0.15 – 0.5	72 to 62 *	62 to 52 *	66 to 56 *	56 to 46 *
0.5 – 5	56	46	56	46
5 – 30	60	50	60	50

**Note:** The more stringent limit applies at transition frequencies.  
**\*** The limit level in dB $\mu$ V decreases linearly with the logarithm of frequency.

### 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.

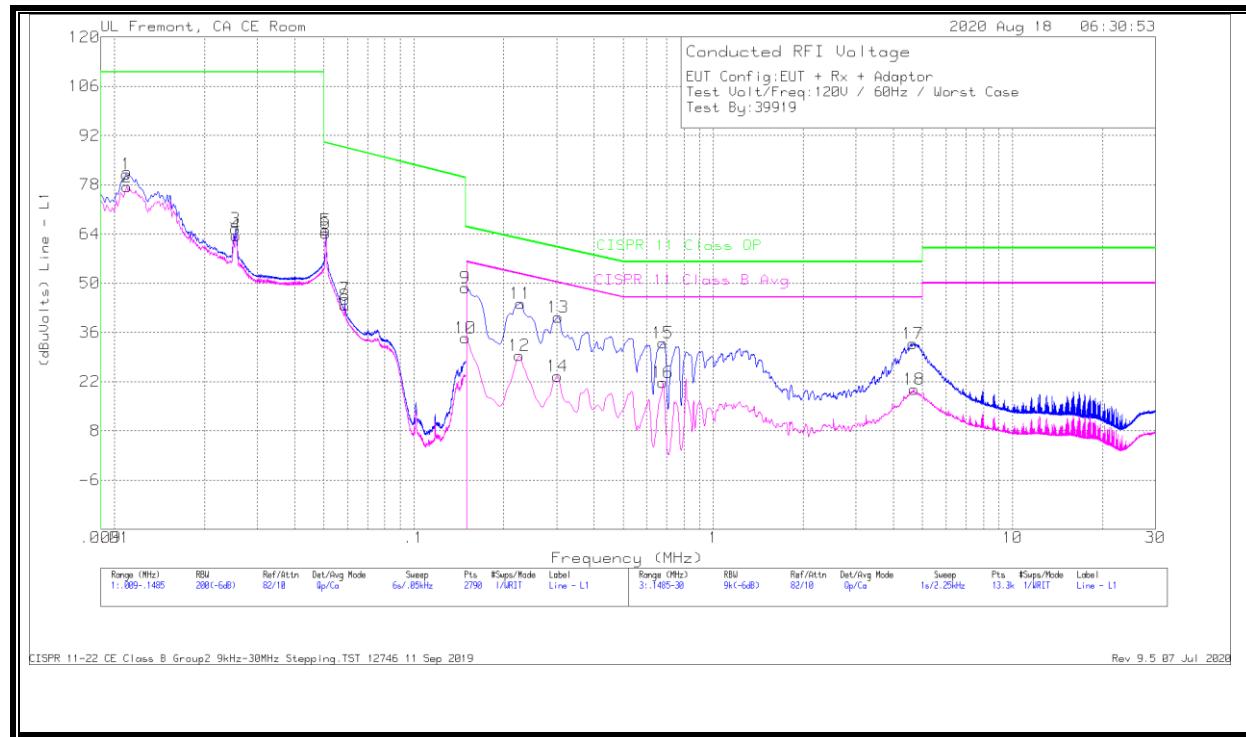
### RESULTS

Note: The limits on the plots from 150kHz – 30MHz cover both ICES-001 and FCC Part 15.207.

## 9.1. EUT With Load

### 9.1.1. OPERATING MODE WITH LOAD POWERED BY AC/DC ADAPTER

#### LINE 1 RESULTS



#### WORST EMISSIONS

##### Range 1: Line - L1 .009 - .1485MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
1	.01095	70.43	Qp	.1	0	10.5	81.03	110	-28.97	-	-
2	.011	66.73	Ca	.1	0	10.5	77.33	-	-	-	-
3	.02524	55.32	Qp	.1	0	10.1	65.52	110	-44.48	-	-
4	.02545	53.39	Ca	.1	0	10.1	63.59	-	-	-	-
5	.0508	55.05	Qp	.1	0	10	65.15	89.85	-24.7	-	-
6	.05075	54.14	Ca	.1	0	10	64.24	-	-	-	-
7	.0589	35.46	Qp	.1	0	10	45.56	88.5	-42.94	-	-
8	.0589	33.61	Ca	.1	0	10	43.71	-	-	-	-

##### Range 3: Line - L1 .1485 - 30MHz

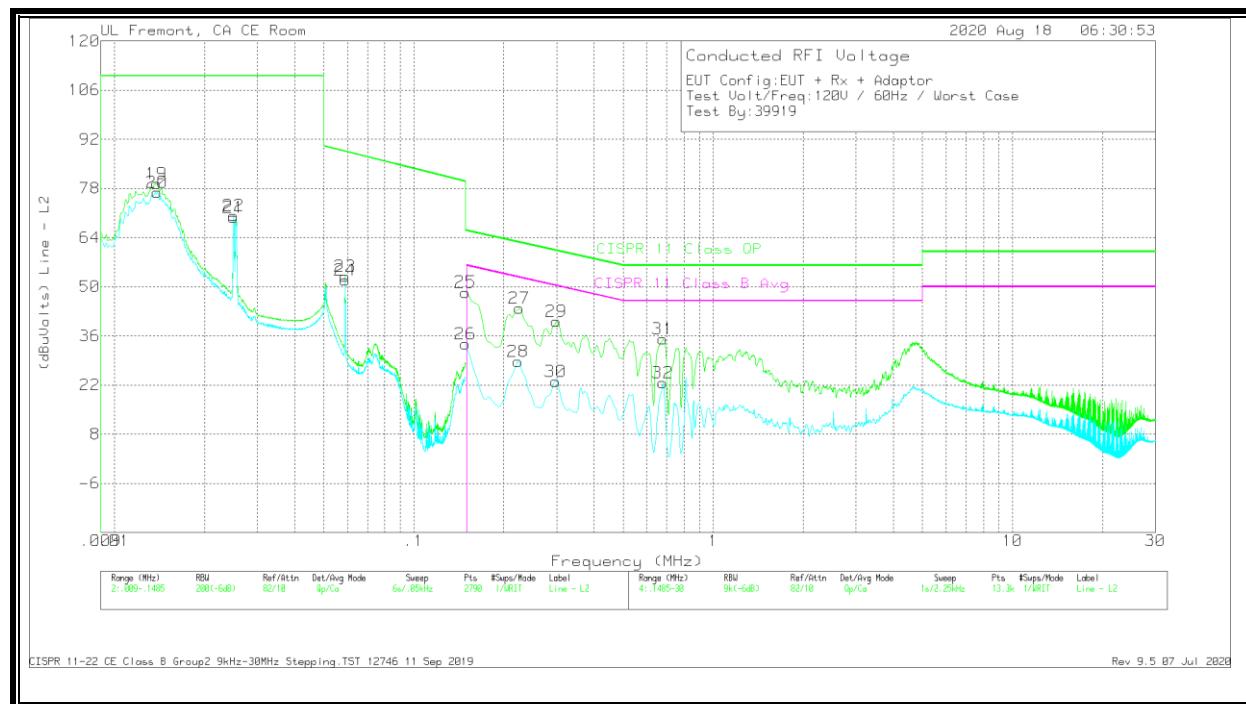
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
9	.1485	38.59	Qp	.1	0	10	48.69	66	-17.31	-	-
10	.1485	24.28	Ca	.1	0	10	34.38	-	-	-	-
11	.22725	34.23	Qp	0	0	10	44.23	62.5	-18.27	-	-
12	.225	19.35	Ca	0	0	10	29.35	-	52.63	-23.28	-
13	.30375	30.25	Qp	0	0	10	40.25	60.11	-19.86	-	-
14	.3015	13.61	Ca	0	0	10	23.61	-	50.2	-26.59	-
15	.6795	22.94	Qp	0	0	10	32.94	56	-23.06	-	-
16	.6795	11.78	Ca	0	0	10	21.78	-	46	-24.22	-
17	4.65075	22.64	Qp	0	.1	10.1	32.84	56	-23.16	-	-
18	4.68	9.59	Ca	0	.1	10.1	19.79	-	46	-26.21	-

Qp - Quasi-Peak detector

Ca - CISPR average detection

CISPR 11-22 CE Class B Group2 9kHz-30MHz Stepping.TST 12746 11 Sep 2019  
Rev 9.5 07 Jul 2020

## LINE 2 RESULTS



## WORST EMISSIONS

### Range 2: Line - L2 .009 - .1485MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
19	.0138	68.9	Qp	.1	0	10.4	79.4	110	-30.6	-	-
20	.0139	66.32	Ca	.1	0	10.4	76.82	-	-	-	-
21	.025	59.6	Qp	.1	0	10.1	69.8	110	-40.2	-	-
22	.025	60.07	Ca	.1	0	10.1	70.27	-	-	-	-
23	.05895	42.93	Qp	.1	0	10	53.03	88.49	-35.46	-	-
24	.05895	41.73	Ca	.1	0	10	51.83	-	-	-	-

### Range 4: Line - L2 .1485 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
25	.1485	38.32	Qp	.1	0	10	48.42	66	-17.58	-	-
26	.1485	23.68	Ca	.1	0	10	33.78	-	-	-	-
27	.225	33.84	Qp	0	0	10	43.84	62.58	-18.74	-	-
28	.22275	18.66	Ca	0	0	10	28.66	-	-	52.72	-24.06
29	.29925	30.12	Qp	0	0	10	40.12	60.23	-20.11	-	-
30	.297	13.07	Ca	0	0	10	23.07	-	-	50.33	-27.26
31	.6795	25.1	Qp	0	0	10	35.1	56	-20.9	-	-
32	.6795	12.58	Ca	0	0	10	22.58	-	-	46	-23.42

Qp - Quasi-Peak detector

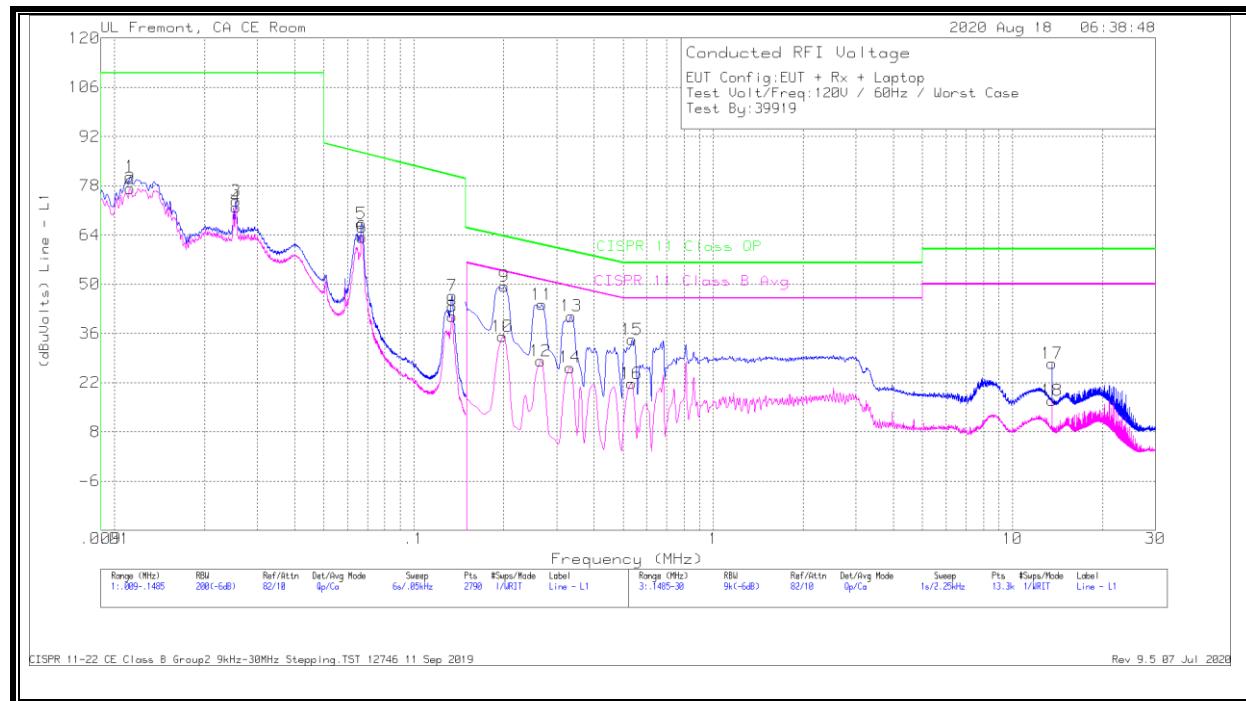
Ca - CISPR average detection

CISPR 11-22 CE Class B Group2 9kHz-30MHz Stepping.TST 12746 11 Sep 2019

Rev 9.5 07 Jul 2020

## 9.1.2. OPERATING MODE WITH LOAD POWERED BY HOST LAPTOP VIA USB CABLE

### LINE 1 RESULTS



### WORST EMISSIONS

#### Range 1: Line - L1 .009 - .1485MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
1	.0113	69.95	Qp	.1	0	10.5	80.55	110	-29.45	-	-
2	.0113	66.61	Ca	.1	0	10.5	77.21	-	-	-	-
3	.02545	63.39	Qp	.1	0	10.1	73.59	110	-36.41	-	-
4	.02545	61.68	Ca	.1	0	10.1	71.88	-	-	-	-
5	.06695	57.21	Qp	.1	0	10	67.31	87.32	-20.01	-	-
6	.067	53.3	Ca	.1	0	10	63.4	-	-	-	-
7	.13425	36.58	Qp	.1	0	10	46.68	80.93	-34.25	-	-
8	.1344	30.79	Ca	.1	0	10	40.89	-	-	-	-

#### Range 3: Line - L1 .1485 - 30MHz

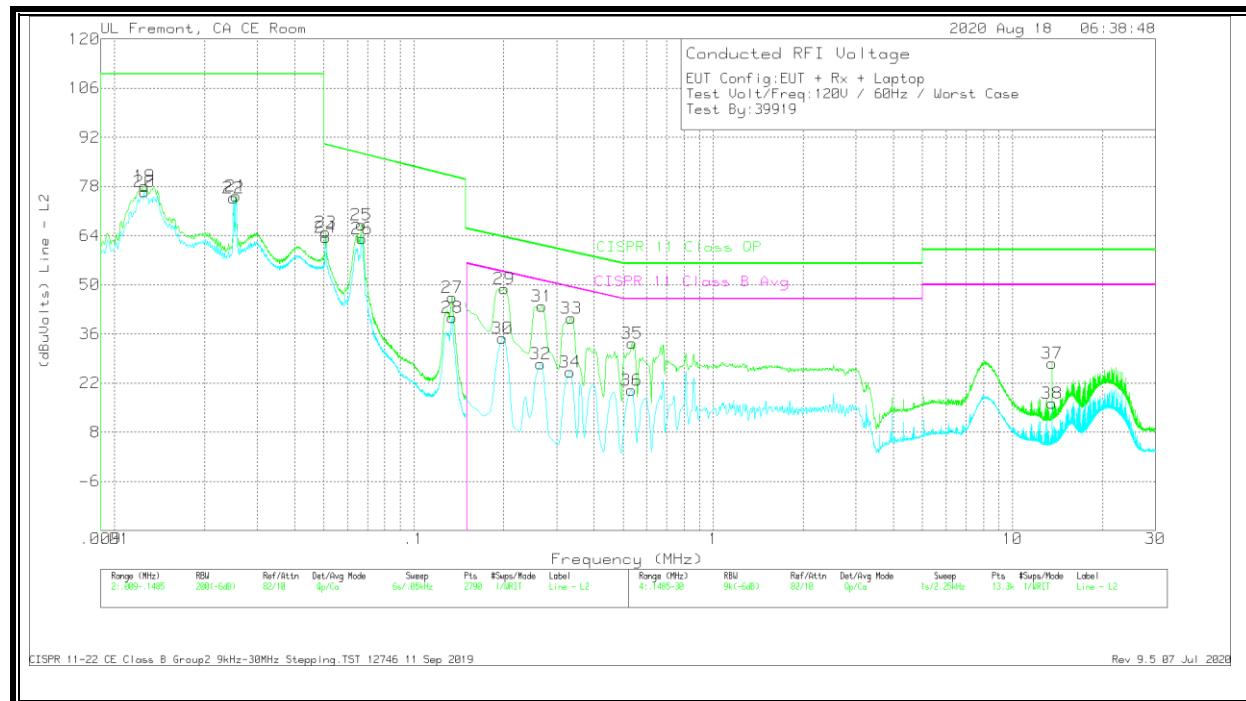
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
9	.20025	39.34	Qp	0	0	10	49.34	63.54	-14.2	-	-
10	.198	25.13	Ca	0	0	10	35.13	-	-	53.69	-18.56
11	.26775	34.28	Qp	0	0	10	44.28	61.14	-16.86	-	-
12	.2655	18.1	Ca	0	0	10	28.1	-	-	51.26	-23.16
13	.33525	30.93	Qp	0	0	10	40.93	59.29	-18.36	-	-
14	.333	16.3	Ca	0	0	10	26.3	-	-	49.38	-23.08
15	.5355	24.23	Qp	0	0	10	34.23	56	-21.77	-	-
16	.53325	11.72	Ca	0	0	10	21.72	-	-	46	-24.28
17	13.56075	17.13	Qp	.1	.2	10.1	27.53	60	-32.47	-	-
18	13.56075	6.6	Ca	.1	.2	10.1	17	-	-	50	-33

Qp - Quasi-Peak detector

Ca - CISPR average detection

CISPR 11-22 CE Class B Group2 9kHz-30MHz Stepping.TST 12746 11 Sep 2019  
Rev 9.5 07 Jul 2020

## LINE 2 RESULTS



## WORST EMISSIONS

### Range 2: Line - L2 .009 - .1485MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
19	.0126	67.44	Qp	.1	0	10.5	78.04	110	-31.96	-	-
20	.0126	65.91	Ca	.1	0	10.5	76.51	-	-	-	-
21	.02545	65.07	Qp	.1	0	10.1	75.27	110	-34.73	-	-
22	.025	64.53	Ca	.1	0	10.1	74.73	-	-	-	-
23	.05075	54.89	Qp	.1	0	10	64.99	89.86	-24.87	-	-
24	.05075	53.35	Ca	.1	0	10	63.45	-	-	-	-
25	.0669	56.97	Qp	.1	0	10	67.07	87.33	-20.26	-	-
26	.067	53.02	Ca	.1	0	10	63.12	-	-	-	-
27	.1342	36.35	Qp	.1	0	10	46.45	80.93	-34.48	-	-
28	.13433	30.51	Ca	.1	0	10	40.61	-	-	-	-

### Range 4: Line - L2 .1485 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading (dBuVolts)	CISPR 11 Class QP	Margin (dB)	CISPR 11 Class B Avg	Margin (dB)
29	.20025	38.94	Qp	0	0	10	48.94	63.54	-14.6	-	-
30	.198	24.82	Ca	0	0	10	34.82	-	-	53.69	-18.87
31	.26775	33.94	Qp	0	0	10	43.94	61.14	-17.2	-	-
32	.2655	17.39	Ca	0	0	10	27.39	-	-	51.26	-23.87
33	.33525	30.41	Qp	0	0	10	40.41	59.29	-18.88	-	-
34	.333	15.17	Ca	0	0	10	25.17	-	-	49.38	-24.21
35	.5355	23.3	Qp	0	0	10	33.3	56	-22.7	-	-
36	.53325	10	Ca	0	0	10	20	-	-	46	-26
37	13.56075	17.27	Qp	.1	.2	10.1	27.67	60	-32.33	-	-
38	13.56075	5.84	Ca	.1	.2	10.1	16.24	-	-	50	-33.76

Qp - Quasi-Peak detector

Ca - CISPR average detection

CISPR 11-22 CE Class B Group2 9kHz-30MHz Stepping.TST 12746 11 Sep 2019  
Rev 9.5 07 Jul 2020

## 10. SETUP PHOTOS

Please refer to 13179110-EP1V1 for setup photos

**END OF TEST REPORT**