



TEST REPORT

Report Number: 13911918-E8V2

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

Model : A2783, A2784, AND A2785

Brand : APPLE

FCC ID : BCG-E4083A AND BCG-E8076A

EUT Description : SMARTPHONE

Test Standard(s) : FCC CFR47 PART 2, 22H, 24E, 27, 90S, 90R, AND 96

Date Of Issue:
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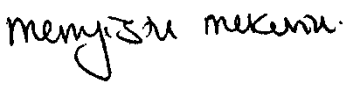


Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/21/2022	Initial Review	Mengistu Mekuria
V2	02/17/2022	Updated EUT descriptions in Section 5.1 and 5.3	Mengistu Mekuria

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.	
Model	A2783, A2784, AND A2785	
Brand	APPLE	
FCC ID	BCG-E4083A AND BCG-E8076A	
EUT Description	SMARTPHONE	
Serial Number	FG112970E8Y17XT6K (Conducted) AND KW223CKQDY (Radiated)	
Sample Receipt date	OCTOBER 5, 2021	
Date Tested	OCTOBER 5, 2021 to JANUARY 21, 2022	
Applicable Standards	FCC CFR47 2, 22H, 24E, 27, 90S, 90R, AND 96	
Test Results	COMPLIES	
<p>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.</p> <p>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.</p> <p>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 A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.</p>		
Approved & Released By:	Reviewed By:	Prepared By:
		
Mengistu Mekuria Staff Engineer UL Verification Services Inc.	John Thompson Test Engineer UL Verification Services Inc.	Tewodros Woldemichael Senior Laboratory Technician UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 22, Part 24, Part 27, Part 90, and Part 96
- [FCC KDB 971168 D01 v03r01](#): Power Meas License Digital Systems
- [FCC KDB 971168 D02 v02r01](#): Misc Rev Approv License Devices
- [FCC KDB 412172 D01 v01r01](#): Determining ERP and EIRP

3. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, certification #0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input checked="" type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
<input checked="" type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA	US0104	22541	550739
<input type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA	US0104	2324B	550739

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 Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Occupied Channel Bandwidth	±1.22 %
Temperature	±2.26%
Supply voltages	±0.57 %
Time	±3.39 %

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. INTRODUCTION OF TEST DATA REUSE

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 FR1, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, GPS, and NFC. All models support at least one UICC based SIM. The second SIM is an UICC based e-SIM (electronic SIM) in some models. China model has 1 p-SIM (physical SIM) only. The device supports a built-in inductive charging 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-E4082A to cover variant model FCC ID: BCG-E4083A, and FCC ID: BCG-E8076A. The major difference between the parent/reference model and the variant model is some LTE and 5G NR Bands. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

5.3. MODEL DIFFERENCES

The manufacturer hereby declares the following for models A2595, A2783, A2784, and A2785.

A2595, A2783, A2784, and A2785 are highly similar, with the only differences being listed on the table below.

Model	FCC ID	Model Changes
A2595	BCG-E4082A	Main Reference Model
A2783	BCG-E4083A	B14/71 Removed
A2784	BCG-E8076A	B14/71 Removed
A2785	BCG-E8076A*	B14/71 Removed

*Note: Model A2785 supports only p-SIM while A2784 supports p-SIM + e-SIM. Both A2785 and A2784 are electrically identical.

They have the same PCB layout, design, common components, antennas, antenna locations and housing cases.

More specifically, their cellular modem, Wi-Fi, BT, and NFC transmitters are identical, and removal of LTE bands in some models is done by de-population of directly related components.

Spot check verification has been done on models A2783, A2784, and A2785 in accordance with the test plan approved via KDB inquiry. Comparison of the models, upper deviation is within 3dB range and all tests are under FCC/ISED Technical Limits. The results documented for model A2595 may be applied as representative to model A2783, A2784, and A2785.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A2783

A2783 SPOT CHECK RESULTS							
Technology	Worst Mode	Test Item	Measured	Original Model: A2595	Sub Model: A2783	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E4082A (dBm)	FCC ID: BCG-E4083A (dBm)		
5G NR BAND N5	QPSK @ 20 MHz BW	Cond Power	824-849	25.70	25.70	0	
	QPSK @ highest BW	RSE		-50.62	-53.12	-2.5	Noise Floor Level
LTE BAND 7	QPSK @ 20 MHz BW	Cond Power	2500-2570	25.70	25.70	0	
	QPSK @ highest BW	RSE		-46.3	-46.67	-0.37	Noise Floor Level
5G NR BAND N7	QPSK @ 20 MHz BW	Cond Power	2500-2570	25.70	25.70	0	
LTE BAND 12	QPSK @ 10 MHz BW	Cond Power	699-716	25.70	25.70	0	
5G NR BAND N12	QPSK @ 15 MHz BW	Cond Power	699-716	25.70	25.70	0	
LTE BAND 13	QPSK @ 10 MHz BW	Cond Power	777-787	25.70	25.70	0	
LTE BAND 17	QPSK @ 10 MHz BW	Cond Power	704-716	25.70	25.70	0	
LTE BAND 25	QPSK @ 20 MHz BW	Cond Power	1850-1915	25.70	25.70	0	
	QPSK @ highest BW	RSE		-48.8	-48.74	0.06	Noise Floor Level
5G NR BAND N25	BPSK @ 20 MHz BW	Cond Power	1850-1915	25.70	25.70	0	
LTE BAND 26 (90S)	QPSK @10 MHz BW	Cond Power	814-824	25.70	25.70	0	
LTE BAND 26 (p22)	QPSK @10 MHz BW	Cond Power	824-849	25.70	25.70	0	
LTE BAND 30	QPSK @ 10 MHz BW	Cond Power	2305-2315	24.00	24.00	0	
5G NR BAND N30	BPSK @ 10 MHz BW	Cond Power	2305-2315	24.00	24.00	0	
LTE BAND 41	QPSK @ 20 MHz BW	Cond Power	2496-2690	27.70	27.70	0	
5G NR BAND N41	BPSK @ 100 MHz BW	Cond Power	2496-2690	27.70	27.70	0	Ant2
LTE BAND 48	QPSK @ 20 MHz BW	Cond Power	3550-3700	22.70	22.70	0	
	QPSK @ 20 MHz BW	RSE		-48.42	-51.02	-2.6	Noise Floor
LTE BAND 66	QPSK @ 20 MHz BW	Cond Power	1710-1780	25.70	25.70	0	
5G NR BAND N66	BPSK @ 20 MHz BW	Cond Power	1710-1780	25.70	25.70	0	
5G NR BAND N77	BPSK @ 100 MHz BW	Cond Power	3450-3550	27.70	27.70	0	
5G NR BAND N77	BPSK @ 100 MHz BW	Cond Power	3700-3980	27.70	27.70	0	

5.5. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A2784 AND A2785

A2784 AND A2785 SPOT CHECK RESULTS							
Technology	Worst Mode	Test Item	Measured	Original Model: A2595	Sub Model: A2784 and A2785	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E4082A (dBm)	FCC ID: BCG-E8076A (dBm)		
5G NR BAND N5	QPSK @ 20 MHz BW	Cond Power	824-849	25.70	25.70	0	
	QPSK @ highest BW	RSE		-50.62	-53.12	-2.5	Noise Floor Level
LTE BAND 7	QPSK @ 20 MHz BW	Cond Power	2500-2570	25.70	25.70	0	
	QPSK @ highest BW	RSE		-46.3	-46.67	-0.37	Noise Floor Level
5G NR BAND N7	QPSK @ 20 MHz BW	Cond Power	2500-2570	25.70	25.70	0	
LTE BAND 12	QPSK @ 10 MHz BW	Cond Power	699-716	25.70	25.70	0	
5G NR BAND N12	QPSK @ 15 MHz BW	Cond Power	699-716	25.70	25.70	0	
LTE BAND 13	QPSK @ 10 MHz BW	Cond Power	777-787	25.70	25.70	0	
LTE BAND 17	QPSK @ 10 MHz BW	Cond Power	704-716	25.70	25.70	0	
LTE BAND 25	QPSK @ 20 MHz BW	Cond Power	1850-1915	25.70	25.70	0	
	QPSK @ highest BW	RSE		-48.8	-48.74	0.06	Noise Floor Level
5G NR BAND N25	BPSK @ 20 MHz BW	Cond Power	1850-1915	25.70	25.70	0	
LTE BAND 26 (90S)	QPSK @10 MHz BW	Cond Power	814-824	25.70	25.70	0	
LTE BAND 26 (p22)	QPSK @10 MHz BW	Cond Power	824-849	25.70	25.70	0	
LTE BAND 30	QPSK @ 10 MHz BW	Cond Power	2305-2315	24.00	24.00	0	
5G NR BAND N30	BPSK @ 10 MHz BW	Cond Power	2305-2315	24.00	24.00	0	
LTE BAND 41	QPSK @ 20 MHz BW	Cond Power	2496-2690	27.70	27.70	0	
5G NR BAND N41	BPSK @ 100 MHz BW	Cond Power	2496-2690	27.70	27.70	0	Ant2
LTE BAND 48	QPSK @ 20 MHz BW	Cond Power	3550-3700	22.70	22.70	0	
	QPSK @ 20 MHz BW	RSE		-48.42	-51.02	-2.6	Noise Floor
LTE BAND 66	QPSK @ 20 MHz BW	Cond Power	1710-1780	25.70	25.70	0	
5G NR BAND N66	BPSK @ 20 MHz BW	Cond Power	1710-1780	25.70	25.70	0	
5G NR BAND N77	BPSK @ 100 MHz BW	Cond Power	3450-3550	27.70	27.70	0	
5G NR BAND N77	BPSK @ 100 MHz BW	Cond Power	3700-3980	27.70	27.70	0	

5.6. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID	Reference Application	Variant model FCC ID	Report Title/Section
PCE, CBE, TNE	BCG-E4082A	13911916-E8	BCG-E4083A	FCC LTE Report/ All Sections except LTE/5GnR Band 14/71 sections
PCE, CBE, TNE	BCG-E4082A	13911916-E8	BCG-E8076A	FCC LTE Report/ All Sections except LTE/5GnR Band 14/71 sections

5.7. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version 0.13.02.

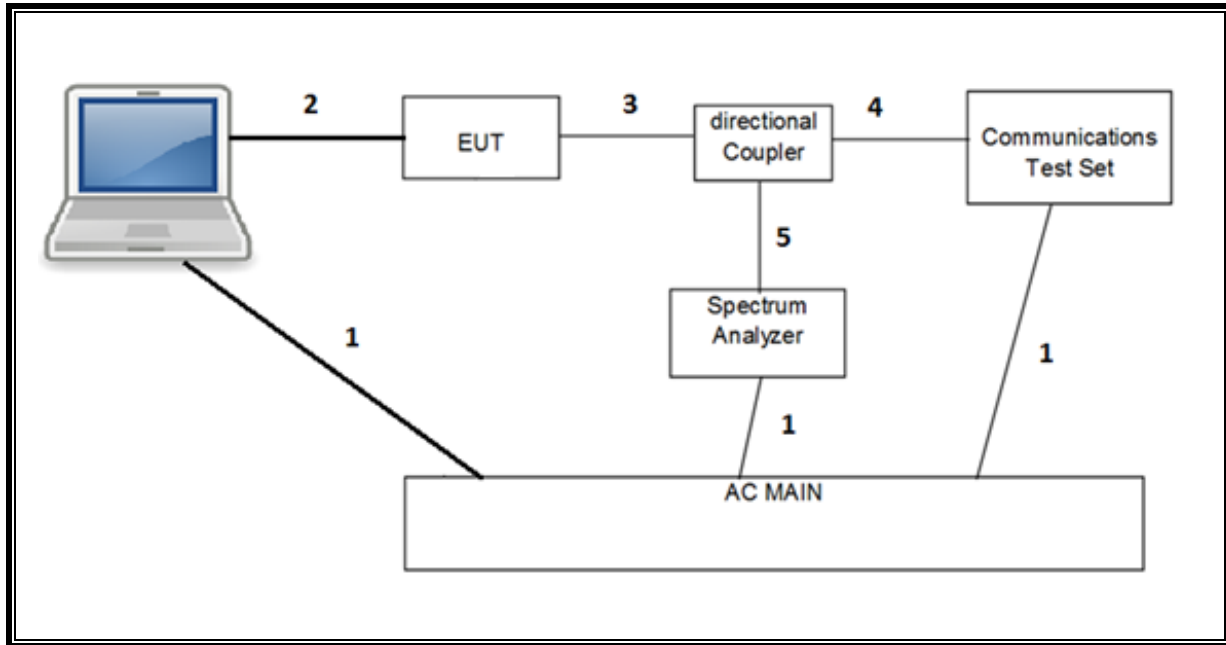
5.8. SPOT CHECK WORST-CASE CONFIGURATION AND MODE

The spot checks were performed on the worst case orientations and configurations based on the parent model of reference report.

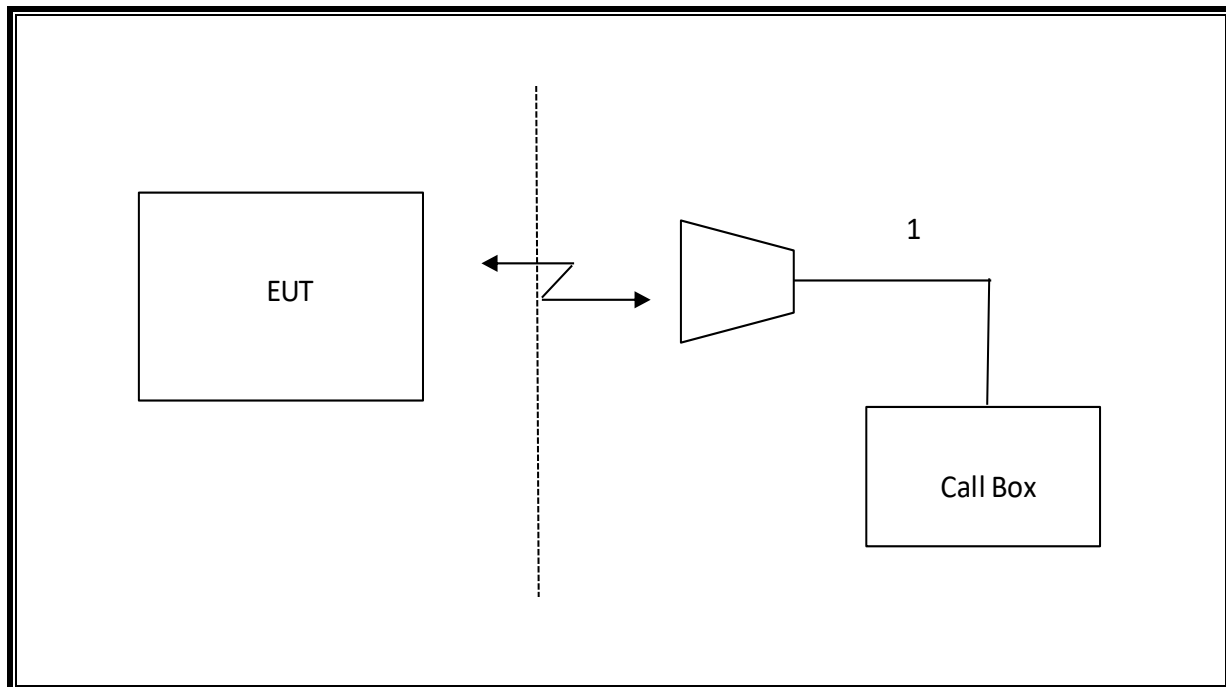
5.9. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description		Manufacturer	Model	Serial Number		FCC ID/ DoC
Laptop		Apple	MacBook Pro	QDS-BRCM1069		A1398
AC/DC adapter		Apple	B123	N/A		PA-1450-BA1
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	3	US 115V	Un-shielded	2.0	N/A
2	USB	1	DC	Un-shielded	1.0	N/A
3	RF In/Out	1	EUT	Un-shielded	0.6	N/A
4	RF In/Out	1	Communication Test Set	Un-shielded	1.2	N/A
5	RF In/Out	1	Barrel	N/A	N/A	N/A
I/O CABLES (RF RADIATED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	RF In/Out	1	Antenna	Un-shielded	5.0	N/A

CONDUCTED SETUP



RADIATED SETUP



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	Asset	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T345	05/26/2022
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	07/07/2022
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	02/24/2022
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	06/12/2022
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T907	07/22/2022
Spectrum Analyzer, PXA 3Hz to 50GHz	Keysight	N9030B	207995	05/27/2022
Spectrum Analyzer, PXA, 3Hz to 50GHz w/Ext. Mixer	Keysight	N9030A	T342	01/25/2022
Spectrum Analyzer, PSA 3Hz to 44GHz	Keysight	E4446A	T123	01/22/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T964	02/17/2022
Wireless Communication Test Set, Call Box	Agilent	E5515C	T211	04/03/2022
Directional Coupler	KRYTAR	152610	T1161	09/23/2022
Directional Coupler	KRYTAR	152610	T1536	09/23/2022
Directional Coupler	KRYTAR	152610	T1537	09/23/2022
Power Meter, P-series single channel	Keysight	N1912A	T1272	01/21/2022
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	T1224	01/28/2022
Filter, HPF 3.0GHz	Micro-Tronics	HPM17543	T487	04/27/2022
Filter, HPF 1.2GHz	Micro-Tronics	152043	152043	07/29/2022
Filter, BRF 1850 – 1910 MHz	Micro-Tronics	BRM50714-02	T1796	06/10/2022
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T1210	01/22/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T979	02/22/2022
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	06/16/2022
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T1154	06/15/2022
Amplifier, 26.5GHz to 40GHz	Miteq	NSP 4000 SP2	T88	04/22/2022
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	T404	04/19/2022
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	04/22/2022
Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640	T1864	04/19/2022
Spectrum Analyzer	Keysight	8564E	T106	01/27/2022
Antenna, Active Loop 9KHz to 30MHz	EMCO	PRE0154914	T1683	05/24/2022
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 3.4, June 08 2021	
Power Measurement Software	UL	UL RF	Ver 3.1.4, May 20, 2021	
Radiated test software	UL	UL RF	Ver 9.5 July 7, 2020	

NOTES:

* Testing is completed before equipment expiration date.

Appendix A – Reference Test Report

Attached is the test report (13911916-E8) containing the reference data from the parent model as detailed in section 5.6.