



TEST REPORT

Report Number: 14523759-E4V2

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

Model : A3089, A3090, A3092

Brand : APPLE

FCC ID : BCG-E8428A, BCG-E8429A, BCG-E8430A

EUT Description : SMARTPHONE

Test Standard(s) : FCC 47 CFR Part 2, Part 22, Part 27, and Part 96

Date Of Issue:

2023-08-25

Prepared by:

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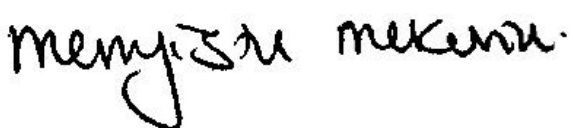
Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2023-07-06	Initial Review	--
V2	2023-08-25	Addressed TCB Questions at Section 5.3 and 5.7	Mengistu Mekuria

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. DECISION RULES AND MEASUREMENT UNCERTAINTY	6
4.1. METROLOGICAL TRACEABILITY.....	6
4.2. DECISION RULES.....	6
4.3. MEASUREMENT UNCERTAINTY.....	6
4.4. SAMPLE CALCULATION.....	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT.....	7
5.2. INTRODUCTION.....	7
5.3. MODEL DIFFERENCES.....	7
5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A3089.....	8
5.5. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A3090.....	8
5.6. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A3092.....	9
5.7. REFERENCE DETAIL.....	10
5.8. SOFTWARE AND FIRMWARE.....	11
5.9. SPOT CHECK WORST-CASE CONFIGURATION AND MODE.....	11
5.10. DESCRIPTION OF TEST SETUP.....	12
6. TEST AND MEASUREMENT EQUIPMENT	13
Appendix A – Reference Test Report	14

1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A3089, A3090, A3092
Brand	APPLE
FCC ID	BCG-E8428A, BCG-E8429A, BCG-E8430A
EUT Description	SMARTPHONE
Serial Number	TM69JWV5W3, Y6F3HQB71K, M6V1FVVQCX, TKJFCV99TK, GJ6H0KK452, WX7MQC7JTP (CONDUCTED) AND FLXXR0CGFH, M73M9YT6CD, JQH2QTDT9C (RADIATED)
Sample Receipt Date	2023-05-23
Date Tested	2023-05-29 TO 2023-06-29
Applicable Standards	FCC 47 CFR Part 2, Part 22, Part 27, and Part 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:	Prepared By:
	
Mengistu Mekuria Staff Engineer UL LLC.	Alex Chen Laboratory Engineer UL LLC.

2. TEST METHODOLOGY

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

- ANSI C63.26:2015
- FCC 47 CFR Part 2, Part 22, Part 27 and Part 96
- [FCC KDB 971168 D01 v03r01](#): Power Meas License Digital Systems
- [FCC KDB 971168 D02 v02r02](#): 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 NVLAP, Laboratory Code 200065-0, 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			
<input type="checkbox"/>	Building 3: 843 Auburn Court, Fremont, CA 94538, USA			
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA			
<input checked="" type="checkbox"/>	Building 5: 47670 Kato Rd, Fremont, CA 94538, USA			

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}
Conducted Antenna Port Emission Measurement	1.940 db
Power Spectral Density	2.466 db
Time Domain Measurements Using SA	3.39 %
RF Power Measurement Direct Method Using Power Meter	0.450 db Peak 1.300 db Ave.
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 db
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 db
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

Uncertainty figures are valid to a confidence level of 95%.

4.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPhone is a smartphone with cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G NR1, 5G NR2, IEEE 802.11a/b/g/n/ac/ax, Bluetooth (BT), Ultra-Wideband (UWB), GPS, NFC, 802.15ab-NB and MSS technologies. The rechargeable battery is not user accessible.

Testing was performed on the parent model and is used to support the application for the parent and variants identified in this report based on the test plan submitted and approved via KDB inquiry by the FCC.

5.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: BCG-E8427A to cover variant model FCC ID: BCG-E8428A, FCC ID: BCG-E8429A, and FCC ID: BCG-E8430A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter, and 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 A2846, A3089, A3090, and A3092.

A2846, A3089, A3090, and A3092 are highly similar, with the only differences being listed on the table below:

Model	FCC ID	Model Changes
A2846	BCG-E8427A	Reference model
A3089	BCG-E8428A	Variant model. Removed FR2 from the reference model
A3090	BCG-E8429A	Variant model, Removed FR2, LTE B11/14/21/29/71, and 5G NR n14/n71 from the reference model
A3092	BCG-E8430A	Variant model, Removed FR2, LTE B11/14/29/53/71, MSS, and 5G NR n14/n53/n71 from the reference Model.

*Note:

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

More specifically, their cellular modem, Wi-Fi, BT, NFC, WPT and UWB transmitters are identical, and removal of cellular bands is done by software and depopulation of band-specific components associated with the removed bands.

Spot check verification has been done on models A3089, A3090, and A3092 in accordance with the test plan approved via KDB inquiry. Comparison of the models, upper deviation is within 0.5dB range of antenna port data and all tests are under FCC Technical Limits. The results documented for model A2846 may be applied as representative to models A3089, A3090, and A3092.

5.4. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A3089

A3089 Spot Check Results							
Technology	Worst Mode	Test Item	Measured	Original Model: A2846	Sub Model: A3089	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E8427A (dBm)	FCC ID: BCG-E8428A (dBm)		
LTE 5CA	QPSK @ 10MHz+10MHz BW	Cond Power	824-849	25.7	25.7	0.00	
LTE 7CA	QPSK @ 15MHz+15MHz BW	Cond Power	2500-2570	25.7	25.7	0.00	
LTE 41CA	QPSK @ 20MHz+15MHz BW	Cond Power	2496-2690	28.7	28.7	0.00	
LTE 48CA	QPSK @ 20MHz+15MHz BW	Cond Power	3550-3700	25.0	25.0	0.00	

5.5. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A3090

A3090 Spot Check Results							
Technology	Worst Mode	Test Item	Measured	Original Model: A2846	Sub Model: A3090	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E8427A (dBm)	FCC ID: BCG-E8429A (dBm)		
LTE 5CA	QPSK @ 10MHz+10MHz BW	Cond Power	824-849	25.7	25.7	0.00	
LTE 7CA	QPSK @ 15MHz+15MHz BW	Cond Power	2500-2570	25.7	25.7	0.00	
LTE 41CA	QPSK @ 20MHz+15MHz BW	Cond Power	2496-2690	28.7	28.7	0.00	
LTE 48CA	QPSK @ 20MHz+15MHz BW	Cond Power	3550-3700	25.0	25.0	0.00	

5.6. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A3092

A3092 Spot Check Results							
Technology	Worst Mode	Test Item	Measured	Original Model: A2846	Sub Model: A3092	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E8427A (dBm)	FCC ID: BCG-E8430A (dBm)		
LTE 5CA	QPSK @ 10MHz+10MHz BW	Cond Power	824-849	25.7	25.7	0.00	
LTE 7CA	QPSK @ 15MHz+15MHz BW	Cond Power	2500-2570	25.7	25.7	0.00	
LTE 41CA	QPSK @ 20MHz+15MHz BW	Cond Power	2496-2690	28.7	28.7	0.00	
LTE 48CA	QPSK @ 20MHz+15MHz BW	Cond Power	3550-3700	25.0	25.0	0.00	

5.7. 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-E8427A	14523758-E16	BCG-E8428A	IC Carrier Aggregation Report / All Sections
PCE, CBE, TNE			BCG-E8429A	IC Carrier Aggregation Report / All Sections
PCE, CBE, TNE			BCG-E8430A	IC Carrier Aggregation Report / All Sections

5.8. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version: 0.15.02.

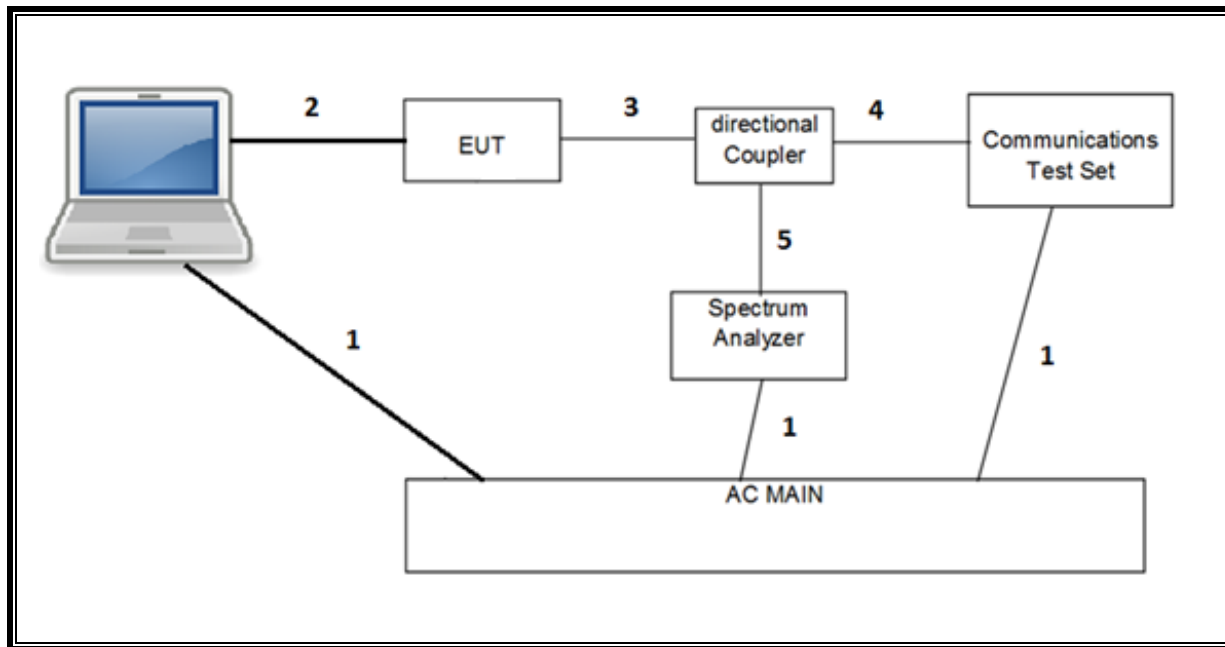
5.9. SPOT CHECK WORST-CASE CONFIGURATION AND MODE

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

5.10. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC		
Laptop	Apple	MacBook Pro	HRP082673	BCGA1708		
AC/DC adapter	Apple	A1718	C4H64450HH3GN8RA6	--		
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

CONDUCTED 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	79834	06/08/2203
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	85151	04/30/2024
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	85313	02/29/2024
Spectrum Analyzer, PXA	Keysight	N9030B	222074	07/16/2023
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	85201	02/29/2024
Spectrum Analyzer, PXA	Keysight	N9030B	85214	07/18/2023
Spectrum Analyzer, PXA	Keysight	N9030B	222073	07/22/2023
PXA Signal Analyzer	Keysight	N9030B	222073	07/22/2023
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	230548	02/29/2024
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	201498	02/29/2024
Directional Coupler	KRYTAR	152610	198816	09/23/2023
Directional Coupler	KRYTAR	152610	198817	09/23/2023
Directional Coupler	KRYTAR	152610	135712	09/23/2023
Power Meter, P-series single channel	Keysight	N1912A	90630	01/24/2024
Power Meter, P-series single channel	Keysight	N1912A	90719	01/31/2024
Power Meter, P-series single channel	Agilent	N1911A	82174	01/31/2024
Power Sensor, P – series, 50MHz to 18GHz, Wideband	Keysight	N1921A	90389	01/31/2024
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	222792	02/29/2024
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	230298	02/29/2024
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	230295	02/29/2024
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	22796	02/29/2024
Wideband Communication Test Set, Call Box	Rohde & Schwarz	CMW500	230297	02/29/2024
*Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	82472	11/16/2023
*Amplifier, 218GHz to 26.5GHz	Ampical	AMP18G26.5-60	215705	02/26/2023
*Amplifier, 26.5GHz to 40GHz	Ampical	AMP26G40-65	172346	02/29/20224
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	172362	03/31/2024
Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640/B	172365	03/31/2024
*Antenna, Active Loop 100KHz to 30MHz	ELECTRO-METRICS	EM-6872	219911	05/10/2023
*Antenna, Active Loop 30Hz to 1MHz	ELECTRO-METRICS	EM-6871	219909	05/10/2023
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	236360	N/A
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	236285	N/A
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	236355	N/A
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 3.4, May 20, 2022	
Power Measurement Software	UL	UL RF	Ver 3.1.4, April 29, 2022	
Radiated test software	UL	UL RF	Ver 9.5, Jan 21, 2022	

NOTES:

- * Testing is completed before equipment expiration date.

Appendix A – Reference Test Report

Attached is the test report (14523758-E16) containing the reference data from the parent model as detailed in section 5.7.