



TEST REPORT

Report Number. : 13018918-E14V1

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

Model : A2296

FCC ID : BCG-E3501A

EUT Description : SMARTPHONE

Test Standard(s) : FCC PART 96.47

Date Of Issue:

February 10, 2020

Prepared by:

UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2/10/2020	Initial Issue	Thu Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. DECISION RULES AND MEASUREMENT UNCERTAINTY	6
4.1. METROLOGICAL TRACEABILITY	6
4.2. DECISION RULES.....	7
4.3. MEASUREMENT UNCERTAINTY.....	7
5. EQUIPMENT UNDER TEST	8
5.1. DESCRIPTION OF EUT	8
5.2. SOFTWARE AND FIRMWARE.....	8
5.3. DESCRIPTION OF TEST SETUP.....	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. END USER DEVICE ADDITIONAL REQUIREMENT	11
7.1. Test Requirement	11
8. TEST PROCEDURE AND EUT CONFIGURATION.....	11
8.1. End User Device Configuration 1.....	12
8.2. End User Device Configuration 2.....	14
9. SETUP PHOTOS.....	16

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Smartphone

MODEL: A2296

SERIAL NUMBER: FFMZW00APM7C

DATE TESTED: NOVEMBER 14, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 96.47	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

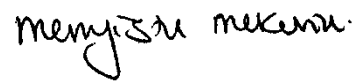
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. 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 any government.

Approved & Released For
UL Verification Services Inc. By:



Thu Chan
Operations Leader
UL Verification Services Inc.

Prepared By:



Mengistu Mekuria
Lead Test Engineer
UL Verification Services Inc.

Tested By:



Steven Tran
Project Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC Part 96.47, KDB 940660 D01 Part 96 CBRS Eqpt v02 and WINNF-TS-0122-v1.0.0.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, 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
☐ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☐ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under ISED Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at [NVLAP Lab Search](#).

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2 DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U _{LAB}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM, if present, is either UICC based pSIM (physical SIM) or e-SIM (electronic SIM). The device has a built-in inductive charging receiver. The rechargeable battery is also not user accessible. However, the test data in this report refers only to LTE Band 48 that operates in the CBRS band.

5.2. SOFTWARE AND FIRMWARE

The test utility software used during testing was WINNF-TS-0122 V1.0.0.

5.3. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Router/AC/DC adapter	ASUS	AC1900	GCIAGO000300	MSQ-RTAC6Uv2
Laptop AC/DC adapter	Lenovo	4236B92	PBFBKHK	ODS-BRCM1046
Directional Coupler	Krytar	152613	T1537	NA

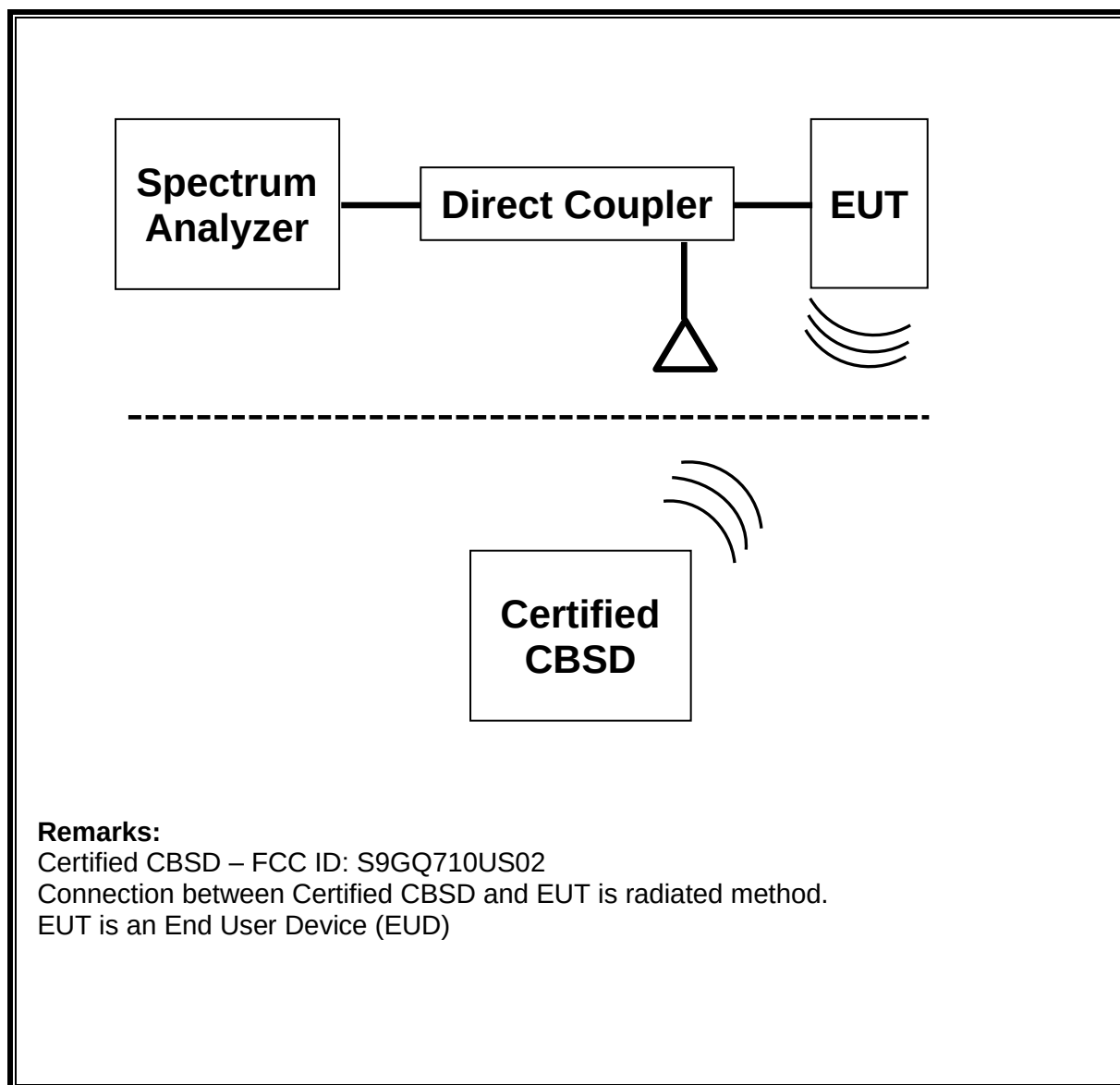
I/O CABLES

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
3	RJ45	3	Ethernet	Un-Shielded	1	N/A
2	RF Port	2	SMA	Shielded	0.5	N/A

TEST SETUP

The standalone EUT connected to a certified CBSD and Spectrum Analyzer via air and an RF cable respectively.

SETUP DIAGRAM OF TEST SYSTEM



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
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2020
Directional Coupler	Krytar	152613	T1537	06/08/2020

Test Software			
Description	Manufacturer	Model	Version Number
Laptop (Local SAS – WINNForum Test Harness)	Lenovo	PBFBKHK	2.0

7. END USER DEVICE ADDITIONAL REQUIREMENT

7.1. Test Requirement

FCC Part 96.47

- (a) End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.
- (1) An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

8. TEST PROCEDURE AND EUT CONFIGURATION

KDB 940660 D01 v01, WINNF-TS-0122 V1.0.0

Additional requirements are required to End-User Device LTE Band 48 device base on CBSD protocol. During the test, the EUT and its companion certified CBSD (FCC ID: S9GQ710US02) device communicate with each other via air.

Configuration	Frequency (MHz)	Power (dBm/MHz)	Bandwidth (MHz)
1	3615 - 3635	13	20
2	3660 - 3670	8	10

Configuration 1

- a) Setup WINNF.PT.C.HBT.1 with 3615MHz-3635MHz and power level 13 dBm/MHz
- b) Enable AP service from Ruckus Cloud Management
- c) Check EUT Transmitter Frequency and power
- d) Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

Configuration 2

- a) Setup WINNF.PT.C.HBT.1 with 3660MHz-3670MHz and power level 8 dBm/MHz
- b) Enable AP service from Ruckus Cloud Management
- c) Check EUT Transmitter Frequency and power
- d) Disable AP service from Ruckus Cloud Management and check EUT stop transmission within 10s.

TEST RESULTS

Keysight Spectrum Analyzer - Swept SA

RF 50 Ω DC SENSE:INT 02:51:06 PM Nov 14, 2019

Avg Type: Log-Pwr

Trig: Free Run Atten: 10 dB

NFE PNO: Fast IFGain:Low

TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P P N N N N N

Ref Offset 12 dB
Ref 12.00 dBm

10 dB/div
Log

Mkr2 3.635 000 GHz
-59.727 dBm

Start 3.55000 GHz
#Res BW 1.0 MHz

Stop 3.70000 GHz
Sweep 1.200 ms (9001 pts)

#VBW 3.0 MHz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.615 000 GHz	-55.620 dBm			
2	N	1	f	3.635 000 GHz	-59.727 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Frequency

Auto Tune

Center Freq
3.625000000 GHz

Start Freq
3.550000000 GHz

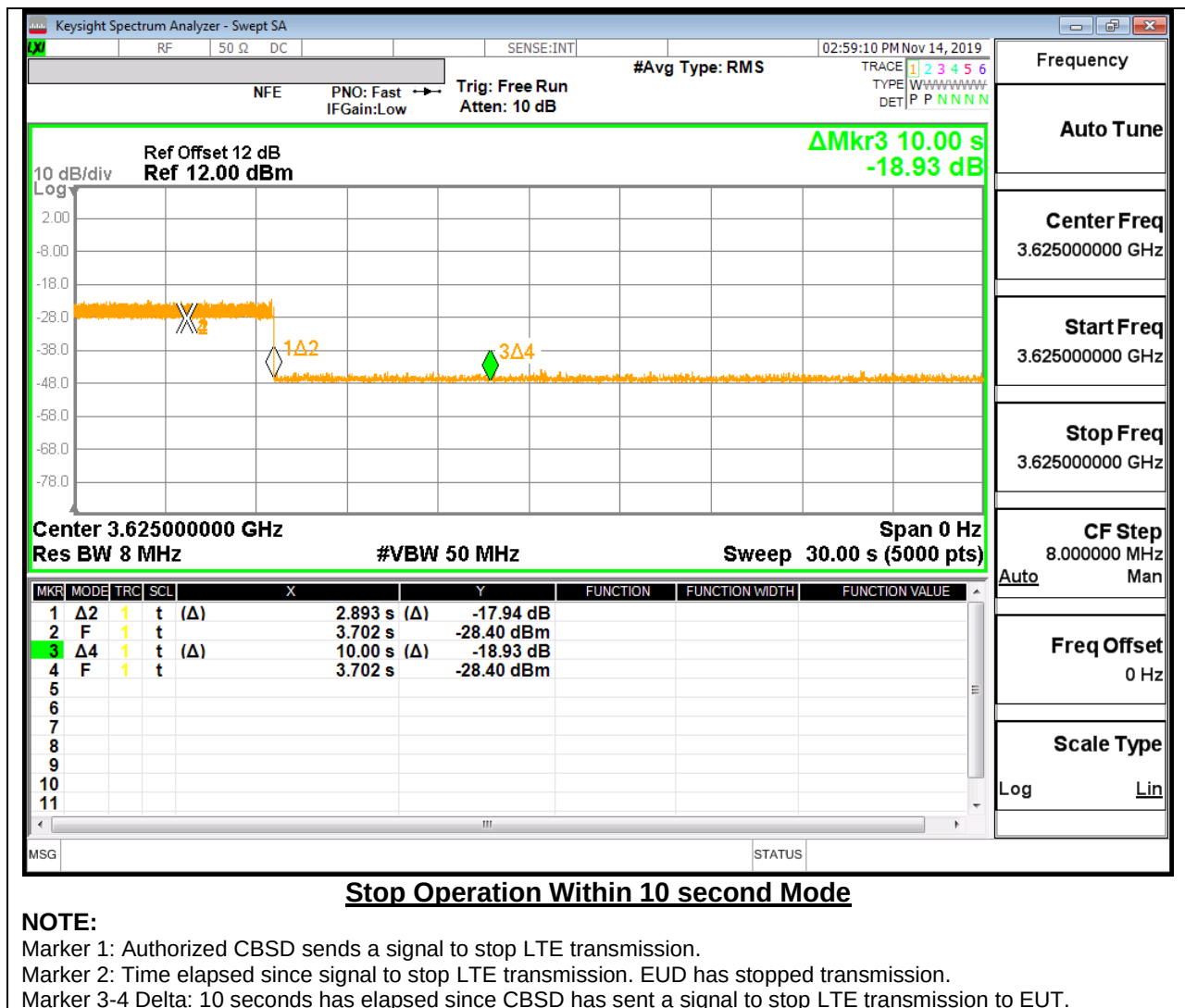
Stop Freq
3.700000000 GHz

CF Step
15.000000 MHz
Auto Man

Freq Offset
0 Hz

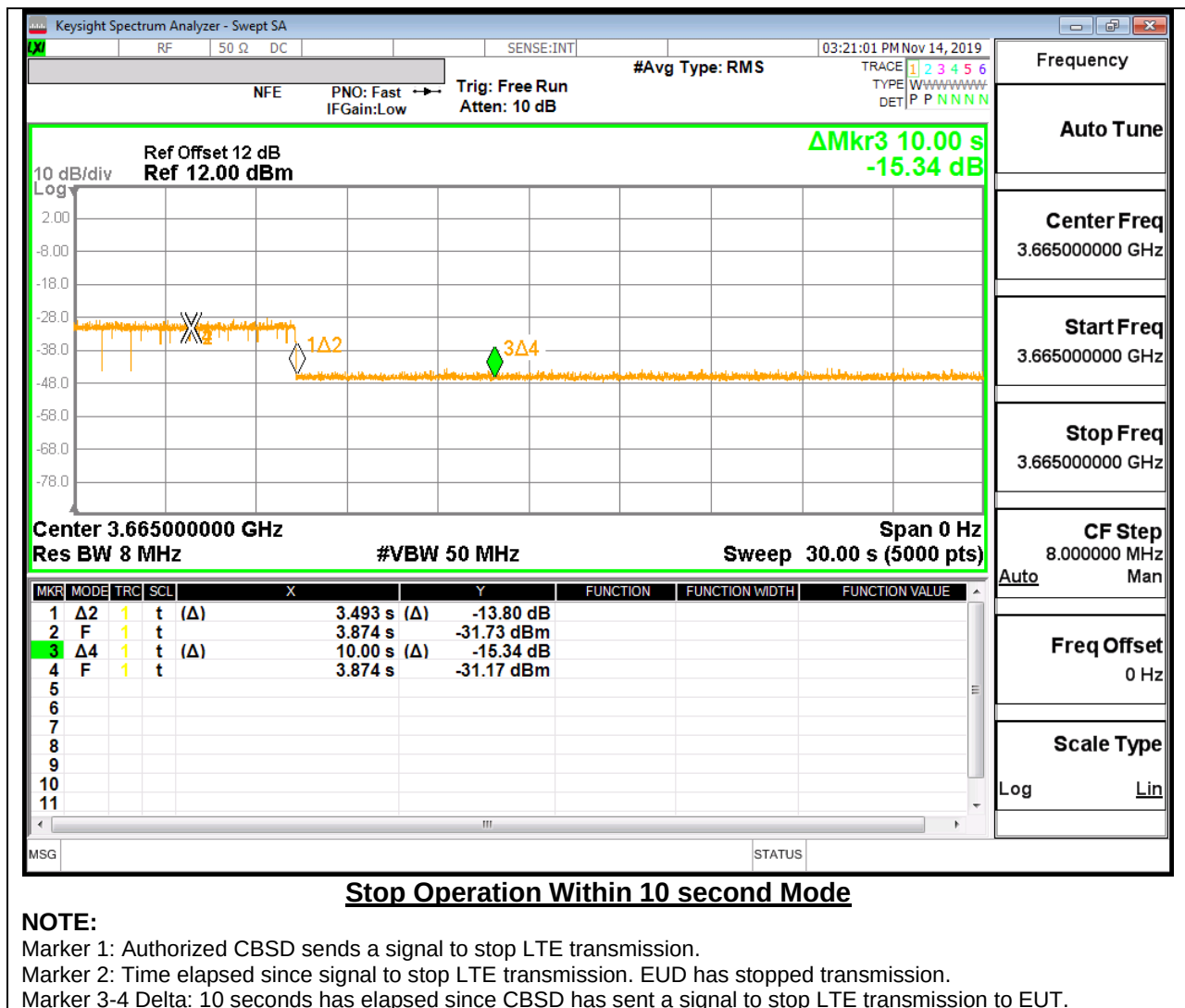
Scale Type
Log Lin

Operation Mode



8.2. End User Device Configuration 2 (3660MHz - 3670MHz; MaxEIRP: 8 dBm/MHz)





9. SETUP PHOTOS

Please see setup report 13018918-EP1V1

END OF REPORT