TEST REPORT

No. I20Z60959-EMC03

for

OnePlus Technology (Shenzhen) Co., Ltd.

Smart Phone

Model Name: BE2028,BE2025,BE2026

FCC ID: 2ABZ2-EF170

with

Hardware Version: 16

Software Version: 10.5.5.BE88CB

Issued Date: 2020-10-15

Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I20Z60959-EMC03	Rev.0	1st edition	2020-10-15

Note: the latest revision of the test report supersedes all previous version.

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location 2: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

Location 3:CTTL (BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology Development Area, Beijing, P. R. China 100176

1.3. Testing Environment

Normal Temperature: 15-35℃

Extreme Temperature: -10/+55℃

Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2020-09-10

Testing End Date: 2020-09-12

1.5. Signature

Zhang Ying

(Prepared this test report)

An Hui

(Reviewed this test report)

Zhang Xia

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address /Post:	18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen
City:	Shenzhen
Postal Code:	/
Country:	China
Telephone:	86 755 61898696-7023
Fax:	/

2.2. Manufacturer Information

Company Name:	OnePlus Technology (Shenzhen) Co., Ltd.
Address /Post:	18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen
City:	Shenzhen
Postal Code:	/
Country:	China
Telephone:	86 755 61898696-7023
Fax:	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Smart Phone
Model Name	BE2028,BE2025,BE2026
FCC ID	2ABZ2-EF170
Power Supply	3.87V DC by Battery

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
UT16a	990016800073023	16	10.5.5.BE88CB

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE

AE ID*	Description	SN
AE1	Battery	---

AE1

Model	BLP815
Manufacturer	Dongguan NVT Technology Co.,Ltd.
Capacity	4210mAh
Nominal Voltage	3.87V

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 90	PRIVATE LAND MOBILE RADIO SERVICES	10-1-19 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI/TIA-102.CAAA-E	DIGITAL C4FMCQPSK TRANSCEIVER MEASUREMENT METHODS	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01

5. LABORATORY ENVIRONMENT

Fully-anechoic chamber 2 (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 1 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

Semi-anechoic chamber 2 / Fully-anechoic chamber 3 (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	<±3.5 dB, 3 m distance
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Shielded room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz, >60dB; 1MHz－1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω

6. SUMMARY OF TEST RESULTS

6.1. Summary of test results

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	1/2/3/4	The test is performed in test location 1, 2, 3 or 4 which are described in section 1.1 of this report

CDMA800 BC10

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Output Power	90.635(b)	ANNEX A	P	/
2	Emission Limit	90.691, 2.1051	ANNEX A	P	2

6.2. Statements

The test cases listed in section 6.1 of this report for the EUT specified in section 3 were performed by TMC according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1.

This report only deals with the CDMA functions among the features described in section 3.

7. Test Facilities Utilized

Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
EMI Antenna	VULB9163	9163-235	Schwarzbeck	2021-03-12	1 year
EMI Antenna	3117	00058889	ETS-Lindgren	2020-11-18	1 year
EMI Antenna	3117	00119021	ETS-Lindgren	2021-01-14	1 year
EMI Antenna	9117	177	Schwarzbeck	2021-10-12	1 year
Signal Generator	N5183A	MY49060052	R&S	2021-06-24	1 year
Test Receiver	E4440A	MY48250642	Agilent	2021-03-13	1 year
Universal Radio Communication Tester	CMW500	143008	R&S	2020-11-26	1 year
Power Amplifier	5S1G4	0341863	AR	/	/

Test Software Utilized

Test Item	Test Software and Version	Software Vendor
ERP/EIRP/RSE	Tile V7.2.3.5	ETS-Lindgren

8. Measurement Uncertainty

Note: Expanded measurement uncertainty for this test item is U = 5.16 dB, k = 2.

ANNEX A: Detailed Test Results

A.1 OUTPUT POWER

Reference

FCC: CFR Part 90.635, and 2.1053

A.1.1 Summary

During the process of testing, the EUT was controlled via Agilent Universal Radio Communication Tester (E5515C) to ensure max power transmission and proper modulation.

This result contains peak output power and ERP/EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

A.1.2 Radiated

A.1.2.1 Description

This is the test for the maximum radiated power from the EUT.

Rule Part 90.635(b) specifies "The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)."

A.1.2.2 Method of Measurement

NASI C63.26 chapter 5.2.5.5: when working in decibels (i.e., logarithmic scale), the ERP and EIRP represent the sum of the transmit antenna gain (in dBd or dBi, respectively) and the conducted RF output power (expressed in dB relative to watts or milliwatts).

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

$$\text{ERP or EIRP} = P_{Mea} + G_T$$

Where

ERP or EIRP	effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Mea} , e.g., dBm or dBW)
P_{Mea}	measured transmitter output power or PSD, in dBm or dBW
G_T	gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP) dBd = dBi – 2.15

CDMA800- ERP

Limits

Band	Peak ERP (dBm)
CDMA800(BC10)	≤50dBm (100W)

Measurement result

Note: The Conducted output power dates were measurement by WMD department.

EVDO Rev.0

Frequency (MHz)	Conducted output power (dBm)	G_T (dBd)	Radiated output power (dBm)
817.9	24.87	-0.8	21.92
823.1	24.84	-0.8	21.89

Sample:

817.9MHz

Radiated output power(dBm)= Conducted output power (24.87dBm) + G_T (-0.8dBi) – 2.15 = XXdBm

EVDO Rev.A

Frequency (MHz)	Conducted output power (dBm)	G_T (dBd)	Radiated output power (dBm)
817.9	24.95	-0.8	22.00
823.1	24.95	-0.8	22.00

1xRTT

Frequency (MHz)	Conducted output power (dBm)	G_T (dBd)	Radiated output power (dBm)
817.9	24.21	-0.8	21.26
823.1	24.42	-0.8	21.47

A.2 EMISSION LIMT

Reference

FCC: CFR Part 90.691 and 2.1053

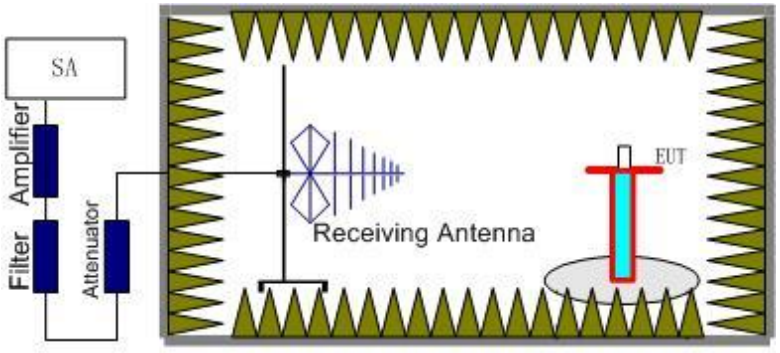
A.2.1 Measurement Method

The measurements procedures in TIA-603-E-2016 are used.

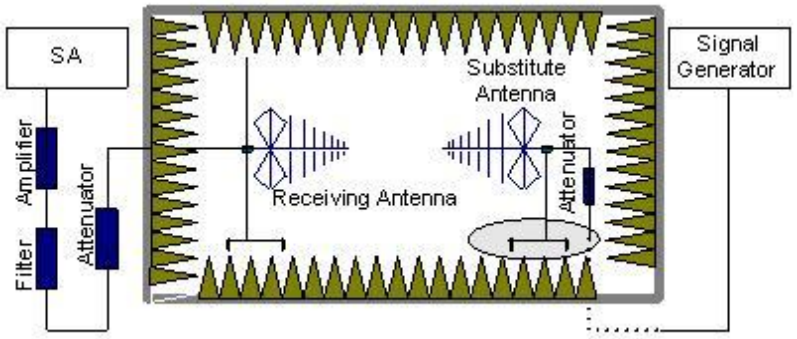
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in CFR Part 90.691. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of CDMA800 BC10.

The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is

connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.
   An amplifier should be connected in for the test.
   The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
5. Power (EIRP) = $P_{Mea} + P_{pl} + G_a$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dB.

A.2.2 Measurement Limit

Part 22.917(a) and 24.238(a) all specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the CDMA BC0 (836.52MHz, 848.31MHz and 824.7MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the CDMA BC0 or CDMA BC1 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

The worst cases:

CDMA BC10, Channel 475

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1634.01	-60.80	-3.55	5.26	2.15	-61.24	-13.00	48.20	H
2454.00	-47.24	-4.58	5.96	2.15	-48.01	-13.00	35.00	V
3273.02	-55.03	-5.28	7.66	2.15	-54.80	-13.00	41.80	V
4093.02	-54.76	-6.04	8.99	2.15	-53.96	-13.00	41.00	H
4904.01	-54.97	-6.73	9.80	2.15	-54.05	-13.00	41.10	H
5725.01	-53.84	-7.30	10.55	2.15	-52.74	-13.00	39.70	H

CDMA BC10, Channel 684

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1646.01	-59.76	-3.56	5.24	2.15	-60.23	-13.00	47.20	H
2470.00	-47.93	-4.59	6.01	2.15	-48.66	-13.00	35.70	V
3288.02	-54.36	-5.28	7.69	2.15	-54.10	-13.00	41.10	V
4117.02	-55.40	-6.04	9.02	2.15	-54.57	-13.00	41.60	H
4941.01	-55.23	-6.71	9.84	2.15	-54.25	-13.00	41.30	H
5765.01	-54.17	-7.24	10.55	2.15	-53.01	-13.00	40.00	H

Sample calculation: 1646.01MHz

Peak ERP (dBm) = PMea(-59.76 dBm) + Pcl (-3.56dB) + Ga (5.24 dBi) -2.15dBm

= -60.23dBm

ANNEX B: Persons involved in this testing

Test Item	Tester
Emission Limit	Chen Tianwei, Zhang Baoguang

*****END OF REPORT*****