



PART 0 SAR CHAR REPORT

No. I23Z60483-SEM03

For

OnePlus Technology (Shenzhen) Co., Ltd.

Mobile Phone

Model Name: CPH2551

with

Hardware Version: 11

Software Version: OxygenOS 13.2

FCC ID: 2ABZ2-AA541

Issued Date: 2023-7-17

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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No.I23Z60483-SEM03

REPORT HISTORY

Report Number	Revision	Issue Date	Description
I23Z60483-SEM03	Rev.0	2023-7-4	Initial creation of test report
I23Z60483-SEM03	Rev.1	2023-7-17	Update the information on section 3



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1 Test Laboratory

1.1 Testing Location

Company Name:	CTTL
Address:	No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

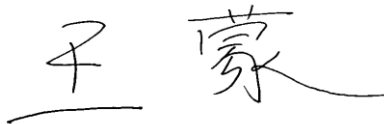
1.2 Testing Environment

Temperature:	18°C~25°C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise & Reflection:	< 0.012 W/kg


1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Wang Meng
Testing Start Date:	April 29,2023
Testing End Date:	July 3, 2023

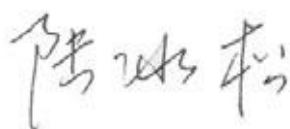
1.4 Signature



Wang Meng
(Prepared this test report)



Qi Dianyuan
(Reviewed this test report)



Lu Bingsong
Deputy Director of the laboratory
(Approved this test report)

2 Introduction

The equipment under test (EUT) is a smart phone. It contains the Qualcomm modem supporting 2G/3G/4G technologies and 5G NR Sub-6 GHz technologies. These modems enable Qualcomm Smart Transmit feature to control and manage transmitting power in real time and to ensure at all times the time-averaged RF exposure is in compliance with the FCC requirement.

In the Part 0 report, the EUT SAR are characterized for WWAN radios (2G/3G/4G/Sub6 NR) to determine the power limit that corresponds to the exposure design target after accounting for all device design related uncertainties, i.e., SAR_design_target (< FCC SAR limit) for sub-6. The SAR characterization are denoted as SAR Char. SAR Char will be used as input for Qualcomm Smart Transmit to operate. SAR Char will be loaded and store in the EUT via the Embedded File System (EFS).

The compliance test under the static transmission scenario and simultaneous transmission analysis are reported in Part 1 report. The validation of the time-averaging algorithm and compliance under the dynamic (time- varying) transmission scenario for WWAN technologies are reported in Part 2 report.

The EUT supports WLAN/BT radio as well but WLAN/BT modem is not enabled with Smart Transmit.

Nomenclature for Part 0 Report

Term	Description
P_{limit}	The time-averaged RF power which corresponds to SAR_design_target.
P_{max}	Maximum target power level
SAR_design_target:	The design target for SAR compliance. It should be less than regulatory power density limit to account for all device design related uncertainties.
SAR Char	P_{limit} for all the technologies/bands for all applicable DSI

3 Equipment Under Test (EUT) Overview

Description:	Mobile Phone		
Model name:	CPH2551		
Operating mode(s):	GSM850/900/1800/1900, WCDMA B1/2/4/5/6/8/19 LTE Band FDD:1/2/3/4/5/7/8/12/13/17/18/19/20/25/26/28/30/32/66/71 LTE Band TDD:38/39/40/41/46/48 5G NR N1/2/3/5/7/8/12/20/25/28/30/38/40/41/66/71/75/77/78 BT, Wi-Fi(2.4G), Wi-Fi(5G), Wi-Fi(6E),NFC		
Tx Frequency:	824 – 849 MHz (GSM 850)		
	1850 – 1910 MHz (GSM 1900)		
	824–849 MHz (WCDMA 850 Band V)		
	1710 – 1755 MHz (WCDMA 1700 Band IV)		
	1850–1910 MHz (WCDMA1900 Band II)		
	1850 – 1910 MHz(LTE Band 2)		
	1710 – 1755 MHz (LTE Band 4)		
	824 – 849 MHz (LTE Band 5)		
	2500 – 2570 MHz(LTE Band 7)		
	699 – 716 MHz (LTE Band 12)		
	777 –787 MHz (LTE Band 13)		
	704 –716 MHz (LTE Band 17)		
	1850 – 1915 MHz(LTE Band 25)		
	814 – 849 MHz (LTE Band 26)		
	2307.5 – 2312.5 MHz (LTE Band 30)		
	2570 – 2620 MHz (LTE Band 38)		
	2496 – 2690 MHz (LTE Band 41)		
	1710 – 1780 MHz (LTE Band 66)		
	665.5 – 695.5 MHz (LTE Band 71)		
	2412 – 2462 MHz (Wi-Fi 2.4G)		
	5180 – 5240 MHz		(Wi-Fi 5G)
	5260 – 5320 MHz		
	5500 – 5700 MHz		
	5745 – 5825 MHz		
	5925 – 6425 MHz		(Wi-Fi 6E)
	6425 – 6525 MHz		
	6525 – 6875 MHz		
	6875 – 7125 MHz		
	2400 – 2483.5 MHz (Bluetooth)		
	1850 – 1910 MHz(n2)		
	824 – 849 MHz(n5)		
	2500 – 2570 MHz (n7)		
	701.5 – 713.5 MHz (n12)		
1852.5 – 1912.5 MHz(n25)			
2307.5 – 2312.5 MHz (n30)			
2570 – 2620 MHz (n38)			
2496 – 2690 MHz (n41)			
1710– 1780 MHz (n66)			
665.5 – 695.5 MHz (n71)			
3455.01 – 3544.98 MHz (n77-L)			
3705 – 3975 MHz (n77-H)			

	13.56 MHz (NFC)
GPRS/EGPRS Multislot Class:	12
Test device production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Hotspot mode:	Support

4 SAR Characterization

4.1 DSI and SAR Determination

This device uses different Device State Index (DSI) to configure different time averaged power levels based on certain exposure scenarios. Depending on the detection scheme implemented in the smartphone, the worst-case SAR is further grouped and determined for each or combined exposure scenario

DSI and Corresponding Exposure Scenarios

Scenario	Description
DSI1	Folder Closed Body CH1 sensor on, CH0 sensor off (Standalone)
DSI2	Folder Closed Body CH1 sensor off, CH0 sensor on (Standalone)
DSI5	Folder Closed Head (Standalone)
DSI6	Folder Closed Body CH1 sensor on, CH0 sensor off (simultaneous transmission)
DSI7	Folder Closed Body CH1 sensor off, CH0 sensor on (simultaneous transmission)
DSI10	Folder Closed Head (simultaneous transmission)
DSI11	Folder Open Body CH1 sensor on (Standalone)
DSI12	Folder Open Body CH1 sensor off (Standalone)
DSI13	Folder Open Head (Standalone)
DSI14	Folder Open Body CH1 sensor on (simultaneous transmission)
DSI15	Folder Open Body CH1 sensor off (simultaneous transmission)
DSI16	Folder Open Head (simultaneous transmission)

Note: CH1 includes ANT1/4, CH0 includes ANT2/7

4.2 SAR Design Target and Uncertainty

SAR_design_target is determined by ensuring that it is less than FCC SAR limit after accounting for total device designed related uncertainties specified by the manufacturer.

To account for total uncertainty, SAR_design_target should be determined as:

$$SAR_design_target < SARregulatory_limit \times 10^{\frac{-total\ uncertainty}{10}}$$

Exposure conditions	DSI	SAR design target W/kg(1g)	Remark
stand-alone	1/2/5/11/12/13	1.2	/
simultaneous transmission	6/7/10/14/15/16	0.9	/

Total uncertainty	Uncertainty dB 2G	Uncertainty dB 3/4G	Uncertainty dB NR
	1	0.8	1.2



4.2 SAR Char

SAR char must be generated to cover all radio configurations and usage scenarios that the wireless device supports for operating. Plimit is calculated by linearly scaling with the measured SAR at the Ppart0 to correspond to the SAR_design_target. When Plimit < Pmax, Ppart0 was used as Plimit in the Smart Transmit EFS. When Plimit >Pmax and Ppart0=Pmax, calculated Pmax was used in the Smart Transmit EFS. All reported SAR obtained from the Ppart0 SAR tests was less than SAR_Design_target+ device uncertainty.

Band	Antenna	Plane														Pmax
		Folder Closed Body CH sensor on (standalone)	Folder Closed Body CH sensor off (standalone)	Folder Closed Head (standalone)	Folder Closed Body CH sensor on, CRD sensor off (simultaneous transmission)	Folder Closed Body CH sensor off, CRD sensor on (simultaneous transmission)	Folder Closed Head (simultaneous transmission)	Folder Open Body CH sensor on (standalone)	Folder Open Body CH sensor off (standalone)	Folder Open Head (standalone)	Folder Open Body CH sensor on (simultaneous transmission)	Folder Open Body CH sensor off (simultaneous transmission)	Folder Open Head (simultaneous transmission)	Folder Open Head (simultaneous transmission)		
		OS1	OS2	OS5	OS6	OS7	OS10	OS11	OS12	OS13	OS14	OS15	OS16			
OSM_B950	1	32.2	32.2	32.2	32.2	32.2	32.2	29.2	29.2	32.2	29.2	32.2	32.2	32.2		
OSM_B950	2	30	29.5	30.5	29.5	29.5	30	27.5	27.5	30.5	27.5	30.5	30.5	30.5		
OSM_B950	3	30	29	30	30	30	30	29	29.5	29.5	30	29.5	29	29		
WCOMA_B2	2	23.5	23.5	23	21.5	20.5	20.5	14	14	19.5	13	15	18	24.5		
WCOMA_B2	3	24	24	24	23	23	24	15.5	15.5	24	14	14	24	24		
WCOMA_B4	1	23.5	23.5	23	21.5	20.5	20.5	14	14	19.5	13	15	18	24.5		
WCOMA_B4	3	24	24	24	23	23	24	15.5	15.5	24	14	14	24	24		
WCOMA_B5	0	24.8	24.8	24.8	24.8	24.8	24.8	18.3	18.3	24.8	18.3	18.3	24.8	24.8		
WCOMA_B5	1	24.2	24.2	24.2	24.2	24.2	24.2	18.7	18.7	24.2	18.7	18.7	24.2	24.2		
LTE_B2	2	22	21	22.5	21	19.5	21	14	14	21	11	11	20.5	24.5		
LTE_B2	3	23.5	23.5	24	22.5	22.5	24	15.5	15.5	24	13.5	13.5	24	24		
LTE_B2	4	21.5	24	24	19	24	24	13.5	23	24	11.5	20	24	24		
LTE_B2	5	19.5	19.5	23.5	16.5	16.5	23.5	13.5	13.5	23.5	13.5	13.5	23.5	23.5		
LTE_B4	2	23	23.5	23	22	20.5	23.5	14	14	21	12.5	12.5	20.5	24.5		
LTE_B4	3	24	24	24	23.5	23.5	24	16	16	24	15	15	24	24		
LTE_B4	4	22.8	24	24	21	24	24	14.5	24	24	13	24	24	24		
LTE_B4	5	22.3	23.3	23.3	20.3	20.3	23.3	12.8	12.8	23.3	11.8	11.8	23.3	23.3		
LTE_B5	0	24.9	24.9	24.9	24.4	24.4	24.4	17.9	17.9	24.9	17.4	17.4	24.9	24.9		
LTE_B5	1	24.7	24.7	24.7	24.2	24.2	24.2	18.7	18.7	24.7	18.2	18.2	24.7	24.7		
LTE_B7	2	21.2	19.7	21.2	20.7	19.7	19.7	13.7	13.7	19.7	12.7	12.7	19.7	19.7		
LTE_B7	3	22	22	24	21	21	24	14.5	14.5	24	12.5	12.5	24	24		
LTE_B7	4	21.5	24	24	20.5	24	24	13	22.5	24	12	21.5	24	24		
LTE_B7	5	20	20	24	17.5	17.5	24	12	12	24	11	11	24	24		
LTE_B12	0	24.9	24.9	24.9	24.4	24.4	24.9	18.3	18.3	24.9	17.9	17.9	24.9	24.9		
LTE_B12	1	24.2	24.2	24.2	23.7	24.2	24.2	18.2	18.2	24.2	18.7	18.2	24.2	24.2		
LTE_B12	2	22.9	22.9	22.9	22.4	22.9	22.9	17.4	17.4	22.9	16.9	16.9	22.9	22.9		
LTE_B12	3	22.2	22.2	22.2	22.2	22.2	22.2	16.2	16.2	22.2	16.7	16.2	22.2	22.2		
LTE_B17	0	24.4	24.4	24.4	24.4	24.4	24.4	18.4	18.4	24.4	18.9	18.9	24.4	24.4		
LTE_B17	1	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B17	2	22	22	21	21.5	21	19.5	20.5	21	24	13.5	13.5	19.5	19.5		
LTE_B25	3	23.5	23.5	24	22.5	22.5	24	15	15	24	12.5	12.5	24	24		
LTE_B25	4	22	24	24	20.5	24	24	13.5	23	24	11.5	21.5	24	24		
LTE_B25	5	22.3	23.3	23.3	20.3	20.3	23.3	12.8	12.8	23.3	11.8	11.8	23.3	23.3		
LTE_B25	6	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	7	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	8	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	9	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	10	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	11	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	12	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	13	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	14	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	15	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	16	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	17	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	18	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	19	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	20	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	21	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	22	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	23	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	24	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	25	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	26	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	27	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	28	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	29	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	30	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	31	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	32	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	33	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	34	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	35	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	36	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	37	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	38	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	39	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	40	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	41	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	42	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	43	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	44	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	45	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	46	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	47	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	48	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	49	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	50	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	51	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	52	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	53	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	54	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	55	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	56	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	57	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2	19.2	24.2	24.2		
LTE_B25	58	24.9	24.9	24.9	24.4	24.9	24.9	18.9	18.9	24.9	18.9	18.9	24.9	24.9		
LTE_B25	59	24.2	24.2	24.2	23.7	24.2	24.2	19.2	19.2	24.2	19.2					



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5 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.