

# FCC SAR Compliance Test Report

For

**TECNO MOBILE LIMITED**

**ROOMS 05-15, 13A/F., SOUTH TOWER,**

**WORLD FINANCE CENTRE, HARBOUR CITY, 17 CANTON ROAD, TSIM SHA TSUI,**

**KOWLOON, HONG KONG**

Model: W4

Test Engineer: Stars Liang

Report Number: FCC16083893A-6

Report Date: 2016-08-29

FCC ID: 2ADYY-W4

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### Modified History

REV.	Modification Description	Issued Date	Remark
REV.1.0	Initial Test Report Release	2016-08-29	Hank Huang

## 1 General information

### 1.1 Notes

The test results of this test report relate exclusively to the test item specified in this test report. Shenzhen Timeway Testing Laboratories does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report is not to be reproduced or published in full without the prior written permission.

### 1.2 Application details

Date of receipt of test item: 2016-08-11  
Start of test: 2016-08-18  
End of test: 2016-08-22

### 1.3 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for W4 is as below:

Band	Position	MAX Reported SAR <sub>1g</sub> (W/kg)
GSM850	Head	0.400
	Body-Worn	0.833
	Hotspot 10mm	0.794
GSM1900	Head	0.109
	Body-Worn	0.799
	Hotspot 10mm	0.647
UMTS Band II	Head	0.216
	Body-Worn	<b>0.883</b>
	Hotspot 10mm	0.632
UMTS Band V	Head	0.345
	Body-Worn	0.479
	Hotspot 10mm	0.330
Wi-Fi 2450	Head	<b>0.536</b>
	Body-Worn	0.640
	Hotspot 10mm	0.727
The highest simultaneous SAR is 1.470W/kg per KDB690783 D01		

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits of 1.6 W/Kg as averaged over any 1g tissue according to the FCC rule §2.1093, the ANSI/IEEE C95.1:2005, the NCRP Report Number 86 for uncontrolled environment, according to the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

## 1.4 EUT Information

Device Information:			
<b>Product Type:</b>	Mobile phone		
<b>Model:</b>	W4		
<b>Device Type:</b>	Portable device		
<b>Exposure Category:</b>	uncontrolled environment / general population		
<b>Production Unit or Identical Prototype:</b>	Production Unit		
<b>Hardware version:</b>	AW875L_MB_BOM_V2.01		
<b>Software version :</b>	W4-AW875C1-M-160721V1		
<b>Antenna Type :</b>	Internal Antenna		
Device Operating Configurations:			
<b>Supporting Mode(s) :</b>	GSM850/1900, UMTS Band II /V,Wi-Fi , BT		
<b>Modulation:</b>	GMSK, OFDM/CCK, GFSK/ $\pi/4$ -DQPSK/ 8-DPSK		
<b>Device Class :</b>	Class B, No DTM Mode		
<b>Operating Frequency Range(s)</b>	<b>Band</b>	<b>TX(MHz)</b>	<b>RX(MHz)</b>
	GSM850	824~849	869~894
	GSM1900	1850~1910	1930~1990
	UMTS Band II	1850~1910	1930~1990
	UMTS Band V	824~840	869~894
	Wi-Fi	2412~2462	2412~2462
	BT	2402~2480	2402~2480
<b>GPRS class level:</b>	GPRS class 12		
<b>Test Channels (low-mid-high):</b>	128-190-251(GSM850)		
	512-661-810(GSM1900)		
	9262-9400-9538(UMTS Band II)		
	4132-4182-4233(UMTS Band V)		
	1-6-11 (Wi-Fi)		
	0-39-78(BT)		
<b>Power Source:</b>	3.8 VDC/3000mAh Rechargeable Battery		

## 2 Testing laboratory

Test Site	QTC Certification & Testing Co., Ltd.
Test Location	2nd Floor, BI Building, Fengyeyuan Industrial Plant,, Liuxian 2st. Road, Xin'an Street, Bao'an District,, Shenzhen, 518000
Telephone	+86-755-26996144 EXT:8164
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## 3 Test Environment

	Required	Actual
Ambient temperature:	18 – 25 °C	22 ± 2 °C
Tissue Simulating liquid:	22 ± 2 °C	22 ± 2 °C
Relative humidity content:	30 – 70 %	30 – 70 %

## 4 Applicant and Manufacturer

Applicant/Client Name:	TECNO MOBILE LIMITED
Applicant Address:	ROOMS 05-15, 13A/F., SOUTH TOWER, WORLD FINANCE CENTRE, HARBOUR CITY, 17 CANTON ROAD, TSIM SHA TSUI, KOWLOON, HONG KONG
Manufacturer Name:	SHENZHEN TECNO TECHNOLOGY CO.,LTD.
Manufacturer Address:	1-4th Floor, 3rd Building, Pacific Industrial Park, No.2088, Shenyang Road, Yantian District, Shenzhen, Guangdong, China

**5 Test standard/s:**

ANSI Std C95.1-2005	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
IEEE Std 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 5 March 2015)
KDB447498 D01	General RF Exposure Guidance v06
KDB648474 D04	Head set SAR v01r03
KDB941225 D06	Hot Spot SAR V02r01
KDB941225 D01	3G SAR Measurement Procedures
KDB248227 D01	SAR meas for 802.11 a/b/g v01r02
KDB865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB865664 D02	RF Exposure Reporting v01r02



## 5.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
<b>Spatial Peak SAR*</b> (Brain/Body/Arms/Legs)	<b>1.60 mW/g</b>	8.00 mW/g
<b>Spatial Average SAR**</b> (Whole Body)	0.08 mW/g	0.40 mW/g
<b>Spatial Peak SAR***</b> (Heads/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

The limit applied in this test report is shown in bold letters

### Notes:

- \* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
- \*\* The Spatial Average value of the SAR averaged over the whole body.
- \*\*\* The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

**Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

## 5.2 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ).

$$SAR = \frac{d}{dt} \left( \frac{dW}{dm} \right) = \frac{d}{dt} \left( \frac{dW}{\rho dV} \right)$$

SAR is expressed in units of watts per kilogram (W/kg). SAR can be related to the electric field at a point by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

where:

$\sigma$  = conductivity of the tissue (S/m)

$\rho$  = mass density of the tissue (kg/m<sup>3</sup>)

E = rms electric field strength (V/m)

## 6 SAR Measurement System

### 6.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Device holder
- Head simulating tissue

The following figure shows the system.



The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

## 6.2 Robot

The COMOSAR system uses the high precision robots KR 6 R900 sixx type out of the newer series from Satimo SA (France).For the 6-axis controller COMOSAR system, the KUKA robot controller version from Satimo is used. The KR 6 R900 sixx robot series have many features that are important for

our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

## 6.3 Probe

For the measurements the Specific Dosimetric E-Field Probe SSE 5 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 5 mm
- Distance between probe tip and sensor center: 2.5mm
- Distance between sensor center and the inner phantom surface: 4 mm  
(repeatability better than +/- 1mm)
- Probe linearity: <0.25 dB
- Axial Isotropy: <0.25 dB
- Spherical Isotropy: <0.50 dB
- Calibration range: 300 to 2600MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and surface normal line:less than 30°

## 6.4 Measurement procedure

The following steps are used for each test position

- Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface.
- Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- Measurement of the SAR distribution with a grid of 8 to 16 mm \* 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors can not directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
- Around this point, a cube of 30 \* 30 \* 30 mm or 32 \* 32 \* 32 mm is assessed by measuring 5 or 8 \* 5 or 8 \* 4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

## 6.5 Description of interpolation/extrapolation scheme

- The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimise measurements errors, but the highest local SAR will occur at the surface of the phantom.
- An extrapolation is used to determine these highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1 mm step.
- The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR average over 10 grams and 1 gram requires a very fine resolution in the three-dimensional scanned data array.

### 6.6 Phantom

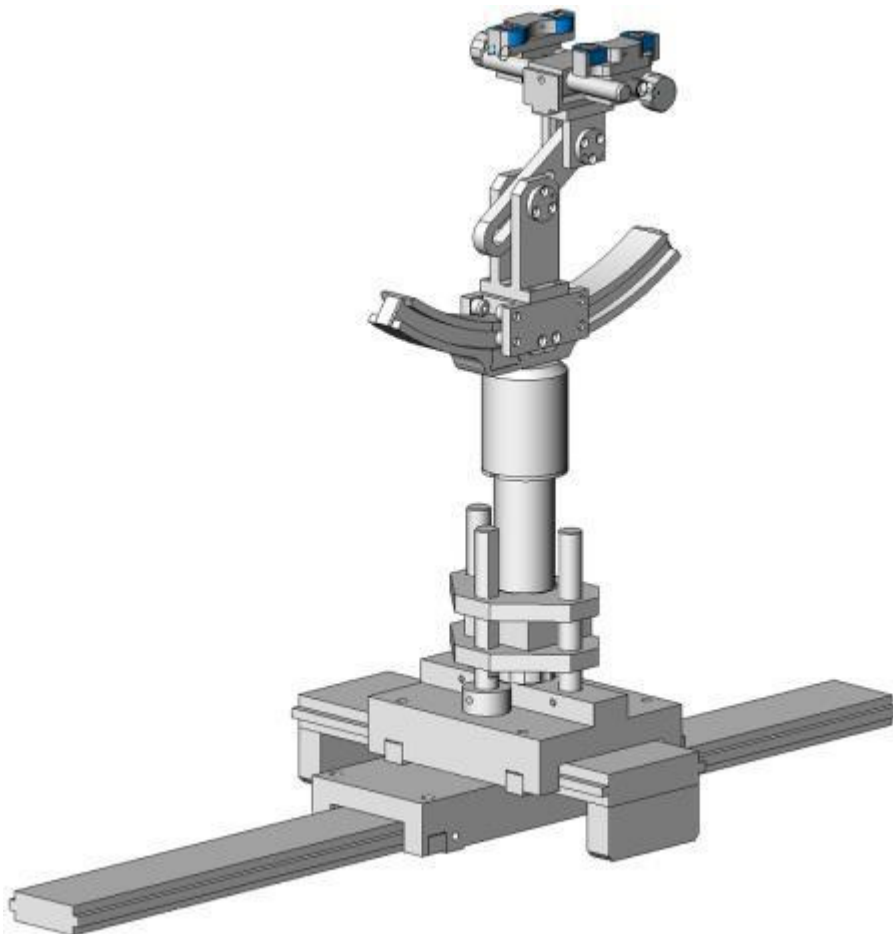
For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.



System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

### 6.7 Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1°.



Device holder

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

## 6.8 Video Positioning System

- The video positioning system is used in OpenSAR to check the probe. Which is composed of a camera, LED, mirror and mechanical parts. The camera is piloted by the main computer with firewire link.
- During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
- The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.



## 6.9 Tissue simulating liquids: dielectric properties

The following materials are used for producing the tissue-equivalent materials.

(Liquids used for tests are marked with ☒):

Ingredients(% of weight)	Frequency (MHz)				
frequency band	<input type="checkbox"/> 450	<input checked="" type="checkbox"/> 835	<input type="checkbox"/> 1800	<input checked="" type="checkbox"/> 1900	<input checked="" type="checkbox"/> 2450
Tissue Type	Head	Head	Head	Head	Head
Water	38.56	41.45	52.64	55.242	62.7
Salt (NaCl)	3.95	1.45	0.36	0.306	0.5
Sugar	56.32	56.0	0.0	0.0	0.0
HEC	0.98	1.0	0.0	0.0	0.0
Bactericide	0.19	0.1	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	36.8
DGBE	0.0	0.0	47.0	44.542	0.0
Ingredients(% of weight)	Frequency (MHz)				
frequency band	<input type="checkbox"/> 450	<input checked="" type="checkbox"/> 835	<input type="checkbox"/> 1800	<input checked="" type="checkbox"/> 1900	<input checked="" type="checkbox"/> 2450
Tissue Type	Body	Body	Body	Body	Body
Water	51.16	52.4	69.91	69.91	73.2
Salt (NaCl)	1.49	1.40	0.13	0.13	0.04
Sugar	46.78	45.0	0.0	0.0	0.0
HEC	0.52	1.0	0.0	0.0	0.0
Bactericide	0.05	0.1	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	29.96	29.96	26.7

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether



### 6.10 Tissue simulating liquids: parameters

Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		$\epsilon_r$ (+/-5%)	$\sigma$ (S/m) (+/-5%)	$\epsilon_r$	$\sigma$ (S/m)		
835MHz Head	825	41.60 (39.52~43.68)	0.90 (0.86~0.95)	40.71	0.91	21.6°C	2016-8-19
	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	40.53	0.93		
	850	41.50 (39.43~43.58)	0.92 (0.87~0.97)	40.32	0.94		
835MHz Body	825	55.20 (52.44~57.96)	0.97 (0.92~1.02)	53.64	1.00	21.6°C	2016-8-19
	835	55.20 (52.44~57.96)	0.97 (0.92~1.02)	53.44	1.01		
	850	55.20 (52.44~57.96)	0.99 (0.94~1.04)	53.16	1.02		
1900MHz Head	1850	40.00 (38.00~42.00)	1.40 (1.33~1.47)	40.08	1.38	21.6°C	2016-8-18
	1880	40.00 (38.00~42.00)	1.40 (1.33~1.47)	40.05	1.41		
	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	40.04	1.43		
	1910	40.00 (38.00~42.00)	1.40 (1.33~1.47)	40.03	1.44		
1900MHz Body	1850	53.30 (50.64~55.97)	1.52 (1.44~1.60)	52.28	1.49	21.6°C	2016-8-18
	1880	53.30 (50.64~55.97)	1.52 (1.44~1.60)	52.25	1.52		
	1900	53.30 (50.64~55.97)	1.52 (1.44~1.60)	52.24	1.55		
	1910	53.30 (50.64~55.97)	1.52 (1.44~1.60)	52.23	1.56		
2450MHz Head	2410	39.30 (37.34~41.26)	1.76 (1.67~1.85)	39.46	1.75	21.6°C	2016-8-22
	2435	39.20 (37.24~41.16)	1.79 (1.70~1.88)	39.36	1.78		
	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	39.27	1.80		
	2460	39.20 (37.24~41.16)	1.81 (1.72~1.90)	39.30	1.80		
2450MHz Body	2410	52.80 (50.16~55.44)	1.91 (1.81~2.00)	51.42	1.89	21.6°C	2016-8-22
	2435	52.70 (50.07~55.34)	1.94 (1.84~2.04)	52.84	2.02		
	2450	52.70 (50.07~55.34)	1.95 (1.85~2.05)	54.22	2.04		
	2460	52.70 (50.07~55.34)	1.96 (1.86~2.06)	55.18	1.96		

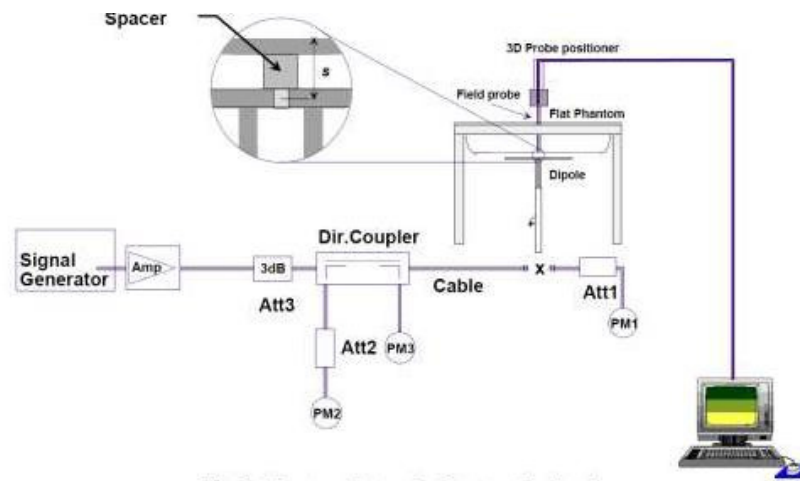
$\epsilon_r$  = Relative permittivity,  $\sigma$  = Conductivity

## 7 System Check

### 7.1 System check procedure

The System check is performed by using a System check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 100 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the System check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



## 7.2 System check results

The system Check is performed for verifying the accuracy of the complete measurement system and performance of the software. The following table shows System check results for all frequency bands and tissue liquids used during the tests (plot(s) see annex A).

System Check	Target SAR (1W) (+/-10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (mW/g)	10-g (mW/g)	1-g (mW/g)	10-g (mW/g)		
<b>D835V2 Head</b>	9.56 (8.60~10.52)	6.19 (5.57~6.81)	9.695	6.115	21.6°C	2016-8-19
<b>D1900V2 Head</b>	39.46 (35.51~43.41)	20.42 (18.38~22.46)	41.501	21.466	21.6°C	2016-8-18
<b>D2450V2 Head</b>	53.08 (47.77~58.39)	23.79 (21.41~26.17)	52.193	23.896	21.6°C	2016-8-22
<b>D835V2 Body</b>	9.86 (8.87~10.85)	6.38 (5.74~7.02)	10.495	6.616	21.6°C	2016-8-19
<b>D1900V2 Body</b>	40.06 (36.05~44.07)	20.76 (18.68~22.84)	42.987	22.164	21.6°C	2016-8-18
<b>D2450V2 Body</b>	54.76 (49.28~60.24)	24.47 (22.02~26.92)	57.346	25.833	21.6°C	2016-8-22

Note: All SAR values are normalized to 1W forward power.

## 8 SAR Test Test Configuration

### 8.1 GSM Test Configurations

SAR tests for GSM850 and GSM1900, a communication link is set up with a base station by air link. Using CMU200 the power lever is set to “5”and “0” in SAR of GSM850 and GSM1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5.

### 8.2 Wi-Fi Test Configuration

For the 802.11b/g SAR tests, a communication link is set up with the test mode software for Wi-Fi mode test. The Absolute Radio Frequency Channel Number(ARFCN) is allocated to 1 ,6 and 11 respectively in the case of 2450 MHz.During the test,at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate. 802.11b/g operating modes are tested independently according to the service requirements in each frquency band. 802.11b/g modes are tested on channel 1, 6, 11; however,if output power reduction is necessary for channels 1 and/or 11 to meet restricted band requirements the highest output channel closest to each of these channels must be tested instead.

SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

Mode	Band	GHz	Channel	“Default Test Channels”	
				802.11b	802.11g
802.11b/g	2.4 GHz	2412	1#	√	Δ
		2437	6	√	Δ
		2462	11#	√	Δ

Notes:

√ = “default test channels”

Δ= possible 802.11g channels with maximum average output ¼ dB the “default test channels”

# = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

802.11 Test Channels per FCC Requirements

## 9 Detailed Test Results

### 9.1 Conducted Power measurements

The output power was measured using an integrated RF connector and attached RF cable.

#### 9.1.1 Conducted Power of GSM850

GSM850(SIM1)		Burst-Averaged output Power (dBm)			Division Factors	Source Based time Average Power(dBm)		
		128CH	190CH	251CH		128CH	190CH	251CH
GSM(CS)		33.20	33.04	32.93	-9.03	24.17	24.01	23.90
GPRS (GMSK)	1 Tx Slot	33.13	33.15	32.94	-9.03	24.10	24.12	23.91
	2 Tx Slots	32.01	31.78	31.76	-6.02	25.99	25.76	25.74
	3 Tx Slots	30.81	30.55	30.32	-4.26	26.55	26.29	26.06
	4 Tx Slots	30.12	29.98	29.88	-3.01	<b>27.11</b>	<b>26.97</b>	<b>26.87</b>
EGPRS (8-PSK)	1 Tx Slot	28.99	29.00	29.06	-9.03	19.96	19.97	20.03
	2 Tx Slots	27.28	27.39	27.37	-6.02	21.26	21.37	21.35
	3 Tx Slots	26.12	26.16	26.22	-4.26	21.86	21.90	21.96
	4 Tx Slots	25.45	25.52	25.48	-3.01	<b>22.44</b>	<b>22.51</b>	<b>22.47</b>

GSM850(SIM2)		Burst-Averaged output Power (dBm)			Division Factors	Source Based time Average Power(dBm)		
		128CH	190CH	251CH		128CH	190CH	251CH
GSM(CS)		32.98	33.05	33.09	-9.03	23.95	24.02	24.06
GPRS (GMSK)	1 Tx Slot	33.66	33.41	33.36	-9.03	24.63	24.38	24.33
	2 Tx Slots	33.28	32.58	32.67	-6.02	27.26	26.56	26.65
	3 Tx Slots	32.30	31.36	31.30	-4.26	28.04	27.10	27.04
	4 Tx Slots	33.02	32.97	32.88	-3.01	<b>30.01</b>	<b>29.96</b>	<b>29.87</b>
EGPRS (8-PSK)	1 Tx Slot	29.17	29.30	29.22	-9.03	20.14	20.27	20.19
	2 Tx Slots	27.31	27.45	27.06	-6.02	21.29	21.43	21.04
	3 Tx Slots	26.11	26.16	26.03	-4.26	21.85	21.90	21.77
	4 Tx Slots	25.58	25.52	25.52	-3.01	<b>22.57</b>	<b>22.51</b>	<b>22.51</b>

Note: 1) The conducted power of GSM850 is measured with RMS detector.

2) Source Based time Average Power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 timeslots.

3) The bolded GPRS 4Tx slots mode was selected for SAR testing according to the highest Source Based time Average Power table.

4) channel /Frequency: 128/824.2; 190/836.6; 251/848.8

5) For Dual SIM Operation, when the power deviation of SIM1 and SIM2 is not more than 0.5dB, which tested SIM1 mode first, and then tested SIM2 mode at the worst position from SIM1 mode.

### 9.1.2 Conducted Power of GSM1900

GSM1900(SIM1)		Burst-Averaged output Power (dBm)			Division Factors	Source Based time Average Power(dBm)		
		512CH	661CH	810CH		512CH	661CH	810CH
GSM(CS)		30.19	30.16	30.00	-9.03	21.16	21.13	20.97
GPRS (GMSK)	1 Tx Slot	29.99	29.96	30.06	-9.03	20.96	20.93	21.03
	2 Tx Slots	28.59	28.46	28.58	-6.02	22.57	22.44	22.56
	3 Tx Slots	27.66	27.37	27.68	-4.26	23.40	23.11	23.42
	4 Tx Slots	27.01	27.00	27.01	-3.01	<b>24.00</b>	<b>23.99</b>	<b>24.00</b>
EGPRS (8-PSK)	1 Tx Slot	28.97	28.87	28.79	-9.03	19.94	19.84	19.76
	2 Tx Slots	26.33	26.39	26.37	-6.02	20.31	20.37	20.35
	3 Tx Slots	25.24	25.36	25.13	-4.26	20.98	21.10	20.87
	4 Tx Slots	24.53	25.42	24.57	-3.01	<b>21.52</b>	<b>22.41</b>	<b>21.56</b>

GSM1900(SIM2)		Burst-Averaged output Power (dBm)			Division Factors	Source Based time Average Power(dBm)		
		512CH	661CH	810CH		512CH	661CH	810CH
GSM(CS)		29.98	29.90	29.91	-9.03	20.95	20.87	20.88
GPRS (GMSK)	1 Tx Slot	32.57	32.37	32.40	-9.03	23.54	23.34	23.37
	2 Tx Slots	31.34	31.42	30.13	-6.02	25.32	25.40	24.11
	3 Tx Slots	30.23	30.34	29.24	-4.26	25.97	26.08	24.98
	4 Tx Slots	30.16	30.13	29.79	-3.01	<b>27.15</b>	<b>27.12</b>	<b>26.78</b>
EGPRS (8-PSK)	1 Tx Slot	28.90	28.80	28.89	-9.03	19.87	19.77	19.86
	2 Tx Slots	26.30	26.33	26.24	-6.02	20.28	20.31	20.22
	3 Tx Slots	25.03	25.00	25.01	-4.26	20.77	20.74	20.75
	4 Tx Slots	24.62	24.00	24.08	-3.01	<b>21.61</b>	<b>20.99</b>	<b>21.07</b>

Note: 1) The conducted power of GSM1900 is measured with RMS detector.

2) Source Based time Average Power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 timeslots.

3) The bolded GPRS 4Tx slots mode was selected for SAR testing according to the highest Source Based time Average Power table.

4) channel /Frequency: 512/1850.2; 661/1880; 810/1909.8

5) For Dual SIM Operation, when the power deviation of SIM1 and SIM2 is not more than 0.5dB, which tested SIM1 mode first, and then tested SIM2 mode at the worst position from SIM1 mode.

**9.1.3 Conducted Power of UMTS Band II**

UMTS Band II		Conducted Power (dBm)		
		9262CH	9400CH	9538CH
WCDMA	12.2kbps RMC	21.46	21.94	21.55
HSDPA	Subtest 1	21.80	22.77	21.75
	Subtest 2	20.96	20.89	20.97
	Subtest 3	21.21	20.68	20.57
	Subtest 4	20.81	20.56	20.79
HSUPA	Subtest 1	22.52	21.87	21.49
	Subtest 2	21.50	21.22	21.63
	Subtest 3	21.47	21.38	21.62
	Subtest 4	20.85	21.82	20.27
	Subtest 5	21.15	21.52	21.41

Note: 1) channel /Frequency: 9262/1852.4, 9400/1880, 9538/1907.6

**9.1.4 Conducted Power of UMTS Band V**

UMTS Band V		Conducted Power (dBm)		
		4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	23.54	23.77	23.49
HSDPA	Subtest 1	22.79	23.49	22.65
	Subtest 2	21.70	21.80	20.88
	Subtest 3	22.13	21.47	20.96
	Subtest 4	21.84	21.45	21.53
HSUPA	Subtest 1	23.44	23.82	23.53
	Subtest 2	22.31	22.48	21.87
	Subtest 3	22.24	22.17	22.39
	Subtest 4	21.76	22.72	21.77
	Subtest 5	21.91	22.47	22.34

Note: 1) channel /Frequency: 4132/826.4, 4182/836.4, 4233/846.6



**9.1.5 Conducted Power of Wi-Fi 2.4G**

Mode	802.11b		
Channel / Frequency (MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	20.65	19.47	18.98
Mode	802.11g		
Channel / Frequency (MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	19.20	18.68	18.69
Mode	802.11n(HT20)		
Channel / Frequency (MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	19.40	19.19	18.51
Mode	802.11n(HT40)		
Channel / Frequency (MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	18.18	18.28	18.44

Note:

<KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

(1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is  $\leq 0.4$  W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is  $\leq 0.8$  W/kg or all test positions are measured.

(2) For Wi-Fi 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is  $\leq 0.8$  W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is  $\leq 1.2$  W/kg.

**9.1.6 Conducted Power of BT**

The maximum output power of BT is:

Mode	1Mbps		
Channel / Frequency (MHz)	0(2402)	39(2441)	78(2480)
Average Power(dBm)	4.66	4.86	2.12
Mode	2Mbps		
Channel / Frequency (MHz)	0(2402)	39(2441)	78(2480)
Average Power(dBm)	-0.89	3.18	1.08
Mode	3Mbps		
Channel / Frequency (MHz)	0(2402)	39(2441)	78(2480)
Average Power(dBm)	-1.34	3.14	0.89

## 9.2 SAR test results

### Notes:

1) Per KDB447498 D01v05 r02, the SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the scaled SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit ( $< 0.8$  W/kg), testing at the high and low channels is optional.

2) Per KDB447498 D01v05r02, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:  $\leq 0.8$  W/kg or  $2.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz. When the maximum output power variation across the required test channels is  $> \frac{1}{2}$  dB, instead of the middle channel, the highest output power channel must be used.

3) Per KDB447498 D01v05r02, All measurement SAR result is scaled-up to account for tune-up tolerance is compliant.

4) Per KDB648474 D04v01r02, body-worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn with headset SAR.

5) Per KDB248227 D01v01r02, the procedures required to establish specific device operating configurations for testing the SAR of 802.11 a/b/g transmitters.

6) Per KDB865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8$  W/Kg; if the deviation among the repeated measurement is  $\leq 20\%$ , and the measured SAR  $< 1.45$  W/Kg, only one repeated measurement is required.

7) Per KDB865664 D02v01r01, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is  $> 1.5$  W/kg, or  $> 7.0$  W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing (Refer to appendix B for details).

8) Per KDB941225 D06v01r01, the DUT Dimension is bigger than  $9$  cm x  $5$  cm, so  $10$  mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than  $2.5$  cm, such position does not need to be tested.

9) KDB 941225 D01, 3G SAR Measurement Procedures, The mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary

modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq 1/4$  dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for the secondary mode.

### 9.2.1 Results overview of GSM850

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Left Head Touched	190/836.6	GSM	0.273	0.183	-4.050	33.04	33.500	0.304	4.93
Left Head Tilted 15°	190/836.6	GSM	0.208	0.140	1.890	33.04	33.500	0.231	4.93
Right Head Touched	190/836.6	GSM	0.282	0.195	-2.490	33.04	33.500	0.314	4.93
Right Head Tilted 15°	190/836.6	GSM	0.201	0.136	-0.540	33.04	33.500	0.223	4.93
Right Head Touched	128/824.2	GSM	0.278	0.189	-2.340	33.20	33.500	0.298	4.93
Right Head Touched	251/848.8	GSM	0.351	0.236	1.830	32.93	33.500	<b>0.400</b>	4.93
SIM2 Card Slot									
Right Head Touched	251/848.8	GSM	0.322	0.214	2.840	32.93	33.500	0.367	4.93
Test Position of Body with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Towards Phantom	190/836.6	GPRS 4TS	0.545	0.386	3.980	29.98	30.500	0.614	5.07
Towards Ground	190/836.6	GPRS 4TS	0.664	0.459	-1.120	29.98	30.500	0.748	5.07
Towards Ground	128/824.2	GPRS 4TS	0.653	0.457	2.920	30.12	30.500	0.713	5.07
Towards Ground	251/848.8	GPRS 4TS	0.701	0.499	3.770	29.88	30.500	<b>0.809</b>	5.07
Towards Ground	251/848.8	EDGE 4TS	0.105	0.068	2.450	25.48	26.000	0.118	5.07
Towards Ground with Headset	251/848.8	GSM	0.389	0.259	-1.780	32.93	33.500	0.444	5.07
SIM2 Card Slot									
Towards Ground	251/848.8	GPRS 4TS	0.722	0.514	3.270	29.88	30.500	<b>0.833</b>	5.07
<b>SAR Results for Hotspot Exposure Condition</b>									
Front Side	190/836.6	GPRS 4TS	0.501	0.339	2.350	29.98	30.500	0.565	5.07
Rear Side	190/836.6	GPRS 4TS	0.625	0.394	1.850	29.98	30.500	0.704	5.07
Right Side	190/836.6	GPRS 4TS	0.492	0.272	3.510	29.98	30.500	0.555	5.07

Bottom Side	190/836.6	GPRS 4TS	0.459	0.305	1.720	29.98	30.500	0.517	5.07
Rear Side	128/824.2	GPRS 4TS	0.672	0.428	4.330	30.12	30.500	0.733	5.07
Rear Side	251/848.8	GPRS 4TS	0.688	0.507	0.150	29.88	30.500	<b>0.794</b>	5.07

**9.2.2 Results overview of GSM1900**

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Left Head Touched	661/1880	GSM	0.101	0.044	0.000	30.160	30.500	<b>0.109</b>	4.63
Left Head Tilted 15°	661/1880	GSM	0.012	0.008	0.000	30.160	30.500	0.013	4.63
Right Head Touched	661/1880	GSM	0.043	0.015	0.000	30.160	30.500	0.047	4.63
Right Head Tilted 15°	661/1880	GSM	0.009	0.002	0.000	30.160	30.500	0.010	4.63
Left Head Touched	512/1850.2	GSM	0.100	0.047	0.000	30.190	30.500	0.107	4.63
Left Head Touched	810/1909.8	GSM	0.148	0.068	0.000	30.000	30.500	0.166	4.63
SIM2 Card Slot									
Left Head Touched	810/1909.8	GSM	0.040	0.015	0.000	30.000	30.500	0.045	4.63
Test Position of Body with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Towards Phantom	661/1880	GPRS 4TS	0.473	0.252	-4.150	27.000	27.500	0.531	4.78
Towards Ground	661/1880	GPRS 4TS	0.712	0.397	-4.720	27.000	27.500	<b>0.799</b>	4.78
Towards Ground	512/1850.2	GPRS 4TS	0.273	0.156	-1.250	27.010	27.500	0.306	4.78
Towards Ground	810/1909.8	GPRS 4TS	0.323	0.179	4.040	27.010	27.500	0.362	4.78
Towards Ground	661/1880	EDGE 4TS	0.092	0.040	2.290	25.420	25.500	0.094	4.78
Towards Ground with Headset	661/1880	GSM	0.214	0.104	0.240	30.160	30.500	0.231	4.78
SIM2 Card Slot									
Towards Ground	661/1880	GPRS 4TS	0.105	0.047	1.730	27.000	27.500	0.118	4.78
<b>SAR Results for Hotspot Exposure Condition</b>									
Front Side	661/1880	GPRS 4TS	0.416	0.231	3.120	27.000	27.500	0.467	4.78
Rear Side	661/1880	GPRS 4TS	0.577	0.267	-1.260	27.000	27.500	<b>0.647</b>	4.78
Right Side	661/1880	GPRS 4TS	0.343	0.288	1.690	27.000	27.500	0.385	4.78
Bottom Side	661/1880	GPRS 4TS	0.311	0.186	2.710	27.000	27.500	0.349	4.78

Rear Side	512/1850.2	GPRS 4TS	0.378	0.239	1.590	27.010	27.500	0.423	4.78
Rear Side	810/1909.8	GPRS 4TS	0.507	0.316	3.510	27.010	27.500	0.568	4.78

### 9.2.3 Results overview of UMTS Band II

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Left Head Touched	9400/1880	RMC	0.213	0.113	3.780	21.940	22.000	<b>0.216</b>	4.63
Left Head Tilted 15°	9400/1880	RMC	0.040	0.013	3.530	21.940	22.000	0.041	4.63
Right Head Touched	9400/1880	RMC	0.182	0.086	2.160	21.940	22.000	0.185	4.63
Right Head Tilted 15°	9400/1880	RMC	0.024	0.009	0.750	21.940	22.000	0.024	4.63
Left Head Touched	9262/1852.4	RMC	0.139	0.072	2.570	22.460	22.000	0.125	4.63
Left Head Touched	9538/1907.6	RMC	0.152	0.018	0.000	21.550	22.000	0.169	4.63
SIM2 Card Slot									
Left Head Touched	9400/1880	RMC	0.158	0.082	0.000	21.940	22.000	0.160	4.63
Test Position of Hotspot with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Towards Phantom	9400/1880	RMC	0.563	0.300	0.830	21.940	22.000	0.571	4.78
Towards Ground	9400/1880	RMC	0.729	0.382	2.140	21.940	22.000	0.739	4.78
Towards Ground	9262/1852.4	RMC	0.781	0.413	2.000	22.460	22.000	0.703	4.78
Towards Ground	9538/1907.6	RMC	0.749	0.387	-2.900	21.550	22.000	0.831	4.78
Towards Ground with Headset	9262/1852.4	RMC	0.780	0.400	1.050	21.460	22.000	<b>0.883</b>	4.78
SIM2 Card Slot									
Towards Ground	9262/1852.4	RMC	0.592	0.310	-0.380	21.460	22.000	0.670	4.78
<b>SAR Results for Hotspot Exposure Condition</b>									
Front Side	9400/1880	RMC	0.545	0.302	0.510	21.940	22.000	0.553	4.78
Rear Side	9400/1880	RMC	0.604	0.359	2.340	21.940	22.000	0.612	4.78
Right Side	9400/1880	RMC	0.588	0.284	-1.240	21.940	22.000	0.596	4.78

Bottom Side	9400/1880	RMC	0.557	0.347	0.840	21.940	22.000	0.565	4.78
Rear Side	9538/1907.6	RMC	0.570	0.406	1.330	21.550	22.000	<b>0.632</b>	4.78
Rear Side	9262/1852.4	RMC	0.524	0.295	1.860	22.460	22.000	0.553	4.78

#### 9.2.4 Results overview of UMTS Band V

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Left Head Touched	4182/836.4	RMC	0.261	0.180	-3.850	23.770	24.000	0.275	4.53
Left Head Tilted 15°	4182/836.4	RMC	0.160	0.111	2.790	23.770	24.000	0.169	4.53
Right Head Touched	4182/836.4	RMC	0.263	0.184	1.370	23.770	24.000	0.277	4.53
Right Head Tilted 15°	4182/836.4	RMC	0.192	0.132	2.470	23.770	24.000	0.202	4.53
Right Head Touched	4132/826.4	RMC	0.165	0.117	0.000	23.540	24.000	0.183	4.53
Right Head Touched	4233/846.6	RMC	0.307	0.215	1.690	23.490	24.000	<b>0.345</b>	4.53
SIM2 Card Slot									
Right Head Touched	4233/846.6	RMC	0.306	0.215	1.910	23.49	24.000	0.344	4.53
Test Position of Hotspot with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
SIM1 Card Slot									
Towards Phantom	4182/836.4	RMC	0.276	0.191	2.970	23.770	24.000	0.291	5.07
Towards Ground	4182/836.4	RMC	0.369	0.264	0.070	23.770	24.000	0.389	5.07
Towards Ground	4132/826.4	RMC	0.263	0.185	-0.030	23.540	24.000	0.292	5.07
Towards Ground	4233/846.6	RMC	0.385	0.272	3.340	23.490	24.000	0.433	5.07
Towards Ground with Headset	4233/846.6	RMC	0.342	0.234	4.640	23.490	24.000	0.385	5.07
SIM2 Card Slot									
Towards Ground	4233/846.6	RMC	0.426	0.302	0.330	23.490	24.000	<b>0.479</b>	5.07
<b>SAR Results for Hotspot Exposure Condition</b>									
Front Side	4182/836.4	RMC	0.313	0.177	3.220	23.770	24.000	<b>0.330</b>	5.07
Rear Side	4182/836.4	RMC	0.249	0.173	2.560	23.770	24.000	0.263	5.07
Right Side	4182/836.4	RMC	0.271	0.155	1.890	23.770	24.000	0.286	5.07



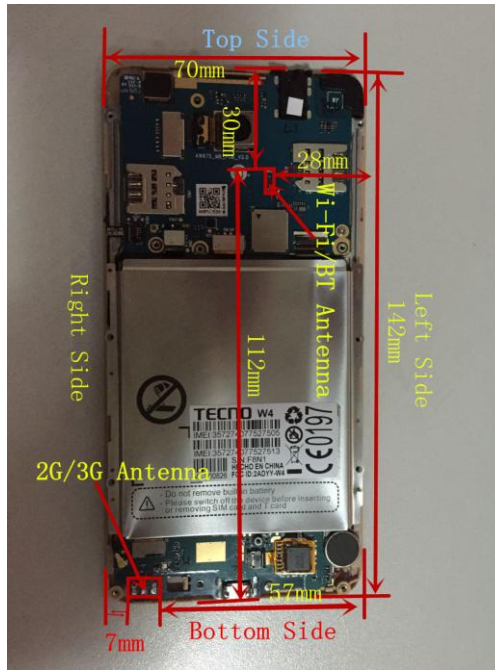
Bottom Side	4182/836.4	RMC	0.254	0.186	2.410	23.770	24.000	0.268	5.07
Front Side	4132/826.4	RMC	0.299	0.182	1.950	23.540	24.000	0.332	5.07
Front Side	4233/846.6	RMC	0.267	0.193	1.840	23.490	24.000	0.330	5.07

### 9.2.5 Results overview of Wi-Fi 2.4G

Test Position of Head	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
Left Head Touched	6/2437	802.11b	0.181	0.077	-1.690	19.47	21	0.257	4.00
Left Head Tilted 15°	6/2437	802.11b	0.171	0.073	-0.080	19.47	21	0.243	4.00
Right Head Touched	6/2437	802.11b	0.377	0.160	2.120	19.47	21	<b>0.536</b>	4.00
Right Head Tilted 15°	6/2437	802.11b	0.167	0.068	1.410	19.47	21	0.238	4.00
Right Head Touched	1/2412	802.11b	0.313	0.130	1.740	20.65	21	0.339	4.00
Right Head Touched	11/2462	802.11b	0.306	0.272	2.020	18.98	21	0.487	4.00
Test Position of Hotspot with 10mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR <sub>1-g</sub> (W/kg)	Conversion factor
			1-g	10-g					
Towards Phantom	6/2437	802.11b	0.366	0.234	0.090	19.47	21	0.521	4.11
Towards Ground	6/2437	802.11b	0.320	0.171	-1.590	19.47	21	0.455	4.11
Towards Phantom	1/2412	802.11b	0.590	0.243	-0.390	20.65	21	<b>0.640</b>	4.11
Towards Phantom	11/2462	802.11b	0.393	0.273	-0.160	18.98	21	0.626	4.11
SAR Results for Hotspot Exposure Condition									
Front Side	6/2437	802.11b	0.511	0.251	0.770	19.47	21	<b>0.727</b>	4.11
Rear Side	6/2437	802.11b	0.475	0.199	1.230	19.47	21	0.676	4.11
Front Side	1/2412	802.11b	0.583	0.283	0.150	20.65	21	0.632	4.11
Front Side	11/2462	802.11b	0.356	0.312	0.230	18.98	21	0.567	4.11

### 10 Multiple Transmitter Information

The SAR measurement positions of each side are as below:



Mode	Front Side	Rear Side	Left Side	Right Side	Top Side	Bottom Side
2G/3G Antenna	Yes	Yes	No	YES	No	YES
Wi-Fi	Yes	Yes	No	No	No	No

1) Per KDB941225 D06v01r01, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

### 10.1.1 Stand-alone SAR test exclusion

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq$  50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

Body-Worn position

Mode	Pmax(dBm)	Pmax(mW)	Distance(mm)	f(GHz)	Calculation Result	exclusion Threshold	SAR test exclusion
BT	6.00	3.98	10.00	2.480	0.63	3.00	Yes

When the standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion

$(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x]$  W/kg for test separation distances  $\leq 50$  mm, where  $x = 7.5$  for 1-g SAR.

When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	Position	Pmax(dBm)	Pmax(mW)	Distance(mm)	f(GHz)	X	Estimated SAR(W/Kg)
BT	Body	6	3.98	10.00	2.48	7.50	0.084

### 10.1.2 Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities are as below:

Simultaneous Transmission Possibilities				
Simultaneous Tx Combination	Configuration	Head	Body	Hotspot
1	GSM/GPRS/UMTS +Wi-Fi	YES	YES	YES
2	GSM/GPRS/UMTS +BT	NO	YES	NO

Note: The device does not support simultaneous BT and Wi-Fi ,because the BT and Wi-Fi share the same antenna and can't transmit simultaneously.

### 10.1.3 SAR Summation Scenario

Test Position		Scaled SAR <sub>Max</sub>		$\sum_{1-g}$ SAR	SPLSP
		GSM850	Wi-Fi		
Head	Left Head Touched	0.304	0.257	0.561	NA
	Left Head Tilted 15°	0.231	0.243	0.474	NA
	Right Head Touched	0.4	0.536	0.936	NA
	Right Head Tilted 15°	0.223	0.238	0.461	NA
Body	Towards Phantom	0.614	0.64	1.254	NA
	Towards Ground	0.883	0.455	1.338	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.444	0	0.444	NA
Hotspot	Towards Phantom	0.565	0.727	1.292	NA
	Towards Ground	0.794	0.676	<b>1.470</b>	NA
	Right Side	0.555	0	0.555	NA
	Bottom Side	0.517	0	0.517	NA

Note: Simultaneous Tx Combination of GSM850 and Wi-Fi

Test Position		Scaled SAR <sub>Max</sub>		$\sum_{1-g}$ SAR	SPLSP
		GSM1900	Wi-Fi		
Head	Left Head Touched	0.109	0.257	0.366	NA
	Left Head Tilted 15°	0.013	0.243	0.256	NA
	Right Head Touched	0.047	0.536	0.583	NA
	Right Head Tilted 15°	0.01	0.238	0.248	NA
Body	Towards Phantom	0.531	0.64	1.171	NA
	Towards Ground	0.799	0.455	1.254	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.231	0	0.231	NA
Hotspot	Towards Phantom	0.467	0.727	1.194	NA
	Towards Ground	0.647	0.676	<b>1.323</b>	NA
	Right Side	0.385	0	0.385	NA
	Bottom Side	0.349	0	0.349	NA

Note: Simultaneous Tx Combination of GSM1900 and Wi-Fi

Test Position		Scaled SAR <sub>Max</sub>		$\Sigma_{1-g}$ SAR	SPLSP
		UMTS Band II	Wi-Fi		
Head	Left Head Touched	0.216	0.257	0.473	NA
	Left Head Tilted 15°	0.041	0.243	0.284	NA
	Right Head Touched	0.185	0.536	0.721	NA
	Right Head Tilted 15°	0.024	0.238	0.262	NA
Body	Towards Phantom	0.571	0.64	1.211	NA
	Towards Ground	0.883	0.455	<b>1.338</b>	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.883	0	0.883	NA
Hotspot	Towards Phantom	0.553	0.727	1.28	NA
	Towards Ground	0.632	0.676	1.308	NA
	Right Side	0.596	0	0.596	NA
	Bottom Side	0.565	0	0.565	NA

Note: Simultaneous Tx Combination of UMTS Band II and Wi-Fi

Test Position		Scaled SAR <sub>Max</sub>		$\Sigma_{1-g}$ SAR	SPLSP
		UMTS Band V	Wi-Fi		
Head	Left Head Touched	0.275	0.257	0.532	NA
	Left Head Tilted 15°	0.169	0.243	0.412	NA
	Right Head Touched	0.345	0.536	0.881	NA
	Right Head Tilted 15°	0.202	0.238	0.44	NA
Body	Towards Phantom	0.291	0.64	0.931	NA
	Towards Ground	0.479	0.455	0.934	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.385	0	0.385	NA
Hotspot	Towards Phantom	0.33	0.727	<b>1.057</b>	NA
	Towards Ground	0.263	0.676	0.939	NA
	Right Side	0.286	0	0.286	NA
	Bottom Side	0.268	0	0.268	NA

Note: Simultaneous Tx Combination of UMTS Band V and Wi-Fi

MAX. $\Sigma$ SAR<sub>1g</sub> = 1.470W/kg < 1.6 W/kg, so the Simultaneous SAR is not required for Wi-Fi and GSM&UMTS antenna.

Test Position		Scaled SAR <sub>Max</sub>		$\sum_{1-g}$ SAR	SPLSP
		GSM850	BT		
Body	Towards Phantom	0.614	0.084	0.698	NA
	Towards Ground	0.883	0.084	<b>0.967</b>	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.444	0	0.444	NA

Note: Simultaneous Tx Combination of GSM850 and BT

Test Position		Scaled SAR <sub>Max</sub>		$\sum_{1-g}$ SAR	SPLSP
		GSM1900	BT		
Body	Towards Phantom	0.531	0.084	0.615	NA
	Towards Ground	0.799	0.084	<b>0.883</b>	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.231	0	0.231	NA

Note: Simultaneous Tx Combination of GSM1900 and BT

Test Position		Scaled SAR <sub>Max</sub>		$\sum_{1-g}$ SAR	SPLSP
		UMTS Band II	BT		
Body	Towards Phantom	0.571	0.084	0.655	NA
	Towards Ground	0.883	0.084	<b>0.967</b>	NA
	Towards Phantom with headset		0	0	NA
	Towards Ground with headset	0.883	0	0.883	NA

Note: Simultaneous Tx Combination of UMTS Band II and BT

Test Position		Scaled SAR <sub>Max</sub>		$\sum_{1-g}$ SAR	SPLSP
		UMTS Band V	BT		
Body	Towards Phantom	0.291	0.084	0.375	NA
	Towards Ground	0.479	0.084	0.563	NA
	Towards Phantom with headset	0	0	0	NA
	Towards Ground with headset	0.385	0	0.385	NA

Note: Simultaneous Tx Combination of UMTS Band V and BT

MAX. $\sum_{1-g}$ SAR<sub>1g</sub> = 0.967W/kg < 1.6 W/kg, so the Simultaneous SAR is not required for BT and GSM&UMTS antenna.

## 11 Measurement uncertainty evaluation

### 11.1 Measurement uncertainty evaluation for SAR test

The following table includes the uncertainty table of the IEEE 1528. The values are determined by Satimo. The breakdown of the individual uncertainties is as follows:

Measurement Uncertainty evaluation for SAR test								
Uncertainty Component	Tol. (±%)	Prob. Dist.	Div.	C <sub>i</sub> (1g)	C <sub>i</sub> (10g)	1g U <sub>i</sub> (±%)	10g U <sub>i</sub> (±%)	V <sub>i</sub>
<b>measurement system</b>								
Probe Calibration	5.8	N	1	1	1	5.8	5.8	∞
Axial Isotropy	3.5	R	$\sqrt{3}$	$(1-C_p)^{1/2}$	$(1-C_p)^{1/2}$	1.43	1.43	∞
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
Boundary Effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
system Detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	3	N	1	1	1	3.00	3.00	∞
Readout Electronics	0.5	N	1	1	1	0.50	0.50	∞
Response Time	0	R	$\sqrt{3}$	1	1	0.00	0.00	∞
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF Ambient Conditions-Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF Ambient Conditions-Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and Integration Algorithms for Max.SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
<b>Test sample Related</b>								
Test Sample Positioning	2.6	N	1	1	1	2.60	2.60	11
Device Holder Uncertainty	3	N	1	1	1	3.00	3.00	7
Output Power Variation-SAR drift measurement	5	R	$\sqrt{3}$	1	1	2.89	2.89	∞
SAR scaling	2	R	$\sqrt{3}$	1	1	1.15	1.15	∞
<b>Phantom and Tissue Parameters</b>								
Phantom Uncertainty (shape and thickness tolerances)	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2.00	1.68	∞
Liquid conductivity ( meas. )	2.5	N	1	0.64	0.43	1.60	1.08	5
Liquid conductivity (target.)	5	R	$\sqrt{3}$	0.64	0.43	1.85	1.24	5
Liquid Permittivity ( meas. )	2.5	N	1	0.60	0.49	1.50	1.23	∞
Liquid Permittivity (target.)	5	R	$\sqrt{3}$	0.60	0.49	1.73	1.42	∞
<b>Combined Standard Uncertainly</b>		Rss				10.63	10.54	
<b>Expanded Uncertainty{95% CONFIDENCE INTERVAL}</b>		k				21.26	21.08	



## 11.2 Measurement uncertainty evaluation for system check

The following table includes the uncertainty table of the IEEE 1528. The values are determined by Satimo. The breakdown of the individual uncertainties is as follows:

Uncertainty For System Performance Check								
Uncertainty Component	Tol. ( $\pm\%$ )	Prob. Dist.	Div.	$C_i$ 1g	$C_i$ 10g	1g $U_i(\pm\%)$	10g $U_i(\pm\%)$	$V_i$
<b>measurement system</b>								
Probe Calibration	5.8	N	1	1	1	5.80	5.80	$\infty$
Axial Isotropy	3.5	R	$\sqrt{3}$	$(1-C_p)^{1/2}$	$(1-C_p)^{1/2}$	1.43	1.43	$\infty$
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	$\infty$
Boundary Effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	$\infty$
system detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Modulation response	0	N	1	1	1	0.00	0.00	$\infty$
Readout Electronics	0.5	N	1	1	1	0.50	0.50	$\infty$
Response Time	0	R	$\sqrt{3}$	1	1	0.00	0.00	$\infty$
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
RF ambient Conditions - Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
RF ambient Conditions – Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
Probe positioned Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	$\infty$
<b>Dipole</b>								
Deviation of experimental source from numerical source	4	N	1	1	1	4.00	4.00	$\infty$
Input power and SAR drift measurement	5	R	$\sqrt{3}$	1	1	2.89	2.89	$\infty$
Dipole axis to liquid Distance	2	R	$\sqrt{3}$	1	1	1.16	1.16	$\infty$
<b>Phantom and Tissue Parameters</b>								
Phantom Uncertainty (shape and thickness tolerances)	4	R	$\sqrt{3}$	1	1	2.31	2.31	$\infty$
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2.00	1.68	$\infty$
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.60	1.08	5
Liquid conductivity (target.)	5	R	$\sqrt{3}$	0.64	0.43	1.85	1.24	5
Liquid Permittivity (meas.)	2.5	N	1	0.60	0.49	1.50	1.23	$\infty$
Liquid Permittivity (target.)	5	R	$\sqrt{3}$	0.60	0.49	1.73	1.41	$\infty$
<b>Combined Standard Uncertainty</b>		Rss				10.28	9.98	
<b>Expanded Uncertainty (95% Confidence interval)</b>		k				20.57	19.95	

## 12 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

	Manufacturer	Device Type	Type(Model)	Serial number	calibration	
					Last Cal.	Due Date
<input checked="" type="checkbox"/>	SATIMO	COMOSAR DOSIMETRIC E FIELD PROBE	SSE5	SN 09/13 EP170	2016-07-25	2017-07-24
<input checked="" type="checkbox"/>	SATIMO	COMOSAR 835 MHz REFERENCE DIPOLE	SID835	SN 14/13 DIP0G835-235	2016-07-25	2017-07-24
<input type="checkbox"/>	SATIMO	COMOSAR 900 MHz REFERENCE DIPOLE	SID900	SN 14/13 DIP0G900-231	2016-07-25	2017-07-24
<input type="checkbox"/>	SATIMO	COMOSAR 1800 MHz REFERENCE DIPOLE	SID1800	SN 14/13 DIP1G800-232	2016-07-25	2017-07-24
<input checked="" type="checkbox"/>	SATIMO	COMOSAR 1900 MHz REFERENCE DIPOLE	SID1900	SN 14/13 DIP1G900-236	2016-07-25	2017-07-24
<input type="checkbox"/>	SATIMO	COMOSAR 2000 MHz REFERENCE DIPOLE	SID2000	SN 14/13 DIP2G000-237	2016-07-25	2017-07-24
<input checked="" type="checkbox"/>	SATIMO	COMOSAR 2450 MHz REFERENCE DIPOLE	SID2450	SN 14/13 DIP2G450-238	2016-07-25	2017-07-24
<input type="checkbox"/>	SATIMO	COMOSAR 2600 MHz REFERENCE DIPOLE	SID2600	SN 28/14 DIP2G600-327	2016-07-25	2017-07-24
<input checked="" type="checkbox"/>	SATIMO	Software	OPENSAR	N/A	N/A	N/A
<input checked="" type="checkbox"/>	SATIMO	Phantom	COMOSAR IEEE SAM PHANTOM	SN 14/13 SAM99	N/A	N/A
<input checked="" type="checkbox"/>	R & S	Universal Radio Communication Tester	CMU 200	117528	2016-08-19	2017-08-18
<input checked="" type="checkbox"/>	HP	Network Analyser	8753D	3410A08889	2016-08-19	2017-08-18
<input checked="" type="checkbox"/>	HP	Signal Generator	E4421B	GB39340770	2016-08-19	2017-08-18
<input checked="" type="checkbox"/>	Keithley	Multimeter	Keithley 2000	4014539	2016-08-19	2017-08-18
<input checked="" type="checkbox"/>	SATIMO	Amplifier	Power Amplifier	MODU-023-A-0004	2015-10-13	2016-10-12
<input checked="" type="checkbox"/>	Agilent	Power Meter	E4418B	GB43312909	2015-10-13	2016-10-12
<input checked="" type="checkbox"/>	Agilent	Power Meter Sensor	E4412A	MY41500046	2015-10-13	2016-10-12
<input checked="" type="checkbox"/>	Agilent	Power Meter	E4417A	GB41291826	2015-10-13	2016-10-12
<input checked="" type="checkbox"/>	Agilent	Power Meter Sensor	8481H	MY41091215	2015-10-13	2016-10-12
<input checked="" type="checkbox"/>	SATIMO	DAE	SUPR72	SN 42/13	2016-07-25	2017-07-24

**Annex A: System performance verification**

(Please See the SAR Measurement Plots of annex A.)

**Annex B: Measurement results**

(Please See the SAR Measurement Plots of annex B.)

**Annex C: Calibration reports**

(Please See the Calibration reports of annex C.)

**Annex D: Photo documentation**

Photo 1: Measurement System OPENSAR



Photo 2: Front view



Photo 3: Rear View



Photo 4: Left Head Touched

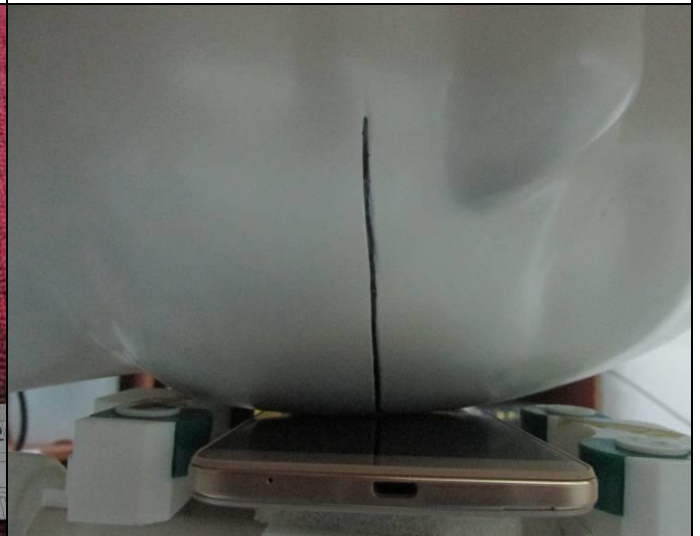
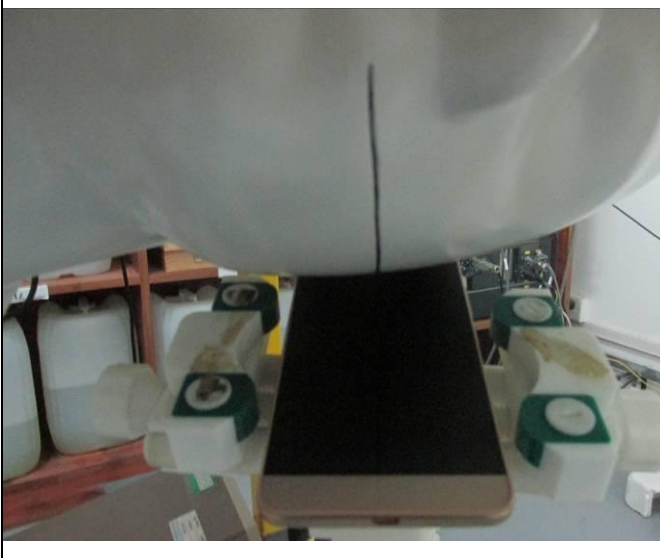
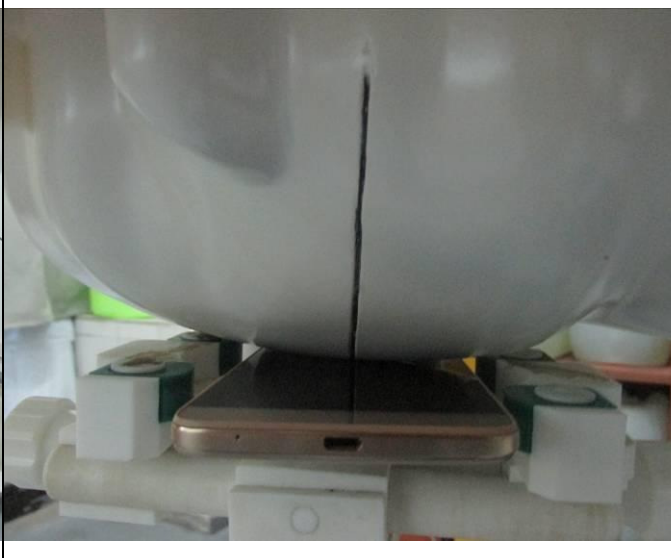
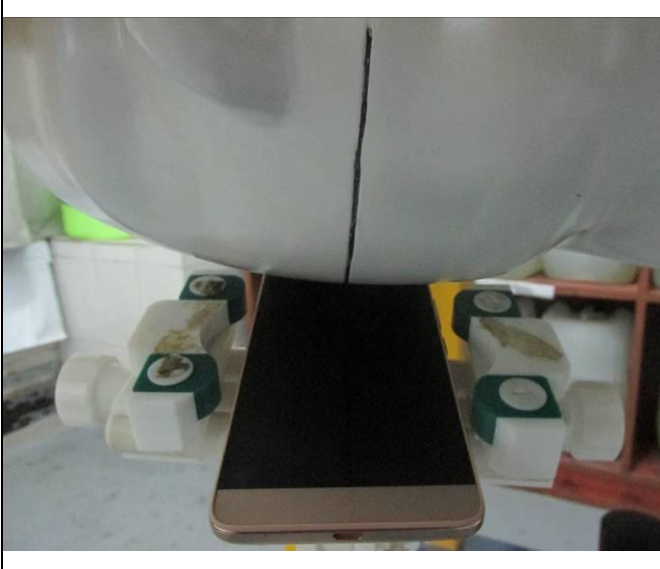

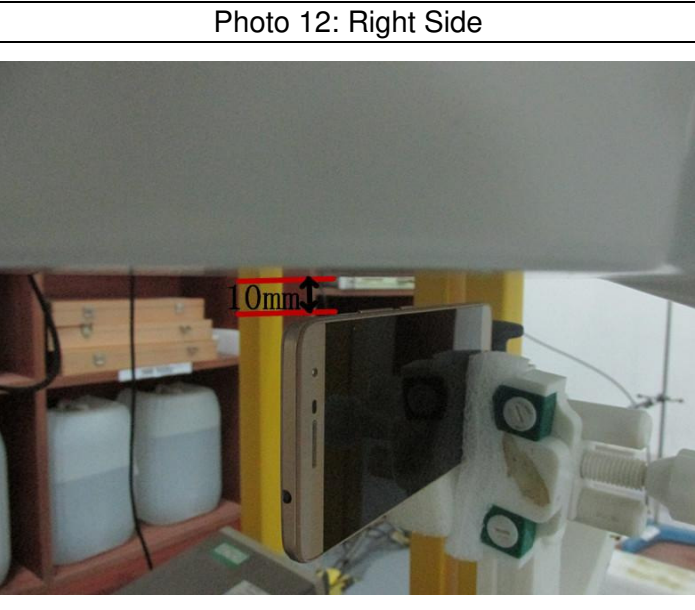
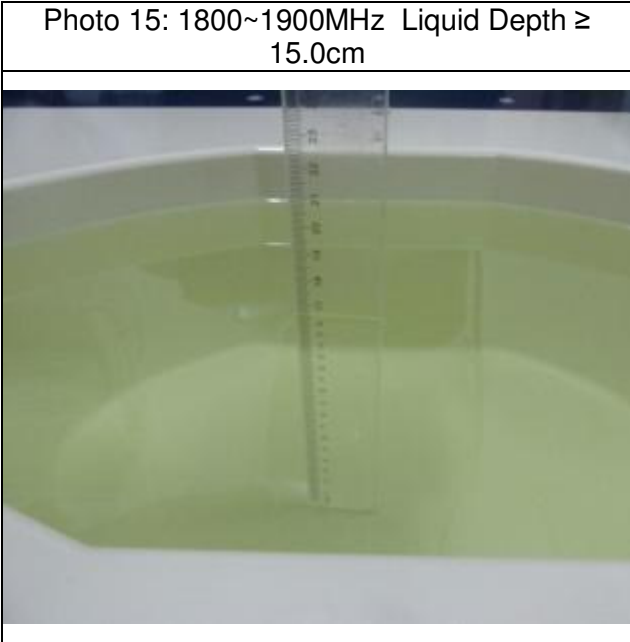
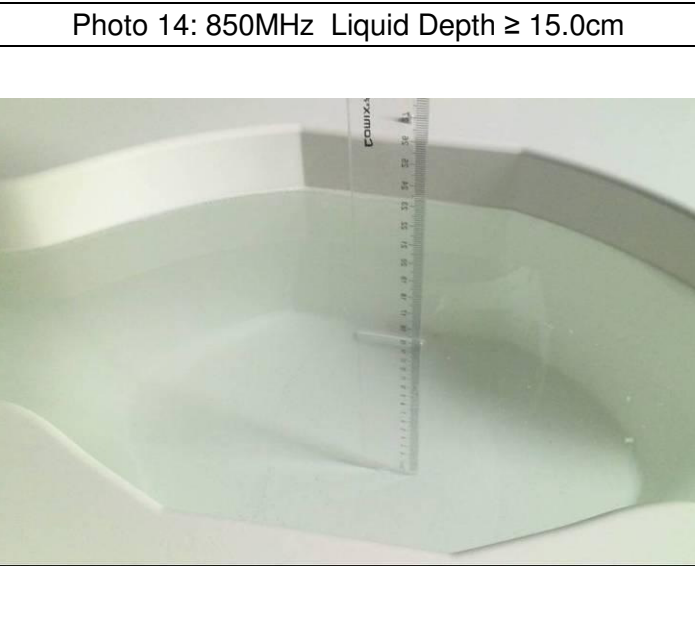


Photo 5: Left Head Tilted 15°	Photo 6: Right Head Touched
 A photograph showing a white mannequin head tilted to the left. A smartphone is positioned below the head, held in place by a black support structure. The background consists of white and green blocks on a wooden table.	 A photograph showing a white mannequin head tilted to the right. A smartphone is positioned below the head, held in place by a black support structure. The background consists of white and green blocks on a wooden table.
Photo 7: Right Head Tilted 15°	Photo 8: Towards Phantom 10mm
 A photograph showing a white mannequin head tilted to the right. A smartphone is positioned below the head, held in place by a black support structure. The background consists of white and green blocks on a wooden table.	 A photograph showing a white mannequin head tilted to the right. A smartphone is positioned below the head, held in place by a black support structure. A red double-headed arrow with the text '10mm' is overlaid on the image, indicating the distance between the phone and a component of the support structure. The background consists of white and green blocks on a wooden table.







End