SAR Test Report

Report No.: AGC00384180701FH01

FCC ID	:	2AQLUTD-11
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	WCDMA Wireless Data Terminal
BRAND NAME	:	CarePro
MODEL NAME	:	TD-11
CLIENT	:	SHENZHEN MOTTO ELECTRONICS CO., LTD.
DATE OF ISSUE	:	Aug. 03,2018
STANDARD(S)	:	IEEE Std. 1528:2013 FCC 47CFR § 2.1093 IEEE/ANSI C95.1:2005
REPORT VERSION	:	V1.1

Attestation of Global Compliance(Shenzhen) Co., Ltd.

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	July 30,2018	Invalid	Initial Release
V1.1	/	Aug. 03,2018	Valid	Modify antenna gain of WCDMA1900

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Test Report Certification

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Applicant Address	Floor 2, Building D, No.71-4 Of Xintian Avenue, Fuyong St., Baoan Dist., 518103 Shenzhen, Guangdong, China
Manufacturer Name	SHENZHEN MOTTO ELECTRONICS CO., LTD.
Manufacturer Address	Floor 2, Building D, No.71-4 Of Xintian Avenue, Fuyong St., Baoan Dist., 518103 Shenzhen, Guangdong, China
Product Designation	WCDMA Wireless Data Terminal
Brand Name	CarePro
Model Name	TD-11
Different Description	N/A
EUT Voltage	DC3.7V by battery
Applicable Standard	IEEE Std. 1528:2013 FCC 47CFR § 2.1093 IEEE/ANSI C95.1:2005
Test Date	July 20,2018 to July 24,2018
Performed Location	Attestation of Global Compliance(Shenzhen) Co., Ltd. 2 F, Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang Street, Bao'an District, Shenzhen, China
Report Template	AGCRT-US-3G3/SAR (2016-01-01)

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1. SUMMARY OF MAXIMUM SAR VALUE

The maximum results of Specific Absorption Rate (SAR) found during testing for EUT are as follows:

Frequency Band	Highest Reported SAR(W/Kg)	
	Face-up (1g-SAR(W/kg))	Wrist back touch (10g-Extremity-SAR(W/kg))
GSM 850	0.014	0.126
PCS 1900	0.257	0.725
UMTS Band II	0.368	0.896
UMTS Band V	0.020	0.130
WIFI 2.4G	0.085	0.374
Simultaneous Reported SAR	0.453	1.270
SAR Test Limit (W/Kg)	1.6	4.0
SAR Test Result	PASS	

This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits specified in IEEE Std. 1528:2013; FCC 47CFR § 2.1093; IEEE/ANSI C95.1:2005 and the following specific FCC Test Procedures:

- KDB 447498 D01 General RF Exposure Guidance v06
- KDB 865664 D01 SAR Measurement 100MHz to 6GHz v01r04
- KDB 941225 D01 3G SAR Procedures v03r01
- KDB 941225 D06 Hotspot Mode v02r01
- KDB 248227 D01 802 11 Wi-Fi SAR v02r02

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2. GENERAL INFORMATION

2.1. EUT Description

General Information	
Product Designation	WCDMA Wireless Data Terminal
Test Model	TD-11
Hardware Version	G76-MB
Software Version	G76lca_b2b5_akq_boy_fcc_english_20180709
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	Internal Antenna
GSM and GPRS	
Support Band	☒GSM 850 ☒PCS 1900 ☒GSM 900 ☒DCS 1800
GPRS Type	Class B
GPRS Class	Class 12(1Tx+4Rx, 2Tx+3Rx, 3Tx+2Rx, 4Tx+1Rx)
TX Frequency Range	GSM 850 : 820-850MHz;; PCS 1900: 1850-1910MHz;
RX Frequency Range	GSM 850 : 869~894MHz; PCS 1900: 1930~1990MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS
Antenna Gain	GSM850:1.20dBi; PCS1900: 1.10dBi;
Max. Average Power	GSM850: 31.24dBm ;PCS1900: 28.56dBm
WCDMA	
Support Band	☒UMTS FDD Band II ☒UMTS FDD Band V ☐UMTS FDD Band I ☐UMTS FDD Band VIII
HS Type	HSPA(HSUPA/HSDPA)
TX Frequency Range	WCDMA FDD Band II: 1850-1910MHz;WCDMA FDD Band V: 820-850MHz
RX Frequency Range	WCDMA FDD Band II: 1930-1990MHz;WCDMA FDD Band V: 869-894MHz
Release Version	Rel-6
Type of modulation	HSDPA:QPSK/16QAM; HSUPA:BPSK; WCDMA:QPSK
Antenna Gain	WCDMA850: 1.12dBi; WCDMA1900:1.10dBi
Max. Average Power	Band II: 22.61dBm; Band V: 21.32dBm

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EUT Description(Continue)

Bluetooth	
Bluetooth Version	☐V2.0 ☐V2.1 ☐V2.1+EDR ☐V3.0 ☐V3.0+HS ☒V4.0 ☐V4.1
Operation Frequency	2402~2480MHz
Type of modulation	☒GFSK ☒Π/4-DQPSK ☒8-DPSK
Peak Power	4.960dBm
Antenna Gain	1.0dBi
WIFI	
WIFI Specification	☐802.11a ☒802.11b ☒802.11g ☒802.11n(20) ☒802.11n(40)
Operation Frequency	2412~2462MHz
Avg. Burst Power	IEEE 802.11b:**19.51**dBm, IEEE 802.11g:**15.85**dBm; IEEE 802.11n(20):**15.69**dBm,IEEE 802.11n(40):**14.08**dBm
Antenna Gain	1.0dBi
Li-ion Battery	
Brand Name	N/A
Model Name	602930
Manufacturer Name	Dongguan ZhuoRui Electronics Technology Co., Ltd.
Manufacturer Address	A2 area, 2/F, Building B2, No.78 JiangBei Road, XieKeng, Qingxi Town, Dongguan, China
Capacitance	550mAh
Rated Voltage	DC3.7V
Charging Voltage	DC4.2V

Note:1.CMU200 can measure the average power and Peak power at the same time
2.The sample used for testing is end product.

Product	Type ☒ Production unit ☐ Identical Prototype

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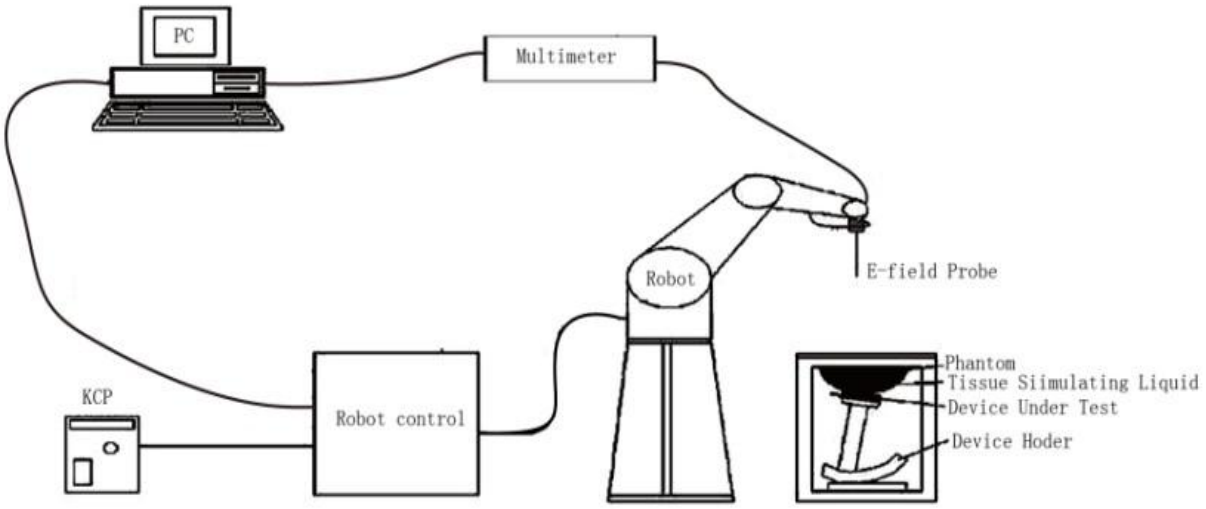
3. SAR MEASUREMENT SYSTEM

3.1. The SATIMO system used for performing compliance tests consists of following items



The COMOSAR system for performing compliance tests consists of the following items:

- The PC. It controls most of the bench devices and stores measurement data.A computer running WinXP and the Opensar software.
- The E-Field probe. The probe is a 3-axis system made of 3 distinct dipoles. Each dipole returns a voltage in function of the ambient electric field.
- The Keithley multimeter measures each probe dipole voltages.
- The SAM phantom simulates a human head. The measurement of the electric field is made inside the phantom.
- The liquids simulate the dielectric properties of the human head tissues.
- The network emulator controls the mobile phone under test.
- The validation dipoles are used to measure a reference SAR. They are used to periodically check the bench to make sure that there is no drift of the system characteristics over time.
- The phantom, the device holder and other accessories according to the targeted measurement.

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3.2. COMOSAR E-Field Probe

The SAR measurement is conducted with the dosimetric probe manufactured by SATIMO. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. SATIMO conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528 and relevant KDB files.) The calibration data are in Appendix D.

Isotropic E-Field Probe Specification

Model	SSE2	
Manufacture	MVG	
Identification No.	SN 08/16 EPGO282	
Frequency	0.7GHz-6GHz Linearity:±0.06dB(700MHz-6GHz)	
Dynamic Range	0.01W/Kg-100W/Kg Linearity:±0.06dB	
Dimensions	Overall length:330mm Length of individual dipoles:2mm Maximum external diameter:8mm Probe Tip external diameter:2.5mm Distance between dipoles/ probe extremity:1mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

3.3. Robot

The COMOSAR system uses the KUKA robot from SATIMO SA (France).For the 6-axis controller COMOSAR system, the KUKA robot controller version from SATIMO is used.
The XL 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

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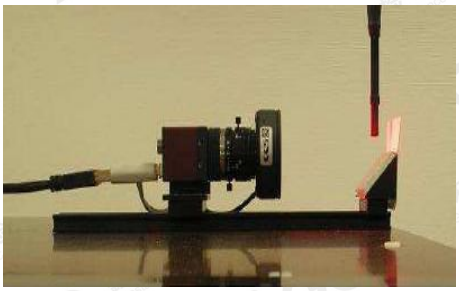
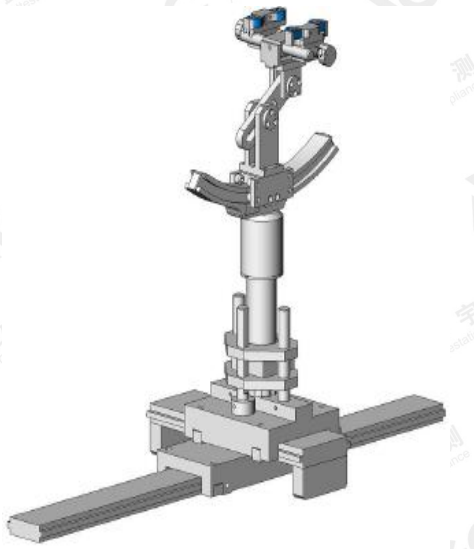
3.4. Video Positioning System

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.	

3.5. Device Holder

The COMOSAR device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR). Thus the device needs no repositioning when changing the angles. The COMOSAR device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.	

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3.6. SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas: □ Left head □ Right head □ Flat phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

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4. SAR MEASUREMENT PROCEDURE

4.1. Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and occupational/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element(dv) of given mass density (ρ). The equation description is as below:

$$\mathrm{SAR} = \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\mathrm{d}W}{\mathrm{d}m}\right) = \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\mathrm{d}W}{\rho \mathrm{d}V}\right)$$

SAR is expressed in units of Watts per kilogram (W/Kg)
SAR can be obtained using either of the following equations:

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

$$\mathrm{SAR} = c_h \left.\frac{\mathrm{d}T}{\mathrm{d}t}\right|_{t=0}$$

Where

SAR	is the specific absorption rate in watts per kilogram;
E	is the r.m.s. value of the electric field strength in the tissue in volts per meter;
σ	is the conductivity of the tissue in siemens per metre;
ρ	is the density of the tissue in kilograms per cubic metre;
c_h	is the heat capacity of the tissue in joules per kilogram and Kelvin;
$\frac{\mathrm{dT}}{\mathrm{dt}} \mid \mathrm{t} = 0$	is the initial time derivative of temperature in the tissue in kelvins per second

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4.2. SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface is 2.7mm This distance cannot be smaller than the distance os sensor calibration points to probe tip as `defined in the probe properties,

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in SATIMO software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in db) is specified in the standards for compliance testing. For example, a 2db range is required in IEEE Standard 1528, whereby 3db is a requirement when compliance is assessed in accordance with the ARIB standard (Japan) If one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximum are detected, the number of Zoom Scan has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100MHz to 6GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scan are used to assess the peak spatial SAR value within a cubic average volume containing 1g abd 10g of simulated tissue. The Zoom Scan measures points(refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1g and 10g and displays these values next to the job's label.

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Zoom Scan Parameters extracted from KDB865664 d01 SAR Measurement 100MHz to 6GHz

Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power Drift Measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the same settings. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

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4.3. RF Exposure Conditions

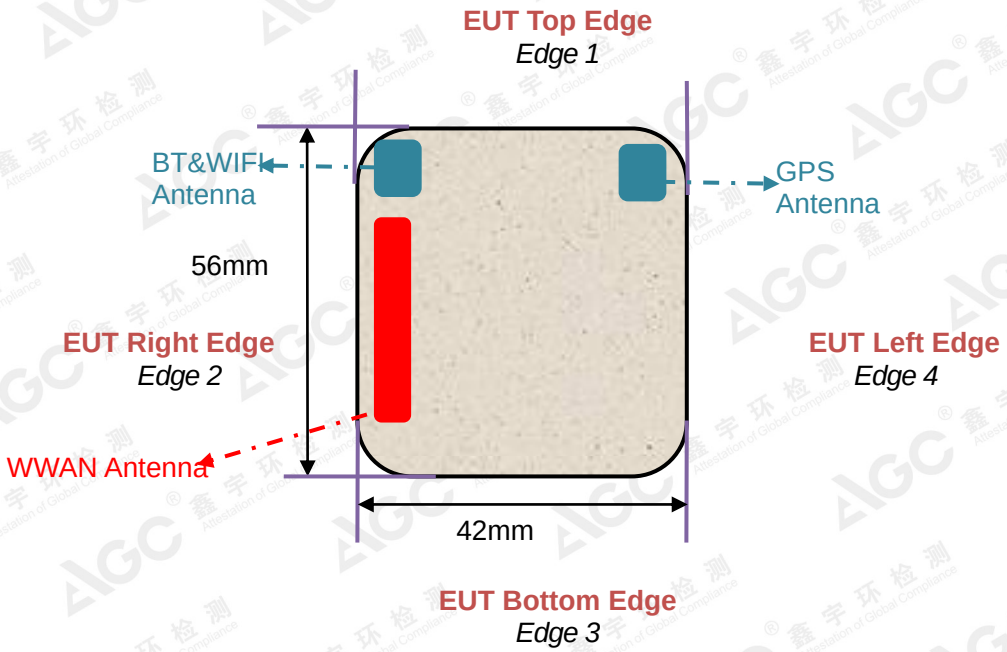
Test Configuration and setting:

The EUT is a model of GSM Portable Mobile Station (MS). It supports GSM/GPRS, WCDMA/HSPA, BT, WIFI, and support hot spot mode.

For WWAN SAR testing, the device was controlled by using a base station emulator. Communication between the device and the emulator were established by air link. The distance between the EUT and the antenna is larger than 50cm, and the output power radiated from the emulator antenna is at least 30db smaller than the output power of EUT.

For WLAN testing, the EUT is configured with the WLAN continuous TX tool through engineering command.

Antenna Location: (the back view)



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5. TISSUE SIMULATING LIQUID

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 5.2

5.1. The composition of the tissue simulating liquid

Ingredient (% Weight) / Frequency (MHz)	Water	Nacl	Polysorbate 20	DGBE	1,2 Propanediol	Triton X-100
835 Head	50.36	1.25	48.39	0.0	0.0	0.0
835 Body	54.00	1	0.0	15	0.0	30
1900 Head	54.9	0.18	0.0	44.92	0.0	0.0
1900 Body	70	1	0.0	9	0.0	20
2450 Head	71.88	0.16	0.0	7.99	0.0	19.97
2450 Body	70	1	0.0	9	0.0	20

5.2. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in IEEE 1528.

Target Frequency (MHz)	head		body	
	εr	σ (S/m)	εr	σ (S/m)
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	**41.5**	**0.90**	**55.2**	**0.97**
900	41.5	0.97	55.0	1.05
915	41.5	1.01	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	**40.0**	**1.40**	**53.3**	**1.52**
2450	**39.2**	**1.80**	**52.7**	**1.95**
3000	38.5	2.40	52.0	2.73

(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

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5.3. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using SATIMO Dielectric Probe Kit and R&S Network Analyzer ZVL6.

Tissue Stimulant Measurement for 835MHz					
Head	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr 41.5 (39.425-43.575)	δ[s/m] 0.90(0.855-0.945)		
	824.2	42.31	0.88	21.2	July 20,2018
	826.4	41.97	0.89		
	835	41.63	0.90		
	836.6	41.25	0.91		
	846.6	40.77	0.92		
	848.8	40.29	0.93		
Body	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [oC]	Test time
		εr 55.20(52.44-57-96)	δ[s/m]0.97(0.9215-1.0185)		
	824.2	56.19	0.93	21.5	July 20,2018
	826.4	55.54	0.94		
	835	55.02	0.95		
	836.6	54.68	0.96		
	846.6	54.23	0.97		
	848.8	53.75	0.98		

Tissue Stimulant Measurement for 1900MHz					
Head	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr40.00(38.00-42.00)	δ[s/m]1.40(1.33-1.47)		
	1850.2	41.18	1.35	21.3	July 21,2018
	1852.4	40.80	1.37		
	1880	40.35	1.38		
	1900	40.02	1.40		
	1907.6	39.77	1.42		
	1909.8	39.29	1.43		
Body	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [oC]	Test time
		εr53.30(50.635-55.965)	δ[s/m]1.52(1.444-1.596)		
	1850.2	54.97	1.46	21.5	July 21,2018
	1852.4	54.53	1.48		
	1880	53.88	1.50		
	1900	53.34	1.51		
	1907.6	52.79	1.53		
	1909.8	52.30	1.55		

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Tissue Stimulant Measurement for 2450MHz					
Head	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr39.2(37.24-41.16)	δ[s/m]1.80(1.71-1.89)		
	2412	40.36	1.73	21.5	July 24,2018
	2437	39.85	1.75		
	2450	39.41	1.79		
	2462	38.99	1.80		
Body	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr52.7(50.065-55.335)	δ[s/m]1.95(1.8525-2.0475)		
	2412	54.26	1.88	21.7	July 24,2018
	2437	53.71	1.92		
	2450	53.14	1.95		
	2462	52.58	1.96		

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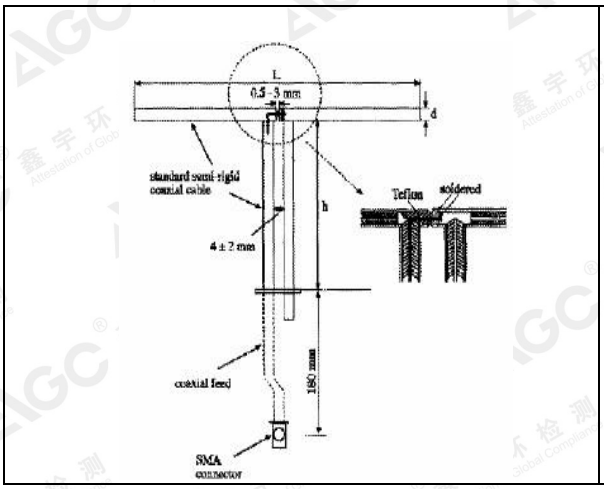
6. SAR SYSTEM CHECK PROCEDURE

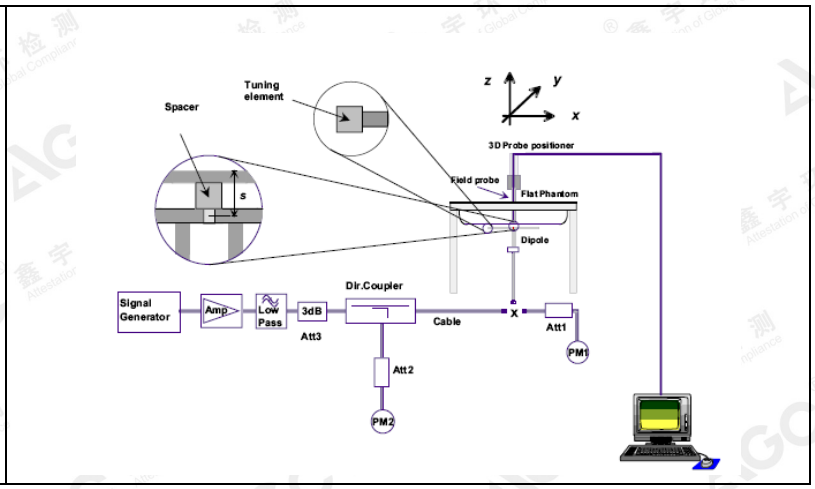
6.1. SAR System Check Procedures

SAR system check is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

Each SATIMO system is equipped with one or more system check kits. These units, together with the predefined measurement procedures within the SATIMO software, enable the user to conduct the system check and system validation. System kit includes a dipole, and dipole device holder.

The system check verifies that the system operates within its specifications. It's performed daily or before every SAR measurement. The system check uses normal SAR measurement in the flat section of the phantom with a matched dipole at a specified distance. The system check setup is shown as below.





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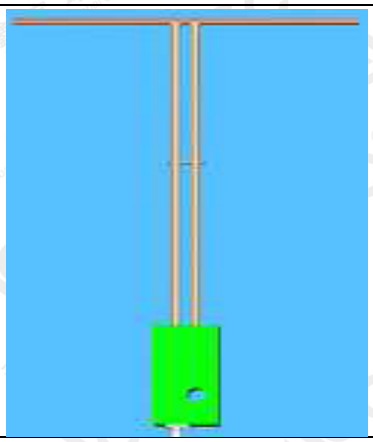
6.2. SAR System Check

6.2.1. Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of IEEE. the table below provides details for the mechanical and electrical
Specifications for the dipoles.

Frequency	L (mm)	h (mm)	d (mm)
835MHz	161.0	89.8	3.6
1900MHz	68	39.5	3.6
2450MHz	51.5	30.4	3.6

6.2.2. System Check Result

System Performance Check at 835MHz&1900MHz&2450MHz for Head								
Validation Kit: SN29/15 DIP 0G835-383&SN 29/15 DIP 1G900-389& SN 29/15DIP 2G450-393								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
835	10.04	6.43	9.036-11.044	5.787 -7.073	10.04	6.04	21.2	July 20,2018
1900	41.44	21.33	37.296-45.584	19.197-23.463	41.13	20.62	21.3	July 21,2018
2450	54.53	24.30	49.077-59.983	21.87-26.730	51.71	24.08	21.5	July 24,2018
System Performance Check at 835MHz&1900MHz&2450MHz for Body								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
835	9.85	6.45	8.865-10.835	5.805-7.095	10.04	6.02	21.5	July 20,2018
1900	39.38	20.86	35.442-43.318	18.774-22.946	41.02	20.57	21.5	July 21,2018
2450	49.92	23.16	44.928-54.912	20.844-25.476	50.03	23.25	21.7	July 24,2018

Note:
(1) We use a CW signal of 18dBm for system check, and then all SAR value are normalized to 1W forward power. The result must be within ±10% of target value.

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7. EUT TEST POSITION

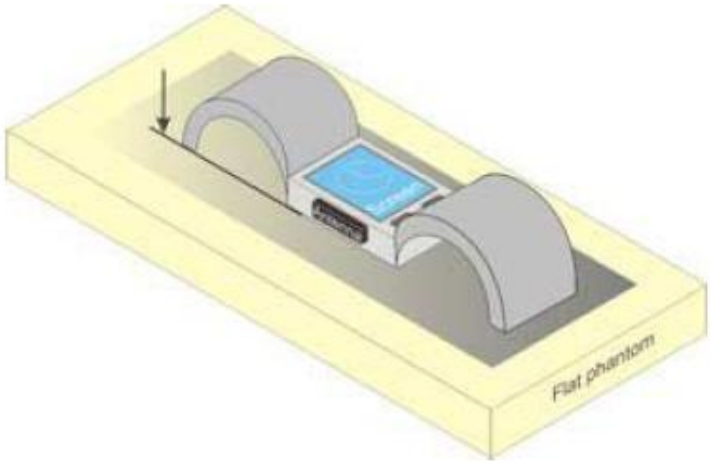
This EUT was tested in **Front Face and Rear Face.**

7.1. Test Position

(1) To position the EUT parallel to the phantom surface.

(2) To adjust the EUT parallel to the flat phantom.

(3) To adjust the distance between the EUT surface and the flat phantom to **10mm** while used in front of face, and **0mm** while used in Wrist.



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8. SAR EXPOSURE LIMITS

Limits for General Population/Uncontrolled Exposure (W/kg)

Type Exposure	Uncontrolled Environment Limit (W/kg)
Spatial Peak SAR (1g cube tissue for brain or body)	1.60
Spatial Average SAR (Whole body)	0.08
Spatial Peak SAR (Limbs)	4.0

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9. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2F., Bldg.2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Shenzhen 518012
NVLAP Lab Code	600153-0
Designation Number	CN5028
Test Firm Registration Number	682566
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0

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10. TEST EQUIPMENT LIST

Equipment description	Manufacturer/ Model	Identification No.	Current calibration date	Next calibration date
SAR Probe	MVG	SN 08/16 EPGO282	Aug. 08,2017	Aug. 07,2018
Phantom	SATIMO	SN_4511_SAM90	Validated. No cal required.	Validated. No cal required.
Liquid	SATIMO	-	Validated. No cal required.	Validated. No cal required.
Comm Tester	Agilent-8960	GB46310822	Mar. 01,2018	Feb. 28,2019
Multimeter	Keithley 2000	1188656	Mar. 01,2018	Feb. 28,2019
Dipole	SATIMO SID835	SN29/15 DIP 0G835-383	July 05,2016	July 04,2019
Dipole	SATIMO SID1900	SN 29/15 DIP 1G900-389	July 05,2016	July 04,2019
Dipole	SATIMO SID2450	SN29/15 DIP 2G450-393	July 05,2016	July 04,2019
Signal Generator	Agilent-E4438C	US41461365	Mar. 01,2018	Feb. 28,2019
Vector Analyzer	Agilent / E4440A	US41421290	Mar. 01,2018	Feb. 28,2019
Network Analyzer	Rhode & Schwarz ZVL6	SN100132	Mar. 01,2018	Feb. 28,2019
Attenuator	Warison /WATT-6SR1211	N/A	N/A	N/A
Attenuator	Mini-circuits / VAT-10+	N/A	N/A	N/A
Amplifier	EM30180	SN060552	Mar. 01,2018	Feb. 28,2019
Directional Couple	Werlatone/ C5571-10	SN99463	Jun. 12,2018	Jun. 11,2019
Directional Couple	Werlatone/ C6026-10	SN99482	Jun. 12,2018	Jun. 11,2019
Power Sensor	NRP-Z21	1137.6000.02	Oct. 12,2017	Oct. 11,2018
Power Sensor	NRP-Z23	US38261498	Mar. 01,2018	Feb. 28,2019
Power Viewer	R&S	V2.3.1.0	N/A	N/A

Note: Per KDB 865664 Dipole SAR Validation, AGC Lab has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:
1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.

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11. MEASUREMENT UNCERTAINTY

Measurement uncertainty for Dipole averaged over 1 gram / 10 gram.									
a	b	c	d	e f(d,k)	f	g	h c×f/e	i c×g/e	k
Uncertainty Component	Sec.	Tol (± %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (±%)	10g Ui (±%)	vi
Measurement System									
Probe calibration	E.2.1	5.831	N	1	1	1	5.83	5.83	∞
Axial Isotropy	E.2.2	0.695	R	$\sqrt{3}$	√0.5	√0.5	0.28	0.28	∞
Hemispherical Isotropy	E.2.2	1.045	R	$\sqrt{3}$	√0.5	√0.5	0.43	0.43	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	0.685	R	$\sqrt{3}$	1	1	0.40	0.40	∞
System detection limits	E.2.4	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	E2.5	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Readout Electronics	E.2.6	0.021	N	1	1	1	0.021	0.021	∞
Response Time	E.2.7	0	R	$\sqrt{3}$	1	1	0	0	∞
Integration Time	E.2.8	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF ambient conditions-Noise	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF ambient conditions-reflections	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner mechanical tolerance	E.6.2	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to phantom shell	E.6.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation, and integrations algorithms for max. SAR evaluation	E.5	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Test sample Related									
Test sample positioning	E.4.2	2.6	N	1	1	1	2.6	2.6	∞
Device holder uncertainty	E.4.1	3	N	1	1	1	3	3	∞
Output power variation—SAR drift measurement	E.2.9	5	R	$\sqrt{3}$	1	1	2.89	2.89	∞
SAR scaling	E.6.5	5	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and tissue parameters									
Phantom shell uncertainty—shape, thickness, and permittivity	E.3.1	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	E.3.2	1.9	N	1	1	0.84	1.90	1.60	∞
Liquid conductivity measurement	E.3.3	4	N	1	0.78	0.71	3.12	2.84	M
Liquid permittivity measurement	E.3.3	5	N	1	0.23	0.26	1.15	1.30	M
Liquid conductivity—temperature uncertainty	E.3.4	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	∞
Liquid permittivity—temperature uncertainty	E.3.4	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	∞
Combined Standard Uncertainty			RSS				9.79	9.59	
Expanded Uncertainty (95% Confidence interval)			K=2				19.58	19.18	

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System check uncertainty for Dipole averaged over 1 gram / 10 gram.									
a	b	c	d	e f(d,k)	f	g	h c×f/e	i c×g/e	k
Uncertainty Component	Sec.	Tol (± %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (±%)	10g Ui (±%)	vi
Measurement System									
Probe calibration drift	E.2.1.3	0.5	N	1	1	1	0.50	0.50	∞
Axial Isotropy	E.2.2	0.695	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Hemispherical Isotropy	E.2.2	1.045	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Linearity	E.2.4	0.685	R	$\sqrt{3}$	0	0	0.00	0.00	∞
System detection limits	E.2.4	1.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Modulation response	E2.5	3.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Readout Electronics	E.2.6	0.021	N	1	0	0	0.00	0.00	∞
Response Time	E.2.7	0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Integration Time	E.2.8	1.4	R	$\sqrt{3}$	0	0	0.00	0.00	∞
RF ambient conditions-Noise	E.6.1	3.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
RF ambient conditions-reflections	E.6.1	3.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Probe positioner mechanical tolerance	E.6.2	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to phantom shell	E.6.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation, and integrations algorithms for max. SAR evaluation	E.5	2.3	R	$\sqrt{3}$	0	0	0.00	0.00	∞
System check source (dipole)									
Deviation of experimental dipoles	E.6.4	2	N	1	1	1	2	2	∞
Input power and SAR drift measurement	8,6.6.4	5	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole axis to liquid distance	8,E.6.6	2	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Phantom and tissue parameters									
Phantom shell uncertainty—shape, thickness, and permittivity	E.3.1	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	E.3.2	1.9	N	1	1	0.84	1.90	1.60	∞
Liquid conductivity measurement	E.3.3	4	N	1	0.78	0.71	3.12	2.84	M
Liquid permittivity measurement	E.3.3	5	N	1	0.23	0.26	1.15	1.30	M
Liquid conductivity—temperature uncertainty	E.3.4	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	∞
Liquid permittivity—temperature uncertainty	E.3.4	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	∞
Combined Standard Uncertainty			RSS				5.564	5.205	
Expanded Uncertainty (95% Confidence interval)			K=2				11.128	10.410	

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System Validation uncertainty for Dipole averaged over 1 gram / 10 gram.									
a	b	c	d	e f(d,k)	f	g	h c×f/e	i c×g/e	k
Uncertainty Component	Sec.	Tol (±%)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (±%)	10g Ui (±%)	vi
Measurement System									
Probe calibration	E.2.1	5.831	N	1	1	1	5.83	5.83	∞
Axial Isotropy	E.2.2	0.695	R	$\sqrt{3}$	1	1	0.40	0.40	∞
Hemispherical Isotropy	E.2.2	1.045	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	0.685	R	$\sqrt{3}$	1	1	0.40	0.40	∞
System detection limits	E.2.4	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	E2.5	3.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Readout Electronics	E.2.6	0.021	N	1	1	1	0.021	0.021	∞
Response Time	E.2.7	0.0	R	$\sqrt{3}$	0	0	0.00	0.00	∞
Integration Time	E.2.8	1.4	R	$\sqrt{3}$	0	0	0.00	0.00	∞
RF ambient conditions-Noise	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF ambient conditions-reflections	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner mechanical tolerance	E.6.2	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to phantom shell	E.6.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation, and integrations algorithms for max. SAR evaluation	E.5	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
System check source (dipole)									
Deviation of experimental dipole from numerical dipole	E.6.4	5.0	N	1	1	1	5.00	5.00	∞
Input power and SAR drift measurement	8,6.6.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole axis to liquid distance	8,E.6.6	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Phantom and tissue parameters									
Phantom shell uncertainty—shape, thickness, and permittivity	E.3.1	4.0	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	E.3.2	1.9	N	1	1	0.84	1.90	1.60	∞
Liquid conductivity measurement	E.3.3	4.0	N	1	0.78	0.71	3.12	2.84	M
Liquid permittivity measurement	E.3.3	5.0	N	1	0.23	0.26	1.15	1.30	M
Liquid conductivity—temperature uncertainty	E.3.4	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	∞
Liquid permittivity—temperature uncertainty	E.3.4	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	∞
Combined Standard Uncertainty			RSS				9.718	9.517	
Expanded Uncertainty (95% Confidence interval)			K=2				19.437	19.035	

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12. CONDUCTED POWER MEASUREMENT

GSM BAND

Mode	Frequency(MHz)	Avg. Burst Power(dBm)	Duty cycle Factor(dBm)	Frame Power(dBm)
GSM 850				
GSM 850	824.2	**31.24**	-9	22.24
	836.6	31.17	-9	22.17
	848.8	31.18	-9	22.18
GPRS 850 （1 Slot）	824.2	30.11	-9	21.11
	836.6	30.23	-9	21.23
	848.8	30.46	-9	21.46
GPRS 850 （2 Slot）	824.2	28.33	-6	22.33
	836.6	28.05	-6	22.05
	848.8	28.11	-6	22.11
GPRS 850 （3 Slot）	824.2	26.12	-4.26	21.86
	836.6	26.26	-4.26	22.00
	848.8	26.33	-4.26	22.07
GPRS 850 （4 Slot）	824.2	25.42	-3	**22.42**
	836.6	25.25	-3	22.25
	848.8	25.42	-3	22.42
PCS 1900				
PCS1900	1850.2	**28.56**	-9	19.56
	1880	28.44	-9	19.44
	1909.8	28.37	-9	19.37
GPRS1900 （1 Slot）	1850.2	27.25	-9	18.25
	1880	27.08	-9	18.08
	1909.8	27.19	-9	18.19
GPRS1900 （2 Slot）	1850.2	24.34	-6	18.34
	1880	24.42	-6	18.42
	1909.8	24.35	-6	18.35
GPRS1900 （3 Slot）	1850.2	23.25	-4.26	18.99
	1880	23.44	-4.26	19.18
	1909.8	23.34	-4.26	19.08
GPRS1900 （4 Slot）	1850.2	22.47	-3	19.47
	1880	22.35	-3	19.35
	1909.8	22.50	-3	**19.50**

Note 1:
The Frame Power (Source-based time-averaged Power) is scaled the maximum burst average power based on time slots. The calculated methods are show as following:
Frame Power = Max burst power (1 Up Slot) – 9 dB
Frame Power = Max burst power (2 Up Slot) – 6 dB
Frame Power = Max burst power (3 Up Slot) – 4.26 dB
Frame Power = Max burst power (4 Up Slot) – 3 dB

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UMTS BAND
HSDPA Setup Configuration:

·The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.

·The RF path losses were compensated into the measurements.

·A call was established between EUT and Based Station with following setting:

(1) Set Gain Factors(βc and βd) parameters set according to each

(2) Set RMC 12.2Kbps+HSDPA mode.

(3) Set Cell Power=-86dBm

(4) Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)

(5) Select HSDPA Uplink Parameters

(6) Set Delta ACK, Delta NACK and Delta CQI=8

(7) Set Ack - Nack Repetition Factor to 3

(8) Set CQI Feedback Cycle (k) to 4ms

(9) Set CQI Repetition Factor to 2

(10) Power Ctrl Mode=All Up bits

·The transmitted maximum output power was recorded.

Table C.10.2.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	βc (Note5)	βd	βd (SF)	βc/βd	βHS (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15(Note 4)	15/15(Note 4)	64	12/15(Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: ΔACK, ΔNACK and ΔCQI = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, ΔACK and ΔNACK = 30/15 with β_{hs} = 30/15 * β_c , and ΔCQI = 24/15 with β_{hs} = 24/15 * β_c .
Note 3: CM = 1 for βc/βd =12/15, hs/ c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.
Note 4: For subtest 2 the c/ d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to c = 11/15 and d = 15/15.

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HSUPA Setup Configuration:

· The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.

· The RF path losses were compensated into the measurements.

· A call was established between EUT and Base Station with following setting * :

(1) Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK

(2) Set the Gain Factors (βc and βd) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121

(3) Set Cell Power = -86 dBm

(4) Set Channel Type = 12.2k + HSPA

(5) Set UE Target Power

(6) Power Ctrl Mode= Alternating bits

(7) Set and observe the E-TFCI

(8) Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI

· The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	βc	βd	βd (SF)	βc/βd	βHS (Note 1)	βec	βed (Note 4) (Note 5)	βed (SF)	βed (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	βed1: 47/15 βed2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, ΔACK, ΔNACK and ΔCQI = 30/15 with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, ΔACK, ΔNACK and ΔCQI = 5/15 with $\beta_{hs} = 5/15 * \beta_c$.
Note 2: CM = 1 for βc/βd =12/15, hs/ c=24/15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the c/ d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to c = 10/15 and d = 15/15.
Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 5: βed cannot be set directly; it is set by Absolute Grant Value.
Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

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UMTS BAND II

Mode	Frequency (MHz)	Avg. Burst Power (dBm)
WCDMA 1900 RMC	1852.4	**22.61**
	1880	22.39
	1907.6	22.51
WCDMA 1900 AMR	1852.4	22.04
	1880	21.98
	1907.6	21.88
HSDPA Subtest 1	1852.4	20.93
	1880	21.13
	1907.6	20.78
HSDPA Subtest 2	1852.4	20.28
	1880	20.48
	1907.6	20.78
HSDPA Subtest 3	1852.4	20.14
	1880	20.15
	1907.6	20.11
HSDPA Subtest 4	1852.4	20.20
	1880	20.46
	1907.6	20.41
HSUPA Subtest 1	1852.4	20.84
	1880	20.68
	1907.6	20.24
HSUPA Subtest 2	1852.4	21.49
	1880	21.48
	1907.6	21.56
HSUPA Subtest 3	1852.4	21.22
	1880	21.42
	1907.6	21.44
HSUPA Subtest 4	1852.4	21.37
	1880	22.27
	1907.6	22.24
HSUPA Subtest 5	1852.4	21.24
	1880	21.82
	1907.6	21.94

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UMTS BAND V

Mode	Frequency (MHz)	Avg. Burst Power (dBm)
WCDMA 850 RMC	826.4	21.14
	836.6	21.07
	846.6	**21.32**
WCDMA 850 AMR	826.4	20.92
	836.6	20.94
	846.6	20.80
HSDPA Subtest 1	826.4	19.65
	836.6	19.76
	846.6	20.05
HSDPA Subtest 2	826.4	19.58
	836.6	19.66
	846.6	19.83
HSDPA Subtest 3	826.4	20.18
	836.6	20.30
	846.6	20.51
HSDPA Subtest 4	826.4	21.09
	836.6	20.56
	846.6	20.73
HSUPA Subtest 1	826.4	20.65
	836.6	20.80
	846.6	20.39
HSUPA Subtest 2	826.4	20.81
	836.6	20.07
	846.6	20.77
HSUPA Subtest 3	826.4	20.25
	836.6	20.58
	846.6	20.71
HSUPA Subtest 4	826.4	20.78
	836.6	20.45
	846.6	21.14
HSUPA Subtest 5	826.4	20.50
	836.6	20.63
	846.6	20.33

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According to 3GPP 25.101 sub-clause 6.2.2 , the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15, β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensation for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

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WIFI

Mode	Data Rate (Mbps)	Channel	Frequency(MHz)	Avg. Burst Power(dBm)
802.11b	1	01	2412	18.75
		06	2437	19.07
		11	2462	**19.51**
802.11g	6	01	2412	13.46
		06	2437	**15.85**
		11	2462	14.14
802.11n(20)	6.5	01	2412	13.30
		06	2437	**15.69**
		11	2462	14.16
802.11n(40)	13.5	03	2422	11.73
		06	2437	**14.08**
		09	2452	12.17

Bluetooth_V4.0_BR/EDR

Modulation	Channel	Frequency(MHz)	Peak Power (dBm)
GFSK	0	2402	4.391
	39	2441	4.932
	78	2480	**4.960**
π /4-DQPSK	0	2402	3.892
	39	2441	4.380
	78	2480	4.360
8-DPSK	0	2402	3.742
	39	2441	4.231
	78	2480	4.246

Bluetooth_V4.0_BLE

Modulation	Channel	Frequency(MHz)	Peak Power (dBm)
GFSK	0	2402	-0.336
	19	2440	-0.019
	39	2480	0.009

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13. TEST RESULTS

13.1. SAR Test Results Summary

13.1.1. Test position and configuration

Face up SAR was performed with the device 10mm from the phantom and Wrist SAR was performed with the device 0mm from the phantom according to IEEE 1528-2013

13.1.2. Operation Mode

1. Per KDB 447498 D01 v06 ,for each exposure position, if the highest 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.
2. Per KDB 865664 D01 v01r04,for each frequency band, if the measured SAR is ≥0.8W/Kg, testing for repeated SAR measurement is required , that the highest measured SAR is only to be tested. When the SAR results are near the limit, the following procedures are required for each device to verify these types of SAR measurement related variation concerns by repeating the highest measured SAR configuration in each frequency band.
   (1) When the original highest measured SAR is ≥0.8W/Kg, repeat that measurement once.
   (2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is >1.20 or when the original or repeated measurement is ≥1.45 W/Kg.
   (3) Perform a third repeated measurement only if the original, first and second repeated measurement is ≥1.5 W/Kg and ratio of largest to smallest SAR for the original, first and second measurement is ≥ 1.20.
3. Body-worn exposure conditions are intended to voice call operations, therefore GSM voice call mode is selected to be test.
4. Per KDB 248227 D01v02r02,for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤1.2W/kg.
5. Per KDB 941225 D06 V02r01, when the same wireless mode transmission configurations for voice and data are required for SAR measurements, the more conservative configuration with a smaller separation distance should be tested for the overlapping SAR configurations.
6. Maximum Scaling SAR in order to calculate the Maximum SAR values to test under the standard Peak Power, Calculation method is as follows:
   Maximum Scaling SAR =tested SAR (Max.) ×[maximum turn-up power (mw)/ maximum measurement output power(mw)]

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13.1.3. Test Result

SAR MEASUREMENT									
Depth of Liquid (cm):>15				Relative Humidity (%): 52.4					
Product: WCDMA Wireless Data Terminal									
Test Mode: GSM850 with GMSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Face-up	voice	190	836.6	0.08	0.014	31.24	31.17	0.014	1.6
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (10g-Extremity) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Wrist	GPRS-4 slot	190	836.6	-0.45	0.121	25.42	25.25	0.126	4.0

SAR MEASUREMENT									
Depth of Liquid (cm):>15				Relative Humidity (%): 50.6					
Product: WCDMA Wireless Data Terminal									
Test Mode: PCS1900 with GMSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Face-up	voice	661	1880.0	-0.96	0.250	28.56	28.44	0.257	1.6
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (10g-Extremity) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Wrist	GPRS-4 slot	661	1880.0	0.46	0.700	22.50	22.35	0.725	4.0

SAR MEASUREMENT									
Depth of Liquid (cm):>15				Relative Humidity (%): 50.6					
Product: WCDMA Wireless Data Terminal									
Test Mode: WCDMA Band II with QPSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Face-up	RMC 12.2kbps	9400	1880	0.90	0.350	22.61	22.39	0.368	1.6
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (10g-Extremity) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Wrist	RMC 12.2kbps	9400	1880	-0.35	0.852	22.61	22.39	0.896	4.0

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SAR MEASUREMENT									
Depth of Liquid (cm):>15				Relative Humidity (%): 52.4					
Product: WCDMA Wireless Data Terminal									
Test Mode: WCDMA Band V with QPSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Face-up	RMC 12.2kbps	4183	836.6	-1.89	0.019	21.32	21.07	0.020	1.6
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (10g-Extremity) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Wrist	RMC 12.2kbps	4183	836.6	1.00	0.123	21.32	21.07	0.130	4.0

SAR MEASUREMENT									
Depth of Liquid (cm):>15				Relative Humidity (%): 53.7					
Product: WCDMA Wireless Data Terminal									
Test Mode:802.11b									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Face-up	DTS	11	2462	0.04	0.085	19.51	19.51	0.085	1.6
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (10g-Extremity) (W/kg)**	**Max. Tune-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit (W/kg)**
Wrist	DTS	11	2462	0.17	0.374	19.51	19.51	0.374	4.0

Note:

- According to KDB 248227 D01v02r02,for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤1.2W/kg.
- All of above “DTS” means data transmitters.

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Simultaneous Multi-band Transmission Evaluation:

Application Simultaneous Transmission information:

NO	Simultaneous state	Portable Handset		
		Face-up	Wrist	Hotspot
1	GSM(voice)+ WIFI 2.4GHz (data)	Yes	-	-
2	GSM(voice)+Bluetooth(data)	Yes	-	-
3	GSM (Data) + Bluetooth(data)	-	Yes	Yes
4	GSM (Data) + WIFI 2.4GHz (data)	-	Yes	Yes
5	WCDMA(RMC12.2kbps) + Bluetooth(data)	Yes	Yes	Yes
6	WCDMA(RMC12.2kbps)+ WIFI 2.4GHz (data)	Yes	Yes	Yes

NOTE:

1. WIFI and BT share the same antenna, and cannot transmit simultaneously.
2. Simultaneous with every transmitter must be the same test position.
3. KDB 447498 D01, BT SAR is excluded as below table.
4. KDB 447498 D01, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user; which is 0mm for Wrist and 10mm for Face-up.
5. According to KDB 447498 D01 4.3.1, Standalone SAR test exclusion is as follow:
   For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
   [(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] • [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR[30], where
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation[31]
   - The result is rounded to one decimal place for comparison
   - The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below

   The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.
6. If the test separation distance is <5mm, 5mm is used for excluded SAR calculation.
7. According to KDB 447498 D01 4.3.2, simultaneous transmission SAR test exclusion is as follow:
   (1) Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.
   (2) Any transmitters and antennas should be considered when calculating simultaneous mode.
   (3) For mobile phone and PC, it's the sum of all transmitters and antennas at the same mode with same position in each applicable exposure condition
   (4)When the standalone SAR test exclusion of section 4.3.2 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to det
   (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
   where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

8. When the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR to peak location separation ratio. The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion. The ratio is determined by (SAR1 + SAR2)1.5/Ri, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

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Estimated SAR		Max Power including Tune-up Tolerance		Separation Distance (mm)	Estimated SAR (W/kg)
		dBm	mW		
BT	Face-up	5	3.16	10	0.066
	Wrist	5	3.16	0	0.053

Sum of the SAR for GSM/WCDMA &Wi-Fi :

Frequency Band	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		GSM/WCDMA	WI-Fi DTS Band	Bluetooth		
GSM 850	Face-up	0.014	0.085		0.099	No
	Face-up	0.014		0.066	0.080	No
PCS 1900	Face-up	0.257	0.085		0.342	No
	Face-up	0.257		0.066	0.323	No
UMTS Band II	Face-up	0.368	0.085		**0.453**	No
	Face-up	0.368		0.066	0.434	No
UMTS Band V	Face-up	0.020	0.085		0.105	No
	Face-up	0.020		0.066	0.086	No
Frequency Band	**Test Position**	**Simultaneous Transmission Scenario**			**Σ10-g-Extremity SAR (W/Kg)**	**SPLSR (Yes/No)**
		GSM/WCDMA	**WI-Fi DTS Band**	**Bluetooth**		
GSM 850	Wrist	0.126	0.374		0.500	No
	Wrist	0.126		0.053	0.179	No
PCS 1900	Wrist	0.725	0.374		1.099	No
	Wrist	0.725		0.053	0.778	No
UMTS Band II	Wrist	0.896	0.374		**1.270**	No
	Wrist	0.896		0.053	0.949	No
UMTS Band V	Wrist	0.130	0.374		0.504	No
	Wrist	0.130		0.053	0.183	No

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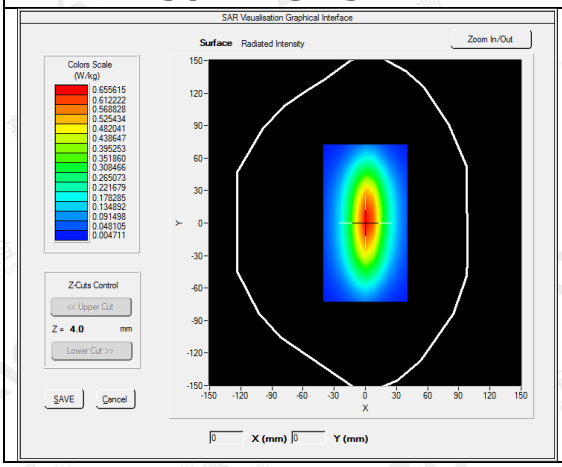
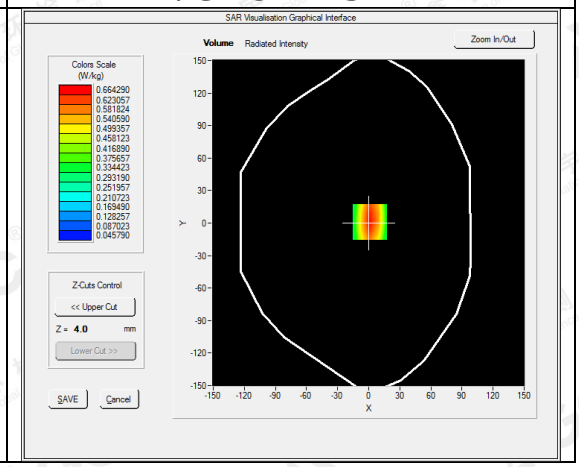
APPENDIX A. SAR SYSTEM CHECK DATA

Test Laboratory: AGC Lab **Date: July 20,2018**
System Check Head 835 MHz
DUT: Dipole 835 MHz Type: SID 835
Communication System CW; Communication System Band: D835 (835.0 MHz); Duty Cycle: 1:1; Conv.F=1.74
Frequency: 835 MHz; Medium parameters used: f = 835 MHz; σ=0.90 mho/m; εr =41.63; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):22.0, Liquid temperature (℃): 21.2

SATIMO Configuration
- Probe: SSE2; Calibrated: Aug. 08, 2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/System Check 835MHz Head/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 835MHz Head/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm

SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=1.00
SAR Peak: 0.98 W/kg

SAR 10g (W/Kg)	0.381147
SAR 1g (W/Kg)	0.633350

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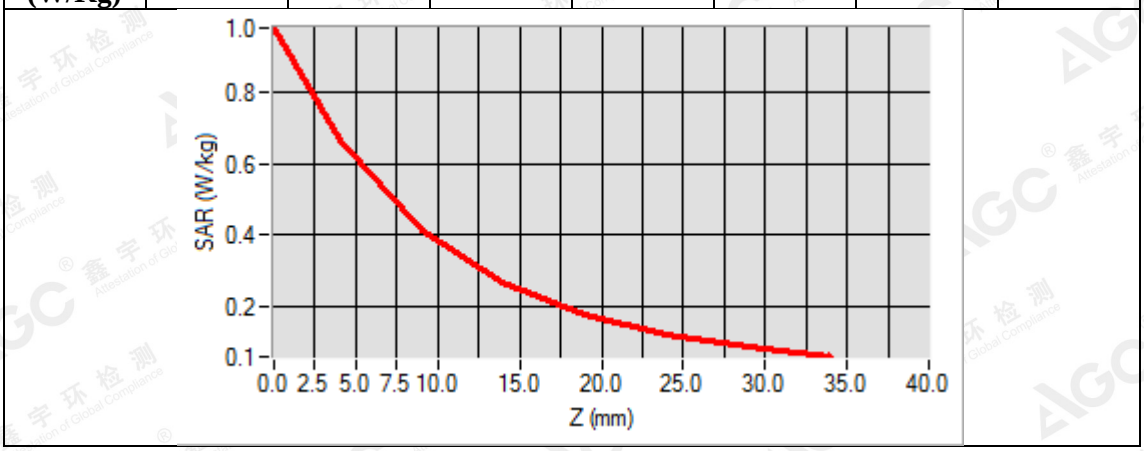
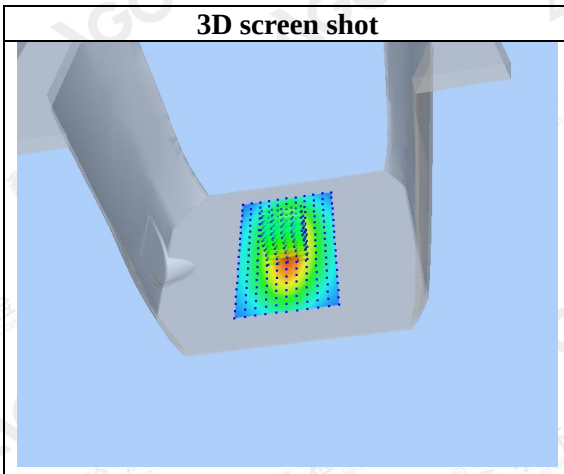
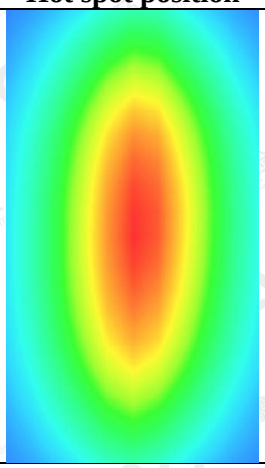
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.9805	0.6643	0.4104	0.2669	0.1778	0.1211	0.0838



3D screen shot	Hot spot position
	

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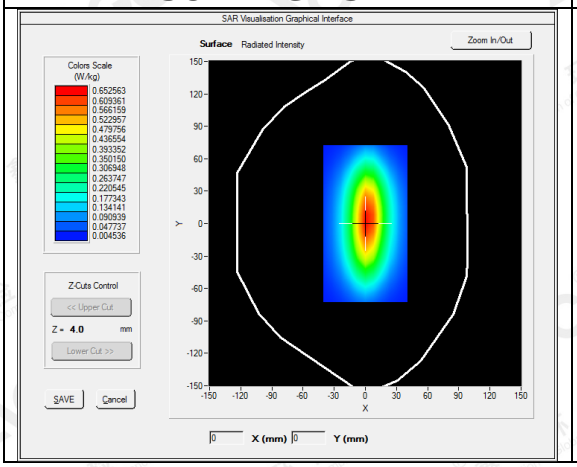
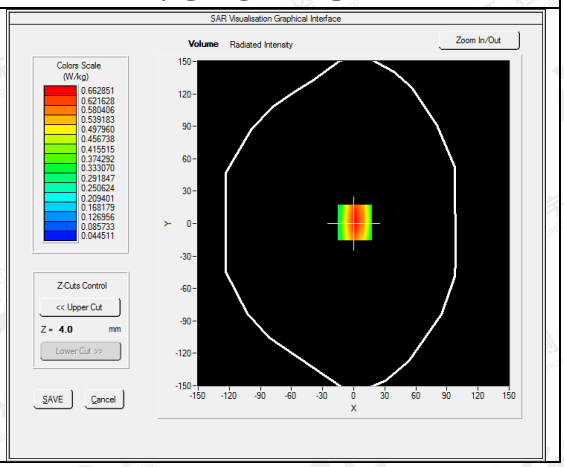
Test Laboratory: AGC Lab **Date: July 20,2018**
System Check Body 835 MHz
DUT: Dipole 835 MHz Type: SID 835
Communication System CW; Communication System Band: D835 (835.0 MHz); Duty Cycle: 1:1; Conv.F=1.81
Frequency: 835 MHz; Medium parameters used: f = 835 MHz; σ=0.95 mho/m; εr =55.02; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):22.0, Liquid temperature (℃): 21.5

SATIMO Configuration
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/System Check 835MHz Body/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 835MHz Body/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm

SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=1.00
SAR Peak: 0.98 W/kg

SAR 10g (W/Kg)	0.379960
SAR 1g (W/Kg)	0.633236

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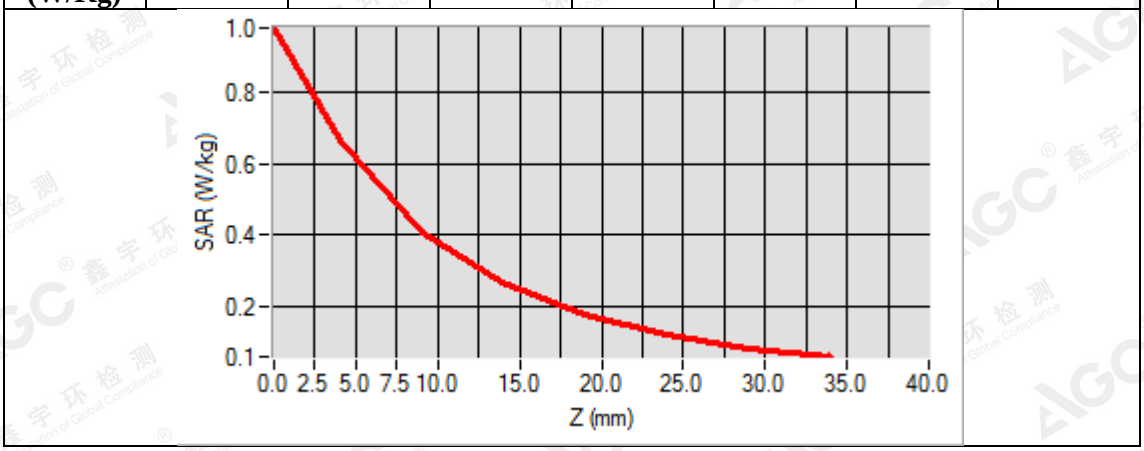
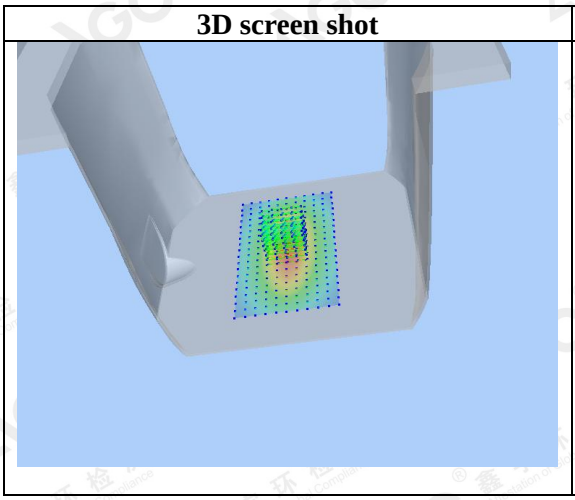
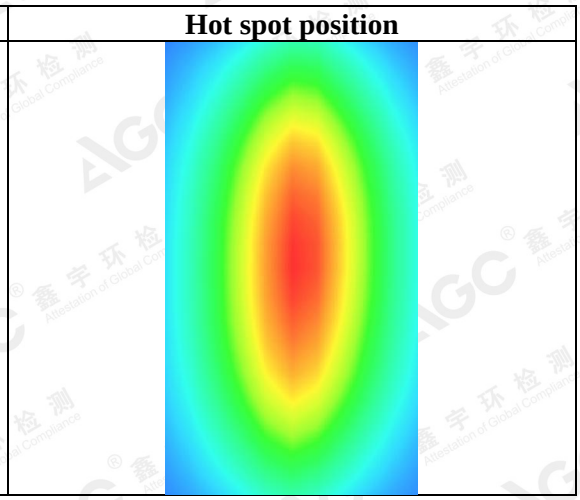
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.9808	0.6629	0.4084	0.2654	0.1767	0.1202	0.0830



3D screen shot	Hot spot position
	

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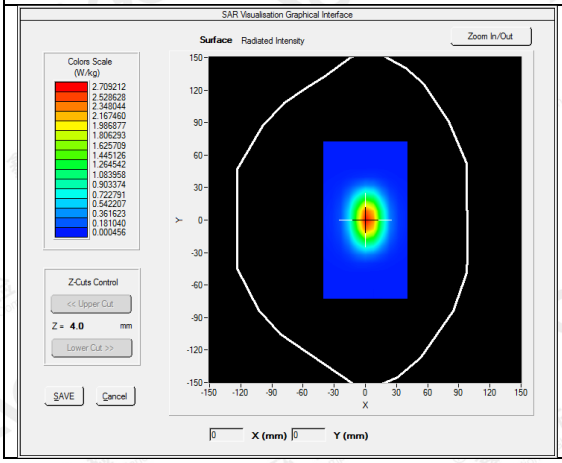
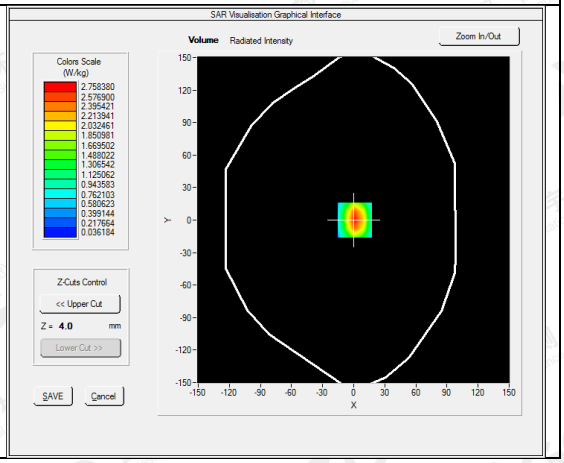
Test Laboratory: AGC Lab **Date: July 21,2018**
System Check Head 1900MHz
DUT: Dipole 1900 MHz; Type: SID 1900
Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Duty Cycle:1:1; Conv.F=2.32
Frequency: 1900 MHz; Medium parameters used: f = 1900 MHz; σ=1.40 mho/m; εr =40.02; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):21.8, Liquid temperature (℃): 21.3

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/System Check 1900MHz Head/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 1900MHz Head/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm

SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=0.00
SAR Peak: 4.43 W/kg

SAR 10g (W/Kg)	1.301294
SAR 1g (W/Kg)	2.594825

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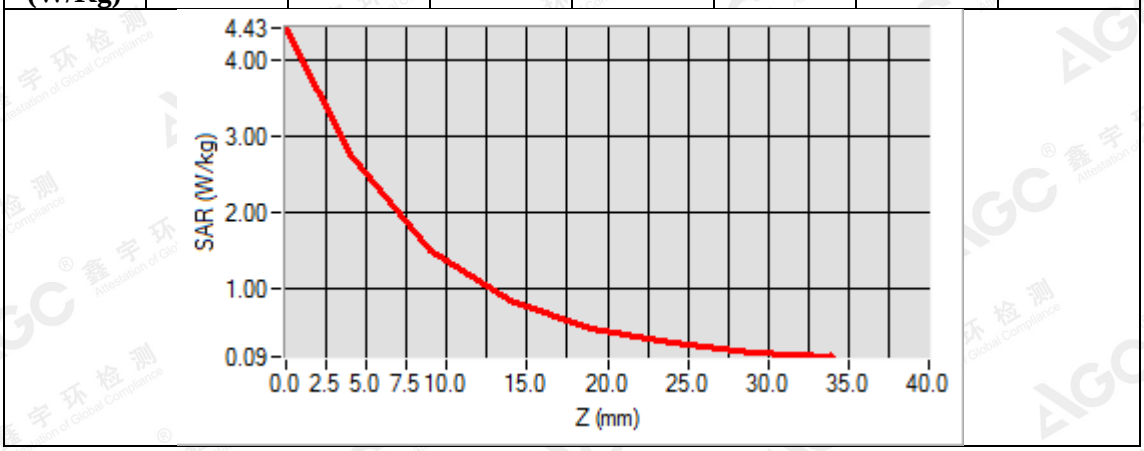
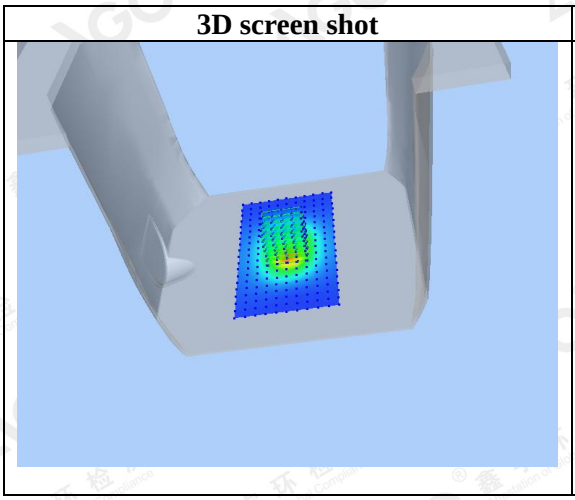
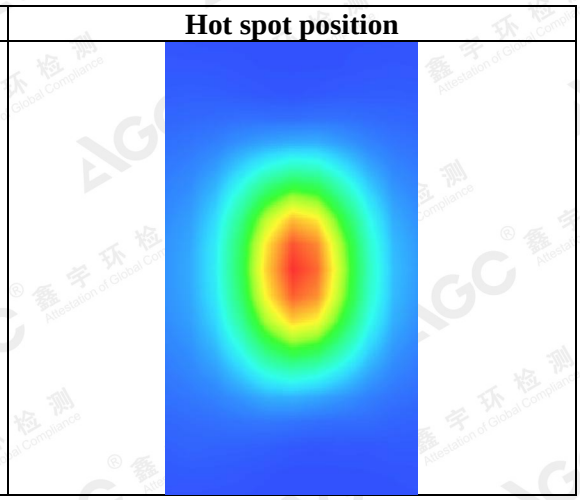
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	4.4320	2.7584	1.4790	0.8261	0.4621	0.2640	0.1520



3D screen shot	Hot spot position
	

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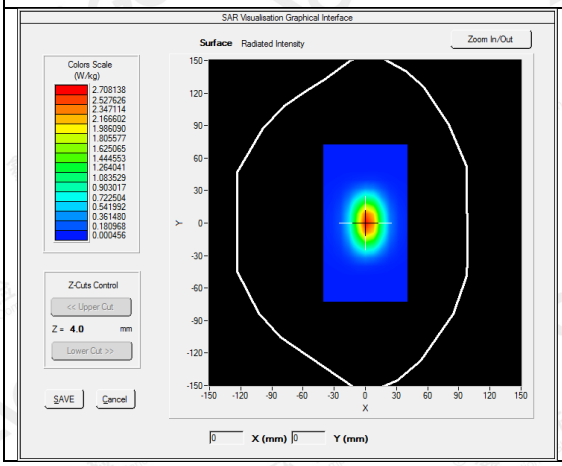
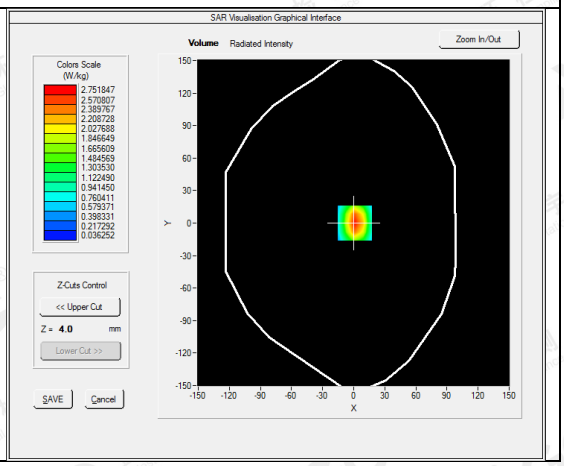
Test Laboratory: AGC Lab **Date: July 21,2018**
System Check Body 1900MHz
DUT: Dipole 1900 MHz; Type: SID 1900
Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Duty Cycle:1:1; Conv.F=2.39
Frequency: 1900 MHz; Medium parameters used: f = 1900 MHz; σ=1.51 mho/m; εr =53.34; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):21.8, Liquid temperature (℃): 21.5

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/System Check 1900MHz Body/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 1900MHz Body/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm

SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=0.00
SAR Peak: 4.42 W/kg

SAR 10g (W/Kg)	1.297986
SAR 1g (W/Kg)	2.588076

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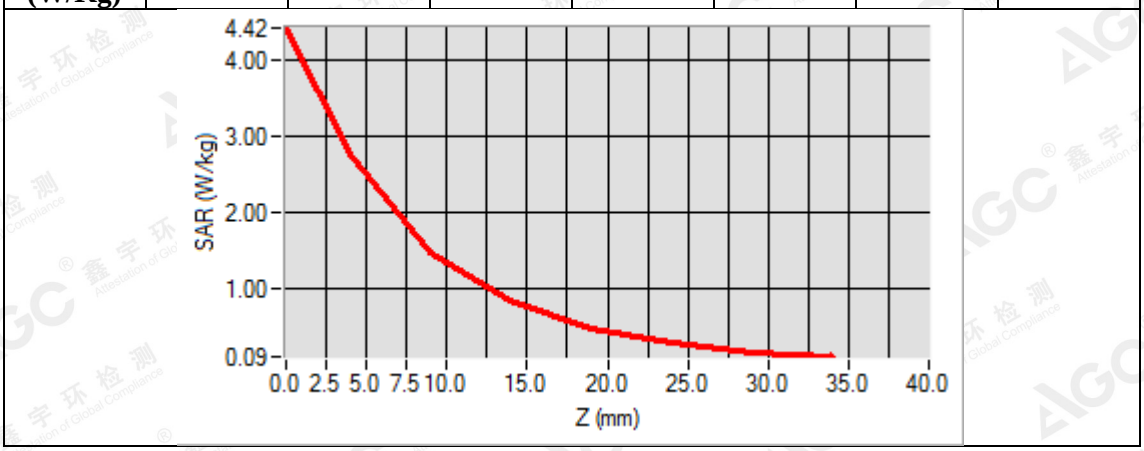
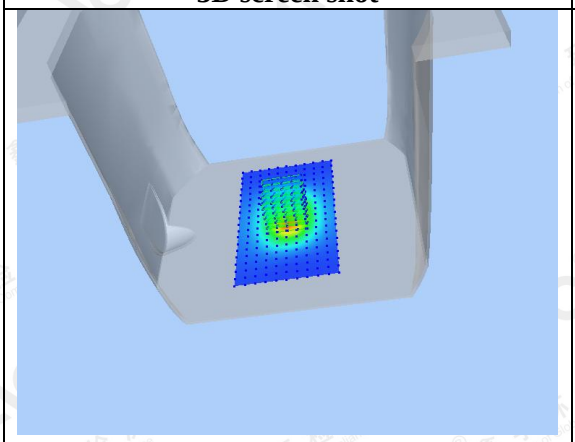
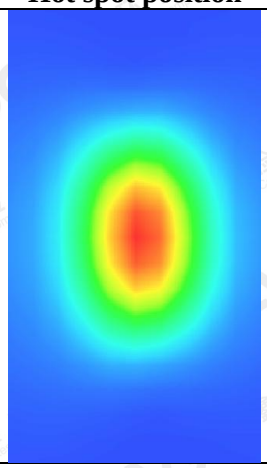
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	4.4246	2.7518	1.4753	0.8251	0.4630	0.2640	0.1518



3D screen shot	Hot spot position
	

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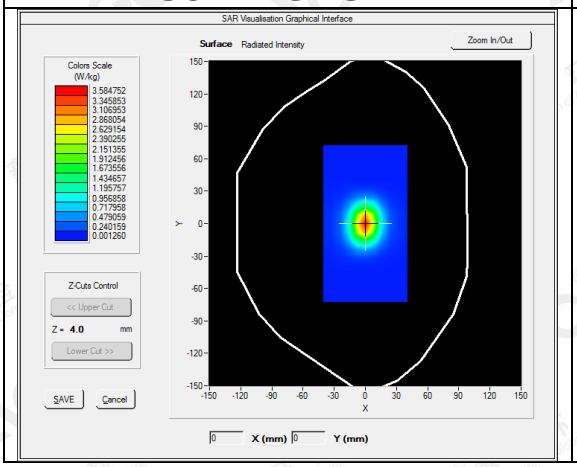
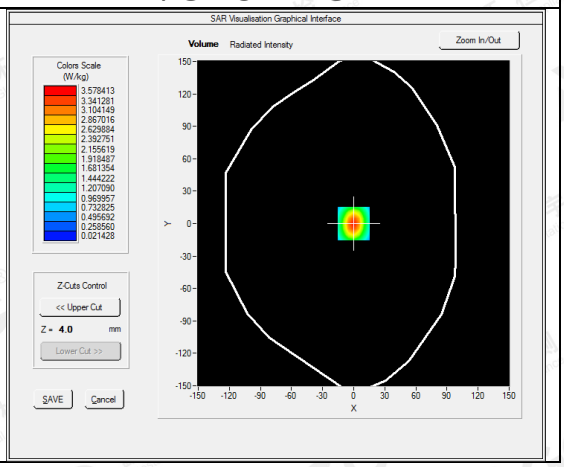
Test Laboratory: AGC Lab **Date: July 24,2018**
System Check Head 2450 MHz
DUT: Dipole 2450 MHz Type: SID 2450
Communication System CW; Communication System Band: D2450 (2450.0 MHz); Duty Cycle: 1:1; Conv.F=2.52
Frequency: 2450 MHz; Medium parameters used: f = 2450 MHz; σ=1.79 mho/m; εr =39.41; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.5

SATIMO Configuration
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/System Check 2450MHz Head/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 2450MHz Head/Zoom Scan: Measurement grid: dx=5mm,dy=5mm, dz=5mm

SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00
SAR Peak: 5.99 W/kg

SAR 10g (W/Kg)	1.519391
SAR 1g (W/Kg)	3.262560

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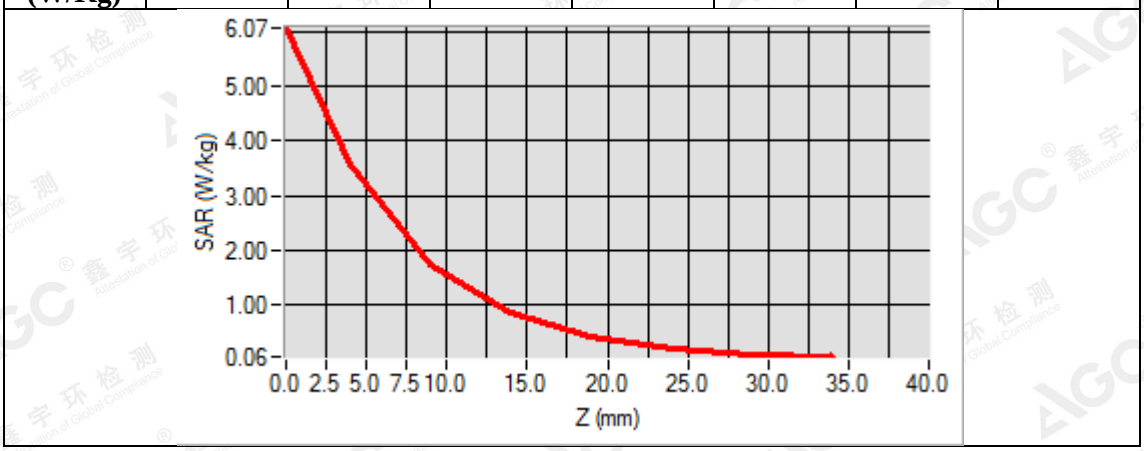
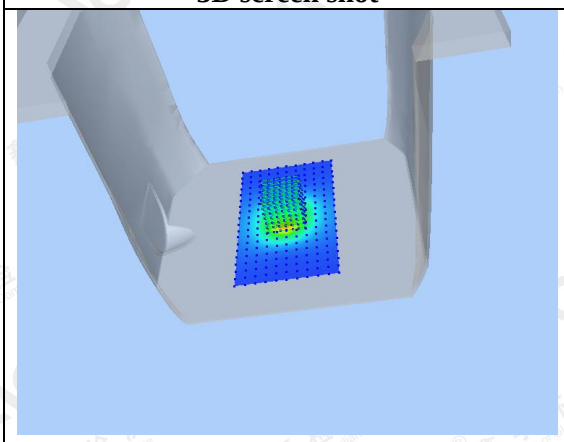
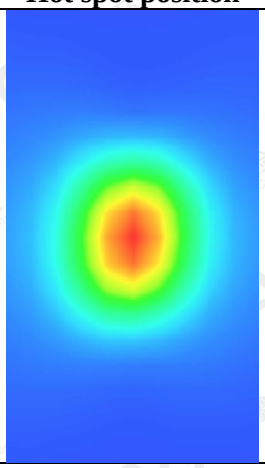
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.0655	3.5784	1.7467	0.8683	0.4357	0.2209	0.1122



3D screen shot	Hot spot position
	

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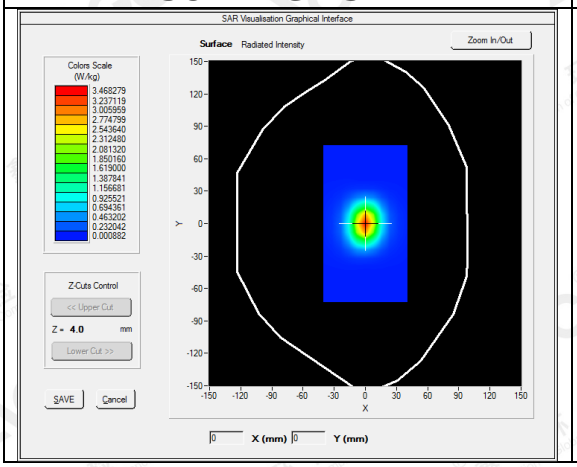
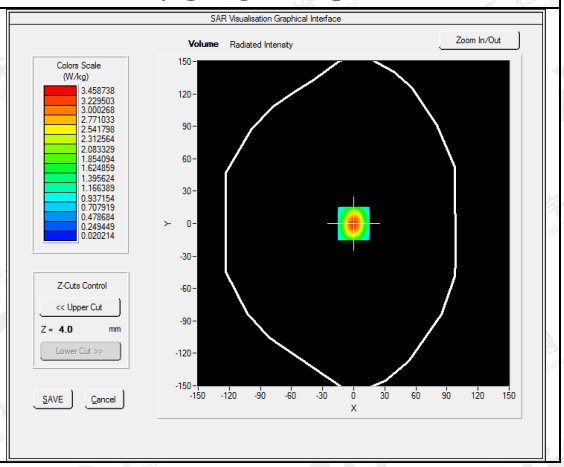
Test Laboratory: AGC Lab **Date: July 24,2018**
System Check Body 2450 MHz
DUT: Dipole 2450 MHz Type: SID 2450
Communication System CW; Communication System Band: D2450 (2450.0 MHz); Duty Cycle: 1:1; Conv.F=2.58
Frequency: 2450 MHz; Medium parameters used: f = 2450 MHz; σ=1.95 mho/m; εr =53.14; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

SATIMO Configuration
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/System Check 2450MHz Body/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 2450MHz Body/Zoom Scan: Measurement grid: dx=5mm,dy=5mm, dz=5mm

SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00
SAR Peak: 5.81 W/kg

SAR 10g (W/Kg)	1.466875
SAR 1g (W/Kg)	3.156383

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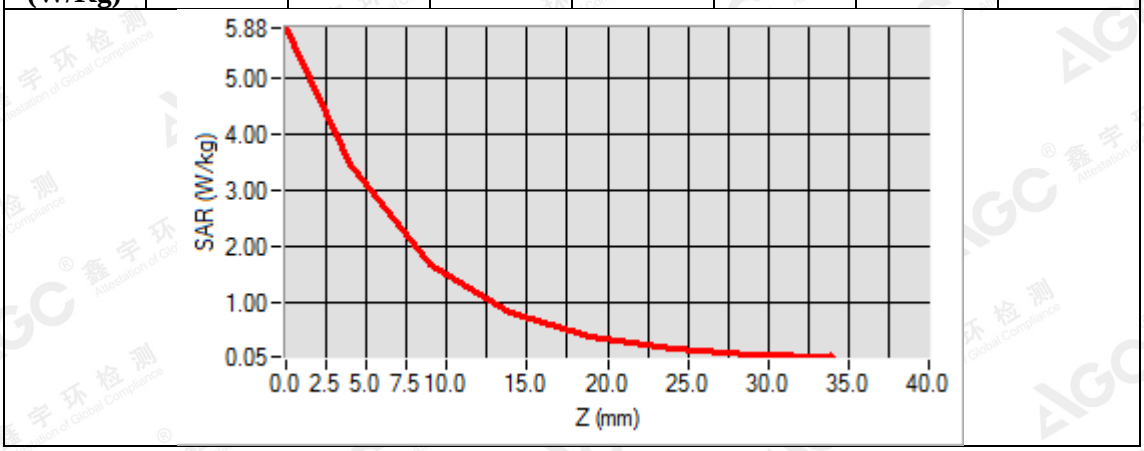
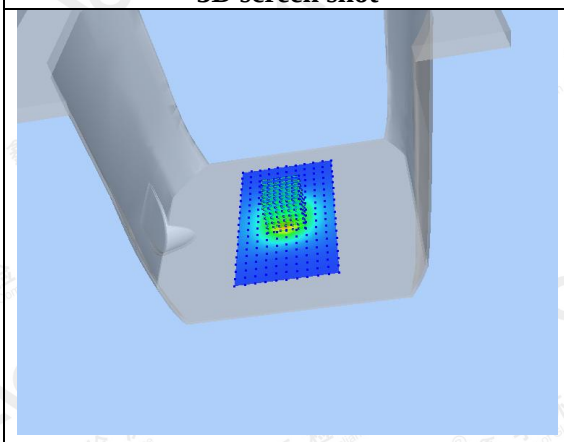
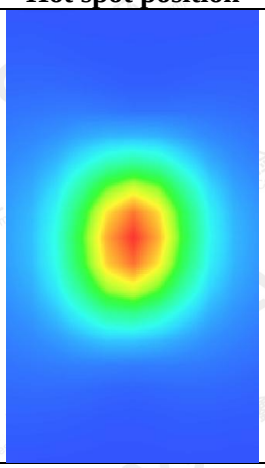
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	5.8826	3.4587	1.6800	0.8319	0.4177	0.2102	0.1065



3D screen shot	Hot spot position
	

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APPENDIX B. SAR MEASUREMENT DATA

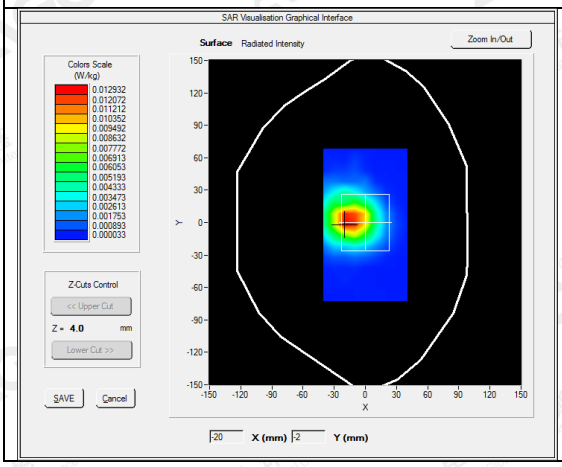
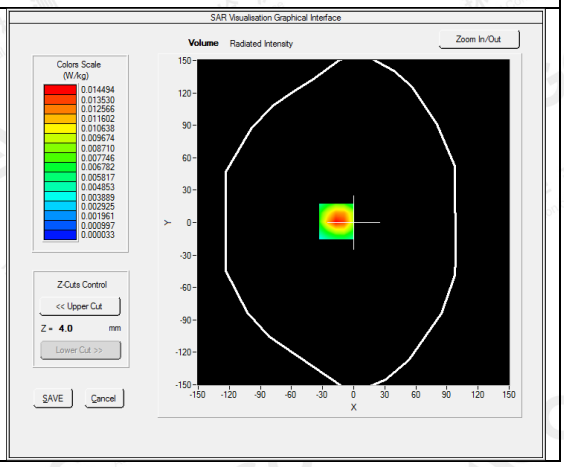
Test Laboratory: AGC Lab **Date: July 20,2018**
GSM 850 Mid- Face-up (MS)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=1.74; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ=0.91 mho/m; εr =41.25; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 22.0, Liquid temperature (℃): 21.5

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/GSM 850 Mid- Face-up/Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/GSM 850 Mid- Face-up/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Face-up
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-17.00, Y=1.00
SAR Peak: 0.02 W/kg

SAR 10g (W/Kg)	0.007711
SAR 1g (W/Kg)	0.013661

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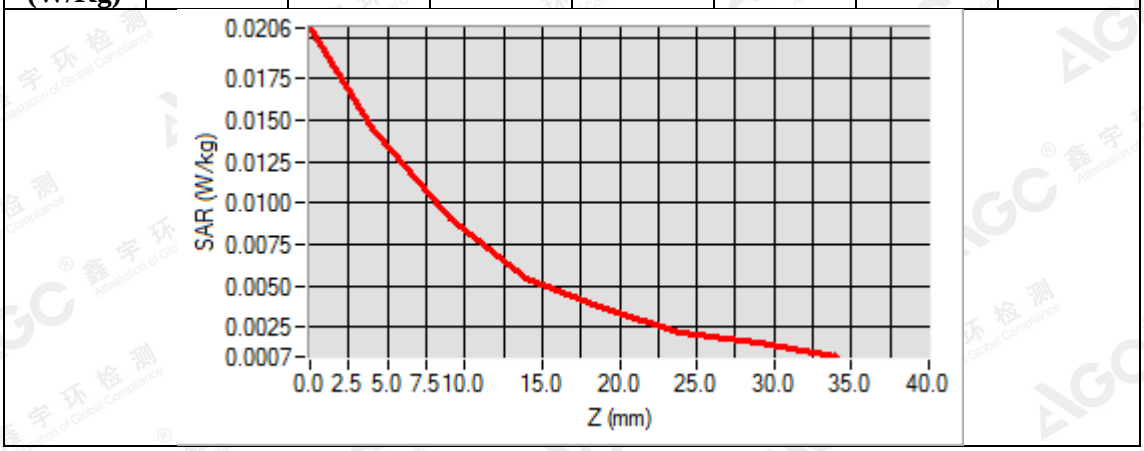
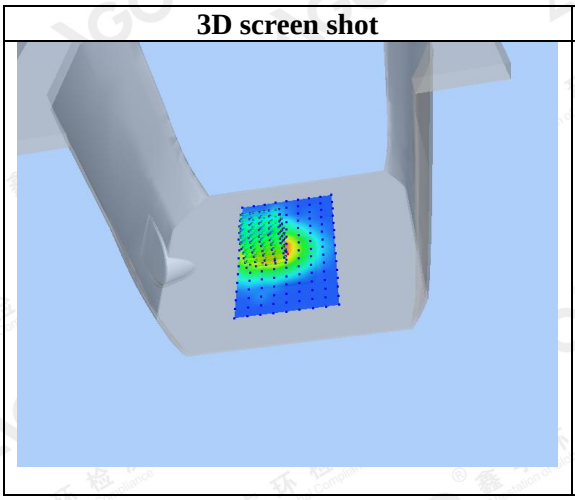
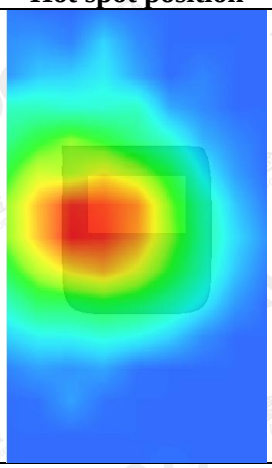
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0206	0.0145	0.0091	0.0055	0.0036	0.0021	0.0016



3D screen shot	Hot spot position
	

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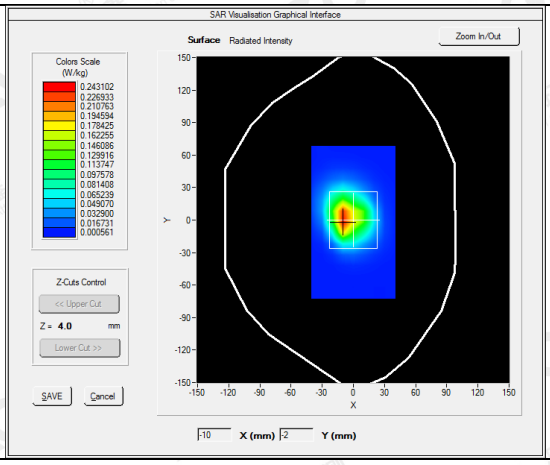
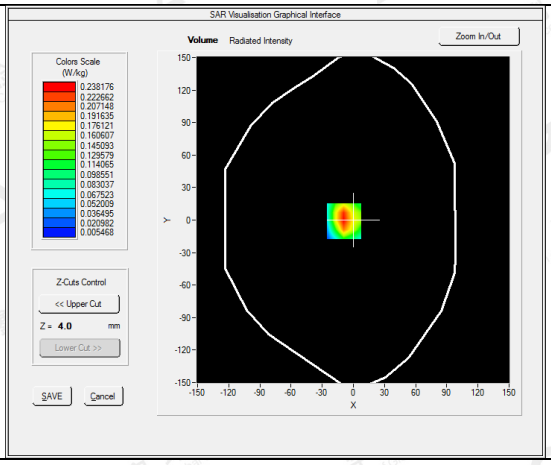
Test Laboratory: AGC Lab **Date: July 20,2018**
GPRS 850 Mid- Touch-Wrist (4up)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

Communication System: GPRS-4 Slot; Communication System Band: GSM 850; Duty Cycle:1:2.1; Conv.F=1.81; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ= 0.96 mho/m; εr = 54.68; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 22.0, Liquid temperature (℃): 21.5

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/GPRS 850 Mid- Touch-Wrist /Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/GPRS 850 Mid- Touch-Wrist /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

Area Scan	sam_direct_droit2_surf8mm.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Wrist
Band	4ST-GPRS 850
Channels	Middle
Signal	TDMA (Crest factor: 2.0)

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-1.00
SAR Peak: 0.36 W/kg

SAR 10g (W/Kg)	0.121083
SAR 1g (W/Kg)	0.220858

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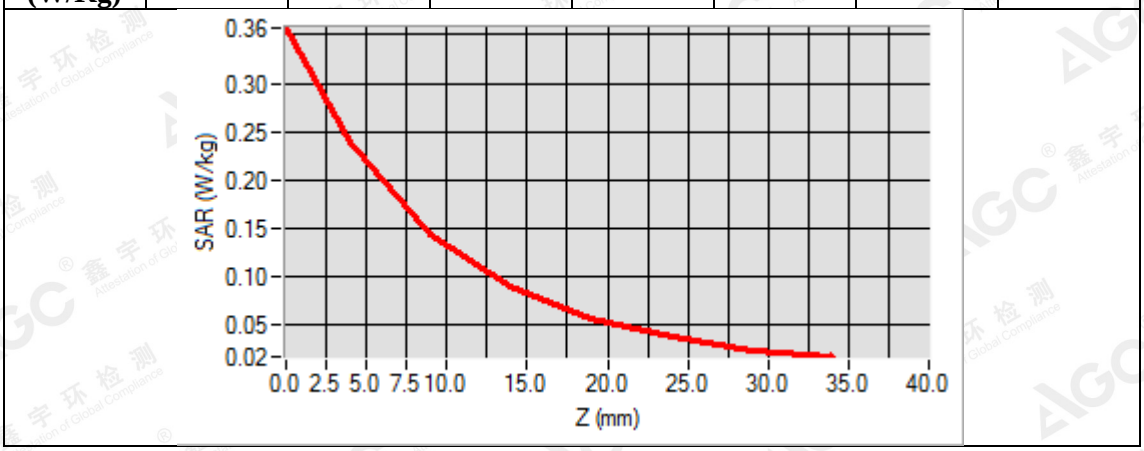
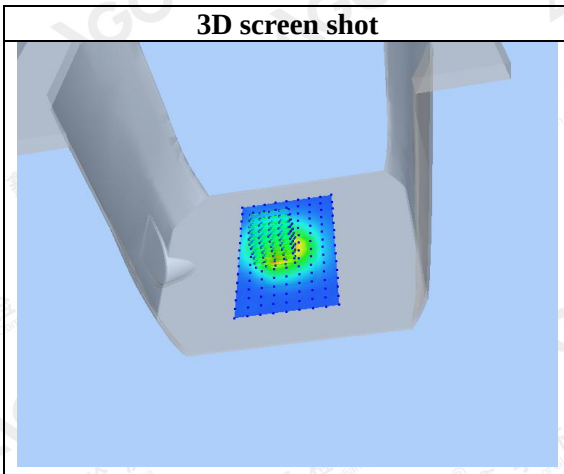
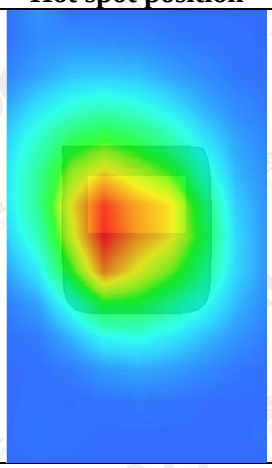
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3571	0.2382	0.1427	0.0891	0.0558	0.0369	0.0238



3D screen shot	Hot spot position
	

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Test Laboratory: AGC Lab **Date: July 21,2018**
PCS 1900 Mid- Face-up (MS)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

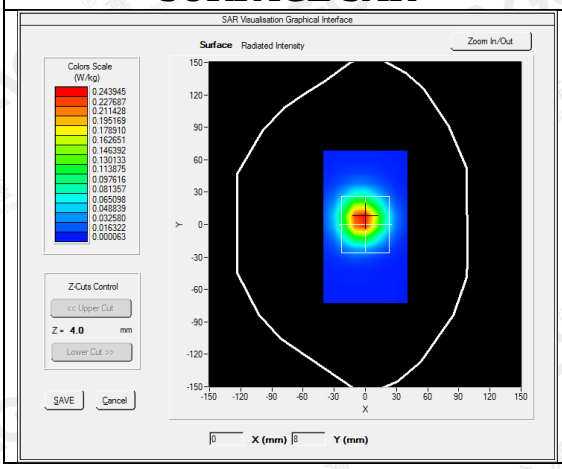
Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=2.32; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ=1.38 mho/m; εr =40.35; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

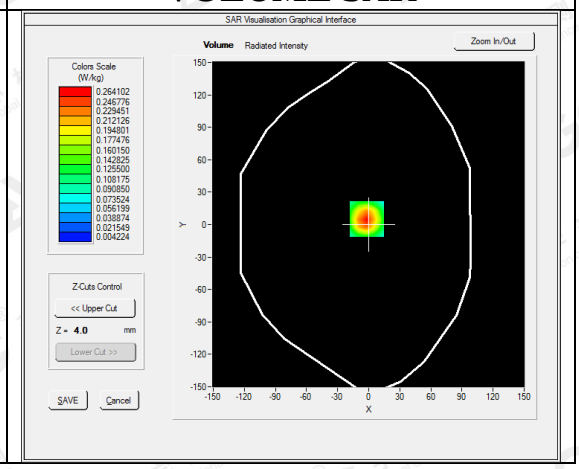
Configuration/PCS1900 Mid- Face-up /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/PCS1900 Mid- Face-up /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Face-up
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

SURFACE SAR



VOLUME SAR



Maximum location: X=-2.00, Y=5.00
SAR Peak: 0.42 W/kg

SAR 10g (W/Kg)	0.131697
SAR 1g (W/Kg)	0.250296

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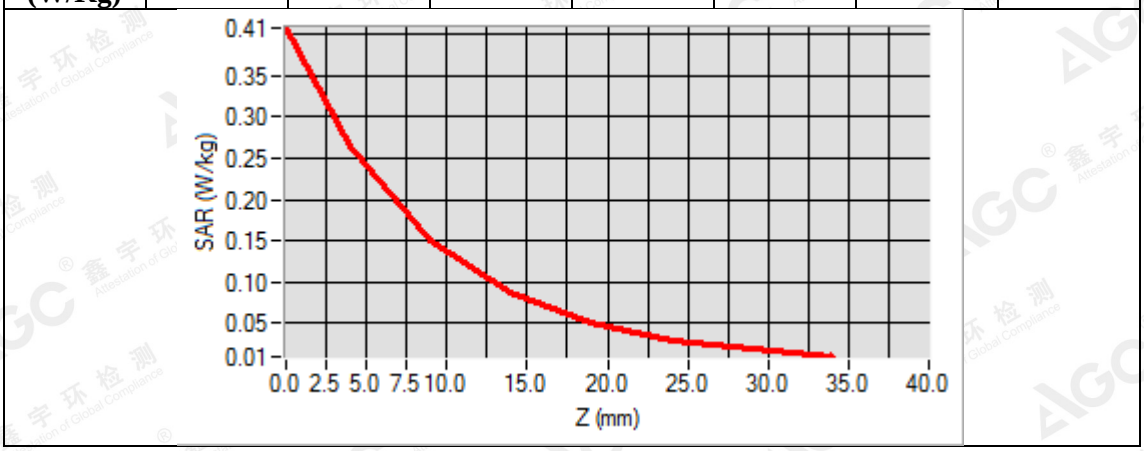
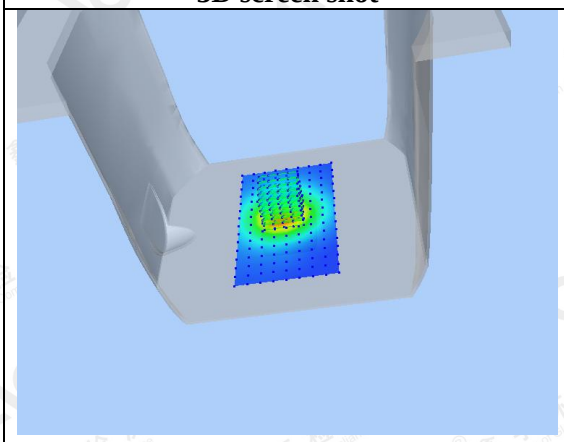
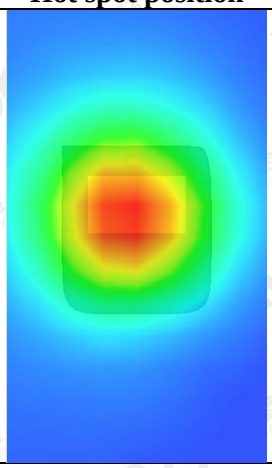
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4073	0.2641	0.1499	0.0869	0.0507	0.0302	0.0182



3D screen shot	Hot spot position
	

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Test Laboratory: AGC Lab **Date: July 21,2018**
GPRS 1900 Mid-Touch-Wrist (4up)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

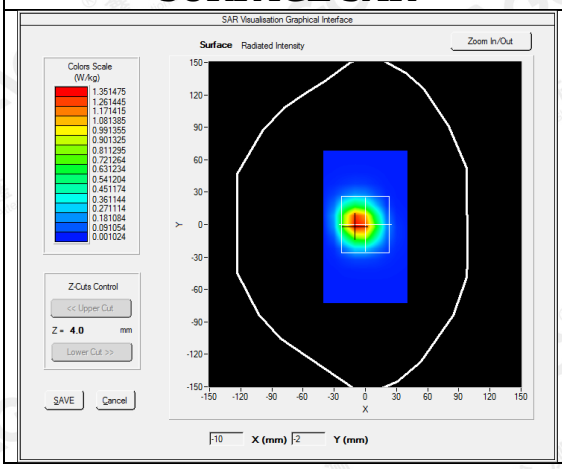
Communication System: GPRS-4Slot; Communication System Band: PCS 1900; Duty Cycle:1:2.1; Conv.F=2.39; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.50 mho/m; εr =53.88; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

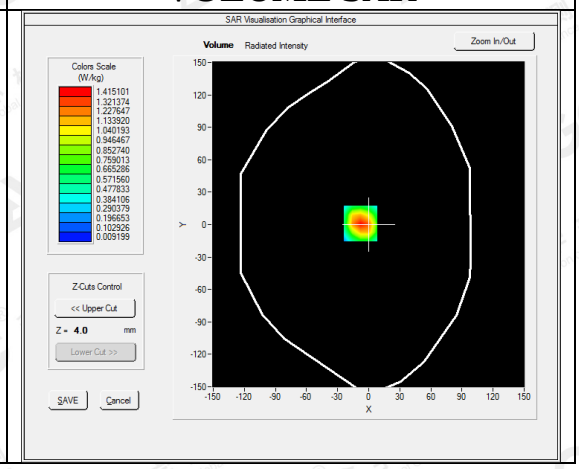
Configuration/GPRS1900 Mid-Touch-Wrist /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/GPRS1900 Mid-Touch-Wrist /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Wrist
Band	4ST-GPRS 1900
Channels	Middle
Signal	TDMA (Crest factor: 2.0)

SURFACE SAR



VOLUME SAR



Maximum location: X=-8.00, Y=1.00
SAR Peak: 2.25 W/kg

SAR 10g (W/Kg)	0.699673
SAR 1g (W/Kg)	1.340462

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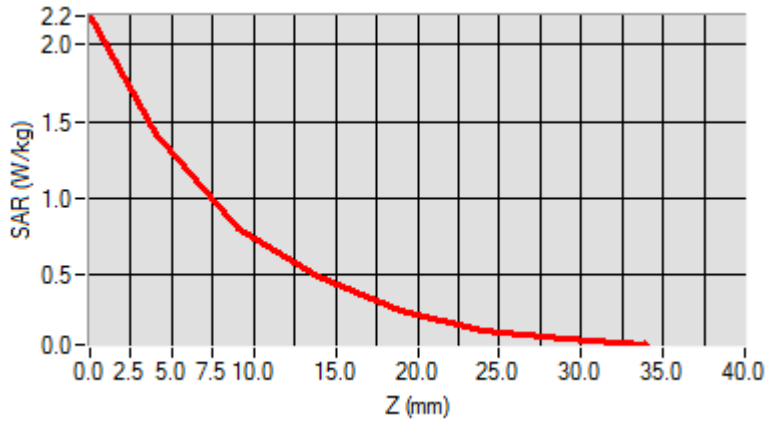
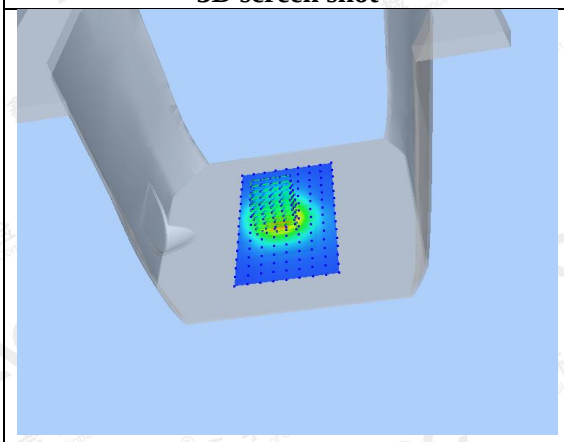
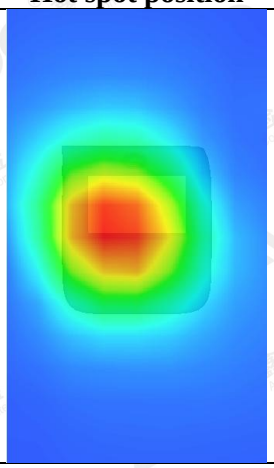
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	2.1847	1.4151	0.7986	0.4845	0.2687	0.1431	0.0829



3D screen shot	Hot spot position
	

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Test Laboratory: AGC Lab **Date: July 21,2018**

WCDMA Band Ⅱ Mid- Face-up (RMC 12.2kbps)

DUT: WCDMA Wireless Data Terminal; Type: TD-11

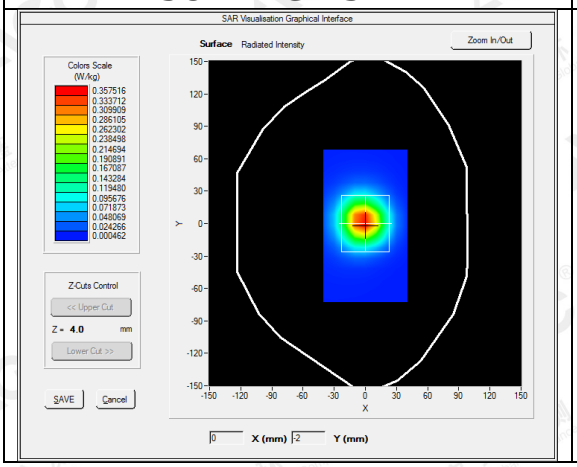
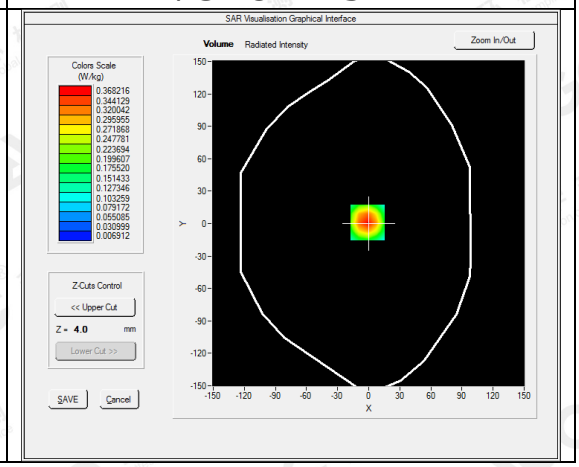
Communication System: UMTS; Communication System Band: Band Ⅱ UTRA/FDD ;Duty Cycle:1:1; Conv.F=2.32; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ=1.38 mho/m; εr =40.35;; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

SATIMO Configuration:

- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/ WCDMA band Ⅱ Mid- Face-up /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/ WCDMA band Ⅱ Mid- Face-up Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5m;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Face-up
Band	WCDMA band Ⅱ
Channels	Middle
Signal	CDMA (Crest factor: 1.0)

SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=-1.00, Y=1.00
SAR Peak: 0.57 W/kg

SAR 10g (W/Kg)	0.189913
SAR 1g (W/Kg)	0.350273

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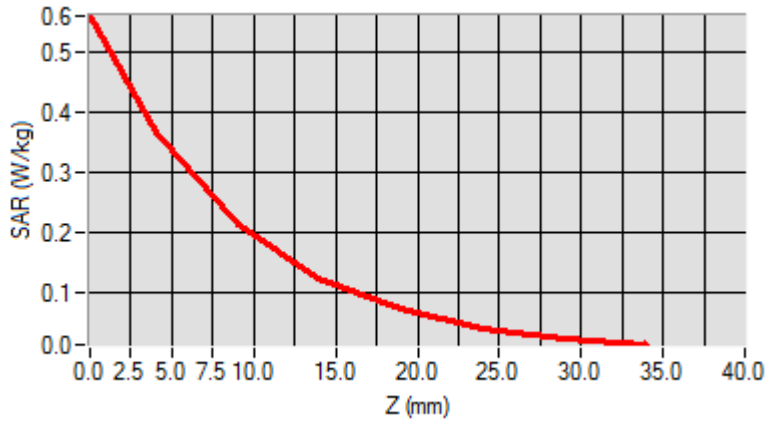
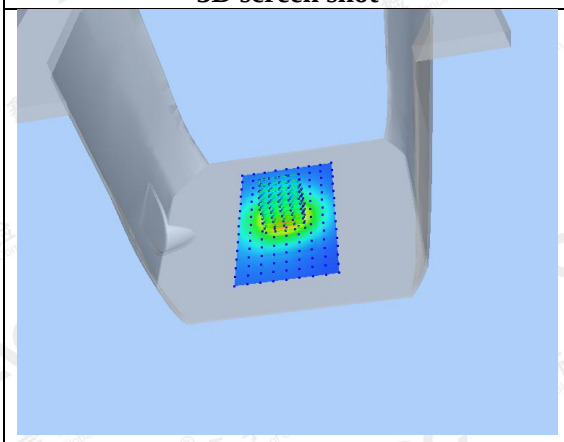
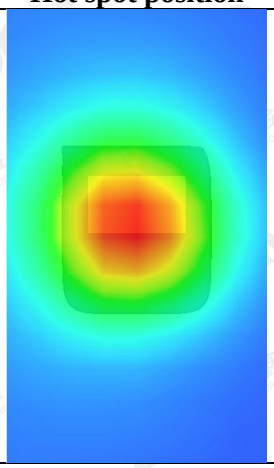
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5600	0.3682	0.2132	0.1251	0.0734	0.0432	0.0258



3D screen shot	Hot spot position
	

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Test Laboratory: AGC Lab **Date: July 21,2018**
WCDMA Band Ⅱ Mid-Touch-Wrist (RMC 12.2kbps)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

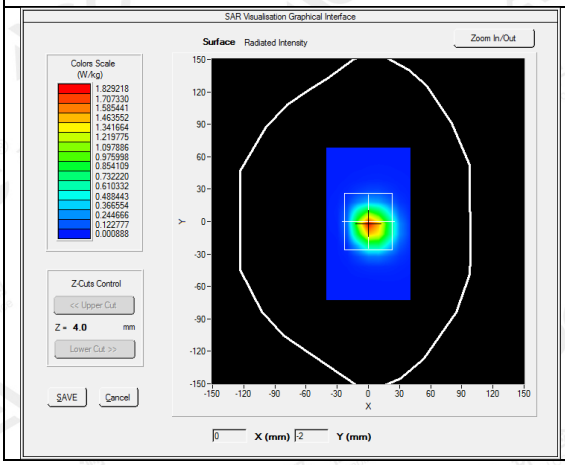
Communication System: UMTS; Communication System Band: Band Ⅱ UTRA/FDD ;Duty Cycle:1:1; Conv.F=2.39;
Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ=1.50 mho/m; εr =53.88; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 21.8, Liquid temperature (℃): 21.5

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

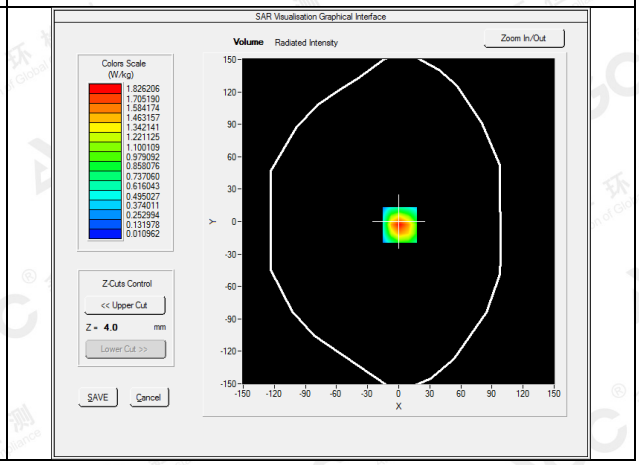
Configuration/ WCDMA band Ⅱ Mid-Touch-Wrist /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/ WCDMA band Ⅱ Mid-Touch-Wrist /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5m;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Wrist
Band	WCDMA band Ⅱ
Channels	Middle
Signal	CDMA (Crest factor: 1.0)

SURFACE SAR



VOLUME SAR



Maximum location: X=1.00, Y=-3.00
SAR Peak: 3.05 W/kg

SAR 10g (W/Kg)	0.852028
SAR 1g (W/Kg)	1.725204

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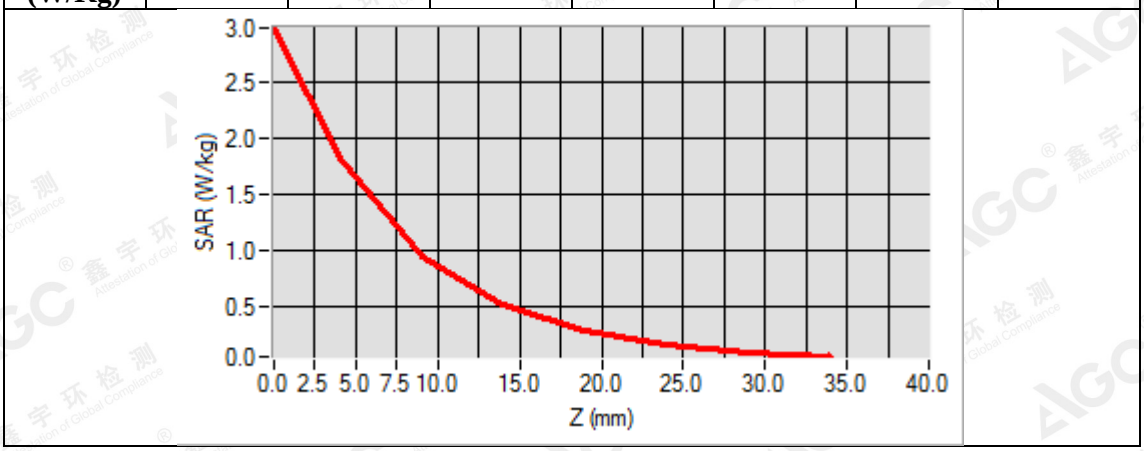
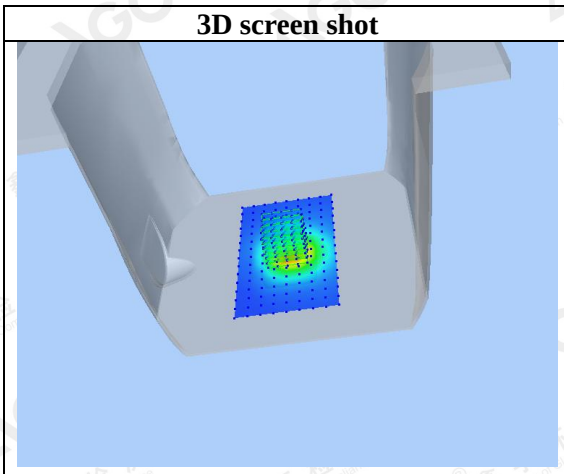
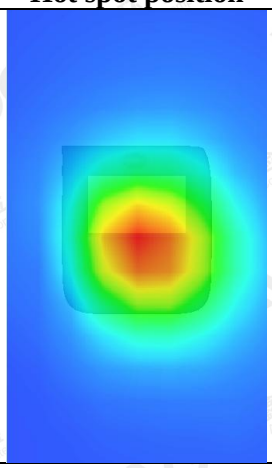
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	2.9942	1.8262	0.9455	0.5076	0.2722	0.1483	0.0814



3D screen shot	Hot spot position
	

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Test Laboratory: AGC Lab **Date: July 20,2018**

WCDMA Band Ⅴ Mid- Face-up (RMC)

DUT: WCDMA Wireless Data Terminal; Type: TD-11

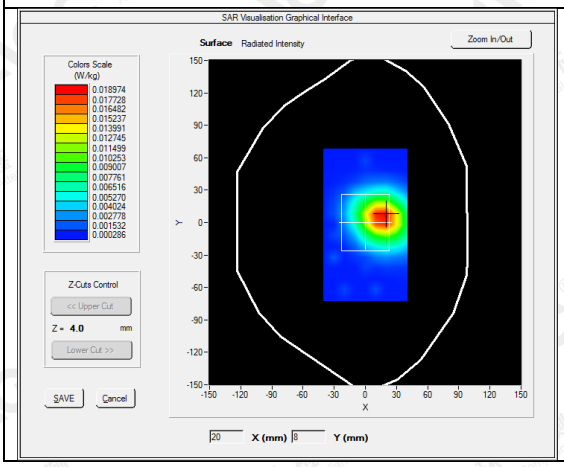
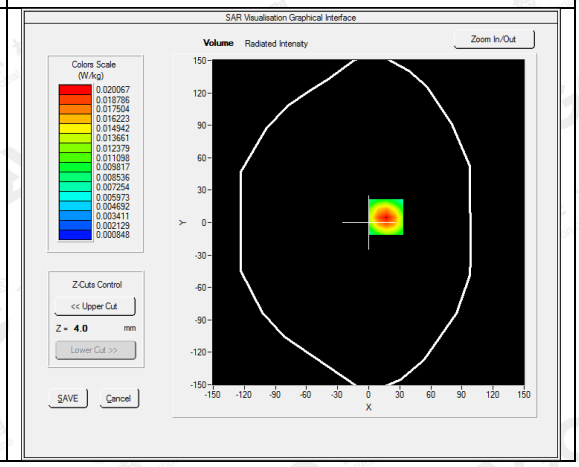
Communication System: UMTS; Communication System Band: BAND Ⅴ UTRA/FDD; Duty Cycle:1: 1; Conv.F=1.74; Frequency: 836.6 MHz; Medium parameters used: f = 835MHz; σ=0.91 mho/m; εr =41.25; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 22.0, Liquid temperature (℃): 21.5

SATIMO Configuration:

- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/ WCDMA Band Ⅴ Mid- Face-up/Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/ WCDMA Band Ⅴ Mid- Face-up /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Face-up
Band	WCDMA Band Ⅴ
Channels	Middle
Signal	CDMA (Crest factor: 1.0)

SURFACE SAR	VOLUME SAR
	

Maximum location: X=17.00, Y=5.00
SAR Peak: 0.03 W/kg

SAR 10g (W/Kg)	0.011407
SAR 1g (W/Kg)	0.018981

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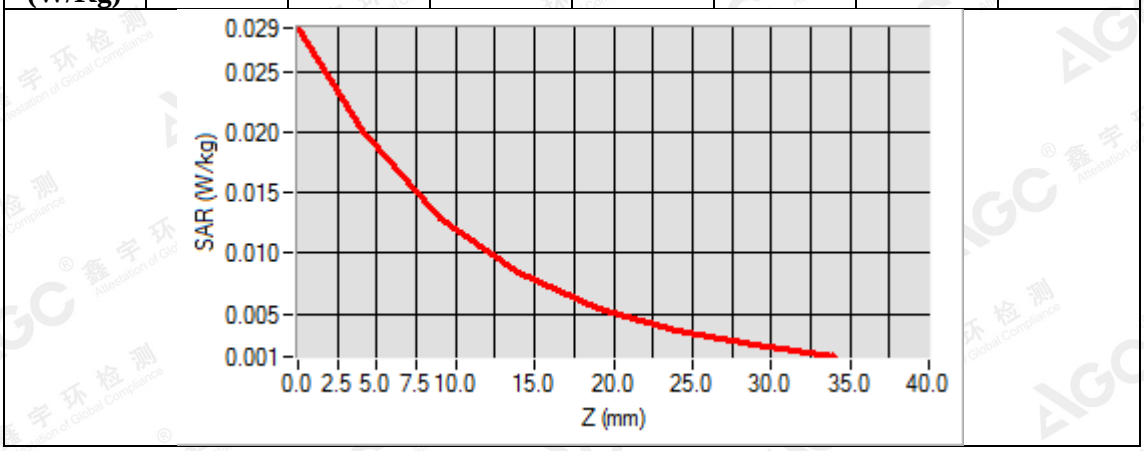
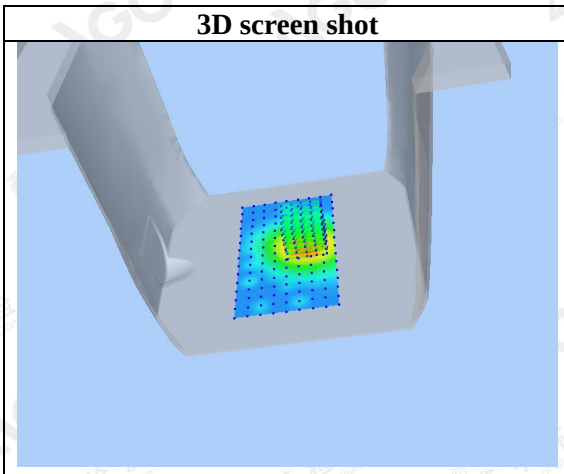
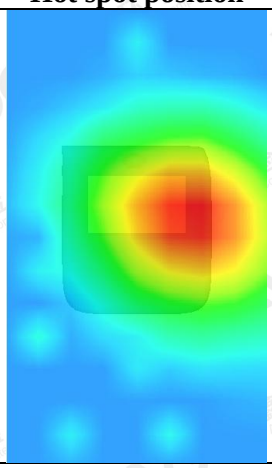
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0286	0.0201	0.0128	0.0084	0.0055	0.0036	0.0024



3D screen shot	Hot spot position
	

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Test Laboratory: AGC Lab **Date: July 20,2018**

WCDMA Band Ⅴ Mid-Touch-Wrist (RMC)

DUT: WCDMA Wireless Data Terminal; Type: TD-11

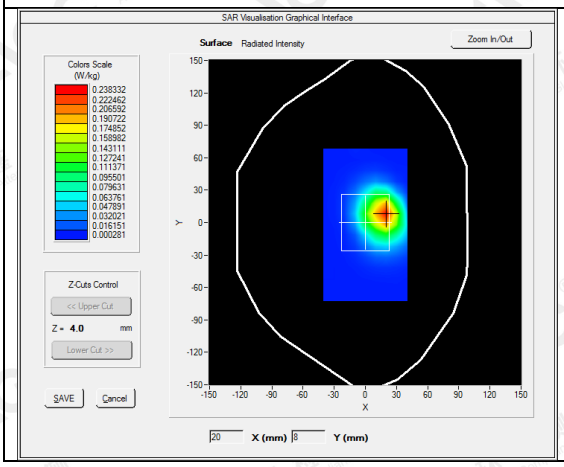
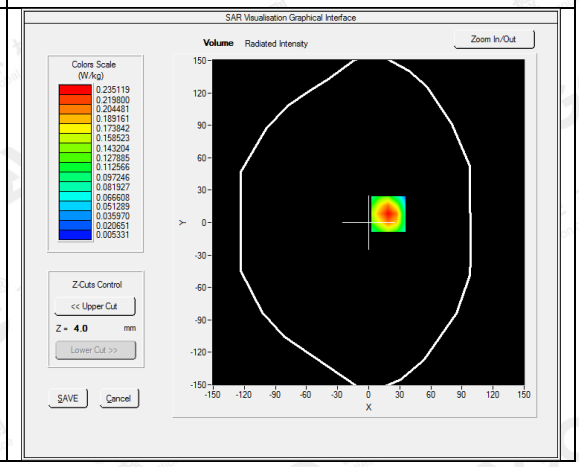
Communication System: UMTS; Communication System Band: BAND Ⅴ UTRA/FDD; Duty Cycle:1: 1; Conv.F=1.81; Frequency: 836.6 MHz; Medium parameters used: f = 835MHz; σ=0.96 mho/m; εr =54.68; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 22.0, Liquid temperature (℃): 21.5

SATIMO Configuration:

- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/ WCDMA Band Ⅴ Mid-Touch-Wrist /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/ WCDMA Band Ⅴ Mid-Touch-Wrist /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Wrist
Band	WCDMA Band Ⅴ
Channels	Middle
Signal	CDMA (Crest factor: 1.0)

SURFACE SAR	VOLUME SAR
	

Maximum location: X=19.00, Y=8.00
SAR Peak: 0.38 W/kg

SAR 10g (W/Kg)	0.122856
SAR 1g (W/Kg)	0.224984

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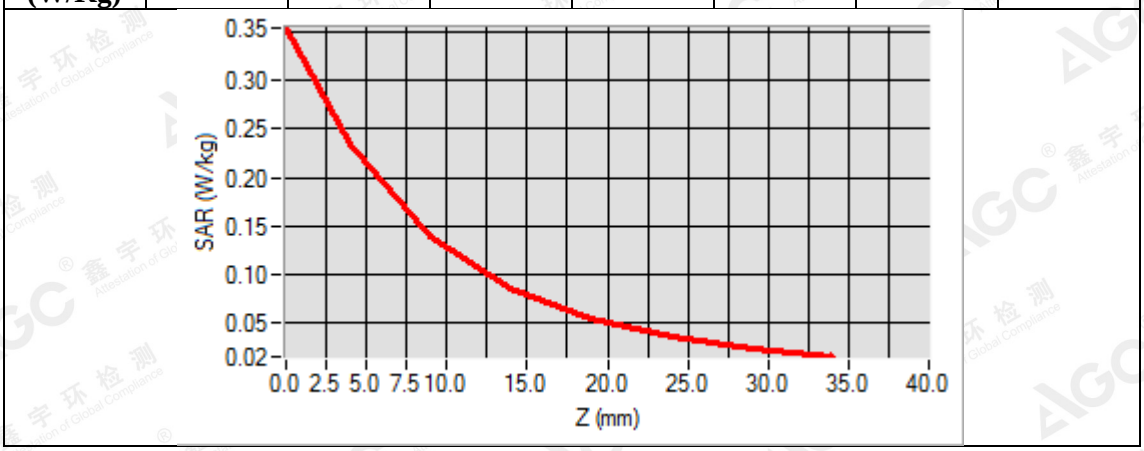
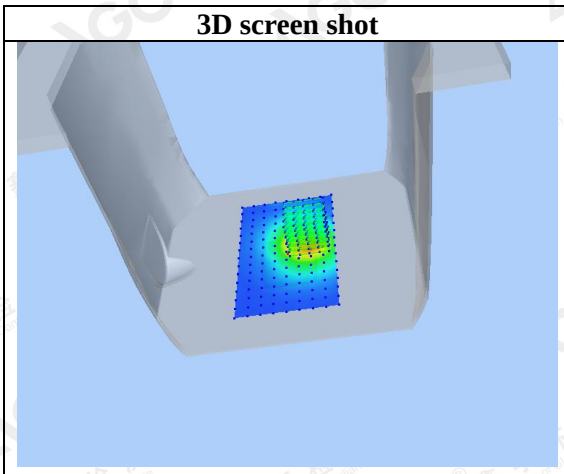
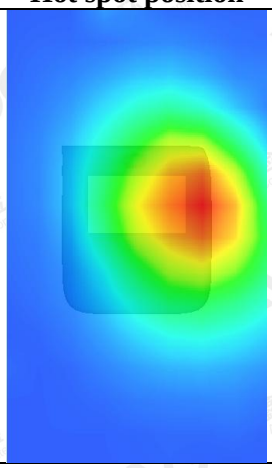
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3541	0.2351	0.1400	0.0864	0.0545	0.0352	0.0230



3D screen shot	Hot spot position
	

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WIFI MODE

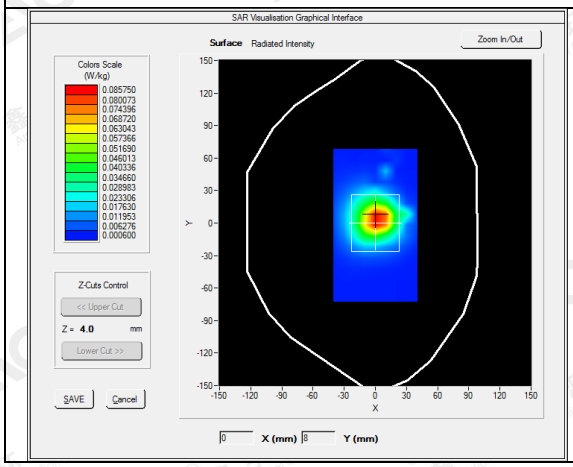
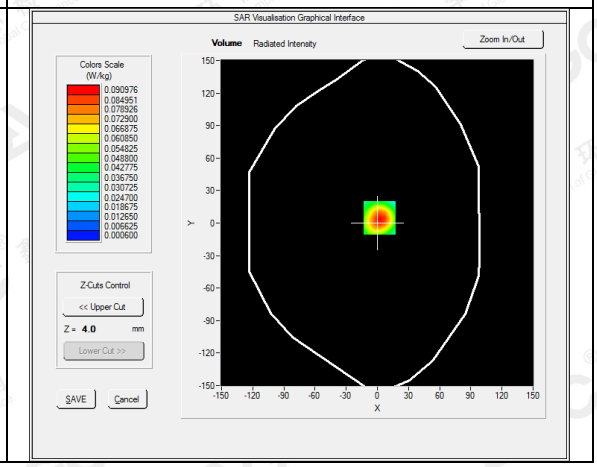
Test Laboratory: AGC Lab **Date: July 24,2018**
802.11b High- Face-up (DTS)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=2.52;
Frequency: 2462 MHz; Medium parameters used: f = 2450 MHz; σ=1.80 mho/m; εr =38.99; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/802.11b High - Face-up /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/802.11b High - Face-up /Zoom Scan: Measurement grid: dx=5mm,dy=5mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Face-up
Band	2450MHz
Channels	High
Signal	Crest factor: 1.0

SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=5.00
SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)	0.044946
SAR 1g (W/Kg)	0.085212

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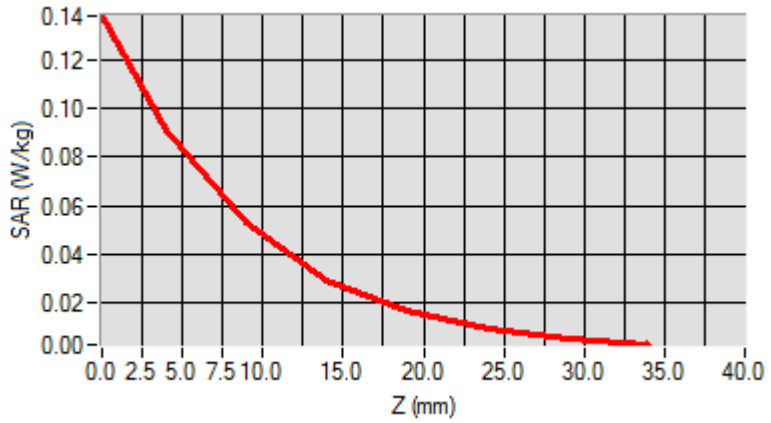
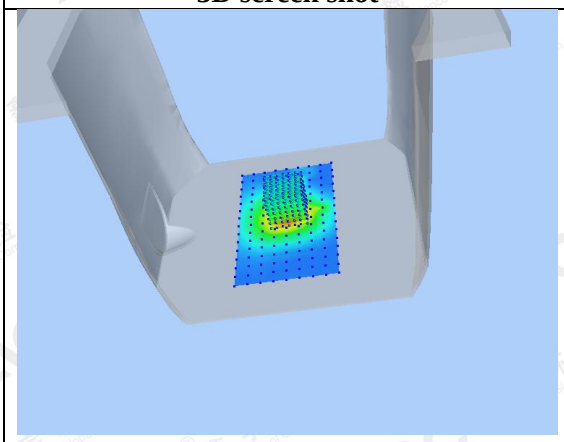
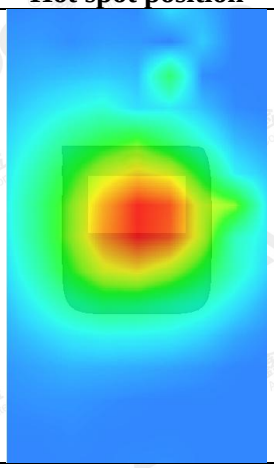
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1378	0.0910	0.0529	0.0295	0.0173	0.0095	0.0053



3D screen shot	Hot spot position
	

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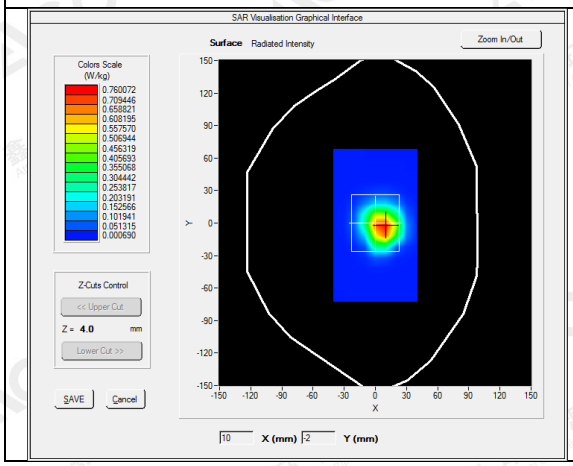
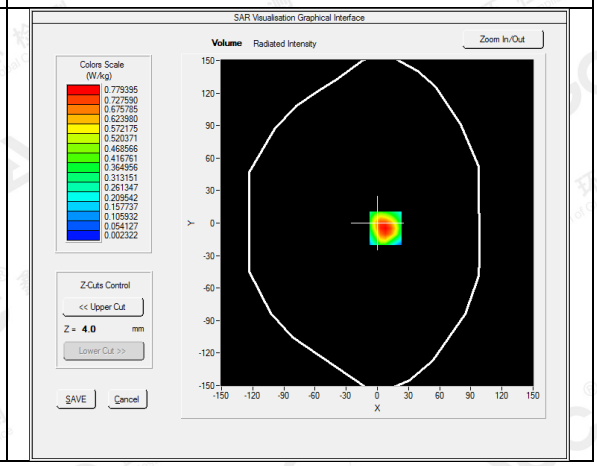
Test Laboratory: AGC Lab **Date: July 24,2018**
802.11b High - Touch-Wirst(DTS)
DUT: WCDMA Wireless Data Terminal; Type: TD-11

Communication System: Wi-Fi; Communication System Band: 802.11b; Duty Cycle: 1:1; Conv.F=2.58;
Frequency: 2462 MHz; Medium parameters used: f = 2450 MHz; σ =1.96mho/m; εr =52.58; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

SATIMO Configuration:
- Probe: SSE2; Calibrated: Aug. 08,2017; Serial No.: SN 08/16 EPGO282
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: SAM twin phantom
- Measurement SW: OpenSAR V4_02_35

Configuration/802.11b High - Touch-Wirst /Area Scan: Measurement grid: dx=10mm, dy=10mm
Configuration/802.11b High - Touch-Wirst /Zoom Scan: Measurement grid: dx=5mm,dy=5mm, dz=5mm;

Area Scan	sam_direct_droit2_surf10mm.txt
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Wrist
Band	2450MHz
Channels	High
Signal	Crest factor: 1.0

SURFACE SAR	VOLUME SAR
	

Maximum location: X=8.00, Y=-5.00
SAR Peak: 1.23 W/kg

SAR 10g (W/Kg)	0.374165
SAR 1g (W/Kg)	0.732132

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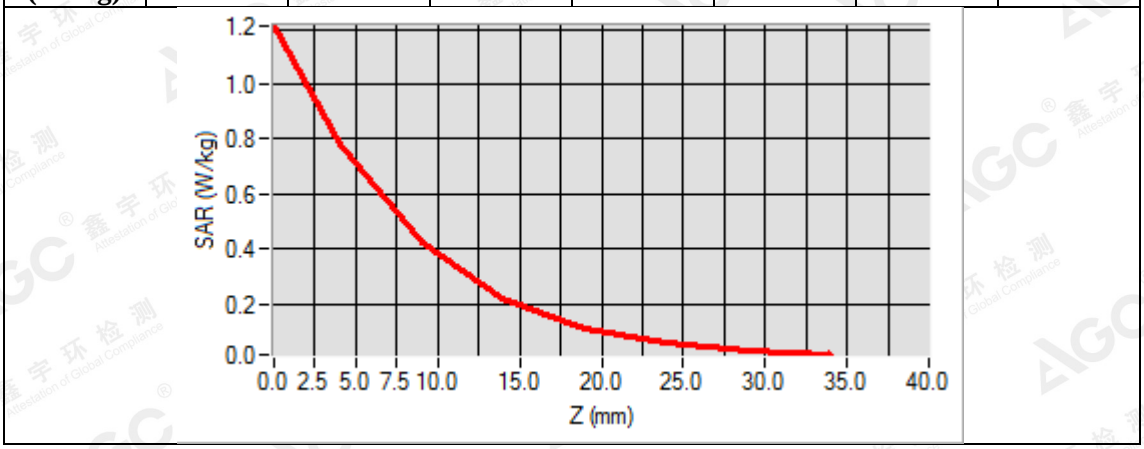
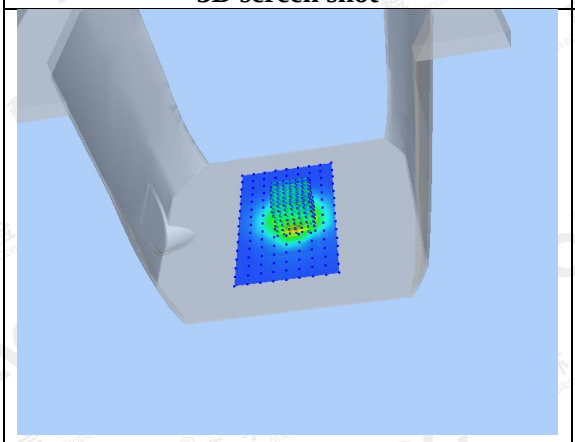
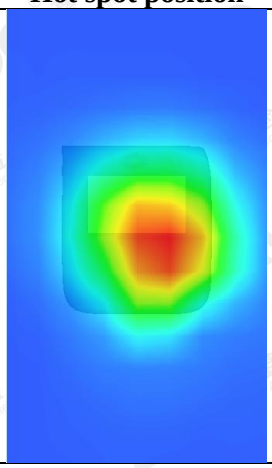
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.2114	0.7794	0.4275	0.2188	0.1121	0.0578	0.0304



3D screen shot	Hot spot position
	

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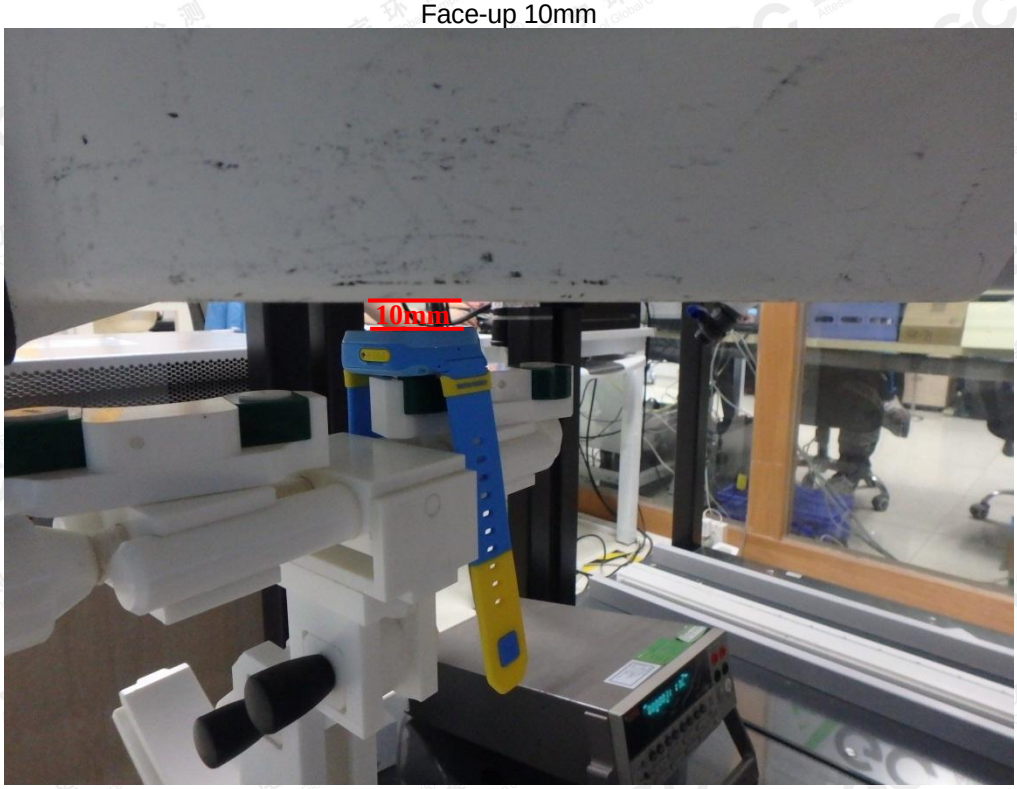
APPENDIX C. TEST SETUP PHOTOGRAPHS

Wrist Touch 0mm

Face-up 10mm



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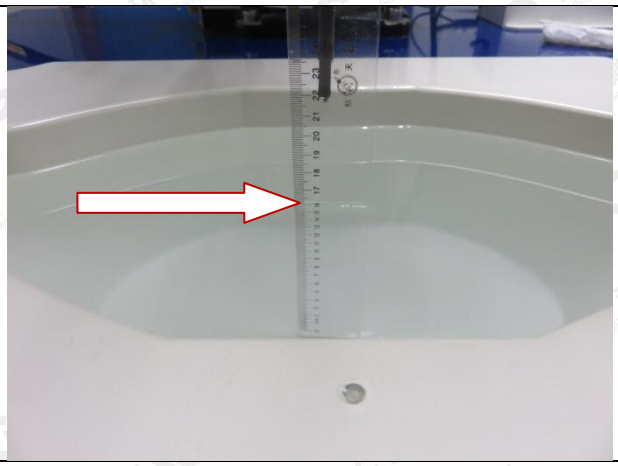
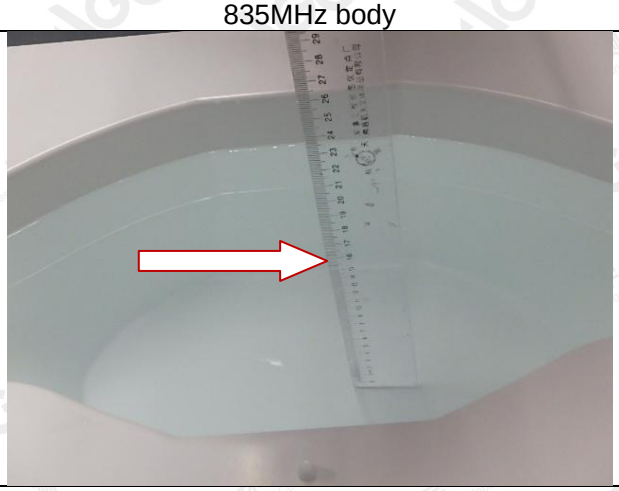
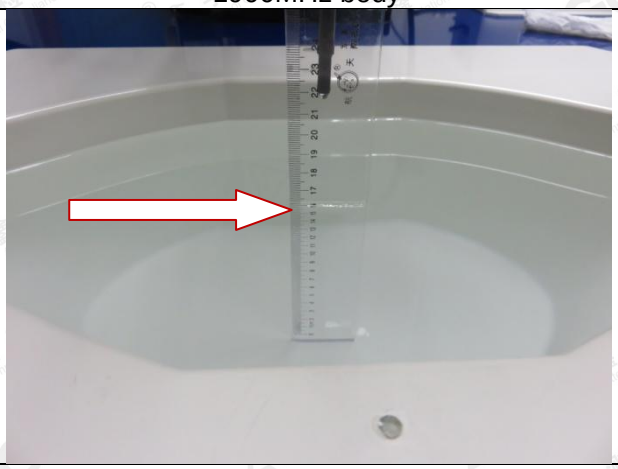
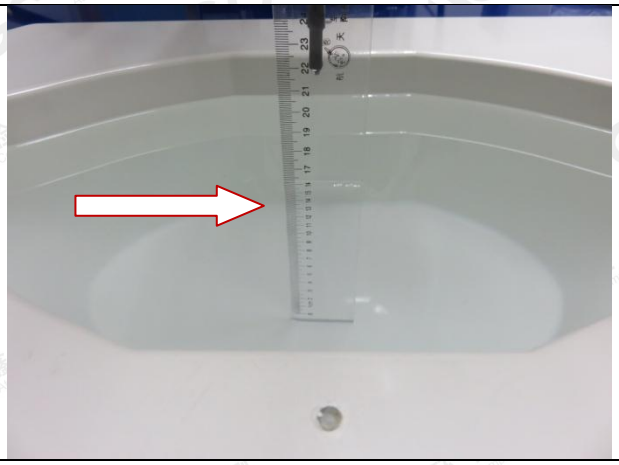
DEPTH OF THE LIQUID IN THE PHANTOM—ZOOM IN

Note：The position used in the measurement were according to IEEE 1528-2013

835MHz head	835MHz body
	
1900MHz head	1900MHz body
	
2450MHz head	2450MHz body
	

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APPENDIX D. CALIBRATION DATA

Refer to Attached files.

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