FCC SAR TEST REPORT

Report No: STS1804069H02

Issued for

Shanghai Huace Navigation Technology LTD.

Building C,599 Gaojing Road,Qingpu District,Shanghai,China

Product Name:	Handheld GNSS Data Collector
Brand Name:	CHCNAV
Model Name:	HCE320
Series Model:	N/A
FCC ID:	SY4-B01010
Test Standard:	ANSI/IEEE Std. C95.1
	FCC 47 CFR Part 2 (2.1093)
	IEEE 1528: 2013
Max. Report SAR (1g):	Body: 0.962 W/kg

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Test Report Certification

Applicant's name ..... : Shanghai Huace Navigation Technology LTD.

Address ..... : Building C,599 Gaojing Road,Qingpu District,Shanghai,China

Manufacture's Name ..... : Shanghai Huace Navigation Technology LTD.

Address ..... : Building C,599 Gaojing Road,Qingpu District,Shanghai,China

Product description

Product name ..... : Handheld GNSS Data Collector

Brand name ..... : CHCNAV

Model name ..... : HCE320

Series Model..... : N/A

Standards..... : ANSI/IEEE Std. C95.1-1992
FCC 47 CFR Part 2 (2.1093)
IEEE 1528: 2013

The device was tested by Shenzhen STS Test Services Co., Ltd. in accordance with the measurement methods and procedures specified in KDB 865664 The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of Test.....:

Date (s) of performance of tests.....: 02 May 2018~06 May 2018

Date of Issue.....: 09 May 2018

Test Result.....: **Pass**

Testing Engineer **:** Aaron Bu

(Aaron Bu)

Technical Manager **:**

(John Zou)

Authorized Signatory **:**

(Vita Li)

Table of Contents

1.General Information

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

1.1 EUT Description

Product Name	Handheld GNSS Data Collector
Brand Name	CHCNAV
Model Name	HCE320
Series Model	N/A
FCC ID	SY4-B01010
Model Difference	N/A
Adapter	Input: AC 100-240V,300mA, 50/60 Hz Output: DC 5.0V,2000mA
Battery	Rated Voltage: 3.8V; Charge Limit: 4.35V; Capacity: 8000mAh
Device Category	Portable
Product stage	Production unit
RF Exposure Environment	General Population / Uncontrolled
IMEI	861263030015079 861263030015080
Hardware Version	A5503_V1.10
Software Version	A5503_MPCB_V4.0_0905
Frequency Range	GSM 850:824.2~848.8MHz PCS1900:1850.2~1909.8MHz WCDMA Band II:1852.4~1907.6MHz WCDMA Band V:826.4~846.6MHz LTE Band 2:1850.7~1909.3MHz LTE Band 4:1710.7~1754.3MHz LTE Band 5:824.7~848.3MHz LTE Band 7:2502.5~2567.5MHz LTE Band 17:706.5~713.5MHz WLAN802.11b/g/n(HT20):2412~2462MHz WLAN 802.11n(HT40):2422~2452MHz WLAN 802.11 a/n (HT20/40)/ac (HT20/40/80): 5150 ~5250 MHz WLAN 802.11 a/n (HT20/40)/ac (HT20/40/80): 5250 ~5350 MHz WLAN 802.11 a/n (HT20/40)/ac (HT20/40/80): 5470 ~5725 MHz WLAN 802.11a/n (HT20/40)/ac (HT20/40/80): 5725 ~ 5875 MHz Bluetooth:2402~ 2480MHz

Max. Reported SAR(1g): (Limit:1.6W/kg)	Band	Mode	Body Worn and Hotspot(W/kg)
	PCB	GSM 850	0.820
	PCB	GSM 1900	0.752
	PCB	WCDMA Band II	0.583
	PCB	WCDMA Band V	0.564
	PCB	LTE Band 2	0.962
	PCB	LTE Band 4	0.511
	PCB	LTE Band 5	0.851
	PCB	LTE Band 7	0.583
	PCB	LTE Band 17	0.485
	DTS	2.4G WLAN	0.328
	NII	5.2G WLAN	0.213
	NII	5.3G WLAN	0.219
	NII	5.6G WLAN	0.310
	NII	5.8G WLAN	0.402
	DSS	Bluetooth Note	0.067
1-g Sum SAR			1.364
FCC Equipment Class	Licensed Portable Transmitter (PCB) Part 15 Spread Spectrum Transmitter (DSS) Digital Transmission System (DTS)		
Operating Mode:	GSM: GSM Voice; GPRS; EGPRS Class 12; WCDMA:RMC,HSDPA,HSUPA Release 6; LTE:QPSK,16QAM; WLAN: 802.11 a/b/g/n(HT20) /n(HT40/ac (HT20/40/80) Bluetooth: 2.1+EDR (GFSK +π/4DQPSK+8DPSK) ; BLE		
Antenna Specification:	GSM,WCDMA,LTE: PIFA Antenna BT,WLAN: PIFA Antenna		
SIM Card	Support dual-SIM, dual stand by, the multiple SIM card with two lines cannot transmitting at the same time		
Hotspot Mode:	Support		
DTM Mode:	Not Support		

Note:
1. Bluetooth body SAR was estimated
2. The dual SIM card mobile has 2 SIM slots and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (Single active)
3. After pre-scan two SIM cards power, we found test result of the SIM1 was the worse, so we chose SIM1 card to perform all tests.
4. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power

1.2 Test Environment

Ambient conditions in the SAR laboratory:

Items	Required
Temperature (℃)	18-25
Humidity (%RH)	30-70

1.3 Test Factory

Shenzhen STS Test Services Co., Ltd.
Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
CNAS Registration No.: L7649
FCC Registration No.: 625569
IC Registration No.: 12108A
A2LA Certificate No.: 4338.01

2.Test Standards And Limits

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	ANSI/IEEE Std. C95.1-1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	IEEE Std. 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
4	FCC KDB 447498 D01 v06	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
5	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
6	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
7	FCC KDB 941225 D01 v03r01	SAR Measurement Procedures for 3G Devices
8	FCC KDB 941225 D05 v02r05	SAR for LTE Devices
9	FCC KDB 941225 D06 v02r01	Hotspot Mode SAR
10	FCC KDB 648474 D04 v01r03	SAR Evaluation Considerations for Wireless Handsets
11	FCC KDB 248227 D01 Wi-Fi SAR v02r02	SAR Considerations for 802.11 Devices

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

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

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

NOTE: Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

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

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

NOTE

GENERAL POPULATION/UNCONTROLLED EXPOSURE

PARTIAL BODY LIMIT

1.6 W/kg

3. SAR Measurement System

3.1 Definition Of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an 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 general population/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 a given density (ρ). The equation description is as below:

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

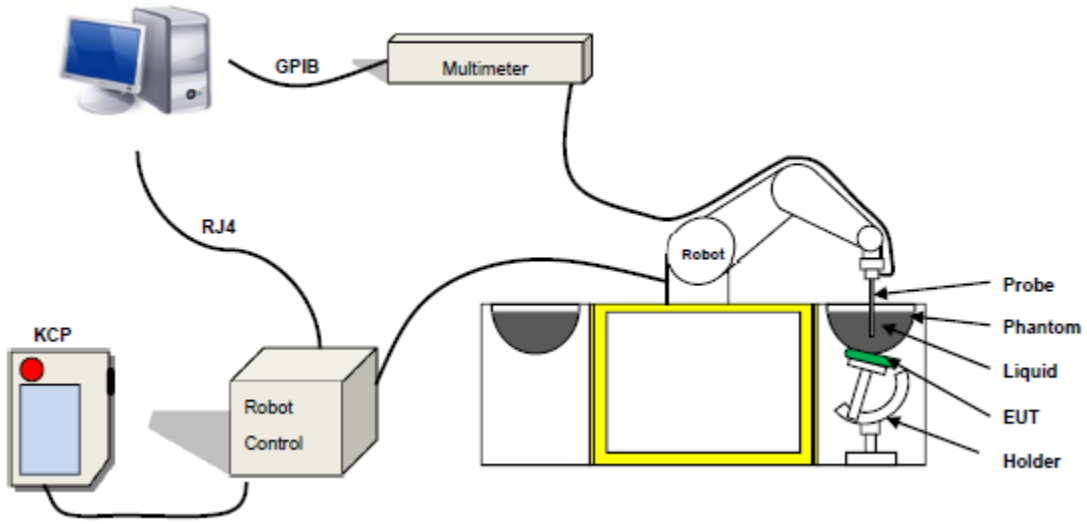
SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue,
ρ is the mass density of the tissue and E is the RMS electrical field strength.

3.2 SAR System

MVG SAR System Diagram:



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

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

The following figure shows the system.

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

3.2.1 Probe

For the measurements the Specific Dosimetric E-Field Probe SN 45/15 EPGO281 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 2.5 mm
- Length of Individual Dipoles: 2 mm
- Maximum external diameter: 8 mm
- Distance between dipole/probe extremity: 8 mm (repeatability better than +/- 1mm)
- Probe linearity: 0±2.60%(0.11dB)
- Axial Isotropy: < 0.25 dB
- Spherical Isotropy: < 0.25 dB
- Calibration range: 450 MHz to 6 GHz for head & body simulating liquid.
- Angle between probe axis (evaluation axis) and surface normal line: less than 30°

Figure-MVG COMOSAR Dosimetric E field Dipole

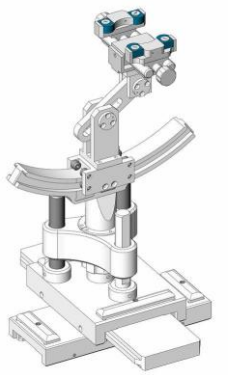
3.2.2 Phantom

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

SN 32/14 SAM115

SN 32/14 SAM116

3.2.3 Device Holder



The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.4. Tissue Simulating Liquids

4. Tissue Simulating Liquids

4.1 Simulating Liquids Parameter Check

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 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 P1528 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 P1528.

Head Tissue

Frequency (MHz)	cellulose	DGBE	HEC	NaCl	Preventol	Sugar	X100	Water	Conductivity	Permittivity
	%	%	%	%	%	%	%	%	σ	εr
750	0.2	/	/	1.4	0.2	57.0	/	41.1	0.89	41.9
835	0.2	/	/	1.4	0.2	57.9	/	40.3	0.90	41.5
900	0.2	/	/	1.4	0.2	57.9	/	40.3	0.97	41.5
1800	/	44.5	/	0.3	/	/	30.45	55.2	1.4	40.0
1900	/	44.5	/	0.3	/	/	30.45	55.2	1.4	40.0
2000	/	44.5	/	0.3	/	/	/	55.2	1.4	40.0
2450	/	44.9	/	0.1	/	/	/	55.0	1.80	39.2
2600	/	45.0	/	0.1	/	/	/	54.9	1.96	39.0

Body Tissue

Frequency (MHz)	cellulose	DGBE	HEC	NaCl	Preventol	Sugar	X100	Water	Conductivity	Permittivity
	%	%	%	%	%	%	%	%	σ	εr
750	0.2	/	/	0.9	0.1	47.2	/	51.7	0.96	55.5
835	0.2	/	/	0.9	0.1	48.2	/	50.8	0.97	55.2
900	0.2	/	/	0.9	0.1	48.2	/	50.8	1.05	55.0
1800	/	29.4	/	0.4	/	/	30.45	70.2	1.52	53.3
1900	/	29.4	/	0.4	/	/	30.45	70.2	1.52	53.3
2000	/	29.4	/	0.4	/	/	/	70.2	1.52	53.3
2450	/	31.3	/	0.1	/	/	/	68.6	1.95	52.7
2600	/	31.7	/	0.1	/	/	/	68.2	2.16	52.3

Tissue dielectric parameters for head and body phantoms				
Frequency	εr		σ S/m	
	Head	Body	Head	Body
300	45.3	58.2	0.87	0.92
450	43.5	56.7	0.87	0.94
900	41.5	55.0	0.97	1.05
1450	40.5	54.0	1.20	1.30
1800	40.0	53.3	1.40	1.52
2450	39.2	52.7	1.80	1.95
3000	38.5	52.0	2.40	2.73
5800	35.3	48.2	5.27	6.00

LIQUID MEASUREMENT RESULTS

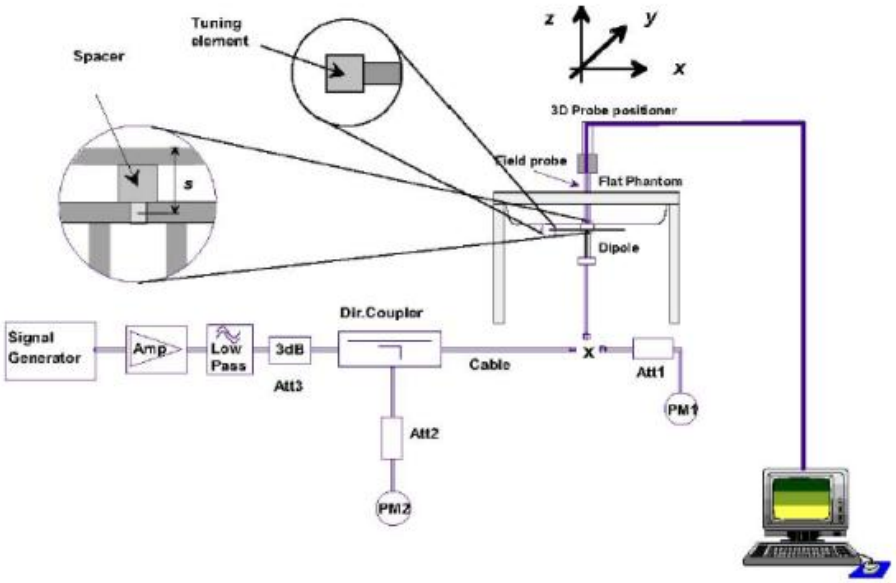
Date	Ambient condition		Body Simulating Liquid		Parameters	Target	Measured	Deviation [%]	Limited [%]
	Temp. [°C]	Humidity [%]	Frequency	Temp. [°C]					
2018-05-02	23.7	49	750 MHz	23.4	Permittivity:	55.5	54.64	-1.56	±5
					Conductivity:	0.96	0.95	-1.11	±5
2018-05-02	23.7	49	835 MHz	23.4	Permittivity:	55.2	55.38	0.33	±5
					Conductivity:	0.97	1.00	3.60	±5
2018-05-03	23.6	51	1800 MHz	23.2	Permittivity:	53.3	53.70	0.75	±5
					Conductivity:	1.52	1.54	1.05	±5
2018-05-03	23.6	51	1900 MHz	23.2	Permittivity:	53.3	53.21	-0.16	±5
					Conductivity:	1.52	1.50	-1.12	±5
2018-05-04	22.9	42	2450 MHz	22.5	Permittivity:	52.7	53.19	0.92	±5
					Conductivity:	1.95	1.98	1.49	±5
2018-05-04	22.9	42	2600 MHz	22.5	Permittivity:	52.5	52.25	-0.48	±5
					Conductivity:	2.16	2.17	0.45	±5
2018-05-05	22.8	42	5200 MHz	22.4	Permittivity:	49.0	48.67	-0.67	±5
					Conductivity:	5.30	5.29	-0.19	±5
2018-05-05	22.8	42	5400 MHz	22.4	Permittivity:	48.70	49.23	1.09	±5
					Conductivity:	5.53	5.68	2.71	±5
2018-05-06	23.0	45	5600 MHz	22.6	Permittivity:	48.5	48.70	0.41	±5
					Conductivity:	5.77	5.81	0.62	±5
2018-05-06	23.0	45	5800 MHz	22.6	Permittivity:	48.2	50.07	3.88	±5
					Conductivity:	6.00	5.87	-2.17	±5

5. SAR System Validation

5.1 Validation System

Each MVG system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the MVG software, enable the user to conduct the system performance 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 validation setup is shown as below.



5.2 Validation Result

Comparing to the original SAR value provided by MVG, the validation data should be within its specification of 10 %.

Freq.(MHz)	Power(mW)	Tested Value (W/Kg)	Normalized SAR (W/kg/W)	Target (W/Kg/W)	Tolerance(%)	Date
750 Body	100	0.829	8.29	8.49	-2.32	2018-05-02
835 Body	100	0.912	9.12	9.56	-4.64	2018-05-02
1800 Body	100	3.932	39.32	38.4	2.41	2018-05-03
1900 Body	100	4.223	42.23	39.7	6.37	2018-05-03
2450 Body	100	5.134	51.34	52.4	-2.01	2018-05-04
2600 Body	100	5.211	52.11	55.3	-5.78	2018-05-04
5200 Body	100	15.723	157.23	159	-1.11	2018-05-05
5400 Body	100	16.531	165.31	166.4	-0.66	2018-05-05
5600 Body	100	17.502	175.02	173.8	0.70	2018-05-06
5800 Body	100	18.085	180.85	181.2	-0.19	2018-05-06

Note: The tolerance limit of System validation ±10%.

6. SAR Evaluation Procedures

The procedure for assessing the average SAR value consists of the following steps:
The following steps are used for each test position

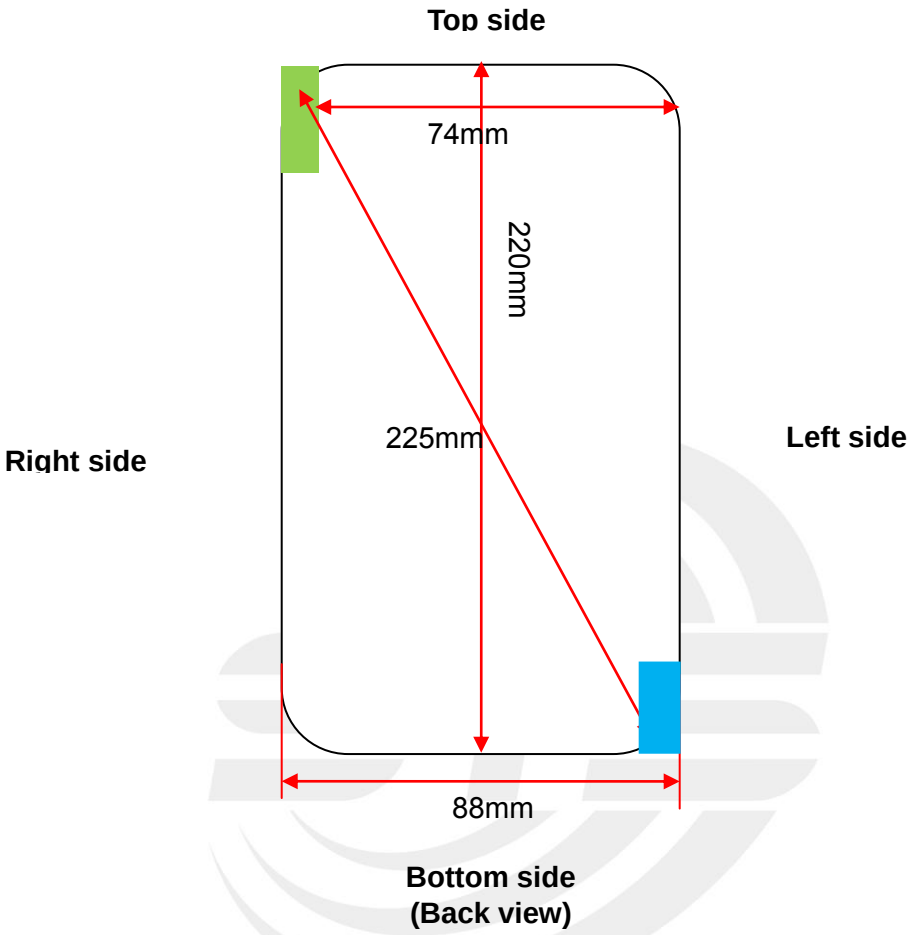
- Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface
- Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
- Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

➢ Area Scan& Zoom Scan

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01 quoted below.
When the 1-g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

7. EUT Antenna Location Sketch

It is a Handheld GNSS Data Collector, support GSM/WCDMA/LTE mode.



WWAN Antenna

WLAN/BT Antenna

7.1 SAR test exclusion consider table

According with FCC KDB 447498 D01, appendix A, <SAR test exclusion thresholds for 100MHz ~6GHz and≤50mm＞table, this device SAR test configurations consider as following:

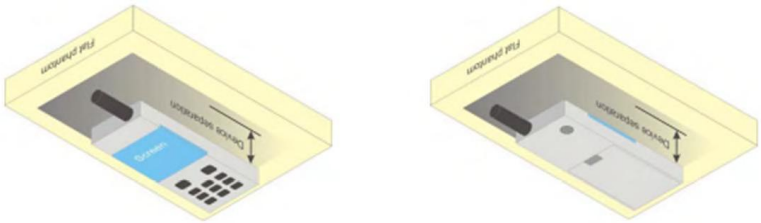
Band	Test position configurations					
	Front	Back	Right edge	Left edge	Top edge	Bottom edge
WWAN	＜5mm	＜5mm	70mm	＜5mm	207mm	＜5mm
	Yes	Yes	No	Yes	No	Yes
WLAN/BT	＜5mm	＜5mm	＜5mm	74mm	＜5mm	200mm
	Yes	Yes	Yes	No	Yes	No

Note：

1. maximum power is the source-based time-average power and represents the maximum RF output power among production units.
2. per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. per KDB 447498 D01, standalone SAR test exclusion threshold is applied; if the distance of the antenna to the user is <5mm, 5mm is user to determine SAR exclusion threshold
4. per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distance ≤50mm are determined by:
   [(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 for10-g extremity SAR ,f(GHz) is the RF channel transmit frequency in GHz.Power and distance are rounded to the nearest mW and mm before calculation.The result is rounded to one decimal place for comparison
   For <50mm distance, we just calculate mW of the exclusion threshold value(3.0)to do compare
5. per KDB 447498 D01, at 100 MHz to 6GHz and for test separation distances >50mm, the SAR test exclusion threshold is determined according to the following
   a)[threshold at 50mm in step 1]+(test separation distance -50mm)*(f (MHz)/150)]Mw, at 100 MHz to 1500 MHz
   b) [threshold at 50mm in step1]+(test separation distance -50mm) *10]mW at＞ 1500MHz and≤6GHz
6. Per KDB 447498 D02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/ HSUPA/DC-HSDPA output power is<0.25db higher than RMC 12.2Kbps,or reported SAR with RMC 12.2kbps setting is ≤1.2W/Kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.
7. Per KDB 248227 D01, choose the highest output power channel to test SAR and determine futher SAR exclusion 8.for each frequency band ,testing at higher data rates and higher order modulations is not required when the maximum average output power for each of each of these configurations is less than 1/4db higher than those measured at the lower data rate than 11b mode ,thus the SAR can be excluded.

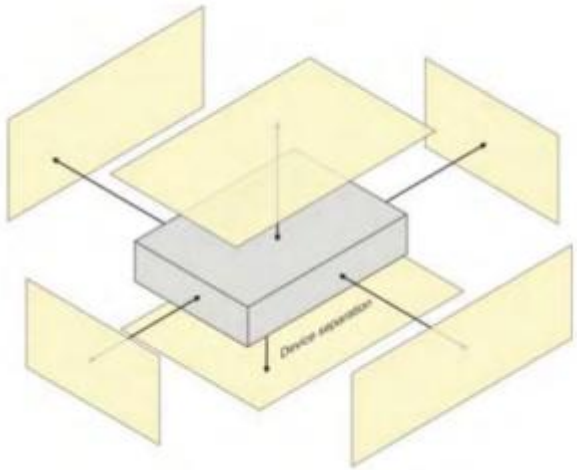
8. EUT Test Position

This EUT was tested in Front Face and Rear Face.



8.1 Hotspot mode exposure position condition

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing function, the relevant hand and body exposure condition are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 0 mm is required between the phantom and all surface and edges with a transmitting antenna located within 25 mm form that surface or edge. When the separate distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration(surface).



9. Uncertainty

9.1 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in IEEE 1528: 2013.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

NO	Source	Tol(%)	Prob. Dist.	Div. k	ci (1g)	ci (10g)	1gUi	10gUi	Veff
Measurement System□									
1	Probe calibration	5.8	N	1	1	1	5.8	5.8	∞
2	Axial isotropy	3.5	R	√3	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.43	1.43	∞
3	Hemispherical isotropy	5.9	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
4	Boundary effect	1.0	R	√3	1	1	0.58	0.58	∞
5	Linearity	4.7	R	√3	1	1	2.71	2.71	∞
6	System Detection limits	1.0	R	√3	1	1	0.58	0.58	∞
7	Readout electronics	0.5	N	1	1	1	0.50	0.50	∞
8	Response time	0	R	√3	1	1	0	0	∞
9	Integration time	1.4	R	√3	1	1	0.81	0.81	∞
10	Ambient noise	3.0	R	√3	1	1	1.73	1.73	∞
11	Ambient reflections	3.0	R	√3	1	1	1.73	1.73	∞
12	Probe positioner mech. restrictions	1.4	R	√3	1	1	0.81	0.81	∞
13	Probe positioning with respect to phantom shell	1.4	R	√3	1	1	0.81	0.81	∞
14	Max.SAR evaluation	1.0	R	√3	1	1	0.6	0.6	∞
Test sample related									

15	Device positioning	2.6	N	1	1	1	2.6	2.6	11
16	Device holder	3	N	1	1	1	3.0	3.0	7
17	Drift of output power	5.0	R	√3	1	1	2.89	2.89	∞
Phantom and set-up									
18	Phantom uncertainty	4.0	R	√3	1	1	2.31	2.31	∞
19	Liquid conductivity (target)	2.5	N	1	0.78	0.71	1.95	1.78	5
20	Liquid conductivity (meas)	4	N	1	0.23	0.26	0.92	1.04	5
21	Liquid Permittivity (target)	2.5	N	1	0.78	0.71	1.95	1.78	∞
22	Liquid Permittivity (meas)	5.0	N	1	0.23	0.26	1.15	1.30	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			10.63%	10.54%	
Expanded uncertainty (P=95%)		$U = k\, U_C$,k=2					21.26%	21.08%	

9.2 System validation Uncertainty

NO	Source	Tol(%)	Prob. Dist.	Div. k	ci (1g)	ci (10g)	1gUi	10gUi	Veff
Measurement System									
1	Probe calibration	5.8	N	1	1	1	5.8	5.8	∞
2	Axial isotropy	3.5	R	√3	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1/2}$	1.43	1.43	∞
3	Hemispherical isotropy	5.9	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
4	Boundary effect	1.0	R	√3	1	1	0.58	0.58	∞
5	Linearity	4.7	R	√3	1	1	2.71	2.71	∞
6	System Detection limits	1.0	R	√3	1	1	0.58	0.58	∞
7	Modulation response	0	N	1	1	1	0	0	∞
8	Readout electronics	0.5	N	1	1	1	0.50	0.50	∞
9	Response time	0	R	√3	1	1	0	0	∞
10	Integration time	1.4	R	√3	1	1	0.81	0.81	∞
11	Ambient noise	3.0	R	√3	1	1	1.73	1.73	∞
12	Ambient reflections	3.0	R	√3	1	1	1.73	1.73	∞
13	Probe positioner mech. restrictions	1.4	R	√3	1	1	0.81	0.81	∞
14	Probe positioning with respect to phantom shell	1.4	R	√3	1	1	0.81	0.81	∞
15	Max.SAR evaluation	1.0	R	√3	1	1	0.6	0.6	∞
Dipole									
16	Deviation of experimental source from	4	N	1	1	1	4.00	4.00	∞

17	Input power and SAR drit measurement	5	R	√3	1	1	2.89	2.89	∞
18	Dipole Axis to liquid Distance	2	R	√3	1	1			∞
Phantom and set-up									
19	Phantom uncertainty	4.0	R	√3	1	1	2.31	2.31	∞
20	Uncertainty in SAR correction for deviation(in	2.0	N	1	1	0.84	2	1.68	∞
21	Liquid conductivity (target)	2	N	1	1	0.84	2.00	1.68	∞
22	Liquid conductivity (temperature uncertainty)	2.5	N	1	0.78	0.71	1.95	1.78	5
23	Liquid conductivity (meas)	4	N	1	0.23	0.26	0.92	1.04	5
24	Liquid Permittivity (target)	2.5	N	1	0.78	0.71	1.95	1.78	∞
25	Liquid Permittivity (temperature uncertainty)	2.5	N	1	0.78	0.71	1.95	1.78	5
26	Liquid Permittivity (meas)	5.0	N	1	0.23	0.26	1.15	1.30	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			10.15%	10.05%	
Expanded uncertainty (P=95%)		$U = k\, U_C$,k=2					20.29%	20.10%	

10. Conducted Power Measurement

10.1 Test Result

Burst Average Power (dBm)						
Band	GSM 850			PCS 1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
GSM(GMSK, 1-Slot)	32.26	32.38	32.42	28.95	29.27	29.22
GPRS (GMSK, 1-Slot)	32.20	32.33	32.41	28.97	29.32	29.32
GPRS (GMSK, 2-Slot)	32.33	32.41	33.00	28.94	28.40	29.45
GPRS (GMSK, 3-Slot)	30.22	30.63	30.87	27.09	27.41	27.23
GPRS (GMSK, 4-Slot)	28.87	29.68	29.58	25.83	25.56	26.82
EGPRS(8PSK, 1-Slot)	32.28	32.35	32.42	29.00	29.27	29.29
EGPRS(8PSK, 2-Slot)	33.07	32.95	33.66	28.67	28.07	28.91
EGPRS(8PSK, 3-Slot)	31.91	31.63	32.68	26.50	26.91	27.33
EGPRS(8PSK, 4-Slot)	29.80	30.80	30.72	25.54	25.80	26.91
Remark: GPRS, CS4 coding scheme. EGPRS, MCS5 coding scheme. Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link						

Fram- Average Power(dBm)						
Band	GSM 850			PCS 1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
GSM(GMSK, 1-Slot)	23.23	23.35	23.39	19.92	20.24	20.19
GPRS (GMSK, 1-Slot)	23.17	23.30	23.38	19.94	20.29	20.29
GPRS (GMSK, 2-Slot)	26.31	26.39	26.98	22.92	22.38	23.43
GPRS (GMSK, 3-Slot)	25.96	26.37	26.61	22.83	23.15	22.97
GPRS (GMSK, 4-Slot)	25.86	26.67	26.57	22.82	22.55	23.81
EGPRS(8PSK, 1-Slot)	23.25	23.32	23.39	19.97	20.24	20.26
EGPRS(8PSK, 2-Slot)	27.05	26.93	27.64	22.65	22.05	22.89
EGPRS(8PSK, 3-Slot)	27.65	27.37	28.42	22.24	22.65	23.07
EGPRS(8PSK, 4-Slot)	26.79	27.79	27.71	22.53	22.79	23.90
Remark : 1. SAR testing was performed on the maximum frame-averaged power mode. 2. The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below: Frame-averaged power = Burst averaged power (1 Tx Slot) – 9.03 dB Frame-averaged power = Burst averaged power (2 Tx Slots) – 6.02 dB Frame-averaged power = Burst averaged power (3 Tx Slots) - 4.26 dB Frame-averaged power = Burst averaged power (4 Tx Slots) – 3.01 dB						

WCDMA

Band	WCDMA Band V			WCDMA Band II		
Channel	4132	4183	4233	9262	9400	9538
Frequency (MHz)	826.4	836.6	846.6	1852.4	1880.0	1907.6
AMR 12.2Kbps	22.56	22.42	22.46	22.68	22.52	22.47
RMC 12.2Kbps	23.73	23.66	23.63	23.13	23.11	23.19
HSDPA Subtest-1	22.69	22.63	22.65	21.99	22.11	22.09
HSDPA Subtest-2	20.66	22.31	20.98	22.31	22.61	22.54
HSDPA Subtest-3	19.89	20.20	20.61	22.20	22.49	21.52
HSDPA Subtest-4	20.73	20.11	20.22	22.11	22.64	21.66
HSUPA Subtest-1	22.18	22.63	22.19	21.73	21.94	21.98
HSUPA Subtest-2	19.16	20.05	20.02	19.45	19.08	19.56
HSUPA Subtest-3	19.28	21.38	21.42	20.71	21.14	20.95
HSUPA Subtest-4	18.89	20.09	20.36	19.25	19.45	20.02
HSUPA Subtest-5	21.42	22.92	22.24	21.14	22.07	22.03

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

Table 6.1A: 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 βc/βd=12/15, βhs/ βc=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.

WLAN

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
802.11b	1	2412	20.12
	6	2437	20.88
	11	2462	21.49
802.11g	1	2412	20.35
	6	2437	21.01
	11	2462	21.57
802.11n(HT 20)	1	2412	21.89
	6	2437	22.43
	11	2462	21.02
802.11n(HT 40)	3	2422	15.72
	6	2437	16.36
	9	2452	16.95

WLAN (5.2Gband)

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
802.11a	36	5180	16.70
	40	5200	16.54
	48	5240	16.50
802.11 n-HT20	36	5180	16.65
	40	5200	16.53
	48	5240	16.44
802.11 n-HT40	38	5190	16.08
	46	5230	16.15
802.11ac(HT20)	36	5180	16.35
	40	5200	16.04
	48	5240	15.98
802.11ac(HT40)	38	5190	16.02
	46	5230	16.10
802.11ac(HT80)	42	5210	15.01

WLAN (5.3Gband)

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
802.11a	52	5260	16.56
	60	5300	16.28
	64	5320	16.05
802.11 n-HT20	52	5260	16.42
	60	5300	16.21
	64	5320	16.03
802.11 n-HT40	54	5270	15.88
	62	5310	15.63
802.11ac(HT20)	52	5260	16.37
	60	5300	16.02
	64	5320	15.96
802.11ac(HT40)	54	5270	15.93
	62	5310	15.60
802.11ac(HT80)	58	5290	14.55

WLAN (5.6Gband)

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
802.11a	100	5500	14.87
	116	5580	15.07
	140	5700	14.78
802.11 n-HT20	100	5500	14.76
	116	5580	14.95
	140	5700	14.66
802.11 n-HT40	102	5510	14.43
	110	5550	14.24
802.11ac(HT20)	134	5670	14.03
	100	5500	14.76
	116	5580	14.62
802.11ac(HT40)	140	5700	14.41
	102	5510	14.07
802.11ac(HT80)	110	5550	13.30

WLAN (5.8Gband)

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
802.11a	149	5745	15.58
	157	5785	15.62
	165	5825	15.71
802.11 n-HT20	149	5745	15.47
	157	5785	15.51
	165	5825	15.64
802.11 n-HT40	151	5755	14.82
	159	5795	15.03
802.11ac(HT20)	149	5745	15.93
	157	5785	15.04
	165	5825	15.50
802.11ac(HT40)	151	5755	14.80
	159	5795	14.97
802.11ac(HT80)	155	5775	13.96

Bluetooth

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
GFSK(1Mbps)	0	2402	1.500
	39	2441	1.422
	78	2480	0.374
π/4-DQPSK(2Mbps)	0	2402	1.212
	39	2441	1.139
	78	2480	0.085
8DPSK(3Mbps)	0	2402	1.533
	39	2441	1.453
	78	2480	0.385

BLE

Mode	Channel Number	Frequency (MHz)	Output Power (dBm)
GFSK(1Mbps)	0	2402	1.498
	20	2440	1.465
	40	2480	0.364

LTE Conducted Power

General Note:

1. Anritsu CMW500 base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are $\leqslant$ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is $\leqslant$ 1.45 W/kg; Per KDB 941225 D05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is $\leqslant$ 1.45 W/kg; Per KDB 941225 D05, smaller bandwidth SAR testing is not required.

LTE Band 2

LTE Band 2 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
1.4	1	0	QPSK	21.24	21.40	21.45
1.4	1	2		21.31	21.50	21.23
1.4	1	5		21.23	21.44	21.20
1.4	3	0		20.99	21.33	21.22
1.4	3	1		21.22	21.40	21.00
1.4	3	2		20.93	21.24	21.05
1.4	6	0		21.29	21.41	21.50
1.4	1	0	16-QAM	20.53	20.77	20.68
1.4	1	2		20.57	20.89	20.69
1.4	1	5		20.53	20.81	20.65
1.4	3	0		20.39	20.54	20.39
1.4	3	1		20.49	20.64	20.45
1.4	3	2		20.45	20.57	20.59
1.4	6	0		19.60	19.81	19.69
3	1	0	QPSK	21.25	21.39	21.51
3	1	7		21.25	21.46	21.20
3	1	14		21.16	21.44	21.01
3	8	0		21.00	21.34	21.45
3	8	4		21.23	21.44	21.09
3	8	7		21.14	21.19	20.86
3	15	0		20.67	20.62	20.95
3	1	0	16-QAM	21.02	20.78	20.78
3	1	7		21.02	20.82	20.62
3	1	14		20.95	20.81	20.52
3	8	0		20.74	20.65	20.55
3	8	4		20.91	20.55	20.40
3	8	7		20.79	20.64	20.42
3	15	0		20.04	19.76	19.77

LTE BAND 2

LTE Band 2 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	21.33	21.54	21.41
5	1	12		21.31	21.54	20.93
5	1	24		21.24	21.55	20.87
5	12	0		21.33	21.41	21.19
5	12	6		21.28	21.31	20.68
5	12	11		21.12	21.51	20.70
5	25	0		21.55	21.30	21.47
5	1	0	16-QAM	20.32	20.73	20.53
5	1	12		20.25	20.75	20.10
5	1	24		20.20	20.71	20.12
5	12	0		20.13	20.64	20.44
5	12	6		19.99	20.66	19.97
5	12	11		20.20	20.57	20.03
5	25	0		19.40	19.82	19.53
10	1	0	QPSK	21.30	21.40	21.01
10	1	24		21.20	21.39	20.97
10	1	49		21.19	21.17	20.50
10	25	0		21.03	21.11	20.95
10	25	12		21.09	21.13	20.75
10	25	24		21.07	20.97	20.47
10	50	0		21.42	21.47	21.44
10	1	0	16-QAM	21.07	20.80	20.36
10	1	24		21.97	20.82	20.33
10	1	49		20.96	20.73	19.97
10	25	0		20.86	20.53	20.13
10	25	12		21.94	20.80	20.13
10	25	24		20.72	20.72	20.09
10	50	0		20.26	19.88	19.33

LTE BAND 2

LTE Band 2 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
15	1	0	QPSK	21.15	21.43	21.22
15	1	37		21.23	21.37	20.99
15	1	74		21.22	21.40	20.80
15	36	0		20.86	21.30	21.05
15	36	18		21.05	21.36	20.89
15	36	39		21.12	21.24	20.76
15	75	0		20.24	20.50	20.23
15	1	0	16-QAM	20.82	20.48	20.55
15	1	38		20.71	20.57	20.35
15	1	75		21.69	20.62	20.20
15	36	0		20.53	20.30	20.48
15	36	18		20.53	20.33	20.10
15	36	39		21.57	20.55	20.13
15	75	0		19.93	19.46	19.74
20	1	0	QPSK	21.35	21.38	21.29
20	1	49		21.21	21.27	20.83
20	1	99		21.34	21.35	20.61
20	50	0		21.11	21.33	21.28
20	50	24		21.03	21.16	20.71
20	50	49		21.10	21.32	20.45
20	100	0		21.29	21.42	21.54
20	1	0	16-QAM	20.65	20.53	20.84
20	1	49		20.46	20.50	20.40
20	1	99		20.52	20.60	20.33
20	50	0		20.62	20.32	20.66
20	50	24		20.44	20.25	20.18
20	50	49		20.38	20.38	20.14
20	100	0		19.76	19.51	19.88

LTE BAND 4

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
1.4	1	0	QPSK	21.53	21.52	21.51
1.4	1	2		21.62	21.59	21.60
1.4	1	5		21.56	21.54	21.54
1.4	3	0		21.44	21.41	21.32
1.4	3	1		21.50	21.34	21.32
1.4	3	2		21.41	21.38	21.26
1.4	6	0		21.85	21.71	21.60
1.4	1	0	16-QAM	20.53	20.72	20.49
1.4	1	2		20.57	20.71	20.54
1.4	1	5		20.55	20.65	20.50
1.4	3	0		20.30	20.71	20.37
1.4	3	1		20.42	20.44	20.38
1.4	3	2		20.30	20.39	20.34
1.4	6	0		19.51	19.71	19.40
3	1	0	QPSK	21.48	21.54	21.54
3	1	7		21.53	21.55	21.56
3	1	14		21.53	21.54	21.52
3	8	0		21.20	21.54	21.25
3	8	4		21.32	21.39	21.32
3	8	7		21.42	21.36	21.34
3	15	0		20.63	20.67	20.62
3	1	0	16-QAM	20.98	20.65	20.51
3	1	7		21.02	20.67	20.50
3	1	14		20.99	20.67	20.48
3	8	0		20.76	20.46	20.43
3	8	4		20.75	20.44	20.42
3	8	7		20.73	20.64	20.23
3	15	0		19.92	19.66	19.42

LTE BAND 4

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	21.63	21.62	21.67
5	1	12		21.65	21.60	21.70
5	1	24		21.64	21.66	21.70
5	12	0		21.53	21.57	21.64
5	12	6		21.41	21.42	21.54
5	12	11		21.50	21.37	21.56
5	25	0		21.68	21.82	22.02
5	1	0	16-QAM	20.62	20.64	20.91
5	1	12		20.64	20.63	20.87
5	1	24		20.61	20.65	20.85
5	12	0		20.62	20.46	20.65
5	12	6		20.61	20.61	20.79
5	12	11		20.32	20.40	20.77
5	25	0		19.69	19.79	20.02
10	1	0	QPSK	21.44	21.59	21.53
10	1	24		21.68	21.56	21.56
10	1	49		21.65	21.54	21.43
10	25	0		21.29	21.38	21.25
10	25	12		21.47	21.29	21.30
10	25	24		21.56	21.53	21.23
10	50	0		21.74	21.85	21.76
10	1	0	16-QAM	20.62	20.59	20.67
10	1	24		21.00	21.12	20.67
10	1	49		21.14	21.08	20.65
10	25	0		21.22	21.14	20.65
10	25	12		20.97	20.98	20.56
10	25	24		20.89	20.79	20.57
10	50	0		20.98	21.04	20.64

LTE BAND 4

LTE Band 4 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
15	1	0	QPSK	21.56	21.63	21.59
15	1	37		21.63	21.64	21.58
15	1	74		21.64	21.57	21.56
15	36	0		21.50	21.58	21.35
15	36	18		21.42	21.51	21.44
15	36	39		21.51	21.49	21.31
15	75	0		20.50	20.76	20.51
15	1	0	16-QAM	21.08	20.78	20.96
15	1	38		21.09	20.71	20.93
15	1	75		21.10	20.78	20.81
15	36	0		20.79	20.57	20.74
15	36	18		20.89	20.71	20.83
15	36	39		20.89	20.57	20.53
15	75	0		20.17	19.80	19.86
20	1	0	QPSK	21.63	21.71	21.48
20	1	49		21.68	21.58	21.57
20	1	99		21.68	21.62	21.49
20	50	0		21.45	21.57	21.19
20	50	24		21.59	21.53	21.47
20	50	49		21.50	21.59	21.27
20	100	0		21.84	21.75	21.74
20	1	0	16-QAM	20.89	20.86	21.05
20	1	49		20.93	20.80	21.06
20	1	99		20.94	20.86	21.07
20	50	0		20.71	20.71	20.89
20	50	24		20.86	20.74	20.80
20	50	49		20.70	20.61	20.77
20	100	0		19.82	19.95	20.15

LTE BAND 5

LTE Band 5 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
1.4	1	0	QPSK	21.79	21.98	22.13
1.4	1	2		21.89	22.09	22.05
1.4	1	5		21.82	22.01	22.10
1.4	3	0		21.78	21.96	22.12
1.4	3	1		21.74	21.82	21.83
1.4	3	2		21.58	21.73	21.83
1.4	6	0		22.06	22.10	22.04
1.4	1	0	16-QAM	21.19	21.31	21.37
1.4	1	2		21.27	21.42	21.47
1.4	1	5		21.20	21.35	21.44
1.4	3	0		21.18	21.14	21.22
1.4	3	1		21.20	21.21	21.19
1.4	3	2		21.10	21.03	21.37
1.4	6	0		20.22	20.44	20.35
3	1	0	QPSK	21.75	21.98	22.15
3	1	7		21.80	22.03	22.11
3	1	14		21.78	22.00	22.10
3	8	0		21.70	21.78	21.96
3	8	4		21.61	21.80	21.91
3	8	7		21.58	21.73	21.83
3	15	0		21.75	21.98	22.15
3	1	0	16-QAM	21.67	21.32	21.34
3	1	7		21.70	21.37	21.41
3	1	14		21.66	21.35	21.46
3	8	0		21.43	21.14	21.34
3	8	4		21.49	21.10	21.27
3	8	7		21.39	21.09	21.23
3	15	0		20.63	20.26	20.31

LTE BAND 5

LTE Band 5 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	21.89	22.16	22.17
5	1	12		21.93	22.15	21.84
5	1	24		22.00	22.20	21.90
5	12	0		21.74	21.94	22.04
5	12	6		21.67	21.91	21.79
5	12	11		21.82	21.97	21.62
5	25	0		22.06	22.05	22.14
5	1	0	16-QAM	21.27	21.52	21.45
5	1	12		21.29	21.58	21.34
5	1	24		21.28	21.65	21.46
5	12	0		21.15	21.34	21.32
5	12	6		21.28	21.41	21.21
5	12	11		21.26	21.37	21.30
5	25	0		20.42	20.62	20.37
10	1	0	QPSK	21.16	21.29	21.37
10	1	24		21.24	21.38	21.36
10	1	49		21.33	21.36	20.89
10	25	0		20.92	21.22	21.35
10	25	12		21.19	21.30	21.31
10	25	24		21.18	21.26	20.79
10	50	0		22.07	22.14	22.09
10	1	0	16-QAM	21.44	21.06	21.05
10	1	24		21.41	21.12	21.09
10	1	49		21.37	21.19	20.76
10	25	0		21.34	20.96	20.96
10	25	12		21.24	21.10	20.80
10	25	24		21.19	21.18	20.54
10	50	0		21.44	21.06	21.05

LTE BAND 7

LTE Band 7 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	20.97	20.56	19.78
5	1	12		20.50	19.87	19.41
5	1	24		20.72	20.07	19.63
5	12	0		20.72	20.54	19.64
5	12	6		20.46	19.66	19.35
5	12	11		20.43	19.89	19.47
5	25	0		20.98	20.76	20.97
5	1	0	16-QAM	20.85	20.45	19.88
5	1	12		20.40	19.95	19.51
5	1	24		20.69	20.19	19.89
5	12	0		20.67	20.40	19.80
5	12	6		20.32	19.77	19.49
5	12	11		20.51	20.00	19.85
5	25	0		19.76	19.39	18.81
10	1	0	QPSK	20.59	19.80	19.61
10	1	24		20.27	19.58	19.53
10	1	49		20.18	19.32	19.25
10	25	0		20.35	19.73	19.35
10	25	12		20.05	19.39	19.28
10	25	24		19.98	19.08	19.03
10	50	0		21.06	21.08	21.08
10	1	0	16-QAM	20.19	19.30	18.85
10	1	24		20.06	19.14	18.86
10	1	49		19.95	18.89	18.67
10	25	0		20.03	19.17	18.61
10	25	12		19.96	19.08	18.71
10	25	24		19.68	18.77	18.59
10	50	0		19.19	18.33	18.00

LTE BAND 7

LTE Band 7 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
15	1	0	QPSK	20.59	20.01	19.69
15	1	37		20.20	19.56	19.50
15	1	74		20.47	19.50	19.47
15	36	0		20.48	19.81	19.66
15	36	18		20.16	19.31	19.49
15	36	39		20.25	19.30	19.33
15	75	0		19.76	18.98	18.70
15	1	0	16-QAM	20.22	19.56	19.23
15	1	38		19.94	19.07	19.10
15	1	75		20.23	19.05	19.17
15	36	0		20.01	19.26	18.99
15	36	18		19.86	19.00	18.88
15	36	39		19.99	18.83	18.93
15	75	0		19.26	18.65	18.32
20	1	0	QPSK	20.62	20.05	19.59
20	1	49		20.24	19.51	19.51
20	1	99		20.35	19.57	19.43
20	50	0		20.44	19.86	19.39
20	50	24		20.03	19.44	19.39
20	50	49		20.31	19.29	19.25
20	100	0		20.98	20.97	20.85
20	1	0	16-QAM	20.63	20.14	19.88
20	1	49		20.36	19.60	19.84
20	1	99		20.48	19.61	19.93
20	50	0		20.63	20.12	19.70
20	50	24		20.11	19.45	19.67
20	50	49		20.33	19.60	19.66
20	100	0		19.61	19.13	18.99

LTE BAND 17

LTE Band 17 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	22.38	22.17	22.13
5	1	12		22.04	22.07	22.10
5	1	24		22.09	22.16	22.06
5	12	0		22.27	21.96	21.87
5	12	6		21.94	21.92	21.91
5	12	11		22.07	22.01	21.93
5	25	0		22.40	22.44	22.47
5	1	0	16-QAM	21.65	21.68	21.61
5	1	12		21.57	21.66	21.50
5	1	24		21.48	21.75	21.40
5	12	0		21.38	21.64	21.60
5	12	6		21.39	21.44	21.48
5	12	11		21.43	21.49	21.24
5	25	0		20.68	20.59	20.65
10	1	0	QPSK	22.46	22.40	22.39
10	1	24		22.08	22.17	22.33
10	1	49		22.25	22.25	22.34
10	25	0		22.38	22.37	22.33
10	25	12		22.03	22.15	22.24
10	25	24		21.97	22.18	22.33
10	50	0		22.59	22.57	22.55
10	1	0	16-QAM	21.93	21.67	21.51
10	1	24		21.86	21.55	21.50
10	1	49		21.90	21.57	21.43
10	25	0		21.67	21.49	21.48
10	25	12		21.66	21.51	21.26
10	25	24		21.60	21.49	21.21
10	50	0		20.84	20.60	20.64

10.2 Tune-up Power

Mode	GSM850(AVG)	GSM1900(AVG)
GSM/PCS	32±1dBm	29±1dBm
GPRS (1 Slot)	32±1dBm	29±1dBm
GPRS (2 Slot)	32.5±1dBm	29±1dBm
GPRS (3 Slot)	30±1dBm	27±1dBm
GPRS (4 Slot)	29±1dBm	26±1dBm
EDGE (1 Slot)	32±1dBm	29±1dBm
EDGE (2 Slot)	33±1dBm	28±1dBm
EDGE (3 Slot)	32±1dBm	27±1dBm
EDGE (4 Slot)	30±1dBm	26±1dBm

Mode	WCDMA Band V(AVG)	WCDMA Band II(AVG)
AMR	22±1dBm	22±1dBm
RMC	23±1dBm	23±1dBm
HSDPA Subtest-1	22±1dBm	22±1dBm
HSDPA Subtest-2	21.5±1dBm	22±1dBm
HSDPA Subtest-3	20±1dBm	22±1dBm
HSDPA Subtest-4	20±1dBm	22±1dBm
HSUPA Subtest-1	22±1dBm	21±1dBm
HSUPA Subtest-2	20±1dBm	19±1dBm
HSUPA Subtest-3	20.5±1dBm	21±1dBm
HSUPA Subtest-4	19.5±1dBm	20±1dBm
HSUPA Subtest-5	22±1dBm	22±1dBm

WLAN (2.4Gband)

Mode	WLAN(AVG)	
IEEE 802.11b	21±1dBm	
IEEE 802.11g	Low	20±1dBm
	Middle	21±1dBm
	High	21±1dBm
IEEE 802.11n(HT 20)	Low	21±1dBm
	Middle	22±1dBm
	High	21±1dBm
IEEE 802.11n(HT 40)	16±1dBm	

WLAN (5.2Gband)

Mode	WLAN(AVG)
IEEE 802.11a	16±1dBm
IEEE 802.11n HT20	16±1dBm
IEEE 802.11n HT40	16±1dBm
IEEE 802.11ac HT20	16±1dBm
IEEE 802.11ac HT40	16±1dBm
IEEE 802.11ac HT80	15±1dBm

WLAN (5.3Gband)

Mode	WLAN(AVG)
IEEE 802.11a	16±1dBm
IEEE 802.11n HT20	16±1dBm
IEEE 802.11n HT40	15±1dBm
IEEE 802.11ac HT20	16±1dBm
IEEE 802.11ac HT40	15±1dBm
IEEE 802.11ac HT80	14±1dBm

WLAN (5.6Gband)

Mode	WLAN(AVG)
IEEE 802.11a	15±1dBm
IEEE 802.11n HT20	14±1dBm
IEEE 802.11n HT40	14±1dBm
IEEE 802.11ac HT20	14±1dBm
IEEE 802.11ac HT40	14±1dBm
IEEE 802.11ac HT80	13±1dBm

WLAN (5.8Gband)

Mode	WLAN(AVG)
IEEE 802.11a	15±1dBm
IEEE 802.11n HT20	15±1dBm
IEEE 802.11n HT40	15±1dBm
IEEE 802.11ac HT20	i15±1dBm
IEEE 802.11ac HT40	14±1dBm
IEEE 802.11ac HT80	13±1dBm

BT

Mode	BT(AVG)	
GFSK	Low	1±1dBm
	Middle	1±1dBm
	High	0±1dBm
π/4-DQPSK	Low	1±1dBm
	Middle	1±1dBm
	High	0±1dBm
8DPSK	Low	1±1dBm
	Middle	1±1dBm
	High	0±1dBm

BT4.0

Mode	BLE(AVG)	
GFSK	Low	1±1dBm
	Middle	1±1dBm
	High	0±1dBm

BW MHz	RB Size	Mode	Band II	Band IV	Band V	Band VII	Band XVII
1.4	1	QPSK	21±1dBm	21±1dBm	22±1dBm	N/A	N/A
1.4	3		21±1dBm	21±1dBm	22±1dBm	N/A	N/A
1.4	6		21±1dBm	21±1dBm	22±1dBm	N/A	N/A
1.4	1	16- QAM	20±1dBm	20±1dBm	21±1dBm	N/A	N/A
1.4	3		20±1dBm	20±1dBm	21±1dBm	N/A	N/A
1.4	6		19±1dBm	19±1dBm	20±1dBm	N/A	N/A
3	1	QPSK	21±1dBm	21±1dBm	22±1dBm	N/A	N/A
3	8		21±1dBm	21±1dBm	21±1dBm	N/A	N/A
3	15		20±1dBm	20±1dBm	22±1dBm	N/A	N/A
3	1	16- QAM	21±1dBm	21±1dBm	21±1dBm	N/A	N/A
3	8		20±1dBm	20±1dBm	21±1dBm	N/A	N/A
3	15		20±1dBm	19±1dBm	20±1dBm	N/A	N/A
5	1	QPSK	21±1dBm	21±1dBm	22±1dBm	20±1dBm	22±1dBm
5	12		21±1dBm	21±1dBm	21±1dBm	20±1dBm	22±1dBm
5	25		21±1dBm	22±1dBm	22±1dBm	20±1dBm	22±1dBm
5	1	16- QAM	20±1dBm	20±1dBm	21±1dBm	20±1dBm	21±1dBm
5	12		20±1dBm	20±1dBm	21±1dBm	20±1dBm	21±1dBm
5	25		19±1dBm	20±1dBm	20±1dBm	19±1dBm	20±1dBm
10	1	QPSK	21±1dBm	21±1dBm	21±1dBm	20±1dBm	22±1dBm
10	25		21±1dBm	21±1dBm	21±1dBm	20±1dBm	22±1dBm
10	50		21±1dBm	21±1dBm	22±1dBm	21±1dBm	22±1dBm
10	1	16- QAM	20.97±1dBm	21±1dBm	21±1dBm	19.5±1dBm	21±1dBm
10	25		21±1dBm	21±1dBm	21±1dBm	19.5±1dBm	21±1dBm
10	50		20±1dBm	21±1dBm	21±1dBm	19±1dBm	20±1dBm
15	1	QPSK	21±1dBm	21±1dBm	N/A	20±1dBm	N/A
15	36		21±1dBm	21±1dBm	N/A	20±1dBm	N/A
15	75		20±1dBm	20±1dBm	N/A	19±1dBm	N/A
15	1	16- QAM	21±1dBm	21±1dBm	N/A	20±1dBm	N/A
15	36		21±1dBm	20±1dBm	N/A	19.5±1dBm	N/A
15	75		19±1dBm	20±1dBm	N/A	19±1dBm	N/A
20	1	QPSK	21±1dBm	21±1dBm	N/A	20±1dBm	N/A
20	50		21±1dBm	21±1dBm	N/A	20±1dBm	N/A
20	100		21±1dBm	21±1dBm	N/A	20±1dBm	N/A
20	1	16- QAM	20±1dBm	21±1dBm	N/A	20±1dBm	N/A
20	50		20±1dBm	20±1dBm	N/A	20±1dBm	N/A
20	100		19±1dBm	20±1dBm	N/A	19±1dBm	N/A

10.3 SAR Test Exclusions Applied

Per FCC KDB 447498D01, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(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, where:

• f(GHZ) is the RF channel transmit frequency in GHz
• Power and distance are rounded to the nearest mW and mm before calculation
• The result is rounded to one decimal place for comparison

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

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

Based on the maximum conducted power of **Bluetooth Body** (rounded to the nearest mW) and the antenna to user separation distance,

Bluetooth Body SAR was not required; [(1.585/5)* √2.480] = **0.25** < 3.0.

Based on the maximum conducted power of **2.4 GHz WLAN Body** (rounded to the nearest mW) and the antenna to user separation distance,

2.4 GHz WLAN SAR was required; [158.489/5)* √2.462] = **24.87** > 3.0.

Based on the maximum conducted power of **5.2 GHz WLAN Body** (rounded to the nearest mW) and the antenna to user separation distance,

5.2 GHz WLAN SAR was required; [(50.119/5)* √5.200] = **11.43** > 3.0.

Based on the maximum conducted power of **5.3 GHz WLAN Body** (rounded to the nearest mW) and the antenna to user separation distance,

5.3 GHz WLAN SAR was required; [(50.119/5)* √5.300] = **11.54** > 3.0.

.
Based on the maximum conducted power of **5.6 GHz WLAN Body** (rounded to the nearest mW) and the antenna to user separation distance,

5.6 GHz WLAN SAR was required; [(39.811/5)* √5.600] = **9.42** > 3.0.

Based on the maximum conducted power of **5.8 GHz WLAN Body** (rounded to the nearest mW) and the antenna to user separation distance,

5.8 GHz WLAN SAR was required; [(39.811/5)* √5.800] = **9.59** > 3.0.

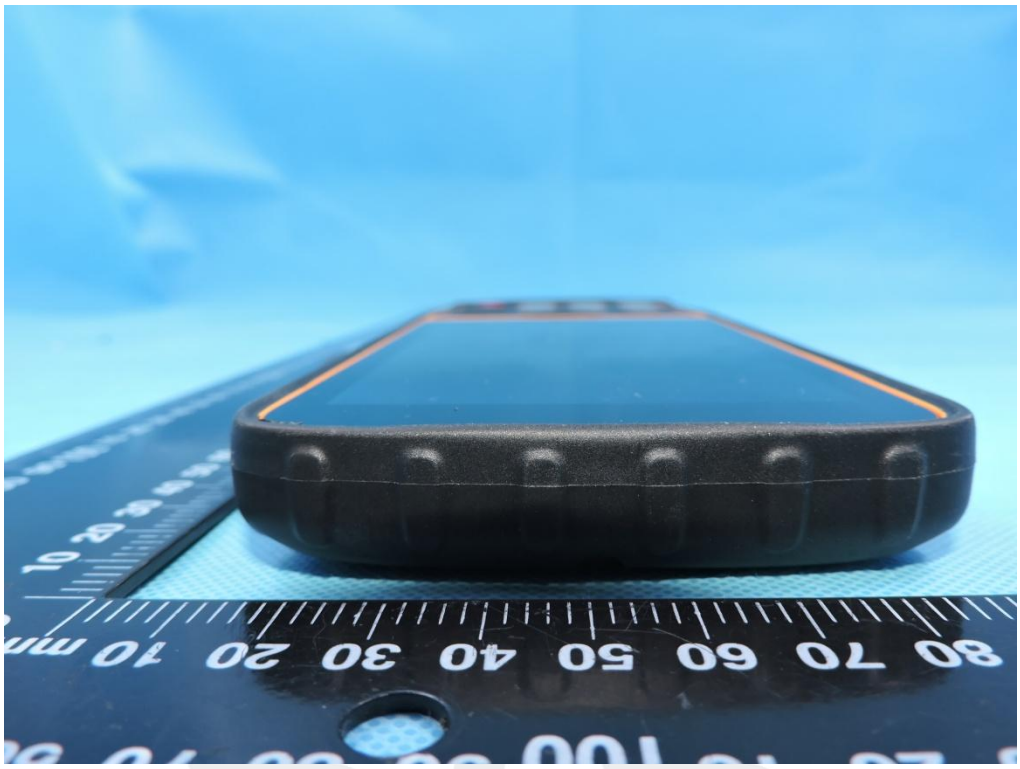
11. EUT And Test Setup Photo

11.1 EUT Photo

Front side

Back side

Top side



Bottom side

Left side

Right side

11.2 Setup Photo

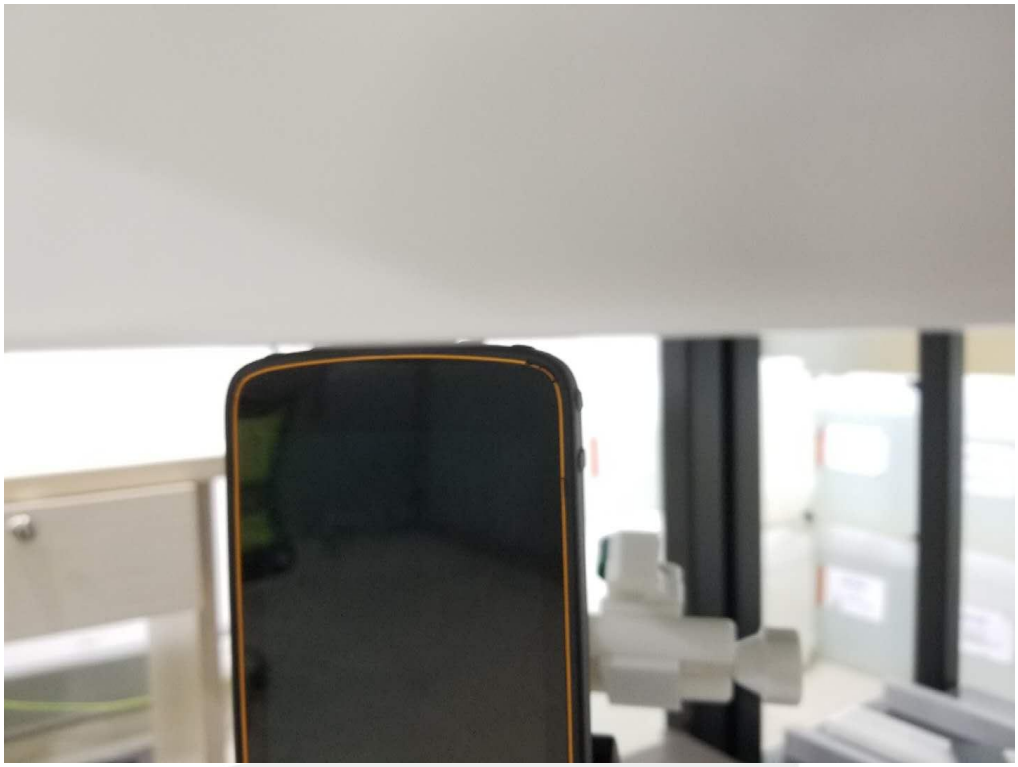
Body Front side(separation distance is 0mm)

Body Back side(separation distance is 0mm)

Body left side(separation distance is 0mm)

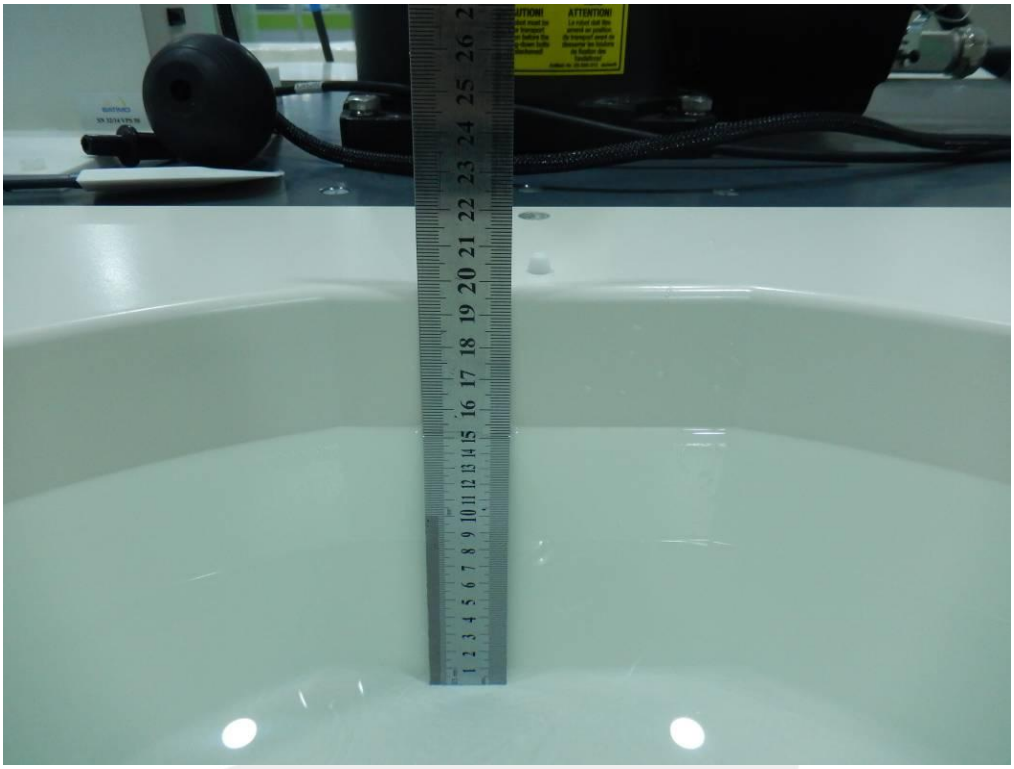
Body right side(separation distance is 0mm)

Body top side(separation distance is 0mm)



Body Bottom side(separation distance is 0mm)

Liquid depth (15 cm)



12. SAR Result Summary

12.1 Body-worn and Hotspot SAR

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Scaled SAR (W/Kg)	Meas. No.
GSM 850	GPRS Data-4 Slot	Front side	190	0.485	-2.25	30	29.68	0.522	/
		Back side	128	0.571	2.99	30	28.87	0.741	/
		Back side	190	0.762	0.23	30	29.68	**0.820**	1
		Back side	251	0.637	-0.47	30	29.58	0.702	/
		Left side	251	0.257	2.13	30	29.68	0.277	/
		Bottom side	251	0.165	-1.03	30	29.68	0.178	/
	EGPRS Data-3 Slot	Front side	190	0.472	-1.66	33	32.68	0.508	/
		Back side	128	0.521	2.61	33	31.91	0.670	/
		Back side	190	0.563	1.33	33	31.63	0.772	/
		Back side	251	0.741	3.40	33	32.68	**0.798**	2
		Left side	251	0.243	-2.90	33	32.68	0.262	/
		Bottom side	251	0.155	2.05	33	32.68	0.167	/
GSM1900	GPRS Data-4 Slot	Front side	810	0.656	-1.22	27	26.82	0.684	/
		Back side	810	0.712	-3.71	27	26.82	**0.742**	3
		Left side	810	0.195	0.41	27	26.82	0.203	/
		Bottom side	810	0.675	-2.99	27	26.82	0.704	/
	EGPRS Data-4 Slot	Front side	810	0.662	-2.04	27	26.91	0.676	/
		Back side	810	0.737	3.44	27	26.91	**0.752**	4
		Left side	810	0.254	-1.62	27	26.91	0.259	/
		Bottom side	810	0.163	2.11	27	26.91	0.166	/
WCDMA II	RMC	Front side	9538	0.383	0.18	24	23.19	0.462	/
		Back side	9538	0.484	0.30	24	23.19	**0.583**	5
		Left side	9538	0.043	3.87	24	23.19	0.052	/
		Bottom side	9538	0.395	2.44	24	23.19	0.476	/
WCDMA V	RMC	Front side	4132	0.502	-3.20	24	23.73	0.534	/
		Back side	4132	0.530	-0.01	24	23.73	**0.564**	6
		Left side	4132	0.322	2.39	24	23.73	0.343	/
		Bottom side	4132	0.409	-1.07	24	23.73	0.435	/

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN	802.11b	Front side	11	0.176	-0.91	22	21.49	100	0.198	/
		Back side	11	0.251	0.21	22	21.49	100	**0.282**	7
		Right side	11	0.101	3.32	22	21.49	100	0.114	/
		Top side	11	0.083	-3.47	22	21.49	100	0.093	/
	802.11n	Front side	6	0.180	2.63	23	22.43	100	0.205	/
		Back side	6	0.288	-1.37	23	22.43	100	**0.328**	8
		Right side	6	0.113	-2.03	23	22.43	100	0.129	/
		Top side	6	0.097	1.64	23	22.43	100	0.111	/

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Duty cycle(%)	Scaled SAR (W/Kg)	Meas. No.
WLAN 5.2G	802.11a	Front side	36	0.131	-1.18	17	16.70	100	0.140	/
		Back side	36	0.199	3.37	17	16.70	100	**0.213**	9
		Right side	36	0.096	-0.97	17	16.70	100	0.103	/
		Top side	36	0.116	0.86	17	16.70	100	0.124	/
WLAN 5.3G	802.11a	Front side	52	0.127	3.82	17	16.56	100	0.141	/
		Back side	52	0.198	-0.23	17	16.56	100	**0.219**	10
		Right side	52	0.063	-0.34	17	16.56	100	0.070	/
		Top side	52	0.097	3.01	17	16.56	100	0.107	/
WLAN 5.6G	802.11a	Front side	116	0.210	0.03	16	15.07	100	0.260	/
		Back side	116	0.250	0.09	16	15.07	100	**0.310**	11
		Right side	116	0.111	-3.44	16	15.07	100	0.138	/
		Top side	116	0.130	2.36	16	15.07	100	0.161	/
WLAN 5.8G	802.11a	Front side	165	0.238	1.52	16	15.71	100	0.254	/
		Back side	165	0.326	-3.56	16	15.71	100	**0.349**	12
		Right side	165	0.076	-1.03	16	15.71	100	0.081	/
		Top side	165	0.168	-0.03	16	15.71	100	0.180	/
	802.11ac	Front side	149	0.256	2.03	16	15.93	100	0.260	/
		Back side	149	0.396	0.95	16	15.93	100	**0.402**	13
		Right side	149	0.084	0.77	16	15.93	100	0.085	/
		Top side	149	0.184	-1.66	16	15.93	100	0.187	/

Note:

1. The test separation of all above table is 0mm.
2. Per KDB 447498 D01v05r01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For WWAN: Scaled SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
3. When the user enables the personal Wireless router functions for the handsets, actual operations include simultaneous transmission of both the Wi-Fi transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.
4. WLAN 5.3G, WLAN 5.6 G not support hotspot mode.

Band	BW (MHz)	Mod.	RB Size	RB offset	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max. Turn-up Power(dBm)	Meas. Output Power(dBm)	Scaled SAR (W/Kg)	Meas. No.
LTE Band 2	20M	QPSK	1	0	Front side	18900	0.631	-2.40	22	21.38	0.728	/
			50	0	Front side	18900	0.583	-3.20	22	21.33	0.680	/
			1	0	Back Side	18700	0.712	-1.21	22	21.35	0.827	/
			1	0	Back Side	18900	0.834	1.89	22	21.38	**0.962**	14
			1	0	Back Side	19100	0.692	3.17	22	21.29	0.815	/
			50	0	Back Side	18700	0.664	2.36	22	21.11	0.815	/
			50	0	Back Side	18900	0.712	1.54	22	21.33	0.831	/
			50	0	Back Side	19100	0.620	-1.08	22	21.28	0.732	/
			100	0	Back Side	19100	0.632	-2.06	22	21.54	0.703	/
			1	0	Left Side	18900	0.387	0.73	22	21.38	0.446	/
			50	0	Left Side	18900	0.314	-3.72	22	21.33	0.366	/
			1	0	Bottom Side	18900	0.423	-3.31	22	21.38	0.488	/
			50	0	Bottom Side	18900	0.405	-0.64	22	21.33	0.473	/
LTE Band 4	20M	QPSK	1	0	Front side	20175	0.372	1.00	22	21.71	0.398	/
			50	0	Front side	20175	0.336	3.23	22	21.59	0.369	/
			1	0	Back Side	20175	0.478	-0.08	22	21.71	**0.511**	15
			50	0	Back Side	20175	0.459	-0.33	22	21.59	0.504	/
			1	0	Left Side	20175	0.169	-1.82	22	21.71	0.181	/
			50	0	Left Side	20175	0.130	1.75	22	21.59	0.143	/
			1	0	Bottom Side	20175	0.217	-1.45	22	21.71	0.232	/
			50	0	Bottom Side	20175	0.178	0.77	22	21.59	0.196	/
LTE Band 5	10M	QPSK	1	0	Front side	20600	0.601	0.58	22	21.37	0.695	/
			25	24	Front side	20525	0.543	-3.45	22	21.26	0.644	/
			1	0	Back Side	20450	0.639	2.08	22	21.16	0.775	/
			1	0	Back Side	20525	0.674	-3.66	22	21.29	0.794	/
			1	0	Back Side	20600	0.736	3.18	22	21.37	**0.851**	16
			25	24	Back Side	20525	0.650	3.23	22	21.26	0.771	/
			50	0	Back Side	20450	0.632	2.62	22	21.44	0.719	/
			1	0	Left Side	20600	0.311	-1.65	22	21.37	0.360	/
			25	24	Left Side	20525	0.273	-3.11	22	21.26	0.324	/
			1	0	Bottom Side	20600	0.145	2.48	22	21.37	0.168	/
			25	24	Bottom Side	20525	0.129	0.73	22	21.26	0.153	/
LTE Band 7	20M	QPSK	1	99	Front side	20850	0.504	3.79	21	20.62	0.550	/
			50	0	Front side	20850	0.428	-2.32	21	20.31	0.502	/
			1	99	Back Side	20850	0.534	-3.91	21	20.62	**0.583**	17
			50	0	Back Side	20850	0.480	2.83	21	20.31	0.563	/
			1	99	Left Side	20850	0.293	-1.55	21	20.62	0.320	/
			50	0	Left Side	20850	0.248	1.25	21	20.31	0.291	/
			1	99	Bottom Side	20850	0.163	2.74	21	20.62	0.178	/
			50	0	Bottom Side	20850	0.137	2.14	21	20.31	0.161	/
LTE Band 17	10M	QPSK	1	49	Front side	23780	0.329	1.51	23	22.46	0.373	/
			25	24	Front side	23800	0.297	0.40	23	22.33	0.347	/
			1	49	Back Side	23780	0.428	1.60	23	22.46	**0.485**	18
			25	24	Back Side	23800	0.383	3.81	23	22.33	0.447	/
			1	49	Left Side	23780	0.192	2.52	23	22.46	0.217	/
			25	24	Left Side	23800	0.163	3.13	23	22.33	0.190	/
			1	49	Bottom Side	23780	0.088	-2.93	23	22.46	0.100	/
			25	24	Bottom Side	23800	0.073	-3.82	23	22.33	0.085	/

Repeated SAR

Band	Mode	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Scaled SAR(W/Kg)	Meas. No.
GSM 850	GPRS Data-4 Slot	Back Side	190	0.732	0.23	30	29.68	0.788	/
	EGPRS Data-3 Slot	Back Side	251	0.722	1.56	33	32.68	0.777	/

Band	Mode	RB Size	Test Position	Ch.	Result 1g (W/Kg)	Power Drift(%)	Max.Turn-up Power(dBm)	Meas.Output Power(dBm)	Scaled SAR(W/Kg)	Meas. No.
LTE Band 2	QPSK	1	Back Side	18900	0.814	-0.31	22	21.38	0.939	/
	QPSK	50	Back Side	18900	0.703	1.52	22	21.33	0.820	/
LTE Band 5	QPSK	1	Back Side	20600	0.721	-1.88	22	21.37	0.834	/

12.3 repeated SAR measurement

Band	Mode	Test Position	Ch.	Original Measured SAR 1g(mW/g)	1 st Repeated SAR 1g	Ratio	Original Measured SAR 1g(mW/g)	2nd Repeated SAR 1g
GSM 850	GPRS Data-4 Slot	Back Side	190	0.762	0.732	1.04	-	-
	EGPRS Data-3 Slot	Back Side	251	0.741	0.722	1.03	-	-

Band	Mode	RB Size	Test Position	Ch.	Original Measured SAR 1g(mW/g)	1 st Repeated SAR 1g	Ratio	Original Measured SAR 1g(mW/g)	2nd Repeated SAR 1g
LTE Band 2	QPSK	1	Back Side	18900	0.834	0.814	1.02	-	-
	QPSK	50	Back Side	18900	0.712	0.703	1.01	-	-
LTE Band 5	QPSK	1	Back Side	20600	0.736	0.721	1.02	-	-

Note:

1. Per KDB 865664 D01V01,for each frequency band ,repeated SAR measurement is required only when the measured SAR is≥0.8W/Kg.
2. Per KDB 865664 D01V01,if the ratio of largest to smallest SAR for the original and first repeated measurement is≤1.2and the measured SAR＜1.45W/Kg, only one repeated measurement is required.
3. 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 ≥ 1.45W/Kg
4. The ratio is the difference in percentage between original and repeated measured SAR.
5.

Simultaneous Multi-band Transmission Evaluation:

Application Simultaneous Transmission information:

Position	Simultaneous state
Body	1. GSM + WLAN
	2. GSM + Bluetooth
	3. WCDMA + WLAN
	4. WCDMA + Bluetooth
	5. LTE + WLAN
	6. LTE + Bluetooth

NOTE:

1. Bluetooth and 2.4/5GHz WLAN can't simultaneous transmission at the same time.
2. 2.4GHz WLAN and 5GHz WLAN can't simultaneous transmission at the same time.
3. For simultaneous transmission at head and body exposure position, 2 transmitters simultaneous transmission was the worst state.
4. WLAN 5.3G, WLAN 5.6 G not support hotspot mode.
5. Based upon KDB 447498 D01, BT SAR is excluded as below table.
6. If the test separation distance is <5mm, 5mm is used for excluded SAR calculation.
7. For minimum test separation distance≦50mm,Bluetooth standalone SAR is excluded according to [(max. power of channel, including tune-up tolerance, mW)/ (min. test separation distance, mm) ·[√f (GHz) /x] ≦3.0 for 1-g SAR and ≦7.5 for 10-g extremity SAR
8. The reported SAR summation is calculated based on the same configuration and test position.
9. KDB 447498 / 4.3.2 (2) when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
   a) (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.
   b) 0.4W/Kg for 1-g SAR and 1.0W/Kg for 10-g SAR, when the separation distance is >50mm.

Estimated SAR		Maximum Power		Antenna to user(mm)	Frequency(GHz)	Stand alone SAR(1g) [W/kg]
		dBm	mW			
BT	Body	2	1.585	5	2.480	0.067

Simultaneous Mode	Position	Mode	Max. 1-g SAR (W/kg)	1-g Sum SAR (W/kg)
GSM + 2.4GWLAN	Body	GSM Data	0.820	1.148
		WLAN	0.328	
GSM + Bluetooth	Body	GSM Data	0.820	0.887
		Bluetooth	0.067	
GSM + 5.2GWLAN	Body	GSM Data	0.820	1.033
		5.2G WLAN	0.213	
GSM + 5.8GWLAN	Body	GSM Data	0.820	1.222
		5.8G WLAN	0.402	
WCDMA + 2.4GWLAN	Body	WCDMA RMC	0.583	0.911
		WLAN	0.328	
WCDMA + Bluetooth	Body	WCDMA RMC	0.583	0.650
		Bluetooth	0.067	
WCDMA + 5.2GWLAN	Body	WCDMA RMC	0.583	0.796
		5.2G WLAN	0.213	
WCDMA + 5.8GWLAN	Body	WCDMA RMC	0.583	0.985
		5.8G WLAN	0.402	
LTE + 2.4GWLAN	Body	LTE RMC	0.962	1.290
		WLAN	0.328	
LTE + Bluetooth	Body	LTE RMC	0.962	1.029
		Bluetooth	0.067	
LTE + 5.2GWLAN	Body	LTE RMC	0.962	1.175
		5.2G WLAN	0.213	
LTE + 5.8GWLAN	Body	LTE RMC	0.962	**1.364**
		5.8G WLAN	0.402	

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.

When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR-1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR 1g is greater than the SAR limit (SAR-1g 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

13. Equipment List

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
750MHz Dipole	MVG	SID750	SN 30/14 DIP0G750-331	2017.08.15	2020.08.14
835MHz Dipole	MVG	SID835	SN 30/14 DIP0G835-332	2017.08.15	2020.08.14
1800MHz Dipole	MVG	SID1800	SN 30/14 DIP1G800-329	2017.08.15	2020.08.14
1900MHz Dipole	MVG	SID1900	SN 30/14 DIP1G900-333	2017.08.15	2020.08.14
2450MHz Dipole	MVG	SID2450	SN 30/14 DIP2G450-335	2017.08.15	2020.08.14
2600MHz Dipole	MVG	SID2600	SN 30/14 DIP2G600-336	2017.08.15	2020.08.14
Waveguide	MVG	SWG5500	SN 13/14 WGA32	2017.08.15	2020.08.14
E-Field Probe	MVG	SSE2	SN 45/15 EPGO281	2018.04.10	2019.04.09
Dielectric Probe Kit	MVG	SCLMP	SN 32/14 OCPG67	2017.12.03	2018.12.02
Antenna	MVG	ANTA3	SN 07/13 ZNTA52	N/A	N/A
Phantom1	MVG	SAM	SN 32/14 SAM115	2014.09.01	N/A
Phantom2	MVG	SAM	SN 32/14 SAM116	2014.09.01	N/A
Phone holder	MVG	N/A	SN 32/14 MSH97	2014.09.01	N/A
Laptop holder	MVG	N/A	SN 32/14 LSH29	2014.09.01	N/A
Network Analyzer	Agilent	8753ES	US38432810	2018.03.08	2019.03.07
Multi Meter	Keithley	Multi Meter 2000	4050073	2017.10.15	2018.10.14
Signal Generator	Agilent	N5182A	MY50140530	2017.10.15	2018.10.14
Wireless Communication Test Set	Agilent	8960-E5515C	MY48360751	2017.10.15	2018.10.14
Wireless Communication Test Set	R&S	CMW500	117239	2017.10.15	2018.10.14
Power Amplifier	DESAY	ZHL-42W	9638	2017.10.15	2018.10.14
Power Meter	R&S	NRP	100510	2017.10.15	2018.10.14
Power Meter	Agilent	E4418B	GB43312526	2017.10.15	2018.10.14
Power Sensor	R&S	NRP-Z11	101919	2017.10.15	2018.10.14
Power Sensor	Agilent	E9301A	MY41497725	2017.10.15	2018.10.14
9dB Attenuator	Agilent	99899	DC-18GHz	2017.05.10	2018.05.09
11dB Attenuator	Agilent	8494B	DC-18GHz	2017.05.10	2018.05.09
110dB Attenuator	Agilent	8494B	DC-18GHz	2017.05.10	2018.05.09
Directional coupler	Narda	4226-20	3305	2017.10.15	2018.10.14
hygrothermograph	MiEO	HH660	N/A	2017.10.18	2018.10.17
Thermograph	Elitech	RC-4	S/N EF7176501537	2017.11.10	2018.11.09

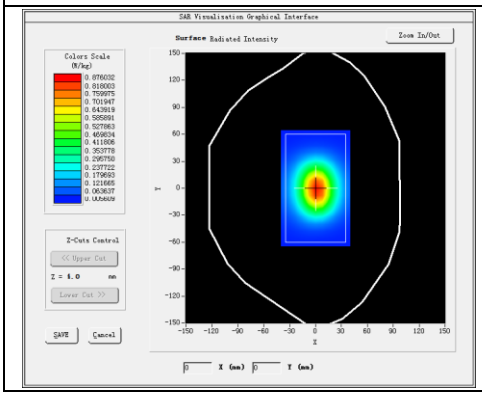
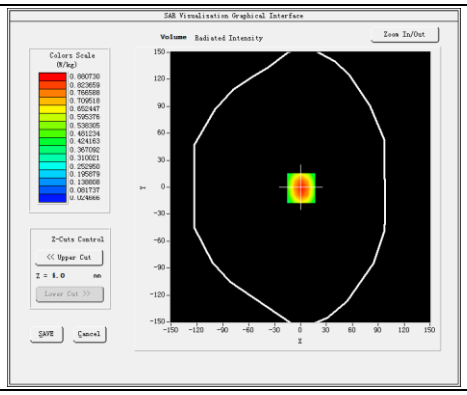
Appendix A. System Validation Plots

System Performance Check Data (750MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-02
Measurement duration: 14 minutes 12 seconds

Experimental conditions.

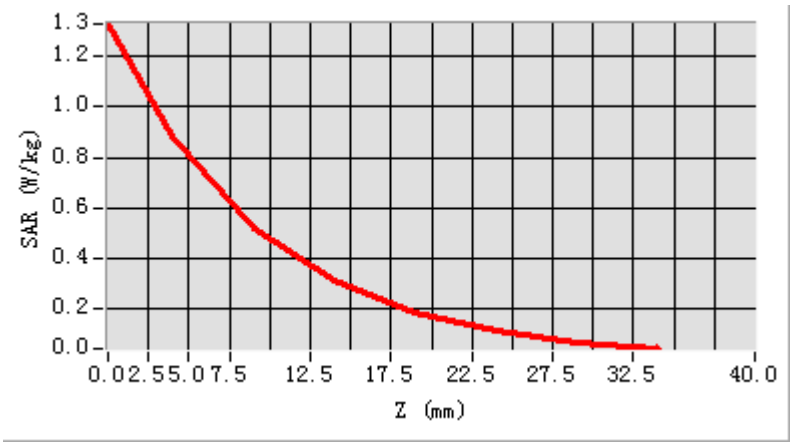
Probe	
Phantom	Validation plane
Device Position	-
Band	750MHz
Channels	-
Signal	CW
Frequency (MHz)	750MHz
Relative permittivity	54.64
Conductivity (S/m)	0.95
Power drift (%)	1.44
Probe	SN 45/15 EPGO281
ConvF:	1.59
Crest factor:	1:1

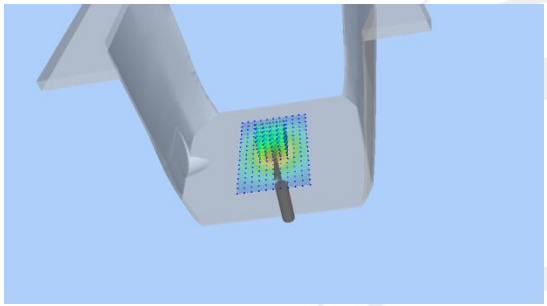
SURFACE SAR	VOLUME SAR
	

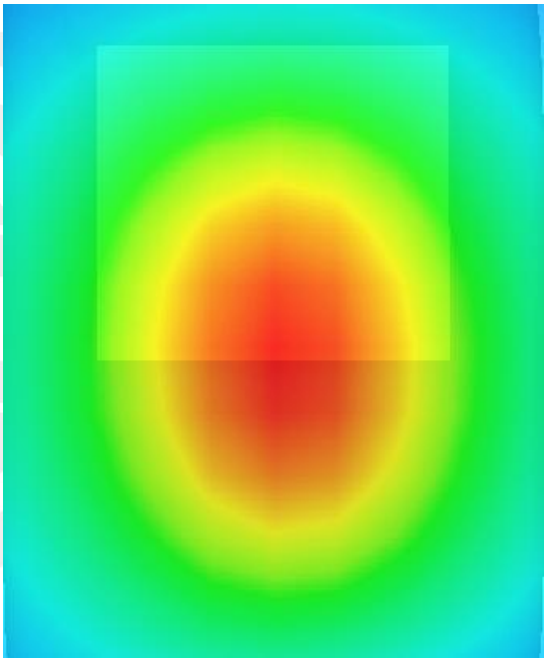
Maximum location: X=1.00, Y=-1.00

SAR 10g (W/Kg)	0.576515
SAR 1g (W/Kg)	0.839326

Z Axis Scan


SAR (W/kg)
1.3
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)



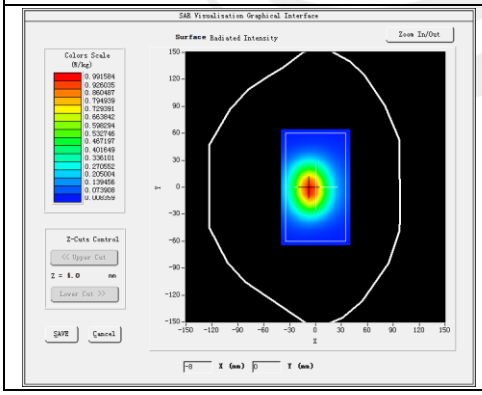
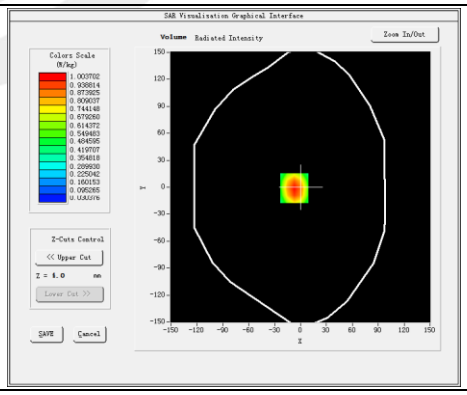


System Performance Check Data (835MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-02
Measurement duration: 14 minutes 13 seconds

Experimental conditions.

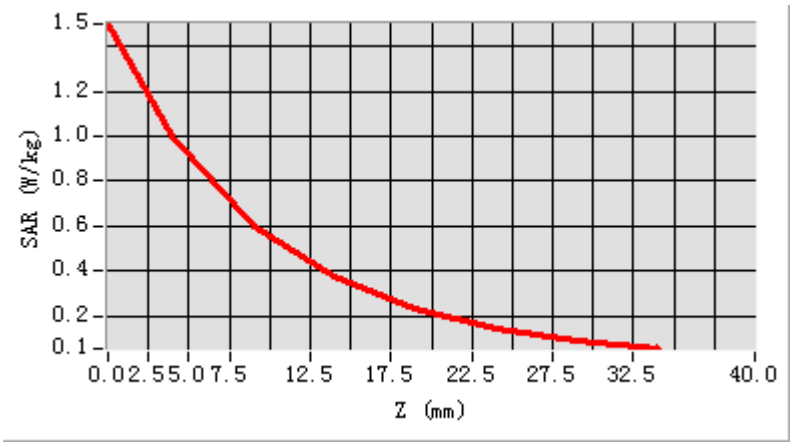
Probe	
Phantom	Validation plane
Device Position	-
Band	835MHz
Channels	-
Signal	CW
Frequency (MHz)	835MHz
Relative permittivity	55.38
Conductivity (S/m)	1.00
Power drift (%)	-0.37
Probe	SN 45/15 EPGO281
ConvF:	1.85
Crest factor:	1:1

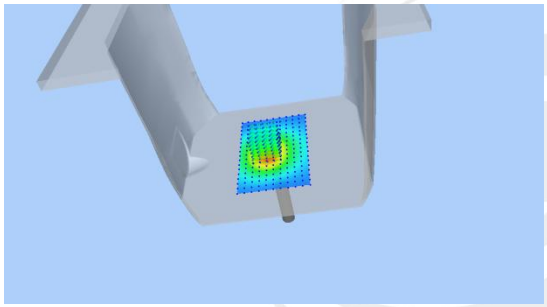
SURFACE SAR	VOLUME SAR
	

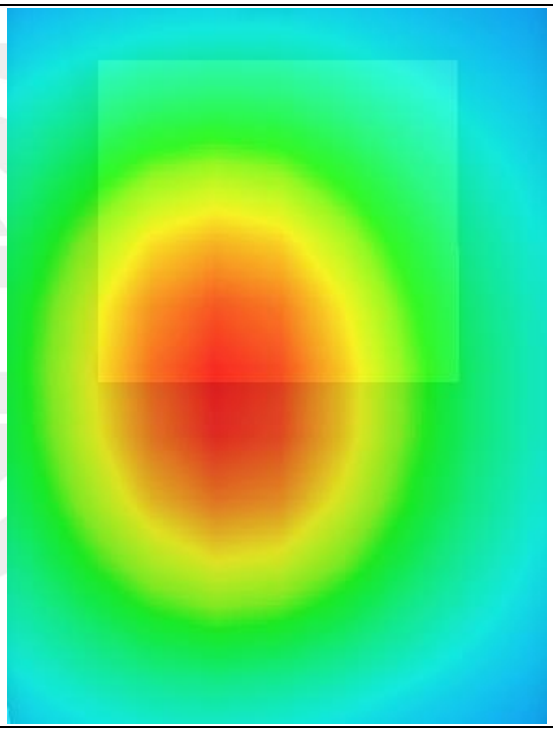
Maximum location: X=-7.00, Y=-1.00

SAR 10g (W/Kg)	0.620754
SAR 1g (W/Kg)	0.911607

Z Axis Scan


1.5
1.2
1.0
0.8
0.6
0.4
0.2
0.1
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)



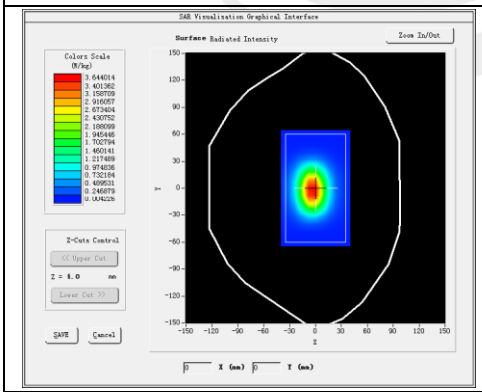
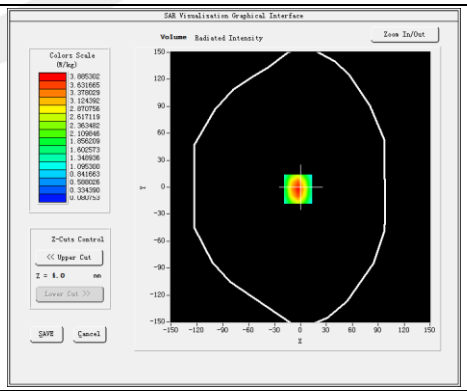


System Performance Check Data(1800MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-03

Experimental conditions.

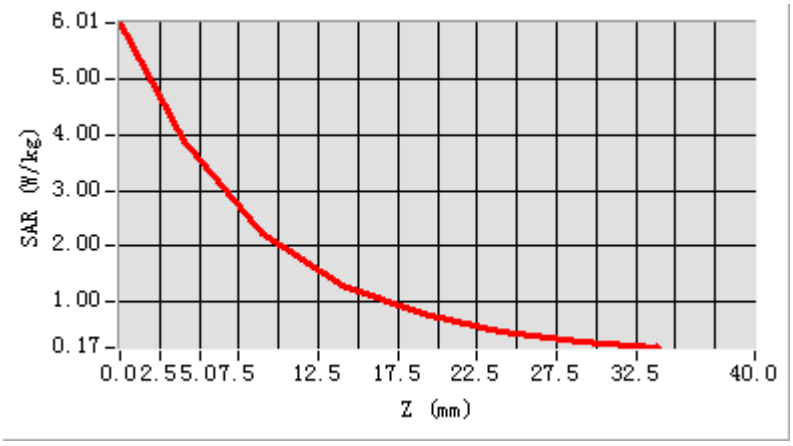
Phantom	Validation plane
Device Position	-
Band	1800MHz
Channels	-
Signal	CW
Frequency (MHz)	1800MHz
Relative permittivity	53.70
Conductivity (S/m)	1.54
Power drift (%)	-0.28
Probe	SN 45/15 EPGO281
ConvF	1.87
Crest factor:	1:1

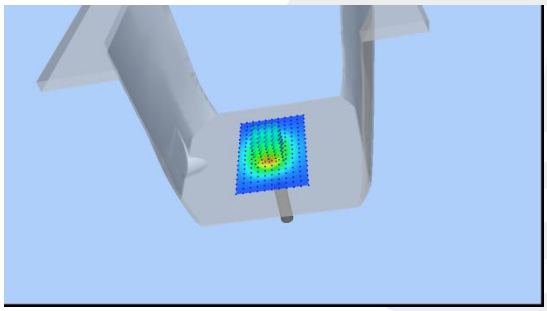
SURFACE SAR	VOLUME SAR
	

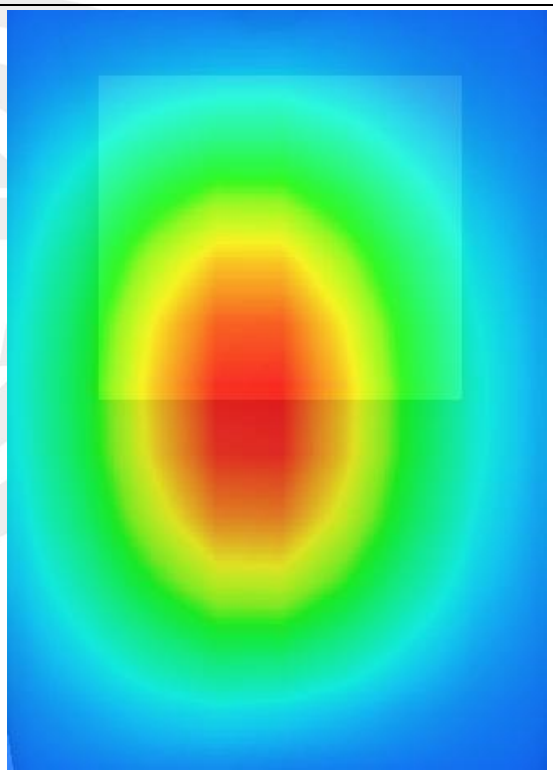
Maximum location: X=-3.00, Y=-2.00

SAR 10g (W/Kg)	1.923541
SAR 1g (W/Kg)	3.932376

Z Axis Scan


6.01
5.00
4.00
3.00
2.00
1.00
0.17
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)



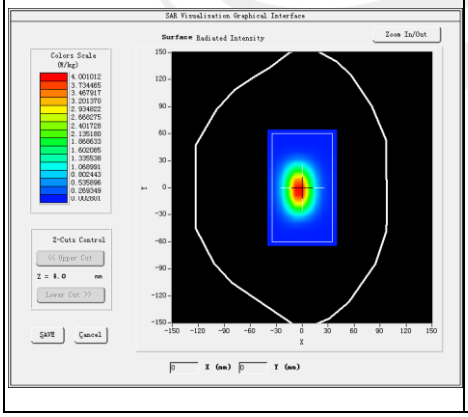
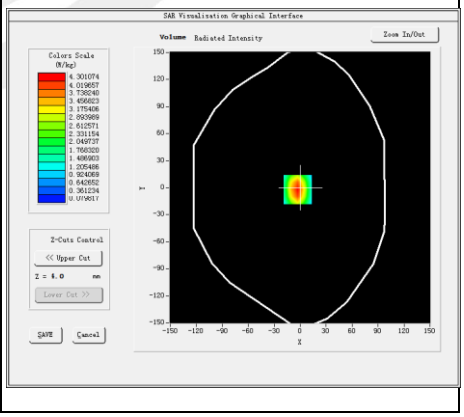


System Performance Check Data (1900MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-03
Measurement duration: 14 minutes 46 seconds

Experimental conditions.

Device Position	-
Band	1900MHz
Channels	-
Signal	CW
Frequency (MHz)	1900
Relative permittivity	53.21
Conductivity (S/m)	1.50
Power drift (%)	-0.31
Probe	SN 45/15 EPGO281
ConvF:	2.16
Crest factor:	1:1

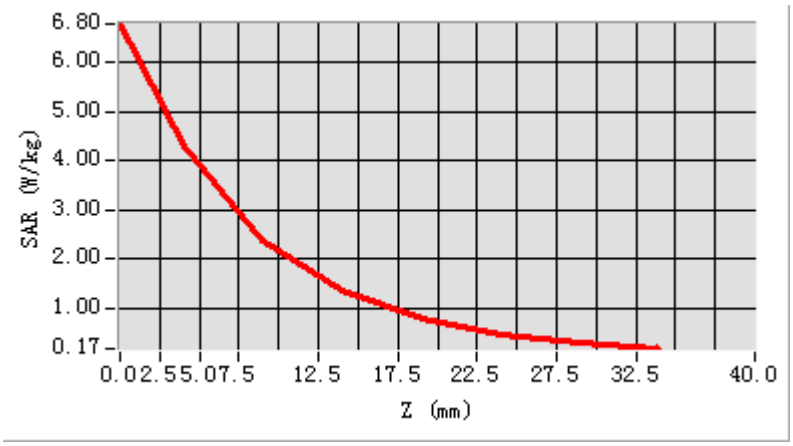
SURFACE SAR	VOLUME SAR
	

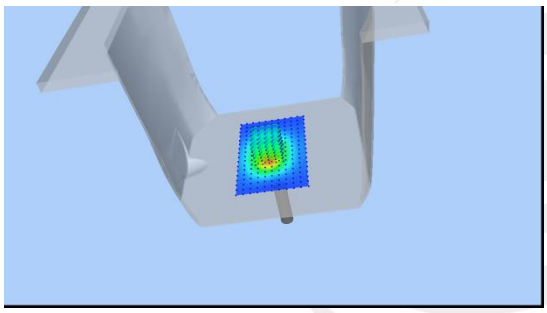
Maximum location: X=-3.00, Y=-2.00

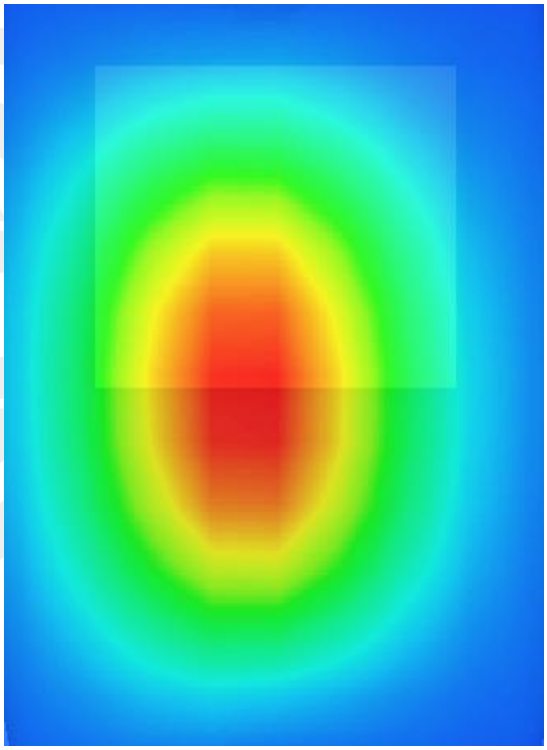
SAR Peak: 5.27 W/kg

SAR 10g (W/Kg)	2.074592
SAR 1g (W/Kg)	4.222872

Z Axis Scan


6.80
6.00
5.00
4.00
3.00
2.00
1.00
0.17
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)



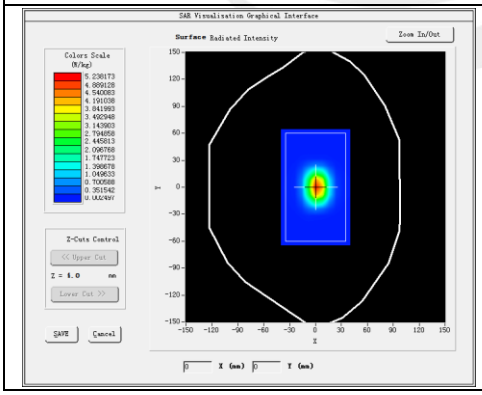
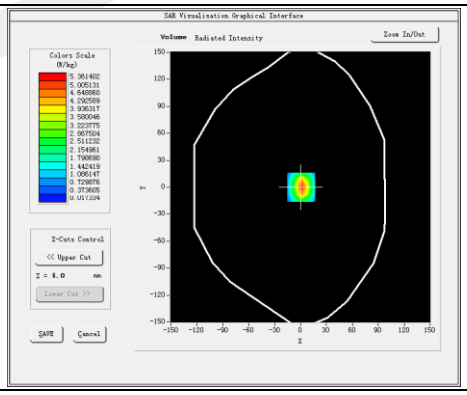


System Performance Check Data (2450MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-04
Measurement duration: 14 minutes 23 seconds

Experimental conditions.

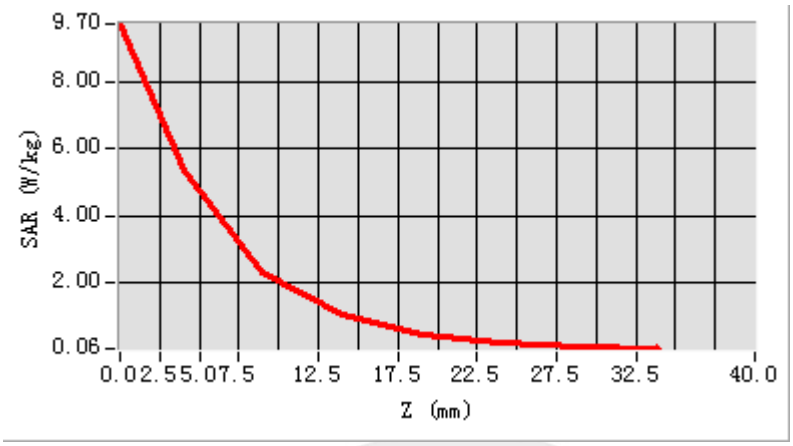
Device Position	Validation plane
Band	2450 MHz
Channels	-
Signal	CW
Frequency (MHz)	2450
Relative permittivity	53.19
Conductivity (S/m)	1.98
Power drift (%)	-0.30
Probe	SN 45/15 EPGO281
ConvF	2.28
Crest factor:	1:1

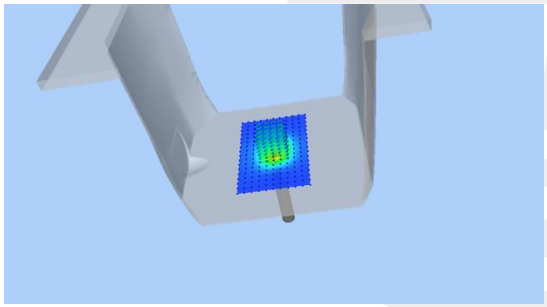
SURFACE SAR	VOLUME SAR
	

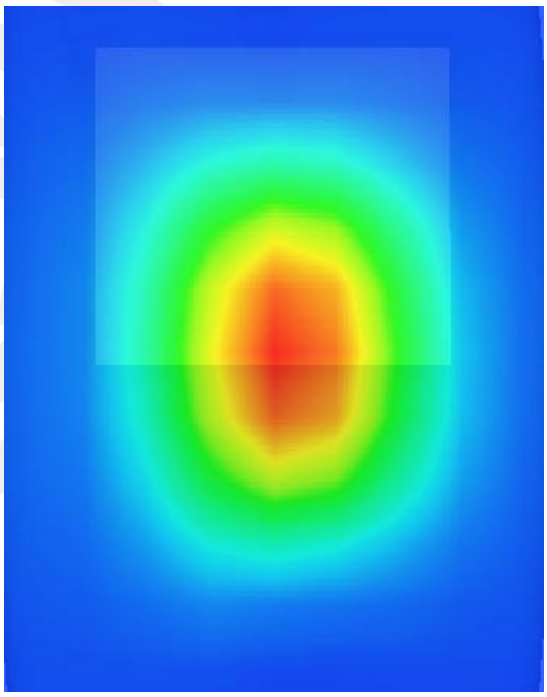
Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	2.298147
SAR 1g (W/Kg)	5.134443

Z Axis Scan


9.70
8.00
6.00
4.00
2.00
0.06
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)



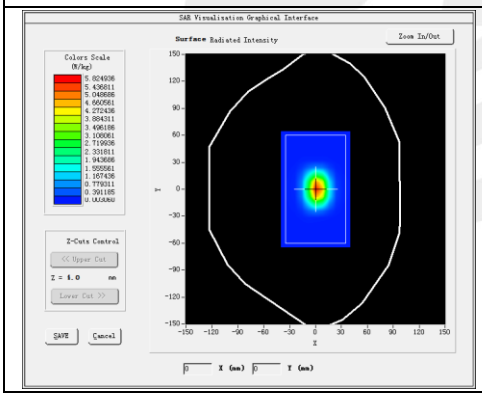
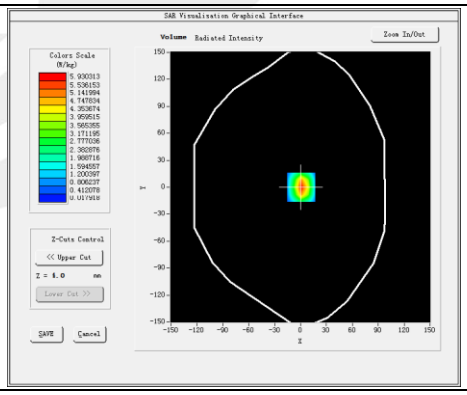


System Performance Check Data(2600MHz Body)

Type: Phone measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-04

Experimental conditions.

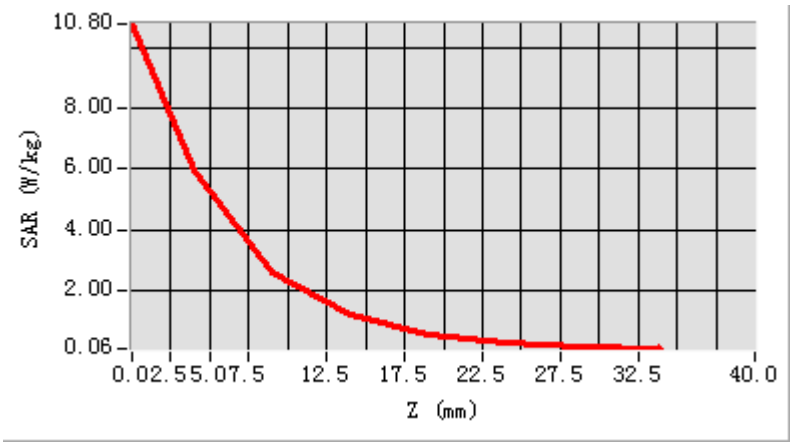
Device Position	Validation plane
Band	2600 MHz
Channels	-
Signal	CW
Frequency (MHz)	2600
Relative permittivity	52.25
Conductivity (S/m)	2.17
Power drift (%)	-0.30
Probe	SN 45/15 EPGO281
ConvF	2.38
Crest factor:	1:1

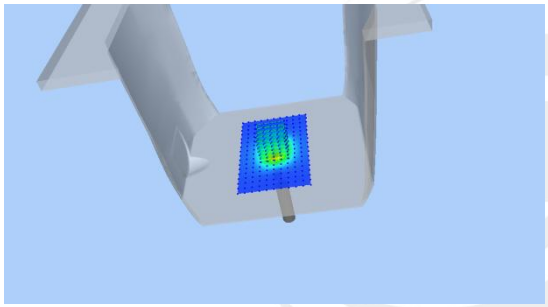
SURFACE SAR	VOLUME SAR
	

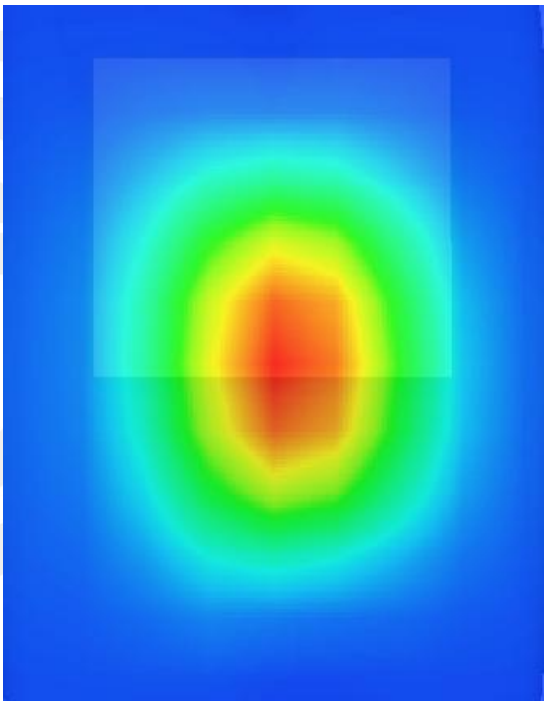
Maximum location: X=3.00, Y=1.00

SAR 10g (W/Kg)	2.356607
SAR 1g (W/Kg)	5.210546

Z Axis Scan


10.80
8.00
6.00
4.00
2.00
0.06
SAR (W/kg)
0.0 2.5 5.0 7.5 12.5 17.5 22.5 27.5 32.5 40.0
Z (mm)



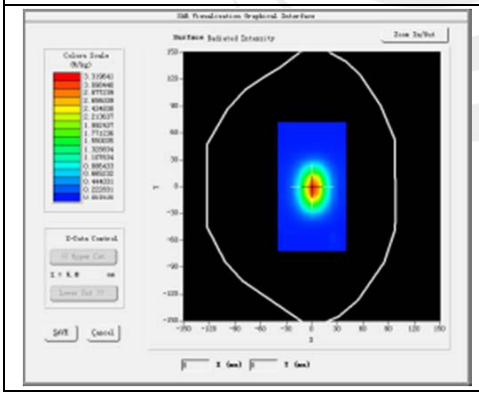
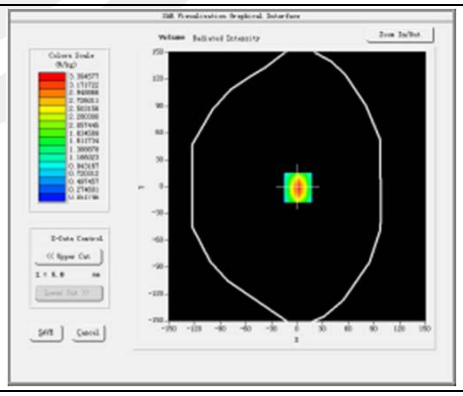


System Performance Check Data(5200MHz)

Type: Dipole measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-05

Experimental conditions.

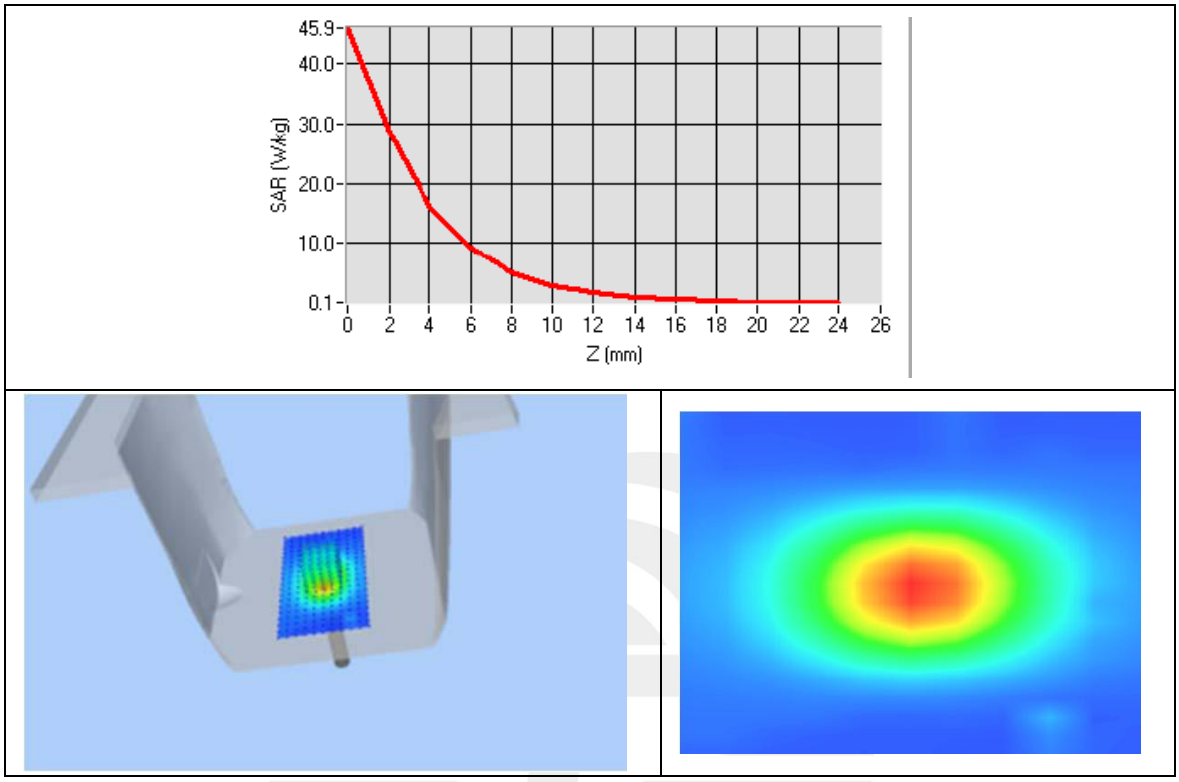
Device Position	Validation plane
Band	5200 MHz
Channels	-
Signal	CW
Frequency (MHz)	5200
Relative permittivity	48.67
Conductivity (S/m)	5.29
Power drift (%)	4.14
Probe	SN 45/15 EPGO281
ConvF	2.46
Crest factor:	1:1

SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=2.00

SAR 10g (W/Kg)	5.735081
SAR 1g (W/Kg)	15.723347

Z Axis Scan

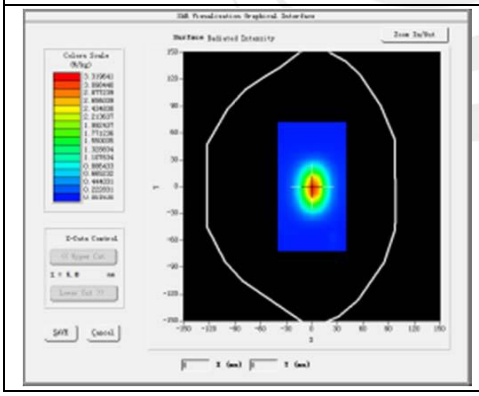
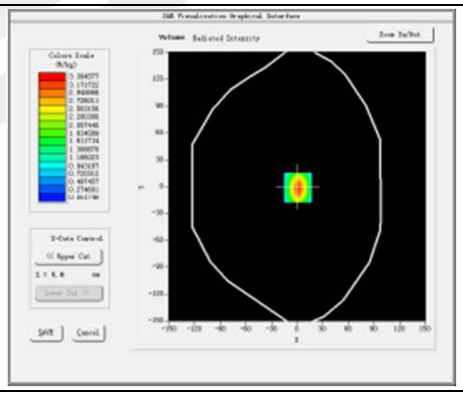


System Performance Check Data(5400MHz)

Type: Dipole measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-05

Experimental conditions.

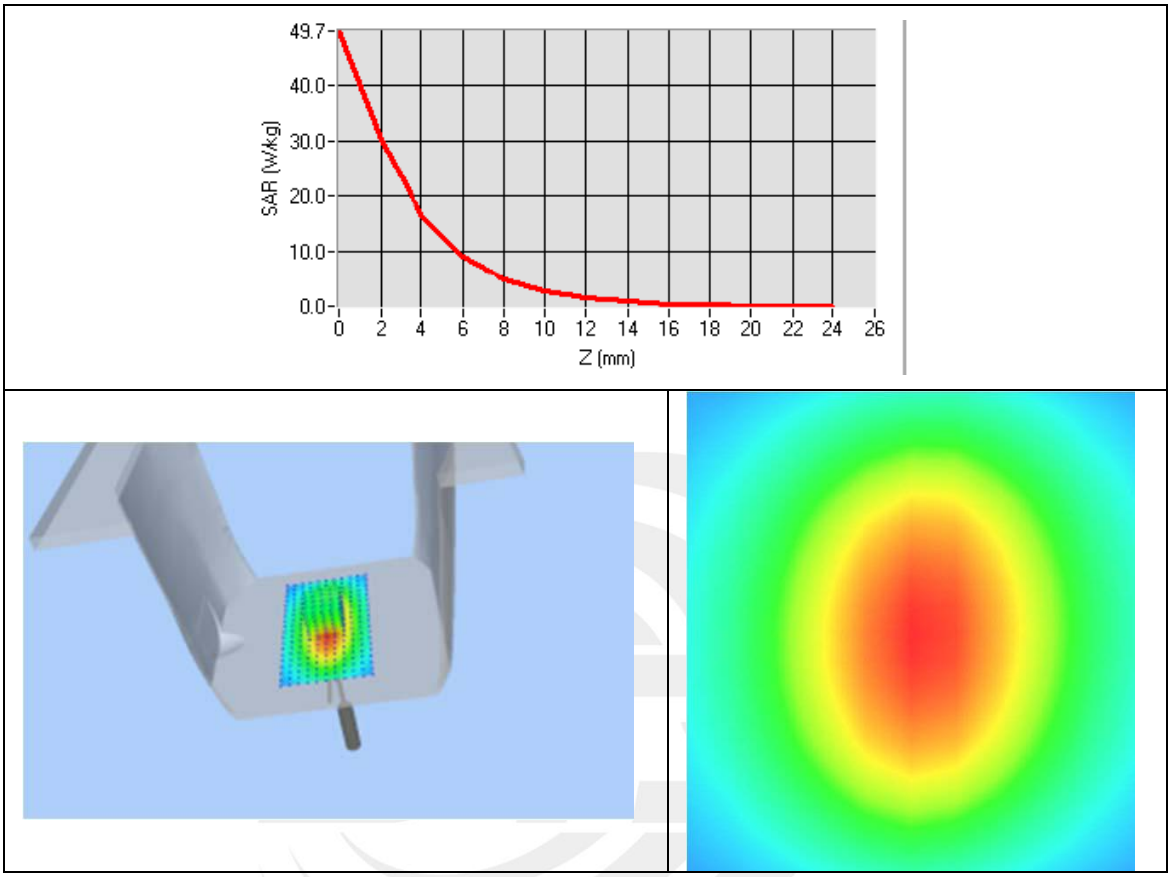
Device Position	Validation plane
Band	5400 MHz
Channels	-
Signal	CW
Frequency (MHz)	5400
Relative permittivity	52.25
Conductivity (S/m)	2.17
Power drift (%)	-1.77
Probe	SN 45/15 EPGO281
ConvF	2.52
Crest factor:	1:1

SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=2.00

SAR 10g (W/Kg)	5.940368
SAR 1g (W/Kg)	16.531257

Z Axis Scan

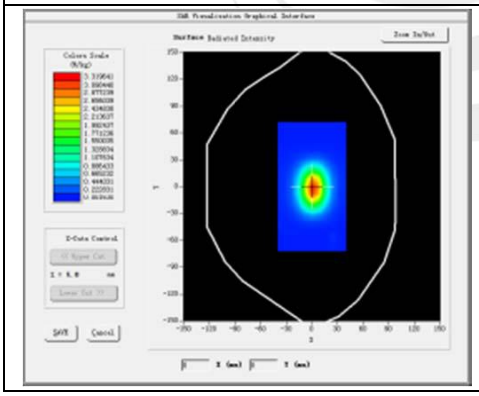
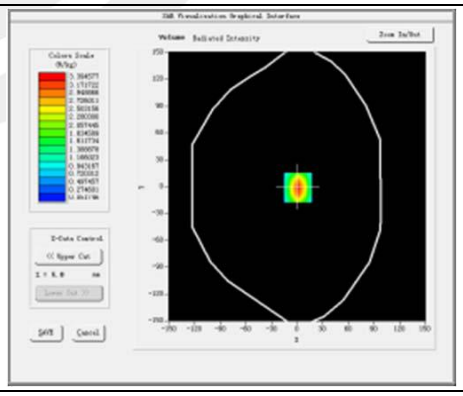


System Performance Check Data(5600MHz)

Type: Dipole measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-06

Experimental conditions.

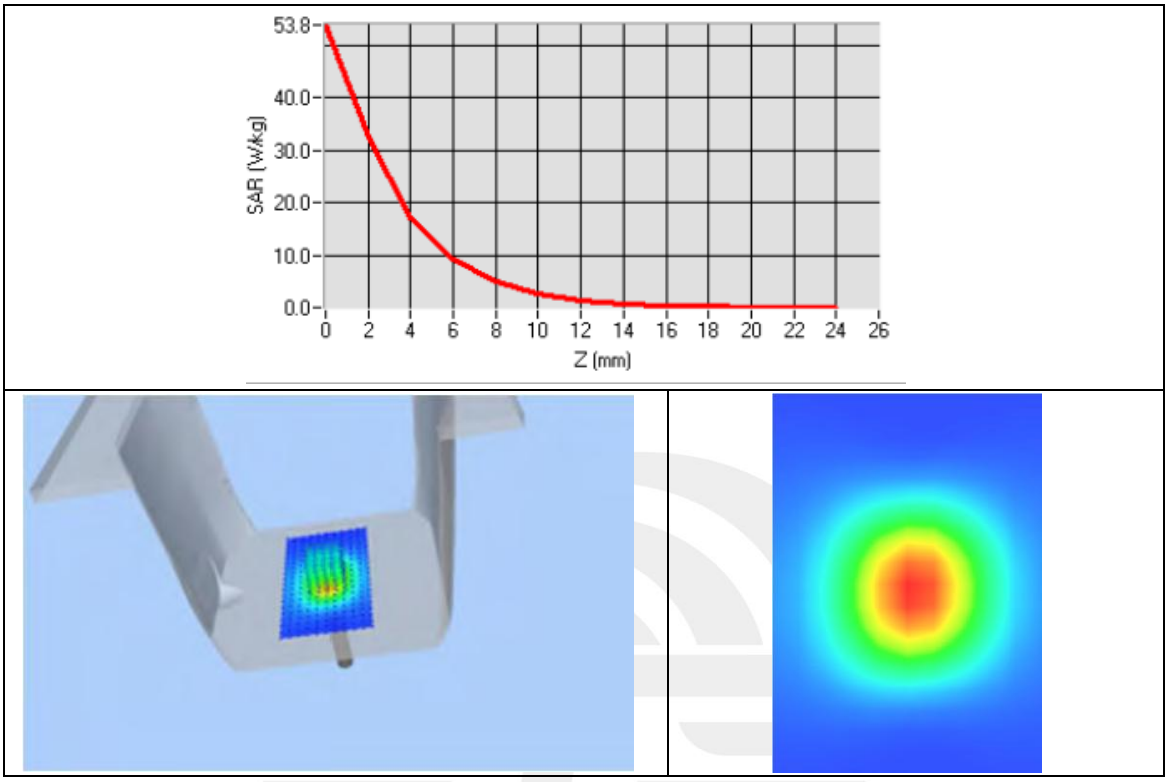
Device Position	Validation plane
Band	5600 MHz
Channels	-
Signal	CW
Frequency (MHz)	5600
Relative permittivity	48.70
Conductivity (S/m)	5.81
Power drift (%)	1.86
Probe	SN 45/15 EPGO281
ConvF	2.83
Crest factor:	1:1

SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=2.00

SAR 10g (W/Kg)	6.164877
SAR 1g (W/Kg)	17.502183

Z Axis Scan

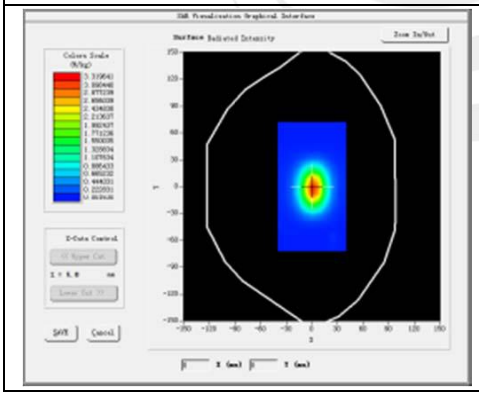
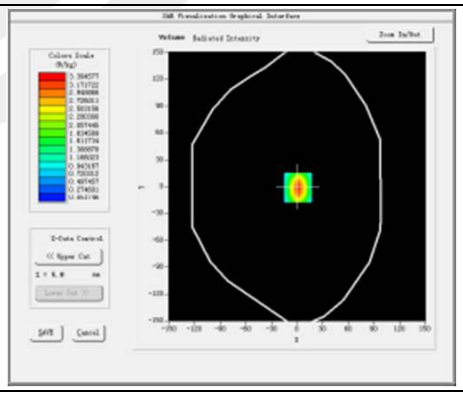


System Performance Check Data(5800MHz)

Type: Dipole measurement (Complete)
Area scan resolution: dx=8mm,dy=8mm
Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm
Date of measurement: 2018-05-06

Experimental conditions.

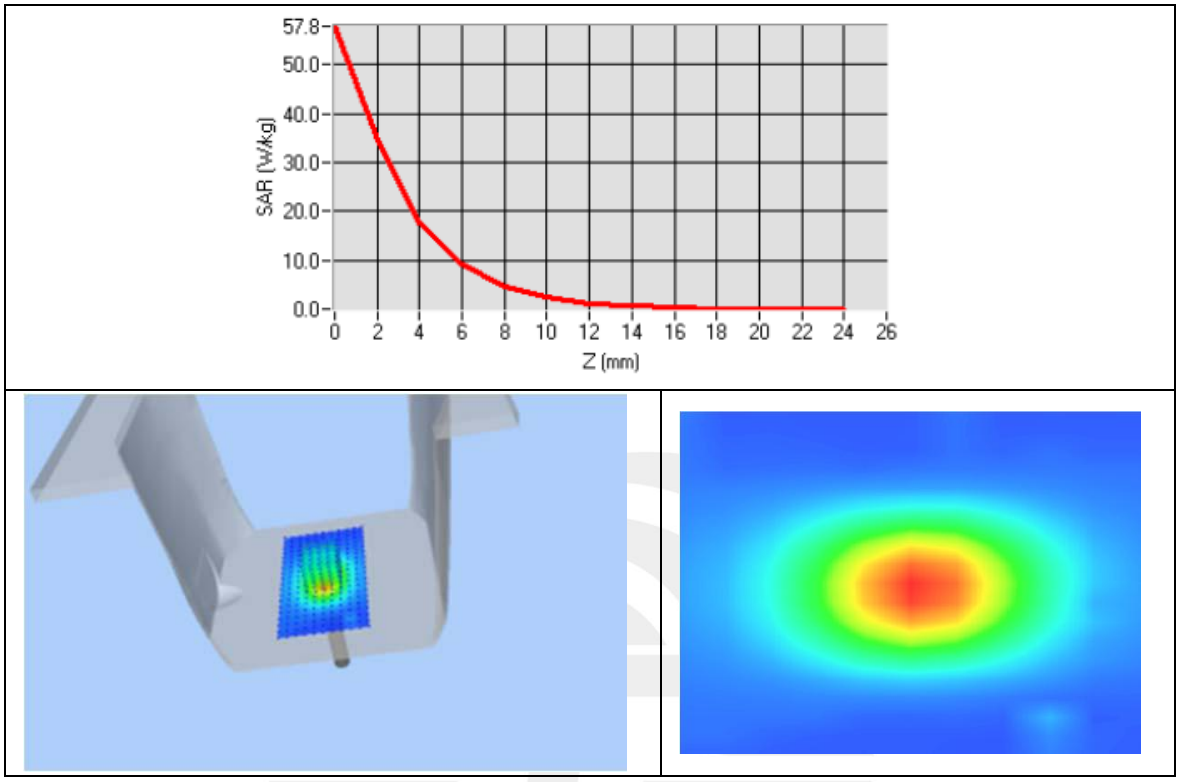
Device Position	Validation plane
Band	5800 MHz
Channels	-
Signal	CW
Frequency (MHz)	5800
Relative permittivity	50.07
Conductivity (S/m)	5.87
Power drift (%)	-1.00
Probe	SN 45/15 EPGO281
ConvF	2.60
Crest factor:	1:1

SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=2.00

SAR 10g (W/Kg)	5.380509
SAR 1g (W/Kg)	18.048756

Z Axis Scan


57.8
50.0
40.0
30.0
20.0
10.0
0.0
SAR (W/kg)
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Z (mm)

Appendix B. SAR Test Plots

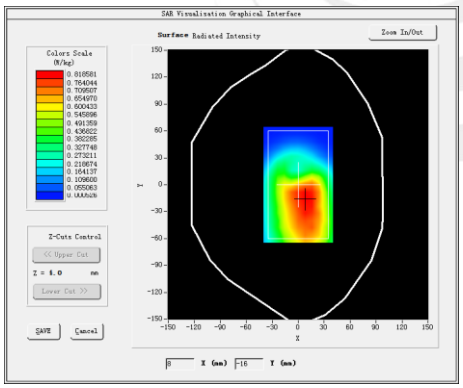
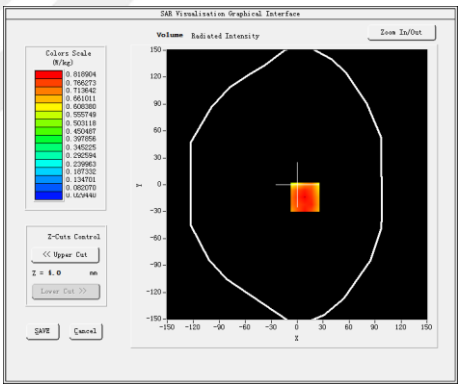
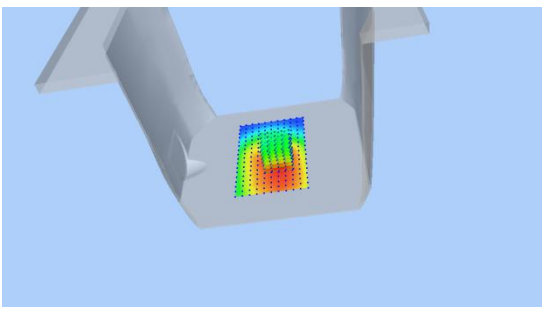
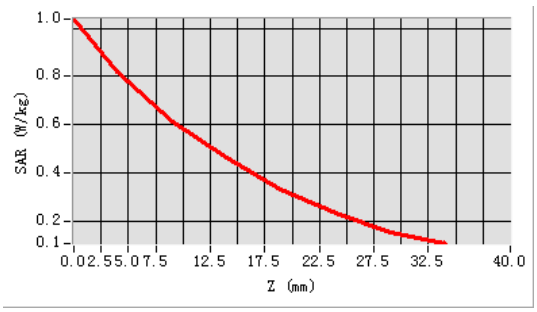
Plot 1: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-02
Probe	SN 45/15 EPGO281
ConvF	1.85
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	GPRS 850
Channels	Middle
Signal	Duty Cycle: 1:2.00 (Crest factor: 2)
Frequency (MHz)	836.6
Relative permittivity (real part)	55.20
Conductivity (S/m)	0.97
Variation (%)	0.23

Maximum location: X=9.00, Y=-14.00

SAR Peak: 1.07 W/kg

SAR 10g (W/Kg)	0.565060
SAR 1g (W/Kg)	0.761866

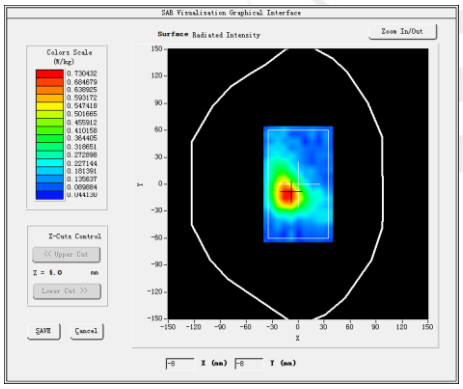
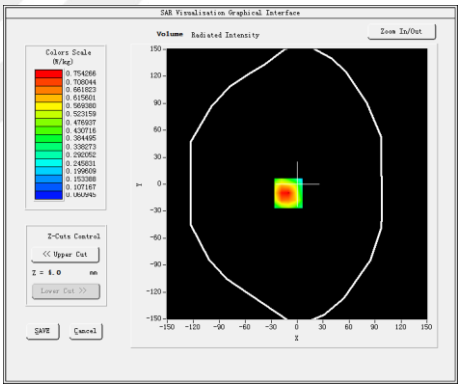
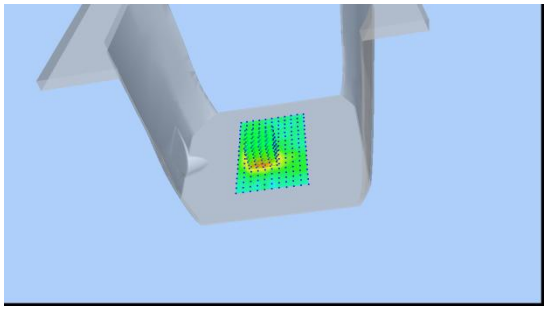
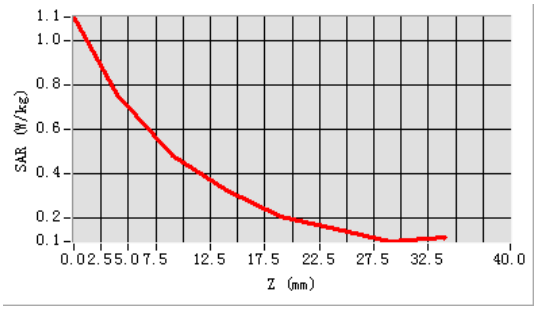
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 2: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-02
Probe	SN 45/15 EPGO281
ConvF	1.85
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	EGPRS 850
Channels	High
Signal	Duty Cycle: 1:2.00 (Crest factor: 2.7)
Frequency (MHz)	848.8
Relative permittivity (real part)	55.20
Conductivity (S/m)	0.97
Variation (%)	3.40

Maximum location: X=-10.00, Y=-10.00
SAR Peak: 1.17 W/kg

SAR 10g (W/Kg)	0.430499
SAR 1g (W/Kg)	0.740657

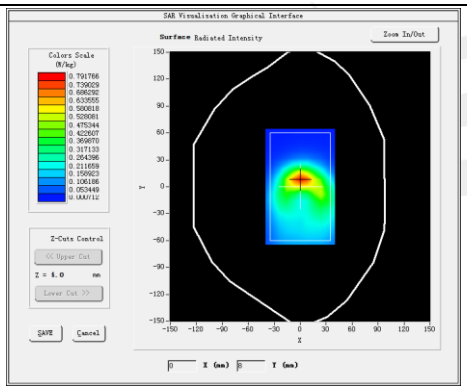
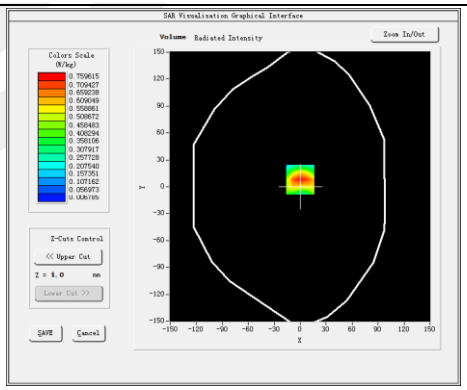
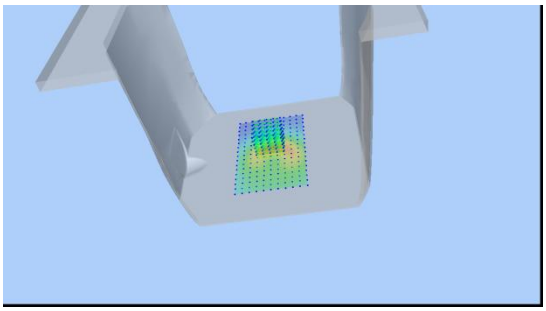
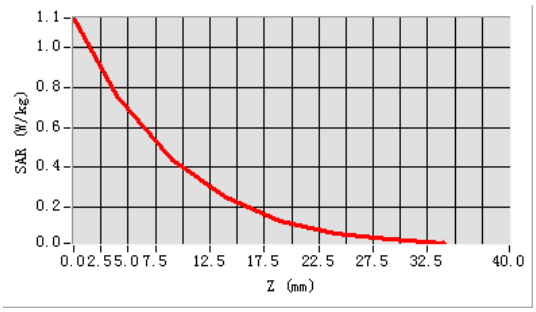
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 3: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-03
Probe	SN 45/15 EPGO281
ConvF	2.16
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body Back side
Band	GPRS 1900
Channels	High
Signal	Duty Cycle: 1:2.00 (Crest factor: 2.0)
Frequency (MHz)	1909.8
Relative permittivity (real part)	53.30
Conductivity (S/m)	1.52
Variation (%)	-3.71

Maximum location: X=0.00, Y=8.00
SAR Peak: 1.19 W/kg

SAR 10g (W/Kg)	0.370415
SAR 1g (W/Kg)	0.712401

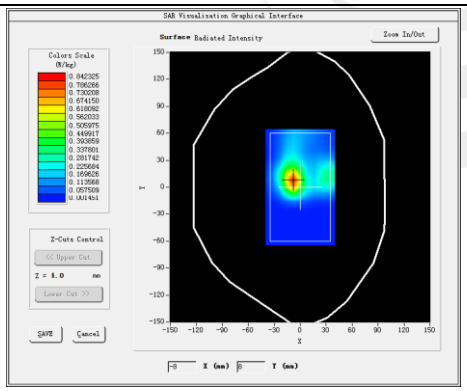
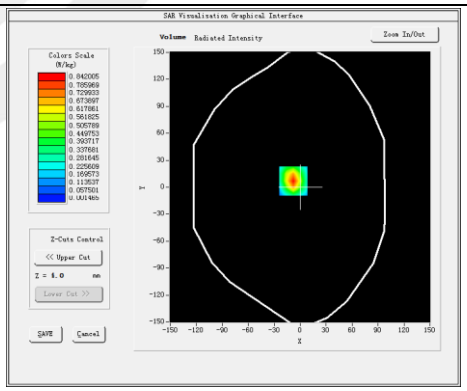
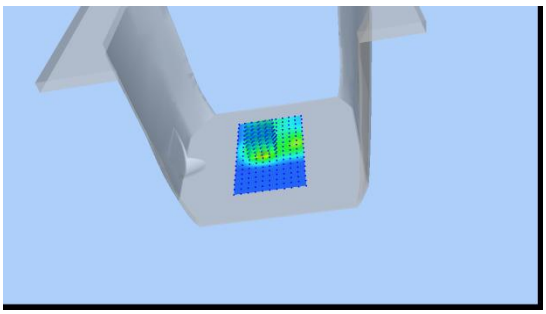
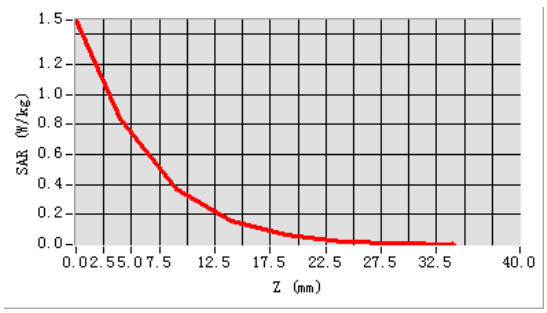
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 4: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-03
Probe	SN 45/15 EPGO281
ConvF	2.16
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body Back side
Band	EGPRS 1900
Channels	High
Signal	Duty Cycle: 1:2.00 (Crest factor: 2.0)
Frequency (MHz)	1909.8
Relative permittivity (real part)	53.30
Conductivity (S/m)	1.52
Variation (%)	3.44

Maximum location: X=-8.00, Y=7.00
SAR Peak: 1.48 W/kg

SAR 10g (W/Kg)	0.333808
SAR 1g (W/Kg)	0.736583

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

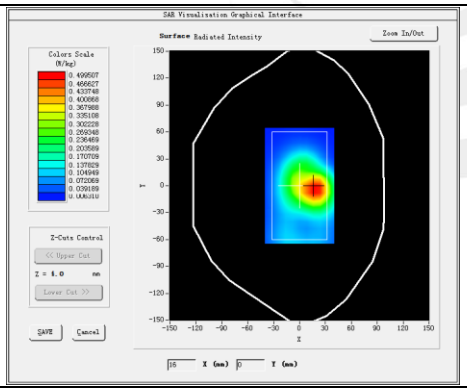
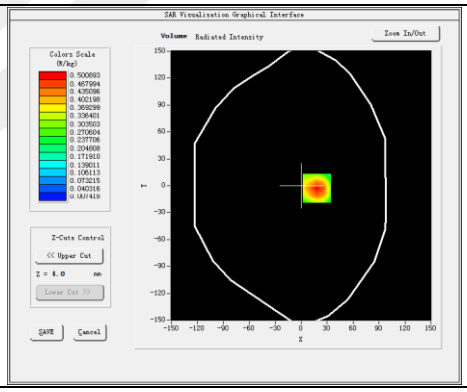
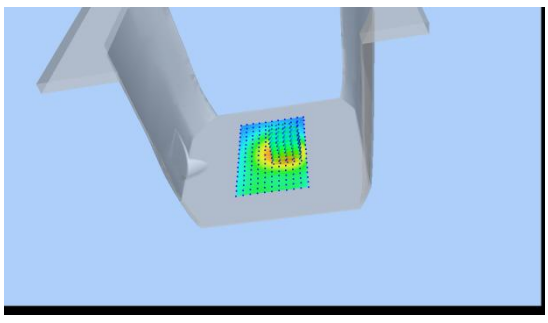
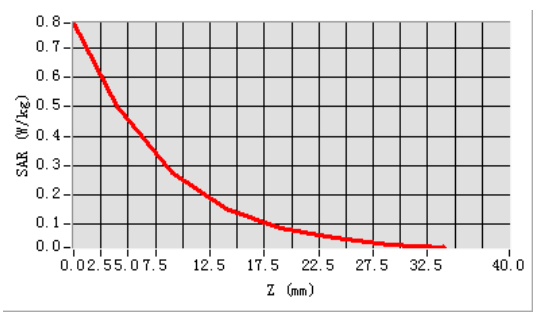
Plot 5: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2017-05-03
Probe	SN 45/15 EPGO281
ConvF	2.16
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back side
Band	WCDMA II
Channels	Low
Signal	WCDMA (Crest factor: 1.0)
Frequency (MHz)	1852.4
Relative permittivity (real part)	53.30
Conductivity (S/m)	1.52
Variation (%)	0.30

Maximum location: X=18.00, Y=-3.00

SAR Peak: 0.79 W/kg

SAR 10g (W/Kg)	0.264059
SAR 1g (W/Kg)	0.484085

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

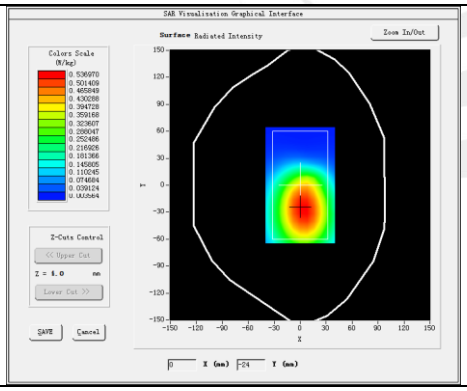
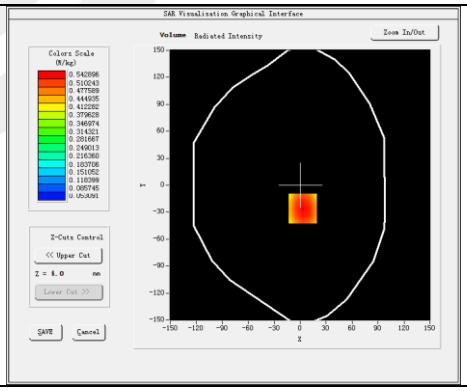
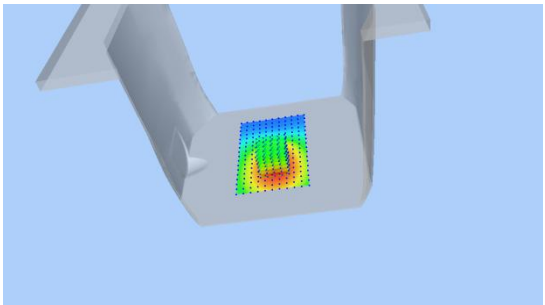
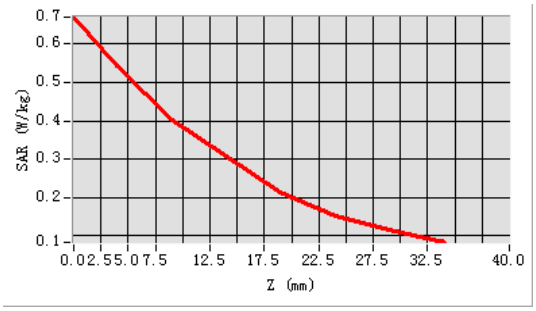
Plot 6: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-02
Probe	SN 45/15 EPGO281
ConvF	1.85
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	WCDMA V
Channels	Low
Signal	WCDMA (Crest factor: 1.0)
Frequency (MHz)	826.4
Relative permittivity (real part)	55.20
Conductivity (S/m)	0.97
Variation (%)	-0.01

Maximum location: X=-3.00, Y=-26.00

SAR Peak: 0.72 W/kg

SAR 10g (W/Kg)	0.372960
SAR 1g (W/Kg)	0.530695

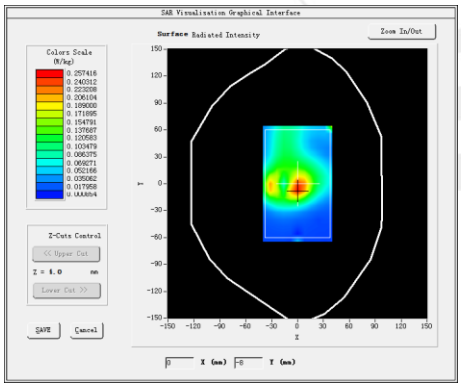
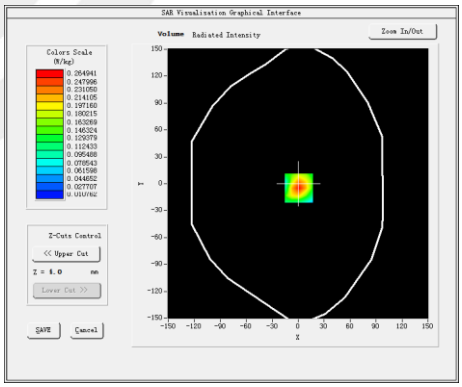
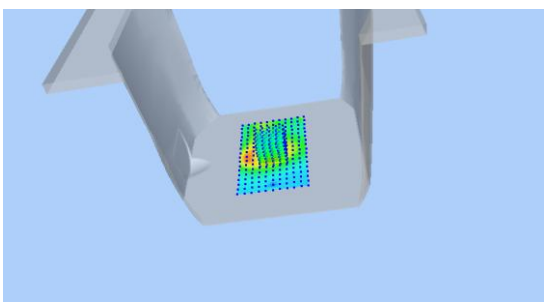
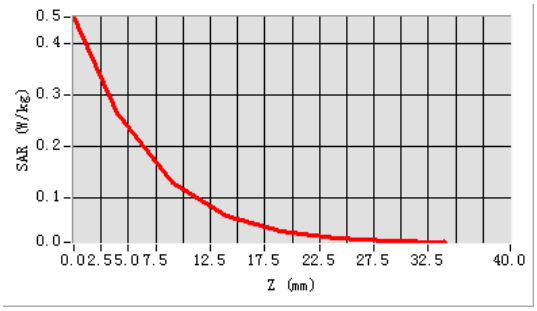
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 7: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-04
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11b ISM
Channels	High
Signal	IEEE802.b (Crest factor: 1.0)
Frequency (MHz)	2462
Relative permittivity (real part)	52.70
Conductivity (S/m)	1.95
Variation (%)	0.21

Maximum location: X=1.00, Y=-5.00
SAR Peak: 0.46 W/kg

SAR 10g (W/Kg)	0.123031
SAR 1g (W/Kg)	0.250959

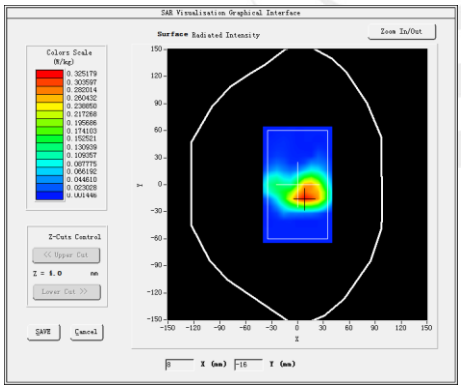
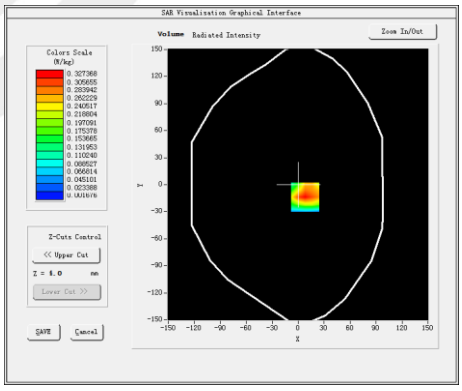
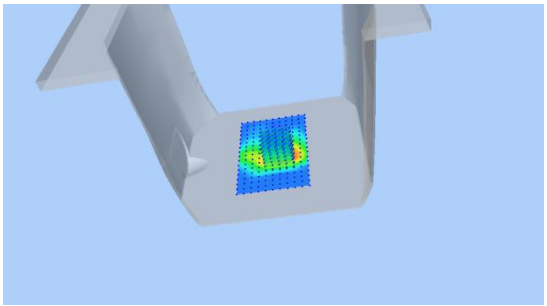
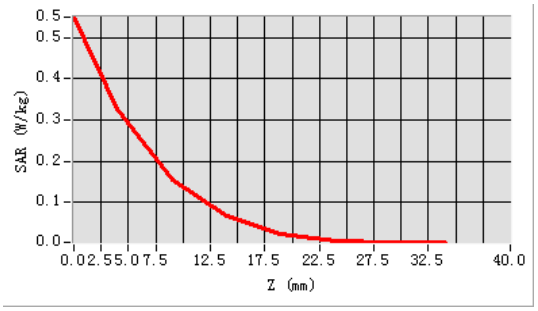
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 8: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-04
Probe	SN 45/15 EPGO281
ConvF	2.28
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11n
Channels	High
Signal	IEEE802.n (Crest factor: 1.0)
Frequency (MHz)	2462
Relative permittivity (real part)	52.70
Conductivity (S/m)	1.95
Variation (%)	-1.37

Maximum location: X=8.00, Y=-14.00
SAR Peak: 0.50 W/kg

SAR 10g (W/Kg)	0.147928
SAR 1g (W/Kg)	0.288321

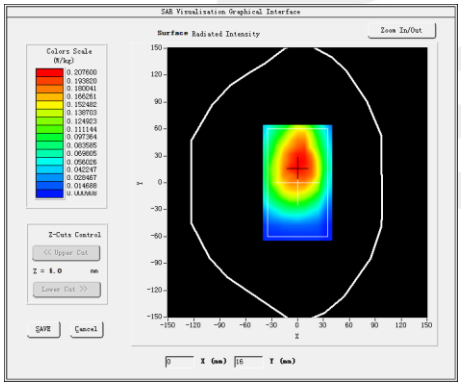
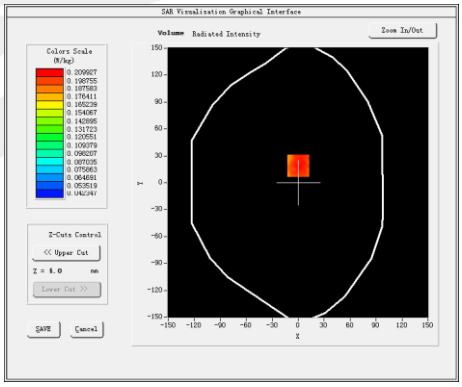
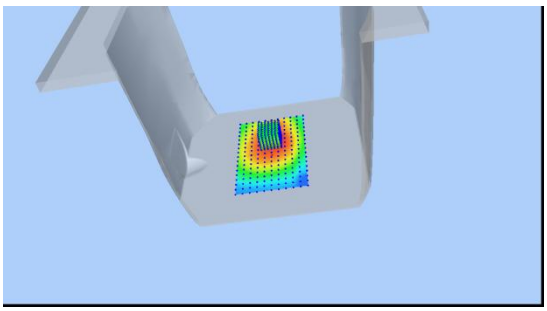
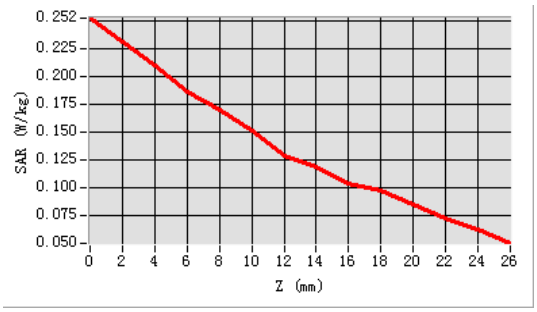
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 9: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-05
Probe	SN 45/15 EPGO281
ConvF	2.52
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11a U-NII
Channels	Low
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5180
Relative permittivity (real part)	34.89
Conductivity (S/m)	4.53
Variation (%)	3.37

Maximum location: X=0.00, Y=19.00
SAR Peak: 0.28 W/kg

SAR 10g (W/Kg)	0.145972
SAR 1g (W/Kg)	0.199212

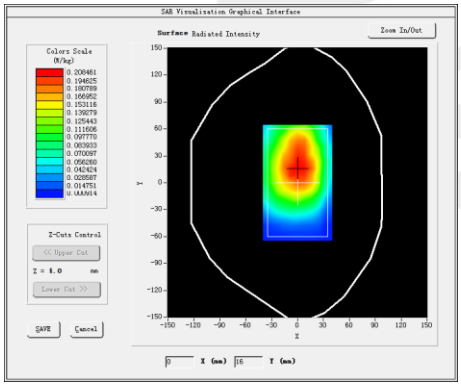
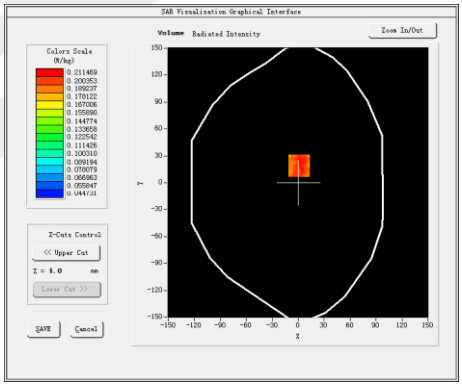
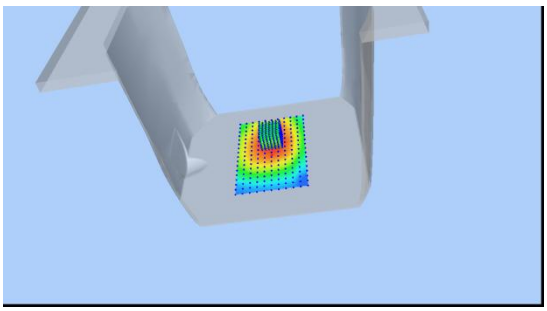
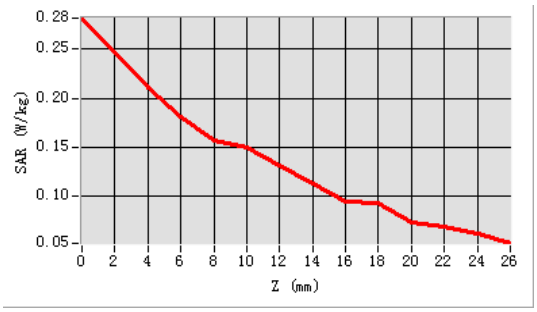
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 10: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-05
Probe	SN 45/15 EPGO281
ConvF	2.79
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11a U-NII
Channels	Low
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5260
Relative permittivity (real part)	36.14
Conductivity (S/m)	4.93
Variation (%)	-0.23

Maximum location: X=1.00, Y=19.00
SAR Peak: 0.30 W/kg

SAR 10g (W/Kg)	0.144376
SAR 1g (W/Kg)	0.198402

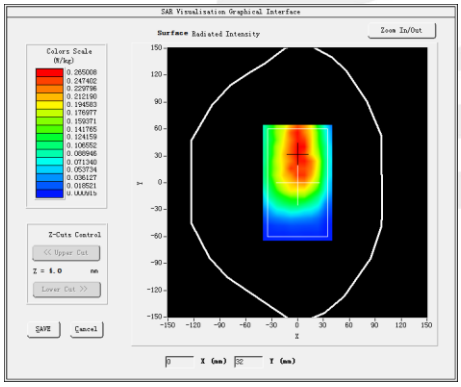
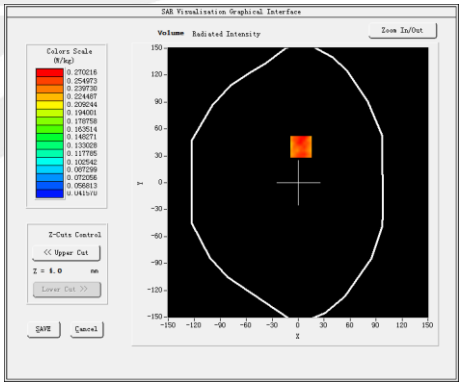
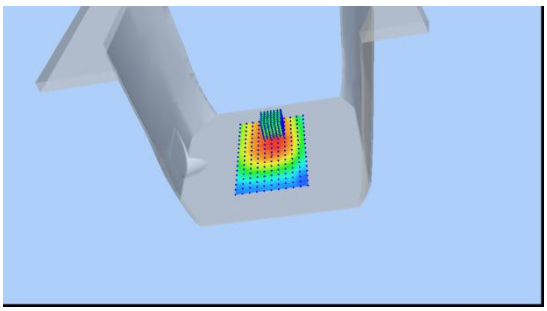
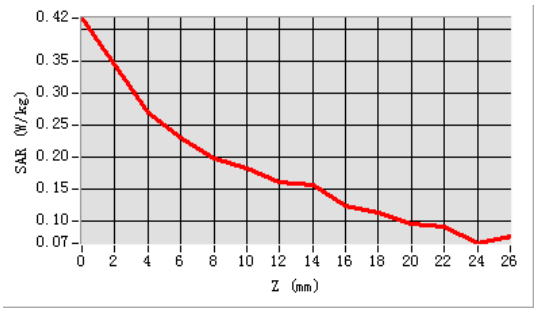
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 11: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-06
Probe	SN 45/15 EPGO281
ConvF	2.83
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11a U-NII
Channels	Middle
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5580
Relative permittivity (real part)	34.80
Conductivity (S/m)	5.08
Variation (%)	0.09

Maximum location: X=3.00, Y=40.00
SAR Peak: 0.39 W/kg

SAR 10g (W/Kg)	0.182004
SAR 1g (W/Kg)	0.249815

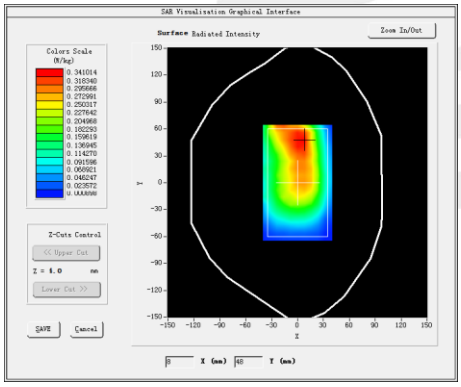
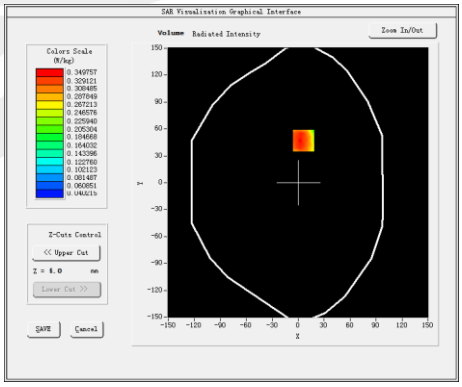
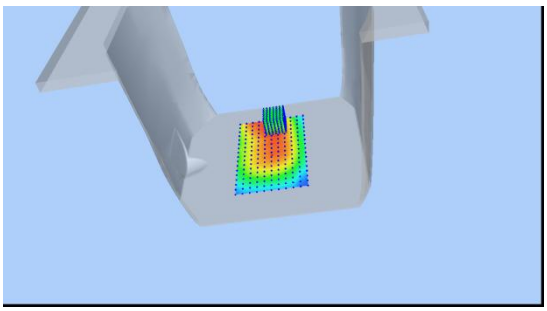
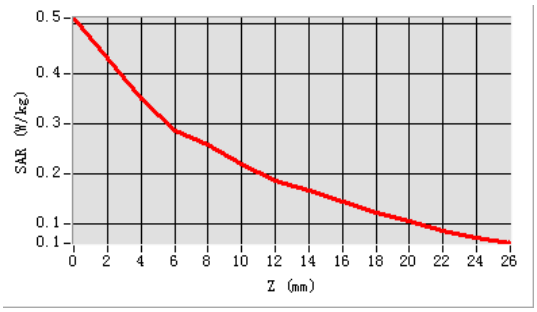
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 12: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-06
Probe	SN 45/15 EPGO281
ConvF	2.60
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11 a U-NII
Channels	High
Signal	IEEE802.a (Crest factor: 1.0)
Frequency (MHz)	5825
Relative permittivity (real part)	35.68
Conductivity (S/m)	5.31
Variation (%)	-3.56

Maximum location: X=6.00, Y=47.00
SAR Peak: 0.51 W/kg

SAR 10g (W/Kg)	0.220280
SAR 1g (W/Kg)	0.325912

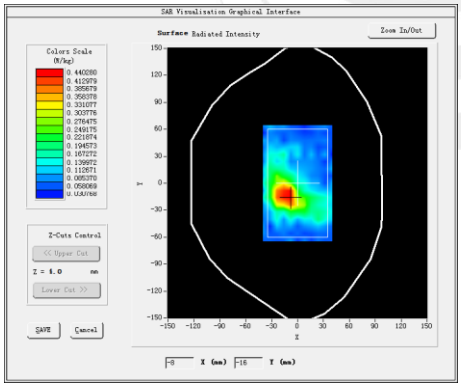
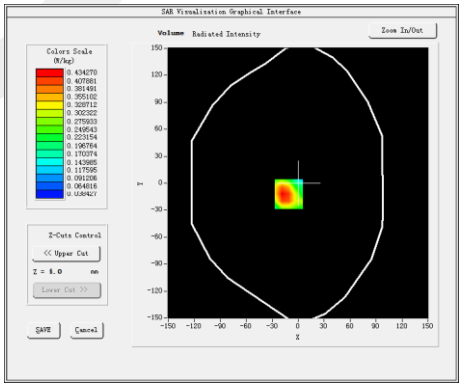
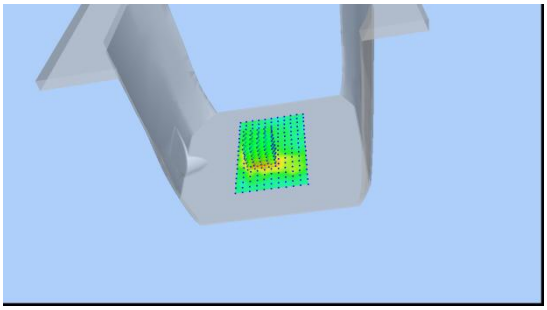
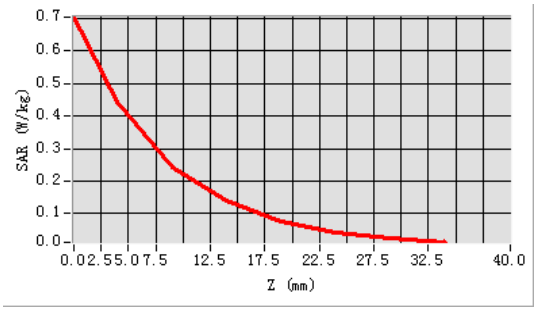
SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

Plot 13: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-06
Probe	SN 45/15 EPGO281
ConvF	2.60
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11 ac
Channels	Low
Signal	IEEE802.ac (Crest factor: 1.0)
Frequency (MHz)	5745
Relative permittivity (real part)	35.68
Conductivity (S/m)	5.31
Variation (%)	0.95

Maximum location: X=-11.00, Y=-12.00
SAR Peak: 0.76 W/kg

SAR 10g (W/Kg)	0.245024
SAR 1g (W/Kg)	0.395766

SURFACE SAR	VOLUME SAR
	
3D	**Z Axis Scan**
	

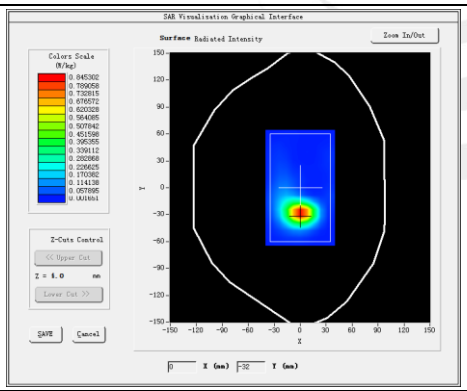
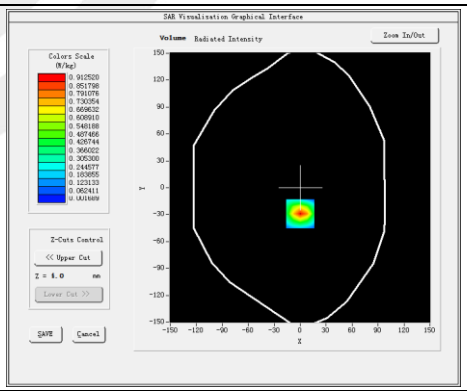
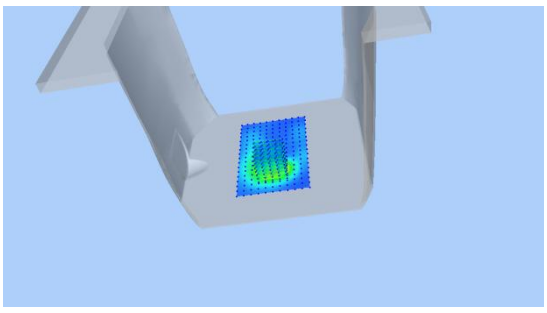
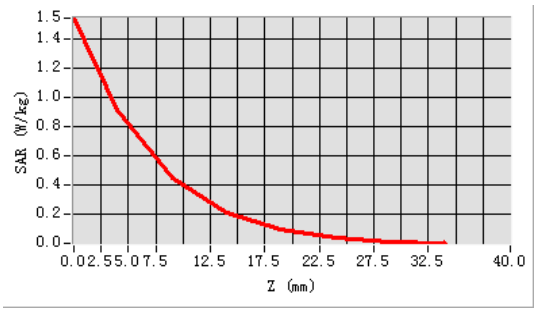
Plot 14: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-03
Probe	SN 45/15 EPGO281
ConvF	2.16
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	LTE Band 2(RB 1)
Channels	Middle
Signal	LTE (Crest factor: 1.0)
Frequency (MHz)	1880
Relative permittivity (real part)	53.30
Conductivity (S/m)	1.52
Variation (%)	1.89

Maximum location: X=0.00, Y=-29.00

SAR Peak: 1.55W/kg

SAR 10g (W/Kg)	0.360765
SAR 1g (W/Kg)	0.833590

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

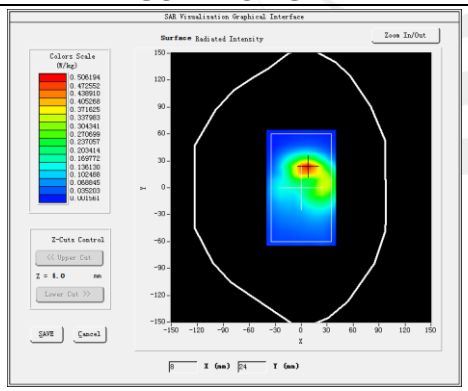
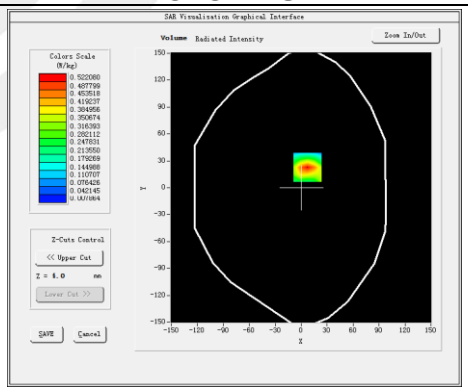
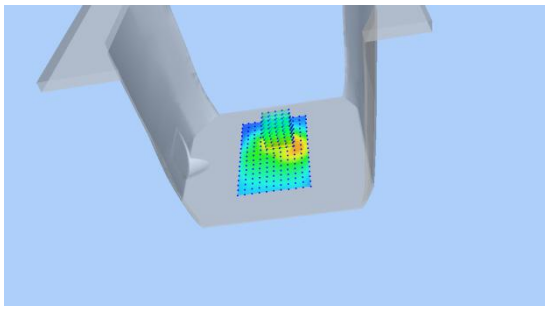
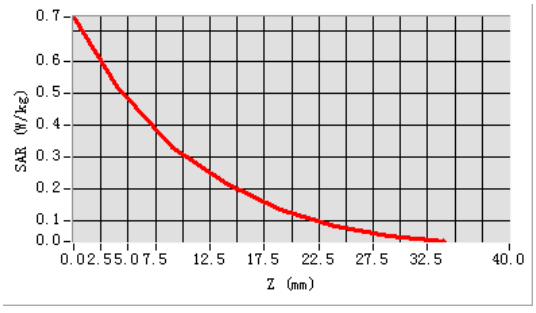
Plot 15: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-03
Probe	SN 45/15 EPGO281
ConvF	1.87
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	LTE Band 4 (RB 1)
Channels	Middle
Signal	LTE (Crest factor: 1.0)
Frequency (MHz)	1732.5
Relative permittivity (real part)	53.30
Conductivity (S/m)	1.52
Variation (%)	-0.08

Maximum location: X=7.00, Y=23.00

SAR Peak: 0.74 W/kg

SAR 10g (W/Kg)	0.264498
SAR 1g (W/Kg)	0.477903

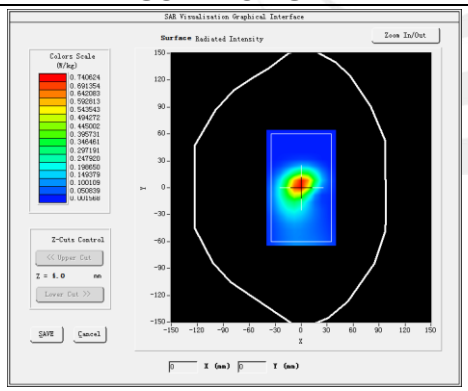
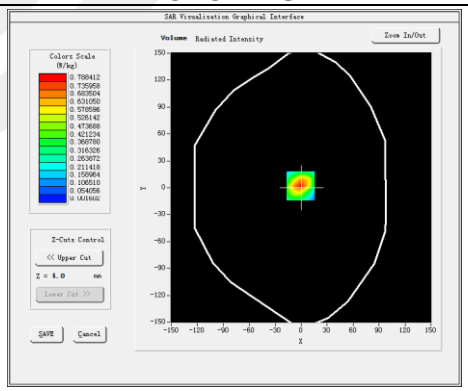
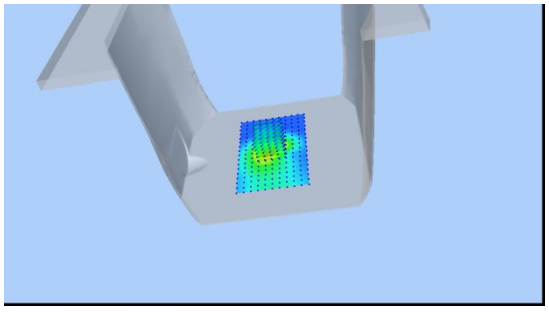
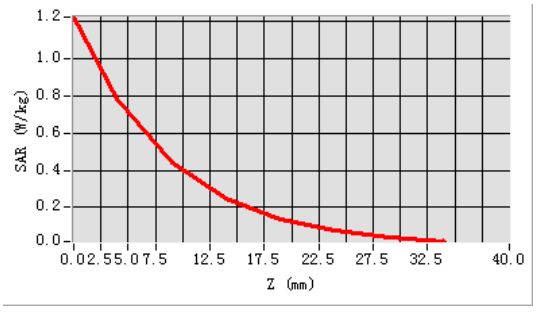
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 16: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-02
Probe	SN 45/15 EPGO281
ConvF	1.85
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	LTE Band 5 (RB 1)
Channels	High
Signal	LTE (Crest factor: 1.0)
Frequency (MHz)	844.0
Relative permittivity (real part)	55.20
Conductivity (S/m)	0.97
Variation (%)	3.18

Maximum location: X=-1.00, Y=2.00
SAR Peak: 1.23 W/kg

SAR 10g (W/Kg)	0.368126
SAR 1g (W/Kg)	0.735568

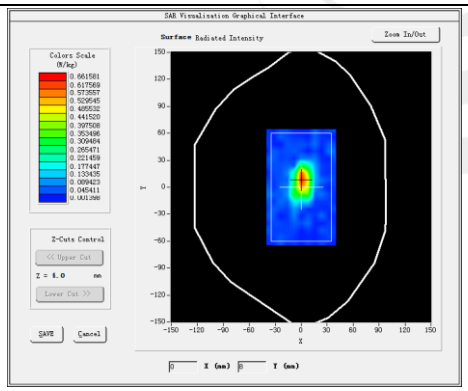
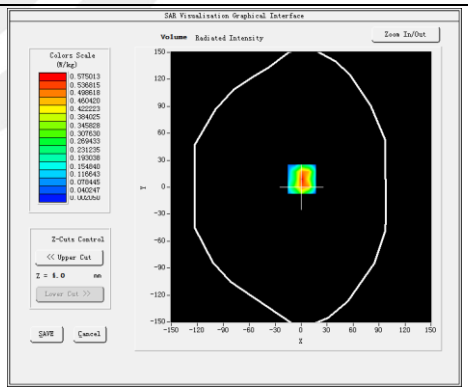
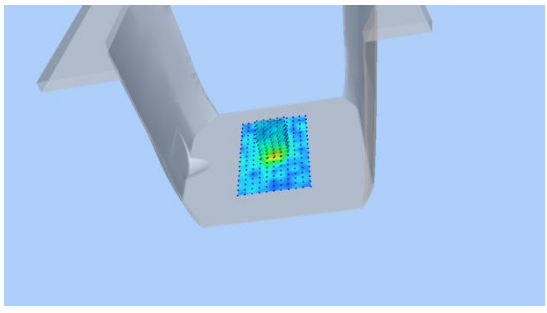
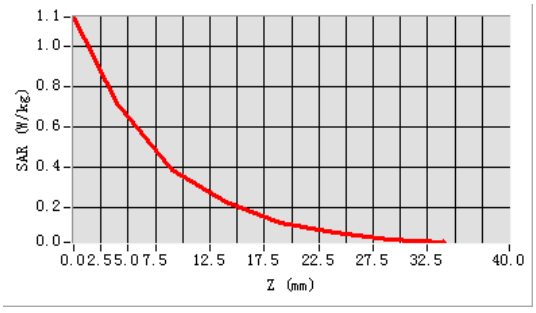
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 17: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-04-15
Probe	SN 45/15 EPGO281
ConvF	2.38
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	LTE Band 7 (RB 1)
Channels	Low
Signal	LTE (Crest factor: 1.0)
Frequency (MHz)	2510
Relative permittivity (real part)	52.50
Conductivity (S/m)	2.16
Variation (%)	-3.91

Maximum location: X=1.00, Y=9.00
SAR Peak: 1.10 W/kg

SAR 10g (W/Kg)	0.214976
SAR 1g (W/Kg)	0.533998

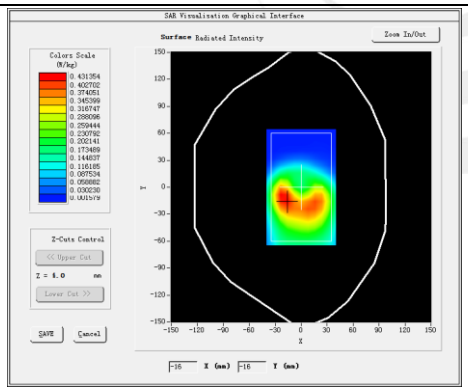
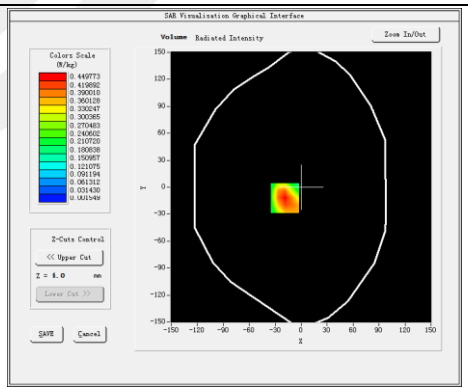
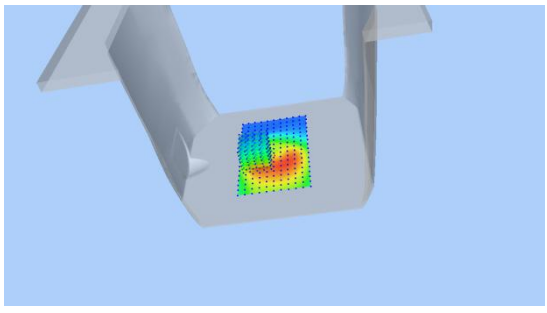
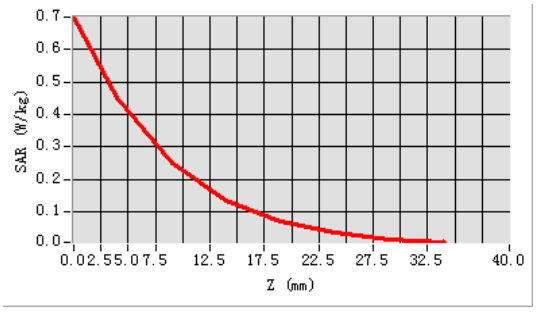
SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Plot 18: DUT: Handheld GNSS Data Collector; EUT Model: HCE320

Test Date	2018-05-02
Probe	SN 45/15 EPGO281
ConvF	1.59
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm, Complete/ndx=8mm dy=8mm, h= 5.00 mm
Phantom	Validation plane
Device Position	Body back
Band	LTE Band 17 (RB 1)
Channels	Low
Signal	LTE (Crest factor: 1.0)
Frequency (MHz)	709
Relative permittivity (real part)	55.50
Conductivity (S/m)	0.96
Variation (%)	1.60

Maximum location: X=-19.00, Y=-12.00
SAR Peak: 0.71 W/kg

SAR 10g (W/Kg)	0.230679
SAR 1g (W/Kg)	0.427536

SURFACE SAR	VOLUME SAR
	
3D screen shot	**Z Axis Scan**
	

Appendix C. Probe Calibration And Dipole Calibration Report

Refer the appendix Calibration Report.

※※※※※END OF THE REPORT※※※※※