S T S L A B

FCC SAR TEST REPORT

Report No: STS1502002H01

Issued for

DOPPIO MOBILE INTERNATIONAL LIMITED

1011A, 10/F., Harbour Centre Tower 1, No.1 Hok Cheung St., Hung Hom Kowloon, Hong Kong.

Product Name:	THUNDER PLUS
Brand Name:	doppio
Model No.:	DP5108
Series Model:	N/A
FCC ID:	N2GDP5108
Test Standard:	ANSI/IEEE Std. C95.1
	FCC 47 CFR Part 2 (2.1093)
	IEEE 1528: 2013
Max. SAR (1g):	Body:1.185 W/kg

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Shenzhen STS Test Services Co., Ltd.
1/F, Building B, Zhuoke Science Park, Chongqing Road, Fuyong, Baoan District, Shenzhen, China
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 13,2015	Valid	Original Report

The test plans were performed in accordance with IEEE Std. 1528:2013; 47CFR § 2.1093; IEEE/ANSI C95.1 and the following specific FCC Test Procedures:

- KDB 447498 D01 General RF Exposure Guidance v05r02
- KDB 648474 D04 Handset SAR v01r02
- KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- KDB 941225 D01 3G SAR Procedures v03
- KDB 941225 D06 Hot Spot SAR v02
- KDB 248227 D01 SAR meas for 802 11 a b g v01r02

Test Report Certification

Applicant Name	DOPPIO MOBILE INTERNATIONAL LIMITED
Applicant Address	1011A, 10/F., Harbour Centre Tower 1, No.1 Hok Cheung St., Hung Hom Kowloon, Hong Kong.
Manufacturer Name	DOPPIO MOBILE (SHENZHEN) LIMITED
Manufacturer Address	Room313, 3th Floor, Building 10 Jiale Building, NO.11 YanNan Road,Futian District, Shenzhen
Product Designation	THUNDER PLUS
Brand Name	doppio
Model Name	DP5108
Different Description	N/A
EUT Voltage	DC3.7V by battery
Applicable Standard	IEEE Std. 1528:2013 47CFR § 2.1093 IEEE/ANSI C95.1
Test Date	Jan. 6,2015 to Jan. 9,2015
Performed Location	Shenzhen STS Test Services Co., Ltd. 1/F, Building 2, Zhuoke Science Park, Chongqing Road, Fuyong, Baoan District, Shenzhen, China
Report Template	STSRT-US-3G3/SAR (2014-12-01)

Testing Engineer : Jin Ming

(Jin Ming)

Report writing : Sunny zheng

(Sunny zheng)

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Authorized Signatory : Bovey Yang

(Bovey Yang)

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1/F, Building B, Zhuoke Science Park, Chongqing Road, Fuyong, Bao'an District, Shenzhen,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

1. SUMMARY OF MAXIMUM SAR VALUE

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

Highest Reported SAR ：

Exposure Position	Frequency Band	Highest Reported Maximum SAR(W/Kg)	Highest Simultaneous Reported SAR(W/Kg)
Body	2G Band	**0.909**	**1.554**
	3G Band	**1.185**	

This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/Kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1, and had been tested in accordance with measurement methods and procedures specified in IEEE 1528-2013 and the relevant KDB files like KDB 941225 D01 ,KDB 865664 D02….etc.

2. GENERAL INFORMATION

2.1. EUT Description

General Information	
Product Designation	THUNDER PLUS
Test Model	DP5108
Hardware Version	P6120-02
Software Version	DP5108_DOPPIO_ONE
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	Internal
Headphone	Call by headphones to answer or hang up the telephone.
GSM and GPRS	
Support Band	☒GSM 850 ☒PCS 1900 (U.S. Bands) ☒GSM 900 ☒DCS 1800 (Non-U.S. Bands)
GPRS Type	Class B
GPRS Class	Class 12(1Tx+4Rx, 2Tx+3Rx, 3Tx+2Rx, 4Tx+1Rx)
TX Frequency Range	GSM 850 : 824.2~848.8MHz; PCS 1900: 1850.2~1909.8MHz;
RX Frequency Range	GSM 850 : 869~894MHz PCS 1900: 1930~1990MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS
Antenna Gain	-1.0dBi(GSM/WCDMA 850), -0.8dBi (GSM/WCDMA 1900)
Max. Average Power (Max. Peak Power)	GSM850: 31.15dBm(32.37dBm-Peak Power) PCS1900: 28.15dBm(29.31dBm-Peak Power)
Bluetooth	
Bluetooth Version	☐V2.0 ☐V2.1 ☐V2.1+EDR ☒V3.0 ☐V3.0+HS ☒V4.0
Operation Frequency	2402~2480MHz
Type of modulation	☒GFSK ☒Π/4-DQPSK ☒8-DPSK
Avg. Burst Power	0.12dBm
Antenna Gain	0.8dBi

EUT Description(Continue)

WCDMA	
Support Band	U.S. Bands: ☒UMTS FDD Band II ☒UMTS FDD Band V Non-U.S. Bands: ☐UMTS FDD Band I ☐UMTS FDD Band VIII
HS Type	HSPA(HSUPA/HSDPA)
TX Frequency Range	WCDMA FDD Band II: 1852.4 -1907.6MHz WCDMA FDD Band V: 826.4-846.6MHz
RX Frequency Range	WCDMA FDD Band II: 1930-1990MHz WCDMA FDD Band V: 869-894MHz
Release Version	Rel-6
Type of modulation	QPSK
Antenna Gain	-1.0dBi(GSM/WCDMA 850), -0.8dBi (GSM/WCDMA 1900)
Max. Average Power (Max. Peak Power)	Band II: 21.32dBm (23.45dBm- Peak Power) Band V: 21.13dBm (23.32dBm- Peak Power)
WIFI	
WIFI Specification	☐802.11a ☒802.11b ☒802.11g ☒802.11n(20) ☒802.11n(40)
Operation Frequency	2412~2462MHz
Avg. Burst Power	11b:9.7dBm,11g:7.54dBm,11n(20):7.48dBm,11n(40):4.75dBm
Antenna Gain	0.8dBi
Accessories	
Battery	Brand name: doppio Model No. : DP5108 Voltage and Capacitance: 3.7 V & 4000mAh
Adapter	Brand name: doppio Model No. : DP5108 Input: AC100-240V 50/60Hz, 0.2A Output: DC 5V, 1A
Earphone	Brand name: N/A Model No. : N/A

Note: CMU200 can measure the average power and Peak power at the same time

Product	Type	
	☒ Production unit	☐ Identical Prototype

2.2. Test Procedure

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	EUT Communicate with 8960, and test them respectively at U.S. bands

2.3. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21± 2
Humidity (%RH)	30-70	55±2

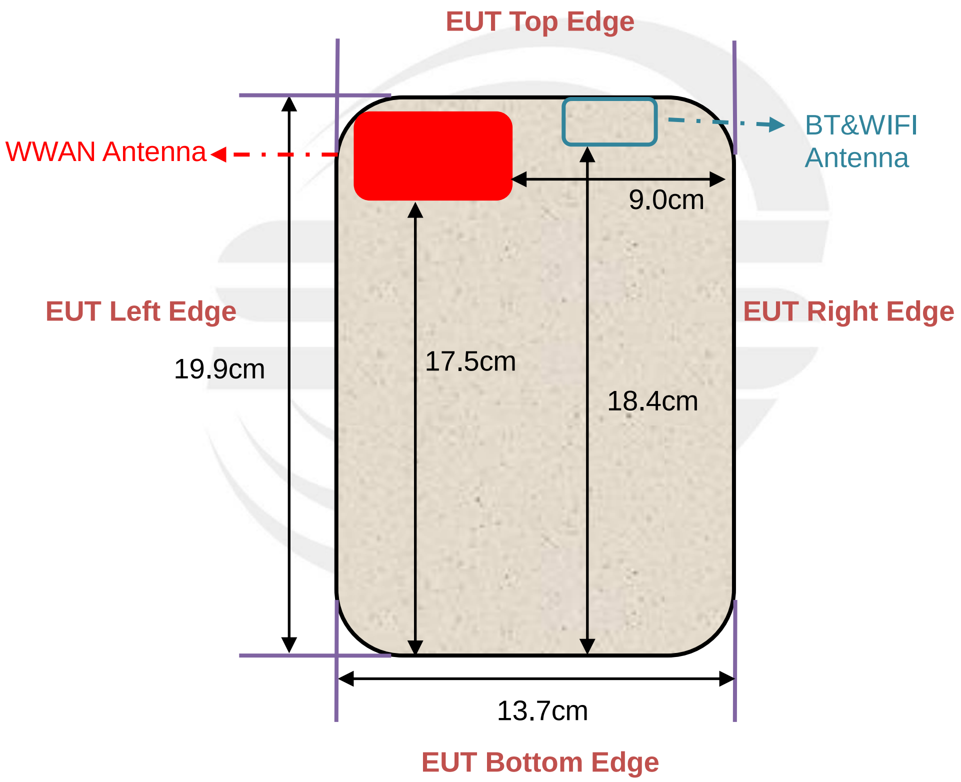
2.4. Test Configuration and setting

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

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

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

Antenna Location: (the front side)



For WWAN mode:

Test Configurations	Antenna to edges/surface	SAR required
Back	<25mm	Yes
Front	<25mm	Yes
Edge 1 (Top)	1	Yes
Edge 2 (Right)	90	No
Edge 3 (Bottom)	175	No
Edge 4 (Left)	1	Yes

Note: SAR is not required for the distance between the antenna and the edge is <25mm as per KDB 941225D06 Hotspot SAR

For WLAN mode:

Test Configurations	Antenna to edges/surface	SAR required
Back	<25mm	Yes
Front	<25mm	Yes
Edge 1 (Top)	1	Yes
Edge 2 (Right)	55	No
Edge 3 (Bottom)	184	No
Edge 4 (Left)	30	No

The simultaneous transmission possibilities are listed as below:

3. SAR MEASUREMENT SYSTEM

3.1. Specific Absorption Rate (SAR)

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

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume (dv) of given mass 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 can be obtained using either of the following equations:

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

$$SAR = c_h \left.\frac{dT}{dt}\right|_{t=0}$$

Where

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

3.2. SAR Measurement Procedure

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

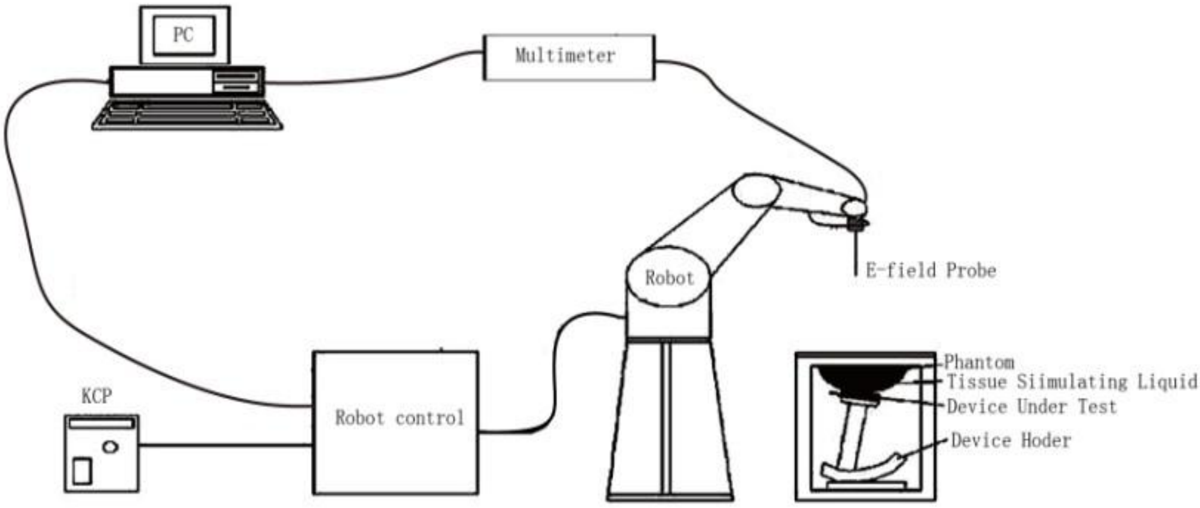
Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the SAM twin phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at $1mm^2$) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at $1mm^3$).

When multiple peak SAR location were found during the same configuration or test mode, Zoom scan shall performed on each peak SAR location, only the peak point with maximum SAR value will be reported for the configuration or test mode.

3.3. COMOSAR System Description



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

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

3.3.1. Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g. IEEE 1528-2013, ANSI C95.1 , relevant KDB files and TCB files.

3.3.2. Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm² step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2013 and relevant KDB files, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

3.3.3. Zoom Scan (Cube Scan Averaging)

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 7x7x7 (5mmx5mmx5mm) providing a volume of 30mm in the X & Y axis, and 30mm in the Z axis.

3.3.4. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Post processor, COMOSAR allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528-2013.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}}\cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

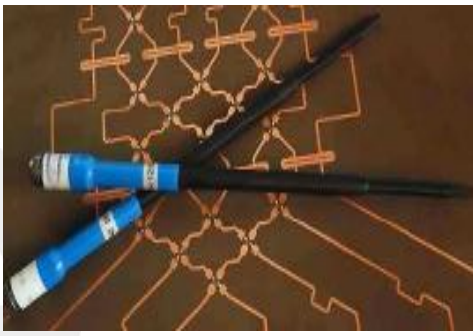
$$f_2(x,y,z) = Ae^{-\frac{z}{a}}\frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

3.4. COMOSAR E-Field Probe

The SAR measurement is conducted with the dosimetric probe manufactured by SATIMO. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. SATIMO conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528-2013 and relevant KDB files.) The calibration data are in Appendix D.

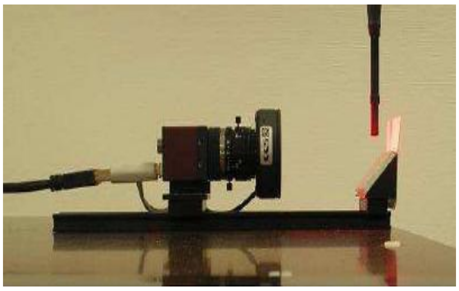
3.5. Isotropic E-Field Probe Specification

Model	SSE5	
Manufacture	SATIMO	
Frequency	0.3GHz-3GHz Linearity:±0.09dB(300MHz-3GHz)	
Dynamic Range	0.01W/Kg-100W/Kg Linearity:±0.09dB	
Dimensions	Overall length:330mm Length of individual dipoles:4.5mm Maximum external diameter:8mm Probe Tip external diameter:5mm Distance between dipoles/ probe extremity:2.7mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 3 GHz with precision of better 30%.	

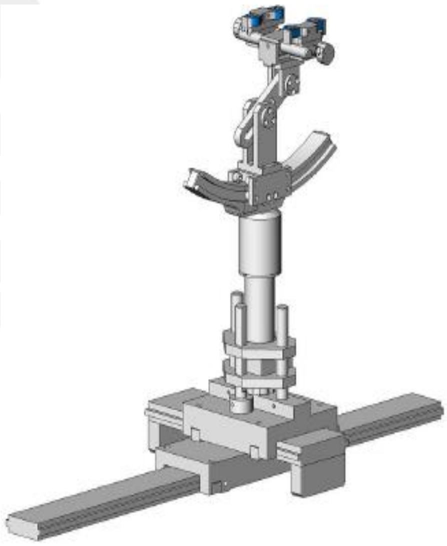
3.6. Robot

The COMOSAR system uses the KUKA robot from SATIMO SA (France).For the 6-axis controller COMOSAR system, the KUKA robot controller version from SATIMO is used.
The XL robot series have many features that are important for our application:
- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

3.7. Video Positioning System

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

3.8. Device Holder

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

3.9. SAM Twin Phantom

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

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

4. TISSUE SIMULATING LIQUID

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 4.2

4.1. The composition of the tissue simulating liquid

Ingredient	835MHz	835MHz	1900MHz	1900MHz
(% Weight)	Head	Body	Head	Body
Water	40.45	52.4	54.90	40.5
Salt	1.42	1.40	0.18	0.50
Sugar	57.6	45.0	0.00	58.0
HEC	0.40	1.00	0.00	0.50
Preventol	0.10	0.20	0.00	0.50
DGBE	0.00	0.00	44.92	0.00
TWEEN	0.00	0.00	0.00	0.00

4.2. Tissue Calibration Result

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

Tissue Stimulant Measurement for 835MHz				
Fr. (MHz)	Dielectric Parameters (±5%) body		Tissue Temp [^{o}C]	Test time
	εr 55.20 52.44-57-96	δ[s/m] 0.97 0.9215-1.0185		
824.2	55.71	0.98	20.7	Jan. 9,2015
826.4	56.10	0.95	20.7	Jan. 9,2015
835.0	56.39	0.97	20.7	Jan. 9,2015
836.6	56.08	0.94	20.7	Jan. 9,2015
846.6	55.43	0.97	20.7	Jan. 9,2015
848.8	55.06	0.95	20.7	Jan. 9,2015

Tissue Stimulant Measurement for 1900MHz				
Fr. (MHz)	Dielectric Parameters (±5%) body		Tissue Temp [^{o}C]	Test time
	εr 53.30 50.635-55.965	δ[s/m] 1.52 1.444-1.596		
1850.2	53.36	1.51	21.1	Jan. 6,2015
1852.4	52.19	1.53	21.1	Jan. 6,2015
1880	53.48	1.48	21.1	Jan. 6,2015
1900	53.89	1.52	21.1	Jan. 6,2015
1907.6	54.29	1.47	21.1	Jan. 6,2015
1909.8	53.09	1.50	21.1	Jan. 6,2015

4.3. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE 1528-2013 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE 1528-2013 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in IEEE 1528-2013.

Target Frequency (MHz)	head		body	
	εr	σ (S/m)	εr	σ (S/m)
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	**55.2**	**0.97**
900	41.5	0.97	55.0	1.05
915	41.5	1.01	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	**53.3**	**1.52**
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

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

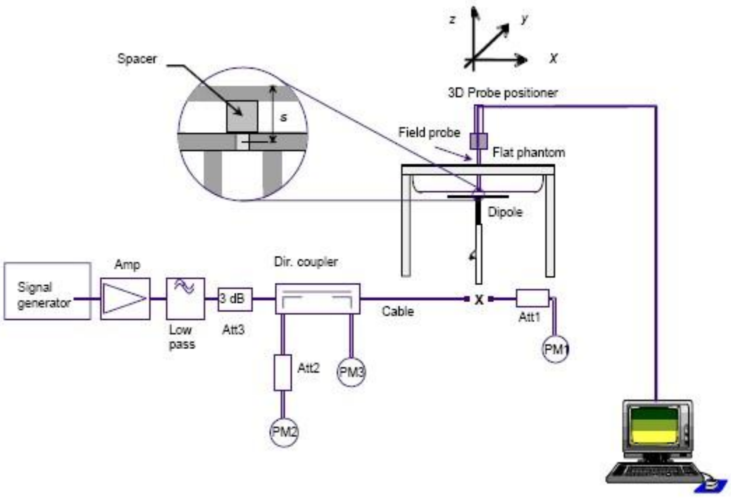
1/F, Building B, Zhuoke Science Park, Chongqing Road, Fuyong, Bao'an District, Shenzhen,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

5. SAR MEASUREMENT PROCEDURE

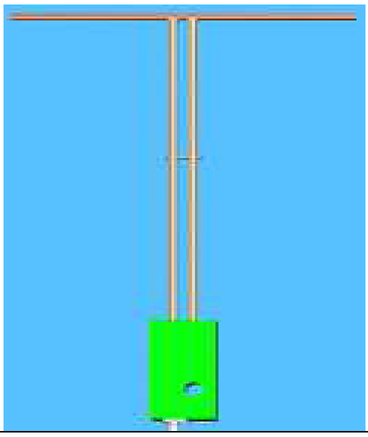
5.1. SAR System Validation Procedures

Each SATIMO system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the SATIMO 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. SAR System Validation
5.2.1. Validation Dipoles



The dipoles used is based on the IEEE1528-2013 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical Specifications for the dipoles.

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

5.2.2. Validation Result

System Performance Check at 835 MHz &1900MHz for Body								
Validation Kit: SN 46/11DIP 0G835-190 & SN 46/11DIP 1G900-187								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
835	9.90	6.39	8.91-10.89	5.75-7.03	10.445	6.886	20.7	Jan. 9,2015
1900	40.74	21.43	36.666-44.814	19.287-23.573	39.184	19.365	21.1	Jan. 6,2015

Note: The input power is 18dbm.

6. EUT TEST POSITION

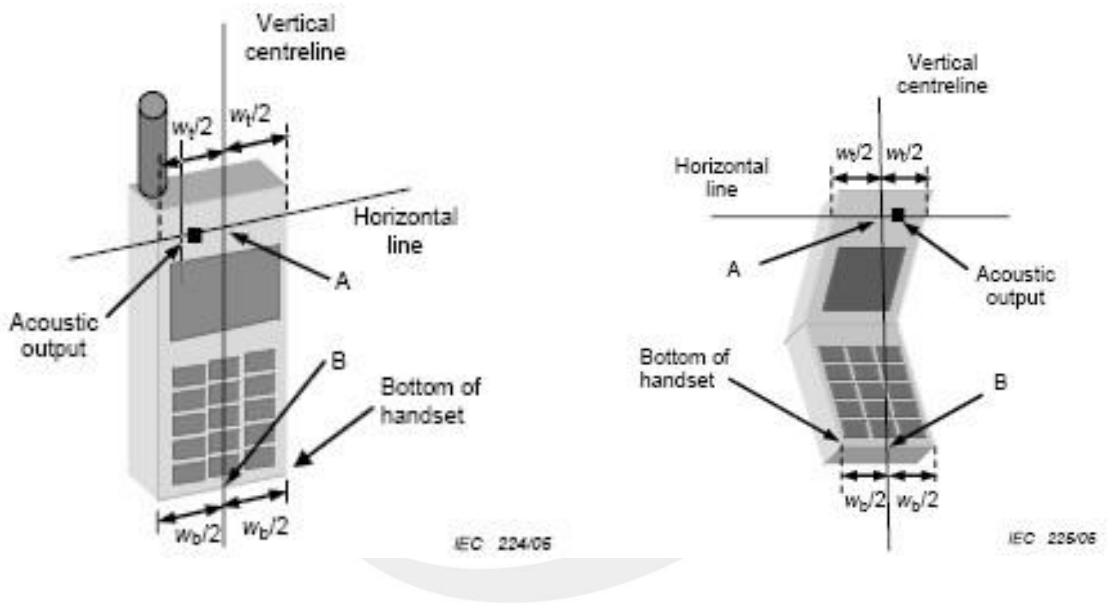
This EUT was tested in **Front Face and Rear Face and 4 edges.**

6.1. Define Two Imaginary Lines on the Handset

(1)The vertical centerline passes through two points on the front side of the handset the midpoint of the width wt of the handset at the level of the acoustic output, and the midpoint of the width wb of the handset.

(2)The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(3)The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



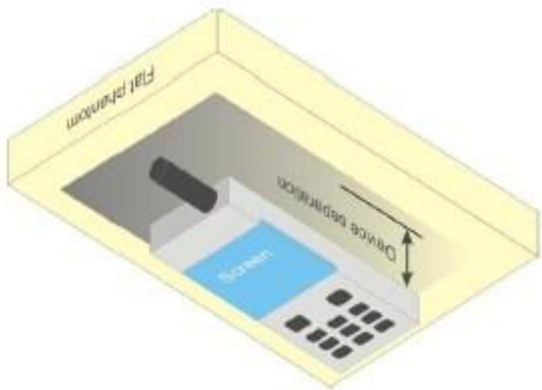
6.2. Body Worn Position

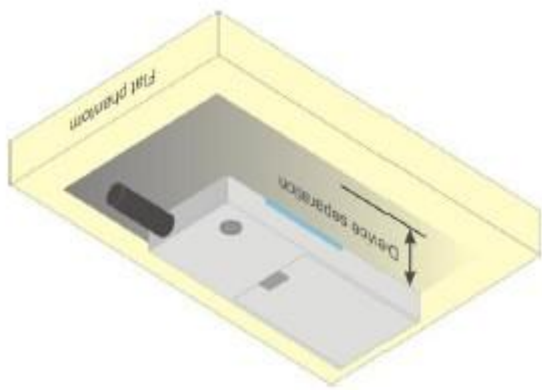
(1) To position the EUT parallel to the phantom surface.

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

(3) To adjust the distance between the EUT surface and the flat phantom to **0mm.**

General Note： Referring KDB941225 D06 v02, SAR must be measured for all sides and surfaces with a transmitting antenna within 25mm from that surface or edge.





7. SAR EXPOSURE LIMITS

SAR assessments have been made in line with the requirements of IEEE-1528:2013, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

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

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

1/F, Building B, Zhuoke Science Park, Chongqing Road, Fuyong, Bao'an District, Shenzhen,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

8. TEST EQUIPMENT LIST

Equipment description	Manufacturer/ Model	Identification No.	Current calibration date	Next calibration date
835MHz Dipole	SATIMO	SN 30/14 DIP0G835-332	2014.09.01	2015.08.31
1900MHz Dipole	SATIMO	SN 30/14 DIP1G900-333	2014.09.01	2015.08.31
2450MHzDipole	SATIMO	SN 30/14 DIP2G450-335	2014.09.01	2015.08.31
E-Field Probe	SATIMO	SN 17/14 EP221	2014.09.01	2015.08.31
Antenna	SATIMO	SN 07/13 ZNTA52	2014.09.01	2015.08.31
Waveguide	SATIMO	SN 13/14 WGA32	2014.09.01	2015.08.31
Phantom1	SATIMO	SN 32/14 SAM115	2014.09.01	2015.08.31
Phantom2	SATIMO	SN 32/14 SAM116	2014.09.01	2015.08.31
SAR TEST BENCH	SATIMO	SN 32/14 MSH97	2014.09.01	2015.08.31
SAR TEST BENCH	SATIMO	SN 32/14 LSH29	2014.09.01	2015.08.31
Dielectric Probe Kit	SATIMO	SN 32/14 OCPG52	2014.09.01	2015.08.31
Multi Meter	Keithley	4050073	2014.11.20	2015.11.19
Signal Generator	**R&S**	**104260**	**2014.10.27**	**2015.10.26**
Power Meter	R&S	100510	2014.10.25	2015.10.24
Power Sensor	R&S	101919	2014.10.25	2015.10.24
Network Analyzer	R&S	EMY46103472	2013.12.12	2014.12.11

Note: Per KDB 865664 Dipole SAR Validation Verification, STS Lab has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.

9. MEASUREMENT UNCERTAINTY

SATIMO Uncertainty Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.									
Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	6.98	6.98	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	1	1	1.16	1.16	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.87	2.87	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	E.2.6	0.02	N	□ 1	1	1	0.03	0.03	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.70	1.70	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.16	1.16	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.71	1.71	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.91	2.91	∞
Test sample Related									
Test sample positioning	E.4.2.1	0.03	N	1	1	1	0.05	0.05	N-1
Device Holder Uncertainty	E.4.1.1	5.00	N	1	1	1	4.95	4.95	∞
Output power Variation - SAR drift measurement	6.6.2	0.65	R	$\sqrt{3}$	1	1	0.36	0.36	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.02	0.02	∞
Liquid conductivity deviation from target value	E.3.2	5.00	R	$\sqrt{3}$	0.64	0.43	1.83	1.23	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.18	2.14	∞
Liquid permittivity - deviation from target value	E.3.2	0.03	R	$\sqrt{3}$	0.6	0.49	0.01	0.01	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.06	4.95	M
Combined Standard Uncertainty			RSS				11.17	10.63	∞
Expanded Uncertainty (95% Confidence interval)			k				22.34	21.26	

SATIMO Uncertainty

System uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.

Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	6.98	6.98	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	1	1	1.16	1.16	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Boundary Effects	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.87	2.87	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.03	0.03	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.70	1.70	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.16	1.16	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.71	1.71	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.91	2.91	∞
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.55	0.55	N-1
Input power and SAR drift measurement	8,6.6.2	0.65	R	$\sqrt{3}$	1	1	0.36	0.36	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.02	0.02	∞
Liquid conductivity - deviation from target value	E.3.2	5.00	R	$\sqrt{3}$	0.64	0.43	1.83	1.23	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.18	2.14	∞
Liquid permittivity - deviation from target value	E.3.2	0.03	R	$\sqrt{3}$	0.6	0.49	0.01	0.01	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.06	4.95	[illegible] M
Combined Standard Uncertainty			RSS				10.03	9.42	
Expanded Uncertainty (95% Confidence interval)			k				20.05	18.85	

10. CONDUCTED POWER MEASUREMENT

Mode	Frequency(MHz)	Peak Power (dBm)	Duty cycle Factor(dBm)	Frame Power(dBm)
Maximum Power <1>				
GSM 850	824.2	**32.37**	-9	23.37
	836.6	32.29	-9	23.29
	848.8	32.24	-9	23.24
GPRS 850 （1 Slot）	824.2	32.18	-9	23.18
	836.6	32.14	-9	23.14
	848.8	32.11	-9	23.11
GPRS 850 （2 Slot）	824.2	29.67	-6	23.67
	836.6	29.62	-6	23.62
	848.8	29.57	-6	23.57
GPRS850 （3 Slot）	824.2	27.53	-4.26	23.27
	836.6	27.51	-4.26	23.25
	848.8	27.45	-4.26	23.19
GPRS 850 （4 Slot）	824.2	26.66	-3	23.66
	836.6	26.62	-3	23.62
	848.8	26.57	-3	23.57
PCS1900	1850.2	**29.31**	-9	20.31
	1880	29.24	-9	20.24
	1909.8	29.21	-9	20.21
GPRS1900 （1 Slot）	1850.2	29.16	-9	20.16
	1880	29.12	-9	20.12
	1909.8	29.07	-9	20.07
GPRS1900 （2 Slot）	1850.2	26.46	-6	20.46
	1880	26.34	-6	20.34
	1909.8	26.31	-6	20.31
GPRS1900 （3 Slot）	1850.2	24.32	-4.26	20.06
	1880	24.27	-4.26	20.01
	1909.8	24.25	-4.26	19.99
GPRS1900 （4 Slot）	1850.2	23.37	-3	20.37
	1880	23.32	-3	20.32
	1909.8	23.29	-3	20.29

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

1/F, Building B, Zhuoke Science Park, Chongqing Road, Fuyong, Bao'an District, Shenzhen,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

UMTS BAND
HSDPA Setup Configuration:

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

·The RF path losses were compensated into the measurements.

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

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

(2) Set RMC 12.2Kbps+HSDPA mode.

(3) Set Cell Power=-86dBm

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

(5) Select HSDPA Uplink Parameters

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

(7) Set Ack - Nack Repetition Factor to 3

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

(9) Set CQI Repetition Factor to 2

(10) Power Ctrl Mode=All Up bits

·The transmitted maximum output power was recorded.

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

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

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

HSUPA Setup Configuration:

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

· The RF path losses were compensated into the measurements.

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

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

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

(3) Set Cell Power = -86 dBm

(4) Set Channel Type = 12.2k + HSPA

(5) Set UE Target Power

(6) Power Ctrl Mode= Alternating bits

(7) Set and observe the E-TFCI

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

· The transmitted maximum output power was recorded.

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

Sub-test	βc	βd	βd (SF)	βc/βd	βHS (Note1)	βec	βed (Note 4) (Note 5)	βed (SF)	βed (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	βed1: 47/15 βed2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, ∆ACK, ∆NACK and ∆CQI = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, ∆ACK, ∆NACK and ∆CQI = 5/15 with β_{hs} = 5/15 * β_c.

Note 2: CM = 1 for βc/βd =12/15, □ hs/□ c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the □ c/□ d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to □ c = 10/15 and □ d = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: βed cannot be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

UMTS BAND II

Mode	Frequency (MHz)	Burst Power (dBm)
WCDMA 1900 RMC	1852.4	**23.45**
	1880	23.37
	1907.6	23.32
WCDMA 1900 AMR	1852.4	22.78
	1880	22.74
	1907.6	22.71
HSDPA Subtest 1	1852.4	22.69
	1880	22.67
	1907.6	22.64
HSDPA Subtest 2	1852.4	22.76
	1880	22.72
	1907.6	22.66
HSDPA Subtest 3	1852.4	22.68
	1880	22.62
	1907.6	22.61
HSDPA Subtest 4	1852.4	22.75
	1880	22.64
	1907.6	22.62
HSUPA Subtest 1	1852.4	22.73
	1880	22.69
	1907.6	22.67
HSUPA Subtest 2	1852.4	22.72
	1880	22.68
	1907.6	22.63
HSUPA Subtest 3	1852.4	22.69
	1880	22.64
	1907.6	22.61
HSUPA Subtest 4	1852.4	22.71
	1880	22.68
	1907.6	22.65
HSUPA Subtest 5	1852.4	22.72
	1880	22.64
	1907.6	22.61

UMTS BAND V

Mode	Frequency (MHz)	Burst Power (dBm)
WCDMA 850 RMC	826.4	**23.32**
	836.6	23.28
	846.6	23.26
WCDMA 850 AMR	826.4	22.74
	836.6	22.71
	846.6	22.67
HSDPA Subtest 1	826.4	22.65
	836.6	22.62
	846.6	22.58
HSDPA Subtest 2	826.4	22.59
	836.6	22.57
	846.6	22.52
HSDPA Subtest 3	826.4	22.62
	836.6	22.56
	846.6	22.57
HSDPA Subtest 4	826.4	22.79
	836.6	22.73
	846.6	22.71
HSUPA Subtest 1	826.4	22.69
	836.6	22.66
	846.6	22.62
HSUPA Subtest 2	826.4	22.72
	836.6	22.67
	846.6	22.63
HSUPA Subtest 3	826.4	22.74
	836.6	22.71
	846.6	22.64
HSUPA Subtest 4	826.4	22.65
	836.6	22.69
	846.6	22.65
HSUPA Subtest 5	826.4	22.78
	836.6	22.69
	846.6	22.62

WIFI

Mode	Data Rate (Mbps)	Channel	Frequency(MHz)	Avg. Burst Power(dBm)
802.11b	1	01	2412	**9.25**
		06	2437	9.34
		11	2462	9.19
802.11g	6	01	2412	7.54
		06	2437	7.45
		11	2462	7.41
802.11n(20)	6.5	01	2412	7.48
		06	2437	7.44
		11	2462	7.36
802.11n(40)	13.5	03	2422	4.75
		06	2437	4.69
		09	2452	4.61

Bluetooth_V3.0

Modulation	Channel	Frequency(MHz)	Avg. Burst Power (dBm)
GFSK	0	2402	-1.71
	39	2441	-0.36
	78	2480	**0.12**
π /4-DQPSK	0	2402	-2.51
	39	2441	-1.24
	78	2480	-0.89
8-DPSK	0	2402	-2.52
	39	2441	-1.24
	78	2480	-0.85

Bluetooth_V4.0

Modulation	Channel	Frequency(MHz)	Avg. Burst Power (dBm)
GFSK	0	2402	-8.24
	19	2440	**-8.22**
	39	2480	-8.90

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

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

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

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

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

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

11. TEST RESULTS

11.1. SAR Test Results Summary

11.1.1. Test position and configuration

Body SAR was performed with the device 0mm from the phantom.

11.1.2. Operation Mode

• According to KDB 447498 D01 v05r02 ,for each exposure position, if the highest 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.

• Per KDB 865664 D01 v01r03,for each frequency band, if the measured SAR is ≥0.8W/Kg, testing for repeated SAR measurement is required , that the highest measured SAR is only to be tested. When the SAR results are near the limit, the following procedures are required for each device to verify these types of SAR measurement related variation concerns by repeating the highest measured SAR configuration in each frequency band.

(1) When the original highest measured SAR is ≥0.8W/Kg, repeat that measurement once.

(2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is >1.20 or when the original or repeated measurement is ≥1.45 W/Kg.

(3) Perform a third repeated measurement only if the original, first and second repeated measurement is ≥ 1.5 W/Kg and ratio of largest to smallest SAR for the original, first and second measurement is ≥1.20.

• Body-worn exposure conditions are intended to voice call operations, therefore GSM voice call mode is selected to be test.

• According to KDB 648474 D04 v01r02,when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤1.2W/Kg, SAR testing with a headset connected is not required.

• According to 941225 D06 v02, when the overall device length and width are>9cm×5cm, Hotspot mode with a test separation distance of 10mm. For device with form factors smaller than 9cm×5cm, Hotspot mode with a test separation distance of 5mm. Body SAR was also performed with the headset attached and without.

• According to 248227 D01 v01r02, SAR is not required for 802.11g channels when the maximum average output power is less than 1/4dB higher than measured on the corresponding 802.11b channels.

• Maximum Scaling SAR in order to calculate the Maximum SAR values to test under the standard Peak Power, Calculation method is as follows:
Maximum Scaling SAR =tested SAR (Max.) ×[maximum turn-up power (mw)/ maximum measurement output power(mw)]

11.1.3. Test Result

SAR MEASUREMENT									
Ambient Temperature (°C) : 20.5				Relative Humidity (%): 48.7					
Liquid Temperature (°C) : 20.7				Depth of Liquid (cm):>15					
Product: THUNDER PLUS									
Test Mode: GSM850 with GMSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Body back	voice	128	824.2	0.69	0.764	33.0	**32.37**	0.885	1.6
Body back	voice	190	836.6	0.25	**0.765**	33.0	32.29	0.903	1.6
Body back	voice	251	848.8	0.71	0.760	33.0	32.24	0.907	1.6
Body front	voice	190	836.6	-0.31	0.575	33.0	32.29	0.679	1.6
Edge 1 (Top)	voice	190	836.6	0.17	0.654	33.0	32.29	0.772	1.6
Edge 2(Right)	voice	190	836.6	-0.89	0.471	33.0	32.29	0.556	1.6
Edge 3(Bottom)	voice	190	836.6	0.62	0.066	33.0	32.29	0.078	1.6
Edge 4(Left)	voice	190	836.6	0.34	0.231	33.0	32.29	0.273	1.6
VoIP									
Body back	GPRS-2 slot	190	836.6	-0.85	0.437	30.0	29.62	0.477	1.6
Body front	GPRS-2 slot	190	836.6	1.22	0.253	30.0	29.62	0.276	1.6
Edge 1 (Top)	GPRS-2 slot	190	836.6	0.35	0.566	30.0	29.62	0.618	1.6
Edge 2(Right)	GPRS-2 slot	190	836.6	-0.69	0.433	30.0	29.62	0.473	1.6
Edge 3(Bottom)	GPRS-2 slot	190	836.6	-0.91	0.064	30.0	29.62	0.070	1.6
Edge 4(Left)	GPRS-2 slot	190	836.6	0.38	0.256	30.0	29.62	0.279	1.6

Note:

· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.

·The test separation for body is 0mm of all above table.

SAR MEASUREMENT									
Ambient Temperature (°C) : 20.5				Relative Humidity (%): 60.3					
Liquid Temperature (°C) : 21.1				Depth of Liquid (cm):>15					
Product: THUNDER PLUS									
Test Mode: PCS1900 with GMSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Body back	voice	512	1850.2	0.23	0.703	30.0	29.31	0.824	1.6
Body back	voice	661	1880.0	0.25	0.706	30.0	29.24	0.841	1.6
Body back	voice	810	1909.8	0.57	0.701	30.0	29.21	0.841	1.6
Body front	voice	661	1880.0	-0.36	0.424	30.0	29.24	0.505	1.6
Edge 1 (Top)	voice	512	1850.2	0.63	0.761	30.0	29.31	0.892	1.6
Edge 1 (Top)	voice	661	1880.0	0.21	**0.763**	30.0	29.24	**0.909**	1.6
Edge 1 (Top)	voice	810	1909.8	-0.55	0.750	30.0	29.21	0.899	1.6
Edge 2(Right)	voice	661	1880.0	1.95	0.294	30.0	29.24	0.350	1.6
Edge 3(Bottom)	voice	661	1880.0	-0.26	0.026	30.0	29.24	0.031	1.6
Edge 4(Left)	voice	661	1880.0	-0.38	0.073	30.0	29.24	0.087	1.6
VoIP									
Body back	GPRS-2 slot	661	1880.0	0.48	0.465	27.0	26.34	0.539	1.6
Body front	GPRS-2 slot	661	1880.0	-0.26	0.296	27.0	26.34	0.343	1.6
Edge 1 (Top)	GPRS-2 slot	661	1880.0	-0.31	0.553	27.0	26.34	0.642	1.6
Edge 2(Right)	GPRS-2 slot	661	1880.0	0.23	0.164	27.0	26.34	0.190	1.6
Edge 3(Bottom)	GPRS-2 slot	661	1880.0	0.31	0.074	27.0	26.34	0.086	1.6
Edge 4(Left)	GPRS-2 slot	661	1880.0	0.56	0.141	27.0	26.34	0.164	1.6

Note:

· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.

·The test separation for body is 0mm of all above table.

SAR MEASUREMENT									
Ambient Temperature (°C) : 20.5				Relative Humidity (%):60.3					
Liquid Temperature (°C) : 21.1				Depth of Liquid (cm):>15					
Product: THUNDER PLUS									
Test Mode: WCDMA Band II with QPSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Body back	RMC 12.2kbps	9262	1852.4	0.26	1.043	24.0	23.45	**1.185**	1.6
Body back	RMC 12.2kbps	9400	1880	0.26	0.864	24.0	23.37	0.999	1.6
Body back	RMC 12.2kbps	9538	1907.6	-0.31	0.615	24.0	23.32	0.702	1.6
Body front	RMC 12.2kbps	9400	1880	0.25	0.463	24.0	23.37	0.536	1.6
Edge 1 (Top)	RMC 12.2kbps	9262	1852.4	0.26	0.768	24.0	23.45	0.872	1.6
Edge 1 (Top)	RMC 12.2kbps	9400	1880	-0.47	0.770	24.0	23.37	0.891	1.6
Edge 1 (Top)	RMC 12.2kbps	9538	1907.6	0.61	0.763	24.0	23.32	0.871	1.6
Edge 2(Right)	RMC 12.2kbps	9400	1880	-0.59	0.343	24.0	23.37	0.397	1.6
Edge 3(Bottom)	RMC 12.2kbps	9400	1880	0.32	0.055	24.0	23.37	0.064	1.6
Edge 4(Left)	RMC 12.2kbps	9400	1880	0.91	0.133	24.0	23.37	0.154	1.6

Note:
· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.
·The test separation for body is 0mm of all above table.

SAR MEASUREMENT									
Ambient Temperature (°C) : 20.5				Relative Humidity (%): 48.7					
Liquid Temperature (°C) : 20.7				Depth of Liquid (cm):>15					
Product: THUNDER PLUS									
Test Mode: WCDMA Band V with QPSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Body back	RMC 12.2kbps	4132	826.4	-0.25	0.909	24.0	23.32	1.061	1.6
Body back	RMC 12.2kbps	4183	836.6	0.33	0.842	24.0	23.28	0.992	1.6
Body back	RMC 12.2kbps	4233	846.6	0.59	0.808	24.0	23.26	0.957	1.6
Body front	RMC 12.2kbps	4183	836.6	0.14	0.522	24.0	23.28	0.615	1.6
Edge 1 (Top)	RMC 12.2kbps	4132	826.4	-0.26	0.994	24.0	23.32	1.160	1.6
Edge 1 (Top)	RMC 12.2kbps	4183	836.6	-0.34	0.935	24.0	23.28	1.102	1.6
Edge 1 (Top)	RMC 12.2kbps	4233	846.6	0.58	0.641	24.0	23.26	0.759	1.6
Edge 2(Right)	RMC 12.2kbps	4183	836.6	-0.12	0.574	24.0	23.28	0.676	1.6
Edge 3(Bottom)	RMC 12.2kbps	4183	836.6	-1.22	0.052	24.0	23.28	0.061	1.6
Edge 4(Left)	RMC 12.2kbps	4183	836.6	0.51	0.251	24.0	23.28	0.296	1.6

Note:

· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.

·The test separation for body is 0mm of all above table.

Repeated SAR								
Product: THUNDER PLUS								
Test Mode: GSM850&PCS1900 with GMSK modulation and WCDMA Band II & V with QPSK modulation								
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±5%)**	**Once SAR (1g) (W/kg)**	**Twice SAR (1g) (W/kg)**	**Third SAR (1g) (W/kg)**	**Limit W/kg**
Body back	voice	190	836.6	0.25	0.764	--	--	1.6
Edge 1 (Top)	voice	661	1880.0	0.21	0.761	--	--	1.6
Body back	RMC 12.2kbps	9262	1852.4	0.26	1.043	--	--	1.6
Edge 1 (Top)	RMC 12.2kbps	4132	826.4	-0.26	0.992	--	--	1.6

Simultaneous Multi-band Transmission Evaluation:

Application Simultaneous Transmission information:

NO	Simultaneous state	Portable Handset			Note
		Head	Body-worn	Hotspot	
1	GSM(voice)+WLAN 2.4GHz (data)	-	Yes	-	-
2	WCDMA(voice)+WLAN 2.4GHz (data)	-	Yes	-	-
3	GSM(voice)+Bluetooth(data)	-	Yes	-	-
4	WCDMA(voice)+Bluetooth(data)	-	Yes	-	-
5	GPRS/EGDE(Data)+Bluetooth(data)	-	Yes	Yes	2.4GHz Hotspot
6	GPRS/EGDE(Data)+WLAN 2.4GHz (data)	-	Yes	Yes	2.4GHz Hotspot
7	WCDMA (Data)+Bluetooth(data)	-	Yes	Yes	2.4GHz Hotspot
8	WCDMA (Data)+WLAN 2.4GHz (data)	-	Yes	Yes	2.4GHz Hotspot

NOTE:

1. WLAN and BT share the same antenna, and cannot transmit simultaneously.
2. Simultaneous with every transmitter must be the same test position.
3. KDB 447498 D01, BT SAR is excluded as below table.
4. KDB 447498 D01, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user; which is 0mm for head SAR and 10mm for body-worn SAR.
5. If the test separation distance is <5mm, 5mm is used for excluded SAR calculation.
6. According to KDB447497 D01 4.3.2, simultaneous transmission SAR test exclusion is as follow:
   (1) Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.
   (2) Any transmitters and antennas should be considered when calculating simultaneous mode.
   (3) For mobile phone and PC, it's the sum of all transmitters and antennas at the same mode with same position in each applicable exposure condition
   (4) When the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:

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

1/F, Building B, Zhuoke Science Park, Chongqing Road, Fuyong, Bao'an District, Shenzhen,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

Estimated SAR		Maximum Average Power		Antenna to user (mm)	SAR exclusion threshold (mW)	SAR testing required （Yes/No）	Body (0mm gap)
		dBm	mW				
BT	Body	1	1.259	0	10	NO	0.053 W/kg
				10	10	NO	
WIFI	Body	9.5	8.913	0	10	NO	0.369 W/kg
				10	10	NO	

Maximum test results (WWAN) with BT and WIFI SAR:
BT: Body (0cm gap): 0.053W/kg
WIFI: Body (0cm gap): 0.369W/kg

Sum of the SAR for GSM &Wi-Fi & BT:

RF Exposure Conditions	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		GSM 850 Band	WI-Fi DTS Band	Bluetooth		
Body-worn	Rear	0.907	0.369	N/A	1.276	No
		0.907	N/A	0.053	0.96	No
	Front	0.679	0.369	N/A	1.048	No
		0.679	N/A	0.053	0.732	No
	Edge 1	0.909	0.369	N/A	1.278	No
		0.909	N/A	0.053	0.962	No
	Edge 2	0.556	0.369	N/A	0.925	No
		0.556	N/A	0.053	0.609	No
	Edge 3	0.078	0.369	N/A	0.447	No
		0.078	N/A	0.053	0.131	No
	Edge 4	0.273	0.369	N/A	0.642	No
		0.273	N/A	0.053	0.326	No
Hotspot (VoIP)	Rear	0.539	0.369	N/A	0.908	No
		0.539	N/A	0.053	0.592	No
	Front	0.343	0.369	N/A	0.396	No
		0.343	N/A	0.053	0.712	No
	Edge 1	0.642	0.369	N/A	1.011	No
		0.642	N/A	0.053	0.695	No
	Edge 2	0.473	0.369	N/A	0.842	No
		0.473	N/A	0.053	0.526	No
	Edge 3	0.086	0.369	N/A	0.455	No
		0.086	N/A	0.053	0.139	No
	Edge 4	0.779	0.369	N/A	1.148	No
		0.779	N/A	0.053	0.832	No

Note:

- According to KDB 447498 D01 General RF Exposure Guidance, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
- SPLSR mean is “The SAR to Peak Location Separation Ratio “

Sum of the SAR for WCDMA &Wi-Fi & BT:

RF Exposure Conditions	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		WCDMA Band II	Wi-Fi DTS Band	Bluetooth		
Body-worn	Rear	1.185	0.369		**1.554**	No
		1.185		0.053	1.238	No
	Front	0.615	0.369		0.984	No
		0.615		0.053	0.668	No
	Edge 1	1.160	0.369		1.529	No
	Edge 2	0.676	0.369		1.045	No
	Edge 3	0.064	0.369		0.433	No
	Edge 4	0.296	0.369		0.665	No

Note:

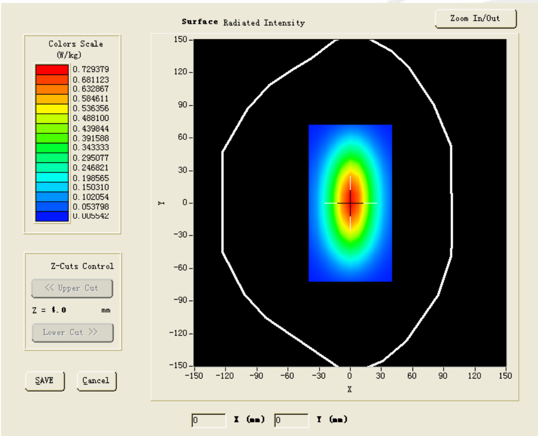
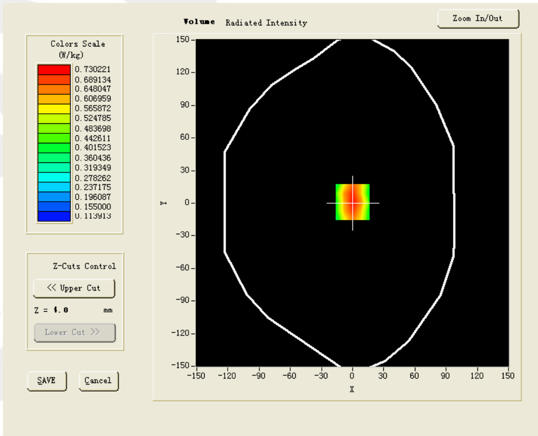
- According to KDB 447498 D01 General RF Exposure Guidance, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
- SPLSR mean is “The SAR to Peak Location Separation Ratio “

APPENDIX A. SAR SYSTEM VALIDATION DATA

Test Laboratory: STS Lab **Date: Jan. 9,2015**
System Check Body 835 MHz
DUT: Dipole 835 MHz Type: SID 835
Communication System CW; Communication System Band: D835 (835.0 MHz); Duty Cycle: 1:1; Conv.F=4.83
Frequency: 835 MHz; Medium parameters used: f = 835 MHz; σ =0.97 mho/m; ε r =56.39; ρ = 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):20.5, Liquid temperature (℃): 20.7

SATIMO Configuration
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

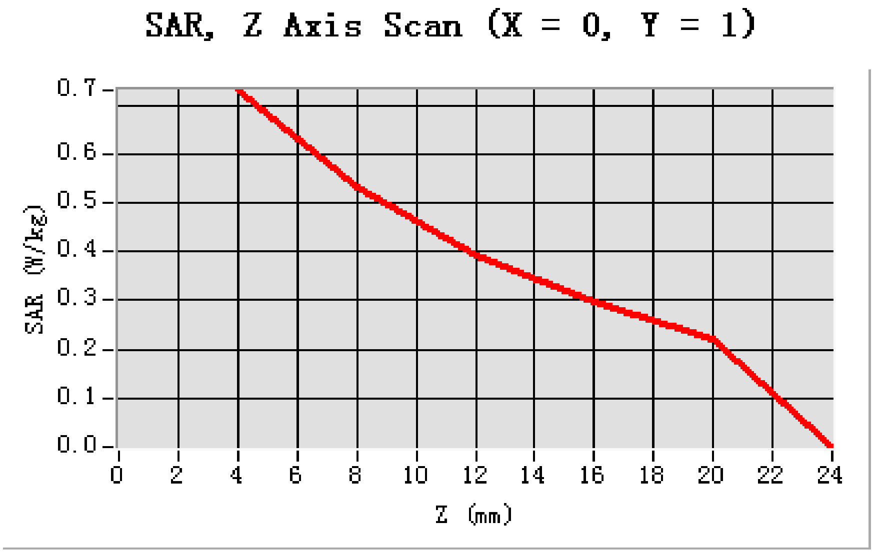
Configuration/System Check 835 Body/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 835 Body/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm

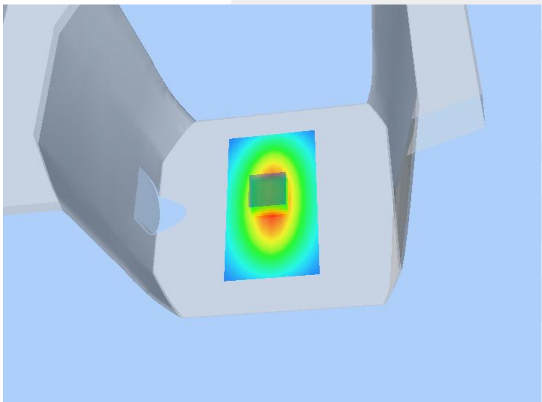
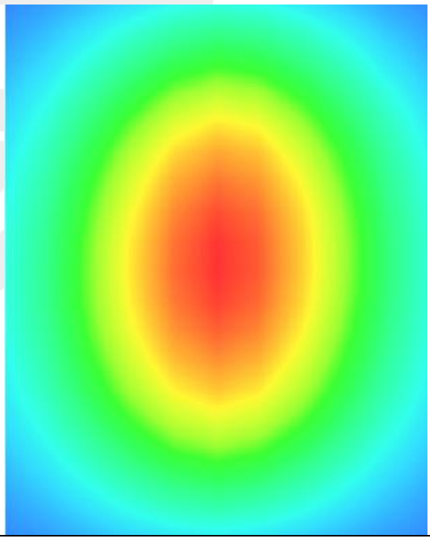
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=1.00

SAR 10g (W/Kg)	0.430388
SAR 1g (W/Kg)	0.652814

Z (mm)	0.00	4.00	8.00	12.00	16.00	20.00
SAR (W/Kg)	0.0000	0.7295	0.5349	0.3908	0.2924	0.2212

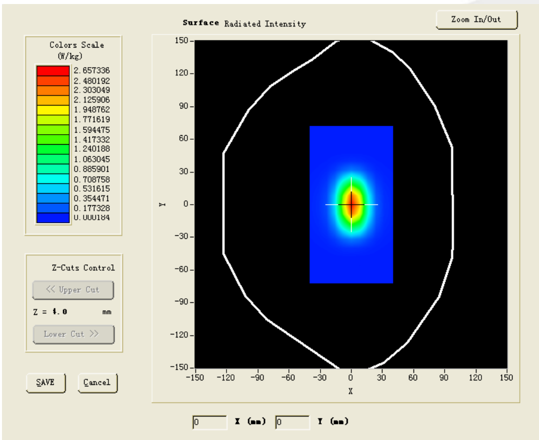
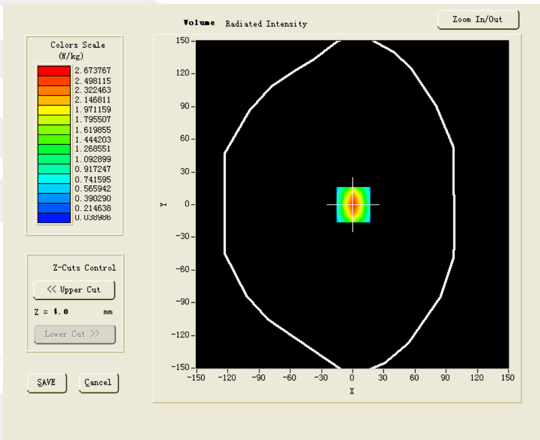


3D screen shot	Hot spot position
	

Test Laboratory: STS Lab **Date: Jan. 6,2015**
System Check Body 1900MHz
DUT: Dipole 1900 MHz; Type: SID 1900
Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Duty Cycle:1:1; Conv.F=5.02
Frequency: 1900 MHz; Medium parameters used: f = 1900 MHz; σ =1.52 mho/m; ε r =53.89; ρ = 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):20.5, Liquid temperature (℃): 21.1

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

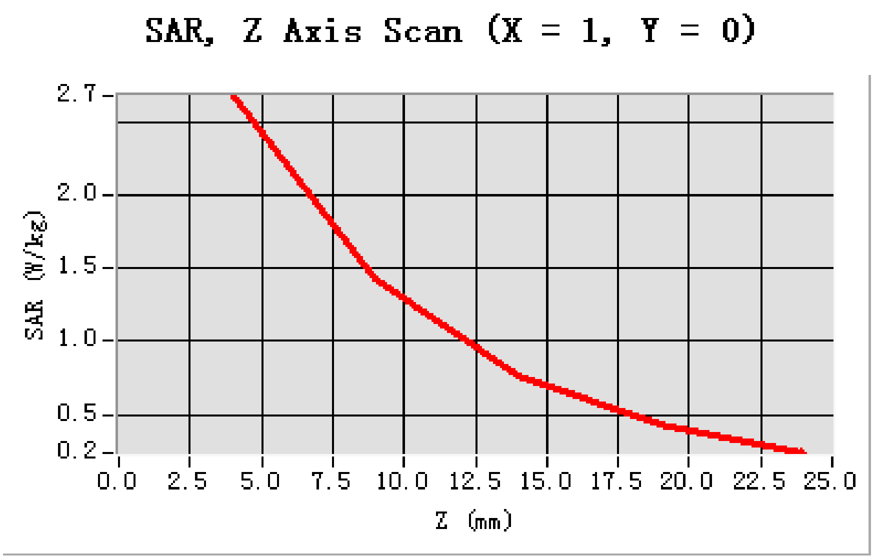
Configuration/System Check 1900 Body/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/System Check 1900 Body/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm

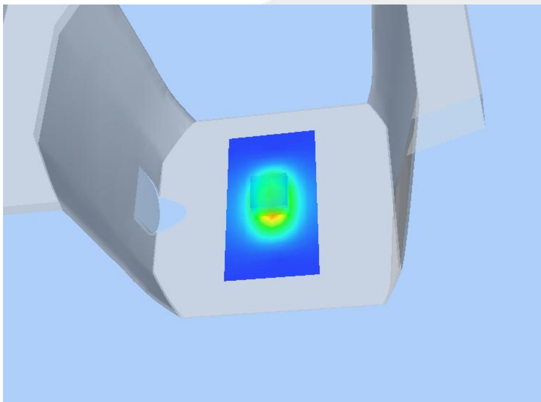
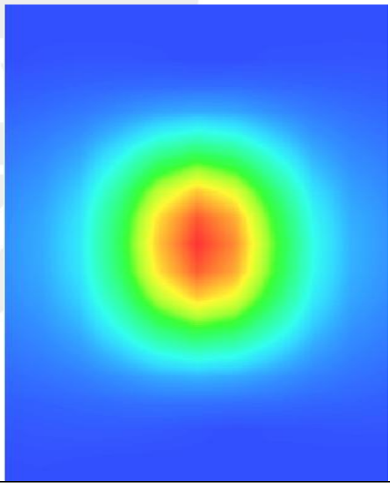
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=0.00

SAR 10g (W/Kg)	1.210298
SAR 1g (W/Kg)	2.449014

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	2.6743	1.4307	0.7692	0.4345



3D screen shot	Hot spot position
	

APPENDIX B. SAR MEASUREMENT DATA

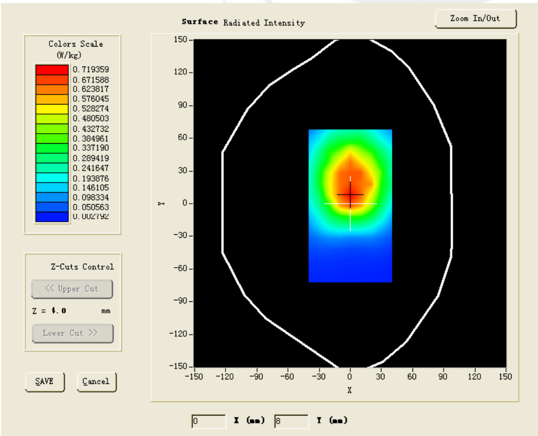
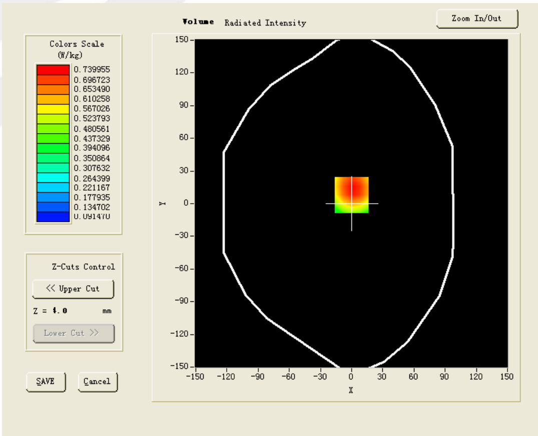
Test Laboratory: STS Lab **Date: Jan. 9,2015**
GSM 850 Mid- Body- Back <SIM 1>
DUT: THUNDER PLUS; Type: DP5108

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=4.83; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ = 0.94 mho/m; ε r = 56.08; ρ = 1000 kg/m^3 ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 20.7

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

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

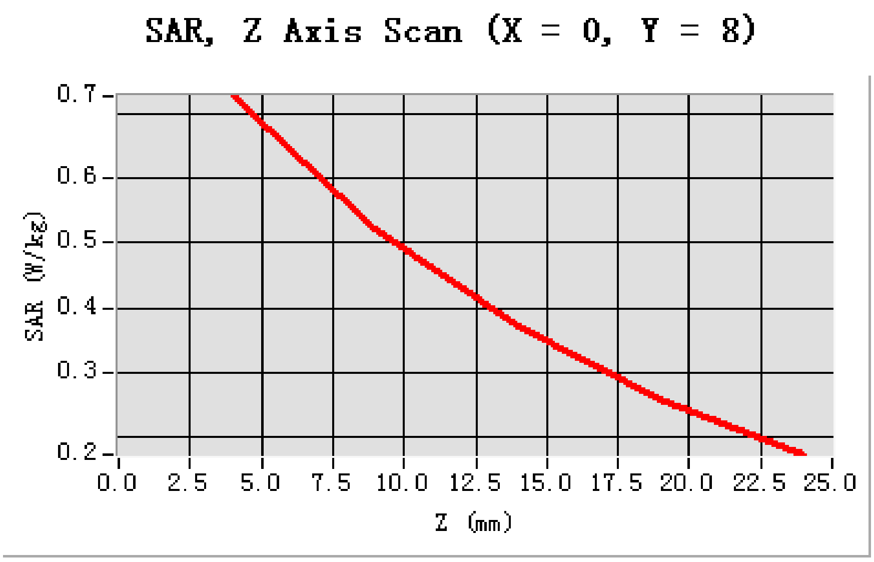
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

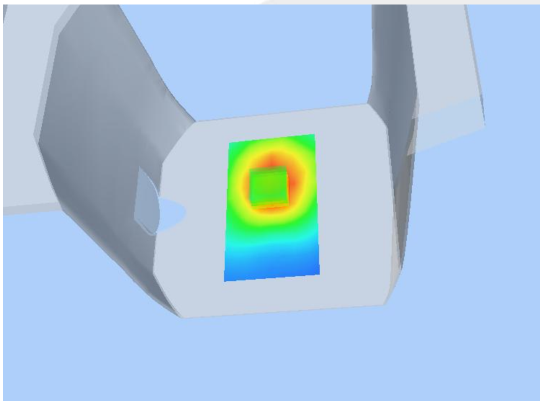
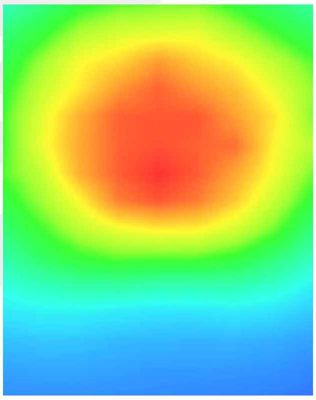
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=8.00

SAR 10g (W/Kg)	0.512433
SAR 1g (W/Kg)	0.765238

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.7283	0.5236	0.3715	0.2589



3D screen shot	Hot spot position
	

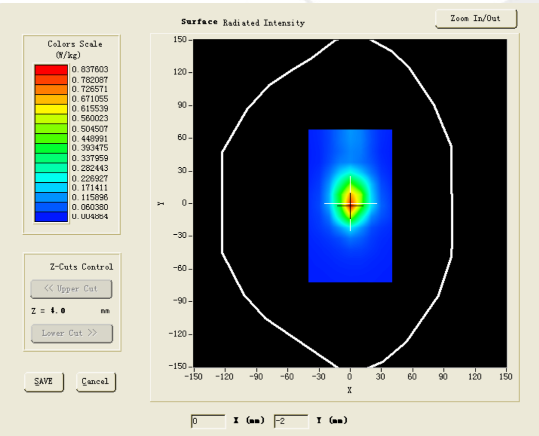
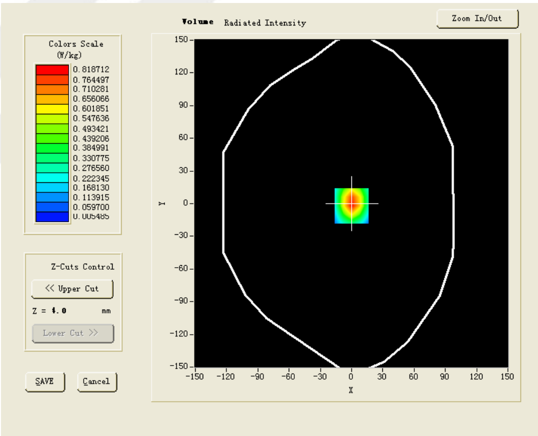
Test Laboratory: STS Lab **Date: Jan. 6,2015**
PCS 1900 Mid- Edge 1<SIM 1>
DUT: THUNDER PLUS; Type: DP5108

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.02;
Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.48 mho/m; ε r =53.48; ρ = 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 21.1

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid- Edge 1/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/PCS1900 Mid- Edge 1 /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

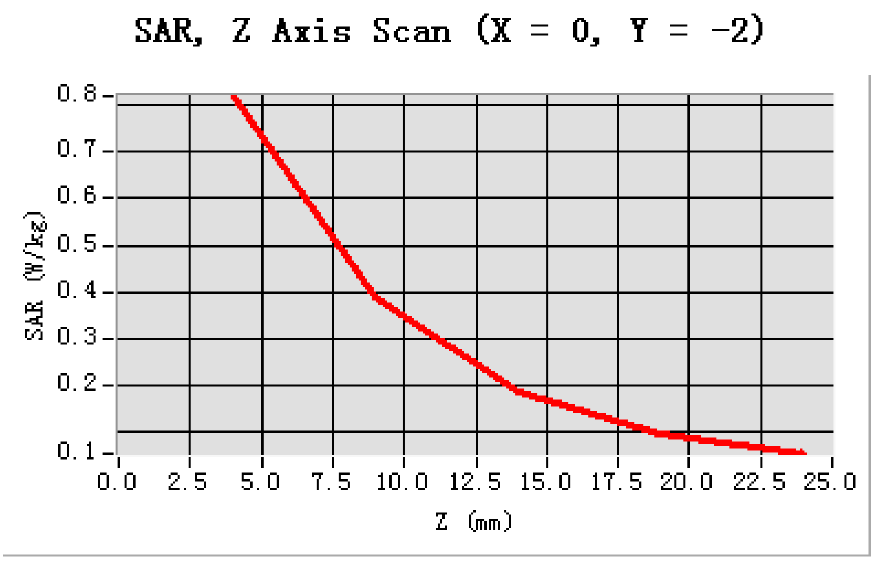
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Edge 1
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

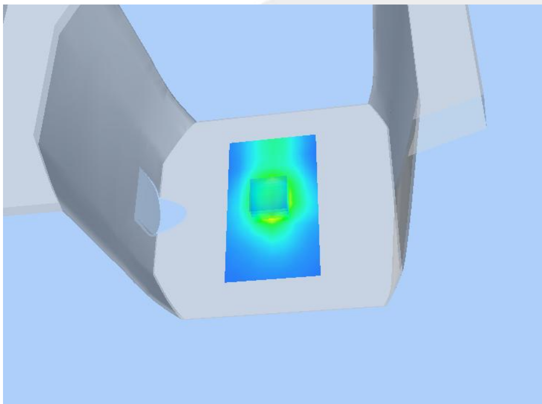
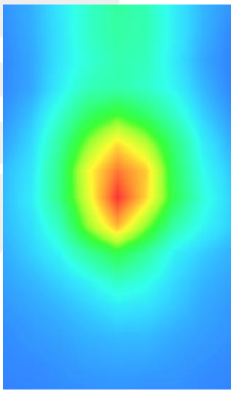
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=-2.00

SAR 10g (W/Kg)	0.361268
SAR 1g (W/Kg)	0.762764

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.8187	0.3896	0.1860	0.0985



3D screen shot	Hot spot position
	

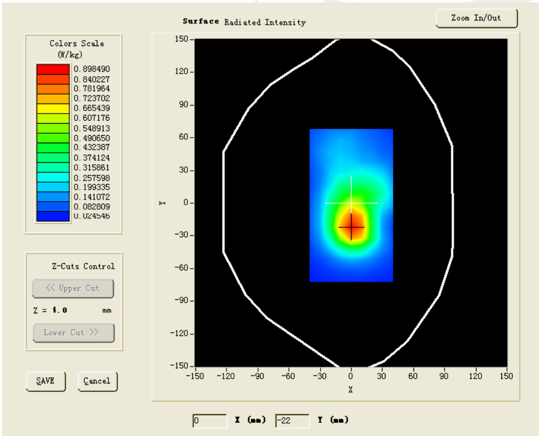
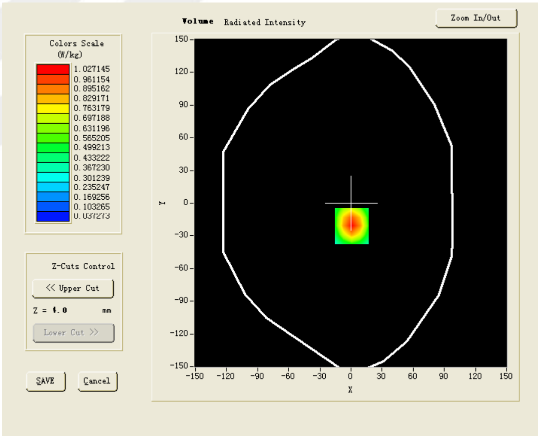
Test Laboratory: STS Lab **Date: Jan. 6,2015**
WCDMA Band Ⅱ Low-Body-Towards Grounds (RMC)
DUT: THUNDER PLUS; Type: DP5108

Communication System: UMTS; Communication System Band: Band Ⅱ UTRA/FDD ;Duty Cycle:1:1; Conv.F=5.02
Frequency: 1852.4 MHz; Medium parameters used: f = 1900 MHz; σ =1.53mho/m; ε r =52.19; ρ = 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 21.1

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/ WCDMA band Ⅱ Low -Body-back/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/ WCDMA band Ⅱ Low -Body-back/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5m;

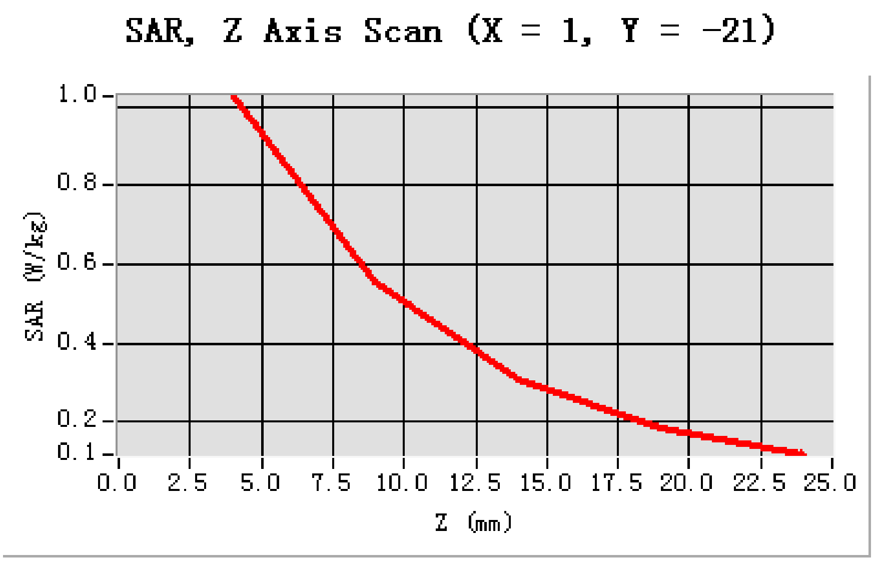
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	WCDMA band Ⅱ
Channels	Low
Signal	CDMA (Crest factor: 1.0)

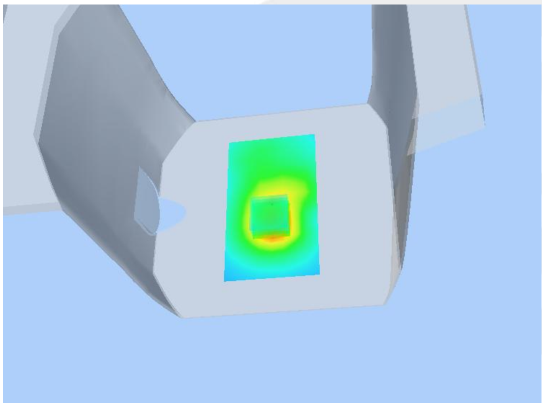
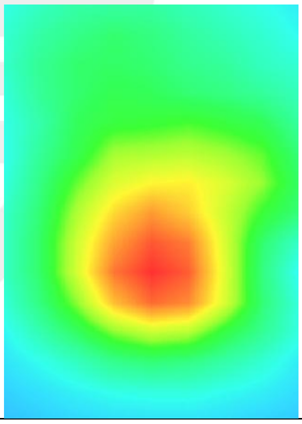
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-21.00

SAR 10g (W/Kg)	0.563872
SAR 1g (W/Kg)	1.043081

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	1.0271	0.5549	0.3081	0.1871



3D screen shot	Hot spot position
	

Test Laboratory: STS Lab **Date: Jan. 9,2015**

WCDMA Band Ⅴ Low- Edge 1 (RMC)

DUT: THUNDER PLUS; Type: DP5108

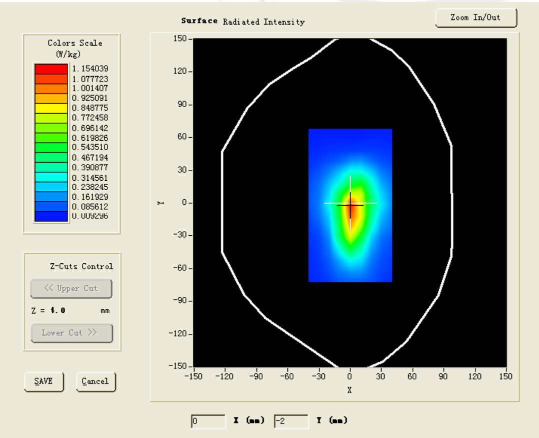
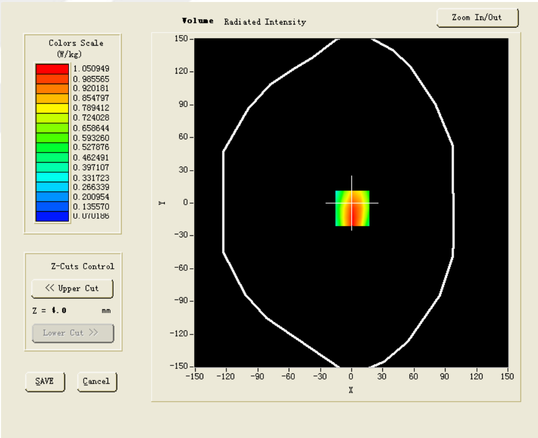
Communication System: UMTS; Communication System Band: BAND Ⅴ UTRA/FDD ; Duty Cycle:1: 1; Conv.F=4.83
Frequency: 826.4 MHz; Medium parameters used: f = 835MHz;σ =0.95 mho/m; ε r =56.10; ρ = 1000kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 20.7

SATIMO Configuration:

Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
Sensor-Surface: 4mm (Mechanical Surface Detection)
Phantom: Flat Phantom; Type: Elliptical Phantom
Measurement SW: OpenSAR V4_02_01

Configuration/ WCDMA Band Ⅴ Low - Edge 1 /Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/ WCDMA Band Ⅴ Low - Edge 1 /Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

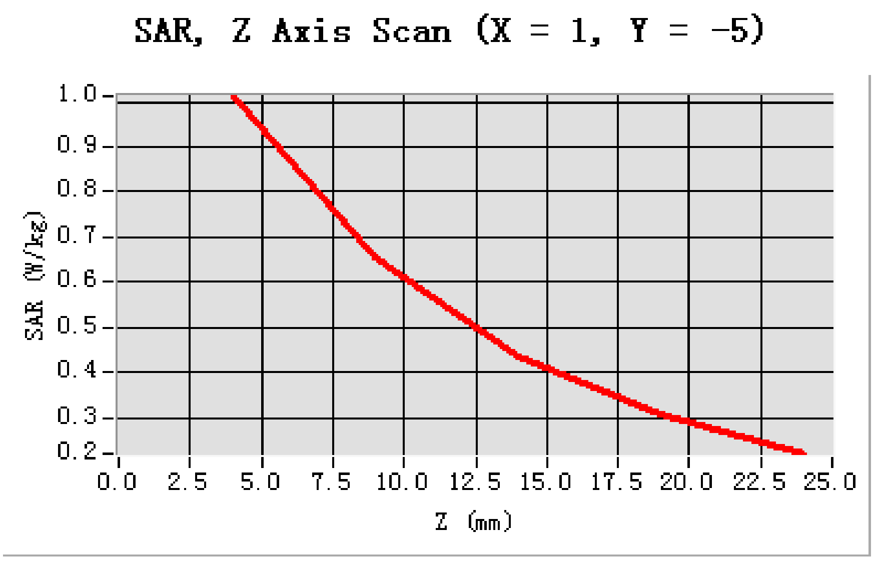
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Edge 1
Band	WCDMA Band Ⅴ
Channels	Low
Signal	CDMA (Crest factor: 1.0)

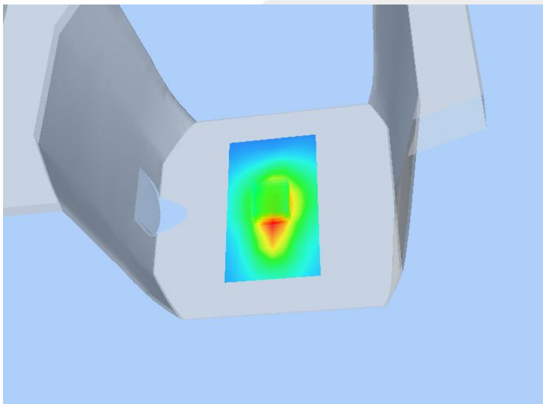
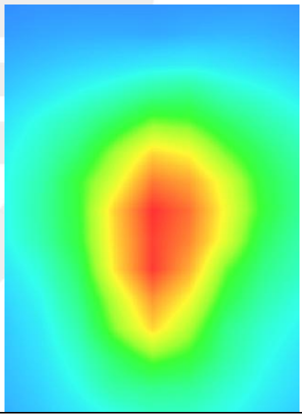
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-5.00

SAR 10g (W/Kg)	0.611083
SAR 1g (W/Kg)	0.993841

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	1.0124	0.6554	0.4378	0.3085



3D screen shot	Hot spot position
	

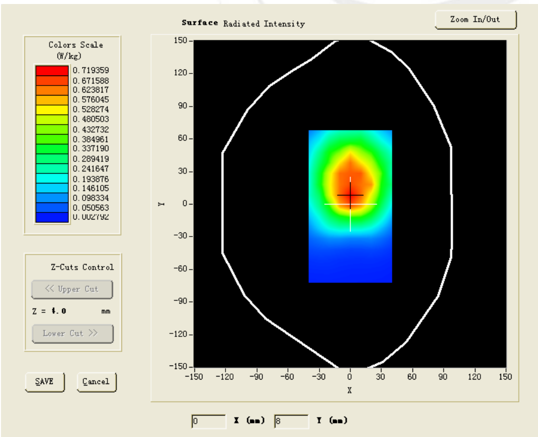
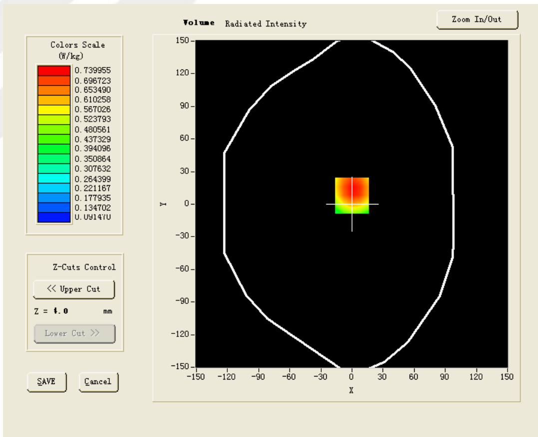
Repeated SAR
Test Laboratory: STS Lab **Date: Jan. 9,2015**
GSM 850 Mid- Body- Back <SIM 1>
DUT: THUNDER PLUS; Type: DP5108

Communication System: Generic GSM; Communication System Band: GSM 850; Duty Cycle: 1:8.3; Conv.F=4.83; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ = 0.94 mho/m; ε r = 56.08; ρ = 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 20.7

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

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

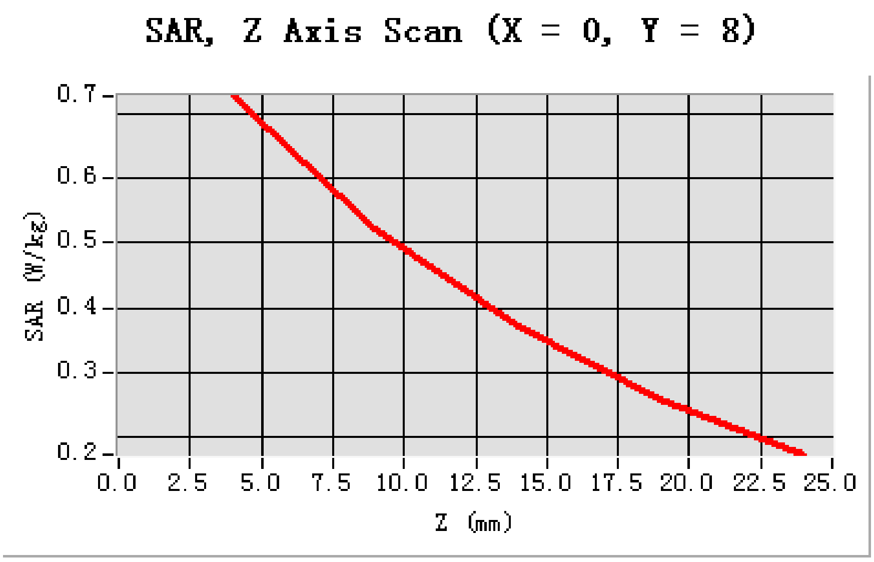
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	GSM 850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

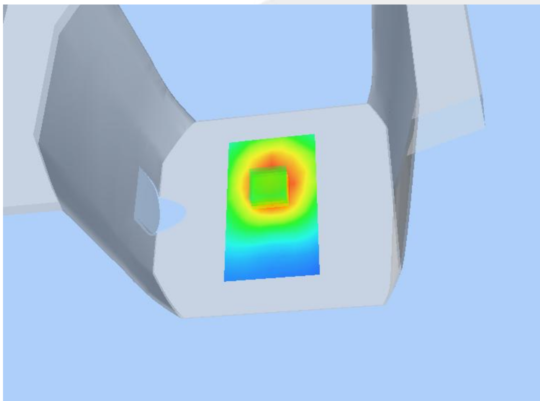
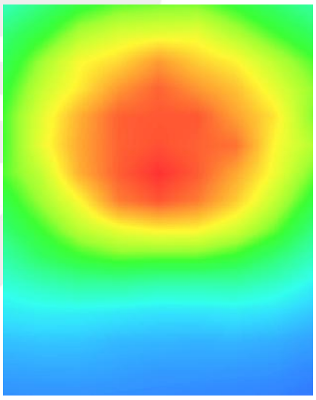
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=0.00, Y=8.00

SAR 10g (W/Kg)	0.511058
SAR 1g (W/Kg)	0.763557

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.7275	0.5230	0.3711	0.2583



3D screen shot	Hot spot position
	

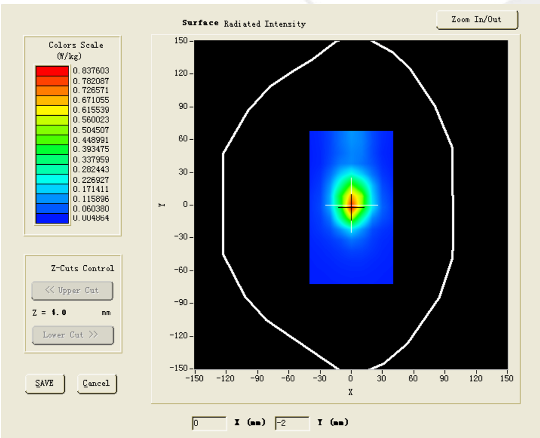
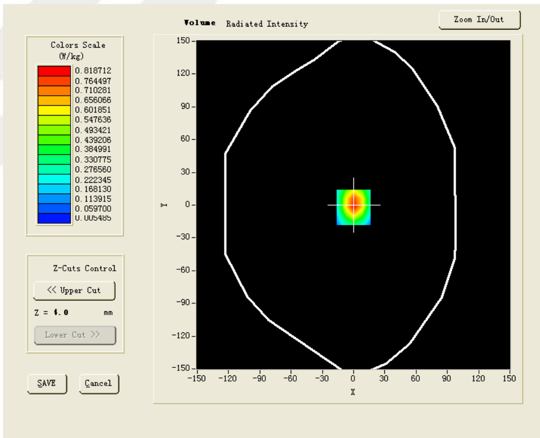
Test Laboratory: STS Lab **Date: Jan. 6,2015**
PCS 1900 Mid- Edge 1<SIM 1>
DUT: THUNDER PLUS; Type: DP5108

Communication System: Generic GSM; Communication System Band: PCS 1900; Duty Cycle: 1:8.3; Conv.F=5.02; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ = 1.48 mho/m; ε r =53.48; ρ = 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 21.1

SATIMO Configuration:
Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
Sensor-Surface: 4mm (Mechanical Surface Detection)
Phantom: Flat Phantom; Type: Elliptical Phantom
Measurement SW: OpenSAR V4_02_01

Configuration/PCS1900 Mid- Edge 1/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/PCS1900 Mid- Edge 1 /Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5mm;

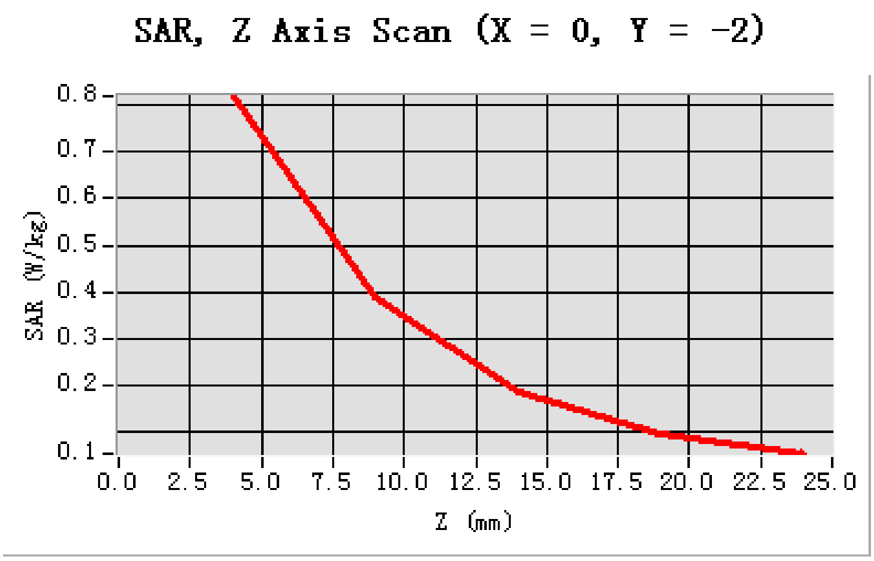
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Edge 1
Band	PCS 1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

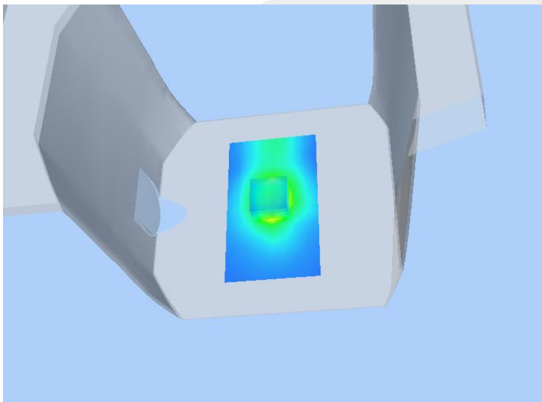
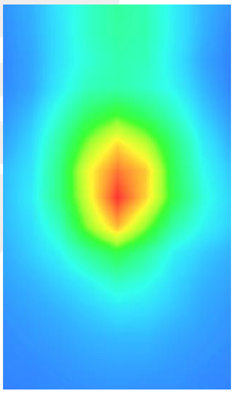
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=-2.00

SAR 10g (W/Kg)	0.360587
SAR 1g (W/Kg)	0.761288

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.8185	0.3893	0.1851	0.0980



3D screen shot	Hot spot position
	

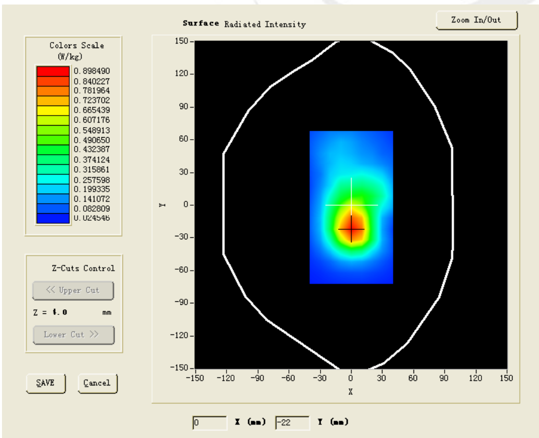
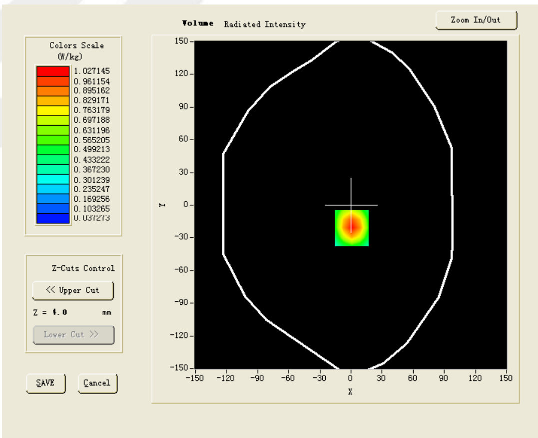
Test Laboratory: STS Lab **Date: Jan. 6,2015**
WCDMA Band Ⅱ Low-Body-Towards Grounds (RMC)
DUT: THUNDER PLUS; Type: DP5108

Communication System: UMTS; Communication System Band: Band Ⅱ UTRA/FDD ;Duty Cycle:1:1; Conv.F=5.02
Frequency: 1852.4 MHz; Medium parameters used: f = 1900 MHz; σ =1.53mho/m; ε r =52.19; ρ = 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 21.1

SATIMO Configuration:
- Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Phantom: Flat Phantom; Type: Elliptical Phantom
- Measurement SW: OpenSAR V4_02_01

Configuration/ WCDMA band Ⅱ Low -Body-back/Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/ WCDMA band Ⅱ Low -Body-back/Zoom Scan: Measurement grid: dx=8mm,dy=8mm, dz=5m;

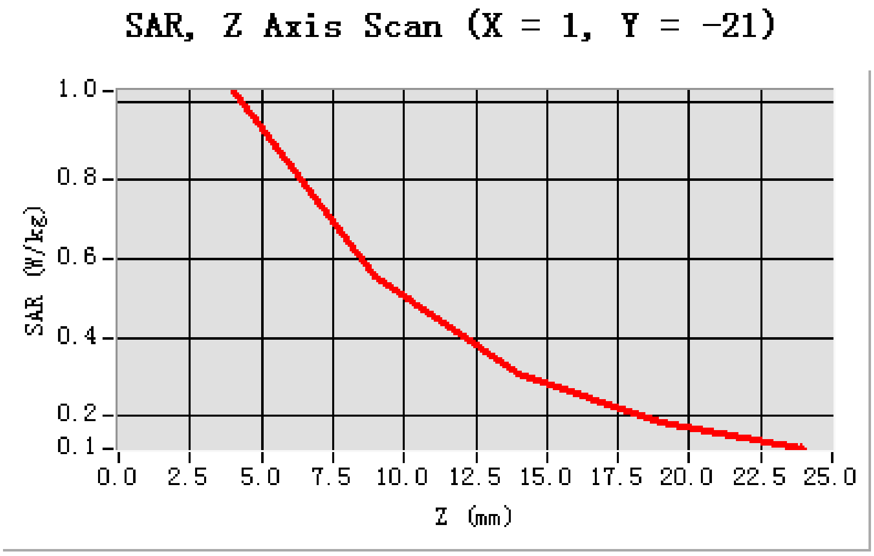
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body Back
Band	WCDMA band Ⅱ
Channels	Low
Signal	CDMA (Crest factor: 1.0)

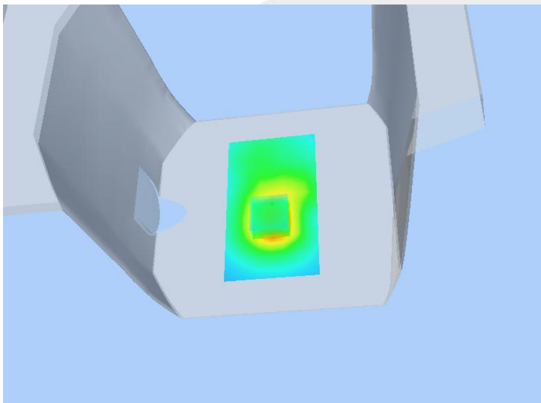
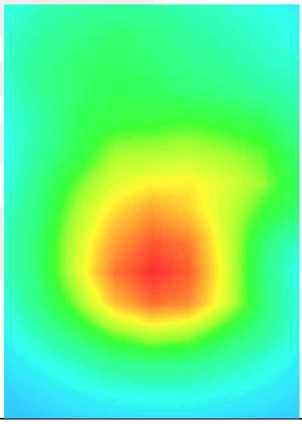
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-21.00

SAR 10g (W/Kg)	0.563057
SAR 1g (W/Kg)	1.042547

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	1.0224	0.5543	0.3082	0.1868



3D screen shot	Hot spot position
	

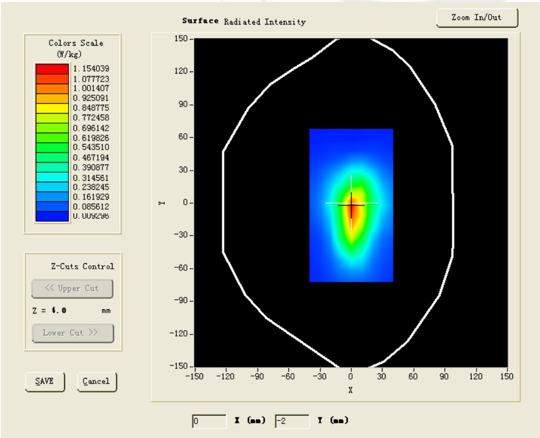
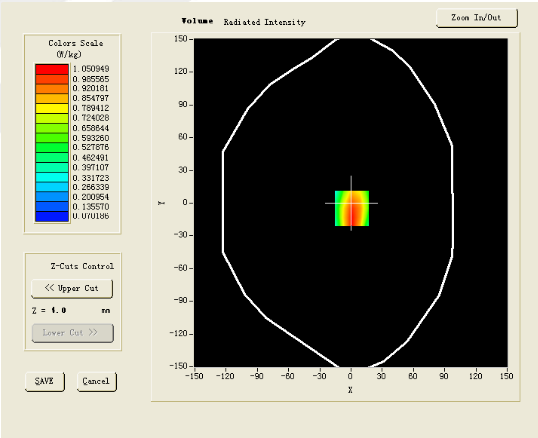
Test Laboratory: STS Lab **Date: Jan. 9,2015**
WCDMA Band Ⅴ Low- Edge 1 (RMC)
DUT: THUNDER PLUS; Type: DP5108

Communication System: UMTS; Communication System Band: BAND Ⅴ UTRA/FDD ; Duty Cycle:1: 1; Conv.F=4.83
Frequency: 826.4 MHz; Medium parameters used: f = 835MHz;σ =0.95 mho/m; ε r =56.10; ρ = 1000kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 20.5, Liquid temperature (℃): 20.7

SATIMO Configuration:
Probe: SSE5; Calibrated: 01/12/2014; Serial No.: SN 17/14 EP221
Sensor-Surface: 4mm (Mechanical Surface Detection)
Phantom: Flat Phantom; Type: Elliptical Phantom
Measurement SW: OpenSAR V4_02_01

Configuration/ WCDMA Band Ⅴ Low - Edge 1 /Area Scan: Measurement grid: dx=8mm, dy=8mm
Configuration/ WCDMA Band Ⅴ Low - Edge 1 /Zoom Scan: Measurement grid: dx=8mm, dy=8mm, dz=5mm;

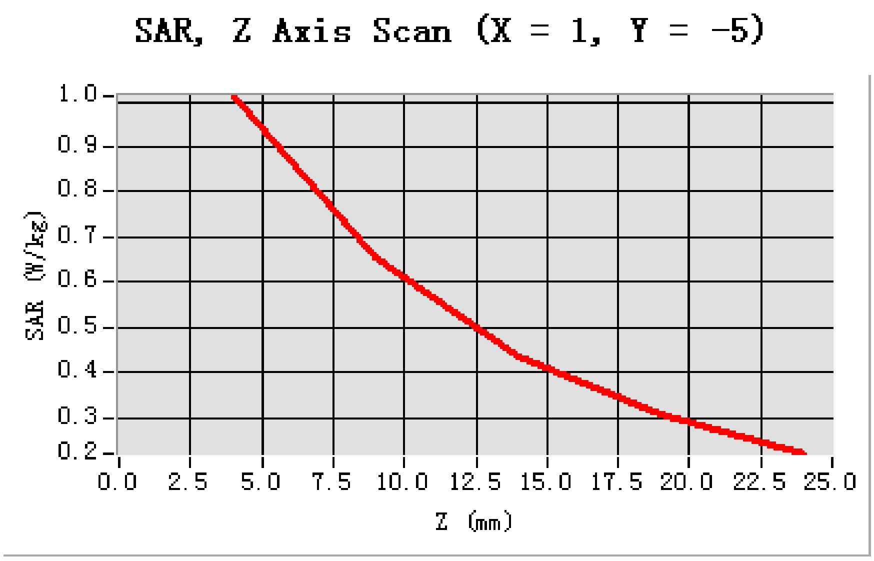
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Edge 1
Band	WCDMA Band Ⅴ
Channels	Low
Signal	CDMA (Crest factor: 1.0)

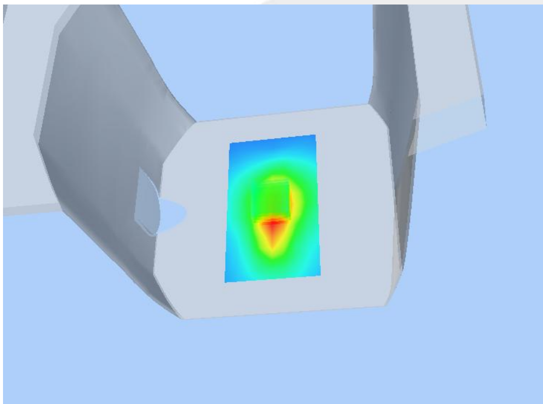
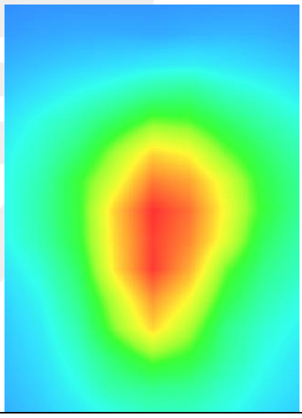
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-5.00

SAR 10g (W/Kg)	0.612079
SAR 1g (W/Kg)	0.992100

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	1.0120	0.6546	0.4378	0.3085



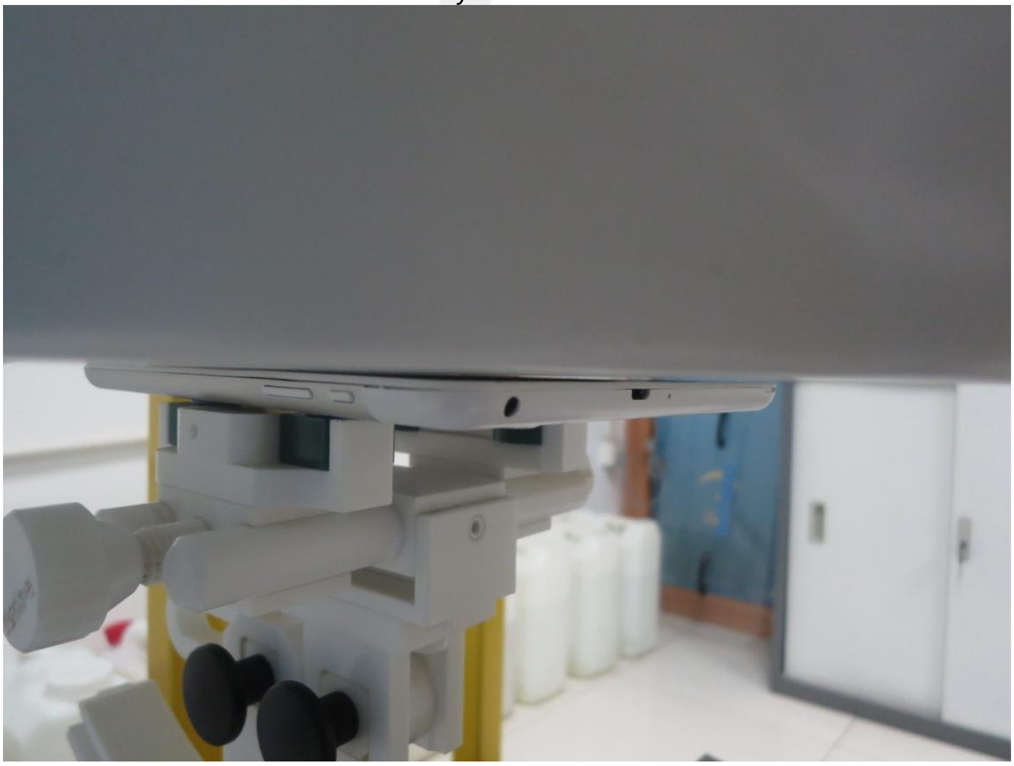
3D screen shot	Hot spot position
	

APPENDIX C. TEST SETUP PHOTOGRAPHS &EUT PHOTOGRAPHS

Test Setup Photographs

Body Back 0mm

Body Front 0mm



Edge 1 (Top)

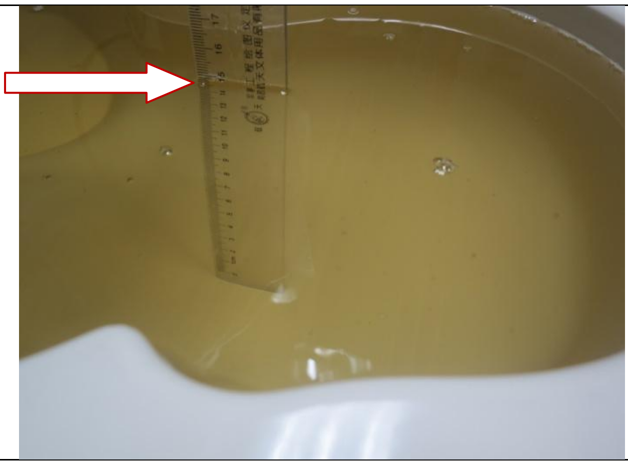
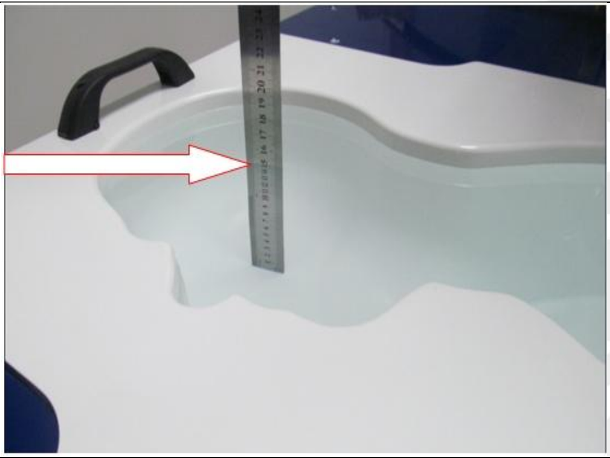
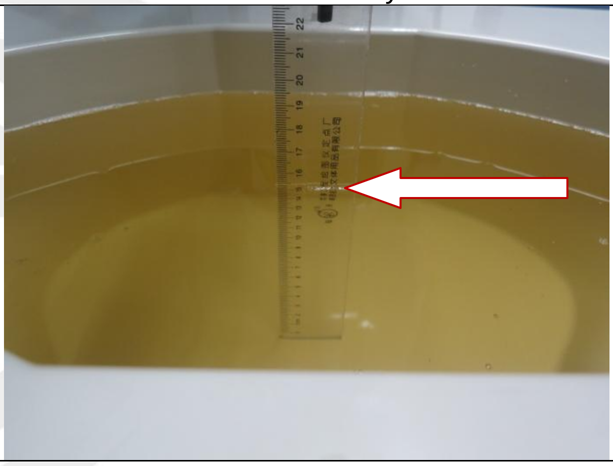
Edge 2(Right)

Edge 3(Bottom)

Edge 4(Left)

DEPTH OF THE LIQUID IN THE PHANTOM—ZOOM IN

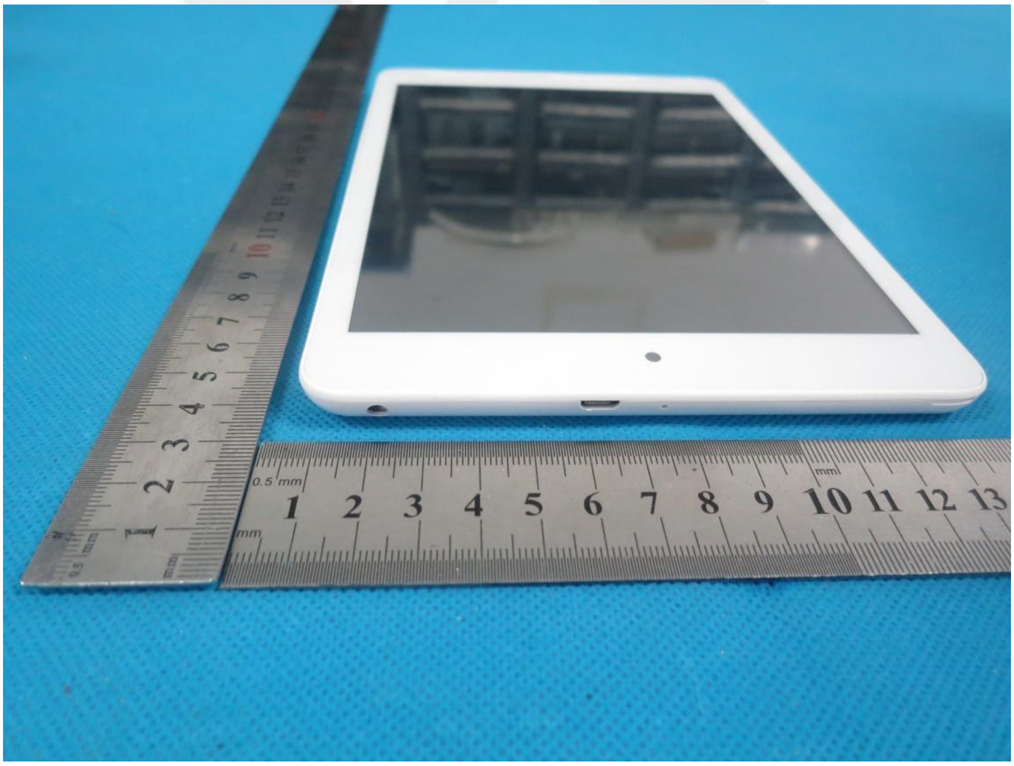
Note：The position used in the measurement were according to IEEE 1528-2013

850MHz head	850MHz body
	
1900MHz head	1900MHz body
	

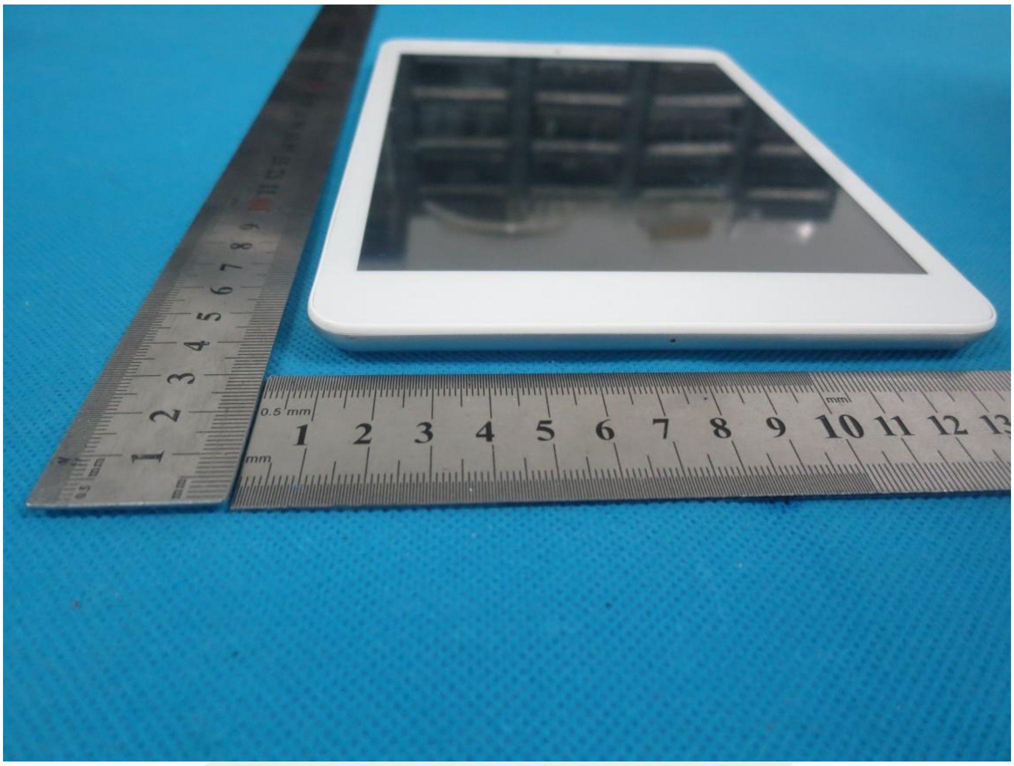
EUT PHOTOGRAPHS

All VIEW OF EUT

TOP VIEW OF EUT



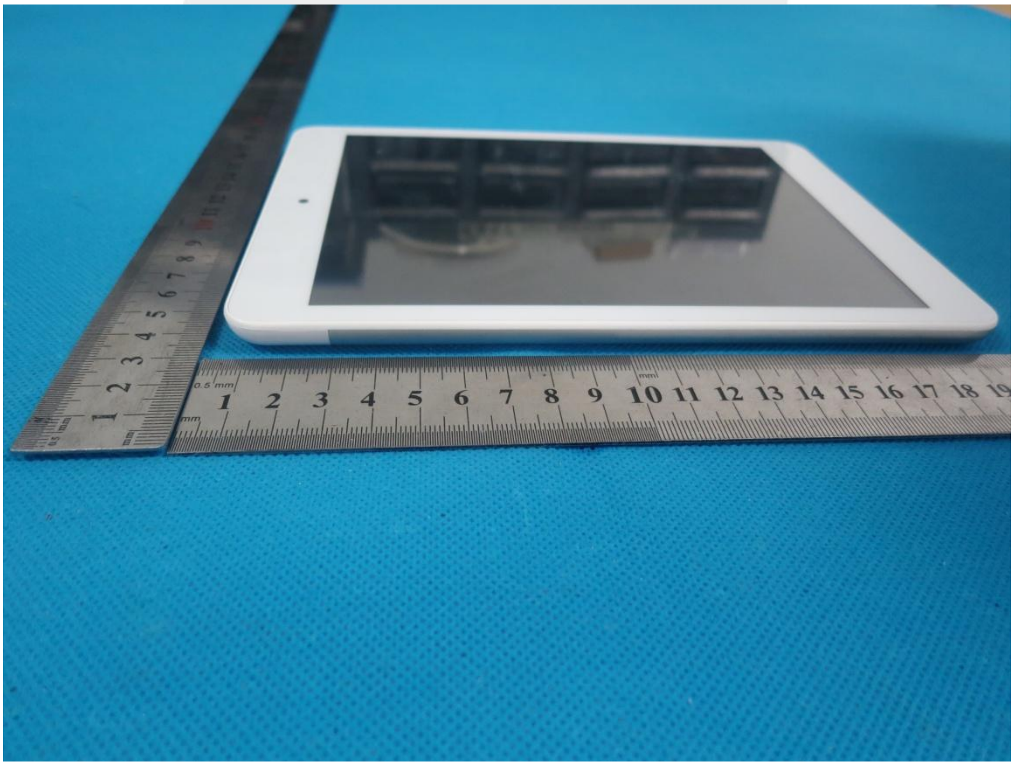
BOTTOM VIEW OF EUT



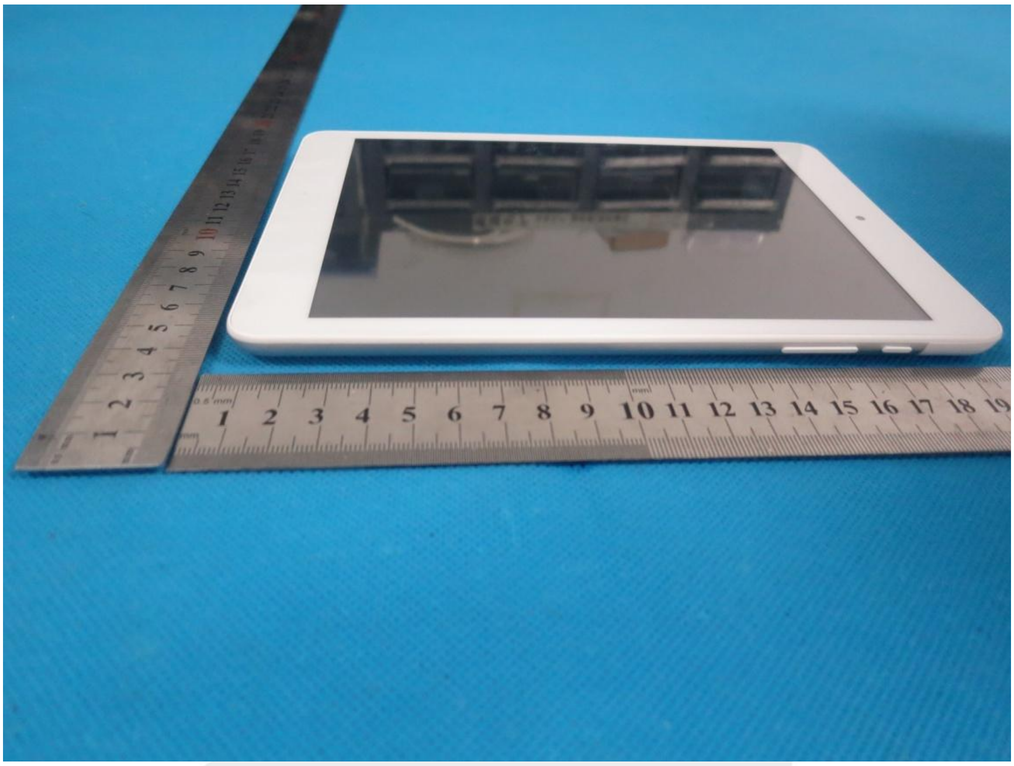
FRONT VIEW OF EUT

BACK VIEW OF EUT

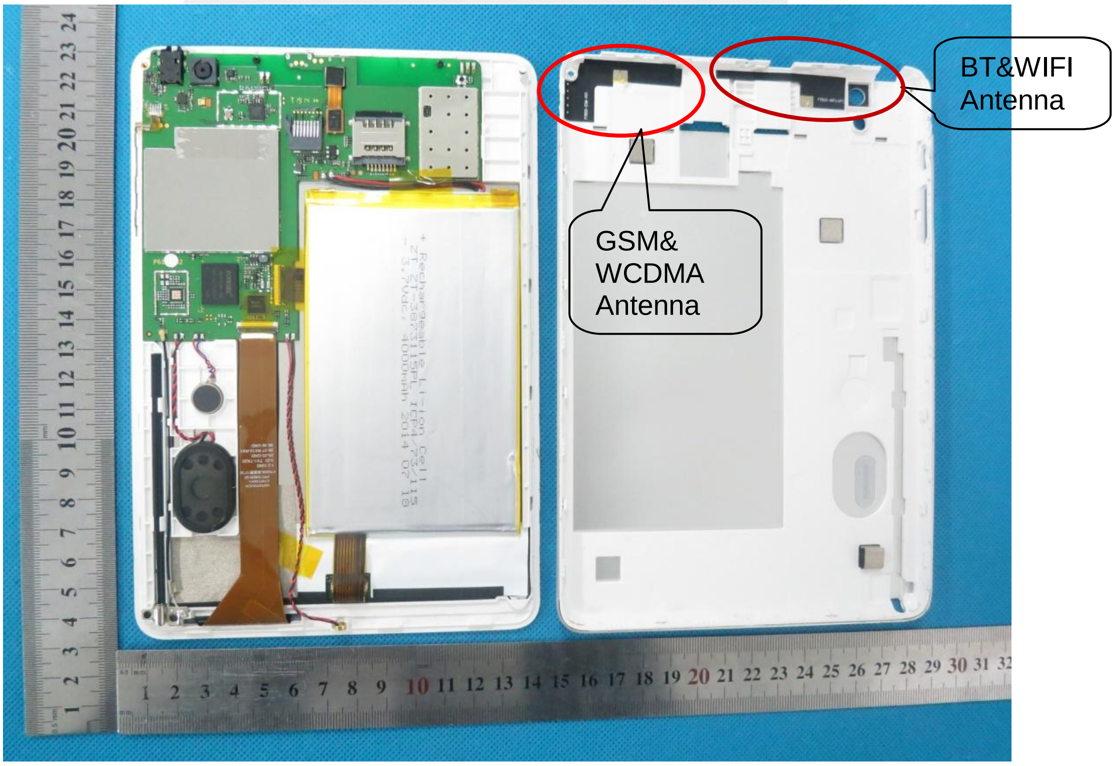
LEFT VIEW OF EUT



RIGHT VIEW OF EUT

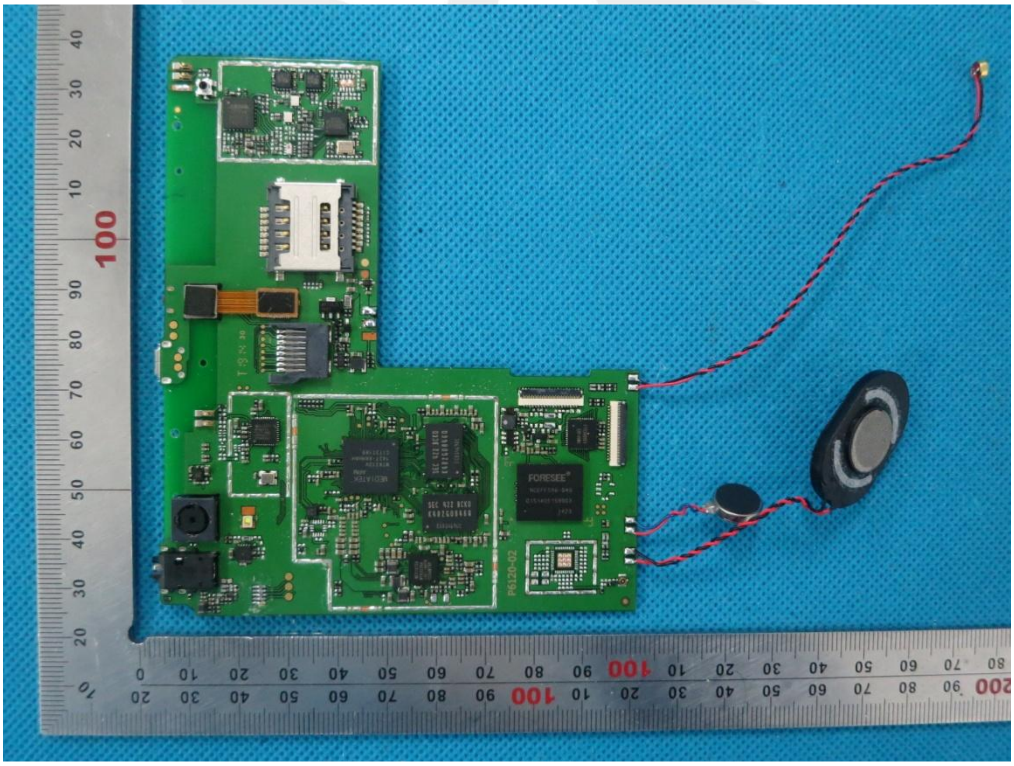


OPEN VIEW OF EUT-1

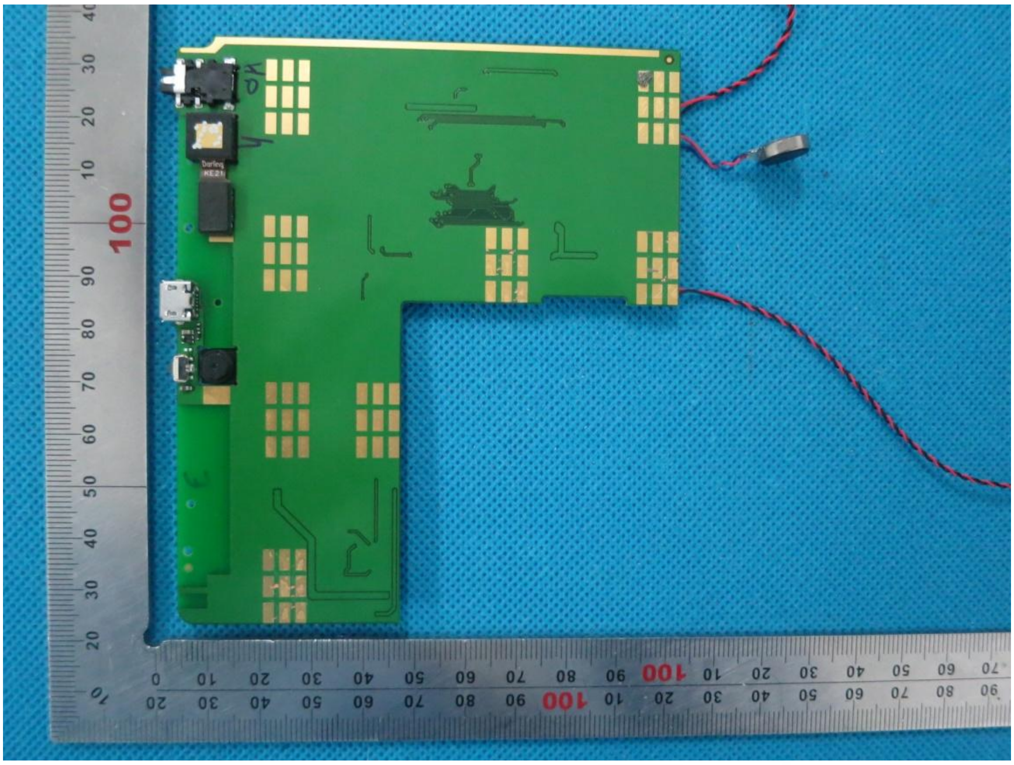


OPEN VIEW OF EUT-2

INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



APPENDIX D. PROBE CALIBRATION DATA AND DIPOLE CALIBRATION DATA

Refer the appendix Calibration Report.