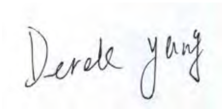
FCC SAR TEST REPORT

Application No:	ZR/2019/50026
Applicant:	TCL Communication Ltd.
Manufacturer:	TCL Communication Ltd.
Product Name:	HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone
Model No.(EUT):	4034T
Trade Mark:	alcatel
FCC ID:	2ACCJH106
Standards:	FCC 47CFR §2.1093
Date of Receipt:	2019-05-23
Date of Test:	2019-05-25 to 2019-05-27
Date of Issue:	2019-06-03
Test conclusion:	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:



Derek Yang

Wireless Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

REVISION HISTORY

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2019-06-03		Original

TEST SUMMARY

Frequency Band	Maximum Reported SAR(W/kg)		
	Head	Body-worn	Hotspot
GSM850	0.72	1.17	1.17
GSM1900	0.48	0.78	0.78
WCDMA Band II	0.95	1.28	1.28
WCDMA Band V	0.72	0.90	0.90
WI-FI (2.4GHz)	0.53	0.25	0.25
SAR Limited(W/kg)	1.6		
Maximum Simultaneous Transmission SAR (W/kg)			
Scenario	Head	Body-worn	Hotspot
Sum SAR	1.48	1.53	1.53
SPLSR	/	/	/
SPLSR Limited	0.04		

Approved & Released by

Simon Ling

SAR Manager

Tested by

Jackson Li

SAR Engineer

CONTENTS

1 General Information

1.1 Details of Client

Applicant:	TCL Communication Ltd.
Address:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Manufacturer:	TCL Communication Ltd.
Address:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052

1.2 Test Location

Company: SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Address: No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China

Post code: 518057

Telephone: +86 (0) 755 2601 2053

Fax: +86 (0) 755 2671 0594

E-mail: ee.shenzhen@sgs.com

1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

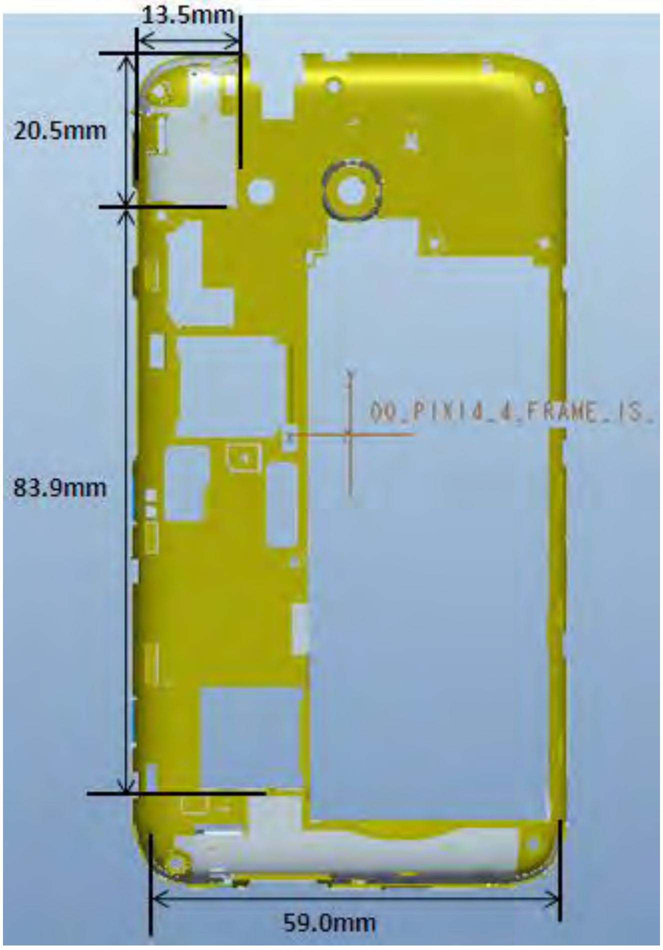
• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

1.4 General Description of EUT

Product Name:	HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone		
Model No.(EUT):	4034T		
FCC ID:	2ACCJH106		
Trade Mark:	ALCATEL		
Product Phase:	production unit		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
SN:	SKY5O7TO5LU8595T/OFKNCUJVVCBIWCD6		
Hardware Version:	PIO		
Software Version:	vAK52		
Antenna Type:	Inner Antenna		
Device Operating Configurations :			
Modulation Mode:	**GSM:** GMSK; **WCDMA**: QPSK, **WIFI:** DSSS; OFDM; **BT:** GFSK, π/4DQPSK,8DPSK		
Device Class:	B		
GPRS Multi-slots Class:	12		
HSDPA UE Category:	10	HSUPA UE Category	6
Power Class	4,tested with power level 5(GSM850)		
	1,tested with power level 0(GSM1900)		
	3, tested with power control "all 1"(WCDMA Band II/V)		
Frequency Bands:	Band	Tx (MHz)	Rx (MHz)
	GSM850	824~849	869~894
	GSM1900	1850~1910	1930~1990
	WCDMA Band II	1850~1910	1930~1990
	WCDMA Band V	824~849	869~894
	WIFI2.4G	2412~2462	2412~2462
	BT	2402~2480	2402~2480
Battery Information1#:	Model:	CAB1500042C7	
	Normal Voltage:	3.8V	
	Rated capacity:	1500mAh	
	Manufacturer:	Ningbo Veken Battery Co.,Ltd.	
Battery Information2#:	Model:	CAB1500077CA	
	Normal Voltage:	3.8V	
	Rated capacity:	1500mAh	
	Manufacturer:	Zhongshan Tianmao Battery Co.,Ltd.	
Headset Information:	Model:	CCB0050A11C1	
	Manufacturer	HUIZHOU JUWEI ELECTRONICS CO., LTD	

1.4.1 DUT Antenna Locations(Back View)



Note:

1）The test device is a mobile phone. The overall diagonal dimension of this device is 129mm. According to the distance between GSM/WCDMA/WiFi antennas and the sides of the EUT we can draw the conclusion that:

EUT Sides for SAR Testing							
Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
Main Antenna	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	Yes	No	Yes
2.4G WIFI & BT	Hotspot/Product specific 10g SAR	Yes	Yes	Yes	Yes	Yes	No

Table 1： EUT Sides for SAR Testing

Note:

1) When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.

1.5 Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE Std C95.1 – 1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 941225 D01 3G SAR Procedures v03r01	3G SAR Measurement Procedures
KDB 941225 D06 Hotspot Mode SAR v02r01	SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities
KDB 248227 D01 802.11 Wi-Fi SAR v02r02	SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 648474 D04 Handset SAR v01r03	SAR Evaluation Considerations for Wireless Handsets
KDB 447498 D01 General RF Exposure Guidance v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
KDB 447498 D03 Supplement C Cross-Reference v01	OET Bulletin 65, Supplement C Cross-Reference
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02	RF Exposure Compliance Reporting and Documentation Considerations

1.6 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain*Trunk)	**1.60 W/kg**	8.00 W/kg
Spatial Average SAR** (Whole Body)	0.08 W/kg	0.40 W/kg
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	4.00 W/kg	20.00 W/kg

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

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

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

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

2 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

Table 2: The Ambient Conditions

3 SAR Measurements System Configuration

3.1 The SAR Measurement System

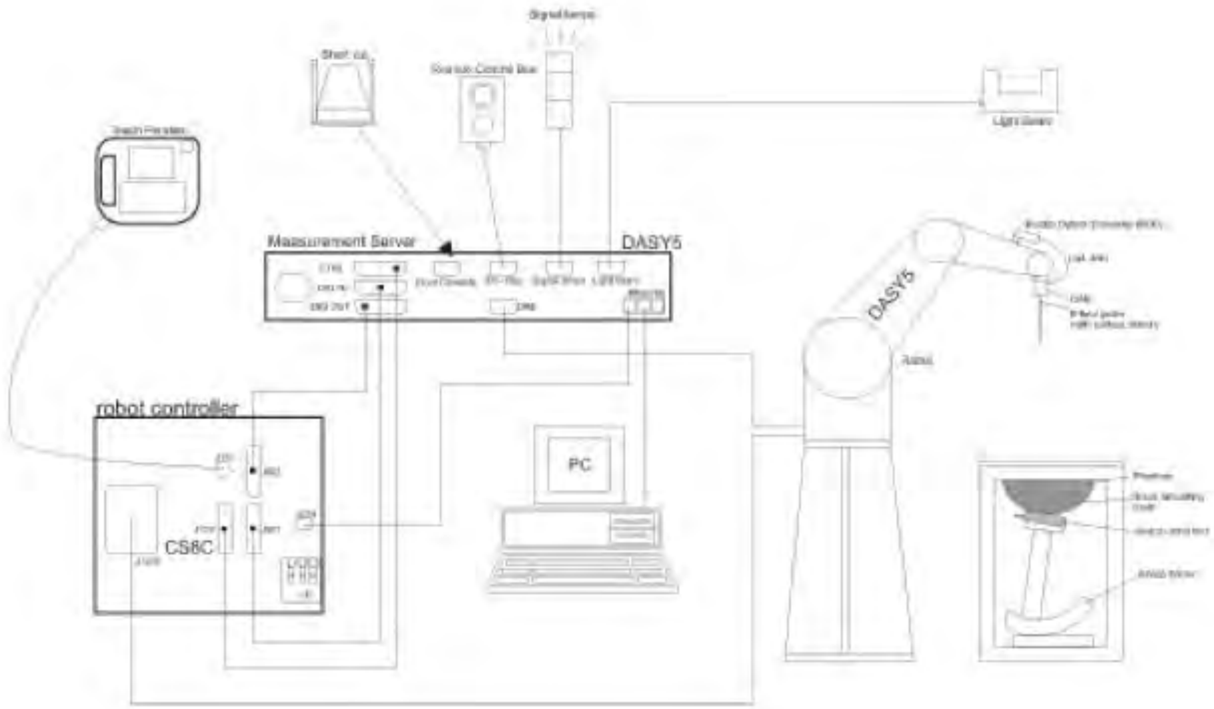
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

The DASY5 system for performing compliance tests consists of the following items:
A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software. An arm extension for accommodation the data acquisition electronics (DAE).

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



F-1. SAR Measurement System Configuration

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- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

3.2 Isotropic E-field Probe EX3DV4

	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

3.3 Data Acquisition Electronics (DAE)

Model	DAE
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV,400mV)
Input Offset Voltage	< 5μV (with auto zero)
Input Bias Current	< 50 f A
Dimensions	60 x 60 x 68 mm

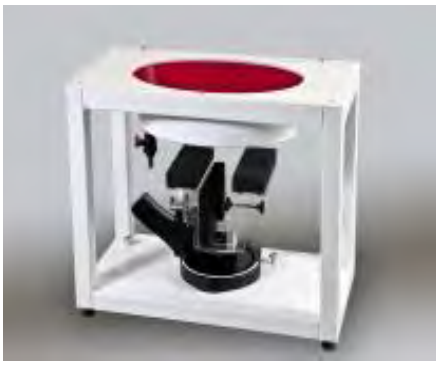
3.4 SAM Twin Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters
Wooden Support	SPEAG standard phantom table

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

3.5 ELI Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	
Wooden Support	SPEAG standard phantom table	

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.

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3.6 Device Holder for Transmitters

F-2. **Device Holder for Transmitters**

- The DASY 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 centres for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
- The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=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.

3.7 Measurement procedure

3.7.1 Scanning procedure

Step 1: Power reference measurement

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.

Step 2: *Area scan*

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: *Zoom scan*

Around this point, a volume of 32mm*32mm*30mm (f≤2GHz), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points (f≤2GHz), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification).The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2013.

Except when area scan based 1-g SAR estimation applies, a zoom scan measurement is required at the highest peak SAR location determined in the area scan to determine the 1-g SAR. 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 (per KDB publication 865664 D01), and the DASY System will be set up based on this condition to ensure that the measurement results is the maximum SAR.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
</table>

Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT's output power and should vary max. ± 5 %

3.7.2 Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.7.3 Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters: - Sensitivity Normi, ai0, ai1, ai2
- Conversion factor ConvFi
- Diode compression point Dcpi
Device parameters: - Frequency f
- Crest factor cf
Media parameters: - Conductivity ε
- Density ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With Vi = compensated signal of channel i (i = x, y, z)

Ui = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:

$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel I (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (Etot^2 \cdot \sigma) / (\varepsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

σ= conductivity in [mho/m] or [Siemens/m]

ε= equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}{}^2{}_2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}{}^2 \cdot 37.7$$

with Ppwe = equivalent power density of a plane wave in mW/cm2
Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

4 SAR measurement variability and uncertainty

4.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
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 ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

4.2 SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

5 Description of Test Position

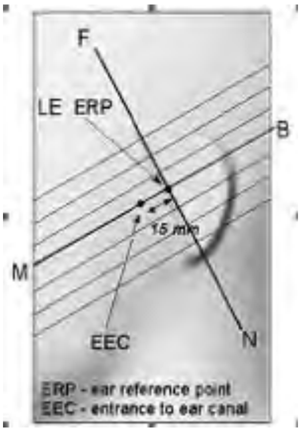
5.1 Head Exposure Condition

5.1.1 SAM Phantom Shape

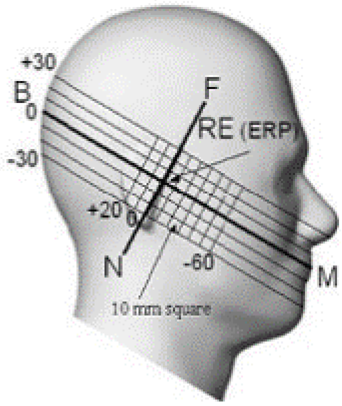
F-3. Front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only-procedures in this recommended practice are intended primarily for the phantom setup.

Note: The centre strip including the nose region has a different thickness tolerance.

F-4. Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)

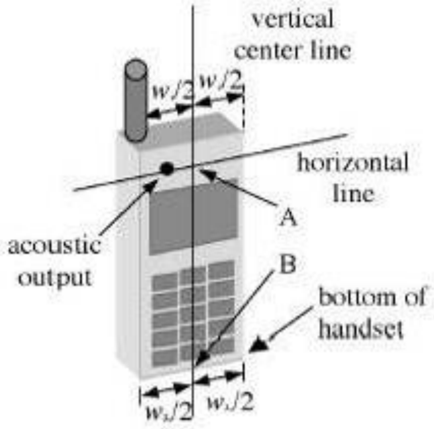


F-5. Close-up side view of phantom, showing the ear region, N-F and B-M lines, and seven cross-sectional plane locations

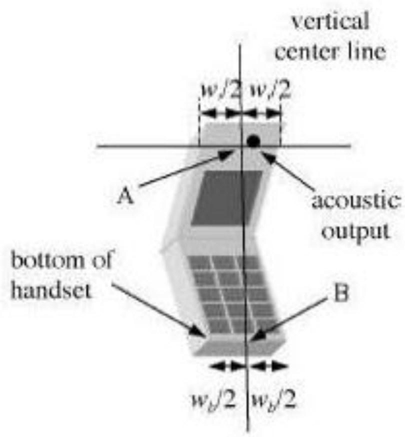


F-6. Side view of the phantom showing relevant markings and seven cross-sectional plane locations

5.1.2 EUT constructions



F-7. Handset vertical and horizontal reference lines-“fixed case”



F-8. Handset vertical and horizontal reference lines-“clam-shell case”

5.1.3 Definition of the “cheek” position

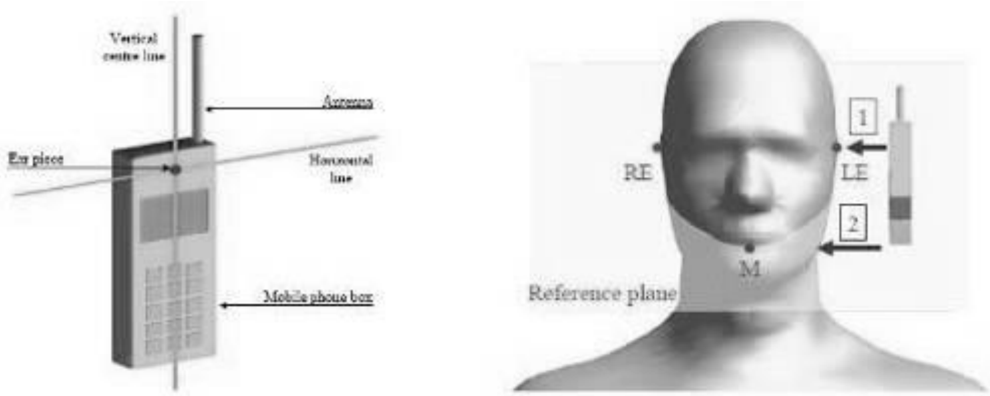
a) Position the device with the vertical centre line of the body of the device and the horizontal line crossing the centre of the ear piece in a plane parallel to the sagittal plane of the phantom ("initial position"). While maintaining the device in this plane, align the vertical centre line with the reference plane containing the three ear and mouth reference points (M, RE and LE) and align the centre of the ear piece with the line RE-LE.

b) Translate the mobile phone box towards the phantom with the ear piece aligned with the line LE-RE until telephone touches the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the box until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

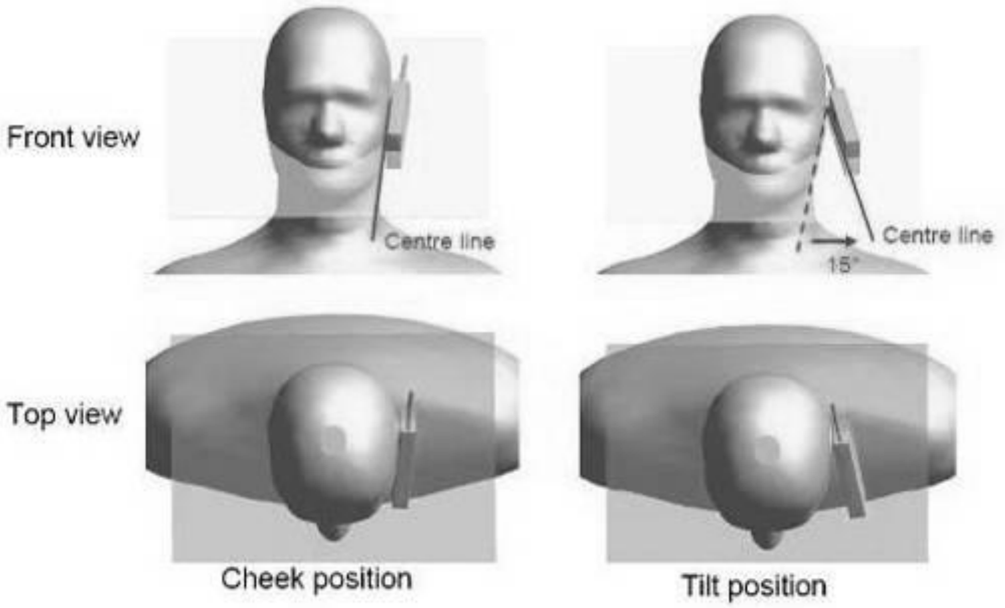
5.1.4 Definition of the "tilted" position

a) Position the device in the "cheek" position described above;

b) While maintaining the device in the reference plane described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.



F-9. **Definition of the reference lines and points, on the phone and on the phantom and initial position**



F-10. **"Cheek" and "tilt" positions of the mobile phone on the left side**

5.2 Body Exposure Condition

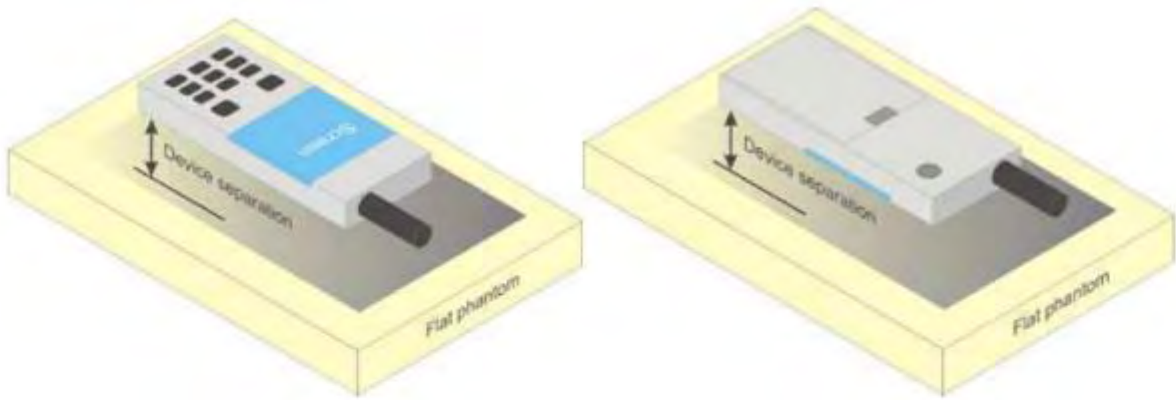
5.2.1 Body-worn accessory exposure conditions

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.



F-11. **Test positions for body-worn devices**

5.2.2 Wireless Router exposure conditions

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. For devices with form factors smaller than 9 cm x 5 cm, a test separation distance of 5 mm is required.

5.3 Body Exposure Condition

Per FCC KDB 648474D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the device is marketed as “Phablet”.

The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for Product Specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

Due to the SAR result, the main antenna frequency bands are not required to test with 0mm for the Product Specific 10-g SAR.

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6 SAR System Check Procedure

6.1 Tissue Simulate Liquid

6.1.1 Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands：

Ingredients (% by weight)	Frequency (MHz)							
	450		835		1800-2000		2300-2700	
Tissue Type	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**
Water	38.56	51.16	40.30	50.75	55.24	70.17	55.00	68.53
Salt (NaCl)	3.95	1.49	1.38	0.94	0.31	0.39	0.2	0.1
Sucrose	56.32	46.78	57.90	48.21	0	0	0	0
HEC	0.98	0.52	0.24	0	0	0	0	0
Bactericide	0.19	0.05	0.18	0.10	0	0	0	0
Tween	0	0	0	0	44.45	29.44	44.80	31.37

Salt: 99^{+}% Pure Sodium Chloride
Sucrose: 98^{+}% Pure Sucrose
Water: De-ionized, 16 $M\Omega^{+}$ resistivity
HEC: Hydroxyethyl Cellulose
Tween: Polyoxyethylene (20) sorbitan monolaurate

HSL5GHz is composed of the following ingredients：
Water：50-65%
Mineral oil：10-30%
Emulsifiers：8-25%
Sodium salt：0-1.5%

MSL5GHz is composed of the following ingredients：
Water：64-78%
Mineral oil：11-18%
Emulsifiers：9-15%
Sodium salt：2-3%

Table 3： Recipe of Tissue Simulate Liquid

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6.1.2 Measurement for Tissue Simulate Liquid

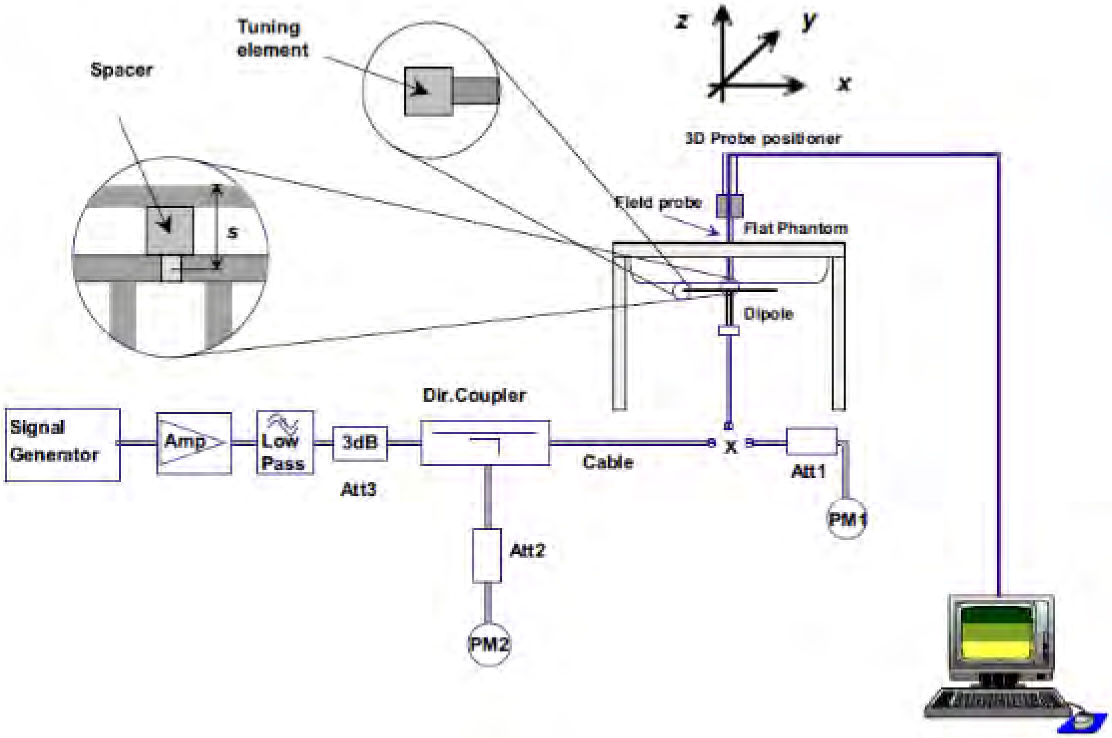
The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent Model 85070E Dielectric Probe in conjunction with Agilent E5071C Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

Tissue Type	Measured Frequency （MHz）	Target Tissue (±5%)		Measured Tissue		Liquid Temp.	Measured Date
		ε_r	σ(S/m)	ε_r	σ(S/m)	(℃)	
835 Head	835	41.5 (39.43~43.58)	0.90 (0.86~0.95)	40.83	0.887	22.1	2019/5/26
835 Body	835	55.2 (52.44~57.96)	0.97 (0.92~1.02)	54.871	1.011	22.1	2019/5/26
1900 Head	1900	40.0 (38.00~42.00)	1.40 (1.33~1.47)	40.029	1.362	22.3	2019/5/26
1900 Body	1900	53.3 (50.64~55.97)	1.52 (1.44~1.60)	52.651	1.499	22.3	2019/5/25
2450 Head	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	39.901	1.826	22.0	2019/5/27
2450 Body	2450	52.70 (50.07~55.34)	1.95 (1.85~2.05)	52.683	1.969	22.0	2019/5/27

Table 4： Measurement result of Tissue electric parameters

6.2 SAR System Check

The microwave circuit arrangement for system check is sketched in below figure. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mW (below 3GHz) or 100mW (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-12. the microwave circuit arrangement used for SAR system check

6.2.1 Justification for Extended SAR Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix H.

a) There is no physical damage on the dipole;
b) System check with specific dipole is within 20% of calibrated value;
c) Return-loss is within 10% of calibrated measurement;
d) Impedance is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

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6.2.2 Summary System Check Result(s)

Validation Kit		Measured SAR 250mW 1g (W/kg)	Measured SAR 250mW 10g (W/kg)	Measured SAR (normalized to 1W) 1g (W/kg)	Measured SAR (normalized to 1W) 10g (W/kg)	Target SAR (normalized to 1W) (±10%) 1-g(W/kg)	Target SAR (normalized to 1W) (±10%) 10-g(W/kg)	Liquid Temp. (℃)	Measured Date
D835V2	Head	2.47	1.61	9.88	6.44	9.59 (8.63~10.55)	6.29 (5.66~6.92)	22.1	2019/5/26
	Body	2.51	1.64	10.04	6.56	9.65 (8.69~10.62)	6.46 (5.81~7.11)	22.1	2019/5/26
D1900V2	Head	10.10	5.21	40.40	20.84	40.7 (36.63~44.77)	21.1 (18.99~23.21)	22.3	2019/5/26
	Body	9.67	5.22	38.68	20.88	41.6 (37.44~45.76)	21.4 (19.26~23.54)	22.3	2019/5/25
D2450V2	Head	13.30	6.15	53.20	24.60	53.1 (47.79~58.41)	24.9 (22.41~27.39)	22.0	2019/5/27
	Body	12.70	5.84	50.80	23.36	51.0 (45.9~56.1)	23.5 (21.15~25.85)	22.0	2019/5/27

Table 5： SAR System Check Result

6.2.3 Detailed System Check Results

Please see the Appendix A

7 Test Configuration

7.1 3G SAR Test Reduction Procedure

According to KDB 941225D01, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

7.2 Operation Configurations

7.2.1 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMW500 the power lever is set to “5”and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

7.2.2 WCDMA Test Configuration

1）. Output Power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1's" for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are required in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

2）. Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure

3）. Body SAR

SAR for body configurations is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreaing code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

4）. HSDPA / HSUPA/ DC-HSDPA

RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest measured SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.5 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

a) HSDPA

HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors(βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) are set according to values indicated in the following table The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Sub-test	βc	Bd	βd(SF)	βc/βd	βhs	CM(dB)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	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

Note1: △ACK, △NACK and △CQI= 8 Ahs = βhs/βc=30/15 βhs=30/15*βc
Note2: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 5.13.1.A,and HSDPA EVM with phase discontinuity in clause 5.13.1AA, △ACK and △NACK= 8 (Ahs=30/15) with βhs=30/15*βc,and △CQI= 7 (Ahs=24/15) with βhs=24/15*βc.
Note3: CM=1 forβc/βd =12/15, βhs/βc=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.

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI"s
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 6： settings of required H-Set 1 QPSK acc. to 3GPP 34.121

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	MaximumH S-DSCH Transport BlockBits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

Table 7： HSDPA UE category

b) HSUPA

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSUPA should be configured according to the values indicated below as well as other applicable procedures described in the „WCDMA Handset" and „Release 5 HSUPA Data Device" sections of 3G device.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}[1]	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (codes)	CM[2] (dB)	MPR (dB)	AG[4] Index	E-TFCI
1	11/15[3]	15/15[3]	64	11/15[3]	22/15	209/225	1039/225	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	β_{ed1}:47/15 β_{ed2}:47/15	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[4]	15/15[4]	64	15/15[4]	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ ACK, Δ NACK and Δ CQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. 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 β_c/β_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 $\beta_c = 10/15$ and $\beta_d = 15/15$

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 8： Subtests for UMTS Release 6 HSUPA

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Speading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF4	11484	5.76
	4	4	2		20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).

Table 9： HSUPA UE category

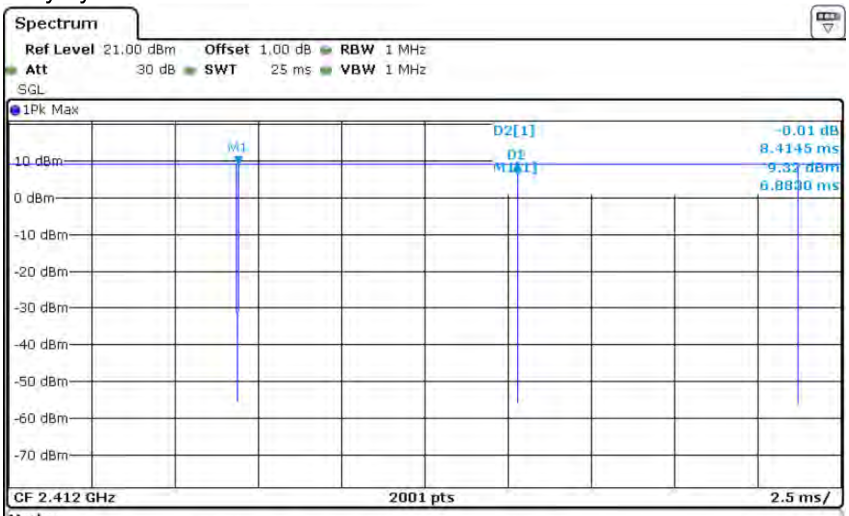
7.2.3 WiFi Test Configuration

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

7.2.3.1 Duty cycle

2.4GHz Wi-Fi 802.11b:

Duty cycle=8.381/8.4145=99.60%



Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	6.883 ms	9.32 dBm		
D1	M1	1	8.381 ms	-0.05 dB		
D2	M1	1	8.4145 ms	-0.01 dB		

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7.2.3.2 Initial Test Position SAR Test Reduction Procedure

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. The initial test position procedure is described in the following:

1） . When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).

2） . When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g

3） SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.

4） . For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested. a) Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

7.2.3.3 Initial Test Configuration Procedures

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required. SAR test reduction for subsequent highest output test channels is determined according to reported SAR of the initial test configuration.
For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.
When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

7.2.3.4 Subsequent Test Configuration Procedures

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. The initial test position procedure is applied to next to the ear, UMPC mini-tablet and hotspot mode configurations. When the same maximum output power is specified for multiple transmission modes, additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. The subsequent test configuration and SAR measurement procedures are described in the following.

1）. When SAR test exclusion provisions of KDB Publication 447498 are applicable and SAR measurement is not required for the initial test configuration, SAR is also not required for the next highest maximum output power transmission mode subsequent test configuration(s) in that frequency band or aggregated band and exposure configuration.

2）. When the highest *reported* SAR for the initial test configuration (when applicable, include subsequent highest output channels), according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

3）. The number of channels in the initial test configuration and subsequent test configuration can be different due to differences in channel bandwidth. When SAR measurement is required for a subsequent test configuration and the channel bandwidth is smaller than that in the initial test configuration, all channels in the subsequent test configuration that overlap with the larger bandwidth channel tested in the initial test configuration should be used to determine the highest maximum output power channel. This step requires additional power measurement to identify the highest maximum output power channel in the subsequent test configuration to determine SAR test reduction.

   a) SAR should first be measured for the channel with highest measured output power in the subsequent test configuration.

   b) SAR for subsequent highest measured maximum output power channels in the subsequent test configuration is required only when the *reported* SAR of the preceding higher maximum output power channel(s) in the subsequent test configuration is > 1.2 W/kg or until all required channels are tested. i) For channels with the same measured maximum output power, SAR should be measured using the channel closest to the center frequency of the larger channel bandwidth channel in the initial test configuration.

4）. SAR measurements for the remaining highest specified maximum output power OFDM transmission mode configurations that have not been tested in the initial test configuration (highest maximum output) or subsequent test configuration(s) (subsequent next highest maximum output power) is determined by recursively applying the subsequent test configuration procedures in this section to the remaining configurations according to the following:

   a) replace “subsequent test configuration” with “next subsequent test configuration” (i.e., subsequent next highest specified maximum output power configuration)

   b) replace “initial test configuration” with “all tested higher output power configurations”

7.2.3.5 2.4 GHz WiFi SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. The SAR test exclusion requirements for 802.11g/n OFDM configurations are described in following.

- **802.11b DSSS SAR Test Requirements**

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1）. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2）. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

- **2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements**

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

1）. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2）. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

- **SAR Test Requirements for OFDM configurations**

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

8 Test Result

8.1 Measurement of RF Conducted Power

8.1.1 Conducted Power of GSM

GSM 850										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		128	190	251			128	190	251	
GSM(GMSK)	GSM	32.77	**32.75**	32.76	33.30	-9.19	23.58	23.56	23.57	24.11
GPRS/EGPRS (GMSK)	1 TX Slot	32.55	32.63	32.60	33.30	-9.19	23.36	23.44	23.41	24.11
	2 TX Slots	29.82	29.81	29.72	30.50	-6.18	**23.64**	23.63	23.54	24.32
	3 TX Slots	27.80	27.72	27.64	28.50	-4.42	23.38	23.30	23.22	24.08
	4 TX Slots	**26.76**	**26.72**	**26.59**	27.50	-3.17	23.59	23.55	23.42	**24.33**
GSM 1900										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		512	661	810			512	661	810	
GSM(GMSK)	GSM	30.15	**30.28**	30.24	30.30	-9.19	20.96	21.09	21.05	21.11
GPRS/EGPRS (GMSK)	1 TX Slot	30.04	30.20	30.25	30.30	-9.19	20.85	21.01	21.06	21.11
	2 TX Slots	27.61	27.83	27.94	28.00	-6.18	21.43	21.65	**21.76**	21.82
	3 TX Slots	25.39	25.65	25.82	26.00	-4.42	20.97	21.23	21.40	21.58
	4 TX Slots	24.19	**24.45**	24.65	25.00	-3.17	21.02	21.28	21.48	**21.83**

Table 10：Conducted Power of GSM

Note:

1）. CMW500 measures GSM peak and average output power for active timeslots. For SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

No. of timeslots	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.075
Time based avg. power compared to slotted avg. power	-9.19	-6.18	-4.42	-3.17

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 = 10 x log (Burst-averaged power mW x Slot used / 8

3）. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used

8.1.2 Conducted Power of WCDMA

WCDMA Band II					
Average Conducted Power(dBm)					
Channel		9262	9400	9538	Tune up
WCDMA	12.2kbps RMC	**23.32**	**23.35**	**23.30**	24.00
	12.2kbps AMR	23.50	23.31	23.24	24.00
HSDPA	Subtest 1	22.54	22.47	22.37	23.00
	Subtest 2	22.52	22.48	22.38	23.00
	Subtest 3	22.05	21.98	21.93	23.00
	Subtest 4	22.58	22.47	22.39	23.00
HSUPA	Subtest 1	20.55	20.52	20.50	21.00
	Subtest 2	20.63	20.54	20.50	21.00
	Subtest 3	20.44	20.51	20.42	21.00
	Subtest 4	20.09	20.03	19.95	21.00
	Subtest 5	22.40	22.50	22.40	23.00
WCDMA Band V					
Average Conducted Power(dBm)					
Channel		4132	4182	4233	Tune up
WCDMA	12.2kbps RMC	**23.95**	**23.95**	**23.84**	24.00
	12.2kbps AMR	23.86	23.87	23.80	24.00
HSDPA	Subtest 1	23.36	23.38	23.39	24.00
	Subtest 2	23.35	23.20	23.07	24.00
	Subtest 3	22.90	22.74	22.58	23.00
	Subtest 4	23.37	23.18	23.15	24.00
HSUPA	Subtest 1	21.41	21.27	21.13	22.00
	Subtest 2	21.42	21.29	21.14	22.00
	Subtest 3	21.44	21.27	21.15	22.00
	Subtest 4	20.86	20.77	20.64	21.00
	Subtest 5	23.40	23.30	23.20	24.00

Table 11：Conducted Power of WCDMA

8.1.3 Conducted Power of WIFI and BT

Mode	Channel	Frequency(MHz)	Data Rate(Mbps)	Tune up	Average Power (dBm)	SAR Test
802.11b	1	2412	1	19	17.51	No
	6	2437		19	**17.53**	Yes
	11	2462		19	17.25	No
802.11g	1	2412	6	16	14.61	No
	6	2437		16	14.29	No
	11	2462		16	14.10	No
802.11n HT20 SISO	1	2412	6.5	15	13.24	No
	6	2437		15	13.70	No
	11	2462		15	13.71	No
802.11n HT40 SISO	3	2422	13.5	12	11.82	No
	6	2437		12	11.48	No
	9	2452		12	11.50	No

Table 12： Conducted Power of WIFI

Note:

a) Power must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band.

b) Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.

1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.

2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.

c) For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured.

BT			Tune up (dBm)	Average Conducted Power(dBm)
Modulation	Channel	Frequency(MHz)		
GFSK	0	2402	6.50	5.46
	39	2441	6.50	4.56
	78	2480	6.50	5.81
π/4DQPSK	0	2402	4.00	3.56
	39	2441	4.00	2.16
	78	2480	4.00	3.94
8DPSK	0	2402	4.50	3.34
	39	2441	4.50	1.90
	78	2480	4.50	3.75
BLE			Tune up (dBm)	Average Conducted Power(dBm)
Modulation	Channel	Frequency(MHz)		
GFSK	0	2402	-1.5	-2.77
	19	2440	-1.5	-4.26
	39	2480	-1.5	-2.32

Table 13：Conducted Power of BT

8.2 Stand-alone SAR test evaluation

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

Freq. Band	Frequency (GHz)	Position	Average Power		Test Separation (mm)	Calculate Value	Exclusion Threshold	Exclusion (Y/N)
			dBm	mW				
Wi-Fi	2.462	Head	19	79.43	0	24.9	3	N
		Hotspot	19	79.43	10	12.5	3	N
Bluetooth	2.48	Head	6.5	4.47	0	1.4	3	Y
		Hotspot	6.5	4.47	10	0.7	3	Y

The 1-g 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

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

8.3 Measurement of SAR Data

8.3.1 SAR Result of GSM850

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift (dB)	Conducted Power (dBm)	Tune up Limit (dBm)	Scaled factor	Scaled SAR(W/kg) 1-g	Scaled SAR(W/kg) 10-g	Liquid Temp
Head Test data												
Left cheek	GSM	190/836.6	1:8.3	0.635	0.473	0.03	32.75	33.30	1.135	**0.721**	0.537	22.1
Left tilted	GSM	190/836.6	1:8.3	0.303	0.233	0.02	32.75	33.30	1.135	0.344	0.264	22.1
Right cheek	GSM	190/836.6	1:8.3	0.602	0.448	0.09	32.75	33.30	1.135	0.683	0.508	22.1
Right tilted	GSM	190/836.6	1:8.3	0.430	0.322	-0.04	32.75	33.30	1.135	0.488	0.365	22.1
Head Test Data at the worst case with Battery 2												
Left cheek	GSM	190/836.6	1:8.3	0.601	0.448	0.02	32.75	33.30	1.135	0.682	0.508	22.1
Body Test data(Separate 10mm)												
Front side	GPRS 4TS	190/836.6	1:2.075	0.921	0.692	-0.10	26.72	27.50	1.197	1.102	0.828	22.1
Front side	GPRS 4TS	128/824.2	1:2.075	0.774	0.586	-0.02	26.76	27.50	1.186	0.918	0.695	22.1
Front side	GPRS 4TS	251/848.8	1:2.075	0.910	0.688	0.12	26.59	27.50	1.233	1.122	0.848	22.1
Back side	GPRS 4TS	190/836.6	1:2.075	0.952	0.720	0.02	26.72	27.50	1.197	1.139	0.862	22.1
Back side-repeat	GPRS 4TS	190/836.6	1:2.075	0.938	0.699	0.00	26.72	27.50	1.197	1.123	0.837	22.1
Back side	GPRS 4TS	128/824.2	1:2.075	0.854	0.642	0.03	26.76	27.50	1.186	1.013	0.761	22.1
Back side	GPRS 4TS	251/848.8	1:2.075	0.949	0.707	0.00	26.59	27.50	1.233	**1.170**	0.872	22.1
Left side	GPRS 4TS	190/836.6	1:2.075	0.773	0.546	0.15	26.72	27.50	1.197	0.925	0.653	22.1
Left side	GPRS 4TS	128/824.2	1:2.075	0.689	0.483	0.14	26.76	27.50	1.186	0.817	0.573	22.1
Left side	GPRS 4TS	251/848.8	1:2.075	0.728	0.507	0.09	26.59	27.50	1.233	0.898	0.625	22.1
Right side	GPRS 4TS	190/836.6	1:2.075	0.796	0.546	0.06	26.72	27.50	1.197	0.953	0.653	22.1
Right side	GPRS 4TS	128/824.2	1:2.075	0.636	0.438	0.13	26.76	27.50	1.186	0.754	0.519	22.1
Right side	GPRS 4TS	251/848.8	1:2.075	0.776	0.531	0.12	26.59	27.50	1.233	0.957	0.655	22.1
Bottom side	GPRS 4TS	190/836.6	1:2.075	0.181	0.107	0.01	26.72	27.50	1.197	0.217	0.128	22.1
Hotspot Test Data at the worst case with Battery 2												
Back side	GPRS 4TS	251/848.8	1:2.075	0.930	0.693	0.00	26.59	27.50	1.233	1.147	0.855	22.1

Table 14：SAR of GSM850 for Head and Body

Note:

1) The maximum Scaled SAR value is marked in bold. Graph Results refer to Appendix B

2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Back Side	190/836.6	0.952	0.938	1.015	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

Table 15：SAR Measurement Variability Results

8.3.2 SAR Result of GSM1900

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift(dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg) 1-g	Scaled SAR(W/kg) 10-g	Liquid Temp
Head Test data												
Left cheek	GSM	661/1880	1:8.3	0.482	0.295	0.17	30.28	30.30	1.005	**0.484**	0.296	22.3
Left tilted	GSM	661/1880	1:8.3	0.159	0.103	0.11	30.28	30.30	1.005	0.160	0.103	22.3
Right cheek	GSM	661/1880	1:8.3	0.430	0.266	0.17	30.28	30.30	1.005	0.432	0.267	22.3
Right tilted	GSM	661/1880	1:8.3	0.287	0.114	-0.16	30.28	30.30	1.005	0.288	0.115	22.3
Head Test Data at the worst case with Battery 2												
Left cheek	GSM	661/1880	1:8.3	0.468	0.287	0.07	30.28	30.30	1.005	0.470	0.288	22.3
Body Test data(Separate 10mm)												
Front side	GPRS 4TS	661/1880	1:2.075	0.491	0.322	0.07	24.45	25.00	1.135	0.557	0.365	22.3
Back side	GPRS 4TS	661/1880	1:2.075	0.685	0.408	0.02	24.45	25.00	1.135	**0.777**	0.463	22.3
Left side	GPRS 4TS	661/1880	1:2.075	0.123	0.076	-0.03	24.45	25.00	1.135	0.140	0.086	22.3
Right side	GPRS 4TS	661/1880	1:2.075	0.163	0.097	0.02	24.45	25.00	1.135	0.185	0.111	22.3
Bottom side	GPRS 4TS	661/1880	1:2.075	0.572	0.323	0.00	24.45	25.00	1.135	0.649	0.367	22.3
Hotspot Test Data at the worst case with Battery 2												
Back side	GPRS 4TS	661/1880	1:2.075	0.666	0.397	0.01	24.45	25.00	1.135	0.756	0.451	22.3

Table 16：SAR of GSM1900 for Head and Body

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

8.3.3 SAR Result of WCDMA Band II

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift(dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg) 1-g	Scaled SAR(W/kg) 10-g	Liquid Temp
Head Test data												
Left cheek	RMC	9400/1880	1:1	0.819	0.498	0.02	23.35	24.00	1.161	**0.951**	0.578	22.3
Left cheek	RMC	9262/1852.4	1:1	0.801	0.493	0.18	23.32	24.00	1.169	0.937	0.577	22.3
Left cheek	RMC	9538/1907.6	1:1	0.756	0.454	0.16	23.30	24.00	1.175	0.888	0.533	22.3
Left tilted	RMC	9400/1880	1:1	0.266	0.040	0.04	23.35	24.00	1.161	0.309	0.046	22.3
Right cheek	RMC	9400/1880	1:1	0.727	0.450	-0.03	23.35	24.00	1.161	0.844	0.523	22.3
Right cheek	RMC	9262/1852.4	1:1	0.647	0.436	0.14	23.32	24.00	1.169	0.757	0.510	22.3
Right cheek	RMC	9538/1907.6	1:1	0.673	0.413	0.08	23.30	24.00	1.175	0.791	0.485	22.3
Right tilted	RMC	9400/1880	1:1	0.425	0.266	-0.02	23.35	24.00	1.161	0.494	0.309	22.3
Left cheek-Repeat	RMC	9400/1880	1:1	0.798	0.491	0.08	23.35	24.00	1.161	0.927	0.570	22.3
Head Test Data at the worst case with Battery 2												
Left cheek	RMC	9400/1880	1:8.3	0.795	0.483	0.02	23.35	24.00	1.161	0.923	0.561	22.3
Body Test data(Separate 10mm)												
Front side	RMC	9400/1880	1:1	0.766	0.499	0.12	23.35	24.00	1.161	0.890	0.580	22.3
Front side	RMC	9262/1852.4	1:1	0.732	0.475	0.03	23.32	24.00	1.169	0.856	0.556	22.3
Front side	RMC	9538/1907.6	1:1	0.705	0.458	0.09	23.30	24.00	1.175	0.828	0.538	22.3
Back side	RMC	9400/1880	1:1	1.100	0.654	-0.02	23.35	24.00	1.161	**1.278**	0.760	22.3
Back side-repeat	RMC	9400/1880	1:1	1.020	0.596	-0.08	23.35	24.00	1.161	1.185	0.692	22.3
Back side	RMC	9262/1852.4	1:1	0.959	0.565	0.07	23.32	24.00	1.169	1.122	0.661	22.3
Back side	RMC	9538/1907.6	1:1	0.961	0.549	0.03	23.30	24.00	1.175	1.129	0.645	22.3
Back side with headset	RMC	9400/1880	1:1	0.913	0.531	0.08	23.35	24.00	1.161	1.060	0.617	22.3
Back side with headset	RMC	9262/1852.4	1:1	0.889	0.531	0.08	23.32	24.00	1.169	1.040	0.621	22.3
Back side with headset	RMC	9538/1907.6	1:1	0.937	0.545	0.01	23.30	24.00	1.175	1.101	0.640	22.3
Left side	RMC	9400/1880	1:1	0.213	0.132	-0.01	23.35	24.00	1.161	0.247	0.153	22.3
Right side	RMC	9400/1880	1:1	0.236	0.142	0.08	23.35	24.00	1.161	0.274	0.165	22.3
Bottom side	RMC	9400/1880	1:1	0.953	0.544	-0.04	23.35	24.00	1.161	1.107	0.632	22.3
Bottom side	RMC	9262/1852.4	1:1	0.921	0.522	-0.05	23.32	24.00	1.169	1.077	0.610	22.3
Bottom side	RMC	9538/1907.6	1:1	0.958	0.551	0.01	23.30	24.00	1.175	1.126	0.647	22.3
Hotspot Test Data at the worst case with Battery 2												
Back side	RMC	9400/1880	1:1	0.995	0.579	0.02	23.35	24.00	1.161	1.156	0.672	22.3

Table 17：SAR of WCDMA Band II for Head and Body

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

Test Position	Channel/ Frequency	Measured SAR (1g)	1st Repeated	Ratio	2nd Repeated	3rd Repeated
	(MHz)		SAR (1g)		SAR (1g)	SAR (1g)
Left cheek	9400/1880	0.819	0.798	1.026	N/A	N/A
Back Side	9400/1880	1.100	1.020	1.078	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

Table 18：SAR Measurement Variability Results

8.3.4 SAR Result of WCDMA Band V

Test position	Test mode	Test Ch./Freq.	Duty Cycle	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power Drift(dB)	Conducted Power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg) 1-g	Scaled SAR(W/kg) 10-g	Liquid Temp
Head Test data												
Left cheek	RMC	4182/836.4	1:1	0.708	0.532	0.05	23.95	24.00	1.012	**0.716**	0.538	22.1
Left tilted	RMC	4182/836.4	1:1	0.379	0.291	0.14	23.95	24.00	1.012	0.383	0.294	22.1
Right cheek	RMC	4182/836.4	1:1	0.633	0.471	0.09	23.95	24.00	1.012	0.640	0.476	22.1
Right tilted	RMC	4182/836.4	1:1	0.401	0.308	-0.06	23.95	24.00	1.012	0.406	0.312	22.1
Head Test Data at the worst case with Battery 2												
Left cheek	RMC	4182/836.4	1:1	0.691	0.519	0.03	23.95	24.00	1.012	0.699	0.525	22.1
Body Test data (Separate 10mm)												
Front side	RMC	4182/836.4	1:1	0.684	0.518	0.01	23.95	24.00	1.012	0.692	0.524	22.1
Back side	RMC	4182/836.4	1:1	0.796	0.597	-0.19	23.95	24.00	1.012	0.805	0.604	22.1
Back side	RMC	4132/826.4	1:1	0.766	0.575	0.01	23.95	24.00	1.012	0.775	0.582	22.1
Back side	RMC	4233/846.6	1:1	0.867	0.650	-0.04	23.84	24.00	1.038	**0.900**	0.674	22.1
Back side-repeat	RMC	4233/846.6	1:1	0.857	0.644	0.06	23.84	24.00	1.038	0.889	0.668	22.1
Left side	RMC	4182/836.4	1:1	0.569	0.401	0.07	23.95	24.00	1.012	0.576	0.406	22.1
Right side	RMC	4182/836.4	1:1	0.493	0.344	0.02	23.95	24.00	1.012	0.499	0.348	22.1
Bottom side	RMC	4182/836.4	1:1	0.163	0.096	0.04	23.95	24.00	1.012	0.165	0.098	22.1
Hotspot Test Data at the worst case with Battery 2												
Back side	RMC	4233/846.6	1:1	0.851	0.638	0.01	23.84	24.00	1.038	0.883	0.662	22.1

Table 19：SAR of WCDMA Band V for Head and Body

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

Test Position	Channel/ Frequency (MHz)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	3rd Repeated SAR (1g)
Back Side	4233/846.6	0.867	0.857	1.012	N/A	N/A
Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.						
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).						
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.						
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg						

Table 20：SAR Measurement Variability Results

8.3.5 SAR Result of 2.4GHz WIFI

Test position	Test mode	Test Ch./Freq.	Duty Cycle	Duty Cycle Scaled factor	SAR (W/kg) 1-g	SAR (W/kg) 10-g	Power drift(dB)	Conducted power(dBm)	Tune up Limit(dBm)	Scaled factor	Scaled SAR(W/kg) 1-g	Scaled SAR(W/kg) 10-g	Liquid Temp.
Head Test data													
Left cheek	802.11b	6/2437	99.60%	1.004	0.378	0.169	-0.04	17.53	19.00	1.403	**0.532**	0.238	22.0
Left tilted	802.11b	6/2437	99.60%	1.004	0.195	0.088	-0.16	17.53	19.00	1.403	0.275	0.123	22.0
Right cheek	802.11b	6/2437	99.60%	1.004	0.190	0.095	0.10	17.53	19.00	1.403	0.268	0.134	22.0
Right tilted	802.11b	6/2437	99.60%	1.004	0.151	0.076	-0.05	17.53	19.00	1.403	0.213	0.108	22.0
Head Test Data at the worst case with Battery 2													
Left cheek	802.11b	6/2437	99.60%	1.004	0.372	0.167	0.01	17.53	19.00	1.403	0.524	0.235	22.0
Body Test data (Separate 10mm)													
Front side	802.11b	6/2437	99.60%	1.004	0.059	0.031	0.18	17.53	19.00	1.403	0.083	0.044	22.0
Back side	802.11b	6/2437	99.60%	1.004	0.177	0.069	0.03	17.53	19.00	1.403	**0.249**	0.097	22.0
Left side	802.11b	6/2437	99.60%	1.004	0.015	0.008	-0.06	17.53	19.00	1.403	0.021	0.012	22.0
Right side	802.11b	6/2437	99.60%	1.004	0.080	0.028	0.09	17.53	19.00	1.403	0.112	0.040	22.0
Top side	802.11b	6/2437	99.60%	1.004	0.041	0.022	0.08	17.53	19.00	1.403	0.057	0.031	22.0
Hotspot Test Data at the worst case with Battery 2													
Back side	802.11b	6/2437	99.60%	1.004	0.172	0.067	0.05	17.53	19.00	1.403	0.242	0.094	22.0

Table 21：SAR of 2.4GHz WIFI for Head and Body

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B

2) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

3) Each channel was tested at the lowest data rate.

4) Per KDB248227D01, for SAR test of WiFi 2.4G, SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure.

5) As the highest reported SAR for DSSS is adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11g/n is not required.

Mode	Tune-up (dBm)	Tune-up (mW)	Max Reported SAR(W/kg)	Adjusted SAR(W/kg)	SAR test
Head					
802.11b	19.00	79.43	0.532	/	Yes
802.11g	16.00	39.81	/	0.27	No
802.1n 20M	15.00	31.62	/	0.21	No
802.11n 40M	12.00	15.85	/	0.11	No
Body					
802.11b	19.00	79.43	0.249	/	Yes
802.11g	16.00	39.81	/	0.12	No
802.1n 20M	15.00	31.62	/	0.10	No
802.11n 40M	12.00	15.85	/	0.05	No

8.4 Multiple Transmitter Evaluation

8.4.1 Simultaneous SAR SAR test evaluation

Simultaneous Transmission

NO.	Simultaneous Transmission Configuration	Head	Body worn	Hotspot
1	GSM(Voice) + WiFi	Yes	Yes	No
2	GSM(Voice) + BT	Yes	Yes	No
3	WCDMA(Voice) + WiFi	Yes	Yes	No
4	WCDMA(Voice) + BT	Yes	Yes	No
5	GPRS (Data) + WiFi	No	No	Yes
6	GPRS (Data) + BT	No	No	Yes
7	WCDMA(Data) + WiFi	No	No	Yes
8	WCDMA(Data) + BT	No	No	Yes
9	BT+WIFI (They share the same antenna and cannot transmit at the same time by design.)	No	No	No

Note:

1) Wi-Fi and Bluetooth share the same Txantenna and can’t transmit simultaneously.
2) The body-worn data copy Body test data of Front and Back surface.

8.4.2 Estimated SAR

When the standalone SAR test exclusion 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.

• 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Estimated SAR Result

Freq. Band	Frequency (GHz)	Test Position	max. power(dBm)	Test Separation (mm)	Estimated
					1g SAR (W/kg)
Bluetooth	2.48	Head	6.5	0	0.188
		Hotspot	6.5	10	0.094

8.4.3 Simultaneous Transmission SAR Summation Scenario for Head

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	②MAX.WLAN SAR(W/kg)	③ MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Case NO.
GSM850	Left Touch	0.721	0.532	0.188	1.253	0.909	No
	Left Tilt	0.344	0.275	0.188	0.619	0.532	No
	Right Touch	0.683	0.268	0.188	0.951	0.871	No
	Right Tilt	0.488	0.213	0.188	0.701	0.676	No
GSM1900	Left Touch	0.484	0.532	0.188	1.016	0.672	No
	Left Tilt	0.160	0.275	0.188	0.435	0.348	No
	Right Touch	0.432	0.268	0.188	0.700	0.620	No
	Right Tilt	0.288	0.213	0.188	0.501	0.476	No
WCDMA Band II	Left Touch	0.951	0.532	0.188	**1.483**	1.139	No
	Left Tilt	0.309	0.275	0.188	0.584	0.497	No
	Right Touch	0.844	0.268	0.188	1.112	1.032	No
	Right Tilt	0.494	0.213	0.188	0.707	0.682	No
WCDMA Band V	Left Touch	0.716	0.532	0.188	1.248	0.904	No
	Left Tilt	0.383	0.275	0.188	0.658	0.571	No
	Right Touch	0.640	0.268	0.188	0.908	0.828	No
	Right Tilt	0.406	0.213	0.188	0.619	0.594	No

8.4.4 Simultaneous Transmission SAR Summation Scenario for body worn

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	②MAX.WLAN SAR(W/kg)	③MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Case NO.
GSM850	Front	1.122	0.083	0.094	1.205	1.216	No
	Back	1.170	0.249	0.094	1.419	1.264	No
GSM1900	Front	0.557	0.083	0.094	0.640	0.651	No
	Back	0.777	0.249	0.094	1.026	0.871	No
WCDMA Band II	Front	0.890	0.083	0.094	0.973	0.984	No
	Back	1.278	0.249	0.094	**1.527**	1.372	No
WCDMA Band V	Front	0.692	0.083	0.094	0.775	0.786	No
	Back	0.900	0.249	0.094	1.149	0.994	No

8.4.5 Simultaneous Transmission SAR Summation Scenario for hotspot

WWAN Band	Exposure position	① MAX.WWAN SAR(W/kg)	②MAX.WLAN SAR(W/kg)	③MAX.BT SAR(W/kg)	Summed SAR①+②	Summed SAR①+③	Case NO.
GSM850	Front	1.122	0.083	0.094	1.205	1.216	No
	Back	1.170	0.249	0.094	1.419	1.264	No
	Left	0.925	0.000	0.094	0.925	1.019	No
	Right	0.957	0.112	0.094	1.069	1.051	No
	Top	0.000	0.057	0.094	0.057	0.094	No
	Bottom	0.217	0.000	0.000	0.217	0.217	No
GSM1900	Front	0.557	0.083	0.094	0.640	0.651	No
	Back	0.777	0.249	0.094	1.026	0.871	No
	Left	0.140	0.000	0.094	0.140	0.234	No
	Right	0.185	0.112	0.094	0.297	0.279	No
	Top	0.000	0.057	0.094	0.057	0.094	No
	Bottom	0.649	0.000	0.000	0.649	0.649	No
WCDMA Band II	Front	0.890	0.083	0.094	0.973	0.984	No
	Back	1.278	0.249	0.094	**1.527**	1.372	No
	Left	0.247	0.000	0.094	0.247	0.341	No
	Right	0.274	0.112	0.094	0.386	0.368	No
	Top	0.000	0.057	0.094	0.057	0.094	No
	Bottom	1.126	0.000	0.000	1.126	1.126	No
WCDMA Band V	Front	0.692	0.083	0.094	0.775	0.786	No
	Back	0.900	0.249	0.094	1.149	0.994	No
	Left	0.576	0.000	0.094	0.576	0.670	No
	Right	0.499	0.112	0.094	0.611	0.593	No
	Top	0.000	0.057	0.094	0.057	0.094	No
	Bottom	0.165	0.000	0.000	0.165	0.165	No

9 Equipment list

Test Platform		SPEAG DASY5 Professional				
Location		SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch				
Description		SAR Test System (Frequency range 300MHz-6GHz)				
Software Reference		DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)				
Hardware Reference						
Equipment		Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
☒	Robot	Staubli	TX60L	F14/5T2NA1/A/01	NCR	NCR
☒	Robot	Staubli	TX60L	F13/5PP1B1/A/01	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 1	1283	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 2	1913	NCR	NCR
☒	Twin Phantom	SPEAG	SAM 3	1912	NCR	NCR
☒	ELI	SPEAG	ELI V5.0	1123	NCR	NCR
☒	DAE	SPEAG	DAE3	414	2018-12-03	2019-12-02
☒	DAE	SPEAG	DAE4	1428	2019-01-11	2020-01-10
☒	E-Field Probe	SPEAG	EX3DV4	3923	2018-09-30	2019-09-29
☒	E-Field Probe	SPEAG	EX3DV4	3793	2019-03-25	2020-03-24
☒	Validation Kits	SPEAG	D835V2	4d105	2016-12-08	2019-12-07
☒	Validation Kits	SPEAG	D1900V2	5d028	2016-12-07	2019-12-06
☒	Validation Kits	SPEAG	D2450V2	733	2016-12-07	2019-12-06
☒	Agilent Network Analyzer	Agilent	E5071C	MY46523590	2019-04-12	2020-04-11
☒	Dielectric Probe Kit	Agilent	85070E	US01440210	NCR	NCR
☒	Universal Radio Communication Tester	R&S	CMW500	103990	2019-04-09	2020-04-08
☒	RF Bi-Directional Coupler	Agilent	86205-60001	MY31400031	NCR	NCR
☒	Signal Generator	Agilent	N5171B	MY53050736	2019-04-12	2020-04-11
☒	Preamplifier	Mini-Circuits	ZHL-42W	15542	NCR	NCR
☒	Power Meter	Agilent	E4416A	GB41292095	2019-04-12	2020-04-11
☒	Power Sensor	Agilent	8481H	MY41091234	2019-04-12	2020-04-11
☒	Power Sensor	R&S	NRP-Z92	100025	2019-04-12	2020-04-11
☒	Attenuator	SHX	TS2-3dB	30704	NCR	NCR
☒	Coaxial low pass filter	Mini-Circuits	VLF-2500(+)	NA	NCR	NCR
☒	Coaxial low pass filter	Microlab Fxr	LA-F13	NA	NCR	NCR
☒	50 Ω coaxial load	Mini-Circuits	KARN-50+	00850	NCR	NCR
☒	DC POWER SUPPLY	SAKO	SK1730SL 5A	NA	NCR	NCR

☒	Speed reading thermometer	MingGao	T809	NA	2019-04-15	2020-04-14
☒	Humidity and Temperature Indicator	KIMTOKA	KIMTOKA	NA	2019-04-15	2020-04-14

Note: All the equipments are within the valid period when the tests are performed.

10 Calibration certificate

Please see the Appendix C

11 Photographs

Please see the Appendix D

Appendix A: Detailed System Check Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

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Appendix A

Detailed System Check Results

1. System Performance Check
System Performance Check 835 MHz Head
System Performance Check 835 MHz Body
System Performance Check 1900 MHz Head
System Performance Check 1900 MHz Body
System Performance Check 2450 MHz Head
System Performance Check 2450 MHz Body

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

System Performance Check 835 MHz Head

DUT: D835V2; Type: D835V2; Serial: 4d105

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1

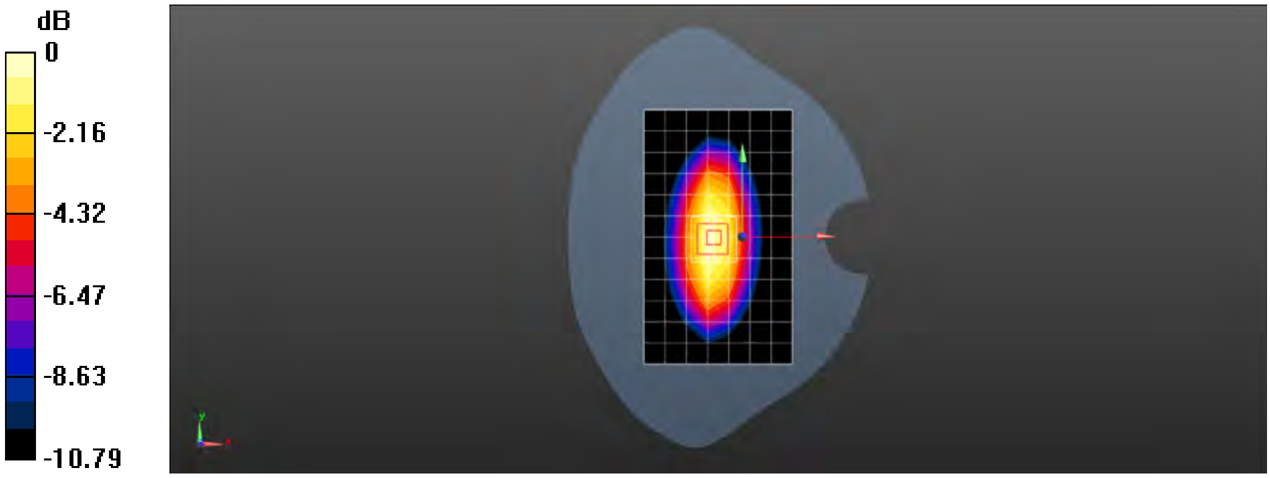
Medium: HSL835;Medium parameters used: f = 835 MHz; σ = 0.887 S/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(10.37, 10.37, 10.37); Calibrated: 2018-09-30;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2019-01-11
- Phantom: SAM 3; Type: SAM; Serial: 1912
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.97 W/kg

Body/d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.84 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.81 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.61 W/kg
Maximum value of SAR (measured) = 3.17 W/kg



0 dB = 3.17 W/kg = 5.01 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

System Performance Check 835 MHz Body

DUT: D835V2; Type: D835V2; Serial: 4d105

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1

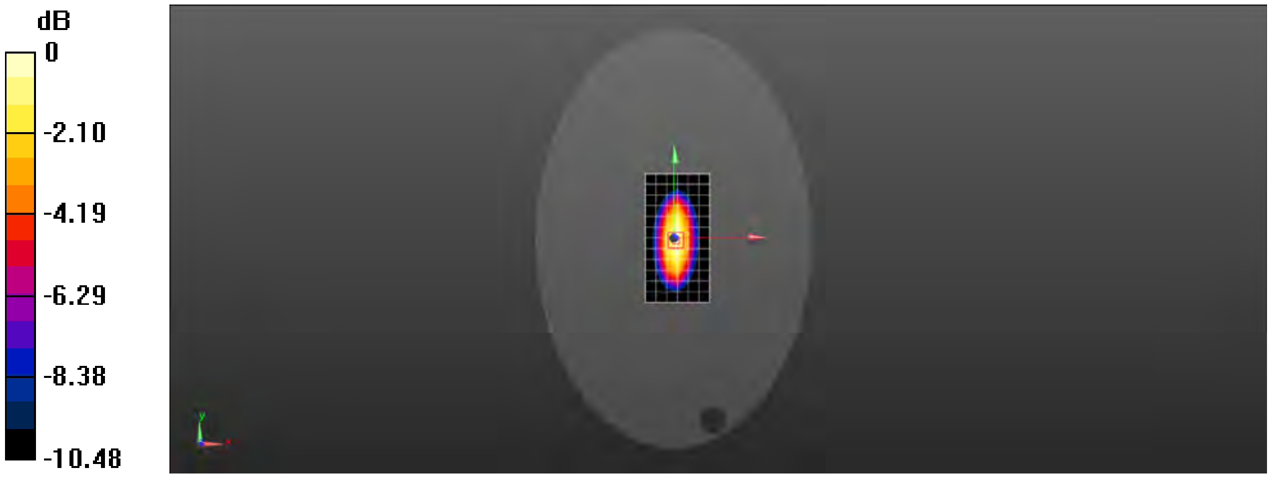
Medium: MSL835;Medium parameters used: f = 835 MHz; σ = 1.011 S/m; ε_r = 54.871; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(10.47, 10.47, 10.47); Calibrated: 2018-09-30;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2019-01-11
- Phantom: ELI V5.0; Type: ELI; Serial: 1123
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.07 W/kg

Body/d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.21 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.72 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 3.17 W/kg



0 dB = 3.17 W/kg = 5.01 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Head

DUT: D1900V2; Type: D1900V2; Serial: 5d028

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1

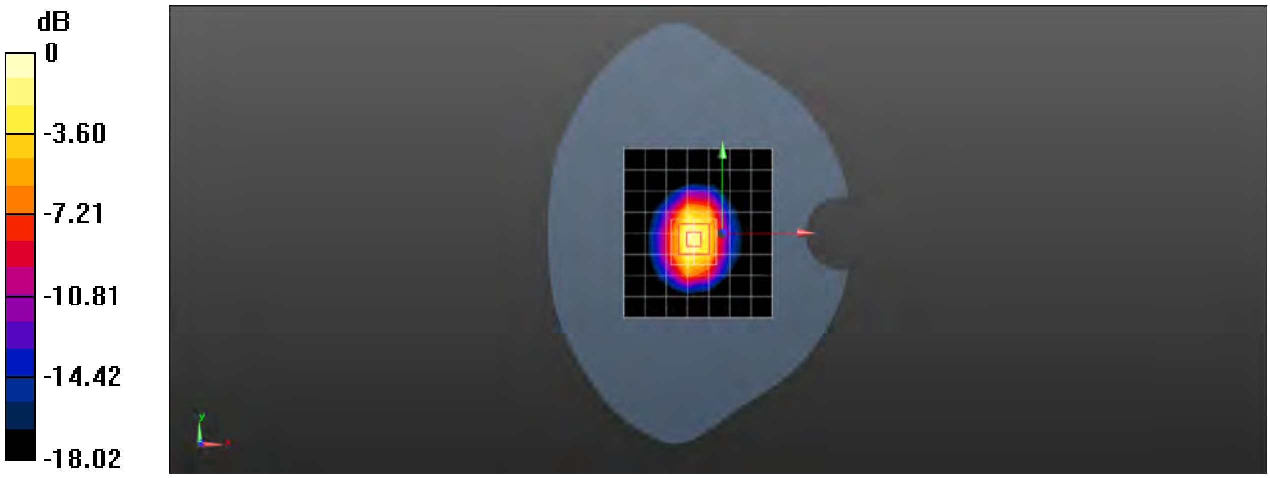
Medium: HSL1900;Medium parameters used: f = 1900 MHz; σ = 1.362 S/m; ε_r = 40.029; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.54, 7.54, 7.54); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 1; Type: SAM; Serial: 1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (8x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 9.50 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 88.89 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.21 W/kg
Maximum value of SAR (measured) = 11.3 W/kg



0 dB = 11.3 W/kg = 10.53 dBW/kg

Date: 2019-05-25

Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Body

DUT: D1900V2; Type: D1900V2; Serial: 5d028

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1

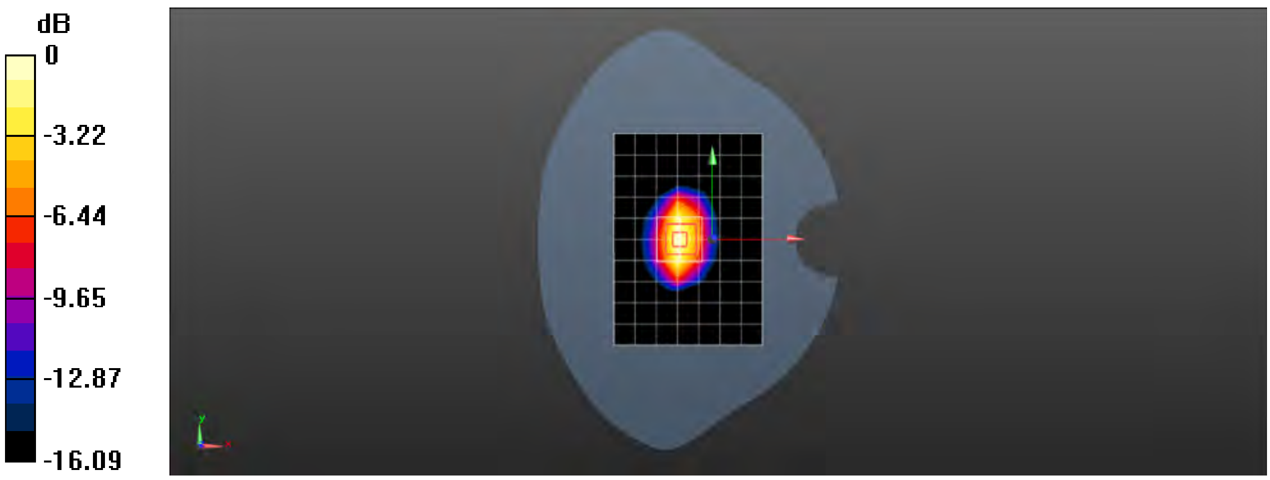
Medium: MSL1900;Medium parameters used: f = 1900 MHz; σ = 1.499 S/m; ε_r = 52.651; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.41, 7.41, 7.41); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 1; Type: SAM; Serial: 1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 14.2 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 82.02 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 9.67 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

Date: 2019-05-27

Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Head

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1

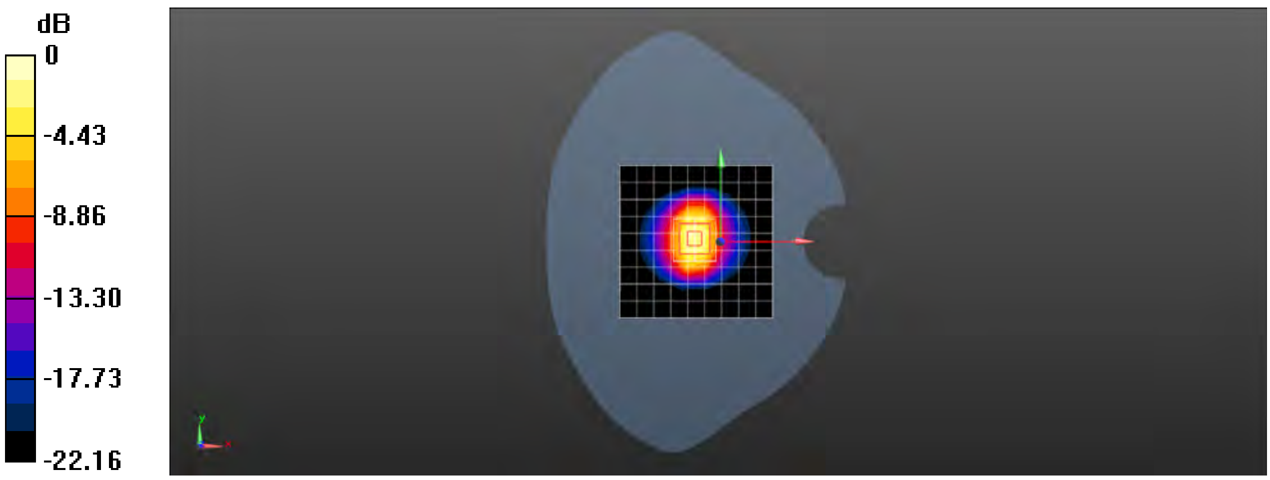
Medium: HSL2450;Medium parameters used: f = 2450 MHz; σ = 1.826 S/m; ε_r = 39.901; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(6.93, 6.93, 6.93); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (10x10x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 17.1 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.70 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg
Maximum value of SAR (measured) = 22.3 W/kg



0 dB = 22.3 W/kg = 13.48 dBW/kg

Date: 2019-05-27

Test Laboratory: SGS-SAR Lab

System Performance Check 2450MHz Body

DUT: D2450V2; Type: D2450V2; Serial: 733

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1

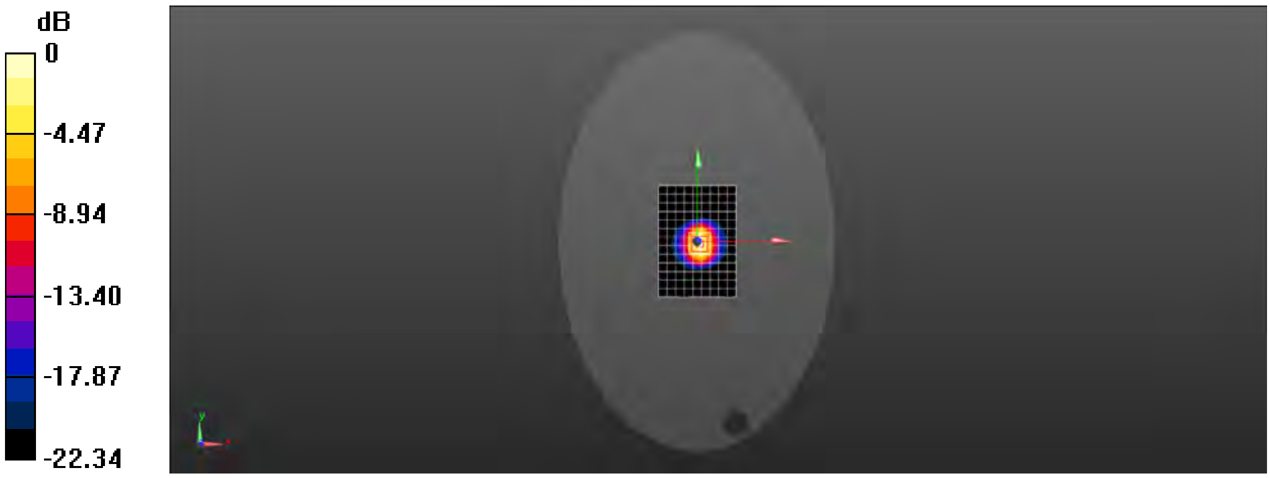
Medium: MSL2450;Medium parameters used: f = 2450 MHz; σ = 1.969 S/m; ε_r = 52.683; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.12, 7.12, 7.12); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: ELI V5.0; Type: ELI; Serial: 1123
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (10x14x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 14.0 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 80.34 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.84 W/kg
Maximum value of SAR (measured) = 14.5 W/kg



0 dB = 14.5 W/kg = 11.61 dBW/kg

Appendix B

Detailed Test Results

1. GSM
GSM850 for Head &Body
GSM1900 for Head &Body
2. WCDMA
WCDMA Band II for Head &Body
WCDMA Band V for Head &Body
3. WIFI
WIFI 2.4G for Head &Body

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

4034T GSM 850 GSM 190CH Left cheek

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: SKY5O7TO5LU8595T

Communication System: UID 0, GSM Only Communication System (0); Frequency: 836.6 MHz;Duty Cycle: 1:8.30042

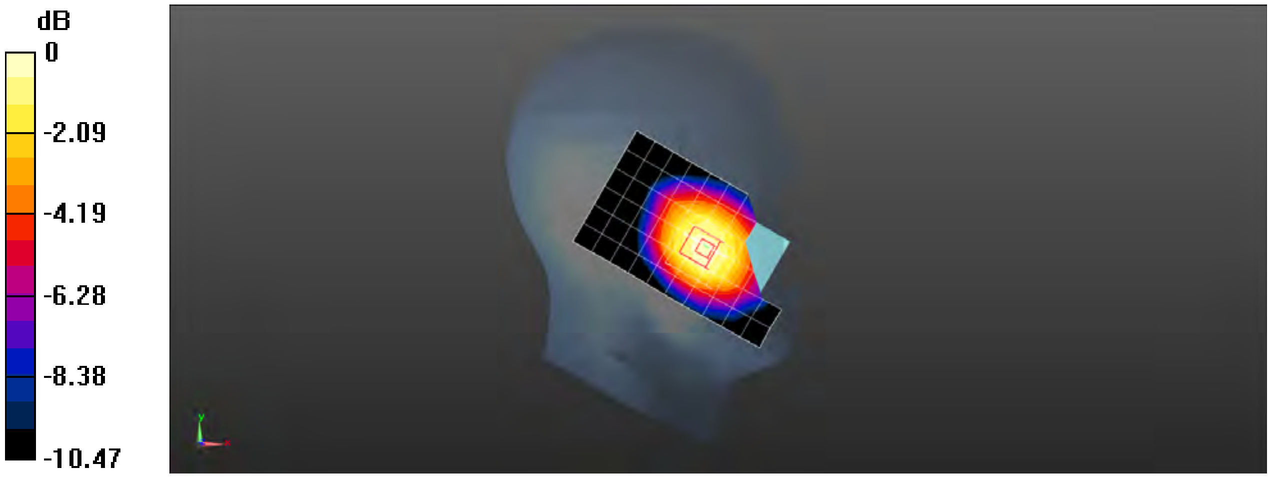
Medium: HSL835;Medium parameters used: f = 837 MHz; $\sigma = 0.888$ S/m; $\varepsilon_r = 40.818$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(10.37, 10.37, 10.37); Calibrated: 2018-09-30;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2019-01-11
- Phantom: SAM 3; Type: SAM; Serial: 1912
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.708 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.951 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.819 W/kg
SAR(1 g) = 0.635 W/kg; SAR(10 g) = 0.473 W/kg
Maximum value of SAR (measured) = 0.765 W/kg



0 dB = 0.765 W/kg = -1.16 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

4034T GSM 850 GPRS 4TS 251CH Back side 10mm

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: SKY5O7TO5LU8595T

Communication System: UID 0, GPRS/EGPRS Mode(4up) Communication System (0); Frequency: 848.6 MHz;Duty Cycle: 1:2.0797

Medium: MSL835;Medium parameters used: f = 849 MHz; σ = 1.02 S/m; ε_r = 54.805; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(10.47, 10.47, 10.47); Calibrated: 2018-09-30;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2019-01-11
- Phantom: ELI V5.0; Type: ELI; Serial: 1123
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.08 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.99 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.949 W/kg; SAR(10 g) = 0.707 W/kg
Maximum value of SAR (measured) = 1.15 W/kg

0 dB = 1.15 W/kg = 0.61 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

4034T GSM 1900 GSM 661CH Left cheek

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: OFKNCUJVVCBIWCD6

Communication System: UID 0, GSM Only Communication System (0); Frequency: 1880 MHz;Duty Cycle: 1:8.30042

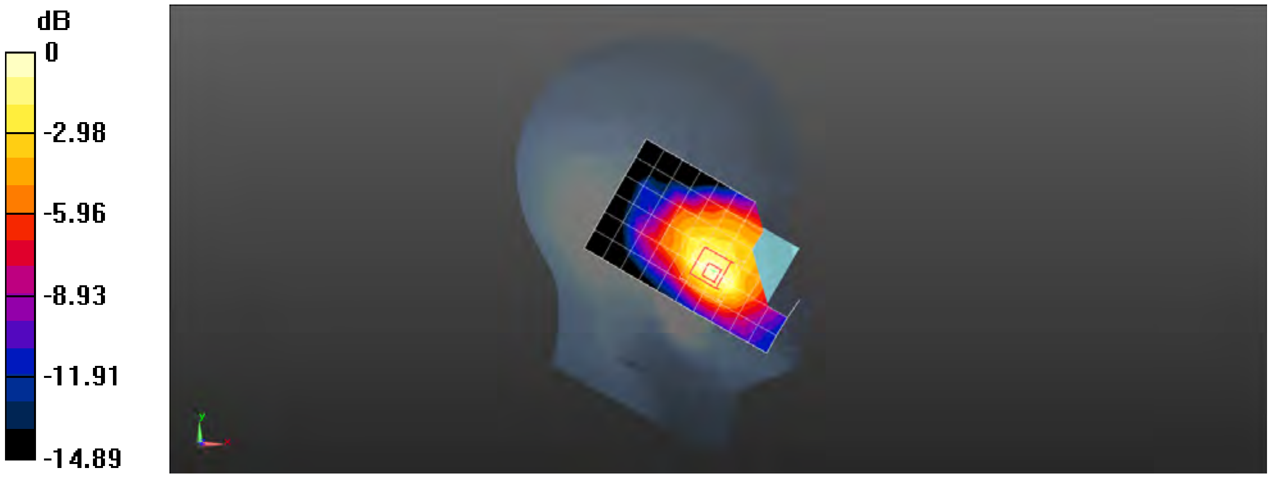
Medium: HSL1900;Medium parameters used: f = 1880 MHz; σ = 1.38 S/m; ε_r = 40.072; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.54, 7.54, 7.54); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 1; Type: SAM; Serial: 1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.652 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.036 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.761 W/kg
SAR(1 g) = 0.482 W/kg; SAR(10 g) = 0.295 W/kg
Maximum value of SAR (measured) = 0.621 W/kg



0 dB = 0.621 W/kg = -2.07 dBW/kg

Date: 2019-05-25

Test Laboratory: SGS-SAR Lab

4034T GSM 1900 GPRS 4TS 661CH Back side 10mm

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: SKY5O7TO5LU8595T

Communication System: UID 0, GPRS/EGPRS Mode(4up) Communication System (0); Frequency: 1880 MHz;Duty Cycle: 1:2.0797

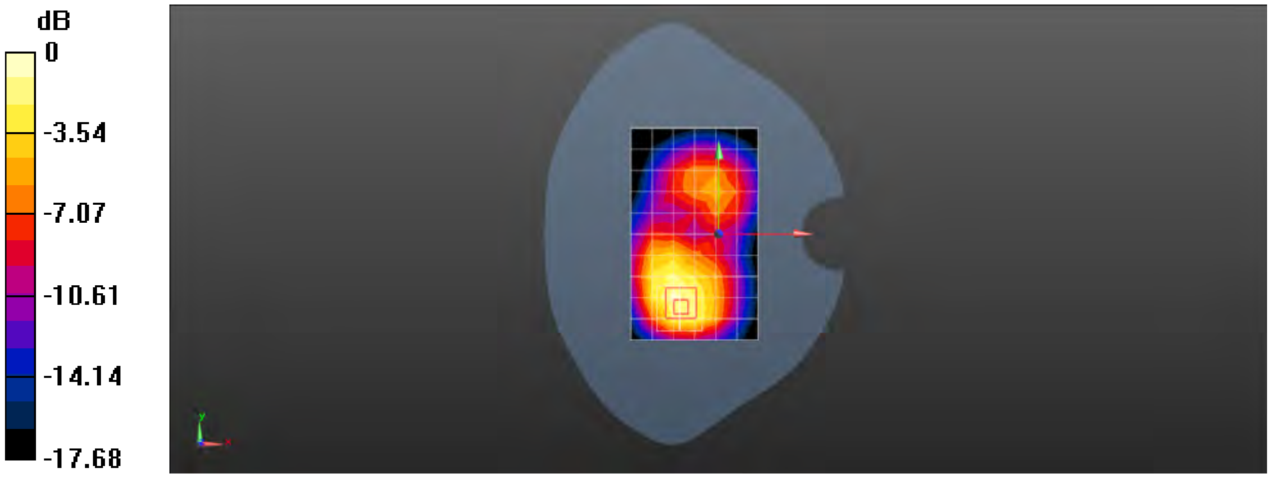
Medium: MSL1900;Medium parameters used: f = 1880 MHz; σ = 1.481 S/m; ε_r = 52.697; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.41, 7.41, 7.41); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 1; Type: SAM; Serial: 1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.858 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.898 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.685 W/kg; SAR(10 g) = 0.408 W/kg
Maximum value of SAR (measured) = 1.00 W/kg



0 dB = 1.00 W/kg = 0.00 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

4034T WCDMA Band II 9400CH Left cheek

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: OFKNCUJVVCBIWCD6

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz;Duty Cycle: 1:1

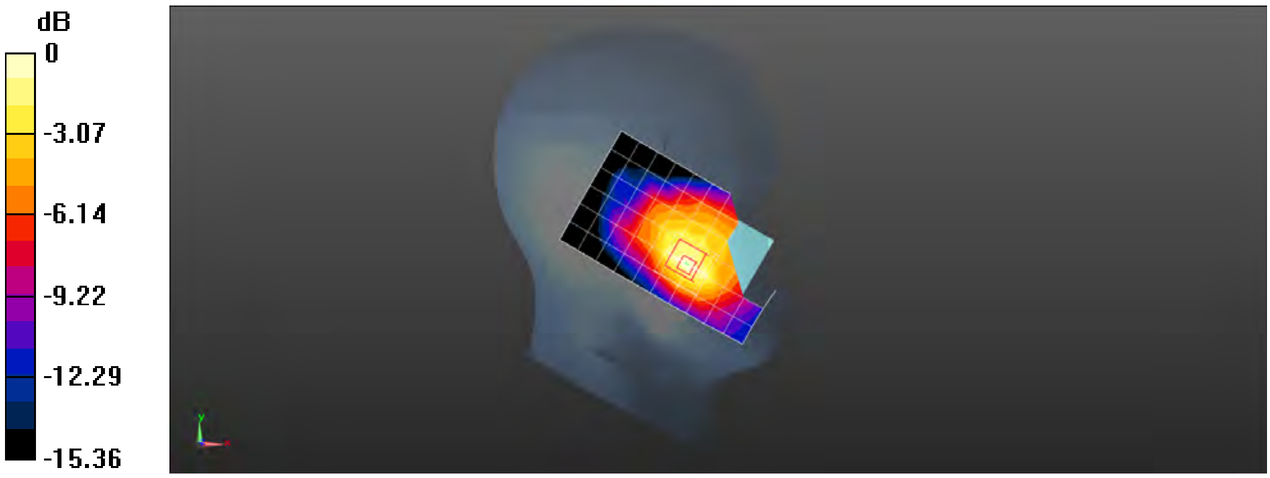
Medium: HSL1900;Medium parameters used: f = 1880 MHz; $\sigma = 1.38$ S/m; $\varepsilon_r = 40.072$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.54, 7.54, 7.54); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 1; Type: SAM; Serial: 1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.09 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.325 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.819 W/kg; SAR(10 g) = 0.498 W/kg
Maximum value of SAR (measured) = 1.10 W/kg



0 dB = 1.10 W/kg = 0.41 dBW/kg

Date: 2019-05-25

Test Laboratory: SGS-SAR Lab

4034T WCDMA Band II 9400CH Back side 10mm

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: SKY5O7TO5LU8595T

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz;Duty Cycle: 1:1

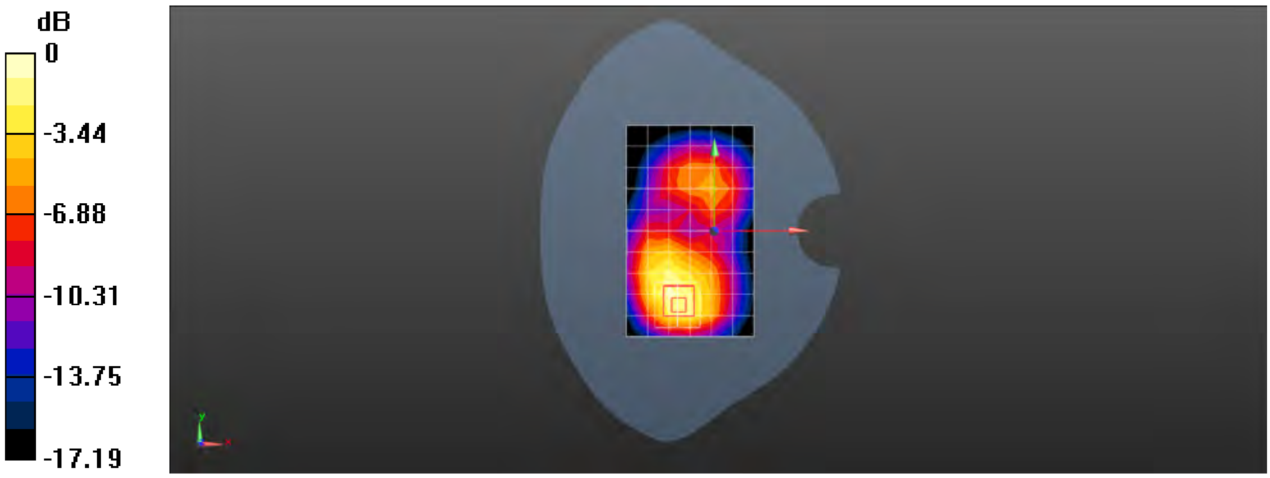
Medium: MSL1900;Medium parameters used: f = 1880 MHz; σ = 1.481 S/m; ε_r = 52.697; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.41, 7.41, 7.41); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 1; Type: SAM; Serial: 1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.39 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.474 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.88 W/kg
SAR(1 g) = 1.1 W/kg; SAR(10 g) = 0.654 W/kg
Maximum value of SAR (measured) = 1.61 W/kg



0 dB = 1.61 W/kg = 2.07 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

4034T WCDMA Band V 4182CH Left cheek

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: SKY5O7TO5LU8595T

Communication System: UID 0, WCDMA (0); Frequency: 836.4 MHz;Duty Cycle: 1:1

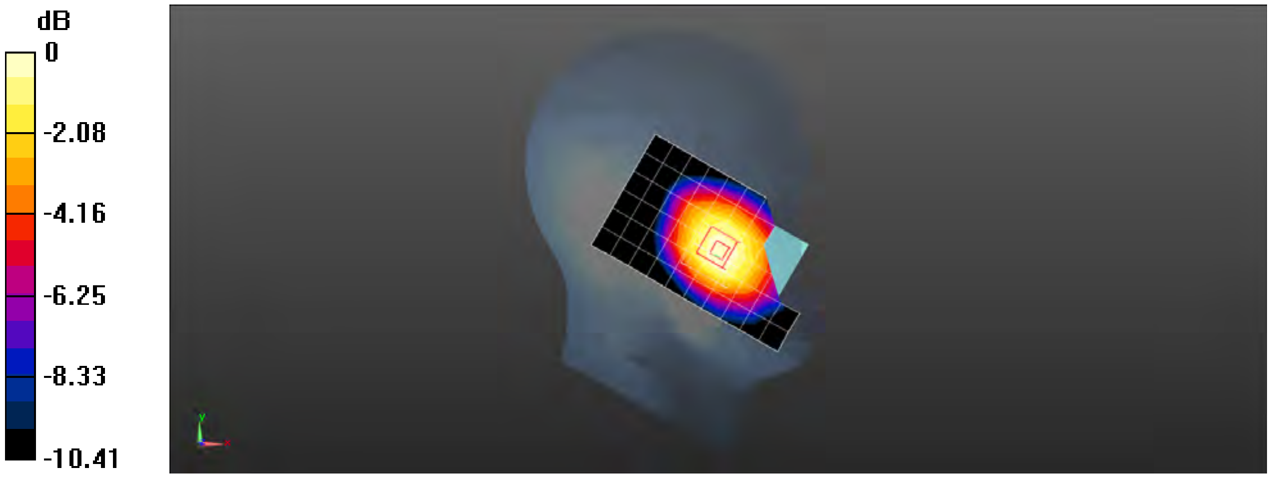
Medium: HSL835;Medium parameters used (interpolated): f = 836.4 MHz; σ = 0.887 S/m; ε_r = 40.821; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(10.37, 10.37, 10.37); Calibrated: 2018-09-30;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2019-01-11
- Phantom: SAM 3; Type: SAM; Serial: 1912
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.797 W/kg

Configuration/Head/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.412 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.913 W/kg
SAR(1 g) = 0.708 W/kg; SAR(10 g) = 0.532 W/kg
Maximum value of SAR (measured) = 0.838 W/kg



0 dB = 0.838 W/kg = -0.77 dBW/kg

Date: 2019-05-26

Test Laboratory: SGS-SAR Lab

4034T WCDMA Band V 4233CH Back side 10mm

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: SKY5O7TO5LU8595T

Communication System: UID 0, WCDMA (0); Frequency: 846.6 MHz;Duty Cycle: 1:1

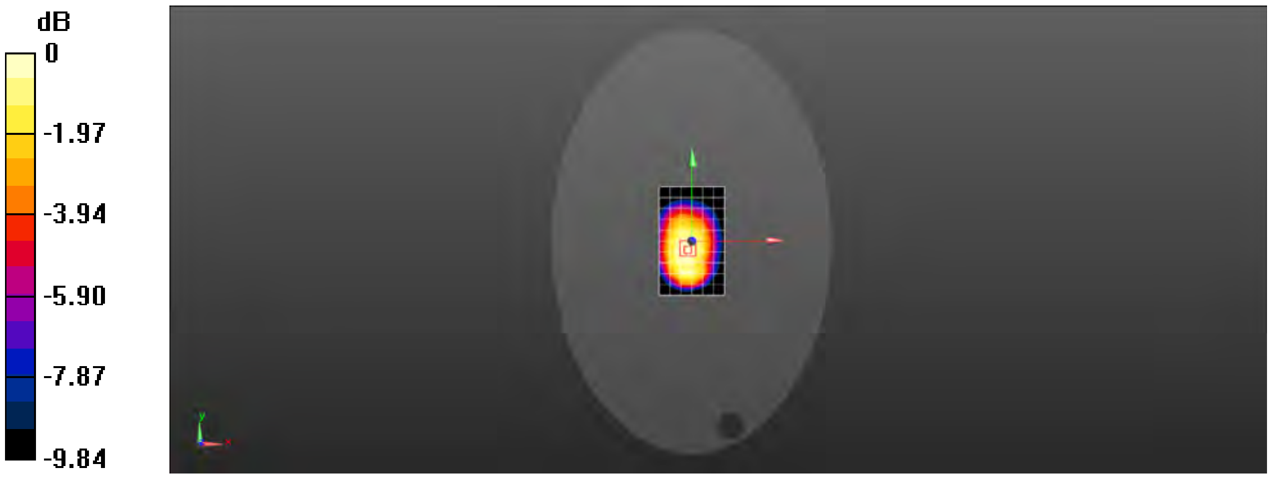
Medium: MSL835;Medium parameters used: f = 847 MHz; σ = 1.019 S/m; ε_r = 54.814; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3923; ConvF(10.47, 10.47, 10.47); Calibrated: 2018-09-30;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE4 Sn1428; Calibrated: 2019-01-11
- Phantom: ELI V5.0; Type: ELI; Serial: 1123
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.01 W/kg

Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.57 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.13 W/kg
SAR(1 g) = 0.867 W/kg; SAR(10 g) = 0.650 W/kg
Maximum value of SAR (measured) = 1.04 W/kg



0 dB = 1.04 W/kg = 0.17 dBW/kg

Date: 2019-05-27

Test Laboratory: SGS-SAR Lab

4034T 802.11b 6CH Left cheek

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: OFKNCUJVVCBIWCD6

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2437 MHz;Duty Cycle: 1:1

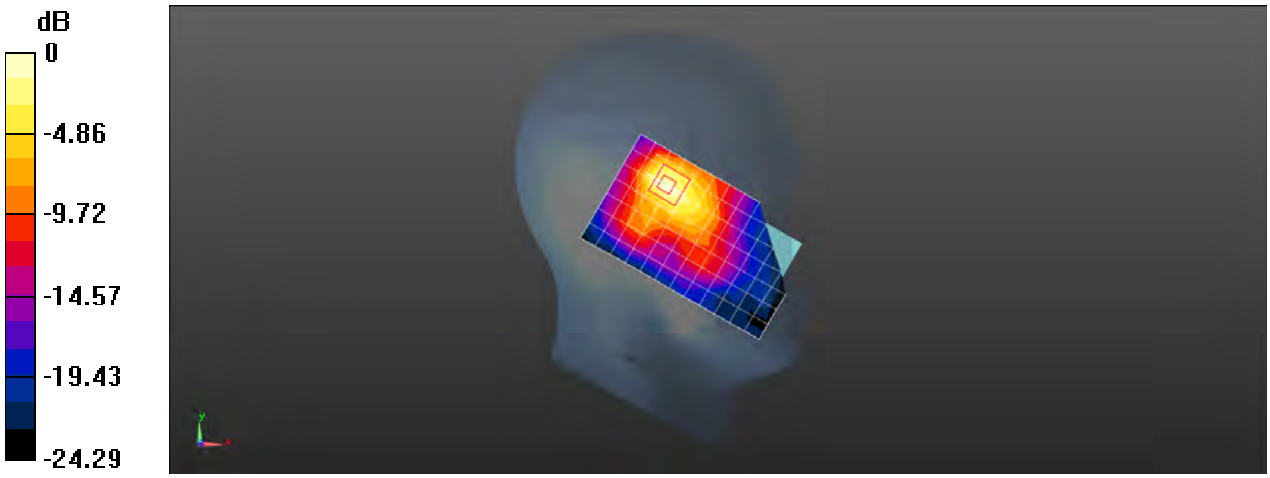
Medium: HSL2450;Medium parameters used: f = 2437 MHz; σ = 1.808 S/m; ε_r = 39.951; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(6.93, 6.93, 6.93); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: SAM 2; Type: SAM; Serial: 1913
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Head/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.623 W/kg

Configuration/Head/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.711 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.801 W/kg
SAR(1 g) = 0.378 W/kg; SAR(10 g) = 0.169 W/kg
Maximum value of SAR (measured) = 0.634 W/kg



0 dB = 0.634 W/kg = -1.98 dBW/kg

Date: 2019-05-27

Test Laboratory: SGS-SAR Lab

4034T 802.11b 6CH Back side 10mm

DUT: 4034T; Type: HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone; Serial: OFKNCUJVVCBIWCD6

Communication System: UID 0, WI-FI(2.4GHz) (0); Frequency: 2437 MHz;Duty Cycle: 1:1

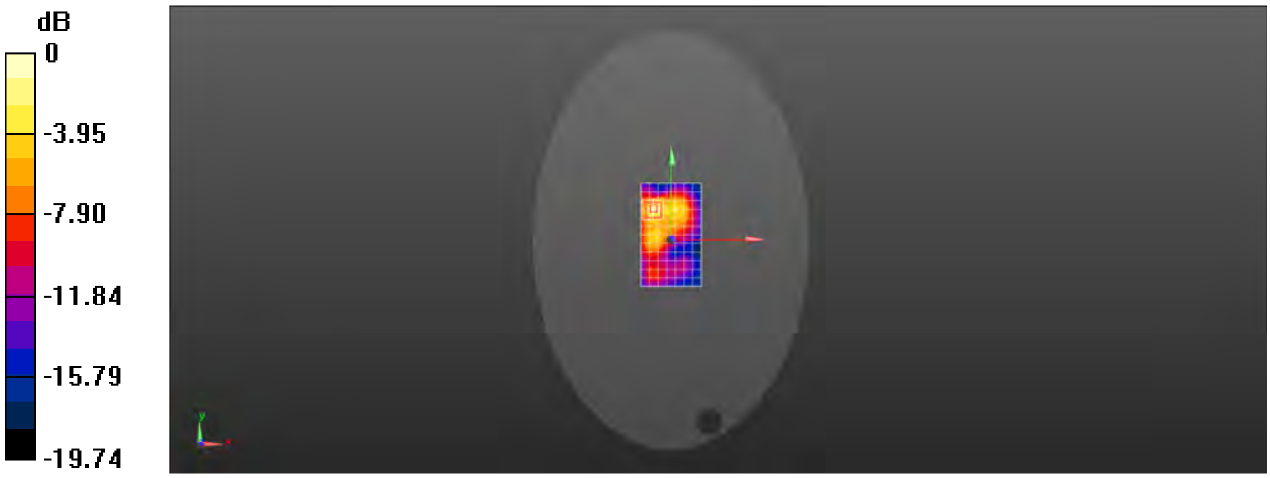
Medium: MSL2450;Medium parameters used: f = 2437 MHz; σ = 1.95 S/m; ε_r = 52.719; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3793; ConvF(7.12, 7.12, 7.12); Calibrated: 2019-03-25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = -2.0, 31.0
- Electronics: DAE3 Sn414; Calibrated: 2018-12-03
- Phantom: ELI V5.0; Type: ELI; Serial: 1123
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.226 W/kg

Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.630 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.415 W/kg
SAR(1 g) = 0.177 W/kg; SAR(10 g) = 0.069 W/kg
Maximum value of SAR (measured) = 0.287 W/kg



0 dB = 0.287 W/kg = -5.42 dBW/kg

Appendix C

Calibration certificate

1. Dipole
D835V2-SN 4d105(2016-12-08)
D1900V2-SN 5d028 (2016-12-07)
D2450V2-SN 733(2016-12-07)
2. DAE
DAE4-SN 414(2018-12-03)
DAE4-SN 1428(2019-01-11)
2. Probe
EX3DV4-SN 3923(2018-09-30)
EX3DV4-SN 3793(2019-03-25)

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CNAS L0570

Client **SGS(Boce)** **Certificate No: Z16-97239**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d105
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	December 8, 2016

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: December 11, 2016

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.43 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.59 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.59 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.29 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.65 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.46 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.2Ω- 3.41jΩ
Return Loss	- 29.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8Ω- 3.25jΩ
Return Loss	- 25.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.500 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 12.08.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d105

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.912 S/m; ε_r = 40.78; ρ = 1000 kg/m^3

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.82, 9.82, 9.82); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

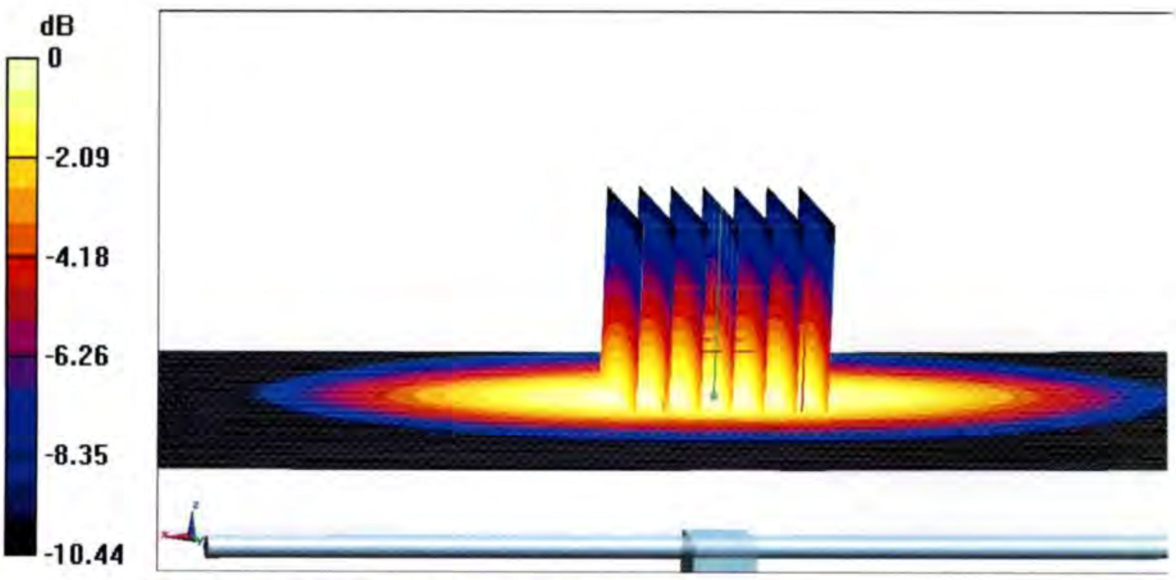
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 49.08V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.62 W/kg

SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 3.08 W/kg



0 dB = 3.08 W/kg = 4.89 dBW/kg

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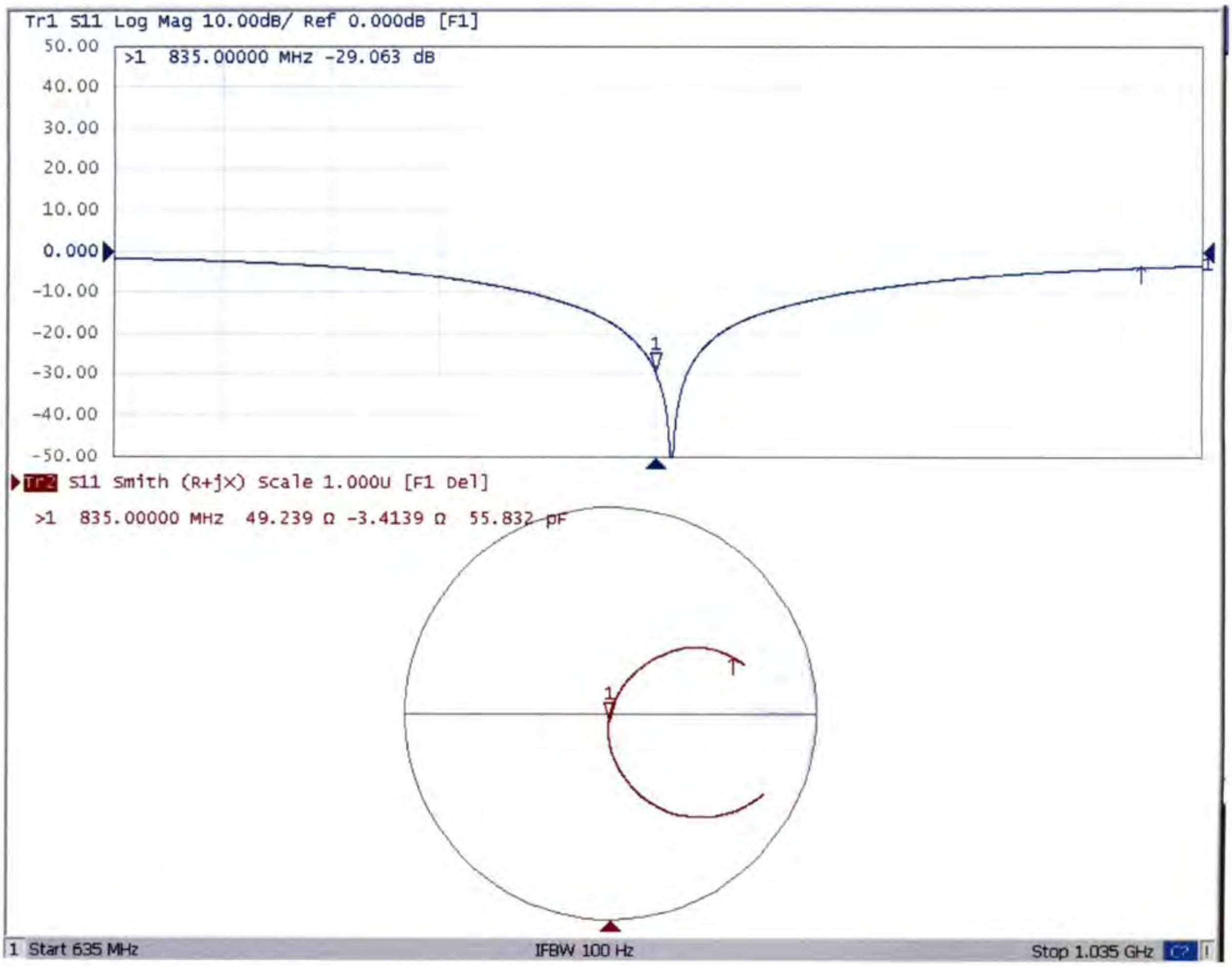
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.08.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d105

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.983 S/m; ε_r = 54.74; ρ = 1000 kg/m^3

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.5,9.5, 9.5); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

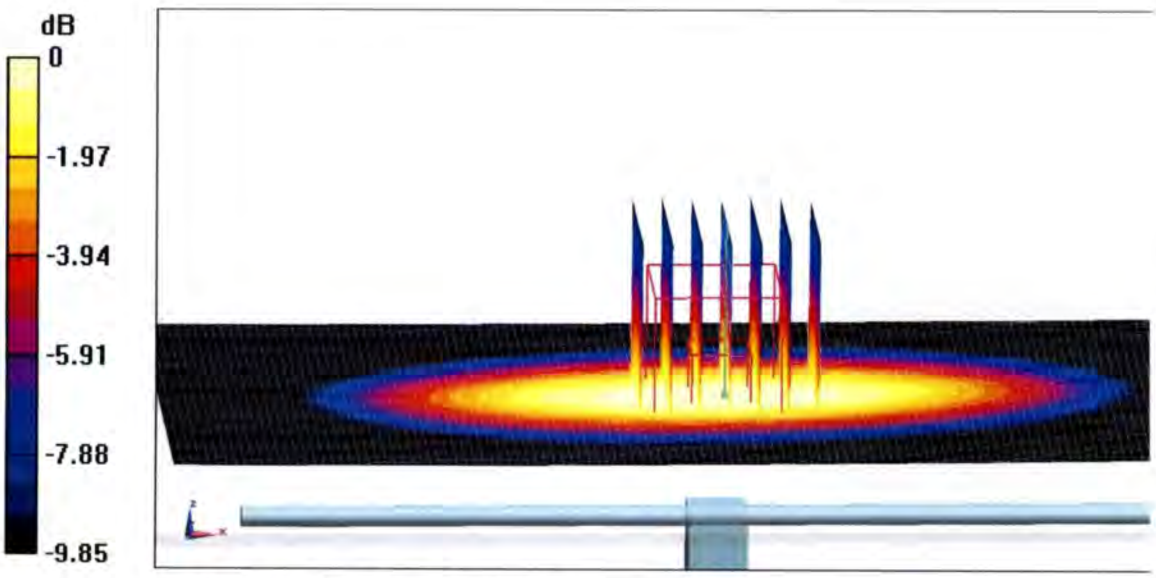
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.10 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.54 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.63 W/kg

Maximum value of SAR (measured) = 3.06 W/kg



0 dB = 3.06 W/kg = 4.86 dBW/kg

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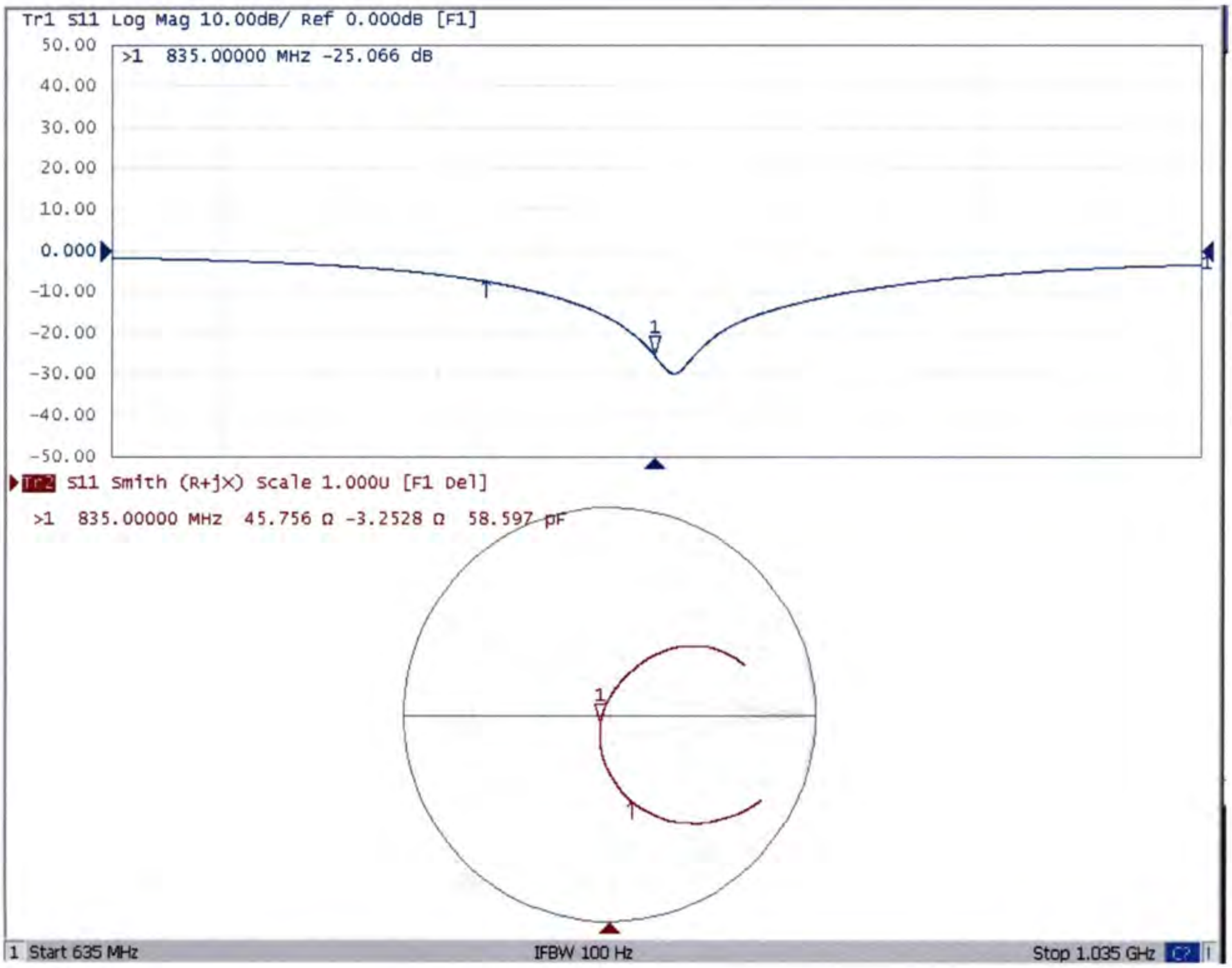
Impedance Measurement Plot for Body TSL



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CALIBRATION
CNAS L0570

Client **SGS(Boce)** **Certificate No: Z16-97240**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d028
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	December 7, 2016

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: December 11, 2016

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.2 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**40.7 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.1 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.51 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**41.6 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.32 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.4 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8Ω+ 5.90jΩ
Return Loss	- 24.4dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.1Ω+ 5.82jΩ
Return Loss	- 24.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.306 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 12.07.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d028

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.383 S/m; εr = 40.16; ρ = 1000 kg/m3

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.98, 7.98, 7.98); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

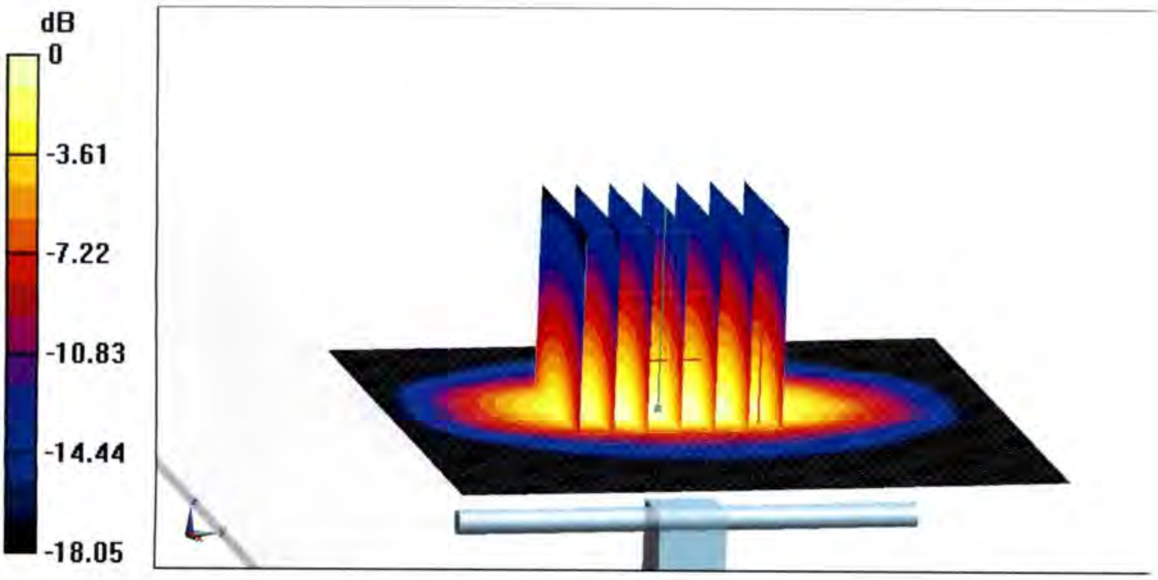
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.5 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 18.7 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.24 W/kg

Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

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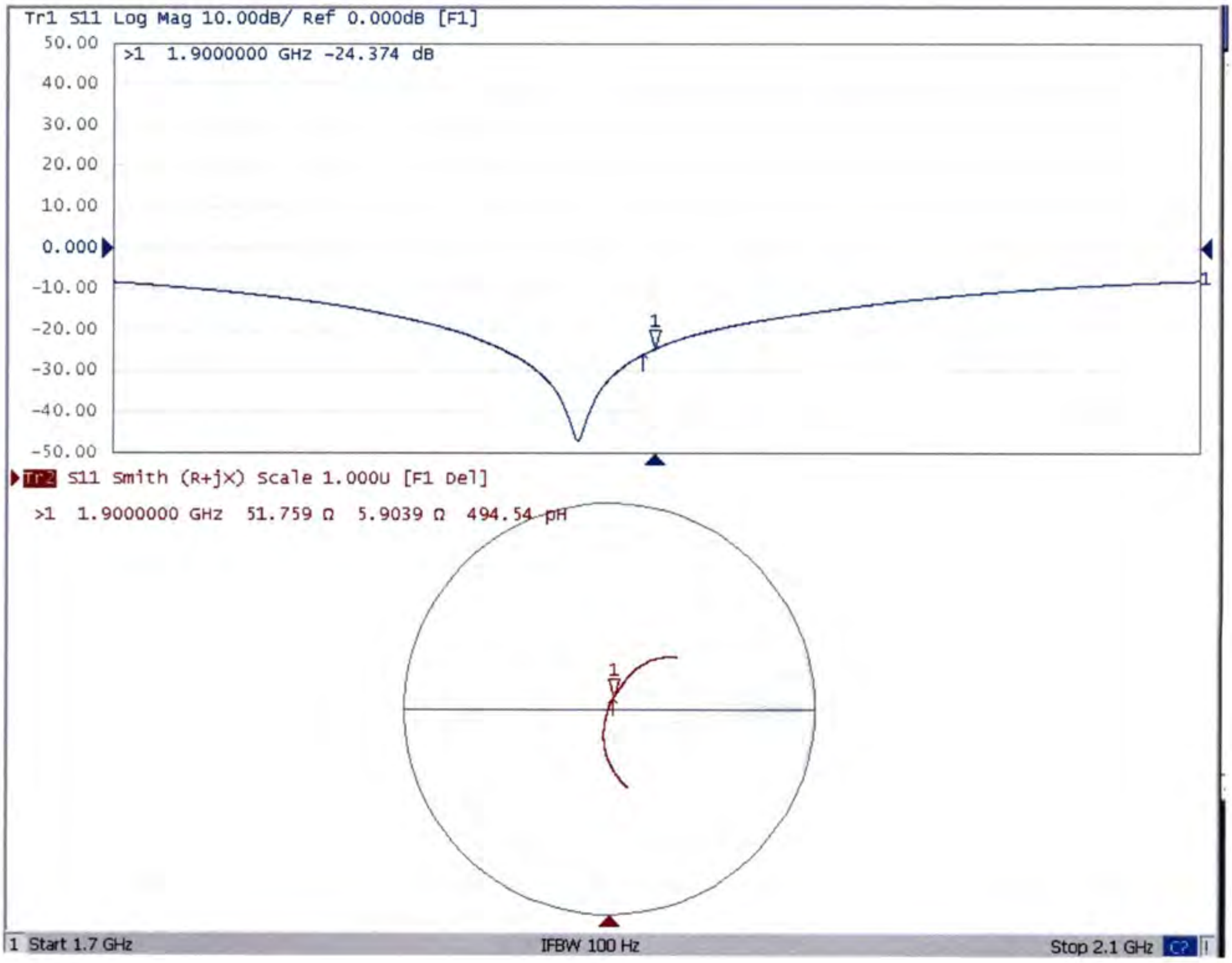
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.07.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d028

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.506 S/m; ε_r = 54.26; ρ = 1000 kg/m^3

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.7, 7.7, 7.7); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

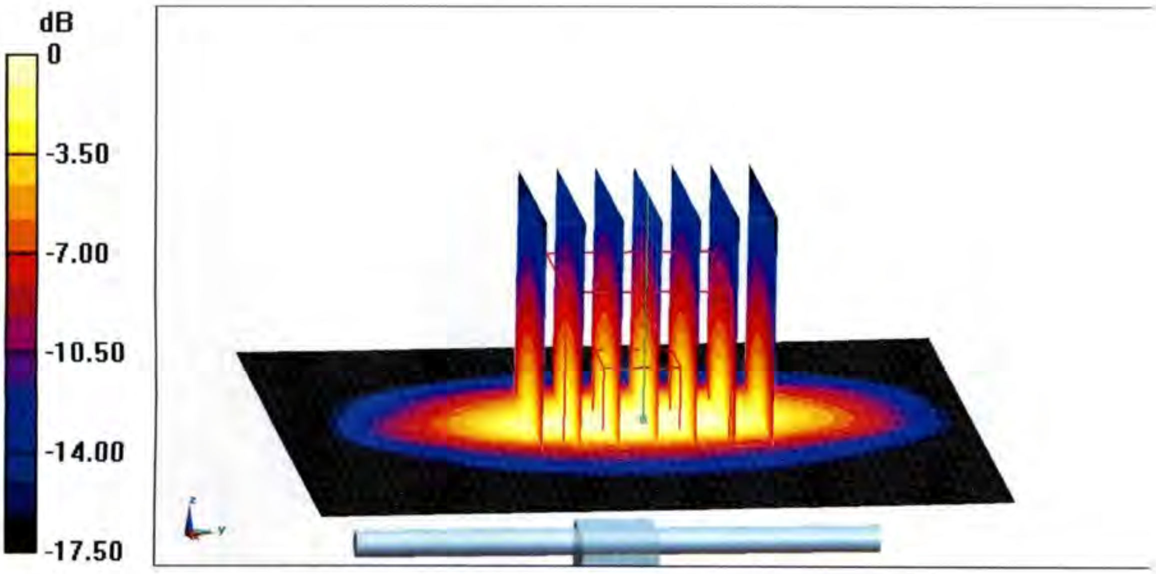
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.69 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 18.8 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.32 W/kg

Maximum value of SAR (measured) = 14.8 W/kg



0 dB = 14.8 W/kg = 11.70 dBW/kg

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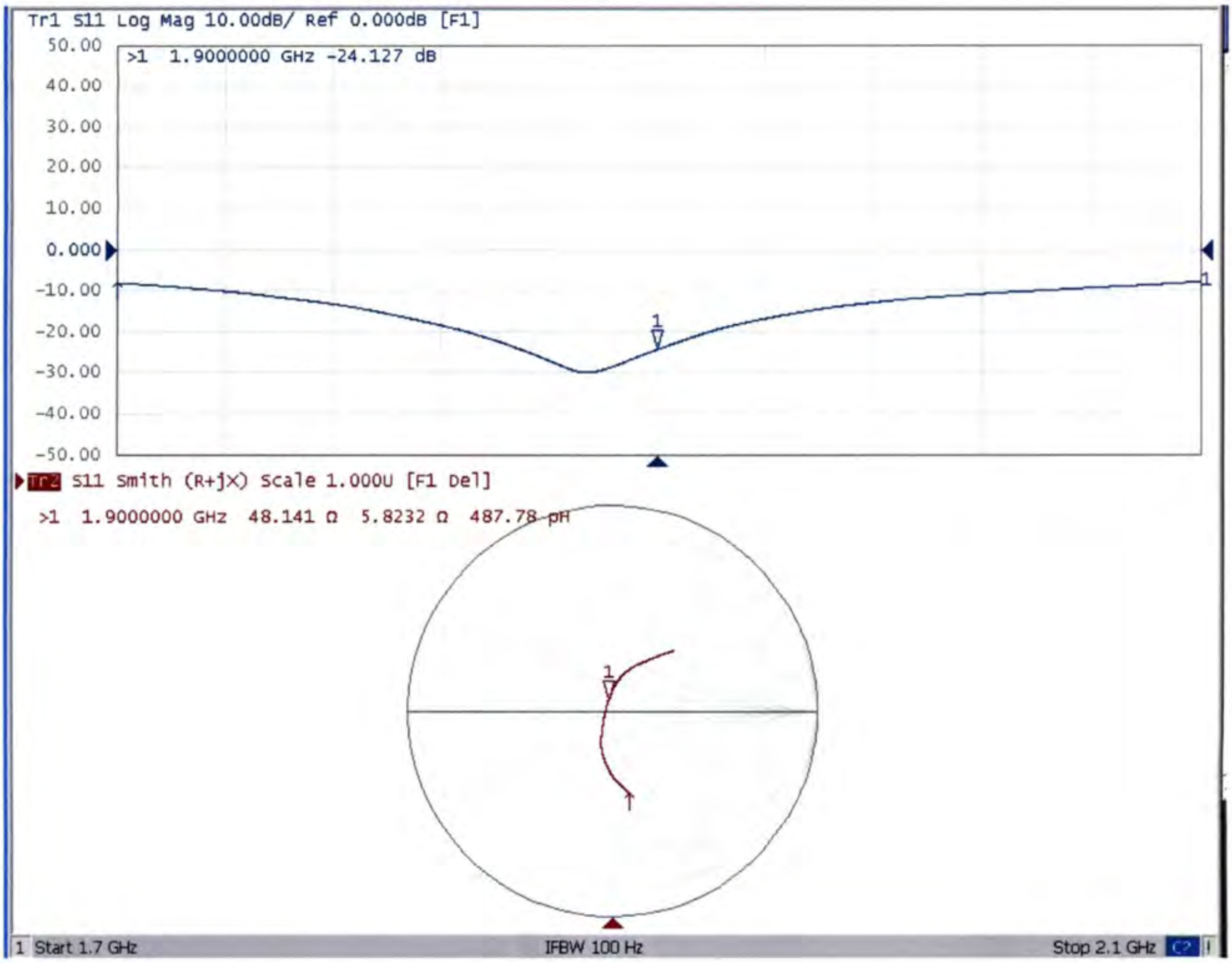
Impedance Measurement Plot for Body TSL



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Client **SGS(Boce)** **Certificate No: Z16-97242**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 733
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	December 7, 2016

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: December 11, 2016

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.4 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**53.1 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.22 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.9 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.1 ± 6 %	1.94 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.0 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.85 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.5 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9Ω+ 4.11jΩ
Return Loss	- 26.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7Ω+ 5.90jΩ
Return Loss	- 24.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.257 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 11.07.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 733

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.809 S/m; εr = 39.42; ρ = 1000 kg/m3

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.45, 7.45, 7.45); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

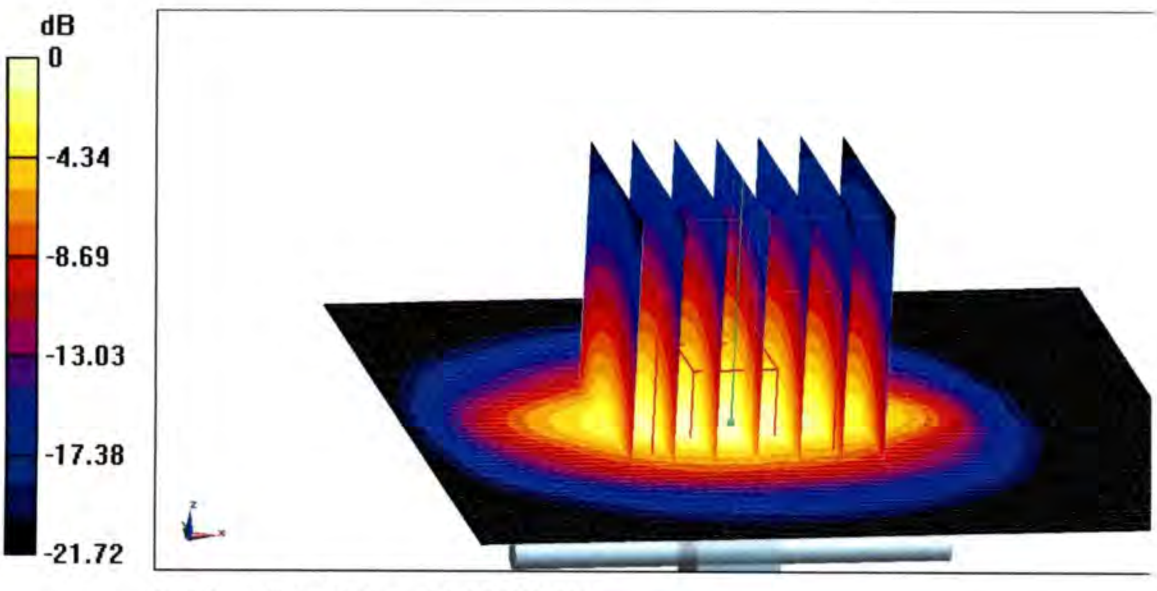
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.8 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.22 W/kg

Maximum value of SAR (measured) = 20.4 W/kg



0 dB = 20.4 W/kg = 13.10 dBW/kg