



TEST REPORT

Report Reference No...... : **TRE17090110** R/C.....: 67073
FCC ID..... : **ZSW-10-009**
Applicant's name..... : **b mobile HK Limited**
 Address..... : Flat 18; 14/F Block 1; Golden Industrial Building;16-26 KwaiTak Street; Kwai Chung; New Territories; Hong Kong.
 Manufacturer..... : b mobile HK Limited
 Address..... : Flat 18; 14/F Block 1; Golden Industrial Building;16-26 KwaiTak Street; Kwai Chung; New Territories; Hong Kong.
Test item description : **Mobile Phone**
 Trade Mark : Bmobile
 Model/Type reference..... : C220
 Listed Model(s) : -
Standard : **FCC 47 CFR Part2.1093**
ANSI/IEEE C95.1: 1999
IEEE 1528: 2013
 Date of receipt of test sample..... : Sept. 11, 2017
 Date of testing..... : Sept. 20, 2017- Sept. 21, 2017
 Date of issue..... : Sept. 26, 2017
Result..... : **PASS**

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Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd**
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The test report merely correspond to the test sample.

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1 . Test Standards and Report version

1.1. Test Standards

The tests were performed according to following standards:

[FCC 47 Part 2.1093](#) Radiofrequency Radiation Exposure Evaluation:Portable Devices

[IEEE Std C95.1, 1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz.

[IEEE Std 1528™-2013](#): IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[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

[KDB 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

[KDB 648474 D04 Handset SAR v01r03](#): SAR Evaluation Considerations for Wireless Handsets

1.2. Report version

Version No.	Date of issue	Description
00	Sept. 26, 2017	Original

2. Summary

2.1. Client Information

Applicant:	b mobile HK Limited
Address:	Flat 18; 14/F Block 1; Golden Industrial Building;16-26 Kwai Tak Street; Kwai Chung; New Territories; Hong Kong
Manufacturer:	b mobile HK Limited
Address:	Flat 18; 14/F Block 1; Golden Industrial Building;16-26 Kwai Tak Street; Kwai Chung; New Territories; Hong Kong

2.2. Product Description

Name of EUT:	Mobile Phone			
Trade Mark:	Bmobile			
Model No.:	C220			
Listed Model(s):	-			
Power supply:	DC 3.7V From exchange battery			
Device Category:	Portable			
Product stage:	Production unit			
RF Exposure Environment:	General Population / Uncontrolled			
IMEI:	353587061411525			
Device Class:	B			
Hardware version:	2416_MB_V1.0			
Software version:	Bmobile_2416_V01			
Maximum SAR Value				
Separation Distance:	Head:	0mm		
	Body:	10mm		
Max Report SAR Value (1g):	Test location:	PCE	Bluetooth	Simultaneous TX
	Head:	0.416 W/Kg	0.235 W/Kg	0.651 W/Kg
	Body:	0.915 W/Kg	0.117 W/Kg	1.032 W/Kg
GSM				
Support Network:	GSM			
Support Band:	GSM850, PCS1900			
Modulation:	GSM: GMSK,			
Transmit Frequency:	GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz			
Receive Frequency:	GSM850: 869.20MHz-893.80MHz PCS1900: 1930.20MHz-1989.80MHz			
Antenna type:	PIFA Antenna			

Bluetooth	
Version:	Supported BT3.0+EDR
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PIFA Antenna
<i>Remark: The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power .</i>	

3. Test Environment

3.1. Test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

3.2. Test Facility

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025:2005 General Requirements) for the Competence of Testing and Calibration Laboratories

A2LA-Lab Cert. No. 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

IC-Registration No.:5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377B-1.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4. Equipments Used during the Test

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Calibration	Calibration Interval
Data Acquisition Electronics DAEx	SPEAG	DAE4	1315	2017/08/15	1
E-field Probe	SPEAG	EX3DV4	3842	2017/08/15	1
System Validation Dipole	SPEAG	D835V2	4d153	2016/07/16	3
System Validation Dipole	SPEAG	D1900V2	5d101	2015/07/23	3
Dielectric Probe Kit	Agilent	85070E	US44020288	/	/
Power meter	Agilent	E4417A	GB41292254	2016/10/25	1
Power sensor	Agilent	8481H	MY41095360	2016/10/25	1
Power sensor	Agilent	E9327A	US40441621	2016/10/25	1
Network analyzer	Agilent	8753E	US37390562	2016/10/24	1
Universal Radio Communication Tester	ROHDE & SCHWARZ	CMU200	112012	2016/10/22	1
Signal Generator	ROHDE & SCHWARZ	SMBV100A	258525	2016/10/22	1
Power Divider	ARRA	A3200-2	N/A	N/A	N/A
Dual Directional Coupler	Agilent	778D	50783	Note	
Attenuator 1	PE	PE7005-10	N/A	Note	
Attenuator 2	PE	PE7005-10	N/A	Note	
Attenuator 3	PE	PE7005-3	N/A	Note	
Power Amplifier	AR	5S1G4M2	0328798	Note	

Note:

1. *The Probe, Dipole and DAE calibration reference to the Appendix A.*
2. *Referring to KDB865664 D01, the dipole calibration interval can be extended to 3 years with justifcatio. The dipole are also not physically damaged or repaired during the interval.*
3. *The Test EUT support two SIM card(SIM1, SIM2), so all the tests are performed at each SIM card (SIM1, SIM2) mode, the datum recorded is the worst case for all the mode at SIM1 Card mode.*

5. Measurement Uncertainty

Measurement Uncertainty										
No.	Error Description	Type	Uncertainty Value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement System										
1	Probe calibration	B	6.0%	N	1	1	1	6.0%	6.0%	∞
2	Axial isotropy	B	4.70%	R	$\sqrt{3}$	0.7	0.7	1.90%	1.90%	∞
3	Hemispherical isotropy	B	9.60%	R	$\sqrt{3}$	0.7	0.7	3.90%	3.90%	∞
4	Boundary Effects	B	1.00%	R	$\sqrt{3}$	1	1	0.60%	0.60%	∞
5	Probe Linearity	B	4.70%	R	$\sqrt{3}$	1	1	2.70%	2.70%	∞
6	Detection limit	B	1.00%	R	$\sqrt{3}$	1	1	0.60%	0.60%	∞
7	RF ambient conditions-noise	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
8	RF ambient conditions-reflection	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
9	Response time	B	0.80%	R	$\sqrt{3}$	1	1	0.50%	0.50%	∞
10	Integration time	B	5.00%	R	$\sqrt{3}$	1	1	2.90%	2.90%	∞
11	RF ambient	B	3.00%	R	$\sqrt{3}$	1	1	1.70%	1.70%	∞
12	Probe positioned mech. restrictions	B	0.40%	R	$\sqrt{3}$	1	1	0.20%	0.20%	∞
13	Probe positioning with respect to phantom shell	B	2.90%	R	$\sqrt{3}$	1	1	1.70%	1.70%	∞
14	Max.SAR evaluation	B	3.90%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
Test Sample Related										
15	Test sample positioning	A	1.86%	N	1	1	1	1.86%	1.86%	∞
16	Device holder uncertainty	A	1.70%	N	1	1	1	1.70%	1.70%	∞
17	Drift of output power	B	5.00%	R	$\sqrt{3}$	1	1	2.90%	2.90%	∞
Phantom and Set-up										
18	Phantom uncertainty	B	4.00%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
19	Liquid conductivity (target)	B	5.00%	R	$\sqrt{3}$	0.64	0.43	1.80%	1.20%	∞
20	Liquid conductivity (meas.)	A	0.50%	N	1	0.64	0.43	0.32%	0.26%	∞
21	Liquid permittivity (target)	B	5.00%	R	$\sqrt{3}$	0.64	0.43	1.80%	1.20%	∞
22	Liquid permittivity (meas.)	A	0.16%	N	1	0.64	0.43	0.10%	0.07%	∞
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$		/	/	/	/	9.79%	9.67%	∞
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		R	K=2	/	/	19.57%	19.34%	∞

System Check Uncertainty										
No.	Error Description	Type	Uncertainty Value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement System										
1	Probe calibration	B	6.0%	N	1	1	1	6.0%	6.0%	∞
2	Axial isotropy	B	4.70%	R	$\sqrt{3}$	0.7	0.7	1.90%	1.90%	∞
3	Hemispherical isotropy	B	9.60%	R	$\sqrt{3}$	0.7	0.7	3.90%	3.90%	∞
4	Boundary Effects	B	1.00%	R	$\sqrt{3}$	1	1	0.60%	0.60%	∞
5	Probe Linearity	B	4.70%	R	$\sqrt{3}$	1	1	2.70%	2.70%	∞
6	Detection limit	B	1.00%	R	$\sqrt{3}$	1	1	0.60%	0.60%	∞
7	RF ambient conditions-noise	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
8	RF ambient conditions-reflection	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
9	Response time	B	0.80%	R	$\sqrt{3}$	1	1	0.50%	0.50%	∞
10	Integration time	B	5.00%	R	$\sqrt{3}$	1	1	2.90%	2.90%	∞
11	RF ambient	B	3.00%	R	$\sqrt{3}$	1	1	1.70%	1.70%	∞
12	Probe positioned mech. restrictions	B	0.40%	R	$\sqrt{3}$	1	1	0.20%	0.20%	∞
13	Probe positioning with respect to phantom shell	B	2.90%	R	$\sqrt{3}$	1	1	1.70%	1.70%	∞
14	Max.SAR evaluation	B	3.90%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
System validation source-dipole										
15	Deviation of experimental dipole from numerical dipole	A	1.58%	N	1	1	1	1.58%	1.58%	∞
16	Dipole axis to liquid distance	A	1.35%	N	1	1	1	1.35%	1.35%	∞
17	Input power and SAR drift	B	4.00%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
Phantom and Set-up										
18	Phantom uncertainty	B	4.00%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
20	Liquid conductivity (meas.)	A	0.50%	N	1	0.64	0.43	0.32%	0.26%	∞
22	Liquid cpermittivity (meas.)	A	0.16%	N	1	0.64	0.43	0.10%	0.07%	∞
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$		/	/	/	/	8.80%	8.79%	∞
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		R	K=2	/	/	17.59%	17.58%	∞

6. SAR Measurements System Configuration

6.1. SAR Measurement Set-up

The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating 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 electronic (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.

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

DASY5 software and SEMCAD data evaluation software.

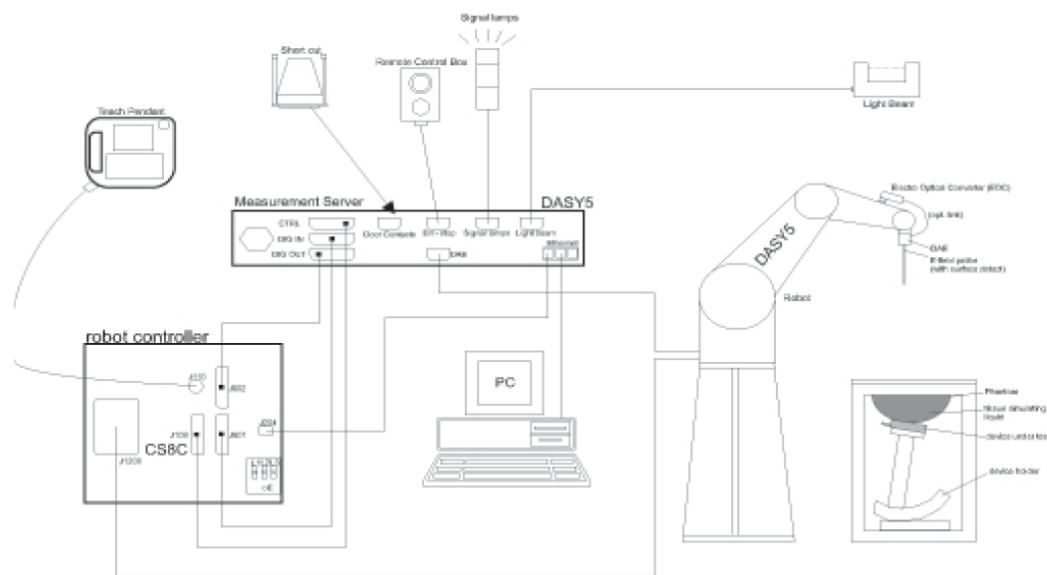
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



6.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

● Probe Specification

Construction Symmetrical design with triangular core
 Interleaved sensors
 Built-in shielding against static charges
 PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration ISO/IEC 17025 calibration service available.

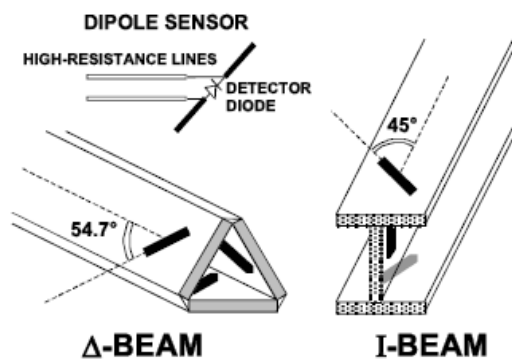
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 W/kg; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 6 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI



● Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



6.3. Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.



SAM Twin Phantom

6.4. Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



Device holder supplied by SPEAG

7. SAR Test Procedure

7.1. Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

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. The indicated drift is mainly the variation of the DUT’s output power and should vary max. $\pm 5\%$.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space.

They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard’s method for extrapolation.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

Table 1: Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v04

		≤ 3 GHz	> 3 GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		$5 \text{ mm} \pm 1 \text{ mm}$	$\frac{1}{2} \cdot \delta \cdot \ln(2) \text{ mm} \pm 0.5 \text{ mm}$	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$	
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$		≤ 2 GHz: $\leq 15 \text{ mm}$ 2 – 3 GHz: $\leq 12 \text{ mm}$	3 – 4 GHz: $\leq 12 \text{ mm}$ 4 – 6 GHz: $\leq 10 \text{ mm}$	
		When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.		
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$		≤ 2 GHz: $\leq 8 \text{ mm}$ 2 – 3 GHz: $\leq 5 \text{ mm}^*$	3 – 4 GHz: $\leq 5 \text{ mm}^*$ 4 – 6 GHz: $\leq 4 \text{ mm}^*$	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$	$\leq 5 \text{ mm}$	3 – 4 GHz: $\leq 4 \text{ mm}$ 4 – 5 GHz: $\leq 3 \text{ mm}$ 5 – 6 GHz: $\leq 2 \text{ mm}$	
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	$\leq 4 \text{ mm}$	3 – 4 GHz: $\leq 3 \text{ mm}$ 4 – 5 GHz: $\leq 2.5 \text{ mm}$ 5 – 6 GHz: $\leq 2 \text{ mm}$
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1) \text{ mm}$	
Minimum zoom scan volume	x, y, z	$\geq 30 \text{ mm}$	3 – 4 GHz: $\geq 28 \text{ mm}$ 4 – 5 GHz: $\geq 25 \text{ mm}$ 5 – 6 GHz: $\geq 22 \text{ mm}$	
<p>Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.</p> <p>* When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB Publication 447498 is $\leq 1.4 \text{ W/kg}$, $\leq 8 \text{ mm}$, $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</p>				

7.2. Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors),s 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 “.DA4”. 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], [W/kg], [mW/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.

Data Evaluation

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:	σ
	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 DASY5 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:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

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

$$E - \text{fieldprobes} : \quad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$H - \text{fieldprobes} : \quad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

Vi:	compensated signal of channel (i = x, y, z)
Norm _i :	sensor sensitivity of channel (i = x, y, z), [mV/(V/m) ²] for E-field Probes
ConvF:	sensitivity enhancement in solution
a _{ij} :	sensor sensitivity factors for H-field probes
f:	carrier frequency [GHz]
E _i :	electric field strength of channel i in V/m
H _i :	magnetic field strength of channel i in A/m

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

SAR: local specific absorption rate in W/kg
Etot: total field strength in V/m
 σ : conductivity in [mho/m] or [Siemens/m]
 ρ : 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.

8. Position of the wireless device in relation to the phantom

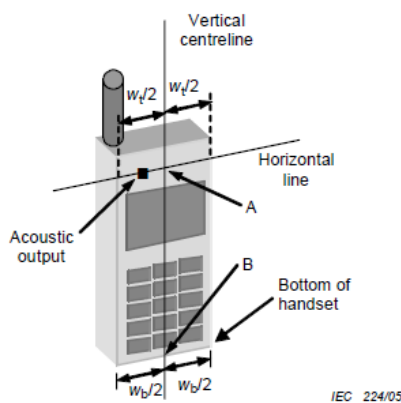
8.1. Head Position

The wireless device define two imaginary lines on the handset, the vertical centreline and the horizontal line, for the handset in vertical orientation as shown in Figures 5a and 5b.

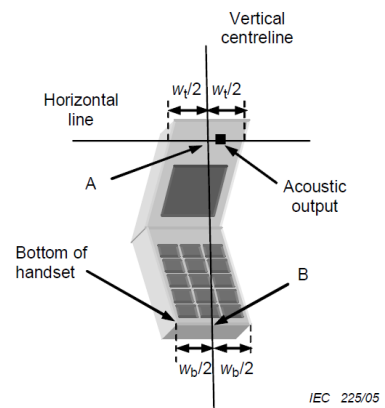
The vertical centreline passes through two points on the front side of the handset: the midpoint of the width W_t of the handset at the level of the acoustic output (point A in Figures 5a and 5b), and the midpoint of the width W_b of the bottom of the handset (point B).

The horizontal line is perpendicular to the vertical centreline and passes through the centre of the acoustic output (see Figures 5a and 5b). The two lines intersect at point A.

Note that for many handsets, point A coincides with the centre of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset (see Figure 5b), especially for clam-shell handsets, handsets with flip cover pieces, and other irregularly shaped handsets.



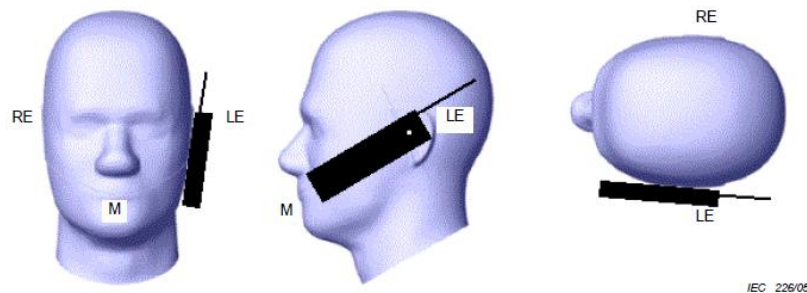
Figures 5a



Figures 5b

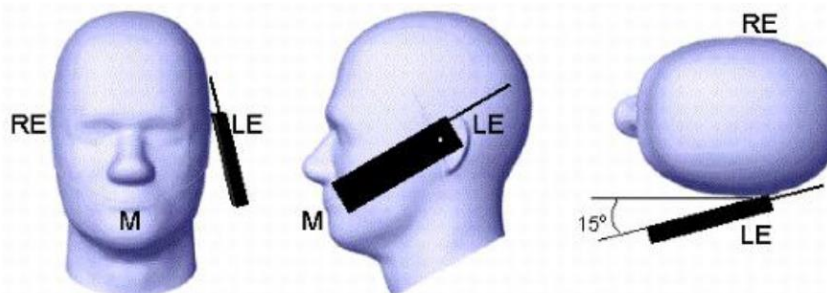
- W_t Width of the handset at the level of the acoustic
- W_b Width of the bottom of the handset
- A Midpoint of the width w_t of the handset at the level of the acoustic output
- B Midpoint of the width w_b of the bottom of the handset

Cheek position



Picture 2 Cheek position of the wireless device on the left side of SAM

Tilt position

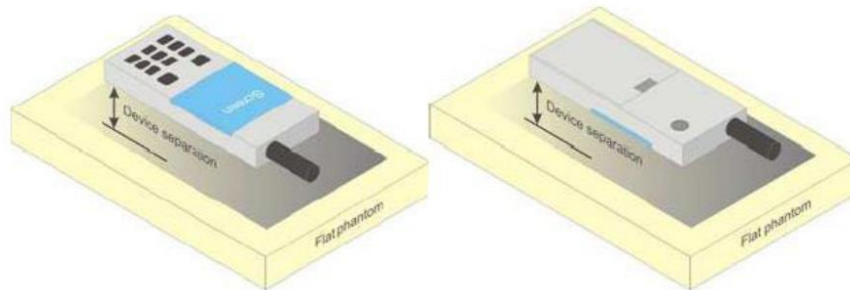


Picture 3 Tilt position of the wireless device on the left side of SAM

8.2. Body Position

Devices that support transmission while used with body-worn accessories must be tested for body-worn accessory SAR compliance, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics.

Devices that are designed to operate on the body of users using lanyards and straps or without requiring additional body-worn accessories must be tested for SAR compliance using a conservative minimum test separation distance $\leq 10 \text{ mm}$ to support compliance



Picture 4 Test positions for body-worn devices

9. System Check

9.1. Tissue Dielectric Parameters

The liquid is consisted of water,salt,Glycol,Sugar,Preventol and Cellulose.The liquid has previously been proven to be suited for worst-case.The table 3 and table 4 show the detail solition.It's satisfying the latest tissue dielectric parameters requirements proposed by the KDB865664.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.4	40
2450	55	0	0	0	0	45	1.8	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800.1900.2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0	0	31.8	2.16	52.5

Tissue dielectric parameters for head and body phantoms				
Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (s/m)	ϵ_r	σ (s/m)
750	41.94	0.89	55.5	0.96
835	41.5	0.90	55.2	0.97
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
2600	39.0	1.96	52.5	2.16

Check Result:

Dielectric performance of Head tissue simulating liquid				
Frequency (MHz)	Description	DielectricParameters		Temp
		ϵ_r	σ (s/m)	°C
835	Recommended result ±5% window	41.50 39.43 to 43.58	0.90 0.86 to 0.95	/
	Measurement value 2017-09-20	41.62	0.92	21
1900	Recommended result ±5% window	40.0 38.00 to 42.00	1.40 1.33 to 1.47	/
	Measurement value 2017-09-21	40.05	1.42	21

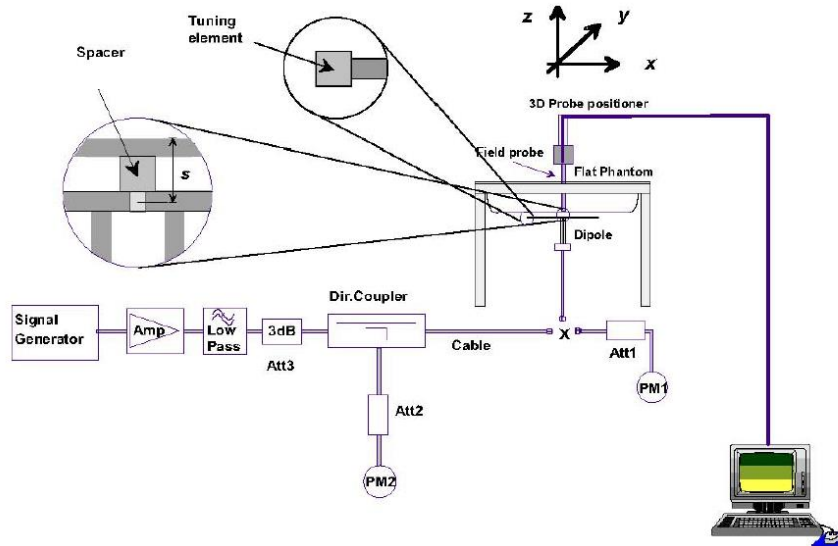
Dielectric performance of Body tissue simulating liquid				
Frequency (MHz)	Description	DielectricParameters		Temp
		ϵ_r	σ (s/m)	°C
835	Recommended result ±5% window	55.2 52.44 to 57.96	0.97 0.92 to 1.02	/
	Measurement value 2017-09-20	55.15	0.96	21
1900	Recommended result ±5% window	53.3 50.64 to 55.97	1.52 1.44 to 1.60	/
	Measurement value 2017-09-21	53.12	1.53	21

9.2. SAR System Check

The purpose of the system check is to verify that the system operates within its specifications at the device test frequency. The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test;

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system ($\pm 10\%$).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



The output power on dipole port must be calibrated to 24 dBm (250mW) before dipole is connected.

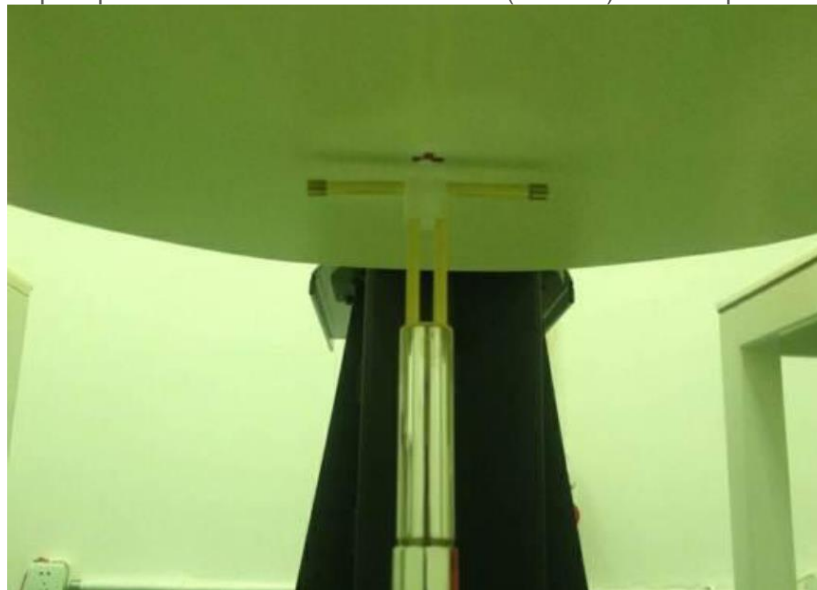


Photo of Dipole Setup

Check Result:

Head				
Frequency (MHz)	Description	SAR(W/kg)		Temp
		1g	10g	°C
835	Recommended result ±10% window	2.30 2.07 - 2.53	1.50 1.35 - 1.65	/
	Measurement value 2017-09-20	2.34	1.52	21
1900	Recommended result ±10% window	10.10 9.09 - 11.11	5.34 4.81 - 5.87	/
	Measurement value 2017-09-21	9.72	5.16	21

Body				
Frequency (MHz)	Description	SAR(W/kg)		Temp
		1g	10g	°C
835	Recommended result ±10% window	2.43 2.19 - 2.67	1.61 1.45 - 1.77	/
	Measurement value 2017-09-20	2.47	1.59	21
1900	Recommended result ±10% window	10.20 9.18 - 11.22	5.47 4.92 - 6.02	/
	Measurement value 2017-09-21	10.3	5.34	21

System Performance Check at 835 MHz Head

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d153

Date:2017-09-20

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 41.62$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.15, 9.15, 9.15); Calibrated: 15/08/2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 15/08/2017
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x91x1):Measurement grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 2.834 W/kg

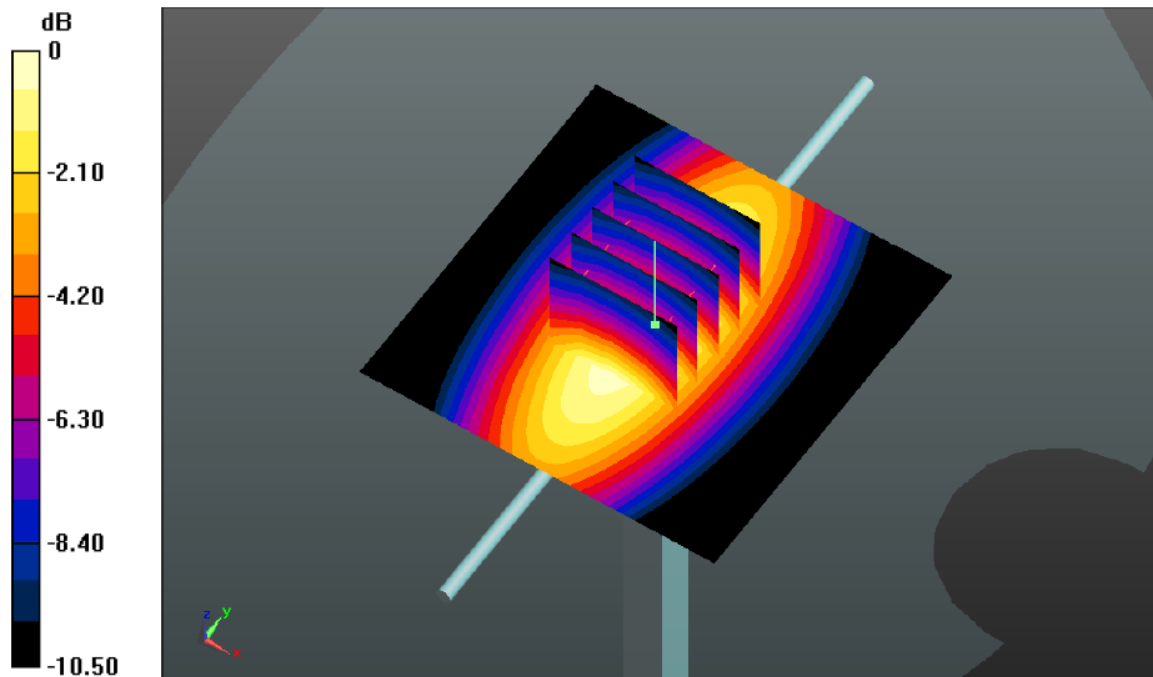
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 49.865 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.286 W/kg

SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.52 W/kg

Maximum value of SAR (measured) = 2.825 W/kg



System Performance Check 835MHz Head 250mW

System Performance Check at 835 MHz Body

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d153

Date:2017-09-20

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 55.15$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.02, 9.02, 9.02); Calibrated: 15/08/2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 15/08/2017
- Phantom: SAM 2; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x91x1):Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.888 W/kg

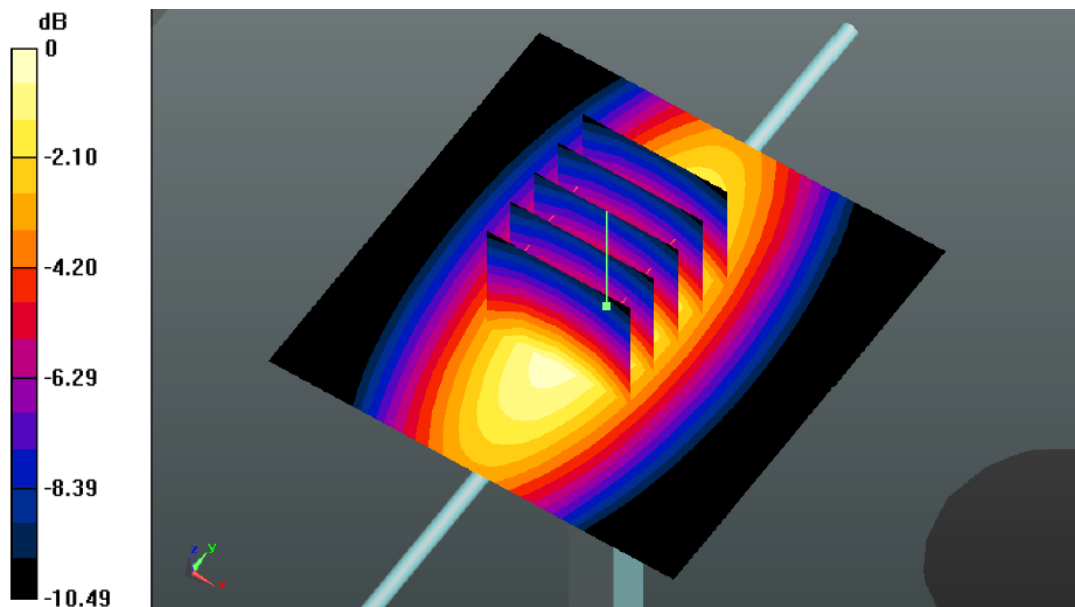
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 50.236 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.339 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 2.871 W/kg



System Performance Check 835MHz Body 250mW

System Performance Check at 1900 MHz Head

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d101

Date:2017-09-21

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.42$ S/m; $\epsilon_r = 40.05$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3842; ConvF(7.58, 7.58, 7.58); Calibrated: 15/08/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 15/08/2017

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1):Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 10.61 W/kg

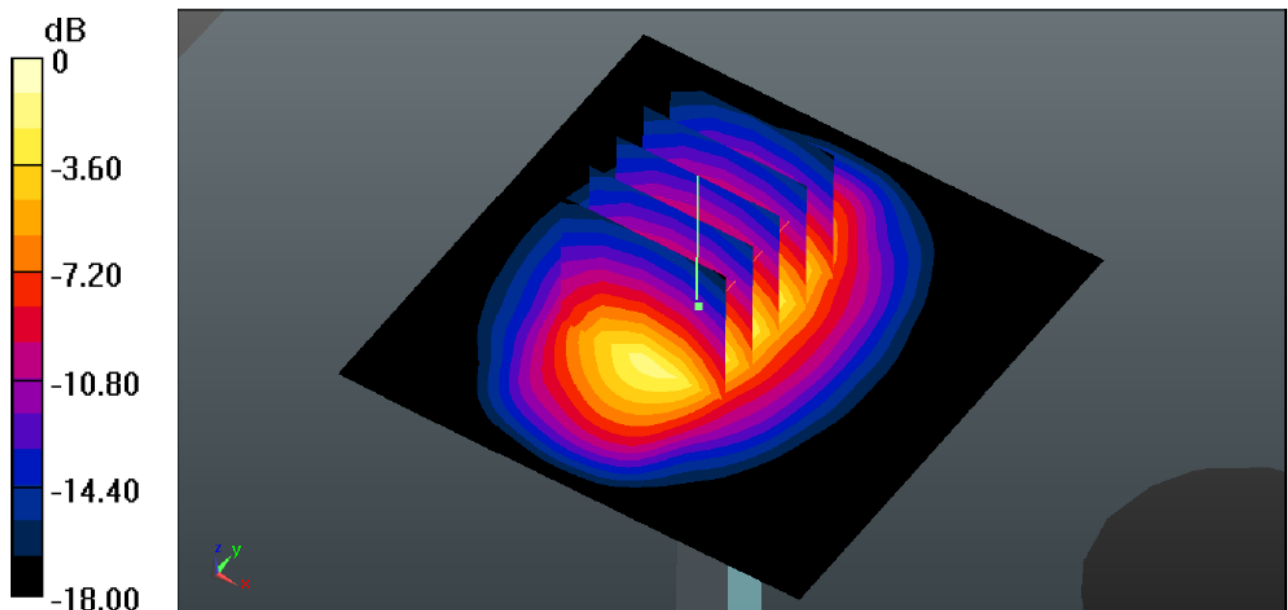
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 94.79 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 12.34 W/kg

SAR(1 g) = 9.72 W/kg; SAR(10 g) = 5.16 W/kg

Maximum value of SAR (measured) = 12.44 W/kg



System Performance Check 1900MHz Head 250mW

System Performance Check at 1900 MHz Body

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d101

Date:2017-09-21

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.53$ S/m; $\epsilon_r = 53.12$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Probe: EX3DV4 - SN3842; ConvF(7.32, 7.32, 7.32); Calibrated: 15/08/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 15/08/2017

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1):Measurement grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 15.187 W/kg

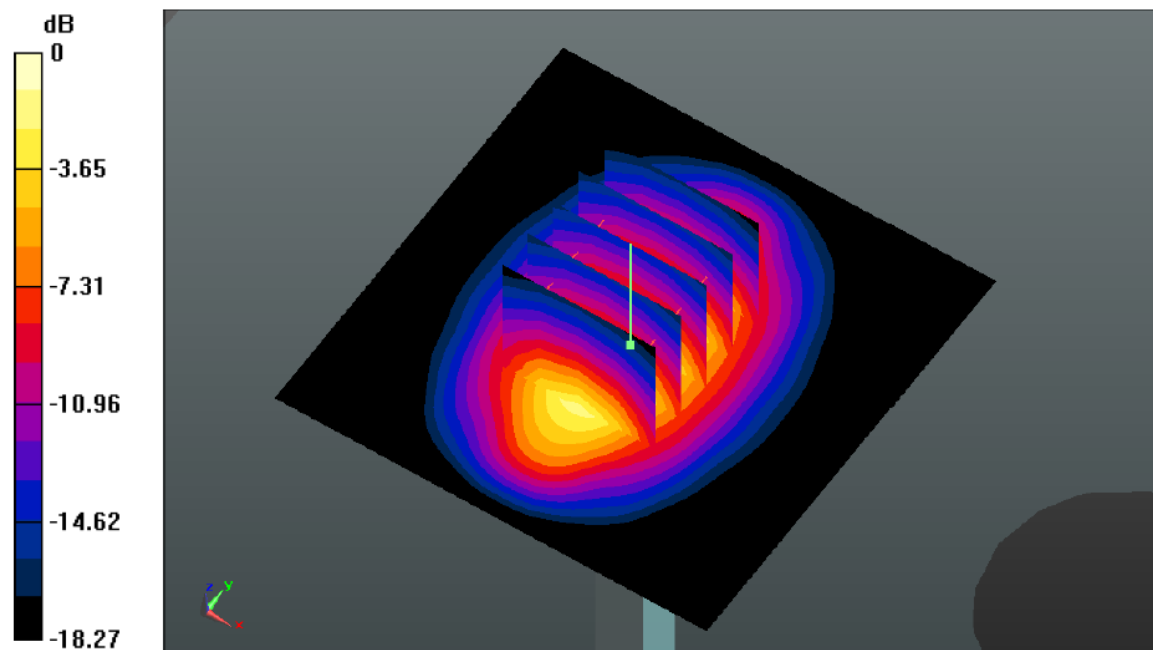
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 87.679 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 19.027 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.34 W/kg

Maximum value of SAR (measured) = 15.09 W/kg



System Performance Check 1900MHz Body250mW

10. SAR Exposure Limits

SAR assessments have been made in line with the requirements of ANSI/IEEE C95.1-1992

Type Exposure	Limit (W/kg)	
	General Population / Uncontrolled Exposure Environment	Occupational / Controlled Exposure Environment
Spatial Average SAR (whole body)	0.08	0.4
Spatial Peak SAR (1g cube tissue for head and trunk)	1.60	8.0
Spatial Peak SAR (10g for limb)	4.0	20.0

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

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

11. Conducted Power Measurement Results

GSM Conducted Power

1. Per KDB 447498 D01, the maximum output power channel is used for SAR testing and further SAR test reduction
2. Per KDB 941225 D01, considering the possibility of e.g. 3rd party VoIP operation for Head and Body-worn SAR test reduction for GSM and GPRS modes is determined by the source-base time-averaged output power including tune-up tolerance. The 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. Therefore, the EUT was set in GPRS (4Tx slots) for GSM850 and GPRS (4Tx slots) for PCS1900.
3. Per KDB941225 D01, for hotspot SAR test reduction for GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance, For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the EUT was set in GPRS (4Tx slots) for GSM850 and GPRS (4Tx slots) for PCS1900.

Mode: GSM850	Conducted Power (dBm)			Division Factors	Averager Power (dBm)		
	CH128	CH190	CH251		CH128	CH190	CH251
	824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
GSM	32.12	33.14	33.33	-9.03	23.09	24.11	24.30
Mode: PCS1900	Conducted Power (dBm)			Division Factors	Averager Power (dBm)		
	CH512	CH661	CH810		CH512	CH661	CH810
	1850.2MHz	1880.0MHz	1909.8MHz		1850.2MHz	1880.0MHz	1909.8MHz
GSM	28.62	28.40	28.12	-9.03	19.59	19.37	19.09

Note:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

Bluetooth Conducted Power

Bluetooth			
Mode	Channel	Frequency (MHz)	Conducted power (dBm)
GFSK	0	2402	6.81
	39	2441	7.06
	78	2480	7.22
π/4QPSK	0	2402	6.07
	39	2441	6.27
	78	2480	6.44
8DPSK	0	2402	6.30
	39	2441	6.49
	78	2480	6.62

12. Maximum Tune-up Limit

GSM		
Mode	Maximum Tune-up (dBm)	
	GSM850	PCS1900
GSM (GMSK, 1Tx Slot)	33.50	29.00

Bluetooth			
Mode	Channel	Frequency (MHz)	Maximum Tune-up (dBm)
GFSK	0	2402	7.5
	39	2441	7.5
	78	2480	7.5
$\pi/4$ QPSK	0	2402	7.5
	39	2441	7.5
	78	2480	7.5
8DPSK	0	2402	7.5
	39	2441	7.5
	78	2480	7.5

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

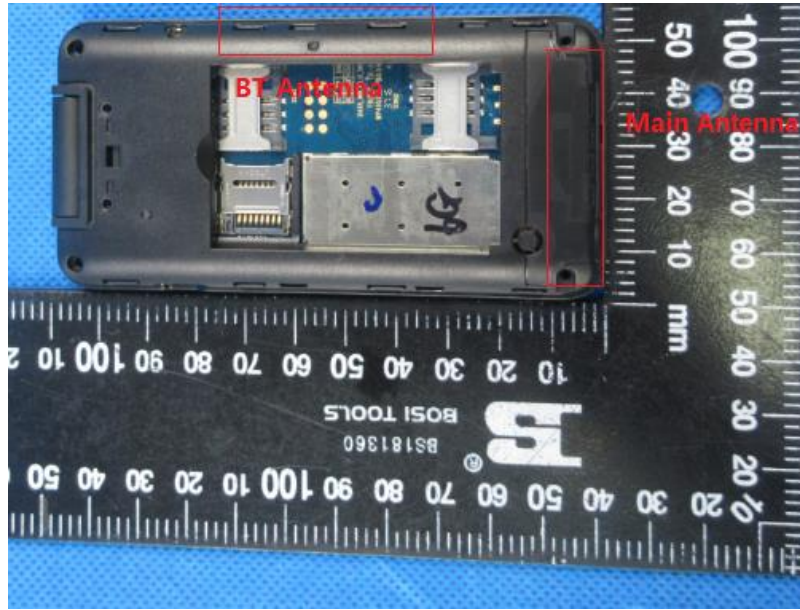
$$[(\text{max. Power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR}$$

Type	Tune up power		SAR Exclusion Threshold Power (mW)		SAR Exclusion	
	dBm	mW	Head	Body	Head	Body
Bluetooth	7.5	5.623	9.6	19.2	Yes	Yes

Per KDB 447498 D01, when the minimum test separation distance is <5mm, a distance of 5mm is applied to determine SAR test exclusion.

The test exclusion threshold is ≤ 3 , SAR testing is not required.

13. Antenna Location



14. SAR Measurement Results

Head SAR

GSM850										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Test Plot
		CH	MHz							
GSM	Left-Cheek	128	824.2	32.12	33.50	1.37	-	-	-	-
		190	836.6	33.14	33.50	1.09	0.14	0.383	0.416	H1
		251	848.8	33.33	33.50	1.04	-	-	-	-
	Left-Tilt	128	824.2	32.12	33.50	1.37	-	-	-	-
		190	836.6	33.14	33.50	1.09	-0.15	0.293	0.318	-
		251	848.8	33.33	33.50	1.04	-	-	-	-
	Right-Cheek	128	824.2	32.12	33.50	1.37	-	-	-	-
		190	836.6	33.14	33.50	1.09	-0.06	0.355	0.386	-
		251	848.8	33.33	33.50	1.04	-	-	-	-
	Right-Tilt	128	824.2	32.12	33.50	1.37	-	-	-	-
		190	836.6	33.14	33.50	1.09	0.08	0.269	0.292	-
		251	848.8	33.33	33.50	1.04	-	-	-	-

PCS1900										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Test Plot
		CH	MHz							
GSM	Left-Cheek	512	1850.2	28.62	29.00	1.09	-	-	-	-
		661	1880.0	28.40	29.00	1.15	-0.10	0.050	0.057	H2
		810	1909.8	28.12	29.00	1.22	-	-	-	-
	Left-Tilt	512	1850.2	28.62	29.00	1.09	-	-	-	-
		661	1880.0	28.40	29.00	1.15	-0.07	0.040	0.046	-
		810	1909.8	28.12	29.00	1.22	-	-	-	-
	Right-Cheek	512	1850.2	28.62	29.00	1.09	-	-	-	-
		661	1880.0	28.40	29.00	1.15	0.05	0.048	0.055	-
		810	1909.8	28.12	29.00	1.22	-	-	-	-
	Right-Tilt	512	1850.2	28.62	29.00	1.09	-	-	-	-
		661	1880.0	28.40	29.00	1.15	0.06	0.038	0.043	-
		810	1909.8	28.12	29.00	1.22	-	-	-	-

Note:

Per KDB865664 D01v01r04, Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg

Body SAR

GSM850										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Test Plot
		CH	MHz							
GSM	Front	128	824.2	32.12	33.50	1.37				-
		190	836.6	33.14	33.50	1.09	0.06	0.554	0.602	-
		251	848.8	33.33	33.50	1.04			-	-
	Back	128	824.2	32.12	33.50	1.37	-0.16	0.661	0.906	-
		190	836.6	33.14	33.50	1.09	-0.13	0.839	0.915	B1
		251	848.8	33.33	33.50	1.04	-0.14	0.807	0.839	-

PCS1900										
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)	Test Plot
		CH	MHz							
GSM	Front	512	1850.2	28.62	29.00	1.09	-	-	-	-
		661	1880.0	28.40	29.00	1.15	0.13	0.193	0.222	-
		810	1909.8	28.12	29.00	1.22	-	-	-	-
	Back	512	1850.2	28.62	29.00	1.09	-	-	-	-
		661	1880.0	28.40	29.00	1.15	0	0.296	0.340	B2
		810	1909.8	28.12	29.00	1.22	-	-	-	-

Note:

Per KDB865664 D01v01r04, Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg

SAR Test Data Plots

Test mode: GSM850

Test Position: Left Head Cheek

Test Plot: H1

Date:2017-09-20

Communication System: Customer System; Frequency: 836.6 MHz;Duty Cycle: 1:8.30042

Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.89$ mho/m; $\epsilon_r = 41.48$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.15, 9.15, 9.15); Calibrated: 15/08/2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 15/08/2017
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.583 W/kg

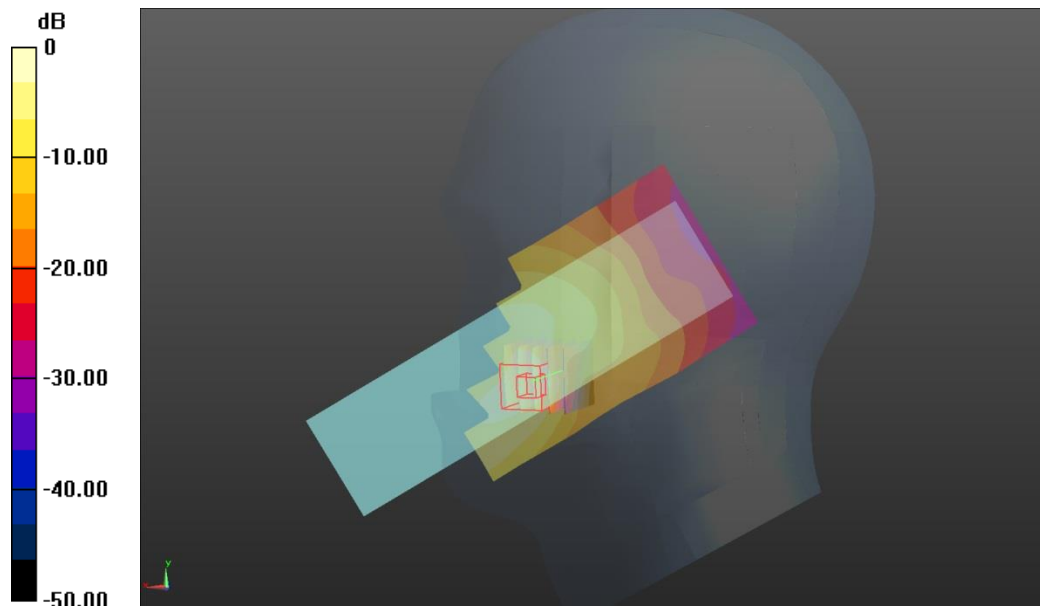
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.586 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 1.060 mW/g

SAR(1 g) = 0.383 mW/g; SAR(10 g) = 0.188 mW/g

Maximum value of SAR (measured) = 0.569 W/kg



Left Head Cheek (GSM850 GSM Middle Channel)

Test mode: PCS1900

Test Position: Left Head Cheek

Test Plot: H2

Date:2017-09-21

Communication System: Customer System; Frequency: 1880 MHz;Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 39.74$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(7.58, 7.58, 7.58); Calibrated: 15/08/2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 15/08/2017
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x111x1): Interpolated grid: $dx=1.500$ mm, $dy=1.500$ mm

Maximum value of SAR (interpolated) = 0.0559 W/kg

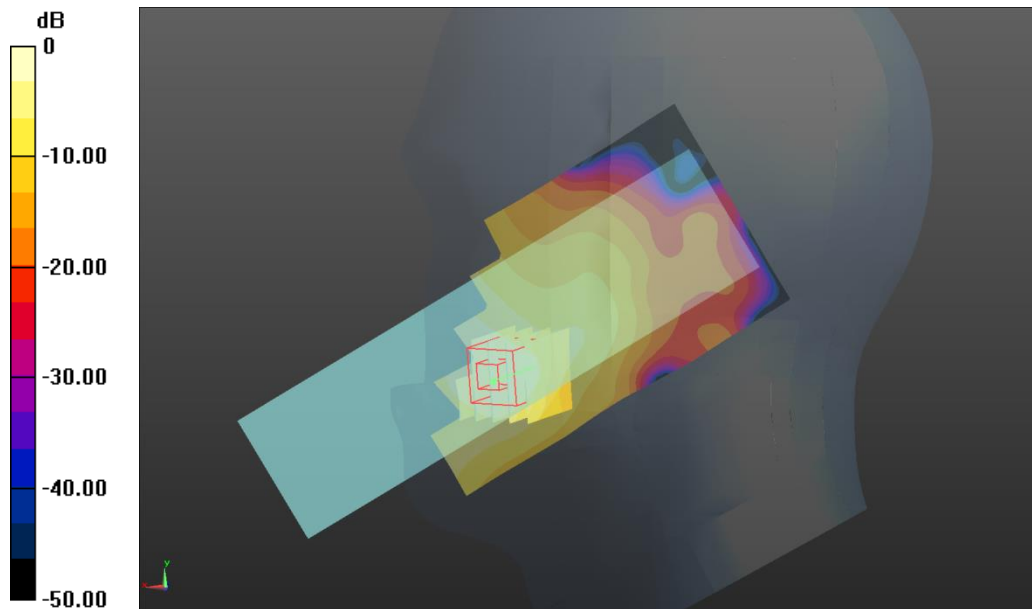
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 1.065 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.087 mW/g

SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.027 mW/g

Maximum value of SAR (measured) = 0.0582 W/kg



Left Head Cheek (PCS1900 GSM Middle Channel)

Test mode: GSM850

Test Position: Body- worn Rear Side

Test Plot: B1

Date:2017-09-20

Communication System: Customer System; Frequency: 836.6 MHz;Duty Cycle: 1:8.30042

Medium parameters used: $f = 836.41$ MHz; $\sigma = 0.96$ mho/m; $\epsilon_r = 55.86$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(9.02, 9.02, 9.02); Calibrated: 15/08/2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 15/08/2017
- Phantom: SAM 2; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.983 W/kg

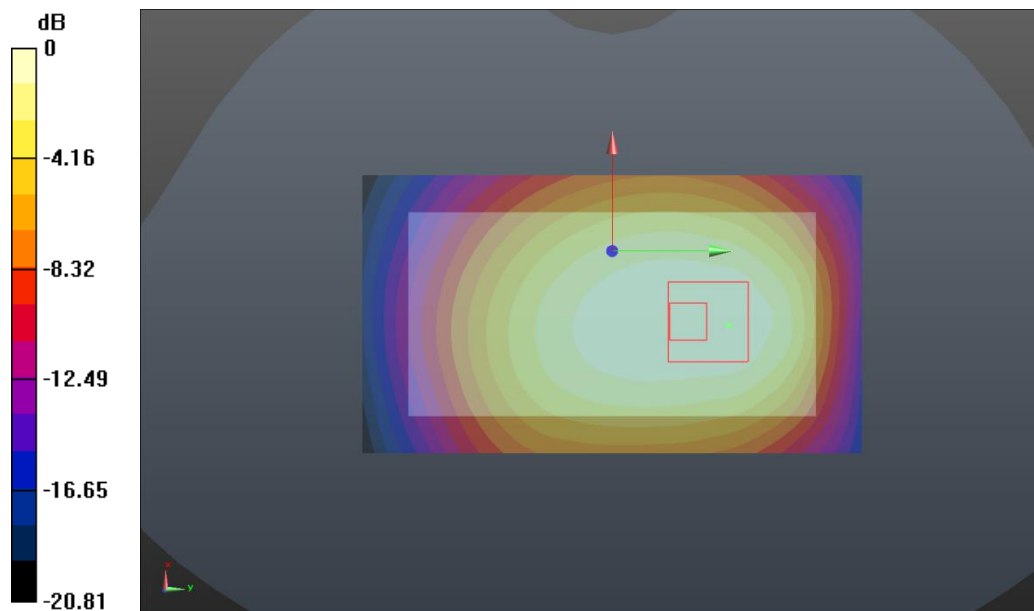
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 31.391 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 1.113 mW/g

SAR(1 g) = 0.839 mW/g; SAR(10 g) = 0.578 mW/g

Maximum value of SAR (measured) = 0.954 W/kg



Body- worn Rear Side (GSM850 GSM Middle Channel)

Test mode: PCS1900

Test Position: Body- worn Rear Side

Test Plot: B2

Date:2017-09-21

Communication System: Customer System; Frequency: 1880 MHz;Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 51.14$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3842; ConvF(7.32, 7.32, 7.32); Calibrated: 15/08/2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 15/08/2017
- Phantom: SAM 2; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.350 W/kg

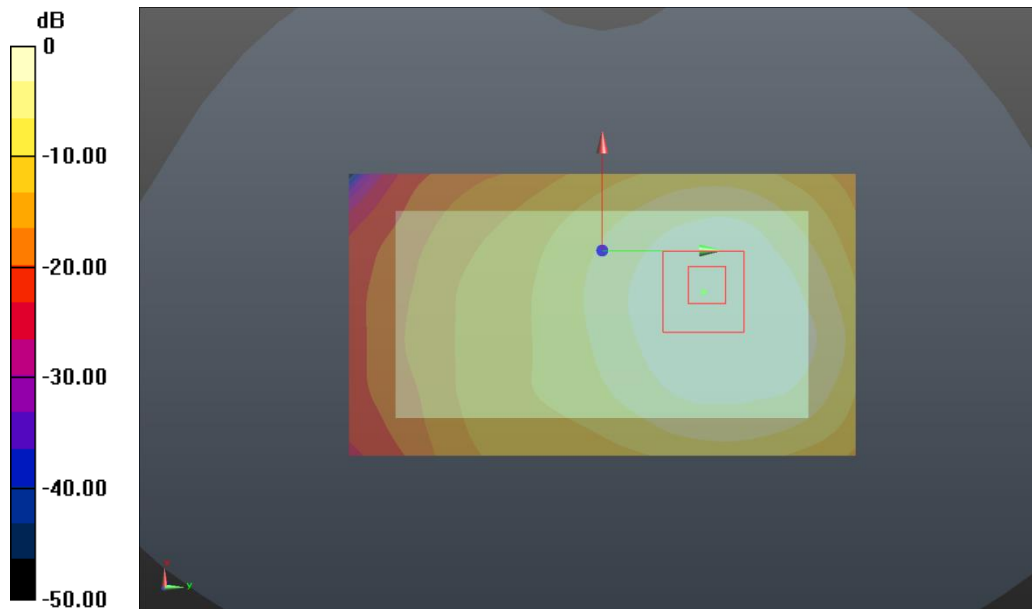
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.431 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.490 mW/g

SAR(1 g) = 0.296 mW/g; SAR(10 g) = 0.171 mW/g

Maximum value of SAR (measured) = 0.361 W/kg



Body- worn Rear Side (PCS1900 GSM Middle Channel)

15. Simultaneous Transmission analysis

No.	Simultaneous Transmission Configurations	Head	Body-worn	Note
1	GSM(voice) + Bluetooth (data)	Yes	Yes	

General note:

1. The reported SAR summation is calculated based on the same configuration and test position
2. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below
 - a) $[(\text{max. Power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})/x}] \text{W/kg}$ for test separation distances $\leq 50\text{mm}$; when $x=7.5$ for 1-g SAR, and $x=18.75$ for 10-g SAR.
 - b) When the minimum separation distance is $<5\text{mm}$, the distance is used 5mm to determine SAR test exclusion
 - c) 0.4 W/kg for 1-g SAR and 1.0W/kg for 10-g SAR, when the test separation distances is $>50\text{mm}$.

Bluetooth Max power	Exposure position	Head	Body worn
	Test separation	0mm	10mm
7.5 dBm	Estimated SAR (W/kg)	0.235 W/kg	0.117 W/kg

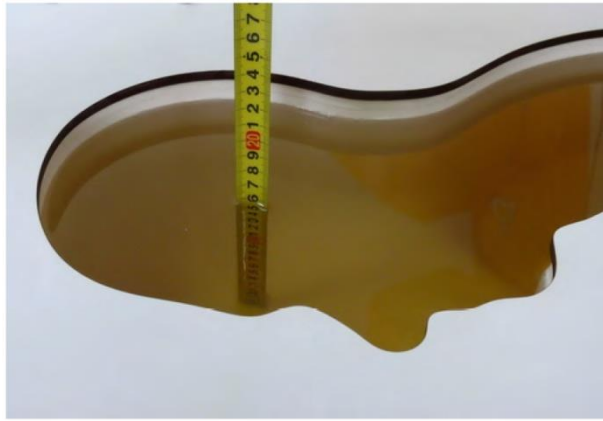
Maximum reported SAR value for Head

WWAN PCE + Bluetooth					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCE	Bluetooth	
GSM	GSM850	Left Cheek	0.416	0.235	0.651
		Left Tilted	0.318	0.235	0.553
		Right Cheek	0.386	0.235	0.621
		Right Tilted	0.292	0.235	0.527
	PCS1900	Left Cheek	0.057	0.235	0.292
		Left Tilted	0.046	0.235	0.281
		Right Cheek	0.055	0.235	0.29
		Right Tilted	0.043	0.235	0.278

Maximum reported SAR value for Body

WWAN PCE + Bluetooth					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCE	Bluetooth	
GSM	GSM850	Front	0.602	0.117	0.719
		Back	0.915	0.117	1.032
	PCS1900	Front	0.222	0.117	0.339
		Back	0.340	0.117	0.457

16. TestSetup Photos



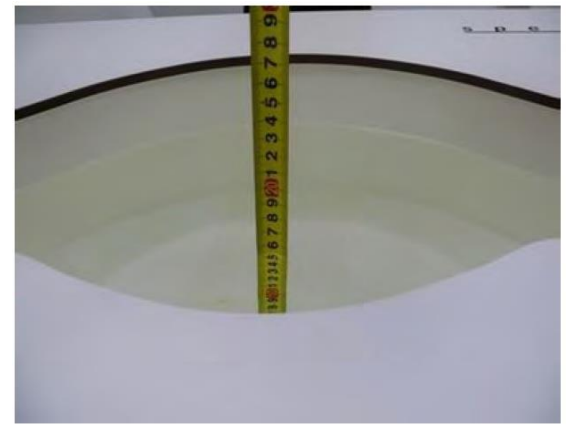
Liquid depth in the head phantom (835MHz)



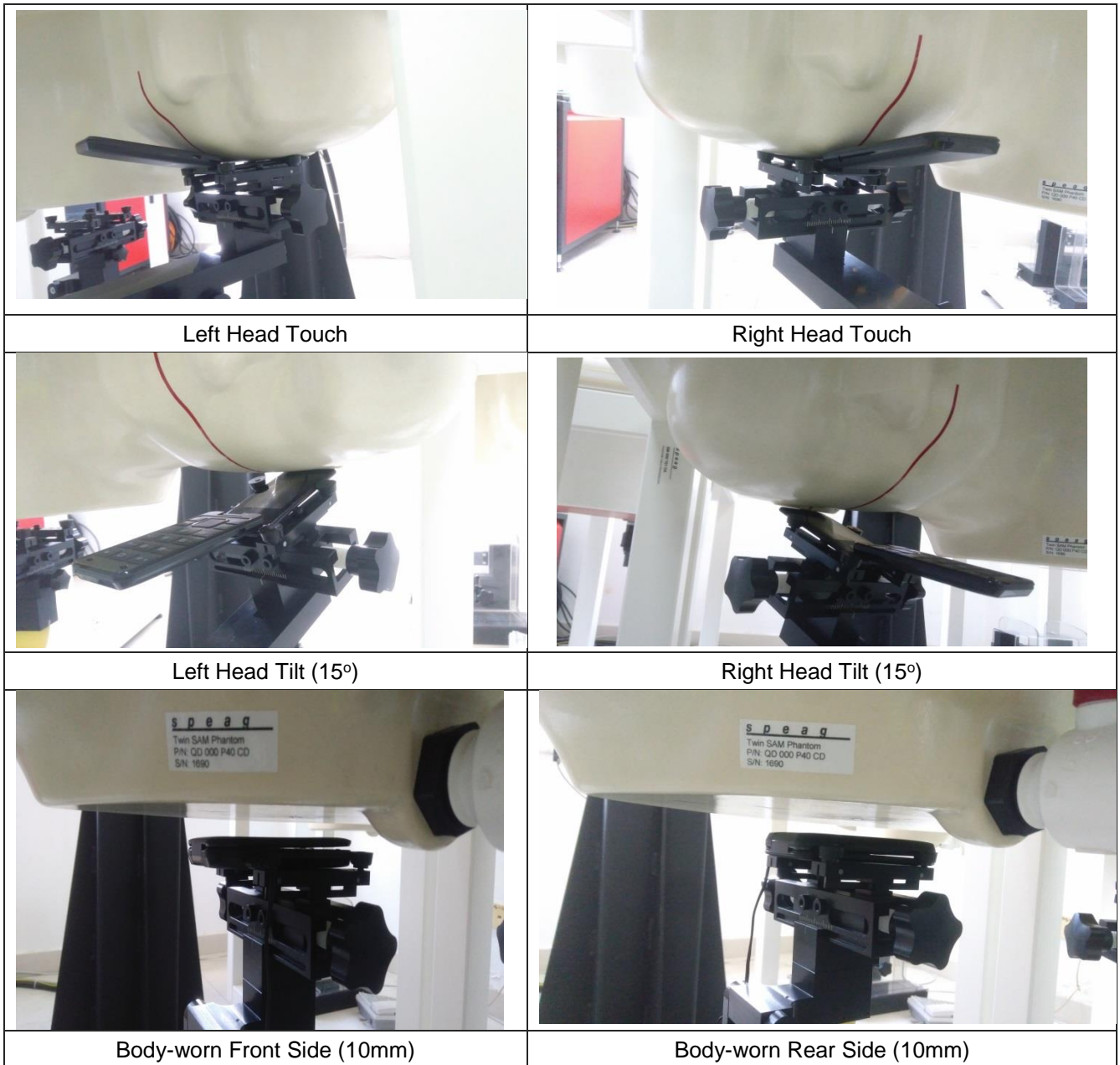
Liquid depth in the body phantom (835MHz)



Liquid depth in the head phantom (1900MHz)



Liquid depth in the body phantom (1900MHz)



17. External and Internal Photos of the EUT

Please reference to the report No.: TRE1709010901

-----End of Report-----