



**SAR Evaluation Report**  
**for**  
**IEEE Std1528-2013 and 47CFR § 2.1093**

**Report No.: 1309080**

Client	:	CDM MIAMI INC
Product	:	Mobile Phone
Model1	:	R180,R181,OK, 711, BBQ
Model2	:	R240,R241, Juicy, Melody, Energy
FCC ID	:	ZZRTM1280
Manufacturer/supplier	:	SHENZHEN B&L YX TECHNOLOGY CO., LTD
Date test campaign completed	:	September 29, 2013
Date of issue	:	October 8, 2013
Test Result	:	<input checked="" type="checkbox"/> Compliance <input type="checkbox"/> Not Compliance

**Statement of Compliance:**

The SAR values measured for the test sample are below the maximum recommended level of 1.6 W/kg averaged over any 1g tissue according to IEEE Std.1528-2013.

**The test result only corresponds to the tested sample. It is not permitted to copy this report, in part or in full, without the permission of the test laboratory.**

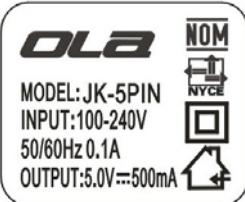
*Total number of pages of this test report: 135 pages*

Test Engineer:		Approved by:
 _____ Leo Chen		 _____ Miro Chueh

The testing described in this report has been carried out to the best of our knowledge and ability, and our responsibility is limited to the exercise of reasonable care. This certification is not intended to relieve the sellers from their legal and/or contractual obligations.



## Applicant Information

<b>Client</b>	: CDM MIAMI INC
<b>Address</b>	: 3100 NW 72ND AVE., UNIT 118, MIAMI FL 33122
<b>Manufacturer</b>	: SHENZHEN B&L YX TECHNOLOGY CO., LTD 5F, BUILDING 10 EAST, HENG MINGZHU IND PARK
<b>Address</b>	: TONGFUYU IND ZONE SHAJING ST BAO'AN DIST SHENZHEN CHINA
<b>EUT</b>	: Mobile Phone
<b>Trademark</b>	: OLA / OLLA / FUN
<b>Model1 No.</b>	: R180,R181,OK, 711, BBQ
<b>Model2 No.</b>	: R240,R241, Juicy, Melody, Energy
<b>Charger label</b>	: 
<b>Standard Applied</b>	: IEEE Std1528-2013 and 47CFR § 2.1093
<b>Laboratory</b>	: CERPASS TECHNOLOGY CORP. No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China.
<b>Test Result</b>	: Maximum SAR Measurement GSM 850: 1.354W/kg(1g) PCS1900: 1.124W/kg(1g)

Note: These two types of mobile phone have the same mainboard and antenna, but their size and antenna locations are different; according to FCC KDB Publication 178919 D01 v05r03, we tested all configurations on the phone of R180 , and compared on R241.



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## History of this test report

ORIGINAL.

Additional attachment as following record:

Attachment No.	Date	Description
1	10/08/2013	ORIGINAL
2	10/21/2013	Update charger label



## 1. Executive Summary

The two EUTs are Mobile Phone with operations in 850MHz and 1900MHz frequency ranges. Both of the devices only contain GSM/GPRS and Bluetooth functions; and they have the same mainboard and antenna, but their size and antenna locations are different. The measurement was conducted by CERPASS and carried out with the dosimetric assessment system under DASY5. And it conducts according to the IEEE Std1528-2013 and 47CFR § 2.1093 for evaluating compliance.



## 2. General Information

### 2.1. Description of Equipment under Test

<b>EUT Type</b>	Mobile Phone
<b>Model1 Name</b>	R180, R181, OK, 711, BBQ
<b>IMEI1</b>	352273017386340
<b>IMEI2</b>	352273017386340
<b>Model2 Name</b>	R240, R241, Juicy, Melody, Energy
<b>IMEI1</b>	352273017386340
<b>IMEI2</b>	3522751019523267
<b>Hardware Version</b>	2678-MB-V0.1
<b>Software Version</b>	2678_XL_R180_OLA_b23021
<b>Bluetooth Version</b>	v2.1
<b>Release Version</b>	GSM850/PCS1900: R99
<b>Tx Frequency</b>	GSM 850: 824~849MHz PCS 1900: 1850~1910MHz Bluetooth: 2402~2480MHz
<b>Rx Frequency</b>	GSM 850: 869~894MHz PCS 1900: 1930~1990MHz Bluetooth: 2402~2480MHz
<b>Type of Modulation</b>	GMSK for GPRS; 8PSK for EDGE Bluetooth: V3.0+HS: GFSK, Pi/4 DQPSK, 8DPSK
<b>Antenna Type</b>	Internal
<b>Antenna Gain</b>	GSM 850: 2dBi DCS1900: 3dBi Bluetooth: 0dBi
<b>Device Category</b>	Portable
<b>RF Exposure Environment</b>	General Population/ Uncontrolled



## 2.2. Photograph of EUT

➤ R180



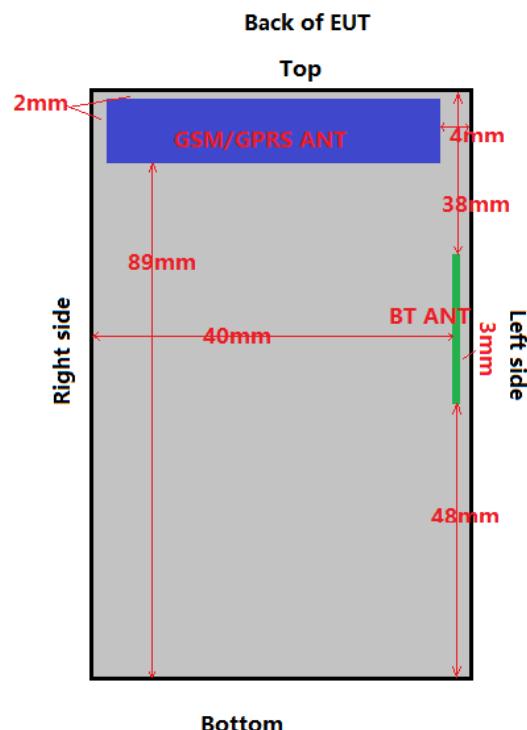
➤ R241



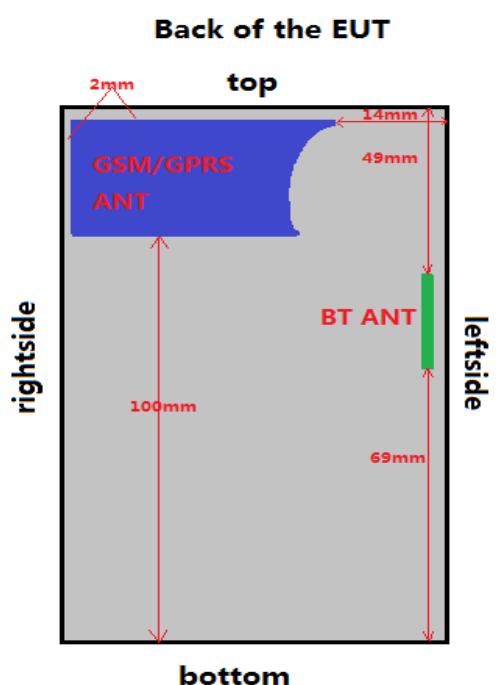


### 2.3. EUT Antenna Locations

➤ R180



➤ R241





## 2.4. Simultaneous Transmission Configurations

### Simultaneous Transmission Scenarios

Ref.	Simultaneous Transmit Configurations	Head	Body-Worn Accessory	Hotspot	Note
		IEEE1528	FCC KDB447498 V05	FCC KDB941225 D06	
1	GSM850 Voice + BT	Yes	Yes	No	
2	GPRS850 Data + BT	Yes	Yes	No	
3	PCS1900 Voice + BT	Yes	Yes	No	
4	GPRS1900 Data + BT	Yes	Yes	No	

Note: Bluetooth and Wi-Fi share the same antenna and cannot transmit simultaneously.

Note: According to FCC KDB Publication 447498 D01v05r01, transmitter are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneously transmission analysis according to FCC KDB Publication 447498 D01v05r01 3) procedures.

## 2.5. SAR Test Exclusions Applied

### 2.5.1 Bluetooth

Per FCC KDB 447498 D01v05, the SAR exclusion threshold for distances<50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth and the antenna to use separation distance, Bluetooth SAR was not required;

$$[(1.59\text{mW}/5) * \sqrt{2.441}] = 0.497 < 3.0 \text{ for Head}; [(1.28\text{mW}/10) * \sqrt{2.441}] = 0.248 < 3.0 \text{ for Body}.$$

### 2.5.2 Licensed Transmitter(s)

GSM/GPRS DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS Data.

## 2.6. Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.



## 2.7. Environment Condition

Item	Target	Measured
Ambient Temperature(°C)	18~25	21.5±2
Temperature of Liquid(°C)	20~22	21±2
Relative Humidity(%RH)	30~70	52

## 2.8. Test Standards

- IEEE Std.1528-2013(Basic standard for human head)
- FCC KDB Publication 941225 D03 v01( SAR Test Reduction GSM GPRS EDGE)
- FCC KDB Publication 447498 D01 v05r01(General RF Exposure Guidance)
- FCC KDB Publication 865664 D01 v01r01(SAR measurement 100 MHz to 6 GHz)

## 2.9. RF Exposure Limits

Human Exposure	Basic restrictions for electric, magnetic and electromagnetic fields. (Unit in mW/ or W/kg)
Spatial Peak SAR <sup>1</sup> (Head and Body)	1.60
Spatial Average SAR <sup>2</sup> (Whole Body)	0.08
Spatial Peak SAR <sup>3</sup> (Arms and Legs)	4.00

- Notes:**
1. The Spatial Peak value of the SAR averaged over any 1gram of tissue(defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
  2. The Spatial Average value of the SAR averaged over the whole body.
  3. The Spatial Peak value of the SAR averaged over any 1 grams of tissue (defined as a tissue volume in the shape of a cube) and over appropriate averaging time.



### 3. The SAR Measurement Procedure

#### 3.1. General Requirements

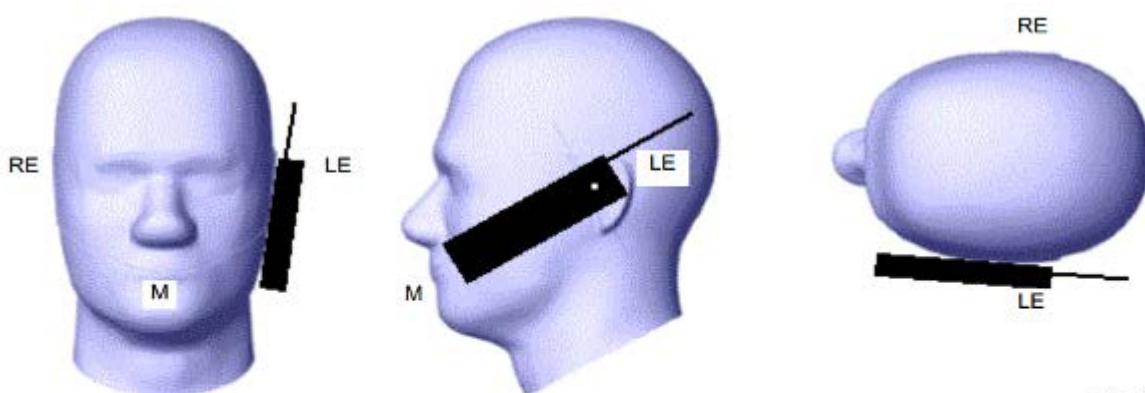
The test should be performed in a laboratory without influence on SAR measurements by ambient RF sources and any reflection from the environment inside. The equivalent liquid temperature should be kept in the range of 20°C to 22°C according to IEEE Std. 1528-2013 with a maximum variation within  $\pm 2^\circ\text{C}$  during the test; and the ambient temperature should be kept in the range of 18°C to 25°C.

#### 3.2. Phantom Requirements

SAR system here in Cerpass technology corp. is DASY5 with SAM twin phantom and ELI4 phantom. The phantoms used in test are simplified representations of the human head and body as a specific shaped container for the head or body simulating liquids. The physical characteristics of the phantom models should resemble the head and the body of a mobile user since the shape is a dominant parameter for exposure. The shell of the phantom should be made of low loss and low permittivity material and the thickness tolerance should be less than 0.2 mm. In addition, the phantoms should provide simulations of both right and left hand operations.

#### 3.3. Test Positions

For cell phone, it has at least 6 different positions should be tested. They are left cheek, left tilted, right cheek, right tilted, body worn back, body worn front as illustrated below:

**Key**

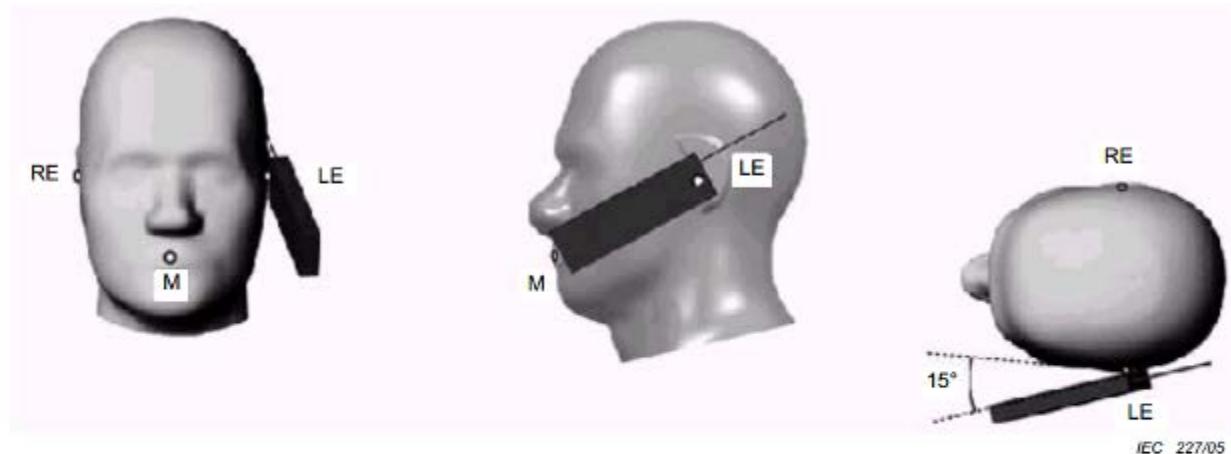
- M Mouth reference point
- LE Left ear reference point (ERP)
- RE Right ear reference point (ERP)

Figure 1-1 Cheek position of the wireless device on left side of SAM

Note1: Cheek position of the wireless device on Right side of SAM also is similar to the left side



represented above.

**Key**

- M Mouth reference point
- LE Left ear reference point (ERP)
- RE Right ear reference point (ERP)

Figure 1-2 Tilt position of the wireless device on left side of SAM

Note2: Tilt position of the wireless device on Right side of SAM also is similar to the left side represented above.

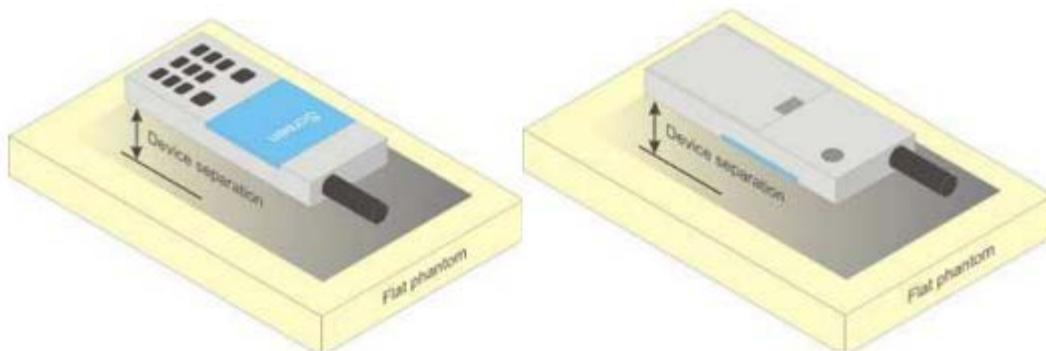


Figure1-3 Test position for body-worn devices

Note3: A separation distance 15mm is commonly used for body-worn Smart Phones, to represent a spacing provided by intended accessories, refer to FCC KDB 865664 D01 v01r01. For devices with hotspot function, the separation distance is 10mm Per FCC KDB941225 D06 v01r01.

### 3.4. Test Procedures

First, engineer should record the conducted power before the test. Then make the EUT connect with the CMU200 basic communication tester or make it transmit by itself. Place the EUT to the specific test location. After the testing, must export SAR test data by SEMCAD. Then writing down the conducted power of the EUT into the report, also the SAR values tested.



### 3.5. Body-Worn Accessory 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\_v01, 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\_v05 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.

### 3.6. Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of Wi-Fi simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v01 where SAR test considerations for handsets ( $L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$ ) 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. Since the hotspot SAR results may overlap with the



body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the Wi-Fi transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the Wi-Fi transmitter according to FCC KDB Publication 447498 D01v05 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

### 3.7. SAR Measurement Conditions for UMTS

#### 3.7.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1s”.

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121 (release 5), using the appropriate RMC with TPC (transmit power control) set to all “1s” or 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, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

#### 3.7.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

#### 3.7.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”.

#### 3.7.4 SAR Measurements for Handsets with Rel 5 HSDPA



Body SAR for HSDPA is not required for handsets with HSDPA capabilities when the maximum average output power of each RF channel with HSDPA active is less than 0.25 dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is  $\leq 75\%$  of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration measured in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that resulted in the highest SAR in 12.2 kbps RMC mode for that RF channel.

The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of  $\beta_c=9$  and  $\beta_d=15$ , and power offset parameters of  $\Delta ACK = \Delta NACK = 5$  and  $\Delta CQI = 2$  is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

### 3.7.5 SAR Measurements for Handsets with Rel 6 HSUPA

Body SAR for HSUPA is not required when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25 dB higher than as measured without HSUPA/HSDPA using 12.2 kbps RMC and maximum SAR for 12.2 kbps RMC is  $\leq 75\%$  of the SAR limit. Otherwise SAR is measured on the maximum output channel for the body exposure configuration produced highest SAR in 12.2 kbps RMC for that RF channel, using the additional procedures under "Release 6 HSPA data devices".

Head SAR for VOIP operations under HSPA is not required when maximum average output of each RF channel with HSPA is less than 0.25 dB higher than as measured using 12.2 kbps RMC. Otherwise SAR is measured using same HSPA configuration as used for body SAR.

Sub-test	$\beta_c$	$\beta_d$	$\beta_a$ (SF)	$\beta_c/\beta_d$	$\beta_{hs}^{(1)}$	$\beta_{ec}$	$\beta_{ed}$	$\beta_{ed}$ (SF)	$\beta_{ed}$ (codes)	CM <sup>(2)</sup> (dB)	MPR (dB)	AG <sup>(4)</sup> Index	E-TFCI
1	11/15 <sup>(3)</sup>	15/15 <sup>(3)</sup>	64	11/15 <sup>(3)</sup>	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	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	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 <sup>(4)</sup>	15/15 <sup>(4)</sup>	64	15/15 <sup>(4)</sup>	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1:  $\Delta ACK = \Delta NACK = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$ .

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  $\beta_c/\beta_d$  ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: For subtest 5 the  $\beta_c/\beta_d$  ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled 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:  $\beta_{ed}$  can not be set directly; it is set by Absolute Grant Value.



#### 4. Description of the Test Equipment

DASY5 is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller. DASY5 uses the latest methodologies to provide a platform which is repeatable with minimum uncertainty. Applications: Predefined measurement procedures compliant with the guidelines of CENELEC, IEEE, IEC, FCC, etc are utilized during the assessment for the device. Automatic detection for all SAR maxima are embedded within the core architecture for the system, ensuring that peak locations used for centering the zoom scan are within a 1mm resolution and a 0.05mm repeatable position. System operation range currently is available up to 6 GHz in simulated tissue.



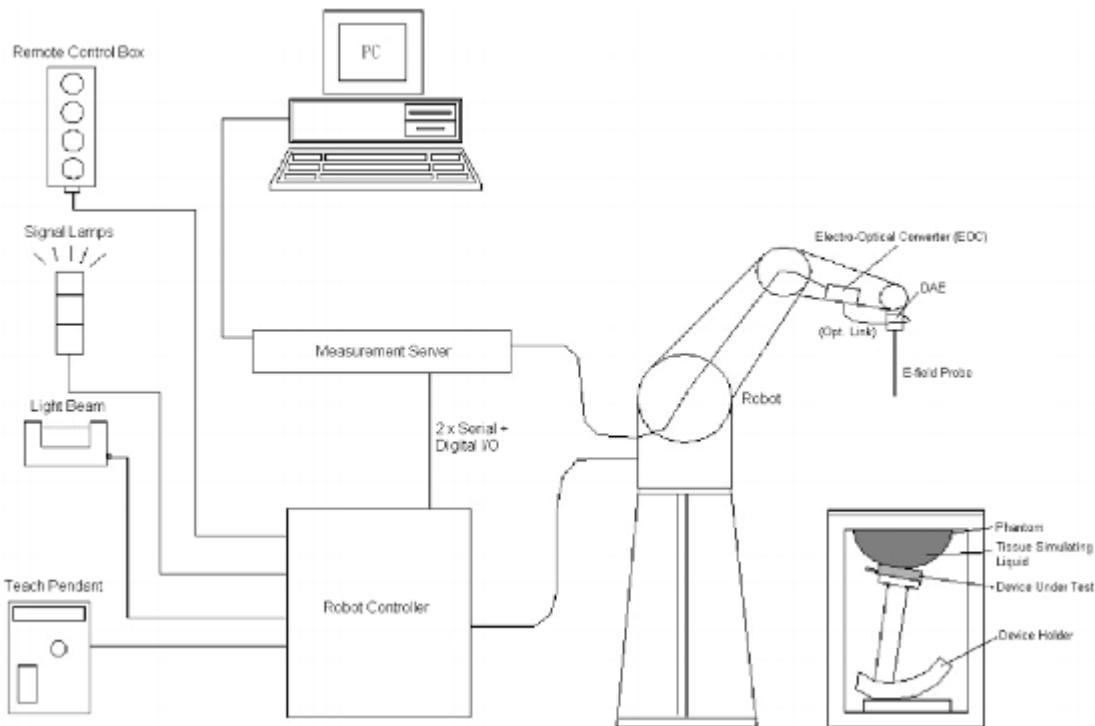
#### 4.1. Test Equipment List

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Stäubli Robot TX60L	Stäubli	TX60L	5P6VA1/A/01	only once
Robot Controller	Stäubli	CS8C	5P6VA1/C/01	only once
Dipole Validation Kits	Speag	D850V2	1008	2015.06.12
Dipole Validation Kits	Speag	D1900V2	5d174	2015.06.09
SAM Twin Phantom	Speag	SAM	1767	N/A
SAM ELI Phantom	Speag	SAM	1211	N/A
Device Holder	Speag	SD 000 H01 KA	N/A	N/A
Laptop Holder	Speag	SM LH1 001CD	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	1379	2014.06.13
E-Field Probe	Speag	EX3DV4	3927	2014.06.23
SAR Software	Speag	DASY5	V5.2 Build 162	N/A
Power Amplifier	Mini-Circuit	ZVA-183W-S+	MN136701248	N/A
Directional Coupler	Agilent	772D	MY52180104	N/A
Universal Radio Communication Tester	R&S	CMU 200	108823	2014.01.08
Vector Network	Agilent	E5071C	MY4631693	2014.01.15
Signal Generator	R&S	SML	103287	2014.03.09
Power Meter	BONN	BLWA0830-160/100/40D	76659	2013.11.10
AUG Power Sensor	R&S	NRP-Z91	100384	2014.03.09



## 4.2. DASY5 Measurement System

### DASY5 Measurement System



**Figure 2.1 SPEAG DASY5 System Configurations**

The DASY5 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic(DAE)attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter(ECO)performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows 7
- DASY5 software
- Remove control with teach pendant additional circuitry for robot safety such as warming lamps,etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

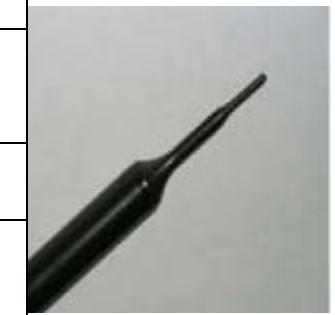


#### 4.3. DASY5 E-Field Probe

The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO 17025. The calibration data are in Appendix D.

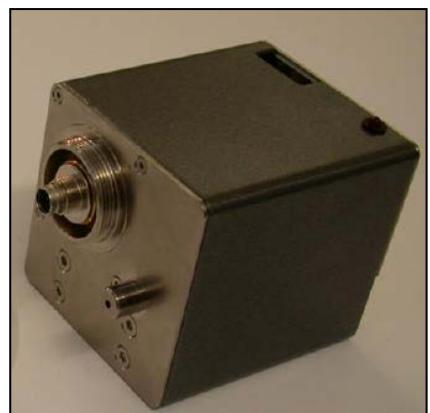
Model	EX3DV4
<b>Construction</b>	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
<b>Frequency</b>	10 MHz to 6 GHz Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)
<b>Directivity</b>	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)
<b>Dynamic Range</b>	10 $\mu$ W/g to 100 mW/g Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)
<b>Dimensions</b>	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
<b>Application</b>	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



#### 4.4. Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.





#### 4.5. Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used.

The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller



#### 4.6. Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.



#### 4.7. Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.





#### 4.8. SAM Phantom

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

- Left head
- Right head
- Flat phantom



The ELI4 Phantom also is a fiberglass shell phantom with 2mm shell thickness. It has 30 liters filling volume, and with a dimension of 600mm for major ellipse axis , 400mm for minor axis. It is intended for compliance testing of handheld and body-mounted wireless devices in frequency range of 30 MHz to 6GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.



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

#### 4.9. Device Holder

- The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).Thus the device needs no repositioning when changing the angles.The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity  $\epsilon_r = 3$  and loss tangent  $\delta = 0.02$ . 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.





- The laptop extension is lightweight and made of POM, acrylic glass and foam. It fits easily on upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.





## 5. SAR Measurement Procedures in DASY5

### Step 1 Setup a Call Connection

Establish a call in handset at the maximum power level with a base station simulator via air interface, or make the EUT estimate by itself in testing band.

### Step 2 Power Reference Measurements

To measure the local E-field value at a fixed location which value will be taken as a reference value for calculating a possible power drift.

### Step 3 Area Scan

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm<sup>2</sup> step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2013 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

### Step 4 Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m<sup>3</sup> is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

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

### Step 5 Power Drift Measurements

Repetition of the E-field measurement at the fixed location mentioned in Step 1 to make sure the two results differ by less than ± 0.2 dB.



## 6. System Performance Check

### 6.1. Purpose

1. To verify the simulating liquids are valid for testing.
2. To verify the performance of testing system is valid for testing.

### 6.2. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
<b>850</b>	<b>41.5</b>	<b>0.92</b>	<b>55.2</b>	<b>0.99</b>
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
<b>1800 – 2000</b>	<b>40.0</b>	<b>1.40</b>	<b>53.3</b>	<b>1.52</b>
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

( $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho = 1000 \text{ kg/m}^3$ )



### 6.3. Tissue Calibration Result

- The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5 Dielectric Probe Kit and Agilent Vector Network Analyzer E5071C

Head Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		$\epsilon_r$	$\sigma$ [s/m]	
850 MHz	Reference result ± 5% window	41.50 39.43 to 43.58	0.92 0.87 to 0.97	N/A
	29-09-2013	41.30	0.90	21.0
1900 MHz	Reference result ± 5% window	40.0 38.00 to 42.00	1.40 1.33 to 1.47	N/A
	29-09-2013	39.69	1.45	21.0

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		$\epsilon_r$	$\sigma$ [s/m]	
850 MHz	Reference result ± 5% window	55.2 52.44 to 57.96	0.99 0.94 to 1.04	N/A
	29-09-2013	55.20	0.99	21.0
1900 MHz	Reference result ± 5% window	53.3 50.64 to 55.97	1.52 1.44 to 1.60	N/A
	29-09-2013	51.05	1.57	21.0

- Refer to IEEE Std.1528-2013, the liquid in phantom head should be at least 15cm deep; and refer to KDB 865664 D01 v01r01, The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm with  $\leq \pm 0.5$  cm variation for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm with  $\leq \pm 0.5$  cm variation for measurements  $> 3$  GHz.



#### 6.4. System Performance Check Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and the system performance check. They are read-only document files and destined as fully defined but unmeasured masks, so the finished system performance check must be saved under a different name. The system performance check document requires the SAM Twin Phantom or ELI4 Phantom, so the phantom must be properly installed in your system. (User defined measurement procedures can be created by opening a new document or editing an existing document file). Before you start the system performance check, you need only to tell the system with which components (probe, medium, and device) you are performing the system performance check; the system will take care of all parameters.

- **The Power Reference Measurement and Power Drift Measurement**

jobs 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 Dipole output power. If it is too high (above  $\pm 0.2$  dB), the system performance check should be repeated;

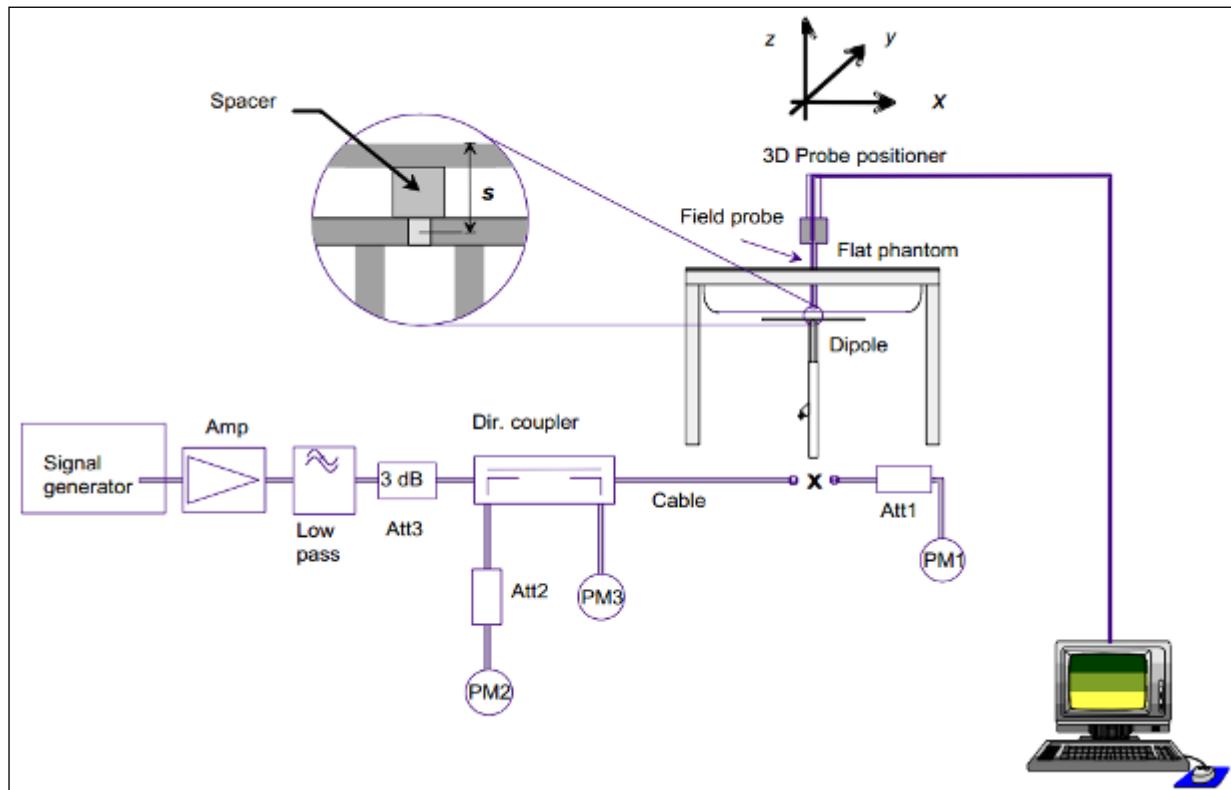
- **The Surface Check** job tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and 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  $\pm 0.1$  mm). In that case it is better to abort the system performance check and stir the liquid.

- **The Area Scan** job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable.

- **The Zoom Scan** job measures the field in a volume around the peak SAR value assessed in the previous Area Scan job (for more information see the application note on SAR evaluation). If the system performance check gives reasonable results. The dipole input power(forward power) was 250mW ,1 g and 10 g spatial average SAR values normalized to 1W dipole input power give reference data for comparisons and it's equal to 10x(dipole forward power). The next sections analyze the expected uncertainties of these values, as well as additional checks for further information or troubleshooting.

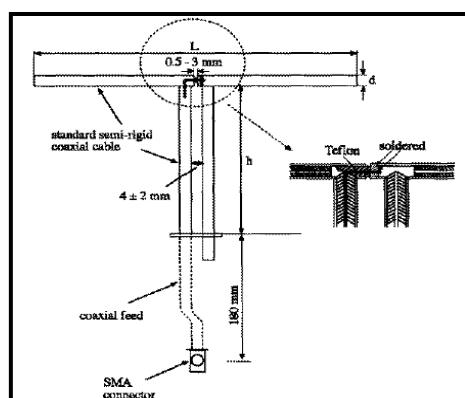


## 6.5. System Performance Check Setup



## 6.6. Validation Dipoles

The dipoles used are based on the IEEE Std.1528-2013 and FCC OET65 Supplement C June 2001 standard, and is complied with mechanical and electrical specifications in line with the requirements of both EN62209-1 and EN62209-2. The table below provides details for the mechanical and electrical specifications for the dipoles.



Frequency	L (mm)	h (mm)	d (mm)
850MHz	158	88	3.6
1900MHz	68.0	39.5	3.6



## 6.7. Result of System Performance Check: Valid Result

### System Performance Check at 850MHz, 1900MHz for Head.

#### Validation Kit: D850V2-SN: 1008

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
850 MHz	Reference result ± 10% window	9.83 8.85 to 10.81	6.37 5.73 to 7.01	N/A
	29-09-2013	9.2	6.00	21.0

#### Validation Kit: D1900V2-SN: 5d174

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
1900 MHz	Reference result ± 10% window	39.9 35.91 to 43.89	20.9 18.81 to 22.99	N/A
	29-09-2013	38.88	20.72	21.0

Note: All SAR values are normalized to 1W forward power.

### System Performance Check at 850MHz, 1900MHz for Body.

#### Validation Kit: D850V2-SN: 1008

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
850 MHz	Reference result ± 10% window	9.62 8.66 to 10.58	6.27 5.64 to 6.90	N/A
	29-09-2013	10.08	6.64	21.0

#### Validation Kit: D1900V2-SN: 5d174

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
1900 MHz	Reference result ± 10% window	40.4 36.36 to 44.44	21.5 19.35 to 23.65	N/A
	29-09-2013	42.00	22.40	21.0

Note: All SAR values are normalized to 1W forward power.



## 7. Results

### 7.1. Summary of Test Results

No deviations form the technical specification(s) were ascertained in the course of the tests performed	<input checked="" type="checkbox"/>
The deviations as specified in this chapter were ascertained in the course of the tests Performed.	<input type="checkbox"/>

### 7.2. Description for EUT test position

The following procedure had been used to prepare the EUT for the SAR test.

- The client supplied a special driver to program the EUT, allowing it to continually transmit the specified maximum power and change the channel frequency.
- The output power(dBm) we measured before SAR test in different channel
- Performing the highest output power channel first
- SAR test Tip edge and Bottom Flat mode.

### 7.3. Conducted power (Average)

#### ➤ GSM/GPRS

##### i. Mode No.:R180

Mode	Frequency (MHz)	Avg. Burst Power (dBm)	Duty Cycle Factor (dB)	Frame Power (dBm)	Max. Power (dBm)	Scaling Factor
GSM850	824.2	31.84	-9	22.84	32	1.04
	836.6	31.74	-9	22.74	32	1.06
	848.8	31.56	-9	22.56	32	1.11
GPRS850(1Slot)	824.2	31.83	-9	22.83	32	1.04
	836.6	31.72	-9	22.72	32	1.07
	848.8	31.54	-9	22.54	32	1.11
GPRS850(2 Slot)	<b>824.2</b>	<b>30.82</b>	<b>-6</b>	<b>24.72</b>	<b>31</b>	<b>1.04</b>
	<b>836.6</b>	<b>30.71</b>	<b>-6</b>	<b>24.71</b>	<b>31</b>	<b>1.07</b>
	<b>848.8</b>	<b>30.67</b>	<b>-6</b>	<b>24.67</b>	<b>31</b>	<b>1.08</b>
GPRS850(3 Slot)	824.2	28.64	-4.25	24.39	29	1.09
	836.6	28.67	-4.25	24.42	29	1.08
	848.8	28.63	-4.25	24.38	29	1.09
GPRS850(4 Slot)	824.2	26.37	-3	23.37	27	1.16
	836.6	26.42	-3	23.42	27	1.14
	848.8	26.41	-3	23.41	27	1.15



PCS1900	1850.2	28.78	-9	19.78	29	1.05
	1880.0	28.31	-9	19.31	29	1.17
	1909.8	28.33	-9	19.33	29	1.17
GPRS1900(1Slot)	1850.2	28.74	-9	19.74	29	1.06
	1880.0	28.19	-9	19.19	29	1.21
	1909.8	28.25	-9	19.25	29	1.19
GPRS1900(2Slot)	1850.2	26.51	-6	20.51	27	1.12
	1880.0	26.56	-6	20.56	27	1.11
	1909.8	26.64	-6	20.64	27	1.09
GPRS1900(3Slot)	<b>1850.2</b>	<b>25.00</b>	<b>-4.25</b>	<b>20.75</b>	<b>25.5</b>	<b>1.12</b>
	<b>1880.0</b>	<b>25.07</b>	<b>-4.25</b>	<b>20.82</b>	<b>25.5</b>	<b>1.10</b>
	<b>1909.8</b>	<b>25.16</b>	<b>-4.25</b>	<b>20.91</b>	<b>25.5</b>	<b>1.08</b>
GPRS1900(4Slot)	1850.2	22.76	-3	19.76	23.5	1.19
	1880.0	22.80	-3	19.8	23.5	1.17
	1909.8	23.06	-3	20.06	23.5	1.11
SIM2						
GSM850	836.6	31.71	-9	22.71	32	1.07
PCS1900	1880.0	28.29	-9	19.29	26	1.18

## ii. Mode No.:R241

Mode	Frequency (MHz)	Avg. Burst Power (dBm)	Duty Cycle Factor (dB)	Frame Power (dBm)	Max. Power (dBm)	Scaling Factor
GSM850	824.2	31.82	-9	22.82	32	1.04
	836.6	31.75	-9	22.75	32	1.06
	848.8	31.59	-9	22.59	32	1.10
GPRS850(1Slot)	824.2	31.81	-9	22.81	32	1.04
	836.6	31.73	-9	22.73	32	1.06
	848.8	31.57	-9	22.57	32	1.10
GPRS850(2 Slot)	<b>824.2</b>	<b>30.83</b>	<b>-6</b>	<b>24.83</b>	<b>31</b>	<b>1.04</b>
	<b>836.6</b>	<b>30.70</b>	<b>-6</b>	<b>24.70</b>	<b>31</b>	<b>1.07</b>
	<b>848.8</b>	<b>30.66</b>	<b>-6</b>	<b>24.66</b>	<b>31</b>	<b>1.08</b>
GPRS850(3 Slot)	824.2	28.64	-4.25	24.39	29	1.09
	836.6	28.66	-4.25	24.41	29	1.08
	848.8	28.63	-4.25	24.38	29	1.09



GPRS850(4 Slot)	824.2	26.37	-3	23.37	27	1.16
	836.6	26.42	-3	23.42	27	1.14
	848.8	26.41	-3	23.41	27	1.15
PCS1900	1850.2	28.79	-9	19.79	29	1.05
	1880.0	28.30	-9	19.30	29	1.17
	1909.8	28.34	-9	19.34	29	1.16
GPRS1900(1Slot)	1850.2	28.75	-9	19.75	29	1.06
	1880.0	28.18	-9	19.18	29	1.21
	1909.8	28.26	-9	19.26	29	1.19
GPRS1900(2Slot)	1850.2	26.53	-6	20.53	27	1.11
	1880.0	26.54	-6	20.54	27	1.11
	1909.8	26.67	-6	20.67	27	1.08
GPRS1900(3Slot)	<b>1850.2</b>	<b>25.01</b>	<b>-4.25</b>	<b>20.76</b>	<b>25.5</b>	<b>1.12</b>
	<b>1880.0</b>	<b>25.09</b>	<b>-4.25</b>	<b>20.84</b>	<b>25.5</b>	<b>1.10</b>
	<b>1909.8</b>	<b>25.14</b>	<b>-4.25</b>	<b>20.89</b>	<b>25.5</b>	<b>1.09</b>
GPRS1900(4Slot)	1850.2	22.75	-3	19.75	23.5	1.19
	1880.0	22.81	-3	19.81	23.5	1.17
	1909.8	23.04	-3	20.04	23.5	1.11

Note: 1. Scaling Factor = Max. Power (mW) / Avg. Burst Power (mW)

2. This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v05.

3. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged powers were calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.

4. The bolded GPRS modes were selected for SAR testing according to the highest frame-averaged output power table per KDB 941225 D03v01.

5. GPRS/EDGE(GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.



## ➤ Mode No.:R180/R241

## Estimated SAR for Bluetooth

Mode	Frequency	Maximum Allowed Power	Separation Distance (Head)	Estimated SAR (Held-to-Ear)	Separation Distance (Body)	Estimated SAR (Body)
Bluetooth	[MHz]	[dBm]	[mm]	[W/kg]	[mm]	[W/kg]
Bluetooth	2441	2	5	0.083	10	0.042

Note: This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is  $\leq 1.6 \text{ W/kg}$ . When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2, the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$



#### 7.4. SAR Test Results Summary

SAR MEASUREMENT													
Ambient Temperature (°C) : 21.5 ± 2				Relative Humidity (%): 52									
Liquid Temperature (°C) : 21.0 ± 2				Depth of Liquid (cm):>15									
Product: Mobile Phone													
Test Mode: GSM850													
Mode No.:R180													
Test Position Head	Antenna Position	Frequency		Frame Power (dBm)	Power Drift ( $<\pm 0.2$ )	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)				
Left-Cheek	Fixed	128	824.2	22.84	0.08	0.944	1.04	0.982	1.6				
Left-Cheek	Fixed	189	836.6	22.74	0.12	1.08	1.06	1.145	1.6				
<b>Left-Cheek</b>	<b>Fixed</b>	<b>251</b>	<b>848.8</b>	<b>22.56</b>	<b>0.07</b>	<b>1.22</b>	<b>1.11</b>	<b>1.354</b>	<b>1.6</b>				
Left-Cheek*	Fixed	251	848.8	22.56	0.17	1.19	1.11	1.321	1.6				
Left-Tilted	Fixed	189	836.6	22.74	-0.03	0.65	1.06	0.689	1.6				
Right-Cheek	Fixed	128	824.2	22.84	0.02	0.886	1.04	0.921	1.6				
Right-Cheek	Fixed	189	836.6	22.74	-0.08	1.01	1.06	1.071	1.6				
Right-Cheek	Fixed	251	848.8	22.56	0.03	1.18	1.11	1.310	1.6				
Right-Tilted	Fixed	189	836.6	22.74	-0.07	0.646	1.06	0.685	1.6				
SIM2:													
Left-Cheek	Fixed	189	836.6	22.71	0.09	1.03	1.07	1.102	1.6				
Mode No.:R241													
Left-Cheek	Fixed	251	848.8	22.59	0.09	1	1.10	1.10	1.6				
Note 1: when the 1-g SAR is $\leq 0.8$ W/kg, testing for low and high channel is optional, refer to KDB 447498.													
2: * - repeated at the highest SAR measurement according to the FCC KDB 865664													



SAR MEASUREMENT														
Ambient Temperature (°C) : $21.5 \pm 2$					Relative Humidity (%): 52									
Liquid Temperature (°C) : $21.0 \pm 2$					Depth of Liquid (cm):>15									
Product: Smart Phone														
<b>Body-worn Accessory SAR Configurations</b>														
Mode No.:R180														
Test Mode: GSM850														
Test Position Body (15mm gap)	Antenna Position	Frequency		Frame Power (dBm)	Power Drift ( $\pm 0.2$ )	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)					
		Channel	MHz											
Body-worn	Fixed	128	824.2	22.84	--	--	1.04	--	1.6					
Body-worn	Fixed	189	836.6	22.74	-0.06	0.419	1.06	0.444	1.6					
Body-worn	Fixed	251	848.8	22.56	--	--	1.11	--	1.6					
Test Mode: GPRS850-2slot														
Body-worn	Fixed	128	824.2	24.72	--	--	1.04		1.6					
<b>Body-worn</b>	<b>Fixed</b>	<b>189</b>	<b>836.6</b>	<b>24.71</b>	<b>-0.03</b>	<b>0.585</b>	<b>1.07</b>	<b>0.626</b>	<b>1.6</b>					
Body-worn	Fixed	251	848.8	24.67	--	--	1.08		1.6					
Body-Front	Fixed	189	836.6	24.71	0.04	0.435	1.07	0.465	1.6					
Test Mode: GPRS850-3slot														
Body-worn	Fixed	189	836.6	24.42	-0.07	0.541	1.08	0.584	1.6					
Test Mode: GPRS850-4slot														
Body-worn	Fixed	189	836.6	23.42	-0.01	0.436	1.14	0.497	1.6					
Mode No.:R241														
Test Mode: GPRS850-2slot														
Body-worn	Fixed	189	836.6	24.70	0.02	0.447	1.07	0.478	1.6					
Note 1: when the 1-g SAR is $\leq 0.8$ W/kg, testing for low and high channel is optional, refer to KDB 447498.														
2: * - repeated at the highest SAR measurement according to the FCC KDB 865664														



SAR MEASUREMENT														
Ambient Temperature (°C) : $21.5 \pm 2$					Relative Humidity (%): 52									
Liquid Temperature (°C) : $21.0 \pm 2$					Depth of Liquid (cm):>15									
Product: Smart Phone														
Test Mode: PCS1900														
Mode No.:R180														
Test Position Head	Antenna Position	Frequency		Frame Power (dBm)	Power Drift ( $<\pm 0.2$ )	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)					
		Channel	MHz											
Left-Cheek	Fixed	512	1850.2	19.78	0.08	1.07	1.05	1.124	1.6					
Left-Cheek*	Fixed	512	1850.2	19.78	0.08	1.05	1.05	1.103	1.6					
Left-Cheek	Fixed	661	1880	19.31	0.14	0.784	1.17	0.917	1.6					
Left-Cheek	Fixed	810	1909.8	19.33	0.08	0.555	1.17	0.649	1.6					
Left-Tilted	Fixed	661	1880.0	19.31	0.11	0.548	1.17	0.641	1.6					
Right-Cheek	Fixed	512	1850.2	19.78	--	--	1.05	--	1.6					
Right-Cheek	Fixed	661	1880	19.31	0.06	0.504	1.17	0.590	1.6					
Right-Cheek	Fixed	810	1909.8	19.33	--	--	1.17	--	1.6					
Right-Tilted	Fixed	661	1880.0	19.31	0.07	0.446	1.17	0.522	1.6					
SIM2														
Left-Cheek	Fixed	661	1880	19.29	0.11	0.784	1.18	0.925	1.6					
Mode No.:R241														
Left-Cheek	Fixed	512	1850.2	19.79	0.10	0.926	1.04	0.963	1.6					
Note 1: when the 1-g SAR is $\leq 0.8$ W/kg, testing for low and high channel is optional, refer to KDB 447498.														
2: * - repeated at the highest SAR measurement according to the FCC KDB 865664														



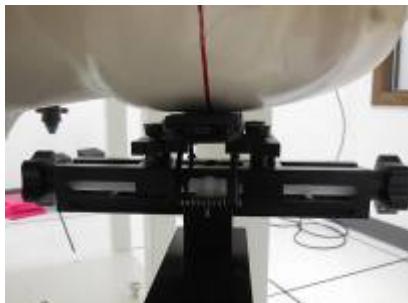
SAR MEASUREMENT														
Ambient Temperature (°C) : $21.5 \pm 2$					Relative Humidity (%): 52									
Liquid Temperature (°C) : $21.0 \pm 2$					Depth of Liquid (cm):>15									
Product: Smart Phone														
<b>Body-worn Accessory SAR Configurations</b>														
Test Mode: PCS1900														
Mode No.:R180														
Test Position Body (15mm gap)	Antenna Position	Frequency		Frame Power (dBm)	Power Drift ( $<\pm 0.2$ )	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)					
		Channe l	MHz											
Body-worn	Fixed	512	1850.2	19.78	--	--	1.05	--	1.6					
Body-worn	Fixed	661	1880	19.31	-0.01	0.14	1.17	0.164	1.6					
Body-worn	Fixed	810	1909.8	19.33	--	--	1.17	--	1.6					
Test Mode: GPRS1900-2slot														
Body-worn	Fixed	661	1880	20.56	-0.07	0.192	1.11	0.213	1.6					
Test Mode: GPRS1900-3slot														
Body-worn	Fixed	512	1850.2	20.75	--	--	1.12	--	1.6					
<b>Body-worn</b>	<b>Fixed</b>	<b>661</b>	<b>1880</b>	<b>20.82</b>	<b>0.04</b>	<b>0.234</b>	<b>1.10</b>	<b>0.257</b>	<b>1.6</b>					
Body-worn	Fixed	810	1909.8	20.91	--	--	1.08	--	1.6					
Body-Front	Fixed	661	1880	20.82	0.06	0.199	1.10	0.219	1.6					
Test Mode: GPRS1900-4slot														
Body-worn	Fixed	661	1880	19.8	-0.03	0.165	1.17	0.193	1.6					
Mode No.:R241														
Test Mode: GPRS1900-3slot														
Body-worn	Fixed	661	1880	20.84	-0.15	0.199	1.10	0.219	1.6					
Note 1: when the 1-g SAR is $\leq 0.8$ W/kg, testing for low and high channel is optional, refer to KDB 447498.														
2: * - repeated at the highest SAR measurement according to the FCC KDB 865664														



### 7.5. Measurement Position

- Mode No.:R180

Left cheek position



Right cheek position



Left tilted position



Right tilted position



Body position Front with gap 15mm

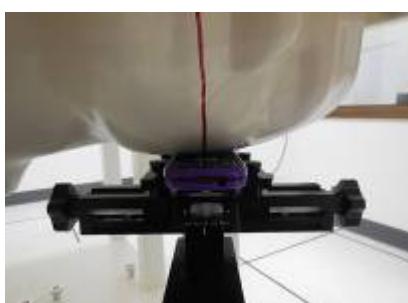


Body position back with gap 15mm



- Mode No.:R241

Left cheek position



Body position back with gap 15mm





## 8. The Description of Test Procedure

### 8.1. Test Methods

#### 8.1.1 Scan Procedure

First area scans were used for determination of the field distribution. Next a zoom scan points covering a volume of at least 30x30x30mm was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the coarse scan and again at the end of the cube scan.

#### 8.1.2 SAR Averaging Methods

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics. In the cube scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

#### 8.1.3 Data Storage

The DASY5 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with measurement server. The post processing 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 erroneous parameter settings.

### 8.2. Test position and configuration

Head SAR was performed with the device configured in the positions according to IEEE1528. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.

### 8.3. Body SAR with Headset

Per FCC KDB Publication 648474 D04v01, SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was  $\leq 1.2$  W/kg, no additional SAR evaluations using a headset cable were required.



#### 8.4. Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is  $\leq 1.6\text{W/kg}$ .

#### 8.5. Simultaneous Transmission Analysis

Simultaneous Transmission Scenario with Bluetooth

Configuration	Mode	Max. Scaled SAR (W/kg)	Bluetooth SAR (W/kg)	$\Sigma$ SAR (W/kg)
Head	GSM850	1.354	0.083	1.437
Head	PCS1900	1.124	0.083	1.207
Body-Worn	GSM850	0.626	0.042	0.668
Body-Worn	PCS1900	0.257	0.042	0.299

Note 1: Bluetooth SAR was not required to be measured per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

2: Body worn at 15mm.

#### 8.6. Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05r01.



## 9. Measurement Uncertainty

DASY5 Uncertainty Budget According to IEEE 1528/2011 and IEC 62209-1/2011 (0.3-3GHz)								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std.Unc. (1g)	Std. nc. (10g)	(vi) veff
<b>Measurement System</b>								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Modulation Response	±2.4%	R	$\sqrt{3}$	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max.SAR Eval.	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
<b>Test Sample Related</b>								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Power Scaling <sup>P</sup>	±0%	R	$\sqrt{3}$	0	0	±0%	±0%	∞
<b>Phantom and Setup</b>								
Phantom Uncertainty	±6.1%	R	$\sqrt{3}$	1	1	±3.5%	±3.5%	∞
SAR correction	±1.9%	R	$\sqrt{3}$	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.) <sup>DAK</sup>	±2.5%	R	$\sqrt{3}$	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity (mea.) <sup>DAK</sup>	±2.5%	R	$\sqrt{3}$	0.26	0.26	±0.3%	±0.4%	∞
Temp. unc. – Conductivity <sup>BB</sup>	±3.4%	R	$\sqrt{3}$	0.78	0.71	±1.5%	±1.4%	∞
Temp. unc. – Permittivity <sup>BB</sup>	±0.4%	R	$\sqrt{3}$	0.23	0.26	±0.1%	±0.1%	∞
<b>Combined Std. Uncertainty</b>						±11.2%	±11.1%	361
<b>Expanded STD Uncertainty(K=2)</b>						±22.3%	±22.2%	



## 10. APPENDIX A PHOTOGRAPHS of EUT and EUT Accessory

➤ R180



➤ R241





## 11. APPENDIX B. SAR System Validation Data

Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D850 Head

**DUT: Dipole 850 MHz D850V2; Type: D850V2; Serial: D850V2 - SN:1008**

Communication System: UID 0, CW (0); Frequency: 850 MHz

Medium parameters used:  $f = 850 \text{ MHz}$ ;  $\sigma = 0.9 \text{ S/m}$ ;  $\epsilon_r = 41.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section Meas. Ambient Temp(celsius)- 22°C; Input power=250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = 1.0, 31.0$
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial:1767
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Configuration/SystemPerformanceCheck-D850 Head/Area Scan (4x12x1):** Measurement grid:

$dx=15\text{mm}$ ,  $dy=15\text{mm}$

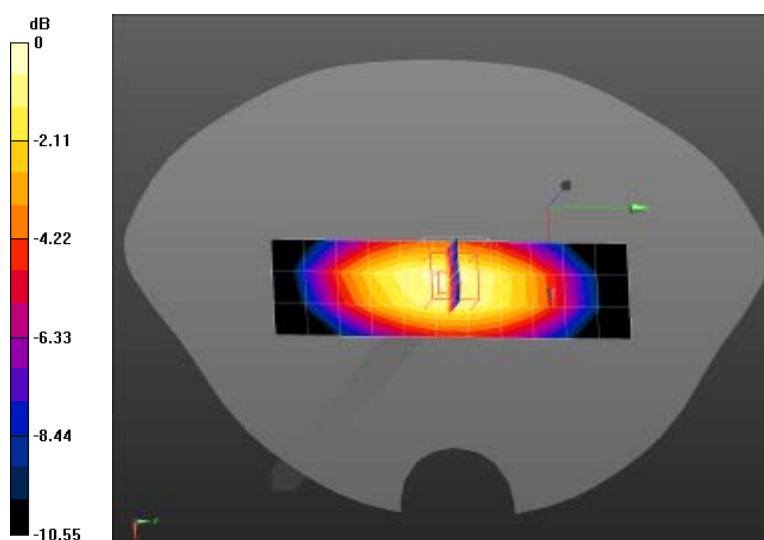
Maximum value of SAR (measured) = 2.24 W/kg

**Configuration/SystemPerformanceCheck-D850 Head/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:

$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 52.500 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.49 W/kg

**SAR(1 g) = 2.3 W/kg; SAR(10 g) = 1.5 W/kg** Maximum value of SAR (measured) = 2.49 W/kg



$0 \text{ dB} = 2.49 \text{ W/kg} = 3.96 \text{ dBW/kg}$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

System Performance Check-D1900 Head

**DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d174**

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.45$  S/m;  $\epsilon_r = 39.69$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section Meas. Ambient Temp(celsius)- 22°C; Input power=250mW

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

DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 2mm (Mechanical Surface Detection),  $z = 1.0, 31.0$
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial:1767
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

#### System Performance Check at Frequencies above 1 GHz/Systemcheck-D1900 Head/Area Scan

(5x7x1): Measurement grid:  $dx=15$  mm,  $dy=15$  mm

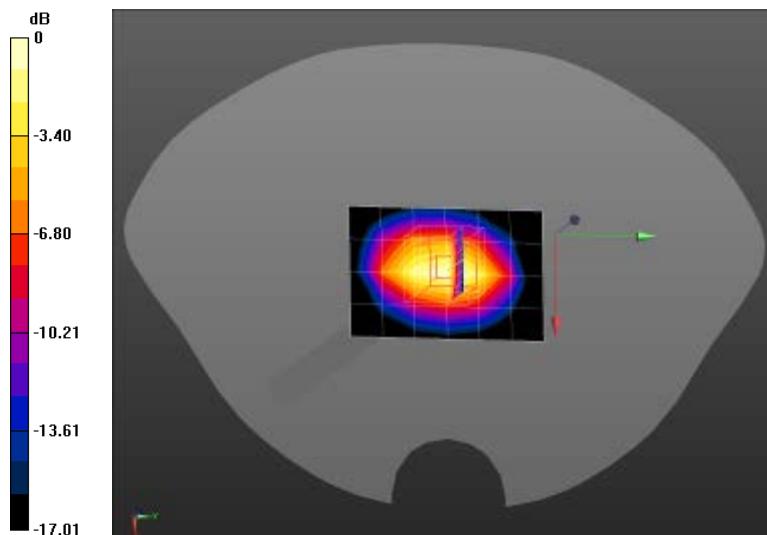
Maximum value of SAR (measured) = 13.2 W/kg

#### System Performance Check at Frequencies above 1 GHz/Systemcheck-D1900 Head/Zoom Scan

(7x7x7)/Cube 0: Measurement grid:  $dx=5$  mm,  $dy=5$  mm,  $dz=5$  mm, Reference Value = 98.307 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 16.7 W/kg

**SAR(1 g) = 9.72 W/kg; SAR(10 g) = 5.18 W/kg** Maximum value of SAR (measured) = 13.5 W/kg



0 dB = 13.5 W/kg = 11.30 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D850 Body-ELI

**DUT: Dipole 850 MHz D850V2; Type: D850V2; Serial: D850V2 - SN:1008**

Communication System: UID 0, CW (0); Frequency: 850 MHz

Medium parameters used:  $f = 850 \text{ MHz}$ ;  $\sigma = 0.99 \text{ S/m}$ ;  $\epsilon_r = 55.2$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section Meas. Ambient Temp(celsius)- 22°C; Input power=250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

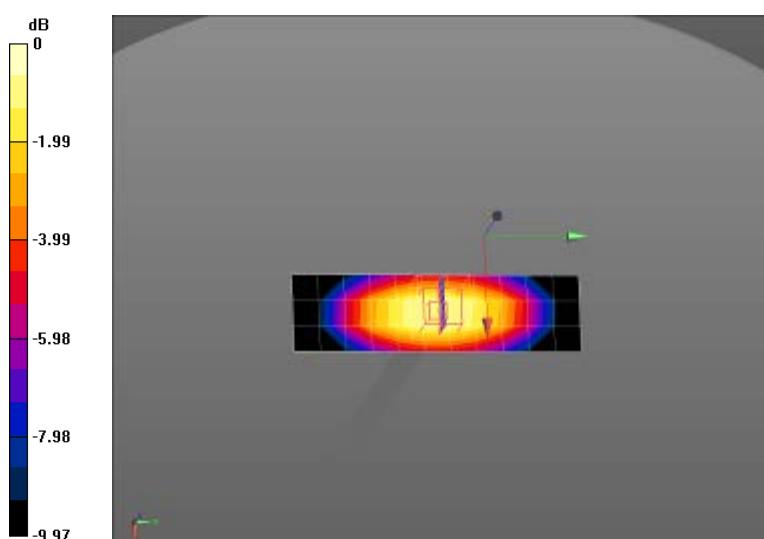
- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = 1.0, 31.0$
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; :1767
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Configuration/SystemPerformanceCheck-D850 Body/Area Scan (4x12x1):** Measurement grid: $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 2.30 W/kg

**Configuration/SystemPerformanceCheck-D850 Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 52.440 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.71 W/kg

**SAR(1 g) = 2.52 W/kg; SAR(10 g) = 1.66 W/kg** Maximum value of SAR (measured) = 2.71 W/kg

$$0 \text{ dB} = 2.71 \text{ W/kg} = 4.33 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

System Performance Check-D1900 Body

**DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d174**

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  S/m;  $\epsilon_r = 51.05$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section Meas. Ambient Temp(celsius)- 22°C; Input power=250mW

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

DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 2mm (Mechanical Surface Detection),  $z = 1.0, 31.0$
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

#### **System Performance Check at Frequencies above 1 GHz/Systemcheck-D1900 Body/Area Scan**

**(5x7x1):** Measurement grid:  $dx=15$  mm,  $dy=15$  mm

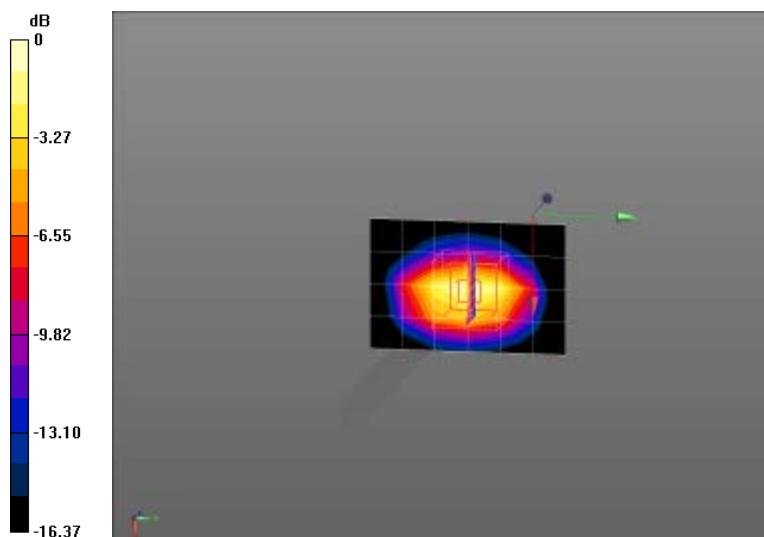
Maximum value of SAR (measured) = 13.0 W/kg

#### **System Performance Check at Frequencies above 1 GHz/Systemcheck-D1900 Body/Zoom Scan**

**(7x7x7)/Cube 0:** Measurement grid:  $dx=5$  mm,  $dy=5$  mm,  $dz=5$  mm, Reference Value = 93.277 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 18.2 W/kg

**SAR(1 g) = 10.5 W/kg; SAR(10 g) = 5.6 W/kg** Maximum value of SAR (measured) = 14.6 W/kg



0 dB = 14.6 W/kg = 11.64 dBW/kg



## 12. APPENDIX C. SAR measurement Data

Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Low Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 824.2 MHz; Duty Cycle: 1:8.30042

Medium parameters used (interpolated):  $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.88 \text{ S/m}$ ;  $\epsilon_r = 41.628$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/850MHz Low Touch-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

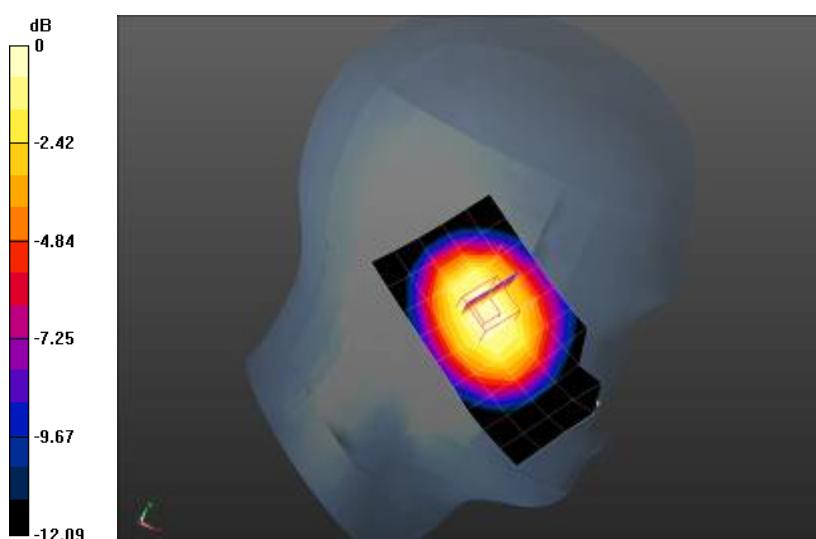
Maximum value of SAR (measured) = 0.929 W/kg

**Configuration/850MHz Low Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,

$dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 24.729 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.31 W/kg

**SAR(1 g) = 0.944 W/kg; SAR(10 g) = 0.653 W/kg** Maximum value of SAR (measured) = 0.997 W/kg



0 dB = 0.997 W/kg = -0.01 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Mid Touch-Left**

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

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.89$  S/m;  $\epsilon_r = 41.478$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/850MHz Mid Touch-Left/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

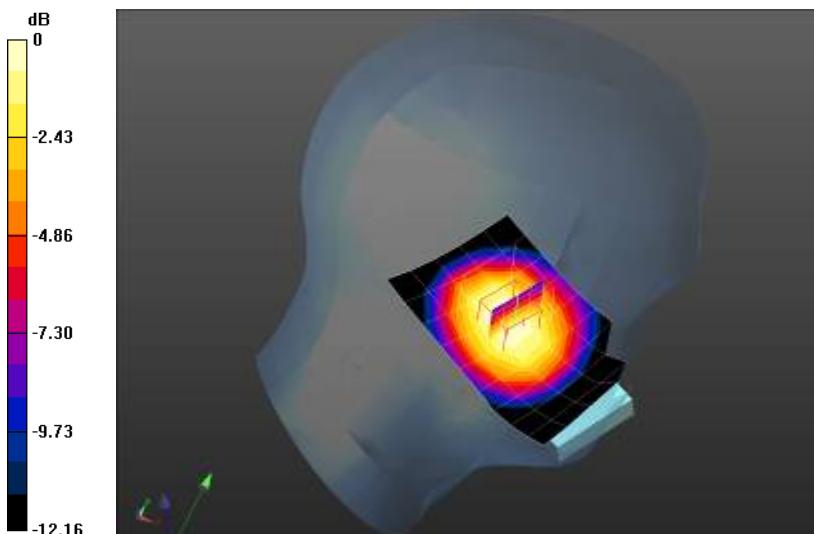
Maximum value of SAR (measured) = 1.06 W/kg

**Configuration/850MHz Mid Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.488 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 1.49 W/kg

**SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.746 W/kg** Maximum value of SAR (measured) = 1.14 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz High Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 848.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used (interpolated):  $f = 848.6$  MHz;  $\sigma = 0.899$  S/m;  $\epsilon_r = 41.327$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

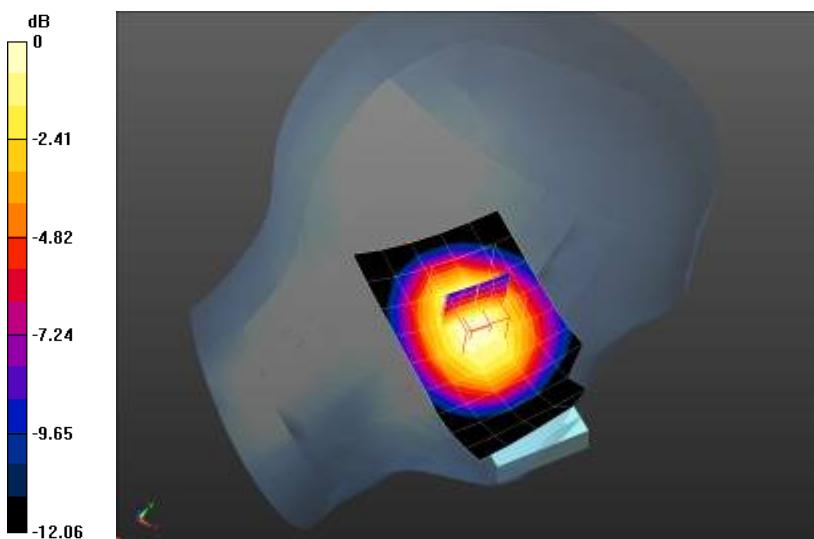
**Configuration/850MHz High Touch-Left/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.19 W/kg

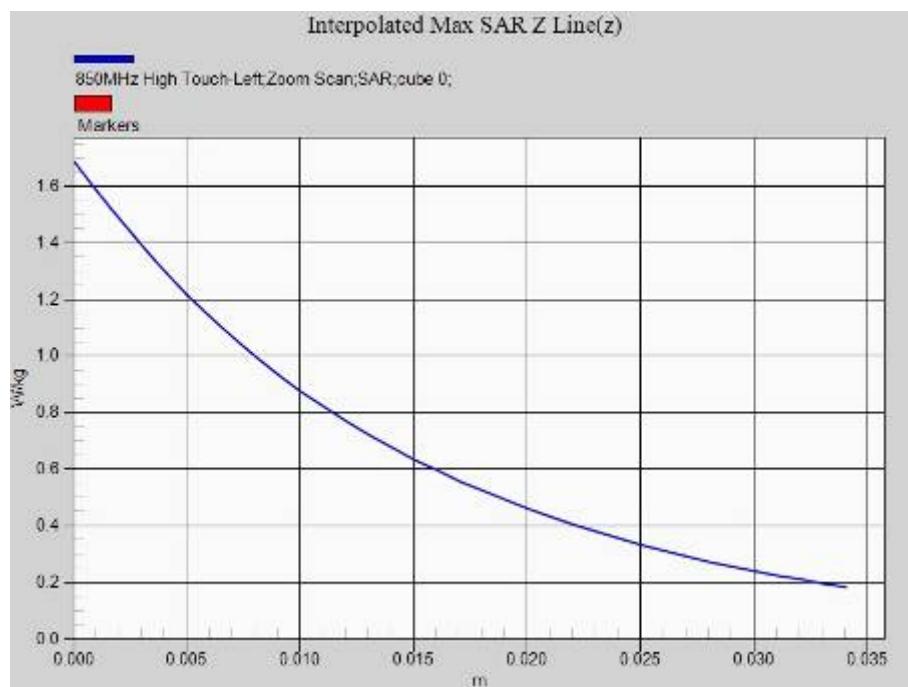
**Configuration/850MHz High Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 27.555 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 1.69 W/kg

**SAR(1 g) = 1.22 W/kg; SAR(10 g) = 0.843 W/kg** Maximum value of SAR (measured) = 1.30 W/kg



0 dB = 1.30 W/kg = 1.14 dBW/kg

**Z-Axis Plot**



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz High Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 848.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used (interpolated):  $f = 848.6$  MHz;  $\sigma = 0.899$  S/m;  $\epsilon_r = 41.327$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/850MHz High Touch-Left/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

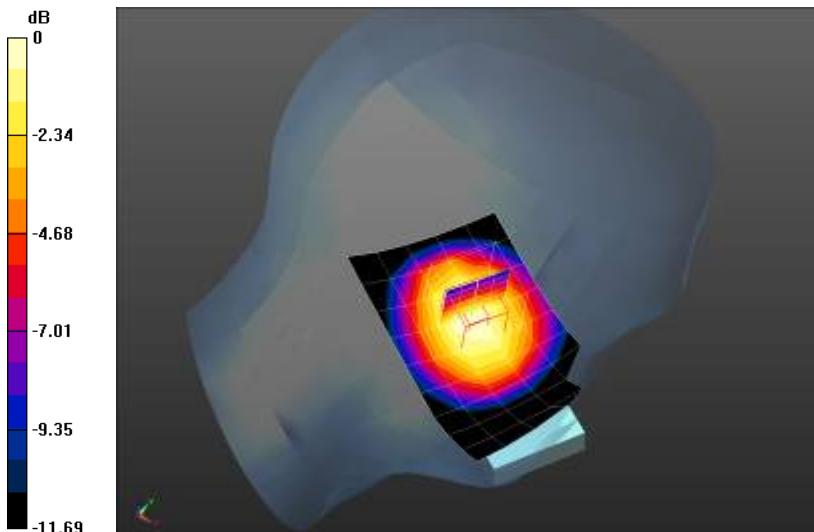
Maximum value of SAR (measured) = 1.25 W/kg

**Configuration/850MHz High Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.030 V/m; Power Drift = 0.37 dB

Peak SAR (extrapolated) = 1.65 W/kg

**SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.820 W/kg** Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.28 W/kg = 1.07 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Mid Tilt-Left**

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

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.89$  S/m;  $\epsilon_r = 41.478$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/850MHz Mid Tilt-Left/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

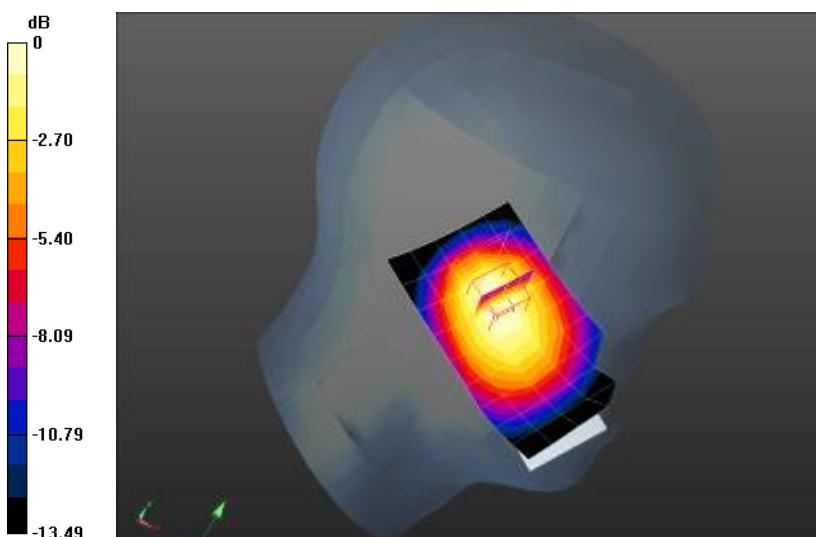
Maximum value of SAR (measured) = 0.665 W/kg

**Configuration/850MHz Mid Tilt-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.219 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.919 W/kg

**SAR(1 g) = 0.650 W/kg; SAR(10 g) = 0.453 W/kg** Maximum value of SAR (measured) = 0.693 W/kg



0 dB = 0.693 W/kg = -1.59 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Low Touch-Right**

Communication System: UID 0, Generic GSM (0); Frequency: 824.2 MHz; Duty Cycle: 1:8.30042

Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 0.88$  S/m;  $\epsilon_r = 41.628$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

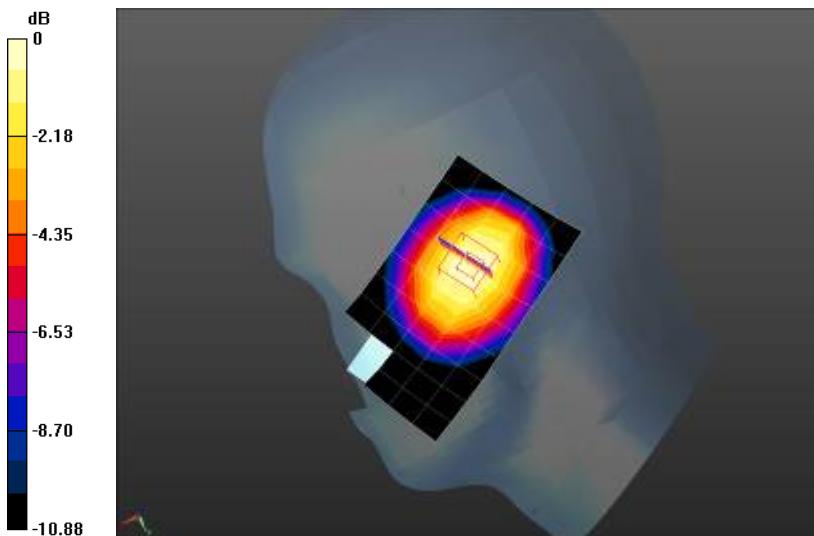
**Configuration/850MHz Low Touch-Right/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.877 W/kg

**Configuration/850MHz Low Touch-Right/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 28.118 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.20 W/kg

**SAR(1 g) = 0.886 W/kg; SAR(10 g) = 0.618 W/kg** Maximum value of SAR (measured) = 0.947 W/kg



0 dB = 0.947 W/kg = -0.24 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Mid Touch-Right**

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

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.89$  S/m;  $\epsilon_r = 41.478$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

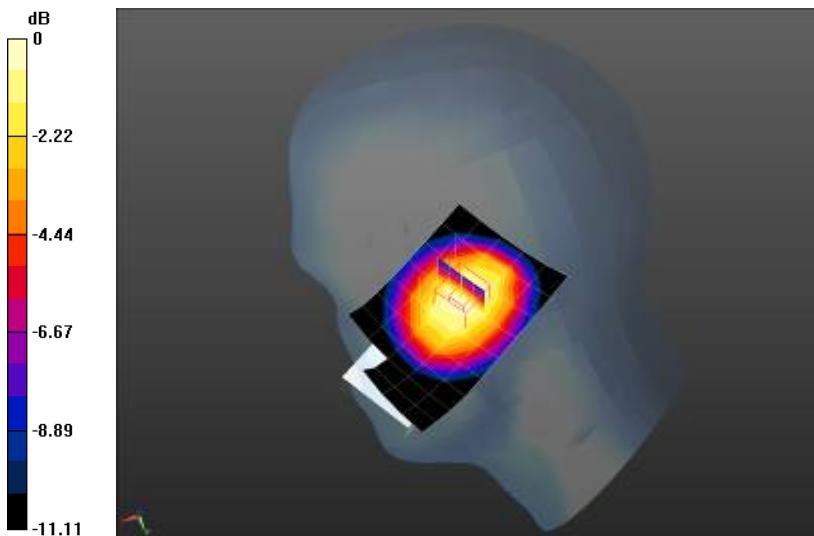
**Configuration/850MHz Mid Touch-Right/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.00 W/kg

**Configuration/850MHz Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 29.920 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.38 W/kg

**SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.704 W/kg** Maximum value of SAR (measured) = 1.08 W/kg



0 dB = 1.08 W/kg = 0.33 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz High Touch-Right**

Communication System: UID 0, Generic GSM (0); Frequency: 848.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used (interpolated):  $f = 848.6$  MHz;  $\sigma = 0.899$  S/m;  $\epsilon_r = 41.327$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

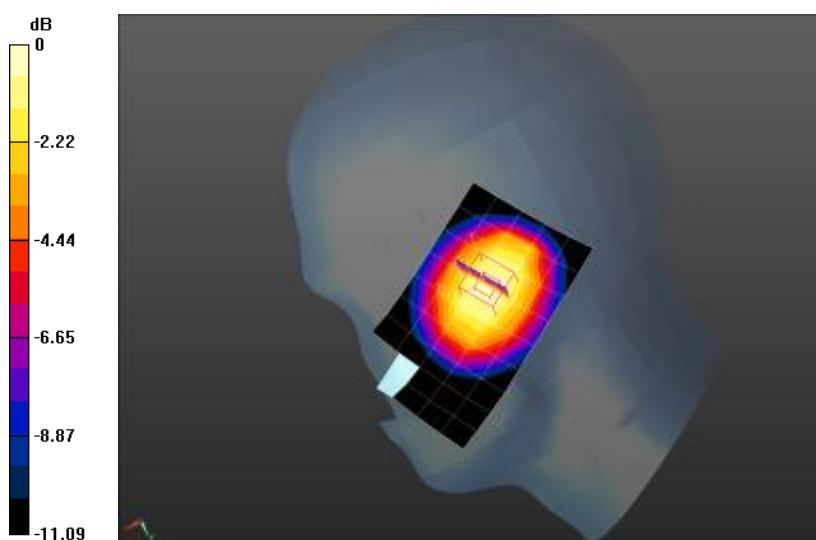
- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/850MHz High Touch-Right/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.17 W/kg

**Configuration/850MHz High Touch-Right/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 31.604 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.62 W/kg

**SAR(1 g) = 1.18 W/kg; SAR(10 g) = 0.813 W/kg** Maximum value of SAR (measured) = 1.26 W/kg

0 dB = 1.26 W/kg = 1.00 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Mid Tilt-Right**

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

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.89$  S/m;  $\epsilon_r = 41.478$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

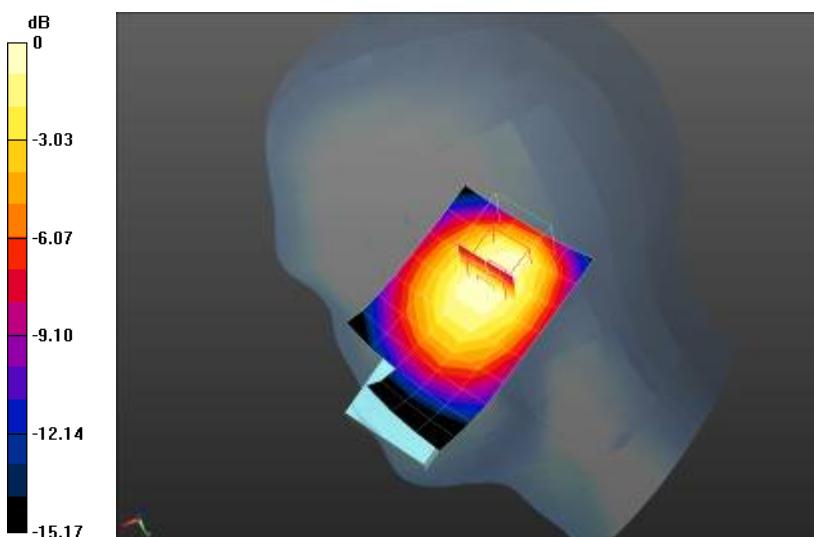
- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/850MHz Mid Tilt-Right/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.648 W/kg

**Configuration/850MHz Mid Tilt-Right/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 27.581 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.962 W/kg

**SAR(1 g) = 0.646 W/kg; SAR(10 g) = 0.445 W/kg** Maximum value of SAR (measured) = 0.683 W/kg

0 dB = 0.683 W/kg = -1.66 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: 850MHz Mid Touch-Left <SIM2>**

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

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.89$  S/m;  $\epsilon_r = 41.478$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

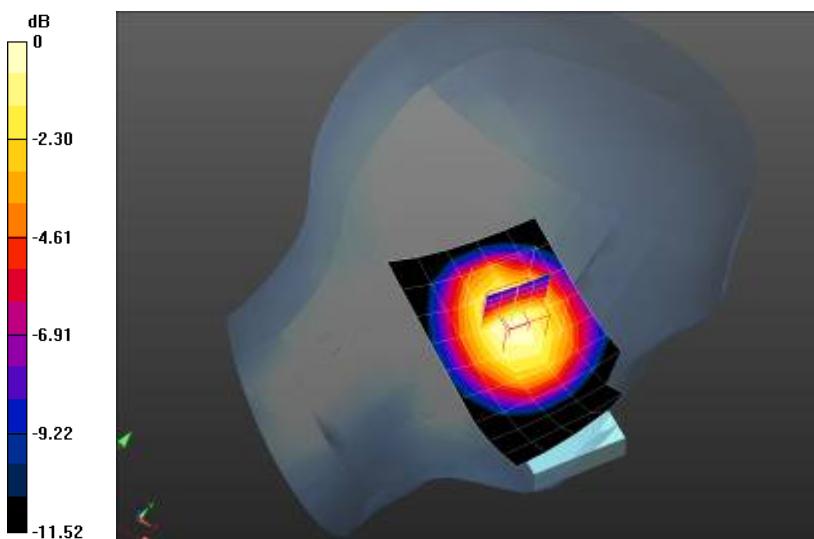
**Configuration/850MHz Mid Touch-Left/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.09 W/kg

**Configuration/850MHz Mid Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 27.310 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.43 W/kg

**SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.712 W/kg** Maximum value of SAR (measured) = 1.10 W/kg



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



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R241

**Procedure Name: 850MHz High Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 848.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used (interpolated):  $f = 848.6$  MHz;  $\sigma = 0.899$  S/m;  $\epsilon_r = 41.327$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.16, 10.16, 10.16); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

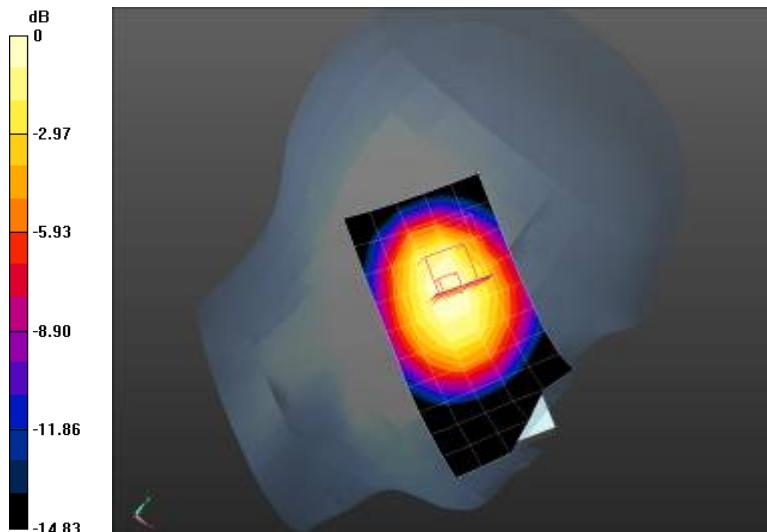
**Configuration/850MHz High Touch-Left/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.995 W/kg

**Configuration/850MHz High Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 28.103 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.38 W/kg

**SAR(1 g) = 1 W/kg; SAR(10 g) = 0.670 W/kg** Maximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.07 W/kg = 0.29 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GSM850MHz Mid Body-Back**

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

Medium parameters used:  $f = 836.6$  MHz;  $\sigma = 0.96$  S/m;  $\epsilon_r = 55.86$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

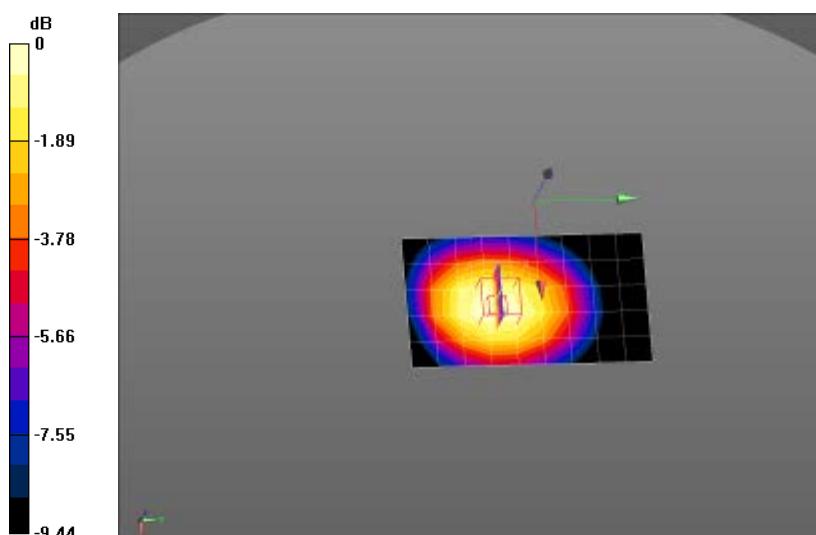
- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GSM850MHz Mid Body-Back/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.436 W/kg

**Configuration/GSM850MHz Mid Body-Back/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 21.388 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.546 W/kg

**SAR(1 g) = 0.419 W/kg; SAR(10 g) = 0.305 W/kg** Maximum value of SAR (measured) = 0.443 W/kg

$$0 \text{ dB} = 0.443 \text{ W/kg} = -3.54 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS850MHz Mid Body-Back(2up)**

Communication System: UID 0, GPRS 850MHz (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.96 \text{ S/m}$ ;  $\epsilon_r = 55.86$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

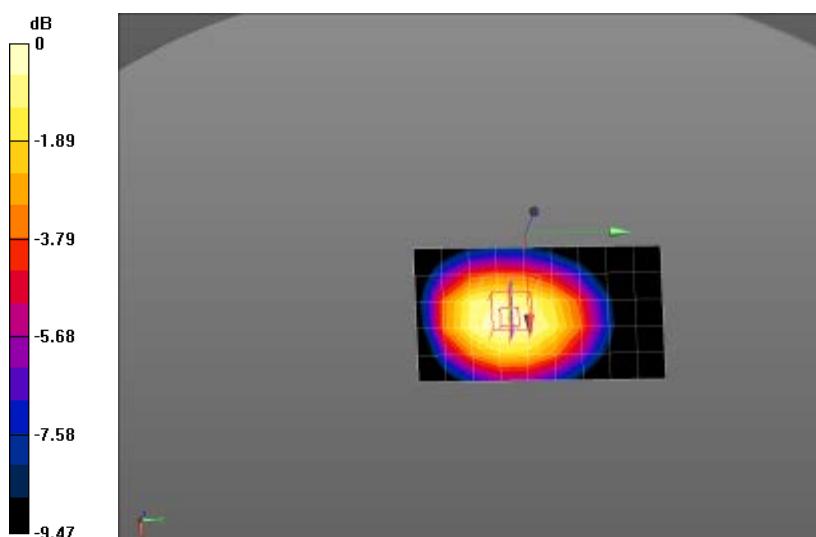
- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS850MHz Mid Body-Back(2up)/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.597 W/kg

**Configuration/GPRS850MHz Mid Body-Back(2up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 25.001 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.751 W/kg

**SAR(1 g) = 0.585 W/kg; SAR(10 g) = 0.430 W/kg** Maximum value of SAR (measured) = 0.617 W/kg

$$0 \text{ dB} = 0.617 \text{ W/kg} = -2.10 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS850MHz Mid Body-Front(2up)**

Communication System: UID 0, GPRS 850MHz (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 836.6$  MHz;  $\sigma = 0.96$  S/m;  $\epsilon_r = 55.86$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

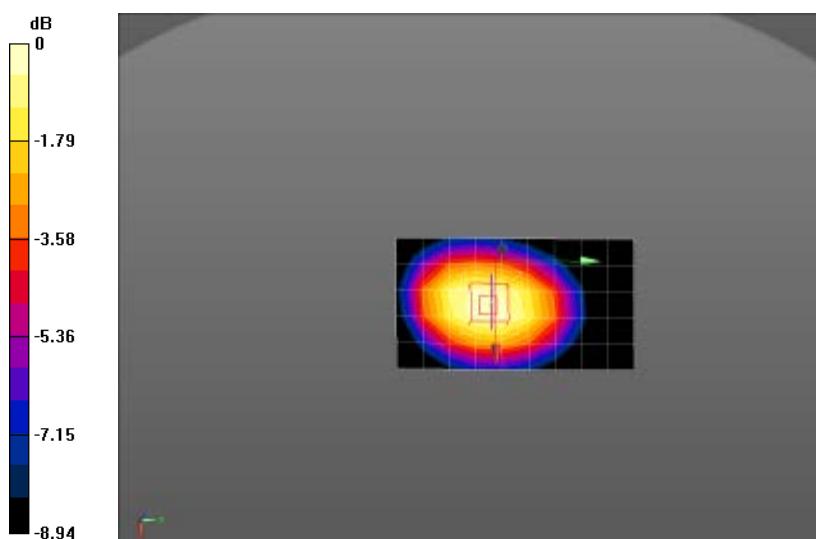
**Configuration/GPRS850MHz Mid Body-Front(2up)/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.430 W/kg

**Configuration/GPRS850MHz Mid Body-Front(2up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm, Reference Value = 21.591 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.563 W/kg

**SAR(1 g) = 0.435 W/kg; SAR(10 g) = 0.316 W/kg** Maximum value of SAR (measured) = 0.461 W/kg

$$0 \text{ dB} = 0.461 \text{ W/kg} = -3.36 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS850MHz Mid Body-Back(3up)**

Communication System: UID 0, GPRS 850MHz (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.96 \text{ S/m}$ ;  $\epsilon_r = 55.86$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

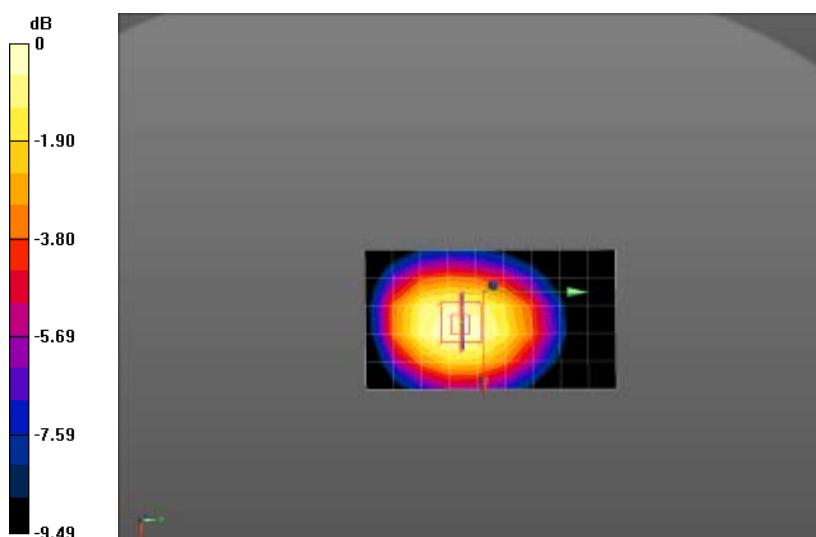
- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS850MHz Mid Body-Back(3up)/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.554 W/kg

**Configuration/GPRS850MHz Mid Body-Back(3up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 24.166 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.695 W/kg

**SAR(1 g) = 0.541 W/kg; SAR(10 g) = 0.398 W/kg** Maximum value of SAR (measured) = 0.572 W/kg

$$0 \text{ dB} = 0.572 \text{ W/kg} = -2.43 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS850MHz Mid Body-Back(4up)**

Communication System: UID 0, GPRS 850MHz (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 836.6$  MHz;  $\sigma = 0.96$  S/m;  $\epsilon_r = 55.86$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

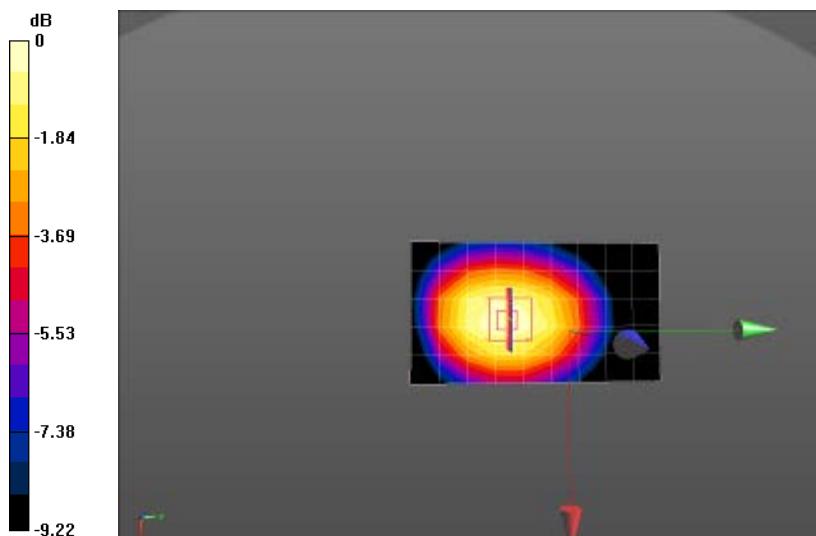
**Configuration/GPRS850MHz Mid Body-Back(4up)/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.446 W/kg

**Configuration/GPRS850MHz Mid Body-Back(4up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm, Reference Value = 21.635 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.558 W/kg

**SAR(1 g) = 0.436 W/kg; SAR(10 g) = 0.321 W/kg** Maximum value of SAR (measured) = 0.460 W/kg

$$0 \text{ dB} = 0.460 \text{ W/kg} = -3.37 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R241

**Procedure Name: GPRS850MHz Mid Body-Back(2up)**

Communication System: UID 0, GPRS 850MHz (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 836.6$  MHz;  $\sigma = 0.96$  S/m;  $\epsilon_r = 55.86$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(10.03, 10.03, 10.03); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

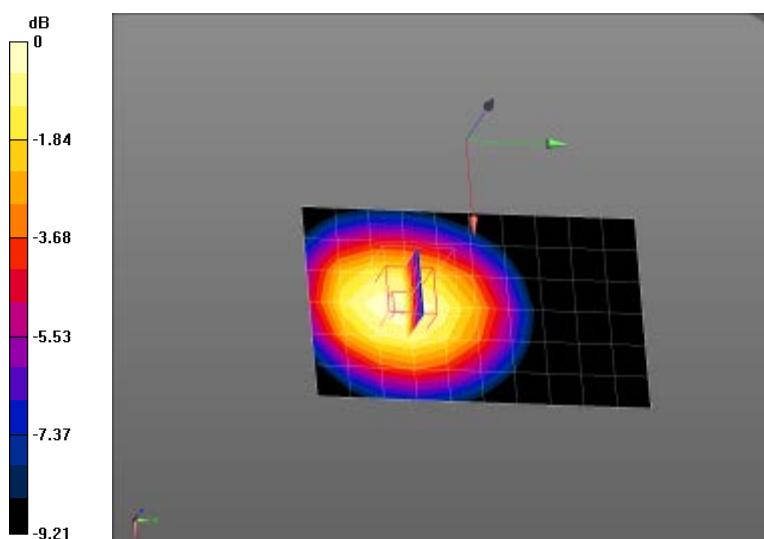
**Configuration/GPRS850MHz Mid Body-Back(2up)/Area Scan (7x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.466 W/kg

**Configuration/GPRS850MHz Mid Body-Back(2up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm, Reference Value = 20.704 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.572 W/kg

**SAR(1 g) = 0.447 W/kg; SAR(10 g) = 0.327 W/kg** Maximum value of SAR (measured) = 0.472 W/kg

$$0 \text{ dB} = 0.472 \text{ W/kg} = -3.26 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Low Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 1850.2 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1850.2 \text{ MHz}$ ;  $\sigma = 1.42 \text{ S/m}$ ;  $\epsilon_r = 39.87$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

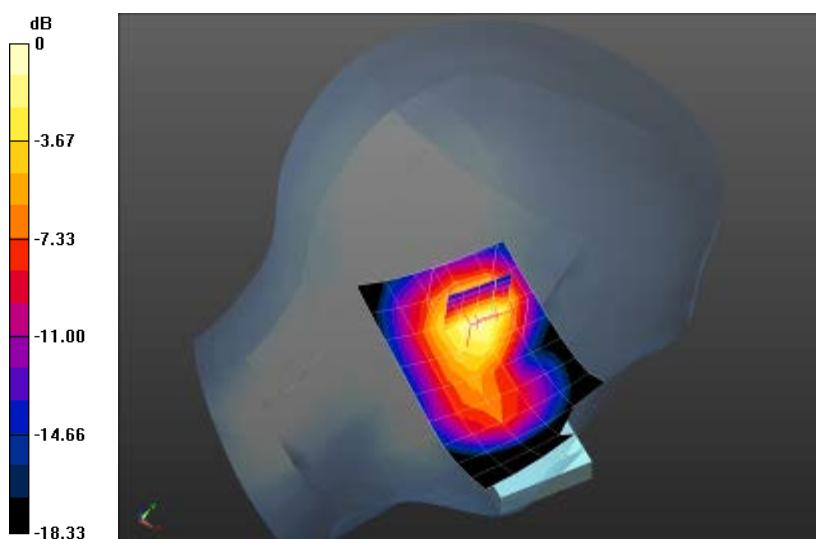
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Low Touch-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 1.12 W/kg

**Configuration/PCS1900MHz Low Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 16.117 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 2.00 W/kg

**SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.554 W/kg** Maximum value of SAR (measured) = 1.13 W/kg $0 \text{ dB} = 1.13 \text{ W/kg} = 0.53 \text{ dBW/kg}$

**Z-Axis Plot**



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Low Touch-Left\***

Communication System: UID 0, Generic GSM (0); Frequency: 1850.2 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1850.2 \text{ MHz}$ ;  $\sigma = 1.4 \text{ S/m}$ ;  $\epsilon_r = 39.87$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

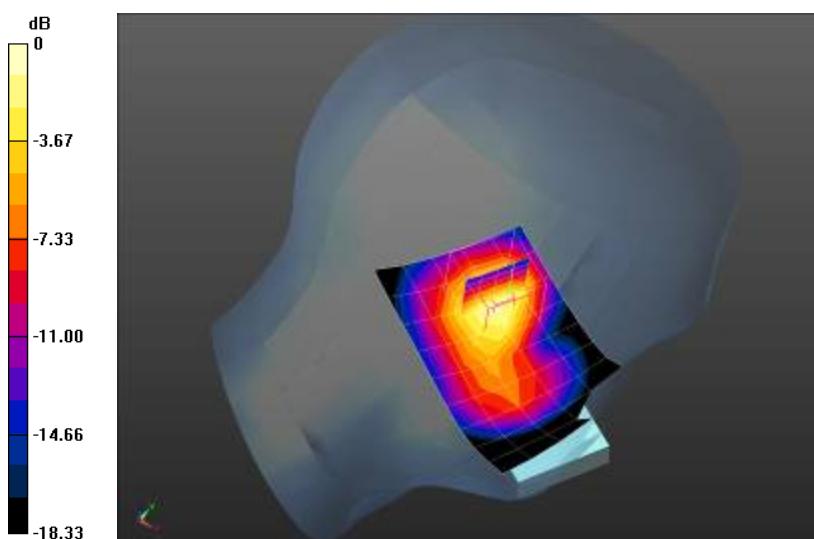
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Low Touch-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 1.11 W/kg

**Configuration/PCS1900MHz Low Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 16.117 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.97 W/kg

**SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.546 W/kg**

$$0 \text{ dB} = 1.11 \text{ W/kg} = 0.45 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Mid Touch-Left**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.45 \text{ S/m}$ ;  $\epsilon_r = 39.74$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

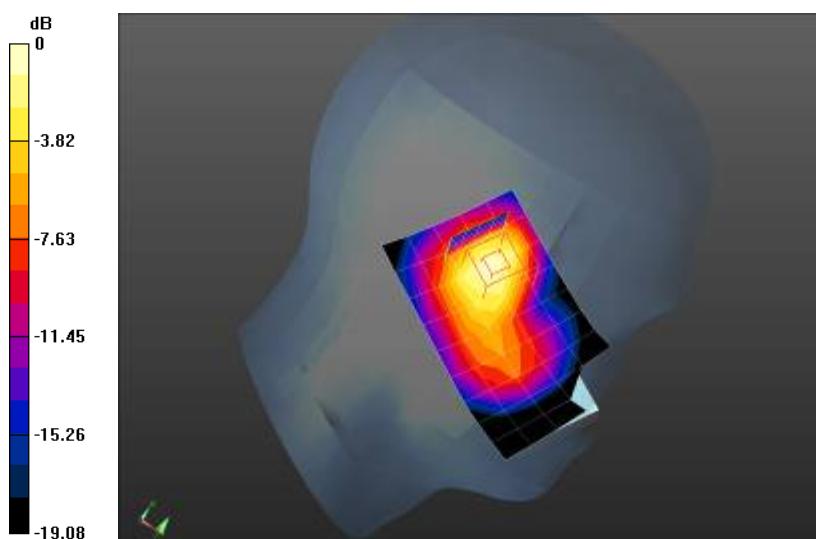
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Mid Touch-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.848 W/kg

**Configuration/PCS1900MHz Mid Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 13.255 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 1.50 W/kg

**SAR(1 g) = 0.784 W/kg; SAR(10 g) = 0.404 W/kg** Maximum value of SAR (measured) = 0.811 W/kg

$$0 \text{ dB} = 0.811 \text{ W/kg} = -0.91 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz High Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 1909.8 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1909.8 \text{ MHz}$ ;  $\sigma = 1.48 \text{ S/m}$ ;  $\epsilon_r = 39.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz High Touch-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

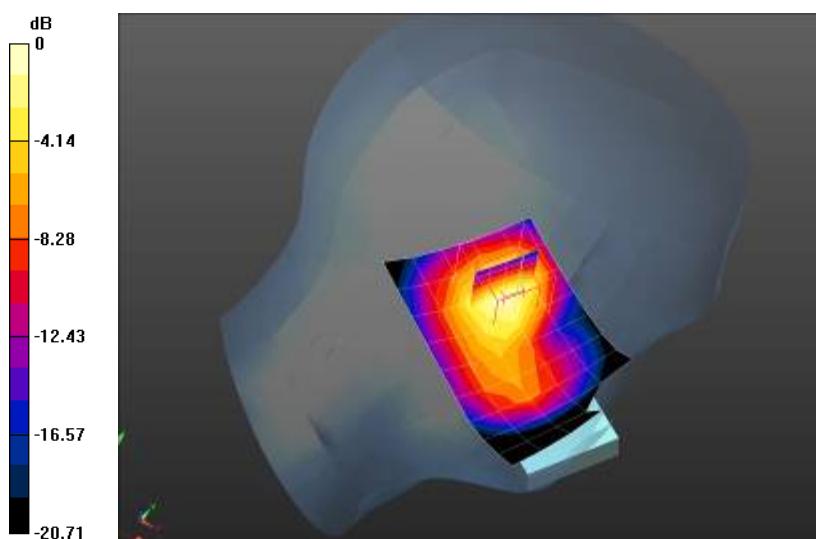
Maximum value of SAR (measured) = 0.583 W/kg

**Configuration/PCS1900MHz High Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

$dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 11.391 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.07 W/kg

**SAR(1 g) = 0.555 W/kg; SAR(10 g) = 0.286 W/kg** Maximum value of SAR (measured) = 0.575 W/kg



$0 \text{ dB} = 0.575 \text{ W/kg} = -2.40 \text{ dBW/kg}$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Mid Tilt-Left**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.45 \text{ S/m}$ ;  $\epsilon_r = 39.74$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

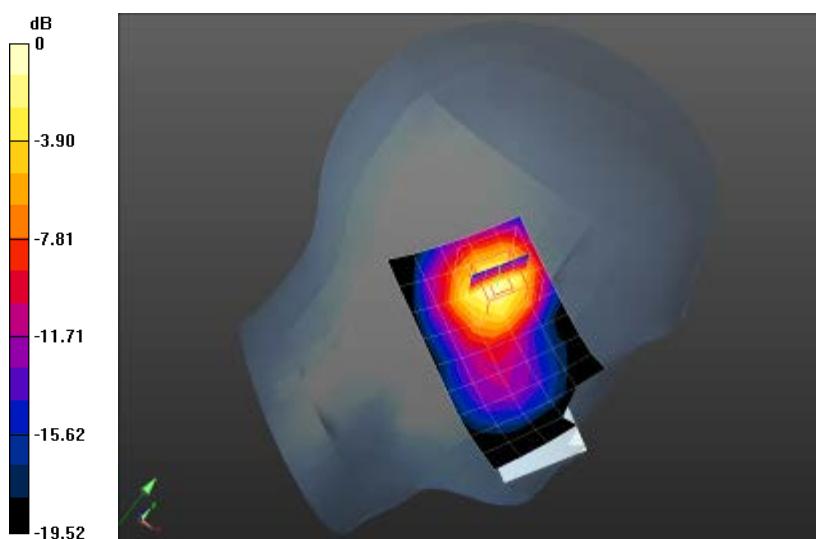
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Mid Tilt-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.595 W/kg

**Configuration/PCS1900MHz Mid Tilt-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 12.045 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.991 W/kg

**SAR(1 g) = 0.548 W/kg; SAR(10 g) = 0.283 W/kg** Maximum value of SAR (measured) = 0.619 W/kg

$$0 \text{ dB} = 0.619 \text{ W/kg} = -2.08 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Mid Touch-Right**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.45 \text{ S/m}$ ;  $\epsilon_r = 39.74$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

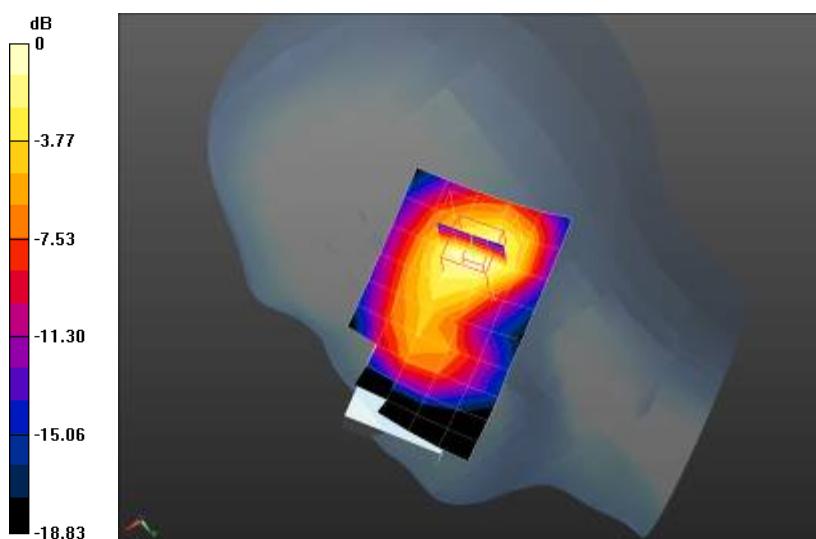
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Mid Touch-Right/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.542 W/kg

**Configuration/PCS1900MHz Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 14.772 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.843 W/kg

**SAR(1 g) = 0.504 W/kg; SAR(10 g) = 0.287 W/kg** Maximum value of SAR (measured) = 0.553 W/kg $0 \text{ dB} = 0.553 \text{ W/kg} = -2.57 \text{ dBW/kg}$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Mid Tilt-Right**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.45 \text{ S/m}$ ;  $\epsilon_r = 39.74$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

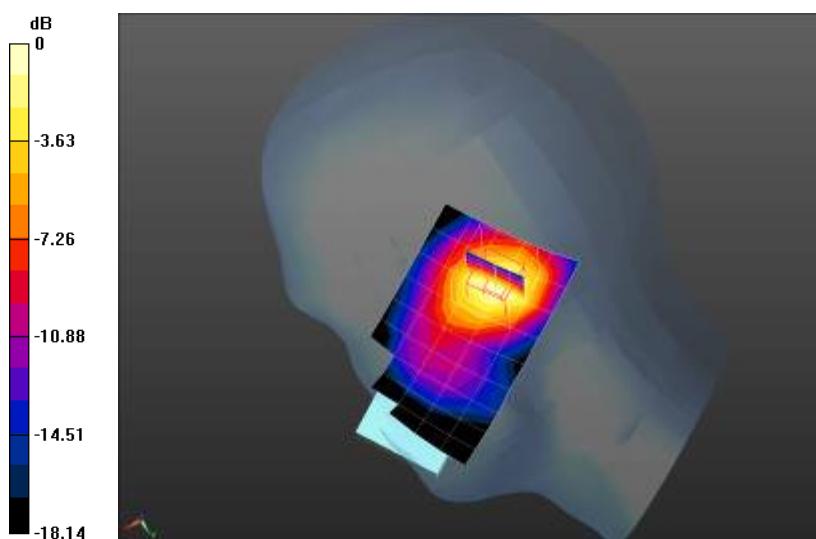
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Mid Tilt-Right/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.495 W/kg

**Configuration/PCS1900MHz Mid Tilt-Right/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 13.266 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.769 W/kg

**SAR(1 g) = 0.446 W/kg; SAR(10 g) = 0.242 W/kg** Maximum value of SAR (measured) = 0.502 W/kg

$$0 \text{ dB} = 0.502 \text{ W/kg} = -2.99 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Mid Touch-Left<SIM2>**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.45 \text{ S/m}$ ;  $\epsilon_r = 39.74$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

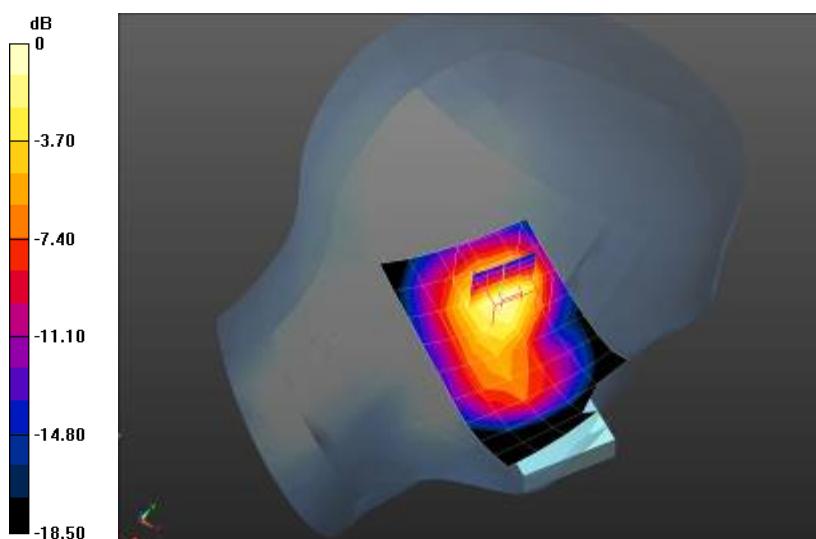
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Mid Touch-Left/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.813 W/kg

**Configuration/PCS1900MHz Mid Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 12.607 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 1.50 W/kg

**SAR(1 g) = 0.784 W/kg; SAR(10 g) = 0.408 W/kg** Maximum value of SAR (measured) = 0.826 W/kg $0 \text{ dB} = 0.826 \text{ W/kg} = -0.83 \text{ dBW/kg}$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R241

**Procedure Name: PCS1900MHz Low Touch-Left**

Communication System: UID 0, Generic GSM (0); Frequency: 1850.2 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1850.2 \text{ MHz}$ ;  $\sigma = 1.42 \text{ S/m}$ ;  $\epsilon_r = 39.87$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

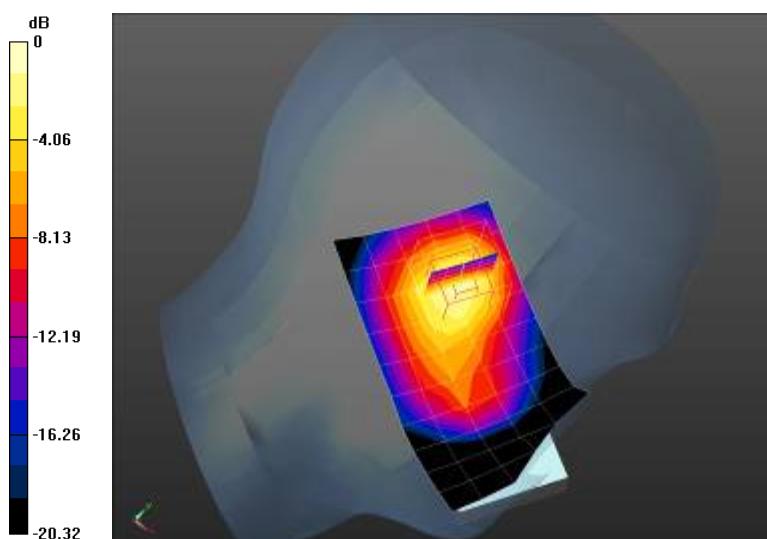
- Probe: EX3DV4 - SN3927; ConvF(8.39, 8.39, 8.39); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: SAM (30deg probe tilt) with CRP v5.0; Type: QD000P40CD; Serial: TP:1767
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Low Touch-Left/Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.903 W/kg

**Configuration/PCS1900MHz Low Touch-Left/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 15.228 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 1.78 W/kg

**SAR(1 g) = 0.926 W/kg; SAR(10 g) = 0.478 W/kg** Maximum value of SAR (measured) = 1.02 W/kg

$$0 \text{ dB} = 1.02 \text{ W/kg} = 0.09 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: PCS1900MHz Mid Body-Back**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.57 \text{ S/m}$ ;  $\epsilon_r = 51.14$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

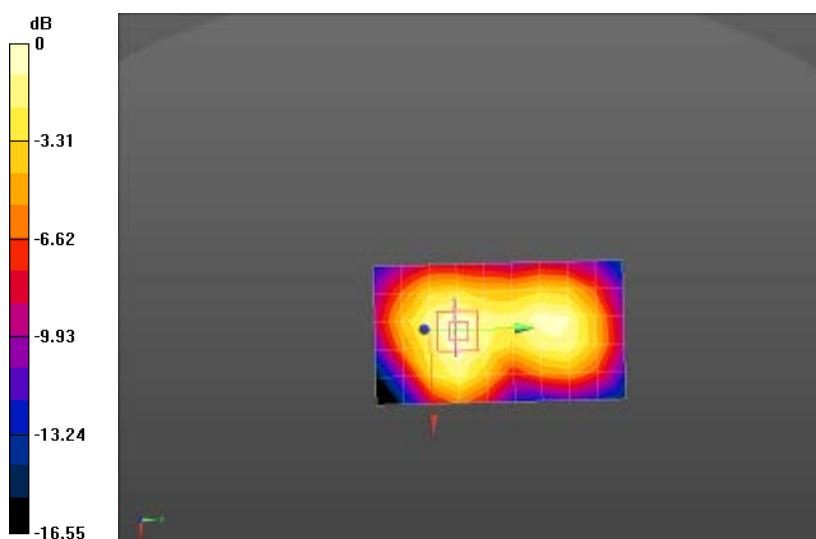
- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/PCS1900MHz Mid Body-Back/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.144 W/kg

**Configuration/PCS1900MHz Mid Body-Back/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 9.714 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.218 W/kg

**SAR(1 g) = 0.140 W/kg; SAR(10 g) = 0.087 W/kg** Maximum value of SAR (measured) = 0.152 W/kg $0 \text{ dB} = 0.152 \text{ W/kg} = -8.18 \text{ dBW/kg}$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS1900MHz Mid Body-Back(2up)**

Communication System: UID 0, GPRS1900(2up) (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.57 \text{ S/m}$ ;  $\epsilon_r = 51.14$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

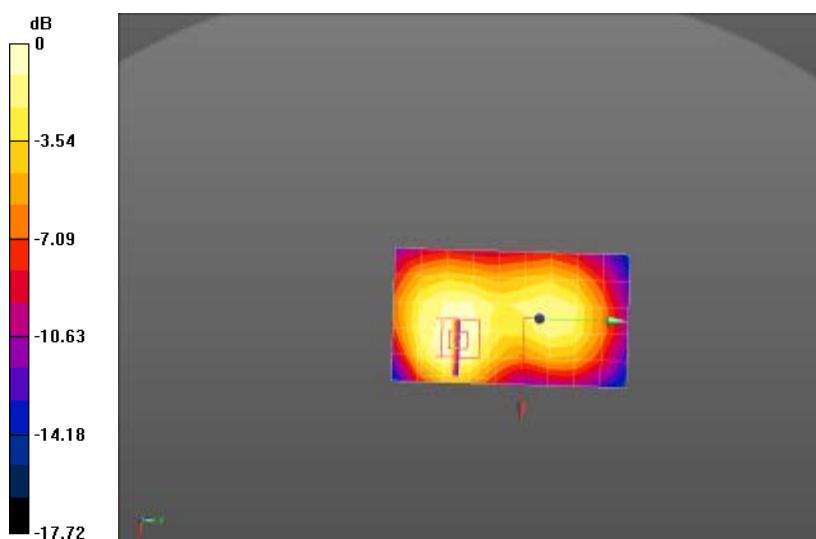
- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS1900MHz Mid Body-Back(2up)/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.187 W/kg

**Configuration/GPRS1900MHz Mid Body-Back(2up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 11.160 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.306 W/kg

**SAR(1 g) = 0.192 W/kg; SAR(10 g) = 0.119 W/kg** Maximum value of SAR (measured) = 0.203 W/kg

$$0 \text{ dB} = 0.203 \text{ W/kg} = -6.93 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS1900MHz Mid Body-Back(3up)**

Communication System: UID 0, GPRS1900(3up) (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.57 \text{ S/m}$ ;  $\epsilon_r = 51.14$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

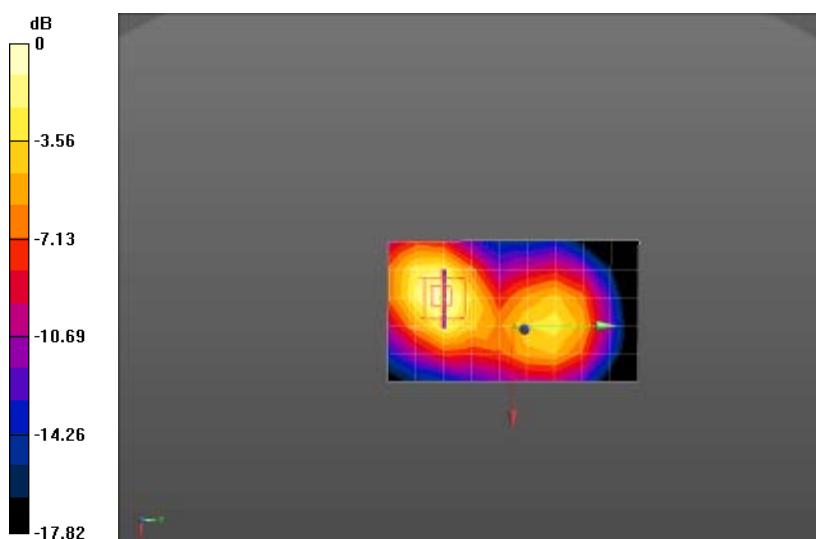
- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS1900MHz Mid Body-Back(3up)/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.253 W/kg

**Configuration/GPRS1900MHz Mid Body-Back(3up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 9.348 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.371 W/kg

**SAR(1 g) = 0.234 W/kg; SAR(10 g) = 0.135 W/kg** Maximum value of SAR (measured) = 0.259 W/kg

$$0 \text{ dB} = 0.259 \text{ W/kg} = -5.87 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS1900MHz Mid Body-Front(3up)**

Communication System: UID 0, GPRS1900(3up) (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.57 \text{ S/m}$ ;  $\epsilon_r = 51.14$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS1900MHz Mid Body-Front(3up)/Area Scan (6x10x1):** Measurement grid:

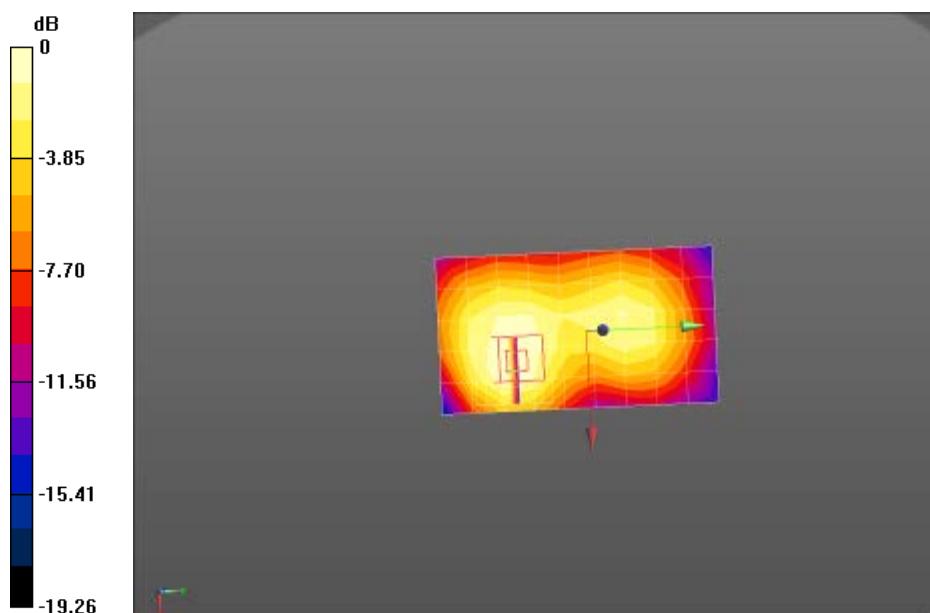
dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.193 W/kg

**Configuration/GPRS1900MHz Mid Body-Front(3up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm, Reference Value = 11.212 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.315 W/kg

**SAR(1 g) = 0.199 W/kg; SAR(10 g) = 0.124 W/kg** Maximum value of SAR (measured) = 0.210 W/kg

0 dB = 0.210 W/kg = -6.78 dBW/kg



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R180

**Procedure Name: GPRS1900MHz Mid Body-Back(4up)**

Communication System: UID 0, GPRS1900(4up) (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.57 \text{ S/m}$ ;  $\epsilon_r = 51.14$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

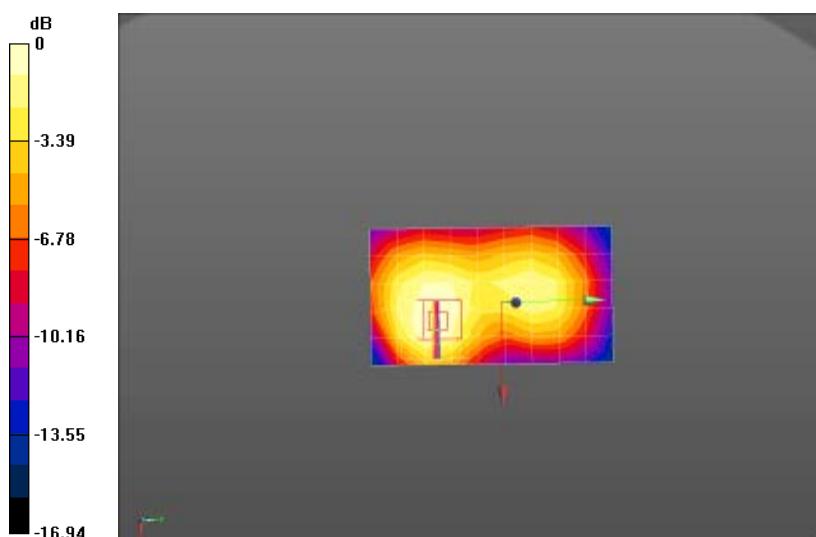
- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS1900MHz Mid Body-Back(4up)/Area Scan (6x10x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.164 W/kg

**Configuration/GPRS1900MHz Mid Body-Back(4up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 10.360 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.260 W/kg

**SAR(1 g) = 0.165 W/kg; SAR(10 g) = 0.103 W/kg** Maximum value of SAR (measured) = 0.175 W/kg

$$0 \text{ dB} = 0.175 \text{ W/kg} = -7.57 \text{ dBW/kg}$$



Date/Time: 29/09/2013

Test Laboratory: Cerpass Lab

DUT: Mobile Phone; Type: R 241

**Procedure Name: GPRS1900MHz Mid Body-Back(3up)**

Communication System: UID 0, GPRS1900(3up) (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.57 \text{ S/m}$ ;  $\epsilon_r = 51.14$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

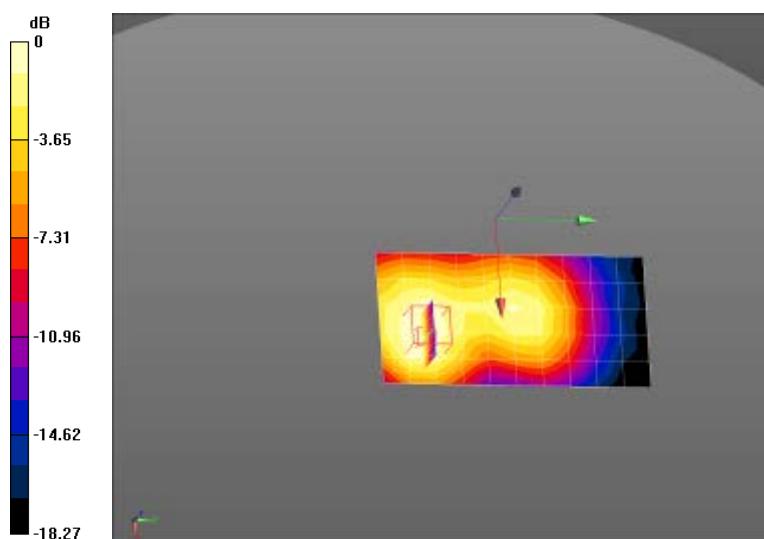
- Probe: EX3DV4 - SN3927; ConvF(7.91, 7.91, 7.91); Calibrated: 2013/6/24;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2013/6/14
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial:1211
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**Configuration/GPRS1900MHz Mid Body-Back(3up)/Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.216 W/kg

**Configuration/GPRS1900MHz Mid Body-Back(3up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ , Reference Value = 11.312 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.323 W/kg

**SAR(1 g) = 0.199 W/kg; SAR(10 g) = 0.123 W/kg** Maximum value of SAR (measured) = 0.214 W/kg

$$0 \text{ dB} = 0.214 \text{ W/kg} = -6.70 \text{ dBW/kg}$$



## 13. APPENDIX D. Probe Calibration Data

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
**Zeughausstrasse 43, 8004 Zurich, Switzerland**



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**C** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**Client: **Cerpass (Audent)**Certificate No: **EX3-3927\_Jun13**

### CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN:3927**

Calibration procedure(s): **QA CAL-01.v8, QA CAL-12.v7, QA CAL-14.v3, QA CAL-23.v4,  
QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes**

Calibration date: **June 24, 2013**

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)°C and humidity < 70%.

Calibration Equipment used (M&amp;TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S6054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: SS277 (20x)	04-Apr-13 (No. 217-01736)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 680	31-Jan-13 (No. DAE4-680_Jsn13)	Jan-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8642C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name	Function	Signature
	Jevon Kastari	Laboratory Technician	
Approved by:	Kenja Pokovic	Technical Manager	

Issued: June 24, 2013

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



**Calibration Laboratory of**  
Schmid & Partner  
Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst  
C Service suisse d'étalonnage  
S Servizio svizzero di taratura  
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108****Glossary:**

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\theta$	$\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ is normal to probe axis

**Calibration is Performed According to the Following Standards:**

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 300 MHz to 3 GHz)", February 2005

**Methods Applied and Interpretation of Parameters:**

- NORMx,y,z: Assessed for E-field polarization  $\theta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z; A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical Isotropy (3D deviation from isotropy): In a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.



EX3DV4 – SN:3927

June 24, 2013

# Probe EX3DV4

## SN:3927

Manufactured: March 8, 2013  
Calibrated: June 24, 2013

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)



EX3DV4- SN:3927

June 24, 2013

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927****Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V/m})^2$ ) <sup>a</sup>	0.57	0.33	0.61	$\pm 10.1 \%$
DCP (mV) <sup>b</sup>	101.1	89.9	97.9	

**Modulation Calibration Parameters**

UID	Communication System Name	A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>c</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	177.4
		Y	0.0	0.0	1.0		169.2
		Z	0.0	0.0	1.0		176.2

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%.

<sup>a</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).<sup>b</sup> Numerical linearization parameter: uncertainty not required.<sup>c</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



EX3DV4- SN:3927

June 24, 2013

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927****Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	11.02	11.02	11.02	0.14	1.46	± 13.4 %
850	41.5	0.92	10.16	10.16	10.16	0.41	0.82	± 12.0 %
1750	40.1	1.37	8.73	8.73	8.73	0.60	0.90	± 12.0 %
1900	40.0	1.40	8.39	8.39	8.39	0.64	0.88	± 12.0 %
2100	39.8	1.49	8.39	8.39	8.39	0.59	0.93	± 12.0 %
2450	39.2	1.80	7.38	7.38	7.38	0.47	1.03	± 12.0 %
5200	36.0	4.66	5.19	5.19	5.19	0.30	1.80	± 13.1 %
5500	35.6	4.96	5.05	5.05	5.05	0.30	1.80	± 13.1 %
5800	35.3	5.27	4.73	4.73	4.73	0.35	1.80	± 13.1 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



EX3DV4- SN:3927

June 24, 2013

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927****Calibration Parameter Determined in Body Tissue Simulating Media**

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	11.57	11.57	11.57	0.05	1.21	± 13.4 %
850	55.2	0.99	10.03	10.03	10.03	0.38	0.93	± 12.0 %
1750	53.4	1.49	8.33	8.33	8.33	0.35	0.85	± 12.0 %
1900	53.3	1.52	7.91	7.91	7.91	0.22	1.13	± 12.0 %
2100	53.2	1.62	8.06	8.06	8.06	0.40	0.80	± 12.0 %
2450	52.7	1.95	7.30	7.30	7.30	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.54	4.54	4.54	0.40	1.90	± 13.1 %
5500	48.6	5.65	4.09	4.09	4.09	0.40	1.90	± 13.1 %
5800	48.2	6.00	4.15	4.15	4.15	0.45	1.90	± 13.1 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

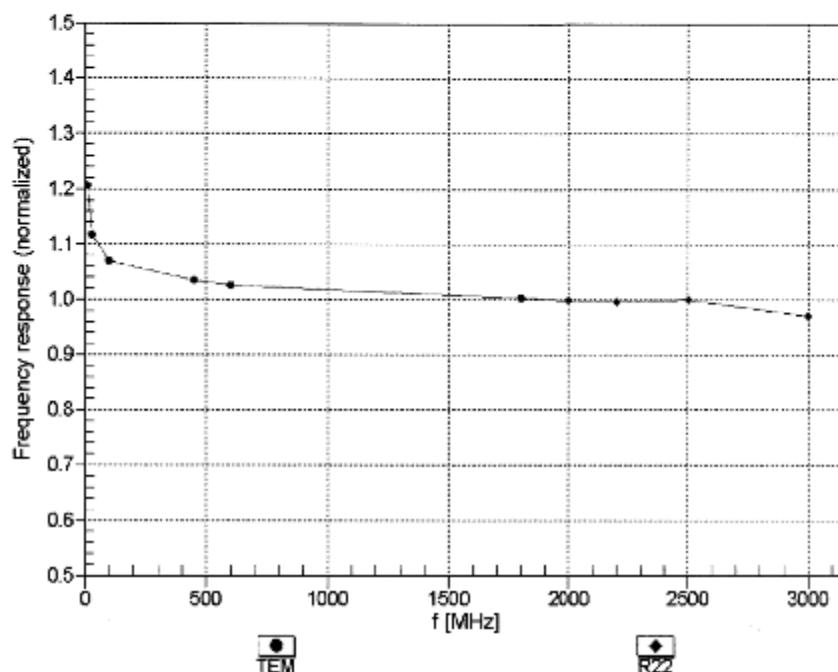


EX3DV4- SN:3927

June 24, 2013

## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

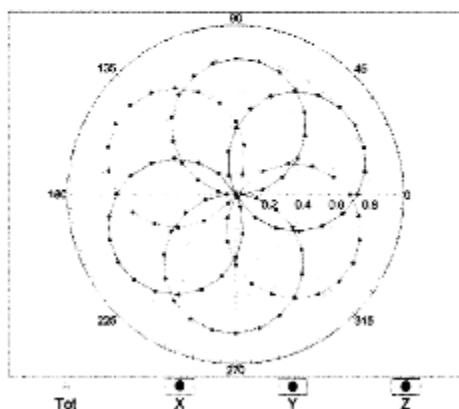


EX3DV4- SN:3927

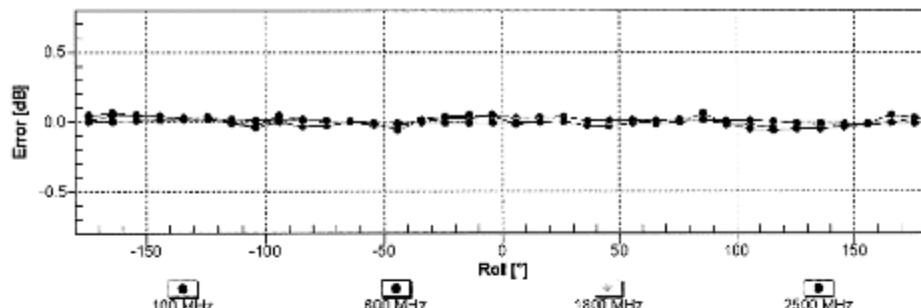
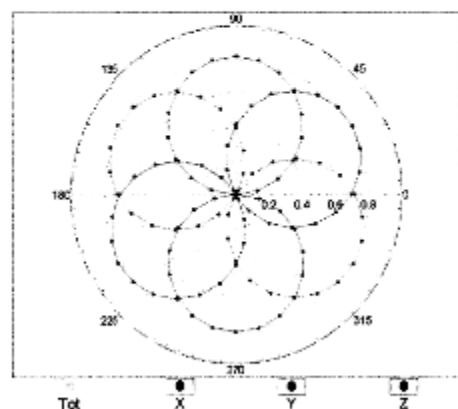
June 24, 2013

**Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$** 

f=600 MHz, TEM



f=1800 MHz, R22

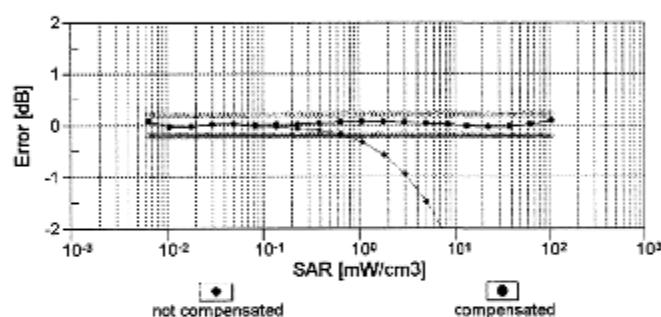
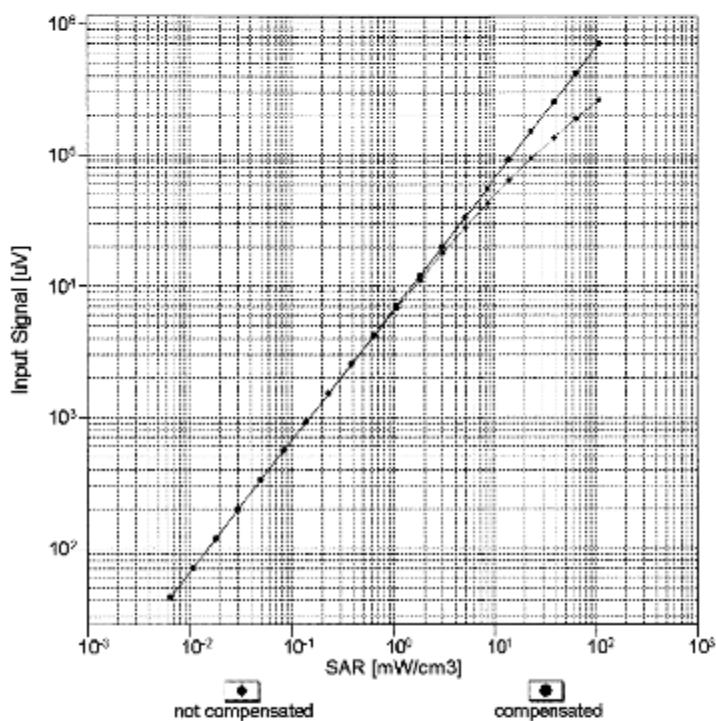
**Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)**



EX3DV4-SN:3927

June 24, 2013

**Dynamic Range f(SAR<sub>head</sub>)**  
(TEM cell, f = 900 MHz)



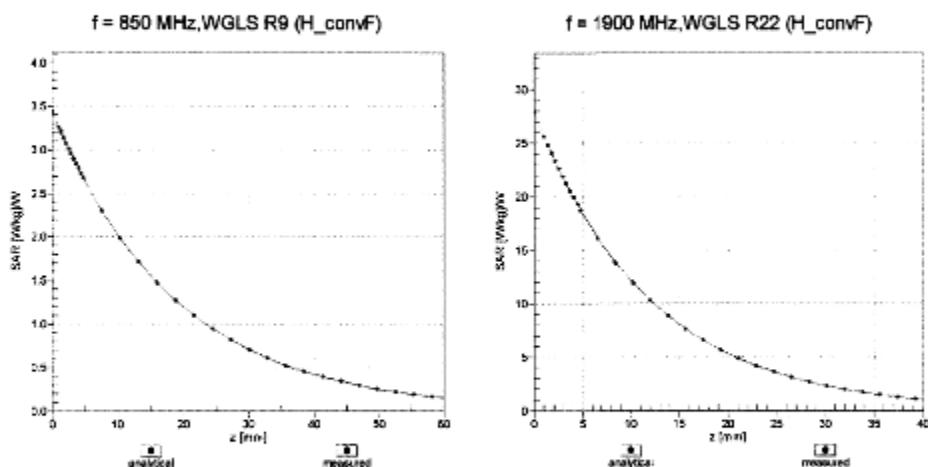
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )



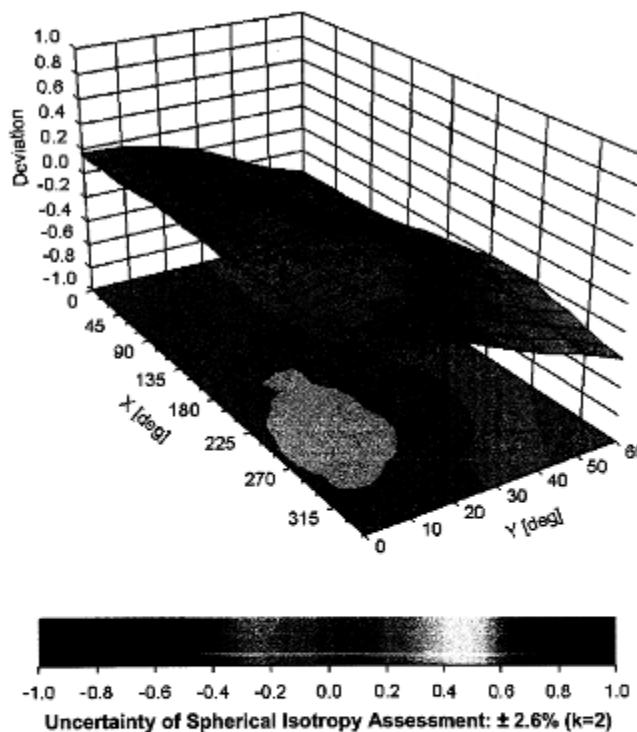
EX3DV4-SN:3927

June 24, 2013

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), $f = 900$ MHz





EX3DV4- SN:3927

June 24, 2013

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927****Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	25.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm



## 14. Appendix E. Dipole Calibration Data

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
**Zeughausstrasse 43, 8004 Zurich, Switzerland**



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Cerpass (Auden)

Certificate No.: D450V3-1086\_Jun13

### CALIBRATION CERTIFICATE

Object D450V3 - SN: 1086

Calibration procedure(s) QA CAL-15.v7  
Calibration procedure for dipole validation kits below 700 MHz

Calibration date: June 14, 2013

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

#### Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ET3DV6	SN: 1507	28-Dec-12 (No. ET3-1507_Dec12)	Dec-13
DAE4	SN: 654	10-Apr-13 (No. DAE4-654_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name	Function	Signature
	Jelton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 14, 2013

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Accreditation No.: SCS 108

#### Glossary:

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

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

- d) 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%.

**Measurement Conditions**

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

<b>DASY Version</b>	DASY5	V52.8.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	ELI4 Flat Phantom	Shell thickness: $2 \pm 0.2$ mm
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	$dx, dy, dz = 5$ mm	
<b>Frequency</b>	$450$ MHz $\pm 1$ MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	43.5	0.87 mho/m
<b>Measured Head TSL parameters</b>	( $22.0 \pm 0.2$ ) °C	$44.2 \pm 6$ %	0.90 mho/m $\pm 6$ %
<b>Head TSL temperature change during test</b>	< 0.5 °C	---	---

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	1.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>4.73 W/kg <math>\pm 18.1</math> % (k=2)</b>
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	0.802 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>3.14 W/kg <math>\pm 17.6</math> % (k=2)</b>

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	56.7	0.94 mho/m
<b>Measured Body TSL parameters</b>	( $22.0 \pm 0.2$ ) °C	$57.1 \pm 6$ %	0.96 mho/m $\pm 6$ %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

**SAR result with Body TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	1.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>4.61 W/kg <math>\pm 18.1</math> % (k=2)</b>
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	0.776 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>3.06 W/kg <math>\pm 17.6</math> % (k=2)</b>



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω - 8.2 jΩ
Return Loss	- 21.8 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	56.2 Ω - 6.2 jΩ
Return Loss	- 21.7 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.349 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
Manufactured on	October 10, 2012

**DASY5 Validation Report for Head TSL**

Date: 14.06.2013

Test Laboratory: The name of your organization

**DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN: 1086**

Communication System: UID 0 - CW ; Frequency: 450 MHz

Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.9 \text{ S/m}$ ;  $\epsilon_r = 44.2$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.59, 6.59, 6.59); Calibrated: 28.12.2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 10.04.2013
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

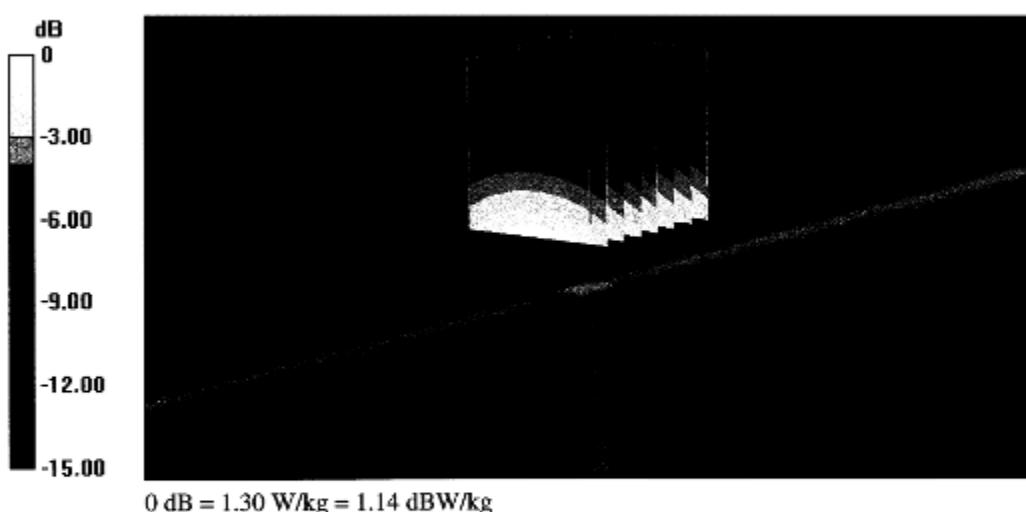
**Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

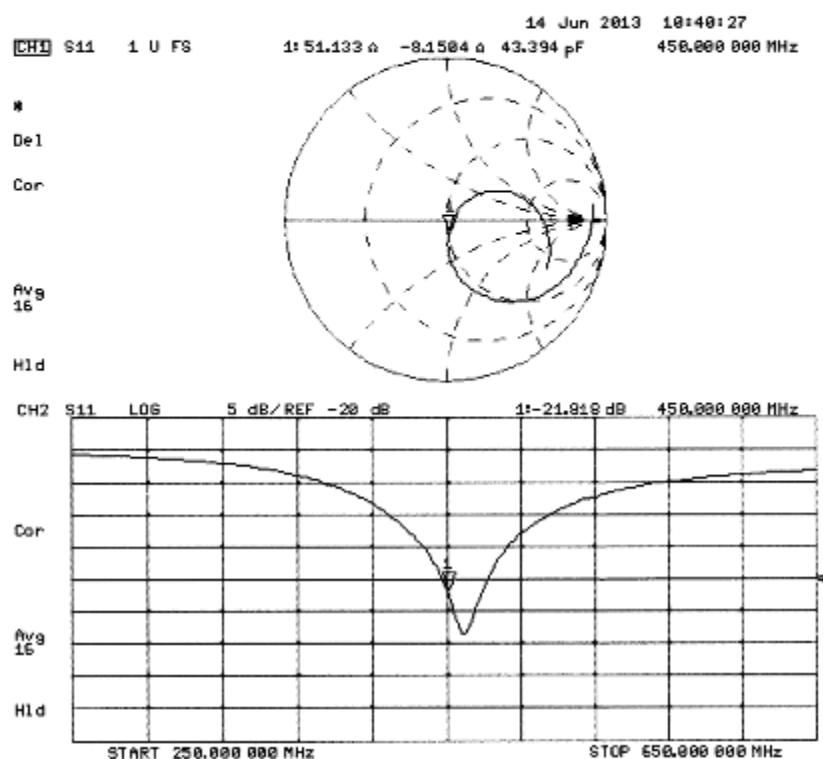
Reference Value = 39.197 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.802 W/kg

Maximum value of SAR (measured) = 1.30 W/kg



**Impedance Measurement Plot for Head TSL**

**DASY5 Validation Report for Body TSL**

Date: 14.06.2013

Test Laboratory: The name of your organization

**DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN: 1086**

Communication System: UID 0 - CW ; Frequency: 450 MHz

Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.96 \text{ S/m}$ ;  $\epsilon_r = 57.1$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(7.03, 7.03, 7.03); Calibrated: 28.12.2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 10.04.2013
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

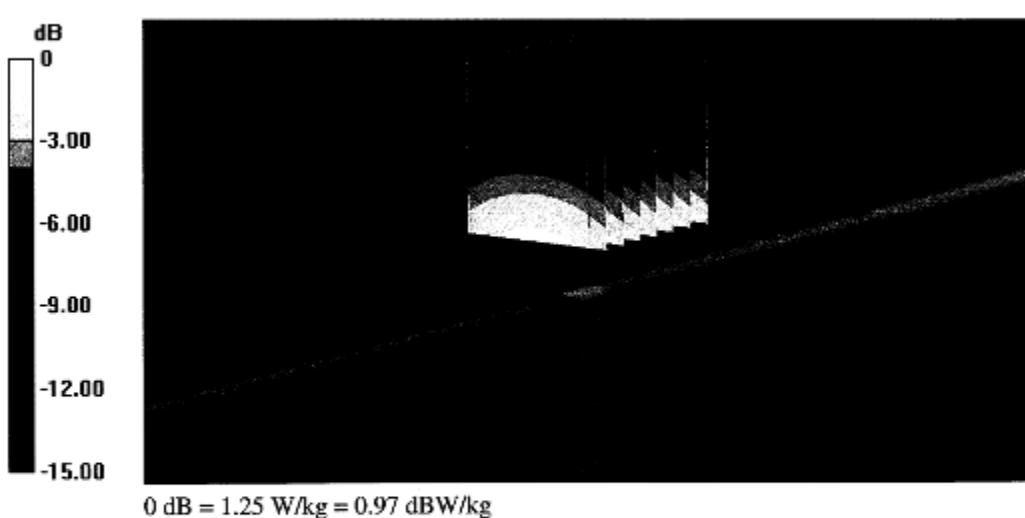
**Dipole Calibration for Body Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 39.197 V/m; Power Drift = -0.04 dB

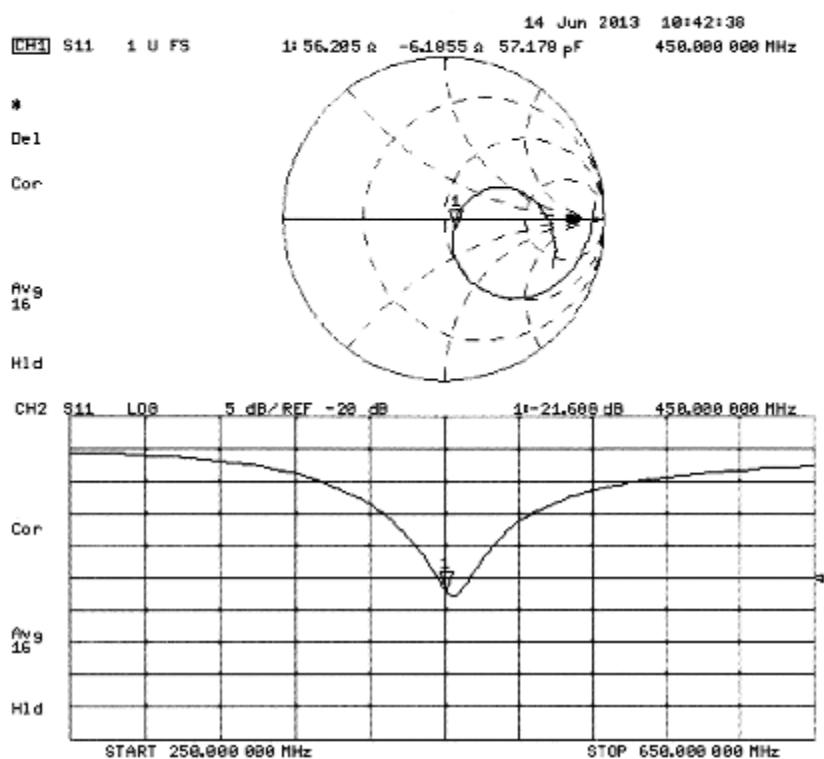
Peak SAR (extrapolated) = 1.81 W/kg

SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.776 W/kg

Maximum value of SAR (measured) = 1.25 W/kg



0 dB = 1.25 W/kg = 0.97 dBW/kg

**Impedance Measurement Plot for Body TSL**



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Accreditation No.: **SCS 108**Client: **Cerpass (Auden)**Certificate No: **D850V2-1008\_Jun13****CALIBRATION CERTIFICATE**

Object	<b>D850V2 - SN: 1008</b>
Calibration procedure(s)	<b>QA CAL-05.v9</b> Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	<b>June 13, 2013</b>

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name	Function	Signature
	Leif Klysnar	Laboratory Technician	

Approved by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Issued: June 13, 2013

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Accreditation No.: SCS 108

#### Glossary:

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

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

- d) 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%.

**Measurement Conditions**

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

<b>DASY Version</b>	DASY5	V52.8.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	850 MHz ± 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	41.5	0.92 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	40.5 ± 6 %	0.95 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	2.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.83 W/kg ± 17.0 % (k=2)
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	1.63 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.37 W/kg ± 16.5 % (k=2)

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	55.2	0.99 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	53.9 ± 6 %	1.03 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

**SAR result with Body TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	2.49 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.62 W/kg ± 17.0 % (k=2)
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.27 W/kg ± 16.5 % (k=2)



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.2 $\Omega$ - 3.1 $j\Omega$
Return Loss	- 28.6 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 $\Omega$ - 5.3 $j\Omega$
Return Loss	- 24.4 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.382 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
Manufactured on	January 30, 2009

**DASY5 Validation Report for Head TSL**

Date: 13.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN: 1008**

Communication System: UID 0 - CW ; Frequency: 850 MHz

Medium parameters used:  $f = 850 \text{ MHz}$ ;  $\sigma = 0.95 \text{ S/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAB4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

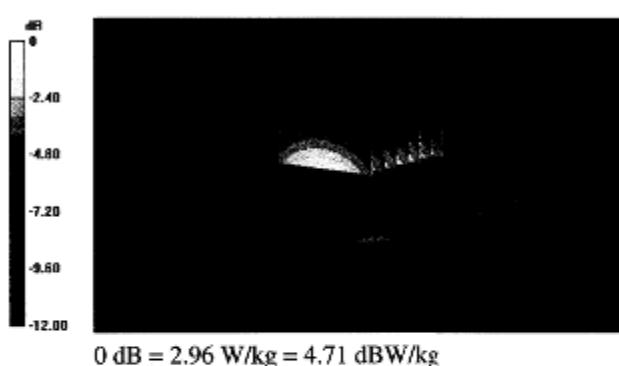
**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)**(7x7x7)/Cube 0: Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

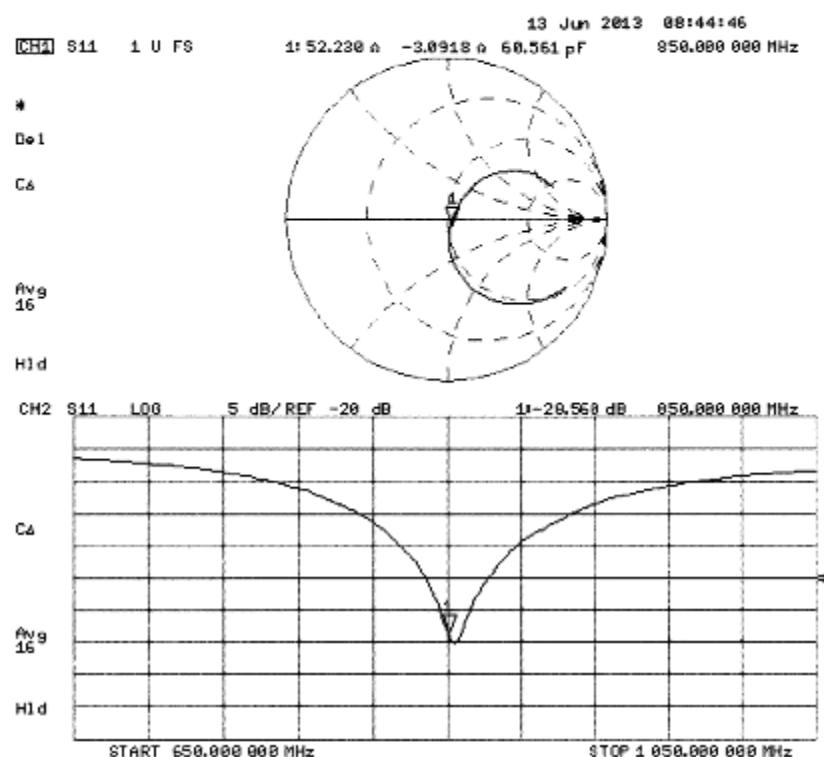
Reference Value = 57.472 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.82 W/kg

**SAR(1 g) = 2.53 W/kg; SAR(10 g) = 1.63 W/kg**

Maximum value of SAR (measured) = 2.96 W/kg



**Impedance Measurement Plot for Head TSL**

**DASY5 Validation Report for Body TSL**

Date: 12.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN: 1008**

Communication System: UID 0 - CW ; Frequency: 850 MHz

Medium parameters used:  $f = 850 \text{ MHz}$ ;  $\sigma = 1.03 \text{ S/m}$ ;  $c_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.01, 6.01, 6.01); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

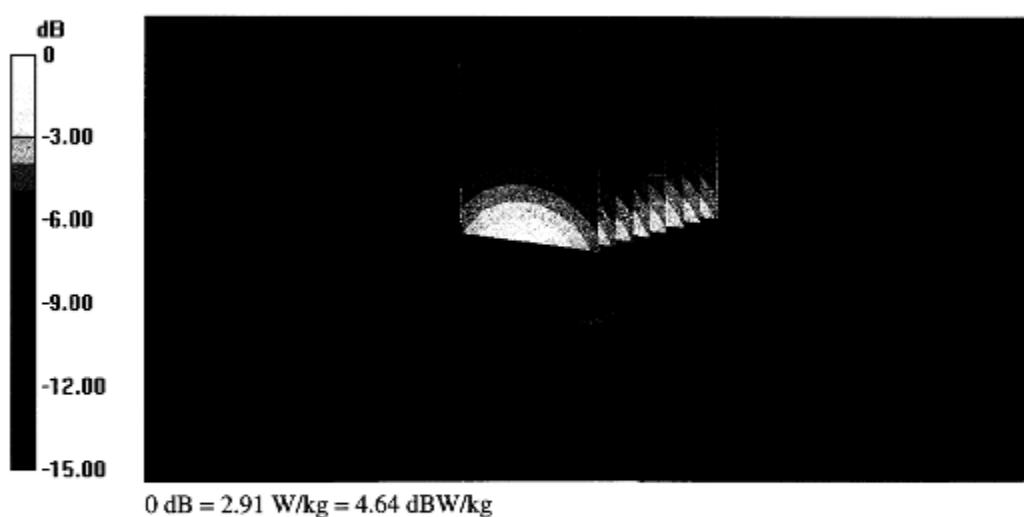
**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)**(7x8x7)/Cube 0: Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

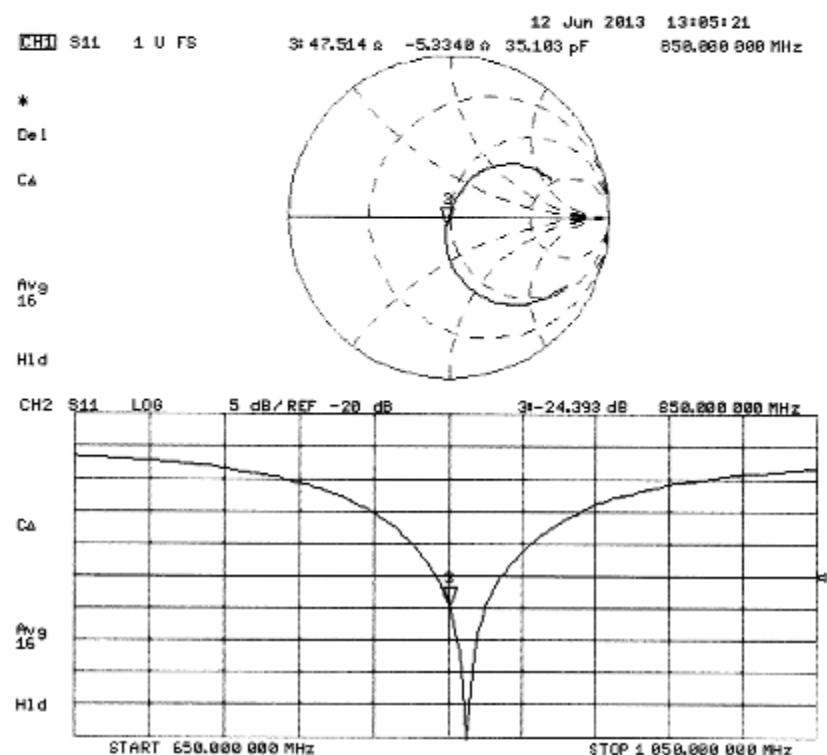
Reference Value = 54.836 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.49 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 2.91 W/kg



**Impedance Measurement Plot for Body TSL**



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Accreditation No.: SCS 108

Client Cerpass (Auden)

Certificate No: D1750V2-1097\_Jun13

## CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1097		
Calibration procedure(s)	<b>QA CAL-05.v9</b> Calibration procedure for dipole validation kits above 700 MHz		
Calibration date:	June 11, 2013		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (<math>22 \pm 3</math>)°C and humidity &lt; 70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5068 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13
Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 
Approved by:	Katja Pokrovic	Technical Manager	
Issued: June 13, 2013			
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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

#### Glossary:

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

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

- d) 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%.

**Measurement Conditions**

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

<b>DASY Version</b>	DASY5	V52.8.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1750 MHz ± 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.1	1.37 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	39.1 ± 6 %	1.32 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	---	---

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	9.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.9 W/kg ± 17.0 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.6 W/kg ± 16.5 % (k=2)

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	53.4	1.49 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	51.7 ± 6 %	1.51 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	---	---

**SAR result with Body TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	9.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.2 W/kg ± 17.0 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	5.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.1 W/kg ± 16.5 % (k=2)



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0 $\Omega$ + 0.5 $j\Omega$
Return Loss	- 38.8 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 $\Omega$ + 0.2 $j\Omega$
Return Loss	- 29.2 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.218 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
Manufactured on	May 16, 2013

**DASY5 Validation Report for Head TSL**

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1097**

Communication System: UID 0 - CW ; Frequency: 1750 MHz

Medium parameters used:  $f = 1750 \text{ MHz}$ ;  $\sigma = 1.32 \text{ S/m}$ ;  $\epsilon_r = 39.1$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.18, 5.18, 5.18); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

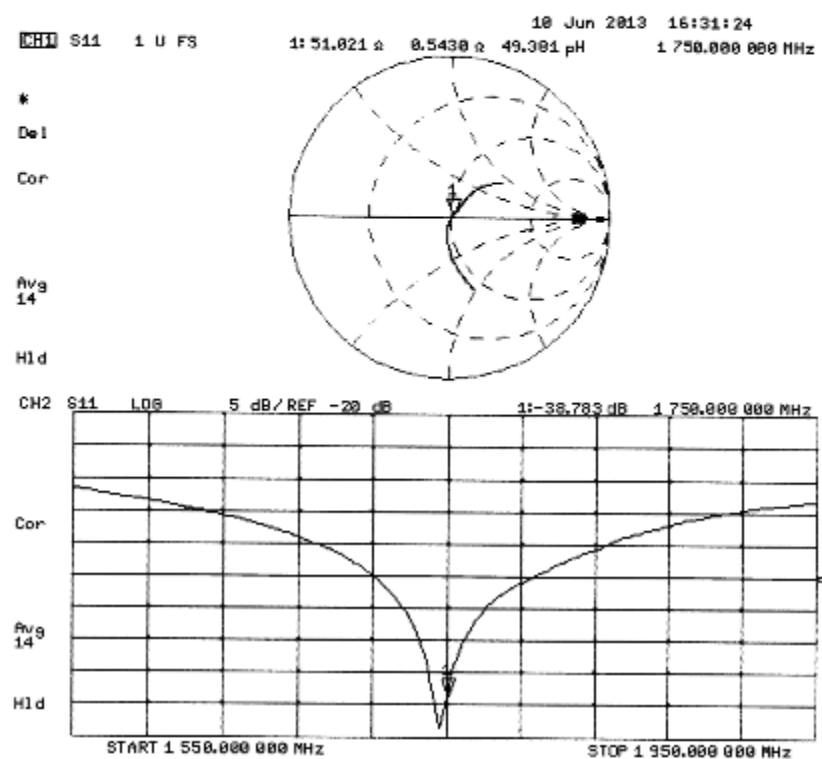
Reference Value = 95.679 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 16.2 W/kg

**SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.85 W/kg**

Maximum value of SAR (measured) = 11.4 W/kg



**Impedance Measurement Plot for Head TSL**

**DASY5 Validation Report for Body TSL**

Date: 11.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1097**

Communication System: UID 0 - CW ; Frequency: 1750 MHz

Medium parameters used:  $f = 1750 \text{ MHz}$ ;  $\sigma = 1.51 \text{ S/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.83, 4.83, 4.83); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

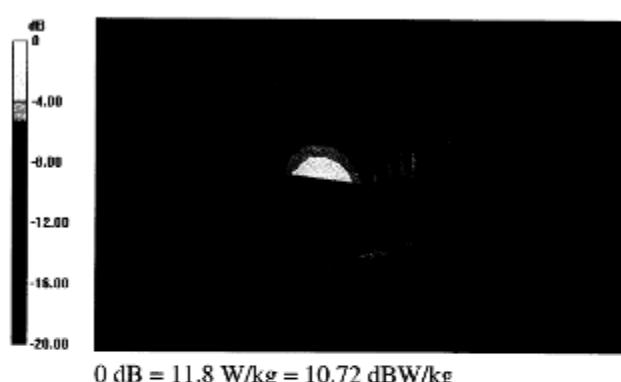
**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

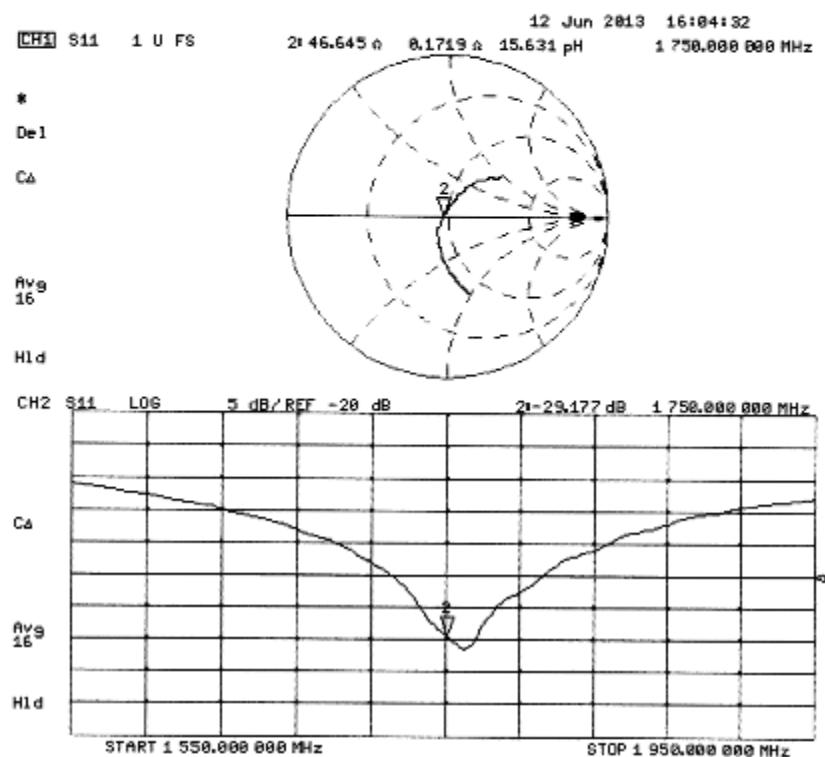
Reference Value = 91.830 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 16.3 W/kg

**SAR(1 g) = 9.46 W/kg; SAR(10 g) = 5.08 W/kg**

Maximum value of SAR (measured) = 11.8 W/kg



**Impedance Measurement Plot for Body TSL**



**Calibration Laboratory of**  
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**Engineering AG**  
**Zeughausstrasse 43, 8004 Zurich, Switzerland**



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**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**Client **Cerpass (Auden)**Certificate No: **D1900V2-5d174\_Jun13**

## CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d174																																														
Calibration procedure(s)	<b>QA CAL-05.v9</b> Calibration procedure for dipole validation kits above 700 MHz																																														
Calibration date:	June 10, 2013																																														
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (<math>22 \pm 3</math>)°C and humidity &lt; 70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>																																															
<table border="1"> <thead> <tr> <th>Primary Standards</th><th>ID #</th><th>Cal Date (Certificate No.)</th><th>Scheduled Calibration</th></tr> </thead> <tbody> <tr> <td>Power meter EPM-442A</td><td>GB37480704</td><td>01-Nov-12 (No. 217-01640)</td><td>Oct-13</td></tr> <tr> <td>Power sensor HP 8481A</td><td>US37292783</td><td>01-Nov-12 (No. 217-01640)</td><td>Oct-13</td></tr> <tr> <td>Reference 20 dB Attenuator</td><td>SN: 5058 (20k)</td><td>04-Apr-13 (No. 217-01736)</td><td>Apr-14</td></tr> <tr> <td>Type-N mismatch combination</td><td>SN: 5047.3 / 06327</td><td>04-Apr-13 (No. 217-01739)</td><td>Apr-14</td></tr> <tr> <td>Reference Probe ES3DV3</td><td>SN: 3205</td><td>28-Dec-12 (No. ES3-3205_Dec12)</td><td>Dec-13</td></tr> <tr> <td>DAE4</td><td>SN: 601</td><td>25-Apr-13 (No. DAE4-601_Apr13)</td><td>Apr-14</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th><th>ID #</th><th>Check Date (In house)</th><th>Scheduled Check</th></tr> </thead> <tbody> <tr> <td>Power sensor HP 8481A</td><td>MY41092317</td><td>18-Oct-02 (in house check Oct-11)</td><td>In house check: Oct-13</td></tr> <tr> <td>RF generator R&amp;S SMT-06</td><td>100005</td><td>04-Aug-99 (in house check Oct-11)</td><td>In house check: Oct-13</td></tr> <tr> <td>Network Analyzer HP 8753E</td><td>US87300585 S4206</td><td>18-Oct-01 (in house check Oct-12)</td><td>In house check: Oct-13</td></tr> </tbody> </table>				Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13	Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13	Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14	Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14	Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13	DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14	Secondary Standards	ID #	Check Date (In house)	Scheduled Check	Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13	RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13	Network Analyzer HP 8753E	US87300585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13
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Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 																																												
Approved by:	Katja Pokovic	Technical Manager																																													
Issued: June 11, 2013																																															
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																																															



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Accreditation No.: SCS 108

#### Glossary:

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

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- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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#### Additional Documentation:

- d) 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%.

**Measurement Conditions**

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

<b>DASY Version</b>	DASY5	V52.8.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz ± 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	39.3 ± 6 %	1.34 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	---	---

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	9.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.9 W/kg ± 17.0 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	5.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.9 W/kg ± 16.5 % (k=2)

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	53.3	1.52 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	53.7 ± 6 %	1.50 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	---	---

**SAR result with Body TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	10.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.4 W/kg ± 17.0 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	5.34 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.5 W/kg ± 16.5 % (k=2)



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.2 \Omega + 3.9 j\Omega$
Return Loss	- 26.2 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.3 \Omega + 5.0 j\Omega$
Return Loss	- 25.4 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 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
Manufactured on	June 08, 2012

**DASY5 Validation Report for Head TSL**

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d174**

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.34 \text{ S/m}$ ;  $\epsilon_r = 39.3$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

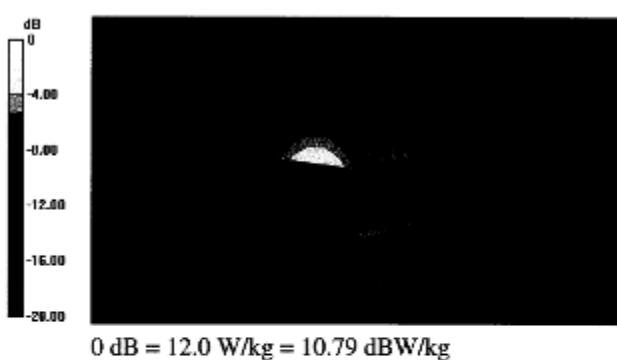
**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 95.712 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 17.6 W/kg

**SAR(1 g) = 9.76 W/kg; SAR(10 g) = 5.15 W/kg**

Maximum value of SAR (measured) = 12.0 W/kg



**DASY5 Validation Report for Body TSL**

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d174**

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.5 \text{ S/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

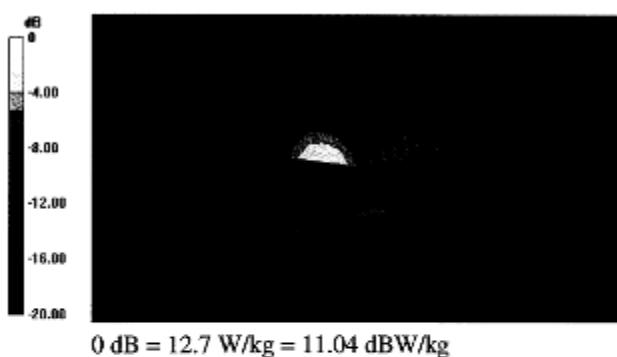
**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

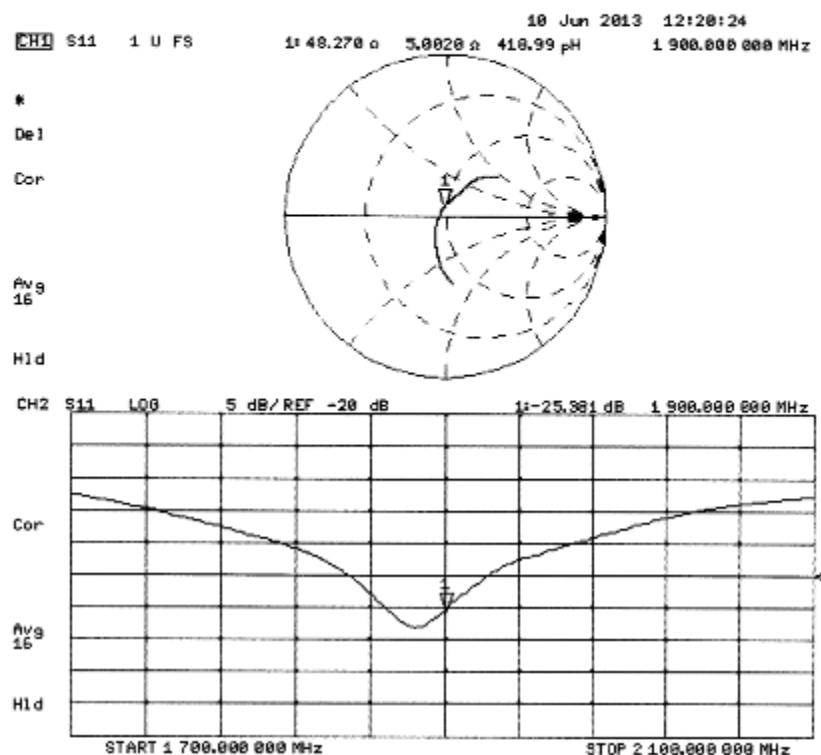
Reference Value = 95.712 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 17.1 W/kg

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

Maximum value of SAR (measured) = 12.7 W/kg



**Impedance Measurement Plot for Body TSL**



**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
**Zeughausstrasse 43, 8004 Zurich, Switzerland**



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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Accreditation No.: **SCS 108**Client **Cerpass (Auden)**Certificate No: **D2450V2-914\_Jun13****CALIBRATION CERTIFICATE**

Object	D2450V2 - SN: 914		
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz		
Calibration date:	June 07, 2013		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature <math>(22 \pm 3)^\circ\text{C}</math> and humidity <math>&lt; 70\%</math>.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US3/390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13
Calibrated by:	Name Leif Klyner	Function Laboratory Technician	Signature 
Approved by:	Katja Pokovic	Technical Manager	
Issued: June 7, 2013			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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Engineering AG  
Zeughaeuserstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: SCS 108

**Glossary:**

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

**Calibration is Performed According to the Following Standards:**

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

- d) 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%.



### Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.8.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	2450 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	39.2	1.80 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	37.8 ± 6 %	1.81 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.4 W/kg ± 17.0 % (k=2)
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	6.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 W/kg ± 16.5 % (k=2)

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	52.7	1.95 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	50.9 ± 6 %	2.02 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

### SAR result with Body TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	51.5 W/kg ± 17.0 % (k=2)
<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.9 W/kg ± 16.5 % (k=2)



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.0 $\Omega$ + 1.9 $j\Omega$
Return Loss	- 23.3 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.1 $\Omega$ + 3.5 $j\Omega$
Return Loss	- 28.0 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 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
Manufactured on	December 19, 2012

**DASY5 Validation Report for Head TSL**

Date: 07.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 914**

Communication System: UID 0 - CW ; Frequency: 2450 MHz

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.81 \text{ S/m}$ ;  $\epsilon_r = 37.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

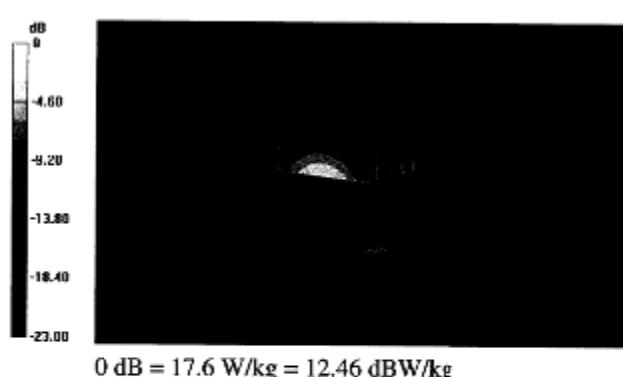
**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 95.695 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 28.3 W/kg

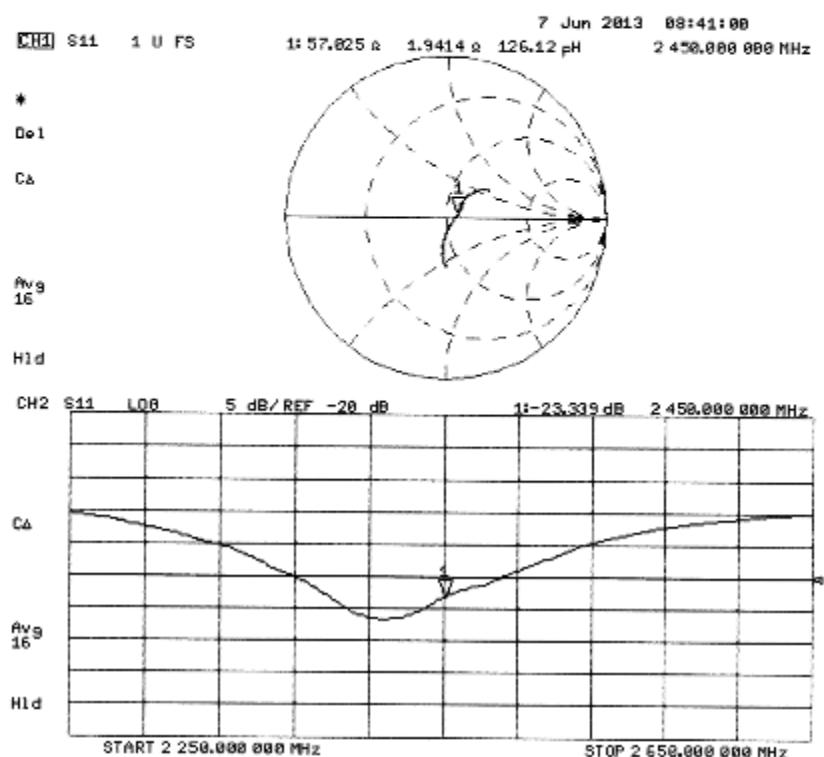
**SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.24 W/kg**

Maximum value of SAR (measured) = 17.6 W/kg





## Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body TSL**

Date: 07.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 914**

Communication System: UID 0 - CW ; Frequency: 2450 MHz

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 2.02 \text{ S/m}$ ;  $\epsilon_r = 50.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

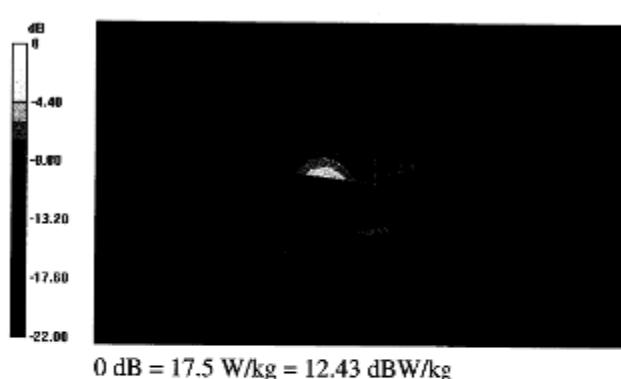
**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

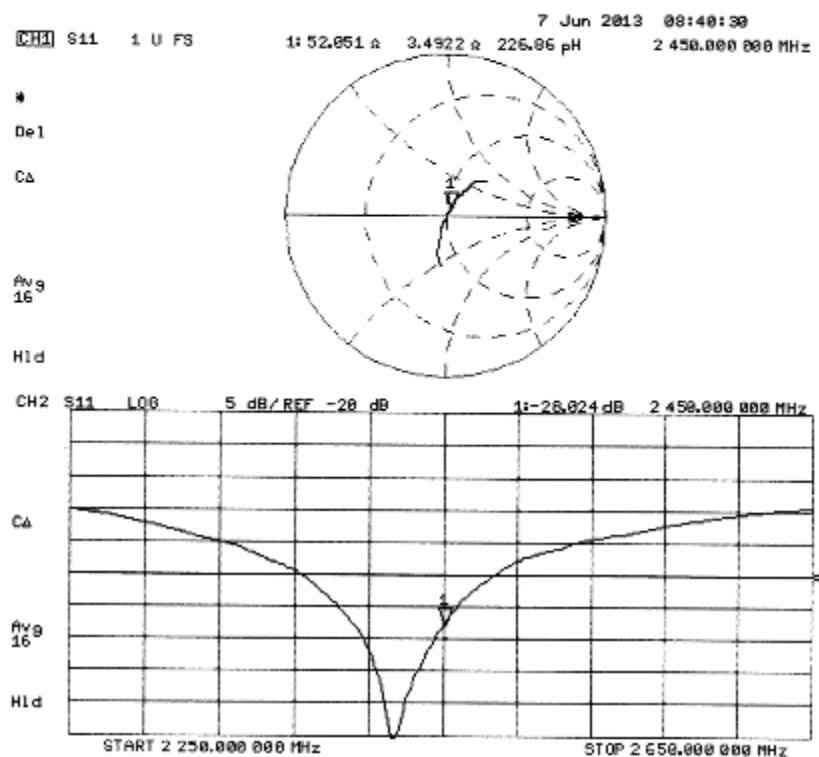
Reference Value = 95.695 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.07 W/kg

Maximum value of SAR (measured) = 17.5 W/kg



**Impedance Measurement Plot for Body TSL**



## 15. Appendix F. DAE Calibration Data

**Calibration Laboratory of**  
**Schmid & Partner**  
**Engineering AG**  
**Zeughausstrasse 43, 8004 Zurich, Switzerland**



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**C** Service suisse d'étalonnage  
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Accreditation No.: **SCS 108**

Client

**Cerpass (Auden)**Certificate No: **DAE4-1379\_Jun13**

### CALIBRATION CERTIFICATE

Object **DAE4 SD 000 D04 BJ - SN: 1379**

Calibration procedure(s) **QA CAL-06.v26**  
**Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **June 14, 2013**

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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&amp;TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Kelthley Multimeter Type 2001	SN: 0810278	02-Oct-12 (No:12728)	Oct-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-13 (in house check)	In house check: Jan-14
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-13 (in house check)	In house check: Jan-14

Calibrated by: Name **Eric Haefliger** Function **Technician** Signature

Approved by: Name **Fin Bonhoff** Function **Deputy Technical Manager** Signature

Issued: June 14, 2013

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Accreditation No.: SCS 108

**Glossary**

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

**Methods Applied and Interpretation of Parameters**

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

**DC Voltage Measurement**

A/D - Converter Resolution nominal

High Range: 1LSB =  $6.1\mu V$ , full range = -100...+300 mVLow Range: 1LSB =  $61nV$ , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	$403.780 \pm 0.02\% (k=2)$	$404.053 \pm 0.02\% (k=2)$	$403.989 \pm 0.02\% (k=2)$
Low Range	$3.99596 \pm 1.50\% (k=2)$	$3.99156 \pm 1.50\% (k=2)$	$3.99899 \pm 1.50\% (k=2)$

**Connector Angle**

Connector Angle to be used in DASY system	$149.5^\circ \pm 1^\circ$
---	---------------------------



## Appendix

### 1. DC Voltage Linearity

High Range		Reading ( $\mu$ V)	Difference ( $\mu$ V)	Error (%)
Channel X	+ Input	199994.77	-0.79	-0.00
Channel X	+ Input	19998.34	-1.48	-0.01
Channel X	- Input	-19999.63	1.83	-0.01
Channel Y	+ Input	199996.50	0.61	0.00
Channel Y	+ Input	19995.46	-4.43	-0.02
Channel Y	- Input	-20002.71	-1.27	0.01
Channel Z	+ Input	199998.27	2.81	0.00
Channel Z	+ Input	19997.65	-2.19	-0.01
Channel Z	- Input	-20002.08	-0.49	0.00

Low Range		Reading ( $\mu$ V)	Difference ( $\mu$ V)	Error (%)
Channel X	+ Input	2000.48	0.36	0.02
Channel X	+ Input	200.15	-0.33	-0.16
Channel X	- Input	-199.65	-0.28	0.14
Channel Y	+ Input	1999.47	-0.73	-0.04
Channel Y	+ Input	200.66	0.01	0.01
Channel Y	- Input	-199.30	0.05	-0.02
Channel Z	+ Input	2000.00	-0.12	-0.01
Channel Z	+ Input	199.74	-0.81	-0.41
Channel Z	- Input	-200.31	-0.98	0.49

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu$ V)	Low Range Average Reading ( $\mu$ V)
Channel X	200	-17.91	-19.73
	-200	20.20	18.29
Channel Y	200	-4.93	-4.72
	-200	3.59	3.43
Channel Z	200	-10.76	-10.75
	-200	8.61	8.62

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X ( $\mu$ V)	Channel Y ( $\mu$ V)	Channel Z ( $\mu$ V)
Channel X	200	-	-0.44	-5.25
Channel Y	200	7.04	-	0.32
Channel Z	200	9.23	5.34	-

**4. AD-Converter Values with inputs shorted**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16053	15886
Channel Y	16274	14321
Channel Z	15829	15916

**5. Input Offset Measurement**

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MΩ

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	-3.67	-4.90	-2.52	0.44
Channel Y	-1.51	-2.97	-0.02	0.59
Channel Z	-0.53	-1.65	1.01	0.65

**6. Input Offset Current**

Nominal Input circuitry offset current on all channels: &lt;25fA

**7. Input Resistance** (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

**8. Low Battery Alarm Voltage** (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

**9. Power Consumption** (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9