



**ANSI/IEEE Std. C95.1-1992**  
**In accordance with the requirements of**  
**FCC Report and Order: ET Docket 93-62, and OET Bulletin 65**  
**Supplement C**

## FCC SAR TEST REPORT

For

Product Name: Mobile Phone

Brand Name: GcWU

Model No.: : 6 % \$ %

Series Model: N/A

Test Report Number:  
KS120507A01-SF

Issued for

GcWU AcVjYHYWta a i bJWUjcbg

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Issued by

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## 1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

<b>Product Name:</b>	Mobile Phone
<b>Trade Name:</b>	Ù[ &æ
<b>Model Name.:</b>	ØÓÆ
<b>Series Model:</b>	N/A
<b>Applicant Discrepancy:</b>	Initial
<b>Devices supporting GPRS:</b>	Class B
<b>Description Test Modes(worst case ):</b>	SIM 1 and SIM2 is a chipset unit and tested as single chipset
<b>Device Category:</b>	PORTABLE DEVICES
<b>Exposure Category:</b>	GENERAL POPULATION/UNCONTROLLED EXPOSURE
<b>Date of Test:</b>	May 8, 2012
<b>Applicant:</b>	GcWU`AcV]Y`HYWta a i b]WUjcbg ì €A P Ò F Ì c Ò U c ù ~ à ^ Ì F Ì Ì Ì c Ò T æ ð Ó a s Ò S Á H F Î G Á W Ò C E
<b>Manufacturer:</b>	G_nbYhHYW bc`c[ m@a ]hX Ü[ [ { Å G F F E G F Í Ê Z @ } * • @ } Å ö å ^ } Ê Ö ä ã ä Ä Ü[ æ ð Ö æ Ä Ö ä d æ Ä @ } : @ } Ê Ö @ æ
<b>Application Type:</b>	Certification
<b>APPLICABLE STANDARDS AND TEST PROCEDURES</b>	
<b>STANDARDS AND TEST PROCEDURES</b>	<b>TEST RESULT</b>
FCC OET 65 Supplement C	No non-compliance noted
<b>Deviation from Applicable Standard</b>	
NAEG	
The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C(Edition 01-01). The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.	

**Approved by:**

Handl. 1100

Hadiif Hoo  
RF Manager  
Compliance Certification Services Inc.

**Tested by:**

Seam.yu

Sean Yu  
Test Engineer  
Compliance Certification Services Inc.





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<b>Product Name:</b>	Mobile Phone
<b>Model Name:</b>	ØÓÆ
<b>Series Model:</b>	N/A
<b>Model Discrepancy:</b>	N/A
<b>Brand Name:</b>	ÙĴ &acirc;
<b>FCC ID:</b>	ZÎ ÜÛT ØÓÆ
<b>GPRS Level:</b>	Multi-Class 1€
<b>Multi-slot Class:</b>	2 Up +3 Down
<b>Power reduction:</b>	NO
<b>DTM Description:</b>	N/A
<b>Device Category:</b>	Production unit
<b>Frequency Range:</b>	GSM 850: 824.2 ~ 848.8 MHz GSM1900: 1850.2 ~ 1909.8MHz GPRS850: 850: 824.2 ~ 848.8 MHz GPRS1900:1850.2 ~ 1909.8 MHz Bluetooth: 2402 ~ 2480 MHz
<b>Transmit Power(Average):</b>	GSM 850 Band: GSM 850: 32.Ĭ HdBm GPRS 850: HÇĬ HdBm GSM 1900 Band: GSM 1900: 29.Ĭ Ĭ dBm GPRS 1900: 2ĴĬĬ dBm Bluetooth:0.56 dBm
<b>Max. SAR:</b>	GSM 850 Head: 0.742 W/kg Body: 0.743 W/kg GSM 1900 Head: 0.523W/kg Body: 0.684W/kg GPRS 850: 0.460 W/kg GPRS 1900: 0.504 W/kg
<b>Modulation Technique:</b>	GSM / GPRS : GMSK Bluetooth:FHSS (GFSK)
<b>Accessories:</b>	Power supply and ADP (rating) : MODEL: ÛÔÆ BRAND: ÛĴ &acirc; INPUT: AC 100-240V 50/60Hz 150mA OUTPUT: DC 5V 500mA Battery (rating) : BRAND: ÛĴ &acirc; MODEL: ØÓÆ Capacitance: Ĩ 00mAh
<b>Antenna Specification:</b>	GSM: PIFA antenna Bluetooth : Dipole antenna
<b>Operating Mode:</b>	Maximum continuous output





The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telePhones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

The Specific Absorption Rate (SAR) testing specification, method and procedure for this GSM Mobile Phone is in accordance with the following standards:

- ☒ 47 CFR Part 2 ( 2.1093)
- ☒ IEEE C95.1-1999
- ☐ KDB 248227 D01 SAR measurement procedures for 802.11 b/g transmitters
- ☒ KDB 648474 D01 SAR evaluation considerations for handsets with multiple transmitters and antennas
- ☐ KDB 447498 D01 Mobile Portable RF Exposure
- ☒ OET Bulletin 65 Supplement C (Edition 01-01)
- ☐ Preliminary Guidance for Reviewing Applications for Certification of 3G Device. May 2006.

The device was controlled by using a base station emulator R&S CMU200. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

Measurements were performed on the lowest, middle, and highest channel for each testing position.

For SAR testing, EUT is in GSM/GPRS link mode. In GSM link mode, its crest factor is 8, In GPRS link mode, its crest factor is 2, because EUT is set in GPRS multi-slot class 12 with 4 uplink slots.

These measurements were performed with the automated near-field scanning system DASY 5 from ATTENNESSA. The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than  $\pm 0.02$  mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the E-field PROBE EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure described in [8] and found to be better than  $\pm 0.25$  dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEE P1528 and CENELEC EN 62209.

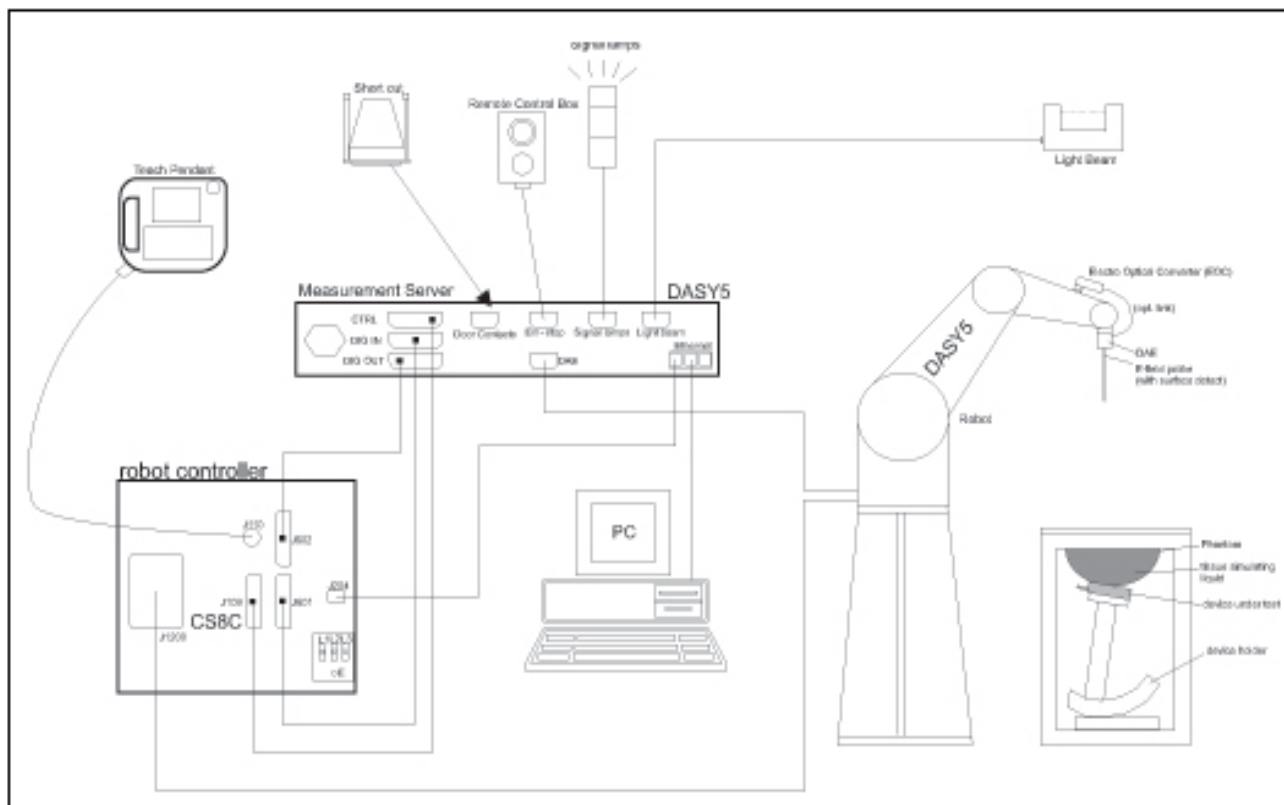




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Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78





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

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile Phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.









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Interior of probe

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**Construction:** In combination with the Twin SAM Phantom, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).



**Construction:** Symmetrical dipole with I/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 900,1800,2450,5800 MHz

**Return loss:** > 20 dB at specified validation position

**Power capability:** > 100 W ( $f < 1\text{GHz}$ ); > 40 W ( $f > 1\text{GHz}$ )

**Dimensions:**

- D835V2: dipole length: 161 mm; overall height: 340 mm
- D1800V2: dipole length: 72.5 mm; overall height: 300 mm
- D1900V2: dipole length: 67.7 mm; overall height: 300 mm
- D2450V2: dipole length: 51.5 mm; overall height: 290 mm
- D5GHzV2: dipole length: 20.6 mm; overall height: 300mm



<b>Construction:</b>	Symmetrical dipole with I/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.
<b>Frequency:</b>	900, 1800, 2450, 5800 MHz
<b>Return loss:</b>	> 20 dB at specified validation position
<b>Power capability:</b>	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
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## 7. EVALUATION PROCEDURES

## DATA EVALUATION

The DASY 5 post processing software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	$ConvF_i$
	- Diode compression point	$dcp_i$
Device parameters:	- Frequency	$f$
	- Crest factor	$cf$
Media parameters:	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the compAEGnt documents or be imported into the software from the configuration files issued for the DASY 5 compAEGnts. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

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

with  $V_i$  = Compensated signal of channel  $i$  ( $i = x, y, z$ )  
 $U_i$  = Input signal of channel  $i$  ( $i = x, y, z$ )  
 $cf$  = Crest factor of exciting field (DASY 5 parameter)  
 $dcp_i$  = Diode compression point (DASY 5 parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes:

$$H_i = \sqrt{V_i} \cdot \frac{a_{i10} + a_{i11}f + a_{i12}f^2}{f}$$

with  $V_i$  = Compensated signal of channel i (i = x, y, z)  
 $Norm_i$  = Sensor sensitivity of channel i (i = x, y, z)  
 $\mu V/(V/m)^2$  for E0field Probes  
 $ConvF$  = Sensitivity enhancement in solution  
 $a_{ij}$  = Sensor sensitivity factors for H-field probes  
 $f$  = Carrier frequency (GHz)  
 $E_i$  = Electric field strength of channel i in V/m  
 $H_i$  = Magnetic field strength of channel i in A/m

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

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




$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

$\rho$  = equivalent tissue density in g/cm<sup>3</sup>

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

$H_{tot}$  = total magnetic field strength in A/m

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for AEG reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY 5 software stop the measurements if this limit is exceeded.





The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g.

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

## Extrapolation

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

Since the decay of the boundary effect dominates for small probes ( $a \ll \lambda$ ), the cos-term can be omitted. Factors  $S_b$  (parameter Alpha in the DASY 5 software) and  $a$  (parameter Delta in the DASY 5 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

- the boundary curvature is small
- the probe axis is angled less than 30° to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY 5 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.



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## UNCERTAINTY BUDGE ACCORDING TO IEEE 1528-2003

Table: Worst-case uncertainty for DASY5 assessed according to IEEE1528-2003.  
The budget is valid for the frequency range 300 MHz to 6G Hz and represents a worst-case analysis.





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

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

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

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

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

**GENERAL POPULATION/UNCONTROLLED EXPOSURE**  
**PARTIAL BODY LIMIT**  
**1.6 W/kg**



Please refer to IEEE1528-2003 illustration below.

## 10.1 ANTHROPOMORPHIC HEAD PHANTOM

Figure 7-1a shows the front, back and side views of SAM. The point “M” is the reference point for the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 7-1b. The plane passing through the two ear reference points and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 7-1c). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs. Anterior to the N-F line, the ear is truncated as illustrated in Figure 7-1b. The ear truncation is introduced to avoid the handset from touching the ear lobe, which can cause unstable handset positioning at the cheek.

Figure 7-1a  
Front, back and side view of SAM (model for the phantom shell)



Figure 7-1b

Close up side view of phantom showing the ear region

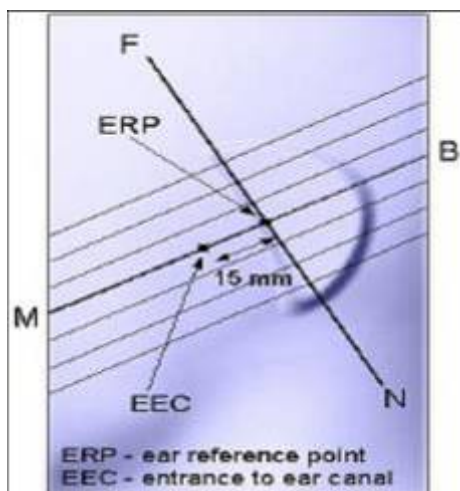


Figure 7-1b

Close up side view of phantom showing the ear region

Figure 7-1c

Side view of the phantom showing relevant markings and the 7 cross sectional plane locations

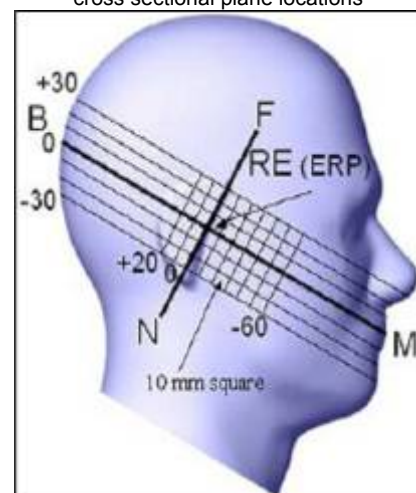


Figure 7-1c

Side view of the phantom showing relevant markings and the 7 cross sectional plane locations



## 10.2 DEFINITION OF THE “CHEEK/TOUCH” POSITION

The “cheek” or “touch” position is defined as follows:

- a. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)
- b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width  $w_t$  of the handset at the level of the acoustic output (point A on Figures 7-2a and 7-2b), and the midpoint of the width  $w_b$  of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7-2a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7-2b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.
- c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7-2c), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
- d. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.
- e. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
- f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.
- g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 7-2c. The physical angles of rotation should be noted.



Figure 7.2c

Phone “cheek” or “touch” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.



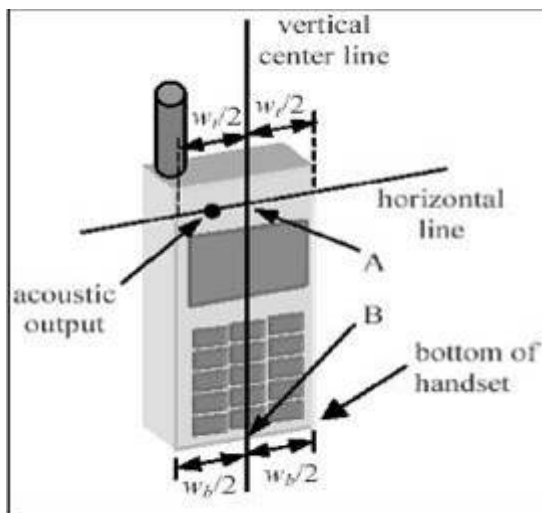


Figure 7.2a

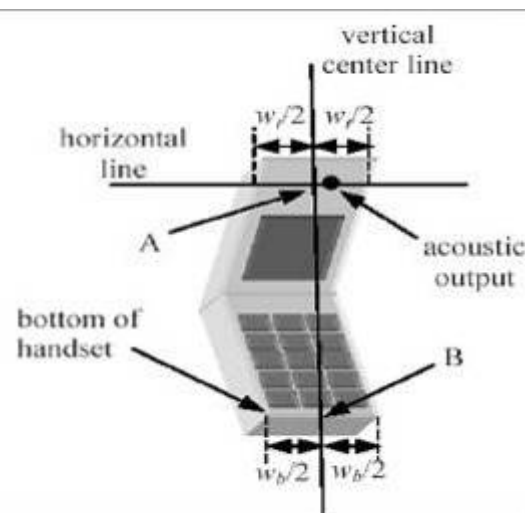


Figure 7.2b

### 10.3 DEFINITION OF THE “TILTED” POSITION

The “tilted” position is defined as follows:

- a. Repeat steps (a) – (g) of 7.2 to place the device in the “cheek position.”
- b. While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.
- c. Rotate the handset around the horizontal line by 15 degrees.
- d. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g., the antenna with the back of the head).

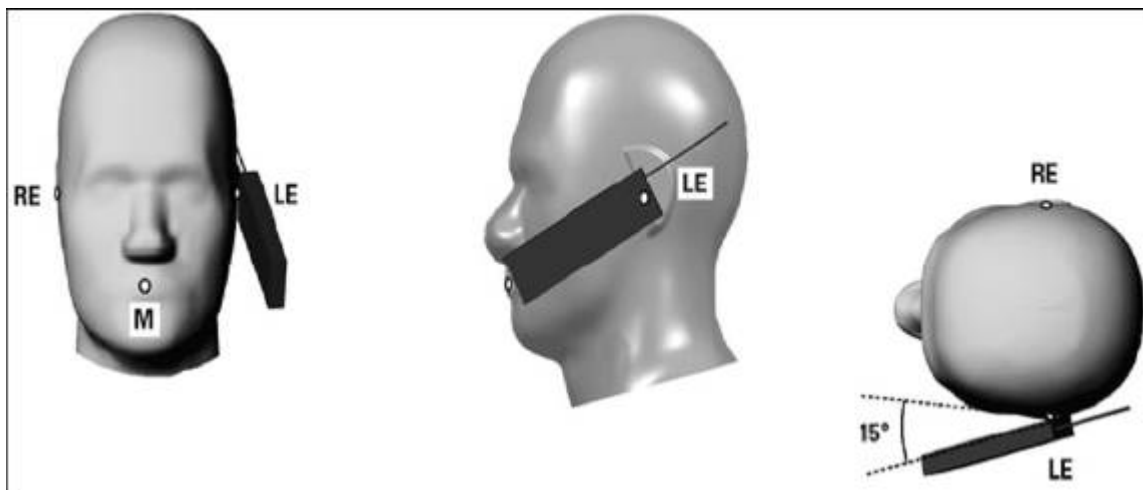


Figure 7-3

Phone “tilted” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.







[illegible]

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of  $\pm 10\%$ . The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

- The measurements were performed in the flat section of the SAM twin phantom filled with head and body simulating liquid of the following parameters.
- The DASY5 system with an E-field probe EX3DV4 SN: 3755 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration ( $dx = 5 \text{ mm}$ ,  $dy = 5 \text{ mm}$ ,  $dz = 5 \text{ mm}$ ).
- Distance between probe sensors and phantom surface was set to 2.5 mm.
- The dipole input power was  $1\text{W} \pm 3\%$ .
- The results are normalized to 1 W input power.





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- ### Reference SAR values

Frequency (MHz)	1g SAR	10g SAR	Local SAR at Surface (Above Feed Point)	Local SAR at Surface (y = 2cm offset from feed point)
850 Head	9.57	6.23	14.1	4.9
850 Body	9.92	6.55		
1900 Head	40.50	21.10	67.6	6.6
1900 Body	39.70	21.10		



[illegible]

Body Simulating Liquid		Parameters	Target	Measured	Deviation[%]	Limited[%]
Frequency	Temp. [°C]					
1900 MHz	20.30	1g SAR	39.70	41.44	4.38	±10
		10g SAR	21.10	20.56	-2.56	±10



## 11.4 EUT TUNE-UP PROCEDURES AND TEST MODE

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

To setup the desire channel frequency and the maximum output power. A Radio Communication Tester “CMU200 ” was used to program the EUT.

### GSM 850 / GPRS850:

Network Support: GSM only / GPRS  
Main Service: Circuit Switched / Packet data  
Power Setting: 33dBm / 33dBm

### GSM 1900 / GPRS 1900:

Network Support: GSM only / GPRS  
Main Service: Circuit Switched / Packet data  
Power Setting: 30dBm / 30dBm

Maximum conducted power was measured by replacing the antenna with an adapter for conductive measurement.

**Conducted output power (Average):**

GSM	Frequency		GSM mode	
	Channel	MHz	before	after
GSM850	128	824.2	32.1 G	32.H8
	190	836.6	32.Î I	32.Î 2
	251	848.8	32.+'	H2.Î 6
GSM	Frequency		GSM mode	
	Channel	MHz	before	after
GSM1900	512	1850.2	29.+,	29.Î 7
	661	1880.0	29.Î ï	29.Í 5
	810	1909.8	29.Î J	29.Î 8





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System and Channel	Power values (dbm)	Average factor (db)	Time average (dbm) (before)	Time average (dbm) (after)
GSM850 CH251(1TS)	---	---	---	---
GPRS850 CH251				
1TS	32.24	-9.03	23.21	---
2TS	32.13	-6.02	<b>26.4%</b>	<b>26.31</b>
GSM1900 Ch 512(1TS)	---	---	---	---
GPRS1900 Ch 512				
1TS	30.14	-9.03	21.11	---
2TS	29.66	-6.02	<b>23.4%</b>	<b>23.56</b>

2TS,3TS and 4TS in a similar way

Multislot Class	Max Slot Allocation			Allowable Configuration	Max Data Rate
	Downlink	Uplink	Active		
10	4	2	5	1 up; 4 down	8-12K bps Send 32-48K bps Receive
				2 up; 3 down	16-24K bps Send 24-36K bps Receive



[illegible]





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	GSM 850 head	GSM 850 body	GPRS 850 body
GSM 850 SAR(worst)	0.742	0.743	0.460
Bluetooth SAR(worst)	0	0	0
Σ1g-SAR	0.742	0.743	0.460
remark	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

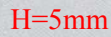
	GSM 1900 head	GSM 1900 body	GPRS 1900 body
GSM 1900 SAR(worst)	0.523	0.684	0.504
Bluetooth SAR(worst)	0	0	0
Σ1g-SAR	0.523	0.684	0.504
remark	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)	Less than 1.6W/kg(limit)

antenna1	antenna2	GSM to Bluetooth antenna distance(cm)	remark
GSM	Bluetooth	0.5cm	Please refer to page 27

Device mode, f	P, dBm	stand-alone SAR(W/kg)
GSM 850,251	31.21	<b>Yes</b> , Please refer to page 23;29
GSM 1900,512	28.61	<b>Yes</b> , Please refer to page 23;29
GPRS 850,251	24.34	<b>Yes</b> , Please refer to page 24;30
GPRS 1900,512	22.66	<b>Yes</b> , Please refer to page 24;30
Bluetooth, 2402	0.56	<b>No</b> , Please refer to page 25

(x,y)	d <sub>xy</sub> , cm	simultaneous Tx SAR	remarks
<b>GSM to Bluetooth antenna distance(cm)</b>	0.5 cm	<b>No</b>	GSM/BT , Antenna distance is less than 2.5cm ,the sum of BT and GSM SAR is less than 1.6 W/kg. so no Simultaneous SAR needed.



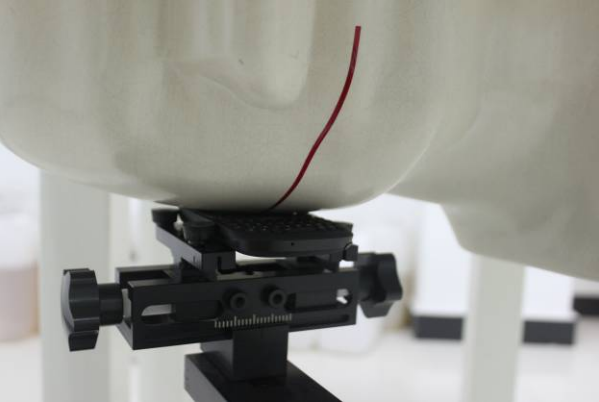

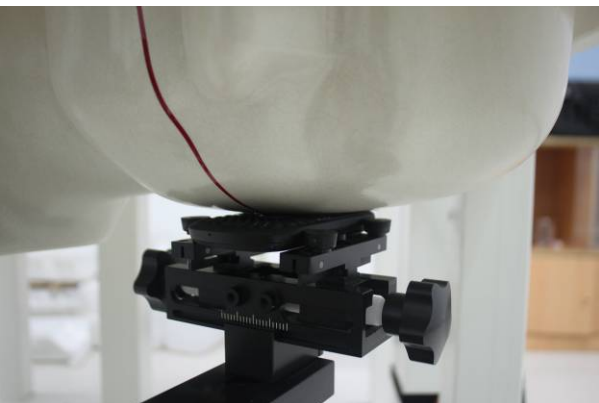

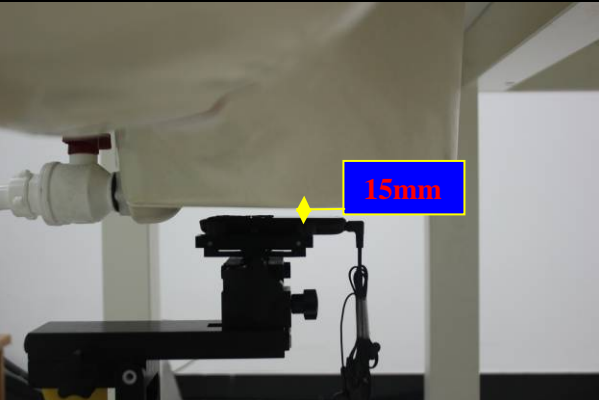
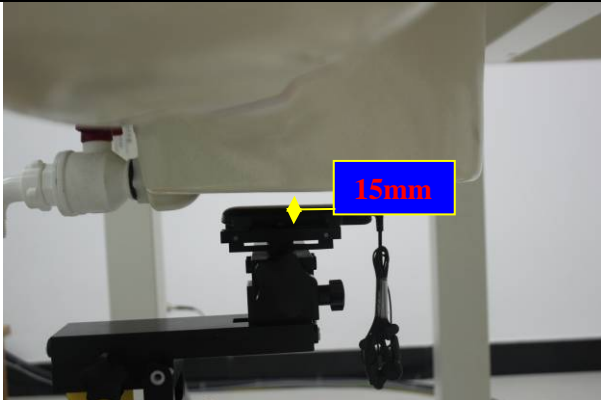
[illegible]

## Bluetooth antenna

## GSM antenna



## 11.6 EUT SETUP PHOTOS

Cheek device with right head phantom.	Tilt device with right head phantom
	
<b><u>EUT Setup Configuration 1</u></b>	<b><u>EUT Setup Configuration 2</u></b>
Cheek device with left head phantom.	Tilt device with left head phantom
	
<b><u>UT Setup Configuration 3</u></b>	<b><u>EUT Setup Configuration 4</u></b>
Up in body position	Down in body position
	
<b><u>EUT Setup Configuration 5</u></b>	<b><u>EUT Setup Configuration 6</u></b>





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Date of Measurement: May 8, 2012

Date of Measurement: May 8, 2012



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Flat(1.5cm)	Fixed	251	848.8	20.0	0.168	1.6
Test mode: <b>GPRS 850 CLASS 12</b> EUT Configuration 6:Down						
EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
Flat(1.5cm)	Fixed	251	848.8	20.0	<b>0.460</b>	1.6
Remarks: For SAR testing, In GSM link mode, its crest factor is 8. (Duty cycle: 1:8); In GPRS link mode, its crest factor is 2. (Duty cycle: 1:2)						

## GSM 1900 & GPRS 1900

Test mode: <b>GSM 1900</b> EUT Configuration 5:UP						
EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
<b>Flat</b> (1.5cm)	Fixed	512	1850.2	20.0	0.454	1.6
Test mode: <b>GSM 1900</b> EUT Configuration 6:Down						
EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
<b>Flat</b> (1.5cm)	Fixed	512	1850.2	20.0	<b>0.684</b>	1.6
		661	1880.0	20.0	0.657	
		810	1909.8	20.0	0.662	
Test mode: <b>GPRS 1900 CLASS 12</b> EUT Configuration 5:UP						
EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
<b>Flat</b> (1.5cm)	Fixed	512	1850.2	20.0	0.207	1.6
Test mode: <b>GPRS 1900 CLASS 12</b> EUT Configuration 6:Down						
EUT Setup Condition		Frequency		Liquid Temp [°C]	SAR(1g) (W/kg)	Limit (W/kg)
Position	Antenna	Channel	MHz			
<b>Flat</b> (1.5cm)	Fixed	512	1850.2	20.0	<b>0.504</b>	1.6

Remarks: For SAR testing, In GSM link mode, its crest factor is 8. (Duty cycle: 1:8);  
In GPRS link mode, its crest factor is 2. (Duty cycle: 1:2)



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[illegible]





**Compliance Certification Services Inc.**  
Report No: KS120507A01-SF











## 13. EQUIPMENT LIST & CALIBRATION STATUS

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Due
P C	HP	Core(rm)3.16G	CZCO48171H	N/A
Signal Generator	Agilent	E8257C	MY43321570	05/13/2012
S-Parameter Network Analyzer	Agilent	E5071B	MY42301382	03/16/2013
Wireless Communication Test Set	R&S	CMU200	SN:B23-03291	05/13/2012
Power Meter	Agilent	E4416A	QB41292714	03/16/2013
Peak & Average sensor	Agilent	E9327A	CF0001	03/16/2013
E-field PROBE	SPEAG	EX3DV4	3755	01/20/2013
DIPOLE 835MHZ ANTENNA	SPEAG	D835V2	4d114	01/10/2013
DIPOLE 1900MHZ ANTENNA	SPEAG	D1900V2	5d136	01/05/2013
DIPOLE 2450MHZ ANTENNA	SPEAG	D2450V2	817	01/26/2013
DUMMY PROBE	SPEAG	DP_2	SPDP2001AA	N/A
SAM PHANTOM (ELI4 v4.0)	SPEAG	QDOVA001BB	1102	N/A
Twin SAM Phantom	SPEAG	QD000P40CD	1609	N/A
ROBOT	SPEAG	TX60	F10/5E6AA1/A101	N/A
ROBOT KRC	SPEAG	CS8C	F10/5E6AA1/C101	N/A
LIQUID CALIBRATION KIT	ANTENNESSA	41/05 OCP9	00425167	N/A
DAE	SD000D04BJ	DEA4	1245	01/11/2013

## 14. FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part, Kunshan City, Jiangsu Province, China.





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- [12] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992..Dosimetric Evaluation of Sample device, month 1998 9
- [13] NIS81 NAMAS, \The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
- [14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device. month 1998 10





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Exhibit	Content
1	System Performance Check Plots
2	SAR Test Plots
3	Probe calibration report EX3DV4 SN3755
4	Dipole calibration report D835V2 SN:4d114
5	Dipole calibration report D1900V2-SN:5d136
6	DAE calibration report DEA4 SD000D04BJ SN: 1245





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**The plots are showing as followings.**



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## System Performance Head Check-D850\_2012.05.08

Communication System: CW; Frequency: 850 MHz

Medium parameters used:  $f = 850$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 41.52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

### DASY5 Configuration:

- Probe: EX3DV4 - SN3755; ConvF(8.99, 8.99, 8.99); Calibrated: 1/20/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 1/11/2012
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- Measurement SW: DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Area Scan (7x12x1):**

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 3.356mW/g

**System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Zoom Scan (7x7x7) /Cube 0:**

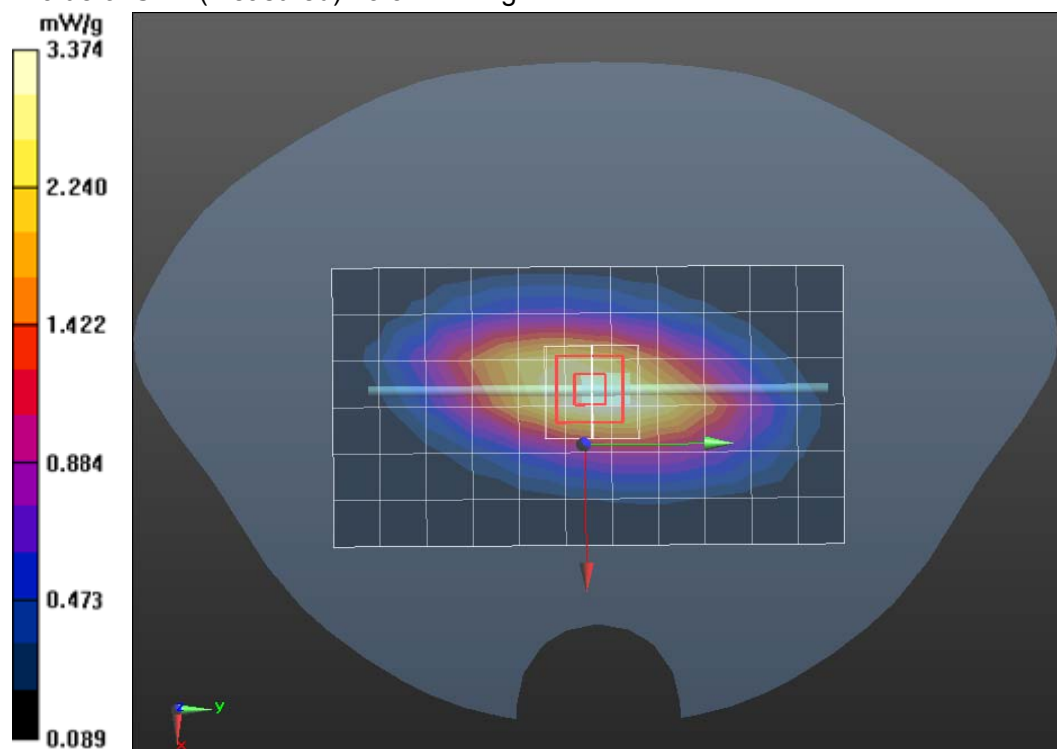
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 58.77 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 3.595W/kg

**SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.58 mW/g**

Maximum value of SAR (measured) = 3.374 mW/g





Test Laboratory: Compliance Certification Services Inc.

# System Performance Body Check-D850\_2012.05.08

DUT: Dipole 850 MHz D835V2; Type: D835V2; SN:4d114

Communication System: CW; Frequency: 850 MHz

Medium parameters used:  $f = 850 \text{ MHz}$ ;  $\sigma = 0.98 \text{ mho/m}$ ;  $\epsilon_r = 55.24$ ;  $\rho = 1000 \text{ kg/m}^3$

### Phantom section: Flat Section

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

### DASY5 Configuration:

- Probe: EX3DV4 - SN3755; ConvF(9.07, 9.07, 9.07); Calibrated: 1/20/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 1/11/2012
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609

Measurement SW: DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Area Scan (7x12x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 3.271mW/g

**System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Zoom Scan (7x7x7)/Cube 0:**

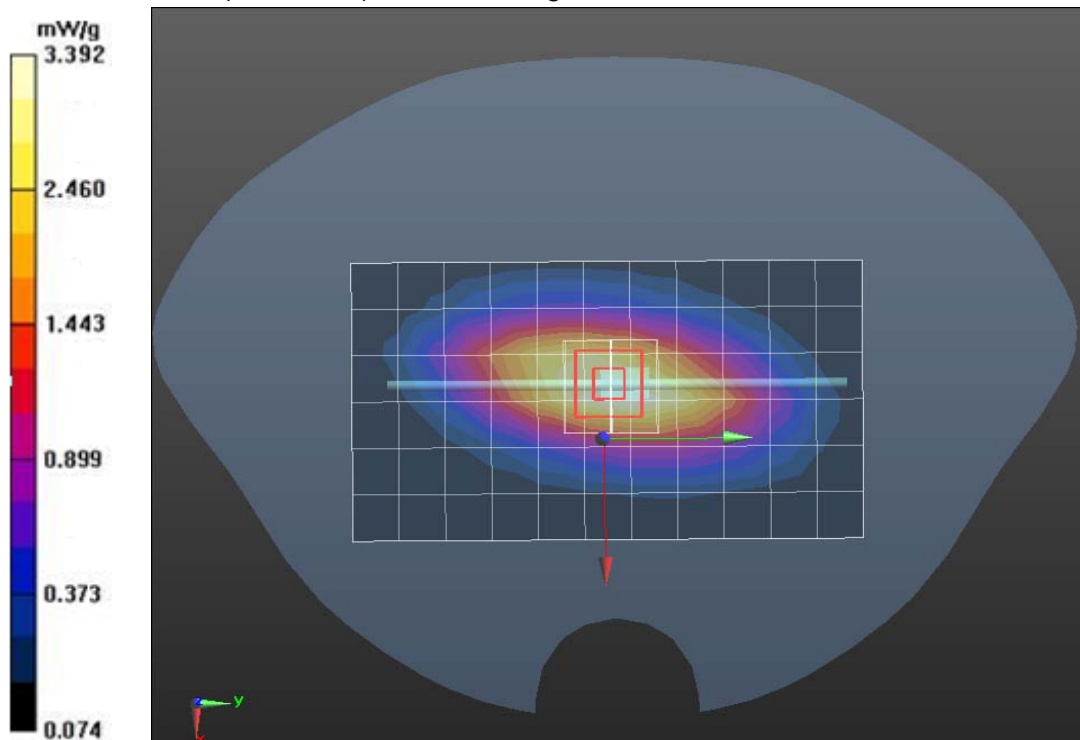
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 58.83 V/m; Power Drift = 0.0022 dB

Peak SAR (extrapolated) = 3.428 W/kg

**SAR(1 g) = 2.51 mW/g; SAR(10 g) = 1.64 mW/g**

Maximum value of SAR (measured) = 3.392 mW/g





Test Laboratory: Compliance Certification Services Inc.

# System Performance Head Check-D1900\_2012.05.08

**DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d136**

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.39 \text{ mho/m}$ ;  $\epsilon_r = 40.16$ ;  $\rho = 1000 \text{ kg/m}^3$

### Phantom section: Flat Section

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

## DASY5 Configuration:

- Probe: EX3DV4 - SN3755; ConvF(7.84, 7.84, 7.84); Calibrated: 1/20/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 1/11/2012
- Phantom: SAM1; Type: SAM; Serial: 1609
- Measurement SW: DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (EX-Probe) 2/Area Scan (7x7x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 11.958 mW/g

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (EX-Probe) 2/Zoom Scan (7x7x7) /Cube 0:**

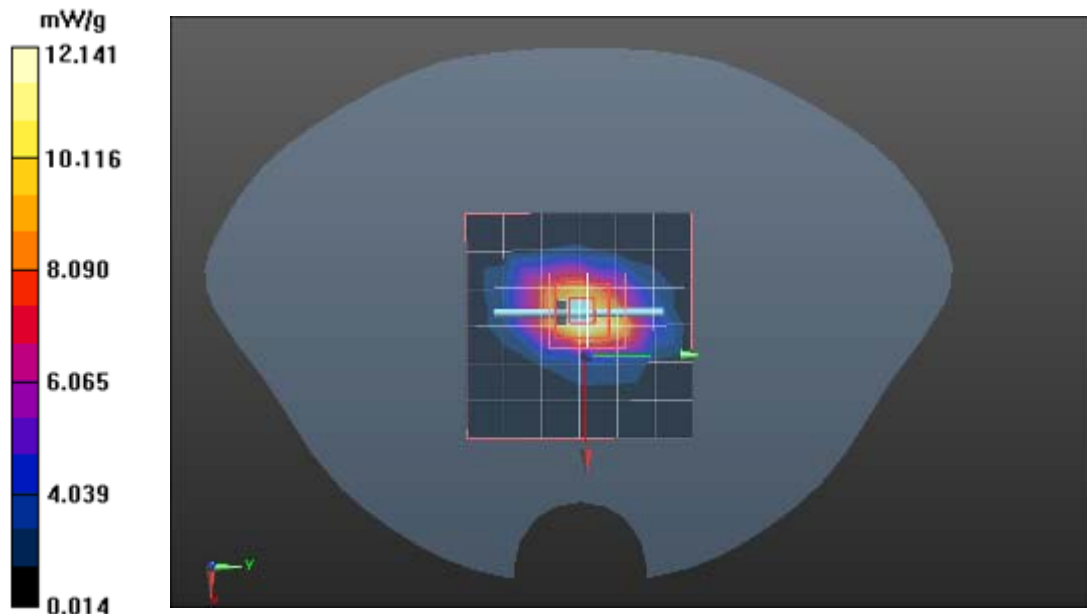
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 97.61 V/m; Power Drift = 0.0033 dB

Peak SAR (extrapolated) = 17.549 W/kg

**SAR(1 g) = 10.04 mW/g; SAR(10 g) = 5.28 mW/g**

Maximum value of SAR (measured) = 12.141 mW/g





Test Laboratory: Compliance Certification Services Inc.

# System Performance Body Check-D1900\_2012.05.08

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d136

Communication System: CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.54 \text{ mho/m}$ ;  $\epsilon_r = 54.24$ ;  $\rho = 1000 \text{ kg/m}^3$

### Phantom section: Flat Section

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

## DASY5 Configuration:

- Probe: EX3DV4 - SN3755; ConvF(7.23, 7.23, 7.23); Calibrated: 1/20/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 1/11/2012
- Phantom: SAM1; Type: SAM; Serial: 1609
- Measurement SW: DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (EX-Probe) 2/Area Scan (7x7x1):**

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 12.986mW/g

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW, dist=3.0mm (EX-Probe) 2/Zoom Scan (7x7x7) /Cube 0:**

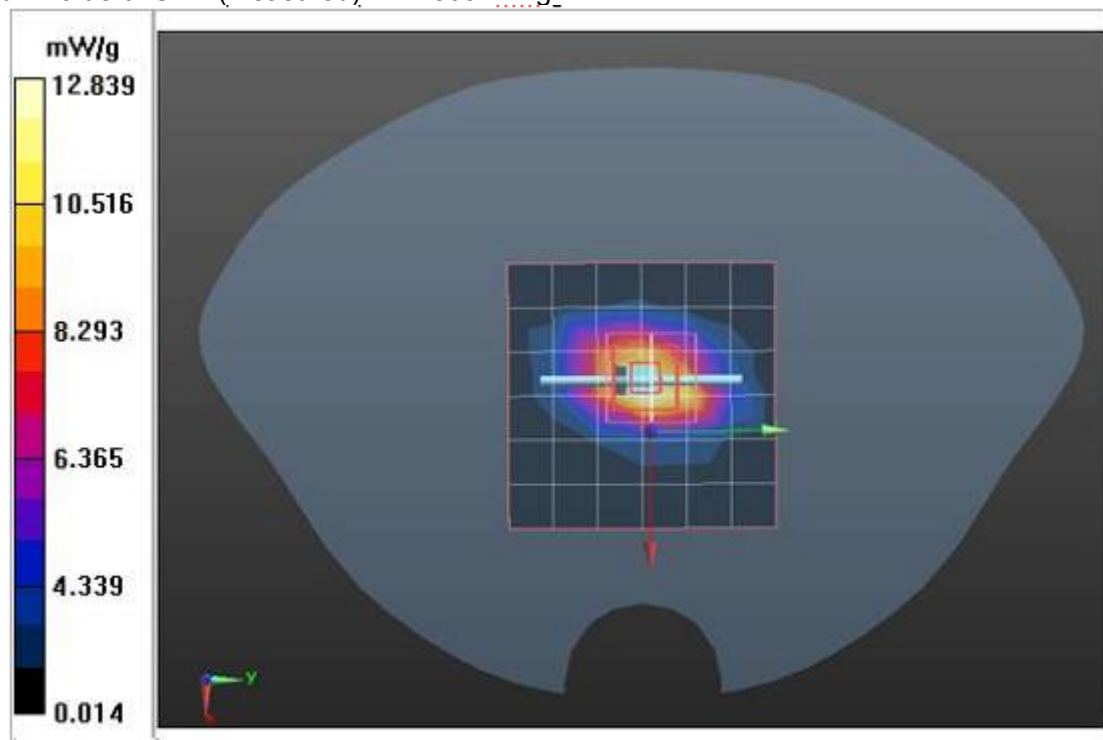
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 102.5V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 16.529 W/kg

**SAR(1 g) = 10.36 mW/g; SAR(10 g) = 5.14 mW/g**

Maximum value of SAR (measured) = 12.839mW/g





[illegible]

**The DASY Calibration Certificates are showing as followings .**



**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)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client **CCS (Auden)**

Certificate No: D835V2-4d114\_Jan11

# CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d114

Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
--------------------------	--

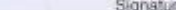

Calibration date: January 10, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292789	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Jeton Kasrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 10, 2011

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Certificate No: D835V2-4d114 Jan11

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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.

Certificate No: D835V2-4d114 Jan11

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 mW / g
SAR normalized	normalized to 1W	9.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.57 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 mW / g
SAR normalized	normalized to 1W	6.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.23 mW / g ± 16.5 % (k=2)</b>



[illegible]

The following parameters and calculations were applied.

### SAR result with Body TSL

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	1.66 mW / g
SAR normalized	normalized to 1W	6.64 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>6.55 mW / g ± 16.5 % (k=2)</b>





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### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.3 \Omega - 2.6 j\Omega$
Return Loss	$\sim 29.5 \text{ dB}$

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.6 \Omega - 4.6 j\Omega$
Return Loss	- 25.5 dB

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.400 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.

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

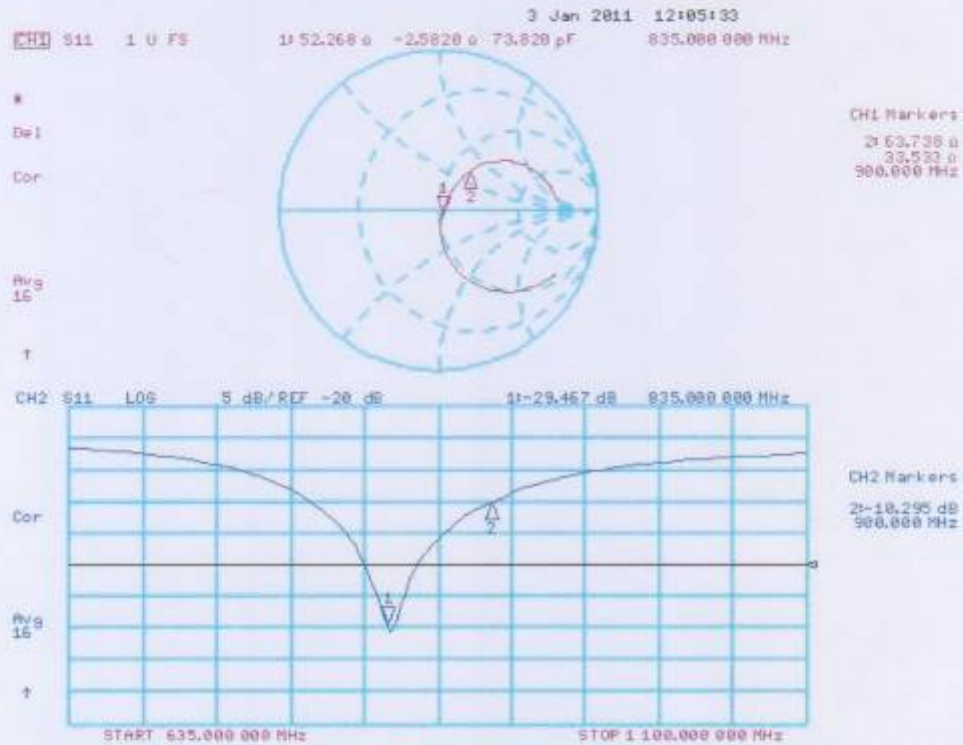
Manufactured by	SPEAG
Manufactured on	June 29, 2010







### Impedance Measurement Plot for Head TSL





## DASY5 Validation Report for Body

Date/Time: 10.01.2011 10:33:12

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d114

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

Medium: MSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 54.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

### DASY5 Configuration:

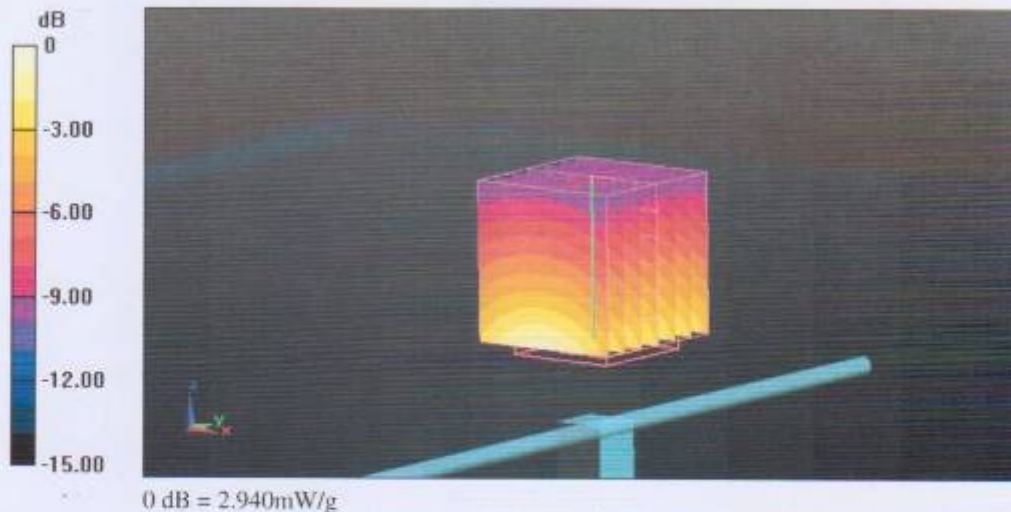
- Probe: ES3DV3 - SN3205; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement  
grid: dx=5mm, dy=5mm, dz=5mm

Peak SAR (extrapolated) = 3.727 W/kg

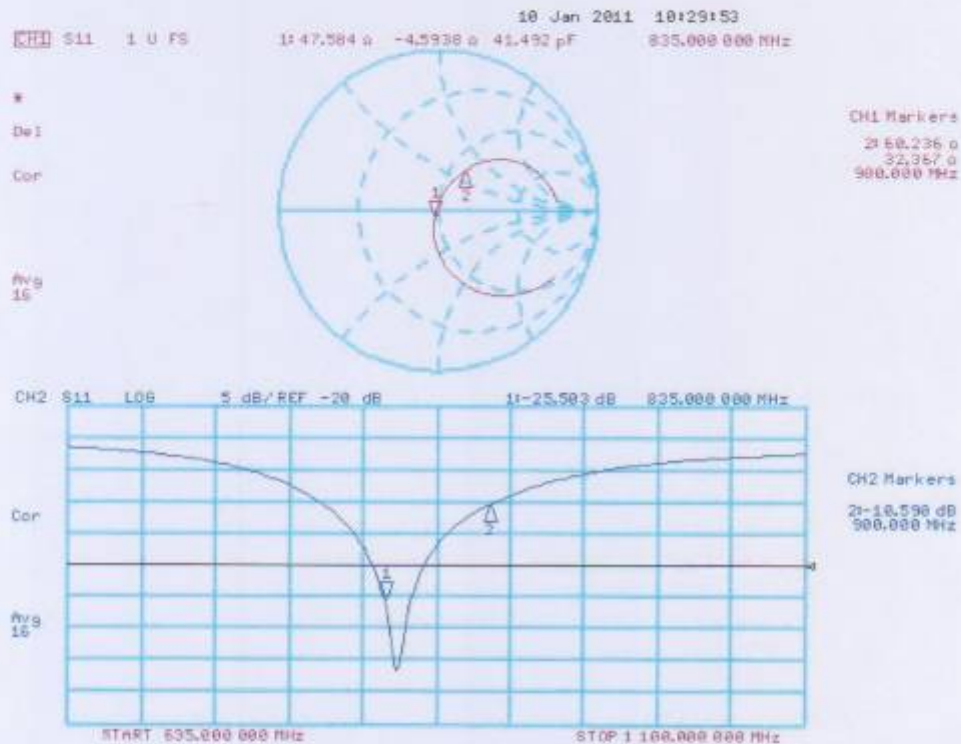
SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.01 mW/g

Maximum value of SAR (measured) = 2.944 mW/g





### Impedance Measurement Plot for Body TSL





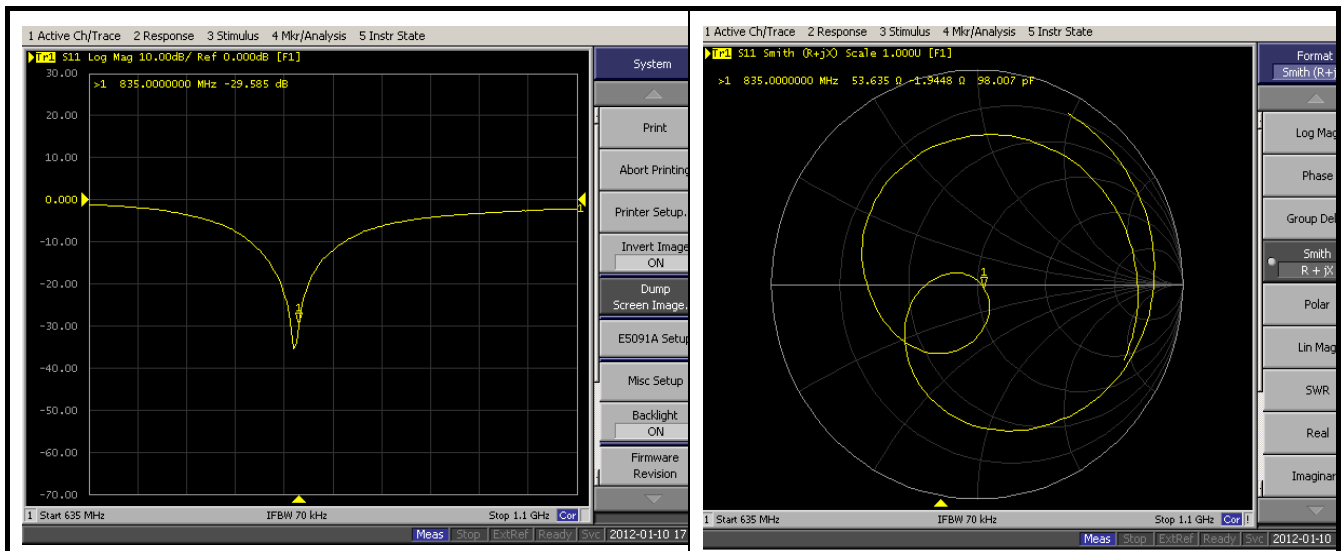
## DASY Calibration Certificate-Extended Dipole-835MHz Calibrations

According to KDB 450824 D02, Dipoles must be recalibrated at least once every three years; however, immediate re-calibration is required for the following conditions. The test laboratory must ensure that the required supporting information and documentation have been included in the SAR report to qualify for the extended 3-year calibration interval

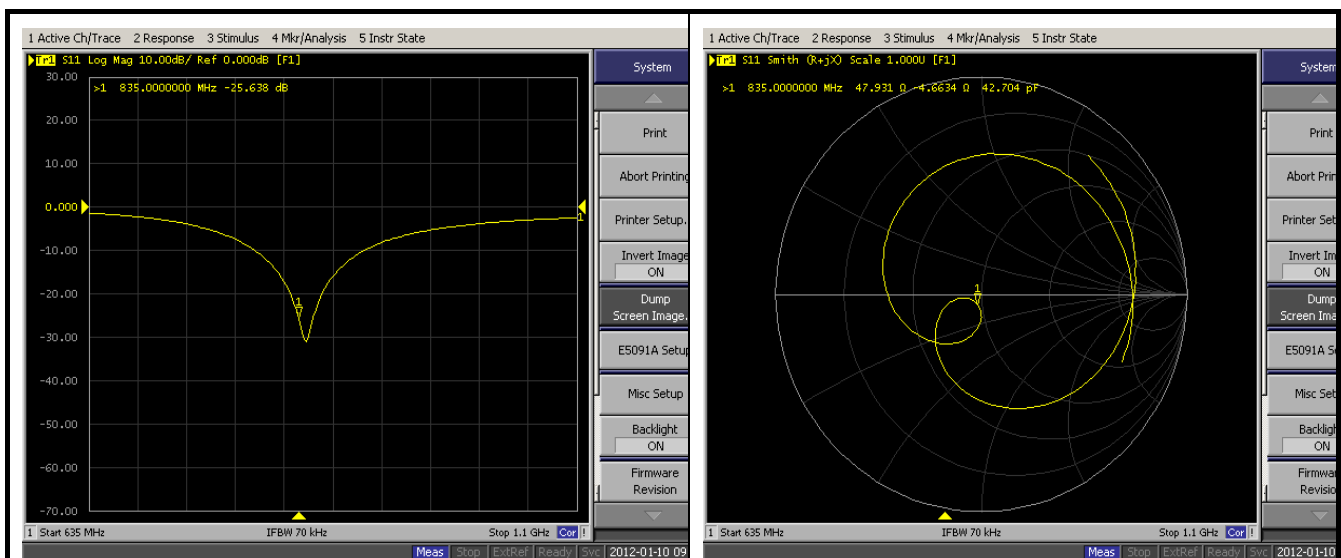
- 1) When the most recent return-loss, measured at least annually, deviates by more than 20% from the previous measurement (i.e. 0.2 of the dB value) or not meeting the required -20 dB return-loss specification
- 2) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, deviates by more than 5  $\Omega$  from the previous measurement

**Dipole Verification plot : D835V2 S/N:4d114**

### 835MHz for Head:



## 835MHz for Body:





[illegible]

According to up table, the return loss is  $< -20\text{dB}$ , deviates by less than 20% from the previous measurement ; the Real Impedance and Imaginary Impedance are all within  $5\ \Omega$  compared to the previous measurement .  
So, the verification result should extended calibration.



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Client CCS (Auden)

Certificate No: D1900V2-5d136 Jan11

# CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d136

Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
--------------------------	--

Calibration date: January 05, 2011



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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 6481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: January 5, 2011

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Certificate No: D1900V2-5d136 Jan11

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**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.

Certificate No: D1900V2-5d136 Jan11

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.5 ± 6 %	1.43 mho/m ± 6 %
Head TSL temperature during test	(20.6 ± 0.2) °C	----	----

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>40.5 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.33 mW / g
SAR normalized	normalized to 1W	21.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>21.1 mW / g ± 16.5 % (k=2)</b>





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The following parameters and calculations were applied.

### SAR result with Body TSL

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.31 mW / g
SAR normalized	normalized to 1W	21.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>21.1 mW / g ± 16.5 % (k=2)</b>

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## DASY5 Validation Report for Head TSL

Date/Time: 04.01.2011 11:58:06

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d136

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

Medium: HSL U12 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 38.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6 Build (401)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement

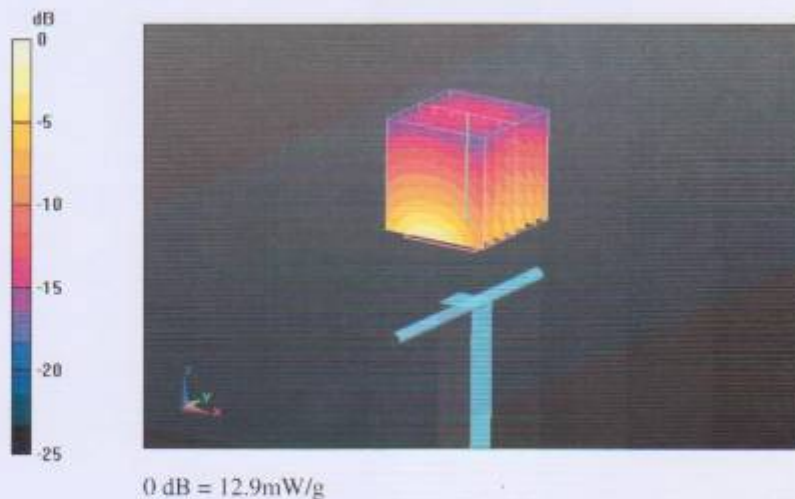
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.7 V/m; Power Drift = 0.035 dB

Peak SAR (extrapolated) = 18.9 W/kg

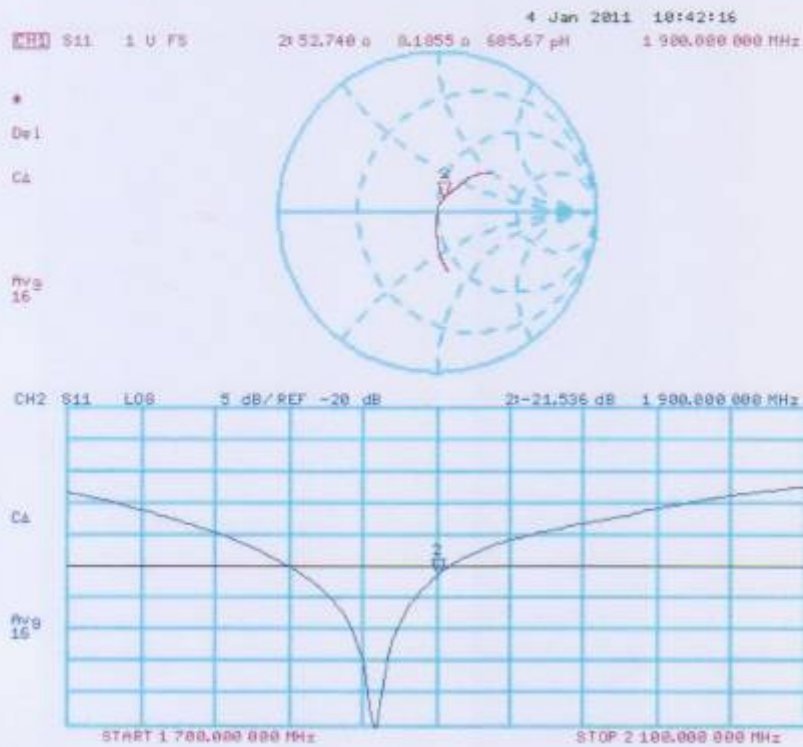
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.33 mW/g

Maximum value of SAR (measured) = 12.9 mW/g





### Impedance Measurement Plot for Head TSL





## DASY5 Validation Report for Body

Date/Time: 05.01.2011 10:43:48

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d136

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

Medium: MSL U12 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 53$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6 Build (401)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement

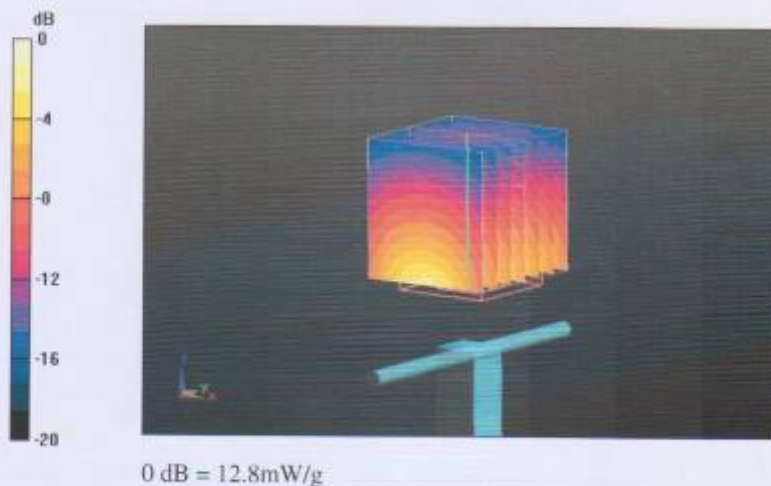
grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 96.3 V/m; Power Drift = -0.054 dB

Peak SAR (extrapolated) = 17.3 W/kg

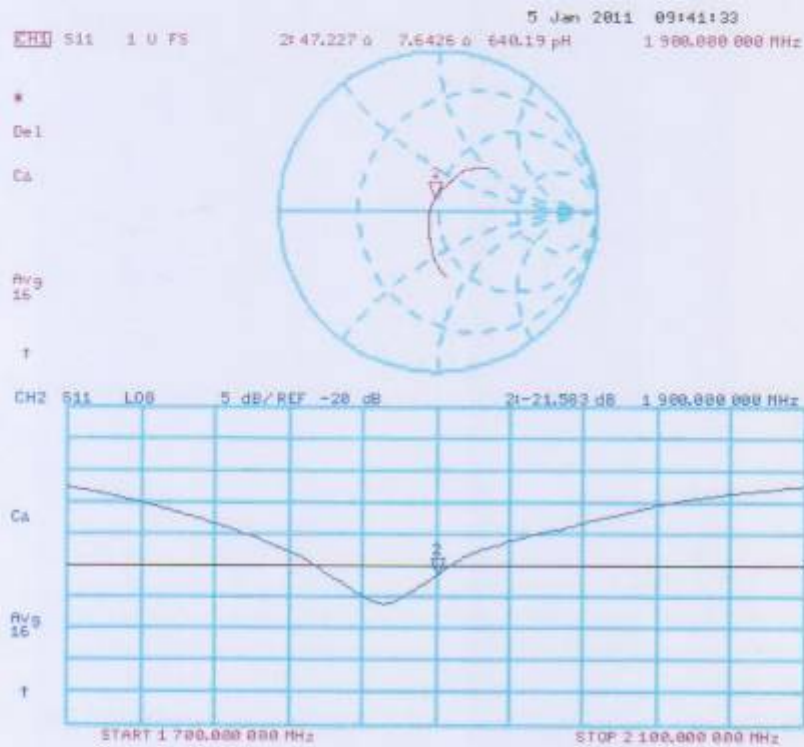
**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.31 mW/g**

Maximum value of SAR (measured) = 12.8 mW/g





### Impedance Measurement Plot for Body TSL





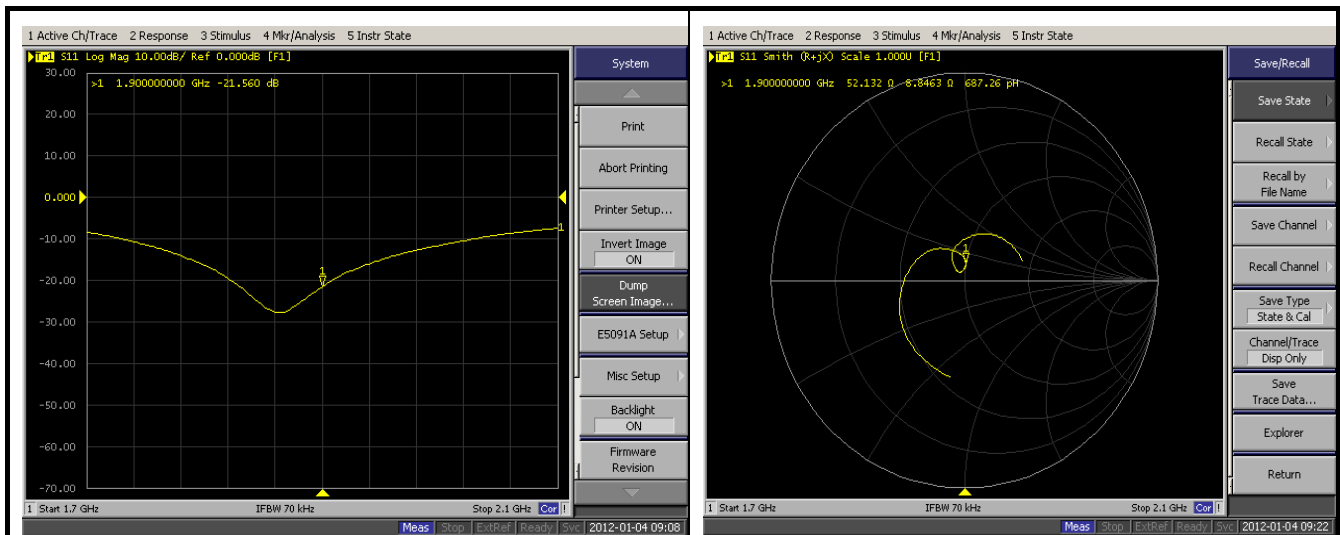
## DASY Calibration Certificate-Extended Dipole-1900MHz Calibrations

According to KDB 450824 D02, Dipoles must be recalibrated at least once every three years; however, immediate re-calibration is required for the following conditions. The test laboratory must ensure that the required supporting information and documentation have been included in the SAR report to qualify for the extended 3-year calibration interval

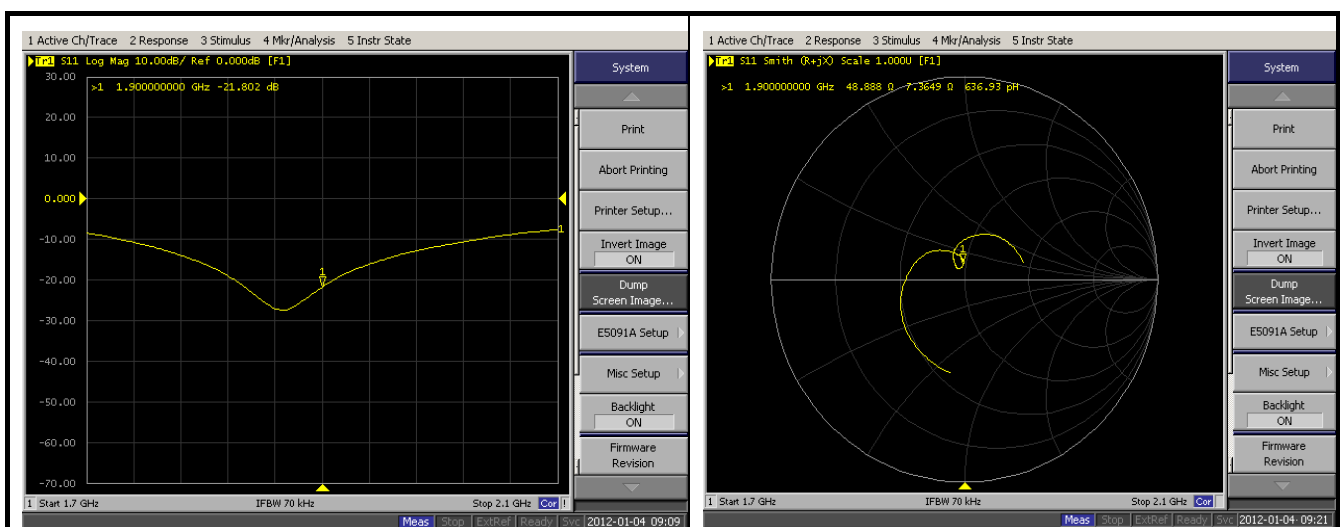
- 1) When the most recent return-loss, measured at least annually, deviates by more than 20% from the previous measurement (i.e. 0.2 of the dB value) or not meeting the required -20 dB return-loss specification
- 2) When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, deviates by more than 5  $\Omega$  from the previous measurement

**Dipole Verification plot : D1900V2-S/N:5d136**

**1900MHz for Head:**



## 1900MHz for Body:





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According to up table, the return loss is  $< -20\text{dB}$ , deviates by less than 20% from the previous measurement ; the Real Impedance and Imaginary Impedance are all within  $5\ \Omega$  compared to the previous measurement .  
So, the verification result should extended calibration.



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Accreditation No.: **SCS 108**

Client **CCS (Auden)**

Certificate No: EX3-3755\_Jan12

# CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3755
--------	------------------

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

Calibration date: January 20, 2012

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 E4419B	GB41293674	1-Apr-11 (No. 217-01136)	Apr-12
Power sensor E4412A	MY41495277	1-Apr-11 (No. 217-01136)	Apr-12
Power sensor E4412A	MY41498087	1-Apr-11 (No. 217-01136)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-11 (No. 217-01159)	Mar-12
Reference 20 dB Attenuator	SN: S5066 (20b)	30-Mar-11 (No. 217-01161)	Mar-12
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-11 (No. 217-01160)	Mar-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Apr-11 (No. DAE4-660_Apr11)	Apr-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-10)	In house check: Oct-12
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function
Calibrated by:	Ketja Poković	Technical Manager

Approved by:	Niels Kuster	Quality Manager
--------------	--------------	-----------------

issued: January 20, 2012

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Certificate No: EX3-3755 Jan12

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Accreditation No.: **SCS 108**

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ 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 effect the E-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.
- **Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z, A, B, C** 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.

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March 16, 2010

January 20, 2012

(Note: non-compatible with DASY2 system!)

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January 20, 2012

DASY/EASY - Parameters of Probe: EX3DV4 SN:3755

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m))^2)^A$	0.49	0.47	0.50	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	99.9	99.3	101.0	

### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc <sup>F</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	157.0	± 2.4 %
			Y	0.00	0.00	1.00	147.8	
			Z	0.00	0.00	1.00	157.0	

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-field uncertainty inside TSL (see Pages 5 and 6).

\* Numerical linearization parameter; uncertainty not required.

<sup>c</sup> Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



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DASY/EASY - Parameters of Probe: EX3DV4 SN:3755

### Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] <sup>C</sup>	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	8.99	8.99	8.99	0.64	0.68 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.36 ± 5%	8.18	8.18	8.18	0.74	0.63 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.84	7.84	7.84	0.63	0.66 ± 11.0%
2000	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.78	7.78	7.78	0.45	0.80 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.07	7.07	7.07	0.30	1.02 ± 11.0%
5200	± 50 / ± 100	36.0 ± 5%	4.67 ± 5%	4.64	4.64	4.64	0.40	1.80 ± 13.1%
5300	± 50 / ± 100	35.9 ± 5%	4.78 ± 5%	4.48	4.48	4.48	0.40	1.80 ± 13.1%
5500	± 50 / ± 100	35.6 ± 5%	4.96 ± 5%	4.45	4.45	4.45	0.45	1.80 ± 13.1%
5600	± 50 / ± 100	35.5 ± 5%	5.07 ± 5%	4.15	4.15	4.15	0.50	1.80 ± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.28 ± 5%	4.31	4.31	4.31	0.45	1.80 ± 13.1%

<sup>2</sup> The validity of  $\pm 100$  MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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DASY/EASY - Parameters of Probe: EX3DV4 SN:3755

### Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] <sup>C</sup>	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.98 ± 5%	9.07	9.07	9.07	0.66	0.68 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	7.48	7.48	7.48	0.91	0.60 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.23	7.23	7.23	0.60	0.72 ± 11.0%
2000	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.31	7.31	7.31	0.58	0.74 ± 11.0%
2450	± 50 / ± 100	52.6 ± 5%	1.95 ± 5%	7.06	7.06	7.06	0.58	0.72 ± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.29 ± 5%	4.02	4.02	4.02	0.50	1.90 ± 13.1%
5300	± 50 / ± 100	48.9 ± 5%	5.42 ± 5%	3.86	3.86	3.86	0.50	1.90 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.66 ± 5%	3.62	3.62	3.62	0.55	1.90 ± 13.1%
5600	± 50 / ± 100	48.5 ± 5%	5.78 ± 5%	3.26	3.26	3.26	0.65	1.90 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.78	3.78	3.78	0.60	1.90 ± 13.1%

2. The validity of  $\pm 100$  MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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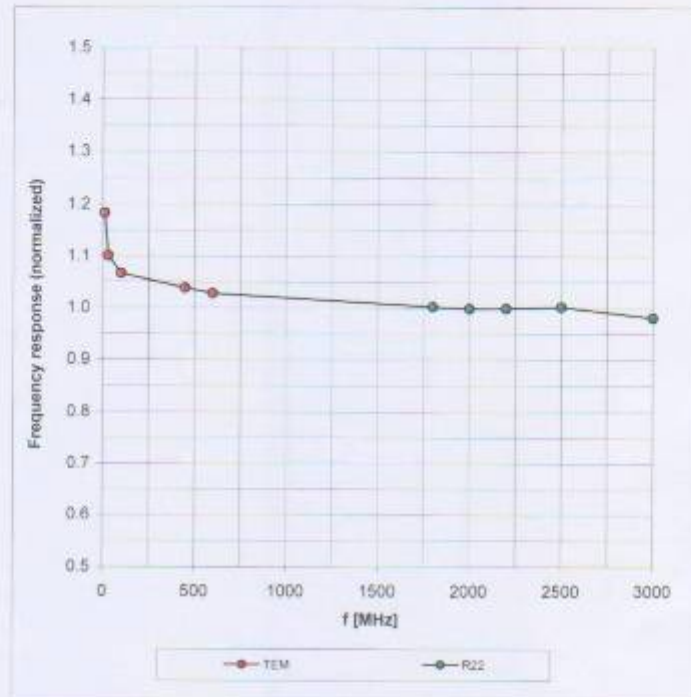


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## Frequency Response of E-Field

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



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

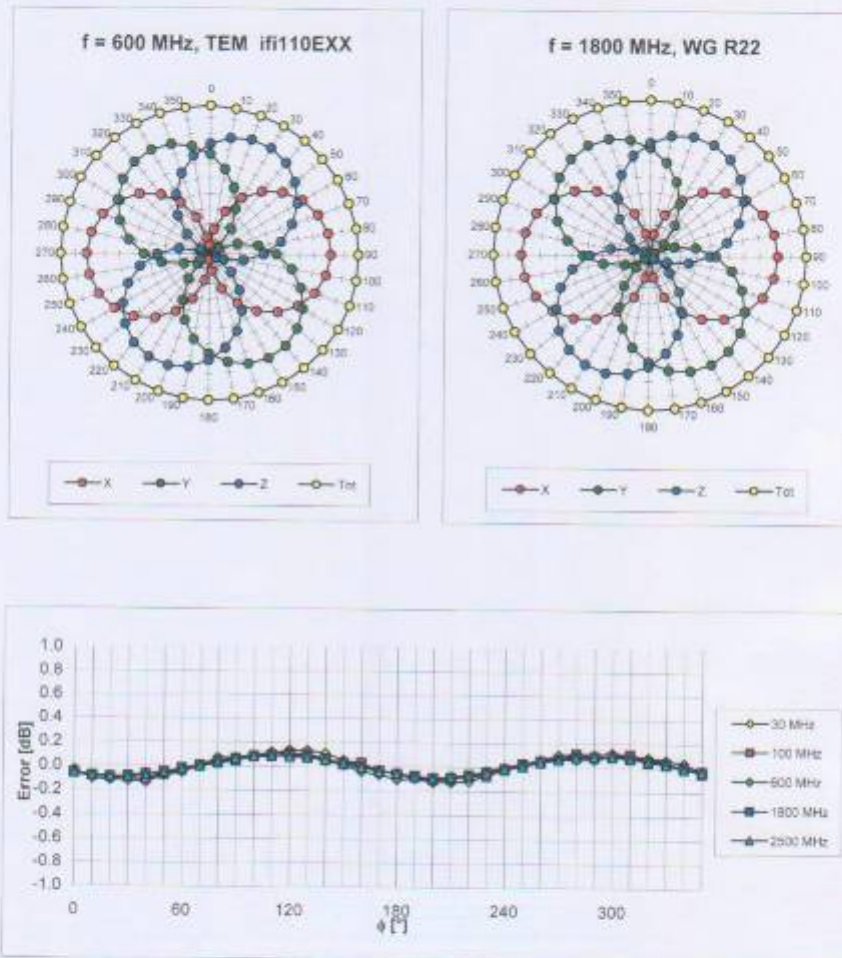
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Receiving Pattern ( $\phi$ ),  $\vartheta = 0^\circ$ 

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

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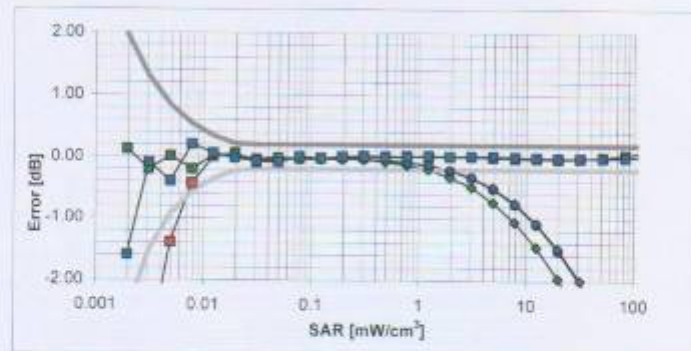
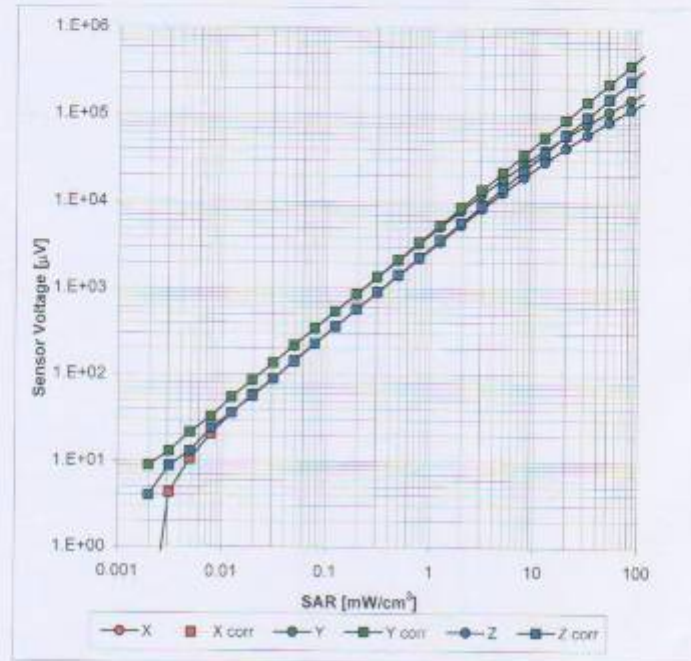
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January 20, 2012

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



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

Certificate No: EX3-3755 Jan12

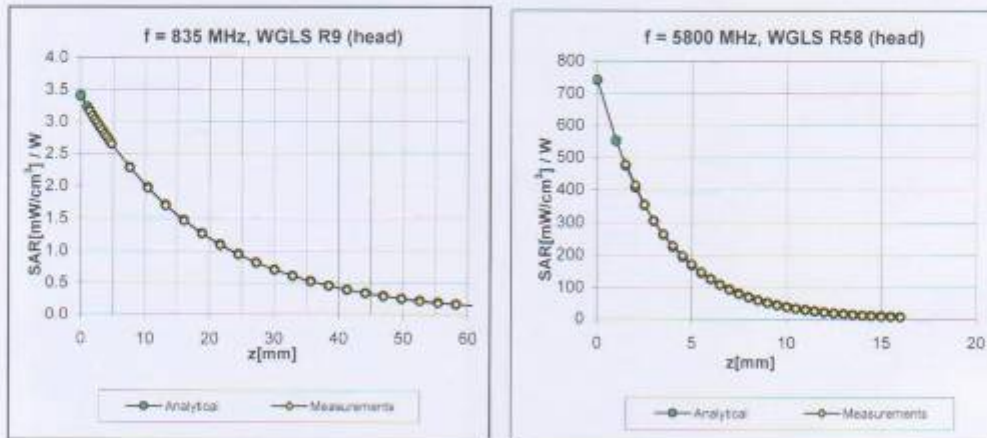
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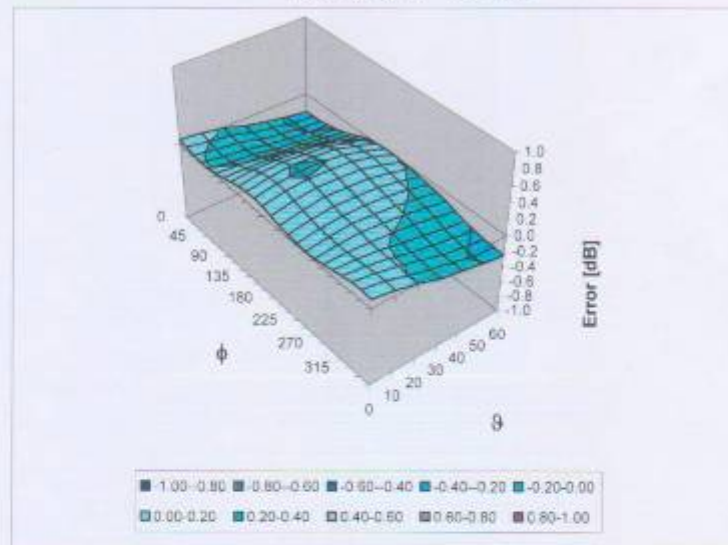
January 20, 2012

### Conversion Factor Assessment



### Deviation from Isotropy in HSL

Error ( $\phi$ ,  $\theta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )





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January 20, 2012

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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



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



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
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**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 108

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client **CCS (Auden)**

Certificate No: DAE4-1245 Jan12

# CALIBRATION CERTIFICATE

Object DAE4 - SD 000 D04 BJ - SN: 1245

Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
--------------------------	---

Calibration date: January 11, 2012

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
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:10376)	Sep-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	07-Jun-11 (In house check)	In house check: Jun-12

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	

Approved by:	Fin Bomholt	R&D Director
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Issued: January 11, 2012

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

Certificate No: DAE4-1245 Jan12

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**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)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA-Multilateral Agreement for the recognition of calibration certificates

## 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.





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A/D - Converter Resolution nominal

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

Calibration Factors	X	Y	Z
High Range	405.949 ± 0.1% (k=2)	404.668 ± 0.1% (k=2)	405.811 ± 0.1% (k=2)
Low Range	3.99652 ± 0.7% (k=2)	3.99470 ± 0.7% (k=2)	3.98099 ± 0.7% (k=2)

### Connector Angle

Connector Angle to be used in DASY system	32.0 ° ± 1 °
---	--------------







[illegible]

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

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**The plots are showing in the file named Appendix C Plots of SAR Test Result**

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Rev. 01

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