



## SAR Test Report

For Firefly R100

FCC ID: R7C-R100

### Application information:

DUT Type	Dual band GSM mobile phone
Trade Name / Mode(s)	Firefly R100
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s)	2.1093; FCC/OET Bulletin 65 Supplement C [July 2001]
Application Type	Certification
Production Unit or Identical Prototype (47 CFR §2.908)	Identical prototype
Antenna type	internal antenna
RF exposure limits	General Population / Uncontrolled

### Device under test (DUT):

DUT ID	IMEI	HW Ver.	SW Ver.
MCN_Firef_0703_L1020k01	011331001234021	PR2	T007

### Accessories of DUT

Accessories ID	Description	Serial Number
MCN_Firef_0701_L1020	Charger	2807HB
Earphone 1	Earphone	-

### Executive Summary

The Firefly R100(FCC ID: R7C-R100) is in compliance with the Federal Communications Commission (FCC) Guidelines [OET65, June 2001] for uncontrolled exposure. The tests were performed according to the FCC requirements, and no change was made to the DUT during the tests.

Issued by (Test Engineer):

Cai Jing

Cai Jing, 2007-09-07

Reviewed by:

Liu Rui Bin

Liu Rui Bin, 2007-09-07



Xiong Xiao Hong, 2007-09-07

## Table of Contents

1	General Information.....	3
2	Subject of investigation .....	3
3	Standard .....	5
3.1	Distinction between exposed population, duration of exposure and frequencies .....	5
3.2	Distinction between Maximum Permissible Exposure and SAR Limits .....	5
3.3	SAR limit .....	5
4	Test procedure.....	6
4.1	General requirements.....	6
4.2	Phantom requirements .....	6
4.3	Brain & Muscle Simulating Mixture Characterization.....	6
4.4	Test positions .....	7
4.5	Test to be performed .....	9
5	Test Equipment.....	10
5.1	Location of Test Equipment .....	10
5.1.1	Test Equipment List.....	10
5.1.2	Test System Setup.....	11
5.2	Measurement Procedure .....	11
5.3	Test positions for device under test .....	12
5.4	Test environment .....	15
5.5	Liquid parameters .....	15
5.6	System performance check .....	17
6	SAR results and evaluation.....	18
6.1	Measurement Result .....	18
6.2	Measured conductive power .....	18
6.3	Test results .....	19
6.4	Summary and comparison to the limit.....	20
7	Reference Document.....	21
	Appendix A: Detailed Measurement Report.....	22
	Appendix B: System performance check report .....	28
	Appendix C: Dipole Certification.....	35
	Appendix D: Probe Certification .....	37
	Appendix E: Phantom Conformity .....	55
	Appendix F: Uncertainty Budget.....	58

## 1 GENERAL INFORMATION

	Test Laboratory	Customer
Name:	FlexMobile Test Laboratory	Firefly Mobile, INC
Address:	Huaxia Technology Building, 8 Zhongguangcun Software Park, No. 8, Dongbeiwang West Street, Haidian District, Beijing, P.R.China 100094	250 Parkway Drive Suite 220 Lincolnshire, IL 60069, USA
Contact Person:	Liang Mao	Shawn Novak
Telephone:	+86 10 5875 5075	(847) 353-1984
Fax:	+86 10 5875 4915	-
E-mail:	Mao.liang@cn.flextronics.com	Shawn.novak@fireflymobile.com

## 2 SUBJECT OF INVESTIGATION

Picture of the device under test





The objective of the measurements done by FlexMobile test laboratory was the dosimetric assessment. The examinations have been carried out with the dosimetric assessment system "DASY4" described in clause 5 below.

### 3 STANDARD

In USA the recent FCC exposure criteria [OET 65] are based upon the IEEE Standard C95.1 [IEEE C95.1]. The IEEE standard C95.1 sets limits for human exposure to radio frequency electromagnetic in the frequency range 3 kHz to 300GHz.

#### 3.1 Distinction between exposed population, duration of exposure and frequencies

The American standard [IEEE C95.1] distinguishes between controlled and uncontrolled environment. Controlled environments are locations where there is exposure that may be incurred by persons who are aware of the potential for exposure as a concomitant of employment or by other cognizant persons. Uncontrolled environments are locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces. For exposure in controlled environments higher field strengths are admissible. In addition the duration of exposure is considered.

Due to the influence of frequency on important parameters, as the penetration depth of the electromagnetic fields into the human body and the absorption capability of different tissues, the limits in general vary with frequency.

#### 3.2 Distinction between Maximum Permissible Exposure and SAR Limits

The biological relevant parameter describing the effects of electromagnetic fields in the frequency range of interest is the specific absorption rate SAR (dimension: power/mass). It is a measure of the power absorbed per unit mass. The SAR may be spatially averaged over the total mass of an exposed body or its parts. The SAR is calculated from the R.M.S. electric field strength  $E$  inside the human body, the conductivity  $\sigma$  and the mass density  $\rho$  of the biological tissue:

$$SAR = \sigma \frac{E^2}{\rho} = c \frac{\partial T}{\partial t} \Big|_{t \rightarrow 0+}$$

The specific absorption rate describes the initial rate of temperature rise  $\partial T/\partial t$  as a function of the specific heat capacity  $c$  of the tissue. A limitation of the specific absorption rate pervers an excessive heating of the human body by electromagnetic energy.

As it is sometimes difficult to determine the SAR directly by measurement (e.g. whole body averaged SAR), the standard specifies more readily measurable maximum permissible exposures in terms of external electric  $E$  and magnetic field strength  $H$  and power density  $S$ , derived from the SAR limits. The limits for  $E$ ,  $H$  and  $S$  have been fixed so that even under worst case conditions, the limits for the specific absorption rate SAR are not exceeded.

#### 3.3 SAR limit

In this report the comparison between the American exposure limits and the measured data is made using the peak spatial-average SAR; the power level of the device under test guarantees that the whole body averaged SAR is not exceeded.

Having in mind a worst case consideration, the SAR limit is valid for uncontrolled environment and mobile respectively portable transmitters. According to table below the SAR values have to be averaged over a mass of 1g ( $SAR_{1g}$ ) with the shape of a cube.

**SAR Test Report**

Relevant peak spatial-average SAR limit averaged over a mass of 1g.

Exposure limits	SAR(mw/g)	
	General Population/Uncontrolled Environment	Occupational/Controlled Exposure Environment
Spatial Average ANSI (Averaged over the whole body)	0.08	0.4
Spatial Peak ANSI (Averaged over any 1-g of tissue)	1.6	8.0
Spatial Peak ICNIRP/ANSI (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Localized SAR - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

## 4 TEST PROCEDURE

IEEE has published a recommended practice for determining the peak spatial-average specific absorption rate (SAR) in the human body due to wireless communications devices [IEEE 1528-2003] for evaluation compliance of mobile phones with IEEE Standard C95.1 [IEEE C95.1]. The standard defines protocols of the measurement of the specific absorption rate (SAR) inside a simplified model of the head of users. It applies to mobile telecommunication equipment in the frequency range from 300 MHz to 3GHz intended to be operated while held next to the ear.

### 4.1 General requirements

The test shall be performed in a laboratory with an environment which avoids influence on SAR measurements by ambient EM sources and any reflection from the environment itself. The ambient temperature shall be in the range of 20°C to 24°C during the test.

### 4.2 Phantom requirements

The phantom is a simplified representation of the human anatomy and comprised of material with electrical properties similar to the corresponding tissues. The physical characteristics of the phantom model shall resemble the head and the neck of a user since the shape is a dominant parameter for exposure.

The shell of the phantom shall be made of low permittivity material and the thickness tolerance shall be  $\pm 0.2\text{mm}$ . Additionally the phantom shall enable to simulate both right and left hand operation of the device under test.

For the measurements the Specific Anthropomorphic Mannequin (SAM) which meet these requirements, shall be used.

### 4.3 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bacteriocide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant

**SAR Test Report**

(permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following table. 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.

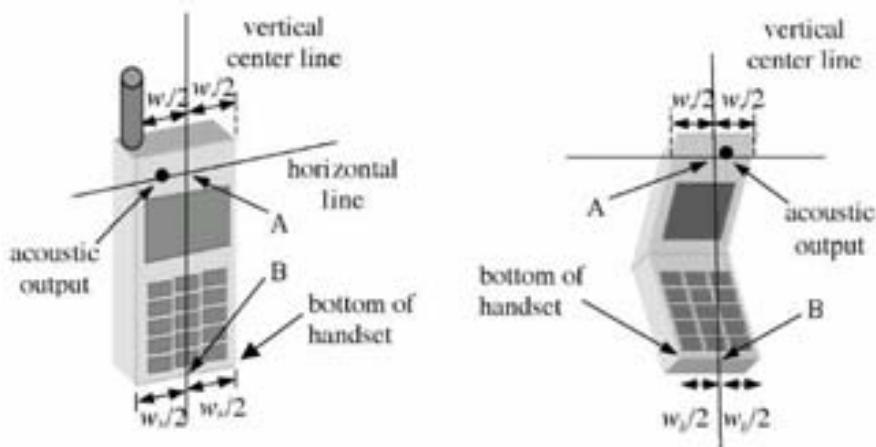
Composition of the Brain & Muscle Tissue Equivalent Matter

INGREDIENTS	SIMULATING TISSUE			
	835MHz Brain	835MHz Muscle	1900MHz Brain	1900MHz Muscle
Water	40.29	50.75	55.24	70.17
DGBE	0	0	44.45	29.44
Sugar	57.90	48.21	0	0
Salt	1.38	0.94	0.31	0.39
Cellulose	0.24	0.00	0	0
Preventol	0.18	0.10	0	0

#### 4.4 Test positions

As it cannot be expected that the user will hold the mobile phone exactly in one well defined position, different operational conditions shall be tested, the IEEE standard requires two test positions. For an exact description helpful geometrical definitions are introduced and shown in the below figure.

There are two imaginary lines on the mobile, 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 the below figure), 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. The two lines intersect at point A.



According to below the human head position is given by means of the following three reference points: auditory canal opening of both ears (RE and LE) and the center of the closed mouth (M). The ear reference points are 15-17 mm above the entrance to the ear canal along the BM line (back-mouth), as shown in the below figure. The plane passing through the two ear canals and M is defined as the reference plane. The line NF (Neck-Front)

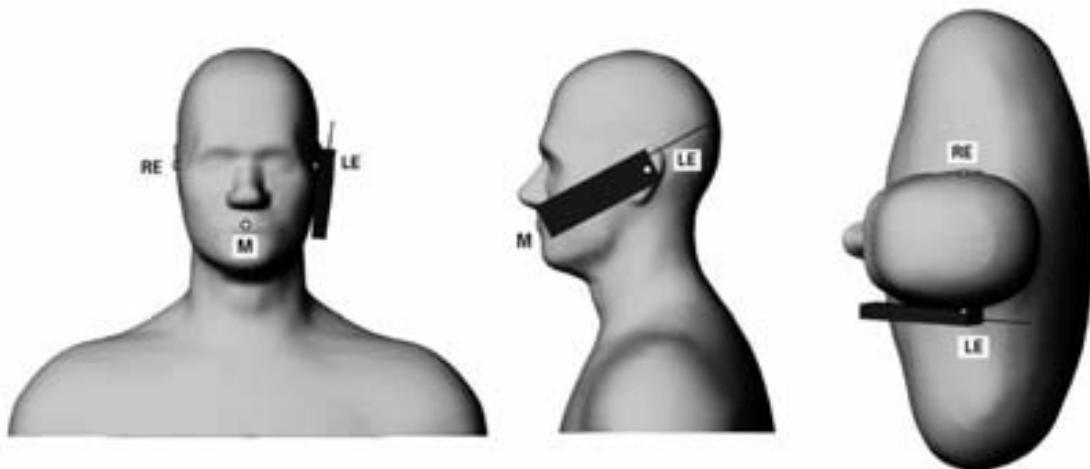
**SAR Test Report**

perpendicular to the reference plane and passing through the RF (or LE) is called the reference pivoting line. Line BM is perpendicular to the NF line. With these definitions the test positions are given by:

➤ **Cheek position:**

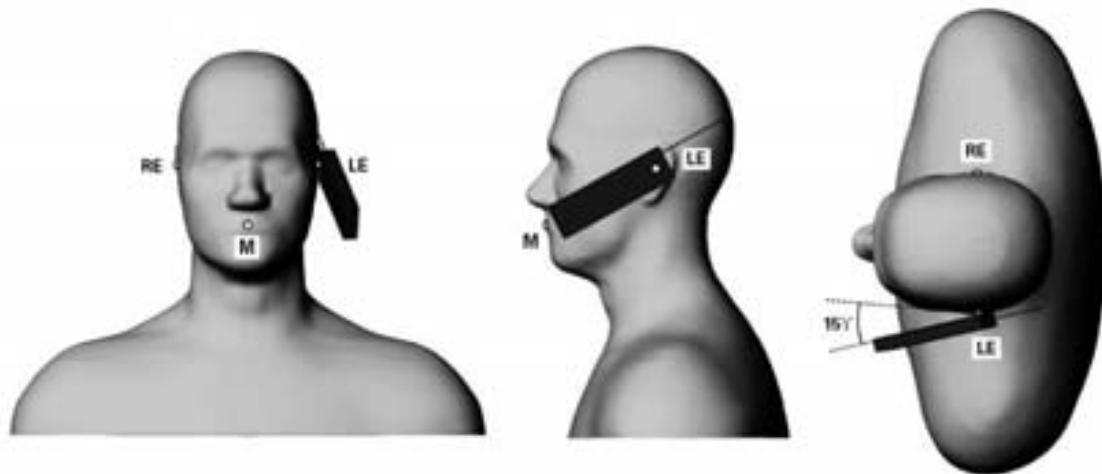
Position the handset close to the surface of phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom, such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear. While maintaining the handset in this plane, rotate it around handset touches the ear. 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). Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point any point on the handset is in contact with a phantom point below the ear.

The cheek position:



➤ **Tilted position:**

While maintaining the orientation of the phone, retract the phone parallel to the reference plane, which is far enough to enable a rotation of the phone by 15°. Rotate the phone around the horizontal line by 15°. While maintaining the orientation of the phone, move the phone parallel to the reference plane until any part of the phone touches the head. In this position, point A will be located on the line RE-LE.



#### 4.5 Test to be performed

The SAR test shall be performed with both phone positions described above, on the left and right side of the phantom. The devices shall be measured for all modes operation when the device is next to the ear, even if the different models operate in the same frequency band. First the SAR test shall be performed using the center frequency of each available operating band and mode with the maximum peak power level. At the device position with highest SAR (check or tilted, left and right), the test is repeated at lowest and highest frequency. In addition, for all other device positions respectively configurations where the spatial peak SAR value is within 2dB of the 1.6W/kg limit, the lowest and highest frequencies should be tested.

For devices with retractable antenna all of the tests described above shall be performed with the antenna fully extended and fully retracted. Other factors that may affect the exposure should also be tested. For example, optional antennas or optional battery packs which may significantly change the volume, lengths, flip open/closed, etc. of the device, or any other accessories which might have the potential to considerably increase the peak spatial-average SAR value.

## 5 TEST EQUIPMENT

### 5.1 Location of Test Equipment

Testing was performed at FlexMobile Test Laboratory.

#### 5.1.1 Test Equipment List

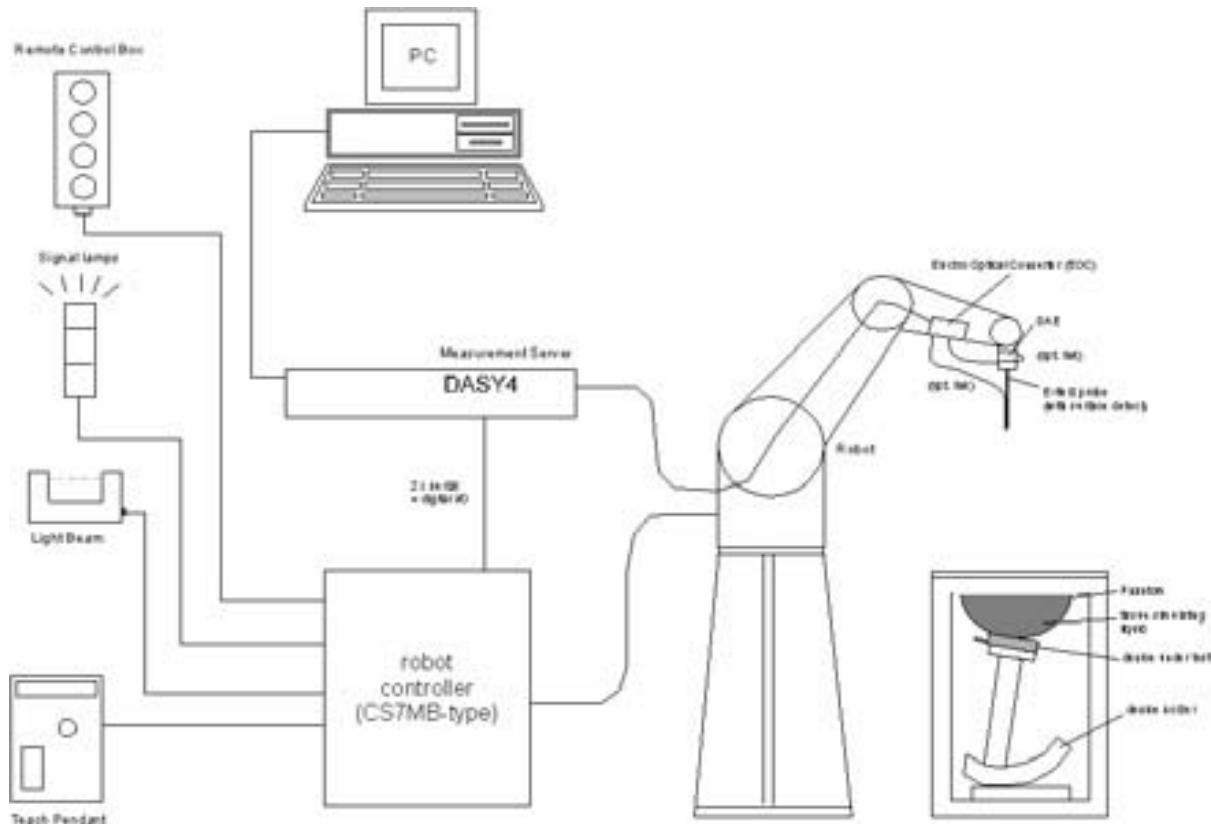
DASY is an abbreviation of “Dosimetric Assessment System” and describes a system that is able to determine the SAR distribution inside a phantom of a human being according to different standards. The DASY4 system consists of the following items:

TYPE	ITEM	S/N	CALIBRATION DATE	DU DATE
CMU200	Wireless Communication Test Set	109172	2007-03-12	2008-03-12
ES3DV3	probe	3110	2006-05-24	2007-11-24
ES3DV3	probe	3109	2006-05-24	2007-11-24
SD000D04BC	DAE4	685	2006-11-15	2007-11-15
D900V2	dipole	1d032	2006-05-16	2007-11-16
D2450V2	dipole	787	2006-05-19	2007-11-19
D1900V2	dipole	5d072	2006-05-22	2007-11-22
D835V2	dipole	4d038	2006-05-23	2007-11-23
D1800V2	dipole	2d126	2006-05-18	2007-11-18
NRVD	Power Meter	835843/014	2006-12-4	2007-12-4
SME03	Signal Generator	100029	2006-12-11	2007-12-11
NRV-Z4	Power Sensor	100381	2006-09-28	2007-09-28
NRV-Z4	Power Sensor	100382	2006-09-28	2007-09-28
NRV-Z2	Power Sensor	100211	2006-09-28	2007-09-28
8491B	Attenuator	MY39262528	NA	NA
8491B	Attenuator	MY39262663	NA	NA
8491B	Attenuator	MY39262640	NA	NA
8491B	Attenuator	MY39262638	NA	NA
778D	Dual directional coupler	20040	NA	NA
E3640A	DC Power Supply	MY40008487	2007-08-14	2008-08-13
85070E	Probe kit	MY44300214	N.A.	N.A.
E5071B	Network Analyzer	MY42404001	2007-06-18	2008-06-17

## SAR Test Report

### 5.1.2 Test System Setup

Tests are performed in setup according to the scheme below:



### 5.2 Measurement Procedure

The following steps are used for each test position:

1. The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm x 15mm.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:
  - a. The data at the surface was extrapolated, since the center of the dipoles is 2.7mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

**SAR Test Report**

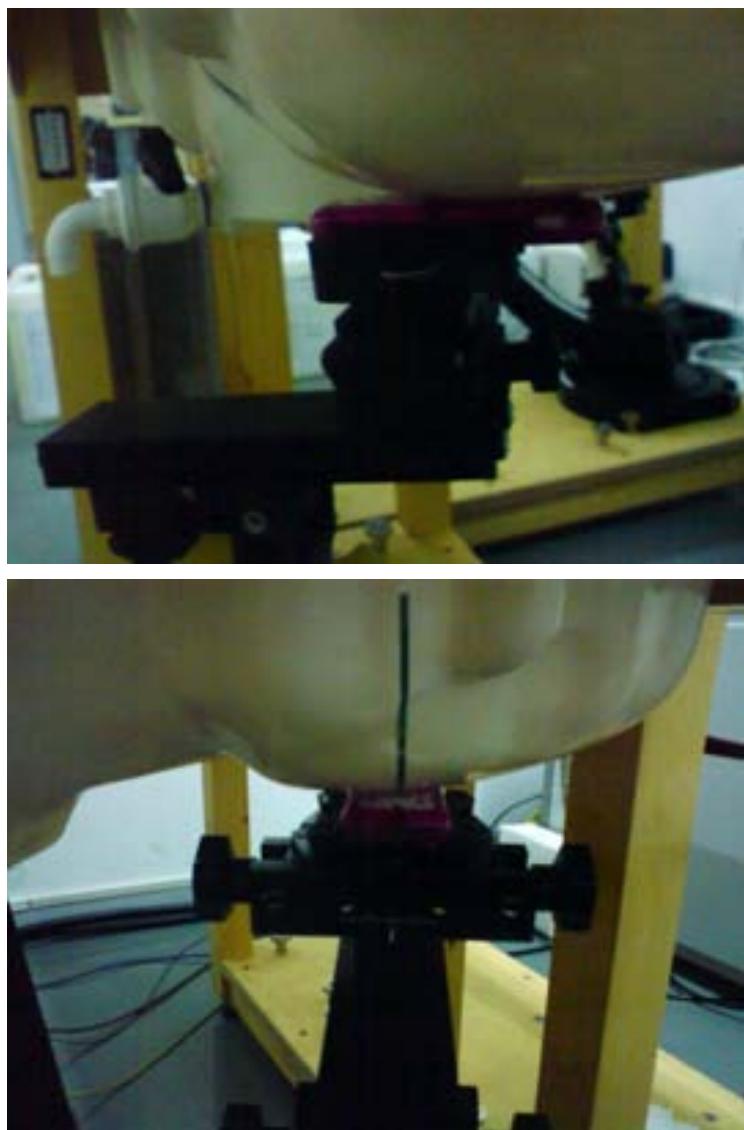
b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as procedure #1, was remeasured. If the value changed by more than 5%, the evaluation is repeated.

### **5.3 Test positions for device under test**

Head SAR touch position:



**SAR Test Report**

Head SAR tilt position:



**SAR Test Report**

Body SAR front position:



Body SAR back position



Body SAR back position with accessory

**SAR Test Report**



#### **5.4 Test environment**

	Ambient humidity (%)	Ambient temperature (°C)	Liquid temperature (°C)
standard	30~70	20~24	20~24
Date: 2007-08-22	46	23	22.4
Date: 2007-08-23	45	22	21.7
Date: 2007-08-24	42	23	22.3
Date: 2007-09-06	60	22.5	22
Date: 2007-09-07	56	22	21.1

#### **5.5 Liquid parameters**

Prior to conducting SAR measurements, the relative permittivity  $\epsilon_r$  and the conductivity  $\sigma$ , of the tissue simulating liquids were measured with the Dielectric Probe Kit. These values of the tissue simulate are shown in the table below. The recommended limits for maximum permittivity and minimum conductivity are also shown.

**SAR Test Report**

Date: 2007-08-22

Frequency	Tissue Type	Type	Dielectric Parameters	
			permittivity	conductivity
1900Mhz	Body	Target	53.3	1.52
		± 5% window	50.635~55.965	1.444~1.596
		Measured	55.28	1.568

Date: 2007-08-23

Frequency	Tissue Type	Type	Dielectric Parameters	
			permittivity	conductivity
835Mhz	Head	Target	41.50	0.900
		± 5% window	39.425~43.975	0.855~0.945
		Measured	40.5	0.87

Date: 2007-08-24

Frequency	Tissue Type	Type	Dielectric Parameters	
			permittivity	conductivity
835Mhz	Body	Target	55.2	0.97
		± 5% window	52.440~57.960	0.922~1.019
		Measured	55.2	0.993
1900Mhz	Head	Target	40.00	1.400
		± 5% window	38.000~42.000	1.330~1.470
		Measured	39.1988	1.401

Date: 2007-09-06

Frequency	Tissue Type	Type	Dielectric Parameters	
			permittivity	conductivity
835Mhz	Body	Target	55.2	0.97
		± 5% window	52.440~57.960	0.922~1.019
		Measured	54.4	0.985

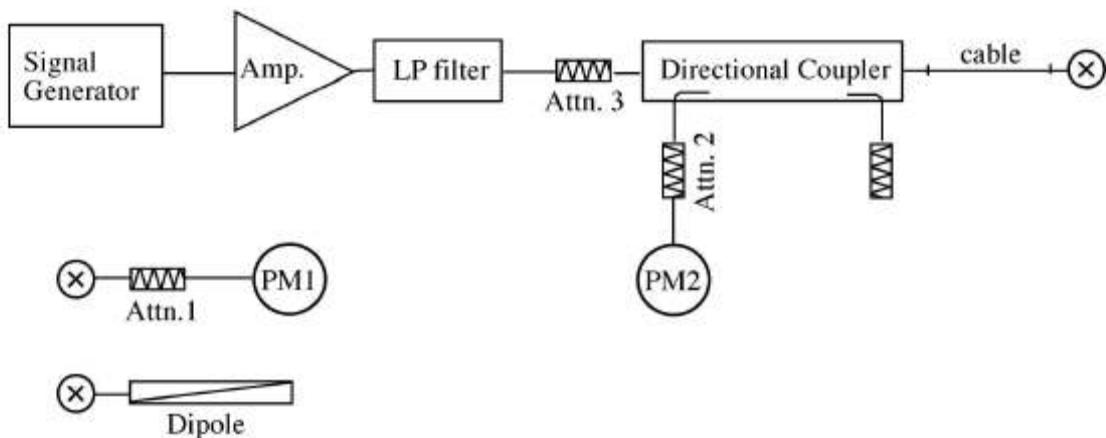
**SAR Test Report**

Date: 2007-09-07

Frequency	Tissue Type	Type	Dielectric Parameters	
			permittivity	conductivity
1900Mhz	Body	Target	53.3	1.52
		±5% window	50.635~55.965	1.444~1.596
		Measured	55.3	1.57

## 5.6 System performance check

A system check measurement was made following the determination of the dielectric parameters of the tissue simulating liquids using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. For power setup, please see the following pictures:



The figure shows the recommended setup. The PM1 (incl. Att1) measures the forward power at the location of the system performance check dipole connector. The signal generator is adjusted for the desired forward power at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. The system checking results are given in the table below. Please see Annex B for detailed report.

**SAR Test Report**

Date:	Tissue	Input Power (mW)	Targeted SAR <sub>1g</sub> (mW/g)	Measured SAR <sub>1g</sub> (mW/g)	Deviation (%) (<±10%)
2007-08-23	835Mhz Head	250	2.32	2.36	1.7
2007-08-24	835Mhz Body	250	2.43	2.49	2.5
2007-08-22	1900Mhz Body	250	10.3	10.7	3.9
2007-08-24	1900Mhz Head	250	9.5	10.4	9.5
2007-09-06	835Mhz Body	250	2.43	2.49	2.5
2007-09-07	1900Mhz Body	250	10.3	10.9	5.8

## 6 SAR RESULTS AND EVALUATION

### 6.1 Measurement Result

Test procedures used are according to FCC/OET Bulletin 65, Supp.C[July2001].

Liquid tissue depth is  $15.1 \pm 0.1$  cm.

The Device (FCC ID R7C-R100) has the 750mAH model 27-0000-002 as the only battery option. This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

The device should be tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

### 6.2 Measured conductive power

GSM850	Channel	128	190	251
	Conductive power (dBm)	31.5	31.6	31.6
GSM1900	Channel	512	661	810
	Conductive power (dBm)	29.0	29.5	29.5

SAR Test Report

### 6.3 Test results

The tables below contain the measured Head SAR values averaged over a mass of {1g}

Phantom configuration	Test position	SAR <sub>1g</sub> [W/kg] / Power Drift		
		Channel 128[low] 824.20 MHz	Channel 190[Mid] 836.60 MHz	Channel 251 [high] 848.80 MHz
Left side of Head	Cheek	0.654 / -0.031	1.07 / 0.0179	<b>1.46 / -0.00365</b>
	Tilted	-	0.652 / -0.0696	-
Right side of Head	Cheek	0.685 / 0.0968	1.09 / 0.00191	1.45 / -0.0273
	Tilted	-	0.636 / -0.0145	-

Measurement result for GSM835 for the Firefly

The tables below contain the measured Head SAR values averaged over a mass of {1g}

Phantom configuration	Test position	SAR <sub>1g</sub> [W/kg] / Power Drift		
		Channel 512[low] 1850.2 MHz	Channel 661[Mid] 1880.0 MHz	Channel 810 [high] 1909.8 MHz
Left side of Head	Cheek		0.711 / -0.0166	-
	Tilted	0.611 / -0.0174	<b>0.796 / -0.047</b>	0.592 / -0.0329
Right side of Head	Cheek		0.493 / -0.0759	
	Tilted		0.573 / -0.0383	

Measurement result for GSM1900 for the Firefly

The tables below contain the measured Body SAR values averaged over a mass of {1g}

DUT configuration	Test position	SAR <sub>1g</sub> [W/kg] / Power Drift		
		Channel 128[low] 824.20 MHz	Channel 190[Mid] 836.60 MHz	Channel 251 [high] 848.80 MHz
Front side	15mm	-	0.442 / 0.0219	-
	22mm	-	-	-
Back side	15mm	<b>0.72 / 0.00899</b>	0.707 / 0.0119	0.505 / 0.0317
	22mm	-	-	-

Measurement result for GSM835 for the Firefly

**SAR Test Report**

The tables below contain the measured Body SAR values averaged over a mass of {1g}

DUT configuration	Test position	SAR <sub>1g</sub> [W/kg] / Power Drift		
		Channel 512[low] 1850.2 MHz	Channel 661[Mid] 1880.0 MHz	Channel 810 [high] 1909.8 MHz
Front side	15mm	-	0.15/ -0.0374	-
	22mm	-	-	-
Back side	15mm	0.285/ 0.033	<b>0.316/ -0.0952</b>	0.247/ 0.00894
	22mm	-	-	-

Measurement result for GSM1900 for the Firefly

The tables below contain the measured Body SAR values averaged over a mass of {1g}

DUT configuration	Test position	SAR <sub>1g</sub> [W/kg] / Power Drift		
		Channel 128[low] 824.20 MHz	Channel 190[Mid] 836.60 MHz	Channel 251 [high] 848.80 MHz
Front side (with earphone connected)	15mm	-	-	-
	22mm	-	-	-
Back side (with earphone connected)	15mm	<b>0.686 / 0.012</b>	-	-
	22mm	-	-	-

Measurement result for GSM835 for the Firefly

The tables below contain the measured Body SAR values averaged over a mass of {1g}

DUT configuration	Test position	SAR <sub>1g</sub> [W/kg] / Power Drift		
		Channel 512[low] 1850.2 MHz	Channel 661[Mid] 1880.0 MHz	Channel 810 [high] 1909.8 MHz
Front side (with earphone connected)	15mm	-	-	-
	22mm	-	-	-
Back side (with earphone connected)	15mm	-	<b>0.311 / -0.053</b>	-
	22mm	-	-	-

Measurement result for GSM1900 for the Firefly

## 6.4 Summary and comparison to the limit

All test results are passed the uncontrolled SAR limit of 1.6W/kg.

## 7 REFERENCE DOCUMENT

The DUT has been tested at Flextronics Mobile Test Laboratory according to the reference documents given below.

- [1] Federal Communications Commission: Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields, Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), FCC, 2001.
- [2] IEEE Std C95.1-1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, Inst. of Electrical and Electronics Engineer, Inc., 1999.
- [3] IEEE Std 1528-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques. 1528-2003, December 19, 2003. the Institute of Electrical and Electronics Engineers.
- [4] Schmid & Partner Engineering AG, DASY4 Manual, February 2004 17-5

## APPENDIX A: DETAILED MEASUREMENT REPORT

File Name: [firefly\\_GSM850\\_LC #L1020n01\\_070823.da4](#)

**DUT: Firefly; Position: Cheek**

Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 0.879$  mho/m;  $\epsilon_r = 40.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient humidity: 45%; Ambient temperature: 22 °C; Liquid temperature: 21.7 °C

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(5.94, 5.94, 5.94); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: SAM with Right; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**high/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.60 mW/g

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

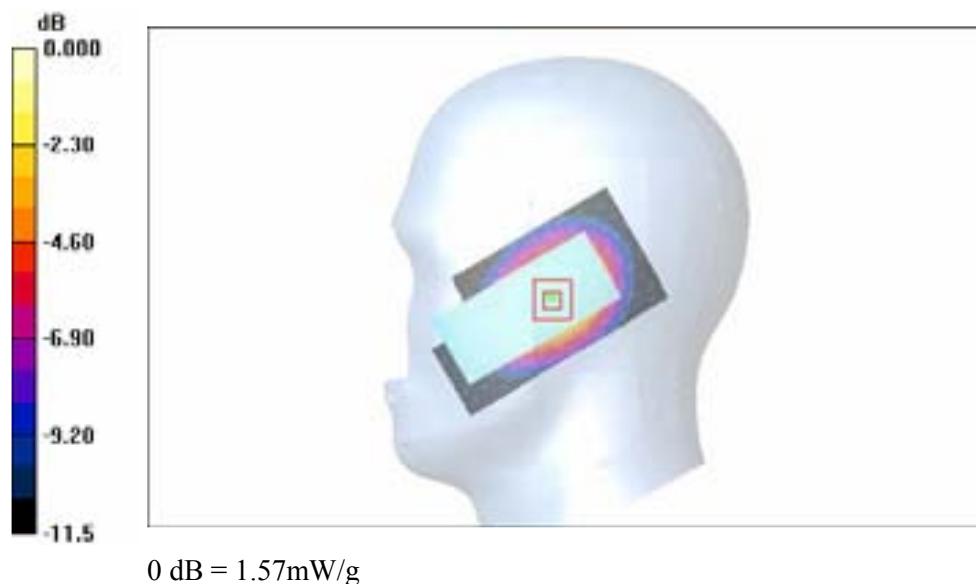
Reference Value = 31.5 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 2.02 W/kg

**SAR(1 g) = 1.46 mW/g; SAR(10 g) = 0.982 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.57 mW/g



SAR Test Report

File Name: [firefly\\_GSM850\\_BB #L1020n01\\_070824.da4](#)

**DUT: firefly; Position: Back**

Communication System: GSM850; Frequency: 825 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.982$  mho/m;  $\epsilon_r = 55.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient humidity: 42%; Ambient temperature: 23 °C; Liquid temperature: 22.3 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(5.92, 5.92, 5.92); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**low/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.785 mW/g

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

Reference Value = 19.0 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 0.996 W/kg

**SAR(1 g) = 0.720 mW/g; SAR(10 g) = 0.506 mW/g**

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.768 mW/g



SAR Test Report

File Name: [firefly\\_GSM1900\\_BB #L1020n01\\_070822.da4](#)

**DUT: Firefly; Position: Back**

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 55.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient humidity: 46%; Ambient temperature: 23 °C; Liquid temperature: 22.4 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(4.51, 4.51, 4.51); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**mid/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.343 mW/g

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

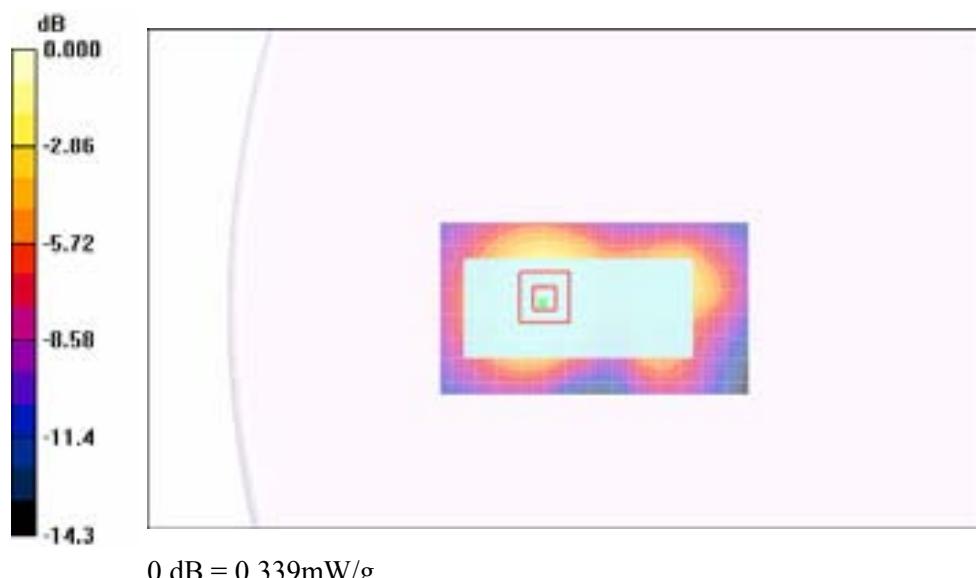
Reference Value = 9.77 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 0.451 W/kg

**SAR(1 g) = 0.316 mW/g; SAR(10 g) = 0.203 mW/g**

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.339 mW/g



SAR Test Report

File Name: [firefly\\_GSM1900\\_LT #L1020n01\\_070824.da4](#)

**DUT: Firefly; Position: Tilt**

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.38$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient humidity: 42%; Ambient temperature: 23 °C; Liquid temperature: 22.3 °C

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(4.93, 4.93, 4.93); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: SAM with Front; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**mid/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm

**Info: Interpolated medium parameters used for SAR evaluation.**

Maximum value of SAR (interpolated) = 0.907 mW/g

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

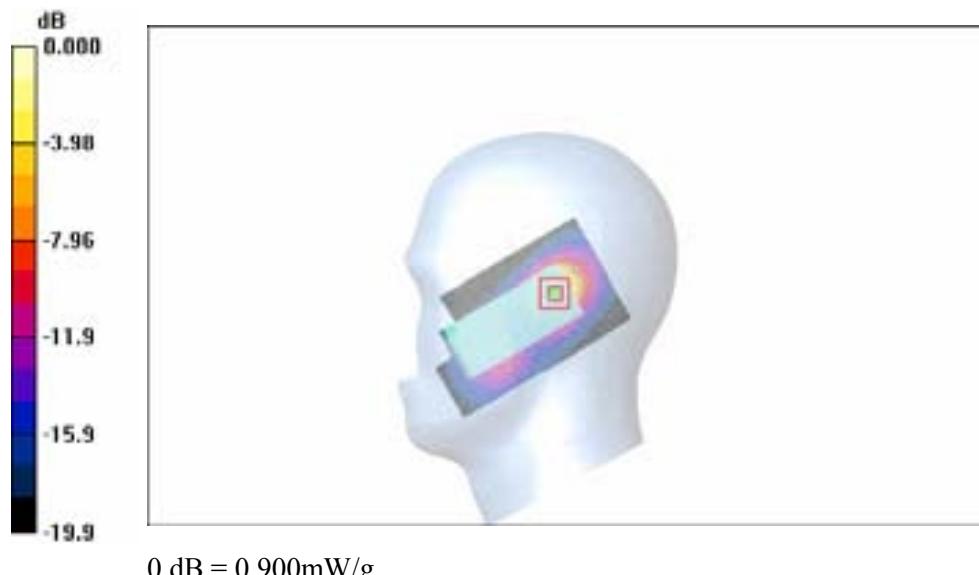
Reference Value = 25.7 V/m; Power Drift = -0.047 dB

Peak SAR (extrapolated) = 1.44 W/kg

**SAR(1 g) = 0.796 mW/g; SAR(10 g) = 0.401 mW/g**

**Info: Interpolated medium parameters used for SAR evaluation.**

Maximum value of SAR (measured) = 0.900 mW/g



SAR Test Report

File Name: [firefly\\_GSM850\\_BB #L1020n01 withearphone 070906.da4](#)

**DUT: 070039; Position: Back**

Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.974$  mho/m;  $\epsilon_r = 54.5$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

Medium Notes: Ambient humidity:60%; Ambient temperature: 22.5 °C; Liquid temperature: 22 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3109; ConvF(5.82, 5.82, 5.82); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-4-3
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**low/Area Scan (111x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.755 mW/g

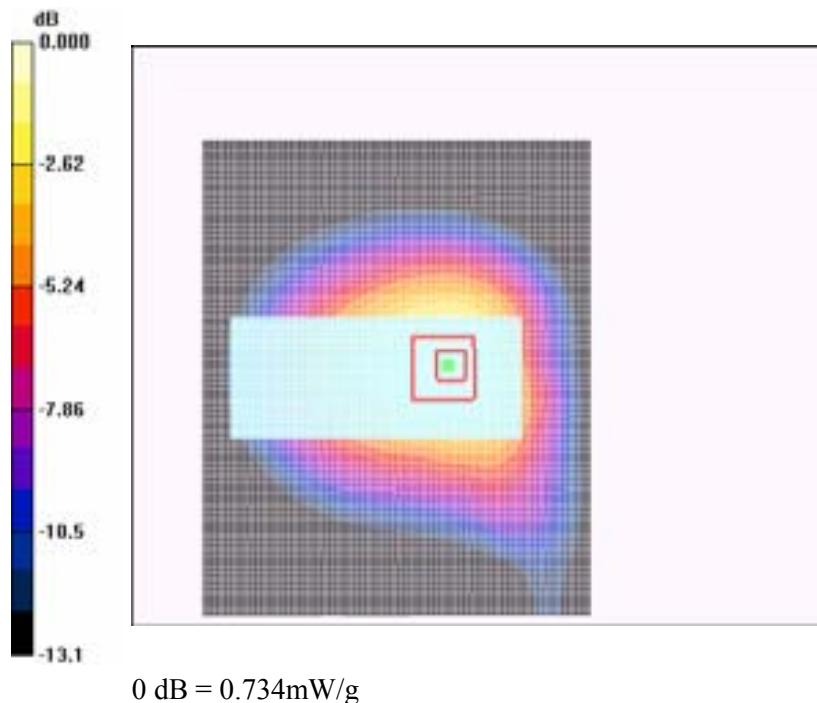
**low/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.1 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 0.992 W/kg

**SAR(1 g) = 0.686 mW/g; SAR(10 g) = 0.464 mW/g**

Maximum value of SAR (measured) = 0.734 mW/g



SAR Test Report

File Name: [firefly\\_GSM1900\\_BB #L1020n01 witearphone 070907.da4](#)

**DUT: 070039; Position: Back**

Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1880$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 55.4$ ;  $\rho = 1000$  kg/m<sup>3</sup> ;

Medium Notes: Ambient humidity: 56%; Ambient temperature: 22 °C; Liquid temperature: 21.1 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3109; ConvF(4.44, 4.44, 4.44); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-4-3
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**mid/Area Scan (111x101x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.346 mW/g

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

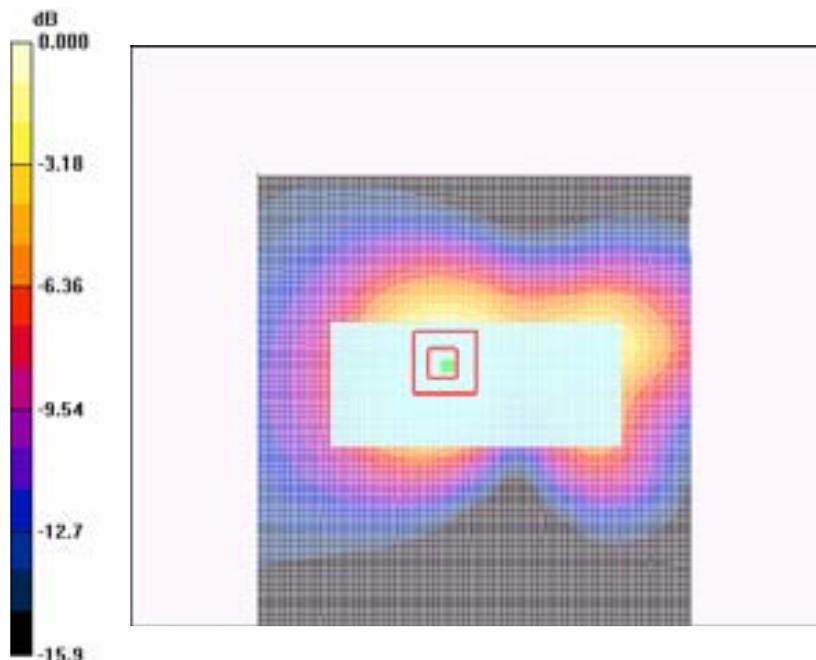
Reference Value = 8.89 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 0.454 W/kg

**SAR(1 g) = 0.311 mW/g; SAR(10 g) = 0.197 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.335 mW/g



0 dB = 0.335mW/g

## APPENDIX B: SYSTEM PERFORMANCE CHECK REPORT

File Name: [SystemPerformanceCheck-Body-D835MHz-070824.da4](#)

**DUT: Dipole 835 MHz;**

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

Medium parameters used (interpolated):  $f = 835 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 55.2$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient humidity: 42%; Ambient temperature: 23 °C; Liquid temperature: 22.3 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(5.92, 5.92, 5.92); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Unnamed procedure/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 2.69 mW/g

**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.0 V/m; Power Drift = -0.007 dB

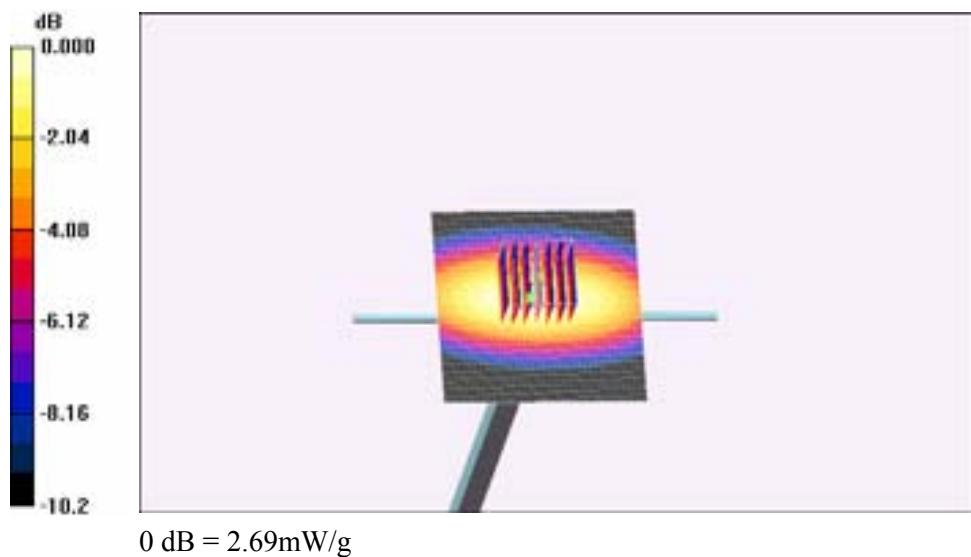
Peak SAR (extrapolated) = 3.67 W/kg

**SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.64 mW/g**

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 2.69 mW/g

SAR Test Report



File Name: [SystemPerformanceCheck-Body-D1900MHz-070822.da4](#)

**DUT: Dipole 1900 MHz;**

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 55.3$ ;  $\rho = 1000$  kg/m $^3$

Ambient humidity: 46%; Ambient temperature: 23 °C; Liquid temperature: 22.4 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(4.51, 4.51, 4.51); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:XXXX
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

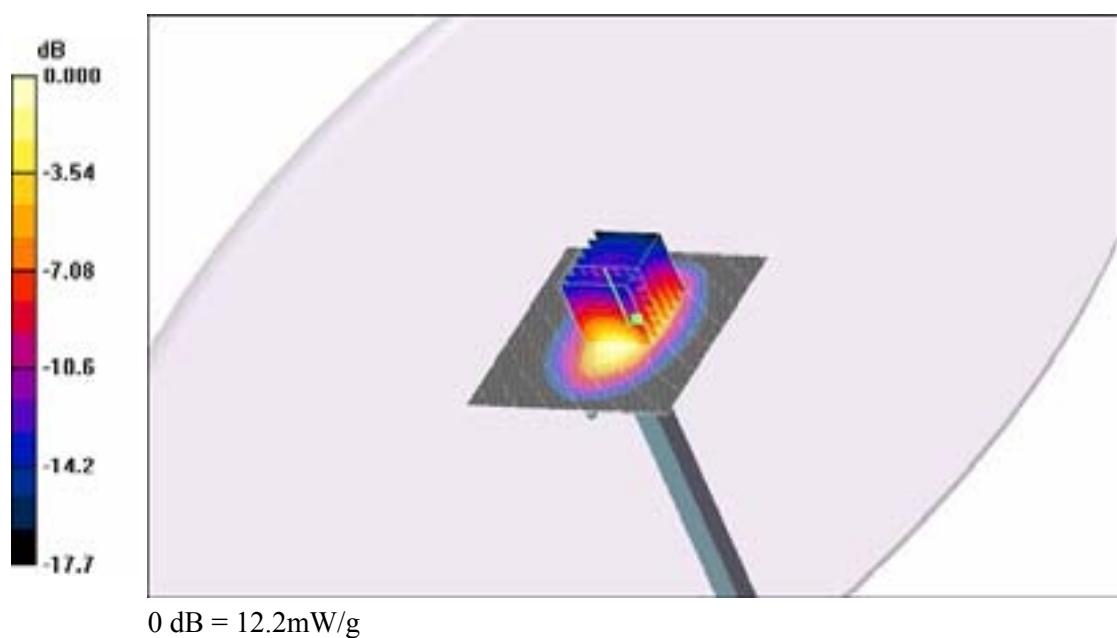
**Unnamed procedure/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 13.7 mW/g

**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 84.6 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 18.5 W/kg

**SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.69 mW/g**  
Maximum value of SAR (measured) = 12.2 mW/g

SAR Test Report



SAR Test Report

File Name: [SystemPerformanceCheck-D835Mhz-070823.da4](#)

**DUT: Dipole 835 MHz;**

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

Medium parameters used (interpolated):  $f = 835 \text{ MHz}$ ;  $\sigma = 0.869 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$ ;

Medium Notes: Ambient humidity: 45%; Ambient temperature: 22 °C; Liquid temperature: 21.7 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(5.94, 5.94, 5.94); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-4-3
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Unnamed procedure/Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm

**Info: Interpolated medium parameters used for SAR evaluation.**

Maximum value of SAR (interpolated) = 2.69 mW/g

**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

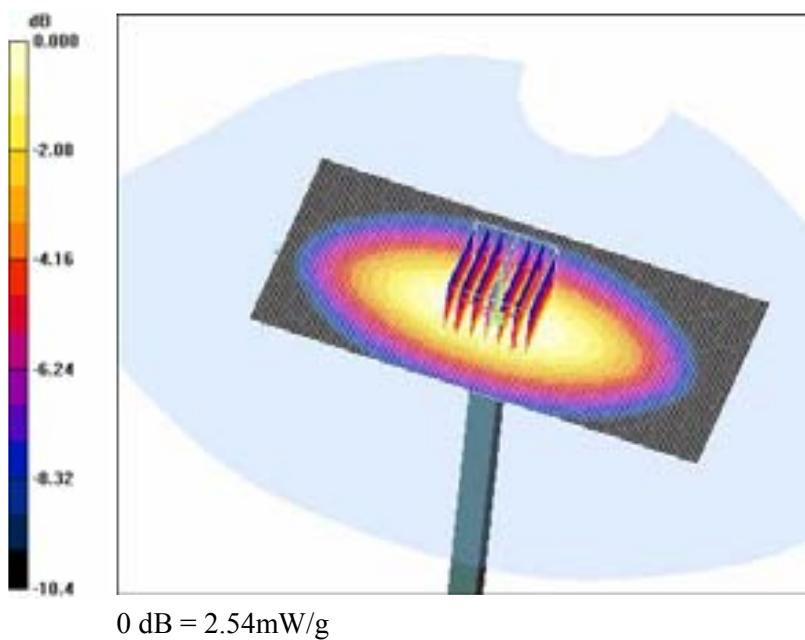
Reference Value = 55.9 V/m; Power Drift = -0.243 dB

Peak SAR (extrapolated) = 3.47 W/kg

**SAR(1 g) = 2.36 mW/g; SAR(10 g) = 1.55 mW/g**

**Info: Interpolated medium parameters used for SAR evaluation.**

Maximum value of SAR (measured) = 2.54 mW/g



**SAR Test Report**

File Name: [SystemPerformanceCheck-D1900MHz-070824.da4](#)

**DUT: Dipole 1900 MHz;**

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient humidity: 42%; Ambient temperature: 23 °C; Liquid temperature: 22.3 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(4.93, 4.93, 4.93); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-11-15
- Phantom: SAM with Front; Type: SAM; Serial: **Not Specified**
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Unnamed procedure/Area Scan (71x71x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.4 mW/g

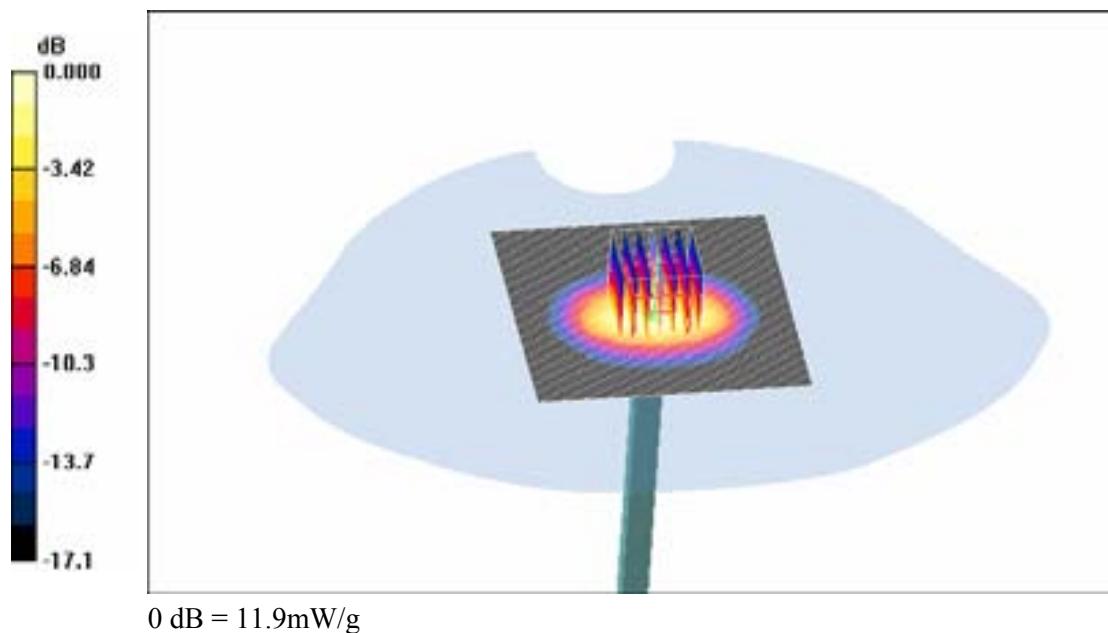
**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.9 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 18.5 W/kg

**SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.48 mW/g**

Maximum value of SAR (measured) = 11.9 mW/g



**SAR Test Report**

File Name: [SystemPerformanceCheck-Body-D835MHz-070906.da4](#)

**DUT: Dipole 835 MHz;**

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

Medium parameters used (interpolated):  $f = 835 \text{ MHz}$ ;  $\sigma = 0.985 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$ ;

Medium Notes: Ambient humidity: 60%; Ambient temperature: 22.5 °C; Liquid temperature: 22 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3109; ConvF(5.82, 5.82, 5.82); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-4-3
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Unnamed procedure/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 2.72 mW/g

**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

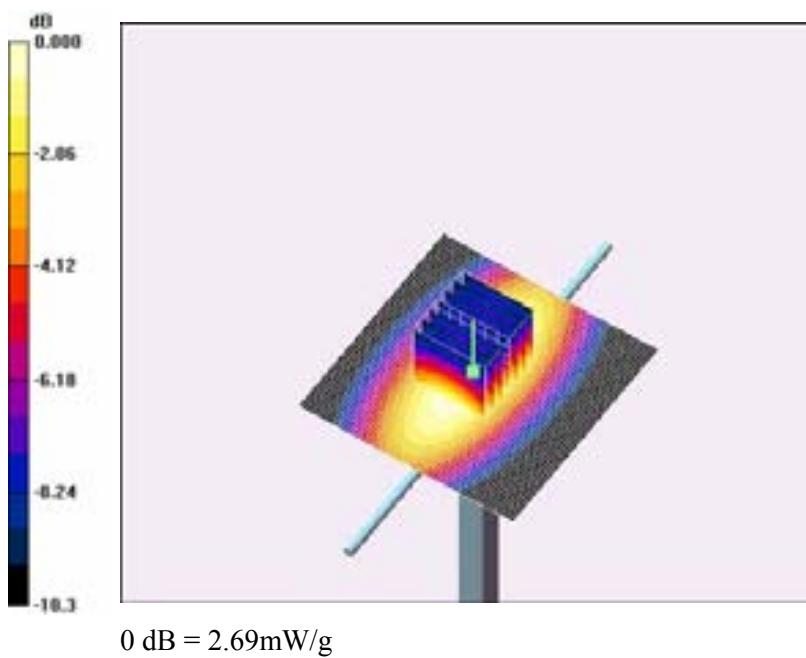
Reference Value = 53.0 V/m; Power Drift = -0.120 dB

Peak SAR (extrapolated) = 3.67 W/kg

**SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.64 mW/g**

**Info:** Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 2.69 mW/g



SAR Test Report

File Name: [SystemPerformanceCheck-Body-D1900MHz-070907.da4](#)

**DUT: Dipole 1900 MHz;**

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

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.57 \text{ mho/m}$ ;  $\epsilon_r = 55.3$ ;  $\rho = 1000 \text{ kg/m}^3$ ;

Medium Notes: Ambient humidity: 56%; Ambient temperature: 22 °C; Liquid temperature: 21.1 °C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3109; ConvF(4.44, 4.44, 4.44); Calibrated: 2006-5-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2006-4-3
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Unnamed procedure/Area Scan (61x61x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 13.8 mW/g

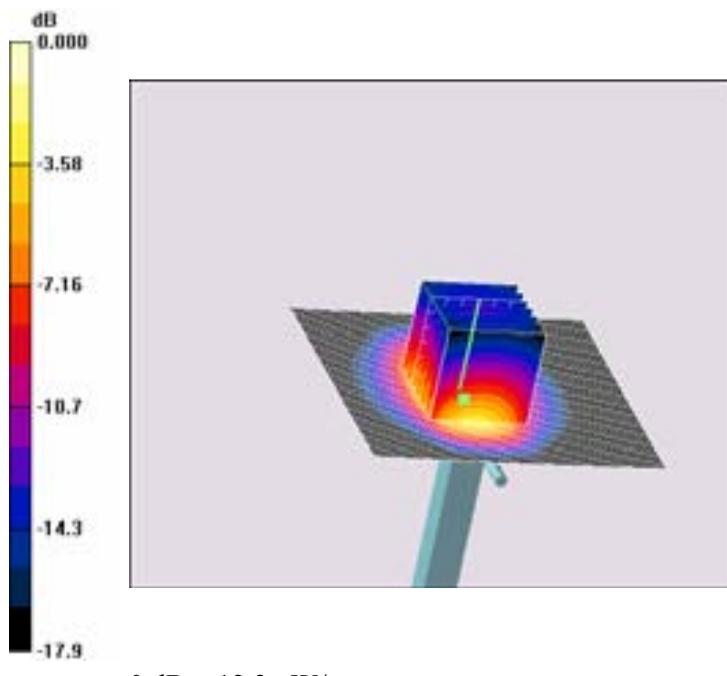
**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 80.7 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 19.0 W/kg

**SAR(1 g) = 10.9 mW/g; SAR(10 g) = 5.69 mW/g**

Maximum value of SAR (measured) = 12.3 mW/g



## APPENDIX C: DIPOLE CERTIFICATION

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



S Schweizerischer Kalibrierdienst  
C Service suisse d'kalibrierung  
S Servizio svizzero di tenzione  
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation  
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 Flextronics (MTT)

Certificate No: D835V2-4d038\_May06

### CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d038

Calibration procedure(s)  
QA CAL-05.v6  
Calibration procedure for dipole validation kits

Calibration date: May 23, 2006

Condition of the calibrated item In Tolerance

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&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	0837482794	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00496)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00496)	Aug-06
Reference Probe ET3DVB	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN 801	15-Dec-05 (SPEAG, No. DAE4-001_Dec05)	Dec-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41082317	16-Oct-05 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000875	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 54206	18-Oct-05 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Manuel Fehr	Laboratory Technician	

Approved by:	Name	Function	Signature
	Katja Pokornic	Technical Manager	

Issued: May 24, 2006

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

SAR Test Report

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



S Schweizerischer Kalibrierdienst  
C Service suisse d'kalimetry  
S Servizio svizzero di Isotruzione  
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation.  
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: Flextronics (MTT)

Certificate No: D1900V2-5d072\_May06

**CALIBRATION CERTIFICATE**

Object: D1900V2 - SN: 5d072

Calibration procedure(s): QA CAL-05.v6  
Calibration procedure for dipole validation kits.

Calibration date: May 22, 2006

Condition of the calibrated item: In Tolerance

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&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	0837480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20p)	11-Aug-05 (METAS, No. 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10p)	11-Aug-05 (METAS, No. 251-00498)	Aug-06
Reference Probe ET3DVR	SN: 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN: 801	15-Dec-05 (SPEAG, No. DAE4-801_Dec05)	Dec-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41002317	18-Oct-05 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37300585 54206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Mike Mell	Laboratory Technician	

Approved by:	Name	Function	Signature
	Katja Pakovic	Technical Manager	

Issued: May 24, 2006

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

## APPENDIX D: PROBE CERTIFICATION

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 Federal Office of Metrology and Accreditation  
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

Flextronics CN (MTT)

Certificate No: ES3-3110\_May06

### CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3110

Calibration procedure(s): QA CAL-01.v5  
Calibration procedure for dosimetric E-field probes

Calibration date: May 24, 2006

Condition of the calibrated item: In Tolerance

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&TE critical for calibration):

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E44198	GB41293674	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41496087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: 55054 (3x)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: 55006 (20x)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: 55129 (30x)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37300585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

Calibrated by:	Name	Function	Signature
	Katja Polkovic	Technical Manager	

Approved by:	Name	Function	Signature
	Fin Bommel	R&D Director	

Issued: May 26, 2006

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

SAR Test Report

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 Federal Office of Metrology and Accreditation  
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
NORM $x,y,z$	sensitivity in free space
ConF	sensitivity in TSL / NORM $x,y,z$
DCP	diode compression point
Polarization $\varphi$	$\varphi$ 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:**

- 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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz)", July 2001

**Methods Applied and Interpretation of Parameters:**

- $NORMx,y,z$ : Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  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<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 (no uncertainty required). DCP does not depend on frequency nor media.
- 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.

ES3DV3 SN:3110

May 24, 2006

# Probe ES3DV3

SN:3110

Manufactured: September 20, 2005  
Calibrated: May 24, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

SAR Test Report

ES3DV3 SN:3110

May 24, 2006

**DASY - Parameters of Probe: ES3DV3 SN:3110**

Sensitivity in Free Space<sup>A</sup>

NormX	$1.33 \pm 10.1\%$	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95 mV
NormY	$1.19 \pm 10.1\%$	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	95 mV
NormZ	$1.18 \pm 10.1\%$	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	95 mV

Diode Compression<sup>B</sup>

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL                    900 MHz                    Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>tx</sub> [%]	Without Correction Algorithm	5.7	2.7
SAR <sub>tx</sub> [%]	With Correction Algorithm	0.0	0.1

TSL                    1750 MHz                    Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>tx</sub> [%]	Without Correction Algorithm	4.1	1.9
SAR <sub>tx</sub> [%]	With Correction Algorithm	0.0	0.2

Sensor Offset

Probe Tip to Sensor Center                    2.0 mm

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 effect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

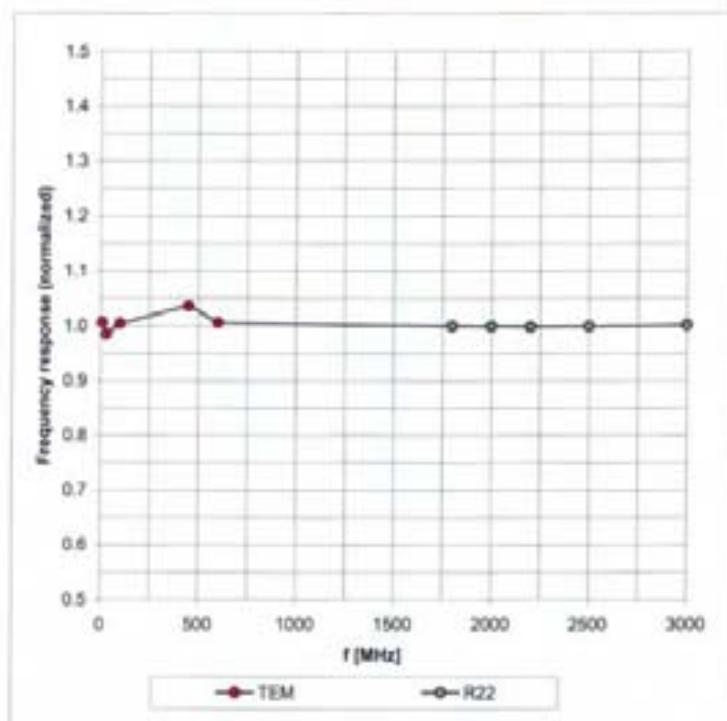
SAR Test Report

ES3DV3 SN:3110

May 24, 2006

### Frequency Response of E-Field

(TEM-Cell:if1110 EXX, Waveguide: R22)



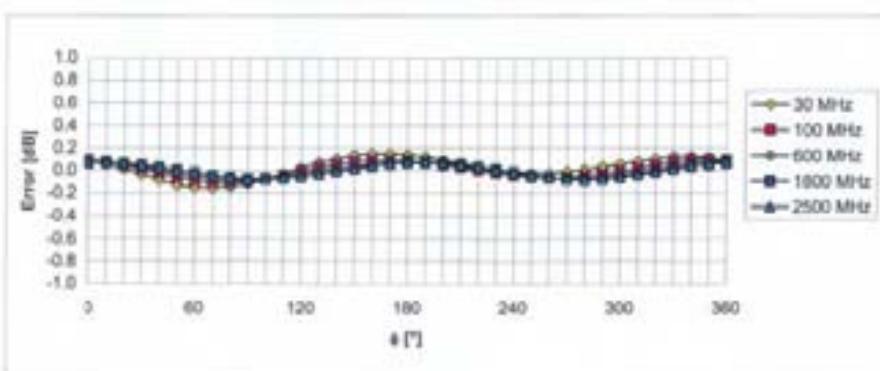
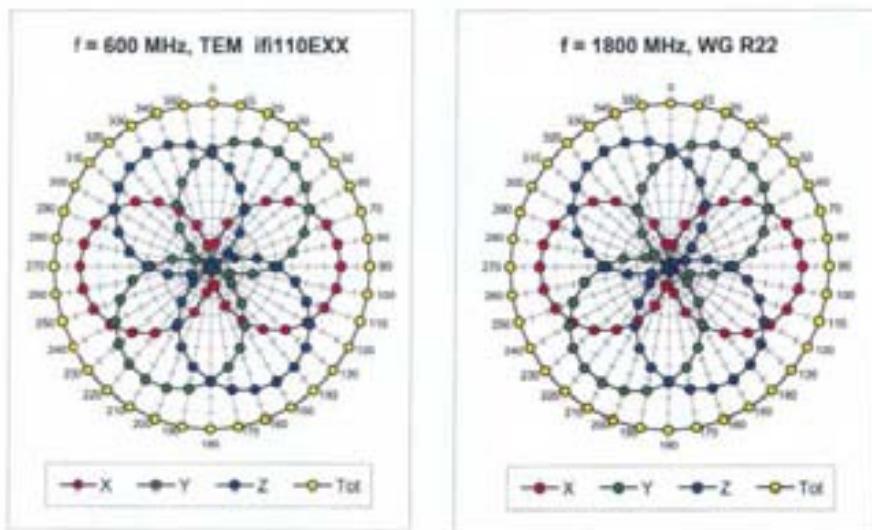
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

SAR Test Report

ES3DV3 SN:3110

May 24, 2006

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



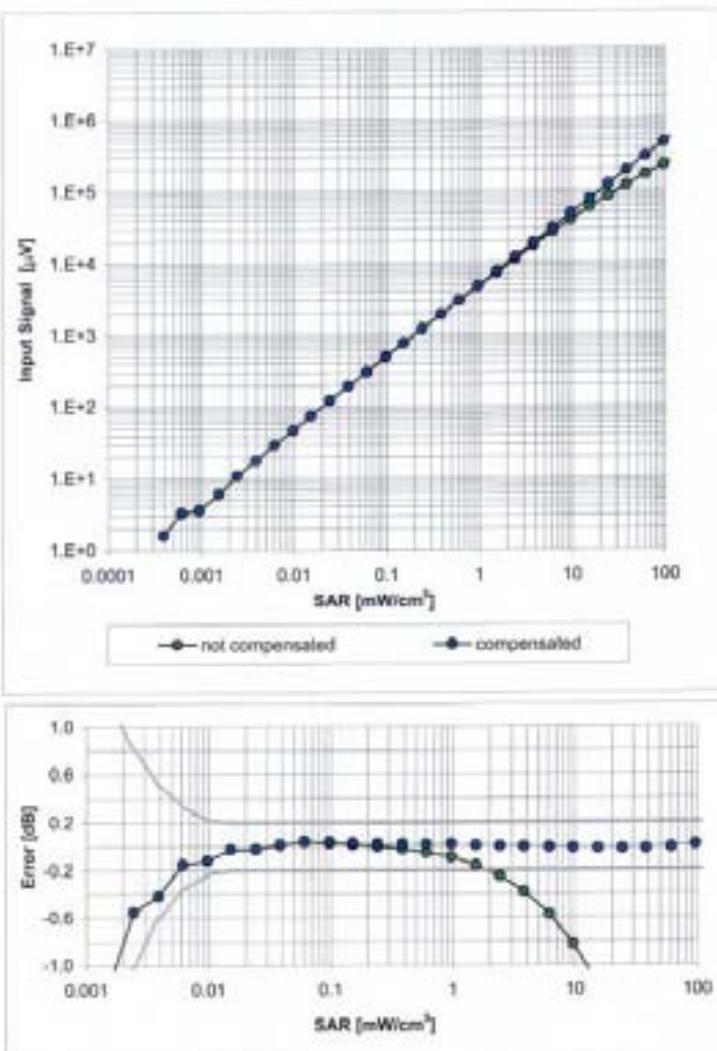
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

SAR Test Report

ES3DV3 SN:3110

May 24, 2006

**Dynamic Range f(SAR<sub>head</sub>)**  
(Waveguide R22, f = 1800 MHz)



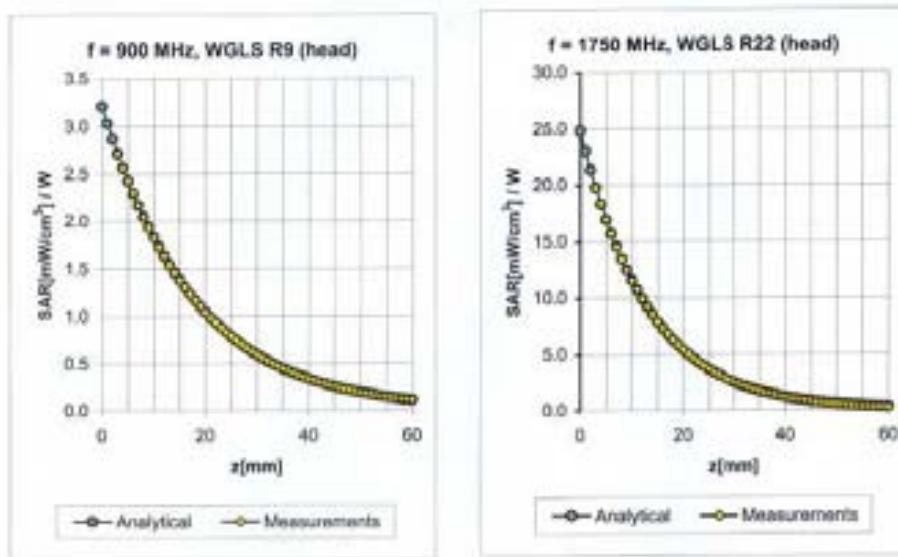
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

SAR Test Report

ES3DV3 SN:3110

May 24, 2006

**Conversion Factor Assessment**



$f$ [MHz]	Validity [MHz] <sup>a</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	$\pm 50 / \pm 100$	Head	$41.5 \pm 5\%$	$0.90 \pm 5\%$	0.38	1.54	$5.94 \pm 11.0\%$ (k=2)	
900	$\pm 50 / \pm 100$	Head	$41.5 \pm 5\%$	$0.97 \pm 5\%$	0.40	1.50	$5.78 \pm 11.0\%$ (k=2)	
1750	$\pm 50 / \pm 100$	Head	$40.1 \pm 5\%$	$1.37 \pm 5\%$	0.27	2.55	$5.08 \pm 11.0\%$ (k=2)	
1900	$\pm 50 / \pm 100$	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.30	2.38	$4.93 \pm 11.0\%$ (k=2)	
2450	$\pm 50 / \pm 100$	Head	$39.2 \pm 5\%$	$1.80 \pm 5\%$	0.45	1.79	$4.38 \pm 11.8\%$ (k=2)	

835	$\pm 50 / \pm 100$	Body	$55.2 \pm 5\%$	$0.97 \pm 5\%$	0.46	1.42	$5.92 \pm 11.0\%$ (k=2)
900	$\pm 50 / \pm 100$	Body	$55.0 \pm 5\%$	$1.05 \pm 5\%$	0.53	1.33	$5.73 \pm 11.0\%$ (k=2)
1750	$\pm 50 / \pm 100$	Body	$53.4 \pm 5\%$	$1.49 \pm 5\%$	0.31	2.47	$4.65 \pm 11.0\%$ (k=2)
1900	$\pm 50 / \pm 100$	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.29	2.59	$4.51 \pm 11.0\%$ (k=2)
2450	$\pm 50 / \pm 100$	Body	$52.7 \pm 5\%$	$1.95 \pm 5\%$	0.69	1.35	$4.14 \pm 11.8\%$ (k=2)

<sup>a</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.

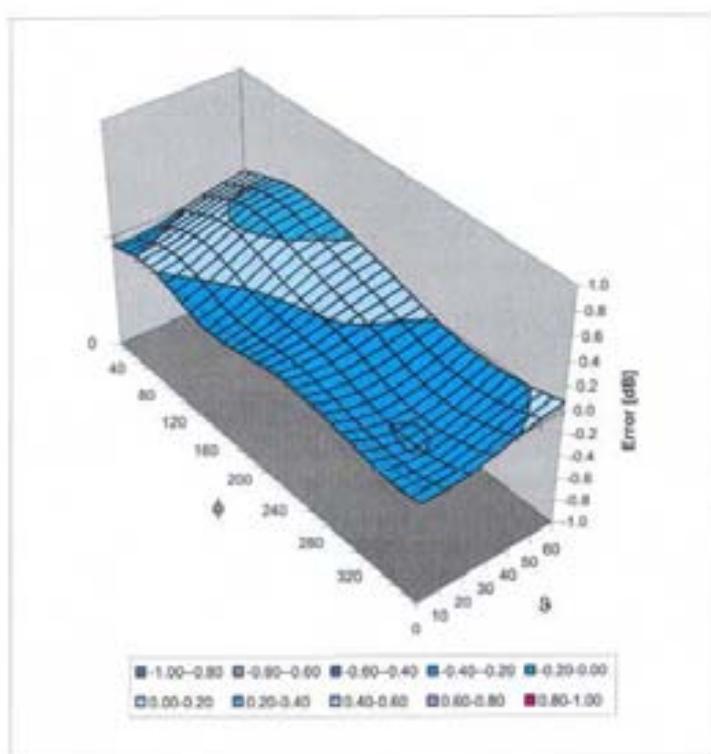
SAR Test Report

ES3DV3 SN:3110

May 24, 2006

**Deviation from Isotropy in HSL**

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



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

SAR Test Report

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



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

Accredited by the Swiss Federal Office of Metrology and Accreditation  
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: Flextronics CN (MTT)

Certificate No: ES3-3109\_May06

**CALIBRATION CERTIFICATE**

Object: ES30V3 - SN:3109

Calibration procedure(s): QA CAL-01.v5  
Calibration procedure for dosimetric E-field probes

Calibration date: May 24, 2006

Condition of the calibrated item: In Tolerance

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&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4410B	GB41203874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41405277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41406067	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: 55054 (3c)	11-Aug-06 (METAS, No. 251-00489)	Aug-06
Reference 20 dB Attenuator	SN: 55086 (20c)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: 55129 (30c)	11-Aug-06 (METAS, No. 251-00900)	Aug-06
Reference Probe ES30V2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

Secondary Standards	ID #	Check Date (In house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Katja Pokorni	Technical Manager	

Approved by:	Name	Function	Signature
	Fin Bommelt	R&D Director	

Issued: May 26, 2006

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 Federal Office of Metrology and Accreditation.  
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
NORM $x,y,z$	sensitivity in free space
ConF	sensitivity in TSL / NORM $x,y,z$
DCP	diode compression point
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\beta$	$\beta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\beta = 0$ is normal to probe axis

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

- 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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz)", July 2001

**Methods Applied and Interpretation of Parameters:**

- NORM $x,y,z$ : Assessed for E-field polarization  $\beta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM $x,y,z$  are only intermediate values, i.e., the uncertainties of NORM $x,y,z$  does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f) $x,y,z$  = NORM $x,y,z$  \* 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.
- DCP $x,y,z$ : DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- 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 NORM $x,y,z$  \* 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.

ES3DV3 SN:3109

May 24, 2006

# Probe ES3DV3

SN:3109

Manufactured: September 20, 2005  
Calibrated: May 24, 2006

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

ES3DV3 SN:3109

May 24, 2006

### DASY - Parameters of Probe: ES3DV3 SN:3109

#### Sensitivity in Free Space<sup>A</sup>

NormX	1.23 ± 10.1%	µV/(V/m) <sup>2</sup>
NormY	1.30 ± 10.1%	µV/(V/m) <sup>2</sup>
NormZ	1.26 ± 10.1%	µV/(V/m) <sup>2</sup>

#### Diode Compression<sup>B</sup>

DCP X	95 mV
DCP Y	95 mV
DCP Z	95 mV

#### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

#### Boundary Effect

TSL                    900 MHz            Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>iso</sub> [%]	Without Correction Algorithm	5.7	2.6
SAR <sub>iso</sub> [%]	With Correction Algorithm	0.0	0.2

TSL                    1750 MHz            Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>iso</sub> [%]	Without Correction Algorithm	4.0	1.8
SAR <sub>iso</sub> [%]	With Correction Algorithm	0.1	0.1

#### Sensor Offset

Probe Tip to Sensor Center            2.0 mm

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 Page 8).

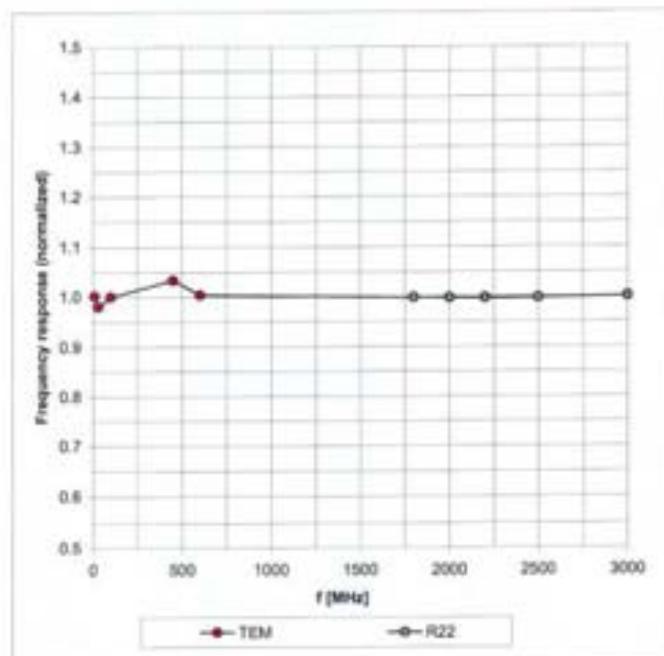
<sup>B</sup> Numerical linearization parameter: uncertainty not required.

ES3DV3 SN:3109

May 24, 2006

### Frequency Response of E-Field

(TEM-Cell:if110 EXX, Waveguide: R22)

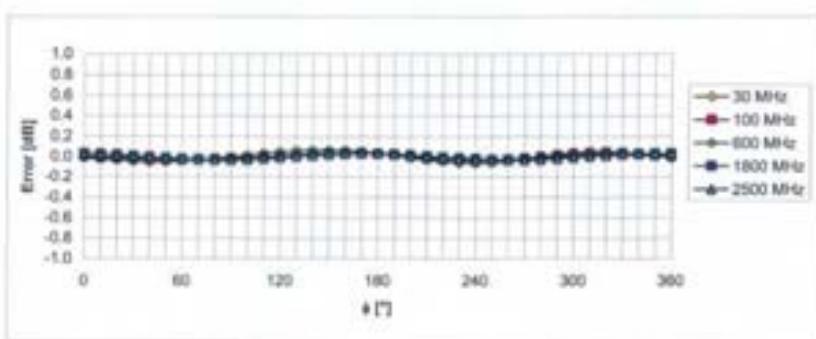
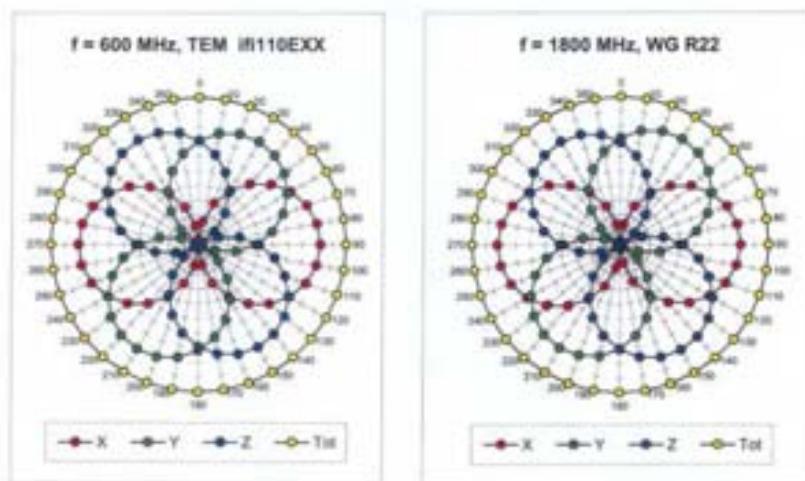


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

ES3DV3 SN:3109

May 24, 2006

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

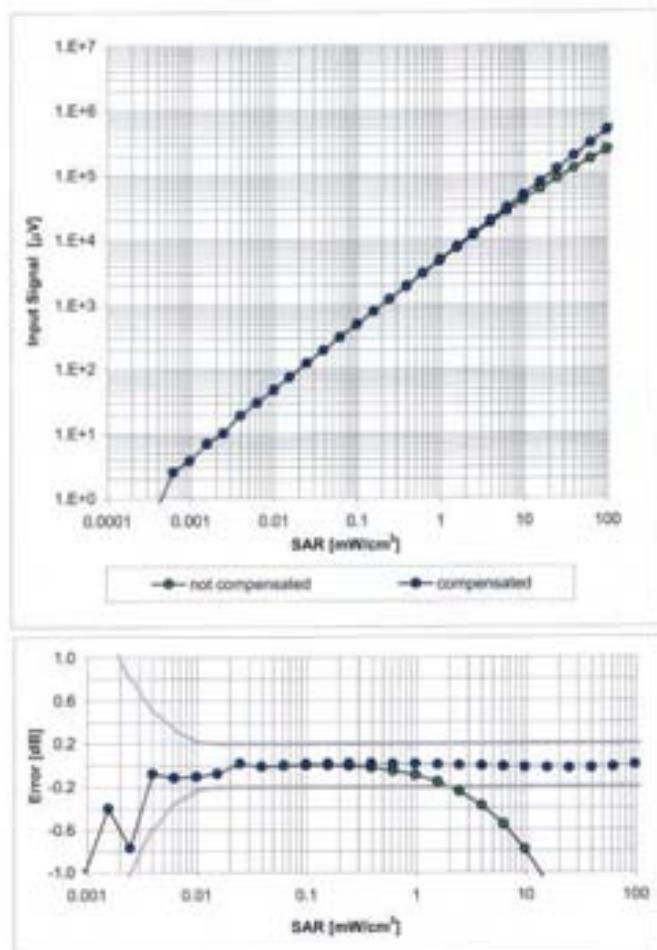


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

ES3DV3 SN:3109

May 24, 2006

**Dynamic Range f(SAR<sub>head</sub>)**  
(Waveguide R22, f = 1800 MHz)

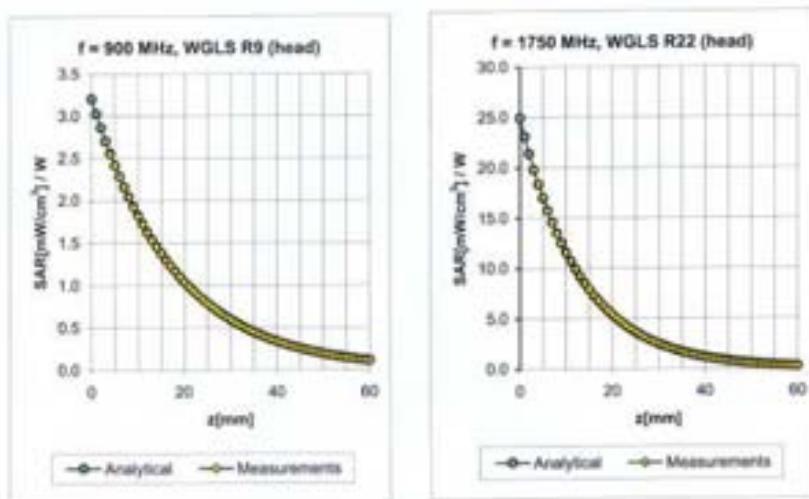


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

ES3DV3 SN:3109

May 24, 2006

### Conversion Factor Assessment



f [MHz]	Validity [MHz] <sup>a</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.36	1.56	5.85 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.42	1.46	5.72 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.33	2.44	5.02 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.29	2.48	4.85 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.51	1.66	4.33 ± 11.8% (k=2)

835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.43	1.47	5.82 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.47	1.41	5.66 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.26	2.89	4.61 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.31	2.51	4.44 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.64	1.42	4.06 ± 11.8% (k=2)

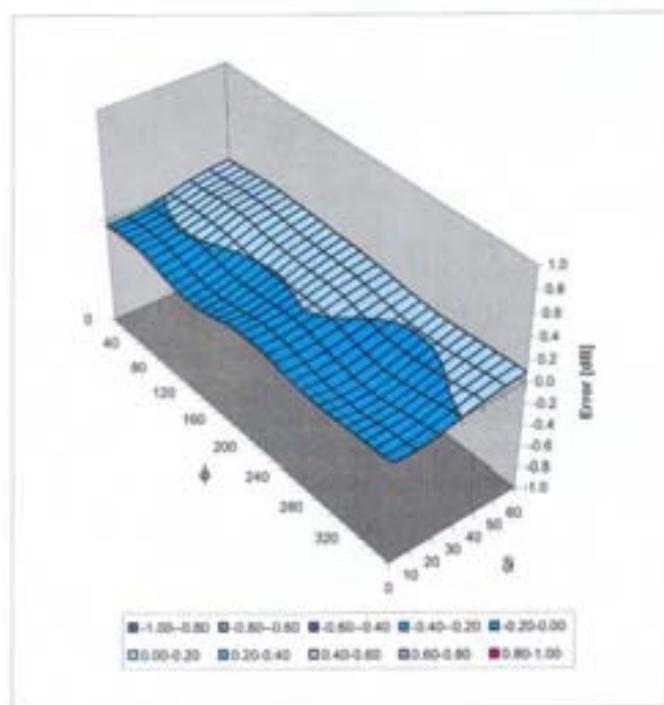
<sup>a</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ES3DV3 SN:3109

May 24, 2006

### Deviation from Isotropy in HSL

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



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

## APPENDIX E: PHANTOM CONFORMITY

Schmid & Partner Engineering AG

**s p e a g**

Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 9700, Fax +41 1 245 9779  
info@speag.com, http://www.speag.com

### Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

#### Tests

The series production process used allows the limitation to test of first articles.

Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas; 6mm +/- 0.2mm at ERP	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz - 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions	DEGMBe based simulating liquids	Pre-series, First article, Samples

#### Standards

- [1] CENELEC EN 50361
- [2] IEEE Std 1528-200x Draft CD 1.1 (Dec 02)
- [3] IEC 62209/CD (Nov 02)

(\*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

#### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 5.5.2003

#### Signature / Stamp

**s p e a g**

Schmid & Partner Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 9700, Fax +41 1 245 9779  
info@speag.com, http://www.speag.com

Schmid & Partner Engineering AG

**s p e a g**

Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 9700, Fax +41 1 245 9779  
info@speag.com, http://www.speag.com

**Certificate of Conformity / First Article Inspection**

Item	Oval Flat Phantom ELI 4.0
Type No	QD OVA 001 B
Series No	1003 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zurich Switzerland

**Tests**

Complete tests were made on the prototype units QD OVA 001 AA 1001, QD OVA 001 AB 1002, pre-series units QD OVA 001 BA 1003-1005 as well as on the series units QD OVA 001 BB, 1006 ff.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the standard IEC 62209 – 2 [1] requirements	Dimensions of bottom for 300 MHz – 6 GHz: longitudinal = 600 mm (max. dimension) width = 400 mm (min. dimension) depth = 190 mm Shape: ellipse	Prototypes, Samples
Material thickness	Compliant with the standard IEC 62209 – 2 [1] requirements	Bottom plate: 2.0mm +/- 0.2mm	Prototypes, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Rel. permittivity = 4 +/- 1, Loss tangent < 0.05	Material sample
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe Technical Note for material compatibility.	DEGMME based simulating liquids	Equivalent phantoms, Material sample
Sagging	Compliant with the requirements according to the standard. Sagging of the flat section when filled with tissue simulating liquid	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

**Standards**

[1] IEC 62209 – 2, Draft Version 0.9, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation and Procedures Part 2: Procedure to determine the Specific Absorption Rate (SAR) for ... including accessories and multiple transmitters", December 2004

**Conformity**

Based on the sample tests above, we certify that this item is in compliance with the standard [1].

Date

07.07.2005

**s p e a g**

Signature / Stamp

Schmid & Partner Engineering AG  
Zeughausstrasse 43, 8004 Zurich  
Phone +41 1 245 9700, Fax +41 1 245 9779  
info@speag.com, http://www.speag.com

Schmid & Partner Engineering AG

**s p e a g**

Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 8700, Fax +41 1 245 8779  
info@spag.com, http://www.spag.com

**Certificate of conformity / First Article Inspection**

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

**Tests**

The series production process used allows the limitation to test of first articles.  
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the  
series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested  
using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT15 CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas; 6mm +/- 0.2mm at ERP	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions	DEGMIBE based simulating liquids	Pre-series, First article, Samples

**Standards**

[1] CENELEC EN 50361

[2] IEEE Std 1528-200x Draft CD 1.1 (Dec 02)

[3] IEC 62209/CD (Nov 02)

(\*) The IT15 CAD file is derived from [2] and is also within the tolerance requirements of the shapes of  
[1] and [3].

**Conformity**

Based on the sample tests above, we certify that this item is in compliance with the uncertainty  
requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 5.5.2003

Signature / Stamp 

Schmid & Partner Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 8700, Fax +41 1 245 8779  
info@spag.com, http://www.spag.com

SAR Test Report

## APPENDIX F: UNCERTAINTY BUDGET

It includes the uncertainty budget suggested by the [IEEE P1528] and determined by Schmid & Partner Engineering AG. **The expanded uncertainty (K=2) is assessed to be  $\pm 20.6\%$ .**

Error Sources	Uncertainty Value	Probability Distribution	Divisor	$C_i$	Standard Uncertainty	$V_i$
Probe calibration	$\pm 4.8\%$	Normal	1	1	$\pm 4.8\%$	$\infty$
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	0.7	$\pm 1.9\%$	$\infty$
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	$\pm 3.9\%$	$\infty$
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	$\pm 0.6\%$	$\infty$
Linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	$\pm 2.7\%$	$\infty$
System detection limit	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	$\pm 0.6\%$	$\infty$
Readout electronics	$\pm 1.0\%$	Normal	1	1	$\pm 1.0\%$	$\infty$
Response time	$\pm 0.8\%$	Rectangular	$\sqrt{3}$	1	$\pm 0.5\%$	$\infty$
Integration time	$\pm 2.6\%$	Rectangular	$\sqrt{3}$	1	$\pm 1.5\%$	$\infty$
RF ambient conditions	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	$\pm 1.7\%$	$\infty$
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	$\pm 0.2\%$	$\infty$
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	$\pm 1.7\%$	$\infty$
Algorithms for max SAR eval.	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	$\pm 0.6\%$	$\infty$
Test Sample Related						
Device positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	$\pm 2.9\%$	145
Device holder	$\pm 3.6\%$	Normal	1	1	$\pm 3.6\%$	5
Power drift	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	1	$\pm 2.9\%$	$\infty$
Phantom and set-up			$\sqrt{3}$			
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	$\pm 2.3\%$	$\infty$
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	$\pm 1.8\%$	$\infty$
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	$\pm 1.6\%$	$\infty$
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7\%$	$\infty$
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	$\pm 1.5\%$	$\infty$
Combined Uncertainty					$\pm 10.3\%$	