

LG Electronics Inc.

DUT: GD510; Type: Cellular / PCS GSM / EDGE Phone with Bluetooth; Serial:#1

Communication System: PCS 1900; Frequency: 1909.80 MHz; Duty Cycle: 1:8.3

Medium: Head 1909.80 MHz; ($\sigma = 1.39\text{mho/m}$; $\epsilon_r = 39.6$; $\rho = 1000\text{ kg/m}^3$)

Phantom section: Left Section

Test Date: 08/17/2009; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3066; ConvF(4.58, 4.58, 4.58); Calibrated: 2009-02-16

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE3 Sn467; Calibrated: 2009-03-10

Phantom: SAM 835; Type: SAM 4.0; Serial: TP-1117

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Left Head Touch, Ch.810, Fixed Ant., Solar Cell

Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.46mW/g

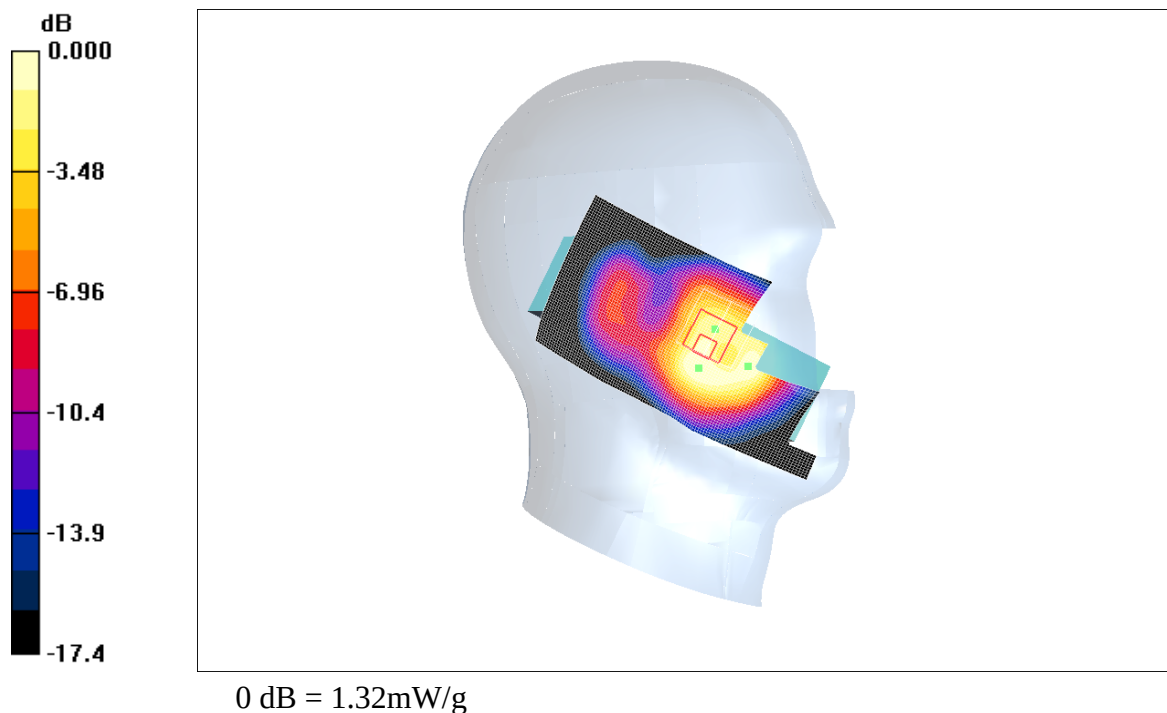
Zoom Scan (5x5x7)/Cube 2: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.5 V/m; Power Drift = -0.079 dB

Peak SAR (extrapolated) = 1.93 W/kg

SAR(1 g) = 1.03mW/g; SAR(10 g) = 0.583mW/g

Maximum value of SAR (measured) = 1.32mW/g



LG Electronics Inc.

DUT: GD510; Type: Cellular / PCS GSM / EDGE Phone with Bluetooth; Serial:#1

Communication System: GPRS 850; Frequency: 848.80 MHz; Duty Cycle: 1:2.075

Medium: Body 848.80 MHz; ($\sigma = 0.958$ mho/m; $\epsilon_r = 54.0$; $\rho = 1000$ kg/m³)

Phantom section: Flat Section

Test Date: 08/14/2009; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3066; ConvF(5.50, 5.50, 5.50); Calibrated: 2009-02-16

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE3 Sn467; Calibrated: 2009-03-10

Phantom: SAM 835; Type: SAM 4.0; Serial: TP-1151

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Flat Touch, Ch.251, Rear, Fixed Ant., Solar Cell

Area Scan (71x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.13mW/g

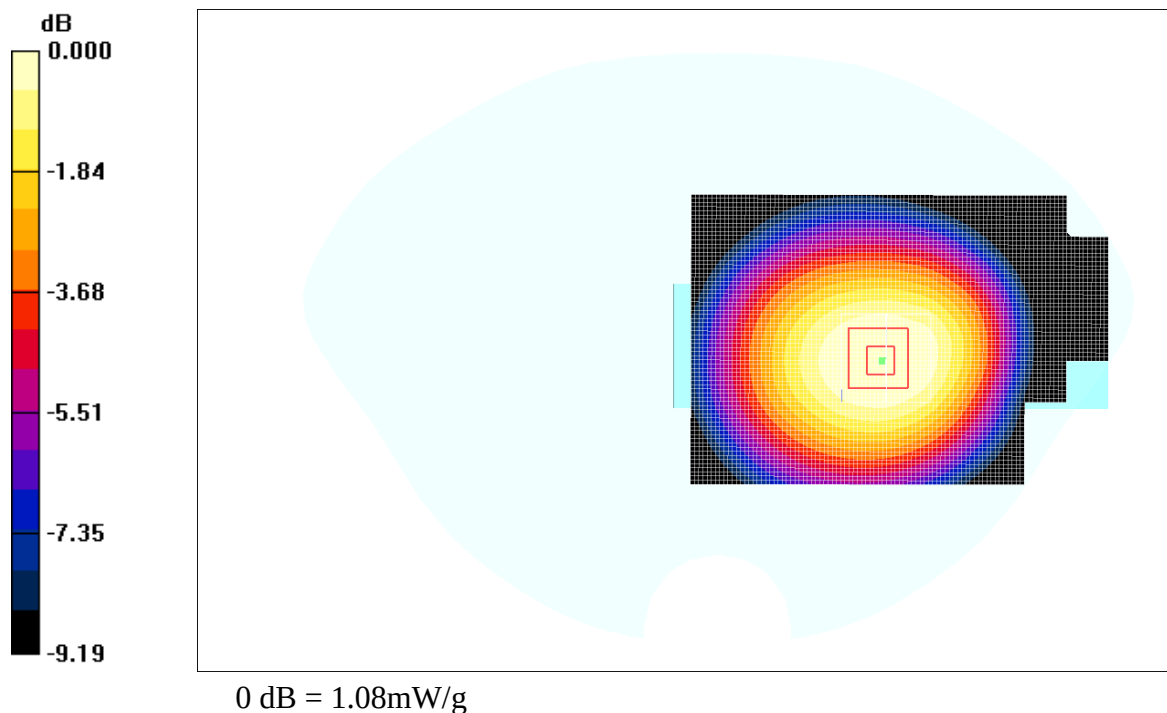
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.8 V/m; Power Drift = -0.319 dB

Peak SAR (extrapolated) = 1.38 W/kg

SAR(1 g) = 1.02mW/g; SAR(10 g) = 0.748mW/g

Maximum value of SAR (measured) = 1.08mW/g



LG Electronics Inc.

DUT: GD510; Type: Cellular / PCS GSM / EDGE Phone with Bluetooth; Serial:#1

Communication System: GPRS 1900; Frequency: 1880.00 MHz; Duty Cycle: 1:2.075

Medium: Body 1880.00 MHz; ($\sigma = 1.50$ mho/m; $\epsilon_r = 54.0$; $\rho = 1000$ kg/m³)

Phantom section: Flat Section

Test Date: 08/17/2009; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3066; ConvF(4.33, 4.33, 4.33); Calibrated: 2009-02-16

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE3 Sn467; Calibrated: 2009-03-10

Phantom: SAM 835; Type: SAM 4.0; Serial: TP-1151

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Flat Touch, Ch.661, Rear, Fixed Ant., Solar Cell

Area Scan (81x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.474mW/g

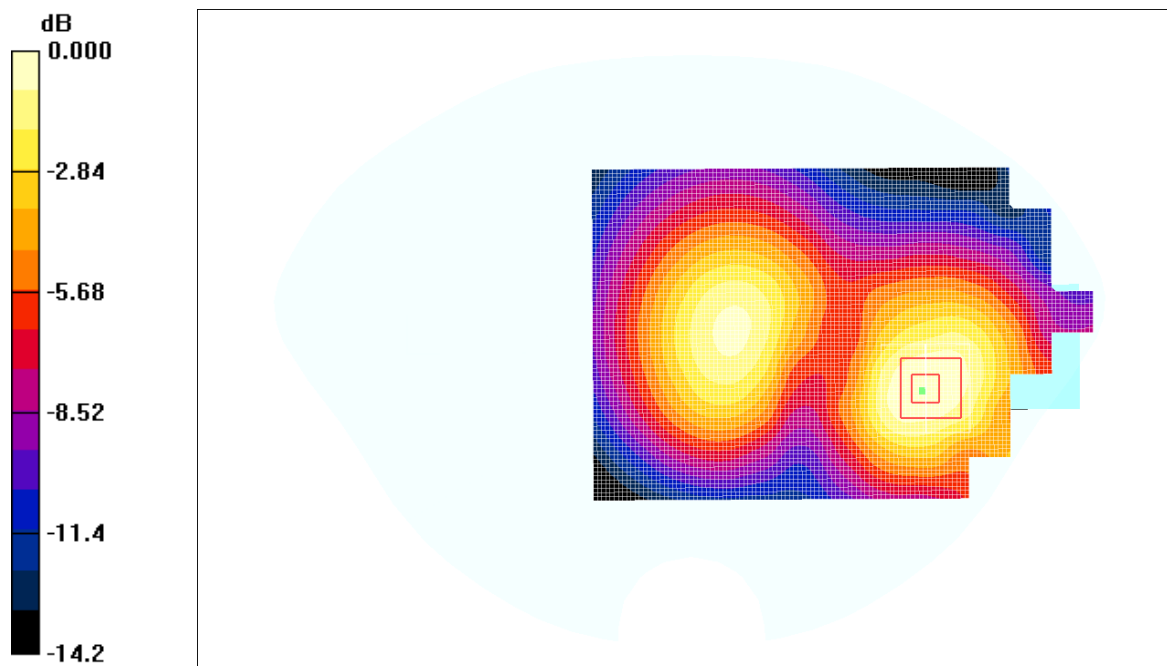
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.4 V/m; Power Drift = -0.373 dB

Peak SAR (extrapolated) = 0.705 W/kg

SAR(1 g) = 0.424mW/g; SAR(10 g) = 0.265mW/g

Maximum value of SAR (measured) = 0.460mW/g



0 dB = 0.460mW/g

1. TEST RESULT SUMMARY

Model Name(s) : GD510
 Date of Test : August 26, 2009
 Date of Issue : August 26, 2009
 Address of Test Site : 60-39, Kasan-Dong, Kumchon-Gu, Seoul 153-801, Korea.
 Responsible Test Engineer : Eui-Soon Park
 Test Engineer : Chan-ho Jeong
 EUT Type : Cellular / PCS GSM / EDGE Phone with Bluetooth
 Tx Frequency : 824.20 ~ 848.80 MHz (GSM850)
 1850.20 ~ 1909.80 MHz (PCS1900)
 2402.00 ~ 2480.00 MHz (Bluetooth)
 Rx Frequency : 869.20 ~ 893.80 MHz (GSM850)
 1930.20 ~ 1989.80 MHz (PCS1900)
 Transmit Output Power : GSM850: 32.5 dBm
 PCS1900: 29.5 dBm
 Bluetooth: 2.0 dBm
 Battery Type : Standard

Maximum Results Found During SAR Evaluation

1. Body Worn Configuration

ANSI / IEEE C95.1(2005) - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					1.6 W/kg averaged over 1 gram			
Frequency		Mod.	Conducted Power (dBm)		Battery	Device Test Position	Antenna Position	SAR (W/kg)
MHz	Ch.		Start	End				
2480.00	78	Bluetooth	-0.38	-0.39	Standard	2.0 [Front]	Fixed	0.0016

2. Measurement Uncertainty

Combine Standard Uncertainty	10.4
Extended Standard Uncertainty	20.8 (k=2, 95% CONFIDENCE LEVEL)

2. SYSTEM VERIFICATION

Tissue Verification

MEASURED TISSUE PARAMETERS				
Liquid Temp (°C)	21.8			
Liquid Depth (mm)	150 ± 1			
Tissue	2450MHz Brain		2450MHz Muscle	
Date	08/26/2009		08/26/2009	
Parameters	Target	Measured	Target	Measured
Dielectric Constant: ϵ	39.2	40.3	52.7	53.3
Conductivity: σ	1.80	1.79	1.95	1.99
Deviation (%)	ϵ : +2.80 σ : -0.55		ϵ : +1.13 σ : +2.05	

Table 10.1 Simulated Tissue Verification

Test System Validation

Prior to assessment, the system is verified to the $\pm 10\%$ of the specifications at 835MHz and 1900MHz by using the system validation kit(s). (Graphic Plots Attached)

SYSTEM DIPOLE VALIDATION TARGET & MEASURED						
Tissue	System Validation Kit	Date	Liquid Temp (°C)	Targeted SAR _{1g} (mW/g)	Measured SAR _{1g} (mW/g)	Deviation (%)
2450MHz Brain	D2450V2, S/N: 768	08/26/2009	21.8	54.5	59.2	+8.62

Table 10.2 System Validation

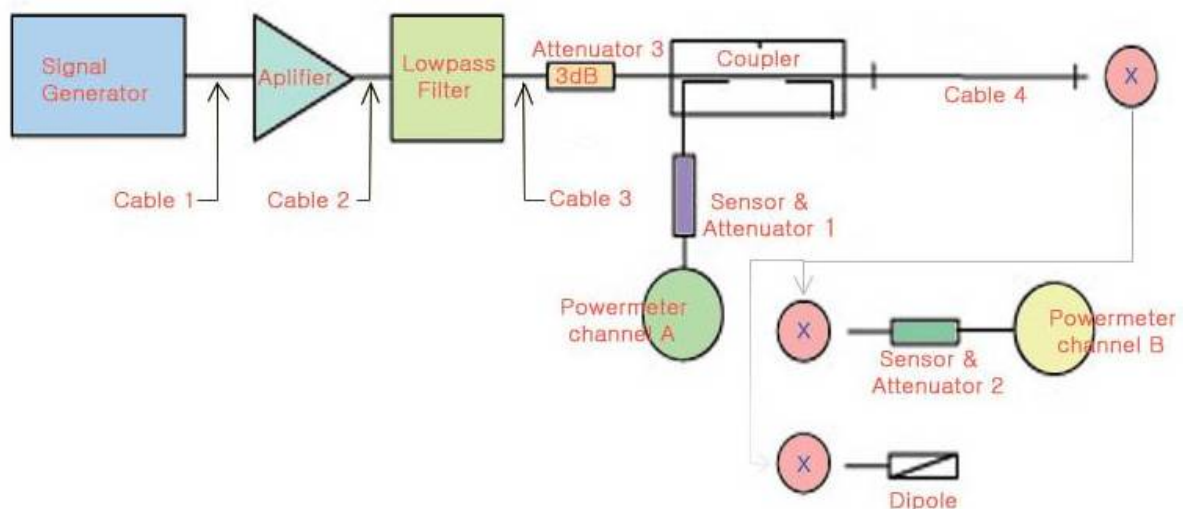


Figure 10.1 Dipole Validation Test Setup

3. MEASUREMENT RESULTS

Ambient Conditions

Ambient Temperature (°C):	22 ± 1
Relative Humidity (%):	55 ± 5
Liquid Tissue Temperature (°C):	21.8 ± 0.5
Liquid Tissue Depth (mm):	150 ± 1
Mixture Type:	2450MHz Muscle
Dielectric Constant:	53.3
Conductivity:	1.99

Measurement Results

ANSI / IEEE C95.1- 2005 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Muscle 1.6 W/kg averaged over 1 gram			
MEASUREMENT RESULTS (Body SAR)								
Frequency		Mod.	Conducted Power (dBm)		Battery	Device Test Position	Antenna Position	SAR (W/kg)
MHz	Ch.		Start	End				
2480.00	78	Bluetooth	-0.38	-0.39	Standard	2.0 [Front]	Fixed	0.0016
2480.00	78	Bluetooth	-0.38	-0.39	Standard	2.0 [Rear]	Fixed	0.0014

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Battery is fully charged for all readings. Standard batteries are the only options.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C [July 2001], if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).



Eui - Soon Park
E. S. Park / Technical Manager
MCCL

APPENDIX A: SAR Test Data

LG Electronics Inc.

DUT: Dipole 2450MHz; Type: D2450V2; Serial: 768

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Head 2450 MHz; ($\sigma = 1.79$ mho/m; $\epsilon_r = 40.3$; $\rho = 1000$ kg/m³)
Phantom section: Flat Section

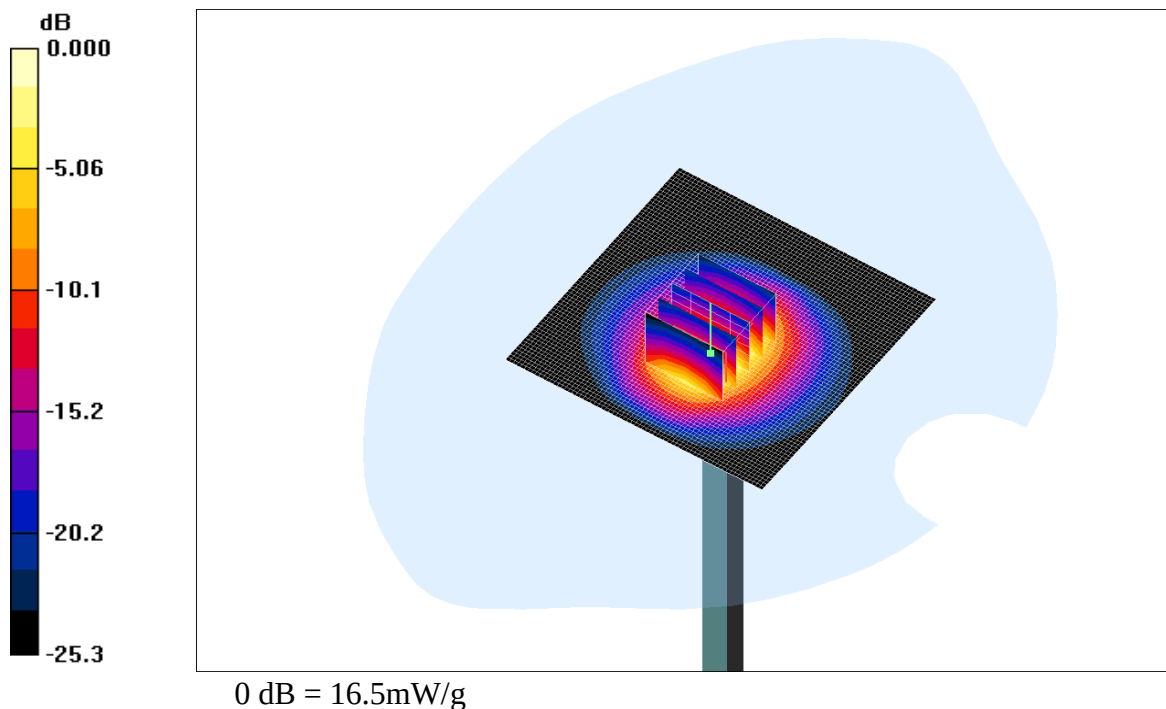
Test Date: 08/26/2009; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3066; ConvF(4.2, 4.2, 4.2); Calibrated: 2009-02-16
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn467; Calibrated: 2009-03-10
Phantom: SAM 835MHz; Type: SAM; Serial: TP-1117
Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

2450 MHz Dipole Validation

Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 16.9mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.0 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 33.7 W/kg
SAR(1 g) = 14.8mW/g; SAR(10 g) = 6.56mW/g
Maximum value of SAR (measured) = 16.5mW/g



LG Electronics Inc.

DUT: GD510; Type: Cellular / PCS GSM / EDGE Phone with Bluetooth; Serial:#1

Communication System: Bluetooth; Frequency: 2480.00 MHz; Duty Cycle: 1:1

Medium: Muscle 2480.00 MHz; ($\sigma = 2.04$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³)

Phantom section: Flat Section

Test Date: 08/26/2009; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3066; ConvF(3.87, 3.87, 3.87); Calibrated: 2009-02-16

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE3 Sn467; Calibrated: 2009-03-10

Phantom: SAM with CRP 1800MHz; Type: SAM; Serial: TP-1151

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Flat Touch, Ch.78, Front, Fixed Ant., Standard Battery

Area Scan (101x131x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.003mW/g

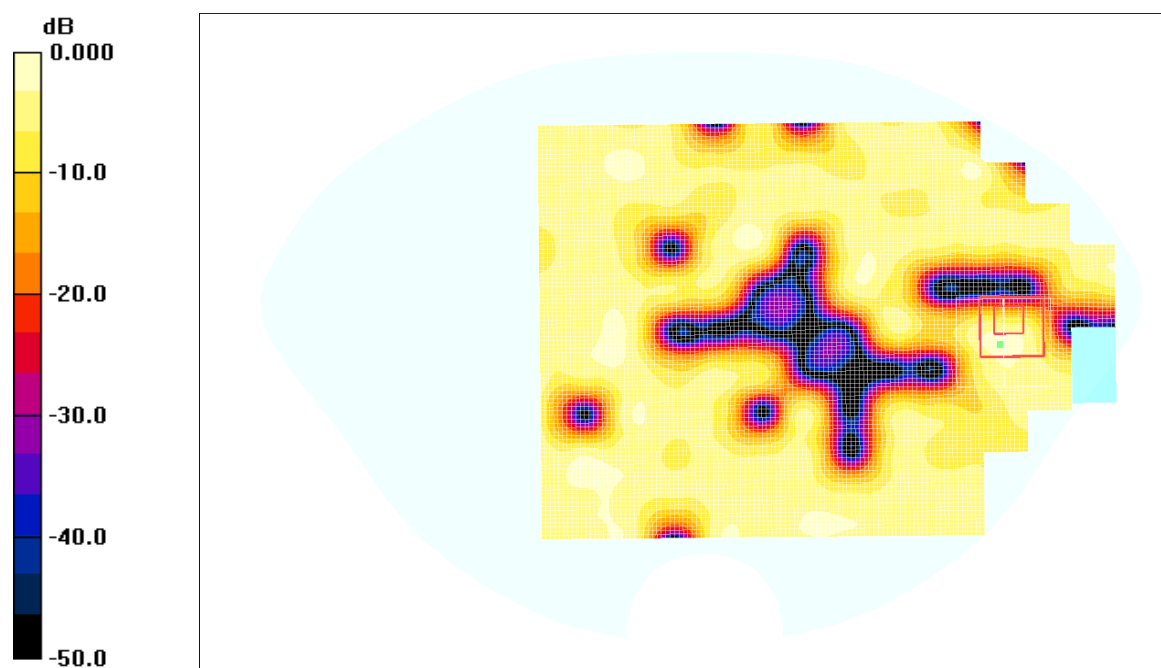
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.650 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 0.003 W/kg

SAR(1 g) = 0.00163mW/g; SAR(10 g) = 0.000893mW/g

Maximum value of SAR (measured) = 0.003mW/g



0 dB = 0.003mW/g

LG Electronics Inc.

DUT: GD510; Type: Cellular / PCS GSM / EDGE Phone with Bluetooth; Serial:#1

Communication System: Bluetooth; Frequency: 2480.00 MHz; Duty Cycle: 1:1

Medium: Muscle 2480.00 MHz; ($\sigma = 2.04$ mho/m; $\epsilon_r = 53.2$; $\rho = 1000$ kg/m³)

Phantom section: Flat Section

Test Date: 08/26/2009; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3066; ConvF(3.87, 3.87, 3.87); Calibrated: 2009-02-16

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE3 Sn467; Calibrated: 2009-03-10

Phantom: SAM with CRP 1800MHz; Type: SAM; Serial: TP-1151

Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Flat Touch, Ch.78, Rear, Fixed Ant., Standard Battery

Area Scan (101x131x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.003mW/g

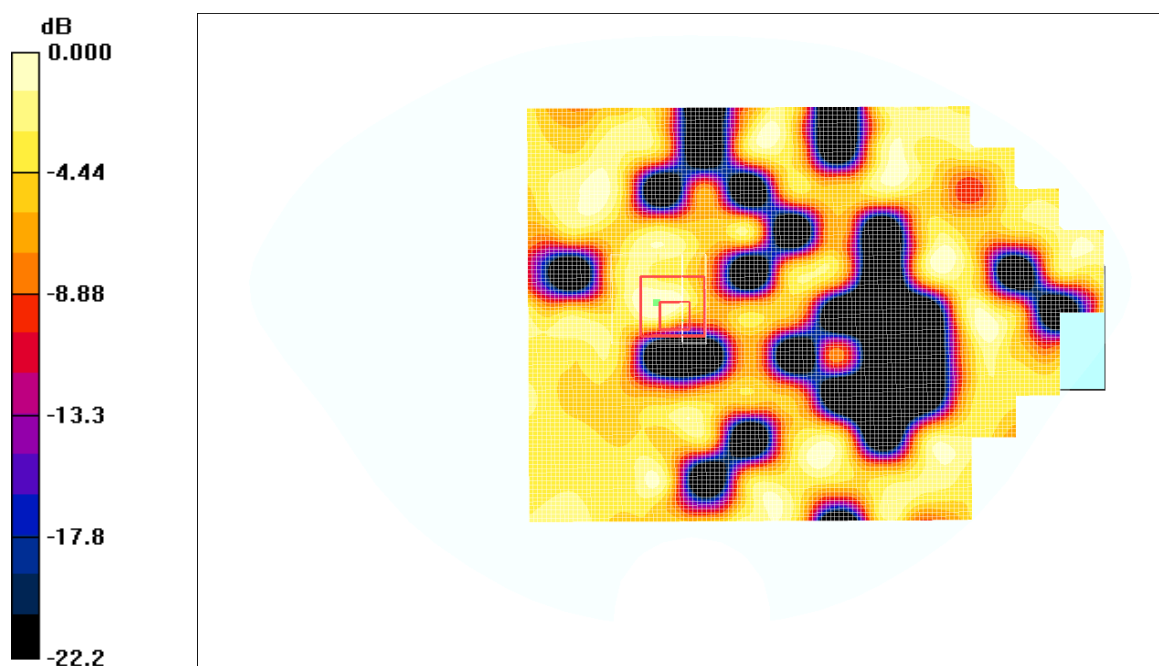
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.515 V/m; Power Drift = 0.394 dB

Peak SAR (extrapolated) = 0.002 W/kg

SAR(1 g) = 0.0014mW/g; SAR(10 g) = 0.000725mW/g

Maximum value of SAR (measured) = 0.002mW/g



0 dB = 0.002mW/g

APPENDIX D: Calibration Certificates

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



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

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

Accreditation No.: **SCS 108**

Client **LG (Dymstec)**

Certificate No: **ES3-3066_Feb09**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3066**

Calibration procedure(s) **QA CAL-01.v6 and QA CAL-23.v3
Calibration procedure for dosimetric E-field probes**

Calibration date: **February 16, 2009**

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

Calibrated by:	Name Katja Pokovic	Function Technical Manager	Signature 
Approved by:	Name Niels Kuster	Function Quality Manager	Signature 

Issued: February 16, 2009

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

Certificate No: ES3-3066_Feb09

Page 1 of 9

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



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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ 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
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ 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^2 -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 ± 50 MHz to ± 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.

Certificate No: ES3-3066_Feb09

Page 2 of 9

ES3DV3 SN:3066

February 16, 2009

Probe ES3DV3

SN:3066

Manufactured:	December 14, 2004
Last calibrated:	March 21, 2008
Recalibrated:	February 16, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ES3-3066_Feb09

Page 3 of 9

ES3DV3 SN:3066

February 16, 2009

DASY - Parameters of Probe: ES3DV3 SN:3066**Sensitivity in Free Space^A**

NormX	1.19 ± 10.1%	$\mu V/(V/m)^2$
NormY	1.34 ± 10.1%	$\mu V/(V/m)^2$
NormZ	1.19 ± 10.1%	$\mu V/(V/m)^2$

Diode Compression^B

DCP X	95 mV
DCP Y	92 mV
DCP Z	93 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 _{be} [%] Without Correction Algorithm	9.2	5.4
SAR _{be} [%] With Correction Algorithm	0.8	0.4

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance	3.0 mm	4.0 mm
SAR _{be} [%] Without Correction Algorithm	10.9	6.7
SAR _{be} [%] With Correction Algorithm	0.9	0.5

Sensor OffsetProbe Tip to Sensor Center **2.0 mm**

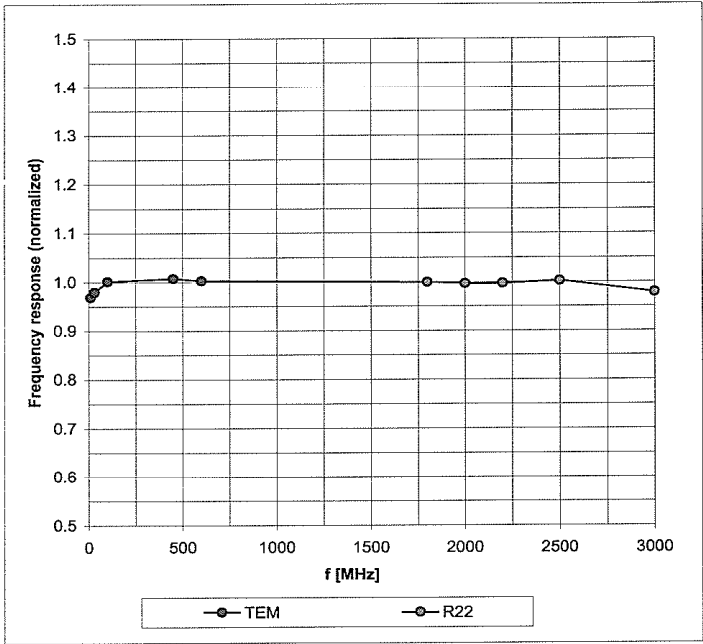
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).^B Numerical linearization parameter: uncertainty not required.

ES3DV3 SN:3066

February 16, 2009

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

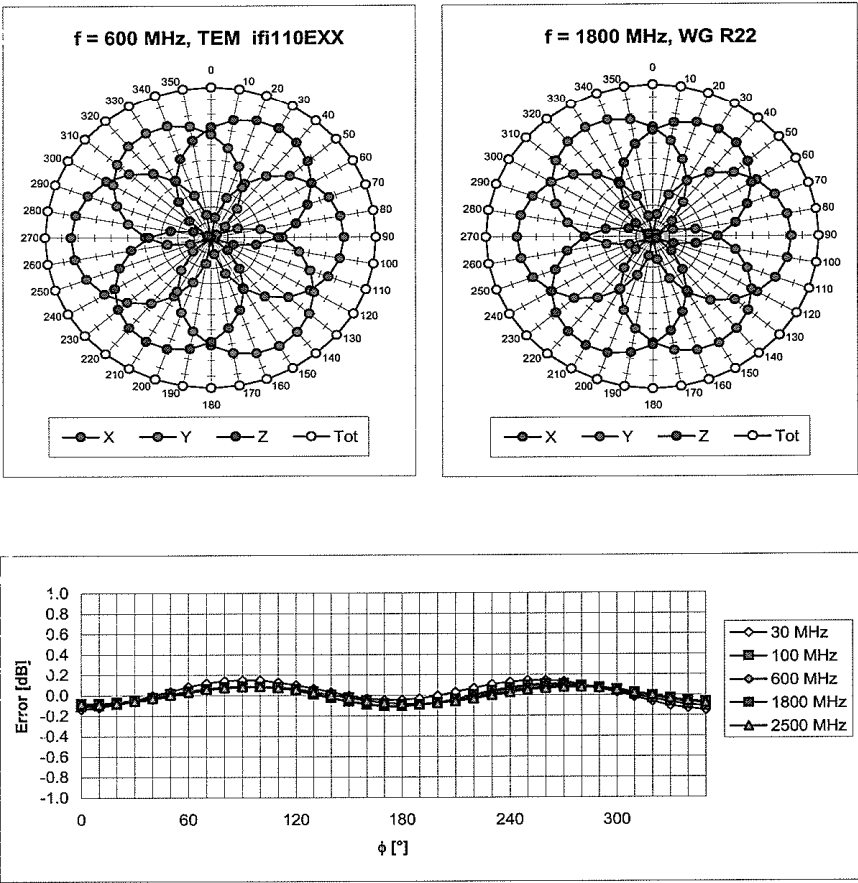


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

ES3DV3 SN:3066

February 16, 2009

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

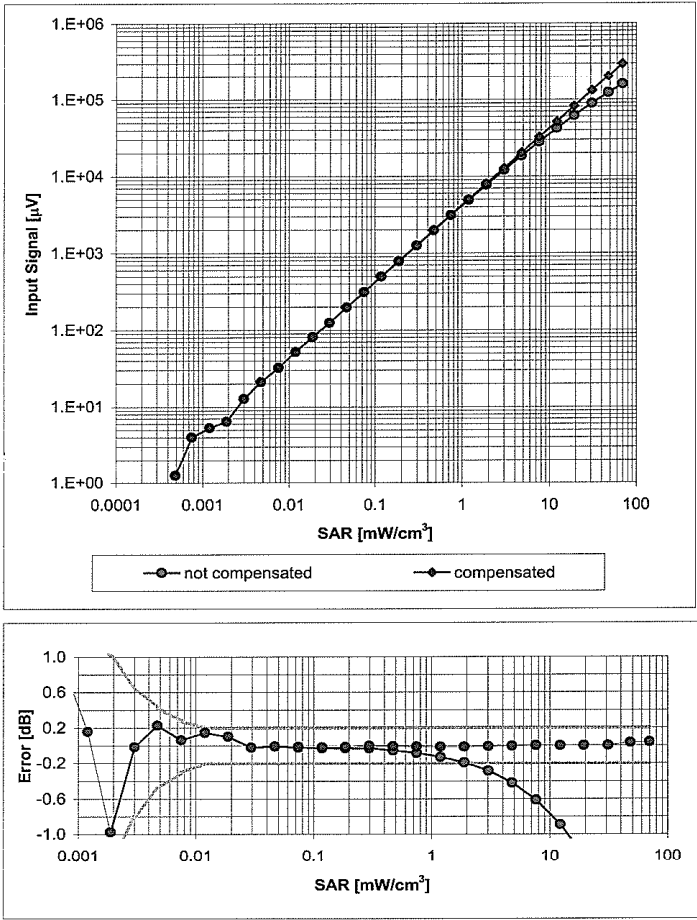


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ES3DV3 SN:3066

February 16, 2009

Dynamic Range f(SAR_{head})
(Waveguide R22, f = 1800 MHz)

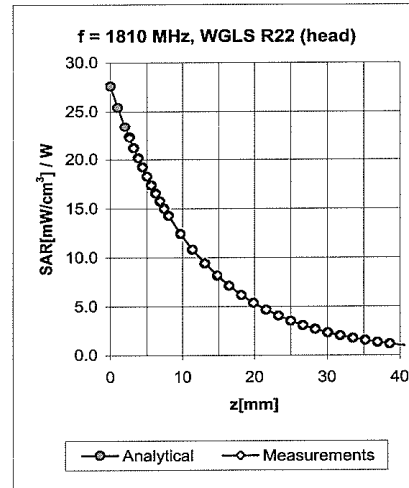
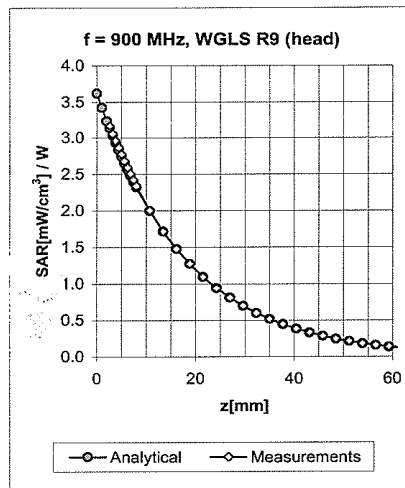


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ES3DV3 SN:3066

February 16, 2009

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.69	1.16	5.57 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.51	1.53	4.72 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.54	1.40	4.54 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.42	1.71	4.20 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.94	1.10	5.53 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.42	1.67	4.53 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.31	1.98	4.49 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.66	1.23	3.87 ± 11.0% (k=2)

^c 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.

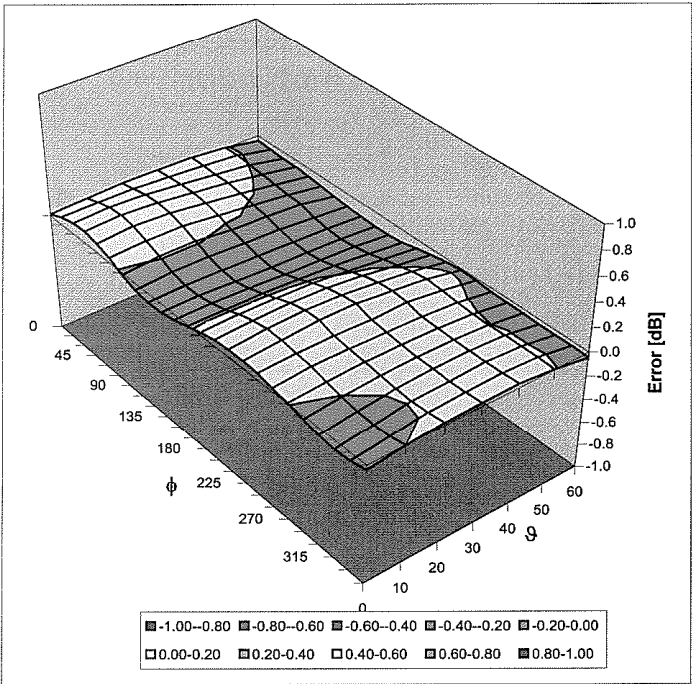
Certificate No: ES3-3066_Feb09

Page 8 of 9

ES3DV3 SN:3066

February 16, 2009

Deviation from Isotropy in HSL
Error (ϕ , θ), $f = 900\text{ MHz}$



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

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, <http://www.speag.com>

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ES3DV3

Serial Number:

3066

Place of Assessment:

Zurich

Date of Assessment:

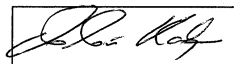
April 27, 2009

Probe Calibration Date:

February 16, 2009

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1810 MHz.

Assessed by:



ES3DV3-SN:3066

Page 1 of 2

April 27, 2009

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

s p e a g

Dosimetric E-Field Probe ES3DV3 - SN:3066

Conversion factor ($\pm$ standard deviation)

835 $\pm$ 50 MHz	ConvF	5.72 $\pm$ 7%	$\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.90 \pm 5\%$ mho/m (head tissue)
1900 $\pm$ 50 MHz	ConvF	4.58 $\pm$ 7%	$\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m (head tissue)
835 $\pm$ 50 MHz	ConvF	5.50 $\pm$ 7%	$\epsilon_r = 55.2 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m (body tissue)
1900 $\pm$ 50 MHz	ConvF	4.33 $\pm$ 7%	$\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\%$ mho/m (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **LG (Dymstec)**

Certificate No: **D835V2-468_Apr08**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 468**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **April 23, 2008**

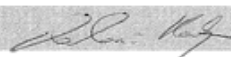
Condition of the calibrated item **In Tolerance**

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 (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (No. 217-00718)	Aug-08
Type-N mismatch combination	SN: 5047.2 / 06327	08-Aug-07 (No. 217-00721)	Aug-08
Reference Probe ES3DV2	SN: 3025	01-Mar-08 (No. ES3-3025_Mar08)	Mar-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 24, 2008

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

Certificate No: D835V2-468_Apr08

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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:

- 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
- 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
- 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:

- 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.

Measurement Conditions

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

DASY Version	DASY4	V4.7
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	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.2 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.28 mW / g
SAR normalized	normalized to 1W	9.12 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.07 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.50 mW / g
SAR normalized	normalized to 1W	6.00 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	5.97 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	52.4 Ω - 2.4 j Ω
Return Loss	- 29.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 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	August 27, 2002

DASY4 Validation Report for Head TSL

Date/Time: 23.04.2008 11:29:27

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:468

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

Medium: HSL 900 MHz;

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.9 \text{ mho/m}$; $\epsilon_r = 41.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(6.09, 6.09, 6.09); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

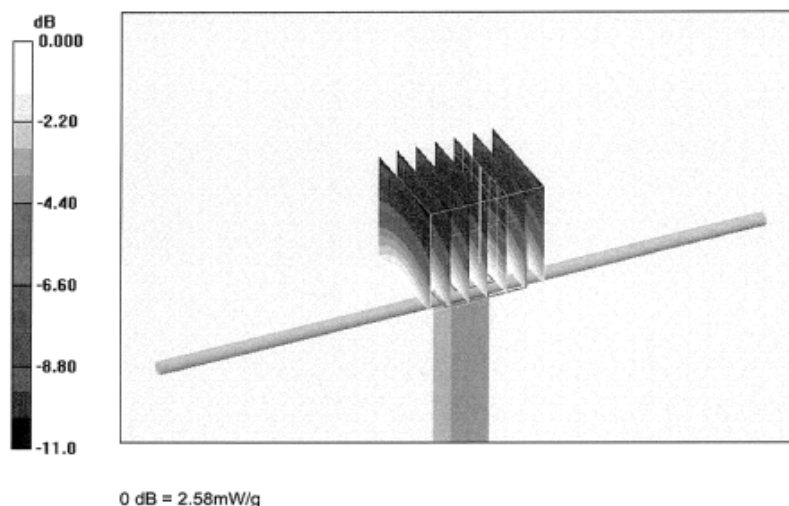
Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0:Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.0 V/m; Power Drift = 0.012 dB

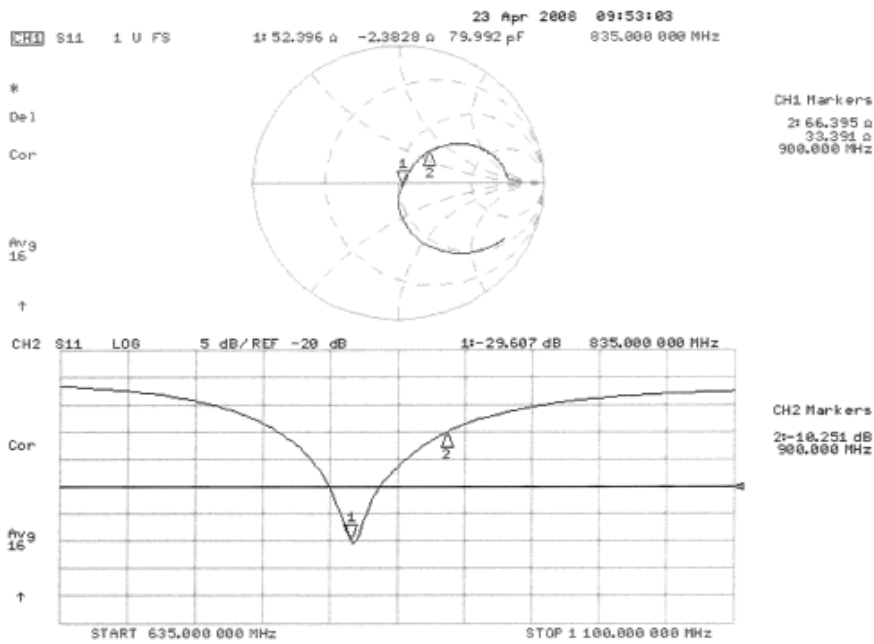
Peak SAR (extrapolated) = 3.29 W/kg

SAR(1 g) = 2.28 mW/g; SAR(10 g) = 1.5 mW/g

Maximum value of SAR (measured) = 2.58 mW/g



Impedance Measurement Plot for Head TSL



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Accreditation No.: **SCS 108**

Client **LG (Dymstec)**

Certificate No: **D1900V2-5d057_Apr08**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d057**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **April 22, 2008**

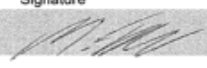
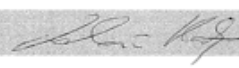
Condition of the calibrated item **In Tolerance**

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	GB37460704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (No. 217-00718)	Aug-08
Type-N mismatch combination	SN: 5047.2 / 06327	08-Aug-07 (No. 217-00721)	Aug-08
Reference Probe ES3DV2	SN: 3025	01-Mar-08 (No. ES3-3025_Mar08)	Mar-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-08
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 23, 2008

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Certificate No: D1900V2-5d057_Apr08

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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:

- 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
- 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:

- 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.

Measurement Conditions

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

DASY Version	DASY4	V4.7
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	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.1 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.2 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.1 mW / g
SAR normalized	normalized to 1W	40.4 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	39.5 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.19 mW / g
SAR normalized	normalized to 1W	20.8 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.6 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.1 Ω + 4.8 j Ω
Return Loss	- 25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 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	March 19, 2004

DASY4 Validation Report for Head TSL

Date/Time: 22.04.2008 14:09:52

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d057

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

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 40.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.9, 4.9, 4.9); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

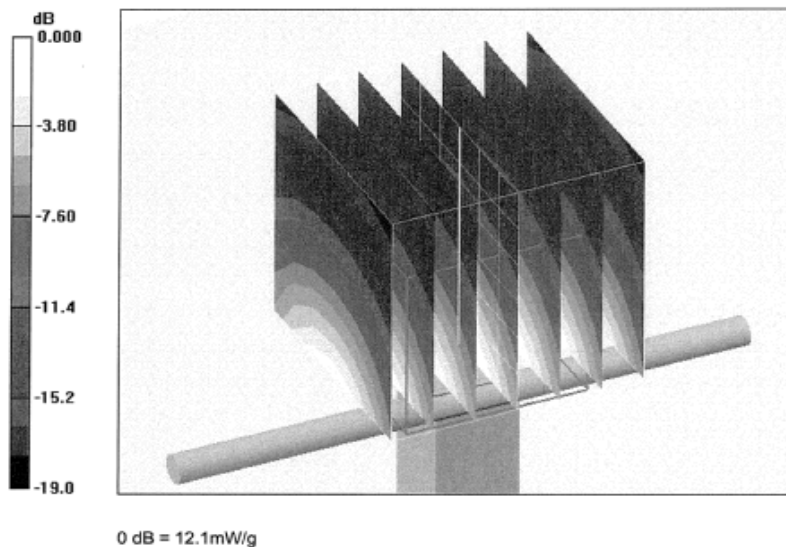
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.1 V/m; Power Drift = 0.035 dB

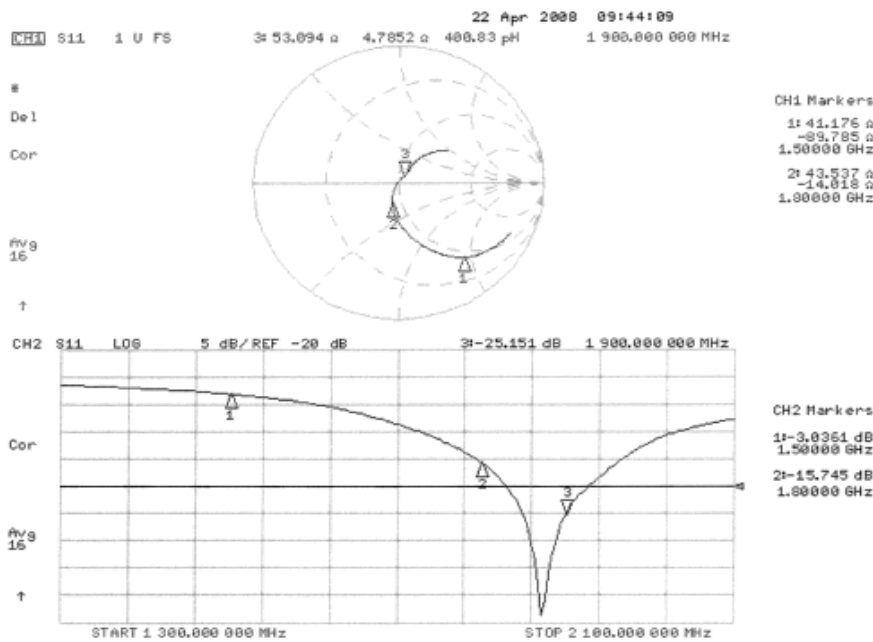
Peak SAR (extrapolated) = 18.8 W/kg

SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.19 mW/g

Maximum value of SAR (measured) = 12.1 mW/g



Impedance Measurement Plot for Head TSL



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Accreditation No.: **SCS 108**

Client **LG (Dymstec)**

Certificate No: **D2450V2-768_Apr08**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 768**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **April 22, 2008**

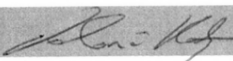
Condition of the calibrated item **In Tolerance**

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (No. 217-00718)	Aug-08
Type-N mismatch combination	SN: 5047.2 / 06327	08-Aug-07 (No. 217-00721)	Aug-08
Reference Probe ES3DV2	SN: 3025	01-Mar-08 (No. ES3-3025_Mar08)	Mar-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

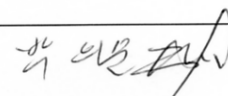
	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 23, 2008

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Certificate No: D2450V2-768_Apr08

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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.

Measurement Conditions

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

DASY Version	DASY4	V4.7
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	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.84 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.1 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 mW / g
SAR normalized	normalized to 1W	54.8 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	54.5 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.35 mW / g
SAR normalized	normalized to 1W	25.4 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	25.4 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	53.4 Ω + 4.8 j Ω
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns
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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	August 10, 2004

DASY4 Validation Report for Head TSL

Date/Time: 22.04.2008 15:40:12

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN768

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

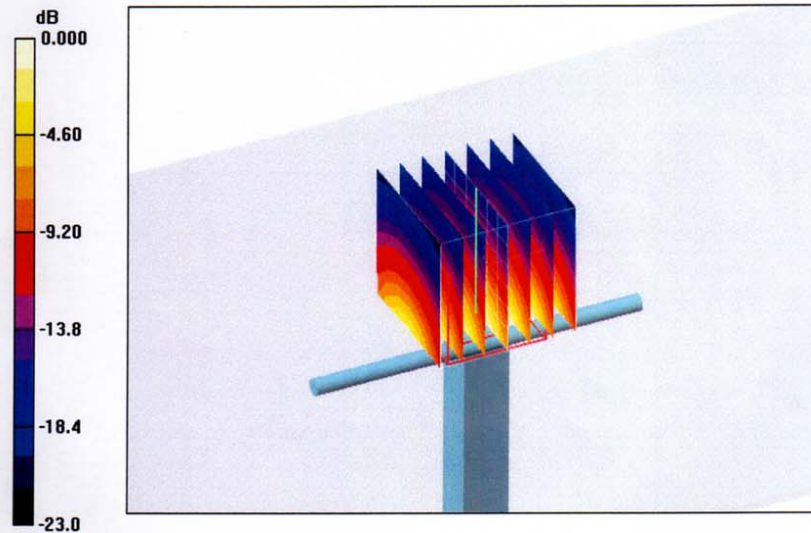
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.5 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.35 mW/g

Maximum value of SAR (measured) = 16.9 mW/g



0 dB = 16.9mW/g

Certificate No: D2450V2-768_Apr08

Page 5 of 6

Impedance Measurement Plot for Head TSL

