Testing Laboratory 1596

TESTING CNAS L5313

CE SAR Test Report

Product Name : LM128 Rugged Phone

Model No. : LM128

Applicant : Shenzhen Xin Kingbrand Enterprises Co., Ltd

Address : Kingbrand Industrial Zone, Nanpu Road, Shang liao ling pi keng, Shajing Town, Baoan District, Shenzhen City, Guangdong

Date of Receipt : 06/08/2012

Date of Test : 10/08/2012

Issued Date : 21/08/2012

Report No. : 128S010R-HP-CE-P01V01

Report Version : V1.1

Test Report Certification

Issued Date: 13/08/2012

Report No.: 128S010R-HP-CE-P01V01

QuieTek

Product Name	:	LM128 Rugged Phone
Applicant	:	Shenzhen Xin Kingbrand Enterprises Co., Ltd
Address	:	Kingbrand Industrial Zone, Nanpu Road, Shang liao ling pi keng, Shajing Town, Baoan District, Shenzhen City, Guangdong
Manufacturer	:	Shenzhen Xin Kingbrand Enterprises Co., Ltd
Address	:	K building, Sheng Guang industrial, Nan Dong Dong Huan road, Huang Pu community, Sha Jing town, Bao An district, Shenzhen
Model No.	:	LM128
EUT Voltage	:	DC: 3.7V
Brand Name	:	Xin Kingbrand
Applicable Standard	:	EN50360: 2001 EN62209-1: 2006 EN62311: 2008 EN62209-2:2010
Test Result	:	Max. SAR Measurement (10g) Head: 0.515 W/kg Body: 0.680 W/kg
Performed Location	:	Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park Loufeng Hi-Tech Development Zone., Suzhou, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098

Documented By : Alice Ni

(Engineering ADM: Alice Ni)

Reviewed By : Robin Wu

(Engineering Supervisor: Robin Wu)

Approved By : Marlin Chen

(Manager: Marlin Chen)

Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	**:**	**BSMI, NCC, TAF**
Germany	**:**	**TUV Rheinland**
Norway	**:**	**Nemko, DNV**
USA	**:**	**FCC, NVLAP**
Japan	**:**	**VCCI**
China	**:**	**CNAS**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site :http://www.quietek.com/tw/ctg/cts/accreditations.htm
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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1. General Information

1.1. EUT Description

Product Name	LM128 Rugged Phone
Model No.	LM128
IMEI	358688000000158
Hardware Version	LM129_MB-V1.0-120611
Software Version	LM129_OINOM_PCB01_gprs_MT6252_S01.SDT_R_LM129_OINOM_WB_V2_01
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	Internal
Support Band	GSM900/DCS1800
GPRS Type	Class B
GPRS Class	Class 12
Uplink	GSM 900: 880 ~ 915 MHz DCS 1800: 1710 ~ 1785 MHz
Downlink	GSM 900: 925 ~ 960 MHz DCS 1800: 1805 ~ 1880 MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS
Antenna Gain	3dBi
Bluetooth Frequency	2402~2480MHz
Bluetooth Version	V2.1 + EDR
Type of modulation	FHSS
Data Rate	1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK)
Antenna Gain	0dBi
Max. Output Power (Conducted)	GSM 900: 32.92 dBm DCS 1800: 30.13 dBm

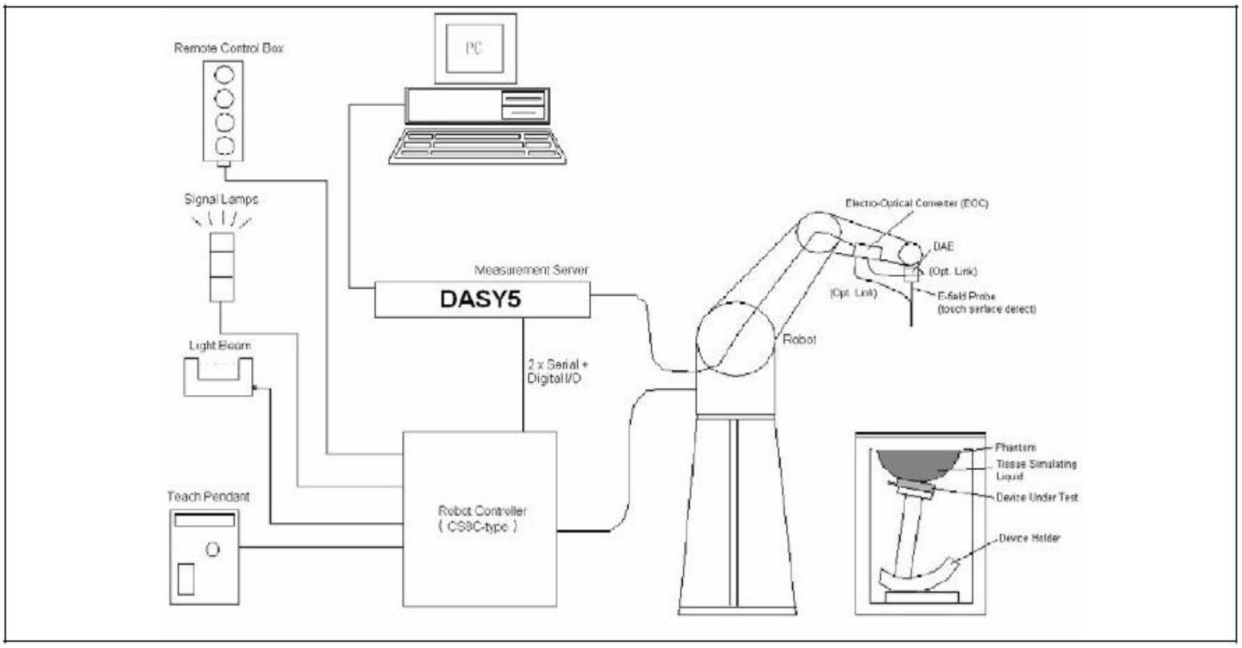
1.2. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21.5± 2
Humidity (%RH)	30-70	52

2. SAR Measurement System

2.1. DASY5 System Description



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

- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

2.1.1. Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEEE 1528, OET 65, IEC 62209-1, IEC 62209-2, EN 50360, EN 50383, EN62311 and others.

2.1.2. Area Scans

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

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

2.1.3. Zoom Scan (Cube Scan Averaging)

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

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

2.1.4. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY5 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}} \cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}} \frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

2.2. DASY5 E-Field Probe

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

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

2.2.1. Isotropic E-Field Probe Specification

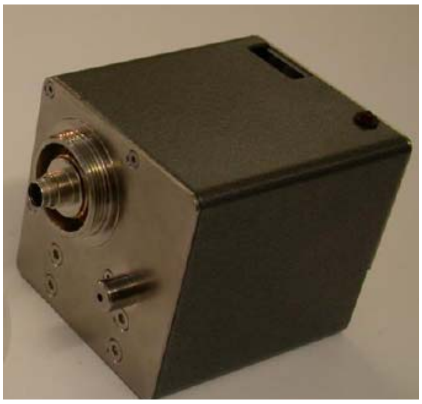
Model	EX3DV4	
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ±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

2.3. Boundary Detection Unit and Probe Mounting Device

The DASY probes use a precise connector and an additional holder for the probe, consisting of a plastic tube and a flexible silicon ring to center the probe. The connector at the DAE is flexibly mounted and held in the default position with magnets and springs. Two switching systems in the connector mount detect frontal and lateral probe collisions and trigger the necessary software response.

2.4. DATA Acquisition Electronics (DAE) and Measurement Server

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit.
Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.
The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.



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

2.5. Robot

The DASY5 system uses the high precision robots TX60 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used.

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

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

2.6. Light Beam Unit

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

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

2.7. Device Holder

The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP).
Thus the device needs no repositioning when changing the angles.
The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

2.8. SAM Twin Phantom

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

- Left head
- Right head
- Flat phantom

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

3. Tissue Simulating Liquid

3.1. The composition of the tissue simulating liquid

INGREDIENT (% Weight)	900MHz Head	900MHz Body	1800MHz Head	1800MHz Body
Water	40.92	56	52.64	40.5
Salt	1.48	0.768	0.36	0.5
Sugar	56.5	41.76	0.00	58
HEC	0.40	1.21	0.00	0.5
Preventol	0.10	0.27	0.00	0.5
DGBE	0.00	0.00	47.0	0.00

3.2. Tissue Calibration Result

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

Head/Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε_r	σ [s/m]	
900 MHz	Reference result ± 5% window	41.50 39.43 to 43.58	0.97 0.92 to 1.02	N/A
	10-08-2012	40.72	0.95	21.0
1800 MHz	Reference result ± 5% window	40.00 38.00 to 42.00	1.40 1.33 to 1.47	N/A
	10-08-2012	40.32	1.39	21.0

3.3. Tissue Dielectric Parameters for Head and Body Phantoms

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

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

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Table 1 – Dielectric properties of the tissue-equivalent liquid material

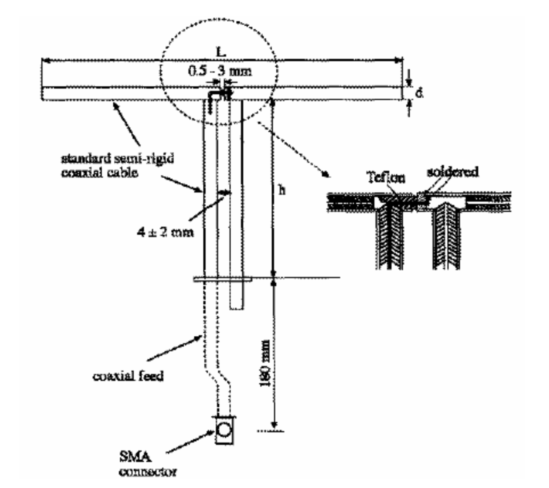
Frequency MHz	Real part of the complex relative permittivity, ε'_r	Conductivity, σ S/m
30	55,0	0,75
150	52,3	0,76
300	45,3	0,87
450	43,5	0,87
750	*41,9*	*0,89*
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
1 800	40,0	1,40
1 900	40,0	1,40
1 950	40,0	1,40
2 000	40,0	1,40
2 100	39,8	1,49
2 450	39,2	1,80
2 600	*39,0*	*1,96*
3 000	38,5	2,40
3 500	37,9	2,91
4 000	37,4	3,43
4 500	36,8	3,94
5 000	36,2	4,45
5 200	36,0	4,66
5 400	35,8	4,86
5 600	35,5	5,07
5 800	35,3	5,27
6 000	35,1	5,48

Note: According to EN 62209-2, the liquid parameters ε_r and σ for head are the same as body requirements.

4. SAR Measurement Procedure

4.1. SAR System Validation

4.1.1. Validation Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles.

Frequency	L (mm)	h (mm)	d (mm)
900MHz	149.0	83.3	3.6
1800MHz	72.0	41.7	3.6

4.1.2. Validation Result

System Performance Check at 900MHz, 1800MHz, 2450MHz.

Validation Kit: D900V2-SN: 1d096

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
900 MHz	Reference result ± 10% window	10.5 9.45 to 11.55	6.73 6.06 to 7.40	N/A
	10-08-2012	10.6	6.8	21.0

Validation Kit: D1800V2-SN: 2d179

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
1800 MHz	Reference result ± 10% window	37.8 34.02 to 41.58	20.0 18.00 to 22.00	N/A
	10-08-2012	35.32	18.32	21.0

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

4.2. SAR Measurement Procedure

The DASY5 calculates SAR using the following equation,

$$SAR = \frac{\sigma |E|^2}{\rho}$$

σ: represents the simulated tissue conductivity

ρ: represents the tissue density

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at $1mm^2$) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at $1mm^3$).

5. SAR Exposure Limits

SAR assessments have been made in line with the requirements of 1999/519/EC, EN50360, and EN62311.

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

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (10g cube tissue for head and trunk)	**2.00 W/kg**
Spatial Average SAR (whole body)	**0.08 W/kg**
Spatial Peak SAR (10g for limb)	**4.00 W/kg**

6. Test Equipment List

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Stäubli Robot TX60L	Stäubli	TX60L	F10/5C90A1/A/01	only once
Controller	Stäubli	SP1	S-0034	only once
Dipole Validation Kits	Speag	D900V2	1d096	2013.02.17
Dipole Validation Kits	Speag	D1800V2	2d179	2013.02.22
Dipole Validation Kits	Speag	D1900V2	5d121	2013.02.22
SAM Twin Phantom	Speag	SAM	TP-1561/1562	N/A
Device Holder	Speag	SD 000 H01 HA	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	1220	2013.01.23
E-Field Probe	Speag	EX3DV4	3710	2013.03.12
SAR Software	Speag	DASY5	V5.2 Build 162	N/A
Power Amplifier	Mini-Circuit	ZVA-183-S+	N657400950	N/A
Directional Coupler	Agilent	778D	20160	N/A
Universal Radio Communication Tester	R&S	CMU 200	117088	2013.04.18
Vector Network	Agilent	E5071C	MY48367267	2013.04.10
Signal Generator	Agilent	E4438C	MY49070163	2013.04.18
Power Meter	Anritsu	ML2495A	0905006	2013.01.12
Wide Bandwidth Sensor	Anritsu	MA2411B	0846014	2013.01.12

7. Measurement Uncertainty

DASY5 Uncertainty Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) Veff
Measurement System								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity (target)	±5.0%	R	$\sqrt{3}$	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±11.0%	±10.8%	387
Expanded STD Uncertainty						±22.0%	±21.5%	

8. Conducted Power Measurement

Mode	Frequency (MHz)	Output Power (dBm)	Path Loss (dB)	Result (dBm)
Maximum Power <SIM 1>				
GSM900	880.2	32.22	0.7	32.92
	897.4	32.16	0.7	32.86
	914.8	32.15	0.7	32.85
GPRS900(1 Slot)	880.2	32.21	0.7	32.91
	897.4	32.15	0.7	32.85
	914.8	32.13	0.7	32.83
GPRS900(2 Slot)	880.2	31.70	0.7	32.40
	897.4	31.65	0.7	32.35
	914.8	31.62	0.7	32.32
GPRS900(3 Slot)	880.2	30.05	0.7	30.75
	897.4	29.98	0.7	30.68
	914.8	29.96	0.7	30.66
GPRS900(4 Slot)	880.2	29.08	0.7	29.78
	897.4	29.05	0.7	29.75
	914.8	29.02	0.7	29.72
DCS1800	1710.2	29.09	1.0	30.09
	1747.4	29.11	1.0	30.11
	1784.8	29.13	1.0	30.13
GPRS1800(1 Slot)	1710.2	29.08	1.0	30.08
	1747.4	29.11	1.0	30.11
	1784.8	29.13	1.0	30.13
GPRS1800(2 Slot)	1710.2	28.48	1.0	29.48
	1747.4	28.53	1.0	29.53
	1784.8	28.44	1.0	29.44
GPRS1800(3 Slot)	1710.2	26.92	1.0	27.92
	1747.4	26.96	1.0	27.96
	1784.8	26.87	1.0	27.87
GPRS1800(4 Slot)	1710.2	25.88	1.0	26.88
	1747.4	25.93	1.0	26.93
	1784.8	25.87	1.0	26.87
Maximum Power <SIM 2>				
GSM900	897.4	32.14	0.7	32.84
DCS1800	1747.4	29.09	1.0	30.09

Note : All SAR testing was done in SIM 1.

9. Test Results

9.1. SAR Test Results Summary

SAR MEASUREMENT							
Ambient Temperature (°C): 21.5 ± 2				Relative Humidity (%): 52			
Liquid Temperature (°C): 21.0 ± 2				Depth of Liquid (cm):>15			
Product: LM128 Rugged Phone							
Test Mode: GSM 900 <SIM 1>							
Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	Power Drift (<±0.2)	SAR 10g (W/kg)	Limit (W/kg)
		Channel	MHz				
Left-Cheek	Fixed	975	880.2	32.92	--	--	2
Left-Cheek	Fixed	37	897.4	32.86	0.01	0.289	2
Left-Cheek	Fixed	124	914.8	32.85	--	--	2
Left-Tilt	Fixed	37	897.4	32.86	-0.15	0.344	2
Right-Cheek	Fixed	975	880.2	32.92	--	--	2
Right-Cheek	Fixed	37	897.4	32.86	0.09	0.515	2
Right-Cheek	Fixed	124	914.8	32.85	--	--	2
Right- Tilt	Fixed	37	897.4	32.86	0.04	0.338	2
Test Mode: GSM 900 <SIM 2>							
Right-Cheek	Fixed	37	897.4	32.84	0.18	0.352	2
Note: when the 10-g SAR is ≤ 1.0 W/kg, testing for low and high channel is optional.							

SAR MEASUREMENT								
Ambient Temperature (°C) : 21.5 ±2				Relative Humidity (%): 52				
Liquid Temperature (°C) : 21.0 ±2				Depth of Liquid (cm):>15				
Product: LM128 Rugged Phone								
Test Mode: GSM 900								
Test Position Body	Antenna Position	Frequency		Separation Distance (mm)	Conducted Power (dBm)	Power Drift (<±0.2)	SAR 10g (W/kg)	Limit (W/kg)
		Channel	MHz					
Body-worn	Fixed	975	880.2	15	32.92	--	--	2
Body-worn	Fixed	37	897.4	15	32.86	-0.01	0.678	2
Body-worn	Fixed	124	914.8	15	32.85	--	--	2
Test Mode: GPRS900-2slot								
Body-worn	Fixed	37	897.4	15	32.35	-0.16	0.582	2
Test Mode: GPRS900-3slot								
Body-worn	Fixed	37	897.4	15	30.68	-0.16	0.572	2
Test Mode: GPRS900-4slot								
Body-worn	Fixed	975	880.2	15	29.78	--	--	2
Body-worn	Fixed	37	897.4	15	29.75	-0.10	**0.680**	2
Body-worn	Fixed	124	914.8	15	29.72	--	--	2
Body-front	Fixed	37	897.4	15	29.75	-0.14	0.539	2
Body-worn (With Headset)	Fixed	37	897.4	15	29.75	-0.10	0.417	2
Note: when the 10-g SAR is ≤ 1.0 W/kg, testing for low and high channel is optional.								

SAR MEASUREMENT							
Ambient Temperature (°C): 21.5 ± 2				Relative Humidity (%): 52			
Liquid Temperature (°C): 21.0 ± 2				Depth of Liquid (cm):>15			
Product: LM128 Rugged Phone							
Test Mode: DCS1800 <SIM 1>							
Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	Power Drift (<±0.2)	SAR 10g (W/kg)	Limit (W/kg)
		Channel	MHz				
Left-Cheek	Fixed	512	1710.2	30.09	--	--	2
Left-Cheek	Fixed	698	1747.4	30.11	0.02	0.213	2
Left-Cheek	Fixed	885	1784.8	30.13	--	--	2
Left-Tilt	Fixed	698	1747.4	30.11	-0.07	0.119	2
Right-Cheek	Fixed	512	1710.2	30.09	--	--	2
Right-Cheek	Fixed	698	1747.4	30.11	-0.02	0.226	2
Right-Cheek	Fixed	885	1784.8	30.13	--	--	2
Right-Tilt	Fixed	698	1747.4	30.11	-0.14	0.104	2
Test Mode: DCS1800 <SIM 2>							
Right-Cheek	Fixed	698	1747.4	30.09	0.04	0.212	2
Note: when the 10-g SAR is ≤ 1.0 W/kg, testing for low and high channel is optional.							

SAR MEASUREMENT								
Ambient Temperature (°C) : 21.5 ±2					Relative Humidity (%): 52			
Liquid Temperature (°C) : 21.0 ±2					Depth of Liquid (cm):>15			
Product: LM128 Rugged Phone								
Test Mode: DCS1800								
Test Position Body	Antenna Position	Frequency		Separation Distance (mm)	Conducted Power (dBm)	Power Drift (<±0.2)	SAR 10g (W/kg)	Limit (W/kg)
		Channel	MHz					
Body-worn	Fixed	512	1710.2	15	30.09	--	--	2
Body-worn	Fixed	698	1747.4	15	30.11	-0.12	0.224	2
Body-worn	Fixed	885	1784.8	15	30.13	--	--	2
Test Mode: GPRS1800-2slot								
Body-worn	Fixed	698	1747.4	15	29.53	-0.12	0.369	2
Test Mode: GPRS1800-3slot								
Body-worn	Fixed	698	1747.4	15	27.96	0.13	0.407	2
Test Mode: GPRS1800-4slot								
Body-worn	Fixed	512	1710.2	15	26.88	--	--	2
Body-worn	Fixed	698	1747.4	15	26.93	-0.02	**0.453**	2
Body-worn	Fixed	885	1784.8	15	26.87	--	--	2
Body-front	Fixed	698	1747.4	15	26.93	0.04	0.401	2
Body- worn (With Headset)	Fixed	698	1747.4	15	26.93	-0.01	0.441	2
Note: when the 10-g SAR is ≤ 1.0 W/kg, testing for low and high channel is optional.								

Appendix A. SAR System Validation Data

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

System Check Head 900MHz

DUT: Dipole 900 MHz D900V2; Type: D900V2

Communication System: CW; Communication System Band: D900 (900.0 MHz); Duty Cycle: 1:1; Frequency: 900 MHz; Medium parameters used: f = 900 MHz; σ = 0.95 mho/m; ε_r = 40.72; ρ = 1000 kg/m³ ; Phantom section: Flat Section ; Input Power=250mW

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

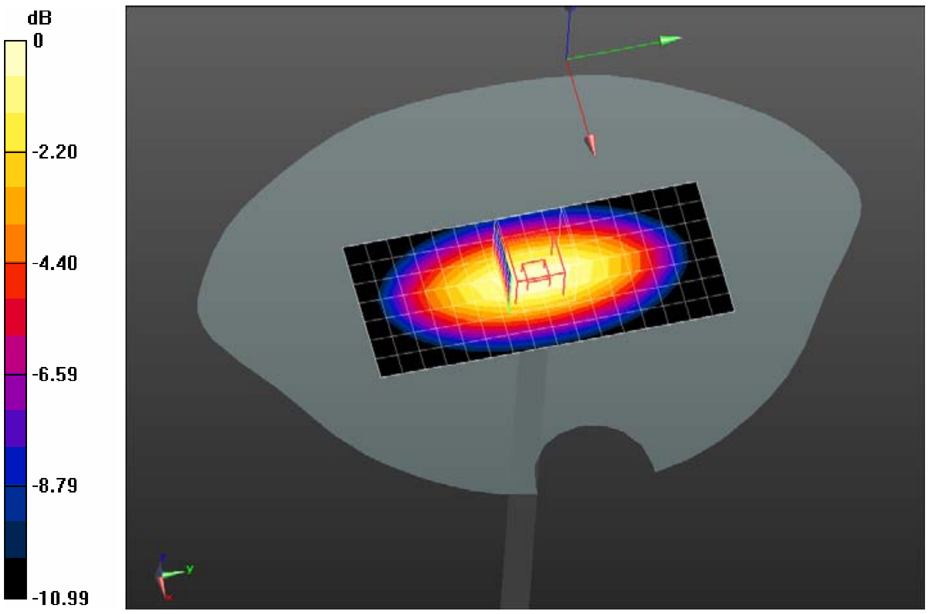
- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Configuration/System Check Head 900MHz/Area Scan (8x17x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 2.77 mW/g

Configuration/System Check Head 900MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 54.970 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 4.006 mW/g

SAR(1 g) = 2.65 mW/g; SAR(10 g) = 1.7 mW/g Maximum value of SAR (measured) = 2.86 mW/g



0 dB = 2.86 mW/g = 9.13 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

System Check Head 1800MHz

DUT: Dipole 1800 MHz D1800V2; Type: D1800V2

Communication System: CW; Communication System Band: D1800 (1800.0 MHz); Duty Cycle: 1:1;

Frequency: 1800 MHz; Medium parameters used: f = 1800 MHz; σ = 1.39 mho/m; ε_r = 40.32; ρ = 1000 kg/m³ ;

Phantom section: Flat Section ; Input Power=250mW

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

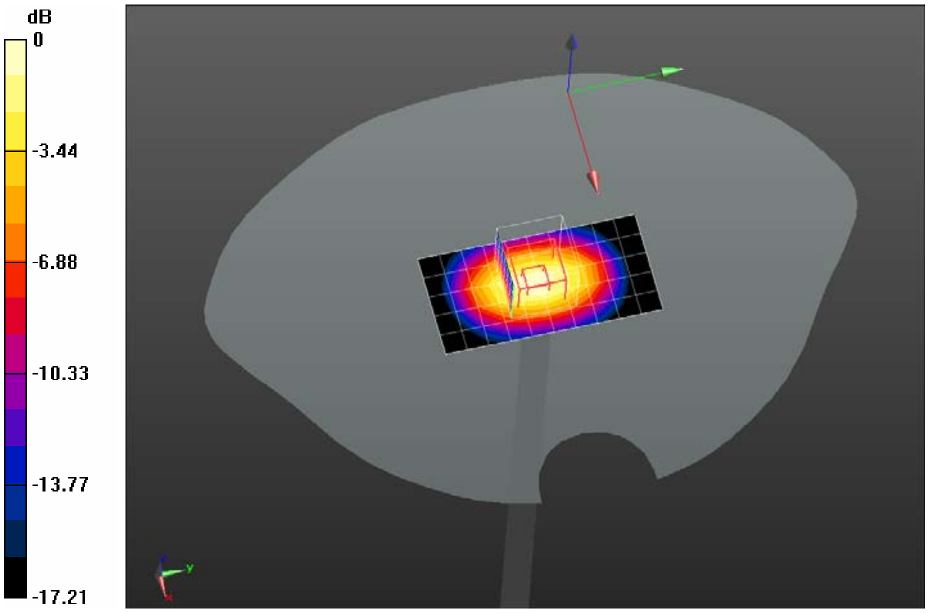
- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Configuration/System Check Head 1800MHz/Area Scan (6x11x1): Measurement grid: dx=10mm, dy=10mm, Maximum value of SAR (measured) = 9.00 mW/g

Configuration/System Check Head 1800MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 83.825 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.608 mW/g

SAR(1 g) = 8.83 mW/g; SAR(10 g) = 4.58 mW/g Maximum value of SAR (measured) = 9.92 mW/g



0 dB = 9.92 mW/g = 19.93 dB mW/g

Appendix B. SAR measurement Data

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GSM900 Mid Touch-Left

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: E-GSM900; Duty Cycle: 1:8.3; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

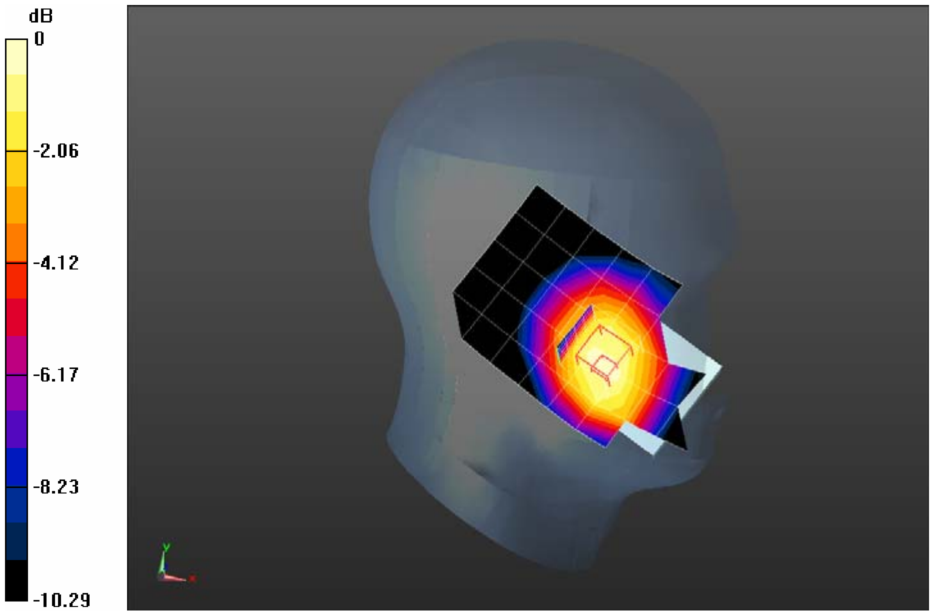
Configuration/GSM900 Mid Touch-Left/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.387 mW/g

Configuration/GSM900 Mid Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 4.677 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.545 mW/g

SAR(1 g) = 0.403 mW/g; SAR(10 g) = 0.289 mW/g Maximum value of SAR (measured) = 0.425 mW/g



0 dB = 0.425 mW/g = -7.43 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GSM900 Mid Tilt-Left

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: E-GSM900; Duty Cycle: 1:8.3; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

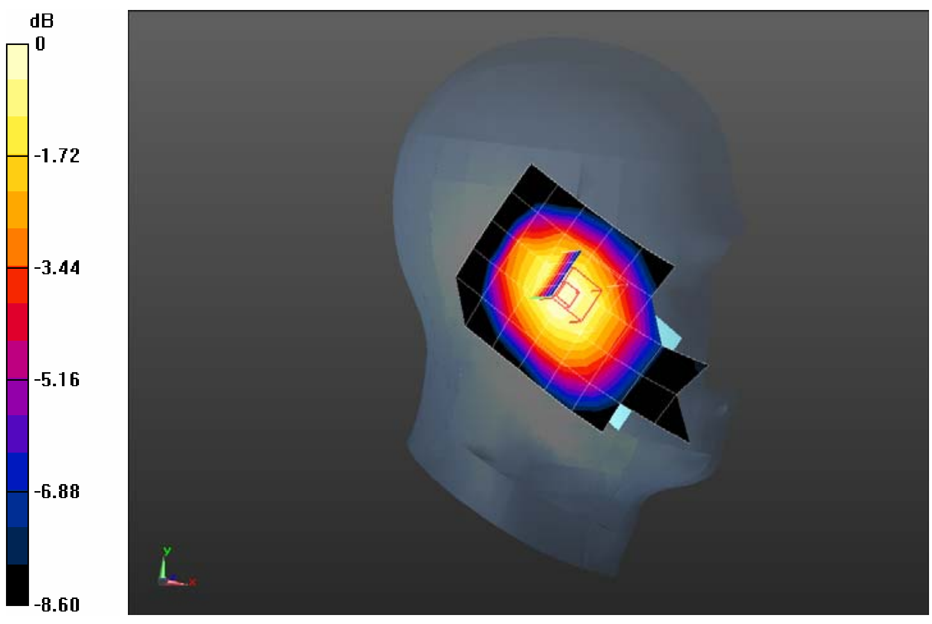
Configuration/GSM900 Mid Touch-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.462 mW/g

Configuration/GSM900 Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 16.441 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.554 mW/g

SAR(1 g) = 0.452 mW/g; SAR(10 g) = 0.344 mW/g Maximum value of SAR (measured) = 0.470 mW/g



0 dB = 0.470 mW/g = -6.56 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GSM900 Mid Touch-Right

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: E-GSM900; Duty Cycle: 1:8.3; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

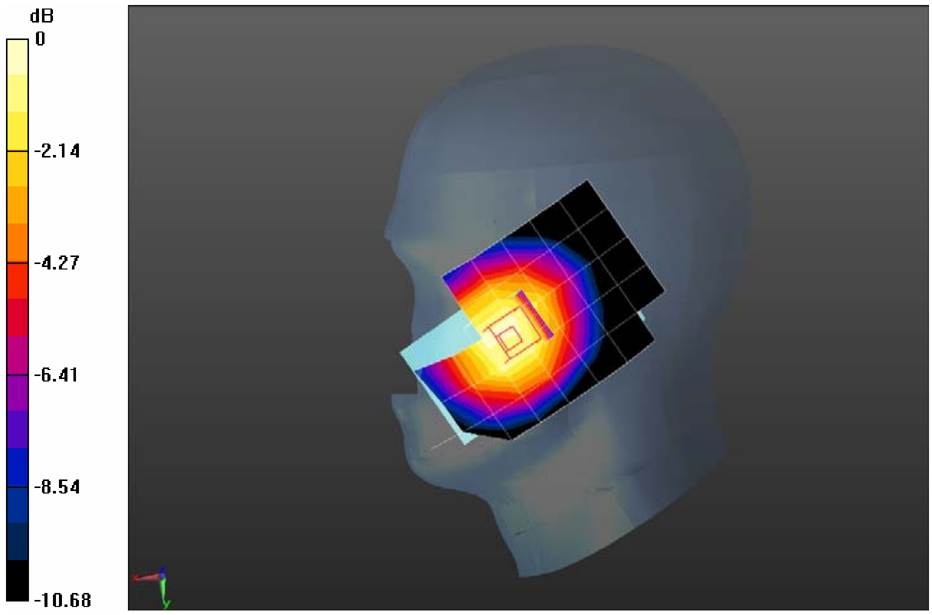
Configuration/GSM900 Mid Touch-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.645 mW/g

Configuration/GSM900 Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 8.098 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.808 mW/g

SAR(1 g) = 0.680 mW/g; SAR(10 g) = 0.515 mW/g Maximum value of SAR (measured) = 0.708 mW/g



0 dB = 0.708 mW/g = -3.00 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GSM900 Mid Tilt-Right

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: E-GSM900; Duty Cycle: 1:8.3; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

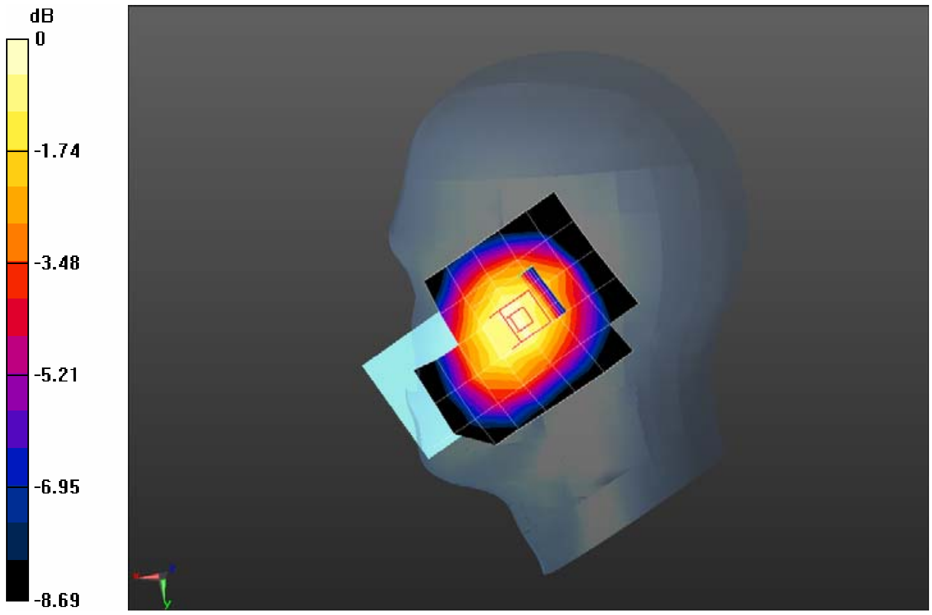
Configuration/GSM900 Mid Touch-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.446 mW/g

Configuration/GSM900 Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 15.094 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.550 mW/g

SAR(1 g) = 0.445 mW/g; SAR(10 g) = 0.338 mW/g Maximum value of SAR (measured) = 0.462 mW/g



0 dB = 0.462 mW/g = -6.71 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GSM900 Mid Touch-Right <SIM 2>

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: E-GSM900; Duty Cycle: 1:8.3; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

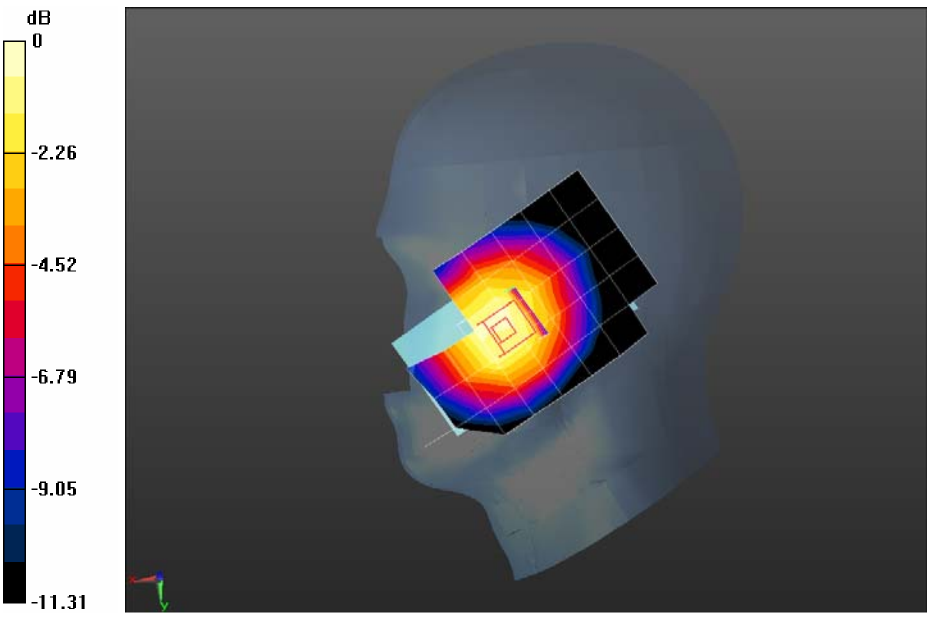
Configuration/GSM900 Mid Touch-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.450 mW/g

Configuration/GSM900 Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 6.967 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.565 mW/g

SAR(1 g) = 0.468 mW/g; SAR(10 g) = 0.352 mW/g Maximum value of SAR (measured) = 0.491 mW/g



0 dB = 0.491 mW/g = -6.18 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GSM900 Mid Body-Back

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: E-GSM900; Duty Cycle: 1:8.3; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

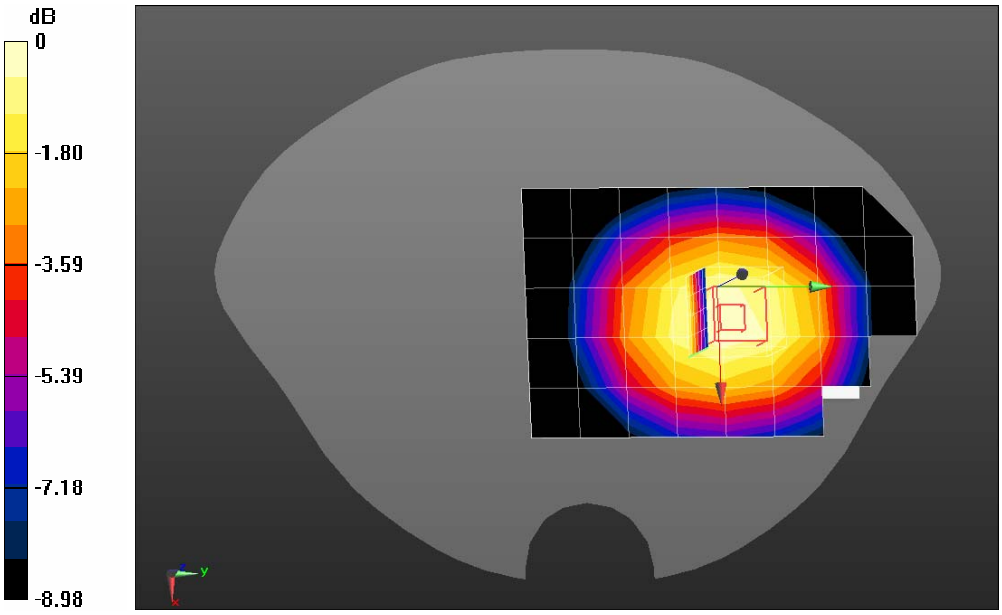
Configuration/GSM900 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.924 mW/g

Configuration/GSM900 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 14.901 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.155 mW/g

SAR(1 g) = 0.909 mW/g; SAR(10 g) = 0.678 mW/g Maximum value of SAR (measured) = 0.959 mW/g



0 dB = 0.959 mW/g = -0.36 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS 900 Mid Body-Back(2up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-2 Slot; Communication System Band: E-GSM900; Duty Cycle: 1:4.2 ; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

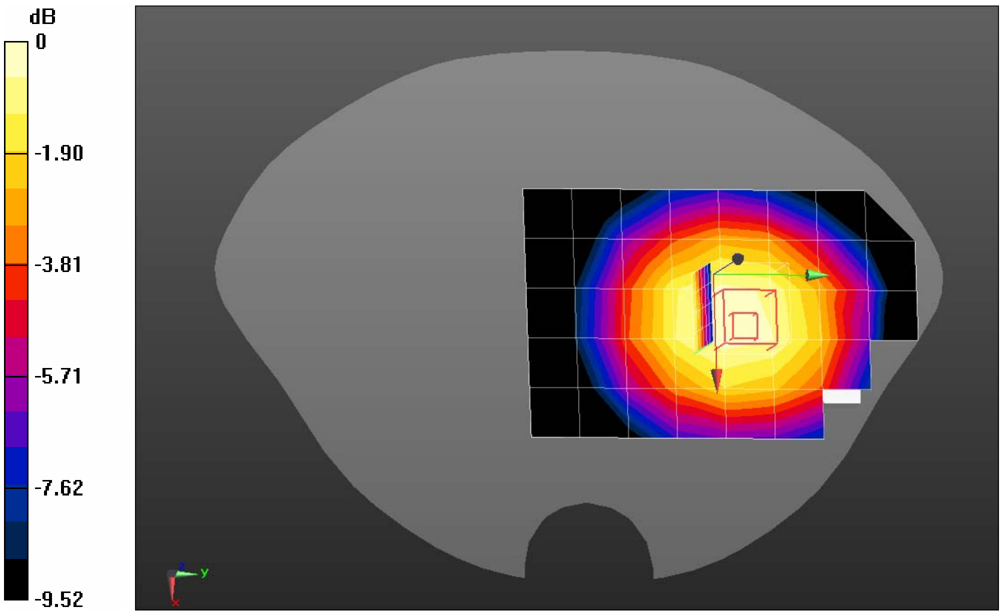
Configuration/GPRS900 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.788 mW/g

Configuration/GPRS900 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 12.206 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 1.116 mW/g

SAR(1 g) = 0.793 mW/g; SAR(10 g) = 0.582 mW/g Maximum value of SAR (measured) = 0.835 mW/g



0 dB = 0.835 mW/g = -1.57 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS 900 Mid Body-Back(3up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-3 Slot; Communication System Band: E-GSM 900; Duty Cycle: 1:2.8 ; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

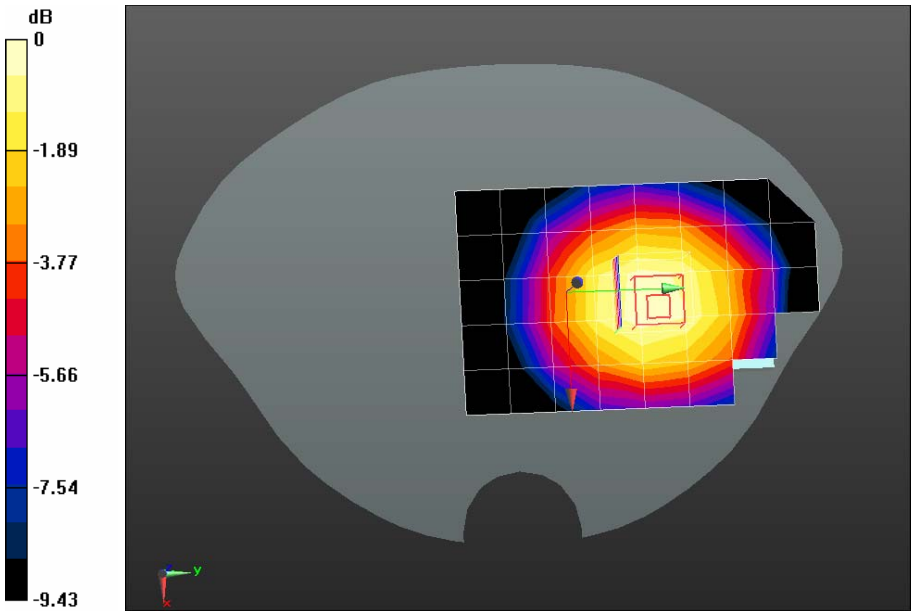
Configuration/GPRS900 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.771 mW/g

Configuration/GPRS900 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 12.183 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 1.085 mW/g

SAR(1 g) = 0.777 mW/g; SAR(10 g) = 0.572 mW/g Maximum value of SAR (measured) = 0.817 mW/g



0 dB = 0.817 mW/g = -1.76 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS 900 Mid Body-Back(4up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-4 Slot; Communication System Band: E-GSM 900; Duty Cycle: 1:2.1 ; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

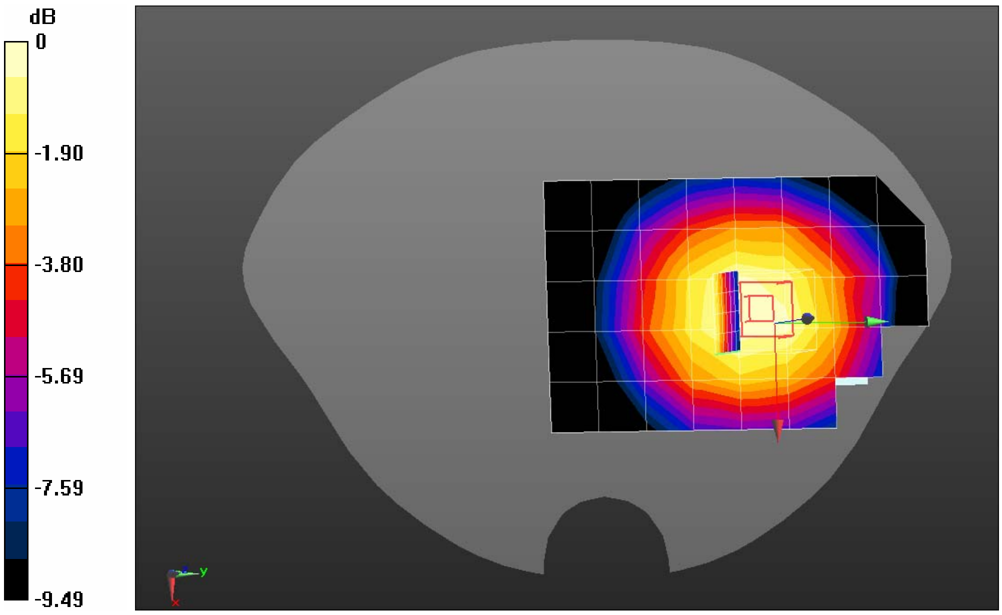
Configuration/GPRS900 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.973 mW/g

Configuration/GPRS900 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 13.032 V/m; Power Drift = -0.10 dB

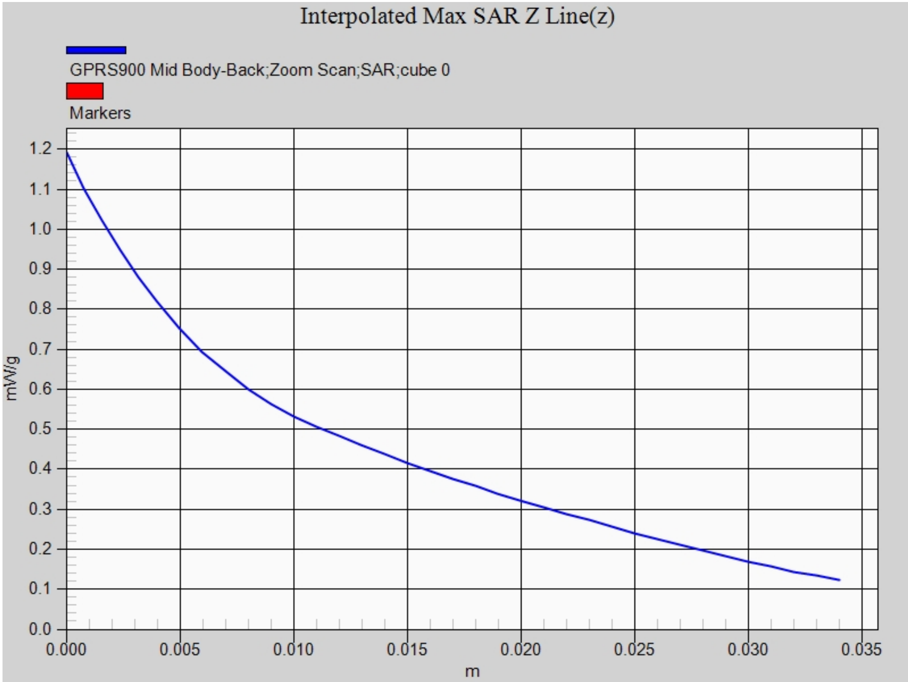
Peak SAR (extrapolated) = 1.193 mW/g

SAR(1 g) = 0.939 mW/g; SAR(10 g) = 0.680 mW/g Maximum value of SAR (measured) = 1.01 mW/g



0 dB = 1.01 mW/g = 0.09 dB mW/g

Z-Axis Plot


Interpolated Max SAR Z Line(z)
GPRS900 Mid Body-Back;Zoom Scan;SAR;cube 0
Markers
mW/g
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS 900 Mid Body-Front(4up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-4 Slot; Communication System Band: E-GSM 900; Duty Cycle: 1:2.1 ; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

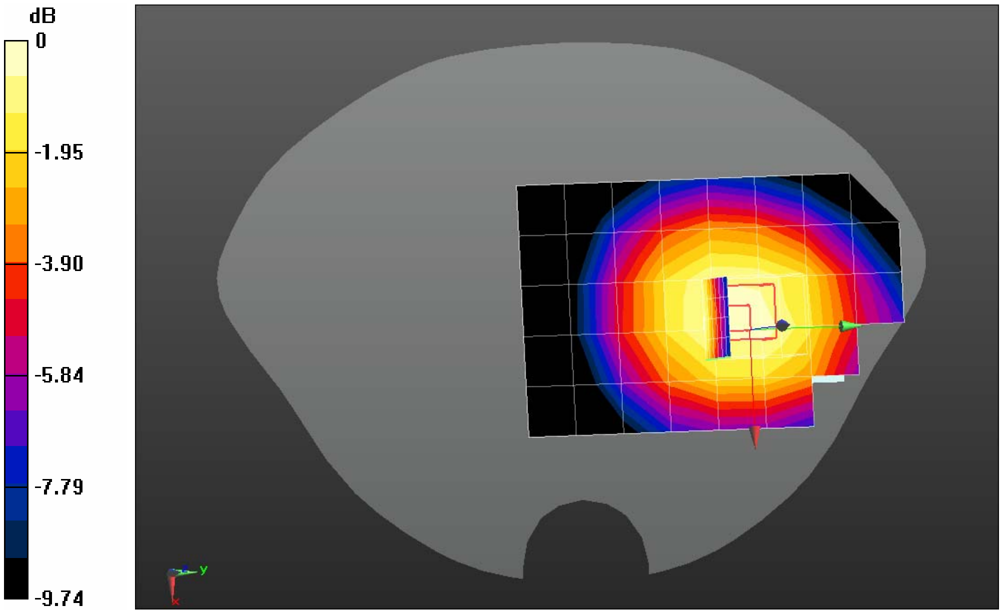
Configuration/GPRS900 Mid Body-Front/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.756 mW/g

Configuration/GPRS900 Mid Body-Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 10.242 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.978 mW/g

SAR(1 g) = 0.735 mW/g; SAR(10 g) = 0.539 mW/g Maximum value of SAR (measured) = 0.784 mW/g



0 dB = 0.784 mW/g = -2.11 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS 900 Mid Body-Back(4up)(with headset)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-4 Slot; Communication System Band: E-GSM 900; Duty Cycle: 1:2.1 ; Frequency: 897.4 MHz; Medium parameters used: f = 897.4 MHz; σ = 0.98 mho/m; εr = 41.87; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.97, 8.97, 8.97); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

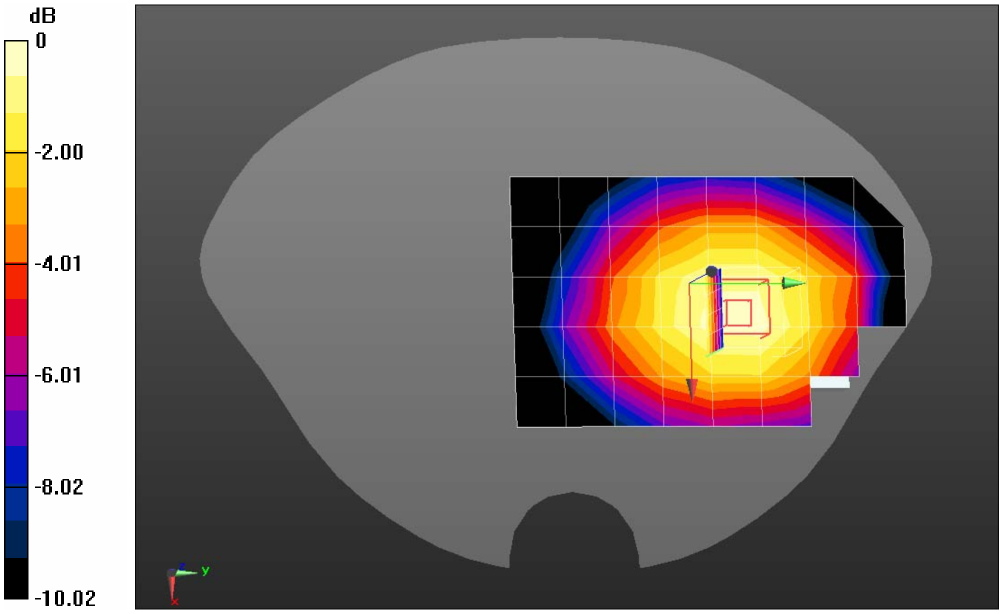
Configuration/GPRS900 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.561 mW/g

Configuration/GPRS900 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 12.014 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.739 mW/g

SAR(1 g) = 0.573 mW/g; SAR(10 g) = 0.417 mW/g Maximum value of SAR (measured) = 0.607 mW/g



0 dB = 0.607 mW/g = -4.34 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

DCS 1800 Mid Touch-Left

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: DCS1800; Duty Cycle: 1:8.3; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

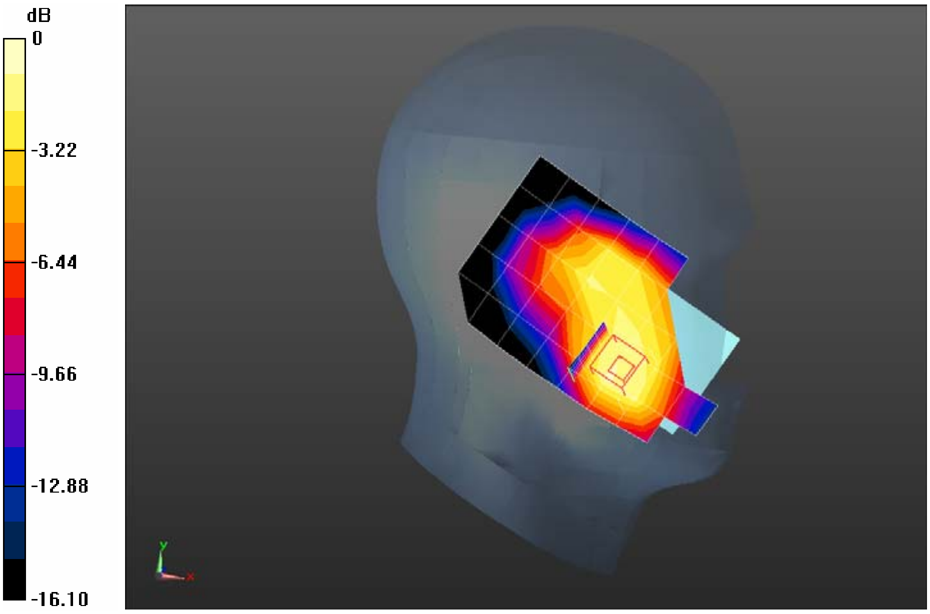
Configuration/DCS 1800 Mid Touch-Left/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.308 mW/g

Configuration/DCS 1800 Mid Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 7.998 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.549 mW/g

SAR(1 g) = 0.353 mW/g; SAR(10 g) = 0.213 mW/g Maximum value of SAR (measured) = 0.377 mW/g



0 dB = 0.377 mW/g = -8.47 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

DCS 1800 Mid Tilt-Left

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: DCS1800; Duty Cycle: 1:8.3; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

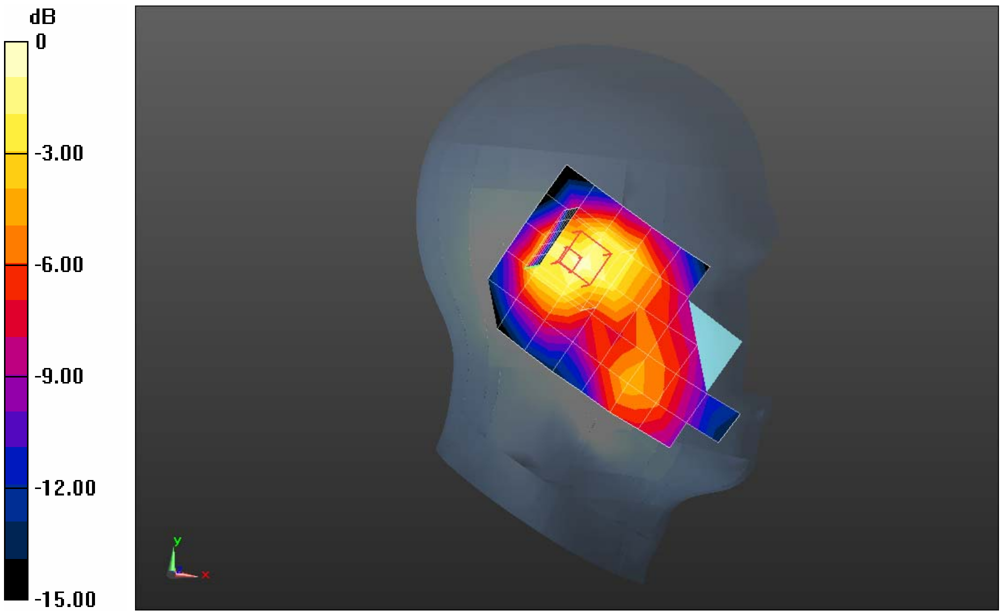
Configuration/DCS 1800 Mid Tilt-Left/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.185 mW/g

Configuration/DCS 1800 Mid Tilt-Left/Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 11.966 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.291 mW/g

SAR(1 g) = 0.186 mW/g; SAR(10 g) = 0.119 mW/g Maximum value of SAR (measured) = 0.202 mW/g



0 dB = 0.202 mW/g = -13.89 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

DCS 1800 Mid Touch-Right

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: DCS1800; Duty Cycle: 1:8.3; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

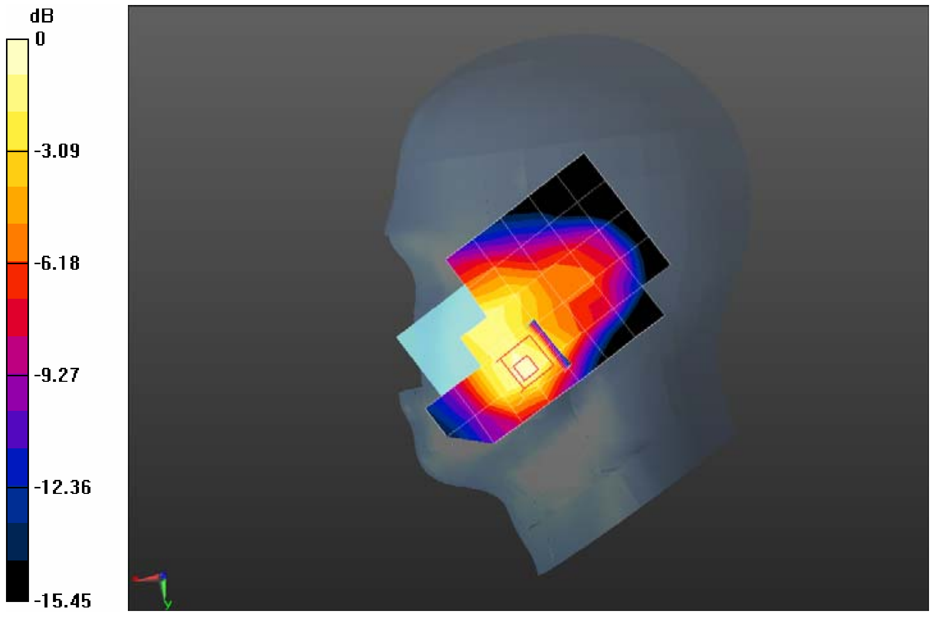
Configuration/DCS 1800 Mid Touch-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.381 mW/g

Configuration/DCS 1800 Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 8.389 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.565 mW/g

SAR(1 g) = 0.365 mW/g; SAR(10 g) = 0.226 mW/g Maximum value of SAR (measured) = 0.388 mW/g



0 dB = 0.388 mW/g = -8.22 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

DCS 1800 Mid Tilt-Right

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: DCS1800; Duty Cycle: 1:8.3; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m^3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

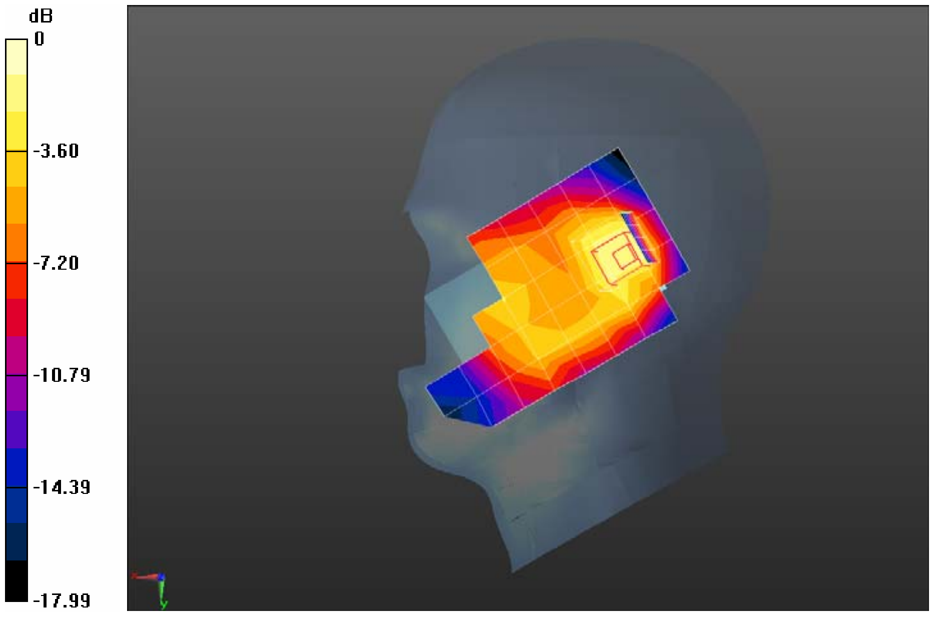
Configuration/DCS 1800 Mid Tilt-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.135 mW/g

Configuration/DCS 1800 Mid Tilt-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 11.973 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.288 mW/g

SAR(1 g) = 0.179 mW/g; SAR(10 g) = 0.104 mW/g Maximum value of SAR (measured) = 0.193 mW/g



0 dB = 0.193 mW/g = -14.29 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

DCS 1800 Mid Touch-Right <SIM 2>

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: DCS1800; Duty Cycle: 1:8.3;
Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

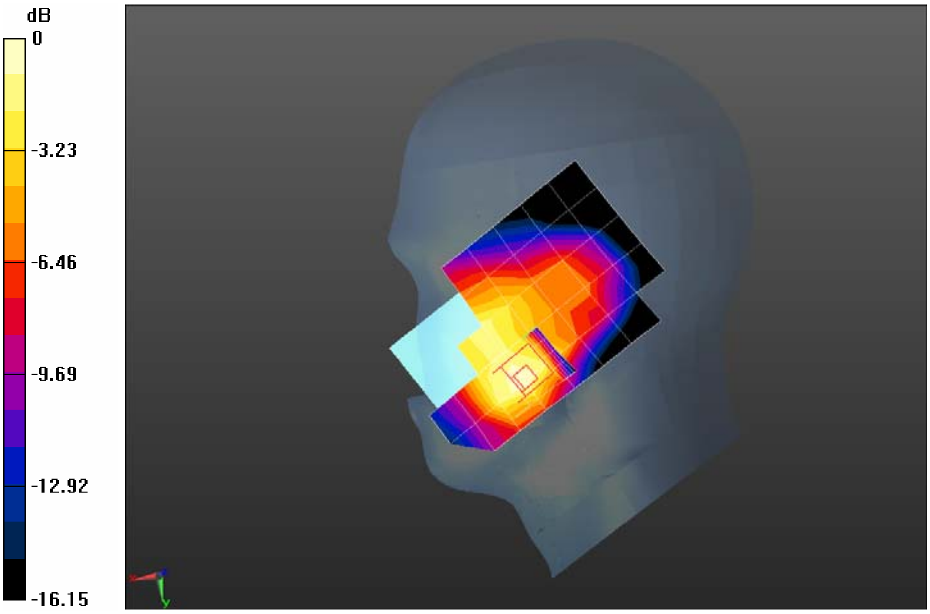
- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Configuration/DCS 1800 Mid Touch-Right/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 0.369 mW/g

Configuration/DCS 1800 Mid Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 7.780 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.544 mW/g

SAR(1 g) = 0.343 mW/g; SAR(10 g) = 0.212 mW/g Maximum value of SAR (measured) = 0.367 mW/g



0 dB = 0.367 mW/g = -8.71 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

DCS1800 Mid Body-Back

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: Generic GSM; Communication System Band: DCS1800; Duty Cycle: 1:8.3;

Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

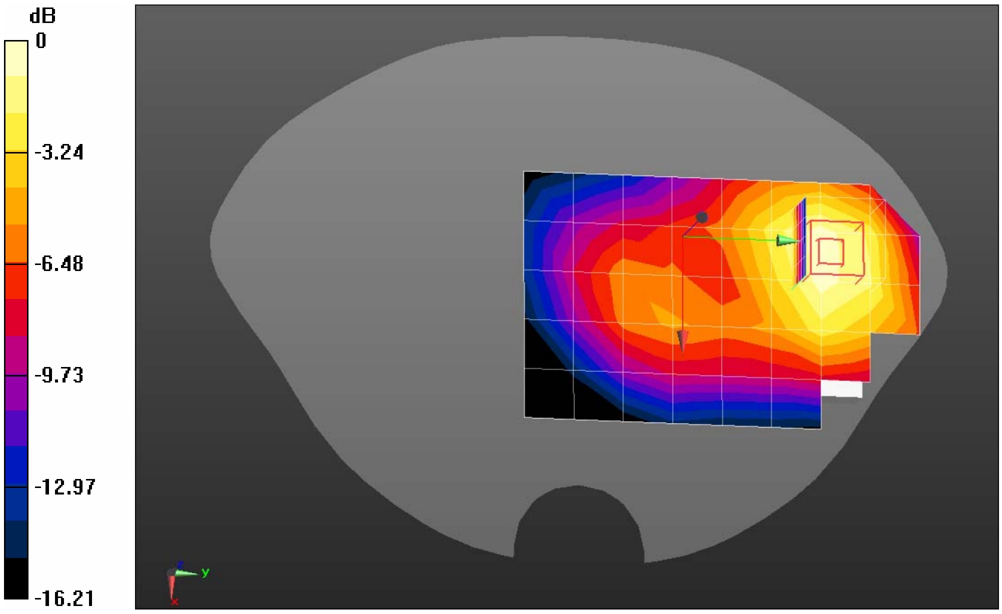
Configuration/DCS1800 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.359 mW/g

Configuration/DCS1800 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 6.678 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.618 mW/g

SAR(1 g) = 0.372 mW/g; SAR(10 g) = 0.224 mW/g Maximum value of SAR (measured) = 0.403 mW/g



0 dB = 0.403 mW/g = -7.89 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS1800 Mid Body-Back(2up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-2 Slot; Communication System Band: DCS1800; Duty Cycle: 1:4.2 ; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

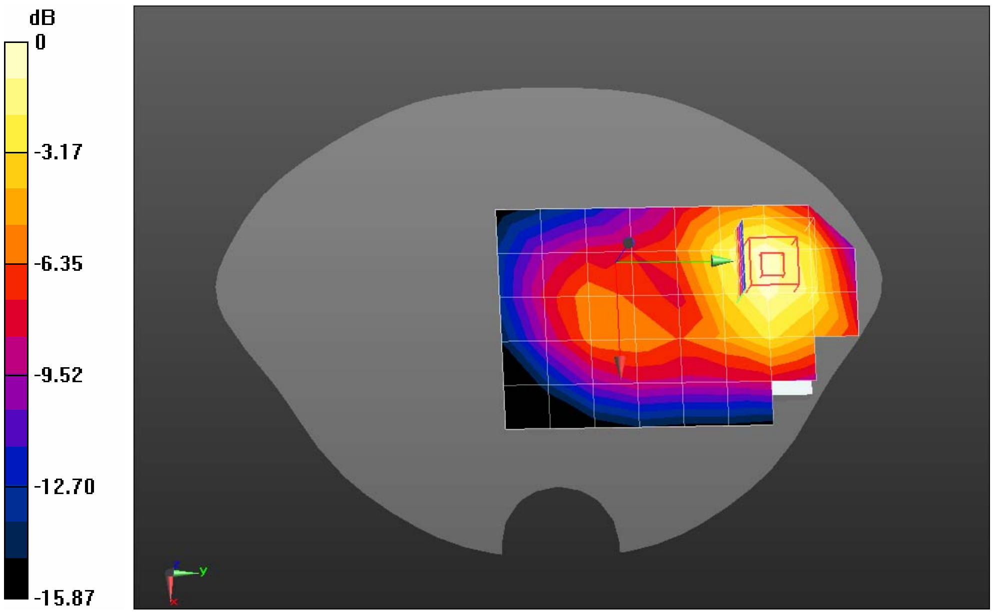
Configuration/GPRS1800 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.608 mW/g

Configuration/GPRS1800 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 9.181 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.015 mW/g

SAR(1 g) = 0.616 mW/g; SAR(10 g) = 0.369 mW/g Maximum value of SAR (measured) = 0.670 mW/g



0 dB = 0.670 mW/g = -3.48 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS1800 Mid Body-Back(3up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-3 Slot; Communication System Band: DCS 1800; Duty Cycle: 1:2.8 ; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

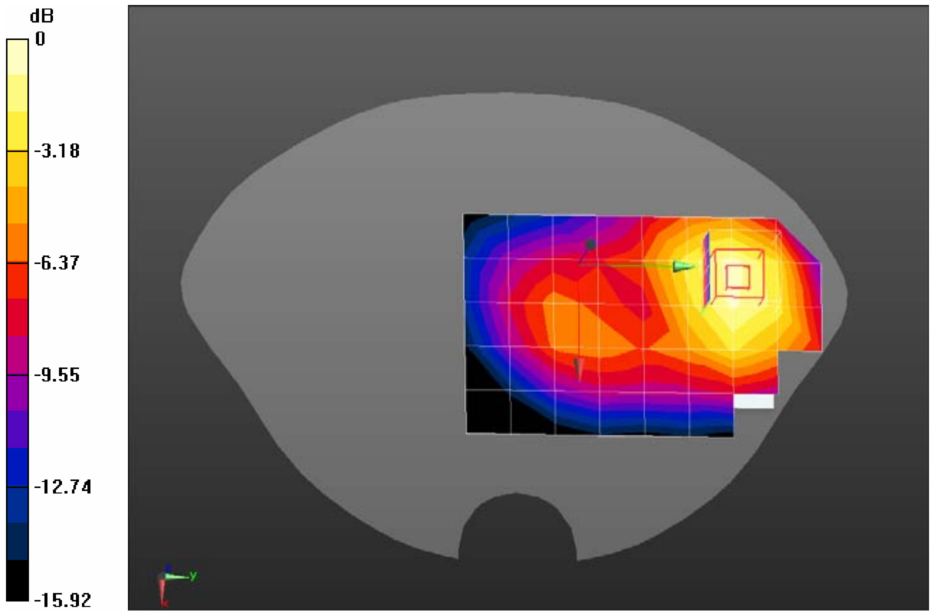
Configuration/GPRS1800 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.649 mW/g

Configuration/GPRS1800 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 9.342 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 1.120 mW/g

SAR(1 g) = 0.680 mW/g; SAR(10 g) = 0.407 mW/g Maximum value of SAR (measured) = 0.740 mW/g



0 dB = 0.740 mW/g = -2.62 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS1800 Mid Body-Back(4up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-4 Slot; Communication System Band: DCS 1800; Duty Cycle: 1:2.1 ; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

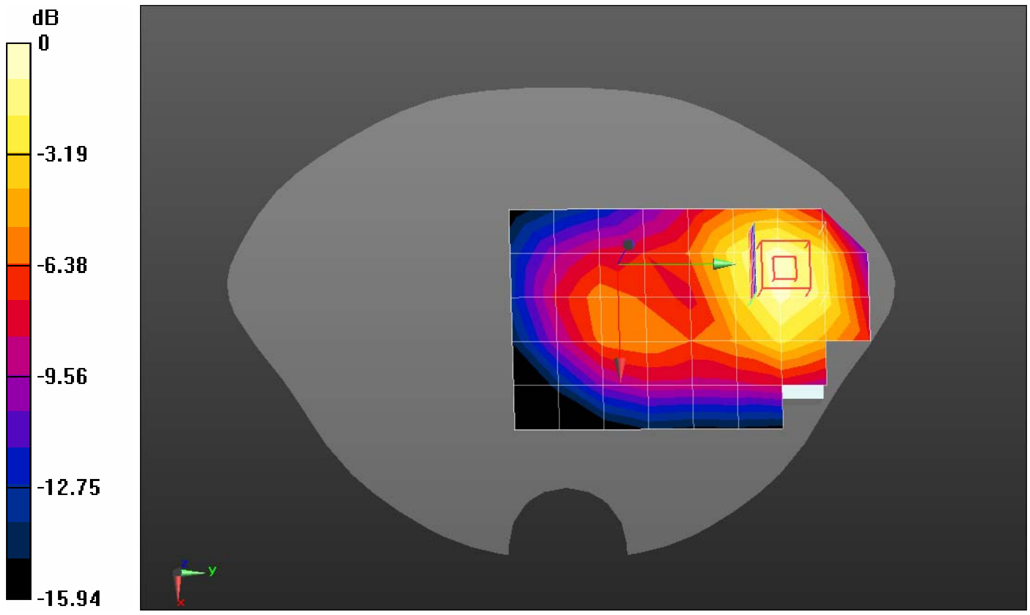
Configuration/GPRS1800 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.743 mW/g

Configuration/GPRS1800 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 9.997 V/m; Power Drift = -0.02 dB

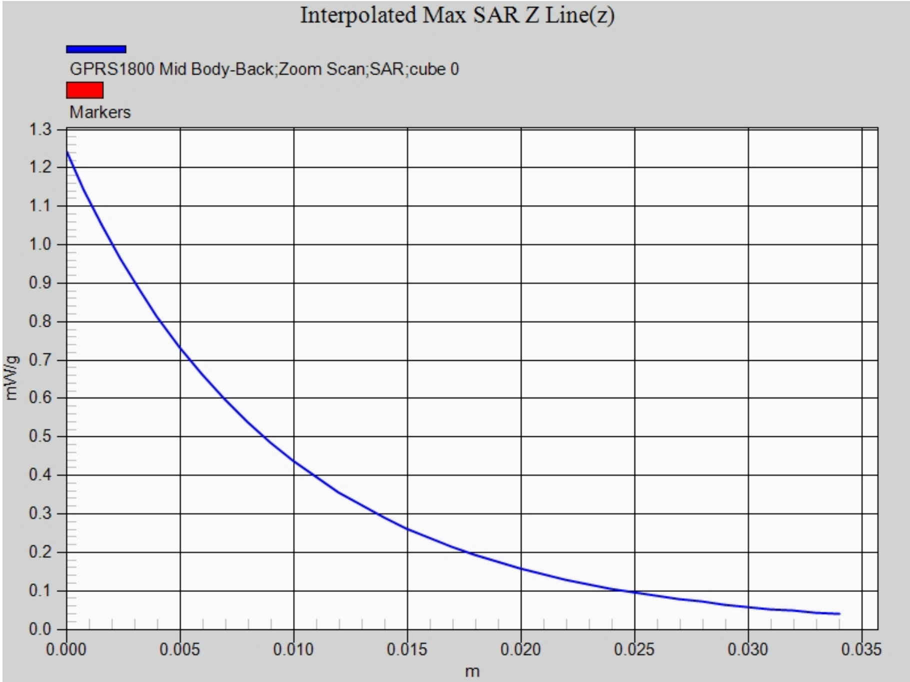
Peak SAR (extrapolated) = 1.244 mW/g

SAR(1 g) = 0.755 mW/g; SAR(10 g) = 0.453 mW/g Maximum value of SAR (measured) = 0.820 mW/g



0 dB = 0.820 mW/g = -1.72 dB mW/g

Z-Axis Plot


Interpolated Max SAR Z Line(z)
GPRS1800 Mid Body-Back;Zoom Scan;SAR;cube 0
Markers
mW/g
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS1800 Mid Body-Front(4up)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-4 Slot; Communication System Band: DCS 1800; Duty Cycle: 1:2.1 ; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

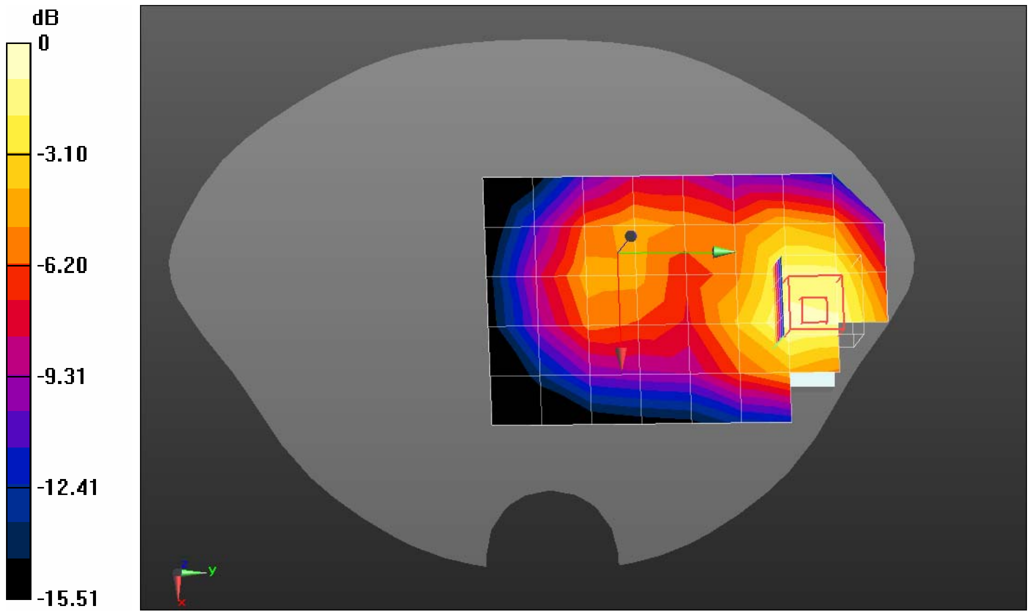
Configuration/GPRS1800 Mid Body-Front/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.638 mW/g

Configuration/GPRS1800 Mid Body-Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 9.297 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.131 mW/g

SAR(1 g) = 0.675 mW/g; SAR(10 g) = 0.401 mW/g Maximum value of SAR (measured) = 0.726 mW/g



0 dB = 0.726 mW/g = -2.78 dB mW/g

Date/Time: 10-08-2012

Test Laboratory: QuieTek Lab

GPRS1800 Mid Body-Back(4up)(with headset)

DUT: LM128 Rugged Phone ; Type: LM128

Communication System: GPRS/EGPRS-4 Slot; Communication System Band: DCS 1800; Duty Cycle: 1:2.1 ; Frequency: 1747.4 MHz; Medium parameters used: f = 1747.4 MHz; σ = 1.36 mho/m; εr = 40.54; ρ = 1000 kg/m³ ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(8.32, 8.32, 8.32); Calibrated: 12/03/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1220; Calibrated: 23/01/2012
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

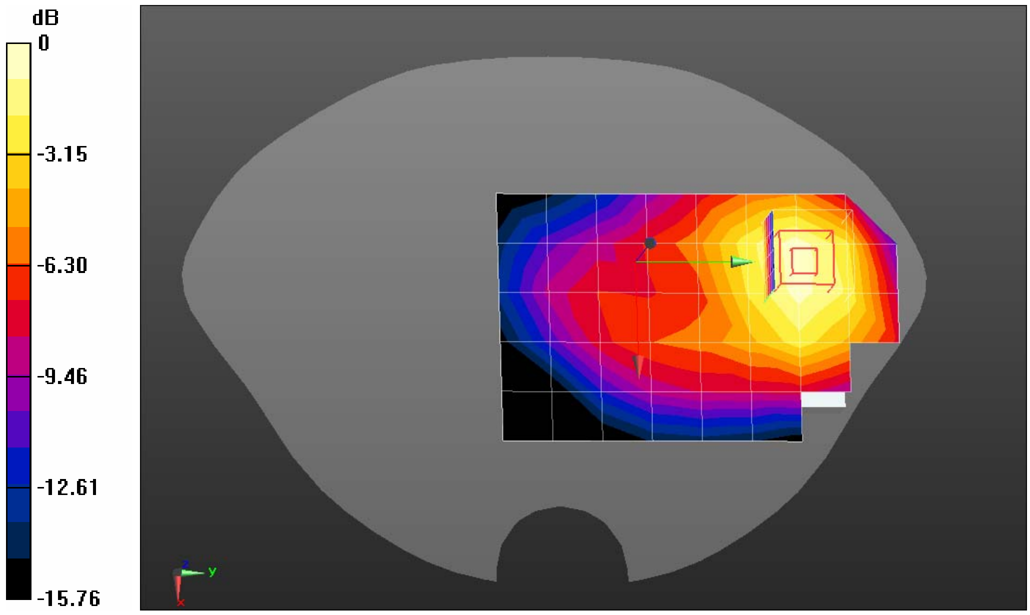
Configuration/GPRS1800 Mid Body-Back/Area Scan (6x9x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (measured) = 0.718 mW/g

Configuration/GPRS1800 Mid Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 8.614 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.201 mW/g

SAR(1 g) = 0.733 mW/g; SAR(10 g) = 0.441 mW/g Maximum value of SAR (measured) = 0.792 mW/g

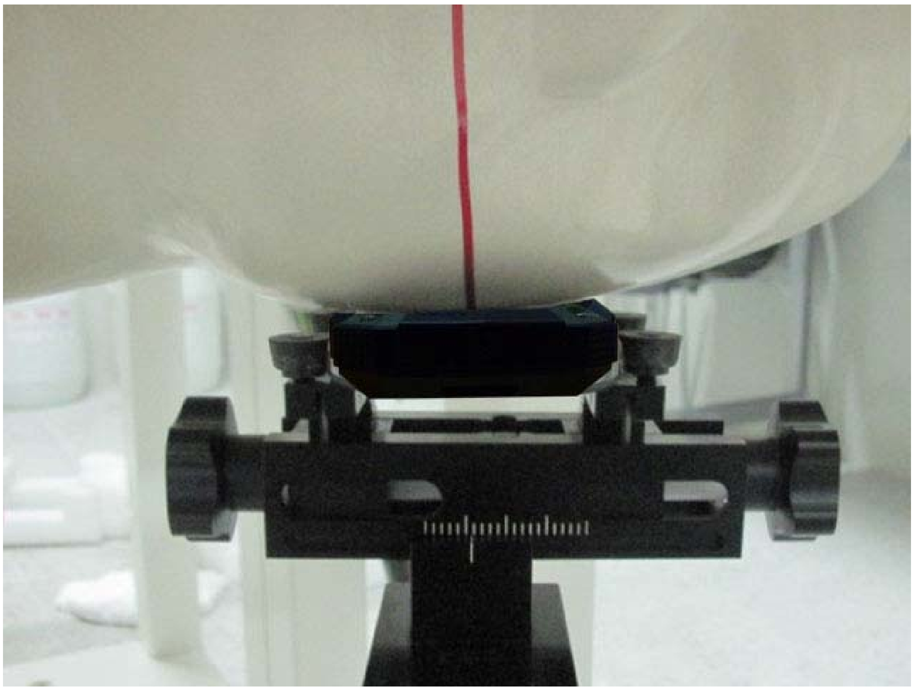


0 dB = 0.792 mW/g = -2.03 dB mW/g

Appendix C. Test Setup Photographs & EUT Photographs

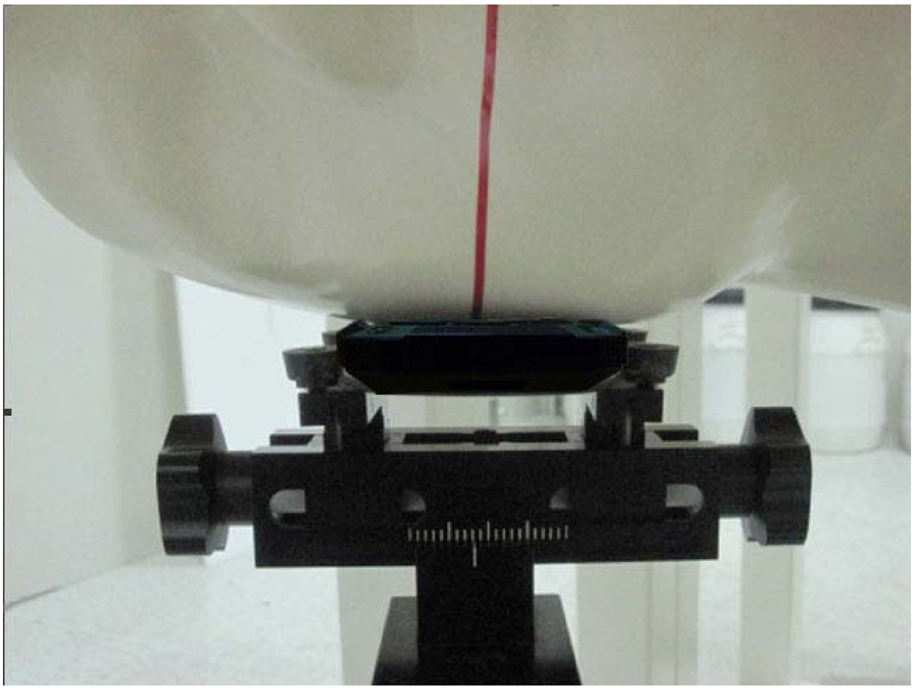
Test Setup Photographs

Left Head (EUT Cheek)

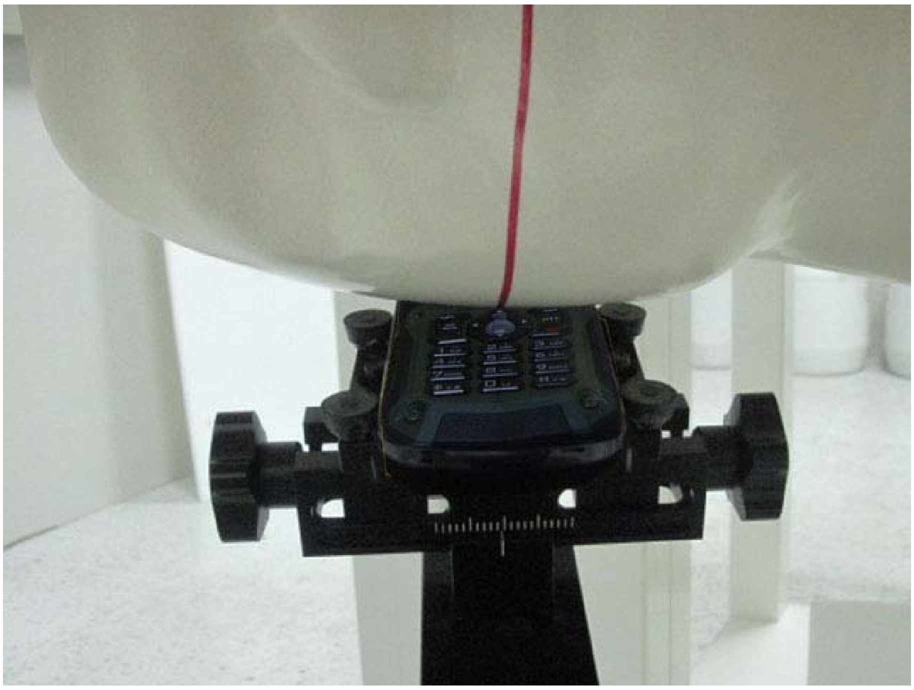


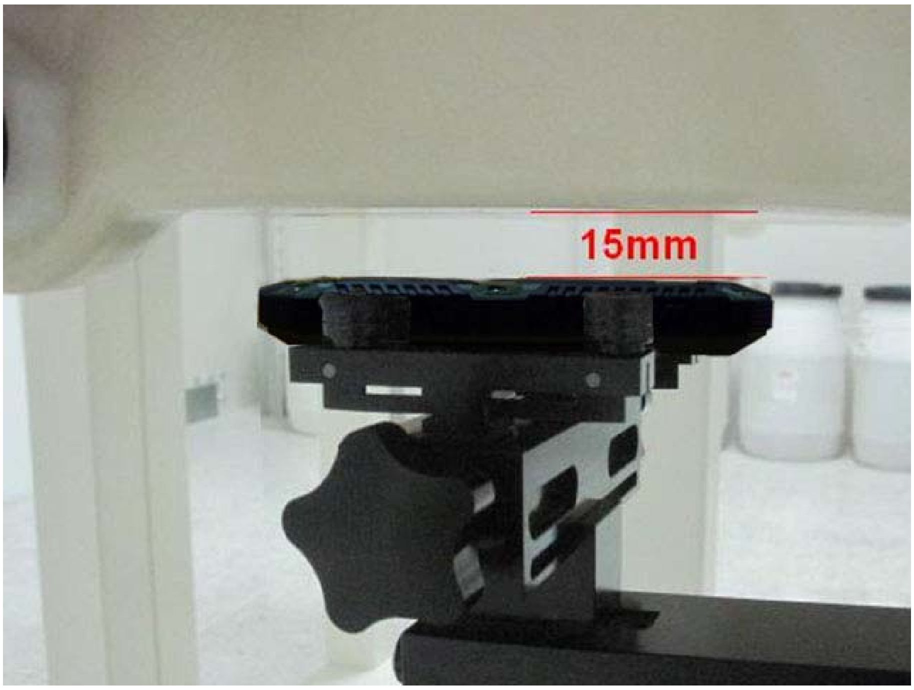
Left Head (EUT Tilted)

Right Head (EUT Cheek)

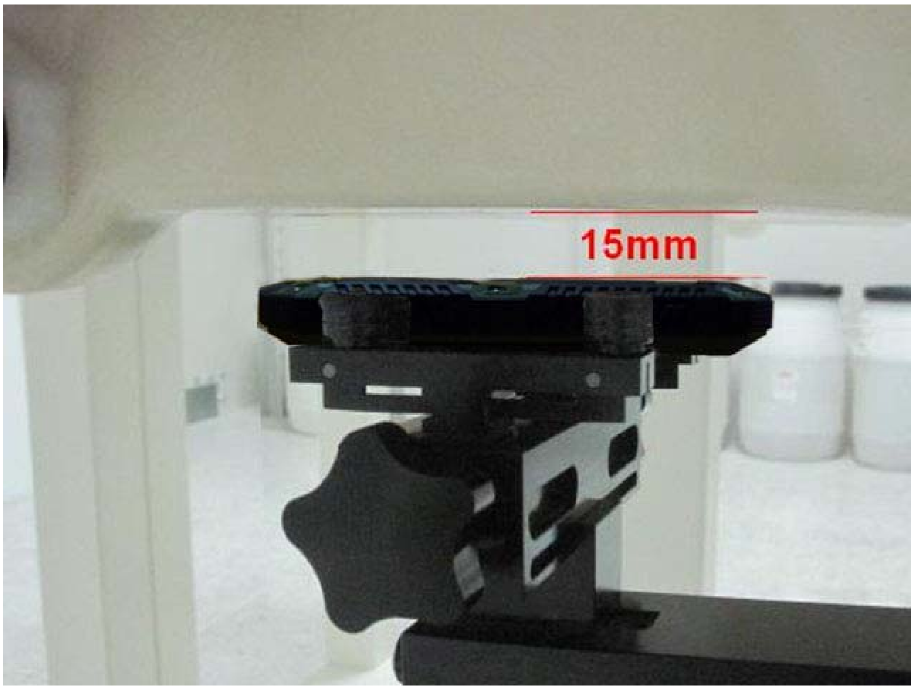


Right Head (EUT Tilted)

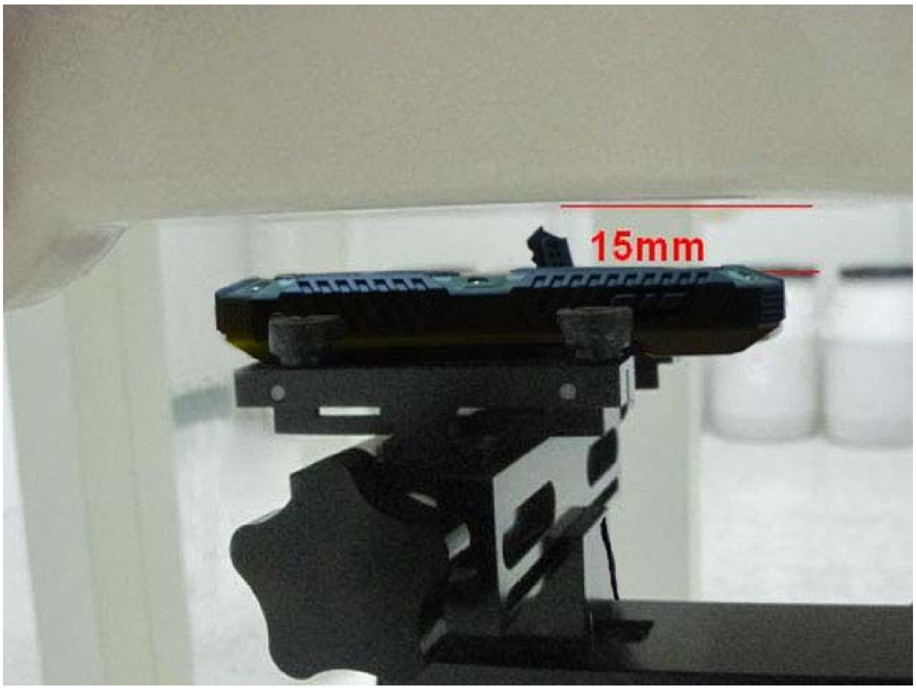




Body SAR Back 15mm

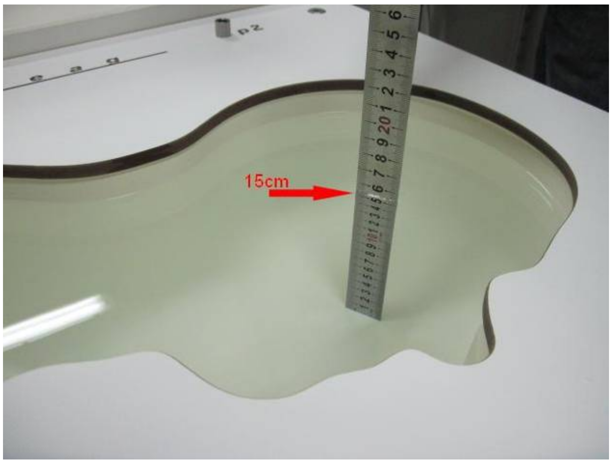


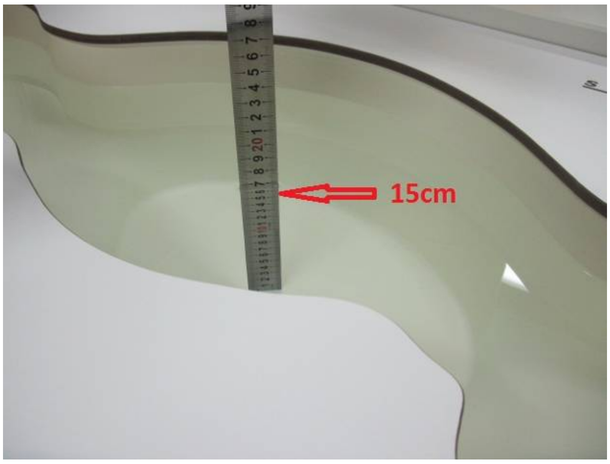
Body SAR Front 15mm



Body SAR Back 15mm with Headset

Depth of the liquid in the phantom – Zoom in





Note: The position used in the measurements were according to IEEE 1528 - 2003

EUT Photographs

Appendix D. Probe Calibration Data

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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 **Quietek-CN (Auden)**

Certificate No: **EX3-3710_Mar12**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3710

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

Calibration date: March 12, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: March 13, 2012

Certificate No: EX3-3710_Mar12 Page 1 of 11

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

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Swiss Calibration Service

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
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., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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 ± 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.

Probe EX3DV4

SN:3710

Manufactured: July 21, 2009
Repaired: February 21, 2012
Calibrated: March 12, 2012

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.51	0.56	0.44	± 10.1 %
DCP (mV)[B]	101.3	98.9	100.9	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	114.4	±2.2 %
			Y	0.00	0.00	1.00	94.4	
			Z	0.00	0.00	1.00	114.2	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	9.61	9.61	9.61	0.12	1.00	± 13.4 %
750	41.9	0.89	9.51	9.51	9.51	0.24	1.16	± 12.0 %
835	41.5	0.90	9.18	9.18	9.18	0.22	1.15	± 12.0 %
900	41.5	0.97	8.97	8.97	8.97	0.19	1.35	± 12.0 %
1810	40.0	1.40	8.32	8.32	8.32	0.79	0.60	± 12.0 %
1900	40.0	1.40	8.16	8.16	8.16	0.72	0.66	± 12.0 %
2450	39.2	1.80	7.25	7.25	7.25	0.36	0.91	± 12.0 %
2600	39.0	1.96	6.96	6.96	6.96	0.39	0.95	± 12.0 %
3500	37.9	2.91	6.80	6.80	6.80	0.33	1.09	± 13.1 %
5200	36.0	4.66	5.21	5.21	5.21	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.9.5	4.9.5	4.9.5	0.35	1.80	± 13.1 %
5800	35.3	5.27	4.56	4.56	4.56	0.45	1.80	± 13.1 %

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

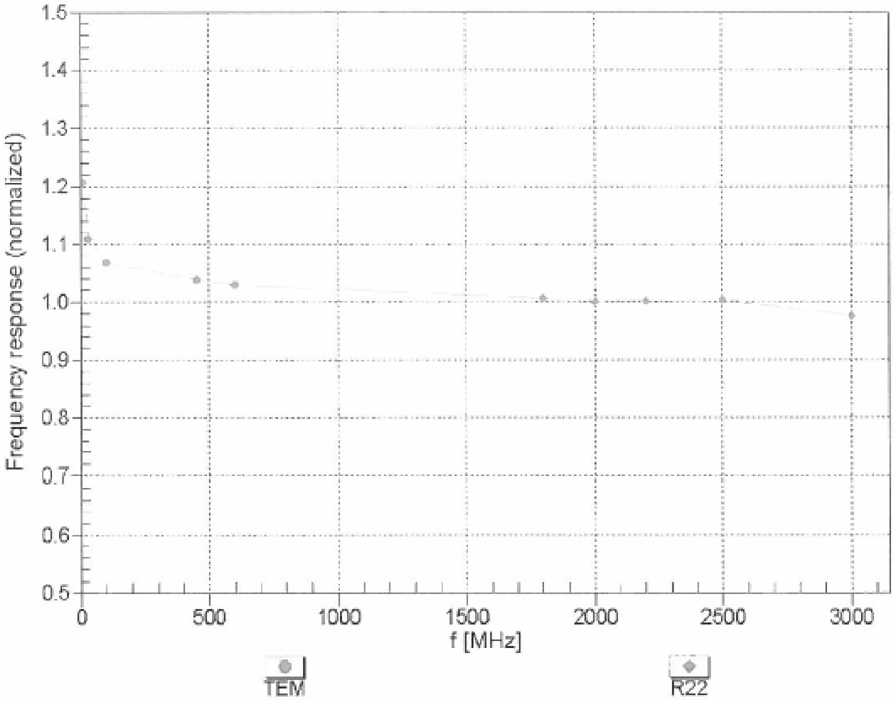
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	10.69	10.69	10.69	0.06	1.00	± 13.4 %
750	55.5	0.96	9.33	9.33	9.33	0.43	0.86	± 12.0 %
835	55.2	0.97	9.13	9.13	9.13	0.63	0.70	± 12.0 %
900	55.0	1.05	9.04	9.04	9.04	0.39	0.88	± 12.0 %
1810	53.3	1.52	7.73	7.73	7.73	0.33	1.10	± 12.0 %
1900	53.3	1.52	7.43	7.43	7.43	0.42	0.90	± 12.0 %
2450	52.7	1.95	6.98	6.98	6.98	0.79	0.59	± 12.0 %
2600	52.5	2.16	6.68	6.68	6.68	0.79	0.52	± 12.0 %
3500	51.3	3.31	6.23	6.23	6.23	0.36	1.13	± 13.1 %
5200	49.0	5.30	4.20	4.20	4.20	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.82	3.82	3.82	0.50	1.90	± 13.1 %
5800	48.2	6.00	3.89	3.89	3.89	0.60	1.90	± 13.1 %

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

Frequency Response of E-Field

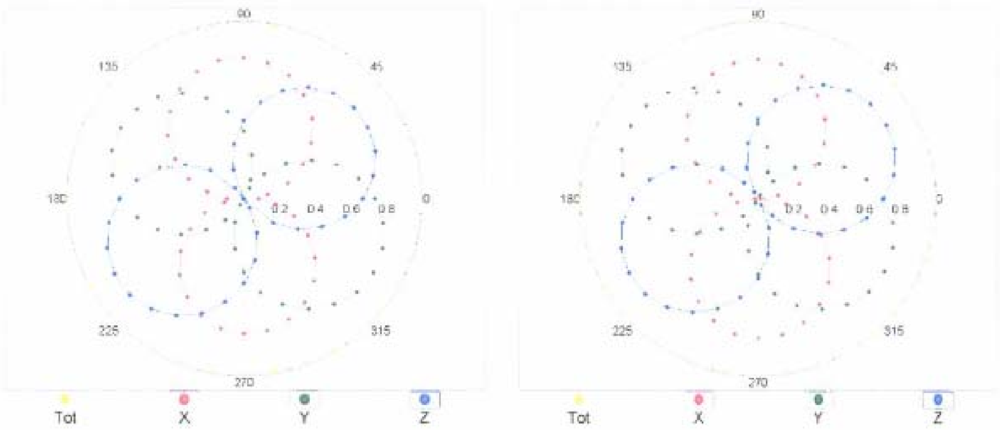
(TEM-Cell:ifi110 EXX, Waveguide: R22)

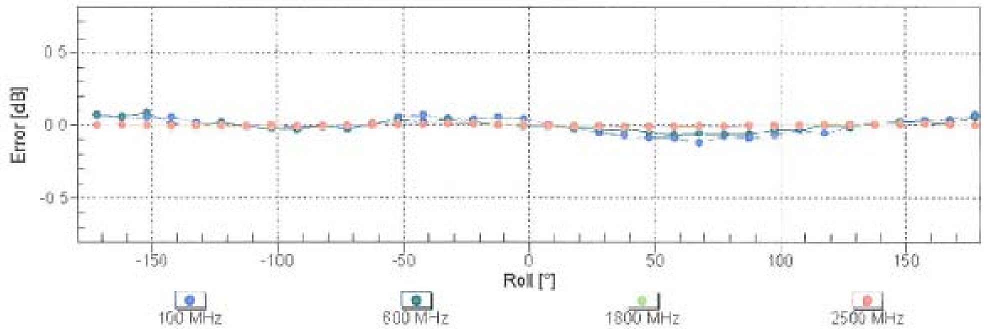


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22



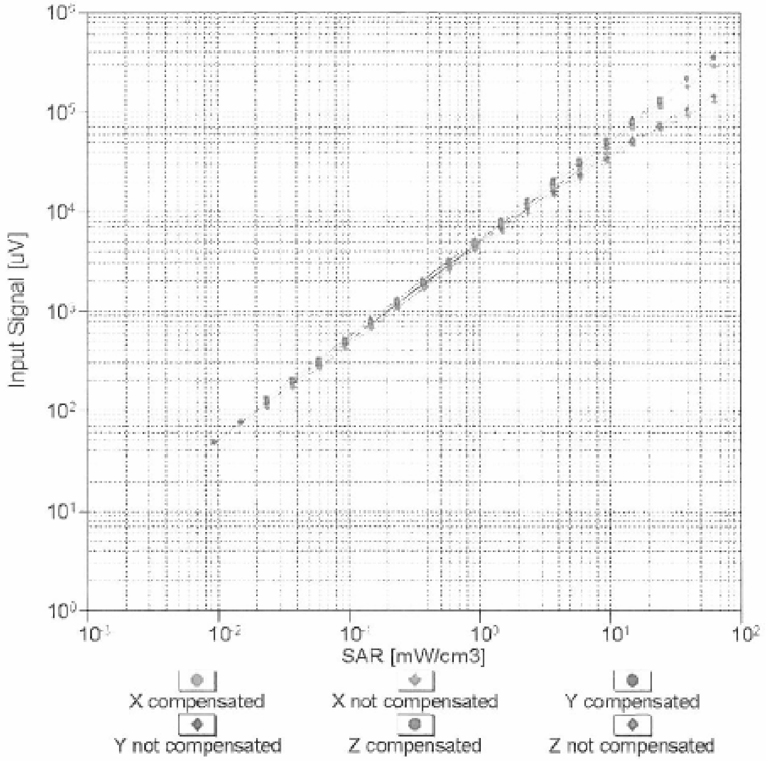


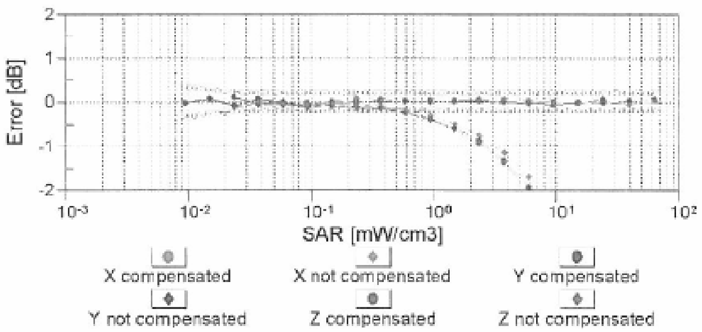
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3710 March 12, 2012

Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)

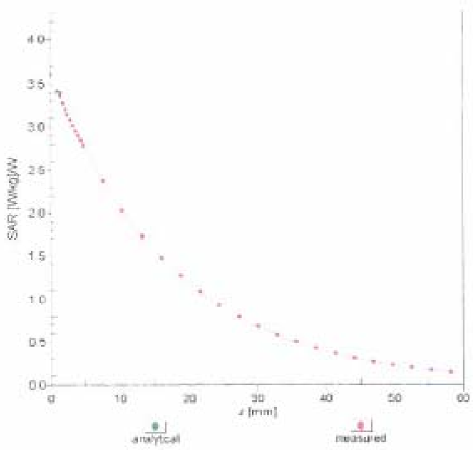


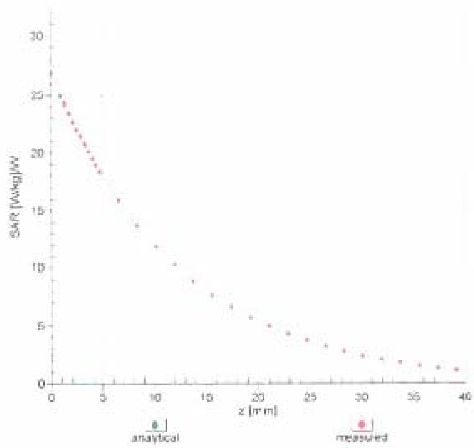


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV4– SN:3710 March 12, 2012

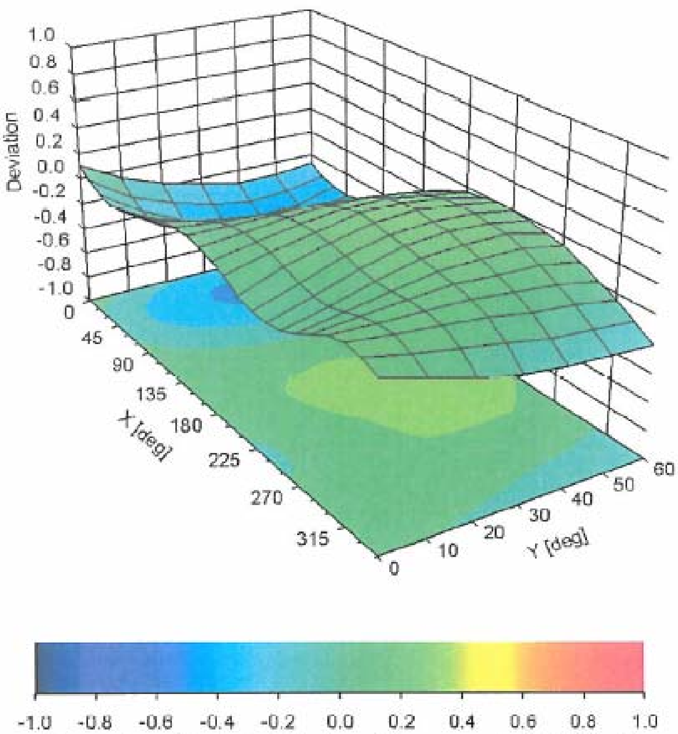
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Appendix E. Dipole Calibration Data

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

ilac-MRA | SWISS CALIBRATION

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Accreditation No.: SCS 108

Client **Quietek-CN (Auden)**

Certificate No: **D900V2-1d096_Feb12**

CALIBRATION CERTIFICATE

Object: D900V2 - SN: 1d096

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: February 17, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 20, 2012

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

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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
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	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	0.95 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.60 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**10.5 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.67 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.73 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.1 ± 6 %	1.08 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.80 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**11.0 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.80 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**7.08 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.1 Ω + 1.4 jΩ
Return Loss	- 29.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.5 Ω - 1.8 jΩ
Return Loss	- 32.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.410 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 22, 2009

DASY5 Validation Report for Head TSL

Date: 17.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

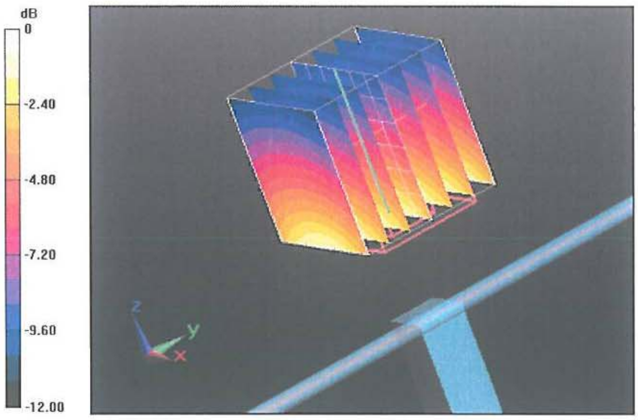
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d096

Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.95 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

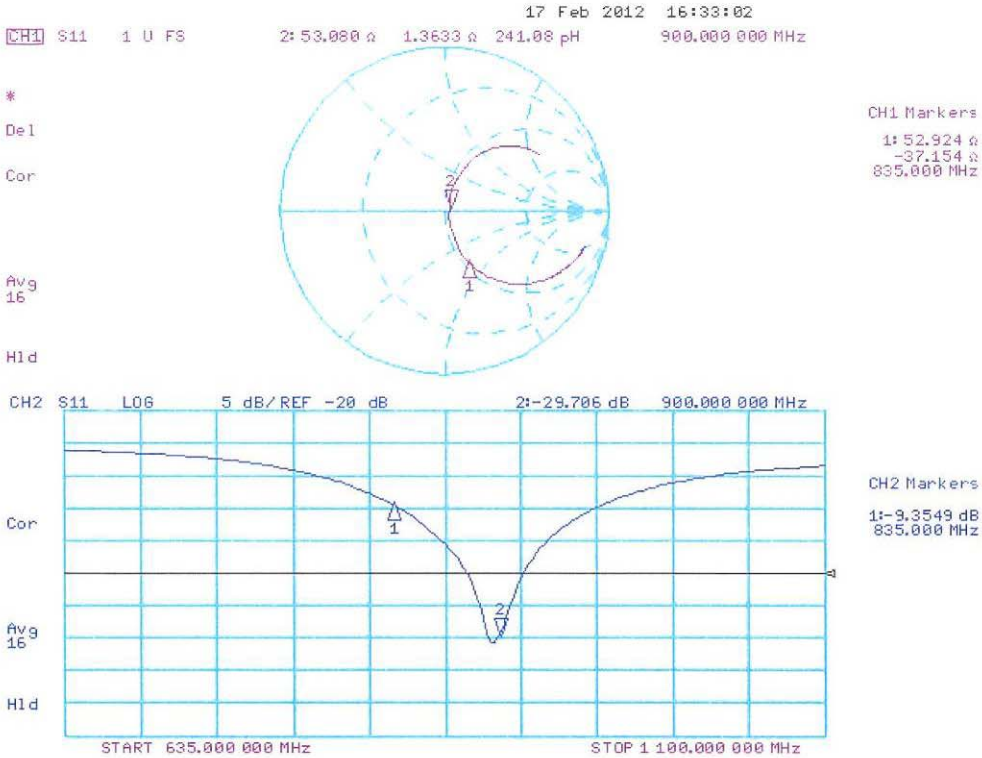
- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.787 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.8810
SAR(1 g) = 2.6 mW/g; SAR(10 g) = 1.67 mW/g
Maximum value of SAR (measured) = 3.046 mW/g



0 dB = 3.050mW/g = 9.69 dB mW/g

Impedance Measurement Plot for Head TSL



Certificate No: D900V2-1d096_Feb12 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 17.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

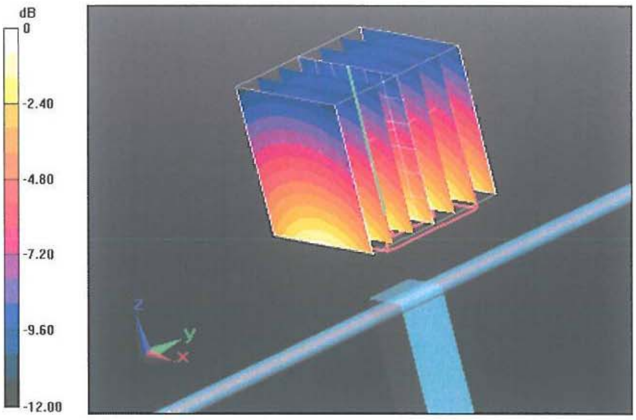
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d096

Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 1.08 mho/m; ε_r = 55.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

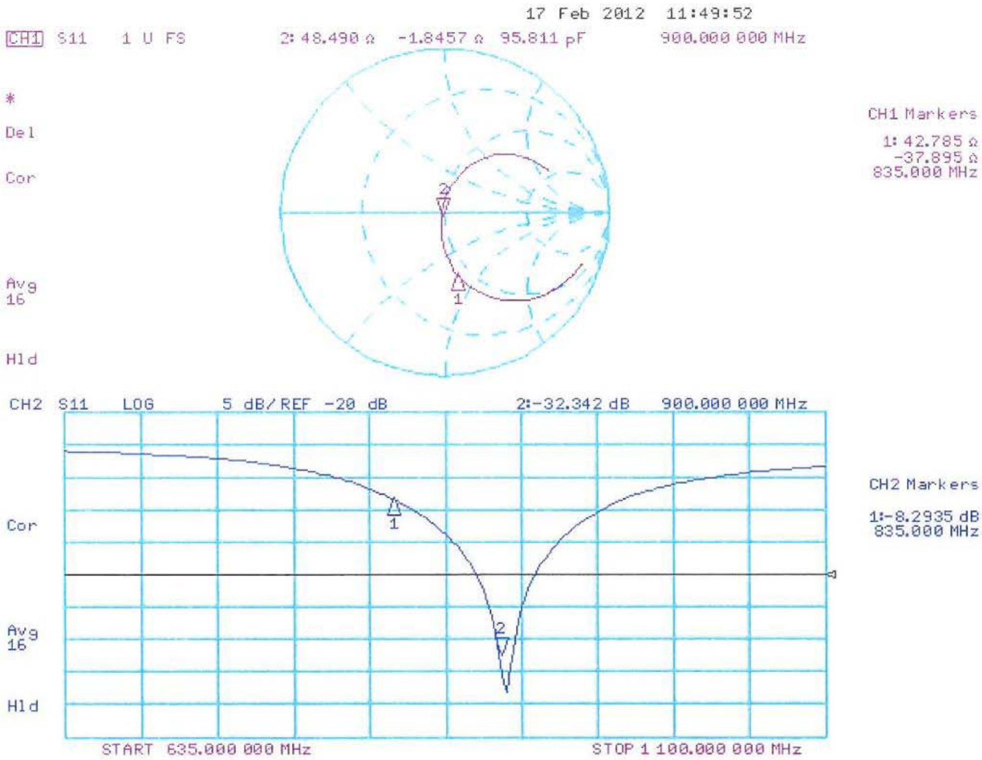
- Probe: ES3DV3 - SN3205; ConvF(5.94, 5.94, 5.94); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.370 V/m; Power Drift = 0.0075 dB
Peak SAR (extrapolated) = 4.2490
SAR(1 g) = 2.8 mW/g; SAR(10 g) = 1.8 mW/g
Maximum value of SAR (measured) = 3.283 mW/g



0 dB = 3.280mW/g = 10.32 dB mW/g

Impedance Measurement Plot for Body TSL



Certificate No: D900V2-1d096_Feb12 Page 8 of 8

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Accreditation No.: SCS 108

Client **Quietek-CN (Auden)**

Certificate No: **D1800V2-2d179_Feb12**

CALIBRATION CERTIFICATE

Object	D1800V2 - SN: 2d179
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 22, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 22, 2012

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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	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 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 ± 0.2) °C	40.5 ± 6 %	1.34 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**37.8 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.91 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.0 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.1 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.27 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**37.5 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.92 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**19.8 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.2 Ω - 2.9 jΩ
Return Loss	- 30.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.1 Ω - 2.8 jΩ
Return Loss	- 26.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.214 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 05, 2008

DASY5 Validation Report for Head TSL

Date: 22.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

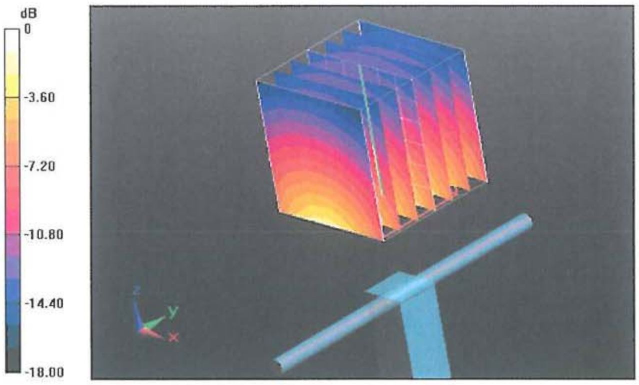
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d179

Communication System: CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.34 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

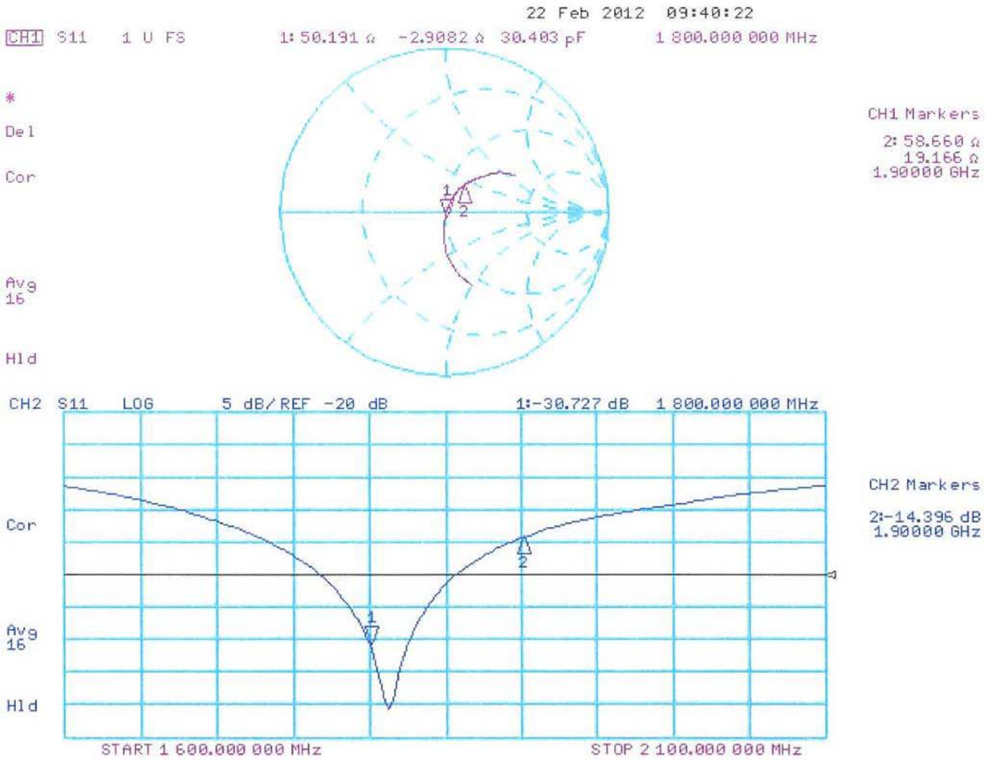
- Probe: ES3DV3 - SN3205; ConvF(5.07, 5.07, 5.07); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.908 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 16.0120
SAR(1 g) = 9.17 mW/g; SAR(10 g) = 4.91 mW/g
Maximum value of SAR (measured) = 11.315 mW/g



0 dB = 11.320mW/g = 21.08 dB mW/g

Impedance Measurement Plot for Head TSL



Certificate No: D1800V2-2d179_Feb12 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 22.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

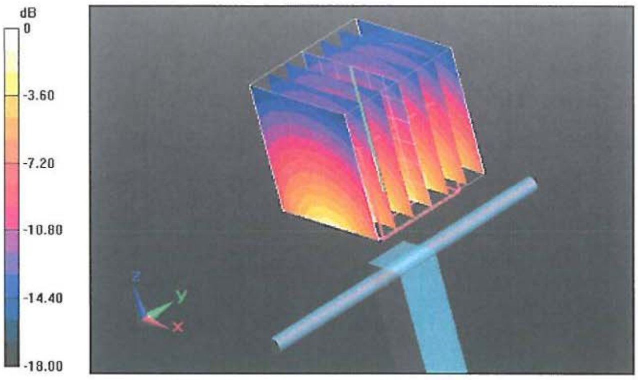
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d179

Communication System: CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.49 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

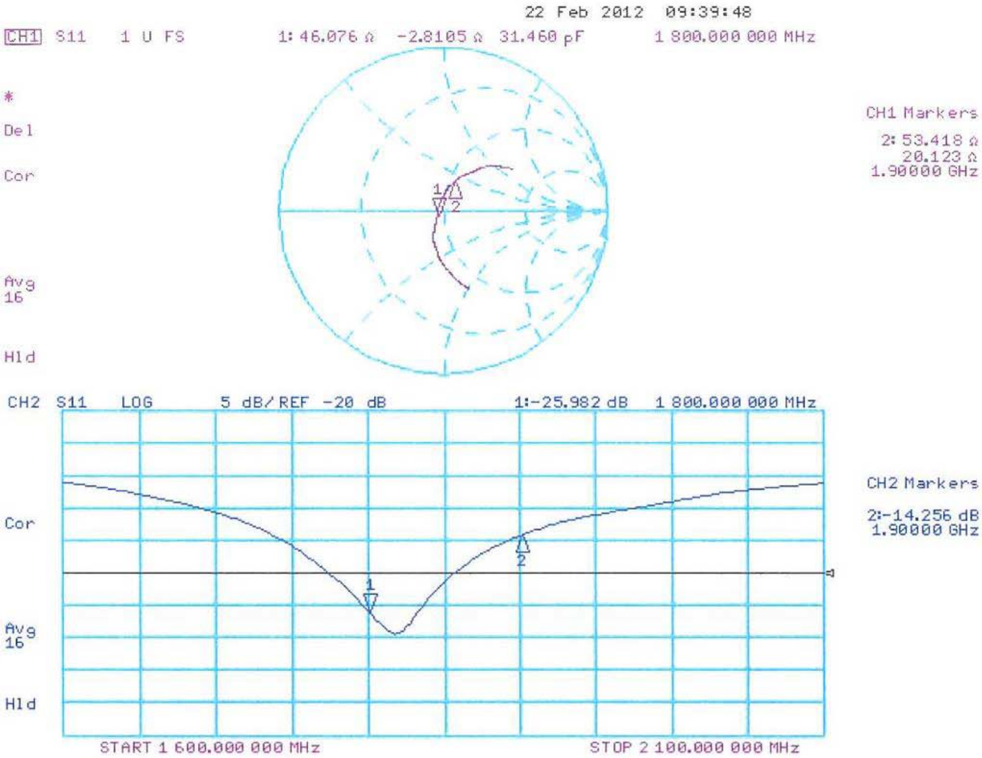
- Probe: ES3DV3 - SN3205; ConvF(4.74, 4.74, 4.74); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.820 V/m; Power Drift = 0.0038 dB
Peak SAR (extrapolated) = 16.0810
SAR(1 g) = 9.27 mW/g; SAR(10 g) = 4.92 mW/g
Maximum value of SAR (measured) = 11.751 mW/g



0 dB = 11.750mW/g = 21.40 dB mW/g

Impedance Measurement Plot for Body TSL



Certificate No: D1800V2-2d179_Feb12 Page 8 of 8

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Accreditation No.: **SCS 108**

Client **Quietek-CN (Auden)**

Certificate No: **D1900V2-5d121_Feb12**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d121
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 22, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 22, 2012

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 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 ± 0.2) °C	40.4 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.84 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.4 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.19 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.0 ± 6 %	1.56 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.84 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**38.7 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.15 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.6 Ω + 7.2 jΩ
Return Loss	- 22.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω + 7.4 jΩ
Return Loss	- 21.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 25, 2009

DASY5 Validation Report for Head TSL

Date: 22.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

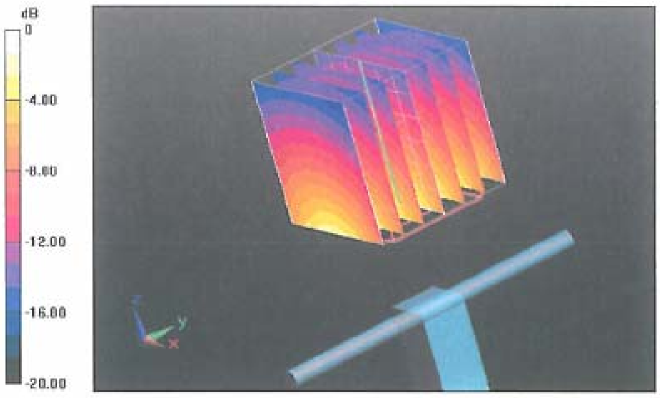
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d121

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

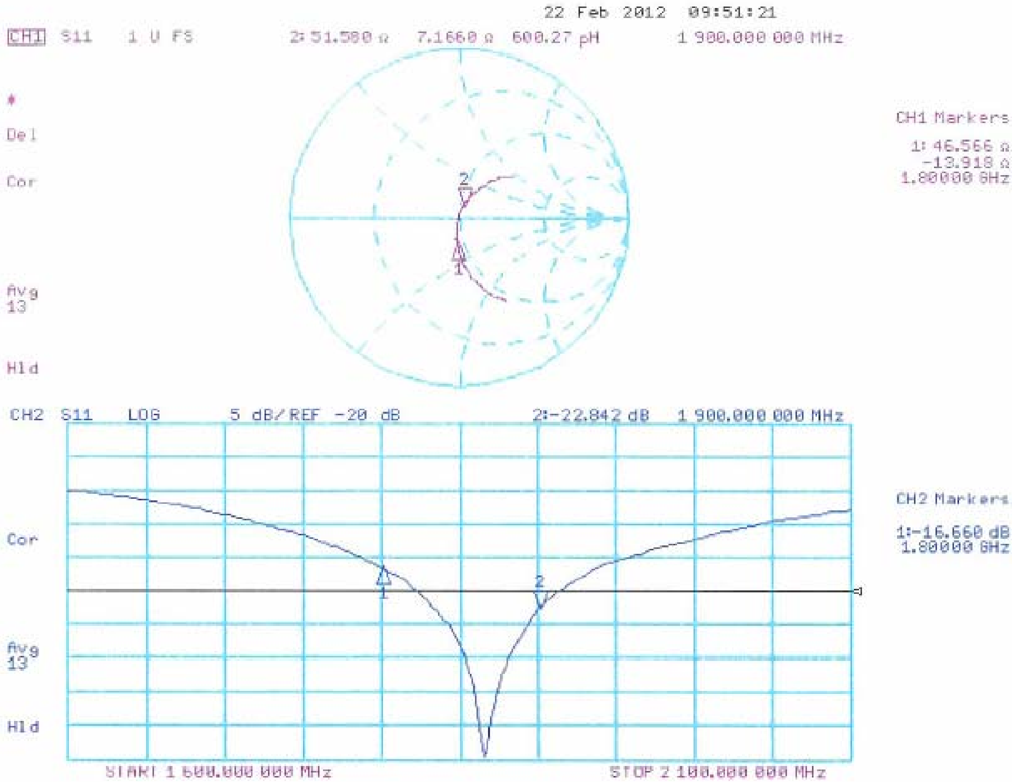
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.900 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.5160
SAR(1 g) = 9.84 mW/g; SAR(10 g) = 5.19 mW/g
Maximum value of SAR (measured) = 12.195 mW/g



0 dB = 12.200mW/g = 21.73 dB mW/g

Certificate No: D1900V2-5d121_Feb12 Page 5 of 8

Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d121_Feb12 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 22.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d121

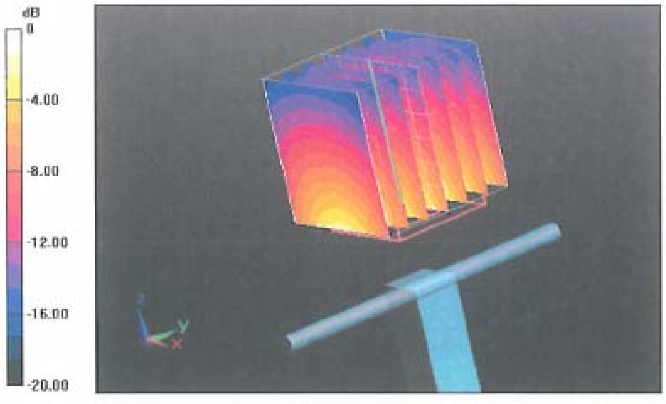
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.56 mho/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

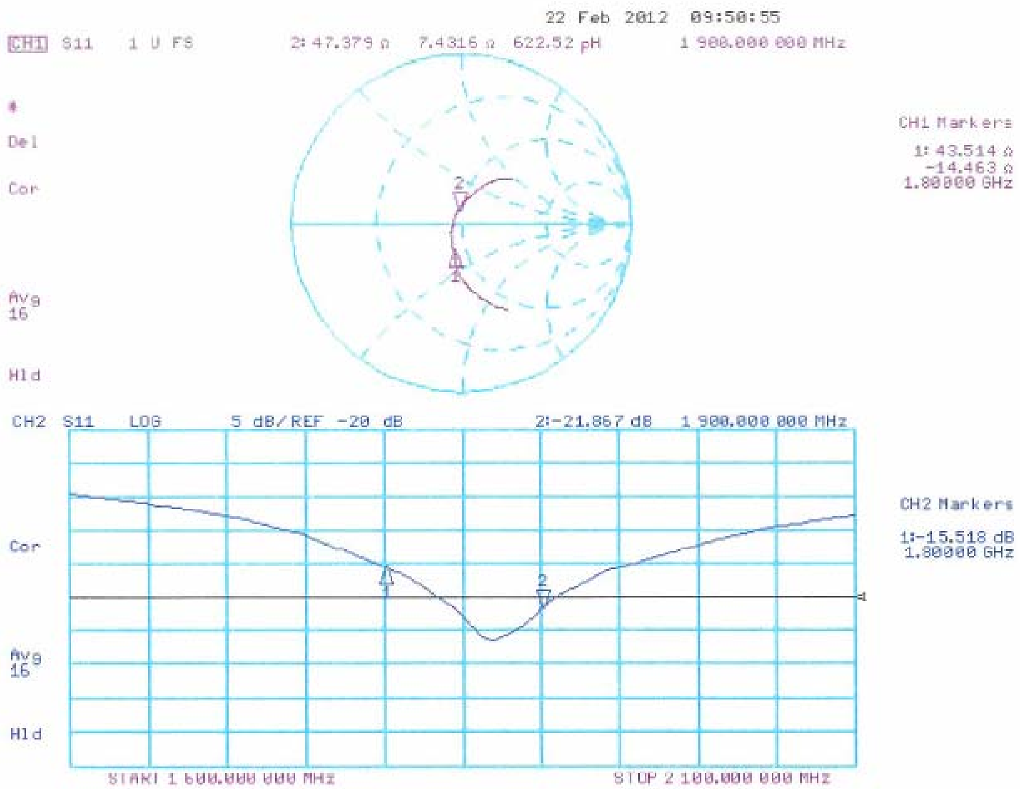
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.537 V/m; Power Drift = 0.0039 dB
Peak SAR (extrapolated) = 17.3450
SAR(1 g) = 9.84 mW/g; SAR(10 g) = 5.15 mW/g
Maximum value of SAR (measured) = 12.473 mW/g



0 dB = 12.470mW/g = 21.92 dB mW/g

Impedance Measurement Plot for Body TSL



Appendix F. DAE Calibration Data

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

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

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

Accreditation No.: SCS 108

Client **Quietek-CN (Auden)**

Certificate No: **DAE4-1220_Jan12**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 1220
Calibration procedure(s)	QA CAL-06.v24 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	January 23, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V2.1	SE UWS 053 AA 1001	05-Jan-12 (in house check)	In house check: Jan-13

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	[signature]
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: January 23, 2012

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

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	405.267 ± 0.1% (k=2)	404.990 ± 0.1% (k=2)	404.221 ± 0.1% (k=2)
Low Range	3.97762 ± 0.7% (k=2)	3.99629 ± 0.7% (k=2)	3.98707 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	176.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199991.77	-2.52	-0.00
Channel X	+ Input	20001.19	1.01	0.01
Channel X	- Input	-19996.52	3.93	-0.02
Channel Y	+ Input	199992.70	-2.15	-0.00
Channel Y	+ Input	19999.00	-1.14	-0.01
Channel Y	- Input	-19999.75	0.71	-0.00
Channel Z	+ Input	199991.55	-3.11	-0.00
Channel Z	+ Input	19999.33	-0.76	-0.00
Channel Z	- Input	-20001.23	-0.67	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	1999.14	-1.60	-0.08
Channel X	+ Input	201.79	0.59	0.29
Channel X	- Input	-198.19	0.48	-0.24
Channel Y	+ Input	1999.56	-0.99	-0.05
Channel Y	+ Input	200.20	-0.96	-0.48
Channel Y	- Input	-199.38	-0.54	0.27
Channel Z	+ Input	2000.07	-0.52	-0.03
Channel Z	+ Input	200.32	-0.83	-0.41
Channel Z	- Input	-199.60	-0.78	0.39

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	10.22	8.65
	- 200	-6.99	-8.91
Channel Y	200	-10.43	-11.02
	- 200	7.95	9.22
Channel Z	200	14.25	13.66
	- 200	-15.77	-14.99

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-1.62	-2.79
Channel Y	200	8.07	-	-2.95
Channel Z	200	7.90	6.93	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15896	16218
Channel Y	16012	15924
Channel Z	15702	15710

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.67	-0.77	1.84	0.43
Channel Y	-1.44	-2.35	-0.02	0.39
Channel Z	-0.81	-1.60	0.01	0.37

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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