Testing Laboratory
1190

Specific Absorption Rate (SAR) Test Report
for
FIC (First International Computer, Inc.)
on the
Neo 1973

Report No.	:	EA721310-1-1-01
Trade Name	:	FIC
Model No.	:	GTA01BV4
Date of Testing	:	May 29 and 30, 2007
Date of Report	:	Jul. 02, 2007
Date of Review	:	Jul. 02, 2007

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- Report Version: Rev.01.

SPORTON International Inc.

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1. Statement of Compliance

The Specific Absorption Rate (SAR) maximum results found during testing for the **FIC (First International Computer, Inc.) Neo 1973 FIC GTA01BV4 are 0.937 W/Kg for GSM head SAR and 1.06 W/Kg for DCS head SAR** with expanded uncertainty 19.3 %. It is in compliance with SAR for general public exposure limits specified in EN 50360 and Council Recommendation 1999/519/EC and had been tested in accordance with the measurement methods and procedures specified in EN 50361.

Approved by

Roy Wu

Roy Wu
Deputy Manager

2. Administration Data

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2.3 Detail of Manufacturer

Company Name : FIC (First International Computer, Inc.)
Address : No. 300, Yang Guang, NeiHu, Taipei, Taiwan, 114

2.4 Application Detail

Date of reception of application: Feb. 13, 2007
Start of test : May 29, 2007
End of test : May 30, 2007

3. General Information

3.1 Description of Device Under Test (DUT)

DUT Type :	Neo 1973
Trade Name :	FIC
Model No. :	GTA01BV4
Tx Frequency :	EGSM : 880-915MHz DCS : 1710-1785MHz
Rx Frequency :	EGSM : 925-960MHz DCS : 1805-1880MHz
GPRS / EGPRS Multislot class :	10
IMEI Code :	351405130798016
Antenna Type :	GSM : Tri-band Monopole Antenna GPS (Internal) : Active Patch Antenna GPS (External) : Active Patch Antenna
Antenna Connector :	GSM : Coaxial Connector GPS (Internal) : Coaxial Connector GPS (External) : MMCX Connector
Antenna Gain :	GSM : 0.07 dBi GPS (Internal) : 0.5 dBi GPS (External) : 5 dBi
Maximum Output Power to Antenna :	EGSM: 33.2 dBm DCS: 30.3 dBm
HW Version :	A4
SW Version :	OpenMoko.GTA01.e.w.v.00.21
Type of Modulation :	GMSK
DUT Stage :	Production Unit
Application Type :	DoC
Accessory :	Battery : FIC, GTC-01 / GTA-01

3.2 Product Photo

3.3 Applied Standards:

The Specific Absorption Rate (SAR) testing specification, method and procedure for this Neo 1973 is in accordance with the following standards:

CENELEC EN 50360
CENELEC EN 50361

3.4 Device Category and SAR Limits

Each of these devices belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user.

Limit for general public exposure should be applied for this device, it is 2.0 W/kg as averaged over any 10 gram of tissue.

3.5 Test Conditions:

3.5.1 Ambient Condition

Item	900	1800
Ambient Temperature (°C)	20-24℃	
Tissue simulating liquid temperature (°C)	21.4℃	21.5℃
Humidity (%)	<60％	

3.5.2 Test Configuration

The device was controlled by using a base station emulator CMU 200. Communication between the devices and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT.

For all the testing, measurements follow the EN50361 standard. The measurements were performed on the middle channel of both bands for each testing position. For the testing position with largest SAR result on each band, measurements of the lowest channel and highest channel were also performed. This testing method is illustrated in Fig. 3.5.

The DUT was set from the emulator to radiate maximum output power during all testings.

For head SAR testing, EUT is in GSM link mode and its crest factor is 8.3.

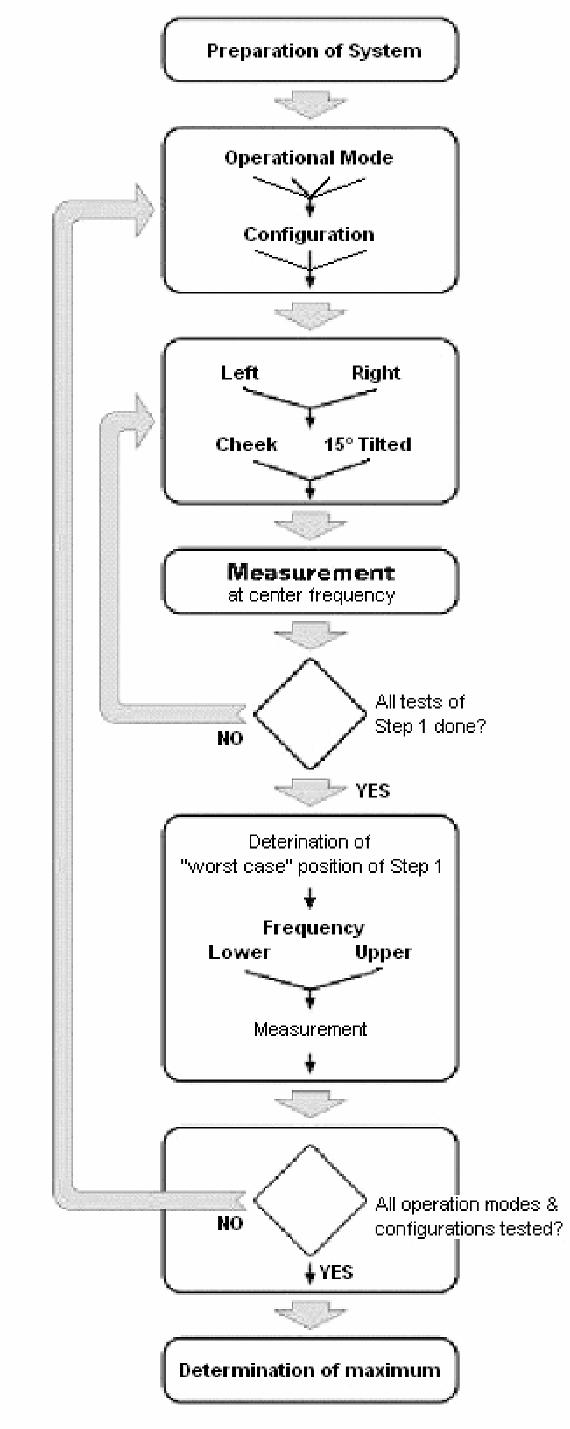


Fig. 3.5 Testing Method

4. Specific Absorption Rate (SAR)

4.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for general public group.

4.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density.
ρ). The equation description is as below:

$$\textbf{SAR} = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dv}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$\textbf{SAR} = C\frac{\delta T}{\delta t}$$

, where C is the specific head capacity, δT is the temperature rise and δt the exposure duration,

or related to the electrical field in the tissue by

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

, where σ is the conductivity of the tissue, ρ is the mass density of the tissue and ***E*** is the rms electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

5. SAR Measurement Setup

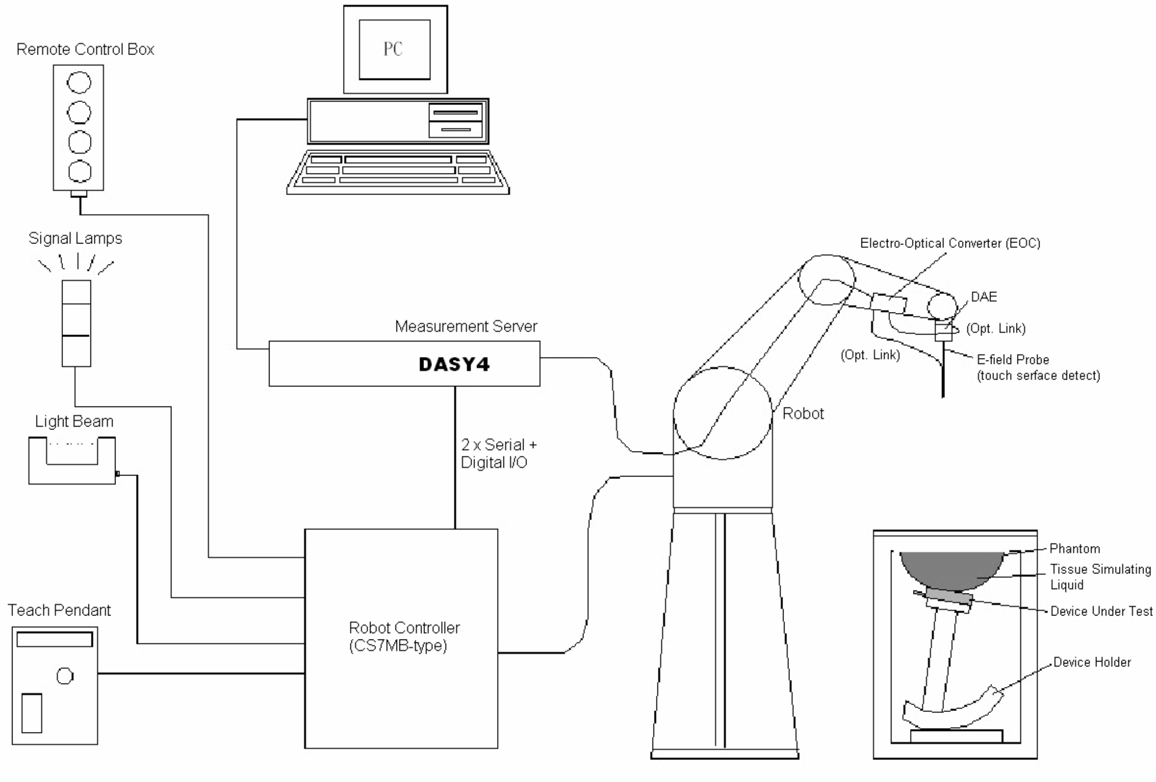


Fig. 5.1 DASY4 system

The DASY4 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (ECO) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY4 software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

5.1 DASY4 E-Field Probe System

The SAR measurement is conducted with the dosimetric probe ET3DV6 (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. This probe has a built in optical surface detection system to prevent from collision with phantom.

5.1.1 ET3DV6 E-Field Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents)
Calibration	Simulating tissue at frequencies of 900MHz, 1.8GHz and 2.45GHz for brain and muscle (accuracy ±8%)
Frequency	10 MHz to > 3 GHz
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation perpendicular to probe axis)
Dynamic Range	5 µ W/g to > 100mW/g; Linearity: ±0.2dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids on reflecting surface
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 3GHz Compliance tests for mobile phones and Wireless LAN Fast automatic scanning in arbitrary phantoms

Fig. 5.2 Probe setup on robot

5.1.2 ET3DV6 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data are as below:

Sensitivity	X axis : 1.73 µV		Y axis : 1.67 µV	Z axis : 1.70 µV
Diode compression point	X axis : 95 mV		Y axis : 101 mV	Z axis : 93 mV
Conversion factor (Head / Body)	**Frequency (MHz)**	**X axis**	**Y axis**	**Z axis**
	800~1000	6.60 / 6.33	6.60 / 6.33	6.60 / 6.33
	1710~1910	5.30 / 4.67	5.30 / 4.67	5.30 / 4.67
Boundary effect (Head / Body)	**Frequency (MHz)**	**Alpha**	**Depth**	
	800~1000	0.49 / 0.45	1.94 / 2.12	
	1710~1910	0.48 / 0.59	2.74 / 2.89	

NOTE:

- The probe parameters have been calibrated by the SPEAG.

5.2 DATA Acquisition Electronics (DAE)

The data acquisition electronics (DAE4) 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

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

5.3 Robot

The DASY4 system uses the high precision robots RX90BL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASYS system, the CS7MB robot controller version from Stäubli is used. The RX 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

5.4 Measurement Server

The DASY4 measurement server is based on a PC/104 CPU board with
166 MHz CPU
32 MB chipset and
64 MB RAM.

Communication with
the DAE4 electronic box
the 16-bit AD-converter system for optical detection and digital I/O interface.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

5.5 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.

The phantom can be used with the following tissue simulating liquids:
*Water-sugar based liquid
*Glycol based liquids

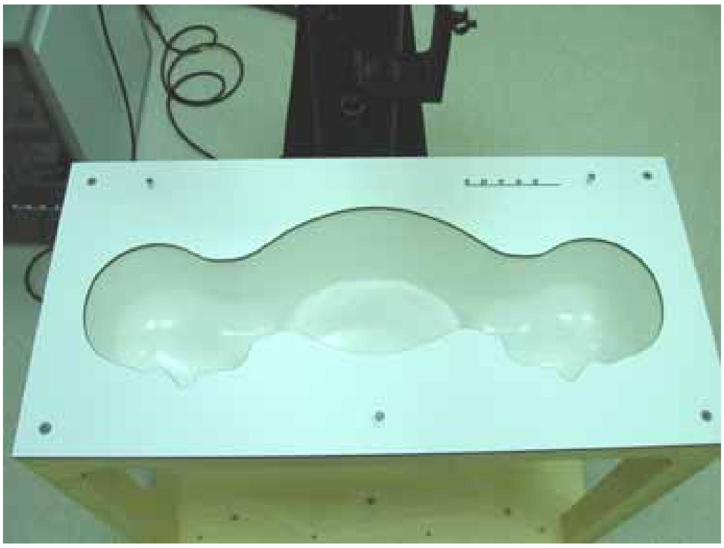


Fig. 5.3 Top view of twin phantom

Fig. 5.4 Bottom view of twin phantom

5.6 Device Holder for SAM Twin Phantom

The SAR in the Phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5 mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ± 20%. An accurate device position is therefore crucial for accurate and repeatable measurement. The position in which the devices must be measured, are defined by the standards.

The DASY 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 centers for both scales is the ear reference point (EPR).
Thus the device needs no repositioning when changing the angles.

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε_r=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.

Fig. 5.5 Device Holder

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY4 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension .DA4. The postprocessing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a loseless media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.7.2 Data Evaluation

The DASY4 postprocessing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software：

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

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.
The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest

factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as：

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

with
V_i = compensated signal of channel i (i = x, y, z)
U_i = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

E-field probes： $E_i = \sqrt{\frac{V_i}{Norm_i ConvF}}$

H-field probes： $H_i = \sqrt{V_i} \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$

with
V_i = compensated signal of channel *i* (*i* = x, y, z)
$Norm_i$ = sensor sensitivity of channel i (*i* = x, y, z)
μ V/(V/m)2 for E-field Probes
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i = electric field strength of channel *i* in V/m
H_i = magnetic field strength of channel *i* in A/m

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

$$E_{tot} = \sqrt{E_X^2 + E_Y^2 + E_Z^2}$$

The primary field data are used to calculate the derived field units.

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

with
SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm^3

＊Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

The power flow density is calculated assuming the excitation field to be a free space field.

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2
E_{tot} = total electric field strength in V/m
H_{tot} = total magnetic field strength in A/m

5.8 Test Equipment List

Manufacture	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Dosimetric E-Filed Probe	ET3DV6	1788	Sep. 19, 2006	Sep. 19, 2007
SPEAG	900MHz System Validation Kit	D900V2	190	Jul. 19, 2005	Jul. 19, 2007
SPEAG	1800MHz System Validation Kit	D1800V2	2d076	Jul. 20, 2005	Jul. 20, 2007
SPEAG	Data Acquisition Electronics	DAE3	577	Nov. 21, 2006	Nov. 21, 2007
SPEAG	Device Holder	N/A	N/A	NCR	NCR
SPEAG	Phantom	QD 000 P40 C	TP-1150	NCR	NCR
SPEAG	Robot	Staubli RX90BL	F03/5W15A1/A/01	NCR	NCR
SPEAG	Software	DASY4 V4.7 Build 53	N/A	NCR	NCR
SPEAG	Software	SEMCAD V1.8 Build 172	N/A	NCR	NCR
SPEAG	Measurement Server	SE UMS 001 BA	1021	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46100746	Feb. 21, 2007	Feb. 21, 2008
Agilent	Wireless Communication Test Set	E5515C	GB46311322	Dec. 22, 2006	Dec. 22, 2008
Agilent	Dielectric Probe Kit	85070D	US01440205	NCR	NCR
Agilent	Dual Directional Coupler	778D	50422	NCR	NCR
Agilent	Power Amplifier	8449B	3008A01917	NCR	NCR
Agilent	Power Meter	E4416A	GB41292344	Feb. 08, 2007	Feb. 08, 2008
Agilent	Power Sensor	E9327A	US40441548	Feb. 08, 2007	Feb. 08, 2008
Agilent	Signal Generator	E8247C	MY43320596	Mar. 01, 2006	Mar. 01, 2008

Table 5.1 Test Equipment List

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY4, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. The liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm.

The following ingredients for tissue simulating liquid are used:

- **Water**: deionized water (pure H_20), resistivity ≧16MΩ- as basis for the liquid
- **Sugar**: refined sugar in crystals, as available in food shops – to reduce relative permittivity
- **Salt**: pure NaCl – to increase conductivity
- **Cellulose**: Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20°C), CAS#54290-to increase viscosity and to keep sugar in solution.
- **Preservative**: Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS#55965-84-9- to prevent the spread of bacteria and molds.
- **DGMBE**: Deithlenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS#112-34-5 – to reduce relative permittivity.

Table 6.1 gives the recipes for one liter of head tissue simulating liquid for frequency bands 900 MHz and 1800 MHz.

Ingredient	HSL-900	HSL-1800
Water	532.98 g	552.42 g
Cellulose	3.2 g	0 g
Salt	18.3 g	3.06 g
Preventol D-7	2.4 g	0 g
Sugar	766.0 g	0 g
DGMBE	0 g	444.52 g
Total amount	1 liter (1.3 kg)	1 liter (1.0 kg)
Dielectric Parameters target at 22°	f=900 MHz ε_r = 42±5%, σ = 0.99±5% S/m	f = 1800MHz ε_r = 40±5%, σ = 1.38±5% S/m

Table 6.1

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

Table 6.2 shows the measuring results for head simulating liquid in these two bands.

Bands	Frequency(MHz)	Permittivity (ε_r)	Conductivity (σ)	Measurement date
EGSM band (880 ~ 960 MHz)	880.2	40.8	0.963	May 30, 2007
	897.6	40.7	0.976	
	914.8	40.5	0.99	
DCS band (1710 ~ 1880 MHz)	1710.2	40.5	1.35	May 29, 2007
	1747.6	40.3	1.39	
	1784.8	40.2	1.42	

Table 6.2

The measuring data are consistent with $\varepsilon_r = 41.5 \pm 5\%$ and $\sigma = 0.97 \pm 5\%$ for EGSM band and $\varepsilon_r = 40.0 \pm 5\%$ and $\sigma = 1.40 \pm 5\%$ for DCS band.

7. *Uncertainty Assessment*

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 7.1

Uncertainty Distributions	**Normal**	**Rectangular**	**Triangular**	**U-shape**
Multiplying factor[(a)]	1/k [(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity
(b) κ is the coverage factor

Table 7.1

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY4 uncertainty Budget is showed in Table 7.2.

Error Description	Uncertainty Value ± %	Probability Distribution	Divisor	C_i 10g	Standard Unc. (10g)	V_i or V_{eff}
Measurement Equipment						
Calibration	± 4.8	Normal	1	1	±4.8	∞
Axial Isotropy	± 4.7	Rectangular	√3	0.7	±1.9	∞
Spherical Isotropy	± 9.6	Rectangular	√3	0.7	±3.9	∞
Linearity	± 4.7	Rectangular	√3	1	±2.7	∞
Detection Limit	± 1.0	Rectangular	√3	1	±0.6	∞
Boundary Effects	± 1.0	Rectangular	√3	1	±0.6	∞
Beadout Electronics	± 1.0	Normal	1	1	±1.0	∞
Response Time	± 0.8	Normal	1	1	±0.8	∞
Noise	± 0	Normal	1	1	± 0	∞
Integration time	± 2.6	Rectangular	1	1	± 2.6	∞
Mechanical Constraints						
Scanning system	± 0.4	Rectangular	√3	1	±0.2	∞
Phantom Shell	± 4.0	Rectangular	√3	1	±2.3	∞
Matching between Probe and Phantom	± 2.9	Rectangular	√3	1	±1.7	∞
Poistioning of the Phone	± 2.9	Normal	1	1	±2.9	145
Physical Parameters						
Liquid Conductivity (deviation from Target)	±5.0	Rectangular	√3	0.5	±1.4	∞
Liquid Conductivity (measurement error)	±4.3	Rectangular	√3	0.5	±1.2	∞
Liquid Permittivity (deviation from Target)	±5.0	Rectangular	√3	0.5	±1.4	∞
Liquid Permittivity (measurement error)	±4.3	Rectangular	√3	0.5	±1.2	∞
Drift in output power of the phone, probe, temperature and humidity	±5.0	Rectangular	√3	1	±2.9	∞
RF Ambient Conditions	±3.0	Rectangular	√3	1	±1.7	∞
Post-processing						
Extrapolation, Interpolation and Integration Algorithms for Max. SAR Evaluation	±1.0	Rectangular	√3	1	±0.6	
Combined Standard Uncertainty					±9.7	18125
Coverage Factor for 95 %		**K=2**				
Expanded uncertainty (Coverage factor = 2)					**±19.3**	

Table 7.2 Uncertainty Budget of DASY

8. SAR Measurement Evaluation

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

8.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

8.2 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator at frequency 900 and 1800 MHz. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

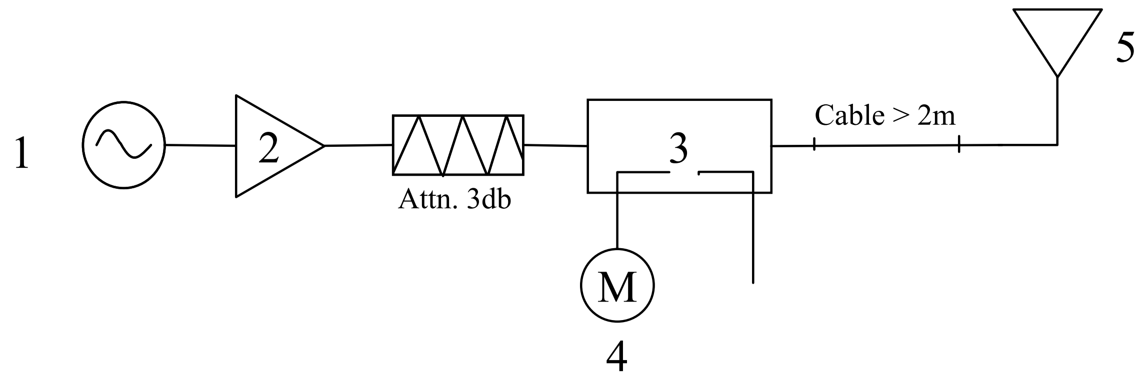


Fig. 8.1

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. 900 MHz or 1800 MHz

The output power on dipole port must be calibrated to 20dBm (100mW) before dipole is connected.

Fig 8.2 Dipole Setup

8.3 Validation Results

Comparing to the original SAR value provided by Speag, the validation data should be within its specification of 10 %. Table 8.1 shows the target SAR and measured SAR after normalized to 1W input power.

		Target (W/kg)	Measurement data (W/kg)	Variation	Measurement date
GSM band (900 MHz)	SAR (1g)	10.8	11	1.9 %	May 30, 2007
	SAR (10g)	6.94	7.14	2.9 %	
DCS band (1800 MHz)	SAR (1g)	38.3	35.4	-7.6 %	May 29, 2007
	SAR (10g)	20.3	18.7	-7.9 %	

Table 8.1

The table above indicates the system performance check can meet the variation criterion.

9. Description for DUT Testing Position

This DUT was tested in 4 different positions. They are left cheek, left tilted, right cheek, and right tilted as illustrated below:

1) " Cheek Position"

   i) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M, RE and LE) and align the center of the ear piece with the line RE-LE.

   ii) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 9.1).

2) " Tilted Position"

   i) To position the device in the " cheek" position described above

   ii) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (sees Fig. 9.2).

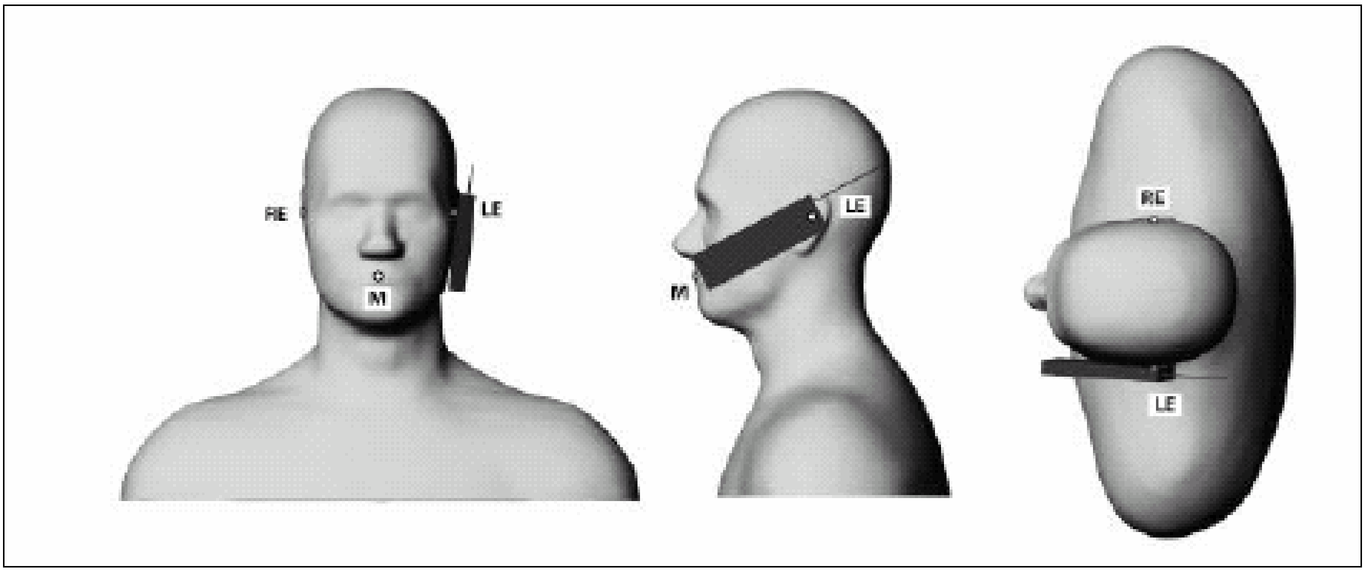


Fig. 9.1 Phone Position 1, “Cheek” or “Touch” Position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the plane for phone positioning, are indicated.

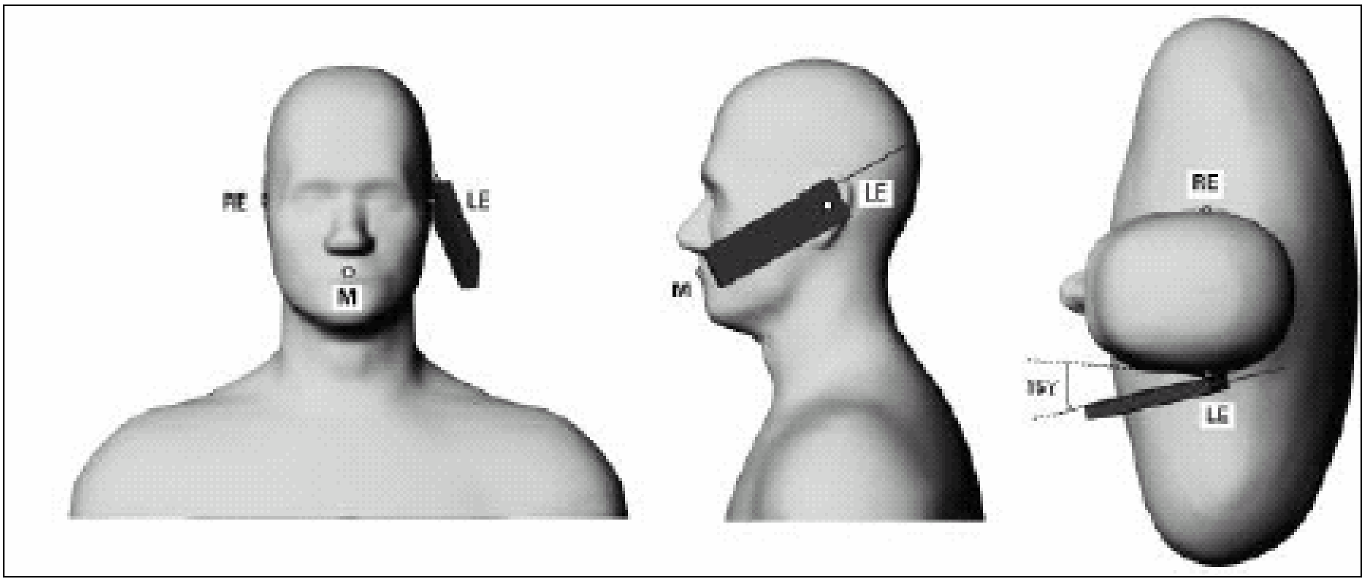


Fig. 9.2 Phone Position 2, “Tilted Position”. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the plane for phone positioning, are indicated.

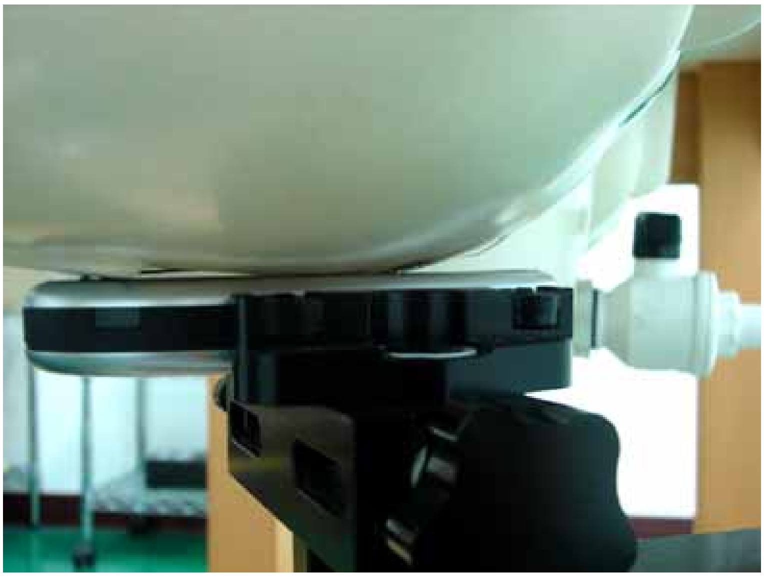


Fig. 9.3 Right Cheek

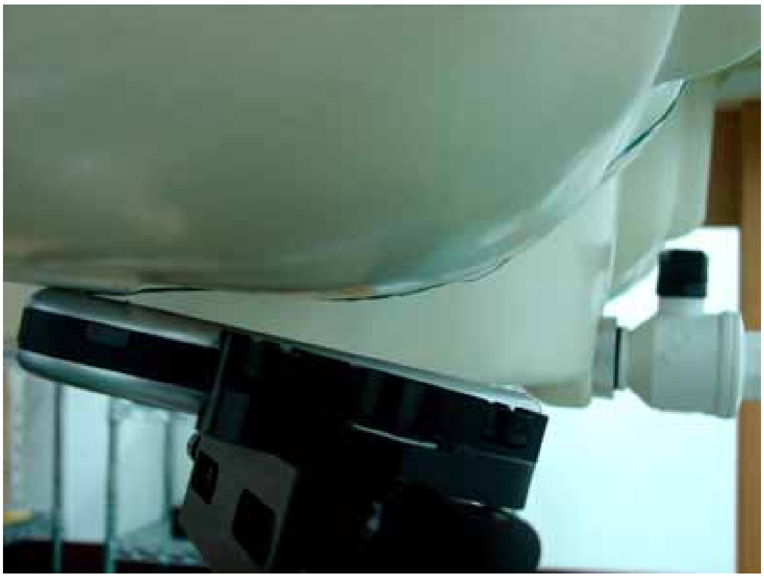


Fig. 9.4 Right Tilted

Fig. 9.5 Left Cheek

Fig. 9.6 Left Tilted

10. Measurement Procedures

The measurement procedures are as follows:

- Linking DUT with base station simulator CMU200 in middle channel for EGSM or DCS band
- Setting PCL=5 for EGSM and PCL=0 for DCS on CMU200 to allow DUT to radiate maximum output power
- Measuring output power through RF cable and power meter
- Placing the DUT in the positions described in the last section
- Setting scan area, grid size and other setting on the DASY4 software
- Taking data for the middle channel on each testing position
- Finding out the largest SAR result on these testing positions of each band
- Measuring output power and SAR results for the low and high channels in this worst case testing position

According to the EN50361 draft standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Verification of the power reference measurement
- Area scan
- Zoom scan
- Power reference measurement

10.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE P1528-2003 standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY4 software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

Base on the Draft: SCC-34, SC-2, WG-2-Computational Dosimetry, IEEE P1528/D1.2 (Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head From Wireless Communications Devices: Measurement Techniques), a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose , the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- extraction of the measured data (grid and values) from the Zoom Scan
- calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- generation of a high-resolution mesh within the measured volume

- interpolation of all measured values form the measurement grid to the high-resolution grid
- extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- calculation of the averaged SAR within masses of 1g and 10g

10.2 Scan Procedures

First **Area Scan** is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an **Area Scan** is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, **Zoom Scan** is required. The **Zoom Scan** measures 7x7x7 points with step size 5, 5 and 5 mm. The **Zoom Scan** is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

10.3 SAR Averaged Methods

In DASY4, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

11. SAR Test Results

11.1 Right Cheek

Bands	Chan.	Freq. (MHz)	Modulation type	Conducted Power (dBm)	Power Drift (dB)	Measured 10g SAR (W/kg)	Limits (W/Kg)	Results
EGSM	**975 (Low)**	**880.2**	**GMSK**	**33.2**	**0.144**	**0.937**	**2.0**	**Pass**
	38 (Mid)	897.6	GMSK	33.2	-0.147	0.918	2.0	Pass
	124 (High)	914.8	GMSK	33	0.013	0.738	2.0	Pass
DCS	**512 (Low)**	**1710.2**	**GMSK**	**28.7**	**0.045**	**1.06**	**2.0**	**Pass**
	699 (Mid)	1747.6	GMSK	29.6	-0.087	0.927	2.0	Pass
	885 (High)	1784.8	GMSK	30.3	0.025	1.02	2.0	Pass

11.2 Right Tilted

Bands	Chan.	Freq. (MHz)	Modulation type	Conducted Power (dBm)	Power Drift (dB)	Measured 10g SAR (W/kg)	Limits (W/Kg)	Results
EGSM	975 (Low)	880.2	GMSK	33.2	-	-	-	-
	38 (Mid)	897.6	GMSK	33.2	-0.098	0.517	2.0	Pass
	124 (High)	914.8	GMSK	33	-	-	-	-
DCS	512 (Low)	1710.2	GMSK	28.7	-	-	-	-
	699 (Mid)	1747.6	GMSK	29.6	-0.043	0.251	2.0	Pass
	885 (High)	1784.8	GMSK	30.3	-	-	-	-

11.3 Left Cheek

Bands	Chan.	Freq. (MHz)	Modulation type	Conducted Power (dBm)	Power Drift (dB)	Measured 10g SAR (W/kg)	Limits (W/Kg)	Results
EGSM	975 (Low)	880.2	GMSK	33.2	-	-	-	-
	38 (Mid)	897.6	GMSK	33.2	0.048	0.925	2.0	Pass
	124 (High)	914.8	GMSK	33	-	-	-	-
DCS	512 (Low)	1710.2	GMSK	28.7	-	-	-	-
	699 (Mid)	1747.6	GMSK	29.6	-0.159	0.508	2.0	Pass
	885 (High)	1784.8	GMSK	30.3	-	-	-	-

11.4 Left Tilted

Bands	Chan.	Freq. (MHz)	Modulation type	Conducted Power (dBm)	Power Drift (dB)	Measured 10g SAR (W/kg)	Limits (W/Kg)	Results
EGSM	975 (Low)	880.2	GMSK	33.2	-	-	-	-
	38 (Mid)	897.6	GMSK	33.2	-0.14	0.504	2.0	Pass
	124 (High)	914.8	GMSK	33	-	-	-	-
DCS	512 (Low)	1710.2	GMSK	28.7	-	-	-	-
	699 (Mid)	1747.6	GMSK	29.6	-0.003	0.23	2.0	Pass
	885 (High)	1784.8	GMSK	30.3	-	-	-	-

Test Engineer：Eric Huang

12.References

[1] CENELEC EN 50360, "Product Standard to Demonstrate the Compliance of Mobile Phones with the Basic Restrictions Related to Human Exposure to Electromagnetic Fields (300 MHz3GHz) " , 2001
[2] CENELEC EN 50361, “Basic Standard for the Measurement of Specific Absorption Rate Related to Human Exposure to Electromagnetic Fields from Mobile Phone”, July 2001
[3] Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), “Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to RF Emissions”, June 2001
[4] IEEE Std. P1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, April 21, 2003
[5] IEEE Std. C95.1-1999, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, 1999
[6] Council Recommendation 1999/519/EC of July 1999 on the limitation od exposure of the general public to electromagnetic fields (0Hz to 300 GHz)
[7] Robert J. Renka, “Multivariate Interpolation Of Large Sets Of Scattered Data”, University of Noth Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148
[8] DAYS4 System Handbook

Appendix A - System Performance Check Data

Test Laboratory: Sporton International Inc. SAR Testing Lab   Date : 2007/5/30

System Check_Head_900MHz

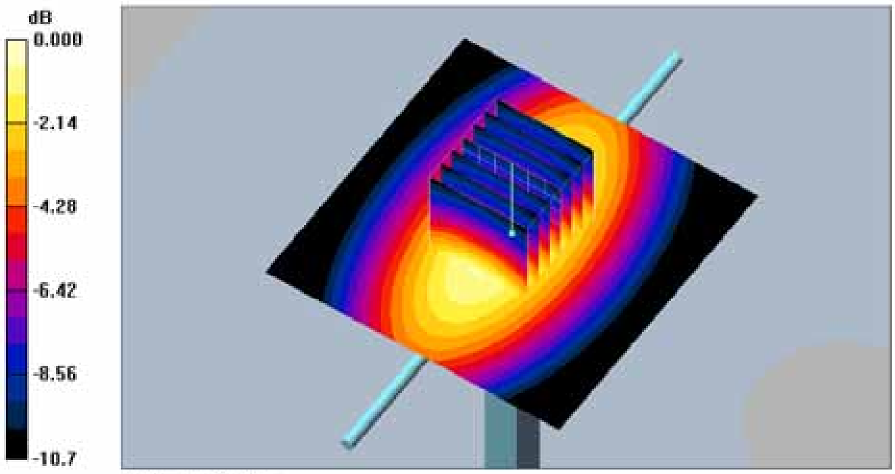
DUT: Dipole 900 MHz

Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: HSL_900 Medium parameters used: f = 900 MHz; σ = 0.978 mho/m; ε_r = 40.7; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.4 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(6.6, 6.6, 6.6); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin=100mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.13 mW/g

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 35.0 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) = 1.63 W/kg
SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.714 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



0 dB = 1.19mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date: 2007/5/29

System Check_Head_1800MHz

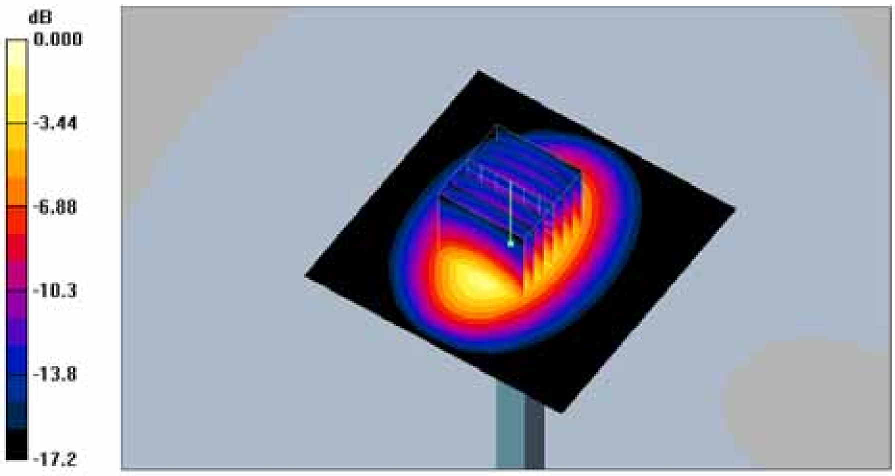
DUT: Dipole 1800 MHz

Communication System: CW; Frequency: 1800 MHz;Duty Cycle: 1:1
Medium: HSL_1800 Medium parameters used: f = 1800 MHz; σ = 1.44 mho/m; ε_r = 40.2; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.5 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin=100mW/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 4.04 mW/g

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.6 V/m; Power Drift = -0.058 dB
Peak SAR (extrapolated) = 6.13 W/kg
SAR(1 g) = 3.54 mW/g; SAR(10 g) = 1.87 mW/g
Maximum value of SAR (measured) = 4.03 mW/g



0 dB = 4.03mW/g

Appendix B - SAR Measurement Data

Test Laboratory: Sporton International Inc. SAR Testing Lab Date: 2007/5/30

Right Cheek_EGSM Ch975

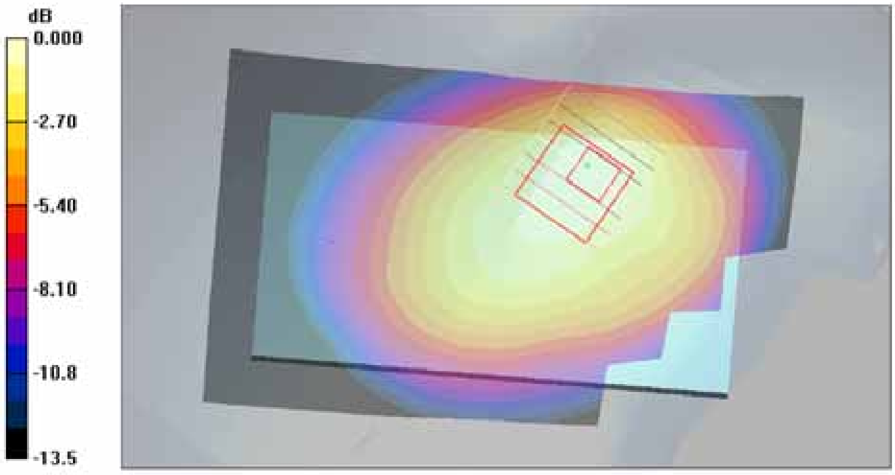
DUT: 721310

Communication System: EGSM; Frequency: 880.2 MHz;Duty Cycle: 1:8.3
Medium: HSL_900 Medium parameters used : f = 880.2 MHz; $\sigma = 0.963$ mho/m; $\varepsilon_r = 40.8$; $\rho = 1000$ kg/m^3
Ambient Temperature : 22.6 ℃; Liquid Temperature : 21.4 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(6.6, 6.6, 6.6); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch975/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.53 mW/g

Ch975/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.6 V/m; Power Drift = 0.144 dB
Peak SAR (extrapolated) = 2.38 W/kg
SAR(1 g) = 1.43 mW/g; SAR(10 g) = 0.937 mW/g
Maximum value of SAR (measured) = 1.55 mW/g



0 dB = 1.55mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date : 2007/5/30

Right Tilted_EGSM Ch38

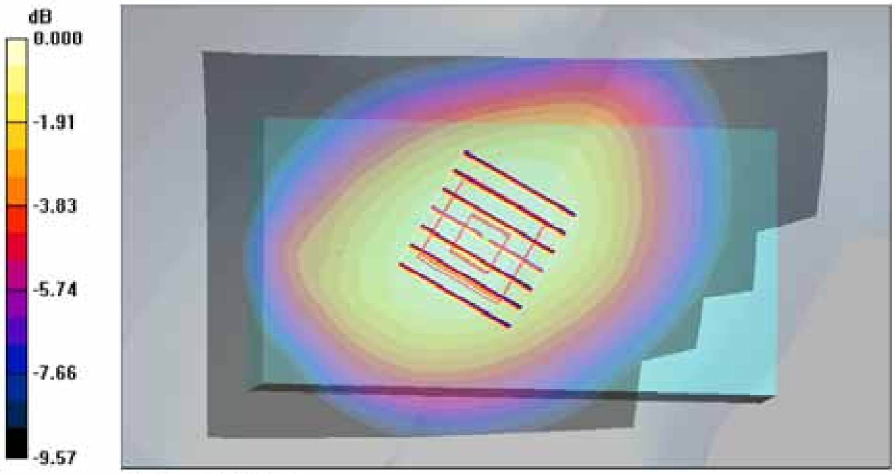
DUT: 721310

Communication System: EGSM; Frequency: 897.6 MHz;Duty Cycle: 1:8.3
Medium: HSL_900 Medium parameters used: f = 898 MHz; $\sigma = 0.976$ mho/m; $\varepsilon_r = 40.7$; $\rho = 1000$ kg/m^3
Ambient Temperature : 22.8 ℃; Liquid Temperature : 21.4 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(6.6, 6.6, 6.6); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch38/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.761 mW/g

Ch38/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.0 V/m; Power Drift = -0.098 dB
Peak SAR (extrapolated) = 0.905 W/kg
SAR(1 g) = 0.708 mW/g; SAR(10 g) = 0.517 mW/g
Maximum value of SAR (measured) = 0.753 mW/g



0 dB = 0.753mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date : 2007/5/30

Left Cheek_EGSM Ch38

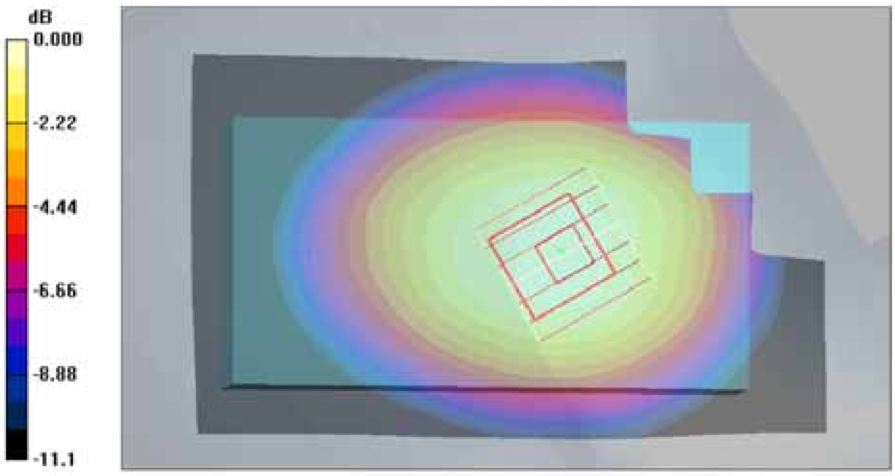
DUT: 721310

Communication System: EGSM; Frequency: 897.6 MHz;Duty Cycle: 1:8.3
Medium: HSL_900 Medium parameters used: f = 898 MHz; σ = 0.976 mho/m; ε_r = 40.7; ρ = 1000 kg/m^3
Ambient Temperature : 22.8 ℃; Liquid Temperature : 21.4 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(6.6, 6.6, 6.6); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch38/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.17 mW/g

Ch38/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.9 V/m; Power Drift = 0.104 dB
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.820 mW/g
Maximum value of SAR (measured) = 1.18 mW/g



0 dB = 1.18mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date : 2007/5/30

Left Tilted_EGSM Ch38

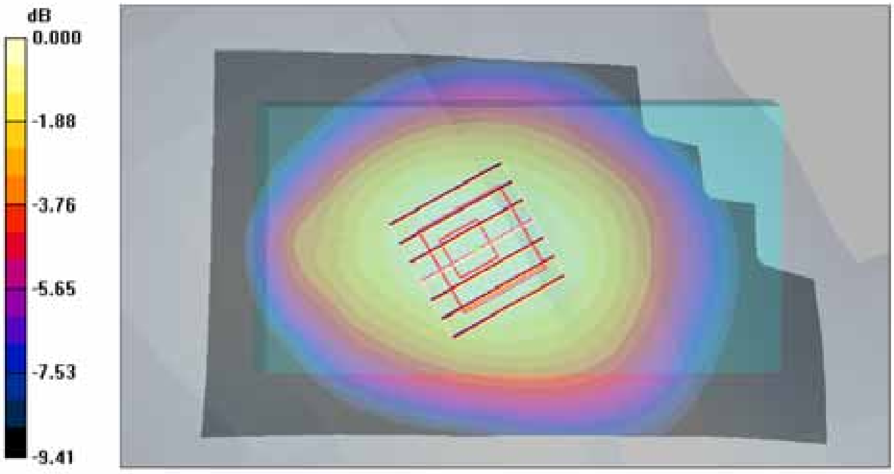
DUT: 721310

Communication System: EGSM; Frequency: 897.6 MHz;Duty Cycle: 1:8.3
Medium: HSL_900 Medium parameters used: f = 898 MHz; σ = 0.976 mho/m; ε_r = 40.7; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.4 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(6.6, 6.6, 6.6); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch38/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.729 mW/g

Ch38/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.3 V/m; Power Drift = -0.140 dB
Peak SAR (extrapolated) = 0.872 W/kg
SAR(1 g) = 0.682 mW/g; SAR(10 g) = 0.504 mW/g
Maximum value of SAR (measured) = 0.721 mW/g



0 dB = 0.721mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date : 2007/5/29

Right Cheek_DCS Ch512

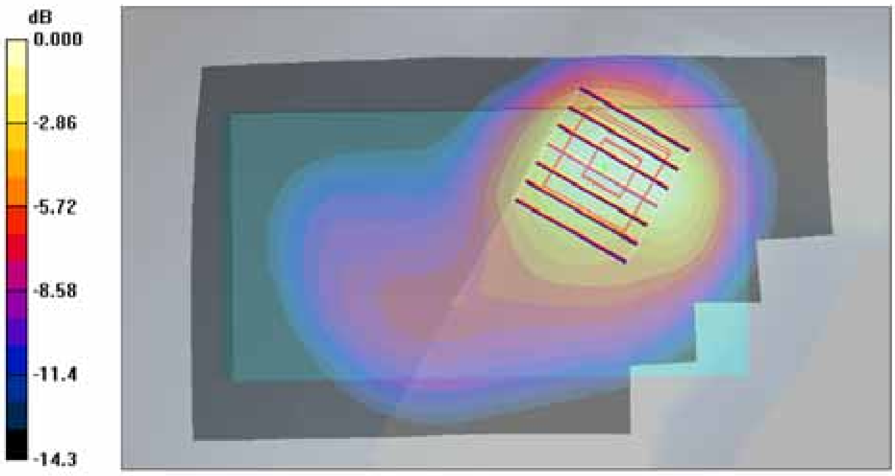
DUT: 721310

Communication System: DCS; Frequency: 1710.2 MHz;Duty Cycle: 1:8.3
Medium: HSL_1800 Medium parameters used: f = 1710.2 MHz; σ = 1.35 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Ambient Temperature : 22.5 ℃; Liquid Temperature : 21.5 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch512/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.10 mW/g

Ch512/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.7 V/m; Power Drift = 0.045 dB
Peak SAR (extrapolated) = 2.89 W/kg
SAR(1 g) = 1.84 mW/g; SAR(10 g) = 1.06 mW/g
Maximum value of SAR (measured) = 2.07 mW/g



0 dB = 2.07mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date: 2007/5/29

Right Tilted_DCS Ch699

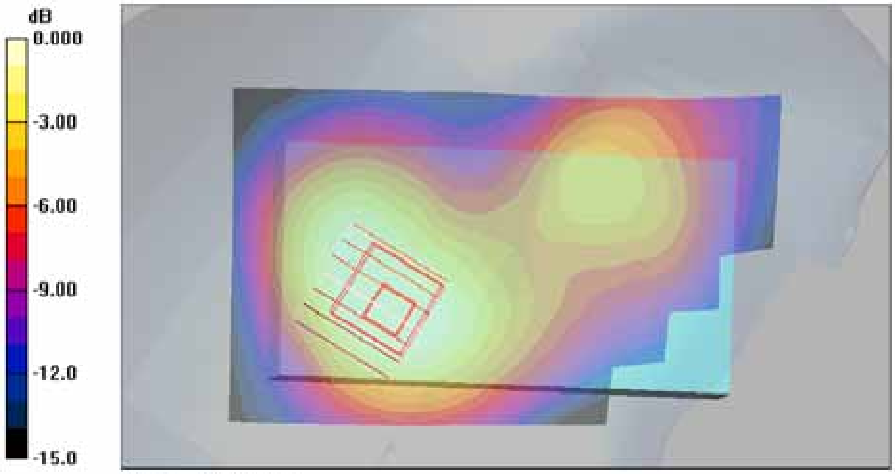
DUT: 721310

Communication System: DCS; Frequency: 1747.6 MHz;Duty Cycle: 1:8.3
Medium: HSL_1800 Medium parameters used: f = 1748 MHz; σ = 1.39 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Ambient Temperature : 22.5 ℃; Liquid Temperature : 21.5 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch699/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.429 mW/g

Ch699/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.0 V/m; Power Drift = -0.043 dB
Peak SAR (extrapolated) = 0.491 W/kg
SAR(1 g) = 0.367 mW/g; SAR(10 g) = 0.251 mW/g
Maximum value of SAR (measured) = 0.392 mW/g



0 dB = 0.392mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date: 2007/5/29

Left Cheek_DCS Ch699

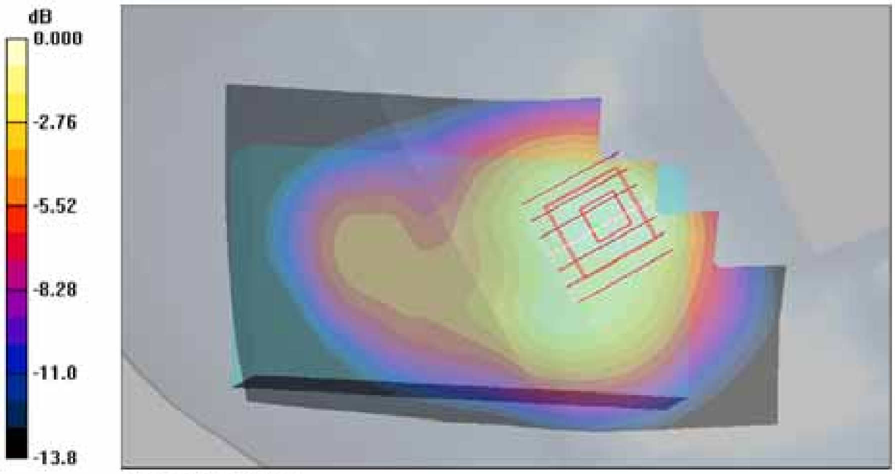
DUT: 721310

Communication System: DCS; Frequency: 1747.6 MHz;Duty Cycle: 1:8.3
Medium: HSL_1800 Medium parameters used: f = 1748 MHz; σ = 1.39 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.5 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch699/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.901 mW/g

Ch699/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.0 V/m; Power Drift = -0.159 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.508 mW/g
Maximum value of SAR (measured) = 0.863 mW/g



0 dB = 0.863mW/g

Test Laboratory: Sporton International Inc. SAR Testing Lab Date: 2007/5/29

Left Tilted_DCS Ch699

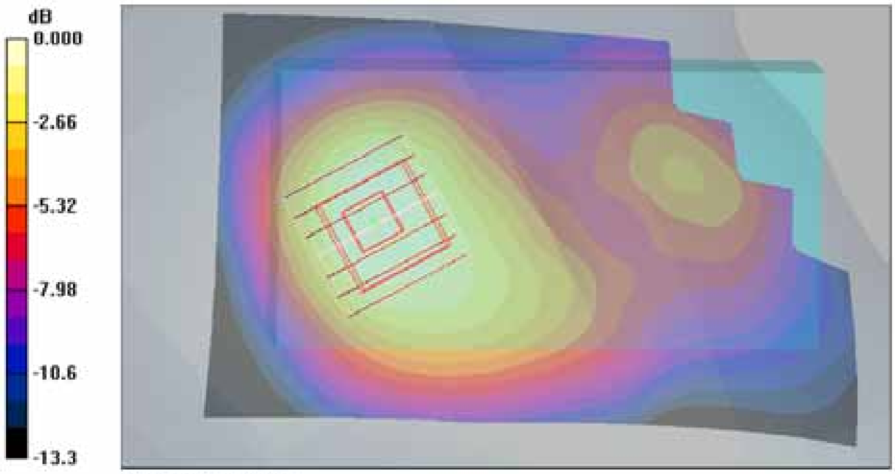
DUT: 721310

Communication System: DCS; Frequency: 1747.6 MHz;Duty Cycle: 1:8.3
Medium: HSL_1800 Medium parameters used: f = 1748 MHz; σ = 1.39 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Ambient Temperature : 22.5 ℃; Liquid Temperature : 21.5 ℃

DASY4 Configuration:
- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 2006/9/19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2006/11/21
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Ch699/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.399 mW/g

Ch699/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.2 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 0.445 W/kg
SAR(1 g) = 0.343 mW/g; SAR(10 g) = 0.230 mW/g
Maximum value of SAR (measured) = 0.367 mW/g



0 dB = 0.367mW/g

Appendix C – Calibration Data

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

SWISS CALIBRATION

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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **D900V2-190_Jul05**

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 190
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	July 18, 2005
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ET3DV6	SN 1507	26-Oct-04 (SPEAG, No. ET3-1507_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-03)	In house check: Oct-05
RF generator R&S SML-03	100698	27-Mar-02 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05

	Name	Function	Signature
Calibrated by:	Judith Müller	Laboratory Technician	J. Müller
Approved by:	Katja Pokovic	Technical Manager	Katja

Issued: July 20, 2005

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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **D1800V2_2d076_Jul05**

CALIBRATION CERTIFICATE

Object	D1800V2 - SN: 2d076
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	July 20, 2005
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ET3DV6	SN 1507	26-Oct-04 (SPEAG, No. ET3-1507_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-03)	In house check: Oct-05
RF generator R&S SML-03	100698	27-Mar-02 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05

	Name	Function	Signature
Calibrated by:	Judith Müller	Laboratory Technician	J. Müller
Approved by:	Katja Pokovic	Technical Manager	K. Pokovic

Issued: July 20, 2005

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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **ET3-1788_Sep06**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1788
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	September 19, 2006
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

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

Issued: September 19, 2006

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Certificate No: ET3-1788_Sep06 Page 1 of 9

Calibration Laboratory of
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Accreditation No.: **SCS 108**

Client **Sporton (Auden)**

Certificate No: **DAE3-577_Nov06**

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 577
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 21, 2006
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	13-Oct-06 (Elcal AG, No: 5492)	Oct-07
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-06 (Elcal AG, No: 5478)	Oct-07
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1002	15-Jun-06 (SPEAG, in house check)	In house check Jun-07

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: November 21, 2006

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Certificate No: DAE3-577_Nov06 Page 1 of 5