SAR TEST REPORT

REPORT NO.: SA991202C03 R2

MODEL NO.: F-06C

RECEIVED: Dec. 02, 2010

TESTED: Dec. 09 ~ Dec. 13, 2010

ISSUED: Feb. 01, 2011

APPLICANT: FUJITSU LIMITED

ADDRESS: 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki 211-8588, Japan

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Testing Laboratory
2021

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	Dec. 21, 2010
SA991202C03 R1	Change product name	Jan. 27, 2011
SA991202C03 R2	Update description in item 3.1	Feb. 01, 2011

1. CERTIFICATION

PRODUCT: Data Modem
MODEL NO.: F-06C
BRAND: FOMA
APPLICANT: FUJITSU LIMITED
TESTED: Dec. 09 ~ Dec. 13, 2010
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 2 (Section 2.1093)**
FCC OET Bulletin 65, Supplement C (01-01)
RSS-102

The above equipment (model: F-06C) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Andrea Hsia / Specialist , **DATE:** Feb. 01, 2011

APPROVED BY : Gary Chang / Assistant Manager , **DATE:** Feb. 01, 2011

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>EUT</td><td colspan="4">Data Modem</td></tr>
<tr><td>MODEL NO.</td><td colspan="4">F-06C</td></tr>
<tr><td>POWER SUPPLY</td><td colspan="4">3.3Vdc (host equipment)</td></tr>
<tr><td>MODULATION TYPE</td><td colspan="4">For WCDMA 850: WCDMA (Band 5) / HSDPA
For GPRS 1900: GMSK</td></tr>
<tr><td>FREQUENCY RANGE</td><td colspan="4">824MHz ~ 849MHz ; 1850MHz ~ 1910MHz</td></tr>
<tr><td rowspan="8">CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER</td><td>CH</td><td>FREQ.</td><td>WCDMA 850</td><td>HSDPA 850</td></tr>
<tr><td>4132</td><td>826.4MHz</td><td>23.71dBm</td><td>23.41dBm</td></tr>
<tr><td>4182</td><td>836.4MHz</td><td>23.89dBm</td><td>23.56dBm</td></tr>
<tr><td>4233</td><td>846.6MHz</td><td>23.18dBm</td><td>22.86dBm</td></tr>
<tr><td>CH</td><td>FREQ.</td><td colspan="2">GPRS 1900</td></tr>
<tr><td>512</td><td>1850.2MHz</td><td colspan="2">29.68dBm</td></tr>
<tr><td>661</td><td>1880.0MHz</td><td colspan="2">28.97dBm</td></tr>
<tr><td>810</td><td>1909.8MHz</td><td colspan="2">28.96dBm</td></tr>
<tr><td>MAX. AVERAGE SAR (1g)</td><td colspan="4">WCDMA 850 band: 1.17W/kg
GPRS1900 band: 0.361W/kg</td></tr>
<tr><td>ANTENNA GAIN</td><td colspan="4">For WCDMA 850: λ/4 Monopole antenna with 0dBi gain
For GPRS 1900: λ/4 Monopole antenna with 1dBi gain</td></tr>
<tr><td>DATA CABLE</td><td colspan="4">NA</td></tr>
<tr><td>I/O PORTS</td><td colspan="4">Refer to user’s manual</td></tr>
<tr><td>ACCESSORY DEVICES</td><td colspan="4">NA</td></tr>
</table>

NOTE:

1. IMEI Code: 352150040002153.
2. Hardware Version: V2.1
3. Software Version: R02.2
4. KDB Number136702
5. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC Part 2 (2.1093)

FCC OET Bulletin 65, Supplement C (01- 01)

RSS-102

IEEE 1528-2003

All test items have been performed and recorded as per the above standards.

2.3 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY4 **(Software 4.7 Build 80)** consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4 software defined. The DASY4 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV4 ISOTROPIC E-FIELD PROBE

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%.

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference "APPENDIX D" for the Calibration Certification Report.
2. For frequencies above 800MHz, calibration in a rectangular wave-guide is used, because wave-guide size is manageable.
3. For frequencies below 800MHz, temperature transfer calibration is used because the wave-guide size becomes relatively large.

TWIN SAM V4.0

CONSTRUCTION	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, EN 62209-1 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
SHELL THICKNESS	2 ± 0.2mm
FILLING VOLUME	Approx. 25liters
DIMENSIONS	Height: 810mm; Length: 1000mm; Width: 500mm

SYSTEM VALIDATION KITS:

CONSTRUCTION	Symmetrical dipole with l/4 balun enables measurement of feedpoint impedance with NWA matched for use near flat phantoms filled with brain simulating solutions. Includes distance holder and tripod adaptor
CALIBRATION	Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions
FREQUENCY	835, 1900MHz
RETURN LOSS	> 20dB at specified validation position
POWER CAPABILITY	> 100W (f < 1GHz); > 40W (f > 1GHz)
OPTIONS	Dipoles for other frequencies or solutions and other calibration conditions upon request

DEVICE HOLDER FOR SAM TWIN PHANTOM

CONSTRUCTION

The device holder for the mobile phone device 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 (ERP). Thus the device needs no repositioning when changing the angles. The holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε =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. The device holder for the portable device makes up of the polyethylene foam. The dielectric parameters of material close to the dielectric parameters of the air.

DATA ACQUISITION ELECTRONICS

CONSTRUCTION

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplex, 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 is 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 DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

2.4 TEST EQUIPMENT

FOR SAR MEASURENENT

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Flat Phantom ELI4.0	SPEAG	QD OVA 001 B	1039	NA	NA
2	Signal Generator	Agilent	E8257C	MY43320668	Feb. 23, 2010	Feb. 22, 2011
3	E-Field Probe	S & P	EX3DV4	3590	Mar. 25, 2010	Mar. 24, 2011
4	DAE	S & P	DAE	861	Jan. 22, 2010	Jan. 21, 2011
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D835V2	4d021	Apr. 29, 2010	Apr. 28, 2011
7	Validation Dipole	S & P	D1900V2	5d036	Feb. 23, 2010	Feb. 22, 2011

NOTE: Before starting, all test equipment shall be warmed up for 30min.

FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E5071C	MY46104190	Apr. 06, 2010	Apr. 05, 2011
2	Dielectric Probe	Agilent	85070D	US01440176	NA	NA

NOTE:

1. Before starting, all test equipment shall be warmed up for 30min.
2. The tolerance (k=1) specified by Agilent for general dielectric measurements, deriving from inaccuracies in the calibration data, analyzer drift, and random errors, are usually ±2.5% and ±5% for measured permittivity and conductivity, respectively. However, the tolerances for the conductivity is smaller for material with large loss tangents, i.e., less than ±2.5% (k=1). It can be substantially smaller if more accurate methods are applied

2.5 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY4 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the micro-volt 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

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

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

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:

$$\text{E-fieldprobes: } E_i = \sqrt{\frac{V_1}{Norm_i \cdot ConvF}}$$

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

V_i	=compensated signal of channel I	(i = x, y, z)
$Norm_i$	=sensor sensitivity of channel i µV/(V/m)2 for E-field Probes	(i = x, y, z)
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.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

SAR	= local specific absorption rate in mW/g
E_{tot}	= total field strength in V/m
σ	= conductivity in [mho/m] or [Siemens/m]
ρ	= equivalent tissue density in g/cm3

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 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:

1. The extraction of the measured data (grid and values) from the Zoom Scan
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7 x 7 x 7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30 x 30 x 30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (42875 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

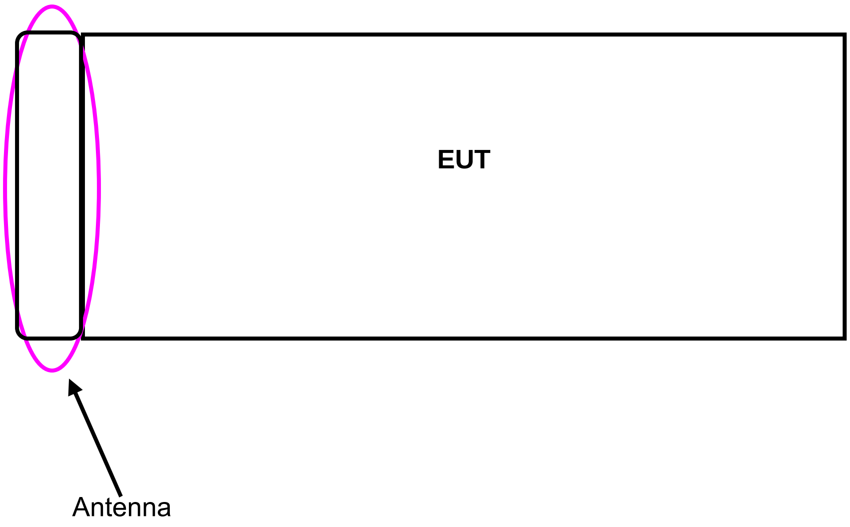
2.6 DESCRIPTION OF SUPPORT UNITS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.
1	Universal Radio Communication Tester	R&S	CMU200	117260
2	NOTEBOOK	HP	nx6215	CND5390CMP

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

3. DESCRIPTION OF ANTENNA LOCATION



4. RECIPES FOR TISSUE SIMULATING LIQUIDS

For the measurement of the field distribution inside the SAM phantom, the phantom must be filled with 25 litters of tissue simulation liquid.

The following are some common ingredients：

- **WATER-** Deionized water (pure H20), resistivity _16 M - 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 (75-125mPa.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-** Diethylenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS # 112-34-5 - to reduce relative permittivity

THE RECIPES FOR 835MHz SIMULATING LIQUID TABLE

INGREDIENT	MUSCLE SIMULATING LIQUID 835MHz (MSL-835)
Water	50.07%
Cellulose	NA
Salt	0.94%
Preventtol D-7	0.09%
Sugar	48.2%
Dielectric Parameters at 22℃	f= 835MHz ε= 55.0 ± 5% σ= 1.05 ± 5% S/m

THE RECIPES FOR 1900MHz SIMULATING LIQUID TABLE

INGREDIENT	MUSCLE SIMULATING LIQUID 1900MHz (MSL-1900)
Water	70.16%
DGMBE	29.44%
Salt	00.39%
Dielectric Parameters at 22℃	f= 1900MHz ε= 53.3 ± 5% σ= 1.52 ± 5% S/m

Testing the liquids using the Agilent Network Analyzer E8358A and Agilent Dielectric Probe Kit 85070D.The testing procedure is following as

1. Turn Network Analyzer on and allow at least 30min. warm up.
2. Mount dielectric probe kit so that interconnecting cable to Network Analyzer will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature (±1°).
4. Set water temperature in Agilent-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with >8mm thickness ε'=10.0, ε''=0.0). If measured parameters do not fit within tolerance, repeat calibration (±0.2 for ε': ±0.1 for ε'').
7. Conductivity can be calculated from ε'' by $\sigma = \omega\ \varepsilon_0\ \varepsilon'' = \varepsilon''\ f\ [GHz] / 18$.
8. Measure liquid shortly after calibration. Repeat calibration every hour.
9. Stir the liquid to be measured. Take a sample (~ 50ml) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in DASY4 for the frequencies necessary for the measurements (‘Setup Config’, select medium (e.g. Brain 900MHz) and press ‘Option’-button.
14. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900MHz).

FOR SIMULATING LIQUID

LIQUID TYPE		MSL-835			
SIMULATING LIQUID TEMP.		21.2			
TEST DATE		Dec. 13, 2010			
TESTED BY		Van Lin			
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**	**LIMIT(%)**
826.4	Permitivity (ε)	55.23	54.42	-1.47	±5
835.0		55.20	54.4	-1.45	
836.4		55.20	54.39	-1.47	
846.6		55.16	54.21	-1.72	
826.4	Conductivity (σ) S/m	0.97	0.99	2.06	
835.0		0.97	0.99	2.06	
836.4		0.97	0.99	2.06	
846.6		0.98	1.00	2.04	

LIQUID TYPE		MSL-1900			
SIMULATING LIQUID TEMP.		21.7			
TEST DATE		Dec. 09, 2010			
TESTED BY		Van Lin			
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**	**LIMIT(%)**
1850.2	Permitivity (ε)	53.30	53.58	0.53	±5
1880.0		53.30	53.50	0.38	
1900.0		53.30	53.42	0.23	
1909.8		53.30	53.37	0.13	
1850.2	Conductivity (σ) S/m	1.52	1.48	-2.63	
1880.0		1.52	1.52	0.00	
1900.0		1.52	1.55	1.97	
1909.8		1.52	1.56	2.63	

5. SYSTEM VALIDATION

The system validation was performed in the flat phantom with equipment listed in the following table. Since the SAR value is calculated from the measured electric field, dielectric constant and conductivity of the body tissue and the SAR is proportional to the square of the electric field. So, the SAR value will be also proportional to the RF power input to the system validation dipole under the same test environment. In our system validation test, 250mW RF input power was used.

5.1 TEST PROCEDURE

Before the system performance check, we need only to tell the system which components (probe, medium, and device) are used for the system performance check; the system will take care of all parameters. The dipole must be placed beneath the flat section of the SAM Twin Phantom with the correct distance holder in place. The distance holder should touch the phantom surface with a light pressure at the reference marking (little cross) and be oriented parallel to the long side of the phantom. Accurate positioning is not necessary, since the system will search for the peak SAR location, except that the dipole arms should be parallel to the surface. The device holder for mobile phones can be left in place but should be rotated away from the dipole.

1. The ”Power Reference Measurement” and ”Power Drift Measurement” jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the amplifier output power. If it is too high (above ±0.1 dB), the system performance check should be repeated; some amplifiers have very high drift during warm-up. A stable amplifier gives drift results in the DASY system below ±0.02dB.

2. The ”Surface Check” job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ±0.1mm). In that case it is better to abort the system performance check and stir the liquid.

3. The ”Area Scan” job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable. If a finer graphic is desired, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result.

4. The ”Zoom Scan” job measures the field in a volume around the peak SAR value assessed in the previous ”Area Scan” job (for more information see the application note on SAR evaluation).

About the validation dipole positioning uncertainty, the constant and low loss dielectric spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom, the error component introduced by the uncertainty of the distance between the liquid (i.e., phantom shell) and the validation dipole in the DASY4 system is less than ±0.1mm.

$$SAR_{tolerance}[\%] = 100 \times \left(\frac{(a+d)^2}{a^2} - 1\right)$$

As the closest distance is 10mm, the resulting tolerance $SAR_{tolerance}[\%]$ is <2%.

5.2 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	**REQUIRED SAR (mW/g)**	**MEASURED SAR (mW/g)**	**DEVIATION (%)**	**SEPARATION DISTANCE**	**TESTED DATE**
MSL 850	2.52 (1g)	2.44	-3.17	15mm	Dec. 13, 2010
MSL 1900	10.30 (1g)	9.96	-3.30	10mm	Dec. 09, 2010
TESTED BY	Van Lin				

NOTE: Please see Appendix for the photo of system validation test.

5.3 SYSTEM VALIDATION UNCERTAINTIES

In the table below, the system validation uncertainty with respect to the analytically assessed SAR value of a dipole source as given in the IEEE 1528 standard is given. This uncertainty is smaller than the expected uncertainty for mobile phone measurements due to the simplified setup and the symmetric field distribution.

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C_i)		Standard Uncertainty (±%)		(v_i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	5.50	Normal	1	1	1	5.50	5.50	∞
Axial Isotropy	0.25	Rectangular	$\sqrt{3}$	0.7	0.7	0.10	0.10	∞
Hemispherical Isotropy	1.30	Rectangular	$\sqrt{3}$	0.7	0.7	0.53	0.53	∞
Boundary effects	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	0.30	Rectangular	$\sqrt{3}$	1	1	0.17	0.17	∞
System Detection Limits	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	9
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	9
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Test sample related								
Sample positioning	1.90	Normal	1	1	1	1.90	1.90	4
Device holder uncertainty	2.80	Normal	1	1	1	2.80	2.80	4
Output power variation-SAR drift measrurement	2.95	Rectangular	$\sqrt{3}$	1	1	1.70	1.70	1
Dipole Related								
Dipole Axis to Liquid Distance	1.60	Rectangular	$\sqrt{3}$	1	1	0.92	0.92	4
Input Power Drift	1.62	Rectangular	$\sqrt{3}$	1	1	0.94	0.94	1
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	$\sqrt{3}$	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	2.63	Normal	1	0.64	0.43	1.68	1.13	9
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	1.72	Normal	1	0.6	0.49	1.03	0.84	9
Combined Standard Uncertainty						**8.64**	**8.36**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**17.29**	**16.72**	

NOTE: About the system validation uncertainty assessment, please reference the section 7.

6. TEST RESULTS

6.1 TEST PROCEDURES

The EUT makes a phone call to the communication simulator station. Establish the simulation communication configuration rather the actual communication. Then the EUT could continuous the transmission mode. Adjust the PCL of the base station could controlled the EUT to transmitted the maximum output power. The base station also could control the transmission channel. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of DASY4 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE 1528 / EN 62209-1, 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

The area scan was performed for the highest spatial SAR location. The zoom scan volume was performed for SAR value averaged over 1g and 10g spatial volumes.

In the zoom scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 3mm and maintained at a constant distance of ±0.5mm during a zoom scan to determine peak SAR locations. The distance is 2mm between the first measurement point and the bottom surface of the phantom. The secondary measurement point to the bottom surface of the phantom is with 7mm separation distance. The cube size is 7 x 7 x 7 points consists of 343 points and the grid space is 5mm.

The measurement time is 0.5s at each point of the zoom scan. The probe boundary effect compensation shall be applied during the SAR test. Because of the tip of the probe to the Phantom surface separated distances are longer than half a tip probe diameter.

In the area scan, the separation distance is 2mm between the each measurement point and the phantom surface. The scan size shall be included the transmission portion of the EUT. The measurement time is the same as the zoom scan. At last the reference power drift shall be less than ±5%.

6.2 DESCRIPTION OF TEST CONDITION

TEST DATE	TISSUE TYPE / FREQ.	TEMPERATURE (°C)		HUMIDITY (%RH)	TESTED BY
		AIMBENT	LIQUID		
Dec. 13, 2010	MSL835	22.5	21.2	63	Van Lin
Dec. 09, 2010	MSL1900	22.7	21.7	59	Van Lin

6.3 MEASURED SAR RESULT

SAR (1g)	
Distance between EUT and phantom is 10mm	
Antenna Degree: 135°	
CHANNEL	**BODY / BOTTOM**
WCDMA 850	
CH 4132: 826.4MHz	1.050
CH 4182: 836.4MHz	1.160
CH 4233: 846.6MHz	0.910
GPRS1900 TS1	
CH 512: 1850.2MHz	**0.361**
CH 661: 1880.0MHz	0.321
CH 810: 1909.8MHz	0.332

SAR (1g)	
Distance between EUT and phantom is 10mm	
Antenna Degree: 0°	
CHANNEL	**BODY / BOTTOM**
WCDMA 850	
CH 4132: 826.4MHz	0.762
CH 4182: 836.4MHz	**1.170**
CH 4233: 846.6MHz	0.963
GPRS1900 TS1	
CH 512: 1850.2MHz	0.301
CH 661: 1880.0MHz	0.256
CH 810: 1909.8MHz	0.255

NOTE:
1. In this testing, the limit for General Population Spatial Peak averaged over 1g, 1.6 W/kg, is applied.
2. Please see the Appendix A for the data.
3. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.
4. SAR for HSDPA mode is not required since the maximum average output of each RF channel with HSDPA active is less than 1/4 dB higher than that measured without HSDPA using 12.2kbps RMC and maximum SAR for 12.2kbps RMC is less than 75% of the SAR limit.

6.4 SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(GENERAL POPULATION / UNCONTROLLED EXPOSURE ENVIRONMENT)	**(OCCUPATIONAL / CONTROLLED EXPOSURE ENVIRONMENT)**
Spatial Peak (averaged over 1 g)	**1.6**	8.0

NOTE: This limits accord to 47 CFR 2.1093 – Safety Limit.

7. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050
Web Site: www.adt.com.tw

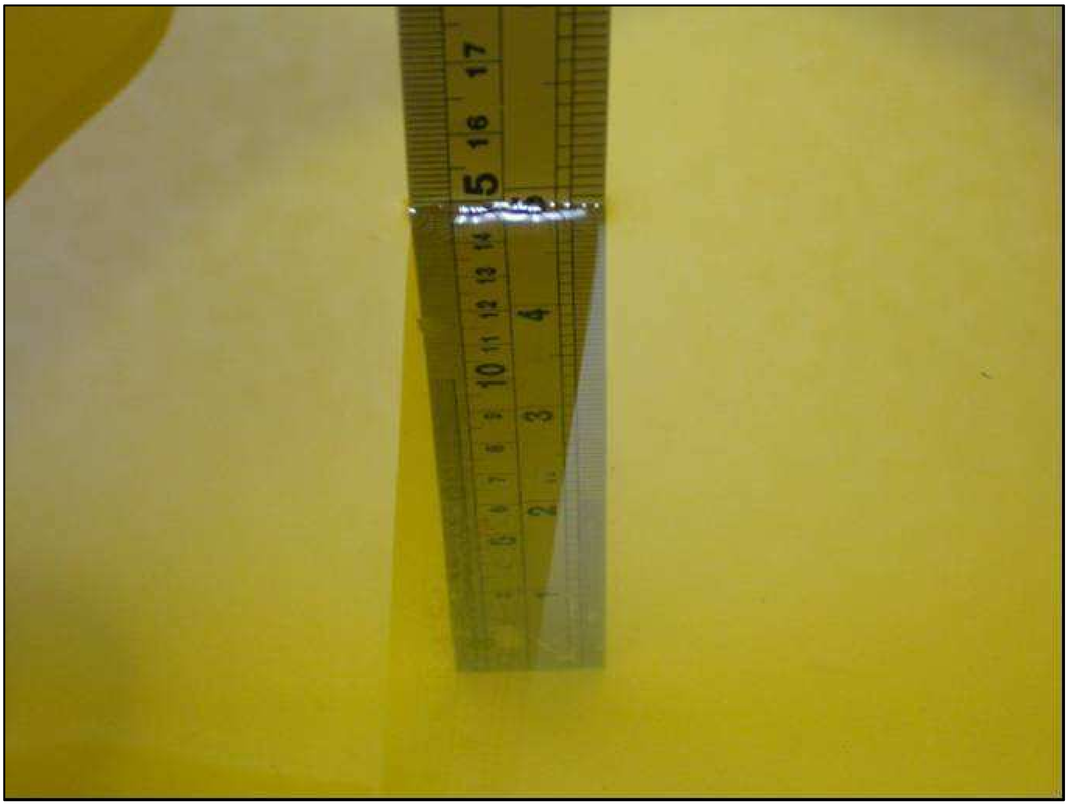
The address and road map of all our labs can be found in our web site also.

---END---

APPENDIX A: TEST DATA

Liquid Level Photo

Tissue 835MHz D=150mm



Tissue 1900MHz D=150mm

Date/Time: 2010/12/13 03:31:37

Test Laboratory: Bureau Veritas ADT

M01-WCDMA850-Ch4132 / Antenna Degree: 135°

DUT: Express Card ; Type: F-06C

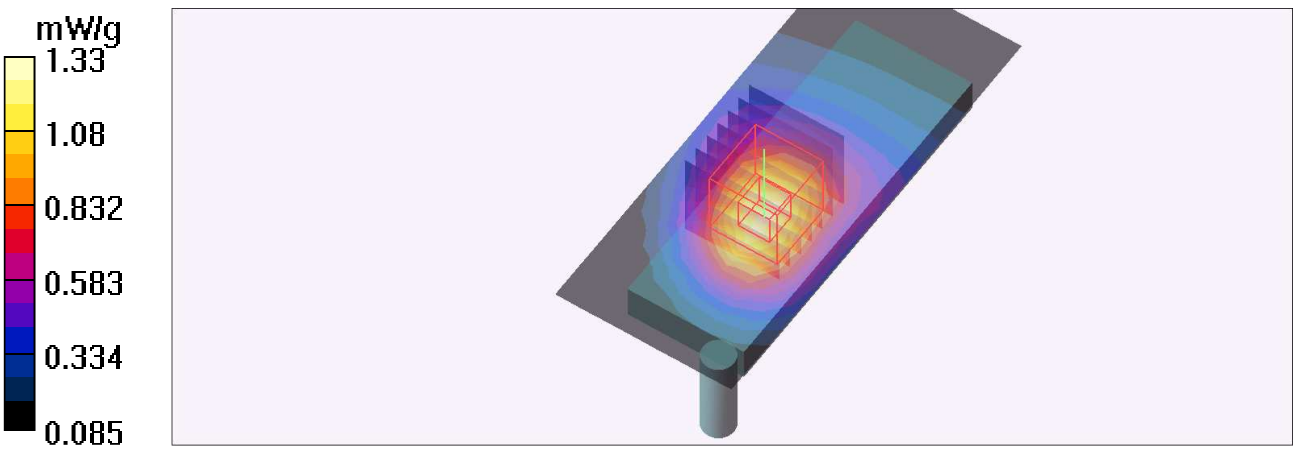
Communication System: WCDMA850 ; Frequency: 826.4 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL835 Medium parameters used : f = 826.4 MHz; σ = 0.99 mho/m; εr = 54.42; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 4132/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 1.30 mW/g

Low Channel 4132/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.6 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.669 mW/g
Maximum value of SAR (measured) = 1.33 mW/g



Date/Time: 2010/12/13 01:35:32

Test Laboratory: Bureau Veritas ADT

M01-WCDMA850-Ch4182 / Antenna Degree: 135°

DUT: Express Card ; Type: F-06C

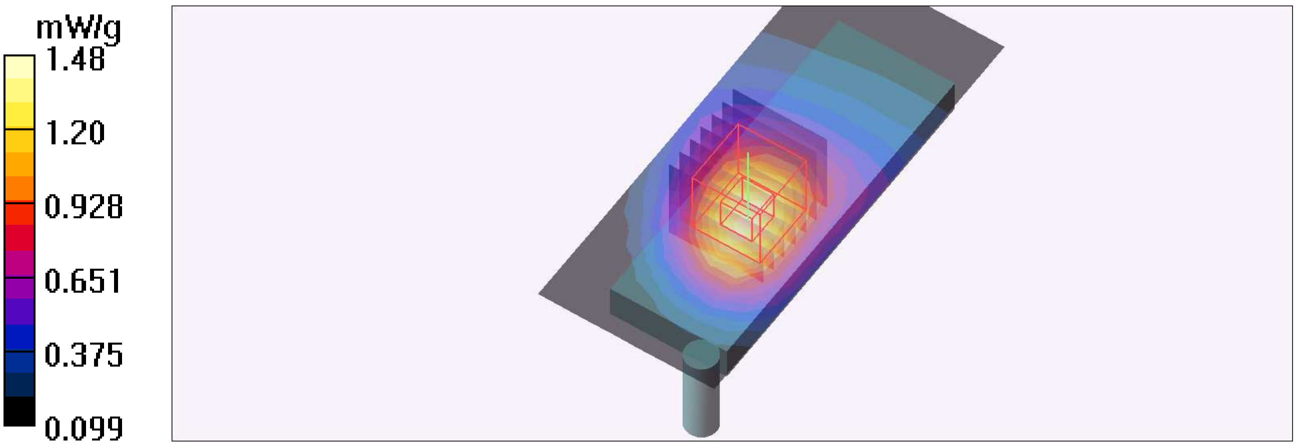
Communication System: WCDMA850 ; Frequency: 836.4 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL835 Medium parameters used: f = 836.4 MHz; σ = 0.99 mho/m; εr = 54.39; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4182/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 1.46 mW/g

Mid Channel 4182/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.3 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 1.76 W/kg
SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.746 mW/g
Maximum value of SAR (measured) = 1.48 mW/g



Date/Time: 2010/12/13 03:59:04

Test Laboratory: Bureau Veritas ADT

M01-WCDMA850-Ch4233 / Antenna Degree: 135°

DUT: Express Card ; Type: F-06C

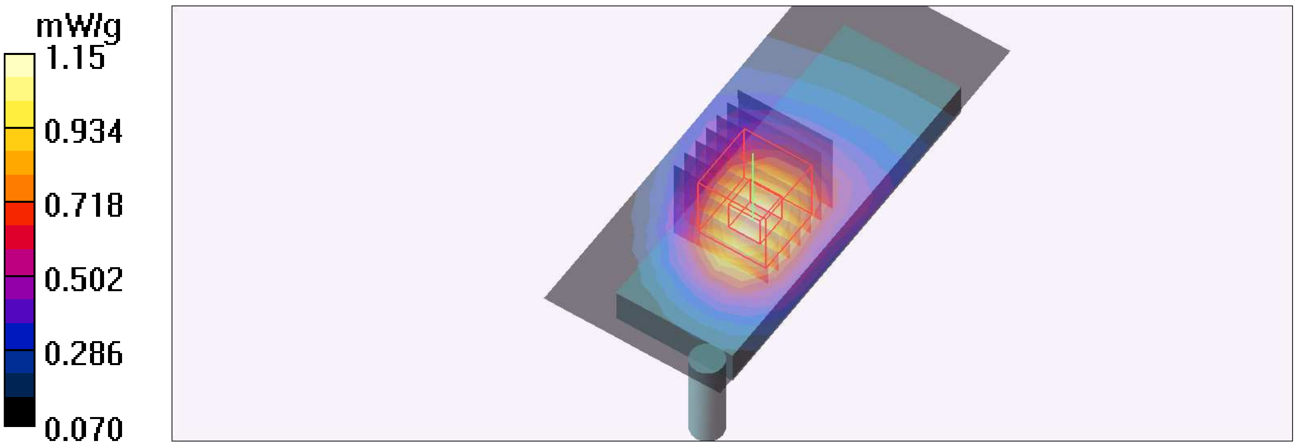
Communication System: WCDMA850 ; Frequency: 846.6 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL835 Medium parameters used : f = 846.6 MHz; σ = 1 mho/m; εr = 54.21; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 4233/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 1.14 mW/g

High Channel 4233/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.0 V/m; Power Drift = 0.066 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.910 mW/g; SAR(10 g) = 0.580 mW/g
Maximum value of SAR (measured) = 1.15 mW/g



Date/Time: 2010/12/13 04:27:49

Test Laboratory: Bureau Veritas ADT

M02-WCDMA850-Ch4132 / Antenna Degree: 0°

DUT: Express Card ; Type: F-06C

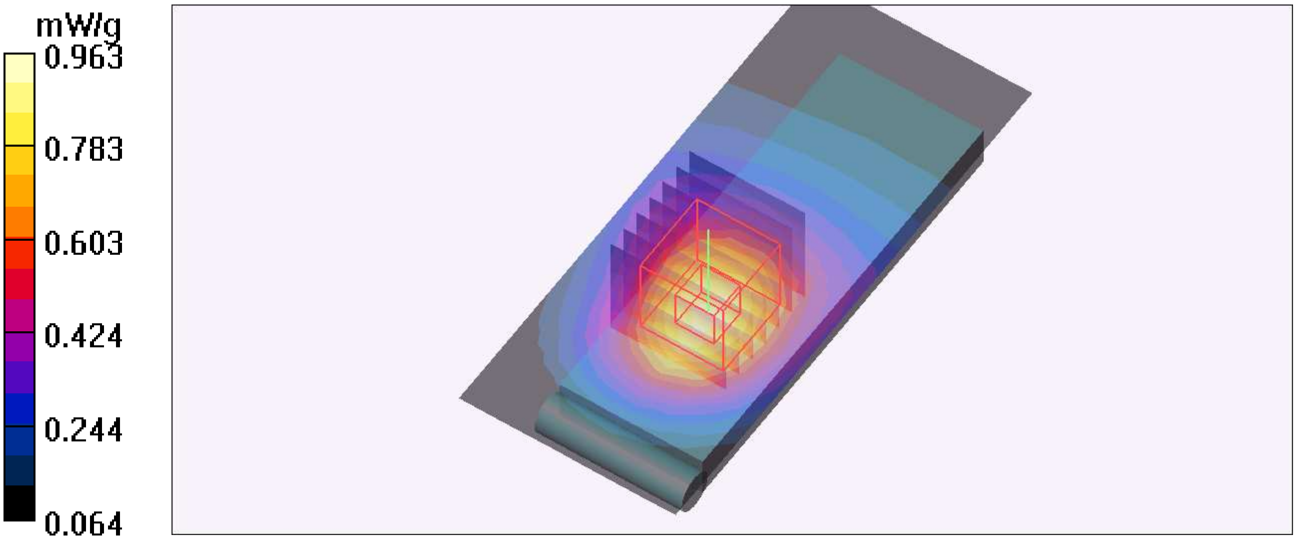
Communication System: WCDMA850 ; Frequency: 826.4 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL835 Medium parameters used : f = 826.4 MHz; σ = 0.99 mho/m; εr = 54.42; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 4132/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.973 mW/g

Low Channel 4132/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.5 V/m; Power Drift = 0.065 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.762 mW/g; SAR(10 g) = 0.493 mW/g
Maximum value of SAR (measured) = 0.963 mW/g



Date/Time: 2010/12/13 02:04:13

Test Laboratory: Bureau Veritas ADT

M02-WCDMA850-Ch4182 / Antenna Degree: 0°

DUT: Express Card ; Type: F-06C

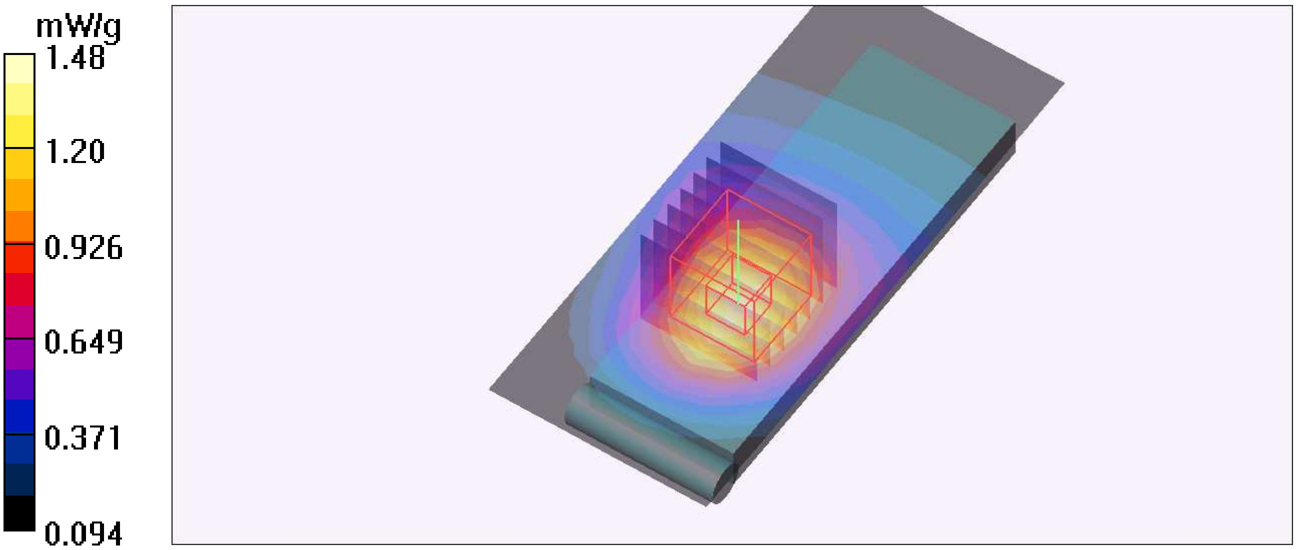
Communication System: WCDMA850 ; Frequency: 836.4 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL835 Medium parameters used: f = 836.4 MHz; σ = 0.99 mho/m; εr = 54.39; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

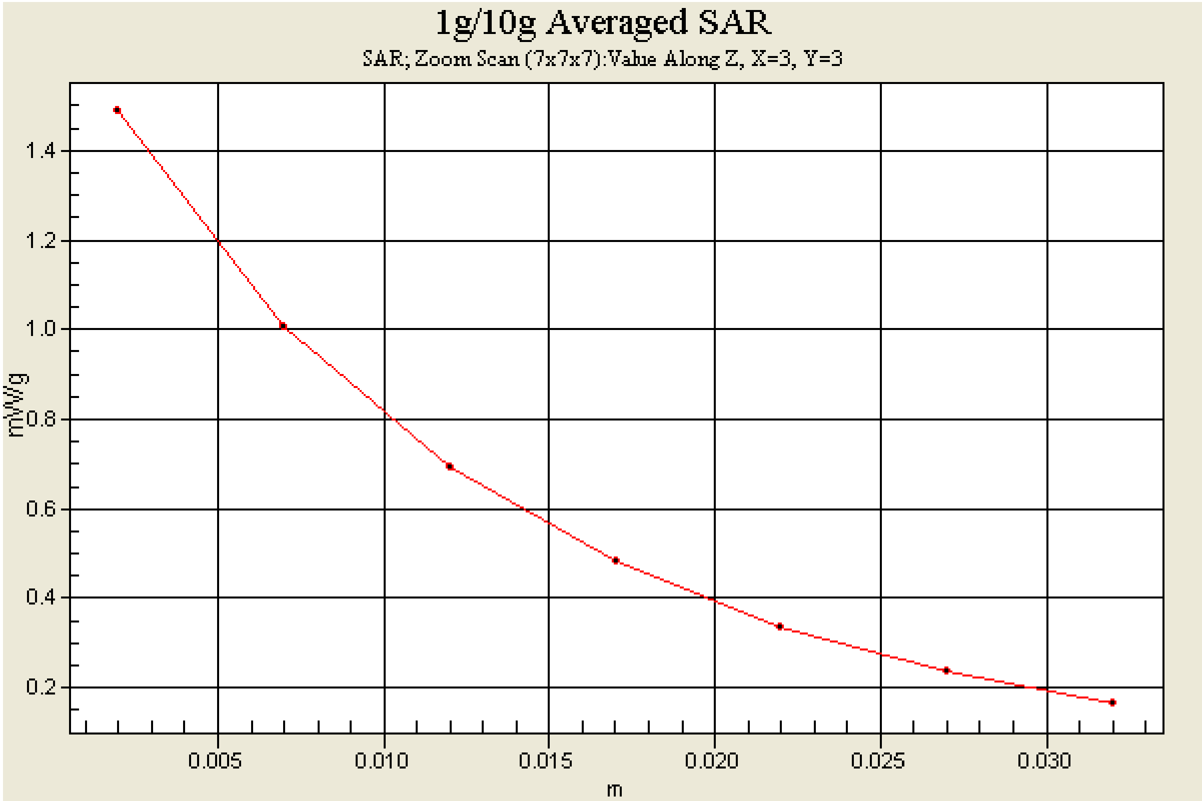
DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4182/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 1.47 mW/g

Mid Channel 4182/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.5 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 1.75 W/kg
SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.756 mW/g




1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.005
0.010
0.015
0.020
0.025
0.030
m

Date/Time: 2010/12/13 04:54:48

Test Laboratory: Bureau Veritas ADT

M02-WCDMA850-Ch4233 / Antenna Degree: 0°

DUT: Express Card ; Type: F-06C

Communication System: WCDMA850 ; Frequency: 846.6 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL835 Medium parameters used : f = 846.6 MHz; σ = 1 mho/m; εr = 54.21; ρ = 1000 kg/m^3

Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 4233/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm

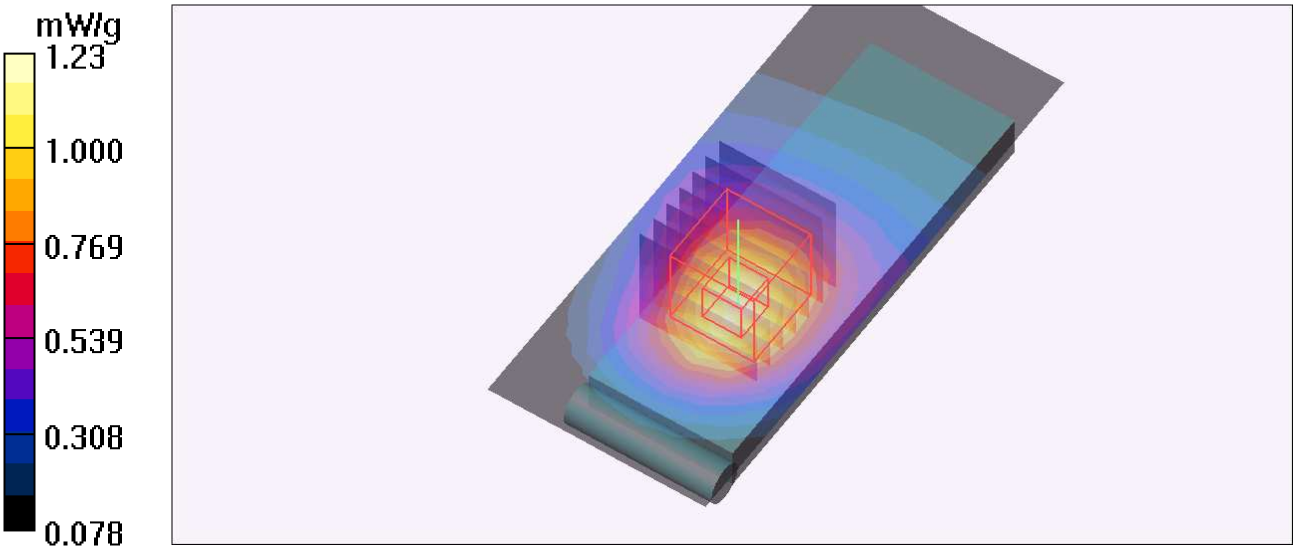
Maximum value of SAR (measured) = 1.23 mW/g

High Channel 4233/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.9 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 1.45 W/kg

SAR(1 g) = 0.963 mW/g; SAR(10 g) = 0.619 mW/g



Date/Time: 2010/12/9 03:31:30

Test Laboratory: Bureau Veritas ADT

M03-GPRS1900 TS1-Ch512 / Antenna Degree: 135°

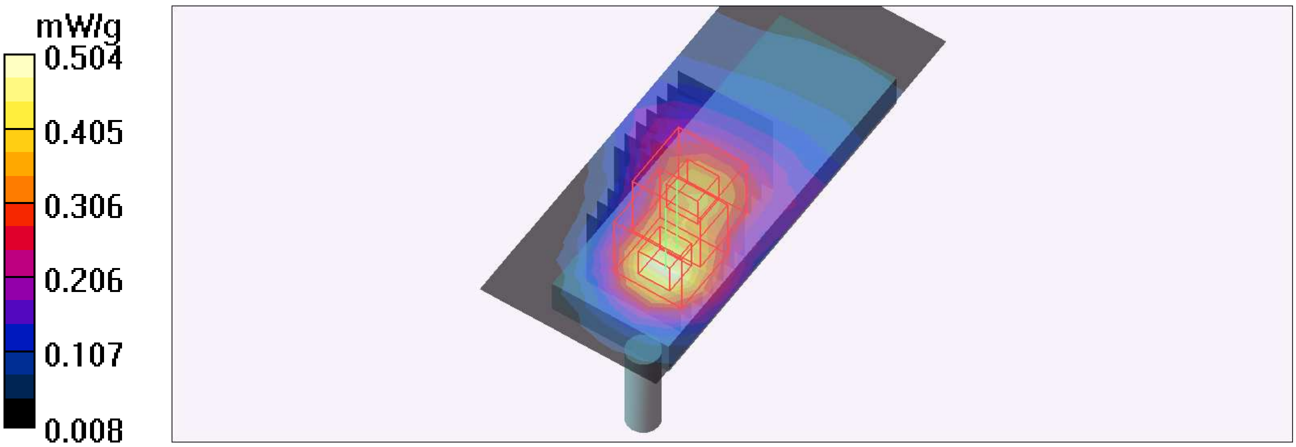
DUT: Express Card ; Type: F-06C

Communication System: GPRS1900 ; Frequency: 1850.2 MHz ; Duty Cycle: 1:8.3 ; Modulation type: GMSK / UL 1 time slot
Medium: MSL1900 Medium parameters used: f = 1850.2 MHz; σ = 1.48 mho/m; εr = 53.58; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA;   Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 512/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.489 mW/g
Low Channel 512/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.9 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 0.642 W/kg
SAR(1 g) = 0.361 mW/g; SAR(10 g) = 0.200 mW/g
Maximum value of SAR (measured) = 0.504 mW/g
Low Channel 512/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.9 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 0.533 W/kg
SAR(1 g) = 0.300 mW/g; SAR(10 g) = 0.186 mW/g
Maximum value of SAR (measured) = 0.434 mW/g



Date/Time: 2010/12/9 04:10:27

Test Laboratory: Bureau Veritas ADT

M03-GPRS1900 TS1-Ch661 / Antenna Degree: 135°

DUT: Express Card ; Type: F-06C

Communication System: GPRS1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3 ; Modulation type: GMSK / UL 1 time slot

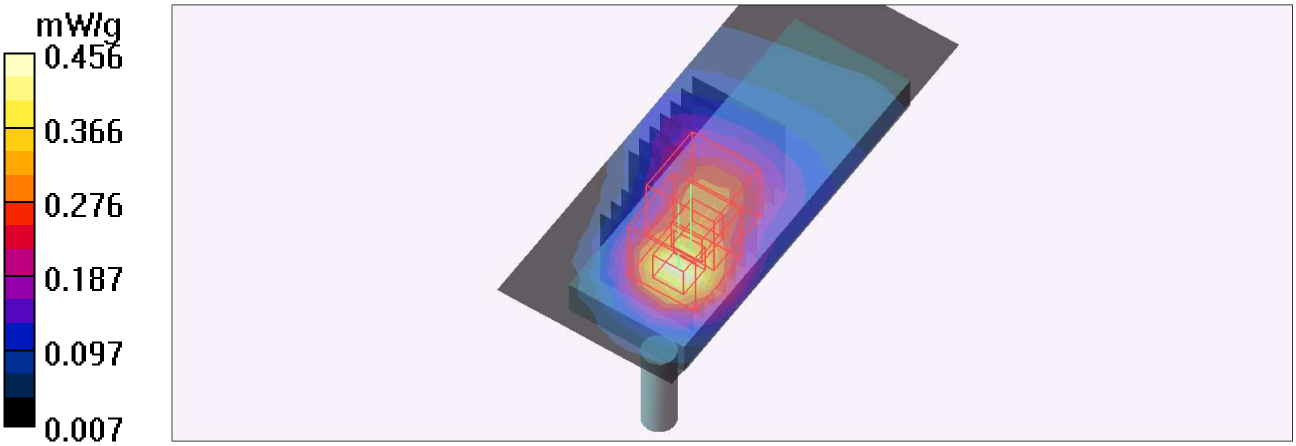
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; εr = 53.5; ρ = 1000 kg/m^3

Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 661/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.436 mW/g
Mid Channel 661/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.9 V/m; Power Drift = 0.073 dB
Peak SAR (extrapolated) = 0.582 W/kg
SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.174 mW/g
Maximum value of SAR (measured) = 0.456 mW/g
Mid Channel 661/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.9 V/m; Power Drift = 0.073 dB
Peak SAR (extrapolated) = 0.482 W/kg
SAR(1 g) = 0.253 mW/g; SAR(10 g) = 0.151 mW/g
Maximum value of SAR (measured) = 0.388 mW/g



Date/Time: 2010/12/9 04:48:12

Test Laboratory: Bureau Veritas ADT

M03-GPRS1900 TS1-Ch810 / Antenna Degree: 135°

DUT: Express Card ; Type: F-06C

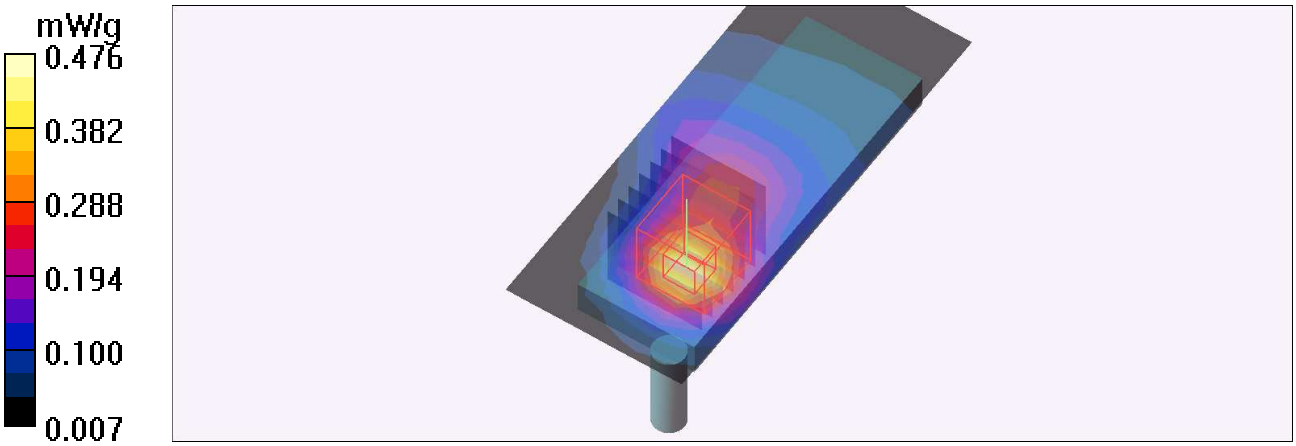
Communication System: GPRS1900 ; Frequency: 1909.8 MHz ; Duty Cycle: 1:8.3 ; Modulation type: GMSK / UL 1 time slot
Medium: MSL1900 Medium parameters used: f = 1909.8 MHz; σ = 1.56 mho/m; εr = 53.37; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 810/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.448 mW/g

High Channel 810/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.2 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 0.611 W/kg
SAR(1 g) = 0.332 mW/g; SAR(10 g) = 0.177 mW/g
Maximum value of SAR (measured) = 0.476 mW/g



Date/Time: 2010/12/9 05:22:01

Test Laboratory: Bureau Veritas ADT

M04-GPRS1900 TS1-Ch512 / Antenna Degree: 0°

DUT: Express Card ; Type: F-06C

Communication System: GPRS1900 ; Frequency: 1850.2 MHz ; Duty Cycle: 1:8.3 ; Modulation type: GMSK / UL 1 time slot

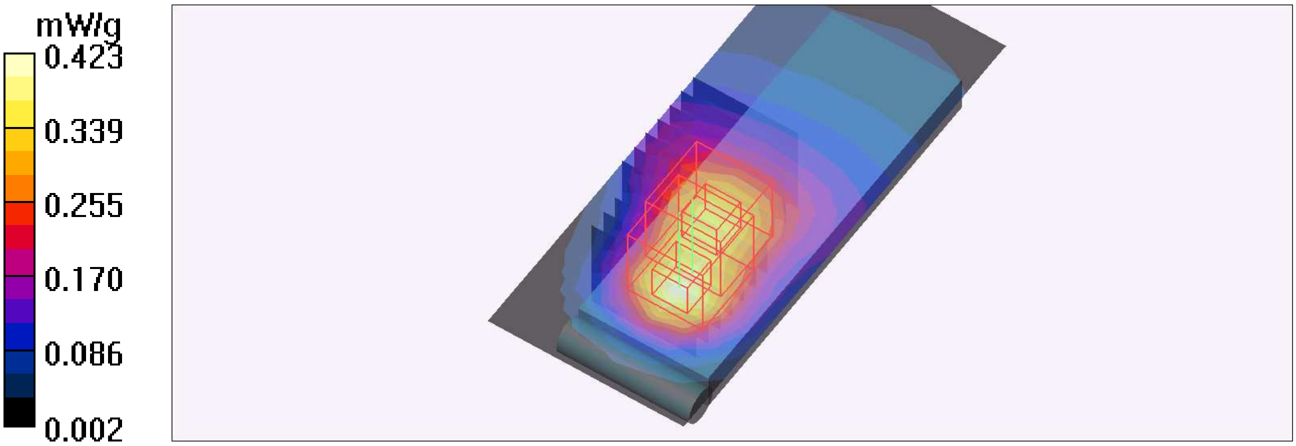
Medium: MSL1900 Medium parameters used: f = 1850.2 MHz; σ = 1.48 mho/m; εr = 53.58; ρ = 1000 kg/m^3

Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA;   Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 512/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.423 mW/g
Low Channel 512/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.5 V/m; Power Drift = 0.020 dB
Peak SAR (extrapolated) = 0.542 W/kg
SAR(1 g) = 0.301 mW/g; SAR(10 g) = 0.177 mW/g
Maximum value of SAR (measured) = 0.420 mW/g
Low Channel 512/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.5 V/m; Power Drift = 0.020 dB
Peak SAR (extrapolated) = 0.474 W/kg
SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.173 mW/g
Maximum value of SAR (measured) = 0.385 mW/g



Date/Time: 2010/12/9 06:47:38

Test Laboratory: Bureau Veritas ADT

M04-GPRS1900 TS1-Ch698 / Antenna Degree: 0°

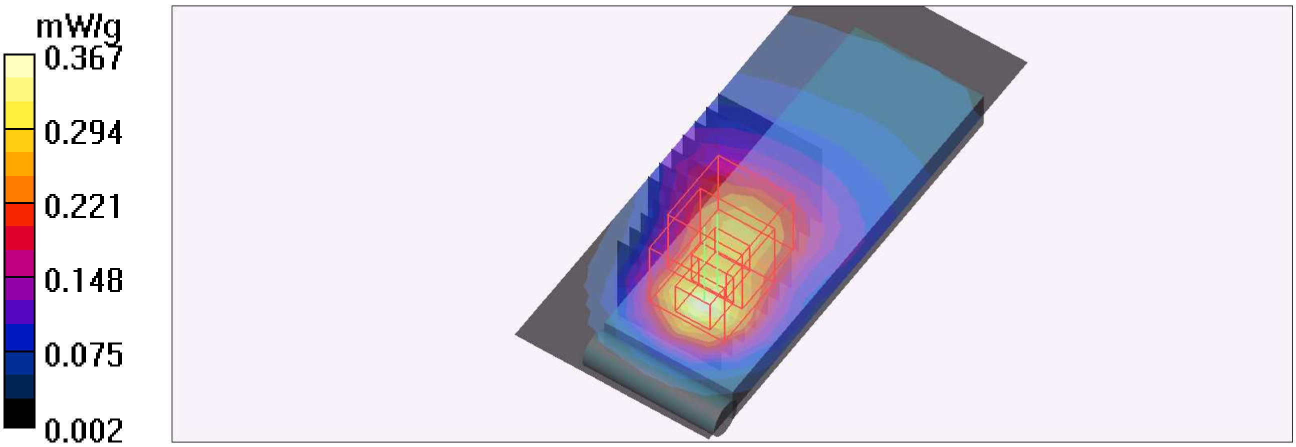
DUT: Express Card ; Type: F-06C

Communication System: GPRS1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3 ; Modulation type: GMSK / UL 1 time slot
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; εr = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA;   Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 661/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.367 mW/g
Mid Channel 661/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.75 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 0.463 W/kg
SAR(1 g) = 0.256 mW/g; SAR(10 g) = 0.144 mW/g
Maximum value of SAR (measured) = 0.362 mW/g
Mid Channel 661/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.75 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 0.401 W/kg
SAR(1 g) = 0.227 mW/g; SAR(10 g) = 0.140 mW/g
Maximum value of SAR (measured) = 0.325 mW/g



Date/Time: 2010/12/9 07:25:31

Test Laboratory: Bureau Veritas ADT

M04-GPRS1900 TS1-Ch810 / Antenna Degree: 0°

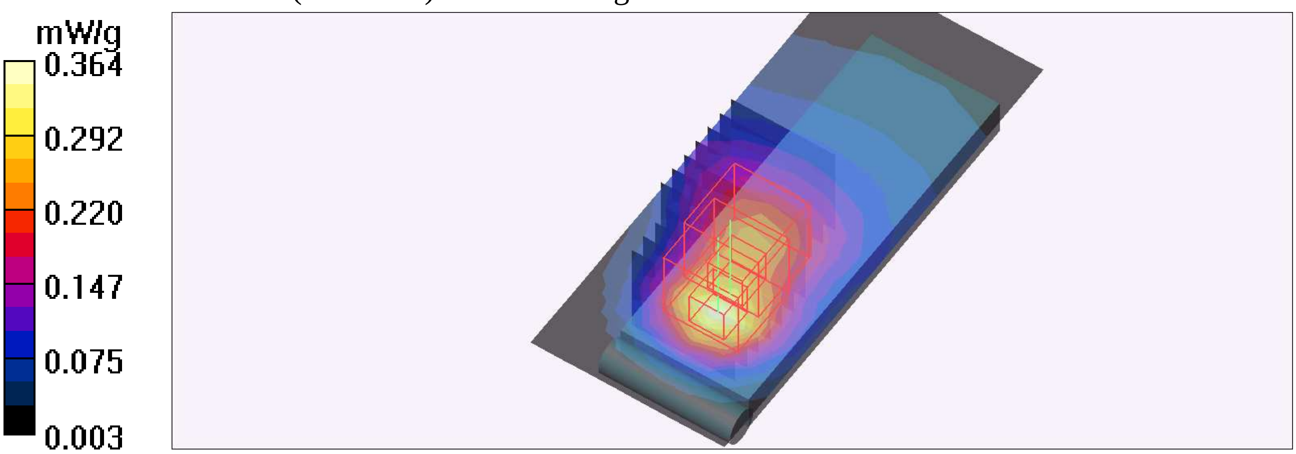
DUT: Express Card ; Type: F-06C

Communication System: GPRS1900 ; Frequency: 1909.8 MHz ; Duty Cycle: 1:8.3 ; Modulation type: GMSK / UL 1 time slot
Medium: MSL1900 Medium parameters used: f = 1909.8 MHz; σ = 1.56 mho/m; εr = 53.37; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 810/Area Scan (8x18x1): Measurement grid: dx=8mm, dy=8mm
Maximum value of SAR (measured) = 0.364 mW/g
High Channel 810/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.55 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 0.474 W/kg
SAR(1 g) = 0.255 mW/g; SAR(10 g) = 0.139 mW/g
High Channel 810/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.55 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 0.392 W/kg
SAR(1 g) = 0.216 mW/g; SAR(10 g) = 0.129 mW/g
Maximum value of SAR (measured) = 0.318 mW/g



Date/Time: 2010/12/13 00:58:30

Test Laboratory: Bureau Veritas ADT

SystemPerformanceCheck-D835V2-MSL835 MHz

DUT: Dipole 835 MHz ; Type: D835V2 ; Serial: D835V2 - SN:4d021 ; Test Frequency: 835 MHz

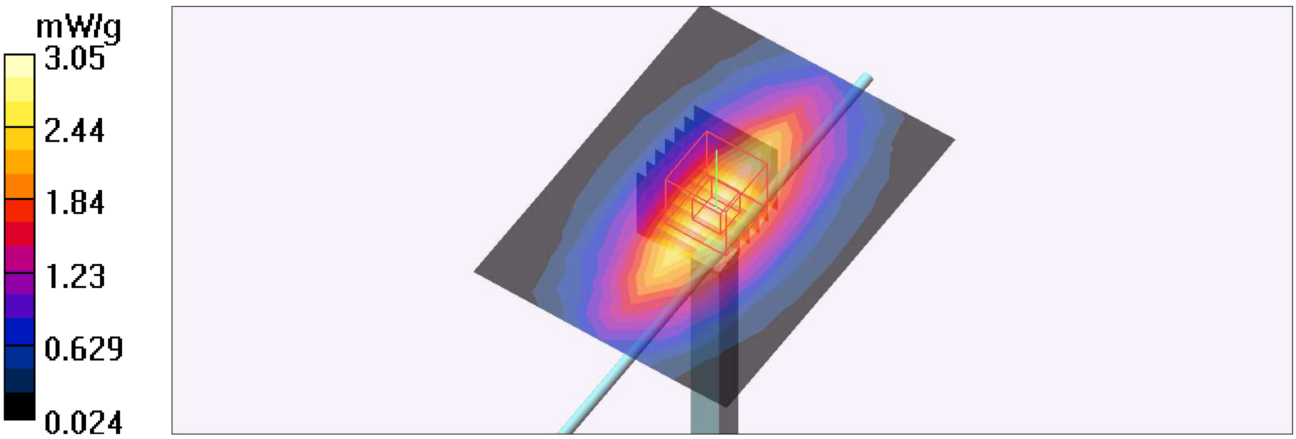
Communication System: CW ; Frequency: 835 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL835;Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 ;
Liquid level : 150 mm
Phantom section: Flat Section ; Separation distance : 15 mm (The feet point of the dipole to the Phantom)Air temp. : 22.5 degrees ; Liquid temp. : 21.2 degrees

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.20, 10.20, 10.20); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.05 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.9 V/m; Power Drift = -0.070 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 3.12 mW/g



Date/Time: 2010/12/9 02:48:35

Test Laboratory: Bureau Veritas ADT

SystemPerformanceCheck-D1900V2-MSL1900 MHz

DUT: Dipole 1900 MHz ; Type: D1900V2 ; Serial: D1900V2 - SN:5d036 ; Test Frequency: 1900 MHz

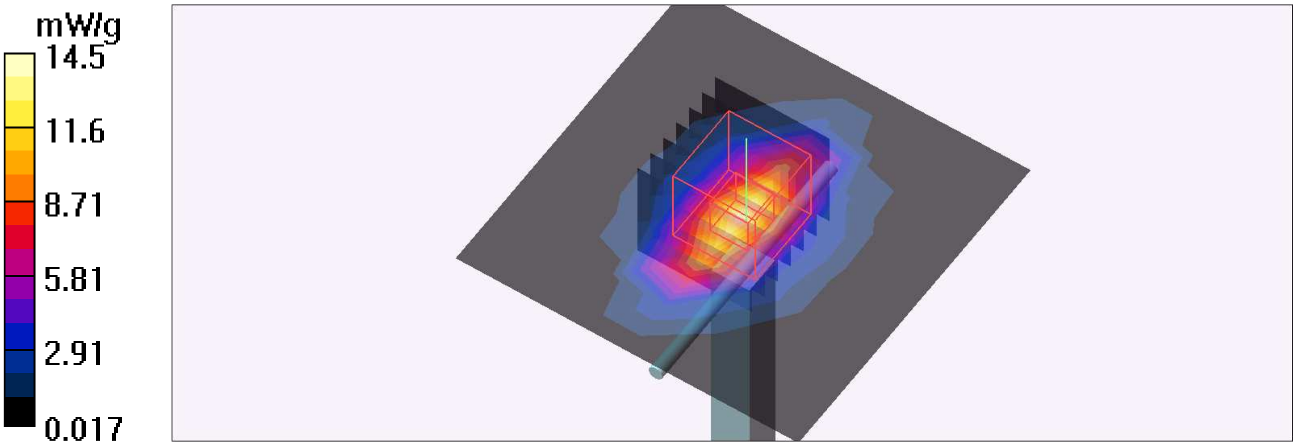
Communication System: CW ; Frequency: 1900 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL1900;Medium parameters used: f = 1900 MHz; σ = 1.55 mho/m; ε_r = 53.42; ρ = 1000 kg/m^3 ; Liquid level : 150 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feet point of the dipole to the Phantom)Air temp. : 22.7 degrees ; Liquid temp. : 21.7 degrees

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(8.61, 8.61, 8.61); Calibrated: 2010/3/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA;   Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

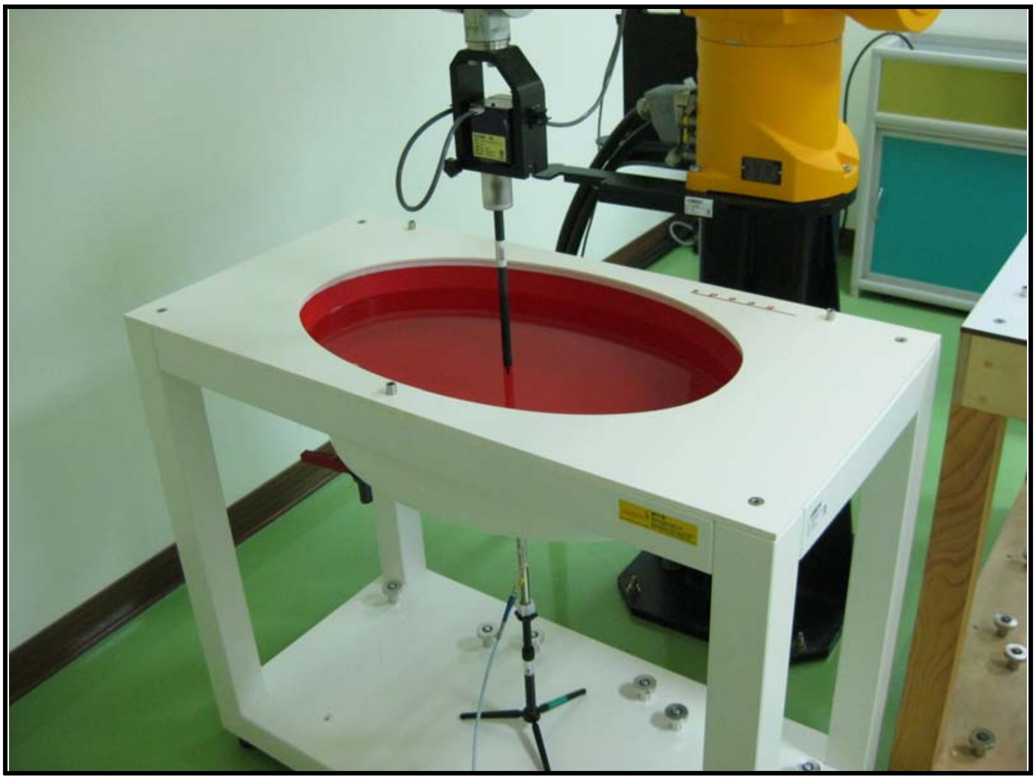
d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 14.5 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.9 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.96 mW/g; SAR(10 g) = 5.16 mW/g
Maximum value of SAR (measured) = 14.4 mW/g



APPENDIX B: BV ADT SAR MEASUREMENT SYSTEM

APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION



APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: PHANTOM

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

Certificate of Conformity / First Article Inspection

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

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

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

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

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

Date 07.07.2005

Signature / Stamp

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

D2: DOSIMETRIC E-FIELD PROBE

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 **BV-ADT (Auden)**

Certificate No: EX3-3590_Mar10

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3590
Calibration procedure(s)	QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	March 25, 2010

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	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: March 25, 2010

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

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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^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.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 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:3590

Manufactured:	March 23, 2009
Last calibrated:	April 28, 2009
Recalibrated:	March 25, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3590

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.49	0.49	0.50	± 10.1%
DCP (mV)[B]	88.1	87.5	87.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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 maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: EX3DV4 SN:3590

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	10.25	10.25	10.25	0.74	0.61	± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	8.89	8.89	8.89	0.76	0.58	± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	8.33	8.33	8.33	0.62	0.64	± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.90	7.90	7.90	0.36	0.84	± 11.0%
2600	± 50 / ± 100	39.0 ± 5%	1.96 ± 5%	7.79	7.79	7.79	0.19	1.32	± 11.0%
5200	± 50 / ± 100	36.0 ± 5%	4.66 ± 5%	5.30	5.30	5.30	0.40	1.90	± 13.1%
5300	± 50 / ± 100	35.9 ± 5%	4.76 ± 5%	4.92	4.92	4.92	0.45	1.90	± 13.1%
5500	± 50 / ± 100	35.6 ± 5%	4.96 ± 5%	4.93	4.93	4.93	0.45	1.90	± 13.1%
5600	± 50 / ± 100	35.5 ± 5%	5.07 ± 5%	4.63	4.63	4.63	0.50	1.90	± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.27 ± 5%	4.54	4.54	4.54	0.50	1.90	± 13.1%

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

DASY - Parameters of Probe: EX3DV4 SN:3590

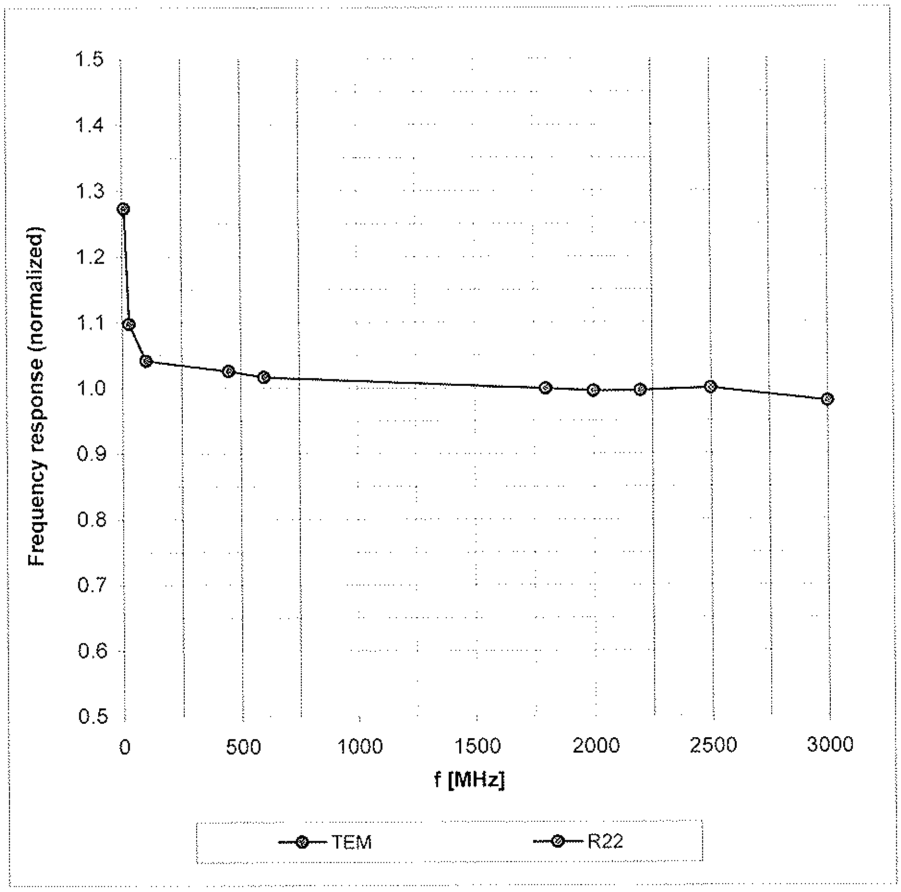
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	10.20	10.20	10.20	0.60	0.71 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	8.69	8.69	8.69	0.79	0.58 ± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	8.61	8.61	8.61	0.40	0.80 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	8.20	8.20	8.20	0.28	1.02 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	8.04	8.04	8.04	0.21	1.25 ± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	4.80	4.80	4.80	0.53	1.95 ± 13.1%
5300	± 50 / ± 100	48.5 ± 5%	5.42 ± 5%	4.50	4.50	4.50	0.53	1.95 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	4.32	4.32	4.32	0.55	1.95 ± 13.1%
5600	± 50 / ± 100	48.5 ± 5%	5.77 ± 5%	4.16	4.16	4.16	0.50	1.95 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	4.41	4.41	4.41	0.60	1.95 ± 13.1%

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

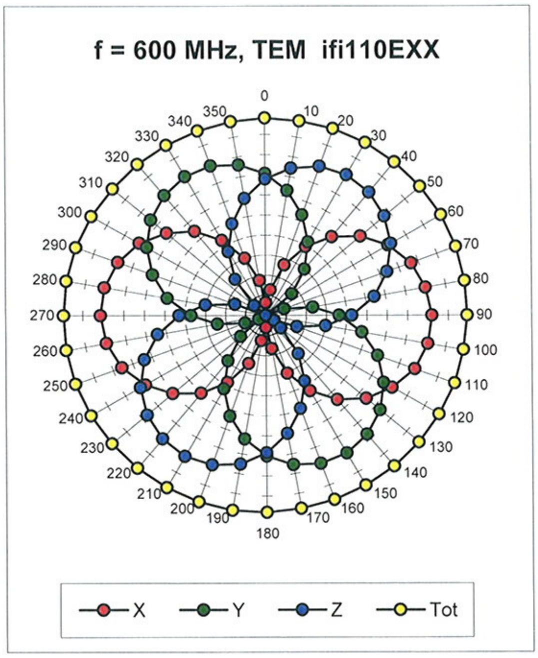
Frequency Response of E-Field

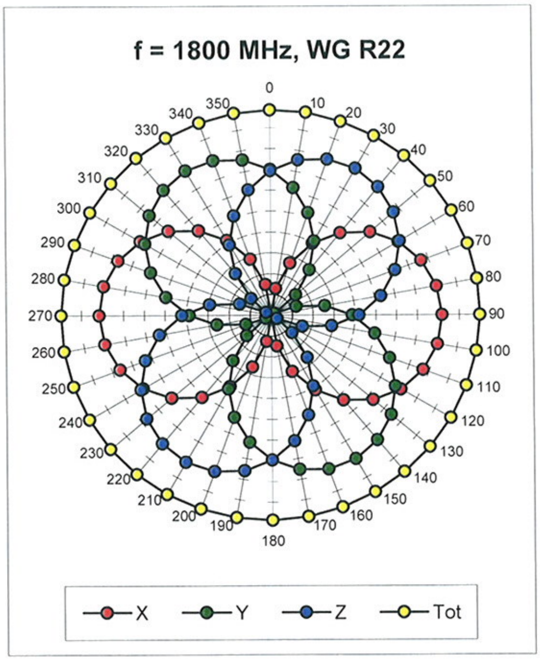
(TEM-Cell:ifi110 EXX, Waveguide: R22)

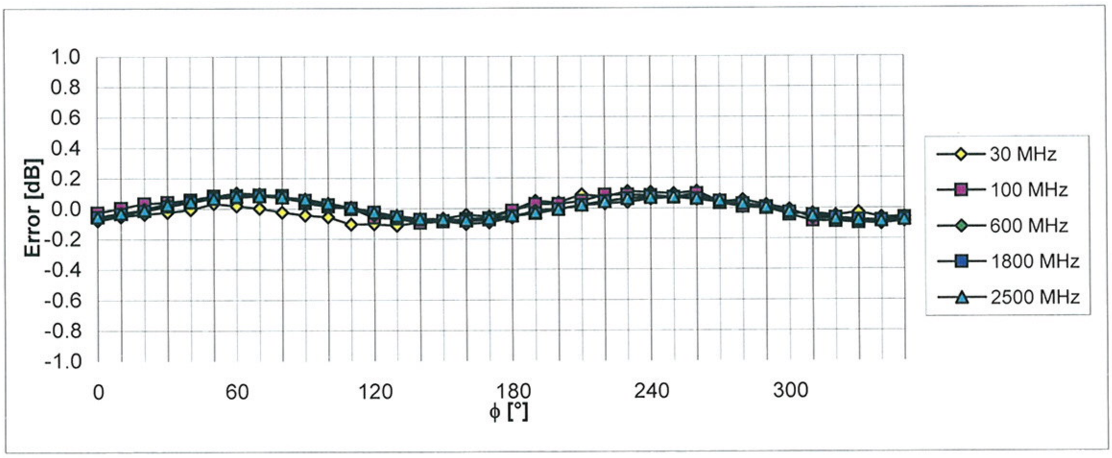


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



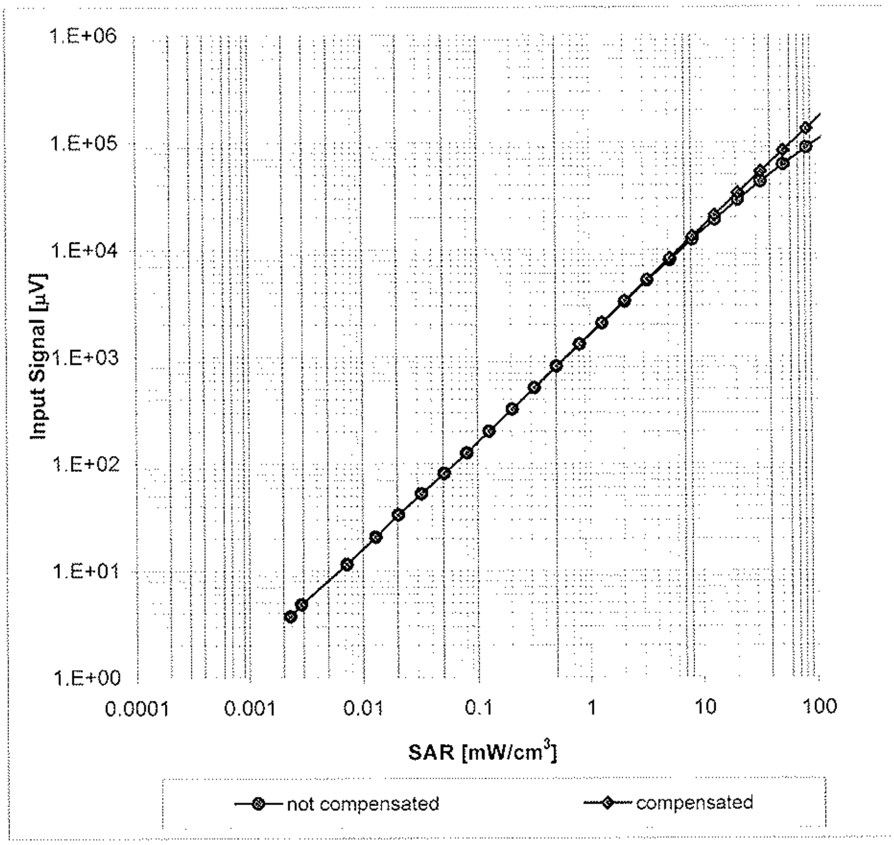


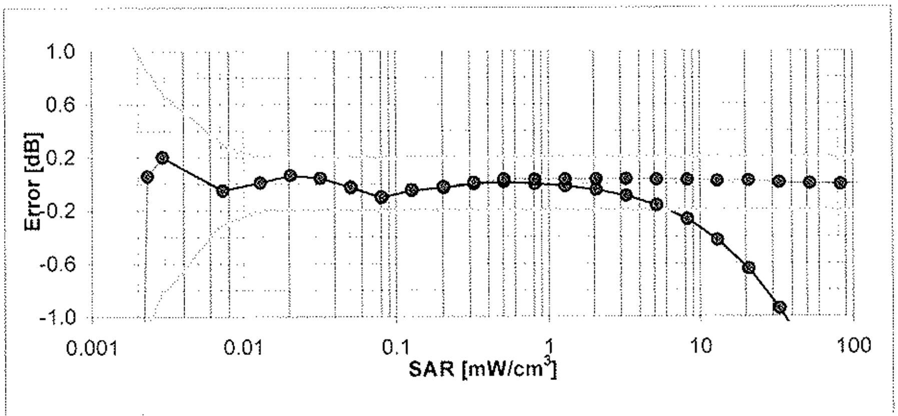


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

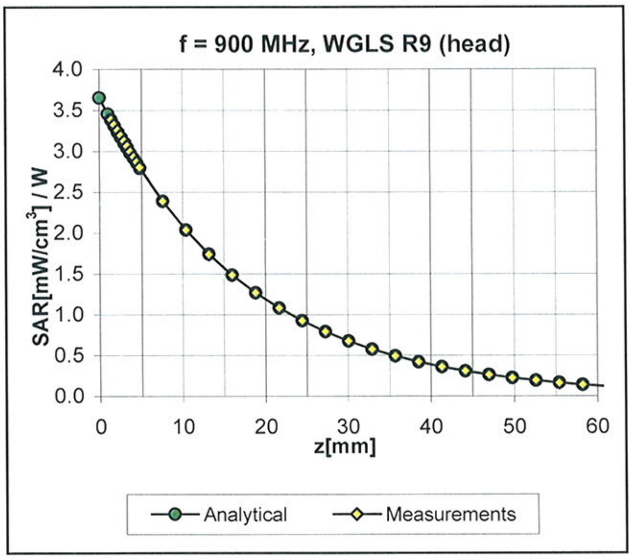
(Waveguide R22, f = 1800 MHz)

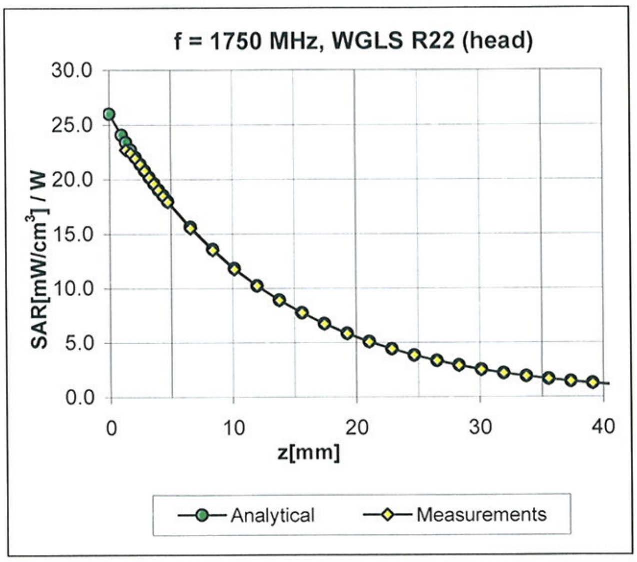




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

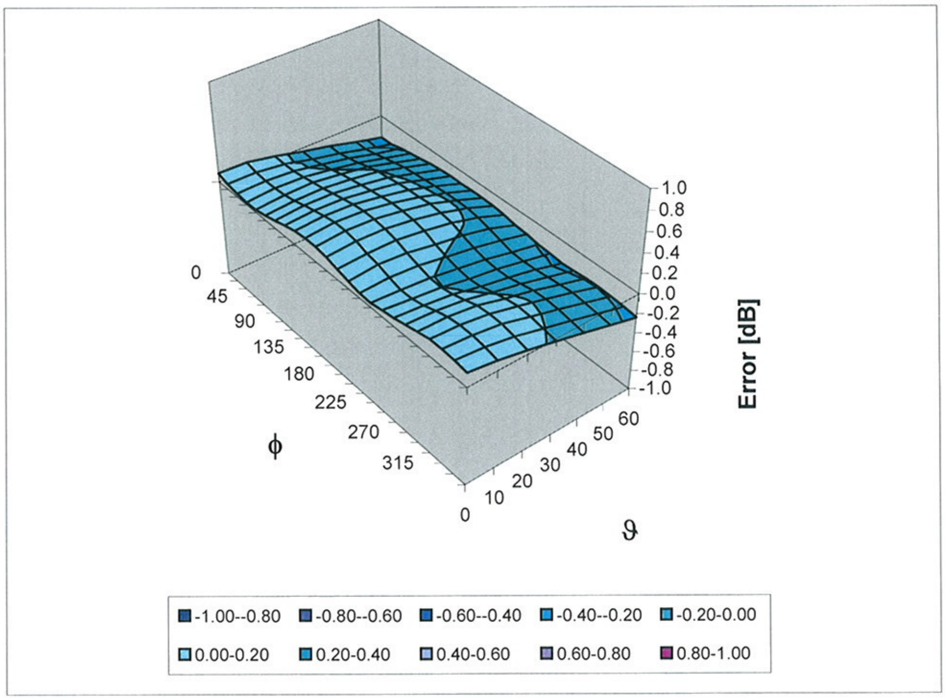
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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

D3: DAE

Schmid & Partner Engineering AG

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

IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:
To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

Schmid & Partner Engineering

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 **BV - ADT (Auden)**

Certificate No: **DAE4-861_Jan10**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 861
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	January 22, 2010

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	1-Oct-09 (No: 9055)	Oct-10
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	05-Jun-09 (in house check)	In house check: Jun-10

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	
Approved by:	Fin Bomholt	R&D Director	i.V.

Issued: January 22, 2010

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:* 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	404.395 ± 0.1% (k=2)	404.784 ± 0.1% (k=2)	405.737 ± 0.1% (k=2)
Low Range	4.01182 ± 0.7% (k=2)	3.98893 ± 0.7% (k=2)	4.01269 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	123.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200003.4	-2.33	-0.00
Channel X	+ Input	19997.73	-1.97	-0.01
Channel X	- Input	-19999.33	1.07	-0.01
Channel Y	+ Input	200002.5	-2.16	-0.00
Channel Y	+ Input	19995.17	-4.43	-0.02
Channel Y	- Input	-20000.88	-0.58	0.00
Channel Z	+ Input	199999.9	-3.99	-0.00
Channel Z	+ Input	19995.97	-3.43	-0.02
Channel Z	- Input	-20002.39	0.01	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	1999.9	-0.34	-0.02
Channel X	+ Input	199.26	-0.64	-0.32
Channel X	- Input	-200.72	-0.82	0.41
Channel Y	+ Input	1999.2	-0.72	-0.04
Channel Y	+ Input	198.82	-1.18	-0.59
Channel Y	- Input	-201.63	-1.83	0.92
Channel Z	+ Input	2001.1	1.22	0.06
Channel Z	+ Input	197.99	-2.01	-1.01
Channel Z	- Input	-201.59	-1.79	0.89

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	5.69	4.19
	- 200	-2.41	-3.99
Channel Y	200	1.24	1.40
	- 200	-2.43	-2.38
Channel Z	200	-9.16	-9.25
	- 200	8.58	8.07

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	-	2.32	1.39
Channel Y	200	1.89	-	4.20
Channel Z	200	1.32	0.19	-

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	15980	16853
Channel Y	16068	14547
Channel Z	16038	17866

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	0.16	-1.64	1.60	0.66
Channel Y	-0.58	-2.29	0.44	0.49
Channel Z	-1.24	-3.18	0.50	0.68

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.1999	199.8
Channel Y	0.2000	201.8
Channel Z	0.1999	199.7

8. Low Battery Alarm Voltage (verified during pre test)

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

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	–0.01	-8	-9