

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen,
Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
Email: ee.shenzhen@sgs.com

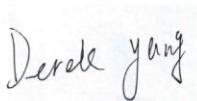
Report No.: SZEM160200075302
Rev.01
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FCC SAR TEST REPORT

Application No: SZEM1602000753RG
Applicant: Bioland Technology LTd.
Manufacturer: Bioland Technology LTd.
Factory: Bioland Technology LTd.
Product Name: Blood Glucose Monitoring System
Model No.(EUT): G-427G
Add Model No.: G-428G,G-777G,G-888G,G-999G
FCC ID: 2AHLE-BGMLG002
Standards: FCC 47CFR §2.1093
Date of Receipt: 2016-07-24
Date of Test: 2016-07-24 to 2016-07-25
Date of Issue: 2016-08-04
Test Result : **PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:



Derek Yang

Wireless Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.



REVISION HISTORY

| Revision Record | | | | |
|-----------------|---------|------------|----------|----------|
| Version | Chapter | Date | Modifier | Remark |
| 01 | | 2016-08-04 | | Original |
| | | | | |
| | | | | |



TEST SUMMARY

| Frequency Band | Test position | Test mode | Max Report SAR1g (W/kg) | SAR limit (W/kg) | Verdict |
|----------------|---------------|-----------|-------------------------|------------------|---------|
| GSM850 | Body | GPRS 2TS | 1.561 | 1.6 | PASS |
| GSM1900 | Body | GPRS 2TS | 0.668 | 1.6 | PASS |

Approved & Released by

Simon Ling

SAR Manager

Tested by

Evan Mi

SAR Engineer

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1 General Information

1.1 Details of Client

| | |
|--------------|---|
| Applicant | Bioland Technology LTd. |
| Address: | NO.A6B7(Block G) Shangrong Industrial Zone No.5 Baolong Road,Baolong Community Longgang District 518116,Shenzhen,Guangdong PEOPLE'S REPUBLIC OF CHINA |
| Manufacturer | Bioland Technology LTd. |
| Address: | NO.A6B7(Block G) Shangrong Industrial Zone No.5 Baolong Road,Baolong Community Longgang District 518116,Shenzhen,Guangdong PEOPLE'S REPUBLIC OF CHINA |
| Factory | Bioland Technology LTd. |
| Address: | NO.A6B7(Block G) Shangrong Industrial Zone No.5 Baolong Road,Baolong Community Longgang District 518116,Shenzhen,Guangdong PEOPLE'S REPUBLIC OF CHINA |

1.2 Test Location

Company: SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address: No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code: 518057
Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
E-mail: ee.shenzhen@sgs.com



1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **Industry Canada (IC)**

The 3m Semi-anechoic chambers and the 10m Semi-anechoic chambers of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-2, 4620C-3.



1.4 General Description of EUT

| | | | | | | |
|--|---|-----------|-----------|--|--|--|
| Product Name: | Blood Glucose Monitoring System | | | | | |
| Model No.(EUT): | G-427G | | | | | |
| Trade Mark: | G-428G,G-777G,G-888G,G-999G | | | | | |
| Product Phase: | production unit | | | | | |
| Device Type : | portable device | | | | | |
| Exposure Category: | uncontrolled environment / general population | | | | | |
| FCC ID | 2AHLE-BGMG002 | | | | | |
| Antenna Type: | Inner Antenna | | | | | |
| Device Operating Configurations : | | | | | | |
| Modulation Mode: | GSM:GMSK | | | | | |
| GPRS Multi-slots Class: | 10 | | | | | |
| Frequency Bands: | Band | Tx (MHz) | Rx (MHz) | | | |
| | GSM850 | 824-849 | 869-894 | | | |
| | GSM1900 | 1850-1910 | 1930-1990 | | | |
| Battery Information | Model:PL503040 | | | | | |
| | Normal Voltage :3.7V | | | | | |
| | Rated capacity :600mAh | | | | | |
| | Battery Type :Rechargeable Li-ion Battery | | | | | |
| Remark: | | | | | | |
| Model No.: G-427G,G-428G,G-777G,G-888G,G-999G | | | | | | |
| Only the model G-427G was tested, since the electrical circuit design, layout, components used and internal wiring were identical for all above models, only different on model No. and product color. | | | | | | |

1.5 Test Specification

| Identity | Document Title |
|-----------------------|--|
| FCC 47CFR §2.1093 | Radiofrequency Radiation Exposure Evaluation: Portable Devices |
| IEEE Std C95.1 – 1991 | IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz. |
| KDB447498 D01 v06 | General RF Exposure Guidance |
| KDB447498 D03 v01 | Supplement C Cross-Reference |
| KDB 865664 D01 v01r04 | SAR Measurement 100 MHz to 6 GHz |
| KDB 865664 D02 v01r02 | RF Exposure Reporting |
| KDB 941225 D01 v03r01 | 3G SAR Procedures |

1.6 RF exposure limits

| Human Exposure | Uncontrolled Environment General Population | Controlled Environment Occupational |
|--|--|--|
| Spatial Peak SAR* (Brain) | 1.60 mW/g | 8.00 mW/g |
| Spatial Average SAR** (Whole Body) | 0.08 mW/g | 0.40 mW/g |
| Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist) | 4.00 mW/g | 20.00 mW/g |

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure (i.e. as a result of employment or occupation).

2 SAR Measurements System Configuration

2.1 The SAR Measurement System

This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation $SAR = \sigma / (\rho |E|^2)$ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

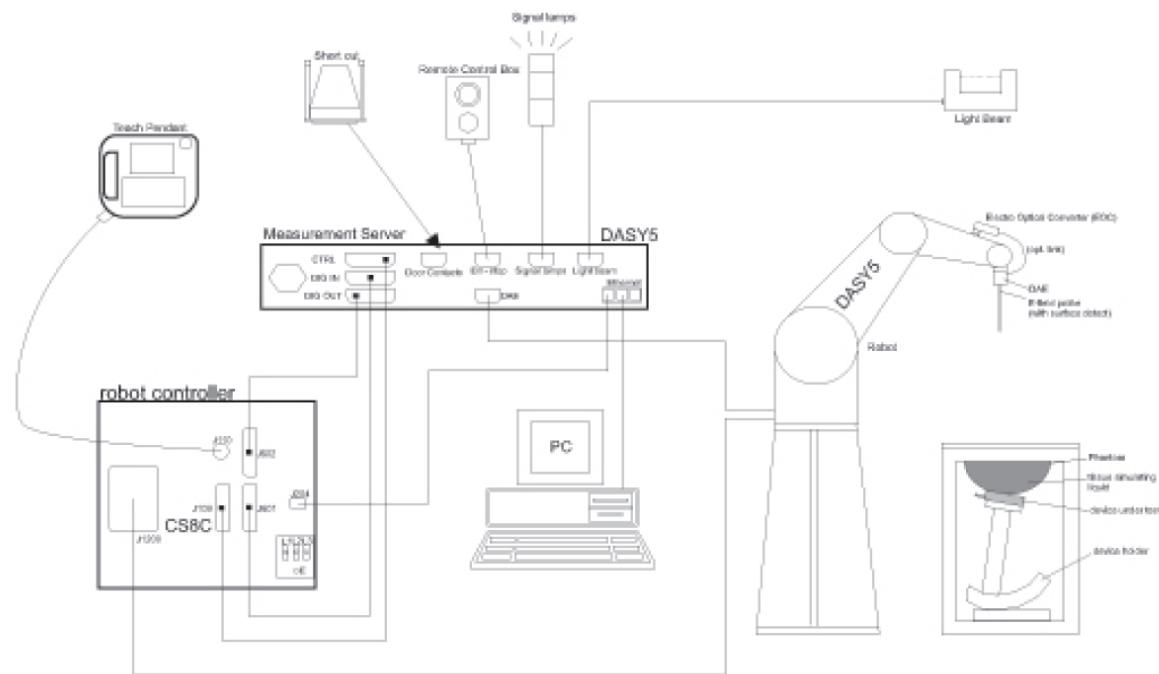
The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software .An arm extension for accommodation the data acquisition electronics (DAE).

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



F-1. SAR Measurement System Configuration

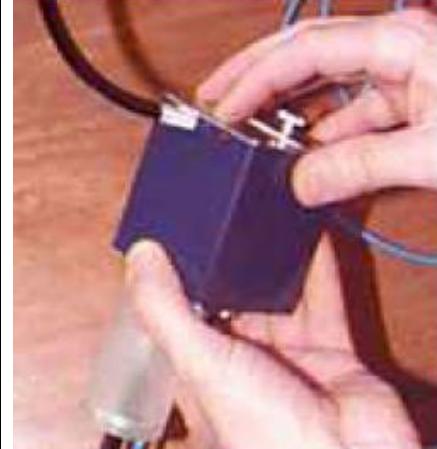
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

2.2 Isotropic E-field Probe EX3DV4

| | |
|--|---|
|  | <p>Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)</p> |
| Calibration | ISO/IEC 17025 calibration service available. |
| Frequency | 10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz) |
| Directivity | ± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis) |
| Dynamic Range | 10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g) |
| Dimensions | Overall length: 337 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); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |
| Compatibility | DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI |

2.3 Data Acquisition Electronics (DAE)

| | |
|-----------------------------|--|
| Model | DAE3, DAE4 |
| Construction | Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop. |
| Measurement Range | -100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV) |
| Input Offset Voltage | < 5µV (with auto zero) |
| Input Bias Current | < 50 f A |
| Dimensions | 60 x 60 x 68 mm |



2.4 SAM Twin Phantom

| | |
|--|---|
| Material | Vinylester, glass fiber reinforced (VE-GF) |
| Liquid Compatibility | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type) |
| Shell Thickness | 2 ± 0.2 mm (6 ± 0.2 mm at ear point) |
| Dimensions (incl. Wooden Support) | Length: 1000 mm Width: 500 mm Height: adjustable feet |
| Filling Volume | approx. 25 liters |
| Wooden Support | SPEAG standard phantom table |



The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. 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 teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

2.5 ELI Phantom

| | | | |
|---|---|--|--|
| Material | Vinylester, glass fiber reinforced (VE-GF) |  | |
| Liquid Compatibility | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type) | | |
| Shell Thickness | 2.0 ± 0.2 mm (bottom plate) | | |
| Dimensions | Major axis: 600 mm Minor axis: 400 mm | | |
| Filling Volume | approx. 30 liters | | |
| Wooden Support | SPEAG standard phantom table | | |
| Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. | | | |
| ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure. | | | |

2.6 Device Holder for Transmitters



F-2. Device Holder for Transmitters

- 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 centres for both scales are the ear reference point (ERP). 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 $\epsilon=3$ and loss tangent $\delta=0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

2.7 Measurement procedure

2.7.1 Scanning procedure

Step 1: Power reference measurement

The “reference” and “drift” measurements 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.

Step 2: Area scan

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Zoom scan

Around this point, a volume of 30mm*30mm*30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5x5x7 points ($\leq 2\text{GHz}$) and 7x7x7 points ($\geq 2\text{GHz}$). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification). The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2003.

| | | ≤ 3 GHz | > 3 GHz |
|--|---|--|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | 5 ± 1 mm | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | | $30^\circ \pm 1^\circ$ | $20^\circ \pm 1^\circ$ |
| | | ≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm | $3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm |
| Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area} | | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |
| Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom} | | ≤ 2 GHz: ≤ 8 mm $2 - 3$ GHz: ≤ 5 mm* | $3 - 4$ GHz: ≤ 5 mm* $4 - 6$ GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{\text{Zoom}}(n)$ | ≤ 5 mm | $3 - 4$ GHz: ≤ 4 mm $4 - 5$ GHz: ≤ 3 mm $5 - 6$ GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface $\Delta z_{\text{Zoom}}(n>1)$: between subsequent points | ≤ 4 mm $\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$ |
| Minimum zoom scan volume | x, y, z | ≥ 30 mm | $3 - 4$ GHz: ≥ 28 mm $4 - 5$ GHz: ≥ 25 mm $5 - 6$ GHz: ≥ 22 mm |

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT's output power and should vary max. $\pm 5\%$

2.7.2 Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE3". The 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 incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

2.7.3 Data Evaluation by SEMCAD

The SEMCAD software 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 | Normi, ai0, ai1, ai2 |
| - Conversion factor | ConvFi | |
| - Diode compression point | Dcp <i>i</i> | |
| Device parameters: | - Frequency | f |
| - Crest factor | cf | |
| Media parameters: | - Conductivity | ε |
| - 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:

$$V_i = U_i + U_i^2 \cdot c_f / d_c p_i$$

With V_i = compensated signal of channel i ($i = x, y, z$)

U_i = input signal of channel i ($i = x, y, z$)

c_f = crest factor of exciting field (DASY parameter)

$d_c p_i$ = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:

$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2) / f$$

With V_i = compensated signal of channel i $(i = x, y, z)$

Normi = sensor sensitivity of channel i $(i = x, y, z)$

[mV/(V/m)2] for E-field Probes

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

Ei = electric field strength of channel i in V/m

Hi = magnetic field strength of channel i in A/m

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

$$E_{tot} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \sigma) / (\epsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g

Etot = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ϵ = equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

with Ppwe = equivalent power density of a plane wave in mW/cm2

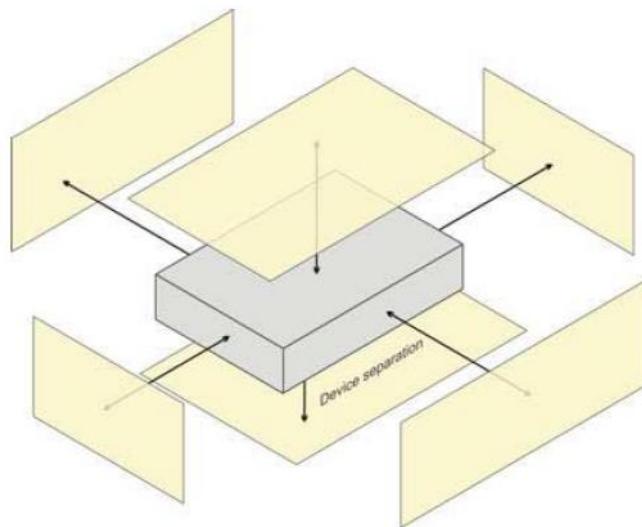
Etot = total electric field strength in V/m

Htot = total magnetic field strength in A/m

3 Description of Test Position

3.1 The Body Test Position

Per the intended use according to the specifications, instructions and information provided by the manufacturer, as indicated in bellow Figure. The back surface and edges of the device should be tested for SAR compliance with the device touching the phantom.



4 SAR System Verification Procedure

4.1 Tissue Simulate Liquid

4.1.1 Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands:

| Ingredients (% by weight) | Frequency (MHz) | | | |
|---|-----------------|---|-------------|-------------|
| | 450 | 835 | 1800-2000 | 2450 |
| Tissue Type | Body | Body | Body | Body |
| Water | 51.16 | 50.75 | 70.17 | 68.53 |
| Salt (NaCl) | 1.49 | 0.94 | 0.39 | 0.1 |
| Sucrose | 46.78 | 48.21 | 0 | 0 |
| HEC | 0.52 | 0 | 0 | 0 |
| Bactericide | 0.05 | 0.10 | 0 | 0 |
| Tween | 0 | 0 | 29.44 | 31.37 |
| Salt: 99 ⁺ % Pure Sodium Chloride | | Sucrose: 98 ⁺ % Pure Sucrose | | |
| Water: De-ionized, 16 MΩ ⁺ resistivity | | HEC: Hydroxyethyl Cellulose | | |
| Tween: Polyoxyethylene (20) sorbitan monolaurate | | | | |

Table 1 : Recipe of Tissue Simulate Liquid

4.1.2 Measurement for Tissue Simulate Liquid

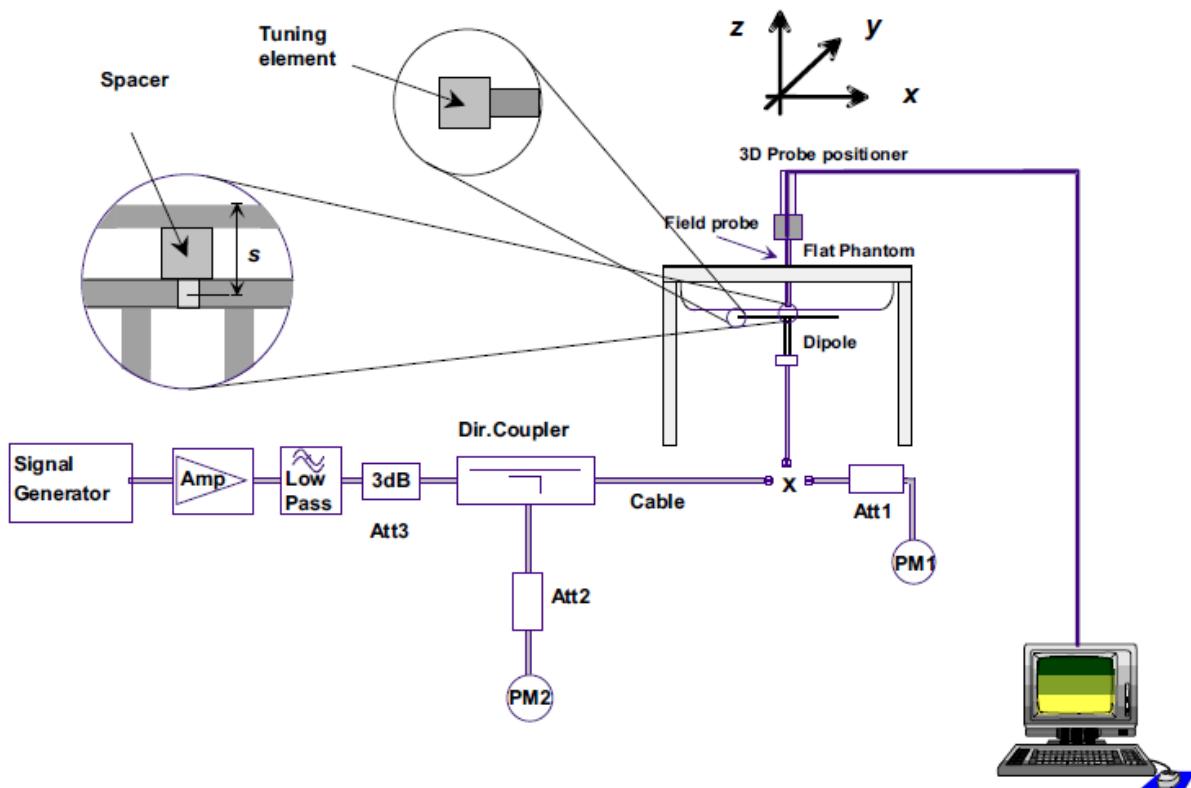
The dielectric properties for this Tissue Simulate Liquids were measured by using the Agilent Model 85070E Dielectric Probe in conjunction with Agilent E5071C Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in Table 1. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was $22\pm2^\circ\text{C}$.

| Tissue Type | Measured Frequency (MHz) | Target Tissue ($\pm 5\%$) | | Measured Tissue | | Liquid Temp. (°C) | Measured Date |
|-------------|--------------------------|-----------------------------|----------------------|-----------------|----------------------|-------------------|---------------|
| | | ϵ_r | $\sigma(\text{S/m})$ | ϵ_r | $\sigma(\text{S/m})$ | | |
| 835 Body | 835 | 55.2 (52.44~57.96) | 0.97 (0.92~1.02) | 55.39 | 0.981 | 22.1 | 2016/7/24 |
| 1900 Body | 1900 | 53.3 (50.64~55.97) | 1.52 (1.44~1.60) | 51.921 | 1.551 | 21.8 | 2016/7/25 |

Table 2 : Measurement result of Tissue electric parameters

4.2 SAR System Validation

The microwave circuit arrangement for system verification is sketched in F-12. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within $\pm 10\%$ from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the table 5 (A power level of 250mw was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range $22 \pm 2^\circ\text{C}$, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-3. the microwave circuit arrangement used for SAR system verification

4.2.1 Justification for Extended SAR Dipole Calibrations

- 1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
 - a) There is no physical damage on the dipole;
 - b) System check with specific dipole is within 10% of calibrated value;
 - c) Return-loss is within 10% of calibrated measurement;
 - d) Impedance is within 5Ω from the previous measurement.
- 2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

4.2.2 Summary System Validation Result(s)

| Validation Kit | | Measured SAR 250mW | Normalized to 1w SAR | 1W Target SAR (±10%) | Liquid Temp. (°C) | Measure d date |
|----------------|------|-----------------------|-------------------------|-------------------------|-------------------------|-------------------|
| | | 1g (W/kg) | 1g (W/kg) | 1g (W/kg) | | |
| D835V2 | Body | 2.23 | 8.92 | 9.64 (8.676~10.604) | 22.1 | 2016/7/24 |
| D1900V2 | Body | 10.8 | 43.2 | 40.5 (36.45~44.55) | 21.8 | 2016/7/25 |

Table 3 : SAR System Validation Result

4.2.3 Detailed System Validation Results

Please see the Appendix A

5 Test results and Measurement Data

5.1 3G SAR Test Reduction Procedure

According to KDB 941225D01 v03, in the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode. This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as "otherwise" in the applicable procedures; SAR measurement is required for the secondary mode.

5.2 Operation Configurations

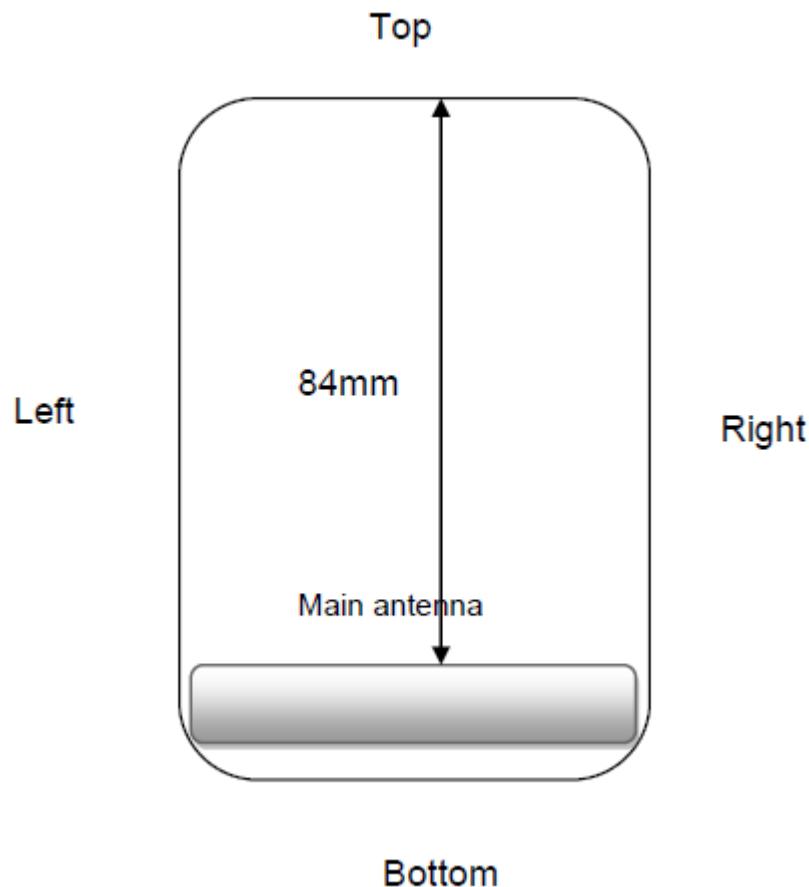
5.2.1 GSM Test Configuration

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMU200 the power lever is set to "5" and "0" in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 10 for this EUT, it has at most 2 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5.

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode

5.2.2 DUT Antenna Locations

5.3 Measurement of RF conducted Power

5.3.1 Conducted Power Of GSM

| GSM 850 | | | | | | | | |
|-------------------------|------------|-------|-------|------------------|---------------------------------|--------------|--------------|--------------|
| Burst Output Power(dBm) | | | | Division Factors | Frame-Average Output Power(dBm) | | | |
| Channel | 128 | 190 | 251 | | 128 | 190 | 251 | |
| GPRS(GMSK) | 1 TX Slot | 33.34 | 33.27 | 33.24 | -9.19 | 24.15 | 24.08 | 24.05 |
| | 2 TX Slots | 33.11 | 33.05 | 33.24 | -6.18 | 26.93 | 26.87 | 27.06 |

| GSM 1900 | | | | | | | | |
|-------------------------|------------|-------|-------|------------------|---------------------------------|--------------|--------------|--------------|
| Burst Output Power(dBm) | | | | Division Factors | Frame-Average Output Power(dBm) | | | |
| Channel | 512 | 661 | 810 | | 512 | 661 | 810 | |
| GPRS(GMSK) | 1 TX Slot | 30.13 | 30.22 | 30.37 | -9.19 | 20.94 | 21.03 | 21.18 |
| | 2 TX Slots | 30.12 | 30.13 | 30.02 | -6.18 | 23.94 | 23.95 | 23.84 |

Table 4: Conducted Power Of GSM

Note:

- 1) CMU200 measures GSM peak and average output power for active timeslots. For SAR the time based average power is relevant. The difference in between depends on the duty cycle of the TDMA signal:

| No. of timeslots | 1 | 2 |
|--|-------|--------|
| Duty Cycle | 1:8.3 | 1:4.15 |
| Time based avg. power compared to slotted avg. power | -9.19 | -6.18 |

- 2) The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:

$$\text{Frame-averaged power} = 10 \times \log (\text{Burst-averaged power mW} \times \text{Slot used} / 8)$$

- 3) Per KDB 447498 D01v06, When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used

5.4 Measurement of SAR Data

5.4.1 SAR Result Of GSM850

| Test position | Test mode | Test Ch./ Freq. | Duty Cycle | SAR (W/kg) 1-g | Powe r drift (dB) | Conduc ted power (dBm) | Tune up Limit (dBm) | Scaled factor | Scaled SAR (W/kg) | Liquid Temp. | SAR limit (W/kg) |
|-------------------------------|-----------|-----------------|------------|-----------------|-------------------|------------------------|---------------------|---------------|-------------------|--------------|------------------|
| Body Test data (Separate 0mm) | | | | | | | | | | | |
| Front side | GPRS 2TS | 190/836.6 | 1:4.15 | 1.22 | -0.05 | 33.05 | 33.5 | 1.109 | 1.353 | 22.1 | 1.6 |
| Front side | GPRS 2TS | 128/824.2 | 1:4.15 | 0.921 | -0.08 | 33.11 | 33.5 | 1.094 | 1.008 | 22.1 | 1.6 |
| Front side | GPRS 2TS | 251/848.8 | 1:4.15 | 1.47 | -0.04 | 33.24 | 33.5 | 1.062 | 1.561 | 22.1 | 1.6 |
| Back side | GPRS 2TS | 190/836.6 | 1:4.15 | 0.362 | -0.14 | 33.05 | 33.5 | 1.109 | 0.402 | 22.1 | 1.6 |
| Left side | GPRS 2TS | 190/836.6 | 1:4.15 | 0.428 | -0.07 | 33.05 | 33.5 | 1.109 | 0.475 | 22.1 | 1.6 |
| Right side | GPRS 2TS | 190/836.6 | 1:4.15 | 0.208 | -0.07 | 33.05 | 33.5 | 1.109 | 0.231 | 22.1 | 1.6 |
| Top side | GPRS 2TS | 190/836.6 | 1:4.15 | 0.098 | -0.05 | 33.05 | 33.5 | 1.109 | 0.109 | 22.1 | 1.6 |
| Bottom side | GPRS 2TS | 190/836.6 | 1:4.15 | 0.472 | -0.08 | 33.05 | 33.5 | 1.109 | 0.524 | 22.1 | 1.6 |
| Front side-repeat | GPRS 2TS | 251/848.8 | 1:4.15 | 1.42 | -0.04 | 33.24 | 33.5 | 1.062 | 1.508 | 22.1 | 1.6 |

Table 5: SAR of GSM850 for Body.

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B
- 2) Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

| Test Position | Channel/ Frequency (MHz) | Measured SAR (1g) | 1st Repeated SAR (1g) | Ratio | 2nd Repeated SAR (1g) | 3rd Repeated SAR (1g) |
|---------------|--------------------------|-------------------|-----------------------|-------|-----------------------|-----------------------|
| Front side | 251/848.8 | 1.47 | 1.42 | 1.03 | N/A | N/A |

Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).

3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 6: SAR Measurement Variability Results [GSM 850(GSM/GPRS/EGPRS)]

5.4.2 SAR Result Of GSM1900

| Test position | Test mode | Test Ch. /Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted power (dBm) | Tune up Limit (dBm) | Scaled factor | Scaled SAR (W/kg) | Liquid Temp. | SAR limit (W/kg) |
|--|-----------|-----------------|------------|----------------|------------------|-----------------------|---------------------|---------------|-------------------|--------------|------------------|
| Body Test data with SIM1(Separate 0mm) | | | | | | | | | | | |
| Front side | GPRS 2TS | 661/1880 | 1:4.15 | 0.613 | 0.1 | 30.13 | 30.5 | 1.089 | 0.668 | 21.8 | 1.6 |
| Back side | GPRS 2TS | 661/1880 | 1:4.15 | 0.244 | 0.02 | 30.13 | 30.5 | 1.089 | 0.266 | 21.8 | 1.6 |
| Left side | GPRS 2TS | 661/1880 | 1:4.15 | 0.179 | 0.02 | 30.13 | 30.5 | 1.089 | 0.195 | 21.8 | 1.6 |
| Right side | GPRS 2TS | 661/1880 | 1:4.15 | 0.318 | 0.04 | 30.13 | 30.5 | 1.089 | 0.346 | 21.8 | 1.6 |
| Top side | GPRS 2TS | 661/1880 | 1:4.15 | 0.159 | -0.08 | 30.13 | 30.5 | 1.089 | 0.173 | 21.8 | 1.6 |
| Bottom side | GPRS 2TS | 661/1880 | 1:4.15 | 0.126 | -0.19 | 30.13 | 30.5 | 1.089 | 0.137 | 21.8 | 1.6 |
| Bottom side | GPRS 2TS | 512/1850 .2 | 1:4.16 | 0.6 | -0.03 | 30.12 | 30.5 | 1.091 | 0.655 | 21.8 | 1.6 |
| Bottom side | GPRS 2TS | 810/1909 .8 | 1:4.17 | 0.707 | -0.02 | 30.02 | 30.5 | 1.117 | 0.790 | 21.8 | 1.6 |

Table 7: SAR of GSM1900 for Body.

Note:

- 1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B
- 2) Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

5.5 Multiple Transmitter Evaluation

5.5.1 Simultaneous SAR test evaluation

1) Simultaneous Transmission

There is only one antenna, so there is no simultaneous SAR evaluation

6 Equipment list

| Test Platform | SPEAG DASY5 Professional | | | | |
|---|---|-------------|----------------|------------------|-------------------------|
| Location | SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch | | | | |
| Description | SAR Test System (Frequency range 300MHz-6GHz) | | | | |
| Software Reference | DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331) | | | | |
| Hardware Reference | | | | | |
| Equipment | Manufacturer | Model | Serial Number | Calibration Date | Due date of calibration |
| <input checked="" type="checkbox"/> Robot | Staubli | RX90L | F03/5V32A1/A01 | NCR | NCR |
| <input checked="" type="checkbox"/> Twin Phantom | SPEAG | SAM 1 | TP-1283 | NCR | NCR |
| <input type="checkbox"/> Flat Phantom | SPEAG | ELI 5.0 | 1128 | NCR | NCR |
| <input checked="" type="checkbox"/> DAE | SPEAG | DAE3 | 569 | 2015-11-24 | 2016-11-23 |
| <input checked="" type="checkbox"/> E-Field Probe | SPEAG | EX3DV4 | 3962 | 2015-11-27 | 2016-11-26 |
| <input checked="" type="checkbox"/> Validation Kits | SPEAG | D835V2 | 4d015 | 2013-11-25 | 2016-11-24 |
| <input checked="" type="checkbox"/> Validation Kits | SPEAG | D1900V2 | 184 | 2013-11-27 | 2016-11-26 |
| <input type="checkbox"/> Validation Kits | SPEAG | D2450V2 | 733 | 2013-11-26 | 2016-11-25 |
| <input type="checkbox"/> Validation Kits | SPEAG | D5GHzV2 | 1165 | 2013-12-11 | 2016-12-10 |
| <input checked="" type="checkbox"/> Agilent Network Analyzer | Agilent | E5071C | MY46523590 | 2016-03-08 | 2017-03-08 |
| <input checked="" type="checkbox"/> Dielectric Probe Kit | Agilent | 85070E | US01440210 | NCR | NCR |
| <input type="checkbox"/> Universal Radio Communication Tester | R&S | CMU200 | 123090 | 2015-10-23 | 2016-10-23 |
| <input type="checkbox"/> Universal Radio Communication Tester | R&S | CMW500 | 152271 | 2016-03-08 | 2017-03-08 |
| <input checked="" type="checkbox"/> RF Bi-Directional Coupler | Agilent | 86205-60001 | MY31400031 | NCR | NCR |
| <input checked="" type="checkbox"/> Signal Generator | Agilent | N5171B | MY53050736 | 2016-03-08 | 2017-03-08 |
| <input checked="" type="checkbox"/> Preamplifier | Mini-Circuits | ZHL-42W | 15542 | NCR | NCR |
| <input checked="" type="checkbox"/> Power Meter | Agilent | E4416A | GB41292095 | 2016-03-08 | 2017-03-08 |
| <input checked="" type="checkbox"/> Power Sensor | Agilent | 8481H | MY41091234 | 2016-03-08 | 2017-03-08 |
| <input checked="" type="checkbox"/> Power Sensor | R&S | NRP-Z92 | 100025 | 2016-03-08 | 2017-03-08 |
| <input checked="" type="checkbox"/> Attenuator | SHX | TS2-3dB | 30704 | NCR | NCR |
| <input checked="" type="checkbox"/> Coaxial low pass filter | Mini-Circuits | VLF-2500(+) | NA | NCR | NCR |
| <input checked="" type="checkbox"/> Coaxial low pass filter | Microlab Fxr | LA-F13 | NA | NCR | NCR |
| <input checked="" type="checkbox"/> 50 Ω coaxial load | Mini-Circuits | KARN-50+ | 00850 | NCR | NCR |
| <input checked="" type="checkbox"/> DC POWER SUPPLY | SAKO | SK1730SL 5A | NA | NCR | NCR |

7 Measurement Uncertainty

Measurements and results are all in compliance with the standards listed in section 12 of this report. All measurements and results are recorded and maintained at the laboratory performing the tests and measurement uncertainties are taken into account when comparing measurements to pass/ fail criteria. The Expanded uncertainty (95% CONFIDENCE INTERVAL) is 21.36%.

| A | b1 | c | d | $e = f(d,k)$ | g | $i = C^*g/e$ | k |
|--|------------------|---------|--------------|--------------|--------------------------|----------------|----------------|
| Uncertainty Component | Section in P1528 | Tol (%) | Prob . Dist. | Div. | Ci (1g) | $1g_{ui} (\%)$ | $Vi (V_{eff})$ |
| Probe calibration | E.2.1 | 6.3 | N | 1 | 1 | 6.30 | ∞ |
| Axial isotropy | E.2.2 | 0.5 | R | $\sqrt{3}$ | $\frac{(1 - Cp)}{Cp}1/2$ | 0.20 | ∞ |
| hemispherical isotropy | E.2.2 | 2.6 | R | $\sqrt{3}$ | \sqrt{Cp} | 1.06 | ∞ |
| Boundary effect | E.2.3 | 1.0 | R | $\sqrt{3}$ | 1 | 0.58 | ∞ |
| Linearity | E.2.4 | 0.6 | R | $\sqrt{3}$ | 1 | 0.35 | ∞ |
| System detection limit | E.2.5 | 0.25 | R | $\sqrt{3}$ | 1 | 0.14 | ∞ |
| Readout electronics | E.2.6 | 0.3 | N | 1 | 1 | 0.30 | ∞ |
| Response time | E.2.7 | 0 | R | $\sqrt{3}$ | 1 | 0.00 | ∞ |
| Integration time | E.2.8 | 2.6 | R | $\sqrt{3}$ | 1 | 1.50 | ∞ |
| RF ambient Condition -Noise | E.6.1 | 3 | R | $\sqrt{3}$ | 1 | 1.73 | ∞ |
| RF ambient Condition - reflections | E.6.1 | 3 | R | $\sqrt{3}$ | 1 | 1.73 | ∞ |
| Probe positioning- mechanical tolerance | E.6.2 | 1.5 | R | $\sqrt{3}$ | 1 | 0.87 | ∞ |
| Probe positioning- with respect to phantom | E.6.3 | 2.9 | R | $\sqrt{3}$ | 1 | 1.67 | ∞ |
| Max. SAR evaluation | E.5.2 | 1 | R | $\sqrt{3}$ | 1 | 0.58 | ∞ |
| Test sample positioning | E.4.2 | 3.7 | N | 1 | 1 | 3.70 | 9 |
| Device holder uncertainty | E.4.1 | 3.6 | N | 1 | 1 | 3.60 | ∞ |
| Output power variation -SAR drift measurement | E.6.2 | 5 | R | $\sqrt{3}$ | 1 | 2.89 | ∞ |
| Phantom uncertainty (shape and thickness tolerances) | E.3.1 | 4 | R | $\sqrt{3}$ | 1 | 2.31 | ∞ |
| Liquid conductivity - deviation from target values | E.3.2 | 5 | R | $\sqrt{3}$ | 0.64 | 1.85 | ∞ |
| Liquid conductivity - measurement uncertainty | E.3.2 | 5.78 | N | 1 | 0.64 | 3.68 | 5 |
| Liquid permittivity - deviation from target values | E.3.3 | 5 | R | $\sqrt{3}$ | 0.6 | 1.73 | ∞ |
| Liquid permittivity - measurement uncertainty | E.3.3 | 0.62 | N | 1 | 0.6 | 0.372 | 5 |
| Combined standard | | | | RSS | | 10.68 | 430 |

| | | | | | | | |
|--|--|--|--|-----|--|--------------|--|
| uncertainty | | | | | | | |
| Expanded uncertainty (95% CONFIDENCE INTERVAL) | | | | K=2 | | 21.36 | |

Table 8 : Measurement Uncertainty

8 Calibration certificate

Please see the Appendix C

9 Photographs

Please see the Appendix D



Appendix A: Detailed System Validation Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

---END---



Appendix A

Detailed System Validation Results

| |
|--|
| 1. System Performance Check for Head |
| System Performance Check 835 MHz Body |
| System Performance Check 1900 MHz Body |

Test Laboratory: SGS-SAR Lab

System Performance Check 835 MHz Body

DUT: D835V2; Type: D835V2; Serial: 4d105

Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1

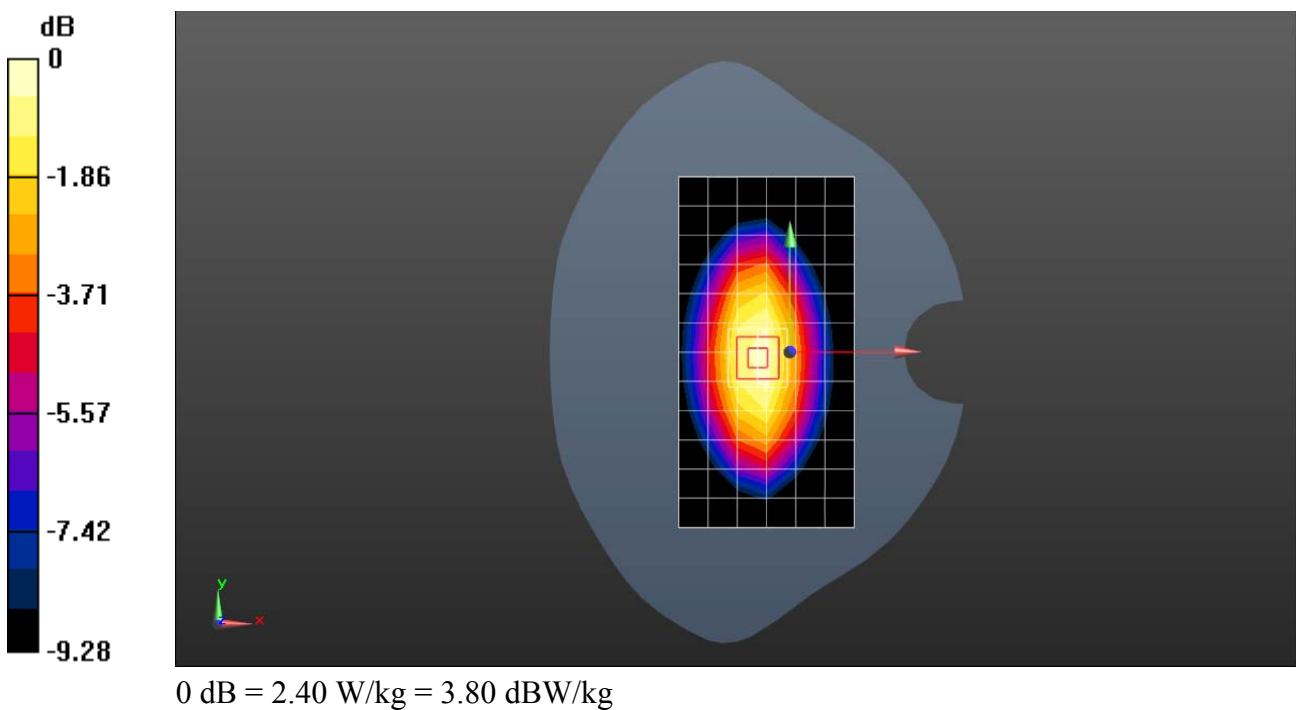
Medium: MSL835; Medium parameters used: $f = 835$ MHz; $\sigma = 0.981$ S/m; $\epsilon_r = 55.395$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.16, 10.16, 10.16); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=15mm, Pin=250mW/Area Scan (7x13x1): Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 2.33 W/kg

Body/d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
 $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 49.88 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 3.25 W/kg
SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.5 W/kg
Maximum value of SAR (measured) = 2.40 W/kg



Test Laboratory: SGS-SAR Lab

System Performance Check 1900 MHz Body

DUT: D1900V2; Type: D1900V2; Serial: 5d028

Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1

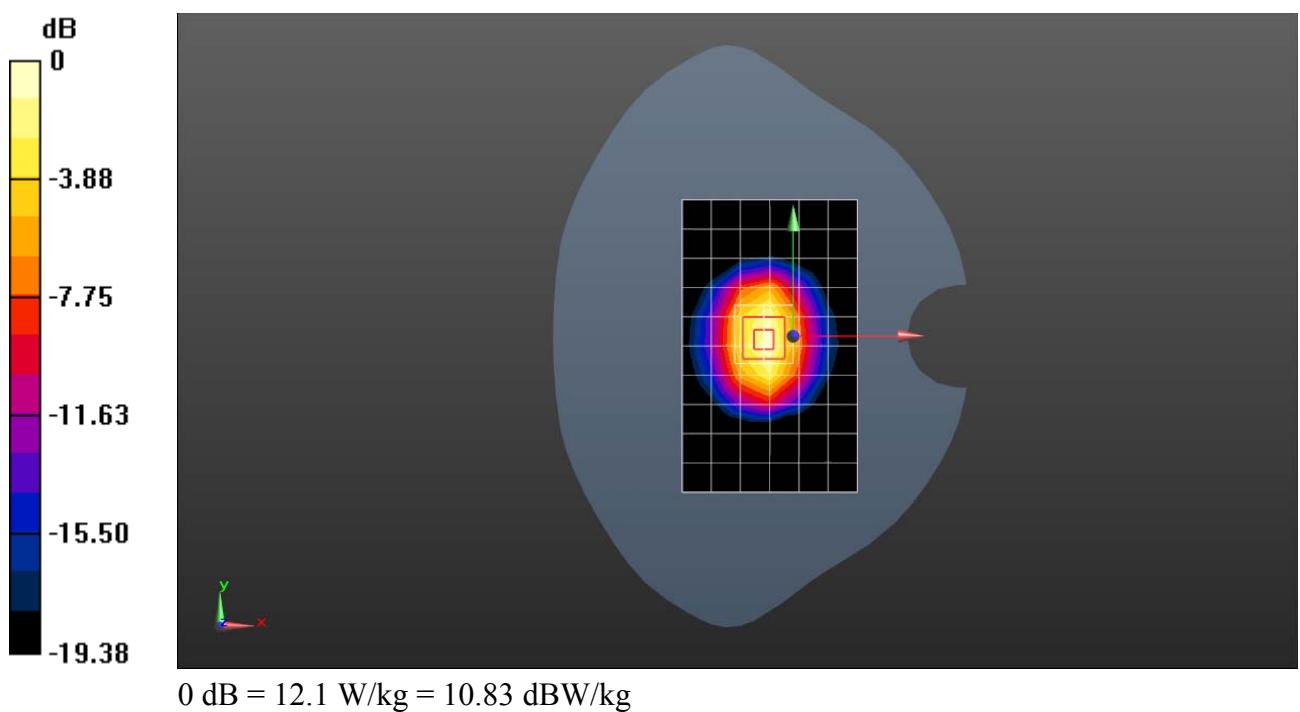
Medium: MSL1900; Medium parameters used: $f = 1900$ MHz; $\sigma = 1.551$ S/m; $\epsilon_r = 51.921$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Body/d=10mm, Pin=250mW/Area Scan (7x11x1): Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 11.4 W/kg

Body/d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
 $dx=5$ mm, $dy=5$ mm, $dz=5$ mm
Reference Value = 87.68 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 21.4 W/kg
SAR(1 g) = 10.8 W/kg; SAR(10 g) = 5.46 W/kg
Maximum value of SAR (measured) = 12.1 W/kg





Appendix B

Detailed Test Results

| |
|------------------|
| 1. GSM |
| GSM835 for Body |
| GSM1900 for Body |

Test Laboratory: SGS-SAR Lab

G-427G GSM850 GPRS 2TS 251CH Front Side 0mm

DUT: G-427G; Type: Blood Glucose Monitoring System; Serial: NA

Communication System: UID 0, GPRS/EGPRS Mode(2up) Communication System (0); Frequency: 848.6 MHz; Duty Cycle: 1:4.14954

Medium: MSL835; Medium parameters used: $f = 849$ MHz; $\sigma = 0.996$ S/m; $\epsilon_r = 54.042$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(10.16, 10.16, 10.16); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (6x10x1): Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 1.56 W/kg

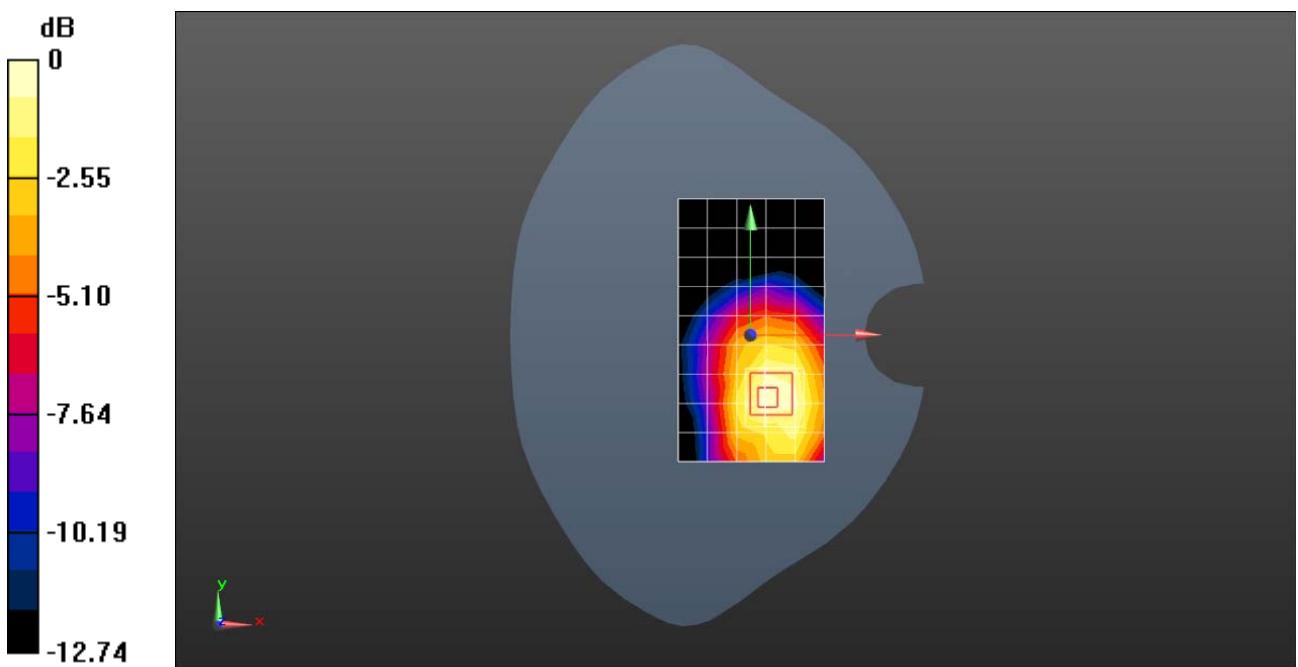
Configuration/Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 26.87 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 2.13 W/kg

SAR(1 g) = 1.47 W/kg; SAR(10 g) = 1.03 W/kg

Maximum value of SAR (measured) = 1.57 W/kg



Test Laboratory: SGS-SAR Lab

G-427G GSM11900 GPRS 2TS 810CH Front Side 0mm

DUT: G-427G; Type: Blood Glucose Monitoring System; Serial: NA

Communication System: UID 0, GPRS/EGPRS Mode(2up) Communication System (0); Frequency: 1909.8 MHz; Duty Cycle: 1:4.14954

Medium: MSL1900; Medium parameters used: $f = 1910$ MHz; $\sigma = 1.578$ S/m; $\epsilon_r = 53.315$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY 5 Configuration:

- Probe: EX3DV4 - SN3962; ConvF(8.2, 8.2, 8.2); Calibrated: 2015-11-27;
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = 1.0, 31.0$
- Electronics: DAE3 Sn569; Calibrated: 2015-11-24
- Phantom: SAM 1; Type: SAM V4.0; Serial: TP-1283
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Configuration/Body/Area Scan (7x10x1): Measurement grid: $dx=15$ mm, $dy=15$ mm
Maximum value of SAR (measured) = 0.773 W/kg

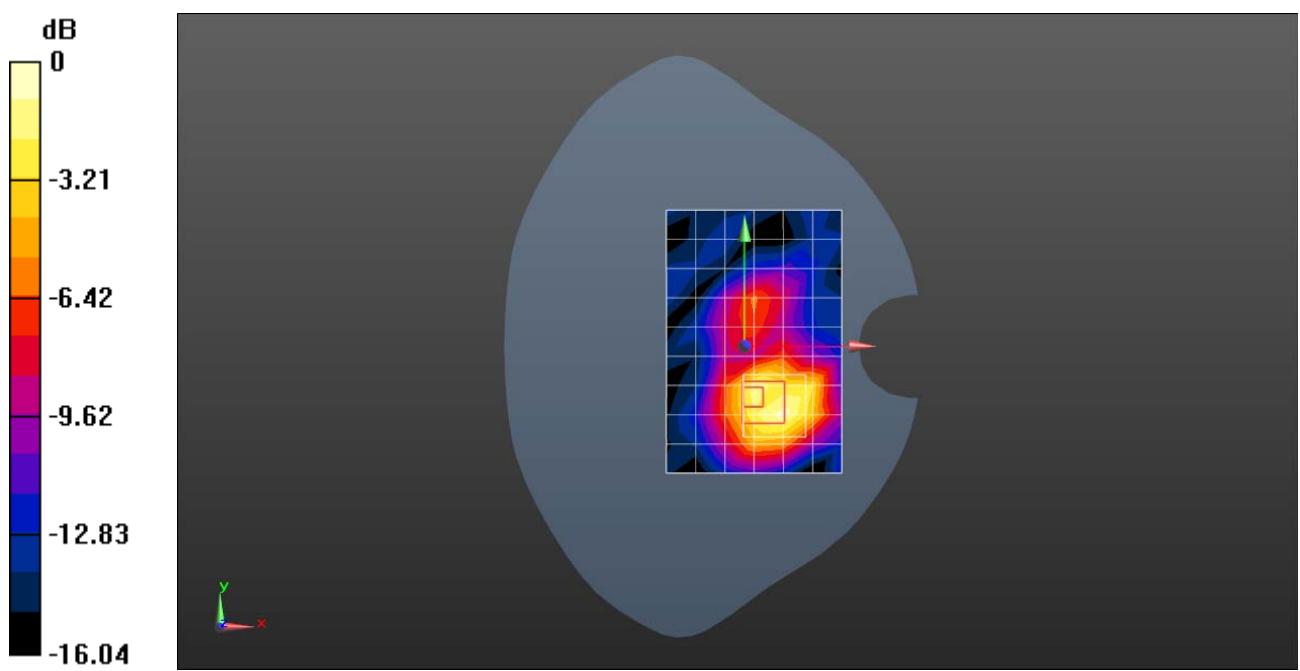
Configuration/Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8$ mm, $dy=8$ mm, $dz=5$ mm

Reference Value = 10.35 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.52 W/kg

SAR(1 g) = 0.707 W/kg; SAR(10 g) = 0.401 W/kg

Maximum value of SAR (measured) = 0.868 W/kg





Appendix C

Calibration certificate

| |
|------------------------------|
| 1. Dipole |
| D835V2-SN 4d105(2013-11-25) |
| D1900V2-SN 5d028(2013-11-27) |
| 2. DAE |
| DAE3-SN 569(2015-11-24) |
| 3. Probe |
| EX3DV4-SN 3962(2015-11-27) |



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **SGS-SZ (Auden)**

Certificate No: **D835V2-4d105_Nov13**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d105**

Calibration procedure(s) **QA CAL-05.v9**
 Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **November 25, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ES3DV3 | SN: 3205 | 28-Dec-12 (No. ES3-3205_Dec12) | Dec-13 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-15 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

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

Issued: November 26, 2013

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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%.

Measurement Conditions

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

| | | |
|-------------------------------------|------------------------|-------------|
| DASY Version | DASY5 | V52.8.7 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 835 MHz \pm 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|--|---------------------|----------------|----------------------|
| Nominal Head TSL parameters | 22.0 °C | 41.5 | 0.90 mho/m |
| Measured Head TSL parameters | (22.0 \pm 0.2) °C | 40.8 \pm 6 % | 0.94 mho/m \pm 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL

| | | |
|---|--------------------|--|
| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 2.50 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 9.64 W/kg \pm 17.0 % (k=2) |

| | | |
|---|--------------------|--|
| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 1.61 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 6.26 W/kg \pm 16.5 % (k=2) |

Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|--|---------------------|----------------|----------------------|
| Nominal Body TSL parameters | 22.0 °C | 55.2 | 0.97 mho/m |
| Measured Body TSL parameters | (22.0 \pm 0.2) °C | 54.7 \pm 6 % | 1.01 mho/m \pm 6 % |
| Body TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Body TSL

| | | |
|---|--------------------|--|
| SAR averaged over 1 cm³ (1 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 2.39 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 9.28 W/kg \pm 17.0 % (k=2) |

| | | |
|---|--------------------|--|
| SAR averaged over 10 cm³ (10 g) of Body TSL | condition | |
| SAR measured | 250 mW input power | 1.55 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 6.06 W/kg \pm 16.5 % (k=2) |

Appendix

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | 51.4 Ω - 4.1 $j\Omega$ |
| Return Loss | - 27.3 dB |

Antenna Parameters with Body TSL

| | |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | 46.9 Ω - 6.0 $j\Omega$ |
| Return Loss | - 23.1 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.395 ns |
|----------------------------------|----------|

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

| | |
|-----------------|--------------|
| Manufactured by | SPEAG |
| Manufactured on | May 26, 2010 |

DASY5 Validation Report for Head TSL

Date: 25.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d105

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.94$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

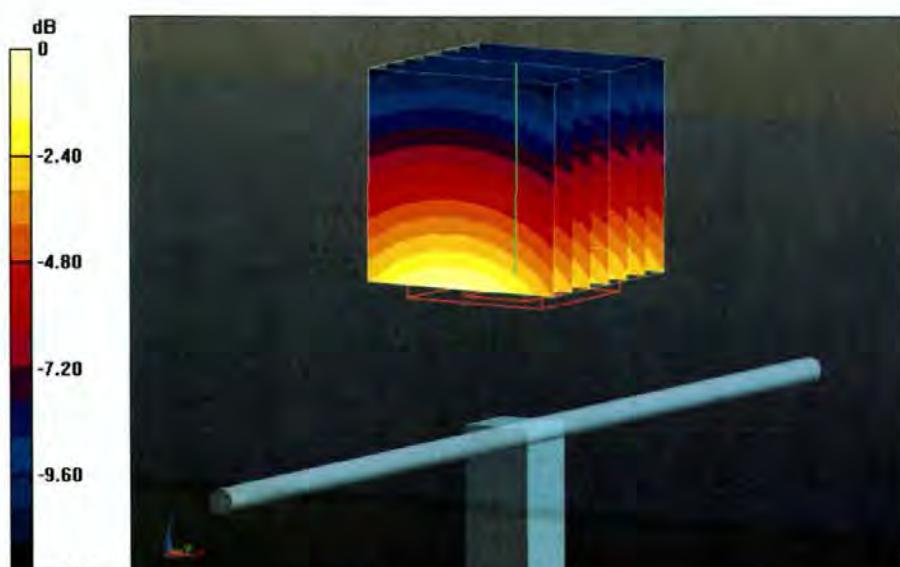
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.324 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 3.80 W/kg

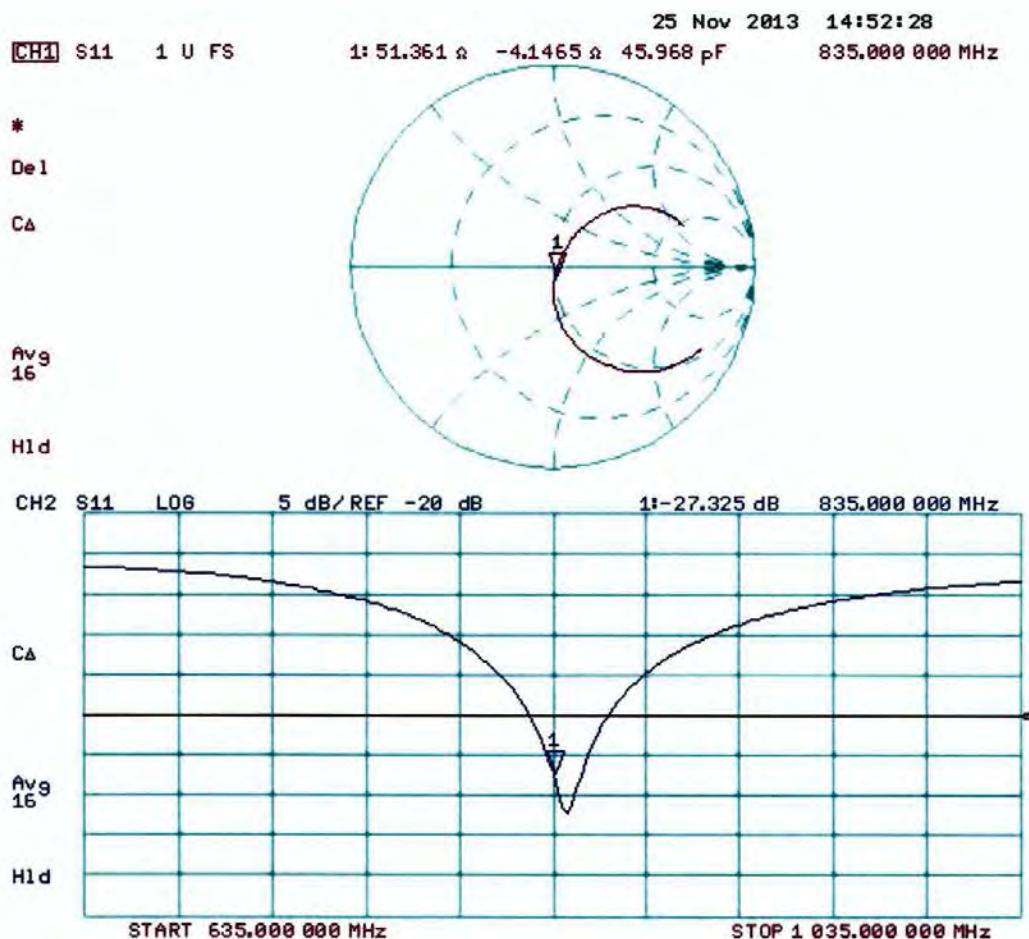
SAR(1 g) = 2.5 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 2.92 W/kg



0 dB = 2.92 W/kg = 4.65 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d105

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 1.007$ S/m; $\epsilon_r = 54.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

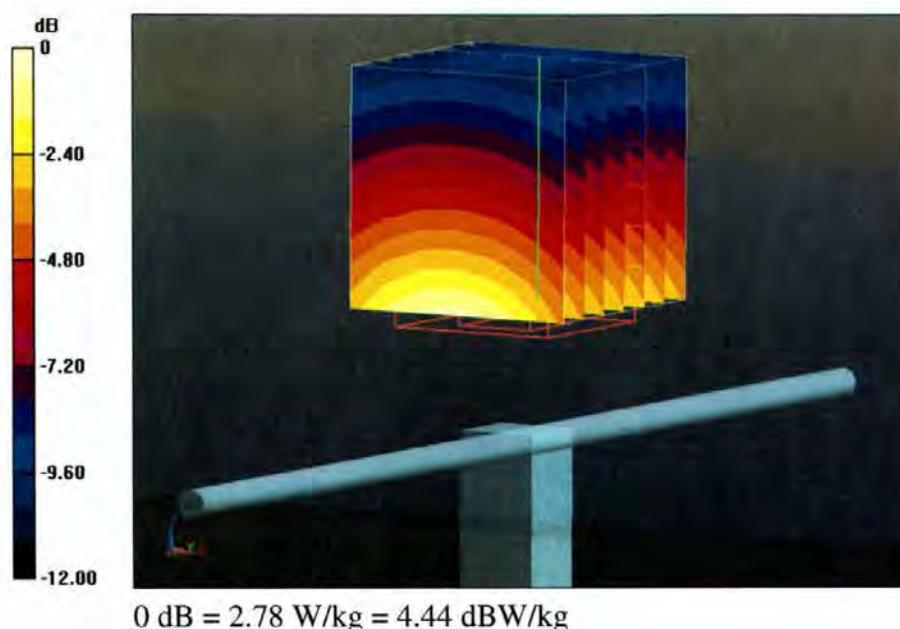
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.53 V/m; Power Drift = 0.00 dB

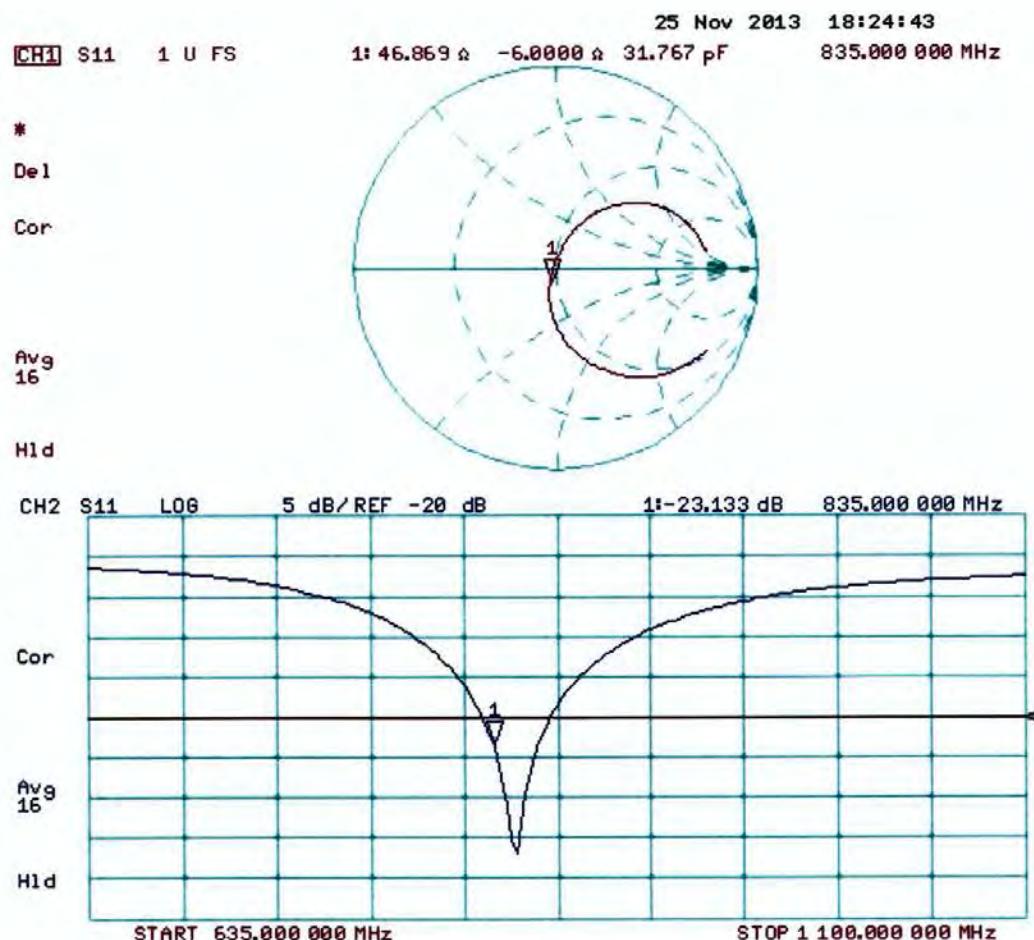
Peak SAR (extrapolated) = 3.53 W/kg

SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.55 W/kg

Maximum value of SAR (measured) = 2.78 W/kg



Impedance Measurement Plot for Body TSL



| Dipole Calibration for Impedance and Return-loss | | | | | |
|---|---------------|-------------|--------------------|-------------------|------------|
| Model NO.: | D835V2 | Serial NO.: | 4d015 | Measurement Date: | 2015-11-25 |
| Liquid Type | Target Value: | | Measured Value: | | verdict |
| | Impedance | Return Loss | Impedance | Return Loss | |
| Head | 51.4Ω-4.1jΩ | -27.3dB | 51.4Ω-3.3jΩ | -27.7dB | Complied |
| Body | 46.9Ω-6.0jΩ | -23.1dB | 46.9Ω-6.6jΩ | -23.7dB | Complied |
| Remark: According to KDB 865664 D01, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements: | | | | | |
| 1) The most recent return-loss result, measured at least annually, deviates by less than 20% from the previous measurement and meeting the required 20 dB minimum return-loss requirement. 2) The most recent measurement of the real and imaginary parts of the impedance, measured at least annually, deviates by less than 5 Ω from the previous measurement. | | | | | |
| Return Loss for Head | | | Impedance for Head | | |
| | | | | | |
| Return Loss for Body | | | Impedance for Body | | |
| | | | | | |



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Client

SGS-SZ (Auden)

Accreditation No.: **SCS 108**

Certificate No: **D1900V2-5d028_Nov13**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d028**

Calibration procedure(s) **QA CAL-05.v9**
 Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **November 27, 2013**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ES3DV3 | SN: 3205 | 28-Dec-12 (No. ES3-3205_Dec12) | Dec-13 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-15 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**




Issued: November 27, 2013

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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%.

Measurement Conditions

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

| | | |
|------------------------------|------------------------|-------------|
| DASY Version | DASY5 | V52.8.7 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 1900 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 40.0 | 1.40 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.8 ± 6 % | 1.39 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Head TSL

| | | |
|---|--------------------|--------------------------|
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 10.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 40.9 W/kg ± 17.0 % (k=2) |

| | | |
|---|--------------------|--------------------------|
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 5.33 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 21.4 W/kg ± 16.5 % (k=2) |

Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 53.3 | 1.52 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 53.4 ± 6 % | 1.51 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | ---- | ---- |

SAR result with Body TSL

| | | |
|---|--------------------|--------------------------|
| SAR averaged over 1 cm ³ (1 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 10.1 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 40.6 W/kg ± 17.0 % (k=2) |

| | | |
|---|--------------------|--------------------------|
| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 5.39 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 21.6 W/kg ± 16.5 % (k=2) |

Appendix

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $50.8 \Omega + 6.8 j\Omega$ |
| Return Loss | - 23.4 dB |

Antenna Parameters with Body TSL

| | |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $46.6 \Omega + 6.8 j\Omega$ |
| Return Loss | - 22.1 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.201 ns |
|----------------------------------|----------|

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

| | |
|-----------------|-------------------|
| Manufactured by | SPEAG |
| Manufactured on | December 17, 2002 |

DASY5 Validation Report for Head TSL

Date: 27.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d028

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.39 \text{ S/m}$; $\epsilon_r = 39.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

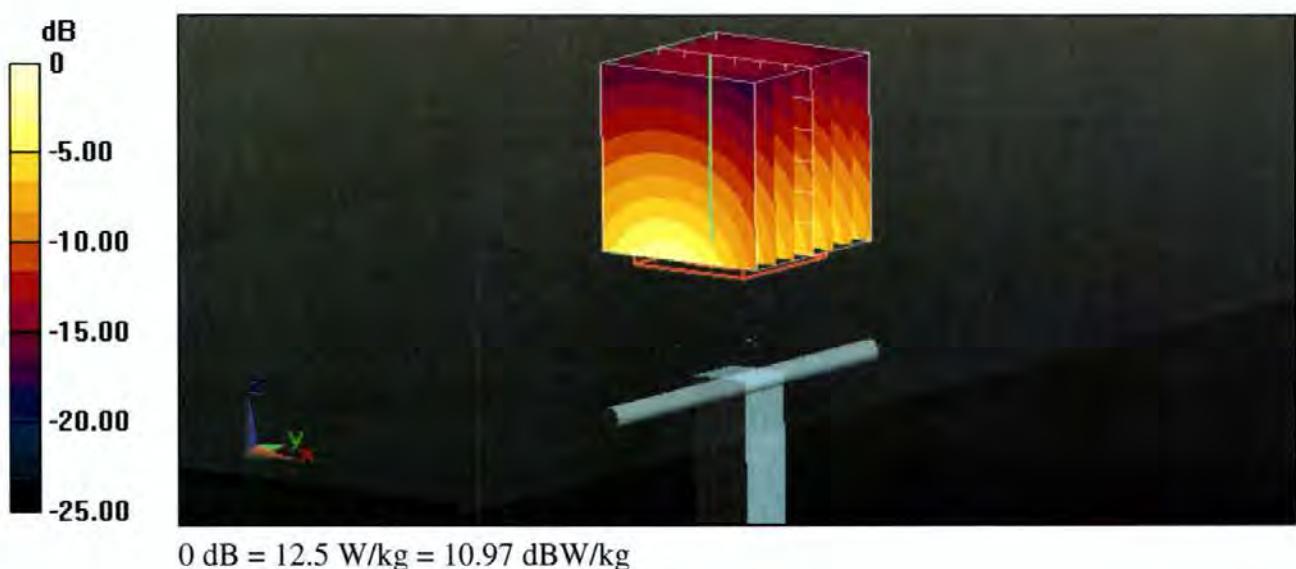
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 97.112 V/m; Power Drift = 0.06 dB

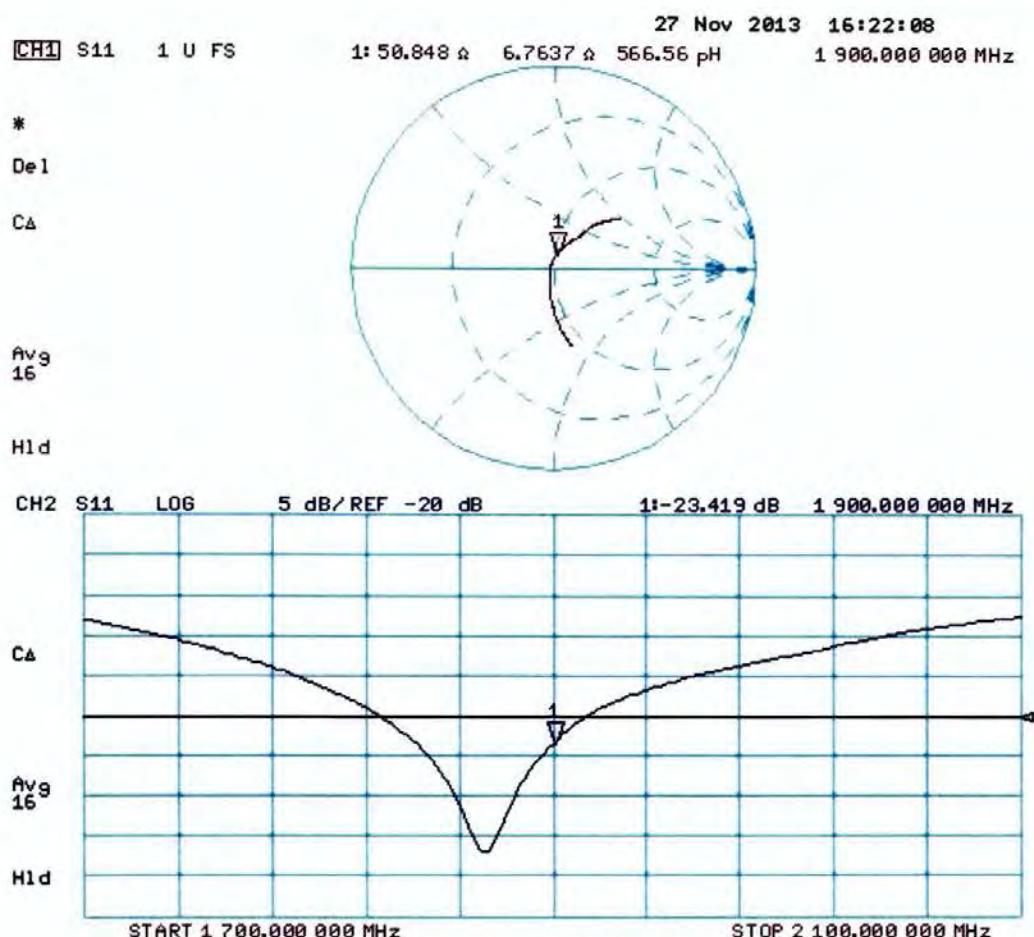
Peak SAR (extrapolated) = 18.6 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.33 W/kg

Maximum value of SAR (measured) = 12.5 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 27.11.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d028

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

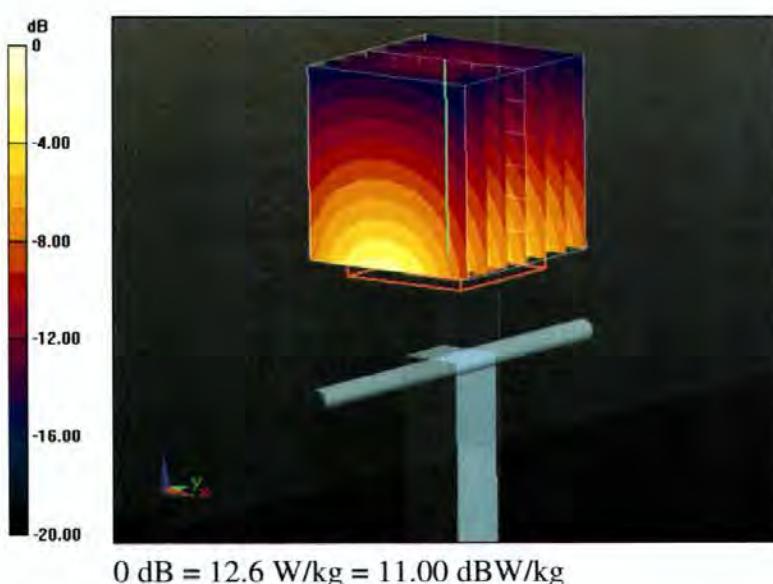
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.784 V/m; Power Drift = 0.01 dB

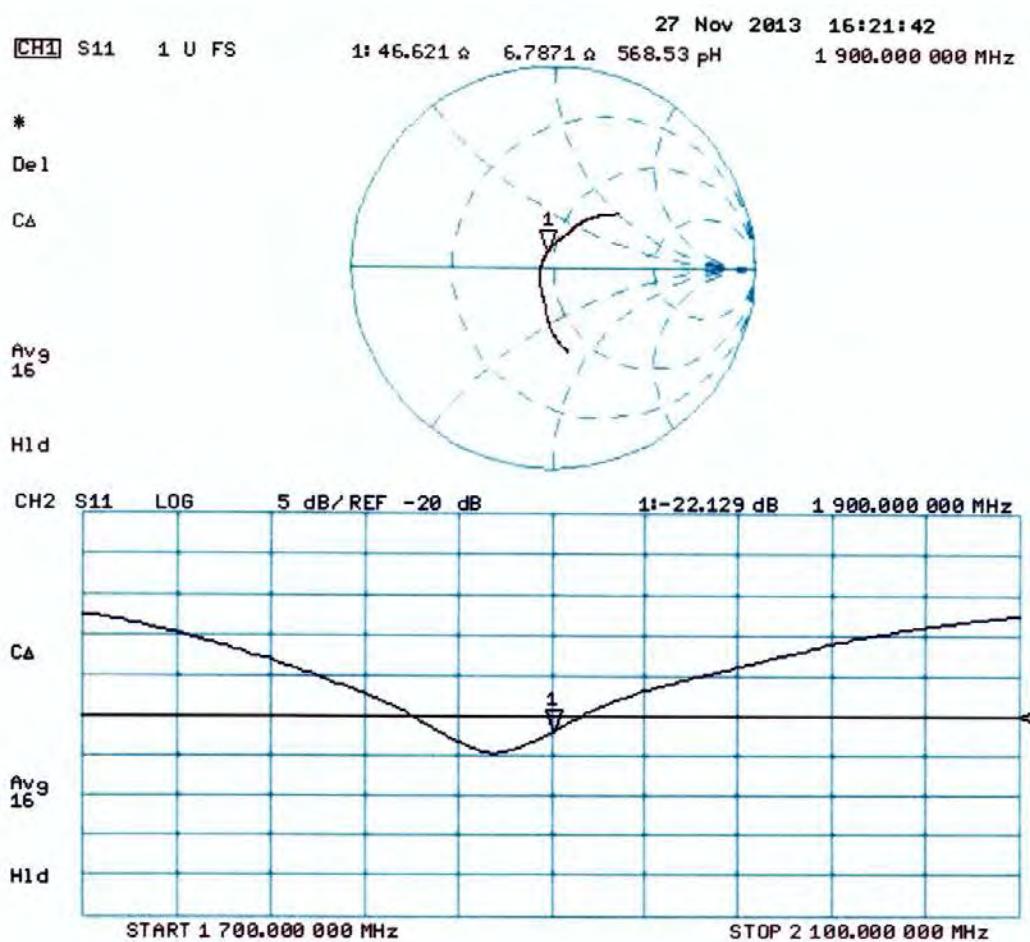
Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.39 W/kg

Maximum value of SAR (measured) = 12.6 W/kg



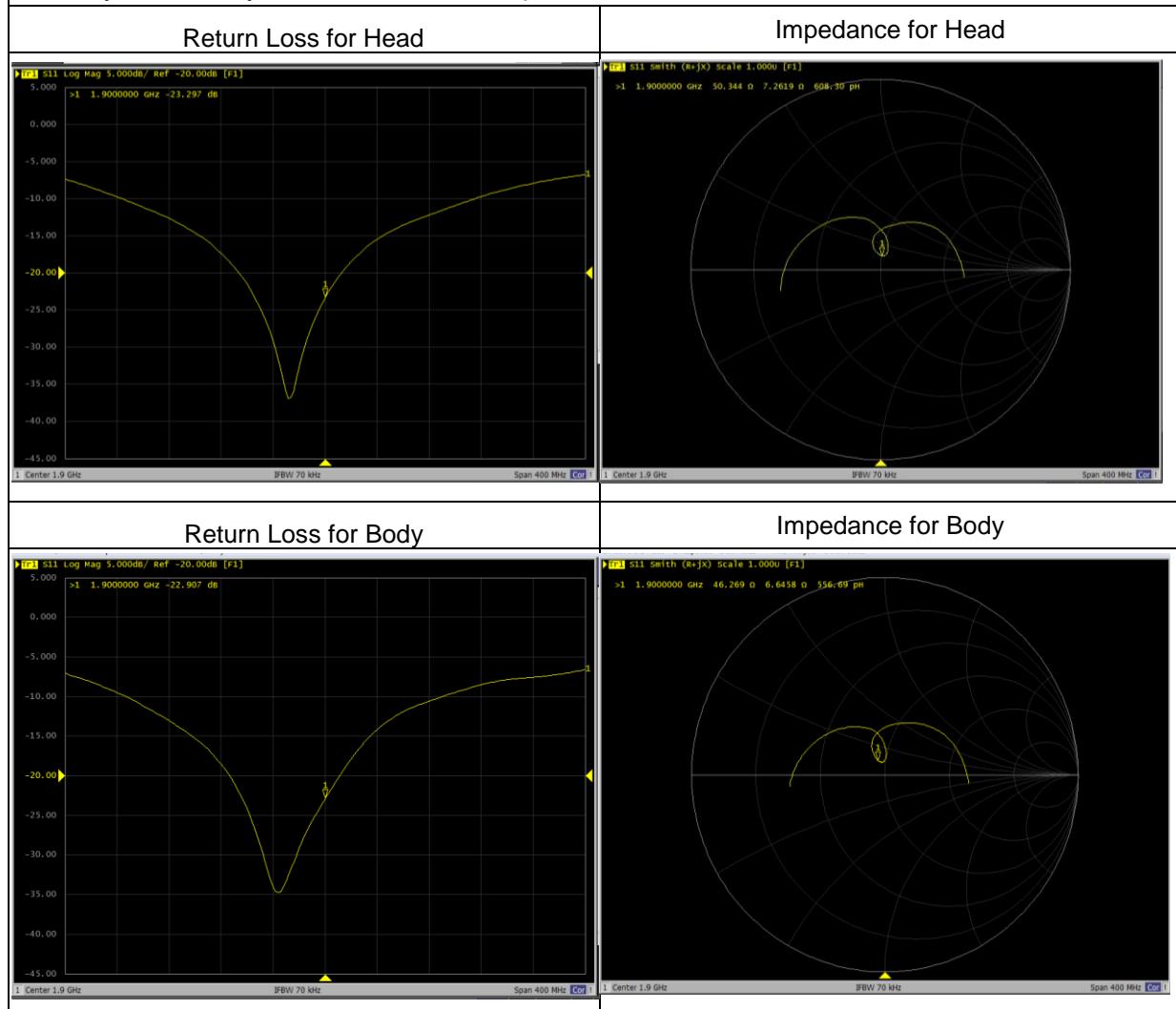
Impedance Measurement Plot for Body TSL



| Dipole Calibration for Impedance and Return-loss | | | | | |
|--|---------------|-------------|-----------------|-------------------|------------|
| Model NO.: | D1900V2 | Serial NO.: | 5d082 | Measurement Date: | 2015-11-25 |
| Liquid Type | Target Value: | | Measured Value: | | verdict |
| | Impedance | Return Loss | Impedance | Return Loss | |
| Head | 50.8Ω+6.8jΩ | -23.4dB | 50.3Ω+7.3jΩ | -23.3dB | Complied |
| Body | 46.6Ω+6.8jΩ | -22.1dB | 46.3Ω+6.6jΩ | -22.9dB | Complied |

Remark: According to KDB 865664 D01, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements:

- 1) The most recent return-loss result, measured at least annually, deviates by less than 20% from the previous measurement and meeting the required 20 dB minimum return-loss requirement.
- 2) The most recent measurement of the real and imaginary parts of the impedance, measured at least annually, deviates by less than 5 Ω from the previous measurement.



IMPORTANT NOTICE

USAGE OF THE DAE 3

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 DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply outmost caution not to bend or damage the connector when changing batteries.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration the customer shall 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 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 Estop failure, 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 M Ω 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.



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Accreditation No.: **SCS 0108**

Client **SGS-CN (Auden)**

Certificate No: **DAE3-569_Nov15**

CALIBRATION CERTIFICATE

Object **DAE3 - SD 000 D03 AA - SN: 569**

Calibration procedure(s) **QA CAL-06.v29**
 Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **November 24, 2015**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278 | 09-Sep-15 (No:17153) | Sep-16 |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
| Auto DAE Calibration Unit | SE UWS 053 AA 1001 | 06-Jan-15 (in house check) | In house check: Jan-16 |
| Calibrator Box V2.1 | SE UMS 006 AA 1002 | 06-Jan-15 (in house check) | In house check: Jan-16 |

| | | | |
|----------------|----------------------------------|-------------------------------|---------------|
| Calibrated by: | Name Dominique Steffen | Function Technician | Signature |
| Approved by: | Fin Bomholt | Deputy Technical Manager | |

Issued: November 24, 2015

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Accreditation No.: SCS 0108

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = $6.1\mu\text{V}$, full range = $-100...+300\text{ mV}$

Low Range: 1LSB = 61nV , full range = $-1.....+3\text{mV}$

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

| Calibration Factors | X | Y | Z |
|---------------------|------------------------------------|------------------------------------|------------------------------------|
| High Range | $403.011 \pm 0.02\% \text{ (k=2)}$ | $403.408 \pm 0.02\% \text{ (k=2)}$ | $403.566 \pm 0.02\% \text{ (k=2)}$ |
| Low Range | $3.92816 \pm 1.50\% \text{ (k=2)}$ | $3.96473 \pm 1.50\% \text{ (k=2)}$ | $3.93879 \pm 1.50\% \text{ (k=2)}$ |

Connector Angle

| | |
|---|---------------------------|
| Connector Angle to be used in DASY system | $250.5^\circ \pm 1^\circ$ |
|---|---------------------------|

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

| High Range | | Reading (µV) | Difference (µV) | Error (%) |
|------------|---------|--------------|-----------------|-----------|
| Channel X | + Input | 200038.63 | 1.85 | 0.00 |
| Channel X | + Input | 20002.22 | -2.58 | -0.01 |
| Channel X | - Input | -20005.78 | -0.13 | 0.00 |
| Channel Y | + Input | 200037.70 | 0.82 | 0.00 |
| Channel Y | + Input | 20006.11 | 1.41 | 0.01 |
| Channel Y | - Input | -20004.48 | 1.30 | -0.01 |
| Channel Z | + Input | 200037.10 | 0.46 | 0.00 |
| Channel Z | + Input | 20001.64 | -2.91 | -0.01 |
| Channel Z | - Input | -20004.65 | 1.21 | -0.01 |

| Low Range | | Reading (µV) | Difference (µV) | Error (%) |
|-----------|---------|--------------|-----------------|-----------|
| Channel X | + Input | 2001.49 | 0.54 | 0.03 |
| Channel X | + Input | 200.86 | 0.01 | 0.00 |
| Channel X | - Input | -199.57 | -0.47 | 0.24 |
| Channel Y | + Input | 2001.26 | 0.44 | 0.02 |
| Channel Y | + Input | 200.62 | -0.15 | -0.08 |
| Channel Y | - Input | -199.64 | -0.49 | 0.25 |
| Channel Z | + Input | 2000.84 | 0.00 | 0.00 |
| Channel Z | + Input | 198.77 | -1.91 | -0.95 |
| Channel Z | - Input | -200.55 | -1.29 | 0.65 |

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 | -0.03 | -1.43 |
| | -200 | 2.82 | 0.59 |
| Channel Y | 200 | 5.00 | 4.82 |
| | -200 | -6.64 | -6.42 |
| Channel Z | 200 | -12.60 | -13.12 |
| | -200 | 10.49 | 10.86 |

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 | - | 2.48 | -2.58 |
| Channel Y | 200 | 9.62 | - | 3.06 |
| Channel Z | 200 | 7.22 | 7.59 | - |

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 | 16201 | 16686 |
| Channel Y | 16541 | 15406 |
| Channel Z | 15797 | 16180 |

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 | 0.08 | -1.21 | 2.15 | 0.70 |
| Channel Y | -0.12 | -1.69 | 1.49 | 0.63 |
| Channel Z | -1.24 | -2.47 | 0.65 | 0.51 |

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

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
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Client **SGS-CN (Auden)**

Certificate No: **EX3-3962_Nov15**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3962**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5,
 QA CAL-25.v6
 Calibration procedure for dosimetric E-field probes**

Calibration date: **November 27, 2015**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B | GB41293874 | 01-Apr-15 (No. 217-02128) | Mar-16 |
| Power sensor E4412A | MY41498087 | 01-Apr-15 (No. 217-02128) | Mar-16 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 01-Apr-15 (No. 217-02129) | Mar-16 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132) | Mar-16 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133) | Mar-16 |
| Reference Probe ES3DV2 | SN: 3013 | 30-Dec-14 (No. ES3-3013_Dec14) | Dec-15 |
| DAE4 | SN: 660 | 14-Jan-15 (No. DAE4-660_Jan15) | Jan-16 |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Apr-13) | In house check: Apr-16 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

| Calibrated by: | Name | Function | Signature |
|----------------|-----------------|-----------------------|-----------|
| | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: November 27, 2015

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Glossary:

| | |
|------------------------|--|
| TSL | tissue simulating liquid |
| NORM _{x,y,z} | sensitivity in free space |
| ConvF | sensitivity in TSL / NORM _{x,y,z} |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A, B, C, D | 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., $\theta = 0$ is normal to probe axis |
| Connector Angle | information used in DASY system to align probe sensor X to the robot coordinate system |

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- 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
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- $NORM_{x,y,z}$: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). $NORM_{x,y,z}$ are only intermediate values, i.e., the uncertainties of $NORM_{x,y,z}$ does not affect the E^2 -field uncertainty inside TSL (see below $ConvF$).
- $NORM(f)x,y,z = NORM_{x,y,z} * frequency_response$ (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of $ConvF$.
- $DCP_{x,y,z}$: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR : PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- $A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}$: A, B, C, D 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 $NORM_{x,y,z} * ConvF$ whereby the uncertainty corresponds to that given for $ConvF$. A frequency dependent $ConvF$ is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle*: The angle is assessed using the information gained by determining the $NORM_x$ (no uncertainty required).

Probe EX3DV4

SN:3962

Manufactured: September 30, 2013
Calibrated: November 27, 2015

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3962

Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|----------|----------|----------|--------------|
| Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A | 0.43 | 0.46 | 0.44 | $\pm 10.1\%$ |
| DCP (mV) ^B | 98.6 | 100.1 | 89.0 | |

Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB $\sqrt{\mu\text{V}}$ | C | D dB | VR mV | Unc ^E (k=2) |
|-----|---------------------------|---|---------|------------------------------|-----|---------|----------|---------------------------|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 121.1 | $\pm 1.9\%$ |
| | | Y | 0.0 | 0.0 | 1.0 | | 128.9 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 120.6 | |

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 Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3962

Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) ^C | Relative Permittivity ^F | Conductivity (S/m) ^F | ConvF X | ConvF Y | ConvF Z | Alpha ^G | Depth ^G (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 450 | 43.5 | 0.87 | 11.00 | 11.00 | 11.00 | 0.15 | 1.30 | ± 13.4 % |
| 750 | 41.9 | 0.89 | 10.67 | 10.67 | 10.67 | 0.50 | 0.80 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 10.17 | 10.17 | 10.17 | 0.50 | 0.80 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.77 | 8.77 | 8.77 | 0.37 | 0.80 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.49 | 8.49 | 8.49 | 0.28 | 0.93 | ± 12.0 % |
| 2300 | 39.5 | 1.67 | 8.02 | 8.02 | 8.02 | 0.25 | 1.09 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.65 | 7.65 | 7.65 | 0.38 | 0.80 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 7.35 | 7.35 | 7.35 | 0.22 | 1.23 | ± 12.0 % |
| 5250 | 35.9 | 4.71 | 5.14 | 5.14 | 5.14 | 0.40 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.56 | 4.56 | 4.56 | 0.45 | 1.80 | ± 13.1 % |
| 5750 | 35.4 | 5.22 | 4.79 | 4.79 | 4.79 | 0.45 | 1.80 | ± 13.1 % |

^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3962

Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) ^C | Relative Permittivity ^F | Conductivity (S/m) ^F | ConvF X | ConvF Y | ConvF Z | Alpha ^G | Depth ^G (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 450 | 56.7 | 0.94 | 11.33 | 11.33 | 11.33 | 0.08 | 1.20 | ± 13.4 % |
| 750 | 55.5 | 0.96 | 10.41 | 10.41 | 10.41 | 0.50 | 0.80 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 10.16 | 10.16 | 10.16 | 0.50 | 0.80 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 8.49 | 8.49 | 8.49 | 0.32 | 0.88 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 8.20 | 8.20 | 8.20 | 0.33 | 0.89 | ± 12.0 % |
| 2300 | 52.9 | 1.81 | 7.96 | 7.96 | 7.96 | 0.39 | 0.80 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 7.70 | 7.70 | 7.70 | 0.38 | 0.80 | ± 12.0 % |
| 2600 | 52.5 | 2.16 | 7.63 | 7.63 | 7.63 | 0.37 | 0.80 | ± 12.0 % |
| 5250 | 48.9 | 5.36 | 4.15 | 4.15 | 4.15 | 0.50 | 1.90 | ± 13.1 % |
| 5600 | 48.5 | 5.77 | 3.61 | 3.61 | 3.61 | 0.60 | 1.90 | ± 13.1 % |
| 5750 | 48.3 | 5.94 | 3.70 | 3.70 | 3.70 | 0.60 | 1.90 | ± 13.1 % |

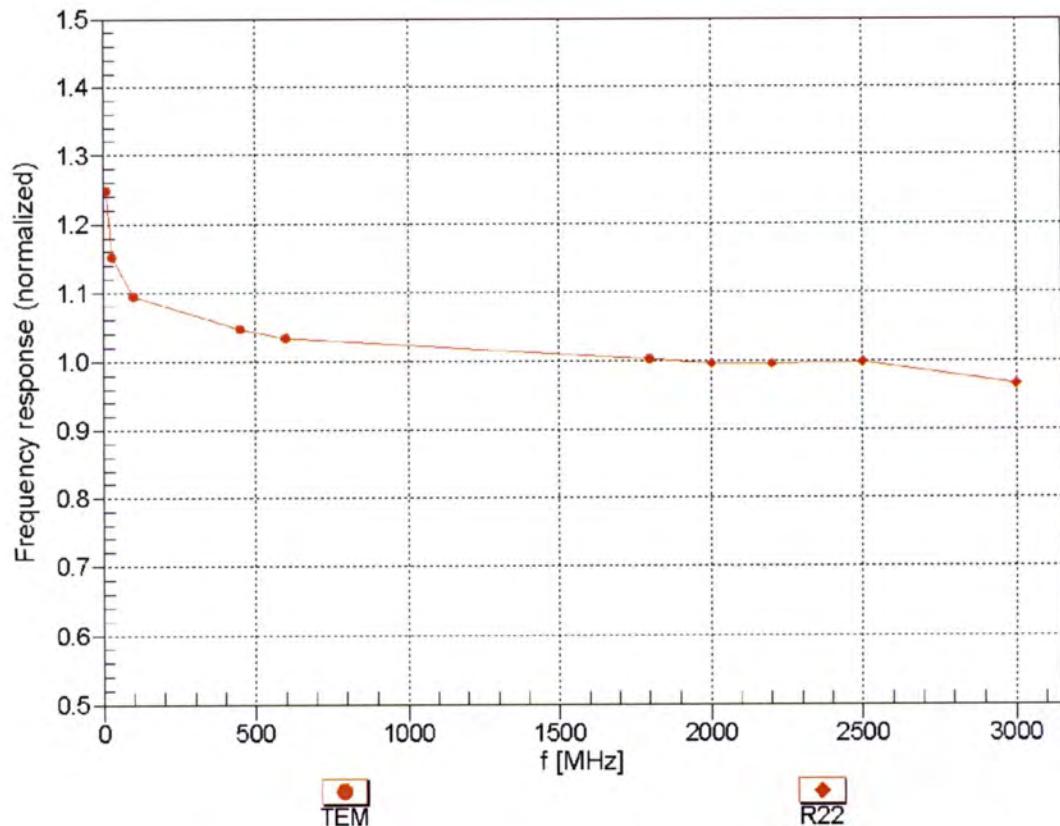
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

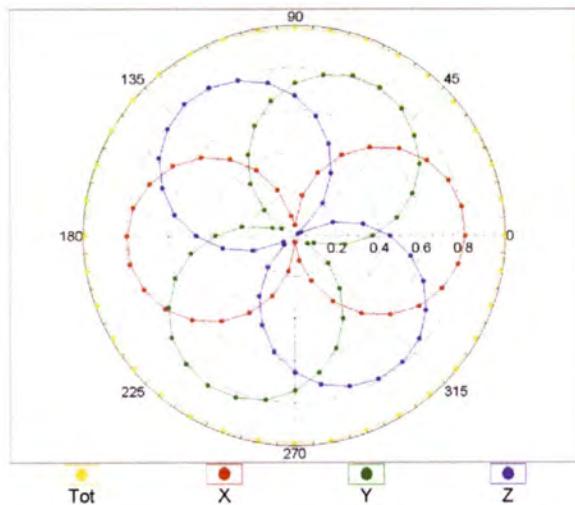
(TEM-Cell:ifi110 EXX, Waveguide: R22)



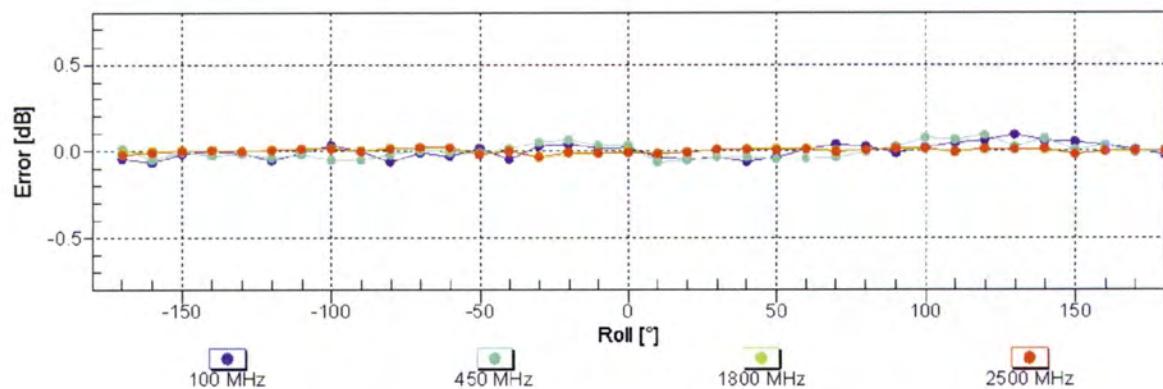
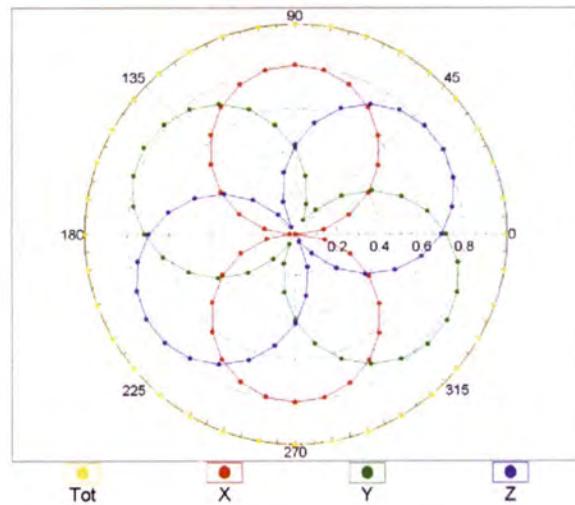
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

$f=450$ MHz, TEM

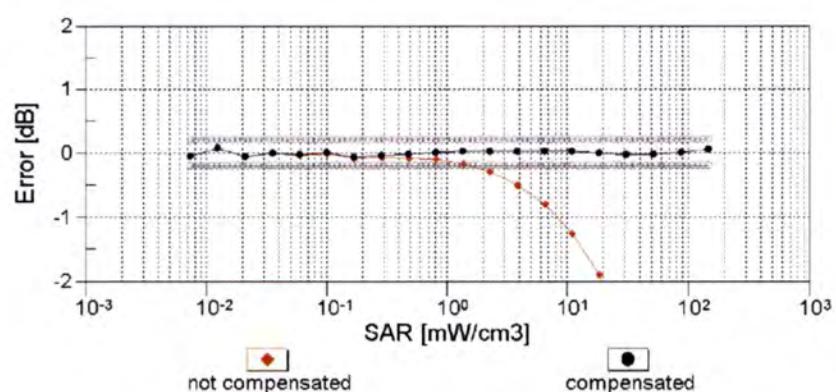
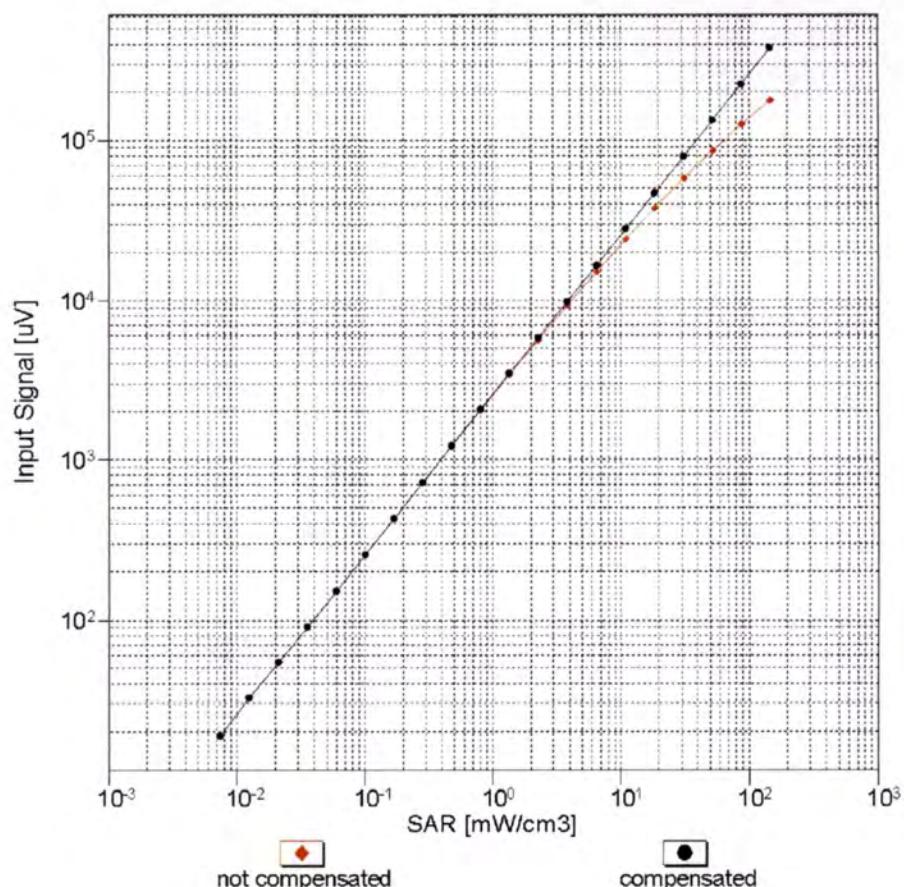


$f=1800$ MHz, R22



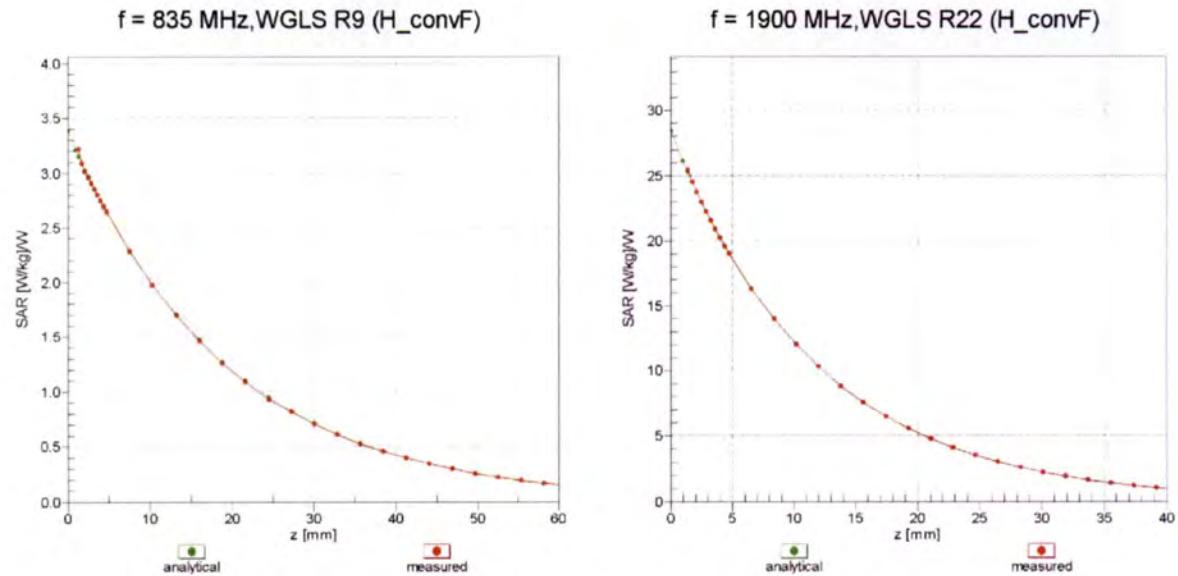
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head}) (TEM cell , f_{eval}= 1900 MHz)

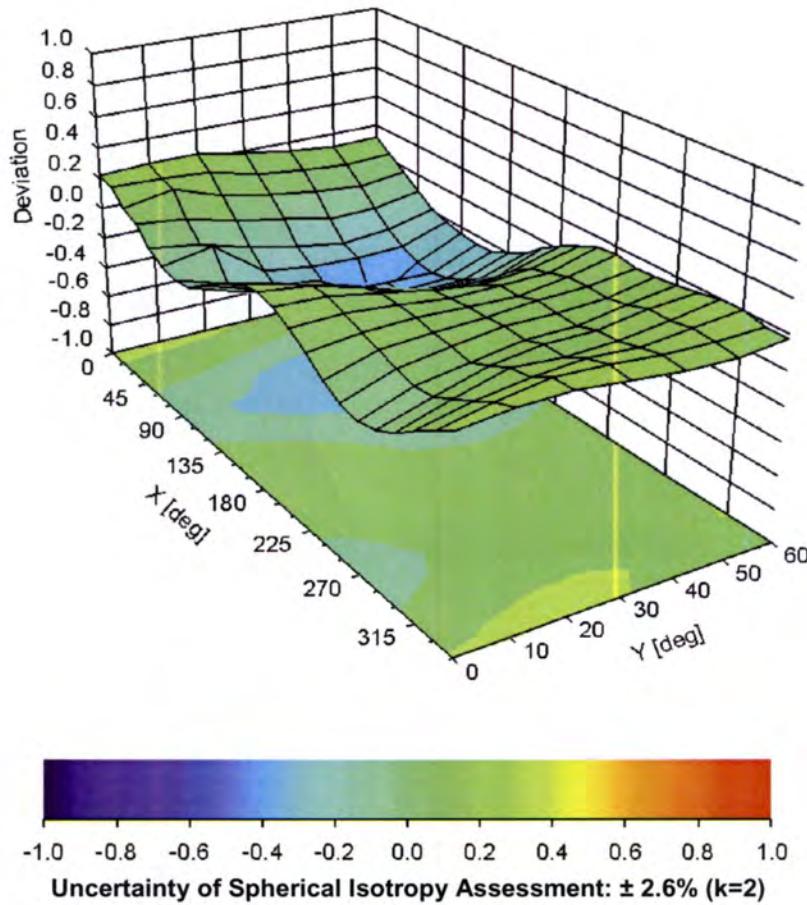


Uncertainty of Linearity Assessment: $\pm 0.6\% (k=2)$

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, θ), $f = 900$ MHz



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3962

Other Probe Parameters

| | |
|---|------------|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | -30.1 |
| 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 | 1.4 mm |

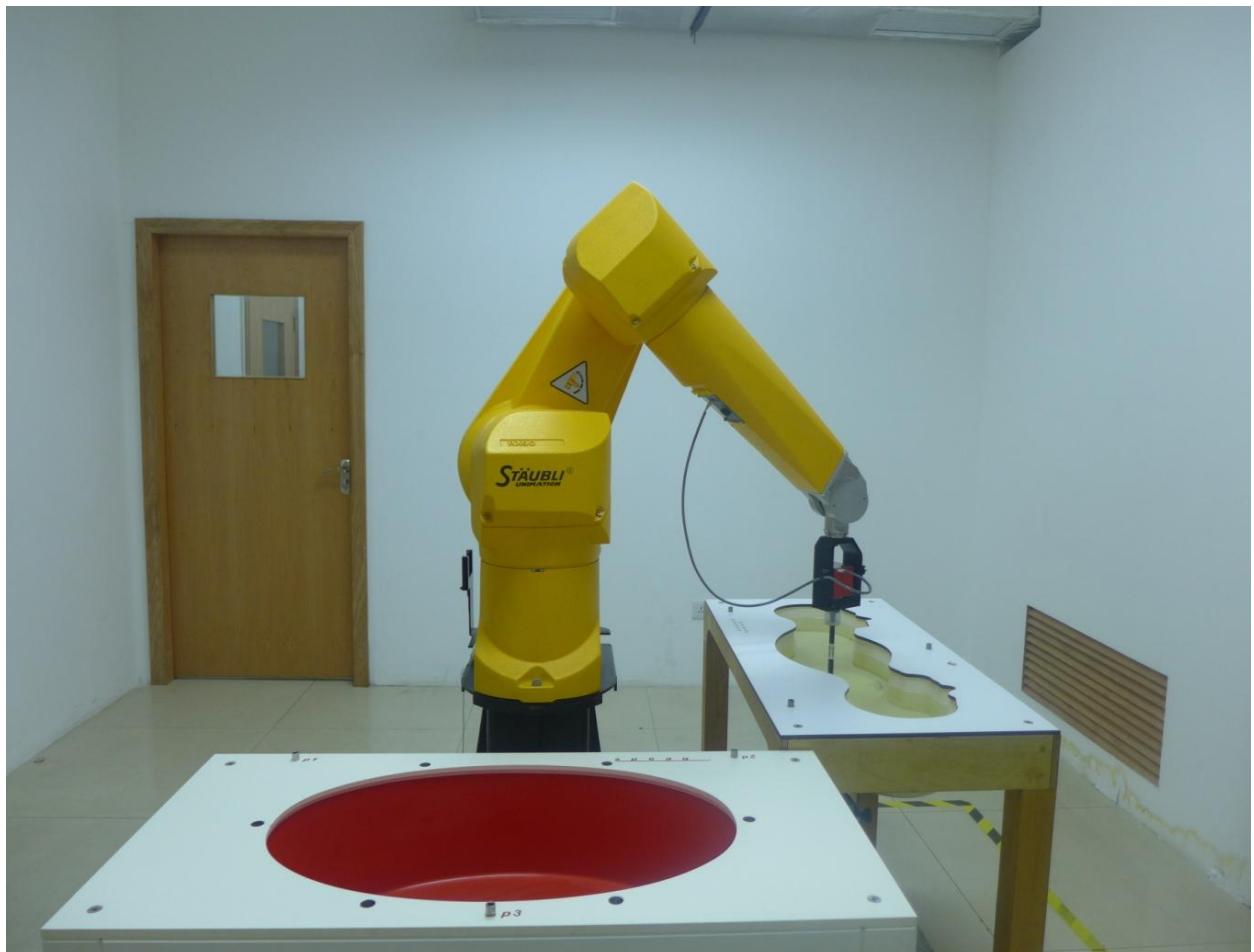


Appendix D

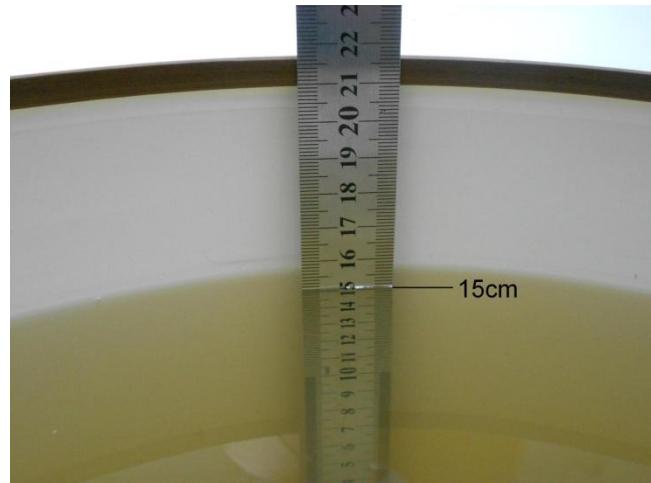
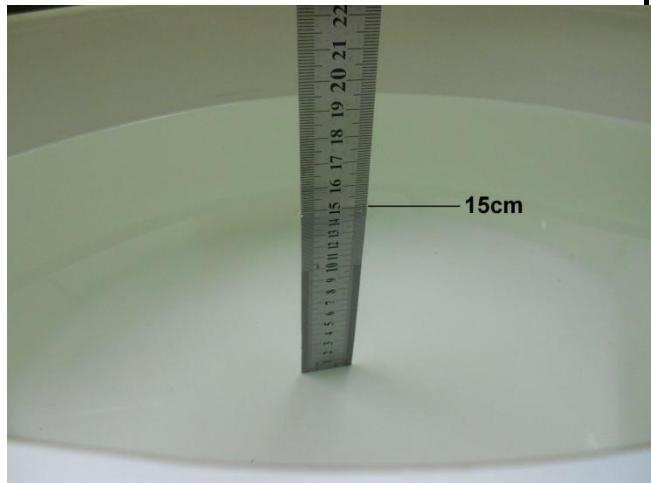
Photographs

| |
|--|
| 1. SAR measurement System |
| 2. Photographs of Tissue Simulate Liquid |
| 3. Photographs of EUT test position |
| 4. EUT Constructional Details |

1. SAR measurement System



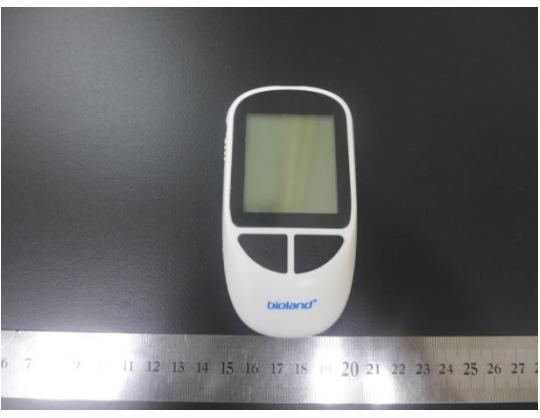
2. Photographs of Tissue Simulate Liquid

| Photo 1: Tissue Simulant Liquid for Body 835 | Photo 2: Tissue Simulant Liquid for Body 1900 |
|---|--|
|  A photograph showing a clear, yellowish-tinted liquid in a container. A vertical ruler is placed next to the container, with the measurement '15cm' marked on the ruler, indicating the height of the liquid. |  A photograph showing a clear, yellowish-tinted liquid in a container. A vertical ruler is placed next to the container, with the measurement '15cm' marked on the ruler, indicating the height of the liquid. |

3. Photographs of EUT test position

| | |
|--|--|
| Photo 3: Front Side 0mm | Photo 4: Back Side 0mm |
|  A photograph showing the front side of a device under test (DUT) positioned 0mm from a vertical reference plane. The DUT is held by a black mechanical fixture and is illuminated by a bright light source above it. |  A photograph showing the back side of the DUT positioned 0mm from a vertical reference plane. The DUT is held by a black mechanical fixture and is illuminated by a bright light source above it. |
| Photo 5: Left Side 0mm | Photo 6: Right Side 0mm |
|  A photograph showing the left side of the DUT positioned 0mm from a vertical reference plane. The DUT is held by a black mechanical fixture and is illuminated by a bright light source above it. |  A photograph showing the right side of the DUT positioned 0mm from a vertical reference plane. The DUT is held by a black mechanical fixture and is illuminated by a bright light source above it. |
| Photo 7: Top Side 0mm | Photo 8: Bottom Side 0mm |
|  A photograph showing the top side of the DUT positioned 0mm from a vertical reference plane. The DUT is held by a black mechanical fixture and is illuminated by a bright light source above it. |  A photograph showing the bottom side of the DUT positioned 0mm from a vertical reference plane. The DUT is held by a black mechanical fixture and is illuminated by a bright light source above it. |

4. EUT Constructional Details

| Photo 9: Front View | Photo 10: Back View |
|--|--|
|  A photograph showing the front view of a white digital glucose meter. The device has a rectangular shape with a small digital display screen at the top, two blue buttons below the screen, and the brand name "bioland" printed at the bottom. It is positioned next to a metric ruler for scale, with markings visible from 6 to 27. |  A photograph showing the back view of the same white digital glucose meter. The device is oriented vertically, showing a small circular hole near the top. A metric ruler is placed below the device for scale, with markings visible from 7 to 26. |