
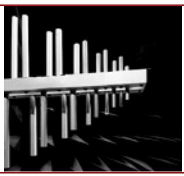
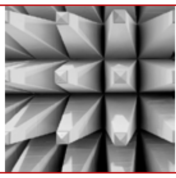

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# TEST REPORT

**Test Report No.: 1-6824/13-01-02-B**

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

## Testing Laboratory


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**Accredited Test Laboratory:**
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01

## Applicant

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## Manufacturer

**Electrosuisse Albislab**
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8047 Zürich /SWITZERLAND

## Test Standard/s

| | |
|---|---|
| IEEE 1528-2003 | Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR)in the Human Head from Wireless Communications Devices: Measurement Techniques |
| RSS-102 Issue 4 | Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |

For further applied test standards please refer to section 3 of this test report.

## Test Item

| | |
|---|---|
| Kind of test item: | Emergency Watch |
| Device type: | portable device |
| **Model name:** | **LM15US0001** |
| S/N serial number: | 19995 |
| FCC-ID: | 2AA5J15US0001 |
| IC-ID: | 11484A-15US0001 |
| Pre-Certified Module: | Telit, GE865-QUAD HW: 3; SW: 10.00.004 |
| IMEI-Number: | 357322042743218 |
| Hardware status: | 1.5 US |
| Software status: | 2172 |
| Firmware version: | 10.00.004 |
| Frequency: | see technical details |
| Antenna: | integrated antenna (-7dBi / -3dBi Gain) |
| Battery option: | integrated battery |
| Accessories: | --- |
| Test sample status: | identical prototype |
| Exposure category: | general population / uncontrolled environment |

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

**Test Report authorised:**

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Marco Scigliano
Expert

# 1 Table of contents

# 2 General information

## 2.1 Notes and disclaimer

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## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2013-09-23 |
| Date of receipt of test item: | 2013-10-15 |
| Start of test: | 2013-10-15 |
| End of test: | 2013-10-22 |
| Person(s) present during the test: | |

## 2.3 Statement of compliance

The SAR values found for the LM15US0001 Emergency Watch are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1 g tissue according to the FCC rule §2.1093, the ANSI/IEEE C 95.1:1992, the NCRP Report Number 86 for uncontrolled environment, according to the Health Canada's Safety Code 6 and the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure.

## 2.4 Technical details

| Band tested for this test report | Technology | Lowest transmit frequency/MHz | Highest transmit frequency/MHz | Lowest receive Frequency/MHz | Highest receive Frequency/MHz | Kind of modulation | Power Class | Tested power control level | GPRS mobile station class | GPRS/EGPRS multislot class | (E)GPRS voice mode or DTM | Test channel low | Test channel middle | Test channel high | Maximum output power/dBm )* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☐ | GSM | 880.2 | 914.8 | 925.2 | 959.8 | GMSK | 4 | 5 | B | 10 | no | 975 | 37 | 124 | --- |
| ☐ | GSM DCS | 1710.2 | 1784.8 | 1805.2 | 1879.8 | GMSK | 1 | 0 | B | 10 | no | 512 | 698 | 885 | --- |
| ☒ | GSM cellular | 824.2 | 848.8 | 869.2 | 893.8 | GMSK | 4 | 5 | B | 10 | no | 128 | 190 | 251 | 32.1 |
| ☒ | GSM PCS | 1850.2 | 1909.8 | 1930.2 | 1989.8 | GMSK | 1 | 0 | B | 10 | no | 512 | 661 | 810 | 29.9 |

)*: measured slotted peak power for GSM

## 3 Test standards/ procedures references

| Test Standard | Version | Test Standard Description |
|---|---|---|
| IEEE 1528-2003 | 2003-04 | Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques |
| RSS-102 Issue 4 | 2010-03 | Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |
| Canada's Safety Code No. 6 | 99-EHD-237 | Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz |
| IEEE Std. C95-3 | 2002 | IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave |
| IEEE Std. C95-1 | 1992 | IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. |
| IEC 62209-2 | 2010 | Human exposure to radio frequency fields from hand-held and bodymounted wireless communication devices. Human models, instrumentation, and procedures. 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) |

FCC KDBs:

| | | |
|---|---|---|
| KDB 865664D01v01 | May 28, 2013 | FCC OET SAR measurement requirements 100 MHz to 6 GHz |
| KDB 865664D02v01 | May 28, 2013 | RF Exposure Compliance Reporting and Documentation Considerations |
| KDB 447498D01v05 | May 28, 2013 | Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies |
| KDB 648474D04v01 | May 28, 2013 | SAR Evaluation Considerations for Wireless Handsets |
| KDB 941225D03v01 | December, 2008 | SAR Test Reduction Procedure for GSM/GPRS/EDGE |
| KDB 450824D01v01 | January, 2007 | SAR Probe Calibration and System Verification considerations for measurements from 150 MHz to 3 GHz |
| KDB 450824D01v01 | March 4, 2012 | Dipole Requirements for SAR System Validation and Verification |

## 3.1 RF exposure limits

| Human Exposure | Uncontrolled Environment General Population | Controlled Environment Occupational |
|---|---|---|
| Spatial Peak SAR* (Brain and Trunk) | **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 |

Table 1: RF exposure limits

The limit applied in this test report is shown in bold letters

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).

## 4 Summary of Measurement Results

| | |
|---|---|
| ☒ | **No deviations from the technical specifications ascertained** |
| ☐ | Deviations from the technical specifications ascertained |

**Maximum SAR value reported (W/kg)**

| | PCE | DTS | UNII |
|---|---|---|---|
| **Extremities for 10g** | **0.407** | **---** | **---** |
| **Next to the mouth with 10mm distance for 1g** | **0.337** | **---** | **---** |

## 5 Test Environment

Ambient temperature: 20 – 24 °C
Tissue Simulating liquid: 20 – 24 °C

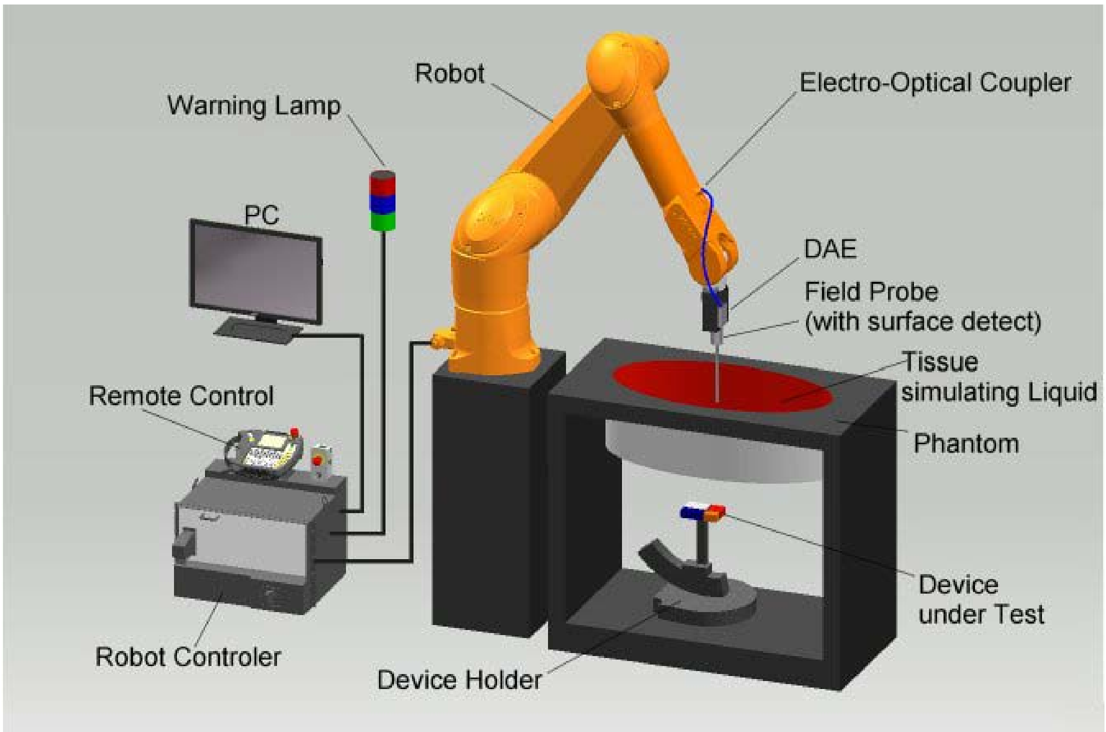
Relative humidity content: 40 – 50 %
Air pressure: not relevant for this kind of testing
Power supply: 230 V / 50 Hz

Exact temperature values for each test are shown in the table(s) under 7.1 and/or on the measurement plots.

# 6 Test Set-up

## 6.1 Measurement system

### 6.1.1 System Description




- The DASY system for performing compliance tests consists of the following items:
- A standard high precision 6-axis robot (Stäubli RX/TX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid.
- A data acquisition electronic (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 Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY measurement server.
- The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7.
- DASY software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The triple flat and eli phantom for the testing of handheld and body-mounted wireless devices.
- The device holder for handheld mobile phones and mounting device adaptor for laptops
- Tissue simulating liquid mixed according to the given recipes.
- System check dipoles allowing to validate the proper functioning of the system.

### 6.1.2 Test environment

The DASY measurement system is placed in a laboratory room within an environment which avoids influence on SAR measurements by ambient electromagnetic fields and any reflection from the environment. The pictures at the beginning of the photo documentation show a complete view of the test environment. The system allows the measurement of SAR values larger than 0.005 mW/g.

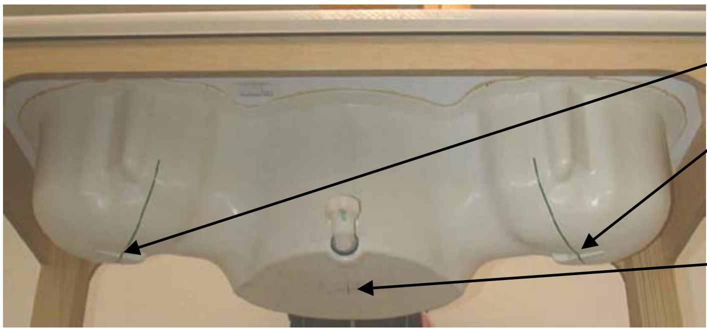
### 6.1.3 Probe description

Isotropic E-Field Probe ET3DV6 for Dosimetric Measurements

| Technical data according to manufacturer information | |
|---|---|
| Construction | Symmetrical design with triangular core<br>Built-in optical fiber for surface detection system<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., glycolether) |
| Calibration | In air from 10 MHz to 2.5 GHz<br>In head tissue simulating liquid (HSL) at 900 (800-1000) MHz and 1.8 GHz (1700-1910 MHz) (accuracy ± 9.5%; k=2) Calibration for other liquids and frequencies upon request |
| Frequency | 10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz) |
| Directivity | ± 0.2 dB in HSL (rotation around probe axis)<br>± 0.4 dB in HSL (rotation normal to probe axis) |
| Dynamic range | 5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB |
| Optical Surface Detection | ± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces (ET3DV6 only) |
| Dimensions | Overall length: 330 mm<br>Tip length: 16 mm<br>Body diameter: 12 mm<br>Tip diameter: 6.8 mm<br>Distance from probe tip to dipole centers: 2.7 mm |
| Application | General dosimetry up to 3 GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms (ET3DV6) |

## 6.1.4 Phantom description

The used SAM Phantom meets the requirements specified in Edition 01-01 of Supplement C to OET Bulletin 65 for Specific Absorption Rate (SAR) measurements.
The phantom consists of a fibreglass shell integrated in a wooden table. It allows left-hand and right-hand head as well as body-worn measurements with a maximum liquid depth of 18 cm in head position and 22 cm in planar position (body measurements). The thickness of the Phantom shell is 2 mm +/- 0.1 mm.




Triple Modular Phantom consists of tree identical modules which can be installed and removed separately without emptying the liquid. It includes three reference points for phantom installation. Covers prevent evaporation of the liquid. Phantom material is resistant to DGBE based tissue simulating liquids.

## 6.1.5 Device holder description

The DASY device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.

Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.
Therefore those devices are normally only tested at the flat part of the SAM.

### 6.1.6 Scanning procedure

- The DASY installation includes predefined files with recommended procedures for measurements and system check. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- 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. The indicated drift is mainly the variation of the DUT’s output power and should vary max. +/- 5 %.

- The highest integrated SAR value is the main concern in compliance test applications. These values can mostly be found at the inner surface of the phantom and cannot be measured directly due to the sensor offset in the probe. To extrapolate the surface values, the measurement distances to the surface must be known accurately. A distance error of 0.5mm could produce SAR errors of 6% at 1800 MHz. Using predefined locations for measurements is not accurate enough. Any shift of the phantom (e.g., slight deformations after filling it with liquid) would produce high uncertainties. For an automatic and accurate detection of the phantom surface, the DASY5 system uses the mechanical surface detection. The detection is always at touch, but the probe will move backward from the surface the indicated distance before starting the measurement.

- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The scan uses different grid spacings for different frequency measurements. Standard grid spacing for head measurements in frequency ranges ≤ 2GHz is 15 mm in x- and y-dimension. For higher frequencies a finer resolution is needed, thus for the grid spacing is reduced according the following table:

  | **Area scan grid spacing for different frequency ranges** | |
  |---|---|
  | Frequency range | Grid spacing |
  | ≤ 2 GHz | ≤ 15 mm |
  | 2 – 4 GHz | ≤ 12 mm |
  | 4 – 6 GHz | ≤ 10 mm |

  Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in annex B.

- A „zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. It uses a fine meshed grid where the robot moves the probe in steps along all the 3 axis (x,y and z-axis) starting at the bottom of the Phantom. The grid spacing for the cube measurement is varied according to the measured frequency range, the dimensions are given in the following table:

  | **Zoom scan grid spacing and volume for different frequency ranges** | | | |
  |---|---|---|---|
  | Frequency range | Grid spacing for x, y axis | Grid spacing for z axis | Minimum zoom scan volume |
  | ≤ 2 GHz | ≤ 8 mm | ≤ 5 mm | ≥ 30 mm |
  | 2 – 3 GHz | ≤ 5 mm | ≤ 5 mm | ≥ 28 mm |
  | 3 – 4 GHz | ≤ 5 mm | ≤ 4 mm | ≥ 28 mm |
  | 4 – 5 GHz | ≤ 4 mm | ≤ 3 mm | ≥ 25 mm |
  | 5 – 6 GHz | ≤ 4 mm | ≤ 2 mm | ≥ 22 mm |

  DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in annex B. Test results relevant for the specified standard (see section 3) are shown in table form in section 7.

## 6.1.7 Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of all points in the three directions x, y and z. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 1 to 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.

- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.

- All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

### Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

### Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff ].

### Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

### Advanced Extrapolation

DASY uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

### 6.1.8 Data Storage and Evaluation

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 ".DA4", ".DA5x". 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], [mW/g], [mW/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.

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 | $Norm_i$, $a_{i0}$, $a_{i1}$, $a_{i2}$ |
| | - Conversion factor | $ConvF_i$ |
| | - Diode compression point | Dcpi |
| Device parameters: | - Frequency | f |
| | - Crest factor | cf |
| Media parameters: | - Conductivity | $\sigma$ |
| | - Density | $\rho$ |

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:

$$V_i = U_i + U_i^2 \cdot cf/dcp_i$$

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

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

E-field probes: $$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

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

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

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

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

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

| | | |
|---|---|---|
| with | SAR | = local specific absorption rate in mW/g |
| | $E_{tot}$ | = total field strength in V/m |
| | $\sigma$ | = conductivity in [mho/m] or [Siemens/m] |
| | $\rho$ | = equivalent tissue density in g/cm$^3$ |

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

### 6.1.9 Tissue simulating liquids: dielectric properties

The following materials are used for producing the tissue-equivalent materials.

(Liquids used for tests described in section 7. are marked with ☒) :

| **Ingredients** (% of weight) | **Frequency (MHz)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| frequency band | ☐ 450 | ☐ 750 | ☒ 835 | ☐ 900 | ☐ 1450 | ☐ 1800 | ☒ 1900 | ☐ 2450 | ☐ 5000 |
| Tissue Type | Head | Head | Head | Head | Head | Head | Head | Head | Head |
| Water | 38.56 | 41.1 | 41.45 | 40.92 | 52.64 | 52.64 | 54.9 | 62.7 | 64 - 78 |
| Salt (NaCl) | 3.95 | 1.4 | 1.45 | 1.48 | 0.61 | 0.36 | 0.18 | 0.5 | 2 - 3 |
| Sugar | 56.32 | 57.0 | 56.0 | 56.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HEC | 0.98 | 0.2 | 1.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Bactericide | 0.19 | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Triton X-100 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.8 | 0.0 |
| DGBE | 0.0 | 0.0 | 0.0 | 0.0 | 46.75 | 47.0 | 44.92 | 0.0 | 0.0 |
| Emulsifiers | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9 - 15 |
| Mineral Oil | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11 - 18 |

Table 2: Head tissue dielectric properties

| **Ingredients** (% of weight) | **Frequency (MHz)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| frequency band | ☐ 450 | ☐ 750 | ☒ 835 | ☐ 900 | ☐ 1450 | ☐ 1800 | ☒ 1900 | ☐ 2450 | ☐ 5000 |
| Tissue Type | Body | Body | Body | Body | Body | Body | Body | Body | Body |
| Water | 51.16 | 51.7 | 52.4 | 56.0 | 70.97 | 69.91 | 69.91 | 73.2 | 64 - 78 |
| Salt (NaCl) | 1.49 | 0.9 | 1.40 | 0.76 | 0.43 | 0.13 | 0.13 | 0.04 | 2 - 3 |
| Sugar | 46.78 | 47.2 | 45.0 | 41.76 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HEC | 0.52 | 0.0 | 1.0 | 1.21 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Bactericide | 0.05 | 0.1 | 0.1 | 0.27 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Triton X-100 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DGBE | 0.0 | 0.0 | 0.0 | 0.0 | 28.60 | 29.96 | 29.96 | 26.7 | 0.0 |
| Emulsifiers | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9 - 15 |
| Mineral Oil | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11 - 18 |

Table 3: Body tissue dielectric properties

Salt: 99+% Pure Sodium Chloride
Water: De-ionized, 16MΩ+ resistivity
Sugar: 98+% Pure Sucrose
HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

## 6.1.10 Tissue simulating liquids: parameters

| Liquid **HSL** | Freq. (MHz) | Target head tissue | | Measurement **head** tissue | | | | | Measurement date |
|---|---|---|---|---|---|---|---|---|---|
| | | Permittivity | Conductivity [S/m] | Permittivity | Dev. % | Conductivity ε'' | Conductivity [S/m] | Dev. % | |
| 835 | 835 | 41.50 | 0.90 | 42.4 | 2.1% | 19.83 | 0.92 | 2.3% | 2014-02-13 |
| | 836 | 41.49 | 0.90 | 42.4 | 2.1% | 19.81 | 0.92 | 2.3% | |
| 1900 | 1850 | 40.00 | 1.40 | 40.4 | 0.9% | 12.97 | 1.33 | -4.7% | 2014-02-12 |
| | 1900 | 40.00 | 1.40 | 40.2 | 0.4% | 12.63 | 1.33 | -4.6% | |

Table 4: Parameter of the head tissue simulating liquid

| Liquid **MSL** | Freq. (MHz) | Target **body** tissue | | Measurement **body** tissue | | | | Measurement date |
|---|---|---|---|---|---|---|---|---|
| | | Permittivity | Conductivity [S/m] | Permittivity | Dev. % | Conductivity [S/m] | Dev. % | |
| 850/900 | 824 | 55.2 | 0.97 | 54.5 | -1.3% | 0.96 | -1.3% | 2013-10-21 |
| | 837 | 55.2 | 0.97 | 54.4 | -1.5% | 0.97 | 0.1% | 2013-10-21 |
| | 849 | 55.2 | 0.97 | 54.3 | -1.7% | 0.98 | 1.5% | 2013-10-21 |
| 1900 | 1850 | 53.3 | 1.52 | 53.9 | 1.1% | 1.46 | -3.8% | 2013-10-22 |
| | 1880 | 53.3 | 1.52 | 53.8 | 1.0% | 1.49 | -1.7% | 2013-10-22 |
| | 1900 | 53.3 | 1.52 | 53.8 | 0.8% | 1.51 | -0.4% | 2013-10-22 |
| | 1910 | 53.3 | 1.52 | 53.7 | 0.8% | 1.53 | 0.4% | 2013-10-22 |

Table 5: Parameter of the body tissue simulating liquid
Note: The dielectric properties have been measured using the contact probe method at 22°C.

## 6.1.11 Measurement uncertainty evaluation for SAR test

| Relative DASY5 Uncertainty Budget for SAR Tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| According to IEEE 1528/2011 and IEC62209-1/2011 (0.3-3GHz range) | | | | | | | | |
| Error Description | Uncertainty Value | Probability Distribution | Divisor | $c_i$ (1g) | $c_i$ (10g) | Standard Uncertainty ± %, (1g) | Standard Uncertainty ± %, (10g) | $v_i^2$ or $v_{eff}$ |
| **Measurement System** | | | | | | | | |
| Probe calibration | ± 6.0 % | Normal | 1 | 1 | 1 | ± 6.0 % | ± 6.0 % | ∞ |
| Axial isotropy | ± 4.7 % | Rectangular | √ 3 | 0.7 | 0.7 | ± 1.9 % | ± 1.9 % | ∞ |
| Hemispherical isotropy | ± 9.6 % | Rectangular | √ 3 | 0.7 | 0.7 | ± 3.9 % | ± 3.9 % | ∞ |
| Boundary effects | ± 1.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.6 % | ± 0.6 % | ∞ |
| Probe linearity | ± 4.7 % | Rectangular | √ 3 | 1 | 1 | ± 2.7 % | ± 2.7 % | ∞ |
| System detection limits | ± 1.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.6 % | ± 0.6 % | ∞ |
| Modulation Response | ± 2.4 % | Rectangular | √ 3 | 1 | 1 | ± 1.4 % | ± 1.4 % | ∞ |
| Readout electronics | ± 0.3 % | Normal | 1 | 1 | 1 | ± 0.3 % | ± 0.3 % | ∞ |
| Response time | ± 0.8 % | Rectangular | √ 3 | 1 | 1 | ± 0.5 % | ± 0.5 % | ∞ |
| Integration time | ± 2.6 % | Rectangular | √ 3 | 1 | 1 | ± 1.5 % | ± 1.5 % | ∞ |
| RF ambient noise | ± 3.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| RF ambient reflections | ± 3.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| Probe positioner | ± 0.4 % | Rectangular | √ 3 | 1 | 1 | ± 0.2 % | ± 0.2 % | ∞ |
| Probe positioning | ± 2.9 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| Max. SAR evaluation | ± 2.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.2 % | ± 1.2 % | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device positioning | ± 2.9 % | Normal | 1 | 1 | 1 | ± 2.9 % | ± 2.9 % | 145 |
| Device holder uncertainty | ± 3.6 % | Normal | 1 | 1 | 1 | ± 3.6 % | ± 3.6 % | 5 |
| Power drift | ± 5.0 % | Rectangular | √ 3 | 1 | 1 | ± 2.9 % | ± 2.9 % | ∞ |
| **Phantom and Set-up** | | | | | | | | |
| Phantom uncertainty | ± 6.1 % | Rectangular | √ 3 | 1 | 1 | ± 3.5 % | ± 3.5 % | ∞ |
| SAR correction | ± 1.9 % | Rectangular | √ 3 | 1 | 0.84 | ± 1.1 % | ± 0.9 % | ∞ |
| Liquid conductivity (meas.) | ± 5.0 % | Rectangular | √ 3 | 0.78 | 0.71 | ± 2.3 % | ± 2.0 % | ∞ |
| Liquid permittivity (meas.) | ± 5.0 % | Rectangular | √ 3 | 0.26 | 0.26 | ± 0.8 % | ± 0.8 % | ∞ |
| Temp. Unc. - Conductivity | ± 3.4 % | Rectangular | √ 3 | 0.78 | 0.71 | ± 1.5 % | ± 1.4 % | ∞ |
| Temp. Unc. - Permittivity | ± 0.4 % | Rectangular | √ 3 | 0.23 | 0.26 | ± 0.1 % | ± 0.1 % | ∞ |
| **Combined Uncertainty** | | | | | | ± 11.3 % | ± 11.3 % | 330 |
| **Expanded Std. Uncertainty** | | | | | | ± **22.7** % | ± **22.5** % | |

Table 6: Measurement uncertainties
Worst-Case uncertainty budget for DASY5 assessed according to IEEE 1528/2011
and IEC 62209-1/2011 draft standards. The budget is valid for the frequency range 300MHz -3 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

| Relative DASY5 Uncertainty Budget for SAR Tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| According to IEC62209-2/2010 (30 MHz - 6 GHz range) | | | | | | | | |
| Error Description | Uncertainty Value | Probability Distribution | Divisor | $c_i$ (1g) | $c_i$ (10g) | Standard Uncertainty ± %, (1g) | Standard Uncertainty ± %, (10g) | $v_i^2$ or $v_{eff}$ |
| **Measurement System** | | | | | | | | |
| Probe calibration | ± 6.6 % | Normal | 1 | 1 | 1 | ± 6.6 % | ± 6.6 % | ∞ |
| Axial isotropy | ± 4.7 % | Rectangular | √ 3 | 0.7 | 0.7 | ± 1.9 % | ± 1.9 % | ∞ |
| Hemispherical isotropy | ± 9.6 % | Rectangular | √ 3 | 0.7 | 0.7 | ± 3.9 % | ± 3.9 % | ∞ |
| Boundary effects | ± 2.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.2 % | ± 1.2 % | ∞ |
| Probe linearity | ± 4.7 % | Rectangular | √ 3 | 1 | 1 | ± 2.7 % | ± 2.7 % | ∞ |
| System detection limits | ± 1.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.6 % | ± 0.6 % | ∞ |
| Modulation Response | ± 2.4 % | Rectangular | √ 3 | 1 | 1 | ± 1.4 % | ± 1.4 % | ∞ |
| Readout electronics | ± 0.3 % | Normal | 1 | 1 | 1 | ± 0.3 % | ± 0.3 % | ∞ |
| Response time | ± 0.8 % | Rectangular | √ 3 | 1 | 1 | ± 0.5 % | ± 0.5 % | ∞ |
| Integration time | ± 2.6 % | Rectangular | √ 3 | 1 | 1 | ± 1.5 % | ± 1.5 % | ∞ |
| RF ambient noise | ± 3.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| RF ambient reflections | ± 3.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| Probe positioner | ± 0.8 % | Rectangular | √ 3 | 1 | 1 | ± 0.5 % | ± 0.5 % | ∞ |
| Probe positioning | ± 6.7 % | Rectangular | √ 3 | 1 | 1 | ± 3.9 % | ± 3.9 % | ∞ |
| Post-processing | ± 4.0 % | Rectangular | √ 3 | 1 | 1 | ± 2.3 % | ± 2.3 % | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device positioning | ± 2.9 % | Normal | 1 | 1 | 1 | ± 2.9 % | ± 2.9 % | 145 |
| Device holder uncertainty | ± 3.6 % | Normal | 1 | 1 | 1 | ± 3.6 % | ± 3.6 % | 5 |
| Power drift | ± 5.0 % | Rectangular | √ 3 | 1 | 1 | ± 2.9 % | ± 2.9 % | ∞ |
| **Phantom and Set-up** | | | | | | | | |
| Phantom uncertainty | ± 7.9 % | Rectangular | √ 3 | 1 | 1 | ± 4.6 % | ± 4.6 % | ∞ |
| SAR correction | ± 1.9 % | Rectangular | √ 3 | 1 | 0.84 | ± 1.1 % | ± 0.9 % | ∞ |
| Liquid conductivity (meas.) | ± 5.0 % | Rectangular | √ 3 | 0.78 | 0.71 | ± 2.3 % | ± 2.0 % | ∞ |
| Liquid permittivity (meas.) | ± 5.0 % | Rectangular | √ 3 | 0.26 | 0.26 | ± 0.8 % | ± 0.8 % | ∞ |
| Temp. Unc. - Conductivity | ± 3.4 % | Rectangular | √ 3 | 0.78 | 0.71 | ± 1.5 % | ± 1.4 % | ∞ |
| Temp. Unc. - Permittivity | ± 0.4 % | Rectangular | √ 3 | 0.23 | 0.26 | ± 0.1 % | ± 0.1 % | ∞ |
| **Combined Uncertainty** | | | | | | ± 12.7 % | ± 12.6 % | 330 |
| **Expanded Std. Uncertainty** | | | | | | ± **25.4** % | ± **25.3** % | |

Table 7: Measurement uncertainties. Worst-Case uncertainty budget for DASY5 assessed according to according to IEC 62209-2/2010 standard. The budget is valid for the frequency range 30MHz - 6 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

## 6.1.12 Measurement uncertainty evaluation for System Check

| Uncertainty of a System Performance Check with DASY5 System for the 0.3 - 3 GHz range | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source of uncertainty | Uncertainty Value | Probability Distribution | Divisor | $c_i$ (1g) | $c_i$ (10g) | Standard Uncertainty ± %, (1g) | Standard Uncertainty ± %, (10g) | $v_i^2$ or $v_{eff}$ |
| **Measurement System** | | | | | | | | |
| Probe calibration | ± 6.0 % | Normal | 1 | 1 | 1 | ± 6.0 % | ± 6.0 % | ∞ |
| Axial isotropy | ± 4.7 % | Rectangular | √ 3 | 0.7 | 0.7 | ± 1.9 % | ± 1.9 % | ∞ |
| Hemispherical isotropy | ± 0.0 % | Rectangular | √ 3 | 0.7 | 0.7 | ± 0.0 % | ± 0.0 % | ∞ |
| Boundary effects | ± 1.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.6 % | ± 0.6 % | ∞ |
| Probe linearity | ± 4.7 % | Rectangular | √ 3 | 1 | 1 | ± 2.7 % | ± 2.7 % | ∞ |
| System detection limits | ± 1.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.6 % | ± 0.6 % | ∞ |
| Readout electronics | ± 0.3 % | Normal | 1 | 1 | 1 | ± 0.3 % | ± 0.3 % | ∞ |
| Response time | ± 0.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.0 % | ± 0.0 % | ∞ |
| Integration time | ± 0.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.0 % | ± 0.0 % | ∞ |
| RF ambient conditions | ± 3.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| Probe positioner | ± 0.4 % | Rectangular | √ 3 | 1 | 1 | ± 0.2 % | ± 0.2 % | ∞ |
| Probe positioning | ± 2.9 % | Rectangular | √ 3 | 1 | 1 | ± 1.7 % | ± 1.7 % | ∞ |
| Max. SAR evaluation | ± 1.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.6 % | ± 0.6 % | ∞ |
| **Test Sample Related** | | | | | | | | |
| Dev. of experimental dipole | ± 0.0 % | Rectangular | √ 3 | 1 | 1 | ± 0.0 % | ± 0.0 % | ∞ |
| Source to liquid distance | ± 2.0 % | Rectangular | √ 3 | 1 | 1 | ± 1.2 % | ± 1.2 % | ∞ |
| Power drift | ± 3.4 % | Rectangular | √ 3 | 1 | 1 | ± 2.0 % | ± 2.0 % | ∞ |
| **Phantom and Set-up** | | | | | | | | |
| Phantom uncertainty | ± 4.0 % | Rectangular | √ 3 | 1 | 1 | ± 2.3 % | ± 2.3 % | ∞ |
| SAR correction | ± 1.9 % | Rectangular | √ 3 | 1 | 0.84 | ± 1.1 % | ± 0.9 % | ∞ |
| Liquid conductivity (meas.) | ± 5.0 % | Normal | 1 | 0.78 | 0.71 | ± 3.9 % | ± 3.6 % | ∞ |
| Liquid permittivity (meas.) | ± 5.0 % | Normal | 1 | 0.26 | 0.26 | ± 1.3 % | ± 1.3 % | ∞ |
| Temp. unc. - Conductivity | ± 1.7 % | Rectangular | √ 3 | 0.78 | 0.71 | ± 0.8 % | ± 0.7 % | ∞ |
| Temp. unc. - Permittivity | ± 0.3 % | Rectangular | √ 3 | 0.23 | 0.26 | ± 0.0 % | ± 0.0 % | ∞ |
| **Combined Uncertainty** | | | | | | ± 9.1 % | ± 8.9 % | 330 |
| **Expanded Std. Uncertainty** | | | | | | ± **18.2** % | ± **17.9** % | |

Table 8: Measurement uncertainties of the System Check with DASY5 (0.3-3GHz)

Note: Worst case probe calibration uncertainty has been applied for all probes used during the measurements.

## 6.1.13 System check

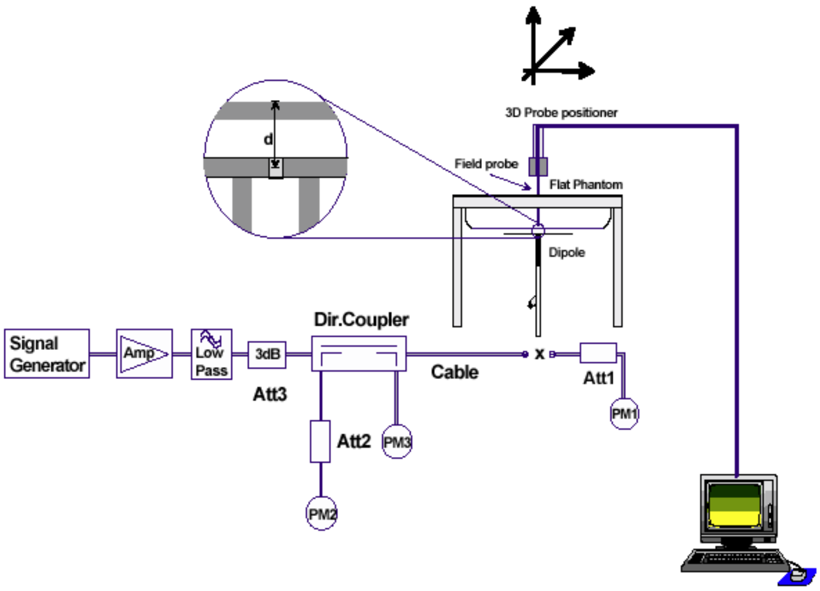
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE 1528. The following table shows system check results for all frequency bands and tissue liquids used during the tests (plot(s) see annex A).

| System performence check (1000 mW) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| System validation Kit | Frequency | Target $SAR_{1g}$ (+/- 10%) | Target $SAR_{10g}$ (+/- 10%) | Measured $SAR_{1g}$ mW/g | $SAR_{1g}$ dev. % | Measured $SAR_{10g}$ mW/g | $SAR_{10g}$ dev. % | Measured date |
| D835V2 S/N: 4d153 | 835 MHz body | 9.40 | 6.12 | 9.74 | 3.6% | 6.45 | 5.4% | 2013-10-21 |
| D1900V2 S/N: 5d009 | 1900 MHz body | 40.90 | 21.70 | 38.50 | -5.9% | 20.30 | -6.5% | 2013-10-22 |
| D835V2 S/N: 4d153 | 835 MHz body | 9.40 | 6.12 | 9.54 | 1.5% | 6.30 | 2.9% | 2014-02-13 |
| D1900V2 S/N: 5d009 | 1900 MHz body | 40.90 | 21.70 | 39.10 | -4.4% | 20.70 | -4.6% | 2014-02-12 |

Table 9: Results system check

## 6.1.14 System check procedure

The system check is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 1000 mW for frequencies below 2 GHz or 100 mW for frequencies above 2 GHz. To adjust this power a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).
System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



### 6.1.15 System validation

The system validation is performed in a similar way as a system check. It needs to be performed once a SAR measurement system has been established and allows an evaluation of the system accuracy with all components used together with the specified system. It has to be repeated at least once a year or when new system components are used (DAE, probe, phantom, dipole, liquid type).
In addition to the procedure used during system check a system validation also includes checks of probe isotropy, probe modulation factor and RF signal.

The following table lists the system validations relevant for this test report:

| DASY System | Frequency/ MHz | Liquid type | Probe / SN | DAE type / SN | Dipole type / SN | DASY software | Date |
|---|---|---|---|---|---|---|---|
| ICT #3 | 835 | Body | ES3DV4 / 3326 | DAE4 / 1387 | D835V2 / 4d153 | V52.8 | 2013-10-07 |
| ICT #3 | 1900 | Body | ES3DV4 / 3326 | DAE4 / 1387 | D1900V2 / 5d009 | V52.8 | 2013-10-07 |

# 7 Detailed Test Results

## 7.1 Conducted power measurements

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 was used.
The output power was measured using an integrated RF connector and attached RF cable.
The conducted output power was also checked before and after each SAR measurement. The resulting power values were within a 0.2 dB tolerance of the values shown below.

Note: 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*** | ***3*** | ***4*** |
|---|---|---|---|---|
| Duty Cycle | 1 : 8 | 1: 4 | 1 : 2.66 | 1 : 2 |
| time based avg. power compared to slotted avg. power | - 9 dB | - 6 dB | - 4.25 dB | - 3 dB |

The signalling modes differ as follows :

| ***mode*** | ***coding scheme*** | ***modulation*** |
|---|---|---|
| GPRS | CS1 to CS4 | GMSK |
| EGPRS (EDGE) | MCS1 to MCS4 | GMSK |
| EGPRS (EDGE) | MCS5 to MCS9 | 8PSK |

Apart from modulation change (GMSK/8PSK) coding schemes differ in code rate without influence on the RF signal. Therefore one coding scheme per mode was selected for conducted power measurements.

### 7.1.1 Conducted power measurements GSM 850 MHz

| Channel / frequency | modulation | timeslots | slotted avg. power | time based avg. Power (calculated) |
|---|---|---|---|---|
| 128 / 824.2 MHz | GMSK | 1 | 32.1 dBm | 23.1 dBm |
| 190 / 836.6 MHz | GMSK | 1 | 32.1 dBm | 23.1 dBm |
| 251 / 848.8 MHz | GMSK | 1 | 32.1 dBm | 23.1 dBm |
| 128 / 824.2 MHz | GMSK | 2 | 32.0 dBm | **26.0 dBm** |
| 190 / 836.6 MHz | GMSK | 2 | 32.0 dBm | **26.0 dBm** |
| 251 / 848.8 MHz | GMSK | 2 | 32.1 dBm | **26.1 dBm** |

Table 10: Test results conducted power measurement GSM 850 MHz

### 7.1.2 Conducted power measurements GSM 1900 MHz

| Channel / frequency | modulation | timeslots | slotted avg. power | time based avg. Power (calculated) |
|---|---|---|---|---|
| 512 / 1850.2 MHz | GMSK | 1 | 29.9 dBm | 20.9 dBm |
| 661 / 1880.0 MHz | GMSK | 1 | 29.2 dBm | 20.2 dBm |
| 810 / 1909.8 MHz | GMSK | 1 | 29.6 dBm | 20.6 dBm |
| 512 / 1850.2 MHz | GMSK | 2 | 29.4 dBm | **23.4 dBm** |
| 661 / 1880.0 MHz | GMSK | 2 | 28.8 dBm | **22.8 dBm** |
| 810 / 1909.8 MHz | GMSK | 2 | 29.1 dBm | **23.1 dBm** |

Table 11: Test results conducted power measurement GSM 1900 MHz

## 7.2 SAR test results

### 7.2.1 Results overview

| measured / extrapolated SAR numbers - Extremity - GSM 850 MHz | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ch. | Freq. (MHz) | time slots | distance (mm) | modulation | Position | cond. $P_{max}$ (dBm) | | $SAR_{10g}$ results(W/kg) | | liquid (°C) |
| | | | | | | declared** | measured | measured | extrapolated | |
| 128 | 824.2 | 2 | 0 | GMSK | rear | 33.0 | 32.0 | **0.164** | **0.206** | 22.1 |
| 190 | 836.6 | 2 | 0 | GMSK | rear | 33.0 | 32.0 | 0.095 | 0.120 | 22.1 |
| 251 | 848.8 | 2 | 0 | GMSK | rear | 33.0 | 32.1 | 0.047 | 0.058 | 22.1 |
| 128 | 824.2 | 1 | 0 | GMSK | rear | 33.0 | 32.1 | 0.036 | 0.045 | 22.1 |

Table 12: Test results Extremity SAR GSM 850 MHz (see max. SAR plot in Annex B.1: GSM 850MHz page 31)

| measured / extrapolated SAR numbers - head - GSM 850 MHz | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ch. | Freq. (MHz) | time slots | distance (mm) | modulation | Position | cond. $P_{max}$ (dBm) | | $SAR_{1g}$ results(W/kg) | | liquid (°C) |
| | | | | | | declared** | measured | measured | extrapolated | |
| 190 | 836.6 | 1 | 10 | GMSK | front | 33.0 | 32.1 | 0.271 | **0.337** | 23.2 |

Table 13: Test results head SAR GSM 850 MHz (see max. SAR plot in Annex B.1: GSM 850MHz)

| measured / extrapolated SAR numbers - Extremity - GSM 1900 MHz | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ch. | Freq. (MHz) | time slots | distance (mm) | modulation | Position | cond. $P_{max}$ (dBm) | | $SAR_{10g}$ results(W/kg) | | liquid (°C) |
| | | | | | | declared** | measured | measured | extrapolated | |
| 512 | 1850.2 | 2 | 0 | GMSK | rear | 30.0 | 29.4 | 0.260 | 0.299 | 21.7 |
| 661 | 1880.0 | 2 | 0 | GMSK | rear | 30.0 | 28.8 | **0.309** | **0.407** | 21.7 |
| 810 | 1909.8 | 2 | 0 | GMSK | rear | 30.0 | 29.1 | 0.272 | 0.335 | 21.7 |
| 661 | 1880.0 | 1 | 0 | GMSK | rear | 30.0 | 29.2 | 0.173 | 0.208 | 21.7 |

Table 14: Test results Extremity SAR GSM 1900 MHz (see max. SAR plot in Annex B.2: GSM 1900MHz page 36)

| measured / extrapolated SAR numbers - head - GSM 1900 MHz | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ch. | Freq. (MHz) | time slots | distance (mm) | modulation | Position | cond. $P_{max}$ (dBm) | | $SAR_{1g}$ results(W/kg) | | liquid (°C) |
| | | | | | | declared** | measured | measured | extrapolated | |
| 512 | 1850.2 | 1 | 10 | GMSK | front | 30.0 | 29.9 | 0.245 | 0.251 | 21.7 |

Table 15: Test results head SAR GSM 1900 MHz (see max. SAR plot in Annex B.2: GSM 1900MHz)

### 7.2.2 General description of test procedures

- The DUT is tested using CMU 200 communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.
- Test positions as described in the tables above are in accordance with the specified test standard.
- Tests in body position were performed in that configuration, which generates the highest time based averaged output power (see conducted power results).
- According to IEEE 1528 the SAR test shall be performed at middle channel. Testing of top and bottom channel is optional.
- According to KDB 447498 D01 testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
  - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
  - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
  - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
  - Next to the mouth use is evaluated with the front of the device positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium.
  - Next to the mouth exposure requires $SAR_{1g}$, and the wrist-worn condition requires extremity $SAR_{10g}$

## 8 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

| Equipment | Type | Manufacturer | Serial No. | Last Calibration | Frequency (months) |
|---|---|---|---|---|---|
| Dosimetric E-Field Probe | ES3DV3 | Schmid & Partner Engineering AG | 3326 | September 02, 2013 | 12 |
| 835 MHz System Validation Dipole | D835V2 | Schmid & Partner Engineering AG | 4d153 | June 06, 2013 | 24 |
| 1900 MHz System Validation Dipole | D1900V2 | Schmid & Partner Engineering AG | 5d009 | May 15, 2013 | 24 |
| Data acquisition electronics | DAE4 | Schmid & Partner Engineering AG | 1387 | August 28, 2013 | 12 |
| Software | DASY52 52.8.7 | Schmid & Partner Engineering AG | --- | N/A | -- |
| Phantom | SAM | Schmid & Partner Engineering AG | --- | N/A | -- |
| Universal Radio Communication Tester | CMU 200 | Rohde & Schwarz | 106826 | January 16, 2013 | 24 |
| Network Analyser 300 kHz to 6 GHz | 8753ES | Hewlett Packard)* | US39174436 | February 24, 2012 | 24 |
| Dielectric Probe Kit | 85070C | Hewlett Packard | US99360146 | N/A | 12 |
| Signal Generator | 8671B | Hewlett Packard | 2823A00656 | January 15, 2013 | 24 |
| Amplifier | 25S1G4 (25 Watt) | Amplifier Reasearch | 20452 | N/A | -- |
| Power Meter | NRP | Rohde & Schwarz | 101367 | January 15, 2013 | 24 |
| Power Meter Sensor | NRP Z22 | Rohde & Schwarz | 100227 | January 14, 2013 | 12 |
| Power Meter Sensor | NRP Z22 | Rohde & Schwarz | 100234 | January 14, 2013 | 12 |
| Directional Coupler | 778D | Hewlett Packard | 19171 | January 14, 2013 | 12 |

)* : Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

## 9 Observations

No observations exceeding those reported with the single test cases have been made.

## Annex A: System performance check

Date/Time: 10/21/2013 3:52:31 PM

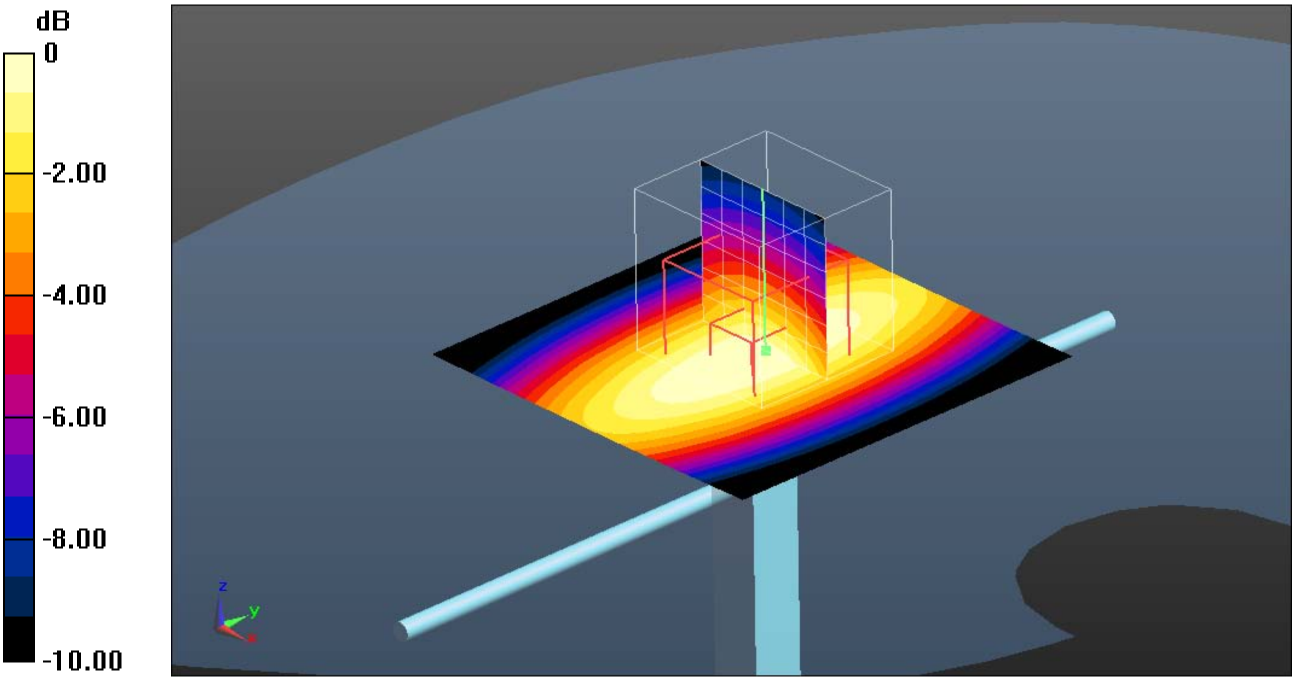
### SystemPerformanceCheck-D835 body 2013-10-21

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d153**

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.969 S/m; $\varepsilon_r$ = 54.416; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(6.04, 6.04, 6.04); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM (FRONT); Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**System Performance Check/d=15mm, Pin=1000 mW, dist=4.0mm/Area Scan (51x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 10.6 W/kg

**System Performance Check/d=15mm, Pin=1000 mW, dist=4.0mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.2 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 14.1 W/kg
**SAR(1 g) = 9.74 W/kg; SAR(10 g) = 6.45 W/kg**
Maximum value of SAR (measured) = 10.5 W/kg




0 dB = 10.5 W/kg = 10.21 dBW/kg

**Additional information:**
ambient temperature: 22.1°C; liquid temperature: 22.5°C

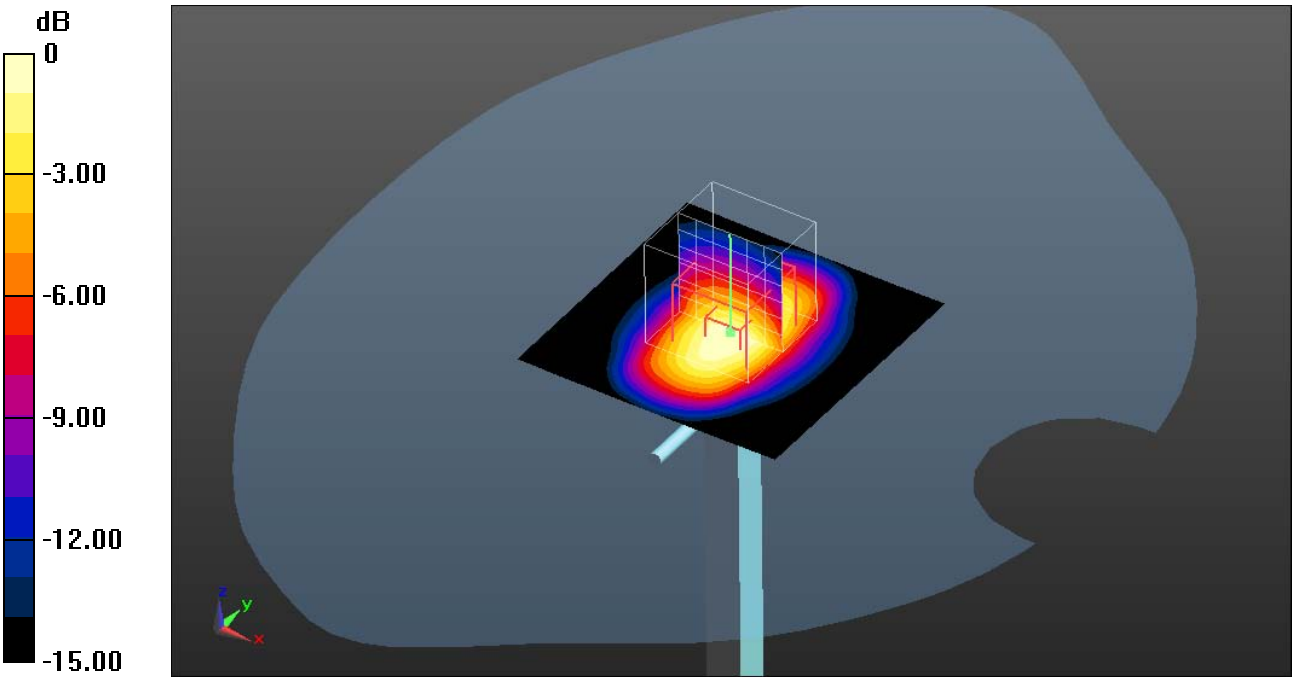
Date/Time: 10/22/2013 8:05:57 AM

## SystemPerformanceCheck-D1900body 2013-10-22

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d009**
Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.514 S/m; $\varepsilon_r$ = 53.753; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(4.65, 4.65, 4.65); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**HSL/d=10mm, Pin=1000mW/Area Scan (51x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 50.6 W/kg

**HSL/d=10mm, Pin=1000mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 176.0 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 68.2 W/kg
**SAR(1 g) = 38.5 W/kg; SAR(10 g) = 20.3 W/kg**
Maximum value of SAR (measured) = 43.5 W/kg




0 dB = 43.5 W/kg = 16.38 dBW/kg

**Additional information:**
ambient temperature: 21.8°C; liquid temperature: 21.7°C

Date/Time: 2/13/2014 1:01:36 PM

# SystemPerformanceCheck-D835 head 2014-02-13

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d153**

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 835 MHz; σ = 0.921 S/m; $\varepsilon_r$ = 42.385; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 - SN3326; ConvF(6.25, 6.25, 6.25); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## HSL835/d=10mm, Pin=1000 mW, dist=4.0mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 10.1 W/kg

## HSL835/d=10mm, Pin=1000 mW, dist=4.0mm/Zoom Scan (7x7x7)/Cube 0:

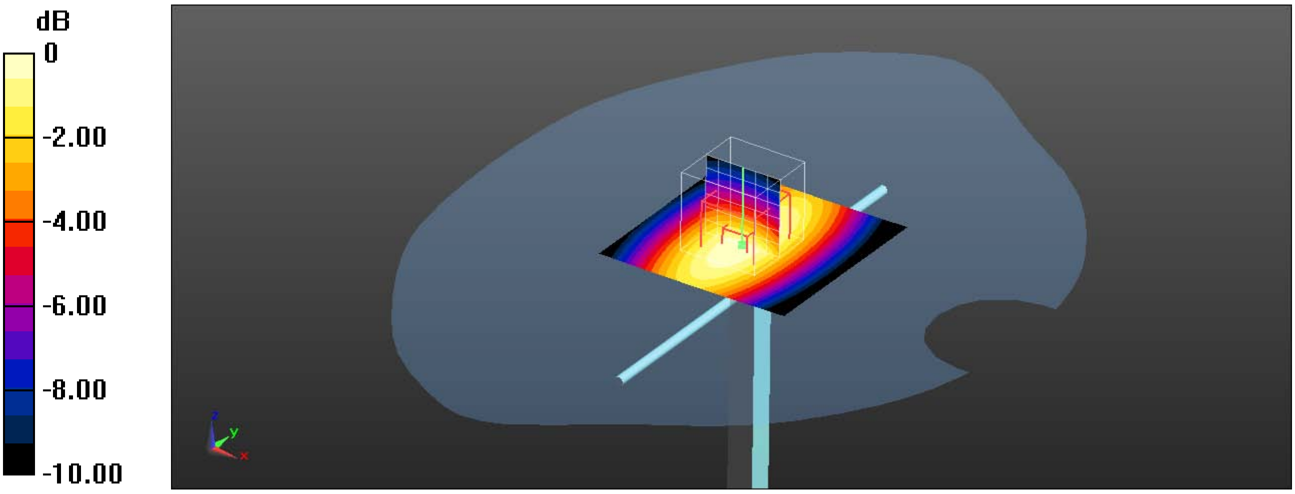
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.8 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 13.8 W/kg

**SAR(1 g) = 9.54 W/kg; SAR(10 g) = 6.3 W/kg**

Maximum value of SAR (measured) = 10.3 W/kg




0 dB = 10.3 W/kg = 10.13 dBW/kg

**Additional information:**

ambient temperature: 23.2°C; liquid temperature: 23.9°C

Date/Time: 2/12/2014 1:43:45 PM

## System Check-D1900 head 2014-02-12

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d009**

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 1900 MHz; σ = 1.335 S/m; $\varepsilon_r$ = 40.172; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 **-** SN3326; ConvF(5.05, 5.05, 5.05); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**System Check-D1900 HSL/d=10mm, Pin=1000 mW, dist=4.0mm/Area Scan (51x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 48.0 W/kg

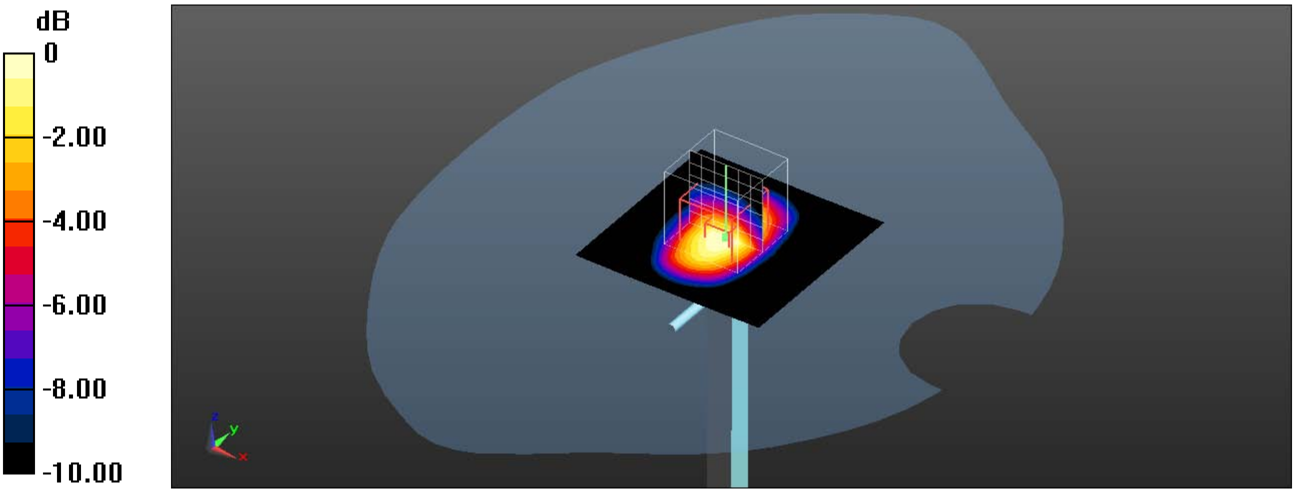
**System Check-D1900 HSL/d=10mm, Pin=1000 mW, dist=4.0mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 181.5 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 70.6 W/kg

**SAR(1 g) = 39.1 W/kg; SAR(10 g) = 20.7 W/kg**

Maximum value of SAR (measured) = 44.0 W/kg




0 dB = 44.0 W/kg = 16.43 dBW/kg

**Additional information:**

ambient temperature: 23.4°C; liquid temperature: 22.9°C

## Annex B: DASY5 measurement results

## Annex B.1: GSM 850MHz

Date/Time: 10/21/2013 12:11:43 PM

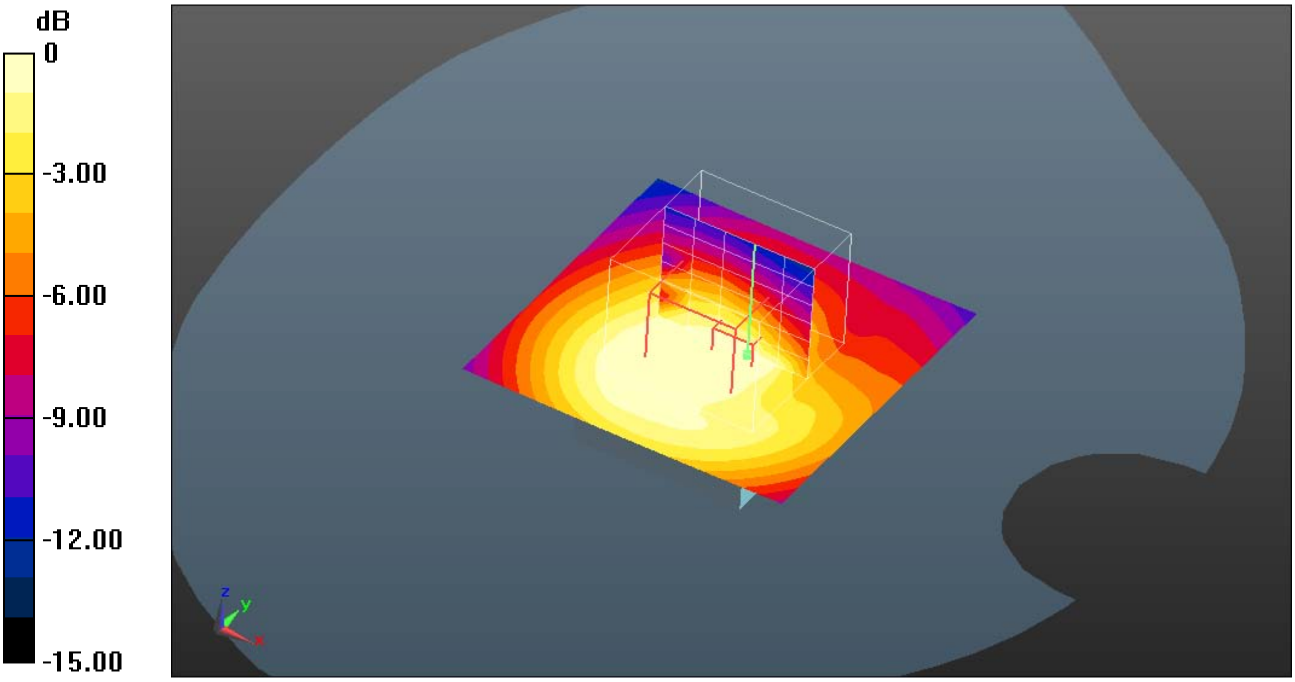
# FCC-Extremity-GSM850

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

Communication System: UID 0, GSM/GPRS 2TS (0); Communication System Band: GSM 850; Frequency: 824.2 MHz; Communication System PAR: 6.021 dB; PMF: 2.00009
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.957 S/m; $\varepsilon_r$ = 54.512; ρ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(6.04, 6.04, 6.04); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Extremity MSL/Rear Position Low GPRS 2TS/Area Scan (81x81x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.335 W/kg

**Extremity MSL/Rear Position Low GPRS 2TS/Zoom Scan (6x6x7)/Cube 0:**
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 16.463 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.479 W/kg
**SAR(1 g) = 0.255 W/kg; SAR(10 g) = 0.164 W/kg**
Maximum value of SAR (measured) = 0.266 W/kg




0 dB = 0.266 W/kg = -5.75 dBW/kg

**Additional information:**
position or distance of DUT to SAM: 0mm
ambient temperature: 22.3°C; liquid temperature: 22.1°C

Date/Time: 10/21/2013 12:50:46 PM

## FCC-Extremity-GSM850

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

Communication System: UID 0, GSM/GPRS 2TS (0); Communication System Band: GSM 850; Frequency: 836.6 MHz; Communication System PAR: 6.021 dB; PMF: 2.00009

Medium parameters used: f = 837 MHz; $\sigma$ = 0.971 S/m; $\varepsilon_r$ = 54.374; $\rho$ = 1000 kg/$m^3$

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 - SN3326; ConvF(6.04, 6.04, 6.04); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## Extremity MSL/Rear Position Middle GPRS 2TS/Area Scan (81x81x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.173 W/kg

## Extremity MSL/Rear Position Middle GPRS 2TS/Zoom Scan (9x8x7)/Cube 0:

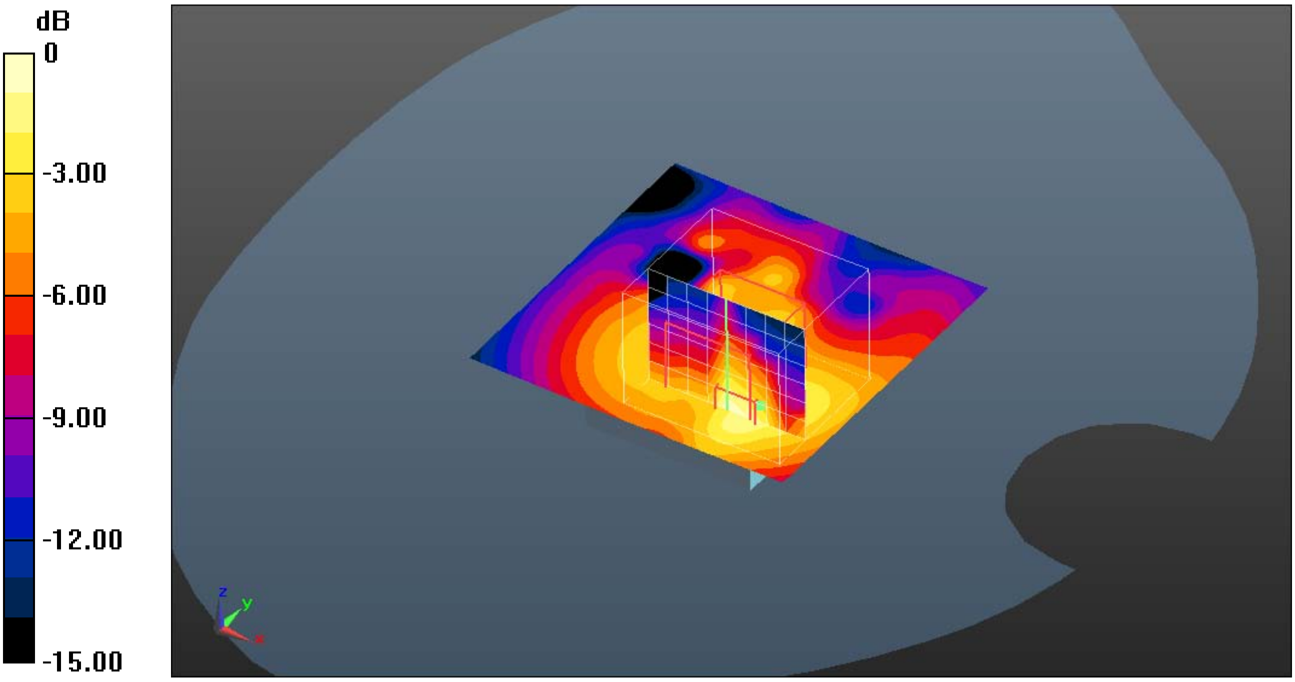
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.600 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.334 W/kg

**SAR(1 g) = 0.186 W/kg; SAR(10 g) = 0.095 W/kg**

Maximum value of SAR (measured) = 0.224 W/kg




0 dB = 0.224 W/kg = -6.50 dBW/kg

**Additional information:**

position or distance of DUT to SAM: 0mm

ambient temperature: 22.3°C; liquid temperature: 22.1°C

Date/Time: 10/21/2013 2:30:01 PM

# FCC-Extremity-GSM850

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

Communication System: UID 0, GSM/GPRS 2TS (0); Communication System Band: GSM 850; Frequency: 848.8 MHz; Communication System PAR: 6.021 dB; PMF: 2.00009

Medium parameters used: f = 849 MHz; σ = 0.985 S/m; $\varepsilon_r$ = 54.282; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 - SN3326; ConvF(6.04, 6.04, 6.04); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## Extremity MSL/Rear Position High GPRS 2TS/Area Scan (81x81x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.116 W/kg

## Extremity MSL/Rear Position High GPRS 2TS/Zoom Scan (7x7x7)/Cube 0:

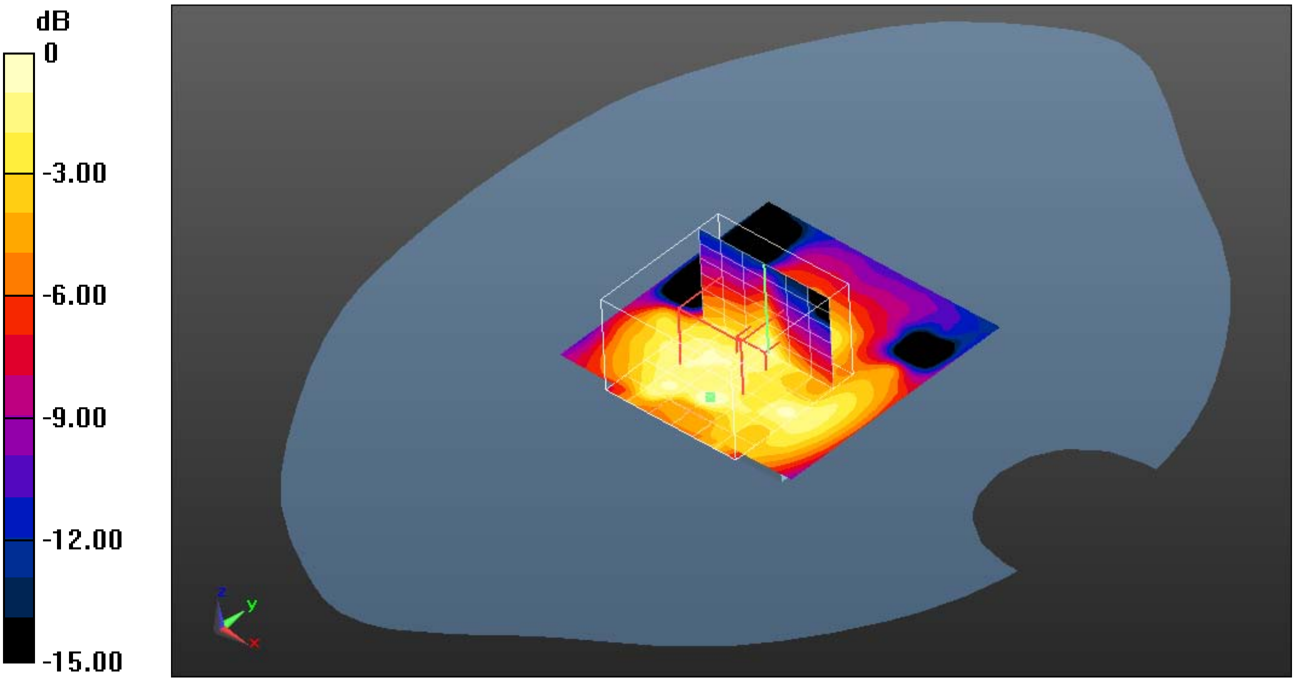
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 7.997 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.159 W/kg

**SAR(1 g) = 0.079 W/kg; SAR(10 g) = 0.047 W/kg**

Maximum value of SAR (measured) = 0.107 W/kg




0 dB = 0.107 W/kg = -9.71 dBW/kg

**Additional information:**

position or distance of DUT to SAM: 0mm

ambient temperature: 22.3°C; liquid temperature: 22.1°C

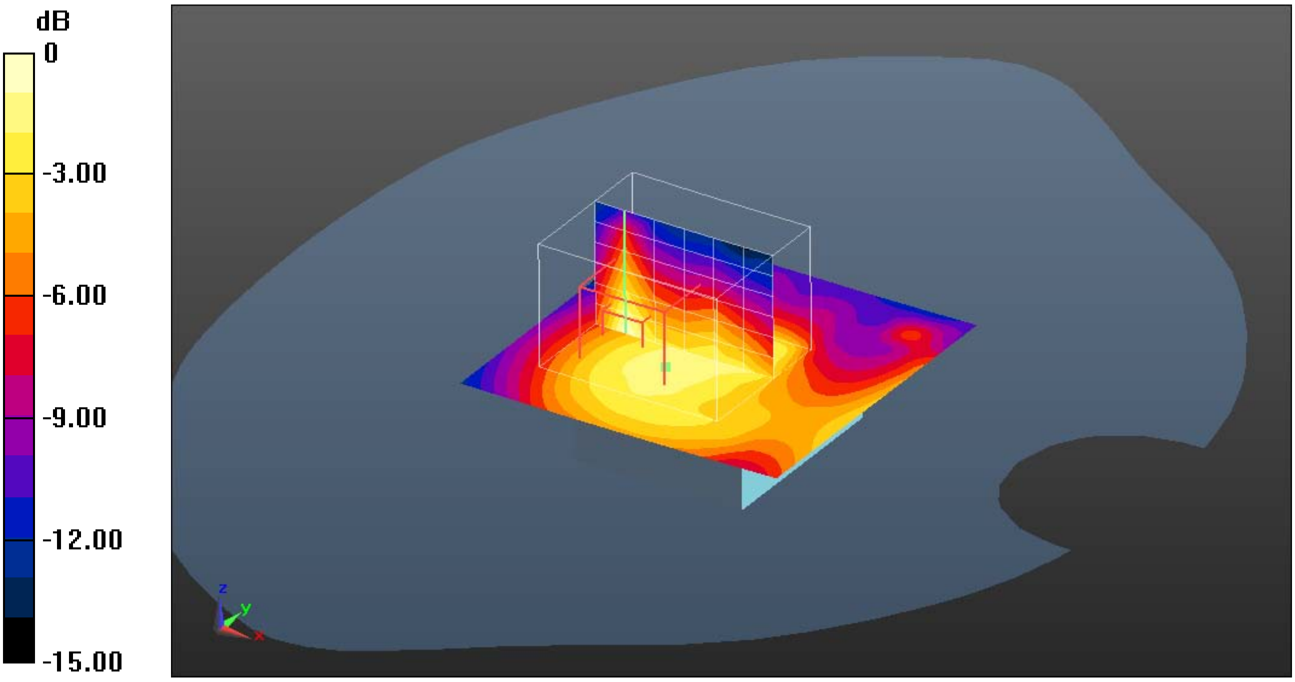
Date/Time: 10/21/2013 3:45:14 PM

## FCC-Extremity-GSM850

**DUT: Limmex; Type: Emergency watch; Serial: 19995**
Communication System: UID 0, GSM (0); Communication System Band: GSM 850 (824.0 - 849.0 MHz);
Frequency: 824.2 MHz; Communication System PAR: 9.191 dB; PMF: 2.88104
Medium parameters used (interpolated): f = 824.2 MHz; $\sigma$ = 0.957 S/m; $\varepsilon_r$ = 54.512; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(6.04, 6.04, 6.04); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Extremity MSL/Rear Position Low/Area Scan (81x81x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0569 W/kg

**Extremity MSL/Rear Position Low/Zoom Scan (7x6x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 7.088 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.0910 W/kg
**SAR(1 g) = 0.058 W/kg; SAR(10 g) = 0.036 W/kg**
Maximum value of SAR (measured) = 0.0784 W/kg




0 dB = 0.0784 W/kg = -11.06 dBW/kg

**Additional information:**
position or distance of DUT to SAM: 0mm
ambient temperature: 22.3°C; liquid temperature: 22.1°C

Date/Time: 2/13/2014 10:03:10 AM

# FCC -GSM850

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

Communication System: UID 0, GSM (0); Communication System Band: GSM 850 (824.0 - 849.0 MHz);
Frequency: 836.6 MHz; Communication System PAR: 9.191 dB; PMF: 2.88104
Medium parameters used: f = 837 MHz; $\sigma$ = 0.923 S/m; $\varepsilon_r$ = 42.35; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:

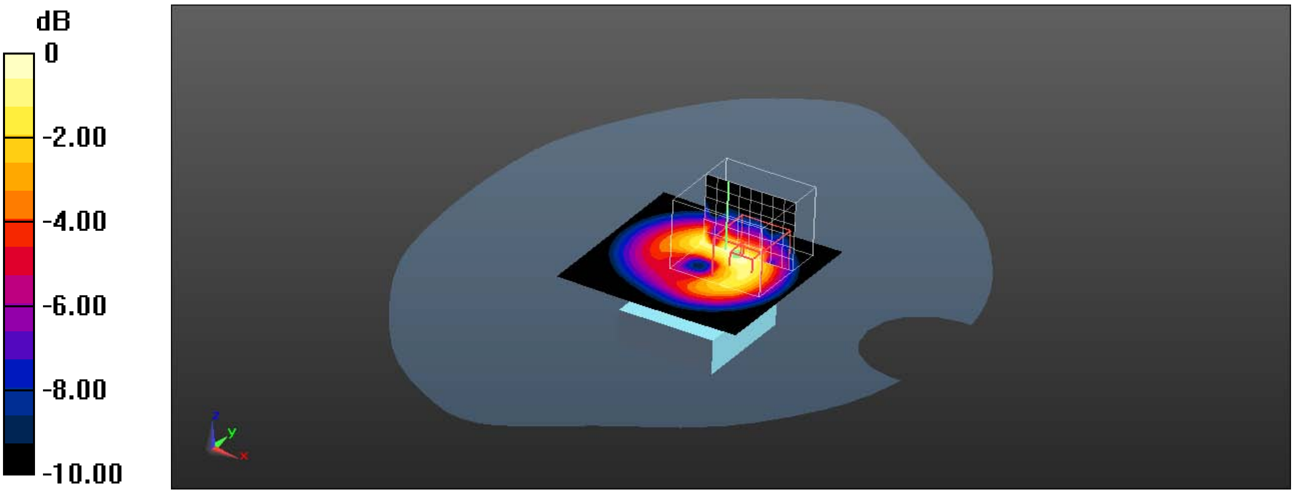
- Probe: ES3DV3 - SN3326; ConvF(6.25, 6.25, 6.25); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## HSL/Front Position Middle 10mm/Area Scan (81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.335 W/kg

## HSL/Front Position Middle 10mm/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.991 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.809 W/kg
**SAR(1 g) = 0.271 W/kg; SAR(10 g) = 0.132 W/kg**
Maximum value of SAR (measured) = 0.356 W/kg




0 dB = 0.356 W/kg = -4.49 dBW/kg

**Additional information:**
position or distance of DUT to SAM: 10mm
ambient temperature: 23.9°C; liquid temperature: 23.2°C

## Annex B.2: GSM 1900MHz

Date/Time: 10/22/2013 10:02:45 AM

# FCC-Extremity-GSM1900

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

Communication System: UID 0, GSM/GPRS 2TS (0); Communication System Band: GSM 1900; Frequency: 1850.2 MHz; Communication System PAR: 6.021 dB; PMF: 2.00009

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.462 S/m; $\varepsilon_r$ = 53.899; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 - SN3326; ConvF(4.65, 4.65, 4.65); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## Extremity MSL/Rear Position Low GPRS 2TS/Area Scan (81x101x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.531 W/kg

## Extremity MSL/Rear Position Low GPRS 2TS/Zoom Scan (7x7x7)/Cube 0:

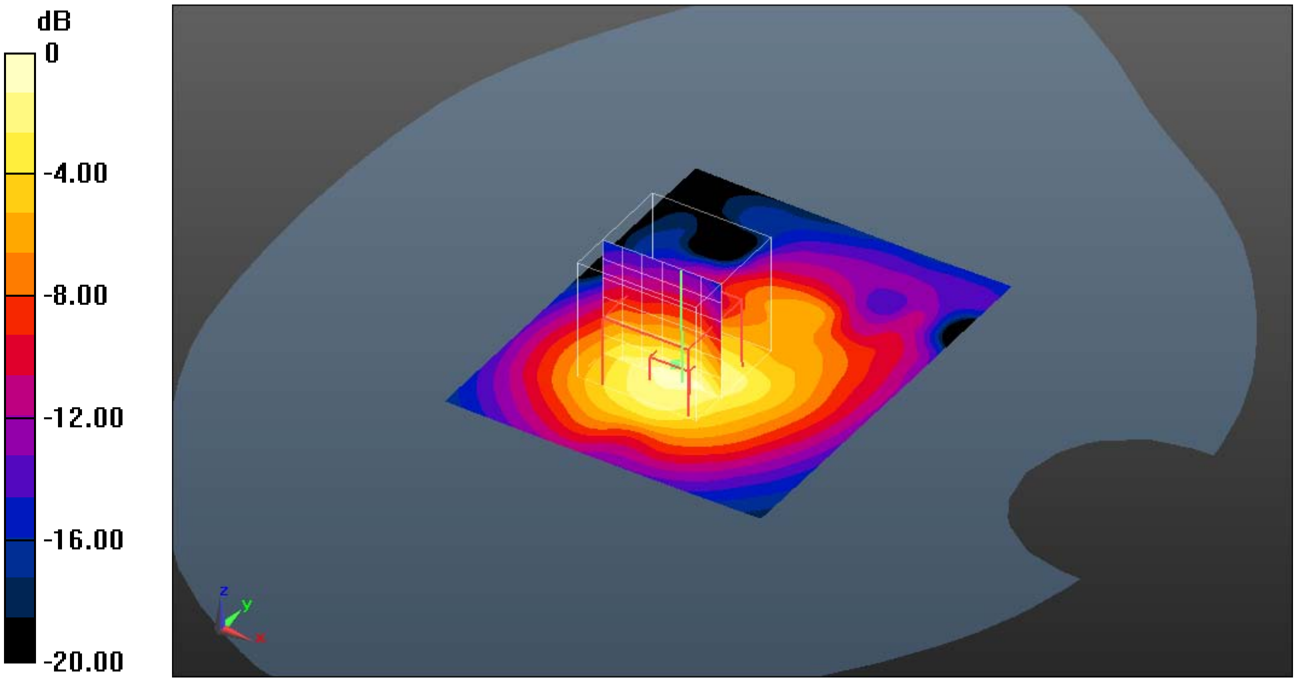
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.196 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.969 W/kg

**SAR(1 g) = 0.515 W/kg; SAR(10 g) = 0.260 W/kg**

Maximum value of SAR (measured) = 0.588 W/kg




0 dB = 0.588 W/kg = -2.31 dBW/kg

**Additional information:**

position or distance of DUT to SAM: 0

ambient temperature: 21.8°C; liquid temperature: 21.7°C

Date/Time: 10/22/2013 11:12:34 AM

# FCC-Extremity-GSM1900

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

Communication System: UID 0, GSM/GPRS 2TS (0); Communication System Band: GSM 1900; Frequency: 1880 MHz; Communication System PAR: 6.021 dB; PMF: 2.00009

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.494 S/m; $\varepsilon_r$ = 53.837; $\rho$ = 1000 kg/$m^3$

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 - SN3326; ConvF(4.65, 4.65, 4.65); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## Extremity MSL/Rear Position Middle GPRS 2TS/Area Scan (81x101x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.747 W/kg

## Extremity MSL/Rear Position Middle GPRS 2TS/Zoom Scan (8x8x7)/Cube 0:

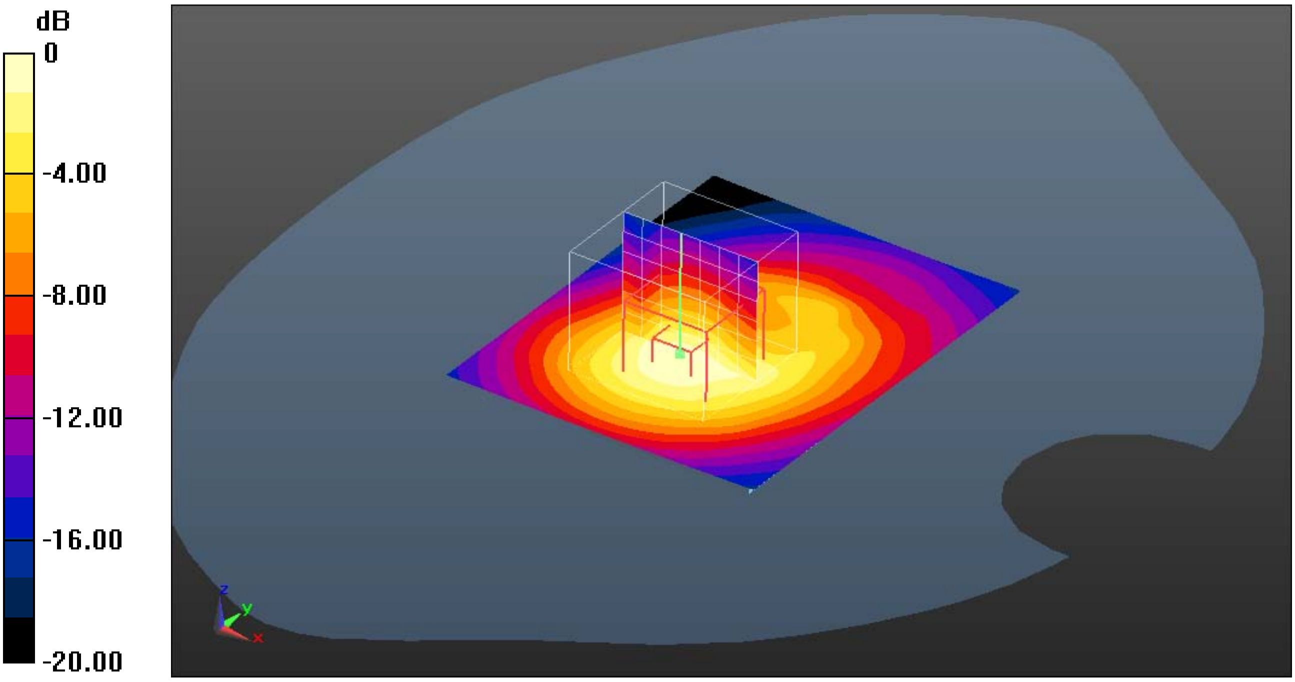
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.477 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 1.17 W/kg

**SAR(1 g) = 0.615 W/kg; SAR(10 g) = 0.309 W/kg**

Maximum value of SAR (measured) = 0.700 W/kg




0 dB = 0.700 W/kg = -1.55 dBW/kg

**Additional information:**

position or distance of DUT to SAM: 0

ambient temperature: 21.8°C; liquid temperature: 21.7°C

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# FCC-Extremity-GSM1900

**DUT: Limmex; Type: Emergency watch; Serial: 19995**

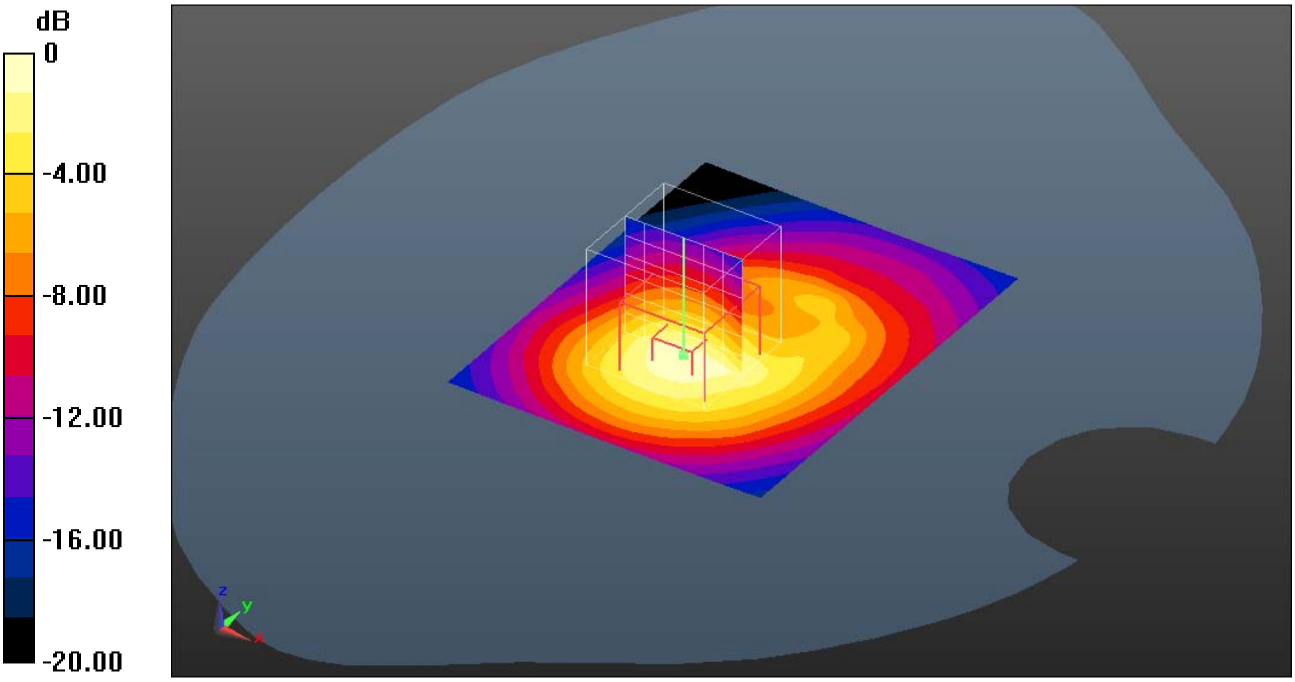
Communication System: UID 0, GSM/GPRS 2TS (0); Communication System Band: GSM 1900; Frequency: 1909.8 MHz; Communication System PAR: 6.021 dB; PMF: 2.00009
Medium parameters used: f = 1910 MHz; $\sigma$ = 1.526 S/m; $\varepsilon_r$ = 53.743; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(4.65, 4.65, 4.65); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

## Extremity MSL/Rear Position High GPRS 2TS/Area Scan (81x101x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.622 W/kg

## Extremity MSL/Rear Position High GPRS 2TS/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.610 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.02 W/kg
**SAR(1 g) = 0.536 W/kg; SAR(10 g) = 0.272 W/kg**
Maximum value of SAR (measured) = 0.622 W/kg




0 dB = 0.622 W/kg = -2.06 dBW/kg

**Additional information:**
position or distance of DUT to SAM: 0
ambient temperature: 21.8°C; liquid temperature: 21.7°C

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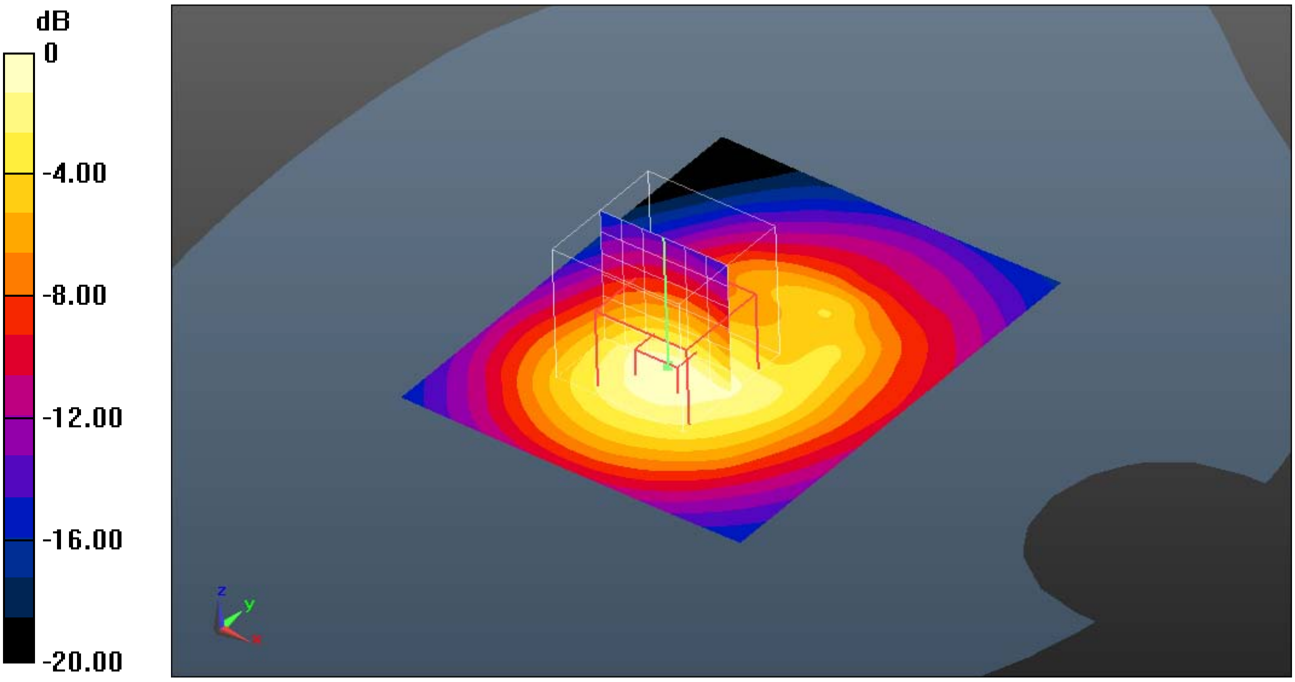
## FCC-Extremity-GSM1900

**DUT: Limmex; Type: Emergency watch; Serial: 19995**
Communication System: UID 0, GSM (0); Communication System Band: PCS 1900 (1850.0 - 1910.0 MHz); Frequency: 1880 MHz; Communication System PAR: 9.191 dB; PMF: 2.88104
Medium parameters used: f = 1880 MHz; σ = 1.494 S/m; $\varepsilon_r$ = 53.837; ρ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(4.65, 4.65, 4.65); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Extremity MSL/Rear Position Middle/Area Scan (81x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.405 W/kg

**Extremity MSL/Rear Position Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.006 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.624 W/kg
**SAR(1 g) = 0.336 W/kg; SAR(10 g) = 0.173 W/kg**
Maximum value of SAR (measured) = 0.388 W/kg




0 dB = 0.388 W/kg = -4.11 dBW/kg

**Additional information:**
position or distance of DUT to SAM: 0
ambient temperature: 21.8°C; liquid temperature: 21.7°C

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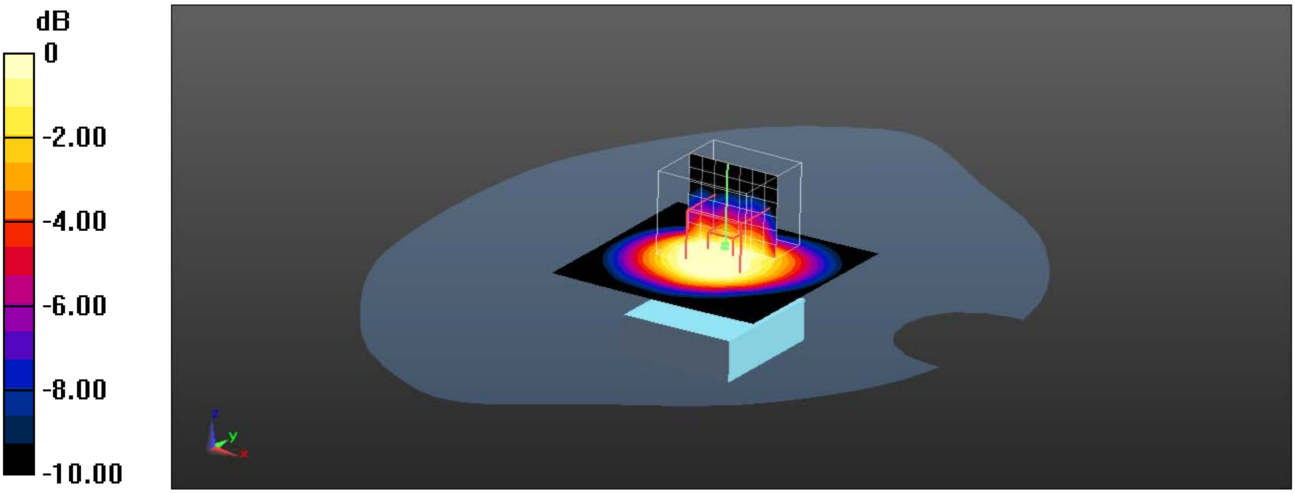
## FCC-GSM1900

**DUT: Limmex; Type: Emergency watch; Serial: 19995**
Communication System: UID 0, GSM (0); Communication System Band: PCS 1900 (1850.0 - 1910.0 MHz); Frequency: 1850.2 MHz; Communication System PAR: 9.191 dB; PMF: 2.88104
Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.335 S/m; $\varepsilon_r$ = 40.373; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(5.05, 5.05, 5.05); Calibrated: 9/2/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 8/28/2013
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Body HSL/Front Position Low 10mm/Area Scan (81x81x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.365 W/kg

**Body HSL/Front Position Low 10mm/Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.996 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.568 W/kg
**SAR(1 g) = 0.245 W/kg; SAR(10 g) = 0.146 W/kg**
Maximum value of SAR (measured) = 0.289 W/kg




0 dB = 0.294 W/kg = -5.32 dBW/kg

**Additional information:**
position or distance of DUT to SAM: 10mm
ambient temperature: 23.9°C; liquid temperature: 23.2°C

## Annex B.3: Liquid depth

Photo 1: Liquid depth 850 MHz head simulating liquid

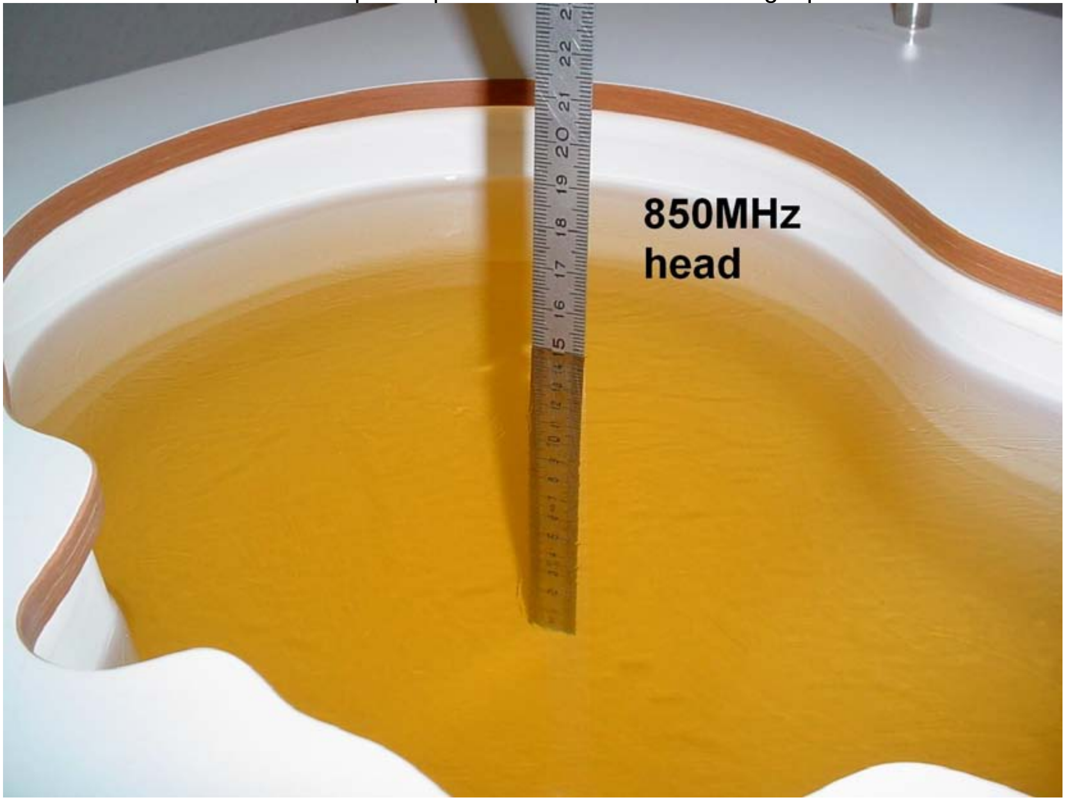



Photo 2: Liquid depth 850 MHz body simulating liquid

Photo 3: Liquid depth 1900MHz head simulating liquid

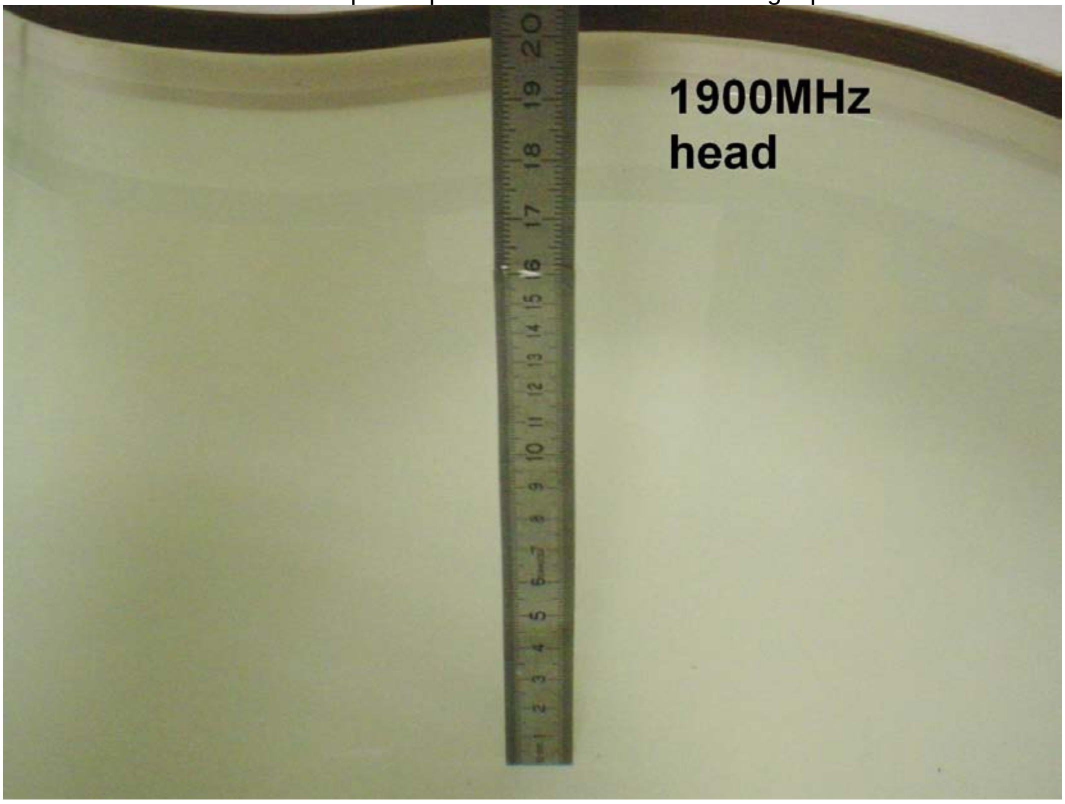
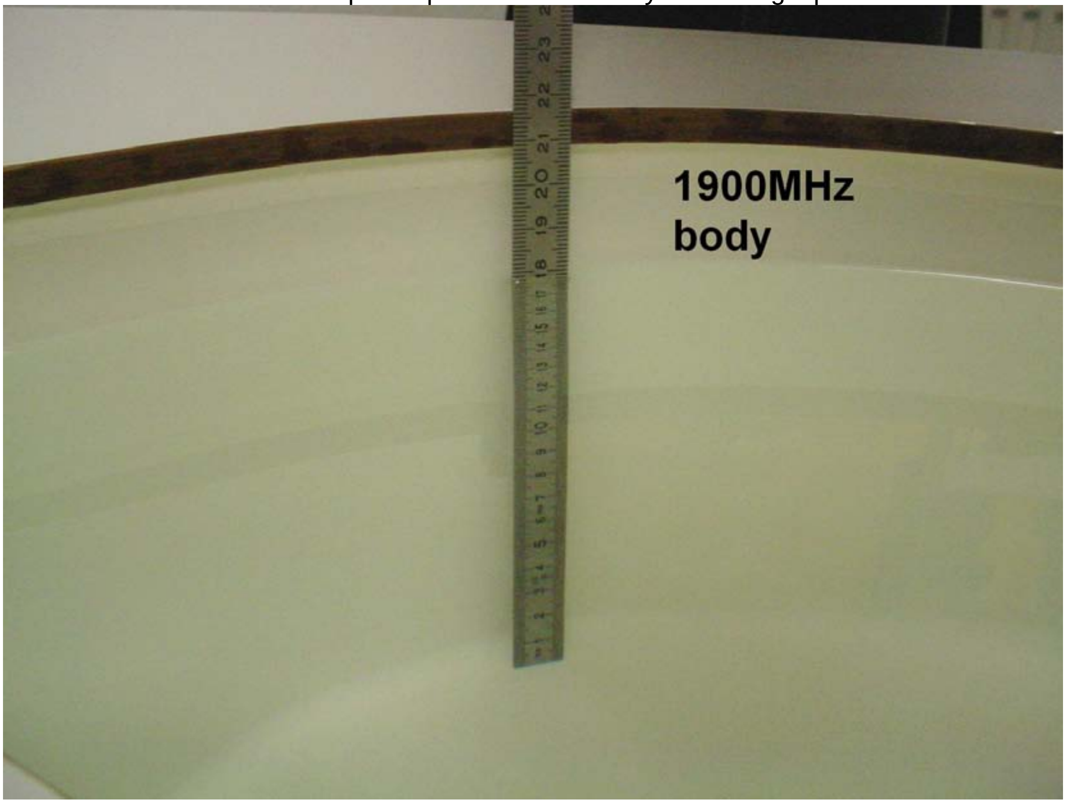



Photo 4: Liquid depth 1900 MHz body simulating liquid



## Annex C: Photo documentation

Photo 1: Measurement System DASY 5

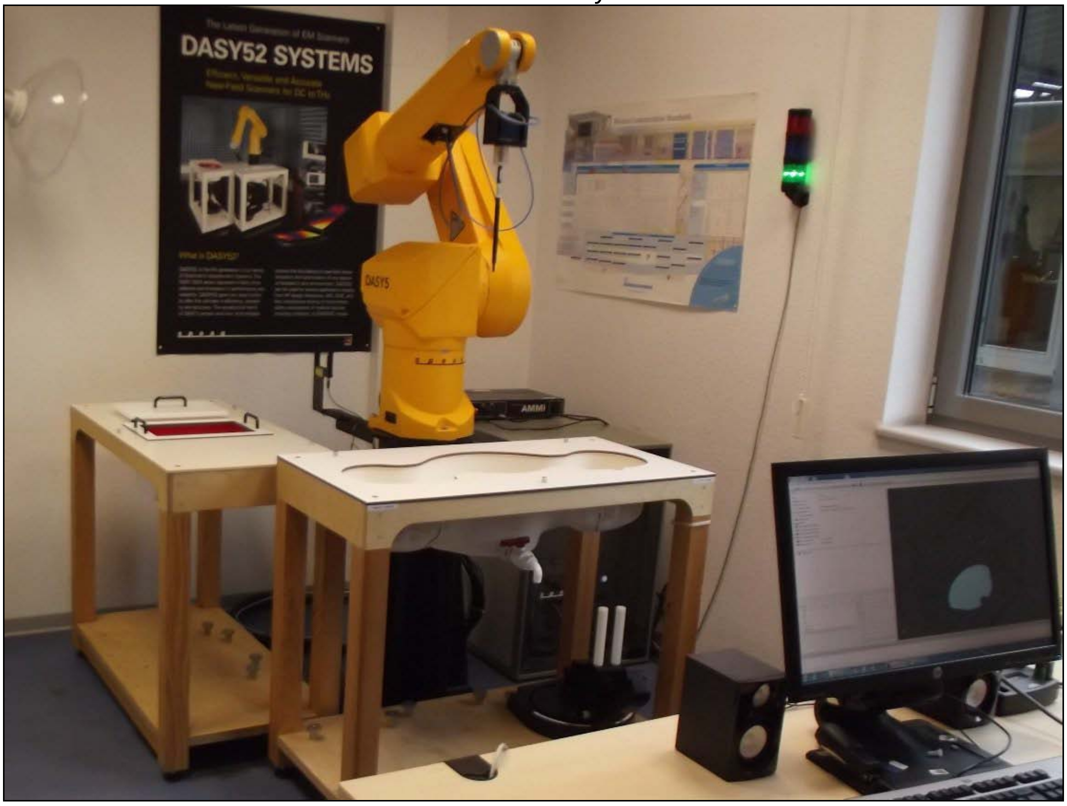



Photo 2: DUT - front view

Photo 3: DUT - side view

Photo 4: DUT - rear view

Photo 5: Test position rear side with 0 mm distance

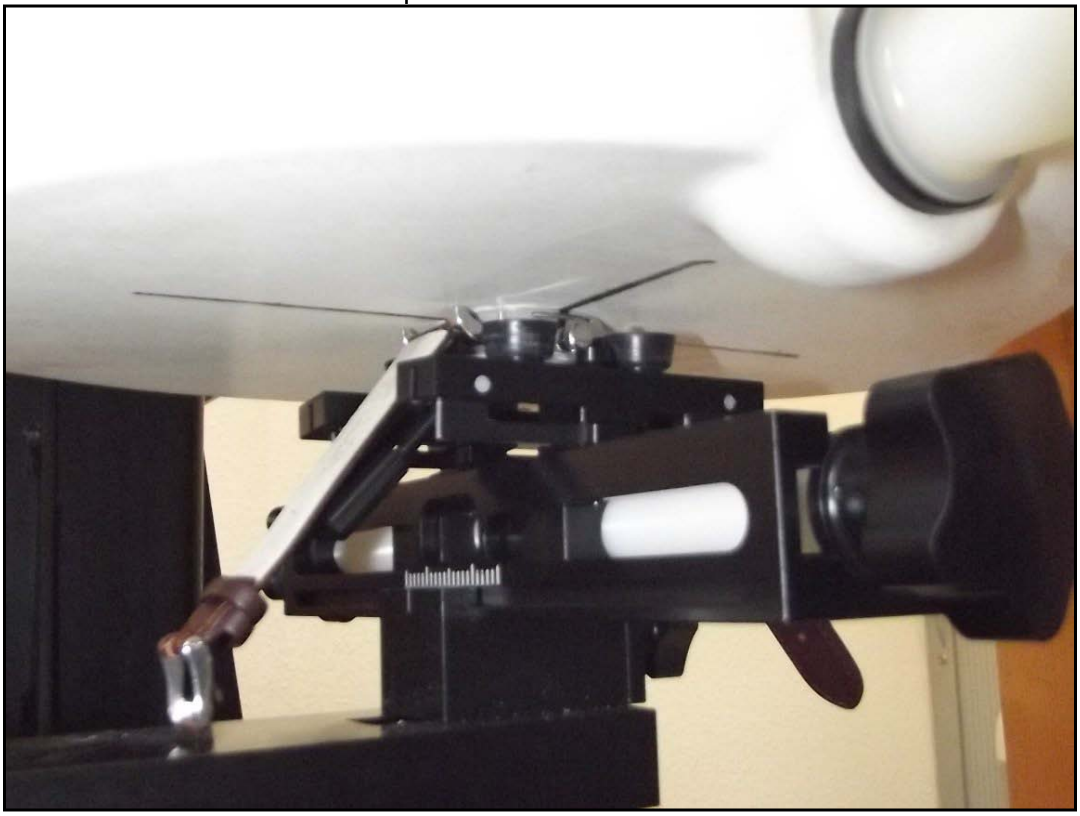


Photo 6: Test position front side with 10 mm distance

## Annex D: Calibration parameters

Calibration parameters are described in the additional document:

**Appendix to test report no. 1-6824/13-01-02-B**
**Calibration data, Phantom certificate**
**and detail information of the DASY5 System**

## Annex E: RF Technical Brief Cover Sheet acc. to RSS-102 Annex A

1. COMPANY NUMBER: **11484A**

2. MODEL NUMBER: **LM15US0001**

3. MANUFACTURER: **Electrosuisse Albislab**

4. TYPE OF EVALUATION:

(a) SAR Evaluation: **Device Used in the Vicinity of the Human Head**

- Multiple transmitters: Yes ☐ No ☒
- Evaluated against exposure limits: General Public Use ☒ Controlled Use ☐
- Duty cycle used in evaluation: 12.5 %
- Standard used for evaluation: RSS-102 Issue 4 (2010-03)
- SAR value**: 0.337 W/kg**. Measured ☒ Computed ☐ Calculated ☐

(c) SAR Evaluation: **Limb-Worn Device**

- Multiple transmitters: Yes ☐ No ☒
- Evaluated against exposure limits: General Public Use ☒ Controlled Use ☐
- Duty cycle used in evaluation: 25 %
- Standard used for evaluation: RSS-102 Issue 4 (2010-03)
- SAR value**: 0.407 W/kg**. Measured ☒ Computed ☐ Calculated ☐

## Annex E.1: Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in Annex E: is correct; that a Technical Brief was prepared and the information it contains is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed and that the device meets the SAR and/or RF exposure limits of RSS-102.

Signature:

cn=Oleksandr Hnatovskiy,
o=CETECOM ICT,
ou=HNA-100728,
email=Oleksandr.Hnatovskiy@cetecom.com, c=DE
2014.02.25 10:56:58 +01'00'

NAME : **Oleksandr Hnatovskiy**

TITLE : Dipl.-Ing. (FH)

COMPANY : CETECOM ICT Services GmbH

## Annex F: Document History

| Version | Applied Changes | Date of Release |
|---|---|---|
| | Initial Release | 2013-12-05 |
| -A | SAR measurements with the front of the device positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium were inserted. | 2014-02-13 |
| -B | SAR Evaluation of the Device Used in the Vicinity of the Human Head was added in Annex E: RF Technical Brief Cover Sheet acc. to RSS-102 Annex A page 47. | 2014-02-25 |

## Annex G: Further Information

**Glossary**

| | | |
|---|---|---|
| BW | - | Bandwidth |
| DTS | - | Distributed Transmission System |
| DUT | - | Device under Test |
| EUT | - | Equipment under Test |
| FCC | - | Federal Communication Commission |
| FCC ID | - | Company Identifier at FCC |
| HW | - | Hardware |
| IC | - | Industry Canada |
| Inv. No. | - | Inventory number |
| LTE | - | Long Term Evolution |
| N/A | - | not applicable |
| PCE | - | Personal Consumption Expenditure |
| OET | - | Office of Engineering and Technology |
| RB | - | resource block(s) |
| SAR | - | Specific Absorption Rate |
| S/N | - | Serial Number |
| $SPLSR_i$ | - | SAR-to-(peak-locations spacing) ratio |
| SW | - | Software |
| UNII | - | Unlicensed National Information Infrastructure |