The Testcenter facility 'Dosimetric Test Lab' within IMST GmbH is accredited by the German National 'Deutsche Akkreditierungsstelle GmbH (DAkkS)' for testing according to the scope as listed in the accreditation certificate: D-PL-12139-01-00.

Report

Dosimetric Assessment of the Portable Device TENA Identifi Logger from SCA Hygiene Products

(FCC ID: 2ABK3IDENTIFI)
(IC: IC-10866A-61407)

According to the FCC Requirements

August 05, 2014

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Executive Summary

The TENA Identifi Logger is a new device from SCA Hygiene Products working as humidity monitoring system in a medical product, operating in the 850 MHz, 1700 MHz and 1900 MHz frequency range. The device has an integrated antenna and the system concepts used are the GPRS/EDGE 850, GPRS/EDGE 1900, WCDMA I (FDD), WCDMA II (FDD) and WCDMA IV (FDD) standards. There is no simultaneous transmission mode available.

The objective of the measurements done by IMST was the dosimetric assessment of one device in body worn configuration in the GPRS 850 (Class 12), GPRS 1900 (Class 12), WCDMA II (FDD) and WCDMA IV (FDD) standards. The measurements were performed in use case scenario in combination with a diaper below the flat part of the SAM phantom. The examinations have been carried out with the dosimetric assessment system „DASY4“.

The measurements were made according to the Supplement C to OET Bulletin 65 of the Federal Communications Commission (FCC) Guidelines [OET 65] for evaluating compliance of mobile and portable devices with FCC limits for human exposure (general population) to radiofrequency emissions and IC RSS 102 Issue 4.

Additional information and guidelines given by the following FCC documents were used:

- SAR Measurement Requirements for 100 MHz to 6 GHz [KDB 865664 D01 v01]
- Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies [KDB 447498 D01 v05]
- SAR Measurement Procedures for 3G Devices [KDB 941225 D01 v02]
- Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE [KDB 941225 D03 v01]
- SAR Guidance for HSPA, HSPA+, DC-HSDPA and 1x-Advance [KDB 941225 D02 and 1x Advanced v02r02]

All measurements have been performed in accordance to the recommendations given by SPEAG.

Compliance Statement

According Manufacturer information the device transmits data for max. 60 seconds every 20 minutes. In a 6 minute exposure time this results a duty factor of 16.6 %.

The portable device TENA Identifi Logger from SCA Hygiene Products (FCC ID: 2ABK3IDENTIFI, IC: IC-10866A-61407) is in compliance with the IC RSS 102 Issue 4 [RSS 102] and Federal Communications Commission (FCC) Guidelines [OET 65] for uncontrolled exposure. SAR assessment in body worn was conducted in use case scenario in combination with a diaper with a distance of 0 mm between the housing of the device and the flat phantom.

The maximum results of SAR for the TENA Identifi Logger are as follows:

Test Position	Frequency Band	Channel	Position	Highest Reported SAR_{1g} [W/kg] (Measured)	Highest Reported SAR_{1g} [W/kg] (duty factor 16.6%)
Body Worn	GPRS 850 (4TX)	190	1 (Fig. 13)	0.139	0.023
	GPRS 1900 (4TX)	810		1.134	0.188
	WCDMA II (FDD)	512		0.744	0.124
	WCDMA IV (FDD)	1312		0.679	0.113

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1 Subject of Investigation

The TENA Identifi Logger is a new device from SCA Hygiene Products working as humidity monitoring system in a medical product, operating in the 850 MHz, 1700 MHz and 1900 MHz frequency range. The device has an integrated antenna and the system concepts used are the GPRS/EDGE 850, GPRS/EDGE 1900, WCDMA I (FDD), WCDMA II (FDD) and WCDMA IV (FDD) standards. There is no simultaneous transmission mode available.

Fig. 1: Pictures of the device under test.

The objective of the measurements done by IMST was the dosimetric assessment of one device in body worn configuration in the GPRS 850 (Class 12), GPRS 1900 (Class 12), WCDMA II (FDD) and WCDMA IV (FDD) standards. The measurements were performed in use case scenario in combination with a diaper below the flat part of the SAM phantom. The examinations have been carried out with the dosimetric assessment system „DASY4“.

2 The IEEE Standard C95.1 and the FCC Exposure Criteria

In the USA the FCC exposure criteria [OET 65] are based on the withdrawn IEEE Standard C95.1-1999 [IEEE C95.1-1999]. This version was replaced by the IEEE Standard C95.1-2005 [IEEE C95.1-2005] in October, 2005.

Both IEEE standards sets limits for human exposure to radio frequency electromagnetic fields in the frequency range 3 kHz to 300 GHz. One of the major differences in the newly revised C95.1-2005 is the change in the basic restrictions for localized exposure, from 1.6 W/kg averaged over 1 g tissue to 2.0 W/kg averaged over 10 g tissue, which is now identical to the ICNIRP guidelines [ICNIRP 1998].

2.1 Distinction Between Exposed Population, Duration of Exposure and Frequencies

The American Standard [IEEE C95.1-1999] distinguishes between controlled and uncontrolled environment. Controlled environments are locations where there is exposure that may be incurred by persons who are aware of the potential for exposure as a concomitant of employment or by other cognizant persons. Uncontrolled environments are locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces. For exposure in controlled environments higher field strengths are admissible. In addition the duration of exposure is considered.

Due to the influence of frequency on important parameters, as the penetration depth of the electromagnetic fields into the human body and the absorption capability of different tissues, the limits in general vary with frequency.

2.2 Distinction between Maximum Permissible Exposure and SAR Limits

The biological relevant parameter describing the effects of electromagnetic fields in the frequency range of interest is the specific absorption rate SAR (dimension: power/mass). It is a measure of the power absorbed per unit mass. The SAR may be spatially averaged over the total mass of an exposed body or its parts. The SAR is calculated from the r.m.s. electric field strength *E* inside the human body, the conductivity σ and the mass density ρ of the biological tissue:

$$SAR = \sigma \frac{E^2}{\rho} = c \frac{\partial T}{\partial t}\bigg|_{t \to 0+} . \quad (1)$$

The specific absorption rate describes the initial rate of temperature rise $\partial T / \partial t$ as a function of the specific heat capacity *c* of the tissue. A limitation of the specific absorption rate prevents an excessive heating of the human body by electromagnetic energy.

As it is sometimes difficult to determine the SAR directly by measurement (e.g. whole body averaged SAR), the standard specifies more readily measurable maximum permissible exposures in terms of external electric *E* and magnetic field strength *H* and power density *S*, derived from the SAR limits. The limits for *E*, *H* and *S* have been fixed so that even under worst case conditions, the limits for the specific absorption rate SAR are not exceeded.

For the relevant frequency range the maximum permissible exposure may be exceeded if the exposure can be shown by appropriate techniques to produce SAR values below the corresponding limits.

2.3 General SAR Limit

In this report the comparison between the American exposure limits and the measured data is made using the spatial peak SAR; the power level of the device under test guarantees that the whole body averaged SAR is not exceeded.

Having in mind a worst case consideration, the SAR limit is valid for uncontrolled environment and mobile respectively portable transmitters. According to Table 1 the SAR values have to be averaged over a mass of 1 g (SAR_{1g}) with the shape of a cube.

Standard	Status	SAR limit [W/kg]
IEEE C95.1-1999	Replaced	1.6

Table 1: Relevant spatial peak SAR limit averaged over a mass of 1 g.

3 The FCC Measurement Procedure

The Federal Communications Commission (FCC) has published a report and order on the 1st of August 1996 [FCC 96-326], which requires routine dosimetric assessment of mobile telecommunications devices, either by laboratory measurement techniques or by computational modeling, prior to equipment authorization or use. In 2001 the Commission's Office of Engineering and Technology has released Edition 01-01 of Supplement C to OET Bulletin 65. This revised edition, which replaces Edition 97-01, provides additional guidance and information for evaluating compliance of mobile and portable devices with FCC limits for human exposure to radiofrequency emissions [OET 65].

3.1 General Requirements

The test shall be performed in a laboratory with an environment which avoids influence on SAR measurements by ambient EM sources and any reflection from the environment itself. The ambient temperature shall be in the range of 20°C to 26°C and 30-70% humidity.

3.2 Tests for Modules in Portable Devices according KDB 941225

For measurements in WCDMA without HSDPA or HSUPA, the default test configuration is to establish a radio link between the DUT and a communication test set using a 12.2 kbps RMC configured Test Loop Mode 1 and TPC bits configured to "all 1". The SAR will be tested for all bands using a Rel99 call configured to transmit at maximum output power per 3GPP 34.121 [3GPP 34.121]. The Rel99 parameters are summarized in Table **Fehler! Textmarke nicht definiert.**.

In addition, body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA. Maximum output power is verified according to 3GPP 34.121 and SAR must be measured according to these maximum output conditions.

Furthermore, body SAR for HSUPA is measured with E-DCH with H-Set 1 in Sub-test 5 and QPSK for FRC and a 12.2 kbps RMC configuration in Test Loop Mode 1 using the highest body SAR configuration in 12.2 kbps RMC without HSUPA. Maximum output power is verified according to 3GPP 34.121 and SAR must be measured according to these maximum output conditions as described in KDB 941225 [KDB 941225].

As stated by the manufacturer, the UE is fully compliant with 3GPP standards defining required UMTS spreading factors.

The UE is fully compliant with 3GPP standards defining required UMTS spreading factors.

- The DPCCH spreading factor is 256 per 3GPP TS 25.213 section 4.3.1.2.1.
- The DPDCH spreading factor is dependent on number of DPDCH channels and data rage. For a single channel the spreading factor can range from 4 to 256. For more than one DPDCH channel the spreading factor is 4. Further details are defined by 3GPP in TS 25.213 section 4.3.1.2.1.
- HS-DPCCH spreading factor is 256. Further details can be found in 3GPP TS 25.213 section 4.3.1.2.2.
- IMST confirms that the device operating parameters such as the different β and Δ values were configured properly and the power measurement procedures used have included the power setback considerations specified in 3GPP TS 34.121, and that the HSPA channels have remained active with the required E-TFCI and AG index values maintained during the durations of the measurements.

IMST confirms that that the required HSPA test parameters, including stable TFCI and output power conditions, have been used for the HSPA SAR measurements.

Additionally the SAR Recommendations regarding test reduction for GSM/GPRS/EDGE are met.

3.3 Tests in Body Worn Configuration according KDB 447498

Devices that support transmission while used with body worn accessories must be tested for body worn accessory SAR compliance. All body worn tests have to be conducted with the same distance between DUT and SAM phantom. Therefore voice and data transmission requirements must be determined according to the wireless technologies and operating characteristics of the individual device. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body worn accessories, must be tested for SAR compliance using a conservative minimum test separation distance ≤ 5 mm to support compliance. Nevertheless, all accessories that contain metallic components must be tested for compliance additionally.

3.4 Measurement Variability

According KDB 865664 SAR measurement variability was assessed for each frequency band which was determined by the SAR probe calibration point and tissue equivalent medium, used for the device measurement. When both head and body tissue equivalent media were required for SAR measurements in a frequency band, the variability measurement procedure were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue equivalent medium in a frequency band. The test device was returned to ambient conditions with the battery fully charged before it was remounted on the device holder for the repeated measurements to minimize any unexpected variations in the repeated results. Repeated measurement is not required when the original measured highest SAR is < 0.8 W/kg.

4 The Measurement System

DASY is an abbreviation of „Dosimetric Assessment System“ and describes a system that is able to determine the SAR distribution inside a phantom of a human being according to different standards. The DASY4 system consists of the following items as shown in Fig: 2. Additional Fig: 3 shows the equipment, similar to the installations in other laboratories.

- Fully compliant with all current measurement standards as stated in Fig. 9
- High precision robot with controller
- Measurement server (for surveillance of the robot operation and signal filtering)
- Data acquisition electronics DAE (for signal amplification and filtering)
- Field probes calibrated for use in liquids
- Electro-optical converter EOC (conversion from the optical into a digital signal)
- Light beam (improving of the absolute probe positioning accuracy)
- Two SAM phantoms filled with tissue simulating liquid
- DASY4 software
- SEMCAD

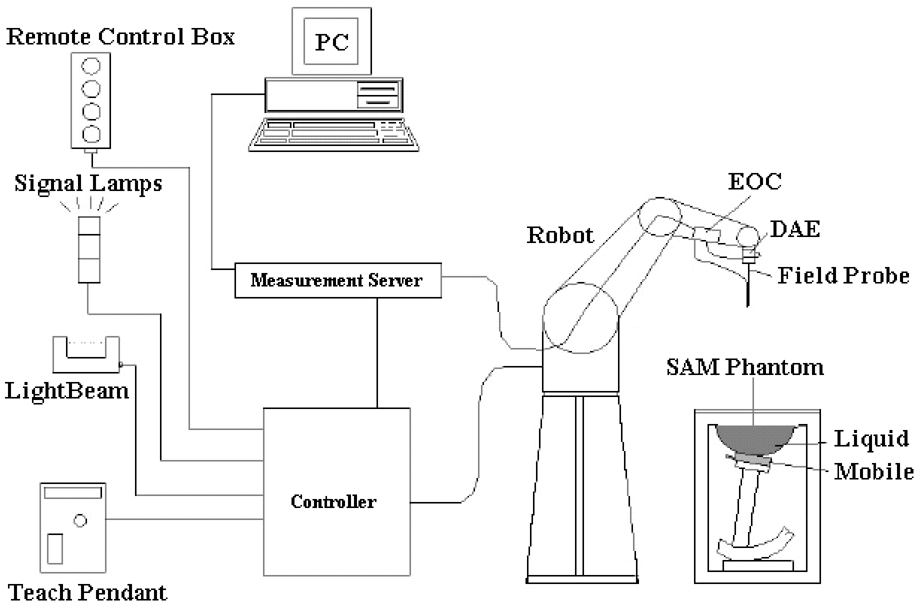


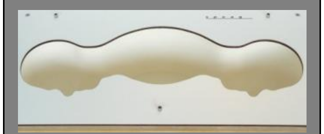
Fig. 2: The DASY4 measurement system.

Fig. 3: The measurement set-up with two SAM phantoms containing tissue simulating liquid.

The mobile phone operating at the maximum power level is placed by a non metallic device holder (delivered from Schmid & Partner) in the above described positions at a shell phantom of a human being. The distribution of the electric field strength *E* is measured in the tissue simulating liquid within the shell phantom. For this miniaturised field probes with high sensitivity and low field disturbance are used. Afterwards the corresponding SAR values are calculated with the known electrical conductivity σ and the mass density ρ of the tissue in the SEMCAD FDTD software. The software is able to determine the averaged SAR values (averaging region 1 g or 10 g) for compliance testing.

The measurements are done by two scans: first a coarse scan determines the region of the maximum SAR, afterwards the averaged SAR is measured in a second scan within the shape of a cube. The measurement time takes about 20 minutes.

4.1 Phantoms

Twin SAM Phantom V4.0	
	Specific Anthropomorphic Mannequin defined in IEEE 1528 and IEC 62209-1 and delivered by Schmid & Partner Engineering AG. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. The details and the Certificate of conformity can be found in Fig. 10.
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm; Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters

4.2 E-Field-Probes

For the measurements the Dosimetric E-Field Probes ET3DV6R or EX3DV4 with following specifications are used. They are manufactured and calibrated in accordance with FCC [OET 65] and IEEE [IEEE 1528-2003] recommendations annually by Schmid & Partner Engineering AG.

ET3DV6R	
Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Dimensions	Overall length: 337 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm
Frequency	10 MHz to 2.3 GHz Linearity: ± 0.2 dB (30 MHz to 2.3 GHz)
Directivity	Axial isotropy: ± 0.2 dB in TSL (rotation around probe axis) Spherical isotropy: ± 0.4 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Calibration Range	450 MHz / 750 MHz / 900 MHz / 1750 MHz / 1900 MHz / 1950 MHz for head and body simulating liquid

EX3DV4	
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
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
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	Axial isotropy: ± 0.3 dB in TSL (rotation around probe axis) Spherical isotropy: ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Calibration Range	1950 MHz / 2450 MHz / 2600 MHz / 3500 MHz / 5200 MHz / 5300 MHz / 5600 MHz / 5800 MHz for head and body simulating liquid

4.3 Measurement Procedure

The following steps are used for each test position:

- Establish a call with the maximum output power with a base station simulator. The connection between the mobile phone and the base station simulator is established via air interface.
- Measurement of the local E-field value at a fixed location (P1). This value serves as a reference value for calculating a possible power drift.
- Measurement of the SAR distribution with resolution settings for area scan and zoom scan according KDB 865664 D01 as shown in Table 2.
- The used extrapolation and interpolation routines are all based on the modified Quadratic Shepard´s method [DASY4].
- Repetition of the E-field measurement at the fixed location (P1) and repetition of the whole procedure if the two results differ by more than ± 0.21dB.

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>≥ 3 GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 - 3 GHz: ≤ 12 mm</td><td>3 - 4 GHz: ≤ 12 mm
4 - 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: ΔX_{Zoom}, ΔY_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 - 3 GHz: ≤ 5 mm*</td><td>3 - 4 GHz: ≤ 5 mm*
4 - 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">Uniform grid: $\Delta Z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 - 4 GHz: ≤ 4 mm
4 - 5 GHz: ≤ 3 mm
5 - 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta Z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 - 4 GHz: ≤ 3 mm
4 - 5 GHz: ≤ 2.5 mm
5 - 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta Z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5· $\Delta Z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 - 4 GHz: ≥ 28 mm
4 - 5 GHz: ≥ 25 mm
5 - 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">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</td></tr>
</table>

Table 2: Parameters for SAR scan procedures.

4.4 Uncertainty Assessment

Table 3 includes the worst case uncertainty budget suggested by the [IEEE 1528-2003] and determined by Schmid & Partner Engineering AG. The expanded uncertainty (K=2) is assessed to be ± 21.7% and is valid up to 3.0 GHz.

Error Sources	Uncertainty Value	Probability Distribution	Divisor	c_i	Standard Uncertainty	v_i^2 or v_{eff}
Measurement System						
Probe calibration	± 5.9 %	Normal	1	1	± 5.9 %	∞
Axial isotropy	± 4.7 %	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical isotropy	± 9.6 %	Rectangular	√3	0.7	± 3.9 %	∞
Boundary effects	± 1.0 %	Rectangular	√3	1	± 0.6 %	∞
Linearity	± 4.7 %	Rectangular	√3	1	± 2.7 %	∞
System detection limit	± 1.0 %	Rectangular	√3	1	± 0.6 %	∞
Readout electronics	± 1.0 %	Normal	1	1	± 1.0 %	∞
Response time	± 0.8 %	Rectangular	√3	1	± 0.5 %	∞
Integration time	± 2.6%	Rectangular	√3	1	± 1.5 %	∞
RF ambient conditions	± 3.0 %	Rectangular	√3	1	± 1.7 %	∞
Probe positioner	± 0.4 %	Rectangular	√3	1	± 0.2 %	∞
Probe positioning	± 2.9 %	Rectangular	√3	1	± 1.7 %	∞
Algorithm for max SAR eval.	± 1.0 %	Rectangular	√3	1	± 0.6 %	∞
Test Sample Related						
Device positioning	± 2.9 %	Normal	1	1	± 2.9 %	145
Device holder	± 3.6 %	Normal	1	1	± 3.6 %	5
Power drift	± 5.0 %	Rectangular	√3	1	± 2.9 %	∞
Phantom and Set-up						
Phantom uncertainty	± 4.0 %	Rectangular	√3	1	± 2.3 %	∞
Liquid conductivity (target)	± 5.0 %	Rectangular	√3	0.64	± 1.8 %	∞
Liquid conductivity (meas.)	± 2.5 %	Normal	1	0.64	± 1.6 %	∞
Liquid permittivity (target)	± 5.0 %	Rectangular	√3	0.6	± 1.7 %	∞
Liquid permittivity (meas.)	± 2.5 %	Normal	1	0.6	± 1.5 %	∞
Combined Uncertainty					± 10.8 %	

Table 3: Uncertainty budget of DASY4.

5 Output Power Values

OUTPUT POWER FOR GSM BANDS [dBm]											
Band	Frequency [MHz]	Channel	BURST AVERAGE POWER [dBm]								
			GPRS / EDGE (GMSK)				**EDGE** (8 PSK)				
			1 TX	2 TX	3 TX	4 TX	1 TX	2 TX	3 TX	4 TX	
850	824.2	128	32.8	32.2	31.7	30.6	27.4	26.9	26.0	24.4	
	836.6	190	32.7	32.2	31.7	30.6	27.2	26.9	26.1	25.4	
	848.8	251	32.7	32.3	31.7	30.6	27.2	26.9	26.2	25.5	
1900	1850.2	512	29.7	29.2	28.8	27.7	25.8	25.6	25.0	24.4	
	1880.0	661	29.6	29.2	28.6	27.4	25.6	25.4	24.7	24.3	
	1909.8	810	29.3	29.0	28.4	27.2	25.4	25.2	24.5	24.1	

Table 4: Burst average output power values for SCA Hygiene Products TENA Identifi Logger.

OUTPUT POWER FOR GSM BANDS [dBm]										
Band	Frequency [MHz]	Channel	FRAME AVERAGE POWER [dBm]							
			GPRS / EDGE (GMSK)				**EDGE** (8 PSK)			
			1 TX	2 TX	3 TX	4 TX	1 TX	2 TX	3 TX	4 TX
850	824.2	128	23.8	26.2	27.4	27.6	18.4	20.9	21.7	21.4
	836.6	190	23.7	26.2	27.4	27.6	18.2	20.9	21.8	22.4
	848.8	251	23.7	26.3	27.4	27.6	18.2	20.9	21.9	22.5
1900	1850.2	512	20.7	23.2	24.5	24.7	16.8	19.6	20.7	21.4
	1880.0	661	20.6	23.2	24.3	24.4	16.6	19.4	20.4	21.3
	1909.8	810	20.3	23.0	24.1	24.2	16.4	19.2	20.2	21.1

* Frame averaged power is linearly scaled the burst averaged power over 8 time slots.
Frame averaged power = Burst average power – 9 dB (1TX) // - 6 dB (2TX) // - 4.3 dB (3TX) // - 3 dB (4TX)

Table 5: Frame average output power values for SCA Hygiene Products TENA Identifi Logger.

Since output power variation for the dedicated test channels is ≤ 0.5 dB SAR assessment has to be started at mid channel. According the frame averaged power values GPRS Class 12 delivers the highest output power. Therefore SAR assessment was conducted in GPRS Class 12 (4TX).

5.1 Output Power Values for WCDMA (FDD)

For measurements in WCDMA, without HSDPA or HSUPA, the default test configuration is to establish a radio link between the DUT and a communication test set using a 12.2 kbps RMC configured Test Loop Mode 1 and TPC bits configured to all “1”. The SAR will be tested for all bands using a Rel99 call configured to transmit at maximum output power per 3GPP 34.121 [3GPP 34.121]. The Rel99 parameters are summarized in Table 6.
WCDMA SAR was tested in RMC mode without HSPA. According KDB 941225 D01 HSPA SAR is not required when the averaged output power of the HSPA subtests are not higher than 0.25 dB then measured in RMC mode and the assessed SAR value in this mode is not higher than 1.2 W/kg.

Maximum Peak-Averaged Output Power [dBm]												
Band	**Freq. [MHz]**	**CH**	**WCDMA RMC**	**HSDPA**				**HSUPA**				
				Subt. 1	**Subt. 2**	**Subt. 3**	**Subt. 4**	**Subt. 1**	**Subt. 2**	**Subt. 3**	**Subt. 4**	**Subt. 5**
1750 (FDD 4)	1712.4	1312	23.5	23.2	22.3	22.1	21.9	21.5	21.5	21.4	21.4	21.4
	1732.6	1413	23.5	23.2	22.2	22.1	21.8	21.5	21.5	21.5	21.5	21.5
	1752.6	1513	23.5	23.3	22.3	22.1	21.9	21.6	21.4	21.6	21.6	21.6
1900 (FDD 2)	1852.4	9626	23.2	23.1	22.1	21.9	21.7	21.3	21.3	21.3	21.3	21.3
	1880.0	9400	22.9	22.6	21.8	21.5	21.3	20.9	20.8	20.9	21.0	20.9
	1907.6	9538	23.0	22.7	21.8	21.6	21.5	21.1	21.1	21.0	21.1	21.0
βc				2/15	12/15	15/15	15/15	11/15	6/15	15/15	2/15	15/15
βd				15/15	15/15	8/15	4/15	15/15	15/15	9/15	15/15	15/15
ΔACK. ΔNACK. ΔCQI				8	8	8	8	8	8	8	8	8

Table 6:According TS 34.121 table C10.1.4 measured max. peak averaged output power for WCMDA for the used TENA Identifi Logger from SCA Hygiene Products.

5.2 Tune-Up Information

NOMINAL TARGET BURST AVERAGE POWER [dBm]				
Band	**GPRS / EDGE** (GMSK)			
	1 TX	**2 TX**	**3 TX**	**4 TX**
850	33.5	33.0	32.5	32.0
1900	30.5	30.0	29.5	29.0

Table 7: Nominal target output power values for SCA Hygiene Products TENA Identifi Logger.

NOMINAL TARGET POWER FOR WCDMA BANDS [dBm]	
Band	**12.2 kbps RMC**
WCDMA II	24.0
WCDMA IV	24.0

Table 8: Nominal target output power values for WCDMA bands for SCA Hygiene Products TENA Identifi Logger.

6 SAR Test Results

The tables below contain the measured SAR values averaged over a mass of 1 g. SAR assessment was conducted in the worst case configuration with output power values according Table 4 - 6.

According KDB 447498 D01 V05, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

Scaling Factor = tune-up limit power (mW) / RF power (mW)
Reported SAR = measured SAR * scaling factor

Furthermore, testing of other required channels within the operating mode of frequency band is not required when the reported SAR for the mid-band or highest output power channel is ≤ 0.4 W/kg for transmission band ≥ 200 MHz.

Band	Mode	Freq [MHz]	Channel	Test Position	Figure No.	Tune-Up Limtt [dBm]	Output Power [dBm	Measured SAR_{1g} [W/kg]	Power Drift [dBm]	Scaling Factor	Highest Reported SAR_{1g} [W/kg]	Plot No
850	GPRS (4TX)	824.2	128	1	13	32.0	30.6	0.092	-0.149	1.380	0.127	
		836.6	190				30.6	0.101	-0.185	1.380	0.139	1
		848.8	251				30.6	0.069	0.140	1.380	0.095	
1900	GPRS (4TX)	1850.2	512	1	13	29.0	27.7	0.790	-0.022	1.349	1.066	
		1880.0	661				27.4	0.727	-0.068	1.445	1.051	
		1909.8	810				27.2	0.749	-0.069	1.514	1.134	2
WCDMA II	RMC	1852.4	9262	1	13	24.0	23.2	0.619	0.093	1.202	0.744	3
		1880.0	9400				22.9	0.509	-0.154	1.288	0.656	
		1907.6	9538				23.0	0.512	-0.198	1.259	0.645	
WCDMA IV	RMC	1712.4	1312	1	13	24.0	23.5	0.605	-0.185	1.122	0.679	4
		1732.6	1413				23.5	0.565	-0.155	1.122	0.634	
		1752.6	1513				23.5	0.376	-0.078	1.122	0.422	

Table 9: Measurement results for GPRS 850, GPRS 1900, WCDMA II (FDD) and WCDMA IV (FDD) for the TENA Identifi Logger from SCA Hygiene Products.

According Manufacturer information the device transmits data for max. 60 seconds every 20 minutes. In a 6 minute exposure time this results a duty factor of 16.6 %. The calculated SAR values are shown in table 10.

Band	Mode	Freq [MHz]	Channel	Highest Reported SAR_{1g} [W/kg]	Highest Calculated SAR_{1g} [W/kg] (duty factor 16.6%)	Plot No
850	GPRS (4TX)	824.2	128	0.127	0.021	
		836.6	190	0.139	0.023	1
		848.8	251	0.095	0.016	
1900	GPRS (4TX)	1850.2	512	1.066	0.177	
		1880.0	661	1.051	0.174	
		1909.8	810	1.134	0.188	2
WCDMA II	RMC	1852.4	9262	0.744	0.124	3
		1880.0	9400	0.656	0.109	
		1907.6	9538	0.643	0.107	
WCDMA IV	RMC	1712.4	1312	0.679	0.113	4
		1732.6	1413	0.634	0.105	
		1752.6	1513	0.422	0.070	

Table 10: Calculated results for GPRS 850, GPRS 1900, WCDMA II (FDD) and WCDMA IV (FDD) for the TENA Identifi Logger from SCA Hygiene Products.

To control the output power stability during the SAR test the used DASY4 system calculates the power drift by measuring the e-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in the above tables labeled as: (Drift[dB]). This ensures that the power drift during one measurement is within 5%. Please note that we add the measured “power drift” values from the DASY4 system.

Notes for test reductions considerations:

The TENA Identifi Logger from SCA Hygiene Products is able to work in HSDPA, HSUPA and HSPA+. Since the reported SAR values assessed in 12.2 kbps RMC mode are below 75% of the SAR limit, according KDB 941225 D01 and KDB 941225 D02 additional SAR assessment for HSPA capabilities is not necessary.

7 Evaluation

In Figure 5 the flat phantom SAR results for GPRS 850, GPRS 1900 and WCDMA II (FDD) given in Table 10 are summarized and compared to the limit.

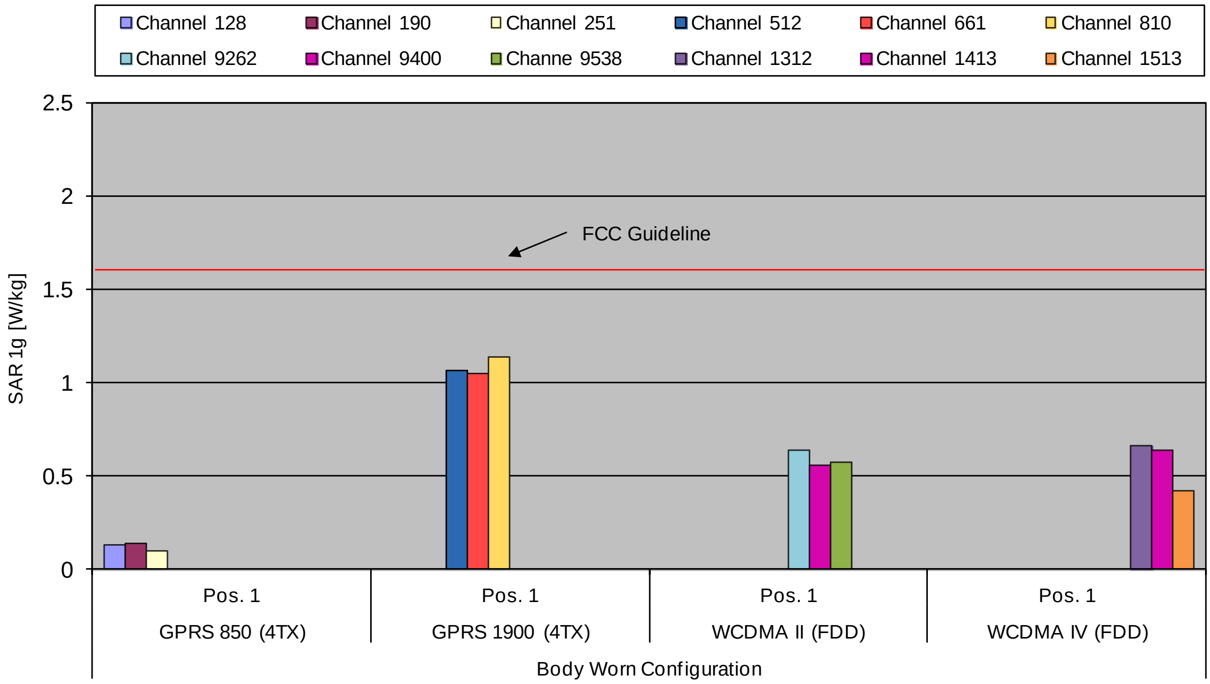


Fig. 4: The reported SAR values for the SCA Hygiene Products TENA Identifi Logger in comparison to the FCC exposure limit.

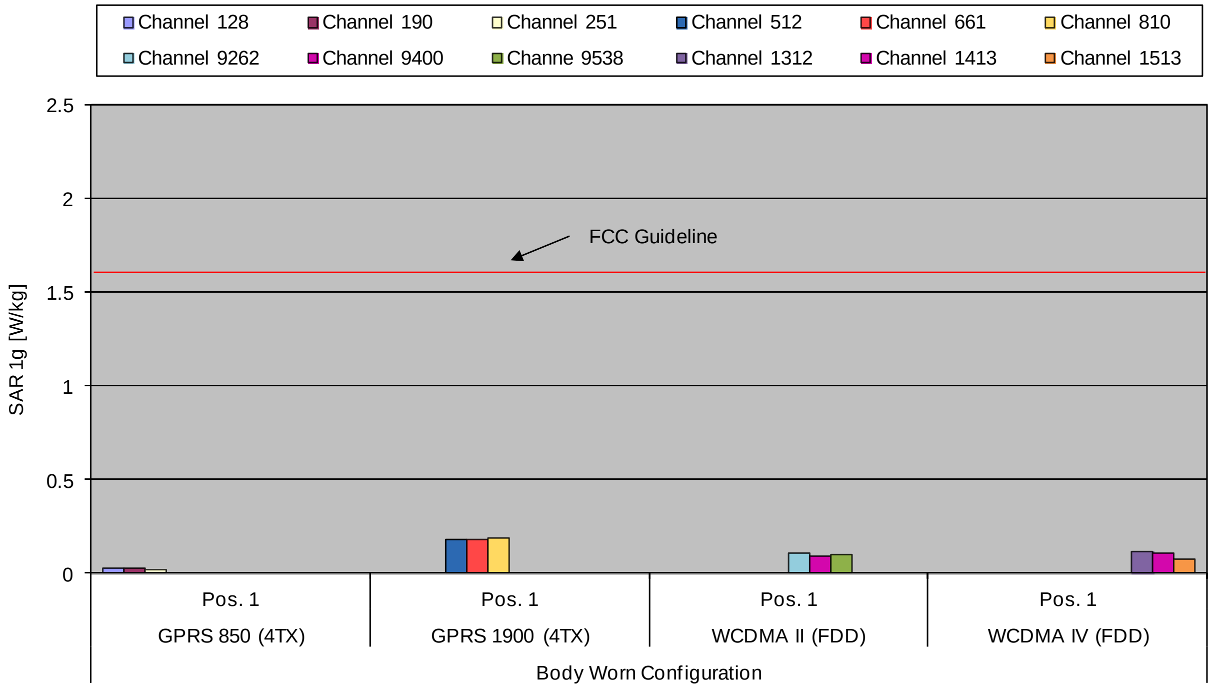


Fig. 5: The calculated SAR values with a duty factor of 16.6% for the SCA Hygiene Products TENA Identifi Logger in comparison to the FCC exposure limit.

8 Appendix

8.1 Administrative Data

Date of Validation:	835 MHz (GPRS 850):	January 23, 2013
	1900 MHz (GPRS 1900):	January 17, 2013
	1900 MHz (WCDMA II):	January 17, 2013
	1750 MHz (WCDMA IV):	June 25, 2013
Date of Measurement:	January 17, 2013 – June 25, 2013	
Data Stored:	Nemko_60320_6130027	
Contact:	IMST GmbH Carl-Friedrich-Gauß-Str. 2 D-47475 Kamp-Lintfort. Germany Tel.: +49- 2842-981 378. Fax: +49- 2842-981 399 email: vandenbosch@imst.de	

8.2 Device under Test and Test Conditions

MTE:	SCA Hygiene Products TENA Identifi Logger (Datalogger; Module), identical prototype
Date of Receipt:	January 16, 2013
IMEI:	351579050121340
IC:	IC-10866A-61407
Equipment Class:	Portable device
Power Class:	GPRS 850: 5, tested with power level 5 GPRS 1900: 2, tested with power level 0 WCDMA II (FDD) and WCDMA IV (FDD): 4 tested with max.allow. UE Power of 24 dBm
RF Exposure Environment:	General Population/ Uncontrolled
Power Supply:	Internal battery
Antenna Type:	integrated
Measured Standards:	GPRS 850 (Class 12) with 4TX uplink; GPRS 1900 (Class 12) with 4 TX uplink, WCDMA II, WCDMA IV
Method to establish a Call:	GPRS 850, GPRS 1900, WCDMA II: Basestation simulator, using the air interface
Modulation:	GPRS: GMSK; WCDMA (FDD): QPSK;
Used Phantom:	SAM Twin Phantom V4.0. as defined by the IEEE SCC-34/SC2 group and delivered by Schmid & Partner Engineering AG

SCA Hygiene Products TENA Identifi Logger	TX Range [MHz]	RX Range [MHz]	Used Channels [low. middle. high]	Used Crest Factor
GPRS 850	824.2 – 848.8	869.2 – 893.8	128, 190, 251	2
GPRS 1900	1850.2 –1909.8	1930.2 – 1989.8	512, 661, 810	2
WCDMA II (FDD)	1852.4 – 1907.6	1932.4 – 1987.6	9262, 9400, 9538	1
WCDMA IV (FDD)	1712.4 – 1752.6	2112.4 – 2152.6	1312, 1413, 1513	1

Table 11: Used channels and crest factors during the test.

8.3 Tissue Recipes

The following recipes are provided in percentage by weight.

835 MHz. Body:	52.40 %	De-Ionized Water
	01.50 %	Salt
	45.00 %	Sugar
	00.10 %	Preventol D7
	01.00 %	Hydroxyetyl-Cellulose
1750 MHz. Body:	29.44%	Diethylenglykol-monobutylether
	70.17%	De-Ionized Water
	0.39%	Salt
1900 MHz. Body:	29.68%	Diethylenglykol-monobutylether
	70.00%	De-Ionized Water
	0.32%	Salt

8.4 Material Parameters

For the measurement of the following parameters the HP 85070B dielectric probe kit is used representing the open-ended coaxial probe measurement procedure. The measured values should be within ± 5% of the recommended values given by the FCC.

Frequency		ε_r	σ [S/m]
835 MHz Body (GPRS 850)	Recommended Value	55.20 ± 2.70	0.97 ± 0.04
	Measured Value (Ch. 128)	56.60	0.99
	Measured Value (Ch. 190)	56.50	1.00
	Measured Value (Ch. 251)	56.40	1.00
1900 MHz Body (GPRS 1900)	Recommended Value	53.30 ± 2.65	1.52 ± 0.07
	Measured Value (Ch. 512)	53.70	1.46
	Measured Value (Ch. 661)	53.70	1.52
	Measured Value (Ch. 810)	53.90	1.58
1900 MHz Body (WCDMA II)	Recommended Value	53.30 ± 2.65	1.52 ± 0.07
	Measured Value (Ch. 9262)	53.70	1.46
	Measured Value (Ch. 9400)	53.70	1.52
	Measured Value (Ch. 9538)	53.90	1.58
1750 MHz Body (WCDMA IV)	Recommended Value	53.40 ± 2.70	1.49 ± 0.07
	Measured Value (Ch. 1312)	54.20	1.44
	Measured Value (Ch. 1413)	54.00	1.50
	Measured Value (Ch. 1513)	53.70	1.53

Table 12: Parameters of the tissue simulating liquid.

8.5 Simplified Performance Checking

The simplified performance check was realized using the dipole validation kits. The input power of the dipole antennas were 250 mW and they were placed under the flat part of the SAM phantoms. The target and measured results are listed in the Table 13 - 14 and shown in Fig. 6 - 8. The target values were adopted from the calibration certificates.

To justify the two year calibration interval of the used validation dipoles, IMST consider the requirements in 3.2.2 of KDB 865664. The result of the annual SAR target, impedance and return loss assessment, conducted by IMST, show no significant deviation to dipole calibration results.

Available Dipoles		SAR_{1g} [W/kg]	ε_r	σ [S/m]
D835V2. SN #437	Target Values Body	2.51	54.50	0.99
D1900V2. SN #5d051		9.66	52.10	1.54
D1750V2. SN #1005		8.55	52.60	1.50

Table 13: Dipole target results.

Used Dipoles		SAR_{1g} [W/kg]	ε_r	σ [S/m]
835 MHz. SN: 437 (GPRS 850)	Measured Values Body	2.61	56.50	1.00
1900 MHz. SN: 5d051 (GPRS 1900; WCDMA II)		9.92	53.80	1.56
1750 MHz. SN: 1005 (WCDMA IV)		8.76	53.70	1.53

Table 14: Measured dipole validation results.

Test Laboratory: Imst GmbH, DASY Yellow (II); File Name: 230113_y_1579.da4

DUT: Dipole 835 MHz SN437; Type: D835V2; Serial: D835V2 - SN:437
Program Name: System Performance Check at 835 MHz

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 56.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6R - SN1579; ConvF(6.24, 6.24, 6.24); Calibrated: 25.01.2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn631; Calibrated: 20.09.2012
- Phantom: SAM Sugar 1341; Type: QD 000 P40 CB; Serial: TP-1341
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.81 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.7 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 3.73 W/kg
SAR(1 g) = 2.61 mW/g; SAR(10 g) = 1.72 mW/g
Maximum value of SAR (measured) = 2.84 mW/g

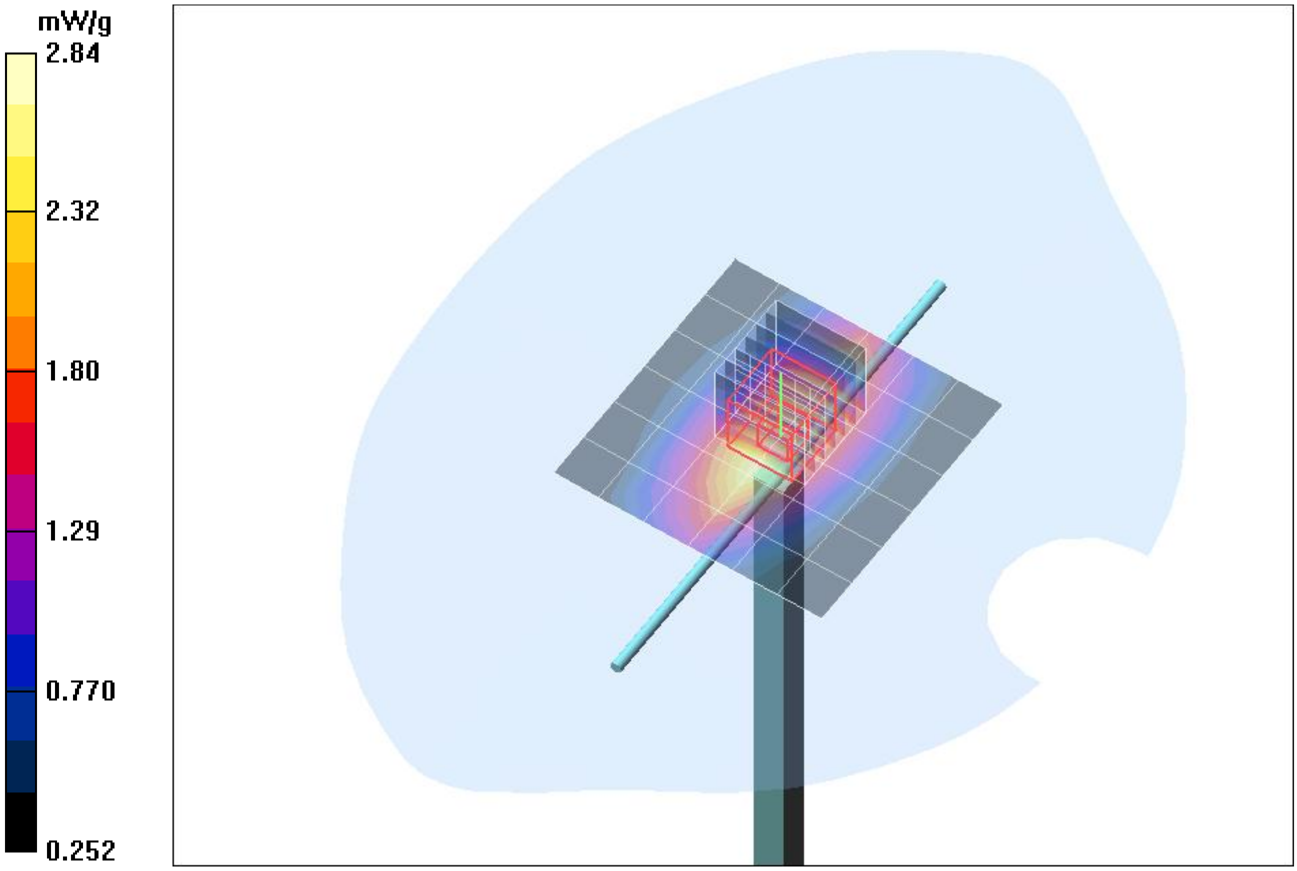


Fig. 6: Validation measurement 835 MHz Body (GPRS 850, January 23, 2013), coarse grid. Ambient Temperature: 21.5°C. Liquid Temperature: 21.3°C.

Test Laboratory: Imst GmbH, DASY Yellow (II); File Name: 170113_y_3536.da4

DUT: Dipole 1900 MHz SN: 5d051; Type: D1900V2; Serial: D1900V2 - SN5d051
Program Name: System Performance Check at 1900 MHz

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.56 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3536; ConvF(8.4, 8.4, 8.4); Calibrated: 24.09.2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn335; Calibrated: 20.02.2012
- Phantom: SAM Glycol 1340; Type: QD 000 P40 CB; Serial: TP-1340
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 10.9 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.9 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 19.2 W/kg
SAR(1 g) = 9.92 mW/g; SAR(10 g) = 4.99 mW/g
Maximum value of SAR (measured) = 11.2 mW/g

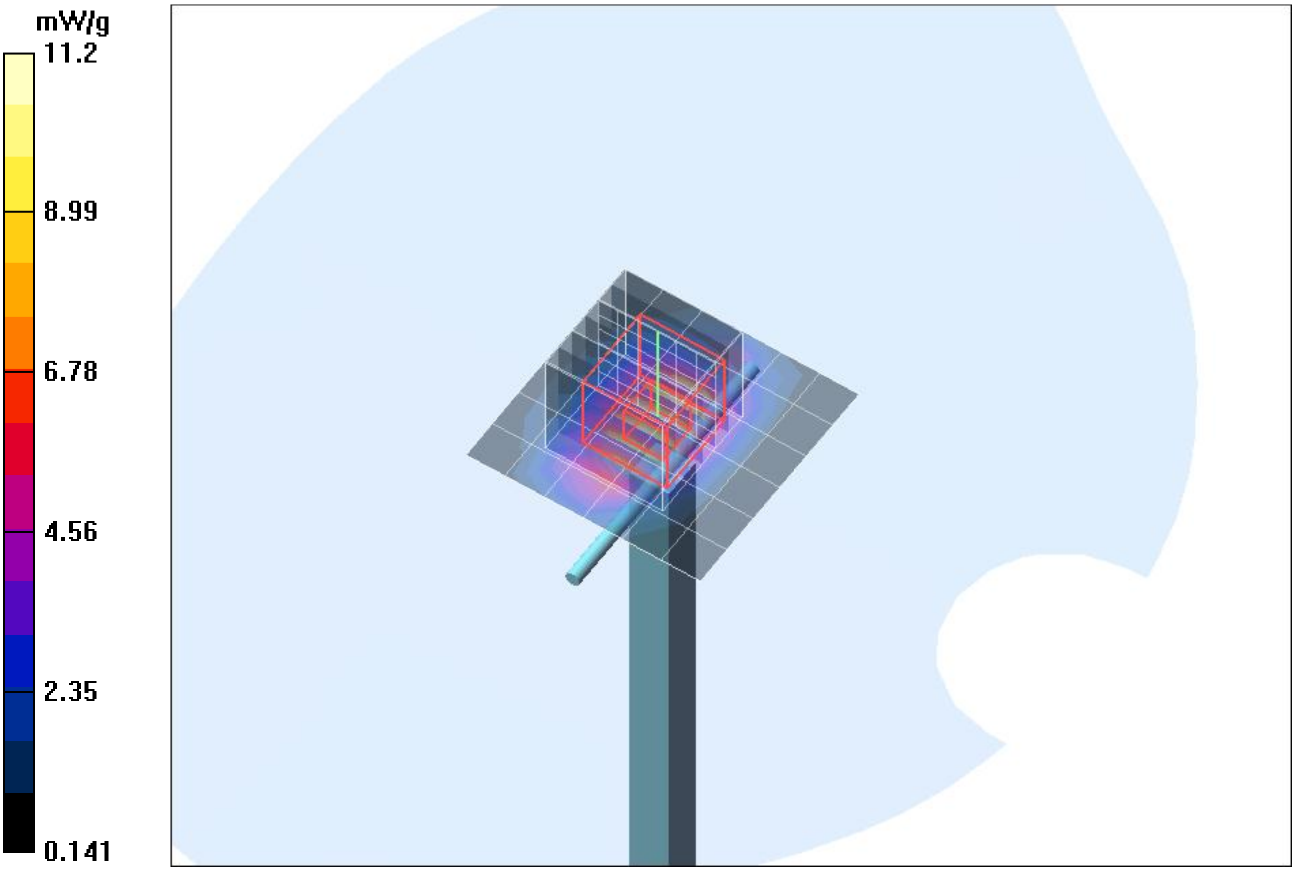


Fig. 7: Validation measurement 1900 MHz Body (GPRS 1900 and WCDMA II, January 17, 2013), coarse grid. Ambient Temperature: 21.8°C. Liquid Temperature: 21.6°C.

Test Laboratory: Imst GmbH, DASY Yellow (II); File Name: 250613_y_1579.da4

DUT: Dipole 1750 MHz SN: 1005; Type: D1750V2; Serial: D1750V2 - SN:1005
Program Name: System Performance Check at 1750 MHz

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1750 MHz; σ = 1.53 mho/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6R - SN1669; ConvF(4.79, 4.79, 4.79); Calibrated: 19.02.2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn335; Calibrated: 18.02.2013
- Phantom: SAM Glycol 1340; Type: QD 000 P40 CB; Serial: TP-1340
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 9.57 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.3 V/m; Power Drift = 0.040 dB
Peak SAR (extrapolated) = 14.3 W/kg
SAR(1 g) = 8.76 mW/g; SAR(10 g) = 4.65 mW/g
Maximum value of SAR (measured) = 9.95 mW/g

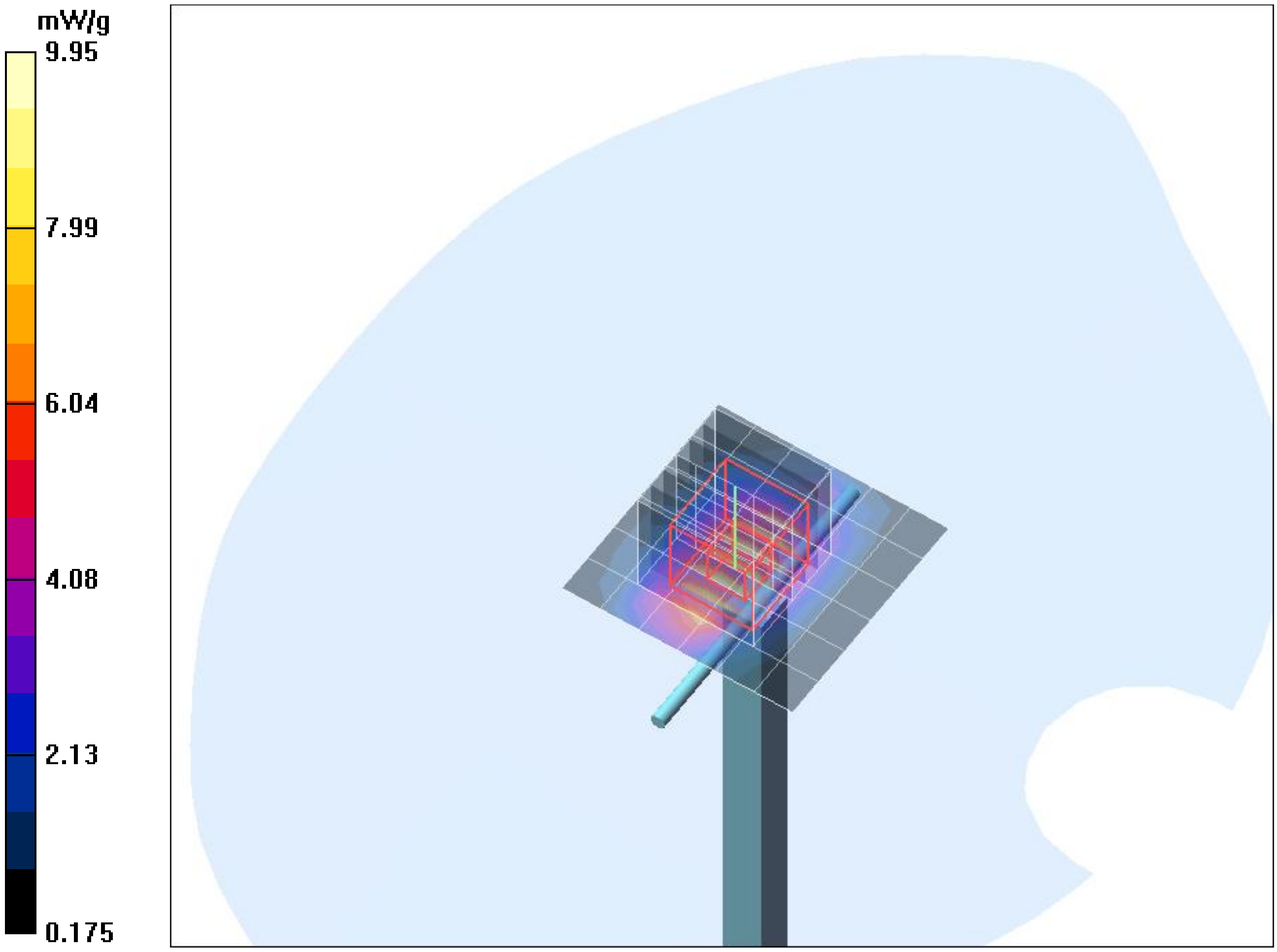


Fig. 8: Validation measurement 1750 MHz Body (WCDMA IV, June 25, 2013), coarse grid. Ambient Temperature: 22.8°C. Liquid Temperature: 22.4°C.

Error Sources	Uncertainty Value	Probability Distribution	Divisor	c_i	Standard Uncertainty	v_i^2 or v_{eff}
Measurement System						
Probe calibration	± 4.8 %	Normal	1	1	± 4.8 %	∞
Axial isotropy	± 4.7 %	Rectangular	√3	1	± 2.7 %	∞
Hemispherical isotropy	± 0 %	Rectangular	√3	1	± 0 %	∞
Boundary effects	± 1.0 %	Rectangular	√3	1	± 0.6 %	∞
Linearity	± 4.7 %	Rectangular	√3	1	± 2.7 %	∞
System detection limit	± 1.0 %	Rectangular	√3	1	± 0.6 %	∞
Readout electronics	± 1.0 %	Normal	1	1	± 1.0 %	∞
Response time	± 0 %	Rectangular	√3	1	± 0 %	∞
Integration time	± 0%	Rectangular	√3	1	± 0 %	∞
RF ambient conditions	± 3.0 %	Rectangular	√3	1	± 1.7 %	∞
Probe positioner	± 0.4 %	Rectangular	√3	1	± 0.2 %	∞
Probe positioning	± 2.9 %	Rectangular	√3	1	± 1.7 %	∞
Algorithms for max SAR eval.	± 1.0 %	Rectangular	√3	1	± 0.6 %	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0 %	Rectangular	1	1	± 1.2 %	∞
Input power and SAR drift meas.	± 4.7 %	Rectangular	√3	1	± 2.7 %	∞
Phantom and Set-up						
Phantom uncertainty	± 4.0 %	Rectangular	√3	1	± 2.3 %	∞
Liquid conductivity (target)	± 5.0 %	Rectangular	√3	0.64	± 1.8 %	∞
Liquid conductivity (meas.)	± 2.5 %	Normal	1	0.64	± 1.6 %	∞
Liquid permittivity (target)	± 5.0 %	Rectangular	√3	0.6	± 1.7 %	∞
Liquid permittivity (meas.)	± 2.5 %	Normal	1	0.6	± 1.5 %	∞
Combined Uncertainty					± 8.4 %	

Table 15: Uncertainty budget for the system performance check.

8.6 Environment

To comply with the required noise level (less than 12 mW/kg) periodically measurements without a DUT were conducted. Humidity: 37% ± 5 %

8.7 Test Equipment

Test Equipment	Model	Serial Number	Last Calibration	Next Calibration
DASY4 Systems				
Software Versions DASY4	V4.7	N/A	N/A	N/A
Software Versions SEMCAD	V1.8	N/A	N/A	N/A
Dosimetric E-Field Probe	ET3DV6R	1579	01/2012	01/2013
Dosimetric E-Field Probe	ET3DV6R	1669	02/2013	01/2014
Dosimetric E-Field Probe	EX3DV4	3536	09/2012	09/2013
Data Acquisition Electronics	DAE 3	335	02/2012	02/2013
Data Acquisition Electronics	DAE 4	631	09/2012	09/2013
Phantom	SAM	1059	N/A	N/A
Phantom	SAM	1176	N/A	N/A
Phantom	SAM	1340	N/A	N/A
Phantom	SAM	1341	N/A	N/A
Dipoles				
Validation Dipole	D835V2	437	04/2012	04/2014
Validation Dipole	D1900V2	5d051	09/2011	09/2013
Material Measurement				
Network Analyzer	E5071C	MY46103220	08/2011	08/2013
Dielectric Probe Kit	HP85070B	US33020263	N/A	N/A

Table 16: SAR equipment.

Test Equipment	Model	Serial Number	Last Calibration	Next Calibration
Power Meters				
Power Meter. Agilent	E4416A	GB41050414	12/2012	12/2014
Power Meter. Agilent	E4417A	GB41050441	12/2012	12/2014
Power Meter. Anritsu	ML2487A	6K00002319	12/2011	12/2013
Power Meter. Anritsu	ML2488A	6K00002078	12/2011	12/2013
Power Sensors				
Power Sensor. Agilent	E9301H	US40010212	12/2012	12/2014
Power Sensor. Agilent	E9301A	MY41495584	12/2012	12/2014
Power Sensor. Anritsu	MA2481B	031600	12/2011	12/2013
Power Sensor. Anritsu	MA2490A	031565	12/2011	12/2013
RF Sources				
Network Analyzer	E5071C	MY46103220	08/2011	08/2013
Rohde & Schwarz	SME300	100142	N/A	N/A
Amplifiers				
Mini Circuits	ZHL-42	D012296	N/A	N/A
Mini Circuits	ZHL-42	D031104#01	N/A	N/A
Mini Circuits	ZVE-8G	D031004	N/A	N/A
Radio Tester				
Anritsu	MT8815B	6200586536	N/A	N/A

Table 17: Test equipment. General.

8.8 Certificates of Conformity

Schmid & Partner Engineering AG **s p e a g**

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

Certificate of conformity

Item	Dosimetric Assessment System DASY4
Type No	SD 000 401A, SD 000 402A
Software Version No	DASY 4.7
Manufacturer / Origin	Schmid & Partner Engineering AG Zeughausstrasse 43, CH-8004 Zürich, Switzerland

References

[1] 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, December 2003
[2] EN 50361:2001, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz)", July 2001
[3] IEC 62209 – 1, "Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz – Measurement Procedure, Part 1: Hand-held mobile wireless communication devices", February 2005
[4] IEC 62209 – 2, Draft Version 0.9, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation and Procedures
Part 2: Procedure to determine the Specific Absorption Rate (SAR) for ... including accessories and multiple transmitters", December 2004
[5] OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition 01-01
[6] ANSI-C63.19-2006, "American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids", June 2006
[7] ANSI-C63.19-2007, "American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids", June 2007

Conformity

We certify that this **system is designed to be fully compliant** with the standards [1 – 7] for RF emission tests of wireless devices.

Uncertainty

The uncertainty of the measurements with this system was evaluated according to the above standards and is documented in the applicable chapters of the DASY4 system handbook.
The uncertainty values represent current state of methodology and are subject to changes. They are applicable to all laboratories using DASY4 provided the following requirements are met (responsibility of the system end user):

1) the system is used by an experienced engineer who follows the manual and the guidelines taught during the training provided by SPEAG,
2) the probe and validation dipoles have been calibrated for the relevant frequency bands and media within the requested period,
3) the DAE has been calibrated within the requested period,
4) the "minimum distance" between probe sensor and inner phantom shell and the radiation source is selected properly,
5) the system performance check has been successful,
6) the operational mode of the DUT is CW, CDMA, FDMA or TDMA (GSM, DCS, PCS, IS136, PDC) and the measurement/integration time per point is ≥ 500 ms,
7) if applicable, the probe modulation factor is evaluated and applied according to field level, modulation and frequency,
8) the dielectric parameters of the liquid are conformant with the standard requirement,
9) the DUT has been positioned as described in the manual.
10) the uncertainty values from the calibration certificates, and the laboratory and measurement equipment dependent uncertainties, are updated by end user accordingly.

Date 24.4.2008 **Signature / Stamp**

Doc No 880 – SD00040XA-Standards_0804 – F KP/FB Page 1 (1)

Fig. 9: Certificate of conformity for the used DASY4 system

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp

Schmid & Partner
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Fig. 10: Certificate of conformity for the used SAM phantom.

8.9 Pictures of the Device under Test

Fig. 11 - 12 show the device under test.

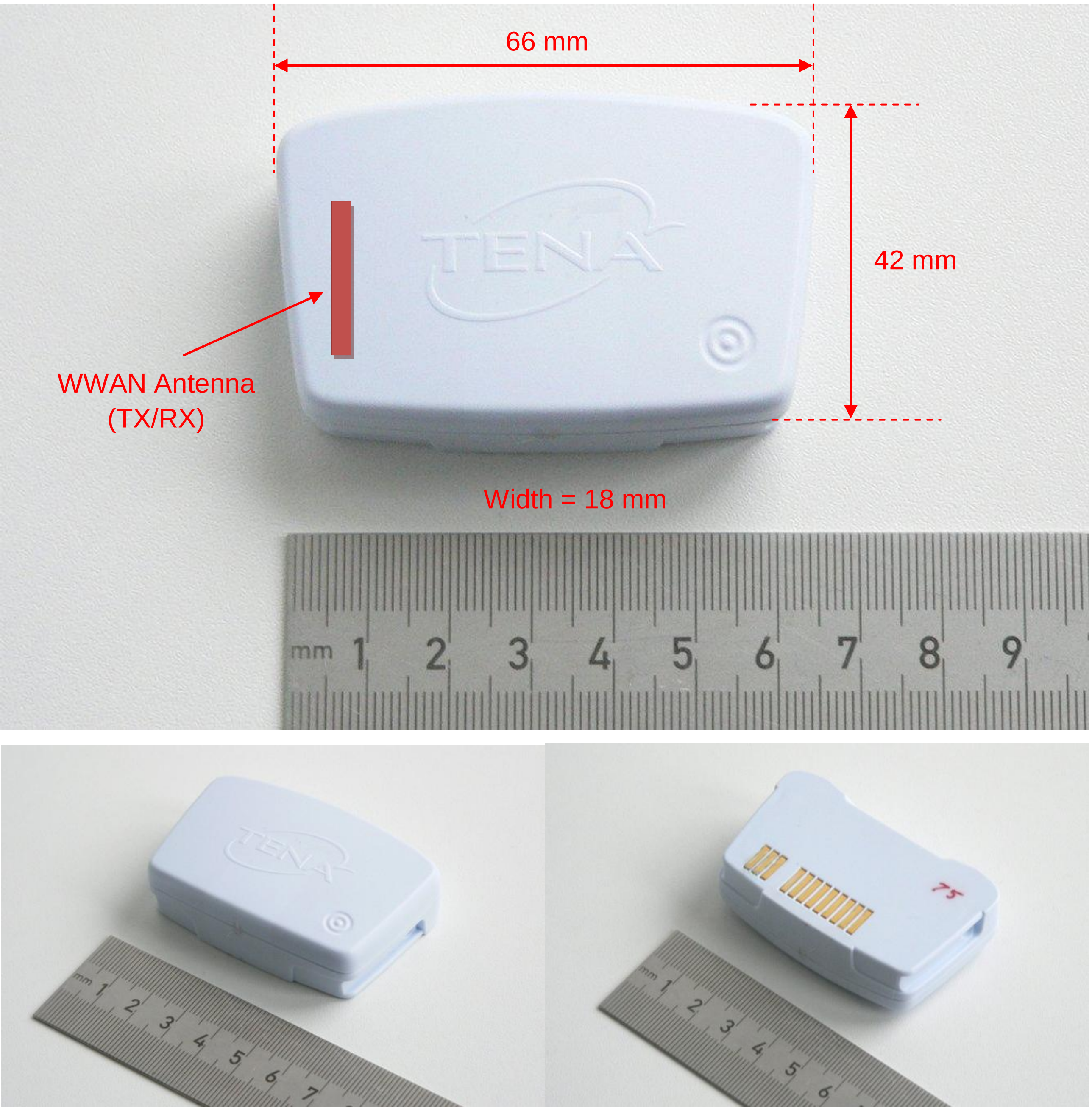

Fig. 11: Front and back view of the TENA Identifi Logger from SCA Hygiene Products.

Fig. 12: TENA Identifi Logger in combination with a diaper.

8.10 Test Positions for the Device under Test

Fig. 13 shows the test position for the SAR measurements.

Fig. 13: Position 1, use case scenario, TENA Identifi Logger from SCA Hygiene Productsin combination with a diaper below the flat part of the SAM phantom.

8.11 Pictures to demonstrate the required Liquid Depth

Fig. 14 – Fig. 16 show the liquid depth in the used SAM phantom.

Fig. 14: Liquid depth for GPRS 850 Body measurements.

Fig. 15: Liquid depth for GPRS 1900 and WCDMA II Body measurements.

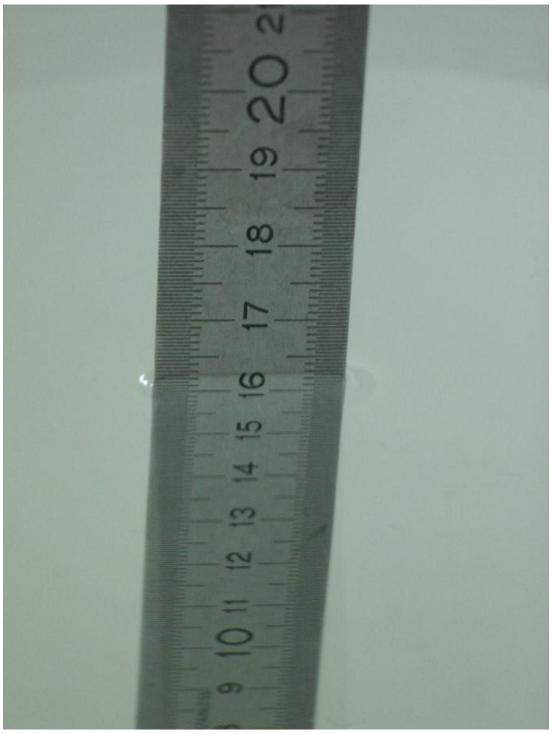

Fig. 16: Liquid depth for WCDMA IV Body measurements.

9 References

[OET 65] Federal Communications Commission: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01). FCC. 2001.

[3G Devices] Laboratory Division. Office of Engineering and Technology. Federal Communications Commission: SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-DO – WCDMA / HSDPA- (Rev. 2; October 2007)

[IEEE C95.1-1999] IEEE Std C95.1-1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields. 3 kHz to 300 GHz. Inst. of Electrical and Electronics Engineers. Inc.. 1999.

[IEEE C95.1-2005] IEEE Std C95.1-2005: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields. 3 kHz to 300 GHz. Inst. of Electrical and Electronics Engineers. Inc.. 2005.

[ICNIRP 1998] ICNIRP: Guidelines for Limiting Exposure to Time-varying Electric. Magnetic. and Electromagnetic Fields (up to 300 GHz). In: Health Physics. Vol. 74. No. 4. 494-522. 1998.

[IEEE 1528-2003] IEEE Std 1528-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques. 1528-2003. December 19. 2003. The Institute of Electrical and Electronics Engineers.

[NIST 1994] NIST: Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results. Technical Note 1297 (TN1297). United States Department of Commerce Technology Administration. National Institute of Standards and Technology. 1994.

[DASY4] Schmid & Partner Engineering AG: DASY4 Manual. April 2008

[FCC 96-326] FCC 96-326. ET Docket No. 93-62. Report and Order. August 1. 1996

[3GPP 34.121] ETSI TS 134 121-1 V7.4.0. Universal Mobile Telecomunications System (UMTS) ; User Equipment (UE) conformance specification; Radio transmission and reception (FDD)

[KDB 447498] 447498 D01 Mobile Portable RF Exposure v04: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies. 11/13/2009

447498 D02 SAR Measurements Procedures for USB Dongle Transmitters v02

[KDB 941225] 941225 D01 SAR Measurement Procedures for 3G Devices v02. October 2007

[KDB 941225] SAR Guidance for HSPA, HSPA+, DC-HSDPA and 1x-Advance v02r02, May 2013

[IC RSS 102] Industry Canada, Radio Standards Specification, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands); RSS-102 Issue 4 March 2010