2.9.3 Belt Clip/Holster Configuration

Test configurations for body-worn operated EUTs are carried out while the belt-clip and/or holster is attached to the EUT and placed against a flat phantom in a regular configuration (see Figure 9). An EUT with a headset output is tested with a headset connected to the device.
Body dielectric parameters are used.
There are two categories for accessories for body-worn operation configurations:

1. accessories not containing metallic components
2. accessories containing metallic components.

When the EUT is equipped with accessories not containing metallic components the tests are done with the accessory that dictates the closest spacing to the body. For accessories containing metallic parts a test with each one is implemented. If the multiple accessories share an identical metallic component (e.g. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that has the closest spacing to the body is tested.
In case that a EUT authorized to be body-worn is not supplied or has no options to be operated with any accessories, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented.
Transmitters operating in front of a person's face (e.g. push-to-talk configurations) are tested for SAR compliance with the front of the device positioned to face the flat platform. SAR Compliance tests for shoulder, waist or chest-worn transmitters are carried out with the accessories including headsets and microphones attached to the device and placed against a flat phantom in a regular configuration.
The SAR measurements are performed to investigate the worst-case positioning. This is documented and used to perform Body SAR testing. [2].

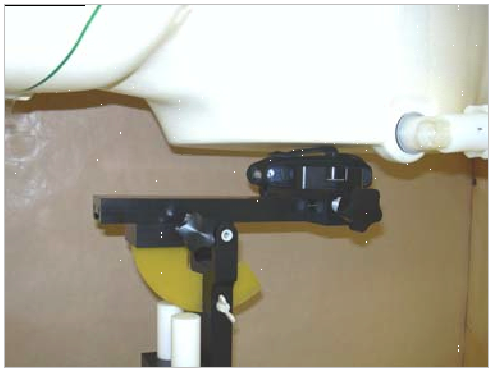

Figure 9

2.9.4 Headset Configuration

Headsets which have their radiating structure in close proximity to the head are measured according to the following conditions.

- Head tissue liquid is used.
- The EUT is positioned on the surface of the head of phantom according the picture below. Right and left position is tested according to the normal use (see figure 10).
- Additional metallic parts like clips or others are subject of testing, too.

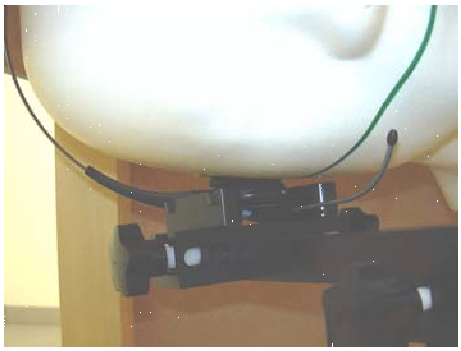

Figure 10

Headsets which have their radiating structure in close proximity to the body are tested as body worn equipment.

2.10 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 system performance check according to IEEE Std. 1528-2003 December 2003.

	Tol.	Prob.	Div.	$(^{c}i)^{1}$	Std. unc.	$(^{v}i)^{2}$
Error Description	(± %)	dist.		(1 g)	(1 g) (± %)	
Measurement System						
Probe Calibration	4.8	N	1	1	4.8	∞
Axial Isotropy	4.7	R	$\sqrt{3}$	0.7	1.9	∞
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	0.7	3.9	∞
Boundary Effects	1.0	R	$\sqrt{3}$	1	0.6	∞
Linearity	4.7	R	$\sqrt{3}$	1	2.7	∞
System Detection Limit	1.0	R	$\sqrt{3}$	1	0.6	∞
Readout Electronics	1.0	N	1	1	1.0	∞
Response Time	0.8	R	$\sqrt{3}$	1	0.5	∞
Integration Time	2.6	R	$\sqrt{3}$	1	1.5	∞
RF Ambient Conditions	3.0	R	$\sqrt{3}$	1	1.7	∞
Probe Positioner	0.4	R	$\sqrt{3}$	1	0.2	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1.7	∞
Algorithms for Max. SAR Eval.	1.0	R	$\sqrt{3}$	1	0.6	∞
Test Sample Related						
Device Positioning	2.9	N	1	1	2.9	*145*
Device Holder	3.6	N	1	1	3.6	*5*
Power Drift	5.0	R	$\sqrt{3}$	1	2.9	∞
Phantom and Setup						
Phantom Uncertainty	4.0	R	$\sqrt{3}$	1	2.3	∞
Liquid Conductivity (target)	5.0	R.	$\sqrt{3}$	0.64	1.8	∞
Liquid Conductivity (meas.)	2.6	N	1	0.64	1.7	∞
Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	1.7	∞
Liquid Permittivity (meas.)	3.8	N	1	0.6	2.3	∞
Combined Standard Uncertainty					**10.4**	*330*
Expanded Uncertainty kp = 2						
Coverage Factor for 95%					**20.8**	

The budget is valid for the frequency range 300 MHz – 3 GHz and represent a worst case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

3. Tissue and System Verification

3.1 Tissue Verification

Dielectric parameters of the simulating liquids were verified using a Dielectric Probe Kit Agilent 85070D to a tolerance of ± 5 %.

Room Temperature: **22.1 - 22.7 °C**

	Measured Tissue Parameters					
	900 MHz Muscle		1800 MHz Muscle		1900 MHz Muscle	
	Target	Measured	Target	Measured	Target	Measured
Date		**30.01.2006**		**27.01.2006**		**27.01.2006**
Liquid Temperature: ° C		22.1 ° C		22.2 ° C		22.2 ° C
Dielectric Constant: ε	55.0	54.4	53.3	54.3	53.3	51.9
Conductivity: σ	1.05	1.04	1.52	1.58	1.52	1.58

3.2 System Verification

Prior to the assessment, the system was verified by using a 900 MHz / 1800 MHz / 1900 MHz validation dipole. Power level of 250 mW was supplied to the dipole antenna placed under the flat section of SAM Phantom. This system validation is valid for a frequency range of 900 ± 100 MHz.

The system was verified to a tolerance of ± 10 %.

Liquid Temperature: **22.2 - 22.4 °C**
Room Temperature: **22.1 - 22.7 °C**
Liquid Depth: **> 15.5 cm**

System Dipole Validation Target & Measurement					
Date	**System Validation Kit:**	**Liquid**	**Targeted SAR 1g (mW/g)**	**Measured SAR 1g (mW/g)**	**Deviation (%)**
30.01.2006	D900V2 SN164	900 MHz Muscle	11,2	11,16	-0,35
30.01.2006	D900V2 SN164	900 MHz Muscle	11,2	11,16	-0,35
27.01.2006	D1800V2 SN2d046	1800 MHz Muscle	40,8	42,0	2,94
27.01.2006	D1900V2 SN5d025	1900 MHz Muscle	45,6	47,2	3,51

Comment: Please find attached the measurement plot.

4. Test Results

Procedures Used To Establish Test Signal

The EUT was placed into simulated call mode (e.g. AMPS, Cellular CDMA & PCS CDMA modes) using manufacturers test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR [2]. The actual transmission is activated through a base station simulator or similar when test modes are not available or inappropriate for testing the EUT.

The EUT is rechargeable battery. The device was tested at full power verified by implementing conducted output power measurements. For confirming of the output power it was tested before and after each SAR measurement. The test was repeated if a conducted power deviation of more than 5 % occurred.

Mixture Type: **850 MHz Muscle**
Date: **30.01.2006**
Liquid Temperature: **22.2 - 22.4 °C** **Room Temperature: 22.1 - 22.7 °C**

Frequency			Power Drift dBm	Antenna Pos.	Phantom Section	Test Position -15 mm	SAR (W/kg)
MHz	Channel	Modulation					
824.2	128	GSM	0.033	Integral	Belt Clip	Back	1.02
836.4	189	GSM	-0.029	Integral	Belt Clip	Back	1.02
848.8	251	GSM	0.008	Integral	Belt Clip	Back	1.03

Note: Upper and lower frequencies were measured at the worst position.

Limits:

Exposure Limits	SAR (W/kg)	
	Uncontrolled Exposure/General Population Environment	Controlled Exposure/Occupational Environment
Spatial Average SAR (averaged over the whole body)	0.08	0.40
Spatial Peak SAR (averaged over any 1g of tissue)	1.60	8.00
Spatial Peak SAR (Hands, Feet, Ankles, Wrist) (averaged over any 10g of tissue)	4.00	20.00

Notes:
1. Test data represent the worst case SAR value and test procedure used are according to OET Bulletin 65, Supplement C (01-01).
2. All modes of operation were investigated.

Mixture Type: **900 MHz Muscle**
Date: **30.01.2006**
Liquid Temperature: **22.2 - 22.4 °C** **Room Temperature: 22.1 - 22.7 °C**

Frequency			Power Drift dBm	Antenna Pos.	Phantom Section	Test Position -15 mm	SAR (W/kg)
MHz	Channel	Modulation					
902.4	62	EGSM	-0.036	Integral	Belt Clip	Back	0.982
880,2	975	EGSM	0.015	Integral	Belt Clip	Back	1.06
914.8	124	EGSM	-0.043	Integral	Belt Clip	Back	0.977

Limits:

Exposure Limits	SAR (W/kg)	
	Uncontrolled Exposure/General Population Environment	Controlled Exposure/Occupational Environment
Spatial Average SAR (averaged over the whole body)	0.08	0.40
Spatial Peak SAR (averaged over any 1g of tissue)	1.60	8.00
Spatial Peak SAR (Hands, Feet, Ankles, Wrist) (averaged over any 10g of tissue)	4.00	20.00

Notes:
3. Test data represent the worst case SAR value and test procedure used are according to OET Bulletin 65, Supplement C (01-01).
4. All modes of operation were investigated.

Mixture Type: **1800 MHz Muscle**
Date: **27.01.2006**
Liquid Temperature: **22.2 - 22.4 °C** **Room Temperature: 22.1 -** 22.7 **°C**

Frequency			Power Drift dBm	Antenna Pos.	Phantom Section	Test Position 0 mm	SAR (W/kg)
MHz	Channel	Modulation					
1710.2	512	GSM	-0.004	Integral	Belt Clip	Back	**1.27**
1747.4	698	GSM	0.038	Integral	Belt Clip	Back	0.869
1784.8	885	GSM	0.053	Integral	Belt Clip	Back	0.799

Mixture Type: **1900 MHz Muscle**
Date: **27.01.2006**
Liquid Temperature: **22.2 - 22.4 °C** **Room Temperature: 22.1 - 22.7 °C**

Frequency			Power Drift dBm	Antenna Pos.	Phantom Section	Test Position -15 mm	SAR (W/kg)
MHz	Channel	Modulation					
1850,2	512	GSM	-0.008	Integral	Belt Clip	Back	0.726
1880,0	661	GSM	0.043	Integral	Belt Clip	Back	0.914
1909,8	810	GSM	-0.085	Integral	Belt Clip	Back	0.934

Note: Upper and lower frequencies were measured at the worst position.

Limits:

Exposure Limits	SAR (W/kg)	
	Uncontrolled Exposure/General Population Environment	Controlled Exposure/Occupational Environment
Spatial Average SAR (averaged over the whole body)	0.08	0.40
Spatial Peak SAR (averaged over any 1g of tissue)	1.60	8.00
Spatial Peak SAR (Hands, Feet, Ankles, Wrist) (averaged over any 10g of tissue)	4.00	20.00

Notes:
5. Test data represent the worst case SAR value and test procedure used are according to OET Bulletin 65, Supplement C (01-01).
6. All modes of operation were investigated.

5. References

[1] ANSI/IEEE C95.3 – 1991, *IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic fields, 300 kHz to 100 GHz,* New York: IEEE, Aug. 1992

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

[3] T. Schmid, O. Egger, N. Kuster, *Automated E-field scanning system for dosimetric assessments,* IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[4] W. Gander, *Computer mathematics*, Birkhaeuser, Basel, 1992.

[5] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, *Numerical Recipes in C,* The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, December 2003 *Recommended Practice for Determining the Peak Spatial-Average Absorption Rate (SAR in the Human Body Due to Wireless Communications Devices: Experimental Techniques*.

[7] DASY4 *Dosimetric Assessment System Manual*; Draft; September 6, 2002; Schmid & Partner Engineering AG

6. Appendix

1.	Appendix A	Calibration Certificate	D900V2 SN164 D1800V2 SN2d046 D1900V2 SN5d025 ET3DV6 SN1711 DAE3V1-522
2.	Appendix B	Measurement Plots	
3.	Appendix C	Pictures	