Dosimetric Assessment of the Portable Device ICON 322 from Option Wireless Germany

According to the FCC requirements

FCC ID: NCMOGI0322

Product:

ICON 322

Option Wireless Technology

Date: August18, 2008

Summary

The device ICON322 is a new USB Stick which provides the operating bands GSM850 (GPRS Class12), GSM900 (GPRS Class12), GSM1800 (GPRS Class12), GSM1900 (GPRS Class12), WCDMA FDD I+II+V.
The device has a swivel antenna with one intended use position. The system concepts used are GPRS/EDGE GSM850, GPRS/EDGE GSM900, GPRS/EDGE PCN1800, GPRS/EDGE PCS1900, WCDMA FDD I, WCDMA FDD II and WDMA FDD V standards. The USB stick provides HSDPA and HSUPA in WCDMA.

The intention of the measurements is the evaluation of radiofrequency radiation exposure of the portable device in the operating bands GSM850 (GPRS Class12), GSM1900 (GPRS Class12), WCDMA FDD II and WCDMA FDD V.

The measurements were performed at IMST, Kamp-Lintfort and Option EMC Lab., Kamp-Lintfort.
The iCON322 usb stick was tested in all orientations: no.2 (antenna side), no.1 (opposite of antenna side), no.3 and no.4 (laterals) and no.5 (tip).
While GSM1900+WCDMAII in no.2 means ½ inch distance (maximum) between portable device and phantom, all other bands and orientations were measured with maximum 5mm distance between device and phantom.

All bands were checked for maximum radiated power: GSM850 was tested with 3 TX-Slots (GPRS) and 2 TX-Slots (EDGE), while GSM1900 tests were performed with 3 TX-Slots (GPRS) and 3or4 TX-Slots (EDGE).

The measurements were performed with the host devices SONY PCG-8113M, SONY VAIO PCG-5G2M and FUJITSU SIEMENS LIFEBOOK S6410. Due to laptop design the measurements in orientation pos.4 were made with a 10cm usb cable.

The device is working in data transfer mode only (no speech mode), so the tests in GSM850 and GSM1900 are performed only in GPRS- and EDGE mode.

The measurements were made according to the Supplement C OET BULLETIN 65 Edition 97-01. Due to the fact the usb stick is designed for use in laptops and notebooks, it is to be classified as a portable device (47 CFR §2.1093).

Pursuant to 47 CFR §2.908 the EUT has the state of a production unit.

The USB-stick was tested in the following configurations:

- **Module for use in portable exposure conditions that do not require SAR evaluation for simultaneous transmission**
- **GSM850 (GPRS powerclass 4), (EDGE powerclass E2)**
- **GSM1900 (GPRS powerclass 1), (EDGE powerclass E2)**
- **WCDMA FDD II and WCDMA FDD V (powerclass 3)**
- **Body worn**
- **Against the flat phantom**

Measurements performed by:
IMST: Andre van den Bosch, Alexander Rahn
OPTION: Dirk Walkowiak, Nevzat Baser, Dr. Sh.G. Pan

Measurements supervised by and testreport by:
Wolfgang Koesters (Teamleader EMC)

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1 Statement Of Compliance

The portable device ICON 322 (FCC ID: NCMOGI0322) is in compliance with the FCC OET 65c, Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), for uncontrolled exposure. Pursuant to 47 CFR §2.908 the EUT has the state of a production unit.

2 Summary Of The SAR Test Results

The measurements were made according to the Supplement C OET BULLETIN 65 Edition 97-01. Due to the fact the usb stick is designed for use in laptops and notebooks, it is to be classified as a portable device (47 CFR §2.1093).

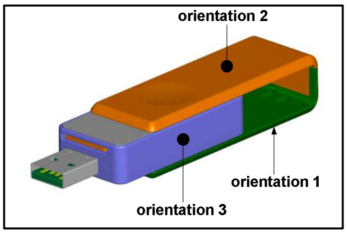
The ICON322 usb stick was tested in all orientations: orientation 2 (antenna side), orientation 1 (opposite of antenna side), orientation 3 and 4 (laterals) and orientation 5 (tip).
Due to the used power reduction in GPRS/EDGE MultislotClass 12 at GSM850/PCS1900, the tests were performed at GSM1900 in GPRS/EDGE MultislotClass 11 or 12 and at GSM850 in GPRS MultislotClass 11 /EDGE MultislotClass 10.

Because of laptop design the ICON322 was tested in orientation 4 with a 10cm usb cable.
Due to the internal dc/dc-converter, a power reduction due to 10cm usb cable is not given.

2.1 Orientation 1

		≤5mm distance to phantom		Temperature	
Transmission Band	Channel	SAR_{1g} [W/kg]	Drift [dB]	Ambient temperatur	Liquid temp. Liquid depth
GPRS / GSM850 (multislot cl. 11)	Ch 128	*1.040*	*0.039*	*23.0°C*	*21.6°C 15.5cm*
	Ch 190	*1.090*	*0.176*		
	Ch 251	*1.110*	*-0.199*		
GPRS / GSM1900 (multislot cl. 11)	Ch 512	*1.160*	*-0.017*	*22.9°C*	*21.5°C 16.3cm*
	Ch 661	*1.15*	*-0.113*		
	Ch 810	*0.991*	*-0.037*		
EDGE / GSM850 (multislot cl. 10)	Ch 128	*0.420*	*0.024*	*23.0°C*	*21.6°C 15.5cm*
	Ch 190	*0.359*	*0.143*		
	Ch 251	*0.429*	*0.179*		
EDGE / GSM1900 (multislot cl. 11)	Ch 512	*0.310*	*0.120*	*22.9°C*	*21.5°C 16.3cm*
	Ch 661	*0.273*	*0.197*		
	Ch 810	*0.257*	*0.048*		
WCDMA FDD II	Ch 9262	*0.778*	*0.122*	*22.9°C*	*21.5°C 16.3cm*
	Ch 9400	*1.090 (max.cube)*	*0.183*		
	Ch 9538	*0.885 (max.cube)*	*0.008*		
WCDMA FDD V	Ch 4132	*0.916*	*-0.036*	*23.0°C*	*21.6°C 15.5cm*
	Ch 4183	*0.714*	*0.165*		
	Ch 4233	*0.865*	*0.065*		
HSDPA subtest 1	Ch 4132	0.854	-0.0412	22.5°C	19.9°C 15.5cm
HSUPA subtest 3	Ch 4132	0.700	0.189	21.5°C	19.9°C 15.1cm
HSUPA subtest 5	Ch 4132	0.638	0.098		

Fig. 2.1: Summary of the measurement result (orientation 1)



Remark: *italic:* device with IMEI: ...6572, measured at IMST, with Laptop B),
underlined: device IMEI: ...6572, measured at Option, with Laptop B)

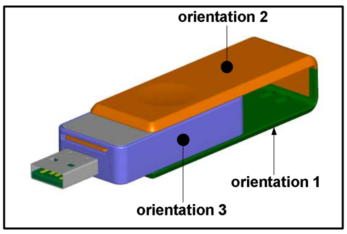
The *(max.cube)* labeling indicates that during the grid scanning an additional peak was found which was within 2.0dB of the highest peak. The value of the highest cube is given in the tables above, the value from the second assessed cube is given in the SAR distribution plots (see appendix).

2.2 Orientation 2

		≤5mm distance to phantom		Temperature	
Transmission Band	Channel	SAR_{1g}[W/kg]	Drift [dB]	Ambient temperatur	Liquid temp. Liquid depth
GPRS / GSM850 (multislot cl. 11)	Ch 128	*1.130*	*-0.073*	*23.0°C*	*21.6°C 15.5cm*
	Ch 190	*1.110*	*-0.074*		
	Ch 251	*1.090*	*-0.005*		
EDGE / GSM850 (multislot cl. 10)	Ch 128	*0.755*	*0.064*	*23.0°C*	*21.6°C 15.5cm*
	Ch 190	*0.333*	*-0.047*		
	Ch 251	*0.282*	*-0.070*		
WCDMA FDD V	Ch 4132	*0.497*	*0.050*	*23.0°C*	*21.6°C 15.5cm*
	Ch 4183	*0.376*	*0.114*		
	Ch 4233	*0.439*	*0.163*		

		≤½inch distance to phantom		Temperature	
Transmission Band	Channel	SAR_{1g}[W/kg]	Drift [dB]	Ambient temperatur	Liquid temp. Liquid depth
GPRS / GSM1900 (multislot cl. 11)	Ch 512	*1.45*	*-0.085*	*23.0°C*	*21.6°C 15.5cm*
	Ch 661	0.852	-0.0155	21.5°C	19.9°C 15.1cm
	Ch 810	1.04	-0.0246		
EDGE / GSM1900 (ch512+661 cl.11 ch810 class12)	Ch 512	0.31	0.05	21.5°C	19.9°C 15.1cm
	Ch 661	0.334	0.0567		
	Ch 810	0.38	0.0527		
WCDMA FDD II	Ch 9262	0.728	0.123	20.5°C	19.6°C 15.0cm
	Ch 9400	1.12	0.0163		
	Ch 9538	1.11	-0.0379		
HSDPA subtest 1	Ch 9400	<u>1.08</u>	<u>0.00624</u>	<u>21.5°C</u>	<u>19.8°C 15.0cm</u>
HSUPA subtest 3	Ch 9400	<u>0.881</u>	<u>-0.0784</u>	<u>22.0°C</u>	<u>19.9°C 15.4cm</u>
HSUPA subtest 5	Ch 9400	<u>0.834</u>	<u>-0.0196</u>		

Fig. 2.2: Summary of the measurement result (orientation 2)

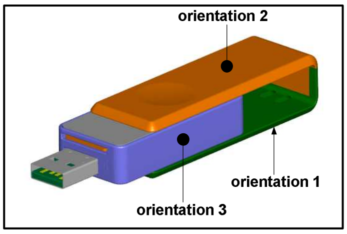


Remark: *italic:* device with IMEI: ...6572, measured at IMST, with Laptop B), GPRS1900 ch512 was measured with Laptop C)
<u>underlined</u>: device IMEI: ...6572, measured at Option, with Laptop B)
engrave: device with IMEI: ...7984, measured at Option, with Laptop B)

2.3 Orientation 3

		≤5mm distance to phantom		Temperature	
Transmission Band	Channel	SAR_{1g}[W/kg]	Drift [dB]	Ambient temperatur	Liquid temp. Liquid depth
GPRS / GSM850 (multislot cl. 11)	Ch 128	0.411	-0.165	21.5°C	18.6°C 15.0cm
	Ch 190	0.45	-0.076		
	Ch 251	0.524	0.00544		
GPRS / GSM1900 (multislot cl. 11)	Ch 512	0.909	-0.172	21°C	19.2°C 15.2cm
	Ch 661	0.881	0.00559		
	Ch 810	1.17	-0.0769		
EDGE / GSM850 (multislot cl. 10)	Ch 128	0.146	-0.0545	21.5°C	18.6°C 15.0cm
	Ch 190	0.117	-0.051		
	Ch 251	0.101	-0.158		
EDGE / GSM1900 (multislot cl. 11)	Ch 512	0.485	-0.0662	21°C	19.2°C 15.2cm
	Ch 661	0.32	-0.155		
	Ch 810	0.356	-0.143		
WCDMA FDD II	Ch 9262	0.942	0.0448	21°C	19.2°C 15.2cm
	Ch 9400	1.17	-0.00674		
	Ch 9538	1.0	0.101		
WCDMA FDD V	Ch 4132	0.358	-0.0792	21.5°C	18.6°C 15.0cm
	Ch 4183	0.263	-0.00453		
	Ch 4233	0.361	-0.0711		

Fig. 2.3: Summary of the measurement result (orientation 3)



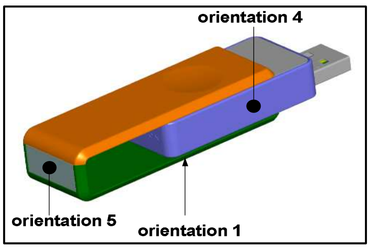
Remark: underlined: device IMEI: ...6572, measured at Option, with Laptop A)
regular: device with IMEI: ...7596, measured at Option, with Laptop A)

2.4 *Orientation 4*

		≤5mm distance to phantom		Temperature	
Transmission Band	Channel	SAR_{1g} [W/kg]	Ambient [°C]	Ambient temperatur	Liquid temp. Liquid depth
GPRS / GSM850 (multislot cl. 11)	Ch 128	0.569	-0.0141	21.5°C	18.6°C 15.0cm
	Ch 190	0.654	0.00375		
	Ch 251	0.722	-0.0317		
GPRS / GSM1900 (multislot cl. 11)	Ch 512	0.932	0.0119	21°C	19.2°C 15.2cm
	Ch 661	0.952	0.0844		
	Ch 810	0.963	0.104		
EDGE / GSM850 (multislot cl. 10)	Ch 128	0.154	-0.0295	21.5°C	18.6°C 15.0cm
	Ch 190	0.142	-0.031		
	Ch 251	0.128	-0.0941		
EDGE / GSM1900 (multislot cl. 11)	Ch 512	0.333	0.0164	21°C	19.2°C 15.2cm
	Ch 661	0.325	0.0565		
	Ch 810	0.319	0.068		
WCDMA FDD II	Ch 9262	0.848	-0.0941	21°C	19.2°C 15.2cm
	Ch 9400	1.11	-0.053		
	Ch 9538	1.07	0.027		
WCDMA FDD V	Ch 4132	0.596	-0.13	22°C	18.8°C 15.0cm
	Ch 4183	0.433	-0.0421		
	Ch 4233	0.632	0.11		

Fig. 2.4: Summary of the measurement result (orientation 4)

Remark: underlined: device IMEI: ...6572, measured at Option, with Laptop A)
regular: device with IMEI: ...7596, measured at Option, with Laptop A)

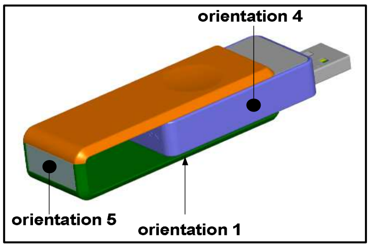


2.5 Orientation 5

		≤5mm distance to phantom		Temperature	
Transmission Band	Channel	SAR_{1g}[W/kg]	Ambient [°C]	Ambient temperatur	Liquid temp. Liquid depth
GPRS / GSM850 (multislot cl. 11)	Ch 128	0.0467	-0.147	21°C	18.8°C 15.0cm
	Ch 190	0.0352	0.0144		
	Ch 251	0.0307	0.0988		
GPRS / GSM1900 (multislot cl. 11)	Ch 512	0.146	0.031	21°C	19.2°C 15.2cm
	Ch 661	0.148	-0.0234		
	Ch 810	0.156	0.015		
EDGE / GSM850 (multislot cl. 10)	Ch 128	0.0101	0.125	21°C	18.8°C 15.0cm
	Ch 190	0.00923	0.109		
	Ch 251	0.00975	0.125		
EDGE / GSM1900 (multislot cl. 11)	Ch 512	0.0554	0.00911	21°C	19.2°C 15.2cm
	Ch 661	0.0539	0.0631		
	Ch 810	0.0546	0.0265		
WCDMA FDD II	Ch 9262	0.173	-0.163	21°C	19.2°C 15.2cm
	Ch 9400	0.229	-0.011		
	Ch 9538	0.213	0.0815		
WCDMA FDD V	Ch 4132	0.0339	0.0579	22°C	18.8°C 15.0cm
	Ch 4183	0.0211	0.119		
	Ch 4233	0.0365	-0.00627		

Fig. 2.5: Summary of the measurement result (orientation 5)

Remark: regular: device with IMEI: ...7596, measured at Option, with Laptop A)



2.6 Check Of Enhanced Energy Coupling

According FCC document 447498 D01 Mobile Portable RF Exposure v03r02 it must be determined if additional SAR evaluation is required due to enhanced energy coupling at increased separation distances.

The measurement procedure is described in that document 447489 D01 in chapter 2)b)ii):
1) Test configuration with the highest 1-g SAR for each device configuration is choosen
2) Probe tip is positioned at the peak SAR location determined in item 2)b)ii at 3.4mm distance from the phantom (half probe tip diameter)
3) DASY4 system is switched to multimeter. The multimeter job measures the field with the probe standing still.
4) While probe location is fixed, the device is moved away from the phantom in 5mm increments from the initial position.
5) A single point SAR is measured for each of these device positions until the SAR is less than 50% of that measured at the initial position.

The maximum SAR was measured in device orientation 2 (antenna towards phantom).
GPRS / GSM850 ch128 is the highest SAR at ≤5mm distance to phantom, while
GPRS / GSM1900 ch512 is the highest SAR at ≤½inch distance to phantom

Measurement results

A) Device IMEI: ...6572
Laptop B)
Ambient temperature: 22.0°C
Liquid temperature: 19.9°C
Liquid depth: 15.4cm
Orientation 2 (antenna towards phantom)
Distance to phantom: **≤5mm**
GPRS/GSM850 (multislot cl. 11)
Channel 128
- Initial position:
  SAR (1g avg.): 1.1 W/kg – Drift: -0.0477dB
- Moving tip by 3.4mm away from phantom, changing DASY4 to "multimeter job":
  SAR (multimeter): 1.37 W/kg at initial device position
- Increment distance between device and phantom by 5mm:
  SAR (multimeter): 0.798 W/kg at 5mm position
- Increment distance between device and phantom by another 5mm:
  SAR (multimeter): 0.247 W/kg at 10mm position

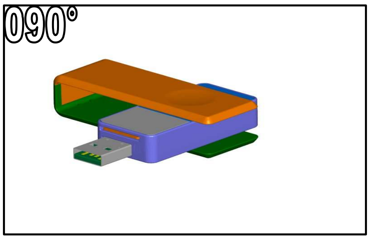
B) Device IMEI: ...6572
Laptop B)
Ambient temperature: 21.0°C
Liquid temperature: 19.8°C
Liquid depth: 15.1cm
Orientation 2 (antenna towards phantom)
Distance to phantom: **≤½inch**
GPRS/GSM1900 (multislot cl. 11)
Channel 512

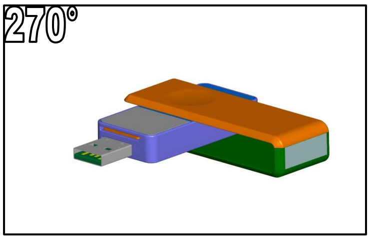
- Initial position:
  SAR (1g avg.): 1.46 W/kg – Drift: 0.0209dB
- Moving tip by 3.4mm away from phantom, changing DASY4 to "multimeter job":
  SAR (multimeter): 1.19 W/kg at initial device position
- Increment distance between device and phantom by 5mm:
  SAR (multimeter): 0.560 W/kg at 5mm position
- Increment distance between device and phantom by another 5mm:
  SAR (multimeter): 0.268 W/kg at 10mm position

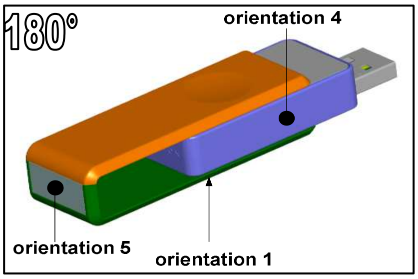
Conclusion: Moving the device away from the phantom results in consistently lower SAR. An enhanced energy coupling is not ascertainable.

2.7 Various Swivel Positions

The intended use case position of the device is 180°. Nevertheless the antenna can snap in at 90° and 270°. For these antenna positions, SAR was measured at worst case orientations.







				Temperature	
Device Position	Swivel Orientation	SAR_{1g} [W/kg]	Drift [dB]	Ambient [°C]	Liquid [°C] Liquid depth
GMSK / GSM1900 / Ch 512 / distance to phantom: ½inch					
orientation 2	180°	*1.45*	*-0.085*	*23.0*	*21.4* *15.5*
orientation 2	090°	1.32	-0.115	20.5	19.6
orientation 2	270°	1.29	-0.091		15.2
WCDMA FDD II / distance to phantom: 5mm					
orie.1 / Ch9262	180°	*0.710*	*0.198*	*23.0*	*21.4* *15.5*
orie.1 / Ch9400		*1.13*	*0.184*		
orie.1 / Ch9538		*0.924*	*0.142*		
orie.1 / Ch9400	090°	*0.947*	*-0.144*	*23.0*	*21.4*
orie.1 / Ch9400	270°	*0.893*	*-0.119*		*15.5*
orie.3 / Ch9400	090°	*0.0806*	*-0.050*	*23.0*	*21.4*
orie.4 / Ch9400	270°	*0.094*	*-0.102*		*15.5*

Fig. 2.6: Summary of the measurement result (various swivel positions)

Remark: *italic:* device with IMEI: ...6572, measured at IMST, with Laptop C)
regular: device with IMEI: ...7596, measured at Option, with Laptop B)

NOTES

1) Laptoptypes A), B), C) are described in chapter 4.5 "Host Devices"

3 Description of the EUT

3.1 General Description

The device iCON322 is a new USB Stick which provides the operating bands GSM850 (GPRS Class12), GSM900 (GPRS Class12), GSM1800 (GPRS Class12), GSM1900 (GPRS Class12), WCDMA FDD I+II+V.

Because the EUT does not have speech function but only data transfer function, the tests in GSM850 and GSM1900 are performed only in GMSK- and EDGE mode.

The EUT has a swivel antenna with one intended use position.

The dimensions of the EUT are: Length: 67mm # With: 24mm # Hight: 17mm

Fig. 3.1: Picture of the ICON322

3.2 Conducted Power

<u>GPRS/EDGE</u>

IMEI ...906572 (SerNo...4801R)

					averaged power:		
GMSK 850MHz	ch 128	ch 190	ch 251		ch 128	ch 190	ch 251
1TXslot	30.9	31	30.9	-9.03dB	21.87	21.97	21.87
2TXslots	29.3	29.4	29.3	-6.02dB	23.28	23.38	23.28
3TXslots	28.1	28.1	28.1	-4.26dB	**23.84**	**23.84**	**23.84**
4TXslots	26.8	26.8	26.7	-3.01dB	23.79	23.79	23.69

					averaged power:		
EDGE 850MHz	ch 128	ch 190	ch 251		ch 128	ch 190	ch 251
1TXslot	26.8	26.2	25.6	-9.03dB	17.77	17.17	16.57
2TXslots	24.7	24.1	23.7	-6.02dB	**18.68**	**18.08**	**17.68**
3TXslots	22.8	22.2	21.8	-4.26dB	18.54	17.94	17.54
4TXslots	21.6	21.0	20.6	-3.01dB	18.59	17.99	17.59

averaged power:

GMSK 1900MHz	ch 512	ch 661	ch 810		ch 512	ch 661	ch 810
1TXslot	28	27.9	28	-9.03dB	18.97	18.87	18.97
2TXslots	26.3	26.3	26.2	-6.02dB	20.28	20.28	20.18
3TXslots	25.0	25.1	25.0	-4.26dB	**20.74**	**20.84**	**20.74**
4TXslots	23.7	23.8	23.7	-3.01dB	20.69	20.79	20.69

averaged power:

EDGE 1900MHz	ch 512	ch 661	ch 810		ch 512	ch 661	ch 810
1TXslot	25.0	25.0	24.5	-9.03dB	15.97	15.97	15.47
2TXslots	22.4	22.4	22.3	-6.02dB	16.38	16.38	16.28
3TXslots	21.1	21.1	20.9	-4.26dB	**16.84**	**16.84**	**16.64**
4TXslots	19.8	19.8	19.6	-3.01dB	16.79	16.79	16.59

IMEI ...907596 (SerNo...6601F)

averaged power:

GMSK 850MHz	ch 128	ch 190	ch 251		ch 128	ch 190	ch 251
1TXslot	31	30.9	30.9	-9.03dB	21.97	21.87	21.87
2TXslots	29.4	29.4	29.3	-6.02dB	23.38	23.38	23.28
3TXslots	28.1	28.1	28.1	-4.26dB	**23.84**	**23.84**	**23.84**
4TXslots	26.8	26.8	26.8	-3.01dB	23.79	23.79	23.27

averaged power:

EDGE 850MHz	ch 128	ch 190	ch 251		ch 128	ch 190	ch 251
1TXslot	26.4	26.0	25.5	-9.03dB	17.37	16.98	16.47
2TXslots	24.4	23.8	23.3	-6.02dB	**18.38**	**17.78**	**17.28**
3TXslots	22.5	21.9	21.5	-4.26dB	18.24	17.64	17.24
4TXslots	21.3	20.7	20.2	-3.01dB	18.29	17.69	17.19

averaged power:

GMSK 1900MHz	ch 512	ch 661	ch 810		ch 512	ch 661	ch 810
1TXslot	28.0	27.9	28.0	-9.03dB	18.97	18.87	18.97
2TXslots	26.2	26.2	26.2	-6.02dB	20.18	20.18	20.18
3TXslots	24.9	25.0	24.9	-4.26dB	**20.64**	**20.74**	**20.64**
4TXslots	23.6	23.7	23.6	-3.01dB	20.59	20.69	20.59

averaged power:

EDGE 1900MHz	ch 512	ch 661	ch 810		ch 512	ch 661	ch 810
1TXslot	24.7	24.6	24.3	-9.03dB	15.57	15.57	15.27
2TXslots	22.4	22.4	22.2	-6.02dB	16.38	16.38	16.18
3TXslots	21.0	21.0	20.8	-4.26dB	**16.74**	**16.74**	**16.54**
4TXslots	19.7	19.6	19.5	-3.01dB	16.69	16.59	16.49

IMEI ...907984 (SerNo...6600A)

GMSK 1900MHz	ch 512	ch 661	ch 810		averaged power: ch 512	ch 661	ch 810
1TXslot	28.0	28.2	28.1	-9.03dB	18.97	19.17	19.07
2TXslots	26.5	26.6	26.5	-6.02dB	20.48	20.58	20.48
3TXslots	25.2	25.3	25.3	-4.26dB	**20.94**	**21.04**	**21.04**
4TXslots	23.9	24.0	23.9	-3.01dB	20.89	20.99	20.89

EDGE 1900MHz	ch 512	ch 661	ch 810		averaged power: ch 512	ch 661	ch 810
1TXslot	24.8	24.7	24.7	-9.03dB	15.77	15.67	15.67
2TXslots	22.7	22.5	22.6	-6.02dB	16.68	16.48	16.58
3TXslots	21.2	21.1	21.1	-4.26dB	**16.94**	**16.84**	16.84
4TXslots	19.9	19.8	19.9	-3.01dB	16.89	16.79	**16.89**

NOTES

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots
=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots
=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots
=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots
=> conducted power divided by (8/4) => -3.01dB

2) Averaged Power Numbers

The maximum averaged power numbers are marked in **bold**.

3) All power numbers in dBm.

WCDMA

IMEI ...906572 (SerNo...4801R)

		Band	V			II		
Cable & Clamp Attenuation (compensated)			1.0 dB			1.7 dB		
		ARFCN	4132.00	4182.00	4233.00	9262.00	9400.00	9538.00
		Channel (MHz)	826.4	836.4	846.4	1852.4	1880.0	1907.6
Test	3GPP 34.121 sec.	3GPP 34.121 subtest						
1	5.2 Rel 99		21.30	21.10	21.30	21.20	21.70	21.50
2	5.2AA Rel6 HSDPA	1	20.90	20.80	21.20	20.80	21.20	20.90
3	5.2AA Rel6 HSDPA	2	20.40	20.40	20.60	20.50	20.90	20.60
4	5.2AA Rel6 HSDPA	3	20.50	20.40	20.80	20.60	21.00	20.70
5	5.2AA Rel6 HSDPA	4	20.50	20.60	20.80	20.50	20.90	20.60
6	5.2B Rel6 HSUPA	1	19.10	19.00	19.20	19.00	19.50	19.00
7	5.2B Rel6 HSUPA	2	18.50	18.80	19.30	18.40	18.90	18.50
8	5.2B Rel6 HSUPA	3	20.00	19.40	20.00	19.70	20.20	19.70
9	5.2B Rel6 HSUPA	4	19.30	19.10	19.00	19.00	19.50	19.00
10	5.2B Rel6 HSUPA	5	19.50	18.90	19.30	18.80	19.30	18.80

Power numbers in dBm

IMEI ...907984 (SerNo...6600A)

BAND	WCDMA II			WCDMA V		
channel	9262	9400	9537	4132	4183	4232
power [dBm]	21.2	21.8	20.7	22.5	21.6	22.2

IMEI ...907596 (SerNo...6601F)

BAND	WCDMA II			WCDMA V		
channel	9262	9400	9537	4132	4183	4232
power [dBm]	21.23	21.55	21.00	22.00	21.27	21.80

3.3 Operating Conditions

	WCDMA V	WCDMA II	GSM 850	GSM 1900
TX frequency range [MHz]	826.4-846.6	1852.4-1907.6	824.2-848.8	1850.2-1909.8
RX frequency range [MHz]	871.4-891.6	1932.4-1987.6	869.2-893.8	1930.2-1989.8
Modulation	QPSK	QPSK	GMSK (EDGE)	GMSK (EDGE)
Power level	TPC all 1	TPC all 1	PCL 5	PCL 0
Power class	3	3	4 (E2)	1 (E2)

4 Operational Conditions During The Tests

4.1 Test Orientations

SAR is evaluated using simulated tissue medium contained in a realistic human shaped phantom shell that allows a small diameter, miniature electric field probe to measure the electric field within the tissue regions exposed to the transmitter configured in normal operating positions.

According 447498 D01 Mobile Portable RF Exposure v03r01 2)b)i)(1) devices that can be connected to a host through a cable must be tested with the device positioned in all applicable orientations against the flat phantom (1). A separation distance ≤ 0.5cm is required for USB-dongle transmitters.

To achieve maximum distance to the border of the phantom, the antenna of the EUT is positioned at the cross of the flat section of the phantom (Fig. 4.2). Hence the orientation 4 needed to be checked with 10cm usb cable.

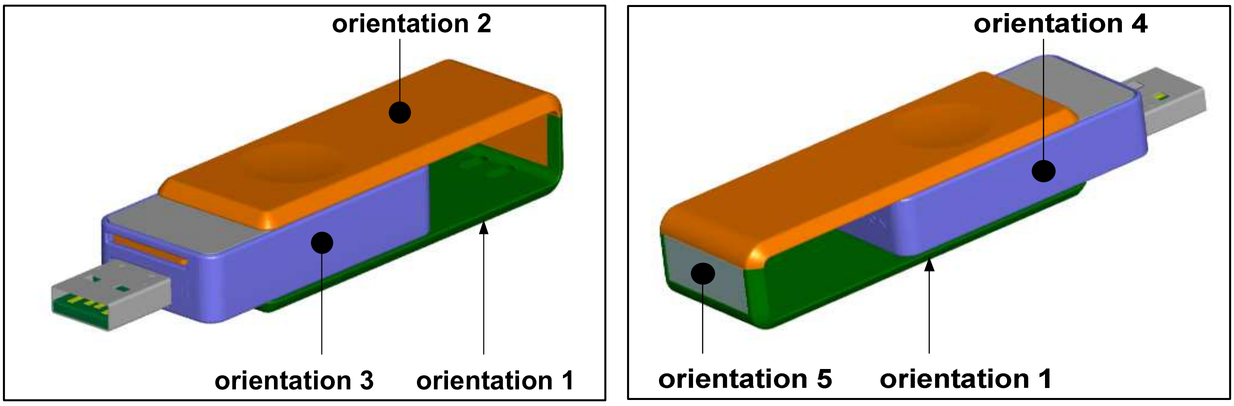


Fig. 4.1: EUT Orientations

4.2 Device Positioning

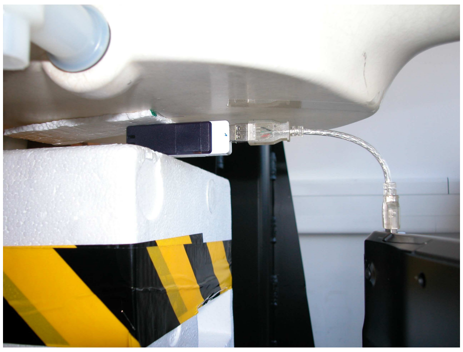
For body worn the flat section of the phantom is used.

Fig. 4.2: Center point of the phantom

Fig. 4.3: Orientation 1 (Distance DUT «» phantom = 5mm)

Fig. 4.4: Orientation 2 (Distance DUT «» phantom = ½inch or 5mm)

Fig. 4.5: Orientation 3 (Distance DUT «» phantom = 5mm)



EUT is clamped between two low loss polystyrene parts and connected to laptop via 10cm flexible usb cable.

Fig. 4.6: Orientation 4 (Distance DUT «» phantom = 5mm)

Fig. 4.7: Orientation 5 (Distance DUT «» phantom = 5mm)

4.3 Measurement Procedure

Each measurement is done pursuant to the following procedure:

- Connection to EUT is established via air interface with a base station controller.
- EUT is set to maximum output power by base station controller
- Measurement of an E-Field level at a certain reference point. This is the reference value to determine the power drift.
- Measurement of the SAR distribution with 15x15mm or 10x10mm grid spacing at a remaining distance to the inner surface of the phantom. Because the sensor can not measure in direct contact with the surface, the values are extrapolated. Based on these values the maximum SAR of the area is calculated by interpolation scheme (combination of a least-square fitted function and a weighted average method). Any additional peak within 2dB of maximum SAR will be searched.
- A cube of 30x30x30mm is assessed around these points by measuring 7x7x7 or 5x5x5 points. The first two measurement points are within the required 10mm of the surface. Based on these dates the peak spatial-average SAR value is calculated.
- All used calculation routines are bases on the Quadratic Shepard's method (DASY4).
- Repetition of E-Field-measurement at the certain reference point to calculate the power drift.
- Measurement will be repeated in case of power drift is more than ±0.2dB.

4.4 Configuration Of Basestation Controller

4.4.1 Determination Of Maximum Radiated Power

In order to manage terminal heat dissipation resulting from transmission on multiple uplink timeslots, the ICON 322 reduces its maximum output power.

To ensure the EUT is transmitting the maximum radiated power during SAR tests, the conducted power was measured in all multislot classes and averaged (chapter 3.3).

For SAR testing the EUT was set to multislot class based on the maximum averaged conducted power.

4.4.2 Configuration Base Station Controller (BSC) For GSM850 (GMSK)

TCH	BCCH	BCCH-Level	Attenuation	Main Slot	Coding Scheme	Mode	Crest factor
190	162	-50.0	35.0	3	MCS1	EGPRS	2.77

Fig. 4.8: General configuration BSC, GSM850

Slot number	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Status	-	-	-	active	active	active	-	-
Gamma (uplink)				3	3	3		

Fig. 49: Slot configuration GSM850

4.4.3 Configuration Base Station Controller (BSC) For GSM850 (8PSK)

TCH	BCCH	BCCH-Level	Attenuation	Main Slot	Coding Scheme	Mode	Crest factor
190	162	-50.0	35.0	3	MCS5	EGPRS	4.16

Fig. 4.10: General configuration BSC, GSM850

Slot number	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Status	-	-	-	active	active	-	-	-
Gamma (uplink)				3	3			

Fig. 4.11
1: Slot configuration GSM850

4.4.4 Configuration Base Station Controller (BSC) For GSM1900 (GMSK)

TCH	BCCH	BCCH-Level	Attenuation	Main Slot	Coding Scheme	Mode	Crest factor
190	162	-50.0	35.0	3	MCS1	EGPRS	2.77

Fig. 4.12: General configuration BSC, GSM1900

Slot number	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Status	-	-	-	active	active	active	-	-
Gamma (uplink)				3	3	3		

Fig. 4.13: Slot configuration GSM1900

4.4.5 Configuration Base Station Controller (BSC) For GSM1900 (8PSK)

TCH	BCCH	BCCH-Level	Attenuation	Main Slot	Coding Scheme	Mode	Crest factor
190	162	-50.0	35.0	3	MCS5	EGPRS	2.77

Fig. 4.14: General configuration BSC, GSM1900

Slot number	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Status	–	–	–	active	active	active	–	–
Gamma (uplink)				3	3	3		

Fig. 4.15: Slot configuration GSM1900

Remark: Only ICON322 IMEI...907984 EDGE 1900MHz Ch810 was tested with 4 uplink timeslots (slot 2+3+4+5 active).

4.4.6 Configuration Base Station Controller (BSC) For WCDMA FDD

DL-Power	Attenuation	TPC-Algorithm	Crest Factor	Open Loop Power	Dedicated Channel
-51.7 dBm	38.0	All1	1	OFF	RMC

Fig. 4.16: General configuration BSC, WCDMA FDD

4.5 Host Laptop

All tests were performed with the following Laptops:

Laptop A)
Laptop SONY PCG-8113M, Ser.No. 28279253 5001033

Fig. 4.17: picture of host device Laptop A)

Fig. 4.18: Laptop A) (horizontal slot)

Fig. 4.19: Laptop A) (vertical slot)

Laptop B)
Laptop SONY VAIO PCG-5G2M

Fig. 4.20: Laptop B)

Fig. 4.21: Laptop B) (horizontal slot)

Laptop C)
Laptop FUJITSU SIEMENS LIFEBOOK S6410

Fig. 4.22: Laptop C)

F

Fig. 4.23: Laptop C) (horizontal slot)

Fig. 4.24: Laptop A) (vertical slot)

5 FCC Informations

provided by Mr. Tim Harrington, Aug14, 2008

FCC is providing USB dongle transmitter manufacturers requesting considerations for products that are in their final stage ready to ship in early fall the opportunity to present relevant SAR test data and supporting info for us to examine if other possible alternatives may apply to issues relating to similar circumstances among these products. This is a collective consideration; we are not likely to consider the specific or individual requests or proposals from each individual manufacturer that have already been determined to be undesirable or unacceptable. These alternative considerations are not long term solutions and will require the certification to be submitted to the FCC for approval.

Manufacturers should consider the following to perform SAR compliance tests for their USB dongle modem transmitter(s). When the final test results for each product are ready, we can review and determine the type and extent of warning and/or labeling requirements according to the test distances and SAR levels to show compliance. While there is the possibility of considering warning instructions and pamphlets etc. to address SAR and distance issues for USB connection orientations that are found less often in typical laptop computers (mainly in one of the up-side-down horizontal configurations), higher SAR levels and larger separation distances in the other USB connection orientations may necessitate warnings on the device. We will need to review the final data to make this determination.

SAR compliance test considerations:
Test all USB orientations (Horizontal-up, Horizontal-down, Vertical-front, and Vertical-back) with a device to phantom separation distance of 0.5 inch (~ 10 mm to 13 mm) or less. A test distance of 5 mm or less, according to KDB 447498, should be considered for the orientations that can satisfy such requirements. The same test separation distance should be used for all frequency bands and modes in each USB orientation; that is, the frequency band with the highest SAR dictates the test distance in each orientation. Do not include any non-compliant data in the test report. All test results must be within the SAR limit (1.6 W/kg) to demonstrate compliance for the 0.5 inch (~ 10 mm to 13 mm) or less separation distances being considered in conjunction with any warning and/or labeling requirements. The typical Horizontal-up USB connection, found in the majority of laptop computers, must be tested using an appropriate laptop computer. A laptop with either Vertical-front or Vertical-back USB connection should be used to test one of the vertical USB orientations. If laptop computers are not available for testing the Horizontal-down or remaining Vertical USB orientation, a short USB cable (12 inch or less) may be used for testing these other orientations. It should be ensured that the USB cable does not affect device output power and SAR. Since the warning and labeling requirements are dependent on the measured SAR levels and test distances, it would be desirable to test at the smallest distance that enable each USB orientation to comply (1.6 W/kg or 1.2 W/kg as appropriate) in all frequency bands and modes. When different distances are used to test the different orientations, the device design and antenna configuration with respect to their operating configurations and exposure conditions will also be considered to determine warning and labeling requirements. The FCC SAR test procedures for 3G devices, including power measurement requirements, should be used to perform the SAR evaluation.

6 SAR Measurement System

6.1 Description Of DASY Measurement Setup

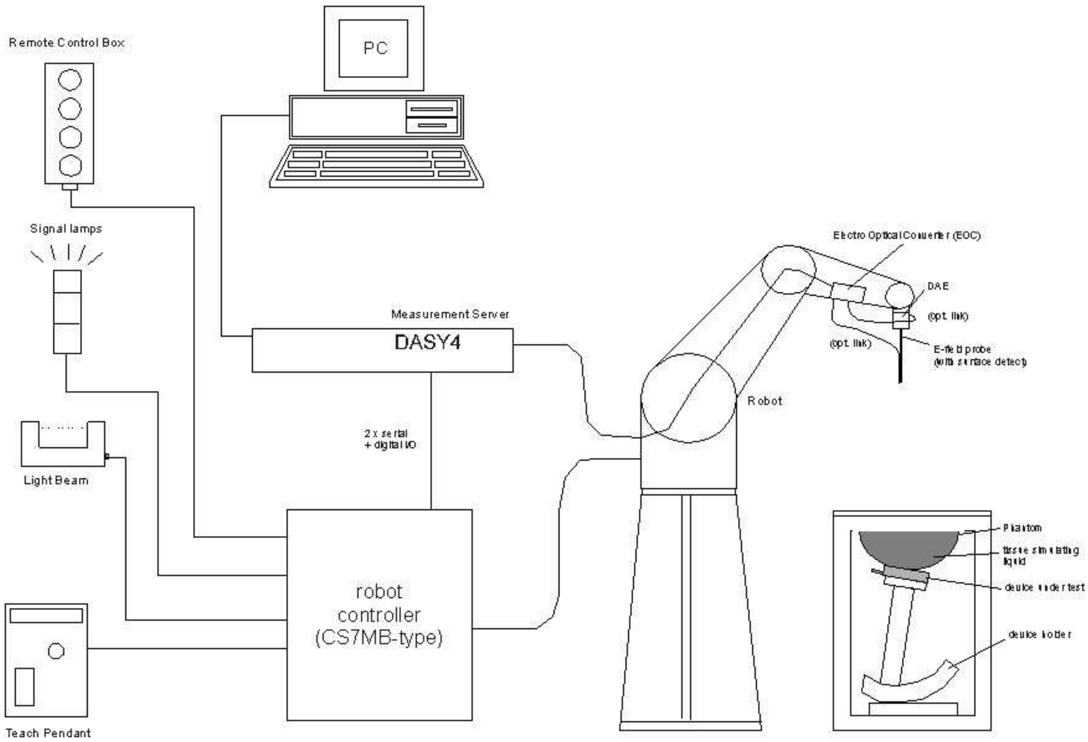


Fig. 6.1: Block diagram of DASY measurement set-up

Fig. 6.2: Picture of DASY measurement set-up with SAM Phantom

The main component of the SAR measurement set-up by SPEAG is the standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. A removable dosimetric probe allows measurements in all operating bands. The mechanical probe offset is completely compensated after aligning the probe in the light-beam. During this procedure, the system measures the actual probe offset. After passing alignment all further movements are adjusted to the actual tip position. This ensures an uncertainty of probe positioning of better than 0.1mm, even after changing probes. A data acquisition electronics (DAE) performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts. The DASY4 software allows a comfortable visualisation of the measurement results.

6.1.1 Description SAR Scan Method

<u>Area Scan</u>

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.
Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB (specified by IEEE 1528-2003) will be ascertained.

<u>Zoom Scan</u>

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 or 5x5x5 points within a cube whose base is centered around the maxima found in the preceding area scan.

<u>Spatial Peak Detection</u>

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard and can determine values of masses of 1g and 10g, as well as for user-specific masses.
The DASY4 system allows evaluations that combine measured data and robot positions, such as:
· maximum search
· extrapolation
· boundary correction
· peak search for averaged SAR
During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm

will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

6.2 Description Of The Phantom (Twin Sam)

The phantom table has a size of: 100cm x 50cm x 85cm (L x W x H) for use with a free standing robot. 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. Only one device holder is necessary if two phantoms are used (e.g., for different liquids) A white cover is provided to top the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible.
On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Parameter of the phantom:

Shell Thickness:	2 ± 0.2 mm;
Center ear point:	6 ± 0.2 mm
Filling Volume:	~ 25 liters
Length:	1000 mm
Width:	500 mm
Height:	adjustable feet

Fig. 6.3: SAM Twin Phantom

6.3 E-Field Probe (ET3DV6)

6.3.1 OPTION E-Field Probe

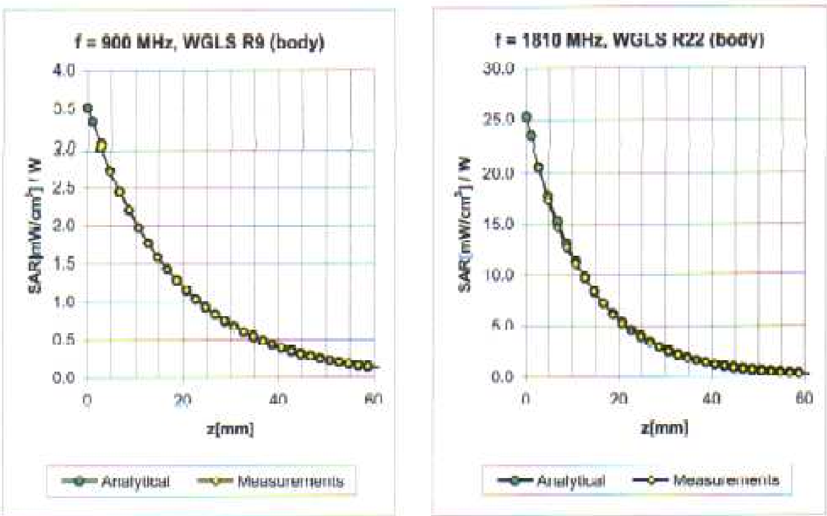
- Construction:
  Symmetrical design with triangular core
  Built-in optical fiber for surface detection system (ET3DV6 only)
  Built-in shielding against static charges
  PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
- Calibration
  Basic Broad Band Calibration in air
  Conversion Factors (CF) for HSL 900 and HSL 1810
  Additional CF for other liquids and frequencies upon request
- Frequency
  10 MHz to 2.3 GHz
  Linearity: ± 0.2 dB (30 MHz to 2.3 GHz)
- Directivity
  ± 0.2 dB in HSL (rotation around probe axis)
  ± 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 (Tip: 16 mm)
  Tip diameter: 6.8 mm (Body: 12 mm)

Distance from probe tip to dipole center: 2.7 mm

- Application
  General dosimetric measurements up to 2.3 GHz
  Compliance tests of mobile phones
  Fast automatic scanning in arbitrary phantoms

ET3DV6 SN:1723 November 20, 2007

Conversion Factor Assessment



f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.73	2.17	5.94	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.57	2.88	4.72	± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.87	1.85	4.31	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.79	2.02	3.98	± 11.8% (k=2)

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

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Fig. 6.4: Conversion factor assessment Dipole ET3DV6

6.4 Probe Positioning

The probe positioning procedures affect the tolerance of the separation distance between the probe tip and the phantom surface as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{\delta/2}$$

where dph is the maximum deviation of the distance between the probe tip and the phantom surface. The optical surface detection has a precision of better than 0.2 mm, resulting in an SARtolerance[%] of <2.9% (rectangular distribution). Since the mechanical detection provides better accuracy, 2.9% is a worst-case figure for DASY4 system.

6.5 Reference Dipols

- Symmetrical dipole with λ/4 balun
- Enables measurement of feedpoint impedance with NWA
- Matched for use near flat phantoms filled with tissue simulating solutions
- Return Loss > 20 dB at specified validation position
- Power Capability > 100 W (f < 1GHz); > 40 W (f > 1GHz)

- Used dipols at Option Wireless Germany:

Type	Dipole length	Overall height
D835V2	161.0 mm	340.0 mm
D900V2	148.5 mm	340.0 mm
D1800V2	72.5 mm	300.0 mm
D1900V2	67.7 mm	300.0 mm

6.6 Recipes SAR-Liquids For Body

Liquid type	M 900-B		M 1950-A	
Ingredient	weight (g)	weight (%)	weight (g)	weight (%)
Water	633.91	50.75	697.94	69.79
DGBE	-	-	300.03	30.00
Sugar	602.12	48.21		
Salt	11.76	0.94	2.03	0.20
Preventol	1.20	0.10		
Total amount	1249.00	100.00	1000.00	100.00
Goal dielectric parameters				
Frequency [MHz]	835	900	1950	2000
Relative Permittivity	55.2	55.0	53.3	53.3
Conductivity [S/m]	0.97	1.05	1.52	1.52

Fig. 6.5: Recipes SAR-liquids for body [DASY4 System Handbook]

6.7 Tissue Dielectric Parameters For Body

Target frequency		ε_r	σ(S/m)
835 MHz	Target value with tolerances	55.2 ± 2.76	0.97 ± 0.10
	Measured value	53.81	0.99
900 MHz	Target value with tolerances	55.0 ± 2.75	1.05 ± 0.10
	Measured value	54.1	1.01
1800 MHz -2000 MHz	Target value with tolerances	53.3 ± 2.66	1.52 ± 0.15
	Measured value	53.95	1.58

Fig. 6.6: Dielectric parameters for body [OET65c Edition 97-01]

The dielectric parameters are measured with the Hewlett Packard Network Analyzer in combination with the Probe Kid 85070D.

6.8 Liquid Depth Of The Phantom

The liquid depth in the phantom should be in a range of 15 cm ± 0.5 cm.

7 OPTION Setup For The System Check

The verification of the system (liquid included) is done by using the reference dipoles. The measurement set-up (Fig.7.4) is based on IEC1528-2003. By setting output power at power meter 1 (PM1) to 250 mW, the listed levels in figure 7.1 indicate what may be expected. Because the probe of the power meter (PM1) is limited to 100mW, an attenuator (Att1) of 10 dB is used. The matching of the dipole is checked by using a directional coupler with power meter PM2 + PM3 to ensure that the backward power is at least 20 dB lower than the forward power.

Frequency Signal Generator	Level Generator [dBm]	Forward Power PM2 [dBm]	Backward Power PM3 [dBm]	Feeding point reference dipole PM1 [dBm]	Liquid Temperature	Liquid depth
835 MHz	-12.22	-15.3	-40.5	14.0	18.8 °C	15.0 cm
1900 MHz	-11.16	-14.9	-37	13.99	19.2 °C	15.1 cm

Fig 7.1: Power performance measurement set-up

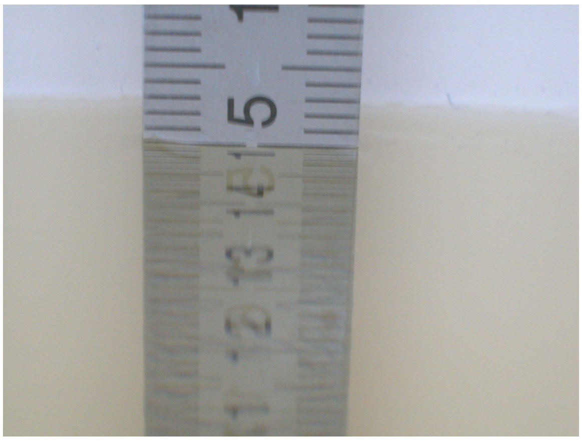

Fig. 7.2: Liquid depth 850/900MHz

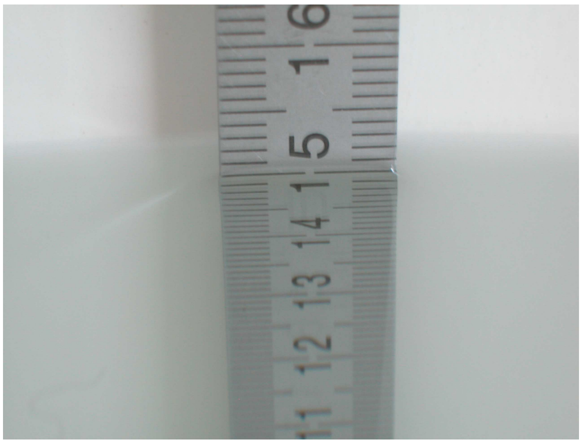

Fig. 7.3: Liquid depth 1900MHz

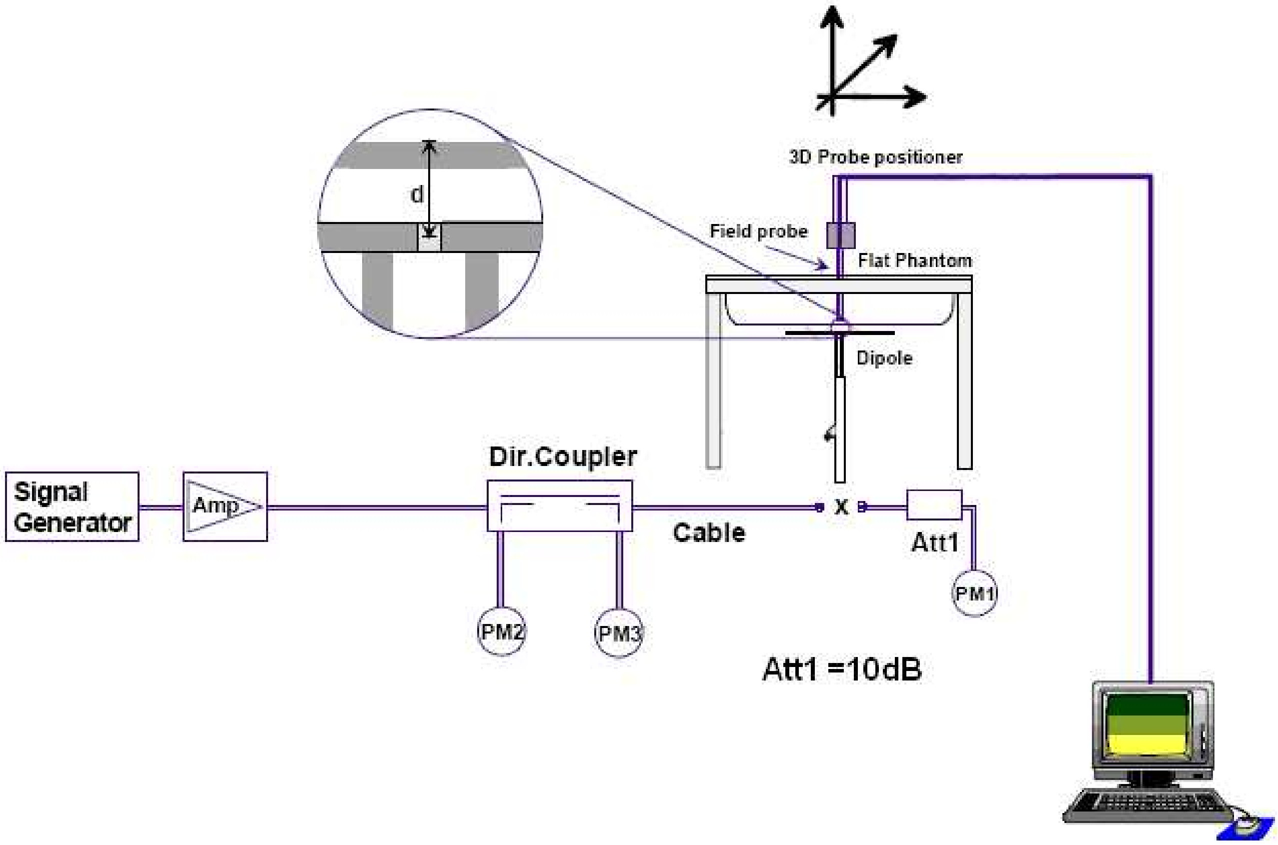

Fig. 7.4: Simplified measurement set-up for system check

Frequency	$SAR_{1g\ avg}$ [W/kg]			Dipole Type
	Lower limit	Upper limit	Measured value	
835 MHz	2.13	2.61	2.51	D835V2
1900 MHz	8.92	10.91	10.5	D1900V2

Fig. 7.5: Target values for Dipole calibration (Body worn)

For the reference dipoles the frequencies the spacing distances d is given by:

a) d = 15 mm ± 0.2 mm for 300 MHz ≤ f ≤ 1000MHz

b) d = 10 mm ± 0.2 mm for 1000 MHz < f ≤ 3000MHz

c) d = 10 mm ± 0.2 mm for 3000 MHz < f ≤ 6000MHz

7.1 Systemvalidation

All systemvalidation files are listed in the appendix: SYSTEMVALIDATION
file: 2008081805 icon322 sarreport systemvalidation

7.2 Equipment For Setup Validation

Measurement Equipment for system performance check				
Measurement device	**Type**	**Serial Number**	**Last calibration**	**Next calibration**
Schmid & Partner Dipole 835 MHz	D835V2	470	12/2007	12/2008
Schmid & Partner Dipole 900	D900V2	167	11/2007	11/2008
Schmid & Partner Dipole 1800 MHz	D1800V2	2d051	11/2007	11/2008
Schmid & Partner Dipole 1900 MHz	D1900V2	5d021	11/2007	11/2008
Power Meter Rohde&Schwarz	NRVS	833302/042	06/2007	06/2008
Power Sensor Rohde&Schwarz	NRV-Z51	839800/036	06/2007	06/2008
Power Meter Hewlett Packard	437B	3125U23483	N/A	N/A
Power Sensor Hewlett Packard	8482A	3318A29530	N/A	N/A
Power Meter Hewlett Packard	437B	3125U23477	N/A	N/A
Power Sensor Hewlett Packard	8482A	3318A29512	N/A	N/A
Directional Coupler Amplifier Research	DC7144M1	305854	N/A	N/A
Linear Power Amplifier MILMEGA		1002534	N/A	N/A
Digital Signal Generator Hewlett Packard	ESG-D2000A	US36260115	N/A	N/A
Network Analyzer Hewlett Packard	8753D	3410J02063	04/2008	04/2009
Dielectric Probe Kid Agilent	85070D	US01440138	N/A	N/A

Fig.7.9: Used equipment to validate the measurement set-up

7.3 Equipment For SAR Measurement

Measurement Equipment for system performance check				
Measurement device	Type	Serial Number	Last calibration	Next calibration
Computer Compac		6S29-KN82-H1LS	N/A	N/A
DASY4 Software	Version 4.5	N/A	N/A	N/A
Semcad	Version 1.8	N/A	N/A	N/A
Robot Stäubli Unimation	EOC5	232	N/A	N/A
Schmid & Partner DAE4	SD 000 D04 BA	523	11/2007	11/2008
Light Beam calibration unit	LB; Version 2	332	N/A	N/A
Coupling Antenna KATHREIN	VPol Indoor 800/2000	D624575853	N/A	N/A
E-fild probe	ET3DV6	1723	11/2007	11/2008
Twin Phantom, SAM Right	QD 000 P40 CA	TP-1241	N/A	N/A
Twin Phantom, SAM Left	QD 000 P40 CA	TP-1237	N/A	N/A
BSC Rohde & Schwarz	CMU200	105314	N/A	N/A
Precision Thermometer	Flüssigkeitsglas-thermometer	1650	02/2008	12/2023

Fig.7.10: General equipment of the measurement set-up

8 Tolerances And Uncertainty

8.1 DASY4 Uncertainty Budget

DASY4 Uncertainty Budget According to IEEE 1528								
Error Description	Uncertainty value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. 1g	Std. Unc. 10g	υ_i
Measurement System								
Probe Calibration	±5.9%	N	1	1	1	±5.9%	±5.9%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Conditions	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	√3	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	√3	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity (target)	±5.0%	R	√3	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±10.8%	±10.6%	330
Expanded uncertainty (95% confidence interval), k = 2						**21.6%**	**21.2 %**	

Fig. 8.1 DASY 4 uncertainty budget according to IEEE 1528

Abbreviations: N ≡ Normal Distribution, R ≡ Rectangular Distribution

Worst-Case uncertainty budget for DASY4 assessed according to IEEE 1528. The budget is valid for the frequency range 300MHz - 3GHz and represents a worst-case analysis.

8.2 System Validation Uncertainty Budget

Uncertainty Budget for system validation, According to IEEE 1528								
Error Description	Uncertainty value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. 1g	Std. Unc. 10g	υ_i
Measurement System								
Probe Calibration	±5.9%	N	1	1	1	±5.9%	±5.9%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.0%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±0.0%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Conditions	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Dipole								
Dipole axis to liquid distance	±2.0%	R	√3	1	1	±1.2%	±1.2%	∞
Input power and SAR drift measurement	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	√3	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity (target)	±5.0%	R	√3	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±9.3%	±9.1%	∞
Expanded uncertainty (95% confidence interval), k = 2						**18.6%**	**18.2 %**	

Fig. 8.2: Uncertainty budget for system validation according to IEEE 1528

Worst-Case uncertainty budget for DASY4 assessed according to IEEE 1528. The budget is valid for the frequency range 300MHz - 3GHz and represents a worst-case analysis.

Abbreviations: N ≡ Normal Distribution, R ≡ Rectangular Distribution

8.3 Overlap Between The Test Results At The Different Labs

For the evaluation of the SAR test results ascertained at different labs IMST and Option, comparison measurements were done.
In accordance with validation procedure of SAR system, a solid radiation source was established by using a signal generator and the calibrated dipoles D835V2 (SN:470) and D1900V2 (SN: 5d021). The use of one power meter (R&S NRVS/NRV-Z51) to check the power level at dipole feeding point reduces uncertainty furthermore.

Power level at dipole feeding point: 250mW
Measurement date: Aug14, 2008

Measurement result

	IMST	OPTION	delta
GSM 850	2.73 W/kg (1g avg.)	2.41 W/kg (1g avg.)	13.3%
GSM 1900	10.8 W/kg (1g avg.)	10.5 W/kg (1g avg.)	2.9%

9 Declaration Of Conformity Of DASY4 System

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	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-C63.19-2007, "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 – 6] 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) the dielectric parameters of the liquid are conformant with the standard requirement,
8) the DUT has been positioned as described in the manual.
9) the uncertainty values from the calibration certificates, and the laboratory and measurement equipment dependent uncertainties, are updated by end user accordingly.

Date 15.8.2007 **Signature / Stamp**

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

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10 Conditions At IMST

10.1 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: 0. Additional Fig: 0 shows the equipment, similar to the installations in other laboratories.

- 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

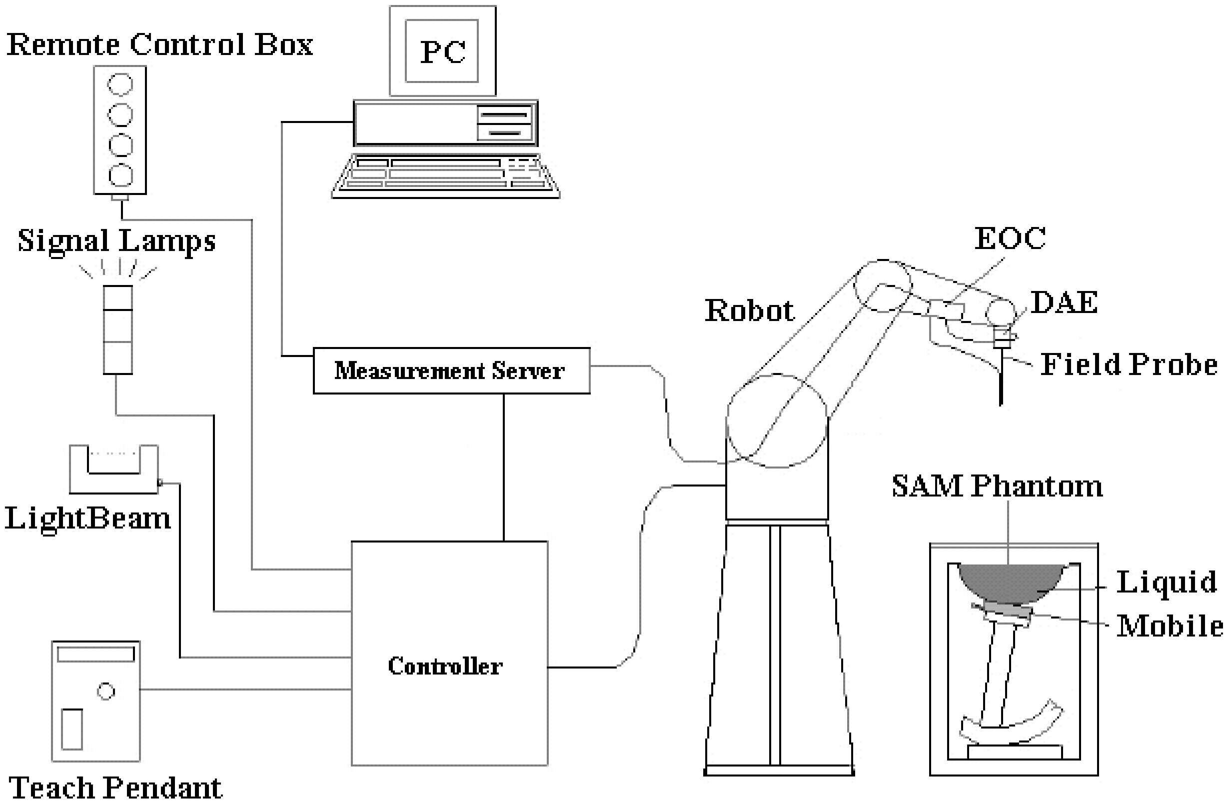

Fig. 10.1: The DASY4 measurement system

Fig. 10.2: The measurement set-up with two SAM phantoms containing tissue simulating liquid

The device 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.

10.2 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM Twin Phantom V4.0) defined by the IEEE SCC-34/SC2 group and delivered by Schmid & Partner Engineering AG is used. The phantom is a fibreglass shell integrated in a wooden table. The thickness of the phantom amounts to 2 mm ± 0.2 mm. It enables the dosimetric evaluation of left and right hand phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a coverage (polyethylene), which prevents the evaporation of the liquid. The details and the Certificate of conformity can be found in Fig. 0.

10.3 Probe

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.
ET3DV6:

- Dynamic range: 5µW/g to > 100mW/g
- Tip diameter: 6.8 mm
- Probe linearity: ± 0.2 dB (30 MHz to 3 GHz)
- Axial isotropy: ± 0.2 dB
- Spherical isotropy: ± 0.4 dB
- Distance from probe tip to dipole centers: 2.7 mm
- Calibration range: 900MHz / 1850MHz for head and body simulating liquid
- Angle between probe axis (evaluation axis) and surface normal line: less than 30°

EX3DV4:

- Dynamic range: 10µW/g to > 100mW/g (noise typically < 1µW/g)
- Tip diameter: 2.5 mm
- Probe linearity: ± 0.2 dB (30 MHz to 6 GHz)
- Axial isotropy: ± 0.2 dB
- Spherical isotropy: ± 0.4 dB
- Distance from probe tip to dipole center: 1.0 mm
- Calibration range: 1950 MHz / 2450MHz / 3500 MHz / 5200 MHz / 5500 MHz / 5800 MHz for head and body simulating liquid
- Angle between probe axis (evaluation axis) and surface normal line: less than 30°

10.4 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 a grid spacing of 15 mm x 15 mm and a constant distance to the inner surface of the phantom. Since the sensors can not directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With this values the area of the maximum SAR is calculated by

an interpolation scheme (combination of a least-square fitted function and a weighted average method). Additional all peaks within 2 dB of the maximum SAR are searched.

- Around this points, a cube of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points whereby the first two measurement points are within the required 10 mm of the surface. With these data, the peak spatial-average SAR value can be calculated within the SEMCAD software.
- 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.

10.5 Uncertainty Assessment

Table 0 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 %	

Fig. 10.3: Uncertainty budget of DASY4.

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 mea.	± 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 %	

Fig. 10.4: Uncertainty budget for the system performance check.

10.6 Administrative Data

Date of validation:	835 MHz (GPRS/EDGE 850):	June 23, 2008
	835 MHz (WCDMA V):	June 23, 2008
	1900 MHz (GPRS/EDGE 1900):	June 24, 2008
	1900 MHz (WCDMA II):	June 24, 2008

Date of measurement: June 23, 2008 – June 24, 2008
Data stored: Option_6620_694
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

10.7 Device Under Test And Test Conditions

MTE: Option iCON322 (USB Stick), identical prototype
Date of receipt: June 22, 2008
SN: 00440144090657201
FCC ID: NCMOGI0322
Equipment class: Portable device
Power Class: GPRS/EDGE 850: 4, tested with power level 5
GPRS/EDGE 1900: 1, tested with power level 0
WCDMA II (FDD) 1900: 3, tested with max.allow. UE Power of 33dBm
WCDMA V (FDD) 850: 3, tested with max.allow. UE Power of 33dBm
RF exposure environment: General Population/Uncontrolled
Power supply: Host Device
Antenna: Antenna Type: swivel
Measured Standards: GPRS 850 (Class 11), EDGE 850 (Class 10),
GPRS 1900 (Class 11), EDGE 1900 (Class 11),
WCDMA II, WCDMA V
Method to establish a call: GPRS/EDGE 850, GPRS/EDGE 1900 WCDMA II,V: Basestation simulator, using the air interface
Modulation: GPRS: GMSK; EDGE: 8-PSK; 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

Option iCON322	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	2.66
EDGE 850	824.2 – 848.8	869.2 – 893.8	128, 190 , 251	4
GPRS 1900	1850.2 –1909.8	1930.2 – 1989.8	512, 661, 810	2.66
EDGE 1900	1850.2 –1909.8	1930.2 – 1989.8	512, 661, 810	2.66
WCDMA II (FDD)	1852.4 – 1907.6	1932.4 – 1987.6	9262, 9400, 9538	1
WCDMA V (FDD)	826.4 – 846.6	871.4 – 891.6	4132, 4183, 4233	1

Fig. 10.5: Used Settings

10.8 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
1900 MHz, Body:	29.68%	Diethylenglykol-monobutylether
	70.00%	De-Ionized Water
	0.32%	Salt

10.9 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 (Validation GPRS/EDGE 850)	Recommended Value	55.20 ± 2.70	0.97 ± 0.10
	Measured Value	53.90	1.05
835 MHz Body (Validation WCDMA V)	Recommended Value	55.20 ± 2.70	0.97 ± 0.10
	Measured Value	53.90	1.05
1900 MHz Body, (Validation GPRS/EDGE 1900)	Recommended Value	53.30 ± 2.65	1.52 ± 0.15
	Measured Value	55.60	1.52
1900 MHz Body (Validation WCDMA II)	Recommended Value	53.30 ± 2.65	1.52 ± 0.15
	Measured Value	55.60	1.52

Fig. 10.6: Parameters of the tissue simulating liquid

10.10 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 Fig. 10.7 and 10.8 . The target values were adopted from the manufactures calibration certificates.

Available Dipoles		SAR_{1g} [W/kg]	ε_r	σ [S/m]
D835V2, SN #437	Target Values Body	2.47	54.80	1.00
D1900V2, SN #535		9.32	53.60	1.54
D1900V2, SN #5d051		9.26	54.30	1.52

Fig. 10.7: Dipole target results

Used Dipoles		SAR_{1g} [W/kg]	ε_r	σ [S/m]
835 MHz, SN: 437 (Validation GPRS/EDGE 850)	Measured Values Body	2.71	53.90	1.05
835 MHz, SN: 437 (Validation WCDMA V)		2.71	53.90	1.05
1900 MHz, SN:5d051 (Validation GPRS/EDGE 1900)		9.84	55.60	1.52
1900 MHz, SN: 535 (Validation WCDMA II)		9.84	55.60	1.52

Fig. 10.8: Measured dipole validation results

Test Laboratory: IMST GmbH, DASY Blue (I); File Name: 230608_b_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 = 1.05 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6R - SN1579; ConvF(6.24, 6.24, 6.24); Calibrated: 23.01.2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn335; Calibrated: 08.02.2008
- Phantom: SAM Sugar 1059; Type: Speag; Serial: 1059
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.95 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.4 V/m; Power Drift = 0.008 dB
Peak SAR (extrapolated) = 3.93 W/kg
SAR(1 g) = 2.71 mW/g; SAR(10 g) = 1.77 mW/g
Maximum value of SAR (measured) = 2.94 mW/g

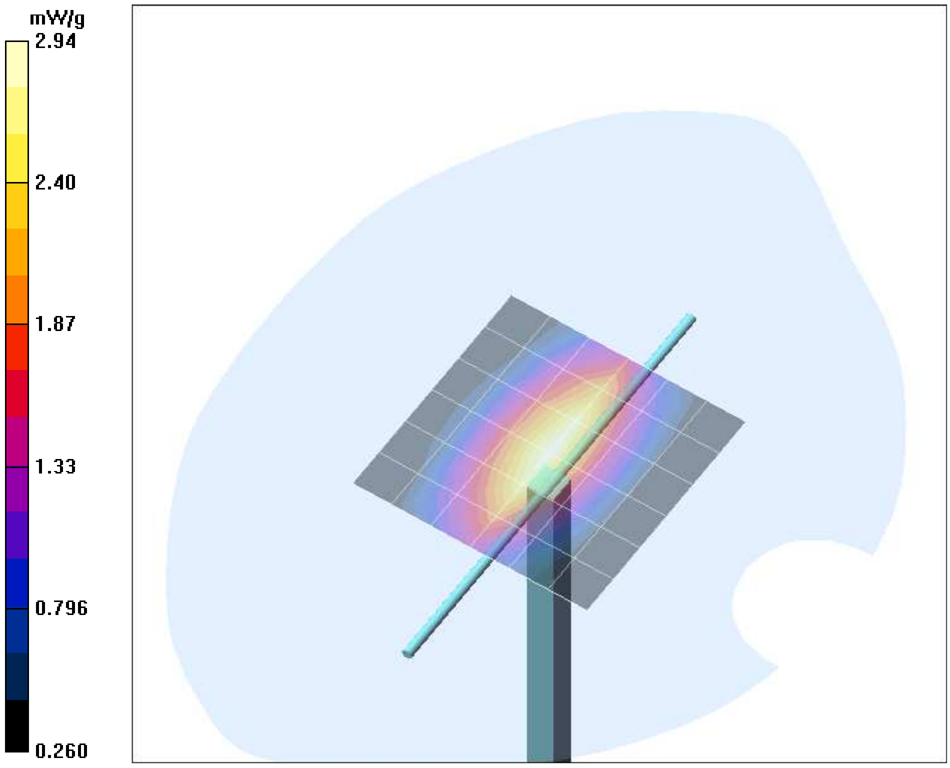

Fig. 10.9: Validation measurement 835 MHz Body (GPRS/EDGE 850, June 23, 2008), coarse grid. Ambient Temperature: 23.0°C, Liquid Temperature: 21.6°C.

Test Laboratory: IMST GmbH, DASY Blue (I); File Name: 240608_b_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 = 1.52 mho/m; ε_r = 55.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3536; ConvF(7.67, 7.67, 7.67); Calibrated: 18.09.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn631; Calibrated: 17.09.2007
- Phantom: SAM Glycol 1176; Type: Speag; Serial: 1176
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 10.8 mW/g
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.1 V/m; Power Drift = 0.139 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 9.84 mW/g; SAR(10 g) = 5.07 mW/g
Maximum value of SAR (measured) = 11.0 mW/g

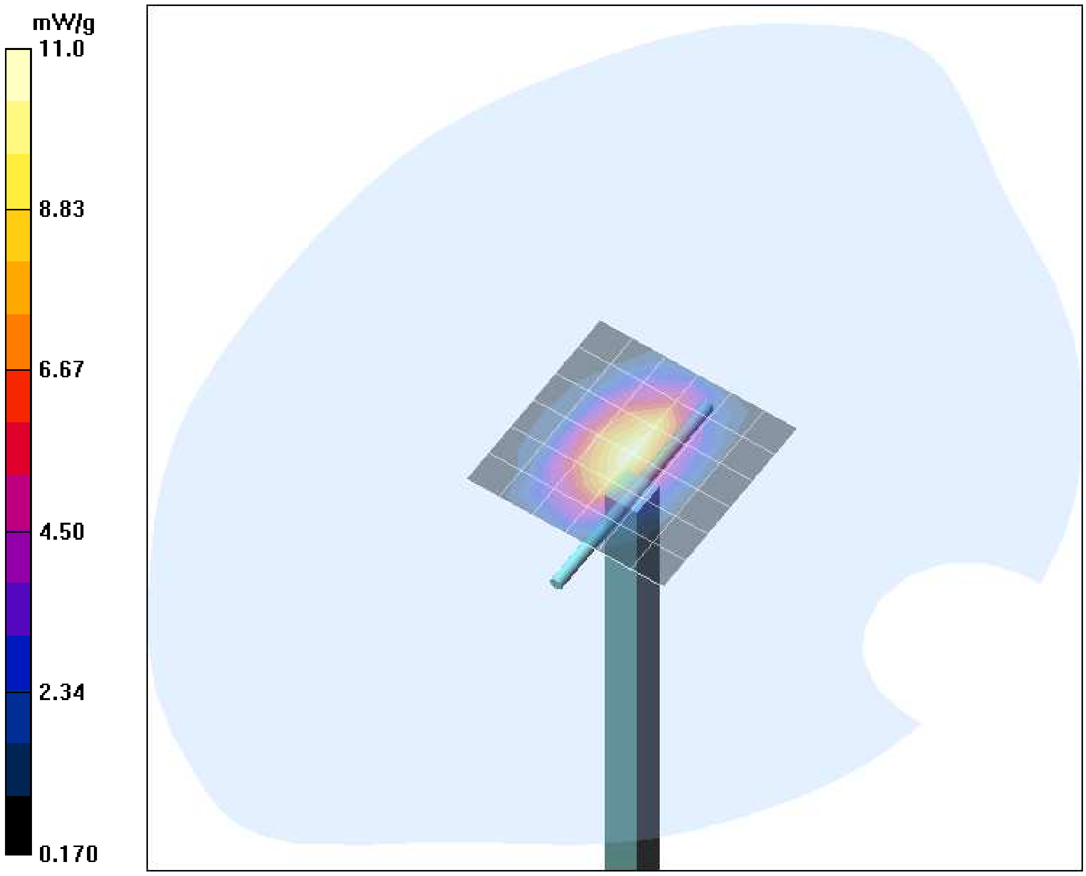

Fig. 10.10: Validation measurement 1900 MHz Body (GPRS/EDGE 1900, June 24, 2008), coarse grid. Ambient Temperature: 22.9°C, Liquid Temperature: 21.5°C.

10.11 Environment

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

10.12 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	ET3DV6	1579	01/2008	01/2009
Dosimetric E-Field Probe	EX3DV4	3536	09/2007	09/2008
Data Acquisition Electronics	DAE 3	335	02/2008	02/2009
Data Acquisition Electronics	DAE 4	631	09/2007	09/2008
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	12/2007	12/2008
Validation Dipole	D1900V2	535	12/2007	12/2008
Validation Dipole	D1900V2	5d051	09/2007	09/2008
Material Measurement				
Network Analyzer	E5071C	MY46103220	01/2008	01/2009
Dielectric Probe Kit	HP85070B	US33020263	N/A	N/A

Fig. 10.11: SAR equipment.

Test Equipment	Model	Serial Number	Last Calibration	Next Calibration
Power Meters				
Power Meter, Agilent	E4416A	GB41050414	12/2006	12/2008
Power Meter, Agilent	E4417A	GB41050441	12/2006	12/2008
Power Meter, Anritsu	ML2487A	6K00002319	12/2007	12/2009
Power Meter, Anritsu	ML2488A	6K00002078	12/2007	12/2009
Power Sensors				
Power Sensor, Agilent	E9301H	US40010212	12/2006	12/2008
Power Sensor, Agilent	E9301A	MY41495584	12/2006	12/2008
Power Sensor, Anritsu	MA2481B	031600	12/2007	12/2009
Power Sensor, Anritsu	MA2490A	031565	12/2007	12/2009
RF Sources				
Network Analyzer	E5071C	MY46103220	01/2008	01/2009
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				
Rohde & Schwarz	CMU200	835305/050	N/A	N/A
Anritsu	MT8815B	6200586536	N/A	N/A

Fig. 10.12: Test equipment, General.

10.13 Certificates of conformity

Schmid & Partner Engineering AG **speag**

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**

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Fig. 10.13: 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
Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

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Fig. 10.14: Certificate of conformity for the used SAM phantom.

10.14 Pictures to demonstrate the required liquid depth

Fig.10.15: Liquid depth for GPRS/EDGE 850 and WCDMA V Body measurements.

Fig.10.16: Liquid depth for GPRS/EDGE 1900 and WCDMA II Body measurements.

11 SAR Distribution Plots

Refer to appendix to the report:
Dosimetric Assessment of the Portable Device ICON 322 from Option Wireless Germany
According to the FCC requirements
FCC ID: NCMOGI0322

12 References / Abbreviations

12.1 References

- FCC OET 65c 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,
- 447498 D01 Mobile Portable RF Exposure v03r01: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies, 05/12/2008
- 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:
- FCC- TCB Training on SAR Review Pt 22/24, Evaluation compliance/SAR Review of Part 22 Subpart H and Part 24 Wireless Handsets for Equipment Approval , Supplement C-01-01, 12-13 May 2003
- DASY4 Manual, Schmid & Partner Engineering AG, DASY4 Manual, February 2004

12.2 Used Abbreviations

BSC .... Base station controller
DAE .... Data Acquisition Electronics
DASY .... Dosimetric Assessment System
EOC .... Electro-optical converter
EUT .... Equipment under test
GPRS .... General Packet Radio Service
N/A .... Non-applicable
PCL .... Power Control Level
SAM .... Specific Anthropomorphic Mannequin
SAR .... Specific Absorption Rate
UL .... Uplink
UMTS .... Universal Mobile Telecommunications System