TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Dell Inc.
Dell Inspiron 910 Netbook PC

To: OET Bulletin 65 Supplement C: (2001-01)

Test Report Serial No:
RFI/SAR2/RP73658JD21B

Supersedes Test Report Serial No:
RFI/SAR1/RP73658JD21B

This Test Report Is Issued Under The Authority Of Steve Flooks, Service Leader:  **pp Brian Watson**	
Checked By: Brian Watson 	**Report Copy No: PDF01**
Issue Date: 10 September 2008	**Test Dates: 22 August 2008 to 07 September 2008**

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1. Customer Information

Company Name:	Dell Inc.
Address:	One Dell Way Round Rock TX 78682 USA
Contact Name:	Mr Thanh Nguyen

2. Equipment Under Test (EUT)

The following information (with the exception of the date of receipt) has been supplied by the customer:

2.1. Description of EUT

The equipment under test is a Dell Inspiron 910 Netbook fitted with an Ericsson mobile broadband module F3507g with alternate model name: Dell Wireless 5530 HSPA Mobile Broadband Mini-card.

2.2. Identification of Equipment Under Test (EUT)

Description:	Netbook PC
Brand Name:	Dell
Model Name or Number:	Dell Inspiron 910
Serial Number:	21 03856400066
Unique Netbook Identifier:	D-QIA-32-310
IMEI Number:	004401700174143
Hardware Version of Module:	F3507g: R1
Software Version of Module:	F3507g: R1B0003
Hardware Revision of Netbook:	A00
Software Revision of Netbook:	Rev.A
FCC ID Number:	VV7-MBMF3507G-D
Country of Manufacture:	F3507g: China Netbook: United States of America
Date of Receipt:	19 August 2008

2.3. Modifications Incorporated in the EUT

WiFi test was performed on the Netbook using 2 WiFi modules that had to be changed to establish the worst case configuration.

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	WLAN Module 802.11b/g
Brand Name:	Atheros Communications
Model Name or Number:	AR5BXB63
Serial Number:	None Stated
FCC ID Number:	PPD-AR5BXB63
Cable Length and Type:	Not Applicable
Country of Manufacture:	None Stated
Connected to Port	Bus Slot Unique to Manufacturer

Description:	WLAN Module 802.11b
Brand Name:	Broadcom Corporation
Model Name or Number:	BCM94312MCG
Serial Number:	None Stated
FCC ID Number:	QDS-BRCM1028
Cable Length and Type:	Not Applicable
Country of Manufacture:	China
Connected to Port	Bus Slot Unique to Manufacturer

Description:	*Bluetooth* Module
Brand Name:	HON HAI Precision Ind.
Model Name or Number:	BCM92046
Serial Number:	None Stated
FCC ID Number:	MCLBCM92046
Cable Length and Type:	Not Applicable
Country of Manufacture:	Taiwan
Connected to Port	Bus Slot Unique to Manufacturer

2.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Radio Communication Analyser
Brand Name:	Anritsu
Model Name or Number:	MT8815b
Serial Number:	62 00576540
Cable Length and Type:	1.5m Utiflex Cable
Connected to Port:	RF (Input/Output) Air Link

Description:	Radio Communication Analyser
Brand Name:	Anritsu
Model Name or Number:	MT8820A
Serial Number:	6K00000647
Cable Length and Type:	1.5m Utiflex Cable
Connected to Port:	RF (Input/Output) Air Link

Description:	Mobile Handset
Brand Name:	Nokia
Model Name or Number:	8800
Serial Number:	None Stated
Cable Length and Type:	Not Applicable (*Bluetooth* Connection)
Connected to Port:	*Bluetooth* Connection (Air Link at 6m)

Description:	BT Business Hub
Brand Name:	2Wire
Model Name or Number:	BT 2700HGV
Serial Number:	22 0711028393
Cable Length and Type:	Not Applicable (WiFi Connection)
Connected to Port:	WiFi 802.11b/g (Air Link)

2.6. Additional Information Related to Testing

Equipment Category	GPRS850/900/1800/1900; EGPRS850/900/1800/1900; UMTS FDD1/FDD2/FDD5; WiFi 802.11b/g; *Bluetooth*	
Type of Unit	Portable Transceiver	
Intended Operating Environment:	Within GSM, 3G, WiFi and *Bluetooth* coverage	
Transmitter Maximum Output Power Characteristics:	GPRS850	33dBm
	GPRS1900	30dBm
	UMTS FDD2	24dBm
	UMTS FDD5	24dBm
	WiFi 2450	27dBm
	Bluetooth	0dBm
Transmitter Frequency Range:	GPRS850	824 to 849 MHz
	GPRS1900	1850 to 1910 MHz
	UMTS FDD2	1880 to 1908 MHz
	UMTS FDD5	826 to 847 MHz
	WiFi 2450	2412 to 2462 MHz
	Bluetooth	2402 to 2480 MHz

Additional Information Related to Testing (Continued)

Transmitter Frequency Allocation of EUT When Under Test:	Channel Number	Channel Description	Frequency (MHz)
	128	Low	824.2
	189	Middle	836.4
	251	High	848.8
	512	Low	1850.2
	660	Middle	1879.8
	810	High	1909.8
	9262	Low	1852.4
	9400	Middle	1880
	9538	High	1907.6
	4132	Low	826.4
	4183	Middle	836.6
	4233	High	846.6
	1	Low	2312
	6	Middle	2437
	11	High	2462
	0	Low	2441
	39	Middle	2480
	78	High	2437
Modulation(s):	GPRS/EGPRS:217; UMTS:0; WiFi: 0		
Modulation Scheme (Crest Factor):	GPRS/EGPRS:4; UMTS:1; WiFi: 1		
Antenna Type:	Integral fixed onto the screen surrounding.		
Antenna Length:	Internal antennas of unknown lengths		
Number of Antenna Positions:	1 Fixed		
Power Supply Requirement:	14.8v DC, 32Wh		
Battery Type(s):	Li-ion		

3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	OET Bulletin 65 Supplement C: (2001-01)
Title:	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in OET Bulletin 65 Supplement C: (2001-01) using the SAR averaging method as described in the test specification above.

3.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

Federal Communications Commission, “Evaluating compliance with FCC Guidelines for human exposure to radio frequency electromagnetic fields”, OET Bulletin 65 Supplement C, FCC, Washington, D.C, 20554, 2001.

Thomas Schmid, Oliver Egger and Neils Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on microwave theory and techniques,
Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

KDB 447498 D01 Mobile Portable RF Exposure v03.

KDB 616217 D01 SAR for Laptop v01.

KDB 248227 SAR Measurement Procedures for 802.11 a/b/g Transmitters Rev.1.2.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

Test was performed as per “FCC KDB 447498 D01 Mobile Portable RF Exposure v03” according to the body-worn procedures in consideration with FCC KDB 616217 and OET Bulletin 65 Supplement C 01-01 specific FCC test procedures.

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating mode(s) unless otherwise stated:

- The EUT could not maintain a stable link using GPRS mode to perform simultaneous transmission SAR evaluation. Therefore Simultaneous transmission was performed using the next highest measured SAR level which was using UMTS FDD2 mode.
- Simultaneous transmission with WiFi 802.11b (i.e. 11Mbps) mode for Broadcom module, UMTS FDD1 & FDD2 - RMC 12.2kbps with TPC bits configured to All "1's" and *Bluetooth* Active (paired with mobile handset and ftp accessible)
- Simultaneous transmission with WiFi 802.11g mode for Atheros module, UMTS FDD1 & FDD2 - RMC 12.2kbps with TPC bits configured to All "1's" and *Bluetooth* Active (paired with mobile handset and ftp accessible)
- WiFi Broadcom module: continuous transmit via test software (EPI_TTCP). Data rate and test channels were set via the WLAN router settings; WiFi Atheros module: continuous transmit via test software (ART) provided my manufacturer.
- UMTS FDD - FRC configured to HS-DPCCH Sub-test 1 and H-Set 1 and QPSK settings
- UMTS FDD - RMC 12.2kbps with Testloop mode 1 and TPC bits configured to All "1's"
- EGPRS850 / EGPRS1900 Data allocated mode
- GPRS850 /GPRS1900 Data allocated mode
- The EUT could not establish a stable link using EGPRS850.

The reason for choosing these operating modes was that they have been defined by the customer as being typical of normal use and likely to be worst case.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration(s) unless otherwise stated:

- The worst case configuration for the Atheros WLAN module was used for the Broadcom module which had a lower power rating.
- Configuration for Simultaneous transmission was acquired from the highest measured SAR level cross the transmitting frequencies. Simultaneous transmission was performed using the worst-case parameters (RF Channel, liquid & position).
- The EUT was configured at a separation distance of 5mm from the 'Oval' phantom flat section. The 5mm separation was determine by evaluating the worst-case orientation at 0mm and moving the EUT away from the phantom flat section until the measured SAR value is < 50% of the initial value. This minimum separation distance is maintained in order to combine any overlapping SAR distribution from antennas transmitting in different frequency bands.
- Standalone Battery Operated.

Body Configuration

a) The EUT was placed in a normal operating position where the centre of EUT was aligned with the centre reference point on the flat section of the 'OVAL 3mm' phantom.

b) With the EUT touching the phantom at an imaginary centre line. The EUT was aligned with a marked plane (X and Y axis) consisting of two lines.

c) For the touch-safe position the handset was gradually moved towards the flat section of the 'Oval 3mm' phantom until any point of the EUT touched the phantom.

d) For position(s) greater then 0mm separation the EUT was positioned as per the touch-safe position, and then the vertical height was decreased/adjusted as required.

e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the handset and its antenna.

h) The EUT was transmitting at predefined power stated in section 5.1 throughout the duration of the test.

6. Summary of Test Results

Test Name	Specification Reference	Compliancy Status
Specific Absorption Rate-GPRS850 Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied
Specific Absorption Rate-GPRS1900 Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied
Specific Absorption Rate-EGPRS1900 Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied
Specific Absorption Rate-UMTS FDD2 Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied
Specific Absorption Rate-UMTS FDD5 Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied
Specific Absorption Rate-WiFi & WLAN Broadcom module Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied
Specific Absorption Rate-WiFi & WLAN Atheros module Body Configuration 1g	OET Bulletin 65 Supplement C: 2001	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ.

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

7.2. Test Results

7.2.1.Specific Absorption Rate - GPRS850 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg) at 5mm:	1.320

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	24.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	189	1.250	1.600	0.350	1	Complied
Base of EUT Facing Phantom	Flat (OVAL 3mm)	189	0.028	1.600	1.572	1,2	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	189	0.870	1.600	0.730	1	Complied
RHS of EUT Facing Phantom	Flat (OVAL 3mm)	189	0.041	1.600	1.559	1	Complied
LHS of EUT Facing Phantom	Flat (OVAL 3mm)	189	0.292	1.600	1.308	1	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	128	1.320	1.600	0.280	1	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	251	1.230	1.600	0.370	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	128	0.843	1.600	0.757	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	251	1.130	1.600	0.470	1	Complied

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Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 5mm from the 'Oval' phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.
2. Power Drift exceeded +/-5% due to Low noise floor reference measurement level.

7.2.2.Specific Absorption Rate - GPRS1900 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg) at 5mm:	1.190

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	24.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	660	0.834	1.600	0.766	1	Complied
Base of EUT Facing Phantom	Flat (OVAL 3mm)	660	0.004	1.600	1.596	1,2	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	660	1.070	1.600	0.530	1	Complied
RHS of EUT Facing Phantom	Flat (OVAL 3mm)	660	0.028	1.600	1.572	1	Complied
LHS of EUT Facing Phantom	Flat (OVAL 3mm)	660	0.030	1.600	1.570	1	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	512	0.979	1.600	0.621	1	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	810	0.905	1.600	0.695	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	512	0.813	1.600	0.787	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	810	1.190	1.600	0.410	1	Complied

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Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 5mm from the 'Oval' phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.
2. Power Drift exceeded +/-5% due to Low noise floor reference measurement level.

7.2.3.Specific Absorption Rate - EGPRS1900 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg) at 5mm:	0.628

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	24.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Top of EUT Facing Phantom	Flat (OVAL 3mm)	810	0.628	1.600	0.972	1	Complied

Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 5mm from the 'Oval' phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.

7.2.4.Specific Absorption Rate - UMTS FDD2 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg) at 5mm:	0.505

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	24.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	4182	0.505	1.600	1.095	1	Complied
Base of EUT Facing Phantom	Flat (OVAL 3mm)	4182	0.022	1.600	1.578	1,3	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	4182	0.458	1.600	1.142	1	Complied
RHS of EUT Facing Phantom	Flat (OVAL 3mm)	4182	0.021	1.600	1.579	1	Complied
LHS of EUT Facing Phantom	Flat (OVAL 3mm)	4182	0.120	1.600	1.480	1	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	4182	0.472	1.600	1.128	1,2	Complied

Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 5mm from the ‘Oval’ phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.
2. HSPA: FRC is configured according to HS-DPCCH Sub-test 1 using H-set 1 and QPSK.
3. Power Drift exceeded +/-5% due to Low noise floor reference measurement level.

7.2.5.Specific Absorption Rate - UMTS FDD5 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.160

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	24.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	9400	0.742	1.600	0.858	1	Complied
Base of EUT Facing Phantom	Flat (OVAL 3mm)	9400	0.005	1.600	1.595	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	9400	1.030	1.600	0.570	1	Complied
RHS of EUT Facing Phantom	Flat (OVAL 3mm)	9400	0.038	1.600	1.562	1	Complied
LHS of EUT Facing Phantom	Flat (OVAL 3mm)	9400	0.023	1.600	1.577	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	9262	1.160	1.600	0.440	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	9538	0.832	1.600	0.768	1	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	9262	0.956	1.600	0.644	1,2	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	9262	1.060	1.600	0.540	1,3	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	9262	1.070	1.600	0.530	1,4	Complied

Note(s):

1. SAR measurements were performed with the EUT at a separation distance of 5mm from the 'Oval' phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.
2. HSPA: FRC is configured according to HS-DPCCH Sub-test 1 using H-set 1 and QPSK.
3. Simultaneous Transmission With Broadcom Module: WLAN 802.11g + *Bluetooth* + WCDMA FDD5 Enabled.
4. Simultaneous Transmission With Atheros Module: WLAN 802.11g + *Bluetooth* + WCDMA FDD1 Enabled.

7.2.6.Specific Absorption Rate - WiFi & WLAN Body Atheros Module Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.110

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	6	0.839	1.600	0.761	3, 4	Complied
Base of EUT Facing Phantom	Flat (OVAL 3mm)	6	0.008	1.600	1.592	1, 3, 4	Complied
Top of EUT Facing Phantom	Flat (OVAL 3mm)	6	0.597	1.600	1.003	3, 4	Complied
RHS of EUT Facing Phantom	Flat (OVAL 3mm)	6	0.007	1.600	1.593	3, 4	Complied
LHS of EUT Facing Phantom	Flat (OVAL 3mm)	6	0.047	1.600	1.553	3, 4	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	1	0.521	1.600	1.079	3, 4	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	11	0.700	1.600	0.900	3, 4	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	6	1.110	1.600	0.490	3, 5	Complied

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Specific Absorption Rate - WiFi & WLAN Body Atheros Module Configuration 1g (continued)

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	1	0.566	1.600	1.034	3, 5	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	11	0.785	1.600	0.815	3, 5	Complied

Note(s):

1. Power Drift exceeded +/-5% due to Low noise floor reference measurement level.
2. SAR measurements were performed with the EUT at a separation distance of 0mm from the 'Oval' phantom flat section. This was to determine the worst case separation distance from the phantom to the EUT.
3. SAR measurements were performed with the EUT at a separation distance of 5mm from the 'Oval' phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.
4. 802.11b (11Mbps).
5. 802.11g (54Mbps).

7.2.7.Specific Absorption Rate - WiFi & WLAN Broadcom Module Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.066

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Level (W/kg)	Limit (W/kg)	Margin (W/kg)	Note(s)	Result
Rear of Display Facing Phantom	Flat (OVAL 3mm)	6	0.066	1.600	1.534	1, 2, 3	Complied
Rear of Display Facing Phantom	Flat (OVAL 3mm)	6	0.032	1.600	1.568	1, 2, 4	Complied

Note(s):

1. Power Drift exceeded +/-5% due to Low noise floor reference measurement level.
2. SAR measurements were performed with the EUT at a separation distance of 5mm from the ‘Oval’ phantom flat section. The 5mm separation was determine from evaluating the worst case at 0mm and moving the EUT away from the phantom until the SAR value was <50%.
3. 802.11b (11Mbps).
4. 802.11g (54Mbps).

7.2.8. EIRP/ERP Measurements:

Channel Number	Frequency (MHz)	TX Power before Test (dBm)	Note
128	880.2	29.0	ERP
189	897.4	28.3	ERP
251	914.8	28.5	ERP
512	1850.2	14.5	EIRP
660	1879.8	16.4	EIRP
810	1909.8	14.9	EIRP
4132	826.4	23.9	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
4183	836.6	23.7	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
4233	846.6	21.2	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
4132	826.4	22.7	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
4183	836.6	23.1	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
4233	846.6	21.8	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
4132	826.4	23.2	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
4183	836.6	24.3	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
4233	846.6	21.4	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
9262	1852.4	22.4	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
9400	1880	21.9	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
9538	1907.6	22.8	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
9262	1852.4	22	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)

EIRP/ERP Measurements (continued)

Channel Number	Frequency (MHz)	TX Power before Test (dBm)	Note
9400	1880	21.4	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
9538	1907.6	22.2	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
9262	1852.4	23.1	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
9400	1880	22.9	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
9538	1907.6	23.8	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
9613	1922.4	23.8	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
9750	1950	23.4	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
9887	1977.6	23.3	ERP: (RMC 12.2 Kbps Test Loop Mode 1)
9613	1922.4	23.4	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
9750	1950	23.9	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
9887	1977.6	24.5	ERP: (HS-DPCCH, E-DPCCH, EDPDCH all enabled along with RMC 12.2 Kbps)
9613	1922.4	24.5	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
9750	1950	24.9	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)
9887	1977.6	26.5	ERP: (FRC enabled with HS-DPCCH Sub-test 1 using H-set 1 and QPSK)

EIRP/ERP Measurements (continued)

Channel Number	Frequency (MHz)	TX Power before Test (dBm)	Note
1	2312	18.4	EIRP (Atheros Module 54 MBPS)
6	2437	19.4	EIRP (Atheros Module 54 MBPS)
11	2462	23.3	EIRP(Atheros Module 54 MBPS)
1	2312	13.3	EIRP (Broadcom Module 11 MBPS)
6	2437	13.9	EIRP (Broadcom Module 11 MBPS)
11	2462	13.9	EIRP (Broadcom Module 11 MBPS)

EIRP/ERP Measurements (continued)

Frequency (MHz)	Conducted Power Measurement + Antenna Gain (dBm)	Note
2402 - 2480	2.2 dBm	EIRP (HON HAI Precision Ind Bluetooth Module)

8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Specific Absorption Rate- GPRS850 / GPRS900 Body Configuration 1g	95%	18.03%
Specific Absorption Rate- GPRS1900 Body Configuration 1g	95%	18.30%
Specific Absorption Rate- WCDMA Body Configuration 1g	95%	18.19%
Specific Absorption Rate- 2450 MHz Body Configuration 1g	95%	19.33%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Measurement Uncertainty (Continued)

8.1. Specific Absorption Rate Uncertainty at 850 MHz Body 1g, GPRS Modulation Scheme calculated in accordance with IEC 62209-1 & IEEE 1528

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	11.000	11.000	normal (k=2)	2.0000	1.0000	5.500	5.500	∞
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.560	0.560	normal (k=2)	2.0000	1.0000	0.280	0.280	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	0.584	0.584	normal (k=1)	1.0000	1.0000	0.584	0.584	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	3.600	3.600	normal (k=1)	1.0000	0.6400	2.304	2.304	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.000	4.000	normal (k=1)	1.0000	0.6000	2.400	2.400	5
	Combined standard uncertainty			t-distribution			9.20	9.20	>500
	Expanded uncertainty			k = 1.96			18.03	18.03	>500

8.2. Specific Absorption Rate Uncertainty at 1900 MHz Body 1g, GPRS Modulation Scheme calculated in accordance with IEC 62209-1 & IEEE 1528

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	11.000	11.000	normal (k=2)	2.0000	1.0000	5.500	5.500	∞
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.560	0.560	normal (k=2)	2.0000	1.0000	0.280	0.280	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	0.584	0.584	normal (k=1)	1.0000	1.0000	0.584	0.584	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.170	4.170	normal (k=1)	1.0000	0.6400	2.669	2.669	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.230	4.230	normal (k=1)	1.0000	0.6000	2.538	2.538	5
	Combined standard uncertainty			t-distribution			9.34	9.34	>400
	Expanded uncertainty			k = 1.96			18.30	18.30	>400

8.3. Specific Absorption Rate Uncertainty at 1900 MHz Body 1g, WCDMA Modulation Scheme calculated in accordance with IEC 62209-1 & IEEE 1528

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	11.000	11.000	normal (k=2)	2.0000	1.0000	5.500	5.500	∞
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.560	0.560	normal (k=2)	2.0000	1.0000	0.280	0.280	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	0.584	0.584	normal (k=1)	1.0000	1.0000	0.584	0.584	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.170	4.170	normal (k=1)	1.0000	0.6400	2.669	2.669	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.230	4.230	normal (k=1)	1.0000	0.6000	2.538	2.538	5
	Combined standard uncertainty			t-distribution			9.28	9.28	>400
	Expanded uncertainty			k = 1.96			18.19	18.19	>400

8.4. Specific Absorption Rate Uncertainty at 2400 MHz Body 1g, calculated in accordance with IEC 62209-1 & IEEE 1528

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	11.800	11.800	normal (k=2)	2.0000	1.0000	5.900	5.900	∞
B	Axial Isotropy	0.500	0.500	normal (k=2)	2.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	2.600	2.600	normal (k=2)	2.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.560	0.560	normal (k=2)	2.0000	1.0000	0.280	0.280	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration/ Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.920	2.920	normal (k=1)	1.0000	1.0000	2.920	2.920	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	3.930	3.930	normal (k=1)	1.0000	0.6400	2.515	2.515	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	3.940	3.940	normal (k=1)	1.0000	0.6000	2.364	2.364	5
	Combined standard uncertainty			t-distribution			9.86	9.86	>400
	Expanded uncertainty			k = 1.96			19.33	19.33	>400

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1094	Digital Camera	Sony	MVC - FD81	125805	-	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A1174	Dielectric Probe Kit	Agilent Technologies	85070C	Us99360072	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partners	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partners	V3.0	None	-	-
A1184	Data Acquisition Electronics	Schmid & Partner	DAE3	394	25 June 2008	12
L0974	Probe	Schmid & Partner	ES3DV3	3173	23 June 2008	12
A1498	Oval Basin Phantom 6mm	MCL	OVAL 3mm	-	Calibrated before use	-
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b	-	Calibrated before use	-
A1322	2450 MHz Dipole Kit	Schmid & Partner Engineering AG	D2450V2	725	17 January 2007	24
A1190	1800 MHz Dipole Kit	Schmid & Partner Engineering AG	D1800V2	264	19 June 2008	24
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	11 June 2007	24
A1329	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	185	18 May 2007	24
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
C1144	Cable	Rosenberger MICRO-COAX	FA147AF00150 3030	41842-1	Calibrated as part of system	-
C1145	Cable	Rosenberger MICRO-COAX	FA147AF00300 3030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147AF03000 3030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner	DASY	None	Calibrated before use	-
M1140	Radio Communication Analyser	Anritsu	MT8820A	6K0000047	Monitoring use only	-
L0975	Radio Communication Analyser	Anritsu	MT8815B	6200576540	Monitoring use only	-
M010	NRV Power Meter	Rohde & Schwarz	NRV	882 317/065	08 May 2008	12
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	24 September 2007	12
M053	HP 8594A Spectrum Analyser	HP	8594A	3108U00205	Monitoring use only	-
M1252	40 GHz Signal Generator	HP	83640A	3119A00489	02 Oct 2008	12
M1047	Robot Arm	Staubli	RX908 L	F00/SD89A1/A/01	Calibrated before use	-
M1069	Diode Power Sensor	Rohde & Schwarz	NRV-Z2	838824/010	08 May 2008	12

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1129	Power Sensor	Rohde & Schwarz	URY-Z2	890242/16	08 May 2008	12
M1144	Thermometer	Testo	110	112895	02 April 2008	12
M103	Power Meter	Rohde & Schwarz	URY	None	08 May 2008	12
M011	Power Sensor	Rohde & Schwarz	NRV-Z1	882 321/004	08 May 2008	12
A1287	Power head	Rohde & Schwarz	URY-Z4	880 174/12	02 Jan 2008	12
M1270	Temperature/Humidity/Pressure Meter	RS Components	None	None	Internal Calibration	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

A.1.1. Calibration Certificates

This section contains the calibration certificates and data for the Probe(s) and Dipole(s) used, which are not included in the total number of pages for this report.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client

Certificate No: ES3-3173_Jun08

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3173
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	June 23, 2008
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: August 15, 2008

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
Accreditation No.: SCS 108
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3173

Manufactured: January 23, 2008
Calibrated: June 23, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3173

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**1.16** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**90** mV
NormY	**1.23** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**93** mV
NormZ	**1.34** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**94** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	6.3
SAR_{be} [%]	With Correction Algorithm	0.8	0.3

TSL **1750 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	9.4	5.8
SAR_{be} [%]	With Correction Algorithm	0.5	0.1

Sensor Offset

Probe Tip to Sensor Center	**2.0** mm

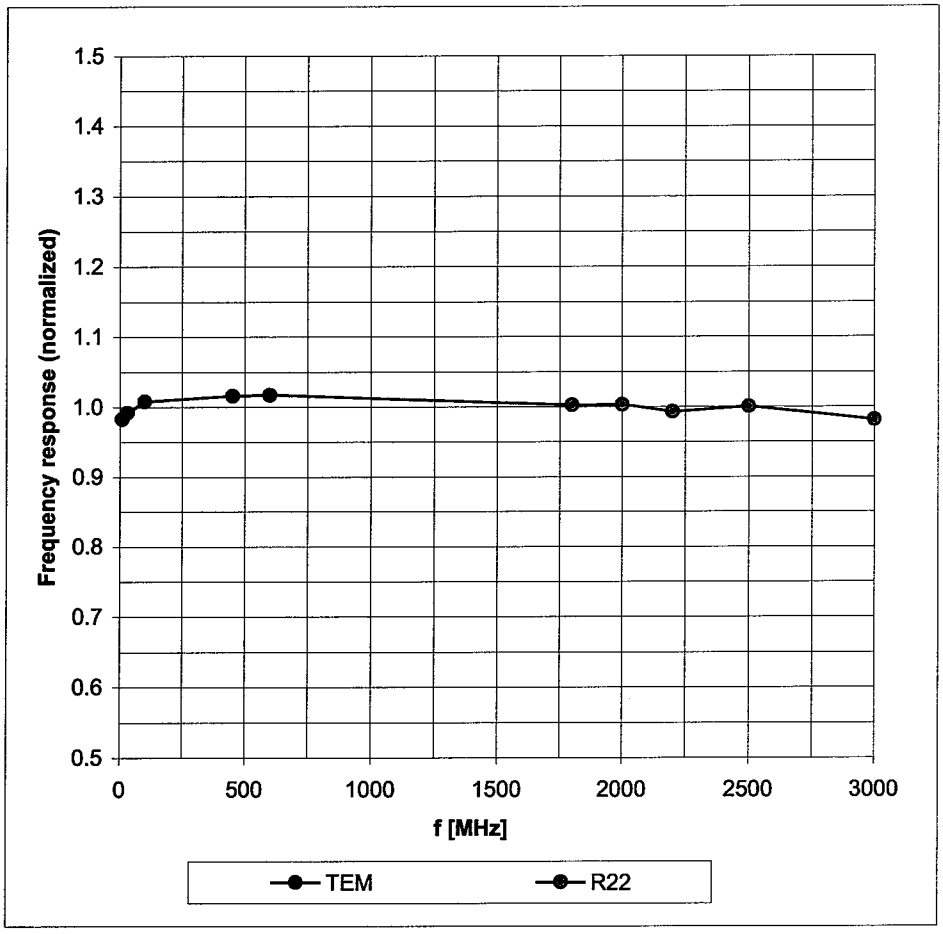
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

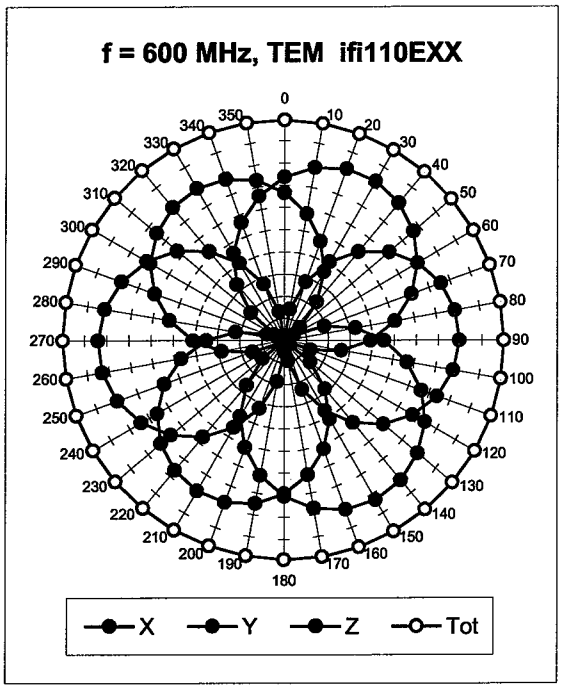
Frequency Response of E-Field

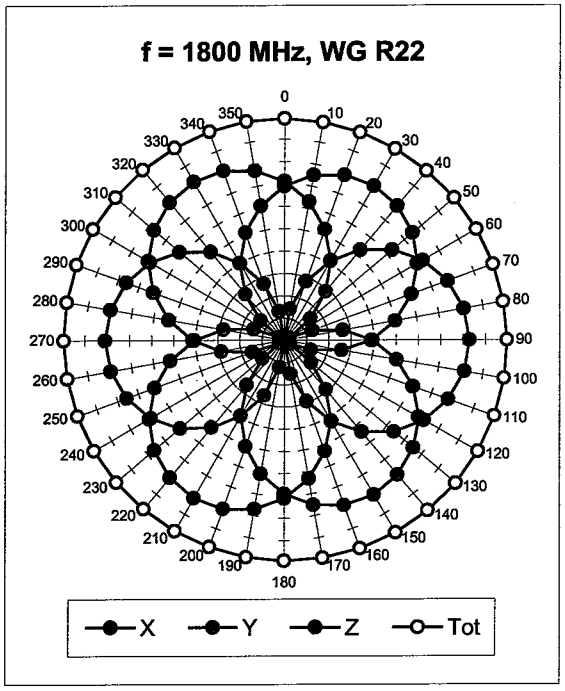
(TEM-Cell:ifi110 EXX, Waveguide: R22)

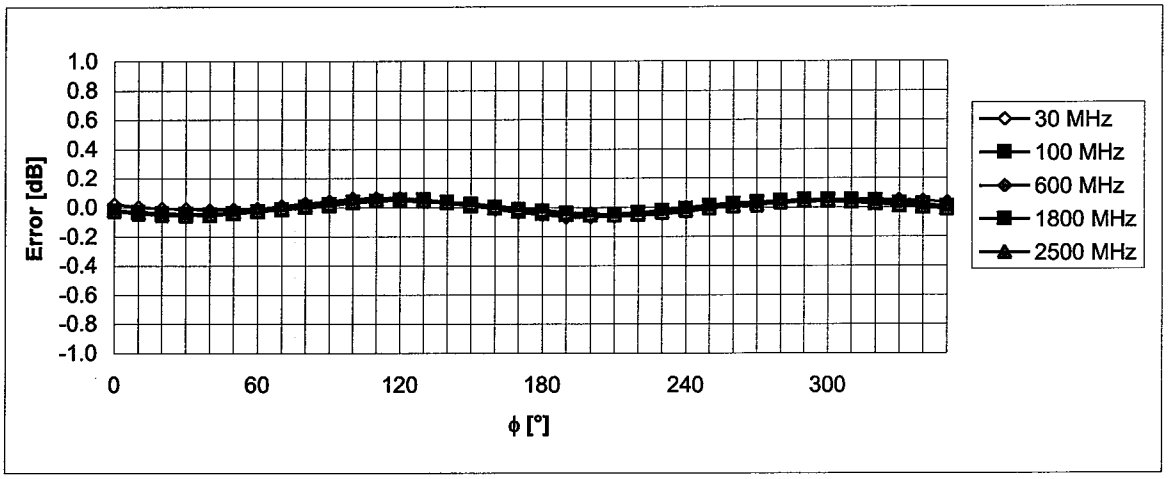


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



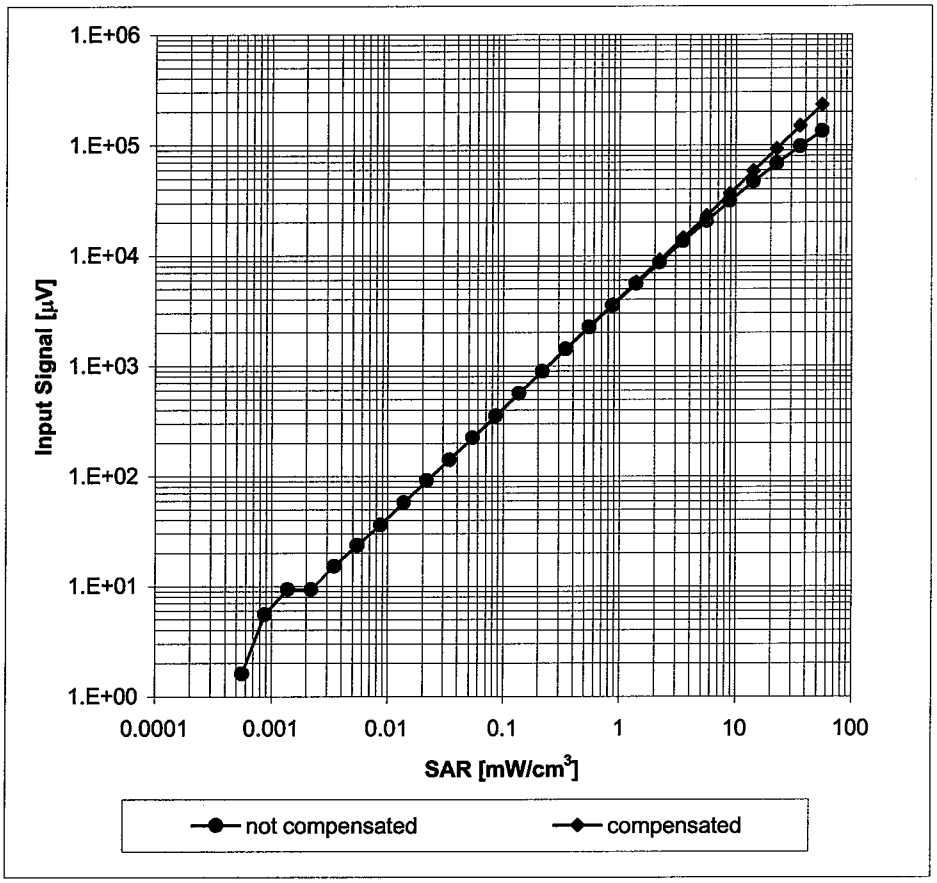


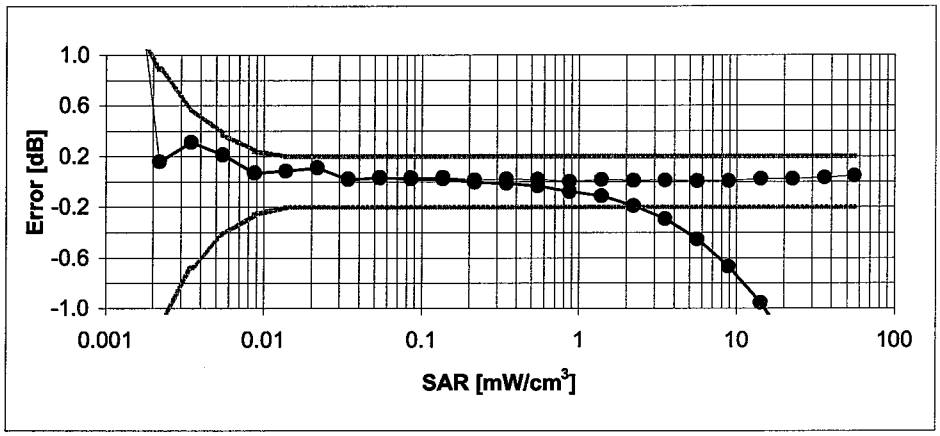


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

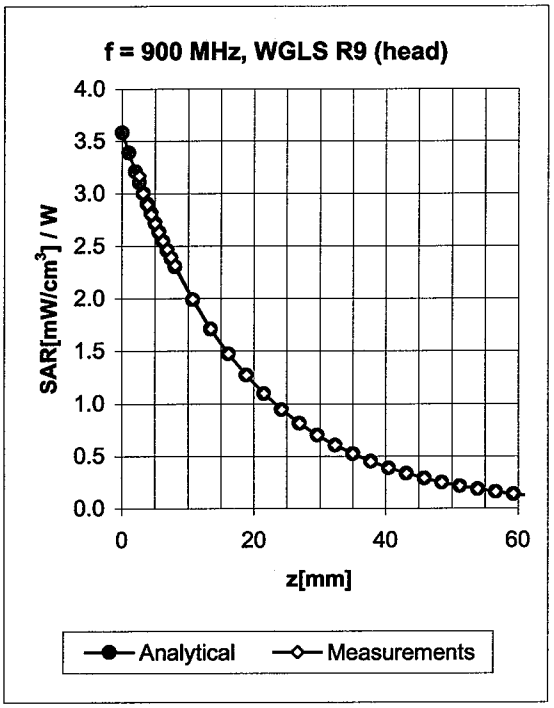
(Waveguide R22, f = 1800 MHz)

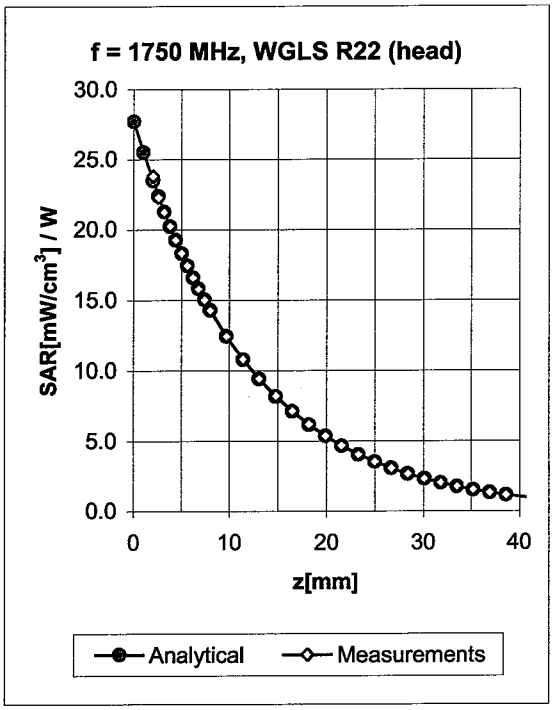




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



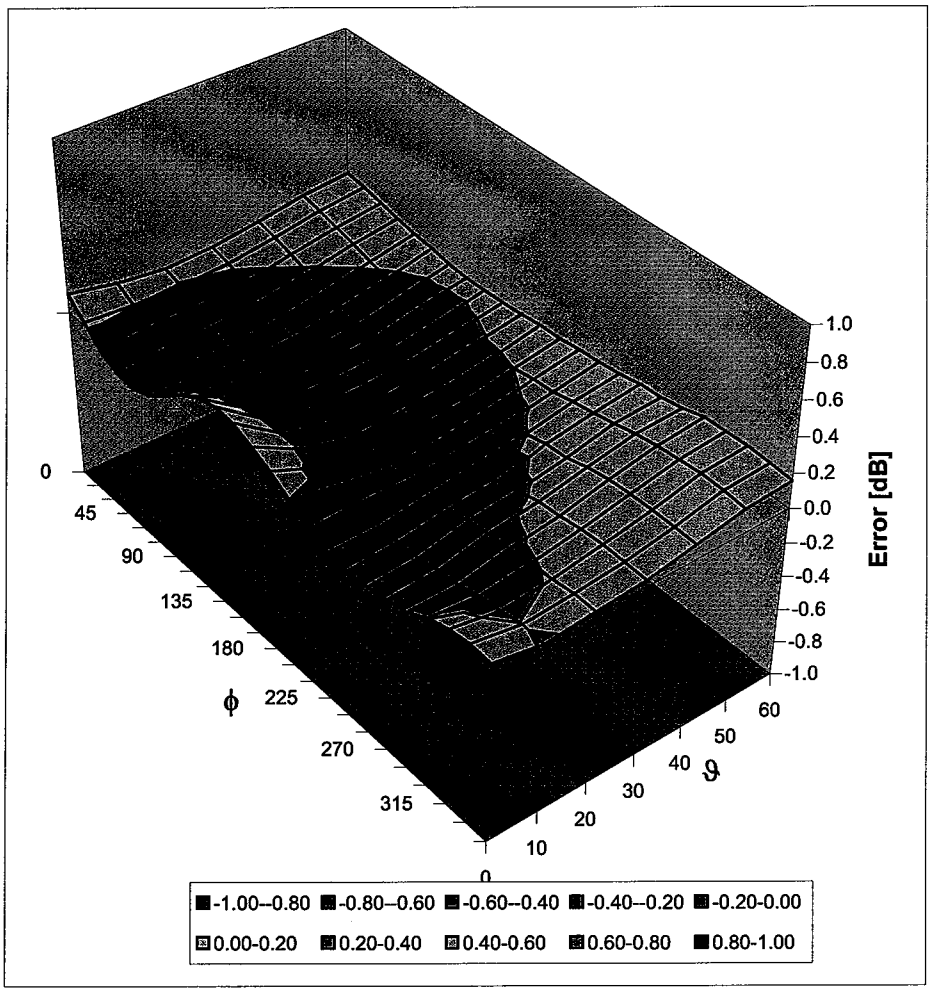


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.25	2.24	5.88 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.40	1.65	5.26 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.40	1.60	4.91 ± 11.0% (k=2)
2150	± 50 / ± 101	Head	39.7 ± 5%	1.53 ± 5%	0.40	1.60	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.40	1.70	4.50 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.29	1.97	5.79 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.43	1.65	4.81 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.40	1.85	4.66 ± 11.0% (k=2)
2150	± 50 / ± 100	Body	53.0 ± 5%	1.75 ± 5%	0.50	1.70	4.39 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.50	1.70	4.05 ± 11.0% (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.**

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

NM 24/01/07

A1322

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Accreditation No.: SCS 108

Client RFI

Certificate No: D2450V2-725_Jan07

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 725
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	January 17, 2007
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ES3DV2	SN 3025	19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07
DAE4	SN: 907	20-Jul-06 (SPEAG, No. DAE4-907_Jul06)	Jul-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 18, 2007

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "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
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	1.79 mho/m ± 6 %
Head TSL temperature during test	(22.3 ± 0.2) °C	-------	------

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	250 mW input power	13.5 mW / g
SAR normalized	normalized to 1W	54.0 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**53.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.26 mW / g
SAR normalized	normalized to 1W	25.0 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**24.8 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.2 ± 6 %	1.97 mho/m ± 6 %
Body TSL temperature during test	(22.1 ± 0.2) °C	-----	-----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.6 mW / g
SAR normalized	normalized to 1W	54.4 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**53.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.21 mW / g
SAR normalized	normalized to 1W	24.8 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**24.5 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.4 Ω + 7.7 jΩ
Return Loss	– 22.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.8 Ω + 7.7 jΩ
Return Loss	– 21.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.154 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 16, 2002

DASY4 Validation Report for Head TSL

Date/Time: 17.01.2007 12:35:59

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN725

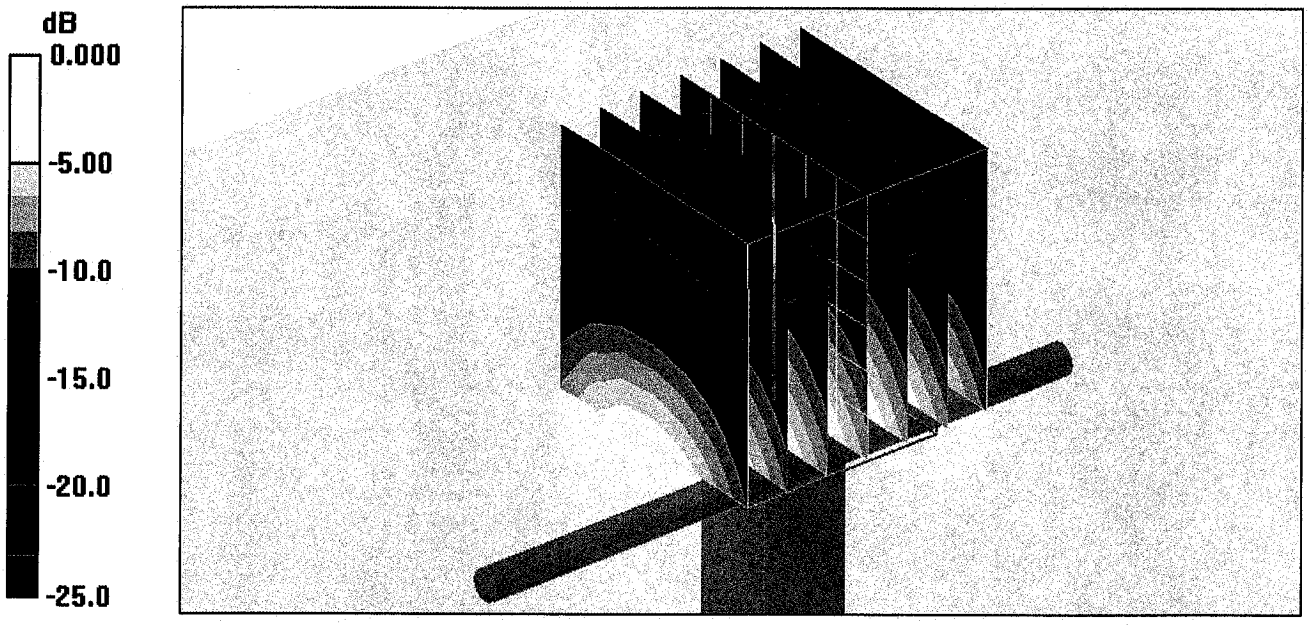
Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 2450 MHz; σ = 1.79 mho/m; ε_r = 38; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.5, 4.5, 4.5); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 20.07.2006
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

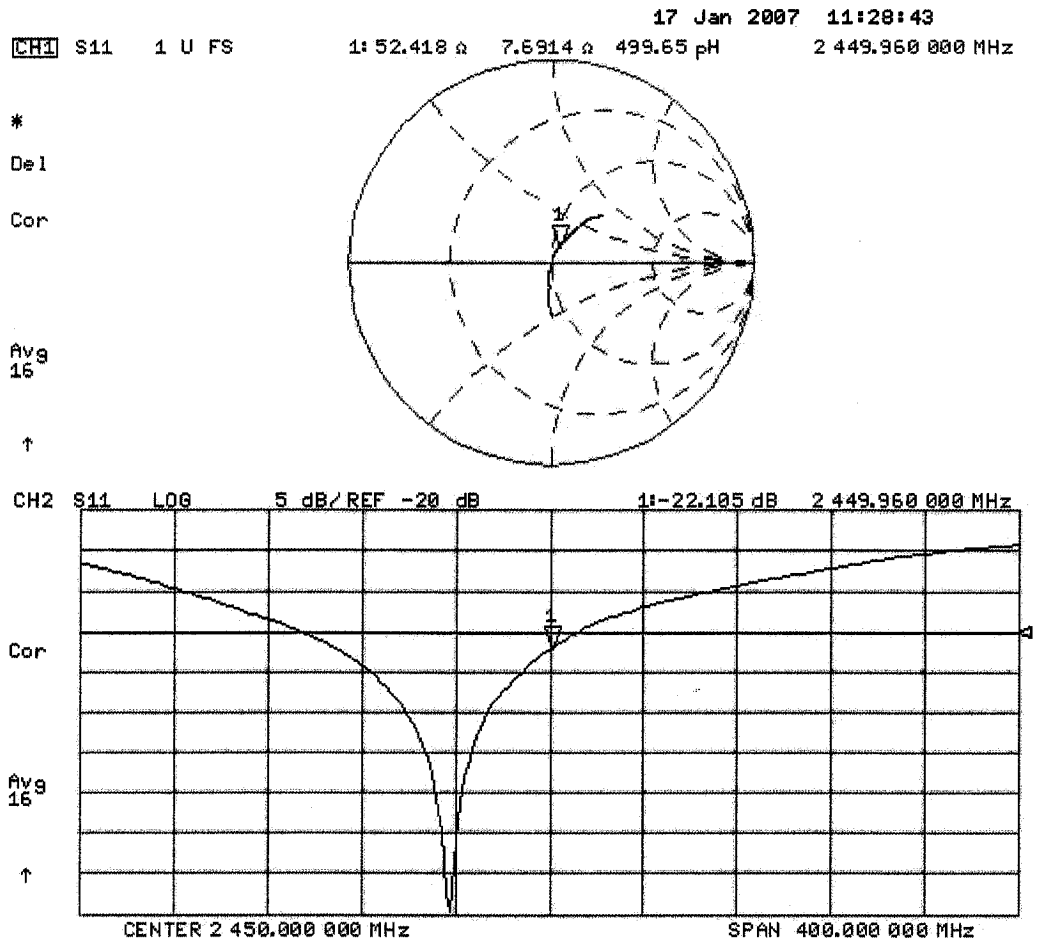
Pin = 250 mW; d = 10 mm 2/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.0 V/m; Power Drift = 0.021 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.26 mW/g
Maximum value of SAR (measured) = 15.1 mW/g



0 dB = 15.1mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 17.01.2007 16:53:02

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN725

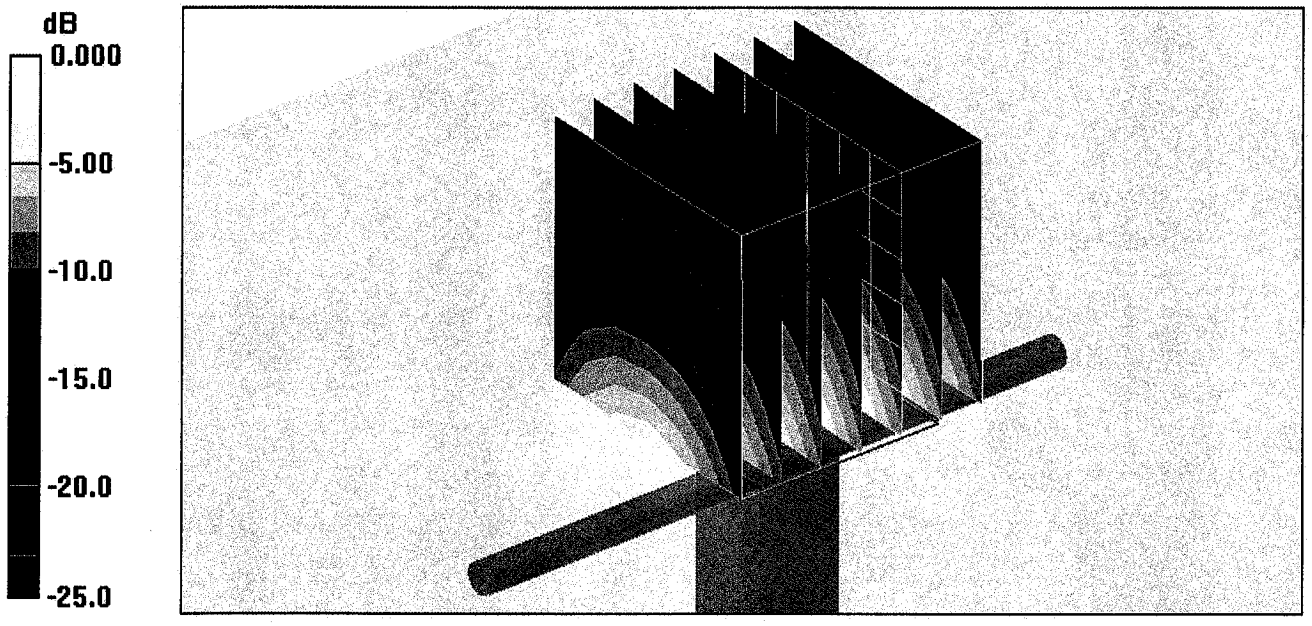
Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB;
Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.16, 4.16, 4.16); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 20.07.2006
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

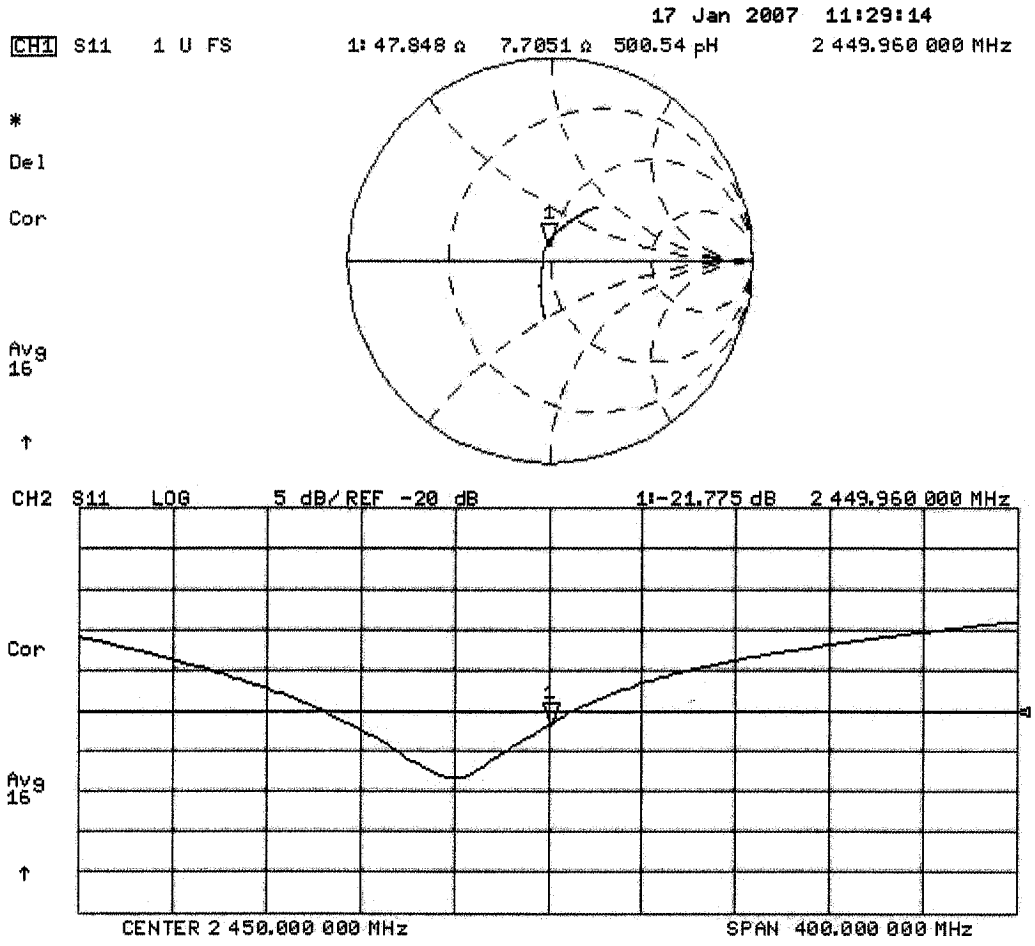
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.8 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 30.8 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.21 mW/g
Maximum value of SAR (measured) = 15.1 mW/g



0 dB = 15.1mW/g

Impedance Measurement Plot for Body TSL



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

Accreditation No.: SCS 108

Client RFI

Certificate No: D1900V2-540_Jun07

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 540
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	June 11, 2007
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN: 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
Reference Probe ES3DV3	SN: 3025	19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

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

Issued: June 14, 2007

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.7 ± 6 %	1.46 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.25 mW / g
SAR normalized	normalized to 1W	37.0 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**36.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.89 mW / g
SAR normalized	normalized to 1W	19.6 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**19.3 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.58 mho/m ± 6 %
Body TSL temperature during test	(21.2 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.52 mW / g
SAR normalized	normalized to 1W	38.1 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**38.0 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**20.7 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.9 Ω + 5.1 jΩ
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.7 Ω + 4.8 jΩ
Return Loss	- 25.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 26, 2001

DASY4 Validation Report for Head TSL

Date/Time: 11.06.2007 10:40:22

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

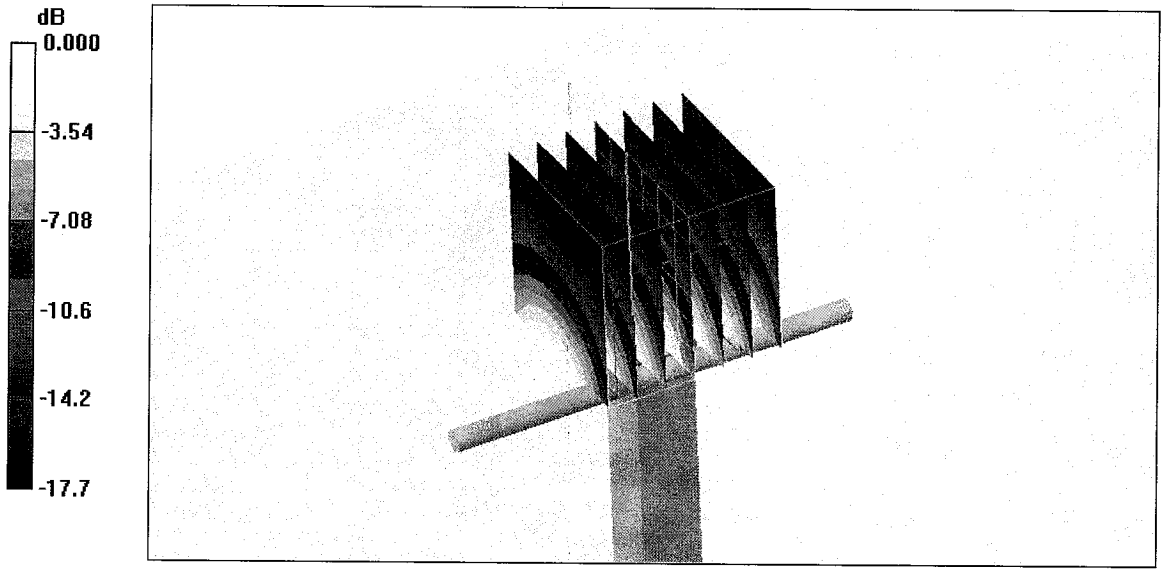
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 1900 MHz; σ = 1.46 mho/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

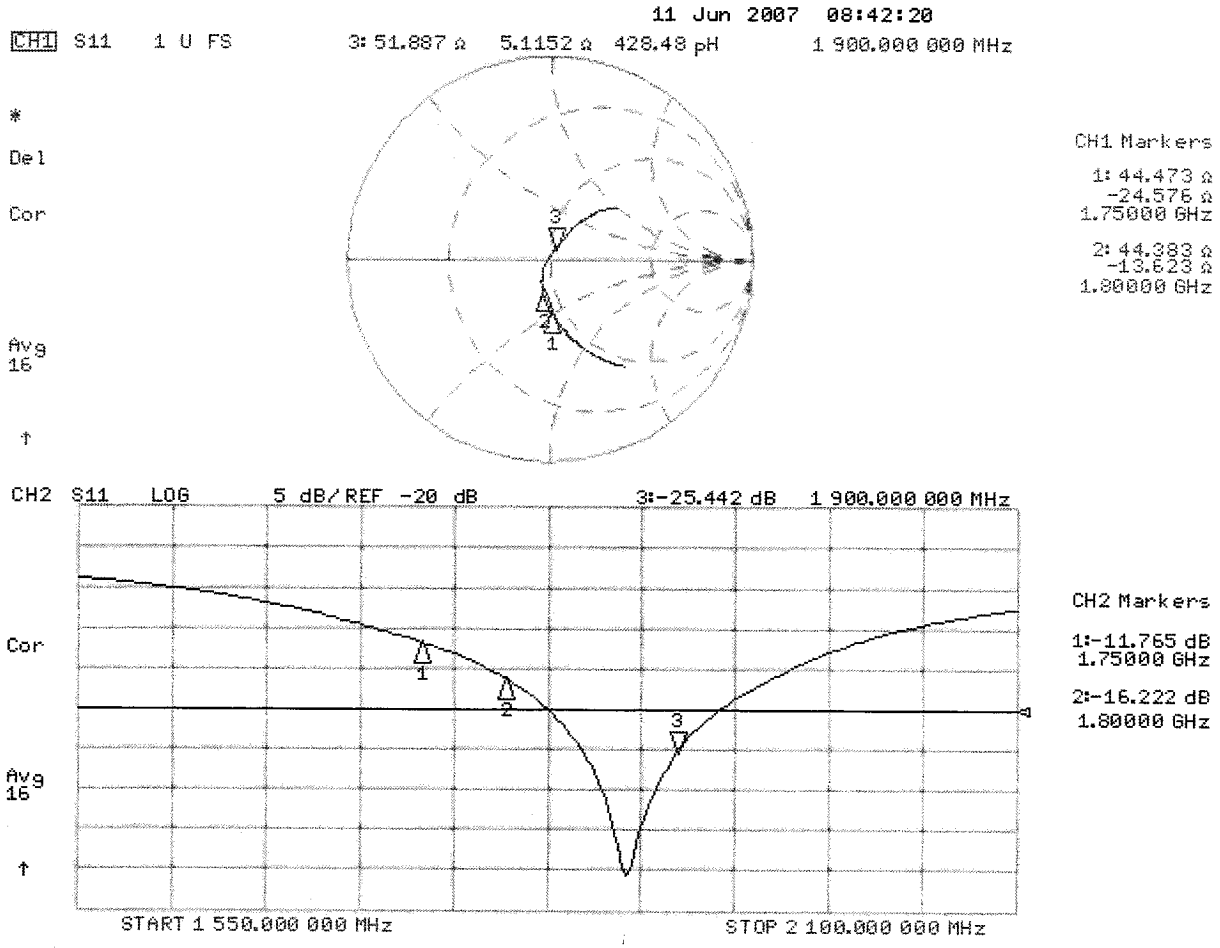
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.9 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 15.7 W/kg
SAR(1 g) = 9.25 mW/g; SAR(10 g) = 4.89 mW/g
Maximum value of SAR (measured) = 10.2 mW/g



0 dB = 10.2mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 11.06.2007 11:24:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

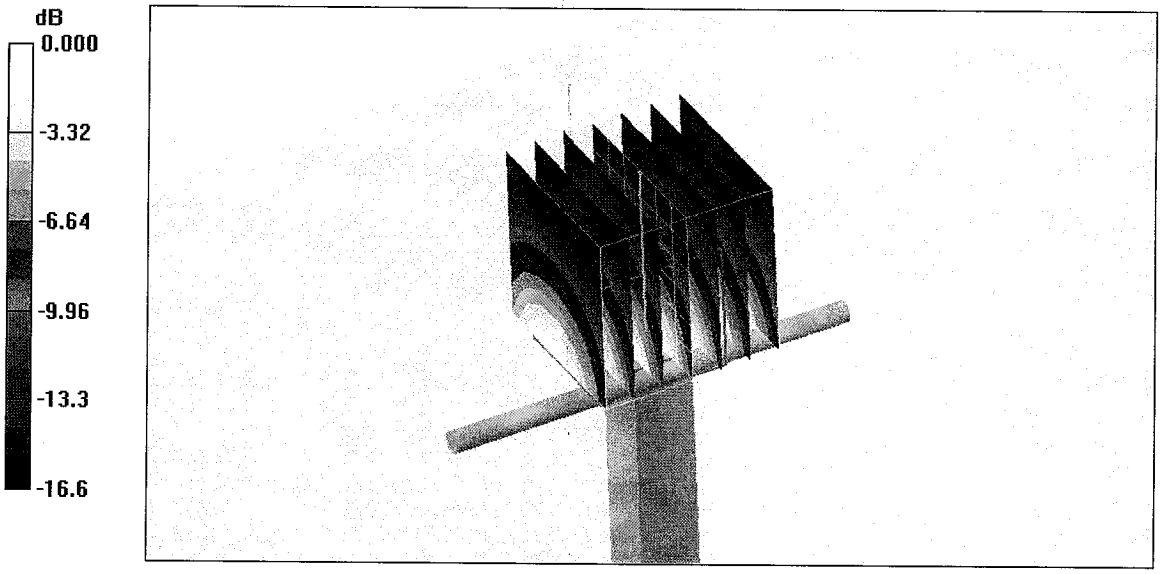
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB;
Medium parameters used: f = 1900 MHz; σ = 1.59 mho/m; ε_r = 55.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

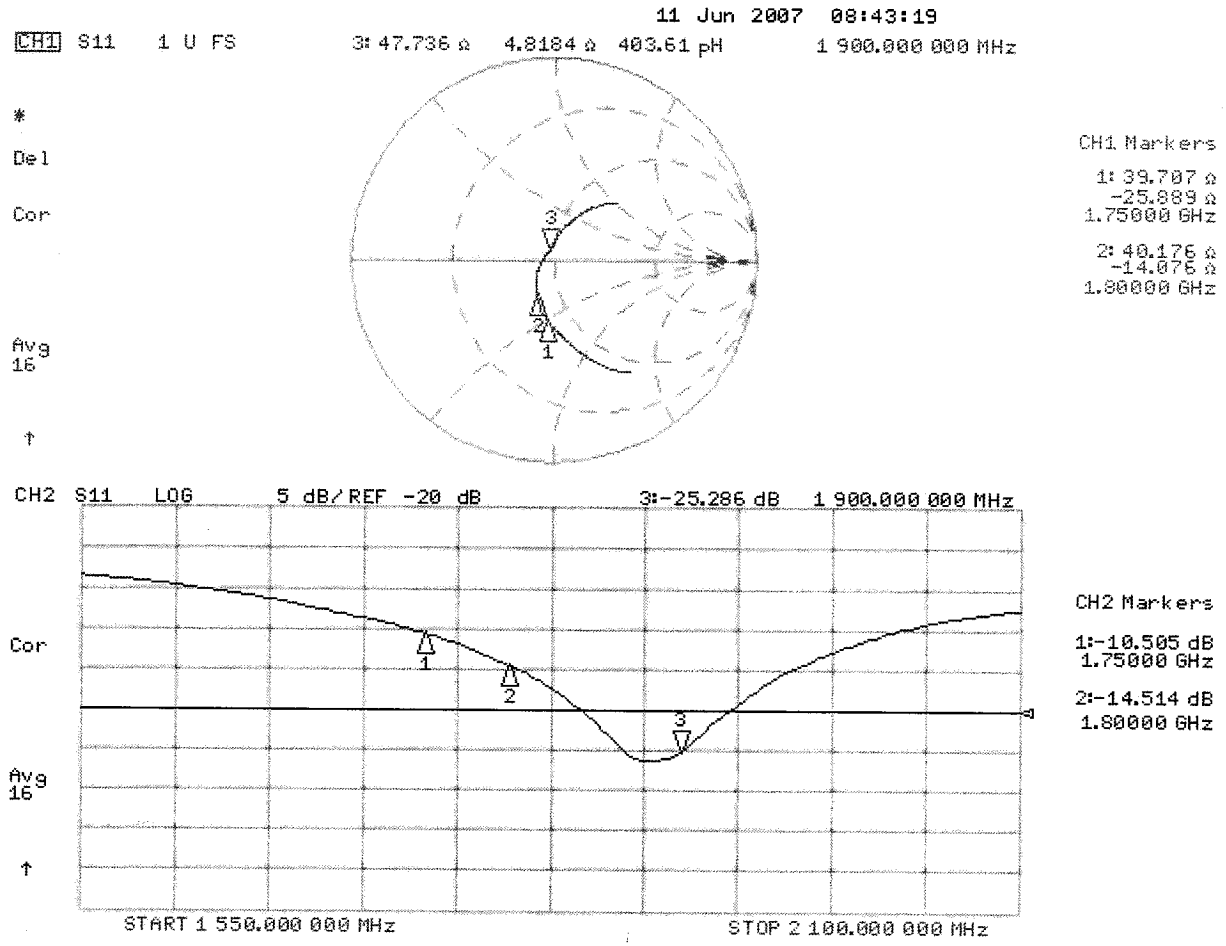
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.9 V/m; Power Drift = 0.027 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9.52 mW/g; SAR(10 g) = 5.14 mW/g
Maximum value of SAR (measured) = 10.6 mW/g



0 dB = 10.6mW/g

Impedance Measurement Plot for Body TSL



A1329
30/05/07 NM

Calibration Laboratory of
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Accreditation No.: SCS 108

Client RFI

Certificate No. D900V2-185_May07

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 185
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	May 18, 2007
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6 (HF)	SN 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

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

Issued: May 21, 2007

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.95 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.65 mW / g
SAR normalized	normalized to 1W	10.6 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**10.6 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.71 mW / g
SAR normalized	normalized to 1W	6.84 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**6.84 mW /g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.3 ± 6 %	1.04 mho/m ± 6 %
Body TSL temperature during test	(22.5 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	2.70 mW / g
SAR normalized	normalized to 1W	10.8 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**10.5 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.76 mW / g
SAR normalized	normalized to 1W	7.04 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**6.88 mW /g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.9 Ω - 8.2 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.5 Ω - 9.2 jΩ
Return Loss	- 20.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.405 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 27, 2003

DASY4 Validation Report for Head TSL

Date/Time: 14.05.2007 14:01:26

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:185

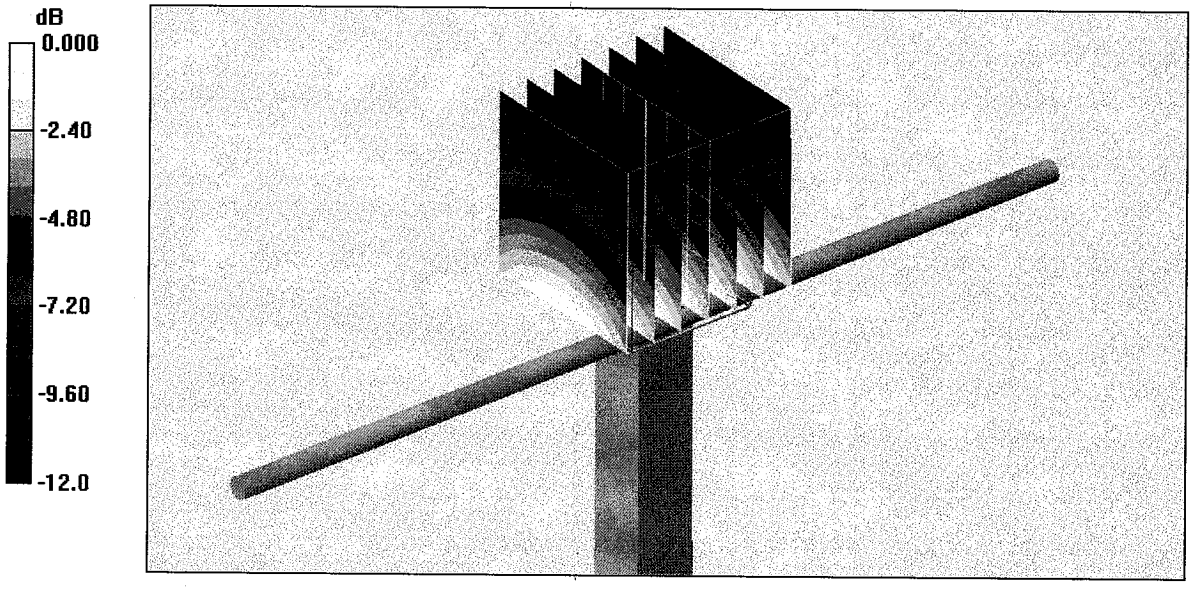
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz;
Medium parameters used: f = 900 MHz; σ = 0.95 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.01, 6.01, 6.01); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

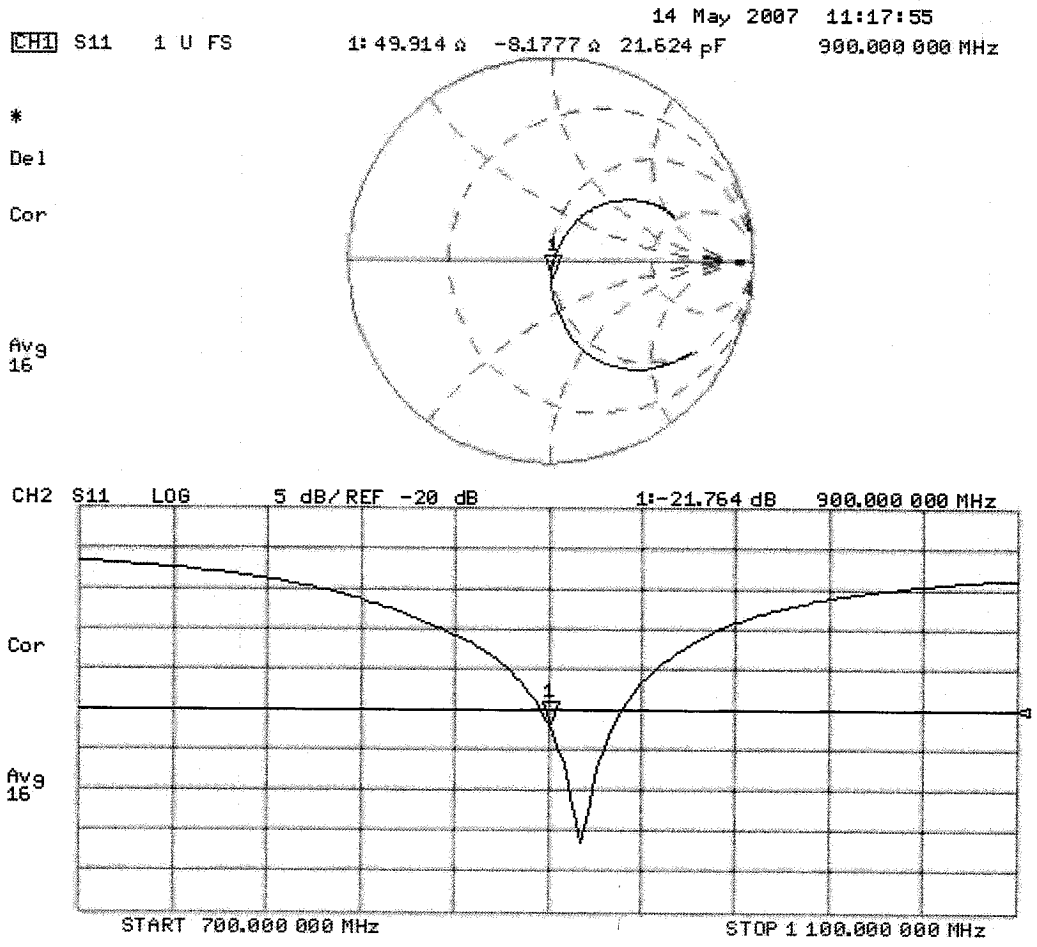
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.5 V/m; Power Drift = -0.044 dB
Peak SAR (extrapolated) = 3.92 W/kg
SAR(1 g) = 2.65 mW/g; SAR(10 g) = 1.71 mW/g
Maximum value of SAR (measured) = 2.89 mW/g



0 dB = 2.89mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 18.05.2007 15:00:08

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:185

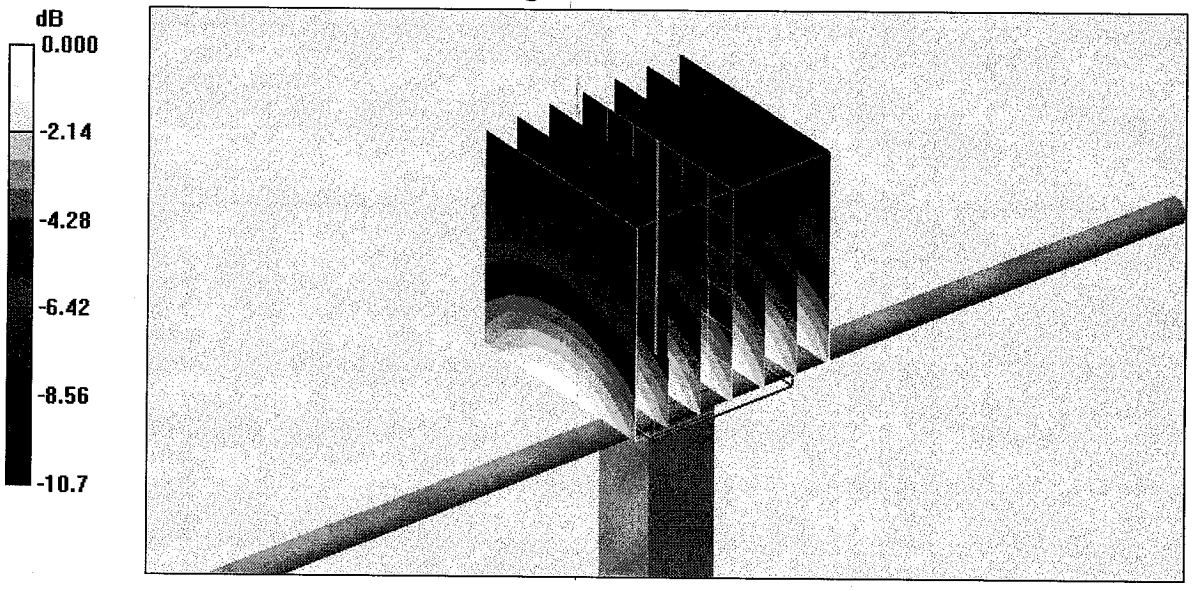
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: MSL900;
Medium parameters used: f = 900 MHz; σ = 1.04 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.8, 5.8, 5.8); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

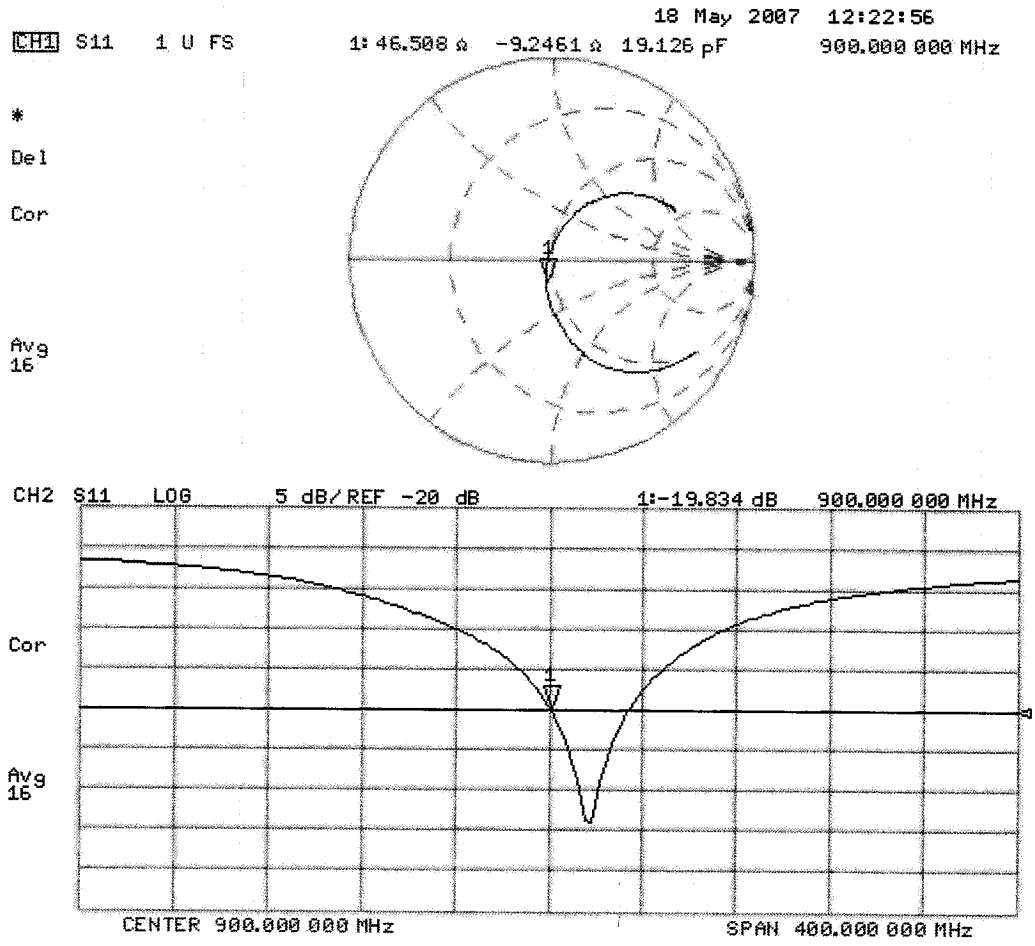
Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.8 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 3.82 W/kg
SAR(1 g) = 2.7 mW/g; SAR(10 g) = 1.76 mW/g
Maximum value of SAR (measured) = 2.94 mW/g



0 dB = 2.94mW/g

Impedance Measurement Plot for Body TSL



Appendix 2. Measurement Methods

A.2.1. Evaluation Procedure

The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

a) (i) The evaluation was performed in an applicable area of the phantom depending on the type of device being tested. For devices worn about the ear during normal operation, both the left and right ear positions were evaluated at the centre frequency of the band at maximum power. The side, which produced the greatest SAR, determined which side of the phantom would be used for the entire evaluation. The positioning of the head worn device relative to the phantom was dictated by the test specification identified in section 3.1 of this report.

(ii) For body worn devices or devices which can be operated within 20 cm of the body, the flat section of the SAM phantom was used were the size of the device(s) is normal. for bigger devices and base station the 2mm Oval phantom is used for evaluation. The type of device being evaluated dictated the distance of the EUT to the outer surface of the phantom flat section.

b) The SAR was determined by a pre-defined procedure within the DASY4 software. The exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm or appropriate resolution.

c) A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.

d) If the EUT had any appreciable drift over the course of the evaluation, then the EUT was re-evaluated. Any unusual anomalies over the course of the test also warranted a re-evaluation.

A.2.2. Specific Absorption Rate (SAR) Measurements to OET Bulletin 65 Supplement C: (2001-01)

Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

SAR measurements were performed in accordance with Appendix D of the standard FCC OET Bulletin 65 Supplement C: 2001, against appropriate limits for each measurement position in accordance with the standard.

The test was performed in a shielded enclosure with the temperature controlled to remain between +18.0ºC and +25.0ºC. The tissue equivalent material fluid temperature was controlled to give a maximum variation of ± 2.0ºC

Prior to any SAR measurements on the EUT, system validation and material dielectric property measurements were conducted. In the absence of a detailed procedure within the specification, system validation and material dielectric property measurements were performed in accordance with Appendix C and Appendix D of FCC OET Bulletin 65 Supplement C: 2001.

Following the successful system validation and material dielectric property measurements, a SAR versus time sweep shall be performed within 10 mm of the phantom inner surface. If the EUT power output is stable after three minutes then the measurement probe will perform a coarse surface level scan at each test position in order to ascertain the location of the maximum local SAR level. Once this area had been established, a 5x5x7 cube of 343 points (5 mm spacing in each axis ≈ 27g) will be centred at the area of concern. Extrapolation and interpolation will then be carried out on the 27g of tissue and the highest averaged SAR over a 10g cube determined.

Once the maximum interpolated SAR measurement is complete; the coarse scan is visually assessed to check for secondary peaks within 50% of the maximum SAR level. If there are any further SAR measurements required, extra 5x5x7 cubes shall be centred on each of these extra local SAR maxima.

At the end of each position test case a second time sweep shall be performed to check whether the EUT has remained stable throughout the test.