TEST REPORT

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: tobii T-C12-R1.0A-V1 Tablet PC

FCC ID: W5MTOBIIC12B

IC ID: 8099A-TOBIIC12B

To: OET Bulletin 65 Supplement C: (2001-01)
RSS-102 Issue 4 March 2010

Test Report Serial No:
RFI-SAR-RP80671JD01A V4.0

Version 4.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:	(APPROVED SIGNATORY)
Checked By: Richelieu Quoi	(APPROVED SIGNATORY)
Issue Date:	**03 August 2012**
Test Dates:	**25 January to 28 January 2011**

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1. Customer Information

Company Name:	Tobii Technology AB
Address:	Karlsrovägen 2D 7th floor Danderyd 182 53 Sweden

2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

Description:	Tablet PC
Brand Name:	tobii
Model Name or Number:	T-C12-R1.0A-V1
Serial Number:	MTC12-030110458195
IMEI Number:	357749034833617
Firmware Version Number:	2.1.6
Software Version Number:	Windows 7 Home Premium
FCC ID Number:	W5MTOBIIC12B
IC ID Number:	8099A-TOBIIC12B
Country of Manufacture:	None Stated
Date of Receipt:	25 January 2011

2.2. Description of EUT

The Equipment Under Test is a Tablet PC. The device operates in GSM850, EGSM900, DCS1800, PCS1900, Wi-Fi 802.11b/g/n and *Bluetooth* bands.

2.3. Modifications Incorporated in the EUT

There were no modifications incorporated in the EUT.

2.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Battery (1st)
Brand Name:	Tobii
Model Name or Number:	TNB12A
Serial Number:	TNBLS-050100144271
Cable Length and Type:	Not Applicable
Country of Manufacture:	Cells Made in Japan / Battery Pack Assembled in China
Connected to Port	8 Pin Contact Point

Description:	Battery (2nd)
Brand Name:	Tobii
Model Name or Number:	TNB12A
Serial Number:	TNBLS-050100143201
Cable Length and Type:	Not Applicable
Country of Manufacture:	Cells Made in Japan / Battery Pack Assembled in China
Connected to Port	8 Pin Contact Point

2.5. Support Equipment

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

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10
Serial Number:	GB46311280
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

2.6. Additional Information Related to Testing

<table>
<tr><td>Equipment Category</td><td colspan="3">GSM850/ PCS1900/ Wi-Fi 802.11b/g/n</td></tr>
<tr><td>Type of Unit</td><td colspan="3">Portable Transceiver</td></tr>
<tr><td>Intended Operating Environment:</td><td colspan="3">With GSM, Wi-Fi and Bluetooth Coverage</td></tr>
<tr><td rowspan="4">Transmitter Maximum Output Power Characteristics:</td><td>GSM850</td><td colspan="2">Communication Test Set was configured to allow the EUT to transmit at a maximum power of up to 31.1dBm.</td></tr>
<tr><td>PCS1900</td><td colspan="2">Communication Test Set was configured to allow the EUT to transmit at a maximum power of up to 27.1dBm.</td></tr>
<tr><td>Wi-Fi 802.11b/g/n</td><td colspan="2">:=12.94 mW</td></tr>
<tr><td>Bluetooth</td><td colspan="2">:=2.00 mW</td></tr>
<tr><td rowspan="2">Transmitter Frequency Range:</td><td>GSM850</td><td colspan="2">824 to 849 MHz</td></tr>
<tr><td>PCS1900</td><td colspan="2">1850 to 1910 MHz</td></tr>
<tr><td rowspan="7">Transmitter Frequency Allocation of EUT When Under Test:</td><td>Channel Number</td><td>Channel Description</td><td>Frequency (MHz)</td></tr>
<tr><td>128</td><td>Low</td><td>824.2</td></tr>
<tr><td>189</td><td>Middle</td><td>836.4</td></tr>
<tr><td>251</td><td>High</td><td>848.8</td></tr>
<tr><td>512</td><td>Low</td><td>1850.2</td></tr>
<tr><td>660</td><td>Middle</td><td>1879.8</td></tr>
<tr><td>810</td><td>High</td><td>1909.8</td></tr>
<tr><td>Modulation(s):</td><td colspan="3">GMSK(GSM): 217 Hz</td></tr>
<tr><td>Modulation Scheme (Crest Factor):</td><td colspan="3">GMSK(GSM): 8.3</td></tr>
<tr><td>Antenna Type:</td><td colspan="3">Internal</td></tr>
<tr><td>Antenna Length:</td><td colspan="3">Unknown</td></tr>
<tr><td>Number of Antenna Positions:</td><td colspan="3">2 fixed (WWAN and Wi-Fi/Bluetooth)</td></tr>
<tr><td>Power Supply Requirement:</td><td colspan="3">11.1 V</td></tr>
<tr><td>Battery Type(s):</td><td colspan="3">Li-ion</td></tr>
</table>

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.
Reference:	RSS-102 Issue 4 March 2010
Title:	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in RSS-102 Issue 4 March 2010 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 616217 D03 SAR Supplemental consideration for Notebook/Netbook/Laptop and Tablet

KDB 447498 D01 Mobile Portable RF Exposure v04

KDB 450824 D01 ‘’SAR Prob Cal and Ver Meas v01r01’’

KDB 248227 D01 SAR measurement Procedure for 802 11 a/b/g Transmitters v01r02

The version of DASY system used by RFI for SAR measurements is v4.7.

The SAR probe for the DASY v4.4 and higher has a validity of +/- 100 MHz from the spot frequency at which the system is calibrated.

The system validation performed at 900 MHz is valid for 800 MHz to 1000 MHz which covers the 850 MHz band. The probe calibration for SN3508 was performed at the spot frequencies of 750 MHz and 900 MHz. The SAR software selects the conversion factor based on the following attributes; 1. The operating frequency 2. The measured permittivity imported to the software and 3. The measured conductivity imported to the software.

The 900 MHz system check is applicable for the 850 band as this is within 100 MHz of the of the 850 MHz spot frequency.

As per FCC KDB pub 450824 for SAR probe calibration; The following procedures are recommended for DUT measurements at 150 MHz to 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. Measurements exceeding 50 % of these intervals, in this case +/- 50 MHz, EUT frequency greater than or equal to 300 MHz, shall apply method 1 of the steps.
1) When the actual tissue dielectric parameters used for probe calibration are available the differences for relative permittivity and conductivity between probe calibration and routine measurements should each be less than or equal to 5 % while also satisfying the required +/- 5 % tolerances in target dielectric parameters.

The simulation liquid used satisfies both 835 MHz and 900 MHz target values for all channels in the GSM850 band. The SAR probe coverage and conversion factor has been calibrated to ensure this condition is met and the appropriate conversion factor is used in the frequency range for up to +/- 100 MHz.

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 "KDB 616217 D03 SAR Supplemental consideration for Notebook/Netbook/Laptop and Tablet, KDB 447498 D01 Mobile Portable RF Exposure v04, KDB 248227 D01 SAR measurement Procedure for 802 11 a/b/g Transmitters v01r02 and according to the body-worn procedures in IEEE Std 1528-2003 and OET Bulletin 65 Supplement C 01-01.

As per the FCC Public Notice DA 02-1438 by the SCC-34/SC-2 and KDB publication 447498 D01 v04, for SAR measurement performed on the middle channel with levels < 50% of the SAR limit and corresponding channel < 100 MHz, SAR evaluation on the low and high channels are not required and therefore not evaluated.

The SAR test was performed on the most conservative orientation ''Base of the EUT''. Secondary-Edge Landscape, Primary-Edge Portrait and Secondary-Edge Portrait were not evaluated, as the EUT Screen is configured to Landscape Orientation only.

According to KDB 447498, SAR is required only for the edge with most conservative exposure conditions. On WWAN Testing, the Primary-Edge Portrait of EUT Facing Phantom was not evaluated, as the distance between the WWAN antenna and the Edge is approximate 12cm and is not most conservative antenna-to-user distance at the edge mode.

According to FCC Document KDB 616217 D02 SAR Supplemental consideration for Notebook/Netbook/Laptop and Tablet, for portable transmitters, SAR evaluation on WLAN802.11b/g/n is typically not required when the maximum transmitter and antenna output power are ≤60/f (GHz) mW. Since, the maximum output power for WLAN of the EUT is 11.12 dBm; Stand-alone SAR evaluation is not required.

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:

- GSM850 – Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.
- PCS1900 – Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.

GSM850 – Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
0 … 2	39
3	37
4	35
5	**33**
6	31
7	29
8	27
9	25
10	23
11	21
12	19
13	17
14	15
15	13
16	11
17	9
18	7
19 ... 31	5

PCS1900 – Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
22 … 29	Reserved
30	33
31	32
0	**30**
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0
16 … 21	Reserved

- Test was performed with Wi-Fi802.11 b/g/n disabled as the output power was < $60/f_{(GHz)}$ and antenna to antenna distance > 5cm.
- Test was performed with Bluetooth disabled as the output power was < $60/f_{(GHz)}$ and antenna to antenna distance > 5cm.

5.2. Configuration and Peripherals

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

- Standalone Battery Operated
- EUT was tested in the Body-Worn configuration only, with the *Base of the EUT* in direct contact against the flat phantom (0mm separation).

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 EUT 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	Result
Specific Absorption Rate-GSM 850 Body Configuration 1g	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-PCS 1900 Body Configuration 1g	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied

SAR Individual Transmitter Evaluation

device, mode	Frequency, (MHz)	P_x (mW)	P_{REF} (mW)	single SAR, W/kg	Remarks
WWAN, GSM	850	1202	60/f	0.037	Routine Evaluation
WWAN, GSM	1900	513	60/f	0.103	Routine Evaluation
WLAN, WiFi802.11	2450	~13	60/f	:=0	{PBT ≤ 2PREF} {$d_{WWAN, WLAN}$ > 5cm}
BT, *Bluetooth*	2400	~ 2	12	:=0	{PBT ≤ 2PREF} {$d_{WWAN, BT}$ > 5cm}

Note(s):

1. Simultaneous transmission was not evaluated as the sum of the individual SAR for WWAN and WLAN was < 1.6 W/kg.
2. WLAN *and Bluetooth* transmitter thresholds output power “P_{Ref} = 12 mW as listed in KDB 648474.
3. Px: power level measured by RFI.
4. Single SAR value measured by RFI.
5. The “Antenna-to-Antenna distance and Antenna-to-User distance were provided by the customer.

SAR Simultaneous Transmitter Evaluation

(x,y)	D(x,y) cm	L(x,y) cm	$SPLSR_{xy}$	Sim-Tx SAR	Remarks
($WWAN_{GSM}$, BT)	>5	N/A	N/A	N/A	{no stand-alone SAR for BT}
($WWAN_{GSM}$, Wi-Fi)	>5	N/A	N/A	N/A	{D(x,y) > 5 } & {$\Sigma_{WWAN, WLAN}$ < 1.6 W/kg}

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

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 - GSM 850 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.037

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.4 to 22.4

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Base of EUT Facing Phantom	Flat (OVAL 3mm)	189	21.8	N/A	0.037	1, 2, 3	GMSK

Note(s):

1. Voice
2. SAR measurements were performed with the EUT at a separation distance of 0mm from the 'Oval' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

7.2.2. Specific Absorption Rate - PCS 1900 Body Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.103

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.4 to 22.4

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-Off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Base of EUT Facing Phantom	Flat (OVAL 3mm)	660	17.9	N/A	0.103	1, 2, 3	GMSK

Note(s):

1. Voice
2. SAR measurements were performed with the EUT at a separation distance of 0mm from the 'Oval' phantom flat section.
3. SAR test was performed in the middle channel only as the measured levels were < 50% of the SAR limit as stated in the FCC Public Notice DA 02-1438 by the SCC-34/SC-2.

7.2.3. Conducted Average Power Measurement

Channel Number	Frequency (MHZ)	GSM TX Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
128	824.2	30.5	21.5	Conducted, GMSK
189	836.4	30.8	21.8	Conducted, GMSK
251	848.8	31.1	22.1	Conducted, GMSK
512	1850.2	27.0	18.0	Conducted, GMSK
660	1879.8	26.9	17.9	Conducted, GMSK
810	1909.8	27.1	18.1	Conducted, GMSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**

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-GSM 850 Body Configuration 1g	95%	±19.44%
Specific Absorption Rate-PCS 1900 Body Configuration 1g	95%	±19.51%

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.

8.1. Specific Absorption Rate- GSM 850 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (10g)}$	Standard Uncertainty + u (%)	Standard Uncertainty - u (%)	υ_i or υ_{eff}
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	0.320	0.320	normal (k=2)	2.0000	1.0000	0.160	0.160	∞
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	2.900	2.900	normal (k=1)	1.0000	1.0000	2.900	2.900	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)	4.690	4.690	normal (k=1)	1.0000	0.6400	3.002	3.002	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.860	4.860	normal (k=1)	1.0000	0.6000	2.916	2.916	5
	Combined standard uncertainty			t-distribution			9.96	9.96	>250
	Expanded uncertainty			k = 1.96			19.51	19.51	>250

8.2. Specific Absorption Rate- PCS 1900 Body Configuration 1g

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	0.320	0.320	normal (k=2)	2.0000	1.0000	0.160	0.160	∞
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	2.500	2.500	normal (k=1)	1.0000	1.0000	2.500	2.500	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)	4.940	4.940	normal (k=1)	1.0000	0.6400	3.162	3.162	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.980	4.980	normal (k=1)	1.0000	0.6000	2.988	2.988	5
	Combined standard uncertainty			t-distribution			9.92	9.92	>200
	Expanded uncertainty			k = 1.96			19.44	19.44	>200

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	-
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 & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partner Engineering AG	V3.0	None	-	-
A1184	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	394	19 April 2010	12
A1378	Probe	Schmid & Partner Engineering AG	EX3DV3	3508	15 July 2010	12
A1329	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	185	18 Aug 2009	24
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	26 Jun 2009	24
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b	001	Calibrated before use	-
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM a	002	Calibrated before use	-
A1990	Digital Camera	Samsung	E515	A23WC90 8A05431K	-	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
C1042	Network Analyzer Cable	Agilent	8120-4779	349	-	-
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	27 Sept 2010	12
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 15 Dec 2010	4
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1270	Temperature/ Humidity/ Pressure Meter	RS Components	None	None	Internal Checked 31 March 2010	12
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-
M1071	Spectrum Analyser	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1044	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/019	26 May 2010	12
M265	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/017	26 May 2010	12
M263	Dual Channel Power Meter	Rohde & Schwarz	NRVD	826558/004	27 May 2010	12

Note: All above equipment’s were in calibration due the course of testing.

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.

Checked by RQ
DATE: 19-07-2010

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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

RFI Asset: A1378

Client RFI

Certificate No: EX3-3508_Jul10

CALIBRATION CERTIFICATE

Object	EX3DV3 - SN:3508
Calibration procedure(s)	QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	July 15, 2010 (Additional Conversion Factors)

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-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 15, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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 EX3DV3

SN:3508

Additional Conversion Factors

Manufactured:	December 19, 2003
Last calibrated:	February 19, 2010
Recalibrated:	July 15, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV3 SN:3508

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.77	0.63	0.65	± 10.1%
DCP (mV)[B]	99.8	95.0	92.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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 Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV3 SN:3508

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	10.81	10.81	10.81	0.11	1.00	± 13.3%
750	± 50 / ± 100	41.9 ± 5%	0.89 ± 5%	10.80	10.80	10.80	0.38	0.75	± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	10.08	10.08	10.08	0.38	0.77	± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	9.09	9.09	9.09	0.52	0.63	± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	8.75	8.75	8.75	0.35	0.76	± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.95	7.95	7.95	0.31	0.80	± 11.0%

[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.

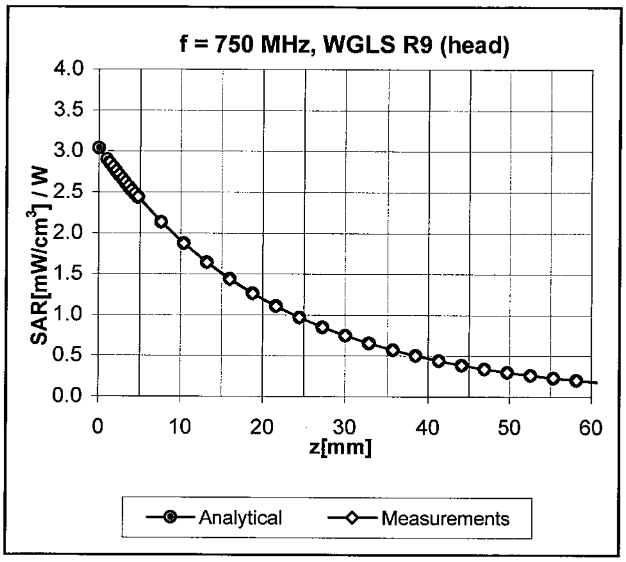
DASY/EASY - Parameters of Probe: EX3DV3 SN:3508

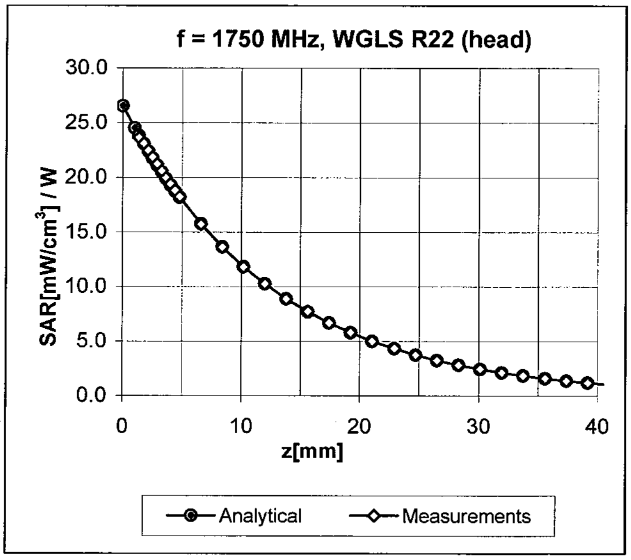
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	11.71	11.71	11.71	0.02	1.00	± 13.3%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	10.45	10.45	10.45	0.50	0.74	± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	8.79	8.79	8.79	0.39	0.77	± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	8.45	8.45	8.45	0.36	0.80	± 11.0%
2150	± 50 / ± 100	53.0 ± 5%	1.75 ± 5%	8.50	8.50	8.50	0.22	1.14	± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	8.19	8.19	8.19	0.34	0.80	± 11.0%

[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.

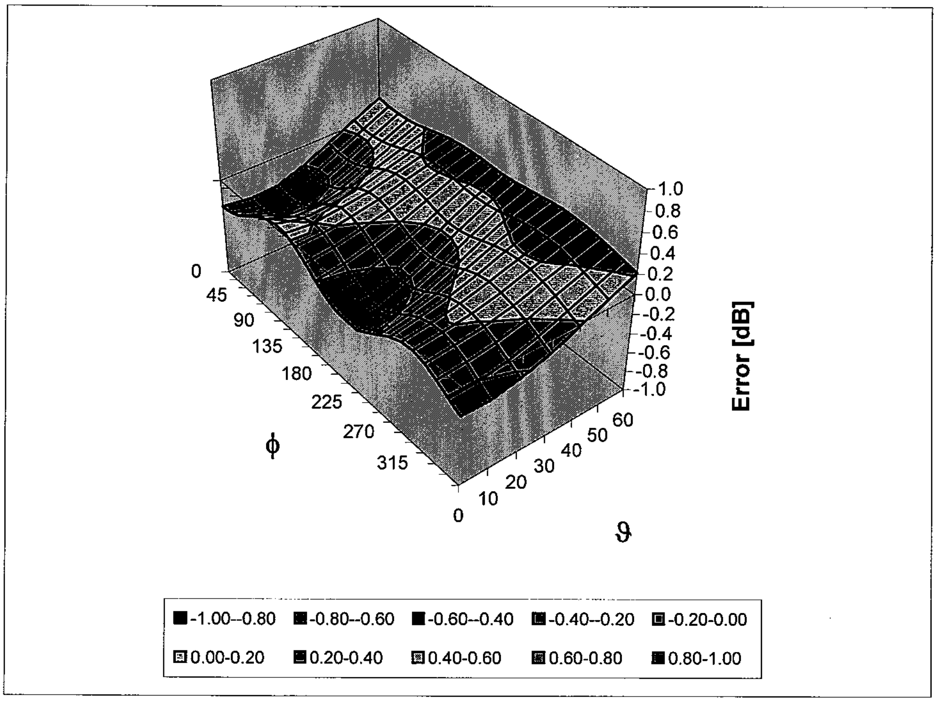
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

reChecked by [illegible]
27-05-2010

A1329

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 RFI

Certificate No: D900V2-185_Aug09

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 185
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 18, 2009
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 EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 18, 2009

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) DASY4/5 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	DASY5	V5.0
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	40.4 ± 6 %	0.96 mho/m ± 6 %
Head TSL temperature during test	(22.4 ± 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	2.75 mW / g
SAR normalized	normalized to 1W	11.0 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**11.0 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.76 mW / g
SAR normalized	normalized to 1W	7.04 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**7.06 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	52.7 ± 6 %	1.06 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 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	2.80 mW / g
SAR normalized	normalized to 1W	11.2 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**11.0 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.81 mW / g
SAR normalized	normalized to 1W	7.24 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**7.16 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	49.5 Ω - 10.3 jΩ
Return Loss	- 19.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.5 Ω - 11.2 jΩ
Return Loss	- 18.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.403 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

DASY5 Validation Report for Head TSL

Date/Time: 18.08.2009 08:57:04

Test Laboratory: SPEAG, Zurich, Switzerland

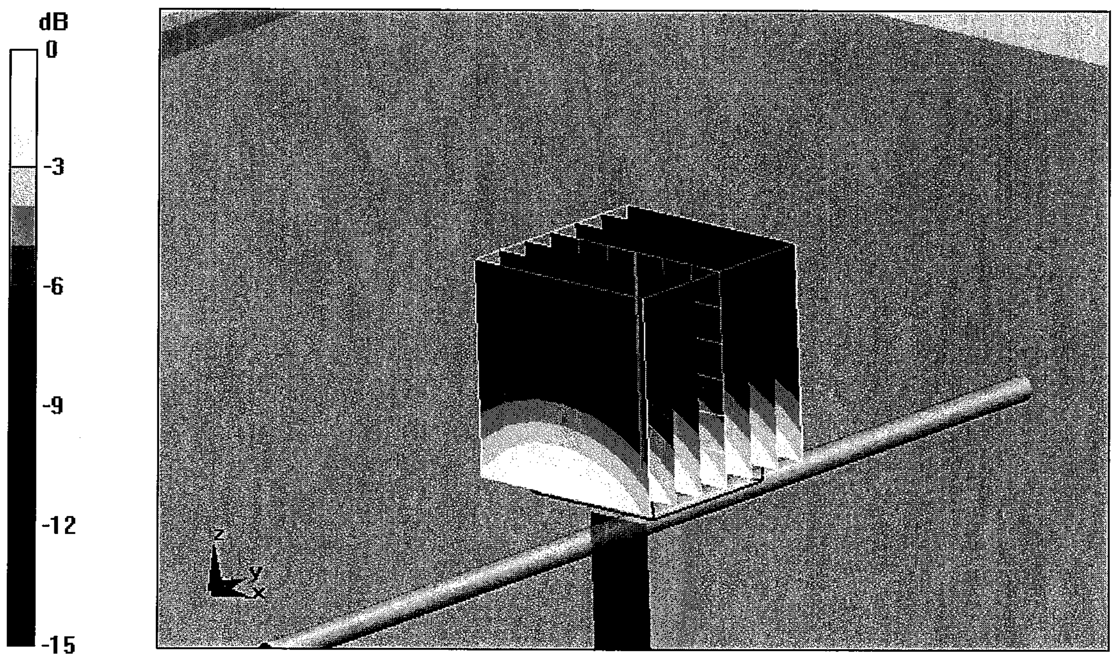
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:185

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.96 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

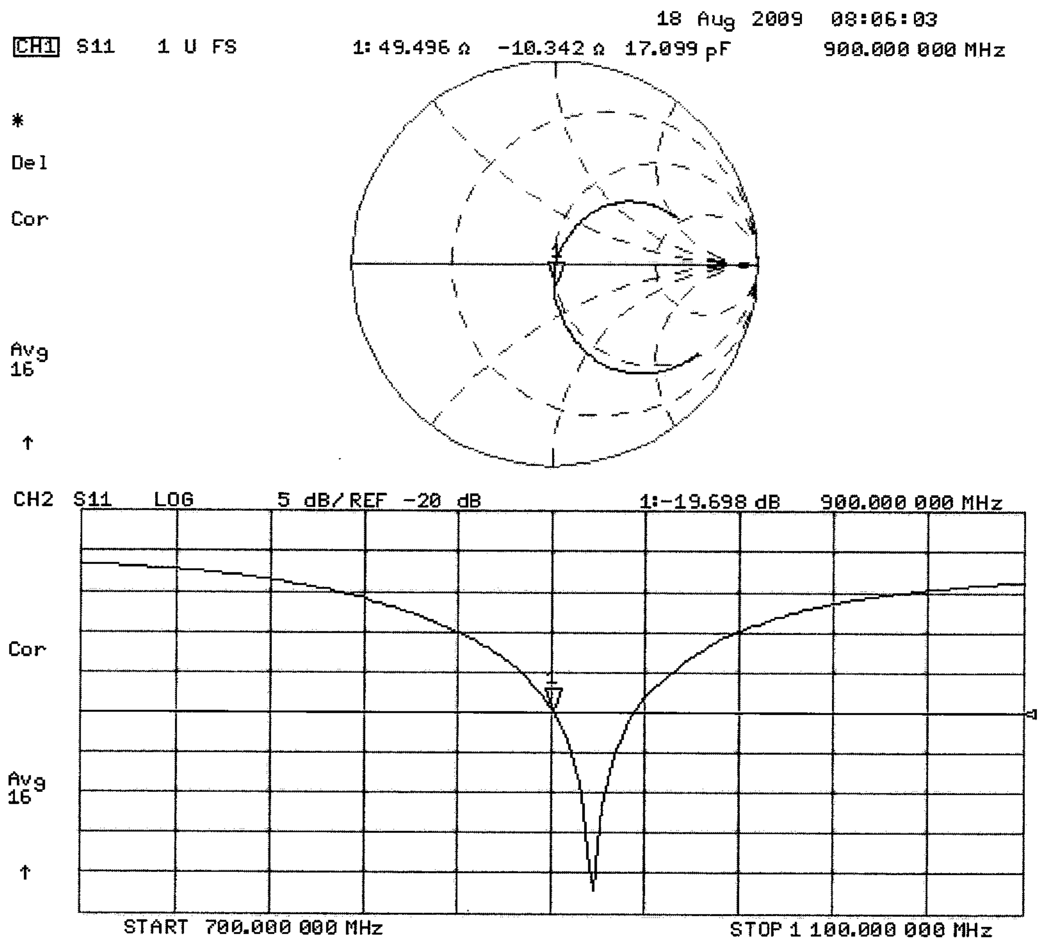
- Probe: ES3DV3 - SN3205; ConvF(5.88, 5.88, 5.88); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.7 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 4.17 W/kg
SAR(1 g) = 2.75 mW/g; SAR(10 g) = 1.76 mW/g
Maximum value of SAR (measured) = 3.23 mW/g



0 dB = 3.23mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 17.08.2009 11:23:13

Test Laboratory: SPEAG, Zurich, Switzerland

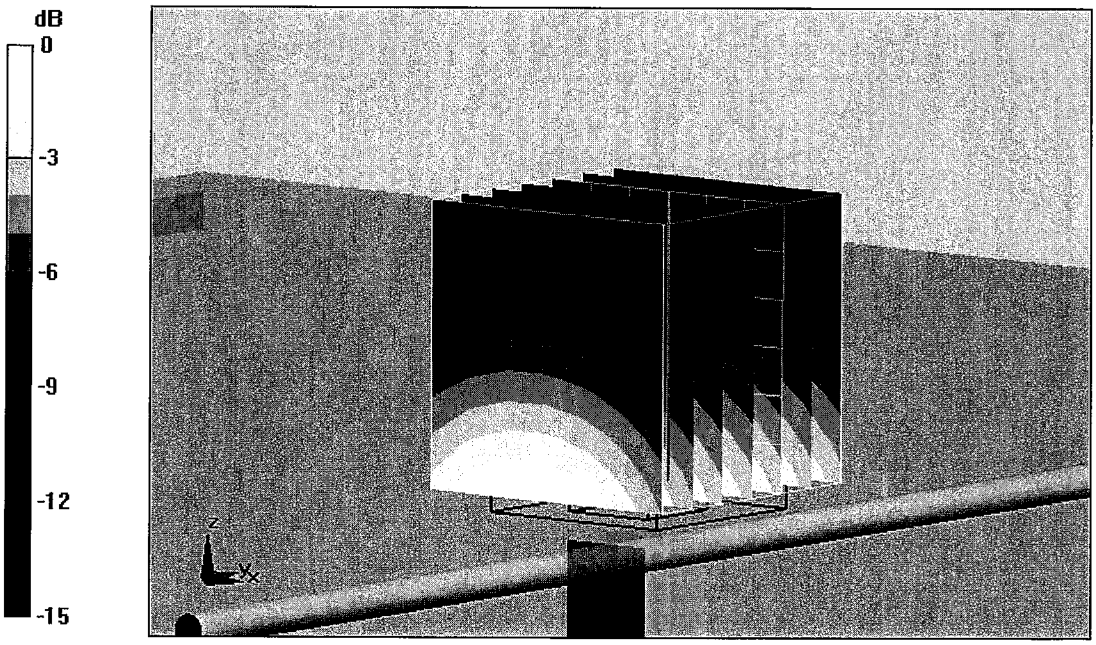
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:185

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 900 MHz; $\sigma = 1.06$ mho/m; $\varepsilon_r = 52.7$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

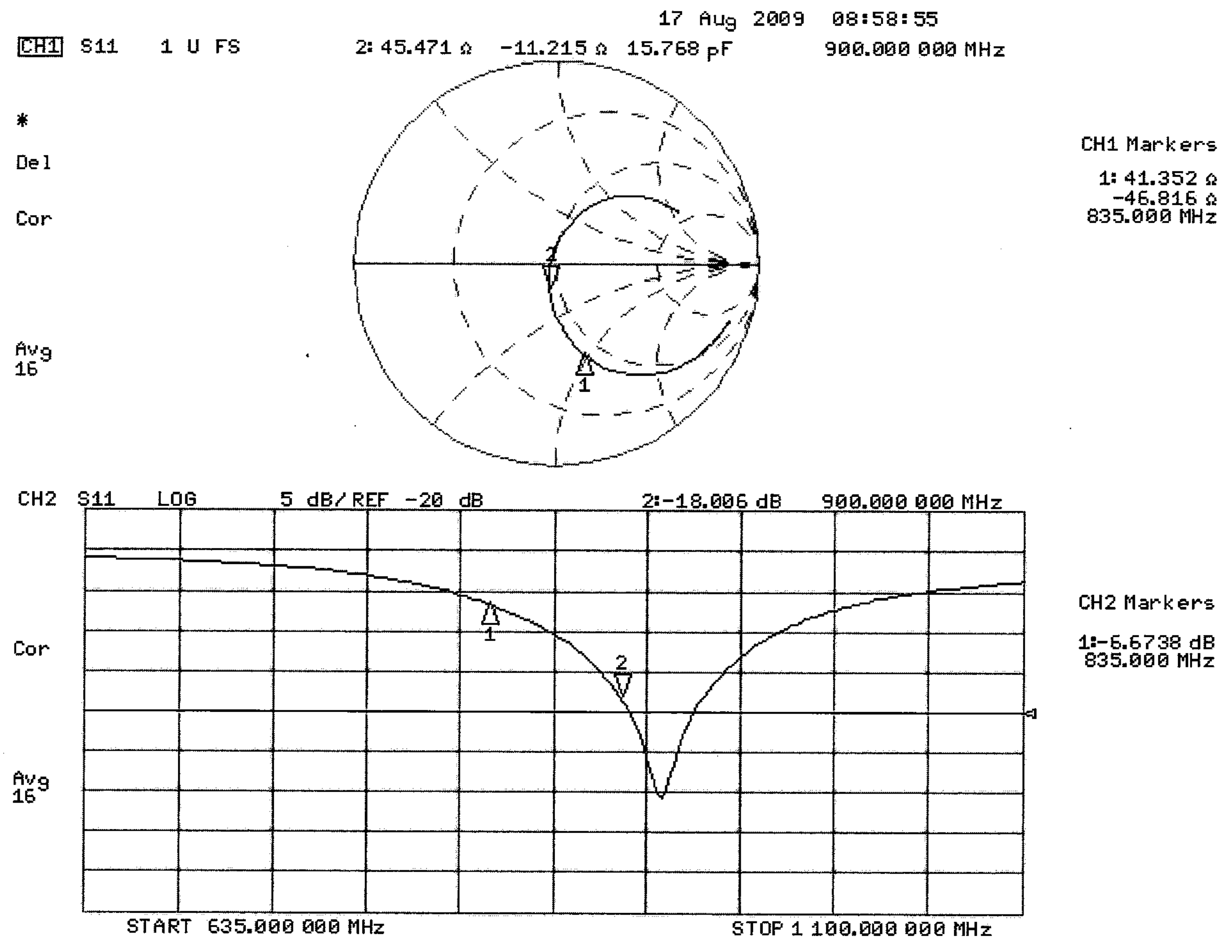
- Probe: ES3DV3 - SN3205; ConvF(5.81, 5.81, 5.81); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.2 V/m; Power Drift = 0.00569 dB
Peak SAR (extrapolated) = 4.19 W/kg
SAR(1 g) = 2.8 mW/g; SAR(10 g) = 1.81 mW/g
Maximum value of SAR (measured) = 3.24 mW/g



0 dB = 3.24mW/g

Impedance Measurement Plot for Body TSL



A 1237
checked on 01/07/2009
by RB

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

ilac-MRA

SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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: RFI

Certificate No: D1900V2-540-Jun09

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 540
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	June 26, 2009
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	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV2	SN: 3025	30-Apr-09 (No. ES3-3025_Apr09)	Apr-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 29, 2009

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) DASY4/5 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	DASY5	V5.0
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	41.0 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 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	10.1 mW / g
SAR normalized	normalized to 1W	40.4 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**40.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.29 mW / g
SAR normalized	normalized to 1W	21.2 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**21.1 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	53.9 ± 6 %	1.55 mho/m ± 6 %
Body TSL temperature during test	(21.2 ± 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	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**40.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.40 mW / g
SAR normalized	normalized to 1W	21.6 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**21.5 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	48.5 Ω + 2.7 jΩ
Return Loss	- 30.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.9 Ω + 2.8 jΩ
Return Loss	- 24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.198 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

DASY5 Validation Report for Head TSL

Date/Time: 26.06.2009 12:43:03

Test Laboratory: SPEAG, Zurich, Switzerland

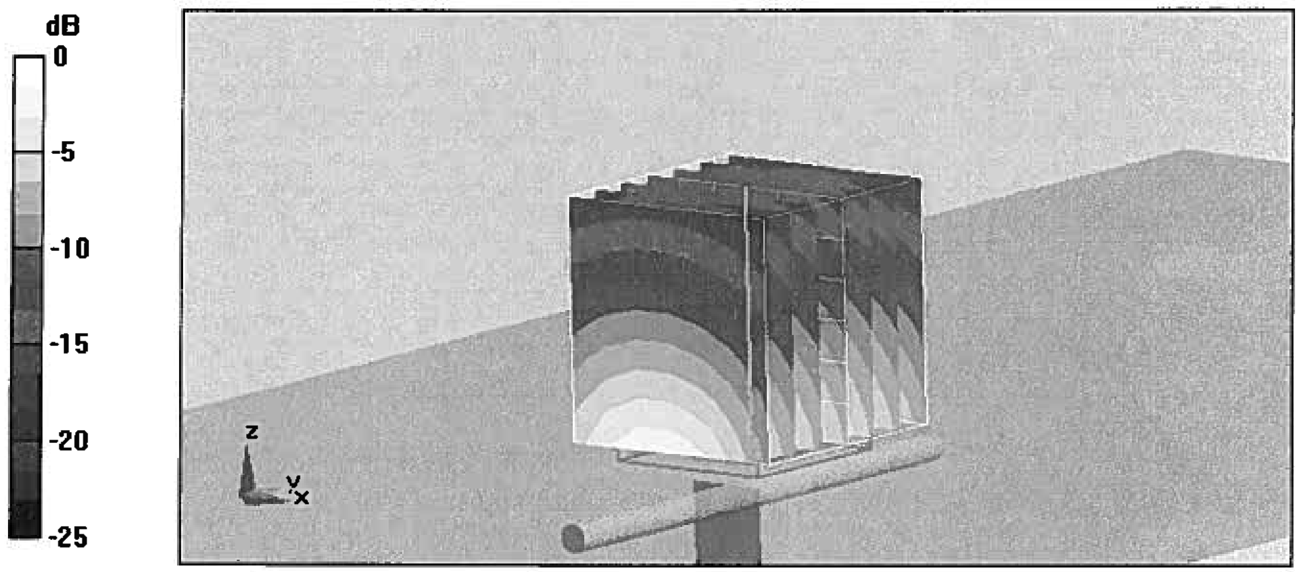
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 1900 MHz; $\sigma = 1.42$ mho/m; $\varepsilon_r = 41$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

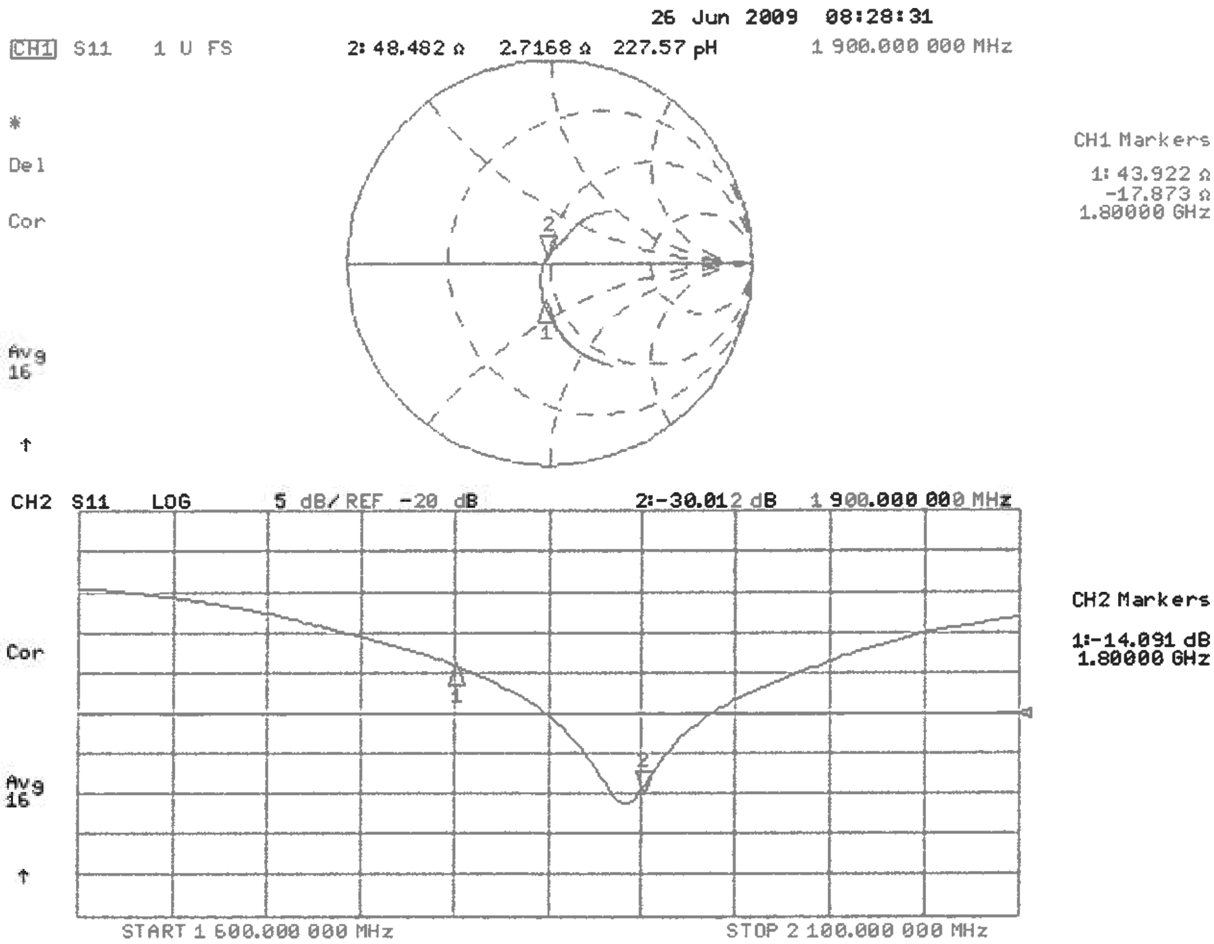
- Probe: ES3DV2 - SN3025; ConvF(4.88, 4.88, 4.88); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm/Zoom Scan (dist=3.0 mm, probe 0deg) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.9 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.29 mW/g
Maximum value of SAR (measured) = 12.5 mW/g



0 dB = 12.5mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 26.06.2009 14:10:45

Test Laboratory: SPEAG, Zurich, Switzerland

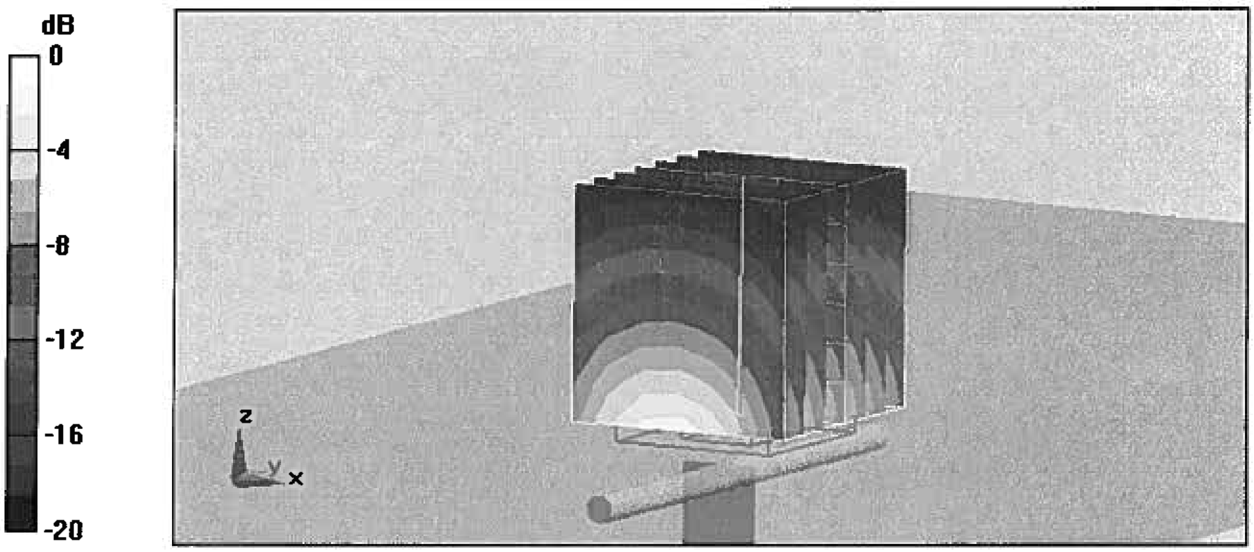
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB
Medium parameters used: f = 1900 MHz; σ = 1.55 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

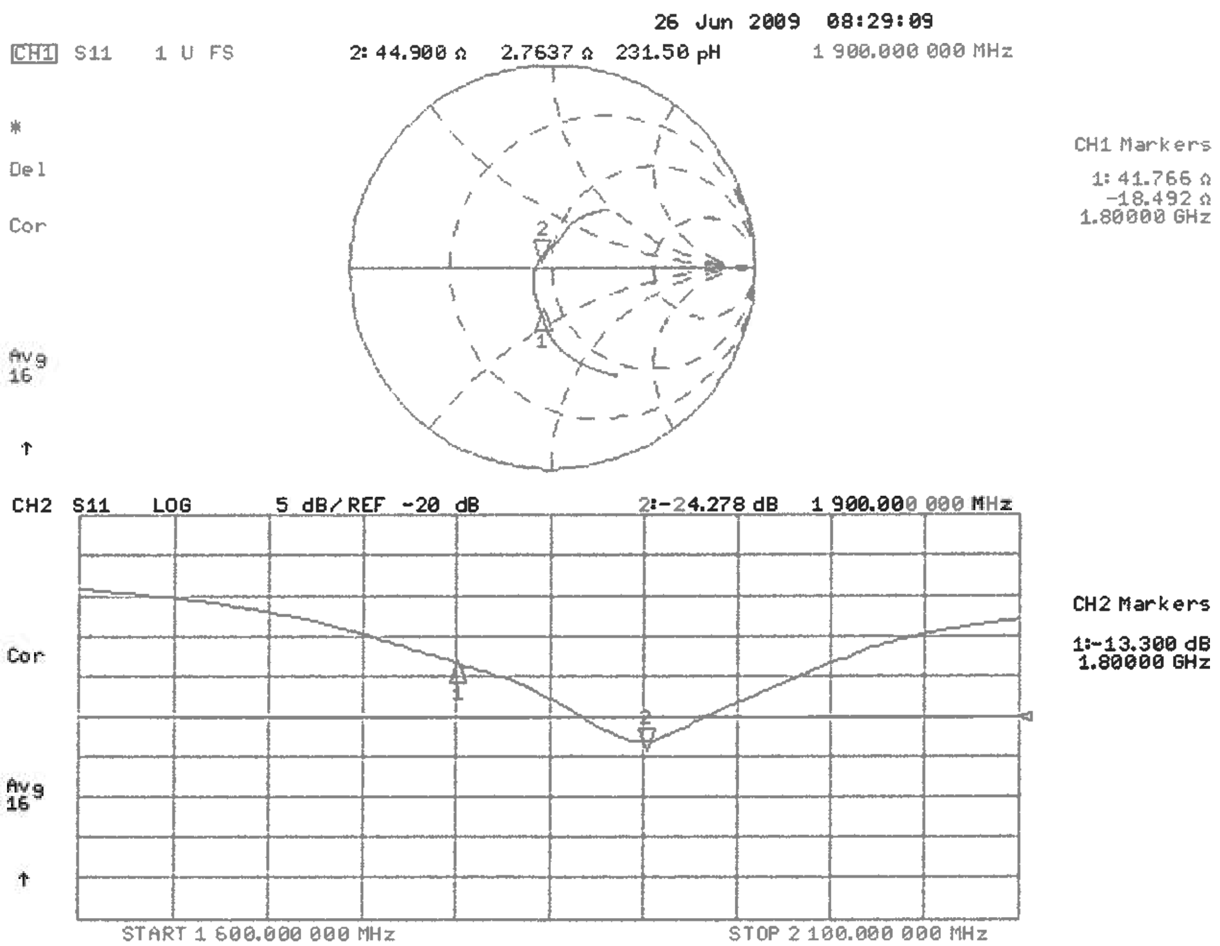
- Probe: ES3DV2 - SN3025; ConvF(4.46, 4.46, 4.46); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm/Zoom Scan (dist=3.0mm, probe 0deg) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.1 V/m; Power Drift = 0.011 dB
Peak SAR (extrapolated) = 18.1 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.4 mW/g
Maximum value of SAR (measured) = 12.9 mW/g



0 dB = 12.9mW/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, IEEE 1528 and FCC KDB procedures, against appropriate limits for each measurement position in accordance with the standard. In some cases the FCC was contacted using a PBA or KDB process to ensure test is performed correctly.

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 and FCC KDB publication 450824.

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 175 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.

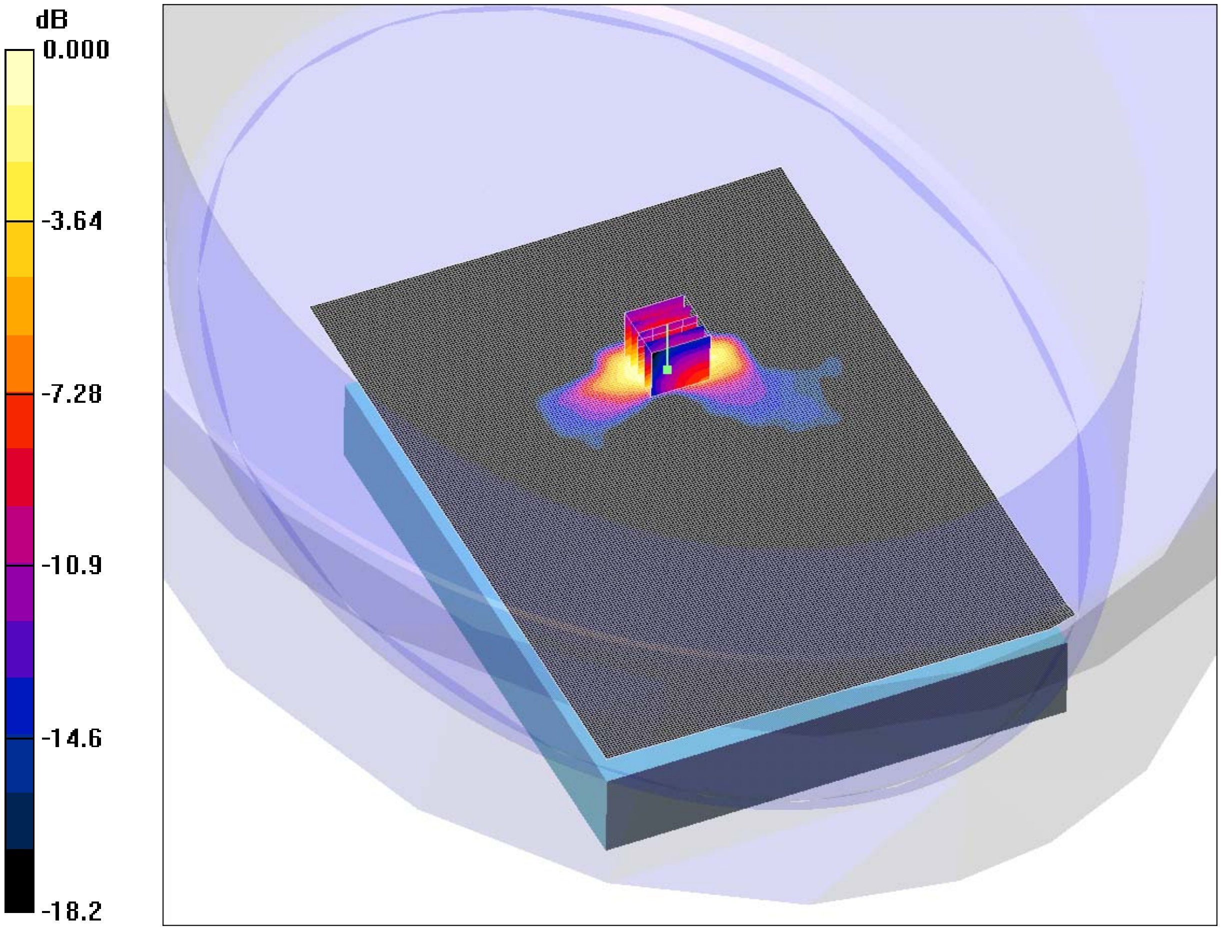
At the end of each position test case a second time sweep shall be performed to check whether the EUT has remained stable throughout the test.

Appendix 3. SAR Distribution Scans

This appendix contains SAR distribution scans which are not included in the total number of pages for this report.

Scan Reference Number	Title
SCN/80671JD01/001	Base of EUT Facing Phantom GSM CH189
SCN/80671JD01/002	Base of EUT Facing Phantom PCS CH660
SCN/80671JD01/003	System Performance Check 900MHz Body 27 01 11
SCN/80671JD01/004	System Performance Check 1900MHz Body 25 01 11

SCN/80671JD01/001: Base of EUT Facing Phantom GSM CH189
Date 27/01/2011
DUT: tobii C12; Type: C Series C-12; Serial: MTC12-030110458195

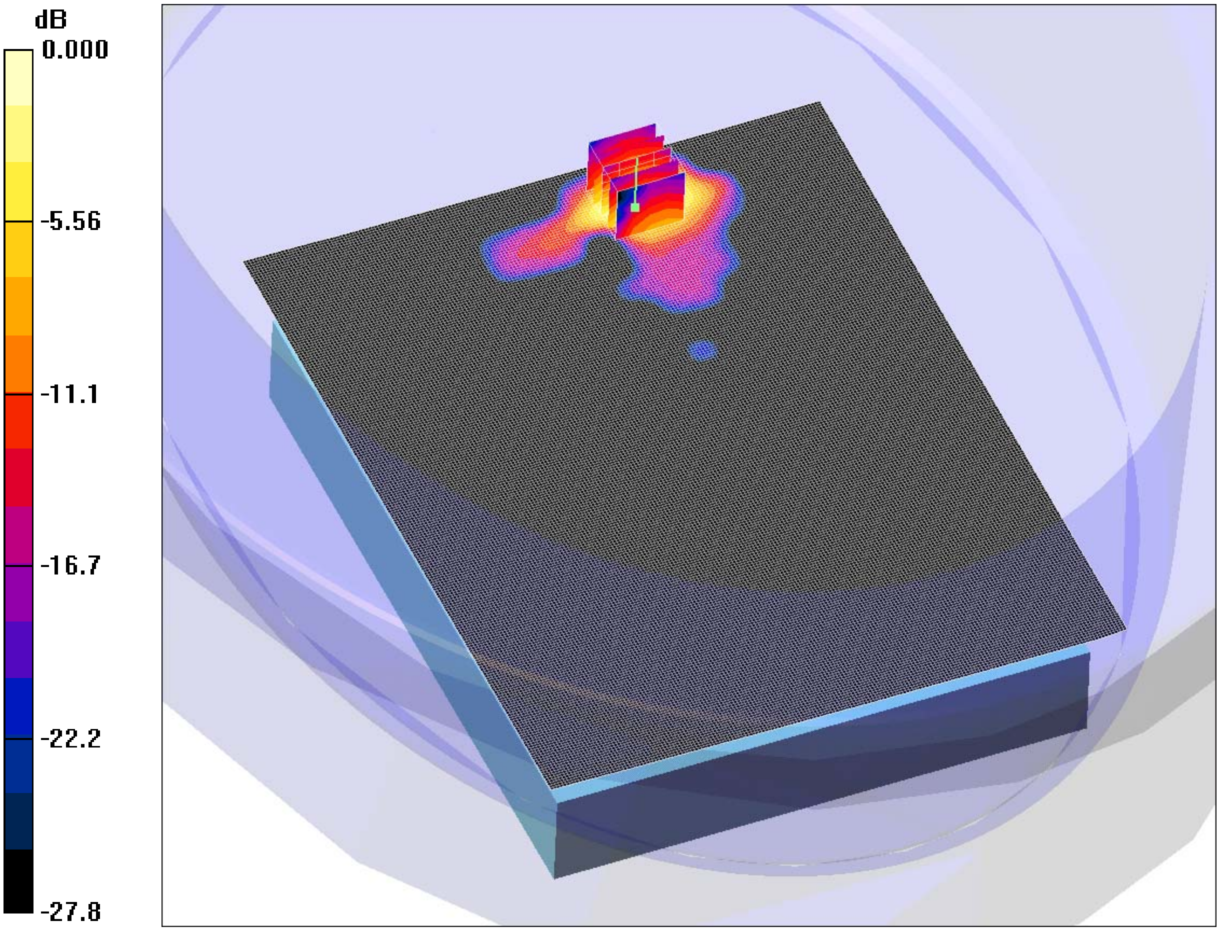


0 dB = 0.040mW/g

Communication System: 850 MHz; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: 900 MHz MSL Medium parameters used (interpolated): f = 836.4 MHz; σ = 1.05 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3
Phantom section: basin Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(10.45, 10.45, 10.45); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base EUT Facing Phantom - Middle/Area Scan 2 (171x241x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.041 mW/g
Base EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.608 V/m; Power Drift = 0.197 dB
Peak SAR (extrapolated) = 0.063 W/kg
SAR(1 g) = 0.037 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.040 mW/g

SCN/80671JD01/002: Base of EUT Facing Phantom PCS CH660
Date 25/01/2011
DUT: tobii C12; Type: C Series C-12; Serial: MTC12-030110458195

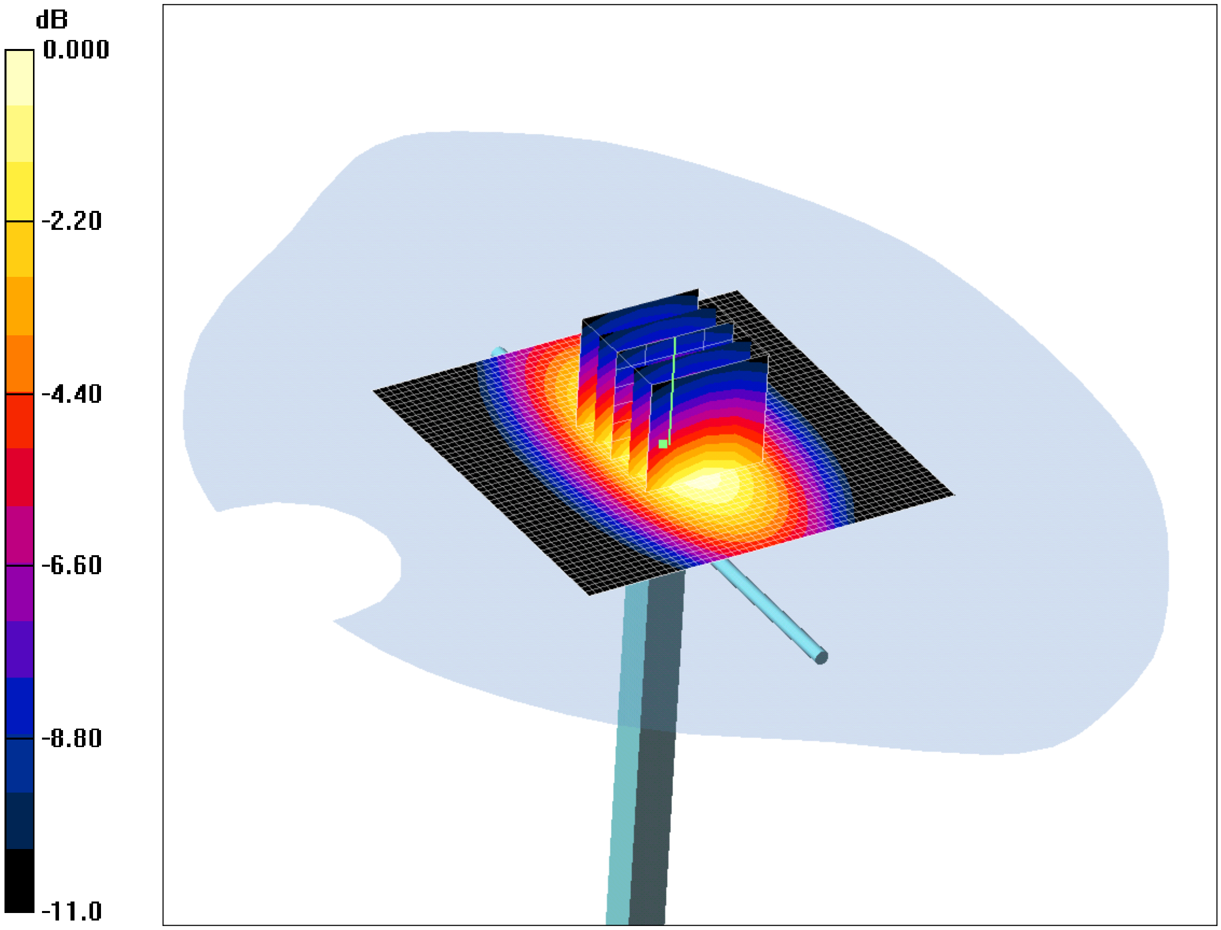


0 dB = 0.118mW/g

Communication System: PCS 1900; Frequency: 1879.8 MHz;Duty Cycle: 1:8.3
Medium: 1900 MHz MSL Medium parameters used (interpolated): f = 1879.8 MHz; σ = 1.56 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: basin Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.45, 8.45, 8.45); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: basin 3mm; Type: 3mm; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Base EUT Facing Phantom - Middle/Area Scan (181x231x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.131 mW/g
Base EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.23 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.192 W/kg
SAR(1 g) = 0.103 mW/g; SAR(10 g) = 0.051 mW/g
Maximum value of SAR (measured) = 0.118 mW/g

SCN/80671JD01/003: System Performance Check 900MHz Body 27 01 11
Date 27/01/2011
DUT: Dipole 900 MHz; Type: D900V2; Serial: SN185

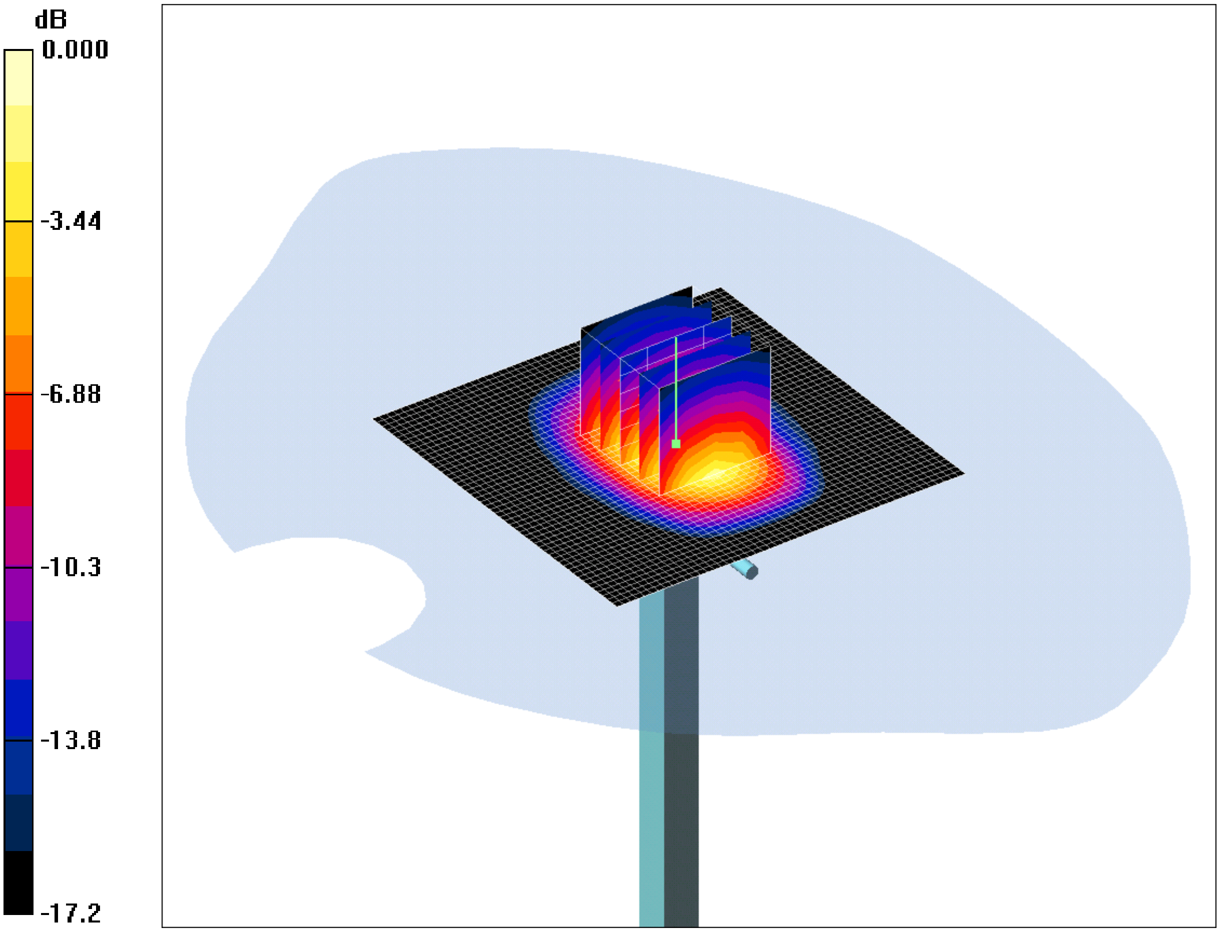


0 dB = 3.11mW/g

Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: 900 MHz MSL Medium parameters used: f = 900 MHz; σ = 1.09 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(10.45, 10.45, 10.45); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 3.19 mW/g
d=15mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.4 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 4.34 W/kg
SAR(1 g) = 2.86 mW/g; SAR(10 g) = 1.85 mW/g
Maximum value of SAR (measured) = 3.11 mW/g

SCN/80671JD01/004: System Performance Check 1900MHz Body 25 01 11
Date 25/01/2011
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN540



0 dB = 11.3mW/g

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 MHz MSL Medium parameters used: f = 1900 MHz; σ = 1.57 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:
- Probe: EX3DV3 - SN3508 (Add. ConvF); ConvF(8.45, 8.45, 8.45); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn394; Calibrated: 19/04/2010
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

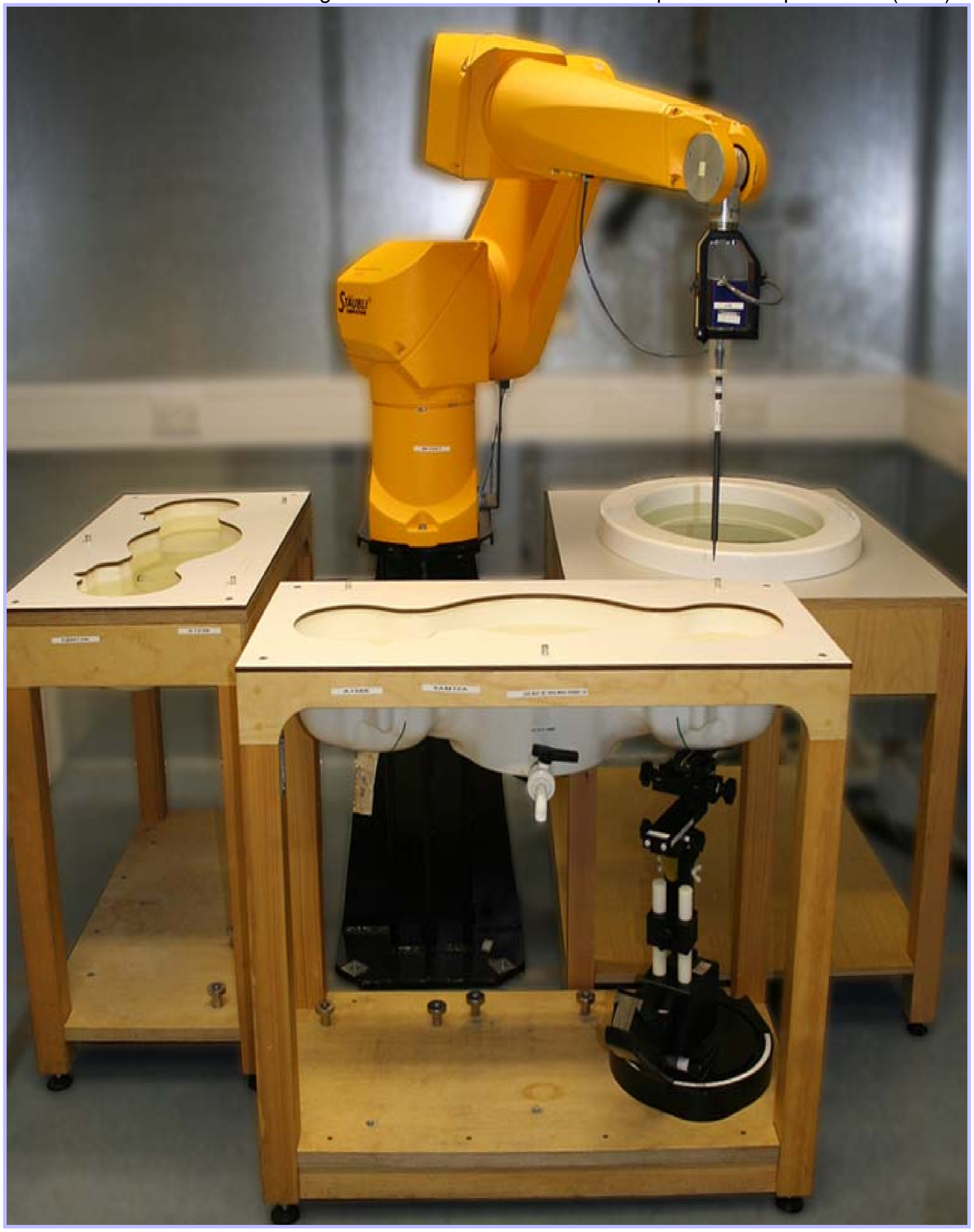
d=10mm, Pin=250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 15.1 mW/g
d=10mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 83.7 V/m; Power Drift = 0.074 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.28 mW/g
Maximum value of SAR (measured) = 11.3 mW/g

Appendix 4. Photographs

This appendix contains the following photographs:

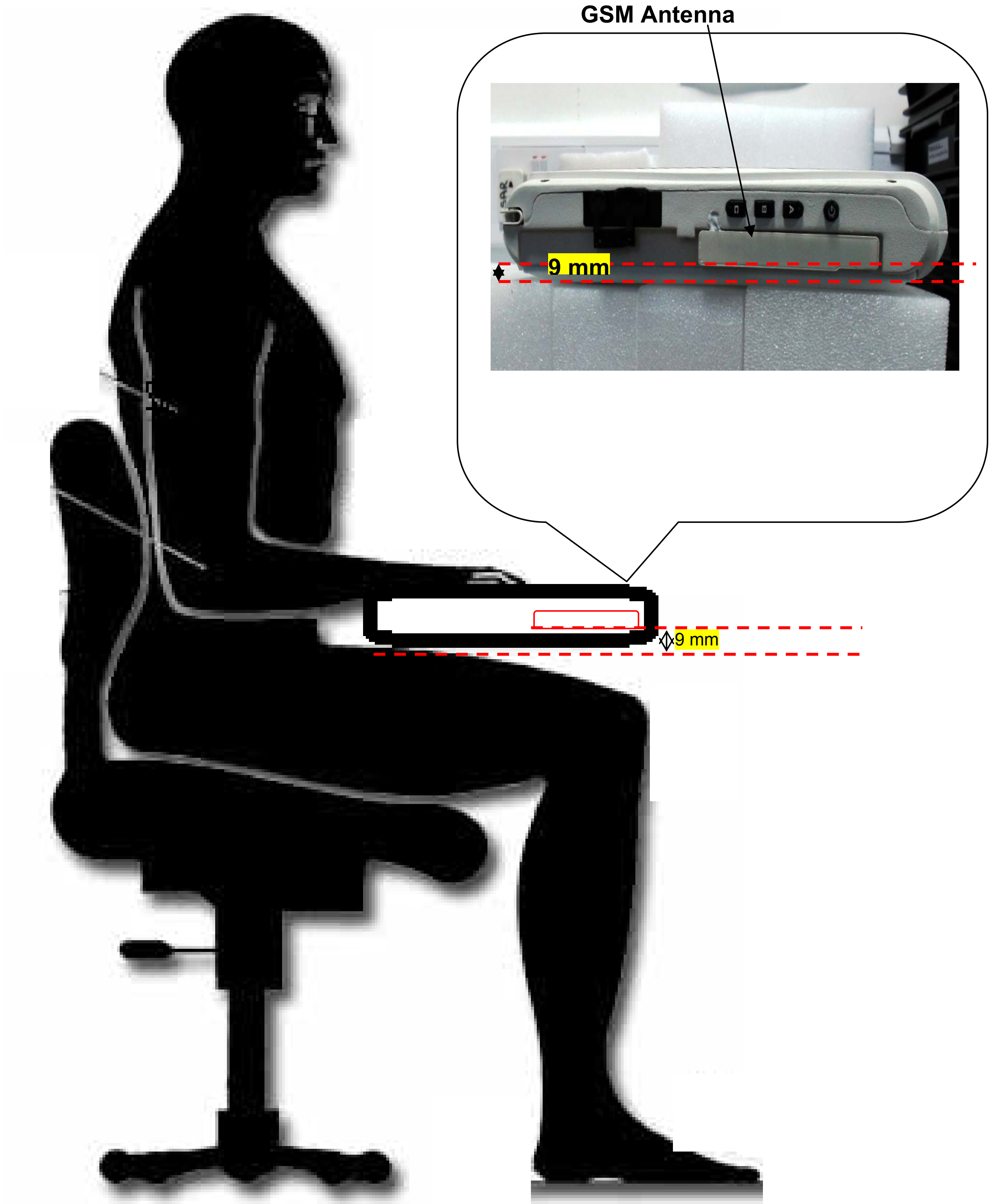
Photo Reference Number	Title
PHT/80671JD01/001	Test configuration for the measurement of Specific Absorption Rate (SAR)
PHT/80671JD01/002	Base of EUT Facing Phantom
PHT/80671JD01/003	User Setup Worst Case WWAN: Antenna-to-User
PHT/80671JD01/004	User Setup Worst Case WLAN: Antenna-to-User
PHT/80671JD01/005	Screen View of EUT
PHT/80671JD01/006	Base View of EUT
PHT/80671JD01/007	1st Battery View
PHT/80671JD01/008	2nd Battery View
PHT/80671JD01/009	900 MHz Body Fluid Level
PHT/80671JD01/010	1900 MHz Body Fluid Level
PHT/80671JD01/011	2450 MHz Body Fluid Level

PHT/80671JD01/001: Test configuration for the measurement of Specific Absorption Rate (SAR)

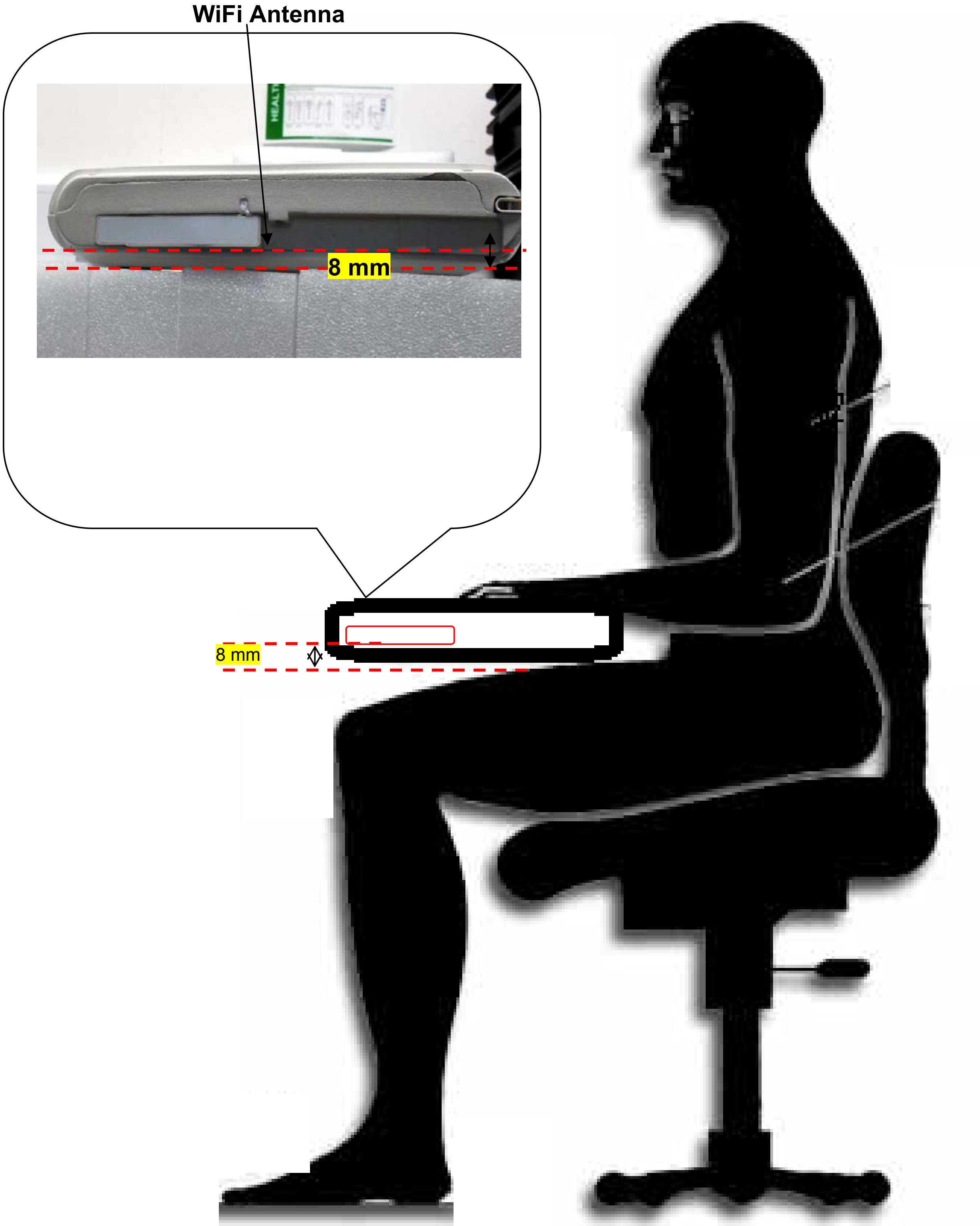


PHT/80671JD01/002: Base of EUT Facing Phantom

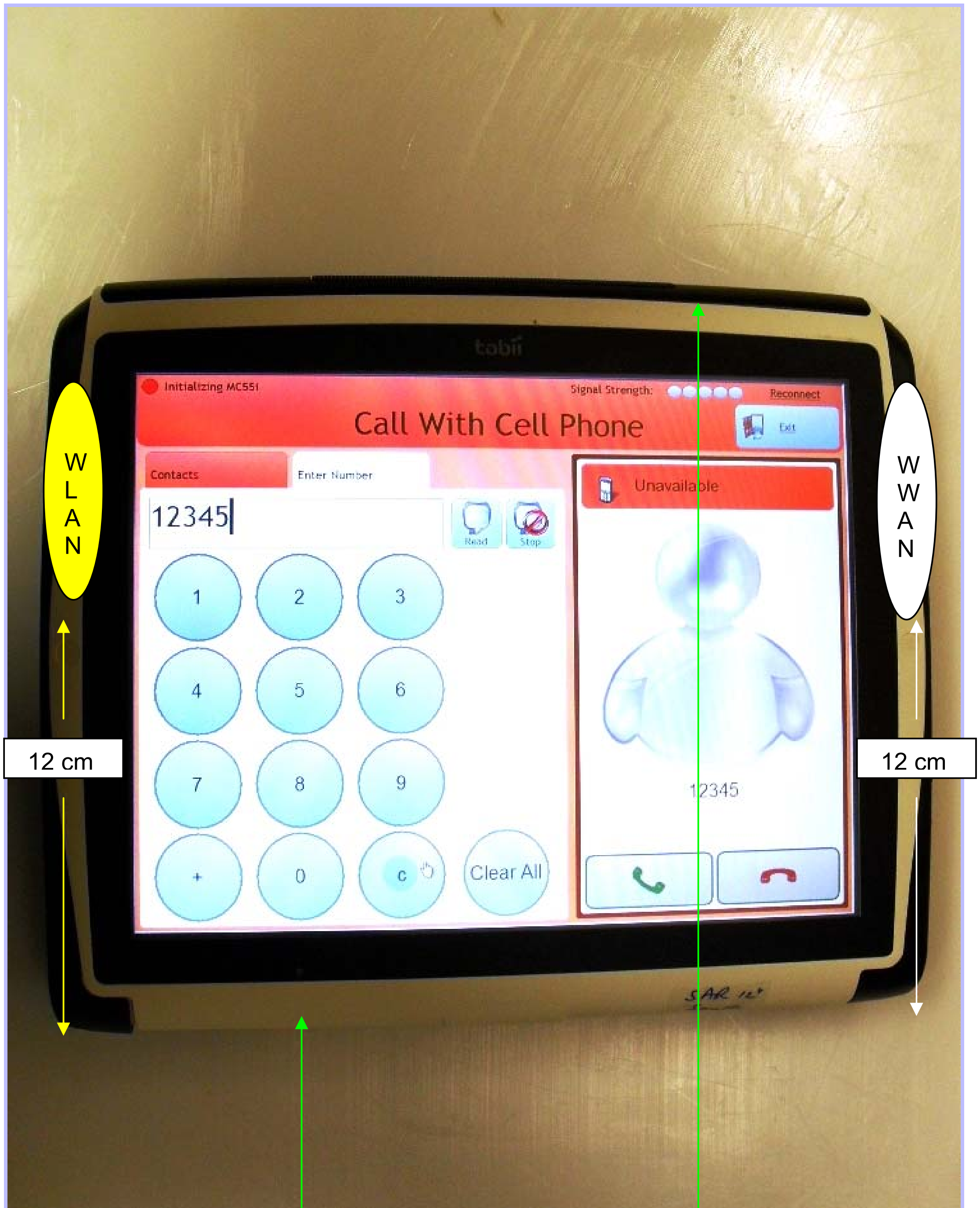
PHT/80671JD01/003: User Setup Worst Case WWAN: Antenna-to-User



PHT/80671JD01/004: User Setup Worst Case WLAN: Antenna-to-User



PHT/80671JD01/005: Screen View of EUT



Secondary-Edge of EUT in Landscape Configuration

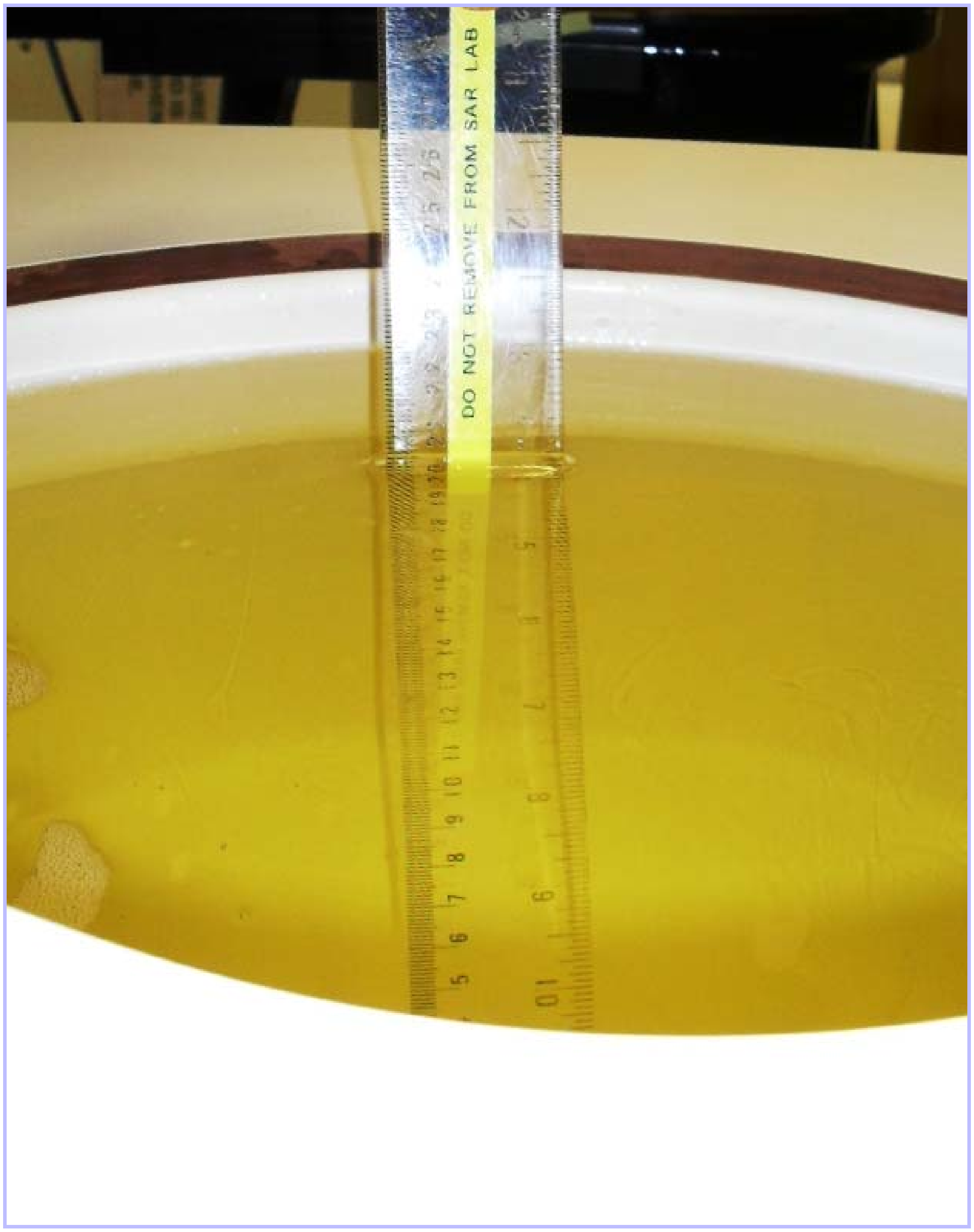
Primary-Edge of EUT in Landscape Configuration

PHT/80671JD01/006: Base View of EUT

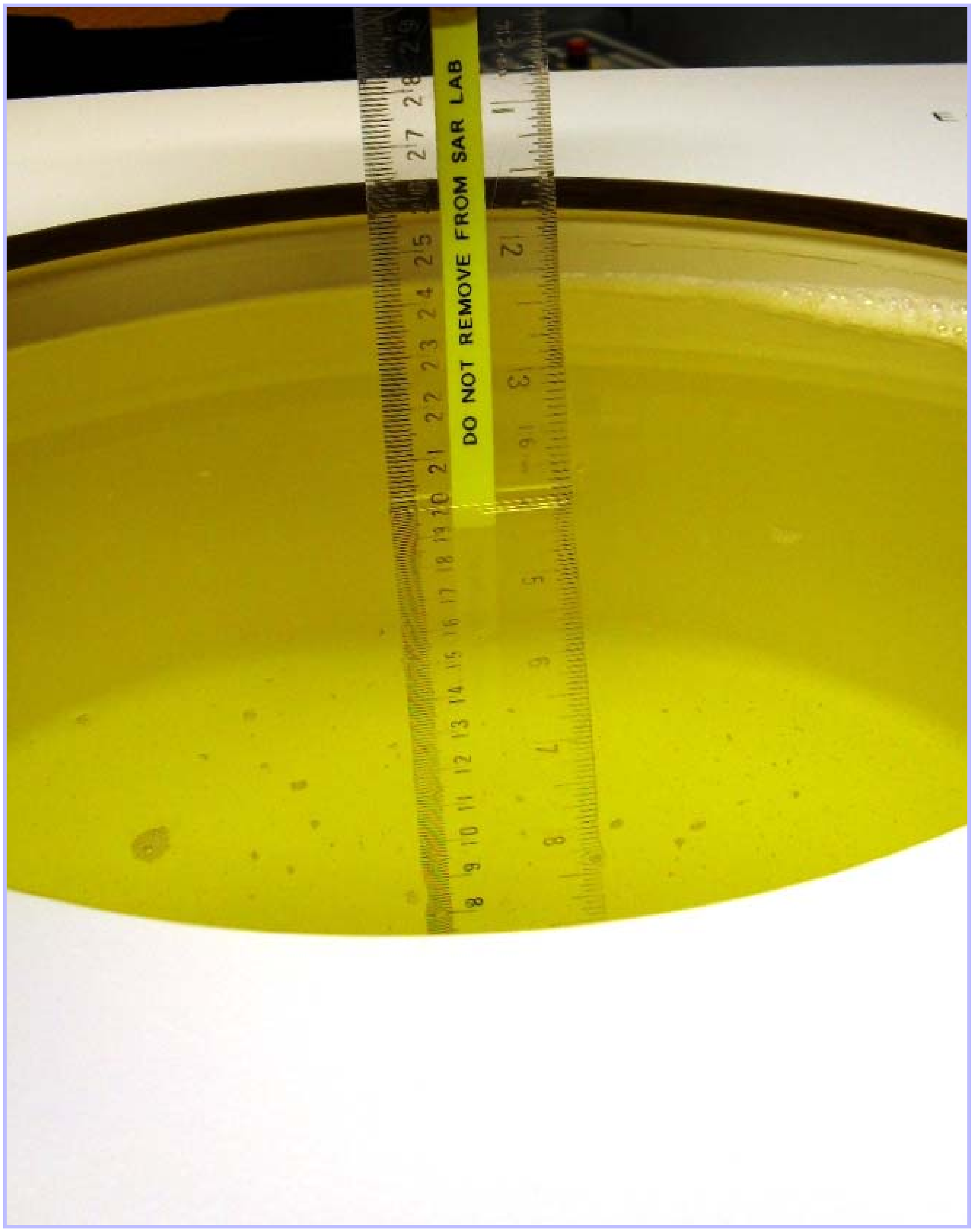
PHT/80671JD01/007: 1st Battery View

PHT/80671JD01/008: 2nd Battery View

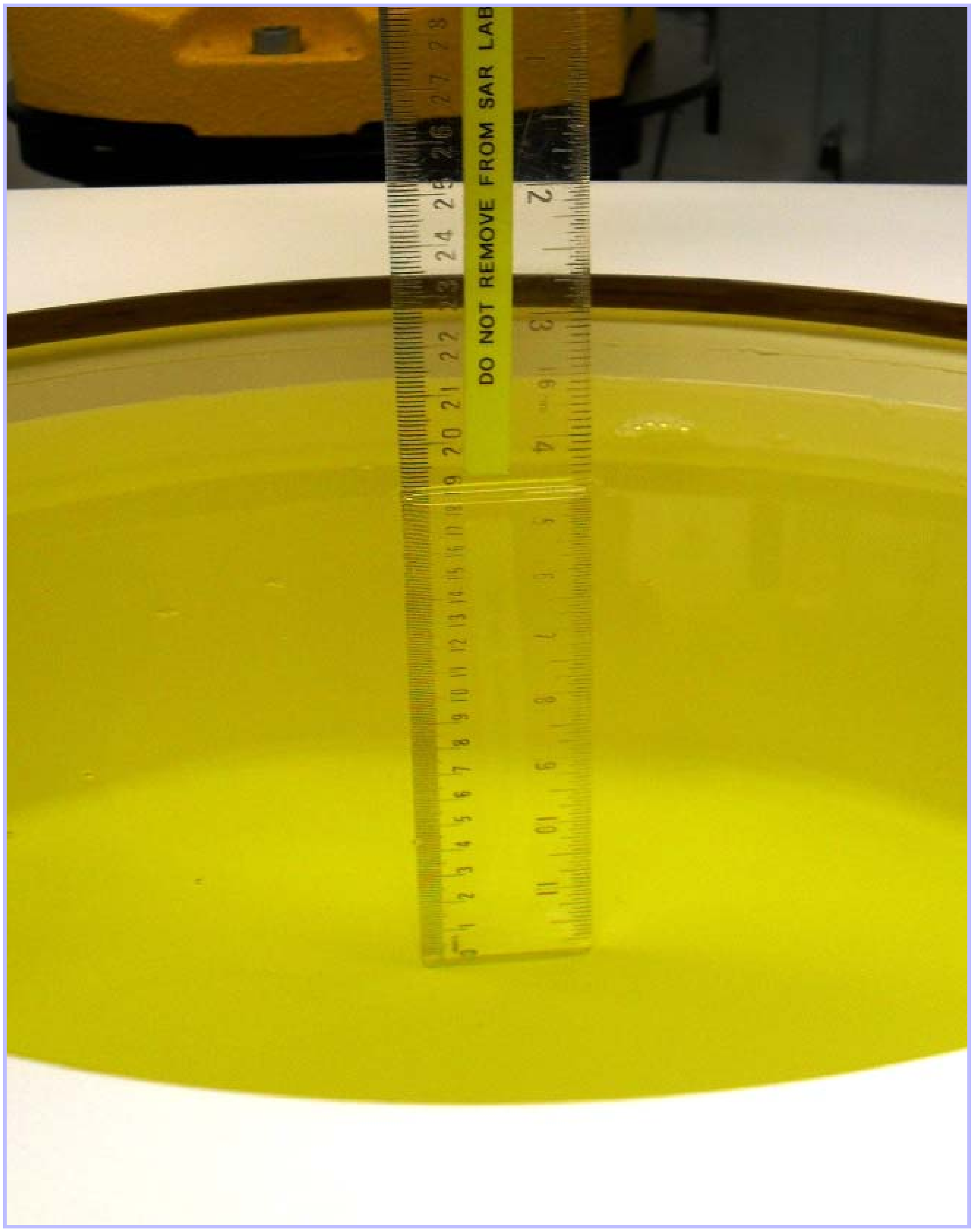
PHT/80671JD01/009: 900 MHz Body Fluid Level



PHT/80671JD01/010: 1900 MHz Body Fluid Level



PHT/80671JD01/011: 2450 MHz Body Fluid Level



Appendix 5. System Check

Prior to the assessment, the system was verified in the flat region of the phantom. 900 MHz and 1900 MHz dipoles were used. A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±5% for the 900 MHz and 1900 MHz dipoles.

The applicable verification normalised to 1 Watt.

Date: 27/01/2011
Validation Dipole and Serial Number: D900V2; SN: 185

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	24.0 ºC	24.1 ºC	ε_r	55.00	54.18	-1.50	5.00
				σ	1.05	1.09	3.82	5.00
				1g SAR	11.00	11.44	4.00	5.00
				10g SAR	7.16	7.40	3.35	5.00

Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	ε_r	54.50
			σ	1.05
189	Middle	836.4	ε_r	54.40
			σ	1.05
251	High	848.8	ε_r	54.30
			σ	1.06

System Check (Continued) Date: 25/01/2011 Validation Dipole and Serial Number: D1900V2; SN: 540								
Simulant	**Frequency (MHz)**	**Room Temp**	**Liquid Temp**	**Parameters**	**Target Value**	**Measured Value**	**Deviation (%)**	**Limit (%)**
Body	1900	24.0 ºC	24.0 ºC	ε_r	53.30	51.40	-3.56	5.00
				σ	1.52	1.57	3.26	5.00
				1g SAR	40.90	40.40	-1.22	5.00
				10g SAR	21.50	21.12	-1.77	5.00

Dielectrics for Frequencies Tested				
Channel Number	**Channel Description**	**Frequency (MHz)**	**Parameters**	
512	Low	1850.2	ε_r	51.50
			σ	1.53
661	Middle	1880	ε_r	51.40
			σ	1.56
810	High	1909.8	ε_r	51.40
			σ	1.58

Appendix 6. Simulated Tissues

The body mixture consists of water, Polysorbate 20 and salt. Visual inspection is made to ensure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

Ingredient	Frequency
	835/850/900 MHz Body
De-Ionized Water	71.30
Polysorbate 20 (Tween 20)	28.00
Salt	0.70

Ingredient	Frequency
	1800/1900 MHz Body
De-Ionized Water	71.50
Polysorbate 20 (Tween 20)	28.00
Salt	0.50

Appendix 7. DASY4 System Details

A.7.1. DASY4 SAR Measurement System

RFI Global Services Ltd, SAR measurement facility utilises the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, and the SAM phantom containing brain or muscle equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller; teach pendant (Joystick), and remote control. This is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. The data acquisition electronics (DAE) performs signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection etc. The DAE is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilises a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching mulitplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

A.7.2. DASY4 SAR System Specifications	
Robot System	
Positioner:	Stäubli Unimation Corp. Robot Model: RX90L
Repeatability:	0.025 mm
No. of Axis:	6
Serial Number:	F00/SD89A1/A/01
Reach:	1185 mm
Payload:	3.5 kg
Control Unit:	CS7
Programming Language:	V+
Data Acquisition Electronic (DAE) System	
Serial Number:	DAE3 SN:394
PC Controller	
PC:	Dell Precision 340
Operating System:	Windows 2000
Data Card:	DASY4 Measurement Server
Serial Number:	1080
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converted and control logic.
Software:	DASY4 Software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock.
PC Interface Card	
Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 nit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.

DASY4 SAR System Specifications (Continued)	
E-Field Probe	
Model:	EX3DV3
Serial No:	3508
Construction:	Triangular core
Frequency:	10 MHz to >6 GHz
Linearity:	±0.2 dB (30 MHz to 6 GHz)
Probe Length (mm):	330
Probe Diameter (mm):	12
Tip Length (mm):	20
Tip Diameter (mm):	2.5
Sensor X Offset (mm):	1
Sensor Y Offset (mm):	1
Sensor Z Offset (mm):	1
Phantom	
Phantom:	OVAL Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm
Phantom	
Phantom:	SAM Phantom
Shell Material:	Fibreglass
Thickness:	2.0 ±0.1 mm