

# TEST REPORT FROM RFI GLOBAL SERVICES LTD

**Test of: GeoSKeeper Model Q**

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

**Test Report Serial No:  
RFI-SAR-RP81245JD06A 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:**

**13 December 2011**

**Test Dates:**

**23 September to 02 December 2011**

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## TABLE OF CONTENTS

1. Customer Information .....	4
2. Equipment Under Test (EUT) .....	5
3. Test Specification, Methods and Procedures .....	8
4. Deviations from the Test Specification.....	9
5. Operation and Configuration of the EUT during Testing .....	10
6. Summary of Test Results .....	12
7. Measurements, Examinations and Derived Results.....	13
8. Measurement Uncertainty .....	21
Appendix 1. Test Equipment Used.....	26
Appendix 2. Measurement Methods.....	29
Appendix 3. SAR Distribution Scans .....	31
Appendix 4. Photographs .....	53
Appendix 5. Validation of System .....	66
Appendix 6. Simulated Tissues .....	69
Appendix 7. DASY4 System Details .....	70

## 1. Customer Information

<b>Company Name:</b>	Aerotel Medical Systems Ltd.
<b>Address:</b>	5 Hazoref St. Holon 58856 Israel

## 2. Equipment Under Test (EUT)

### 2.1. Identification of Equipment Under Test (EUT)

Description:	Wearable Mobile Safety and Tracking Device
Brand Name:	GeoSKeeper
Model Name or Number:	Model Q
Serial Number:	803024
IMEI Number:	357464031802488
Hardware Version Number:	2.4
Software Version Number:	1.6.4-X.X.X
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	VZU-GEOSKEEPER-Q
Country of Manufacture:	None Stated
Date of Receipt:	22 September 2011

### 2.2. Description of EUT

The Equipment Under Test is a Wearable Mobile Safety and Tracking Device with 2G Quad Band (850/900/1800/1900 MHz). The EUT has GPRS Class 10 mode and GPS capabilities.

### 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:

<b>Description:</b>	Battery
<b>Brand Name:</b>	VARTA PoLiflex
<b>Model Name or Number:</b>	None Stated
<b>Serial Number:</b>	None Stated
<b>Cable Length and Type:</b>	Not Applicable
<b>Country of Manufacture:</b>	None Stated
<b>Connected to Port</b>	2 Pin Plug Contact Unique to Manufacturer

#### 2.5. Support Equipment

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

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

2.6. Additional Information Related to Testing			
<b>Equipment Category</b>	GSM850/GPRS850, PCS1900/GPRS1900		
<b>Type of Unit</b>	Portable Transceiver		
<b>Intended Operating Environment:</b>	Within GSM Coverage.		
<b>Transmitter Maximum Output Power Characteristics:</b>	GSM850	Communication Test Set was configured to allow the EUT to transmit at a maximum Using Power Control Level (PCL = 5 with a maximum power of up to 33.0 dBm).	
	PCS1900	Communication Test Set was configured to allow the EUT to transmit at a maximum Using Power Control Level (PCL = 0 with a maximum power of up to 30.0 dBm).	
<b>Transmitter Frequency Range:</b>	GSM850	824 to 849 MHz	
	PCS1900	1850 to 1910 MHz	
<b>Transmitter Frequency Allocation of EUT When Under Test:</b>	<b>Channel Number</b>	<b>Channel Description</b>	<b>Frequency (MHz)</b>
	128	Low	824.2
	189	Middle	836.4
	251	High	848.8
	512	Low	1850.2
	660	Middle	1879.8
	810	High	1909.8
<b>Modulation(s):</b>	GMSK (GSM/ GPRS): 217 Hz		
<b>Modulation Scheme (Crest Factor):</b>	GMSK (GSM): 8.3 GMSK (GPRS): 4		
<b>Antenna Type:</b>	Internal Integral		
<b>Antenna Length:</b>	Unknown		
<b>Number of Antenna Positions:</b>	1 Fixed		
<b>Power Supply Requirement:</b>	3.7V		
<b>Battery Type(s):</b>	Li-ion		

### 3. Test Specification, Methods and Procedures

#### 3.1. Test Specification

<b>Reference:</b>	OET Bulletin 65 Supplement C: (2001-01)
<b>Title:</b>	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
<b>Purpose of Test:</b>	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 known precision", IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

KDB 447498 D01 Mobile Portable RF Exposure v04

KDB 941225 D03 " SAR Test Reduction GSM/GPRS/EDGE v01"

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 SN:1528 was performed at the spot frequencies of 750 MHz and 900 MHz and the probe calibration for SN:1611 was performed at spot frequencies of 835 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 validation is applicable for the 850 band as this is within 50 MHz of the 850 MHz spot frequency.

#### 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 447498 D01 "Mobile Portable RF Exposure v04", KDB 941225 D03 "SAR Test Reduction GSM/GPRS/EDGE v01" according to the handset procedures in IEEE Std 1528-2003, OET Bulletin 65 Supplement C 01-01.

The Device is wrist-worn with the capability to use in voice call; therefore SAR test was performed in the in-front-of-mouth configuration at 10mm as per FCC KDB inquiry number 895849. See Appendix 4 for setup illustrations.

## 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 Call allocated mode with Communication Test Set was configured to allow the EUT to transmit at a maximum Using Power Control Level (PCL = 5 with a maximum power of up to 33.0 dBm).
- GPRS850 Data allocated mode with Communication Test Set was configured to allow the EUT to transmit at a maximum Using Power Control Level (PCL = 5 with a maximum power of up to 33.0 dBm). With 2-Uplink time slots.
- PCS1900 Call allocated mode with Communication Test Set was configured to allow the EUT to transmit at a maximum Using Power Control Level (PCL = 0 with a maximum power of up to 30.0 dBm).
- GPRS1900 Data allocated mode with Communication Test Set was configured to allow the EUT to transmit at a maximum Using Power Control Level (PCL = 0 with a maximum power of up to 30.0 dBm). With 2-Uplink time slots.

(PCL) Power Setting Table:

GSM850 – UPLINK Power Table Settings used for Test Set	
Power Control Level (PCL)	Nominal Power (dBm)
0 ... 2	39
3	37
4	35
<b>5</b>	<b>33</b>
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

Upper Tolerance for PCL 5 per tune-up +0.5 dB

PCS1900 – UPLINK Power Table Settings used for Test Set	
Power Control Level (PCL)	Nominal Power (dBm)
22 ... 29	Reserved
30	33
31	32
<b>0</b>	<b>30</b>
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

Upper Tolerance for PCL 0 per tune-up +1.0 dB

## 5.2. Configuration and Peripherals

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

- Standalone battery powered with EUT transmitting at maximum power.
- The applied configurations for In-front-of-mouth orientations with the corresponding surface, 'Front' is closest to the user with the most conservative exposure condition was evaluated at 10mm separation.
- The applied configurations for Wrist-worn orientations with the corresponding surface, 'Rear' is closest to the user with the most conservative exposure condition was evaluated at 0mm separation.

### In-front-of-mouth and Wrist 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 'SAM' 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 EUT was gradually moved towards the flat section of the 'SAM' phantom until any point of the EUT touched the phantom.
- d) For position(s) greater than 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 full power throughout the duration of the test powered by a fully charged battery.

## 6. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate-GSM 850 In-Front-of-Mouth Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 850 Wrist Configuration 10g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GSM 850 Wrist Configuration 10g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS 1900 In-Front-of-Mouth Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 1900 Wrist Configuration 10g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS 1900 Wrist Configuration 10g	OET Bulletin 65 Supplement C: (2001-01)	Complied

## SAR Individual Transmitter Evaluation

device, mode	Frequency, (MHz)	P <sub>x</sub> (mW)	P <sub>REF</sub> (mW)	Maximum Measure SAR level (W/kg)	Remarks
WWAN, GSM	850	1841	60/f	3.000	Routine Evaluation
WWAN, GSM	1900	1084	60/f	2.050	Routine Evaluation

### Note(s):

Simultaneous transmission evaluation was not required as the EUT does not support this feature.

## 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 In-Front-of-Mouth Configuration 1g

**Test Summary:**

Tissue Volume:	1g
Maximum Level Measured (W/kg):	0.502
Maximum Level Scaled (Upper Limit) (W/kg):	0.632

**Environmental Conditions:**

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

**SAR Limit = 1.6W/kg**

**Results:**

EUT Position	Phantom Configuration	Channel Number	Conducted Power (mW)	SAR Measured Level (W/kg) Note: 2, 3	Upper Limit Max Power From Tune-up <sup>1</sup> (mW)	SAR Scaled Max Level <sup>1</sup> (W/kg) Note: 2, 3
Front of EUT Facing Phantom	Flat (SAM)	189	1778	0.502	2239	0.632

**Note(s):**

1. The Upper tolerances (+0.5dB) => Upper Max Power = 2239mW = 33.5dBm
2. Test Performed with Front of EUT 10mm from Phantom flat section
3. Head Simulation Liquid used as configuration is for In-Front-of-Mouth

### 7.2.2. Specific Absorption Rate - GPRS 850 Wrist-Worn Configuration 10g

**Test Summary:**

<b>Tissue Volume:</b>	10g
<b>Maximum Level Measured (W/kg):</b>	3.000
<b>Maximum Level Scaled (Upper Limit) (W/kg):</b>	3.777

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	23.0 to 23.0
<b>Temperature Variation in Liquid (°C):</b>	23.0 to 23.0

**SAR Limit = 4.0W/kg**

**Results:**

EUT Position	Phantom Configuration	Channel Number	Conducted Power (mW)	SAR Measured Level (W/kg)	Upper Limit Max Power From Tune-up <sup>1</sup> (mW)	SAR Scaled Max Level <sup>1</sup> (W/kg)
Rear of EUT Facing Phantom	Flat (SAM)	128	1698	2.770	2239	3.652
<b>Rear of EUT Facing Phantom</b>	<b>Flat (SAM)</b>	<b>189</b>	<b>1778</b>	<b>3.000</b>	<b>2239</b>	<b>3.777</b>
Rear of EUT Facing Phantom	Flat (SAM)	251	1905	2.980	2239	3.501

**Note(s):**

1. The Upper tolerances (+0.5dB) => Upper Max Power = 2239mW = 33.5dBm

### 7.2.3. Specific Absorption Rate - GSM 850 Wrist-Worn Configuration 10g

**Test Summary:**

<b>Tissue Volume:</b>	10g
<b>Maximum Level Measured (W/kg):</b>	2.310
<b>Maximum Level Scaled (Upper Limit) (W/kg):</b>	2.908

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	23.0 to 23.0
<b>Temperature Variation in Liquid (°C):</b>	23.0 to 23.0

**SAR Limit = 4.0W/kg**

**Results:**

EUT Position	Phantom Configuration	Channel Number	Conducted Power (mW)	SAR Measured Level (W/kg)	Upper Limit Max Power From Tune-up <sup>1</sup> (mW)	SAR Scaled Max Level <sup>1</sup> (W/kg)
Rear of EUT Facing Phantom	Flat (SAM)	128	1698	1.930	2239	2.544
<b>Rear of EUT Facing Phantom</b>	<b>Flat (SAM)</b>	<b>189</b>	<b>1778</b>	<b>2.310</b>	<b>2239</b>	<b>2.908</b>
Rear of EUT Facing Phantom	Flat (SAM)	251	1905	2.280	2239	2.679

**Note(s):**

1. The Upper tolerances (+0.5dB) => Upper Max Power = 2239mW = 33.5dBm

### 7.2.4. Specific Absorption Rate – PCS1900 In-Front-of-Mouth Configuration 1g

**Test Summary:**

<b>Tissue Volume:</b>	1g
<b>Maximum Level Measured (W/kg):</b>	0.932
<b>Maximum Level Scaled (Upper Limit) (W/kg):</b>	1.261

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	23.0 to 23.0
<b>Temperature Variation in Liquid (°C):</b>	23.0 to 23.0

**SAR Limit = 1.6W/kg**

**Results:**

EUT Position	Phantom Configuration	Channel Number	Conducted Power (mW)	SAR Measured Level (W/kg) Note: 2, 3	Upper Limit Max Power From Tune-up <sup>1</sup> (mW)	SAR Scaled Max Level <sup>1</sup> (W/kg) Note: 2, 3
Front of EUT Facing Phantom	Flat (SAM)	512	1000	0.932	1259	1.173
Front of EUT Facing Phantom	Flat (SAM)	660	1000	0.926	1259	1.166
Front of EUT Facing Phantom	Flat (SAM)	810	891	0.893	1259	1.261

**Note(s):**

1. The Upper tolerances (+1.0dB) => Upper Max Power = 1259mW = 31dBm
2. Test Performed with Front of EUT 10mm from Phantom flat section
3. Head Simulation Liquid used as configuration is for In-Front-of-Mouth

### 7.2.5. Specific Absorption Rate - GPRS 1900 Wrist-Worn Configuration 10g

**Test Summary:**

<b>Tissue Volume:</b>	10g
<b>Maximum Level Measured (W/kg):</b>	2.050
<b>Maximum Level Scaled (Upper Limit) (W/kg):</b>	2.848

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	23.0 to 23.0
<b>Temperature Variation in Liquid (°C):</b>	23.0 to 23.0

**SAR Limit = 4.0W/kg**

**Results:**

EUT Position	Phantom Configuration	Channel Number	Conducted Power (mW)	SAR Measured Level (W/kg)	Upper Limit Max Power From Tune-up <sup>1</sup> (mW)	SAR Scaled Max Level <sup>1</sup> (W/kg)
Rear of EUT Facing Phantom	Flat (SAM)	512	977	2.050	1259	2.641
Rear of EUT Facing Phantom	Flat (SAM)	660	977	2.000	1259	2.576
Rear of EUT Facing Phantom	Flat (SAM)	810	871	1.970	1259	2.848

**Note(s):**

1. The Upper tolerances (+1.0dB) => Upper Max Power = 1259mW = 31dBm

### 7.2.6. Specific Absorption Rate - PCS 1900 Wrist-Worn Configuration 10g

**Test Summary:**

<b>Tissue Volume:</b>	10g
<b>Maximum Level Measured (W/kg):</b>	1.380
<b>Maximum Level Scaled (Upper Limit) (W/kg):</b>	1.822

**Environmental Conditions:**

<b>Temperature Variation in Lab (°C):</b>	23.0 to 23.0
<b>Temperature Variation in Liquid (°C):</b>	23.0 to 23.0

**SAR Limit = 4.0W/kg**

**Results:**

EUT Position	Phantom Configuration	Channel Number	Conducted Power (mW)	SAR Measured Level (W/kg)	Upper Limit Max Power From Tune-up <sup>1</sup> (mW)	SAR Scaled Max Level <sup>1</sup> (W/kg)
Rear of EUT Facing Phantom	Flat (SAM)	512	1000	1.340	1259	1.737
Rear of EUT Facing Phantom	Flat (SAM)	600	1000	1.380	1259	1.687
Rear of EUT Facing Phantom	Flat (SAM)	810	891	1.290	1259	1.822

**Note(s):**

1. The Upper tolerances (+1.0dB) => Upper Max Power = 1259mW = 31dBm

### 7.2.7.Conducted Power Measurement

Channel Number	Frequency (MHZ)	GSM Conducted 0.5 dB path loss Power (dBm)	GPRS Conducted + 0.5 dB path loss Power (dBm)		Time Slot Average Burst Power GPRS Conducted + 0.5 dB path loss Power (dBm)	
			1 Time Slot	2 Time Slots	1 Time Slot <sup>1</sup>	2 Time Slots <sup>2</sup>
128	824.2	32.3	32.3	32.3	23.3	26.3
189	836.4	32.5	32.5	32.5	23.5	26.5
251	848.8	32.8	32.8	32.8	23.8	26.8
512	1850.2	30.0	29.9	29.9	20.9	23.9
660	1879.8	30.0	29.9	29.9	20.9	23.9
810	1909.8	29.5	29.4	29.4	20.4	23.4

#### Note(s):

##### Scale factor for uplink time slot:

- 1 Uplink: time slot ratio = 8:1 =>  $10 \log(8/1) = 9.00 \text{ dB}$
- 2 Uplink: time slot ratio = 8:2 =>  $10 \log(8/2) = 6.02 \text{ dB}$

## 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 In-Front-of-Mouth Configuration 1g	95%	19.94%
Specific Absorption Rate-GSM /GPRS / 850 Wrist Configuration 10g	95%	18.53%
Specific Absorption Rate-PCS 1900 In-Front-of-Mouth Configuration 1g	95%	20.72%
Specific Absorption Rate-PCS / GPRS / 1900 Wrist Configuration 10g	95%	18.38%

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 Uncertainty - GSM 850 In-Front-of-Mouth Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	C <sub>i</sub> (10g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	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	0.160	0.160	normal (k=1)	1.0000	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	2.400	2.400	normal (k=1)	1.0000	1.0000	2.400	2.400	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)	4.920	4.920	normal (k=1)	1.0000	0.6400	3.149	3.149	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.970	4.970	normal (k=1)	1.0000	0.6000	2.982	2.982	5
	Combined standard uncertainty			t-distribution			10.17	10.17	>250
	Expanded uncertainty			k = 1.96			19.94	19.94	>250

## 8.2. Specific Absorption Rate-GSM / GPRS / 850 Wrist Configuration 10g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	c <sub>i</sub> (10g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	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	0.160	0.160	normal (k=1)	1.0000	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	1.900	1.900	normal (k=1)	1.0000	1.0000	1.900	1.900	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	0.4300	1.241	1.241	∞
A	Liquid Conductivity (measured value)	4.690	4.690	normal (k=1)	1.0000	0.4300	2.017	2.017	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.4900	1.415	1.415	∞
A	Liquid Permittivity (measured value)	4.860	4.860	normal (k=1)	1.0000	0.4900	2.381	2.381	5
	Combined standard uncertainty			t-distribution			9.46	9.46	>500
	Expanded uncertainty			k = 1.96			18.53	18.53	>500

### 8.3. Specific Absorption Rate- PCS 1900 In-Front-of-Mouth Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	c <sub>i</sub> (10g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	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	0.160	0.160	normal (k=1)	1.0000	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	3.800	3.800	normal (k=1)	1.0000	1.0000	3.800	3.800	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)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.880	4.880	normal (k=1)	1.0000	0.6000	2.928	2.928	5
	Combined standard uncertainty			t-distribution			10.57	10.57	>200
	Expanded uncertainty			k = 1.96			20.72	20.72	>200

#### 8.4. Specific Absorption Rate-PCS / GPRS / 1900 Wrist Configuration 10g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	c <sub>i</sub> (10g)	Standard Uncertainty		v <sub>i</sub> or v <sub>eff</sub>
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	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	0.160	0.160	normal (k=1)	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	1.200	1.200	normal (k=1)	1.0000	1.0000	1.200	1.200	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	0.4300	1.241	1.241	∞
A	Liquid Conductivity (measured value)	4.940	4.940	normal (k=1)	1.0000	0.4300	2.124	2.124	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.4900	1.415	1.415	∞
A	Liquid Permittivity (measured value)	4.980	4.980	normal (k=1)	1.0000	0.4900	2.440	2.440	5
	Combined standard uncertainty			t-distribution			9.38	9.38	>500
	Expanded uncertainty			k = 1.96			18.38	18.38	>500

### 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	-	-
A1234	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	450	09 Feb 2011	12
A1235	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	124	09 Feb 2011	24
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	08 Feb 2011	24
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b	001	Calibrated before use	-
L1036	Probe	Schmid & Partner Engineering AG	ET3 DV6	1611	12 May 2011	12
A1185	Probe	Schmid & Partner Engineering AG	ET3 DV6	1528	18 Jul 2011	12
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	-	-
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-

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	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1159*	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 15 August 2011	4
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1044	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/019	26 May 2011	12
M265	Diode Power Sensor	Rohde & Schwarz	NRV-Z1	893350/017	26 May 2011	12
M263	Dual Channel Power Meter	Rohde & Schwarz	NRVD	826558/004	25 May 2011	12
M509	Thermometer	Testo 110 Immersion Probe & Thermometer	Testo 110	03100047	25 May 2011	12
M1270	Digital Thermometer	RS	N/A	N/A	Internal Checked 13 May 2011	12
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-

### **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.

Asset: A1235 Checked by *DK*  
21/02/2011

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

Client

**RFI**

Certificate No: **D900V2-124 Feb11**

## CALIBRATION CERTIFICATE

Object **D900V2 - SN: 124**

Calibration procedure(s) **QA CAL-05.v8**  
Calibration procedure for dipole validation kits

Calibration date: **February 09, 2011**

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 ( $22 \pm 3$ )°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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by: Name **Dimce Iliev** Function **Laboratory Technician**

*D. Iliev*

Approved by: Name **Katja Pokovic** Function **Technical Manager**

*K. Pokovic*

Issued: February 9, 2011

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



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
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.

<b>DASY Version</b>	DASY5	V52.6
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V4.9	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	$dx, dy, dz = 5 \text{ mm}$	
<b>Frequency</b>	$900 \text{ MHz} \pm 1 \text{ MHz}$	

## Head TSL parameters

The following parameters and calculations were applied.

	<b>Temperature</b>	<b>Permittivity</b>	<b>Conductivity</b>
<b>Nominal Head TSL parameters</b>	22.2 °C	41.5	0.97 mho/m
<b>Measured Head TSL parameters</b>	$(22.0 \pm 0.2) \text{ °C}$	$40.3 \pm 6 \text{ %}$	$0.95 \text{ mho/m} \pm 6 \text{ %}$
<b>Head TSL temperature during test</b>	$(21.5 \pm 0.2) \text{ °C}$	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	<b>Condition</b>	
SAR measured	250 mW input power	2.72 mW / g
SAR normalized	normalized to 1W	10.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>11.0 mW /g ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	<b>Condition</b>	
SAR measured	250 mW input power	1.74 mW / g
SAR normalized	normalized to 1W	6.96 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>7.01 mW /g ± 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	55.0	1.05 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	53.6 ± 6 %	1.05 mho/m ± 6 %
<b>Body TSL temperature during test</b>	(21.8 ± 0.2) °C	----	----

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.79 mW / g
SAR normalized	normalized to 1W	11.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	11.1 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.79 mW / g
SAR normalized	normalized to 1W	7.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	7.14 mW / g ± 16.5 % (k=2)

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.9 $\Omega$ - 8.2 $j\Omega$
Return Loss	- 21.6 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.1 $\Omega$ - 8.6 $j\Omega$
Return Loss	- 20.2 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.409 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 04, 2001

# DASY5 Validation Report for Head TSL

Date/Time: 09.02.2011 11:44:15

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:124**

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: HSL900

Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.95$  mho/m;  $\epsilon_r = 40.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.88, 5.88, 5.88); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

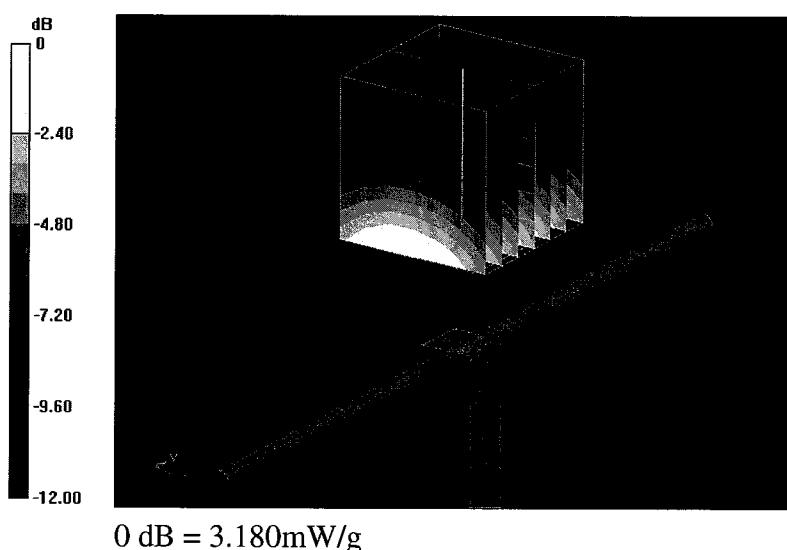
**Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.560 V/m; Power Drift = 0.03 dB

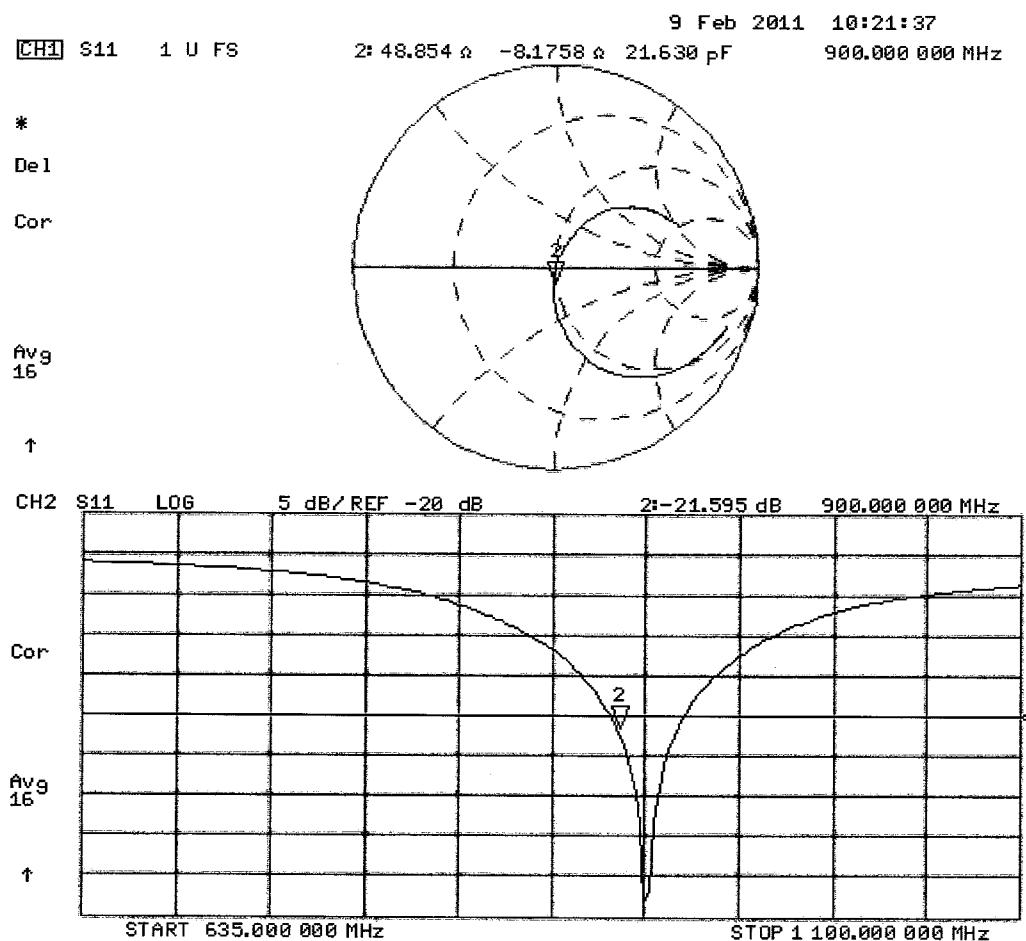
Peak SAR (extrapolated) = 4.135 W/kg

**SAR(1 g) = 2.72 mW/g; SAR(10 g) = 1.74 mW/g**

Maximum value of SAR (measured) = 3.183 mW/g



## Impedance Measurement Plot for Head TSL



# DASY5 Validation Report for Body TSL

Date/Time: 09.02.2011 14:54:48

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:124**

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: M900

Medium parameters used:  $f = 900$  MHz;  $\sigma = 1.05$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.81, 5.81, 5.81); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

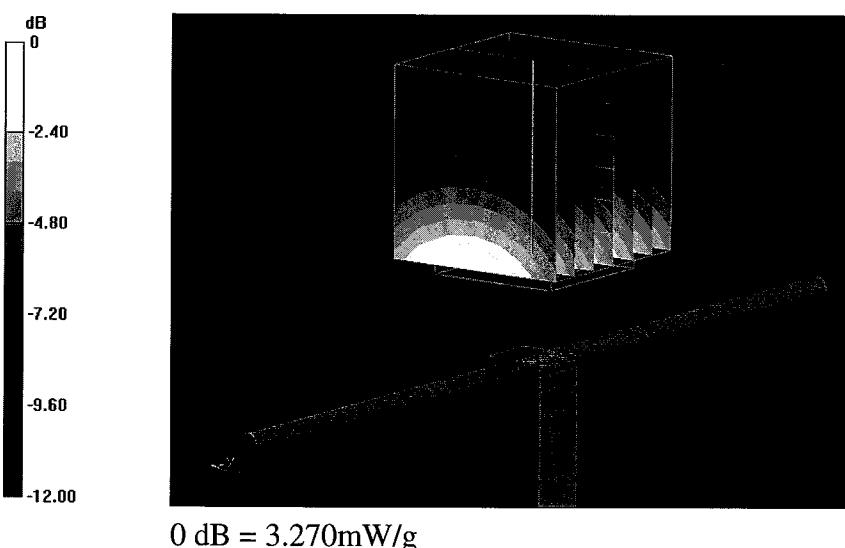
**Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.520 V/m; Power Drift = 0.01 dB

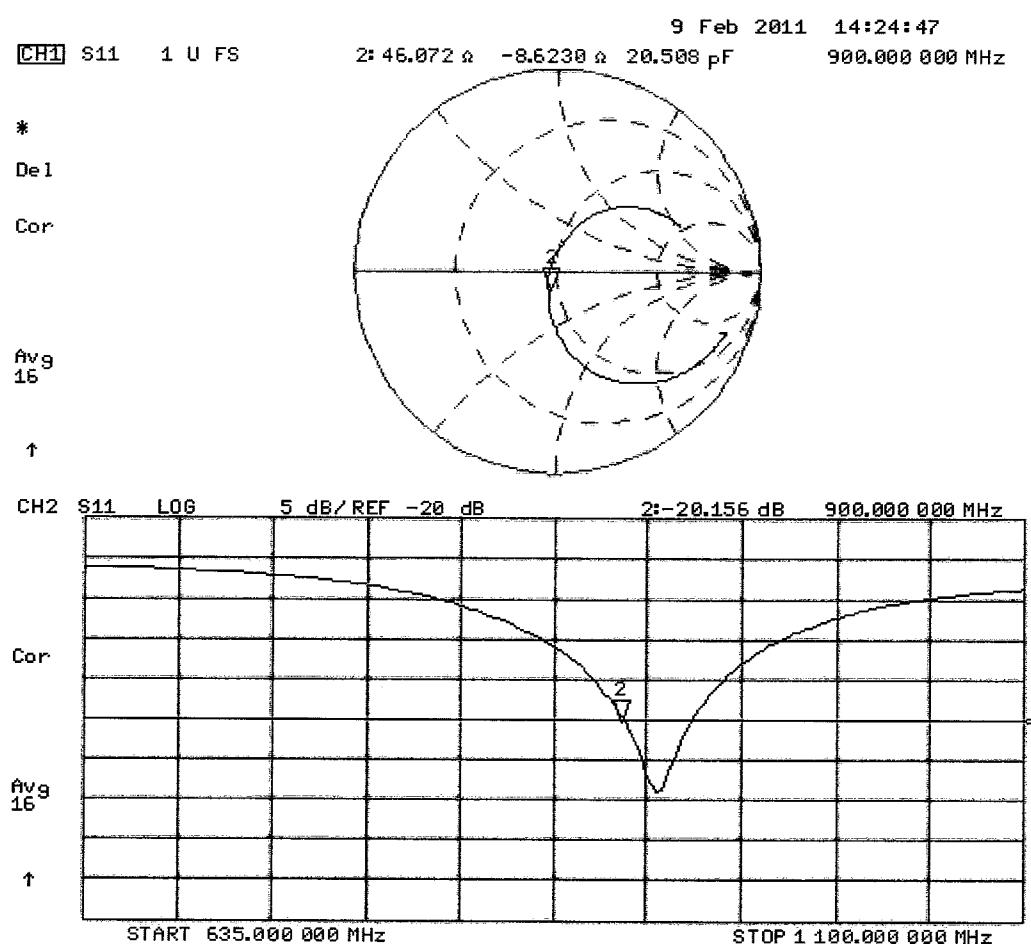
Peak SAR (extrapolated) = 4.203 W/kg

**SAR(1 g) = 2.79 mW/g; SAR(10 g) = 1.79 mW/g**

Maximum value of SAR (measured) = 3.271 mW/g



## Impedance Measurement Plot for Body TSL



Asset: A1237 - Checked by *KH*

21/02/2011

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

Client

RFI

Certificate No.: D1900V2-540\_Feb11

## CALIBRATION CERTIFICATE

Object D1900V2 - SN: 540

Calibration procedure(s)  
QA CAL-05.v8  
Calibration procedure for dipole validation kits

Calibration date: February 08, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by:	Name	Function	Signature
	Dimce Iliev	Laboratory Technician	<i>D. Iliev</i>
Approved by:	Katja Pokovic	Technical Manager	<i>K. Pokovic</i>

Issued: February 8, 2011

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



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
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.

<b>DASY Version</b>	DASY5	V52.6
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	<b>Temperature</b>	<b>Permittivity</b>	<b>Conductivity</b>
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	39.8 $\pm$ 6 %	1.41 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(21.0 $\pm$ 0.2) °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	<b>Condition</b>	
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	normalized to 1W	40.3 mW / g $\pm$ 17.0 % (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	<b>Condition</b>	
SAR measured	250 mW input power	5.25 mW / g
SAR normalized	normalized to 1W	21.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.0 mW / g $\pm$ 16.5 % (k=2)

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	53.3	1.52 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	52.8 ± 6 %	1.55 mho/m ± 6 %
<b>Body TSL temperature during test</b>	(21.2 ± 0.2) °C	----	----

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (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	normalized to 1W	<b>40.7 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.43 mW / g
SAR normalized	normalized to 1W	21.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>21.6 mW / g ± 16.5 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$50.5 \Omega + 4.2 j\Omega$
Return Loss	- 27.6 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$45.6 \Omega + 5.0 j\Omega$
Return Loss	- 23.1 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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: 07.02.2011 15:18:47

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 U12 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 39.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

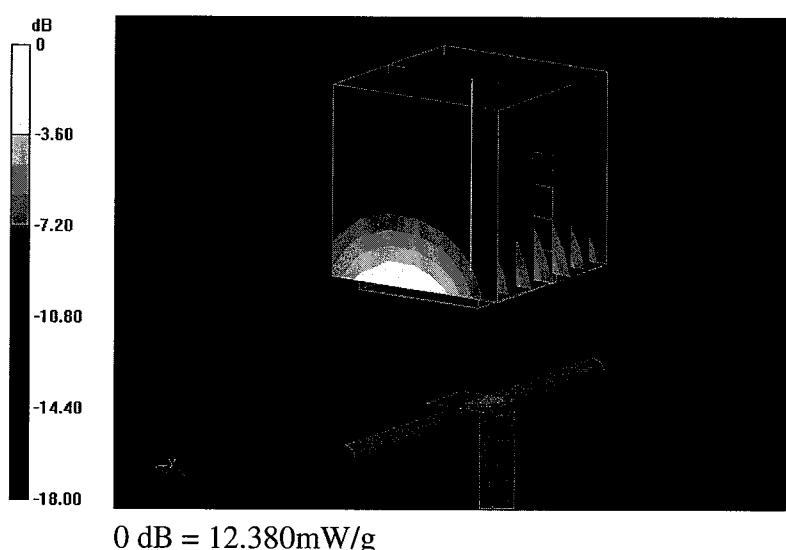
**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.936 V/m; Power Drift = 0.04 dB

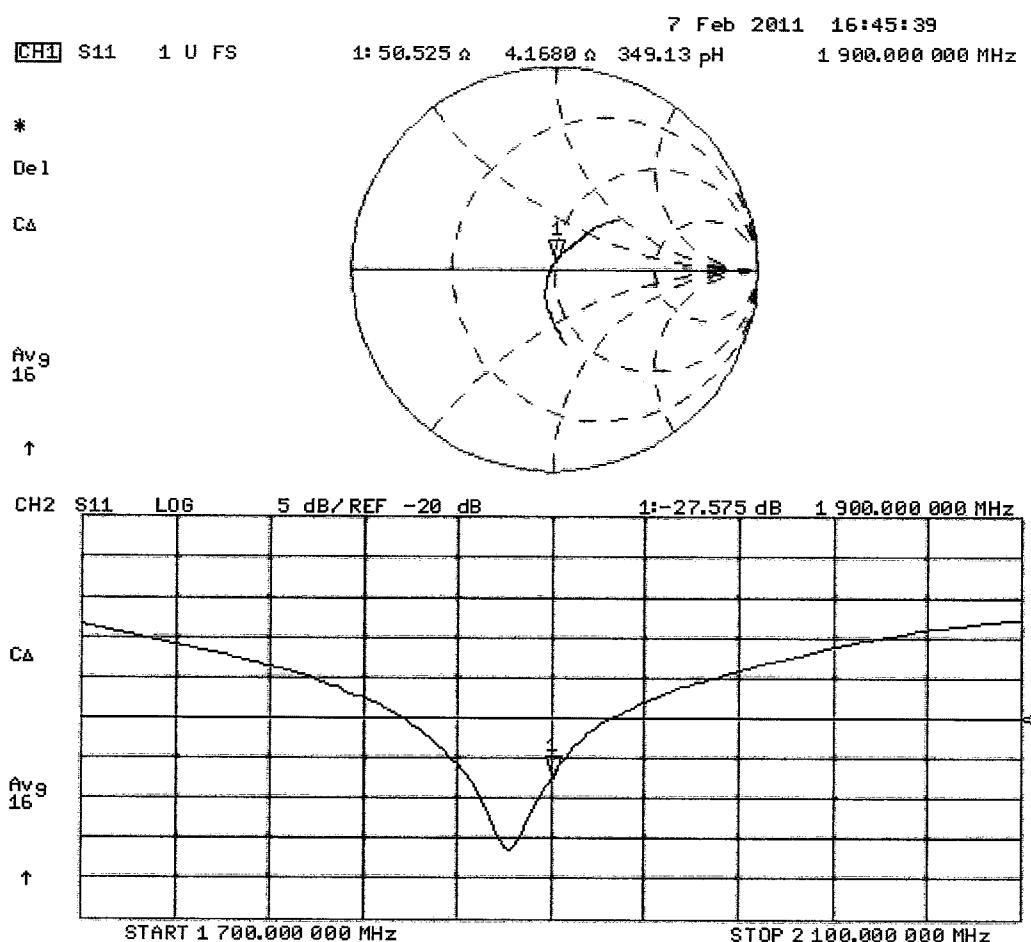
Peak SAR (extrapolated) = 18.544 W/kg

**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.25 mW/g**

Maximum value of SAR (measured) = 12.384 mW/g



## Impedance Measurement Plot for Head TSL



# DASY5 Validation Report for Body TSL

Date/Time: 08.02.2011 12:04:35

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 U12 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 52.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

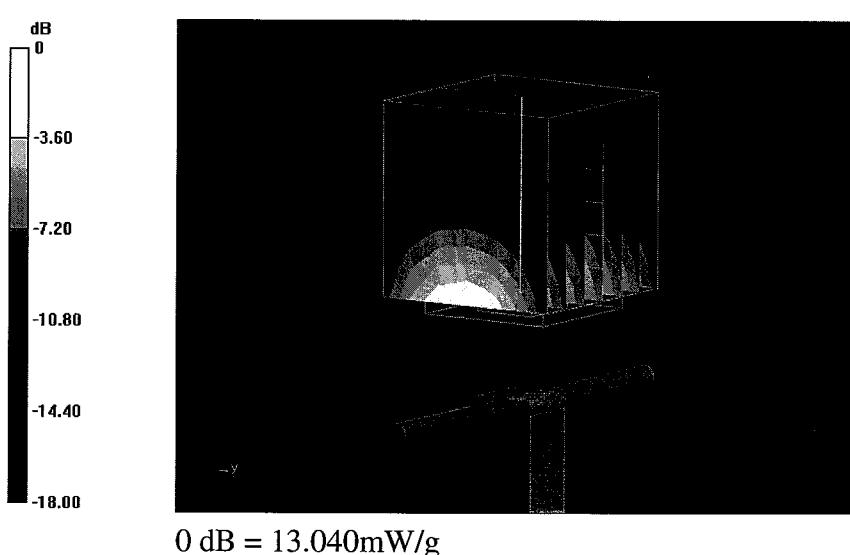
**Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.899 V/m; Power Drift = -0.03 dB

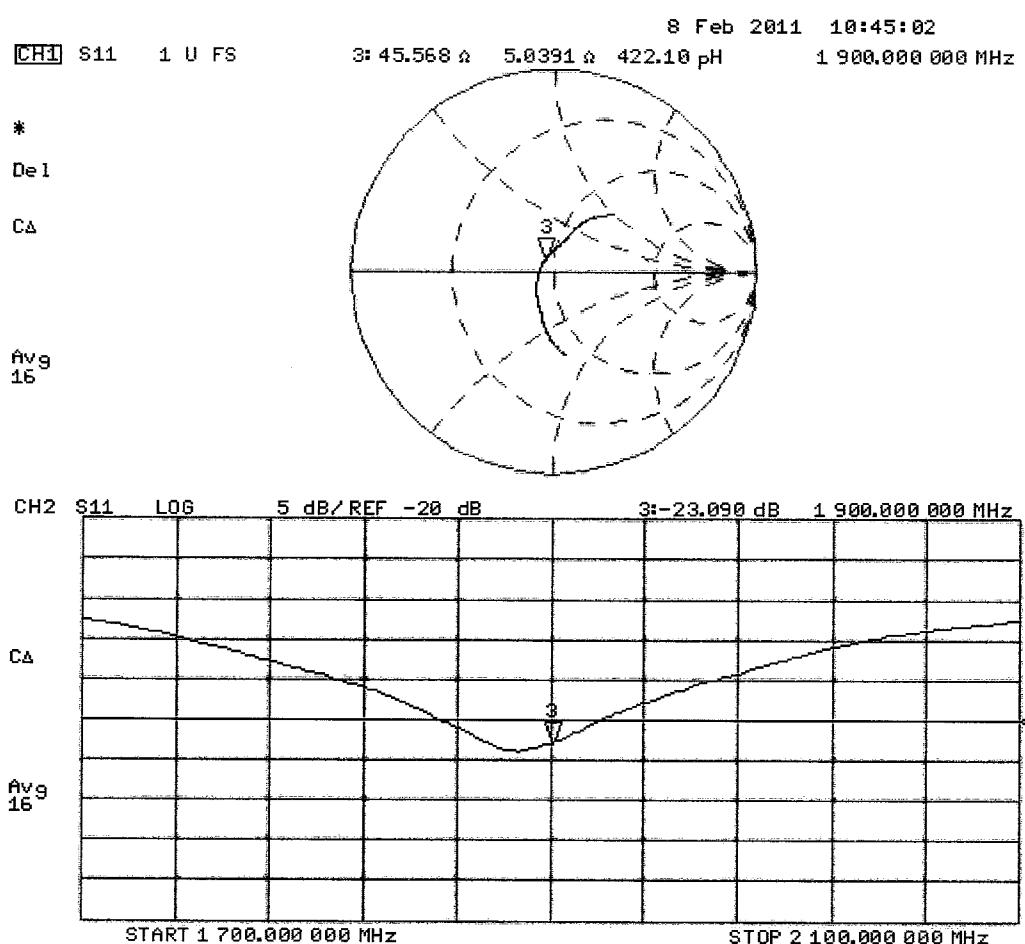
Peak SAR (extrapolated) = 17.597 W/kg

**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.43 mW/g**

Maximum value of SAR (measured) = 13.038 mW/g



## Impedance Measurement Plot for Body TSL



**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  
**Swiss Calibration Service**

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Accreditation No.: **SCS 108**

Client

**Sony Ericsson UK**

Certificate No: **ET3-1611\_May11**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1611**

Calibration procedure(s) **QA CAL-01.v7, QA CAL-23.v4, QA CAL-25.v3**  
 Calibration procedure for dosimetric E-field probes

Calibration date: **May 12, 2011**

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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
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-10)	In house check: Oct-11

Calibrated by:	Name <b>Jeton Kastrai</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	<b>Katja Pokovic</b>	Technical Manager	

Issued: May 16, 2011

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**Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

### **Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ 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:**

- 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
- 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:**

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)x,y,z = NORM<sub>x,y,z</sub> \* 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.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z** are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- VR**: VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- 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 *NORM<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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 ET3DV6

**SN:1611**

Manufactured: July 27, 2001  
Calibrated: May 12, 2011

**Calibrated for DASY/EASY Systems**  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1611

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.74	1.95	1.77	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	96.7	99.3	98.5	

### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	105.3	$\pm 2.7\%$
			Y	0.00	0.00	1.00	109.8	
			Z	0.00	0.00	1.00	104.6	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1611

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>f</sup>	Conductivity (S/m) <sup>f</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	41.5	0.90	6.51	6.51	6.51	0.64	2.00	± 12.0 %
900	41.5	0.97	6.41	6.41	6.41	0.66	1.94	± 12.0 %
1750	40.1	1.37	5.43	5.43	5.43	0.54	2.47	± 12.0 %
1900	40.0	1.40	5.23	5.23	5.23	0.55	2.40	± 12.0 %
2450	39.2	1.80	4.55	4.55	4.55	0.69	1.91	± 12.0 %

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## DASY/EASY - Parameters of Probe: ET3DV6- SN:1611

### Calibration Parameter Determined in Body Tissue Simulating Media

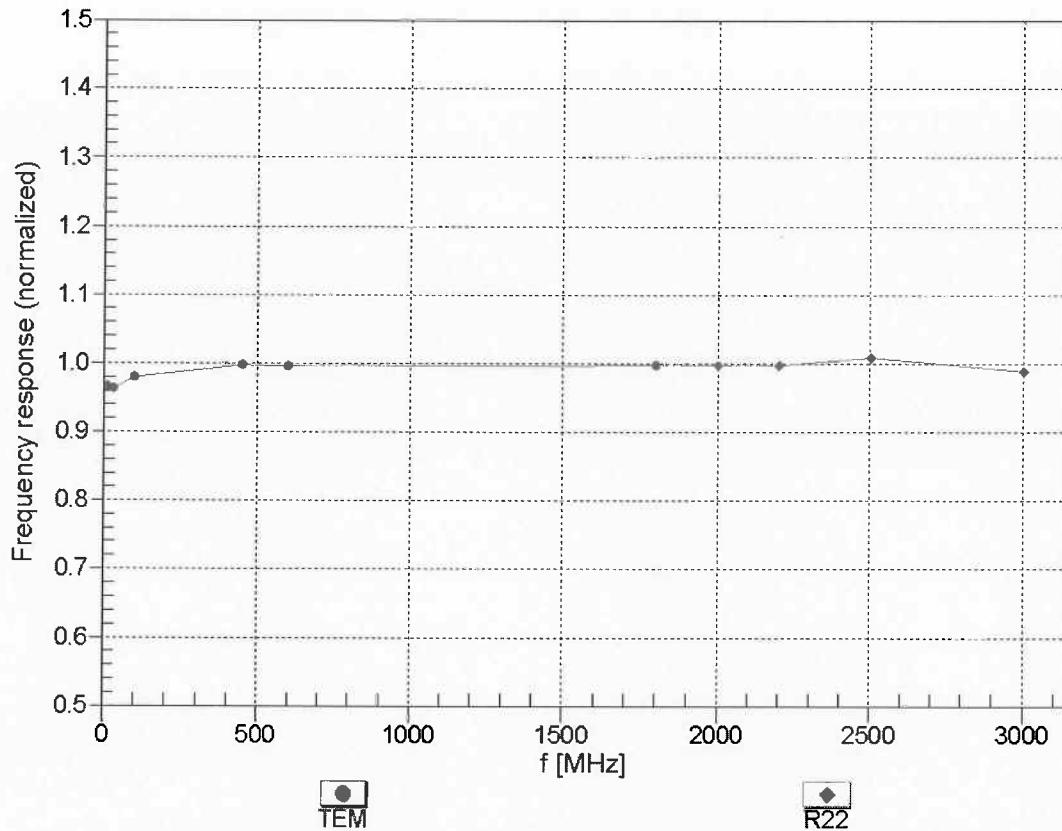
f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	6.40	6.40	6.40	0.72	1.90	± 12.0 %
900	55.0	1.05	6.32	6.32	6.32	0.75	1.85	± 12.0 %
1750	53.4	1.49	4.80	4.80	4.80	0.57	2.77	± 12.0 %
1900	53.3	1.52	4.55	4.55	4.55	0.57	2.59	± 12.0 %
2450	52.7	1.95	4.09	4.09	4.09	1.00	1.22	± 12.0 %

<sup>c</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## Frequency Response of E-Field

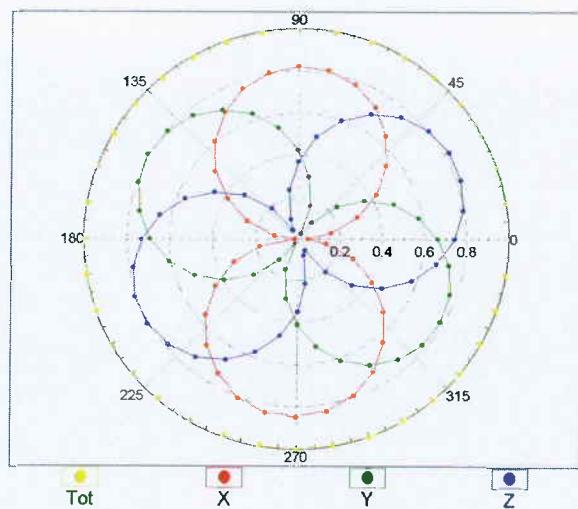
(TEM-Cell:ifi110 EXX, Waveguide: R22)



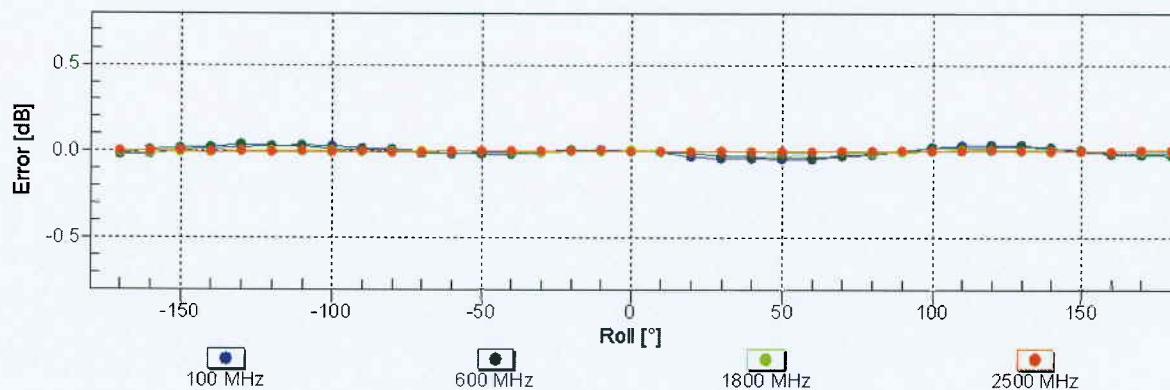
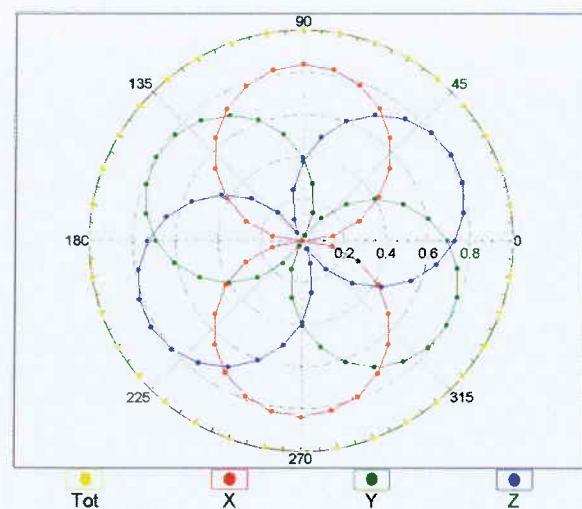
**Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )**

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM



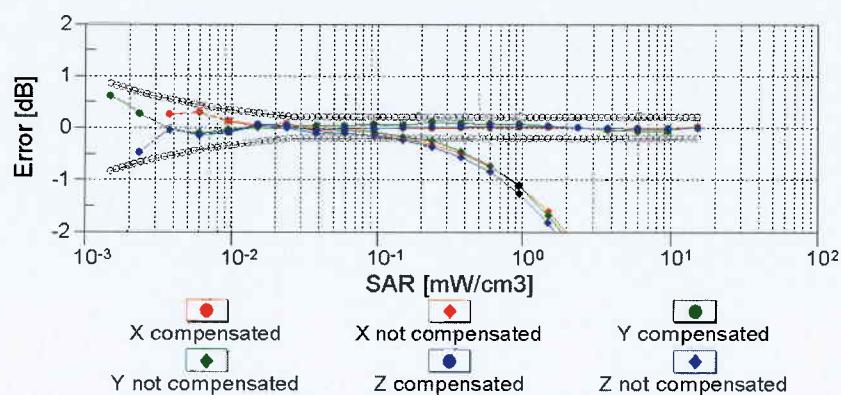
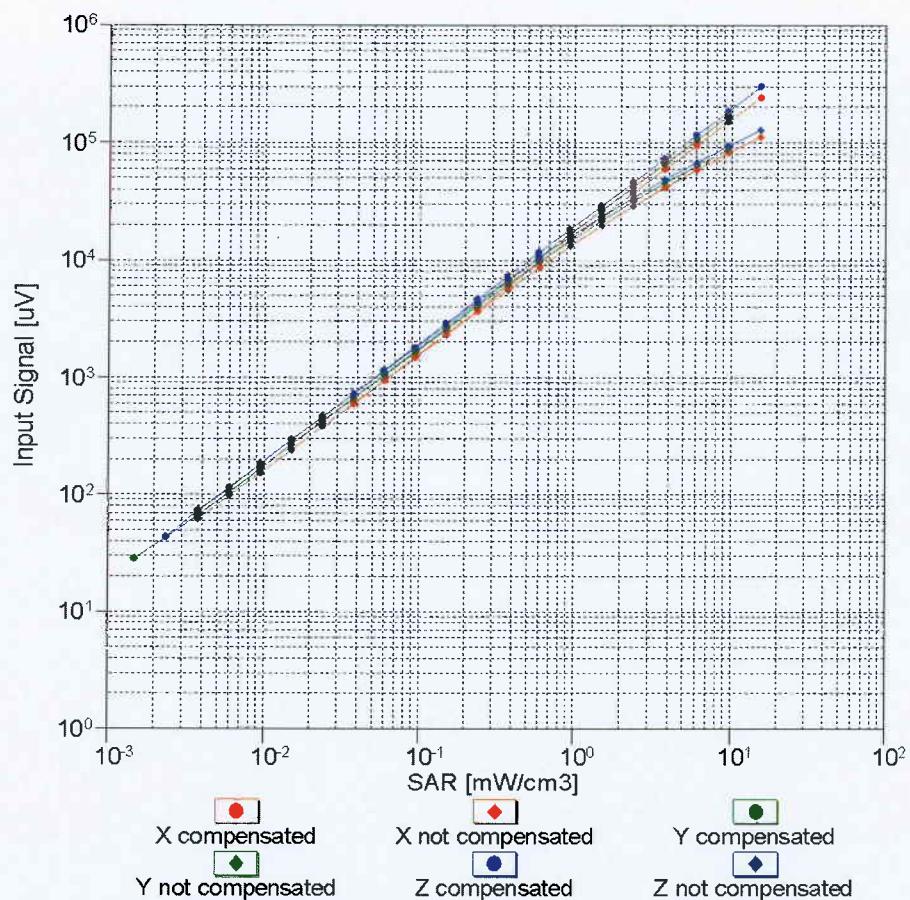
f=1800 MHz,R22



Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

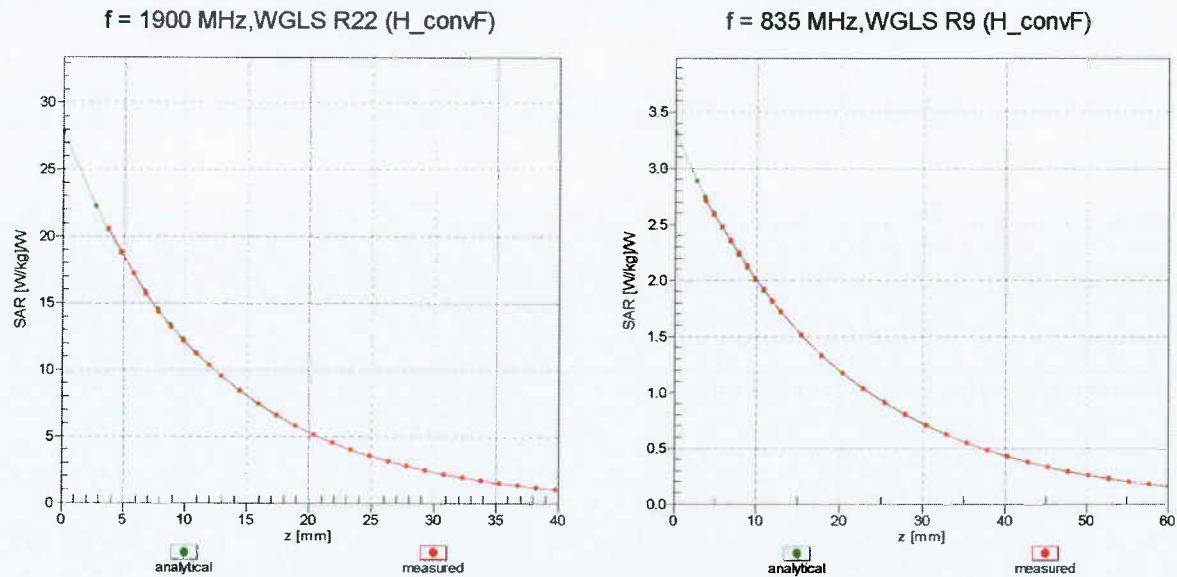
## Dynamic Range f(SAR<sub>head</sub>)

(TEM cell , f = 900 MHz)



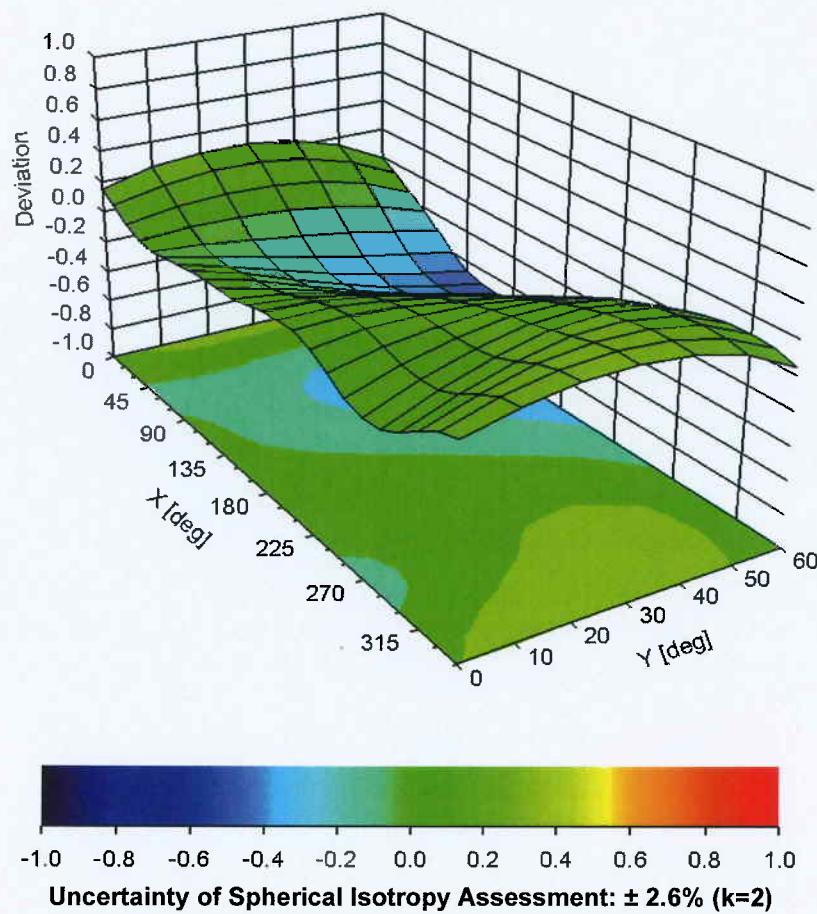
**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900$  MHz



## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1611

### 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	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

Checked by *RFI* 31-july - 2011

RFI Asset A 1185

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  
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: ET3-1528\_Jul11

## CALIBRATION CERTIFICATE

Object ET3DV6 - SN: 1528

Calibration procedure(s) QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes

Calibration date: July 18, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
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-10)	In house check: Oct-11

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

Issued: July 20, 2011

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



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**

### 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 $\varphi$	$\varphi$ rotation around probe axis
Polarization $\theta$	$\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ is normal to probe axis

### Calibration is Performed According to the Following Standards:

- 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
- 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  $\theta = 0$  ( $f \leq 900$  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 affect the E<sup>2</sup>-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.
- $PAR$ : PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- $Ax,y,z; Bx,y,z; Cx,y,z; VRx,y,z$ :  $A, B, C$  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  $\pm 50$  MHz to  $\pm 100$  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 ET3DV6

## SN:1528

Manufactured: March 21, 2000  
Calibrated: July 18, 2011

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

## Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.46	1.87	1.62	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	99.5	97.2	99.6	

## Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	132.2	$\pm 2.2\%$
			Y	0.00	0.00	1.00	106.9	
			Z	0.00	0.00	1.00	128.6	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	45.3	0.87	7.28	7.28	7.28	0.20	2.22	± 13.4 %
750	41.9	0.89	6.26	6.26	6.26	0.97	1.69	± 12.0 %
900	41.5	0.97	5.85	5.85	5.85	0.97	1.65	± 12.0 %
1750	40.1	1.37	5.03	5.03	5.03	0.57	2.17	± 12.0 %
1900	40.0	1.40	4.81	4.81	4.81	0.68	2.03	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## DASY/EASY - Parameters of Probe: ET3DV6- SN:1528

### Calibration Parameter Determined in Body Tissue Simulating Media

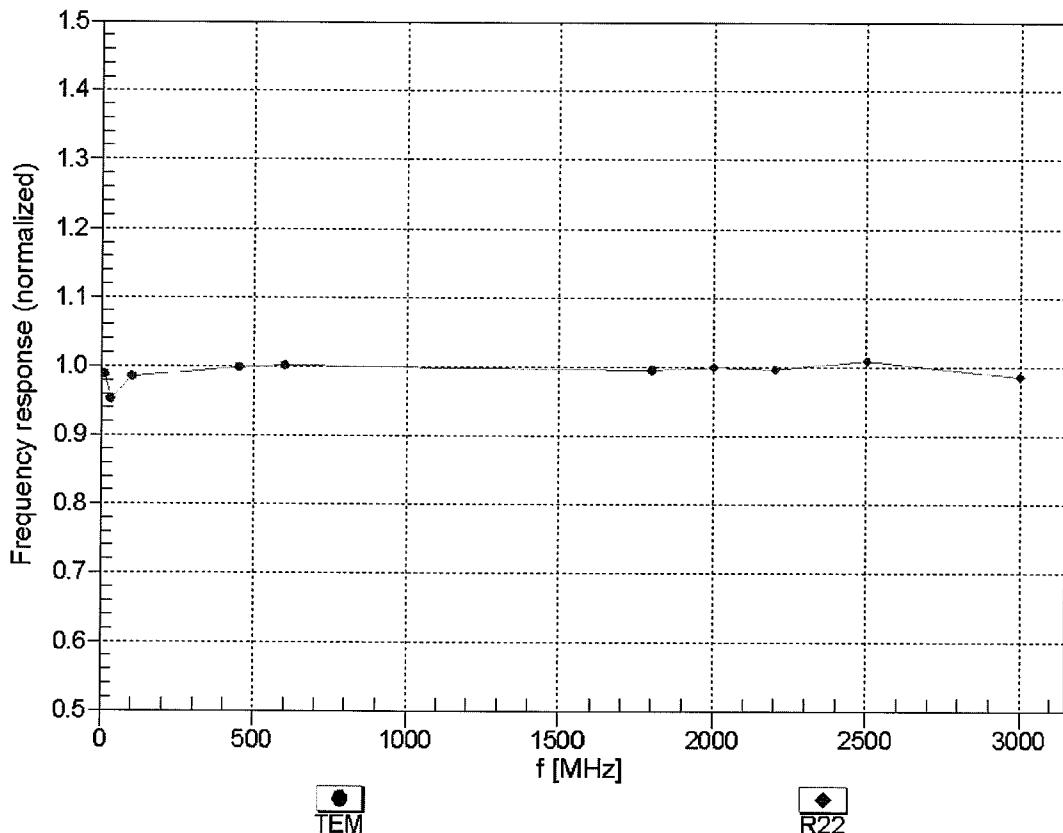
f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.66	7.66	7.66	0.15	2.23	± 13.4 %
750	55.5	0.96	5.98	5.98	5.98	1.00	1.67	± 12.0 %
900	55.0	1.05	5.77	5.77	5.77	1.00	1.66	± 12.0 %
1750	53.4	1.49	4.57	4.57	4.57	0.68	2.55	± 12.0 %
1900	53.3	1.52	4.37	4.37	4.37	0.72	2.41	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## Frequency Response of E-Field

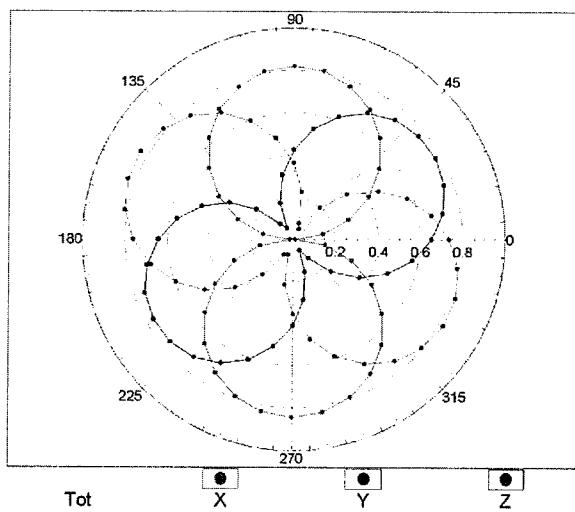
(TEM-Cell:ifi110 EXX, Waveguide: R22)



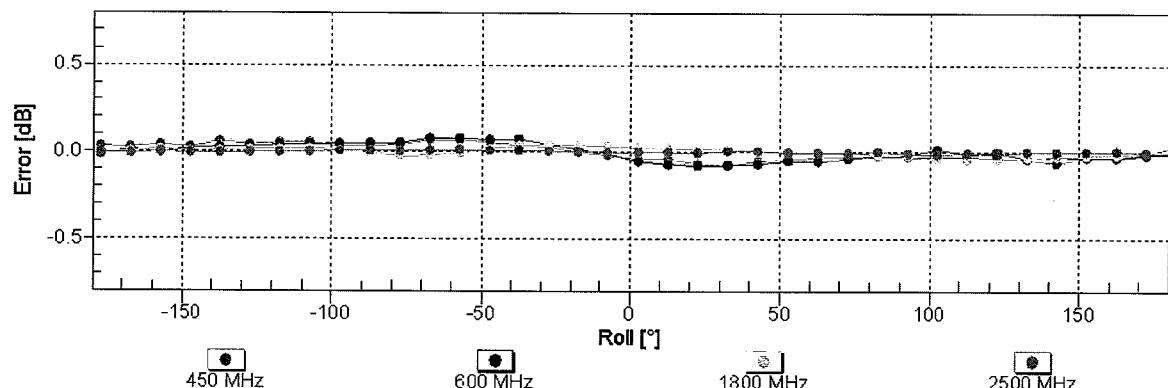
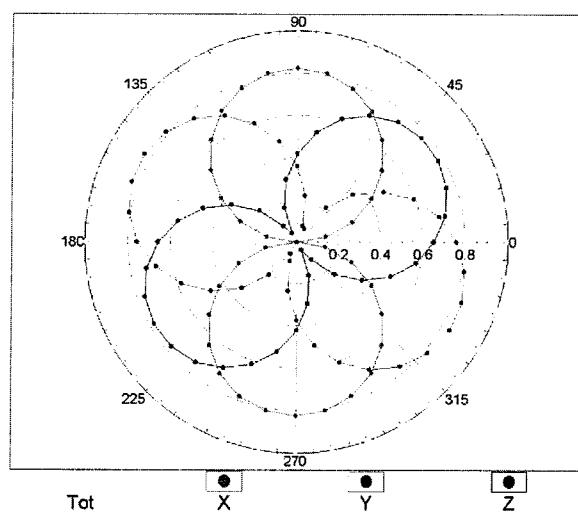
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

$f=600$  MHz, TEM

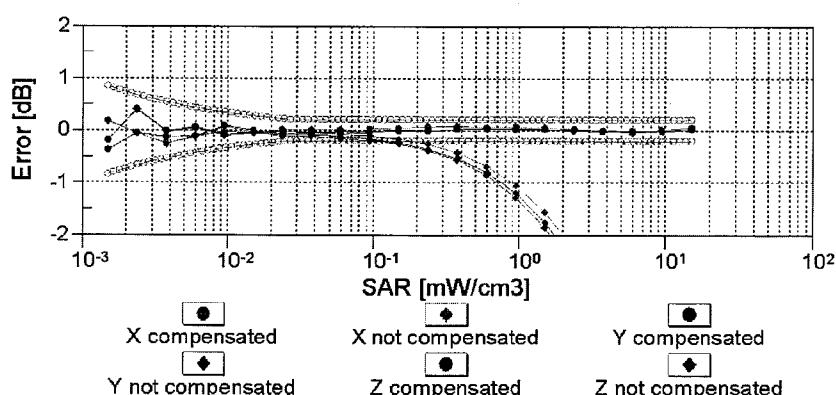
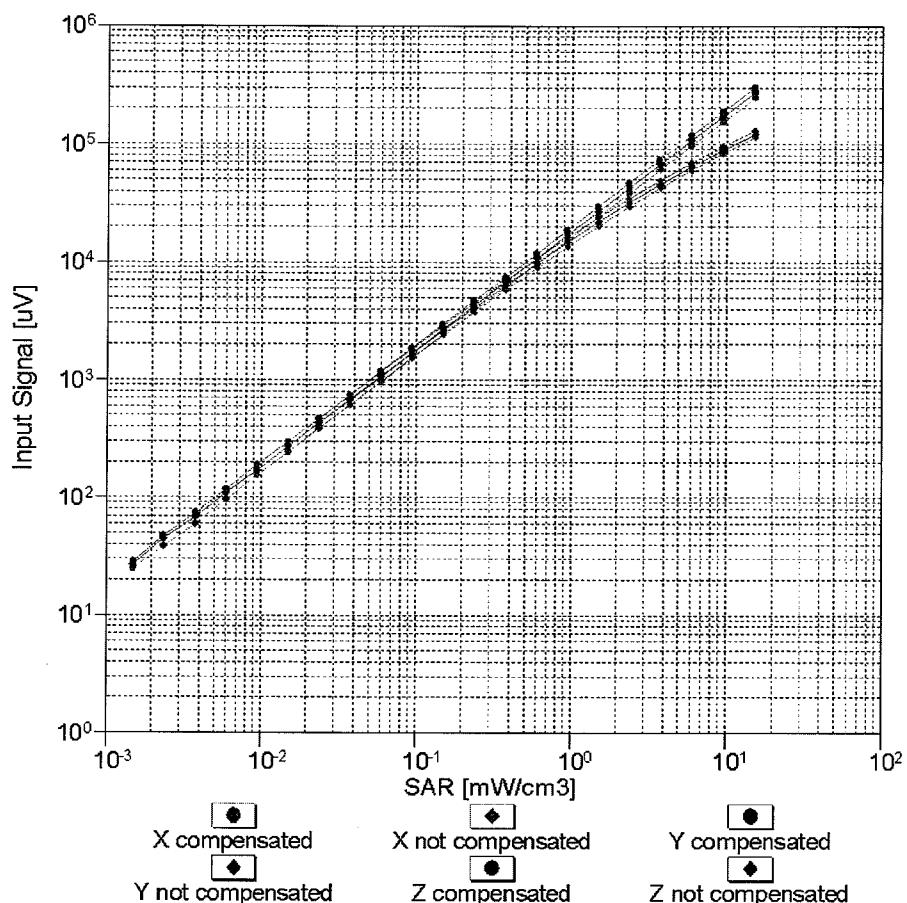


$f=1800$  MHz, R22



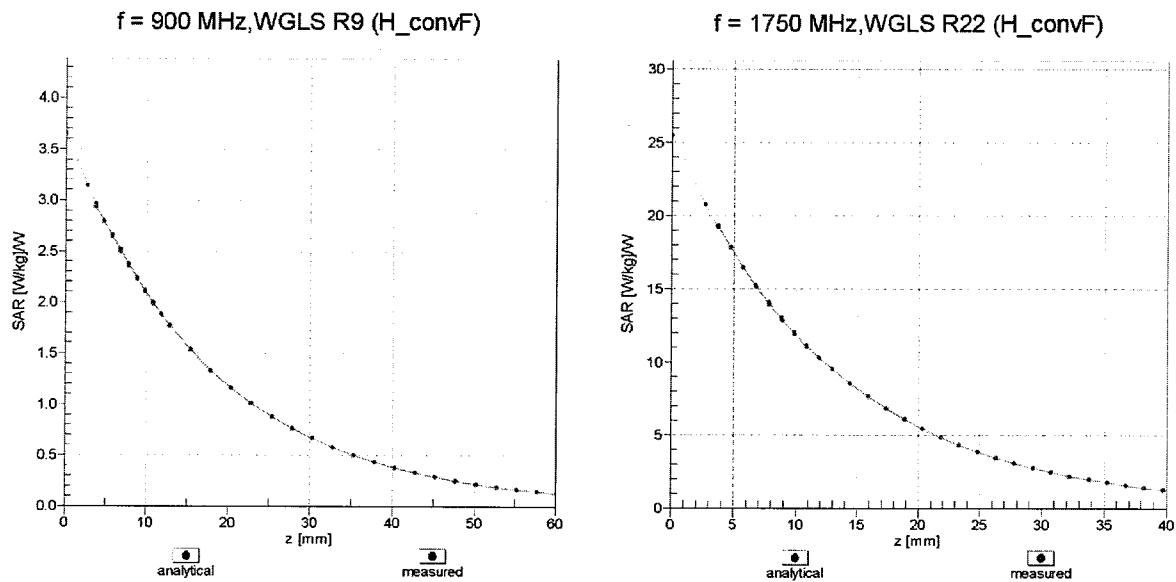
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

## Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f = 900 MHz)

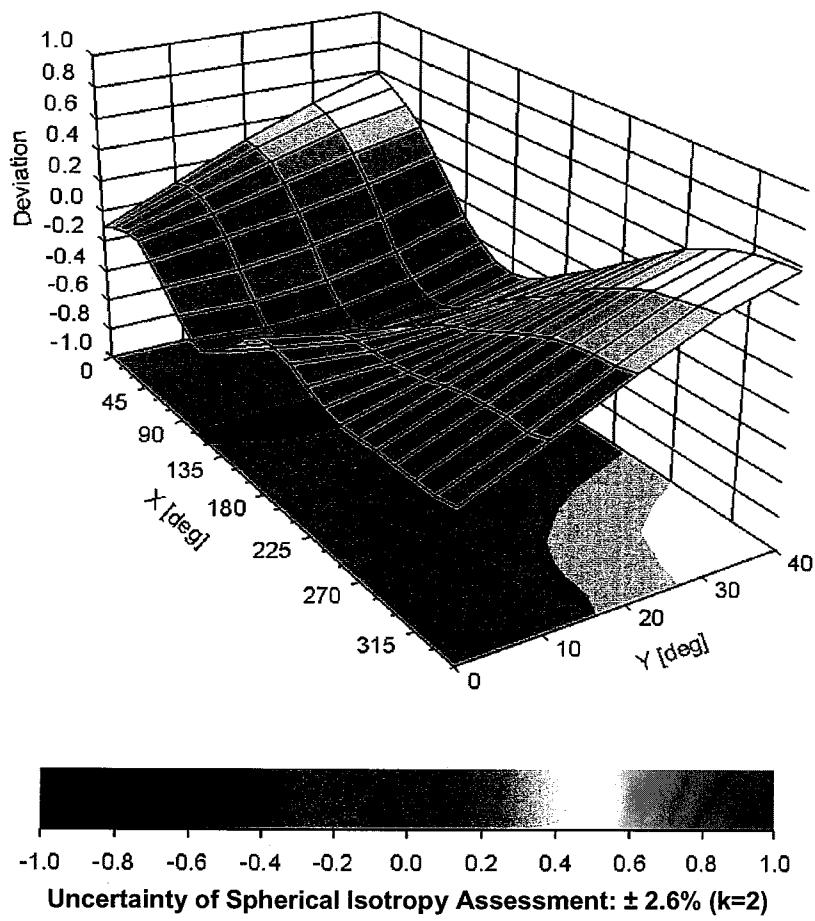


**Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )**

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), $f = 900$ MHz



## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

## 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 +18.0°C and +25.0°C. The tissue equivalent material fluid temperature was controlled to give a maximum variation of  $\pm 2.0^{\circ}\text{C}$

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  $\approx 27\text{g}$ ) 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

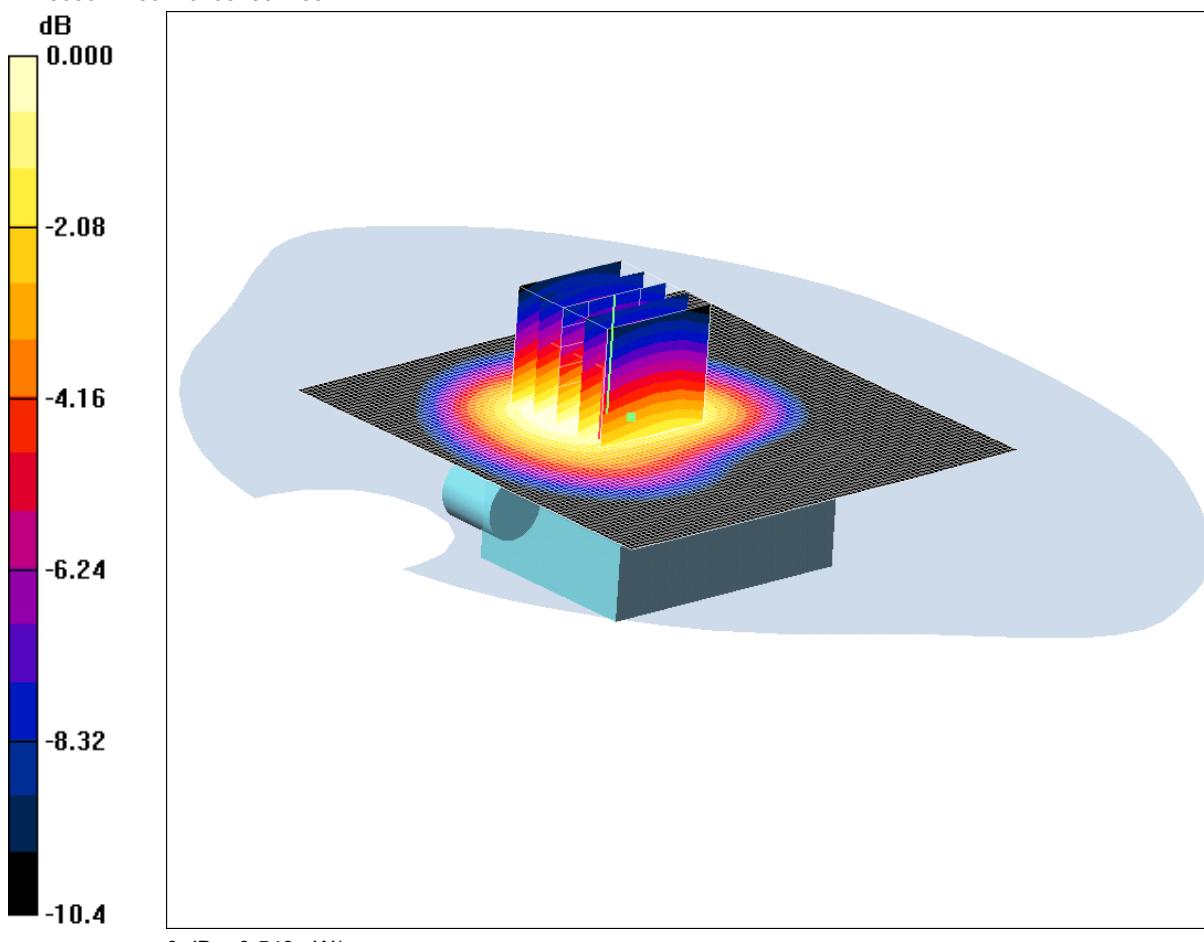
This appendix contains SAR distribution scans which are not included in the total number of pages for this report.

Scan Reference Number	Title
SCN/81245JD06/001	In-Front-of-Mouth EUT Facing Phantom GSM CH189
SCN/81245JD06/002	Rear of EUT Facing Phantom GPRS CH189
SCN/81245JD06/003	Rear of EUT Facing Phantom GPRS CH128
SCN/81245JD06/004	Rear of EUT Facing Phantom GPRS CH251
SCN/81245JD06/005	Rear of EUT Facing Phantom GSM CH189
SCN/81245JD06/006	Rear of EUT Facing Phantom GSM CH128
SCN/81245JD06/007	Rear of EUT Facing Phantom GSM CH251
SCN/81245JD06/008	In-Front-of-Mouth EUT Facing Phantom PCS CH660
SCN/81245JD06/009	In-Front-of-Mouth EUT Facing Phantom PCS CH512
SCN/81245JD06/010	In-Front-of-Mouth EUT Facing Phantom PCS CH810
SCN/81245JD06/011	Rear of EUT Facing Phantom GPRS CH660
SCN/81245JD06/012	Rear of EUT Facing Phantom GPRS CH512
SCN/81245JD06/013	Rear of EUT Facing Phantom GPRS CH810
SCN/81245JD06/014	Rear of EUT Facing Phantom PCS CH660
SCN/81245JD06/015	Rear of EUT Facing Phantom PCS CH512
SCN/81245JD06/016	Rear of EUT Facing Phantom PCS CH810
SCN/81245JD06/017	System Performance Check 900MHz Head 25 11 11
SCN/81245JD06/018	System Performance Check 900MHz Body 26 09 11
SCN/81245JD06/019	System Performance Check 900MHz Body 27 09 11
SCN/81245JD06/020	System Performance Check 1900MHz Head 02 12 11
SCN/81245JD06/021	System Performance Check 1900MHz Body 28 09 11

## SCN/81245JD06/001: In-Front-of-Mouth EUT Facing Phantom GPRS CH189

Date 25/11/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkeeper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



0 dB = 0.543mW/g

Communication System: GSM 850 MHz; Frequency: 836.4 MHz; Duty Cycle: 1:8.3

Medium: 900 MHz HSL Medium parameters used (interpolated):  $f = 836.4$  MHz;  $\sigma = 0.899$  mho/m;  $\epsilon_r = 43.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1528; ConvF(5.85, 5.85, 5.85); Calibrated: 18/07/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Front of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.572 mW/g

**Front of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.0 V/m; Power Drift = -0.077 dB

Peak SAR (extrapolated) = 0.732 W/kg

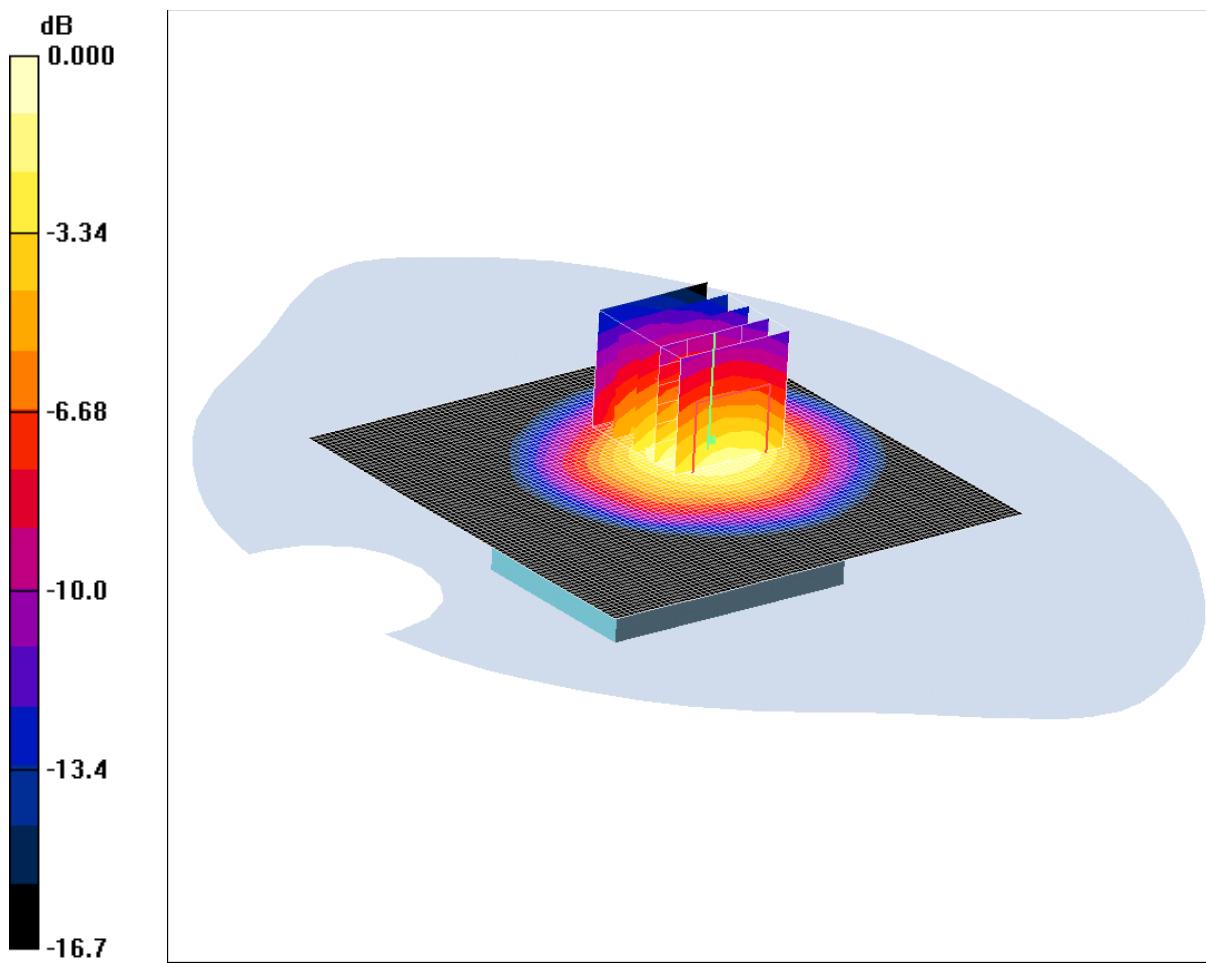
**SAR(1 g) = 0.520 mW/g; SAR(10 g) = 0.361 mW/g**

Maximum value of SAR (measured) = 0.543 mW/g

## SCN/81245JD06/002: Rear of EUT Facing Phantom GPRS CH189

Date 26/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



0 dB = 5.51mW/g

Communication System: GPRS 850 MHz; Frequency: 836.4 MHz; Duty Cycle: 1:4

Medium: 900 MHz MSL Medium parameters used (interpolated):  $f = 836.4$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.85 mW/g

**Rear of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.4 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 7.99 W/kg

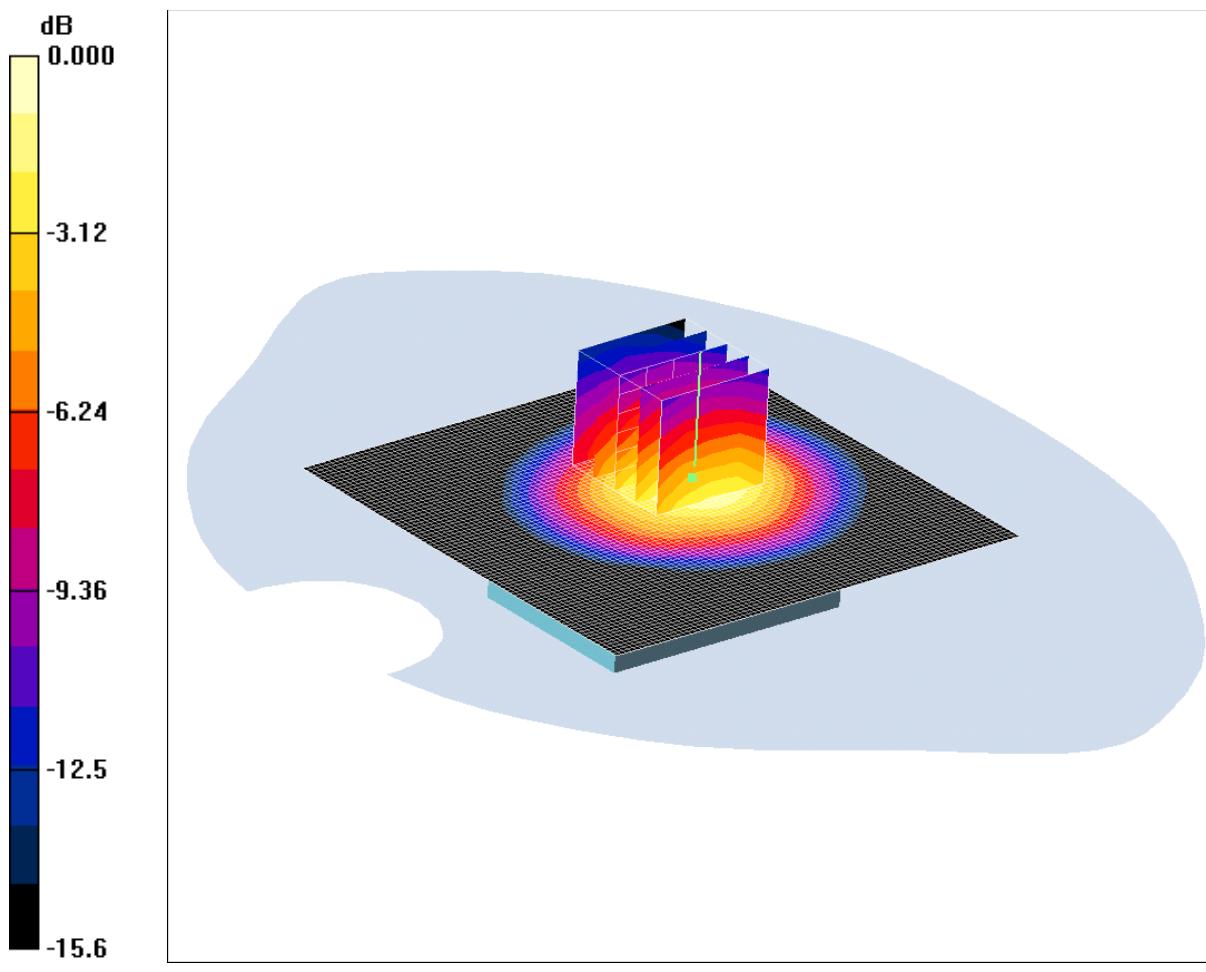
**SAR(1 g) = 4.92 mW/g; SAR(10 g) = 3 mW/g**

Maximum value of SAR (measured) = 5.51 mW/g

## SCN/81245JD06/003: Rear of EUT Facing Phantom GPRS CH128

Date 26/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



Communication System: GPRS 850 MHz; Frequency: 824.2 MHz; Duty Cycle: 1:4

Medium: 900 MHz MSL Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Low/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 5.15 mW/g**Rear of EUT Facing Phantom - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 54.3 V/m; Power Drift = -0.367 dB

Peak SAR (extrapolated) = 8.63 W/kg

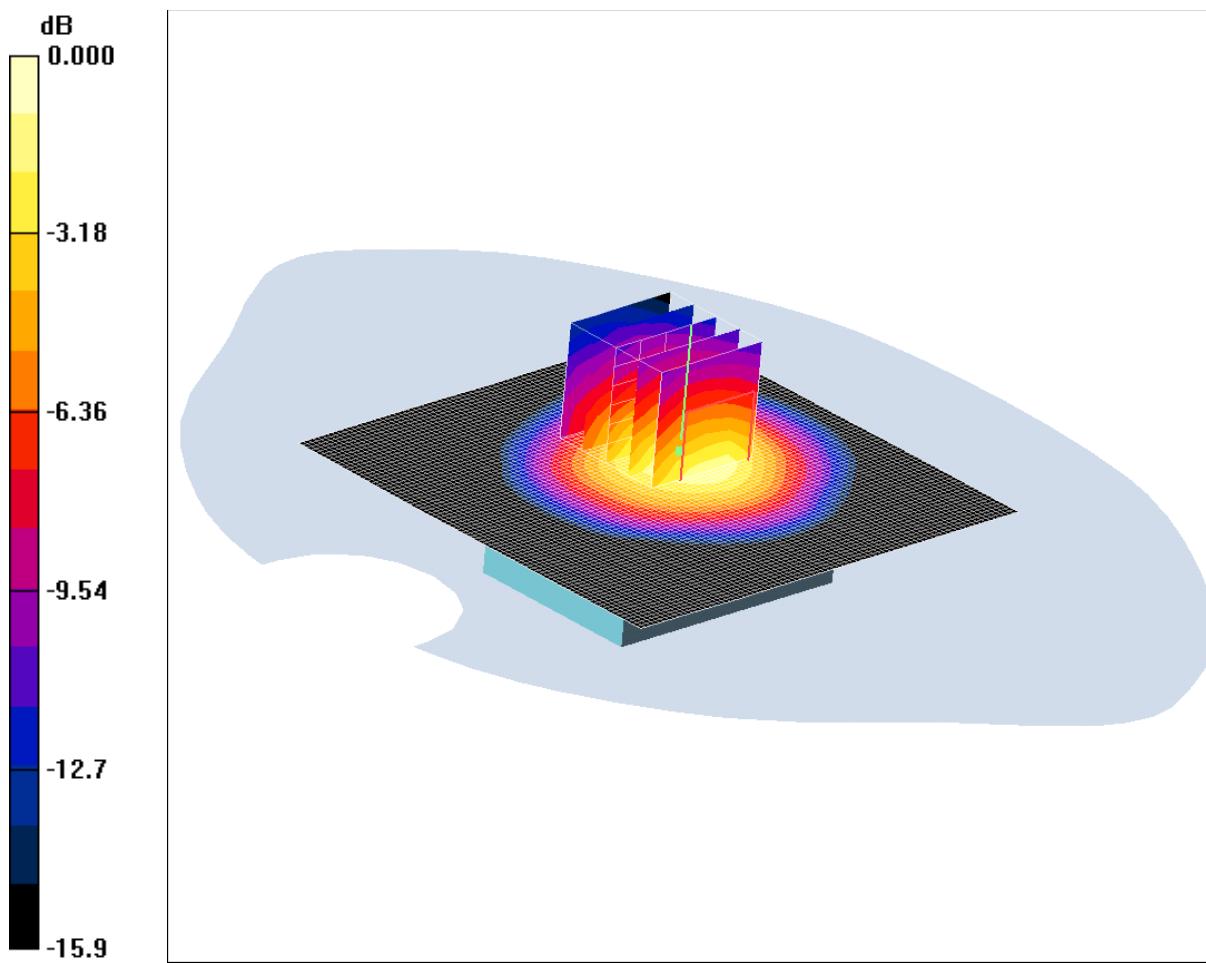
**SAR(1 g) = 4.67 mW/g; SAR(10 g) = 2.77 mW/g**

Maximum value of SAR (measured) = 5.21 mW/g

## SCN/81245JD06/004: Rear of EUT Facing Phantom GPRS CH251

Date 26/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



0 dB = 5.39mW/g

Communication System: GPRS 850 MHz; Frequency: 848.8 MHz; Duty Cycle: 1:4

Medium: 900 MHz MSL Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - High/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.46 mW/g

**Rear of EUT Facing Phantom - High/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.0 V/m; Power Drift = -0.128 dB

Peak SAR (extrapolated) = 8.19 W/kg

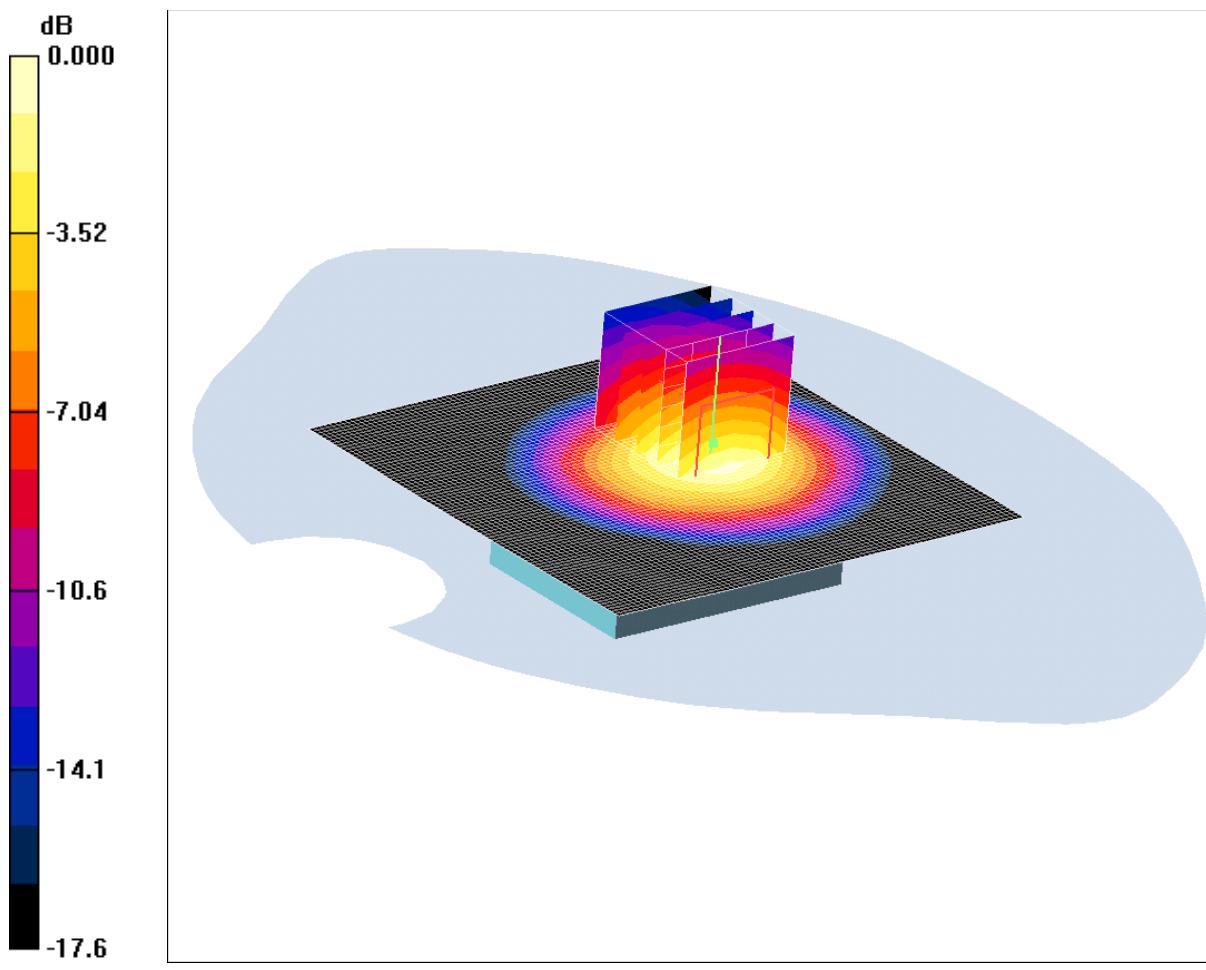
**SAR(1 g) = 4.94 mW/g; SAR(10 g) = 2.98 mW/g**

Maximum value of SAR (measured) = 5.39 mW/g

## SCN/81245JD06/005: Rear of EUT Facing Phantom GSM CH189

Date 26/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



0 dB = 4.17mW/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;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.26 mW/g

**Rear of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 49.1 V/m; Power Drift = -0.286 dB

Peak SAR (extrapolated) = 7.77 W/kg

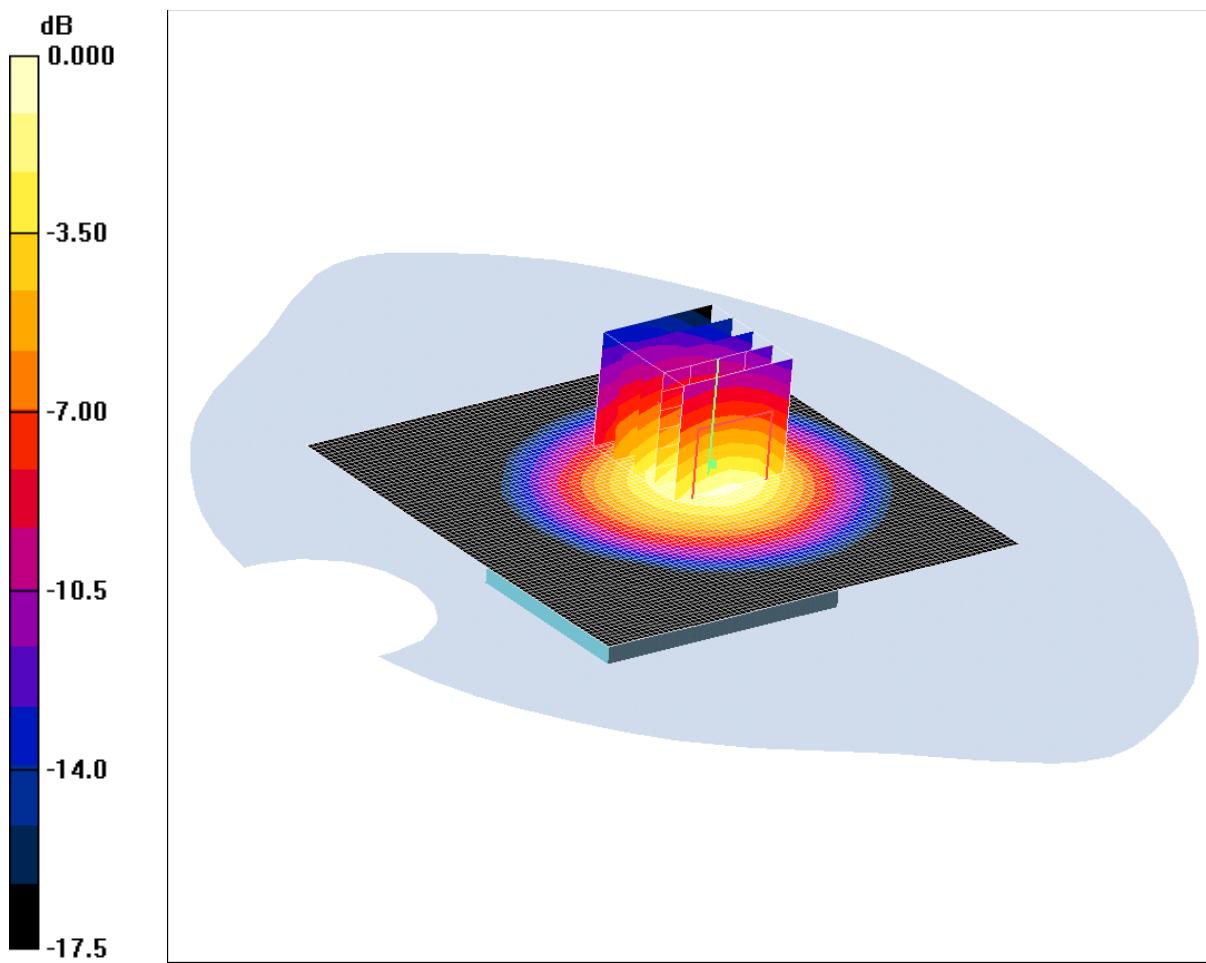
**SAR(1 g) = 3.88 mW/g; SAR(10 g) = 2.31 mW/g**

Maximum value of SAR (measured) = 4.17 mW/g

## SCN/81245JD06/006: Rear of EUT Facing Phantom GSM CH128

Date 26/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



Communication System: 850 MHz; Frequency: 824.2 MHz; Duty Cycle: 1:8.3

Medium: 900 MHz MSL Medium parameters used (interpolated):  $f = 824.2$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Low/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 3.55 mW/g**Rear of EUT Facing Phantom - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 44.6 V/m; Power Drift = -0.196 dB

Peak SAR (extrapolated) = 6.69 W/kg

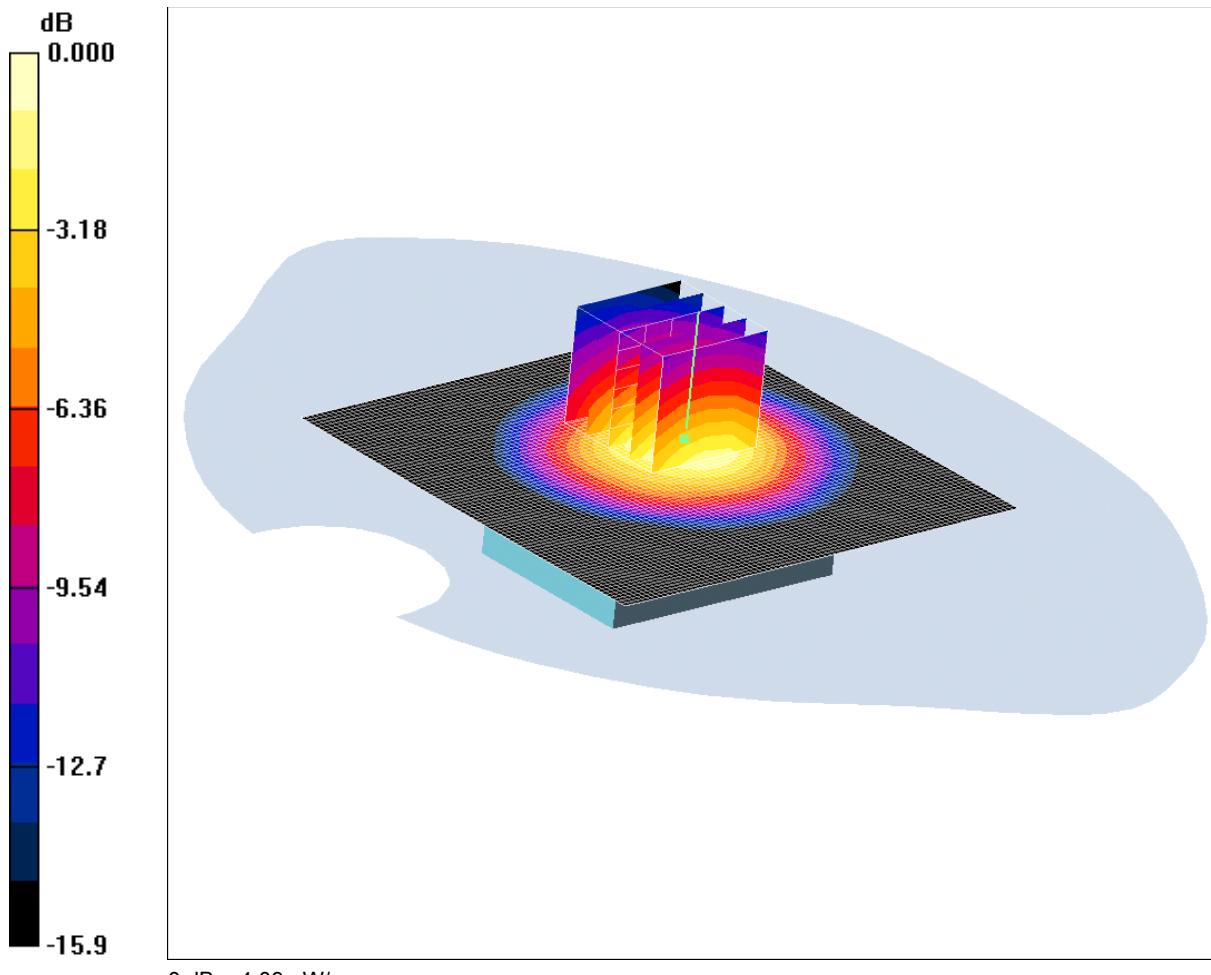
**SAR(1 g) = 3.25 mW/g; SAR(10 g) = 1.93 mW/g**

Maximum value of SAR (measured) = 3.48 mW/g

## SCN/81245JD06/007: Rear of EUT Facing Phantom GSM CH251

Date 27/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024: 357464031802488



0 dB = 4.09mW/g

Communication System: 850 MHz; Frequency: 848.8 MHz; Duty Cycle: 1:8.3

Medium: 900 MHz MSL Medium parameters used (interpolated):  $f = 848.8$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - High/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.33 mW/g

**Rear of EUT Facing Phantom - High/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.8 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 7.52 W/kg

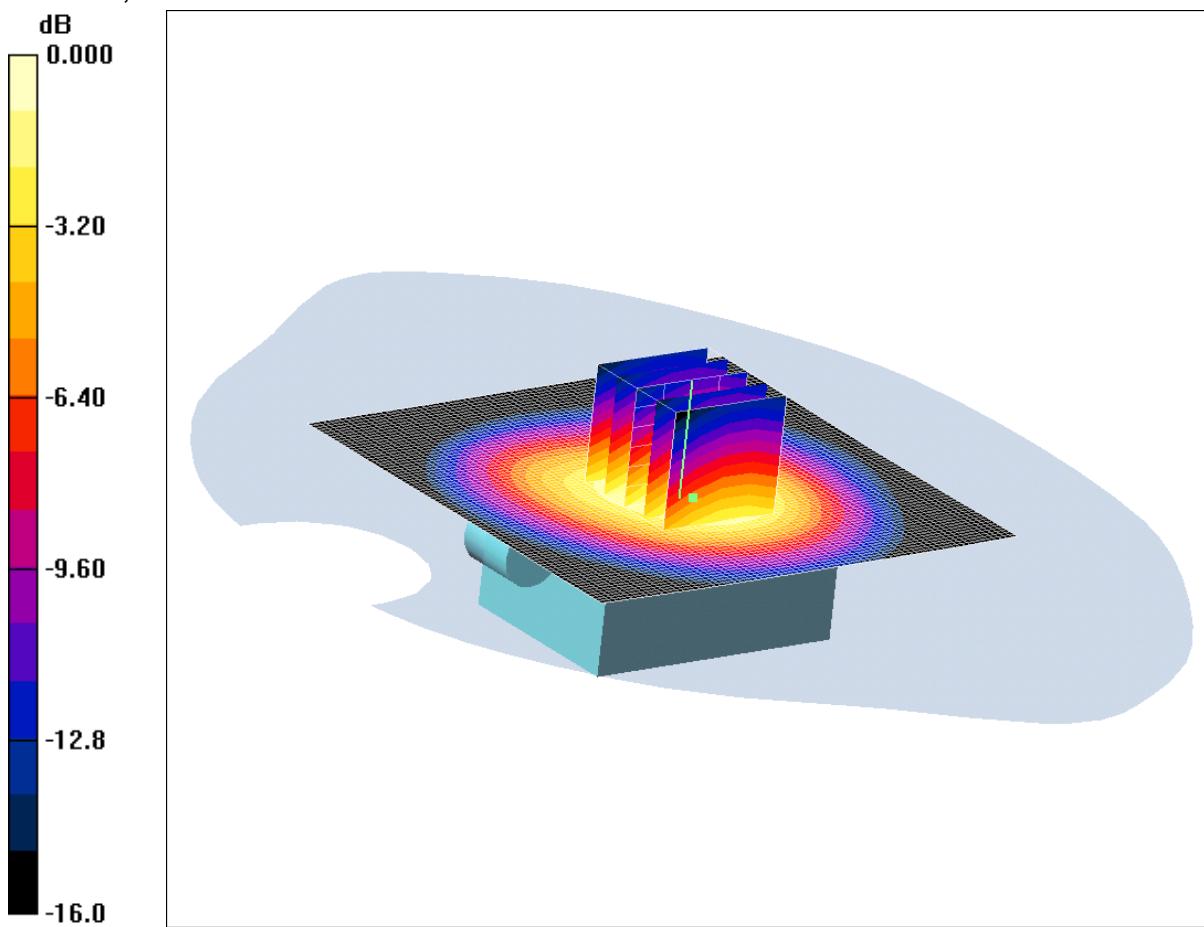
**SAR(1 g) = 3.81 mW/g; SAR(10 g) = 2.28 mW/g**

Maximum value of SAR (measured) = 4.09 mW/g

SCN/81245JD06/008: In-Front-of-Mouth EUT Facing Phantom PCS CH660

Date 02/12/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkeeper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



Communication System: PCS 1900; Frequency: 1879.8 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1879.8$  MHz;  $\sigma = 1.42$  mho/m;  $\epsilon_r = 38.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1528; ConvF(4.81, 4.81, 4.81); Calibrated: 18/07/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Front of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.03 mW/g

**Front of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.3 V/m; Power Drift = -0.013 dB

Peak SAR (extrapolated) = 1.40 W/kg

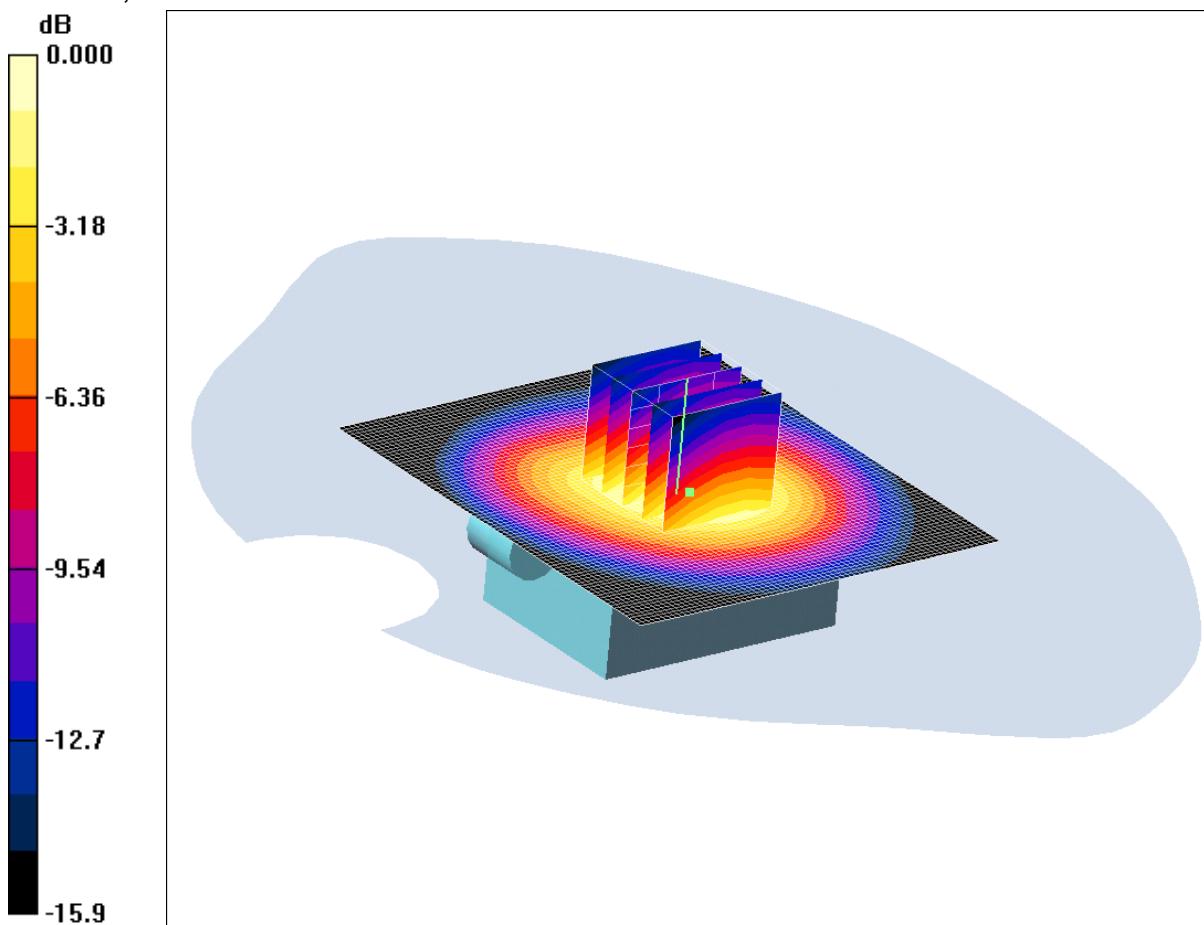
**SAR(1 g) = 0.926 mW/g; SAR(10 g) = 0.571 mW/g**

Maximum value of SAR (measured) = 0.982 mW/g

SCN/81245JD06/009: In-Front-of-Mouth EUT Facing Phantom PCS CH512

Date 02/12/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkeeper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



Communication System: PCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1528; ConvF(4.81, 4.81, 4.81); Calibrated: 18/07/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Front of EUT Facing Phantom - Low/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.02 mW/g

Front of EUT Facing Phantom - Low/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.2 V/m; Power Drift = -0.052 dB

Peak SAR (extrapolated) = 1.40 W/kg

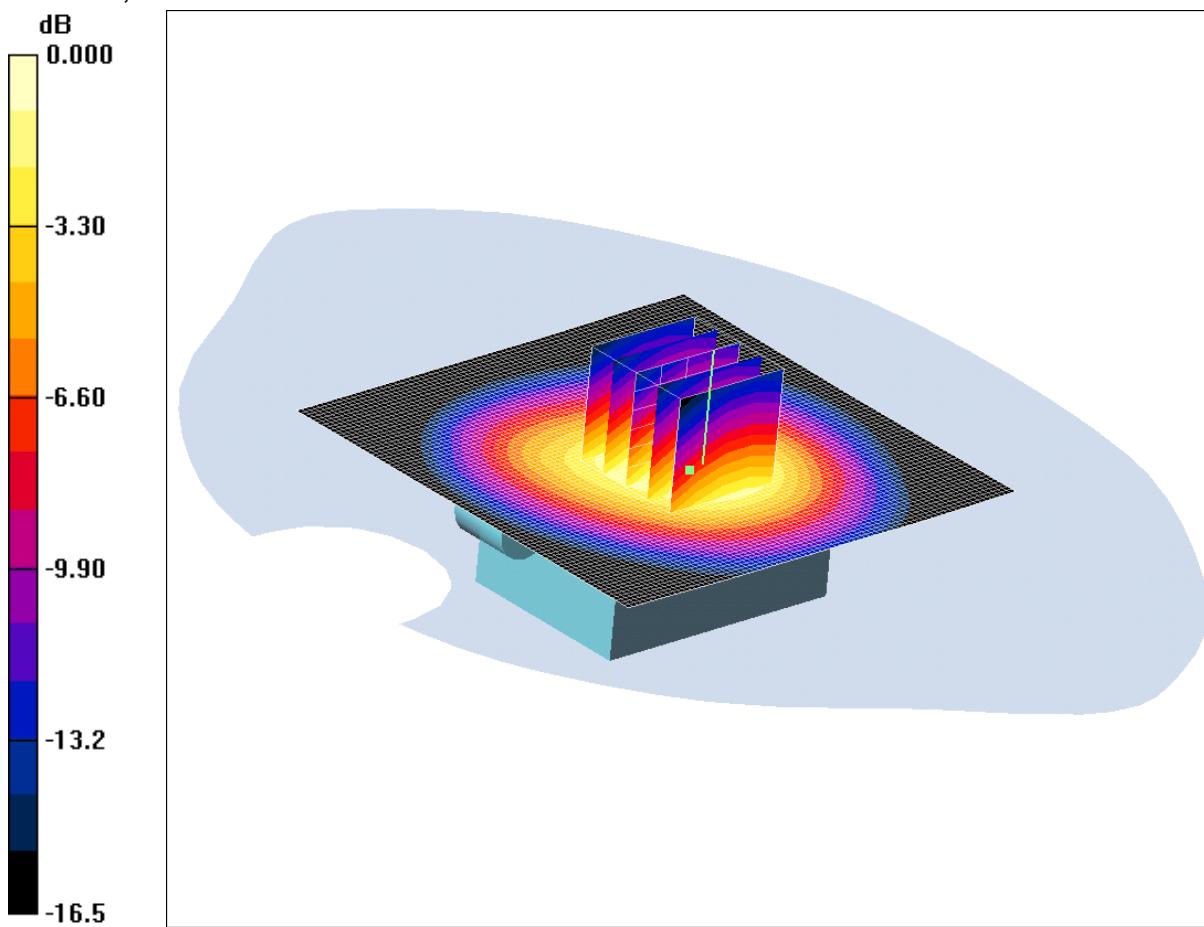
SAR(1 g) = 0.932 mW/g; SAR(10 g) = 0.576 mW/g

Maximum value of SAR (measured) = 0.993 mW/g

SCN/81245JD06/010: In-Front-of-Mouth EUT Facing Phantom PCS CH810

Date 02/12/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkeeper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



0 dB = 0.953mW/g

Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz HSL Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1528; ConvF(4.81, 4.81, 4.81); Calibrated: 18/07/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1207

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Front of EUT Facing Phantom - High/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.987 mW/g

Front of EUT Facing Phantom - High/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.8 V/m; Power Drift = -0.027 dB

Peak SAR (extrapolated) = 1.37 W/kg

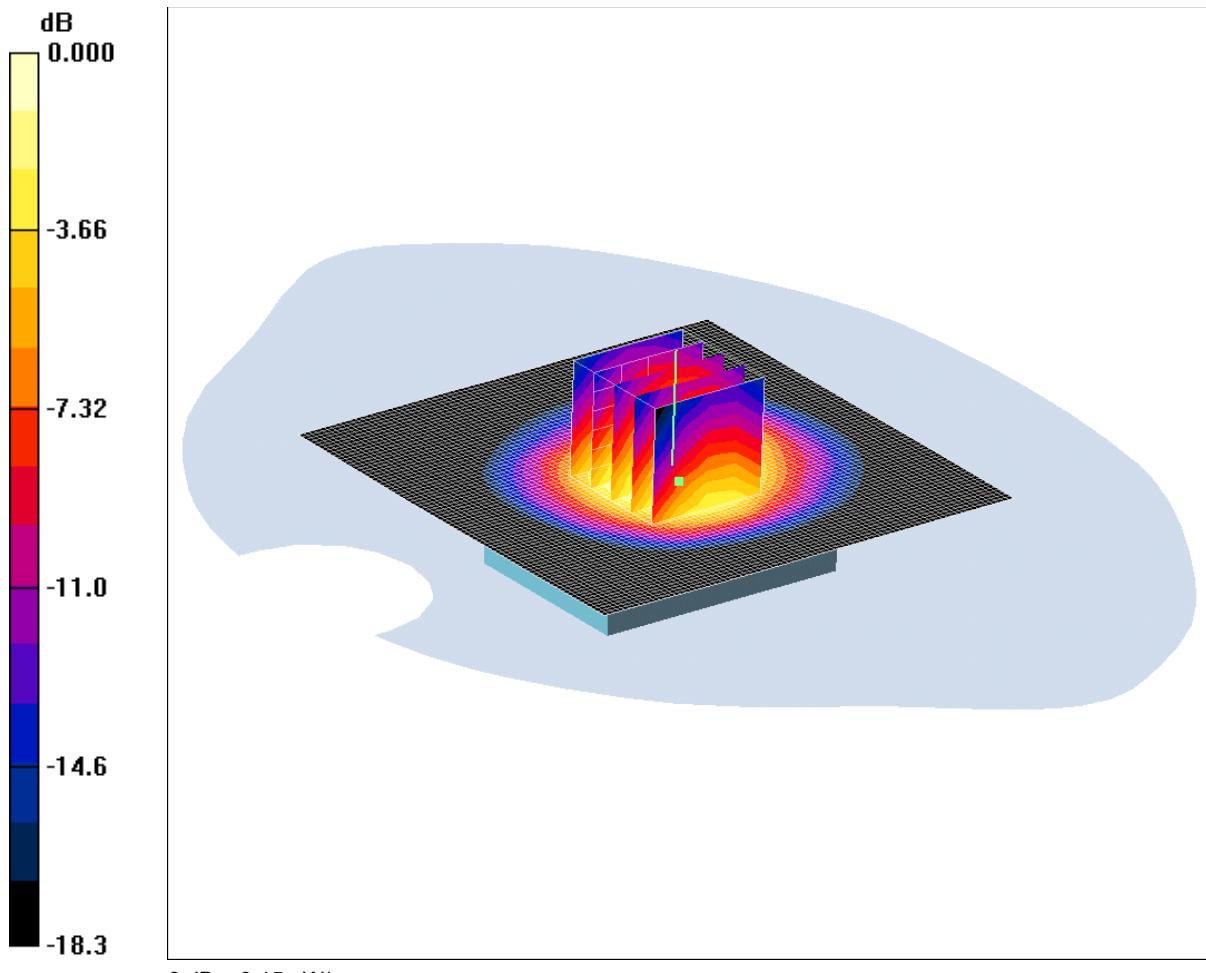
SAR(1 g) = 0.893 mW/g; SAR(10 g) = 0.546 mW/g

Maximum value of SAR (measured) = 0.953 mW/g

## SCN/81245JD06/011: Rear of EUT Facing Phantom GPRS CH660

Date 28/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



0 dB = 3.15mW/g

Communication System: GPRS 1900; Frequency: 1879.8 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1879.8$  MHz;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.82 mW/g

**Rear of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.9 V/m; Power Drift = -0.077 dB

Peak SAR (extrapolated) = 4.12 W/kg

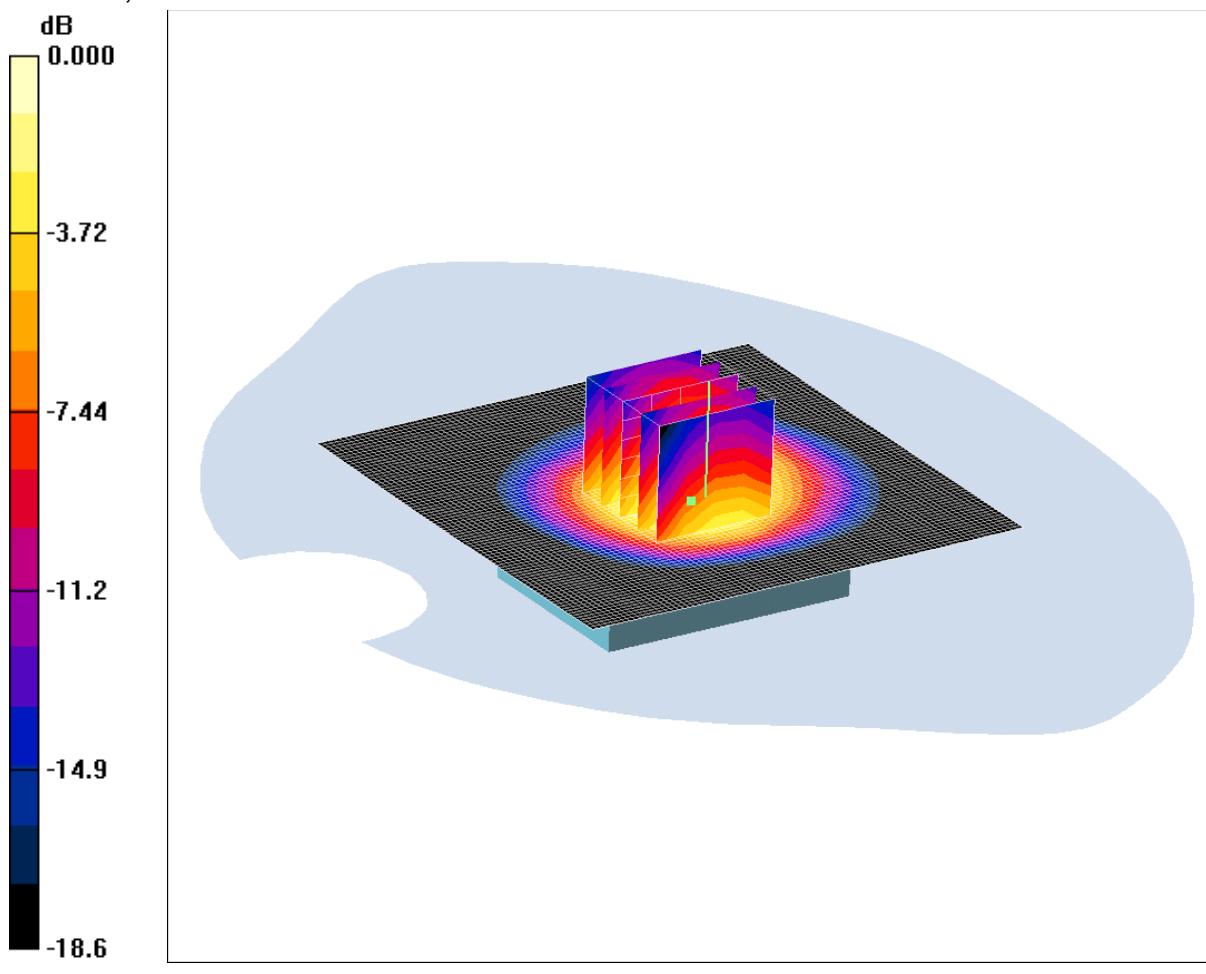
**SAR(1 g) = 3.03 mW/g; SAR(10 g) = 2 mW/g**

Maximum value of SAR (measured) = 3.15 mW/g

## SCN/81245JD06/012: Rear of EUT Facing Phantom GPRS CH512

Date 28/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



Communication System: GPRS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 52.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Low/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.68 mW/g

**Rear of EUT Facing Phantom - Low/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 50.7 V/m; Power Drift = -0.211 dB

Peak SAR (extrapolated) = 4.28 W/kg

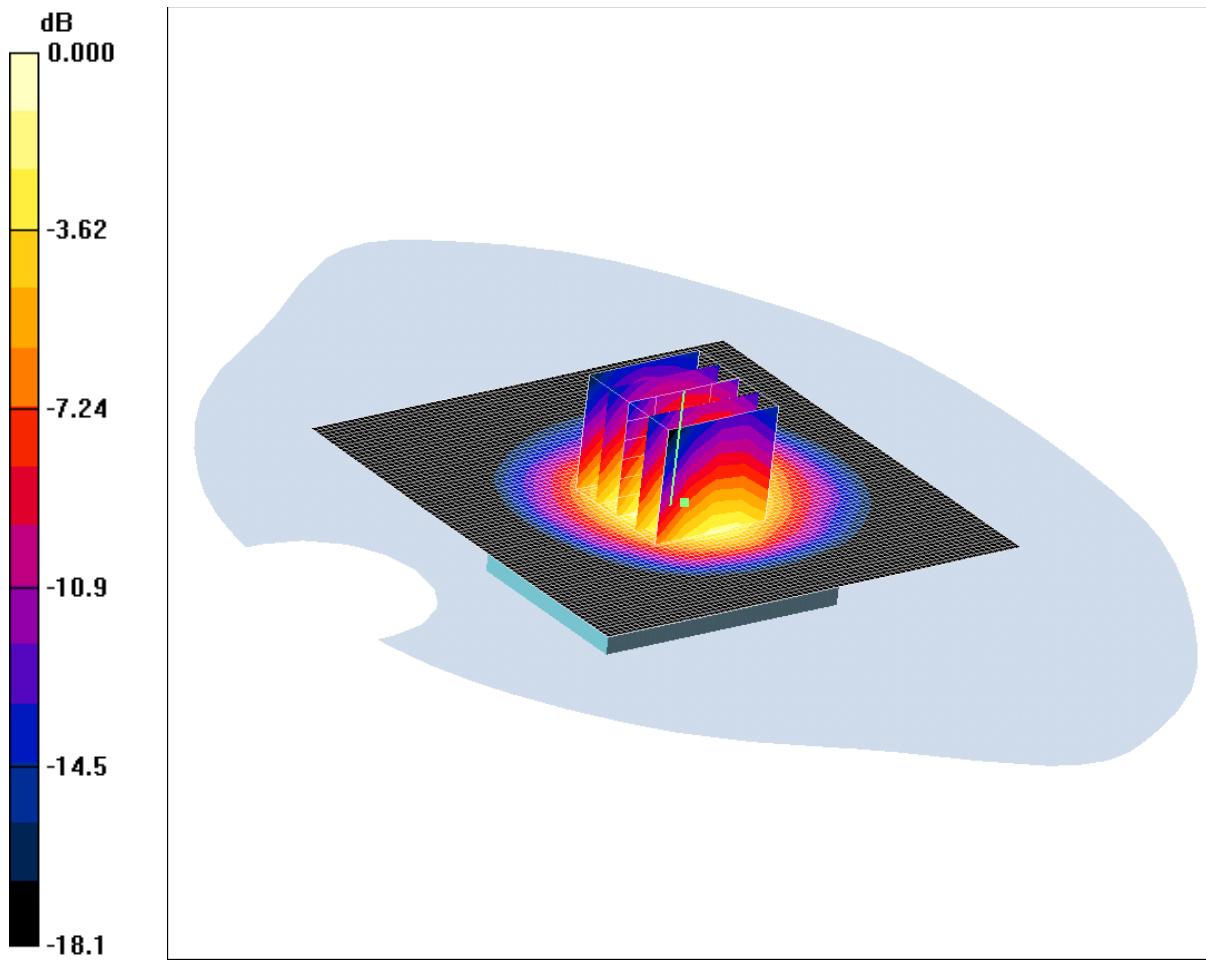
**SAR(1 g) = 3.11 mW/g; SAR(10 g) = 2.05 mW/g**

Maximum value of SAR (measured) = 3.24 mW/g

## SCN/81245JD06/013: Rear of EUT Facing Phantom GPRS CH810

Date 28/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



Communication System: GPRS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - High/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.64 mW/g

**Rear of EUT Facing Phantom - High/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 49.1 V/m; Power Drift = -0.339 dB

Peak SAR (extrapolated) = 4.15 W/kg

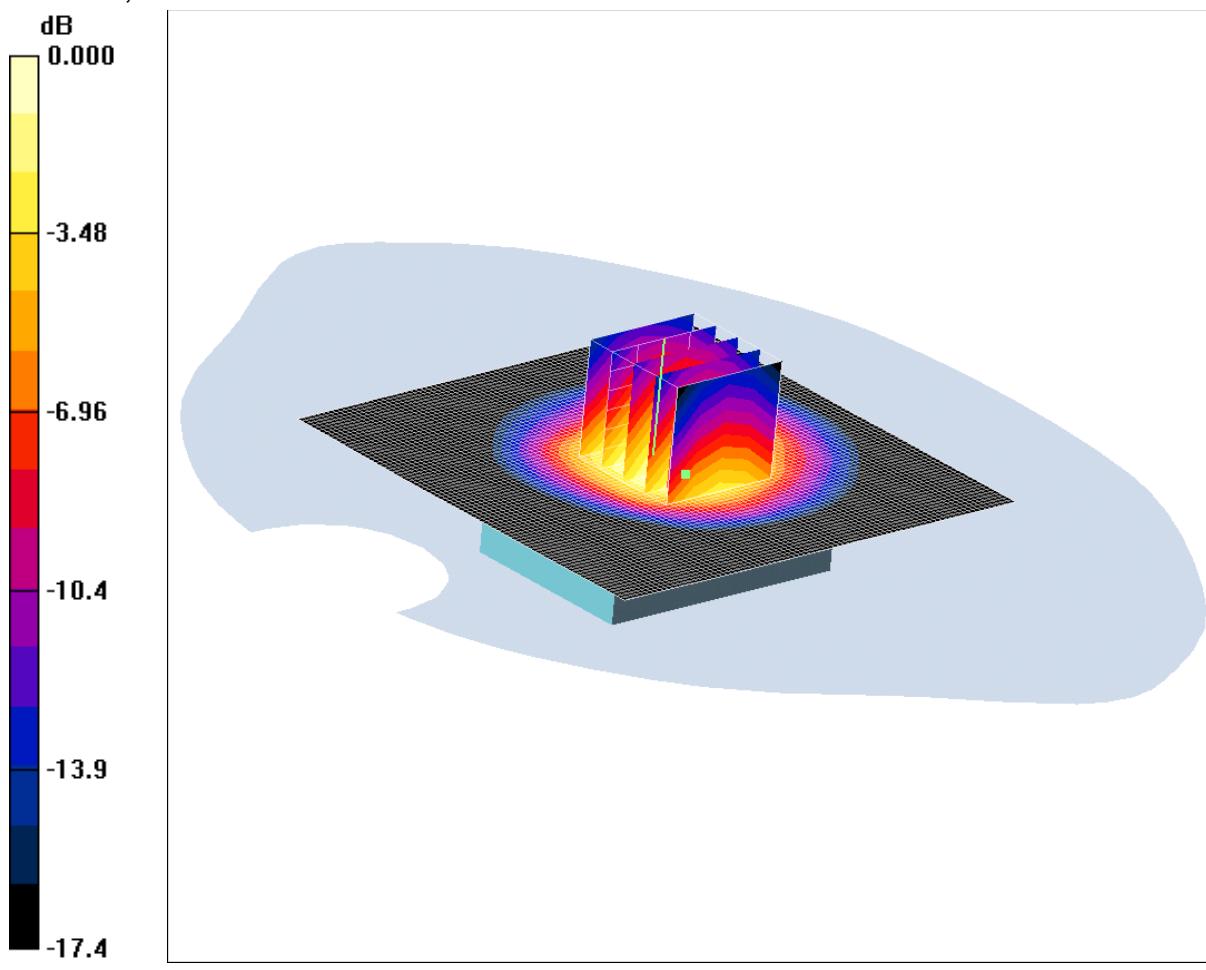
**SAR(1 g) = 3.05 mW/g; SAR(10 g) = 1.97 mW/g**

Maximum value of SAR (measured) = 3.21 mW/g

## SCN/81245JD06/014: Rear of EUT Facing Phantom PCS CH660

Date 28/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



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;  $\sigma = 1.55$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 2.38 mW/g**Rear of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 39.8 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 2.98 W/kg

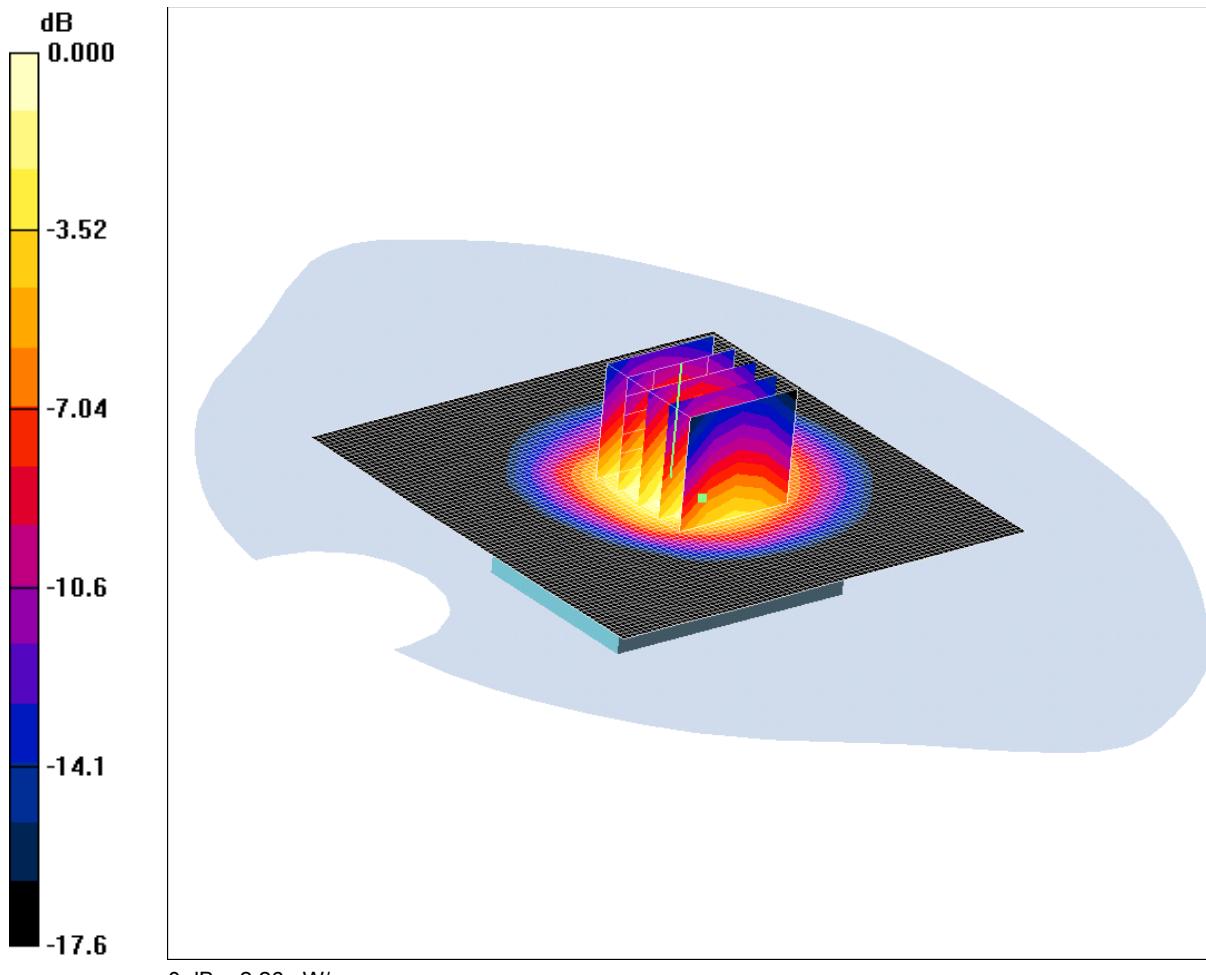
**SAR(1 g) = 2.06 mW/g; SAR(10 g) = 1.34 mW/g**

Maximum value of SAR (measured) = 2.16 mW/g

## SCN/81245JD06/015: Rear of EUT Facing Phantom PCS CH512

Date 28/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



Communication System: PCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 52.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - Middle/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 2.40 mW/g**Rear of EUT Facing Phantom - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 40.2 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 3.11 W/kg

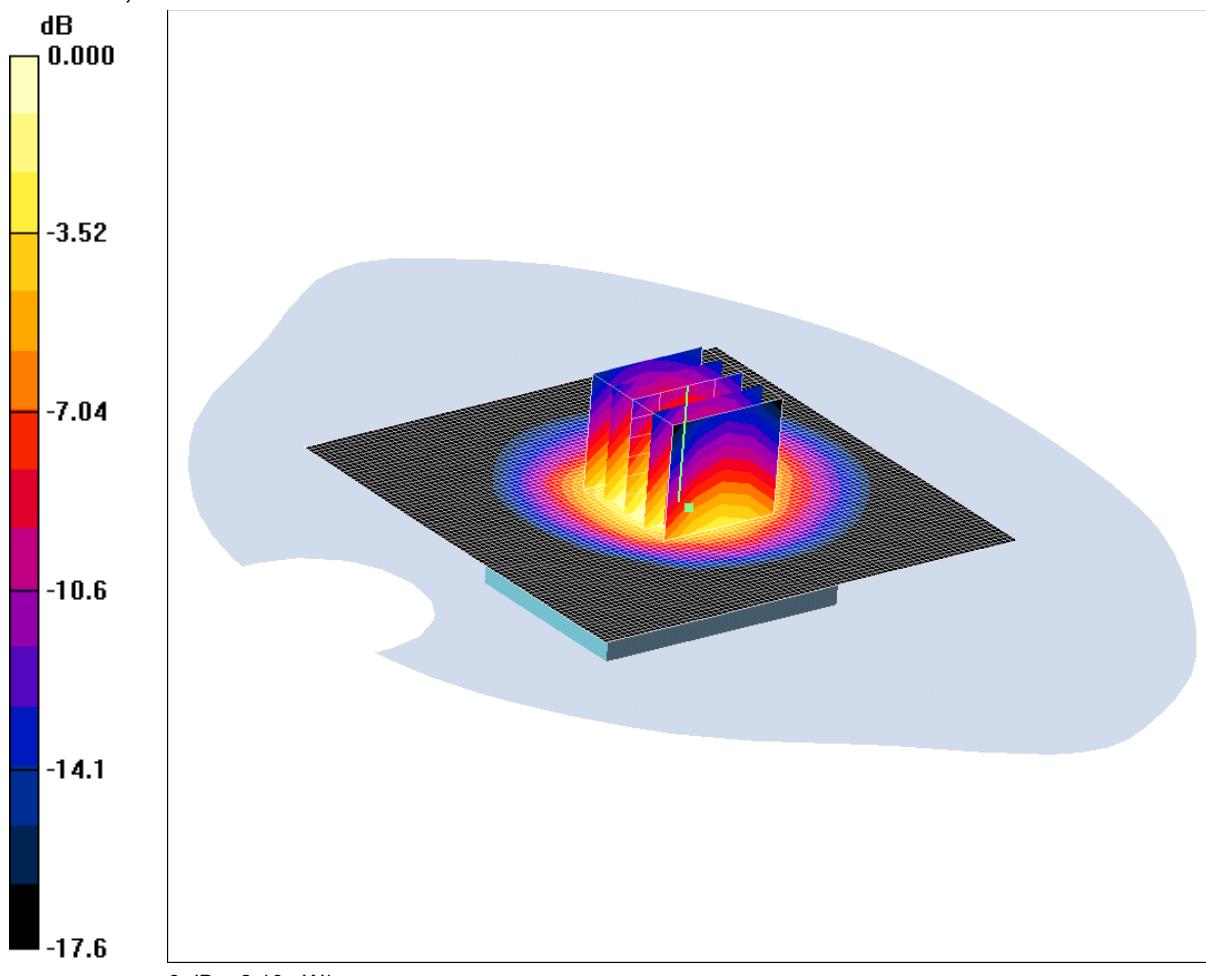
**SAR(1 g) = 2.13 mW/g; SAR(10 g) = 1.38 mW/g**

Maximum value of SAR (measured) = 2.26 mW/g

## SCN/81245JD06/016: Rear of EUT Facing Phantom PCS CH810

Date 28/09/2011

DUT: Aerotel Medical Systems Ltd; Type: GeoSkepper Model Q Wristop Cellular Communicator; Serial: 803024; IMEI: 357464031802488



Communication System: PCS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: 1900 MHz MSL Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- Phantom: SAM 12a; Type: SAM 4.0; Serial: TP:1193

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Rear of EUT Facing Phantom - High/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.35 mW/g

**Rear of EUT Facing Phantom - High/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 38.8 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 2.84 W/kg

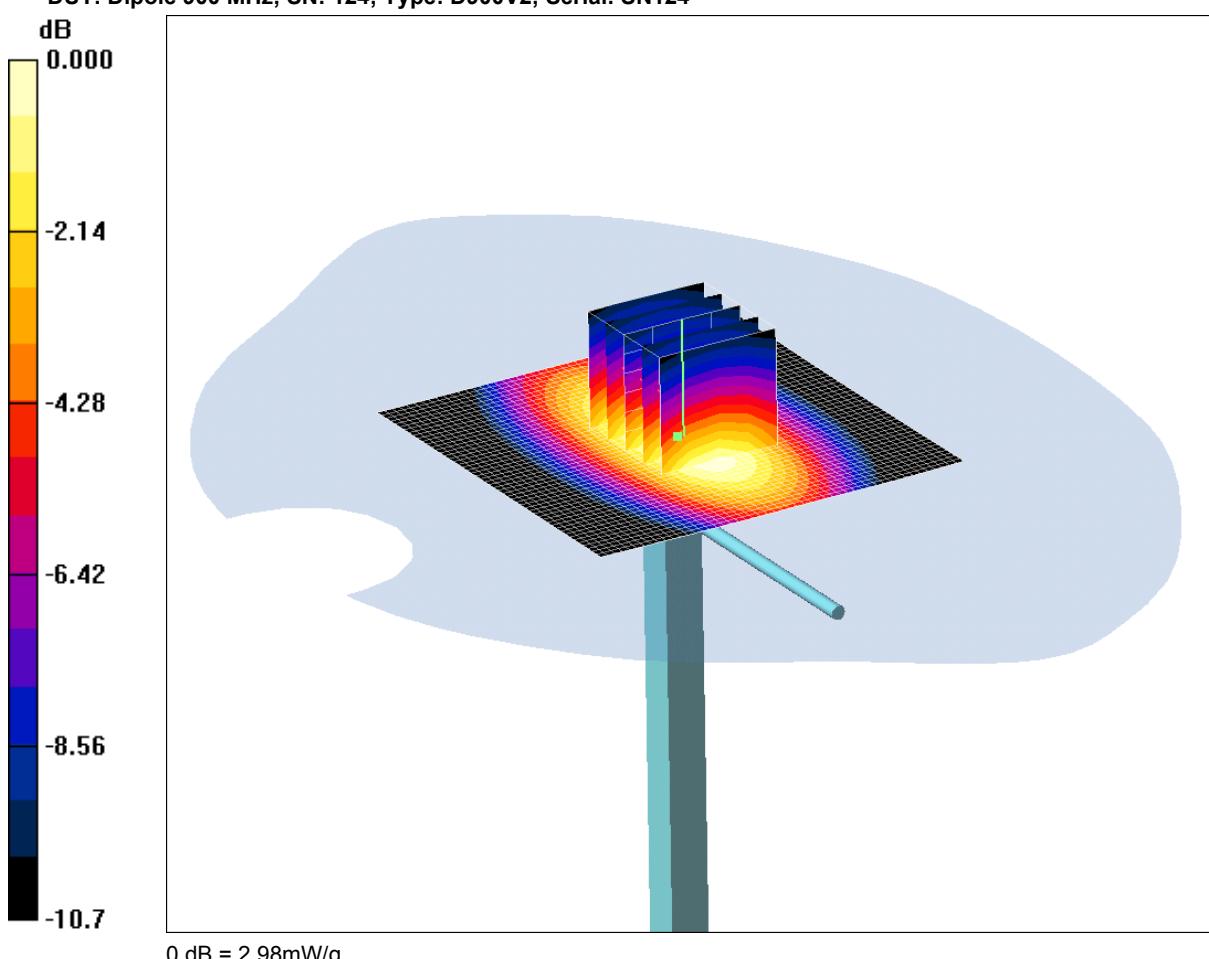
**SAR(1 g) = 1.99 mW/g; SAR(10 g) = 1.29 mW/g**

Maximum value of SAR (measured) = 2.10 mW/g

## SCN/81245JD06/017: System Performance Check 900MHz Head 25 11 11

Date 25/11/2011

DUT: Dipole 900 MHz; SN: 124; Type: D900V2; Serial: SN124



0 dB = 2.98mW/g

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: 900 MHz HSL Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.942$  mho/m;  $\epsilon_r = 42.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1528; ConvF(5.85, 5.85, 5.85); Calibrated: 18/07/2011

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn450; Calibrated: 09/02/2011

- 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) = 3.03 mW/g

**d=15mm, Pin=250mW /Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 58.6 V/m; Power Drift = 0.018 dB

Peak SAR (extrapolated) = 3.89 W/kg

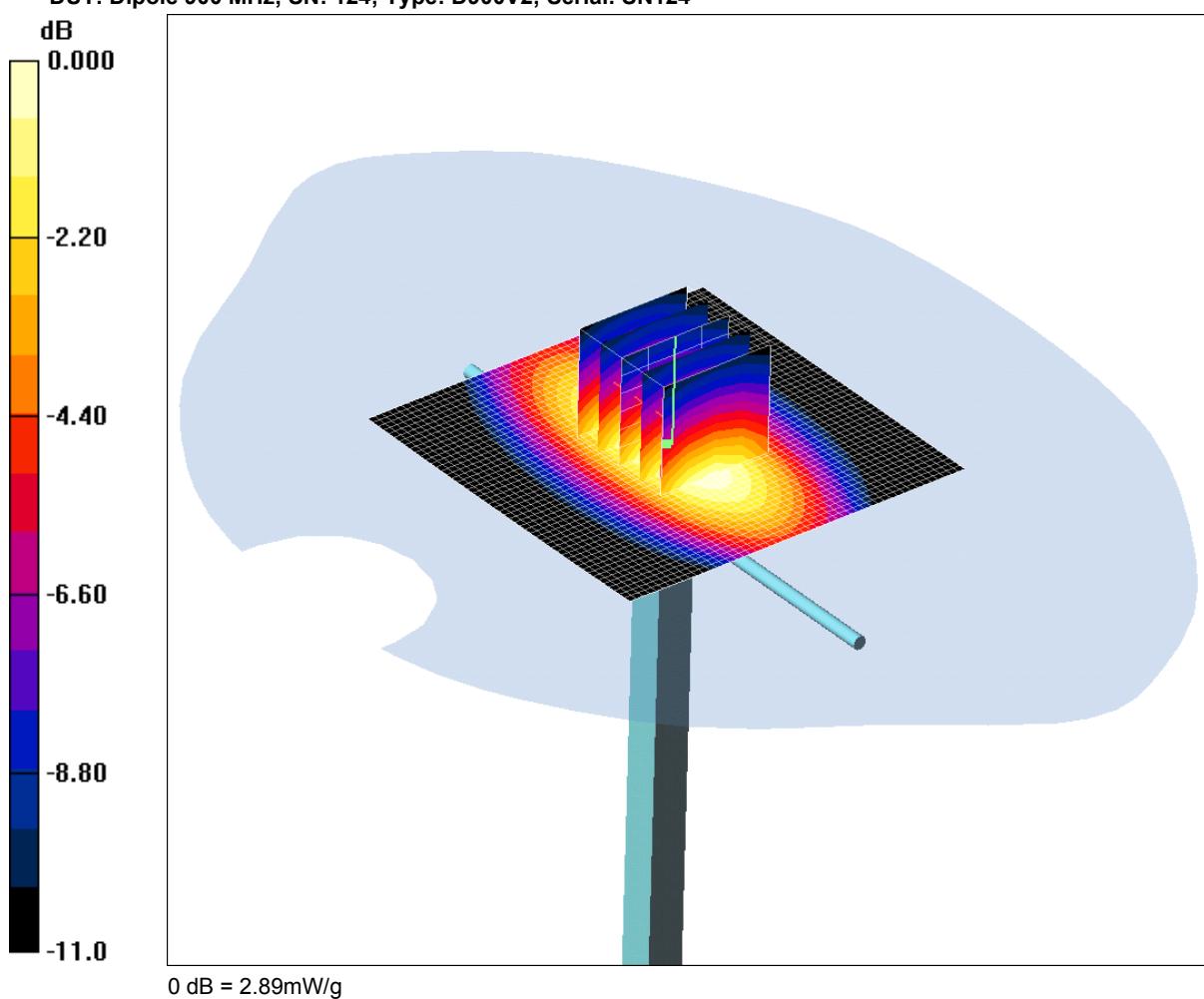
**SAR(1 g) = 2.76 mW/g; SAR(10 g) = 1.81 mW/g**

Maximum value of SAR (measured) = 2.98 mW/g

## SCN/81245JD06/018: System Performance Check 900MHz Body 26 09 11

Date 26/09/2011

DUT: Dipole 900 MHz; SN: 124; Type: D900V2; Serial: SN124



Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: 900 MHz MSL Medium parameters used:  $f = 900$  MHz;  $\sigma = 1.05$  mho/m;  $\epsilon_r = 54$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- 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=15mm, Pin=250mW/Area Scan (51x51x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 3.01 mW/g

**d=15mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 54.7 V/m; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 3.73 W/kg

**SAR(1 g) = 2.65 mW/g; SAR(10 g) = 1.72 mW/g**

Maximum value of SAR (measured) = 2.89 mW/g

**Note:**

The probe calibration for SN:1611 was performed at the spot frequencies of 835 MHz and 900 MHz.

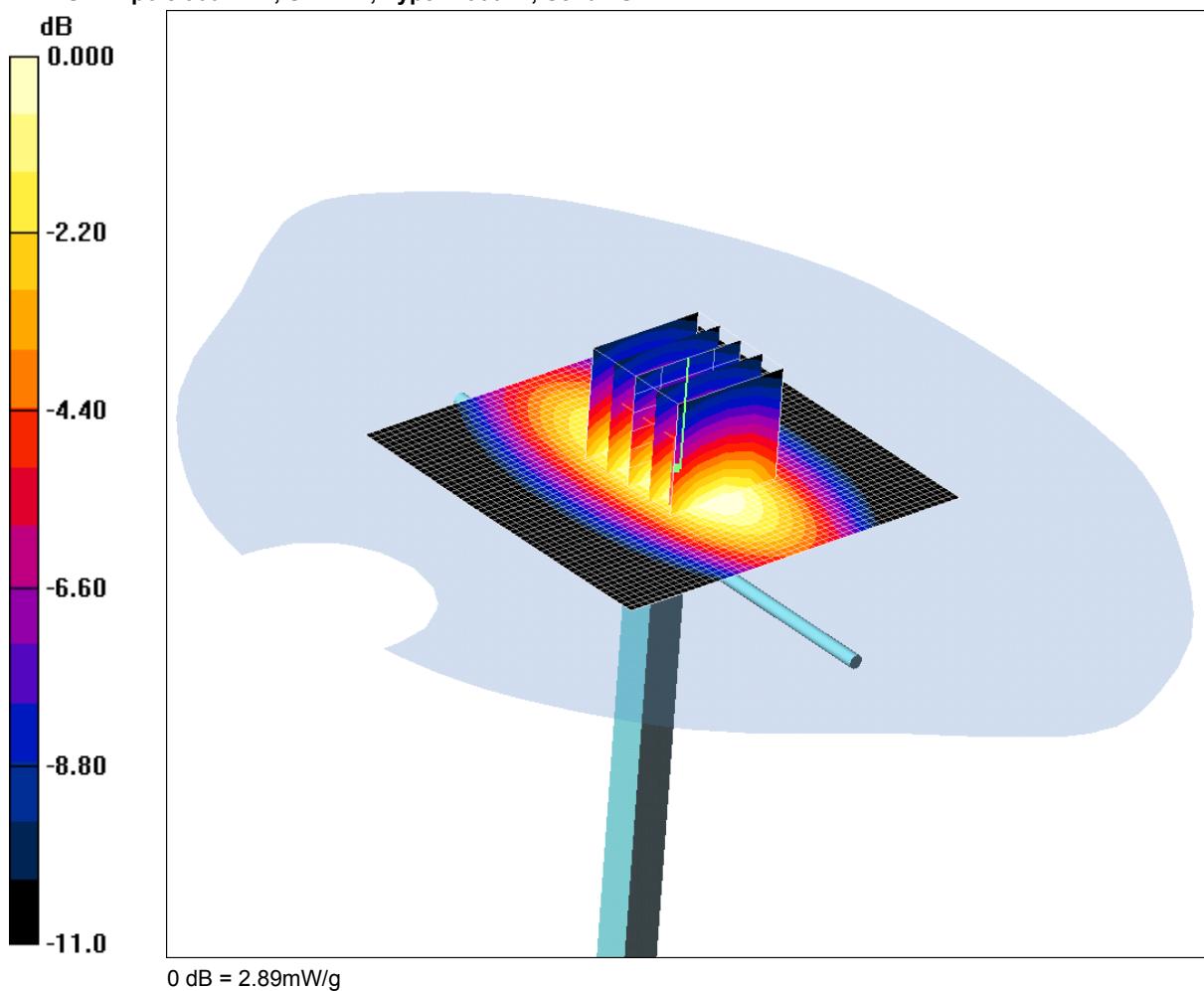
The SAR software selects the conversion factor based on the following attributes;

1. operating frequency, 2. permittivity tolerance and 3. conductivity tolerance. The software selects the conversion factor of 835 MHz from the probe calibration as the range is still valid for 900 MHz based on 1. The selected spot frequency for validation 900 MHz, 2. The measured permittivity of 54 and 3. The measured conductivity of 1.05.

## SCN/81245JD06/019: System Performance Check 900MHz Body 27 09 11

Date 27/09/2011

DUT: Dipole 900 MHz; SN: 124; Type: D900V2; Serial: SN124



Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: 900 MHz MSL Medium parameters used:  $f = 900$  MHz;  $\sigma = 1.05$  mho/m;  $\epsilon_r = 54$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(6.4, 6.4, 6.4); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- 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=15mm, Pin=250mW/Area Scan (51x51x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 3.04 mW/g

**d=15mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.2 V/m; Power Drift = -0.064 dB

Peak SAR (extrapolated) = 3.78 W/kg

**SAR(1 g) = 2.67 mW/g; SAR(10 g) = 1.74 mW/g**

Maximum value of SAR (measured) = 2.89 mW/g

**Note:**

The probe calibration for SN:1611 was performed at the spot frequencies of 835 MHz and 900 MHz.

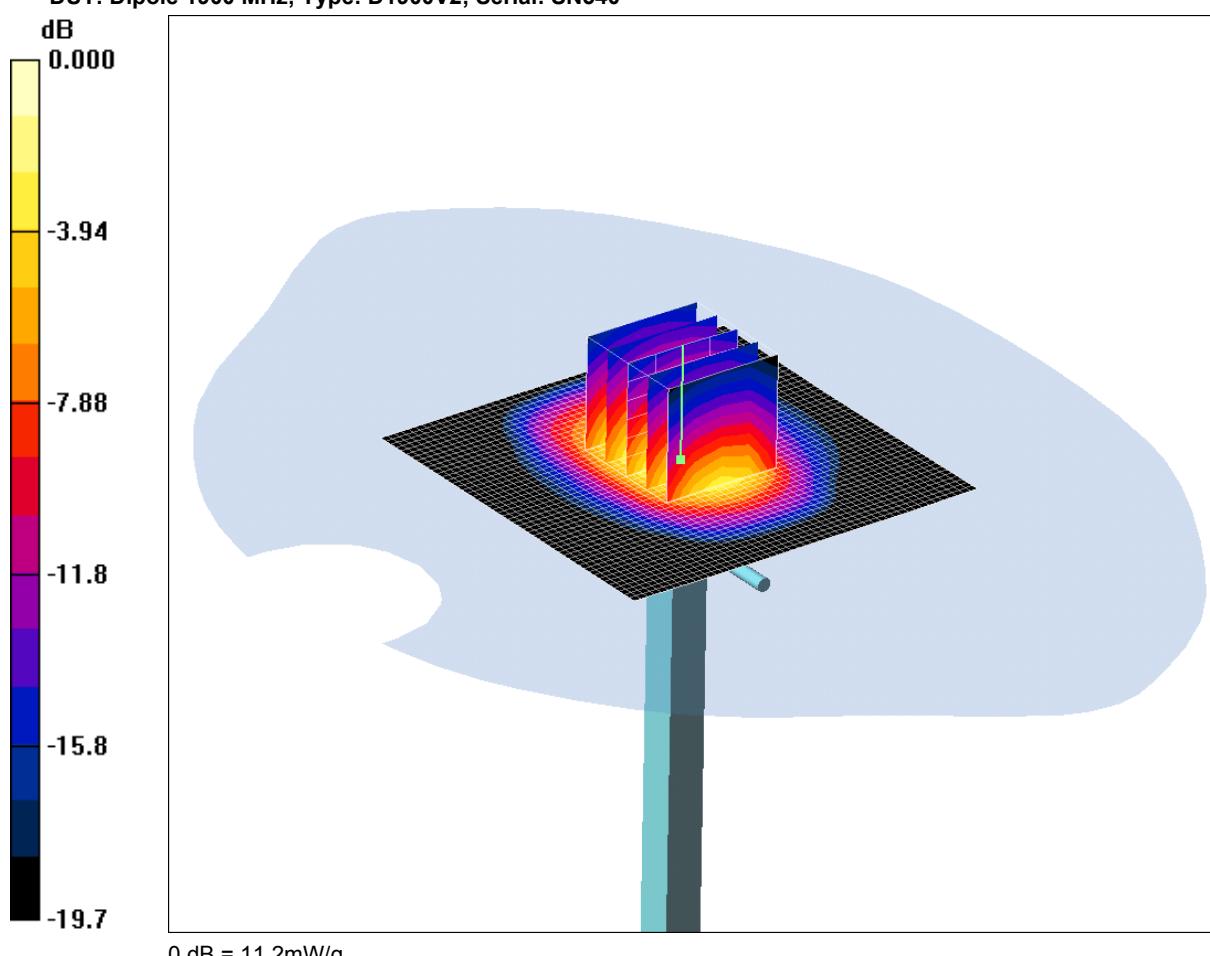
The SAR software selects the conversion factor based on the following attributes;

1. operating frequency, 2. permittivity tolerance and 3. conductivity tolerance. The software selects the conversion factor of 835 MHz from the probe calibration as the range is still valid for 900 MHz based on 1. The selected spot frequency for validation 900 MHz, 2. The measured permittivity of 54 and 3. The measured conductivity of 1.05.

## SCN/81245JD06/020: System Performance Check 1900MHz Head 02 12 11

Date 02/12/2011

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN540



Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 MHz HSL Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.44$  mho/m;  $\epsilon_r = 38.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1528; ConvF(4.81, 4.81, 4.81); Calibrated: 18/07/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- 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=10mm, Pin=250mW/Area Scan (51x51x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 14.8 mW/g

**d=10mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 90.4 V/m; Power Drift = -0.498 dB

Peak SAR (extrapolated) = 18.4 W/kg

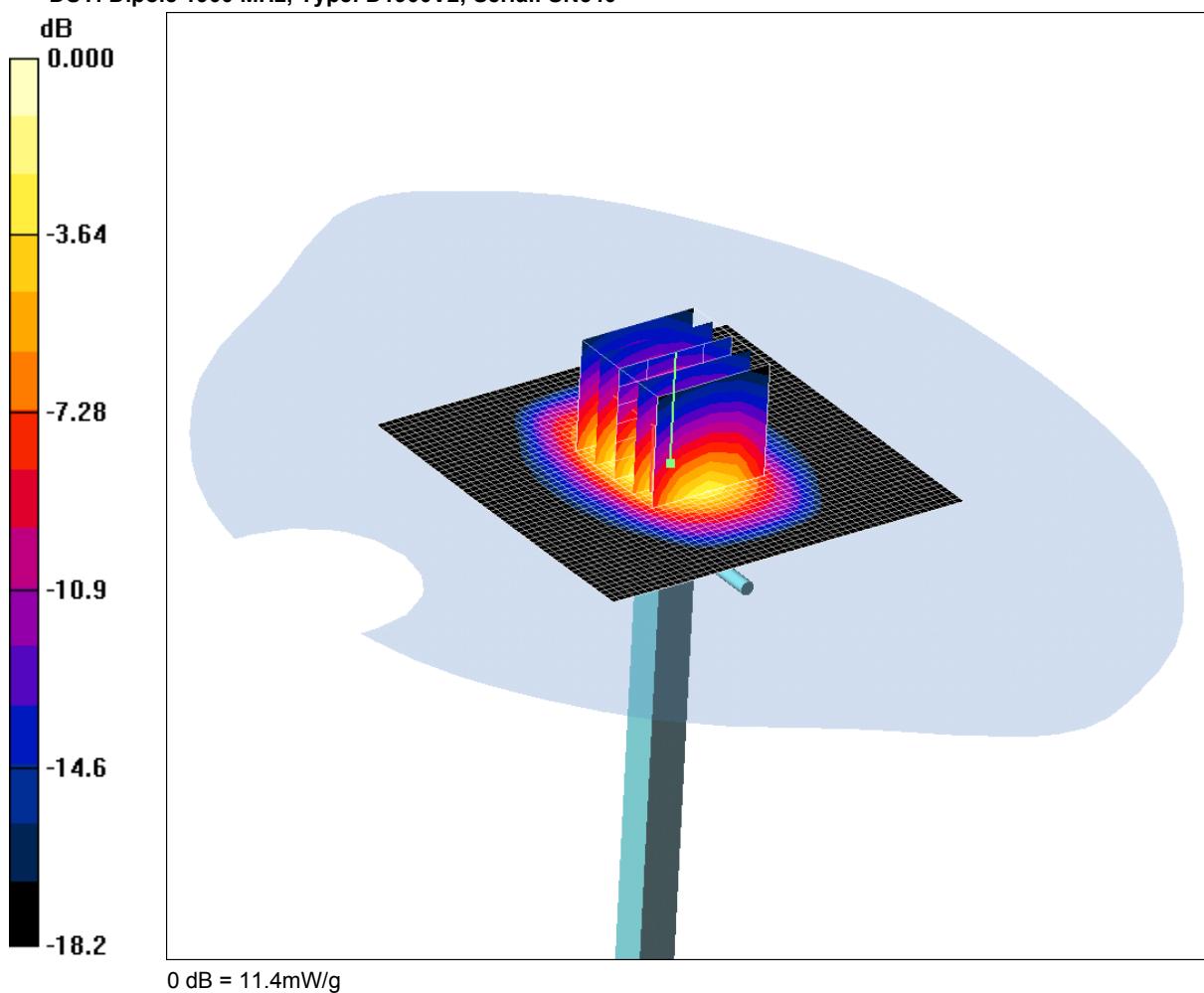
**SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.33 mW/g**

Maximum value of SAR (measured) = 11.2 mW/g

## SCN/81245JD06/021: System Performance Check 1900MHz Body 28 09 11

Date 28/09/2011

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: SN540



Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 MHz MSL Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1611; ConvF(4.55, 4.55, 4.55); Calibrated: 12/05/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 09/02/2011
- 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) = 15.2 mW/g

**d=10mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 90.7 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 17.7 W/kg

**SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.29 mW/g**

Maximum value of SAR (measured) = 11.4 mW/g

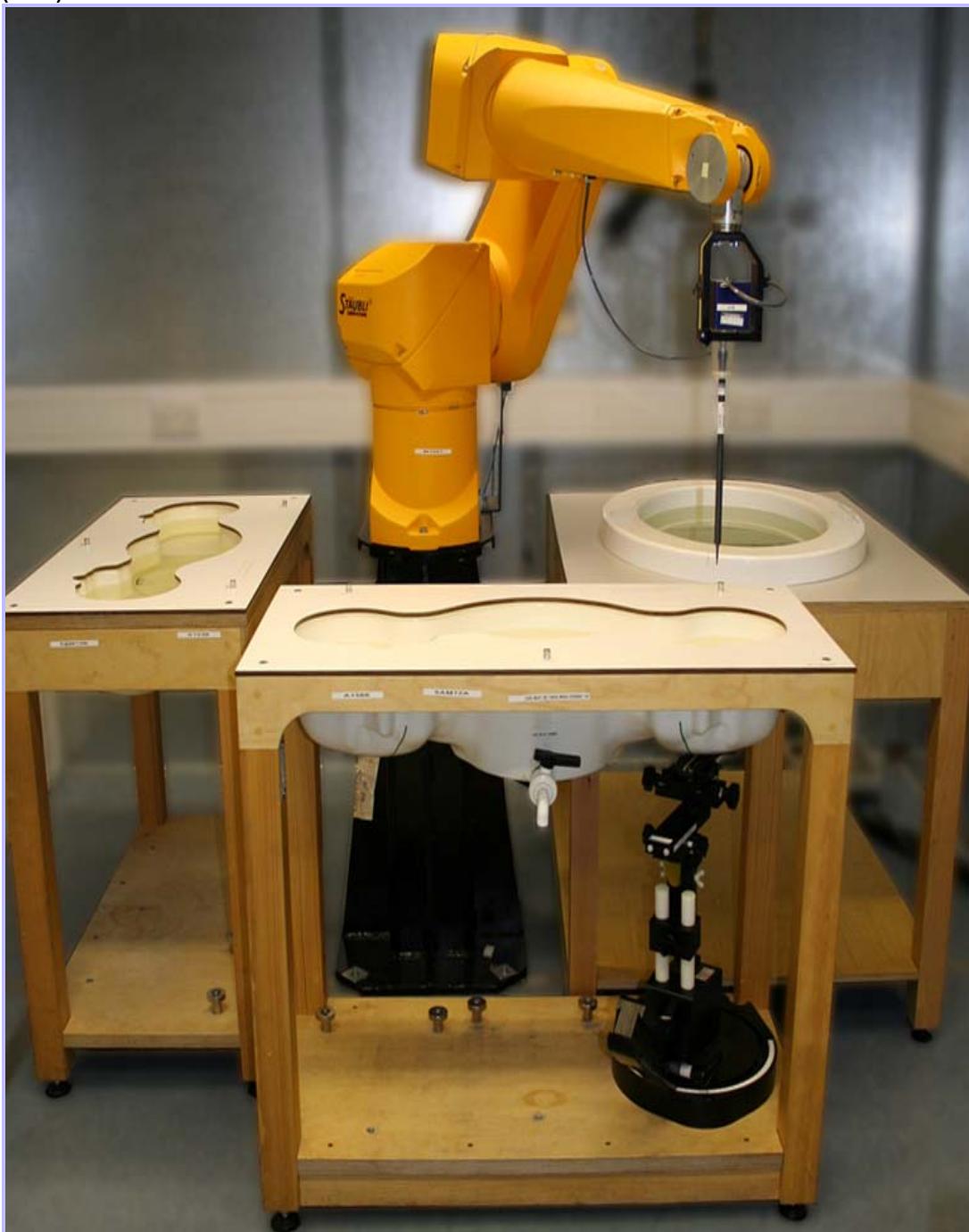
## Appendix 4. Photographs

This appendix contains the following photographs:

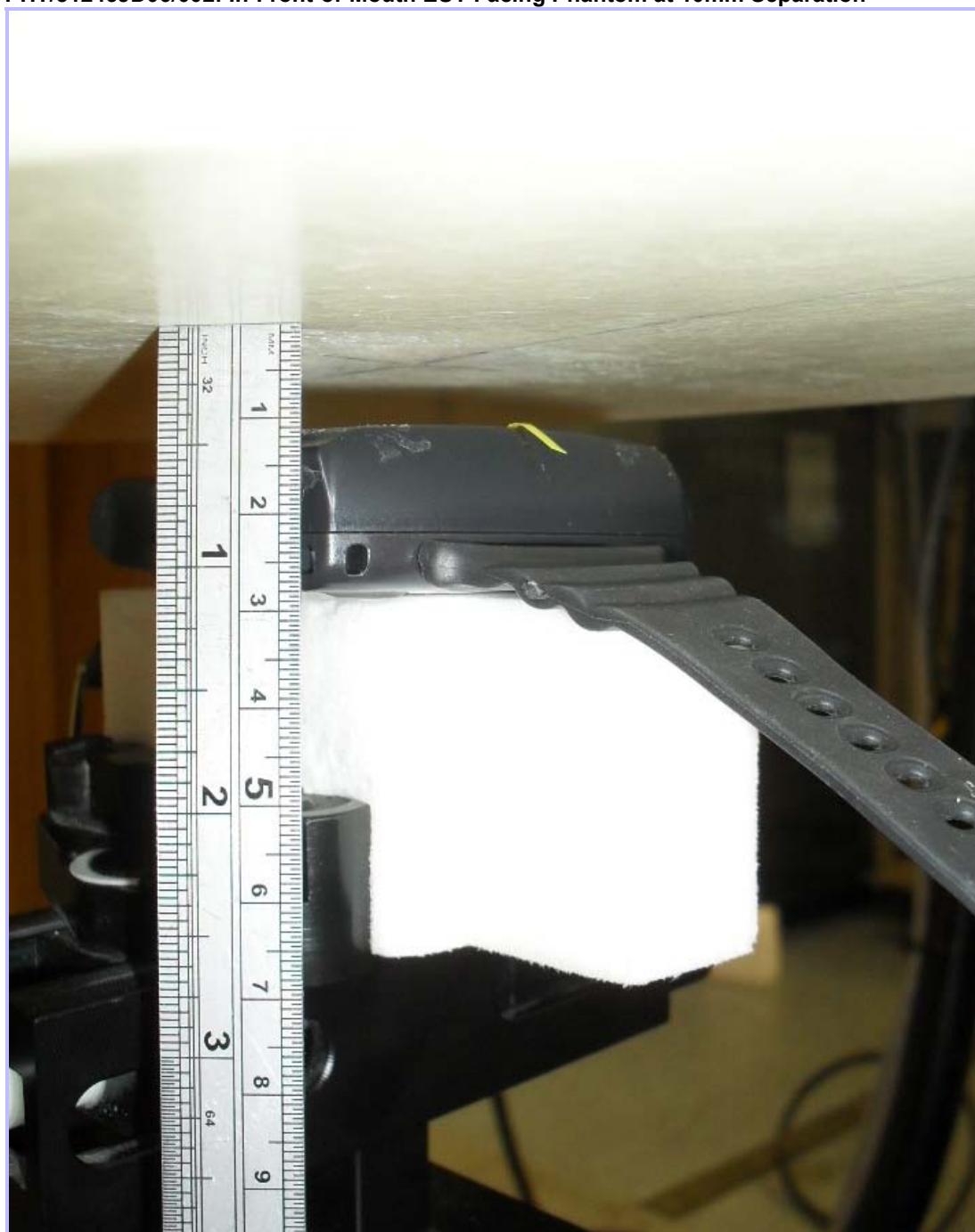
Photo Reference Number	Title
PHT/81245JD06/001	Test configuration for the measurement of Specific Absorption Rate (SAR)
PHT/81245JD06/002	In-Front-of-Mouth EUT Facing Phantom at 10mm Separation
PHT/81245JD06/003	Rear of EUT Facing Phantom
PHT/81245JD06/004	Front View of EUT
PHT/81245JD06/005	Rear View of EUT
PHT/81245JD06/006	Internal View of EUT
PHT/81245JD06/007	Internal View of EUT (Without Antenna Cap)
PHT/81245JD06/008	Battery View
PHT/81245JD06/009	900 MHz Head Fluid Level
PHT/81245JD06/010	900 MHz Body Fluid Level
PHT/81245JD06/011	1900 MHz Head Fluid Level
PHT/81245JD06/012	1900 MHz Body Fluid Level

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**PHT/81245JD06/001: Test configuration for the measurement of Specific Absorption Rate (SAR)**



PHT/81245JD06/002: In-Front-of-Mouth EUT Facing Phantom at 10mm Separation



**PHT/81245JD06/003: Rear of EUT Facing Phantom**



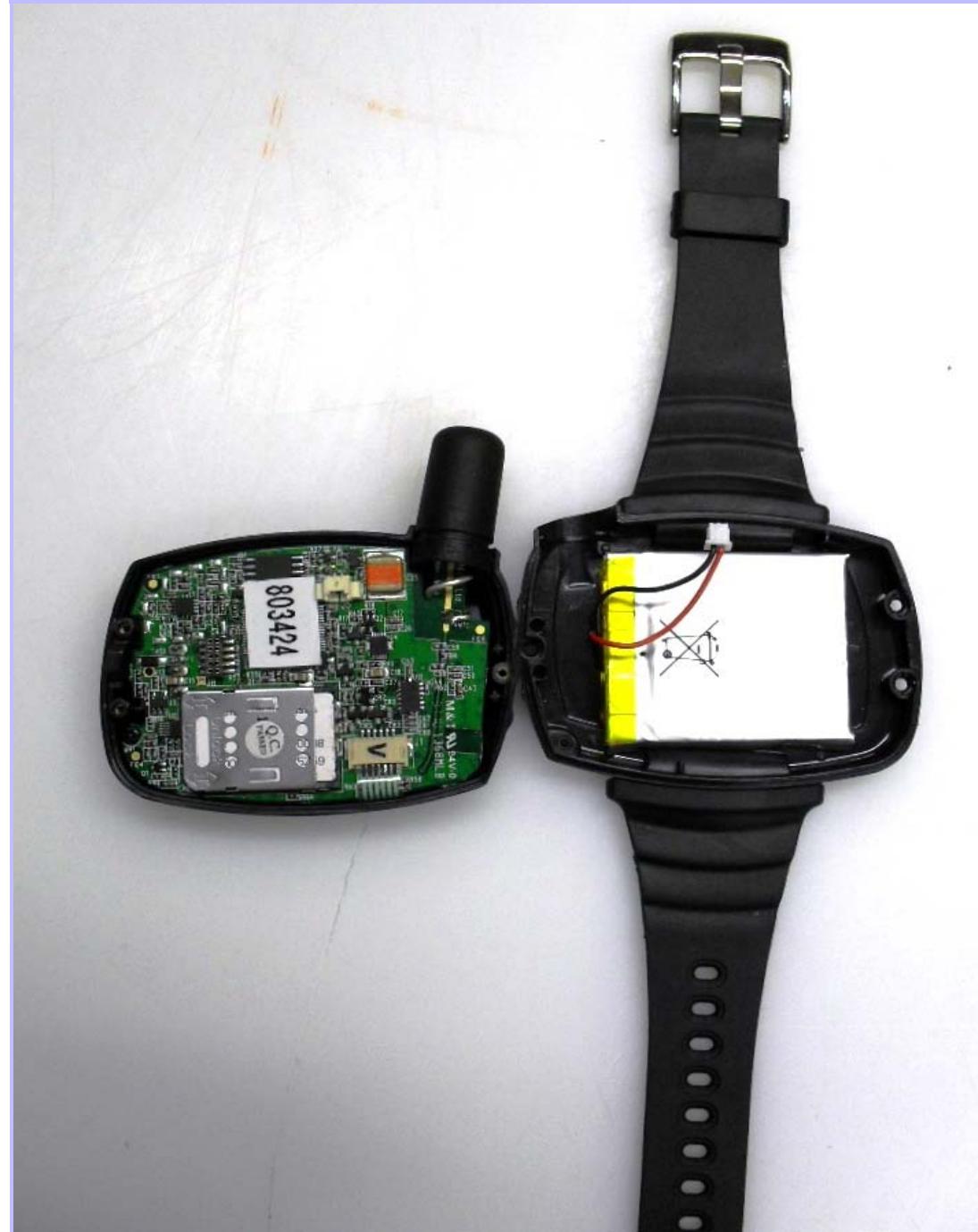
**PHT/81245JD06/004: Front View of EUT**



**PHT/81245JD06/005: Rear View of EUT**



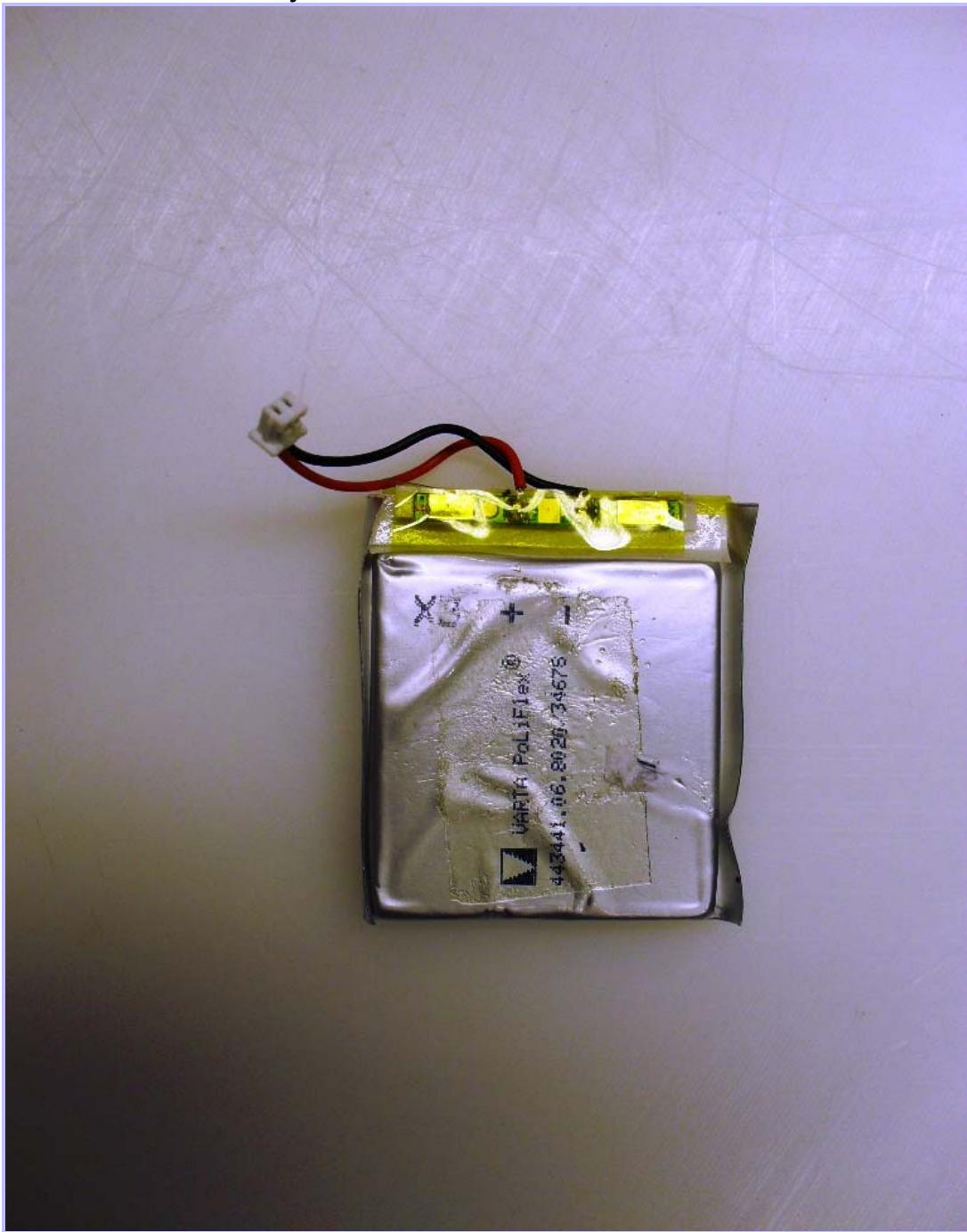
**PHT/81245JD06/006: Internal View of EUT**



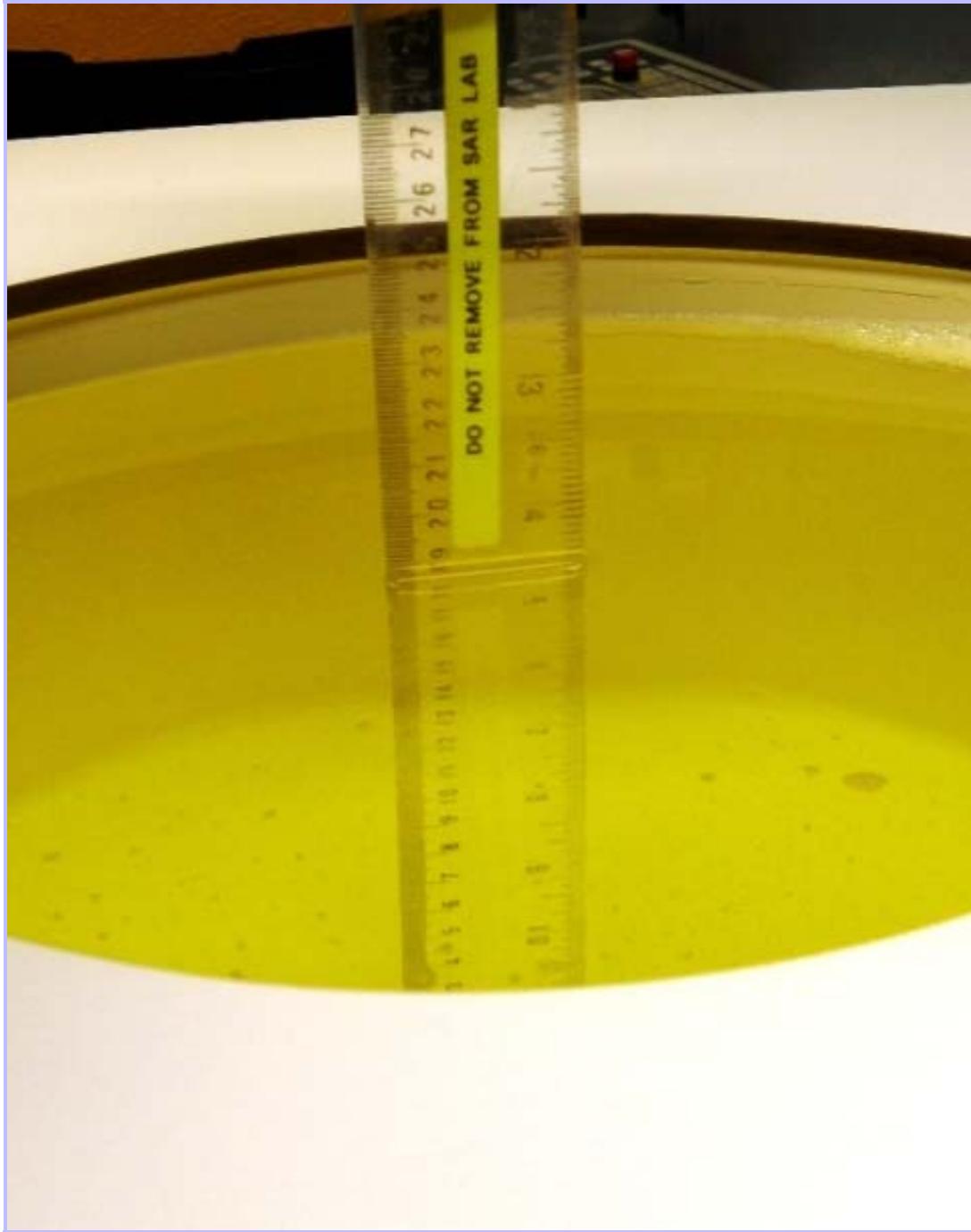
PHT/81245JD06/007: Internal View of EUT (Without Antenna Cap)



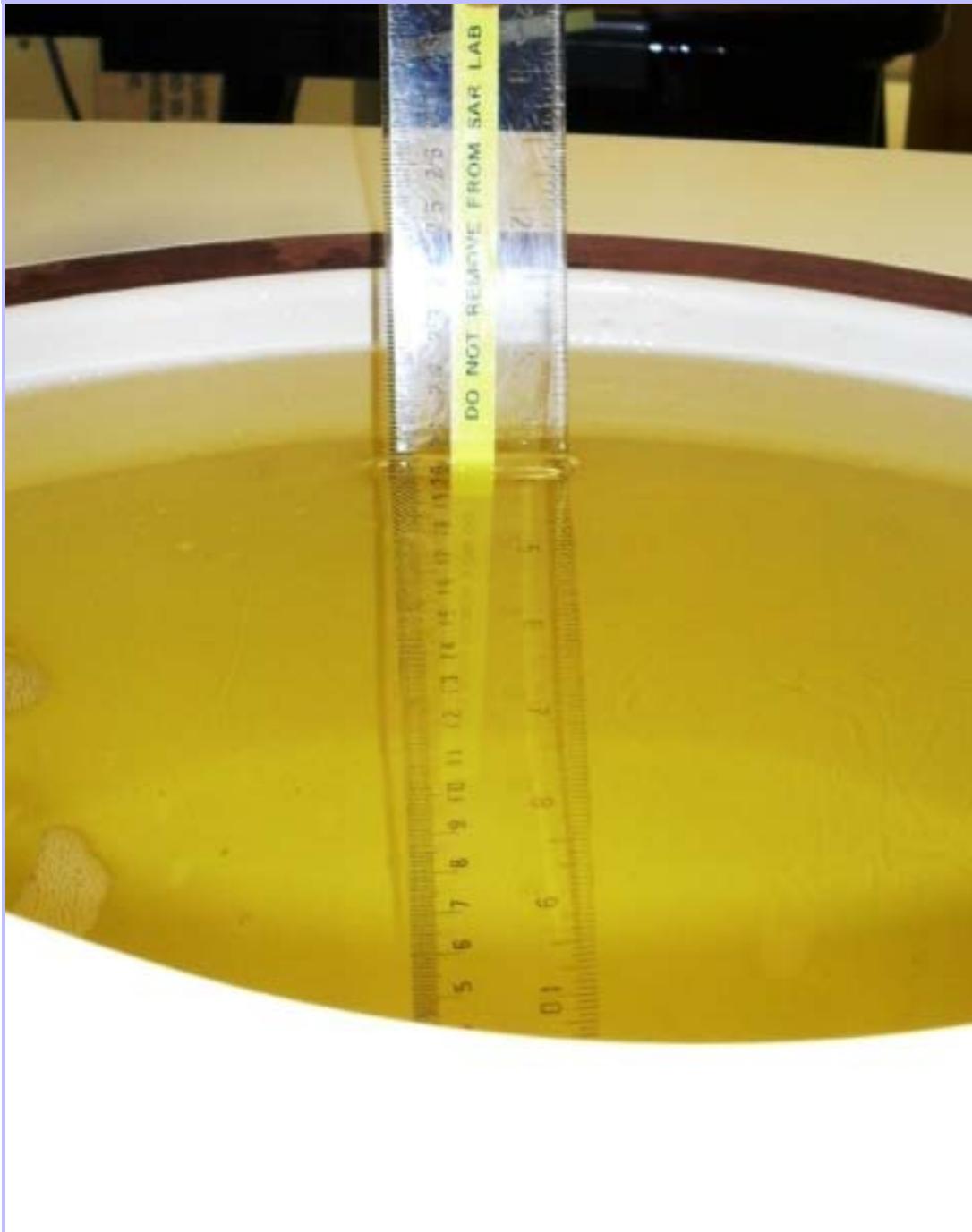
**PHT/81245JD06/008: Battery View**



**PHT/81245JD06/009: 900 MHz Head Fluid Level**



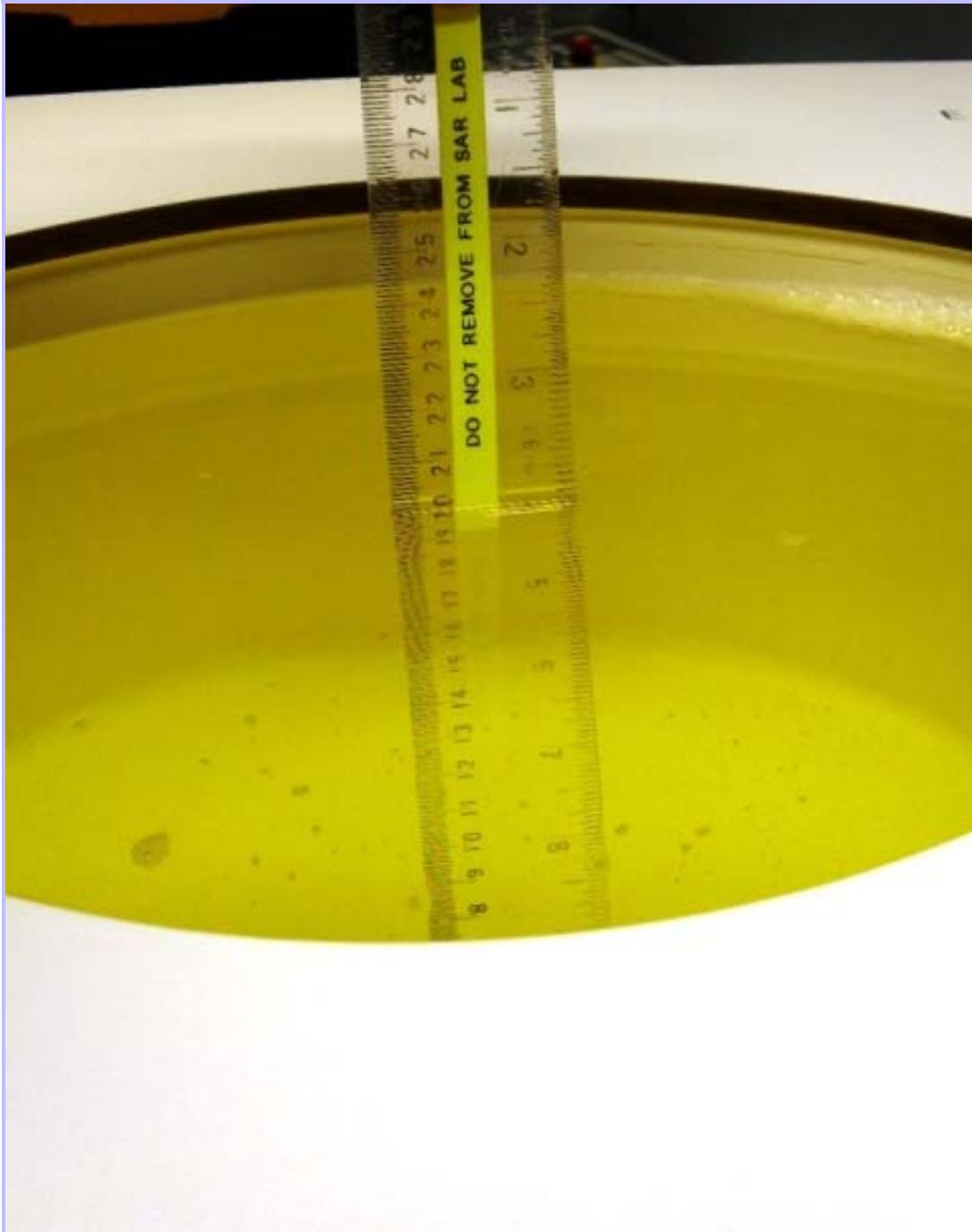
**PHT/81245JD06/010: 900 MHz Body Fluid Level**



**PHT/81245JD06/011: 1900 MHz Head Fluid Level**



**PHT/81245JD06/012: 1900 MHz Body Fluid Level**



## Appendix 5. Validation of System

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 dipoles and the system was verified to a tolerance of  $\pm 5\%$  for the 900 MHz and 1900 MHz dipoles.

The applicable verification normalised to 1 Watt.

**Date: 25/11/2011**

**Validation Dipole and Serial Number: D900V2; SN: 124**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	900	23.0°C	22.3°C	$\epsilon_r$	41.50	42.62	2.70	5.00
				$\sigma$	0.97	0.94	-3.05	5.00
				1g SAR	11.00	11.04	0.36	5.00
				10g SAR	7.01	7.24	3.28	5.00

### Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	$\epsilon_r$	43.10
			$\sigma$	0.89
189	Middle	836.4	$\epsilon_r$	43.10
			$\sigma$	0.90
251	High	848.8	$\epsilon_r$	43.00
			$\sigma$	0.90

**Date: 26/09/2011**

**Validation Dipole and Serial Number: D900V2; SN: 124**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0 °C	22.0 °C	$\epsilon_r$	55.00	53.96	-1.89	5.00
				$\sigma$	1.05	1.05	-0.43	5.00
				1g SAR	11.10	10.60	-4.50	5.00
				10g SAR	7.14	6.88	-3.64	5.00

### Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	$\epsilon_r$	54.30
			$\sigma$	1.00
189	Middle	836.4	$\epsilon_r$	54.30
			$\sigma$	1.01
251	High	848.8	$\epsilon_r$	54.20
			$\sigma$	1.01

### Validation of System (continued)

Date: 27/09/2011

Validation Dipole and Serial Number: D900V2; SN: 124

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	900	23.0°C	22.0°C	$\epsilon_r$	55.00	53.96	-1.89	5.00
				$\sigma$	1.05	1.05	-0.43	5.00
				1g SAR	11.10	10.68	-3.78	5.00
				10g SAR	7.14	6.96	-2.52	5.00

### Dielectrics for Frequencies Tested

Channel Number	Channel Description	Frequency (MHz)	Parameters	
128	Low	824.2	$\epsilon_r$	54.30
			$\sigma$	1.00
189	Middle	836.4	$\epsilon_r$	54.30
			$\sigma$	1.01
251	High	848.8	$\epsilon_r$	54.20
			$\sigma$	1.01

**Validation of System (continued)**

**Date: 02/12/2011**  
**Validation Dipole and Serial Number: D1900V2; SN: 540**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Head	1900	24.0 °C	22.1 °C	$\epsilon_r$	40.00	38.69	-3.29	5.00
				$\sigma$	1.40	1.44	2.81	5.00
				1g SAR	40.30	40.80	1.24	5.00
				10g SAR	21.00	21.32	1.52	5.00

**Dielectrics for Frequencies Tested**

Channel Number	Channel Description	Frequency (MHz)	Parameters	
512	Low	1850.2	$\epsilon_r$	38.90
			$\sigma$	1.40
660	Middle	1879.8	$\epsilon_r$	38.80
			$\sigma$	1.42
810	High	1909.8	$\epsilon_r$	38.60
			$\sigma$	1.45

**Date: 28/09/2011**  
**Validation Dipole and Serial Number: D1900V2; SN: 540**

Simulant	Frequency (MHz)	Room Temp	Liquid Temp	Parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
Body	1900	23.0 °C	23.0 °C	$\epsilon_r$	53.30	51.95	-2.54	5.00
				$\sigma$	1.52	1.57	3.10	5.00
				1g SAR	40.70	40.80	0.25	5.00
				10g SAR	21.60	21.16	-2.04	5.00

**Dielectrics for Frequencies Tested**

Channel Number	Channel Description	Frequency (MHz)	Parameters	
512	Low	1850.2	$\epsilon_r$	52.10
			$\sigma$	1.52
660	Middle	1879.8	$\epsilon_r$	52.00
			$\sigma$	1.55
810	High	1909.8	$\epsilon_r$	51.90
			$\sigma$	1.58

## Appendix 6. Simulated Tissues

The body mixture consists of de-ionised 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 Head
De-Ionized Water	52.87
Polysorbate 20 (Tween 20)	46.10
Salt	1.03

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 Head
De-Ionized Water	55.40
Polysorbate 20 (Tween 20)	44.22
Salt	0.38

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 multiplexer, 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

<b>Positioner:</b>	Stäubli Unimation Corp. Robot Model: RX90L
<b>Repeatability:</b>	0.025 mm
<b>No. of Axis:</b>	6
<b>Serial Number:</b>	F00/SD89A1/A/01
<b>Reach:</b>	1185 mm
<b>Payload:</b>	3.5 kg
<b>Control Unit:</b>	CS7
<b>Programming Language:</b>	V+

#### Data Acquisition Electronic (DAE) System

<b>Serial Number:</b>	DAE3 SN:450
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#### PC Controller

<b>PC:</b>	Dell Precision 340
<b>Operating System:</b>	Windows 2000
<b>Data Card:</b>	DASY4 Measurement Server
<b>Serial Number:</b>	1080

#### Data Converter

<b>Features:</b>	Signal Amplifier, multiplexer, A/D converted and control logic.
<b>Software:</b>	DASY4 Software
<b>Connecting Lines:</b>	Optical downlink for data and status info. Optical uplink for commands and clock.

#### PC Interface Card

<b>Function:</b>	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot.
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**DASY4 SAR System Specifications (Continued)**  
**E-Field Probe**

<b>Model:</b>	ET3DV6
<b>Serial No:</b>	1611
<b>Construction:</b>	Triangular core
<b>Frequency:</b>	735 MHz to >2.55 GHz
<b>Linearity:</b>	±0.2 dB (735 MHz to 2.55 GHz)
<b>Probe Length (mm):</b>	337
<b>Probe Diameter (mm):</b>	10
<b>Tip Length (mm):</b>	10
<b>Tip Diameter (mm):</b>	6.8
<b>Sensor X Offset (mm):</b>	2.7
<b>Sensor Y Offset (mm):</b>	2.7
<b>Sensor Z Offset (mm):</b>	2.7
<b>E-Field Probe</b>	
<b>Model:</b>	ET3DV6
<b>Serial No:</b>	1528
<b>Construction:</b>	Triangular core
<b>Frequency:</b>	735 MHz to >2.00 GHz
<b>Linearity:</b>	±0.2 dB (735 MHz to 2.00 GHz)
<b>Probe Length (mm):</b>	337
<b>Probe Diameter (mm):</b>	10
<b>Tip Length (mm):</b>	10
<b>Tip Diameter (mm):</b>	6.8
<b>Sensor X Offset (mm):</b>	2.7
<b>Sensor Y Offset (mm):</b>	2.7
<b>Sensor Z Offset (mm):</b>	2.7
<b>Phantom</b>	
<b>Phantom:</b>	SAM Phantom
<b>Shell Material:</b>	Fibreglass
<b>Thickness:</b>	2.0 ±0.1 mm