

 Celltech Testing and Engineering Services Ltd.	<u>Date(s) of Evaluation</u> May 01-02, 2008	<u>Test Report Serial No.</u> 032608O78-T884-S90U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 IAC-MRA ACCREDITED
	<u>Test Report Issue Date</u> May 16, 2008	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational / Controlled	

Test Lab Certificate No. 2470.01

## APPENDIX F - PROBE CALIBRATION

<b>Applicant:</b>	Smart Communications Ltd.	<b>Model:</b>	SC-580C	<b>FCC ID:</b>	O78SC580C	 SMARTCOMM USA INC. <sup>TM</sup>
<b>DUT Type:</b>	Portable FM UHF PTT Radio Transceiver	<b>Transmit Frequency Range:</b>	480 - 512 MHz			
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Accreditation No.: **SCS 108**

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 Multilateral Agreement for the recognition of calibration certificates

Client

**Celltech**

Certificate No: **ET3-1387\_Apr08**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1387**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3**  
 Calibration procedure for dosimetric E-field probes

Calibration date: **April 22, 2008**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

Calibrated by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Approved by:	Name	Function
	Niels Kuster	Quality Manager

Issued: April 22, 2008

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



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### **Glossary:**

TSL	tissue simulating liquid
NORM $x,y,z$	sensitivity in free space
ConvF	sensitivity in TSL / NORM $x,y,z$
DCP	diode compression point
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 $x,y,z$ :** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM $x,y,z$  are only intermediate values, i.e., the uncertainties of NORM $x,y,z$  does not effect 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 (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM $x,y,z * ConvF$  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:1387

Manufactured:	September 21, 1999
Last calibrated:	March 16, 2007
Recalibrated:	April 22, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space <sup>A</sup>			Diode Compression <sup>B</sup>	
NormX	<b>1.63</b> $\pm$ 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	92 mV
NormY	<b>1.71</b> $\pm$ 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	90 mV
NormZ	<b>1.69</b> $\pm$ 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	91 mV

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

### Boundary Effect

TSL                    835 MHz                    Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
SAR <sub>be</sub> [%]      Without Correction Algorithm	10.6	5.9
SAR <sub>be</sub> [%]      With Correction Algorithm	0.9	0.8

### Sensor Offset

Probe Tip to Sensor Center                    **2.7** mm

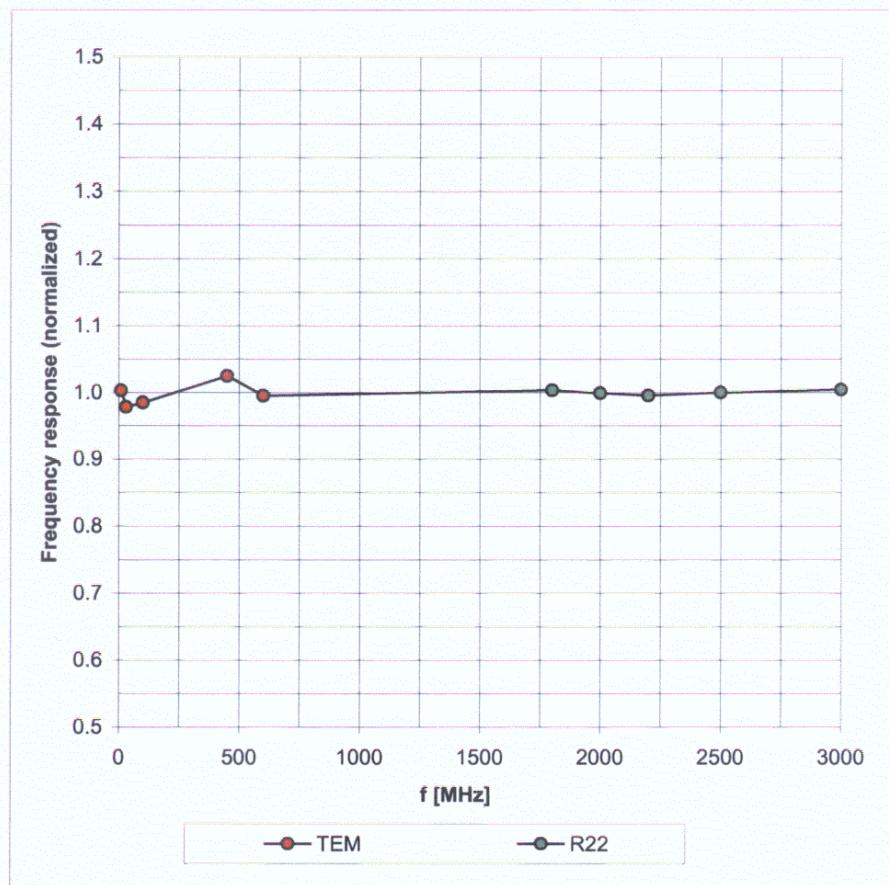
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

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

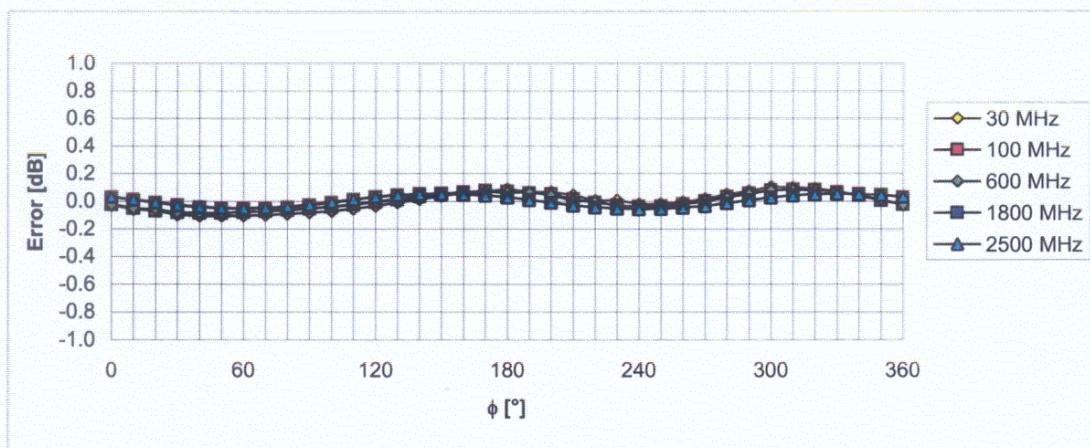
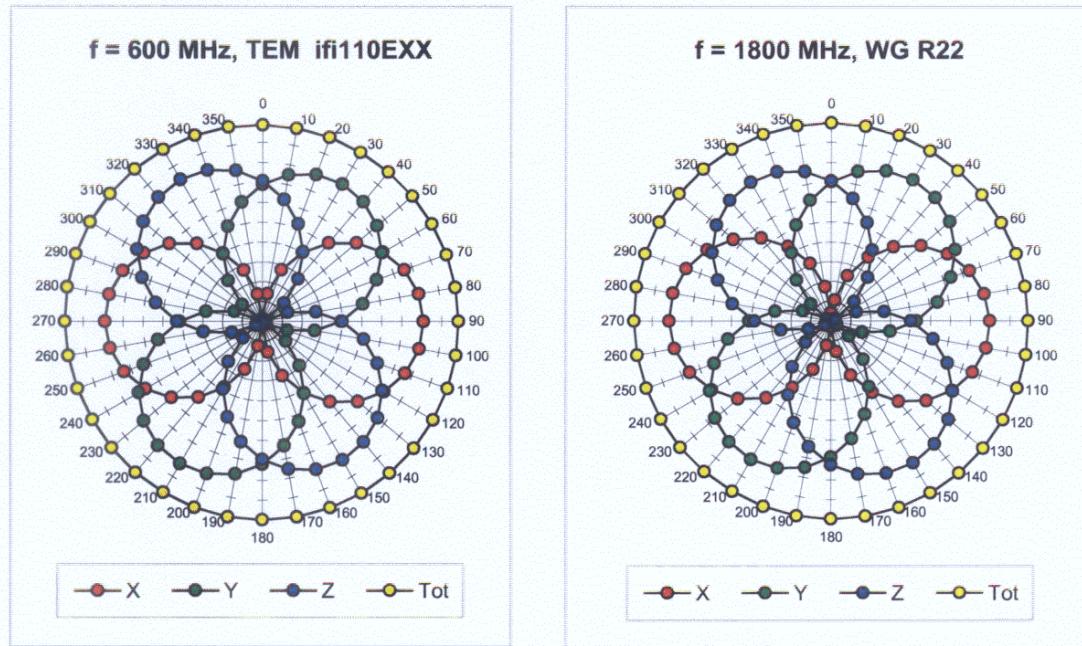
## Frequency Response of E-Field

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



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

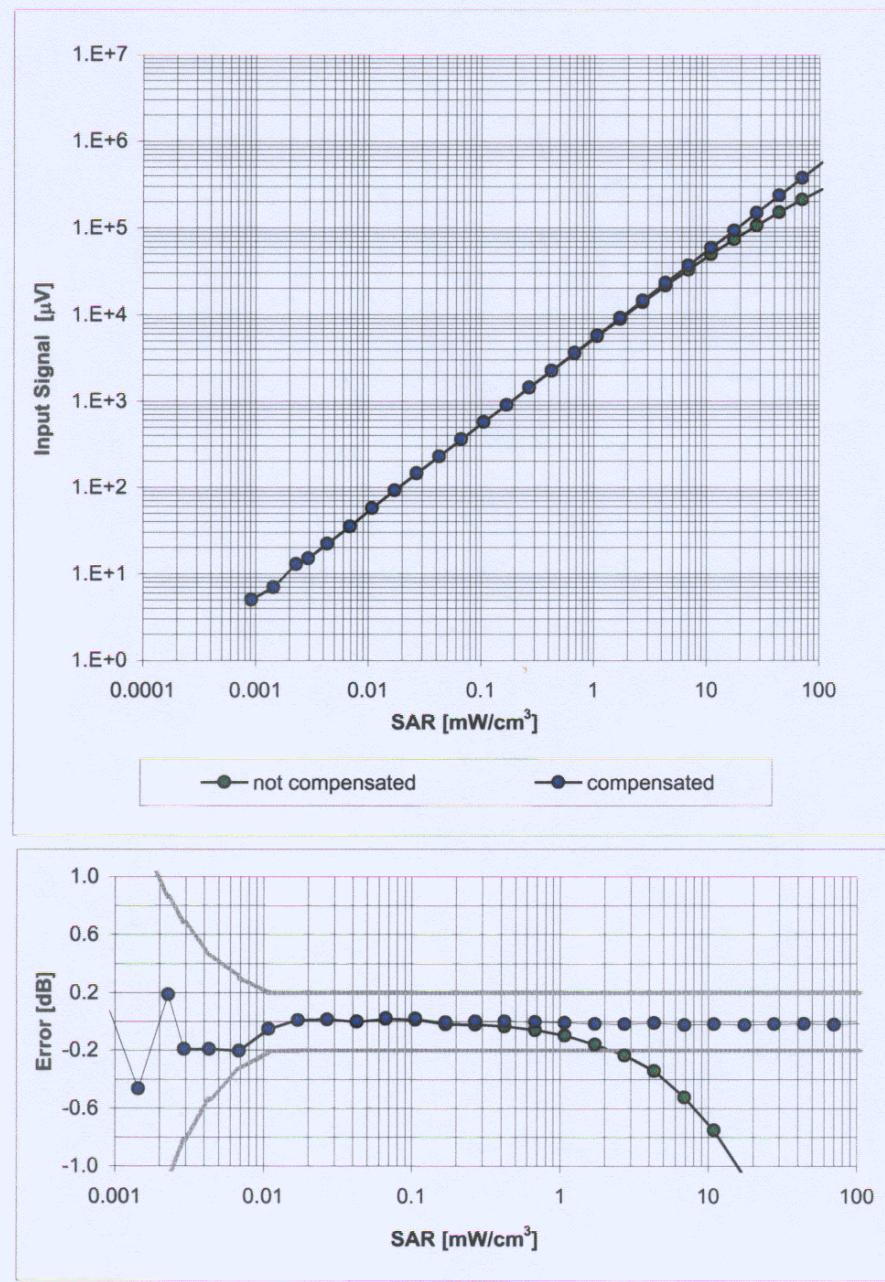
## Receiving Pattern ( $\phi$ ), $\vartheta = 0^\circ$



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

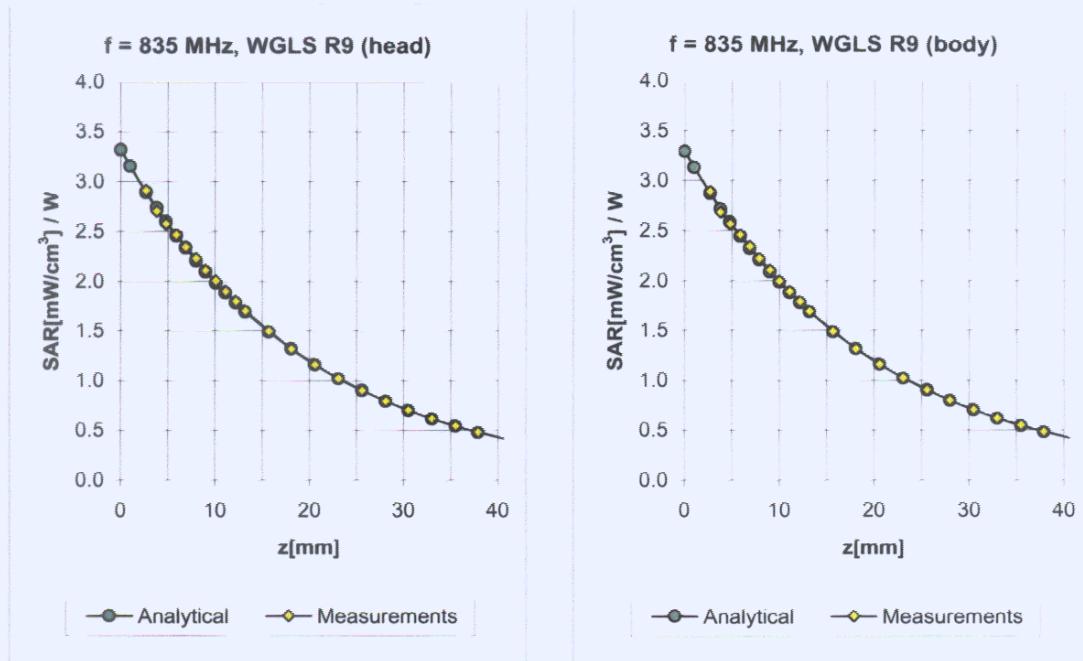
## Dynamic Range $f(\text{SAR}_{\text{head}})$

(Waveguide R22,  $f = 1800$  MHz)



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

## Conversion Factor Assessment

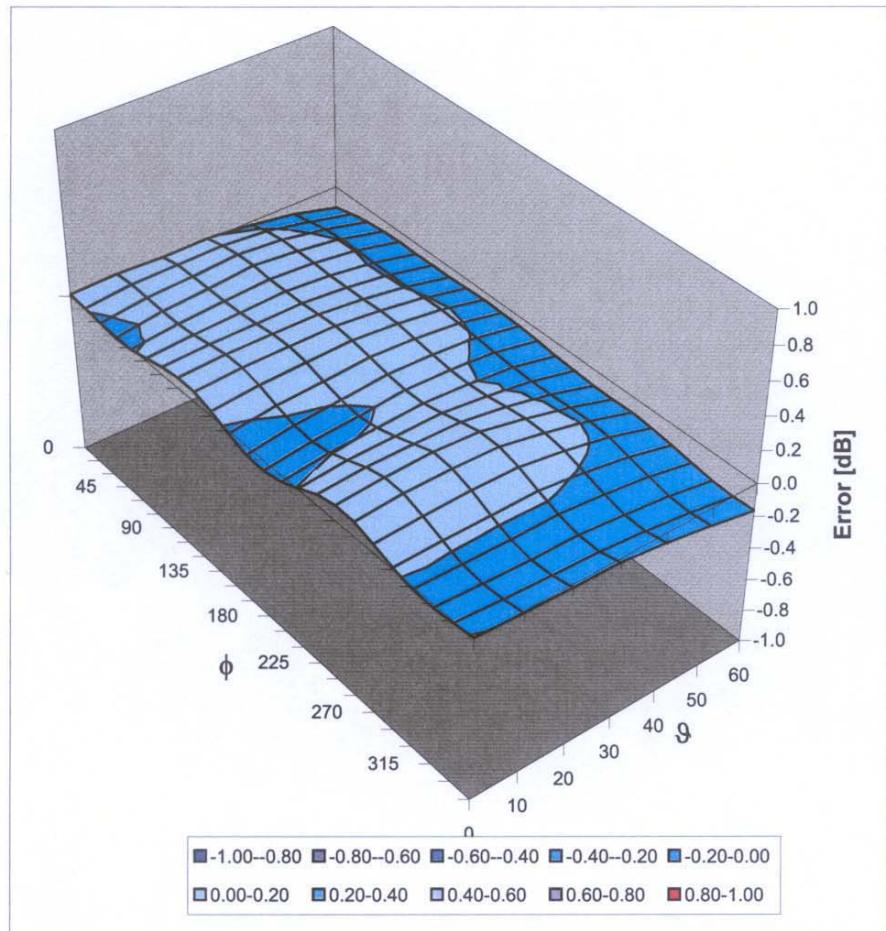


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.38	1.93	7.32	± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.74	1.95	6.52	± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.32	1.87	7.76	± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.89	1.82	5.96	± 11.0% (k=2)

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

## Deviation from Isotropy in HSL

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



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  (k=2)