

1900 GPRS Test Position 4 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 4/Area Scan (71x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.361 mW/g

Test Position 4/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.6 V/m; Power Drift = -0.096 dB

Peak SAR (extrapolated) = 0.529 W/kg

SAR(1 g) = 0.332 mW/g; SAR(10 g) = 0.211 mW/g

Maximum value of SAR (measured) = 0.354 mW/g

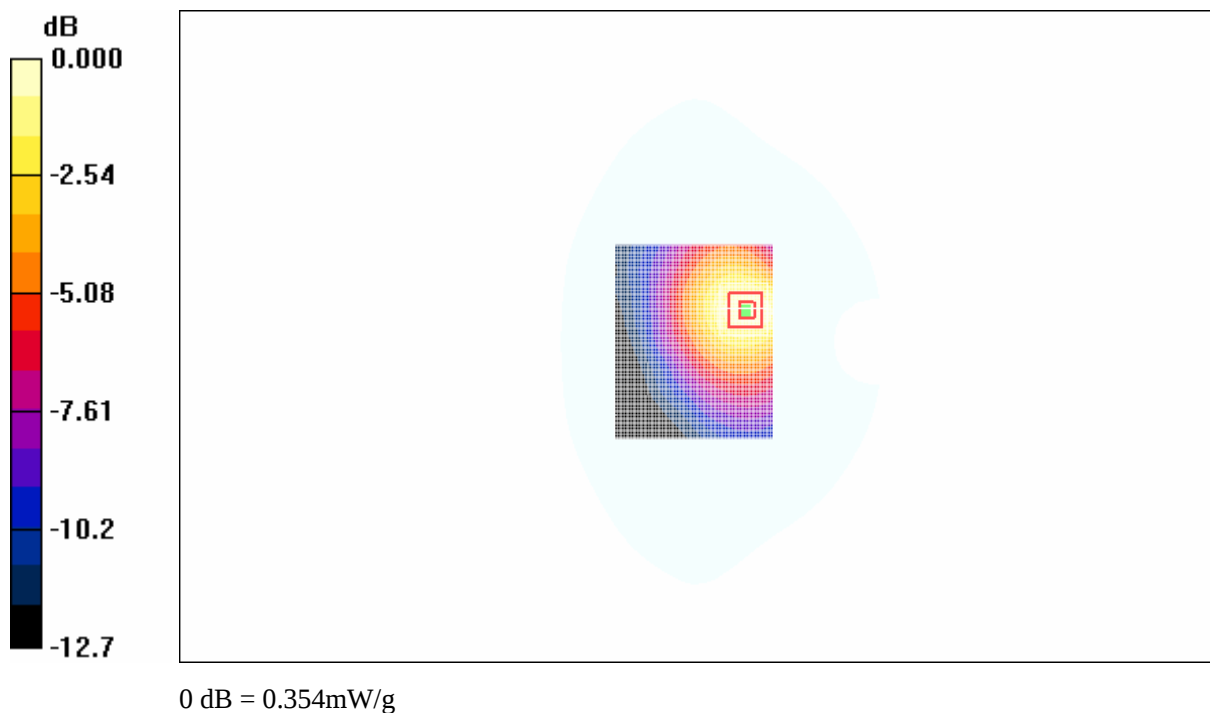


Fig. 77 PCS 1900 GPRS CH661 Test Position 4

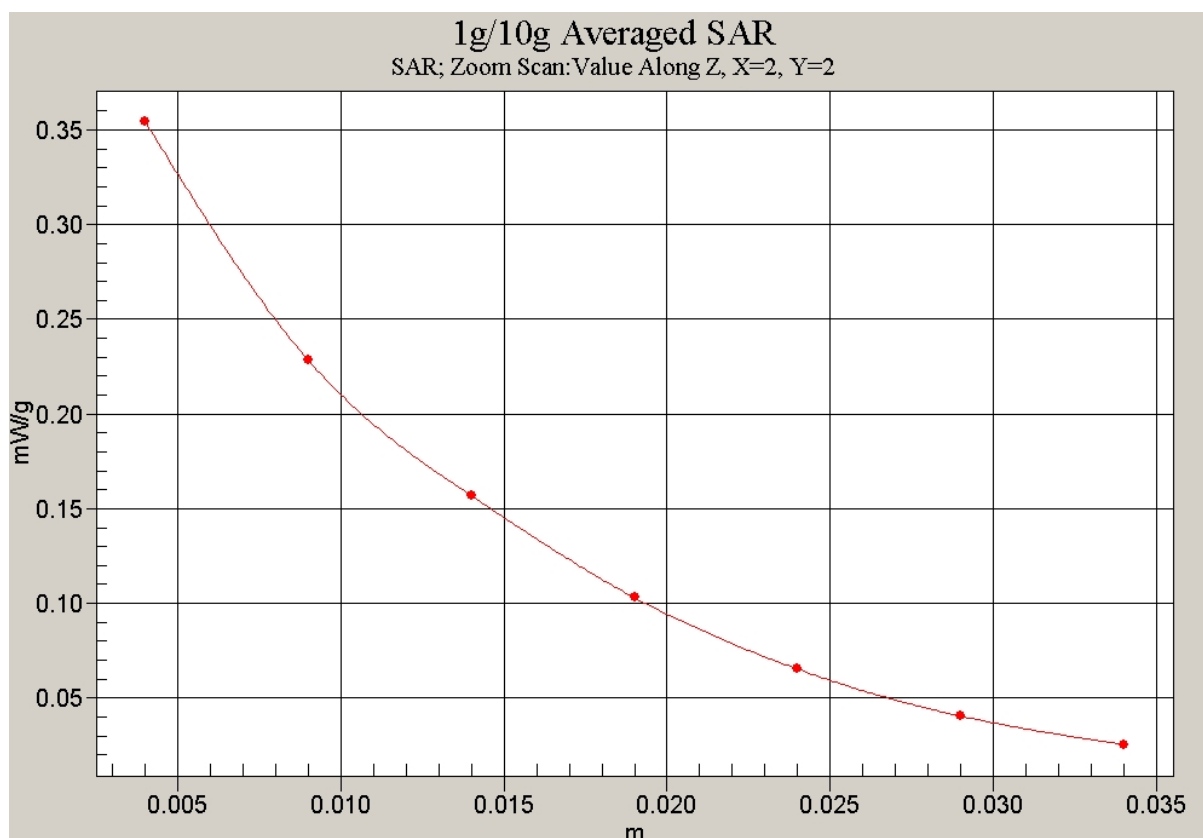


Fig.78 Z-Scan at power reference point (PCS 1900 GPRS CH661 Test Position 4)

1900 GPRS Test Position 5 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 5/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.147 mW/g

Test Position 5/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.21 V/m; Power Drift = 0.054 dB

Peak SAR (extrapolated) = 0.222 W/kg

SAR(1 g) = 0.137 mW/g; SAR(10 g) = 0.088 mW/g

Maximum value of SAR (measured) = 0.145 mW/g

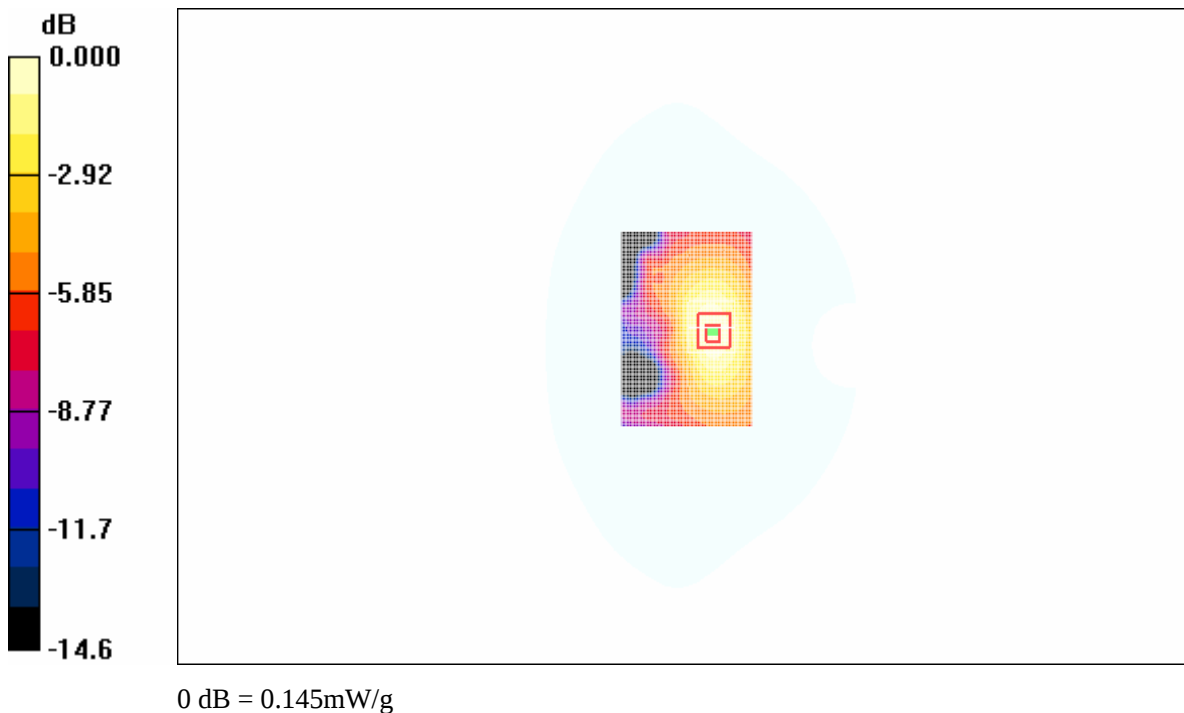


Fig.79 PCS 1900 GPRS CH661 Test Position 5

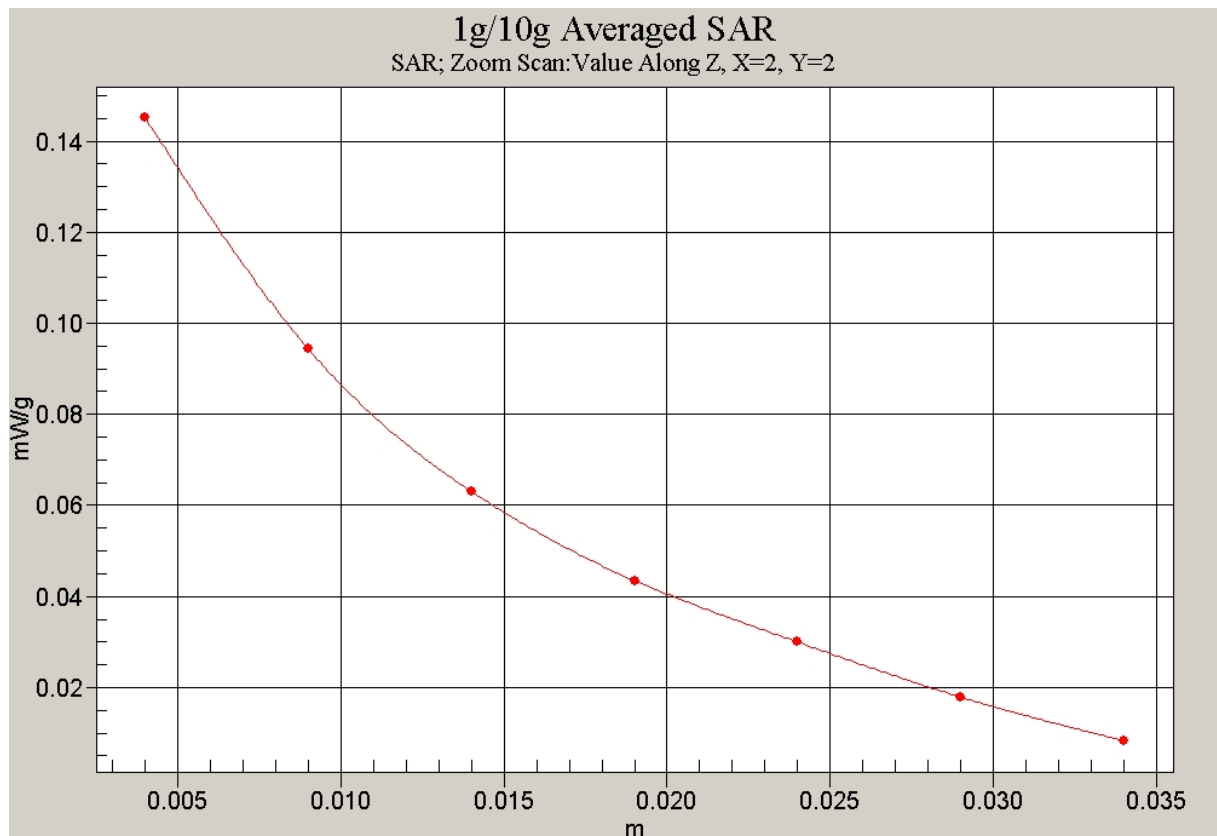


Fig.80 Z-Scan at power reference point (PCS 1900 GPRS CH661 Test Position 5)

1900 EGPRS Test Position 1 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 1/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.351 mW/g

Test Position 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.5 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 0.516 W/kg

SAR(1 g) = 0.328 mW/g; SAR(10 g) = 0.207 mW/g

Maximum value of SAR (measured) = 0.356 mW/g

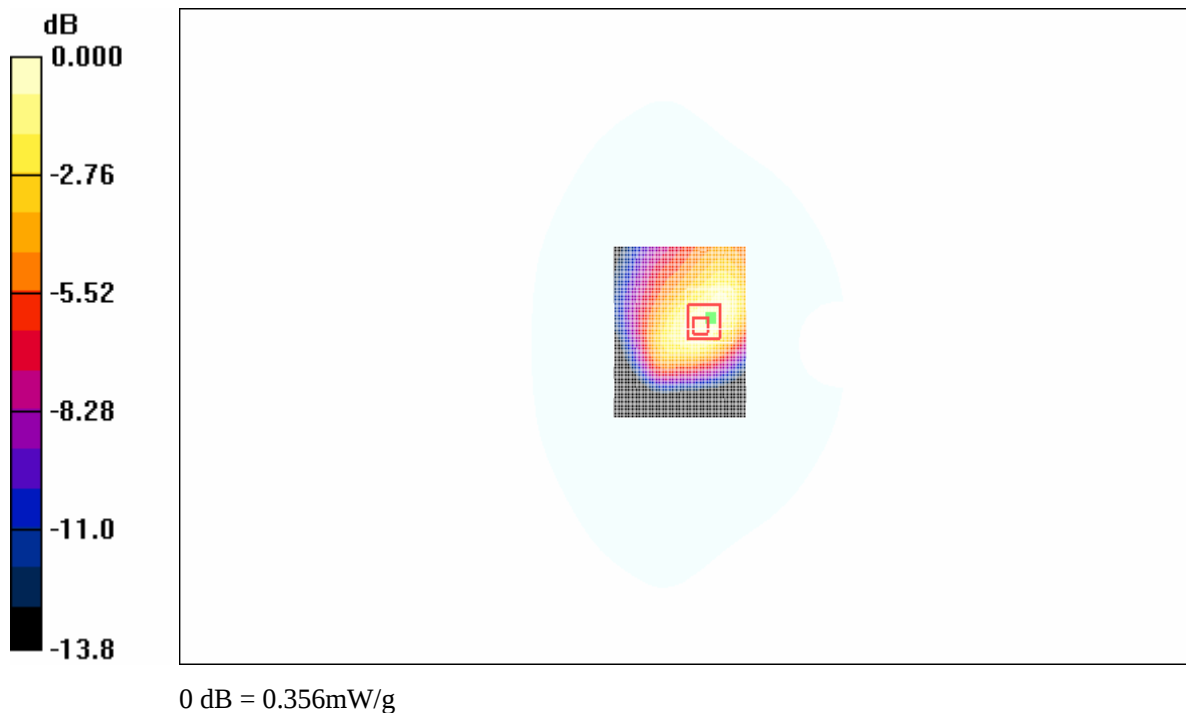


Fig. 81 PCS 1900 EGPRS CH661 Test Position 1

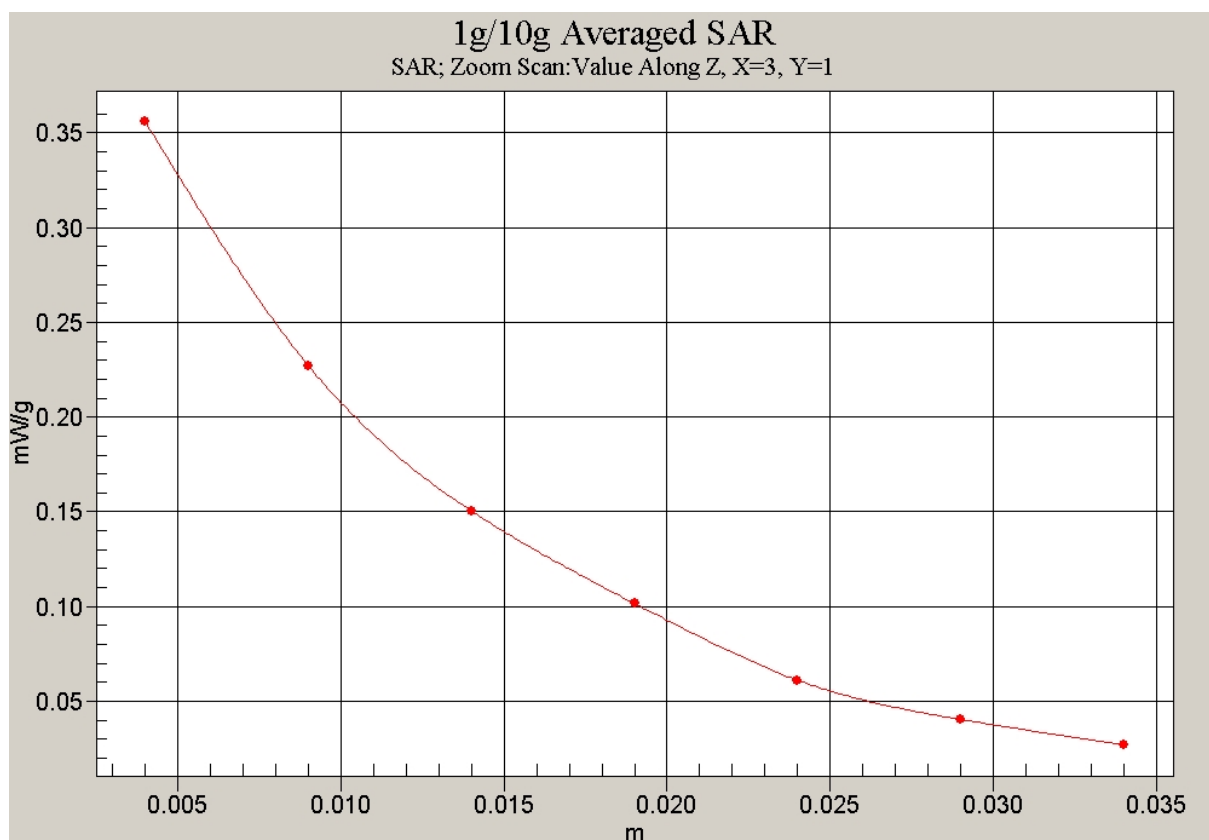


Fig.82 Z-Scan at power reference point (PCS 1900 EGPRS CH661 Test Position 1)

1900 EGPRS Test Position 2 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 2/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.279 mW/g

Test Position 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.3 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 0.429 W/kg

SAR(1 g) = 0.261 mW/g; SAR(10 g) = 0.163 mW/g

Maximum value of SAR (measured) = 0.279 mW/g

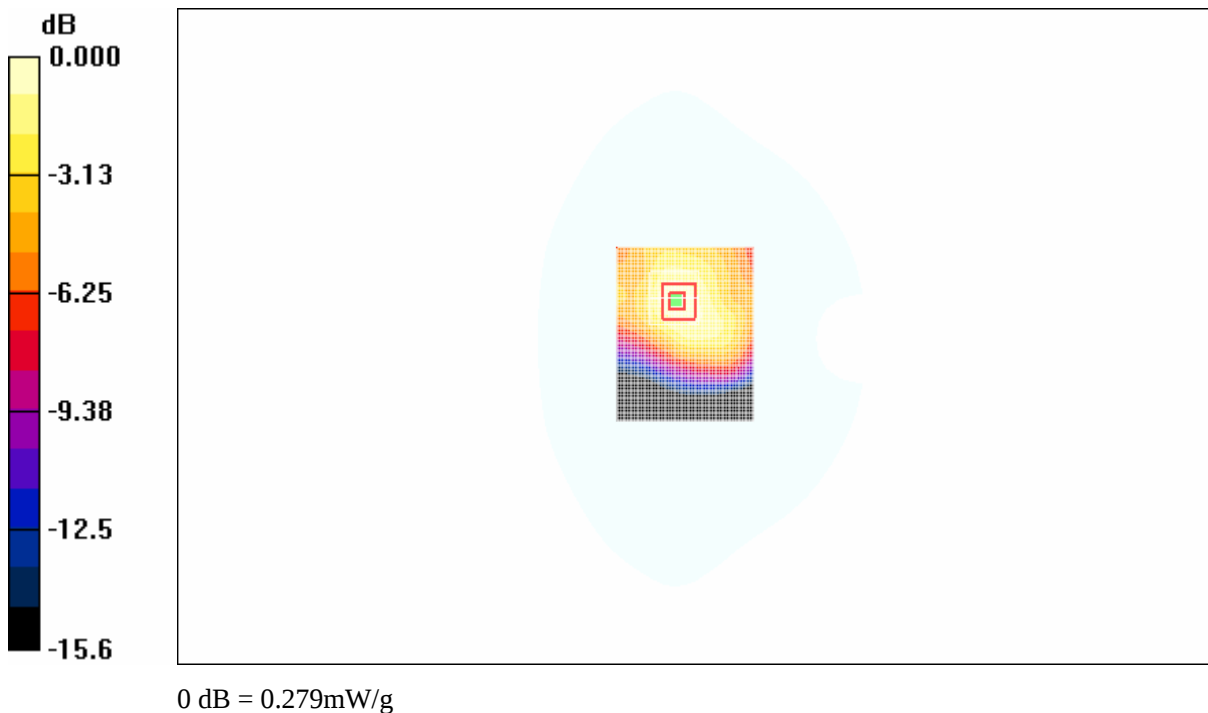


Fig. 83 PCS 1900 EGPRS CH661 Test Position 2

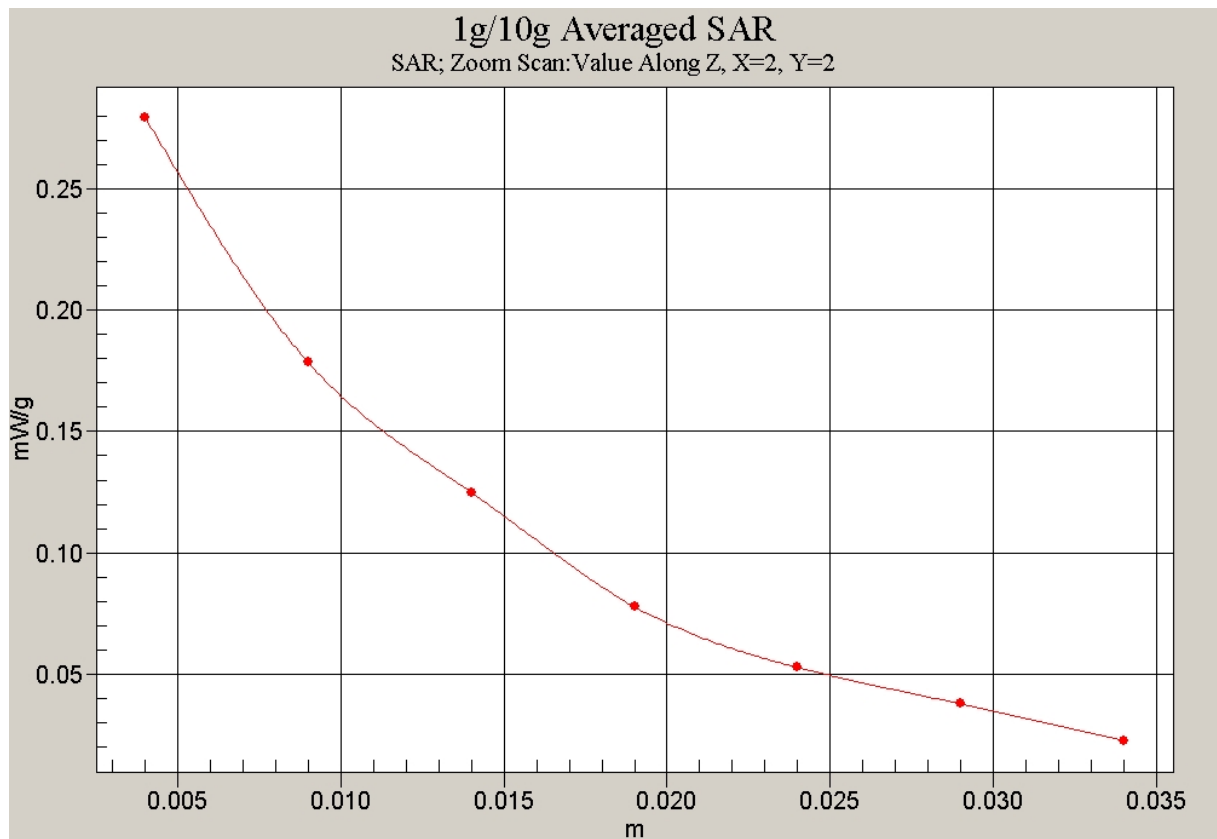


Fig.84 Z-Scan at power reference point (PCS 1900 EGPRS CH661 Test Position 2)

1900 EGPRS Test Position 3 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 3/Area Scan (71x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.183 mW/g

Test Position 3/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.78 V/m; Power Drift = -0.030 dB

Peak SAR (extrapolated) = 0.280 W/kg

SAR(1 g) = 0.170 mW/g; SAR(10 g) = 0.103 mW/g

Maximum value of SAR (measured) = 0.183 mW/g

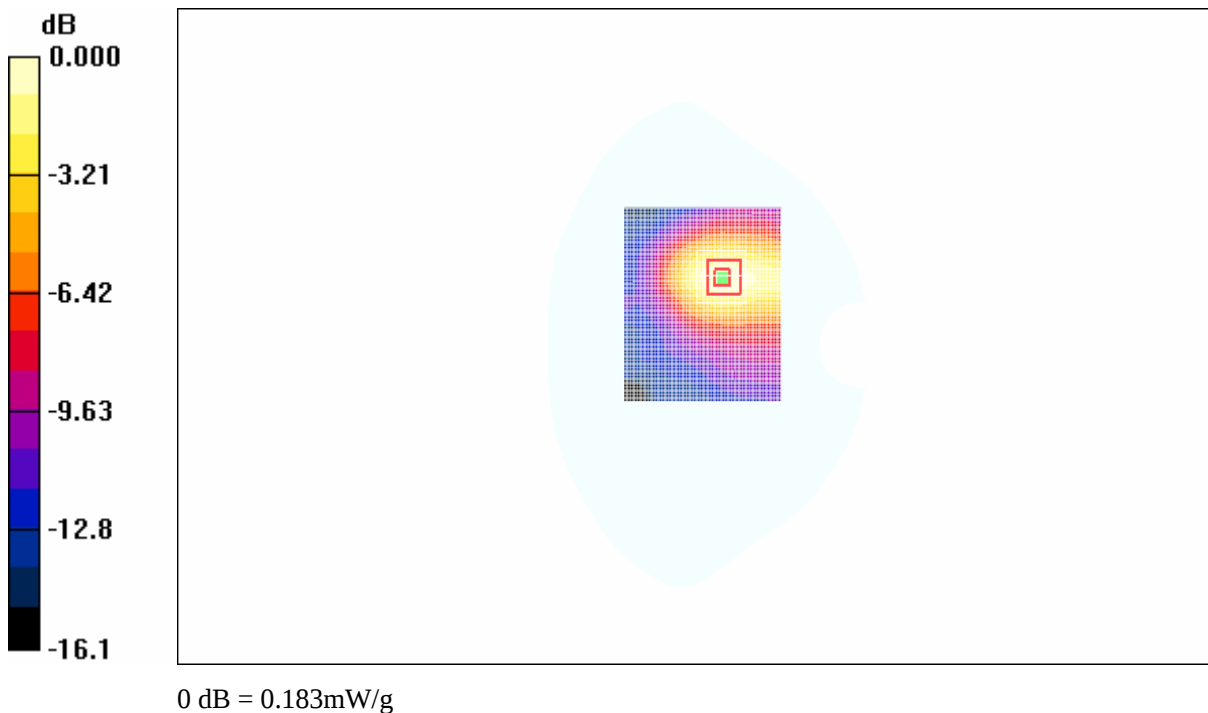


Fig. 85 PCS 1900 EGPRS CH661 Test Position 3

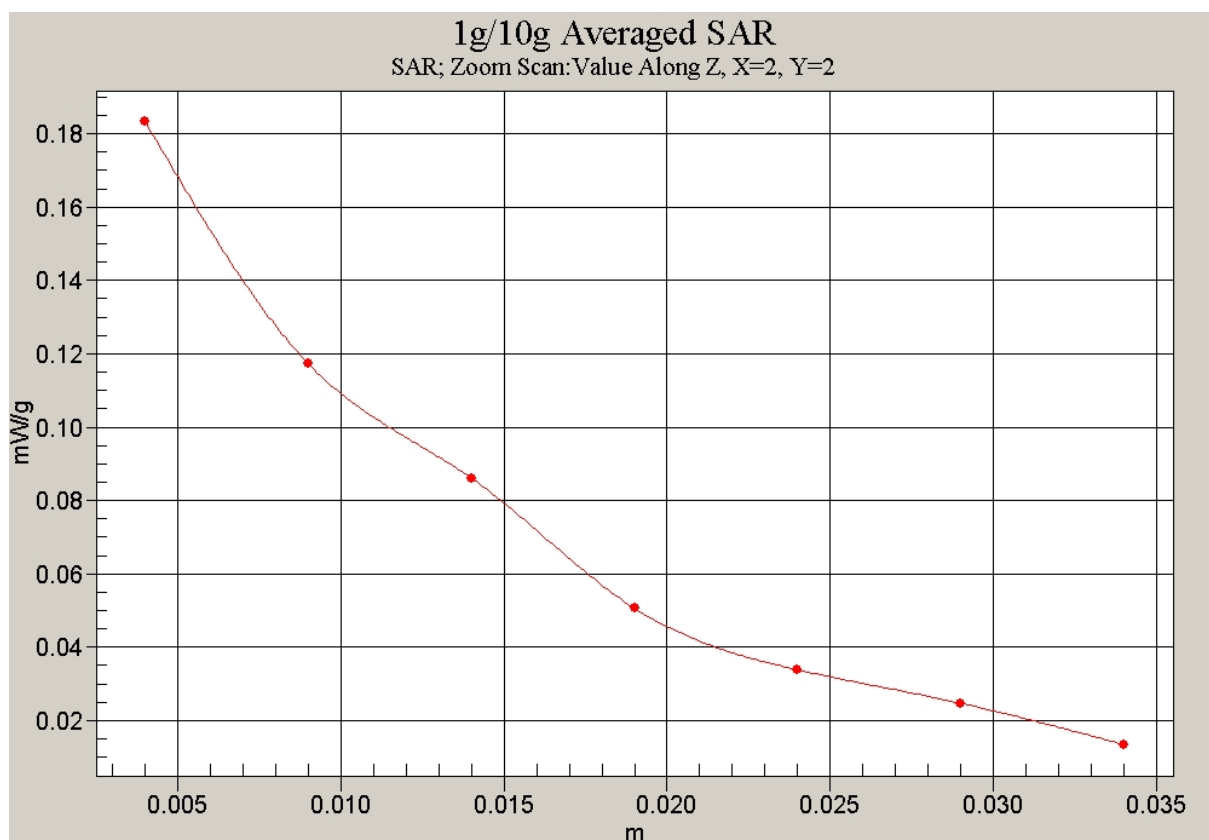


Fig.86 Z-Scan at power reference point (PCS 1900 EGPRS CH661 Test Position 3)

1900 EGPRS Test Position 4 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 4/Area Scan (71x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.260 mW/g

Test Position 4/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.25 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 0.389 W/kg

SAR(1 g) = 0.244 mW/g; SAR(10 g) = 0.156 mW/g

Maximum value of SAR (measured) = 0.263 mW/g

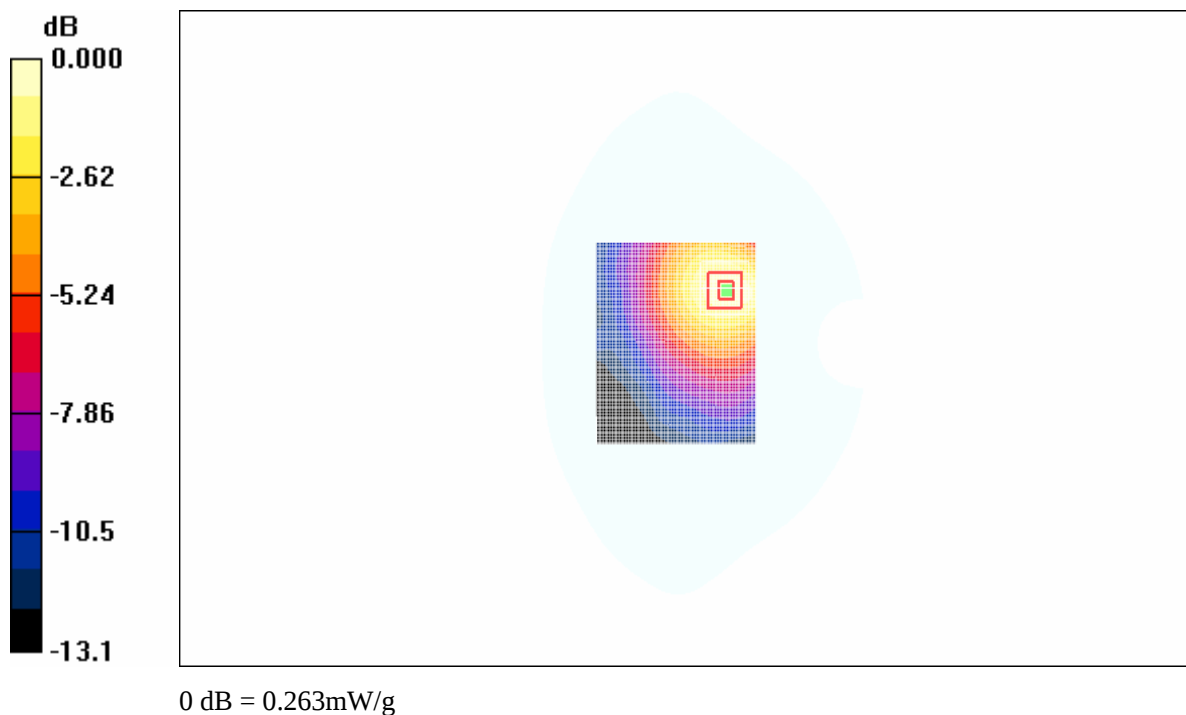


Fig. 87 PCS 1900 EGPRS CH661 Test Position 4

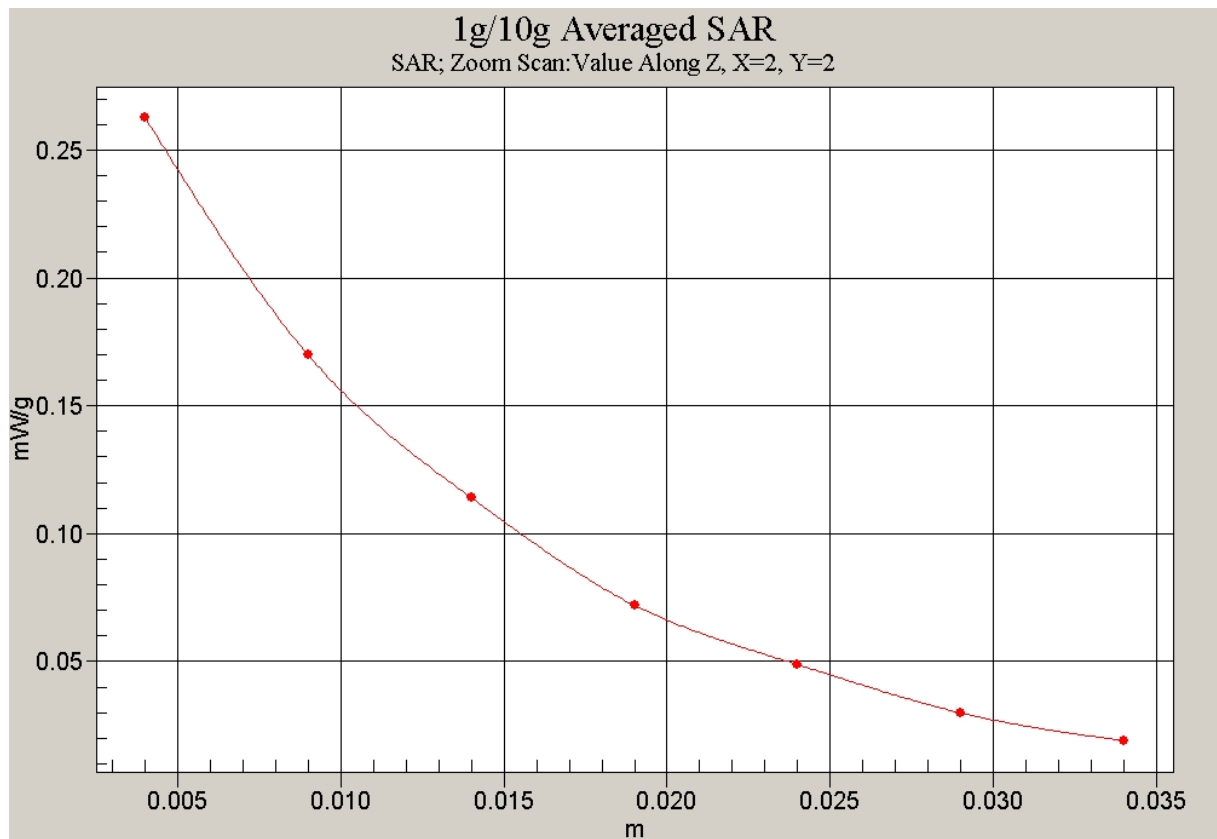


Fig.88 Z-Scan at power reference point (PCS 1900 EGPRS CH661 Test Position 4)

1900 EGPRS Test Position 5 with HP Laptop

Electronics: DAE3 Sn536

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ET3DV6 - SN1736 ConvF(4.88, 4.88, 4.88)

Test Position 5/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.053 mW/g

Test Position 5/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.65 V/m; Power Drift = 0.124 dB

Peak SAR (extrapolated) = 0.076 W/kg

SAR(1 g) = 0.049 mW/g; SAR(10 g) = 0.032 mW/g

Maximum value of SAR (measured) = 0.052 mW/g

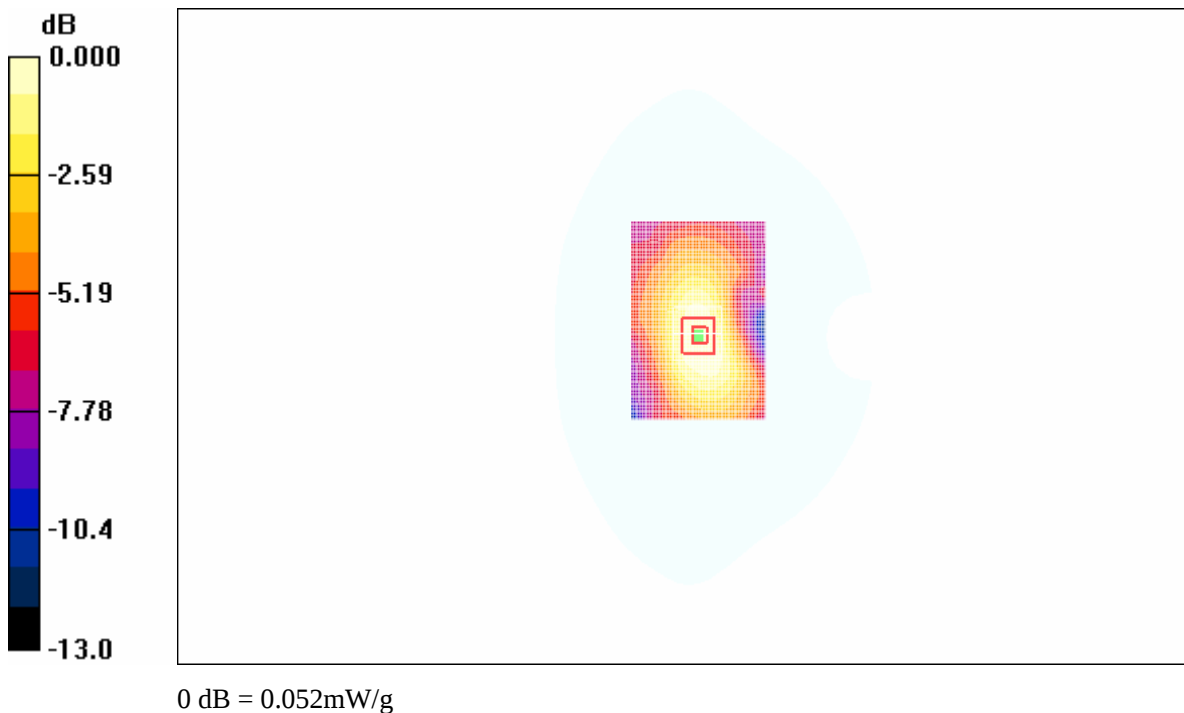


Fig.89 PCS 1900 EGPRS CH661 Test Position 5

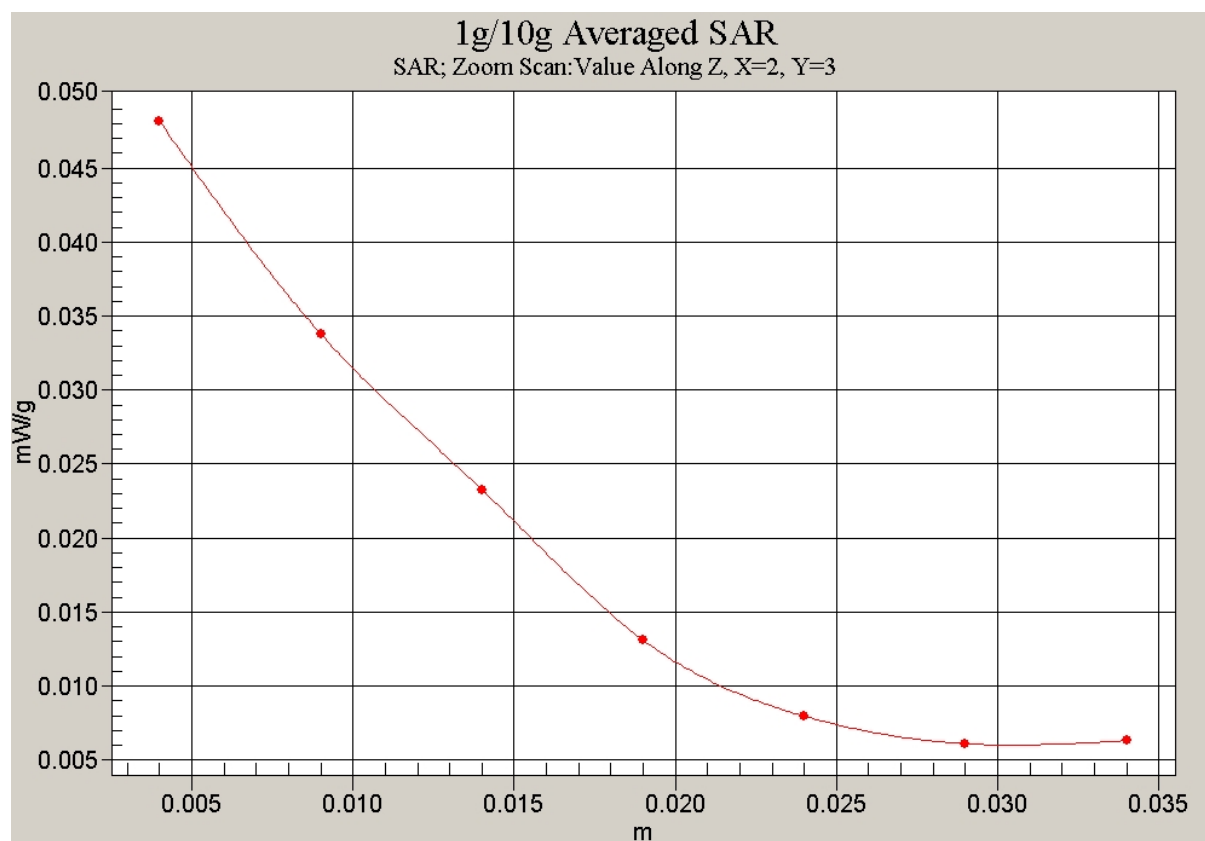


Fig.90 Z-Scan at power reference point (PCS 1900 EGPRS CH661 Test Position 5)

ANNEX D: SYSTEM VALIDATION RESULTS

1900MHzDAE536Probe1736

Electronics: DAE3 Sn536

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

Probe: ET3DV6 - SN1736 ConvF(5.4, 5.4, 5.4)

System Validation/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm

Reference Value = 92.1 V/m; Power Drift = 0.1 dB

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

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.1 V/m; Power Drift = 0.1 dB

Maximum value of SAR (measured) = 11.3 mW/g

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.91 mW/g; SAR(10 g) = 5.27 mW/g

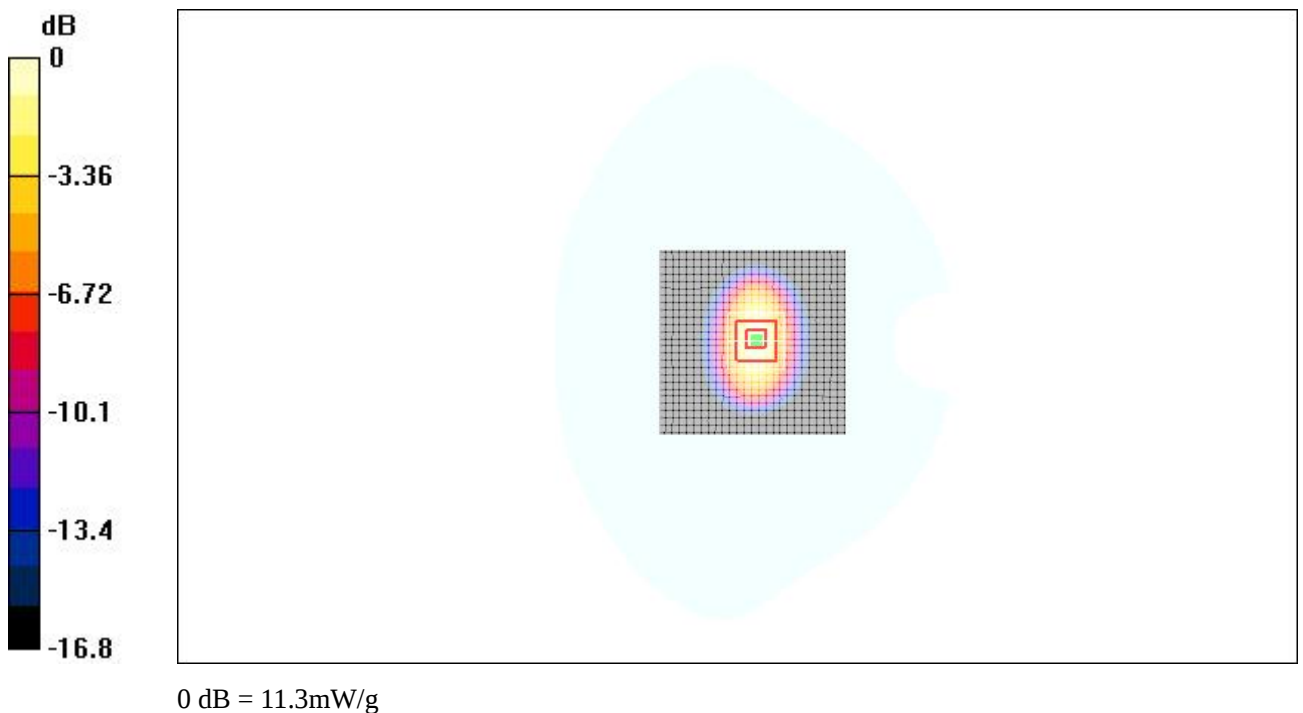


Fig.91 validation 1900MHz 250mW

Telecommunication Metrology Center
of Ministry of Information Industry

No. 2006E00933

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ANNEX E: PROBE CALIBRATION CERTIFICATE

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 Federal Office of Metrology and Accreditation
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 TMC-Auden

Certificate No: ET3-1736_Nov05

CALIBRATION CERTIFICATE

Object ET3DV6 - SN:1736

Calibration procedure(s) QA CAL-01.v5
Calibration procedure for dosimetric E-field probes

Calibration date: November 25, 2005

Condition of the calibrated item In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference Probe ES3DV2	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
DAE4	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
Reference Probe ES3DV2	SN: 907	21-Jun-05 (SPEAG, No. DAE4-907_Jun05)	Jun-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

Calibrated by:	Name Nico Vetterli	Function Laboratory Technician	Signature
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Approved by:	Katja Pokovic	Technical Manager	
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Issued: November 25, 2005

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

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 Federal Office of Metrology and Accreditation
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
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- 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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

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 E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(*f*)_{x,y,z} = NORM_{x,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*.
- DCP_{x,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 ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 SN:1736

November 25, 2005

Probe ET3DV6

SN:1736

Manufactured:	September 27, 2002
Last calibrated:	July 14, 2005
Recalibrated:	November 25, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1736

November 25, 2005

DASY - Parameters of Probe: ET3DV6 SN:1736

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.97 ± 10.1%	$\mu V/(V/m)^2$	DCP X	93 mV
NormY	1.75 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	1.97 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	93 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.6	5.0
SAR _{be} [%]	With Correction Algorithm	0.1	0.3

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	13.2	8.8
SAR _{be} [%]	With Correction Algorithm	0.6	0.1

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%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

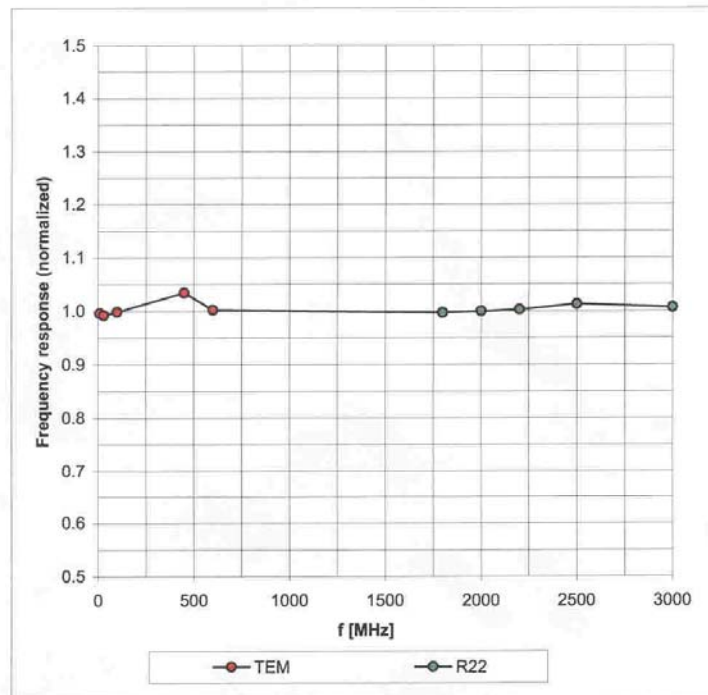
^B Numerical linearization parameter: uncertainty not required.

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Frequency Response of E-Field

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

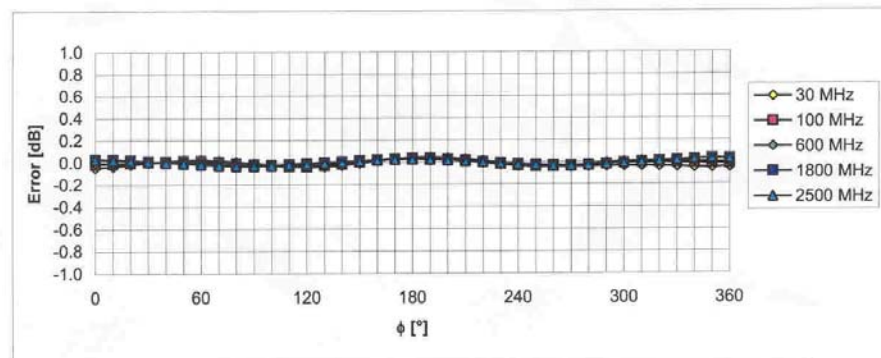
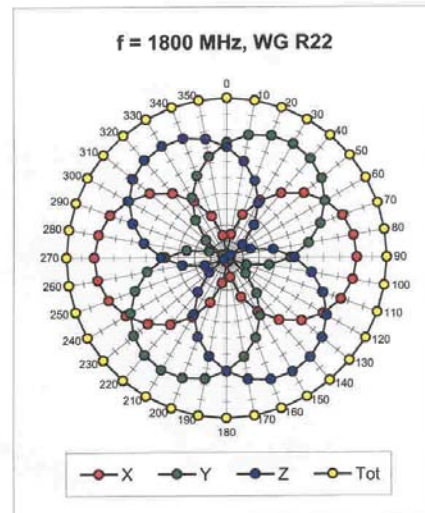
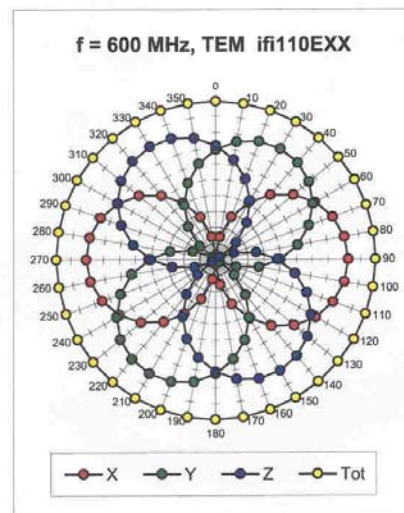


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

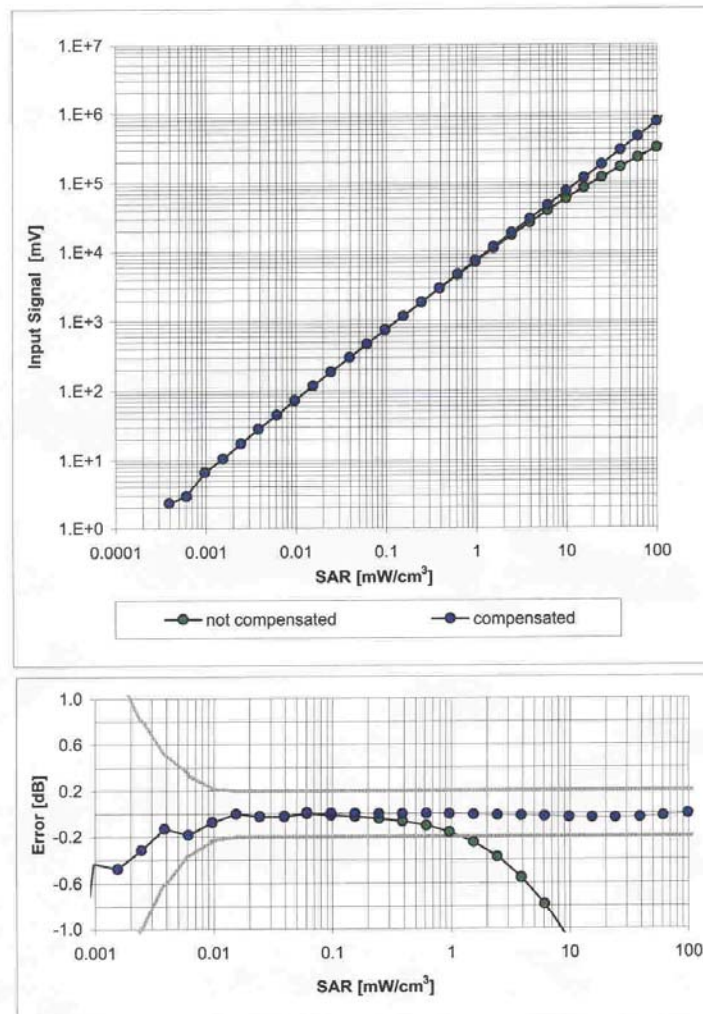


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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Dynamic Range $f(\text{SAR}_{\text{head}})$
(Waveguide R22, $f = 1800 \text{ MHz}$)

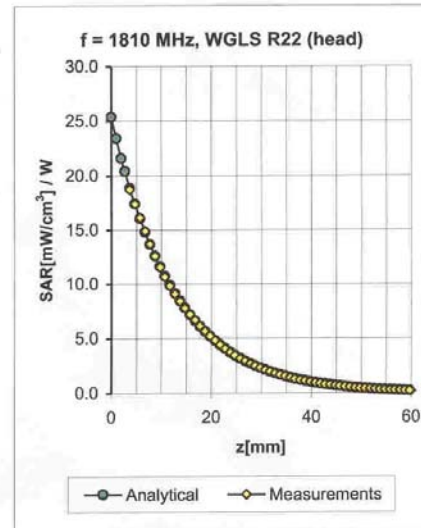
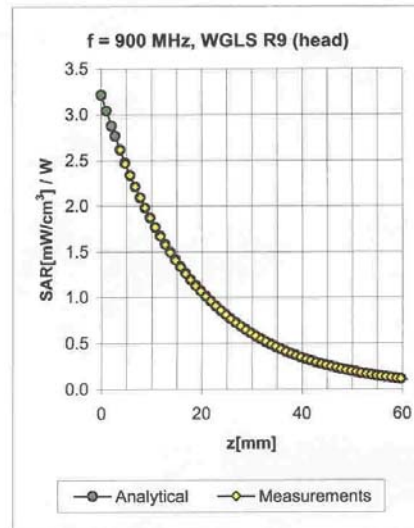


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	1.85	6.51 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.47	5.40 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.62	2.29	4.67 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.12	1.61	7.74 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.47	2.15	6.45 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.53	2.78	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	2.11	4.35 ± 11.8% (k=2)

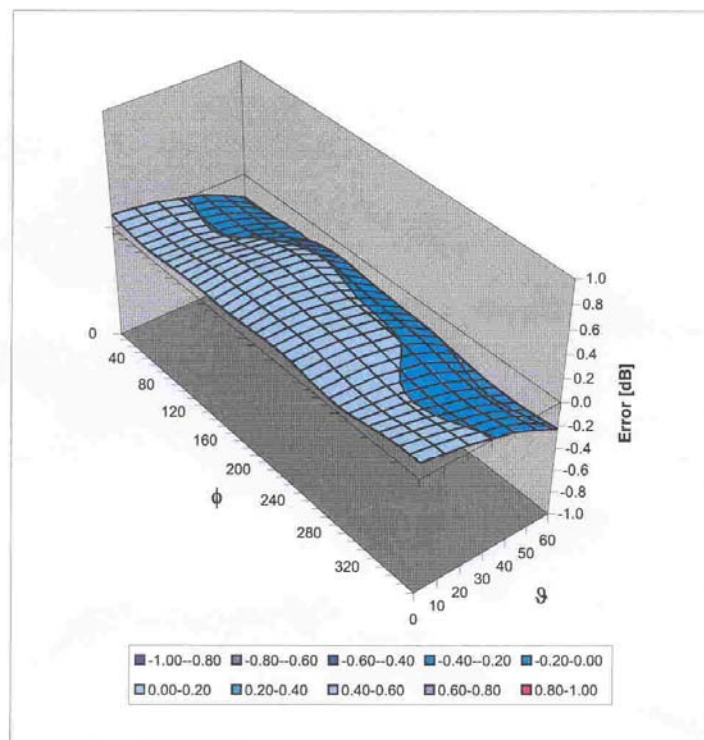
^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1736

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Deviation from Isotropy in HSL

Error (ϕ , ϑ), $f = 900$ MHz



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