

Schmid & Partner Engineering AG

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Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1733

Place of Calibration:

Zurich

Date of Calibration:

December 3, 2002

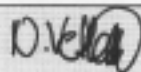
Calibration Interval:

12 months

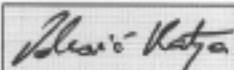
Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:



Approved by:



Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1733

Place of Assessment:

Zurich

Date of Assessment:

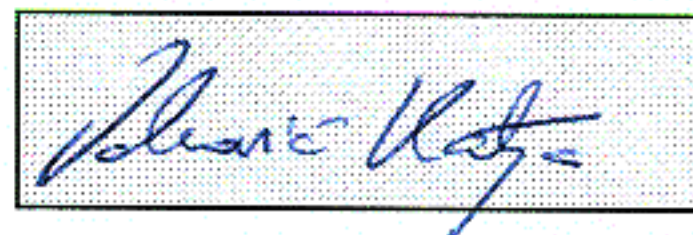
January 23, 2003

Probe Calibration Date:

December 3, 2002

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1733Conversion factor ($\pm$ standard deviation)835 MHz ConvF $6.4 \pm 8\%$

$\epsilon_r = 55.2 \pm 5\%$
 $\sigma = 0.97 \pm 5\% \text{ mho/m}$
(body tissue)

900 MHz ConvF $6.3 \pm 8\%$

$\epsilon_r = 55.0 \pm 5\%$
 $\sigma = 1.05 \pm 5\% \text{ mho/m}$
(body tissue)

1800 MHz ConvF $5.0 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$
(body tissue)

1900 MHz ConvF $4.8 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$
(body tissue)

1950 MHz ConvF $5.1 \pm 8\%$

$\epsilon_r = 40.0 \pm 5\%$
 $\sigma = 1.40 \pm 5\% \text{ mho/m}$
(head tissue)

1950 MHz ConvF $4.7 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$
(body tissue)

X1/202
Due for cal
John G.

Probe ET3DV6

SN:1733

Manufactured:	September 27, 2002
Last calibration:	December 3, 2002

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1733**Sensitivity in Free Space****Diode Compression**

NormX	1.50 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	93	mV
NormY	1.46 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	93	mV
NormZ	1.44 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	93	mV

Sensitivity in Tissue Simulating Liquid

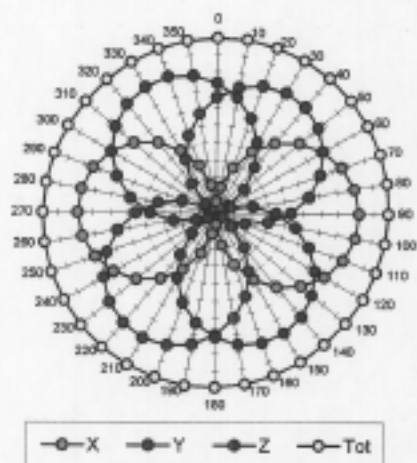
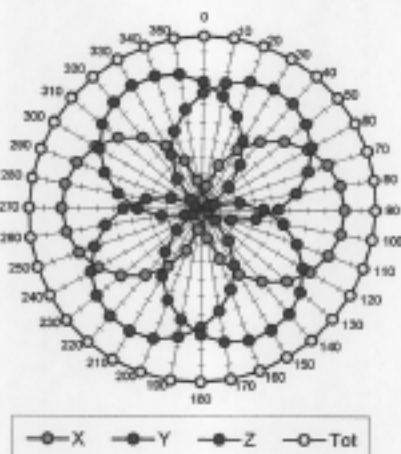
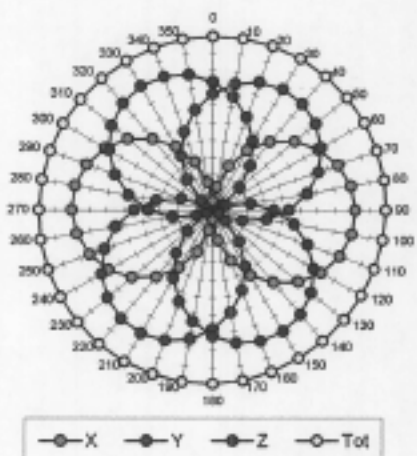
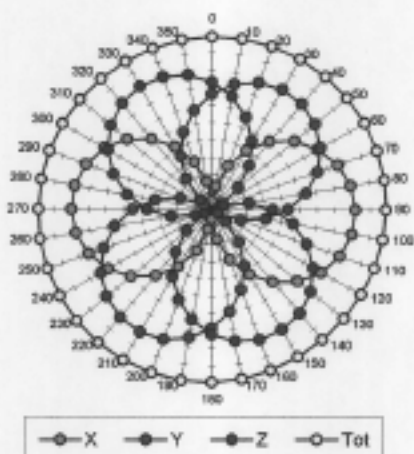
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
ConvF X	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha	0.35
ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth	2.57
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
ConvF X	5.4 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.4 $\pm 9.5\%$ (k=2)	Alpha	0.47
ConvF Z	5.4 $\pm 9.5\%$ (k=2)	Depth	2.44

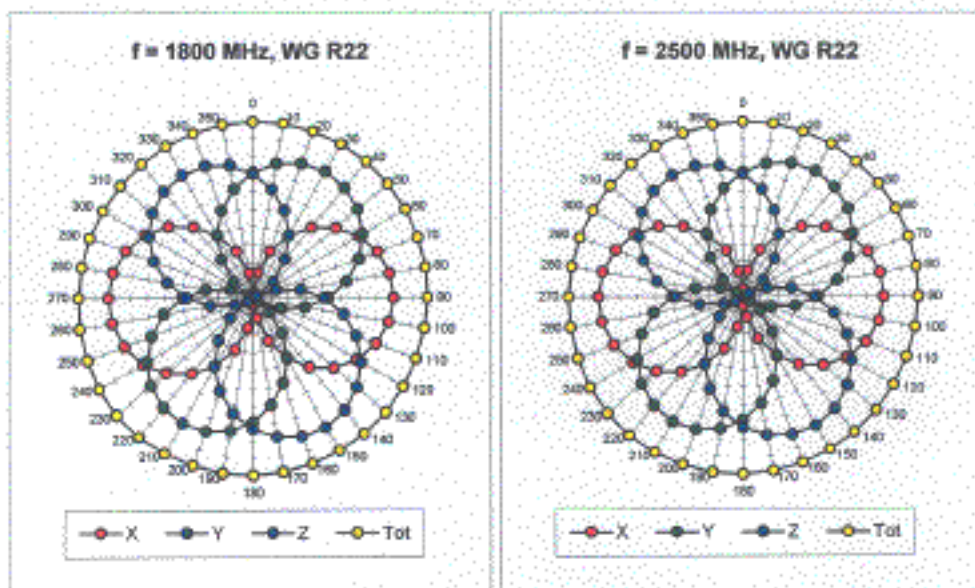
Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm		
Probe Tip to Boundary		1 mm	2 mm	
SAR _{be} [%]	Without Correction Algorithm	9.4	5.4	
SAR _{be} [%]	With Correction Algorithm	0.3	0.5	
Head	1800 MHz	Typical SAR gradient: 10 % per mm		
Probe Tip to Boundary		1 mm	2 mm	
SAR _{be} [%]	Without Correction Algorithm	11.3	7.6	
SAR _{be} [%]	With Correction Algorithm	0.2	0.2	

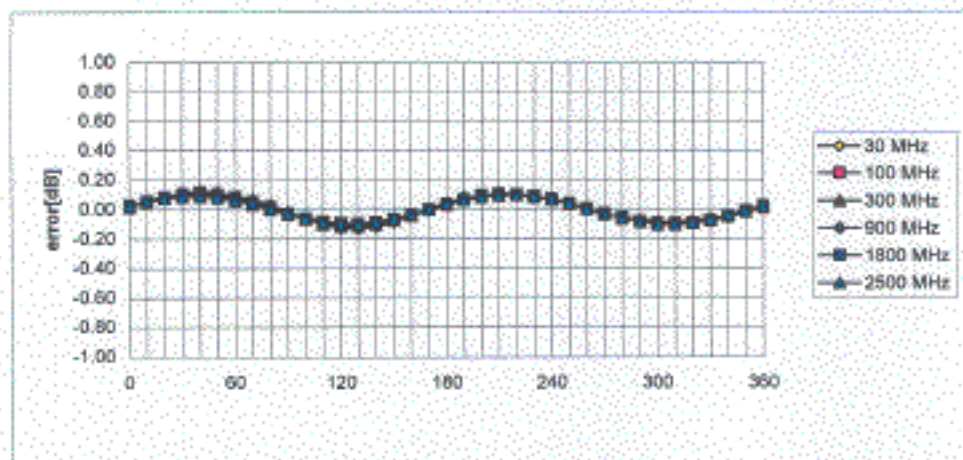
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 $\pm$ 0.2	mm

Receiving Pattern (ϕ), $\theta = 0^\circ$ $f = 30$ MHz, TEM cell if110 $f = 100$ MHz, TEM cell if110 $f = 300$ MHz, TEM cell if110 $f = 900$ MHz, TEM cell if110

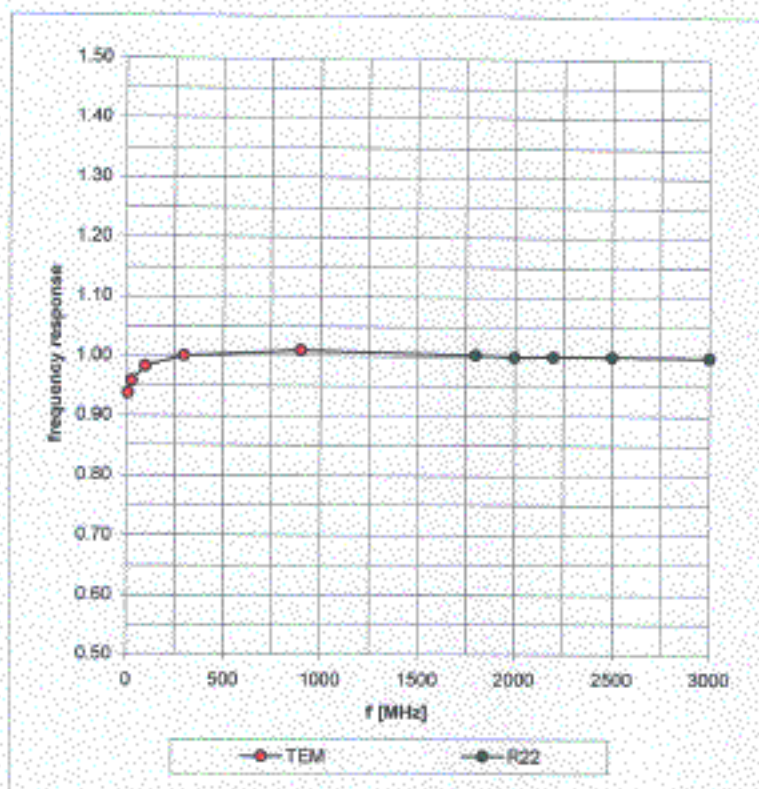


Isotropy Error (ϕ), $\theta = 0^\circ$

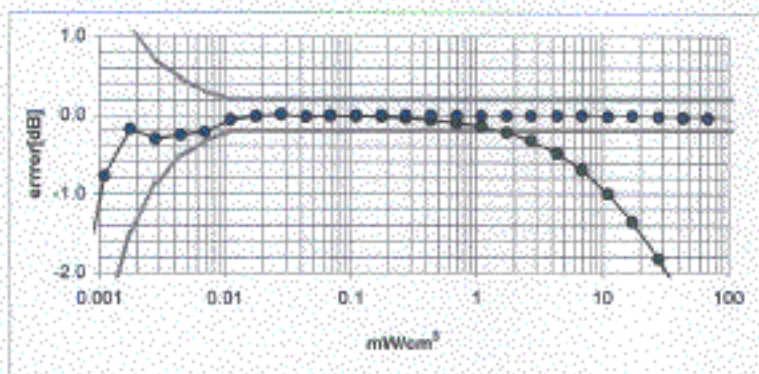
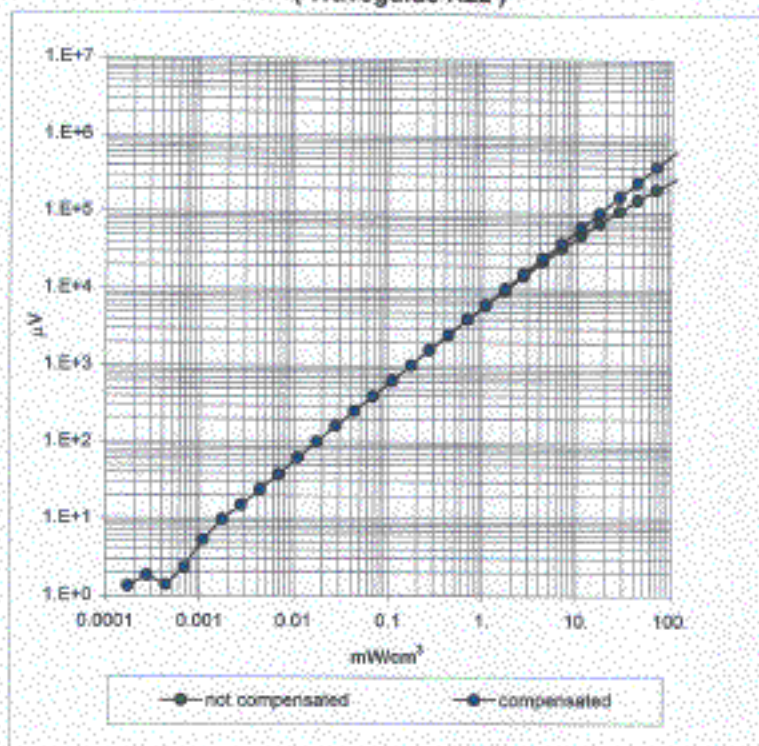


Frequency Response of E-Field

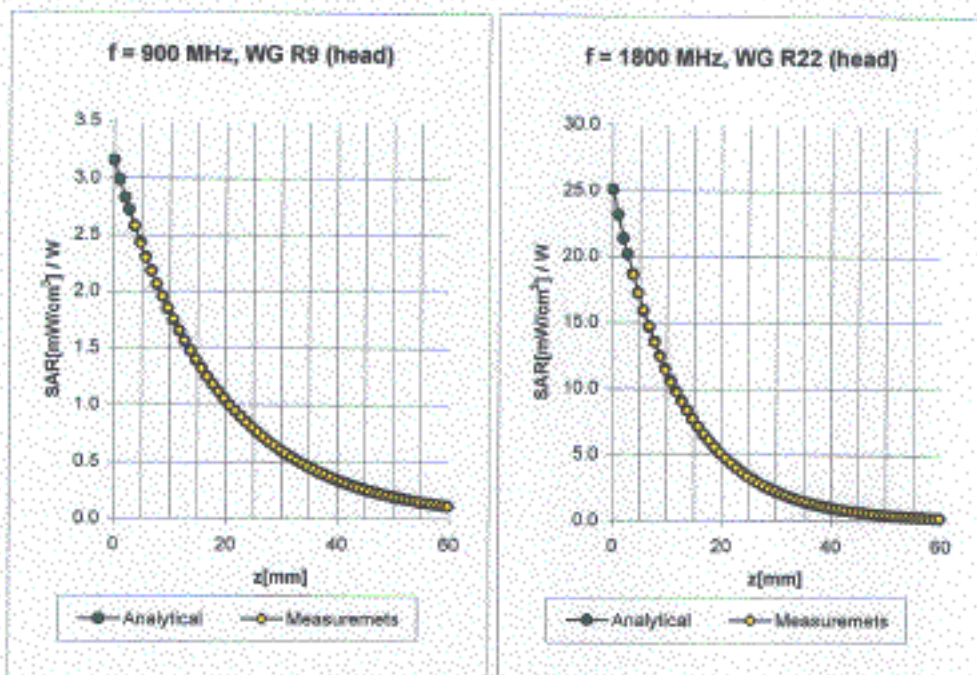
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range $f(\text{SAR}_{\text{brain}})$ (Waveguide R22)



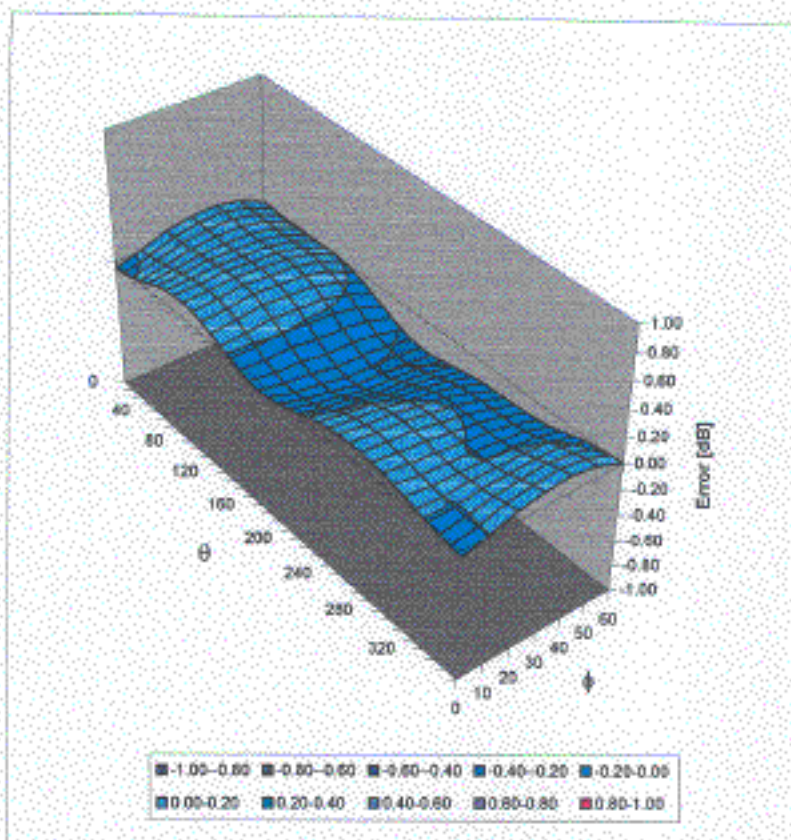
Conversion Factor Assessment



Head	800 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	$6.5 \pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	$6.5 \pm 9.5\%$ (k=2)	Alpha 0.35
	ConvF Z	$6.5 \pm 9.5\%$ (k=2)	Depth 2.57
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
	ConvF X	$5.4 \pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	$5.4 \pm 9.5\%$ (k=2)	Alpha 0.47
	ConvF Z	$5.4 \pm 9.5\%$ (k=2)	Depth 2.44

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Appendix A. Leather Holster Accessory (Dec. 2004)

A.1 General

This section documents additional SAR testing on Qsec-2700 that was performed as the result of two new leather holster accessories that have different dimensions than the original clip described in Section 2 of this report, and also contains some metal parts. The testing for this accessory involved only flat phantom testing as described in Section A.3. Both holsters have identical clip designs and dimensions, and therefore only one holster, QUALCOMM part number 700-47205-0001, was tested as representative of both models. The second holster, QUALCOMM part number 700-47205-002, has an additional leather flap to cover the front of the phone. Photos of both models are shown in Section A.2.

A.2 Photos of Leather Holster

Figure A-1 Three-quarter view of leather holster MCN (part number) 700-47205-0001



Figure A-2 Front view of leather holster, MCN (part number) 700-47204-0001



Figure A-3 Three-quarter view of leather holster MCN (part number) 700-47205-0001 with phone installed



Figure A-4 Side view of leather holster MCN 700-47205-0001 showing clip dimension



Figure A-5 Front view of leather holster MCN (part number) 700-47205-0002 (not tested)



Figure A-6 Front view of leather holster MCN 700-47205-0002 with flap open



Figure A-7 View of leather holster 700-47205-0002 (not tested) with phone installed, flap open



Figure A-8 Side view of leather holster 700-47205-0002 (not tested) showing clip dimension



A.3 Test Set-up

A.3.1 Description

The Qsec-2700 was put into the holster and mounted into the device positioning holder such that the phone was parallel with the bottom of the flat portion of the phantom, facing away from the phantom, and the ear (near field) speaker was aligned with the crosshairs on the phantom. The phone was then positioned up against the phantom with the clip touching. Photos of phone in position with the holster are shown in Section A.3.2.

A.3.2 Photos

Figure A-9 Overall view of test set-up



Figure A-10 Close-up side view of phone in position



Figure A-11 Bottom view of phone in position (looking up at phantom)



A.4 Validation

Table A-1 shows validation data for the respective days of the test program.

Table A-1 SAR Validation Data for QSEC-2700 with optional leather holster Test Program

Date	Frequency (MHz)	1 g SAR (mW/g)			
		Measured @ 20 dBm input	Scaled to 24 dBm	Target	Difference (%)
11/19/2004	900	1.14	2.86	2.74	4.2%
11/22/2004	1900	3.84	9.9	10.3	-3.9%

A.5 Liquid Dielectric

Table A-2 shows permittivity and conductivity values of the liquid dielectric mediums measured on the days of testing.

Table A-2 Tissue Dielectric Properties at the Time of Testing

Date	Frequency (MHz)	Section	Permittivity (ϵ_r)				Conductivity (s)			
			Measured Values	Target Values	Deviation (%)	Limit	Measured Values	Target Values	Deviation (%)	Limit
	824.7	Body	55.75	56.11	-0.64%	5%	0.978	0.97	0.82%	5%
	836.51		55.81	56.11	-0.53%	5%	0.995	0.97	2.58%	5%
	848.31		55.64	56.11	-0.84%	5%	1.008	0.97	3.92%	5%
	1851.25	Body	53.98	54.3	-0.59%	5%	1.443	1.44	0.21%	5%
	1880		53.83	54.3	-0.87%	5%	1.471	1.44	2.15%	5%
	1908.75		53.69	54.3	-1.12%	5%	1.508	1.44	4.72%	5%

A.6 Results

A.6.1 Test Data

Tables A-3 and A-4 give 1 g SAR data for Qsec-2700 with leather holster in body position for Band Classes 0 and 1 respectively.

Table A-3 1 g SAR for Qsec-2700 with leather holster, Band Class 0 (Cellular)

Ch.	Section	Position	Cond. Power (dBm)	1 g (mW/g)	Air temp (°C)	Liq. Temp (°C)	Humidity (%)
1013	Flat	Holster	23.8	0.414	21	23	47
383	Flat	Holster	23.8	0.514	21	23	47
777	Flat	Holster	23.8	0.484	21	22	47

Table A-4 1 g SAR for Qsec-2700 with leather holster, Band Class 1 (PCS)

Ch.	Section	Position	Cond. Power (dBm)	1 g (mW/g)	Air temp (°C)	Liq. Temp (°C)	Humidity (%)
25	Flat	Holster	22.5	0.185	21	22	45
600	Flat	Holster	23.1	0.233	21	22	45
1175	Flat	Holster	23.1	0.299	21	22	45

A.6.2 Plots

On the following pages are scan plots from the DASY4 SEMCAD software.

Date/Time: 11/19/04 11:13:06

Test Laboratory: QUALCOMM Incorporated

2004-11-19 Val 900-20 dBm**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:083**

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

Medium: HSL835 Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 43.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1543; ConvF(5.97, 5.97, 5.97); Calibrated: 5/27/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn566; Calibrated: 4/29/2004
- Phantom: SAM with CRP; Type: SAM; Serial: 209
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Reference Value = 37.2 V/m; Power Drift = -0.2 dB

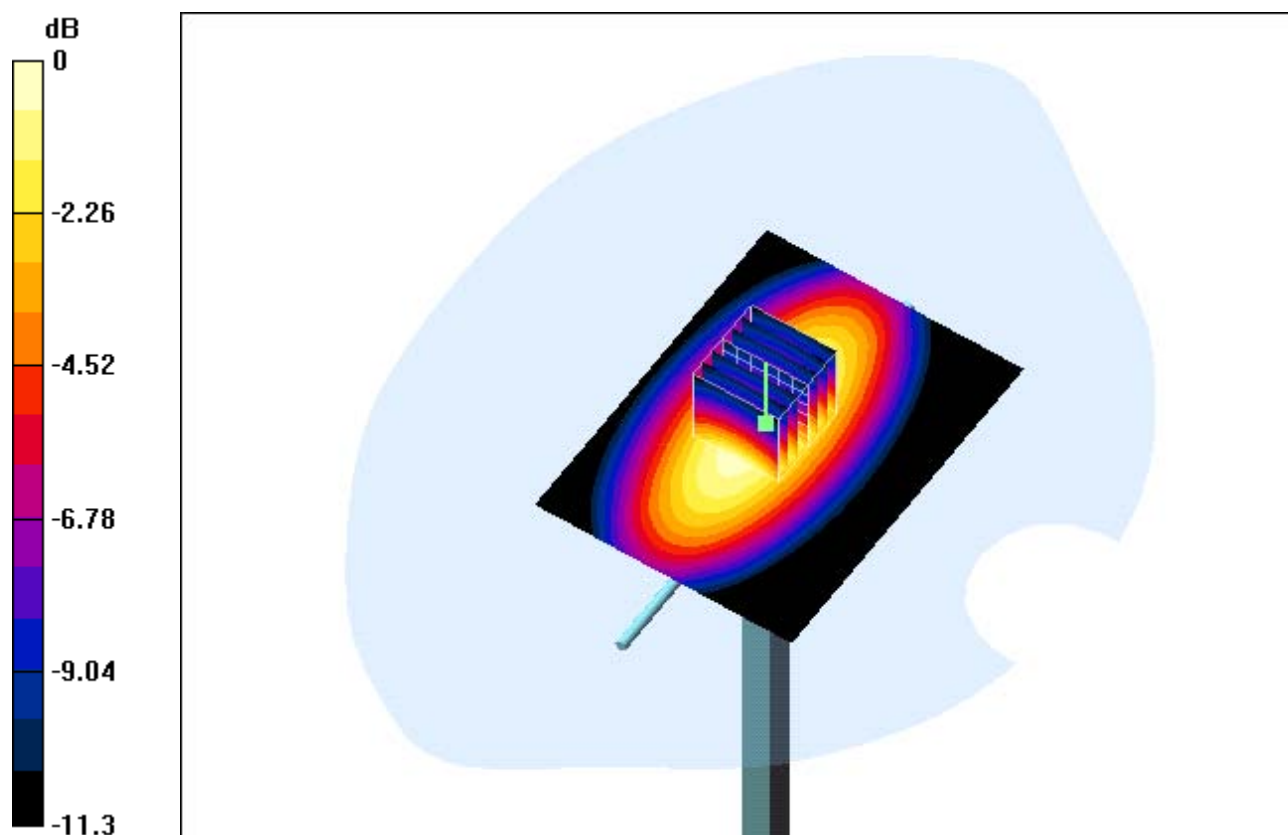
Maximum value of SAR (interpolated) = 1.25 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 37.2 V/m; Power Drift = -0.2 dB

Maximum value of SAR (measured) = 1.24 mW/g

Peak SAR (extrapolated) = 1.75 W/kg

SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.723 mW/g

0 dB = 1.24mW/g

Date/Time: 11/22/04 11:44:22

Test Laboratory: QUALCOMM Incorporated

2004-11-22 Val 1900-20 dBm**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019**

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

Medium: HSL1800 Medium parameters used: $f = 1900$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1534; ConvF(5.19, 5.19, 5.19); Calibrated: 3/18/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn566; Calibrated: 4/29/2004
- Phantom: SAM with CRP; Type: SAM; Serial: 209
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=10mm, Pin=20 dBm/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 57.5 V/m; Power Drift = 0.0 dB

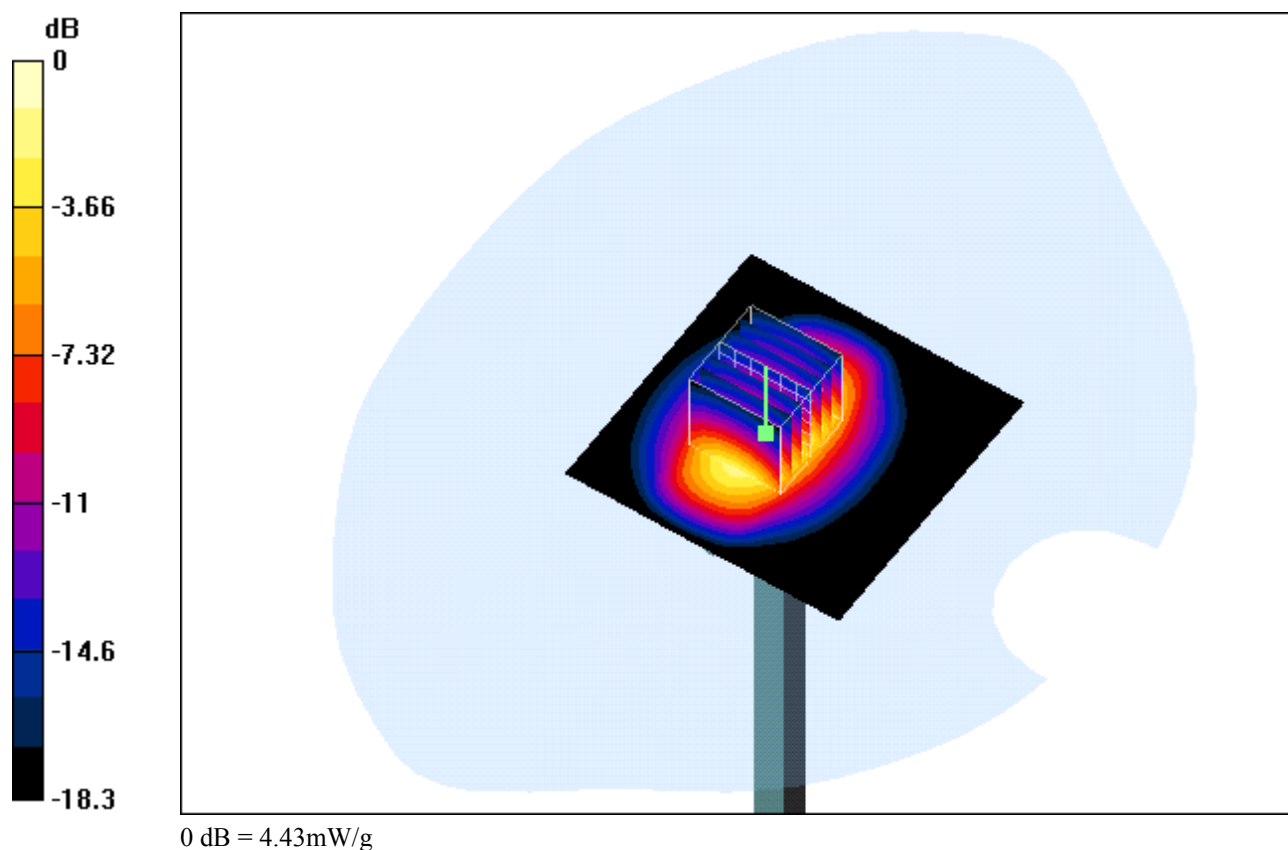
Maximum value of SAR (interpolated) = 4.8 mW/g

d=10mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.5 V/m; Power Drift = 0.0 dB

Maximum value of SAR (measured) = 4.43 mW/g

Peak SAR (extrapolated) = 7.08 W/kg

SAR(1 g) = 3.94 mW/g; SAR(10 g) = 2.03 mW/g

Date/Time: 11/19/04 12:07:30

Test Laboratory: QUALCOMM Incorporated

2004-11-19 sn 361 Flat - holster-CDMA**DUT: Casper; Type: Phone; Serial: P2b-361**

Communication System: CDMA835; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: HSL835 Body Medium parameters used: $f = 824.7 \text{ MHz}$; $\sigma = 0.978 \text{ mho/m}$; $\epsilon_r = 55.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1543; ConvF(5.82, 5.82, 5.82); Calibrated: 5/27/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn566; Calibrated: 4/29/2004
- Phantom: SAM with CRP; Type: SAM; Serial: 209
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Belt Clip - Low/Area Scan (61x131x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Reference Value = 14.9 V/m; Power Drift = -0.3 dB

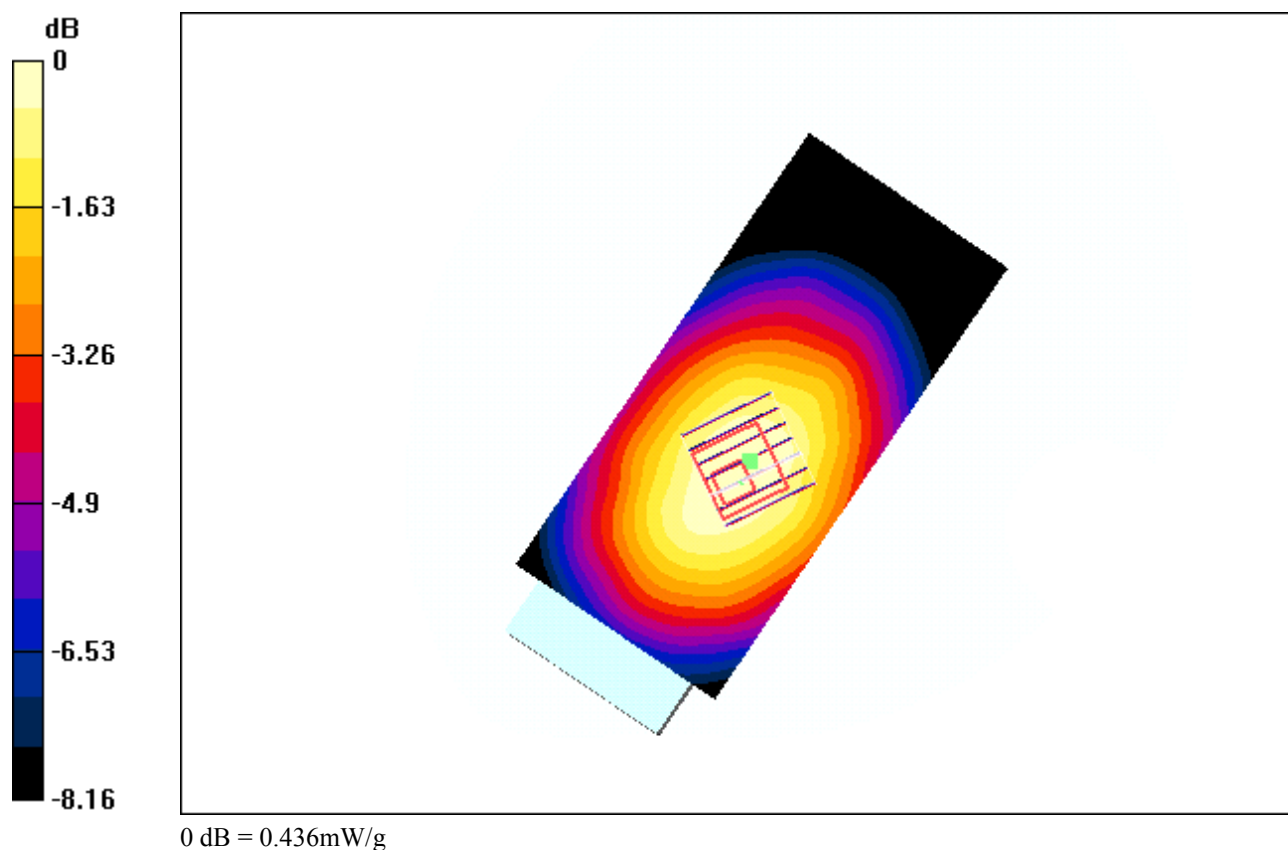
Maximum value of SAR (interpolated) = 0.442 mW/g

Belt Clip - Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 14.9 V/m; Power Drift = -0.3 dB

Maximum value of SAR (measured) = 0.436 mW/g

Peak SAR (extrapolated) = 0.538 W/kg

SAR(1 g) = 0.414 mW/g; SAR(10 g) = 0.306 mW/g

Date/Time: 11/19/04 12:07:30

Test Laboratory: QUALCOMM Incorporated

2004-11-19 sn 361 Flat - holster-CDMA**DUT: Casper; Type: Phone; Serial: P2b-361**

Communication System: CDMA835; Frequency: 836.49 MHz; Duty Cycle: 1:1

Medium: HSL835 Body Medium parameters used (interpolated): $f = 836.49$ MHz; $\sigma = 0.994$ mho/m; $\epsilon_r = 55.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1543; ConvF(5.82, 5.82, 5.82); Calibrated: 5/27/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn566; Calibrated: 4/29/2004
- Phantom: SAM with CRP; Type: SAM; Serial: 209
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Belt Clip - Middle/Area Scan (61x131x1): Measurement grid: dx=12mm, dy=12mm

Reference Value = 15.4 V/m; Power Drift = -0.2 dB

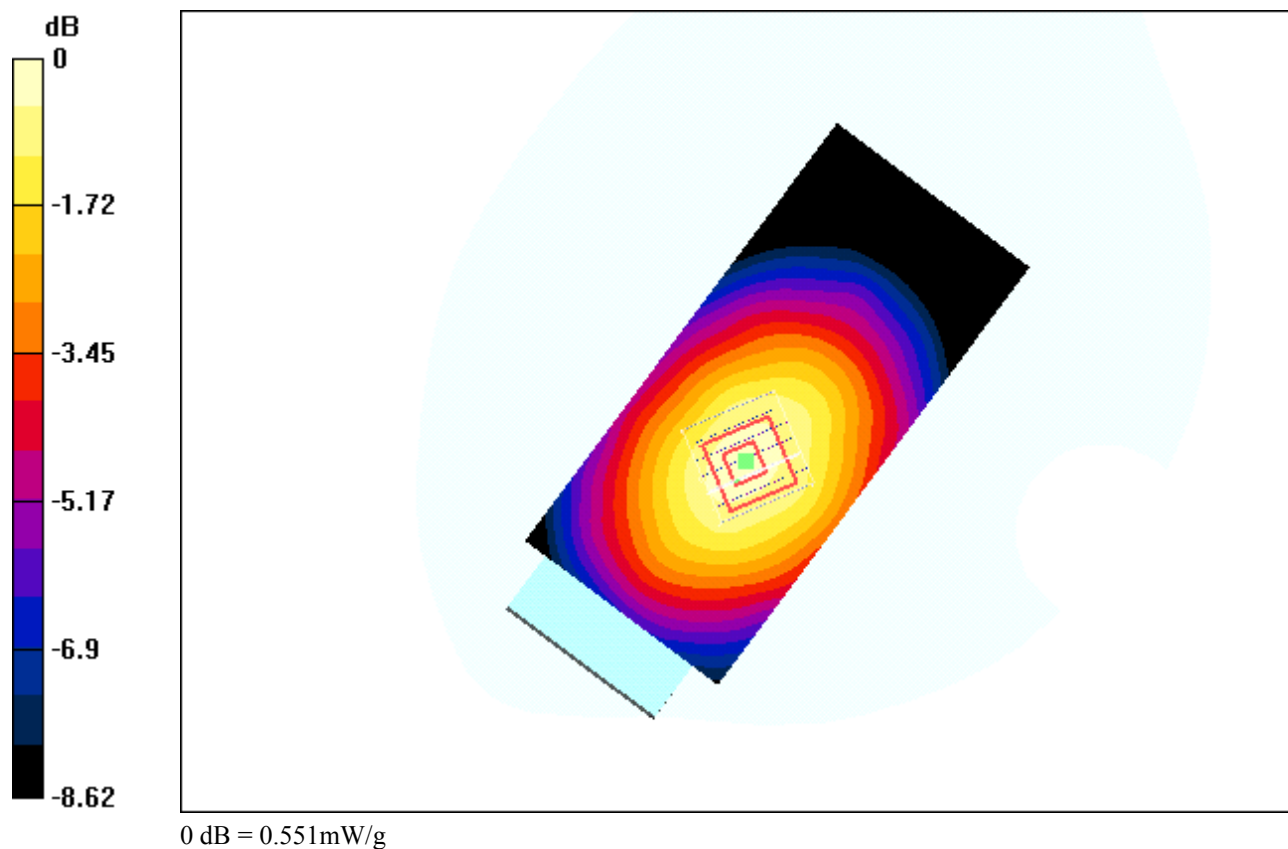
Maximum value of SAR (interpolated) = 0.542 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Belt Clip - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.4 V/m; Power Drift = -0.2 dB

Maximum value of SAR (measured) = 0.551 mW/g

Peak SAR (extrapolated) = 0.715 W/kg

SAR(1 g) = 0.514 mW/g; SAR(10 g) = 0.375 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 11/19/04 12:07:30

Test Laboratory: QUALCOMM Incorporated

2004-11-19 sn 361 Flat - holster-CDMA**DUT: Casper; Type: Phone; Serial: P2b-361**

Communication System: CDMA835; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: HSL835 Body Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 55.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1543; ConvF(5.82, 5.82, 5.82); Calibrated: 5/27/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn566; Calibrated: 4/29/2004
- Phantom: SAM with CRP; Type: SAM; Serial: 209
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Belt Clip - High/Area Scan (61x131x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Reference Value = 13.9 V/m; Power Drift = 0.4 dB

Maximum value of SAR (interpolated) = 0.557 mW/g

Belt Clip - High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 13.9 V/m; Power Drift = 0.4 dB

Maximum value of SAR (measured) = 0.533 mW/g

Peak SAR (extrapolated) = 0.671 W/kg

SAR(1 g) = 0.484 mW/g; SAR(10 g) = 0.341 mW/g