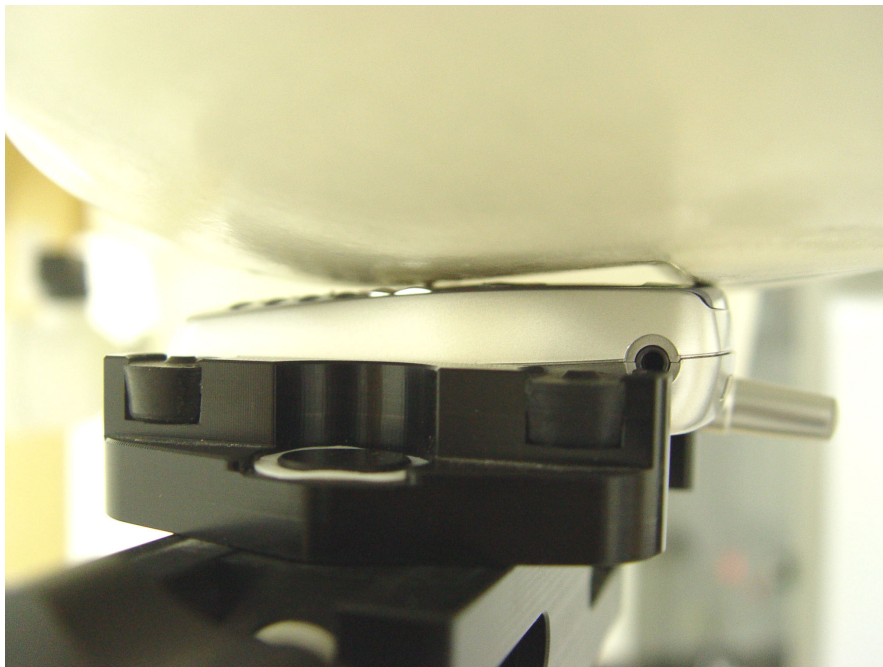


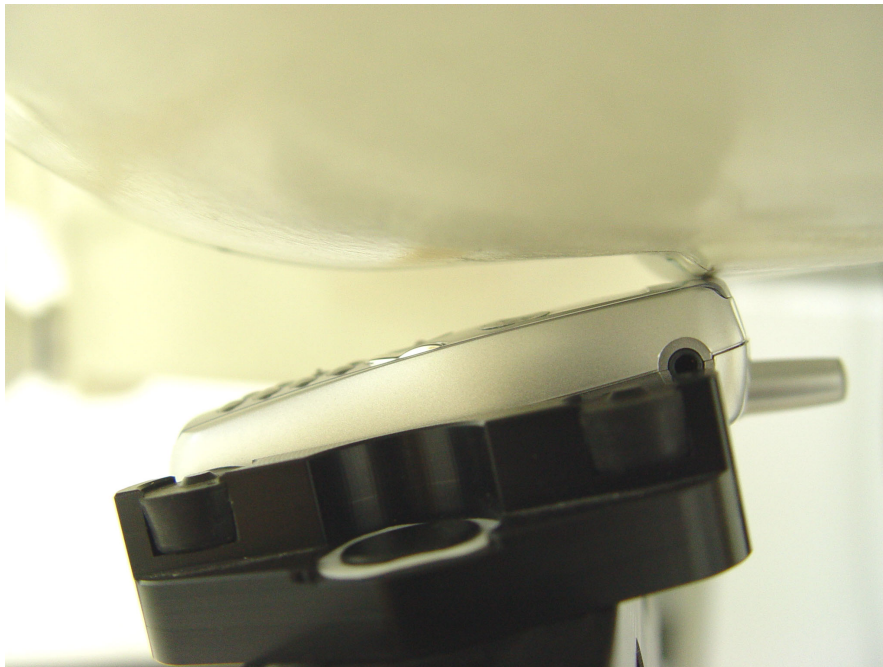
**Fig. 9.3 Right Cheek**



**Fig. 9.4 Right Tilted**

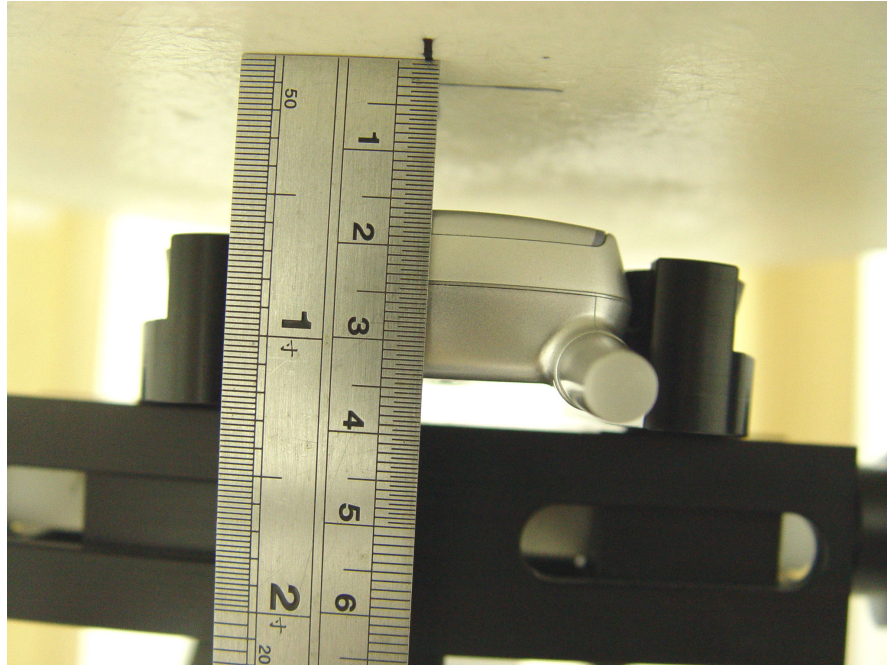


**Fig. 9.5 Left Cheek**

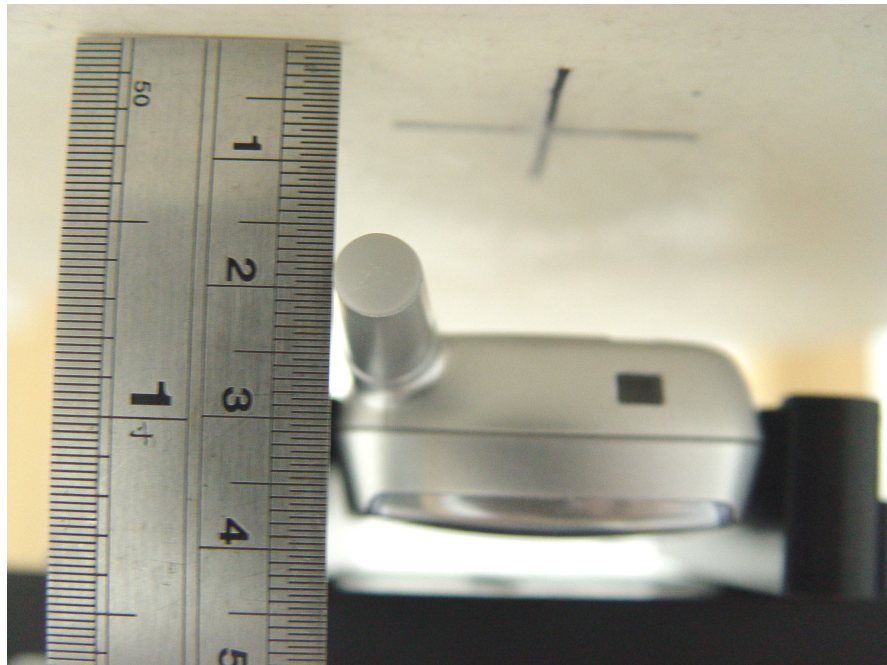


**Fig. 9.6 Left Tilted**





**Fig. 9.7 Body Worn-keypad up**



**Fig. 9.8 Body Worn-keypad down**



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## **10. Measurement Procedures**

The measurement procedures are as follows:

- Linking DUT with base station emulator CMU200 in middle channel for PCS band
- Setting PCL=0 for PCS on CMU200 to allow DUT to radiate maximum output power
- Measuring output power through RF cable and power meter
- Placing the DUT in the positions described in the last section
- Setting scan area, grid size and other setting on the DASY4 software
- Taking data for the lowest, middle, and highest channel on each testing position

According to the IEEE P1528 draft standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Area scan
- Zoom scan
- Power reference measurement

### ***10.1 Spatial Peak SAR Evaluation***

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1528-2003 standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY4 software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

Base on the Draft: SCC-34, SC-2, WG-2-Computational Dosimetry, IEEE P1528/D1.2 (Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques), a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the postprocessing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- extraction of the measured data (grid and values) from the Zoom Scan
- calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)



- 
- generation of a high-resolution mesh within the measured volume
  - interpolation of all measured values from the measurement grid to the high-resolution grid
  - extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
  - calculation of the averaged SAR within masses of 1g and 10g

### ***10.2 Scan Procedures***

First **Area Scan** is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an **Area Scan** is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, **Zoom Scan** is required. The **Zoom Scan** measures 5x5x7 points with step size 8, 8 and 5 mm. The **Zoom Scan** is performed around the highest E-field value to determine the averaged SAR-distribution over 1 g.

### ***10.3 SAR Averaged Methods***

In DASY4, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.



## **11. SAR Test Results**

### ***11.1 Right Cheek***

<b>Bands</b>	<b>Chan.</b>	<b>Freq. (MHz)</b>	<b>Modulation type</b>	<b>Conducted Power (dBm)</b>	<b>Power Drift (dB)</b>	<b>Measured 1g SAR (W/kg)</b>	<b>Limits (W/Kg)</b>	<b>Results</b>
PCS	512 (Low)	1850.2	GMSK	29.7	0	0.495	1.6	Pass
	661(Mid)	1880.0	GMSK	29.45	0.1	0.57	1.6	Pass
	810 (High)	1909.8	GMSK	29.46	0	0.581	1.6	Pass

### ***11.2 Right Tilted***

<b>Bands</b>	<b>Chan.</b>	<b>Freq. (MHz)</b>	<b>Modulation type</b>	<b>Conducted Power (dBm)</b>	<b>Power Drift (dB)</b>	<b>Measured 1g SAR (W/kg)</b>	<b>Limits (W/Kg)</b>	<b>Results</b>
PCS	512 (Low)	1850.2	GMSK	29.7	-0.1	0.515	1.6	Pass
	661 (Mid)	1880.0	GMSK	29.45	0	0.577	1.6	Pass
	<b>810 (High)</b>	<b>1909.8</b>	<b>GMSK</b>	<b>29.46</b>	<b>-0.007</b>	<b>0.601</b>	<b>1.6</b>	<b>Pass</b>

### ***11.3 Left Cheek***

<b>Bands</b>	<b>Chan.</b>	<b>Freq. (MHz)</b>	<b>Modulation type</b>	<b>Conducted Power (dBm)</b>	<b>Power Drift (dB)</b>	<b>Measured 1g SAR (W/kg)</b>	<b>Limits (W/Kg)</b>	<b>Results</b>
PCS	512 (Low)	1850.2	GMSK	29.7	0	0.376	1.6	Pass
	661 (Mid)	1880.0	GMSK	29.45	-0.1	0.439	1.6	Pass
	810 (High)	1909.8	GMSK	29.46	0	0.445	1.6	Pass

### ***11.4 Left Tilted***

<b>Bands</b>	<b>Chan.</b>	<b>Freq. (MHz)</b>	<b>Modulation type</b>	<b>Conducted Power (dBm)</b>	<b>Power Drift (dB)</b>	<b>Measured 1g SAR (W/kg)</b>	<b>Limits (W/Kg)</b>	<b>Results</b>
PCS	512 (Low)	1850.2	GMSK	29.7	0	0.432	1.6	Pass
	661 (Mid)	1880.0	GMSK	29.45	-0.1	0.464	1.6	Pass
	810 (High)	1909.8	GMSK	29.46	-0.1	0.465	1.6	Pass

**11.5 Body Worn-keypad up**

Bands	Chan.	Freq. (MHz)	Modulation type	Conducted Power (dBm)	Power Drift (dB)	Measured 1g SAR (W/kg)	Limits (W/Kg)	Results
PCS	512 (Low)	1850.2	GMSK	29.7	-	-	-	-
	661 (Mid)	1880.0	GMSK	29.45	0	0.136	1.6	Pass
	810 (High)	1909.8	GMSK	29.46	-	-	-	-

**11.6 Body Worn-keypad down**

Bands	Chan.	Freq. (MHz)	Modulation type	Conducted Power (dBm)	Power Drift (dB)	Measured 1g SAR (W/kg)	Limits (W/Kg)	Results
PCS	512 (Low)	1850.2	GMSK	29.7	-	-	-	-
	<b>661 (Mid)</b>	<b>1880.0</b>	<b>GMSK</b>	<b>29.45</b>	<b>0</b>	<b>0.206</b>	<b>1.6</b>	<b>Pass</b>
	810 (High)	1909.8	GMSK	29.46	-	-	-	-



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## **12. References**

- [1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”
- [2] IEEE Std. P1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, April 21, 2003
- [3] Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), “Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to RF Emissions”, June 2001
- [4] IEEE Std. C95.3-2002, “IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields-RF and Microwave”, 2002
- [5] IEEE Std. C95.1-1999, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, 1999
- [6] Robert J. Renka, “Multivariate Interpolation Of Large Sets Of Scattered Data”, University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148
- [7] DAYS4 System Handbook





## Appendix A - System Performance Check Data

Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/01/04 17:32:57

### System Check\_Head\_1900MHz\_20040701

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041**

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

Medium: HSL\_1900 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Pin=100mW/Area Scan (91x91x1):** Measurement grid: dx=10mm, dy=10mm

Reference Value = 60.1 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 4.7 mW/g

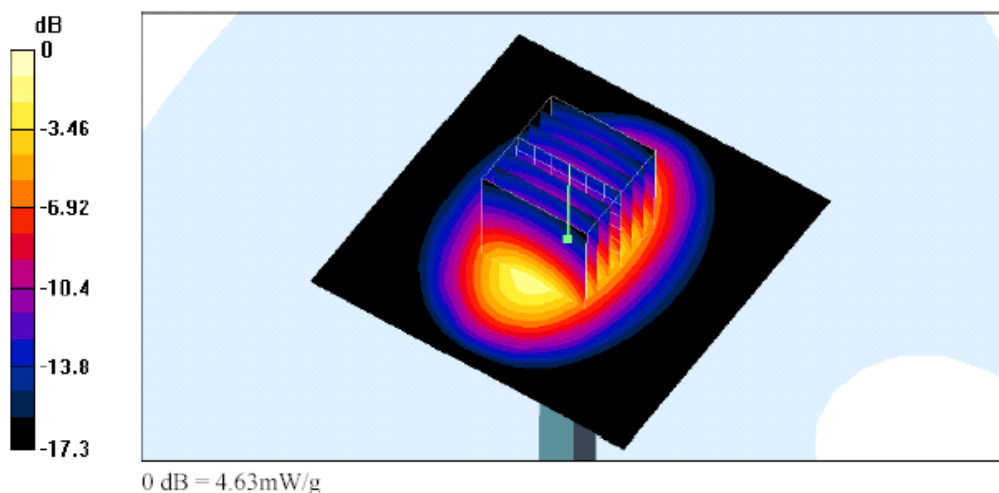
**Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 60.1 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 4.63 mW/g

Peak SAR (extrapolated) = 7.09 W/kg

SAR(1 g) = 4.07 mW/g; SAR(10 g) = 2.14 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/02/04 09:10:42

**System Check\_Body\_1900MHz\_20040702****DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041**

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

Medium: MSL\_1900 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.59$  mho/m;  $\epsilon_r = 52.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5, 5, 5); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Pin=100mW/Area Scan (91x91x1):** Measurement grid: dx=10mm, dy=10mm

Reference Value = 57.3 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 4.66 mW/g

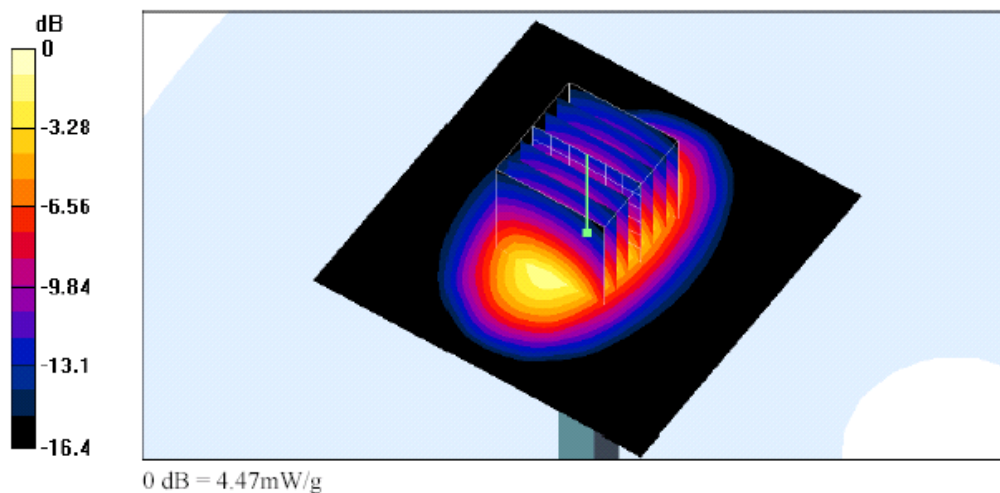
**Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.3 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 4.47 mW/g

Peak SAR (extrapolated) = 6.64 W/kg

SAR(1 g) = 3.95 mW/g; SAR(10 g) = 2.12 mW/g





## Appendix B - SAR Measurement Data

Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/01/04 19:08:48

### Right Check\_PCS Ch810\_20040701

**DUT: Panasonic EB-A102; Type: GSM Tri-Band Mobile Phone; Serial: 350421030000600**

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

Medium: HSL\_1900 Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Ch810/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 14.3 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 0.672 mW/g

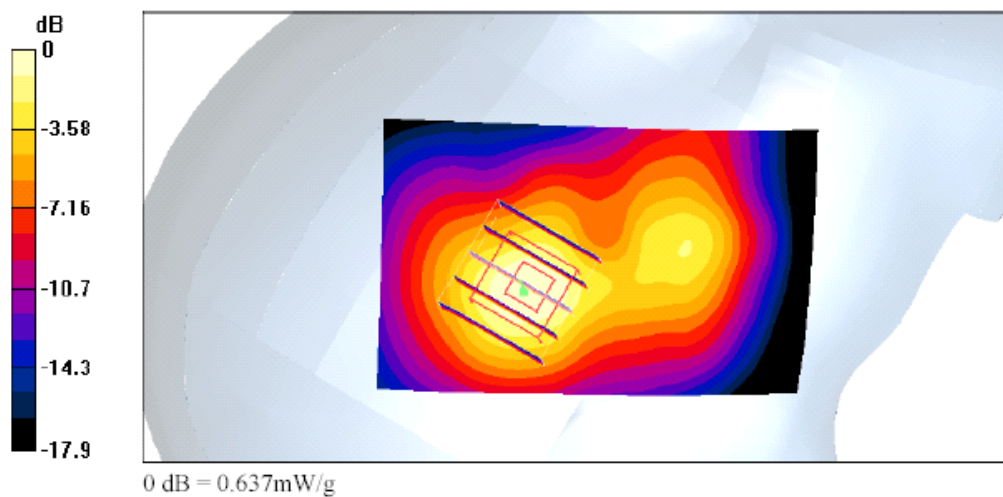
**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.3 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.637 mW/g

Peak SAR (extrapolated) = 0.985 W/kg

SAR(1 g) = 0.581 mW/g; SAR(10 g) = 0.315 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/01/04 19:40:30

**Right Tilted\_PCS Ch661\_20040701**

**DUT: Panasonic EB-A102; Type: GSM Tri-Band Mobile Phone; Serial: 350421030000600**

Communication System: PCS; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: HSL\_1900 Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.44$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Ch661/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 17.6 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 0.670 mW/g

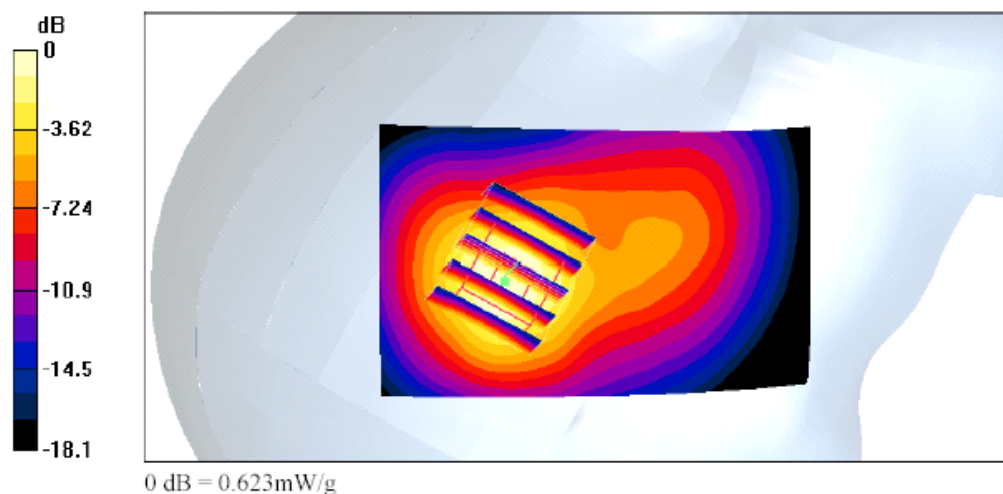
**Ch661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.6 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.623 mW/g

Peak SAR (extrapolated) = 0.955 W/kg

SAR(1 g) = 0.577 mW/g; SAR(10 g) = 0.317 mW/g







Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/01/04 19:54:03

**Right Tilted\_PCS Ch810\_20040701**

**DUT: Panasonic EB-A102; Type: GSM Tri-Band Mobile Phone; Serial: 350421030000600**

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

Medium: HSL\_1900 Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Ch810/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 17.2 V/m; Power Drift = -0.007 dB

Maximum value of SAR (interpolated) = 0.691 mW/g

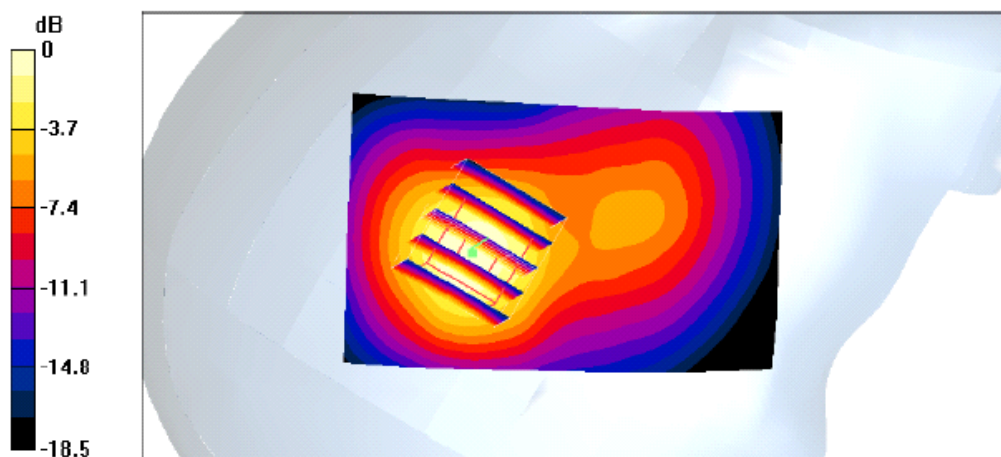
**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.2 V/m; Power Drift = -0.007 dB

Maximum value of SAR (measured) = 0.647 mW/g

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.601 mW/g; SAR(10 g) = 0.327 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/02/04 09:26:26

**Body\_PCS Ch661\_Keypad Down With 1.5cm Gap \_20040702****DUT: Panasonic EB-A102; Type: GSM Tri-Band Mobile Phone; Serial: 350421030000600**

Communication System: DCS 1900; Frequency: 1880 MHz; Duty Cycle: 1: 8.3

Medium: MSL\_1900 Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 52$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5, 5, 5); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Ch661/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 9 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 0.232 mW/g

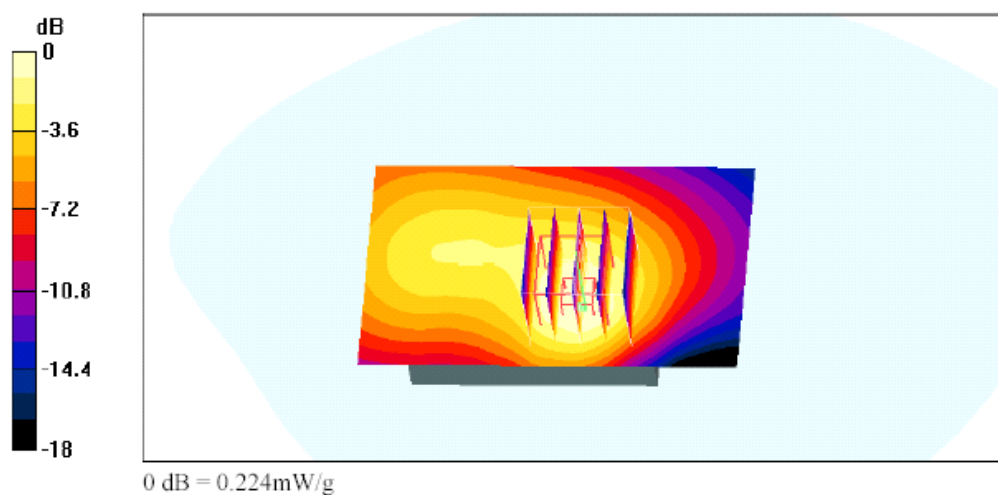
**Ch661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.224 mW/g

Peak SAR (extrapolated) = 0.334 W/kg

SAR(1 g) = 0.206 mW/g; SAR(10 g) = 0.125 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 07/01/04 19:54:03

**Right Tilted\_PCS Ch810\_20040701****DUT: Panasonic EB-A102; Type: GSM Tri-Band Mobile Phone; Serial: 350421030000600**

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

Medium: HSL\_1900 Medium parameters used (interpolated):  $f = 1909.8$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 39.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(5.3, 5.3, 5.3); Calibrated: 8/29/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/21/2003
- Phantom: SAM 12; Type: QD 000 P40 C; Serial: TP-1150
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Ch810/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 17.2 V/m; Power Drift = -0.007 dB

Maximum value of SAR (interpolated) = 0.691 mW/g

**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.2 V/m; Power Drift = -0.007 dB

Maximum value of SAR (measured) = 0.647 mW/g

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.601 mW/g; SAR(10 g) = 0.327 mW/g**