7 - SYSTEM EVALUATION

7.1 Simulated Tissue Liquid Parameter Confirmation

The dielectric parameters were checked prior to assessment using the HP85070A dielectric probe kit. The dielectric parameters measured are reported in each correspondent section:

7.2 Evaluation Procedures

Maximum Search

The maximum search is automatically performed after each coarse scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacings. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations.

Extrapolation

The extrapolation can be used in z-axis scans with automatic surface detection. The SAR values can be extrapolated to the inner phantom surface. The extrapolation distance is the sum of the probe sensor offset, the surface detection distance and the grid offset. The extrapolation is based on fourth order polynomal functions. The extrapolation is only available for SAR values.

Boundary Corrections

The correction of the probe boundary effect in the vicinity of the phantom surface can be done in two different ways. In the standard (worse case) evaluation, the boundary effect is reduced by different weights for the lowest measured points in the extrapolation routine. The result is a slight overestimation of the extrapolated SAR values (2% to 8%) depending on the SAR distribution and gradient. The advanced evaluation makes a full compensation of the boundary effect before doing the extrapolation. This is only possible of probes with specifications on the boundary effect.

Peak Search for 1g and 10g cube averaged SAR

The 1g and 10g peak evaluations are only available for the predefined cube 4x4x7 and cube 5x5x7 scans. The routine are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 32x32x35mm contains about 35g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation get all points within the measured volume in a 1mm grid (35000 points). In the last step, a 1g cube is place numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. This last procedure is repeated for a 10g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning,: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

7.3 System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

IEEE P1528 recommended reference value

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (above feed point)	Local SAR at surface (v=2cm offset from feed point)
300	3.0	2.0	4.4	2.1
450	4.9	3.3	7.2	3.2
835	9.5	6.2	14.1	4.9
900	10.8	6.9	16.4	5.4
1450	29.0	16.0	50.2	6.5
1800	38.1	19.8	69.5	6.8
1900	39.7	20.5	72.1	6.6
2000	41.1	21.1	74.6	6.5
2450	52.4	24.0	104.2	7.7
3000	63.8	25.7	140.2	9.5

Validation Dipole SAR Reference Test Result for Body

Validation Measurement	SAR @ 0.025W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.025W Input averaged over 10g	SAR @ 1W Input averaged over 10g
Test 1	0.222	8.88	0.112	4.48
Test 2	0.221	8.84	0.111	4.44
Test 3	0.222	8.88	0.112	4.48
Test 4	0.220	8.80	0.111	4.44
Test 5	0.223	8.92	0.113	4.52
Test 6	0.222	8.88	0.115	4.60
Test 7	0.221	8.84	0.114	4.56
Test 8	0.222	8.88	0.114	4.56
Test 9	0.223	8.92	0.113	4.52
Test 10	0.222	8.88	0.112	4.48
Average	0.2218	8.872	0.1127	4.51

System Validation Result

Ambient Temperature (ºC): 23

2004-01-29

Simulant	Freq MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation	Limits [%]
Body	835	ε_r	21	55.2	55.3	0.18	±5
		σ	21	0.97	0.97	0	±5
		1g SAR	21	8.872	8.97	1.10	±10
Head	835	ε_r	21	41.5	40.5	-2.41	±5
		σ	21	0.90	0.90	0	±5
		1g SAR	21	9.5	9.56	0.63	±10

ε_r = relative permittivity, σ = conductivity and ρ=1000kg/m^3

Body Forward Power = 20.64 dBm =115.88 mW
Head Forward Power = 20.45 dBm =110.92 mW

Ambient Temperature (ºC): 22

2004-01-30

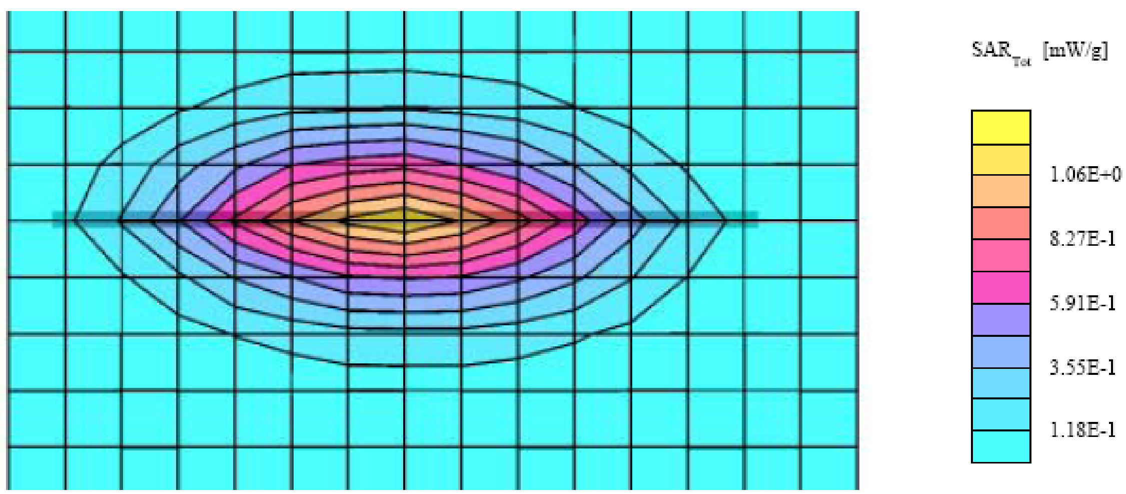
Simulant	Freq MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation	Limits [%]
Body	835	ε_r	21	55.2	53.3	-3.44	±5
		σ	21	0.97	0.95	-2.06	±5
		1g SAR	21	8.872	8.34	-5.99	±10
Head	835	ε_r	21	41.5	40.3	-2.89	±5
		σ	21	0.90	0.90	0	±5
		1g SAR	21	9.5	9.5	0	±10

ε_r = relative permittivity, σ = conductivity and ρ=1000kg/m^3

Body Forward Power = 20.64 dBm =115.88 mW
Head Forward Power = 20.31 dBm =107.40 mW

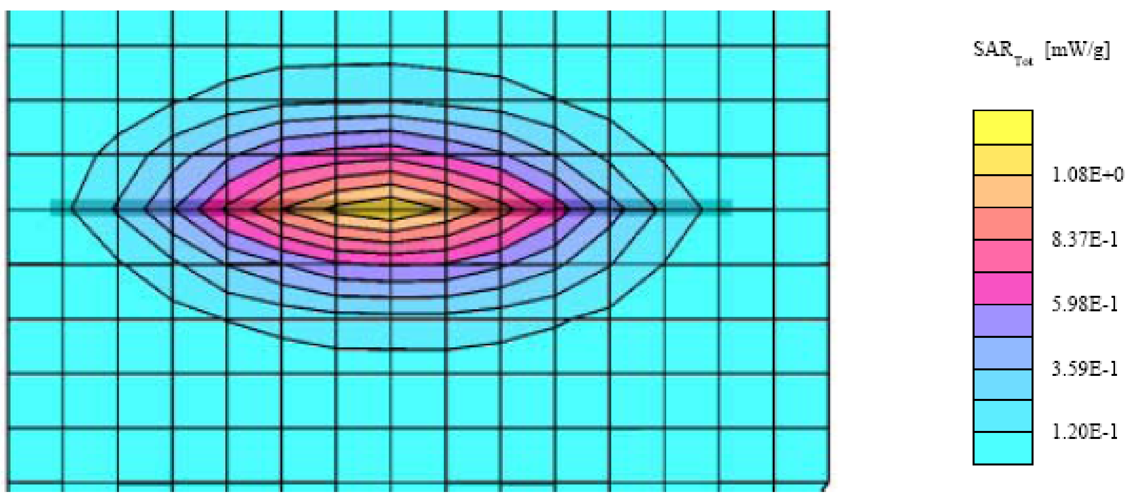
System Validation 835 MHz Body Liquid (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.64 dBm, 01/29/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; 835 (Body) MHz: σ = 0.97 mho/m ε_r = 55.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.04 mW/g, SAR (10g): 0.597 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



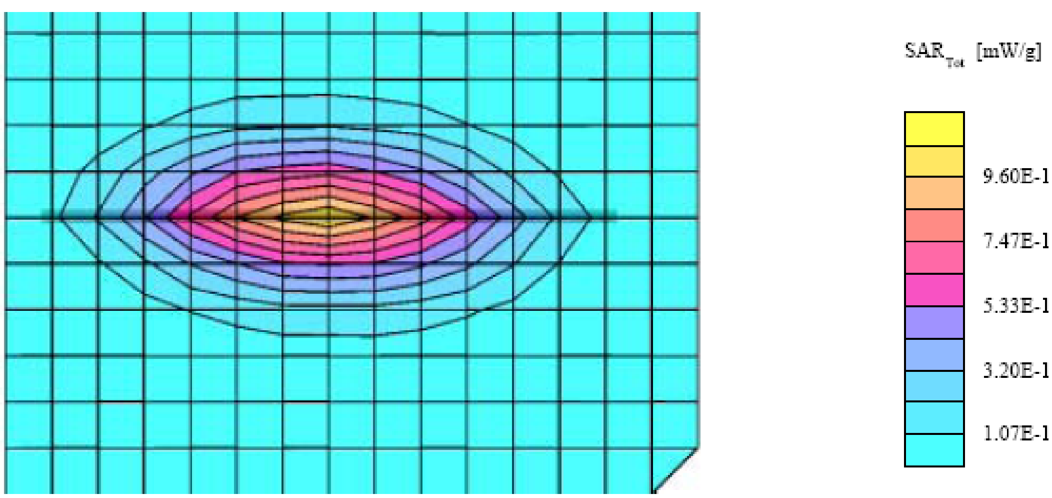
System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.45 dBm, 01/29/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ES3DV2 - SN3019; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.90 mho/m ε_r = 40.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.06 mW/g, SAR (10g): 0.605 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.03 dB



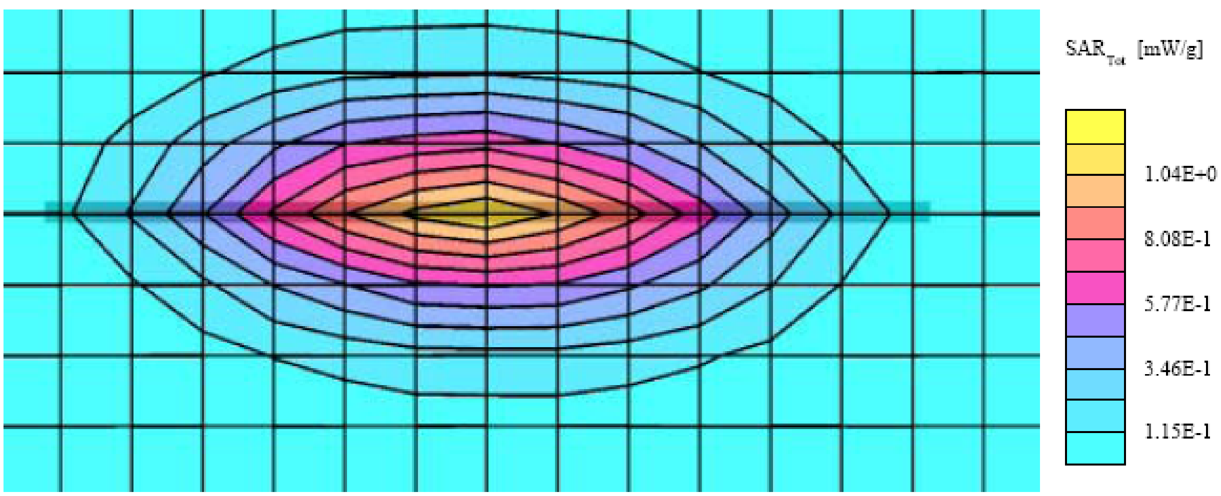
System Validation 835 MHz Body Liquid (Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.64 dBm, 01/30/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; 835 (Body) MHz: σ = 0.95 mho/m ε_r = 53.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.967 mW/g, SAR (10g): 0.554 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.00 dB



System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.31dBm, 01/30/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ES3DV2 - SN3019; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.90 mho/m ε_r = 40.3 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.02 mW/g, SAR (10g): 0.582 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



7.4 SAR Evaluation Procedure

a. The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For device held to the dear during normal operation, both the left and right ear positions were evaluated in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom. For body-worn and face-held devices a planar phantom was used. The EUT in the test setup for body-worn and face-held devices was placed in three different positions (relative to the phantom): with belt clip, without belt clip and 2.5cm facing left head side and 2.5cm facing right head side.
b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm.
c. A 5x5x7 matrix was performed around the greatest special 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. The depth of the simulating tissue in the planar used for the SAR evaluation and system validation was no less than 15.0cm.
e. For this particular evaluation, a stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.
f. Re-measurement of the SAR value at the same location as in a. If the value changed by more than 5%, the evaluation was repeated.

7.5 Exposure Limits

Table 1: Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands. Wrists. Feet and Ankles
0.4	8.0	20.0

Table 2: Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands. Wrists. Feet and Ankles
0.08	1.6	4.0

Note: Whole-body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube SAR for hands, writs, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

Population/uncontrolled environments Partial-body limit 1.6W/kg applied to the EUT.

8 - TEST RESULTS

This page summarizes the results of the performed dosimeter evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device could be found in the following pages.

According to the data in section 8.1, the EUT complied with the FCC 2.1093 RF Exposure standards, with worst case of 0.775 mW/g.

8.1 SAR Test Data

Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3

Host Laptop	Position	Frequency (MHz)	Output Power (dBm)	Test Type	Antenna position	Liquid	Phantom	Measured (mW/g)	Limit (mW/g)	Plot #
Acer	Bottom side facing phantom	835	24.67	Body Worn	Antenna pointing down and perpendicular with phantom bottom with headset	Body	Body	0.512	1.6	1
	Keyboard side facing phantom	835	24.67		Antenna parallel with phantom bottom with headset			0.452		2
	Keyboard side facing phantom	835	24.67		Antenna pointing into and perpendicular with phantom bottom gaped 1.5cm with headset			0.0375		3
	Left side edge of laptop facing phantom	835	24.67		Antenna pointing parallel out and perpendicular with phantom bottom gaped 1.5com with headset			0.144		4
	Bottom side facing phantom	835	24.67		Antenna pointing down and perpendicular with phantom bottom			0.600		5
	Keyboard side facing phantom	835	24.67		Antenna parallel with phantom bottom			0.501		6
	Keyboard side facing phantom	835	24.67		Antenna pointing into and perpendicular with phantom bottom gaped 1.5cm			0.0322		7
	Left side edge of laptop facing phantom	835	24.67		Antenna pointing parallel out and perpendicular with phantom bottom gaped 1.5cm			0.139		8
Toshiba	Bottom side facing phantom	835	24.67		Antenna pointing down and perpendicular with phantom bottom with headset			0.437		9
	Bottom side facing phantom	835	24.67		Antenna parallel with phantom bottom with headset			0.370		10
	Keyboard side facing phantom	835	24.67		Antenna pointing into and perpendicular with phantom bottom gaped 1.5cm with headset			0.0334		11
	Left side edge of laptop facing phantom	835	24.67		Antenna pointing parallel out and perpendicular with phantom bottom gaped 1.5cm with headset			0.103		12
	Keyboard side facing phantom	835	24.67		Antenna pointing into and perpendicular with phantom bottom gaped 1.5cm			0.0414		13
	Bottom side facing phantom	835	24.67		Antenna pointing down and perpendicular with phantom bottom			0.398		14

Toshiba	Bottom side facing phantom	835	24.67	Body Worn	Antenna parallel with phantom bottom	Body	Body	0.554	1.6	15
	Lefe side edge of laptop facing phantom	835	24.67		Antenna pointing parallel out and perpendicular with phantom bottom gaped 1.5cm			0.108		16
Compal	Bottom side facing phantom	835	24.67		Antenna pointing down and perpendicular with phantom bottom with headset			0.122		17
	Keyboard side facing phantom	835	24.67		Antenna parallel with phantom bottom with headset			0.595		18
	Keyboard side facing phantom	835	24.67		Antenna pointing into and perpendicular with phantom bottom gaped 1.5cm with headset			0.0197		19
	Left side edge of laptop facing phantom	835	24.67		Antenna pointing parallel out and perpendicular with phantom bottom paged 1.5cm with headset			0.144		20
	Bottom side facing phantom	835	24.67		Antenna pointing down and perpendicular with phantom bottom			0.321		21
	Keyboard side facing phantom	835	24.67		Antenna parallel with phantom bottom			0.755		22
	Keyboard side facing phantom	835	24.67		Antenna pointing into and perpendicular with phantom bottom gaped 1.5cm			0.0196		23
	Left side edge of laptop facing phantom	835	24.67		Antenna pointing parallel out and perpendicular with phantom bottom gaped 1.5cm			0.0940		24

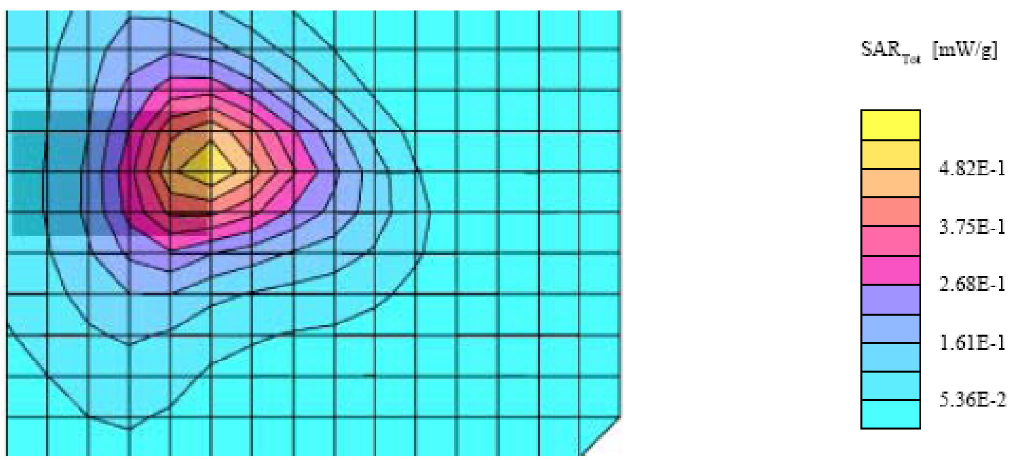
8.2 Plots of Test Result

The plots of test result were attached as reference.

Acer with headset (Plot #1)

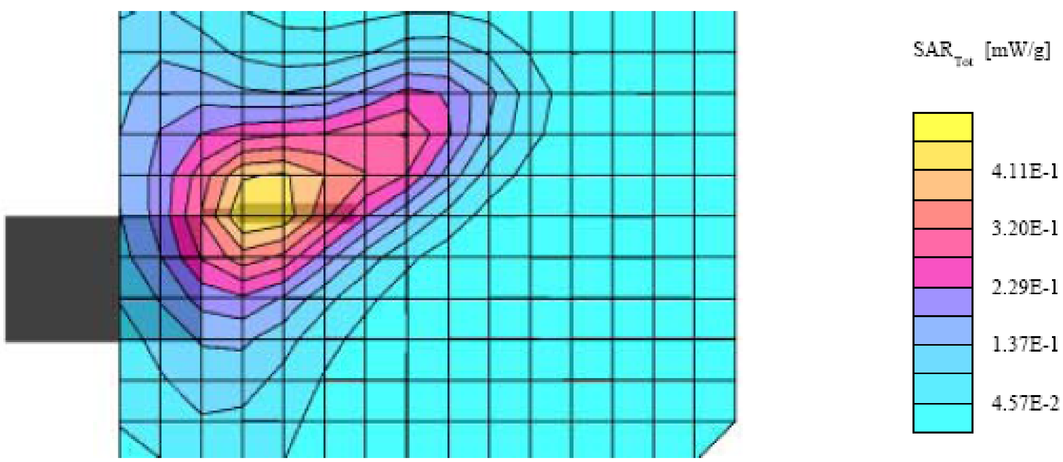
Mason Electronics, Model: MM-5100U (Notebook Model: Acer, bottom side facing phantom, EUT bottom side facing phantom, antenna pointing down and perpendicular with phantom bottom with headset, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 1/29/2004)

SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 836 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.97 mho/m ε_r = 55.3 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.512 mW/g, SAR (10g): 0.338 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.04 dB



Acer with headset (Plot #2)

Mason Electronics, Model: MM-5100U (Notebook Model: Acer, Keyboard side facing phantom, EUT top side facing phantom, antenna parallel with phantom bottom with headset, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 1/29/2004)
SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 836 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.97 mho/m ε_r = 55.3 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.452 mW/g, SAR (10g): 0.304 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.00 dB



Acer with headset (Plot #3)

Mason Electronics, Model: MM-5100U (Notebook Model: Acer, Keyboard side facing phantom, EUT top side facing phantom, antenna pointing into and perpendicular with phantom bottom gaped 1.5 cm with headset, Middle Channel, Ambient Temp = 23 Deg C, Liqiud Temp = 21 Deg C, 1/29/2004)

SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 836 MHz
Probe: ES3DV2 - SN3019; ConvF(6.10,6.10,6.10); Crest factor: 1.0; (Body) 835 MHz: σ = 0.97 mho/m ε_r = 55.3 ρ = 1.31 g/cm³
Cube 5x5x7: SAR (1g): 0.0375 mW/g, SAR (10g): 0.0271 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.03 dB