6.3 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [13] and the NIST1297 [14] documents and is given in the following Table.

Measurement Uncertainty Analysis per IEEE P1528-2002

Description	Section	Reported Variance (%)	Probability Distribution type	Divisor	Ci (1g)	Ui (1g)	Vi	welc/satt series term
Probe Calibration	E.2.1	4.80	N	1	1	4.80	1.00E+09	5.30842E-07
Axial isotropy	E.2.2	4.70	R	1.732	0.707107	1.92	1.00E+09	1.35563E-08
Hemispherical isotropy	E.2.2	9.60	R	1.732	0.707107	3.92	1.00E+09	2.35957E-07
Boundary effects	E.2.3	8.30	R	1.732	1	4.79	1.00E+09	5.27377E-07
Linearity	E.2.4	4.70	R	1.732	1	2.71	1.00E+09	5.4225E-08
System Detection Limit	E.2.5	1.00	R	1.732	1	0.58	1.00E+09	1.11124E-10
Readout Electronics	E.2.6	0.00	N	1	1	0.00	1.00E+09	0
Response time	E.2.7	0.00	R	1.732	1	0.00	1.00E+09	0
Integration time	E.2.8	0.00	R	1.732	1	0.00	1.00E+09	0
RF Ambient conditions	E.6.1	3.00	R	1.732	1	1.73	1.00E+09	9.00106E-09
Probe positioning mechanical tolerance	E.6.2	0.40	R	1.732	1	0.23	1.00E+09	2.84478E-12
Probe positioning wrt phantom shell	E.6.3	2.90	R	1.732	1	1.67	1.00E+09	7.8596E-09
Extra/inter-polation & integration algorithmsfor max SAR evaluation	E.5.2	3.90	R	1.732	1	2.25	1.00E+09	2.57079E-08
Test sample positioning	8, E.4.2	6.00	R	1.732	1	3.46	1.00E+09	1.44017E-07
Device holder distance tolerance	E.4.1	5.00	N	1	1	5.00	1.00E+09	0.000000625
Output power and SAR drift measurement	8, E.6.6.2	5.00	R	1.732	1	2.89	1.00E+09	6.94526E-08
Phantom uncertainty, shell thickness tolerance	E.3.1	4.00	R	1.732	1	2.31	1.00E+09	2.84478E-08
Liquid conductivity, deviation from target values	E.3.2	5.00	R	1.732	0.64	1.85	1.00E+09	1.16522E-08
Liquid conductivity, measurement uncertainty	E.3.3	5.00	N	1	0.64	3.20	5	20.97152
Liquid permitivity, deviation from target values	E.3.2	5.00	R	1.732	0.6	1.73	1.00E+09	9.00106E-09
Liquid permitivity, measurement uncertainty	E.3.3	5.00	N	1	0.6	3.00	5	16.2
								689
Probe isotropy sensitivity coefficient	**0.5**							
Combined Standard Uncertainty						**12.65 %**		
Expanded Uncertainty, 95%		**k=**	**2.0036**			**25.34 %**		

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 for Head

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 (2450 MHz)

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	14.2	56.80	6.33	25.32
Test 2	14.3	57.20	6.34	25.36
Test 3	14.2	56.80	6.33	25.32
Test 4	14.1	56.40	6.32	25.28
Test 5	14.3	57.20	6.33	25.32
Test 6	14.0	56.00	6.31	25.24
Test 7	14.2	56.80	6.33	25.32
Test 8	14.2	56.80	6.33	25.32
Test 9	14.4	57.60	6.34	25.36
Test 10	14.2	56.80	6.32	25.28
Average	14.21	56.84	6.32	25.31

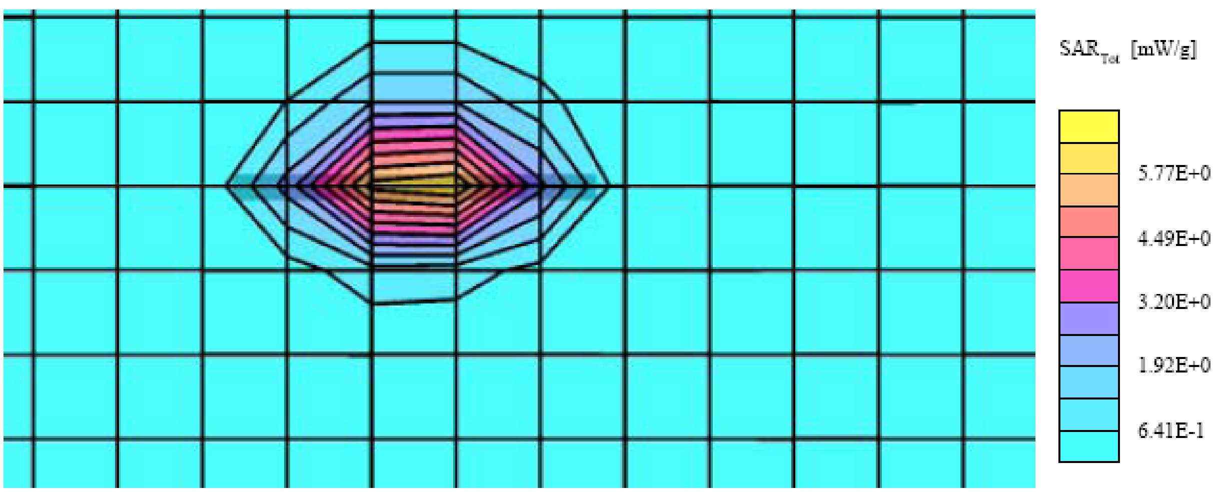
System validation result

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
Body	2450	ε	21	52.7	52.6	-0.19	±5
		σ	21	1.95	1.92	-1.54	±5
		1g SAR	21	56.84	56.84	0	±10
Head	2450	ε	21	39.2	39.0	-0.51	±5
		σ	21	1.80	1.88	4.45	±5
		1g SAR	21	52.4	56.18	7.21	±10

ε = relative permittivity, σ = conductivity and ρ=1000kg/m^3
Body Forward Power = 20.05 dBm =101.16 mW
Head Forward Power = 20.30 dBm =107.15 mW

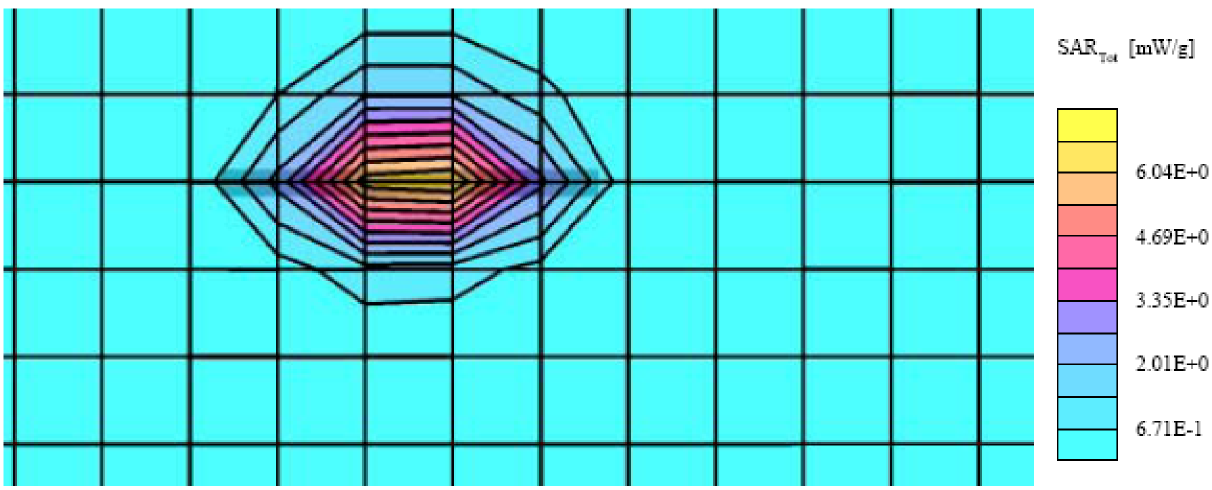
2450 MHz Body Liquid System Validation (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.05 dBm, 2/10/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2450 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz: σ = 1.93 mho/m ε_r = 52.5 ρ= 1.00 g/cm³
Cube 5x5x7: SAR (1g): 5.75 mW/g, SAR (10g): 2.33 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.05 dB



2450 MHz Head Liquid System Validation (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, Forward Power = 20.3 dBm, 2/10/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2450 MHz
Probe: ES3DV2 - SN3019; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 2450 MHz Head Liquid: σ = 1.88 mho/m ε_r = 39 ρ= 1.00 g/cm³
Cube 5x5x7: SAR (1g): 6.02 mW/g, SAR (10g): 2.45 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.00 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): parallel, bystand (perpendicular) and 1.5cm separation.
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 6.1, the EUT complied with the FCC 2.1093 RF Exposure standards, with worst case of 1.54.

8.1 SAR Body-Worn Test Data

Ambient Temperature (ºC): 22.0

Worst case SAR reading

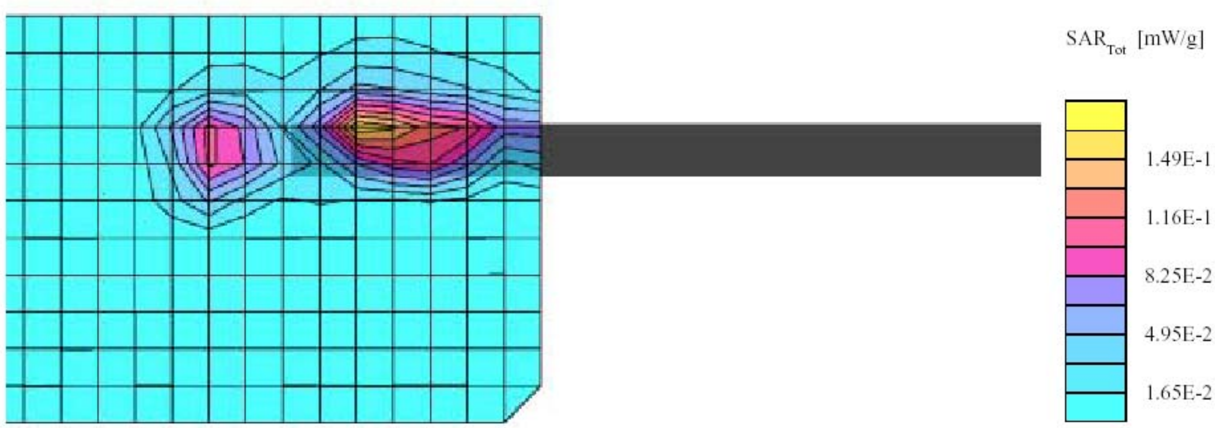
Host PC	EUT position	Frequency (MHz)	Output Power (W)	Test Type	Antenna Type	Liquid	Antenna Position	Measured (mW/g)	Limit (mW/g)	Plot #
CAO-S	Perpendicular touching flat phantom	2437	0.112	Body worn	Built-in	body	Left side (Aux)	0.155	1.6	1
	Perpendicular touching flat phantom	2437	0.117	Body worn	Built-in	body	Right side (Main)	0.361	1.6	2
	Bottom side touching flat phantom	2437	0.112	Body worn	Built-in	body	Left side (Aux)	0.0083	1.6	3
	Bottom side touching flat phantom	2437	0.117	Body worn	Built-in	body	Right side (Main)	0.0061	1.6	4
	Top side touching flat phantom	2437	0.112	Body worn	Built-in	body	Left side (Aux)	0.715	1.6	5
	Top side touching flat phantom	2437	0.117	Body worn	Built-in	body	Right side (Main)	0.699	1.6	6
HFT06	Perpendicular touching flat phantom	2437	0.117	Body worn	Built-in	body	Left side (Aux)	0.572	1.6	7
	Perpendicular touching flat phantom	2437	0.117	Body worn	Built-in	body	Right side (Main)	0.496	1.6	8
	Bottom side touching flat phantom	2437	0.117	Body worn	Built-in	body	Left side (Aux)	0.0108	1.6	9
	Bottom side touching flat phantom	2437	0.117	Body worn	Built-in	body	Right side (Main)	0.0094	1.6	10
	Top side touching flat phantom	2462	0.112	Body worn	Built-in	body	Left side (Aux)	0.668	1.6	11
	Top side touching flat phantom	2412	0.108	Body worn	Built-in	body	Left side (Aux)	0.919	1.6	12
	Top side touching flat phantom	2437	0.117	Body worn	Built-in	body	Left Side (Aux)	1.03	1.6	13
	Top side touching flat phantom	2463	0.112	Body worn	Built-in	body	Right side (Main)	1.54	1.6	14
	Top side touching flat phantom	2412	0.112	Body worn	Built-in	body	Right side (Main)	1.31	1.6	15
	Top side touching flat phantom	2437	0.117	Body worn	Built-in	body	Right side (Main)	1.37	1.6	16

8.2 Plots of Test Result

The plots of test result were attached as reference.

Ambit, AIR-MPI 350, Antenna Model: CAO-S (Aux) (Notebook cover closed, perpendicular touching flat phantom, Antenna Position: Left Side (Aux), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

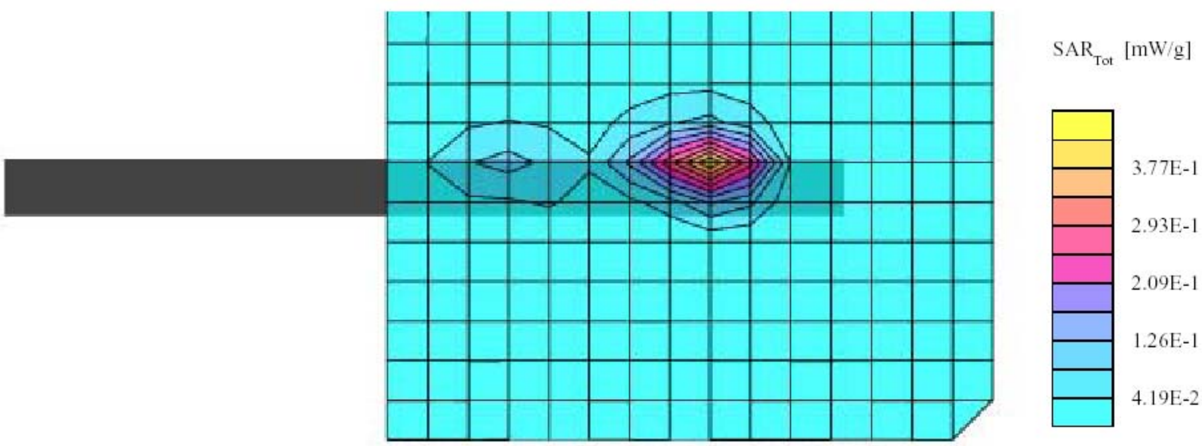
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.155 mW/g, SAR (10g): 0.0715 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



Plot # 1

Ambit, AIR-MPI 350, Antenna Model: CAO-S (Main) (Notebook cover closed, perpendicular touching flat phantom, Antenna Position: Right Side (Main), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

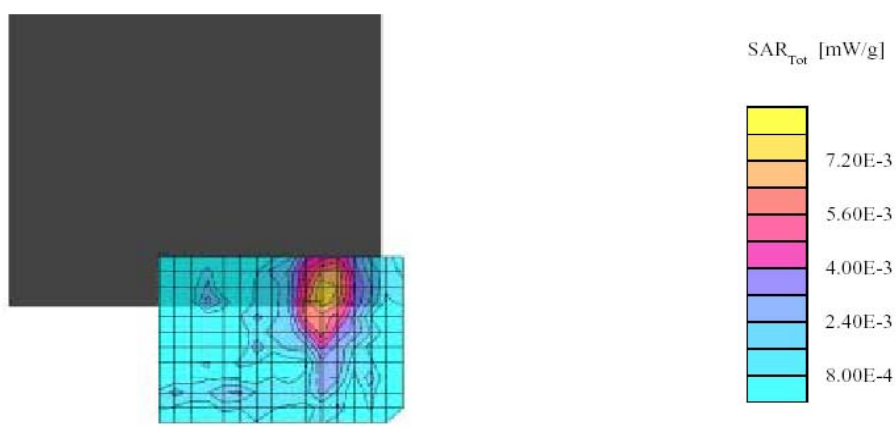
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.361 mW/g, SAR (10g): 0.155 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.04 dB



Plot # 2

Ambit, AIR-MPI 350, Antenna Model: CAO-S (Aux) (Notebook cover closed, bottom side touching flat phantom, Antenna Position: Left Side (Aux), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

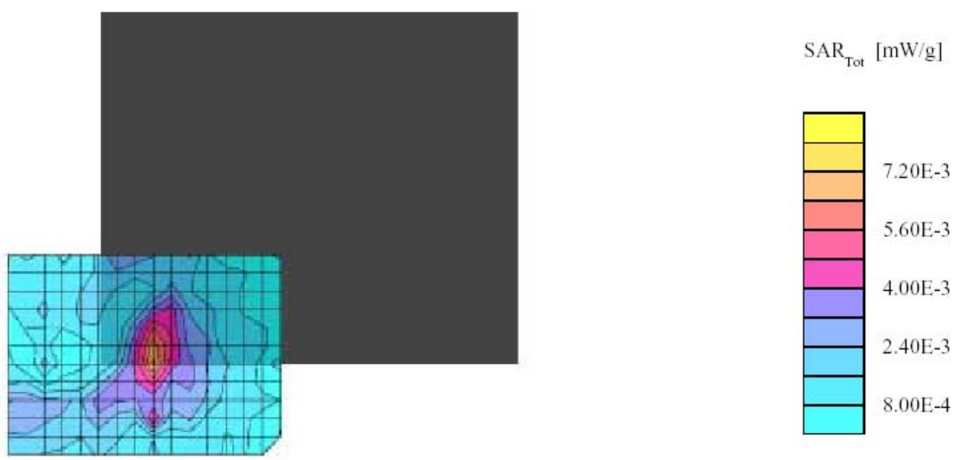
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.0083 mW/g, SAR (10g): 0.0044 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.05 dB



Plot # 3

Ambit, AIR-MPI 350, Antenna Model: CAO-S (Main) (Notebook cover closed, bottom side touching flat phantom, Antenna Position: Right Side (Main), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

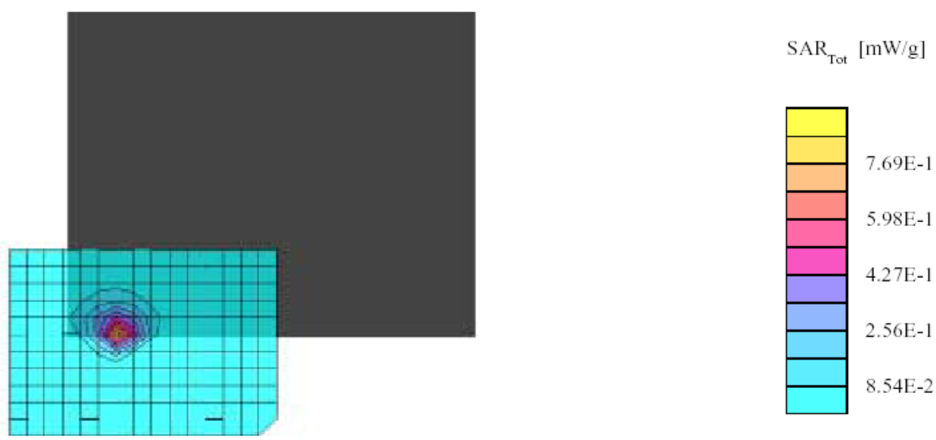
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.0061 mW/g, SAR (10g): 0.0037 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.04 dB



Plot # 4

Ambit, AIR-MPI 350, Antenna Model: CAO-S (Aux) (Notebook cover closed, top side touching flat phantom, Antenna Position: Left Side (Aux), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

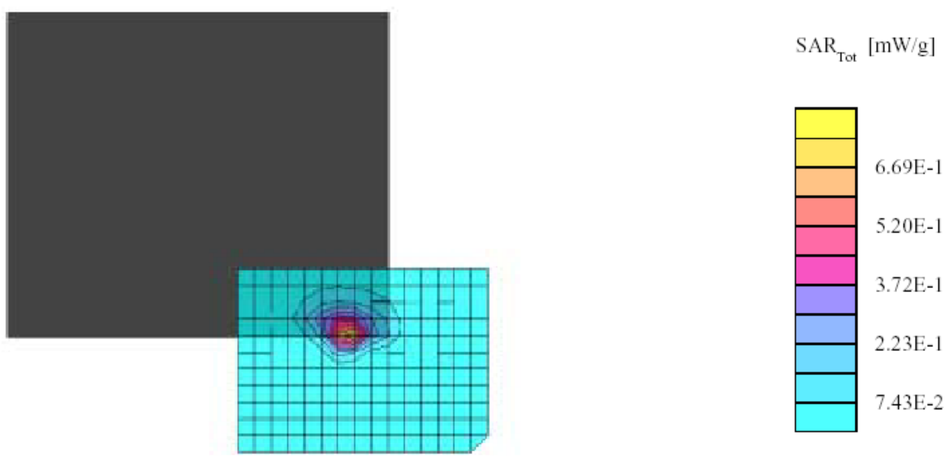
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.715 mW/g, SAR (10g): 0.299 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.03 dB



Plot # 5

Ambit, AIR-MPI 350, Antenna Model: CAO-S (Main) (Notebook cover closed, top side touching flat phantom, Antenna Position: Right Side (Main), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

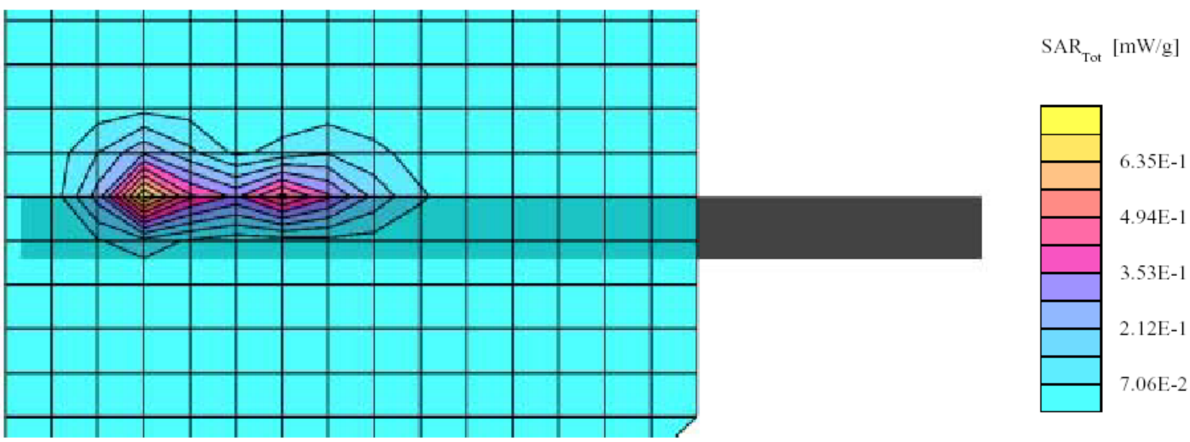
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.699 mW/g, SAR (10g): 0.290 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



Plot # 6

Ambit, AIR-MPI 350, Antenna Model: HFT06 (Aux) (Notebook cover closed, perpendicular touching flat phantom, Antenna Position: Left Side (Aux), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

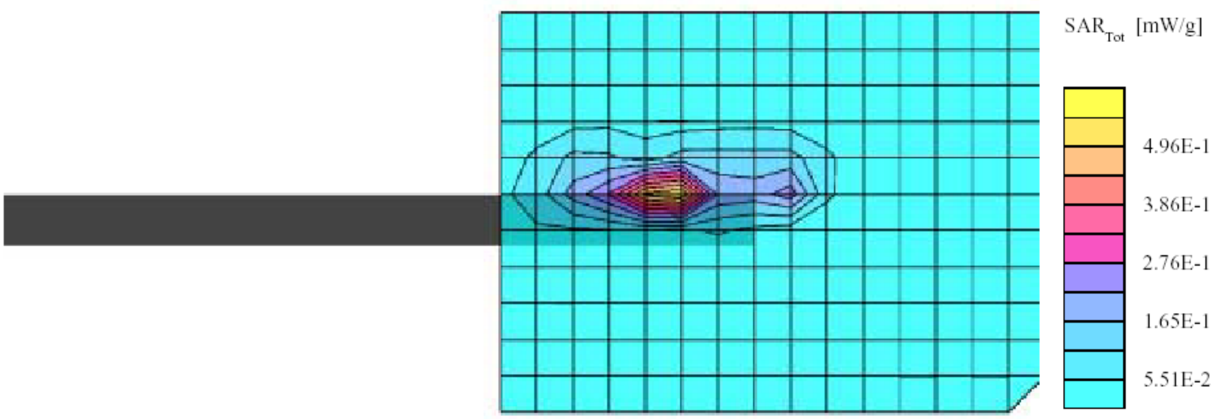
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.572 mW/g, SAR (10g): 0.232 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



Plot # 7

Ambit, AIR-MPI 350, Antenna Model: HFT06 (Main) (Notebook cover closed, perpendicular touching flat phantom, Antenna Position: Right Side (Main), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

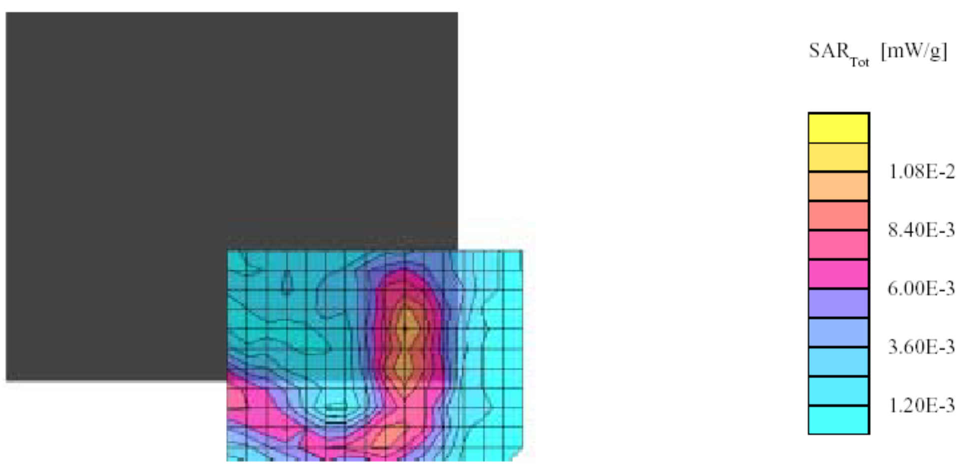
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.496 mW/g, SAR (10g): 0.175 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



Plot #8

Ambit, AIR-MPI 350, Antenna Model: HFT06 (Aux) (Notebook cover closed, bottom side touching flat phantom, Antenna Position: Left Side (Aux), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

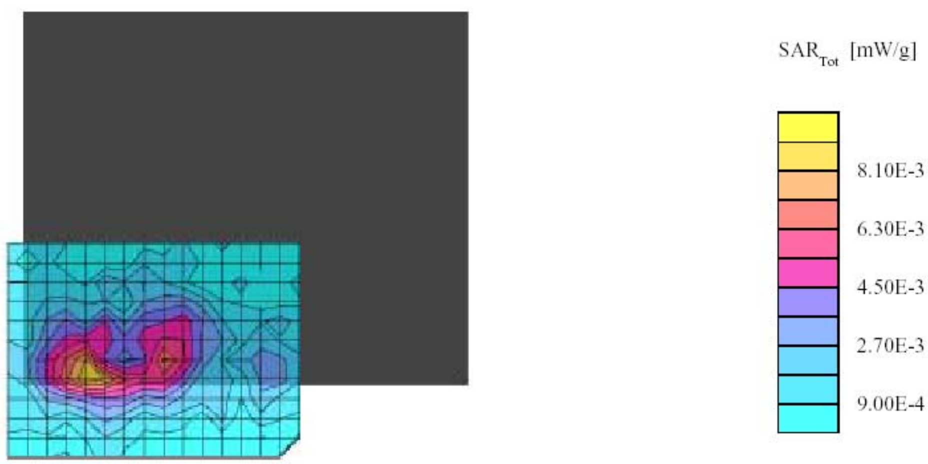
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.0108 mW/g, SAR (10g): 0.0057 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



Plot #9

Ambit, AIR-MPI 350, Antenna Model: HFT06 (Main) (Notebook cover closed, bottom side touching flat phantom, Antenna Position: Right Side (Main), Middle Channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz
Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.0094 mW/g, SAR (10g): 0.0048 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.04 dB



Plot #10

Ambit, AIR-MPI 350, Antenna Model: HFT06 (Aux) (Notebook cover closed, top side touching flat phantom, Antenna Position: Left Side (Aux), High channel, Ambient Temp = 22 Deg C, Liquid Temp = 21 Deg C, 2/10/2004)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2462 MHz

Probe: ES3DV2 - SN3019; ConvF(4.20,4.20,4.20); Crest factor: 1.0; 2450 MHz Body Liquid: σ = 1.93 mho/m ε_r = 52.5 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 0.668 mW/g, SAR (10g): 0.287 mW/g, (Worst-case extrapolation)

Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0

Powerdrift: -0.02 dB

Plot #11