7 - EVALUATION PROCEDURE

7.1 SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 20 mm x 20 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm [11]. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three onedimensional splines with the “Not a knot"-condition (in x, y and z-directions) [11], [12]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

3. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

7.2 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).

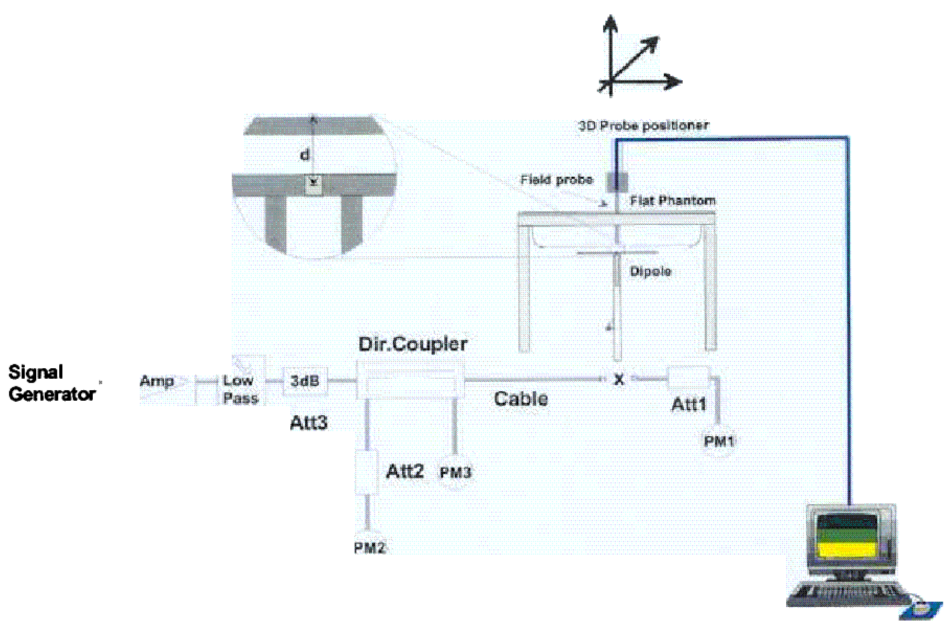
Population/uncontrolled environments Partial-body limit 1.6W/kg applied to the EUT.

7.3 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:

7.4 SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First, the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at he dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. after connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM 2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed form the previous value. The reflected power should be 20dB below the forward power.

The SAR measurements were performed in order to achieve repeatability and to establish an average target value.

7.5 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

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

7.6 Liquid Measurement Result

DELL Notebook:

2003-09-16

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation	Limits [%]
Head	835	ε_r	21.0	41.5	41.4	0.24	±5
		σ	21.0	0.90	0.89	-1.11	±5
		1g SAR	21.0	9.5	9.93	4.53	±10
Body	835	ε_r	22.0	55.2	54.5	-1.27	±5
		σ	22.0	0.97	0.97	0	±5
		1g SAR	22.0	8.872	9.185	3.53	±10

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

Liquid Forward Power = 135 mW

IBM Notebook:

2003-09-16

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation	Limits [%]
Head	835	ε_r	21.0	41.5	41.4	0.24	±5
		σ	21.0	0.90	0.89	-1.11	±5
		1g SAR	21.0	9.5	9.93	4.53	±10
Body	835	ε_r	22.0	55.2	54.5	-1.27	±5
		σ	22.0	0.97	0.97	0	±5
		1g SAR	22.0	8.872	9.185	3.53	±10

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

Liquid Forward Power = 135 mW

SONY Notebook:

2003-09-18

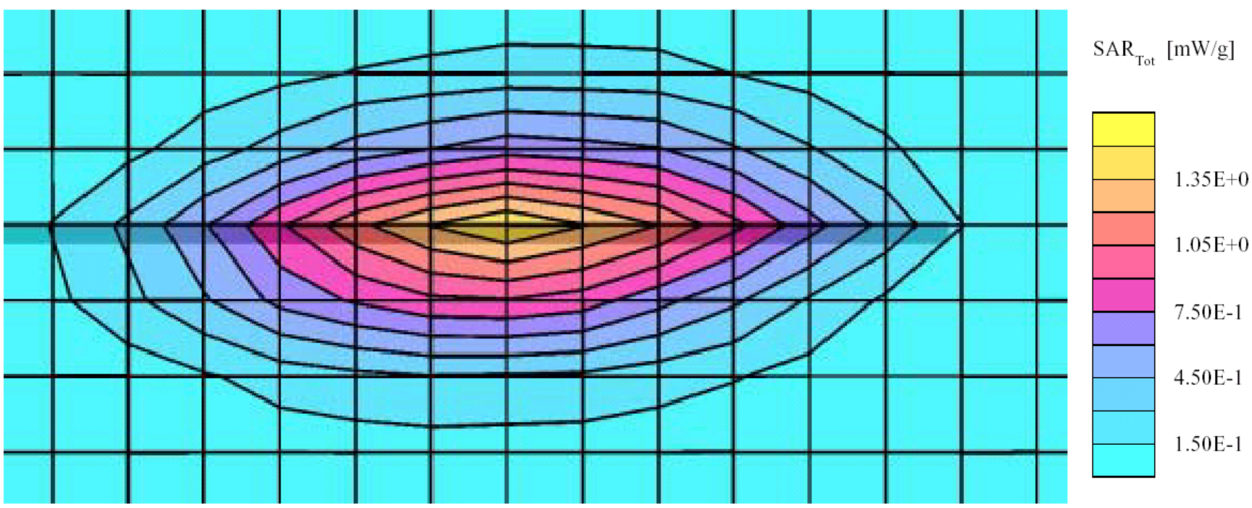
Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation	Limits [%]
Head	835	ε_r	21.0	41.5	40.9	-1.45	±5
		σ	21.0	0.90	0.88	-2.22	±5
		1g SAR	21.0	9.5	9.78	2.95	±10
Body	835	ε_r	22.0	55.2	54.4	-1.45	±5
		σ	22.0	0.97	0.96	-1.03	±5
		1g SAR	22.0	8.872	9.19	3.58	±10

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

Liquid Forward Power = 135 mW

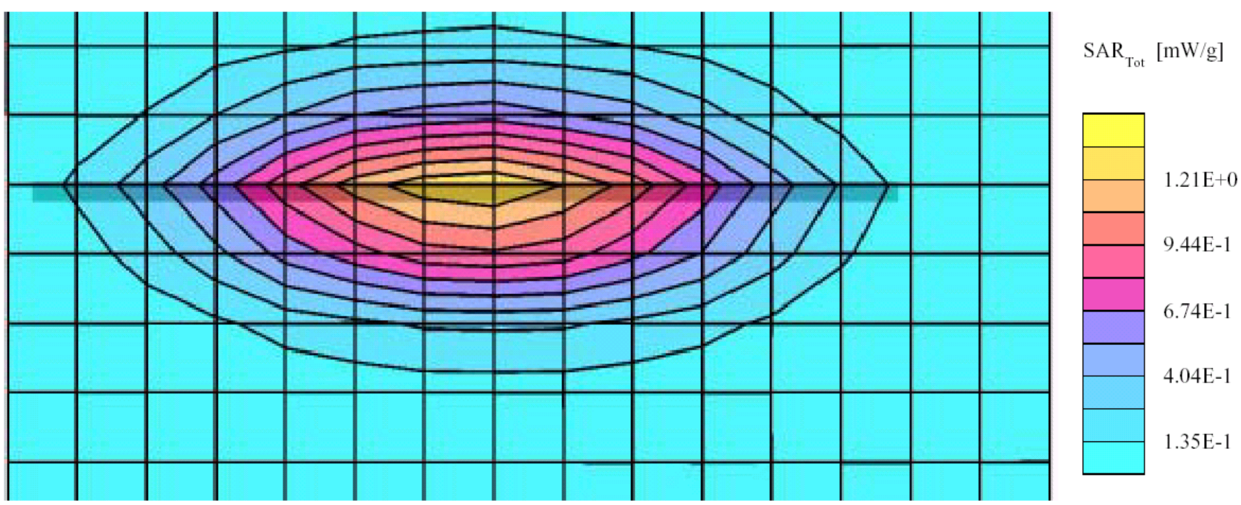
System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 21.54 dBm, 9/16/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.89 mho/m ε_r = 41.4 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.34 mW/g, SAR (10g): 0.742 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



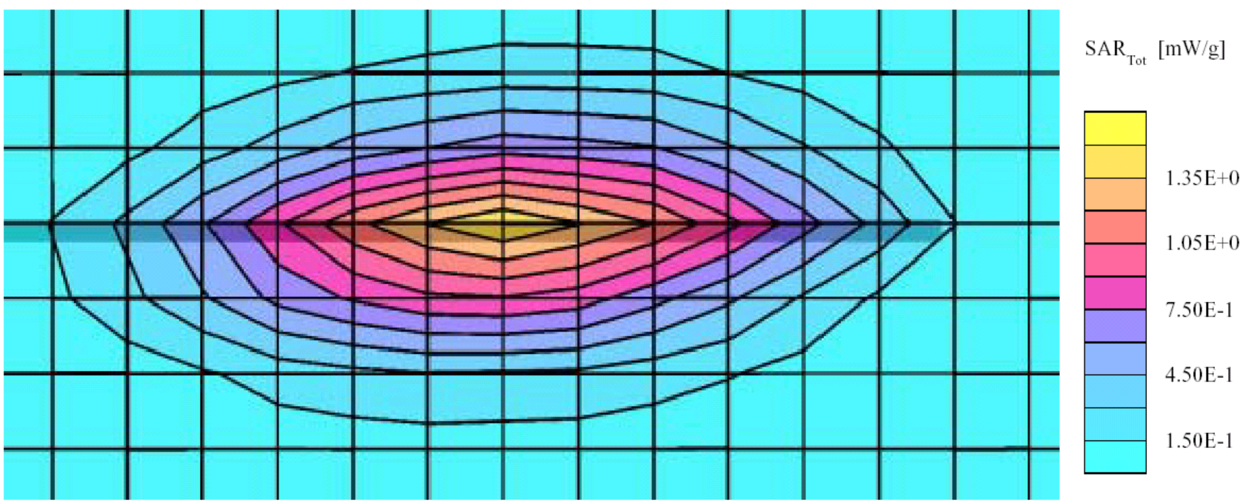
System Validation 835 MHz Body liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 21.51 dBm, 9/16/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.40,6.40,6.40); Crest factor: 1.0; 835 (Body) MHz: σ = 0.97 mho/m ε_r = 54.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.24 mW/g, SAR (10g): 0.705 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



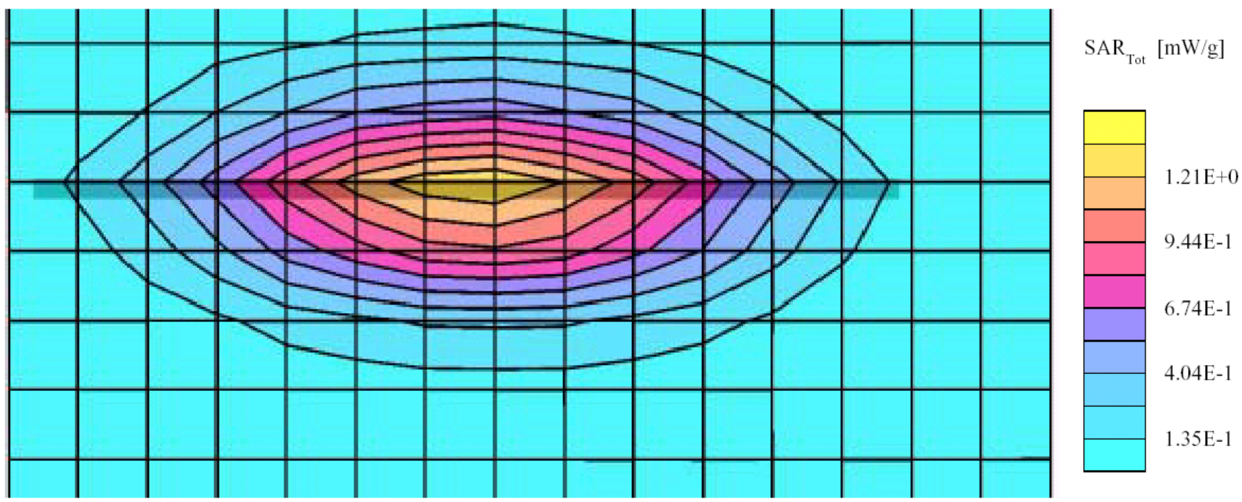
System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 21.54 dBm, 9/16/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.89 mho/m ε_r = 41.4 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.34 mW/g, SAR (10g): 0.742 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



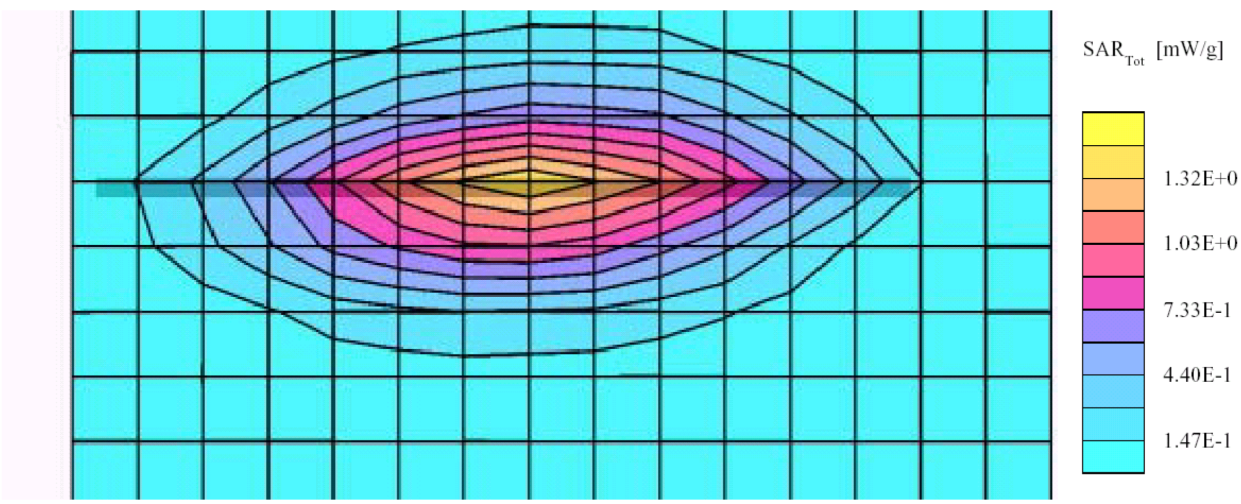
System Validation 835 MHz Body liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 21.51 dBm, 9/16/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.40,6.40,6.40); Crest factor: 1.0; 835 (Body) MHz: σ = 0.97 mho/m ε_r = 54.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.24 mW/g, SAR (10g): 0.705 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.02 dB



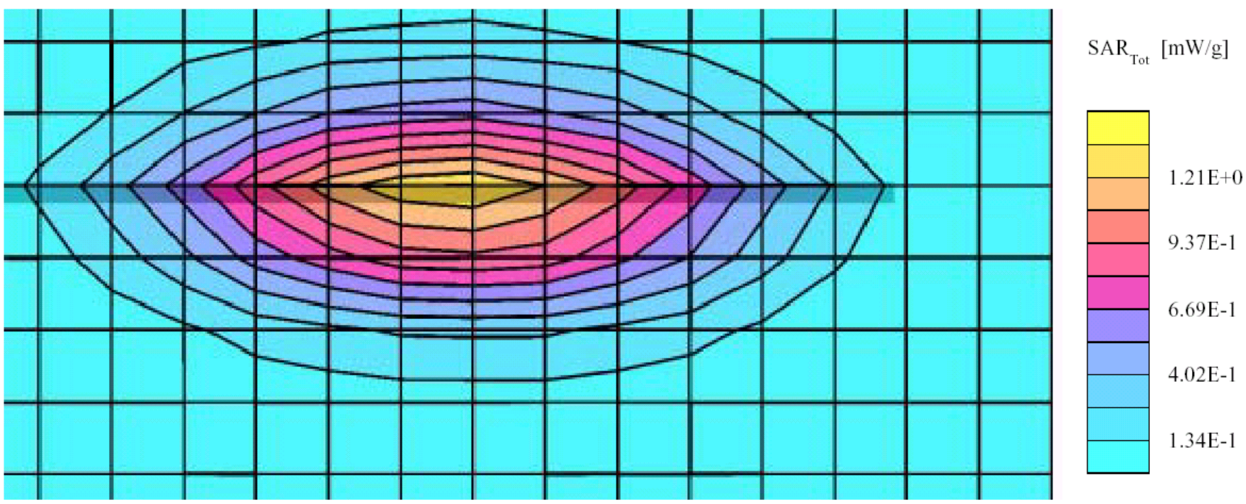
System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 21.43 dBm, 9/18/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.88 mho/m ε_r = 40.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.32 mW/g, SAR (10g): 0.730 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0



System Validation 835 MHz Body liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 21.48 dBm, 9/18/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.40,6.40,6.40); Crest factor: 1.0; 835 (Body) MHz: σ = 0.96 mho/m ε_r = 54.4 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.24 mW/g, SAR (10g): 0.703 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.00 dB

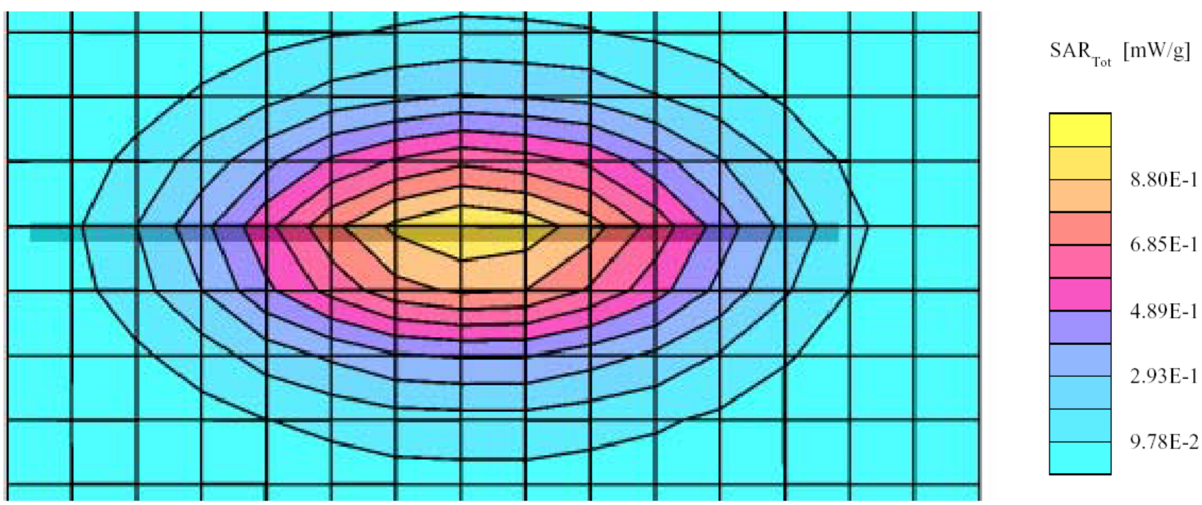


7.7 835MHz Head Liquid Probe Comparison Measurement Result

System Validation for Probe ET3DV6, S/N 1604:

System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 20.03 dBm, 10/27/2003)

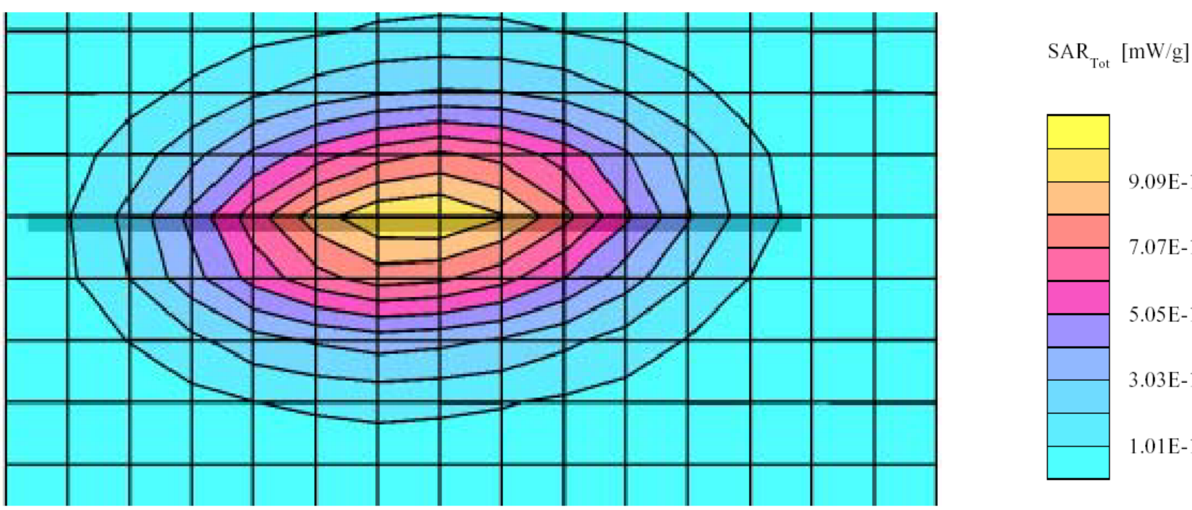
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1604; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 (Head) MHz: σ = 0.88 mho/m ε_r = 41.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.957 mW/g, SAR (10g): 0.562 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.04 dB



System Validation for Probe ES3DV2, S/N 3019:

System Validation 835 MHz Head liquid (Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, Forward Power = 20.01dBm, 10/27/2003)

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 = 0.88 mho/m ε_r = 41.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.944 mW/g, SAR (10g): 0.599 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.05 dB



Liquid validation for old probe and new probe:

frequency	e'	e''
815000000.0000	41.6784	18.9594
815800000.0000	41.6548	18.9960
816600000.0000	41.6532	18.9826
817400000.0000	41.6960	18.9560
818200000.0000	41.6273	18.9400
819000000.0000	41.6478	18.9304
819800000.0000	41.6525	18.9436
820600000.0000	41.6282	18.9145
821400000.0000	41.6570	18.9469
822200000.0000	41.6668	18.9416
823000000.0000	41.6506	18.9957
823800000.0000	41.6434	18.9887
824600000.0000	41.6212	18.9959
825400000.0000	41.5609	18.9687
826200000.0000	41.6105	18.9599
827000000.0000	41.6714	18.9590
827800000.0000	41.6953	18.9890
828600000.0000	41.6275	18.9322
829400000.0000	41.6154	18.9436
830200000.0000	41.6499	18.9693
831000000.0000	41.6999	18.9928
831800000.0000	41.6025	18.9849
832600000.0000	41.6173	19.0019
833400000.0000	41.5795	18.9378
834200000.0000	41.5522	18.9308
835000000.0000	41.5346	18.9688
835800000.0000	41.5565	18.9829
836600000.0000	41.6205	19.0210
837400000.0000	41.6171	19.0533
838200000.0000	41.6109	18.9972
839000000.0000	41.5361	18.9929
839800000.0000	41.5469	19.0195
840600000.0000	41.5562	19.0223
841400000.0000	41.5711	18.9985
842200000.0000	41.5525	18.9719
843000000.0000	41.6239	18.9781
843800000.0000	41.5551	18.9677
844600000.0000	41.5436	19.0193
845400000.0000	41.5216	18.9942
846200000.0000	41.5225	18.9356
847000000.0000	41.5523	18.9988
847800000.0000	41.5984	18.9826
848600000.0000	41.5384	18.9932
849400000.0000	41.5450	18.9888
850200000.0000	41.5531	19.0081
851000000.0000	41.5570	19.0170
851800000.0000	41.5712	19.0016
852600000.0000	41.5646	18.9745
853400000.0000	41.5670	18.9598
854200000.0000	41.5499	19.0254
855000000.0000	41.5494	18.9838